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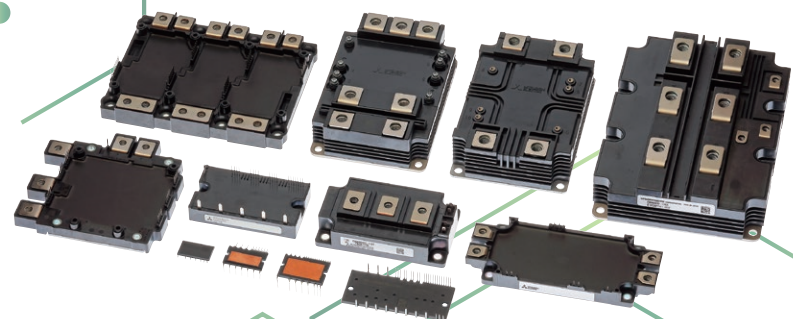
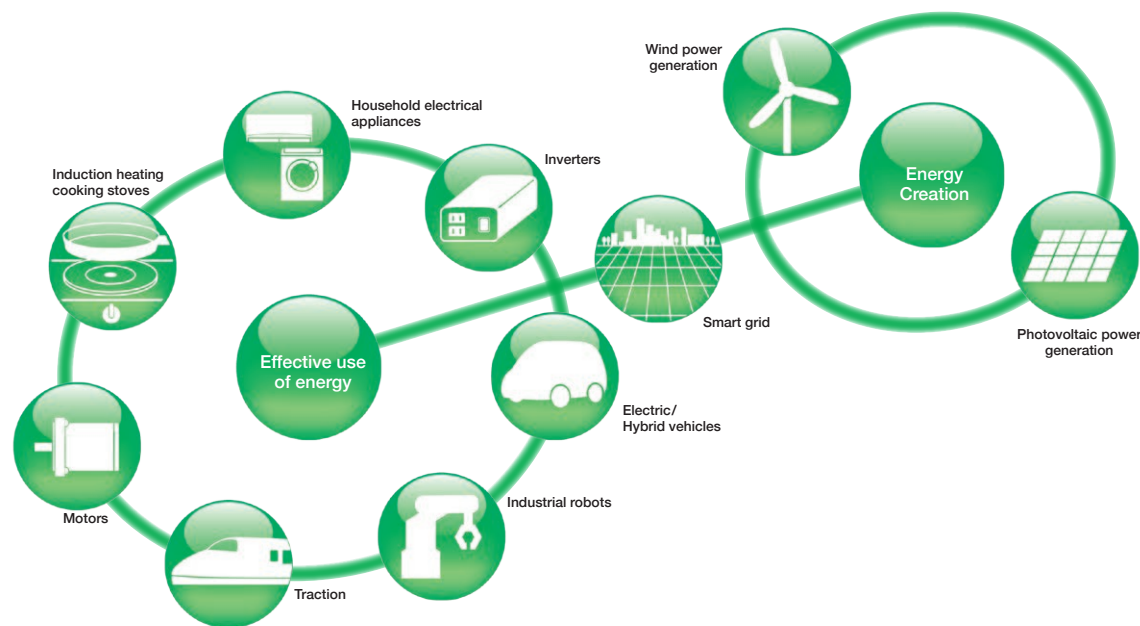
# Power Devices

Revised publication, effective Apr. 2021.  
Superseding publication of H-CT575-F Jun. 2020.  
Specifications subject to change without notice.

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# 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.



## Index

Product	Page	Connection						Rated voltage	Rated current	Main Application
		IGBT Module	Intelligent Power Module	MOSFET Module	Diode Module	Discrete Diode	Discrete MOSFET			
SiC Power Modules	5-11	✓ (Hybrid)	✓	✓				600V	15A-30A	 Home Appliance Industrial equipment Traction
								1200V	75A-1200A	
								1700V	300A, 1200A	
								3300V	375A-750A	
SiC-MOSFET	12						✓	1200V	38A-95A	 Home Appliance Industrial equipment xEV
SiC-SBD	13							600V	20A	 Home Appliance Industrial equipment xEV
								1200V	10A, 20A	
SOIPM	14		✓					600V	2A	 Home Appliance
DIIPM	14-19		✓					600V	5A-75A	 Home Appliance
								1200V	5A-100A	
IPM	20-24		✓					600V	50A-800A	 Industrial equipment
								650V	50A-450A	
								1200V	25A-450A	
IGBT Modules	25-35	✓						600V	75A-600A	 Industrial equipment
								650V	50A-600A	
								1200V	35A-1400A	
								1700V	75A-1200A	
HVIGBT Modules	36-40	✓						1700V	600A-2400A	 Traction High Power
								2500V	400A-1200A	
								3300V	400A-1800A	
								4500V	450A-1500A	
								6500V	200A-1000A	
HVDIODE Modules	41-42							1700V	1200A-1800A	 Traction High Power
								3300V	400A-1500A	
								4500V	300A-1500A	
								6500V	200A-1000A	
MOSFET Modules	43			✓				75V	100A-300A	 Industrial equipment
								100V		
								150V		
Power Modules for xEV*1	44-45	✓						650V	300A-700A	 xEV

\*1 EV: Electric Vehicle

\*2 SOIPM, DIIPM, SLIMDIP, DIPIM+, DIPPF, 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.

Contributing to the realization of a low-carbon society and more affluent lifestyles

### 2010

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



October 2010  
Launched "Kirigamine" inverter air conditioner



### Early 1990s

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

### 2011

January 2011  
Verified highest power conversion efficiency\*1 for solar power generation system power conditioner (domestic industry)\*2

October 2011  
Commercialized SiC inverter for use in railcars



### 2014

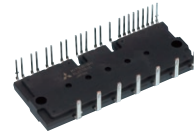
February 2014  
Developed EV motor drive system with built-in SiC inverter



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



November 2014  
Launched Large Hybrid SiC DIPIPM™ for PV Applications



### 2017

March 2017  
Launched SiC-SBD



March 2017  
Develops World's smallest SiC Inverter for HEVs.



September 2017  
Develops SiC Power Device with Record Power Efficiency

December 2017  
Mitsubishi Electric and the University of Tokyo Quantify 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

### 2021

January 2021  
Launched Second-generation Full-SiC Power Modules



### 2020

November 2020  
Launched 4-terminal SiC-MOSFETs



July 2020  
Launched SiC-MOSFET

July 2020  
Develops Accurate Circuit Simulation Technology for SiC-MOSFETs

### 2015

January 2015  
Launched power conditioner for PV equipped with full SiC-IPM\*2



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

### 2019

June 2019  
Began shipping samples of 1200V SiC-SBD



February 2019  
Develops Super Compact Power Unit for Hybrid Electric Vehicle

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

### 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\*1 with approx. 70% reduction in power loss



November 2009  
Verified 20kW SiC inverter, world's highest value\*1 with approx. 90% reduction in power loss



### 2012

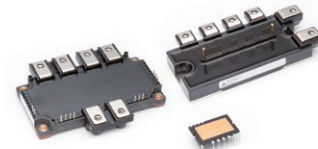
March 2012  
Developed motor system with built-in SiC inverter



September 2012  
Verified built-in main circuit system for railcars



July 2012  
Began shipping samples of hybrid SiC



December 2012  
Launched CNC drive unit equipped with SiC power module



### 2013

February 2013  
Developed SiC for application in elevator control systems



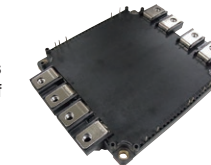
March 2013  
Delivered auxiliary power supply systems for railcars



May 2013  
Launched SiC power modules



February 2013  
Developed technologies to increase capacities of SiC power modules

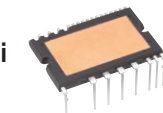


December 2013  
Launched railcar traction inverter with full SiC power module



### 2016

April 2016  
Launched Super mini Full SiC DIPIPM™



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



October 2016  
Launched package air conditioners with full SiC DIPIPM™ in Japan



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.

\*1 Researched in press releases by Mitsubishi Electric.

\*2 Mitsubishi Electric solar-power generation system discontinued on March 31, 2020.

Data sheet here



## Lineup of SiC Power Modules

Application	Product name	Model	Rating		Connection	States	Page	
			Voltages[V]	Current[A]				
Industrial equipment	Full SiC Power Modules	FMF300BXZ-24B	1200	300	4in1	Under development	6	
		FMF400BX-24B		400	4in1			
		FMF400BXZ-24B		400	4in1			
		FMF600DXZ-24B		600	2in1			
		FMF800DX-24B		800	2in1			
		FMF800DXZ-24B		800	2in1			
		FMF1200DXZ-24B		1200	2in1			
		FMF300DXZ-34B		1700	300			2in1
		FMF300E3XZ-34B			300			2in1(Chopper)
	Full SiC-IPM	PMF75CGA120	1200	75	6in1			
		PMF75CGAL120						
	Hybrid SiC Power Modules for High-frequency Switching Applications	CMH100DY-24NFH	1200		100	2in1		
		CMH150DY-24NFH			150			
		CMH200DU-24NFH			200			
		CMH300DU-24NFH			300			
		CMH300DX-24NFH			300			
		CMH400DU-24NFH			400			
		CMH600DU-24NFH			600			
		CMH400HC6-24NFM			400			1in1
	Traction inverter HVDC system	Full SiC Power Modules	FMF375DC-66A	3300	375	2in1	Commercially available	
FMF750DC-66A			750					
Hybrid SiC Power Modules		CMH600DC-66X	3300	600				
		CMH1200DC-34S		1700		1200		
Home appliances	Super mini Full SiC DIPIPM	PSF15S92F6	600	15	6in1	9		
		PSF25S92F6		25				
	Super mini Hybrid SiC DIPFC	PSH30L92C6-W	600	30Arms	Three-phase interleaved			
		PSH20L91A6-A		20Arms	Two-phase interleaved			
Super mini Full SiC DIPFC	PSF20L91A6-A							



## Full-SiC Power Modules for Industrial Equipment

Under development

Contributes to reducing size/weight of industrial-use inverters

### Features

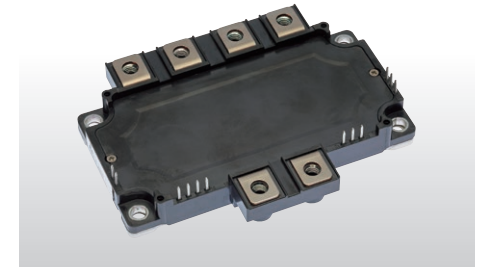
- Power loss reduced approx. 70% compared to the conventional product\*
- Low-inductance package adopted to deliver full SiC performance
- Contributes to increasing the output current and downsizing peripheral components by low power loss characteristics of SiC

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

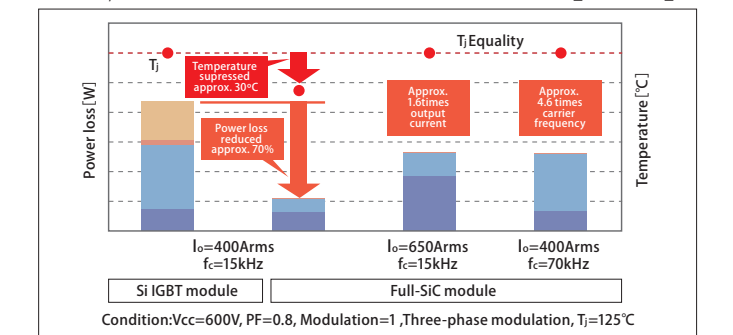
### Product lineup

Model	Rated voltage	Rated current	Circuit configuration	Package size (D x W)
FMF400BX-24B**	1200V	400A	4 in 1	92.3mm x 121.7mm
FMF800DX-24B**		800A	2 in 1	

\*\*Under development



### Power loss comparison



## Full-SiC Power Modules for Industrial Equipment

(built-in short-circuit protection function) Under development

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

### Features

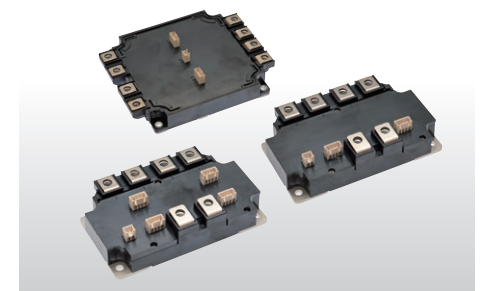
- By using short circuit monitoring circuit in the module it is possible to transfer a short circuit detection signal to the system side
- Power loss reduced approx. 70% compared to the conventional product\*
- Low-inductance package adopted to deliver full SiC performance

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

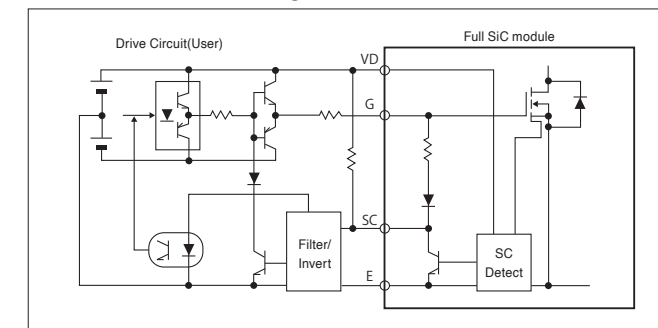
### Product lineup

Model	Rated voltage	Rated current	Circuit configuration	Package size (D x W)
FMF300BXZ-24B**	1200V	300A	4 in 1	79.6mm x 122mm
FMF400BXZ-24B**		400A	4 in 1	
FMF600DXZ-24B**		600A	2 in 1	
FMF800DXZ-24B**		800A	2 in 1	
FMF1200DXZ-24B**	1700V	1200A	2 in 1	152mm x 122mm
FMF300DXZ-34B**		300A	2 in 1	79.6mm x 122mm
FMF300E3XZ-34B**		300A	2 in 1(Chopper)	

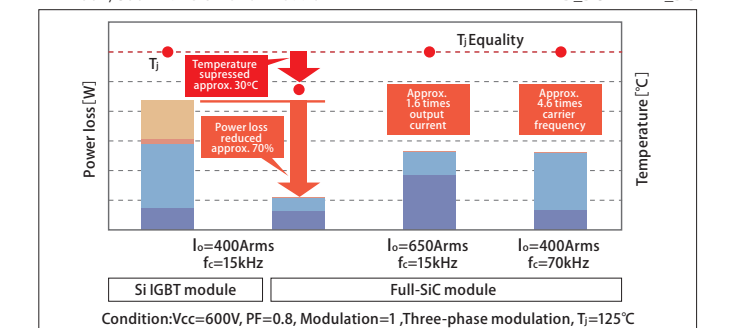
\*\*Under development



### Protection circuit diagram



### Power loss comparison



# SiC Power Modules



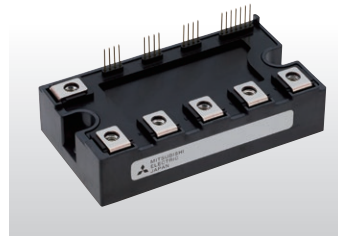
## 1200V/75A Full SiC-IPM for Industrial Equipment PMF75CGA120/PMF75CGAL120 Under development

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

### Features

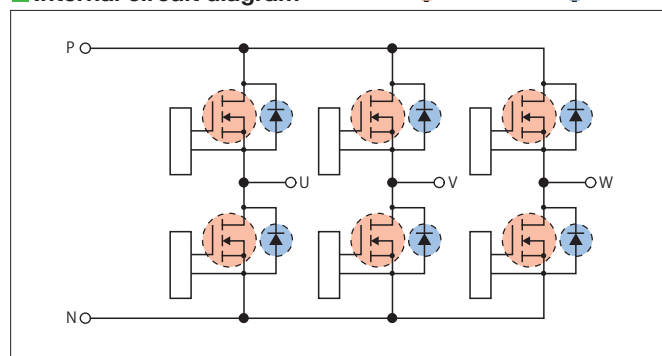
- Realized high performance and low power loss by 2nd. generation SiC-MOSFET and SiC-SBD with current sense and temperature sense
- External size is reduced approx.30% with the conventional Silicon IPM products\* of the same rating.
- Available to drive it by the equivalent I/F and power supply circuit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

\* Conventional product: Mitsubishi Electric G1 Series PM75CG1B120



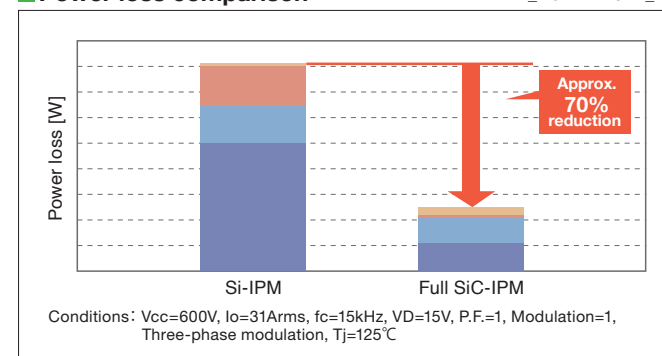
### Internal circuit diagram

● SiC-MOSFET ● SiC-SBD



### Power loss comparison

■ FWD\_SW ■ IGBT\_SW  
■ FWD\_DC ■ IGBT\_DC



## 3300V Full/Hybrid SiC Power Modules for Traction Inverters and HVDC system FMF375DC-66A / FMF750DC-66A CMH600DC-66X 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\*
- Low inductance package maximize SiC performance

### Product lineup

	Model	Rated Voltage	Rated Current	Circuit configuration	External size (D x W)
Full SiC	FMF375DC-66A*	3300V	375A	2 in 1	100 x 140 mm
	FMF750DC-66A		750A		
Hybrid SiC	CMH600DC-66X*		600A		

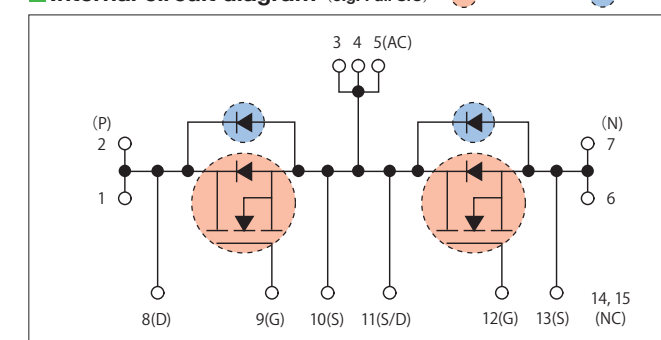
\*New Product



\* Si product: Mitsubishi Electric HVIGBT, CM600DC-66X

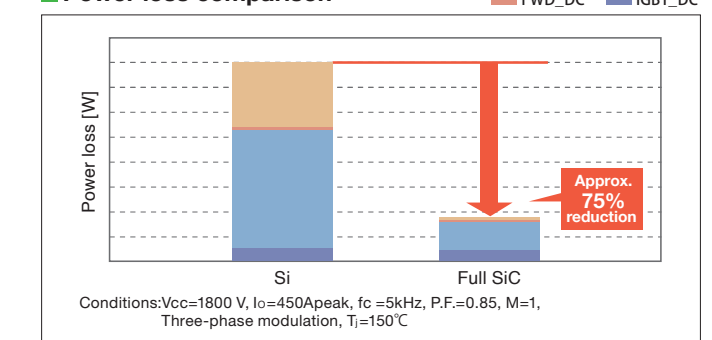
### Internal circuit diagram (e.g. Full SiC)

● SiC-MOSFET ● SiC-SBD



### Power loss comparison

■ FWD\_SW ■ IGBT\_SW  
■ FWD\_DC ■ IGBT\_DC



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

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

### Features

- 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\*

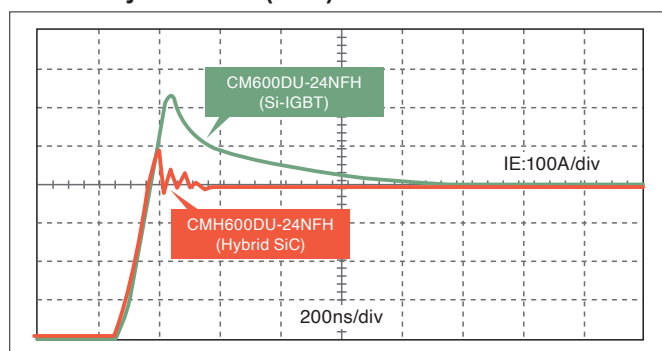
\* Conventional product: Mitsubishi Electric NFH Series IGBT Modules

### Product lineup

Applications	Model	Rated voltage	Rated current	Circuit configuration	External size (D x W)
Industrial equipment	CMH100DY-24NFH	1200V	100A	2 in 1	48x94mm
	CMH150DY-24NFH		150A		48x94mm
	CMH200DU-24NFH		200A		62x108mm
	CMH300DU-24NFH		300A		62x108mm
	CMH300DX-24NFH		300A		62.5 x152mm
	CMH400DU-24NFH		400A		80x110mm
	CMH600DU-24NFH		600A		80x110mm
	CMH400HC6-24NFM		400A		1 in 1

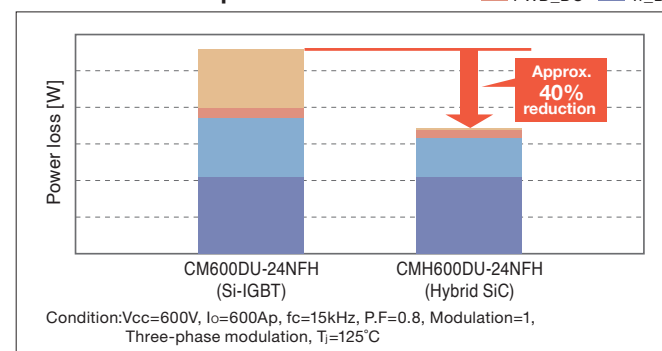


### Recovery waveform (FWD)



### Power loss comparison

■ FWD\_SW ■ Tr\_SW  
■ FWD\_DC ■ Tr\_DC



## 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\*

\* Conventional product: Mitsubishi Electric Power Module CM1200DC-34N

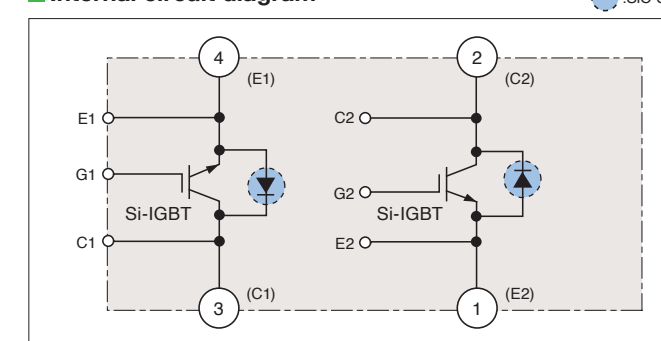
### Main specifications

Module	Max. operating temperature	150°C
Si-IGBT @150°C	Isolation voltage	4000Vrms
	Collector-emitter saturation voltage	2.3V
	Switching loss 850V/1200V	turn-on
turn-off		390mJ
SiC-SBD @150°C	Emitter-collector voltage	2.3V
	Capacitive charge	9.0μC



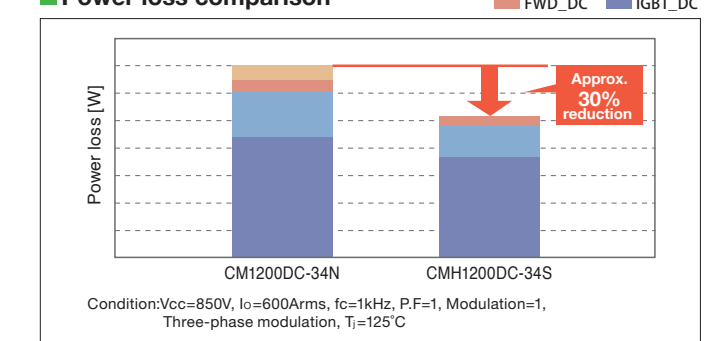
### Internal circuit diagram

● SiC-SBD



### Power loss comparison

■ FWD\_SW ■ IGBT\_SW  
■ FWD\_DC ■ IGBT\_DC



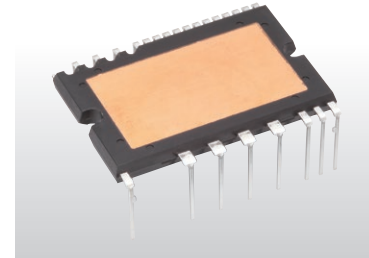


## 15A/25A Super mini Full / Hybrid SiC DIPIPM™ for Home Appliances PSF15S92F6-A/PSF25S92F6-A Commercially available

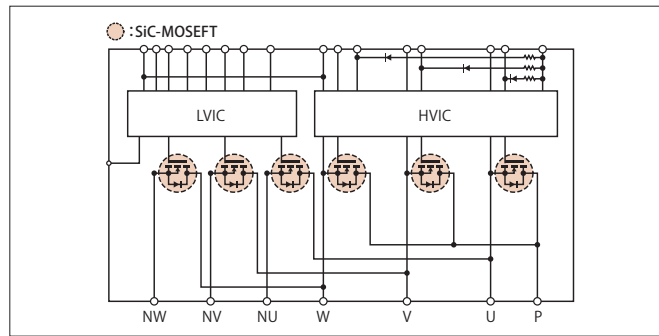
Contributes to extremely high power-efficiency in air conditioners,  
and easily applicable to industrial equipment

### ■ Features

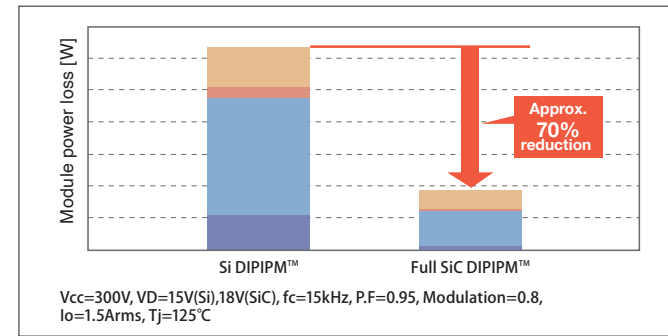
- SiC-MOSFET achieves reduction in ON resistance, power loss reduced approx. 70% compared to conventional product\*
- Construct low-noise system by reducing recovery current
- Numerous built-in functions: Bootstrap diode for power supply to drive P-side, temperature information output, etc.
- Unnecessary 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



### ■ Internal block diagram



### ■ Power loss comparison



## Super mini Full / Hybrid SiC DIPPFM™ for Home Appliances PSH20L91A6-A / PSF20L91A6-A / PSH30L92C6-W Commercially available

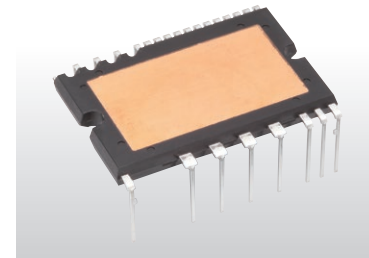
Utilizing SiC enables high-frequency switching and contributes to  
reducing the size of peripheral components

### ■ Features

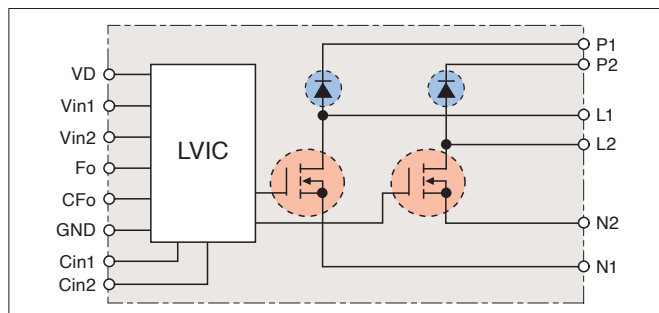
- Incorporating SiC chip in the Super mini package widely used in home appliances
- The SiC chip allows high-frequency switching (up to 40kHz) and contributes to downsizing the reactor, heat sink and other peripheral components
- Adopts the same package as the Super mini DIPIPM™ to eliminate the need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

### ■ Product lineup

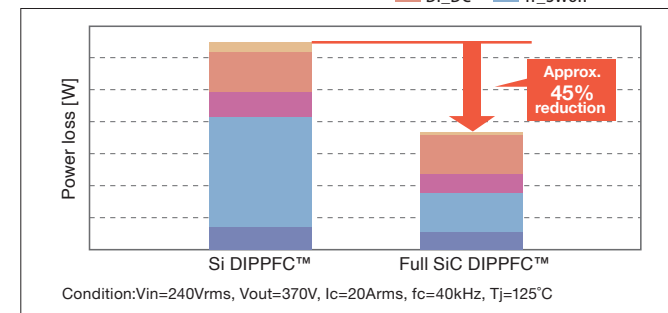
Model	Circuit configuration	Chips
PSH20L91A6-A	2phase Interleaved	Hybrid SiC
PSF20L91A6-A	2phase Interleaved	Full SiC
PSH30L92C6-W	3phase Interleaved	Hybrid SiC



### ■ Internal block diagram (PSF20L91A6-A)

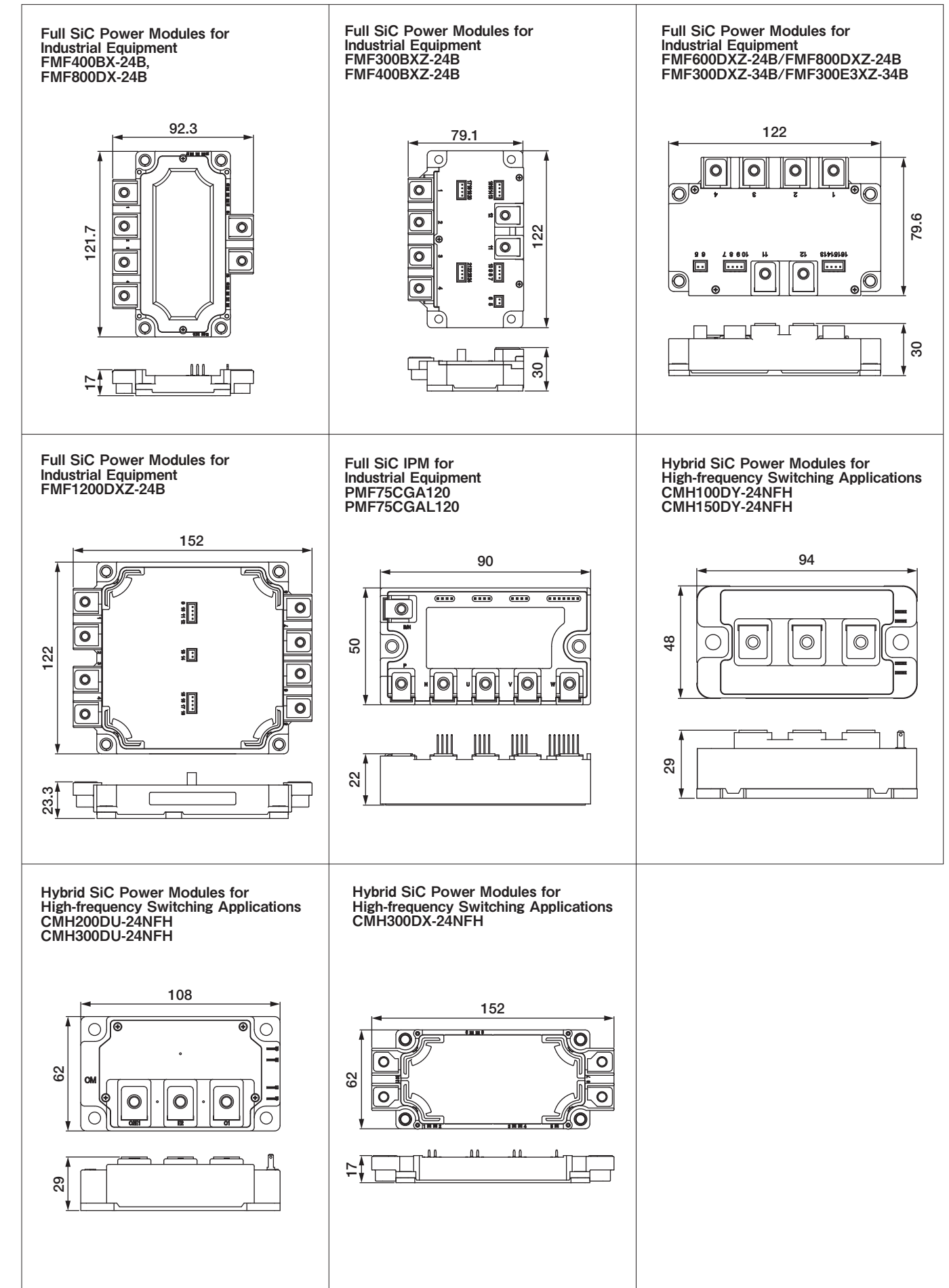


### ■ Power loss comparison



### ■ Outline Drawing of SiC Power Modules

Unit:mm



## Outline Drawing of SiC Power Modules

Unit:mm

<p><b>Hybrid SiC Power Modules for High-frequency Switching Applications</b> CMH400DU-24NFH CMH600DU-24NFH</p>	<p><b>Hybrid SiC Power Modules for High-frequency Switching Applications</b> CMH400HC6-24NFH</p>	<p><b>3300V Full/Hybrid SiC Power Modules for Traction Inverters and HVDC system</b> FMF375DC-66A/FMF750DC-66A CMH600DC-66X</p>
<p><b>1700V/1200A Hybrid SiC Power Module for Traction Inverters</b> CMH1200DC-34S</p>	<p><b>Super mini Full SiC DIPIPM™</b> PSF15S92F6-A / PSF25S92F6-A <b>Super mini Full/Hybrid SiC DIPPFCT™</b> PSH20L91A6-A/PSF20L91A6-A Long</p>	<p><b>Super mini Full SiC DIPIPM™</b> PSF15S92F6-C/PSF25S92F6-C <b>Control side of Zigzag</b></p>
<p><b>Super mini Full SiC DIPIPM™</b> PSF15S92F6/PSF25S92F6 Short</p>	<p><b>Super mini Hybrid SiC DIPPFCT™</b> PSH30L92C6-W <b>Both side of Zigzag</b></p>	



## SiC-MOSFET for power supply systems

### 1200V N-series

Sample available

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

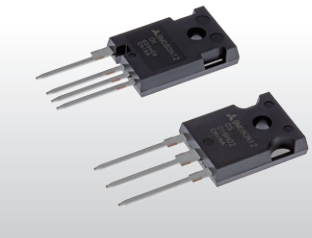
#### Features

- Junction field effect transistor (JFET) doping technology reduces both switching loss and on-resistance, achieving power loss reduction by approx. 80%\* compared to the conventional silicon (Si) products.
- The SiC-MOSFET allows high frequency switching and contributes to downsizing the reactor, heat sink and other peripheral components

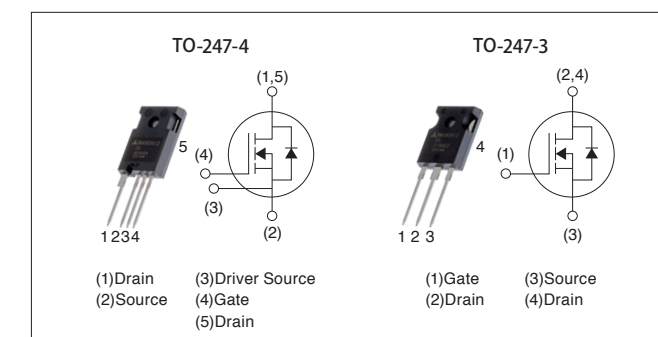
#### Product lineup

Application	Model	Rating		Package	
		Voltage	RDS(on) Current		
Automotive	BM080N120SJ**	1200V	80mΩ	38A	TO-247-3
	BM080N120KJ**				TO-247-4
	BM040N120SJ**		40mΩ	68A	TO-247-3
	BM040N120KJ**				TO-247-4
	BM022N120SJ**		22mΩ	95A	TO-247-3
	BM022N120KJ**				TO-247-4
Home appliance	BM080N120S**	1200V	80mΩ	38A	TO-247-3
	BM040N120S**		40mΩ	68A	TO-247-3
Industrial equipment	BM080N120K**	1200V	80mΩ	38A	TO-247-4
	BM040N120K**		40mΩ	68A	TO-247-4
	BM022N120S**		22mΩ	95A	TO-247-3
	BM022N120K**				TO-247-4

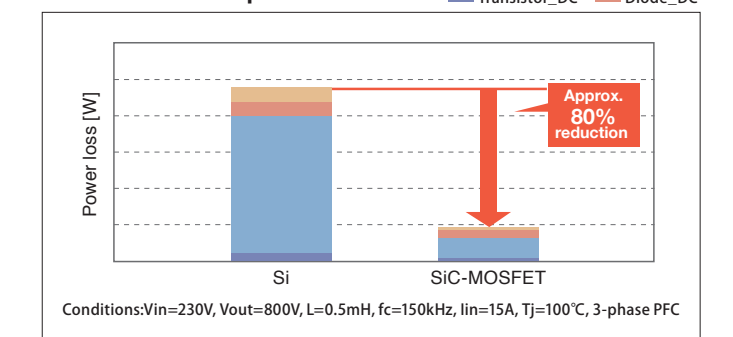
\*\*Under development



#### Inner circuit

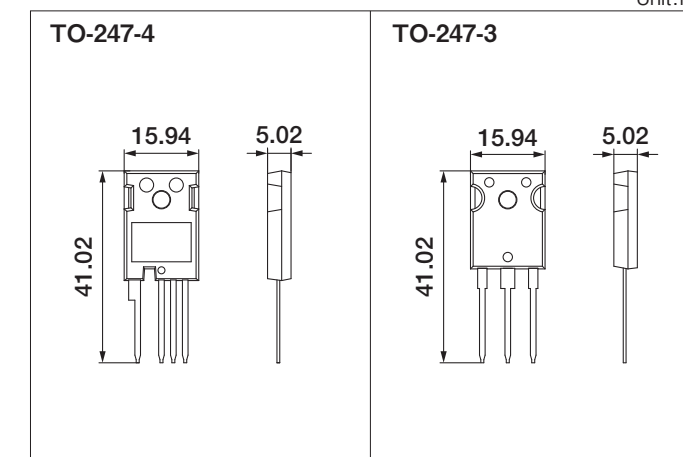


#### Power loss comparison



#### Outline Drawing of SiC-MOSFET

Unit:mm





**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**

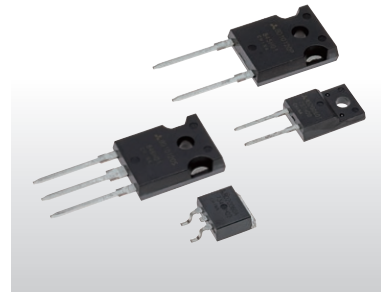
**Features**

- Power loss is reduced by approx. 21%<sup>1</sup> 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<sup>2</sup> structure allows high forward surge capability and contributes to improving reliability

**Product lineup**

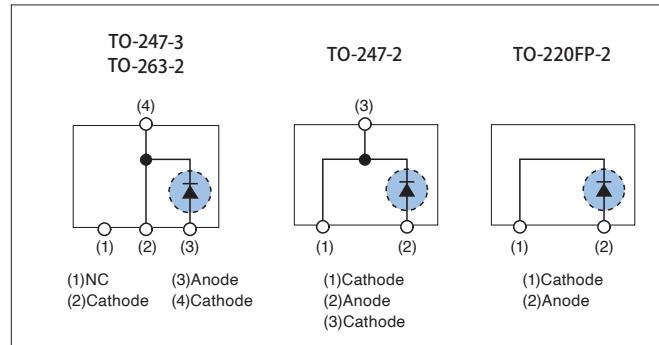
Application	Model	Rated Voltage	Rated Current	Package
Home appliance	BD20060T	600V	20A	TO-220FP-2
	BD20060A			TO-263-2
	BD20060S**			TO-247-3
Industrial equipment	BD20120S**	1200V	20A	TO-247-3
	BD20120P**			TO-247-2
Automotive	BD20120SJ**			TO-247-3

\*\*Under development

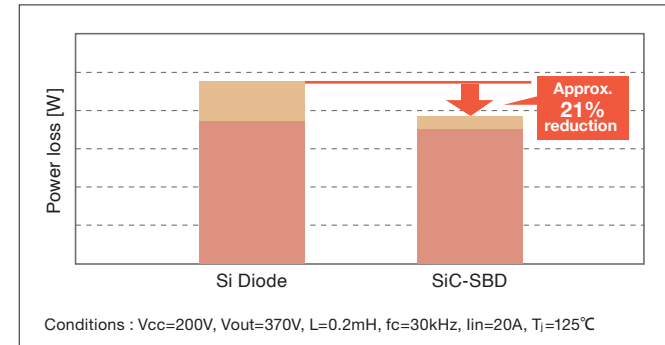


**Inner circuit**

● SiC-SBD

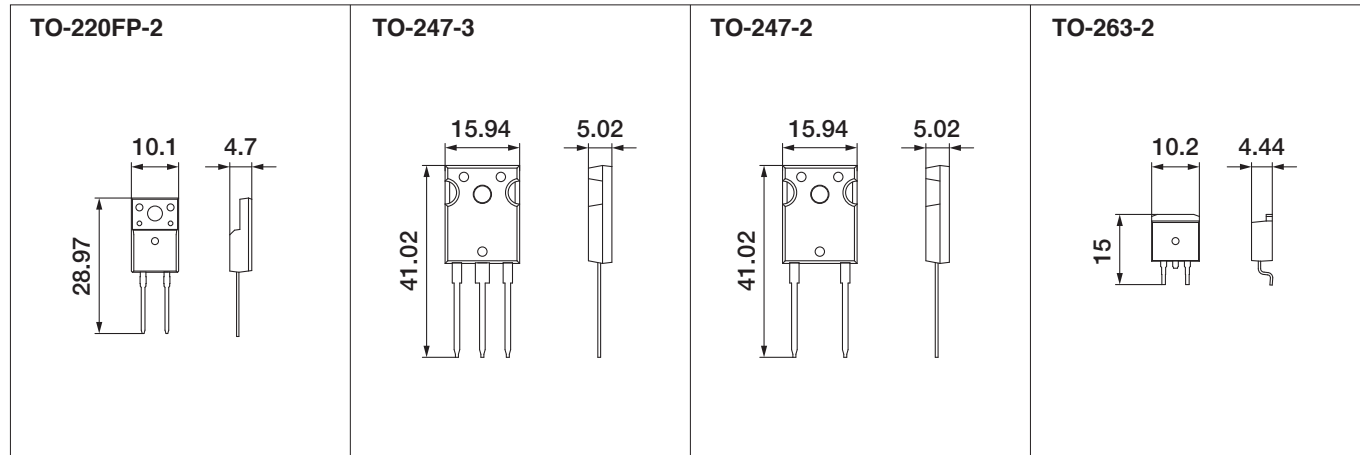


**Power loss comparison**



**Outline Drawing of SiC-SBD**

Unit:mm



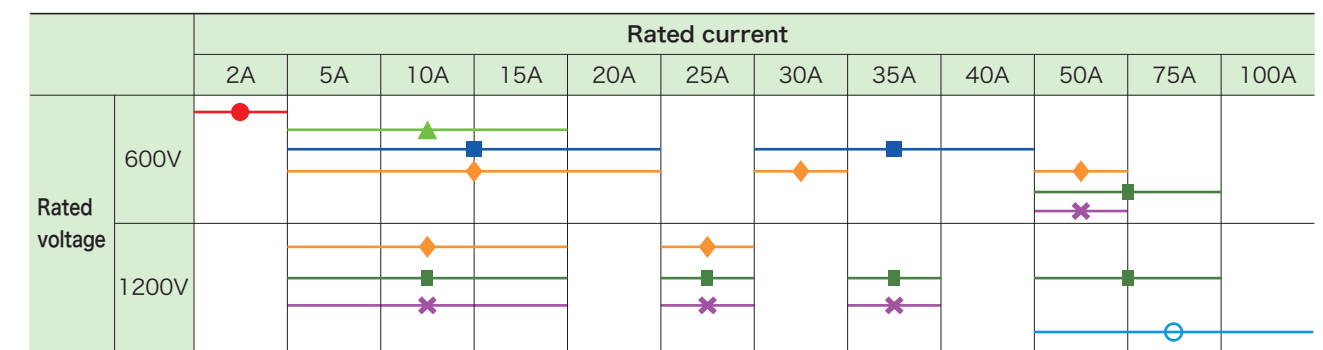
**Package, Main Application**

Package	Main application
SOIPM	Fan motor
SLIMDIP	Air conditioner/Fan motor/Washing machine/Refrigerator
Super mini	Air conditioner/Washing machine/Servo/Robot
Mini	Air conditioner/Motion control
Large	Commercial air conditioner/Motion control
DIIPM+	Commercial air conditioner/Motion control
Large DIIPM+	Commercial air conditioner/Motion control

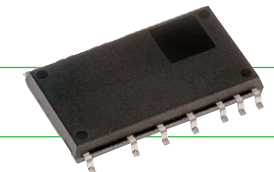
Data sheet here



**Rated Lineup**



**New Products**



**Surface mount package IPM SOIPM™**

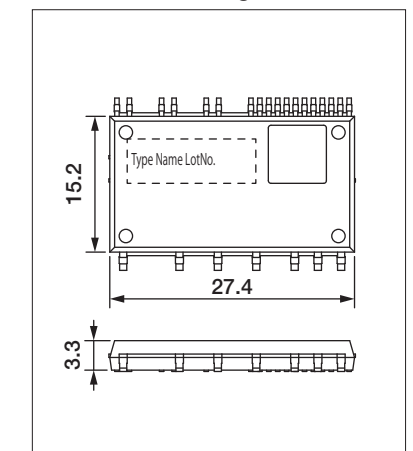
**A small surface mount package IPM enables easy system design by enough insulation distance and protection function for fan and low-power motor drive applications**

**<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<sup>1</sup> simultaneously realizes compact package and low loss performance can go together
- Bootstrap diode is integrated for the P-side drive power supply like conventional DIIPM™ series, reducing the number of peripheral external parts

<sup>1</sup> Reverse-conducting IGBT

**Outline Drawing**



**SOIPM™**

Type name	Rated current	Rated voltage	Chips	Protection	Shape
SP2SK	2A	600V	RC-IGBT, HVIC, LVIC, BSD	UV, SC, OT, VoT, IL	Surface mount package

[Term] UV : Power supply Under Voltage protection  
SC : Short Circuit protection  
OT : Over Temperature protection  
VoT : 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

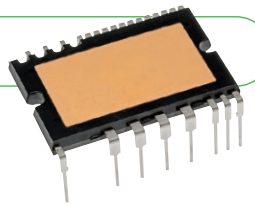
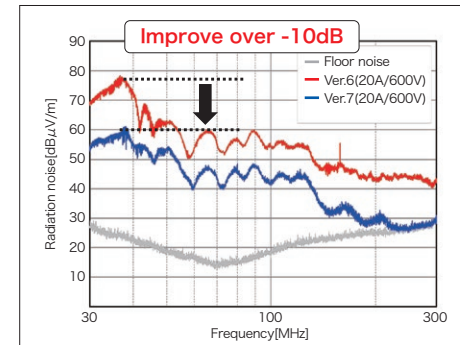
### Super Mini DIIPM™ Ver.7

#### <Main Features>

- New low-noise 7th-generation CSTBT\*1 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

#### Radiation noise



## Featured Products

Expanded line up for SLIMDIP series contributes system cost down for home appliances and fan drive application.

### SLIMDIP™ SLIMDIP-S, SLIMDIP-M, SLIMDIP-L, SLIMDIP-W

#### <Main Features>

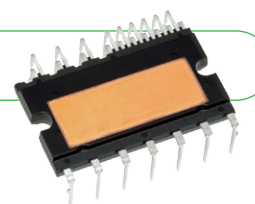
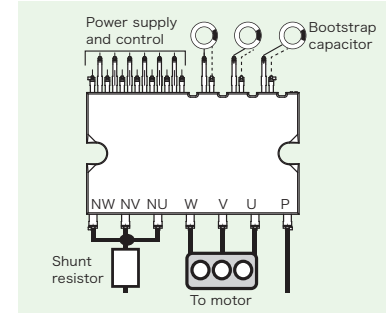
- RC-IGBT\*1 incorporated, reducing package size 30% compared to Super mini DIIPM
- Maximum case temperature expanded to 115°C, increasing the operating temperature range and leading to easier system design temperature range and leading to easier system design
- Additional terminals for floating supply and built-in bootstrap diodes simplify PCB wiring pattern
- Both V<sub>OT</sub>\*2 and OT\*3 functions integrated for temperature protection
- New SLIMDIP-M line-up for washing machine, fans and so on

\*1 Reverse conducting IGBT \*2 V<sub>OT</sub>: Analog Temperature Output \*3 OT: Over Temperature protection

#### Product lineup

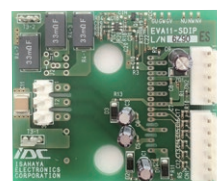
Type name	Main application
SLIMDIP-S	Fan, refrigerator
SLIMDIP-M	Fan, washing machine
SLIMDIP-L	Air conditioner
SLIMDIP-W	Washing machine, Fan

#### Wiring example

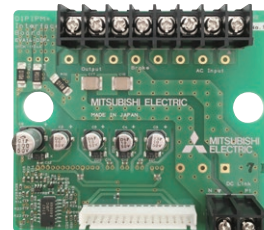


## Customer Support

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



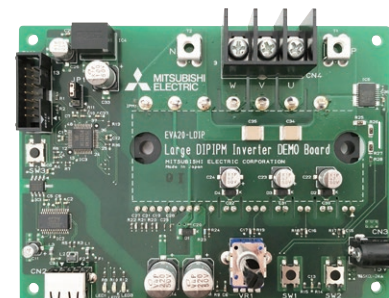
For Super mini DIIPM  
EVA11-SDIP



For DIIPM+  
EVA14-DIP+



For SOIPM  
EVA18-SOP



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

\* For further information, please contact sales office.

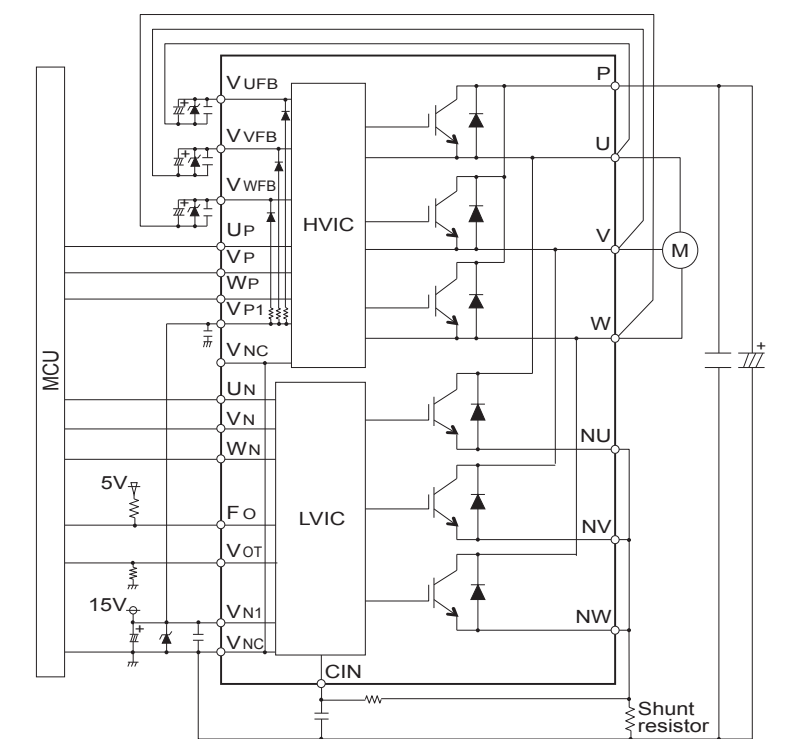
### Series Matrix of 600V DIIPM™

V <sub>CEs</sub>	Series	600V						
		SLIMDIP	Super mini		Mini		Large	DIIPM+
I <sub>c</sub>			Ver.7	Ver.6	Ver.7	—	Ver.6	CIB/CI
5A	SLIMDIP-S			PSS05S92F6-AG PSS05S92E6-AG		PSS05S51F6		
10A	SLIMDIP-M*			PSS10S92F6-AG PSS10S92E6-AG		PSS10S51F6		
15A	SLIMDIP-L SLIMDIP-W		PSS15S93F6-AG* PSS15S93E6-AG*	PSS15S92F6-AG PSS15S92E6-AG		PSS15S51F6		
20A			PSS20S93F6-AG PSS20S93E6-AG	PSS20S92F6-AG PSS20S92E6-AG	PSS20S73F6	PSS20S51F6 PSS20S71F6		
30A			PSS30S93F6-AG PSS30S93E6-AG	PSS30S92F6-AG PSS30S92E6-AG	PSS30S73F6	PSS30S71F6		
35A				PSS35S92F6-AG PSS35S92E6-AG				
40A			PSS40S93F6-AG PSS40S93E6-AG					
50A					PSS50S73F6	PSS50S71F6	PSS50SA2F6	PSS50MC1F6 PSS50NC1F6**
75A							PSS75SA2F6	
Chip		RC-IGBT	CSTBT	CSTBT	CSTBT	CSTBT	CSTBT	CSTBT
UV		P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/ N-side/ Brake
SC		N-side	N-side	N-side	N-side	N-side	N-side with sense	N-side
OT		N-side	N-side*1	N-side*1	—	—	—	—
VOT		N-side	N-side*1	N-side*1	N-side	N-side	N-side	N-side
Active input		High(3/5V)	High(3/5V)	High(3/5V)	High(3/5V)	High(3/5V)	High(3/5V)	High(5V)
Emitter pin of N-side		Open	Open	Open	Open	Open	Open	Open
Fault output		N-side(UV,SC,OT)	N-side(UV,SC,OT)	N-side(UV,SC,OT)	N-side(UV,SC)	N-side(UV,SC)	N-side(UV,SC)	N-side(UV,SC)
Insulation voltage		2000Vrms*2	1500Vrms*2	1500Vrms*2	2500Vrms	2500Vrms	2500Vrms	2500Vrms
Insulation structure		Insulation sheet	Insulation sheet	Insulation sheet	Insulation sheet	Molding resin*4/Insulation sheet	Insulation sheet	Insulation sheet
RoHS directive*5		Compliant	Compliant	Compliant	Compliant	Compliant*3	Compliant	Compliant
Pin type*7		Control side of Zigzag (Normal, Short)	Long	Long	Short	Control side of Zigzag, Short	—	—

- [Notes] \*1 : PSSxxS9xE6 has OT function, PSSxxS9xF6 has V<sub>OT</sub> function  
 \*2 : AC60Hz, 1 minute. Corresponds to isolation voltage 2500Vrms in the case the convex-shaped heat sink  
 \*3 : High melting point solder (Lead Over 85%) is used for chip soldering of PSSxxS51F6 only.  
 \*4 : Molding resin insulation for PSSxxS51F6/-C  
 \*5 : PSS50NC1F6 is not included brake.  
 \*6 : RoHS directive (2011/65/EU and (EU) 2015/863)  
 \*7 : Refer the datasheet of each product for more detail

- [Term] CSTBT™: 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  
 VOT: Analog Temperature Output  
 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 DIIPM™



★: New Product

# Lineup of DIPIPM™

## Series Matrix of 1200V DIPIPM™

V <sub>CES</sub>	1200V					
	Series	Mini		Large	DIPIPM+	Large DIPIPM+
I <sub>c</sub>	Ver.7	—	Ver.6	CIB/CI	CI	
5A		PSS05S72FT	PSS05SA2FT	PSS05MC1FT PSS05NC1FT*1		
10A		PSS10S72FT	PSS10SA2FT	PSS10MC1FT PSS10NC1FT*1		
15A	PSS15S73FT*		PSS15SA2FT	PSS15MC1FT PSS15NC1FT*1		
25A	PSS25S73FT*		PSS25SA2FT	PSS25MC1FT PSS25NC1FT*1		
35A			PSS35SA2FT	PSS35MC1FT PSS35NC1FT*1		
50A			PSS50SA2FT			PSS50NE1CT*
75A			PSS75SA2FT			PSS75NE1CT*
100A						PSS100NE1CT*

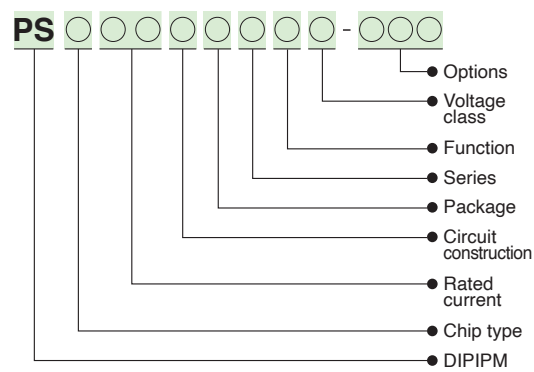
Chip	CSTBT	CSTBT	CSTBT	CSTBT	CSTBT
UV	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side/Brake	P-side/N-side
SC	N-side	N-side	N-side	N-side	N-side
OT	—	—	—	—	—
V <sub>OT</sub>	N-side	N-side	N-side	N-side	N-side
Active input	High(5V)	High(5V)	High(5V)	High(5V)	High(3/5V)
Emitter pin of N-side	Open	Open	Open	Open	Open
Fault output	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)
Insulation voltage	2500Vrms	2500Vrms	2500Vrms	2500Vrms	2500Vrms
Insulation structure	Insulation sheet	Insulation sheet	Insulation sheet	Insulation sheet	Insulation sheet
RoHS directive*2	Compliant	Compliant	Compliant	Compliant	Compliant
Pin type	—	—	—	—	—

★: New Product

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

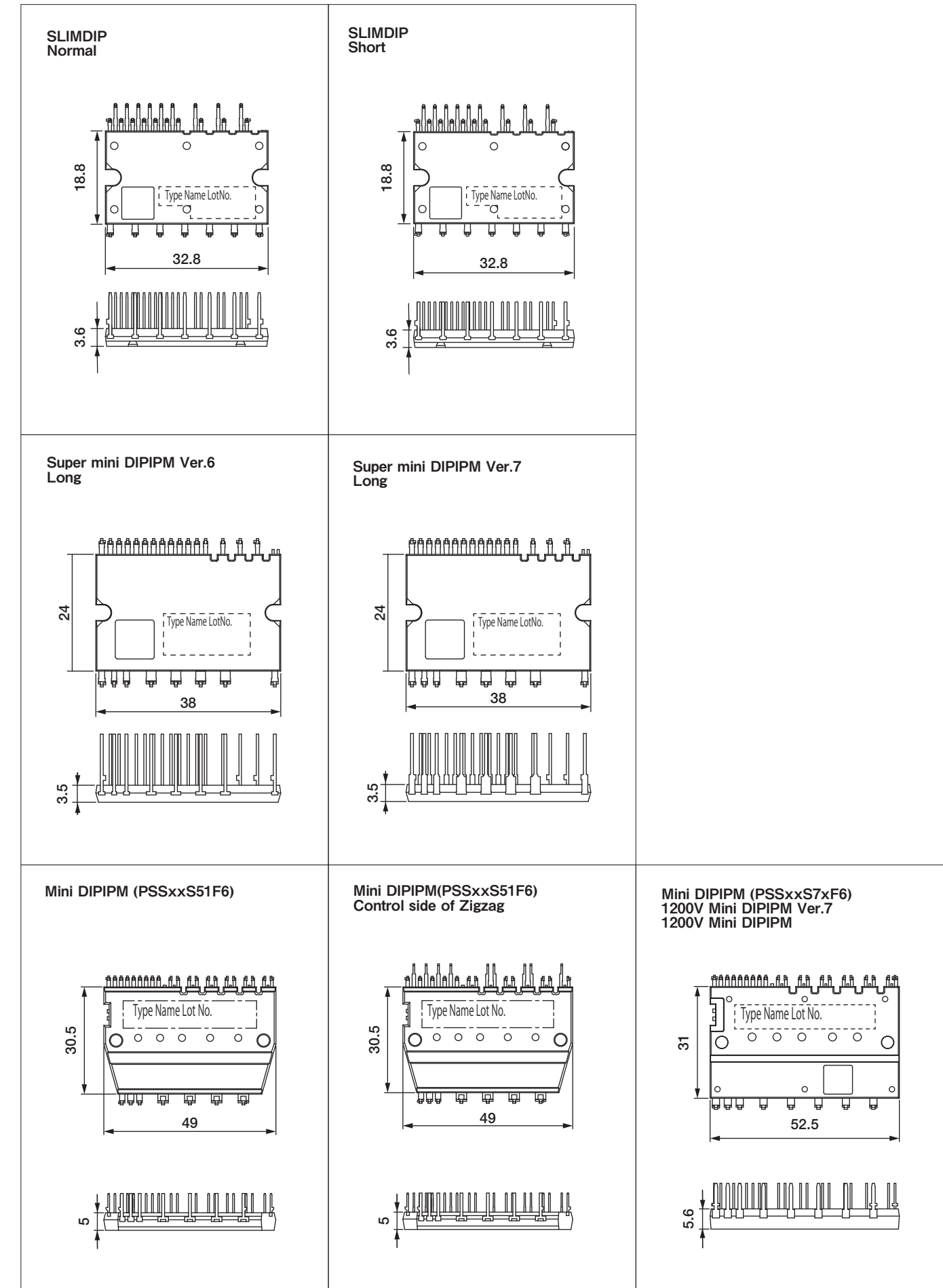
[Term] CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect  
UV: Supply Under Voltage protection  
OT: Over Temperature protection  
SC: Short Circuit protection  
V<sub>OT</sub>: Analog Temperature Output  
RoHS: Restriction of the use of certain Hazardous Substances in electrical and electronic equipment  
CIB: Converter Inverter Brake  
CI: Converter Inverter

## Type Name Definition of DIPIPM™



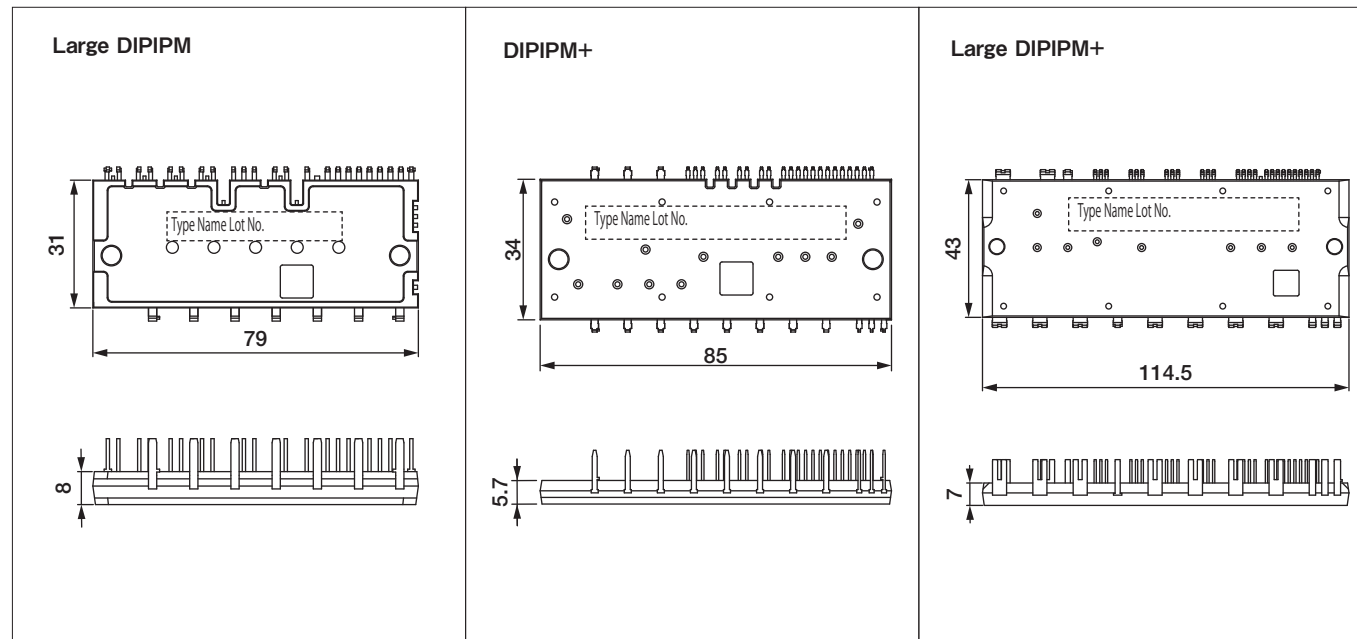
## Outline Drawing of DIPIPM™

Unit:mm



## Outline Drawing of DIIPM™

Unit:mm



## Series , Main Application

Series	Main Application
G1	Motion control/Renewable energy/Power supply
L1	
S1	
V1	
Photovoltaic	Photovoltaic
L	Motion control/Renewable energy/Power supply

Data sheet here



## Rated Lineup

Rated voltage	Rated current												
	25A	35A	50A	75A	100A	150A	200A	300A	400A	450A	500A	600A	800A
600V													
650V													
1200V													

## 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™<sup>1</sup> and a diode incorporating a RFC<sup>2</sup> 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,<sup>3</sup> automatic switching speed control, and error detection function contribute to lowering inverter loss and shortening design time

<sup>1</sup> CSTBT™: Mitsubishi Electric's unique IGBT that utilizes the carrier cumulative effect

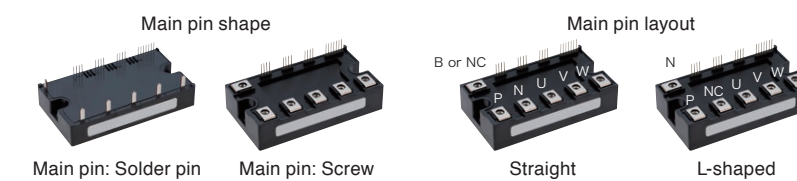
<sup>2</sup> RFC: Relaxed field cathode

<sup>3</sup> 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



# Lineup of IPM

Matrix of IPM 650V/600V (No.: Number of outline drawing, see page 23 to 24)

V <sub>CEs</sub> Series I <sub>c</sub>	650V						600V						
	G1 Series		L1 Series		S1 Series		V1 Series		Photovoltaic		L Series		
	Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.	
50A	PM50CG1A065	C	12						PM50B4LA060	B4	01		
	PM50RG1A065	R	12						PM50B5LA060	B5	01		
	PM50CG1B065	C	10	PM50CL1A060	C	01			PM50B6LA060	B6	01		
	PM50RG1B065	R	10	PM50CL1B060	C	02			PM50B4LB060	B4	02		
	PM50CG1AL065	C	12	PM50RL1A060	R	01	PM50CS1D060	C	05	PM50B5LB060	B5	02	
	PM50CG1AP065	C	09	PM50RL1B060	R	02			PM50B6LB060	B6	02		
	PM50CG1APL065	C	09	PM50RL1C060	R	03			PM50B4L1C060	B4	03		
	PM50RG1AP065	R	09						PM50B5L1C060	B5	03		
								PM50B6L1C060	B6	03			
75A	PM75CG1A065	C	12						PM75B4LA060	B4	01		
	PM75RG1A065	R	12						PM75B5LA060	B5	01		
	PM75CG1B065	C	10	PM75CL1A060	C	01			PM75B6LA060	B6	01		
	PM75RG1B065	R	10	PM75CL1B060	C	02			PM75B4LB060	B4	02		
	PM75CG1AL065	C	12	PM75RL1A060	R	01	PM75CS1D060	C	05	PM75B5LB060	B5	02	
	PM75CG1AP065	C	09	PM75RL1B060	R	02			PM75B6LB060	B6	02		
	PM75CG1APL065	C	09						PM75B4L1C060	B4	03		
	PM75RG1AP065	R	09						PM75B5L1C060	B5	03		
								PM75B6L1C060	B6	03			
100A	PM100CG1A065	C	12										
	PM100CG1B065	C	10	PM100CL1A060	C	01							
	PM100RG1B065	R	10	PM100CL1B060	C	02							
	PM100CG1AL065	C	12	PM100RL1A060	R	01	PM100CS1D060	C	05				
	PM100CG1AP065	C	09	PM100RL1B060	R	02							
	PM100CG1APL065	C	09										
150A	PM150CG1B065	C	10	PM150CL1A060	C	01							
	PM150RG1B065	R	10	PM150CL1B060	C	02							
				PM150RL1A060	R	01	PM150CS1D060	C	05				
				PM150RL1B060	R	02							
200A	PM200CG1B065	C	10	PM200CL1A060	C	04							
	PM200RG1B065	R	10	PM200CL1B060	C	04							
	PM200CG1C065	C	11	PM200RL1A060	R	04	PM200CS1D060	C	05				
	PM200RG1C065	R	11										
300A	PM300CG1C065	C	11	PM300CL1A060	C	04							
	PM300RG1C065	R	11	PM300RL1A060	R	04							
400A							PM400DV1A060	D	06				
450A	PM450CG1C065	C	11								PM450CLA060	C	08
600A	PM450RG1C065	R	11								PM600CLA060	C	08
800A								PM800DV1B060	D	07			
IGBT chip	CSTBT*1 Emitter sensor installed Temperature sensor installed		CSTBT*1 Built-in emitter sensor Built-in temperature sensor		CSTBT*1 Built-in emitter sensor Built-in temperature sensor		CSTBT*1 Built-in emitter sensor Built-in temperature sensor		CSTBT*1 Built-in emitter sensor Built-in temperature sensor		CSTBT*2 Built-in emitter sensor Built-in temperature sensor		
Fault output	UV	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	
	OT	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	
	SC	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	
Identification	P-side/N-side	—	—	—	—	—	—	—	—	—	—	—	
RoHS directive*3	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	
Compatibility	—	L Series	S-DASH SERVO	V Series	—	—	—	—	—	—	—	—	
Connection	D	B4	B5	B6	C	R							

[Notes] \*1: Full-gate CSTBT™ \*2: PCM (Plugged Cell Merged) CSTBT™  
\*3: RoHS directive (2011/65/EU and (EU) 2015/863)

[Term] UV: Power supply Under Voltage protection  
SC: Short Circuit protection  
OT: Over Temperature protection  
RoHS: Restriction of hazardous substances in electrical and electronic equipment

Matrix of IPM 1200V (No.: Number of outline drawing, see page 23 to 24)

V <sub>CEs</sub> Series I <sub>c</sub>	1200V													
	G1 Series		L1 Series		S1 Series		V1 Series		L Series					
	Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.				
25A	PM25CG1A120	C	12											
	PM25CG1B120	C	10	PM25CL1A120	C	01								
	PM25RG1A120	R	12	PM25CL1B120	C	02								
	PM25RG1B120	R	10	PM25RL1A120	R	01	PM25CS1D120	C	05					
	PM25CG1AL120	C	12	PM25RL1B120	R	02								
	PM25CG1AP120	C	09	PM25RL1C120	R	03								
	PM25CG1APL120	C	09											
	PM25RG1AP120	R	09											
35A	PM35CG1A120	C	12											
	PM35CG1B120	C	10											
	PM35RG1A120	R	12											
	PM35RG1B120	R	10											
	PM35CG1AL120	C	12											
	PM35CG1AP120	C	09											
	PM35CG1APL120	C	09											
	PM35RG1AP120	R	09											
50A	PM50CG1A120	C	12											
	PM50CG1B120	C	10	PM50CL1A120	C	01								
	PM50RG1B120	R	10	PM50CL1B120	C	02								
	PM50CG1AL120	C	12	PM50RL1A120	R	01	PM50CS1D120	C	05					
	PM50CG1AP120	C	09	PM50RL1B120	R	02								
PM50CG1APL120	C	09												
75A	PM75CG1B120	C	10	PM75CL1A120	C	01								
	PM75RG1B120	R	10	PM75CL1B120	C	02								
				PM75RL1A120	R	01	PM75CS1D120	C	05					
				PM75RL1B120	R	02								
100A	PM100CG1B120	C	10											
	PM100CG1C120	C	11	PM100CL1A120	C	04								
	PM100RG1B120	R	10	PM100RL1A120	R	04	PM100CS1D120	C	05					
	PM100RG1C120	R	11											
150A	PM150CG1C120	C	11	PM150CL1A120	C	04								
	PM150RG1C120	R	11	PM150RL1A120	R	04								
200A	PM200CG1C120	C	11						PM200DV1A120	D	06	PM200CLA120	C	08
	PM200RG1C120	R	11											
300A									PM300DV1A120	D	06	PM300CLA120	C	08
450A									PM450DV1A120	D	06	PM450CLA120	C	08
IGBT chip	CSTBT*1 Emitter sensor installed Temperature sensor installed		CSTBT*1 Built-in current sensor Built-in temperature sensor		CSTBT*1 Built-in current sensor Built-in temperature sensor		CSTBT*1 Built-in current sensor Built-in temperature sensor		CSTBT*1 Built-in current sensor Built-in temperature sensor		CSTBT*2 Built-in current sensor Built-in temperature sensor			
Fault output	UV	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side		
	OT	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side		
	SC	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side		
Identification	P-side/N-side	—	—	—	—	—	—	—	—	—	—	—		
RoHS directive*3	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant		
Compatibility	—	L Series	S-DASH SERVO	V Series	—	—	—	—	—	—	—	—		
Connection	D	C	R											

[Notes] \*1: Full-gate CSTBT™ \*2: PCM (Plugged Cell Merged) CSTBT™  
\*3: RoHS directive (2011/65/EU and (EU) 2015/863)

[Term] CSTBT™: 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

Unit:mm

<p><b>01</b> PM50,75,100,150CL1A/RL1A060 PM25,50,75CL1A/RL1A120 PM50,75B4/B5/B6LA060</p>	<p><b>02</b> PM50,75,100,150CL1B/RL1B060 PM25,50,75CL1B/RL1B120 PM50,75B4/B5/B6LB060</p>	<p><b>03</b> PM50RL1C060 PM25RL1C120 PM50,75,B4/B5/B6L1C060</p>
<p><b>04</b> PM200,300CL1A/RL1A060 PM100,150CL1A/RL1A120</p>	<p><b>05</b> PM50,75,100,150,200CS1D060 PM25,50,75,100CS1D120</p>	<p><b>06</b> PM400,600DV1A060 PM200,300,450DV1A120</p>
<p><b>07</b> PM800DV1B060</p>	<p><b>08</b> PM450,600CLA060 PM200,300,450CLA120</p>	<p><b>09</b> PM50,75,100CG1AP/CG1APL065 PM50,75RG1AP065 PM25,35,50CG1AP/CG1APL120 PM25,35RG1AP120</p>

## Outline Drawing of IPM

Unit:mm

<p><b>10</b> PM50,75,100,150,200CG1B/ RG1B065 PM25,35,50,75,100CG1B/ RG1B120</p>	<p><b>11</b> PM200,300,450CG1C/ RG1C065 PM100,150,200CG1C/ RG1C120</p>	<p><b>12</b> PM50,75,100CG1A/CG1AL065 PM50,75RG1AP065 PM25,35,50CG1A/CG1AL120 PM25,35RG1A120</p>
--	--	--

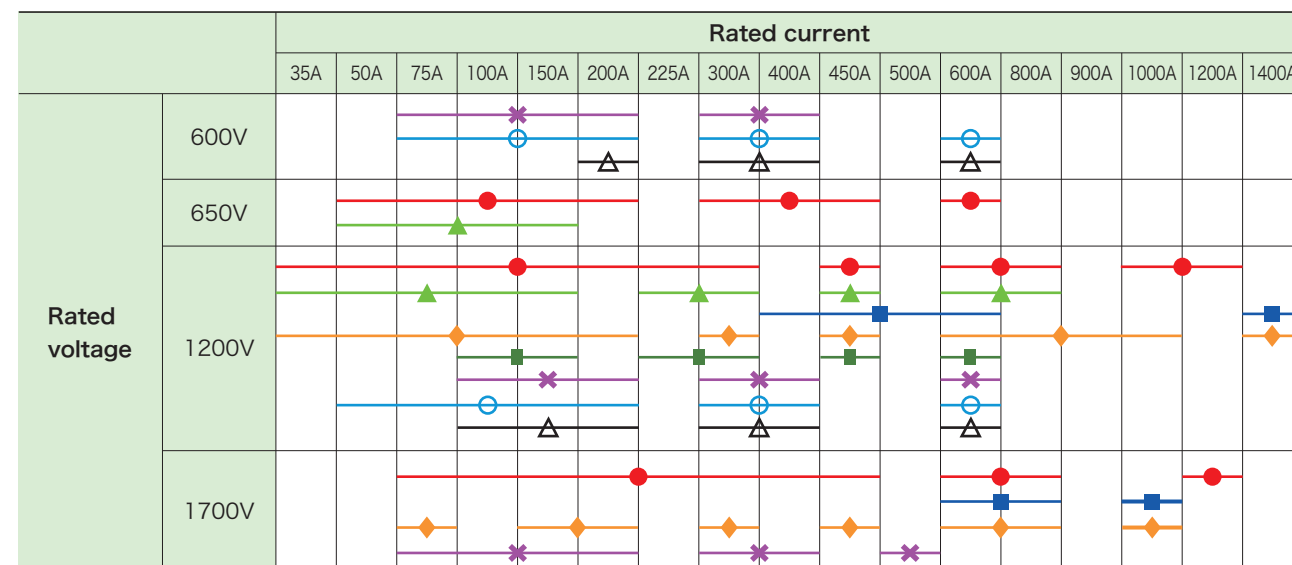
## Series , Main Application

Series	Main Application
T	Motion control/Renewable energy /Power supply
T1	
For 3-level Inverters	
S	
S1	
A	
NF	
NF(NFH type)	

Data sheet here



## Rated Lineup



## New Products

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

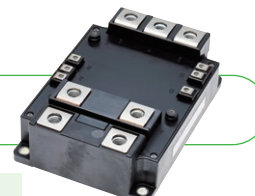
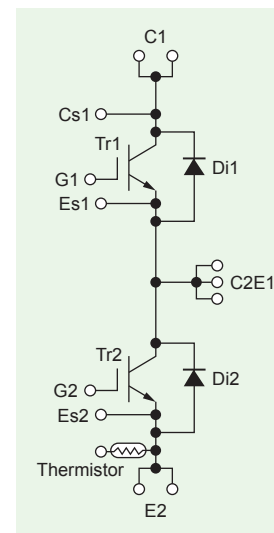
IGBT module T-series (LV100 for industrial)

IGBT module 2in1 type

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

(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>

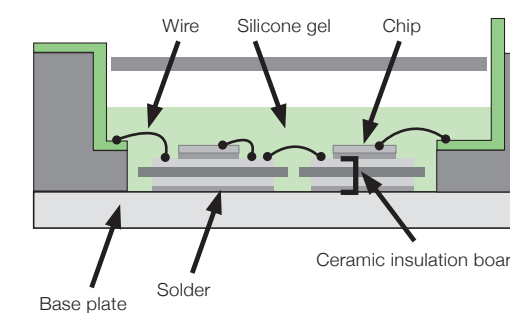
- New modules equipped with three-phase converter, inverter, and brake circuit(CIB), contributes to simplifying design for inverter systems
- CIB modules contribute to compact inverter systems by reducing package size by 36% compared to the Mitsubishi Electric's existing module.(CIB)
- Power loss has been reduced with the introduction of the 7th-generation IGBT produced using CSTBT<sup>TM2</sup> 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<sup>1</sup> contribute to simplifying the assembly process for inverters

\*1 PC-TIM: Phase change - thermal interface material

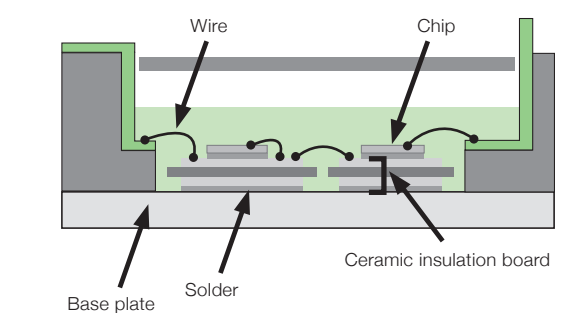
\*2 CSTBT<sup>TM</sup>: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect

### New structure realizes improved reliability (improved thermal cycle lifetime)

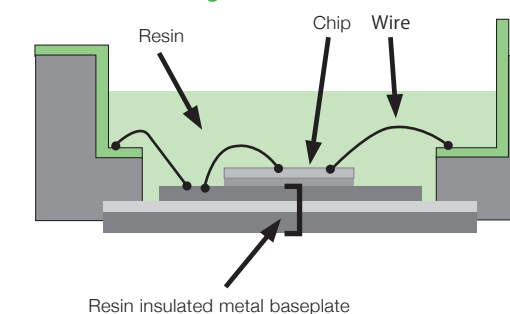
NX package structure comparison 6th-generation IGBT



Compared to standard (std) package structure 6th-generation IGBT

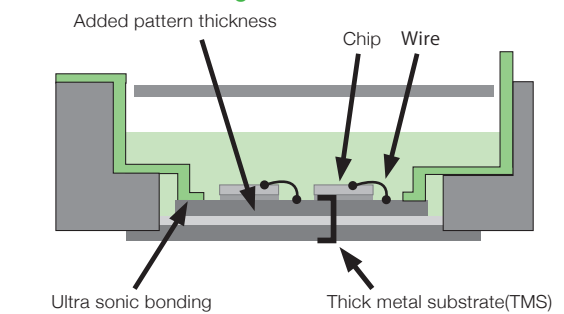


7th-generation IGBT



※Adopts SoLid Cover(SLC) Technology

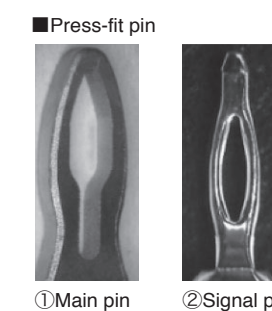
7th-generation IGBT



※Standard package is not available for CIB

### Press-fit terminal support (NX)

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



①Main pin ②Signal pin

# Lineup of IGBT Modules

Matrix of IGBT Modules 650V/600V (No.: Number of outline drawing, see page 30 to 35) RoHS directive (2011/65/EU, (EU)2015/863) compliant

V <sub>ces</sub> Series I <sub>c</sub>	650V				600V										
	T/T1-Series NX Type	Connection	No.	T-Series std Type	Connection	No.	A-Series NX Type	Connection	No.	NF-Series	Connection	No.	NF-Series NFH Type	Connection	No.
50A	CM50MXUB-13T CM50MXUB-13T1 CM50MXUBP-13T CM50MXUBP-13T1	M	42 42 46 46												
75A	CM75MXUB-13T CM75MXUB-13T1 CM75MXUBP-13T CM75MXUBP-13T1	M	42 42 46 46				CM75MX-12A	M	01	CM75TL-12NF CM75RL-12NF	T R	07 07			
100A	CM100TX-13T CM100TXP-13T CM100MXUB-13T CM100MXUB-13T1 CM100MXUBP-13T CM100MXUBP-13T1 CM100MXUD-13T CM100MXUD-13T1 CM100MXUDP-13T CM100MXUDP-13T1	T	33 37 42 42 46 46 44 44 48 48	CM100DY-13T	D	30	CM100MX-12A CM100RX-12A	M R	01 02	CM100TL-12NF CM100RL-12NF	T R	07 07			
150A	CM150TX-13T CM150TXP-13T CM150RX-13T CM150RX-13T CM150MXUD-13T CM150MXUD-13T1 CM150MXUDP-13T CM150MXUDP-13T1	T	33 37 34 38 44 44 48 48	CM150DY-13T	D	30	CM150RX-12A	R	02	CM150DY-12NF CM150TL-12NF CM150RL-12NF	D T R	08 07 07			
200A	CM200TX-13T CM200TXP-13T CM200RX-13T CM200RX-13T	T	33 37 34 38	CM200DY-13T	D	30	CM200RX-12A	R	02	CM200DY-12NF CM200TL-12NF CM200RL-12NF	D T R	08 09 09	CM200DU-12NFH	D	13
225A															
300A	CM300DX-13T CM300DXP-13T	D	28 39	CM300DY-13T	D	31	CM300DX-12A	D	03	CM300DY-12NF	D	08	CM300DU-12NFH	D	14
400A				CM400DY-13T	D	31	CM400DX-12A	D	03	CM400DY-12NF	D	10	CM400DU-12NFH	D	14
450A	CM450DX-13T CM450DXP-13T	D	28 39												
600A	CM600DX-13T CM600DXP-13T	D	28 39	CM600DY-13T	D	32				CM600DY-12NF	D	11	CM600DU-12NFH	D	15
1000A															
Connection															

Matrix of Power Modules for 3-level Inverter (No.: Number of outline drawing, see page 31 to 33) RoHS directive (2011/65/EU, (EU)2015/863) compliant

V <sub>ces</sub> /V <sub>RRM</sub> I <sub>c</sub> /I <sub>F</sub>	1200 V IGBT Module			1700 V IGBT Module			1200 V Diode Module			1700 V Diode Module		
	T/S/S1-Series std Type	Connection	No.	S/S1-Series std Type	Connection	No.	S/S1-Series std Type	Connection	No.	S/S1-Series std Type	Connection	No.
400A	CM400ST-24S1 CM400C1Y-24S	S C1	35 11									
450A	CM450C1Y-24T	C1	32									
500A	CM500C2Y-24S	C2	36									
600A	CM600C1Y-24T	C1	32	CM600HA-34S	H	36				RM600DY-34S	D	32
800A				CM800HA-34S	H	36				RM800DY-34S	D	32
1000A				CM1000HA-34S	H	36						
1400A	CM1400HA-24S	H	36				RM1400HA-24S*	H	36			
Connection												

\* Connection of diode module and IGBT module are different.

★: New Product

Matrix of IGBT Modules 1200V (No.: Number of Outline Drawing, see page 30 to 35) RoHS directive (2011/65/EU, (EU)2015/863) compliant

V <sub>ces</sub> Series I <sub>c</sub>	1200V														
	T-Series LV100 Type	T/T1-Series NX Type		T-Series std Type		S/S1-Series NX Type		S/S1-Series std Type		S/S1-Series MPD Type		A-Series*1 NF-Series*1			
		Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.		
35A				CM35MXUA-24T CM35MXUA-24T1 CM35MXUAP-24T CM35MXUAP-24T1	M M M M	41 41 45 45		CM35MXA-24S	M	04					
50A				CM50MXUA-24T CM50MXUA-24T1 CM50MXUAP-24T CM50MXUAP-24T1	M M M M	41 41 45 45		CM50MXA-24S	M	04		CM50RL-24NF CM50TL-24NF	R T	07 07	
75A				CM75MXUB-24T CM75MXUB-24T1 CM75MXUBP-24T CM75MXUBP-24T1 CM75MXUC-24T CM75MXUC-24T1 CM75MXUCP-24T CM75MXUCP-24T1	M M M M M M M M	42 42 46 46 43 43 47 47		CM75MXA-24S CM75TX-24S CM75RX-24S	M T R	04 05 02		CM75RL-24NF CM75TL-24NF	R T	07 07	
100A				CM100TX-24T CM100TXP-24T CM100RX-24T CM100RX-24T CM100MXUC-24T CM100MXUC-24T1 CM100MXUCP-24T CM100MXUCP-24T1	T T R R M M M M	33 37 34 38 43 43 47 47	CM100DY-24T	D	30	CM100MXA-24S CM100TX-24S1 CM100RX-24S1	M T R	04 25 26	CM100DY-24A CM100DY-24NF CM100E3Y-24NF CM100RL-24NF CM100TL-24NF CM100DU-24NFH	D D E3 R T D	08 08 08 07 07 13
150A				CM150TX-24T CM150TXP-24T CM150RX-24T CM150RX-24T CM150MXUD-24T CM150MXUD-24T1 CM150MXUDP-24T CM150MXUDP-24T1	T T R R M M M M	33 37 34 38 44 44 48 48	CM150DY-24T	D	30	CM150DX-24S CM150EXS-24S CM150TX-24S1 CM150RX-24S1	D E T R	03 24 25 26	CM150DY-24A CM150DY-24NF CM150E3Y-24NF CM150RL-24NF CM150TL-24NF CM150DU-24NFH	D D E3 R T D	08 08 08 09 09 13
200A				CM200TX-24T CM200TXP-24T CM200RX-24T CM200RX-24T	T T R R	33 37 34 38	CM200DY-24T	D	31	CM200EXS-24S CM200RXL-24S	E R	24 21	CM200DY-24A CM200DY-24NF CM200RL-24NF CM200TL-24NF CM200DU-24NFH	D D R T D	08 10 09 09 14
225A				CM225DX-24T CM225DXP-24T CM225DX-24T1 CM225DXP-24T1	D D D D	28 39 28 39		CM225DX-24S1	D	27					
300A				CM300DX-24T CM300DXP-24T CM300DX-24T1 CM300DXP-24T1	D D D D	28 39 28 39	CM300DY-24T	D	31	CM300DX-24S1 CM300EXS-24S CM300RXL-24S1	D E R	27 24 21	CM300DY-24A CM300DY-24NF CM300DU-24NFH	D D D	10 11 14
400A													CM400DY-24A CM400HA-24A CM400DY-24NF CM400DU-24NFH	D H D D	11 16 11 15
450A				CM450DX-24T CM450DXP-24T CM450DX-24T1 CM450DXP-24T1	D D D D	28 39 28 39	CM450DY-24T	D	32	CM450DX-24S1	D	27	CM450DY-24S	D	11
600A				CM600DX-24T CM600DXP-24T CM600DX-24T1 CM600DXP-24T1	D D D D	28 39 28 39	CM600DY-24T	D	32	CM600DX-24S1 CM600DXL-24S	D D	27 06	CM600DY-24S	D	11
800A	CM800DW-24T	D	49	CM800DX-24T1 CM800DXP-24T1	D D	28 39				CM800DY-24S	D	12			
900A													CM900DUC-24S	D	17
1000A				CM1000DX-24T CM1000DXP-24T	D D	29 40				CM1000DXL-24S	D	06			
1200A	CM1200DW-24T	D	49												
1400A										CM1400HA-24S	H	36	CM1400DUC-24S	D	17
Connection															

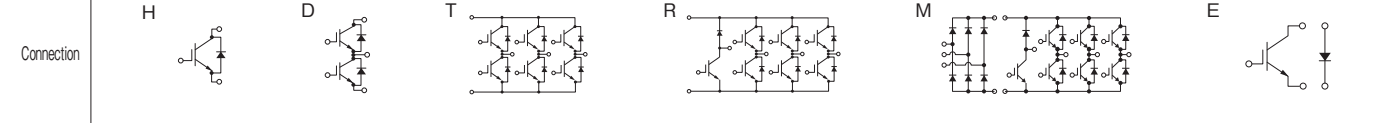
\*1: A-Series have model name ending with A, NF-Series have model name ending with NF/NFH

# Lineup of IGBT Modules

Matrix of IGBT Modules 1700V(No.: Number of Outline Drawing, see page 30 to 35)

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

V <sub>CEs</sub>	1700V															
	T-Series LV100 Type		T-Series NX Type		T-Series std Type		S/S1-Series NX Type		S/S1-Series std Type		S/S1-Series MPD Type		A-Series std Type			
Series	Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.	Connection	No.		
75A					CM75DY-34T	D	30	CM75MXA-34SA	M	23			CM75DY-34A	D	08	
100A			CM100TX-34T	T	33	CM100DY-34T	D	30					CM100DY-34A	D	08	
150A			CM100TXP-34T	T	37											
150A			CM150TX-34T	T	33	CM150DY-34T	D	31	CM150DX-34SA	D	20		CM150DY-34A	D	10	
150A			CM150TXP-34T	T	37				CM150RXL-34SA	R	21					
200A						CM200DY-34T	D	31	CM200DX-34SA	D	20		CM200DY-34A	D	10	
200A									CM200EXS-34SA	E	24					
225A			CM225DX-34T	D	28											
225A			CM225DXP-34T	D	39											
300A			CM300DX-34T	D	28	CM300DY-34T	D	32	CM300DX-34SA	D	20		CM300DY-34A	D	11	
300A			CM300DXP-34T	D	39											
400A						CM400DY-34T	D	32					CM400DY-34A	D	18	
450A			CM450DX-34T	D	28				CM450DXL-34SA	D	22					
450A			CM450DXP-34T	D	39											
500A													CM500HA-34A	H	16	
600A			CM600DX-34T	D	28			CM600DXL-34SA	D	22	CM600HA-34S	H	36			
600A			CM600DXP-34T	D	39											
800A	CM800DW-34T	D	49								CM800HA-34S	H	36			
800A	CM800DW-34TA	D	49													
1000A											CM1000HA-34S	H	36	CM1000DUC-34SA	D	17
1200A	CM1200DW-34T	D	49													



Outline Drawing of IGBT Modules

Unit:mm

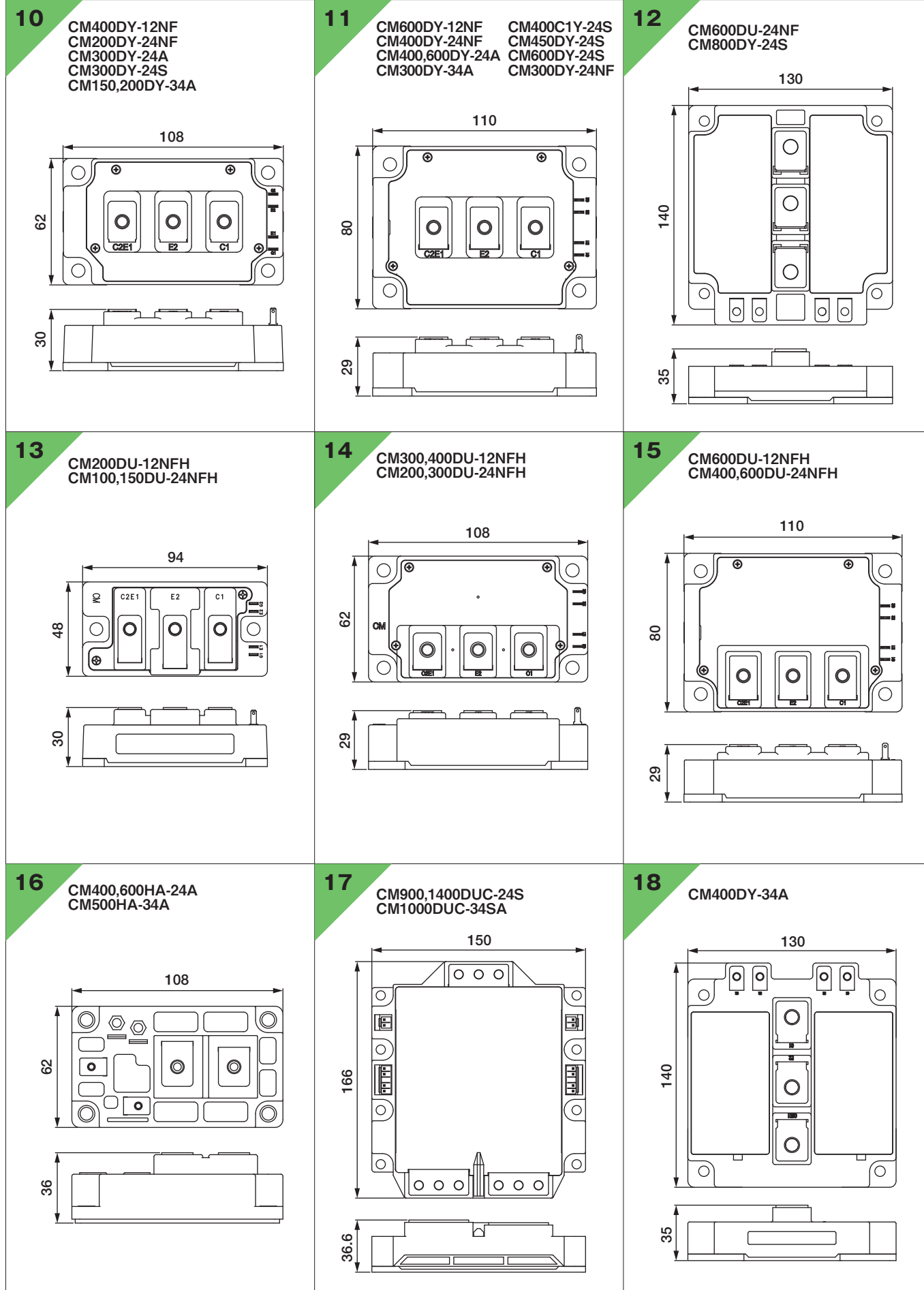
<p><b>01</b> CM75,100MX-12A</p>	<p><b>02</b> CM100,150,200RX-12A CM75RX-24S</p>	<p><b>03</b> CM300,400DX-12A CM150,200DX-24S</p>
<p><b>04</b> CM35,50,75,100MXA-24S</p>	<p><b>05</b> CM75TX-24S</p>	<p><b>06</b> CM600,1000DXL-24S</p>
<p><b>07</b> CM75,100,150TL/RL-12NF CM50,75,100TL/RL-24NF</p>	<p><b>08</b> CM150,200,300DY-12NF CM100,150DY-24NF CM100,150,200DY-24A CM75,100DY-34A CM100,150E3Y-24NF</p>	<p><b>09</b> CM200TL/RL-12NF CM150,200TL/RL-24NF</p>



# Lineup of IGBT Modules

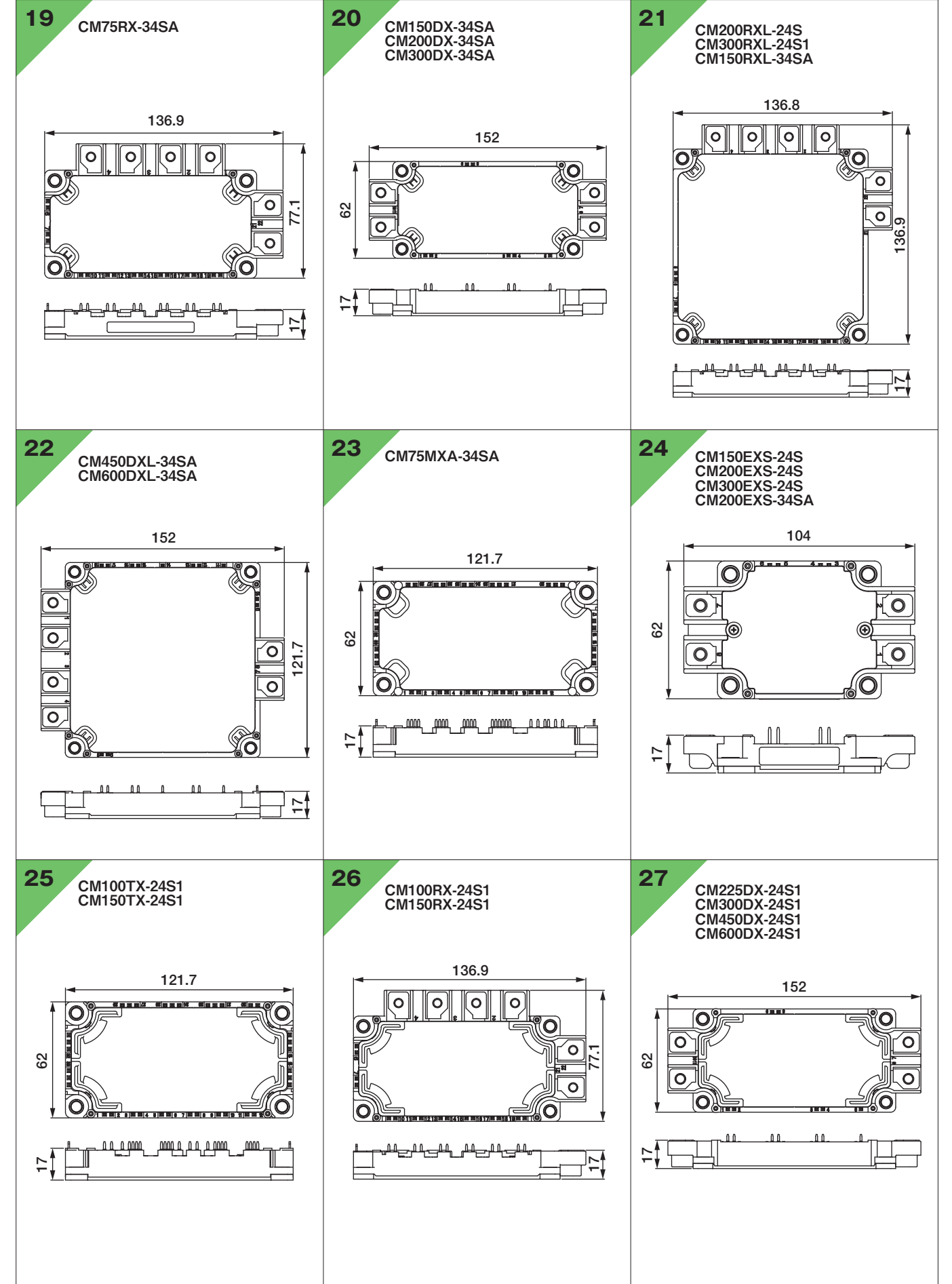
Outline Drawing of IGBT Modules

Unit:mm



Outline Drawing of IGBT Modules

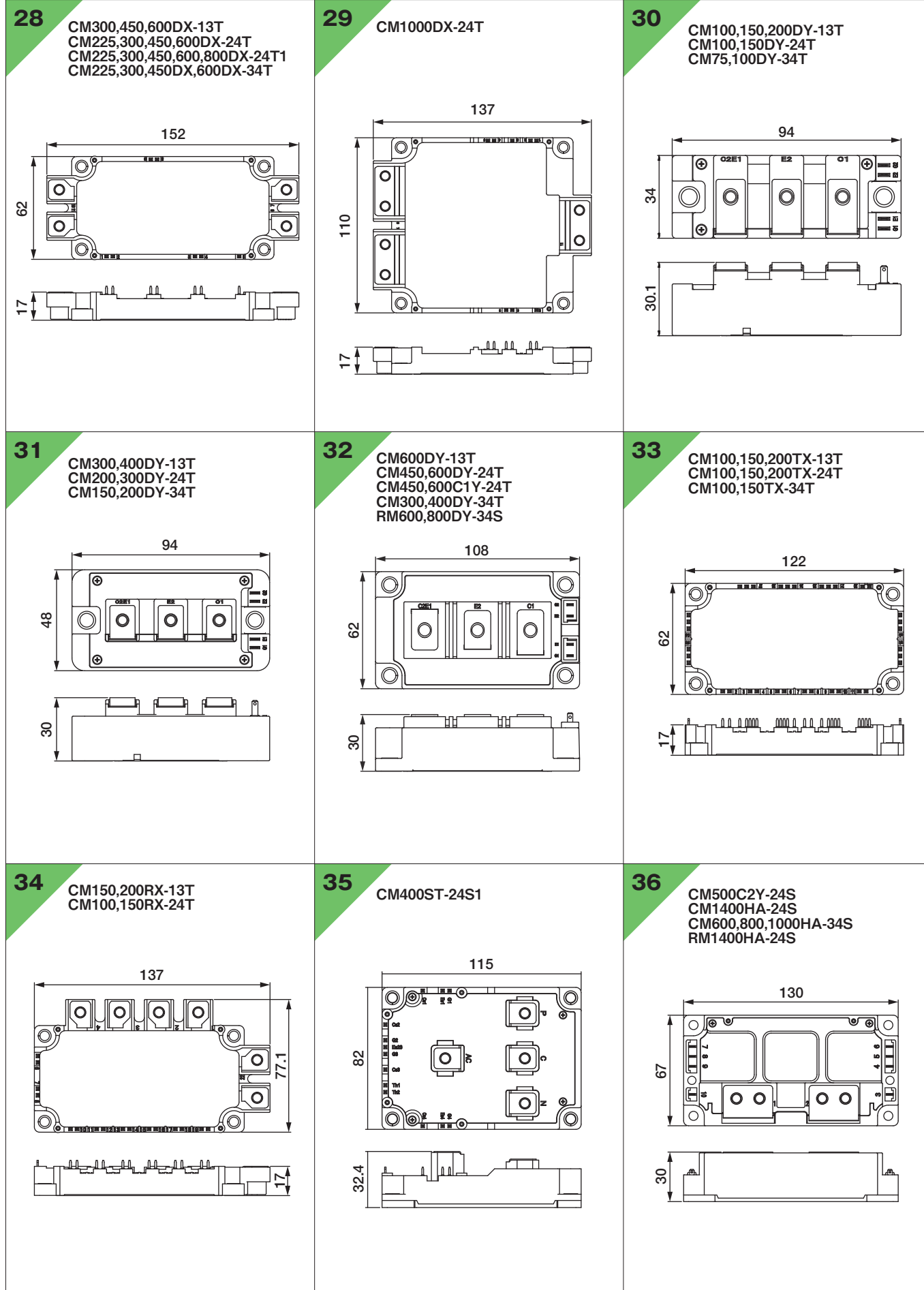
Unit:mm



# Lineup of IGBT Modules

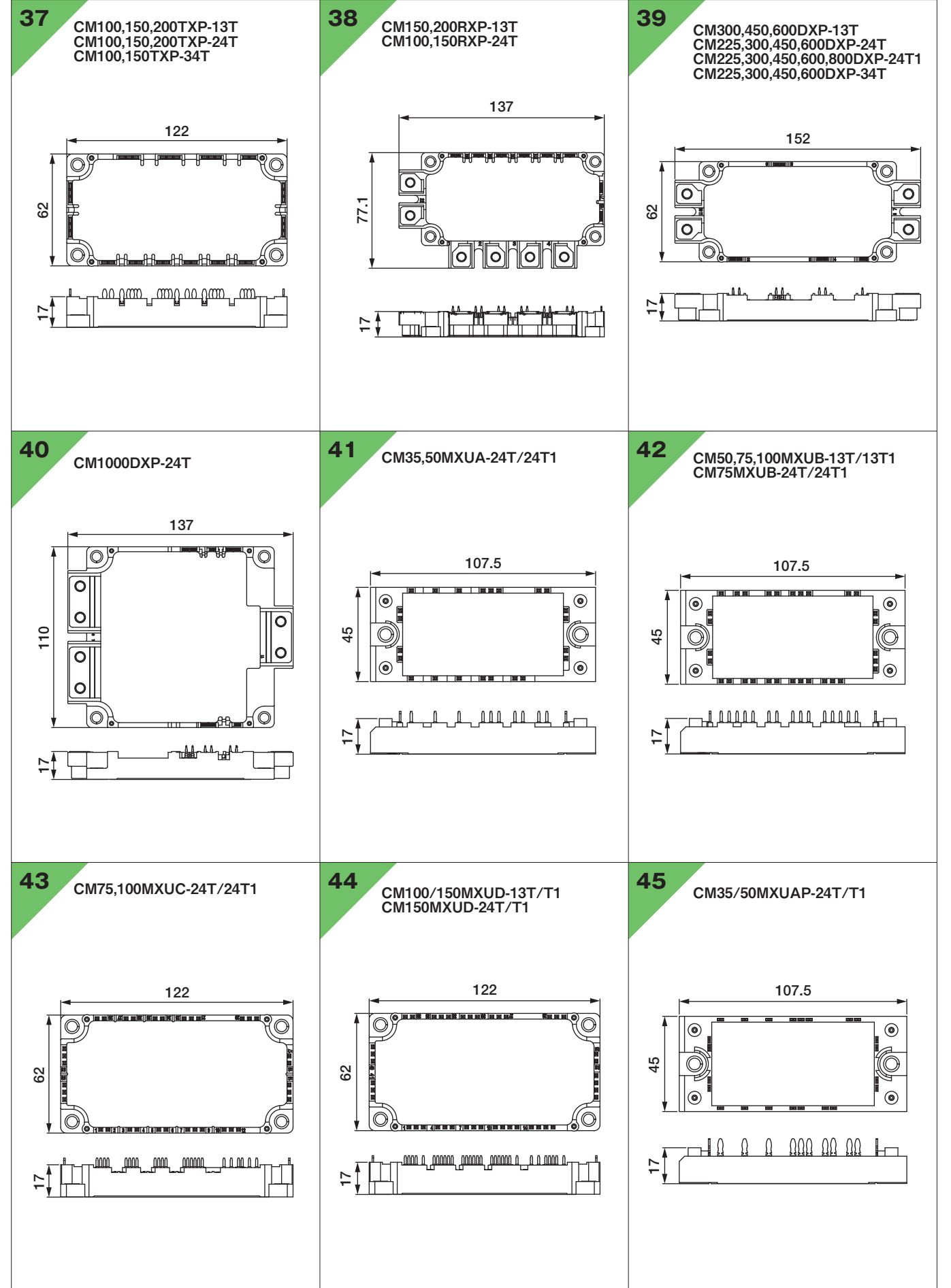
Outline Drawing of IGBT Modules

Unit:mm



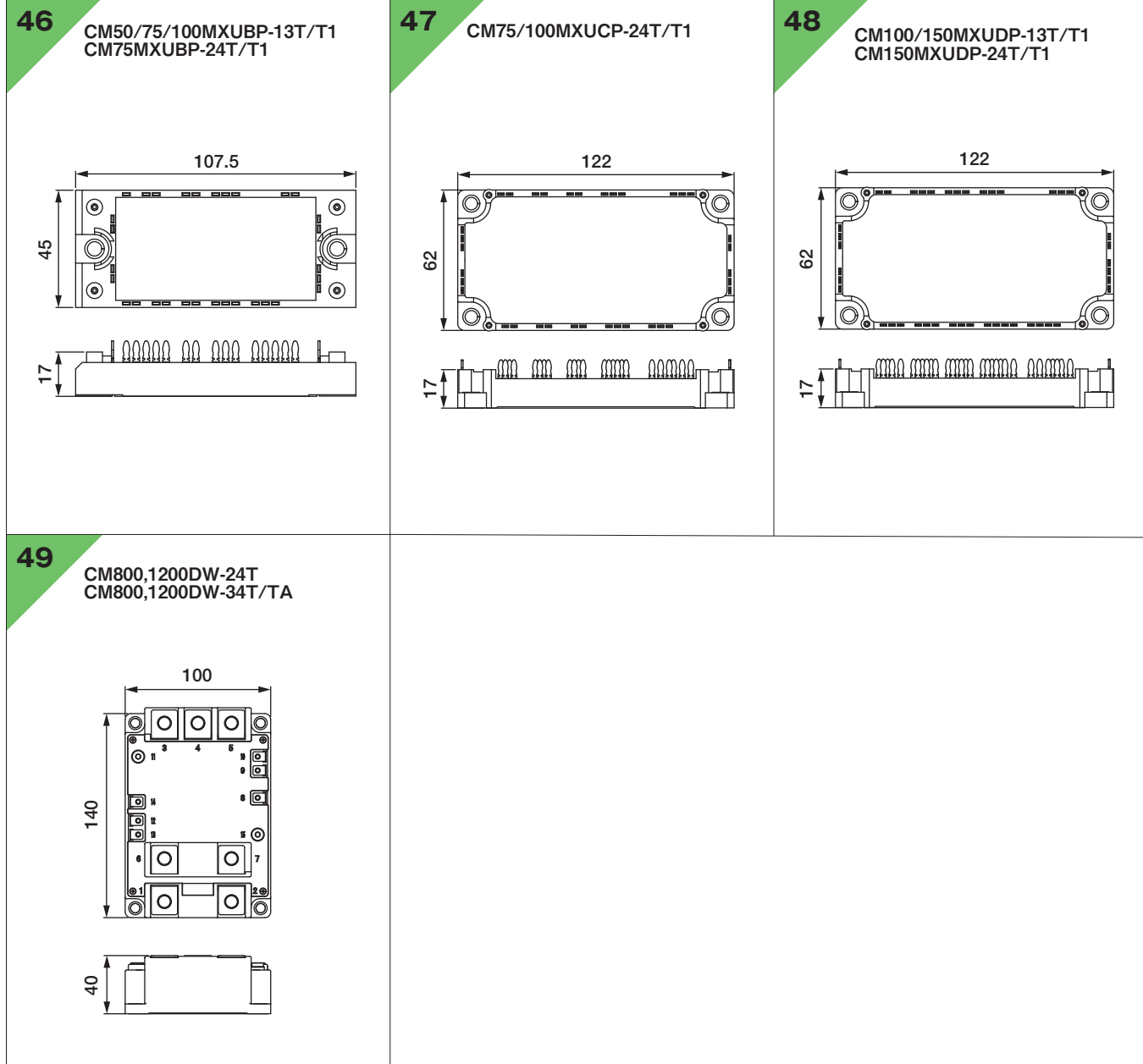
Outline Drawing of IGBT Modules

Unit:mm



## Outline Drawing of IGBT Modules

Unit:mm



## Series , Main Application

Series	Main Application
X	Traction/Power transmission/Motion control
R	
S	
N	
H	

Data sheet here



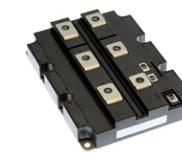
## Rated Lineup

Rated voltage	Rated current														
	200A	300A	400A	450A	600A	750A	800A	900A	1000A	1200A	1350A	1500A	1600A	1800A	2400A
1700V															
2500V															
3300V															
4500V															
6500V															

## 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<sup>1</sup> diode
- Compared to the existing CM900HC-90H and CM1350HC-90X, the new models' rated output currents are 50% greater but external dimensions are the same.
- Compared to existing CM900HC-90H, new CM900HC-90X, etc. are 33% smaller but achieve the same voltage and current ratings.
- Optimal package internal structure realizes improved heat dissipation, humidity resistance and flame retardance, increasing product life

\*1 RFC : Relaxed field of cathode

#### Product lineup

std type	1.7kV	3.3kV	4.5kV	6.5kV
	1600A 2400A	1200A	900A 1000A	600A
	2400A	1200A 1800A	900A 1350A 1500A	600A 900A 1000A

### 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<sup>1</sup> diode
- Industry's highest 3.3kV/600A Si module power density of 8.57A/cm<sup>2</sup>\*2 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

\*2 As of Dec. 17, 2020 based on Mitsubishi Electric research

#### Product lineup

LV100	1.7kV	3.3kV	HV100	3.3kV	4.5kV	6.5kV
	1200A	450A 600A		450A 600A	450A	300A

# Lineup of HVIGBT Modules

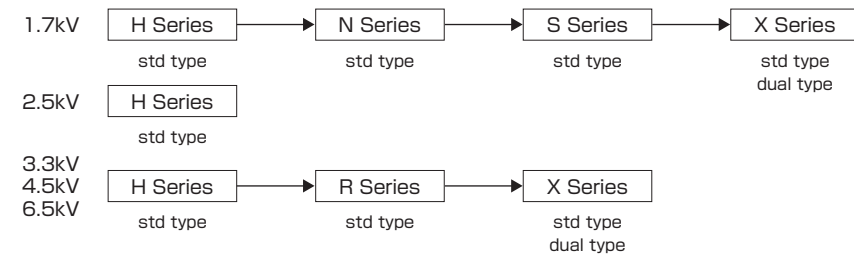
Series Matrix of HVIGBT (No.: Number of Outline Drawing, see page 39 to 40)

V <sub>CEs</sub> I <sub>c</sub>	1700V						2500V			3300V																																										
	X-Series		S-Series N-Series		H-Series		H-Series			X-Series		R-Series		H-Series																																						
	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.																																						
400A							CM400DY-50H	D1	B	08				CM400HG-66H	H	G	05	CM400DY-66H	H	D1	B	08																														
450A										CM450DA-66X	D2	A	09																																							
600A							CM600DY-34H	D1	B	01	CM600E2Y-34H	E2	B	01	CM600DA-66X	D2	A	09	CM600DE-66X*	D2	E	10																														
800A							CM800DZB-34N	D1	C	01	CM800DZ-34H	D1	C	01	CM800HB-50H	H	B	03				CM800HC-66H	H	C	03	CM800E4C-66H	E4	C	04	CM800E6C-66H	E2	C	04																			
1000A													CM1000HC-66R	H	C	03	CM1000E4C-66R	E4	C	04																																
1200A	CM1200DA-34X*	D2	A	09	CM1200E4C-34X*	E4	C	03	CM1200HC-34N	H	C	03	CM1200DC-34N	D1	C	01	CM1200E4C-34N	E4	C	03	CM1200DC-34S	D1	C	01	CM1200HC-34H	H	C	02	CM1200HC-50H	H	C	04	CM1200HC-66X	H	C	03	CM1200HC-66X	H	C	04	CM1200E4C-66X*	E4	C	04	CM1200HG-66H	H	C	06	CM1200HG-66H	H	C	04
1500A																CM1500HC-66R	H	C	04	CM1500HG-66R	H	G	06																													
1600A	CM1600HC-34X*	H	C	03				CM1600HC-34H	H	C	02																																									
1800A							CM1800HC-34N	H	C	03	CM1800HC-34H	H	C	04				CM1800HC-66X	H	C	04	CM1800HG-66X	H	G	06																											
2400A	CM2400HC-34X	H	C	03	CM2400HC-34X**	H	C	04	CM2400HC-34N	H	C	03	CM2400HC-34H	H	C	04																																				

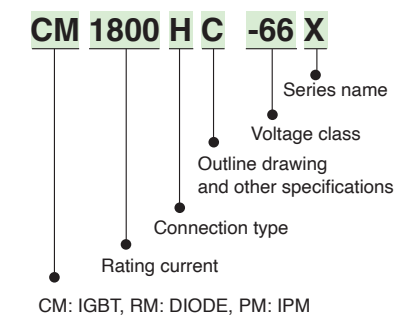
[Type]  
 A: Al base plate 6kV Isolation  
 B: Cu base plate 6kV Isolation  
 C: AISiC base plate 6kV Isolation  
 G: AISiC base plate 10kV Isolation  
 E: Al base plate 10kV Isolation

★★: Under Development ★: New Product  
 (※) Under consideration for development  
 The outline drawing is written the figure of principal part numbers that have a common dimension.

## Evolution of HVIGBT Module Series



## Type Name Definition of IGBT Modules



Series Matrix of HVIGBT (No.: Number of Outline Drawing, see page 39 to 40)

V <sub>CEs</sub> I <sub>c</sub>	4500V						6500V																						
	X-Series		R-Series		H-Series		X-Series		R-Series		H-Series																		
	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.																	
200A													CM200HG-130H	H	G	05													
300A										CM300DE-130X*	D2	E	10																
400A													CM400HG-130H	H	G	07	CM400E2G-130H	E2	G	06	CM400E4G-130H	E4	G	06					
450A	CM450DE-90X*	D2	E	10																									
600A										CM600HG-90H	H	G	07	CM600HG-130X*	H	G	07	CM600HGB-130X*	H	G	06	CM600E4G-130X*	E4	G	06	CM600HG-130H	H	G	06
750A																CM750HG-130R	H	G	06										
800A										CM800HC-90R	H	C	03	CM800HG-90R	H	G	07												
900A	CM900HC-90X**	H	C	03	CM900HG-90X	H	G	07	CM900HGB-90X*	H	G	06	CM900HC-90H	H	C	04	CM900HG-90H	H	G	06	CM900HG-130X	H	G	06					
1000A	CM1000HG-90X	H	G	07										CM1000HG-130XA	H	G	06												
1200A										CM1200HC-90R	H	C	04	CM1200HC-90RA	H	C	04	CM1200HG-90R	H	G	06								
1350A	CM1350HC-90X	H	C	04	CM1350HG-90X	H	G	06																					
1500A	CM1500HC-90XA	H	C	04	CM1500HG-90X	H	G	06																					

[Type]

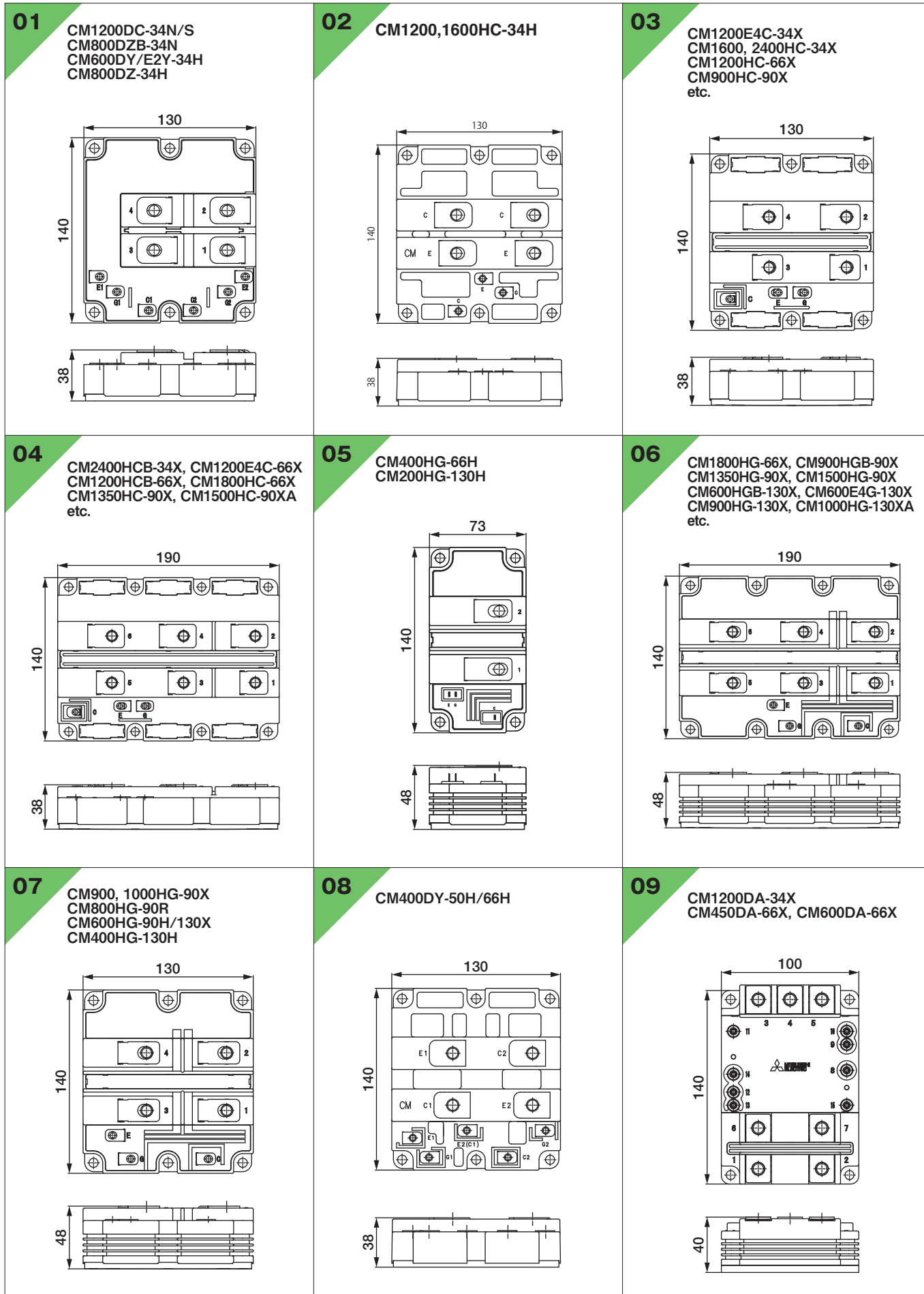
A: Al base plate 6kV Isolation  
 B: Cu base plate 6kV Isolation  
 C: AISiC base plate 6kV Isolation  
 G: AISiC base plate 10kV Isolation  
 E: Al base plate 10kV Isolation

★★: Under Development ★: New Product  
 (※) Under consideration for development  
 The outline drawing is written the figure of principal part numbers that have a common dimension.

# Lineup of HVIGBT Modules

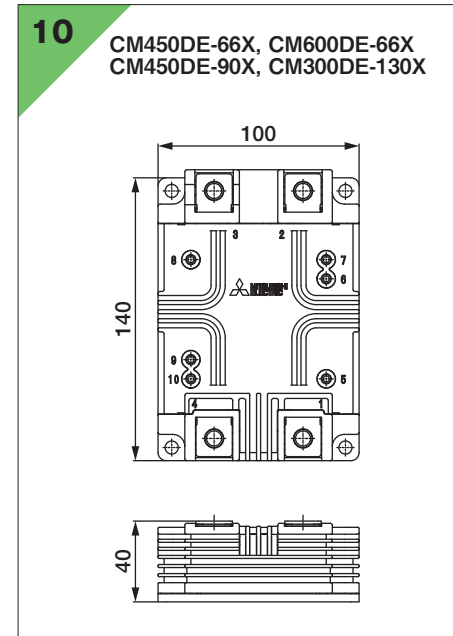
■ Outline Drawing of HVIGBT Modules

Unit:mm




■ Outline Drawing of HVIGBT Modules

Unit:mm



**Series , Main Application**

Series	Main Application
HV DIODE Modules	Traction/Power transmission/Motion control

Data sheet here 

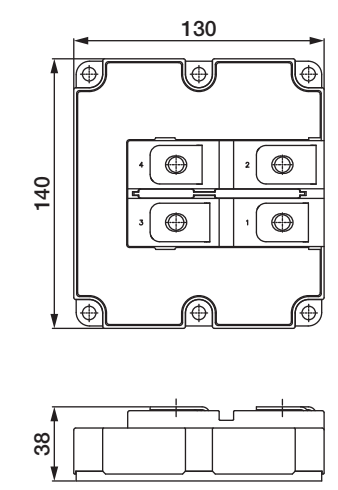
**Rated Lineup**

Rated voltage	Rated current												
	200A	250A	300A	400A	450A	600A	800A	900A	1000A	1200A	1500A	1800A	
1700V													
3300V													
4500V													
6500V													

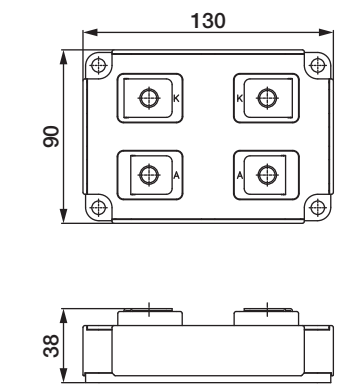
## Outline Drawing of HV DIODE Modules

Unit:mm

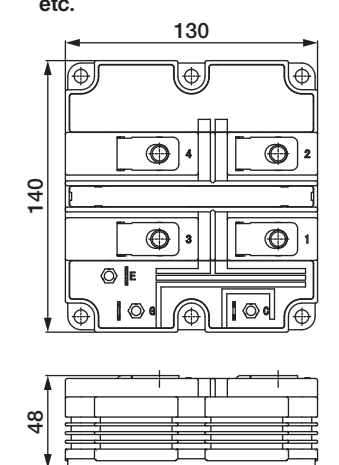
**11** RM1200DC-34X  
RM1200DB-34S



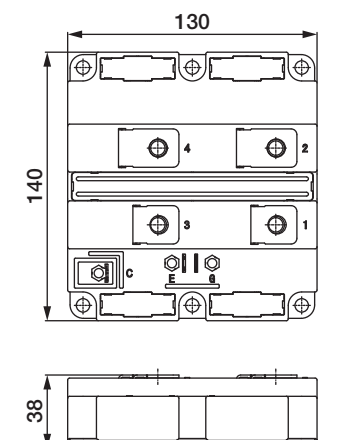
**12** RM1800HE-34S, RM1500HE-66F  
RM1200HE-66S, RM600HE-90S



**13** RM1200DG-66X  
RM450/900/1500DG-90X  
RM300/450/600DG-130X  
RM1000DG-130XA  
etc.

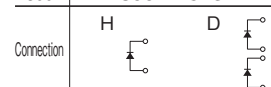


**14** RM600/1200DC-66X  
RM1500DC-90X  
RM1000/1500DC-66F  
RM400/600DY-66S  
RM1200DB-66S, RM900DB/HC-90S



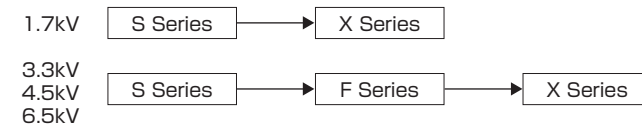
## Series Matrix of HV DIODE Modules (No.: Number of outline drawing, see page 42)

V <sub>FRM</sub> If	1700V		3300V		4500V		6500V		
	Connection	Type No.	Connection	Type No.	Connection	Type No.	Connection	Type No.	
200A							RM200DG-130S	D G 13	
250A							RM250DG-130F	D G 13	
300A						RM300DG-90S	D G 13	RM300DG-130X**	D G 13
400A			RM400DG-66S RM400DY-66S	D G 13 D B 14		RM400DG-90F	D G 13		
450A						RM450DG-90X	D G 13	RM450DG-130X**	D G 13
600A			RM600DY-66S RM600DC-66X	D B 14 D C 14		RM600HE-90S	H C 13	RM600DG-130S RM600DG-130X**	D G 13 D G 13
800A						RM800DG-90F	D G 13		
900A						RM900HC-90S RM900DB-90S RM900DG-90X**	H C 14 D B 14 D G 13		
1000A			RM1000DC-66F	D C 14				RM1000DG-130XA	D G 13
1200A	RM1200DB-34S RM1200DC-34X**	D B 11 D C 11	RM1200DG-66S RM1200HE-66S RM1200DB-66S RM1200DC-66X** RM1200DG-66X	D G 13 H C 12 D B 14 D C 14 D G 13		RM1200DG-90F	D G 13		
1500A			RM1500HE-66F RM1500DC-66F	H C 12 D C 14		RM1500DC-90X** RM1500DG-90X**	D C 14 D G 13		
1800A	RM1800HE-34S	H C 12							

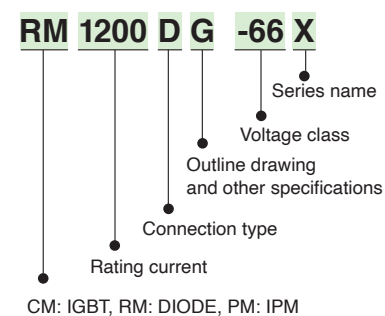


[Type] ★★: Under Development  
 B: Cu base plate 6kV Isolation C: AISiC base plate 6kV Isolation The outline drawing is written the figure of principal part numbers that have a common dimension.  
 G: AISiC base plate 10kV Isolation

## Evolution of HV DIODE Module Series



## Type Name Definition of IGBT Modules



## Series Matrix of MOSFET Modules

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

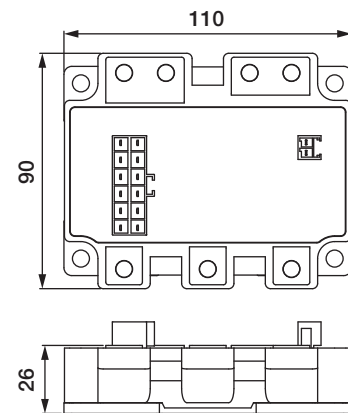
V <sub>oss</sub> I <sub>o</sub>	75V		100V		150V	
	Model	Connection	Model	Connection	Model	Connection
100A	FM200TU-07A	T	FM200TU-2A	T	FM200TU-3A	T
200A	FM400TU-07A	T	FM400TU-2A	T	FM400TU-3A	T
300A	FM600TU-07A	T	FM600TU-2A	T	FM600TU-3A	T

Connection: T

## Outline Drawing of MOSFET Modules

Unit: mm

FM200TU-07A, -2A, -3A  
FM400TU-07A, -2A, -3A  
FM600TU-07A, -2A, -3A



Data sheet here



## Series, Main Application

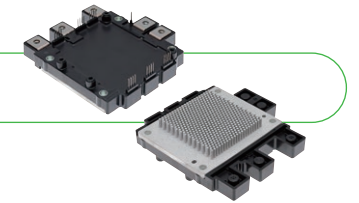
Series	Main Application
J1	xEV
J	

## Rated Lineup

Rated voltage	650V	Rated current		
		300A	600A	700A

## Featured Products

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



### J1 Series power Modules for xEV

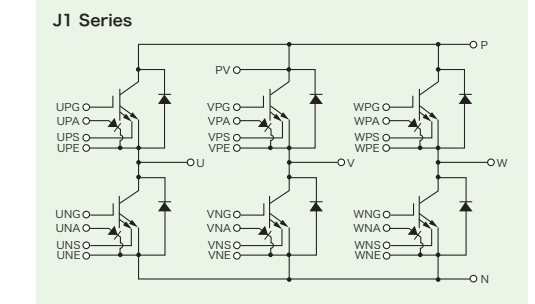
CT600C1A060-A, CT700CJ1A060-A

#### <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.

## Block Diagram



## 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 environmental 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)

