

# 6MBI50VA-060-50

IGBT Modules

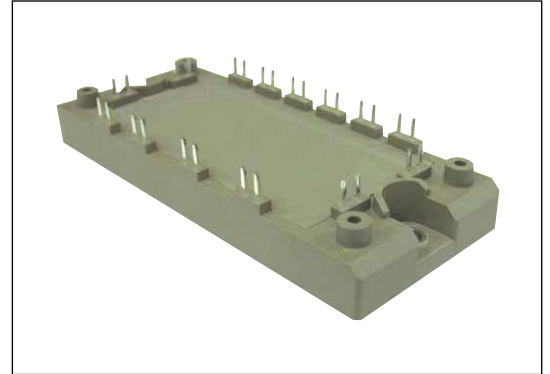
## IGBT MODULE (V series) 600V / 50A / 6 in one package

### ■ 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	$V_{CES}$			600	V
	Gate-Emitter voltage	$V_{GES}$			$\pm 20$	V
	Collector current	$I_C$	Continuous	$T_c=80^\circ\text{C}$	50	A
		$I_{C(pulse)}$	1ms	$T_c=80^\circ\text{C}$	100	
		$-I_C$			50	
		$-I_{C(pulse)}$	1ms		100	
Collector power dissipation	$P_C$	1 device		200	W	
Junction temperature		$T_j$			175	$^\circ\text{C}$
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)

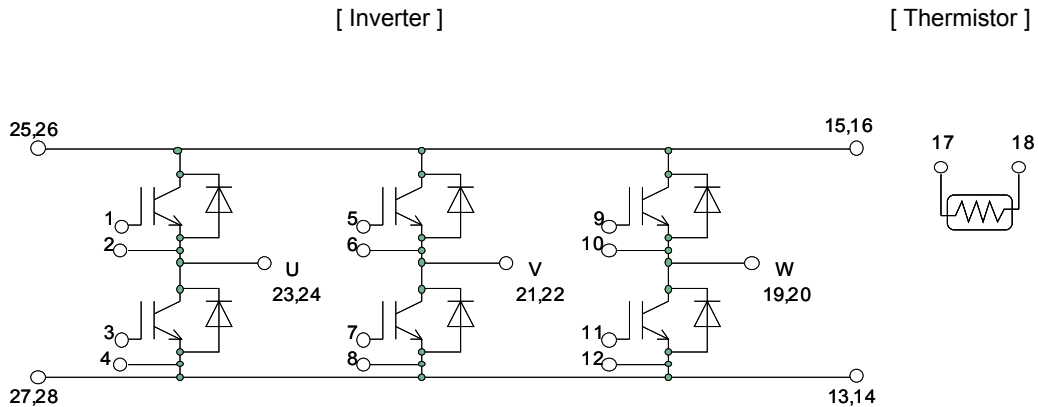
Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I <sub>CEs</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 600V	-	-	1.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	200	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 50mA	6.2	6.7	7.2	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>J</sub> = 25°C	-	1.90	2.35	V
			T <sub>J</sub> = 125°C	-	2.20	-	
			T <sub>J</sub> = 150°C	-	2.40	-	
	V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>J</sub> = 25°C	-	1.60	2.05	
			T <sub>J</sub> = 125°C	-	1.90	-	
			T <sub>J</sub> = 150°C	-	2.10	-	
Internal gate resistance	R <sub>G(int)</sub>	-		0	-	Ω	
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	3.3	-	nF	
Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 300V I <sub>c</sub> = 50A	-	0.36	1.20	μs	
	t <sub>r</sub>		-	0.25	0.60		
	t <sub>r(i)</sub>		-	0.07	-		
Turn-off time	t <sub>off</sub>	V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 43Ω	-	0.52	1.20	μs	
	t <sub>f</sub>		-	0.03	0.45		
Forward on voltage	V <sub>F</sub> (terminal)	I <sub>F</sub> = 50A	T <sub>J</sub> = 25°C	-	1.90	2.35	V
			T <sub>J</sub> = 125°C	-	1.80	-	
			T <sub>J</sub> = 150°C	-	1.75	-	
	V <sub>F</sub> (chip)	I <sub>F</sub> = 50A	T <sub>J</sub> = 25°C	-	1.60	2.05	
			T <sub>J</sub> = 125°C	-	1.50	-	
			T <sub>J</sub> = 150°C	-	1.45	-	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 50A	-	-	0.35	μs	
Resistance	R	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	-	-	0.71	°C/W
		Inverter FWD	-	-	1.15	
Contact thermal resistance (1device) (*4)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.05	-	

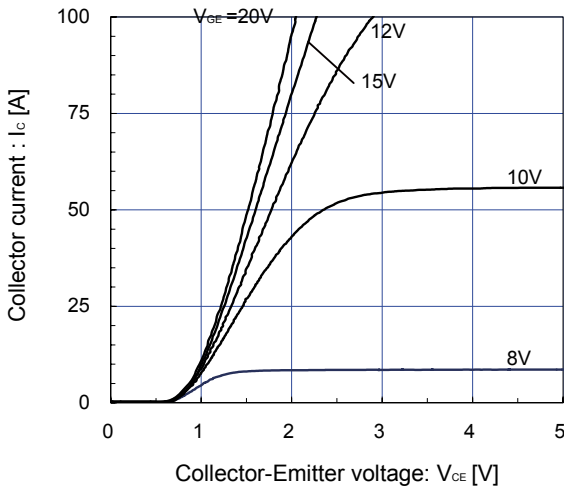
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Equivalent Circuit Schematic

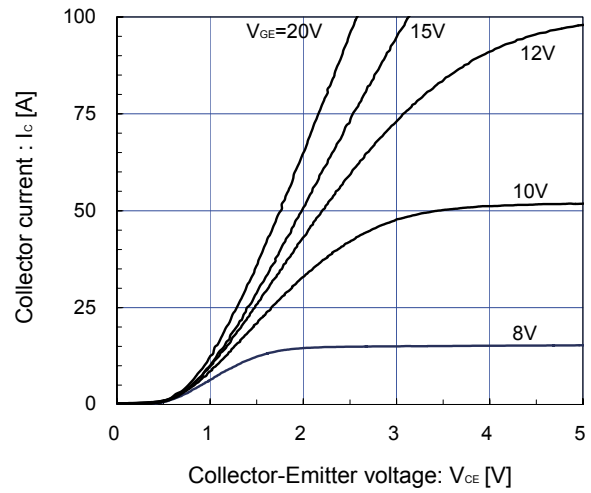


■ Characteristics (Representative)

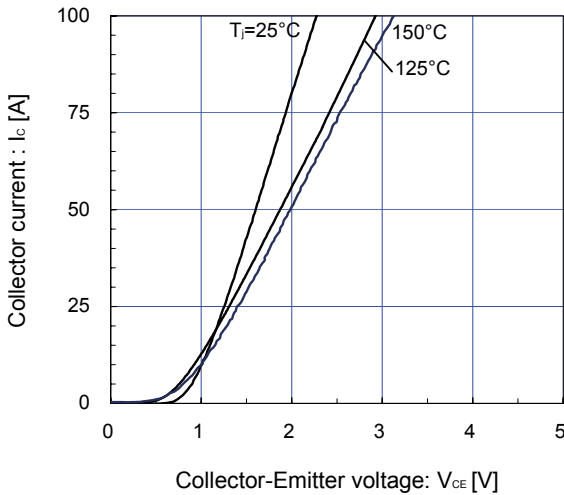
[ Inverter ]  
Collector current vs. Collector-Emmitter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



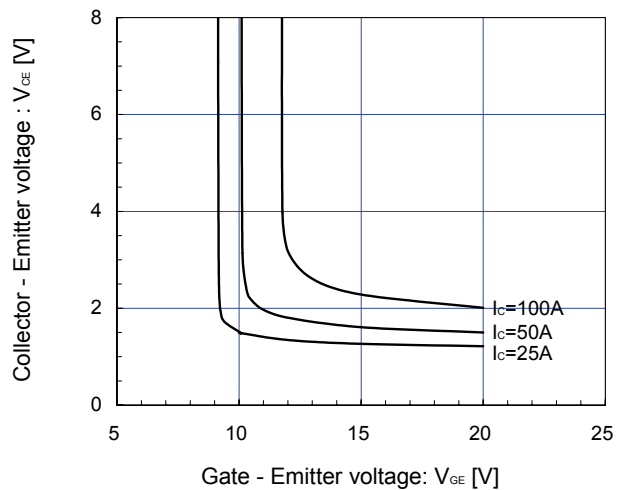
[ Inverter ]  
Collector current vs. Collector-Emmitter voltage (typ.)  
 $T_j = 150^\circ\text{C}$  / chip



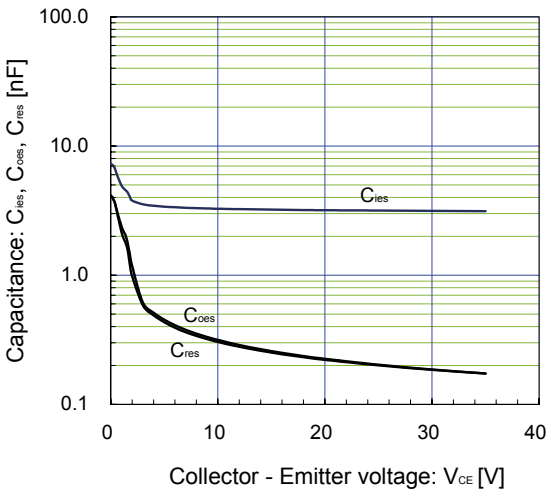
[ Inverter ]  
Collector current vs. Collector-Emmitter voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



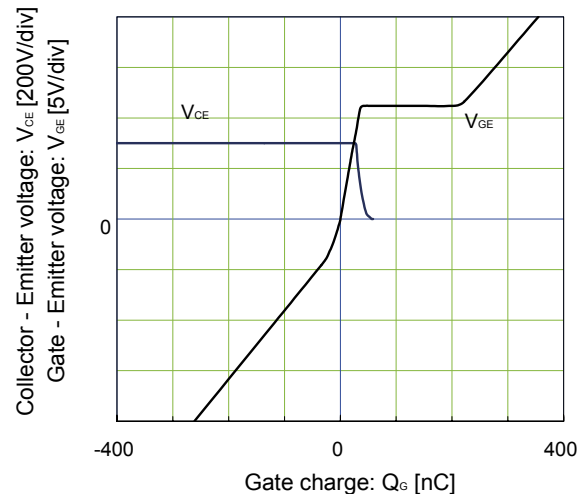
[ Inverter ]  
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



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

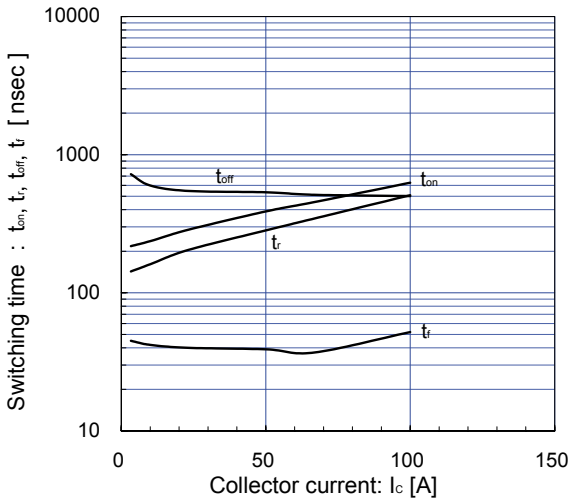


[ Inverter ]  
Dynamic gate charge (typ.)  
 $V_{CC} = 300\text{V}$ ,  $I_c = 50\text{A}$ ,  $T_j = 25^\circ\text{C}$



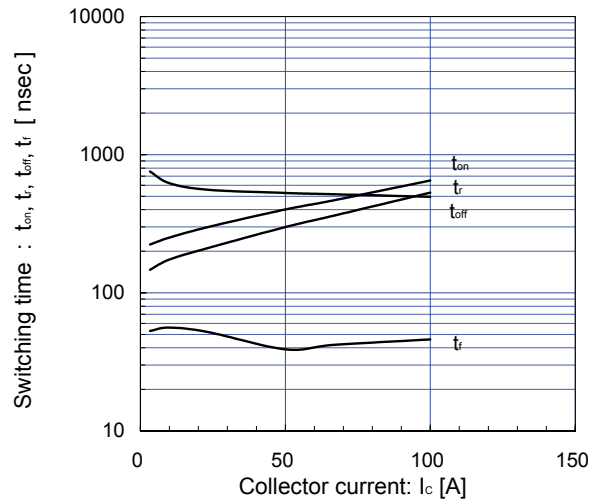
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega, T_J=125^\circ C$



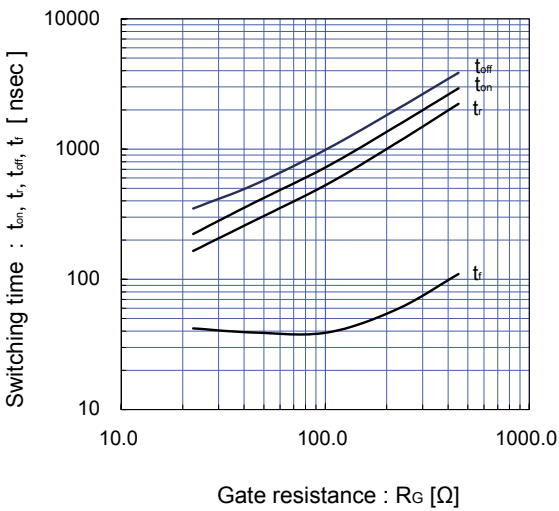
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega, T_J=150^\circ C$



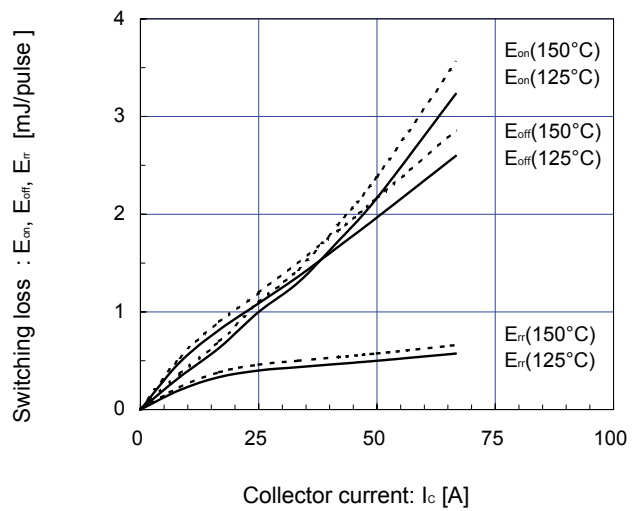
[ Inverter ]

Switching time vs. gate resistance (typ.)  
 $V_{CC}=300V, I_c=50A, V_{GE}=\pm 15V, T_J=125^\circ C$



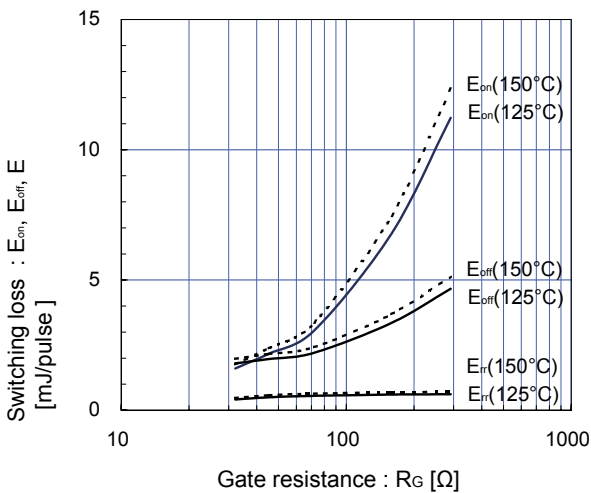
[ Inverter ]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega$



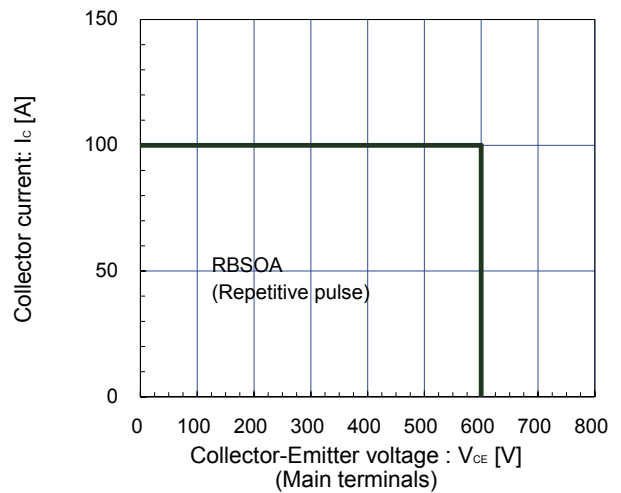
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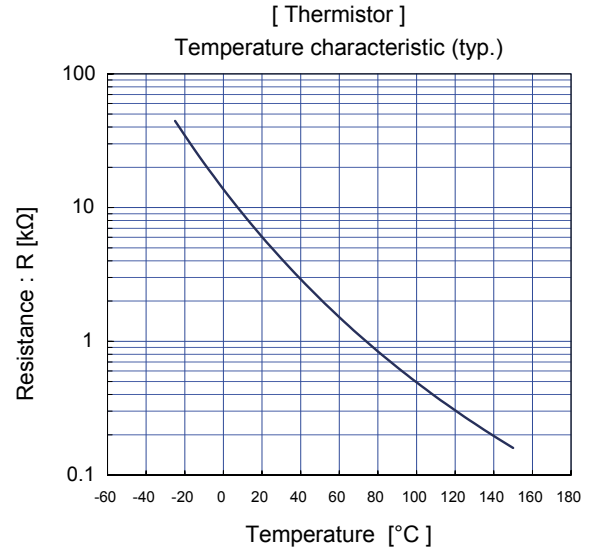
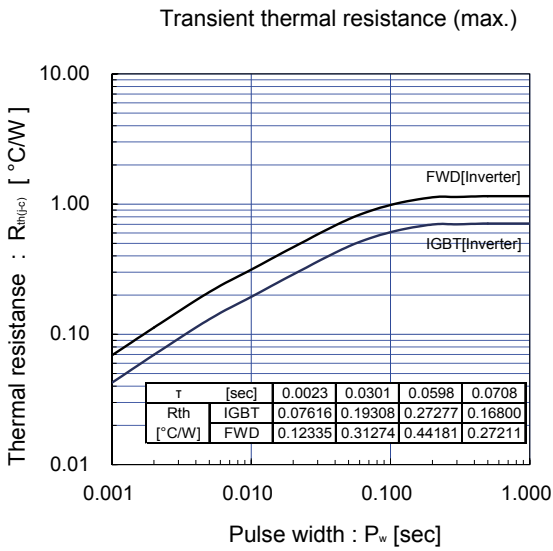
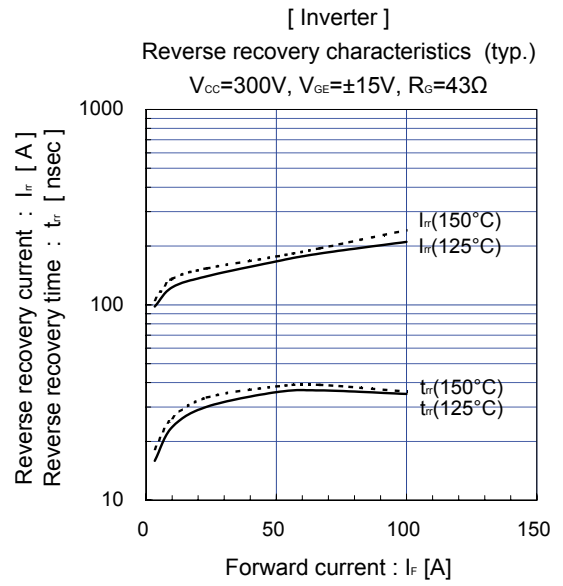
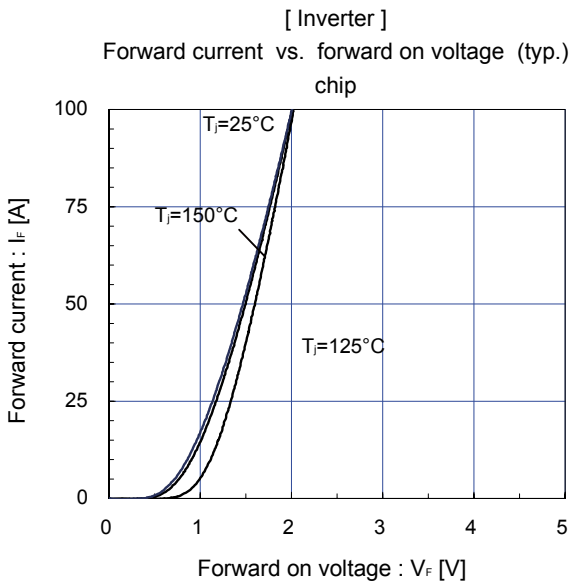
Switching loss vs. gate resistance (typ.)  
 $V_{CC}=300V, I_c=50A, V_{GE}=\pm 15V$



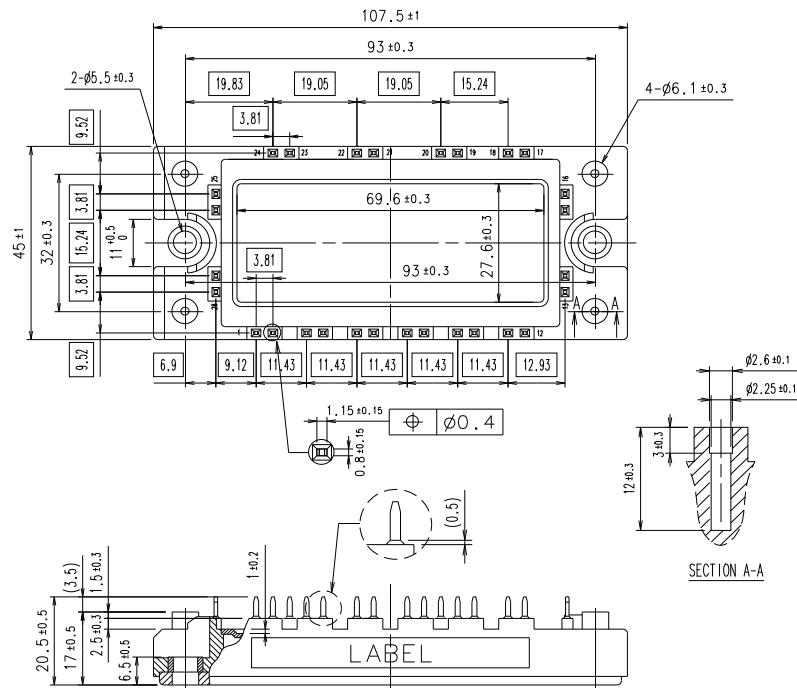
[ Inverter ]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_G \ge 43\Omega, T_J \le 150^\circ C$





■ Outline Drawings, mm



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