

AUTOMOTIVE +
TRANSPORTATION



In the not-too-distant future, transportation will become part of the Internet of Moving Things, connected vehicles will meet Smart Cities, ships will be controlled remotely and GPS, wireless radio and computers will enable Positive Train Control. The intersection of technology and the possibility pose demanding and interesting design challenges. From sensors to wiring harness components; from design to production; on-board and off-board – a TTI Transportation Specialist will help you keep moving in the latest direction. TTI has been successful for over 40 years because of two fundamentals – the industry's broadest and deepest interconnect, passive and electromechanical inventory, and the Specialists who know all about it.



LEADING EDGE
TECHNOLOGY





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With More than 6 Billion Components in Stock, There's a Good Chance TTI has Exactly What You Need

At TTI we just moved into our new custom-built 800,000 square foot distribution center. More than 6 billion parts, over 650,000 part numbers, zipping along miles of conveyors, pulled from acres of multi-story racks stocked with the parts you need. TTI has more specialized inventory than anyone in the business – from capacitors and resistors, to connectors and sensors, on the shelf and ready to ship. And now, we have even more of it.



Call your local TTI Specialist at 1.800.CALL.TTI or check us out online at ttiinc.com, chances are we have the components you can't find anywhere else.

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CABLE & CABLE MANAGEMENT

Standard Cable Ties

All-purpose standard cable ties are designed to arrange and secure bundles such as wires, cables, hoses, and more. Made of PA66 material, standard cable ties are available in 18- to 50-pound tensile strengths.



FEATURES & BENEFITS

- Inside serrations allow for strong hold on cables and wire bundles
- Head design provides high tensile strength with low insertion force
- Bent tail ensures a quick and simple installation
- Wide range of sizes, colors and tensile strengths

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

Standard Cable Ties Special Materials

Specialty material cable ties are available in various polymers for applications in extreme environments. Available materials include heat resistant, UV stabilized and chemical resistant blends with varying levels of humidity tolerance.



FEATURES & BENEFITS

- Various materials for extreme environments: PA66HS, PA66UV, PA46, TEFZEL, PAEK, PEEK
- Inside serrations allow for strong hold on cables and wire bundles
- Head design provides high tensile strength with low insertion force
- Bent tail ensures a quick and simple installation
- Wide range of sizes, colors and tensile strengths

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Military
- Aerospace

Heavy Duty Cable Ties

Heavy duty cable ties offer a higher tensile strength for heavy load applications. Available in 120- to 250-pound ratings, heavy duty cable ties are available in longer lengths, 8" to 52", for securing larger bundles.



FEATURES & BENEFITS

- Robust strap and head designs withstand aggressive motion environments
- Head design provides high tensile strength with low insertion force
- Bent tail ensures a quick and simple installation
- Wide range of sizes, colors and tensile strengths

APPLICATIONS

- Heavy truck and equipment
- Military
- Rail

Wide Strap Cable Ties

Wide strap cable ties have a wide-yet-flexible strap that conforms to bundles to minimize pinching. Available in 120-pound tensile strength in a variety of lengths for securing different bundle sizes.



FEATURES & BENEFITS

- Wide strap design to minimize pinching of delicate wire bundles, soft hoses and/or convoluted tubing
- Low-profile head provides compact fit around the bundle
- Clamping rails on the bottom of head to increase grip on bundles
- Bent tail ensures a quick and simple installation

APPLICATIONS

- Heavy truck and equipment
- Military
- Rail

Outside Serrated Cable Ties



Outside serrated ties are designed to minimize abrasion on sensitive wires, cables and hoses. Available in 18- to 50-pound tensile strengths, in lengths 4" to 15", these ties also feature a lower profile head design.

FEATURES & BENEFITS

- Outside serrations allow for a smooth surface on the interior surface touching the bundle
- Contour-style head design provides additional space in constrained areas

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

Double Head Cable Ties



Double head cable ties allow separation of two wire, cable or hose bundles. The tie's second loop may be secured around a fixed object to secure the bundle without the need for additional fasteners. Available in 50- and 120-pound tensile strengths, in lengths 6" to 15.5".

FEATURES & BENEFITS

- Tie contains a dual-locking design to secure two bundles at once
- Head design can also provide spacing between parallel bundles
- Bent tail allows for quick insertion into head

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

Stainless Steel Cable Ties



Stainless steel cable ties are designed with a ball bearing locking mechanism to ensure high tensile strength and easy insertion when securing hoses, cables, pipes and more. Available in 304- and 316-grade stainless steel.

FEATURES & BENEFITS

- Provides protection when used where there is potential for corrosion, fire or temperature extremes
- Ball bearing locking mechanism ensures high tensile strength and easy insertion

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Shipbuilding and marine

Releasable Cable Ties



Releasable cable ties are designed for easy removal and reuse. Available in standard and heavy duty tensile strengths, in lengths 5" to 40", for securing a variety of bundle sizes.

FEATURES & BENEFITS

- Release feature in the head provides easy access to wire bundles when future changes are necessary
- Head design provides high tensile strength even after repeated use, ensuring extended longevity

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

Fir Tree Mount Cable Ties

Fir tree mount cable ties feature a versatile, highly engineered fir tree mount that inserts easily into a surface hole to provide a secure fastening point for cable and wire bundles.



FEATURES & BENEFITS

- Fir tree style mount provides low insertion force and high extraction force
- Design of the fir tree ensures a positive and secure attachment in a wide range of panel thicknesses
- Disc on top of the fir tree covers the hole and minimizes the ingress of water and debris
- Wide range of fir tree sizes for different hole types, hole sizes and panel thicknesses

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery



Arrowhead Mount Cable Ties

Arrowhead mount cable ties feature an integrated mount design that inserts quickly into a surface hole with an audible click, assuring the installer it has been properly installed.

FEATURES & BENEFITS

- Arrowhead style mount provides low insertion force and high extraction force
- Easy and quick insertion ideal for a production environment
- Ties click into place upon final installation assuring installer insertion is complete
- Wide range of arrowhead sizes for different hole types, hole sizes and panel thicknesses

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery
- Aerospace

Offset Fir Tree Cable Ties

Offset fir tree cable ties serve as a robust solution for securing bundles beside mounting holes or surfaces. The dense design of the offset bar helps ensure limited bundle movement.



FEATURES & BENEFITS

- Offset design allows bundles to sit beside mounting points to keep mount exposed or position bundle where a mounting point is unavailable
- Fir tree style mount provides low insertion force and high extraction force
- Disc on top of the fir tree covers the hole and minimizes the ingress of water and debris
- Wide range of offset lengths and fir tree sizes for different hole types, sizes and panel thicknesses

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery

Stand-Off Fir Tree Cable Ties

Stand-off fir tree cable ties serve as a robust solution for securing bundles positioned above mounting holes or surfaces. The dense design of the stand-off bar helps ensure limited bundle movement.



FEATURES & BENEFITS

- Stand-off design positions bundles away from mounting points to avoid friction against surrounding areas
- Fir tree style mount provides low insertion force and high extraction force
- Disc on top of the fir tree covers the hole and minimizes the ingress of water and debris
- Wide range of stand-off lengths and fir tree sizes for different hole types, sizes and panel thicknesses

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery

Stud Mount Cable Ties

Stud mount cable ties attach and secure bundles to a stud, bolt, or machine screw stud. Stud mount cable ties are available with different mount orientations to accommodate a variety of applications.



FEATURES & BENEFITS

- Fast and easy installation is ideal for quick-connect manufacturing environment
- Low insertion force allows it to be installed onto the stud without the use of tools
- Wide range of mount sizes for different stud types, sizes and lengths
- Various orientations to position bundle above or next to stud

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery

Edge Clip Cable Ties

Edge clip cable ties secure wire and cable bundles to plastic or metal frame edges without the need for holes. These assemblies are available with edge clips that accommodate different panel thicknesses and cable routing orientations.



FEATURES & BENEFITS

- Applies easily to plastic and metal edges without the need for a mounting hole
- Provides low insertion force and high extraction force, ideal for assembly environments
- Various orientations to position bundle above or next to edge

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery

Blind Hole Mount Cable Ties

Blind hole mount cable ties for threaded and non-threaded holes are designed to accelerate bundling and affixing to deep holes without continuing through to the opposite end.



FEATURES & BENEFITS

- Delivers high extraction force for reliable performance, yet it's easy to install
- Eliminates extra hardware versus traditional screw mounts
- No need to force other solutions not intended for blind holes

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery

Omega C-Clip Cable Ties

Omega C-Clip cable ties allow for bundle separation without the need for a second cable tie installation. The design eases the application process on the production floor by allowing for an easy, one-step snap fit of the harness assembly to the wire or hose.



FEATURES & BENEFITS

- C-Clip can be turned 360 degrees, allowing for orientation in any direction
- The C-shape opening allows for easy insertion and removal of wire, tubes and hoses
- Design allows quick and easy installation by hand without the need for tools
- Various sizes available for varying bundle diameters

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery
- Aerospace

Ratchet P-Clamps



Ratchet P-Clamps offer versatility when managing wires, cables, and hoses. Offered in four sizes and in several mounting configurations, the reusable design minimizes part inventory, speeds fastening and simplifies maintenance.

FEATURES & BENEFITS

- One-piece ratchet closure design allows for easy installation during pre- or final assembly
- Clamp interior is designed to guide and center bundle to reduce pinching
- Easy release feature allows for quick adjustments and maintenance
- Steel mounting plate tolerates high torque mounting and is treated to resist chemicals and salt spray

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Shipbuilding and marine
- Rail

Heavy Duty Mounts



Heavy Duty Mounts attach with a screw or bolt to an existing hole, providing a fastening point for securing and routing a single bundle together with a heavy-duty cable tie.

FEATURES & BENEFITS

- Mount and tie combination makes it easy to service bundles in the field
- Eliminates the needs for multiple sized fix diameter clamps, reducing part numbers and complexity
- Offered in different torque capacities for various applications

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery

Connector Clips



Connector Clips offer an easy way to secure and mount wire harnesses via the harness connector to a panel.

FEATURES & BENEFITS

- Provides secure mounting of a connector housing in the bundle routing application
- Variety of mount options including edge clip, fir tree and stud mount styles
- Various slot designs to mate with all leading connector manufacturers

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery

Bundling Clips



Bundling Clips provide a simple method of securing wire and cable with cable ties or electrical tape. The clips are designed for applications that require the bundle to be secured onto a surface using a mounting hole or edge.

FEATURES & BENEFITS

- Offered in standard and standoff orientations for all types of bundle routing
- Variety of mount options including edge clip, fir tree and push mount styles

APPLICATIONS

- Automotive
- Heavy truck and equipment
- Industrial machinery

MOC Routing Clips

MOC routing clips feature open clips design for securing and separating tube and pipe routings as well as harnesses, cables and hoses. Available in rotatable clip pairs, coupled to ties or locking clips or with integrated fir tree mounts, the MOC is designed to prevent disengagement while allowing easy routing installation.



FEATURES & BENEFITS

- Open design allows for ergonomic installation of routings
- Patented double retention features and smaller opening prevent inadvertent disengagement
- Three attachment directions allow for a variety of configurations
- Various fir tree mounting options available to secure routings to surfaces

APPLICATIONS

- Automotive
- Heavy Truck and Equipment
- Industrial Machinery

Flexible Conduit and Fittings - HelaGuard Non-metallic



HelaGuard Non-metallic series includes flexible corrugated conduit that offers high-fatigue life properties and snap-on liquid-tight fittings for high-ingress protection. The system provides a highly versatile and lightweight solution for flexible cable management protection.

FEATURES & BENEFITS

- Conduit materials address standard routing applications: standard, flame retardant and continuous motion
- Nylon fittings provide superior tensile strength with a simple snap-on and twist motion
- Fittings achieve various levels of IP ratings for ingress protection
- Multiple fitting configurations serve all forms of routing: straight, elbow, flanges, T-connections, etc.

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Shipbuilding and marine
- Rail

Heat Shrinkable Molded Shapes



Heat shrinkable molded shapes offer important functional and cost saving benefits for electrical and electronic applications ranging from insulation and protection of individual components to fabrication of complete inter-connecting cable harness assemblies.

FEATURES & BENEFITS

- Quick and easy installation with high electric strength, mechanical toughness and superior chemical and environmental resistance.
- Strain-relieving boots, transitions and connector backshell covers, as well as other specialized shapes are available.

APPLICATIONS

- Military
- Aerospace
- Rail
- Heavy Truck and Equipment

Flexible Conduit and Fittings - HelaGuard Metallic



HelaGuard Metallic series includes galvanized, jacketed and liquid-tight metal core conduits that offer exceptional flexibility, a high degree of mechanical strength and wide range of protection against environmental conditions.

FEATURES & BENEFITS

- Conduit materials address aggressive routing applications: flameproof, corrosion resistance, aggressive motion and constrained spaces
- Metallic fittings provide a robust connection for the harshest environments
- Fittings achieve various levels of IP ratings for ingress protection
- Multiple fitting configurations serve all forms of routing: straight, elbow, flanges, couplers, etc.

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Shipbuilding and marine
- Rail

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Braided Sleeving - Specialty



Specialty sleeving provides protection against flame, heat and/or electromagnetic interference.

FEATURES & BENEFITS

- Materials include PA66, PA66 Helagaine, Polyester (PET) Plenum Rated Halar® and Electromagnetic Helagaine
- Available in a wide range of diameters and reel sizes
- Cuts cleanly with a hot knife and installs easily

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Shipbuilding and marine
- Rail

Braided Sleeving - Wraps



Wrap sleeving products are designed for easy application and removal. They feature a lateral split and overlapping design with one design featuring a hook and loop closure strip.

FEATURES & BENEFITS

- Styles include split wrap, hook & loop expandable, and split wrap woven
- Split wrap design installs quickly, saving assembly time and future accessibility without disassembly
- Available in a wide range of diameters and reel sizes
- Cuts cleanly with a hot knife and installs easily

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Shipbuilding and marine
- Rail

Sleeving - High Temperature



High temperature sleeving products protect wires and cables in applications with temperatures in excess of 491°F (255°C).

FEATURES & BENEFITS

- Materials include resin-saturated fiberglass, highly flexible Nomex® and heat reflective aluminum laminated fiberglass
- Available in a wide range of diameters and reel sizes
- Cuts cleanly with scissors and installs easily

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Shipbuilding and marine
- Rail

Installation Tools - EVO7



EVO7 mechanical hand tool is ergonomically designed to reduce the risks of repetitive stress injuries to operators while increasing productivity. Available in a standard grip span (EVO7) or short grip span (EVO7SP) for smaller hands.

FEATURES & BENEFITS

- Provides clean, flush cuts for 18 to 80 lb. cable ties
- Features Tension/Lock/Cut technology, which delivers performance, safety and comfort for the operator
- Contoured soft trigger and air-cushion handle keep the wrist in an upright, neutral position providing greater control
- Lightweight tool with the most technologically advanced ergonomic design for reducing work-related risks
- Easy-to-adjust tension knob offers 33 settings for precise, repeatable applications

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

Installation Tools - EVO9



EVO9 mechanical hand tool is ergonomically designed to reduce the risks of repetitive stress injuries to operators while increasing productivity. Available in a standard tension (EVO9) or high tension (EVO9HT) model optimized for the highest tensile strength cable ties.

FEATURES & BENEFITS

- Provides clean, flush cuts for 50 to 250 lb. cable ties, including wide strap ties
- Features Tension/Lock/Cut technology, which delivers performance, safety and comfort for the operator
- Contoured soft trigger and air-cushion handle keep the wrist in an upright, neutral position providing greater control
- Lightweight tool with the most technologically advanced ergonomic design for reducing work-related risks
- Easy-to-adjust tension knob offers 33 settings for precise, repeatable applications

APPLICATIONS

- General purpose and heavy duty industrial applications
- Wire and cable assembly manufacturing

Automatic Installation Tools - AT2000 CPK



AT2000 CPK automatic cable tie tool applies 18 lb. tensile strength cable ties in bandoliers of 50 or reels of 5000, with the ability to tie bundles up to 0.75" in 0.8 seconds.

FEATURES & BENEFITS

- Cable ties are installed quickly with the press of a trigger, increasing productivity and decreasing labor costs
- Ergonomic design features a comfortable grip, low weight and easy trigger pressure to reduce installer effort
- Visual panel and computer connectivity provide critical operational feedback and diagnostics to ensure quality and uniformity
- Adaptable to almost any manufacturing setting; can be used handheld, bench mounted, suspended or integrated into a robotic application

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

Automatic Installation Tools - AT2060

AT2060 automatic cable tie tool applies 30 lb. tensile strength cable ties in bandoliers of 30 or reels of 3000, with the ability to tie bundles up to 1.25" in 1.2 seconds.



FEATURES & BENEFITS

- Cable ties are installed quickly with the press of a trigger, increasing productivity and decreasing labor costs
- Ergonomic design features a comfortable grip, low weight and easy trigger pressure to reduce installer effort
- Visual panel provides critical diagnostics to ensure operator efficiency
- Adaptable to most manufacturing settings; can be used handheld, bench mounted or suspended

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

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Automatic Installation Tools - ATS3080



ATS3080 automatic cable tie tool applies 50 lb. tensile strength cable ties with the ability to tie bundles up to 3.14" in 1.3 seconds. This tool uses a strap and closure system for waste-free applications.

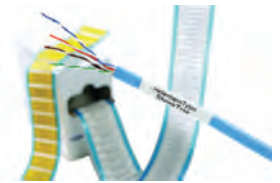
FEATURES & BENEFITS

- Provides a waste-free application process by using a continuous feed strap and closure system
- Cable ties are installed quickly with the press of a trigger, increasing productivity and decreasing labor costs
- The ergonomic design features a comfortable grip, low weight, and easy trigger pressure to reduce installer effort
- Visual panel provides critical diagnostics to ensure operator efficiency
- Adaptable to most manufacturing settings; can be used handheld, bench mounted or suspended

APPLICATIONS

- General purpose industrial applications
- Wire and cable assembly manufacturing

Identification - ShrinkTrak



ShrinkTrak heat shrinkable labels make it easy to mark wire, cable and other components. For use with thermal transfer printers, labels are available with side or center slit for easy application. The 3:1 shrink ratio means each marker covers a wide range of wire diameters.

FEATURES & BENEFITS

- Side slit and optional center slits for easy wire insertion
- Smooth surface for clean and legible printing
- Supplied on a ladder style carrier so markers can be kitted after printing
- 3:1 shrink ratio means fewer skews as each marker covers a wider range of wire diameters

APPLICATIONS

- Heavy truck and equipment
- Industrial machinery
- Rail
- Military

Thermal Transfer Printers

Thermal transfer printer options for low- to high-volume, industrial-grade printing. HellermannTyton thermal transfer printers use heat and specialized ink ribbons to create long lasting, durable labels for a variety of industrial applications and environments.



FEATURES & BENEFITS

- TT230SM/SMC: ideal for small- to medium-volume users looking for ease of use
- TTM430/460: ideal for medium- to large-volume users looking for both ease of use and extreme functionality
- TagPrint® Pro 3.0 software for use across printer platforms offers user-friendly and intuitive experience

APPLICATIONS

- Printers for industrial grade and volume printing
- Heavy truck and equipment
- Industrial machinery
- Rail
- Military

Heavy-Duty Double Clamp Cable Ties

The Pan-TY® Double Clamp cable ties provide a cost-effective way to secure and separate parallel hoses, tubing, wires, and wiring bundles in an easy to install one-piece design. The Double Clamp cable tie has a strong 150lbs. loop tensile strength to provide secure support for even high load applications. The new cable tie is ideal for heavy-duty applications such as truck and heavy equipment.



Part Number	Max. Bundle Dia.		Length		Width		Thickness		Min. Loop Tensile		Recommended Installation Tool	Std. Pkg. Qty.	Std. Ctn. Qty.
	inch	mm.	inch	mm.	inch	mm.	inch	mm.	lb.	N			
PLDC1.5EH-C350	1.3	33	13.1	332.7	0.5	12.73	0.057	1.5	150	667.2	GS4EH-E, PPTEH	100	500
PLDC2.5EH-C350	2.3	58.4	19.28	489	0.5	12.73	0.057	1.5	150	667.2	GS4EH-E, PPTEH	100	500

FEATURES & BENEFITS

- Offers multiple loop capability
- Prevents bundle damage with a strap body that spreads the clamping forces
- Provides high tensile strength
- Installs easily by hand, uses Panduit® tooling for repeatable tension and cutoff
- Reduces part number inventory with a single product to cover multiple bundle sizes

APPLICATIONS

- Underhood hose and harness routing
- Areas where bundles must be secured parallel to each other or another element

Pan-Ty® Cable Tie - Flexible Heavy Cross Section

Provides excellent tensile strength that is expected with a heavy cross section design. These cable ties install quickly and more easily than the typical heavy cross section ties. This innovative design allows no-slip gripping of the tip along with the ability to cinch with one hand. Installation with Panduit GTH-E or GS4H-E cable tie hand tools provide faster installation, exact bundle tension and smooth tie cut off. This flexible heavy cross section is ideal for heavy-duty applications such as truck, bus, and heavy equipment.



Part Number	Length		Width		Thickness		Max. Bundle Dia.		Min. Loop Tensile Str.		Material	Std. Pkg. Qty.	Std. Ctn. Qty.
	inch	mm.	inch	mm.	inch	mm.	inch	mm.	lb.	N			
PLT4H-TL0/147	14.5	368	0.300	7.6	0.060	1.5	4.11	104.5	120	534	Weather resisant nylon 6.6	250	2500
PLT4H-TL30/147	14.5	368	0.060	7.6	0.060	1.5	4.11	104.5	120	534	Heat stabilized nylon 6.6	250	2500

FEATURES & BENEFITS

- Allows installation of the cable with one hand
- No-slip gripping of tail on initial insertion
- Provides a low thread force for quick and easy installation to improve productivity and worker safety
- Easier, faster installation with lower installer effort to install ties to proper tension settings
- Available in both weather resistant (-0) and heat stabilized (-30) materials for application versatility

Heavy-Duty Mounts and Assemblies

Panduit® offers many accessories for mounting the Pan-Ty® wide strap extra heavy cable ties, including: extra-heavy screw applied cable tie mounts. In addition to these accessories, the Pan-Ty® wide strap extra heavy cable ties are also available pre-assembled with mounting accessories.



Part Number	Used with Cable Ties ‡	Material	Color	Environment	Mounting Method	Std. Pkg. Qty.	Std. Ctn. Qty.
TMEH2S5-D350	M, I, S, HS, LH, H, EH	Impact modified heat stabilized weather resistant nylon 6.6	Black	Outdoors or Indoors	#10 (M5) Screw	500	2,000
TMEH2S6-D350					1/4 (M6) Screw	500	2,000
TMEH2S8-D350					5/16 (M8) Screw	500	2,000

Fir Tree Push Mounts and Assemblies

FEATURES & BENEFITS

- Unique alternating barb design
- Lock securely into position
- Umbrella tensioning
- Exclusive contoured anvil head
- Fewer parts throughout the manufacturing/assembly process
- Heat stabilized Nylon 6.6



Part Number	Used with Cable Ties	Head Diameter		Panel to Top of Mount		Overall Height		Panel Hole		Panel Thickness Range		Std. Pkg. Qty.	Std. Ctn. Qty.
		inch	mm.	inch	mm.	inch	mm.	inch	mm.	inch	mm		
PUME925-D350 NEW!	M, I, S, LH, H, EH	1.00	25.4	0.317	8.0	1.15	29.2	0.34-0.36	8.8 - 9.3	0.04 - 0.62	1.0 - 16.0	500	5000

Part Number	Used with Cable Ties	Head Diameter		Panel to Top of Mount		Overall Height		Panel Hole		Panel Thickness Range		Max. Bundle Diameter		Std. Pkg. Qty.	Std. Ctn. Qty.
		inch	mm.	inch	mm.	inch	mm.	inch	mm.	inch	mm				
PUME925-3E-C350 NEW!	M, I, S, LH, H, EH	1.18	30.0	0.275	7.0	1.10	28.0	0.34-0.36	8.8 - 9.3	0.04 - 0.62	1.0 - 16.0	3.25	82.6	100	1000
PUME925-4E-C350 NEW!												4.13	105	100	1000

Cable Tie Tools- Tool Controlled Tension Cut and Cut Off

FEATURES & BENEFITS

- Tool controlled tension provides flush cut off and speeds installation
- Lightweight and balanced
- Easy to change tension adjustment and easy to operate
- Used in production and maintenance



GTS-E

GS2B-E

GTH-E



GS4H-E

GS4EH-E

Rail – Cables

100G Series Light Power and Instrumentation Wire



FEATURES & BENEFITS

- Small size, lightweight
- Zero halogen
- 19/37/56 strand conductors depending on size
- Excellent handling and flexibility
- Outstanding resistance to oils
- Excellent scrape abrasion and cut through
- Voltage rating: 750V
- Conductor cores 0.15mm² to 4.0mm²
- Temperature rating: -30°C – 125°C
- Flexible (does not wrinkle on bending)
- Dual wall construction (notch and abrasion resistant)

ZHPCG Power Cable

FEATURES & BENEFITS

- Radiation cross-linked insulation system
- Zero halogen
- Low smoke
- Flame retardant
- Fluid resistant jacket
- Excellent handling and flexibility
- Full range of sizes: 1.5mm² – 240mm²
- Available in IEC 60228 Class 5 and 6 conductor stranding
- Tin-plated copper conductors
- Temperature rating: -30°C – 105°C



Railways Cable Multicore

FEATURES & BENEFITS

- Small size, lightweight
- Limited fire hazard
- Custom designed to application requirements
- Greater flexibility in the choice of routings
- Mixed sizes, component types and functionality
- Excellent handling and flexibility
- Optional shielding internal and external
- Segregation of cabling
- Easy to install and maintain
- Wide range of temperatures
- Wide range of jacket materials to suit application requirements



Rail Cat 7 Data Cables

Rail approved zero halogen, high speed data cables. TE Connectivity introduces the new high performance, networking cables for railway ethernet applications. The new cable reads rates of 1Gbps, expanding design capabilities into broader bandwidth Ethernet applications.



FEATURES & BENEFITS

- Obtain data rates of 1Gbps
- Expand design capabilities for broader bandwidth
- Ethernet connections with increased speed
- Stranded conductors for flexible cable application use
- Zero halogen jacket
- High performance rail approved to EN45545-2

APPLICATIONS

- Railway CCTV/passenger information
- Trackside control cabinets
- Entertainment systems
- Industrial switches, routers, servers, hubs
- Sensor systems
- Video link

Industrial Rail Low Fire Hazard Wire 100E Wire and Cable

This rail-approved wire and cable is fully compliant to all of the clauses specified in EN50306-2, EN50306-3, EN50306-4. The wire meets all of the thin-walled EN rail approvals, and is suitable for all new rail builds within the EU.



FEATURES & BENEFITS

- Lightweight, thin-walled leading to reduce bundle volume and weight
- Approximately 30% lighter than conventional thick-walled wire, giving significant energy savings to the end user
- Approximately 50% saving in bulk of wire giving more room for the train designer, builder and passengers
- Compliant to EN50306-2,-3,-4 thin-wall rail standard, meaning it is suitable to be used in passage trains close to passengers

APPLICATIONS

- Rail market rolling stock
- Underground metro tunnels
- All signal and power applications for rolling stock and tunnels



Cable ID/Labels

TMS-SCE Military Grade Heat-shrinkable Wire Identification Sleeves



TMS-SCE marker sleeves are designed to meet the wire and cable marking needs of manufacturers with high-performance requirements.

Made from durable, flame-retardant, radiation cross linked heat-shrinkable polyolefin, TMS-SCE can be used in a wide variety of applications including aerospace, military, motor sports and oil and gas. TMS-SCE meets the performance requirements of SAE-ASM-DTL-23053/5 class 1. The marks are permanent immediately after printing and remain legible even when exposed to abrasion, aggressive cleaning solvents, and military fuels and oils. TMS-SCE meets the mark permanence requirements of SAE AS81531 4.6.2 and MIL-STD-202. TMS-SCE is supplied with a 3:1 shrink ratio. The lightweight 3:1 products provide extremely fast shrinking and cover a wider range of wire diameters, thus simplifying inventory.

FEATURES & BENEFITS

- Permanent identification sleeves
- Computer printable
- Lightweight for aerospace applications
- Military specification material and print performance
- 2:1 shrink ratio
- CSA certified
- UL recognized
- VW all flame tubing test rated
- Quick for heat sensitive areas

APPLICATIONS

- Rail
- Military
- Aerospace
- Marine

ZHD-SCE Heat-shrinkable Wire Identification Sleeves



ZHD-SCE Low Fire Hazard, fluid resistant heat-shrinkable wire identification sleeves.

ZHD-SCE is designed specifically for applications requiring the highest performance from an identification sleeve, without compromising on safety or capability. ZHD is designed to bridge the gap between D-SCE and HX-SCE, by being both zero halogen and diesel resistant. ZHD-SCE can be used in a wide variety of applications including rail, mass transit, motorsports and industrial.

FEATURES & BENEFITS

- Meets industry standards, including EN45545-2
- Zero halogen
- Diesel resistant
- Resistant to key rail and industrial fluids including diesel (defined by RW-2536)
- Low toxic fumes
- Non-flame propagating
- Shrink ratio 2:1
- Single product enables inventory reduction
- Decreases set-up and change-over frequency

APPLICATIONS

- Rail
- Industrial
- Military
- Aerospace

HX-SCE Low Fire Hazard Heat-shrinkable Wire Identification Sleeves



HX-SCE is a thin-walled, zero halogen, low smoke, low toxicity, radiation crosslinked, polyolefin heat-shrinkable tubing, assembled as cut sleeves organized in a ladder format.

Ideal for applications where limited fire hazard characteristics are necessary. The zero halogen material coupled with low smoke and low toxic fume emissions make this product best used in enclosed spaces such as mass transit, marine and industrial applications. This product is not recommended where strain relief properties are required. Supplied in a "ladder format", sleeves are held horizontally between two polyester strips and offers ease of printing and kitting.

FEATURES & BENEFITS

- Zero halogen
- Low toxic fumes
- Low smoke
- Self-extinguishing, non-flame propagating
- Low heat release rate
- Resistant to key industrial and rail fluids (defined by RW2072)
- Excellent resistance to burning (typical LOI 39%)
- Sleeve diameters from 2.4
- 2:1 shrink ratio

APPLICATIONS

- Pre-termination cable identification
- Particularly suitable for locations with a fire risk to human life or equipment
- Mass transit – rail, aerospace, marine and industrial

D-SCE Fluid Resistant Heat-shrinkable Wire Identification Sleeves



D-SCE markers are used to identify wires and cables where exposure to organic fluids, especially oils, is required.

D-SCE markers are designed to operate in elevated temperatures for extended periods of time. They are suitable for use in environments with temperatures of -55°C to +135°C (-67°F to +275°F), and will provide strain relief, insulation and protection from mechanical abuse.

FEATURES & BENEFITS

- Supplied with side scoring
- Resistance to organic fluids, common fuels, lubricants and solvents
- 3:1 shrink ratio
- Wide range of sizes for several wire and bundle diameters
- Formulated for use in harsh environments
- Dot matrix and thermal printable – both print technologies meet all specifications and approvals list

APPLICATIONS

- Rail
- Industrial
- Military
- Aerospace



TE Connectivity Cable Management

HLX-NEL Narrow Edge Leading Low Fire Hazard Tie-On Printable Cable Marker Tags

HLX-NEL Cable Markers are designed to offer flexibility when it comes to wire and cable identification.

Manufactured from the same low fire hazard, UV stabilized material as HLX, with the difference being that it is assembled in a Narrow Edge Leading (NEL) format. Ideal for applications where low fire-hazard characteristics (low smoke, low toxicity and low flammability) and UV protection are critical. Applied using cable ties, HLX-NEL Cable Markers give the ability to identify large diameter wire and cable, as well as post connector installation.









FEATURES & BENEFITS

- Excellent resistance to burning – typical LOI 39%
- Zero halogen
- Low toxic fumes
- Low smoke
- Self-extinguishing
- Recommended for use where combustion of products may endanger personnel or delicate electronics at risk
- Resistant to key industrial and rail fluids
- Ideal for low volume applications
- Cost effective identification solution
- Ideal for pre- or post-termination assembly





CAPACITORS


SMT Ceramic Capacitors

Product	Description	Dielectric	Operating Temp	Range
Tin Termination				
	AVX Ceramic Capacitors exhibit low parasitics and excellent EMI filtering capabilities. AVX MLC Capacitors are available in a wide range of values, styles, voltage ratings and dielectrics. Ultra Low ESR NPO – “U” dielectric parts are designed for RF applications requiring ultra-low ESR. NPO parts are suitable for use in MHz range with very stable characteristics. X7R parts are suitable for use in general kHz range. X8R/X8L parts are designed for high temperature applications up to +150°C. (+150°C X7R option available.)	Ultra-low ESR NPO	+125°C	50V - 200V 0.2pF - 1.0nF
		NPO	+125°C	25V - 100V 1pF - 4.7nF
		X7R	+125°C	16V - 500V 220pF - 22μF
		X7R High Voltage	+125°C	600V - 3000V 100pF - 0.15μF
		X8R/X8L/X7R*	+150°C	25V - 100V 330pF - 4.7μF
FLEXITERM®				
	MLC Capacitors equipped with an AVX flexible termination system – FLEXITERM®. Capacitors have superior resistance to both – mechanical stress (board flexure – 5mm bend test guaranteed) and thermal stress (increased temperature cycling performance, 3000 cycles and beyond). (+150°C X7R option available.)	X7R	+125°C	16V - 200V 270pF - 22μF
		X7R High Voltage	+125°C	600V - 3000V 100pF - 0.15μF
		X8R/X8L/X7R*	+150°C	25V - 100V 330pF - 4.7μF
FLEXISAFE				
	Specifically designed with an industry-leading set of safety features for safety critical applications. Combines FLEXITERM™ layer in conjunction with the cascade design.	X7R	+125°C	16V - 100V 1nF - 470nF
ESDSafe				
	Enhanced MLC capacitor designed specifically for general ESD protection.	X7R	+125°C	25V - 100V 4.7nF - 22μF
IPC Array				
	Capacitor array is an Integrated Passive Component (IPC) and associates up to four capacitance elements in a single case and is ideal for use in modern integrated circuits in automotive applications. It offers PCB space saving, increased assembly line output and better electrical performance thanks to small dimensions. Available also with FLEXITERM® for X7R and X8R range.	NPO	+125°C	16V - 100V 1pF - 470pF
		X7R	+125°C	10V - 100V 220pF - 100nF
		X*R	+150°C	16V 220pF - 680pF
EMI Filter				
	Capacitor with excellent filtering capability thanks to the feed-thru L-C-T like filter design.	NPO and X7R	+125°C	50V - 100V 22pF - 47nF


Leaded Ceramic Capacitors

Product	Description	Dielectric	Operating Temp	Range
Radial				
	AVX leaded MLCCs offer excellent mechanical shock and vibration resistance in harsh environment applications. With a wide range of dielectric materials, capacitance values, voltage ratings and lead styles, leaded capacitors offer robust mechanical shock and vibration characteristics, exceptional thermal resistance and proven reliability and quality. Both dipped and molded configurations available	NPO	+125°C	50V - 200V 1pF - 8200pF
		X7R	+125°C	50V - 100V 470pF - 10μF
		X7R High Voltage	+125°C	1000V - 3000V 470pF - 10nF
		X8R	+150°C	50V 1nF - 330nF
Axial				
	Axial version of the leaded epoxy coated capacitors. Both dipped and molded configurations available.	X7R	+125°C	50V 1nF - 4.7μF


Tantalum Capacitors

Product	Description	Series	Operating Temp	Range
Tantalum Capacitors				
	AVX automotive tantalum capacitors offer high ripple and surge current capability and resistance against thermo-mechanical stresses. Parts are available in standard and low ESR options and also in high temperature series up to +175°C while respecting the requirements for high reliability which make them suitable for a wide range of automotive control circuits in applications such as engine control units, ABS systems, MDPS, electronic gearboxes, TPMS, etc.	TAJ	+125°C	6.3V - 50V 0.22μF - 680μF
		F93-AJ6	+125°C	4V - 35V 1μF - 680μF
		TPS	+125°C	6.3V - 50V 0.22μF - 680μF
		F91-AJ6	+125°C	6.3V - 16V 10μF - 100μF
		TRJ	+125°C	4V - 50V 0.1μF - 680μF
		F97	+125°C	6.3V - 35V 0.33μF - 150μF
		TRM	+125°C	2.5V - 50V 4.7μF - 1500μF
		TMJ	+125°C	6.3V - 50V 0.22μF - 680μF
		THJ +175°C	+175°C	6.3V - 50V 0.1μF - 220μF



Conductive Polymer Capacitors

Product	Description	Series	Operating Temp	Range
Conductive Polymer Capacitors				
	Automotive polymer series of low ESR capacitors. Qualified in accordance to AEC-Q200.	TCQ	+105/125°C	4V - 50V 10μF - 220μF

Niobium Oxide Capacitors

Product	Description	Series	Operating Temp	Range
Radial				
	AVX NbO OxiCap® capacitors offer unique features – high reliability, non-burn and non-smoke technology, more resistance to overvoltage breakdown, lower recommended derating, high resistance failure mode. NbO OxiCap® capacitors suit well in applications where reliability and safety is of primary focus, such as automotive.	NOJ	+105°C	1.8V - 10V 4.7µF - 1000µF
		NOS	+125°C	1.8V - 8V 10µF - 1000µF
		NOM	+125°C	1.8V - 6.3V 220µF - 680µF

Film Capacitors

Product	Description	Dielectric	Operating Temp	Range
Film Chip Capacitors				
	The self-healing property of film dielectric provides an open failure mode capacitor with excellent reliability. The intrinsic characteristic of film provides a capacitor that exhibits low DC bias, excellent thermal behavior and thermal shock resistance, no piezo effect and low ESR, ESL, and dissipation factor.	PPS	+125°C	16V - 50V 1nF - 180nF
		PEN	+125°C	25V - 630V 0.01µF - 4.7µF
		PEN-HT	+125°C	63V - 630V 0.01µF - 4.7µF
Medium Power Film				
	FFV, FFLI and custom parts are medium power film capacitors for DC filtering, high RMS current and high temperature automotive applications. FAV series are high reactive energy tuning capacitors for HEV/EV battery charging applications.	FFV Series (PET/PPY)	+105°C	300 - 1900V 22µF - 400µF
		FFLI (PPY)	+95°C	800V - 1400V 105µF - 3mF
		Custom Parts (PPY)	+105°C	75V - 1400V 300µF - 1.5µF
		FAV (PPY)	+85°C	300V - 650V 80nF - 1.2mF

Automotive Applications

Capacitors	Safety	Body Electronics	Drive Train	Comfort and Convenience	Hybrid and Electric
	Airbag Anti-Lock Brake System Crash Avoidance Circuit Tire Pressure Traction Control (ESP) Seat Weight Sensor V2X Communications Small Motor Drives (e.g. Windows) Communication Bus (LIN, CAN, FlexRay) Transponders Dashboard Systems Car Alarm Lamp/LED Driver HID Lighting Windshield Wipers Rain Sensor Light Sensor Engine Control Unit (ECU) Electronic Clutch Fuel Pump Water Pump Gear Box Sensors Electric Power Steering Engine Cooling Fan Temperature Sensor Transmission Control Unit Turbo Charger Underhood Modules Seat Heating Air Conditioning GPS Location System Electric Seat Controls Electric Window Controls Electric Mirror Controls Parking Assistant Audio Entertainment Satellite Radio Keyless System Cruise Control Remote Start DC/DC Converters Regenerative Braking Start/Stop System Electric Drive Battery Management / Charging Battery Cell Temperature Monitoring				
Ceramic Capacitors					
NP0	•	•	•	•	•
X7R	•	•	•	•	•
X7R High Voltage					•
High Temperature X8R					•
FLEXITERM™	•	•	•	•	•
FLEXISAFE™	•	•	•	•	•
U Series		•			•
IPC Array	•	•			•
ESD-Safe™		•	•	•	•
Radial and Axial Capacitor		•	•	•	•
X7R Feed-thru	•	•	•	•	•
Tantalum Capacitors					
TAJ/F93-AJ6		•	•	•	•
TPS/F91-AJ6		•	•	•	•
TRJ/F97	•	•	•	•	•
TRM	•	•	•	•	•
TMJ		•	•	•	•
THJ	•	•	•	•	•
Conductive Polymer Capacitors					
TCQ		•	•	•	•
Niobium Oxide – OxiCap®					
NOJ	•	•	•	•	•
NOS		•	•	•	•
NOM		•	•	•	•
Film Capacitors					
PPS Film Chip			•	•	•
PEN Film Chip	•	•	•	•	•
PET-HT Film Chip	•	•	•	•	•
FFV/FFLI/Custom parts					•
FAV					•



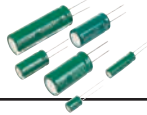
Powering Business Worldwide

Eaton Capacitors

Supercapacitors

Family	Capacitance (F)	Maximum Working Voltage (V)	Operating Temperature
HV Cylindrical Cells	1.0 - 100	2.7	-40°C to +65°C with linear voltage derating to 2.3V at +85°C
XVM Module	65	16.2	-40°C to +85°C with linear voltage derating to 13.8V at +85°C
XV Cells	300 - 600	2.7	-40°C to +85°C with linear voltage derating to 2.3V at +85°C
XLR Module	166	48.6	-40°C to +65°C, extended to +85°C at 41V

HV Cylindrical Cells



FEATURES & BENEFITS

- Ultra low ESR for high power density
- UL recognized

APPLICATIONS

- Door locks
- Emergency backup energy
- E-call

XVM 16V Module



FEATURES & BENEFITS

- Compact size for easy mounting
- Series or parallel connections for easy integration
- High reliability, green solution for pulse or backup power
- Maintenance free

APPLICATIONS

- Engine starting for marine and automotive

XV Cells



FEATURES & BENEFITS

- Ultra low ESR provides high efficiency, high power
- High capacitance (300F to 600F versions) enables long-term power back-up and high peak current capability
- Industrial Operating Temperature Range (-40 to +85°C)
- Long operating life, achievable over 20 years

APPLICATIONS

- Energy regeneration in fork lifts and delivery vehicles
- Active suspension HEV

XLR 48V Module



FEATURES & BENEFITS

- Ultra low ESR provides high efficiency, high power
- Industry standard form factor for easy integration
- High power density for low operating costs
- Millions of charge/discharge cycles
- No heavy metals, non-hazardous energy storage
- Heavy duty metal housing
- Meets IP65 environmental rating

APPLICATIONS

- Hybrid or electric vehicle
- Commercial vehicles: trucks, mining, construction
- Trolley, subway, train

Why Choose KEMET

KEMET Electronics Corporation is a leading global supplier of electronic components. We offer our customers the broadest selection of capacitor technologies in the industry, along with an expanding range of electromechanical devices, electromagnetic compatibility solutions, and supercapacitors. Our vision is to be the preferred supplier of electronic component solutions for customers demanding the highest standards of quality, delivery, and service.

U2J Automotive MLCC



FEATURES & BENEFITS

- AEC-Q200 automotive qualified
- Low noise
- Low ESR & ESL
- High thermal stability
- Higher capacitance value than COG
- Lead (Pb)-free, RoHS & REACH compliant
- Non-polarized devices
- Flex termination available

ESD Rated COG and E7R MLCC

FEATURES & BENEFITS

- ESD qualified per HBM AEC-Q200
- Extremely low ESR & ESL (COG)
- High thermal stability
- High ripple current capability
- No capacitance change with respect to applied DC voltage (COG)
- Lead (Pb)-free, RoHS & REACH compliant
- Non-polarized devices
- Flex termination available



Varistors: VA Series, VK Series, and VM Series



FEATURES & BENEFITS

- Wide range of SMD sizes
- Operating temperature range of up to 150°C
- Automotive and industrial grade
- RoHS, GADSL and REACH
- AEC-Q200 compliant

Aluminum Electrolytic: EDH, EDK, EEV, EXV, EDT, and PEH526 series



FEATURES & BENEFITS

- Designed for automotive applications
- 3,000 hours at +125°C (V_R, I_R applied)
- Resistance to vibrations
- Low ESR
- High ripple current capability



Film: F862, F863, R47, and R41 series



FEATURES & BENEFITS

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.1 – 4.7 μ F
- Lead spacing: 15.0 – 27.5 mm
- Capacitance tolerance: \pm 20%, \pm 10%
- Climatic category: 40/110/56, IEC 60068-1
- Tape and reel in accordance with IEC 60286-2
- RoHS Compliant and lead-free terminations
- Operating temperature range of -40°C to +110°C
- 100% screening factory test at 1,900 VDC
- Automotive qualification based on AEC-Q200 guidelines

KO Auto: T591 and T598 series














FEATURES & BENEFITS

- Ultra-low ESR
- (T598) Full compliance with AEC-Q200 Qualification Test Plan
- (T591) Qualification plan based on AEC-Q200 with 85°C/85% RH load specification limited to 500 hours
- TS 16949 certified plant
- Subject to PPAP/PSW and Change Control
- Meets or exceeds EIA standard 535BAAC
- Taped and reeled per EIA 481
- Halogen-free epoxy/RoHS compliant

Chip Monolithic Ceramic Capacitors/Lead Type Ceramic Capacitors

Powertrain/Safety

Series	Series Name	Characteristics	Rated Voltage		Capacitance	
			V	kV	pF	μF
			1 10 100 10 1	0.1 1 10 100 1000 10000 0.1 1 10 100 1000		
GCM	 General purpose products for automotive	<ul style="list-style-type: none"> AEC-Q200 compliant product 	6.3Vdc - 1000Vdc		0.10pF - 47μF	
GCD	 Specially designed product to reduce shorts	<ul style="list-style-type: none"> AEC-Q200 compliant product Fail safe product Product resistant to deflection cracking 	16Vdc - 100Vdc		1000pF - 0.50μF	
GCE	 Specially designed product to reduce shorts and resin electrode products	<ul style="list-style-type: none"> AEC-Q200 compliant product Fail safe product Product resistant to deflection cracking 	25Vdc - 100Vdc		220pF - 0.10μF	
GCG	 Conductivity adhesive compatible type	<ul style="list-style-type: none"> AEC-Q200 compliant product Product resistant to deflection cracking Product with solder cracking suppression 	6.3Vdc - 100Vdc		1.0pF - 47μF	
GCJ	 Resin external electrode products	<ul style="list-style-type: none"> AEC-Q200 compliant product Fail safe product Product resistant to deflection cracking 	6.3Vdc - 1000Vdc		220pF - 47μF	
GC3	 High effective capacitance and high allowable ripple current	<ul style="list-style-type: none"> AEC-Q200 compliant product Product suitable for acoustic noise reduction and low distortion 	250Vdc - 630Vdc		10000pF - 1.0μF	
KCM	 Metal terminal type for automotive	<ul style="list-style-type: none"> AEC-Q200 compliant product Product suitable for acoustic noise reduction and low distortion Product resistant to deflection cracking Product with solder cracking suppression 	25Vdc - 100Vdc		4.7μF - 68μF	
KC3	 Metal terminal type/high effective capacitance and high allowable ripple current for automotive	<ul style="list-style-type: none"> AEC-Q200 compliant product Product suitable for acoustic noise reduction and low distortion Product resistant to deflection cracking Product with solder cracking suppression 	250Vdc - 630Vdc		0.10μF - 2.2μF	
DE6	 Safety standard certified (IEC60384-14 Class X1/Y2 for automotive)	<ul style="list-style-type: none"> AEC-Q200 compliant product Certified by safety standard 	300Vac (r.m.s.)		100pF - 4700pF	
RCE	 125°C compatible type for automotive	<ul style="list-style-type: none"> AEC-Q200 compliant product 	25Vdc - 1000Vdc		1.0pF - 22μF	
RH	 150°C compatible type for automotive	<ul style="list-style-type: none"> AEC-Q200 compliant product 	25Vdc - 100Vdc		100pF - 22μF	

Infotainment/Comfort

Series	Series Name	Characteristics	Rated Voltage		Capacitance	
			V	kV	pF	μF
			1 10 100 10 1	0.1 1 10 100 1000 10000 0.1 1 10 100 1000		
GRM	For general purpose (infotainment/comfort)		2.5Vdc – 3150Vdc		0.10pF – 330μF	
GA2	Products based on the electrical appliance and material safety law of Japan		250Vac		470pF – 0.10μF	
GA3	Safety standard certified type		250Vac		10pF – 56000pF	
GJM	High frequency high Q type 1005 (in mm)/0402 (in inch) Size Max.	• Low dissipation for high frequency	6.3Vdc – 50Vdc		0.10pF – 47pF	
GMA	Top and bottom electrode type for bonding		6.3Vdc – 100Vdc		100pF – 0.47μF	
GMD	Compatible to bonding/AuSn soldering		6.3Vdc – 50Vdc		100pF – 1.0μF	
GQM	High frequency high Q type 1608 (in mm)/0603 (in inch) Size Min.	• Low dissipation for high frequency	50Vdc – 500Vdc		0.10pF – 200pF	
GR3	High effective capacitance and high allowable ripple current	• Product suitable for acoustic noise reduction and low distortion	250Vdc – 630Vdc		10000pF – 1.0μF	
GR4	For ethernet LAN and primary-secondary coupling of DC-DC converters		2000Vdc		100pF – 10000pF	
GRJ	Resin external electrode type	• Product resistant to deflection cracking	6.3Vdc – 1000Vdc		220pF – 47μF	
KR3	Metal terminal type, high effective capacitance and high allowable ripple current for general purpose	• Low dissipation for high frequency • Product resistant to deflection cracking • Product with solder cracking suppression	250Vdc – 630Vdc		0.10μF – 2.2μF	
KRM	Metal terminal type for general purpose (Infotainment/comfort)	• Low dissipation for high frequency • Product resistant to deflection cracking • Product with solder cracking suppression	16Vdc – 1000Vdc		68000pF – 68μF	

Polymer Aluminium Electrolytic Capacitors
Infotainment/Comfort

Series	Series Name	Characteristics	Rated Voltage		Capacitance	
			V	kV	pF	μF
			1 10 100 10 1	0.1 1 10 100 1000 10000 0.1 1 10 100 1000		
ECAS	7.3 × 4.3mm	• Over 220μF • No DC bias characteristics	2Vdc-16Vdc		6.8μF-560μF	

nichicon | Nichicon Capacitors

GYA Conductive Polymer Hybrid Aluminum Electrolytic Capacitors



FEATURES & BENEFITS

- Temperature range: -55°C to +125°C
- Voltage range: 25 to 63V
- Capacitance range: 10 μ F to 330 μ F
- Life: 4,000h @ 125°C
- Case size range: 6.3mm x 5.8mm - 10mm x 10mm

APPLICATIONS

- Low ESR/High ripple current
- Automotive/Transportation

UCX Aluminum Electrolytic Capacitors



FEATURES & BENEFITS

- Temperature range: -40°C to +135°C
- Voltage range: 10 to 50V
- Capacitance range: 47 μ F to 3300 μ F
- Life: 2,000h @ 135°C
- Case size range: 6.3mm x 10mm - 18mm x 21.5mm

APPLICATIONS

- Low ESR
- Engine control unit

UBY Radial Lead Type Aluminum Electrolytic Capacitors



FEATURES & BENEFITS

- Temperature range: -40°C to +135°C
- Voltage range: 25 to 50V
- Capacitance range: 620 μ F to 12000 μ F
- Life: 3,000h @ 135°C

APPLICATIONS

- Engine control unit
- Electric power steering
- Motor control unit

UCZ Aluminum Electrolytic Capacitors



FEATURES & BENEFITS

- Temperature range: -40°C to +125°C
- Voltage range: 10 to 100V
- Capacitance range: 10 μ F to 470 μ F
- Life: 1,000h to 3,000h
- Case size range: 6.3mm x 5.8mm - 18mm x 21.5mm

APPLICATIONS

- Engine control unit
- Motor control unit
- Climate control

UCM Low Impedance Capacitors



FEATURES & BENEFITS

- Temperature range: -55°C to +105°C
- Voltage range: 6.3 to 50V
- Capacitance range: 10 μ F to 2200 μ F
- Life: 4,000h

APPLICATIONS

- Low ESR
- Audio
- Engine control unit









Aluminum Electrolytic/Hybrid Capacitors

Series	Features
EEE - FCxxxxxx	SMT, FC Series, Low Impedance, Pb-Free
EEE - FKxxxxxAQ/AM	SMT, FK Series, 260C Reflow, 12.5 ~ 18 mm dia.
EEE - FKxxxxxAR / AP	SMT, FK Series, 260C Reflow, 4 ~ 10mm dia.
EEE - FKxxxxxGx	SMT, FK Series, Low Impedance, 5000 Hrs
EEE - FKxxxxxR / P	SMT, FK Series, Low Impedance, Pb-Free
EEE - FKXXXXXSP	SMT, FK Series, Low Impedance, 5000 Hrs
EEE - FPXXXXXAX	SMT, FP Series, Low Impedance, 260C Reflow
EEE - FT	SMT, FT Series, Low Impedance, 260C Reflow
EEE - HAXXXXXXAX	SMT, HA Series, 1000hrs, 260C Reflow
EEE - HB	SMT, HB Series, Long Life, 2000hrs, Pb-Free
EEE - HBXXXXXAX	SMT, HB Series, 2000hrs, 260C Reflow
EEE - HC	SMT, HC Series, Long Life, 3000hrs, Pb-Free
EEE - HD	SMT, HD Series, Long Life 105C 5Khr, Pb-Free
EEE - TG	SMT, TG series 125C, Pb-Free
EEE - TGXXXXXP/R	SMT TG series 125C (Dia. <12mm) RoHS Compliant
EEE - TK	SMT, TK series 125C, Pb-Free
EEE - TP	SMT, TP series 125C, Pb-Free
EEE - FCXXXXXAX	SMT, FC Series, Low Impedance, 260C Reflow
EEH - ZAXXXXXXX	SMT ZA Series, 105C
EEH - ZCXXXXXX	SMT ZC Series, 125C
EEH - ZK	SMT ZK Series, 125C Long Life
EEU - FC	Radial, FC Series (16mm & 18mm Dia.)
EEU - FC	Radial, FC Series (Other case sizes)
EEU - TA	Radial TA series, 125C
EEU - TP	Radial TP series, 135C
EEV - FKXXX (M) (Q)	SMT, FK Series, Low Impedance, (Dia. > 12mm) RoHS Compliant
EEV - TGXXX (M)(Q)	SMT TG series 125C (Dia. >12mm) RoHS Compliant

POSCAP Tantalum Capacitors

Series	Features
TA	POSCAP, Polymer Tantalum, Chip, 105C
TV	POSCAP, Polymer Tantalum, Chip, 7.3 x 4.3mm, 125C













Ceramic Capacitors

Series	Technical Data	Features & Benefits	Ordering Code/Type
MEGACAP	 <ul style="list-style-type: none"> Case sizes ranging from 1210 to 2220 Temperature Characteristics: COG, X5R, X7R, X7S, X7T Rated voltage of 16 to 1,000V Capacitance range of 1nF to 100μF 	<ul style="list-style-type: none"> Double-stack capacitor (single also available) Advanced design for twice the capacitance on a single footprint Designed for excessive board flex Capable of absorbing thermal and mechanical stress Excellent vibration performance Lower ESR and ESL than ALU and TA capacitors Qualified to AEC-Q200 	CKG*J (Last character is a "J")
High Temperature	 <ul style="list-style-type: none"> Case sizes ranging from 0402 to 2220 Temperature Characteristics: X8R, NP0 Rated voltage of 16 to 450V Capacitance range of 100pF to 10μF 	<ul style="list-style-type: none"> For temperature extremes -55 to +150°C Stable capacitance over temperature range Robust and reliable Low ESR & ESL Qualified to AEC-Q200 	CGA*X8R* CGA*NP0*
Soft Termination	 <ul style="list-style-type: none"> Case sizes ranging from 0402 to 3025 Temperature Characteristics: COG, X7R, X7S, X7T, X8R Rated voltage of 6.3 to 3,000V Capacitance range of 1nF to 100μF 	<ul style="list-style-type: none"> Conductive resin soft termination Absorbs mechanical stress from board flexure Reduces crack development due to heat shock Qualified to AEC-Q200 	CGA*E (Last character is an "E")
Dipped Radial	 <ul style="list-style-type: none"> 2.5mm (FA1*) and 5.0mm (FA2*) Lead Spacing Temperature Characteristics: COG, NP0, X7R, X7S, X7T, X8R Rated voltage of 25 to 630V Capacitance range of 1pF to 22μF 	<ul style="list-style-type: none"> Halogen-free Ideal noise reduction solution in motor applications Can be used for welding or crimping Absorbs mechanical stress from board flexure Qualified to the AEC-Q200 	FA
X1/Y2 Safety Disc Capacitor	 <ul style="list-style-type: none"> Temperature Characteristics: B, SL, Z5U Rated voltage: X1-440Vac, Y2-300Vac Capacitance range of 10pF to 4.7nF 	<ul style="list-style-type: none"> 1,000 cycles guaranteed under heat shock testing at -55°C to +125°C Can be used as a Y capacitor for battery chargers used in vehicles (EV, PHEV) Compliant with IEC and the safety standards of various countries Flame-resistant, reinforced outer insulation prevents fires, electrical shock, and other potential hazards Halogen-free external resin coating Qualified to AEC-Q200 	CS*A* (14th Character is an "A")
ESD Protection	 <ul style="list-style-type: none"> Case size: 0603 Temperature Characteristics: COG, NP0 Rated voltage of 100V Capacitance range of 1nF to 10nF 	<ul style="list-style-type: none"> Compliant with the IEC 61000-4-2 standard for ESD immunity Stable capacitance values regardless of DC bias, temperature, or aging effects Up to 30+kV of rated ESD capability Qualified to AEC-Q200 	CGA3EA*
High Voltage	 <ul style="list-style-type: none"> Case sizes ranging from 1206 to 2220 Temperature Characteristics: COG, X7R, X7S Rated voltage of 1kV to 3kV Capacitance range of 10pF to 47nF 	<ul style="list-style-type: none"> High rated voltage enables MLCC to be used as snubber for IGBT The capacitance drop under high voltage is not significant Monolithic structure ensures higher reliability in humidity resistivity compared with film capacitors Extremely stable temperature characteristics; equivalent to or better than film capacitors Low loss, no polarity Qualified to AEC-Q200 	CGA*3A* CGA*3D* CGA*3F
Mid Voltage	 <ul style="list-style-type: none"> Case sizes ranging from 0402 to 2220 Temperature Characteristics: COG, X7R, X7S, X7T, X8R, NP0 Rated voltage of 100V to 630V Capacitance range of 1pF to 15μF 	<ul style="list-style-type: none"> Low ESR, high ripple current capability Unique electrode design allows for a higher voltage application in smaller case size Lower residual inductance compared to competing technologies Improved DC bias properties Qualified to AEC-Q200 	CGA*2A* CGA*2E* CGA*2W* CGA*2J*

Aluminium Electrolytic Capacitors

Series	Product	Technical Data	Features & Benefits	Ordering Code/ Type
Capacitors with 4-pin snap-in terminals/ solder pins		385 – 500 V DC 220 – 3300 µF	• Compact can size	B43512, B43522
		350 – 450 V DC 270 – 2700 µF	• Long useful life	B43513, B43523
		350 – 450 V DC 270 – 1800 µF	• Compact can size, 105°C	B43516, B43526
Snap-in capacitors		200 – 450 V 56 – 2200 µF	• Long useful life	B43624
		200 – 450 V 82 – 2700 µF	• Ultra-compact can size	B43634
		200 – 600 V 47 – 2200 µF	• Outstanding ripple current capability, high voltage	B43541
		200 – 450 V 56 – 2700 µF	• Compact can size, 105°C	B43509
		200 – 450 V 200 – 450 V	• Ultra-compact can size, 105°C	B43640
		47 – 2700 µF 200 – 500 V	• Ultra-compact can size, 105°C	B43644
		35 – 2700 µF 200 – 550 V	• Outstanding ripple current capability	B43544
		47 – 2700 µF 400 – 450 V 82 – 820 µF 200 – 5000 V 56 – 2200 µF	• Compact can size, 105°C, outstanding ripple current capability • Very long useful life, 105°C, outstanding ripple current capability	B43545 B43547
Large-size capacitors Low-voltage series		25 - 63 V DC 900 - 4700 µF 125°C - > 10,000 h	• Very high ripple current capability optimized for high frequencies • Outstanding reliability • Long useful life	B41607
		25 - 63 V DC 2000 – 27,000 µF 125°C - > 5000 h	• Ultra-compact design • Very high ripple current capability optimized for high frequencies • High vibration stability (up to 40g available) • Up to 150°C	B41605
Large-size and snap-in capacitors High-voltage series		450 V DC 120 – 680 µF 105°C - 3000 h	• Design for On Board Charger • High ripple current capability • Compact can size	B43508
Axial-lead and soldering star capacitors		25 - 63 V DC 360 – 4500 µF 125°C - > 10,000 h 150°C - > 2000 h	• Very high ripple current capability • Long useful life • Low ESR also at 63V • High vibration stability (up to 45g available) • Different constructions available	B41689/B41789
		25 - 100 V DC 300 – 10,000 µF 125°C - > 10,000 h 150°C - > 2000 h	• Each series is optimized to meet certain customer requirements (according to data book) • Different constructions available	B41690/ B41790 B41691/ B41791 B41692/ B41792 B41693/ B41793 B41696/ B41796
		140 - 250 V DC 47 – 620 µF 125°C - > 2500 h 105°C - > 10,000 h	• High voltage design • High ripple current capability	B43693/ B43793
Single-ended capacitors		10 - 100 V DC 22 – 10,000 µF 105°C - > 10,000 h	• Design for automotive applications • Each series is optimized to meet certain customer requirements (according to data book) • Various taping, packaging and lead configurations available	B41858 B41859 B41887 B41888
		10 - 100 V DC 22 – 10,000 µF 125°C - > 7000 h 135°C - > 3000 h	• Design for automotive applications • High voltage design • Low ESR • Various taping, packaging and lead configurations available	B41856 B41866 B41896
		10 - 100 V 22 – 10,000 µF 125°C - > 4000 h	• Design for automotive applications • High voltage design • Low ESR • Various taping, packaging and lead configurations available	B41856 B41866 B41896
		160 - 450 V DC 10 – 330 µF 125°C > 4000 h 105°C > 10000 h	• Design for automotive applications • High voltage design • Low ESR • Various taping, packaging and lead configurations available	B43858 B43888 B43896

Film Capacitors

Series	Technical Data	Features & Benefits	Ordering Code/Type
EMI/AC Filtering Capacitors	 <ul style="list-style-type: none"> • 305 Vac • 100nF - 15uF • Lead space: 10-37.5 	<ul style="list-style-type: none"> • Severe Ambient Condition Robustness • UL/ENEC Approval and AEC-Q200 • 85°C / 85% RH / 1000h / 240 Vac 	B3292xH/J (X2)
	 <ul style="list-style-type: none"> • 350 Vac • 470nF - 10uF • Lead space: 27.5-37.5 	<ul style="list-style-type: none"> • Even Greater Severe Ambient Conditions Protection • UL/ENEC Approval and AEC-Q200 • 85°C / 85% RH / 1000h / 330 Vac 	B3293xA/B (X2)
	 <ul style="list-style-type: none"> • 300Vac • 1nF-1uF • Lead space: 10-37.5 	<ul style="list-style-type: none"> • General Purpose line to ground applications (5kV impulse test) • UL/ENEC Approval and AEC-Q200 (with limitations) 	B3202xA/B(Y2)
	 <ul style="list-style-type: none"> • 500Vac • 1.0nF-10nF • Lead space: 15-22.5 	<ul style="list-style-type: none"> • General Purpose line to ground applications (8kV impulse test) • UL/ENEC Approval 	B81123C (Y1)
General Purpose PFC Snubbing DC-Link	 <ul style="list-style-type: none"> • 63-400 Vdc • 1.5-220 uF • Lead space: 5-37.5 	<ul style="list-style-type: none"> • DC link / DC filtering • Lower Voltage, Low Irms/μF • AECQ-200 	B3252x
	 <ul style="list-style-type: none"> • 250-2000Vdc • 1nf-40 uF • Lead Space: 15-52.5 	<ul style="list-style-type: none"> • General Purpose • DC and AC applications (High Irms vs Freq.) • AEC-Q200 	B3265x
	 <ul style="list-style-type: none"> • 300-875 Vdc • 0.47-270 uF • Lead space 27.5-52.5 	<ul style="list-style-type: none"> • DC link/ DC filtering • High Power (Irms / uF) • AEC-Q200 	B3267x
	 <ul style="list-style-type: none"> • 250-2000 Vdc • 1 nf-1 uF • Lead space: 10-15 	<ul style="list-style-type: none"> • DC and AC applications • Miniaturized size / high dV/dt / 125°C Max temp. • AECQ-200 	B3267xL
	 <ul style="list-style-type: none"> • 450-630 Vdc • 68 nF - 2.2 uF • Lead space 10 -22.5 	<ul style="list-style-type: none"> • PFC / DC Filtering (MKP) • Max Operating Temp. 125°C • AEC-Q200 	B3267xP
	 <ul style="list-style-type: none"> • 630-849 Vdc • 1 uF - 50 uF • Lead space 27.5 -52.5 	<ul style="list-style-type: none"> • DC link / DC filtering • Max Operating Temp. 125°C • AEC-Q200 	B3277xP
	 <ul style="list-style-type: none"> • 400-2000 Vdc • 2.2nF-560 nF • Lead space: 10-22.5 	<ul style="list-style-type: none"> • DC and AC applications • Low losses / higher dV/dt • AEC-Q200 	B3264x
	 <ul style="list-style-type: none"> • 850-2000 Vdc • 68 nf-5.6 uF • Flat terminals 	<ul style="list-style-type: none"> • Snubbing • 17 terminal configurations to fit IGBT or bus bar 	B3265xS



Vishay Capacitors

Series	Product	Type	Technology	Description	Mounting	Voltage (V)	Capacitance	
							(min.)	(max.)
146 CTI		Capacitors, fixed	Aluminium	Aluminium capacitors SMD (chip), high temperature, low impedance	Surface mount	16	220 µF	4.7 mF
						25	100 µF	2.7 mF
						35	33 µF	1.8 mF
						50	47 µF	1.2 mF
						63	22 µF	1 mF
						80	10 µF	470 µF
150 CRZ		Capacitors, fixed	Aluminium	Aluminium capacitors SMD (chip), very low Z	Surface mount	6.3	470 µF	10 mF
						10	330 µF	6.8 mF
						16	220 µF	4.7 mF
						25	150 µF	3.3 mF
						35	100 µF	2.2 mF
						50	68 µF	1.5 mF
						63	33 µF	680 µF
						80	47 µF	680 µF
160 CLA		Capacitors, fixed	Aluminium	Aluminium capacitors SMD (chip), high temperature, low impedance	Surface mount	16	470 µF	3.3 mF
						25	330 µF	2.2 mF
						35	220 µF	1.5 mF
						50	100 µF	1 mF
						63	47 µF	680 µF
						80	68 µF	330 µF
K...V Series		Capacitors, fixed	Ceramic, multilayer leaded	Radial leaded multilayer ceramic capacitors for automotive applications class 1 and class 2, 50 VDC, 100 VDC, 200 VDC (Only supplier offering 160°C)	Radial	50	100 pF	1 µF
						100	100 pF	470 nF
						200	100 pF	100 nF
AY2 Series		Capacitors, fixed	Ceramic, single layer	Automotive Grade AC line rated ceramic disc capacitors class X1, 440 VAC, class Y2, 300 VAC (Only supplier offering 3000 temperature cycles)	Radial	300	10 pF	4.7 nF
						440	10 pF	4.7 nF
MKP1848 DC-Link		Capacitors, fixed	Film	Metallized polypropylene film automotive grade DC-link capacitor, AEC-Q200 qualified, low ESR	Radial	450	1 µF	400 µF
						700	1 µF	320 µF
						800	1 µF	240 µF
						900	1 µF	200 µF
						1100	1 µF	140 µF
						1200	1 µF	120 µF
TH4		Capacitors, fixed	Tantalum, solid	Solid tantalum surface mount chip capacitors TANTAMOUNT® molded case, high temperature 175 °C, Automotive Grade	SMD, molded	6.3	10 µF	47 µF
						10	10 µF	47 µF
						16	10 µF	100 µF
						35	22 µF	22 µF
						50	4.7 µF	
TP3		Capacitors, fixed	Tantalum, solid	Solid tantalum surface mount chip capacitors TANTAMOUNT® molded case, high performance, Automotive Grade	SMD, molded	4	4.7 µF	68 µF
						6.3	2.2 µF	470 µF
						10	1.5 µF	220 µF
						16	1 µF	220 µF
						20	680 nF	100 µF
						25	470 nF	47 µF
						35	100 nF	22 µF
50	100 nF	10 µF						

YAGEO | Yageo Capacitors

Automotive Grade MLCC – AC Series



FEATURES & BENEFITS

- AEC-Q200 qualified and PPAP ready
- Board flex $\geq 2\text{mm}$
- 100% AOI
- ISO/TS16949 certified
- TC = NPO/X7R ($-55^{\circ}\text{C} - 125^{\circ}\text{C}$)
- EIA case size: 0402 to 1812
- Capacitance range: 0.47pF – 4.7uF

APPLICATIONS

- All general purpose applications
- Infotainment
- Comfort and security
- Navigation
- Remote vehicle control

Automotive Grade with Soft Termination MLCC - AS Series

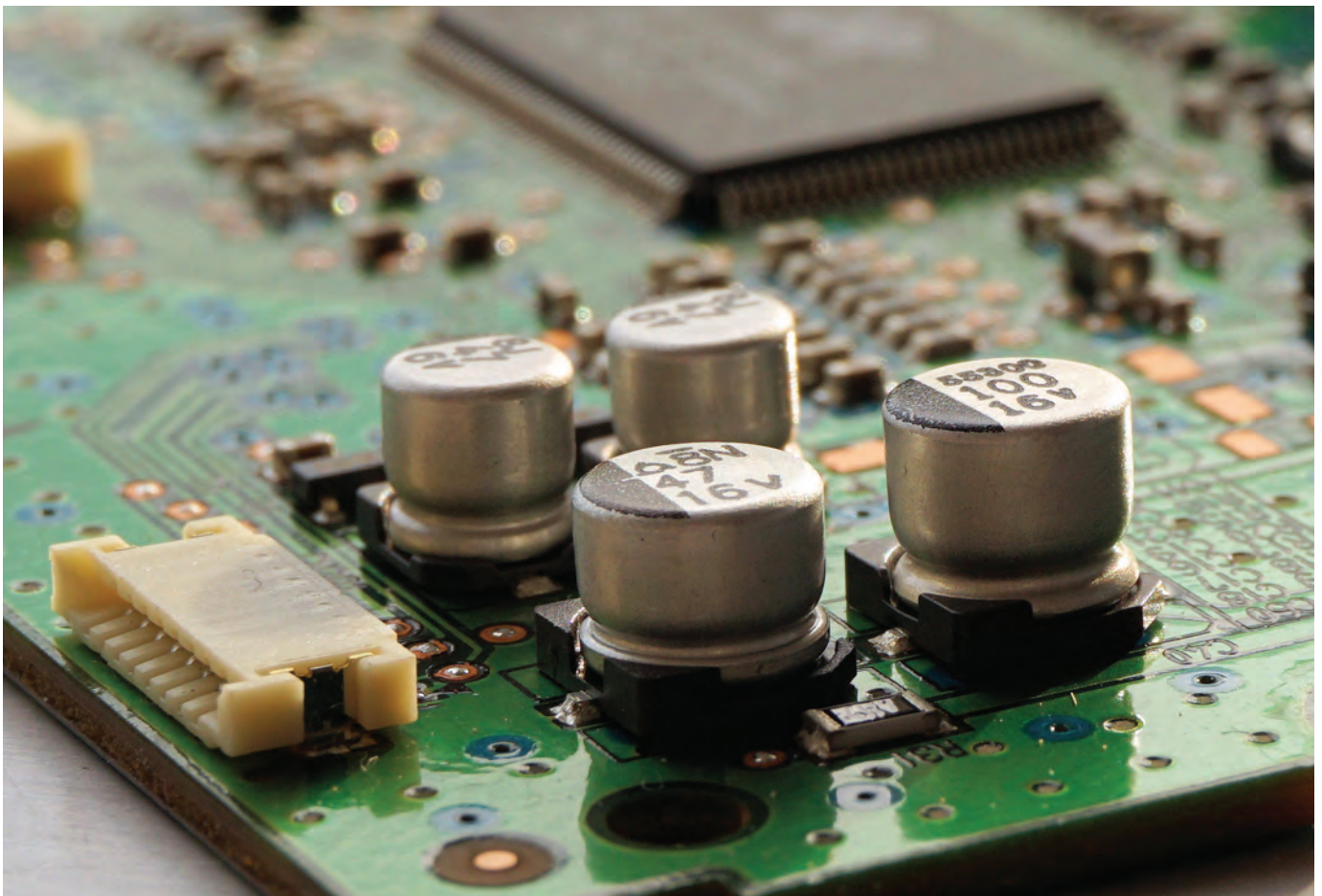


FEATURES & BENEFITS

- AEC-Q200 qualified
- J-STD-020D and TS-16949 compliant
- TC = X7R
- EIA case size: 0805 to 1210
- Flexible termination system
- Increased mechanical performance
- Capacitance range: 1nF to 4.7uF

APPLICATIONS











- All general purpose applications
- Entertainment applications
- Comfort/security applications
- Information applications





CIRCUIT PROTECTION

Circuit Protection

Product	Series	Description	Operating Temp	Range
Automotive Series Multilayer Varistors				
	Automotive TransGuard®	Wide range of varistors for overvoltage protection with EMI/RFI filtering function in the off state.	+125°C	3.3 - 85Vdc 0.05J - 13J
	Automotive StaticGuard	Lower capacitance version of TransGuard® for general ESD and CMOS protection.	+125°C	18Vdc 40 - 80pF
	Communication Bus Varistors	Low capacitance varistors for protection of CANBus, FlexRay, data lines, etc.	+125°C	18, 32Vdc 15 - 37pF
	Automotive AntennaGuard	Low capacitance varistors for applications such as antennas, RF, high-speed data links, etc.	+125°C	18 - 30Vdc 1.5 - 12pF
	Automotive Sub pF AntennaGuard	Ultra-low capacitance varistors for applications such as sensors, RF, HDMI, high-speed data links, etc.	+125°C	16Vdc 0.8pF
	Controlled Capacitance	Varistors with controlled capacitance for circuit protection and targeted EMI filtering.	+125°C	22 - 30Vdc 33 - 82pF
	Miniature AC Varistor	Varistors designed for low power AC, LC resonant circuits, and higher DC data lines protection.	+125°C	70/52Vdc 6 - 22pF
	Automotive High Temperature	Varistors designed for use in high temperature environment, underhood applications, etc.	+150°C	18, 32Vdc 12 - 22pF
	Radial Automotive Varistors	Radial epoxy coated part for radial mounting in harsh environments. Also available in high-temp series.	+125°C +150°C	14 - 48Vdc 0.1 - 2.0J
	CapGuard™	Combines advantages of varistor and high capacitance MLC capacitor in single component for overvoltage protection and enhanced EMI/RFI filtering.	+125°C	26, 45Vdc 0.47, 1.0µF
	Automotive TransFeed	Varistor with Feed-thru construction for ESD suppression and enhanced EMI filtering.	+125°C	5.6 - 26Vdc 0.05 - 0.3J
	Glass Encapsulated	Glass encapsulated varistors designed for high energy or harsh environment applications.	+125°C	16 - 85Vdc 0.6 - 13.8J
NTC Thermistors				
	SMT Series	SMT thermistors for temperature measurement and temperature compensation.	+150°C	R: 10Ω - 1MΩ
	Disc Thermistors	Disc thermistors for temperature measurement and temperature compensation.	+150°C	R: 68Ω - 1MΩ
	High Accurate Series	Highly accurate thermistors for temperature sensing with tolerances from +/-1%.	+150°C	R: 2kΩ - 0.1MΩ

Automotive Applications

Circuit Protection	Safety					Body Electronics					Drive Train					Comfort and Convenience					Hybrid and Electric																												
	Airbag	Anti-Lock Brake system	Crash Avoidance Circuit	Tire Pressure	Traction Control (ESP)	Seat Weight Sensor	V2X Communications	Small Motor Drives (e.g. Windows)	Communication Bus (LIN, CAN, FlexRay)	Transponders	Dashboard Systems	Car Alarm	Lamp/LED Driver	Windshield Wipers	Rain Sensor	Light Sensor	Engine Control Unit (ECU)	Electronic Clutch	Fuel Pump	Water Pump	Gear Box Sensors	Electric Power Steering	Engine Cooling Fan	Temperature Sensor	Transmission Control Unit	Turbo Charger	Underhood Modules	Seat Heating	Air Conditioning	GPS Location System	Electric Seat Controls	Electric Window Controls	Electric Mirror Controls	Parking Assistant	Audio Entertainment	Satellite Radio	Keyless System	Cruise Control	Remote Start	DC/DC Converters	Regenerative Braking	Start/Stop System	Electric Drive	Battery Management Charging	Battery Cell Temperature Monitoring				
Circuit Protection																																																	
Automotive TransGuard®	•				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Communication Bus Varistor	•	•	•					•					•			•	•												•	•											•	•	•	•					
Automotive StaticGuard	•	•	•	•						•	•	•																																					
Automotive AG/Sub pF AG						•		•	•							•												•																			•		
Controlled Capacitance		•						•	•				•			•													•	•																	•		
High Temperature Varistors																•				•																											•		
Miniature AC Varistors								•	•																																								
Radial Varistors							•											•	•																														
CapGuard							•						•					•	•																														
Glass Encapsulated Varistors	•		•										•			•	•	•	•	•	•								•	•	•	•																	
Automotive TransFeed		•									•						•												•																				
NTC Theristors																																																	
SMT Thermistors				•												•				•																													
Leaded Thermistors			•														•	•	•																														

BOURNS® | Bourns Circuit Protection

Multifuse® PPTC Resettable Fuses (Surface Mount)



FEATURES & BENEFITS

- Compliant with AEC-Q200 Rev-C Stress Test Qualification for Passive Components in Automotive Applications
- Operating temperature range up to 125°C
- Low thermal derating factor
- Higher hold currents at elevated temperature
- Fast tripping resettable circuit protection
- Surface mount packaging available for automated assembly
- Choice of operating currents
- RoHS compliant

APPLICATIONS

- Protection of automotive circuitry including engine control modules
- Overcurrent surge protection of electronic equipment required to operate at high operating temperature ranges
- Resettable fault protection of general electronic equipment

Multifuse® PPTC Resettable Fuses (Leaded)



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ChipGuard® Automotive Grade ESD Suppressors



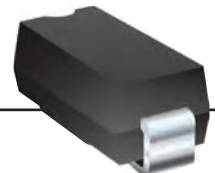
FEATURES & BENEFITS

- AEC-Q200 qualified (CGA series only)
- ESD protection to IEC 61000-4-2 Level 4
- <1 ns response time to ESD strike
- Low leakage current
- Low capacitance versions (0.2pF typ.) available
- Bidirectional devices
- Multi-strike capability
- RoHS compliant

APPLICATIONS

- HDMI
- CANbus
- Ethernet
- GPS
- Camera links
- Sensors
- Touchscreen interfaces
- GPS
- Antennas
- USB 3.0
- High-speed communications buses
- Circuits sensitive to ESD

TVS Diodes



FEATURES & BENEFITS

- RoHS compliant
- Surface Mount SMA package
- Standoff Voltage: 5.0 to 495 volts
- Power Dissipation: 400 watts

APPLICATIONS

- IEC 61000-4-2 ESD (Min. Level 4)
- IEC 61000-4-4 EFT
- IEC 61000-4-5 Surge

CC12H Surface Mount Fuses



FEATURES & BENEFITS

- AEC-Q200 qualified
- High inrush withstand capability
- Excellent temperature and cycling characteristics

APPLICATIONS

- Automotive infotainment
- Electronic control units
- Electronic spark igniters
- Wireless chargers
- Battery management

	Current Rating (A)		Voltage Rating (VDC)		Breaking Capacity (A)		Resistance (mΩ) Typical		Typical Melt (I ² T) DC		Typical Voltage Drop (mV)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
CC12H	0.25	30	32	63	50	200	2.1	3500	0.00038	100	90	1400

PS04LTVA1 ESD Suppressor



FEATURES & BENEFITS

- AEC-Q200 qualified
- Ultra-low capacitance
- Small footprint
- Low trigger and clamping voltages

APPLICATIONS

- Automotive infotainment
- High speed data ports

	Rated Voltage (Vdc)	Clamping Voltage (V)	Trigger Voltage (V)	Capacitance (pF)
PS04LTVA1	5	25	150	0.05

Automotive Blade Fuses



The ATL, ATR, ATM, ATC and MAX blade fuses are commonly used in most domestic and imported cars today. All Bussmann blade fuses meet or exceed OEM and SAE standards.

Vehicle Electrical Center (VEC) Series



Eaton Vehicle Electrical Centers (VECs) are power distribution centers capable of high power density and water and dust ingress protection with the flexibility to customize per customer wiring schematic. Widely used in the transportation industry, they use patented configurable 3D matrix technologies that can be easily modified to accommodate changes to an electrical system. The product requires no tooling charges for implementation.

VEC Power Connector

Male output connector with optional terminal position assurance or connector position assurance for use with Eaton Vehicle Electrical Centers (VECs).



FEATURES & BENEFITS

- Connector position assurance
- Terminal position assurance

PolySwitch Surface-Mount Devices

PolySwitch SMD devices help protect computer and consumer electronics against temporary overcurrent faults.

The PolySwitch surface mount product family has been extended to include a range of devices, which are qualified to rigorous automotive standards (following the AEC-Q200 specification). As a result, they are suitable for protecting Electronic Control Units (ECUs) against damage from faults that would otherwise require costly, complete module replacement.

FEATURES & BENEFITS

- Current ratings up to 3A
- Voltage ratings up to 60VDC
- A wide range of current ratings available
- Small size down to 1608mm (0603mils)
- Temperature range -40°C/+85°C or +125°C
- Suitable for ECU I/O and trace protection
- Devices available for both current and future vehicle electrical systems (12V, 24V, 48V systems)
- Maximum design flexibility
- Minimizes circuit-board space, weight and cost
- Can be designed in-cabin or underhood applications

Automotive Grade Polymer ESD Suppressor

The AXGD series auto-grade polymer ESD suppressor protects sensitive electronic devices against ESD from 8kV up to extreme condition as high as 30kV contact/air discharge.



PolySwitch Radial-Leaded Devices

PolySwitch through-hole devices represent a comprehensive and complete range of PPTC overcurrent protection for the car, truck and bus industries.

Littelfuse offers a wide range of devices all qualified to rigorous automotive standards (following the AEC-Q200 specification).

FEATURES & BENEFITS

- Current ratings up to 15A
- Voltage ratings up to 72VDC
- Compatible with high-volume, automatic insertion, electronic assembly processes
- Very low electrical resistance
- Broad range of through-hole polymeric PTC devices available with small current increments
- Temperature range -40°C/+85°C or +125°C
- Can be used in applications that require fuse values up to 30A
- Devices available for both existing and future vehicle electrical systems (12V, 24V, 48V systems)
- Low installation cost
- Low voltage drop
- Many available electrical and physical sizes facilitate the most precise protection design
- Can be designed in-cabin or underhood applications



MLA Auto and AUML Varistor Series

Multilayer Varistor

The MLA Auto Series Varistor devices protect integrated circuits and other components at the circuit board level.



The MLA Automotive and AUML Varistor Series of transient voltage surge suppression devices is based on the Littelfuse Multilayer fabrication technology. These components are designed to suppress a variety of transient events, including those specified in IEC 61000-4-2 or other standards used for Electromagnetic Compliance (EMC).

FEATURES & BENEFITS

- AEC-Q200 compliant
- RoHS compliant
- Leadless 0603, 0805, 1206, 1210, 1812 and 2220 chip sizes
- Multilayer ceramic construction technology
- -55°C to +125°C operating temp. range
- Operating voltage range VM(DC) = 3.5V to 120V
- Rated for surge current (8 x 20µs); rated for energy (10 x 1000µs)
- No plastic or epoxy packaging assures better than UL94V-0 flammability rating
- Meets automotive industry requirements
- Suitable for harsh automotive environments
- Eliminating lead inductance and assuring fast speed of response to transient surges

APPLICATIONS

- Body electronics systems
- Powertrain systems
- Infotainment systems
- Automotive control module protection
- Motor or inductive load transient suppression

AUMOV® Varistor Series

Metal Oxide Varistor

AUMOV® Varistor Series protects sensitive automotive systems from voltage transients induced by load dump, jump starts and other transient events.



The AUMOV Series Varistor offers 50 percent greater surge withstanding capability than existing technologies on the market for low DC voltage automotive electronics applications. The maximum peak surge current is rated up to 5kA (8/20µs pulse) to protect sensitive automotive systems from voltage transients induced by load dump and other transient events.

FEATURES & BENEFITS

- Phenolic and silicone coating parts are AEC-Q200 compliant
- UL recognized
- -40°C to +85°C operating temp. range (epoxy coating), optional phenolic and silicone coating for operating temps up to 125°C
- High peak surge current rating and energy absorption capability
- Reduced footprint and volume required for voltage surge protection
- Operating Voltage Range: VM (DC) = 16V - 825V and VM(AC) = 14V - 625V.
- High resistance to thermal cycles for phenolic and silicone coating
- Lead free, halogen free and RoHS compliant
- Meets automotive industry requirements
- Suitable for harsh automotive environments
- Helps meet UL1449 requirements
- Up to 3x higher surge handling capability than similar sized varistors

APPLICATIONS

- Body electronics systems
- Powertrain systems
- Infotainment systems
- Automotive control module protection
- Motor or inductive load transient suppression

Blade Fuses

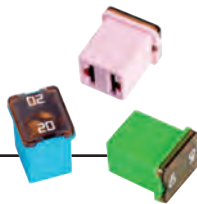
Sometimes called spade or plug-in fuses, automotive blade fuses are widely used in automotive OEMs.



FEATURES & BENEFITS

- MICRO
 - 32V; up to 30 Amps
- MINI
 - 32V and 58V; up to 30 Amps
- MAXI
 - 32V and 58V; up to 80 Amps
- ATO
 - 32V; up to 40 Amps

MCASE and JCASE Cartridge Fuses



FEATURES & BENEFITS

- MCASE
 - 32V; up to 60 Amps
- JCASE
 - 32V; up to 60 Amps
- JCASE Low Profile
 - 32V; up to 60 Amps

High Current Fuses

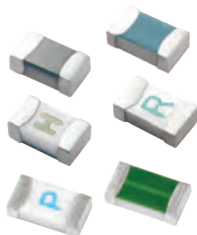


FEATURES & BENEFITS

- MEGA Bolt-down
 - 32V Slo-Blo, 32V Low Temp, 70V
 - Up to 500 Amps
- MIDI Bolt-down
 - Tag Lag 32V, Clear 32V, 48V, 58V
 - Up to 500 Amps

AECQ Compliant Fuses

The 437A, 438A, 440A and 441A series AECQ-Compliant fuses are specifically tested to cater to secondary circuit protection needs of compact auto electronics applications.



DC Power Distribution Modules

Power Distribution Modules (PDM) for vehicles or commercial equipment feature multiple electrical power outputs, acceptance of many fuses, fuse types and relays and allow for custom configuration.

Select a product that fits your application or contact us for custom designs.

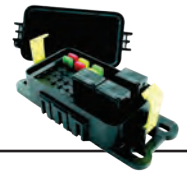


FLEC™ Series Flexible Electrical Center

FEATURES & BENEFITS

- Flexible Electrical Centers
- Ingress rating: IP67
- Temperature range: -40°C to 85°C
- Material: UL94-V0 Thermoplastic

Hard-wired PDM



FEATURES & BENEFITS

- Available to accommodate from 3 (HWB6) to 30 (HWB60-AL) mini (2.8mm) plug-in circuit protection components
- Ingress protection ratings of IP67
- AssureLatch™ yellow positive-sealing latches
- Can accept any combination of mini fuses, relays, and circuit breakers
- Standard clear or black UL covers
- Terminal position assurance (TPA) locks that cannot unplug themselves accidentally, even if the vehicle is subject to heavy vibration or rough terrain

Fuse Only PDM





FEATURES & BENEFITS


- MEGA & MIDI Power Distribution Fuse Box
- Available IP67 and IP69K rating
- Temp range available: -40°C to 120°C
- Maximum continuous voltage: up to 600VDC
- Max total continuous current: up to 600A


EMI Suppression Filters


Powertrain/Safety


BLM Inductor Type		Series	Size Code in Inches (in mm)	Impedance (Ω) at 100MHz	Effective Frequency Range (Applicable frequency ranges are only for reference)						
					10kHz	100kHz	1MHz	10MHz	100MHz	1GHz	10GHz
For General Band Noise	For General Signal Lines	BLM_AG		0402-0805 (1005-2012)	10-1000				██████████		
	For High Speed Signal Lines	BLM_B		0402-0805 (1005-2012)	5-2700				██████████		
	Power Lines Type	BLM_PG+		0603-1806 (1608-4516)	22(6A)-1000(1.5A)				██████████	██████████	
For GHz Band Noise	Universal Type [Power Lines/Signal Lines]	BLM18EG+		0603 (1608)	100(2A)-600(0.5A)				██████████	██████████	
	Signal Lines Type	BLM_HG+HD		0402-0603 (1005-1608)	470-1800				██████████	██████████	



NFM Capacitor Type	Series	Size Code in Inches (in mm)	Capacitance (F)	Effective Frequency Range (Applicable frequency ranges are only for reference)						
				10kHz	100kHz	1MHz	10MHz	100MHz	1GHz	10GHz
Universal Type [Power Lines/Signal Lines]	NFM21HC		0805 (2012)	22p-1 μ				██████████		
	NFM31HK+		1206 (3216)	10000p-0.1 μ				██████████		


NFE LC Combined Type	Series	Size Code in Inches (in mm)	Impedance (Ω) at 100MHz	Effective Frequency Range (Applicable frequency ranges are only for reference)						
				10kHz	100kHz	1MHz	10MHz	100MHz	1GHz	10GHz
Universal Type [Power Lines/Signal Lines]	NFE61HT		2706 (6816)	33p-3300p				██████████		

DLW Common Mode Choke Coils		Series	Size Code in Inches (in mm)	Impedance (Ω) at 100MHz	Effective Frequency Range (Applicable frequency ranges are only for reference)					
					100kHz	1MHz	10MHz	100MHz	1GHz	10GHz
Signal Lines Type	For Differential Signal Lines	DLW31S		1206 (3216)	2200			██████████		

DLW Common Mode Choke Coils		Series	Size Code in Inches (in mm)	Impedance (Ω) at 100MHz	Effective Frequency Range (Applicable frequency ranges are only for reference)						
					10kHz	100kHz	1MHz	10MHz	100MHz	1GHz	10GHz
Signal Lines Type	For Differential Signal Lines	DLW43S		1812 (4532)	11-100			██████████			





PLT Large Current Common Mode Choke Coils for Automotive Available		Series	Size Code in Inches (in mm)	Impedance (Ω) at 100MHz	Effective Frequency Range (Applicable frequency ranges are only for reference)						
					10kHz	100kHz	1MHz	10MHz	100MHz	1GHz	10GHz
Power Lines Type		PLT10H+		-	45-1000			██████████			

BNX Block EMIFIL®		Series	Height (mm)	Rated Voltage (VDC)	Rated Current (A)	Effective Frequency Range (Applicable frequency ranges are only for reference)						
						10kHz	100kHz	1MHz	10MHz	100MHz	1GHz	10GHz
Power Lines Type	SMD Type	BNX024H01+		3.5	50	15				██████████		
		BNX025H01+		3.5	25	15				██████████		
		BNX026H01+		3.5	50	15				██████████		
		BNX027H01+		3.5	16	15				██████████		
	Lead Type	BNX012H01+		8.5 max.	50	15				██████████		

VFC Lead Type Capacitors with Varistor Function	Series	Height (mm)	Capacitance (F)	Varistor Voltage (V)	
Power Lines Type	VFC2		6.0 max.	1.0 μ	27

* The derating of rated current is required for some items according to the operating temperature.


PTC Thermistors

Series		Technical Data	Features & Benefits	Ordering Code/Type
ICL in Phenolic Resin Plastic Case		<ul style="list-style-type: none"> V_{max}: 260 – 560 VAC R_R: 22 ... 100 Ω C_{th}: 2.3 J/K 	<ul style="list-style-type: none"> Self-protection in case of malfunction of short-circuit relay or internal short circuit of capacitor For high pulse currents and a high number of operation cycles Inrush current limiters are not damaged when directly connected to V_{max} even without additional current limitation 	B59213J0130A020 B59215J0130A020 B59217J0130A020 B59219J0130A020
ICL Leaded Disks, Coated		<ul style="list-style-type: none"> V_{max}: 440 VAC R_R: 120 Ω C_{th}: 2.1 J/K 	<ul style="list-style-type: none"> Self-protection in case of malfunction of short-circuit relay or internal short circuit of capacitor For high pulse currents and a high number of operation cycles Inrush current limiters are not damaged when directly connected to V_{max} even without additional current limitation 	B59412C1130B070 B59451C1130B070
Overcurrent Protection Leaded		<ul style="list-style-type: none"> V_{max}: 20 – 1,000 VAC R_R: 0.3 – 7500 Ω 	<ul style="list-style-type: none"> Broad product range Partially UL approval Partially VDE approval 	B599*5C0***A070 B599*0C0***A070 B598*0C0***A070 B5988*C0120A070 B5975*B01*0A070 B5977*B01*0A070 B5940*B0060A040
SMD PTC Superior Series		<ul style="list-style-type: none"> B59721A Series - case size 0805, 70°C to 130°C B59641A Series - case size 0603, 75°C to 145°C B59421A series - case size 0402, 75°C to 135°C 	<ul style="list-style-type: none"> Qualification based on AEC-Q200 rev. D High operating temperature of up to 150°C Operating voltage range: 14VDC – 40VDC Very short response time of 0.5ns 	B59721A B59641A B59421A


Negative Temperature Coefficient (NTC) Inrush Current Limiters

Series		Technical Data	Features & Benefits	Ordering Code/Type
ICLs for On-board Chargers		<ul style="list-style-type: none"> R_R at 25°C: 1.5 or 10 I_{max}: up to 16 A V_{RMS}: 110 or 230 V 	<ul style="list-style-type: none"> Qualified to AEC-Q200 	B57364S1*








Negative Temperature Coefficient (NTC) Thermistors

Series		Technical Data	Features & Benefits	Ordering Code/Type
NTCG10 -DS, -DSX, -1S, -1SX NTCG16 -DS, -DSX, -1S, -1SX		<ul style="list-style-type: none"> Case sizes: 1005 & 1608 (EIA 0402 & 0603) B constant: 3250 - 4550K [+25/+85°C] Nominal resistance value: 100Ω - 150kΩ [@+25°C] Operating temperature range: -40 to +150°C 	<ul style="list-style-type: none"> Temperature measurement and compensation Lead (Pb) free product Lead-less terminals electrodes and electroplating (Ni-Sn), excellent solderability and soldering heat resistance Product series provides a wide range of resistances and B constants Good stability of resistance value after soldering Attains less than low floating capacitance (using TCXO) in the high frequency region Qualified to AEC-Q200 	NTCG10*DS NTCG10*DSX NTCG10*1S NTCG10*1SX NTCG16*DS NTCG16*DSX NTCG16*1S NTCG16*1SX


Multilayer Varistors (MLVs)

Series		Technical Data	Features & Benefits	Ordering Code/Type
SMD Multilayer Varistor E Series		<ul style="list-style-type: none"> Case sizes: (EIA) 0402...2220 Operating voltage: 16 ... 56 VDC Load dump energy: 1 ... 25 J No derating up to +150°C 	<ul style="list-style-type: none"> Reliable ESD protection up to 30kV acc. to IEC 61000-4-2, level 4 (8kV contact, 15kV air) High energy absorption capability Bidirectional protection No temperature derating up to 150°C Qualification based on AEC-Q200 	B725xxE

Metal Oxide Varistors (MOVs)

Series	Technical Data	Features & Benefits	Ordering Code/Type
CU Varistors (SMD)	 <ul style="list-style-type: none"> • VR: 16 - 34VDC • Ctyp: 600 - 2300pF • VRMS: 14 - 30VAC • WLD: 6 - 12 J • Case Sizes: 3225, 4032 	<ul style="list-style-type: none"> • Jump start and load-dump protection acc. to ISO 7637, pulse 5 • Overvoltage protection in SMT version of standard disk varistors (5 and 7 mm dia) • AEC-Q200 qualified 	B72650M B72660
Disk Varistors AUTO Types	 <ul style="list-style-type: none"> • VRMS: 14 - 30VAC • IRMS: 0.25 - 2kA 	<ul style="list-style-type: none"> • High energy absorption, particularly for load dump • Jump-start strength • Stable protection level, minimum leakage current • High resistance to cyclic temperature stress 	B72210S1 B72214S1 B72220S1
Disk Varistors AUTO (D1) Types	 <ul style="list-style-type: none"> • VDC: 16 - 34V • VRMS: 14 - 30VAC • IRMS 8/20us: 0.25 - 2kA • Ctyp: 2.3- 19nF 	<ul style="list-style-type: none"> • High energy absorption, particularly for load dump • Jump-start strength • Operating temperature up to +125°C 	B722207S1 B72210S1 B72214S1 B72220S1
Disk Varistors SNF Types	 <ul style="list-style-type: none"> • VDC: 170 - 825V • VRMS: 130 - 625VAC • IRMS: 0.15 - 3kA 	<ul style="list-style-type: none"> • Operating temperature up to +125°C • AEC-Q200 qualified 	B72210U B72214U B72220U
Housed Disk Varistors ThermoFuse Types	 <ul style="list-style-type: none"> • VDC: 170 - 560V • VRMS: 130 - 420VAC • IRMS: 6 - 10kA 	<ul style="list-style-type: none"> • High energy absorption • Overvoltage protection with integrated thermal fuse 	B72214T B72220T
AVRM AVR-M AVRH	 <ul style="list-style-type: none"> • Case sizes : 1005 & 1608 & 2012 (EIA 0402, 0603 & 0805) • Varistor voltage (breakdown voltage): 22 (19.8 to 24.2) to 100 (90 to 110) V (DC1mA) • Maximum continuous voltage (Rated voltage) VDC: 16 to 70V • Clamping voltage: 34(2A) to 190V(1A)(8/20μs) • Maximum energy: 0.02 to 0.3J(10/1000μs) • Maximum peak current: 1 to 100A(8/20μs) • Capacitance: 4.7(1MHz, 1Vrms) to 800pF typ.(1kHz1Vrms) • Operating temperature range: -40 to +125°C 	<ul style="list-style-type: none"> • Countermeasure for surge and static electricity • No polarity due to symmetrical current-voltage characteristics • Excellent absorption capability • Adopted inner electrode lamination structure • Qualified to AEC-Q200 	AVRM* AVR-M* AVRH*
AVRL	 <ul style="list-style-type: none"> • Case sizes : 1005 & 1608 (EIA 0402 & 0603) • Varistor voltage (breakdown voltage): 22 (19.8 to 24.2) to 100 (90 to 110) V (DC1mA) • Maximum continuous voltage Rated voltage VDC: 10V • Clamping voltage: 58(1A) to 62V(0.5A)(8/20μs) • Maximum energy: 0.01J(10/1000μs) • Maximum peak current: 0.5 to 1A(8/20μs) • Capacitance: 3.3 to 6.8pF typ.(1MHz, 1Vrms) • Operating temperature range: -40 to +125°C 	<ul style="list-style-type: none"> • Low capacitance type • Countermeasure for surge and static electricity • No polarity due to symmetrical current-voltage characteristics • Excellent absorption capability • Adopted inner electrode lamination structure • Qualified to AEC-Q200 	AVRL*

Gas Filled Contactor

Series	Technical Data	Features & Benefits	Ordering Code/Type
High Voltage Contactor	 <ul style="list-style-type: none"> • Max operating voltage up to 900 VDC • Continuous operating current up to 500 A • Dimensions: 89 mm x 44 mm x 93.5 mm • High-speed extinguishing of arcs • Optional detection of switching status 	<ul style="list-style-type: none"> • Bipolar design • 1 million nominal switching cycles • Operating voltage up to 900 V • Contact stuck detection available • EMI free, hermetically sealed • RoHS compatible • UL 60947-4-1 approval 	B88269X

Attracting Tomorrow

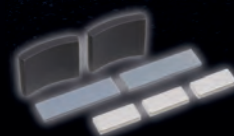


TDK Technology Driving new mobility.

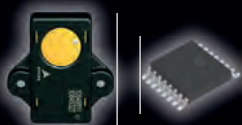
DC-DC converters and
on-board chargers
in industry-leading small size



Rare earth and ferrite
magnets for high-efficiency
motors



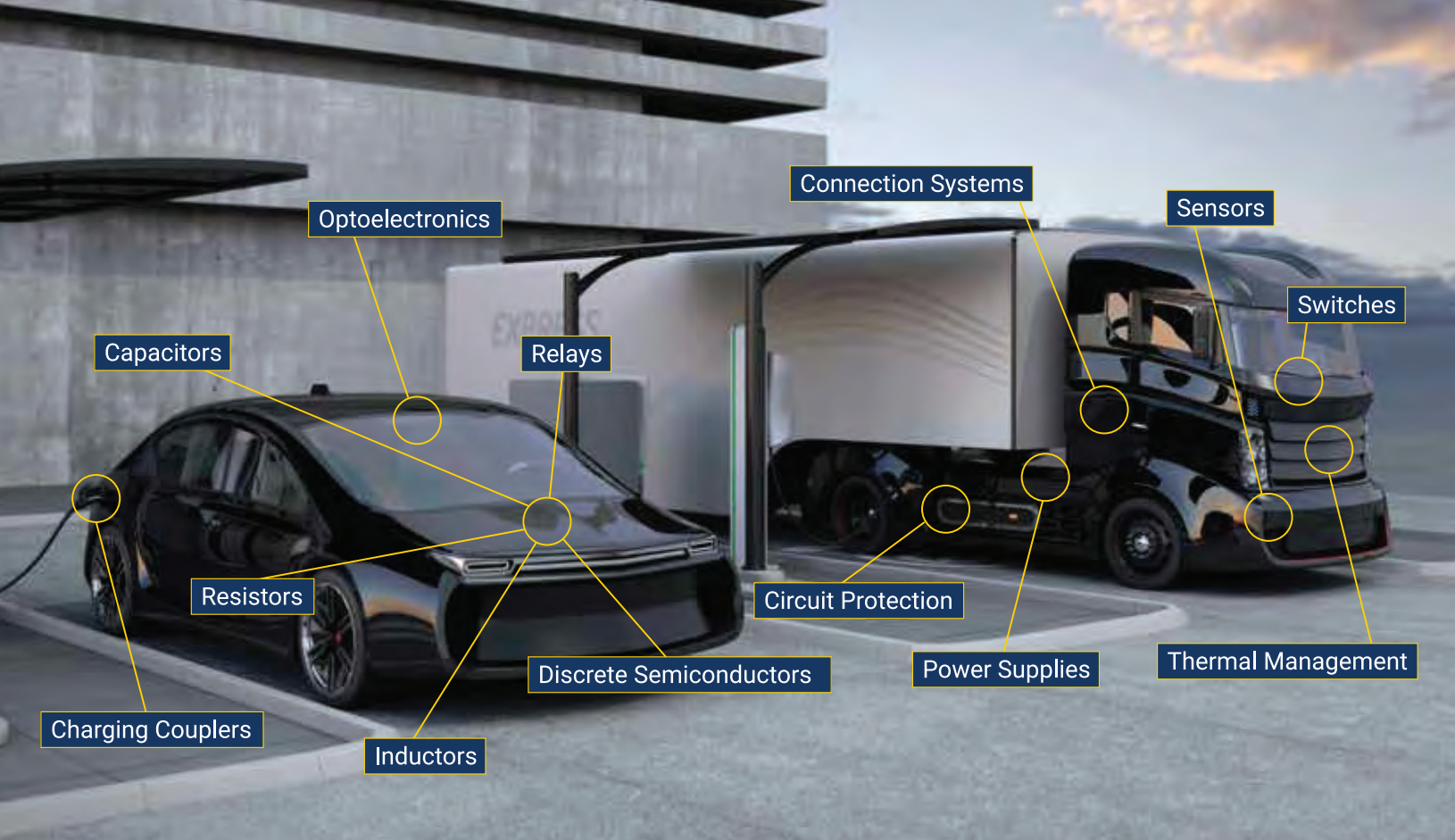
Pressure sensors and TMR
angle and motion sensors
for high-precision applications



Aluminum electrolytic
capacitors and MLCCs
with high reliability



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- One of our seven proximity warehouses in Mexico's major manufacturing centers.



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Enabling Smart Mobility Solutions
for the Future of Transportation

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now Aptiv

In December of 2017, Delphi announced a bold new strategy to move its technologies business forward under the Aptiv brand, while spinning the Powertrain business off under the legacy Delphi brand name. This change affects the entirety of Delphi branded products on the TTI line card and we are proud to continue to partner with our friends, associates, and colleagues at the former Delphi business, in driving the new Aptiv brand forward.

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DELPHI
Innovation for the Real World

• **APTIV** •



CONNECTORS

ePower Connectors



The ePower series of connectors are designed for the demanding requirements of hybrid, electric vehicles, and utility truck electrical systems, operating at 800VDC – 1,000VDC with a 200A – 700A rating.

FEATURES & BENEFITS

- Two or three circuit power
- Crimp, lug or bus bar termination
- IP2X on pin and socket
- Environmental IP67 rating
- Two HVIL circuits
- 1,000VDC rating
- 8.0mm, 11.1mm, & 18mm RADSOK® technology for 200, 400, & 700A continuous current capability
- Strain relief for jacketed cable incorporated into shell
- Integrated EMI shielding
- Excellent vibration resistance
- All aluminum shell
- RoHS compliant

APPLICATIONS

- Power converters
- Hybrid electric vehicles
- Heavy equipment electrification
- Starter generators
- Power distribution unit
- Motor control
- Power/battery storage

Max-M12 Connectors



Based on the IEC 61076-2-101 and SAE J 2839 standards, the Max-M12 connection system makes it the perfect solution for the ultra-rugged applications that sometimes exist in markets dealing with Heavy Equipment, Rail & Mass Transit, Process Control, Factory Automation, etc.

FEATURES & BENEFITS

- HDM 12 versions available
 - Plastic or metal (for shielding)
 - 90° right angle and straight connector offerings
 - 3, 4, and 5 way circuit patterns
 - A, B, D & P polarity codes – based on IEC 61076-2-101
 - Terminals for solder to wire or pins for PCB applications
- Available as stand-alone connectors & cable assemblies (standard and overmolded)
- Terminals capable of being terminated to:
 - 0.8 mm² (18AWG) or 0.5 mm² (20 AWG) conductors as defined by SAE J1128 and 0.75 mm² and 0.50 mm² conductors as defined by ISO 6722
- 444 N (100 LBF) pull force on cable
- Backward compatible with IEC 61076-2-101 (M12)
- More resistant to terminal damage
- Extreme environmental testing based on J2839 requirements
 - High pressure wash down
- Provisions for overall cable shield or drain wire to the connector plug housing
- RoHS compliant

APPLICATIONS

- Event recorders
- Communications
- Door systems
- Monitoring & Diagnostic
- Data transmission
- Cameras
- GPS

GT Reverse Bayonet



Designed with MIL-DTL-5015 insert patterns in mind, this circular reverse bayonet connector has roots in the military market. Amphenol GT's have become a widely used connector in other markets like geophysical, aerospace, alternative energy and preferred in the mass transit industry.

FEATURES & BENEFITS

- Rugged aluminum or stainless steel shell styles
- Variety of additional shell platings available
- Crimp and solder contacts available with silver or gold plating
- Inserts with Neoprene or optional low smoke material or Viton material
- Operating temperature: Neoprene/low smoke -55°C to +125°C; Viton -50°C to +200°C
- Audible, tactile, and visual indication of positive coupling
- 2000+ mating cycles
- High shock and vibration resistance
- No lock-wiring necessary
- IP67 protection

APPLICATIONS

- Event recorders
- Communications
- Door systems
- Monitoring & Diagnostic
- HVAC
- Engine/Motor
- Brakes
- Electrical
- Transmission
- EV/HEV/Battery/Charging

PT Series I



Amphenol Miniature Cylindrical connectors offer twice the number of contacts in just half the size of a standard connector. These miniature connectors are available in several series, each with varying design characteristics and custom options to meet cost considerations and provide maximum design flexibility. This series features gold-plated contacts in either solder or crimp. Available as the MS part number or commercial equivalents.

FEATURES & BENEFITS

- ¼ Turn Mating
- Versatility for power and signal
- Triple fully mated indicators
- 500+ mating cycles
- Resilient neoprene insert
- Variety of shell styles
- Available with Solder, Crimp, PCB, Coax, Thermocouple, or Hermetic
- Contacts may be plated with gold or silver
- Intermateable/Interchangeable with Cannon's KPT series
- Variety of finishes available

APPLICATIONS

- Event recorders
- Communications
- Door systems
- Monitoring & Diagnostic
- HVAC
- Engine/Motor
- Brakes
- Electrical
- Transmission
- Cameras
- GPS
- Data transmission
- Lighting

PowerLok™



Amphenol Industrial PowerLok™ Series is the lowest cost cylindrical interconnect solution. Utilizing Amphenol's RADSOK® technology, PowerLok is designed with compactness and robustness in mind. Low insertion force/high cycle durability with secondary lock prevents unintentional loosening of the contact. Suitable for applications up to 1000V ranging from 70A-500A, the PowerLok is a reliable, easy to use, and cost effective solution. Applications include energy storage, power distribution, and EV/HEV. PowerLok is IP67 when mated and RoHS Compliant.

FEATURES & BENEFITS

- Low profile
- Multi polarization
- Low insertion force and high-cycle durability
- Secondary lock
- Economical
- Accepts shielded & unshielded cable
- Water immersion: IP67 in mated condition
- Scoop-proof, satisfy the battery or electric box needed
- RoHS compliant

APPLICATIONS

- Energy storage
- Power distribution
- EV/HEV
- Power distribution unit
- Motor control
- Power/battery storage
- Charger

ePower-Lite



Amphenol Industrial ePower-Lite Plastic Power Connectors are a medium amperage connection system that is rated up to 70A of continuous current. Amphenol Industrial ePower-Lite also features an 800VDC operating voltage. These plastic power connectors offer two-, three-, and four-pole systems with optional high-voltage interlock loop (HVIL) and electromagnetic interference (EMI) shielding for safety and performance.

These Amphenol Industrial connectors feature a compact plastic shell structure that is light weight with a small footprint. Designed for hybrid and electric vehicle applications, ePower-Lite connectors provide weight and space savings in vehicle architecture.

FEATURES & BENEFITS

- Plastic shell, light weight
- Compact design for space considerations with electric vehicles
- Low mating/unmating force
- 70A continuous current
- 800VDC operating voltage
- 2-, 3-, and 4-pole options
- 100 mating cycles minimum durability
- IP67 waterproof rated

APPLICATIONS

- Hybrid vehicles
- Electric vehicles
- Power distribution unit

UPC

UPC (Universal Power Connector) is a plastic power connector series especially designed to be used in the hybrid electric vehicle market. The 2-pole and 3-pole connectors incorporate the patented RADSOK® technology for higher amperage, lower T-rise and voltage drop, and less resistance. RADSOK® twisted grid configuration allows for 50% more current to pass through the same size pin, while providing increased reliability and cycle durability, as well as lower mating forces.



The compact, plastic shell structure is light weight with a small footprint, has continuous power up to 400A, and is field installable and repairable. These attributes make UPC robust and the interconnect of choice for the EV and Hybrid markets.

FEATURES & BENEFITS

- Plastic shell, light weight
- Compact design for space considerations with EVs
- Wide amperage range (200-400A)
- Low mating/unmating force
- Durability: 500 mating cycles minimum
- Touch Proof (UL 2251)
- HVIL
- EMI (60db/100M)

APPLICATIONS

- Power converters
- Hybrid electric vehicles
- Heavy equipment electrification
- Motor control
- Starter generators
- Power/battery storage
- Power distribution unit
- Charger

SurLok Plus™

Amphenol Industrial SurLok Plus™ Compression Lugs are IP67 rated field installable, highly reliable alternatives to common compression lugs that require no special torque tools by using industry standard crimp, screw, and busbar termination options.



The lugs feature quick lock and press-to-release design as well as a “keyway” design to prevent incorrect mating. The SurLok Plus™ Lugs incorporate the latest R4 RADSOK® technology, utilizing high tensile strength properties of a stamped and formed high conductivity alloy grid to produce low insertion forces while maintaining a large conductive surface area.

FEATURES & BENEFITS

- R4 RADSOK technology
- IP67 rated
- Touch proof
- Quick lock and press-to-release design
- “Keyway” design to prevent incorrect mating
- 360° rotating plug
- Various termination options (threaded, crimp, busbar)
- Compact robust design

APPLICATIONS

- EV/HEV
- Power/battery storage
- Heavy equipment
- Power distribution unit

Battery Flex



Flex and/or Rigid-Flex circuits are used to improve reliability, provide design flexibility through 3D packaging, reduce weight, lower overall cost of valuable assembly and labor time, enable package size reduction, among others.

FEATURES & BENEFITS

- Senses cell voltage
- Senses cell temperature
- Saves space
- Saves weight
- Improves ease of installation
- Eliminates wiring errors (repeatable)
- Operating temperature: 45°C up to 200°C

APPLICATIONS

- Hybrid vehicles
- Electric vehicles
- Power/battery storage



HC 32POS

Amphenol's HC 32POS is a rectangular connector used for power and/or signal. Housed in a plastic shell with thirty-two positions, this series lends itself well to the Hybrid and Electric vehicle markets. Commonly featured within the battery system with an IP67 rating and is RoHS compliant.

FEATURES & BENEFITS

- Contact size 16 & 20
- IP67 rated
- Plastic shell
- 32 way
- Sealed rear panel mount
- Current rating 13 amp (power) & 5 amp (signal)
- Cable size 1418 AWG (power) & 2022 AWG (signal)
- Operating temperature: 40°C up to 125°C

APPLICATIONS

- Hybrid vehicles
- Electric vehicles
- Power/battery storage

RADLOK™



Utilizing Amphenol's latest R4 RADSOK® technology, our RADLOK™ product line was designed to be compact and robust.

Power interconnect products in today's market often require additional mounting hardware (e.g. washers, clamps, bolts, nuts, etc.) making them prone to costly labor expenses for installation and routine maintenance.

Paired with Amphenol's RADLOK™ PIN, the single finger operation lock feature allows end users to connect any power distribution/storage system in a quick and secure manner.

The RADLOK™ product line is the answer to industries where a custom, reliable, easy to install, rugged, and cost effective solution is required.

FEATURES & BENEFITS

- Voltage rating: 1000V
- Current rating: 70A - 400A
- Tool-free mechanical locking
- High cycle durability (500 mating cycles)
- RoHS compliant
- Available in black, red, orange (custom coloring available)

APPLICATIONS

- Power/battery storage
- Hybrid-electric system
- Power interconnect

• APTIV • | Aptiv (formerly Delphi) Connectors

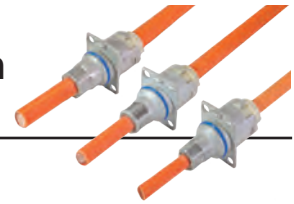
Main Global Terminal Families

FEATURES & BENEFITS

- OCS 05, 064, 150, 280 ...
- DUOTWIN/ MTS 064
- DCK/ CTS 050, 064, 120, 150, 280, 480/630 ...
- DCS/ DSQ 150, 280, 480/630, 950
- SICMA/ BTS 150, 280
- APEX 064, 120, 150, 280, 635 and 950
- DUCON, GTS, Perf. Pack, HDK, HES, Power Pack, GT, MP
- Ring terminals and grounding systems



High Voltage Metal Pass-Through



FEATURES & BENEFITS

- High voltage: 1000V DC
- 250A continuous depending cable characteristics and selection
- Sealing protection: IP67, IP6K9K
- 8 codlings for 50mm²
- 6 codlings for 35 and 25mm²
- Wire sections: 25, 35 and 50mm²
- Vibration: SAE/USCAR2 5.8.2 severe vibration with -40°C to +150°C environment loading
- Volvo truck class 5 and 6 vibrations
- Flange size: 111mm x 52mm
- IP2XB Finger proof/touch safe
- 1 key/index

APPLICATIONS

- E-motor connections, screw type device connections with heavy duty requirements
- Commercial vehicles: trucks, tractors with high vibration profiles

RCS890 High Voltage 2 Way Right Angle Connection System with HVIL

FEATURES & BENEFITS

- Bundle shielding with external braid
- Panel mount to device with face seal to module
- HVIL shunted-in harness connector
- Two-stage disconnect for safe unmating
- Slider mating assist system on harness connector
- Two HV power circuits (8.0mm round terminal)
- IP2xB finger proof/touch safe
- Cable size: 35mm² – 50mm² power circuit; 0.5mm² – 0.75mm² HVIL circuit
- Current capacity: 230A at 70°C
- Voltage: 750V
- Temperature range: -40°C – +125°C
- Sealing protection: IP67, IPx9K



APPLICATIONS

- High voltage/high current modules:
 - Inverter
 - Battery
 - Junction box
 - Power electric box
 - Electric vehicle

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APEX® HV280 2 Way Connection System with HVIL



FEATURES & BENEFITS

- Bundle shielding with external braid
- Panel mount to device with face seal
- HVIL shunted-in harness connector
- Two-stage disconnect for safe unmating
- ErgoMate™ axial mating assist system on harness connector
- Two HV power circuits (2.8mm terminal)
- IP2xB finger proof/touch safe
- Cable size: 2.5mm² – 4mm² power circuit; 0.5mm² – 0.75mm² HVIL circuit
- Current capacity: 35A at 70°C
- Voltage: 1000V
- Temperature range: -40°C – +125°C
- Sealing protection: IP67, IPx9K

APPLICATIONS

- High voltage peripheral equipment connection system:
 - Air conditioning
 - PTC
 - Charger

RCS800 High Voltage 2 Way Connection System with HVIL



FEATURES & BENEFITS

- Bundle shielding with external braid
- Panel mount to device with face seal to module
- HVIL shunted-in harness connector
- Two-stage disconnect for safe unmating
- ErgoMate™ axial mating assist system on harness connector
- Two HV power circuits (8.0mm round terminal)
- IP2xB finger proof/touch safe
- Cable size: 35mm² to 50mm² power circuit; 0.5mm² – 0.75mm² HVIL circuit
- Current capacity: 230A at 70°C
- Voltage: 1000V
- Temperature range: -40°C – +125°C
- Sealing protection: IP67, IPx9K

APPLICATIONS

- High voltage/high current modules:
 - Inverter
 - Battery
 - Junction box
 - Power electric box

Shield-Pack™ HV280 - 2 Piece Header with Pluggable Inner Connector



FEATURES & BENEFITS

- Inner connector with TPA can be plugged into header during device assembly
- Sealed connection system
- Panel mount to device with face seal
- Internal HVIL (shunt in harness connector)
- Two HV power circuits (2.8mm terminal)
- IP2XB finger proof/touch safe
- Cable range: 2mm² to 5mm² power circuit; 0.5mm² HVIL circuit
- Three keys/indexes
- Current capacity: 40A at 85°C
- Voltage: 600V
- Temperature range: -40°C to +125°C
- Sealing protection: IP67, IP6K9K

APPLICATIONS

- Ideal for internal battery harnesses/high voltage connection system

• APTIV • | Aptiv (formerly Delphi) Connectors

Charge Coupler Connector Pigtails



FEATURES & BENEFITS

- Current capacity: 15A to 32A
- Voltage range: 120V to 480V
- Temperature range: -40°C to +50°C
- Validation: see part number information
- SAE J1772/IEC62196 Type I, IEC62196 Type II, and GB/T 20234 compliant connections
- Wiring crimps sealed from environment
- Rubber overmold and plastic grip options available

APPLICATIONS

- Cable assemblies for integration into charging stations or portable cordsets per customer requirements

Charge Plug Mode 2 Assembly (with ICCB)



FEATURES & BENEFITS

- Vehicle interface through three global standards
- EVSE provides restart in the event of power grid fault
- Programmable for multiple charge currents
- NEMA 4 construction
- UL/CE marking
- 120V/12A
- 240V/10A, 13A, or 16A
- SAE J1772/IEC62196 Type I, IEC62196 Type II, and GB/T 20234 vehicle interface
- Grid cord as required by country of use
- Call for additional configurations

APPLICATIONS

- Portable Electric Vehicle Supply Equipment (EVSE) for electric vehicle charging

Charge Plug Mode 3 Jumpers



FEATURES & BENEFITS

- Vehicle interface through three global standards
- UL/CE marking
- SAE J1772/IEC62196 Type I, IEC62196 Type II, and GB/T 20234 vehicle interface
- Call for additional configurations

APPLICATIONS

- Electric vehicle charging

Charge Inlet - Type II Vehicle Charging Inlet



FEATURES & BENEFITS

- Supports single-phase or three-phase power supply
- Supports: 16A, 230V and 63A, 400V
- Voltage: 400V maximum rating
- Temperature range: -40°C to +50°C
- Electrical protection: IP2XB
- Sealing protection: IP44 (connector/inlet mated)
- Design life: 10,000+ mating cycles
- Interface complies with IEC62196 Type II standard
- Panel mounts to vehicle
- Integrated thermal circuit breaker to prevent abnormal temperature increase inlet connector only
- Cover provides dust protection
- Designed to drain fluid if introduced to inlet
- Holes provided for coupler lock actuator
- Available with cover opening right or left

APPLICATIONS

- Plug-in hybrid and electric vehicle charge inlet

• APTIV • | Aptiv (formerly Delphi) Connectors

APEX® 150 Sealed Connectors – 10, 14, 16 & 24 ways



FEATURES & BENEFITS

- USCAR "on-engine" performance standard suitable for harsh environments
- Circumferential interface seal
- Mat seal design
- Wire accommodation range – 0.35mm² (22 AWG) to 1.5mm² (16 AWG)
- Mid-sized housings (3.5mm pitch)
- Fully assembled connector for ease of use
- Terminal Position Assurance (TPA) device to detect partially installed terminals
- Connector Position Assurance (CPA) available
- 24 ways version includes FCI's ErgoMate® mate-assist technology
- 14 ways and 24 ways connectors offer shorting bar options

APEX® SensoMate™ 2.8mm Sealed Sensors – 2, 3 & 4 ways



FEATURES & BENEFITS

- APEX® terminal technology and performance in our smallest package
- Sealing technology: cable seal
- SWS (cable seal) terminal seal design
- SensoMate 2.8 connectors mate to certain Bosch fuel injectors and components
- Heavy duty – for diesel engine vibration and temperature duty cycles
- Compliant with USCAR design guidelines and performance standards
- Superior single-piece housing construction
- Terminal Position Assurance (TPA) device to detect partially installed terminals

APEX® 2.8 Sealed & Unsealed Connectors – 2, 3, 4, 6, 10 & 14 ways



FEATURES & BENEFITS

- Circumferential interface seal
- Heavy duty connectors for demanding environments
- Proven record since 1993
- Most compact 2.8mm system in the industry
- Wire accommodation range – sealed 0.75mm² (20 AWG) to 4mm² (10 AWG) – unsealed 0.35mm² (22 AWG) to 5mm² (10 AWG)
- Robust APEX® performance
- Mid-sized housings (5.25mm pitch – 6.40mm rows)
- Mat seal design
- Fully assembled connector for ease of use
- Terminal Position Assurance (TPA) device to detect partially installed terminals
- CPA Available
- Up to 7 mechanical polarizations available
- Meets or exceeds USCAR performance standards

APEX® SensoMate™ 1.2mm Sealed Connectors – 2, 3 & 4 ways



FEATURES & BENEFITS

- APEX® terminal technology and performance in our smallest package
- SWS (cable seal) terminal seal design
- SensoMate 1.2 connectors mate to AK 1.2 device interface
- Heavy Duty – for diesel engine vibration and temperature duty cycles
- Sealing technology: cable seal
- Compliant with USCAR design guidelines and performance standards
- Superior single-piece housing construction
- Terminal Position Assurance (TPA) device to detect partially installed terminals
- CPA available

• APTIV • | Aptiv (formerly Delphi) Connectors

Sicma Sealed Connectors – Mini-Sealed 2, 3, 4, 5, 6 & 24 ways



FEATURES & BENEFITS

- High-sealing performance ensured by rear mat-seal and circumferential interface seal
- Optimized size with 3.33mm pitch for 1.5mm terminals
- Reduced size sealed housing
- Easy and quick connection system with Go-No-Go locking principle
- Integrated secondary lock feature (TPA) allowing detection of unlocked terminals
- Terminal Position Assurance (TPA)
- Optional Connector Position Assurance for 2 and 6 ways (CPA)
- Optional 6 ways hybrid with rear latch principle: 17260685A (black coding)
- Suitable for body, engine compartment and harsh environment applications

Sicma Panel Through Sealed Connectors – 14, 16, 24, 26, 34 & 50 ways



FEATURES & BENEFITS

- High density connectors particularly suitable for door-to-body or engine-to-cockpit applications
- Suitable for a combination of low and medium current applications
- Mating assistance system with slider to minimize mating force and allow blind mating
- Male terminals can be protected from hazardous damage thanks to a front grid protection

Sicma Sealed Relay Sockets – 7, 8 & 11 ways



FEATURES & BENEFITS

- Single wire seal
- Circumferential interface seal
- 15g vibration performance
- Front terminal position assurance
- Slider for reduced mating assistance

Sicma Sealed Full Interconnect – 6, 24, 56 & 90 ways



FEATURES & BENEFITS

- Female housing connection to male housing for PCB mount
- High-sealing performance ensured by rear mat-seal and front interfacial seal
- Slider for mating force reduction and blind mating
- Integrated secondary lock device allowing detection of terminals (TPA)
- Typical applications: electrical parking brake, clutchless gear box controller, liquified petrol gas controller, engine management electronic control unit

• APTIV • | Aptiv (formerly Delphi) Connectors

Harsh Environment Series (HES)



FEATURES & BENEFITS

- Circular connector size 24 shell
- 19, 21, 23, 29, 31, 47, 50 and 60 way headers
- Various terminal sizes and patterns
- Terminal designed for lower insertion forces
- Size 20 and 16 available
- 3-rib design provides better sealing capability up to 50% compared to existing designs
- Environmentally sealed to IP67
- Male pin and female socket terminal cavity compatible with all industry pin and socket connections
- Rugged construction to withstand harsh environments
- Forward/backward compatibility
- Sonic welded design provides 360° of contact to withstand high vibration to meet J-2030 standards

APPLICATIONS

- Commercial vehicles
- Construction vehicles
- Military vehicles
- Marine vehicles

OCS Unsealed Connectors



FEATURES & BENEFITS

- Female connector
- Male connector
- Secondary locks
- Robust design features for enhanced warranty performance and designed-in durability
 - Connector lock design ensures connection integrity
 - Overstress feature for handling robustness
 - CPA capability
 - Clear and consistent audible click
- USCAR indexing
- Front-mounted spacer (primary lock reinforcement) is delivered pre-staged to the harness manufacturer
- Independent secondary lock (ISL) for certain size terminals
- Multiple terminal sizes available
 - 0.64mm, 1.20mm, 1.50mm, 2.80mm
- Cavity compatible with industry standard terminals
- Validated to USCAR and other custom specifications

APPLICATIONS

- Automotive
- Transportation

GT Global Terminal Series

FEATURES & BENEFITS

- 1.50mm and 2.80mm versions
- Headers
- Lever lock
- Mixed
- SlimLine
- Tangless terminals
- Low engagement force
- Pump-handle primary lock
- Secondary lock, Connector Position Assurance (CPA), and Terminal Position Assurance (TPA) capabilities
- Mates to ISO, SAE blades
- Optimized content packaging for space-efficient terminations
- Pre-staged male blade stabilizer or superior male blade protection
- Mixed terminal capability or design flexibility
- Protected seal interface
- Conforms to USCAR design footprint
- Cam lever/mechanical assist or hand engage/disengage



APPLICATIONS

- Ergonomic connections for in-line device, header, and bulkhead applications

OCS Sealed Connectors






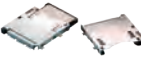


FEATURES & BENEFITS

- Robust design features for enhanced warranty performance and designed-in durability
 - Patented connector lock design
 - Low profile lock with overstress protection
 - Clear and consistent audible click
 - Enhanced strain relief
 - Cavities can be molded fully open, or selectively punched, eliminating the need for loose piece cavity plugs
 - Thumb grip incorporated to aid connector unmating
 - Optional conduit capture
 - Optional CPA
 - USCAR indexing
 - PLR is delivered pre-staged to the harness manufacturer
- Reliable connector seal design
- Multiple terminal sizes available
 - 0.64mm, 1.20mm, 1.50mm, 2.5mm
- Cavity compatible with industry standard terminals
- Validated to USCAR-2 Class III and other custom specifications

APPLICATIONS

- Automotive
- Transportation

Product	Series	Description	Range
	Custom Automotive Connectors	Advanced component, process and automation technology provides high pin and component (Mechatronics) count connector and module solutions for emerging automotive systems; engine management, braking, steering, safety, environmental, etc.	Designed based on customer requirements
	IDC	Provides reliable "Gas Tight" wire-to-board connections for high temperature, shock and vibration applications	AWG: 12-30 SMT and PTH
	Board-to-Board	Fine pitch, vertical board-to-board connectors	20-120 pos 3-9mm stacking height
	Secure Locking FFC/FPC	FFC/FPC cables connectors with secure locking mechanism	8-80 positions right angle and vertical types
	High Speed FFC/FPC	FFC/FPC cables connectors for high data speed	24-51 positions right angle
	SDIO	SDIO connectors for SD memory cards with push-push spring eject mechanism	Reverse and normal mount type 2.7-2.9mm connector max height





ITT Cannon Connectors

Transportation and Heavy Equipment Connectors

Trident Series Connectors



ITT Cannon's Trident Series is a versatile range of corrosion resistant, high performance plastic or metal connectors. The series includes the Trident Neptune, Trident Neptune Metal, Trident Ringlock, Trident High Voltage, Trident Flame Retardant and Trident Snap Together.

FEATURES & BENEFITS

- Integrally molded latches or bayonet coupling
- High voltage connectors (up to 250 VAC)
- Mixed power (30A) and signal (13A up to 16A) layouts
- High sealing, high vibration, high voltage with shielded variants
- Accessories: end bells, conduit & heat shrink tubing, adapters, dust caps and gaskets
- Low total cost of ownership with easy contact installation and fast mating
- Wide range of stamped and machined contacts, plating and wire sizes
- Contacts interchangeable between all series
- IP65/IP67 & RoHS compliant
- UL & CSA listed for some series

APPLICATIONS

- Engine compartment
- Cabins/chassis
- EV batteries/power distribution
- Gear box/switch cabinets
- Control panels/box
- Sensor applications
- Dashboard harnessing
- Lighting
- Cooling and heating systems

CTC Series Connectors



The ITT Cannon CTC Series is a high-performance, high-density, cost effective cable-to-cable rectangular solution for use in harsh environment applications where reliable signal circuits are critical to operating performance.

FEATURES & BENEFITS

- Snap together latch with audible feedback when mating
- Small in size, light in weight, space saving
- Operating Temperature: - 55°C to +105°C
- Rugged thermoplastic, robust design with keying features
- Available in 8,12,16, 24 way
- Up to IP69 sealing level
- Hand insertable 13 amp & 16 amp contacts
- No special tools required
- Excellent durability: Up to 200 mating cycles
- Wire range: 24-16 awg (0,20 mm² - 1,5 mm²)
- Operating Voltage: Up to 250 VAC

APPLICATIONS

- LCD displays
- Sensors
- Engine harnesses
- Lighting systems
- Controllers
- Signal interface
- Cabin accessories
- Seat and window controls
- Wipers/Underhood electronics
- LCD displays & accessories

Transportation and Heavy Equipment Connectors

APD Connectors Series and Modular Panel Interface



ITT Cannon's APD Series is well suited for various applications in the cabin or chassis area. The full plastic connector series with bayonet coupling and optional secondary locking feature is rated to IP67/IP69K and ISO 15170.

New to this series is the APD Modular Interface. The Modular APD Interface ensures installing, reconfiguring, mating and unmating of Cannon's class leading APD interconnects is simple, fast and pain-free.

The sub-system delivers exceptional flexibility during the entire vehicle product life cycle. This customizable, modular connector system allows you to add and change connectors as additional vehicle services are developed or new standardized are implemented.

FEATURES & BENEFITS

- Designed according to ISO 15170
- Full plastic, robust design
- Bayonet locking with secondary locking feature
- IP67 & IP69K sealing level
- Temp Range: -40°C to +140°C
- High power up to 245 A
- High voltage up to 500 VDC/VAC
- Wire range: 0.35 – 50 mm² (AWG 22 – AWG 0)
- Configurations 1, 2, 4, 6/7, 19, 37, 51-way
- Versatile mounting styles: Plug, Flange, Snap-In & Jam Nut
- Light in weight, cost effective in terms of material used

APPLICATIONS

- Gear box
- Control panels/box
- Sensor applications
- Dashboard harnessing
- Cooling and heating systems
- Signal and power distribution
- Lighting
- Engine control unit
- EV battery & power distribution

CA Bayonet Connector Series



Cannon's CA Bayonet Series is a reverse bayonet connector with exceptional shock and vibration resistances. A proven, versatile high-performance interconnect solution for critical harsh environment applications. VG95234 certified, with sealing up to IP68/IP69k and a wide variety of RoHS compliant plating options.

FEATURES & BENEFITS

- Configurations: Box mount, wall mount, jam nut, thru-bulkhead, straight, cable-to-cable, right angle VG95234 approved
- Proven bayonet coupling design
- Ruggedized for harsh environment applications
- Extreme shock and vibration resistance
- Superior shielding performance
- Wide variety of shell sizes and accessories
- Extensive variety of contact arrangements (~ 140 layouts)
- RoHS compliant plating options including:
 - ITT Cannon's Blue Generation® plating (A240), 500h salt spray, highly conductive
 - ZincCobalt black plating (A232), 200h salt spray
 - ZincCobalt green plating (A233), 200h salt spray, highly conductive
- Durability: 500 mating cycles
- IP67/IP68/IP69 environmental resistance

APPLICATIONS

- Ground defense vehicles/systems
- Construction/off-road vehicles
- Heavy industrial equipment
- Combustion engines & motors
- Power and signal control boxes
- Control & sensor systems
- Rail applications, rolling stock
- Rail and highway infrastructure
- Heavy industrial machinery & production equipment
- Test & measurement equipment in harsh environments



ITT Cannon Connectors

Rail and Rail Infrastructure Connectors

CIR/FRCIR Connector Series



ITT VEAM's CIR/FRCIR connectors offer a cost effective, highly engineered industrial circular connector. This is ideal for exterior exposure and transportation applications. This broad series of connectors is available in 256 different layouts and with a wide range of accessories. Shell material options include Aluminum Alloy, Stainless Steel and Marine Bronze.

FEATURES & BENEFITS

- 1-159 poles and 256 layouts for signal, power and coax
- IP67 environmental resistant
- Flame retardant (EN 45545 HL3 – NFPA 130)
- 2,000 mating cycles
- Aluminum alloy shells up to 500 hours salt spray resistance
- Also available in stainless steel, Blue Generation® plating, & marine bronze

APPLICATIONS

- Rail: rolling stock and railway infrastructure
 - Switches
 - Train control
 - Couplers
 - Converters/inverters
 - Power distribution
 - Intervehicles
 - Signaling
 - Automatic doors
 - Brake/Speed sensors
 - HVAC

Power Plate Interconnect Solutions



ITT Veam's Power Plate solution is a multi-pole power interconnection system, which connects the railcar to the bogie. This customizable solution delivers a compact design and high performance in extreme environments.

FEATURES & BENEFITS

- Operating voltage: from 1200V to 3700V
- Overvoltage rating: from OV1 to OV4 according to CEI EN 50124-1
- Pollution degree: PD1 according to CEI EN 50124-1
- Current rating: 225 Amps. Max 350 Amps
- Insulation resistance: 5000M ohms min.
- Protection degree: IP67 (in mated condition)
- Operating temperature: -55°C +125°C
- Flame retardant thermoplastic material rated I2F2 acc. to NF F 16 101 & 16 102 and UNI CEI 11170 class I2F2.
- Contacts: size 4/0 for 50 and 70 mm2
- Shell: aluminum alloy black hard anodized finished

APPLICATIONS

- Rail: rolling stock
 - Converters/inverters
 - Power distribution
 - Intervehicles
 - Traction motors

Rail and Rail Infrastructure Connectors

CIR M12

ITT's VEAM CIR M12 Series is a bayonet coupling circular connector for harsh environment Ethernet communication applications. This high speed connector solution is a combination of M12 and coax contacts mounted into Veam FRCIR connector series hardware. Supporting gigabit communication, the CIR M12 enables the transfer of data from Ethernet, MVB, WTB, and Video lines within the same connector.



FEATURES & BENEFITS

- Available in 1 way and 4 way versions
- M12 contact system: 2, 4, 8-pole and COAX contacts
- Performance up to ISO/IEC Class FA, supports communication speeds up to 10 Gbps
- Flame retardant (EN 45545 HL3 - NFPA 130)
- IP67 environmental resistant
- Aluminum alloy shells up to 500 hours salt spray resistance

APPLICATIONS

- Couplers
- Converters/inverters
- Intervehicles

Electric Vehicles and Infrastructure

Charging Connectors, Inlets & Accessories

ITT's VEAM charging connectors, inlets, harness assemblies and accessories offer interconnect solutions for charging stations (both captive and jumper cable) and electric vehicles (jumper cable and inlet to vehicle). Our EV/Hybrid connectors provide charging capabilities up to 80A at 600V.



FEATURES & BENEFITS

- Built in accordance with all key regional standards - IEC 62196, SAE J1772 and GB/T 20234
- ITT offers both 1 phase and 3 phase charging for all underlying standards
- Up to 80A AC charging option
- Low contact resistance
- Minimum 10k mating cycles
- Coupler connector/plug strain relief provides protection from cable overstressing
- Customized interconnect solutions adding significant value to specific solutions
- Accessories: spring loaded cap, rear strain relief boot, ring cap assembly for ECIER rear mount inlets
- Coupler connector/plug dual locking system
- Jumper cables available for IEC (Europe) and GB (China)
- Certifications: UL, Intertek, ETC, CQC, & Jet

APPLICATIONS

- Public charging stations
- Mode 3 charging cables
- Roadside assistance trucks
- Fleet trucks
- EV city buses and distribution trucks
- Residential EV charging units
- EV airfield vehicles/equipment
- EV passenger cars
- Electric motorcycles
- Electric bikes (E-bikes)
- Electric agriculture vehicles



Kyocera Connectors

AUTOMOTIVE APPLICATIONS

Connectors	Safety	Body Electronics	Drive Train	Comfort and Convenience	Hybrid and Electric
	Airbag Anti-Lock Brake System Crash Avoidance Circuit Traction Control (ESP) Seat Weight Sensor Small Motor Drives (e.g. Windows) Communication Bus (LIN, CAN) Dashboard Systems Car Alarm Lamp/LED Driver HID Lighting Windshield Wipers Rain Sensor Light Sensor	Engine Control Unit (ECU) Electronic Clutch Fuel Pump Gear Box Sensors Electric Power Steering Temperature Sensor Transmission Control Unit Underhood Modules	Seat Heating Air Conditioning GPS Location System Electric Seat Controls Electric Window Controls Electric Mirror Controls Parking Assistant Audio Entertainment Satellite Radio Keyless System Cruise Control	DC/DC Converters Regenerative Braking Start/Stop System Electric Drive Battery Management Charging Battery Cell Temperature Monitoring	
IDC	•	•	•	•	•
FFC/FPC		•	•	•	•
Board-to-Board		•		•	•
SDIO				•	
Custom Automotive	•	•	•	•	•



Power Distribution Box (µPDB) Sealed Modules



Standard and customizable compact automotive power distribution boxes provide a junction point for power switching and circuit protection within wiring architectures. Fewer µPDB sealed module components create space and cost savings.

FEATURES & BENEFITS

- Standard connector configurations for design flexibility
- Attaches simply and inexpensively
- Eliminates hardwiring, costs and potential errors
- Modular design allows feature specificity as required
- Fully sealed with an IP6k7 Rating

APPLICATIONS

- Subsystems within vehicle wiring architectures
- Specialty vehicles (police cars/ambulances)
- Boats, personal watercraft
- Recreational vehicles, snowmobiles, off-road vehicles

Battery Lugs



Seamless performance for AC or DC power distribution in harsh environments. Wire ranges from 8 AWG to 4/0, with a variety of stud hole sizes that can be crimped with industry standard tooling. Also available with sight holes for inspection or optional soldering after crimping

FEATURES & BENEFITS

- Seamless design for power transmission up to 35kV
- Industry standard crimp tooling
- Flared barrel entry for easy stranded wire insertion
- Easy part identification with wire gauge and stud size on barrel

APPLICATIONS

- Emergency vehicles
- Recreational vehicles
- Trucks, cranes and lifting equipment

CMC Hybrid Connectors Standard and Power Versions



Cost effective, IPx9K sealed, high-density transportation connection. The modular, hybrid system fits with various headers and runs at operating temperatures between -40 and +125°C. Standard version hold 0.635mm (.025") and 1.50mm (.059") terminals. Power version CMC hybrid connectors hold 0.635mm (.025"), 1.50mm (.059") and 2.80mm (.110") terminals.

FEATURES & BENEFITS

- Matte seal technology for CP 0.635mm (.025") and 1.50mm (.059") terminals
- Single wire seal (SWS) technology for CP 2.80mm (.110") terminals
- Fine pitch 2.54mm (.100") design for high-density applications
- A variety of color coded and mechanical polarizations options
- Modular connector system with a choice of different circuit sizes
- CP terminals available in tin and gold-plated versions

APPLICATIONS

- Engine control unit
- Power braking
- Lighting control system
- Hybrid – vehicle control unit



HSAutoLink

The Molex HSAutoLink Interconnect System has the bandwidth to support advanced devices across the automotive and commercial vehicle industries. Optimized for Vehicle-to-Vehicle communications, Infotainment, Telematics and "Connected Vehicle" applications.

FEATURES & BENEFITS

- Standard Molex components for ease-of-use and assembly
- Shrouds and latches meet USCAR requirements
- Flexible, expandable product family with data rates to 5 Gbps
- Available in 6 and 12 circuits and allows for combined links
- Full-length cable shield reduces EMI

APPLICATIONS

- Automotive
- Trucks
- ATVs

molex | Molex Connectors

Squba Sealed Wire-to-Wire Connectors



Deliver reliable power in a wide range of space-constrained applications. The 1.80mm- and 3.60mm-Pitch Sealed Wire-to-Wire Connector Systems offer an IP67-seal rating and carry up to 14.0A of current. Circuit sizes include 2 to 10 circuits for the 1.80mm pitch system and 2 to 4 circuits for the 3.60mm pitch connectors.

FEATURES & BENEFITS

- Protected, low-profile positive latch prevents wire from getting caught on latch and damaging it
- Seal caps safeguard seals from damage during shipping, handling and use. Align terminals to prevent seal from being punctured during assembly
- Sealed components with proven performance, deliver IP67 rating and prevent ingress of dust and water to ensure reliable connection
- Clean-body terminals avoid seal punctures

APPLICATIONS

- Recreational vehicles
- Buses and trucks
- Marine: Under-dash wiring, lighting
- Industrial

MX150L Industrial Sealed Connector System

A pre-assembled, submersible system that exceeds IEC IP67 requirements, designed for commercial-vehicle, marine and other harsh environments.

FEATURES & BENEFITS

- Rugged 2 to 16 circuit, sealed 5.84 and 7.62mm pitch supporting up to 40.0A per circuit
- Wire-to-wire, wire-to-panel-mount plugs and wire-to-board configurations
- Integral wire and interface seals provide IP67 sealing
- Sealed panel-mount plugs are equipped with blind-hole boss feature, which improves the sealing process during assembly
- Integral terminal position assurance (TPA) ensures that crimped terminal leads are properly locked into connector

Sealed FAKRA RF Connector



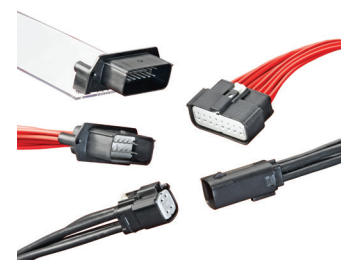
This in-line FAKRA solution is ideal for transportation applications requiring an IP69K rating. Appropriate for exterior automotive and commercial vehicle devices requiring a robust seal against powerful water ingress.

FEATURES & BENEFITS:

- Prevents fluid ingress, IP69K rated
- Color coded and keyed shrouds prevent mis-mating and help guide proper connection
- Frequency DC to 6 GHz, ideal for wireless and GPS applications
- Mates with original FAKRA PCB jacks and plugs. Backward compatibility to existing components minimizes additional costs (sealing requires both plug and jack from sealed family).

APPLICATIONS

- Infotainment
- Cameras
- Navigation systems



APPLICATIONS

- Chassis and safety
- Interior
- Electronic control module
- Powertrain

MX123 Sealed Connector System



MX123 is a high-performance connection system optimized for transportation powertrain applications in the most challenging underhood environments. The system offers a rugged, fully sealed interface with one of the smallest packaging sizes in the industry.

FEATURES & BENEFITS

- GMW3191 specifications – designed specifically for high-vibration under-the-hood applications. Meets IP67, IP68 and IP69k sealing specs, Temp Class III operating temperature specs and Vibe Class I vibration specs
- Receptacle and header housings with six unique mechanical polarization options and unique color coding to prevent incorrect cross-mating of harnesses
- Wire dress available in two options: 0° and 180° orientations allows for wire routing design flexibility
- Anti-scooping features suitable for blind-mate conditions
- Integrated TPA and CPA protects against unmating in high-vibration environments and reduces assembly complexity

APPLICATIONS

- Powertrain
- Electronic control module

MX64 Sealed Connectors



Small and compact, the MX64™ single-row female housings set the standard for 2.54mm pitch sealed connectors. These connectors meet all USCAR footprint and testing requirements for 0.64mm pitch square-pin connector systems and allow for the greatest level of flexibility by accommodating three different OEM female terminal systems.

FEATURES & BENEFITS

- Integrates with automotive OEM-approved terminal systems for maximum design flexibility
- IP67-rated matte seal design eliminates secondary operation and costs associated with cable seals
- Available with or without CPA; added locking protection when CPA is used
- Four polarization options available to protect against mismating

APPLICATIONS

- Powertrain
- Electronic control module
- Chassis and safety

In-Vehicle Smart Charging Modules

Off-the-shelf and custom In-Vehicle Charging Modules with smart technology ensure fast battery recharging in a compact, convenient pack. Molex offers several off-the-shelf USB chargers and smart chargers that are standard for many transportation vehicle applications, and eliminate extra tooling and engineering support costs.



FEATURES & BENEFITS:

- Pre-assembled active USB charger with PCB routing and mechanical enclosure design saves costs
- Designed for existing rocker-switch panels for commercial vehicles to facilitate drop-in design
- Compliant with Battery Charging (BC) 1.2 standards, charges up to 5V DC / 1.5A (with compliant BC 1.2 devices)
- Custom Smart technology that communicates with plug-in mobile devices to ensure effective battery charging for a range of device profiles

APPLICATIONS:

- Passenger cars
- Construction equipment
- Farm equipment

molex | Molex Connectors

Mizu-P25 Miniature Waterproof Connectors

The Mizu-P25 wire-to-wire connector system is the first miniature sealed system in the market to achieve IP67 certification, which provides superior levels of dustproof and waterproof protection along with space savings.



FEATURES & BENEFITS

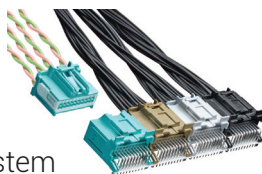
- 2, 3 and 4 circuit single row configuration
- Certified for IP67 rating for complete dustproof and waterproof protection
- Compact size achieves space savings for tight-packaging applications
- Positive lock for secure mating retention
- Spring-beam terminal design provides high pressure and small deflection for high-vibration applications

APPLICATIONS

- Chassis and safety
- Interior

Stac64 Connector System

This stackable connection system provides single- and multi-pocket PCB solutions.



FEATURES & BENEFITS

- The header and female receptacle housings are molded in standard USCAR color schemes offering visual polarization and aiding in connection system assembly
- Pre-assembled, linear Mylar PC tail alignment strip for right-angle headers reduces PCB packaging complexity and provides space savings
- Standard dovetail feature molded into the modular housings allow headers to be ganged together in large assemblies
- PCB alignment posts ensure all terminals are properly aligned into PCB through-holes during assembly and help to retain header to PCB during assembly and solder processing
- PCB stand-offs are molded into the housings, providing an additional trace-routing area under the headers

APPLICATIONS

- Chassis and safety
- Interior

Mini50 Sealed and Unsealed Connector System

Achieve significant space savings over traditional USCAR 0.64mm connectors with Molex's miniature Mini50 connection system.



FEATURES & BENEFITS

- Unsealed version approximately 50% smaller than USCAR 0.64mm unsealed interfaces
- The unsealed system is the industry's only interface that meets USCAR 050 standards
- Sealed receptacle has no parting lines on sealing surfaces Meets IP68 rating and IP69K with backshell
- Footprint on the sealed version is reduced by 25% compared to USCAR 0.64mm unsealed interfaces
- High-temperature thermoplastic housings on both sealed and unsealed connector systems

APPLICATIONS

- Interior and external lighting
- Cameras and sensors
- Navigation
- Power steering

DuraClik Connector System

Molex's DuraClik connectors provides superior electrical contact reliability, mating retention and space savings for high-vibration and high temperature applications.



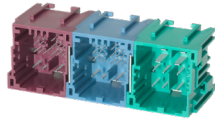
FEATURES & BENEFITS

- Available now in 2-15 circuits with both tin and gold plating options
- Inner positive-lock design prevents latch breakage from wire tangling
- Click sound when mated gives audible mating confirmation
- Independent Secondary Lock (ISL) terminal retainer
- Terminal Position Assurance (TPA) terminal retainer

APPLICATIONS

- Automotive applications
- Steering wheel wiper/blinker lever
- Shift lever
- Front/back headlights
- Electric bicycle

stAK50h



Leveraging industry-approved terminal design, the stAK50h Connection System offers unsealed hybrid headers and receptacles to deliver both signal and Ethernet connectivity within a small footprint. The stackable nature of the stAK50h unsealed system allows easy connection and eliminates custom tooling.

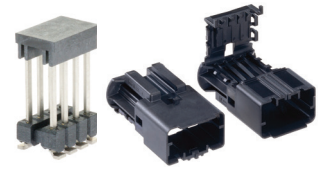
FEATURES & BENEFITS

- Standard USCAR color-coded housings support visual polarization and expedite assembly of connector systems
- PCB-alignment posts for mating headers ensure proper terminal alignment in via-holes of the PCB during assembly
- Compliant to USCAR-2 and global automotive OEM standards, enables faster time-to-market
- The 0.50mm and 1.20mm terminals developed around NanoMQS and AK (Arbeitskreis) Specifications support a wide range of low-current signal (4.0A) and Ethernet applications

APPLICATIONS

- Driver assistance systems/convenience
- In-vehicle networking
- Safety/Chassis
- Body electronic modules
- Interior electronic modules

MX150 Sealed, Unsealed and Unshrouded Connector System



The sealed MX-150 connector system is a fully submersible high-performance connector system, supporting both signal and power applications. The MX150 Unsealed Connector System for direct connect or in-line mid-power harness applications provides overall reduced package sizes compared to conventional 1.50mm connection systems. The Unshrouded SMT Headers offer speedier and lower-cost PCB processing.

FEATURES & BENEFITS

- Sealed version offers reduced 3.50mm pitch housing design that supports single-row configurations for 2 to 6 circuits and dual-row configuration for 4 to 12, 16 (hybrid) and 20 circuits. Sealed system meets or exceeds USCAR-2 Class 3 requirements
- Unsealed system offers integral locking-latch and is designed with legacy MX150 low-insertion force terminal system. Four polarization options. Integrated Terminal Position Assurance (TPA) lock molded into receptacle
- Unshrouded headers provide high-temperature LCP housing. Withstands high reflow-temperatures (up to 260°C) during soldering. Wide current range (up to 16A) to suit both high and low-current applications

APPLICATIONS

- Chassis and safety
- Interior
- Electronic control module
- Powertrain

Phoenix Contact Connectors

Phoenix Contact offers a reliable product and technology portfolio for E-Mobility that enables you to implement various concepts for your charging infrastructure. The new design line of AC vehicle connectors from Phoenix Contact has been developed in accordance with the requirements of the automotive industry. Just as the tried-and-tested handle design line, the new AC vehicle connectors rely on robust and high-quality materials as well as on a uniform plug design.

AC Vehicle Connector Type 2 (Europe)

FEATURES & BENEFITS

- 5 + 2 poles for 3-phase charging
- Rated voltage up to 480V AC
- Robust, high-quality materials
- Strong strain relief
- Low insertion and redrawing forces
- Complies with IEC 62196
- Superior protection against water ingress and icing conditions



AC Vehicle Connector Type 1 (North America)

FEATURES & BENEFITS

- 3 + 2 poles for 1-phase charging
- Rated voltage up to 250V
- Complies with IEC 62196-2 and SAE J1772
- Locking and unlocking by means of a lever system
- Lockable lever system optional
- Robust, high-quality materials
- Strong strain relief
- Superior protection against water ingress and icing conditions



AC Charging System GB/T Standard (China)

FEATURES & BENEFITS

- 5 + 2 poles for 3-phase charging
- Rated voltage up to 440V AC
- Locking and unlocking by means of a lever system
- Lockable lever system optional
- Robust, high-quality materials
- Strong strain relief
- Low insertion and redrawing forces
- According to the GB/T standard
- Superior protection against water ingress and icing conditions



Smiths Interconnect is a leading supplier of application specific, high-reliability electrical interconnect solutions from highly integrated assemblies to micro-miniature connectors and spring probe contacts. Our technology brands are synonymous for exceptional performance where critical applications require a technologically advanced, high-quality, multi-pin electrical connection to ensure reliability and safety.



HBB Series



HBB Series is an IP67 rugged metal circular connector that combines high-current handling capability with small size and exceptional performance in harsh environments. Designed for easy mating and quick release, HBB connectors use Hypertac® hyperboloid contact technology to attain current ratings of 300A and 500A (750A available on request) with high-reliability and excellent electrical integrity.

B Series



B series is a rectangular modular solution mixing signal, power, coaxial and high speed contacts. The B Series features an adaptable cable clamp and a jackscrew. B Series connectors are in full compliance with NFF railway standards.

M12 Connector Series



M12 Connector series has been specifically developed for applications where space or weight are at a premium. The compact and robust design incorporates hyperboloid contacts to provide an unrivalled performance. The new design features a unique side loading contact retention system that provides a positive contact retention and simplifies the assembly process. This simplified approach to contact assembly not only makes the product series very user friendly, but also reduces assembly times. Within a common housing design, Smiths Interconnect M12 series includes insert options from 3 to 8 ways, with both crimp and solder contact terminations available.

Hypermod Series



Hypermod Series is a heavy-duty modular rectangular connector designed for high speed signal interconnections in railway applications. Available in both modular and monobloc frame version this connector series is equipped with mixed signal, power, coaxial, high speed and fiber optics contacts and conforms to DIN 43652 standards and NF F61-030 railway approved.

REP Connector Series



Smiths Interconnect delivers optimal durability with the REP connectors, a comprehensive series of high-reliability, rectangular plastic connectors for rail applications such as sensors, brakes, signaling, alarms, doors, lighting, air conditioning, seats, passenger information and driver cabin. The connectors provide IP66 & IP67 sealing index to meet the requirements of applications where sealing, reliability and easy cabling are key factors. The material used conforms to the fire and smoke requirements such as NFF 16-101, NFF 16-102, EN 45545-2 and UL94-V0 standards.

L Series Connectors



L Series Connectors are high density, modular, rack and panel connectors that include coax and high current contacts up to 200 amps, as well as the patented Hot Plug contact. The L series is used in high demanding applications where the environment requires durability, ruggedization and extended operating life. Utilizing the Hypertac® contact technology, the interconnect offers high mating cycles (up to 100,000) combined with low insertion and extraction mating forces, as well as unsurpassable immunity to shock and vibration.

LHS Series



LHS Series is a flat floating connector mixing power, signal, coaxial and high speed quadrax contacts. The LHS connector has been designed to meet the most demanding requirements of the rail transportation industry and is qualified according to SNCF standards. They are ideal for rack and panel, cable and program applications. The LHS connector range provides a quick and easy connection/disconnection and the float mounting enables to compensate mechanical misalignment up to 1.25mm during blind mating, ensuring an excellent signal integrity. The 14 units of 5.5m pitches allow a high contact density up to 70 signal contacts.



Automotive

AMP Power Series Connectors

AMP Power Series connectors provide a durable, quick connect/disconnect means to transmit "power" levels of current and voltage (15-275A, 600V AC/DC).

This product family is primarily comprised of single-pole and 2-pole (battery) connector housings, snap-in contacts and accessories. Housings are offered in various colors. Two pole housings have different polarization configurations. The different colors identify a different keying configuration and only like color housings will mate. This feature can be used to help identify different voltage ratings. Contacts are either cold-headed or stamped and formed, depending upon the connector series. AMP Power Series connectors are divided into eight series, based on approximate current-carrying capability.



FEATURES & BENEFITS

- Single-pole and 2-pole (battery) quick connect/disconnect connectors
- 8 series based on approximate current carrying capability: 15A to 275A rated
- Voltage rating: 600V AC/DC
- Hermaphroditic (genderless) housings and contacts reduce inventory
- Modular, single-pole housings are stackable in four directions
- Polarity (+ and -) molded into 2-pole housings promotes proper wiring
- Mechanical keys help prevent two different color housings from mating together
- Stamped and formed, open barrel contacts (6AWG – 20AWG) on reels for automatic and semi-automatic termination

- Loose piece, cold-headed contacts (6AWG – 300MCM) for manual termination
- Printed circuit board (PCB) contacts available in the 15/30/45A series

APPLICATIONS

- AC/DC power supplies and charging systems
- Rechargeable batteries
- Material handling equipment (i.e. forklifts)
- Electric vehicle (i.e. golf carts and sweepers)
- Industrial equipment

AMP MCP Connectors and Contacts

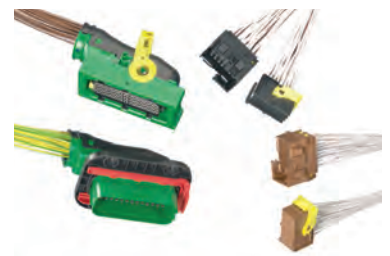
The AMP MCP connectors and contacts are designed for electronic and electrical applications in motor vehicles, including long-term use in high-vibration, high-current and high-ambient temperature applications.

FEATURES & BENEFITS

- CuNiSi with high current capacity
- 3 contact points (1.5mm), 4 contact points (2.8mm/6.3mm), 6 contact points (9.5mm)
- High reliability connector system for long-term use
- Integrated secondary locking device delivered in pre-locked position
- Polarization, several keying options

APPLICATIONS

- Wire-to-wire
- ECU applications



AMP SUPERSEAL 1.5mm Connectors



AMP SUPERSEAL 1.5mm connectors are suitable for harsh environments in motor vehicle applications due to its sealing capability.

The connectors are suitable for industry specifications IEC 60529 and DIN 40050-9 I.P 6.7.

FEATURES & BENEFITS

- Compact system minimizes packaging requirements
- Sealing reliability proven under harsh conditions
- Designed for ease of manual harness assembly, engine mounting and underhood environments

APPLICATIONS

- Wire-to-wire
- ECU applications

Econoseal Connector Series



The Econoseal connector series is used in extreme vehicle conditions where waterproof protection and resistance to moisture, dust and corrosive gasses is needed.

FEATURES & BENEFITS

- Waterproof
- Rugged construction

APPLICATIONS

- Wiring of sensors in the interior or motor hoods
- Connections to electrical control systems under extreme temperature conditions

AMP Timer Connectors and Contacts



AMP Timer connectors and contacts are extensively used in the automotive and commercial vehicle and occasionally in the appliance industry.

Contact types come in various sealed, unsealed, crimp and IDC versions for wire-to-wire, wire-to-board and wire-to-device applications. Geometry of contacts allows housings to be mated in a pivoting hinged manner. Larger pin count connectors can be mated with reduced force through sequential connection.

FEATURES & BENEFITS

- Available as receptacle and tab housings or as receptacle housings and multiple tabs
- Receptacle has two or four contact springs

APPLICATIONS

- Motor vehicle applications
- Underhood and interior applications



TE Connectivity Connectors

FASTON Terminals and Splices

FASTON products consist of receptacles, tabs, splices and housings designed for quick connections in motor vehicle applications.



FEATURES & BENEFITS

- Straight, right-angle and receptacle tab combinations available
- Receptacles available for 6.3mm, 4.8mm and 2.8mm tab size
- Receptacles mate with 0.5mm and 0.8mm thick tabs
- Expanded line of low insertion force receptacles eases assembly
- Housings insulate, withstand high temperatures and improve ergonomics

APPLICATIONS

- Used for single and multiple connections
- Offers speed of application, uniform reliability and low per line cost
- Automotive applications

MQS Connectors

MQS connectors offer one of the most compact connector packages, robust construction and high functional requirements.



FEATURES & BENEFITS

- High packing density
- Waterproof
- Compact design

APPLICATIONS

- Electronic and electrical applications
- High vibration and mechanical stress areas

Flat Contact Systems

TE Connectivity's flat contact systems (2.8mm/6.3mm) offer a comprehensive range of products used in motor vehicle applications. The 2.8mm/6.3mm contact systems mate with a variety of receptacle contacts.



FEATURES & BENEFITS

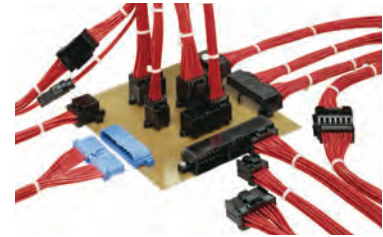
- Tabs mate with a variety of receptacle contacts
- Tabs can also be applied in both watertight and non-watertight connectors

APPLICATIONS

- Mother vehicle applications

MULTILOCK Connectors

MULTILOCK connectors are available in .040 (Standard), .040 (Mark II), .070 (Mark I and II), .025 (0.64mm) Series and .040/.070 (Series Hybrid I/O) for use in multiple motor vehicle applications.



FEATURES & BENEFITS

.040 (Standard):

- Contacts spaced at 2.5mm centerline
- Connectors consist of plug housing
- Receptacle contacts and cap housing assemblies

.040 (Mark II):

- Contacts are spaced at 2.5mm centerline
- Plug housings with two piece double-lock plates

.070 (Mark I and II):

- Designed as high density and reliability due to housing lances
- Mark I plug connectors with double-lock plates
- Mark II plug connectors with two piece type double-lock mechanism

.025 (0.64mm) Series:

- High-density connectors
- Designed to resist deformation of contacts by scooping at mating/unmating
- Hybrid types of .025, .040 and .090

.040/.070 (Series Hybrid I/O):

- Connectors for use with a mixture of .040 terminals for signal circuits and .070 terminals for power circuits
- Plug connector supplied with hinge lock or side lock
- High range of pin count variants

APPLICATIONS

.040 (Standard); .040 (Mark II); .070 (Mark I and II):

- Wire-to-wire
- Wire-to-board applications

.025 (0.64mm) Series:

- Engine Control Unit (ECU) and downsized wire harnesses

.040/.070 (Series Hybrid I/O):

- Engine Control Unit (ECU)

Commercial Vehicles

HP/HPSL Sealed Connectors

The family 2 and 3 position high performance (HP) connectors and high performance spring lock (HPSL) have been developed to meet severe OEM requirements, especially in extreme vibration conditions.



The connectors can be used in the car body, with wire-to-wire applications as well as in the engine area on sensors or actuators. The HP family offers solutions for electronic and electrical applications which require a high level of performance:

- Watertightness (IPX9K and 500mb immersion, with an included family seal)
- Temperature (150°C)
- Resistance to extreme vibration conditions (40G, with TE Connectivity's Sensor Flat Contact 2 terminal)

FEATURES & BENEFITS

- Wire-to-wire applications or wire-to-sensors/actuators
- Spring lock version available (HPSL)
- Optional CPA for HP version
- Positive locking device
- Primary and secondary (integrated TPA) receptacle lock
- Covers compatible
- Full shroud (seal is protected all around the connector)
- High vibration level

APPLICATIONS

- Engine or body car harness

The housing design is based on the 1.5 x 0.8mm receptacle and tab terminals in the centerline 3.33mm. A positive mate (Go-Nogo) locking feature is integrated in the housing and is improved with a spring system in the HPSL version.



TE Connectivity Connectors

AMPSEAL Headers

AMPSEAL connectors provide rugged reliability and environmental sealing. They are available in cable plugs and PCB mount headers that are designed to stand up to high-temperature underhood applications.



The pre-assembled receptacle housing connector features built-in contact sealing and an integral interfacial seal that protects mated connectors.

AMPSEAL connectors provide rugged reliability and environmental sealing. They are available in cable plugs and PCB mount headers that are designed to stand up to high-temperature underhood applications.

The pre-assembled receptacle housing connector features built-in contact sealing and an integral interfacial seal that protects mated connectors.

FEATURES & BENEFITS

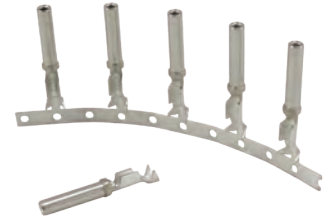
- Accepts contact size 1.3mm (up to 17 amps gold, up to 8 amps tin)
- 16-20 AWG (1.25-0.50mm²)
- 8, 14, 23, and 35 cavity arrangements
- PCB mount
- Rectangular, thermoplastic housing
- Product specification documents: 108-1329 and 114-16016

APPLICATIONS

- Agriculture
- Construction
- Emergency vehicles
- Forestry
- Marine
- Material handling/lifts
- Military
- Mining
- Off-highway
- Recreation
- Truck/bus

AMPSEAL 16 Terminals

AMPSEAL 16 connectors commonly use the HDSF size 16 contact system. The contacts are round, stamped and formed with dual beam sockets.



FEATURES & BENEFITS

- Accepts contact size HDSF 16 (up to 13 amps)

APPLICATIONS

- Agriculture
- Construction
- Emergency vehicles
- Forestry
- Marine
- Material handling/lifts
- Military
- Mining
- Off-highway
- Recreation
- Truck/bus

AMPSEAL 16 Wire-to-Wire Connectors

The AMPSEAL 16 connector system is targeted for off-road, heavy-duty industrial, recreational and agricultural applications.



This wire-to-wire and wire-to-device connector line was designed to meet the rigorous demands of an industry that requires the highest standards in performance. AMPSEAL 16 receptacle and pin housings offer a one-piece approach and come fully assembled.

APPLICATIONS

- Agriculture
- Construction
- Emergency vehicles
- Forestry
- Marine
- Material handling/lifts
- Military
- Mining
- Off-highway
- Recreation
- Truck/bus

HDSCS Connectors



The heavy duty sealed connector series (HDSCS) is designed for high vibration and extreme temperature and with inflammable materials in motor vehicle applications.

The Heavy Duty Sealed Connector Series (HDSCS) offers several cavity arrangements and mixed wire sizes. The rugged, thermoplastic connectors have a secondary lock with poke-yoke feature and can be used for in-line or flange mount applications. HDSCS connectors are available in five housing sizes and four keying options.

FEATURES & BENEFITS

- Accepts contact sizes 6.3 (up to 40 amps), 2.8 (up to 40 amps), and 1.5K (up to 20 amps)
- 6.00-0.20mm²
- 2, 3, 4, 6, 7, 8, 10, 12, 15, 16, and 18 cavity arrangements
- In-line or flange mount
- Rectangular, thermoplastic housing
- Slide lock for mating
- Integrated secondary lock confirms contact alignment and retention
- Product specification documents: 108-94020 and 114-18756

APPLICATIONS

- Agriculture
- Construction
- Emergency vehicles
- Forestry
- Marine
- Material handling/lifts
- Military
- Mining
- Off-highway
- Recreation
- Truck/bus

LEAVYSEAL Headers



The LEAVYSEAL connectors have been developed to meet the tough requirements of the truck industry.

This fully sealed series combines the advantages of proven AMP MCP terminals with a robust design and easy mating of multi position connectors. It gives a choice of 7 groups, 15 to 120 positions with terminals of 3 different sizes. The lever-slide mechanism reduces the force required to close the system. Due to high vibration resistance, perfect temperature behavior and the size, LEAVYSEAL connectors are the product of choice for major commercial vehicles ECU manufacturers.

FEATURES & BENEFITS

- High vibration level supported
- Integrated secondary locking device delivered in pre-locked position
- Polarization, several keyings
- Lever-slide mechanism
- Easy handling
- Mixed terminal sizes in one housing

APPLICATIONS

- Agriculture
- Construction
- Emergency vehicles
- Forestry
- Marine
- Material handling/lifts
- Military
- Mining
- Off-highway
- Recreation
- Truck/bus



| TE Connectivity Connectors

LEAVYSEAL Connectors



LEAVYSEAL multi-position connectors, based on AMP MCP terminals, have proven themselves in truck applications where they withstand vibration and temperature exposure.

The rugged LEAVYSEAL connectors are multi-pin and accept multiple wire sizes. LEAVYSEAL products utilize a lever-lock system for mating and are available in several mounting styles and keying options. The housings come in six sizes and feature an integrated cable attachment.

FEATURES & BENEFITS

- Accepts contact sizes 6.3 (up to 40 amps), 2.8 (up to 40 amps), and 1.5K (up to 20 amps)
- 6.00-0.20mm²
- 15, 18, 21, 22, 26, 29, 31, 39, 46, 62, and 92 cavity arrangements
- In-line, flange or PCB mount
- Rectangular, thermoplastic housing
- Lever for mating
- Integrated secondary lock confirms contact alignment and retention
- Product specification documents: 108-18696 and 114-18376

APPLICATIONS

- Agriculture
- Construction
- Emergency vehicles
- Forestry
- Marine
- Material handling/lifts
- Military
- Mining
- Off-highway
- Recreation
- Truck/bus

Rail – Connectors

NGC - Compact Plastic Wire-to-Wire Connectors



The family 2 and 3 position high performance (HP) connectors and high performance spring lock (HPSL) have been developed to meet severe OEM requirements, especially in extreme vibration conditions.

The NGC Series is a compact and cost effective solution for all non-secure connections for wire-to-wire applications. From 4 to 28 poles, it will answer your fast connection needs with high level protection (IP66) and up to 500 volts (EN 50124-1/A2) applications. NGC offers cable capacity of up to 2.85mm² for AWG16 contacts.

FEATURES & BENEFITS

- Compact and cost-effective solutions
- High level of performance
- Halogen free
- Field proven

APPLICATIONS

- Train control
- PIS and safety
- Sub systems

Heavy Duty Connectors

TE's Heavy Duty Connectors offer high-reliability performance in rugged and industrial environments with a variety of inserts, contacts, hoods and housings that offer options for wire termination, mounting, cable exit, latching and environmental protection.

The modular HMN range enables engineers to quickly design and prototype application specific connectors, utilizing more than 25 different module types for maximum flexibility and reliability with minimum installation or maintenance effort.

FEATURES & BENEFITS

Housings

- Thermoplastic, aluminium and zinc die cast alloy
- Protection class: IP20 – IP69K
- Locking systems
 - Locking clip
 - Screw locking
 - Powder-coated surface-corrosion resistant hard coating

Contact Inserts

- Thermoplastic, glass-fiber reinforced according to UL 94 V-0
- Rated current: up to 200A
- Rated voltage: up to 1000V
- Types of wire connections
 - Screw terminal
 - Spring clamp terminal
 - Crimp terminal
- Contact material
 - Copper alloy
- Contact surfaces
 - Silver-plated
 - Gold-plated
 - UL, CSA, VDE approved

APPLICATIONS

- Industrial
 - Production equipment
 - Material handling
 - Forklifts
 - Robots
 - Motors
 - Control cabinets
 - Monitoring (HMI)
- Rail
- Renewable energies



EKO Series

Composite and shielded connectors for power applications.

EKO Series is dedicated for all main rolling stock power systems applications, especially designed for harsh environment applications.

Field-proven solution from metros to very high-speed trains, EKO Composite Series is designed in accordance with EN 50467 (2012) and NFF 61030 standards.

It will answer to all static applications for inline or panel connections. The EKO solution ranges from 1 to 4 poles and up to 240mm² cable size for 3000 volt applications.

The EKO family is completed by EKO-S (shielded and high resistance for mechanical constraints), EKO-D (derivation) and EKO-A (inter-vehicle).

FEATURES & BENEFITS

- Compact and weight saving
- Straight and 90 degree connection
- Shielded and unshielded version
- 3 or 4 pole configurations
- Cable from 10 to 240mm²
- Halogen free
- Field proven

APPLICATIONS

- Traction power
- Inter-vehicle connection





TE Connectivity Connectors

SRC Series

The SRC Series is the solution for signal static connectivity with flexible modular designs and various shell sizes with a bayonet locking system.



SRC connector is derived from MIL-DTL-5015 Standard and adapted to be compliant with NFF 61030 railway standard with a hard thermoplastic insert which is self-extinguishing and halogen free.

Adapted for outdoor applications in panel versions, it offers a choice up to 9 size shells, 11 arrangements and many angled or straight backshells for integrating in different configurations of cables for cable sizes from 0.5mm² to 6mm². SRC also provides a choice of removable and interchangeable inserts (plug and receptacle can be male or female).

FEATURES & BENEFITS

- Quick positive lock system
- NF F 61-030 standard compliant
- Broad range of accessories
- Field-proven
- From 6 to 60 crimp contacts over 9 shells and 11 configurations
- Connector design based on MIL-DTL-5015 and VG95234 specifications

APPLICATIONS

- Train control
- Passenger information and safety
- Train sub-systems (e.g. doors, train control, air conditioning)

UIC552 Series

The UIC552 Series is a railway standard power connector used for international service.



The UIC552 Series is a long field-proven solution for junction and derivation box, jumpers and dummy plugs for applications where the UIC 552 standard is requested.

The UIC552 connectors have to assure the power supply between locomotives and all coaches for trains able to do international trips.

FEATURES & BENEFITS

- Compliant to UIC552 standard
- Rail networks approved
- Low maintenance costs
- Field-proven
- Full UIC package available ICT DIN Connectors

APPLICATIONS

- Inter-vehicle connection

Circular Plastic Connectors

TE's Circular Plastic Connectors (CPC) can be used practically anywhere signal and/or power need to enter/exit a system.

These come in a versatile range of power and signal options – versatile and rugged, cost-effective designs. CPC comes in six different series to allow you to choose the product best suited to your design requirements. Mounting options include panel mount, free-hanging and wire-to-board. The receptacle and plug housings accept Type III+ or Size 20 signal contacts, Type XII power contacts or AMP POWERBAND contacts.

The housings come in configurations designed to handle signal, power or combinations of signal and power in the same housing. Sealing to IP67 is also available.



FEATURES & BENEFITS

- Lightweight, all-plastic and metal-shell connectors
- UL 94V-0 rated and made of stabilized, heat resistant, self-extinguishing thermoplastic material
- Quick connect/disconnect capability with thread assist, positive detent coupling
- Built-in pin and socket protection
- Polarized for proper mating of connector halves
- Removable contacts and replaceable coupling ring make field repair easy

APPLICATIONS

- Rail and transit vehicles and systems
- Motor vehicles
 - Auto/bus/truck
 - Off-road and recreational vehicles
 - Agricultural machinery
 - Construction equipment

M12 Rail Cable Connectors

The newly expanded M12 connector system, designed for railway (EN45545) and automation industry applications.

M12 Cable Connectors for field assembly provides a solution that safely and reliably helps ensure communication in harsh environments. Our crimp flange technology and machined crimp contacts providing 360° EMI/RFI shielding, torsion and vibration proof cable strain relief.



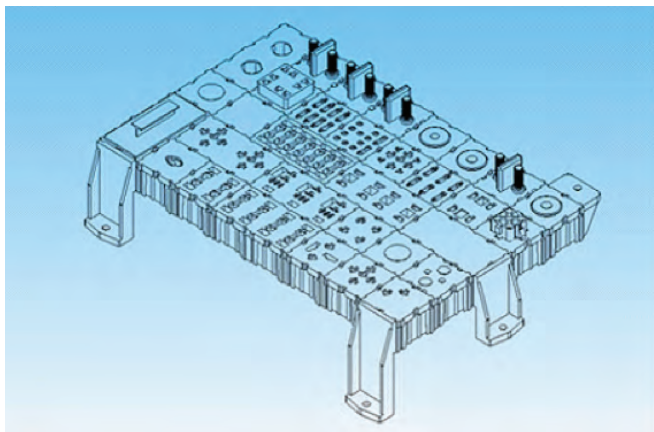
FEATURES & BENEFITS

- Reduced installation times when compared with gland sealed connectors
- Reduced service time and cost with easier access to thread grip

APPLICATIONS

- CCTV
- Door controls
- Passenger information systems
- Inverter/converter control
- Train management
- Wayside control

Connectors



Fargo Industries DillBlox

DillBlox Power Distribution Modules are designed to provide flexible, easy-to-configure electrical distribution panels using off-the-shelf components. DillBlox Modules have a unique interlocking edge that's joined together using the dovetail wedge, creating a strong, rigid panel assembly. Standard Modules accept most plug-in devices that are widely used in over-the-road, off-road, construction, and agricultural vehicles. Custom designed modules can be provided.



KOSTAL

KOSTAL develops and produces standardized and customer-specific housing systems. Housing systems are tailored to meet requirements and suitable for automated processing, lower assembly forces and optimum handling result in reduced system costs for our customers.



KOSTAL is the market leader in top-quality contact systems. A combination of a wide performance range, great reliability, compact sizes and problem-free handling is the outstanding characteristic of KOSTAL terminals.

KOSTAL

Lear Corporation

Lear's product portfolio includes standard and custom terminal and connector systems, with capability ranging from signal to high power. Our experience in integrating terminal and connector solutions throughout the vehicle's electrical distribution system allows for maximum reliability while reducing cost.



Lear continues to commit its resources to the development of the industry's most technically advanced terminals and connectors. Our focus remains on developing and manufacturing high performance, ultra-compact, cost-effective systems, engineered for optimal performance anywhere in the vehicle.



| Connectors

PKC Group

PKC combines specialized design and manufacturing capabilities, advanced technologies, and industry expertise to ensure that customers get the precise interconnect product for their needs. PKC sets the industry benchmark for economical product design, process innovation, time-to-market and operational excellence.



PKC products include:

Power Distribution Centers — PKC Power Distribution Centers deliver power from the main vehicle power source to remote electrical systems throughout the vehicle.

Modular Power Distribution Centers — The mPDC family consists of common components that can be assembled into various configurations, creating custom PDCs with minimal tooling investment.

Connection and Terminal Systems — PKC offers a wide selection of connection systems to meet an impressive range of automotive, commercial vehicle and recreational products. Standard voltage, high power, sealed or unsealed; PKC connection systems are compact, robust and reliable.

PKC 's portfolio of high performance blade and pin terminals as well as the innovative Verti-Grip Battery Terminal family are produced under the highly respected brand, GTS (Grand Traverse Stamping).

USCAR approved 0.64 mm, 1.5 mm, 2.8 mm, 4.8 mm, 6.35 mm, 9.5 mm, and 14.5 mm terminal systems.

Routing and Retention Aids — PKC offers a Routing and Retention Aid product family that provides a robust and inexpensive means of routing and retaining harnesses, connectors and other components within a vehicle. PKC offers multiple retention options for both interior and exterior applications.



PKC GROUP

Sumitomo Wiring Systems

Sumitomo Wiring Systems is one of the leading manufacturers of Connection Systems for the transportation industry.

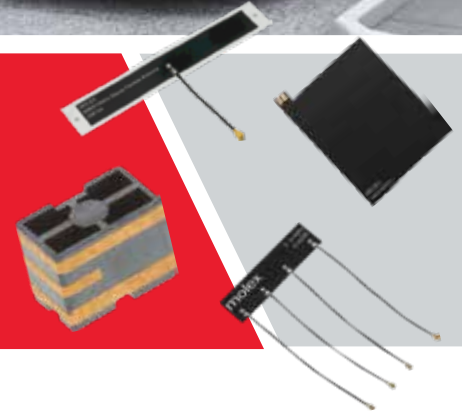
Sumitomo's basic concept of "Connect with the Best" refers not only to the connectors they make, but also to improving the "connections" with the world. Sumitomo is committed to making sure their Connection Systems are second to none. As well as connecting devices and equipment, Sumitomo is dedicated to pave the way for the future of the transportation industry, connecting devices, vehicles, people, and society.

Sumitomo offers a variety of connection systems to meet and exceed the requirements of automotive, commercial, and recreational vehicles. The company offers a full range of sealed and unsealed connection systems using 0.64, 1.0, 1.5, 2.3, 2.8, 4.8, 8.0, and 9.5 mm terminal systems, including USCAR-2 compliant parts. Sumitomo also offers coaxial connection systems for on-board multimedia systems.





Molex Antennas Keep You Fully Connected



Bluetooth, WiFi, 5G, 4G LTE, GPS and More, for All Vehicle Types

From a GPS antenna on a smart excavator, to an LTE antenna on a commercial truck's data-logger module, Molex's design experience in custom and off-the-shelf antennas keeps the transportation industry in touch.

- The industry's Widest Selection of Internal and External Antennas
- Connectivity for Vehicle Networking, Infotainment and Wireless Communication
- New, Ultra-precise GPS Antennas for Autonomous Vehicle Control

TTI stocks a broad and deep inventory of Molex antennas for transportation applications.

Contact Your Sales Representative at [1.800.CALL.TTI](tel:1800CALLTTI) or ttiinc.com

molex



DISCRETES

AEC-Q101 Qualified Diode Arrays (SPA[®] Diodes)



FEATURES & BENEFITS

- Multiple configurations in single channel and multichannel arrays, spanning 0201 through MSOP-10 package
- Signal integrity-friendly solutions from 0.1pF - 400pF
- Offers at least +/-8kV ESD protection, and in some instances +/-30kV
- Operating voltages through 36V, unidirectional and bidirectional
- Surpasses surge expectations
- All products AEC-Q101 qualified, MSL Level 1

APPLICATIONS

- In-vehicle communication interfaces including CAN, LIN
- Safety interfaces including tire pressure and airbag deployment
- Antenna protection Radio, GPS, Bluetooth, Wifi, and LTE
- Driver convenience interfaces including USB, HDMI
- Charging port interfaces

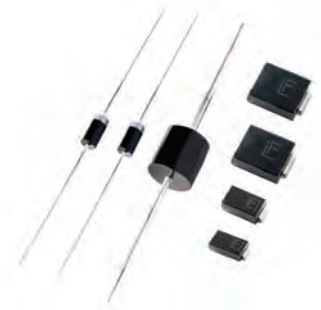
Series Name	Package	Capacitance (pF)	Clamping Voltage	Working Voltage	Number of Channels	ESD Rating (Contact Discharge, IEC61000-4-2)	Maximum Surge Rating (tp=8/20µs)	AEC-Q101 Qualified
General Purpose ESD Protection (Discretes and Array)								
SP1001	SC70-3	8	8.0V at 1A	5.5	2/4/5	15kV	2A	●
AQ1003	SOD882	30	12.0V at 7A	5.0	1	30kV	7A	●
AQ1005	0402 (SOD882)	30	9.3V at 1A	6.0	1	30kV	10A	●
SDxx	SOD323	50-350	9.8-50V at 1A	5-36	1	30kV	5-30A	●
SDxx-C	SOD323	30-260	10-52V at 1A	5-36	1	30kV	5-30A	●
SM24CANA	SOT23-3	11	36V at 1A	24.0	2	24kV	3A	●
SM24CANB	SOT23-3	30	34V at 1A	24.0	2	30kV	10A	●
SM712	SOT23-3	75	11V at 1A	-7-12	2	24kV	19A	●
SPHVxx	SOD882, SOD882 with side lead exposure	25-60	19-52V at 1A	12-36	1	30/30/24/15kV	2-8A	●
SPHVxx-C	SOD882, SOD882 with side lead exposure	13-30	19-52V at 1A	12-36	1	30/24/17/13kV	2-8A	●
SMxx	SOT23-3	65-400	9.8-36V at 1A	5.0	2	30kV	7-24A	●
Low Capacitance ESD Protection (Discretes and Array)								
SP1255P	µDFN-6	0.5	6.6V at 1A	12.0	3	30kV	4A	●
SP3014	µDFN6L	1.0	6.6V at 1A	5.0	2	15kV	8A	●
AQ3045	0402 (SOD882)	0.35	12V at 1A	5.3	1	20kV	3A	●
RF3077	1004 DFN	0.2	10V at 2.2A	7.0	4	20kV	2A	●
AQ3041	0402 (SOD882)	0.5	9.2V at 1A	5.0	1	20kV	3A	●
SP3003	µDFN6L	0.65	10V at 1A	6.0	2/4/8	8kV	2.5A	●
AQ3130	SOD882	0.3	39V at 1A	28.0	1	10kV	2A	●
AQ3118	SOD882	0.3	31V at 1A	18.0	1	10kV	2A	●
SESD Ultra Low Cap. TVS RF2192, RF2193, RF2943, RF2945	0201 µDFN, 0402 µDFN	0.1-0.2	9.2-10V at 2A	9-9.8	1	20kV	2A	●
SESD Ultra Low Cap. Diode Arrays RF2946, RF3076, RF3077, RF3078	0402 µDFN, 0802 µDFN, 1004 µDFN, 1103 µDFN	0.2	9.2V at 2A	9.0	2/4/6	20kV	2A	●
Lightning Surge Protection (Discretes and Array)								
SP3051	SOT23-6	3.8	9V at 1A	6	4	30kV	20A	●
SP3312T	µDFN-08	1.3	6V at 1A	3.3	1	30kV	15A	●
SP4022	SOD323	1.3	19V at 1A	12.0	1	30kV	15A	●
SP4023	SOD323	1.3	23V at 1A	15.0	1	30kV	12A	●
SP4024	SOD323	1.3	34V at 1A	24.0	1	30kV	7A	●
SP2574N	µDFN10	3.8	4.5V at 1A	2.5	-	30kV	40A	●
SLVU2.8-8	SOIC	2.6	17V at 24A	2.8	8	30kV	30A	●

Automotive TVS Diodes

Littelfuse AEC-Q101 qualified components TVS Diodes help protect the growing number of electronic applications in modern vehicles.

From high-power surge protection to automotive load protection, Littelfuse semiconductors have the solutions and expertise to match your technical and application challenges.

AEC-Q101 qualified components TVS Diodes meet ISO7637-2 and ISO 16750-2.



FEATURES & BENEFITS

- Wide standoff voltage range fulfills all design requirements for automotive applications
- Peak pulse power rating from 400W to 5000W and 2200W load dump
- Helps the power system pass the different surge tests operationally as specified by ISO7637-2
- Automotive-grade products are well-suited for high-reliability applications
- Standard package and compact footprint allow quick and easy layout in high reliability applications

APPLICATIONS

- Auto chassis and safety systems such as active suspension, ABS, etc.
- Network systems and body application such as dashboard control and power window control
- Advanced driver assistance systems (ADAS)
- Power train system applications such as turbocharger, transmission control unit and many others
- New energy car applications such as Battery Management System (BMS) and fuel cell electric

AEC-Q101 QUALIFIED TVS DIODE SOLUTIONS INCLUDING LOAD DUMP PROTECTION

Series Name	Mounting Type	Polarity	Package Type	Reverse Standoff Voltage (V _R)	Peak Pulse Power Range † (P _{PP} 10x1000µs)	Peak Pulse Power Rangen ‡ (P _{PP} 10x15ms)	Halogen Free	RoHS Compliant	UL Compliant	AEC-Q101 Qualified
General Lightning Protection										
TPSMF4L	SMT	Unidirectional	SOD-123FL	5-85	400W		●	●	●	●
TPSMA6L	SMT	Unidirectional	DO-221AC	5-85	600W		●	●	●	●
TPSMB	SMT	Uni/Bidirectional	DO-214AA	5.8-468	600W		●	●	●	●
TPSMB-VR	SMT	Uni/Bidirectional	DO-214AA	6.5-150	600W		●	●	●	●
TPSMC	SMT	Uni/Bidirectional	DO-214AB	10.2-77.8	1500W		●	●	●	●
TPSMD	SMT	Uni/Bidirectional	DO-214AB	10-85	3000W		●	●	●	●
SLD8S	SMT	Unidirectional	SMTO-263	12-57	7000W	2200W load dump	●	●	●	●
TP6KE	Axial Lead	Uni/Bidirectional	DO-15	11.1-77.8	600W		●	●	●	●
TP1.5KE	Axial Lead	Uni/Bidirectional	DO-201	10-40.2	1500W		●	●	●	●
TP5KP	Axial Lead	Uni/Bidirectional	P600	11-60	5000W		●	●	●	●
SLD (or Load Dumping)	Axial Lead	Uni/Bidirectional	P600	10-60	5000W	2200W load dump	●	●	●	●

AEC-Q101 QUALIFIED TVS DIODE (MEETS ISO7637-2 AND ISO16750-2)

Series Name	12V System										24V System													
	1	2a	2b	3a	3b	5a	1	2a	2b	3a	3b	5a	1	2a	2b	3a	3b	5a	1	2a	2b	3a	3b	5a
	-75v	37v	10v	-112v	75v	65v	-100v	112v	10v	-220v	150v	87v	-300v	37v	20v	-150v	150v	123v	-600v	112v	20v	-300v	300v	173v
Automotive Transient Surge Including Load Dump Protection																								
TPSMF4L	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
TPSMA6L	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
TPSMB/TPSMB-VR	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
TPSMC	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
TPSMD	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
TP6KE	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
SLD8S (or Load Dump)						Pass						Pass						Pass						Pass
TP1.5KE	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
TP5KP	Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass		Pass	Pass	Pass	Pass	Pass	
SLD (or Load Dump)						Pass						Pass						Pass						Pass

Automotive DST Series Schottky Rectifier in TO-277B

For automotive applications up to 10A, the Automotive DST Series Schottky Rectifier in TO-277B offers the same or better performance as Schottky provided in D-PAK packaging, but with a footprint that's only one-third as large.

New automotive DST series of Schottky Barrier Rectifiers contain part numbers that are AEC-Q qualified, supported by PPAP and manufactured by sites certified by TS/ISO16949.



FEATURES & BENEFITS

- Provides ultra-low forward voltage drop (VF) that can reduce thermal and electrical conduction losses, thereby improving system efficiency
- Provides fast switching speed for very high-frequency applications with minimal switching loss
- Requires 1/3 of footprint compared to conventional D-PAK products that enable much smaller device design, or more functions in same size
- AEC-Q101 qualified and PPAP capable

APPLICATIONS

- DC-DC converter of power supply found in automotive applications such as ADAS devices (camera, sensors and ECU), infotainment devices
- 16 ARMS

AEC-Q101 QUALIFIED DST SERIES SCHOTTKY RECTIFIER IN TO-277B

Series/Part Number	AEC-Q101 Qualified	Configuration	Package	IF (A)	V _{RWM} (V)	I _{FSM} (A)	V _F (V)
DST1045S-A	Yes	Single	TO-277B	10	45	150	0.51
DST560S-A	Yes	Single	TO-277B	5	60	100	0.7
DST580S-A	Yes	Single	TO-277B	5	80	80	0.72
DST5100S-A	Yes	Single	TO-277B	5	100	120	0.75
DST860S-A	Yes	Single	TO-277B	8	60	140	0.61
DST8100S-A	Yes	Single	TO-277B	8	100	150	0.68
DST1040S-A	Yes	Single	TO-277B	10	40	150	0.57
DST1050S-A	Yes	Single	TO-277B	10	50	150	0.55
DST10100S-A	Yes	Single	TO-277B	10	100	150	0.6

Ignition IGBTs Power Semiconductors

Insulated Gate Bipolar Transistor (IGBT) technology features monolithic circuitry integrating ESD and over-voltage clamped protection for use in inductive coil driver application.



Primary Switching Regulators



The BD99010EFV-M and BD99011EFV-M are low Iq buck DC/DC converters that integrate a power MOSFET and provide 3.3V and 5V output, respectively.

The BD906xxEFJ-C series of buck switching regulators feature a built-in high-voltage power MOSFET and allow the operating frequency to be set via an external resistor.

FEATURES & BENEFITS

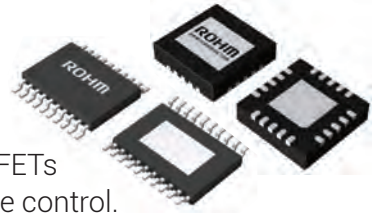
- Low quiescent current: 22µA (Typ.)
- High efficiency
- Synchronous rectification (No external Schottky diode required)
- Simple Light Load Mode (SLLM™)
- Supports cold cranking operation (3.6V operation)
- Input voltage range: 3.6V to 35V (42V rating) (Initial startup over 3.9V)
- Output voltage: 3.3V ±2% (BD99010EFV-M) / 5.0V ±2% (BD99011EFV-M)
- Switching output current: 2A (Max.)
- Switching frequency: 200k to 500kHz
- Integrated switching FET: Pch 170mΩ (Typ.), Nch 130mΩ (Typ.)
- Soft start built in
- Enable pin compatible with CMOS logic and battery voltages
- Forced PWM mode function
- Current mode control with external compensation circuit
- Over Current/Short Circuit Protection, VOUT Over Voltage Protection, Under Voltage Lock Out, and Thermal Shutdown circuits

BD906xxEFJ-C

- Input voltage range: 3.5V to 36V (42V rating) (Initial startup over 3.9V)
- Built-in Pch FET enables 100% duty
- Circuit current at shutdown: 0µA (Typ.)
- Reference voltage: 0.8V ±2% (Ta: -40C to +125C) / 0.8V ±1% (Ta: 25C)
- Switch output current: 1.25A Max. (BD90610EFJ-C) / 2.5A Max. (BD90620EFJ-C/HFP-C) / 4A Max. (BD90640EFJ-C/HFP-C)
- Switching frequency: 50k to 600kHz
- Internal switching FET: Pch 160mΩ (Typ.)
- Soft start function
- Enable pin compatible with CMOS logic and battery voltages
- Current mode control with external compensation circuit
- Over Current/Short Circuit Protection, Under Voltage Lock Out, and Thermal Shutdown circuits

Secondary Switching Regulators

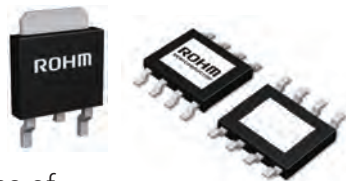
The BD905x1 series of synchronous buck converters incorporate both Pch and Nch MOSFETs and deliver current mode control.



FEATURES & BENEFITS

- Synchronous rectification type
- Switching frequency: 0.3M to 2.4MHz ±15%
- Synchronous operation possible via external clock
- Input voltage range: 2.6V to 5.5V (7V rating)
- Integrated switching FET: Pch 90mΩ (Typ.), Nch 60mΩ (Typ.)
- Current mode control
- Over Current/Short Circuit Protection, VOUT Over Voltage Protection, Under Voltage Lock Out, and Thermal Shutdown circuits

Primary Linear Regulators



The BD7xxLxxxx-C series of low quiescent current regulators are ideal for applications requiring a direct battery connection and low current consumption.

FEATURES & BENEFITS

- Ultra-low quiescent current: 6µA (Typ.)
- Output transistor: Low saturation Pch DMOS (3Ω Typ.)
- VCC maximum voltage: 50V
- Output current: 200mA (Max.) / 500mA (Max.)
- Output voltage: 3.3V ±2% / 5.0V ±2%
- Enables low ESR ceramic capacitors to be used for output phase compensation
- Integrated output current control circuit protects the IC against damage due to short circuits
- Built-in thermal shutdown prevents IC overheating due to overload conditions



ROHM Discretes

SiC MOSFETs

SiC exhibits minimal ON resistance rise and provides greater package miniaturization and energy savings than Si devices, where the ON resistance can more than double with increased temperature. Compared to IGBTs, SiC MOSFETs have no tail current during switching. This allows faster switching speed, further decreasing solution size. Products available in withstand voltages of 650V, 1200V, and 1700V, with $R_{DS(on)}$ as low as 17m Ω .



SiC Power Modules

SiC power modules that integrate SiC MOSFETs and SBDs feature significantly lower switching losses than Si IGBT modules. This enables high-frequency operation above 100kHz (unlike conventional solutions). ROHM offers 1200V-/1700V-class products that support currents up to 300A.



SiC Schottky Barrier Diodes (SBD)

Unlike Si-based fast recovery diodes where the t_{rr} increases along with temperature, SiC devices maintain constant characteristics, resulting in better performance. AEC-Q101 qualified models are available featuring withstand voltages of 650V and 1200V and currents ranging from 2A to 40A.



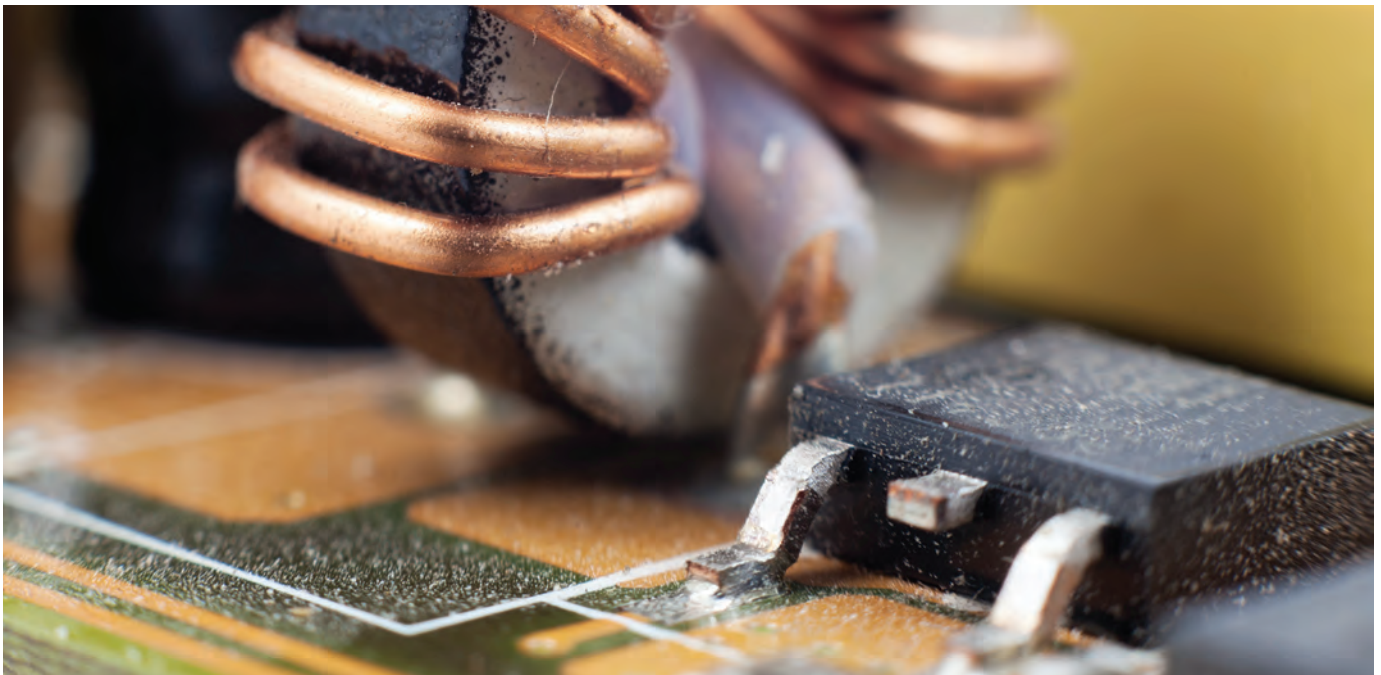
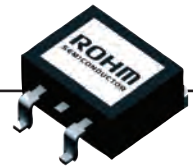
Ignition IGBTs

FEATURES & BENEFITS

- AEC-Q101 qualified
- TO-252/T0263 Package
- 400V or 430V
- 20A/30A

APPLICATIONS

- Ignition Coil Driver Circuits
- Solenoid Driver Circuits





DIODES - TVS (Transient Voltage Suppressors)

Series	Product	Product Line	Package Outline	Power Rating (W)	TVS Polarity	V _{BR} min. (V)	V _{WM} min. (V)	V _{WM} max. (V)	T _J max. (°C)
TPSMA6.8 thru TPSMA43A		PAR® TVS	DO-214AC (SMA)	400	Unidirectional	6.12	5.5	36.8	185
TPSMP6.8 thru TPSMP43A		PAR® TVS	DO-220AA (SMP)	400	Unidirectional	6.12	5.5	36.8	185
TPSMB6.8 thru TPSMB43A		PAR® TVS	DO-214AA (SMBJ)	600	Unidirectional	6.12	5.5	36.8	185
TPSMC6.8 thru TPSMC47A		PAR® TVS	DO-214AB (SMCJ)	1500	Unidirectional	6.12	5.5	40.2	185

MOSFETs

Series	Package	Channel	Configuration	V _{DS} (V)	V _{GS} (V)	R _{DS(on)} (max.) at 10 V _{GS} (Ω)	R _{DS(on)} (max.) at 4.5 V _{GS} (Ω)	R _{DS(on)} (max.) at 2.5 V _{GS} (Ω)	R _{DS(on)} (max.) at 1.8 V _{GS} (Ω)	Q _g (typ.) at 10 V _{GS} (nC)	Q _g (typ.) at 4.5 V _{GS} (nC)	I _D (A)	P _D (W)
SINGLE N-CHANNEL													
SQJQ402E	PowerPAK® 8 x 8L	N	Single	40	20	0.0017	0.002	0.0017	0.002	169	–	200	150
SQJ410EP	PowerPAK® SO-8L	N	Single	30	20	0.0039	0.0042	–	–	73.5	–	32	83
SQJ840EP		N	Single	30	20	0.0093	0.0138	–	–	25.3	–	30	46
SQJ422EP		N	Single	40	20	0.0034	0.0043	–	–	67	–	75	83
SQJ412EP		N	Single	40	20	0.0041	–	–	–	80	–	32	83
SQJ886EP		N	Single	40	20	0.0045	0.0055	–	–	43	–	60	55
SQJ858AEP		N	Single	40	20	0.0063	0.0075	–	–	36	–	58	48
SQJ460AEP		N	Single	60	20	0.0087	0.0094	–	–	71	–	64	83
SQJ850EP		N	Single	60	20	0.023	0.032	–	–	20	–	24	45
SQJ486EP		N	Single	75	20	0.026	0.032	–	–	22	–	30	56
SQJ402EP		N	Single	100	20	0.011	0.014	–	–	37	–	32	83
SQJ488EP		N	Single	100	20	0.021	0.0258	–	–	18	–	42	83
SQJ456EP		N	Single	100	20	0.026	–	–	–	42	–	32	83
DUAL N-CHANNEL													
SQJ910AEP	PowerPAK® SO-8L	N	Dual	30	20	0.007	0.0086	–	–	25.8	–	30	48
SQJ844AEP		N	Dual	30	20	0.0166	0.0276	–	–	17	–	8	48
SQJ912AEP		N	Dual	40	20	0.0093	0.0111	–	–	25.6	–	30	48
SQJ952EP		N	Dual	60	20	0.02	0.024	–	–	24	–	23	25
SQJ968EP		N	Dual	60	20	0.0336	0.0444	–	–	12.3	–	18	25
SQJ992EP		N	Dual	60	20	0.0562	0.0745	–	–	8.1	–	15	34
SQJ980AEP		N	Dual	75	20	0.05	0.066	–	–	14	–	17	34
SINGLE P-CHANNEL													
SQJ401EP	PowerPAK® SO-8L	P	Single	-12	8	–	0.006	0.008	–	–	109	32	83
SQJ403EEP		P	Single	-30	20	0.0085	0.02	–	–	75	–	30	68
SQJ463EP		P	Single	-40	20	0.01	0.015	–	–	98	–	30	83
SQJ443EP		P	Single	-40	20	0.029	0.047	–	–	38	–	40	83
SQJ461EP		P	Single	-60	20	0.016	0.021	–	–	90	–	30	83
SQJ465EP		P	Single	-60	20	0.085	0.115	–	–	26.5	–	8	45
SQJ469EP		P	Single	-80	20	0.025	0.029	–	–	101	–	32	100
SQJ431EP		P	Single	-200	20	0.213	–	–	–	71	–	12	83
DUAL P-CHANNEL													
SQJ951EP	PowerPAK® SO-8L	P	Dual	-30	20	0.017	0.036	–	–	33	–	30	56
SQJ963EP		P	Dual	-60	20	0.085	–	–	–	26.5	–	8	27
N-CHANNEL AND P-CHANNEL PAIR													
SQJ500AEP	PowerPAK® SO-8L	P	N&P pair	-40	20	0.027	0.0435	–	–	30.2	–	30	48
		N	N&P pair	40	20	0.0092	0.0112	–	–	25.5	–	30	48



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Power Inductors - High Current (Shielded)



FEATURES & BENEFITS

- Shielded construction
- Carbonyl powder core
- High saturation current
- Inductance range: 0.1 to 100 μ H
- AEC-Q200 compliant
- RoHS compliant and halogen free

APPLICATIONS

- Automotive systems:
 - Driver assistant
 - Infotainment
 - Lighting
- DC/DC converters
- Power supplies

Common Mode Chip Inductors



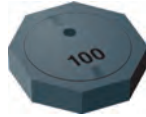
FEATURES & BENEFITS

- Shielded construction – low radiation
- Bifilar wound
- Impedance range: 67 to 2200 ohms @ 100 MHz
- AEC-Q200 compliant
- RoHS compliant and halogen free

APPLICATIONS

- EMI suppression for:
 - Data and signal lines
 - CANbus
 - Automotive electronics
 - Consumer electronics
 - Telecom devices

Power Inductors (Shielded)



FEATURES & BENEFITS

- Low radiation
- Low DCR
- Ferrite core
- Induction range: 0.47 to 15,000 μ H
- AEC-Q200 compliant
- RoHS compliant and halogen free

APPLICATIONS

- Automotive systems:
 - Driver assistant
 - Infotainment
 - Lighting
- DC/DC converters
- Power supplies

Common Mode Chokes



FEATURES & BENEFITS

- Multiple applications: parallel, series, dual-inductor and transformer
- Magnetically shielded, low radiation
- Inductance range: 0.33 to 4000 μ H
- AEC-Q200 compliant
- RoHS compliant

APPLICATIONS

- Automotive systems:
 - Driver assistant
 - Infotainment
 - Lighting
- DC/DC converters
- Power supplies
- SEPIC - DC/DC converters

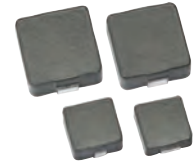
DRA Series
High Power,
Shielded Inductors



FEATURES & BENEFITS

- AEC-Q200 qualified, Grade 1
- 165°C max operating temperature
- Ferrite core material
- 5 size options available

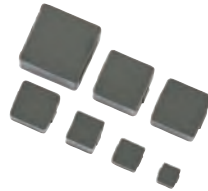
HCMA Series
High Current
Shielded Inductors



FEATURES & BENEFITS

- AEC-Q200 qualified
- 125°C max operating temperature
- Iron powder core material
- 5 size options available

HCM1A Series
High Current
Shielded Inductors



FEATURES & BENEFITS

- AEC-Q200 qualified, Grade 1
- 155°C max operating temperature
- Pressed magnetic powder construction
- PCB footprint sizes

DRAQ Series
High Power
Dual Winding
Shielded Inductors



FEATURES & BENEFITS

- AEC-Q200 qualified
- 165°C max operating temperature
- Dual winding inductors that can be used as single inductor or coupled inductor/transformers
- Ferrite core material

MPIA40V2 Series
High Current, Low Profile
Miniature Power Inductors



FEATURES & BENEFITS

- AEC-Q200 qualified, Grade 3
- Handles high transient inrush current spikes
- Magnetically shielded
- 4.7 x 4.31 footprint SMD in 1.2, 1.5, or 2.0mm heights
- Rugged pressed magnetic powder construction
- Halogen free, lead free, RoHS compliant

Family	Inductance (μ H)		Isat Current (A)		Irms Current (A)		DCR Maximum (Ω)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
DRA	0.29	1002	0.24	56	0.24	15.9	0.003	6.18
DRAQ	9.63	192	2.54	11.2	1.31	6.02	0.022	0.44
HCM1A	0.1	100	2.1	80	1.2	53	0.6	265
HCMA	0.1	68	1.9	118	1.8	55	0.59	270
MPIA	0.1	22	1.65	22	1.2	16	4.5	402

DLW Series Common Mode Choke Coils

Murata DLW Common Mode Choke Coils are part of the EMI suppression filter product line.

The DLW Common Mode Choke Coils from Murata offer wound, low-profile construction in multiple case sizes and ultra-high self resonance frequency that enables high cut-off frequency for high-speed differential lines. The DLW series also offers large current (6A maximum) suitable for an input connector from an AC adaptor.



FEATURES & BENEFITS

- High cut-off frequency for high-speed differential signal lines
- Low profile
- Wound structure
- Large current (6A maximum) suitable for input connector from an AC adaptor



Application Matrix					
Product Name	Series	Powertrain	Safety	Comfort	Infotainment
RF Inductors Film Type	LQP			•	•
RF Inductors Multilayer Type	LQG	•	•	•	•
RF Inductors/Power Lines Wire Wound Type	LQW			•	•
Power Lines/General Circuit Multilayer Type	LQM	•	•	•	•
Power Lines/General Circuit Wire Wound Type	LQH	•	•	•	•

Powertrain/Safety

Series	Type	Size Code in Inch (in mm)	Thickness (mm/max.)	Inductance Range (H)						Rated Current
				1n	10n	100n	1μ	10μ	100μ	
LQG	RF Inductors Multilayer Type	0402 (1005)	–	1.0nH-270nH						110mA-300mA
		0603 (1608)	–	1.2nH-270nH						200mA-500mA
LQM	Power Lines/General Circuit Multilayer Type	0805 (2012)	1.2 ≥ Size T ≥ 1				2.2μH			800mA
LQH	Power Lines/General Circuit Wire Wound Type	1210 (3225)	Size T > 1.2				0.15μH-22μH			250mA-1.45A






Infotainment/Comfort

Series	Type	Size Code in Inch (in mm)	Thickness (mm/max.)	Inductance Range (H)						Rated Current
				1n	10n	100n	1μ	10μ	100μ	
LQP	RF Inductors Film Type	0201 (0603)	–	0.6nH-120nH						80mA-850mA
LQG	RF Inductors Multilayer Type	0402 (1005)	–	1.0nH-270nH						110mA-300mA
LQW	RF Inductors/Power Lines Wire Wound Type	0402 (1005)	–	1.3nH-120nH						110mA-1.2A
		0603 (1608)	–	2.2nH-470nH						75mA-1.4A
LQM	Power Lines/General Circuit Multilayer Type	0805 (2012)	1 > Size T				0.47μH-2.2μH			600mA-1.1A
			1.2 ≥ Size T ≥ 1				0.47μH-4.7μH			800mA-1.3A
		0806 (2016)	1.2 ≥ Size T ≥ 1				0.47μH-4.7μH			1.1A-1.6A
			1 > Size T				0.56μH			1.5A
LQH	Power Lines/General Circuit Wire Wound Type	1008 (2520)	1.2 ≥ Size T ≥ 1				0.24μH-4.7μH			800mA-1.8A
			1.2 ≥ Size T ≥ 1				0.47μH-22μH			430mA-2.75A
		1206 (3216)	Size T > 1.2				0.054μH-0.88μH			180mA-920mA
			Size T > 1.2				0.47μH-330μH			60mA-2.9A
		1210 (3225)	1.2 ≥ Size T ≥ 1				0.47μH-47μH			460mA-2.86A
			1.2 ≥ Size T ≥ 1				0.68μH-47μH			410mA-2.5A
			Size T > 1.2				1.0μH-2200μH			30mA-3.3A
			Size T > 1.2				0.47μH-22μH			1.05A-4.0A









Inductors

Series		Technical Data	Features & Benefits	Ordering Code/Type
SIMID 0603 – 2220		L _R : 1 nH – 10,000µH I _R : up to 3.51A	<ul style="list-style-type: none"> Wide temperature range from -55°C – +150°C Miniaturized versions High mechanical strength Suitable for lead-free soldering profiles to JEDEC J-STD 020C Qualified to AEC-Q200 	B82496-C B82498-F B82422 B82432 B82442
Data and Signal Line Chokes SIMDAD		L _R : 11 - 100µH I _R : 150 - 300mA	<ul style="list-style-type: none"> Temperature range up to 150°C Suitable for lead-free reflow soldering as referenced in JEDEC J-STD 020C Qualified to AEC-Q200 RoHS-compatible Cost-optimized I-core solution 	B82789
Data and Signal Line Chokes ACT45B		L _R : 51 and 100µH I _R : 200 and 150mA	<ul style="list-style-type: none"> Temperature range up to 150°C Qualified to AEC-Q200 Suitable for lead-free soldering as referenced in JEDEC J-STD 020D RoHS-compatible Cost-optimized I-core solution 	B82787
Data and Signal Line Chokes ACT45R		L _R : 5 – 100µH I _R : 2 – 200mA		ACT45R-101-2P-TL*
Data and Signal Line Chokes ACT45L		L _R : 200µH I _{max} : 200mA		ACT45L-201-2P-TL*
Data and Signal Line Chokes		L _R : 0.005 µH – 4.7mH I _R : 0.4 – 1.2A	<ul style="list-style-type: none"> High-rated current Qualified to AEC-Q200 RoHS-compatible Reduced component height Cost-optimized open construction 	B82793
Current Compensated Ring Core Chokes		L _R : 0.2 – 82mH I _R : 0.3 – 16A	<ul style="list-style-type: none"> High resonance frequency Approximately 1% stray inductance UL and/or VDE approvals 	B82721A/J/K B82724A/J B82722A/J B82725A/J B82723A/J B82726S
ERU Helical Wound Chokes		L _R : 0.5 – 35µH I _R : 12 – 71A	<ul style="list-style-type: none"> Very low profile Qualified to AEC-Q200 High-rated current Low DC resistance Magnetically shielded 	B82559A-A020 B82559A-A019 B82559A-A016





Inductors

Series		Technical Data	Features & Benefits	Ordering Code/Type
High Frequency Inductors		MHQ <ul style="list-style-type: none"> • Case size: 1005 • Inductance ranging from 0.7 to 150nH • Rated current from 0.11 to 1.2A • Operating temperature range from -55 to +125°C 	MHQ <ul style="list-style-type: none"> • Achieves high Q characteristics equivalent to an air-core wirewound inductor • Inductance is provided in small increments, taking advantage of the multilayer technique • Qualified to AEC-Q200 	MHQ*D25
		MLG <ul style="list-style-type: none"> • Case sizes ranging from 0603 to 1005 • Inductance ranging from 0.3 to 180nH • Rated current from 0.05 to 1A • Operating temperature range from -55 to +125°C 	MLG <ul style="list-style-type: none"> • Optimal for fine-pitch circuits • Advanced monolithic structure is formed using multilayering and sintering process with ceramic and conductive materials for high frequency • Qualified to AEC-Q200 	MLG*D25
		MLK <ul style="list-style-type: none"> • Case size: 1005 • Inductance ranging from 1 to 330nH • Rated current from 0.07 to 0.5A • Operating temperature range from -55 to +125°C 	MLK <ul style="list-style-type: none"> • Giga-spiral laminated structure • High self-resonant frequency • Limited decrease of Q in the GHz band 	MLK*D25
Signal Use Inductors		MLF <ul style="list-style-type: none"> • Case sizes ranging from 1005 to 2012 • Inductance ranging from 0.047 to 100μH • Rated current from 0.002 to 0.3A • Operating temperature range from -55 to +125°C 	MLF <ul style="list-style-type: none"> • Inductance tolerance ±5% or ±10% (J-tolerance and K-tolerance, respectively) • Temperature stress (drift variance percentage) for soldering ±3% 	MLF*D25
		NLV-EFD <ul style="list-style-type: none"> • Case sizes ranging from 2520 to 3225 • Inductance ranging from 0.01 to 470μH • Rated current from 0.025 to 0.53A • Operating temperature range from -40 to +105°C 	NLV-EFD <ul style="list-style-type: none"> • Good heat durability that withstands lead-free compatible reflow soldering conditions • Lead-free material is used for the plating on the terminal • Metal terminals provide excellent connection reliability • Highly heat-resistant thermoplastic resin is used to form the exterior package 	NLV*EFD

Inductors

Series		Technical Data	Features & Benefits	Ordering Code/Type
Decoupling Inductors		KLZ (Soft termination) <ul style="list-style-type: none"> Case sizes ranging from 1608 to 2012 Inductance ranging from 1 to 100μH Rated current from 0.03 to 0.7A Operating temperature range from -55 to +150°C 	KLZ (Soft termination) <ul style="list-style-type: none"> Excellent DC superimposition characteristics and low DC resistance Compatible with wide frequency band noise, from low to high frequency Conductive resin soft termination Absorbs mechanical stress from board flexure Reduces crack development due to heat shock Qualified to AEC-Q200 	KLZ*D25
		MLZ <ul style="list-style-type: none"> Case sizes ranging from 1608 to 2012 Inductance ranging from 1 to 100μH Rated current from 0.03 to 1A Operating temperature range from -55 to +125°C 	MLZ <ul style="list-style-type: none"> Best DC superimposition characteristics Lowest DC resistance Effective mainly on the decoupling of power circuits Suitable for audio lines due to low DC resistance Qualified to AEC-Q200 	MLZ*D25
		ADL (for power over Coax Line) <ul style="list-style-type: none"> Case size: 3225 Inductance ranging from 4.7 to 47μH Rated current from 0.3 to 0.72A Operating temperature range from -40 to +150°C 	ADL (for power over Coax Line) <ul style="list-style-type: none"> Small size and thin form factor Achieves broadband impedance characteristics and good DC superimposition characteristics as a result of an original coil wiring design and original structure Ensures consistent high quality and reliability as a result of a completely automated manufacturing process 	ADL-V ADL-VT
		NLCV-EFD/EFRD <ul style="list-style-type: none"> Case sizes ranging from 2520 to 3225 Inductance ranging from 0.1 to 330μH Rated current from 0.07 to 2.85A Operating temperature range from -40 to +105°C 	NLCV-EFD/EFRD <ul style="list-style-type: none"> Good heat durability that withstands lead-free compatible reflow soldering conditions Lead-free material is used for the plating on the terminal Metal terminals provide excellent connection reliability High heat-resistant thermoplastic resin is used to form the exterior package 	NLCV*EFD NLCV*EFRD
Power Inductors		TFM-ALMA <ul style="list-style-type: none"> Case sizes range from 2016 to 2520 Inductance ranging from 0.47 to 2.2μH Rated current from 1.9 to 3.9A Operating temperature range from -40 to +150°C 	TFM-ALMA <ul style="list-style-type: none"> Low height of 1.0 and 1.2mm Excellent DC bias characteristics Consists of original fine copper pattern with micro-processing technology Coil pattern coated with metal magnetic material Qualified to AEC-Q200 	TFM*ALMA*
		VLS-EX-CA <ul style="list-style-type: none"> Case sizes range from 5045 to 6045 Inductance ranging from 1 to 220μH Rated current from 0.45 to 6.0A Operating temperature range from -40 to +105°C 	VLS-EX-CA <ul style="list-style-type: none"> Magnetically shielded, wirewound inductor Large current and low Rdc achieved by optimizing the ferrite core figure High magnetic shield construction and compatible with high-density mounting 	VLS*EX*CA
		MLD <ul style="list-style-type: none"> Case size: 2016 Inductance ranging from 1 to 4.7μH Rated current from 0.2 to 1.4A Operating temperature range from -40 to +125°C 	MLD <ul style="list-style-type: none"> For compact DC/DC converters Most suitable for power lines with low output Optimized ferrite materials enables the reduction of losses Qualified to AEC-Q200 	MLD*D25
		CLF-NI-D <ul style="list-style-type: none"> Case sizes range from 6045 to 12577 Inductance ranging from 1 to 470μH Rated current from 280mA to 8.5A Operating temperature range up to +150°C 	CLF-NI-D <ul style="list-style-type: none"> High-rated DC current High reliability with welding connection Ferrite shield component Qualified to AEC-Q200 	CLF*NI*D

Inductors

Series		Technical Data	Features & Benefits	Ordering Code/Type
Ferrite Beads		MMZ <ul style="list-style-type: none"> Case sizes ranging from 0603 to 2012 Impedance ranging from 3 to 5000Ω Rated current from 0.1 to 1.5A Operating temperature range from -55 to +125°C 	MMZ <ul style="list-style-type: none"> Noise reduction solution for signal line High reliability Closed magnetic circuit structure Low DC resistance structure of electrode Qualified to AEC-Q200 	MMZ*D25
		KMZ (Soft termination) <ul style="list-style-type: none"> Case size: 1608 Impedance ranging from 50 to 2500Ω Rated current from 0.2 to 0.8A Operating temperature range from -55 to +150°C 	KMZ (Soft termination) <ul style="list-style-type: none"> Noise reduction solution for signal line Various frequency characteristics with 6 materials of different features Conductive resin soft termination Absorbs mechanical stress from board flexure Reduces crack development due to heat shock Qualified to AEC-Q200 	KMZ*D25
		MPZ <ul style="list-style-type: none"> Case sizes ranging from 1005 to 2012 Impedance ranging from 10 to 1000Ω Rated current from 0.45 to 6A Operating temperature range from -55 to +125°C 	MPZ <ul style="list-style-type: none"> Best-in-class energy-saving in the low DC resistance range No crosstalk with closed magnetic circuit structural design Qualified to AEC-Q200 	MPZ*D25
		KPZ (Soft termination) <ul style="list-style-type: none"> Case size: 1608 Impedance ranging from 30 to 1000Ω Rated current from 0.8 to 5.0A Operating temperature range from -55 to +150°C 	KPZ (Soft termination) <ul style="list-style-type: none"> Compared to KMZ series, has low direct current resistance for compatibility with large currents, optimal for low power consumption Conductive resin soft termination Absorbs mechanical stress from board flexure Reduces crack development due to heat shock Qualified to AEC-Q200 	KPZ*D25
Common-Mode Filters	  	ACT1210 <ul style="list-style-type: none"> Case size: 1210 Rated inductance range of 11 to 100μH Impedance range of 300 to 5800Ω (10MHz) Rated current range from 0.15 to 0.25A Operating temperature range from -40 to +150°C 	ACT1210 <ul style="list-style-type: none"> ACT1210 for CAN and FlexRay ACT1210L for 100Base-T1 Non-soldered internal construction provides excellent heat resistance to ensure effective circuit board mounting Robust lead-frame termination Suitable for lead-free soldering profiles according to JEDEC J-STD 020D Qualified to AEC-Q200 	ACT1210* ACT1210L*
		ACT45 <ul style="list-style-type: none"> Case size: 1812 Rated inductance range of 11 to 100μH Impedance range of 300 to 5800Ω (10MHz) Rated current range from 0.15 to 0.25A Operating temperature range from -40 to +150°C 	ACT45 <ul style="list-style-type: none"> ACT45B/C for CAN-Bus ACT45R for FlexRay ACT45L for 100Base-T1 Non-soldered internal construction provides excellent heat resistance to ensure effective circuit board mounting Robust lead-frame termination Suitable for lead-free soldering profiles according to JEDEC J-STD 020D Qualified to AEC-Q200 	ACT45*
		ACM <ul style="list-style-type: none"> Case size: 2012 Impedance range of 90 to 360Ω (100MHz) Rated current range from 0.22 to 0.4A Operating temperature range from -40 to +105°C 	ACM <ul style="list-style-type: none"> High reliability Impedance variation: 4 types of impedance values are prepared to correspond to the various applications Suppresses the common mode EMI without waveform distortion Qualified to AEC-Q200 	ACM*

Inductors

Series		Technical Data	Features & Benefits	Ordering Code/Type
Power Inductors - SMD A and G Series		<ul style="list-style-type: none"> Rated inductance: 0.82 ... 1000µH Rated current: 0.11 ... 7.6A Temperature: up to +150°C Size: 6 x 6 and 10 x 10mm Height: 3.0 ... 4.8mm 	<ul style="list-style-type: none"> Shielded and unshielded construction High-rated current Low DC resistance Qualified to AEC-Q200 Suitable for lead-free reflow soldering as referenced in JEDEC J-STD 020D 	B82462 B82464
Power Inductors - P, R and M Series		<ul style="list-style-type: none"> Rated inductance: 0.82 ... 1000µH Rated current: 0.2 ... 11A Temperature: up to +150°C Size: 7.3 x 7.3 ... 12.5 x 12.5mm Height: 4.5 ... 8.5mm 	<ul style="list-style-type: none"> Shielded and unshielded construction High mechanical stability High-rated current Low DC resistance Qualified to AEC-Q200 Suitable for lead-free reflow soldering as referenced in JEDEC J-STD 020D 	B82464 ... B82477
Dual Inductors - SMD		<ul style="list-style-type: none"> Rated inductance: 2.0 ... 100µH (inductance per winding) Rated current: 1.35 ... 7.05A Temperature: up to +150°C Size: 7.3 x 7.3 ... 12.5 x 12.5mm Height: 4.6 ... 10.5mm 	<ul style="list-style-type: none"> Two windings 1:1 transformer Shielded construction Special winding technology for low-stray inductance High coupling factor Qualified to AEC-Q200 Suitable for lead-free reflow soldering as referenced in JEDEC J-STD 020D 	B82472D ... B82477D B82477C

Transformers

Series		Technical Data	Features & Benefits	Ordering Code/Type
EP6 Shielded - SMD		<ul style="list-style-type: none"> Output voltage (typ.): 80 ... 140V Size (l x w x h): 9 x 7.6 x 7.4mm 	<ul style="list-style-type: none"> High turns ratio Low leakage inductance High frequencies Insensitive to external fields AEC-Q200 qualified 	B78416
EP7 / EP10 Current Sense Transformer		<ul style="list-style-type: none"> I_{sense}: up to 30 ARMS Turn ratio: 1:50 up to 1:180 	<ul style="list-style-type: none"> AEC-Q200 qualified Basis isolation 	B78417A* B78419A*

Transponder Coils

Series		Technical Data	Features & Benefits	Ordering Code/Type
X/Y Transponder Coils - SMD		<ul style="list-style-type: none"> Size 8mm: B82450A ... E ... Size 11mm: B82450A ... A ... High Q 11mm: B82450H ... A ... Inductance: 1 ... 26mH Sensitivity: 10 ... 51mV/µT 	<ul style="list-style-type: none"> Rugged construction for high mechanical stability when exposed to shock, drop and bending tests High Q version available Low profile version available Qualified to AEC-Q200 	B82450A ... B82450H ...
Z Transponder Coils - SMD		<ul style="list-style-type: none"> Size: 7.7 x 7.4 x 2.65mm Inductance: 1 ... 10mH Sensitivity: 23mV/µT 	<ul style="list-style-type: none"> Rugged construction for high mechanical stability when exposed to shock, drop and bending tests Qualified to AEC-Q200 	B82451L ...
3D Transponder Coils - SMD		<ul style="list-style-type: none"> Size: 11.5 x 12.5 x 3.6mm Inductance range 125kHz: 1 ... 13.2mH Inductance range 21.8kHz: 30 ... 55mH Sensitivity range 125kHz: 49 ... 100mV/µT Sensitivity range 21.8kHz: 22 ... 25mV/µT 	<ul style="list-style-type: none"> Long receiving distance at 125kHz High Sensitivity in all orientations (X/Y/Z) Rugged construction for high mechanical stability when exposed to shock, drop and bending tests Qualified to AEC-Q200 	B82453C



Inductors

Series	Product Image	Description	Inductance Range (μ H)	Size Class	Rating Current (A)
DIHLE-4040DD-5A		Low profile, high-current inductors with e-field shield	0.47 to 68	4040	2.4 to 30
IHLE-3232DD-5A		Low profile, high-current inductors with e-field shield	0.22 to 33	3232	3.1 to 36
IHLE-2525CD-5A		Low profile, high-current inductors with e-field shield	0.47 to 22	2525	2.8 to 20
IHLD-3232HB-5A		Low profile, high-current dual inductors	10 to 33	3232	3.1 to 5.6
IHLD-4032KB-5A		Low profile, high-current dual inductors	10 to 33	4032	3.1 to 5.6
IHLP-8787MZ-5A		Low profile IHLP [®] power inductors – high temperature, automotive, 22.0 x 22.1 x 13.0	0.47 to 100	8787	9.1 to 80
IHLP-6767 Series		Low Profile IHLP [®] power inductors – automotive, 17.9 x 17.1 x 7.0	0.22 to 100	6767	5 to 80
IHLP-5050 Series		Low Profile IHLP [®] power inductors – high temperature (+155°C/+180°C), automotive, 13.6 x 12.9 x 3.5/13.6 x 12.9 x 5.0/13.6 x 12.9 x 6.5	0.1 to 22	5050	7.0 to 66
IHLP-4040 Series		Low Profile IHLP [®] power inductors – high temperature (+155°C/+180°C), automotive, 11.5 x 10.3 x 4.0	0.19 to 47	4040	2.5 to 40
IHLP-3232 Series		Low Profile IHLP [®] power inductors – automotive, 8.0 x 8.0 x 3.0/8.0 x 8.0 x 4.0	0.22 to 33	3232	3.1 to 36
IHLP-2525 Series		Low Profile IHLP [®] power inductors – low DCR, high temperature (+155°C/+180°C), automotive, 7.2 x 6.7 x 1.8/7.2 x 6.7 x 2.4/7.2 x 6.7 x 3.0	0.1 to 22	2525	2.5 to 32.5
IHLP-2020 Series		Low Profile IHLP [®] power inductors – low DCR, high temperature (+155°C), automotive, 5.7 x 5.4 x 2.0/5.7 x 5.4 x 3.0	0.1 to 15	2020	2.4 to 23
IHLP-1616 Series		Low Profile IHLP [®] power inductors – automotive, 4.7 x 4.3 x 1.2	0.047 to 4.7	1616	1.7 to 13



ELECTROMECHANICAL

NP Series

Sealed Industrial Pushbutton Switch



FEATURES & BENEFITS

- IP68 sealed to endure harsh environments
- 1,000,000 life cycle
- Anodized aluminum housing
- Multiple housing styles for variety of mounting options
- Capable of switching up to 5A resistive load
- Wirelead options available for simple installation
- RoHS compliant

APPLICATIONS

- Harsh environments
- Off-road
- Industrial
- Transportation
- Military

KSC Series

Sealed Tactile Switches for SMT



FEATURES & BENEFITS

- IP67 sealed
- Positive tactile feeling
- Range of 6 actuation forces
- Gullwing option available for each part number

APPLICATIONS

- Key fobs
- Door and trunk handles
- Interior controls
- Door panels and seat control
- Steering wheel
- Column switches
- Interior lighting
- Gear box
- Mechatronics detection

K12S Series

High-performance SMT Keyswitches



FEATURES & BENEFITS

- IP40 or IP67 sealed
- SMD
- Illuminated versions
- Excellent tactile feel
- High reliability/long life
- SPST/DPST and detect versions (NO or NC)

APPLICATIONS

- Motorcycles
- Transportation/Off-road
- Joysticks
- Harsh environments
- Safety appliances
- Industrial

PNP Series

Sealed Pushbutton Switch



FEATURES & BENEFITS

- IP68 sealed to endure harsh environments
- 1,000,000 life cycle
- PBT thermoplastic housing
- Longer solder leads for ease of wire installation
- Multiple housing styles for variety of mounting options
- Capable of switching up to 5A resistive load
- Wirelead options available for simple installation
- RoHS compliant

APPLICATIONS

- Control grips
- Off-road panels
- Heavy equipment
- Industrial instruments
- Lifts
- Conveyor controls

Sealed Rocker Switches



Setting the industry standard, Carling Technologies sealed switches offer complete protection against dust and prolonged effects of spray and immersion under pressure.

V-SERIES CONTURA®

- Ratings: up to 15A 24VDC; 15A 125VAC; 10A 250VAC
- IP68 sealing protection
- Full switch or actuator only
- UL, CSA, VDE

L-SERIES

- Ratings: up to 15A 24VDC; 10A 250VAC; 12A 18VDC
- IP67 sealing protection
- Available with paddle actuator

Controls



Variety of control products include Dimmer Control, Mirror Rotate Control, Wiper Washer Control, and USB Dual Port Charger.

V-CHARGER®

- Charges electronic devices
- Dual USB charging ports
- 3.15 amps
- 12-24V operating voltage
- IP64 sealing protection
- Protects internal components

LMR-SERIES MIRROR ROTATE

- Two or four axis
- Controls up to four separate motors
- 44 x 22mm mounting
- Includes Delphi-Packard 8 pin connector

Switches



A wide range of rocker, toggle, push-button, rotary and mini-submini style switches come with many aesthetic and functional options to fit any application.

V-SERVICES CONTURA® ROTARY

- Ratings: 10A 250VAC; 15A 24VDC/150VAC
- IP67 sealing protection
- PC board supports LED and surface mount resistors
- Up to three separate LEDs

ST-SERIES

- Ratings: 16A, 12/24V
- Designed to meet MIL-DTL-3950G requirements
- IEC 60529 IP68 sealing
- Complies with UL 61058-1

Battery Disconnect



Designed to minimize battery drain, ensure maintenance personnel safety, and when used in conjunction with a padlock, provide vehicle theft protection.

BD-SERIES

- Single pole
- Ratings: 100-300 amp; 12VDC/24VDC
- IP67 sealing protection
- Lock compatible
- M10 stud termination
- Sturdy ergonomic knob
- Operating temperature of -40°C to +85°C

Honeywell | Honeywell Electromechanical

Operator Controls

Often used on control panels or machinery in harsh environments.



Honeywell key and rotary switches use o-rings to help keep dirt and moisture out of the contact chamber and prolong the switch life. Custom switches and controls are "standard" for Honeywell S&C.

APPLICATIONS

- Power sports
- Agriculture
- Construction
- Lawn equipment
- Off-road heavy duty trucks

Electromechanical Switches

Simple or precision on/off, end of limit, presence/absence, pressure, temperature, and manual operator interface application needs.

Watertight/dust-tight series provide IP67 protection to operate under difficult environmental conditions. Premium series delivers a broad range of ratings, operating actions, and terminations.

MICRO SWITCH™ Limit Switches

Meet IEC standards for world-wide acceptance.



Often used in lifts and elevators, electronic assembly, construction and agriculture equipment, material handling, and rail. EN50041 and EN50047 mounting pattern options. Global approvals, support, and sourcing.

APPLICATIONS

- Suspension systems
- Vehicle/tilt position
- Overload detection
- Door position











APPLICATIONS

- Door position
- Brake light switch
- Clutch pedal position

HWB Series: Compact Sealed Hard-Wired Boxes for 2.8mm Fuses & Relays

The HWB series hard-wired boxes are sealed units that accept any 2.8mm style fuses, relays, circuit breakers or diodes. Perfect fit for accessory circuits and overflow circuits from your main power distribution module featuring durable construction, IP67 & IP69K ratings, compact sizes, gasket sealed covers and multiple mounting types. The HWB series eliminates the need for internal bussing allowing designer to customize the circuitry utilizing direct wire-to-component connections. TPAs (terminal position assurance locks) give secondary locking protection of the wire leads, which aid in prevention of leads from being pulled out.

- Accepts a combination of 2.8mm components – MINI® fuses, relays, circuit breakers or diodes (sold separately).
- HWB60 series are modular and can be dovetailed together to expand circuit protection capacity. They can also be interlocked to other PDMs and fuse holders (FLEC Flexible Electrical Control Center and MEGA/MIDI Flex fuse holder).
- HWB12 and HWB6 series are available with black or clear covers for easy component status identification.

Series	Product	Part Numbers	Max Continuous Current	Max Fuse Rating Per Circuit	Number of Cavities	Ingress Protection	Dimensions	Terminals	Cover	Gasket	TPAs	Bracket
HWB60-AL		PDM71001ZXM	250A	30A	60	IP67 & IP69K	113x52x82mm	Delphi	Black	●	●	
HWB60		PDM21001LXM	250A	30A	60	IP67 & IP69K	113x52x82mm	Delphi	Black	●	●	
HWB18		PDM31001ZXM	200A	30A	18	IP67 & IP69K	60x38x74mm	Delphi	Black	●	●	●
HWB18		PDM31001ZXM	200A	30A	18	IP67 & IP69K	60x38x74mm	Delphi	Black	●	●	
HWB12		PDM33001ZXM	130A	30A	12	IP67 & IP69K	83x70x44mm	Tyco MCP	Clear	●	●	
HWB12		PDM32001ZXM	130A	30A	12	IP67 & IP69K	83x70x44mm	Tyco MCP	Clear	●	●	●
HWB6		PDM32001ZXM	68A	30A	6	IP67 & IP69K	71x64x36mm	Tyco MCP	Clear	●	●	
HWB6		PDM32003ZXM	68A	30A	6	IP67 & IP69K	71x64x36mm	Tyco MCP	Clear	●	●	●

95060 Series: 12-48V DC Sealed Ignition Switches

Durable engineering thermoplastic construction withstands impact, and will not corrode, even on continual exposure to road salt. 95060 switches have integral Deutsch-type connector for easy installs and IP rated sealing. Matching harness: part number 31101

- Voltages: 10A at 12V, 5A at 24V, 3A at 36V and 2A at 48V
- Actuator Options: single or multiple key codes, lever, knob or D-shaft actuator with key boot, anti-restart, or spring return.
- Ignition Protection: Tested to SAE J259 and UL-Recognized



95060 Series



95061 Series



95062 Series

Part Number	Positions					Actuator	Spring Return	Anti-restart
	Total	1	2	3	4			
95060	4	Acc	Off	Ign/Acc	Start	Keys w/ boot	●	
95060-01	4	Acc	Off	Ign/Acc	Start	Keys w/boot	●	●
95061	4	Acc	Off	Ign/Acc	Start	Lever	●	
95062-10	4	Acc	Off	Ign/Acc	Start	Knob	●	
95060-03	3	Off	Ign/Acc	Start	-	Keys w/ boot	●	
95060-04	3	Off	Ign/Acc	Start	-	Keys w/ boot	●	●
95061-04	3	Off	Ign/Acc	Start	-	Lever	●	●
95062-13	3	Off	Ign/Acc	Start	-	Knob	●	
95060-07	2	Off	Ign/Acc	-	-	Keys w/ boot		
95061-07	2	Off	Ign/Acc	-	-	Lever		
95062-17	2	Off	Ign/Acc	-	-	Knob		

100-150A SPST Compact Battery Disconnect Switch



Standard Compact Manual Battery Disconnect Switch that features a removable handle with a plastic body. Rated to 100A continuous current this switch is ideal for light-duty applications.

08099080 is an upgraded design with bigger contacts (M10) and improved components for heavier 150A current loads within the same compact dimensions, which make it one of the most popular products for 12V applications.

Part Number	Voltage	Amperage	Intermittent Currency	Circuitry	Ingress	Notes
08098700	12-24V DC	100A	500A at 5s	SPST	IP4X	-
08099080	12-24V DC	150A	1000A at 5s	SPST	IP43	Key seal & cap

250A SPST IP65 Push-to-Off Battery Disconnect Switch



Manual Battery Disconnect Switch features a turn-to-on and a push-to-off operation. Easy to operate and shut off vehicle power in emergency situations.

Switch features an identical mounting pattern to similar metal body removable key switches so the same application has multiple options with minimal design changes.

Part Number	Voltage	Amperage	Intermittent Currency	Circuitry	Ingress	Notes
08010200	24VDC	250A	2500A at 3s	SPST	IP65	Push-to-off

350A SPST IP65-IP69K Battery Disconnect Switch



Standard metal body high amp manual switches with a removable or fixed handle and protective boots.

Part Number	Voltage	Amperage	Intermittent Currency	Circuitry	Ingress	Notes
08098900	12-24VDC	350A	2500A at 3s	SPST	IP65	Removable handle
08098980	12-24VDC	350A	2500A at 3s	SPST	IP65	Removable handle w/ chain keyhole cover
080908981	12-24VDC	350A	2500A at 3s	SPST	IP65/IP69K	Fixed handle w/ black boot

400A SPST Sealed Battery Disconnect Switch



Protects vehicles against tampering, theft and battery drain. Switch protects from hazards during vehicle servicing and provides an effective emergency power cutoff. Can be used in both positive or in negative path applications. Built-in lockout satisfies OSHA requirements for an energy isolation device.

- 400A continuous at 12VDC – 3000A intermittent at 12VDC (15 sec on 5 min off)
- Waterproof and dustproof to IP68 – switch can be mounted in exposed locations
- Built-in lockout satisfies OSHA requirements for an energy isolation device

Part Number	Voltage	Amperage	Circuitry	Ingress	Notes
75920	12-36VDC	200-400A	SPST	IP68	Bezel marked "OFF - ON"

500A DPST Dual Pole Battery Disconnect Switch



Cuts all battery power from vehicle electrical system, or for applications needing switching of two circuits, or both positive and negative.

- Can be used to switch two vehicle voltage circuit simultaneously (12 & 24VDC)

- Built-in lockout satisfies OSHA requirements for an energy isolation device
- Ignition protected to SAE J1171 and ISO8846
- Ingress protection to IP67 and IP69k

Part Number	Voltage	Amperage	Circuitry	Ingress	Notes
880175	12-24VDC	500A	DPST	IP67/IP69K	-

Automotive Relays

Our relays do everything from maximize space to setting industry standards giving you multiple mounting options. We have continuously increased switching efficiency without compromising competitive pricing. Capable of switching up to 70A.



Popular series: G8JN, G8ND

High Voltage DC Power Relays

Compact relays capable of interrupting high-voltage and high-current loads. Ideal for HEV applications. Capable of switching from 30A up to 200A. G9EN switches 400VDC at 60A.



Popular Series: G9EA, G9EN

Detection Switches

Sealed and unsealed, snap-action switches are available with a variety of ratings, actuators and termination options. Sealed versions, rated to IP67 and IP50, are suitable for use in "wet" locations. D2VW IP67 with wire leads.



Popular Series: D2HW, D2QW, D2VW

Tactile Switches

Consistent switching characteristics offer excellent performance. Available with a wide variety of actuators, mounting styles, and switching capabilities.



Popular Series: B3AL, B3F, B3S, B3U, B3W



E-Car – Isolation Measurement

Hybrid and electric drivetrains in cars, trucks and two-wheelers are introducing new, previously unknown challenges in the transportation industry.

The 12V or 24V board net is now complemented with a 400V or higher battery and power system, which introduces a completely new set of requirements for the car OEMs and system module providers.

Operating with such high voltages and current in a harsh automotive environment drives the need for more robust, but also long-term stable solutions for isolating these high voltage levels from the other electronic functions, but most important, also for the passengers. This isolation need is present in all functions of hybrid and electric vehicles like the high-voltage battery, the DC/DC converter, the inverter for driving the electric motor, but also for the charger module



connected to the 230V/380V power grid. Therefore, electronic vehicles contain an internal measurement system. This system checks all electrical parameters like isolation and dielectrical strength (isolation resistance between active and electronic components and the frame). To switch or cut such a measurement system to the power system, a high isolation is required.

KT Reed Relays

The KT Series Reed Relays integrate high technology packed into a small footprint.

Available in either surface mount or through-hole mounting, the KT relay measures just L30 x W8.6 x H10.6 mm. Additionally, the KT Relay series offer excellent isolation resistance at $\geq 10^{13}\Omega$ and an isolation voltage between the coil and contact of ≥ 7 kVDC.



Both its high isolation characteristics and small size make these KT relays highly suitable for green applications such as solar photovoltaic technology. They are particularly helpful in measuring isolation resistance across several components within a solar system prior to grid connection preventing injury or further current leakages.

SPECIFICATIONS

- Coil voltage 5VDC, 12VDC, 24VDC
- Coil resistance 150 Ω
- Contact form 1A
- Rated power 100W
- Switching voltage 1000VDC
- Switching current 1A
- Carry current 0 A – 2.5A
- Breakdown voltage 2 kVDC to 5 kVDC

FEATURES & BENEFITS

- High isolation characteristic
- Small dimensions
- High isolation voltage
- PCB through-hole mounting
- Hermetically sealed thermoset
- Molded encapsulation
- Dynamically tested contacts
- Millions of reliable operations
- SMT and THT available

APPLICATIONS

- E-vehicles
- Hybrid cars
- Solar collectors
- Photovoltaic

Automotive, Truck, Bus and Off-Road Relays

Relays and Contacts

From passenger comfort and infotainment, to higher DC voltages and power levels, to harsh environments, TE's relays and contactors provide critical switching functions in multiple vehicle applications.



FEATURES & BENEFITS

- Broad portfolio offering
- Performance classes from 1A up to 6,000A
- System voltages from conventional 12/24V vehicles to hybrid and electric vehicles up to 800V
- Plug-in and PCB mount, as well as screw terminals
- Monostable and latching (bistable) versions
- High resistance to shock, vibration and temperature extremes

APPLICATIONS

- Automotive
- Truck
- Bus
- Off-road
- Construction and agriculture equipment
- Hybrid and electric vehicles

High Current HCR 150 and HCR200 Relays



TE's high-current relays provide increased safety connections and disconnections for system voltages up to 48V.

They are compact and provide high-current switching capabilities.

The High Current Relay 150 (HCR 150) and High Current Relay 200 (HCR 200) provide two ideal solutions for all automotive applications, where particularly high load currents must be handled. HCR 150 and HCR 200 meet the demand for relays in increasing electric and electronic driver assistance systems that cannot only carry and switch such high loads, but also ensure a reliable function at temperatures up to 110°C.

FEATURES & BENEFITS

- Compact relays for power applications
- High current switching capabilities
- Suitable for system voltages up to 48V

APPLICATIONS

- Energy/battery management
- Start-stop systems
- Electric power steering
- Engine control
- Glow plug
- Heated front screen
- Preheating systems (e.g. for diesel engines, catalytic converters)
- Switches for loading ramps



TE Connectivity Electromechanical

High Voltage Mini K HV Relays

TE's high voltage Mini K HV pre-charge relays are a cost-effective, safe, lightweight and reliable solution for pre-charging the DC high voltage power system.



An innovative contact design enables switching loads at a system voltage of up to 450V. The Mini K HV supports the connection and disconnection of the traction battery in switching assemblies for hybrid and battery electric vehicles. Even under fault conditions, the Mini K HV reliably disconnects the pre-charge circuit from the traction battery for excellent safety. TE's high voltage pre-charge relays, Mini K HV, operate safely with two arc extinguishing magnets. Its small package and PCB mount or plug-in terminals make it an easy choice for voltage levels up to 450VDC and pre-charge currents and limiting break currents up to 20A.

FEATURES & BENEFITS

- Safe-magnetic arc suppression
- Prevents contact welds
- Form X (NO DM) contact arrangement
- Suitable for voltage level up to 450VDC
- Pre-charge current up to 20A
- Limiting break current up to 20A
- Small package size – low profile
- Lightweight
- Available with PCB mount and plug-in terminals

APPLICATIONS

- Hybrid Electric Vehicles (HEV, PHEV)
- Full Battery Electric Vehicles (BEV)
- Fuel Cell Vehicles (FCV)

High Voltage EVC 135, EVC 175, EVC 250, EVC 500 Contactors



TE Connectivity's high-voltage contactors provide safe disconnection and connection of the traction battery in hybrid, electric and fuel cell vehicles, as well as charging systems.

TE's high-voltage contactors and relays use proven technology in an innovative manner and are suited for use in hybrid, full electric and fuel cell vehicles, as well as vehicle charging systems.

FEATURES & BENEFITS

- Designed for automotive requirements
- Suitable for hybrid, full electric and fuel cell vehicles as well as vehicle charging systems
- Compact relays and contactors for high voltage applications

APPLICATIONS

- Hybrid vehicles
- Full battery electric vehicles, fuel-cell cars
- DC battery charging systems
- Main power contactor for traction batteries
- Accessory relays for high voltage loads
- Pre-charge circuits

Plug-In Micro Relays

TE's automotive plug-in micro ISO relays include latching versions, modules and sockets in 12V and 24V power supply systems.



TE Connectivity offers high-performing plug-in micro ISO relays that are available in a variety of contact arrangements. A wide range of options include: silent, customized and special footprints, and serial as well as parallel components.

FEATURES & BENEFITS

- Design, production, support locations and application engineering around the globe
- Limiting continuous current up to 35A
- Flexible contact arrangements (make, changeover)
- Customized versions available (color, mounting and release features, parallel or serial components)
- Compact size

APPLICATIONS

Cross carline up to 35A

- ABS control
- Blower fans
- Cooling fan
- Door control
- Door lock
- Fuel pump
- Heated front screen
- Immobilizer
- Seat belt pretensioner
- Trunk lock
- Valves window lifter, wiper control

Plug-In Mini and Maxi Relays

TE's automotive plug-in mini and maxi ISO relays include latching versions, modules, and sockets in 12V, 24V, and 48V power supply systems.



TE's high-performing plug-in mini and maxi ISO relays are available in a variety of contact arrangements. A wide range of options include latching, customized and special footprints, serial and parallel components as well as shrouded waterproof versions.

FEATURES & BENEFITS

- Design, production, support locations and application engineering around the globe
- Limiting continuous current 40A up to 70A
- Flexible pin assignment (ISO, Non ISO)
- Flexible contact arrangements (make, changeover, double make, double contact, 2*87 ...)
- Customized versions available (color, mounting features, parallel or serial components, latching, shrouded ...)
- 24V versions with contact gap >0.8mm
- Plug-in or PCB terminals

APPLICATIONS

Cross carline up to 70A

- ABS control
- Cooling fan
- Energy management
- Engine control
- Glow plug
- Heated front screen
- Ignition
- Main switch/supply relay



PCB Micro K Relays

TE's range of automotive PCB Micro K relays are suitable for wave solder and reflow processing. They are available as single and double versions for the full performance range of vehicle applications.



FEATURES & BENEFITS

- Small power relay
- Limiting continuous current 20A at 85°C
- Low weight
- Low noise operation
- Wave (THT) and reflow (THR/pin-in-paste) solderable versions

APPLICATIONS

- Door lock
- Heated front/rear screen
- Lamps front/rear/fog light
- Interior lights
- Seat control
- Sun roof
- Window lifter
- Wiper control

PCB Power Relay PK2 HE (Monostable)

TE's range of automotive PCB PK2 relays are suitable for wave solder and reflow processing. They are available as single and latching versions for the full performance range of vehicle applications.



FEATURES & BENEFITS

- High endurance performance up to 125°C
- High shock and vibration resistance
- Wave (THT) and reflow (THR/pin-in-paste) solderable versions
- For latching (bistable) version refer to Power Relay PK2 HE Latching
- Limiting continuous current 40A at 85°C
- Maximum switch-on current 250A

APPLICATIONS

- Clamp switch (power distribution box)
- Blower fan
- Cooling fan
- Fuel pump
- Glow plug
- Starter (start/stop)
- Heated screens

PCB Power Relay PK2 HE Latching

TE's latching version of the Power Relay PK2 HE is specially designed to have no continuous coil power consumption resulting in reduced emissions and heat dissipation.



Power Relays PK2 HE Latching operate on not permanently energized high endurance performance levels.

FEATURES & BENEFITS

- High endurance performance up to 125°C
- Minimized coil power consumption
- Limiting continuous current 45A at 85°C
- Maximum switch on current 200A
- High shock and vibration resistance
- No change of switching state at breakdown of battery voltage
- Wave (THT) and reflow (THR/pin-in-paste) solderable versions
- For monostable version refer to Power Relay PK2 HE (THT – THR)

APPLICATIONS

- Clamp switch (power distribution box)
- Switched power supply
- Quiescent current management



RESISTORS

BOURNS® | Bourns Resistors

High Power Metal Strip Current Sense Chip Resistors



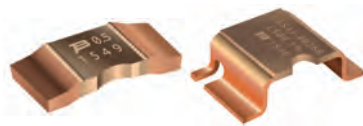
FEATURES & BENEFITS

- Resistance value as low as 0.001 ohm
- High power density
- Inductance less than 5 nH
- RoHS compliant
- AEC-Q200 compliant

APPLICATIONS

- Power supplies
- Stepper motor drives
- Input amplifiers

Current Sense Resistors



FEATURES & BENEFITS

- EB welded metal strip
- Power up to 50W
- Excellent long-term stability
- Low resistance, low TCR
- Low thermal EMF
- RoHS compliant and halogen free
- AEC-Q200 compliant

APPLICATIONS

- Current sensing
- Voltage division
- Battery management systems
- Power modules
- Frequency converters
- Industrial

Power Resistors SMD DPAK, D2PAK & Through-hole TO220, 247



FEATURES & BENEFITS

- Low inductance
- Resistor electrically isolated from the backplate
- High power rating up to 100W
- AEC-Q200 compliant
- RoHS compliant

APPLICATIONS

- Power supplies
- Motor drives
- Test and measurement
- Rectifiers

High Power Current Sense & Surge Withstand Thick Film Chip Resistors



FEATURES & BENEFITS

- Power rating up to 2 watts
- High power surge withstanding
- Sulfur-resistant design (ASTM B-809)
- RoHS compliant and halogen free
- AEC-Q200 compliant

APPLICATIONS

- Automotive systems:
 - Driver assistant
 - Infotainment
 - Lighting
- Power supplies
- Stepper motor drives

High Current Metal Plate Shunt Resistors: PSJ2 (3920) and PSG4 (2725) Series



FEATURES & BENEFITS

- High current measurements up to 140 A
- Low resistance values available: 0.5 mΩ and 1 mΩ
- High power (0.5 mΩ: 10W and 1 mΩ: 8 W) metal plate resistor
- Standard resistance tolerance ±1%
- Operating temperature range is -65°C to +175°C
- Stable detecting with T.C.R.: ±50 ppm/K/±75 ppm/K
- Metal alloy resistive element
- Excellent pulse resistance and very low inductance
- Superior corrosion and heat resistance
- AEC-Q200 qualified

APPLICATION

- High current sensing in modules for automotive
 - ECUs under the hood
 - EPS
 - Motor control
 - Electric brake
- Intelligent power modules
- Power inverter
- DC/DC converter

Metal Plate Shunt Resistors: TLR and SL Series



FEATURES & BENEFITS

- Ultra-low resistance values 0.5 mΩ for large current sensing
- High power ratings in small sizes (e.g. 0805 = 1 W; 2512 = 3 W; 4527 = 5 W)
- Best T.C.R. of ±50 ppm/K
- Molded construction (SL series) for high mechanical stress is also available
- Resistance tolerance ±1% is standard
- AEC-Q200 qualified

APPLICATIONS

- Automotive electronics
- Current motor control units
- Power steering (EPS)
- Power supplies, battery packs
- DC-DC converters
- AC adapters
- Metering
- CPU current sensing
- Power conditioner/inverter
- Industrial equipment

High Precision & High Reliability Thin Film SMD Chips: RN73H Series



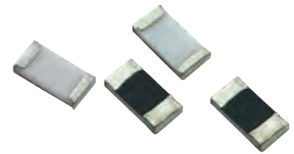
FEATURES & BENEFITS

- Improved moisture and high heat resistance by special resistive film and special inner protecting coating
- High component and equipment reliability
- Sizes 0402 to 1210
- Tight tolerances down to ±0.05%
- Stable T.C.R. down to ±5 ppm/K
- Rated ambient temperature: +85°C
- Rated terminal part temperature up to +110°C
- Operating temperatures up to +155°C
- AEC-Q200 qualified

APPLICATIONS

- Automotive electronics
 - Engine ECU, HEV/BMS, EPB, EPS
- Industrial equipment
 - Control circuits, diagnostic devices
- Power grid
 - Power meter, power conditioner
- Scale, test and measuring equipment
- Automatic equipment controller
- Converters
- High precision voltage divider circuits

Low Resistance Flat Chip: UR73V Series



FEATURES & BENEFITS

- Current detecting thick film resistor for power supplies, motor circuits, etc.
- R-range from 10 mΩ to 100 mΩ
- Power rating: 0.5 W, 1206 size
- Standard or face-down version
- T.C.R.: ±100 ppm/K (12 mΩ to 100 mΩ)
- Resistance tolerance ±1% is standard
- Competitive alternative to metal plate parts
- AEC-Q200 qualified

APPLICATIONS

- Automotive, including under the hood applications such as ECUs
- Power supplies
- DC-DC converters
- Motor controls
- Industrial automation
- Meter
- LED lighting
- Consumer electronics

Heat Sinkable Planar TAP600/800 Series

Up to 800 watts of power when used with a liquid or air-cooled heat-sink system.



TAP600/800 is designed for low inductance and capacitance, and provides stable performance in addition to high wattage and pulse loading capability. The high alumina content ceramic metalized base plate is ideal for heat transfer and optimum discharge into a heat sink.

FEATURES & BENEFITS

- High alumina ceramic bottom
- Connections made with M4 or M5 screws (not included)
- Materials meet the requirements of UL94-V0
- Resin filled epoxy casing with a large creepage distance
- High insulation resistance (CTI 600)

Power Resistors PFE and PFR Series

Constructed of a heavy-resistance alloy mounted on ceramic insulators and supported by a metal mounting bracket.



Metal parts, except for the resistance element, are heavily plated to prevent oxidation at high operating temperatures and to prevent corrosion. The mounting bar is slotted on each end to facilitate installation. Edge wound units provide clamp-type terminals, permitting a reliable connection which can be moved along the resistive element to obtain intermediate values.

FEATURES & BENEFITS

- 700-1000 watts of power dissipation
- Heavily plated to prevent oxidation and corrosion
- Slotted mounting bar for easy installation
- Clamp-type terminals used to obtain intermediate values

Wirewound Resistor 270/280 Series

The 270/280 type resistors are equipped with lug terminals suitable for soldering or sturdy bolt connection.



When secure mounting is required, the hollow core of these resistors permit fastening with spring-type brackets, thru bolts or thru bolts with slotted-steel brackets.

Rugged design with wattage rating up to 1KW and high overload ratings up to 10 times rated wattage for 5 seconds. Vitreous coating doesn't outgas and provides protection.

FEATURES & BENEFITS

- Terminals suitable for soldering or bolt connection
- High wattage applications
- Rugged lead free vitreous enamel coating
- Flame resistant coating
- All-welded construction
- RoHS compliant available

Wirewound Resistor ARCOL HS Series/89 Series

A robust wirewound resistor is sealed in an aluminium extrusion.



These molded-construction metal-housed resistors are available in higher power ratings than standard axial resistors and are better suited to withstanding vibration, shock and harsh environmental conditions. Wattage range from 5 watts to 600 with proper heatsink.

The resistor is isolated electrically from the aluminium casing and provides chassis mounting capabilities. The internal element is also protected from the outside elements.

This design also enables heat sinking capabilities to extend wattage range. Standard parts can be customized using wired connections or heatsink mounting and assembly.

FEATURES & BENEFITS

- High stability: $\pm 0.5\% \Delta R$
- High power to size ratio
- Metal housing allows chassis mounting and provides heat sink capability
- Custom variations welcome

Metalohm Series

Cold-rolled steel-encased wirewound heatsinkable radial terminal.



The metal encased wirewound resistor is heatsinkable up to 150W and resistance values to 100K ohms. Dielectric strength of the metalohm series starts at 1500V and goes as high as 4250V. The metalohm series offers great connectivity with multiple terminal options and the ability to be tapped at most values. Non inductive versions are available in all sizes for specific customer needs.

FEATURES & BENEFITS

- Flameproof and inorganic
- Higher power rating due to heat sink capacity
- All welded construction
- Non-hygroscopic
- High surge construction
- Non-inductive versions (Aryton-Perry windings)
- Terminal sleeves to increase dielectric strength and maximize creepage distance
- Variety of terminal choices
- Potted or soldered wire terminals including quick connect, ring, spade terminals
- Tapped models

Rheostats

Ohmite offers multiple sizes ranging from 7.5 watts up to 1000 watts.



All models are built using metal and ceramic with all welded construction. This robust design uses vitreous enamel to lock in the resistance wire. Metal-graphite contacts are used to minimize wear on the wire providing maximum reliability and long-term usability.

FEATURES & BENEFITS

- Large wattage range
- Enclosed types available
- Rugged construction
- UL listed File no. E10946 for certain models
- Custom designs welcome

Aluminum Cased Resistors BA Series

Aluminum housed wirewound with heatsinking capabilities



The Ohmite BA series is constructed using mica materials to provide great dielectric properties. They are available in three extrusion forms and are available in up to 1000 watts of power dissipation. More power can be achieved with heatsinking and extended lengths. Thermal cutoff switches are available as a standard option along with wired leads for custom connections. The range of applications for the BA series are dynamic braking, motor starting and power controls.

FEATURES & BENEFITS

- Three extrusion forms available
- Heatsinkable
- Rugged design
- Up to 1000 watts
- Thermal cut-off available
- Scalable, custom lengths available
- Custom leads available

Metal Clad Resistors ARF Series

Low profile wirewound metal clad resistors



The Ohmite/ARCOL ARF series is designed with flexibility in mind. Each part can easily be mounted with provided holes to increase wattage capabilities. The ARF series comes standard with 600V cables that can be terminated with many types of popular connectors. The ARF series is ideally suited to braking and inverter/converter applications.

FEATURES & BENEFITS

- High power density
- Low profile
- 600V cables as standard
- Heatsink mount for increased power dissipation
- RoHS Compliant

Panasonic | Panasonic Resistors

Thin Film Chip Resistors, High Reliability Type

ERA - 14XB/14XD	1210, 1/4W, 0.1%
ERA - 1A	0201, 1/20W
ERA - 2AXB/2AXD/2AK	0402, 1/16W, 0.1% / 0.5%
ERA - 2H	0402, 1/16W, 0.1%/0.05%, High Sound Quality
ERA - 3AXB/3AXD	0603, 1/10W, 0.1% / 0.5% / 0.05%
ERA - 3YXB/3EXB	0603, 1/16W, 0.1%, 0.5%, E-24 / E-96
ERA - 6AXB/6AXD	0805, 1/8W, 0.1% / 0.5% / 0.05%
ERA - 6YXB/6ExB	0805, 1/10W, 0.1%, 0.5%, E-24 / E-96
ERA - 6YxD	0805, 1/10W, 0.5%
ERA - 8A	1206, 1/4W, 0.1% / 0.5% / 0.05%

Metal Film Thermosensitive Chip Resistors

ERA - S	Thermal Sensitive, 0805
ERA - V	Thermal Sensitive, 0603
ERA - W	Thermal Sensitive, 0402

Metal (Oxide) Film Resistors

ERG - 1 (others)	Axial Lead, 1W, 2%, 5%
ERG - 12	1/2W, 2%, 5%
ERG - 1FJSxxxE	T-Shape Radial Lead, 1W, 2%, 5%
ERG - 1HJ/GxxxH	1W/2W, 5%, 2%
ERG - 1SJxxx (E)	Hairpin Style Lead, 1W, 2%, 5%
ERG - 1SJxxxV	Axial Lead, 1W, 2%, 5%
ERG - 2 (others)	2W, 2%, 5%
ERG - 2FJSxxx (E)	T-Shape Lead, 2W, 2%, 5%
ERG - 2HJ/GxxxH	1W/2W, 5%, 2%
ERG - 2SJxxxA / E	Hairpin Style Lead, 2W, 2%, 5%
ERG - 2SJxxxV	Axial Lead, 2W, 2%, 5%
ERG - 3 (others)	3W, 2%, 5%
ERG - 3 (others)	T-Shape Lead, 3W, 2%, 5%
ERG - 3SJxxxV	Axial Lead, 3W, 2%, 5%
ERG - 5	5W, 2%, 5%
ERG - xxFxxx xxx	Leaded
ERG - xxSxGx xxx _ ("Nil" or 'V' suffixes Std)	Leaded
ERG/X/Q - 1H/2H J/GxxxH	1W/2W, 5%, 2%
ERX - 1F	1W, 2%, 5%
ERX - 1H	SMT, Power Device, 1W
ERX - 1SGxxxV	Axial Lead
ERX - 1SJxxxA / E	Hairpin Style Lead, 1W, 2%, 5%
ERX - 1SJxxxV	Axial Lead, 1W, 2%, 5%
ERX - 1SZGxxxV	Axial Lead
ERX - 2 (others)	2W, 2%, 5%
ERX - 2FJSxxxE	T-Shape Radial Lead, 2W, 2%, 5%
ERX - 2H	SMT, Power Device, 2W
ERX - 2SJxxxA / -2SG	Axial Lead, 2W, 5%, 2%
ERX - 2SJxxxE / V	Hairpin Style Lead, 2W, 2%, 5%
ERX - 3 (others)	3W, 2%, 5%
ERX - 3FJSxxxE	T-Shape Radial Lead, 3W, 2%, 5%
ERX - 3SJxxx (V)	Axial, 3W, 2%, 5%
ERX - 3SJxxxA	Axial, 3W, 2%, 5%
ERX - 5	5W, 2%, 5%

Thick Film Chip Resistors

ERJ - 1GNF	0201 1%, Halogen free type
ERJ - 1GNJ	0201 5%, Halogen free type
ERJ - 12NF	1812, 1/2W 1%
ERJ - 12R	1812, Low Ohmic Value, 1%, 5%
ERJ - 12SF	Thick Film Chip Resistor, 2010, 1/2W 1%
ERJ - 12Y0	1812, 1/2W Jumper
ERJ - 12YJ	1812, 1/2W 5%
ERJ - 12YK	1812, 1/2W 10%
ERJ - 12ZQJXXXU	2010, 1/2W Low Ohmic Value, 1%, 5%
ERJ - 12ZSXXXU	2010, 1/2W Low Ohmic Value, 1%, 5%
ERJ - 12ZYJ/0	2010, 1/2W 5% / Jumper
ERJ - 14BX	0402, Low Ohmic Value, 1% 2% 5%
ERJ - 14NF	1210, 1/4W 1%, Precision
ERJ - 14R	1210, Low Ohmic Value, 1%, 5%
ERJ - 14YJ/0	1210, 1/4W 5%
ERJ - 14YK	1210, 1/4W 10%
ERJ - 1GEF	0201, 1%
ERJ - 1TNF	2512, 1W 1%
ERJ - 1TR	2512, Low Ohmic Value, 1%, 5%
ERJ - 1TYJ/1TYF/0	2512, 1W 5% / 1% / Jumper
ERJ - 2BW	0402, Ultra Low Ohmic Value, 2% 5%
ERJ - 2BX	0402, Low Ohmic Value, 1% 2% 5%
ERJ - 2GEF	0402, 1/16W 1%
ERJ - 2RKF	0402, 1/16W 1%
ERJ - 2RXD	0402, 1/16W 0.5%
ERJ - 3BW	0603, Ultra Low Ohmic Value, 1% 2% 5%
ERJ - 3BX	0603, Low Ohmic Value, 1% 2% 5%
ERJ - 3KEF	0603, 1/16W 1%, Precision
ERJ - 3GEYF	0603, 1/16W 1%, Precision
ERJ - 3GEYJ/0	0603, 1/16W 5% / Jumper
ERJ - 3GEYK	Thick Film Chip Resistor, 0603, 1/16W 10%
ERJ - 3LW	0603, Ultra Low Ohmic Value, 1% 2% 5%
ERJ - 3RX	0603, Low Ohmic Value, 1%, 5%
ERJ - 3RXD	0603, 1/16W 0.5%, Precision
ERJ - 6BW	0805, Ultra Low Ohmic Value, 1% 2% 5%
ERJ - 6BX	0805, Low Ohmic Value, 1% 2% 5%
ERJ - 6ENF	0805, 1/10W 1% Precision
ERJ - 6GEYJ/0	0805, 1/10W 5% / Jumper
ERJ - 6GEYK	0805, 1/10W 10%
ERJ - 6RX	0805, Low Ohmic Value, 1%, 5%
ERJ - 6RXD	0805, 1/10W 0.5% Precision
ERJ - 8BW	1206, Ultra Low Ohmic Value, 1% 2% 5%
ERJ - 8BX	1206, Low Ohmic Value, 1% 2% 5%
ERJ - 8CW	1206, Ultra Low Ohmic Value, 1% 2% 5%
ERJ - 8ENF	1206, 1/8W 1% Precision
ERJ - 8GEYJ/0 & ERJ-8GEYK	1206, 1/8W 5% / Jumper
ERJ - 8RX	1206, Low Ohmic Value, 1%, 5%

Current Sensing Resistors, Metal Plate Type	
ERJ - MB1	Metal Plate Type, 1020
ERJ - MS4	Metal Plate Type, 2512
ERJ - MS6	Metal Plate Type, 2526
ERJ - MP	Metal Plate Type

Anti-surge/Anti-pulse Thick Film Chip Resistors	
ERJ - P0x/P14/PA/PB	Thick Film Chip Resistor, Anti-surge
ERJ - P6W	0805 High Power
ERJ - S02	Anti-sulfur, 0402
ERJ - S03	Anti-sulfur, 0603
ERJ - S06	Anti-sulfur, 0805
ERJ - S08	Anti-sulfur, 1206
ERJ - S12	Anti-sulfur, 1812
ERJ - S14	Anti-sulfur, 1210
ERJ - S1D	Anti-sulfur, 2010
ERJ - S1T	Anti-sulfur, 2512
ERJ - T06/T08/T14	Anti-pulse, 0805/1206/1210
ERJ - U02	Anti-sulfur, 0402 Ag Pd Based
ERJ - U03	Anti-sulfur, 0603 Ag Pd Based
ERJ - U06	Anti-sulfur, 0805 Ag Pd Based
ERJ - U08	Anti-sulfur, 1206 Ag Pd Based
ERJ - U12	Anti-sulfur, 1812 Ag Pd Based
ERJ - U14	Anti-sulfur, 1210 Ag Pd Based
ERJ - U1D	Anti-sulfur, 2010 Ag Pd Based
ERJ - U1T	Anti-sulfur, 2512 Ag Pd Based

High Power Current Sensing Resistors, Wide Terminal Type	
ERJ - A1x	1225, Wide Terminal, 5%,1%
ERJ - B1x/B2x/B3x	2010/1206/0805, Wide Terminal, 5%,1%

Anti Sulfurated High Power Wide Terminal Chip Resistors	
ERJ - C1x	1210, Wide Terminal, 5%,1%

Embedded Resistors	
ERJ - E01	Embedded Resistor
ERJ - E02	Embedded Resistor

Current Sensing Resistors, Thick Film Type	
ERJ - L14/L08/L06/L03	Low Ohmic Value, 1210/1206/0805/0603, 1%, 5%
ERJ - L1D/L12	Low Ohmic Value, 2010/1812, 1%, 5%
ERJ - L1W	Low Ohmic Value, 2512, 1%, 5%

NTC Thermistors	
ERT-JxxxxxxM	NTC Thermistor, SMT

Power Choke Coils for Automotive Applications, Metal Core Type	
ETQ - P3MxxxYFN	SMT, 6.5x6.0x3.0mm MC Series
ETQ - P3MxxxYFP	SMT, 5.5x5.0x3.0mm MC Series
ETQ - P4MxxxYFN	SMT, 6.5x6.0x4.5mm MC Series
ETQ - P4MxxxYFP	SMT, 5.5x5.0x4.0mm MC Series
ETQ - P5MxxxYFK	SMT, 7.5x7.0x5.4mm MC Series
ETQ - P5MXXXYFM	SMT, 8.5x8.0x5.4mm MC Series
ETQ - P5MXXXYGC	SMT, 10.7x10.0x5.0mm MC Series
ETQ - P5MXXXYGK	SMT, 8.5x8.0x5.0mm MC Series
ETQ - P6MXXXYLC	SMT PCC-M1060ML
ETQ - P6MXXXYLC	SMT PCC-M1060ML
ETQ - P8MXXXJFA	SMT PCC-M1280MF

Chip Attenuators	
EXB - 24AB	4 Resistor Elements with O Shaped Circuit
EXB - 24AT	3 Resistor Elements

Chip Resistor Arrays	
EXB - 24V	Resistor Array, Chip, 0404, 2 Elements
EXB - 28N	0804, 4 Elements, Halogen-free
EXB - 28V	Resistor Array, Chip, 0804, 4 Elements
EXB - 2HN	8 Elements, 1506 Size, Halogen-free
EXB - 2HV	Resistor Array, Chip, 8 Elements, 1506 Size
EXB - 34V	2 Elements
EXB - 38A	4 Elements
EXB - 38V	4 Elements
EXB - A10 (P/E)	8 Elements
EXB - AL	5 Elements, Low Ohmic Value

Chip Resistor Networks	
EXB - D	RF Jumper, 1206
EXB - D10C	Thick Film, 1206, 8 Elements
EXB - D6	Thick Film, 1206
EXB - E10C	Thick Film, 1608, 8 Elements
EXB - Q	Thick Film, 1506, 16 Elements

Anti-Sulfurated Chip Resistor Arrays	
EXB - U14/U18	2/4 Elements 0201, Anti-sulfur
EXB - U24/U28/U2H	2/4/8 Elements 0402, Anti-sulfur
EXB - U34/U38	2/4 Elements 0603, Anti-sulfur



Series	Product	Description	Power (W)	Case (EIA, MIL)	Typical TCR (ppm/°C)	Minimum Tolerance (%)	Resistance Range
WSL		Very high power (to 3 W), low value (down to 0.0005 Ω), surface mount	0.1 to 2	0603 to 2512	Element with low TCR (< 20 ppm/°C)	0.50	0.5 mΩ to 0.5 Ω
WSLP			0.4 to 3	0603 to 2512	Element with low TCR (< 20 ppm/°C)	0.50	0.5 mΩ to 50 mΩ
WSHM2818		High power (7 W), low value (down to 0.001 Ω), surface mount	7	2818	Element with low TCR (< 20 ppm/°C)	0.50	1 mΩ to 200 mΩ
CRCW-HP e3		Pulse proof, high-power thick film chip resistors	0.125 to 1.5	0402 to 2512	100	1.00	1 Ω to 1 mΩ
RCA e3		Automotive, sulfur-resistant, lead (Pb)-free thick film, rectangular chip resistors	0.063 to 1	0402 to 2512	50	0.50	1 Ω to 10 mΩ
RCL e3		Long side termination thick film chip resistors	0.25 to 2	0406 to 1225	100	1.00	1 Ω to 2.2 mΩ
MELF		Thin film MELF resistors	0.3 to 1	0102 to 0207	15	0.10	0.22 Ω to 15 mΩ
MCx AT Precision		Thin film chip resistors	0.1 to 0.4	0402 to 1206	25	0.10	1 Ω to 1 mΩ
MCx AT Professional							
TNPW e3		High stability thin film flat chip resistors	0.063 to 0.33	0402 to 1210	10	0.10	4.7 Ω to 3.01 mΩ
TNPV e3		High voltage thin film flat chip resistors	0.25 (700 V), 0.33 (1000 V)	1206, 1210	10	0.10	121 kΩ to 3.01 mΩ
ACAS AT Precision		Precision thin film chip resistor array, superior moisture resistivity	0.2, 0.4	0606, 0612	Relative TCR: 15, 10, 5	Relative tol.: 0.05	47 Ω to 150 kΩ
ACAS ATAU Precision							
PAT		Precision automotive thin film chip resistors, AEC-Q200 qualified, 2 kV ESD rating	0.05 to 1	0402 to 2512	25	0.10	2.5 Ω to 3 mΩ

Automotive Grade Thin Film Chip Resistors AT Series



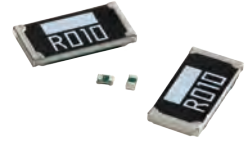
FEATURES & BENEFITS

- Superior resistance against sulfur-containing environments
- High precision and stability
- Low TCR, low electrical noise
- Advanced sputtering technology
- Tolerance: $\pm 0.1\%$, $\pm 0.25\%$, $\pm 0.5\%$, $\pm 1\%$

APPLICATIONS

- Automotive electronics
- Industrial and medical equipment
- Test and measuring equipment
- Telecommunications

Low TCR Metal Current Sensor PA/PE Series



FEATURES & BENEFITS

- Excellent current sensing performance
- High power rating for large current detection
- Reduce power consumption
- Low thermal EMF ($< 0.3 \mu\text{V}/^\circ\text{C}$)
- Low TCR

APPLICATIONS

- Automotive electronics
- Consumer goods, computers
- Telecom/datacom
- Industrial/power supplies
- Alternative energy

Automotive Grade Thick Film Chip Resistors AC Series



FEATURES & BENEFITS

- AEC-Q200 qualified
- EIA case size: 0201 to 2512
- Tolerance: $\pm 0.5\%$, $\pm 1\%$, $\pm 5\%$
- Highly reliable electrode construction
- Highly stable in auto-placement surface mount applications

APPLICATIONS

- Automotive electronics
- All general purpose applications
- Industrial applications

Surge Chip Resistors SR Series



FEATURES & BENEFITS

- Excellent performance at pulse loading
- EIA 0402 to 2512 case sizes
- Outstanding anti-surge characteristics
- High power rating and ESD resistance
- Handle high transient current spikes without saturation

APPLICATIONS

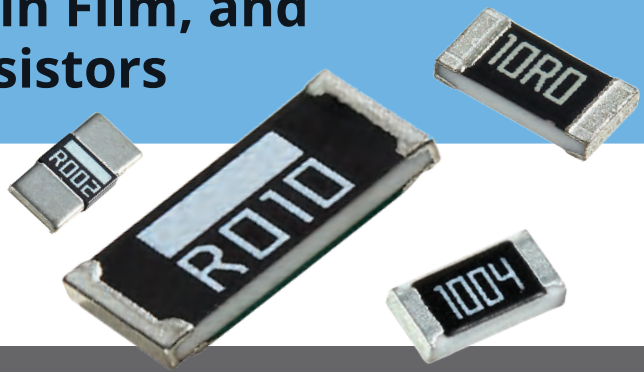
- Automotive electronics
- Telecommunications
- Power supplies
- Industrial control



Automotive Resistors that Make the Grade

Yageo AEC-Q200 Certified Thick Film, High-precision Thin Film, and Current Sense Resistors

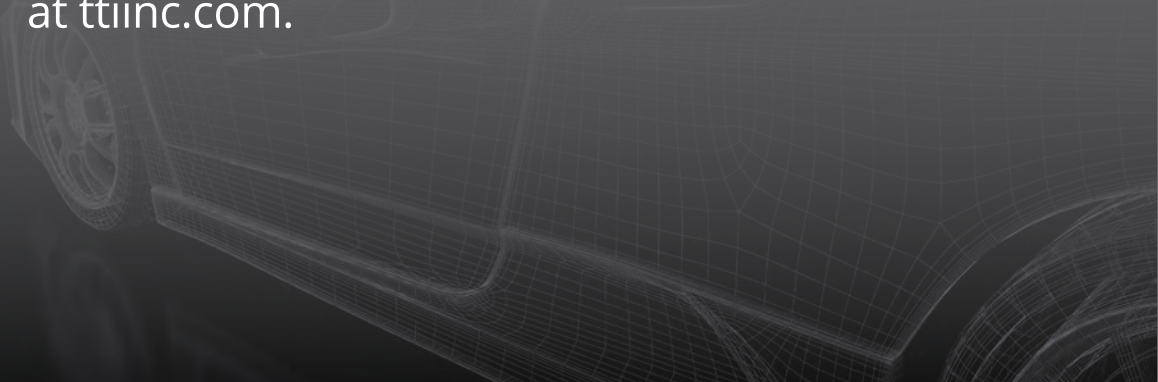
YAGEO



TTI carries a broad and deep inventory of Yageo AEC-Q200 components for infotainment, security, engine control units, lighting, performance-by-wire systems, and more, for automotive and commercial vehicle applications.

- Case Sizes from 0201–2512
- Power Ratings up to 2 watts

For more information contact a TTI Transportation Specialist at 1.800.CALL.TTI, or purchase online at ttiinc.com.





SENSORS

Amphenol | Amphenol Sensors

Advanced Sensors

Amphenol Advanced Sensors







A Global Resource for Your On-Vehicle Measurement Needs

- Engine Management
- Battery Management
- HVAC Cabin Comfort
- Safety System
- Air Quality

Reliable and accurate on-vehicle measurement is critical to long-term performance and everyday dependability.

To deliver these results, Amphenol Advanced Sensors offers a complete line of innovative and high-performing on-vehicle sensors that brings your automotive systems together to protect the vehicle, its occupants – and the environment.

Our automotive sensors regulate the temperature and air quality of the cabin. They monitor engine temperature, as well as battery temperature, and they protect the environment from harmful emissions.

Temperature	Pressure	Humidity
<p>Our temperature sensors are suited for numerous applications of Tier 1 and OEM products. We tailor sensing elements to your systems – with packaging customized for your platform's requirements.</p> 	<p>With our own MEMS fabrication for piezo-resistive pressure die and expertise in high-volume sensor packaging, we can meet all of your pressure needs.</p> 	<p>Our resistive, capacitive and silicon-based humidity sensing elements are used in sensors for such applications as air intake and cabin comfort.</p> 
Gas	Infrared	Solar and Twilight
<p>We offer cabin air quality and exhaust gas sensors to provide a comfortable cabin while reducing the emissions level of the exhaust.</p> 	<p>From driver and passenger temperature sensing for in-cabin comfort control to rotating part temperature measurement, we have small-to-dual sensor packages that meet your application requirements.</p> 	<p>With the increased number of automatic climate control systems seen in vehicles today, we supply solar and twilight sensors for use with both HVAC and lighting systems.</p> 

Temperature Sensors

Compact, lightweight. Operate with enhanced sensitivity, reliability, and stability under diverse conditions of shock, vibration, humidity, and corrosion.

Variety of custom packages available for air, liquid, and solid temperature sensing applications.



LTP
Temperature
Probes

APPLICATIONS

- HVAC
- Engine
- Transmission

Pressure Switches



FEATURES & BENEFITS

- Life cycle rating: up to 2 million
- IP67 sealing rating
- Operating temperature range: -40°C to 120°C [-40°F to 248°F]
- Proof pressure: 10,000psi [689 bar] (High Pressure), 500 psi [34,47 bar] (Low Pressure)
- Burst pressure: 20,000psi [1379 bar] (High Pressure), 750psi for 3.5psi to 22psi, 1250psi > 22psi (Low Pressure)
- Hysteresis option (HP, HE, and LP series only)
- Variety of pressure ports and electrical terminations
- Pressure switching set point range: Factory set 150 psi to 4500 psi [10,34 bar to 310,26 bar] (High Pressure) or factory set or field adjustable 3.5 psi to 150 psi [0,24 bar to 10,34 bar] (Low Pressure)
- Switching point accuracy: up to $\pm 2\%$

APPLICATIONS

- Agricultural machinery
- Heavy-duty construction machinery
- Heavy-duty trucks
- Lawn and garden
- Marine vessels
- Material-handling machinery
- Railway

Speed and Direction Sensors

Provides true zero speed capability, direction sensing, and precise switch point measurement.

Speed sensor diagnostics provide information on air gap and sensor failure for increased reliability and functionality. A comprehensive line-up of Hall-effect, magnetoresistive, and variable reluctance sensors.



APPLICATIONS

- Engine speed
- Transmission
- Hydraulic pumps and motors
- Wheel speed

Position Sensors (Linear, Rotary, Arc)

Honeywell's SMART Position Sensors are some of the most durable and adaptable position devices available in the industry today. Their simple, non-contact design eliminates mechanical failure mechanisms, reduces wear and tear, improves reliability and durability and enhances operator efficiency and safety, while minimizing downtime.



APPLICATIONS

- Boom angle
- Shift and gear position
- Suspension systems

Position Sensors (Hall-effect Rotary)

RTY Series: These shaft-activated products are available in two versions: an integral shaft with or without a lever. The lever may allow customers to reduce the number of mechanical linkages required for their applications, which may reduce the cost of the overall customer solution.

RTP Series: Takes non-contact sensing to the next level by separating the magnet from the sensor body. The absence of the actuator shaft removes the wear and tear on the bearings caused by radial forces. A choice of a bare or a housed magnet is available.

APPLICATIONS

- Position and movement detection
 - Pedals, throttles, gear shift, levers, steering, linkages, and hitches
 - Trucks, buses, off-road vehicles, cranes, and industrial/construction/agricultural vehicles and equipment
- Suspension/kneeling position
 - Buses, trucks
- Tilt/trim position
 - Boat engines, tilling equipment

Pressure Sensors

Honeywell TruStability®
Board Mount
Pressure Sensors



HSC Series: ($\pm 1\%$ Total Error Band)
SSC Series: ($\pm 2\%$ Total Error Band)
 Fully calibrated and temperature compensated using ASIC.
 Both series have pressure ranges from ultra-low (± 2.5 mbar – ± 40 mbar) through low to mid (60 mbar – 10 bar).

NSC Series: Uncalibrated, unamplified, uncompensated with a low to mid (± 2.5 mbar – 10 bar) pressure range.

FEATURES & BENEFITS

- Configurability (pressure, housing, output)
- Stability over time and thermal shock
- Accuracy

APPLICATIONS

- HVAC pressure
- Air-based comfort systems

Magnetic Sensors (Analog and Digital)

Digital magnetic sensor ICs generate an output in response to a magnetic flux perpendicular to the surface of the sheet. Linear magnetic sensor ICs generate an analog voltage output proportional to the magnetic flux, perpendicular to the surface of the sheet. Quad Hall elements design minimizes effects of mechanical or thermal stress on output and provide a stable output.

APPLICATIONS

- BLDC motor control
- Cylinder and steering position
- Current measurement

Magnetic Sensors		
SS30/SS40/SS50/ Nanopower Series	SS300/360 Series	Honeywell Nanopower Series
SS59ET/VF526DT Series	SS360PT/SS460P	SS400/460
VF401 Series	SS490 Series	

MACD-14 Reed Switch

MACD-14 close-differential reed switch is ideally suited for proximity and level-sensing applications.

MACD-14 is an axial-leaded, sub-miniature reed switch containing normally open contacts within a 14mm long x 2.28mm diameter glass envelope. The contacts are capable of switching up to 200VDC at 10W. The reed switch features a close-differential characteristic where there is a low hysteresis between close and open operations. Available sensitivity range is 10AT to 30AT. The reed switch has a high insulation resistance of at least $10_{10}\Omega$ and has a low contact resistance of less than 100m Ω .

FEATURES & BENEFITS

- Capable of switching 200VDC at up to 10W
- Normally open switch contacts
- Low close/open hysteresis (close-differential)
- Hermetically sealed switch contacts are not affected by, and have no effect on, their external environment
- Zero operating power required for contact closure
- Excellent for switching micro-controller logic level loads

APPLICATIONS

- Proximity/position sensing
- Liquid level sensing (e.g. brake fluid reservoir)

MASM-14 Surface Mount Reed Switch

MASM-14 close-differential surface mount reed switch is ideally suited for proximity and level-sensing applications.

MASM-14 is a surface-mount, sub-miniature reed switch containing normally open contacts within a 14mm long x 2.28mm diameter glass envelope. The contacts are capable of switching up to 200VDC at 10W. The reed switch features a close-differential characteristic where there is a low hysteresis between close and open operations. Available sensitivity range is 10AT to 30AT. The reed switch has a high insulation resistance of at least $10_{10}\Omega$ and has a low contact resistance of less than 100m Ω .

FEATURES & BENEFITS

- Capable of switching 200VDC at up to 10W
- Normally open switch contacts
- Low close/open hysteresis (close-differential)
- Hermetically sealed switch contacts are not affected by, and have no effect on, their external environment
- Zero operating power required for contact closure
- Excellent for switching micro-controller logic level loads

APPLICATIONS

- Proximity/position sensing
- Liquid level sensing (e.g. brake fluid reservoir)



MEMS Sensors

Murata accelerometers, inclinometers, gyroscopes and gyro accelerometer combo sensors are an optimum choice for transportation industries.

Based on the company's proprietary 3D MEMS technology in accordance with the automotive quality requirements (TS16949 and ISO 14100 certified), Murata sensors offer high stability, robustness, accuracy and excellent performance.

Combined with a state-of-the-art ASIC and highly reliable packaging solution, they perfectly meet the requirements of the most demanding applications from vehicle stability control (ESC), electronic parking brake (EPB) and hill start assistance (HSA) to autonomous driving (ADAS) and various machine control applications.

SCA103T Series Analog High Performance Differential 1 Axis Inclinometer



FEATURES & BENEFITS

- Murata's most accurate and stable inclinometer
- Size 11.31mm x 15.58mm x 5.08mm (W x L x H)
- Best in class noise performance $7\mu\text{g}/\sqrt{\text{Hz}}$ noise density
- 0.001° resolution (10Hz BW, analog output)
- Offset temperature dependency (-25°C – 85°C) $\pm 0.002^\circ/\text{C}$

APPLICATIONS

- Heavy-duty vehicles, instruments
- Platform levelling and stabilization
- Avionics
- Machine control

SCA830 Series Digital 1 Axis Accelerometer



FEATURES & BENEFITS

- Competitive price with high performance
- Lower integration cost with good digital output
- Extremely stable output over wide range of temperature, humidity and vibrations
- Size 7.0mm x 3.3mm x 8.6mm (W x H x L)
- Advanced self-diagnostic features

APPLICATIONS

- Automotive
- Inclination measurement
- Heavy-duty vehicles
- Platform leveling and stabilization
- Electronic Stability Control (ESC)
- Hill Start Assist (HSA)
- Electric Parking Brake (EPB)

SCA100T Series Analog 2 Axis Inclinometer



FEATURES & BENEFITS

- High performance
- Robust design with high shock durability (20,000g)
- Excellent stability over temperature and time
- Size 11.31mm x 5.08mm x 15.58mm (W x H x L)
- $14\mu\text{g}/\sqrt{\text{Hz}}$ noise density
- 0.0025° resolution (10Hz BW, analogue output)
- Offset temperature dependency (-25°C – 85°C) $\pm 0.008^\circ/\text{C}$

APPLICATIONS

- Heavy-duty vehicles, instruments
- Platform leveling and stabilization
- 360° vertical orientation measurement
- Machine control
- Avionics and navigation

Thermistors

Application Matrix						
Product Name		Series	Powertrain	Safety	Comfort	Infotainment
PTC Thermistors (POSISTOR®)	Chip Type	PRF	•	•	•	•
		PRG	•	•	•	•
	Lead Type	PTGL	•	•	•	•

PTC Thermistors (POSISTOR®) Chip Type

Optimal for overheat detection at heat generation areas including power transistors, power diodes and LED lamp.



Series	Sensing Temperature (°C)	Max. Voltage (V)	Operating Temperature Range (°C)
PRF	+65 to +145*	32	-40 to +150

Optimal for over-current protection for various circuits including those for car navigation and LED lamp.

Series	Hold Current (mA)	Max. Voltage (V)	Operating Temperature Range (°C)
PRG	54 to 205 at 25°C	16 to 30V	-40 to 105

* The line-up contains nine models in 10°C increments. Detection precision: ±5°C (±3°C models are also available.)

PTC Thermistors (POSISTOR®) Lead Type

Optimal for over-current protection for various circuits including those for car navigation and LED lamp.



Series	Resistance Tolerance (%)	Operating Temperature Range (°C)	Max. Voltage (V)
PTGL	±10	-40 to +125	16 to 140
	±20	-30 to +85	

Safety

Ultrasonic Sensors

Measures the distance between the car and the object behind it when backing up to park. Has a flat orientation, being wide horizontally and narrow vertically.



Series	Type	Using Method	Nominal Frequency (kHz)	Capacitance (pF)	Overall Sensitivity (Vop)	Directivity (deg.)	Size (mm)
MA58MF14-7N	Drip Proof Type	Dual Use	58	1400 typ.	2.0 typ.	80x35° typ.	ø14

The detection distance and resolution vary according to the circuit to be used.

Shock Sensors

Used to detect tire revolutions to save battery power in TPMS.



Series	Inclination Angle of Primary Axis (degree)	Electric Charge Sensitivity	Insulation Resistance (MΩ)	Resonant Frequency (kHz)	Capacitance (pF)	Operating Temperature Range (°C)	Size (mm)
PKGS-25TA-R	25°	0.205pC/G	500 min.	39 typ.	240	-40 to +125	4.8×2.3×1.3
PKGS-00TAV-R	0°	0.80mV/G	500 min.	39 typ.	245		
PKGS-45TAV-R1	45°	0.77mV/G	500 min.	37 typ.	195		

Proximity Sensors

Good for harsh environments.
Chemical and detergent proof.
The one piece completely
stainless steel housing of the
sensing section withstands chemicals.



120°C rating and IP69K for highest water
resistance – E2EH series.

Popular Series: E2E, E2K, TL-W



P4000 Series Pressure Sensor



The P4000 series pressure sensors incorporate a stainless steel isolation diaphragm and welded construction to withstand harsh environments. The sensor uses piezo-resistive sensing technology and is paired with our custom ASIC to produce a stable, accurate output. Using a 5 Vdc input, the sensors provide a 0.5 to 4.5 Vdc output proportional to pressure. Internal temperature compensation provides an accurate, easy-to-use device. The rugged construction of the P4000 series is specifically designed to withstand high overpressure spikes and provide compatibility with a wide range of process media including refrigerants and hydraulic oils.

FEATURES & BENEFITS

- Pressure range: 0 to 100 up to 0 to 5000 PSI
- Electrical connection: Packard Electric Metri-Pack 150 series, Deutsch
- Pressure connection: 1/8 – 27 NPT, 7/16 – 20 UNF
- Housing material: 304 stainless steel (1.4301)
- Output signal: 0.5 - 4.5 VDC
- Welded stainless steel construction
- Isolation diaphragm
- Absolute or sealed gage reference
- Low power consumption
- High vibration tolerance
- Outstanding EMI/RFI protection
- Amplified linear output
- Temperature compensated

APPLICATIONS

- On & off-highway vehicles
- Hydraulic systems
- Pressurized tools
- Instruments
- Pneumatic controls
- Refrigerant control & recovery

P4055 Series Pressure Transducer



The P4055 pressure transducer incorporates a back-side PRT configuration that is compatible with many types of liquid and gaseous media. This flexible product family can be supplied with a built-in Metri-Pack 150 electrical connector. The small sensor size is ideal for high volume applications. Pressure ranges may be customized for OEM applications. The P4055 is specified with pressure ranges measured in PSI.

P4056 Series Pressure Transducer



The P4056 pressure transducer incorporates a back-side PRT configuration that is compatible with many types of liquid and gaseous media. This flexible product family can be supplied with a built-in Metri-Pack 150 electrical connector. The small sensor size is ideal for high volume applications. Pressure ranges may be customized for OEM applications. The P4056 pressure ranges are measured in Bar.

FEATURES & BENEFITS

- Pressure range: 0 to 3 up to 0 to 300 PSI
- Electrical connection: Packard Electric Metri-Pack 150 Series
- Pressure connection: 1/4-18 NPT (external), 1/8-27 NPT (external)
- Housing material: brass
- Output signal: 0.5 - 4.5 VDC
- Small size
- Absolute, gage or sealed gage pressure references
- High vibration tolerance
- Superior EMI/RFI performance
- Available with NPT, G1/4, M10, & M12 pressure ports
- Temperature compensated
- RoHS compliant

FEATURES & BENEFITS

- Pressure range: 0 to 200 mBar up to 0 to 20 bar
- Electrical connection: Packard Electric Metri-Pack 150 Series
- Pressure connection: 1/4-18 NPT (external), 1/8-27 NPT (external)
- Housing material: brass
- Output signal: 0.5 - 4.5 VDC
- Small size
- Absolute, gage or sealed gage pressure references
- High vibration tolerance
- Superior EMI/RFI performance
- Available with NPT, G1/4, M10, & M12 pressure ports
- Temperature compensated
- RoHS compliant

APPLICATIONS

- Pumps & compressors
- Process controls
- Filter restriction
- Oil and fuel pressures
- Water management
- Level measurement
- Test & monitoring equipment

APPLICATIONS

- Pumps & compressors
- Process controls
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Planes, trains, automobiles and more ... providing quality components for diverse applications

Standex-Meder reed switches, reed sensors, reed relays, and magnetics are present in millions of operations daily within the transportation industry. With the growth in the number of on-board systems, the increasing number of "smart" features, and the importance of safety and security, convenience, and energy, these sensors are becoming an even more integral feature of next-generation vehicles.

The importance of reed switch-based sensors in transportation sensor applications is abundant. From fluid level management, to magnetics for heavy construction vehicle satellite systems, to fuel injector coils, reed switch-based sensors have long played a key role in cars, trucks, and recreational vehicles.

Reed Sensors for Transportation Applications

Reed switch-based sensors are ideal for transportation applications because, unlike other sensors, they draw no power, leading to significant energy savings. This is particularly important in the electrical vehicle market, which wants to reduce battery power consumption. Also, the contacts of the reed switch are sealed away from the environment, protecting them from dirt, water,

and other fluids. High quality/high reliability reed switch-based sensors can be found in thousands of transportation applications, including fluid level sensors as well as automotive navigation, entertainment, communication, convenience systems. Here are a few of the more recent interesting and innovative transportation sensors on the market.

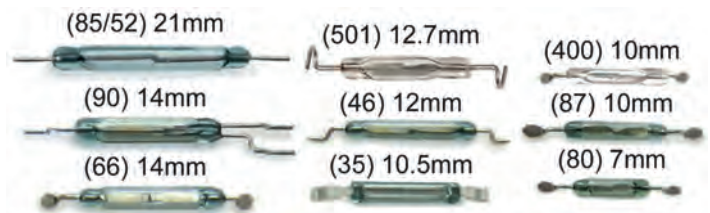
MK23 Reed Sensors for Automotive Applications

SMD Reed Switches are a non-molded cost-efficient version of our surface mount sensors.

Offering a more economic and compact design as compared to our over-molded sensors. The SMD series are sold in tape and reel packing and are suitable for pick and place automation. SMD Reed Switches are magnetically actuated and are ideal in applications that require little or no external power to operate. The SMD Series offers versatility in that it can be designed into any application where single or multi-point position or liquid level sensing is required.

SPECIFICATIONS

- Contact form 1A, 1B, 1C
- Rated power 0W – 100W
- Switching voltage 0VDC – 1000VDC
- Switching current 1A
- Carry current 0A – 3.0A
- Breakdown voltage 210 kVDC – 2500 kVDC
- Available operation range 6 AT – 70 AT



FEATURES & BENEFITS

- Flat or round bent leads
- Surface mounted
- Very small
- Tape and reel packaging
- Designed for ease in pick and place machines
- Hermetically sealed
- Long life expectancy
- Fast switching
- No external circuit requirements
- No power consumption
- Low on resistance (low contact resistance)

APPLICATIONS

- Brake pedal position
- Convertible roof position
- Door lock
- Emission control
- End position control
- Gas tank monitoring
- Hood position
- Power windows
- Seat belt sensor
- Battery control
- Gearshift sensor
- Ignition sensor
- Speedometer

Standex-Meder Sensors

Fluid Level Sensors

Brake, washer fluid, and coolant level sensors are one key area of use for transportation applications.

Washer fluid sensors and safety standards vary in different areas of the world, and switch makers can tailor the sensor design to meet the unique requirements of the particular application.

Standex-Meder makes an all-inclusive electronic liquid level reed sensor that contains the sensing element (reed switch), float, and magnet all as one component. The hermetically sealed reed switches are then further sealed in rugged plastic with epoxy seals.



R12431/R12449/ R12456 Series Fluid Level Sensors



Standex-Meder Electronics manufactures fluid level sensors using magnetic and conductive sensing technology to best suit customer requirements. Our unique designs are helping companies to gain competitive market advantages.

Our conductive fluid level sensors have false full protection and current level shift to indicate fluid level. Custom molding capabilities allow us to design and build floats and sensors to suit any fluid level sensing application.

FEATURES & BENEFITS

- For blow or injection molded bottles
- Side mount design uses separate seal grommet
- Form A (normally open) and Form B (normally closed) operation
- Switch rated 0.5A/100V/10VA maximum
- Internal snubber resistor

APPLICATIONS






- Fuel
- Oil
- Brake fluid
- Radiator
- Windshield washer level
- Other fluids

MARKETS


- Automotive
- Heavy truck
- Recreational vehicles
- Planes
- Railway
- Marine
- Transportation




NTC Temperature Sensors

Series		Technical Data	Features & Benefits	Ordering Code/Type
NTCDS		<ul style="list-style-type: none"> • Size: 3.0 x Ø1.8mm to 4.0 x Ø2.0mm • Heat dissipation constant: 1 to 2mW/°C in still air • Thermal time constant: 10 to 20s max. in still air • Insulation resistance between lead and glass: 50MΩ min. (DC500 V) • Operating temperature ranges: -40°C to +250°C (lead wire Ni plating) -40°C to +160°C (lead wire Sn plating) 	<ul style="list-style-type: none"> • Glass-sealed construction identical to that of DHDs (Double Heatsink Diodes) • Highly reliable and resistant to high relative humidity • Tight tolerances are maintained in resistance vs. temperature characteristics • The application of semiconductor mass production techniques has resulted in considerable size reduction and improved consistency 	NTCDS+
NTC Sensor Elements – Glass Encapsulated		<ul style="list-style-type: none"> • Insulation voltage 500 V/1 s • R₂₅ 2 kΩ ... 100 kΩ • Head diameter 0.9 ... 3 mm (max) • With or without insulation • Special insulation for direct media contact available 	<ul style="list-style-type: none"> • Glass encapsulated, heat resistive and high stability • For temperature measurement up to 300°C • Very short response time • Small dimensions • Leads: dumet wires (copper-clad FeNi) 	B57540G ..., B57541G ..., B57550G ..., B57551G ..., B57560G ..., B57561G ..., B57565G ...
NTC Sensor Elements – Miniature		<ul style="list-style-type: none"> • Temperature measurement up to +155°C • R₂₅ 2 kΩ ... 50 kΩ • Head diameter 2.41 mm (max) • With or without insulation • Version with improved resistance to humidity available 	<ul style="list-style-type: none"> • Short response time • High measuring accuracy • Tight B value tolerances available • Bendable wires • Long wires up to 1m available 	B57861S ..., B57863S ...
NTC Sensor Elements – w/lead spacing		<ul style="list-style-type: none"> • Lead Diameter 0.4 ... 0.6 mm • R₂₅ 15 Ω ... 470 kΩ • Temperature measurement up to +155°C • Available with or without insulation (flexible coating) • Lead spacing 2.5mm and 5mm 	<ul style="list-style-type: none"> • Rugged design, epoxy resin encapsulation • Cost effective • High measurement accuracy • Delivery on tape and reel possible 	B57871S ...
Temperature Sensor Probes		<ul style="list-style-type: none"> • Sensing temperature: 60 – 130°C • R_N: <100 Ω • Tolerances: ±5°C 	<ul style="list-style-type: none"> • Sensor with epoxy coating and metal tag for easy mounting • Good thermal contact • Short response time 	B59901D0 ...

TMR Angle Sensor

Series		Technical Data	Features & Benefits	Ordering Code/Type
TAS		<ul style="list-style-type: none"> • Tunnel magneto resistance (TMR) angle sensor • Packaging size: TSSOP-16 • Digital Outputs: SPI, HSM, PWM, Encoder (AZB) • Guaranteed Accuracy: $\pm 0.2^\circ$ • Operating temperature range: -40°C to $+150^\circ\text{C}$ • Magnetic field measuring range: 20mT to 80mT (typ.), 20mT to 150mT (max.) 	<ul style="list-style-type: none"> • World's highest accuracy for angle error of just $\pm 0.05^\circ$ • Digital output for all major interfaces, realized with ASICs from ICsense • Automatic correction function and compensation of system errors • Contactless 360° angle measurement • Suitable for automotive applications, such as EPS drives, brushless motors, and steering angle and pedal positions • Suitable for industrial applications, such as angle of rotation of motors, robot linkages, drones, actuator positions, etc ... 	TAS*

SMD NTC

Series		Technical Data	Features & Benefits	Ordering Code/Type
SMD NTC – Automotive Series		<ul style="list-style-type: none"> • Temperature range: $-40 \dots +150^\circ\text{C}$ • Case sizes: 0402, 0603, 0805 • Resistance tolerance: $\pm 1\%$, $\pm 3\%$, $\pm 5\%$ • Rated resistance @ $+25^\circ\text{C}$: 4.7 ... 100kΩ 	<ul style="list-style-type: none"> • Qualified AEC-Q200 • Operating temperatures up to $+150^\circ\text{C}$ • Excellent long-term aging stability in high humidity • UL approval (E69802) • Multilayer SMD NTC with inner electrodes 	B572xxV5 B573xxV5 B574xxV5



Optical Sensors – Slotted Interrupters with Analog Output

Part Number		Description	Dimensions L x W x H (mm)	Gap Width (mm)	Aperture Width (mm)	Typical Output (mA)
TCPT1350X01		1-channel Incremental	5.5 x 4 x 4	3	0.3	1.6
TCUT1350X01		2-channel Incremental	5.5 x 4 x 4	3	0.3	1.6
TCUT1630X01		3-channel Turn & Push Incremental	5.5 x 5.85 x 7	3	0.3	1.3
TCUT1800X01		4-channel Absolute or Incremental	5.5 x 5.85 x 7	3	0.3	1.3

-X01≠ AEC-Q101 Qualified

Optical Sensors - Digital Output via I²C

Part Number		Infrared Emitter	Ambient Light Sensor	Photodiode	Signal Processing IC	Dimensions L x W x H (mm)	Maximum Detection Distance (m)	Analog to Digital Resolution Proximity/ Ambient Light Sensor	Ambient Light Resolution (lux per count)	Operating Temperature Range (°C)
VCNL3020		•		•	•	395 x 3.95 x 0.75	0.2	16 bit / ---	---	-25 to 85
VCNL4020X01		•	•	•	•	4.90 x 2.40 x 0.83	0.2	16 bit / 16 bit	0.2500	-25 to 85
VCNL4040		•	•	•	•	4.0 x 2.0 x 1.1	0.2	16 bit / 16 bit	0.0125	-40 to 85
VCNL4200		•	•	•	•	8.0 x 3.0 x 1.8	1.5	12 bit / 16 bit	0.0030	-40 to 85

-X01≠ AEC-Q101 Qualified

Infrared Emitters

Part Number		Package Form	Package Dimensions L x W x H (mm)	Peak Wavelength (nm)	Radiant Intensity (mW/sr)	Angle of Half Intensity (±°)	Rise time (ns)
VSMG2000X01		Reverse gullwing	2.3 x 2.3 x 2.8	850	40	12	20
VSMG2020X01		Gullwing	2.3 x 2.3 x 2.8	850	40	12	20
VSMY1850X01		0805	2 x 1.25 x 0.85	850	10	60	10
VSMY1940X01		0805	2 x 1.25 x 0.85	940	10	60	10
VSMY2940GX01		Gullwing	2.3 x 2.3 x 2.8	940	145	10	10
VSMY2940RGX01		Reverse gullwing	2.3 x 2.3 x 2.8	940	145	10	10
VSMY2943SLX01		Side view	2.3 x 2.55 x 2.3	940	50	28	10
VSMY3940X01		PLCC-2	3.5 x 2.8 x 1.75	940	15	60	10

-X01≠ AEC-Q101 Qualified



Photodetectors

Part Number		Device Type	Package Dimensions L x W x H (mm)	Peak Wavelength λ_p (nm)	Spectral Bandwidth (nm)	Output Current	Angle of Half Sensitivity φ (\pm deg)
VEMD5010X01		PIN Photodiode	5 x 4 x 0.9	940	430 to 1100	48 μ A	65
VEMD5110X01		PIN Photodiode	5 x 4 x 0.9	940	790 to 1050	48 μ A	65
VEMD6010X01		PIN Photodiode	4 x 2 x 1.05	900	430 to 1100	9.5 μ A	60
VEMD6110X01		PIN Photodiode	4 x 2 x 1.05	950	750 to 1050	9.5 μ A	60
VEMT2000X01		NPN Phototransistor	2.3 x 2.3 x 2.8	860	790 to 970	6 mA	15
VEMT2023SLX01		NPN Phototransistor	2.3 x 2.55 x 2.3	860	790 to 970	2.7 mA	35
VEMT2523SLX01		NPN Phototransistor	2.3 x 2.55 x 2.3	850	470 to 1090	2.7 mA	35
VEMT2500X01		NPN Phototransistor	2.3 x 2.3 x 2.8	850	470 to 1090	6 mA	15
VEMD2523SLX01		PIN Photodiode	2.3 x 2.55 x 2.3	900	350 to 1120	10 μ A	35
VEMD2523X01		PIN Photodiode	2.3 x 2.3 x 2.55	900	350 to 1120	10 μ A	35
TEMT6200FX01		Ambient Light Sensor - Phototransistor	2 x 1.25 x 0.85	550	450 to 610	23 μ A	60

-X01= AEC-Q101 Qualified





Temperature Sensors – NTC Thermistors

Series	Product	Size and Encapsulant	Lead Wire or Termination Characteristics	R ₂₅ Range	Tolerance	B _{25/85}	B _{25/85} Tolerance	Temperature Range
NTC SMD, High Accuracy over a Wide Temperature Range, AEC-Q200 Qualified								
NTCS		0805	Nickel Barrier + Tinned on T&R Glass Protected	2.2KΩ to 680KΩ	±1% to ±5%	3430K to 4125K	±1 to ±3	-40°C to +150°C
		0603		2KΩ to 100KΩ		3420K to 4100K	±1	
		0402		4.7KΩ to 100KΩ		3490K to 4075K	±3	
NTCC		2mm x 2mm x 0.7mm	Wire Bondable Flat Chip contacted top and bottom (Silver or Gold electrode)	4.7KΩ to 20KΩ	±1% to ±5%	3435K to 3865K	±1	-55°C to +175°C
NTC Through Hole, High Stability/Accuracy over a Long Life, Exceptional Robustness in Thermal Shocks, AEC-Q200 Qualified								
NTCLE213		4mm epoxy	Tinned Nickel 0.4mm	2.1KΩ to 100KΩ	±1% to ±5%	3511K to 4190K	±0.5 to ±1.5	-55°C to +150°C
NTCLE305		1.6mm epoxy	Insulated Silvered Nickel 0.2mm	2.06KΩ to 10KΩ	±0.5°C	3511K to 3984K	±0.5 to ±1	-40°C to +125°C
Surface Temperature Measurement, Wide Temperature Range, High Insulation Voltage, Flexibility through Customization, AEC-Q200 Qualified								
NTCALUG		Stud Screw M3	PTFE AWG24 Tin Plated Cu ETFE AWG26 Silver Plated Cu	4.7KΩ to 100KΩ	±1% to ±5%	3435K to 4190K	±0.5 to ±1	-40°C to +150°C
		Stud Screw M3	PEEK AWG30 Silver Plated Ni	4.7KΩ to 100KΩ	±1% to ±3%	3435K to 4190K	±0.5 to ±1	-55°C to +125°C
		Stud Screw M2	Insulated AWG32 Silver Plated Ni	10KΩ to 47KΩ	±2% to ±3%	3740K to 3984K	±0.5 to ±1	-40°C to +125°C
NTCAFLEX		6mm diameter	SMD 0603 on Flex Foil	10KΩ to 122KΩ	±1% to ±3%	3435K to 3960K	±1	-40°C to +125°C

Temperature Sensors – Thin film Linear RTD

Series	Product	Size and Encapsulant	Lead Wire or Termination Characteristics	R at T _{ref}	Tolerance	T _{ref}	TCR	Temperature Range
Linear Positive Temperature Characteristic, Accurate and Highly Stable over Wide Temperature Range, AEC-Q200 Qualified								
PTS AT		0603	Nickel Barrier + Tinned on T&R Glass Sealed with Protective Coating	100Ω	±0.3°C, ±0.6°C	0°C	+3850ppm/°C	-55°C to +175°C
		0805		100KΩ, 500Ω				
		1206		100Ω, 500Ω, 1KΩ				
TFPT		0603	Nickel Barrier + Tinned in Bulk/T&R	100Ω to 1KΩ	±0.5%, ±1%, ±5%	25°C	+4110ppm/°C	-55°C to +150°C
		0805		100Ω to 5KΩ				
		1206		100Ω to 10KΩ				



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Measure tilt, acute angle, height, pitch, yaw, rotational position, and encoders



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SPECIALTY PRODUCTS



Timing Devices

Product	Series	Description	Operating Temp	Range
	Crystals	Crystal units for automotive applications. They are enclosed in a sealed package and oscillate when connected to an oscillation circuit.	+85°C +125°C +150°C	4MHz -54MHz
	Oscillators	Clock oscillators combine semiconductor and quartz crystal units, and emit an oscillation signal when power is switched on.	+85°C +105°C +125°C	1.5MHz - 160MHz
	TCXO	Temperature-compensated crystal oscillator (TCXO) to provide highly stable output frequency.	+70°C +75°C +85°C +105°C	13MHz - 52MHz
	Resonators	Miniaturized, high-performance ceramic resonators are used as standard clocks for microprocessors.	+85°C +125°C +150°C	4MHz - 20MHz

Automotive Applications

	Safety				Body Electronics				Drive Train				Comfort & Convenience				HEV												
	Airbag	Anti-Lock Brake System	Crash Avoidance Circuit	Tire Pressure	Traction Control (ESP)	V2X Communications	Communication Bus (LIN, CAN, FlexRay)	Transponders	Dashboard Systems	Car Alarm	Windshield Wipers	Engine Control Unit (ECU)	Fuel Pump	Electric Power Steering	Engine Cooling Fan	Temperature Sensor	Transmission Control Unit	Underhood Modules	Air Conditioning	GPS Location System	Electric Seat Controls	Electric Window Controls	Parking Assistant	Audio Entertainment	Satellite Radio	Keyless System	Cruise Control	Remote Start	Battery Management/Charging
Timing Devices																													
Timing Devices	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

RUW15 Series DC/DC Converters

Murata RUW15 Series DC/DC Converters are suitable for use in applications in railway, industrial or telecommunications where variable input voltages or high-transient voltages are present.

With an ultra-wide input voltage range of 16VDC – 160VDC, RUW15 Series DC/DC Converters are capable of withstanding surges from 24V, 36V, 48V, 72V, 90V and 110V systems, largely eliminating the requirement for input protection circuitry. Optional features include a power fail/DC OK signal and circuitry to facilitate long hold-up times with a small external capacitor across $\pm V_{int}$ pins.



FEATURES & BENEFITS

- UL 60950 recognized for reinforced insulation
- High transient voltage withstand capability
- Ultra-wide input voltage range of 16VDC – 160VDC
- Externally settable hold up time with additional capacitor
- DC OK/power fail signal
- Short circuit protection
- Over temperature protection
- Over voltage protection

APPLICATIONS

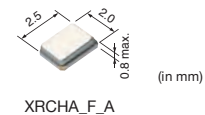
- Railway
- Industrial
- Telecommunication

Timing Devices

Application Matrix					
Product Name	Series	Powertrain	Safety	Comfort	Infotainment
Crystal Units	XRC	•	•	•	•
Ceramic Resonators CERALOCK®	CSTCR/CSTCE	•	•	•	•

Crystal Units

Murata offers a wide lineup of small crystal units based on the original excellent package technology and high-grade quartz crystal elements. Suitable for powertrain, ADAS, chassis and safety applications, etc.



Series	Frequency Range (MHz)											Frequency Shift by Temperature (ppm)	Operating Temperature Range (°C)						
	1	2	3	4	5	6	7	8	9	10	20			30	40	50	70	100	
XRCHA_F_A																		± 100	-40 to +125

Sound Components

Piezoelectric Sounds

Sound components to generate acknowledgement tone in instrumental panel, power slide door alarm, ultrasonic sonar operation alert and other alarm sounds.



Series	Type	Features
PKLCS	SMD Type	Super compact and low profile, workable with automatic mounting and reflow soldering
PKM_EPP(H)	Pin Type	General purpose products, low frequency (2kHz) products and high sound pressure products are in the lineup
PKM13EPYH	Pin Type	Small and low profile, workable with automatic insertion

GPS/GLONASS Antenna



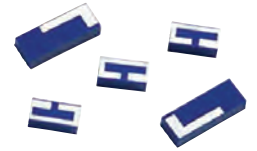
FEATURES & BENEFITS

- Support GPS and GLONASS system
- High radiation efficiency
- Pin or SMD soldering
- Frequency: 1575/1602 MHz

APPLICATIONS

- Navigation device
- Telematics box
- Fleet management

2.4 GHz Bluetooth/WiFi Antenna



FEATURES & BENEFITS

- Compact size
- Omni-directional radiation
- Tape and reel automatic mounting
- Reflow process compatible

APPLICATIONS

- 2.4 GHz WiFi device
- Bluetooth gadget
- ZigBee device
- ISM band equipment





LINE CARD

Cables & Cable Management

WIRE & BOARD MANAGEMENT/ ACCESSORIES	Manufacturer															
	3M	AirBorn	Amphenol	Amphenol FCI	Amphenol Pcd	AVX - Elco	Carlisle Interconnect - Tri-Star	Esterline Connection Tech - Souriau	Glennair	Harwin	HellermannTyton	ITT Cannon	Molex	Panduit	Phoenix Contact	TE Connectivity
Backshells	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Cable Clips	◆								◆	◆				◆		◆
Cable Management	◆			◆						◆				◆	◆	◆
Cable Marker Ties	◆									◆				◆	◆	◆
Cable Mounts	◆									◆			◆	◆		
Cable Spacers	◆								◆					◆		
Cable Terminals	◆								◆				◆		◆	◆
Cable Ties	◆									◆			◆	◆	◆	◆
Heat Shrink Products	◆							◆					◆	◆	◆	◆
Jumper Links			◆						◆				◆			
Labeling Systems	◆		◆							◆				◆	◆	◆
Labels	◆									◆				◆	◆	◆
PCB Spacers	◆			◆					◆					◆		
PCB Terminals			◆	◆		◆	◆		◆		◆	◆		◆	◆	◆
Printers/Software and Ribbons	◆									◆				◆	◆	◆
RFI Clips & Fingers									◆							◆
Shorting Links									◆					◆		
Solderless Terminals	◆		◆										◆	◆	◆	◆
Splices	◆			◆	◆	◆	◆						◆	◆	◆	◆
Stainless Steel Accessories	◆									◆				◆		
Test Points									◆							◆
Tooling	◆	◆	◆	◆		◆		◆	◆	◆	◆	◆	◆	◆	◆	◆
Wire & Cable	◆		◆	◆									◆			◆
Wire Ducting	◆									◆				◆	◆	◆



● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Capacitors

ALUMINUM	AVX	Barker Microfarad (BMI)	Cornell Dubilier - Illinois Capacitor	Eaton - PowerStor	KEMET	Murata	Nichicon	Panasonic	TDK - EPCOS	UCC	Vishay - BCcomponents
AC Motor Start											
Axial Electrolytic		●	●								●
EDLC/Supercapacitor	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆
Flatpack Electrolytic			▲								
Polymer					◆	◆	◆	◆	◆	◆	◆
Radial Miniature		●	●		◆		◆	◆	◆	◆	●
Screw Terminal			◆		◆		◆	◆	◆	◆	◆
Snap-In			◆		◆		◆	◆	◆	◆	◆
Surface Mount			◆		◆		◆	◆	◆	◆	◆

FILM & MICA	API Technologies - Spectrum Control	AVX	Cornell Dubilier	Dearborn	KEMET	Nichicon	Panasonic	TDK - EPCOS	Vishay	Vishay - BCcomponents	Vishay - Roederstein	WIMA
FILM												
Motor Run			◆		◆				◆			
Polyester	◆	◆	●	●	◆	◆	◆	◆	●	●	●	◆
Polypropylene	◆	◆	●	▲	◆	◆	◆	◆	●	●	●	◆
Power Film		◆	●	▲	◆	◆	◆	◆	●	●	◆	◆
Snubber		◆	●	▲	◆	◆	◆	◆	●	●	◆	◆
Suppression X-Y (Safety Cap)	◆		●		◆	◆	◆	◆	●	●	◆	◆
Surface Mount		◆	●	◆	◆	◆	◆	◆	●	●	◆	◆
MICA												
Metal Clad			●									
Mica			●									
Surface Mount			●									

CERAMIC	API Technologies - Spectrum Control	AVX	Cornell Dubilier	CTS - Tusonix	KEMET	Knowles - Syfer, Novacap, DLI	Murata	TDK - EPCOS	Vishay	Vishay - BCcomponents	Vishay - Ceramite	Vishay - Roederstein	Vishay - Vitramin	United Chemi-com	Yageo
Arrays	◆	●			◆		◆	◆							◆
Dip 2-Pin		◆				●									
Disc			◆	●	◆		◆	◆	◆	◆					
High Cap		●			●	●	◆	◆	◆	●			●	◆	◆
High Q	◆	◆			◆	◆	◆	◆	◆				◆		
High Temperature		●			●	●	◆	◆	◆				◆		
High Voltage	◆	◆	◆		◆	◆	◆	◆	◆				◆	◆	◆
Low Inductance		◆			◆	●	◆	◆	◆		◆				
Multi-Layer	◆	●			●	●	◆	◆	◆	●			●	◆	◆
RF/Microwave		◆			◆	●	◆							◆	
Safety					◆	●	◆				◆	◆	◆		
Single Layer		●			◆	●	◆		◆				◆		
Switch Mode	◆	◆			◆	◆	◆								
Tip and Ring		◆			◆	●	◆		◆				◆		
Trimmer				◆			◆								

TANTALUM	AVX	KEMET	Panasonic	Vishay
Conformal Coated Chip	◆			●
Dipped Radial	●	●		●
Fail Safe/ Fused Chip	●	●		●
Hermetic Through Hole		●		●
High Temperature Chip	●	●		●
Low ESR Chip	●	●		●
Low Profile Chip	●	●		●
Micro-Chip	◆	◆		◆
Molded Chip	●	●		●
Molded Through Hole		●		●
Niobium Chip	◆			◆
Polymer Chip	●	●	◆	●
Solid Metal Case Through Hole		●		●
Supertan				●
Wet Through Hole				●

● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Circuit Protection

PROTECTION DEVICES	MANUFACTURERS													
	AVX	Bourns	Eaton - Bussmann	KOA	Littelfuse - Raychem	Littelfuse - Teccor	Murata	Panasonic	ROHM Semiconductors	TDK	TDK - EPCOS	United Chemi-Con	Vishay	Vishay - Dale
OVER CURRENT														
Automotive (Blade) Fuses			◆		◆									
Axial Fuses					◆									
Cartridge Fuses			◆		◆									
NTC Thermistors	●			◆			◆	◆		◆	◆		●	●
Power (Electrical) Fuses			◆		◆									
PTC Thermistors		◆	◆	◆			◆			◆	◆		●	●
Radial Leaded Resettable Fuses (PTC)		◆	◆		◆									
Radial Subminiature Fuses			◆		◆									
Surface Mount Resettable Fuses (PTC)		◆	◆	◆	◆									
Surface Mount (125V+) Fuses		◆	◆	◆	◆									
Thermal Cutoffs (TCO)				◆				◆						
Thin Film (Chip) Fuses	●	◆	◆	◆	◆		◆					◆		
OVER VOLTAGE														
Gas Discharge Tube (GDT)		●			◆					◆				
Line Protection Networks		◆												
Polymer ESD Suppression			◆	◆	◆									
Protection Thyristors		◆			◆									
Surface Mount Varistors (MLV)	◆	◆	◆	◆	◆		◆			◆	◆			
Thermal MOV					◆					◆	◆			
Through-Hole Varistors (MOV)		◆		◆	◆		◆			◆	◆			
TVS Diodes	◆	◆	◆		◆	◆	◆	◆				◆		
TVS Diodes Arrays		◆	◆		◆	◆	◆	◆				◆		

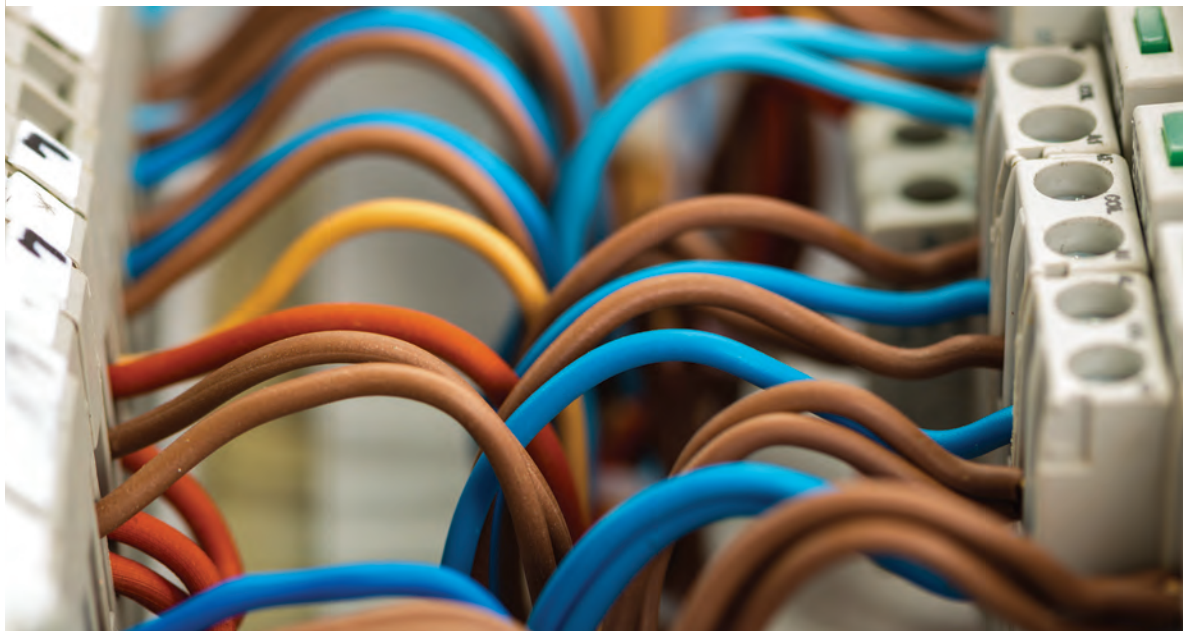
EMI/RFI RF FILTERS RF WIRELESS	MANUFACTURERS																			
	Abrakon	Amphenol RF	API Technologies - Immet	API Technologies - Spectrum Control	API Technologies - Weinschel	AVX	CTS - Tusonix	KEMET - NEC TOKIN	Knowles - Syfer	Molex	Murata	Panasonic	Phoenix Contact	Pulse	TDK - EPCOS	TDK - RF360	TE Connectivity	TE Connectivity - Corcom	Yageo	
Amplifiers				●							●									
Antennas	●	●		●						●				●	●	●	●	●	●	●
Attenuators			●	●	●															
Couplers						●					●			●	●					
EMI/RFI Filters	●			●	●	●	●	●	●		●	●		●	●			◆	●	●
Feed-Thru Filters				●		●	●	●	●		●				●			◆		
Noise Suppression Sheets							◆								●			◆		
RF/Microwave Filters				●		●					●	●		●	●	●				●
RF Module											●	●		●	●	●				
SAW Filters	●			●		◆					◆	◆			◆	◆				
Surface Mount Filters				●		●	●	●	●		●	●		●	●	●				●



● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Connectors

TRANSPORTATION		3M	Amphenol	Amphenol FCI	API Technologies - Spectrum Control	Aptiv (formerly Delphi)	AVX - Elco	Carlisle Interconnect - Tri-Star	Delphi (now Aptiv)	Esterline Connection Tech - Souriau	Fargo	Glenair	Harwin	HELLERMANN TYTON	INCON Inc.	ITT Cannon	KOSTAL	Lear	Molex	Panduit	Phoenix Contact	PKC Group	Preci-Dip	Smiths Connectors	Sumitomo Wiring Systems	TE Connectivity	
APPLICATIONS																											
Agricultural			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Automotive			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Commercial Vehicles			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Construction			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Marine			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass Transit			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Recreational Vehicles			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
INTERCONNECTS																											
Backplane		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Backshells		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Board-to-Board		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Circular			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Contacts			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Device-to-Board		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Input/Output		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Memory Card		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
RF/Coax/Microwave			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Solderless Terminals		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Speciality		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Terminal Blocks			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Tooling		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
USB		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Wire & Cable		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Wire Management		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Wire-to-Board		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Wire-to-Wire		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆



● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Connectors

	3M	AirBorn	Amphenol	Amphenol Commercial	Amphenol FCI	Amphenol Pcd	Amphenol TCS	AVX - Elco	Bourns	Esterline Connection Tech - Souriau	Harwin	INCON Inc.	ITT Cannon	Molex	Omron	Panasonic	Smiths Connectors	TE Connectivity		
BACKPLANE																				
BOARD-TO-BOARD																				
DEVICE-TO-BOARD																				
BACKPLANE																				
10 Gb/s+ Solutions	◆	◆	◆									◆	◆						◆	
2.00 mm (.079 inch)	◆				◆			◆				◆	◆						◆	◆
AOC Assemblies	◆			◆	◆									◆					◆	◆
Assemblies (Backplane)	◆													◆					◆	◆
ATCA/MicroTCA	◆				◆			◆						◆					◆	◆
Cable Assemblies	◆	◆			◆			◆					◆	◆					◆	◆
Card Edge	◆	◆			◆							◆	◆						◆	◆
Compact PCI	◆		◆									◆	◆						◆	◆
DIN 41612 (Eurocard)	◆				◆			◆					◆	◆					◆	◆
Fiber Optic	◆				◆	◆								◆					◆	◆
Future Bus	◆				◆									◆					◆	◆
Hard Metric	◆				◆			◆						◆					◆	◆
High Speed Cable Assemblies	◆			◆	◆									◆					◆	◆
PCI Express	◆		◆										◆	◆					◆	◆
Power	◆	◆		◆	◆	◆		◆					◆	◆					◆	◆
RF / Ganged RF			◆		◆									◆					◆	◆
SCA-2				◆	◆									◆					◆	◆
BOARD TO BOARD																				
Ball Grid Array (BGA)	◆				◆		●							◆					◆	◆
Battery Connectors					◆			◆	◆		◆			◆					◆	◆
Board Stacking	◆	●			◆		●	◆			◆			◆					◆	◆
Breakaway Headers	◆		◆		◆						◆			◆					◆	◆
Compression	◆	◆						◆			◆			◆					◆	◆
Headers & Receptacles	◆		◆		◆			◆			◆			◆					◆	◆
Mezzanine/FPC	◆				◆	◆	●	◆			◆			◆	◆	◆			◆	◆
Power	◆	◆	◆	◆	◆	◆	●	◆			◆	◆	◆	◆					◆	◆
SCSI	◆		◆	◆	◆						◆	◆	◆	◆					◆	◆
Shunts	◆		◆	◆	◆			◆			◆			◆					◆	◆
Stacking	◆	◆	◆	◆	◆		●	◆			◆			◆					◆	◆
DEVICE TO BOARD																				
AOC Assemblies	◆			◆										◆					◆	◆
DIMM				◆				◆						◆					◆	◆
DIP	◆			◆							◆								◆	◆
High Speed Cable Assemblies	◆			◆	◆									◆					◆	◆
PCMCIA	◆			◆										◆					◆	◆
PGA	◆													◆					◆	◆
PLCC	◆			◆							◆								◆	◆
Rambus														◆					◆	◆
RIMM/DIMM/SIMM				◆										◆					◆	◆
Rotary Backlock															◆				◆	◆
SIP	◆										◆								◆	◆
Slot 1 & 2																			◆	◆
SO DIMM & RIMM				◆				◆						◆					◆	◆
Test/Burn-In Sockets	◆																		◆	◆
Transistor									◆										◆	◆

	Amphenol Audio	Amphenol Nexus	Amphenol Tuchel	API Technologies - Spectrum Control	Switchcraft Conxall	TE Connectivity
AUDIO						
1/4" Phone (T Series, M Series and Jacks)	◆					◆
1/4" Phone SwitchPlug	◆					◆
3.5mm PCB	◆					◆
AC PDN	◆					
AC Series XLR Cable	◆					◆
AC Series XLR Metal "Z" Chassis Mount	◆					
AC Series XLR PBC Chassis Mount	◆					◆
AC Series Dual 1/4" XLR	◆					
AC Series XLR Thermoplastic Chassis Mount	◆					◆
Accessories	◆	◆				◆
AX Series XLR Cable	◆					◆
BNC 75ohm Connectors	◆					◆
C Type Combo 1/4" - XLR PCB	◆					
EP/AP Series High Power	◆					
Multipin Series	◆	◆	◆	◆		
RCA Series	◆	◆				◆
SP High Current Loudspeaker	◆					◆
XLNnet Series Cable	◆					
XLNnet Series PCB/Chassis Mount	◆					

	3M	Amphenol	Amphenol FCI	AVX - Elco	C&K Components	Molex	TE Connectivity
MEMORY CARD CONNECTORS							
CompactFlash™		◆	◆	◆			◆
DDR/DDR2/Mini DDR2		◆	◆	◆	◆		◆
Express Card			◆				◆
Full Size Card					◆		◆
Memory Stick/Duo			◆				◆
Micro SD			◆	◆			◆
Mini SD			◆	◆			◆
MMC			◆	◆			◆
PC Card/CardBus		◆	◆	◆			◆
PCMCIA		◆	◆	◆			◆
SD (Secure Digital)		◆	◆	◆			◆
Smart Card (SAM)					◆		◆
Smart Card (SIM)		◆	◆	◆			◆
TransF		◆					◆
xD		◆					◆

● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Connectors

INPUT/ OUTPUT																								
	3M	AirBorn	Amphenol	Amphenol Commercial	Amphenol FCI	Amphenol Pcd	API Technologies - Spectrum Control	AVX - Elco	Carlisle Interconnect - Tri-Star	Conesys - Aero Electric	Conesys - J-Tech	Esterline Connection Tech - Souriau	Glenair	Harwin	INCON Inc.	ITT Cannon	Molex	Omron	Panasonic	Phoenix Contact	Smiths Connectors	Switchcraft Conxall	TE Connectivity	
1394 & 1394b	◆																							
Audio		◆				◆	◆										◆						◆	◆
Camera Link																								
Mini Camera Link	◆																							
Circular	◆		◆			◆	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆	◆
Combo I/O	◆			◆	◆																		◆	◆
Display Port				◆	◆																		◆	◆
D-Subminiature	◆		◆	◆	◆						◆						◆	◆	◆	◆	◆		◆	◆
DVI			◆															◆					◆	◆
Fiber Channel				◆	◆						◆											◆	◆	◆
Fiber Optic	◆		◆		◆				◆	◆	◆						◆	◆			◆	◆	◆	◆
Filtered I/O	◆																					◆	◆	◆
HDMI / Micro HDMI				◆	◆	◆																◆	◆	◆
IPass				◆	◆																		◆	◆
InfiniBand®			◆	◆																			◆	◆
M12/M12D/M8																						◆	◆	◆
Micro D		◆	◆			◆						◆										◆	◆	◆
Mini DIN/ Circular DIN			◆			◆																◆	◆	◆
Mini D-Subminiature											◆	◆										◆	◆	◆
Mobile Systems											◆											◆	◆	◆
Modular Plugs & Jacks	◆		◆	◆	◆						◆						◆	◆					◆	◆
PCI Express				◆	◆																		◆	◆
Power	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆						◆	◆			◆	◆	◆	◆
Push/Pull											◆											◆	◆	◆
Rectangular	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆					◆	◆	◆
RF/Coax / Microwave	◆		◆				◆				◆											◆	◆	◆
RJ / Industrial Ethernet			◆	◆	◆	◆	◆				◆											◆	◆	◆
SATA/SAS/ Mini SATA	◆		◆	◆	◆		◆															◆	◆	◆
SCSI	◆		◆	◆	◆																	◆	◆	◆
SFP/XFP				◆	◆																		◆	◆
TDP																							◆	◆
USB/Mini USB/ USB OTG			◆	◆	◆	◆	◆				◆										◆	◆	◆	◆

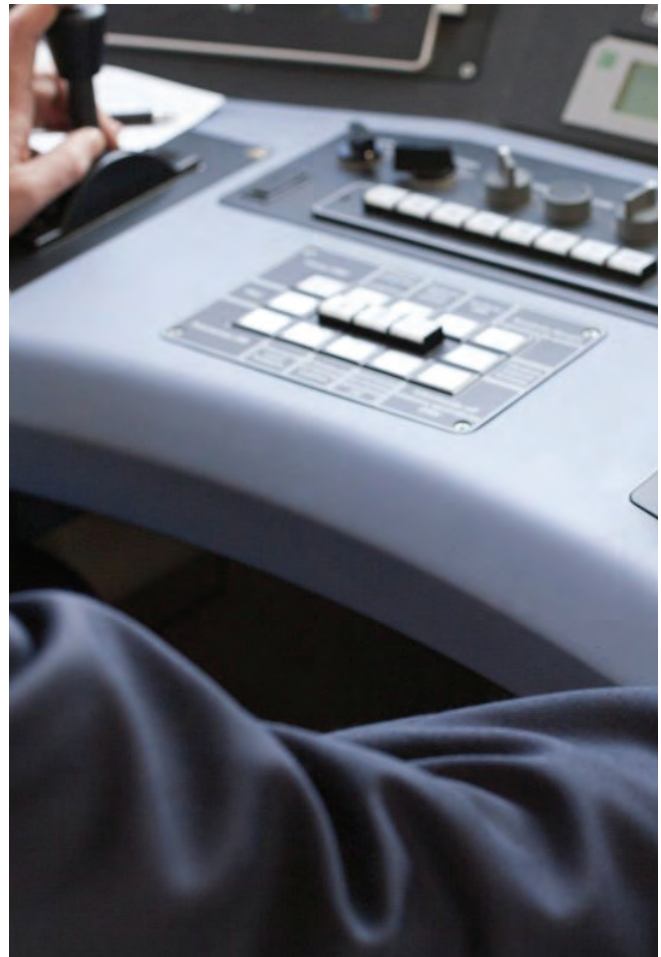
● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

RF/COAXIAL/ MICROWAVE												
	3M	AirBorn	Amphenol Aerospace	Amphenol RF	Amphenol SV Microwave	Carlisle Interconnect - Tri-Star	Delta Electronics Mfg Corp.	Molex	Smiths Connectors	Switchcraft Conxall	TE Connectivity	
1.0 / 2.3				◆				◆			◆	◆
1.6 / 5.6				◆								◆
7 / 16				◆								◆
BMA					◆							◆
BNC (50/75Ω)				◆	◆			◆	◆	◆	◆	◆
BNC (Miniature)				◆								◆
B to B Blindmate/Compression					◆							◆
BSA					◆							◆
FAKRA				◆								◆
MCX/MMCX				◆								◆
MHV/SHV				◆								◆
Microwave Cable Assemblies												◆
Precision ¹				◆								◆
QMA				◆								◆
Reverse Polarity ²				◆								◆
RF Cable Assemblies				◆	◆			◆	◆	◆		◆
Shielded Terminators				◆								◆
SMA				◆	◆			◆	◆	◆		◆
SMB (50/75Ω)				◆	◆			◆	◆	◆		◆
SMB (Miniature)				◆								◆
SMC				◆	◆			◆	◆	◆		◆
SMP				◆	◆							◆
SMT				◆								◆
SSMA					◆							◆
TNC				◆	◆			◆	◆	◆		◆
Triax				◆	◆	◆	◆	◆	◆	◆		◆
Twinax		◆	◆	◆	◆	◆	◆	◆	◆	◆		◆
Type F/G				◆								◆
Type N				◆	◆			◆	◆	◆		◆
UHF/MiniUHF				◆				◆	◆	◆		◆

TERMINAL BLOCKS							
	Amphenol FCI	Amphenol Pcd	API Technologies - Spectrum Control	Esterline Connection Technology - Souriau	Molex - Beau	Phoenix Contact	TE Connectivity
Barrier Strips				◆		◆	◆
Europa							◆
Eurostyle - Fixed / Pluggable		◆	◆	◆		◆	◆
2.54/3.50/3.81/5.0/5.08 mm		◆	◆			◆	◆
Filtered				◆			
Interface Modules			◆				
NEMA							◆
Phenolic						◆	◆
Push Button						◆	
Rail Mounted			◆	◆	◆	◆	◆
Screw Terminal		◆	◆	◆	◆	◆	◆
Spring Clamp		◆	◆			◆	◆

Connectors

WIRE-TO-BOARD/ WIRE-TO-WIRE		3M	AirBorn	Amphenol	Amphenol Commercial	Amphenol FCI	Amphenol Pcd	API Technologies - Spectrum Control	Aptiv (formerly Delphi)	AVX - Elco	Esterline Connection Tech - Souriau	Glenair	Harwin	INCON Inc.	ITT Cannon	Molex	Phoenix Contact	Smiths Connectors	TE Connectivity	
100 mm (.039 inch)		◆				◆										◆				◆
1.25 mm (.049 inch)						◆										◆				◆
1.27 mm (.050 inch)		◆				◆										◆				◆
2.00 mm (.079 inch)		◆				◆										◆	◆	◆	◆	◆
2.50 mm (.098 inch)						◆										◆	◆	◆	◆	◆
2.54 mm (.100 inch)		◆	▲			◆							◆	◆		◆	◆	◆	◆	◆
3.00 mm (.118 inch)		◆				◆										◆	◆	◆	◆	◆
3.68 mm (.145 inch)						◆										◆				◆
3.96 mm (.156 inch)						◆										◆				◆
4.00 mm (.157 inch)						◆										◆				◆
4.20 mm (.165 inch)						◆										◆				◆
5.00 mm (.197 inch)						◆										◆	◆			◆
5.03 mm (.198 inch)						◆										◆	◆			◆
5.08 mm (.200 inch)						◆										◆	◆			◆
6.35 mm (.250 inch)						◆										◆	◆			◆
7.50 mm (.295 inch)						◆										◆	◆			◆
9.00 mm (.354 inch)						◆										◆	◆			◆
10.00 mm (.393 inch)						◆										◆	◆			◆
Bus Bar						◆										◆	◆			◆
Cable Assemblies			◆	◆	◆	◆	◆	◆	◆				◆	◆	◆	◆	◆	◆	◆	◆
Discrete Wire			◆			◆		◆	◆			◆	◆	◆	◆	◆	◆	◆	◆	◆
FFC/FPC						◆		◆	◆							◆				◆
IDC Discrete Wire			◆			◆		◆	◆				◆	◆	◆	◆	◆	◆	◆	◆
IDC/Mass Termination			◆			◆		◆	◆				◆	◆	◆	◆	◆	◆	◆	◆
Mini D Ribbon/Champ			◆			◆		◆	◆							◆	◆			◆
Power			◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆	◆	◆	◆	◆	◆
SATA/SAS/Mini SATA			◆			◆		◆	◆							◆	◆			◆
SCSI I, II, III			◆			◆		◆	◆							◆	◆			◆



SPECIALTY		3M	AirBorn	Amphenol	Amphenol Commercial	Amphenol FCI	Amphenol Pcd	API Technologies - Spectrum Control	Aptiv (formerly Delphi)	AVX - Elco	Bourns	Carlisle Interconnect - Tri-Star	Conesys - Aero Electric	Conesys - J-Tech	Delphi (now Aptiv)	Esterline Connection Tech - Souriau	Glenair	Harwin	INCON Inc.	ITT Cannon	Molex	Omnron	Panasonic	Phoenix Contact	Smiths Connectors	Switchcraft Conxall	TE Connectivity
Automotive				◆		◆			◆	◆			◆	◆	◆	◆					◆	◆				◆	◆
Battery				◆		◆				◆	◆		◆	◆	◆	◆					◆	◆			◆	◆	◆
COTS			◆	◆		◆		◆	◆	◆		◆	◆	◆	◆	◆					◆	◆			◆	◆	◆
EMI Shielded		◆	◆	◆		◆		◆	◆	◆			◆	◆	◆	◆					◆	◆			◆	◆	◆
Filtered				◆		◆		◆	◆	◆			◆	◆	◆	◆					◆	◆			◆	◆	◆
Harsh Environment		◆	◆		◆			◆	◆	◆			◆	◆	◆	◆					◆	◆			◆	◆	◆
Hermetic			◆	◆				◆	◆	◆			◆	◆	◆	◆					◆	◆			◆	◆	◆
High Voltage			◆	◆	◆			◆	◆	◆			◆	◆	◆	◆					◆	◆			◆	◆	◆
Industrial		◆		◆			◆	◆	◆	◆			◆	◆	◆	◆					◆	◆			◆	◆	◆
LED Connector					◆																◆	◆			◆	◆	◆
M8/M12																				◆	◆	◆			◆	◆	◆
Micro Miniature/ Nano		◆	◆	◆	◆	◆				◆			◆	◆	◆	◆					◆	◆			◆	◆	◆

◆ Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

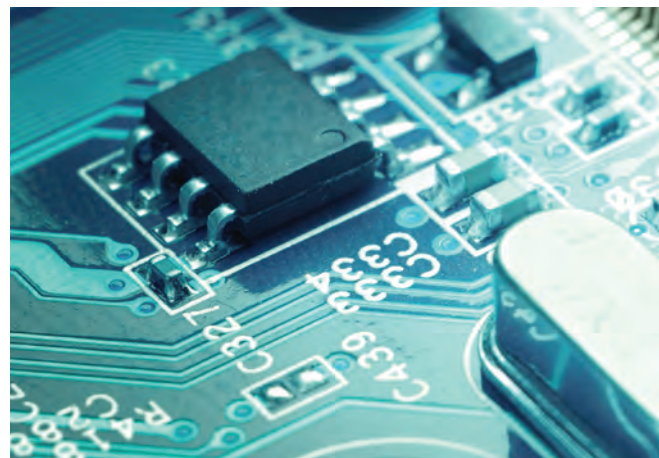
Discretes

POWER SEMICONDUCTORS	AVX	Bourns	Littelfuse - Teccor	MACOM - Aeroflex/Metelics	Panasonic	ROHM Semiconductor	Toshiba	TT Electronics - Semelab	Vishay
DIODES									
Arrays		◆	◆			◆	◆	◆	◆
Schottky	◆	◆	◆	◆	◆	◆	◆	◆	◆
Small Signal		◆	◆	◆	◆	◆	◆	◆	◆
TVS	◆				◆	◆	◆	◆	◆
Zener		◆	◆	◆	◆	◆	◆	◆	◆
Silicon Carbide (SiC)			◆			◆	◆		
RECTIFIERS									
Bridge		◆				◆		◆	◆
Rectifiers		◆	◆			◆	◆	◆	◆
Schottky		◆	◆	◆		◆	◆	◆	◆
THYRISTORS									
Protection		◆	◆						
Switching (SCRs, Triacs)			◆						◆
TRANSISTORS									
Bipolar		◆				◆	◆	◆	◆
LDO (Low Drop Out)						◆	◆	◆	◆
Small Signal		◆	◆	◆	◆	◆	◆	◆	◆
IGBTs									
Discrete						◆	◆		
Modules			◆			◆	◆	◆	◆
MOSFETS									
High-voltage						◆	◆	◆	◆
Low-voltage					◆	◆	◆	◆	◆
Modules						◆	◆	◆	◆
Silicon Carbide (SiC)						◆	◆		◆

◆ MIL Spec Discretes (DSCC)



OPTOELECTRONICS	Kingbright	Littelfuse	Murata - MPS	Panasonic	ROHM Semiconductor	Toshiba	TT Electronics - OPTeK	Vishay
Digital Panel Meters			◆					
High Voltage Isolators					◆	◆	◆	◆
Infrared Components	◆				◆		◆	◆
Infrared Touch Panels								◆
LCD Modules								◆
LEDs - Indication	◆			◆	◆		◆	◆
LEDs Illumination <1W	◆			◆	◆		◆	◆
LEDs Illumination >1W	◆			◆	◆		◆	◆
LED Displays	◆				◆			◆
LED Drivers				◆	◆			◆
LED Modules	◆				◆		◆	◆
OLED Displays								◆
Optical Sensing		◆			◆	◆	◆	◆
Optocouplers	◆					◆		◆
Plasma Displays								◆
Solid State Relays				◆		◆		◆
TFT Displays								◆



ADDITIONAL DISCRETE COMPONENTS	ROHM Semiconductor	Toshiba	TT Electronics - Semelab	Vishay
Analog	◆	◆	◆	◆
Logic	◆	◆	◆	◆
Motor Control Drivers	◆	◆		◆
RF Diodes	◆	◆	◆	◆
RF Transistors	◆	◆	◆	◆
Voltage Regulators	◆	◆	◆	◆

◆ MIL Spec Discretes (DSCC)

● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Electromagnetic

FERRITES INDUCTORS TRANSFORMERS															
	Abracon	API Delevan	API Technologies - Spectrum Control	AVX	Bourns - JW Miller	Eaton - Coiltronics	KEMET - NEC TOKIN	KOA	Murata	Panasonic	Pulse	TDK - EPCOS	TT Electronics - BI Technologies	Vishay - Dale	Yageo
Air Coil Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Common Mode Chokes	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Custom Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ferrite Beads	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ferrite Cores/Clamp Filters	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
High Current Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Leaded Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Military Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Multilayer Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Power Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
RF Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Thin Film Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Toroid Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Transformers	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Wirewound/Coil Inductors	●	●	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

SOUND DEVICES					
	Abracon	API Technologies	Murata	TDK	TE Sensor
Buzzer			●	●	
Piezo			●	●	
Receiver			●		
Ringer			●		
Sensor			●	●	◆
Sounder			●		
Speaker			●		

FREQUENCY CONTROL					
	Abracon	API Technologies	Kyocera	Murata	Vishay - Dale
Crystals	●	●	●	●	●
Oscillators	●	●	●	●	●
Resonators	●	●	●	●	●
Tuning Forks	●		●		●

THERMAL MANAGEMENT		
	Ohmite	Panasonic
Extruded Heatsinks	●	
Liquid Coldplates	●	
Liquid Cooling	●	
Thermal Solutions Graphite Sheets		●



● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Electromechanical

RELAYS	Bourns	C&K Components	Carling Tech.	Honeywell	KEMET - NECTOKIN	Littelfuse - Hamlin	Omron	Panasonic	Phoenix Contact	Sensata (Crydom)	Standex - Meeder	TE Connectivity
RELAYS												
Automotive							◆	◆				◆
Communication							◆	◆				◆
Compressor												◆
Contactors									◆			◆
Crystal Can												◆
Definite Purpose Contactors												◆
DIN Rail Mounted							◆	◆	◆			◆
Dry Reed					◆							◆
Forcibly-Guided Contact							◆					◆
General Purpose			◆				◆	◆	◆			◆
High Voltage Switching							◆	◆	◆			◆
Industrial DC & AC							◆	◆	◆			◆
Input/Output Modules							◆	◆				◆
Low Signal PCB					◆		◆	◆				◆
Magnetic Latching							◆	◆				◆
Military												◆
Miniature PCB							◆	◆	◆			◆
MOSFET							◆	◆				
Panel/Plug-In							◆	◆	◆			◆
Phase Sequencing												◆
Power							◆	◆	◆			◆
Power Controllers												◆
Power Distribution Panels												◆
Power PCB							◆	◆	◆			◆
Programmable Time Delay							◆	◆				◆
Protective							◆	◆				◆
Reed					◆							◆
Reverse Power												◆
RF								◆				◆
Rotary												◆
Safety							◆	◆	◆			◆
Signal							◆	◆	◆			◆
Sockets							◆	◆				◆
Solid State							◆	◆	◆	◆		◆
Time Delay							◆	◆				◆
Timers							◆					◆
TO-5												◆
Traffic Control												◆

CIRCUIT BREAKERS & SWITCHES	Bourns	C&K Components	Carling Tech.	Honeywell	KEMET - NECTOKIN	Littelfuse - Hamlin	Omron	Panasonic	Phoenix Contact	Sensata (Crydom)	Standex - Meeder	TE Connectivity
CIRCUIT BREAKERS												
Electronic Circuit Breaker												◆
Ground Fault Circuit Breakers			◆									
Hydraulic/Magnetic Circuit Breakers			◆							◆		◆
Thermal Circuit Breakers			◆							◆		◆
SWITCHES												
Contact Block								◆				◆
Detector		◆						◆	◆			◆
DIP	◆	◆										◆
Encoder				◆					◆			
Fader									◆			
Hour Meter				◆								
Industrial		◆	◆	◆				◆	◆			◆
Keylock		◆							◆			◆
Keypad		◆	◆									
Knobs								◆				◆
Limit				◆								
Membrane								◆				
Navigation		◆	◆									
Optical				◆				◆	◆			
Paddle		◆	◆	◆								◆
Panel Mount		◆	◆	◆				◆				◆
Power Rocker		◆	◆						◆			◆
Pressure Switch				◆								
Pushbutton		◆	◆	◆				◆	◆			◆
Pushwheel		◆										◆
Reed						◆					◆	
Rocker		◆	◆	◆				◆				◆
Rotary	◆	◆	◆	◆				◆				◆
Safety		◆	◆	◆				◆				
Selector		◆						◆				
Slide									◆			◆
Snap Action		◆	◆	◆				◆	◆			◆
Special Purpose		◆	◆	◆				◆	◆			◆
Switchlock		◆										
Surface Mount	◆	◆						◆	◆			◆
Tactile	◆	◆						◆	◆			◆
Thumbwheel		◆						◆				
Toggle		◆	◆	◆								◆
Vacuum				◆								

Resistors

FILM	Bourns	KOA	OHMITE	Panasonic	TE Connectivity	TT Electronics - IRC, Welwyn	Vishay	Vishay - Dale	Vishay - Thin Film	Vishay Precision Group	Yageo
METAL FILM											
Discrete Chip		●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Flame Proof	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Fusible	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
High Temp	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
High Voltage	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Matched Sets			●			◆	◆	◆	◆	◆	◆
Melf/Cylindrical		◆			◆	◆	◆	◆	◆	◆	◆
Metal Film	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Metal Glaze			◆			◆	◆	◆	◆	◆	◆
Metal Oxide		●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Precision	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Thick Film Chip	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Thin Film Chip	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆
Trimmable				◆	◆	◆	◆	◆	◆	◆	◆
Voltage Divider			◆		◆	◆	◆	▲	◆		

POWER WIREWOUND CARBON & FOIL	Bourns	KOA	OHMITE	Panasonic	TE Connectivity	TT Electronics - IRC, Welwyn	Vishay	Vishay - Dale	Vishay - Huntington/Milwaukee	Vishay - Sfernice	Vishay Precision Group	Yageo
POWER/WIREWOUND												
Brackets/Hardware			●		◆		◆	◆	◆	◆	◆	◆
Ceramic Composition		◆	◆		◆		◆	◆	◆	◆	◆	◆
Commercial	◆	●	◆		◆	◆	◆	◆	◆	◆	◆	◆
Current Sense/Low Resistance	◆	●	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Grid			◆				◆	◆	◆	◆	◆	◆
Industrial	◆	◆	●		◆	◆	◆	◆	◆	◆	◆	◆
Precision		●	◆		◆	◆	◆	◆	◆	◆	◆	◆
Rheostat			◆		◆	◆	◆	◆	◆	◆	◆	◆
Special Purpose		◆	●		◆	◆	◆	◆	◆	◆	◆	◆
Tubular		◆	●		◆	◆	◆	◆	◆	◆	◆	◆
Vitreous Enamel		◆	●		◆	◆	◆	◆	◆	◆	◆	◆
CARBON												
Carbon Composition		●	◆		◆							
Carbon Film		●	◆		◆	◆	◆	◆	◆	◆	◆	◆
FOIL												
Bulk Metal Foil											●	

POTENTIOMETERS TRIMMERS	Bourns	Honeywell	OHMITE	Panasonic	TE Connectivity	TT Electronics - BI Technologies	Vishay	Vishay - Dale	Vishay - Sfernice	Vishay - Spectrol	Vishay Precision Group
TRIMMING POTENTIOMETERS											
Adjustment Tools	◆						◆				◆
Carbon			◆	◆	◆	◆					
Cermet	●	●		◆	◆	◆	◆	◆	◆	◆	◆
Counters	◆		◆			◆	◆	◆	◆	◆	◆
Multi-Turn	●				◆	◆	◆	◆	◆	◆	◆
Open Frame				◆	◆	◆	◆	◆	◆	◆	◆
Sealed Frame	●			◆	◆	◆	◆	◆	◆	◆	◆
Single-Turn	●		◆	◆	◆	◆	◆	◆	◆	◆	◆
Wirewound	▲		●		◆		◆			◆	
PRECISION PANEL CONTROL											
Carbon	◆						◆				
Cermet	◆	◆			◆	◆	◆	◆	◆	◆	◆
Conductive Plastic	◆	◆			◆	◆	◆	◆	◆	◆	◆
Dials/Knobs			◆		◆	◆	◆	◆	◆	◆	◆
Knobs	◆		◆		◆	◆	◆	◆	◆	◆	◆
Hybrid	◆				◆						
Linear	◆		●		◆						
Metal Foil							◆				◆
Modular				◆		◆	◆	◆	◆	◆	◆
Motor Pot					◆	◆	◆	◆	◆	◆	◆
Multi-Turn	◆				◆	◆	◆	◆	◆	◆	◆
Non-Linear					◆	◆	◆	◆	◆	◆	◆
Open Frame Slide	◆						◆				
Rheostat			●				◆	◆	◆	◆	◆
Rotary	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sealed Frame			●		◆	◆	◆	◆	◆	◆	◆
Single-Turn	◆		●		◆	◆	◆	◆	◆	◆	◆
Wirewound	◆	◆	●		◆	◆	◆	◆	◆	◆	◆
SENSOR/ENCODER											
Attenuator					◆		◆	●			
Encoders	◆	●		◆	◆	◆	◆	◆	◆	◆	◆
Linear Motion	◆						◆		◆	◆	◆
Rotary	◆	●		◆	◆		◆	◆	◆	◆	◆

NETWORK	Bourns	KOA	Panasonic	TE Connectivity - IRC, Welwyn	Vishay	Vishay - Dale	Vishay - Thin Film	Vishay Precision Group	Yageo
Array	◆	●	◆	◆	◆	◆	◆	◆	◆
Conformal Coated	◆	●			◆	◆	◆	◆	◆
Custom				◆	◆	◆	◆	◆	◆
Integrated Passive	◆	◆			◆	◆	◆	◆	◆
Ladder	●	●			◆	◆	◆	◆	◆
Line Protection	◆				◆	◆	◆	◆	◆
Molded	●	◆		◆	◆	◆	◆	◆	◆
Resistor/Capacitor	●	◆			◆	◆	◆	◆	◆
SMT	●	●	◆	◆	◆	◆	◆	◆	◆
Surge	◆			◆	◆	◆	◆	◆	◆
Thick Film DIP	●			◆	◆	◆	◆	◆	◆
Thick Film SIP	●	●			◆	◆	◆	◆	◆
Thin Film DIP	●			◆	◆	◆	◆	◆	◆
Thin Film SIP	●	◆		◆	◆	◆	◆	◆	◆

● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available

Sensors

SENSORS	Manufacturers																	
	Amphenol Advanced Sensors	AVX	Bourns	Honeywell	KEMET	KOA	Littelfuse, Hamlin	Murata	Omron Automation & Safety	Omron Electronic Components	Panasonic	ROHM Semiconductor	Sensata (BEI Sensors, Kavlico)	Standex Meder	TDK YPCOS	TE Connectivity's MEAS Sensors	TT Electronics	Vishay
MOTION/POSITION/SPEED																		
Accelerometer				○			●				●	◆				◆		
Inclinometer/Tilt							◆		●				○			◆		●
Inertial Measurement Unit				○			●						○			○		
Liquid Level				○			○			○			○	●	●	○		
Motion (Human Presence)	●						●		●	◆	◆							
Position: Linear			○	○					●				○			◆		○
Position: Encoder/Rotary			○	◆			○	●	◆		●		○			◆	●	
Proximity				○			○	●	○	○				○			○	○
Shock & Vibration				○			●		◆	◆						◆		
Speed (Hall effect)			◆	◆			○	●			◆	◆	○	◆	○	●	◆	
Ultrasonic				○			◆	○								○		
OPTICAL																		
Ambient Light/Proximity	●						●			●	◆							●
Color (RGB)											◆							●
Fiber Optic				○					○							○		
Infrared	●			◆			●			●	◆						●	●
Optoelectronics				●							◆						●	●
Photoelectric/Safety	◆			◆					◆								◆	◆
UAV/Solar	○										◆							●
PRESSURE/FORCE/FLOW																		
Altimeter/ Barometer	●															●		
Flow				◆				◆	◆			◆				◆		○
Force				●									○			◆		
Load Cell/Load Pin				○												○		
Pressure	◆			◆			●		●	◆	◆		●	●	◆	◆		◆
THERMAL/HUMIDITY																		
Air/Gas/Fluid Property	◆			◆											●	○		
CO ₂	◆																	
Combination MEMS/SMD	●			●					●		◆					●		
Humidity	◆			●											●	◆		
NTC Thermistor	◆			◆		●		●			●				◆	◆		◆
Probes & Other Temperature	○	●		○	◆										○	○	○	○
PTC Thermistor	●					●		●		◆					●			◆
RTD	○			◆					◆							◆	◆	●
Thermocouples	○								○							○	○	
Thermopile	●						●		●							●		
Turbidity	○																	
OTHER																		
Auto/Vehicle	◆		●	◆			●					○		●	◆	●		
Capacitive Touch								●										
Current	●			◆	◆			●							○			

● Lead & Lead-free compliant parts available ◆ Lead-free only parts available ▲ Lead-only compliant parts available



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Interconnect Products



This supplier listing is current as of spring 2018. Since this catalog was published, TTI may have expanded to include additional suppliers and/or our suppliers may have acquired additional lines, brands or companies. Speak with your TTI Specialist for the most current roster of suppliers and brands.



Cable and Wire Management

Aptiv (formally Delphi)
HellermannTyton
Panduit
TE Connectivity

Capacitors

API Technologies/
Spectrum Control
AVX
Barker Microfarads (BMI)
Cornell Dubilier/Illinois
Capacitor
CTS/Tusonix
Dearborn
Eaton/PowerStor
KEMET/NEC TOKIN
Knowles/Novacap/
Syfer/DLI
Murata
Nichicon
Panasonic/Sanyo
TDK/EPCOS
United Chemi-Con
Vishay/BCcomponents/
Roederstein/Ceramide/
Vitramon
WIMA
Yageo

Circuit Protection

AVX
Bourns/Komatsulite
Eaton/Bussmann
KOA
Littelfuse/Raychem/Teccor
Murata
Panasonic
ROHM Semiconductor
TDK/EPCOS
United Chemi-Con
Vishay/Dale

Connectors

3M
AirBorn
Amphenol
API Technologies/
Spectrum Control
Aptiv (formally Delphi)
AVX/Elco
Bourns
C&K
Carlisle Interconnect
Technologies/Tri-Star
Conesys/Aero Electric/
J-Tech
Delta Electronics
Esterline Connection
Technology/Souriau
 Fargo Assembly
Glenair
Harwin

Connectors (continued)

INCON Inc.
ITT Cannon
KOSTAL
Lear Corporation
Molex
Omron Electronic
Components
Panasonic
Phoenix Contact
PKC Group
Preci-Dip
Smiths Interconnect
Sumitomo Wiring Systems
Switchcraft/Conxall
TE Connectivity
Vishay

Discretes

AVX
Bourns
Littelfuse/Teccor
MACOM/Aeroflex Metelics
Panasonic
ROHM Semiconductor
Toshiba
TT Electronics/Semelab
Vishay

Filters

Abracon
Amphenol RF
API Technologies/
Spectrum Control/
Inmet/Weinschel
AVX
CTS/Tusonix
KEMET/NEC TOKIN
Knowles/Syfer
Molex
Murata
Panasonic
Phoenix Contact
Pulse
RF360
TDK/EPCOS
TE Connectivity/Corcom
Yageo

High Voltage

Amphenol
Aptiv (formerly Delphi)
Bourns
Eaton
ITT Cannon
KOSTAL
Littelfuse
Molex
Omron
Panasonic
Phoenix Contact
TE Connectivity

Magnetics

Abracon
API Delevan
API Technologies/
Spectrum Control
AVX
Bourns/JW Miller/Transtek
Eaton/Coiltronics
KEMET/NEC TOKIN
KOA
Murata/TOKO
Panasonic
Pulse
TDK/EPCOS
TT Electronics/
BI Technologies
Vishay
Yageo

Optoelectronics

Kingbright
Littelfuse
Murata
Panasonic
ROHM Semiconductor
Toshiba
TT Electronics/OPTEK
Vishay

Piezo

Murata
TDK

Potentiometers & Trimmers

Bourns
Honeywell
Ohmite
Panasonic
TE Connectivity
TT Electronics/
BI Technologies
Vishay/Dale/Sfernice/
Spectrol
Vishay Precision Group

Power Supplies

Murata Power Solutions
Omron Automation &
Safety
Panasonic
Phoenix Contact
TDK

Relays & Circuit Breakers

Carling Technologies
KEMET/NEC TOKIN
Littelfuse/Hamlin
Omron Automation &
Safety
Omron Electronic
Components
Panasonic
Phoenix Contact
Sensata/Crydom
Standex/Meder
TE Connectivity

Resistors

Bourns
KOA
Ohmite/Arcol
Panasonic
TE Connectivity
TT Electronics/IRC/Welwyn
Vishay/Dale/Draloric/
Sfernice/Thin Film
BCC/Electro Films/
Huntington/Milwaukee
Vishay Precision Group/
Foil Resistors
Yageo

Sensors

Amphenol Advanced
Sensors
AVX
Bourns
Honeywell
KEMET
KOA
Littelfuse/Hamlin
Molex
Murata
Omron Automation &
Safety
Omron Electronic
Components
Panasonic
ROHM Semiconductor
Sensata/BEI Sensors/
Kavlico
Standex/Meder
TDK/EPCOS
TE Connectivity
TT Electronics
Vishay

Switches

Bourns
C&K
Carling Technologies
Honeywell
Littelfuse/Hamlin
Omron Automation &
Safety
Omron Electronic
Components
Panasonic
Standex/Meder
TE Connectivity

Thermal Management

Ohmite
Panasonic

Timing Devices

Abracon
API Technologies
AVX
Kyocera
Murata
Vishay/Dale



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