

6MBI50VA-060-50

IGBT Modules

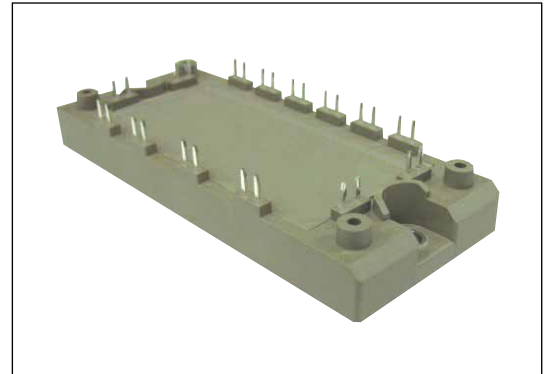
IGBT MODULE (V series) 600V / 50A / 6 in one package

■ 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}			± 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_J = 25°C unless otherwise specified)

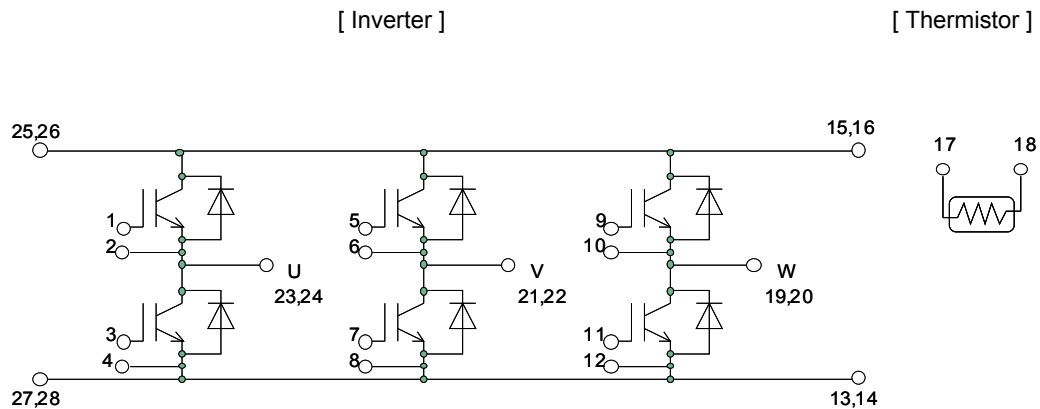
Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I _{CEs}	V _{GE} = 0V, V _{CE} = 600V	-	-	1.0	mA	
Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	200	nA	
Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 50mA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

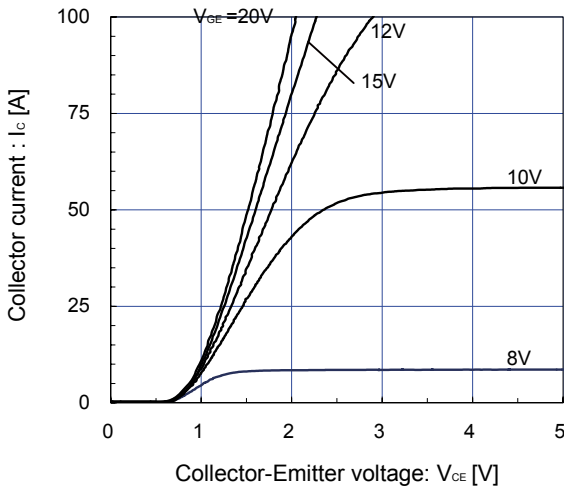
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Equivalent Circuit Schematic

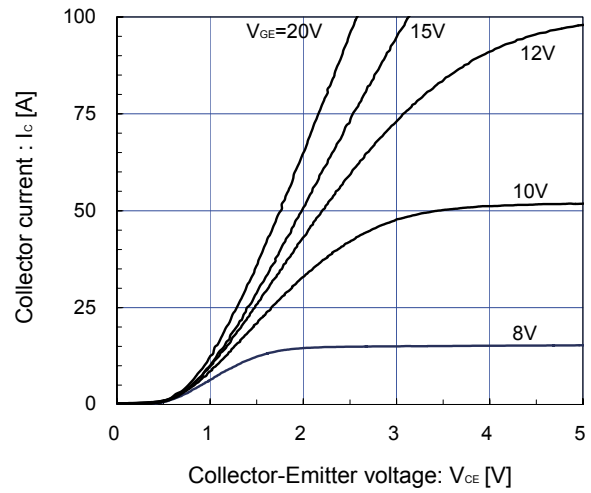


■ Characteristics (Representative)

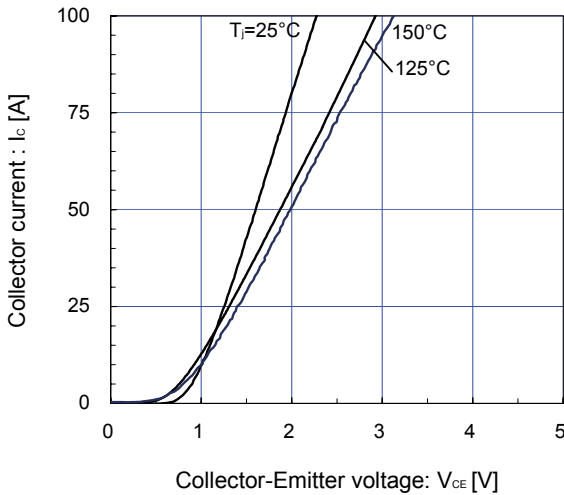
[Inverter]
Collector current vs. Collector-Emmitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



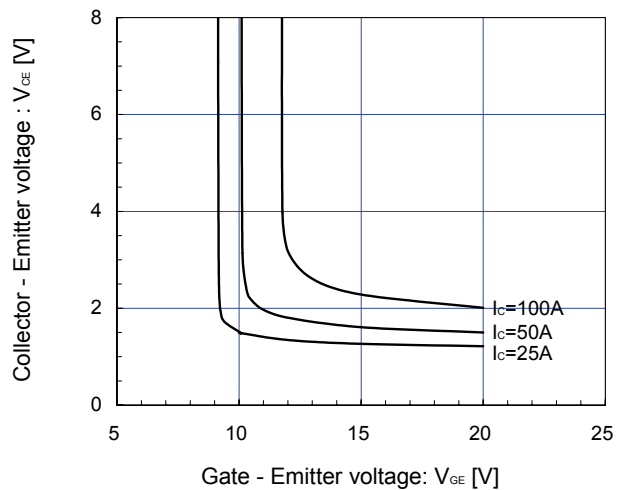
[Inverter]
Collector current vs. Collector-Emmitter voltage (typ.)
 $T_j = 150^\circ\text{C}$ / chip



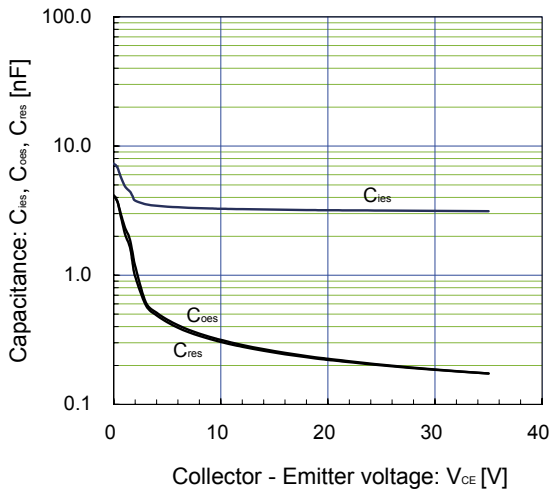
[Inverter]
Collector current vs. Collector-Emmitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



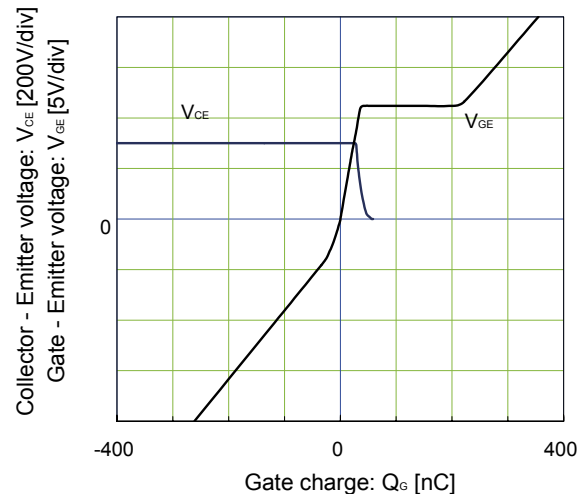
[Inverter]
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



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

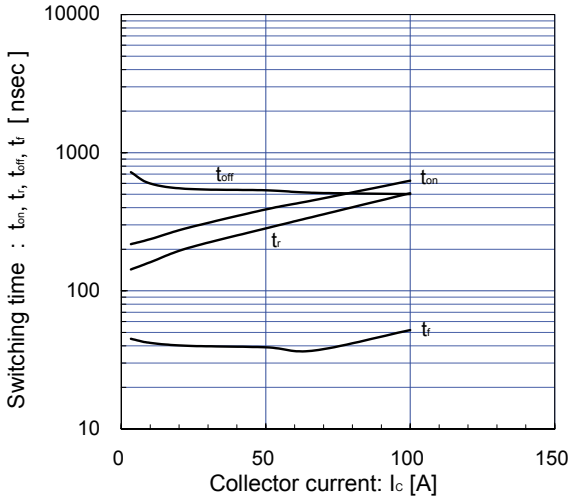


[Inverter]
Dynamic gate charge (typ.)
 $V_{CC} = 300\text{V}$, $I_c = 50\text{A}$, $T_j = 25^\circ\text{C}$



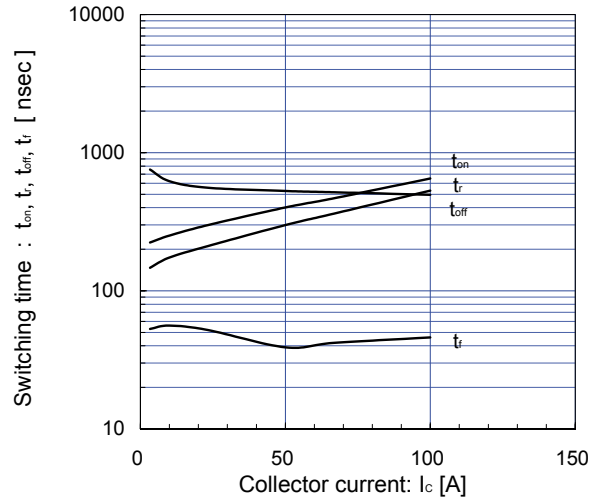
[Inverter]

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



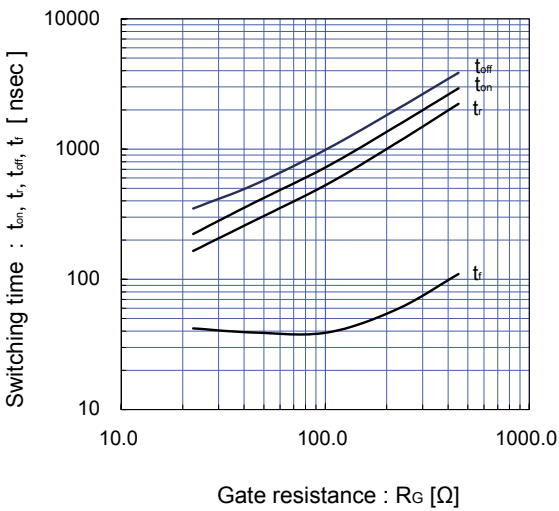
[Inverter]

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



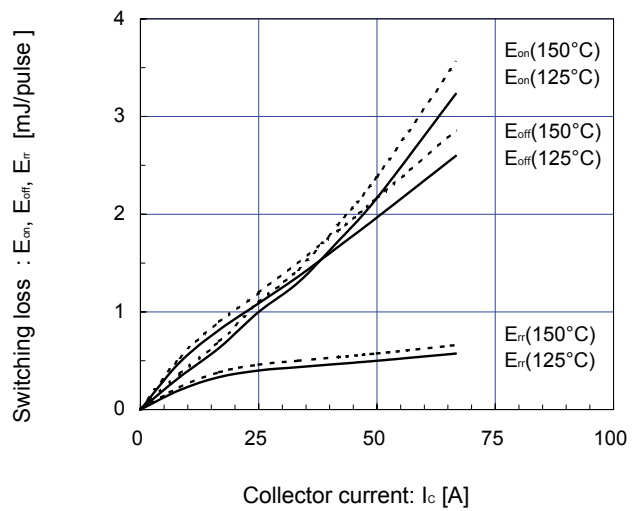
[Inverter]

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



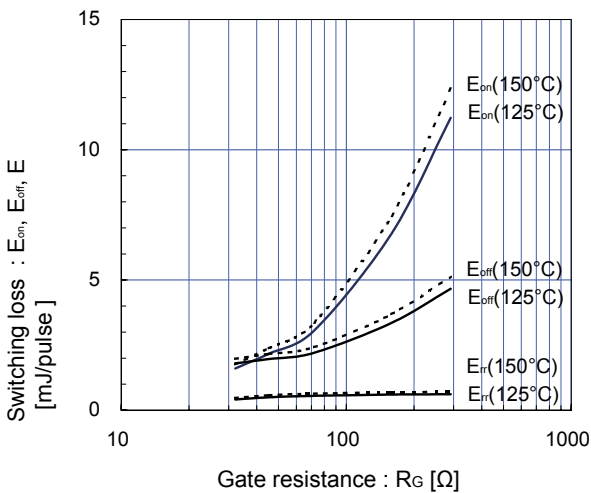
[Inverter]

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



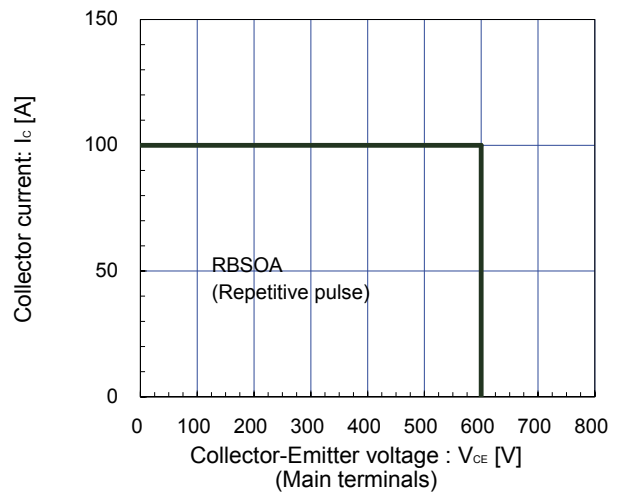
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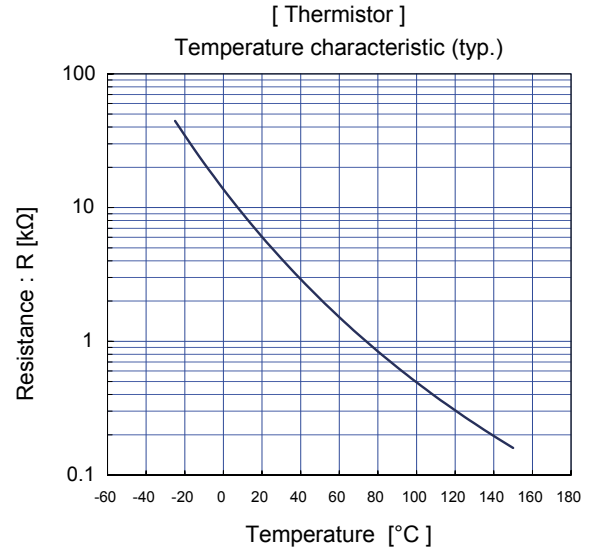
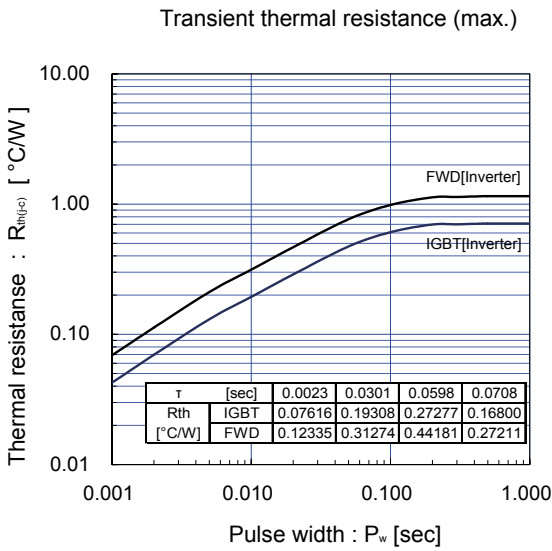
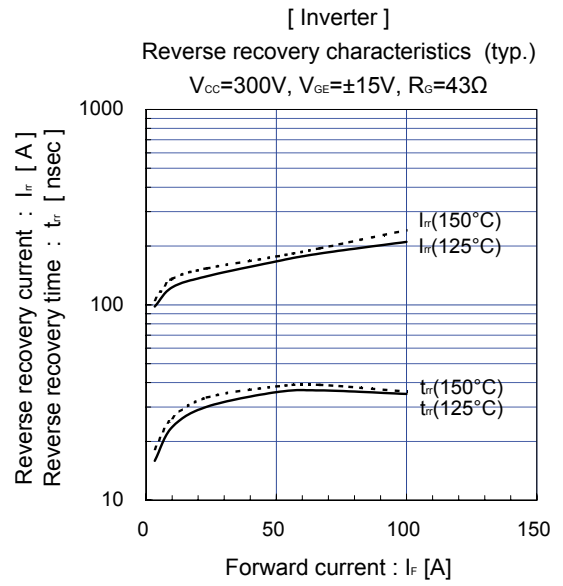
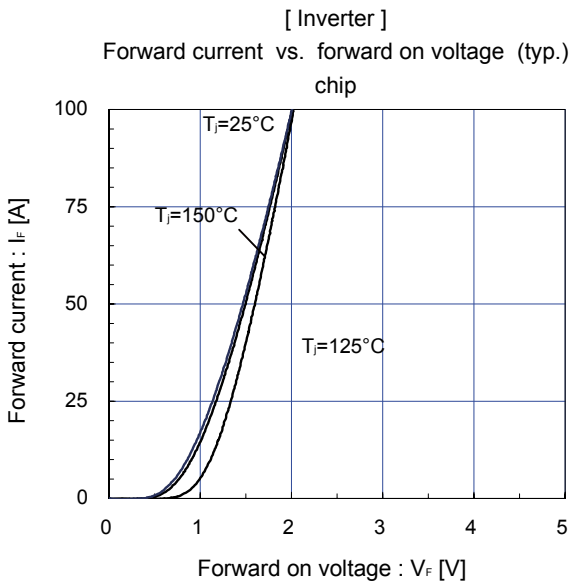
Switching loss vs. gate resistance (typ.)
 $V_{CC}=300V, I_c=50A, V_{GE}=\pm 15V$



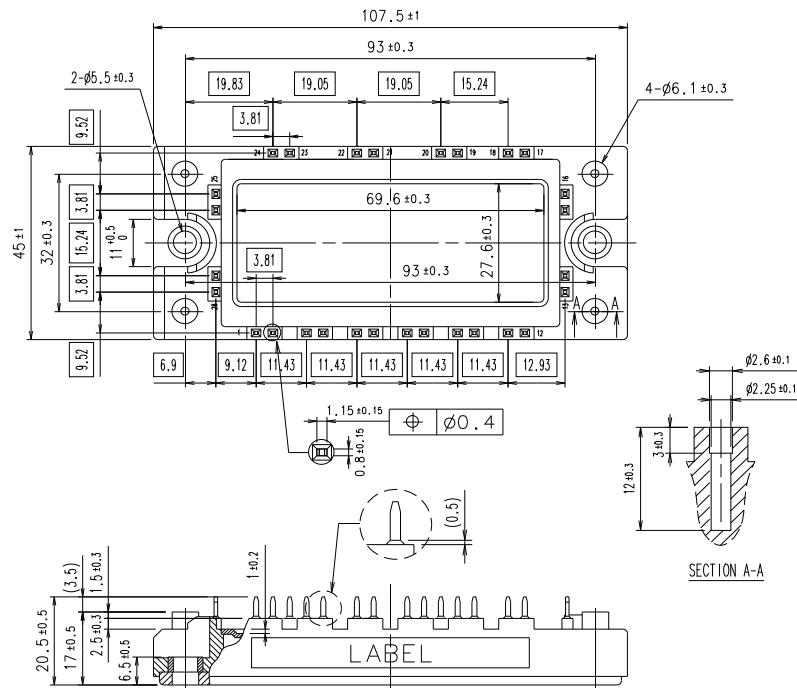
[Inverter]

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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