

# 6MBI180VX-120-55

IGBT Modules

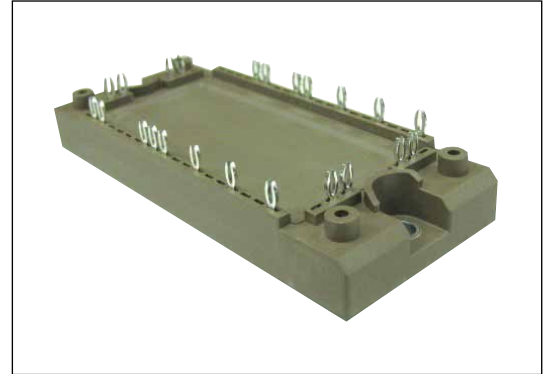
## IGBT MODULE (V series) 1200V / 180A / 6 in one package

### ■ Features

- Compact Package
- P.C.Board Mount
- Low  $V_{CE(sat)}$

### ■ 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 $T_c=25^\circ\text{C}$ unless otherwise specified)

Items		Symbols	Conditions		Maximum ratings	Units	
Inverter	Collector-Emitter voltage	$V_{CES}$			1200	V	
	Gate-Emitter voltage	$V_{GES}$			$\pm 20$	V	
	Collector current	$I_C$	Continuous	$T_c=100^\circ\text{C}$		150	A
		$I_{C(pulse)}$	1ms	$T_c=80^\circ\text{C}$		400	
		$-I_C$				150	
		$-I_{C(pulse)}$	1ms			400	
Collector power dissipation	$P_C$	1 device		1075	W		
Junction temperature	$T_j$			175	°C		
Operating junction temperature (under switching conditions)	$T_{jop}$			150			
Case temperature	$T_c$			125			
Storage temperature	$T_{stg}$			-40 ~ +125			
Isolation voltage	Between terminal and copper base (*1) Between thermistor and others (*2)	$V_{iso}$	AC : 1min.		2500	VAC	
Screw torque	Mounting (*3)	-	M5		3.5	N m	

Note \*1: All terminals should be connected together during the test.

Note \*2: Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

Note \*3: Recommendable value : 2.5-3.5 Nm (M5)

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

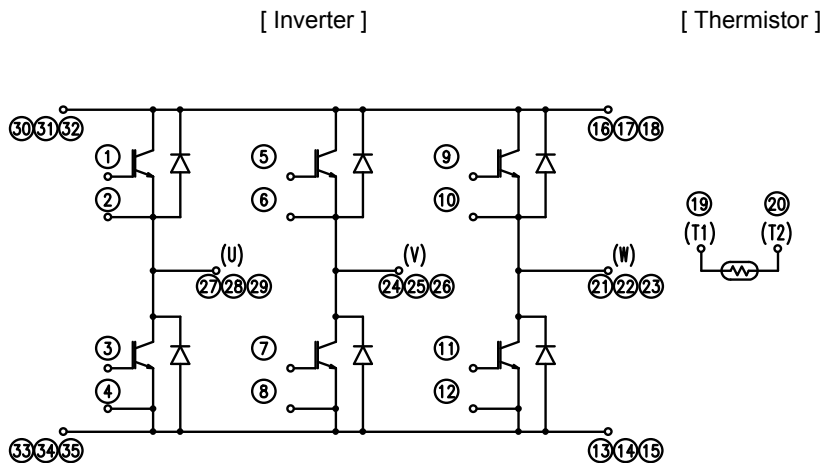
Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I <sub>CEs</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V	-	-	1.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	200	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 200mA	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 200A	T <sub>J</sub> = 25°C	-	2.70	3.15	V
			T <sub>J</sub> = 125°C	-	3.05	-	
			T <sub>J</sub> = 150°C	-	3.10	-	
	V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 200A	T <sub>J</sub> = 25°C	-	1.85	2.30	
			T <sub>J</sub> = 125°C	-	2.20	-	
			T <sub>J</sub> = 150°C	-	2.25	-	
Internal gate resistance	R <sub>G(int)</sub>	-	-	3.8	-	Ω	
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	16.5	-	nF	
Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 600V I <sub>c</sub> = 200A	-	0.39	1.20	μs	
	t <sub>r</sub>		-	0.09	0.60		
	t <sub>r(i)</sub>		V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 1.2Ω	-	0.03		-
Turn-off time	t <sub>off</sub>	R <sub>G</sub> = 1.2Ω	-	0.53	1.00	μs	
	t <sub>r</sub>		-	0.06	0.30		
Forward on voltage	V <sub>F</sub> (terminal)	I <sub>F</sub> = 200A	T <sub>J</sub> = 25°C	-	2.55	3.00	V
			T <sub>J</sub> = 125°C	-	2.70	-	
			T <sub>J</sub> = 150°C	-	2.65	-	
	V <sub>F</sub> (chip)	I <sub>F</sub> = 200A	T <sub>J</sub> = 25°C	-	1.70	2.15	
			T <sub>J</sub> = 125°C	-	1.85	-	
			T <sub>J</sub> = 150°C	-	1.80	-	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 200A	-	-	0.35	μs	
Thermistor	Resistance	T = 25°C	-	5000	-	Ω	
		T = 100°C	465	495	520		
	B value	B	T = 25 / 50°C	3305	3375	3450	K

● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	Inverter IGBT	-	-	0.14	°C/W
		Inverter FWD	-	-	0.25	
Contact thermal resistance (1device) (*4)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.05	-	

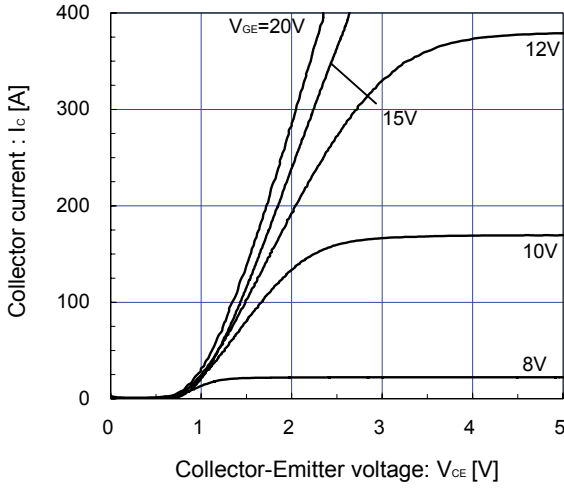
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Equivalent Circuit Schematic

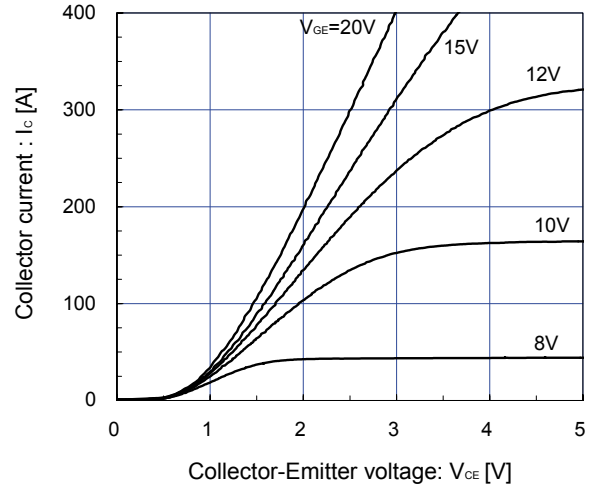


■ Characteristics (Representative)

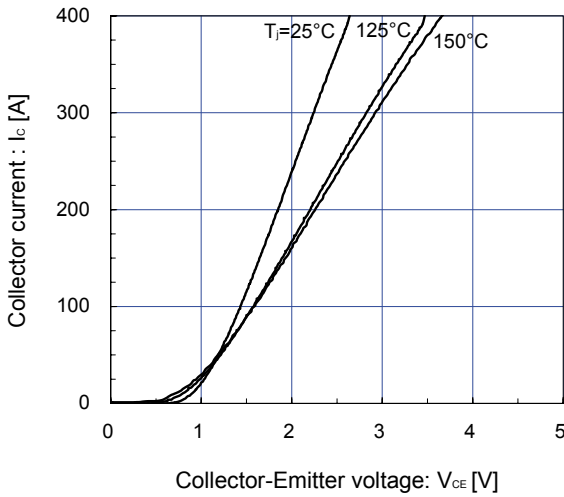
[ Inverter ]  
Collector current vs. Collector-Emmitter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



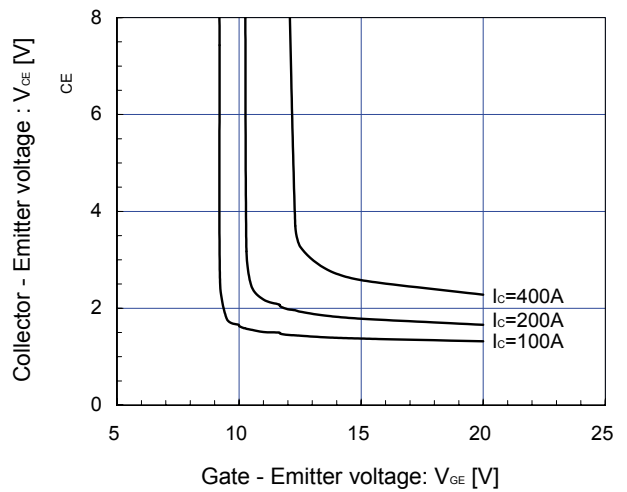
[ Inverter ]  
Collector current vs. Collector-Emmitter voltage (typ.)  
 $T_j = 150^\circ\text{C}$  / chip



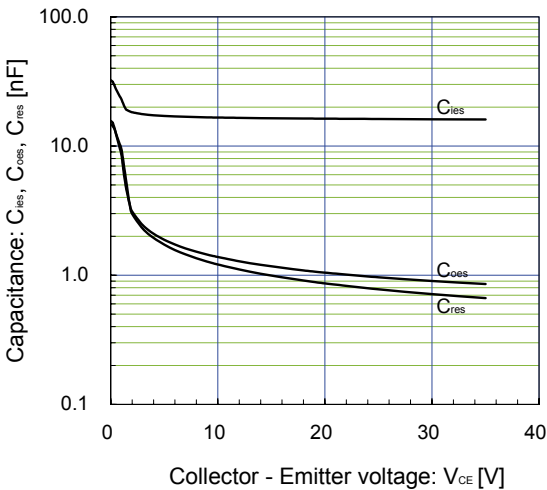
[ Inverter ]  
Collector current vs. Collector-Emmitter voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



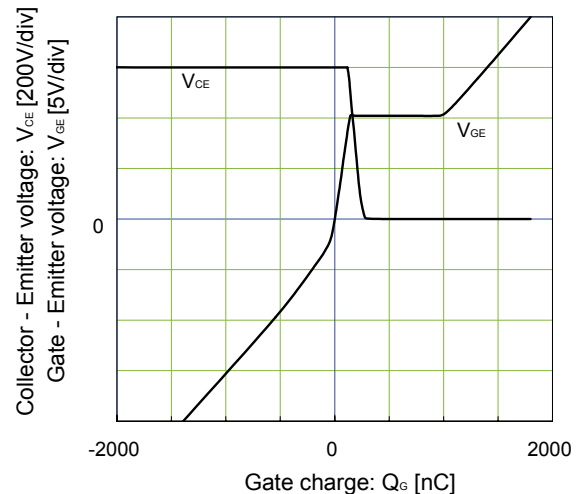
[ Inverter ]  
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



[ Inverter ]  
Capacitance vs. Collector-Emmitter voltage (typ.)  
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$

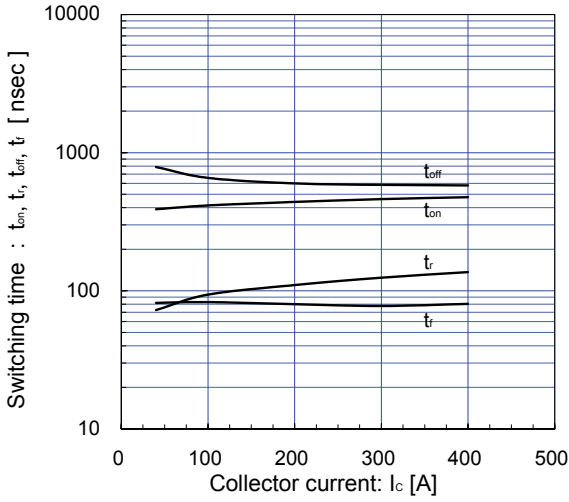


[ Inverter ]  
Dynamic gate charge (typ.)  
 $V_{CC} = 600\text{V}$ ,  $I_c = 200\text{A}$ ,  $T_j = 25^\circ\text{C}$



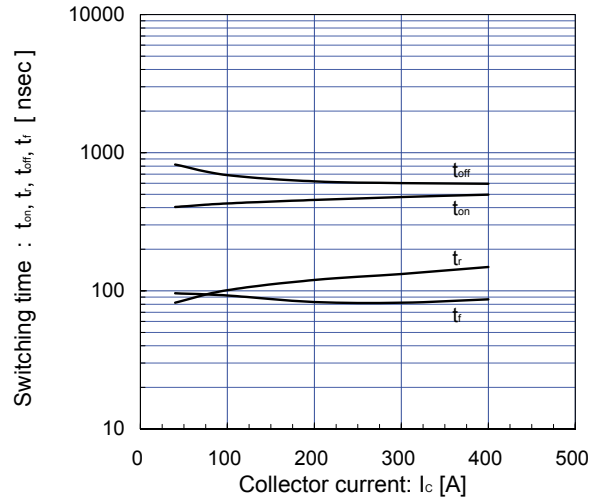
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=125^\circ C$



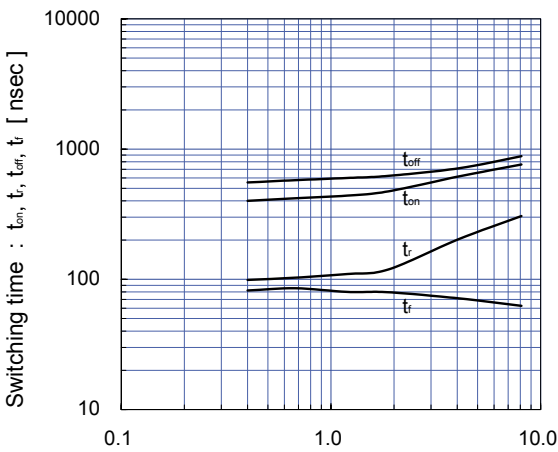
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=150^\circ C$



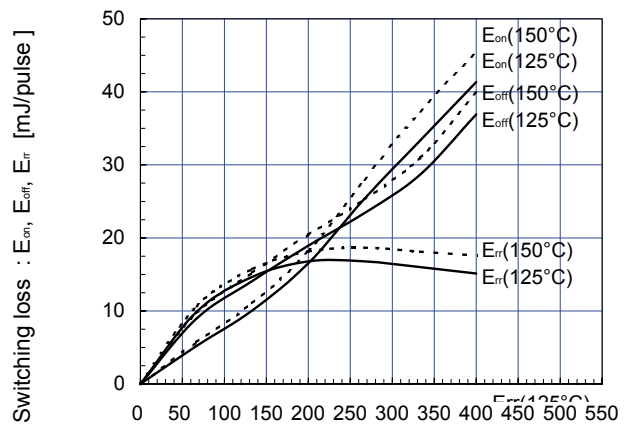
[ Inverter ]

Switching time vs. gate resistance (typ.)  
 $V_{CC}=600V, I_c=200A, V_{GE}=\pm 15V, T_J=125^\circ C$



[ Inverter ]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega$

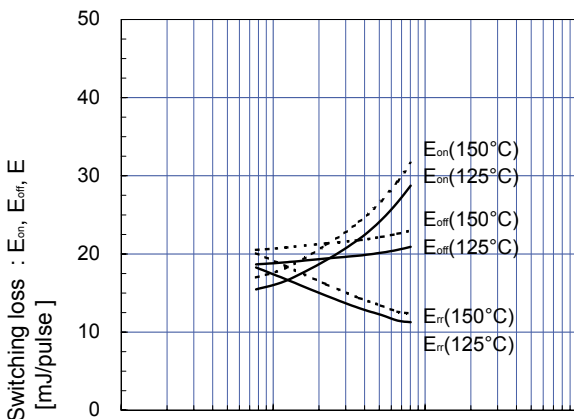


Gate resistance :  $R_G [\Omega]$

Collector current:  $I_c [A]$

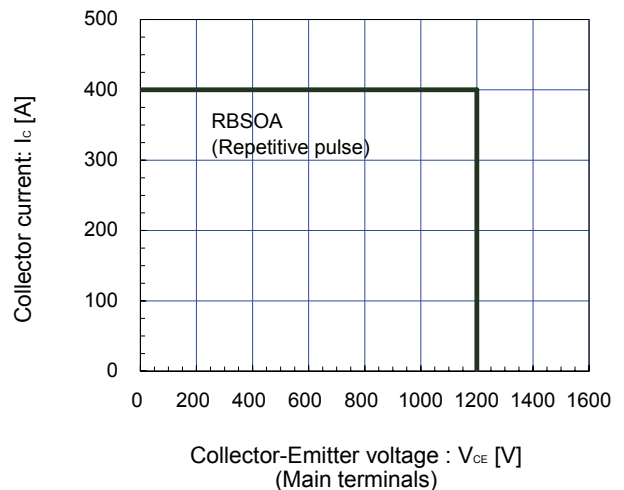
[ Inverter ]

Switching loss vs. gate resistance (typ.)  
 $V_{CC}=600V, I_c=200A, V_{GE}=\pm 15V$



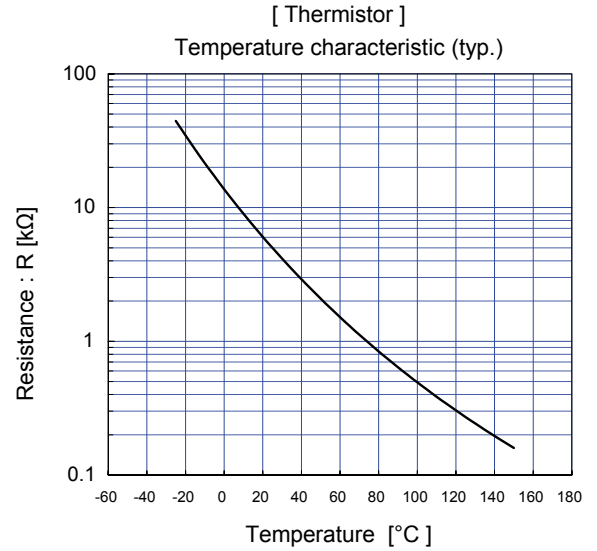
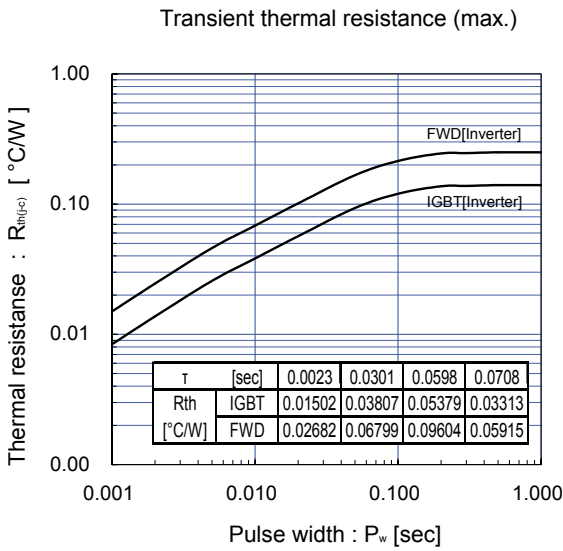
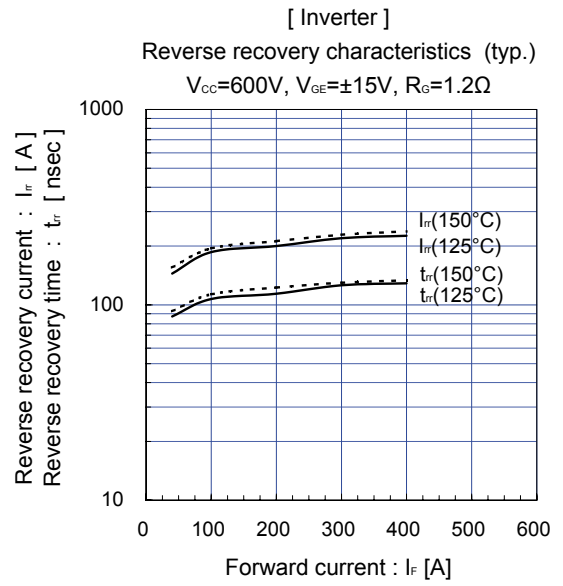
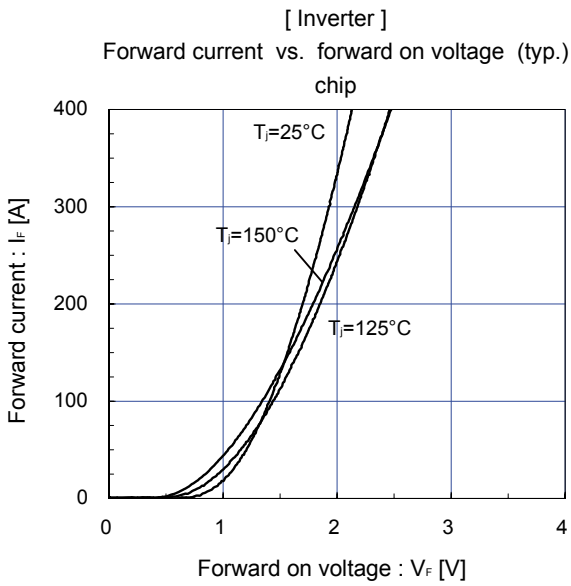
[ Inverter ]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_G \ge 1.2\Omega, T_J \le 150^\circ C$

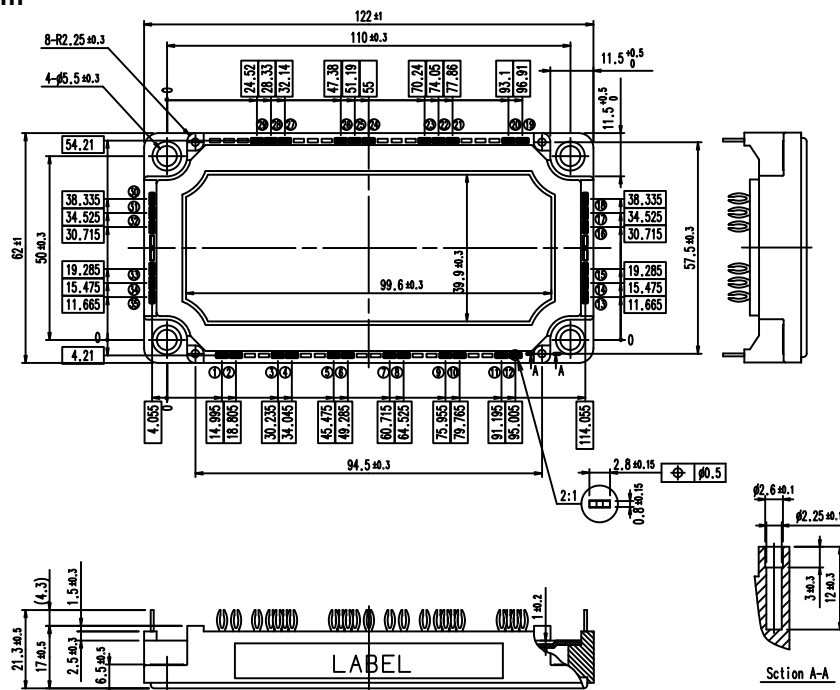


Gate resistance :  $R_G [\Omega]$

Collector-Emmitter voltage :  $V_{CE} [V]$   
 (Main terminals)



■ Outline Drawings, mm



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