TENTATIVE

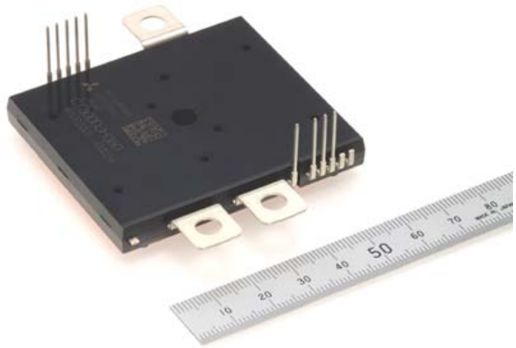
MITSUBISHI ELECTRIC

< Transfer-molded Power-Module >

CT300DJH060

FOR HIGH-POWER SWITCHING
INSULATED PACKAGE

CT300DJH060



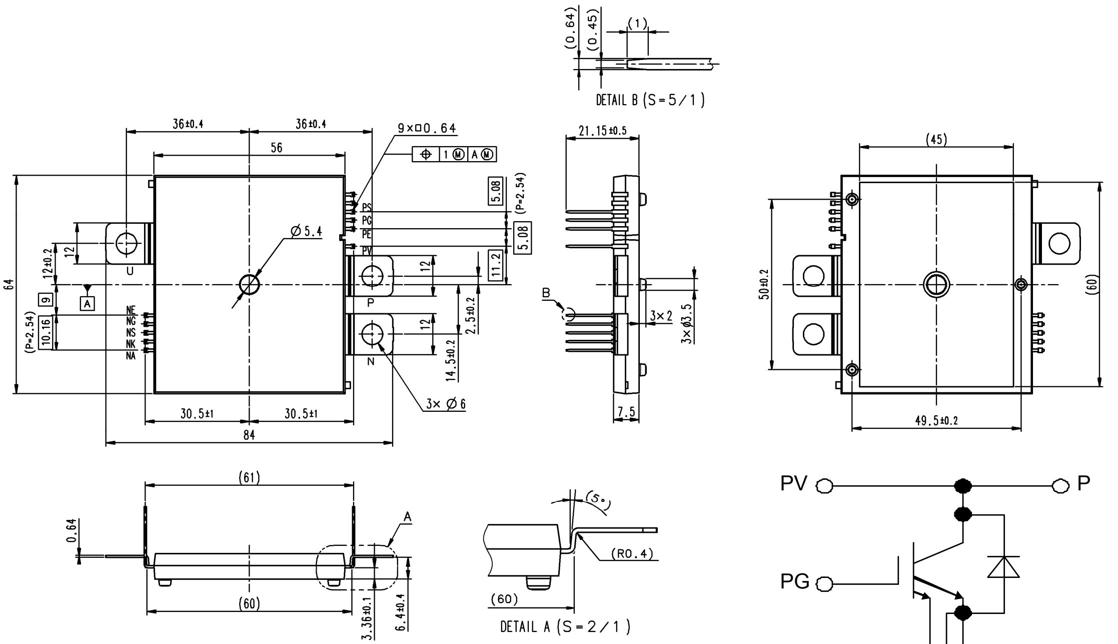
FEATURE

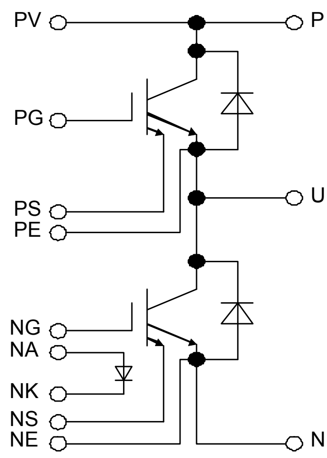
- IC 300A
- VCES 600V
- RoHS compliant
- Insulated type
- 2-Elements package

APPLICATION

EV/HEV and High Reliability Inverter

PACKAGE OUTLINES & CIRCUIT DIAGRAM **Dimensions in mm**





CIRCUIT DIAGRAM

ABSOLUTE MAXIMUM RATINGS (T_j = 25°C, unless otherwise noted)

Symbol	Item	Conditions		Ratings	Unit
V_{CES}	Collector-Emitter Voltage	T_j = 25°C	G-E short-circuited	650	V
		-30°C ≤ T_j ≤ 150 °C		600	
$V_{CC(surge)}$	Surge voltage when operating	Between P-N (short-circuit surge included)		500	V
V_{GES}	Gate-emitter voltage	C-E short-circuited		20	V
—	Sense emitter - emitter voltage	C-E short-circuited, G-E short-circuited, non-repetition		2	V
—	Temperature sense diode - emitter voltage	C-E short-circuited, G-E short-circuited		20	V
I_C	Collector current	T_C = 25°C		300	A
I_E	Emitter current	T_C = 25°C		300	A
P_C	Maximum collector dissipation	T_C = 25°C		735	W
T_j	Junction temperature	—		-30 ~ +125	°C
		t = 0.2s, non-repetition, accumulated time=3600s		+125 ~ +175	
T_{stg}	Storage temperature	—		-40 ~ +125	°C
V_{iso}	Isolation voltage	Main terminals to base plate, AC 1 minute		2000	Vrms

MECHANICAL RATINGS

Symbol	Item	Conditions	Ratings	Unit
—	Tightening torque strength	Main terminal screw M5	2.5 ~ 3.5	Nm
—	Tightening surface pressure(Max.)	Mounting screw M5	40	MPa
—	Weight	Typical value	100	g

ELECTRICAL STATIC CHARACTERISICS (T_j = 25°C, unless otherwise noted)

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector cut-off current	V_{CE} = V_{CES}, V_{GE} = 0V		—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C = 30mA,V_{CE} = 10V		5.0	6.0	7.0	V
I_{GES}	Gate leakage current	V_{GE} = 20V		—	—	15	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	T_j = 25°C	I_C = 300A, V_{GE} = 15.0V	—	1.6	2.0	V
		T_j = 125°C		—	1.7	2.2	V
V_{EC}	Emitter-collector voltage	I_E = 300A, V_{GE} = 0V		—	—	1.8	V
V_F	On-chip temperature-sense diode voltage	I_F = 200μA		2.50	2.60	2.70	V
		I_F = 200μA, T_j = 125°C		1.83	1.93	2.03	V
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V		—	30	—	nF
C_{oes}	Output capacitance			—	3	—	nF
C_{res}	Reverse transfer capacitance			—	1.3	—	nF
Q_G	Total gate charge	V_{CC} = 300V, I_C = 300A, V_{GE} = 15V		—	1.2	1.6	μC

ELECTRICAL DYNAMIC CHARACTERISICS (T_j = 25°C, unless otherwise noted)

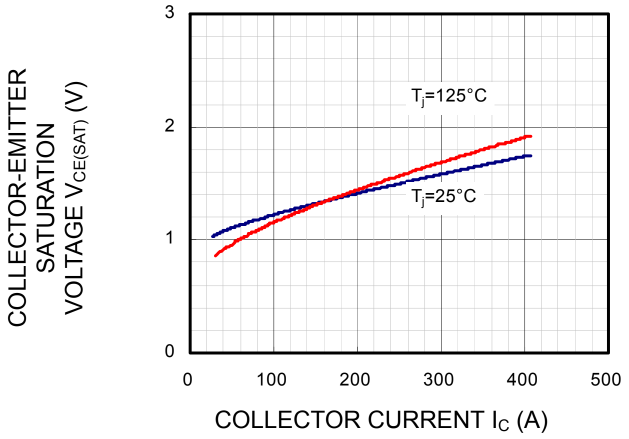
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	V_{CC} = 300V, I_C = 300A, V_{GE} = 15V $R_{G(on)}$ = 10Ω, $R_{G(off)}$ = 3.3Ω Inductive load switching operation. Note) Based on switching-time and diode reverse-recovery waveforms measurements.	—	0.35	0.50	μs
t_r	Turn-on rise time		—	0.14	0.25	μs
$t_{d(off)}$	Turn-off delay time		—	0.68	1.06	μs
t_f	Turn-off fall time		—	0.09	0.30	μs
t_{rr}	Reverse-recovery time		—	0.10	0.18	μs
Q_{rr}	Reverse-recovery charge		—	8.8	—	μC

THERMAL RESISTANCES

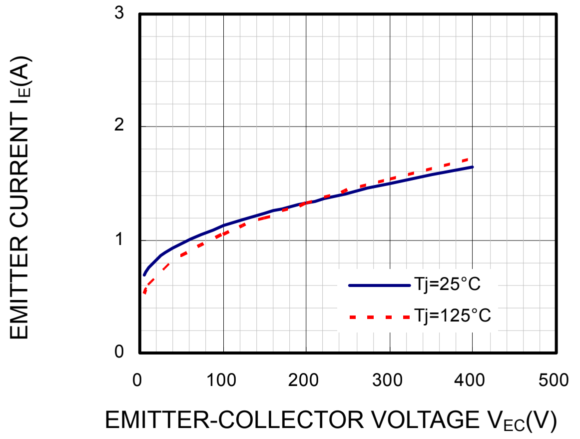
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Junction-case thermal resistance	IGBT part (1/2 module)	—	—	0.22	°C/W
$R_{th(j-c)R}$		FWD part (1/2 module)	—	—	0.22	°C/W

PERFORMANCE CURVES

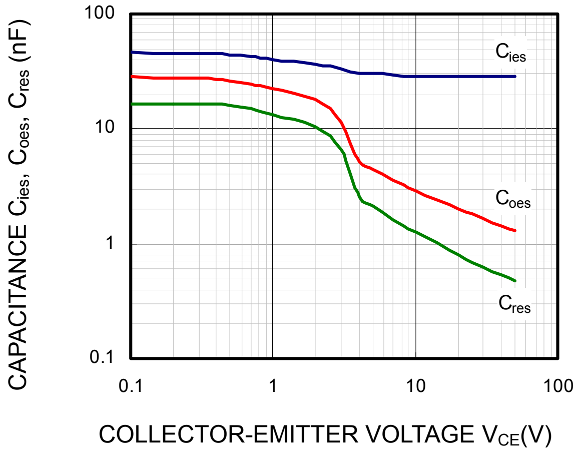
COLLECTOR-EMITTER SATURATION CHARACTERISTICS (Representative Example)



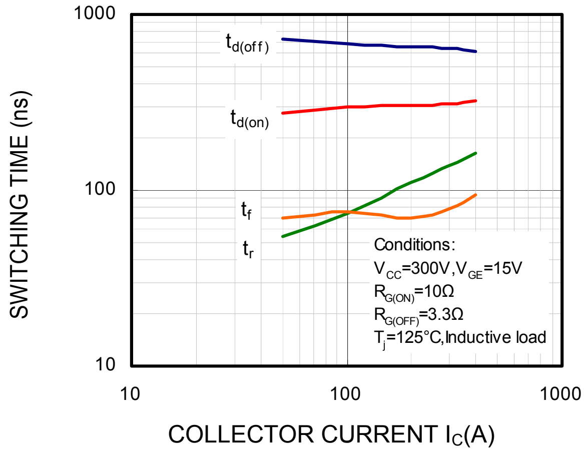
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (Representative Example)



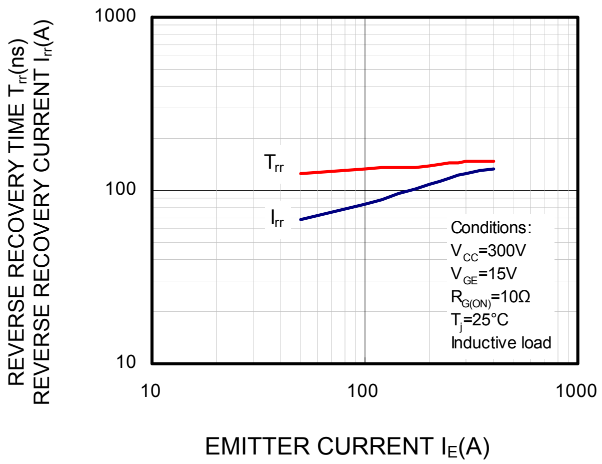
CPACITANCE-vs-V_{CE} CHARACTERISTICS (Representative Example)



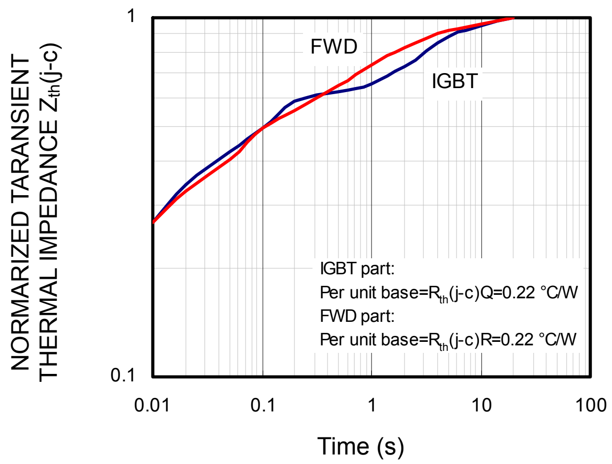
SWITCHING CHARACTERISTICS (Representative Example)



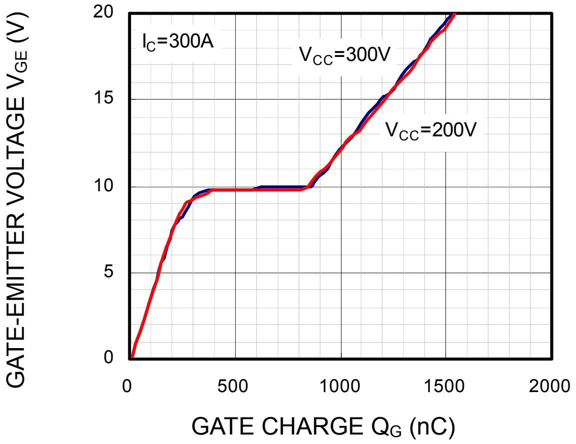
FREE-WHEEL DIODE REVERSE RECOVERY CHARACTERISTICS (Representative Example)



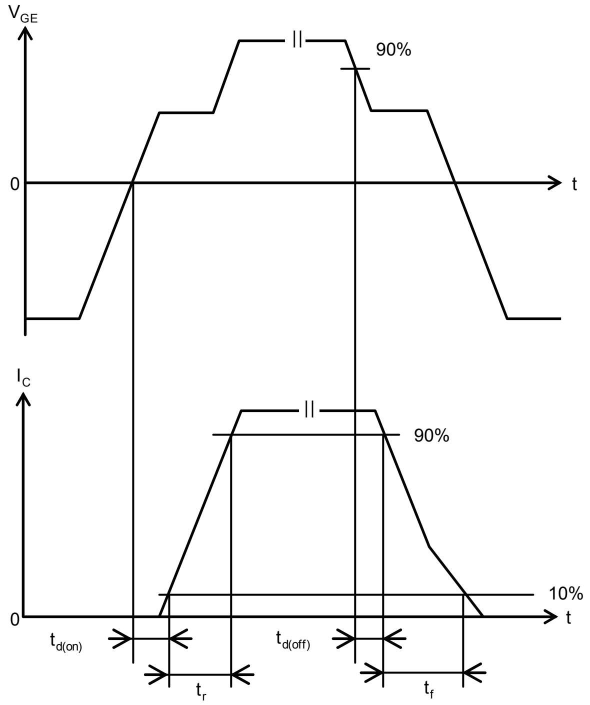
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Representative Example)



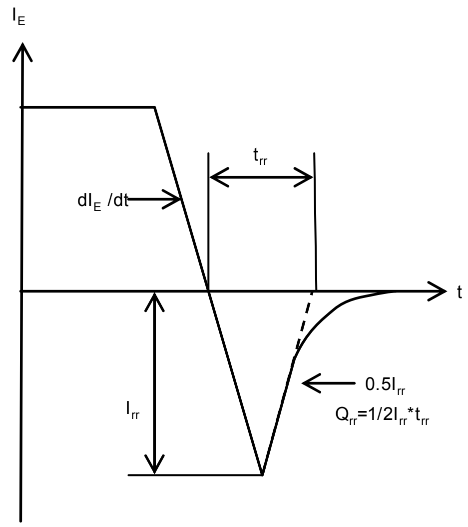
GATE CHARGE CHARACTERISTICS
(Representative Example)



Switching time measurement wave forms:



FWDi reverse-recovery characteristic measurement wave form:



Correct and Safety Use of Power Module

Unsuitable operation (such as electrical, mechanical stress and so on) may lead to damage of power modules.
Please pay attention to the following descriptions and use Mitsubishi Electric's IGBT modules according to the guidance.

During Transit:

• Keep shipping cartons right side up. If stress is applied by either placing a carton upside down or by leaning a box against something, terminals can be bent and/or resin packages can be damaged.
• Tossing or dropping of a carton may damage devices inside.
• If a device gets wet with water, malfunctioning and failure may result. Special care should be taken during rain or snow to prevent the devices from getting wet.

Storage:

• The temperature and humidity of the storage place should be 5~35°C and 45~75% respectively. The performance and reliability of devices may be jeopardized if devices are stored in an environment far above or below the range indicated above.

Prolonged Storage:

• When storing devices more than one year, dehumidifying measures should be provided for the storage place. When using devices after a long period of storage, make sure to check the exterior of the devices is free from scratches, dirt, rust, and so on.

Operating Environment:

• Devices should not be exposed to water, organic solvents, corrosive gases, explosive gases, fine particles, or corrosive agents, since any of those can lead to a serious accident.

Flame Resistance:

• Although the epoxy resin is in conformity with UL 94-V0 standards, it should be noted that those are not non-flammable.

Anti-electrostatic Measures:

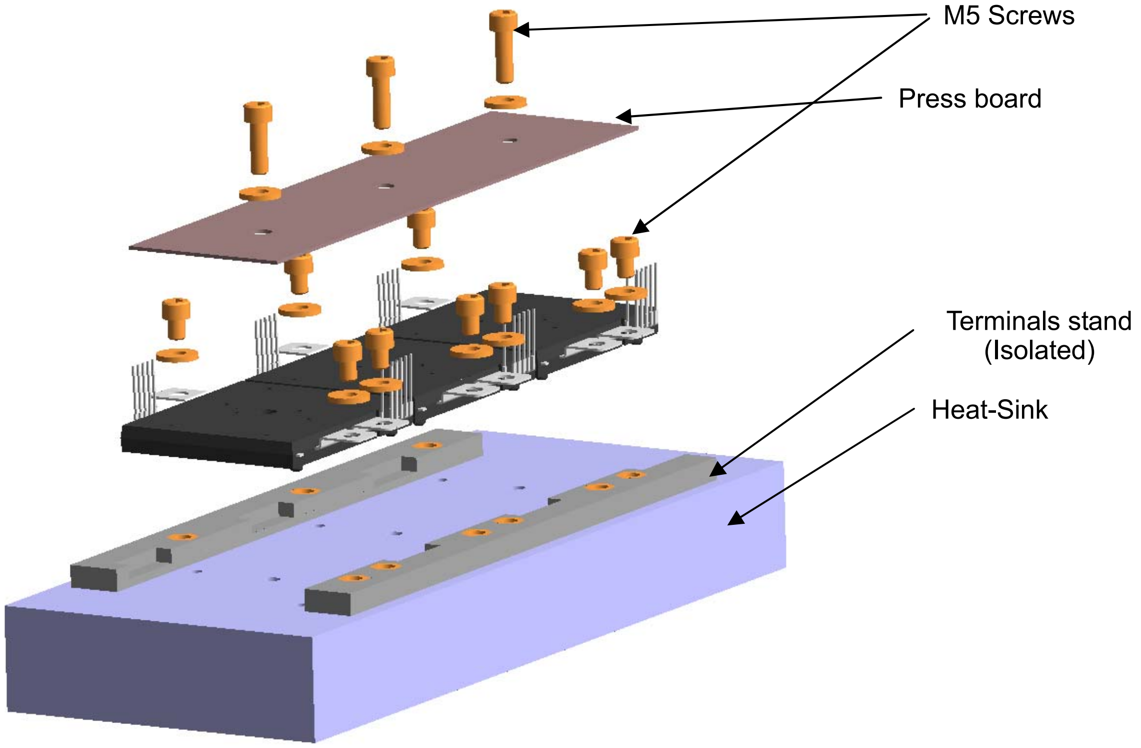
• Following precautions should be taken for MOS-gated devices to prevent static buildup which could damage the devices.

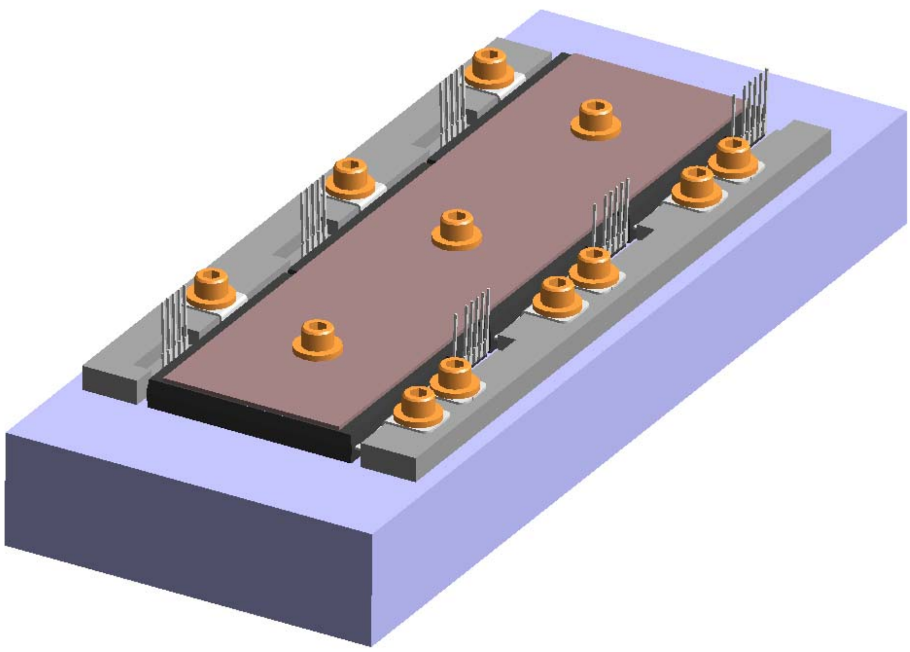
(1) Precautions against the device rupture caused by static electricity
Static electricity of human bodies and cartons and/or excessive voltage applied across the gate to emitter may damage and rupture devices. Sense-emitter and temperature-sensor are also vulnerable to excessive voltage. The basis of anti-electrostatic build-up and quick dissipation of the charged electricity.

* Containers that are susceptible to static electricity should not be used for transit nor for storage.
* Signal terminals to emitter should be always shorted with a carbon cloth or the like until right before a module is used. Never touch the signal terminals with bare hands.
* Always ground the equipment and your body during installation (after removing a carbon cloth or the like. It is advisable to cover the workstation and it's surrounding floor with conductive mats and ground them.
* It should be noted that devices may get damaged by the static electricity charged to a printed circuit board if the signal terminals to emitter of the circuit board is open.
* Use soldering irons with grounded tips.

(2) Precautions when the signal terminals to emitter is open
* Voltage should not be applied across the collector to emitter when the signal terminals to emitter is open.
* The signal terminals to emitter should be shorted before removing a device from a unit.

Installation Method (image diagram)





Installation method

When installing a module to a heat sink, fastening with excessive uneven stress might cause the module to be damaged or to be degraded because the internal silicon chips will be stressed.

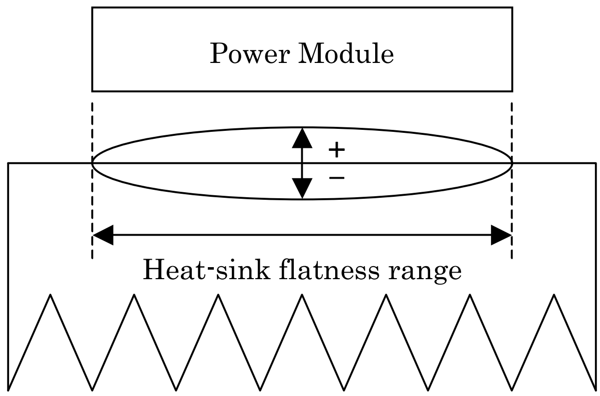
Initial fastening: As a general rule, set the initial (or temporary) fastening torque to less than 20% of the maximum rating.

Heat-Sink Flatness: In order to get most effective heat dissipation, it is necessary to enlarge the contact area between the module and the heat-sink as much as possible to minimize the contact thermal resistance. Regarding the heat sink flatness (warp/concavity and convexity) on the module installation surface, the surface finishing-treatment should be less than 12s (please refer to the figure below).

***Note:** The flatness of the heat sink should be designed to be within **–50µm ~ +50µm**

Thermal Grease: Evenly apply thermally-conductive grease (about 100µm~200µm thickness) over the contact surface between the module and the heat sink. Applying grease is also useful for preventing the contact surface from corrosion. Furthermore, ensure the grease to be with stable quality and long endurance within wide operating temperature range.

Fastening Torque: Use a torque wrench to fasten up to the specified torque rating. As mentioned above, exceeding the maximum torque limitation might cause a module to be damaged or degraded. Also, pay attention not to have any dirt remaining on the contact surface between the module and the heat sink.



Heat-Sink Flatness Measurement Range

Main Revision for this Edition

No.	Date	Revision	
		Pages	Points

Keep safety first in your circuit designs!

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