

# 1MBI2400VC-170E

**IGBT Modules**

## IGBT MODULE (V series) 1700V / 2400A / 1 in one package

### ■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

### ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as Welding machines



### ■ Maximum Ratings and Characteristics

#### ● Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units
Collector-Emitter voltage	$V_{CES}$		1700	V
Gate-Emitter voltage	$V_{GES}$		±20	V
Collector current	$I_c$	Continuous	Tc=25°C 3600	A
	$I_{cp}$	1ms	4800	
	$-I_c$		2400	
	$-I_{c\ pulse}$	1ms	4800	
Collector power dissipation	$P_c$	1 device	15000	W
Junction temperature	$T_j$		175	°C
Operating junction temperature (under switching conditions)	$T_{jop}$		150	
Storage temperature	$T_{stg}$		-40 ~ +150	
Isolation voltage	Between terminal and copper base (*1) $V_{iso}$	AC : 1min.	4000	VAC
Screw torque (*2)	Mounting	M6	5.75	Nm
	Main Terminals	M8	10	
	Sense Terminals	M4	2.5	

Note \*1: All terminals should be connected together when isolation test will be done.

Note \*2: Recommendable Value :

Mounting 4.25~5.75 Nm (M6) , Main Terminals 8~10 Nm (M8) , Sense Terminals 1.7~2.5 Nm (M4)

● Electrical characteristics (at Tj= 25°C unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V, V_{CE} = 1700V$	-	-	1.0	mA	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	3200	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 2400mA$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (main terminal)	$V_{GE} = 15V$ $I_c = 2400A$	$T_j = 25^\circ C$	-	2.32	2.61	V
			$T_j = 125^\circ C$	-	2.72	-	
			$T_j = 150^\circ C$	-	2.77	-	
	$V_{CE(sat)}$ (chip)		$T_j = 25^\circ C$	-	2.00	2.25	
			$T_j = 125^\circ C$	-	2.40	-	
			$T_j = 150^\circ C$	-	2.45	-	
Internal gate resistance	Int Rg		-	0.94	-	$\Omega$	
Input capacitance	$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	218	-	nF	
Turn-on	$t_{on}$	$V_{CC} = 900V, I_c = 2400A$ $L_m = 56nH, V_{GE} = \pm 15V, T_j = 125^\circ C$	-	2.63	-	$\mu s$	
	$t_r$		-	0.94	-		
Turn-off	$t_{off}$	$R_{gon} = 0.82 \Omega$	-	2.41	-	$\mu s$	
	$t_f$	$R_{goff} = 0.39 \Omega$	-	0.38	-		
Forward on voltage	$V_F$ (main terminal)	$V_{GE} = 0V$ $I_F = 2400A$	$T_j = 25^\circ C$	-	2.12	2.52	V
			$T_j = 125^\circ C$	-	2.32	-	
			$T_j = 150^\circ C$	-	2.30	-	
	$V_F$ (chip)		$T_j = 25^\circ C$	-	1.80	2.15	
			$T_j = 125^\circ C$	-	2.00	-	
			$T_j = 150^\circ C$	-	1.98	-	
Reverse recovery	$t_{rr}$	$I_F = 2400A, T_j = 125^\circ C$	-	0.60	-	$\mu s$	
Lead resistance, terminal-chip	R lead		-	0.134	-	m $\Omega$	

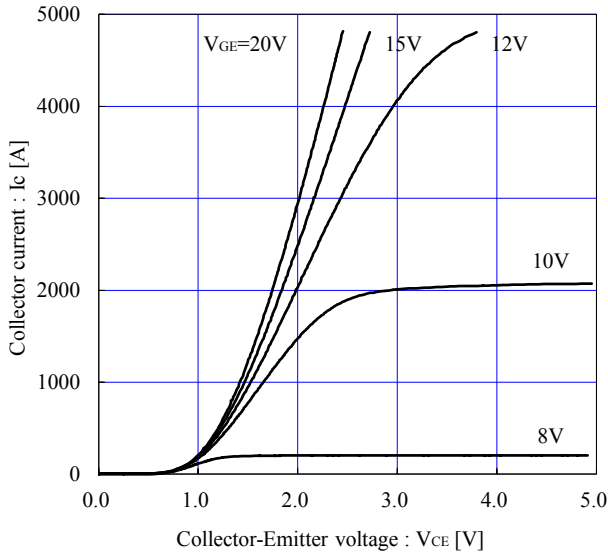
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance	$R_{th(j-c)}$	IGBT	-	-	0.0100	$^\circ C/W$
		FWD	-	-	0.0165	
Contact thermal resistance (*3)	$R_{th(c-f)}$	with Thermal Compound	-	0.006	-	

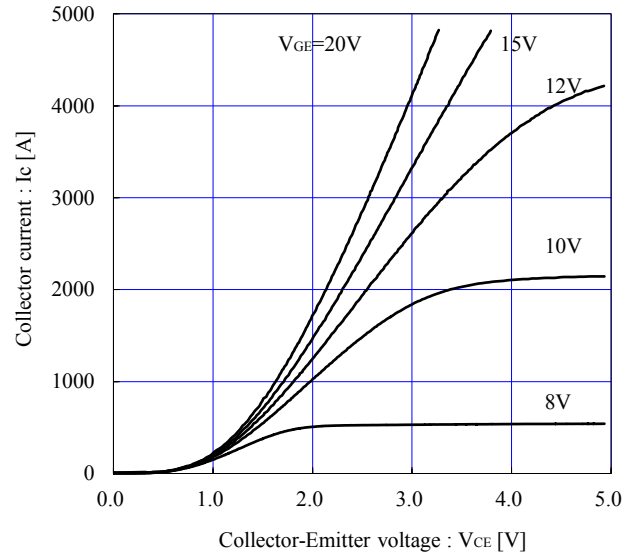
Note \*3: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

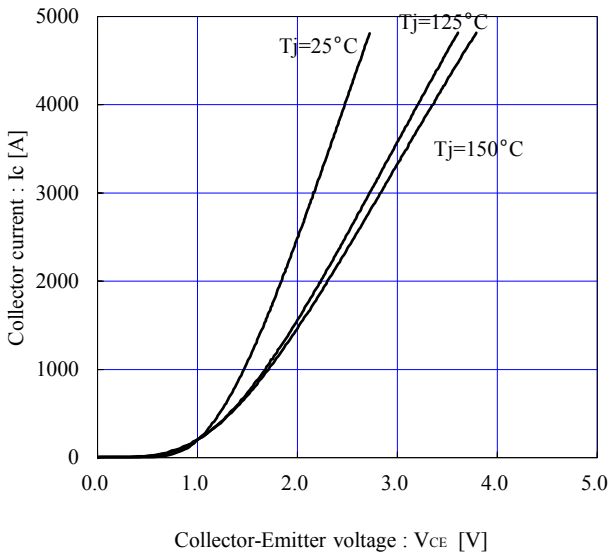
Collector current vs. Collector-Emittor voltage (typ.)  
Tj=25°C, chip



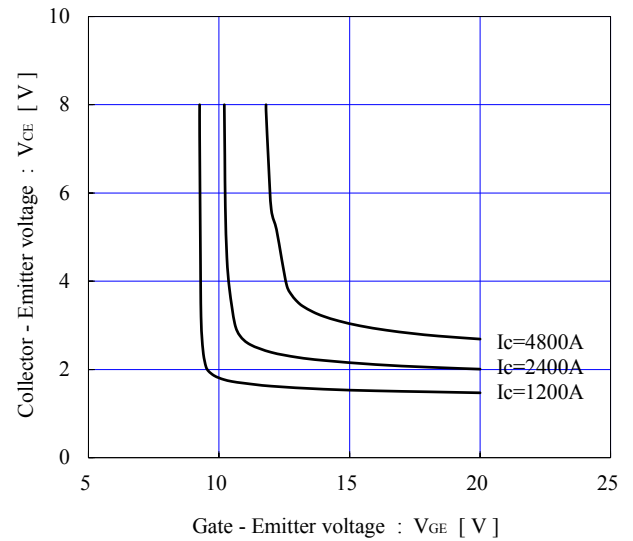
Collector current vs. Collector-Emittor voltage (typ.)  
Tj= 150°C, chip



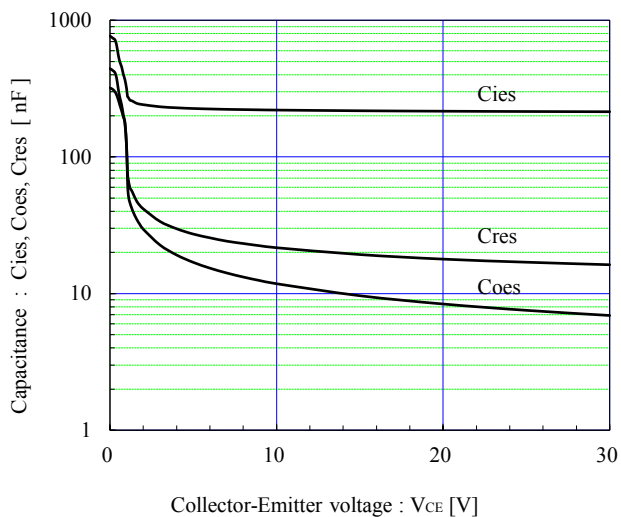
Collector current vs. Collector-Emittor voltage (typ.)  
VGE=+15V, chip



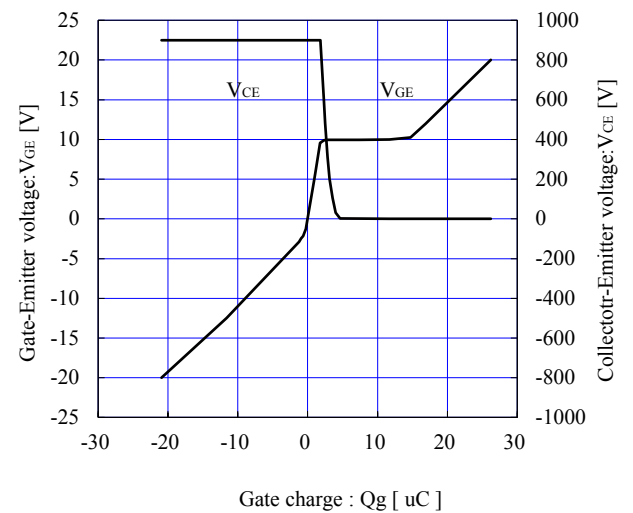
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
Tj=25°C, chip



Capacitance vs. Collector-Emittor voltage (typ.)  
VGE=0V, f= 1MHz, Tj= 25°C

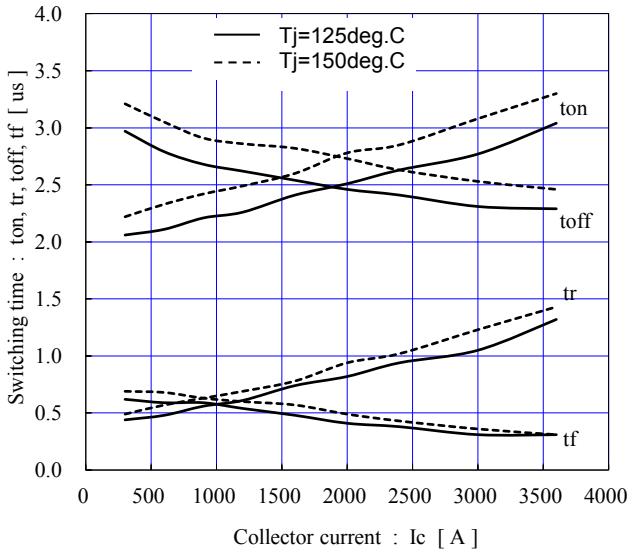


Dynamic Gate charge (typ.)  
Tj= 25°C



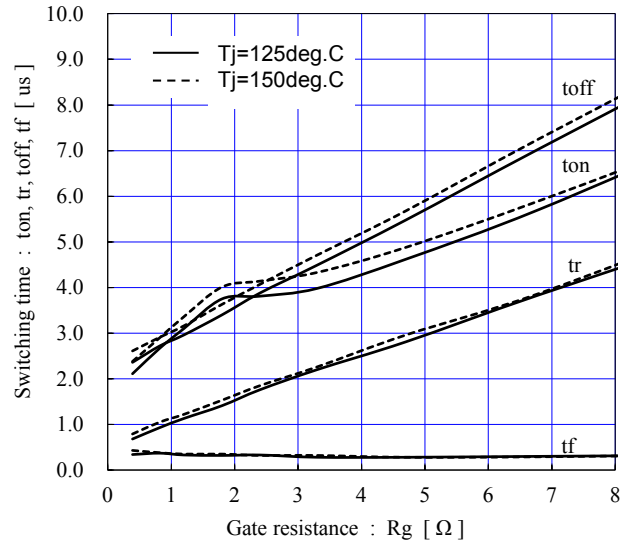
Switching time vs. Collector current (typ.)

V<sub>cc</sub>=900V, V<sub>GE</sub>=±15V, R<sub>gon</sub>=0.82Ω, R<sub>goff</sub>=0.39Ω



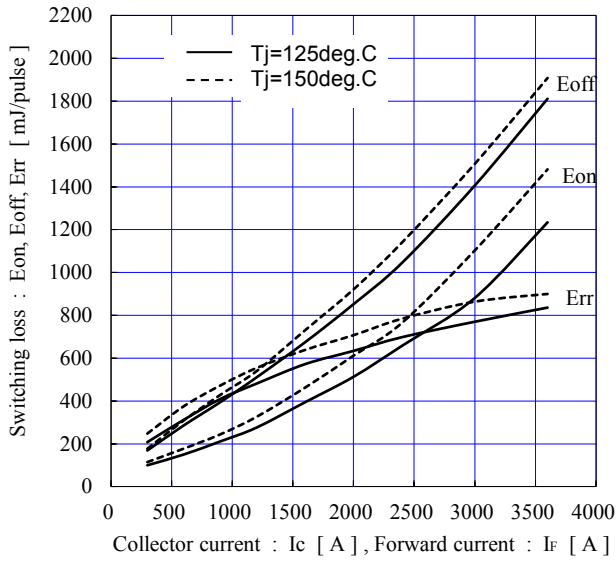
Switching time vs. Gate resistance (typ.)

V<sub>cc</sub>=900V, I<sub>c</sub>=2400A, V<sub>GE</sub>=±15V



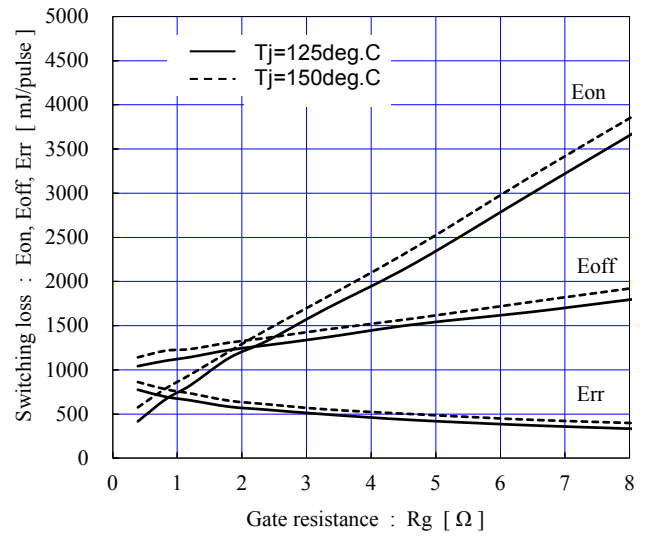
Switching loss vs. Collector current (typ.)

V<sub>cc</sub>=900V, V<sub>GE</sub>=±15V, R<sub>gon</sub>=0.82Ω, R<sub>goff</sub>=0.39Ω



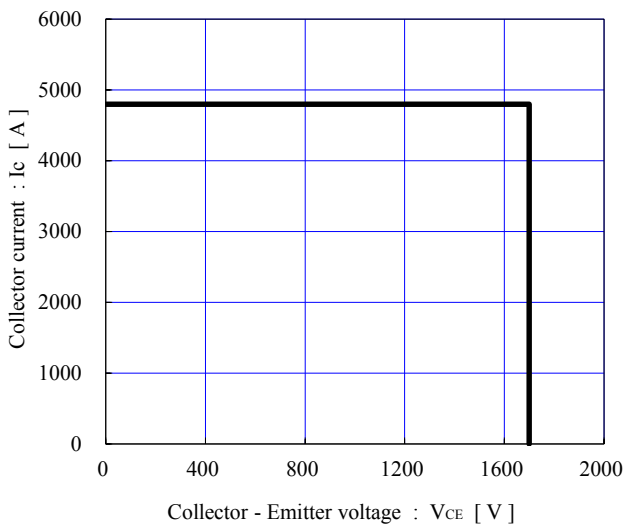
Switching loss vs. Gate resistance (typ.)

V<sub>cc</sub>=900V, I<sub>c</sub>=2400A, V<sub>GE</sub>=±15V

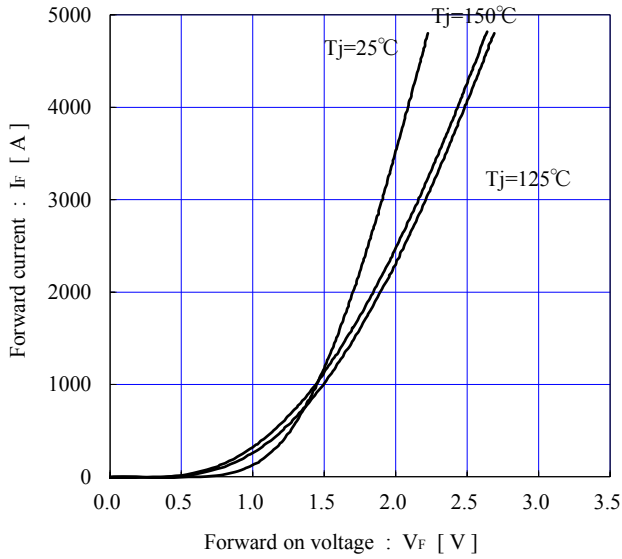


Reverse bias safe operating area (max.)

±V<sub>GE</sub>=15V, T<sub>j</sub> = 150°C / chip

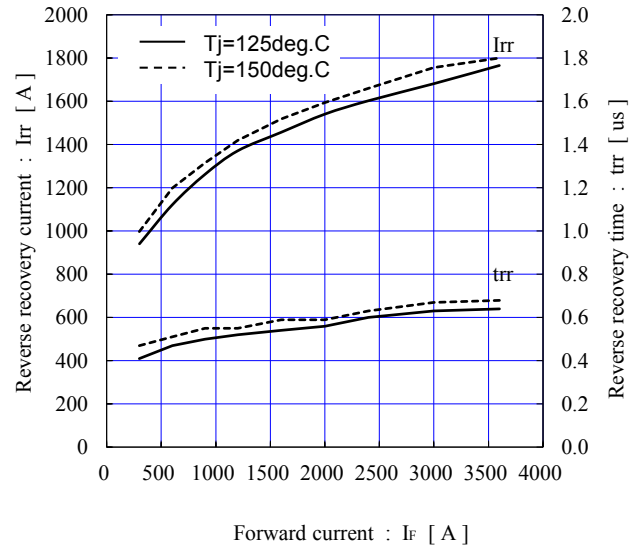


Forward current vs. Forward on voltage (typ.)  
chip

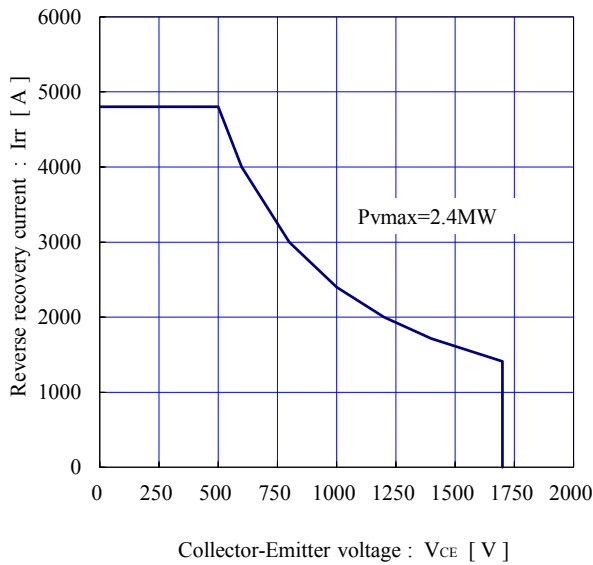


Reverse recovery characteristics (typ.)

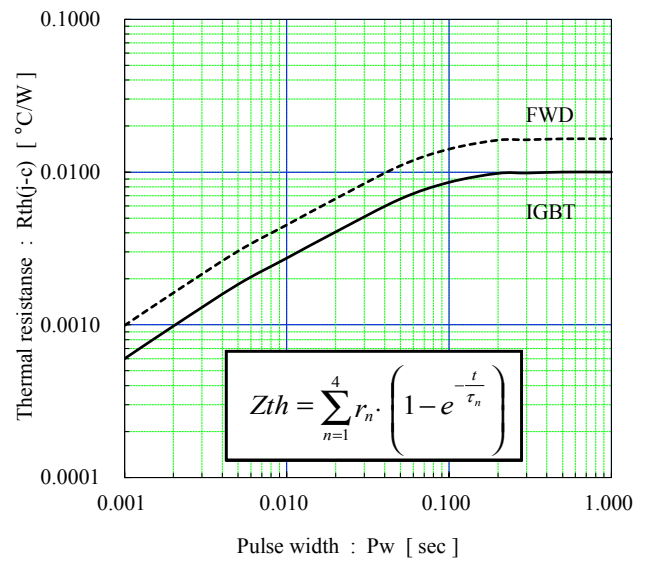
V<sub>CC</sub>=900V, V<sub>GE</sub>=±15V, R<sub>gon</sub>=0.82Ω



FWD safe operating area (max.)  
T<sub>j</sub>=150°C / sence terminals

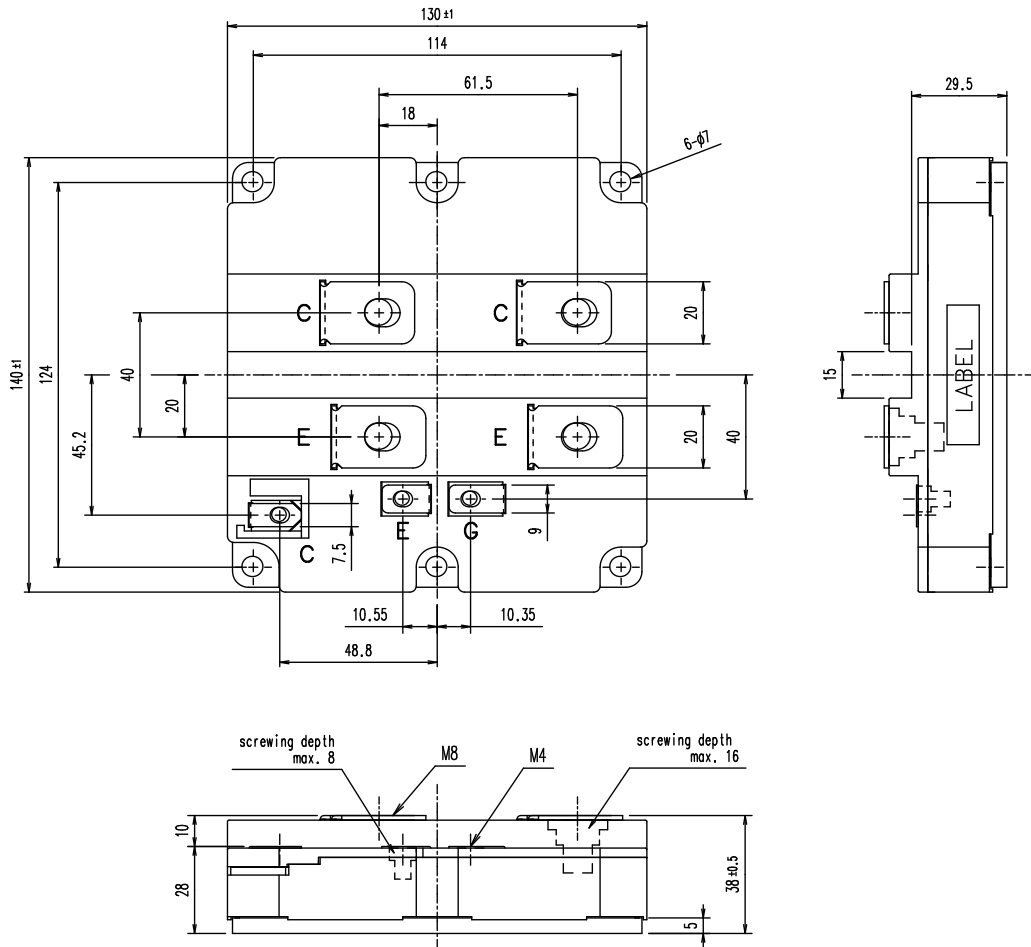


Transient thermal resistance (max.)

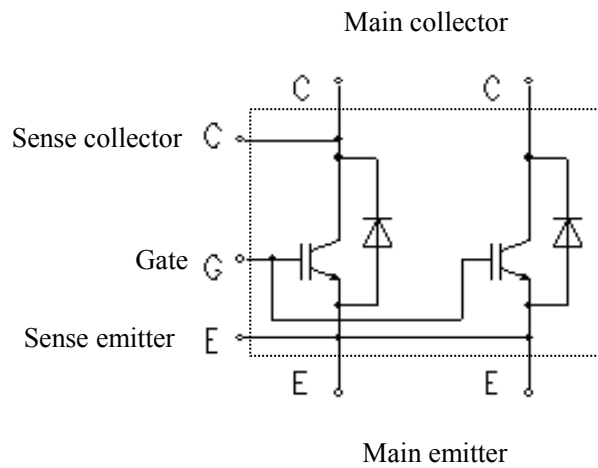


	IGBT	FWD
r1	0.00217	0.00275
r2	0.00317	0.00568
r3	0.00256	0.00447
r4	0.00210	0.00360
τ1	0.0078	0.0044
τ2	0.0473	0.0470
τ3	0.0596	0.0562
τ4	0.0783	0.0719

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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