

# 1MBI400HH-120L-50

IGBT Modules

## IGBT MODULE

1200V / 400A / 1 in one package

### ■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

### ■ Applications

- Inverter DB for Motor Drive
- AC and DC Servo Drive Amplifier (DB)
- Active PFC
- Industrial machines



### ■ 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>		1200	V	
Gate-Emitter voltage	V <sub>GES</sub>		±20	V	
Collector current	I <sub>c</sub>	Continuous	T <sub>c</sub> =25°C 600	A	
			T <sub>c</sub> =80°C 400		
	I <sub>cp</sub>	1ms	T <sub>c</sub> =25°C 1200		
			T <sub>c</sub> =80°C 800		
	-I <sub>c</sub>		75		
	-I <sub>c</sub> pluse	1ms	150		
Collector Power Dissipation	P <sub>c</sub>	1 device	2500	W	
Reverse voltage for FWD	V <sub>R</sub>		1200	V	
Forword current for FWD	I <sub>F</sub>	Continuous	400	A	
	I <sub>F</sub> pulse	1ms	800		
Junction temperature	T <sub>J</sub>		+150	°C	
Storage temperature	T <sub>stg</sub>		-40 to +125		
Isolation voltage	between terminal and copper base (*1)	V <sub>iso</sub>	AC : 1min.	2500	VAC
	between thermistor and others (*2)				
Screw Torque	Mounting (*3)		3.5	Nm	
	Terminals (*4)		4.5		

Note \*1: All terminals should be connected together when isolation test will be done.

Note \*2: Two thermistor terminals should be connected together, each other terminals should be connected together and shorted to base plate when isolation test will be done.

Note \*3: Recommendable Value : Mounting 2.5 to 3.5 Nm (M5 or M6)

Note \*4: Recommendable Value : Terminals 3.5 to 4.5 Nm (M6)

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

Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
IGBT+Inverse Diode	Zero gate voltage collector current	I <sub>ces</sub>	V <sub>CE</sub> = 1200V V <sub>GE</sub> = 0V	-	-	4.0	mA	
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V V <sub>GE</sub> = ±20V	-	-	800	nA	
	Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V I <sub>C</sub> = 400mA	5.7	6.2	6.7	V	
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	I <sub>C</sub> = 400A V <sub>GE</sub> = 15V	T <sub>J</sub> = 25°C	-	3.30	3.60	V
				T <sub>J</sub> = 125°C	-	4.30	-	
		V <sub>CE(sat)</sub> (chip)		T <sub>J</sub> = 25°C	-	3.10	3.40	
				T <sub>J</sub> = 125°C	-	4.00	-	
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	35	-	nF	
	Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 600V	-	0.20	0.60	μs	
		t <sub>r</sub>	I <sub>C</sub> = 400A	-	0.10	0.50		
Turn-off time	t <sub>r(l)</sub>	V <sub>GE</sub> = ±15V	-	0.30	-			
	t <sub>off</sub>	R <sub>G</sub> = 1.6 Ω	-	0.40	0.70			
Forward on voltage	V <sub>F</sub> (terminal)	I <sub>F</sub> = 75A V <sub>GE</sub> = 0V	T <sub>J</sub> = 25°C	-	1.80	2.30	V	
			T <sub>J</sub> = 125°C	-	1.95	-		
	V <sub>F</sub> (chip)		T <sub>J</sub> = 25°C	-	1.70	2.15		
			T <sub>J</sub> = 125°C	-	1.85	-		
FWD	Reverse Current	I <sub>R</sub>	V <sub>CE</sub> = 1200V	-	-	1.0	mA	
	Forward on voltage	V <sub>F</sub> (terminal)	I <sub>F</sub> = 400A V <sub>GE</sub> = 0V	T <sub>J</sub> = 25°C	-	8.20	9.80	V
				T <sub>J</sub> = 125°C	-	4.50	-	
	V <sub>F</sub> (chip)	T <sub>J</sub> = 25°C		-	8.00	9.60		
T <sub>J</sub> = 125°C		-		4.30	-			
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 400A	-	-	0.20	μs		
Lead resistance, terminal-chip (*5)	R lead		-	0.48	-	mΩ		
Thermistor	Resistance	R	T = 25°C	-	5000	-	Ω	
			T = 125°C	465	495	520		
	B value	B	T = 25/50°C	3305	3375	3450	K	

Note \*5: Biggest internal terminal resistance among arm.

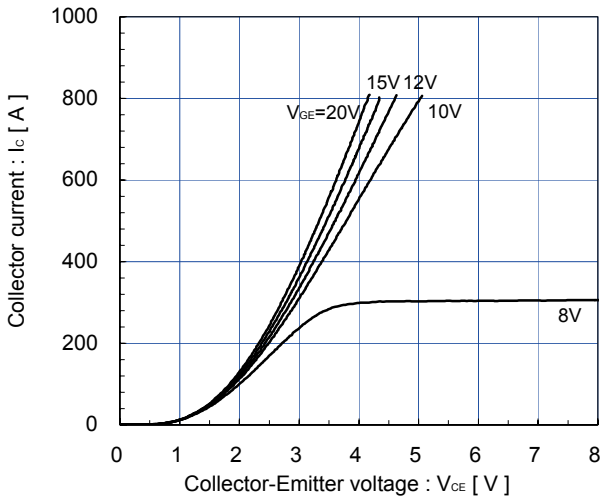
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1device)	R <sub>th(j-c)</sub>	IGBT	-	-	0.036	°C/W
		Inverse Diode	-	-	0.460	
		FWD	-	-	0.084	
Contact Thermal resistance	R <sub>th(c-f)</sub>	with Thermal Compound (*6)	-	0.0125	-	

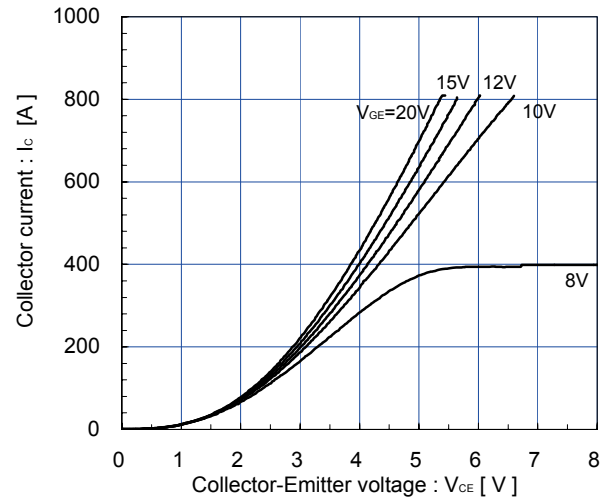
Note \*6: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

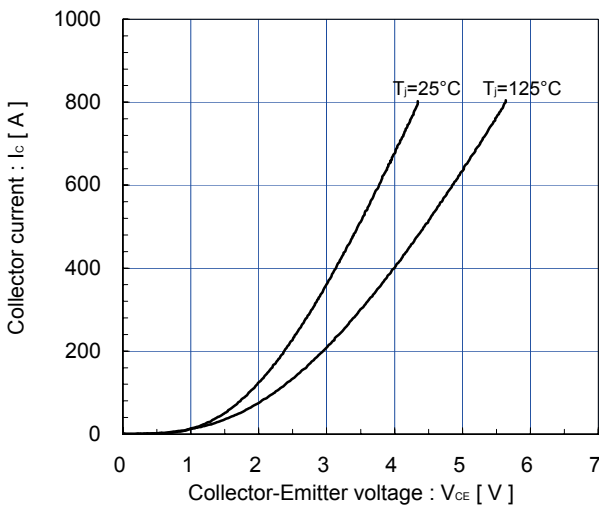
Collector current vs. Collector-Emitter voltage (typ.)  
 $T_J=25^\circ\text{C}$  / chip



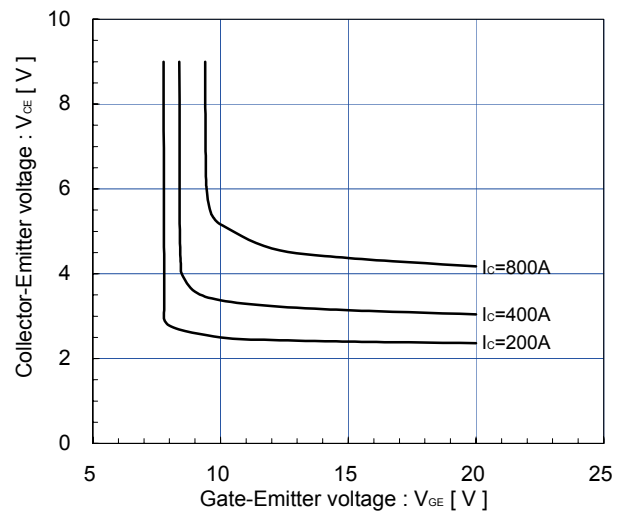
Collector current vs. Collector-Emitter voltage (typ.)  
 $T_J=125^\circ\text{C}$  / chip



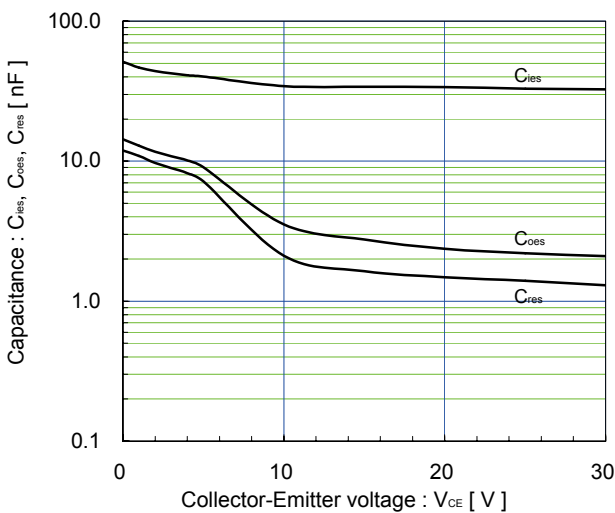
Collector current vs. Collector-Emitter voltage (typ.)  
 $V_{GE}=15\text{V}$  / chip



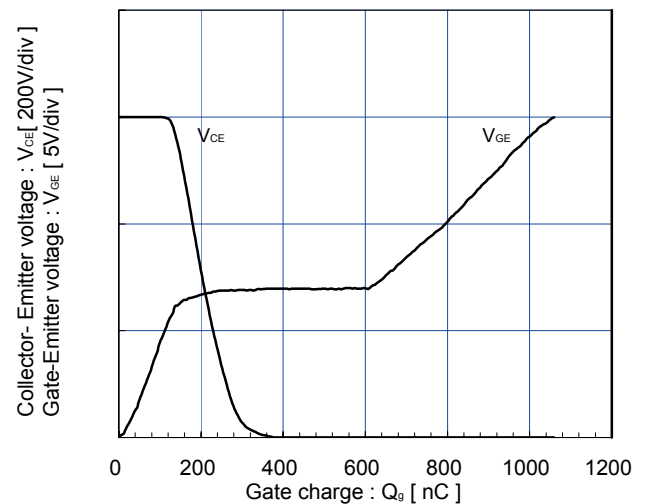
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)  
 $T_J=25^\circ\text{C}$  / chip



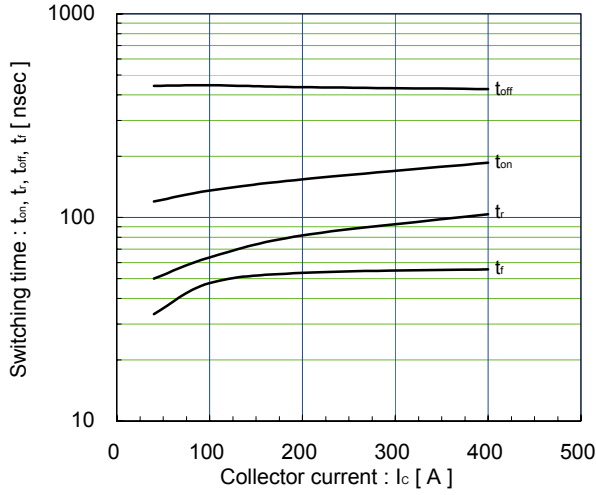
Capacitance vs. Collector-Emitter voltage (typ.)  
 $V_{GE}=0\text{V}$ ,  $f=1\text{MHz}$ ,  $T_J=25^\circ\text{C}$



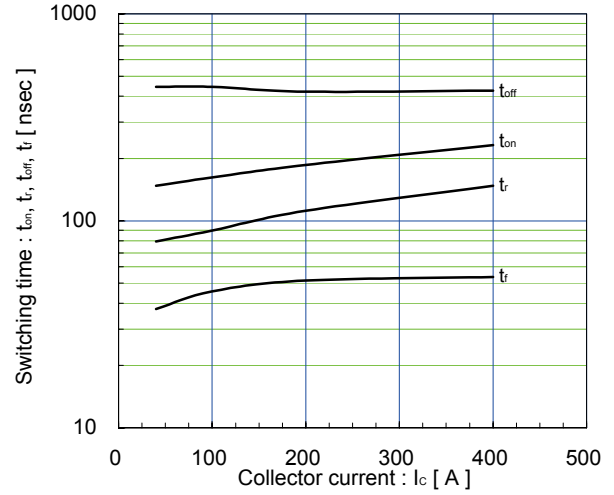
Dynamic Gate charge (typ.)  
 $V_{CC}=600\text{V}$ ,  $I_C=400\text{A}$ ,  $T_J=25^\circ\text{C}$



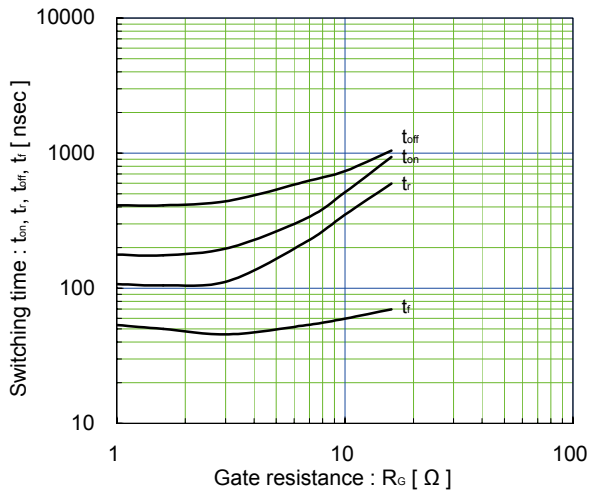
Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.6\Omega, T_J=25^\circ C$



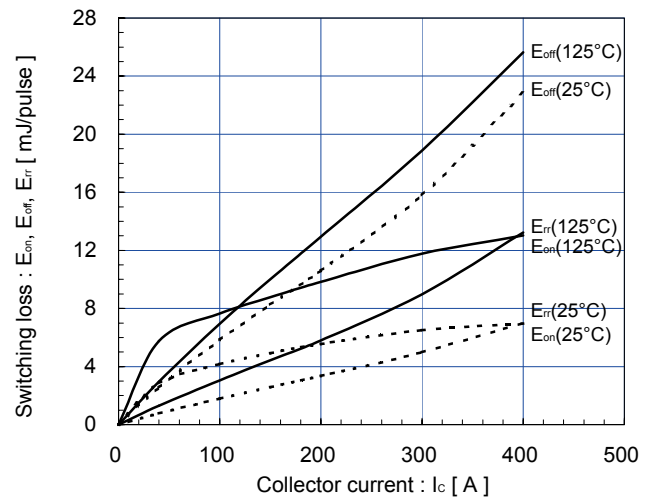
Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.6\Omega, T_J=125^\circ C$



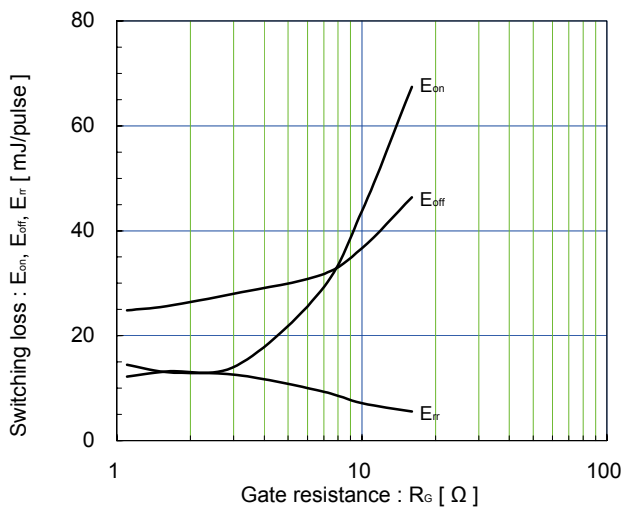
Switching time vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=400A, V_{GE}=\pm 15V, T_J=25^\circ C$



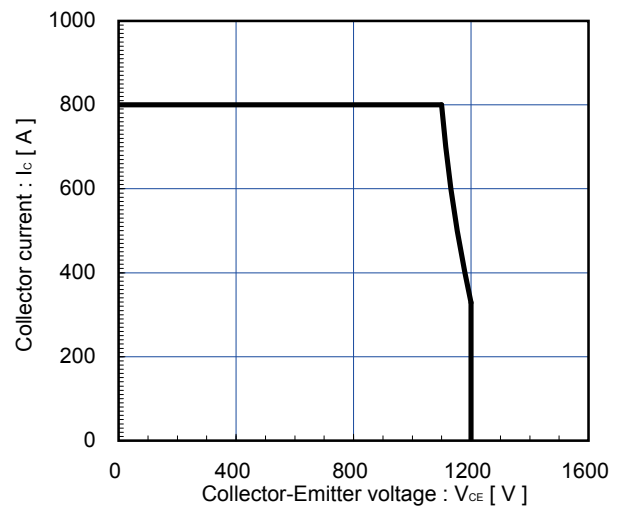
Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.6\Omega$

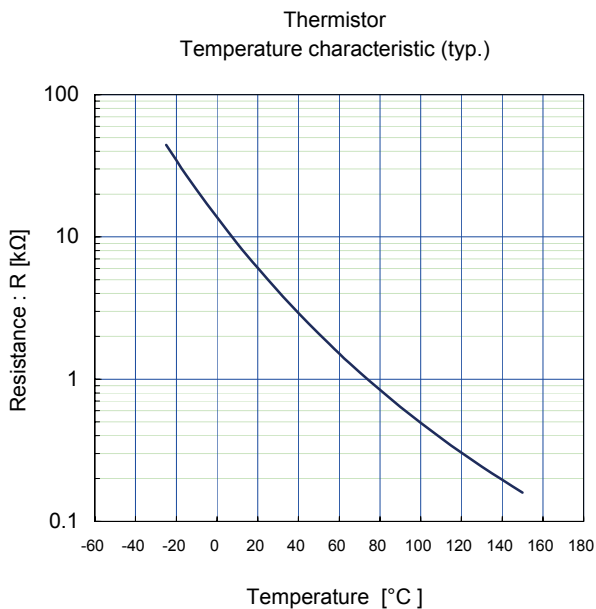
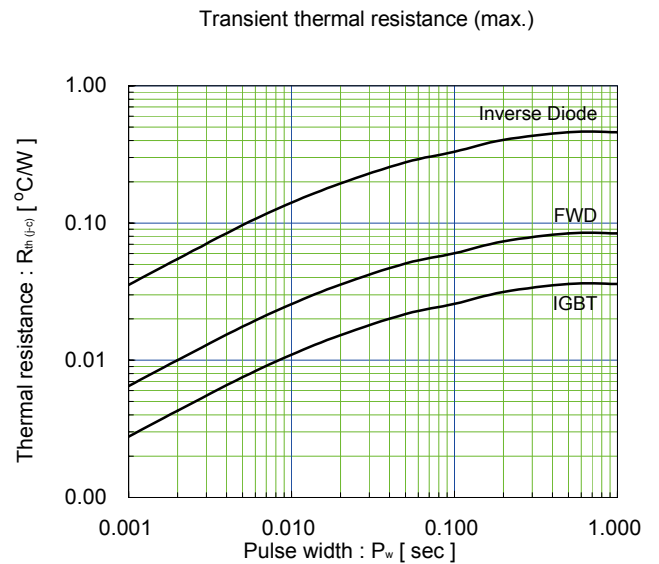
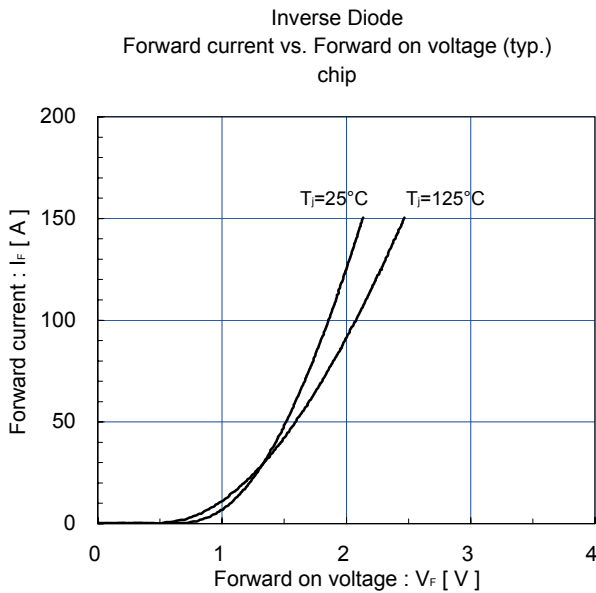
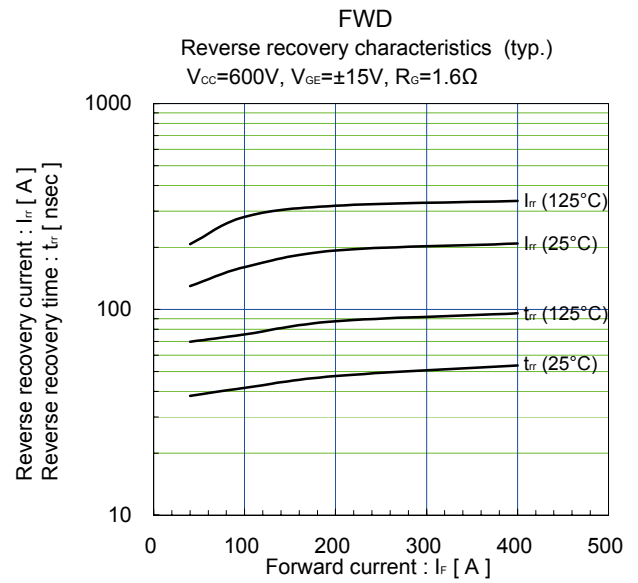
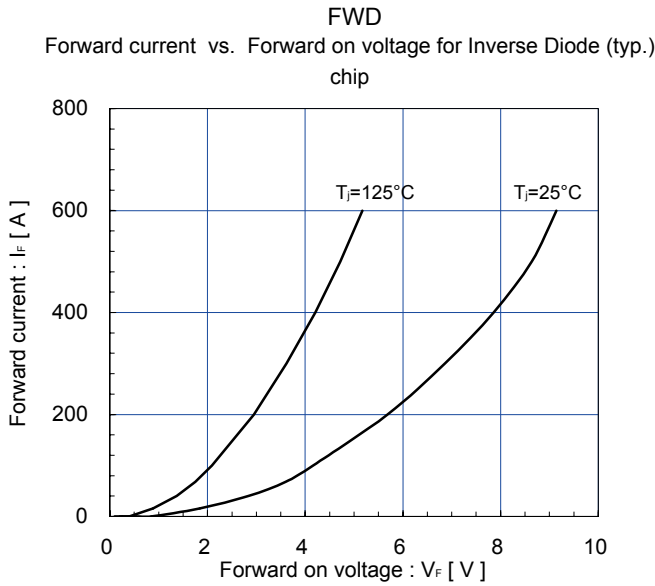


Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=400A, V_{GE}=\pm 15V, T_J=125^\circ C$

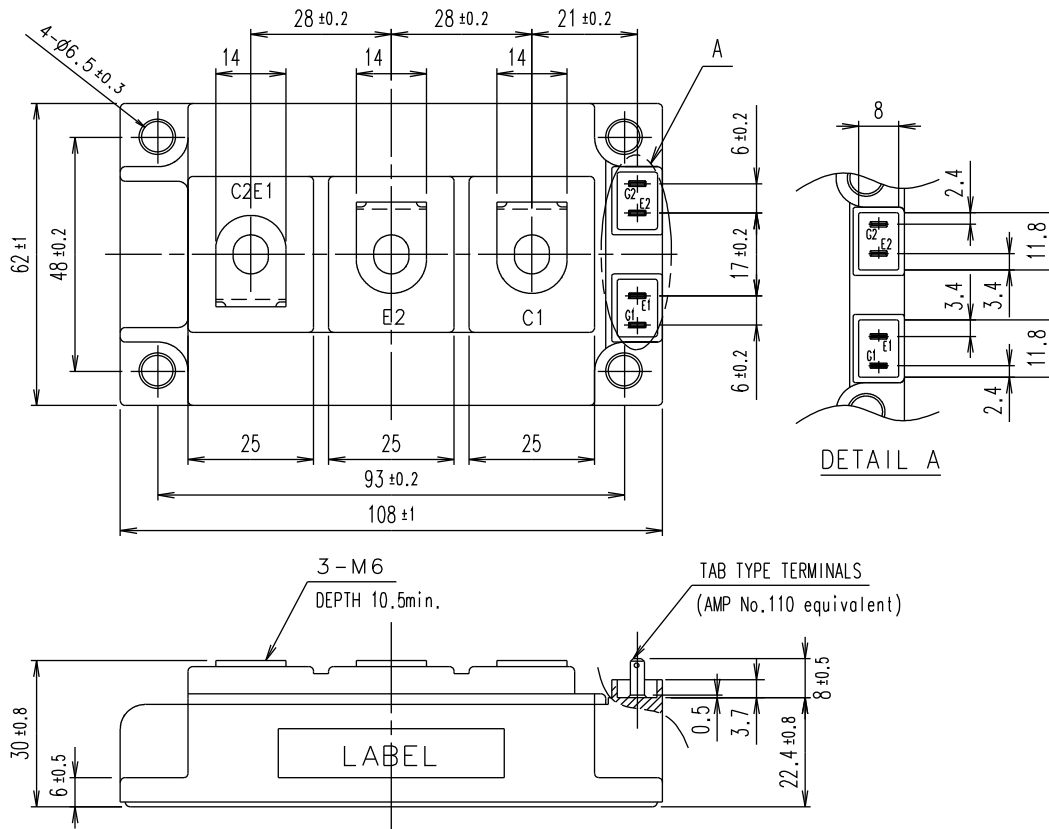


Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_G \geq 1.6\Omega, T_J \leq 125^\circ C$

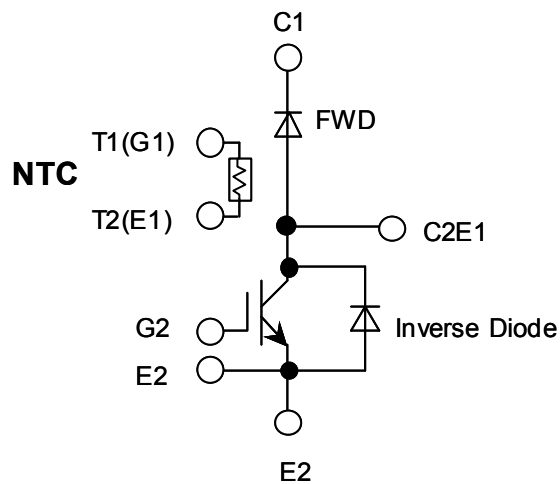




■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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