

MG1200V2YS71

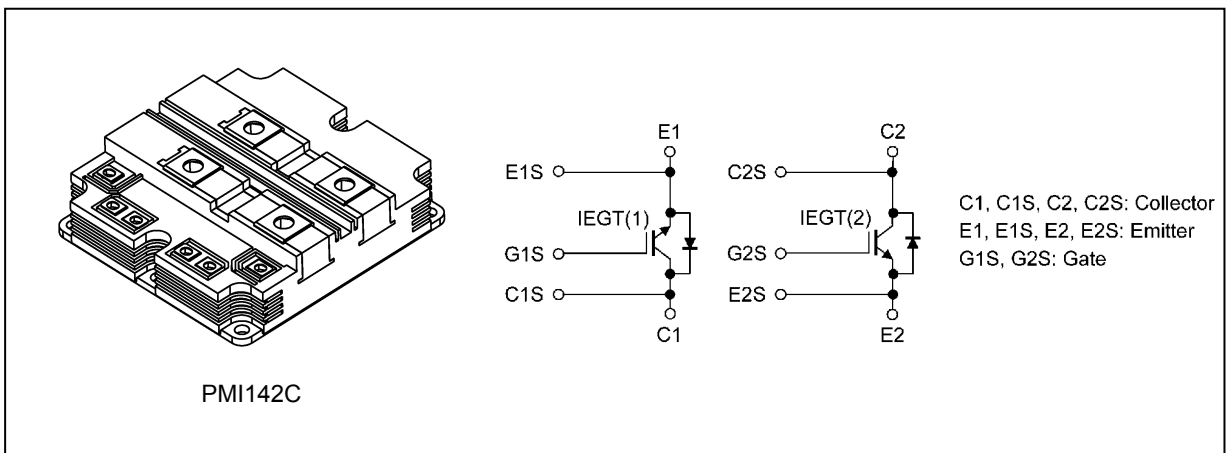
1. Applications

- High-Power Switching
- Motor Controllers

2. Features

- (1) Enhancement mode.
- (2) Electrodes are isolated from case.
- (3) Embedded two devices.
- (4) Embedded Silicon carbide diode.

3. Packaging and Internal Circuit Pin Assignment



Start of commercial production

2014-09

4. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_c = 25\text{ }^\circ\text{C}$)

Characteristics	Symbol	Note	Test Condition	Rating	Unit
Collector-emitter voltage	V_{CES}			1700	V
Gate-emitter voltage	V_{GES}			± 20	V
Collector current (RMS)	$I_{C(RMS)}$	(Note 1)		1200	A
Collector current (pulsed)	I_{CP}	(Note 2)	Peak turn-off current	2400	A
Non-repetitive peak forward surge current	I_{FSM}		10 ms (half-sine wave)	5	kA
Collector power dissipation	P_C			5200	W
Junction temperature	T_j			-40 to 150	$^\circ\text{C}$
Storage temperature	T_{stg}			-40 to 150	$^\circ\text{C}$
Isolation voltage	V_{isol}		AC 1 min	6000	V
Mounting torque	TOR		Terminal: M4/M8	2/7	N · m
	TOR		Mounting: M6	4	N · m

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: $T_c = 40\text{ }^\circ\text{C}$, without switching losses.

Note 2: $V_{CP} \leq 1700\text{ V}$, $V_{CC} \leq 1200\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{G(off)} = 3.3\ \Omega$, $T_j \leq 150\text{ }^\circ\text{C}$, $L_s \approx 100\text{ nH}$.

5. Thermal Characteristics

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Thermal resistance (junction-to-case)	$R_{th(j-c)}$		Transistor part	—	—	24	K/kW
	$R_{th(j-c)}$		Diode part	—	—	48	
Thermal resistance (case-to-fin)	$R_{th(c-f)}$	(Note 1)	Per module	—	9	—	K/kW

Note 1: The heat radiation grease is recommended for use with semiconductor devices.

Apply a thin, even (100 to 200 μm) coating of grease.

6. Electrical Characteristics (Unless otherwise specified, $T_c = 25\text{ }^\circ\text{C}$)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Gate-emitter leakage current	I_{GES}		$V_{GE} = \pm 20\text{ V}, V_{CE} = 0\text{ V}$	—	—	± 100	nA
Collector-emitter cut-off current	I_{CES}		$V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_j = 150\text{ }^\circ\text{C}$	—	—	100	mA
Gate-emitter cut-off voltage	$V_{GE(off)}$		$I_C = 1.2\text{ A}, V_{CE} = 5\text{ V}, T_j = 150\text{ }^\circ\text{C}$	5.3	6.0	6.7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		$I_C = 1200\text{ A}, V_{GE} = 15\text{ V}, T_j = 150\text{ }^\circ\text{C}$	—	3.2	3.8	V
Input capacitance	C_{ies}		$V_{CE} = 10\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$	—	200	—	nF
Switching time (turn-on delay time)	$t_{d(on)}$		$V_{CC} = 850\text{ V}, I_C = 1200\text{ A}, V_{GE} = \pm 15\text{ V}, R_{G(on)} = 1.0\ \Omega, R_{G(off)} = 3.3\ \Omega, T_j = 150\text{ }^\circ\text{C}$ (Inductive load, $L_s \approx 100\text{ nH}$) See Fig. 6.1, 6.2	—	0.5	—	μs
Switching time (rise time)	t_r			—	0.2	—	μs
Switching time (turn-on time)	t_{on}			—	0.7	—	μs
Switching time (turn-off delay time)	$t_{d(off)}$			—	1.0	—	μs
Switching time (fall time)	t_f			—	1.0	—	μs
Switching time (turn-off time)	t_{off}			—	2.0	—	μs
Forward voltage	V_F			$I_F = 1200\text{ A}, V_{GE} = 0\text{ V}, T_j = 150\text{ }^\circ\text{C}$	—	2.8	3.5
Reverse recovery charge	Q_{rr}		$V_{CC} = 850\text{ V}, I_F = 1200\text{ A}, V_{GE} = -15\text{ V}, R_{G(on)} = 1.0\ \Omega, T_j = 150\text{ }^\circ\text{C}$ (Inductive load, $L_s \approx 100\text{ nH}$) See Fig. 6.1, 6.3	—	15	—	μC
Peak reverse recovery current	I_{rr}			—	200	—	A
Reverse recovery time	t_{rr}			—	0.1	—	μs
Turn-on switching loss	E_{on}		$V_{CC} = 850\text{ V}, I_C = 1200\text{ A}, V_{GE} = \pm 15\text{ V}, R_{G(on)} = 1.0\ \Omega, R_{G(off)} = 3.3\ \Omega, T_j = 150\text{ }^\circ\text{C}$ (Inductive load, $L_s \approx 100\text{ nH}$) See Fig. 6.1, 6.2	—	0.1	—	J
Turn-off switching loss	E_{off}			—	0.5	—	J
Reverse recovery loss	E_{dsw}		$V_{CC} = 850\text{ V}, I_F = 1200\text{ A}, V_{GE} = -15\text{ V}, R_{G(on)} = 1.0\ \Omega, T_j = 150\text{ }^\circ\text{C}$ (Inductive load, $L_s \approx 100\text{ nH}$) See Fig. 6.1, 6.3	—	0.015	—	J

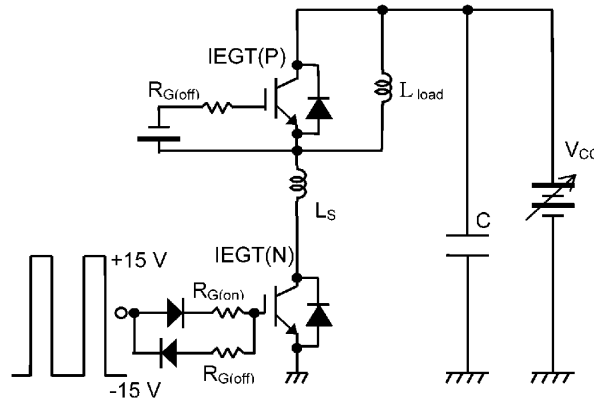


Fig. 6.1 Inductive Load Switching Test Circuit

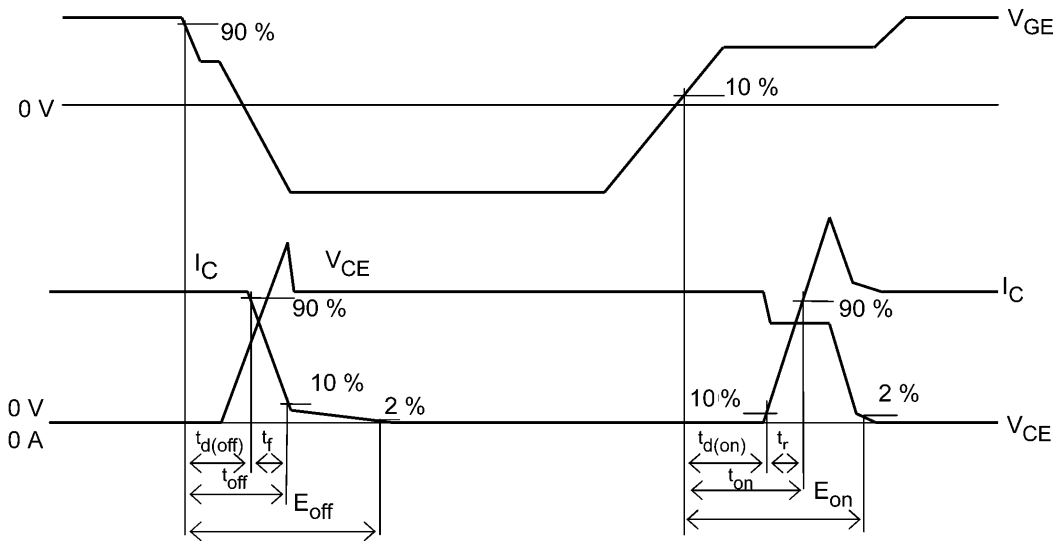


Fig. 6.2 Timing Chart (Transistor part)

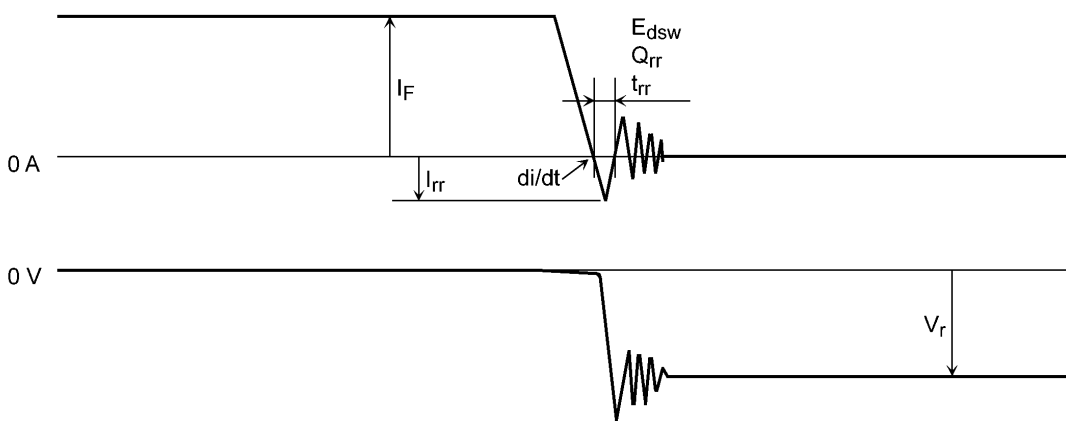


Fig. 6.3 Timing Chart (Diode part)

7. Characteristics Curves (Note)

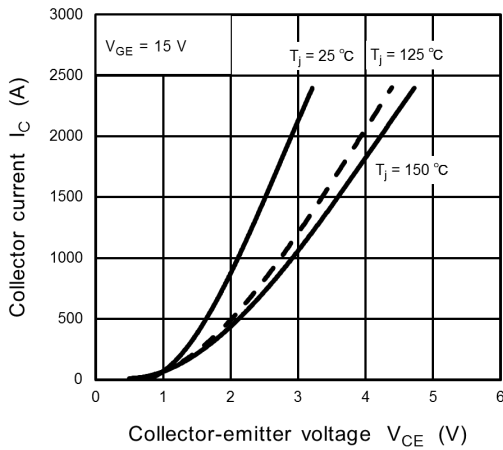


Fig. 7.1 $I_C - V_{CE}$

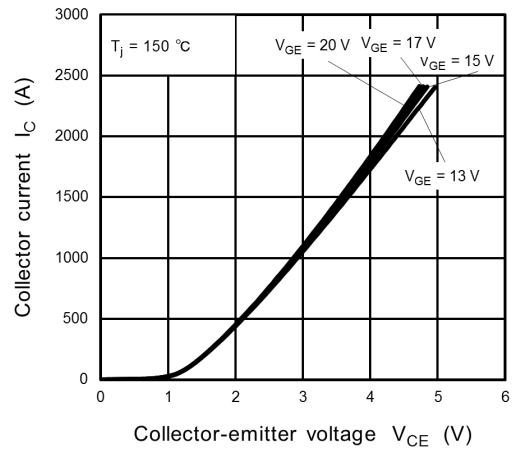


Fig. 7.2 Output characteristics

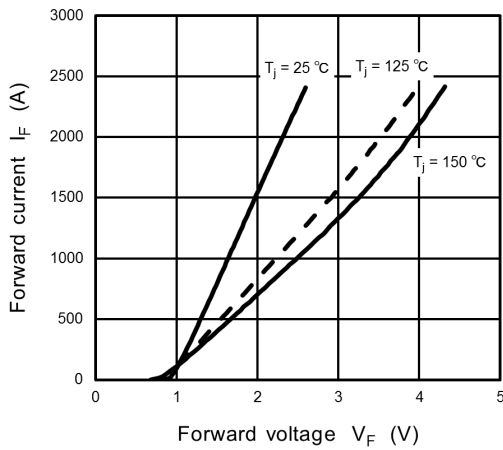


Fig. 7.3 $I_F - V_F$

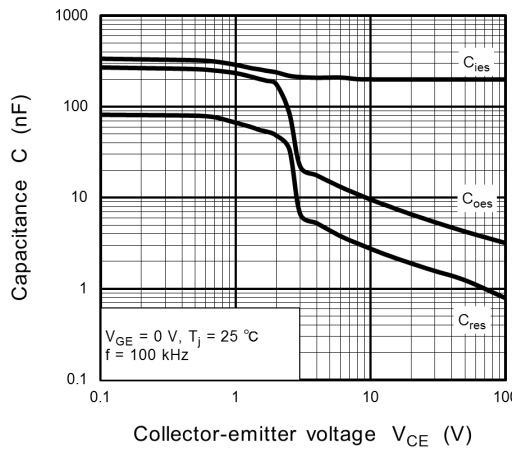


Fig. 7.4 $C_{ies}, C_{oes}, C_{res} - V_{CE}$

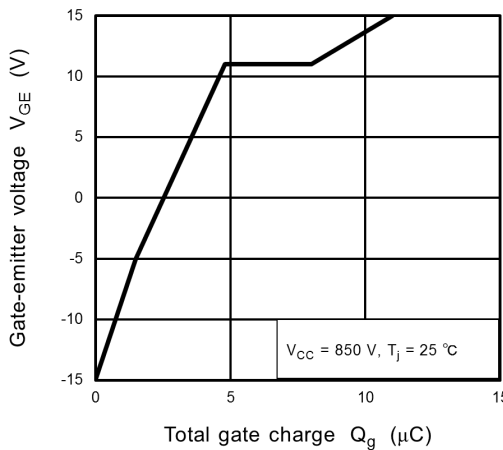


Fig. 7.5 $V_{GE} - Q_g$

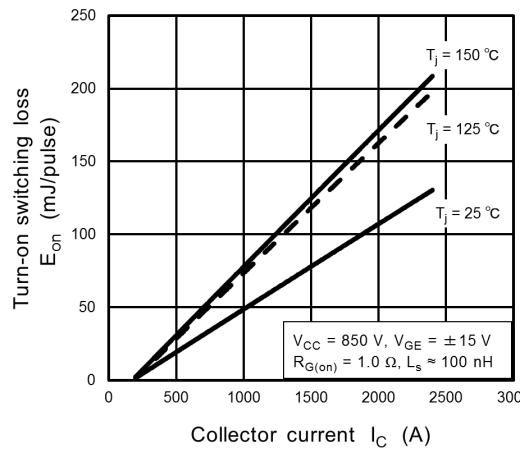


Fig. 7.6 $E_{on} - I_C$

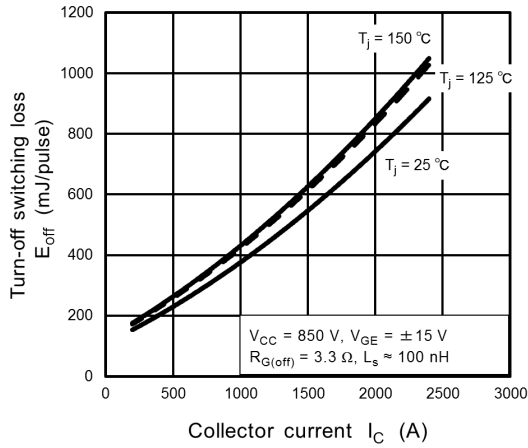


Fig. 7.7 $E_{off} - I_C$

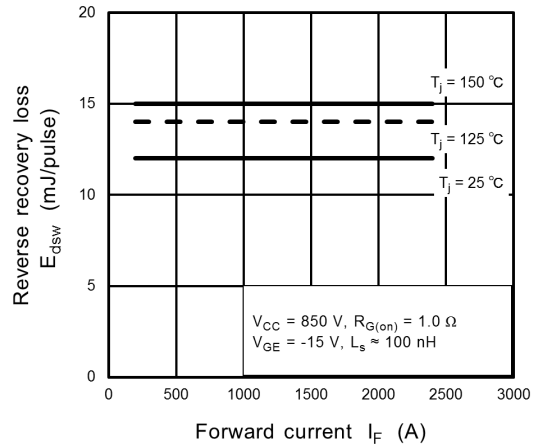


Fig. 7.8 $E_{dsw} - I_F$

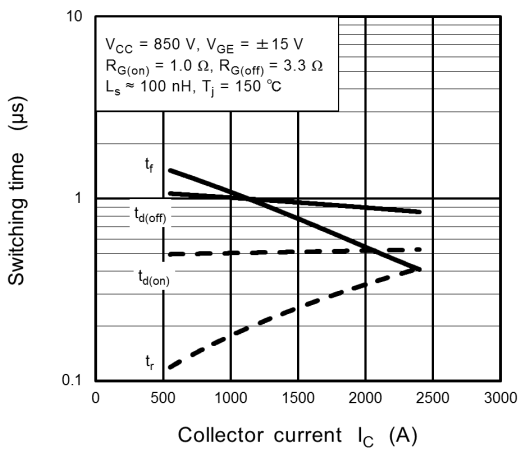


Fig. 7.9 $t_{d(on)}$, t_r , $t_{d(off)}$, $t_f - I_C$

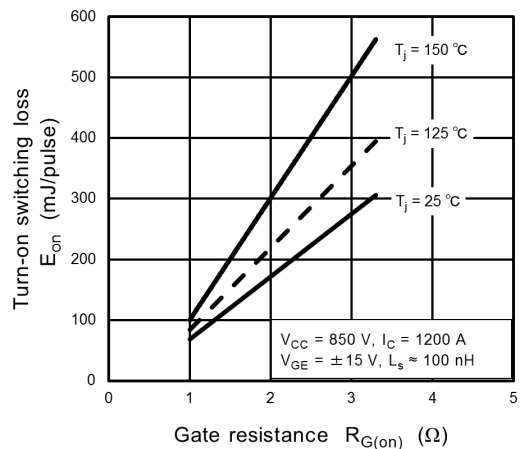


Fig. 7.10 $E_{on} - R_{G(on)}$

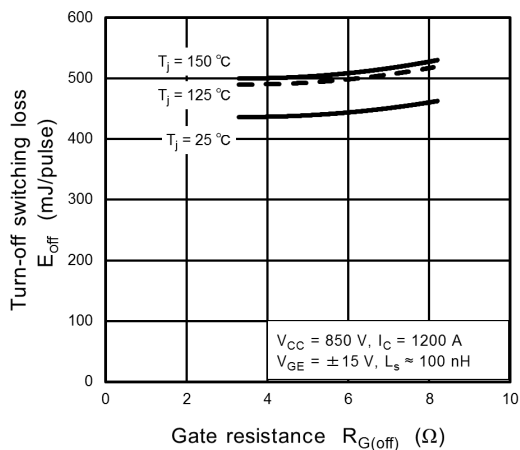


Fig. 7.11 $E_{off} - R_{G(off)}$

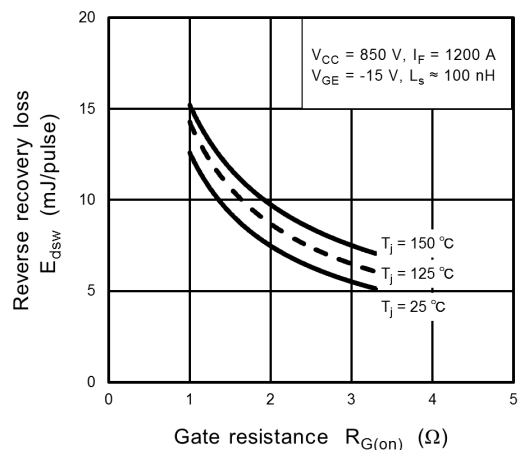
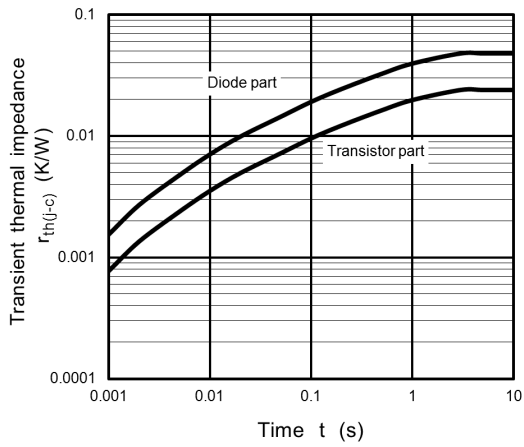


Fig. 7.12 $E_{dsw} - R_{G(on)}$



**Fig. 7.13 $r_{th(j-c)} - t$
(Guaranteed Maximum)**

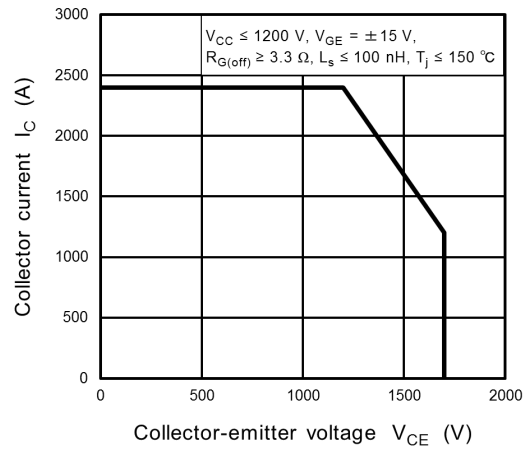
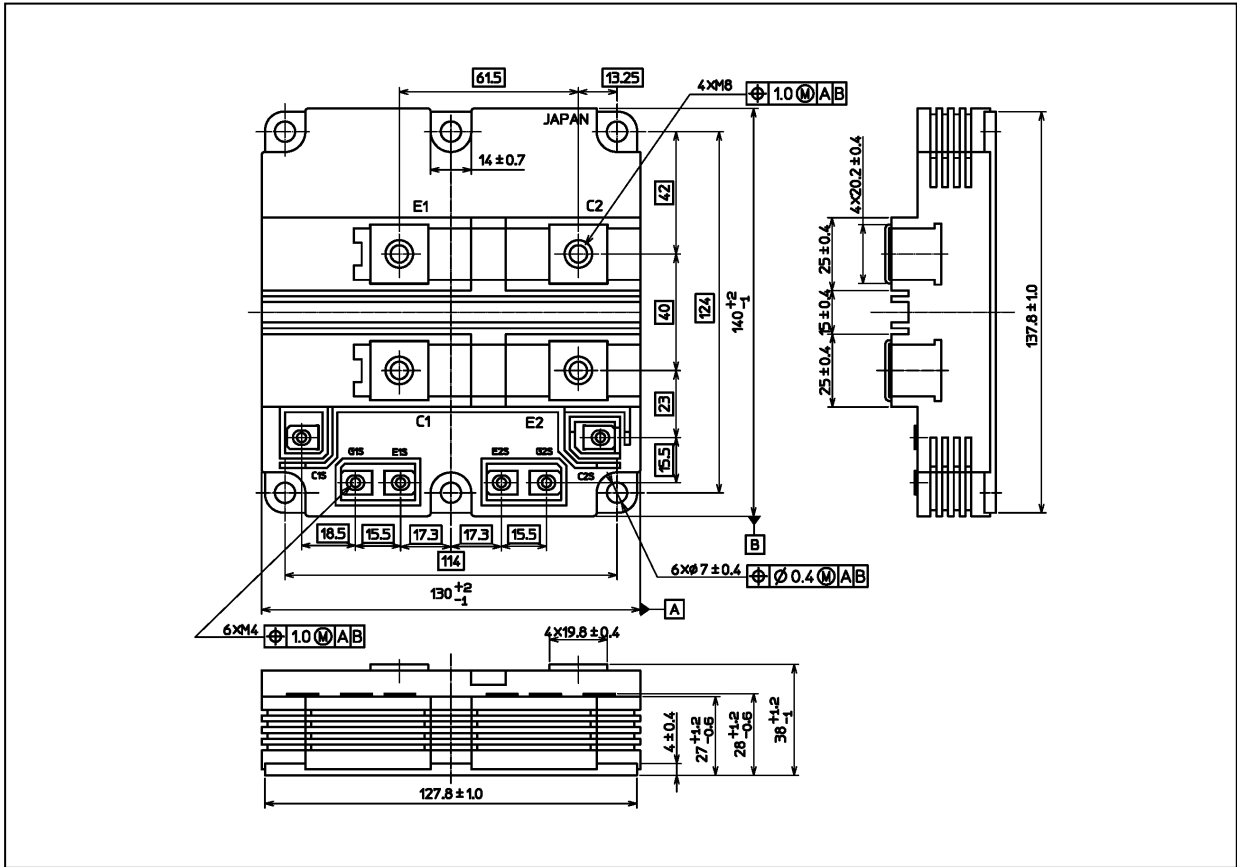


Fig. 7.14 RBSOA(Guaranteed Maximum)

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 800 g (typ.)

Package Name(s)
TOSHIBA: 2-142C1A
Nickname: PMI142C

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