

1MBI600V-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 Tc=25°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	Tc=100°C 600 Tc=25°C 720	A
	I _c pulse	1ms	1200	
	-I _c		600	
	-I _c pulse	1ms	1200	
Collector power dissipation	P _c	1 device	3000	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
	Mounting (*2)			
Screw torque	Terminals (*3)	M4	2.0	Nm
		M6	5.0	

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

Note *2: Recommendable Value : 3.0-6.0 Nm (M5, M6)

Note *3: Recommendable Value : 1.1-2.0 Nm (M4)

Recommendable Value : 2.5-5.0 Nm (M6)

● Electrical characteristics (at Tj= 25°C unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V, V_{CE} = 1200V$	-	-	4.0	mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	400	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)	$V_{GE} = 15V$ $I_c = 600A$	Tj=25°C	-	2.05	2.50	V
			Tj=125°C	-	2.35	-	
			Tj=150°C	-	2.40	-	
	$V_{CE(sat)}$ (chip)		Tj=25°C	-	1.75	2.15	
			Tj=125°C	-	2.05	-	
			Tj=150°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}	$V_{CC} = 600V, I_c = 600A$ $V_{GE} = \pm 15V, R_G = 1.2\Omega$ $T_j = 150^\circ C, L_s = 35nH$	-	0.70	-	μs	
	t_r		-	0.25	-		
	$t_{r(i)}$		-	0.10	-		
Turn-off time	t_{off}		-	0.90	-		
	t_f		-	0.10	-		
	t_{tr}		-	0.10	-		
Forward on voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 600A$	Tj=25°C	-	1.85	2.30	V
			Tj=125°C	-	2.00	-	
			Tj=150°C	-	1.95	-	
	V_F (chip)		Tj=25°C	-	1.70	2.15	
			Tj=125°C	-	1.85	-	
			Tj=150°C	-	1.80	-	
Reverse recovery time	t_{rr}	$I_F = 600A$	-	0.27	-	μs	

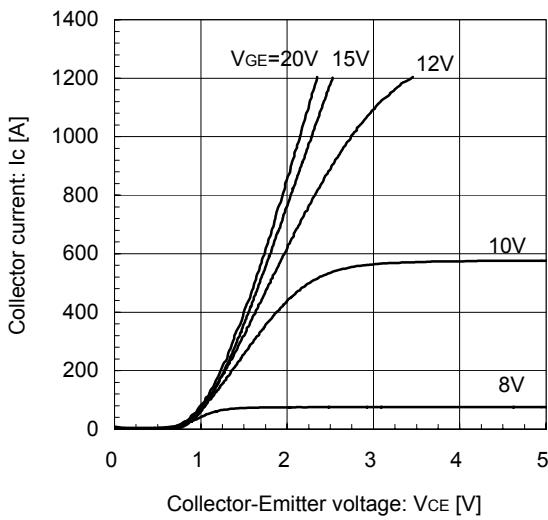
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.050	°C/W
		FWD	-	-	0.070	
Contact thermal resistance (*4)	$R_{th(c-f)}$	with Thermal Compound	-	0.0063	-	

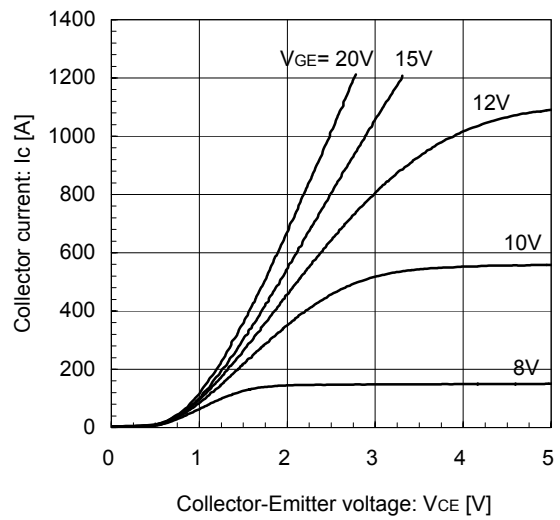
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

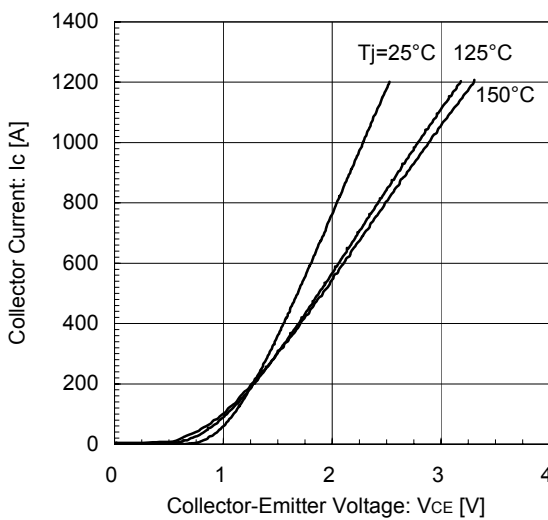
Collector current vs. Collector-Emmitter voltage (typ.)
T_j = 25°C / chip



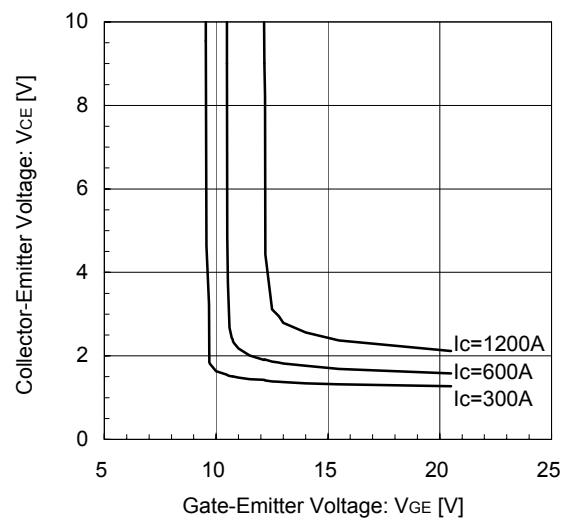
Collector current vs. Collector-Emmitter voltage (typ.)
T_j = 150°C / chip



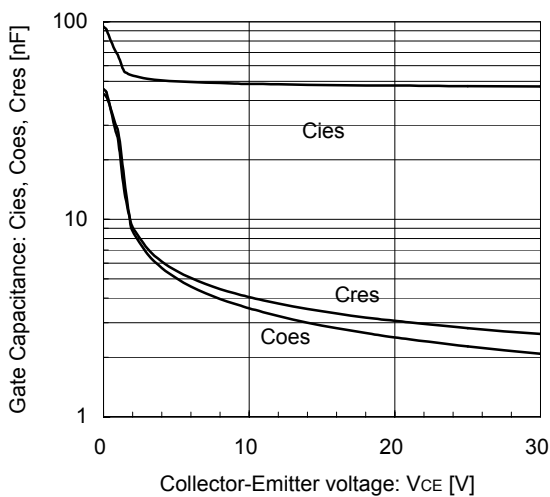
Collector current vs. Collector-Emmitter voltage (typ.)
V_{GE} = 15V / chip



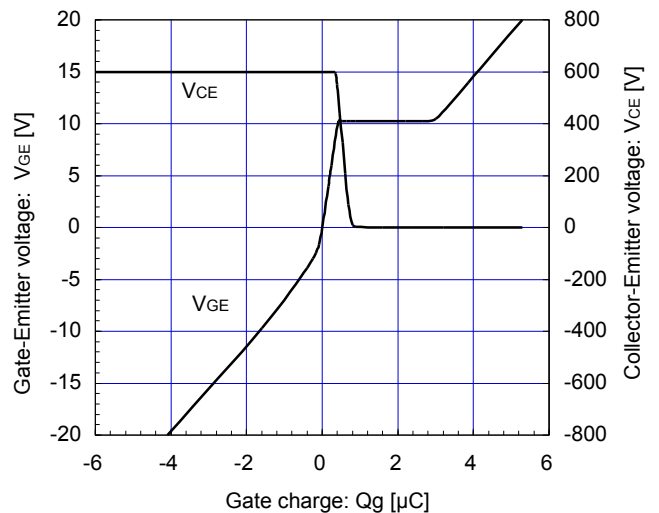
Collector-Emmitter voltage vs. Gate-Emmitter voltage
T_j = 25°C / chip



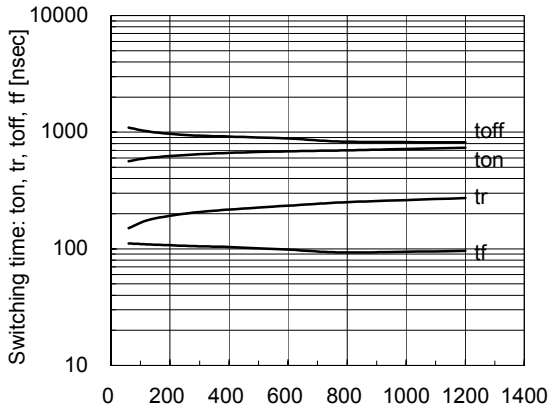
Gate Capacitance vs. Collector-Emmitter Voltage
V_{GE} = 0V, f = 1MHz, T_j = 25°C



Dynamic Gate Charge (typ.)
V_{cc} = 600V, I_c = 600A, T_j = 25°C

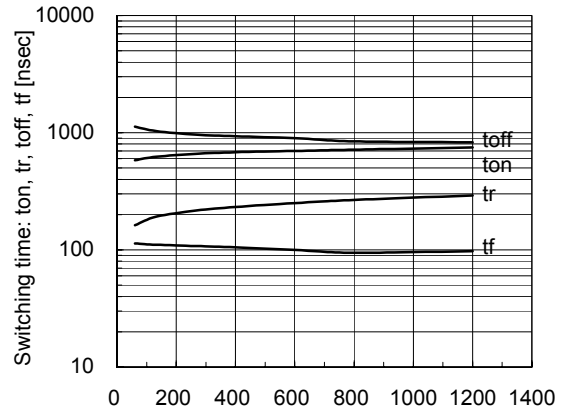


Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_j=125^\circ C$



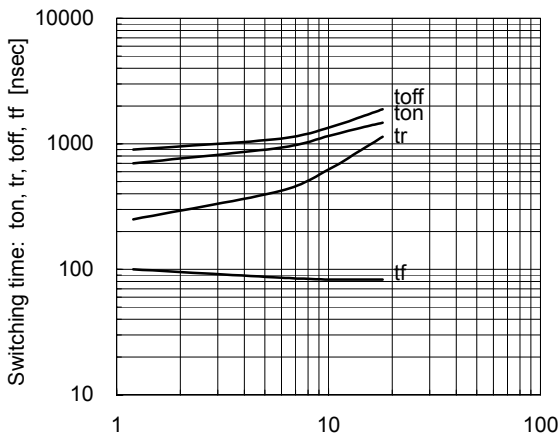
Collector current: I_c [A]

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



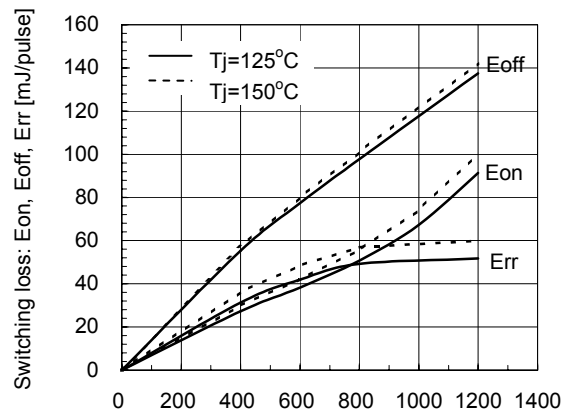
Collector current: I_c [A]

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



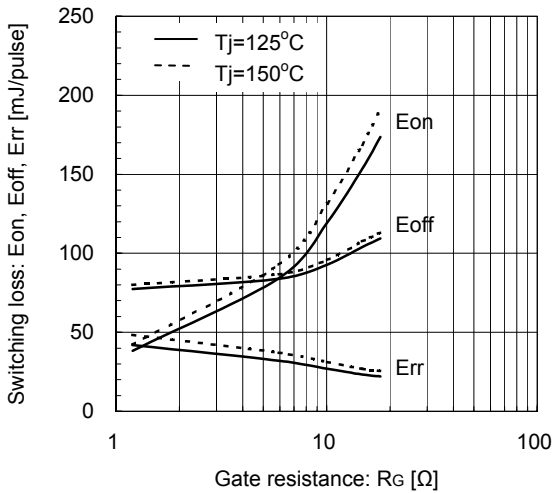
Gate resistance: R_G [Ω]

Switching loss vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.2\Omega, T_j=125^\circ C, 150^\circ C$



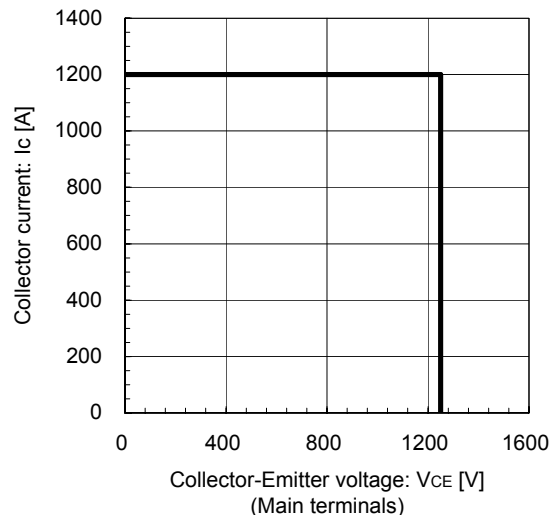
Collector current: I_c [A]

Switching loss vs. Gate resistance (typ.)
 $V_{CC}=600V, I_c=600A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$

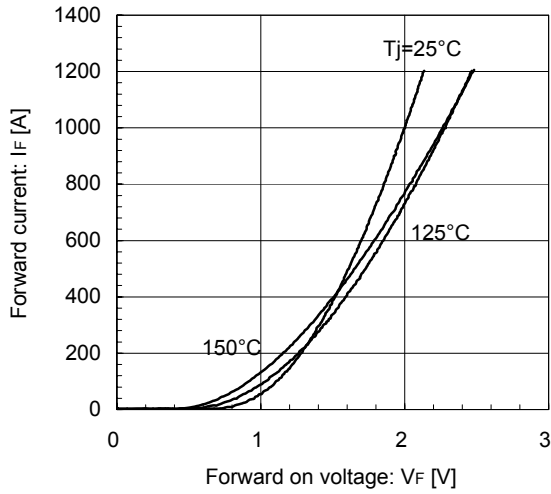


Gate resistance: R_G [Ω]

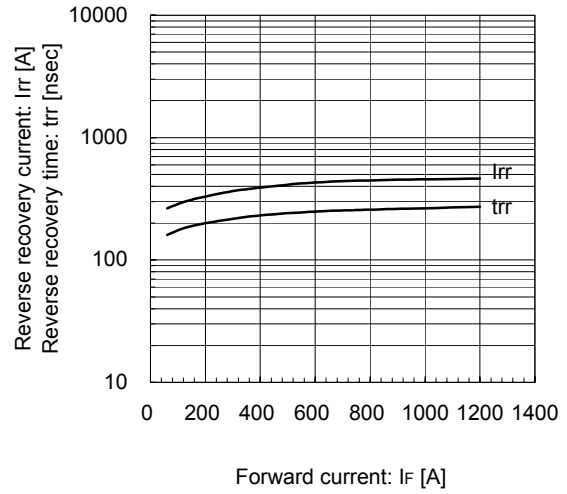
Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE}=15V, R_G=1.2\Omega, T_j=150^\circ C, L_s=35nH$



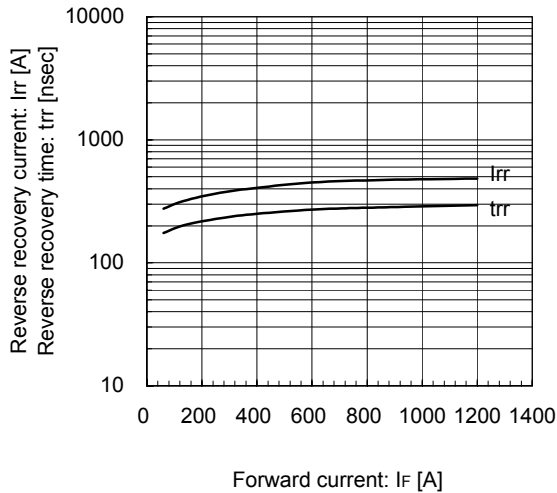
Forward Current vs. Forward Voltage (typ.)
chip



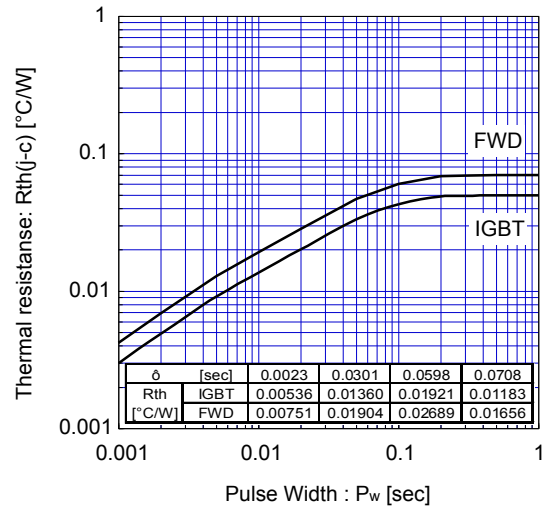
Reverse Recovery Characteristics (typ.)
Vcc=600V, VGE=±15V, RG=1.2Ω, Tj=125°C



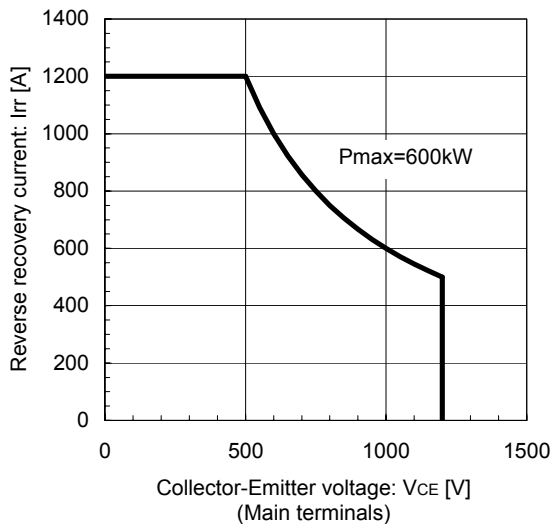
Reverse Recovery Characteristics (typ.)
Vcc=600V, VGE=±15V, RG=1.2Ω, Tj=150°C



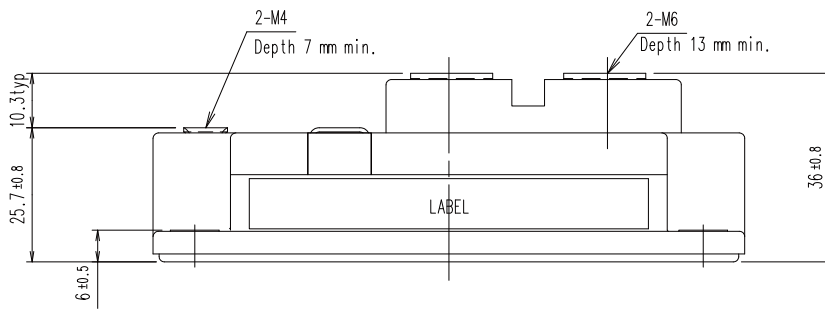
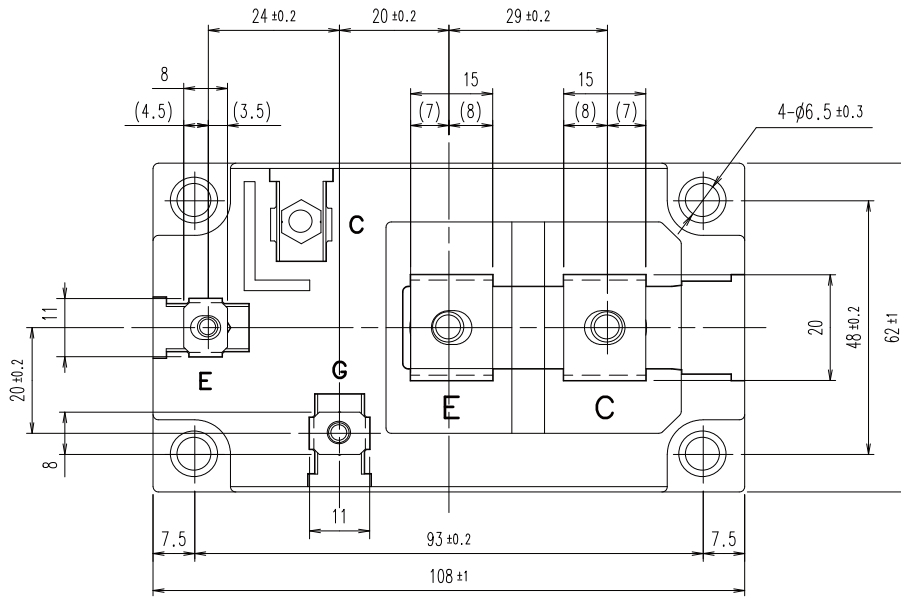
Transient Thermal Resistance (max.)



FWD safe operating area (max.)
Tj=150°C

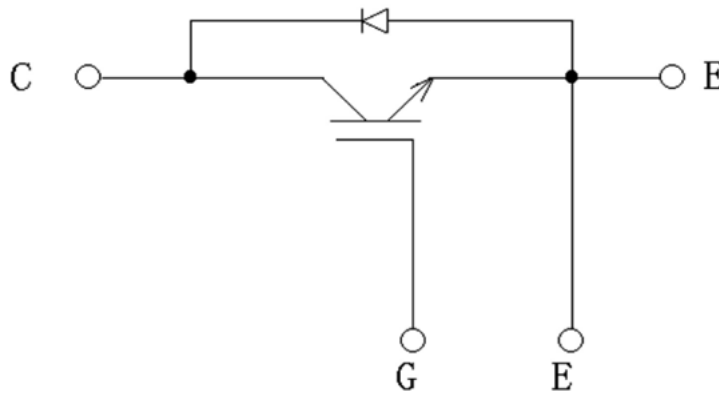


■ Outline Drawings(Unit:mm)



Weight: 370g (typ.)

■ Equivalent Circuit



WARNING

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