

1MBI400VF-120-50

IGBT Modules

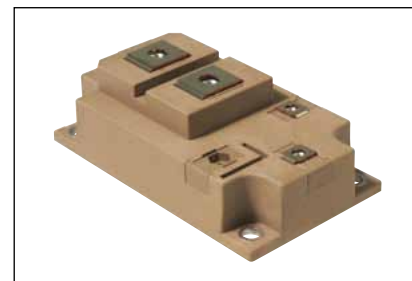
IGBT MODULE (V series) 1200V / 400A / 1 in one package

■ Features

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

■ 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
Collector-Emitter voltage	V_{CES}		1200	V
Gate-Emitter voltage	V_{GES}		± 20	V
Collector current	I_C	Continuous	$T_c=100^{\circ}\text{C}$ 400	A
	I_C pulse	1ms	$T_c=25^{\circ}\text{C}$ 480	
	$-I_C$		800	
	$-I_C$ pulse	1ms	400	
Collector power dissipation	P_C	1 device	800	W
Junction temperature	T_j		3330	°C
Operating junction temperature (under switching conditions)	T_{jop}		175	
Case temperature	T_c		150	
Storage temperature	T_{stg}		125	
Isolation voltage	Between terminal and copper base (*1)	AC : 1min.	-40~+125	VAC
Screw torque	Mounting (*2)		2500	
	Terminals (*3)		6.0	
			2.0	N m
			5.0	

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

Note *2: Recommendable Value : 1.96-6.0 Nm (M5, M6)

Grease type : Shin-Etsu Chemical Co., Ltd "G-747"

Note *3: Recommendable Value : 0.98-2.0 Nm (M4)

Recommendable Value : 1.96-5.0 Nm (M6)

● Electrical characteristics (at $T_J = 25^\circ\text{C}$ unless otherwise specified)

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 1200V		-	-	4.0	mA
Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V		-	-	400	nA
Gate-Emitter threshold voltage	V _{GE (th)}	V _{CE} = 20V, I _C = 400mA		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	V _{CE (sat)} (terminal)	V _{GE} = 15V I _C = 400A	T _J =25°C	-	1.95	2.40	V
			T _J =125°C	-	2.25	-	
			T _J =150°C		2.30		
	V _{CE (sat)} (chip)		T _J =25°C	-	1.75	2.15	
			T _J =125°C	-	2.05	-	
			T _J =150°C		2.10		
Internal gate resistance	R _{G(int)}	-		-	1.9	-	Ω
Input capacitance	C _{ies}	V _{GE} = 0V, V _{CE} = 10V, f = 1MHz		-	36	-	nF
Turn-on time	t _{on}	V _{CC} = 600V, I _C = 400A V _{GE} = ±15V, R _G = 1.8Ω T _J =150°C, L _S =35nH		-	600	-	nsec
	t _r			-	200	-	
	t _{r(l)}			-	80	-	
Turn-off time	t _{off}			-	1000	-	
	t _f			-	140	-	
Forward on voltage	V _F (terminal)	V _{GE} = 0V I _F = 400A	T _J =25°C	-	1.85	2.35	V
			T _J =125°C	-	2.00	-	
			T _J =150°C		1.95		
	V _F (chip)		T _J =25°C	-	1.70	2.15	
			T _J =125°C	-	1.85	-	
			T _J =150°C		1.80		
Reverse recovery time	t _{rr}	I _F = 400A		-	200	-	nsec

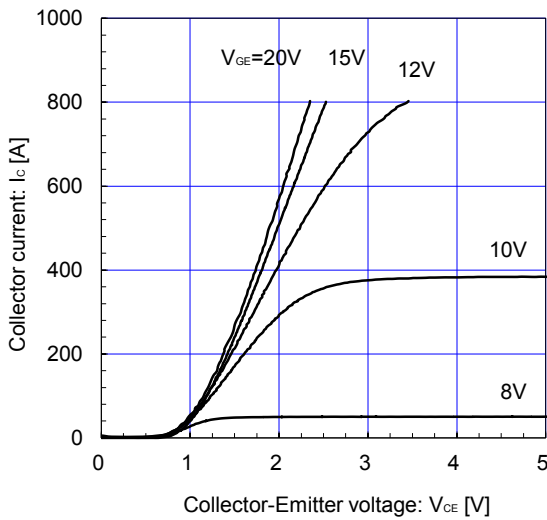
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.045	$^\circ\text{C/W}$
		FWD	-	-	0.077	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	with Thermal Compound	-	0.0125	-	

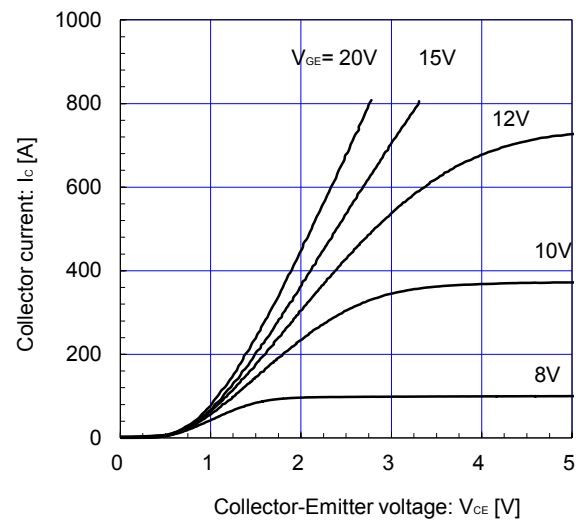
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

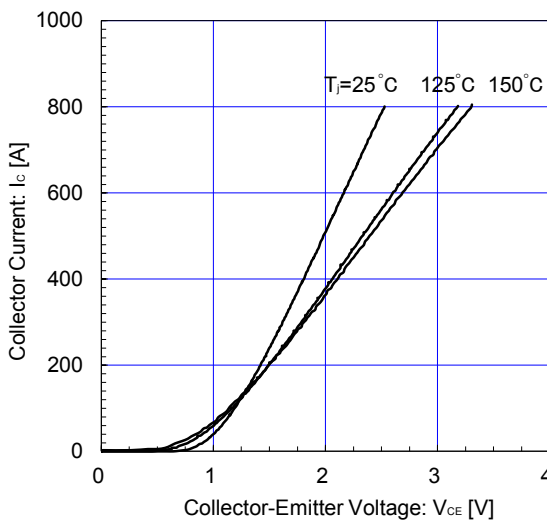
Collector current vs. Collector-Emmitter voltage (typ.)
 $T_J = 25^\circ\text{C}$ / chip



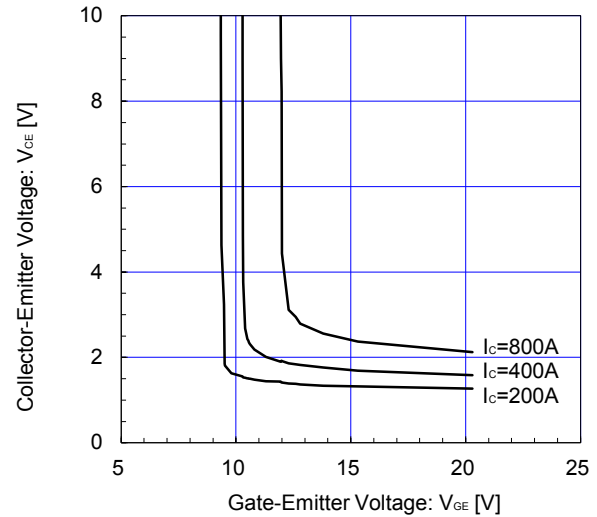
Collector current vs. Collector-Emmitter voltage (typ.)
 $T_J = 150^\circ\text{C}$ / chip



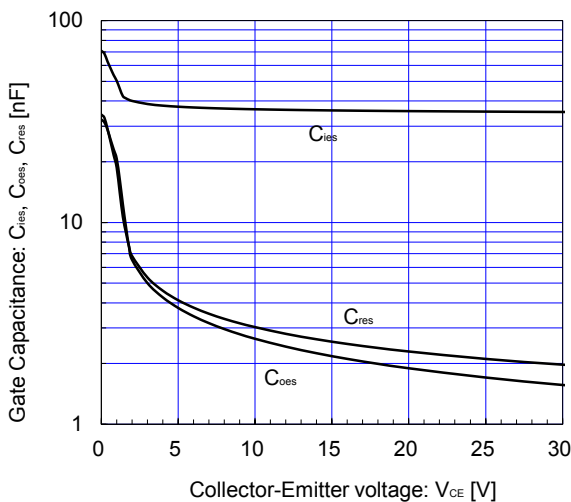
Collector current vs. Collector-Emmitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



Collector-Emmitter voltage vs. Gate-Emmitter voltage
 $T_J = 25^\circ\text{C}$ / chip

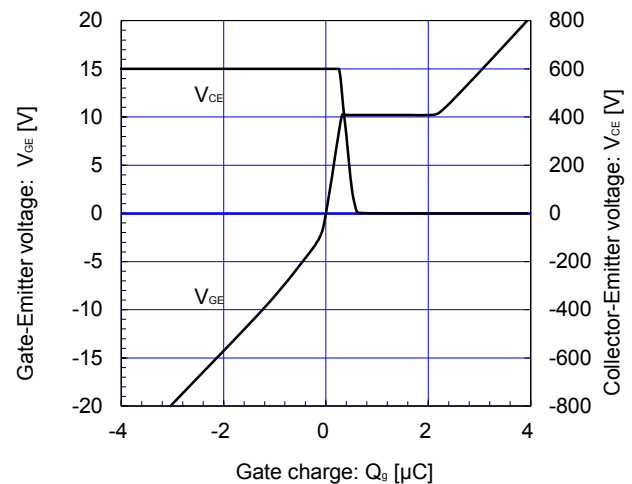


Gate Capacitance vs. Collector-Emmitter Voltage
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_J = 25^\circ\text{C}$

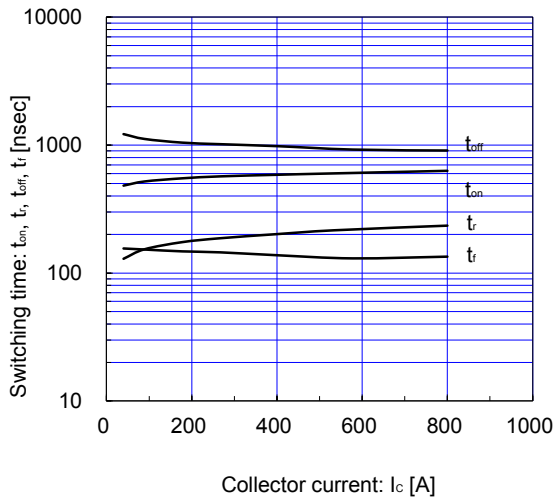


Dynamic Gate Charge (typ.)

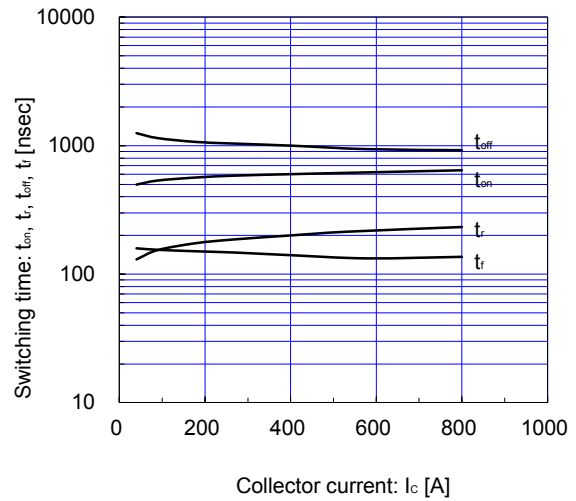
$V_{CC} = 600\text{V}$, $I_C = 400\text{A}$, $T_J = 25^\circ\text{C}$



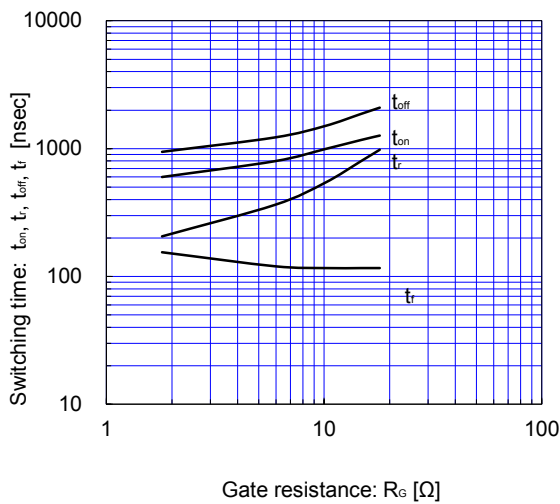
Switching time vs. Collector current (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=1.8\Omega$, $T_J=125^\circ C$



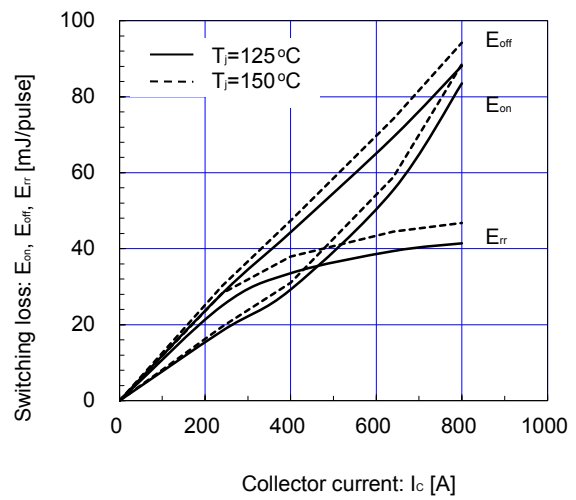
Switching time vs. Collector current (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=1.8\Omega$, $T_J=150^\circ C$



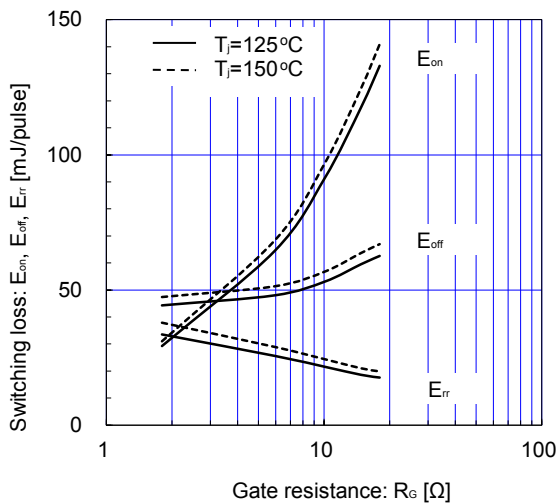
Switching time vs. Gate resistance (typ.)
 $V_{CC}=600V$, $I_C=400A$, $V_{GE}=\pm 15V$, $T_J=125^\circ C$



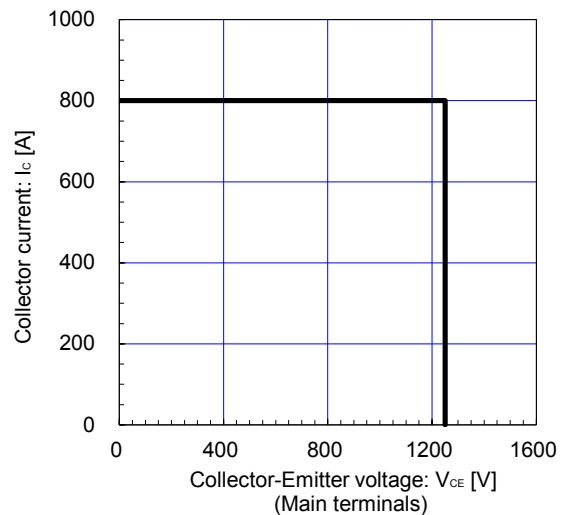
Switching loss vs. Collector current (typ.)
 $V_{CC}=600V$, $V_{GE}=\pm 15V$, $R_G=1.8\Omega$, $T_J=125^\circ C$

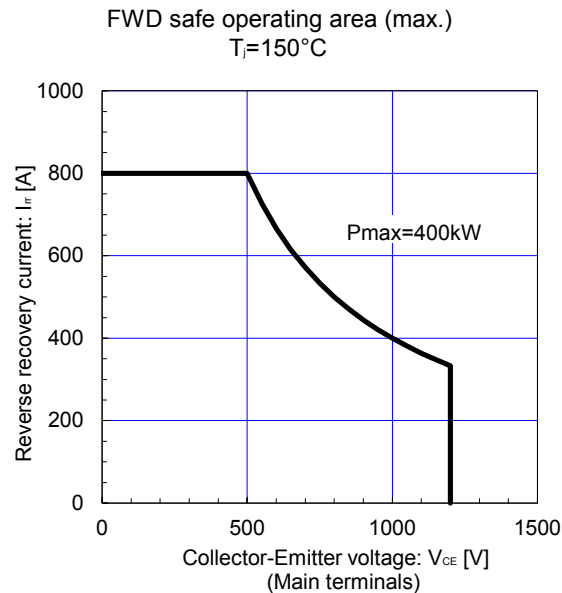
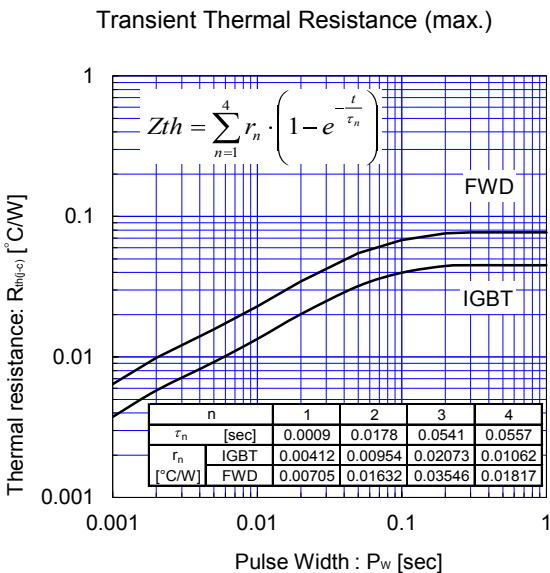
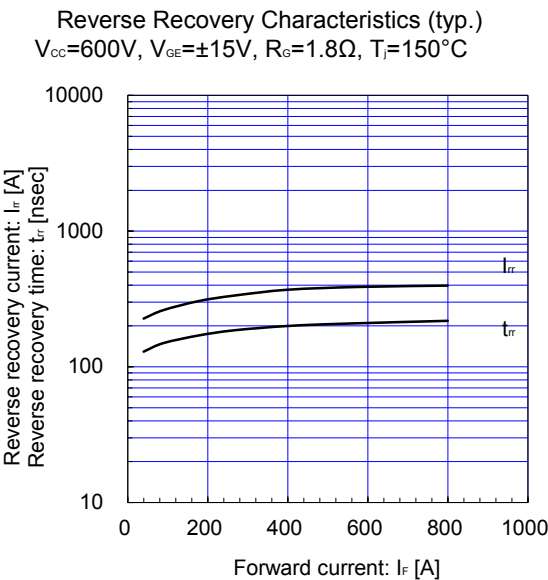
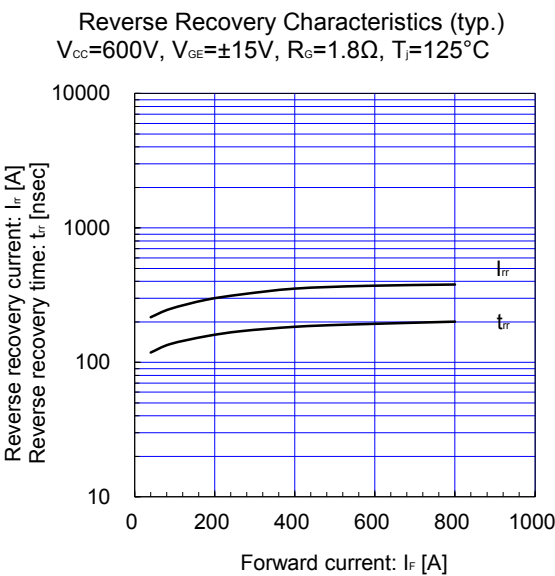
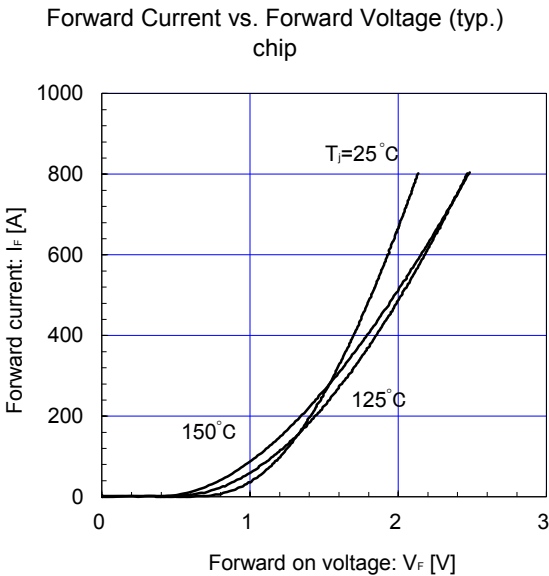


Switching loss vs. Gate resistance (typ.)
 $V_{CC}=600V$, $I_C=400A$, $V_{GE}=\pm 15V$, $T_J=125^\circ C$

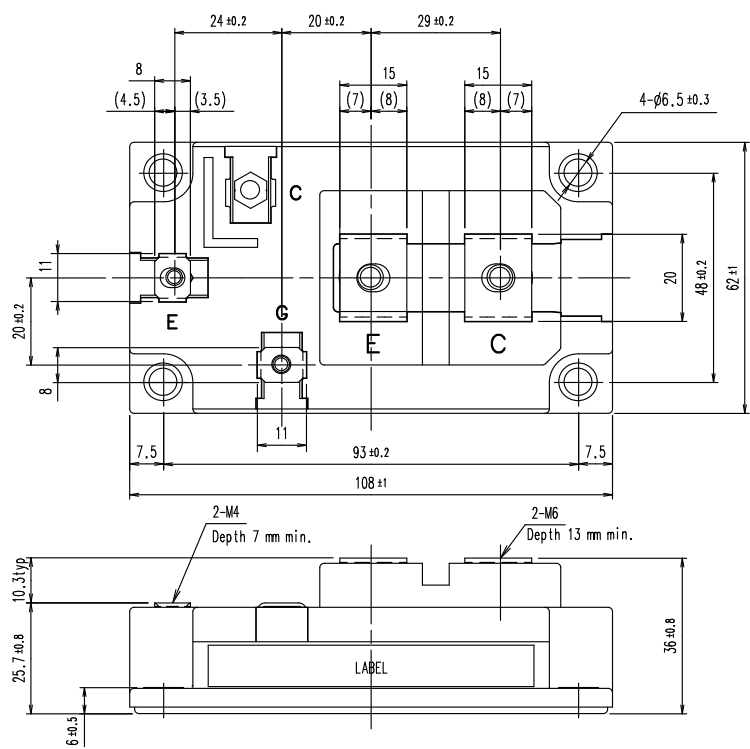


Reverse bias safe operating area (max.)
 $V_{GE}=\pm 15V$, $R_G=1.8\Omega$, $T_J=150^\circ C$, $L_s=35nH$

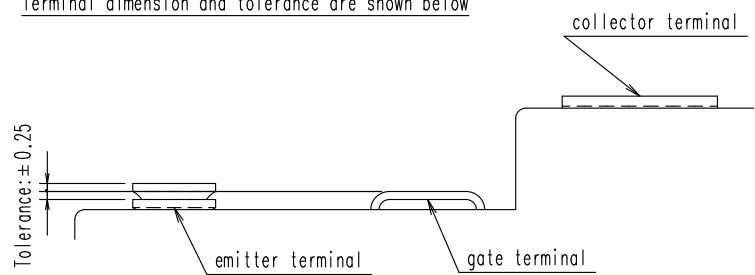




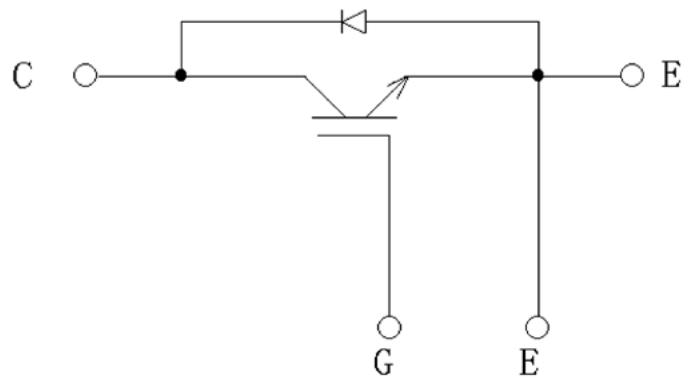
Outline Drawings(Unit:mm)



Terminal dimension and tolerance are shown below



Equivalent Circuit



WARNING

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			• Industrial robots etc.
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• Emergency equipment for responding to disasters and anti-burglary devices	• Safety devices
• Medical equipment	
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• Submarine repeater equipment		
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