

1MBI400HH-120L-50

IGBT Modules

IGBT MODULE

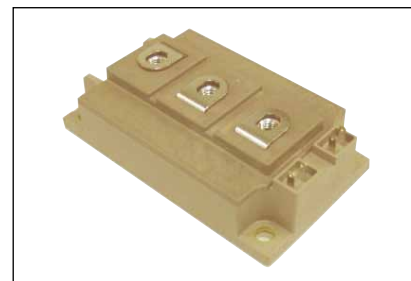
1200V / 400A / 1 in one package

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

Items	Symbols	Conditions	Maximum ratings	Units
Collector-Emitter voltage	V_{CES}		1200	V
Gate-Emitter voltage	V_{GES}		± 20	V
Collector current	I_C	Continuous	$T_c=25^\circ\text{C}$ $T_c=80^\circ\text{C}$	A
	I_{CP}	1ms	$T_c=25^\circ\text{C}$ $T_c=80^\circ\text{C}$	
	$-I_C$		75	
	$-I_C$ pulse	1ms	150	
Collector Power Dissipation	P_C	1 device	2500	W
Reverse voltage for FWD	V_R		1200	V
Forward current for FWD	I_F	Continuous	400	A
	I_F pulse	1ms	800	
Junction temperature	T_J		+150	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	
Isolation voltage	between terminal and copper base (*1)	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 $T_J = 25^\circ\text{C}$ unless otherwise specified)

Items		Symbols	Conditions		Characteristics			Units	
					min.	typ.	max.		
IGBT+Inverse Diode	Zero gate voltage collector current	I _{CES}	V _{CE} = 1200V V _{GE} = 0V		-	-	4.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V V _{GE} =±20V		-	-	800	nA	
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V I _C = 400mA		5.7	6.2	6.7	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (terminal)	I _C = 400A	T _J = 25°C	-	3.30	3.60	V	
				T _J =125°C	-	4.30	-		
		V _{CE(sat)} (chip)	V _{GE} =15V	T _J = 25°C	-	3.10	3.40		
				T _J =125°C	-	4.00	-		
	Input capacitance	C _{ies}	V _{CE} =10V,V _{GE} =0V,f=1MHz		-	35	-	nF	
	Turn-on time	t _{on}	V _{CC} = 600V I _C = 400A	V _{GE} = ±15V	-	0.20	0.60	μs	
					-	0.10	0.50		
					-	0.30	-		
		Turn-off time	t _{off}	R _G = 1.6 Ω L _S = 20nH	-	0.40	0.70		
					-	0.05	0.20		
Forward on voltage	V _F (terminal)	I _F = 75A	V _{GE} =0V	T _J = 25°C	-	1.80	2.30	V	
				T _J =125°C	-	1.95	-		
	V _F (chip)	V _{GE} =0V	T _J = 25°C	-	1.70	2.15			
				T _J =125°C	-	1.85	-		
FWD	Reverse Current	I _R	V _{CE} = 1200V		-	-	1.0	mA	
	Forward on voltage	V _F (terminal)	I _F = 400A	V _{GE} =0V	T _J = 25°C	-	8.20	9.80	V
					T _J =125°C	-	4.50	-	
		V _F (chip)	V _{GE} =0V	T _J = 25°C	-	8.00	9.60		
					T _J =125°C	-	4.30	-	
Reverse recovery time	t _{rr}	I _F = 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.

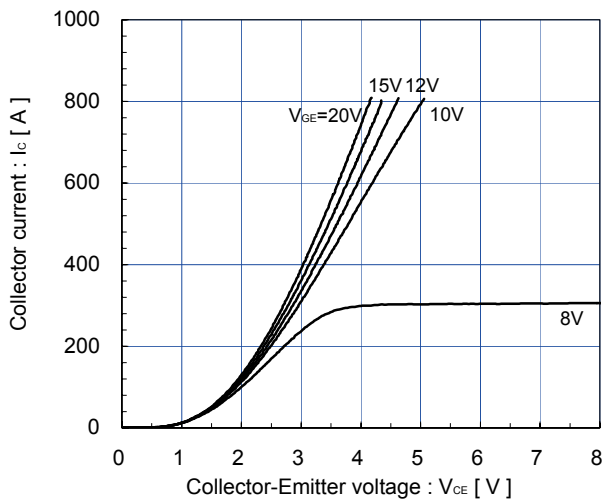
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1device)	$R_{th(j-c)}$	IGBT	-	-	0.036	$^\circ\text{C/W}$
		Inverse Diode	-	-	0.460	
		FWD	-	-	0.084	
Contact Thermal resistance	$R_{th(c-f)}$	with Thermal Compound (*6)	-	0.0125	-	

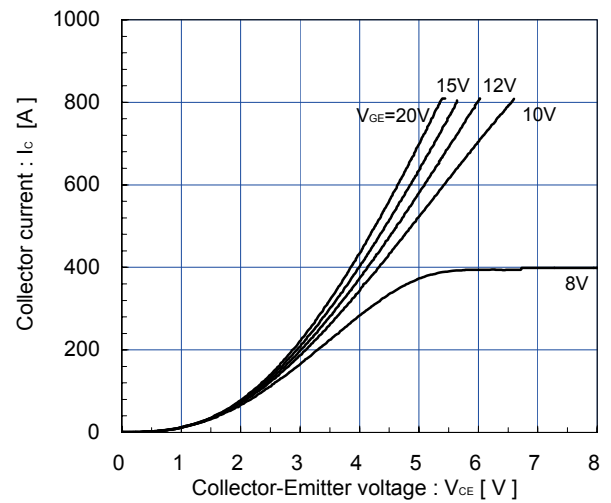
Note *6: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

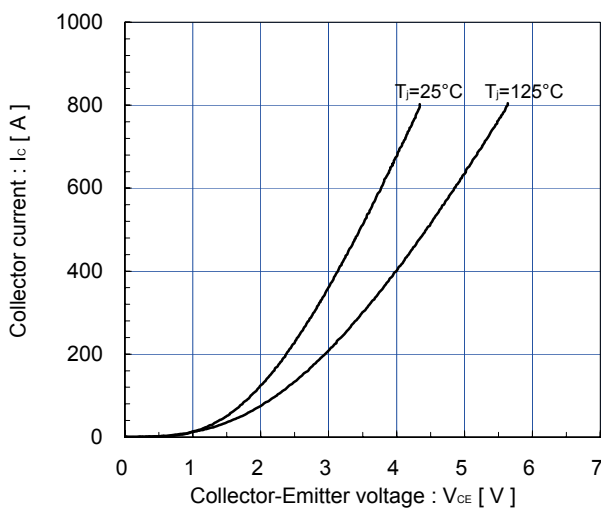
Collector current vs. Collector-Emitter voltage (typ.)
 $T_J=25^\circ\text{C}$ / chip



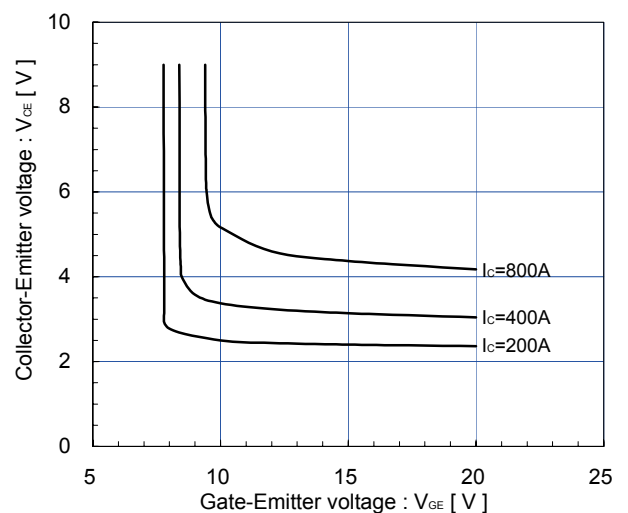
Collector current vs. Collector-Emitter voltage (typ.)
 $T_J=125^\circ\text{C}$ / chip



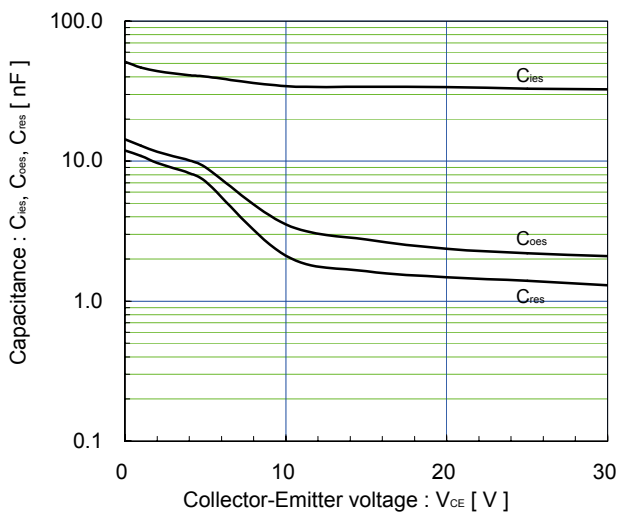
Collector current vs. Collector-Emitter voltage (typ.)
 $V_{GE}=15\text{V}$ / chip



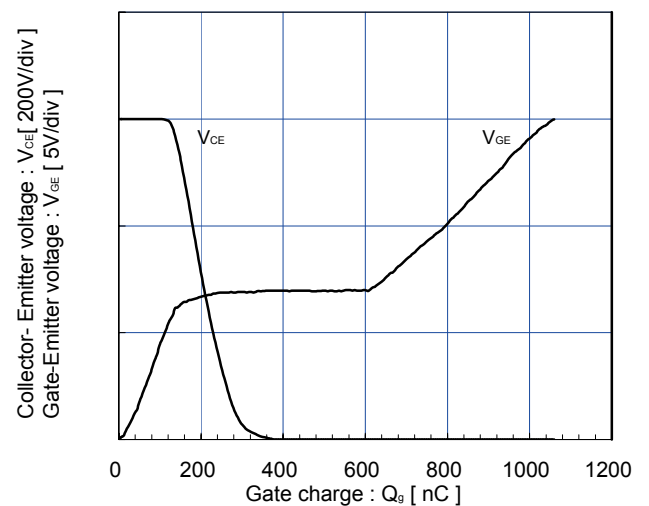
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
 $T_J=25^\circ\text{C}$ / chip



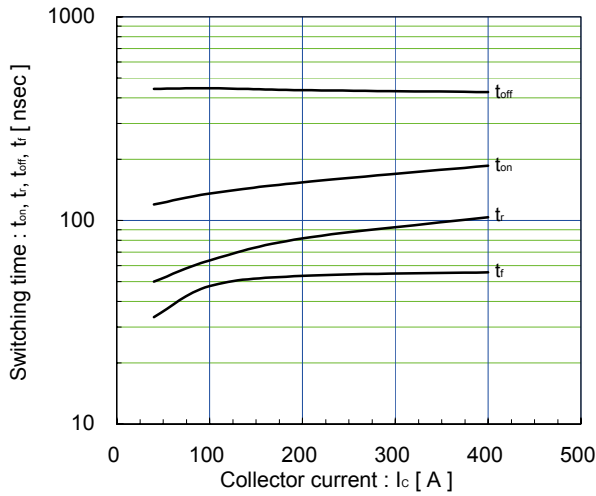
Capacitance vs. Collector-Emitter voltage (typ.)
 $V_{GE}=0\text{V}$, $f=1\text{MHz}$, $T_J=25^\circ\text{C}$



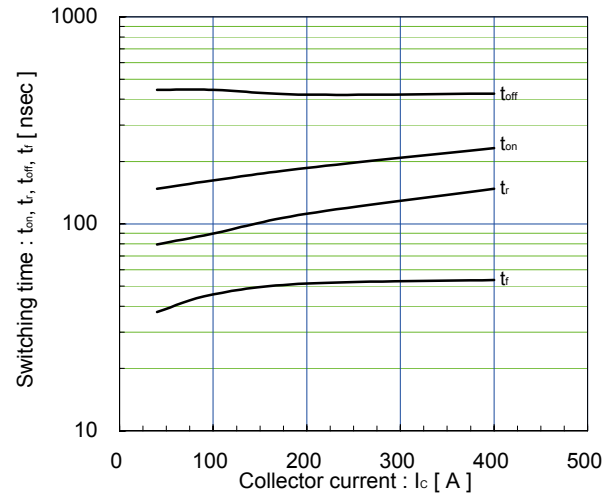
Dynamic Gate charge (typ.)
 $V_{CE}=600\text{V}$, $I_C=400\text{A}$, $T_J=25^\circ\text{C}$



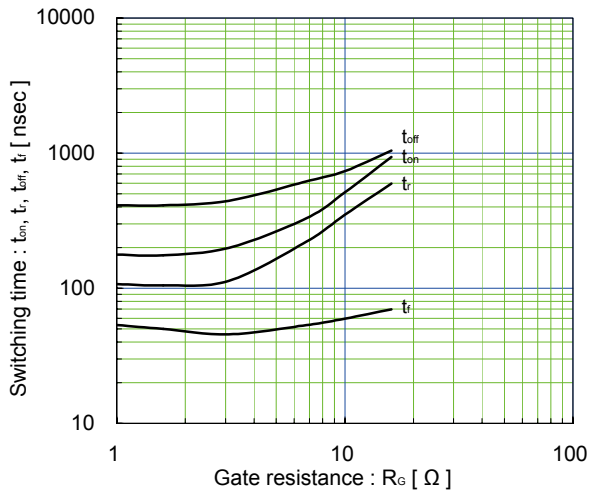
Switching time vs. Collector current (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=1.6\Omega$, $T_J=25^\circ C$



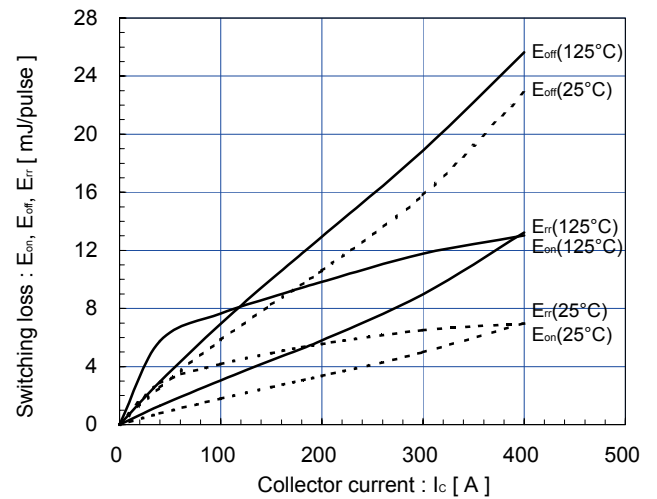
Switching time vs. Collector current (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=1.6\Omega$, $T_J=125^\circ C$



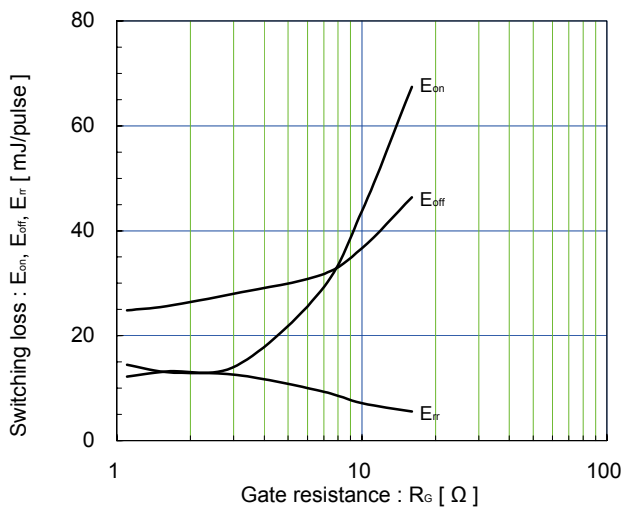
Switching time vs. Gate resistance (typ.)
 $V_{CC}=600V$, $I_C=400A$, $V_{GE}=\pm 15V$, $T_J=25^\circ C$



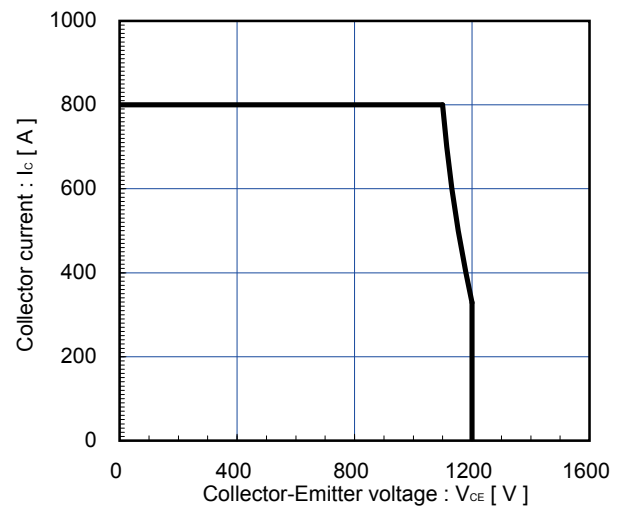
Switching loss vs. Collector current (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=1.6\Omega$



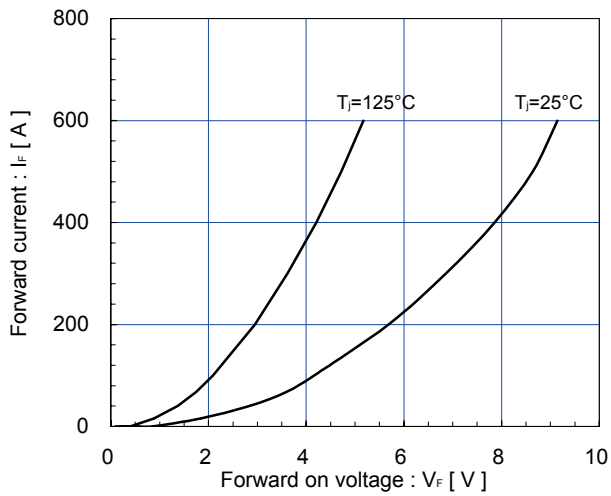
Switching loss vs. Gate resistance (typ.)
 $V_{CC}=600V$, $I_C=400A$, $V_{GE}=\pm 15V$, $T_J=125^\circ C$



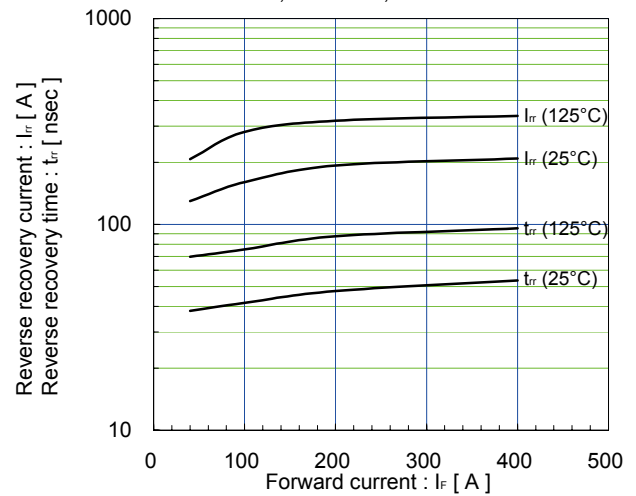
Reverse bias safe operating area (max.)
 $+V_{GE}=15V$, $-V_{GE} \leq 15V$, $R_G \geq 1.6\Omega$, $T_J \leq 125^\circ C$



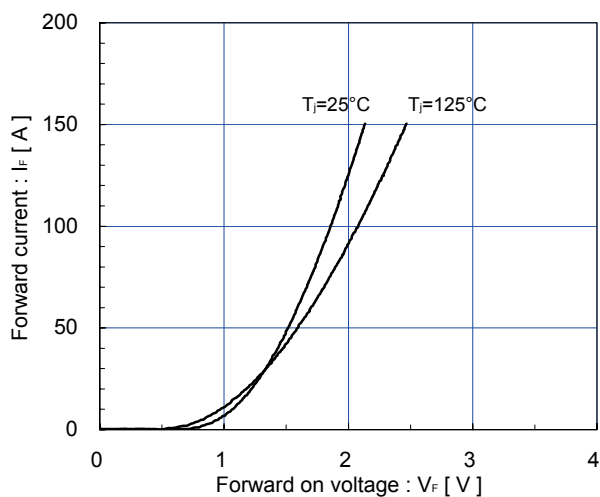
FWD

Forward current vs. Forward on voltage for Inverse Diode (typ.)
chip

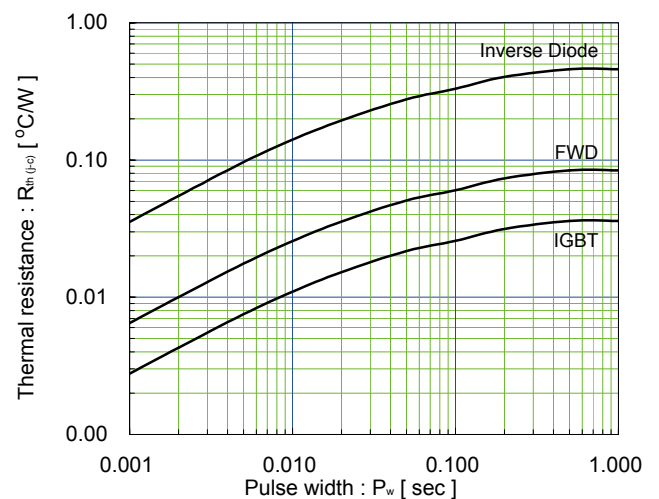
FWD

Reverse recovery characteristics (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=1.6\Omega$ 

Inverse Diode

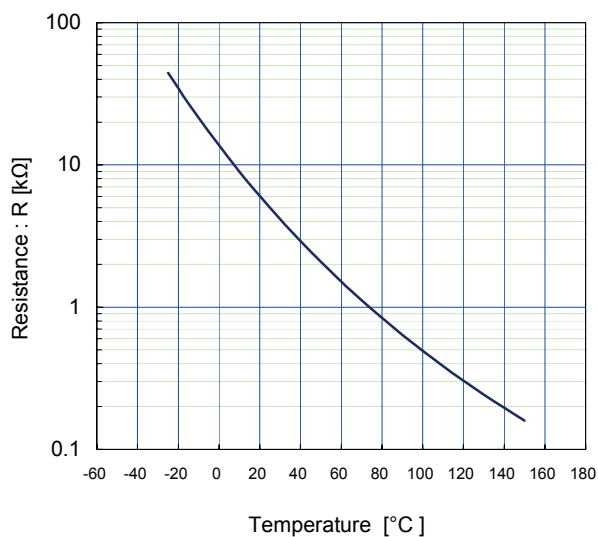
Forward current vs. Forward on voltage (typ.)
chip

Transient thermal resistance (max.)

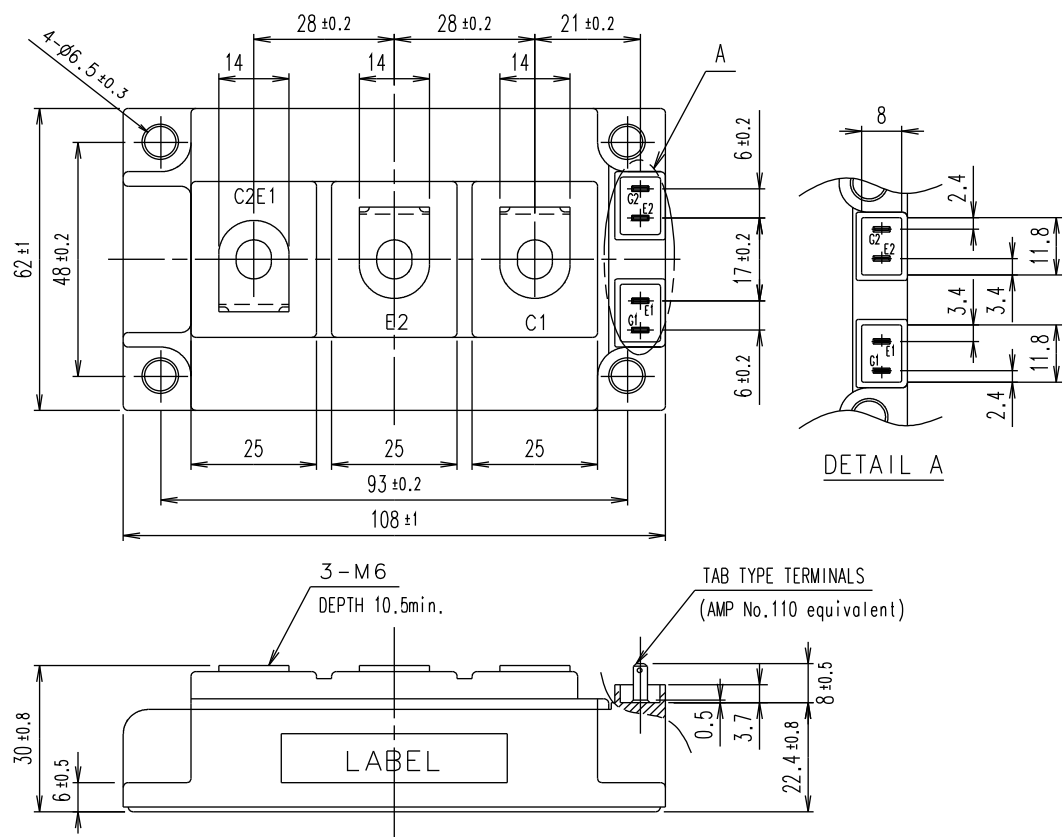


Thermistor

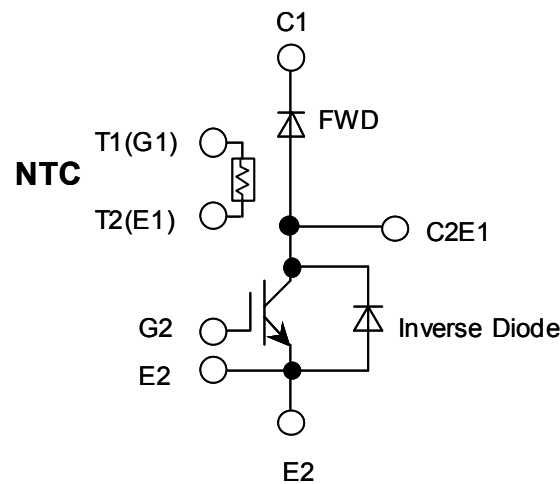
Temperature characteristic (typ.)



Outline Drawings, mm



Equivalent Circuit Schematic



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