



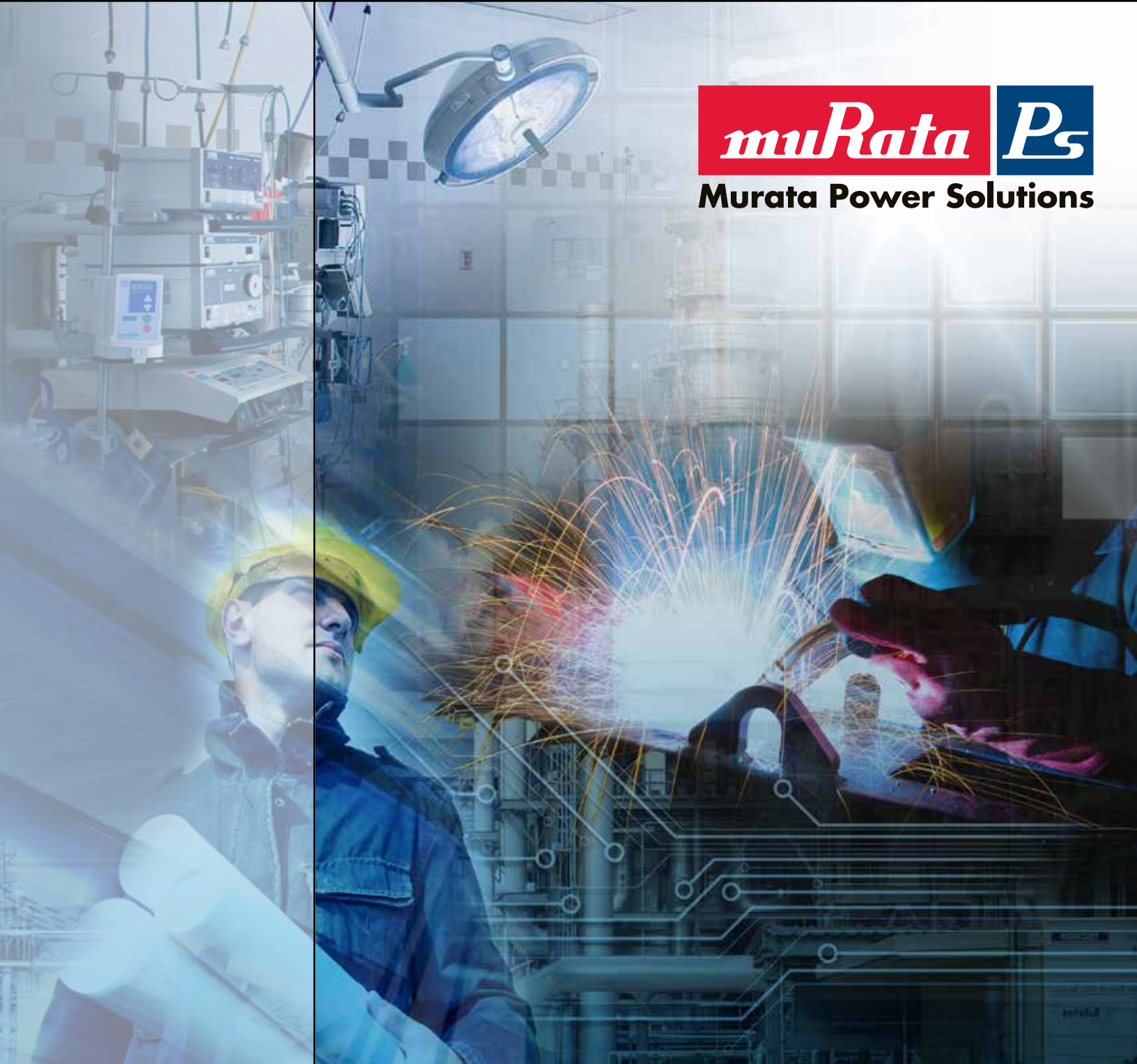
A Berkshire Hathaway  
Company

# MURATA POWER SOLUTIONS

## DC-DC Converter

### Product Selection Guide

[www.ttiinc.com](http://www.ttiinc.com)



***muRata*** **Ps**  
**Murata Power Solutions**

The Specialist in Electronic Component Distribution

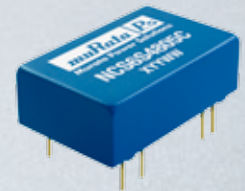
# Focus Products – Isolated, Low Power DC-DC Converters

- Regulated and unregulated solutions
- Single, dual and triple output models available
- Small footprints - SIP and DIP pinouts
- Wide temperature ranges
- Robust designs - fully encapsulated, internal SMD construction, UL 94V-0 package material
- UL recognized models available



Low Power Isolated Single Output (*Regulated)					
Series	Rating	Current Range	Package	Input(s)	Output(s)
LME	0.25W	16-50mA	SIP4/DIP8	3.3V, 5V, 12V	5V, 9V, 12V, 15V
MEE1	1W	67-303mA	SIP4/DIP8	3.3V, 5V, 12V, 15V, 24V	3.3V, 5V, 9V, 12V, 15V
MER1	1W	67-200mA	SIP7	5V, 12V, 15V, 24V, 48V	5V, 9V, 12V, 15V
MEV1	1W	67-200mA	SIP7/DIP14	5V, 12V, 15V, 24V, 48V	5V, 9V, 12V, 15V
MTU1	1W	67-200mA	SMD	3.3V, 5V, 12V	5V, 9V, 12V, 15V
NKE	1W	66-203mA	SIP4/DIP8	3.3V, 5V, 12V	3.3V, 5V, 9V, 12V, 15V
NME	1W	42-200mA	SIP4/DIP8	5V, 12V, 15V, 24V, 48V	5V, 9V, 12V, 15V
NMF	1W	67-100mA	SIP7/DIP14	5V, 12V, 24V, 48V	5V, 9V, 12V, 15V
NMJ	1W	67-100mA	SIP7	3.3V, 5V, 12V	3.3V, 5V, 9V, 12V, 15V
NMR	1W	67-200mA	SIP7	5V, 12V, 15V, 24V	5V, 12V, 15V
NMV	1W	67-200mA	SIP7/DIP14	5V, 12V, 15V	5V, 9V, 12V, 15V
NTE	1W	67-303mA	SMD	3.3V, 5V, 12V	3.3V, 5V, 9V, 12V, 15V
PWR13	1.5W	100-300mA	DIP24	5V, 12V, 15V	5V, 12V, 15V
NDL	2W	134-400mA	SIP8	5V, 12V, 24V, 48V - 2:1	5V, 9V, 12V, 15V (*)
NMG	2W	133-400mA	SIP7	5V, 12V	5V, 9V, 12V, 15V
NMK	2W	133-400mA	SIP7	5V, 12V, 15V, 24V	5V, 9V, 12V, 15V
NML	2W	134-400mA	SIP4	5V, 12V	5V, 9V, 12V, 15V
MEE3	3W	200-600mA	SIP4	5V, 12V	5V, 9V, 12V, 15V
MEV3	3W	200-600mA	SIP7	5V, 12V	5V, 9V, 12V, 15V
NDTS	3W	200-909mA	DIP24	5V, 12V, 24V, 48V - 2:1	3.3V, 5V, 12V, 15V (*)
NDY	3W	200-909mA	DIP24	5V, 12V, 24V, 48V - 2:1	3.3V, 5V, 9V, 12V, 15V (*)
UST	3W	200-500mA	STD DIP	Ranges 4.5-9V, 9-18V, 18-72V	5V, 12V, 15V (*)
NCS6	6W	0.4-1.52A	DIP24	Ranges 9-36V, 18-75V	3.3V, 5V, 12V, 15V (*)
NDS6	6W	0.4-1.2A	DIP24	Range 18-36V	5V, 12V, 15V (*)

Low Power Isolated Dual Output (*Regulated)					
Series	Rating	Current Range	Package	Input(s)	Output(s)
MEA1	1W	67-200mA	SIP7/DIP14	5V, 12V, 15V, 24V, 48V	5V, 9V, 12V, 15V
MEV1	1W	67-200mA	SIP7/DIP14	5V, 12V, 15V, 24V, 48V	5V, 9V, 12V, 15V
MTU1	1W	67-200mA	SMD	3.3V, 5V, 12V	5V, 9V, 12V, 15V
NKA	1W	67-304mA	SIP6/DIP14	3.3V, 5V, 12V	3.3V, 5V, 9V, 12V, 15V
NMA	1W	66-200mA	SIP7/DIP14	5V, 12V, 15V	5V, 9V, 12V, 15V
NMD	1W	134-200mA	SIP7/DIP14	5V, 12V	3.3V, 5V, 9V, 12V, 15V - Twin
NMJ	1W	67-200mA	SIP7	5V, 12V	5V, 9V, 12V, 15V
NMV	1W	67-200mA	SIP7/DIP14	5V, 12V, 15V	5V, 9V, 12V, 15V
NTA	1W	66-304mA	SMD	3.3V, 5V, 12V	3.3V, 5V, 9V, 12V, 15V
NTV	1W	66-200mA	SMD	5V, 12V	5V, 9V, 12V, 15V
PWR13	1.5W	100-300mA	DIP24	5V, 12V, 15V	5V, 12V, 15V
NMH	2W	134-400mA	SIP7/DIP14	5V, 12V, 24V, 48V	5V, 9V, 12V, 15V
NMK	2W	134-400mA	SIP7	5V, 12V, 15V, 24V	5V, 9V, 12V, 15V
NMS	2W	134-400mA	DIP24	5V, 12V	5V, 9V, 12V, 15V
NTH	2W	134-400mA	SMD	5V, 12V	5V, 9V, 12V, 15V
BST	3W	85-250mA	STD DIP	Ranges 4.5-9V, 9-18V, 18-72V	5V, 12V, 15V (*)
NDH	3W	125-200mA	SIP9	Ranges 18-36V, 24-48V, 36-72V	12V, 15V (*)
NDTD	3W	200-909mA	DIP24	5V, 12V, 24V, 48V - 2:1	3.3V, 5V, 12V, 15V (*)
NCS6	6W	0.4-1.2A	DIP24	Ranges 9-36V, 18-75V	5V, 12V, 15V (*)
NCS6	6W	0.4-1.2A	DIP24	Range 18-36V	5V, 12V, 15V (*)



Low Power Isolated Triple Output					
Series	Rating	Current Range	Package	Input(s)	Output(s)
NMT	3W	77-126mA	SIP8	5V, 12V	-24V, -48V, -72V Triple

## Focus Products - Isolated Medium to High Power DC-DC Converters

- Isolated industrial power 5-60W
- Ultra-wide 4:1 input ranges available
- Single, dual and triple outputs
- 1"x1", 1"x1.25", 1"x2", 1.6"x2", 2"x2" and other standard industrial form factors

Industrial Package Styles – Regulated Output					
Series	Rating	Current Range	Package	Input(s)	Output(s)
PWR	5W	180-334mA	STD Industrial*	Ranges 4.5-5.5V, 7-16V, 10-18V	15V - Bipolar Out
NPH10S	10W	0.67-2.94A	1"x1.25"	Ranges 18-36V, 36-75V	3.4V, 5.1V, 12.1V, 15.1V
NPH15S	15W	1-4.4A	1"x2"	Ranges 18-36V, 36-75V	3.4V, 5.1V, 12.1V, 15.1V
TWR	11W	1.1-1.4A	1"x2"	Ranges 4.7-7V, 9-18V, 18-36V, 36-72V	5V & +/-12V, +/-15V Triple Out
TWR	20W	4A	2"x2"	Ranges 9-36V, 18-75V	5V & +/-12V, +/-15V Triple Out
TWR	22W	3.5-4.6A	1"x2"	Ranges 10-18V, 18-36V, 36-72V	3.3V or 5V & +/-12V, +/-15V Triple Out
DWR	15W	3A	1"x2"	Ranges 10-18V, 18-36V, 36-75V	5V & 3.3V Dual Out
BE115	15W	1-3A	1"x1"	Ranges 9-36V, 18-75V	5V, 12V, 15V - Bipolar Out
BWR	17W	1.15-3A	1"x2"	Ranges 10-18V, 18-36V, 36-75V	5V, 12V, 15V - Bipolar Out
BWR	20W	1-3.4A	2"x2"	Ranges 4.7-7.5V, 9-36V, 18-75V	5V, 12V, 15V - Bipolar Out
UWR	3W	200-500mA	24-pin DIP	Ranges 4.5-9V, 9-18V, 18-72V	5V, 12V, 15V
UWR	5W	335-1000mA	1"x1"	Ranges 18-36V, 36-72V	5V, 12V, 15V
UWR	10W	530-2000mA	1"x2"	Ranges 4.7-7.25V, 9-18V, 18-75V, 18-36V	5V, 12V, 15V
UWR	15W	1-4.5A	1"x2"	Ranges 10-18V, 18-36V, 36-75V	3.3V, 5V, 12V, 15V
UWR	40W	7-9A	2"x2"	Ranges 10-18V, 18-36V, 36-75V, 36-72V	3.3V, 5V
UHE	30W	2-7.5A	1.6"x2"	12V, 24V, 48V - 2:1 & 24V, 48V - 4:1	3.3V, 5V, 12V, 15V
UE115	15W	1.1-5A	1"x1"	Ranges 9-36V, 18-75V	3.3V, 5V, 12V, 15V
UE125	25W	2.1-7.5A	1"x1"	Ranges 36-75V	3.3V, 5V, 12V
UE130	30W	2-9A	1"x2"	Ranges 9-36V, 18-75V	3.3V, 5V, 12V, 15V
UEI	60W	3.3-18A	STD Industrial*	Ranges 9-36V, 18-75V, 36-75V	3.3V, 5V, 12V, 15V
RUW15	15W	0.125-0.625A	2"x2"	Ranges 16-160V	12V, 24V

\*Footprints accepted and adopted by the power industry



## Industrial

- Building automation
- Distributed power architecture (DPA)
- Factory automation/ process controls
- Instrumentation
- Lighting
- Motor control/power
- Process automation equipment
- Production equipment
- Test & Measurement
- Wafer handling equipment

## Medical

- CT scanners
- Diagnostic equipment (i.e. blood analyzers)
- Instrumentation
- Non-patient contact equipment (i.e. plasma separators)
- Test & Measurement

## Transportation

- Distributed power architecture (DPA)
- Motor control/power
- Rail



# Broad Market Applications

## If There is a Transistor, There is a Power Converter

## DC-DC Converter Terminology

**Buck Converter** – Common converter design that does not use a transformer and the output voltage is always less than the input voltage. Also known as a step down converter.

**Boost Converter** – Common converter design with an output voltage greater than its input voltage. Contains at least two semiconductor switches and at least one energy storage element (a capacitor, inductor, or a combination of the two).

**Distributed-power Open Standards Alliance (DOSA)** – A number of competing companies joined to promote open standard POL market. Open standard offering based on standard pinout and features. Pin to pin compatibility critical in addressing possible second source concerns. Product feature may be the same, but performance may differ supplier to supplier.

**Efficiency** – The difference between power consumed at the input of a power supply and that available at the output, usually stated in percent.

**Communications**

- Air traffic control
- LAN/WAN
- RF/Microwave
- Telecom switches

**Consumer**

- Appliances
- Audio equipment
- Video equipment

**Computer**

- Computing
- Mobile routers
- Peripherals
- Ruggedized computers
- Server equipment
- Storage equipment
- Super computer
- Workstations

**Business Machines**

- Business equipment
- Camera surveillance
- Education equipment
- Instrumentation
- Passenger screening
- Process automation equipment
- Retail equipment
- Security
- Ticketing



**Holdup Time** – The time under worst case conditions during which a power supply's output voltage remains following the loss of input power.

**Isolation** – The maximum voltage applied to the input of a power supply that can be isolated from the output of that supply, in the event of a failure.

**Load** – Capacitance, resistance, inductance in any combination, which, when connected across a circuit determines current flow and power used.

**Negative Remote Control Logic** – The DC-DC logic will be inhibited and not start up if the RC pin is logic high.

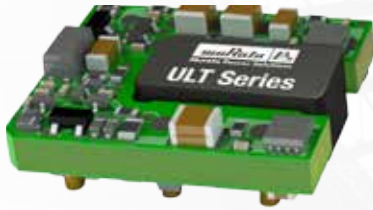
**Point of Load (PoL)** – Supply regulator placed close to the microcontroller or ASIC to solve the challenge of high peak current and low noise demands.

**Point of Load Alliance (POLA)** – A number of competing companies working in an alliance to promote, market and sell PoL converters designed by Texas Instruments.

**Positive Remote Control Logic** – The DC-DC converter will automatically start up with application of input voltage if the RC pin is logic high.

## Focus Products - Isolated Medium to High Power DC-DC Converters (Continued)

- Isolated telecom brick power 30 - 360W
- Ultra-wide 4:1 input ranges available
- Available in 1/32, 1/16, 1/8, 1/4 and 1/2 brick form factors



Brick Package Styles (DOSAs) - Regulated Output					
Series	Rating	Current Range	Package	Input(s)	Output(s)
ULT	30W	2.5-7.5A	1/32 Brick	Range 36-75V	3.3V, 5V, 12V
UWS	54W	4.5-15A	1/16 Brick	Range 18-75V	3.3V, 5V, 12V
ULS	66W	2-20A	1/16 Brick	Range 36-75V	3.3V, 5V, 12V
ULE	72W	1.25-20A	1/8 Brick	Ranges 9-18V, 18-36V, 36-75V	1.5V-48V
UEE	99W	15-30A	1/8 Brick	Range 36-75V	3.3V
UCE	120W	8.3-40A	1/8 Brick	Range 36-75V	1.2V-12V
UWE	120W	3-20A	1/8 Brick	Ranges 9-36V, 18-75V	3.3V, 5V, 12V, 15V, 24V
UQQ	105W	4-25A	1/4 Brick	Ranges 9-36V, 18-75V	3.3V, 5V, 12V, 15V, 24V
UVQ	120W	2.5-40A	1/4 Brick	Ranges 18-36V, 36-75V	1.5V-48V
UCQ	132W	8.3-40A	1/4 Brick	Ranges 18-36V, 36-75V	1.2V-15V
UWQ	204W	17A	1/4 Brick	Range 18-75V	12V
HPQ	300W	22-50A	1/4 Brick	Range 36-75V	3.3V, 8.3V, 12V
UCH	150W	6.7-40A	1/2 Brick	Ranges 18-36V, 36-75V	1.8V-15V
HPH	360W	30-70A	1/2 Brick	Range 36-75V	3.3V, 5V, 12V

## What is an Isolated Brick?

An Isolated Brick converts a DC input voltage ( $V_{in}$ ) to an electrically and physically isolated DC Output Voltage ( $V_{out}$ ).

- An Isolated brick incorporates a high frequency transformer which provides a barrier between the primary side and the secondary side of the DC-DC converter.
- Many safety agencies and/or customers require a separation from the applied input voltage and the output voltage of a DC-DC.
- Isolation eliminates/reduces noise that is generated from the system bus from appearing on the output side of the DC-DC.
- The output of an isolated brick can be configured to be either positive or negative.

## Why use Isolated Bricks?

### Safety requirements

- UL60950 information technology equipment - SELV (Safety Extra Low Voltage) requirements
- UL60950 isolation or insulation requirements
- UL60601 isolation requirements for medical equipment
- Agency approvals
- Eliminate noise from a system bus
- Eliminate ground loop noise
- Wireless infrastructure equipment 18-75V<sub>in</sub> range, multiple installation voltages
- Industrial applications requiring 9-36V<sub>in</sub> range (i.e. 12Vdc/24Vdc battery source)

## Focus Products - DOSA PoLs, Non-Isolated Programmable Output

- Programmable output voltage
- Wide input voltage range
- Overcurrent protection
- Over temperature protection
- Industry accepted standard package and pinouts in SMT and SIP
- On/off control
- Pre-bias immunity
- Monotonic startup
- Sequence/tracking
- Ideal for powering the latest generation of FPGAs (Field-programmable gate arrays) and DSPs (Digital Signal Processors)
- Tightly regulated output



## Point of Load DC-DC Converters

Non-Isolated (PoL) - Regulated Output					
Series	Rating	Current Range	Package	Input(s)	Output(s)
<b>78xxSR</b>	4.8W	400-500mA	SIP3/LM78XX Pinouts	Range 7.5-36V	3.3V, 5V, 12V
<b>OKI-78SR</b>	7.5W	1.5A	SIP horizontal or vert.	Range 7-36V	3.3V, 5V
<b>OKL</b>	15W	3-6A	DOSA-SMT iLGA	Range 4.5-14V	0.591-5.5V programmable
<b>OKR</b>	50W	3-10A	SIP	Range 4.5-14V	0.591-6.0V programmable
<b>OKI</b>	36W	3A	DOSA-SMT	Range 19-40V	5.021-15.5V programmable
<b>OKX</b>	80W	3-10A	DOSA-SIP	Range 8.3-14V	0.7525-5.5V programmable
<b>OKY</b>	80W	3-10A	DOSA-SMT	Range 8.3-14V	0.7525-5.5V programmable
<b>LSM2</b>	125W	30A	DOSA-SMT	Range 6-14V	0.8-5V programmable
<b>LSN2</b>	150W	30A	DOSA-SIP	Range 6-14V	0.8-5V programmable

## Advantages of Using PoL Modules

- Ease of use
  - Need input and output capacitors only, and one resistor to program the output voltage
  - Layout, control loop stability, noise issues and protection are resolved in the module
- Multiple sourcing is available via DOSA
- Board savings versus discrete parts design
- Reduced BOM since one module replaces multiple discrete parts
- Higher efficiency is typical versus low profile IC-type DC-DCs



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There's a TTI location near you



## Murata Power Solutions DC-DC Converter Product Selection Guide

### Competitors

- Delta Electronics
- Emerson Network Power (Astec & Artesyn)
- Ericsson
- TDK Lambda
- Vicor
- Traco
- Lineage Power
- Power-One
- SynQor
- Recom

### Questions to Ask

Do you use off-the-shelf power converters or do you build your own power converters?

What is the overall power required (W)?

Do you require an isolated or non-isolated DC-DC converter?

How many output voltages are required and what are they?

What package style is preferred? SMT, or through-hole?

What input ranges need to be covered?

Are you interested in developing a strategic power supply sourcing strategy?

### DC-DC Converter Selection Guide Index

Do you need a point of load converter? *If Yes, go to page 7*

Are you looking for a low power option in a SIP or DIP package? *If Yes, go to page 2*

Do you need an isolated DC-DC converter for an UL60601 medical application? *If Yes, go to page 2, 3 or 6*

Are you looking for an industrial package? *If Yes, go to page 3*

Are you going to use a DOSA compliant brick package? *If Yes, go to page 6*



**Murata Power Solutions isolated bricks  
have UL and CSA approvals**



Scan the code for more information  
about Murata Power Solutions.