

# 1MBI1000UG-330

**IGBT Modules**

## IGBT MODULE (U series) 3300V / 1000A / 1 in one package

### ■ Features

- AlSiC Baseplate
- AlN DCB substrate
- CTI ≥ 600
- V<sub>iso</sub> 6000 Vac
- Low Inductance module structure



### ■ Applications

- Traction drives
- Industrial motor drives
- Wind power
- Chopper

### ■ Maximum Ratings and Characteristics

#### ● Absolute Maximum Ratings (at T<sub>c</sub>=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units
Collector-Emitter voltage	V <sub>CES</sub>		3300	V
Gate-Emitter voltage	V <sub>GES</sub>		±20	V
Collector current	I <sub>c</sub>	T <sub>c</sub> =95°C	1000	A
	I <sub>c pulse</sub>	1ms	2000	
	-I <sub>c</sub>		1000	
	-I <sub>c pulse</sub>	1ms	2000	
Collector power dissipation	P <sub>C</sub>	1 device	10.4	kW
Junction temperature	T <sub>j</sub>		150	°C
Storage temperature	T <sub>stg</sub>		-40 ~ +125	°C
Isolation voltage   Between terminal and copper base (*1)	V <sub>iso</sub>	AC : 1min.	6.0	kVAC
Partial discharge extinction voltage	V <sub>e</sub>	AC, Q≤10pC (acc. To IEC 1287)	2.6	kVAC
Screw torque (*2)	Mounting		5.75	N·m
	Main Terminals		10	
	Sense Terminals		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 N·m (M6), Main Terminal : 8-10 N·m (M8), Sense Terminal : 1.7-2.5 N·m (M4)

● Electrical characteristics (at T<sub>j</sub> = 25°C unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I <sub>CES</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 3300V	-	-	1.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	3200	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 1000mA	6.0	6.75	7.5	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (main terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 1000A	T <sub>j</sub> = 25°C	-	2.59	3.09	V
			T <sub>j</sub> = 125°C	-	3.37	-	
			T <sub>j</sub> = 150°C	-	3.56	-	
	V <sub>CE(sat)</sub> (chip)		T <sub>j</sub> = 25°C	-	2.46	2.96	
			T <sub>j</sub> = 125°C	-	3.24	-	
			T <sub>j</sub> = 150°C	-	3.43	-	
Internal gate resistance	Int R <sub>g</sub>		-	0.84	-	Ω	
Input capacitance	C <sub>es</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 10V, f = 1MHz	-	200	-	nF	
Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 1800V, I <sub>c</sub> = 1000A V <sub>GE</sub> = ±15V, T <sub>j</sub> = 150°C R <sub>g</sub> = 1.6Ω, L <sub>m</sub> = 167nH	-	2.5	-	μs	
	t <sub>r</sub>		-	1.8	-		
Turn-off time	t <sub>off</sub>		-	2.0	-		
	t <sub>f</sub>		-	0.5	-		
Forward on voltage	V <sub>F</sub> (main terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 1000A	T <sub>j</sub> = 25°C	-	2.51	3.11	V
			T <sub>j</sub> = 125°C	-	2.81	-	
			T <sub>j</sub> = 150°C	-	2.77	-	
	V <sub>F</sub> (chip)		T <sub>j</sub> = 25°C	-	2.35	2.95	
			T <sub>j</sub> = 125°C	-	2.65	-	
			T <sub>j</sub> = 150°C	-	2.61	-	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 1000A, T <sub>j</sub> = 150°C	-	0.94	-	μs	
Lead resistance, terminal-chip	R <sub>lead</sub>		-	0.156	-	mΩ	

● Thermal resistance characteristics

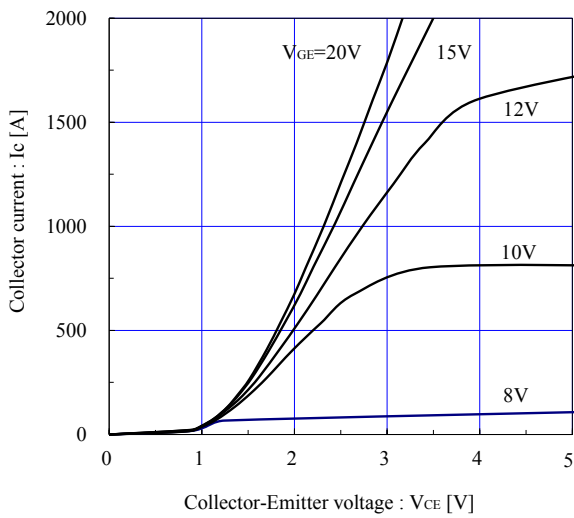
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	IGBT	-	-	12.0	°C/kW
		FWD	-	-	22.5	
Contact thermal resistance (1device)	R <sub>th(c-f)</sub>	with Thermal Compound (*3)	-	7.7	-	

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

■ Characteristics (Representative)

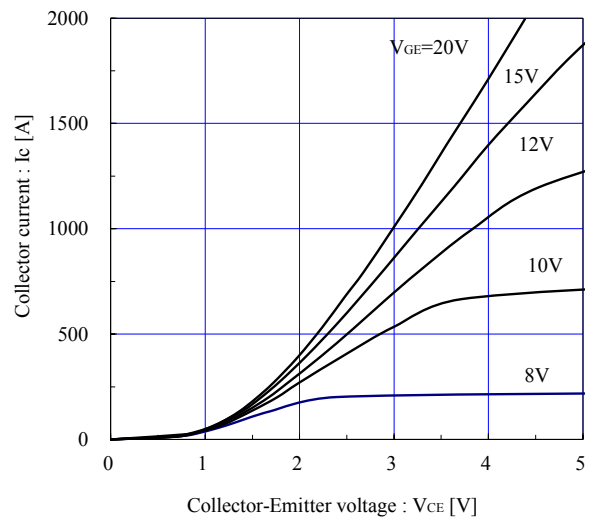
Collector current vs. Collector-Emmitter voltage (typ.)

$T_j = 25^\circ\text{C}$  / chip



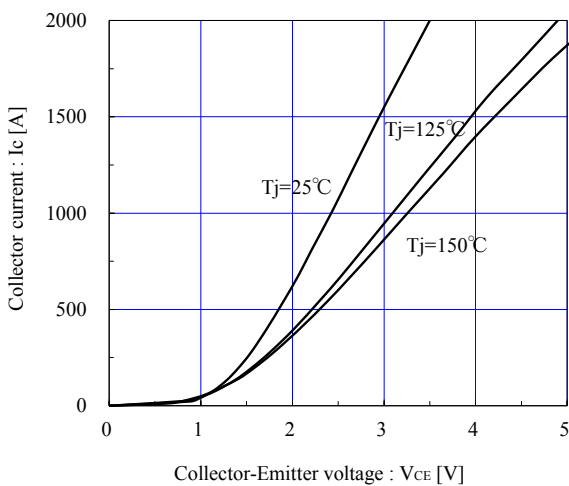
Collector current vs. Collector-Emmitter voltage (typ.)

$T_j = 150^\circ\text{C}$  / chip



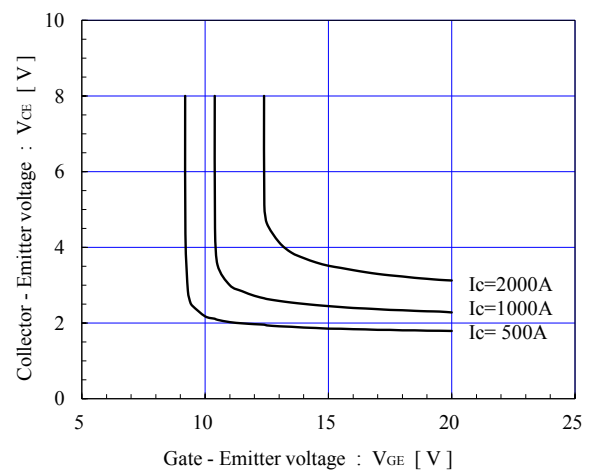
Collector current vs. Collector-Emmitter voltage (typ.)

$V_{GE} = 15\text{V}$  / chip



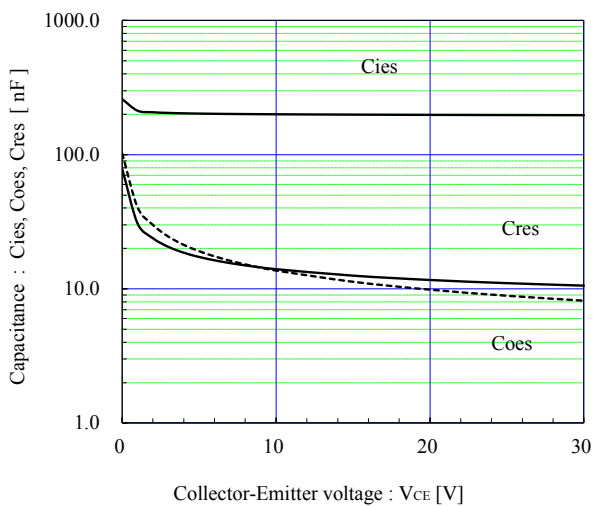
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)

$T_j = 25^\circ\text{C}$  / chip



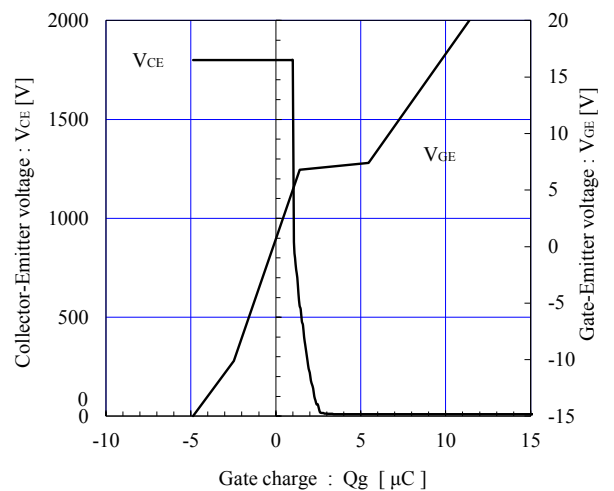
Capacitance vs. Collector-Emmitter voltage (typ.)

$V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$



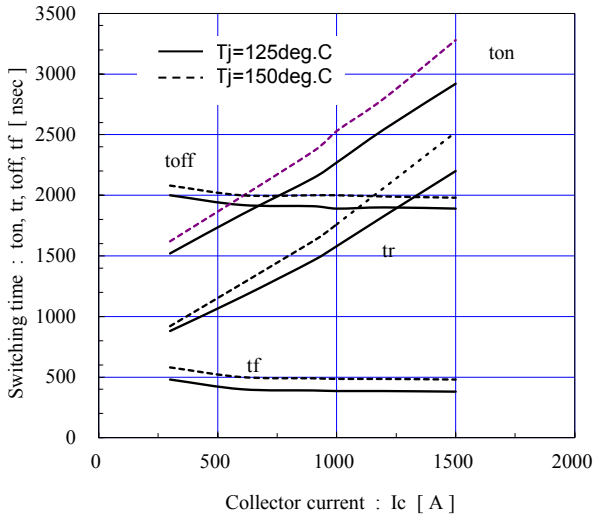
Dynamic Gate charge (typ.)

$V_{CC} = 1800\text{V}$ ,  $T_j = 25^\circ\text{C}$



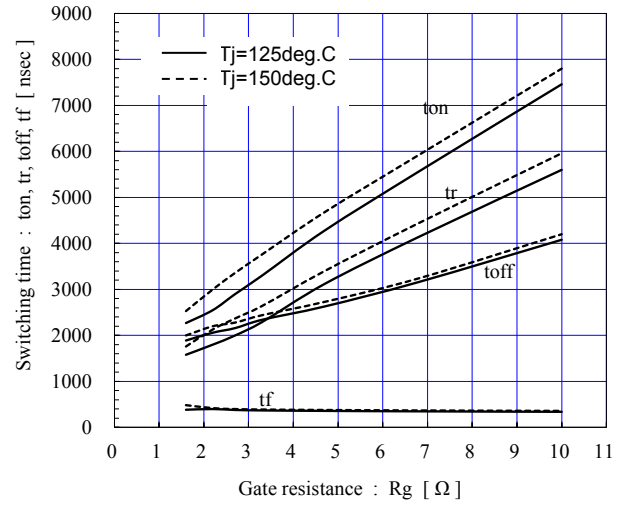
**Switching time vs. Collector current (typ.)**

V<sub>cc</sub>=1800V, V<sub>GE</sub>=±15V, R<sub>g</sub>=±1.6Ω, L<sub>m</sub>=160nH



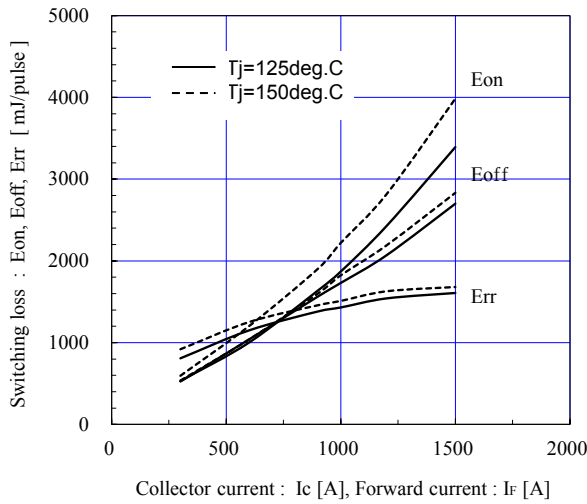
**Switching time vs. Gate resistance (typ.)**

V<sub>cc</sub>=1800V, I<sub>c</sub>=1500A, V<sub>GE</sub>=±15V, L<sub>m</sub>=160nH



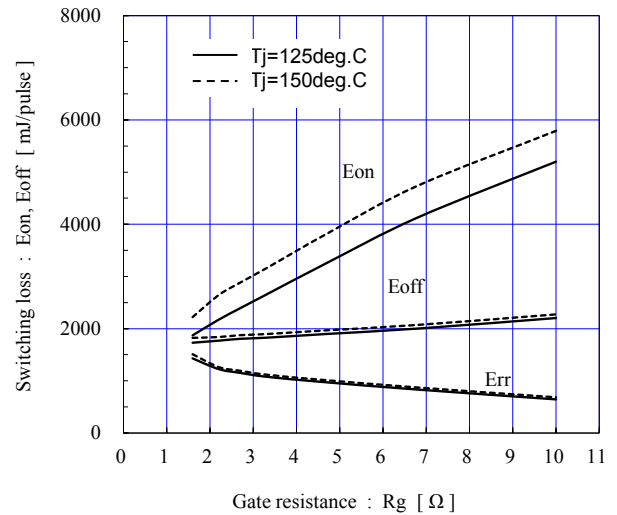
**Switching loss vs. Collector current (typ.)**

V<sub>cc</sub>=1800V, V<sub>GE</sub>=±15V, R<sub>g</sub>=±1.6Ω, L<sub>m</sub>=160nH



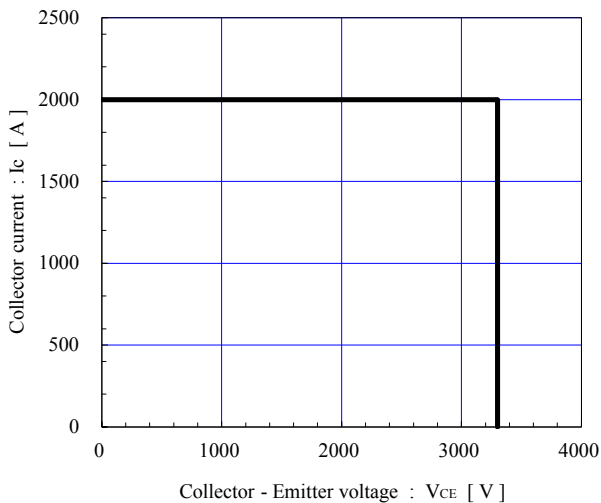
**Switching loss vs. Gate resistance (typ.)**

V<sub>cc</sub>=1800V, V<sub>GE</sub>=±15V, I<sub>c</sub>=1500A, L<sub>m</sub>=160nH

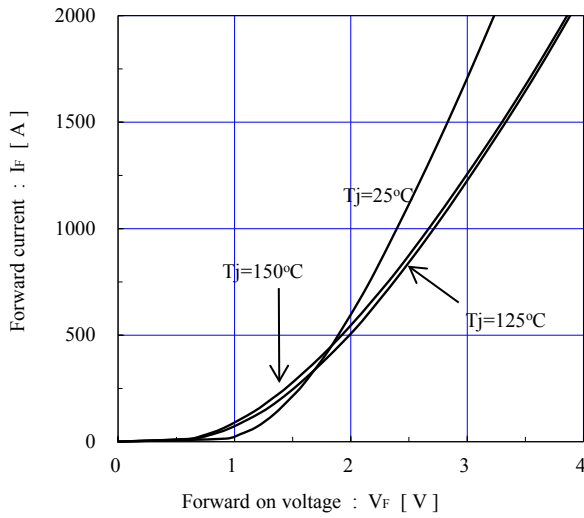


**Reverse bias safe operating area (max.)**

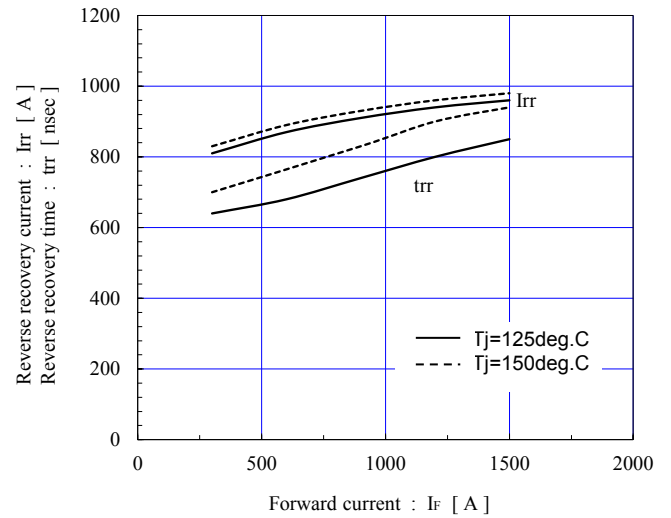
±V<sub>GE</sub>=15V, T<sub>j</sub>=150°C / chip



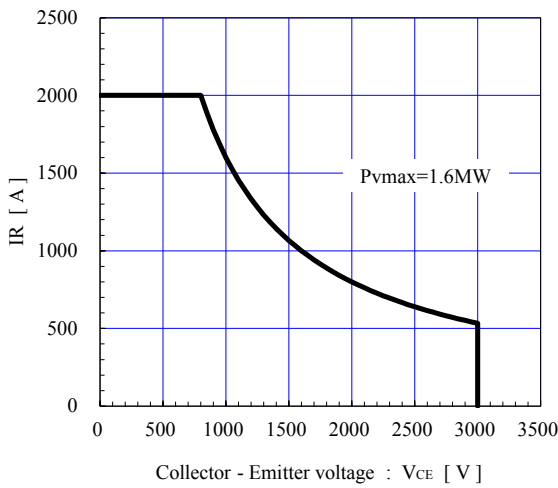
**Forward current vs. Forward on voltage (typ.)**  
chip



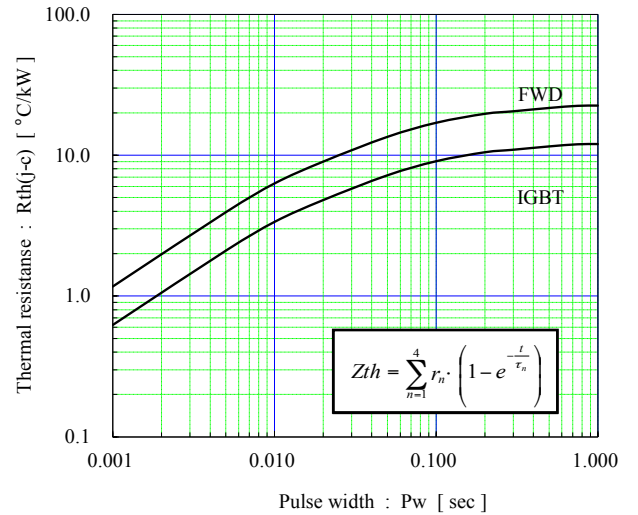
**Reverse recovery characteristics (typ.)**  
V<sub>CC</sub>=1800V, V<sub>GE</sub>=±15V, R<sub>g</sub>=±1.6Ω, L<sub>m</sub>=160nH



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

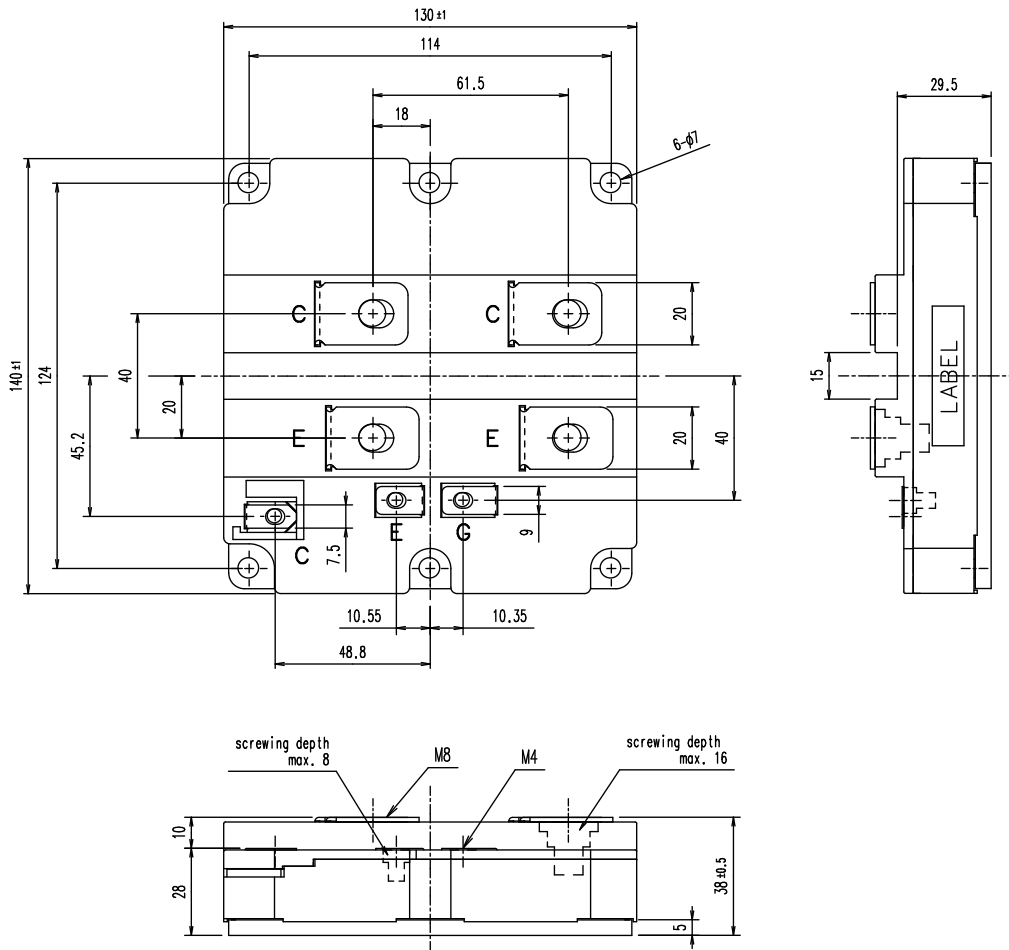


**Transient thermal resistance (max.)**

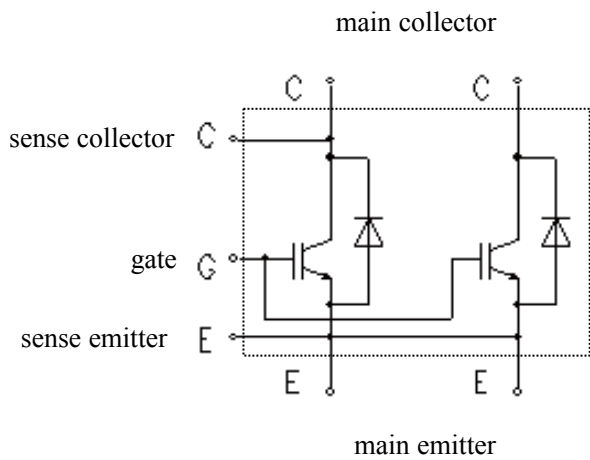


	IGBT	FWD
r1	0.00213	0.00400
r2	0.00309	0.00580
r3	0.00305	0.00572
r4	0.00372	0.00698
τ1	0.0050	0.0050
τ2	0.0404	0.0404
τ3	0.0410	0.0410
τ4	0.2271	0.2271

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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