DC-DC converters for rail and transportation

Designed for the most demanding applications
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 rail, transportation, and industrial DC-DC converters are designed to provide isolated DC power for applications requiring high reliability in demanding conditions.

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

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**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
- HVAC
- Headlights

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

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

**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

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### Products support EN50155:2017

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

### IRV300-54W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 54/48
- Iout (A): 5.5
- Pout (W): 300
- Vin Nom (V): 72
- Package: CHASSIS

### IRV300-24W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 24
- Iout (A): 12.5
- Pout (W): 300
- Vin Nom (V): 72
- Package: CHASSIS

### IRV300-12W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 12
- Iout (A): 25
- Pout (W): 300
- Vin Nom (V): 72
- Package: CHASSIS

### IRV300-MCK Mating connector kit IRV300 series

### IRH-54/4.7-W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 54
- Iout (A): 4.7
- Pout (W): 250
- Vin Nom (V): 72
- Package: 1/2 BRICK

### IRH-24/10.5-W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 24
- Iout (A): 10.5
- Pout (W): 250
- Vin Nom (V): 72
- Package: 1/2 BRICK

### IRH-12/21-W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 12
- Iout (A): 21
- Pout (W): 250
- Vin Nom (V): 72
- Package: 1/2 BRICK

### MP-HW80EVAL-01 Models
- Vin Range (V): 16–160
- Vout (V): 250
- Iout (A):
- Pout (W): 72
- Package: 1/2 BRICK

### IRQ-24/6.25-W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 24
- Iout (A): 6.25
- Pout (W): 150
- Vin Nom (V): 72
- Package: 1/4 BRICK

### IRQ-12/12.5-W80xx-C Models
- Vin Range (V): 16–160
- Vout (V): 12
- Iout (A): 12.5
- Pout (W): 150
- Vin Nom (V): 72
- Package: 1/4 BRICK

### MP-QW80EVAL-01 Models
- Vin Range (V): 16–160
- Vout (V): 150
- Iout (A):
- Pout (W): 72
- Package: 1/4 BRICK
### IR series selection guide

<table>
<thead>
<tr>
<th>Series</th>
<th>Models</th>
<th>Vin Range (V)</th>
<th>Vout (V)</th>
<th>Iout (A)</th>
<th>Pout (W)</th>
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<tbody>
<tr>
<td>IRH-T110</td>
<td>IRH-24/6.3-T110xx-C</td>
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<td>IRQ-12/8.3-T110xx-C</td>
<td>57.6-160</td>
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<td>IRE-48/2.5-Q12xx-C</td>
<td>9-36</td>
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<td>IRS-Q48</td>
<td>IRS-48/1-Q48xx-C</td>
<td>18-75</td>
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<td>IRS-3.3/15-Q48xx-C</td>
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</tr>
</tbody>
</table>

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

Environmental qualification testing

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

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.
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   - Undersea equipment
   - Medical equipment
   - Traffic signal equipment
   - Data-processing equipment
   - Aerospace equipment
   - Power plant equipment
   - Transportation equipment (vehicles, trains, ships, etc.)
   - Disaster prevention / crime prevention equipment
   - Application of similar complexity and/or reliability requirements to the applications listed above

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