MITSUBISHI ELECTRIC

Power Devices General Catalog

Changes for the Better

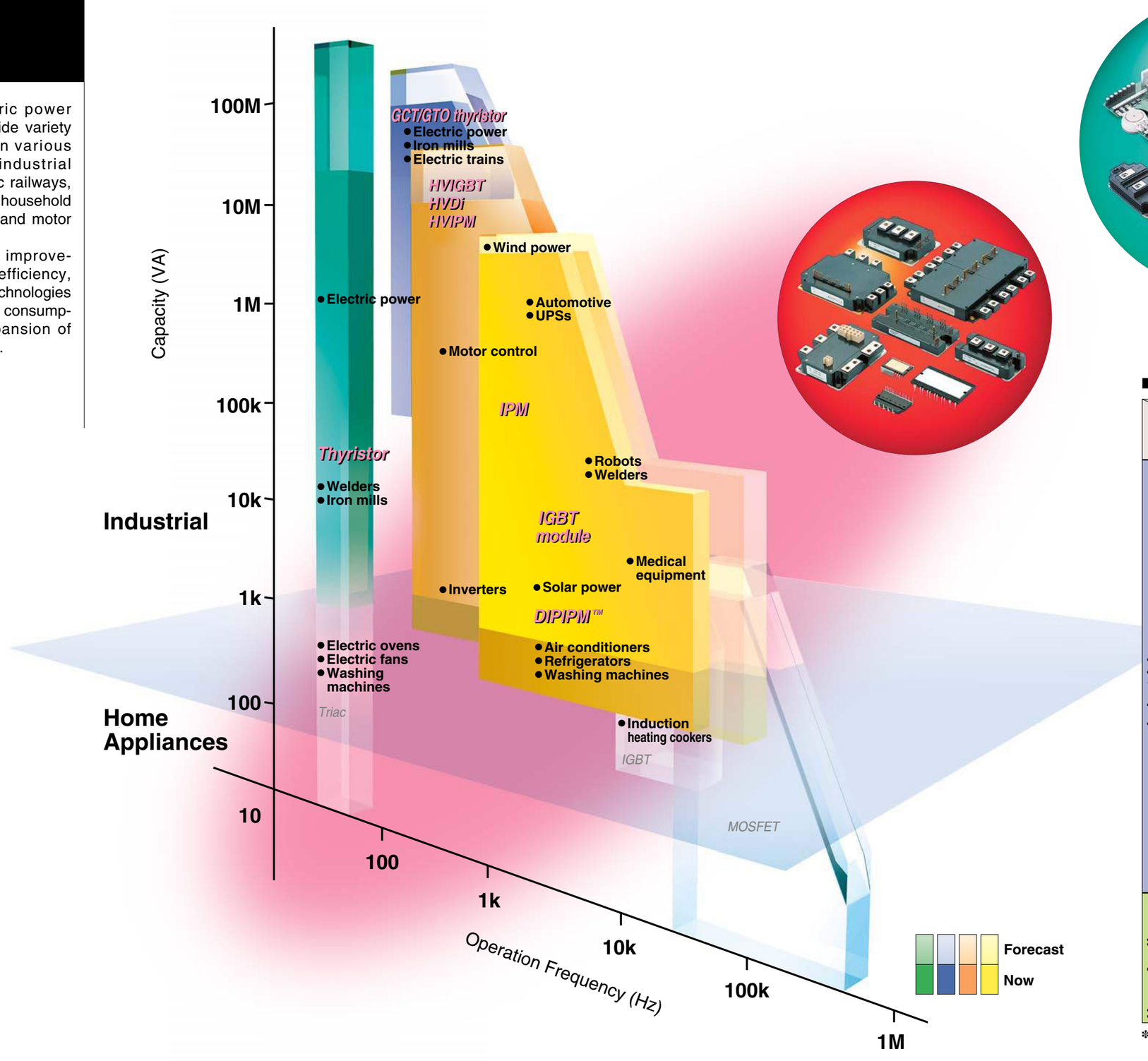
State-of-the-art technology pursuing energy-savings and environmental protection.

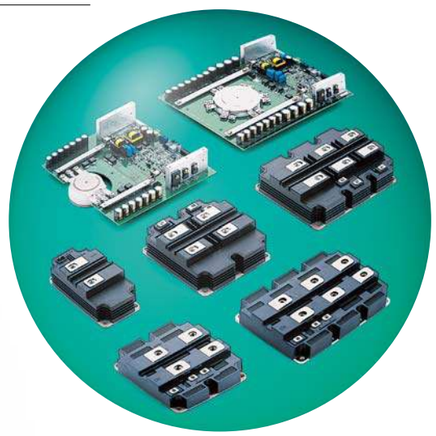
Mitsubishi Electric power devices meet demands for energy-saving and eco-friendly semiconductors with advanced technology and a diversified product line-up. Industrial use, traction, home appliances ... wherever electric power or motor control is needed, we have the means and tools to respond, including the industry's first DIPIPMs™ (Dual-In-line Package Intelligent Power Modules), and the HVIPMs (High-voltage Intelligent Power Modules).

Applications

Mitsubishi Electric power devices have a wide variety of applications in various fields, such as industrial machinery, electric railways, office automation, household power appliances and motor control.
We are pursuing improvements in energy efficiency, development of technologies that reduce power consumption, and the expansion of our product line-up.

Power Devices Offering Unlimited Application Potential





■ Main application & products

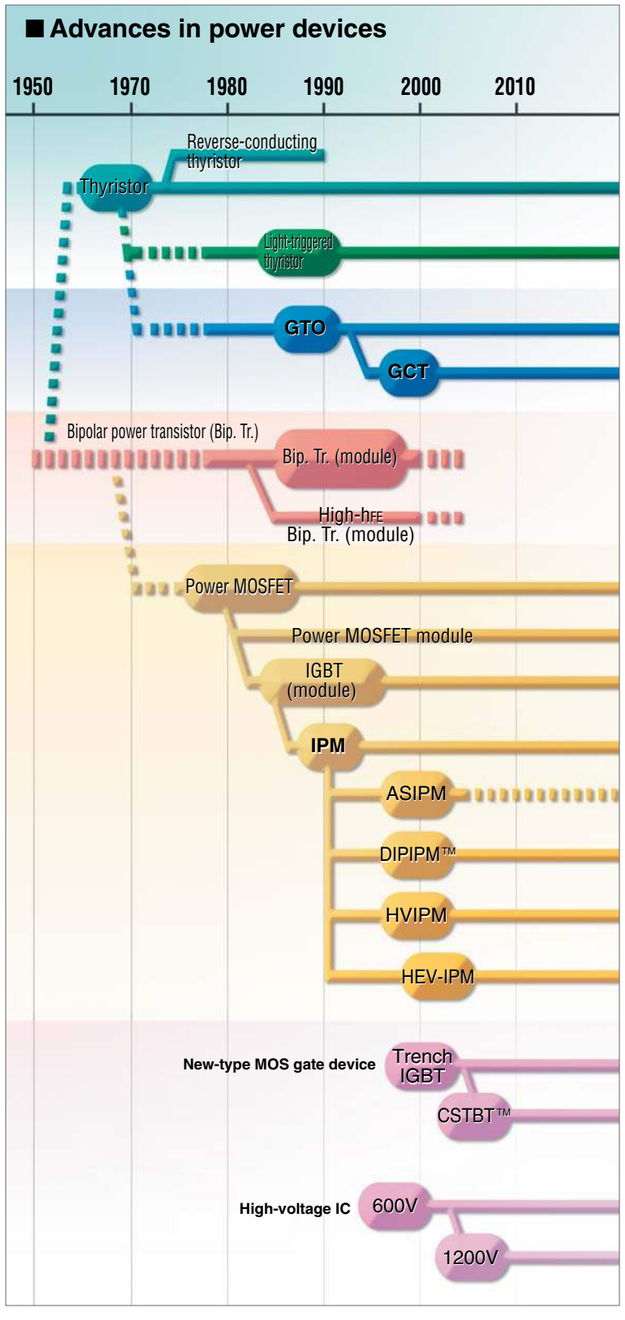
		DIPIPM™	IPM	IGBT module	GCT/ GTO thyristor	Thyristor	HVIGBT HVIPM
Industrial use	Electric power				■	■	■
	Iron mills				■	■	■
	Electric Trains ※1		■	■	■	■	■
	Automotive ※1		■	■			
	UPSs		■	■		■	
	Inverters	■	■	■			
	Motor control	■	■	■	■	■	■
	Welders		■	■		■	
	Medical equipment			■			
	Wind power Solar power		■	■			■
Home Appliances	Air conditioners	■	■	■			
	Refrigerators	■					
	Washing machines	■		■			

※1: This is limited to the case when the relevant mutual parties can confirm and agree with the operating conditions, quality control and guarantee system

Trends in Power Device Technology

The technological progress of power devices is closely related to market needs. There is a constant requirement for them to be less noisy, more efficient, smaller, lighter, more advanced in function, more accurate, and have larger capacities.
In order to meet these needs with precision, Mitsubishi Electric is now accelerating the improvement of its existing devices and the research and development of new devices. Energetic efforts are being mode to develop and commercialize IGBT modules, and in particular IPMs.

■ Advances in power devices

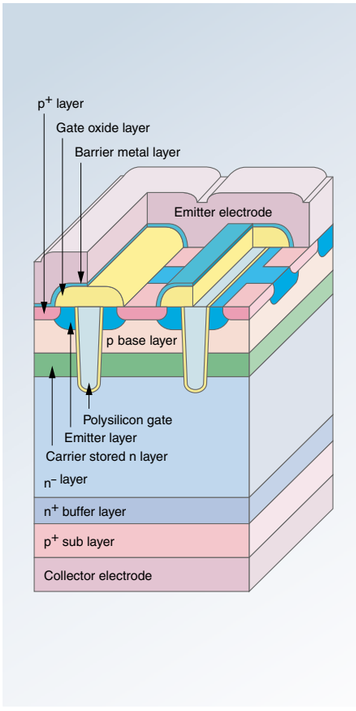


Actual Principle of CSTBT™

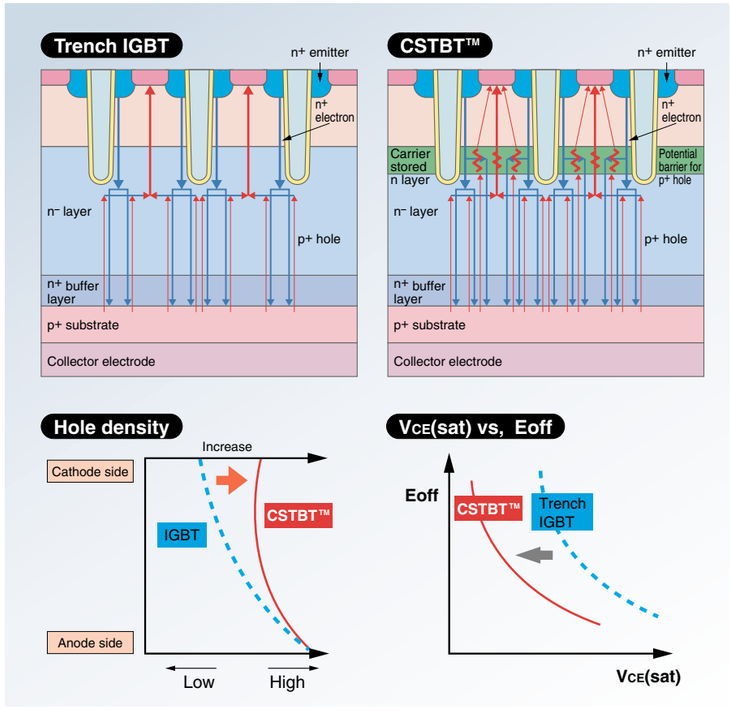
CSTBT™ has achieved an extremely low-loss structure by advancing a conventional trench structure IGBT.
In addition to the conventional trench structure, CSTBT™ has a carrier-stored n layer to accumulate carriers as shown in the diagram on the right. The concentration of the n layer (conservation of charge layer) connected with the p base layer is higher than the n^- layer, and the internal electric potential difference between the p base and the n layer is higher than that of the p base and the n^- layer.
This high internal electric potential serves as a barrier to prevent holes infused from the p^+ layer to n^- layer from going through to the emitter side. In short, holes can be stored on the emitter side of an element by the conservation of a charge layer, and the n layer controls the shift of holes to the p base layer.
This conservation of charge function drastically improves the on-state characteristics of CSTBT™, compared to the trench structure of IGBTs. Increasing the carrier density on the emitter side and decreasing the impedance in silicon makes on-state voltage reduction possible.

CSTBT™: Mitsubishi Electric's original IGBT, utilizing a novel carrier storage effect

■ CSTBT™ chip structure



■ Comparison of trench IGBT and CSTBT™

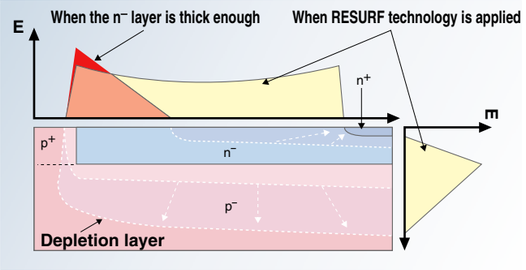


High-voltage Technology of 1200V HVICs

Utilizing reduced surface field (RESURF) technology, Mitsubishi Electric Corporation has developed a 1200V horizontal MOSFET for level shift circuits.
We have further developed a split-RESURF structure for level shift technology without high-potential wiring. Our high-voltage integrated circuits (HVICs) have a high-rating of 1200V.

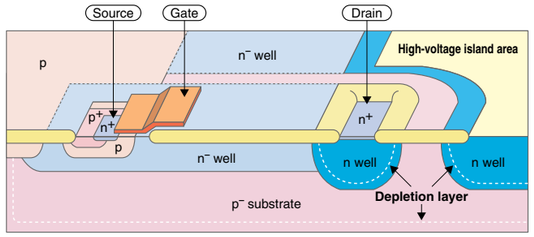
■ What is RESURF?

The p^- substrate depletion layer forcibly extends the p^+n^- junction depletion layer underneath the surface. The n^- layer becomes a complete depletion layer, and the surface electric field is thereby reduced.
The RESURF structure has the ability to withstand high-voltage in the vertical direction because the p^- substrate depletion layer extends in the depth direction. The rating of the entire device can therefore be increased significantly.

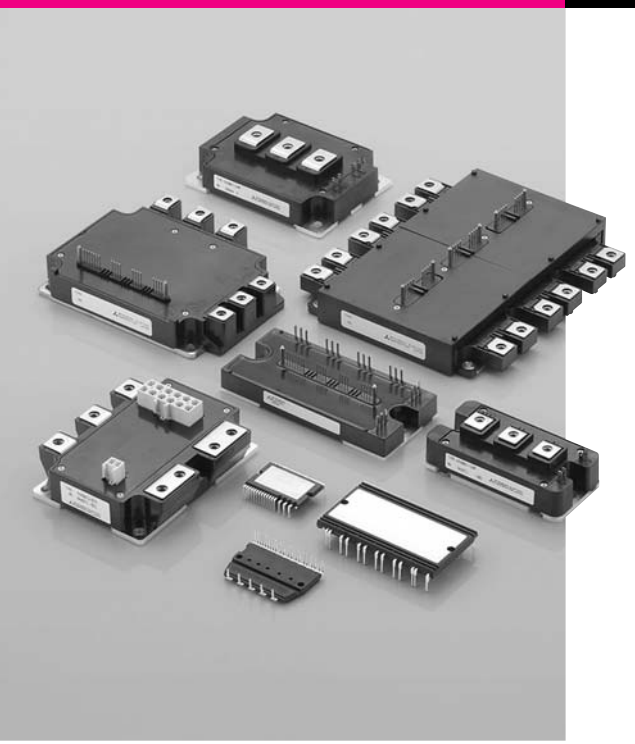


■ What is split-RESURF structure?

The split-RESURF structure is characterized by a narrow p^- substrate area exposed on the surface between the drain and island areas of the horizontal MOSFET for level shift circuits.
When high-voltage is applied across the power supply electrodes, the p^- substrate becomes a depletion layer between the n-diffusion areas; therefore, the surface potential of this p^- substrate area is not significantly different from that of the n-diffusion areas.
In the past, HVIC maximum ratings were limited to 600V because, under high-potential wiring, a dielectric film is required to have the ability to withstand the same voltage as semiconductor junctions. The split-RESURF structure enables an HVIC to achieve a rating of 1200V.



Power Modules

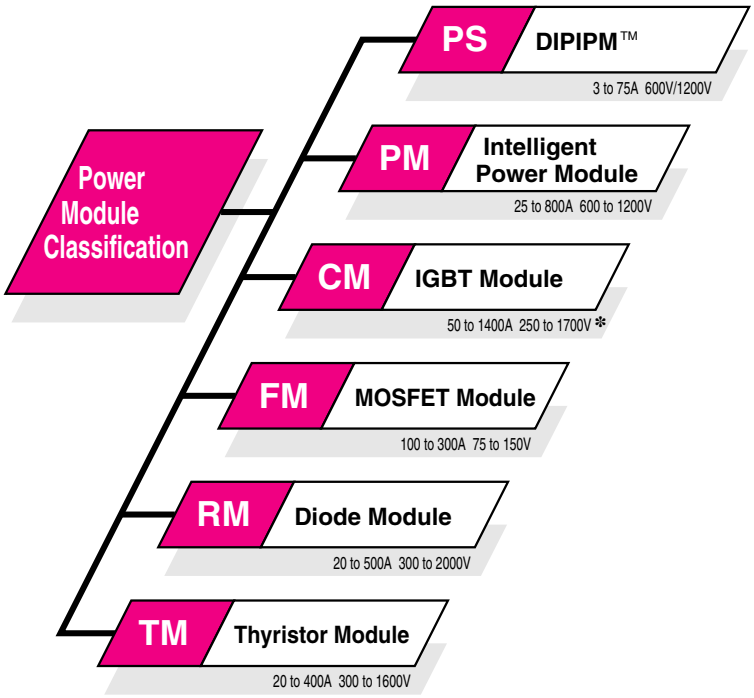


Industry-leading Technologies and a Wide Range of Products

The power module is a compound-type semiconductor that is installed in a package after wiring semiconductor chips to meet the application needs and specifications. Power modules are classified into diodes, thyristors, IGBTs and intelligent power modules (IPMs) according to the type of chips installed. Since 1978, when we placed these power modules in practical use, Mitsubishi Electric has always been endeavoring to extend the corresponding market through developing new devices. In recent years, the demand for IGBT modules and IPMs has rapidly increased and we are doing our utmost to develop products and improve product characteristics in this field.

■ Features:

- New package design for less environmental pollution, which also contributes to energy savings due to reduced power loss
- Long creeping distance and high dielectric strength (1500V to 3500V)
- Since we offer a variety of models in terms of voltage, current, wiring pattern, etc., our power modules can be used in a wide range of applications such as inverters, choppers and uninterruptible power supplies (UPSs)
- Compliance with international standards (UL1557) has been certified (Yellow Card No. E80276, File No.E80271) (excluding some products)
- The ease of both installation and wiring due to the design allows application equipment to be reduced in size and weight



❇: Please refer to high-power device for IGBT modules over 2500V

■ Codes for DIPIPM™ naming

PS ○○○○○-○○○

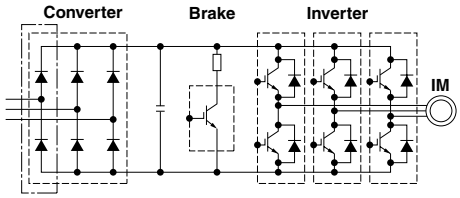
- Change of appearance or others
- Rated current
- Change of IGBT chip
- Change of package
- Voltage class
- Series name

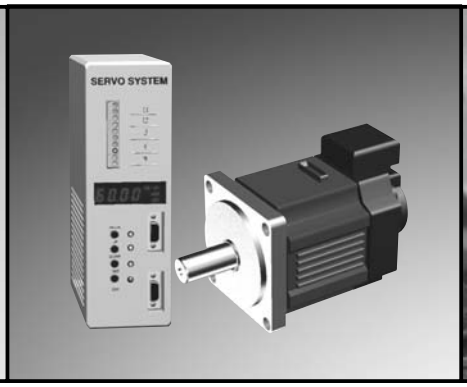
■ Codes for power module naming

CM 150 D Y -24 NF
PM 100 R L A 120

- Series name
- Voltage class
- Change of appearance or others
- Series name
- Connection
- Rated current
- Type

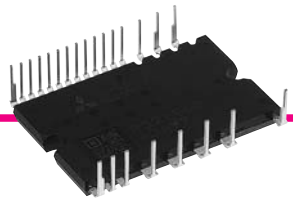
■ Application of IPM/IGBT to AC motor controls (VVVF inverter, servo amps, etc.)





DIPIPM™

Dual In-line Package Intelligent Power Module



Strongly supporting smaller and more energy-saving electric home appliances and low-power industrial equipment.

DIPIPM™ Series are being used widely in both home appliances such as air conditioners, refrigerators and washing machines, as well as small-capacity industrial equipment such as inverters and servo amplifiers.
They contribute greatly to power-savings and product miniaturization.
In addition to 600V-rated devices, 1200V-rated devices designed for the global market are included in the line-up.

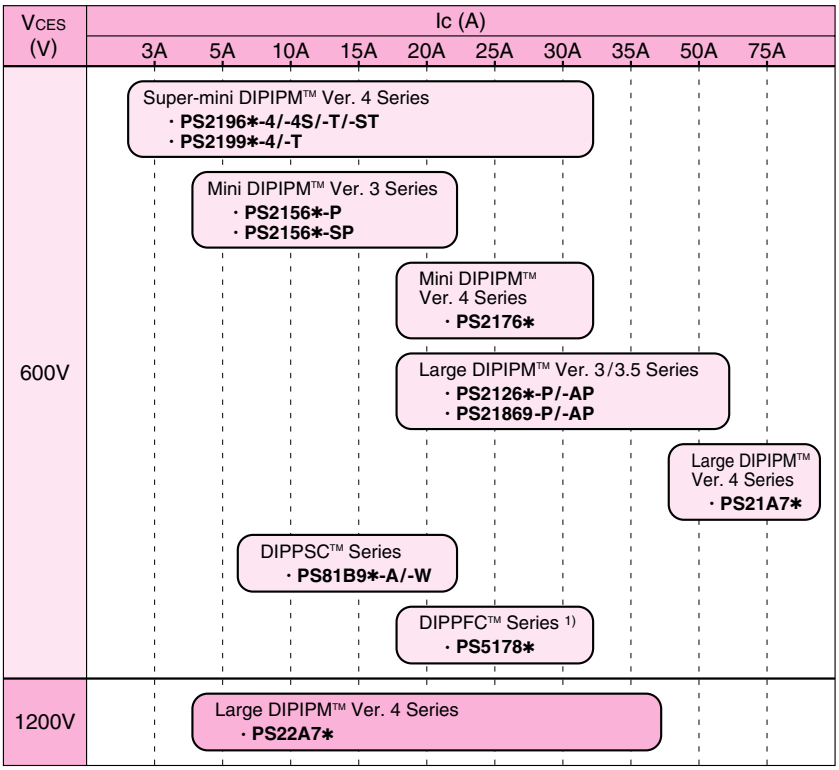
■ Applications

- Air conditioners, refrigerators, washing machines, and package air conditioners
- Low-power industrial motor drives

■ Features

- Wide line-up from 3A to 75A/600V, and 5A to 35A/1200V
- Use of low-loss IGBT or CSTBT™
- Direct drive by control unit possible (non-optocoupler interface)
- Single supply scheme simplifies the power supply circuits
- External-terminal plating using a lead-free solder in compliance with the RoHS directive
  The lead-free solder is used for soldering the power chips in the DIPIPM™ Ver. 4 series

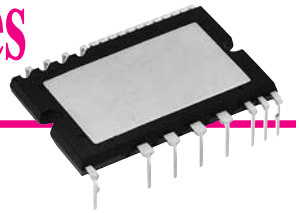
■ Series map



1) **PS5178∗** correspond to input current 20Arms and 30Arms

Super-mini and Mini DIPIPM™ Ver. 4 Series

Super-mini and Mini Dual In-line Package Intelligent Power Module Ver. 4 Series



■ Applications

- Low-power home appliances
  (air conditioners, washing machines and refrigerators)
- Small-capacity industrial motor drives

■ Internal functions

- For P-side IGBTs:
  Drive circuit, high-voltage, high-speed level shifting, and control supply under-voltage (UV) protection
- For N-side IGBTs:
  Drive circuit, control supply under-voltage (UV) protection, and short-circuit (SC) protection
  Over-temperature (OT) protection [-T series only]
- Error output:
  Corresponds to SC, UV (N-side only), and OT protection
- IGBT drive power supply:
  15VDC single power supply (bootstrap supply scheme can be applied)
- Input interface:
  3V, 5V compatible, high active logic

■ Features

- Use of an insulated thermal radiating sheet structure realizes low thermal resistance
- A lead-free solder is used in terminal plating and power chip soldering (RoHS directive compliance)

■ Line-up

Super-mini-package Series

PS2196✻ Series	Type	Ratings	fc max.(kHz)	Outline drawings no.
Isolation voltage 1500Vrms class (✻1)	**PS21961-4/-4S/-T/-ST**	3A/600V	20	PS1 PS2 PS3 (✻2) PS4
	PS21962-4/-4S/-T/-ST	5A/600V		
	PS21963-4E/-4ES/-ET/-EST	8A/600V		
	PS21963-4/-4S/-T/-ST	10A/600V		
	PS21964-4/-4S/-T/-ST	15A/600V		
	PS21965-4/-4S/-T/-ST	20A/600V		
	PS21997-4/-T	30A/600V		

✻1: Corresponds to isolation voltage 2500Vrms in the case of using the convex-shaped heat sink
✻2: 3 shunts type is not available for **PS21997**
-T: Over temperature protection is available
-S: N-side open emitter (3 shunts)
(Other 3 terminal forming types are available)

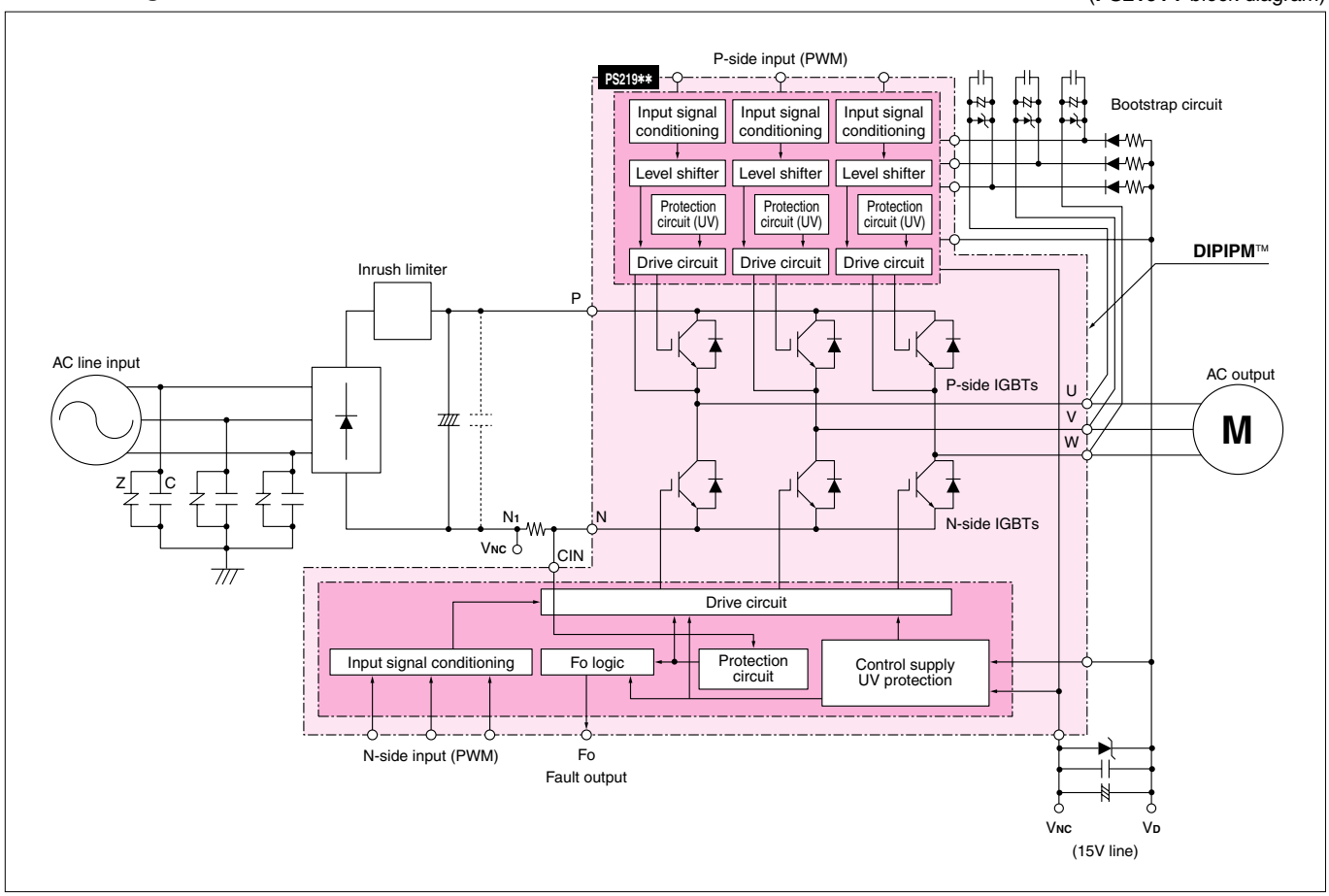
Mini-package Series

	Type	Ratings	fc max.(kHz)	Outline drawings no.
Isolation voltage 2500Vrms class	**PS21765**	20A/600V	20	PS10
	PS21767/-V	30A/600V		

-V: Higher switching speed

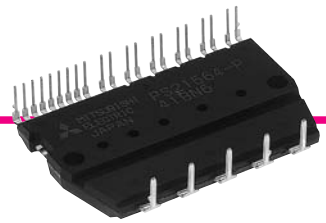
■ Block diagram

(**PS219✻✻** block diagram)



DIPIPM™ Ver. 3/3.5 Series

Dual In-line Package Intelligent Power Module Ver. 3/3.5 Series



■ Applications

- Low-power home appliances
  (air conditioners, washing machines, refrigerators)
- Small-capacity industrial motor drives

■ Internal functions

- For P-side IGBTs:
  Drive circuit, high-voltage, high-speed level shifting, and control supply under-voltage (UV) protection
- For N-side IGBTs:
  Drive circuit, control supply under-voltage (UV) protection, and short-circuit (SC) protection
- Error output:
  Corresponds to SC and UV (N-side only) protection
- IGBT drive power supply:
  15VDC single power supply (bootstrap supply scheme can be applied)
- Input interface:
  3V, 5V compatible, high active logic

■ Features

- A lead-free solder is used in terminal plating
  (RoHS directive compliance)

■ Line-up

Mini-package Series

	Ver.	Type	Ratings	fc max.(kHz)	Outline drawings no.
Isolation voltage 2500Vrms class	3	**PS21562-P/-SP**	5A/600V	20	PS5 PS6
		PS21563-P/-SP	10A/600V		
		PS21564-P/-SP	15A/600V		
		PS21565-P/-SP	20A/600V		

-SP: N-side open emitter (3 shunts)

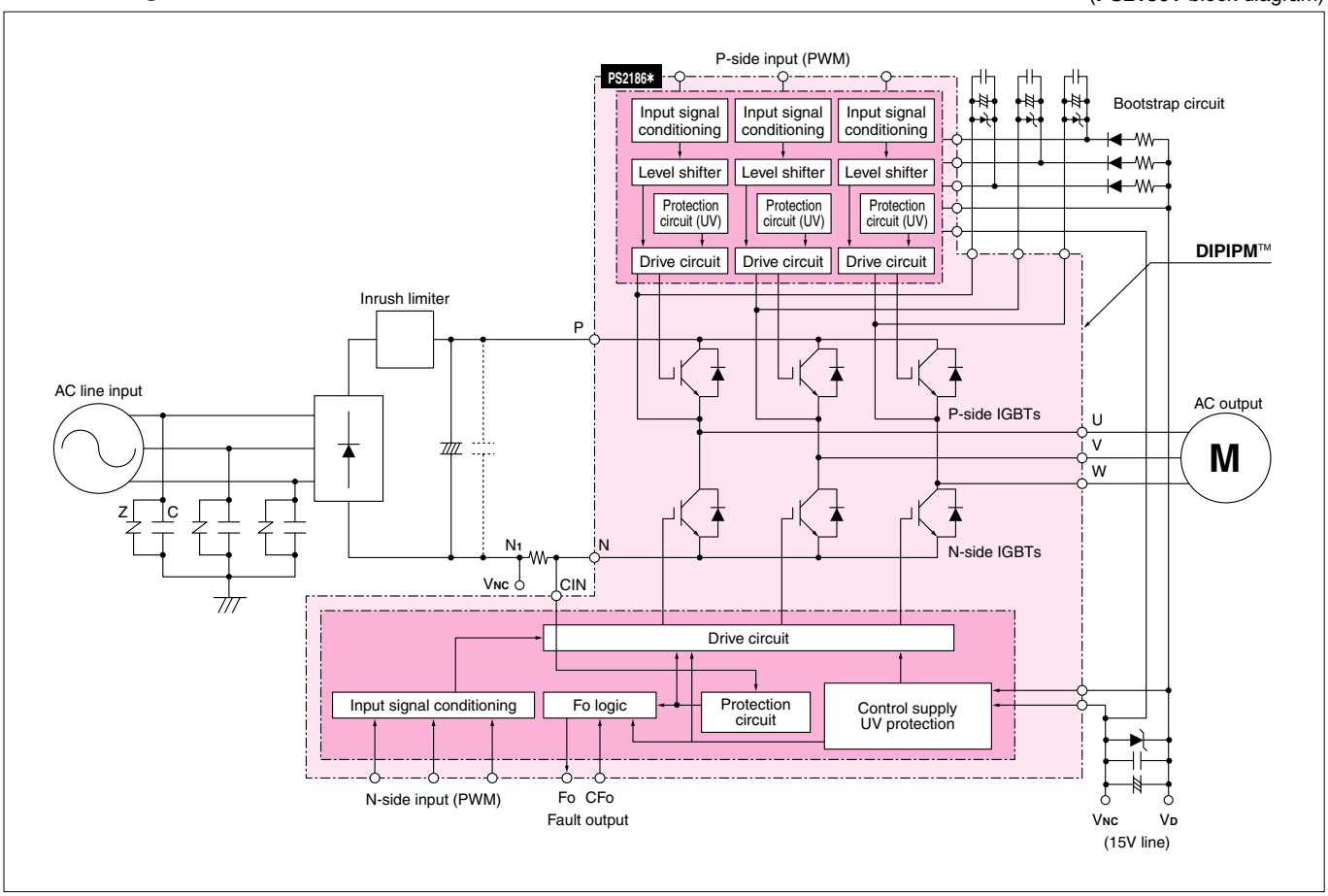
Large-package Series

	Ver.	Type	Ratings	fc max.(kHz)	Outline drawings no.
Isolation voltage 2500Vrms class	3.5	**PS21265-P/-AP**	20A/600V	20	PS9
		PS21267-P/-AP	30A/600V		
	3	**PS21869-P/-AP**	50A/600V	20	PS7

-AP: Long outer terminal

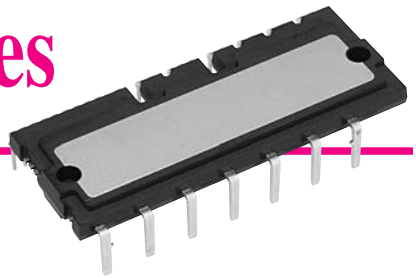
■ Block diagram

(**PS2186∗** block diagram)



Large DIPIPM™ Ver. 4 Series

Large Dual In-line Package Intelligent Power Module Ver. 4 Series



■ Applications

- Low-power appliances
  (air conditioners, general-purpose inverter, AC servo amplifier, etc.)

■ Internal functions

- For P-side IGBTs:
  Drive circuit, high-voltage, high-speed level shifting, and control supply under-voltage (UV) protection
- For N-side IGBTs:
  Drive circuit, control supply under-voltage (UV) protection, and short-circuit (SC) protection
- Error output:
  Corresponds to SC and UV (N-side only) protection
- IGBT drive power supply:
  15VDC single power supply (bootstrap supply scheme can be applied)
- Input interface:
  5V compatible, high active logic

■ Features

- Outputting LVIC temperature by analog signal
- Use of an insulated thermal radiating sheet structure realizes low thermal resistance
- A lead-free solder is used in terminal plating and power chip soldering (RoHS directive compliance)

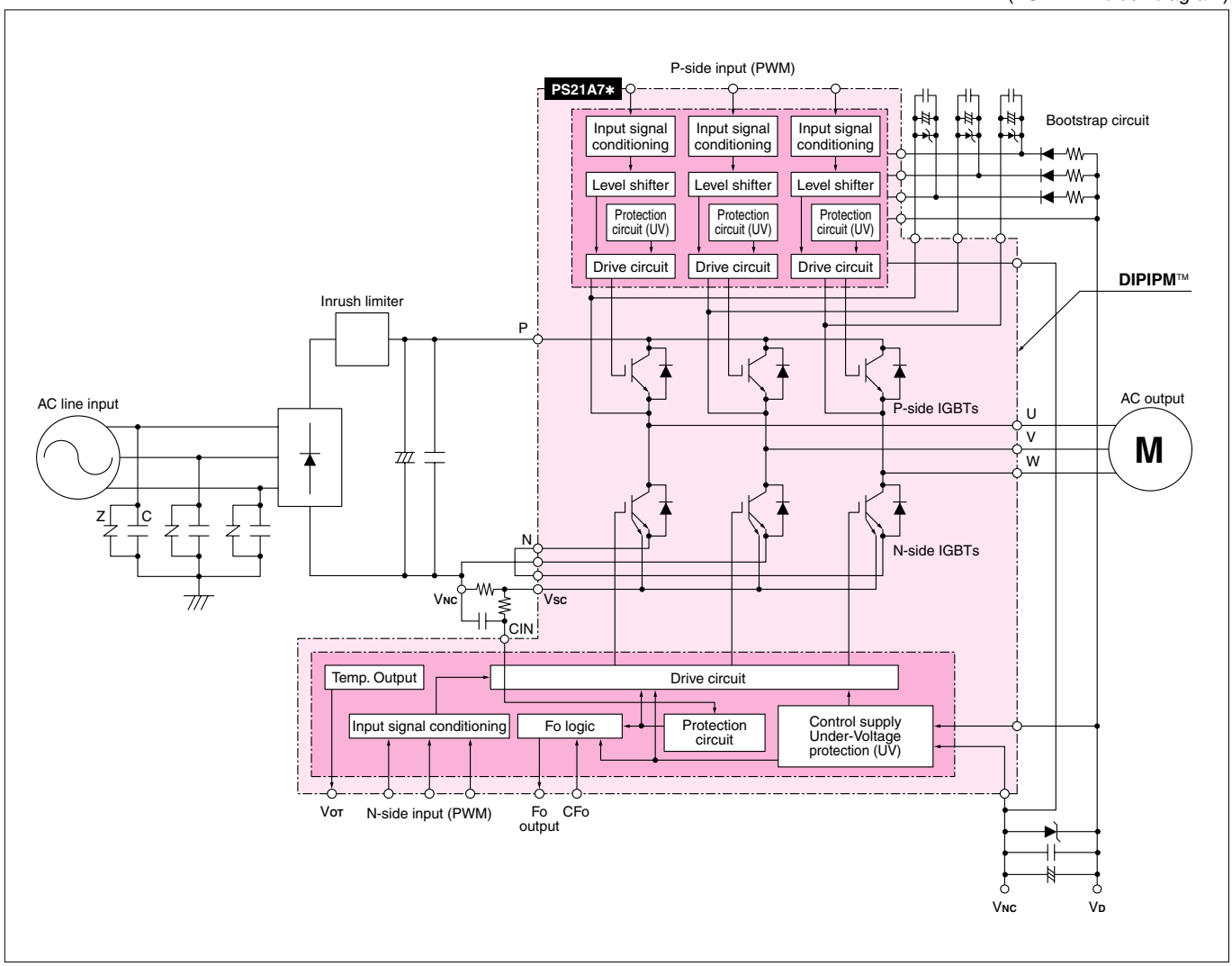
■ Line-up

Large-package Series

	Type	Ratings	fc max.(kHz)	Outline drawings no.
Isolation voltage 2500Vrms class	**PS21A79**	50A/600V	20	PS8
	PS21A7A	75A/600V		
	PS22A72	5A/1200V	20	PS8
	PS22A73	10A/1200V		
	PS22A74	15A/1200V		
	PS22A76	25A/1200V		
	PS22A78-E	35A/1200V		

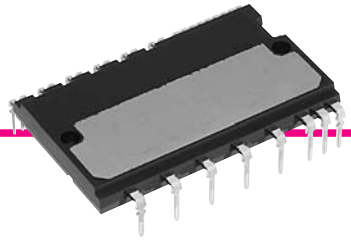
■ Block diagram

(**PS21A7∗** block diagram)



Mini DIPPFC™ Series

Mini Dual In-line Package Power Factor Correction Series



■ Applications

- Air conditioners, general purpose inverters, etc.

■ Internal functions

- Low-loss IGBT
- Rectifier circuit
- IGBT drive circuit
- Control supply under-voltage protection (UV)

■ Features

- A lead-free solder is used in terminal plating (RoHS directive compliance)
- Special IC **M63914FP** for DIPPFC™ control is available. The combination with the IC can offer short circuit and over voltage protection

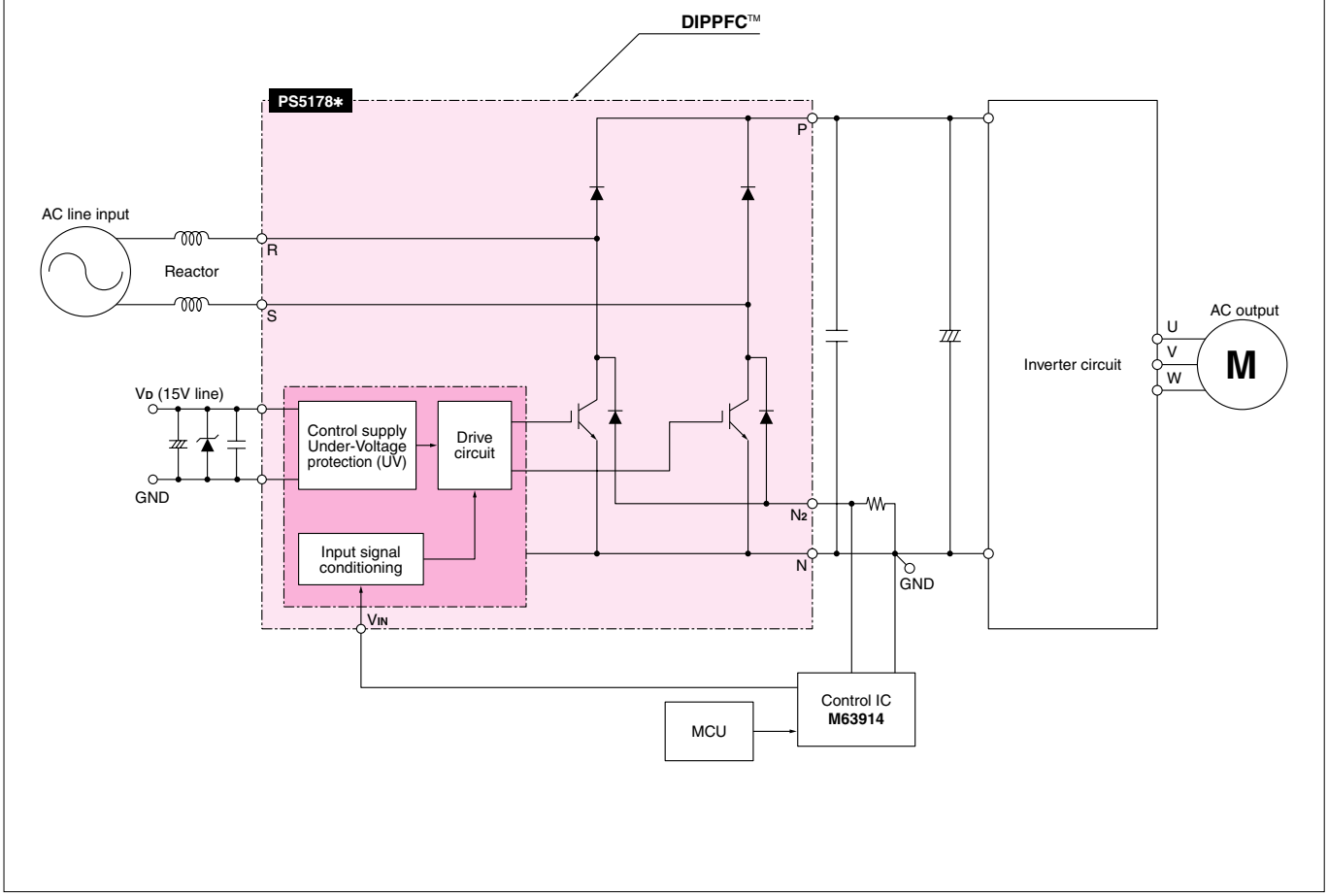
■ Line-up

Mini DIPPFC™ Series

	Type	Ratings		fc typ.(kHz)	Outline drawings no.
		Input voltage	Input current		
Isolation voltage 2500Vrms class	**PS51787**	90 to 264Vrms	20Arms	20	PS10
	PS51789		30Arms		

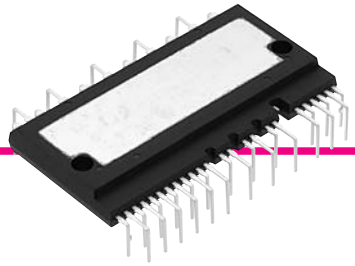
■ Block diagram

(**PS5178∗** block diagram)



DIPPSC™ Series

Dual In-line Package Partial Switching Circuit Series



■ Applications

- Low-power home appliances
  (air conditioners, washing machines and refrigerators)
- Small-capacity industrial motor drive

■ Internal functions

- **Inverter part**
  - For P-side IGBTs:
    Drive circuit, high-voltage, high-speed level shifting, and control supply under-voltage (UV) protection
  - For N-side IGBTs:
    Drive circuit, control supply under-voltage (UV) protection, .and short-circuit (SC) protection
  - Error output:
    Corresponds to SC and UV (N-side only) protection
  - IGBT drive power supply:
    17VDC single power supply (bootstrap supply scheme can be applied)
  - Input interface: 3, 5V compatible, high active logic
- **PSC part**

  Drive circuit, control supply under-voltage (UV) protection, and Short-circuit (SC) protection
  Error output for SC and UV protection

■ Features

- Built-in PSC (Partial Switching Circuit) for power factor corrector
- Outputting LVIC temperature by analog signal
- Use of an insulated thermal radiating sheet structure realizes low thermal resistance.
- A lead-free solder is used in terminal plating
  (RoHS directive compliance)

■ Line-up

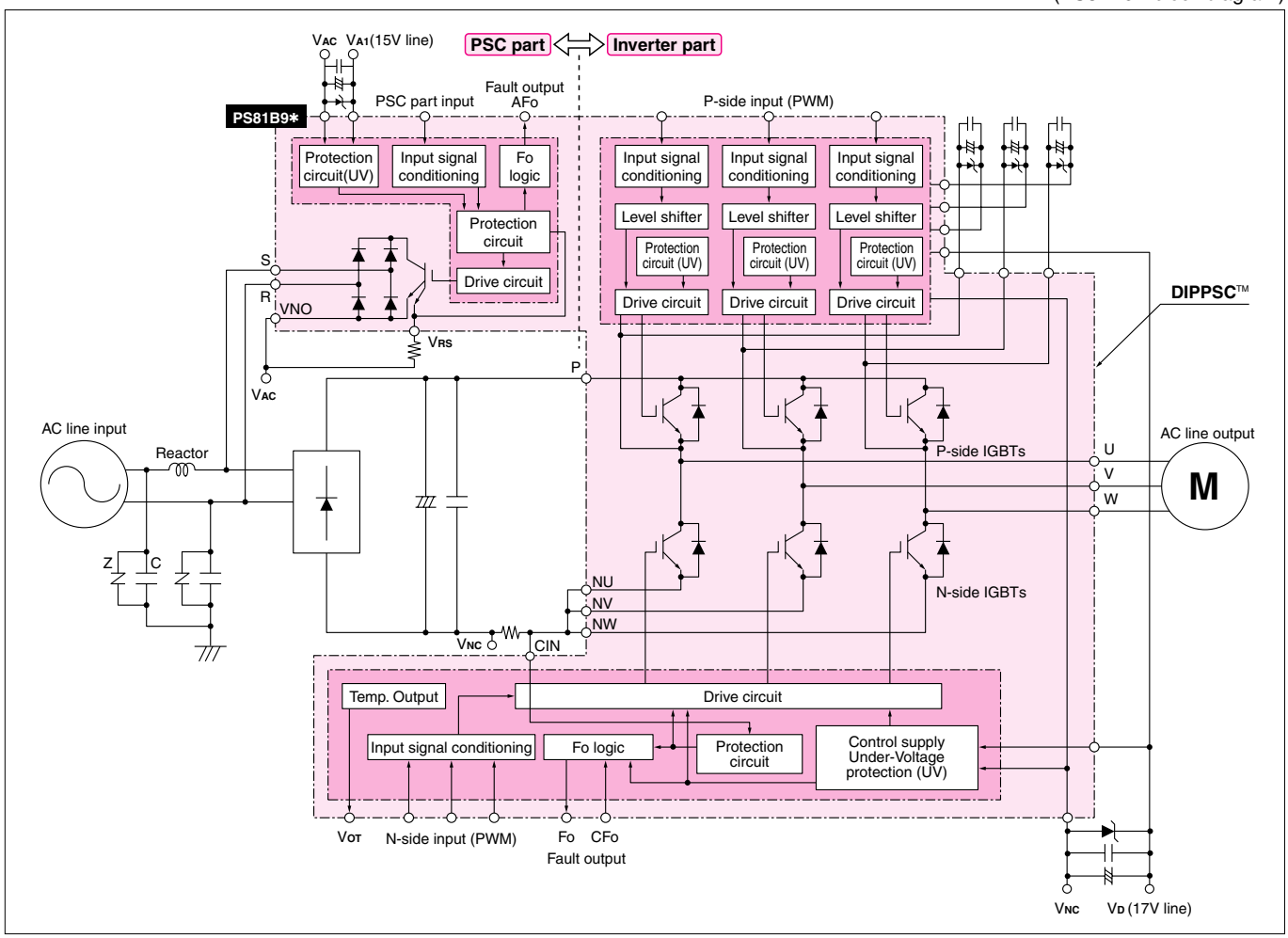
DIPPSC™ Series

	Type	Ratings		fc max.(kHz)	Outline drawings no.
		Partial SW part	Inverter part	Inverter part	
Isolation voltage 2500Vrms class	PS81B93-AE/-EW	15A/600V	8A/600V	20	PS11 PS12
	PS81B93-A/-W	15A/600V	10A/600V		
	PS81B94-A/-W	20A/600V	15A/600V		
	PS81B95-A/-W	20A/600V	20A/600V		

-A : Long outer terminal
-W: Both sides zigzag terminal

■ Block diagram

(**PS81B9∗** block diagram)



IPM

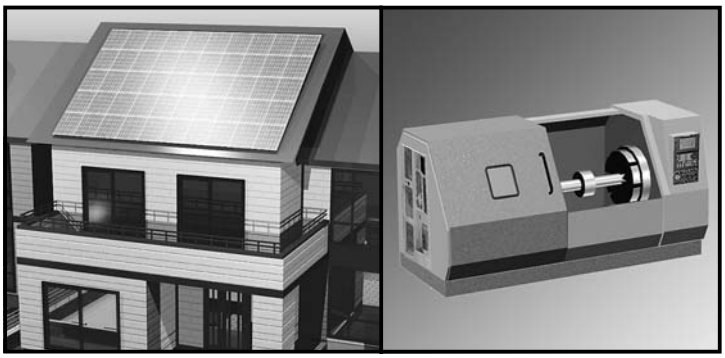
Intelligent Power Modules

In recent years, new demands for ease-of-use and environmental concerns have been added to the need for improved performance, miniaturization, compactness and reduced power loss in motor controllers such as general purpose inverters and AC servos for industrial equipment. Mitsubishi Electric is already in production of power modules such as the 3rd-generation IPM "S Series" and 4th-generation IPM "S-DASH Series", and now adds the miniaturized and lightweight 5th-generation "L Series" to its line-up. The "L Series" incorporates a CSTBT™ chip for reduced power loss and a new compact package.

■ Applications

- Motor control devices (220VAC/440VAC inverters, servos, etc.)
- DC power supplies such as UPS

❇ IPMs for photovoltaic generation using solar devices series



■ Features (L1/S1 Series)

- Low-loss by new CSTBT™ chip optimized V_{CE}(sat) vs Eoff trade-off
- Optimized thermal sensor on chip (Tj sensor)
- Improved of power cycle capability
- Completely lead-free (RoHS directive compliance)
- The package compatible to the L-Series IPM ·····L1 Series
- Adoption of new small-package (50A/600V and 25A/1200V Pin type) ·····L1 Series

■ Intelligent Power Modules (L1 Series)

600V

V_{CES} (V)	Connection	Main terminal	Ic (A)					
			50	75	100	150	200	300
600	3ø	Screw	PM50CL1A060	PM75CL1A060	PM100CL1A060	PM150CL1A060	PM200CL1A060	PM300CL1A060
		Pin	PM50CL1B060	PM75CL1B060	PM100CL1B060	PM150CL1B060	—	—
	3ø +Brake	Screw	PM50RL1A060	PM75RL1A060	PM100RL1A060	PM150RL1A060	PM200RL1A060	PM300RL1A060
		Pin	PM50RL1B060 PM50RL1C060	PM75RL1B060	PM100RL1B060	PM150RL1B060	—	—

1200V

V_{CES} (V)	Connection	Main terminal	Ic (A)				
			25	50	75	100	150
1200	3ø	Screw	PM25CL1A120	PM50CL1A120	PM75CL1A120	PM100CL1A120	PM150CL1A120
		Pin	PM25CL1B120	PM50CL1B120	PM75CL1B120	—	—
	3ø +Brake	Screw	PM25RL1A120	PM50RL1A120	PM75RL1A120	PM100RL1A120	PM150RL1A120
		Pin	PM25RL1B120 PM25RL1C120	PM50RL1B120	PM75RL1B120	—	—

■ IPM series map

3rd-generation (former)	3rd-generation (latter)	4th-generation	5th-generation
S Series	V Series	S-DASH Series S-DASH Servo Series	L Series L1 Series S1 Series

V Series, S-DASH Series, S-DASH Servo Series, L Series, L1 Series, S1 Series are RoHS directive compliance.
S Series are not RoHS directive compliance.

IPM
Intelligent Power Modules

■ High-speed intelligent power modules

220VAC for Line

	Type	Rating		Applicable motor rating(kW)	Output characteristics		Built-in functions							Outline drawings no.
		V_{CES}(V)	I_C(A)		Phase	Vac	OC	SC	UV	OT	BR	PFo	NFo	
L1 Series	PM50RL1A060	600	50	3.7	3	220	×	○	○	○	○	○	○	P35
	PM50RL1B060						×	○	○	○	○	○	○	P36
	PM75RL1A060		75	5.5/7.5			×	○	○	○	○	○	○	P35
	PM75RL1B060						×	○	○	○	○	○	○	P36
	PM100RL1A060		100	11			×	○	○	○	○	○	○	P35
	PM100RL1B060						×	○	○	○	○	○	○	P36
	PM150RL1A060		150	15/18.5			×	○	○	○	○	○	○	P35
	PM150RL1B060						×	○	○	○	○	○	○	P36
	PM200RL1A060		200	22			×	○	○	○	○	○	○	P37
	PM300RL1A060		300	30			×	○	○	○	○	○	○	
	PM50CL1A060		50	3.7			×	○	○	○	×	○	○	P35
	PM50CL1B060						×	○	○	○	×	○	○	P36
	PM75CL1A060		75	5.5/7.5			×	○	○	○	×	○	○	P35
	PM75CL1B060						×	○	○	○	×	○	○	P36
	PM100CL1A060		100	11			×	○	○	○	×	○	○	P35
	PM100CL1B060						×	○	○	○	×	○	○	P36
	PM150CL1A060		150	15/18.5			×	○	○	○	×	○	○	P35
	PM150CL1B060						×	○	○	○	×	○	○	P36
	PM200CL1A060		200	22			×	○	○	○	×	○	○	P37
	PM300CL1A060		300	30			×	○	○	○	×	○	○	
	PM50RL1C060		50	3.7			×	○	○	○	○	○	○	P39
S1 Series	PM50CS1D060		50	3.7			×	○	○	○	×	×	○	P40
	PM75CS1D060		75	5.5/7.5			×	○	○	○	×	×	○	
	PM100CS1D060		100	11			×	○	○	○	×	×	○	
	PM150CS1D060		150	15/18.5			×	○	○	○	×	×	○	
	PM200CS1D060		200	22			×	○	○	○	×	×	○	
L Series	PM200CLA060		200	22			×	○	○	○	×	○	○	P37
	PM300CLA060		300	30			×	○	○	○	×	○	○	
	PM450CLA060		450	37/45			×	○	○	○	×	○	○	P38
	PM600CLA060		600	55			×	○	○	○	×	○	○	

OC: Overcurrent protection
SC: Short-circuit protection
UV: Control supply under-voltage
OT: Over-temperature protection

BR : Elements for braking control
PFo: P-side fault output
NFo: N-side fault output

○: Built-in integrated
×: Non-integrated

IPM
Intelligent Power Modules

■ High-speed intelligent power modules

220VAC for Line

	Type	Rating		Applicable motor rating(kW)	Output characteristics		Built-in functions							Outline drawings no.
		V_{CES}(V)	I_C(A)		Phase	Vac	OC	SC	UV	OT	BR	PFo	NFo	
S-DASH Series	PM50RSD060	600	50	3.7	3	220	○	○	○	△	○	○	○	P2
	PM75RSD060		75	5.5/7.5			○	○	○	△	○	○	○	
	PM100RSD060		100	11			○	○	○	△	○	○	○	
	PM150RSD060		150	15/18.5			○	○	○	△	○	○	○	
	PM200RSD060		200	22			○	○	○	△	○	○	○	P3
	PM300RSD060		300	30			○	○	○	△	○	○	○	
	PM50CSD060		50	3.7			○	○	○	△	×	○	○	P2
	PM75CSD060		75	5.5/7.5			○	○	○	△	×	○	○	
	PM100CSD060		100	11			○	○	○	△	×	○	○	
	PM150CSD060		150	15/18.5			○	○	○	△	×	○	○	
	PM200CSD060		200	22			○	○	○	△	×	○	○	P3
	PM300CSD060		300	30			○	○	○	△	×	○	○	
	PM50RSE060		50	3.7			○	○	○	△	○	×	○	P31
	PM75RSE060		75	5.5/7.5			○	○	○	△	○	×	○	
	PM100RSE060		100	11			○	○	○	△	○	×	○	
	PM150RSE060		150	15/18.5			○	○	○	△	○	×	○	
	PM200RSE060		200	22			○	○	○	△	○	×	○	P32
	PM300RSE060		300	30			○	○	○	△	○	×	○	
	PM50CSE060		50	3.7			○	○	○	△	×	×	○	P31
	PM75CSE060		75	5.5/7.5			○	○	○	△	×	×	○	
	PM100CSE060		100	11			○	○	○	△	×	×	○	
	PM150CSE060		150	15/18.5			○	○	○	△	×	×	○	
	PM200CSE060		200	22			○	○	○	△	×	×	○	P32
	PM300CSE060		300	30			○	○	○	△	×	×	○	
V Series	PM75RVA060		75	5.5/7.5			○	○	○	△	○	○	○	P25
	PM100CVA060		100	11			○	○	○	△	×	○	○	
	PM150CVA060		150	15			○	○	○	△	×	○	○	P26
	PM200CVA060		200	22			○	○	○	△	×	○	○	
	PM300CVA060		300	30			○	○	○	△	×	○	○	P27
	PM400DVA060		400	37	1		○	○	○	△	×	○	○	P28
	PM600DVA060		600	45/55			○	○	○	△	×	○	○	P29

OC: Overcurrent protection
SC: Short-circuit protection
UV: Control supply under-voltage
OT: Over-temperature protection

BR : Elements for braking control
PFo: P-side fault output
NFo: N-side fault output

○: Built-in integrated
△: Installed only with N-side
×: Non-integrated

IPM

Intelligent Power Modules

440VAC for Line

	Type	Rating		Applicable motor rating(kW)	Output characteristics		Built-in functions							Outline drawings no.
		V_{CES}(V)	I_C(A)		Phase	Vac	OC	SC	UV	OT	BR	PFo	NFo	
L1 Series	PM25RL1A120	1200	25	3.7	3	440	×	○	○	○	○	○	○	P35
	PM25RL1B120						×	○	○	○	○	○	○	P36
	PM50RL1A120		50	7.5			×	○	○	○	○	○	○	P35
	PM50RL1B120						×	○	○	○	○	○	○	P36
	PM75RL1A120		75	15			×	○	○	○	○	○	○	P35
	PM75RL1B120						×	○	○	○	○	○	○	P36
	PM100RL1A120		100	18.5/22			×	○	○	○	○	○	○	P37
	PM150RL1A120		150	30			×	○	○	○	○	○	○	
	PM25CL1A120		25	3.7			×	○	○	○	×	○	○	P35
	PM25CL1B120						×	○	○	○	×	○	○	P36
	PM50CL1A120		50	7.5			×	○	○	○	×	○	○	P35
	PM50CL1B120						×	○	○	○	×	○	○	P36
	PM75CL1A120		75	15			×	○	○	○	×	○	○	P35
	PM75CL1B120						×	○	○	○	×	○	○	P36
	PM100CL1A120		100	18.5/22			×	○	○	○	×	○	○	P37
	PM150CL1A120		150	30			×	○	○	○	×	○	○	
	PM25RL1C120		25	3.7			×	○	○	○	×	○	○	P39
S1 Series	PM25CS1D120		25	3.7			×	○	○	○	×	×	○	P40
	PM50CS1D120		50	7.5			×	○	○	○	×	×	○	
	PM75CS1D120		75	15			×	○	○	○	×	×	○	
	PM100CS1D120		100	18.5/22			×	○	○	○	×	×	○	
L Series	PM100CLA120		100	18.5/22			×	○	○	○	×	○	○	P37
	PM150CLA120		150	30			×	○	○	○	×	○	○	
	PM200CLA120		200	37/45			×	○	○	○	×	○	○	P38
	PM300CLA120		300	55			×	○	○	○	×	○	○	
	PM450CLA120		450	75			×	○	○	○	×	○	○	
S-DASH Series	PM50RSD120		50	7.5			○	○	○	△	○	○	○	P2
	PM75RSD120		75	15			○	○	○	△	○	○	○	
	PM100RSD120		100	18.5/22			○	○	○	△	○	○	○	P3
	PM150RSD120		150	30			○	○	○	△	○	○	○	
	PM50CSD120		50	7.5			○	○	○	△	×	○	○	P2
	PM75CSD120		75	15			○	○	○	△	×	○	○	
	PM100CSD120		100	18.5/22			○	○	○	△	×	○	○	P3
	PM150CSD120		150	30			○	○	○	△	×	○	○	
	PM50RSE120		50	7.5			○	○	○	△	○	×	○	P31
	PM75RSE120		75	15			○	○	○	△	○	×	○	
	PM100RSE120		100	18.5/22			○	○	○	△	○	×	○	P32
	PM150RSE120		150	30			○	○	○	△	○	×	○	
	PM50CSE120		50	7.5			○	○	○	△	×	×	○	P31
	PM75CSE120		75	15			○	○	○	△	×	×	○	
	PM100CSE120		100	18.5/22			○	○	○	△	×	×	○	P32
	PM150CSE120		150	30			○	○	○	△	×	×	○	
V Series	PM50RVA120		50	7.5			○	○	○	△	○	○	○	P25
	PM75CVA120		75	15			○	○	○	△	×	○	○	P26
	PM100CVA120		100	18.5/22			○	○	○	△	×	○	○	
	PM150CVA120		150	30			○	○	○	△	×	○	○	P27
	PM200DVA120		200	30/37	1		○	○	○	△	×	○	○	P28
	PM300DVA120		300	45/55			○	○	○	△	×	○	○	P29

OC: Overcurrent protection
SC: Short-circuit protection
UV: Control supply under-voltage
OT: Over-temperature protection

BR : Elements for braking control
PFo: P-side fault output
NFo: N-side fault output

○: Built-in integrated
△: Installed only with N-side
×: Non-integrated

IPM

Intelligent Power Modules

For Solar Power

Type	Rating		Output characteristics		Built-in functions							Outline drawings no.
	V_{CES}(V)	I_C(A)	Phase	Vac	OC	SC	UV	OT	Con	PFo	NFo	
PM50B4LA060	600	50	2	220	×	○	○	○	×	○	○	P35
PM50B4LB060					×	○	○	○	×	○	○	P36
PM50B5LA060					×	○	○	○	○:1	○	○	P35
PM50B5LB060					×	○	○	○	○:1	○	○	P36
PM50B6LA060					×	○	○	○	○:2	○	○	P35
PM50B6LB060					×	○	○	○	○:2	○	○	P36
PM75B4LA060		75			×	○	○	○	×	○	○	P35
PM75B4LB060					×	○	○	○	×	○	○	P36
PM75B5LA060					×	○	○	○	○:1	○	○	P35
PM75B5LB060					×	○	○	○	○:1	○	○	P36
PM75B6LA060					×	○	○	○	○:2	○	○	P35
PM75B6LB060					×	○	○	○	○:2	○	○	P36

OC: Overcurrent protection
SC: Short-circuit protection
UV: Control supply under-voltage
OT: Over-temperature protection

Con: Step up converter
PFo: P-side fault output
NFo: N-side fault output

○: Built-in integrated
×: Non-integrated
○:1→ Built-in 1 converter
○:2→ Built-in 2 converter

IGBT Modules

Insulated Gate Bipolar Transistor Modules

In the past 15 years since the development of the IGBT as the industrial power semiconductor switch, performance has been improved and applications have increased, and now it has replaced transistors in most electric powered industrial equipment. Mitsubishi Electric developed the "F Series", a 4th-generation trench IGBT module that delivers power-savings and noise reduction at the same time. The "NF/A Series", a 5th-generation IGBT module that adopts the CSTBT™ chip, combines the characteristics of the popular planar IGBT and the trench IGBT, and is known for reducing power loss. The "NFH Series", suitable for higher-frequency switching-use, has been newly-developed and put into mass production.

(NF Series)

■ Applications

- General-purpose inverters
- AC servo amplifiers
- Wind power/solar power
- UPS

■ Features

- Same outer dimensions as 3rd-generation H Series
- Uses low-loss CSTBT™
- Same driving power as the H Series
- High-speed soft recovery free-wheel diode
- Low-inductance (half the value of the H Series)
- High-power cycle lifetime
- Low thermal resistance (Utilizes an aluminum nitride ceramic substrate)
- Compliant with RoHS directives

(NFH Series)

■ Applications

- CT scanners
- MRIs
- Induction heating equipment
- Welding machines

■ Features

- 5th-generation CSTBT™
- Low turn-off losses (below 20% standard 1200V NFH Series)
- Soft switching turn-off function
- Enhanced inner wiring (skin effect)
- High-power cycle lifetime
- Compliant with RoHS directives

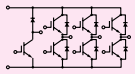
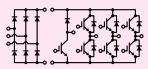
■ IGBT modules series map

3rd-generation (former)	3rd-generation (latter)	4th-generation	5th-generation
H Series	U Series KA Series	F Series DUS Series (high-frequency)	NX Series NF/A Series Mega Power Dual NFH Series (high-frequency)

IGBT Modules

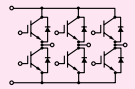
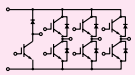
Insulated Gate Bipolar Transistor Modules

■IGBT modules <NX Series>

Connection		V_{CES} (V)	Ic (A)									
			35	50	75	100	150	200	300	400(450)	600	1000
H		600									CM600HX-12A ✻ NX101	
		1200								CM400HX-24A ✻	CM600HX-24A ✻ NX101	
D		600							CM300DX-12A ✻	CM400DX-12A ✻ NX201		
		1200					CM150DX-24A ✻	CM200DX-24A ✻	CM300DX-24A ✻	CM450DX-24A ✻ NX201	CM600DXL-24A	CM1000DXL-24A NXL21
R		600				CM100RX-12A ✻	CM150RX-12A ✻	CM200RX-12A ✻ NX701				
		1200			CM75RX-24A ✻ NX701	CM100RX-24A ✻						
M		600			CM75MX-12A ✻	CM100MX-12A ✻ NXM01						
		1200	CM35MX-24A ✻	CM50MX-24A ✻	CM75MX-24A ✻ NXM01							

✻: Built-in NTC thermistor

■IGBT modules <NF Series>

Connection		V_{CES} (V)	Ic (A)							
			50	75	100	150	200	300	400	600
D		600				CM150DY-12NF	CM200DY-12NF	CM300DY-12NF	CM400DY-12NF	CM600DY-12NF
						N201			N202	N203
		1200			CM100DY-24NF	CM150DY-24NF	CM200DY-24NF	CM300DY-24NF	CM400DY-24NF	CM600DU-24NF
					N201		N202	N203		U205
T		600		CM75TL-12NF	CM100TL-12NF	CM150TL-12NF	CM200TL-12NF			
				NF601			NF602			
		1200	CM50TL-24NF	CM75TL-24NF	CM100TL-24NF	CM150TL-24NF	CM200TL-24NF			
			NF601			NF602				
R		600		CM75RL-12NF	CM100RL-12NF	CM150RL-12NF	CM200RL-12NF			
				NF601			NF602			
		1200	CM50RL-24NF	CM75RL-24NF	CM100RL-24NF	CM150RL-24NF	CM200RL-24NF			
			NF601			NF602				

■IGBT modules <For high-frequency switching use (NFH Series / F Series DUS)>

Connection		V_{CES} (V)	Ic (A)					
			100	150	200	300	400	600
D		600	CM100DUS-12F ✻	CM150DUS-12F ✻	CM200DU-12NFH	CM300DU-12NFH	CM400DU-12NFH	CM600DU-12NFH
			U203			U201		U206
		1200	CM100DU-24NFH	CM150DU-24NFH	CM200DU-24NFH	CM300DU-24NFH	CM400DU-24NFH	CM600DU-24NFH
			U203		U201		U206	

✻: High-speed turn-off F Series

■IGBT modules <A Series>

Connection		V_{CES} (V)	Ic (A)					
			100	150	200	300	400	600
H		1200					CM400HA-24A ✻ H106	CM600HA-24A ✻ H106
								CM600HB-24A ✻ H107
D		1200	CM100DY-24A	CM150DY-24A	CM200DY-24A	CM300DY-24A	CM400DY-24A	CM600DY-24A
			N201			N202	N203	

✻: Not RoHS directive compliant

● Numbers H106, H107, U201, U203, U205, U206, N201 to N203, NF601, NF602, NX101, NX201, NX701, NXM01, NXL21 are recorded with product names to show the outline drawing numbers

IGBT Modules

Insulated Gate Bipolar Transistor Modules

■ IGBT modules <Mega Power Dual>

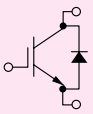
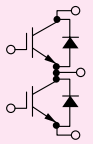
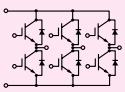
Connection		V_{CES} (V)	Ic (A)		
			900	1000	1400
D		1200	CM900DU-24NF ✻		CM1400DU-24NF ✻
			N204		N204
		1700		CM1000DU-34NF ✻	
				N204	

✻: Not RoHS directive compliant

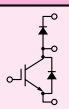
■ IGBT modules <1700V Dual>

Connection		V_{CES} (V)	Ic (A)					
			75	100	150	200	300	400
D		1700	CM75DY-34A	CM100DY-34A	CM150DY-34A	CM200DY-34A	CM300DY-34A	CM400DY-34A
			N201		N202		N203	N205

■ IGBT modules <F Series>

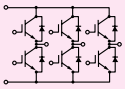
Connection		V_{CES} (V)	Ic (A)							
			50	75	100	150	200	300(350)	400(450)	600
H		250							CM450HA-5F	CM600HA-5F CM600HN-5F
									H105	H106
		600								CM600HU-12F
										U101
		1200							CM400HU-24F	CM600HU-24F
									U101	U102
D		250						CM350DU-5F	CM400DU-5F	CM600DU-5F
								U202	U201	U202
		600		CM75DU-12F	CM100DU-12F	CM150DU-12F	CM200DU-12F	CM300DU-12F	CM400DU-12F	
				U203				U201		
		1200	CM50DU-24F	CM75DU-24F	CM100DU-24F	CM150DU-24F	CM200DU-24F	CM300DU-24F	CM400DU-24F	CM600DU-24F
			U203			U201		U202	U204	U205
T		600		CM75TU-12F	CM100TU-12F	CM150TU-12F	CM200TU-12F			
				U601		U602				
		1200	CM50TU-24F	CM75TU-24F	CM100TU-24F					
			U601	U602						

■ IGBT modules <For brake systems>

Connection		V_{CES} (V)	Ic (A)					
			50	75	100	150	200	300
E3		600		CM75E3U-12H ✻	CM100E3U-12H ✻	CM150E3U-12H ✻	CM200E3U-12NF ✻	CM300E3U-12H ✻
				U111				U112
		1200	CM50E3U-24H ✻	CM75E3U-24H ✻	CM100E3U-24NF ✻	CM150E3U-24H ✻		
			U111			U112		

✻: Production on orders

■ IGBT modules <KA Series>

Connection		V_{CES} (V)	Ic (A)						
			50	75	100	150	200	300	400
D		1700			CM100DU-34KA	CM150DU-34KA	CM200DU-34KA	CM300DU-34KA	CM400DU-34KA
					U201		U202	U205	
T		1700	CM50TU-34KA	CM75TU-34KA					
			U602						

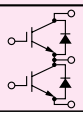
● Numbers H105, H106, U101, U102, U111, U112, U201 to U205, U601, U602, N201 to N205 are recorded with product names to show the outline drawing numbers

IGBT Modules

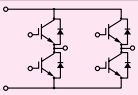
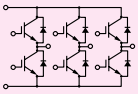
Insulated Gate Bipolar Transistor Modules

■IGBT modules <U Series>

1 arm to 2 arms

Connection		V_{CES} (V)	Ic (A)							
			50	75	100	150	200	300	400	600
H		600								**CM600HU-12H** U101
		1200							**CM400HU-24H** U101	**CM600HU-24H** U102
D		600		**CM75DU-12H**	**CM100DU-12H**	**CM150DU-12H**	**CM200DU-12H**	**CM300DU-12H**	**CM400DU-12H**	
				U203				U201		
		1200	**CM50DU-24H**	**CM75DU-24H**	**CM100DU-24H**	**CM150DU-24H**	**CM200DU-24H**	**CM300DU-24H**		
			U203			U201		U202		

4 arms to 6 arms

Connection		V_{CES} (V)	Ic (A)				
			50	75	100	150	200
B		600		**CM75BU-12H**	**CM100BU-12H**		
				U401			
T		600		**CM75TU-12H**	**CM100TU-12H**	**CM150TU-12H**	**CM200TU-12H**
				U601		U602	
		1200	**CM50TU-24H**	**CM75TU-24H**	**CM100TU-24H**		
			U601	U602			

● Numbers U101, U102, U201 to U203, U401, U601 and U602 are recorded with product names to show the outline drawing numbers

Power MOSFET Modules

Circuits which made from parallel connection of low-voltage IGBT module and discrete MOSFET up to now are mainly used by the electric power conversion equipment for drives motors, typically like a battery drive forklift.

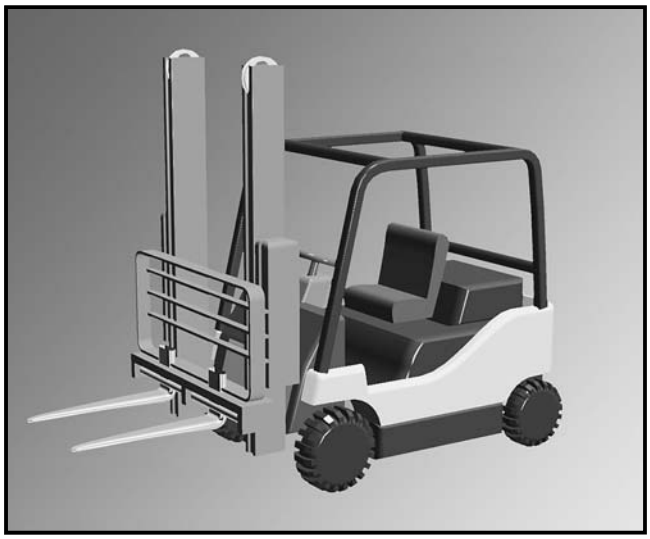
However, the ease of an assembly, the miniaturization of equipment, and the improvement in reliability are being strongly required recently. The line-up of the low-voltage MOSFET module has been realized corresponding to such a large-capacity and low-voltage use.

■ Applications

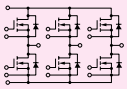
- Battery forklift
- UPS

■ Features

- Using low-loss trench MOSFET chip
- Using connector terminal for gate source
- Built-in temperature sensor
- Completely lead-free
  (RoHS directive compliance)



■ Power MOSFET modules

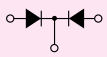
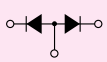
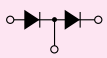
Connection		V_{DSS} (V)	I_D (A)		
			100	200	300
T		75	FM200TU-07A	FM400TU-07A	FM600TU-07A
			F601		
		100	FM200TU-2A	FM400TU-2A	FM600TU-2A
			F601		
		150	FM200TU-3A	FM400TU-3A	FM600TU-3A
			F601		

● Numbers F601 is recorded with product names to show the outline drawing number

Diode Modules

■ High-speed diode modules

Not RoHS directive compliant (Except. RM25HG-24S, RM50HG-12S, RM35HG-34S)

Connection		V_{RRM} (V)	I_{DC} (A) 20(25)		50(35)		100		200		250		300		400/450	
H		250/500									RM250HA-10F	R1			RM450HA-5H	R23
		600	RM20HA-12F	R2	RM50HA-12F RM50HG-12S※1	R3 R4	RM100HA-12F									
		1000	RM20HA-20F		RM50HA-20F		RM100HA-20F	R3	RM200HA-20F							
		1200	RM20HA-24F RM25HG-24S※1	R2 R4	RM50HA-24F	R3	RM100HA-24F		RM200HA-24F	R5			RM300HA-24F	R1	RM400HA-24S	R6
		1700			RM35HG-34S※1	R4										
C		300	RM20CA-6S ×	R5	RM50CA-6S ×	R5										
		450											RM300CA-9W ※2	R24		
		600	RM20CA-12F RM20CA-12S		RM50CA-12F RM50CA-12S		RM100CA-12F	R5								
		1000	RM20CA-20F		RM50CA-20F RM50CA-20S		RM100CA-20F									
		1200	RM20CA-24F		RM50CA-24F		RM100CA-24F									
C1		300	RM20C1A-6S ×	R5	RM50C1A-6S ×	R5										
		600	RM20C1A-12F RM20C1A-12S		RM50C1A-12F RM50C1A-12S		RM100C1A-12F	R5								
		1000	RM20C1A-20F		RM50C1A-20F RM50C1A-20S		RM100C1A-20F									
		1200	RM20C1A-24F		RM50C1A-24F		RM100C1A-24F									
D		600	RM20DA-12F RM20DA-12S		RM50DA-12F RM50DA-12S											
		1000	RM20DA-20F						RM200DA-20F	R7						
		1200	RM20DA-24F						RM200DA-24F							

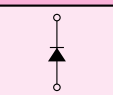
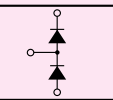
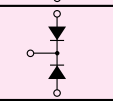
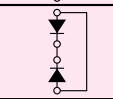
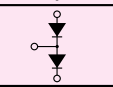
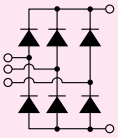
Note: "F" at the end of type name means the high-speed diode module for the transistor modules
"H" or "S" at the end of type name means the super high-speed diode module for the MOSFET or IGBT modules

※1: For the snubber circuit of IGBT modules and IPMs
※2: Exclusive use for welder

×: Plan for production discontinue

■ Diode modules

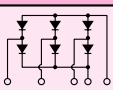
RoHS directive compliant

Connection		V_{RRM} (V)	$I_{F(AV)}$ (A) / Io (A) 20		30		40		50		60		100		150		250		500	
H		400																	RM500HA-M	R8
		800																	RM500HA-H	
		1200																	RM500HA-24	
		1600																	RM500HA-2H	
D		400			RM30DZ-M	R9					RM60DZ-M	R9	RM100DZ-M	R9	RM150DZ-M	R11	RM250DZ-M	R11	RM500DZ-M	R12
		800			RM30DZ-H						RM60DZ-H		RM100DZ-H		RM150DZ-H		RM250DZ-H		RM500DZ-H	
		1200			RM30DZ-24	R10					RM60DZ-24		RM100DZ-24		RM150DZ-24		RM250DZ-24		RM500DZ-24	
		1600			RM30DZ-2H						RM60DZ-2H		RM100DZ-2H		RM150DZ-2H		RM250DZ-2H		RM500DZ-2H	
C		400			RM30CZ-M	R9					RM60CZ-M		RM100CZ-M		RM150CZ-M		RM250CZ-M			
		800			RM30CZ-H						RM60CZ-H		RM100CZ-H		RM150CZ-H		RM250CZ-H			
		1200			RM30CZ-24	R10					RM60CZ-24		RM100CZ-24		RM150CZ-24		RM250CZ-24			
		1600			RM30CZ-2H						RM60CZ-2H		RM100CZ-2H		RM150CZ-2H		RM250CZ-2H			
U		400													RM150UZ-M		RM250UZ-M ×		RM500UZ-M	R12
		800													RM150UZ-H		RM250UZ-H		RM500UZ-H	
		1200													RM150UZ-24		RM250UZ-24		RM500UZ-24	
		1600													RM150UZ-2H		RM250UZ-2H		RM500UZ-2H	
D_2		2000							RM50D2Z-40	R10			RM100D2Z-40	R10						
T (DC output current)		400	RM10TA-M	R13	RM15TA-M	R13	RM20TPM-M ×	R20			RM30TA-M RM30TB-M × RM30TPM-M ×	R16 R17 R20	RM50TC-M	R18	RM75TC-M RM75TPM-M	R19 R22				
		800	RM10TA-H		RM15TA-H		RM20TPM-H				RM30TA-H RM30TB-H RM30TPM-H	R16 R17 R20	RM50TC-H		RM75TC-H RM75TPM-H	R19 R22				
		1200	RM10TA-24		RM15TA-24		RM20TA-24 × RM20TPM-24 ×	R15 R21			RM30TC-24	R18	RM50TC-24		RM75TC-24 RM75TPM-24	R19 R22				
		1600	RM10TA-2H		RM15TA-2H		RM20TA-2H RM20TPM-2H	R15 R21			RM30TC-2H		RM50TC-2H		RM75TC-2H RM75TPM-2H	R19 R22				
		2000			RM15TC-40	R14					RM30TC-40 ×	R14								

×: Plan for production discontinue

■ New diode modules

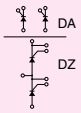
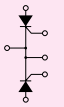
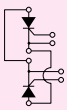
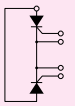
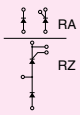
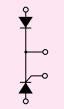
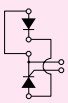
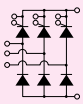
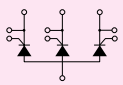
RoHS directive compliant

Connection		V_{RRM} (V)	Io (A) 7		24		12		36	
TN		800			RM20TNA-H	R25			RM30TNA-H	R25
		1600	RM10TN-2H	R25			RM25TN-2H	R25		

● Numbers from R1 to R25 are recorded with product names to show the outline drawing numbers

Thyristor Modules

■ Thyristor modules

Connection		V_{RRM} (V)	$I_{T(AV)}$ (A) 20		25		55		90		130		150		200		400	
H		400															TM400HA-M	T1
		800															TM400HA-H	
		1200															TM400HA-24	
		1600															TM400HA-2H	
D		400	TM20DA-M	T2	TM25DZ-M	T3	TM55DZ-M	T3	TM90DZ-M	T3	TM130DZ-M	T5			TM200DZ-M	T5	TM400DZ-M	T6
		800	TM20DA-H		TM25DZ-H		TM55DZ-H		TM90DZ-H		TM130DZ-H				TM200DZ-H		TM400DZ-H	
		1200			TM25DZ-24	T4	TM55DZ-24	T4	TM90DZ-24	T4	TM130DZ-24				TM200DZ-24		TM400DZ-24	
		1600			TM25DZ-2H		TM55DZ-2H		TM90DZ-2H		TM130DZ-2H				TM200DZ-2H		TM400DZ-2H	
C		400			TM25CZ-M	T3	TM55CZ-M	T3	TM90CZ-M	T3	TM130CZ-M×				TM200CZ-M		TM400CZ-M	
		800			TM25CZ-H		TM55CZ-H		TM90CZ-H		TM130CZ-H				TM200CZ-H		TM400CZ-H	
		1200			TM25CZ-24	T4	TM55CZ-24	T4	TM90CZ-24	T4	TM130CZ-24				TM200CZ-24		TM400CZ-24	
		1600			TM25CZ-2H		TM55CZ-2H		TM90CZ-2H		TM130CZ-2H				TM200CZ-2H		TM400CZ-2H	
P		400									TM130PZ-M				TM200PZ-M×		TM400PZ-M	
		800									TM130PZ-H				TM200PZ-H		TM400PZ-H	
		1200									TM130PZ-24				TM200PZ-24		TM400PZ-24	
		1600									TM130PZ-2H				TM200PZ-2H		TM400PZ-2H	
U		400															TM400UZ-M	
		800															TM400UZ-H	
		1200															TM400UZ-24	
		1600															TM400UZ-2H	
R		400	TM20RA-M	T7	TM25RZ-M	T8	TM55RZ-M	T8	TM90RZ-M	T8	TM130RZ-M	T5			TM200RZ-M×	T5		
		800	TM20RA-H		TM25RZ-H		TM55RZ-H		TM90RZ-H		TM130RZ-H				TM200RZ-H			
		1200			TM25RZ-24	T9	TM55RZ-24	T9	TM90RZ-24	T9	TM130RZ-24				TM200RZ-24			
		1600			TM25RZ-2H		TM55RZ-2H		TM90-RZ-2H		TM130RZ-2H				TM200RZ-2H			
E		400			TM25EZ-M	T8	TM55EZ-M	T8	TM90EZ-M	T8	TM130EZ-M×				TM200EZ-M×			
		800			TM25EZ-H		TM55EZ-H		TM90EZ-H		TM130EZ-H×				TM200EZ-H			
		1200			TM25EZ-24	T9	TM55EZ-24	T9	TM90EZ-24	T9	TM130EZ-24×				TM200EZ-24			
		1600			TM25EZ-2H		TM55EZ-2H		TM90EZ-2H		TM130EZ-2H×				TM200EZ-2H			
G		400									TM130GZ-M×				TM200GZ-M×			
		800									TM130GZ-H				TM200GZ-H			
		1200									TM130GZ-24				TM200GZ-24			
		1600									TM130GZ-2H				TM200GZ-2H			
T3		400	※1 TM10T3B-M	T10	※1 ※3 × TM15T3A-M	T11	※1 ※4 TM25T3A-M	T11										
		800	※1 TM10T3B-H		※1 ※3 TM15T3A-H		※1 ※4 TM25T3A-H											
S		300					※1 ※4 TM60SA-6	T12	※2 TM90SA-6	T12			※2 TM150SA-6	T14				
		400					※1 ※4 TM60SZ-M	T13	※2 ※5 TM100SZ-M	T13								

※1: DC output current ※2: Non-isolation ※3: I_T=30A ※4: I_T=60A ※5: I_T=100A

×: Plan for production discontinue

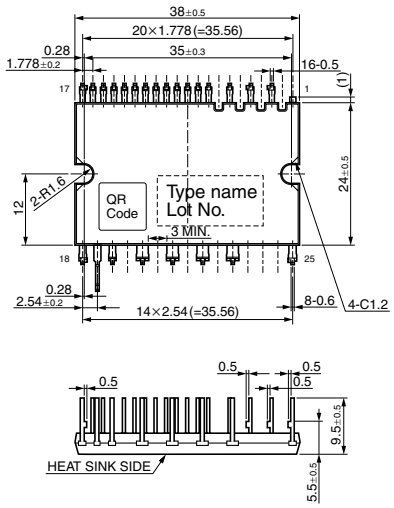
● Numbers from T1 to T14 are recorded with product names to show the outline drawing numbers

■ Power modules outline drawings

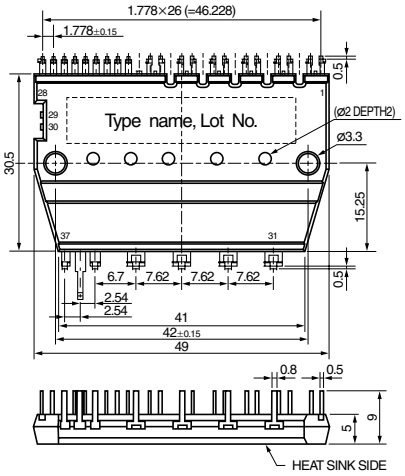
(unit: mm)

DIPIPM™
Dual In-Line Package
Intelligent Power Modules

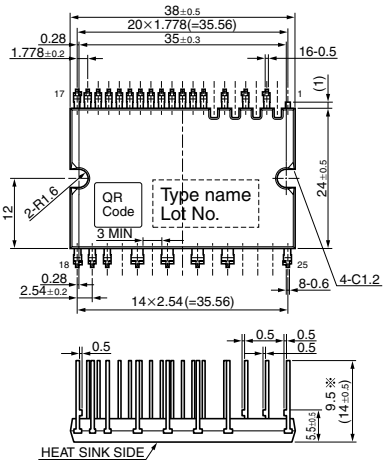
PS3
Super-mini DIPIPM™ Ver. 4
PS2196∗-4S/-ST
PS21963-4ES/-EST



PS6
Mini DIPIPM™ Ver. 3
PS2156∗-SP

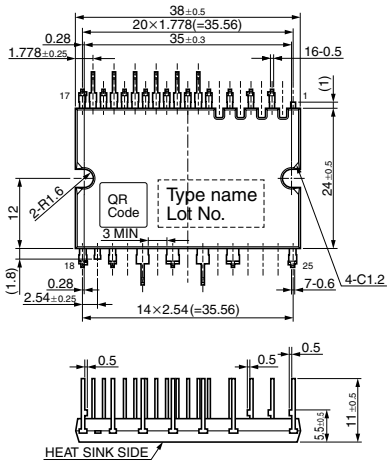


PS1
Super-mini DIPIPM™ Ver. 4
PS219∗∗-4/-4A/-T/-AT
PS219∗3-4E/-4AE/-ET/-AET

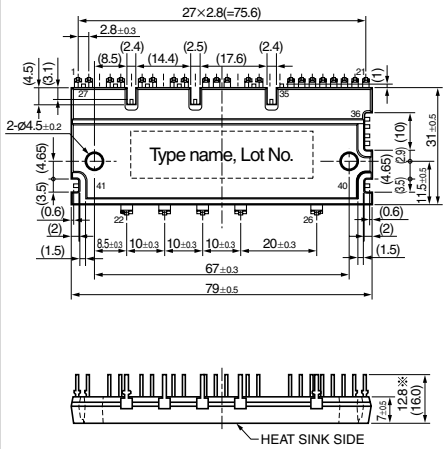


※In the case of -A, this length is 14.0mm

PS4
Super-mini DIPIPM™ Ver. 4
PS219∗∗-4W/-TW
PS219∗3-4EW/-ETW

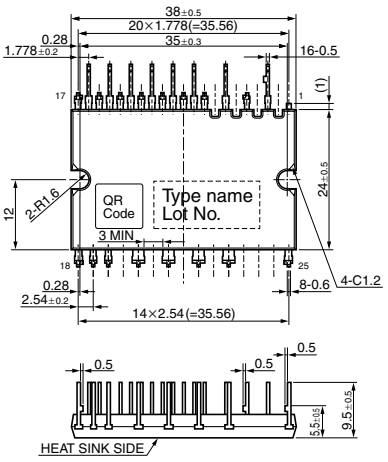


PS7
Large DIPIPM™ Ver. 3
PS21869-P/-AP

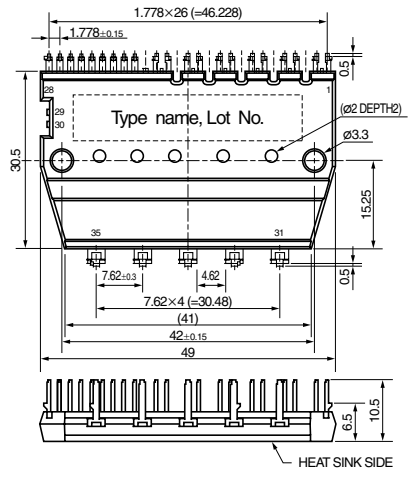


※In the case of -AP, this length is 16.0mm

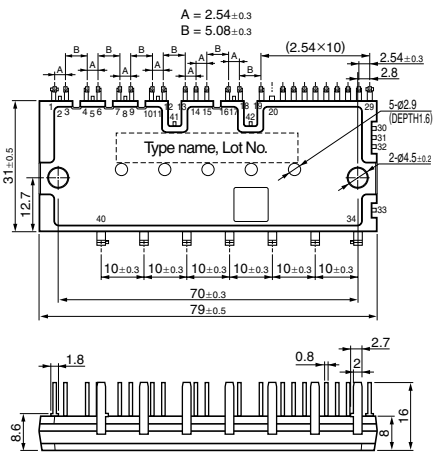
PS2
Super-mini DIPIPM™ Ver. 4
PS219∗∗-4C/-CT
PS219∗3-4CE/-CET



PS5
Mini DIPIPM™ Ver. 3
PS2156∗-P



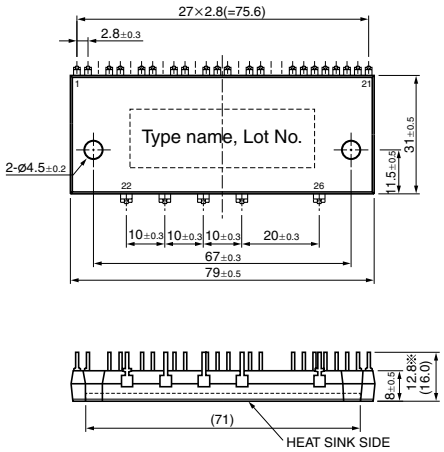
PS8
Large DIPIPM™ Ver. 4
PS21A79 PS22A72 PS22A74
PS21A7A PS22A73 PS22A76
PS22A78-E



QR Code: QR Code is registered trademarks of DENSO WAVE INCORPORATED in JAPAN and other countries

PS9

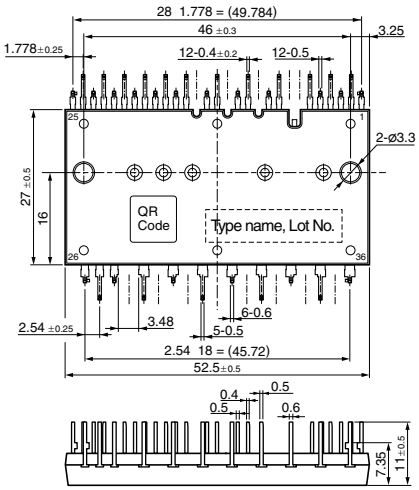
Large DIPIPM™ Ver. 3.5
PS21265-P/-AP
PS21267-P/-AP



※In the case of -AP, this length is 16.0mm

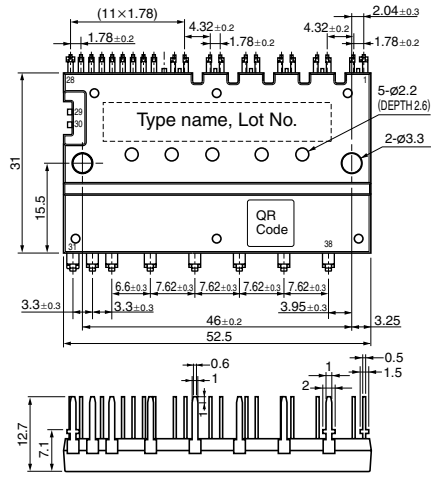
PS12

DIPPSC™
PS81B93-EW PS81B94-W
PS81B93-W PS81B95-W



PS10

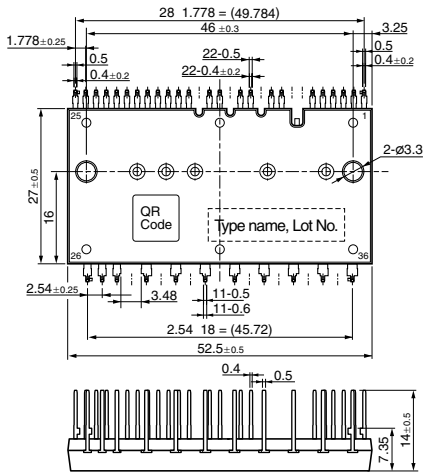
Mini DIPIPM™ Ver. 4 DIPPFC™
PS21765 PS51787
PS21767/-V PS51789



Note: All outer lead terminals are with lead free solder (Sn-Cu) plating

PS11

DIPPSC™
PS81B93-AE PS81B94-A
PS81B93-A PS81B95-A



QR Code: QR Code is registered trademarks of DENSO WAVE INCORPORATED in JAPAN and other countries

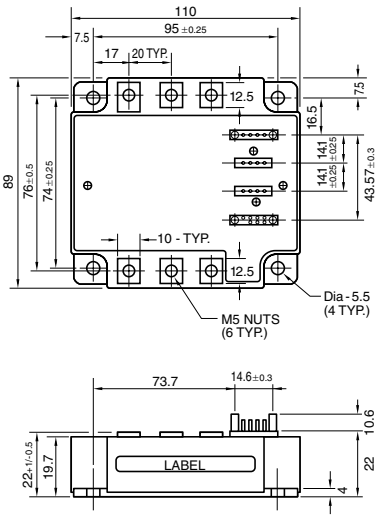
(unit: mm)

IPM

Intelligent Power Modules

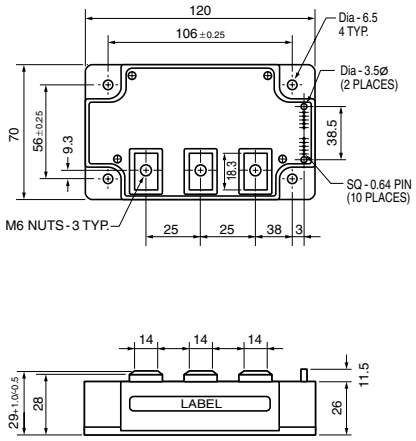
P25

PM50RVA120
PM75RVA060
PM100CVA060



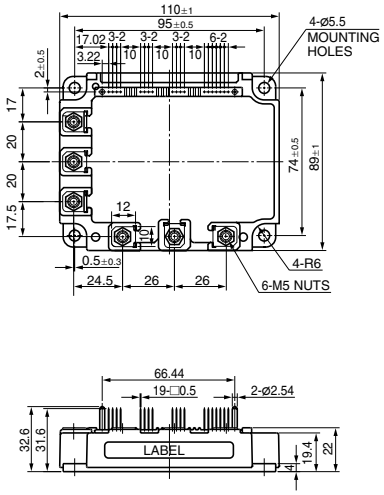
P28

PM200DVA120
PM400DVA060



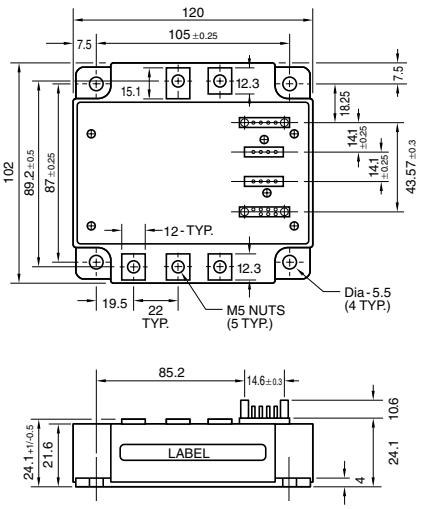
P2

PM50,75,100,150CSD/RSD060
PM50,75CSD/RSD120



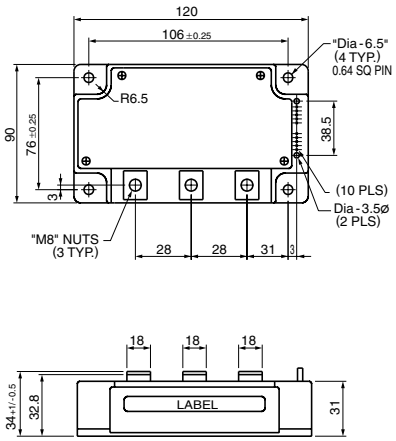
P26

PM75,100CVA120
PM150,200CVA060



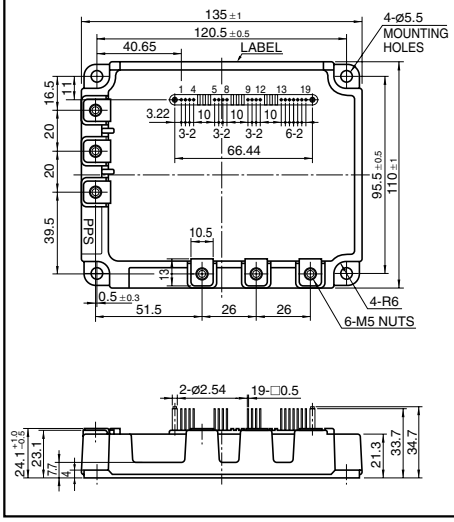
P29

PM300DVA120
PM600DVA060



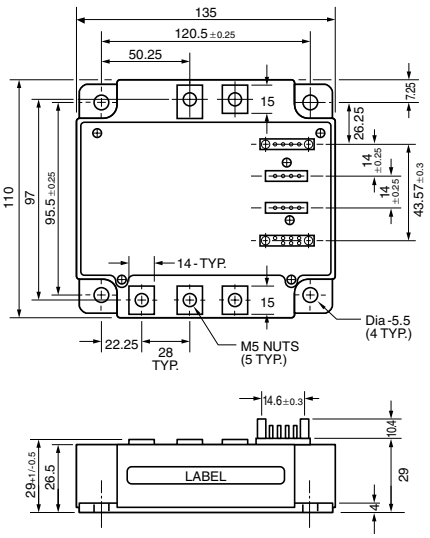
P3

PM200,300CSD/RSD060
PM100,150CSD/RSD120



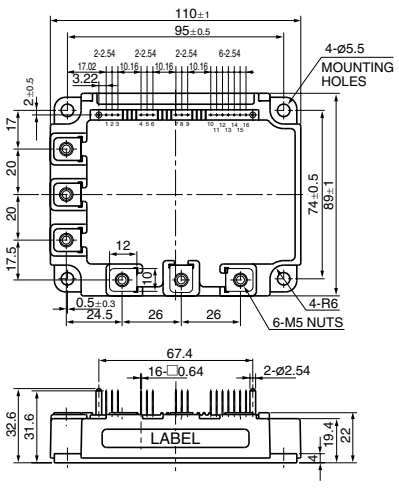
P27

PM150CVA120
PM300CVA060



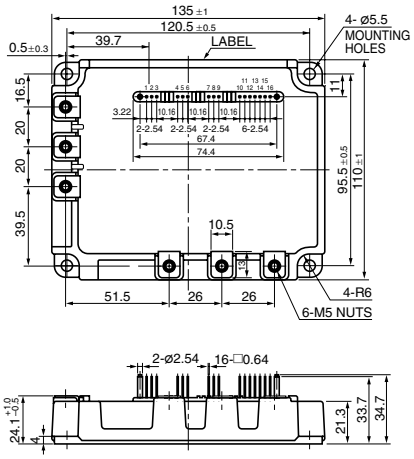
P31

PM50,75,100,150CSE/RSE060
PM50,75CSE/RSE120



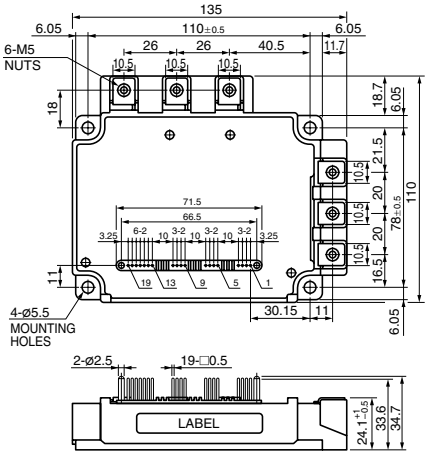
P32

PM200,300CSE/RSE060
PM100,150CSE/RSE120



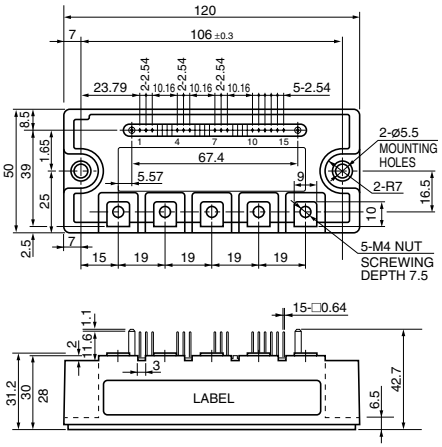
P37

PM200,300CLA/CL1A/RL1A060
PM100,150CLA/CL1A/RL1A120



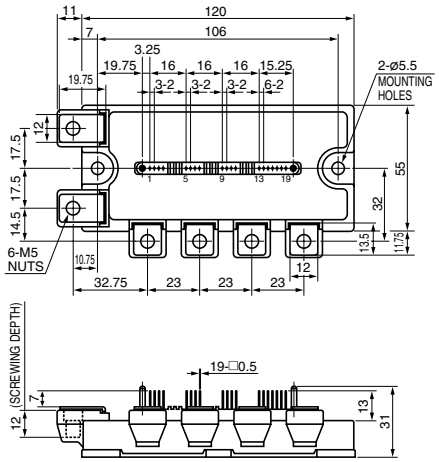
P40

PM50,75,100,150,200CS1D060
PM25,50,75,100CS1D120



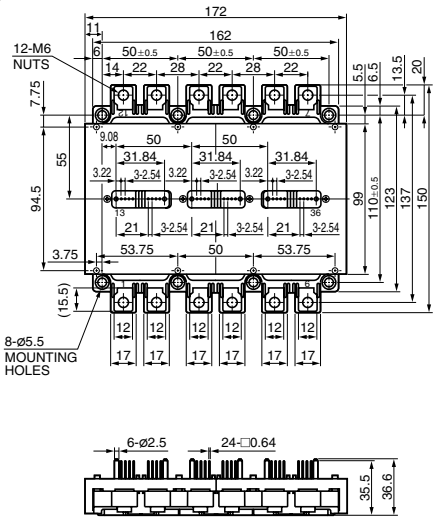
P35

PM50,75,100,150CL1A/RL1A060
PM25,50,75CL1A/RL1A120
PM50,75B4/B5/B6LA060



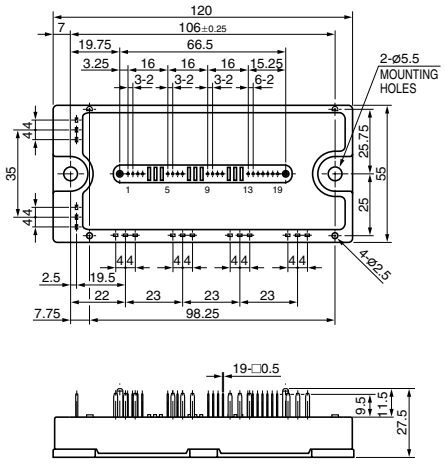
P38

PM200,300,450CLA120
PM450,600CLA060



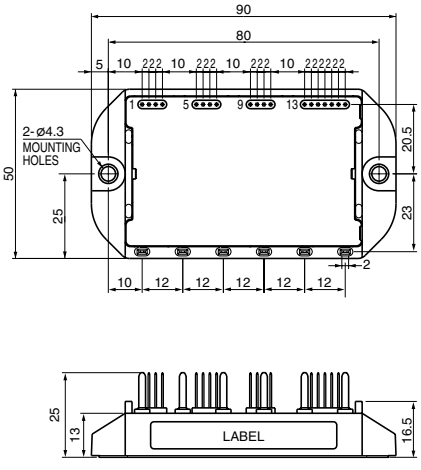
P36

PM50,75,100,150CL1B/RL1B060
PM25,50,75CL1B/RL1B120
PM50,75B4/B5/B6LB060



P39

PM50RL1C060
PM25RL1C120

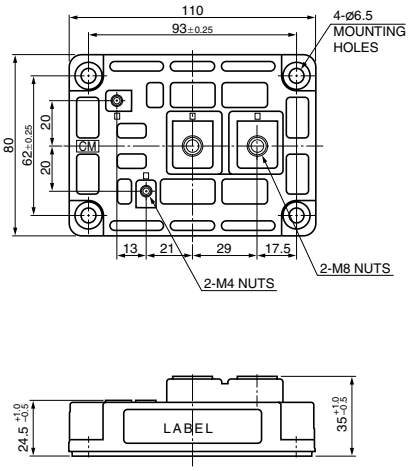


(unit: mm)

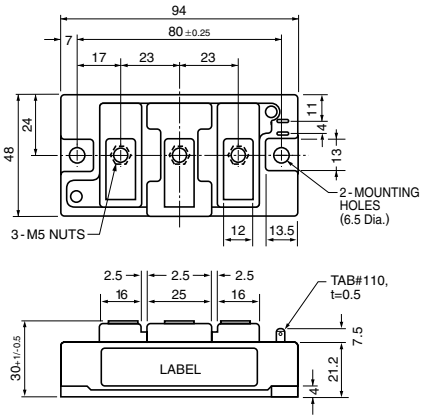
IGBT Module

Insulated Gate Bipolar Transistor Modules

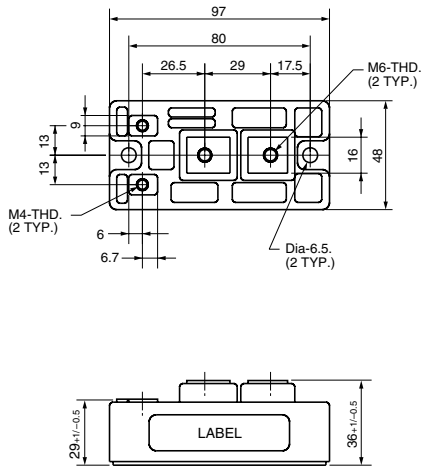
H107 CM600HB-24A



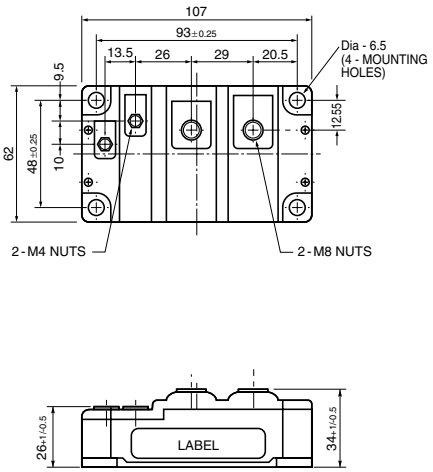
U111 CM50E3U-24H, CM75E3U-12H,-24H, CM100E3U-12H,-24NF, CM150E3U-12H, CM200E3U-12NF



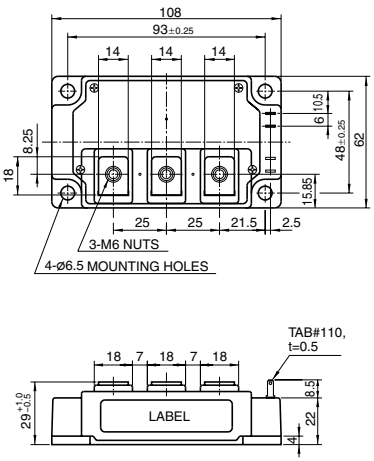
H105 CM450HA-5F



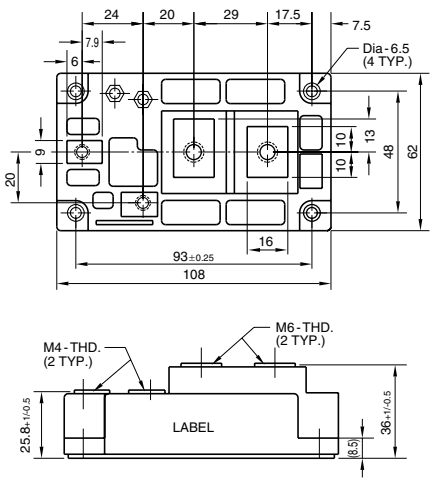
U101 CM600HU-12H,-12F, CM400HU-24H,-24F



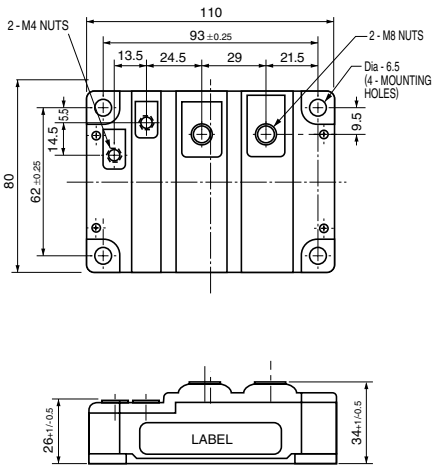
U112 CM150E3U-24H, CM300E3U-12H



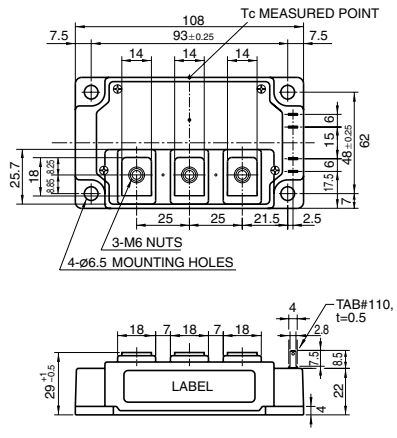
H106 CM400HA-24A, CM600HA-24A,-5F, CM600HN-5F



U102 CM600HU-24H,-24F

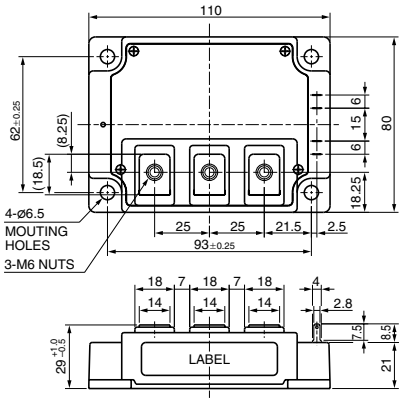


U201 CM100DU-34KA, CM150DU-24H,-24F,-34KA, CM200DU-24H,-24F,-24NFH, CM300DU-12H,-12F,-12NFH,-24NFH, CM400DU-5F,-12H,-12F,-12NFH



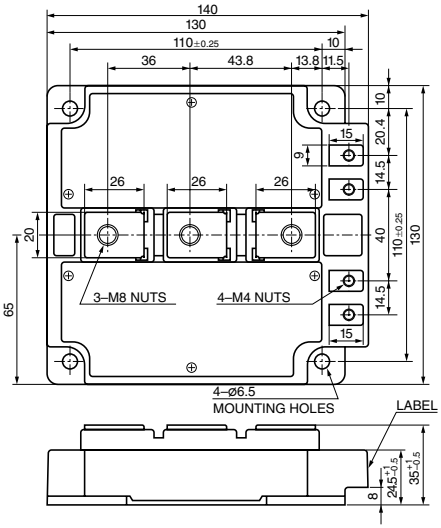
U202

CM200DU-34KA
CM300DU-24H,-24F
CM350DU-5F
CM600DU-5F



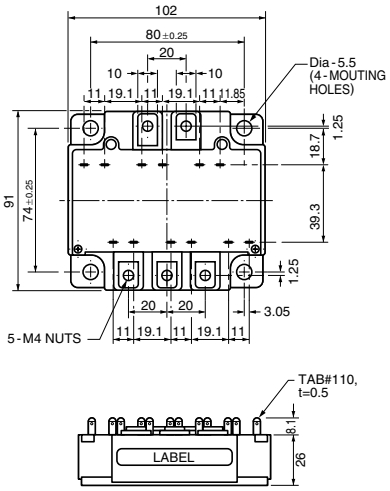
U205

CM300,400DU-34KA
CM600DU-24F,-24NF



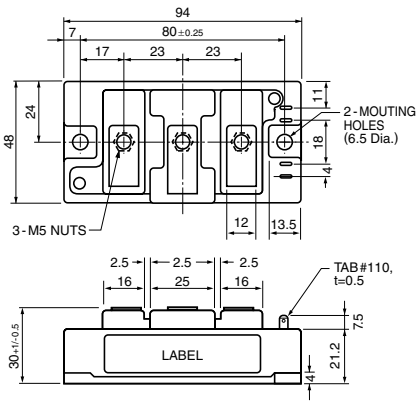
U601

CM50TU-24H,-24F
CM75TU-12H,-12F
CM100TU-12H,-12F



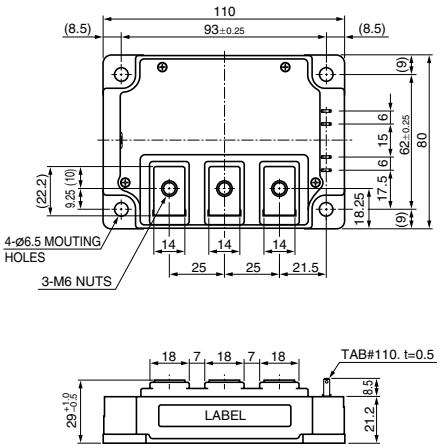
U203

CM50DU-24H,-24F
CM75DU-12H,-24H,-12F,-24F
CM100DU-12H,-24H,-12F,-24F,-24NFH
CM150DU-12H,-12F,-24NFH **CM100DUS-12F**
CM200DU-12H,-12F,-12NFH **CM150DUS-12F**



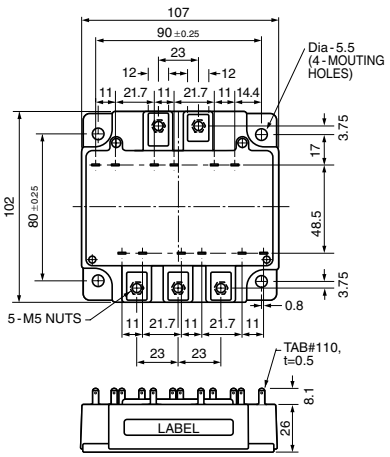
U206

CM600DU-12NFH
CM400DU-24NFH
CM600DU-24NFH



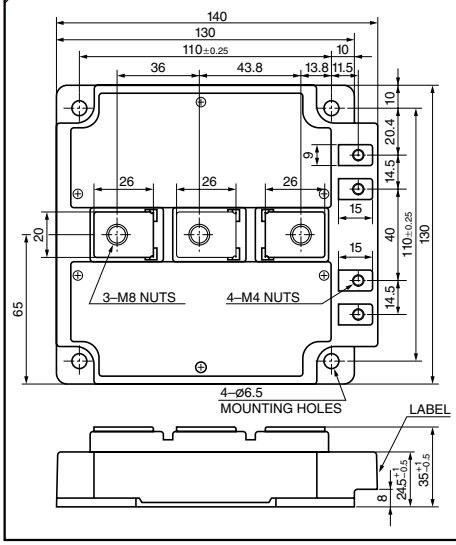
U602

CM75TU-24H,-24F
CM100TU-24H,-24F
CM150TU-12H,-12F
CM200TU-12H,-12F
CM50,75TU-34KA



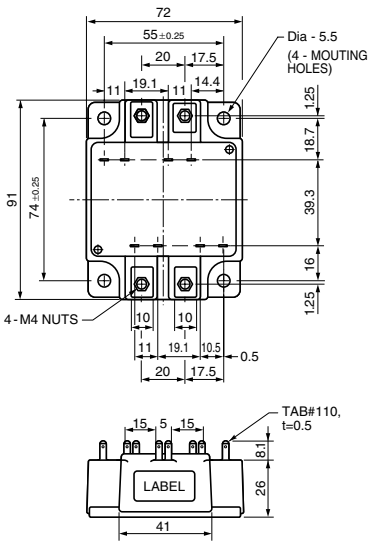
U204

CM400DU-24F



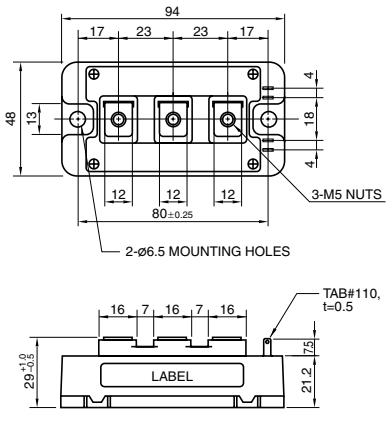
U401

CM75,100BU-12H



N201

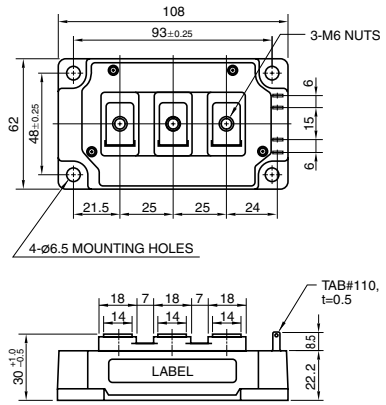
CM75DY-34A
CM100DY-24NF,-24A,-34A
CM150DY-12NF,-24NF,-24A
CM200DY-12NF,-24A
CM300DY-12NF



(unit: mm)

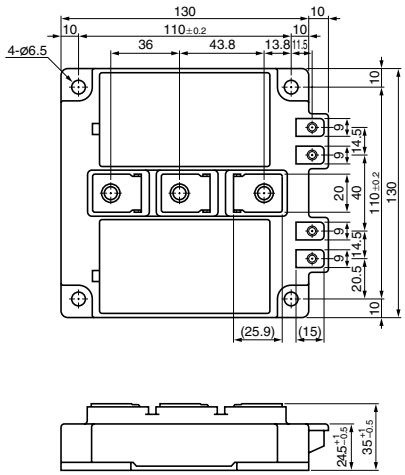
N202

CM150DY-34A
CM200DY-24NF,-34A
CM300DY-24A
CM400DY-12NF



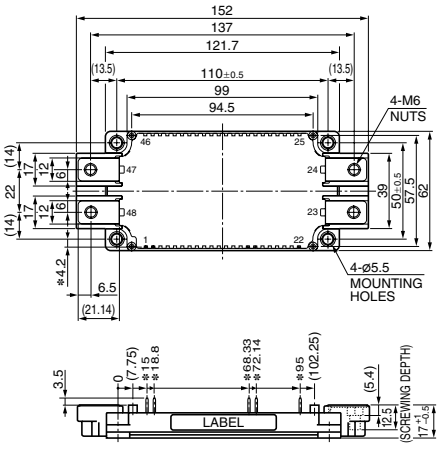
N205

CM400DY-34A



NX101

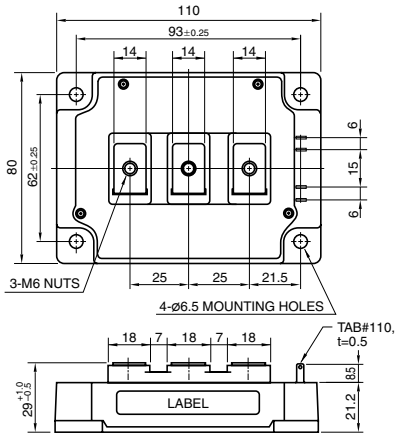
CM400HX-24A
CM600HX-12A,-24A



∗All dimensions with a tolerance of ⊕ø0.5

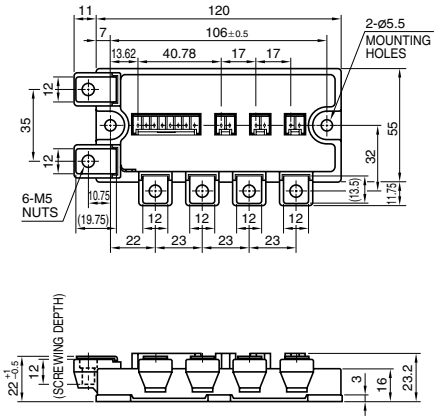
N203

CM300DY-24NF,-34A
CM400DY-24NF,-24A
CM600DY-12NF,-24A



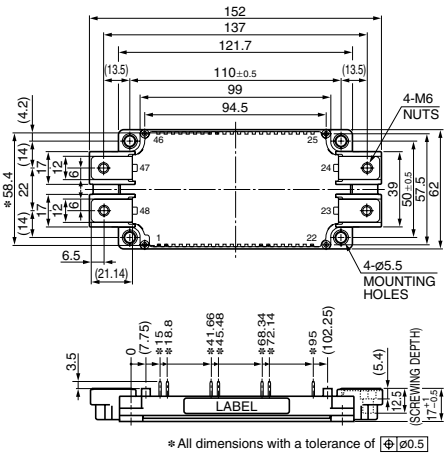
NF601

CM50TL/RL-24NF
CM75TL/RL-12NF,-24NF
CM100TL/RL-12NF,-24NF
CM150TL/RL-12NF



NX201

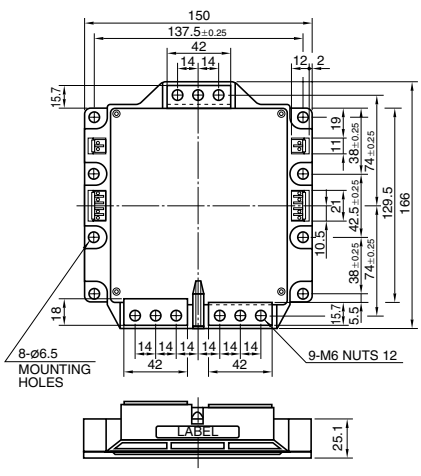
CM150DX-24A
CM200DX-24A
CM300DX-12A,-24A
CM400DX-12A
CM450DX-24A



∗All dimensions with a tolerance of ⊕ø0.5

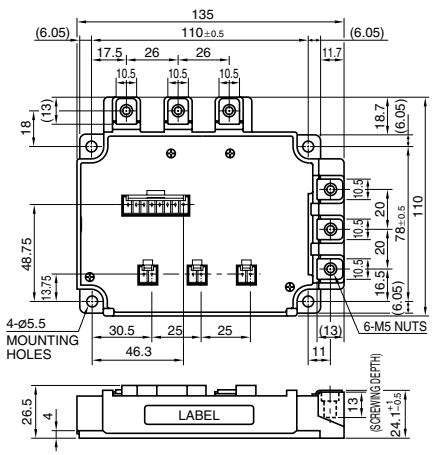
N204

CM900,1400DU-24NF
CM1000DU-34NF



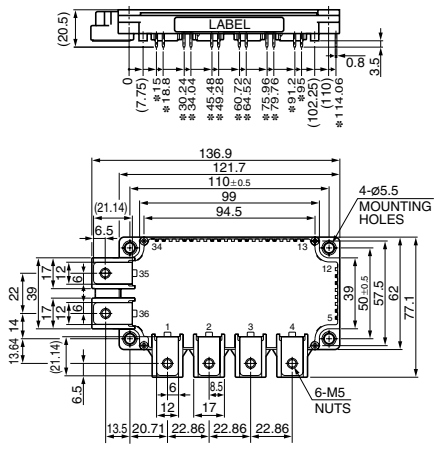
NF602

CM150TL/RL-24NF
CM200TL/RL-12NF,-24NF



NX701

CM75RX-24A
CM100RX-12A,-24A
CM150RX-12A
CM200RX-12A

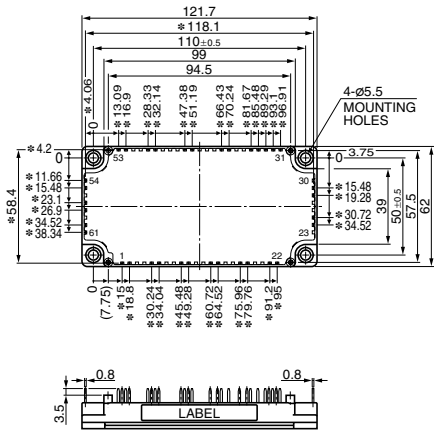


∗All dimensions with a tolerance of ⊕ø0.5

Power MOSFET Modules

NXM01

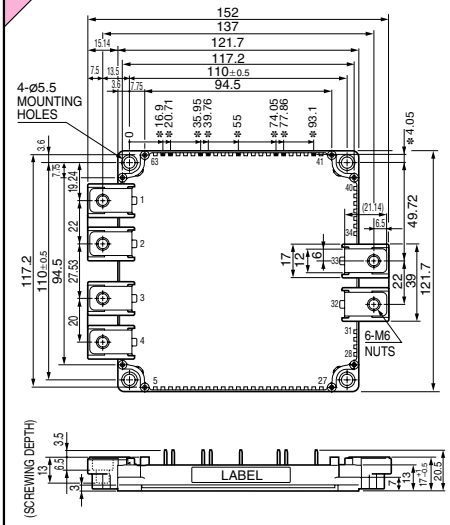
CM35MX-24A
CM50MX-24A
CM75MX-12A,-24A
CM100MX-12A



*All dimensions with a tolerance of ⊕ø0.5

NXL21

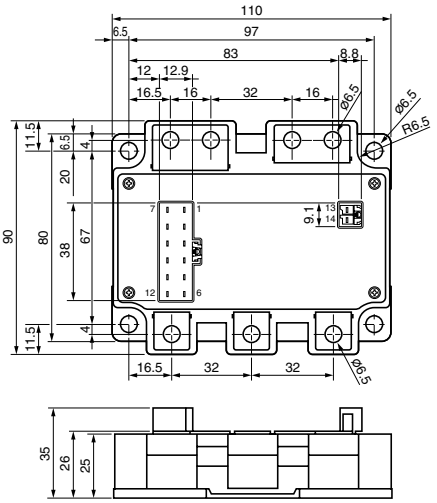
CM600DXL-24A
CM1000DXL-24A



*All dimensions with a tolerance of ⊕ø0.5

F601

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

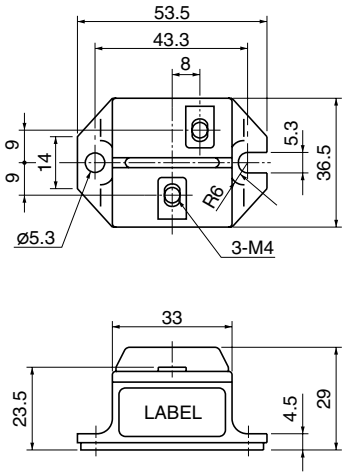


(unit: mm)

Diode Modules

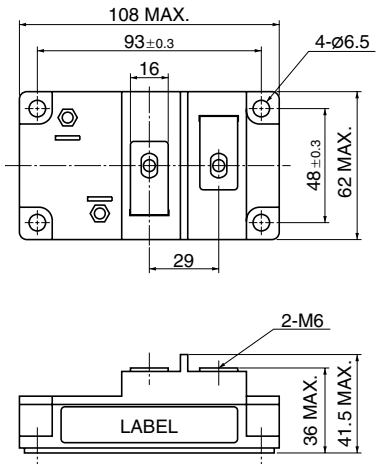
R3

RM50HA-12F,-20F,-24F
RM100HA-12F,-20F,-24F



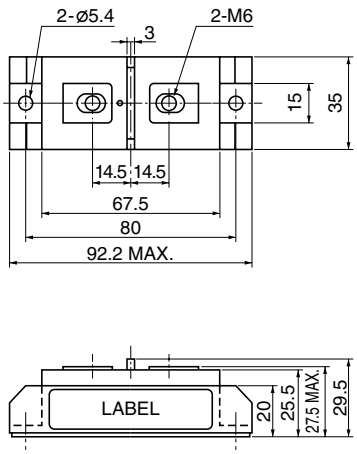
R6

RM400HA-24S



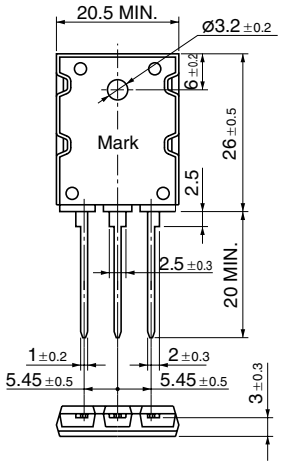
R1

RM250HA-10F
RM300HA-24F



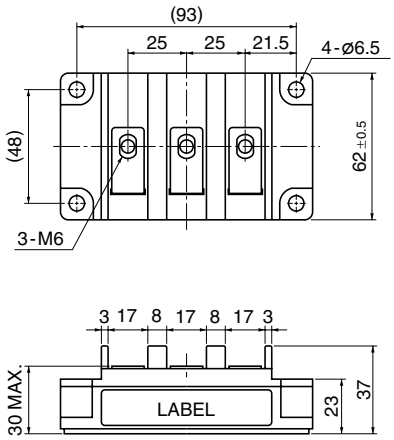
R4

RM25HG-24S
RM50HG-12S
RM35HG-34S



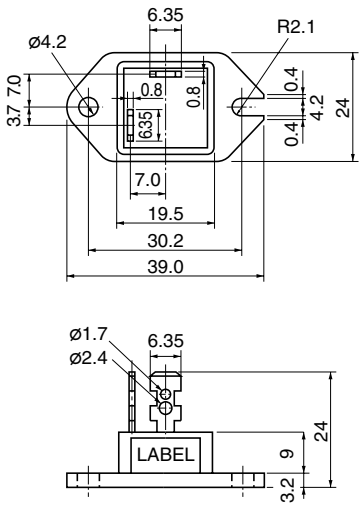
R7

RM200DA-20F,-24F



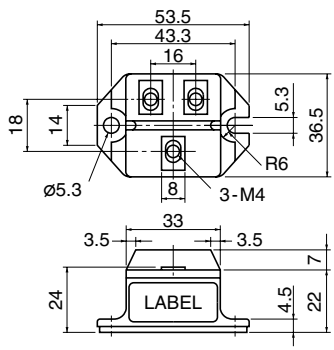
R2

RM20HA-12F,20F,-24F



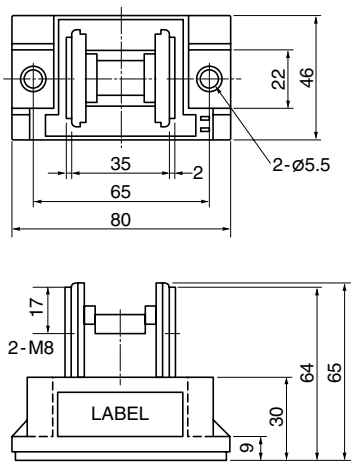
R5

RM100C1A-12F,-20F,-24F
RM100CA-12F,-20F,-24F
RM200HA-20F,-24F
RM20C1A-6S,-12F,-12S,-20F,-24F
RM20CA-6S,-12F,-12S,-20F,-24F
RM20DA-12F,-12S,-20F,-24F
RM50C1A-6S,-12F,-12S,-20F,-20S,-24F
RM50CA-6S,-12F,-12S,-20F,-20S,-24F
RM50DA-12F,-12S



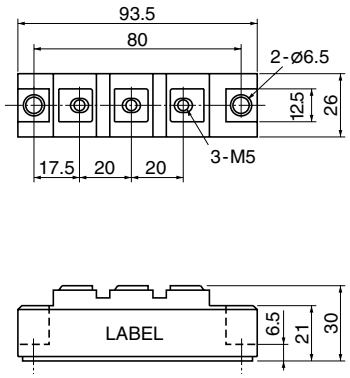
R8

RM500HA-M,-H,-24,-2H



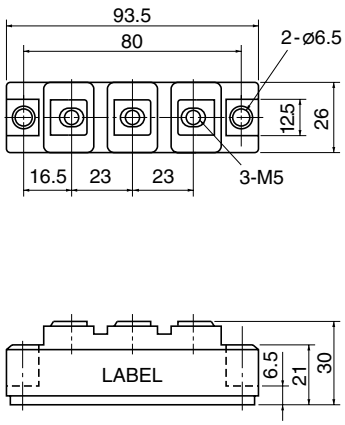
R9

RM30CZ-M,-H
RM30DZ-M,-H
RM60CZ-M,-H,-24,-2H
RM60DZ-M,-H,-24,-2H
RM100CZ-M,-H,-24,-2H
RM100DZ-M,-H,-24,-2H



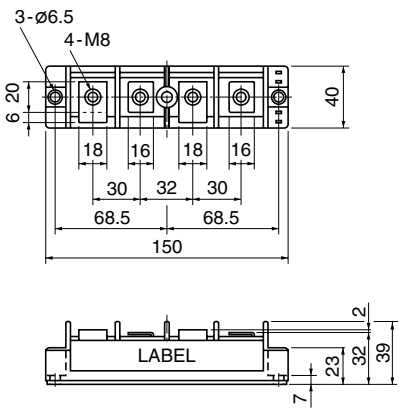
R10

RM30CZ-24,-2H
RM30DZ-24,-2H
RM50D2Z-40
RM100D2Z-40



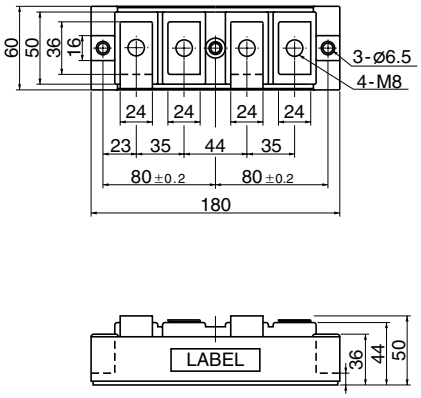
R11

RM150CZ-M,-H,-24,-2H
RM150DZ-M,-H,-24,-2H
RM150UZ-M,-H,-24,-2H
RM250CZ-M,-H,-24,-2H
RM250DZ-M,-H,-24,-2H
RM250UZ-M,-H,-24,-2H



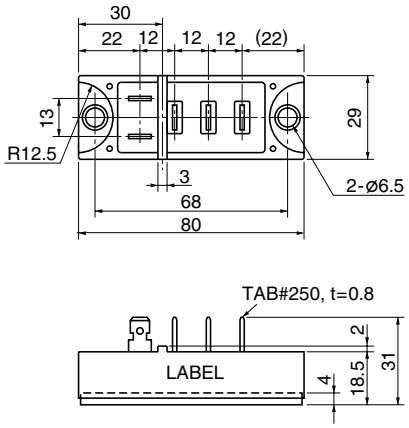
R12

RM500DZ-M,-H,-24,-2H
RM500UZ-M,-H,-24,-2H



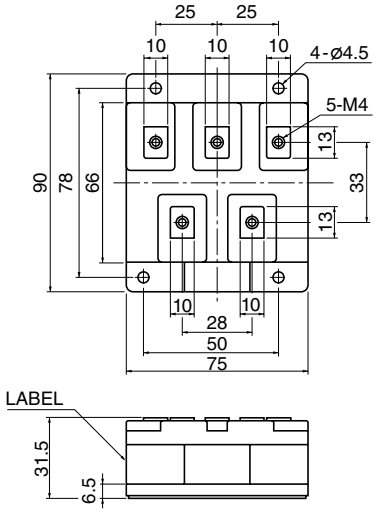
R13

RM10TA-M,-H,-24,-2H
RM15TA-M,-H,-24,-2H



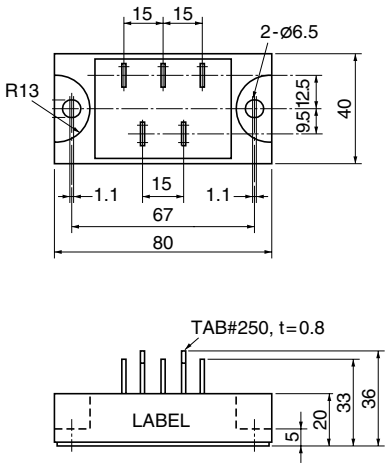
R14

RM15TC-40
RM30TC-40



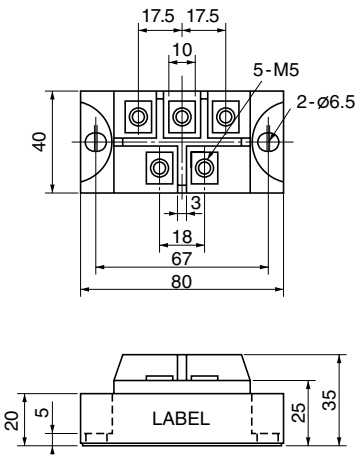
R15

RM20TA-24,-2H



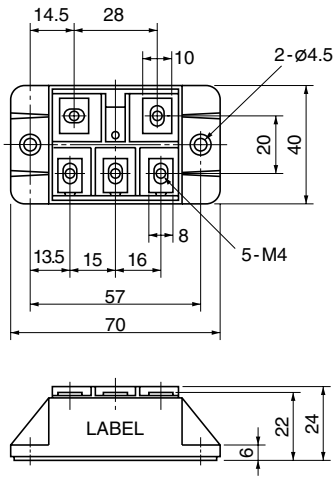
R16

RM30TA-M,-H



R17

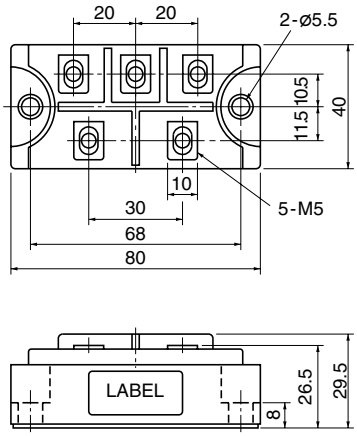
RM30TB-M,-H



(unit : mm)

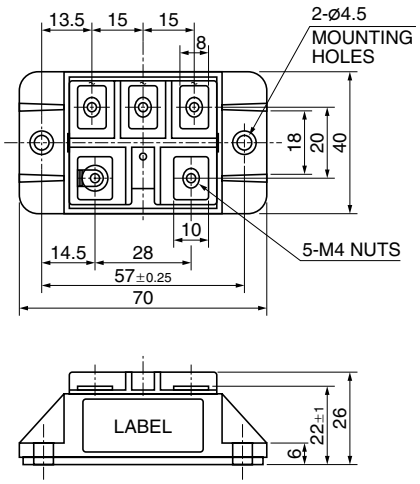
R18

RM30TC-24,-2H
RM50TC-M,-H,-24,-2H



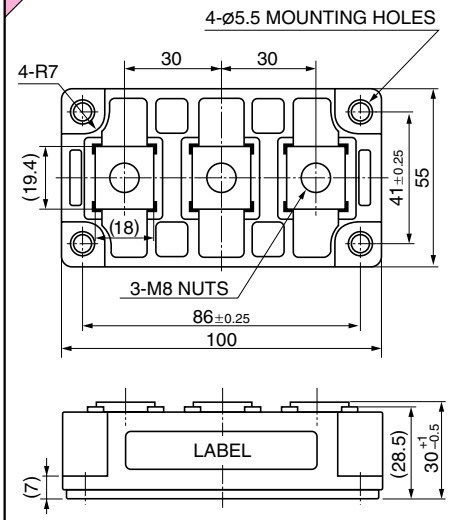
R21

RM20TPM-2H,-24



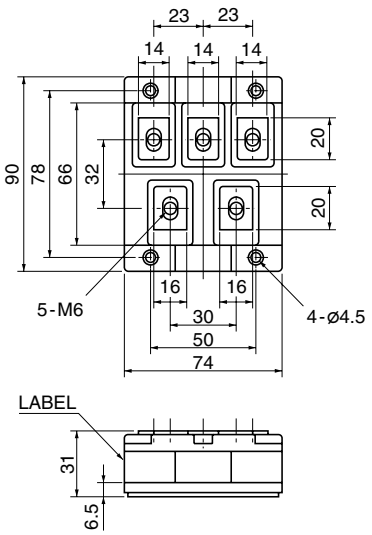
R24

RM300CA-9W



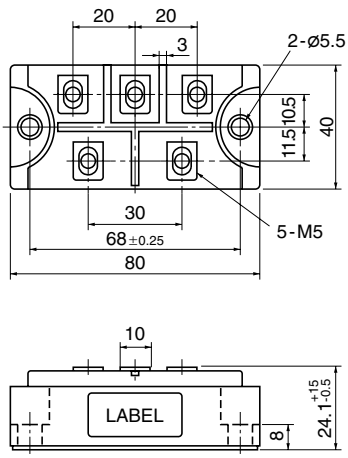
R19

RM75TC-M,-H,-24,-2H



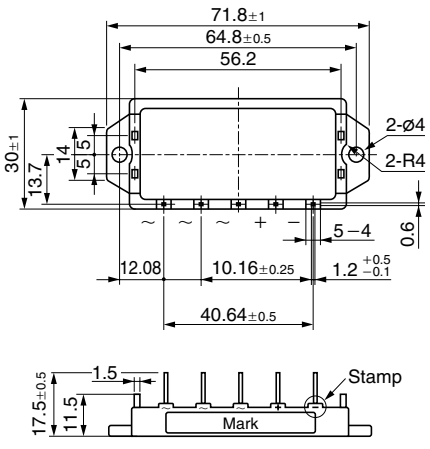
R22

RM75TPM-M,-H,-24,-2H



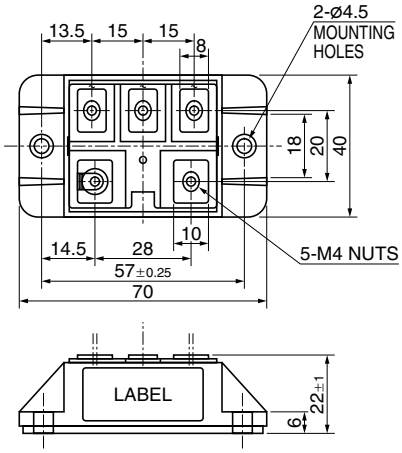
R25

RM10TN-2H
RM20TNA-H
RM25TN-2H
RM30TNA-H



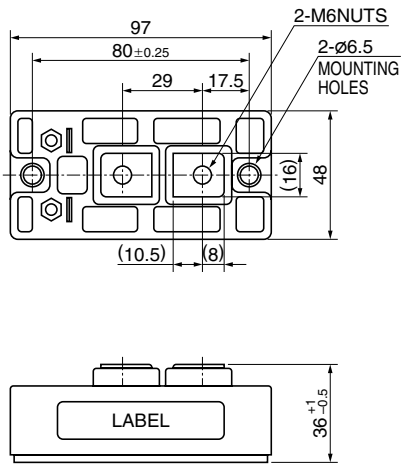
R20

RM20TPM-H,-M
RM30TPM-H,-M



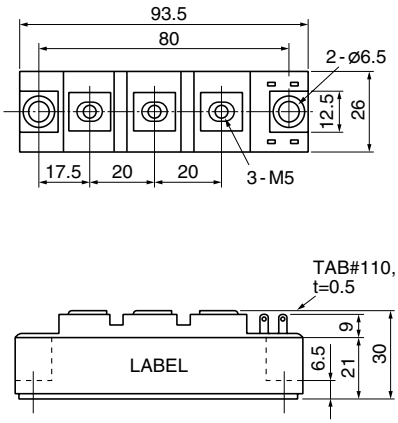
R23

RM450HA-5H

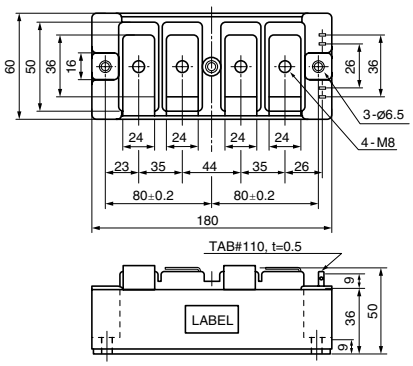


Thyristor Modules

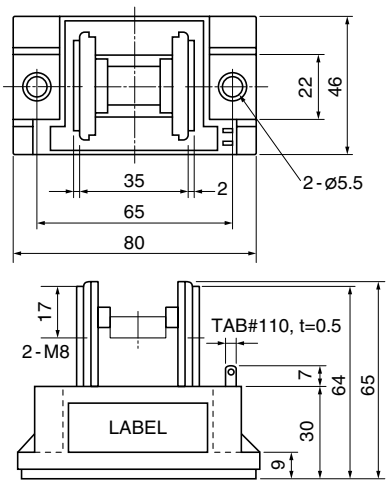
T3
TM25CZ/DZ-M,-H
TM55CZ/DZ-M,-H
TM90CZ/DZ-M,-H



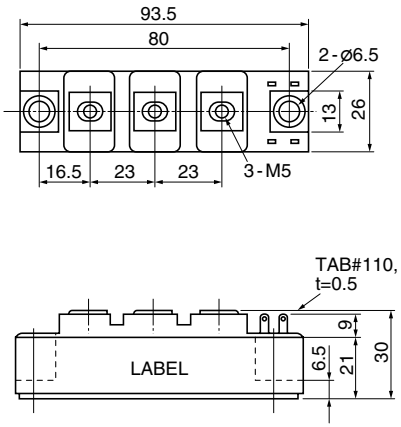
T6
TM400CZ/DZ/PZ/UZ-M,-H,-24,-2H



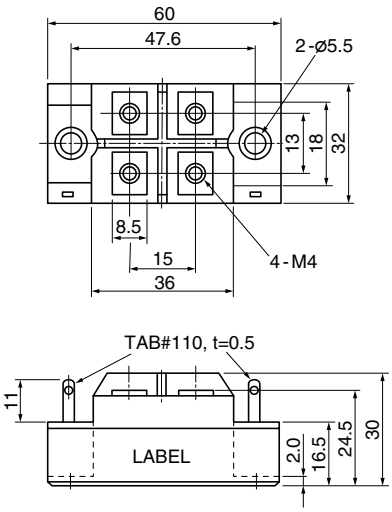
T1
TM400HA-M,-H,-24,-2H



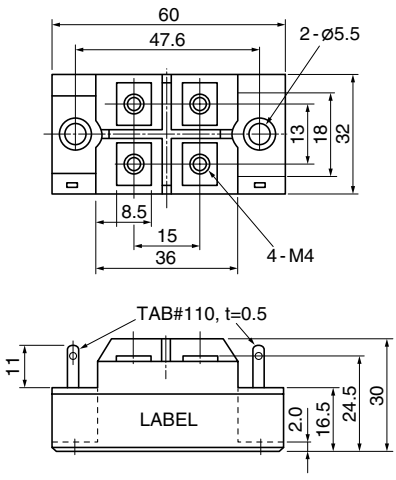
T4
TM25CZ/DZ-24,-2H
TM55CZ/DZ-24,-2H
TM90CZ/DZ-24,-2H



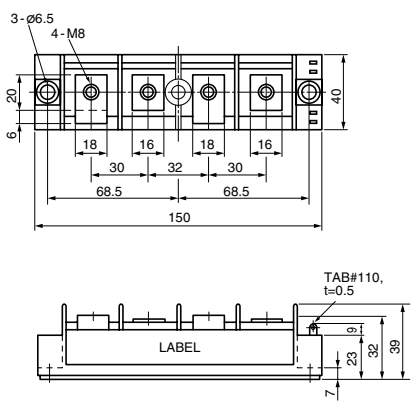
T7
TM20RA-M,-H



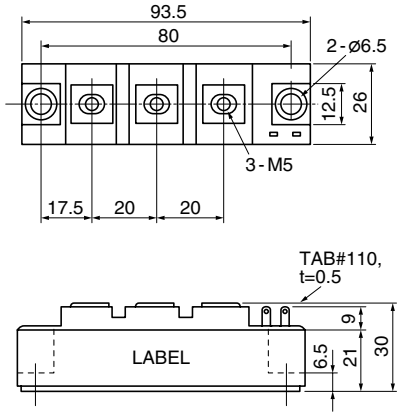
T2
TM20DA-M,-H



T5
TM130CZ/DZ/EZ/GZ/PZ/RZ-M,-H,-24,-2H
TM200CZ/DZ/EZ/GZ/PZ/RZ-M,-H,-24,-2H



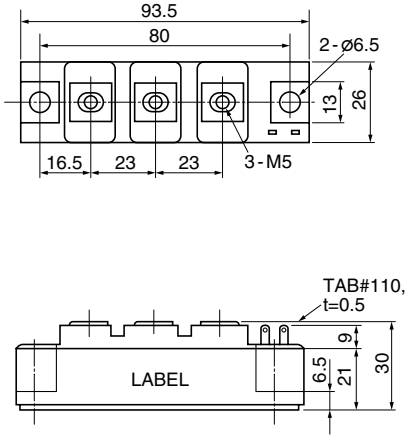
T8
TM25EZ/RZ-M,-H
TM55EZ/RZ-M,-H
TM90EZ/RZ-M,-H



(unit: mm)

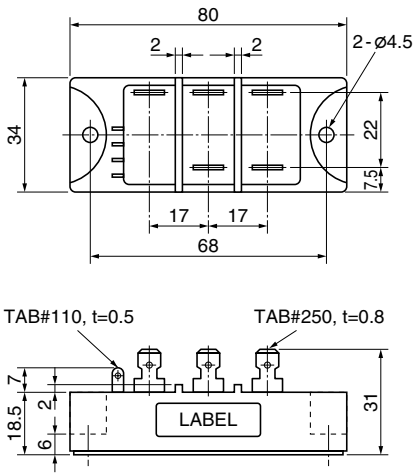
T9

TM25EZ/RZ-24,-2H
TM55EZ/RZ-24,-2H
TM90EZ/RZ-24,-2H



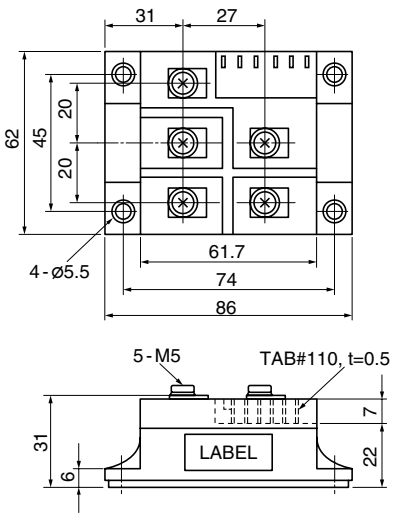
T10

TM10T3B-M,-H



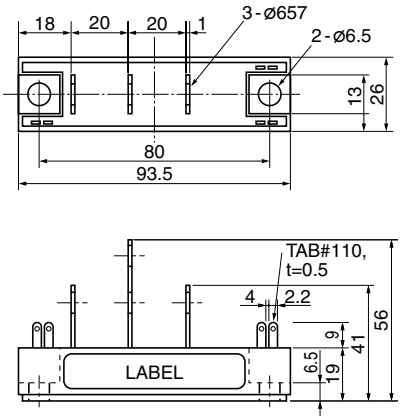
T11

TM15T3A-M,-H
TM25T3A-M,-H



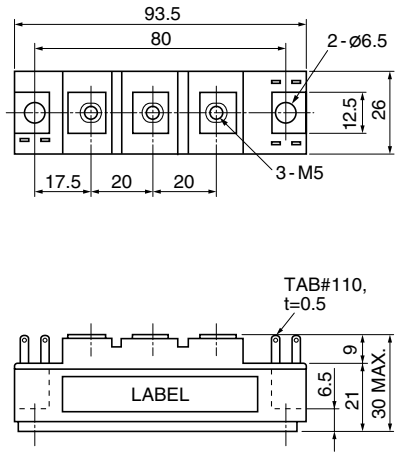
T12

TM60SA-6
TM90SA-6



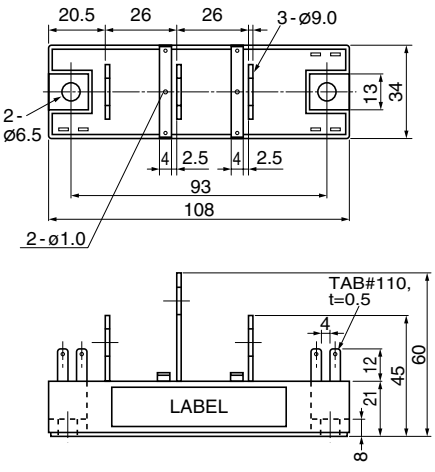
T13

TM60SZ-M
TM100SZ-M

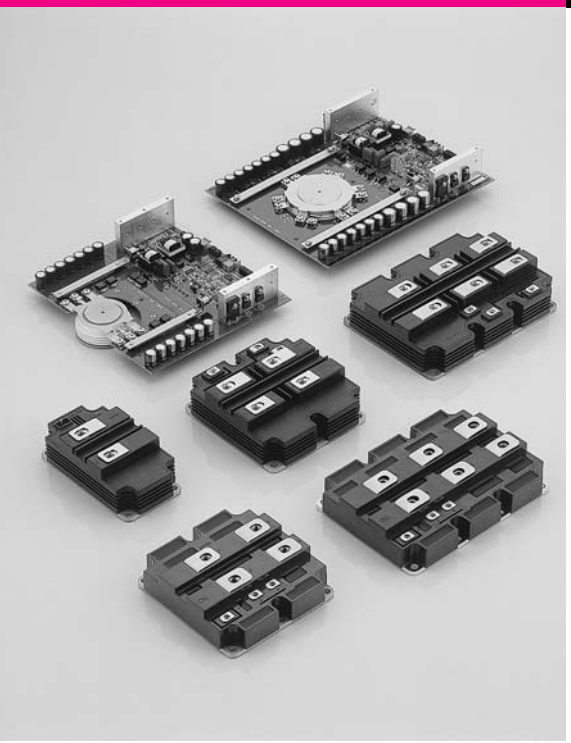


T14

TM150SA-6

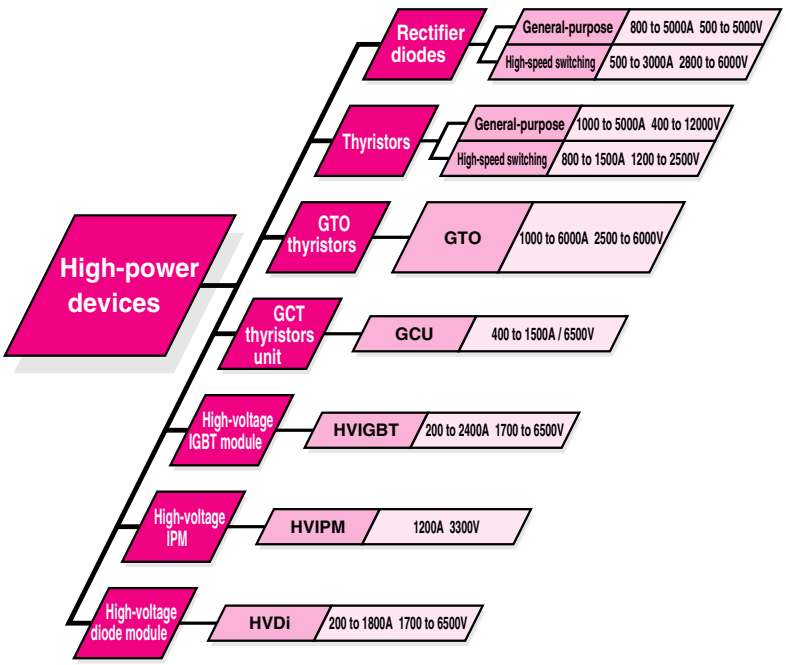


High-power Devices



Large Product Variety for Wide-Ranging Needs

High-power devices are semiconductor devices represented by gate commutated turn-off (GCT) thyristors and high-voltage insulated-gate bipolar transistor (HVIGBT) modules, and these devices are now used in equipment designed for traction, including high-speed express trains, and in power system equipment.
We offer a variety of high-power devices to suit diversified applications. These devices include diodes, thyristors, GTO thyristors, GCT thyristors, HVIGBT modules, and high-voltage intelligent power modules (HVIPM).



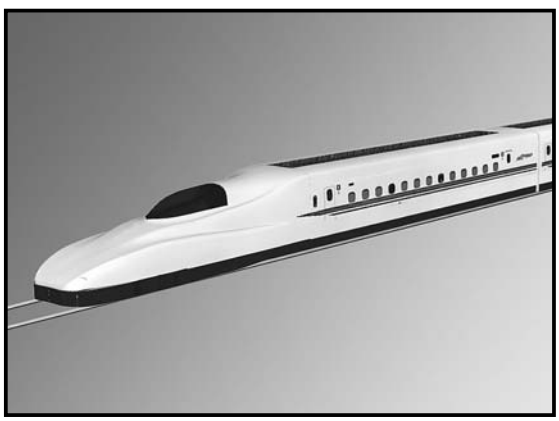
■ Naming system

PM	1200	H	CE		330	-1	(TYPE 1)
CM	1200	H	C		-66	H	(TYPE 2)
FG	4000		G	X	-90	DA	(TYPE 3)
GCU	15		CA		-130		(TYPE 3)

- Series code
- Voltage class
  For TYPE 1:
  Withstand voltage class × 10 = V_{CES}
  Example: 330 × 10 = 3,300 V
  For TYPE 2:
  Withstand voltage class × 50 = V_{CES}
  Example: 66 × 50 = 3,300 V
  For TYPE 3:
  Withstand voltage class × 50 = V_{DRM} or V_{RRM}
  Example: 90 × 50 = 4,500 V
- Voltage classification or turn-off time or high-frequency type in case of "x"
- Auxiliary number (denotes the type of outline or manufacturing process)
- Connection
- Rated current capacity (however, the GCT thyristor unit is shown as a value multiplied by 1/100.)
- Type of device

■ Types and symbols

Type of device \ Symbol	Outline			
	Stud or flat base	Flat	Module	Type
General-purpose rectifier diode / High-speed switching rectifier diode	**SR**	**FD**	—	3
General-purpose thyristor / High-speed switching thyristor	**CR**	**FT**	—	3
GTO thyristor	—	**FG**	—	3
GCT thyristor unit	—	**GCU**	—	3
HVIGBT module	—	—	**CM**	2
HVIPM	—	—	**PM**	1
HVDi module	—	—	**RM**	2



GTO / GCT Thyristors and HVIGBT Module Series

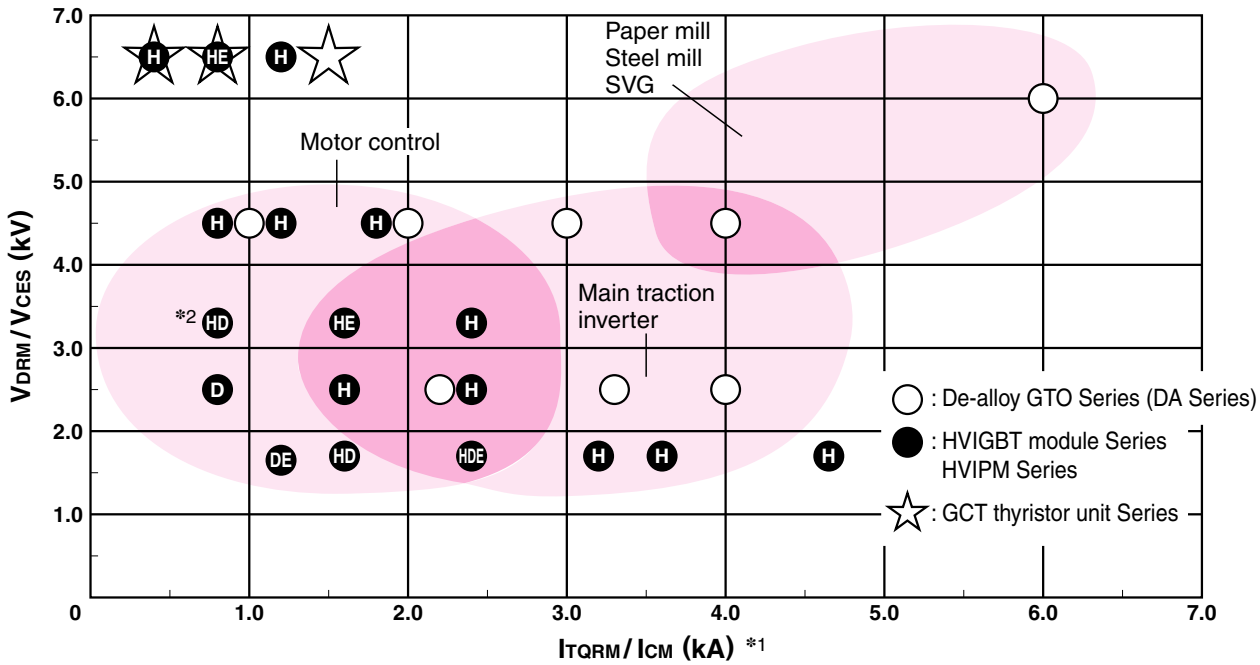
High-power modules are used in various installations, such as tractions, power supply systems, and other large-capacity industrial equipment.
In today's market, there are increasing demands for these modules to have enhanced withstand voltage and capacity together with lower power loss.
The established series of Mitsubishi Electric diodes, general-purpose thyristors, GTO thyristors, GCT thyristor units, and high-voltage insulated-gate bipolar transistor (HVIGBT) modules meet a variety of customer needs. We are also actively engaged in improving existing modules and developing new products.

■ GCT thyristor Series (Gate Commutated Turn-off thyristor)

The GCT thyristor is high-power device that takes the place of existing GTO thyristors. Because the turn-off capability has rapidly improved, and the turn-off time shortened to about 1/10 of GTO thyristors, it is most suitable for applications which require series connection.
Because the GCT thyristor can be turned-off using only the clamping circuit, even if there is no snubber circuit like that required by the GTO thyristor, low-loss, small size and lighter equipment are achieved.

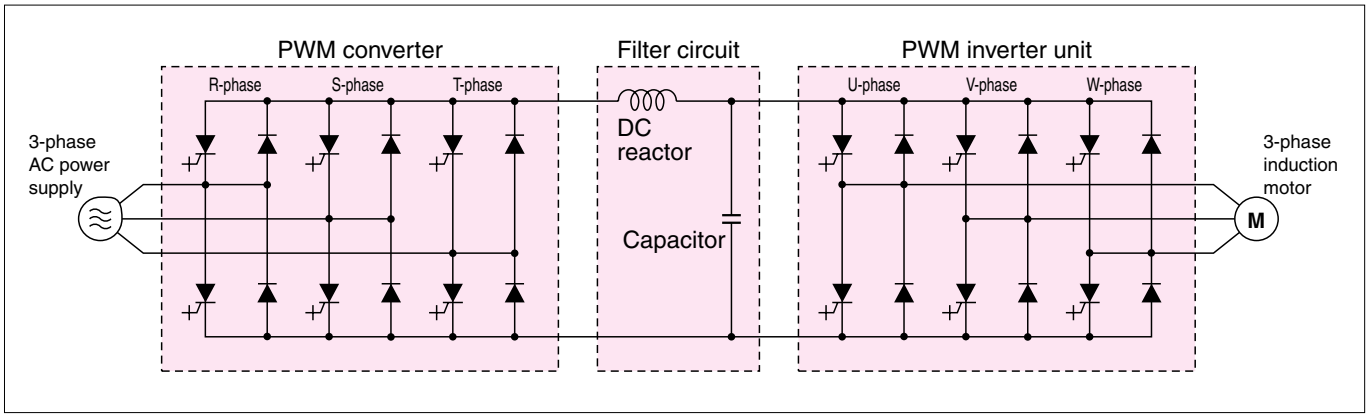
■ HVIGBT modules (High Voltage Insulated Gate Bipolar Transistor module)

HVIGBT modules are manufactured in an exclusive assembly lines under strict quality control. Use of aluminum silicon carbide (AlSiC) base plates enables improved reliability and extended service life for these modules.
With a line-up of high withstand voltage modules in the voltage range of 1.7kV to 6.5kV, the highest level in the world, Mitsubishi Electric is ready to meet various customer needs for applications in tractions and other large-scale industrial installations.
The newly-developed N Series HVIGBT modules are equipped with CSTBT™ chip that allows lower power loss and the minimization of package size.
Mitsubishi Electric has also produced a series of "HG" modules that are housed in a well-insulated packages and demonstrate an insulating performance as high as 10.2kV.



*1: $I_{CM} = I_C \times 2$
*2: "H" denotes the single type, "D" denotes the dual type, and "E" denotes the chopper type

■ Main circuit of PWM converter/inverter system



Rectifier Diodes

■ Rectifier diodes for general use

Type	Voltage (V) / Current (A)*1	500	600	2800	3000	4000	5000	Shape
FD1000A-56	800			●				Flat type ø45
FD1000D-56				●				Flat type ø35
FD1600CP-10	1600	●						Flat type ø35
FD1600A-60					●			Flat type ø50
FD1600CV-80						●		Flat type ø60
FD3500BP-12	3500		●					Flat type ø60
FD3500AH-56				●				Flat type ø80
FD5000AV-100DA	5000						●	Flat type ø85

*1: Shown by the average forward current

■ Rectifier diodes for fast switching

Type	Voltage (V) / Current (A)*1	2800	4500	6000	Shape
FD1000FV-90	800		●		Flat type ø60
FD1000FX-90			●		Flat type ø60
FD1000FH-56	1000	●			Flat type ø50
FD1500AV-90	1500		●		Flat type ø70
FD2000DU-120	1700			●	Flat type ø130

*1: Shown by the average forward current

■ Rectifier diodes for fast switching (Soft recovery type)

Type	Voltage (V) / Current (A)*1	4500	6000	Shape
FD500JV-90DA	500	●		Flat type ø47
FD1500CV-90DA	1500	●		Flat type ø85
FD1500AU-120DA	1500		●	Flat type ø85
FD3000AU-120DA	3000		●	Flat type ø130

*1: Shown by the average forward current

Thyristors / GTO Thyristors

Thyristors / Gate Turn-off Thyristors

■ Thyristors for general use

Type	Voltage (V) / Current (A)※1	400	1200	1400	2500	2700	2800	4000	12000	Shape
FT1000A-50	1000				●					Flat type ø50
FT1000BV-80								●		Flat type ø60
FT1500DL-28	1500			●						Flat type ø50
FT1500CH-54						●				Flat type ø60
FT1500DV-80								●		Flat type ø80
FT1500GV-80 ※2								●		Flat type ø80
FT1500AU-240									●	Flat type ø105
FT2500CL-24	2500		●							Flat type ø60
FT2500BH-56							●			Flat type ø80
FT5000AP-8	5000	●								Flat type ø80

※1: Shown by the average ON current
※2: Current type inverter thyristor

■ Fast switching thyristors

Type	Voltage (V) / Current (A)※1	1200	1800	2500	Shape
FT1000CY-24	800	● (15)			Flat type ø50
FT1000CX-36			● (30)		Flat type ø50
FT1000AX-50	1000			● (35)	Flat type ø60
FT1500EX-24	1500	● (30)			Flat type ø60
FT1500EY-24		● (20)			Flat type ø60

※1: Shown by the average ON current
Note: Numerical values in ( ) indicate the maximum shut-off time [μs]

■ GTO thyristors

Type	Voltage (V) / Current (A)※1	2500	4500	6000	Shape
FG1000BV-90DA	1000		●		Flat type ø47
FG2000JV-90DA	2000		●		Flat type ø63
FG2000FX-50DA	2200	●			Flat type ø63
FG3000DV-90DA	3000		●		Flat type ø70
FG3000GX-90DA			●		Flat type ø75
FG4000BX-90DA			●		Flat type ø85
FG3300AH-50DA	3300	●			Flat type ø70
FG4000EX-50DA	4000	●			Flat type ø85
FG4000CX-90DA			●		Flat type ø85
FG4000GX-90DA			●		Flat type ø85
FG6000AU-120D	6000			●	Flat type ø130

※1: Shown by the repeatable control ON current

GCT Thyristor Unit

Gate-commutated Turn-off Thyristor Unit

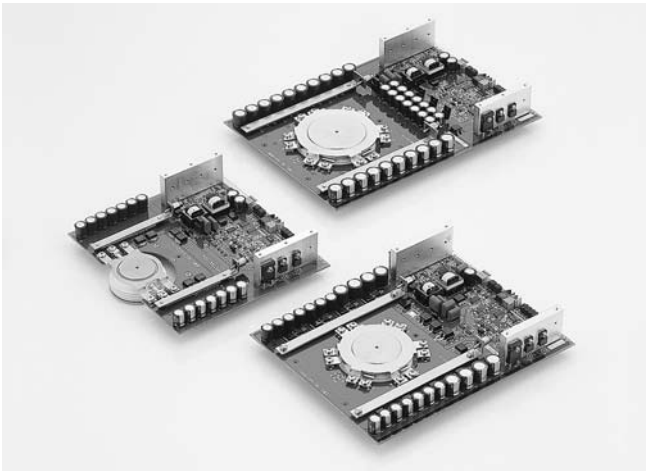


Image of the GCT Thyristor Unit Series

■ Features

GCT thyristor units are a new product which combine the a GCT thyristor and a gate driver.
The GCT thyristor is operated by an optimally designed gate driver to obtain the highest performance based on its performance characteristics.

■ Applications

The handling of GCT thyristor units is easy because the GCT thyristor and gate driver are combined into a single unit.
The GCT thyristor unit is most suitable for high-power electronic applications.

- Electric power applications
  - SVG (Static Var Generator)
  - BTB (Back to Back)
  - Frequency exchanger
- Heavy industrial applications
  - Motor drive for fans, pumps, steel mills and paper mills
- AC switch applications

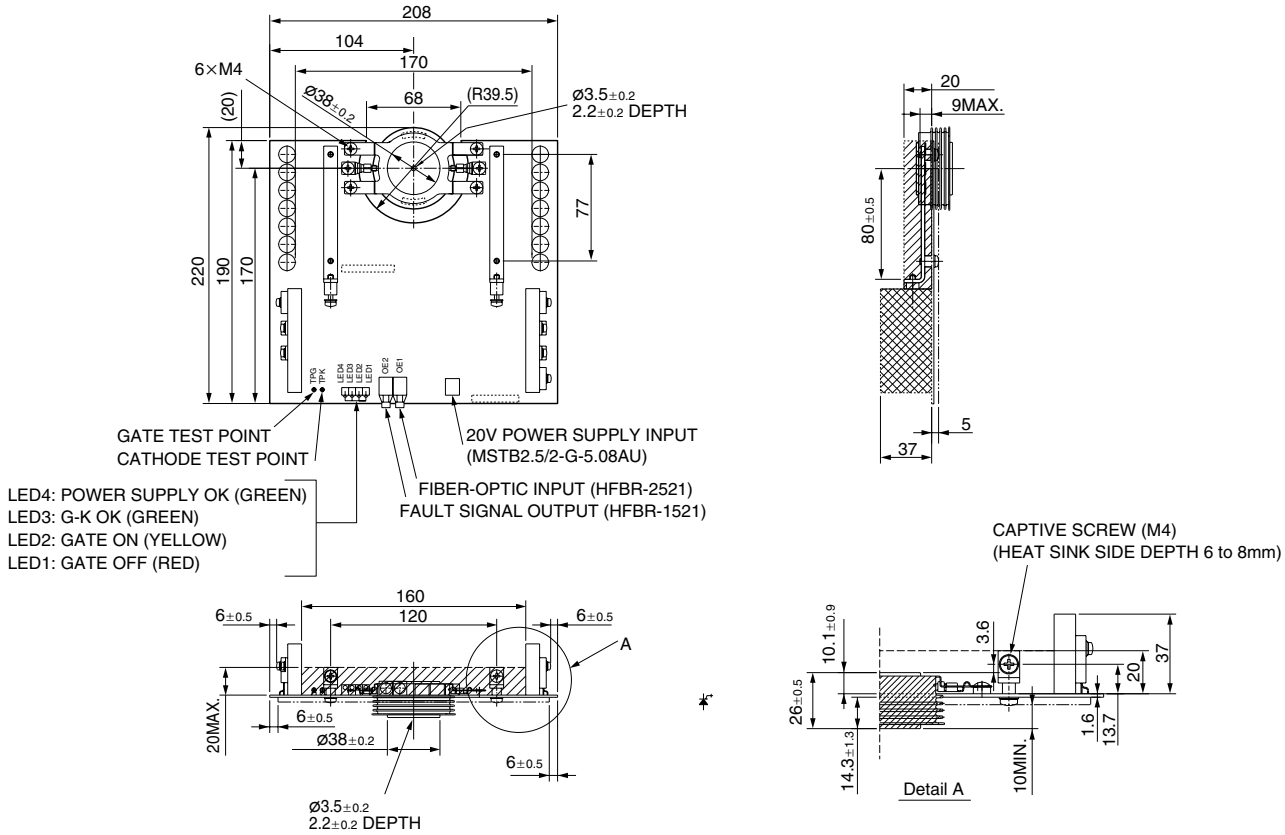
■ GCT units

Type	Structure	V_{DRM} (V)	V_{RRM} (V)	I_{TQRM} (A)	Tj (°C)	Frequency	Gate driver supply		Control input signal
		Repetitive peak off-state voltage	Repetitive peak reverse voltage	Repetitive controllable on-state current	Junction temperature	f (Hz)	Vc	Supply connector	
GCU04AA-130	Symmetrical	6500	6500	400	125	780	20V DC	Made by Phoenix Contact Co.,Ltd. Type name: MSTB2.5/2-G-5.08AU	Optical fiber data link Transmitter: HFBR-1521: Made by Agilent Co.,Ltd. Receiver: HFBR-2521: Made by Agilent Co.,Ltd.
GCU08BA-130				800					
GCU15CA-130				1500					

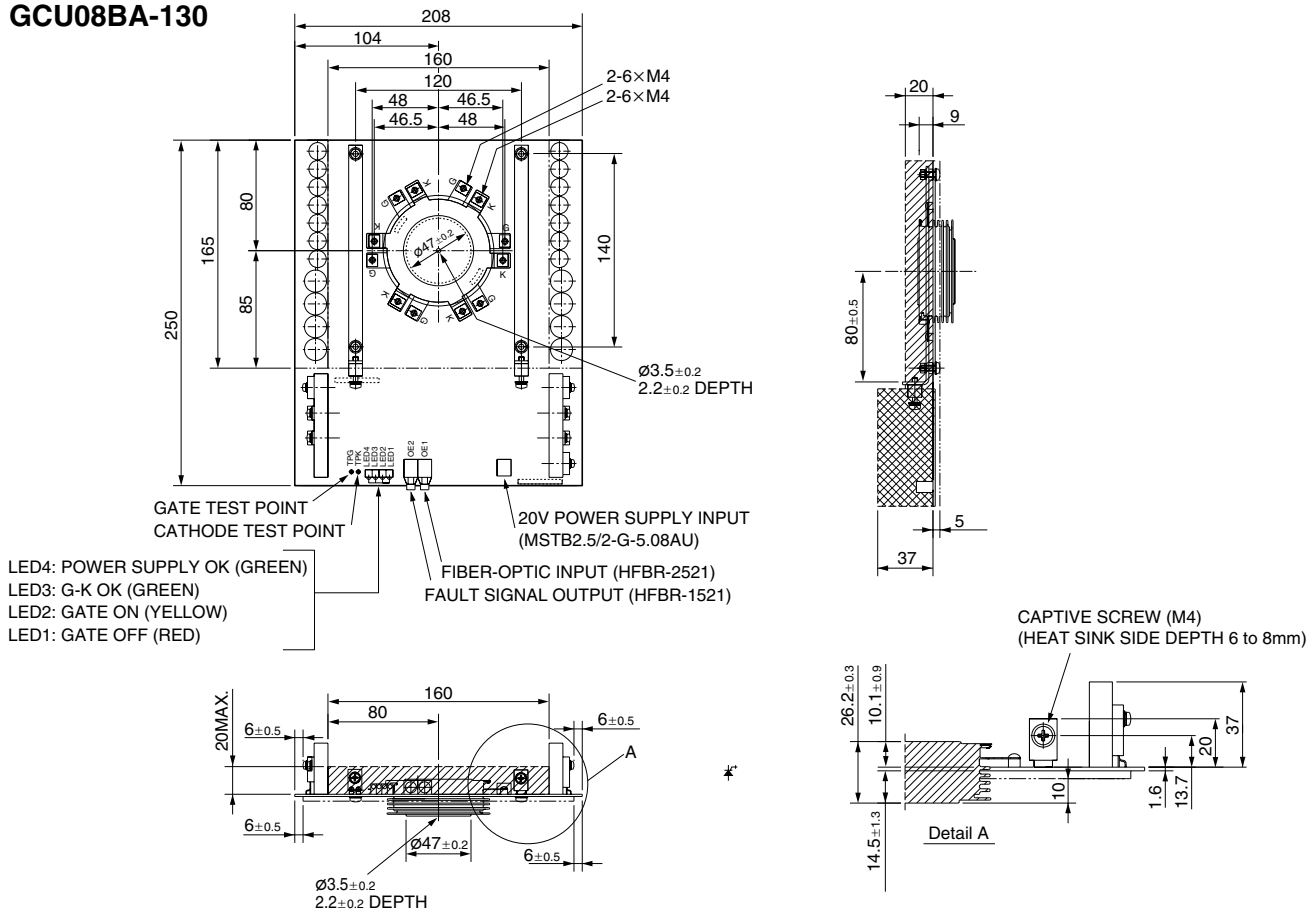
■ GCT thyristor outline drawings

(Unit: mm)

GCU04AA-130

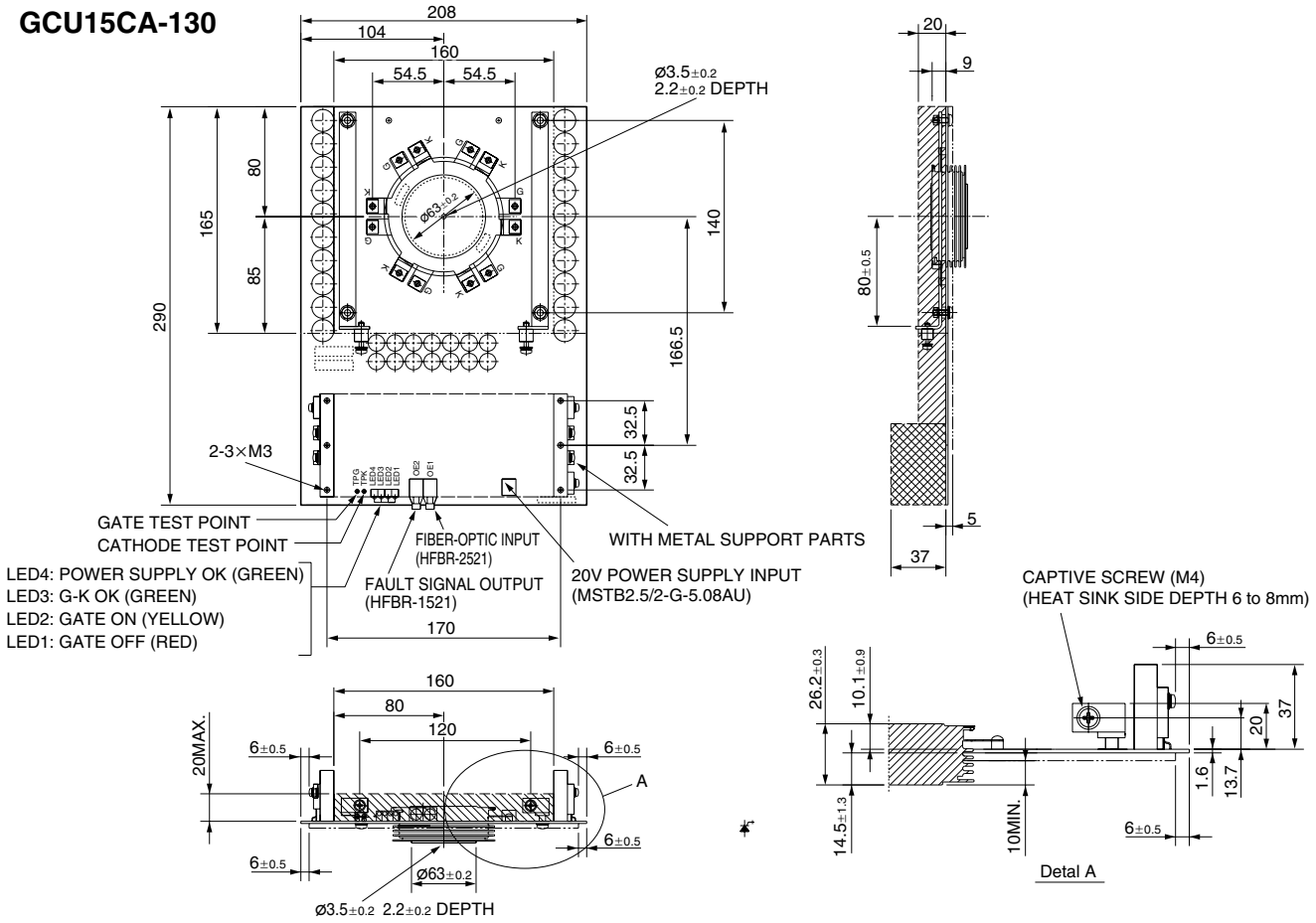


GCU08BA-130



(Unit: mm)

GCU15CA-130



HVIGBT Modules

High-voltage Insulated-gate Bipolar Transistor Modules

Image of HVIGBT modules Series

■ Features

- R Series was added to the line-up.
- High-isolation voltage (10.2kVrms, AC 1min.)
- High-voltage/Large-capacity (6.5kV/600A, 1.7kV/2.4kA)
- High-heat cycle capability
- Abundant line-up with various connecting

■ Applications

- Traction applications
  - Inverter, converter, chopper, SIV (Static inverter)
- Heavy industrial applications
  - Motor drive for fans, pumps, steel mills and paper mills
- Electric power applications
  - SVG (Static Var Generator)
  - Frequency exchanger

■ High-voltage insulated-gate bipolar transistor modules <R Series>: Low-loss, AlSiC baseplate

Connection		V_{CES} (V)	Isolation voltage (kV)	Ic (A)			
				750	1000	1200	1500
H		3300	6.0		**CM1000HC-66R★★** CM13		**CM1500HC-66R★** CM11
		4500				**CM1200HC-90R★★** CM11	
E4		3300	6.0		**CM1000E4C-66R★★** CM12		
H		3300	10.2				**CM1500HG-66R★★** CM17
		4500				**CM1200HG-90R★★** CM17	
		6500		**CM750HG-130R★★** CM17			

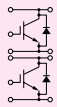
★: New product
★★: Under development

● Numbers CM11 to CM13, CM17 are recorded with product names to show the outline drawing numbers

HVIGBT Modules

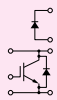
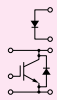
High-voltage Insulated-gate Bipolar Transistor Modules

■ High-voltage insulated-gate bipolar transistor modules <N Series / N Series B Type>: Low-loss, CSTBT™ chip

Connection		V_{CES} (V)	Ic (A)			
			800	1200	1800	2400
H		1700		CM1200HCB-34N★ CM7	CM1800HC-34N CM10 CM1800HCB-34N★ CM8	CM2400HC-34N CM10 CM2400HCB-34N★ CM8
D		1700	CM800DZB-34N★ CM4	CM1200DB-34N CM1200DC-34N CM9		
E4		1700		CM1200E4C-34N CM10		

★: New product

■ High-voltage insulated-gate bipolar transistor modules <HG Series>: High-isolation, AlSiC baseplate

Connection		V_{CES} (V)	Ic (A)				
			200	400	600	900	1200
H		3300		CM400HG-66H★ CM14			CM1200HG-66H★ CM16
		4500			CM600HG-90H★ CM15	CM900HG-90H★ CM16	
		6500	CM200HG-130H★ CM14		CM600HG-130H★ CM16		
E2		6500		CM400E2G-130H★★ CM16			
E4		6500		CM400E4G-130H★★ CM16			

★: New product

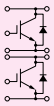
★★: Under development

● Numbers CM4, CM7 to CM10, CM14 to CM16 are recorded with product names to show the outline drawing numbers

HVIGBT Modules

High-voltage Insulated-gate Bipolar Transistor Modules

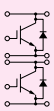
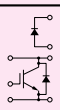
■ High-voltage insulated-gate bipolar transistor modules <HC Series>: Low-loss, AlSiC baseplate

Connection		V_{CES} (V)	Ic (A)					
			800	900	1200	1600	1800	2400
H		1700			**CM1200HC-34H**	**CM1600HC-34H**	**CM1800HC-34H**	**CM2400HC-34H**
					CM1		CM8	
		2500			**CM1200HC-50H**			
					CM8			
		3300	**CM800HC-66H**		**CM1200HC-66H**			
			CM7		CM8			
		4500		**CM900HC-90H**				
				CM8				
D		1700	**CM800DZ-34H**					
			CM4					
E2 / E6		3300	**CM800E2C-66H** **CM800E6C-66H**					
			CM8					
E4		3300	**CM800E4C-66H**					
			CM8					

■ High-voltage insulated-gate bipolar transistor modules <HB Series>: Low-loss, Cu baseplate

Connection		V_{CES} (V)	Ic (A)				
			400	600	800	900	1200
H		2500			**CM800HB-50H**		**CM1200HB-50H**
					CM7		CM8
		3300			**CM800HB-66H**		**CM1200HB-66H**
					CM7		CM8
		4500	**CM400HB-90H**	**CM600HB-90H**		**CM900HB-90H**	
			CM7			CM8	

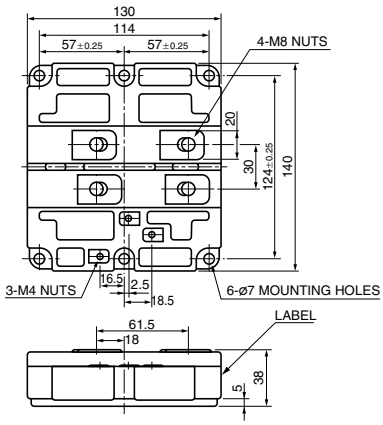
■ High-voltage insulated-gate bipolar transistor modules <HA Series>: Cu baseplate

Connection		V_{CES} (V)	Ic (A)			
			400	600	800	1200
H		1700			**CM800HA-34H**	**CM1200HA-34H**
					CM1	
		2500			**CM800HA-50H**	**CM1200HA-50H**
					CM2	CM3
		3300			**CM800HA-66H**	**CM1200HA-66H**
					CM2	CM3
D		1700		**CM600DY-34H**		
				CM4		
		2500	**CM400DY-50H**			
			CM5			
		3300	**CM400DY-66H**			
			CM5			
E2		1700		**CM600E2Y-34H**		
				CM6		

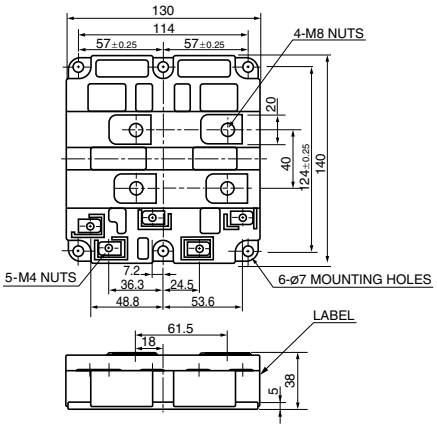
● Numbers CM1 to CM8 are recorded with product names to show the outline drawing numbers

■ HVIGBT modules outline drawings

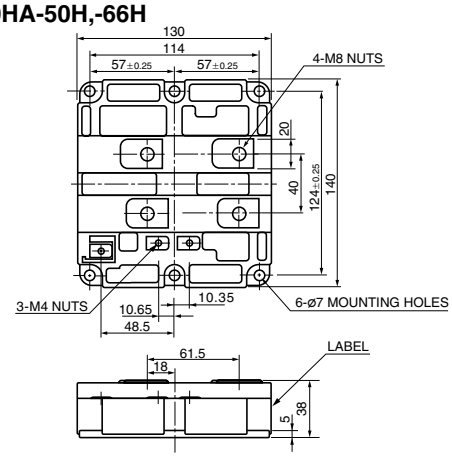
CM1
CM800,1200HA-34H CM1200,1600HC-34H



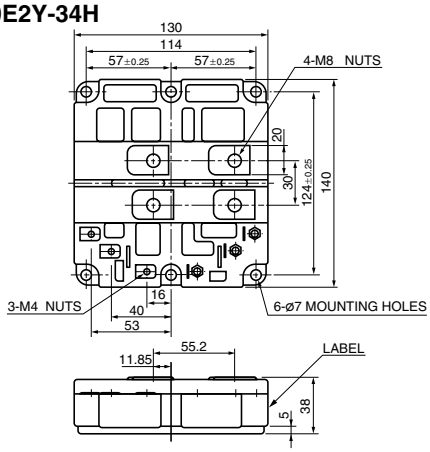
CM5
CM400DY-50H,-66H



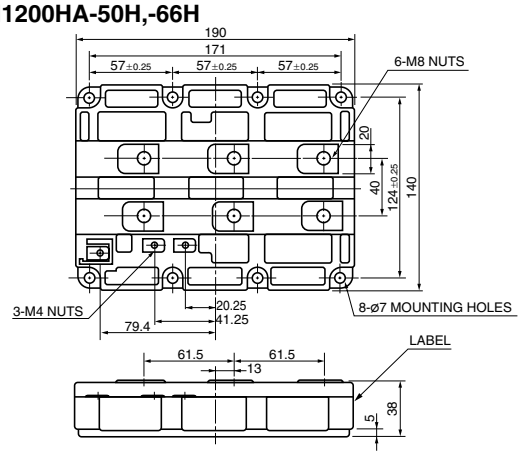
CM2
CM800HA-50H,-66H



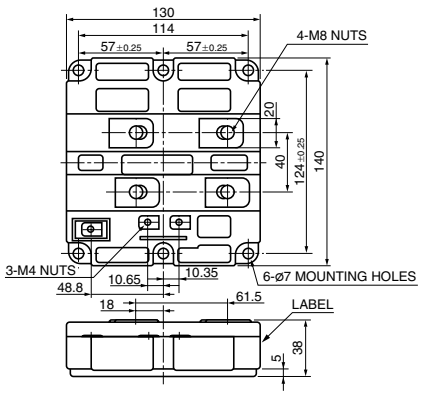
CM6
CM600E2Y-34H



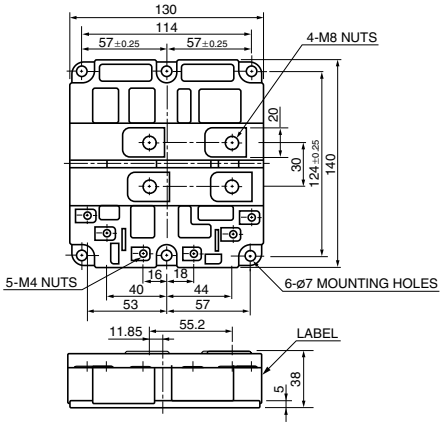
CM3
CM1200HA-50H,-66H



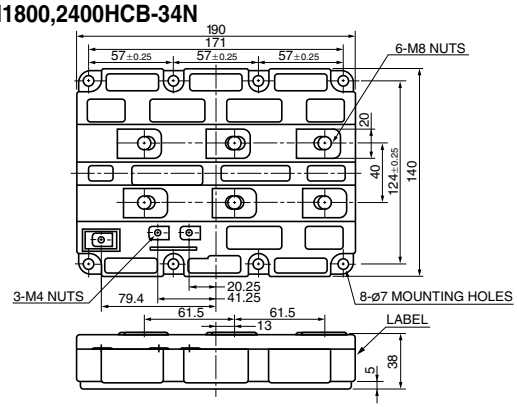
CM7
CM400,600HB-90H CM1200HCB-34N
CM800HB-50H,-66H CM800HC-66H



CM4
CM600DY-34H CM800DZ-34N CM800DZB-34N



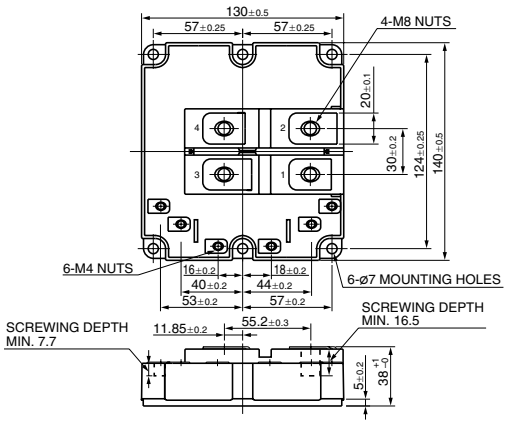
CM8
CM800E2C/E4C/E6C-66H CM1200HB/HC-50H,-66H
CM900HB/HC-90H CM1800,2400HC-34H
CM1800,2400HCB-34N



(Unit: mm)

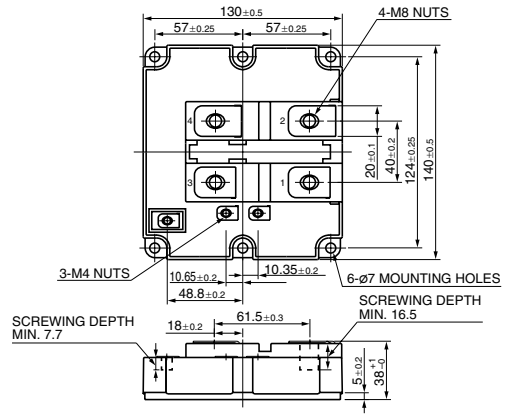
CM9

CM1200DB-34N CM1200DC-34N



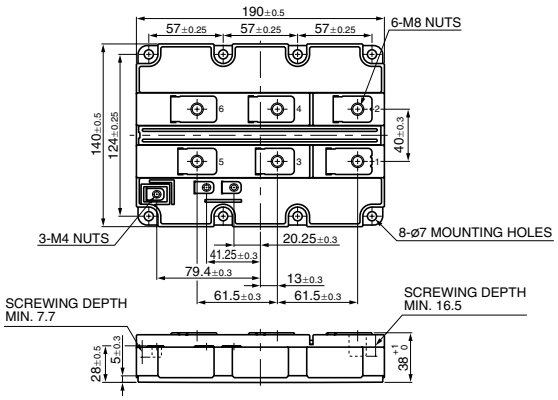
CM10

CM1200E4C-34N CM1800,2400HC-34N



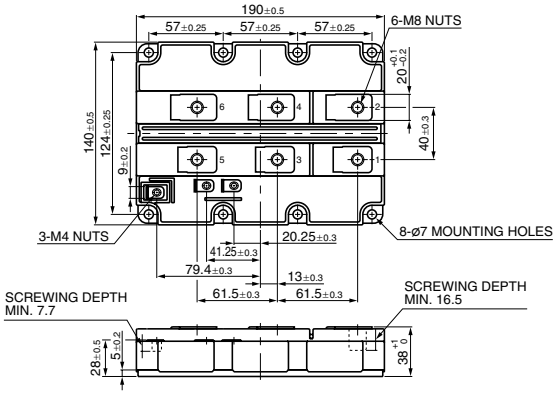
CM11

CM1200HC-90R CM1500HC-66R



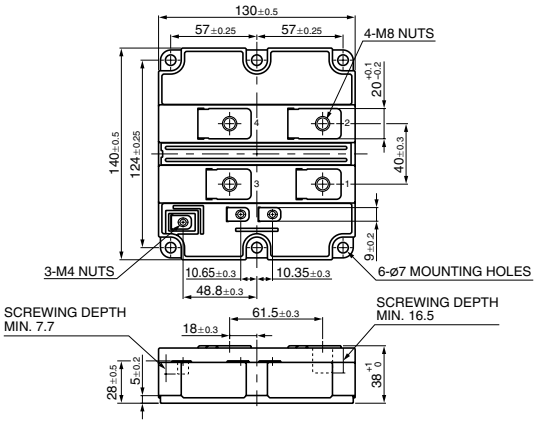
CM12

CM1000E4C-66R



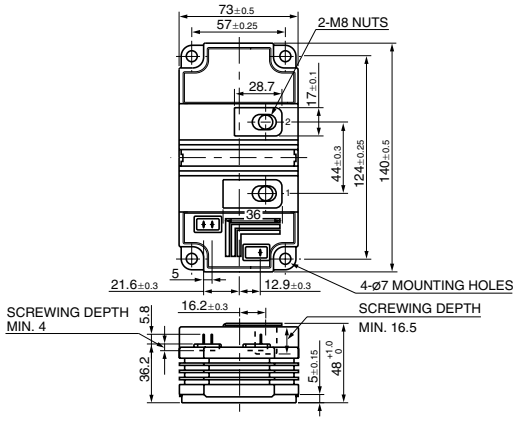
CM13

CM1000HC-66R



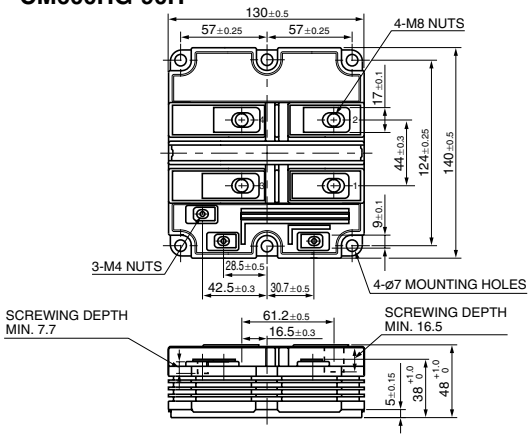
CM14

CM200HG-130H CM400HG-66H



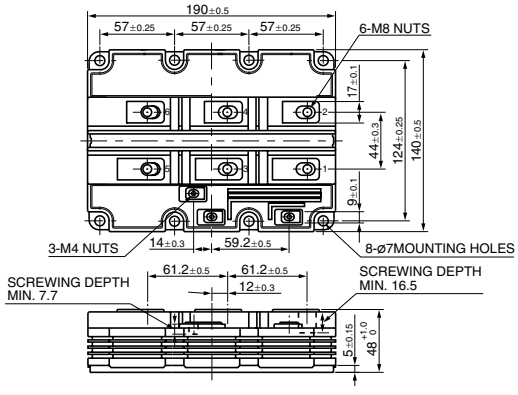
CM15

CM600HG-90H



CM16

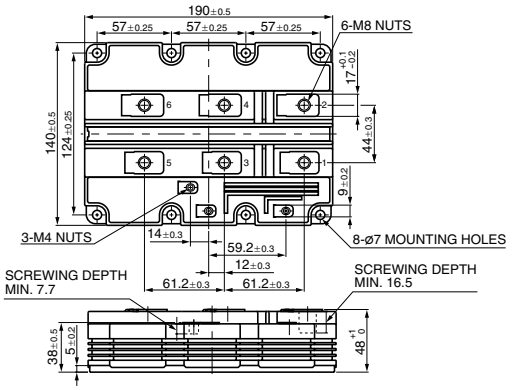
CM400E2G-130H CM600HG-130H CM1200HG-66H CM400E4G-130H CM900HG-90H



(Unit: mm)

CM17

CM750HG-130R CM1200HG-90R CM1500HG-66R



HVDi Modules

High-voltage Diode Modules

■ HVDi modules <R Series>: Low-loss, AlSiC baseplate

Connection		V_{RRM} (V)	Ic (A)
			1000
D		3300	**RM1000DC-66F★★** RM6

★★: Under development

■ HVDi modules: High-isolation, AlSiC baseplate

Connection		V_{RRM} (V)	Ic (A)				
			200	300	400	600	1200
D		3300			**RM400DG-66S★** RM4		**RM1200DG-66S★** RM4
		4500		**RM300DG-90S★** RM4			
		6500	**RM200DG-130S★** RM4			**RM600DG-130S★** RM4	

★: New product

■ HVDi modules: AlSiC baseplate

Connection		V_{RRM} (V)	Ic (A)			
			600	900	1200	1800
H		1700				**RM1800HE-34S** RM2
		3300			**RM1200HE-66S** RM2	
		4500	**RM600HE-90S** RM2	**RM900HC-90S★** RM3		

★: New product

■ HVDi modules: Cu baseplate

Connection		V_{RRM} (V)	Ic (A)			
			400	600	900	1200
D		1700				**RM1200DB-34S★** RM5
		3300	**RM400DY-66S**	**RM600DY-66S**		**RM1200DB-66S★** RM3
			RM1			
		4500			**RM900DB-90S★** RM3	

★: New product

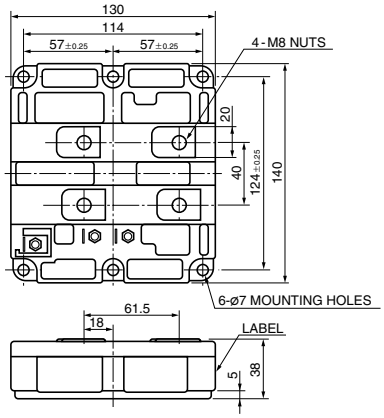
● Numbers RM1 to RM6 are recorded with product names to show the outline drawing numbers

■ HVDi modules outline drawings

(Unit: mm)

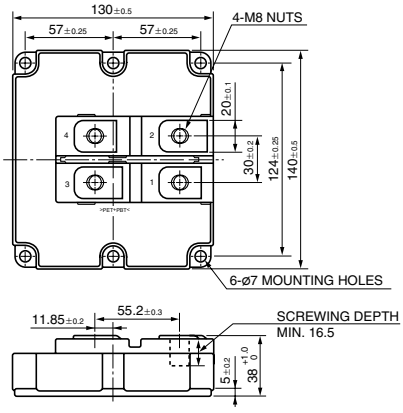
RM1

RM400,600DY-66S



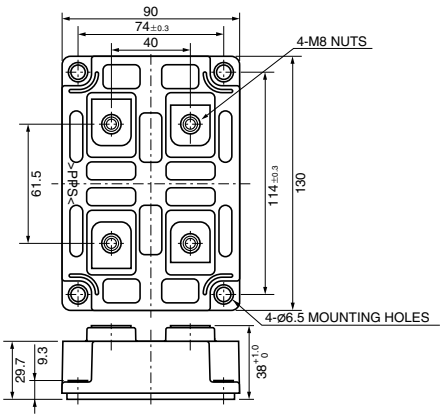
RM5

RM1200DB-34S



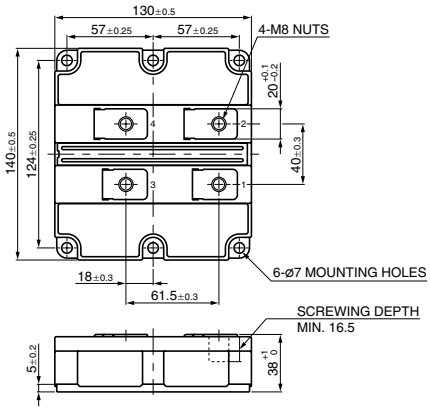
RM2

RM600HE-90S RM1200HE-66S RM1800HE-34S



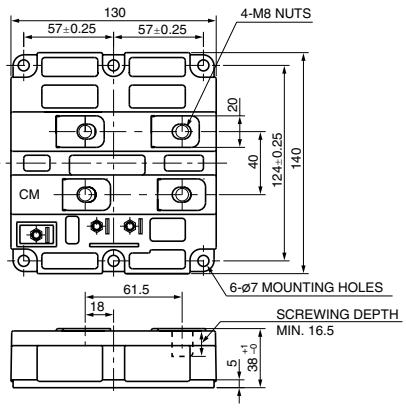
RM6

RM1000DC-66F



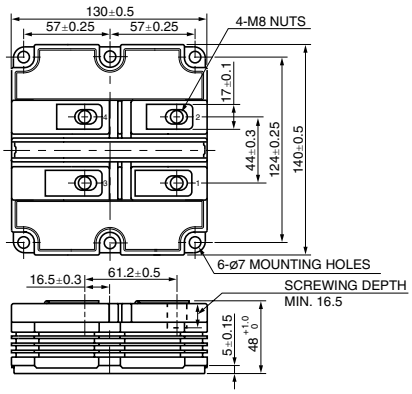
RM3

RM900DB/HC-90S RM1200DB-66S



RM4

RM200,600DG-130S RM1200DG-66S
RM300DG-90S RM400DG-66S



HVIPM

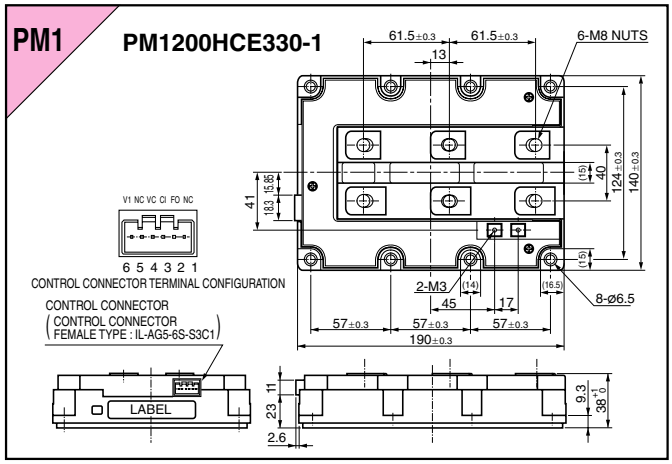
High-voltage Intelligent Power Modules

■ High-voltage intelligent power modules

Connection		V_{RRM} (V)	Ic (A)
			1200
H		3300	**PM1200HCE330-1**
			PM1

■ Outline drawing

(Unit: mm)



High-voltage Integrated Circuits

600V and 1200V Half-bridge Driver HVIC

This product is a semiconductor integrated circuit designed to directly drive the power MOS/IGBT modules of half-bridge composition by integrating the 600V (1200V) and 8/24V dielectric elements onto one chip.
The internal installation of high-side/low-side driver circuits, protective circuits against power supply voltage drop and interlocking circuits enables a devices to drive/control the power elements without using the photocoupler from a logic circuit such as a microcomputer.

■ Applications

Most suitable for the following, applied in products to drive the power MOS/IGBT modules for inverters.

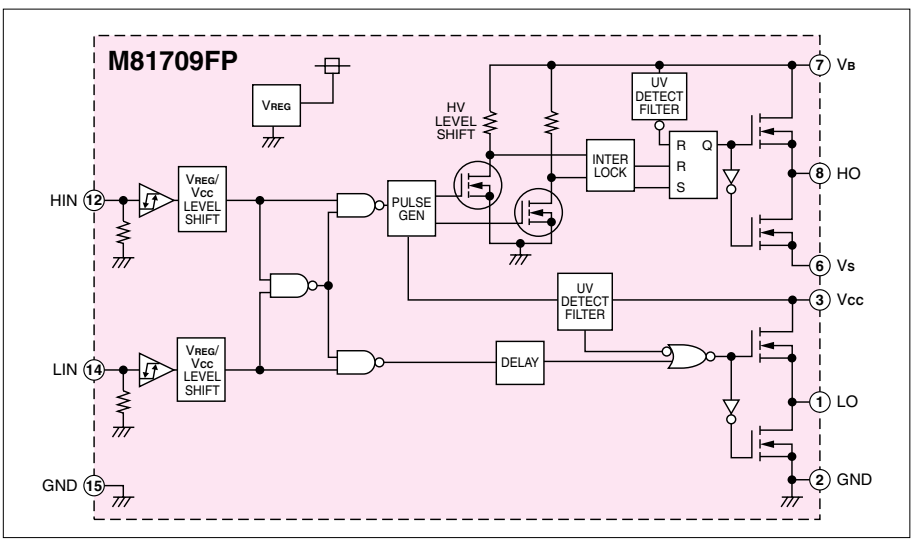
- General inverters
- Air conditioners, refrigerators and washing machines
- AC servo motors
- Brushless DC motors
- Plasma display panels
- Illumination machinery

■ Reference by function

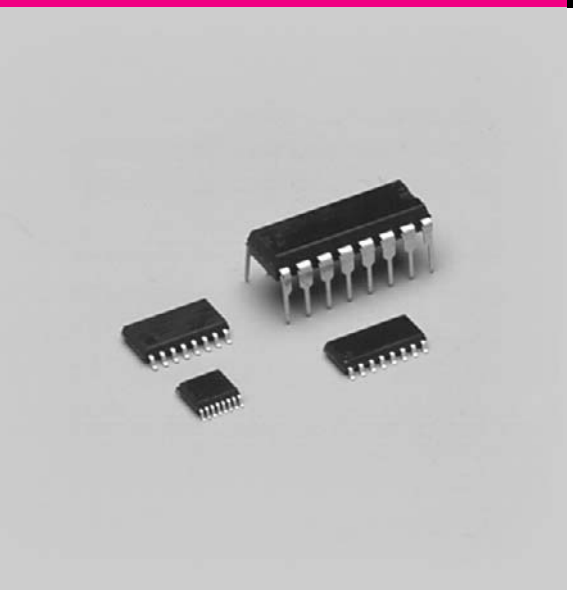
Type	Floating supply voltage [V]	Output current [A]	Driving method	Number of input-signals	Dead-time control	Remarks	Package outline	Outline drawings
M63975FP (Lead-free)	24	±0.5	Low-side	1	—	—	10P2N	⑫
M63991FP (pb-free)	600	±0.5	Half-bridge	2	Input-signal	With interlock function	16P2N	⑤
M63992FP (pb-free)		±2.0						
M63993FP (Lead-free)		±0.3	3ø bridge	2×3 (6)			36P2R	⑩
M63994FP (Lead-free)		±0.5	Half-bridge	1	Inside	—	8P2S	⑪
M63996FP (pb-free)		±2.0		2	Input-signal		16P2N	⑤
M81700FP (Lead-free)	600	±2.0	Half-bridge	2	Input-signal	SD/With interlock function	16P2N	⑤
M81701FP (Lead-free)						With interlock function		
M81702FP (Lead-free)						With SD function		
M81703FP (Lead-free)						—		
M81705FP (Lead-free)		+0.15/−0.125	High-side	1	—		8P2S	⑪
M81706AFP (pb-free)		+0.12/−0.25	Half-bridge	2	Input-signal	With interlock function	16P2N	⑤
M81707FP (pb-free)		±0.1	Dual high-side			—		
M81708FP (pb-free)		+0.12/−0.25	Half-bridge			With interlock function		
M81709FP (pb-free)		±2.0						
M81713FP (pb-free)		±0.5		1	Inside	—	8P2S	⑪
M81019FP (pb-free)	1200	±1.0		2	Input-signal	With interlock function	24P2Q	⑰
M81711FP (pb-free)	24	±0.5	Dual low-side	1×2	—	—	8P2S	⑪
M81716FP (pb-free)								
M81712FP (pb-free)	600	+0.2/−0.35	3ø bridge	2×3 (6)	Input-signal	With interlock function	28X9R	⑱
M81719FP (pb-free)		+0.12/−0.25	Half-bridge	2		—	8P2S	⑪
M81721FP (pb-free)		±1.0				With interlock function	24P2Q	⑰
M81722FP (pb-free)		±3.0				—	8P2S	⑪
M81723FP (pb-free)		±0.1	Dual high-side	1×2	—		16P2N	⑤
M81725FP (pb-free)		±3.0	High-side	1			8P2S	⑪
M81731FP (pb-free)			Dual high-side	1×2			16P2N	⑤
M81734FP ★★ (pb-free)		±0.5	Half-bridge	1	Inside		8P2S	⑪
M81735FP ★★ (pb-free)				2	Input-signal	With interlock function	16P2N	⑤
M81737FP ★★ (pb-free)		±0.2	Dual high-side	1×2	—	—		
M63958FP (pb-free)	600	+0.5/−0.25	Half-bridge	—	Inside	—	16P2N	⑤

★★: Under development

■ Block diagram



Transistor Array



Wide Product Range Helps Reduce Product Size and Weight

Transistor arrays are semiconductor integrated circuits in which a minute input current enables a big current drive. The abundant product line-up enables them to be used in a wide range of fields. (50mA to 1.5A/35V to 50V) Application of the surface mounting package also enables compact, lightweight and high-density mounting of sets.

■ Applications

- Drivers for stepping motors of printers and facsimile machines
- Thermal head drivers for handheld word processors and thermal printers
- Hammer head drivers for calculators with a printer and ECRs
- Drivers for relays, solenoids, lamps, LEDs and fluorescent display tubes

■ Codes for transistor array naming

M 5 4523 P
M 6 3823 FP
M 6 3803 KP

- Package type
  P/WP: DIP type
  FP/GP/DP: SOP type
  KP: SSOP type
- Circuit type and circuit kind for product series
- Application and range of ambient temperature for operation
- Abbreviation shows the Mitsubishi Electric Integrated Circuit

■ Quick reference

Current \ Voltage	35V	40V	50V
50mA		◇⑧**M54513P/FP**	
150mA			△⑦**M54580P/FP**
200mA		◇⑧**M81016P/FP/KP** ◇⑧**M81049P/FP/SP** ◇⑧**M81302SP/FP** ★★	
300mA	◇⑦**M63802P/FP/GP/KP** ◇⑦**M63803P/FP/GP/KP** ◇⑧**M63805P/FP/KP** ◇⑧**M63806P/FP/KP** ◇⑧**M63807P/FP/KP** ◇⑦**M63813P/FP/GP/KP** ◇⑧**M63816P/FP/KP**	△⑦**M54561P**	
400mA		◇⑧**M54522P/FP** ◇⑦**M54530P/FP** ◇⑦**M54531FP** ◇⑦**M54531WP** ★★	◇⑦**M54566WP** ★★ ◇⑦**M54566FP** ◇⑧**M54583P/FP**
500mA		△⑧**M63840P/FP/KP** ★	◇⑦**M54523P/FP** △⑧**M54562P/FP** △⑧**M54563P/FP** △⑧**M54564P/FP** ◇⑧**M54585WP** ★★ ◇⑧**M54585P/FP/KP** ◇⑧**M54587P/FP** △⑦**M63800FP** ◇⑧**M63820FP/KP** ◇⑦**M63823P/FP/GP** ◇⑦**M63824GP/KP** ◇⑦**M63826P/FP/GP** ◇⑦**M63827WP/DP** ◇⑦**M63828WP/DP** ◇⑦**M63832GP/KP** ◇⑧**M63834FP/KP** ◇⑧**M63836FP/KP**
1.5A			◇④**M54532P/FP** ◇④**M54567P/FP** ◇④**M63830P/FP**

◇: Output current-synchronized type
△: Output current-sourcing type
○: Circled numbers indicate the number of circuits

★: New product
★★: Under development

Transistor Array

■ Reference by function

Type	Unit	Io max [mA]	Vo max [V]	Input-function voltage	Output current	Darlington transistor	With output clamp-diode	Low collector-emitter voltage	High-input threshold voltage	Mini-frat package	Package outlines	Outline drawings
M54513FP	8	50	40	H	Sink			●		●	20P2N	⑥
M54513P											18P4G	③
M54522FP	8	400	40	H	Sink	●	●			●	20P2N	⑥
M54522P											18P4G	③
M54523FP	7	500	50	H	Sink	●	●			●	16P2N	⑤
M54523P											16P4	②
M54530FP	7	400	40	H	Sink	●	●			●	16P2N	⑤
M54530P											16P4	②
M54531FP	7	400	40	H	Sink	●	●			●	16P2N	⑤
M54531WP ★★											16P4X	⑮
M54532FP	4	1500	50	H	Sink	●	●			●	16P2N	⑤
M54532P											16P4	②
M54561P	7	300	40	L	Source	●	●				16P4	②
M54562FP	8	500	50	H	Source	●	●			●	20P2N	⑥
M54562P											18P4G	③
M54563FP	8	500	50	H	Source	●	●			●	20P2N	⑥
M54563P											18P4G	③
M54564FP	8	500	50	H	Source	●				●	20P2N	⑥
M54564P											18P4G	③
M54566FP	7	400	50	L	Sink	●				●	16P2N	⑤
M54566WP ★★											16P4X	⑮
M54567FP	4	1500	50	L	Sink	●	●			●	16P2N	⑤
M54567P											16P4	②
M54580FP	7	150	50	L	Source	●				●	16P2N	⑤
M54580P											16P4	②
M54583FP	8	400	50	L	Sink	●				●	20P2N	⑥
M54583P											18P4G	③
M54585FP	8	500	50	H	Sink	●	●			●	20P2N	⑥
M54585KP										●	20P2E	⑨
M54585WP ★★											18P4X	⑲
M54585P											18P4G	③
M54587FP	8	500	50	L	Sink	●	●			●	20P2N	⑥
M54587P											20P4	④

★★: Under development

Transistor Array

■ Reference by function

Type	Unit	Io max [mA]	Vo max [V]	Input-function voltage	Output current	Darlington transistor	With output clamp-diode	Low collector-emitter voltage	High-input threshold voltage	Mini-frat package	Package outlines	Outline drawings
M63800FP	7	500	50	H	Source	●	●	●		●	16P2N	⑤
M63802FP	7	300	35	H	Sink			●	●	●	16P2N	⑤
M63802GP										●	16P2S	⑦
M63802KP										●	16P2Z	⑧
M63802P											16P4	②
M63803FP	7	300	35	H	Sink			●		●	16P2N	⑤
M63803GP										●	16P2S	⑦
M63803KP										●	16P2Z	⑧
M63803P											16P4	②
M63805FP	8	300	35	H	Sink			●	●	●	20P2N	⑥
M63805KP										●	20P2E	⑨
M63805P											18P4G	③
M63806FP	8	300	35	H	Sink			●		●	20P2N	⑥
M63806KP										●	20P2E	⑨
M63806P											18P4G	③
M63807FP	8	300	35	H	Sink			●		●	20P2N	⑥
M63807KP										●	20P2E	⑨
M63807P											18P4G	③
M63813FP	7	300	35	H	Sink		●	●		●	16P2N	⑤
M63813GP										●	16P2S	⑦
M63813KP										●	16P2Z	⑧
M63813P											16P4	②
M63816FP	8	300	35	H	Sink		●	●		●	20P2N	⑥
M63816KP										●	20P2E	⑨
M63816P											18P4G	③
M63820FP	8	500	50	H	Sink	●	●			●	20P2N	⑥
M63820KP										●	20P2E	⑨
M63823FP	7	500	50	H	Sink	●	●			●	16P2N	⑤
M63823GP										●	16P2S	⑦
M63823P											16P4	②
M63824GP	7	500	50	H	Sink	●	●			●	16P2S	⑦
M63824KP										●	16P2E	⑭
M63826FP	7	500	50	H	Sink	●	●			●	16P2N	⑤
M63826GP										●	16P2S	⑦
M63826P											16P4	②
M63827WP	7	500	50	H	Sink	●	●				16P4X	⑮
M63827DP										●	16P2X	⑯
M63828WP	7	500	50	H	Sink	●	●				16P4X	⑮
M63828DP										●	16P2X	⑯
M63830FP	4	1500	50	L	Sink	●	●			●	16P2N	⑤
M63830P											16P4	②
M63832GP	7	500	50	L	Sink	●				●	16P2S	⑦
M63832KP										●	16P2E	⑭
M63834FP	8	500	50	L	Sink	●				●	20P2N	⑥
M63834KP										●	20P2E	⑨
M63836FP	8	500	50	L	Sink	●	●			●	20P2N	⑥
M63836KP										●	20P2E	⑨
M63840FP ★	8	500	40	H	Source	●	●			●	20P2N	⑥
M63840KP ★										●	20P2F	⑨
M63840P ★											18P4G	③

★: New product

Transistor Array

■ CMOS array

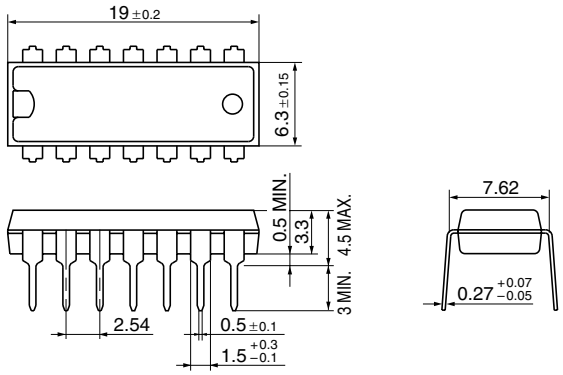
Type	Unit	Io max [mA]	Vo max [V]	Output current	Function	Mini-frat package	Package outlines	Outline drawings
M81016P	8	200	40	Sink	OCTAL D-TYPE, FLIP-FLOP DRIVER WITH CLEAR		20P4B	⑬
M81016FP						●	20P2N	⑥
M81016KP						●	20P2E	⑨
M81049P							20P4	④
M81049FP						●	20P2N	⑥
M81049SP							20P4B	⑬
M81302SP ★★					OCTAL INVERTER WITH OPEN-DREIN OUTPUTS		20P4B	⑬
M81302FP ★★						●	20P2N	⑥

★★: Under development

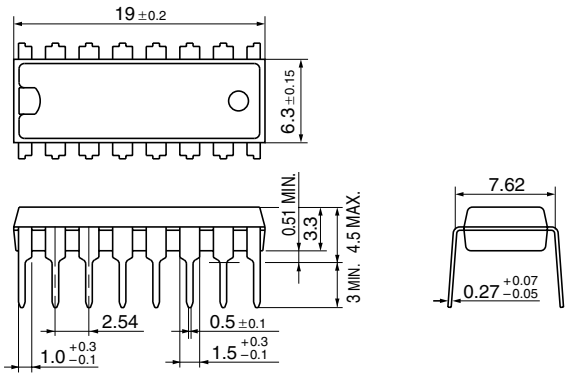
■ High-voltage integrated circuits and transistor array outline drawings

(Unit: mm)

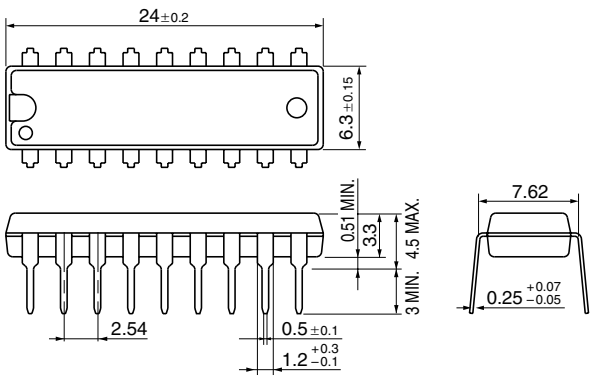
① TYPE 14P4 14pin 300mil DIP



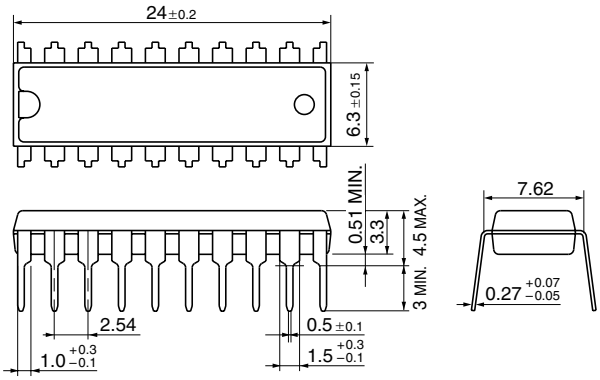
② TYPE 16P4 16pin 300mil DIP



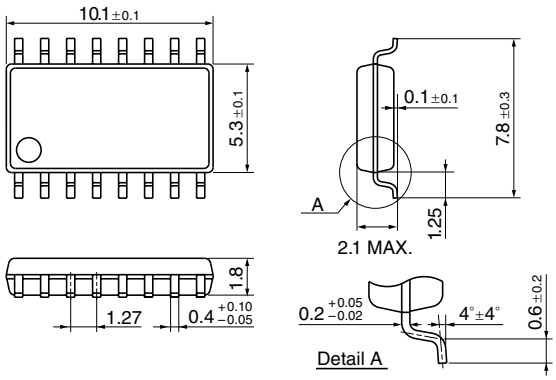
③ TYPE 18P4G 18pin 300mil DIP



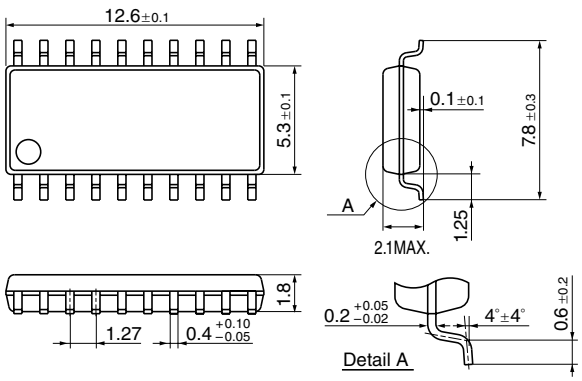
④ TYPE 20P4 20pin 300mil DIP



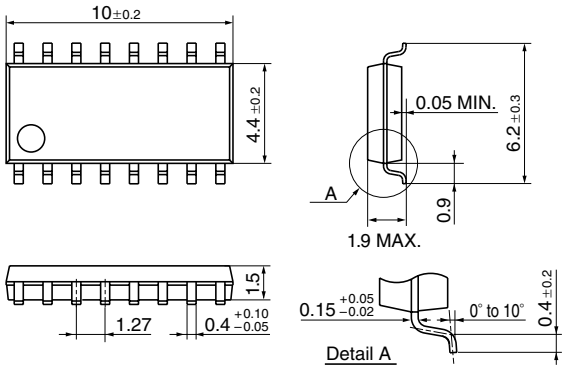
⑤ TYPE 16P2N 16pin 300mil SOP



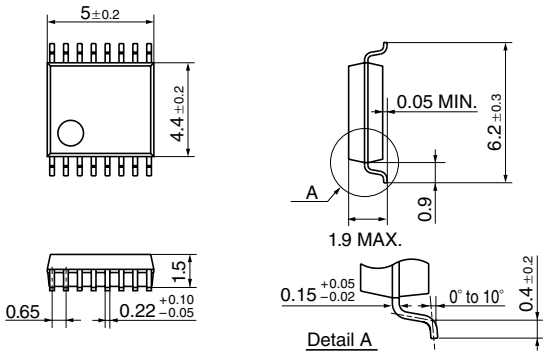
⑥ TYPE 20P2N 20pin 300mil SOP



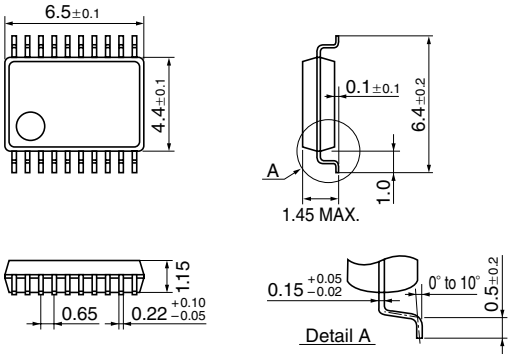
⑦ TYPE 16P2S 16pin 225mil SOP



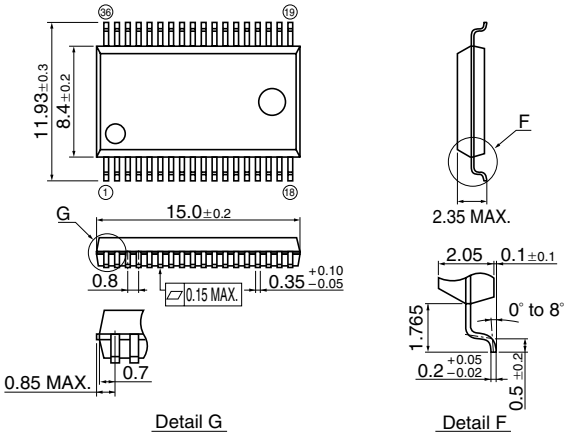
⑧ TYPE 16P2Z 16pin 225mil SSOP



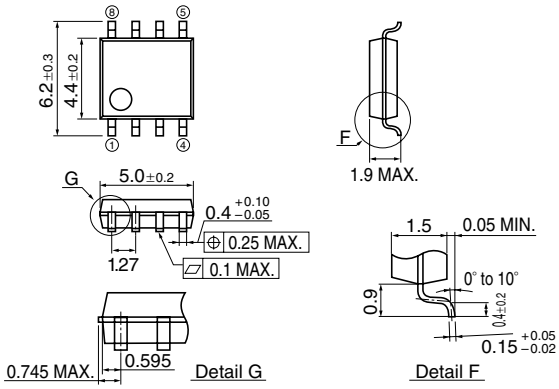
⑨ TYPE 20P2E-A TYPE 20P2F-A 20pin 225mil SSOP



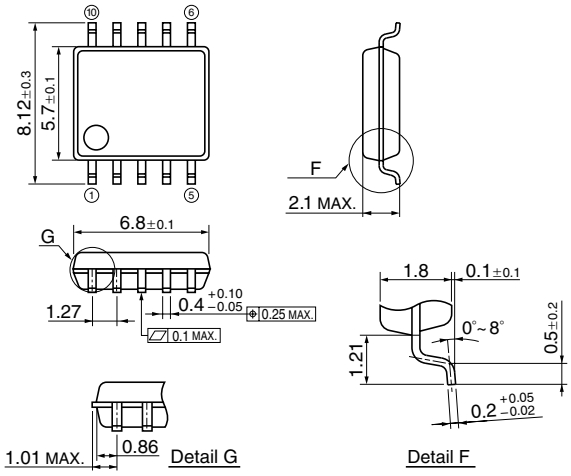
⑩ TYPE 36P2R-D 36pin 450mil SSOP



⑪ TYPE 8P2S-A 8pin 225mil SOP

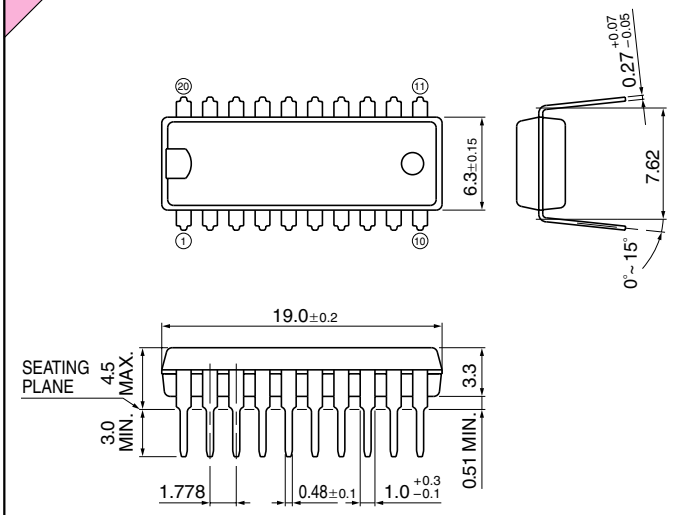


⑫ TYPE 10P2N-A 10pin 300mil SOP

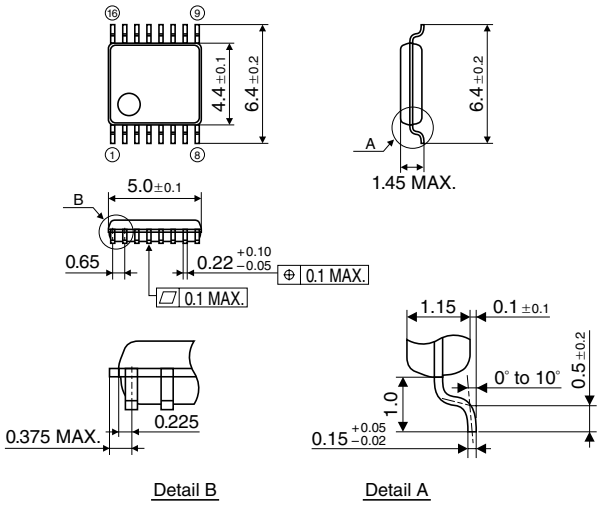


(Unit: mm)

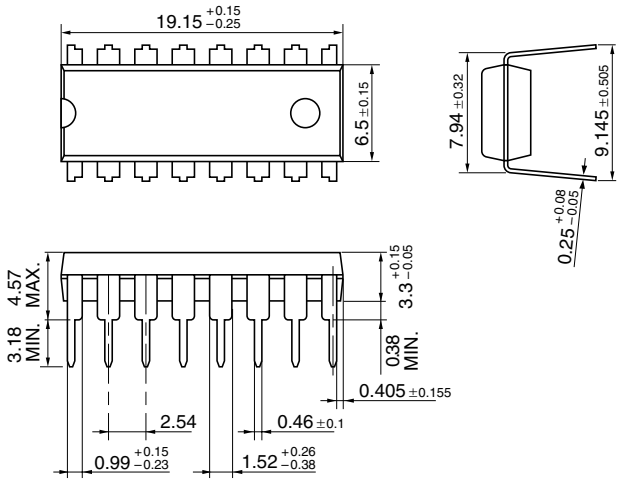
⑬ TYPE 20P4B 20pin 300mil DIP



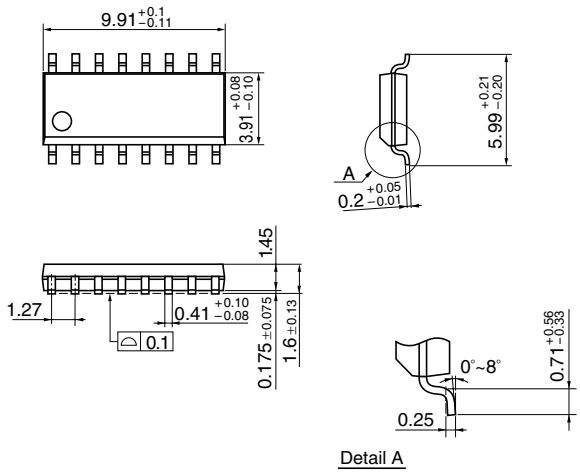
⑭ TYPE 16P2E-A 16pin 225mil SSOP



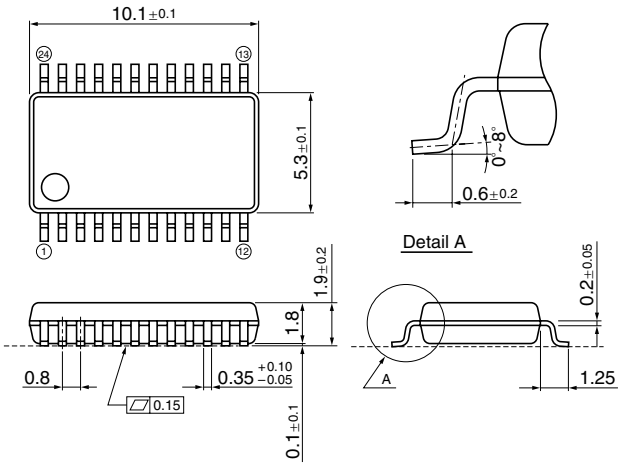
⑮ TYPE 16P4X 16pin 300mil DIP



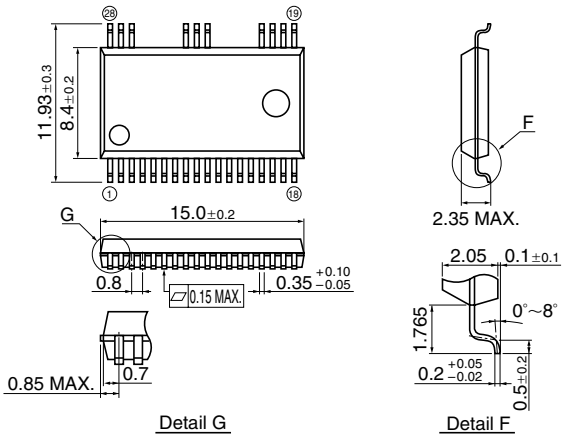
⑯ TYPE 16P2X 16pin 225mil SOP



⑰ TYPE 24P2Q 24pin 300mil SSOP



⑱ TYPE 28X9R 28pin 450mil SSOP



(Unit: mm)

⑲ **TYPE 18P4X** 16pin 300mil DIP