

# 2MBI600U4G-120

IGBT Modules

## IGBT MODULE (U series) 1200V / 600A / 2 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 <sub>CEs</sub>		1200	V	
Gate-Emitter voltage	V <sub>GES</sub>		±20	V	
Collector current	I <sub>c</sub>	Continuous	Tc=25°C	800	A
			Tc=80°C	600	
	I <sub>c</sub> pulse	1ms	Tc=25°C	1600	
			Tc=80°C	1200	
	-I <sub>c</sub>			600	
-I <sub>c</sub> pulse	1ms		1200		
Collector power dissipation	P <sub>c</sub>	1 device	3670	W	
Junction temperature	T <sub>j</sub>		150	°C	
Storage temperature	T <sub>stg</sub>		-40 ~ +125		
Isolation voltage	Between terminal and copper base (*1)	AC : 1min.	4000	VAC	
	Mounting (*2)		5.75		
Screw torque	Terminals (*3)		10	N m	
			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)

Note \*3: Recommendable Value : 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 <sub>CEs</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V	-	-	1.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	1200	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 600mA	5.5	6.5	7.5	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (main terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 600A	Tj=25°C	-	2.08	2.26	V
			Tj=125°C	-	2.28	-	
	V <sub>CE(sat)</sub> (chip)		Tj=25°C	-	1.90	2.05	
			Tj=125°C	-	2.10	-	
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	68	-	nF	
Turn-on	t <sub>on</sub>	V <sub>CC</sub> = 600V I <sub>c</sub> = 600A R <sub>son</sub> = 6.8Ω R <sub>goff</sub> = 2Ω	-	1.35	-	μs	
	t <sub>r</sub>		-	0.65	-		
Turn-off	t <sub>off</sub>	V <sub>GE</sub> = ±15V Tj = 125°C	-	0.80	-	μs	
	t <sub>f</sub>		-	0.20	-		
Forward on voltage	V <sub>F</sub> (main terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 600A	Tj=25°C	-	1.83	2.01	V
			Tj=125°C	-	1.93	-	
	V <sub>F</sub> (chip)		Tj=25°C	-	1.65	1.80	
			Tj=125°C	-	1.75	-	
Reverse recovery	t <sub>rr</sub>	I <sub>F</sub> = 600A	-	0.45	-	μs	
Lead resistance, terminal-chip (*4)	R <sub>lead</sub>		-	0.29	-	mΩ	

Note \*4: Biggest internal terminal resistance among arm.

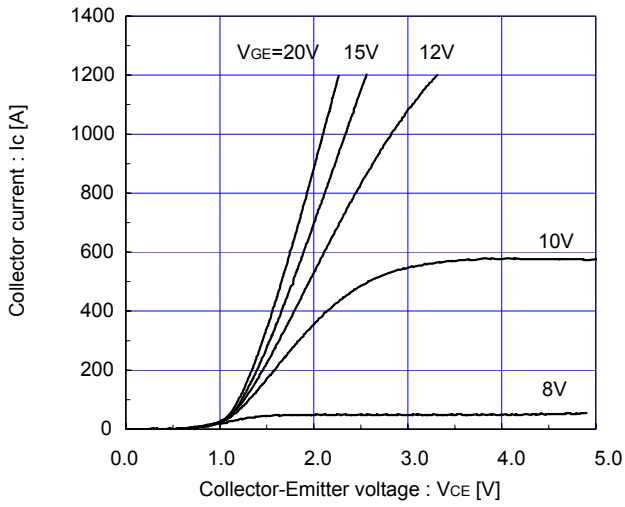
#### ● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	IGBT FWD	-	-	0.034	°C/W
Contact thermal resistance (1device)	R <sub>th(c-f)</sub>	with Thermal Compound (*5)	-	0.006	-	

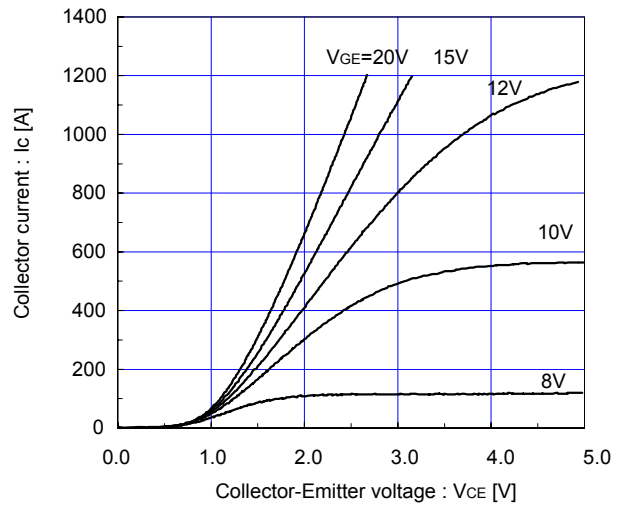
Note \*5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

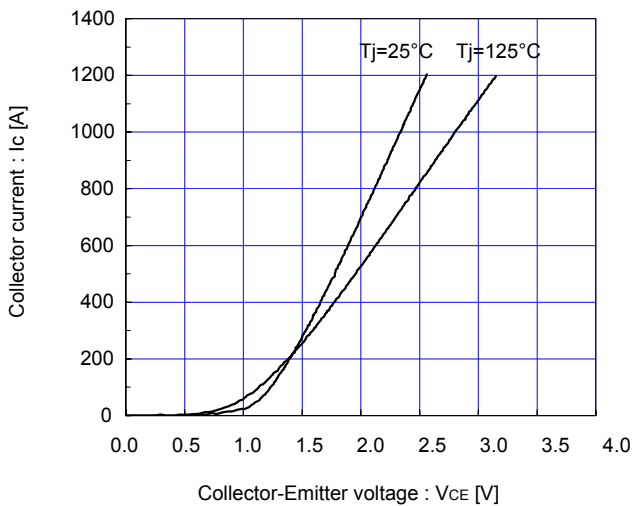
Collector current vs. Collector-Emitter voltage (typ.)  
Tj=25°C, chip



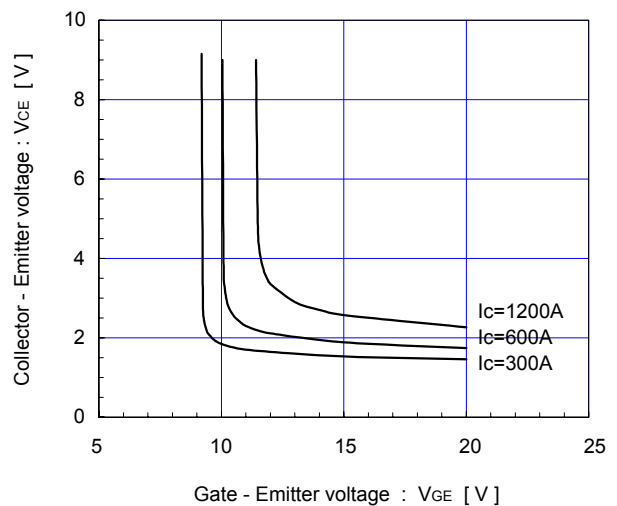
Collector current vs. Collector-Emitter voltage (typ.)  
Tj= 125°C, chip



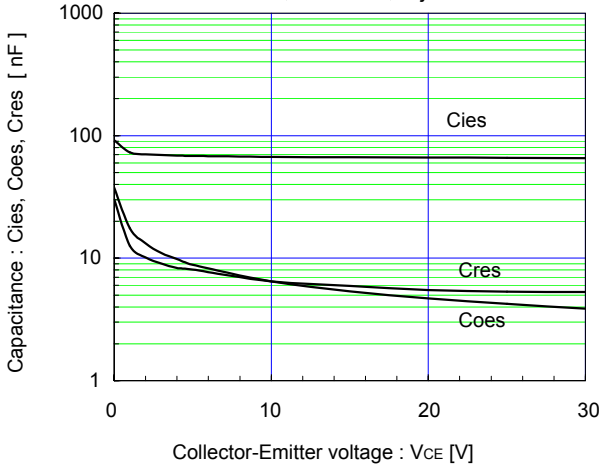
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)  
VGE=+15V, chip



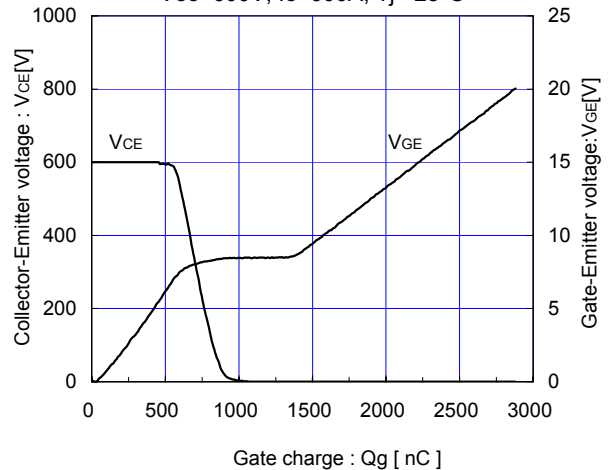
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)  
Tj=25°C, chip



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

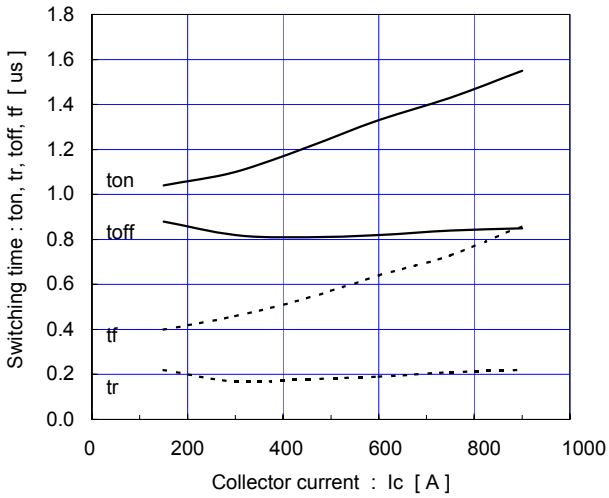


Dynamic Gate charge (typ.)  
Vcc=600V, Ic=600A, Tj= 25°C



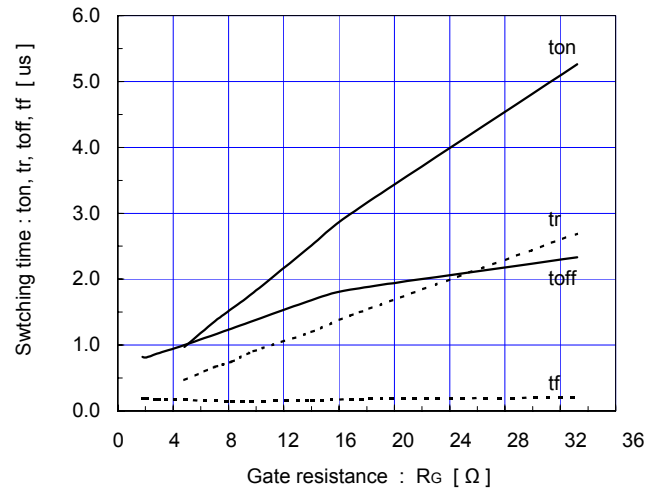
Switching time vs. Collector current (typ.)

V<sub>cc</sub>=600V, V<sub>GE</sub>=±15V, R<sub>Gon</sub>=6.8Ω, R<sub>Goff</sub>=2Ω, T<sub>j</sub>= 125°C



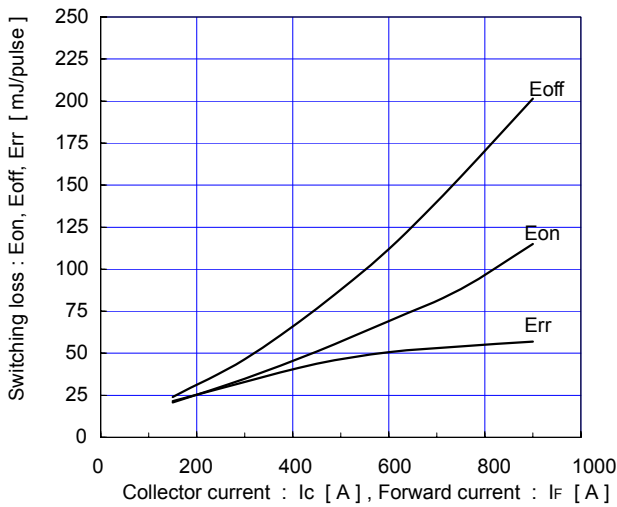
Switching time vs. Gate resistance (typ.)

V<sub>cc</sub>=600V, I<sub>c</sub>=600A, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C



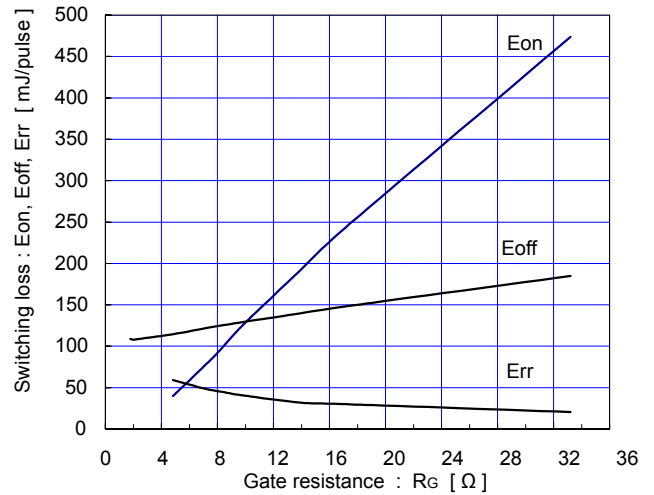
Switching loss vs. Collector current (typ.)

V<sub>cc</sub>=600V, V<sub>GE</sub>=±15V, R<sub>Gon</sub>=6.8Ω, R<sub>Goff</sub>=2Ω, T<sub>j</sub>= 125°C



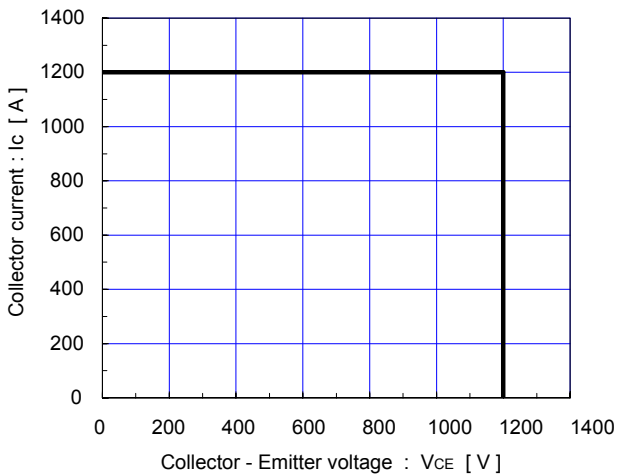
Switching loss vs. Gate resistance (typ.)

V<sub>cc</sub>=600V, I<sub>c</sub>=600A, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C

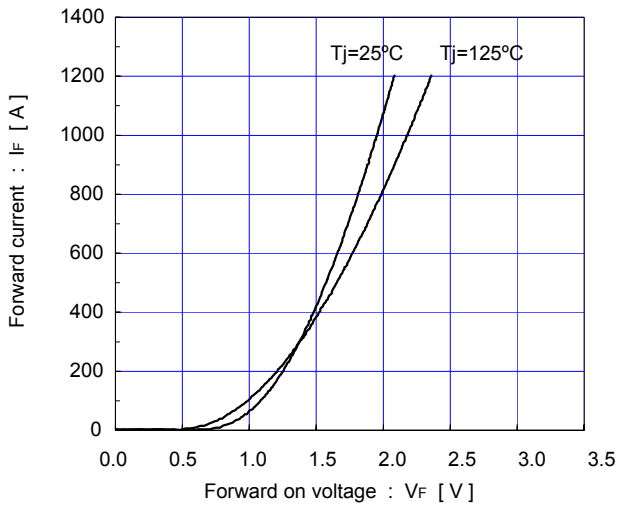


Reverse bias safe operating area (max.)

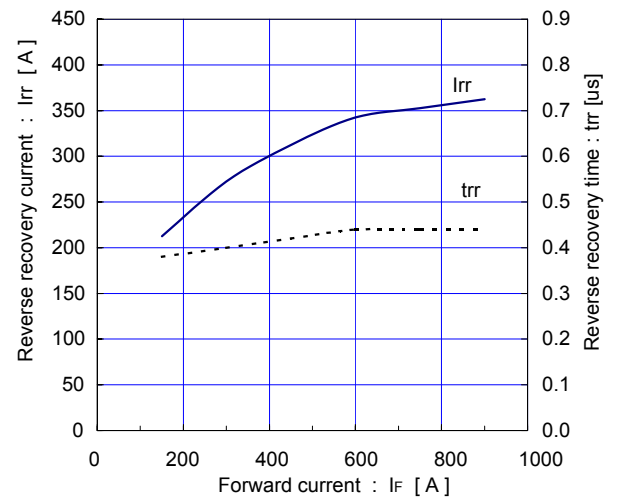
±V<sub>GE</sub>=15V, T<sub>j</sub> = 125°C / chip



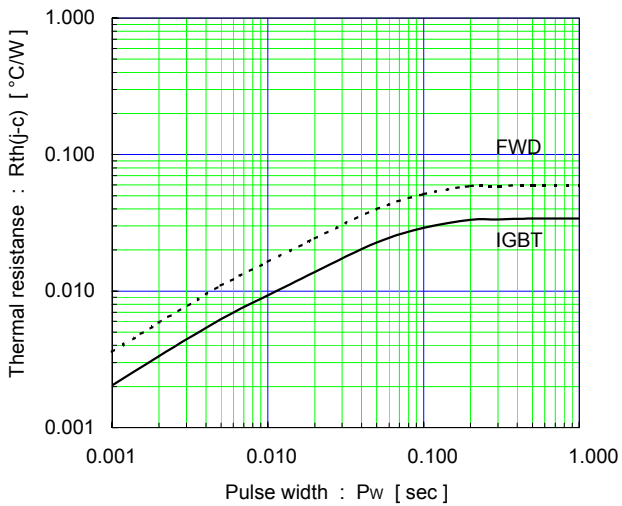
Forward current vs. Forward on voltage (typ.)  
chip



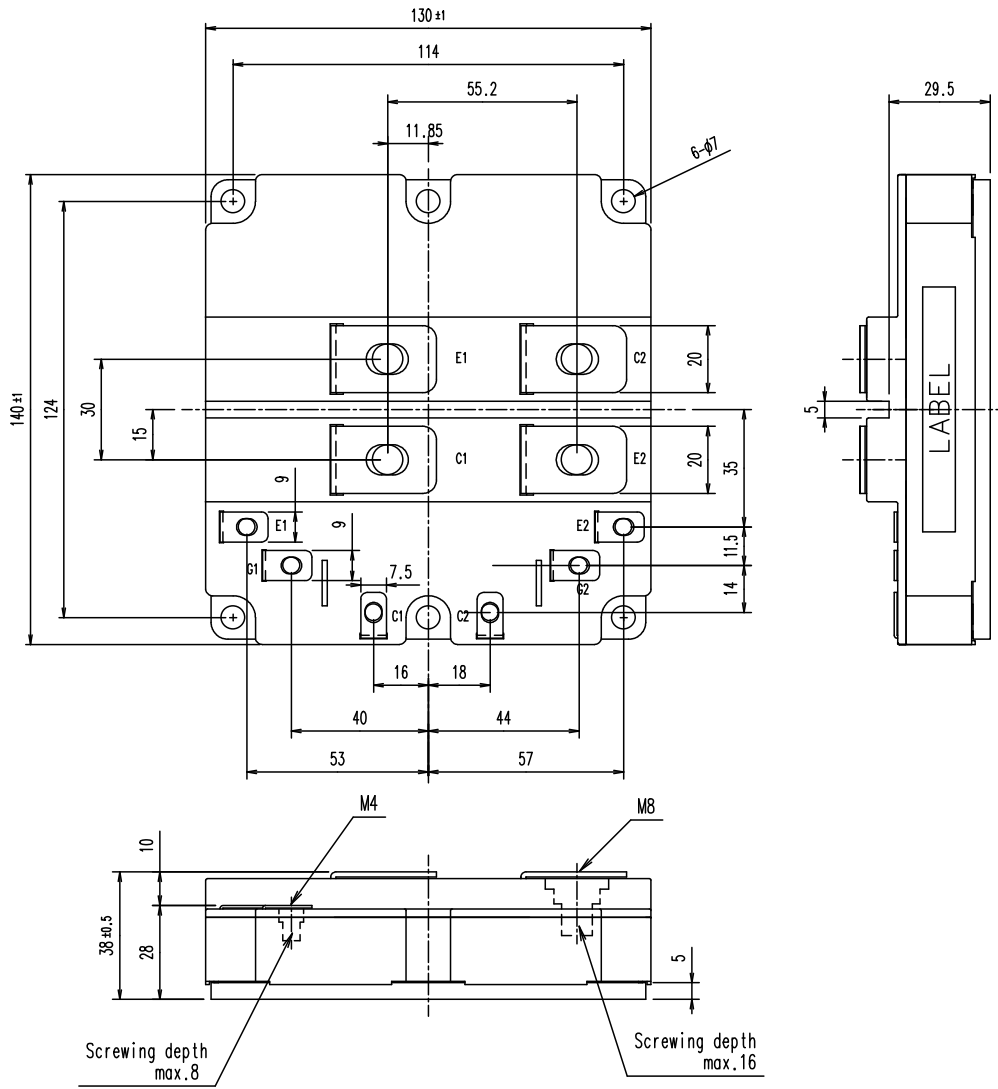
Reverse recovery characteristics (typ.)  
 $V_{CC}=600\text{V}$ ,  $V_{GE}=\pm 15\text{V}$ ,  $R_G=6.8\Omega$ ,  $T_j=125^\circ\text{C}$



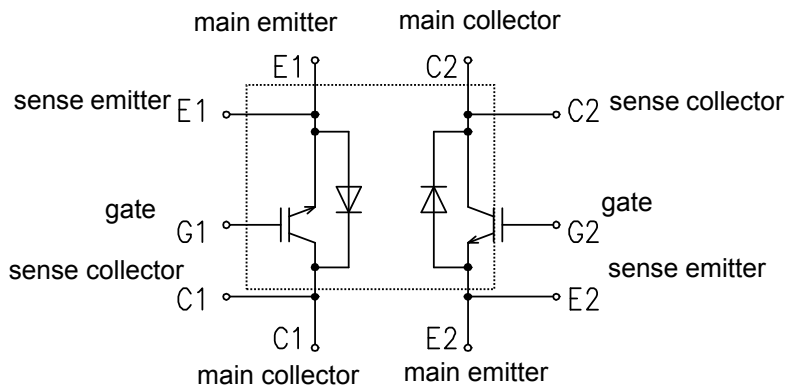
Transient thermal resistance (max.)



■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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