

Murata Power Solutions

# DC-DC converters for rail and transportation

*Designed for the most demanding applications*



# Empowering innovations in transportation

Murata's rail, transportation, and industrial DC-DC converters are designed to provide isolated DC power for applications requiring high reliability in demanding conditions.

Utilizing the latest in technology development, Murata's DC-DC converters are able to cover a wide range of battery input voltages from 9V to 160V DC in a single module (with input voltage ratios up to 10:1). Specific nominal battery input voltage range converters are also available. Products are suitable for both onboard and trackside rail applications, as well as industrial/manufacturing and farming equipment and e-mobility applications.

## Murata's IR series

### For transportation applications

#### Features

- 1/2, 1/4, 1/8, and 1/16 brick formats
- Input voltage ranges from 9-160V
- Stable no-load operation
- -40°C up to 85°C (ambient) and 110°C (case) operating temperature
- Baseplate and flange package options
- High efficiency - up to 91.5%
- 3.3V, 5V, 12V, and 24V output
- Tight line and load regulation
- 3000V RMS input/output isolation
- Dipped varnish coating

#### Travelers' cabin

- Wi-Fi®
- Infotainment
- Lighting
- Air conditioning
- Smoke alarm

#### Facilities

- Door opening control
- Washrooms
- Passenger counter
- Smart sand
- Public address system

#### Driver's cabin

- Cab radio
- Displays
- Wipers
- CCTV
- Headlights

#### Propulsion

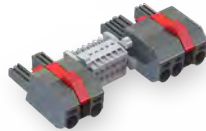
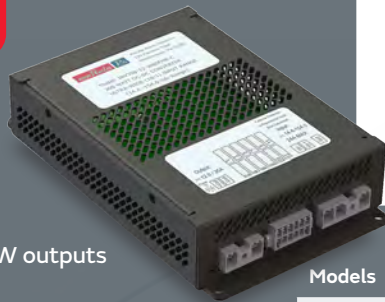
- Braking
- Axle monitor
- Drive control
- PTC
- Sensor

#### Trackside

- Signaling
- Level crossing
- Communications
- Lighting
- Thermal rail

# Ultra-wide (10:1) input chassis mount DC-DC converters

By utilizing proprietary technologies and our component selection process, Murata has developed a range of ultra-wide (10:1) input voltage ratio DC-DC converters, in both component “brick” style format and stand-alone fully EN50155 compliant and chassis mount solutions.



## IRV300 series

- 16V – 160V DC input
- 12V, 24V, 48V/54V @ 300W outputs
- Compliant to EN50155, EN45545, EN50121
- Environmentally qualified
- -40°C to +70°C operating (+85°C for 10 minutes)
- Optional holdup, parallel functions
- Connector kit available

## Products support EN50155:2017

Nominal input	Variation range of nominal input (0.7-1.25 x Vin)	Brownout 100ms (0.6 x Vin)	Transient 1s (1.4 x Vin)
24V	16.8V – 30V	14.4V	33.6V
28V	19.6V – 35V	16.8V	39.2V
36V	25.2V – 45V	21.6V	50.4V
48V	33.6V – 60V	28.8V	67.2V
72V	50.4V – 90V	43.2V	100.8V
96V	67.2V – 120V	57.6V	134.4V
110V	77V – 137.5V	66V	154V

Models	Vin Range (V)	Vout (V)	Iout (A)	Pout (W)	Vin Nom (V)	Package
IRV300-54W80xx-C	16-160	54/48	5.5	300	72	CHASSIS
IRV300-24W80xx-C	16-160	24	12.5	300	72	CHASSIS
IRV300-12W80xx-C	16-160	12	25	300	72	CHASSIS
IRV300-MCK	Mating connector kit IRV300 series					

## IRH/IRQ W80 series

- 16V – 160V DC 10:1 input range
- 250W 1/2 brick or 150W 1/4 brick option
- Hold-up function pin
- -40°C to +100°C temperature range
- 12V, 24V, 48V/54V outputs
- Under voltage lockout feature
- Remote sense
- ±10% adjustment range
- Extremely high efficiency
- EN50155 compliant



Models	Vin Range (V)	Vout (V)	Iout (A)	Pout (W)	Vin Nom (V)	Package
IRH-54/4.7-W80xx-C	16-160	54	4.7	250	72	1/2 BRICK
IRH-24/10.5-W80xx-C	16-160	24	10.5	250	72	1/2 BRICK
IRH-12/21-W80xx-C	16-160	12	21	250	72	1/2 BRICK
MP-HW80EVAL-01	16-160			250	72	1/2 BRICK



Models	Vin Range (V)	Vout (V)	Iout (A)	Pout (W)	Vin Nom (V)	Package
IRQ-24/6.25-W80xx-C	16-160	24	6.25	150	72	1/4 BRICK
IRQ-12/12.5-W80xx-C	16-160	12	12.5	150	72	1/4 BRICK
MP-QW80EVAL-01	16-160			150	72	1/4 BRICK



### Evaluation boards

- EMC filtering (EN50155)
- Output adjustment
- Cage clamp connectors
- LED indication
- Remote on/off
- Full signals interfacing
- Hold-up

## IR series selection guide

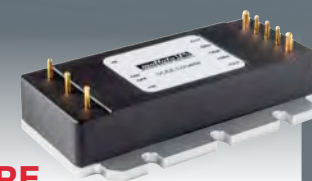
Series	Models	Vin Range (V)	Vout (V)	Iout (A)	Pout (W)	Vin Nom (V)	Package
IRH-T110	IRH-24/6.3-T110xx-C	54/48	24	6.25	150	110	1/2 BRICK
	IRH-12/12.5-T110xx-C	24	12	12.5	150	110	1/2 BRICK
	IRH-5/30-T110xx-C	57.6-160	5	30	150	110	1/2 BRICK
	IRH110-EVAL	57-160			150	110	1/2 BRICK
IRQ-T110	IRQ-24/4.2-T110xx-C	57.6-160	24	4.2	100	110	1/4 BRICK
	IRQ-12/8.3-T110xx-C	57.6-160	12	8.3	100	110	1/4 BRICK
	IRQ-5/20-T110xw x-C	57.6-160	5	20	100	110	1/4 BRICK
	IRQ110-EVAL	57-160			100	110	1/4 BRICK
IRE-Q12	IRE-48/2.5-Q12xx-C	9-36	48	2.5	120	12/24	1/8 BRICK
	IRE-24/5-Q12xx-C	9-36	24	5	120	12/24	1/8 BRICK
	IRE-12/10-Q12xx-C	9-36	12	10	120	12/24	1/8 BRICK
	IRE-5/24-Q12xx-C	9-36	5	24	120	12/24	1/8 BRICK
IRS-Q48	IRS-48/1-Q48xx-C	18-75	48	1	50	24/48	1/16 BRICK
	IRS-24/2-Q48xx-C	18-75	24	2	50	24/48	1/16 BRICK
	IRS-12/4.5-Q48xx-C	18-75	12	4.5	50	24/48	1/16 BRICK
	IRS-5/10-Q48xx-C	18-75	5	10	50	24/48	1/16 BRICK
	IRS-3.3/15-Q48xx-C	18-75	3.3	15	50	24/48	1/16 BRICK
IRS-Q12	IRS-48/1-Q12xx-C	9-36	48	1	50	12/24	1/16 BRICK
	IRS-24/2-Q12xx-C	9-36	24	2	50	12/24	1/16 BRICK
	IRS-15/3-Q12xx-C	9-36	15	3	50	12/24	1/16 BRICK
	IRS-12/4.5-Q12xx-C	9-36	12	4.5	50	12/24	1/16 BRICK
	IRS-5/10-Q12xx-C	9-36	5	10	50	12/24	1/16 BRICK
	IRS-3.3/15-Q12xx-C	9-36	3.3	15	50	12/24	1/16 BRICK



**IRH**  
150W half brick



**IRQ**  
100W quarter brick



**IRE**  
120W eighth brick



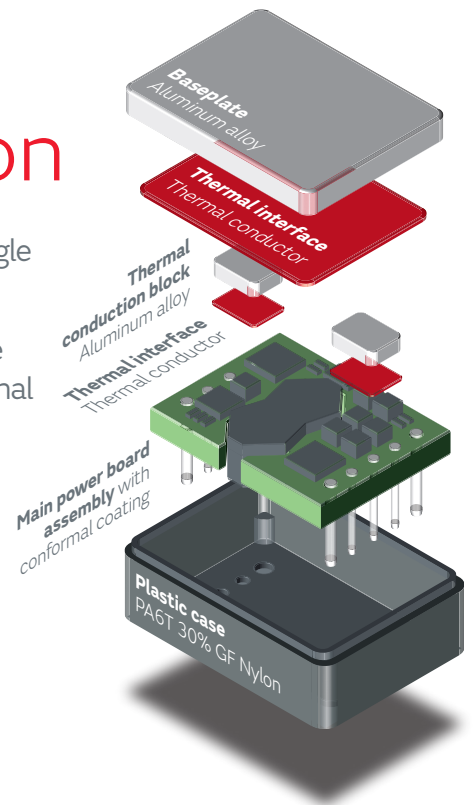
**IRS**  
50W sixteenth brick



Automated guided vehicle

## Construction

- Baseplate machined from a single block of aluminum
- Thermal interface materials are of the highest quality and thermal conductivity
- Plastic components are made from engineered plastics with temperature ratings >300°C
- Conformal coated with Cytec CE-1171 — which is qualified to meet IPC-CC-830B



## Testing & compliance

For rail applications, both onboard and trackside environments have been carefully considered, while meeting the constraints of EN50155:2017.

Wide DC input ranges cater to the battery-powered applications for both 12V and 24V systems, offering the highest power density packages available on the market. Murata's industrial DC-DC products use the latest and most efficient architectures and components for power conversion along with proprietary packaging materials and processes.

To ensure robustness, Murata enforces strict engineering design for reliability processes to maximize the life of the product.

Engineering policies and procedures include strict component derating guidelines to ensure low electrical stress, as well as extensive EVT/DVT testing and evaluation. Each module design is subject to extensive design review stages and rigorous HALT/HASS testing for electrical and mechanical stress testing. To the right is a list of the environmental testing procedures performed.

### Environmental qualification testing

Qualification testing	Test conditions
Vibration	EN 61373:1999 category I, class B, body mounted
Mechanical shock	EN 61373:1999 category I, class B, body mounted
DMTBF (life test)	Vin nom, units at derating point, 101 days
Temperature cycling test	-40°C to 125°C, unit temp. ramp 15°C/min., 500 cycles
Power and temperature cycling	Temperature operating = min to max, Vin = min to max, load = 50% of rated maximum, 100 cycles
Temperature, humidity, and bias	85°C 85%RH, Vin = max, load = min load, 1072 hour (72 hours with a pre-conditioning soak, unpowered)
Damp heat test, cyclic	EN60068-2-30: temperatures: +55°C and +25°C; number of cycles: 2 (respiration effect); time: 2 x 24 hours; relative humidity: 95%
Dry heat test	EN60068-2-2, Vin = nom line, full load, 85°C for 6 hours
High temperature operating bias	Vin = min to max, 95% rated load, units at derating point, 500 hours
Low temperature operating	Vin=nom line, full load, -40°C for 2 hours
Highly accelerated life test	High temperature limits, low temperature limits, vibration limits, combined environmental tests
Solderability	Pins MIL-STD-883, method 2003 (IPC/EIA/JEDEC J-SID-002B)

# Global locations

For details please visit [www.murata.com](http://www.murata.com)



## ⚠ Note

### 1 Export Control

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No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.

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2 Please contact our sales representatives or product engineers before using the products in this brochure for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

- ① Aircraft equipment
- ② Undersea equipment
- ③ Medical equipment
- ④ Traffic signal equipment
- ⑤ Data-processing equipment
- ⑥ Aerospace equipment
- ⑦ Power plant equipment
- ⑧ Transportation equipment (vehicles, trains, ships, etc.)
- ⑨ Disaster prevention / crime prevention equipment
- ⑩ Application of similar complexity and/or reliability requirements to the applications listed above

3 Product specifications in this catalog are as of June 2021. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4 Please read rating and & CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.

5 This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

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7 No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.

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