

# 1MBI50U4F-120L-50

IGBT Modules

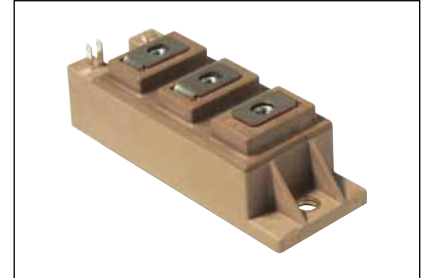
## IGBT MODULE (U series) 1200V / 50A / 1 in one package

### ■ 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 Tc=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	75	A
			T <sub>c</sub> =80°C	50	
	I <sub>c</sub> pulse	1ms	T <sub>c</sub> =25°C	150	
			T <sub>c</sub> =80°C	100	
	-I <sub>c</sub>			25	
-I <sub>c</sub> pulse	1ms		50		
Collector power dissipation	P <sub>c</sub>	1 device	275	W	
Reverse voltage for FWD	V <sub>R</sub>		1200	V	
Forward current for FWD	I <sub>F</sub>	Continuous	75	A	
		I <sub>F</sub> pulse	1ms		150
Junction temperature	T <sub>j</sub>		+150	°C	
Storage temperature	T <sub>stg</sub>		-40~+125	°C	
Isolation voltage	Between terminal and copper base (*1) V <sub>iso</sub>	AC : 1min.	2500	VAC	
Screw torque	Mounting (*2)		3.5	Nm	
	Terminals (*3)				

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

Note \*2: Recommendable Value : 2.5 to 3.5 Nm (M5 or M6)

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

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V, V_{CE} = 1200V$	-	-	1.0	mA	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	200	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 50mA$	4.5	6.5	8.5	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ C$	-	2.00	2.15	V
			$T_j = 125^\circ C$	-	2.20	-	
	$V_{CE(sat)}$ (chip)		$T_j = 25^\circ C$	-	1.90	2.05	
			$T_j = 125^\circ C$	-	2.10	-	
Input capacitance	$C_{ies}$	$V_{GE} = 0V, V_{CE} = 10V, f = 1MHz$	-	6	-	nF	
Turn-on time	$t_{on}$	$V_{CC} = 600V, I_c = 50A$ $V_{GE} = \pm 15V, R_G = 22\Omega$	-	0.32	1.20	$\mu s$	
	$t_r$		-	0.10	0.60		
	$t_r(i)$		-	0.03	-		
Turn-off time	$t_{off}$		-	0.41	1.00		
	$t_f$		-	0.07	0.30		
	$t_f$		-	0.07	0.30		
Forward on voltage	$V_F$ (terminal)	$V_{GE} = 0V$ $I_F = 25A$	$T_j = 25^\circ C$	-	1.65	2.00	V
			$T_j = 125^\circ C$	-	1.75	-	
	$V_F$ (chip)		$T_j = 25^\circ C$	-	1.60	1.85	
			$T_j = 125^\circ C$	-	1.70	-	
Reverse Current	$I_R$	$V_{CE} = 1200V$	-	-	1.0	mA	
Forward on voltage	$V_F$ (terminal)	$V_{GE} = 0V$ $I_F = 75A$	$T_j = 25^\circ C$	-	1.75	1.90	V
			$T_j = 125^\circ C$	-	1.90	-	
	$V_F$ (chip)		$T_j = 25^\circ C$	-	1.60	1.75	
			$T_j = 125^\circ C$	-	1.75	-	
Reverse recovery time	$t_{rr}$	$I_F = 75A$	-	-	0.35	$\mu s$	
Lead resistance, terminal-chip(*4)	R lead		-	1.39	-	m $\Omega$	

Note \*4: Biggest internal terminal resistance among arm.

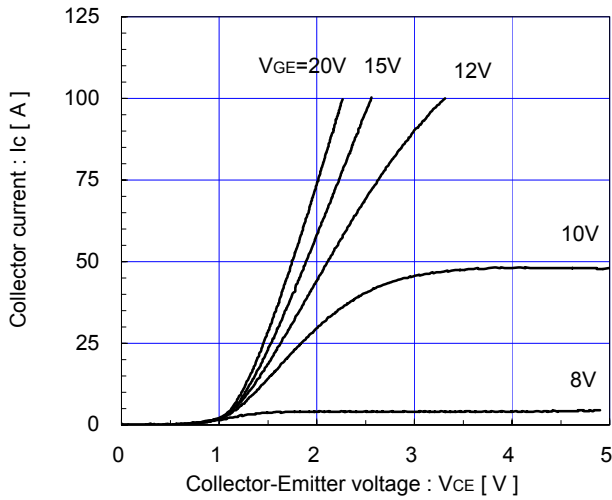
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.45	$^\circ C/W$
		Inverse Diode	-	-	1.19	
		FWD	-	-	0.48	
Contact thermal resistance	$R_{th(c-f)}$	with Thermal Compound (*5)	-	0.05	-	

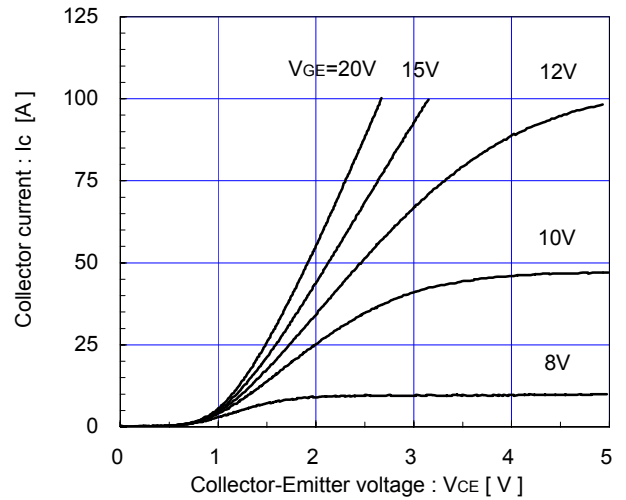
Note \*5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

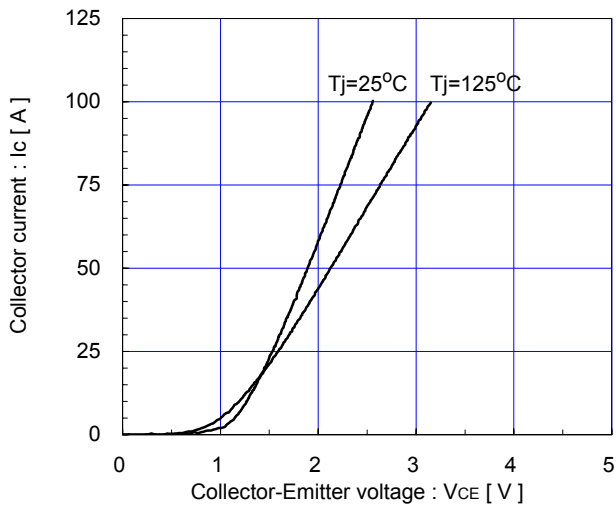
Collector current vs. Collector-Emitter voltage (typ.)  
Tj=25°C / chip



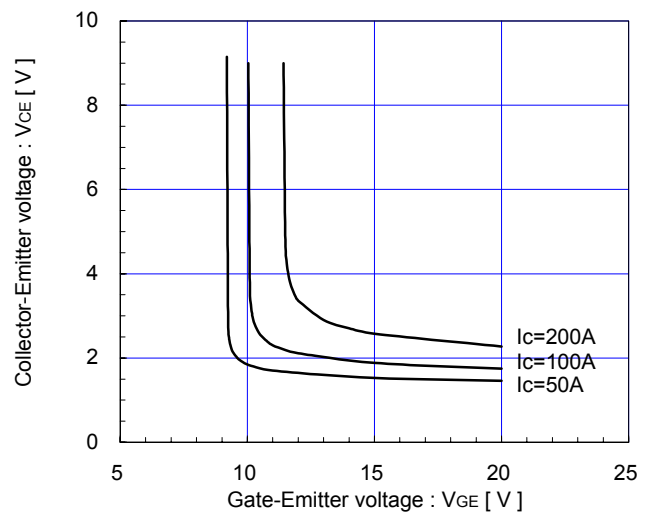
Collector current vs. Collector-Emitter voltage (typ.)  
Tj=125°C / chip



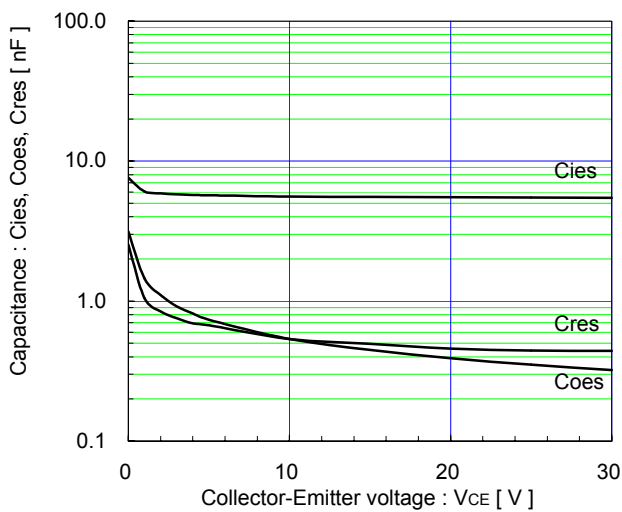
Collector current vs. Collector-Emitter voltage (typ.)  
VGE=15V / chip



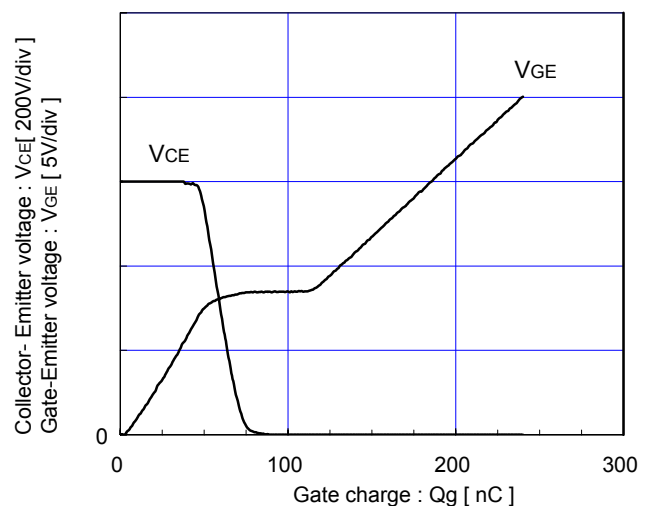
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)  
Tj=25°C / chip



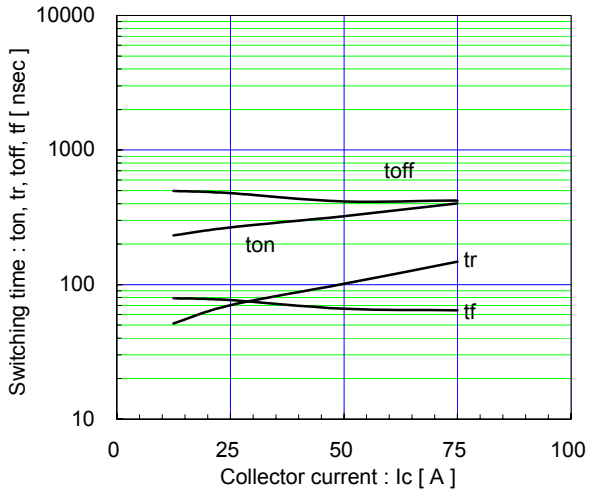
Capacitance vs. Collector-Emitter voltage (typ.)  
VGE=0V, f=1MHz, Tj=25°C



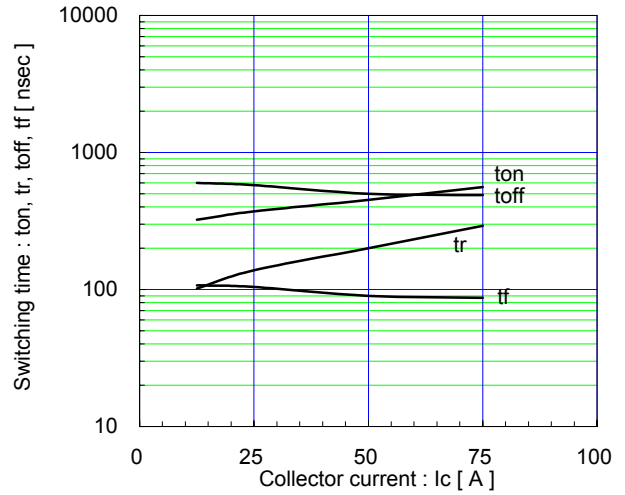
Dynamic Gate charge (typ.)  
Vcc=600V, Ic=50A, Tj=25°C



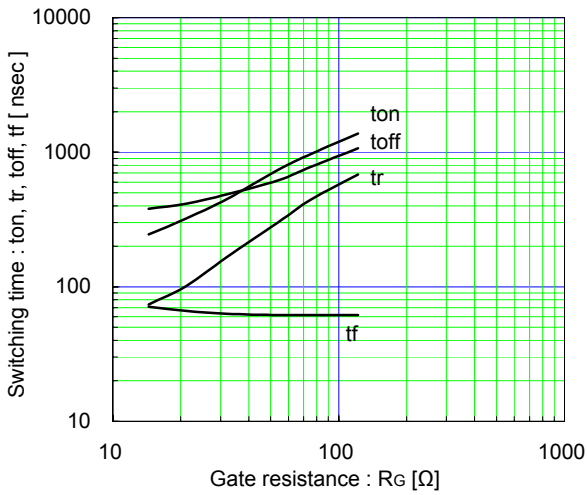
Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=22\Omega, T_j=25^\circ C$



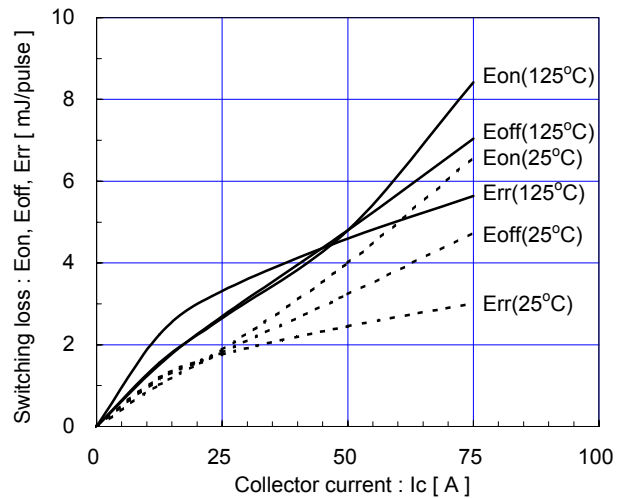
Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=22\Omega, T_j=125^\circ C$



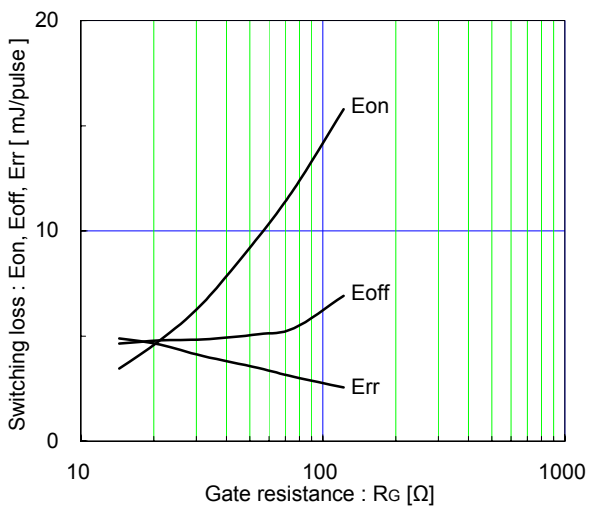
Switching time vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=50A, V_{GE}=\pm 15V, T_j=25^\circ C$



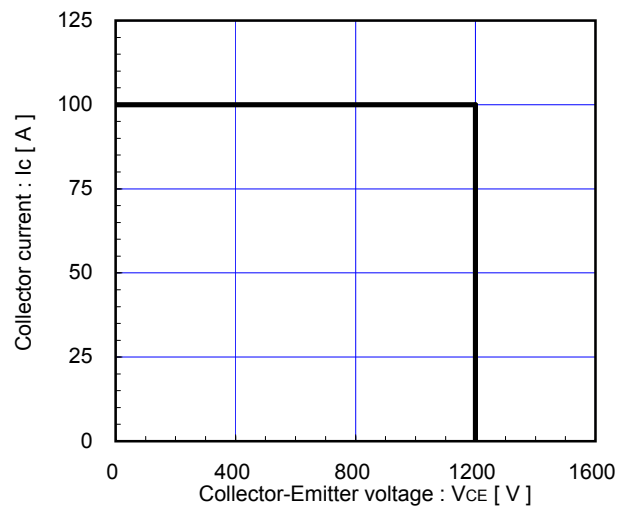
Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=22\Omega$

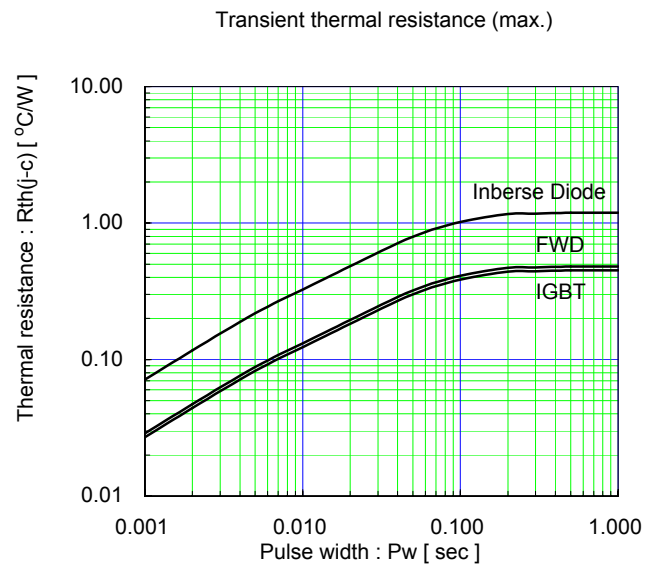
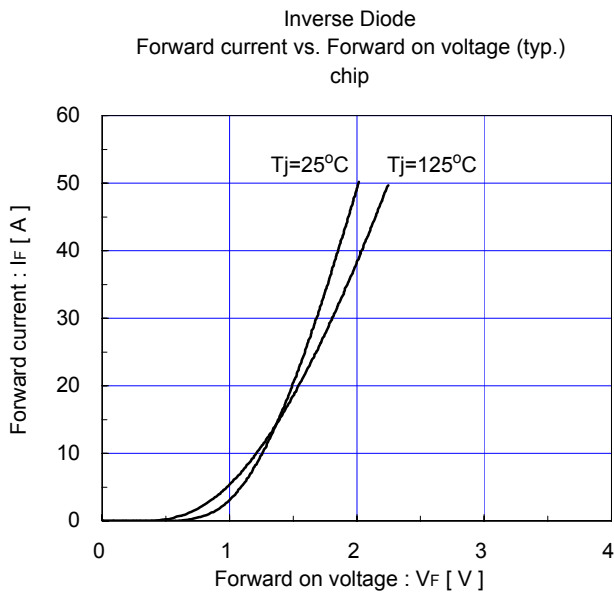
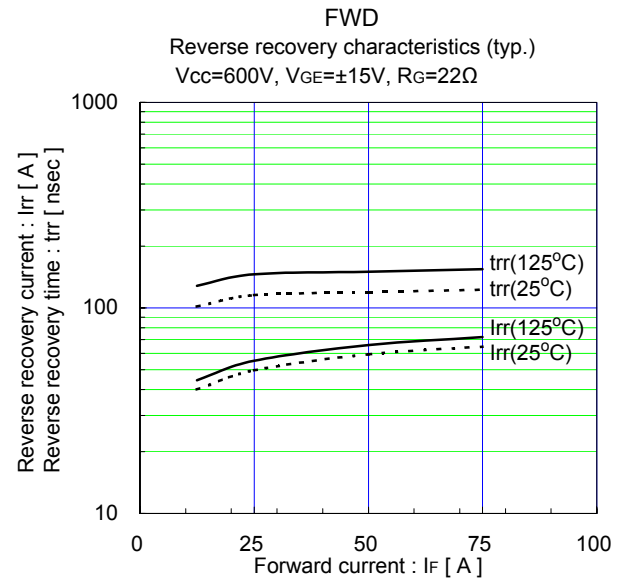
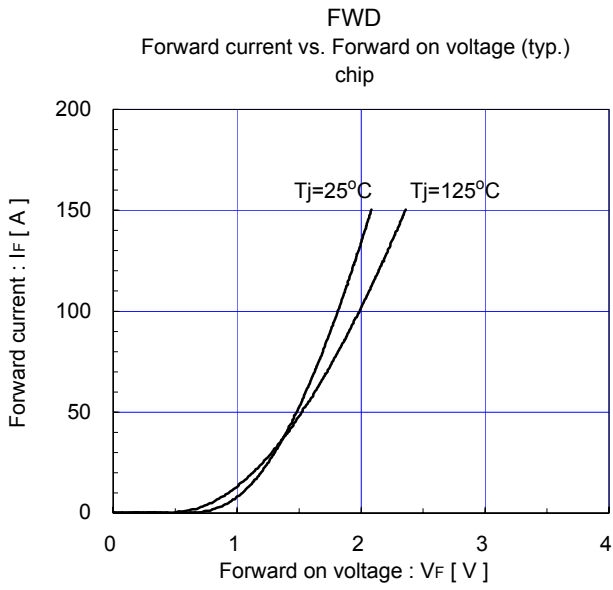


Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=50A, V_{GE}=\pm 15V, T_j=125^\circ C$

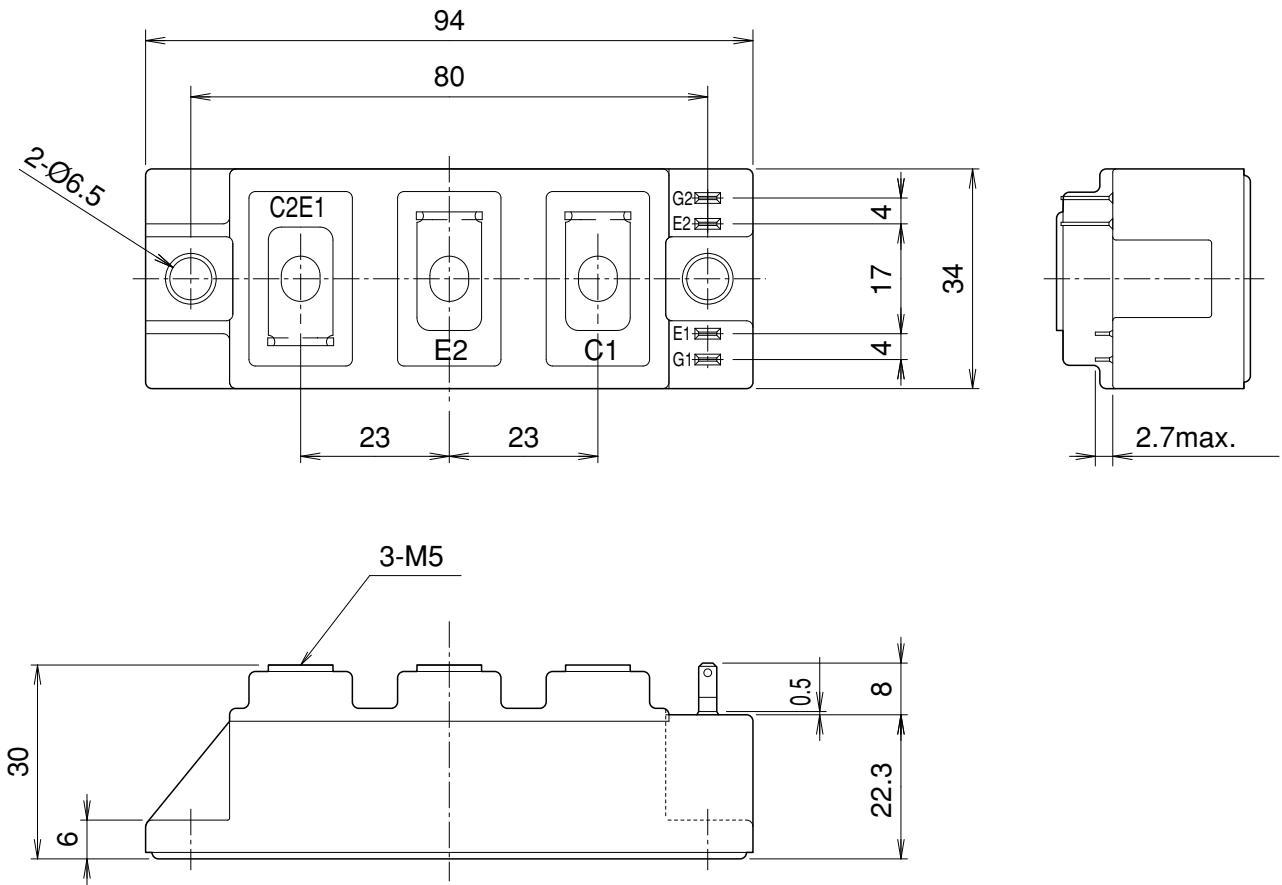


Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_G \ge 22\Omega, T_j \le 125^\circ C$

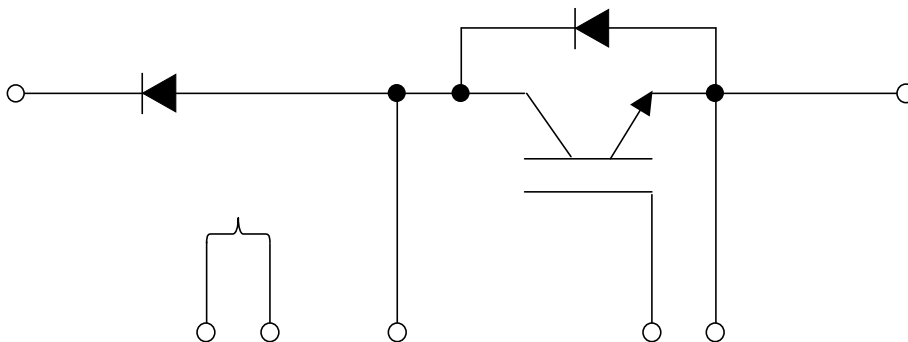




■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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