Innovative Power Devices for a Sustainable Future

Mitsubishi Electric power modules are at the forefront of the latest energy innovations that seek to solve global environmental issues while creating a more affluent and comfortable society for all. Some of these innovations are photovoltaic (PV) and wind power generation from renewable energy sources, smart grids realizing efficient supply of power, hybrid/electric vehicles (HVs/EVs) that take the next step in reducing carbon emissions and fuel consumption, and home appliances that achieve ground-breaking energy savings. Whether in appliances, railcars, EVs or industrial systems, our power modules are key elements in changing the way energy is used.
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<th>Product</th>
<th>Page</th>
<th>Connection</th>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Main Application</th>
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<tr>
<td>SIC Power Modules</td>
<td>5-11</td>
<td>✔ ✔ ✔</td>
<td>600V</td>
<td>15A-30A</td>
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<td>75A-1200A</td>
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<td>300A-1200A</td>
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<td>HVIGBT Modules</td>
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<td>200A-1000A</td>
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<td>HV DIODE Modules</td>
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<td>800A-1800A</td>
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<td>6500V</td>
<td>200A-1000A</td>
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<td>Power Modules for xEV*2</td>
<td>43-44</td>
<td>✔</td>
<td>650V</td>
<td>300A-1000A</td>
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<td>1200V</td>
<td>300A, 600A</td>
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</table>

*1 EV: Electric Vehicle
*2 SOPiPM, DIPiPM, SLiMDiP, DiPiPM, DiPPFC, CSTBT are trademarks of Mitsubishi Electric
Development of Mitsubishi Electric SiC Power Devices and Power Electronics Equipment Incorporating Them

Mitsubishi Electric began developing SiC as a new material in the early 1990s. Pursuing special characteristics, we succeeded in developing various elemental technologies.

In 2010, we commercialized the first air conditioner in the world equipped with a SiC power device. Furthermore, substantial energy-saving effects have been achieved for traction and FA machinery. We will continue to provide competitive SiC power modules with advanced development and achievements from now on.

**Early 1990s**
Developed new material, silicon-carbide (SiC) power semiconductor, maintaining a lead over other companies

**2000s**
Developed various elemental technologies

**2006**
January 2006
Successfully developed SiC inverter for driving motor rated at 3.7kW

**2009**
February 2009
Verified 11kW SiC inverter, world’s highest value* with approx. 70% reduction in power loss

November 2009
Verified 20kW SiC inverter, world’s highest value* with approx. 90% reduction in power loss

**2010**
January 2010
Developed large-capacity power module equipped with SiC diode

October 2010
Launched “Kigamine” inverter air conditioner

**2011**
January 2011
Verified highest power conversion efficiency** for solar power generation system power conditioner (domestic industry)**

October 2011
Commercialized SiC inverter for use in railcars

**2012**
March 2012
Developed motor system with built-in SiC Inverter***

September 2012
Verified built-in main circuit system for railcars

December 2012
Launched CNC drive unit equipped with SiC power module

**2013**
February 2013
Developed SiC for application in elevator control systems****

March 2013
Delivered auxiliary power supply systems for railcars

Development of these modules and applications has been partially supported by Japan’s Ministry of Economy, Trade and Industry (METI) and New Energy and Industrial Technology Development Organization (NEDO).

* The year and month listed are based on press releases or information released during the product launch month in Japan.
2014
February 2014
Developed EV motor drive system with built-in SiC inverter

May 2014
Began shipping samples of hybrid SiC power modules for high-frequency switching applications

November 2014
Launched Large Hybrid SiC DIPiP™ for PV Applications

2015
January 2015
Launched power conditioner for PV equipped with full SiC-IPM™

June 2015
Railcar traction system with full SiC power modules installed in Shinkansen bullet trains

2016
April 2016
Launched Super mini Full SiC DIPiP™

May 2016
Launched room air conditioners with full SiC DIPiP™ in Japan

2017
March 2017
Launched SiC-SBD

March 2017
Developed World’s smallest SiC Inverter for HEVs.

September 2017
Developed SiC Power Device with Record Power Efficiency

December 2017
Mitsubishi Electric and the University of Tokyo Quantity Factors for Reducing SiC Power Semiconductor Resistance by Two-Thirds

2018
January 2018
New 6.5kV Full-SiC Power Semiconductor Module Achieves World’s Highest Power Density

December 2018
Mitsubishi Electric and the University of Tokyo Reveal New Mechanism for Enhancing Reliability of SiC Power Semiconductor Devices

2019
June 2019
Began shipping samples of 1200V SiC-SBD

February 2019
Developed Super Compact Power Unit for Hybrid Electric Vehicle

September 2019
Trench-type SiC-MOSFET with unique electric-field-limiting structure developed

*1 Researched in press releases by Mitsubishi Electric.
*2 Currently under development, as of April 2019.
*3 Mitsubishi Electric solar-power generation system discontinued on March 31, 2020.
### Lineup of SiC Power Modules

<table>
<thead>
<tr>
<th>Application</th>
<th>Product name</th>
<th>Model</th>
<th>Rating V</th>
<th>Current(A)</th>
<th>Connection</th>
<th>States</th>
<th>Page</th>
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<tbody>
<tr>
<td>SiC-MOSFET Built-in</td>
<td>Hybrid SiC Power Modules</td>
<td>FMH600STX-24B</td>
<td>1200</td>
<td>600</td>
<td>3Level T-type</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FMH600FX-24B</td>
<td></td>
<td></td>
<td>Vienna rectifier</td>
<td></td>
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<td>Full SiC Power Modules</td>
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<td>FMF300B2X-24B</td>
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<td>75</td>
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<td>PMF75CGAL120</td>
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<td>Full SiC Power Modules</td>
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#### Contributes to improvement of power loss and downsizing of equipment by optimized to IGBT and Diode configuration

- SiC-MOSFET built-in hybrid power module
- Contributes to improvement of power loss and downsizing of equipment by optimized to IGBT and Diode for 3Level T type and Vienna rectifier
- Reduction surge voltage by Low-inductance package

#### Features

**Product lineup**

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated voltage</th>
<th>Circuit configuration</th>
<th>Package size (D x W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMH600STX-24B**</td>
<td>1200V</td>
<td>3Level T-type</td>
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<td>FMH600FX-24B**</td>
<td>1200V</td>
<td>Vienna rectifier</td>
<td>10mmx30mmx5.7mm</td>
</tr>
</tbody>
</table>

#### Internal circuit diagram

- 3Level T type
- Vienna rectifier

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1200V/600A SiC-MOSFET Built-in Hybrid SiC Power Modules for Industrial Equipment

Under development
Contributes to reducing size/weight of industrial-use inverters

**Features**
- Power loss reduced approx. 70% compared to the conventional product*
- Low-inductance package adopted to deliver full SiC performance
- Contributes to increasing the output current and downsizing peripheral components by low power loss characteristics of SiC

*Comparison with the same rated value of the conventional 7th Gen. IGBT modules

**Product lineup**

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Circuit configuration</th>
<th>Package size (D x W)</th>
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<td>FMF400BX-248**</td>
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<td>4 in 1</td>
<td>92.3mm x 121.7mm</td>
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<tr>
<td>FMF800DX-248**</td>
<td>800A</td>
<td>2 in 1</td>
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</tbody>
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*Under development

**Power loss comparison**

- 1200V/800A Full SiC Power module
- Condition: Vcc=600V, PF=0.8, Modulation=1, Three-phase modulation, Tj=125°C

Full-SiC Power Modules for Industrial Equipment

Contributes to enhancing the performance of industrial-use inverters thanks to built-in protection function for short circuit

**Features**
- By using short circuit monitoring circuit in the module it is possible to transfer a short circuit detection signal to the system side
- Power loss reduced approx. 70% compared to the conventional product*
- Low-inductance package adopted to deliver full SiC performance

*Comparison with the same rated value of the conventional 7th Gen. IGBT modules

**Product lineup**

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Circuit configuration</th>
<th>Package size (D x W)</th>
</tr>
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<td>FMF300DZ-248**</td>
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<td>78.6mm x 112mm</td>
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<tr>
<td>FMF800DZ-248**</td>
<td>800A</td>
<td>2 in 1</td>
<td></td>
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<tr>
<td>FMF1200DZ-248**</td>
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<td></td>
<td>152mm x 122mm</td>
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<td>FMF1800DZ-248**</td>
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<td>FMF300EBX-248**</td>
<td>300A</td>
<td>2 in 1</td>
<td>12(Diff.)</td>
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</tr>
</tbody>
</table>

*Under development

**Power loss comparison**

- 1200V/800A Full SiC Power module
- Condition: Vcc=600V, PF=0.8, Modulation=1, Three-phase modulation, Tj=125°C
SiC Power Modules

1200V/75A Full SiC-IPM for Industrial Equipment
PMF75CGA120/PMF75CGAL120 Under development

SiC chips (MOSFET and Schottky Barrier Diode) incorporated in an IPM with a built-in drive circuit and protection functions. Power loss reduction of approx. 70% contributes to improving the performance of industrial equipment.

- Realized high performance and low power loss by 2nd generation SiC-MOSFET and SiC-SBD with current sense and temperature sense.
- External size is reduced approx. 30% with the conventional Silicon IPM products* of the same rating.
- Available to drive it by the equivalent I/F and power supply circuit with the Silicon IPM products.

* Conventional product: Mitsubishi Electric G1 Series PM75CG1B120

Internal circuit diagram

SIC-MOSFET  SIC-SBD

Power loss comparison

Approx. 70% reduction

Hybrid SiC Power Modules for High-frequency Switching Applications Commercially available

For optimal operation of power electronics devices that conduct high-frequency switching.

- Power loss reduction of approx. 40% contributes to higher efficiency, smaller size and weight reduction of total system.
- Suppresses surge voltage by reducing internal inductance.
- Package compatible with the conventional product.*

* Conventional product: Mitsubishi Electric N1H Series IGBT Modules

Product lineup

Applicance: Industrial equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Circuit configuration</th>
<th>External dim (D x W)</th>
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<td>48x84mm</td>
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<td>CMH150SU-24NFH</td>
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<td>48x84mm</td>
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<td>48x84mm</td>
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<tr>
<td>CMH200SU-24NFH</td>
<td>200A</td>
<td>62x106mm</td>
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<td>48x84mm</td>
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<tr>
<td>CMH300SU-24NFH</td>
<td>300A</td>
<td>62x106mm</td>
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<tr>
<td>CMH400SU-24NFH</td>
<td>400A</td>
<td>1 in 1</td>
<td>2 in 1</td>
<td>48x84mm</td>
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<tr>
<td>CMH600SU-24NFH</td>
<td>600A</td>
<td>80x133mm</td>
<td>2 in 1</td>
<td>48x84mm</td>
</tr>
</tbody>
</table>

Recovery waveform (FWD)

IE: 100A/div
200ns/div

Power loss comparison

Approx. 40% reduction

Condition: Vcc=600V, f=15kHz, P.F=0.6, Modulation=1, Three-phase modulation, Tj=125°C
3300V Full SiC Power Modules for Traction Inverters and HVDC system

FMF375DC-66A Under development /FMF750DC-66A Commercially available

Contributes to energy saving and downsizing for inverters in traction motors, DC-power transmitters, large industrial machinery

Features
- Suitable chip set combination for high speed switching
- Reduced power loss compared to the conventional products*1
- Low inductance package maximize SiC performance

*1 Si product: Mitsubishi Electric HVIGBT, CM660DC-66X

<table>
<thead>
<tr>
<th>Model</th>
<th>Series Voltage</th>
<th>Rated Current</th>
<th>Output Configuration</th>
<th>Output Power [kW]</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMF375DC-66A</td>
<td>3800V</td>
<td>750A</td>
<td>2 in 1</td>
<td>100 x 140 x 110</td>
</tr>
<tr>
<td>FMF750DC-66A</td>
<td>7500V</td>
<td>1750A</td>
<td>2 in 1</td>
<td>140 x 200 x 110</td>
</tr>
</tbody>
</table>

Internal circuit diagram

Power loss comparison

---

1700V/1200A Hybrid SiC Power Modules for Traction inverters
CMH1200DC-34S Commercially available

High-power/low-loss/highly reliable modules appropriate for use in traction inverters

Features
- Power loss reduced approximately 30% compared to the conventional product
- Highly reliable design appropriate for use in traction
- Package compatible with the conventional product

*1 Conventional product: Mitsubishi Electric Power Module CM/2000DC-34N

<table>
<thead>
<tr>
<th>Module</th>
<th>Max Operating Temperature</th>
<th>150°C</th>
<th>Isolation Voltage</th>
<th>6000Vrms</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI-IGBT @150°C</td>
<td>Collector-emitter saturation voltage</td>
<td>2.3V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching loss 650V1200V</td>
<td>turn-on</td>
<td>140mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>turn-off</td>
<td>360mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SiC-SBD</td>
<td>@150°C</td>
<td>Emitter-collector voltage</td>
<td>2.2V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Capacitive change</td>
<td>9.0pC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Internal circuit diagram

Power loss comparison

---

Condition: Vdc=450V, Idc=1kApeak, f=5kHz, P.F.=0.85, M=1, Three-phase modulation, Tj=150°C

Approx. 75% reduction

Condition: Vdc=800V, Idc=800Apeak, f=5kHz, P.F.=0.85, M=1, Three-phase modulation, Tj=150°C

Approx. 30% reduction
**SiC Power Modules**

### 15A/25A Super mini Full SiC DIPIPMTM for Home Appliances

**PSF15S92F6-A/PSF25S92F6-A** Commercially available

Contributes to extremely high power-efficiency in air conditioners, and easily applicable to industrial equipment

**Features**
- SiC-MOSFET achieves reduction in ON resistance, power loss reduced approx. 70% compared to conventional product*.
- Construct low-noise system by reducing recovery current
- Numerous built-in functions: Bootstrap diode for power supply to drive P-side, temperature information output, etc.
- Unnecessary minus-bias gate drive circuit using original high Vth SiC-MOSFET technology
- As package and pin layout compatibility with conventional products* is ensured, simply replace with this product to improve performance

*Conventional product: Mitsubishi Electric Super mini DIPIPMTM Series

**Internal block diagram**

![Internal block diagram](image)

**Power loss comparison**

![Power loss comparison](image)

### Super mini Hybrid / Full SiC DIPPFCTM for Home Appliances

**PSH20L91A6-A / PSF20L91A6-A / PSH30L92C6-W** Commercially available

Utilizing SiC enables high-frequency switching and contributes to reducing the size of peripheral components

**Features**
- Incorporating SiC chip in the Super mini package widely used in home appliances
- The SiC chip allows high-frequency switching (up to 40kHz) and contributes to downsizing the reactor, heat sink and other peripheral components
- Adopts the same package as the Super mini DIPIPMTM to eliminate the need for a spacer between the inverter and heat sink, and to facilitate its implementation

**Internal block diagram (PSF20L91A6-A)**

![Internal block diagram](image)

**Power loss comparison**

![Power loss comparison](image)
Outline Drawing of SiC Power Modules

SIC-MOSFET Built-in Hybrid
SIC Power Modules for Industrial Equipment
FMH600STX-24B
FMH600FX-24B

Full SiC Power Modules for Industrial Equipment
FMF400BX-24B
FMF800DX-24B

Full SiC Power Modules for Industrial Equipment
FMF300BXZ-24B
FMF400BXZ-24B

Full SiC Power Modules for Industrial Equipment
FMF600DXZ-24B/FMF800DXZ-24B
FMF300DXZ-34B/FMF300E3XZ-34B

Full SiC Power Modules for Industrial Equipment
FMF1200DXZ-24B

Full SiC IPM for Industrial Equipment
PMF75CGL120
PMF75CGL120

Hybrid SiC Power Modules for High-frequency Switching Applications
CMH100DY-24NFH
CMH150DY-24NFH

Hybrid SiC Power Modules for High-frequency Switching Applications
CMH200DU-24NFH
CMH300DU-24NFH

Hybrid SiC Power Modules for High-frequency Switching Applications
CMH300DX-24NFH

Unit:mm
SiC-SBD

SiC-SBD (Schottky Barrier Diode) for power supply systems
600V series 1200V series

Sample available

Contribute to reducing power loss and the size of power supply systems

**Features**

- Power loss is reduced by approx. 21% compared to the conventional silicon (Si) products, contributing to energy conversion.
- The SiC-SBD allows high frequency switching and contributes to downsizing the reactor, heat sink and other peripheral components.
- JBS structure allows high forward surge capability and contributes to improving reliability.

**Product lineup**

<table>
<thead>
<tr>
<th>Application</th>
<th>Model</th>
<th>Rated Voltage</th>
<th>Rated Current</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home appliance</td>
<td>BD20060T</td>
<td>600V</td>
<td>20A</td>
<td>TO-220FP-2</td>
</tr>
<tr>
<td>Industrial equipment</td>
<td>BD20060S**</td>
<td>600V</td>
<td>10A</td>
<td>TO-220FP-2</td>
</tr>
<tr>
<td></td>
<td>BD20060A**</td>
<td>600V</td>
<td>20A</td>
<td>TO-247-3</td>
</tr>
<tr>
<td></td>
<td>BD10120S**</td>
<td>1200V</td>
<td>10A</td>
<td>TO-247-2</td>
</tr>
<tr>
<td></td>
<td>BD10120P**</td>
<td>1200V</td>
<td>20A</td>
<td>TO-247-3</td>
</tr>
<tr>
<td></td>
<td>BD20120S**</td>
<td>1200V</td>
<td>10A</td>
<td>TO-247-2</td>
</tr>
<tr>
<td></td>
<td>BD20120P**</td>
<td>1200V</td>
<td>20A</td>
<td>TO-247-3</td>
</tr>
</tbody>
</table>

*1 Conventional Si (Silicon) product: Si diode which is equipped with Mitsubishi Electric DIPFC™
*2 Junction Barrier Schottky

**Inner circuit**

- BD20060S/BD20060A
- BD10120S/BD20120S
- BD20120S

**Power loss comparison**

- Diode SW
- Diode DC

Conditions: Vcc=200V, Vd=170V, L=0.2mH, f=30kHz, In=20A, To=-125°C

Approx. 21% reduction

**Outline Drawing of SiC-SBD**

Unit: mm
### Package, Main Application

<table>
<thead>
<tr>
<th>Package</th>
<th>Main application</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOPIPM</td>
<td>Fan motor</td>
</tr>
<tr>
<td>SLIMDIP</td>
<td>Air conditioner/Fan motor/Washing machine/Refrigerator</td>
</tr>
<tr>
<td>Super mini</td>
<td>Air conditioner/Washing machine/Servo/Robot</td>
</tr>
<tr>
<td>Mini</td>
<td>Air conditioner/Motion control</td>
</tr>
<tr>
<td>Large</td>
<td>Commercial air conditioner/Motion control</td>
</tr>
<tr>
<td>DIPIPM+</td>
<td>Commercial air conditioner/Motion control</td>
</tr>
<tr>
<td>Large DIPIPM+</td>
<td>Commercial air conditioner/Motion control</td>
</tr>
</tbody>
</table>

#### Rated Lineup

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>2A</th>
<th>5A</th>
<th>10A</th>
<th>15A</th>
<th>20A</th>
<th>25A</th>
<th>30A</th>
<th>35A</th>
<th>40A</th>
<th>50A</th>
<th>75A</th>
<th>100A</th>
</tr>
</thead>
<tbody>
<tr>
<td>600V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1200V</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### New Products

**Surface mount package IPM SOPIPM™**

A small Surface mount package IPM has been newly developed for fan and low-power motor drive applications.

**Main Features**
- Optimal pin layout realizes easier PCB wiring design and enables smaller PCB size
- Insulation distance between pins ensured, realizing easier board mounting without coating process
- Newly integrated interlock function in addition to conventional protection features for robust operation
- Installing RC-IGBT™ simultaneously realizes compact package and low loss performance can go together
- Bootstrap diode is integrated for the P-side drive power supply like conventional DIPIPM™ series, reducing the number of peripheral external parts

*Reverse-conducting IGBT

### SOPIPM™

<table>
<thead>
<tr>
<th>Type name</th>
<th>Rated current</th>
<th>Rated voltage</th>
<th>Chips</th>
<th>Protection</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP2SK</td>
<td>2A</td>
<td>600V</td>
<td>RC-IGBT, HVIC, LVIC, BSD</td>
<td>UV, SC, OT Vr, IL</td>
<td>Surface mount package</td>
</tr>
</tbody>
</table>

**Terms**
- UV: Power supply Under Voltage protection
- SC: Short Circuit protection
- OT: Over Temperature protection
- Vr: Analog Temperature Output
- IL: Inter Lock
New Products

New design with expanded operating temperature range and lower noise contributes to easier system design and reduction in system cost

**Super Mini DIIPM™ Ver.7**

*Main Features*
- New low-noise 7th-generation CSTBT™ incorporated, keeping same efficiency as DIIPM Ver.6 Series. System cost reduction for noise suppression parts achieved.
- Maximum junction temperature range expanded to 175°C, supporting instantaneous overcurrent capability at overload operation.
- Wider terminal base shape contributes to improved terminal strength and suppresses increase in temperature.
- High compatibility for terminal layout, easy to replace from the conventional series

*1 CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect

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Featured Products

Smaller package size realized by integrating newly designed RC-IGBT
Recommended for low-cost inverter and fan controller applications

**SLIMDIP™**
- SLIMDIP-S, SLIMDIP-L, SLIMDIP-W

*Main Features*
- RC-IGBT™ incorporated, reducing package size 30% compared to Super mini DIIPM
- Maximum case temperature expanded to 115°C, increasing the operating temperature range and leading to easier system design temperature range and leading to easier system design.
- Additional terminals for floating supply and built-in bootstrap diodes simplify PCB wiring pattern.
- Both Von-1 and OT™ functions integrated for temperature protection.
- New SLIMDIP-W line-up for washing machine, fans etc.

*1 Reverse conducting IGBT *2 Von : Analog Temperature Output *3 OT : Over Temperature protection

---

Customer Support

EVA Series evaluation boards for each DIIPM Series to support system design

For Super mini DIIPM
EVA11-SDIP

For DIIPM+
EVA14-DIP+

For SOPIM
EVA18-SOP

For Large DIIPM Series
(Microcomputer-embedded demonstration board)
EVA20-LDIP

* For further information, please contact sales office.
### Series Matrix of 600V DIPIPMTM

<table>
<thead>
<tr>
<th>Voss (V)</th>
<th>SLIMDIP</th>
<th>600V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ic (A)</td>
<td>Series</td>
<td>Ver.7</td>
</tr>
<tr>
<td>5</td>
<td>SLIMDIP-S</td>
<td>PSS05S526F6-AG</td>
</tr>
<tr>
<td>10</td>
<td>SLIMDIP-L</td>
<td>PSS10S926F6-AG</td>
</tr>
<tr>
<td>15</td>
<td>SLIMDIP-W*</td>
<td>PSS15S926F6-AG</td>
</tr>
<tr>
<td>20</td>
<td>PSS20S926F6-AG*</td>
<td>PSS20S926F6-AG</td>
</tr>
<tr>
<td>30</td>
<td>PSS30S926F6-AG*</td>
<td>PSS30S926F6-AG</td>
</tr>
<tr>
<td>35</td>
<td>PSS35S926F6-AG</td>
<td>PSS35S926E6-AG</td>
</tr>
<tr>
<td>40</td>
<td>PSS40S926F6-AG*</td>
<td>PSS40S926F6-AG</td>
</tr>
<tr>
<td>50</td>
<td>PSS50S926F6-AG</td>
<td>PSS50S91F6</td>
</tr>
<tr>
<td>75</td>
<td>PSS75S926F6*</td>
<td>PSS75S91F6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chip</th>
<th>RC-IGBT</th>
<th>CSTBT</th>
<th>CSTBT</th>
<th>CSTBT</th>
<th>CSTBT</th>
<th>CSTBT</th>
<th>CSTBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV</td>
<td>N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
</tr>
<tr>
<td>SC</td>
<td>N-side</td>
<td>N-side*1</td>
<td>N-side</td>
<td>N-side</td>
<td>N-side with sense</td>
<td>N-side</td>
<td></td>
</tr>
<tr>
<td>VT</td>
<td>N-side</td>
<td>N-side*1</td>
<td>N-side</td>
<td>N-side</td>
<td>N-side</td>
<td>N-side</td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td>High(5/3,\text{SV})</td>
<td>High(5/3,\text{SV})</td>
<td>High(5/3,\text{SV})</td>
<td>High(5/3,\text{SV})</td>
<td>High(5/3,\text{SV})</td>
<td>High(5/3,\text{SV})</td>
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</tr>
<tr>
<td>Inhibit</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>Fault output</td>
<td>N-side(UV,SC,0T)</td>
<td>N-side(UV,SC,0T)</td>
<td>N-side(UV,SC,0T)</td>
<td>N-side(UV,SC)</td>
<td>N-side(UV,SC)</td>
<td>N-side(UV,SC)</td>
<td>N-side(UV,SC)</td>
</tr>
<tr>
<td>Insulation Voltage</td>
<td>2000Vrms*2</td>
<td>1500Vrms*2</td>
<td>1500Vrms*2</td>
<td>2500Vrms</td>
<td>2500Vrms</td>
<td>2500Vrms</td>
<td>2500Vrms</td>
</tr>
<tr>
<td>Insulation state</td>
<td>Insulation sheet</td>
<td>Insulation sheet</td>
<td>Insulation sheet</td>
<td>Insulation sheet</td>
<td>Insulation sheet</td>
<td>Insulation sheet</td>
<td>Insulation sheet</td>
</tr>
<tr>
<td>Pin type*7</td>
<td>Control side of Zigzag (Normal, Short)</td>
<td>Long</td>
<td>Long</td>
<td>Short</td>
<td>Control side of Zigzag, Short</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:**
*1: PSS0xS9x6 has OT function, PSS0xS9x6 has Voss function
*2: A050H8: 8mm. Corresponds to isolation voltage 2500Vrms in the case of the convex-shaped heat sink
*3: High melting point solder (Lead Over 65%) is used for chip soldering of PSS0xS51F6 only.
*4: Molding resin insulation for PSS0xS91F6-C
*5: PSS50S51C1F6 is not included brake.
*6: RoHS directive (2011/65/EU and (EU) 2015/863)
*7: Refer to the data sheet of each product for more detail

**Term:**
- **CSTBT:MM:** Mitsubishi Electric’s unique IGBT that makes use of the carrier cumulative effect
- **RC-IGBT:** Reverse conducting IGBT
- **HVIC:** High Voltage IC
- **UV:** Power Supply Under Voltage protection
- **OT:** Over Temperature protection
- **SC:** Short Circuit protection
- **VT:** Analog Temperature Protection
- **RoHS:** Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
- **CIB:** Converter Inverter Brake
- **CI:** Converter Inverter

### Application circuit of super mini DIPIPMTM
### Series Matrix of 1200V DIPiPM™

<table>
<thead>
<tr>
<th>V_{ass} (V)</th>
<th>Ic (A)</th>
<th>Mini</th>
<th>Large</th>
<th>DIPiPM+</th>
<th>Large DIPiPM+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ver.6</td>
<td>CI/CI</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td>PSS05S2FT</td>
<td>PSS10S2FT</td>
<td>PSS15S2FT</td>
<td>PSS25S2FT</td>
<td>PSS35S2FT</td>
<td>PSS50S2FT</td>
</tr>
<tr>
<td>PSS05MC1FT</td>
<td>PSS10MC1FT</td>
<td>PSS15MC1FT</td>
<td>PSS25MC1FT</td>
<td>PSS35MC1FT</td>
<td>PSS50NE1CFT**</td>
</tr>
<tr>
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<td>PSS10NC1FT</td>
<td>PSS15NC1FT</td>
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<td>PSS35NC1FT</td>
<td>PSS50NE1CFT**</td>
</tr>
<tr>
<td>PSS05MC1FT</td>
<td>PSS10MC1FT</td>
<td>PSS15MC1FT</td>
<td>PSS25MC1FT</td>
<td>PSS35MC1FT</td>
<td>PSS50NE1CFT**</td>
</tr>
<tr>
<td>PSS05NC1FT</td>
<td>PSS10NC1FT</td>
<td>PSS15NC1FT</td>
<td>PSS25NC1FT</td>
<td>PSS35NC1FT</td>
<td>PSS50NE1CFT**</td>
</tr>
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<td>PSS05MC1FT</td>
<td>PSS10MC1FT</td>
<td>PSS15MC1FT</td>
<td>PSS25MC1FT</td>
<td>PSS35MC1FT</td>
<td>PSS50NE1CFT**</td>
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<td>PSS15NC1FT</td>
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<td>PSS15NC1FT</td>
<td>PSS25NC1FT</td>
<td>PSS35NC1FT</td>
<td>PSS50NE1CFT**</td>
</tr>
</tbody>
</table>

### Type Name Definition of DIPiPM™

- **PS**

---

**Notes:**
- "1:" PSS**NC1FT** is not included brake
- "2:" RoHS directive (2011/65/EU and (EU) 2015/863)

---

**Options:**
- Voltage class
- Function
- Series
- Package
- Circuit construction
- Rated current
- Chip type
- DIPiPM
### Series, Main Application

<table>
<thead>
<tr>
<th>Series</th>
<th>Main Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Motion control/Renewable energy/Power supply</td>
</tr>
<tr>
<td>S1</td>
<td></td>
</tr>
<tr>
<td>V1</td>
<td></td>
</tr>
<tr>
<td>Photovoltaic</td>
<td>Photovoltaic</td>
</tr>
<tr>
<td>L</td>
<td>Motion control/Renewable energy/Power supply</td>
</tr>
</tbody>
</table>

### Rated Lineup

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>25A</th>
<th>35A</th>
<th>50A</th>
<th>75A</th>
<th>100A</th>
<th>150A</th>
<th>200A</th>
<th>300A</th>
<th>400A</th>
<th>450A</th>
<th>500A</th>
<th>600A</th>
<th>800A</th>
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<tbody>
<tr>
<td>600V</td>
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<td>650V</td>
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<tr>
<td>1200V</td>
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</tbody>
</table>

### Featured Products

Loaded with built-in functions, contributing to inverters with enhanced energy savings

**G1 Series IPM with 7th-generation IGBT**

*Main Features*
- Power loss has been reduced with the introduction of the 7th-generation IGBT produced using CSTBT™ and a diode incorporating a RFC™ structure that contributes to reducing the power consumed in inverters
- The new resin-insulated metal baseplate, originally introduced in 7th-generation IGBT modules, eliminates the solder-attached section, increasing the thermal cycle lifetime and improving inverter reliability
- In addition to the built-in functions of the previous product, an automatic switching speed control, and error detection function contribute to lowering inverter loss and shortening design time

*1 CSTBT™: Mitsubishi Electric’s unique IGBT that utilizes the carrier cumulative effect
*2 RFC: Relaxed field cathode
*3 Conventional product: IPM L1-Series
  Built-in functions: Supply Undervoltage lock protection (UV), Short-circuit protection (SC), Over-temperature protection (OT)

**“A” package main pin shape and layout**

For the “A” package 6-in-1 (CG1A) main pin shape, select either solder pin or screw type
For the pin layout, select either straight or L-shaped
### Matrix of IPM Modules 650V/600V

<table>
<thead>
<tr>
<th>Vo(V) (Vac)</th>
<th>650V</th>
<th>600V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G1 Series</td>
<td>L1 Series</td>
</tr>
<tr>
<td>50</td>
<td>PM50CG1A065</td>
<td>PM50CG1A066</td>
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<tr>
<td></td>
<td>R 12</td>
<td>R 12</td>
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<tr>
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<td>PM50SRG1A065</td>
<td>PM50CG1B065</td>
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<td></td>
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<tr>
<td></td>
<td>R 10</td>
<td>R 10</td>
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<td>PM75CG1A065</td>
<td>PM75CG1A066</td>
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<td>R 12</td>
<td>R 12</td>
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<td>PM75SRG1A065</td>
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<td>PM75CG1A066</td>
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<td>R 10</td>
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<tr>
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<td>PM100CG1A065</td>
<td>PM100CG1A066</td>
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<td>R 12</td>
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<tr>
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<td>PM100SRG1A065</td>
<td>PM100CG1B065</td>
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<td>R 10</td>
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<td>PM100CG1B066</td>
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<td>PM100CG1B066</td>
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<td>PM200SRG1A065</td>
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<td>PM200CG1B066</td>
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<tr>
<td></td>
<td>R 12</td>
<td>R 12</td>
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**IGBT chip**
- CSTBT*: Emitter sensor installed
- CSTBT**: Built-in emitter sensor

**Fault output**
- UV: P-side/N-side
- OT: P-side/N-side
- SC: P-side/N-side

**Termination**
- N-side: P-side/N-side

**Compatibility**
- L Series: Compliant
- S-DASH SERVO: Compliant
- V Series: Compliant

**Connection**
- D: B4
- B5: B6
- B6: B6
- C: R

**Notes**
1. CSTBT**: Full-gate CSTBT
2. CSTBT**: Plugged Cell Merged CSTBT
3. CSTBT**: RoHS directive (2011/65/EU and EU) 2015/603

**Term**
- UV: Power supply Under Voltage protection
- OT: Over Temperature protection
- SC: Short Circuit protection
- RoHS: Restriction of hazardous substances in electrical and electronic equipment
Matrix of IPM Modules 1200V (No.: Number of outline drawing, see page 22 to 23)

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>G1 Series</th>
<th>L1 Series</th>
<th>S1 Series</th>
<th>V1 Series</th>
<th>L Series</th>
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<tbody>
<tr>
<td>25</td>
<td>PM25C1A120 C 12</td>
<td>PM25C1A120 C 01</td>
<td>PM25C1A120 C 02</td>
<td>PM25C1A120 C 03</td>
<td>PM25CS1D120 C 05</td>
</tr>
<tr>
<td>35</td>
<td>PM35C1A120 C 12</td>
<td>PM35C1A120 C 01</td>
<td>PM35C1A120 C 02</td>
<td>PM35C1A120 C 03</td>
<td>PM35CS1D120 C 05</td>
</tr>
<tr>
<td>50</td>
<td>PM50C1A120 C 12</td>
<td>PM50C1A120 C 01</td>
<td>PM50C1A120 C 02</td>
<td>PM50C1A120 C 03</td>
<td>PM50CS1D120 C 05</td>
</tr>
<tr>
<td>75</td>
<td>PM75C1A120 C 12</td>
<td>PM75C1A120 C 01</td>
<td>PM75C1A120 C 02</td>
<td>PM75C1A120 C 03</td>
<td>PM75CS1D120 C 05</td>
</tr>
<tr>
<td>100</td>
<td>PM100C1A120 C 12</td>
<td>PM100C1A120 C 01</td>
<td>PM100C1A120 C 02</td>
<td>PM100C1A120 C 03</td>
<td>PM100CS1D120 C 05</td>
</tr>
<tr>
<td>150</td>
<td>PM150C1A120 C 12</td>
<td>PM150C1A120 C 01</td>
<td>PM150C1A120 C 02</td>
<td>PM150C1A120 C 03</td>
<td>PM150CS1D120 C 05</td>
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<td>PM200C1A120 C 01</td>
<td>PM200C1A120 C 02</td>
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<td>PM300C1A120 C 03</td>
<td>PM300CS1D120 C 05</td>
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<tr>
<td>450</td>
<td>PM450C1A120 C 12</td>
<td>PM450C1A120 C 01</td>
<td>PM450C1A120 C 02</td>
<td>PM450C1A120 C 03</td>
<td>PM450CS1D120 C 05</td>
</tr>
</tbody>
</table>

IGBT chip
- CST9T**: Emitter sensor installed
- Built-in current sensor
- Built-in temperature sensor

<table>
<thead>
<tr>
<th>Full-width</th>
<th>CST9T**</th>
<th>CST9T**</th>
<th>CST9T**</th>
<th>CST9T**</th>
<th>CST9T**</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
<td>N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
</tr>
<tr>
<td>OT</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
<td>N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
</tr>
<tr>
<td>SC</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
<td>N-side</td>
<td>P-side/N-side</td>
<td>P-side/N-side</td>
</tr>
</tbody>
</table>

[Notes] 1: Fullgate CST9T** 2: PCM (Plugged Off Mode) CST9T**
3: RoHS directive (2011/65/EU and EU 2015/863)

[List] CST9T**: Mitsubishi Electric’s unique IGBT that makes use of the carrier cumulative effect
UV: Power supply Under Voltage protection
SC: Short Circuit protection
OT: Over Temperature protection
RoHS: the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
Lineup of IPM

Outline Drawing of IPM

10
PM50, 75, 100, 150, 200CG1B/ RG1B06S
PM25, 35, 50, 75, 100CG1B/ RG1B120

11
PM200, 300, 450CG1C/ RG1C06S
PM100, 150, 200CG1C/ RG1C120

12
PM50, 75, 100CG1A/ CG1AL06S
PM50, 75RG1AP06S
PM25, 35, 50CG1A/ CG1AL120
PM25, 35RG1A120

Unit: mm
Series, Main Application

<table>
<thead>
<tr>
<th>Series</th>
<th>Main Application</th>
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</thead>
<tbody>
<tr>
<td>T</td>
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</tr>
<tr>
<td>T1</td>
<td></td>
</tr>
<tr>
<td>For 3-level Inverters</td>
<td>Motion control/Renewable energy /Power supply</td>
</tr>
<tr>
<td>S</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td></td>
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<tr>
<td>A</td>
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<tr>
<td>NF</td>
<td></td>
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<tr>
<td>NF(NFH type)</td>
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Rated Lineup

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<th>Rated voltage</th>
<th>Rated current</th>
<th>35A</th>
<th>50A</th>
<th>75A</th>
<th>100A</th>
<th>150A</th>
<th>200A</th>
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<th>300A</th>
<th>400A</th>
<th>500A</th>
<th>600A</th>
<th>800A</th>
<th>900A</th>
<th>1000A</th>
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<th>1400A</th>
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<tbody>
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<td>1200V</td>
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<td>1700V</td>
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</tbody>
</table>

New Products Under Development

Industrial IGBT module with new standard package "LV100" for high power density inverter

IGBT module T-series (LV100 for industrial)

IGBT module 2in1 type

- Lineup
  800A/1700V, 800A/1700V(with enhanced FWD), 1200A/1700V
  800A/1200V, 1200A/1200V 2in1 type (Under development)

(Main Features)

- Next generation high capacity standard package for industrial use
- Improved ease of use by applying low impedance package
- Reducing the switching loss and optimal for the applications that are used in 1 to 5kHz
- Isolation voltage 4kV
Featured Products

New lineup contributes to simple design downsizing, energy-savings of industrial inverters.

IGBT Module T/T1-Series

<Main Features>

- New modules equipped with three-phase converter, inverter, and brake circuit(CIB), contributes to simplifying design for inverter systems
- CIB modules contribute to compact inverter systems by reducing package size by 36% compared to the Mitsubishi Electric's existing module (CIB)
- Power loss has been reduced with the introduction of the 7th-generation IGBT produced using CSTBT™* and a diode incorporating a relaxed field of cathode (RFC) structure
- The new structure introduced eliminates the solder-attached section, increasing the thermal cycle lifetime, which contributes to improving the reliability of inverters
- The introduction of press-fit pins and PC-TIM™ contribute to simplifying the assembly process for inverters

*1 PC-TIM: Phase change • thermal interface material
*2 CSTBT™: Mitsubishi Electric’s unique IGBT that makes use of the carrier cumulative effect

New structure realizes improved reliability (improved thermal cycle lifetime)

NX package structure comparison

6th-generation IGBT

7th-generation IGBT

Compared to standard (std) package structure

6th-generation IGBT

7th-generation IGBT

◆ Press-fit terminal support (NX)

- Possible to select the control pin shape (soldered terminals/press-fit terminals)
- Solder attachment process eliminated

Press-fit pin

Main pin Signal pin

Ultra sonic bonding adopted
Thick metal substrate(TMS)

Standard package is not available for CIB
Lineup of IGBT Modules

Matrix of IGBT Modules 650V/600V (No.: Number of outline drawing, see page 29 to 34)
RoHS directive (2011/65/EU, (EU)2015/863) compliant

<table>
<thead>
<tr>
<th>IGBT Type</th>
<th>650V</th>
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Matrix of Power Modules for 3-level Inverter (No.: Number of outline drawing, see page 30 to 32)
RoHS directive (2011/65/EU, (EU)2015/863) compliant

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<th>IGBT Module</th>
<th>Power Module</th>
<th>1200 V IGBT Module</th>
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<th>1700 V IGBT Module</th>
<th>1700 V Diode Module</th>
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Connection:
- IGBT module
- Diode module

* Connection of diode module and IGBT module are different.

* New Product
## Matrix of IGBT Modules 1200V

### 1200V

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<thead>
<tr>
<th>Voltage (V)</th>
<th>T/Series</th>
<th>T/1/Series-100 Type</th>
<th>T/Series std Type</th>
<th>S/S1/Series std Type</th>
<th>S/S1/Series MPO Type</th>
<th>A/Series* NF-Series*</th>
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</thead>
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**Note:**
- A-Series have model names ending with A, NF-Series have model names ending with NF/NFH
- Unmarked under development

---

*1: A-Series have model names ending with A, NF-Series have model names ending with NF/NFH

---

**Under Development**
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Connection:

[Diagram of connections]

羅HS directive (2011/65/EU, (EU)2015/863) compliant

★★: Under Development
Lineup of IGBT Modules

01 CM75,100MX-12A
02 CM100,150,200RX-12A
CM75RX-24S
03 CM300,400DX-12A
CM150,200DX-24S

04 CM35,50,75,100MXA-24S
05 CM7STX-24S
06 CM600,1000DXL-24S

07 CM75,100,150TL/RL-12NF
CM50,75,100TL/RL-24NF
08 CM150,200,300DY-12NF
CM100,150DY-24NF
CM100,150,200DY-24A
CM75,100DY-34A
CM100,150E3Y-24NF

09 CM200TL/RL-12NF
CM150,200TL/RL-24NF

Unit: mm
Outline Drawing of IGBT Modules

10
- CM400DY-12NF
- CM200DY-24NF
- CM300DY-24A
- CM300DY-24S
- CM150,200DY-34A

11
- CM600DY-12NF
- CM400DY-24NF
- CM400C1Y-24S
- CM450DY-24S
- CM600DY-24A
- CM600DY-24S

12
- CM600DU-24NF
- CM800DY-24S

13
- CM200DU-12NFH
- CM100,150DU-24NFH

14
- CM300,400DU-12NFH
- CM200,300DU-24NFH

15
- CM600DU-12NFH
- CM400,600DU-24NFH

16
- CM400,600HA-24A
- CM500HA-34A

17
- CM900,1400DUC-24S
- CM1000DUC-34SA

18
- CM400DY-34A

Unit: mm
Outline Drawing of IGBT Modules

28 CM300,450,600DX-13T CM225,300,450,600DX-24T CM800DX-24T CM225,300,450DX,600DX-34T

29 CM1000DX-24T

30 CM100,150,200DY-13T CM100,150DY-24T CM75,100DY-34T

31 CM300,400DY-13T CM200,300DY-24T CM150,200DY-34T

32 CM600DY-13T CM450,600DY-24T CM450,600C1Y-24T CM300,400DY-34T RM600,800DY-34S

33 CM100,150,200TX-13T CM100,150,200TX-24T CM100,150TX-34T

34 CM150,200RX-13T CM100,150RX-24T

35 CM400ST-24S1

36 CM500C2Y-24S CM1400HA-24S CM600,800,1000HA-34S RM1400HA-24S
Lineup of IGBT Modules

Outline Drawing of IGBT Modules

Unit: mm

37
CM100,150,200TXP-13T
CM100,150,200TXP-24T
CM100,150TXP-34T

38
CM150,200RXP-13T
CM100,150RXP-24T

39
CM300,450,600DXP-13T
CM225,300,450,600DXP-24T
CM800DXP-24T
CM225,300,450,600DXP-34T

40
CM1000DXP-24T

41
CM35,50MXUA-24T/24T1

42
CM35,75,100MXUB-13T/13T1
CM75MXUB-24T/24T1

43
CM75,100MXUC-24T/24T1

44
CM100/150MXUD-13T/T1
CM150MXUD-24T/T1

45
CM35/50MXUAP-24T/T1
## Series Matrix of MOSFET Modules

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RoHS directive (2011/65/EU, (EU)2015/863) compliant

## Outline Drawing of MOSFET Modules

Unit: mm

![Outline Drawing](image_url)
HVIGBT Modules

Series, Main Application

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New Products

X Series HVIGBT Modules std type

Existing compatible package: Standard type Contributes to smaller, higher-capacity inverter systems by expanding lineup

<Main Features>
- Power loss reduced by incorporating 7th-generation IGBT and RFC™ diode
- Industry-leading power² for increased inverter capacity
- External size reduced 33% while maintaining the same voltage resistance and rated current as conventional products,³ contributing to inverter downsizing
- Optimal package internal structure realizes improved heat dissipation, humidity resistance and flame retardance, increasing product life
  *¹ RFC - Relaxed field of cathode
  *² 3.3kV - 6.6kV (as of Apr.1, 2020 based on Mitsubishi Electric research)
  *³ Comparison of X Series CM1200HC-66X and H Series CM1200HC-66H

Product lineup

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X Series HVIGBT Modules dual type

New common frame package: dual type Class-leading current density contributes to increased power output in inverter systems

<Main Features>
- Power loss reduced by incorporating 7th-generation IGBT and RFC™ diode
- Industry's highest 3.3kV/600A S module power density of 8.57A/cm²*⁴ contributes to increased power output and efficiency
- Terminal layout optimized for easy paralleling and flexible inverter configurations and capacities
- New package structure offers extra reliability
  *⁴ As of Apr. 1, 2020 based on Mitsubishi Electric research

Product lineup

<table>
<thead>
<tr>
<th></th>
<th>LV100</th>
<th>1.7kV</th>
<th>3.3kV</th>
<th></th>
<th>4.5kV</th>
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<td>450A</td>
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36
### Series Matrix of HVIGBT

<table>
<thead>
<tr>
<th>I(A)</th>
<th>1700V</th>
<th>2500V</th>
<th>3300V</th>
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<tr>
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<td>X-Series</td>
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<td>H-Series</td>
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<td>400A</td>
<td>CM80D5Y09H</td>
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<td>600A</td>
<td>CM800D7Y4H</td>
<td>E2 B 04</td>
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<td>800A</td>
<td>CM800D2-34H</td>
<td>D1 C 01</td>
<td>CM800D2-34H</td>
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<td>CM100D5C4H</td>
<td>D2C 03</td>
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</tr>
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<td>1200A</td>
<td>CM100D5C4H</td>
<td>D2C 03</td>
<td>CM1200C3-4H</td>
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<td>1500A</td>
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<td>1600A</td>
<td>CM1600C3-4H</td>
<td>H C 02</td>
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<td>1800A</td>
<td>CM1800C3-4H</td>
<td>H C 02</td>
<td>CM1800C3-4H</td>
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<td>2400A</td>
<td>CM2400C3-4H</td>
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<td>CM2400C3-4H</td>
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<td>CM3600C3-4H</td>
<td>H C 04</td>
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### Connection

![Connection Diagram]

**Type**
- B: Du base plate 6kV isolation
- C: A/B/C base plate 6kV isolation
- G: A/B/C base plate 10kV isolation

**Future Development**
- Under Development
- New Product

*Type name may change during development.*
*Please check the latest information on the website.*

The outline drawing is written in the figure of principal part numbers that have a common dimension.

### Evolution of HVIGBT Module Series

<table>
<thead>
<tr>
<th>Voltage (kV)</th>
<th>Series</th>
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<tr>
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<td>H Series std type</td>
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<td>2.5kV</td>
<td>H Series std type</td>
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<td>3.3kV</td>
<td>H Series std type</td>
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<td>4.5kV</td>
<td>H Series std type</td>
</tr>
<tr>
<td>6.5kV</td>
<td>H Series std type</td>
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### Type Name Definition of IGBT Modules

- **CM 1800 H C**
  - **Series name**: Outline drawing and other specifications
  - **Connection type**: Rating current
  - **CM**: IGBT, RM: DIODE, PM: IPM
### Series Matrix of HVIGBT (No.: Number of Outline Drawing, see page 39 to 40)

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<td>CM330G-150K**</td>
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<td>CM450G-150K**</td>
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<td>CM600H-450H</td>
<td>H G 07</td>
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<td>750A</td>
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<td>H C G 03</td>
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<td>CM900H-450K**</td>
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<td>CM1000H-450K**</td>
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<tr>
<td>1500A</td>
<td>CM1500H-450K**</td>
<td>H C G 04</td>
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**Connection**

- **E2/E6**
- **E4**
- **D2**

**[Type]**
- **B**: Cu base plate 6kV Isolation
- **C**: AIS/C base plate 6kV Isolation
- **G**: AIS/C base plate 10kV Isolation

**Notes:**
- Star Mark: Under Development
- Circle Mark: New Product
- (*)Type name may change during development.
- Please check the latest information on the website.
- The outline drawing is written the figure of principal part numbers that have a common dimension.
Lineup of HVIGBT Modules

**Outline Drawing of HVIGBT Modules**

**01**
CM1200DC-34N/S
CM800DZB-34N
CM800DY/EZY-34N
CM800DZ-34N

**02**
CM1200,1600HC-34H

**03**
CM1200E4C-34X
CM1800,2400HC-34X
CM1200HC-66X
CM900HC-90X
etc.

**04**
CM2400HC-34X, CM3600HC-34X
CM1200E4C-66X, CM1200HC-66X
CM1800HC-66X, CM1350HC-90X
CM1500HC-90X/X
CM500HC-90X/X
etc.

**05**
CM400HG-66H
CM200HG-130H

**06**
CM1800HG-66X, CM900HGB-90X,
CM900EHG-90X, CM1350HG-90X,
CM1250HG-90X, CM600HG-130X,
CM600EHG-130X, CM900HG-130X,
CM1000HG-130X/X
CM1000HC-130X/X
etc.

**07**
CM900, 1000HG-90X
CM800HG-90R
CM600HG-90H/130X
CM400HG-130H

**08**
CM400DY-50H/66H

**09**
CM1000DC-34X, CM1200DC-34X
CM450DC-66X, CM600DC-66X
Outline Drawing of HVIGBT Modules

CM450DG-66X, CM600DG-66X
CM350DG-90X, CM450DG-90X
CM225DG-130X, CM300DG-130X

Unit:mm
### Series, Main Application

<table>
<thead>
<tr>
<th>Series</th>
<th>Main Application</th>
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<td>HVDIODE Modules</td>
<td>Traction/Power transmission/Motion control</td>
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### Rated Lineup

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<th>300A</th>
<th>400A</th>
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### Series Matrix of HVDIODE Modules

(No.: Number of outline drawing, see page 42)

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<tr>
<td>1200</td>
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<tr>
<td>1500</td>
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<tr>
<td>1800</td>
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</tbody>
</table>

### Evolution of HVDIODE Module Series

- 1.7kV: S Series → X Series
- 3.3kV: S Series → F Series → X Series
- 4.5kV: S Series
- 6.5kV: S Series

### Type Name Definition of IGBT Modules

- **RM 1200 D G -66 X**
  - **Series name**
  - **Connection type**
  - **Outline drawing and other specifications**
  - **Rating current**

  CM: IGBT, RM: DIODE, PM: IPM

---

**Type**:
- B: Cu base plate 6kV isolation
- C: AlSiC base plate 6kV isolation
- G: AlSiC base plate 10kV isolation

The outline drawing is written the figure of principal part numbers that have a common dimension.
Outline Drawing of HVDIODE Modules

11
RM800-DC-34X
RM1200DB-34S

12
RM1800HE-34S, RM1500HE-66F
RM1200HE-66S, RM600HE-90S

13
RM600/900/1200DG-66X
RM450/900/1500DG-90X
RM300/450/600DG-130X
RM1000DG-130XA
etc.

14
RM600,1200DC-66X
RM1500DC-90X
RM1000,1500DC-66F
RM400,600DY-66S
RM1200DB-66S, RM900DB/HC-90S
Series, Main Application

<table>
<thead>
<tr>
<th>Series</th>
<th>Main Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
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<tr>
<td>J</td>
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Rated Lineup

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<th>700A</th>
<th>1000A</th>
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<td>-</td>
<td>-</td>
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<tr>
<td>1200V</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

Featured Products

Package with 6-in-1 connection and integrated water-cooled fin contributes to more compact, high-power inverters for xEV

J1 Series / High Power J1 Series power Modules for xEV

CT600C1A060-A, CT700CJ1A060-A
CT1000CJ1B080, CT600CJ1B120

Main Features:

- Integrated direct water-cooling structure with cooling fins and 6-in-1 connection contribute to more compact inverters for xEV
- Direct lead bonding (DLB) structure ensures high reliability
- Loss further reduced by incorporating 7th-generation IGBT built with a CSTBT™ structure
- On-chip current sensor that enables high-speed current-cutoff protection is installed
- Completely lead-free, conforms to RoHS directive (2011/65/EU)
- Suitable for a variety of electric and hybrid vehicle inverters

* CSTBT™: Mitsubishi Electric’s unique IGBT that utilizes the carrier cumulative effect.

Features

Common

- Long power/temperature cycle life
- High-precision on-chip temperature sensor
- High traceability in managing materials/components for each product throughout the entire production process
- Package structure compliant with the End-of-Life-Vehicles Directive, regulations relating to substances of enviromental concern

J Series T-PM (Transfer-molded Power Module)

- Structure incorporates transfer molding and original direct lead bonding (DLB) technique
- DLB structure reduces internal wiring resistance and inductance
- Completely Pb-free (including the pins)
### Matrix of 650V Power Modules

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<th>Ic(A)</th>
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<th>J Series</th>
<th>650V</th>
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<th>650V</th>
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<td>C</td>
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<td>700</td>
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<td>1000</td>
<td>CT1000CJ1B060</td>
<td>C</td>
<td>03</td>
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Connection

[Diagram of Connection]

★☆: Under Development

### Matrix of 1200V Power Modules

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<th>1200V</th>
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<tr>
<td>300</td>
<td>CT300CJ1A120-A**</td>
<td>C</td>
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<td>600</td>
<td>CT600CJ1B120</td>
<td>C</td>
</tr>
</tbody>
</table>

Connection

[Diagram of Connection]

★☆: Under Development

### Type Name Definition of Power Modules for xEV

| CT | 600 | C | J1B | 120 |

- Voltage class
- Series name and structure
- Connection type
- Rating current class
- CT: IGBT

### Outline Drawing of Power Modules for xEV

<table>
<thead>
<tr>
<th>01</th>
<th>02</th>
<th>03</th>
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</thead>
<tbody>
<tr>
<td>CT600CJ1A060-A</td>
<td>CT700CJ1A060-A</td>
<td>CT300CJ1A120-A</td>
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<tr>
<td>CT300DJG060</td>
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<td>CT1000CJ1B060</td>
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<tr>
<td>CT600CJ1B120</td>
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<td></td>
</tr>
</tbody>
</table>

Unit: mm

NOTE: In case of CT1000CJ1B060 and CT600CJ1B120, each pair of arms is not connected internally.
<table>
<thead>
<tr>
<th>Country</th>
<th>Company Name</th>
<th>Address/Contact Details</th>
<th>Email</th>
<th>Website</th>
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<tr>
<td>Austria</td>
<td>GLYN AUSTRIA</td>
<td>Campus 21 / Businesspark Wien Süd Liebermannstr. A02/301, A-2345 Brunn am Gebirge</td>
<td><a href="mailto:sales@glyn.at">sales@glyn.at</a></td>
<td><a href="http://www.glyn.at">www.glyn.at</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phone +43 (0) 2236 311 112 0 Fax +43 (0) 2236 311 112 20</td>
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</tr>
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<td></td>
<td>HY-LINE COMPONENTS GMBH</td>
<td>Inselkammerstr. 10, D-82008 Unterhaching Phone +49 (0) 89 61 45 03 10 Fax +49 (0) 89 61 45 03 20</td>
<td><a href="mailto:power@hy-line.de">power@hy-line.de</a></td>
<td><a href="http://www.hy-line.de">www.hy-line.de</a></td>
</tr>
<tr>
<td>Baltic countries (Lithuania, Estonia, Latvia)</td>
<td>ELGERTA UAB</td>
<td>Visorūtis 2, LT-08300 Vilnius, Lithuania Phone +370 5 265 2683, 265 2689</td>
<td><a href="mailto:lithuania@elgerta.com">lithuania@elgerta.com</a></td>
<td><a href="http://www.elgerta.com">www.elgerta.com</a></td>
</tr>
<tr>
<td>Belarus</td>
<td>SYMMETRON MINSK</td>
<td>V. Khoruzhey str. 1a, 220005, Minsk, Belarus Phone +375 17 3360606 Fax +375 17 2863069</td>
<td><a href="mailto:minsk@symmetron.ru">minsk@symmetron.ru</a></td>
<td></td>
</tr>
<tr>
<td>Benelux</td>
<td>GLYN GMBH &amp; CO KG, Benelux Division</td>
<td>Ringstr. 88, D-41334 Nettetal Phone +49 2157 124 231 Fax +49 2157 124 232</td>
<td><a href="mailto:benelux@glyn.com">benelux@glyn.com</a></td>
<td><a href="http://www.glyn.com">www.glyn.com</a></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>OHM BG EOOD</td>
<td>Svetlina Street No. 11, 8800 Silven, Bulgaria Phone +359 4468 7533 Fax +359 4468 7533</td>
<td><a href="mailto:teokay@ohm.com.tr">teokay@ohm.com.tr</a></td>
<td><a href="http://www.ohm.com.tr">www.ohm.com.tr</a></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>STARMANS ELECTRONICS, S.R.O.</td>
<td>V Zahradčí 8362/4, 180 00 Praha 8, Czech Republic Phone +420 (0) 225 442 260 Fax +420 (0) 283 841 067</td>
<td><a href="mailto:components@starmans.cz">components@starmans.cz</a></td>
<td><a href="http://www.starmans.net">www.starmans.net</a></td>
</tr>
<tr>
<td>Denmark</td>
<td>GLYN DENMARK</td>
<td>Slotsmarken 16, DK-2970 Hørsholm Phone +45 702 016 33 Fax +45 702 016 37</td>
<td><a href="mailto:sales@glyn-nordic.dk">sales@glyn-nordic.dk</a></td>
<td><a href="http://www.glyn-nordic.dk">www.glyn-nordic.dk</a></td>
</tr>
<tr>
<td>France</td>
<td>ARCEL</td>
<td>ZI le troc'hon – 2 rue des auines F-69410 Champagne Au Mont D'or Phone +33 (0) 478 35 0221 Fax +33 (0) 478 35 6954</td>
<td><a href="mailto:info@arcel.eu">info@arcel.eu</a></td>
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<tr>
<td></td>
<td>COMPELEC</td>
<td>MultiParc du Jubin, Bâtiment A 27, chemin des Peupliers 69 570 Dardilly, France Phone +33 (0) 472 088 080 Fax +33 (0) 472 088 215</td>
<td><a href="mailto:yfouletier@compelec.com">yfouletier@compelec.com</a></td>
<td><a href="http://www.compelec.com">www.compelec.com</a></td>
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<tr>
<td>Germany</td>
<td>GLYN GMBH &amp; CO KG</td>
<td>Am Wörtzgarten 8, D-65510 Idstein/Ts. Phone +49 (0) 6126 590 388 Fax +49 (0) 6126 590 188</td>
<td><a href="mailto:power@glyn.de">power@glyn.de</a></td>
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<td><a href="mailto:power@hy-line.de">power@hy-line.de</a></td>
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<td>INELTRON GMBH</td>
<td>Hugenottenstr. 30, D-61381 Friedrichsdorf Phone +49 (0) 6172 49 98 23 0 Fax +49 (0) 6172 75 93 3</td>
<td><a href="mailto:info@ineltron.de">info@ineltron.de</a></td>
<td><a href="http://www.ineltron.de">www.ineltron.de</a></td>
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<tr>
<td>Hungary</td>
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<td>Fecske 16, H-1194 Budapest Phone +36 70 3866055</td>
<td><a href="mailto:liaszlo@ineltron.hu">liaszlo@ineltron.hu</a></td>
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<tr>
<td>Israel</td>
<td>RAM N.S TECHNOLOGIES LTD</td>
<td>1, Harnasger St., Raanana 43653, Israel Phone +972-(0)77-920 8111 Fax +972-(0)77-920 8112</td>
<td><a href="mailto:nati@ram-tech.co.il">nati@ram-tech.co.il</a></td>
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