

1MBI600VF-120-50

IGBT Modules

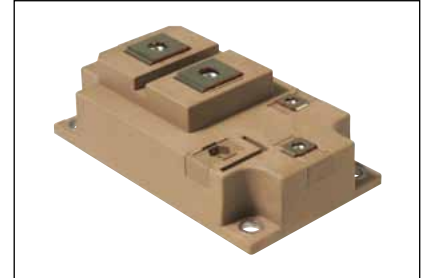
IGBT MODULE (V series) 1200V / 600A / 1 in one package

■ 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	$T_c=100^\circ\text{C}$	600	A
			$T_c=25^\circ\text{C}$	720	
	$I_{c\ pulse}$	1ms	1200		
	$-I_c$		600		
	$-I_{c\ pulse}$	1ms	1200		
Collector power dissipation	P_c	1 device	4680	W	
Junction temperature	T_j		175	°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)	AC : 1min.	2500	VAC	
Screw torque	Mounting (*2)	-	6.0	N m	
	Terminals (*3)	M4	2.0		
		M6	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}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	800	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 600mA$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 600A$	$T_j = 25^\circ\text{C}$	-	2.10	2.55	V
			$T_j = 125^\circ\text{C}$	-	2.40	-	
			$T_j = 150^\circ\text{C}$	-	2.45	-	
	$V_{CE(sat)}$ (chip)		$T_j = 25^\circ\text{C}$	-	1.75	2.15	
			$T_j = 125^\circ\text{C}$	-	2.05	-	
$T_j = 150^\circ\text{C}$	-	2.10	-				
Internal gate resistance	$R_{G(int)}$	-	-	1.3	-	Ω	
Input capacitance	C_{ies}	$V_{GE} = 0V, V_{CE} = 10V, f = 1MHz$	-	49	-	nF	
Turn-on time	t_{on}	$V_{CC} = 600V, I_c = 600A$ $V_{GE} = \pm 15V, R_G = 1.2\Omega$ $T_j = 150^\circ\text{C}, L_S = 35nH$	-	700	-	nsec	
	t_r		-	250	-		
	$t_{r(l)}$		-	100	-		
Turn-off time	t_{off}		-	900	-		
	t_f		-	100	-		
Forward on voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 600A$	$T_j = 25^\circ\text{C}$	-	1.90	2.40	V
			$T_j = 125^\circ\text{C}$	-	2.05	-	
			$T_j = 150^\circ\text{C}$	-	2.00	-	
	V_F (chip)		$T_j = 25^\circ\text{C}$	-	1.70	2.15	
			$T_j = 125^\circ\text{C}$	-	1.85	-	
$T_j = 150^\circ\text{C}$	-	1.80	-				
Reverse recovery time	t_{rr}	$I_F = 600A$	-	270	-	nsec	

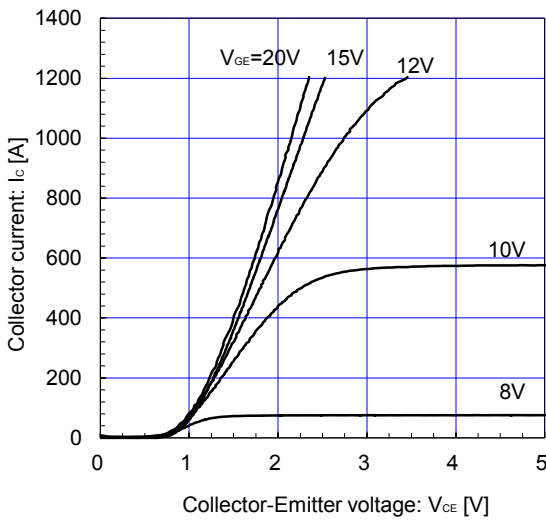
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.032	$^\circ\text{C/W}$
		FWD	-	-	0.055	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	with Thermal Compound	-	0.0063	-	

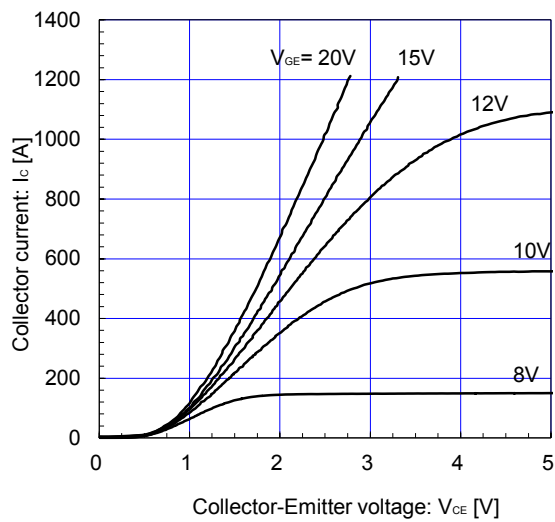
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

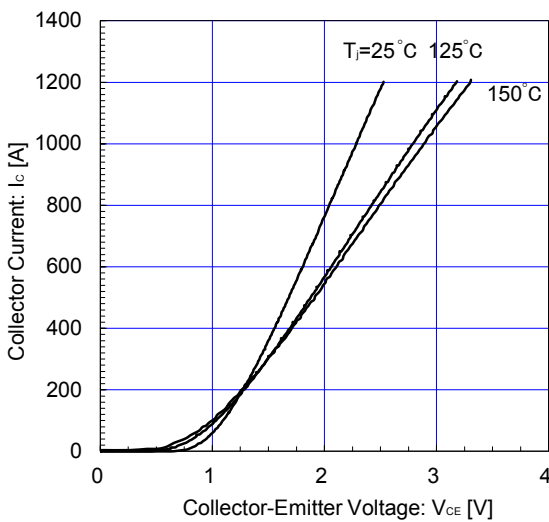
Collector current vs. Collector-Emmitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



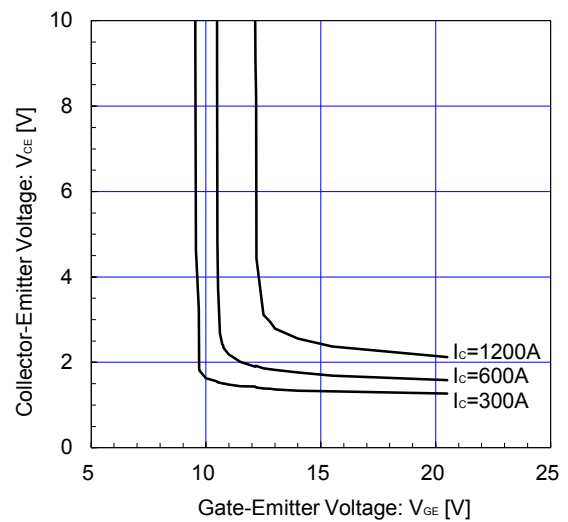
Collector current vs. Collector-Emmitter voltage (typ.)
 $T_j = 150^\circ\text{C}$ / chip



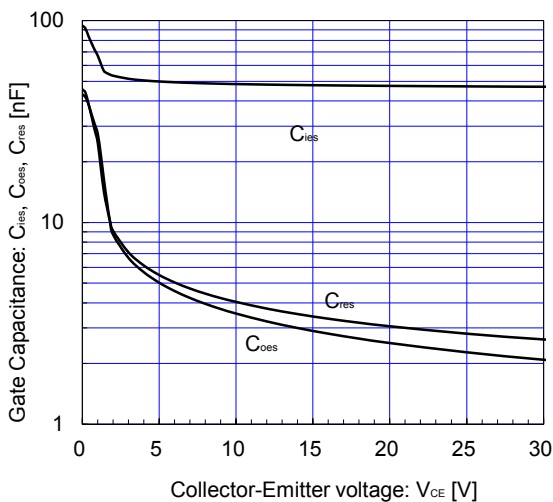
Collector current vs. Collector-Emmitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



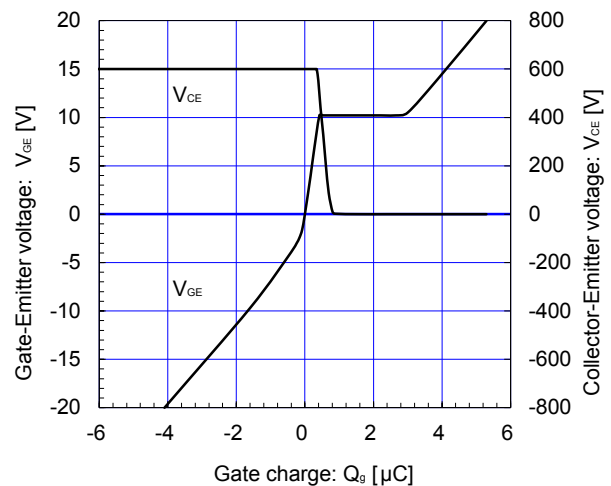
Collector-Emmitter voltage vs. Gate-Emmitter voltage
 $T_j = 25^\circ\text{C}$ / chip



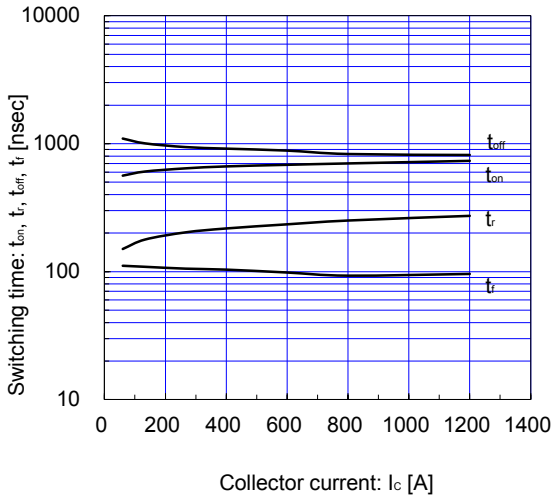
Gate Capacitance vs. Collector-Emmitter Voltage
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$



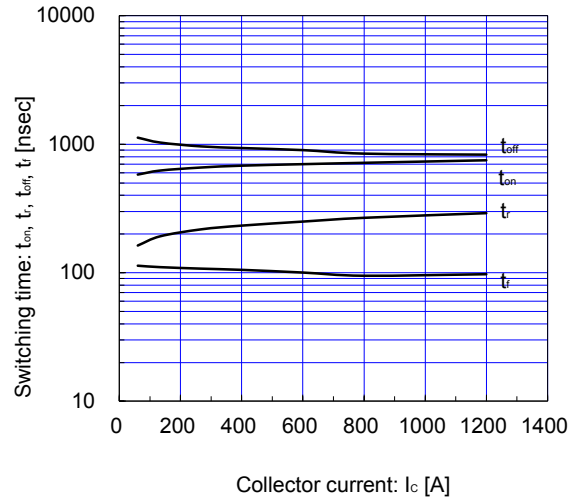
Dynamic Gate Charge (typ.)
 $V_{CC} = 600\text{V}$, $I_c = 600\text{A}$, $T_j = 25^\circ\text{C}$



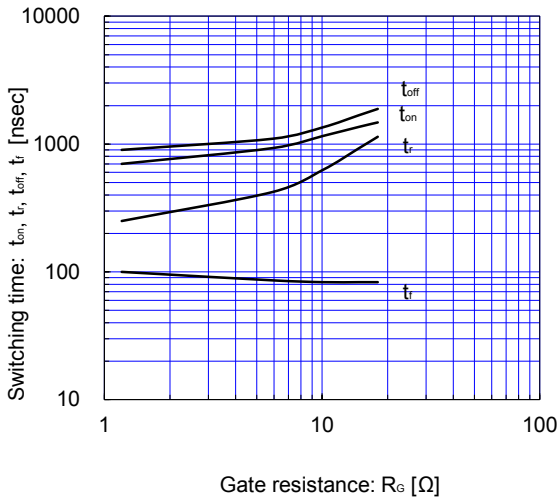
Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=125^\circ C$



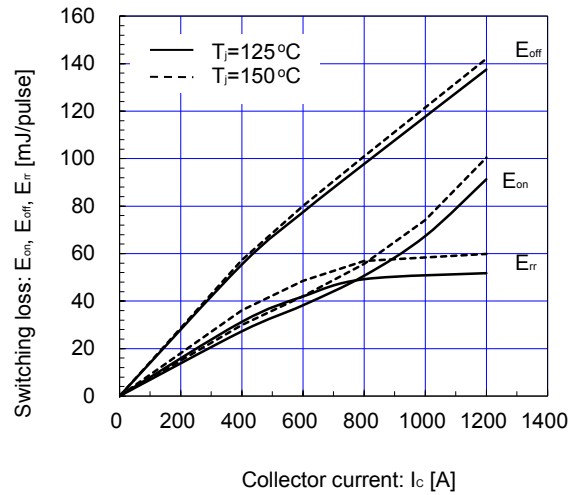
Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=150^\circ C$



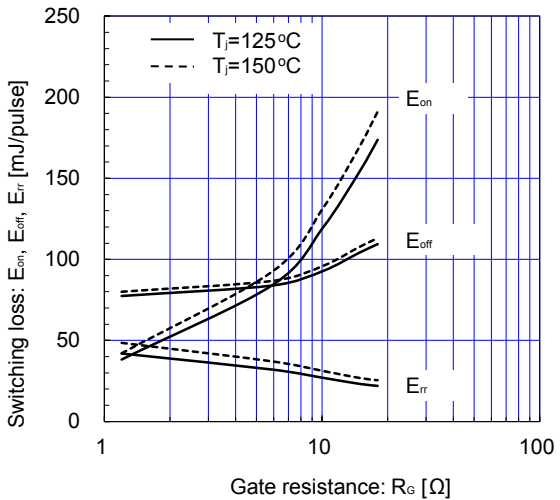
Switching time vs. Gate resistance (typ.)
 $V_{CC}=600V, I_c=600A, V_{GE}=\pm 15V, T_J=125^\circ C$



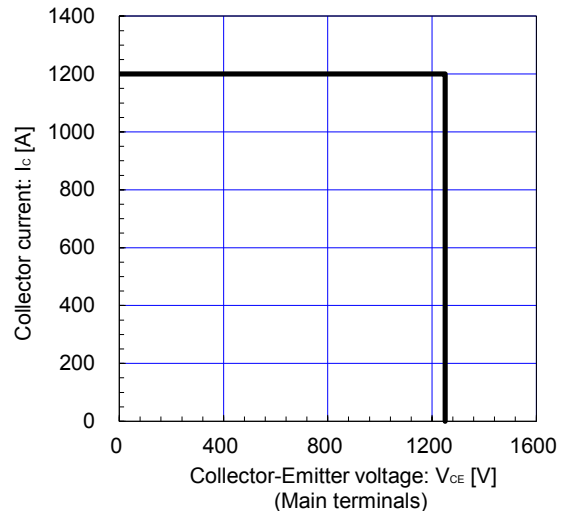
Switching loss vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=125^\circ C$



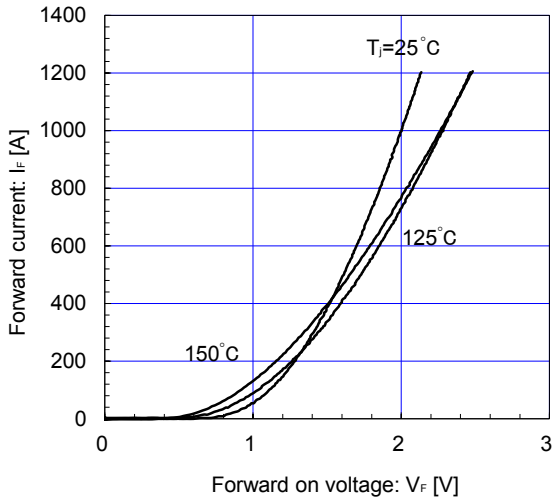
Switching loss vs. Gate resistance (typ.)
 $V_{CC}=600V, I_c=600A, V_{GE}=\pm 15V, T_J=125^\circ C$



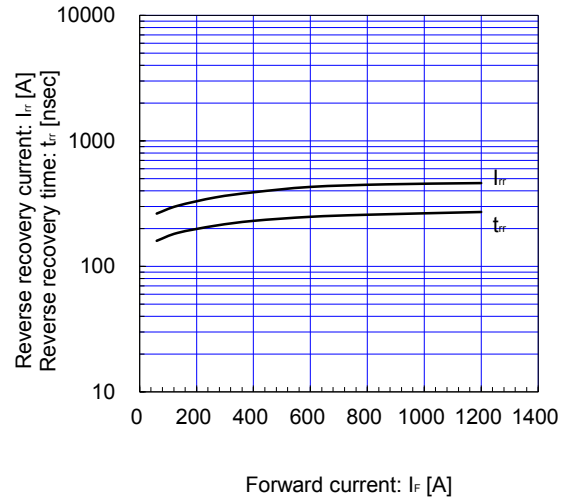
Reverse bias safe operating area (max.)
 $V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=150^\circ C, L_s=35nH$



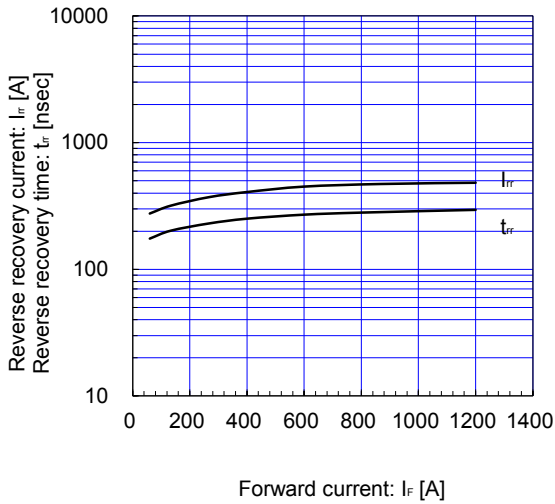
Forward Current vs. Forward Voltage (typ.)
chip



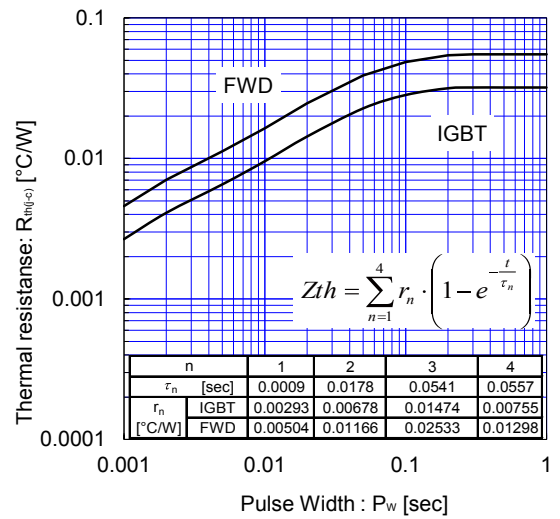
Reverse Recovery Characteristics (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=125^\circ C$



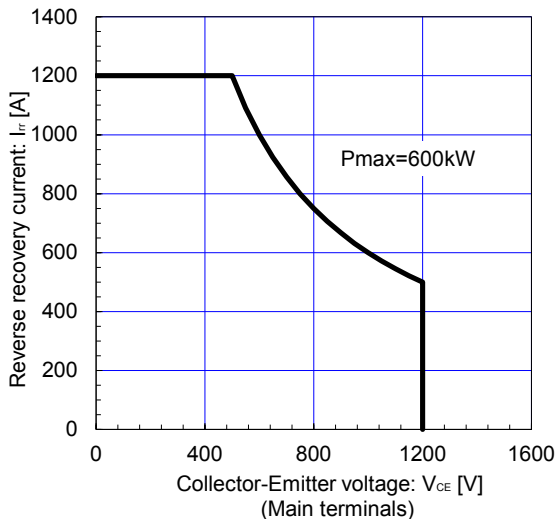
Reverse Recovery Characteristics (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_J=150^\circ C$



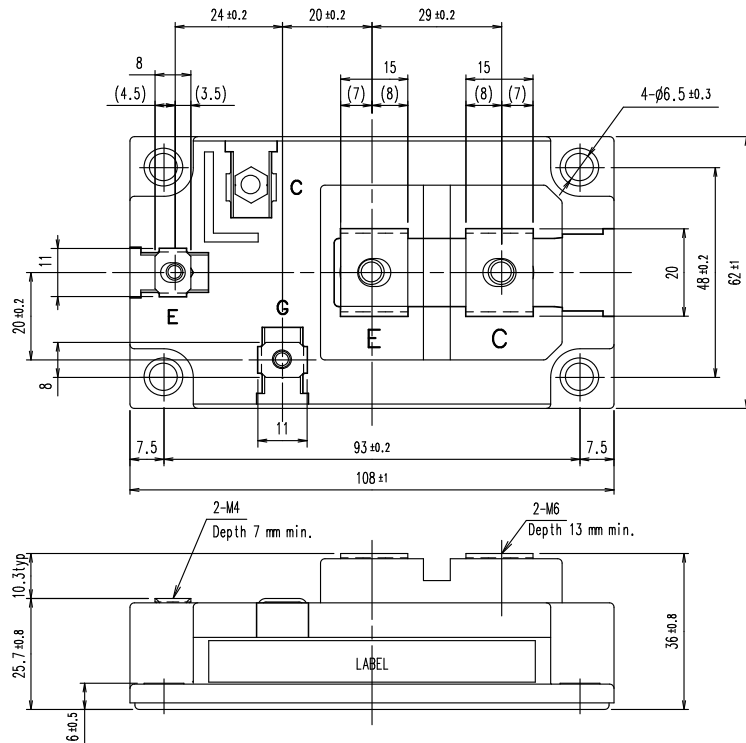
Transient Thermal Resistance (max.)



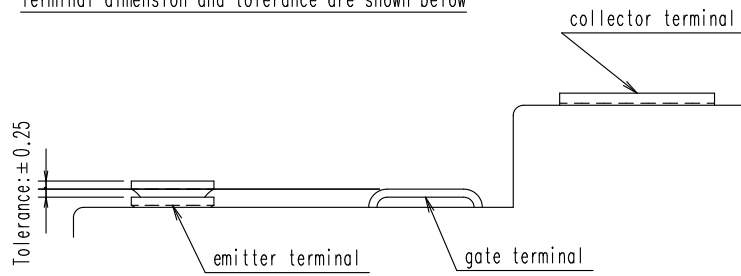
FWD safe operating area (max.)
 $T_J=150^\circ C$



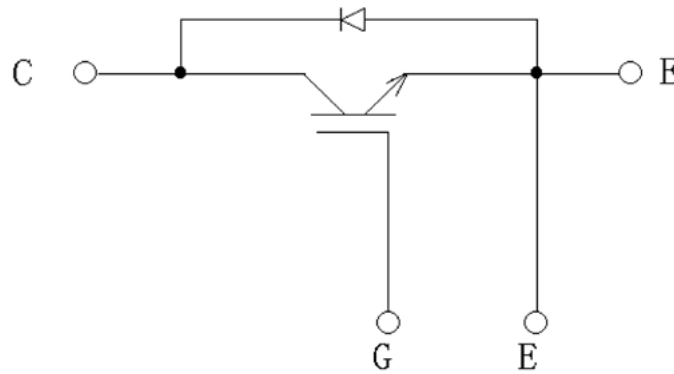
■ Outline Drawings(Unit:mm)



Terminal dimension and tolerance are shown below



■ Equivalent Circuit



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