

CONNECTED VEHICLE
APPLICATIONS:
CONNECTOR SOLUTIONS

molex

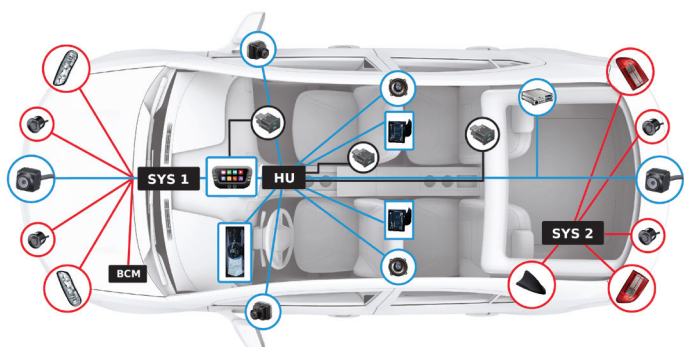
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Demands for vehicle safety, connectivity, comfort and autonomy have resulted in an increasing number of functional designs and electronic modules in today's cars. Additionally, requirements continue to grow for data communication interfaces and transmission channels, resulting in more-efficient accurate communication and providing an even better driving experience.

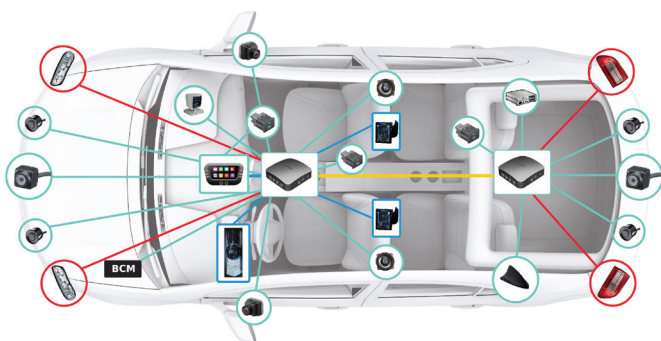
The evolution of connected vehicle applications is bringing about both new demands and new challenges to the research and development of in-vehicle electronic modules. The biggest challenges for system upgrades in connected vehicles come from the need for increased transmission channels, compatibility with diverse interfaces, compactness of modular designs, solutions for layout and space restrictions, and weight control. As connectors serve as one of the most important hardware components for module power, signal communication, control and more, solutions that

deliver miniaturization, low weight and compatibility with different transmission protocols will significantly drive the development of connected vehicles. Based on research into connected vehicle module applications and feedback from industry customers, Molex offers connector solutions for four common connected vehicle applications (not including special transmission interface options for high-speed data rates, radio frequency and audio/video and imaging processing) by taking advantage of our competitive edge.

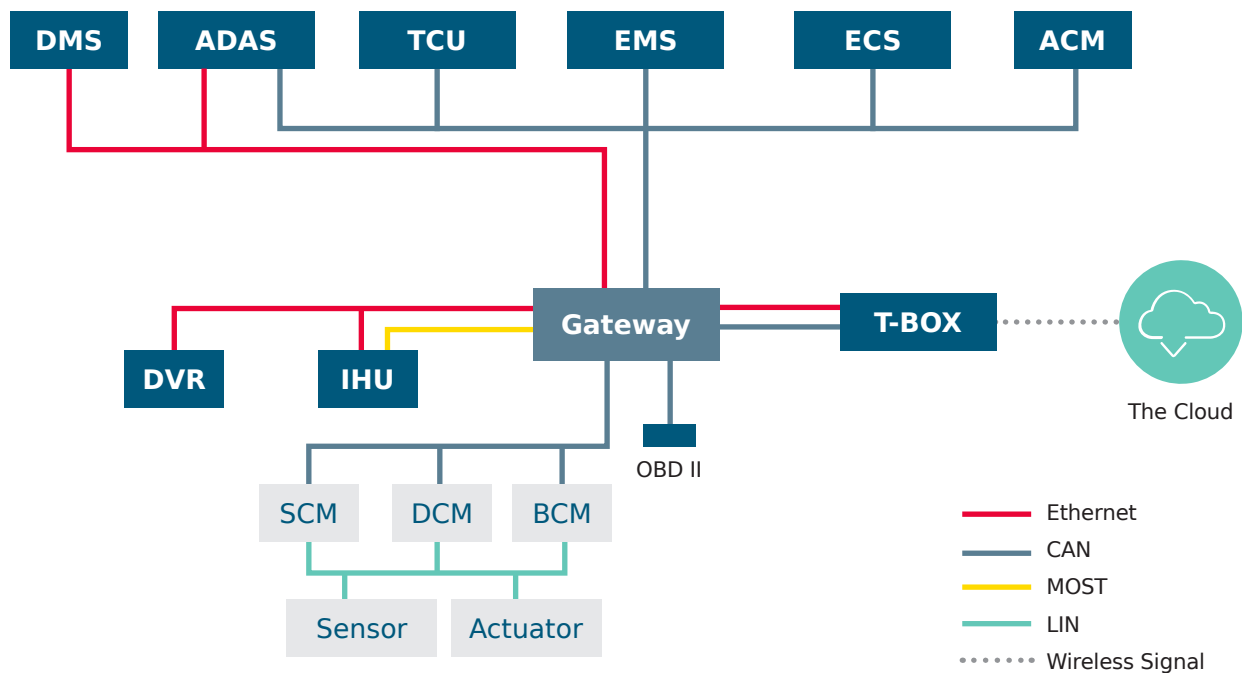
Existing Network Architecture



Future Network Architecture



- Local network CAN, CAN-FD, LIN
- LVDS 6Gbps (display)
- 100Mbps Ethernet UTP
- 1G+ network backbone
- USB 2.0



	APPLICATION DEVICE	MOLEX CONNECTOR
1	Gateway Control Module (Gateway)	Mini50 Unsealed
2	Infotainment Head Unit (IHU)	stAK50h
3	Telematics Control Unit (T-BOX)	Mini50 Unsealed
		ConnTAK50
4	Automobile Data Recorded (DVR)	Mini50 Unsealed
		ConnTAK50
		DuraClik



GATEWAY CONTROL MODULE (GATEWAY)

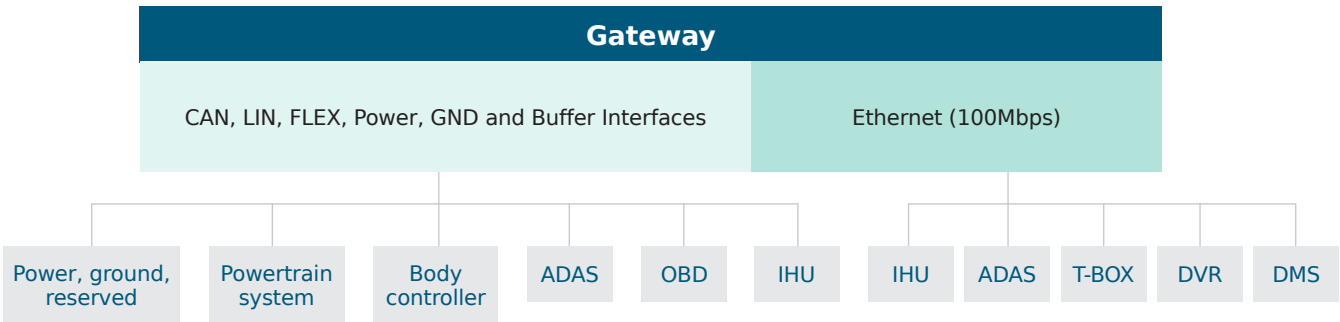
The gateway control module (gateway), similar to a car's centralized router, provides secure and reliable interconnections across multiple local area networks within a vehicle, enabling connected interactions between functional devices that share data.



MODULE DESIGN REQUIREMENT

Diversified Transmission Communications (CAN, LIN, Ethernet, etc.)

- These include interface requirements for regular 12-way (24-circuit) signal transmission, power management and other functions that enable data communication with body controls (SCM, DCM, BCM), powertrain systems (ECU, TCU), vehicle stability and safety systems (ABS, ESC), infotainment (IHU), and telematics (T-BOX).
- Also involves upgrades to an Ethernet gateway based on a traditional CAN gateway, with enhanced data transmission capability and functional advantages such as low weight, miniaturization and modularity. The Ethernet interfaces mainly deal with T-BOX, IHU, DVR, ADAS and OBD. Approximately 5 ways of megabit Ethernet lines.
- Delivers separate designs for the interfaces from low-speed, low-frequency signal transmission and Ethernet transmission communication for a reliable, secure, efficient and scalable gateway solution for multiple-transmission communications.



Flexibility of Configuration, Ease of Installation, Higher Reliability

- A gateway module is often mounted below or on one side of the console screen or around a pillar. The connectors are required to be smaller and more compact, saving space and reducing weight.
- To adapt to ever-changing, complex applications, connectors should meet automobile test criteria such as USCAR-2 or LV214.

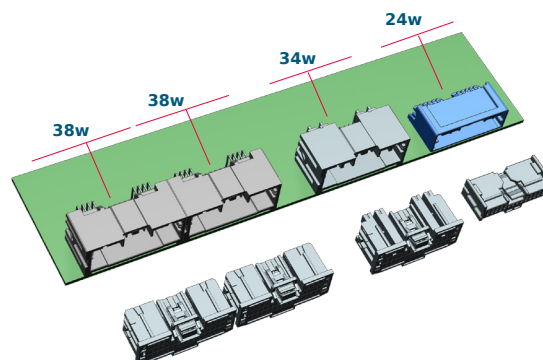


CONNECTOR SOLUTIONS

Mini50 Unsealed Connector System

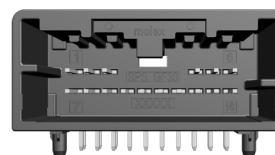
- CAN, LIN communications and power: Mini50 Connector 24-, 34- and 38-circuit options; 34 and 38 circuits for splicing.

Mini50 Connector Information		
Female terminal	560023-XXXX	
24-circuit	male 34897-824X	female 34824-124X
34-circuit	male 34961-834X	female 34959-034X
38-circuit	male 34961-838X	female 34959-038X
16-circuit	male 34897-XXXX	female 34824-XXXX

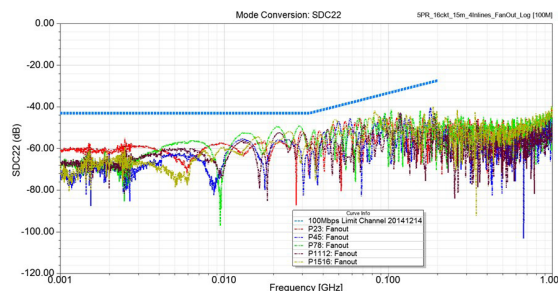


- 100Mbps Ethernet transmission: The Mini50 Connector 16-circuit version provides 5 separate unshielded twisted pairs for megabit transmission.

Mini50 Connector Information		
16-circuit	male 34897-XXXX	female 34824-XXXX

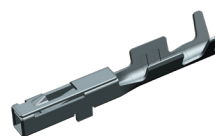
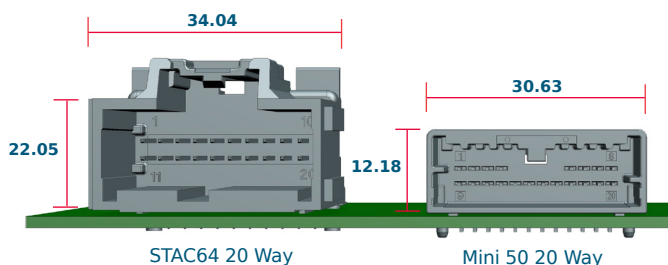


- The Mini50 Connector System provides Ethernet transmission capability that meets the test requirement for the BroadR-Reach (100Mbps) megabit Ethernet and the 1000BASE-T1 (1Gbps) gigabit Ethernet, catering to the demands for high-speed, highly cost-effective transmission.

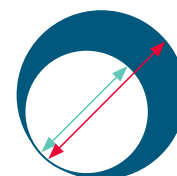


- Mini50 Connector products validate and meet USCAR-2 test specifications; they are T2-S1-V1 rated, with 4A maximum current on a single terminal.

- The Mini50 Connector System features a USCAR interface and CTX50 0.50mm terminal design that supports 0.13 to 0.35mm² conductor crimping. Compared to the 0.64mm connector system for USCAR interfaces, the smaller pitch design provides a 50% space savings. The 0.13mm² conductor saves 50% weight versus the 0.35mm² version. This system is in compliance with the USCAR-2 test specification, T2-S1-V1 rated, 4.0A maximum current on a single terminal.



CTX50 Terminal



50% WEIGHT SAVINGS

OD Max. 1.50
(0.13SQ)

OD Max. 1.40
(0.35SQ)



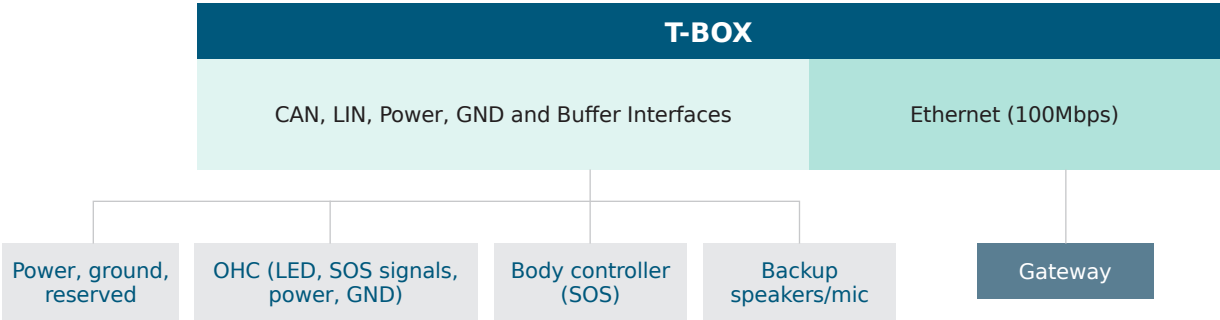
TELEMATICS CONTROL UNIT (T-BOX)

T-BOX provides connected vehicles with telecommunication interfaces for enhanced interactivity. According to the Administrative Provisions for the Entry of New Energy Vehicle Makers and Products by the Ministry of Industry and Information Technology of the People’s Republic of China, mounting in-vehicle ECUs has become mandatory for all new-energy vehicles since January 1, 2017, so the number of preinstalled T-BOXes for new-energy vehicles will grow significantly. As a source of big data, T-BOX provides real-time information on vehicle battery performance and complete vehicle condition information.

 MODULE DESIGN REQUIREMENT

Rapid Communication, Low Delay, Reduced Electromagnetic Interference

- Entails modular circuit management (B+, ACC+, GND, standby battery); standby speaker, MIC control; interconnection of LED, SOS signal and vehicle body control; around 20 circuits required total; about 3.0A maximum current required.
- Provides faster and more accurate transmission with gateway; 1 pair of megabit Ethernet (100base-T1 Ethernet UTP) applied for transmission, with enhanced bandwidth and a more cost-effective solution.
- Has separate connector interfaces designed for low-speed and Ethernet signal transmission lines, ensuring low interference and high fidelity.



Flat and Lightweight Module

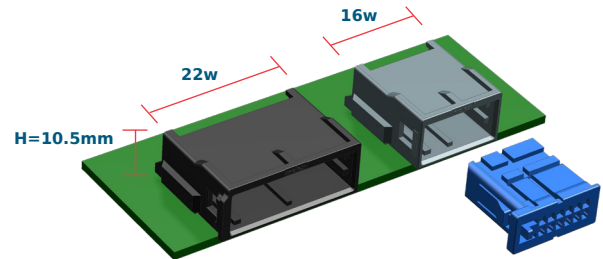
- As an embedded module, T-BOX is restricted in terms of mounting space, which is in most cases allocated to the sides of a vehicle’s console. Therefore, flat, compact and lightweight connector options work best.
- To meet complex, changing application installation requirements, connector products should meet automobile application test criteria such as USCAR-2 or LV214.



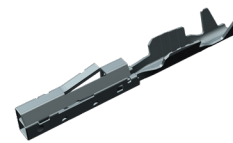
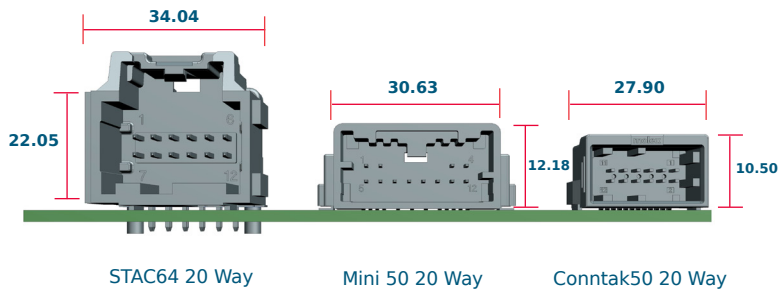
ConnTAK50 Connectors

- CAN, LIN communications and power: The ConnTAK50 Connector System, 20- and 22-circuit versions as options.

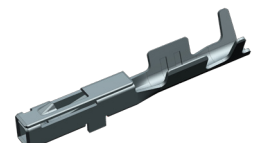
ConnTAK50 Connector Information		
Female terminal	200096-XXXX	
20-circuit	male 206958-22XX	female 205825-22XX
22-circuit	male 206958-22XX	female 205825-22XX



- Interface and side interlocking. The 0.50mm terminal design of ConnTAK50 and its 1.80mm pitch provide a 60% space savings compared to a USCAR 0.64 standard interface system; supports 0.13 to 0.35mm² conductor crimping; and can hold 6.0A maximum current on a single terminal. Compliant with LV214 test specification.



TAK50 Terminal

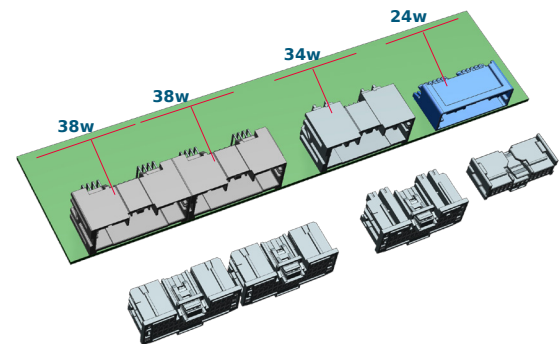


CTX50 Terminal

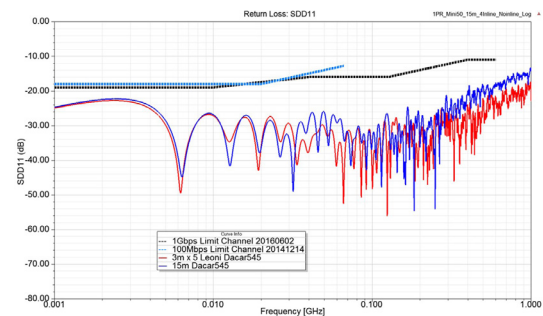
Mini50 Connectors

- CAN, LIN communications and power: The Mini50 Connector System, 20- and 24-circuit versions as options.

Mini50 Connector Information		
Female terminal	560023-XXXX	
24-circuit	male 34897-824X	female 34824-124X
2-circuit	male 34912-802X	female 34791-002X



- 100Mbps Ethernet transmission: The Mini50 Connector System 2-circuit versions can provide 1 pair of megabit or gigabit Ethernet transmission.
- Mini50 features standard USCAR interface and top interlocking. The 0.5mm terminal design of CTX50 and 2.00mm pitch support 0.13 to 0.35mm² conductor crimping; can hold 4.0A maximum current on a single terminal; and are in compliance with USCAR-2 test specifications.





INFOTAINMENT HEAD UNIT (IHU)

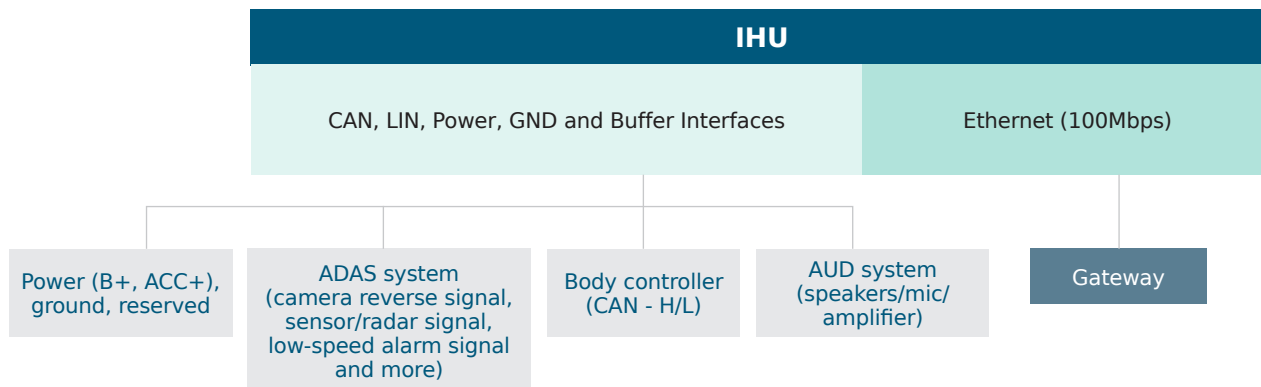
The infotainment head unit (IHU) is the information hub of a vehicle, providing integration of infotainment (radio, audio/video, streaming, display, etc.), navigation and positioning, and communication networks (Bluetooth, 3G/4G, Wi-Fi and others), as well as safety and security functions.



MODULE DESIGN REQUIREMENT

Integrated Functions, High Power and Current

- The design of the IHU includes low-voltage power and ground lines; low-, mid- and high-pitch speaker audio control; power amplifier control; microphone control; T-BOX interconnection; rearview camera connection; reverse signal reception; low-speed pedestrian alarm (as per EV regulations). It requires about 10 to 20 circuits (20 to 40 pins) for the control of the CAN, LIN and MIC as well as the speakers; 1 circuit for power grounding (2 to 4 pins) and 1 circuit for 100Mbps UTP Ethernet interface and gateway communication.
- Around 10.0A maximum current is required, which is mainly used for providing sufficient source power for the normal operation of the amplifiers or speakers; 3.0 to 4.0A maximum current is required for other aspects.



Safety-Rated (Highly Flame Resistant), Miniaturized

- The host provides a wide variety of external interfaces by taking into account a reasonable onboard layout and minimum EMI. Separate designs for different transmission protocols with compatibility for signal and power circuits result in greater challenges for onboard space.
- As per the most current Revision 3 of IEC 62368-1 (audio/video, information and communication technology equipment—part 1: safety requirements), a series of processes would be applied for assessing the possibility of electrical fires on the basis of safety engineering against potential hazards, and necessary protective measures would be taken. The fire rating for the use of a power connector will also be enhanced to V1 or V0. The new requirements took effect in North America (including the United States and Canada) and Europe on December 20, 2020.



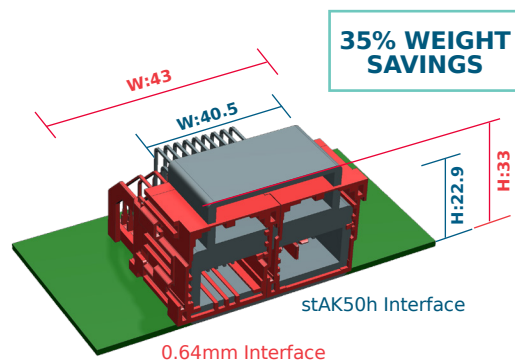
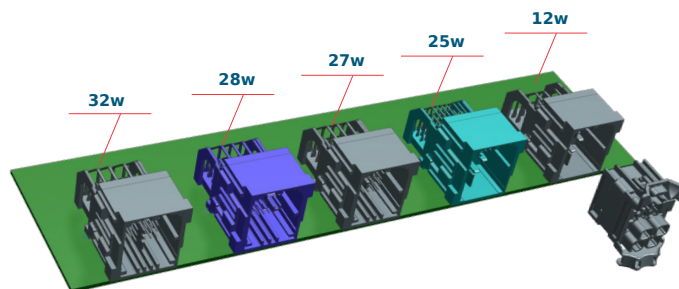
CONNECTOR SOLUTIONS

stAK50h Connectors

- CAN, LIN communications and power: StAK50h Unsealed Hybrid Connectors; 12-, 25-, 27/28- and 32-circuit versions; splicing supported between the interfaces.

stAK50 Connector Information		
	MALE	FEMALE
12-circuit	200502-XXXX	160026
25-circuit	200502-XXXX	160027
27-circuit	200502-XXXX	160029
28-circuit	200502-XXXX	160014
32-circuit	200502-XXXX	160028

- StAK50h Connectors feature a compact profile, on which the height and especially the width are much smaller than those of the 0.64mm system and has a 25.70mm interface width.
- StAK50h Connectors provides HB and V0 flame-resistant versions, complying with USCAR-2 test requirements.



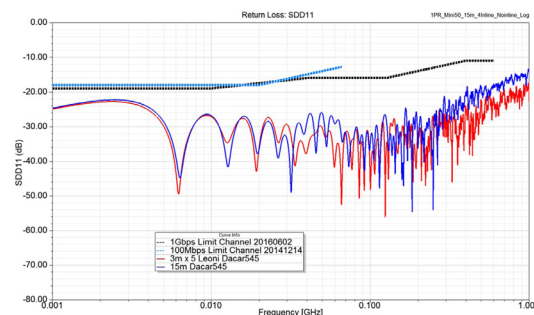
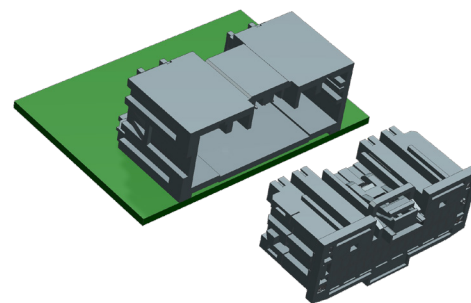
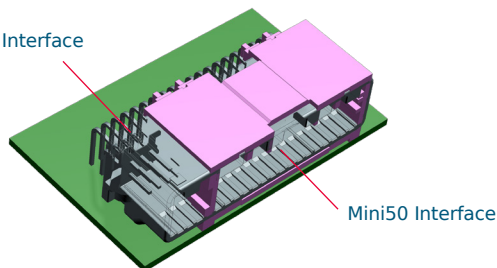
Mini50 Connectors

- CAN, LIN communications and power: Mini50 Unsealed Hybrid Connectors 34-circuit versions; splicing supported.

Mini50 Connector Information		
Female terminal	560023-XXXX	
34-circuit	male 34958-824X	female 34959-124X
2-circuit	male 34912-802X	female 34791-002X

- 100 Mbps Ethernet transmission: Mini50 Connectors 2-circuit versions provide 1 pair of megabit or gigabit Ethernet transmission.
- The Mini50 Connector 34-circuit product provides a 3-row pin design and more compact height design, with a 16.60mm interface height.

0.63mm 40 Pins Interface



- The 34-circuit Mini50 Connector provides HB and V0-flame-resistant versions, complying with USCAR-2 test requirements.

AUTOMOBILE DATA RECORDER (DVR)

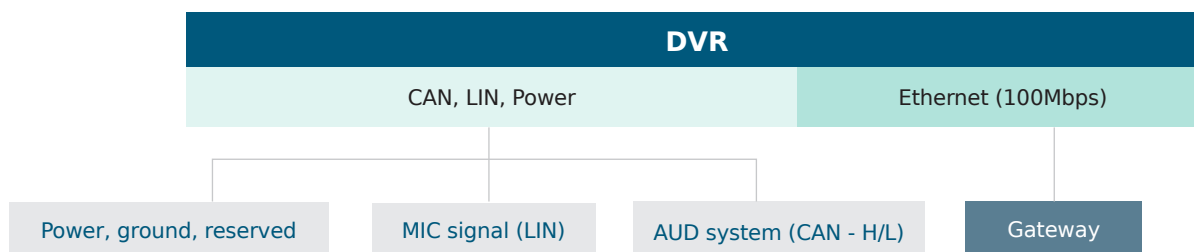
An automobile data recorder functions like an airplane's "black box," providing digital video recording and cyclic refreshing of data on conditions in front of, within and surrounding the vehicle. The data includes information on functions such as in-vehicle recording, vehicle acceleration, and steering and braking for reference during investigations into traffic accidents.



MODULE DESIGN REQUIREMENT

Integrated Functions, Small Footprint, Convenient Installation

- A DVR incorporates video recording, LED, microphone, SD card storage, external communication and linking to a gateway and host. Its signal transmission and power management require an interface with 5 circuits in total, including a 1-way 100Mbps UTP Ethernet interface for communication with other modules.
- Since it's an embedded module mounted on the interior mirror or within other narrow spaces, its external dimensions must be compact. The onboard space layout poses significant challenges, requiring routing flexibility for outgoing circuitry and appropriate interlocking devices.

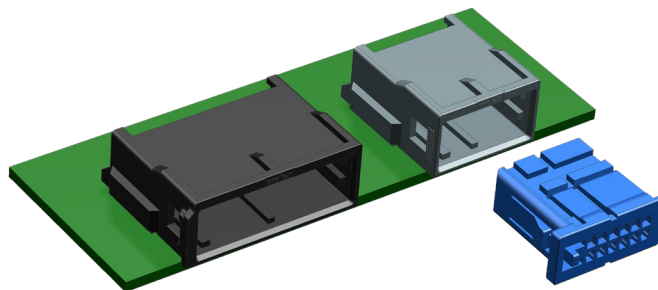




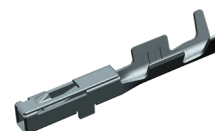
CONNECTOR SOLUTIONS

ConnTAK50

- CAN, LIN communications and power: With 8-, 10- and 12-circuit ConnTAK50 Connectors; 6.0A maximum current on a single terminal.
- ConnTAK50 Connectors feature a standard AK interface, compact design and 0.50mm TAK50 terminal; its 0.13 to 0.35mm² conductor crimping capability reduces the total weight of the harness.
- ConnTAK50 products validate and meet LV214 and USCAR-2 test specifications. T2-V1-S1.



TAK50 Terminal

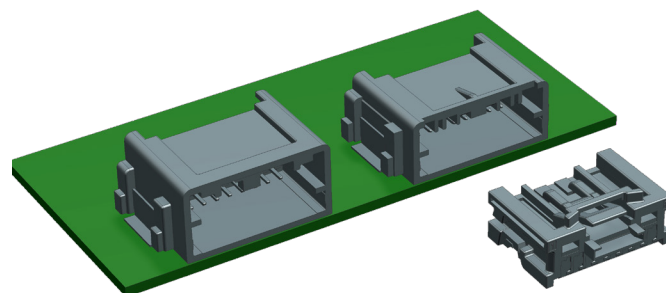


CTX50 Terminal

ConnTAK50 Connector Information		
Female terminal	200096-XXXX	
8-circuit	male 209658-208X	female 205825-208X
10-circuit	male 206958-210X	female 205825-210X
12-circuit	male 206958-212X	female 205825-212X

Mini50

- CAN, LIN communications and power: 8- and 12-circuit Mini50 Connectors as options. 4.0A maximum current on a single terminal.
- The 2-circuit Mini50 2-Connector provides 1 separate pair of megabit or gigabit Ethernet transmission that connects to the gateway.
- Mini50 Connectors feature a standard USCAR interface and a CTX50 0.50mm terminal; their 0.13 to 0.35mm² conductor crimping capability reduces the total weight of the harness. Complies with USCAR-2 test specifications.
- Mini50 products validate and meet USCAR-2 test specifications. T2-V1-S1.

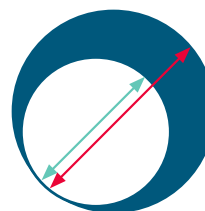


Mini50 Connector Information		
	MALE	FEMALE
8-circuit	4912-808X	34791-018X
12-circuit	34897-812X	34791-018X
2-circuit	34912-XXXX	4791-002X

50% WEIGHT SAVINGS

OD Max. 1.50
(0.135Q)

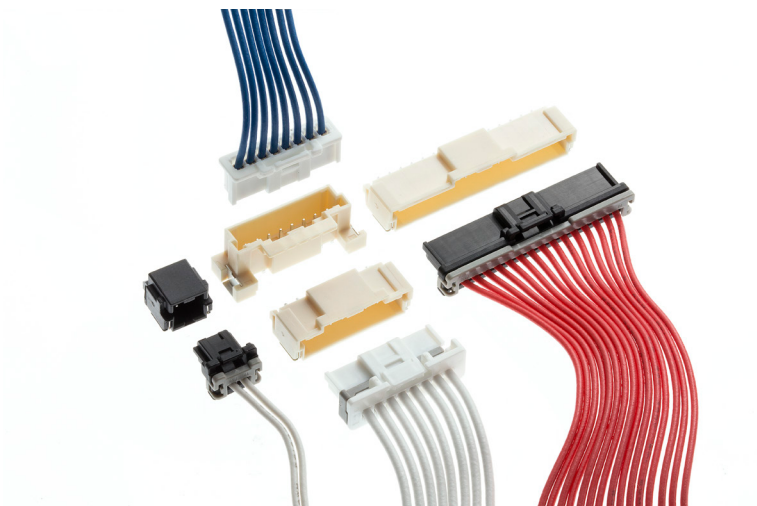
OD Max. 1.40
(0.355Q)



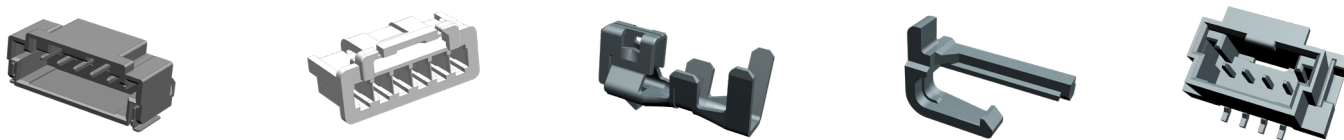
DuraClik ISL

- CAN, LIN communications and power: DuraClik Connectors with 6 to 12 circuits. 3.0A current rating.
- DuraClik Connectors feature a single-row design, with a 6.40mm overall height; their 2.00mm pitch and embedded solder tabs help reduce the width. SMT soldering does not occupy back panel space, improving the PCB utilization.
- DuraClik products validate and meet LV214 test specifications.T3-V2-S1.

DuraClik Connector Information		
Male	502352-XXXX	560020-XXXX
Female	560123-XXXX	
Secondary Lock	560125-XXXX	
Terminal	560124-XXXX	



- DuraClik Connectors provide a small footprint and superior performance.



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