

1MBI50U4F-120L-50

IGBT Modules

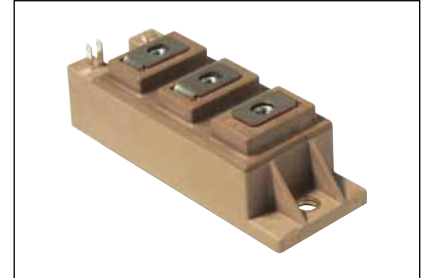
IGBT MODULE (U series) 1200V / 50A / 1 in one package

■ 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 _{CES}		1200	V	
Gate-Emitter voltage	V _{GES}		±20	V	
Collector current	I _c	Continuous	Tc=25°C	75	A
			Tc=80°C	50	
	I _c pulse	1ms	Tc=25°C	150	
			Tc=80°C	100	
	-I _c			25	
-I _c pulse	1ms		50		
Collector power dissipation	P _c	1 device	275	W	
Reverse voltage for FWD	V _R		1200	V	
Forward current for FWD	I _F	Continuous	75	A	
		I _F pulse	1ms		150
Junction temperature	T _j		+150	°C	
Storage temperature	T _{stg}		-40~+125	°C	
Isolation voltage	Between terminal and copper base (*1) V _{iso}	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	μs	
	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	μs	
Lead resistance, terminal-chip(*4)	R lead		-	1.39	-	m Ω	

Note *4: Biggest internal terminal resistance among arm.

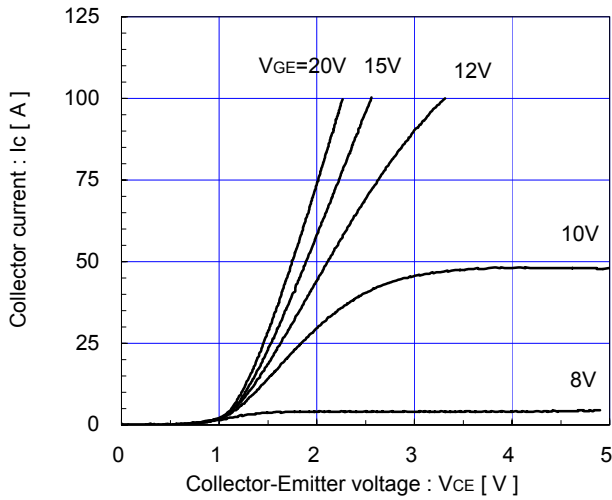
● Thermal resistance characteristics

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	-	

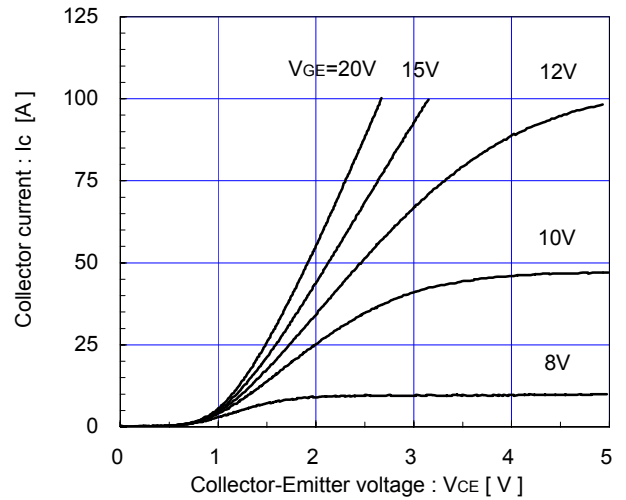
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

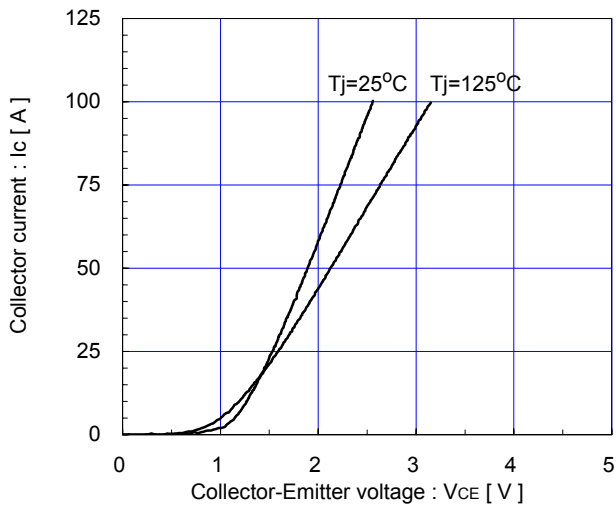
Collector current vs. Collector-Emitter voltage (typ.)
Tj=25°C / chip



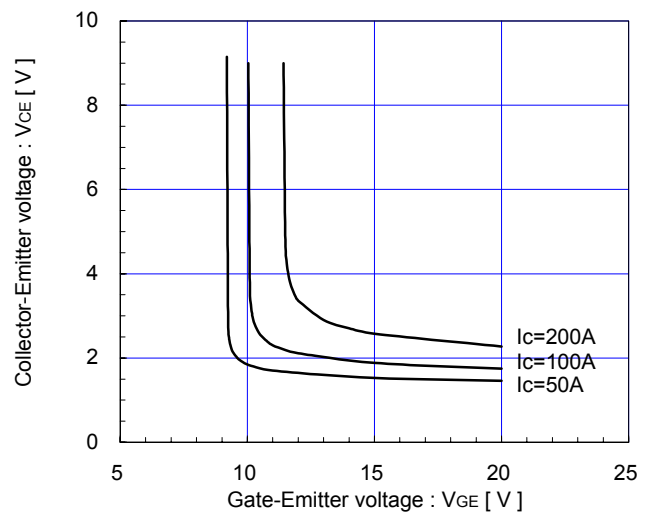
Collector current vs. Collector-Emitter voltage (typ.)
Tj=125°C / chip



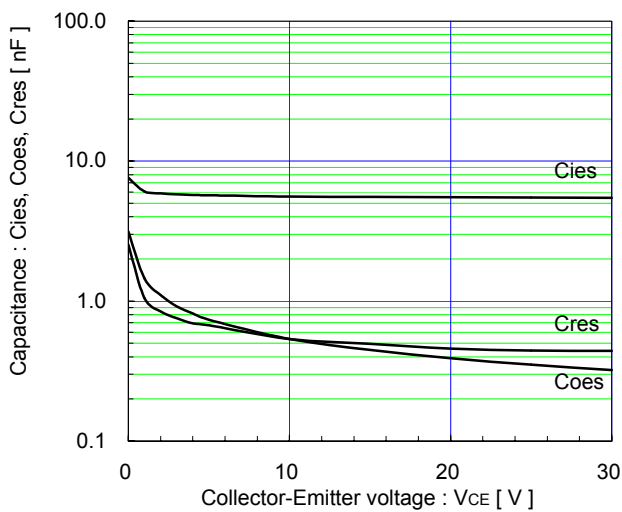
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



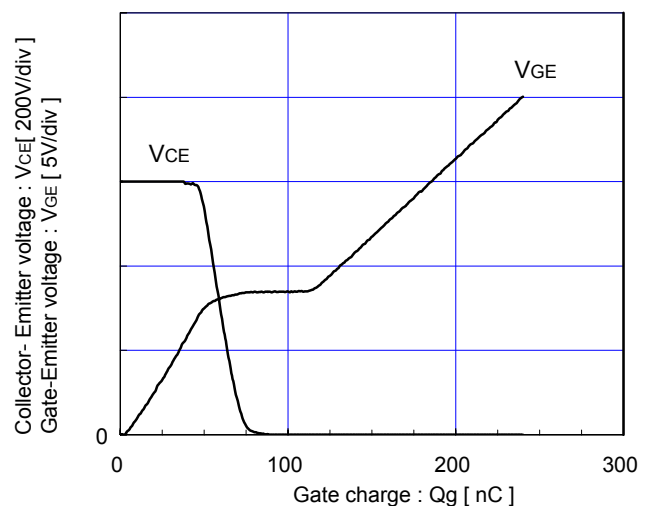
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj=25°C / chip



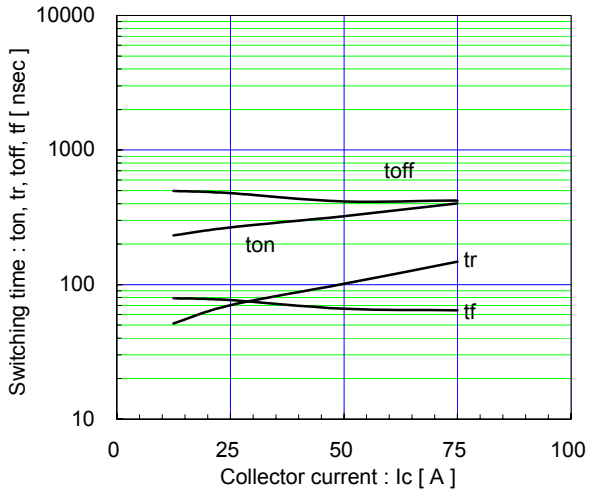
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f=1MHz, Tj=25°C



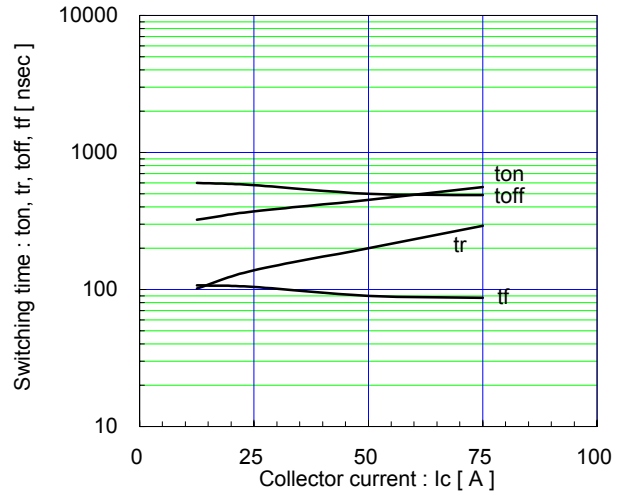
Dynamic Gate charge (typ.)
Vcc=600V, Ic=50A, Tj=25°C



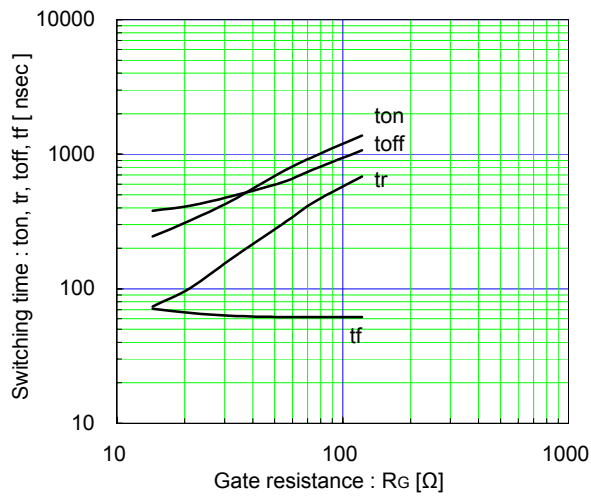
Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=22\Omega, T_j=25^\circ C$



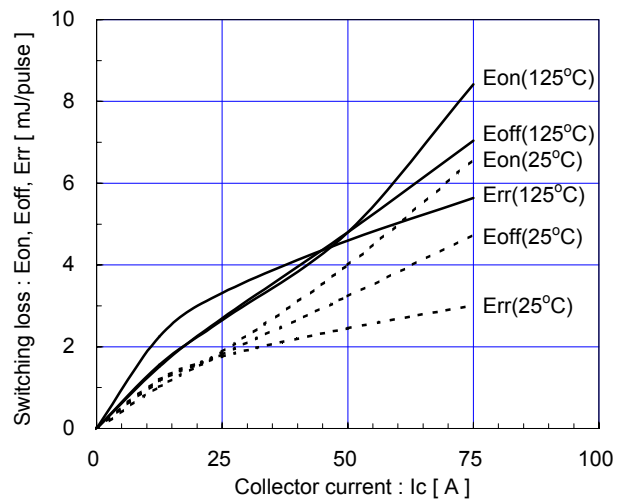
Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=22\Omega, T_j=125^\circ C$



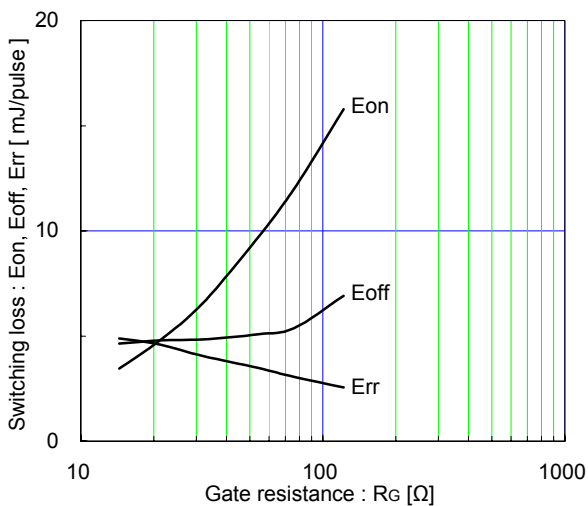
Switching time vs. Gate resistance (typ.)
 $V_{CC}=600V, I_c=50A, V_{GE}=\pm 15V, T_j=25^\circ C$



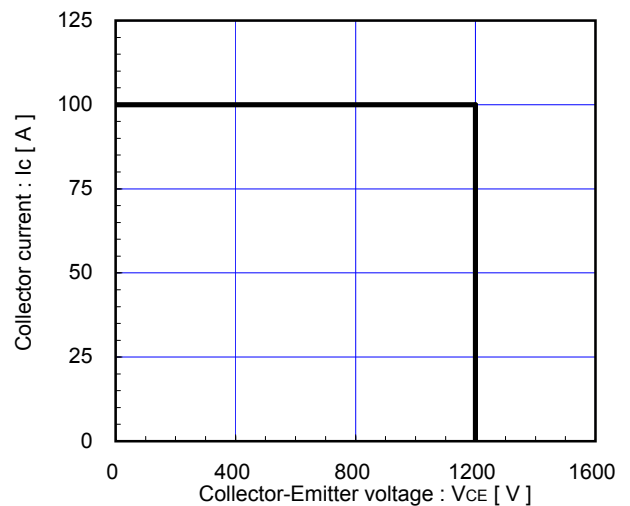
Switching loss vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=22\Omega$

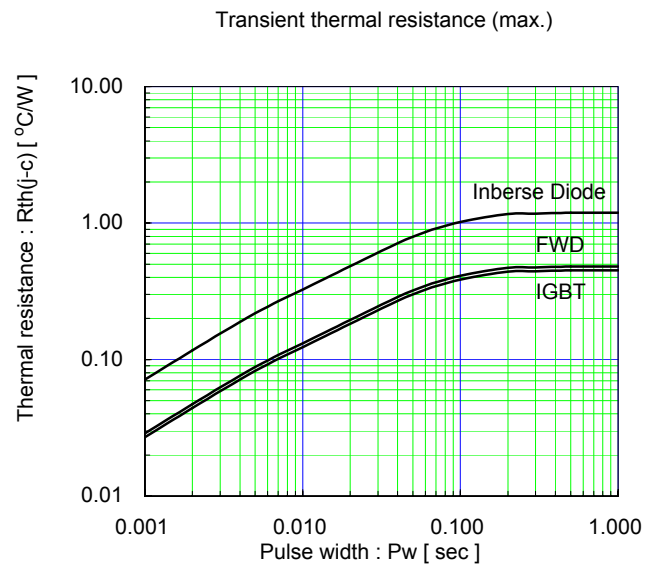
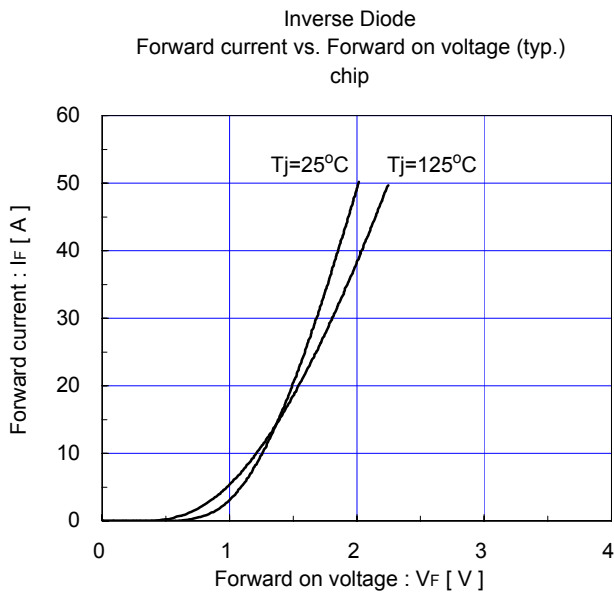
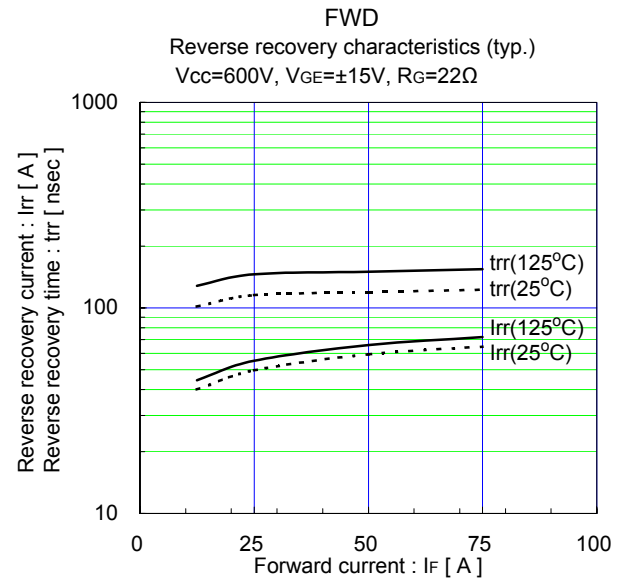
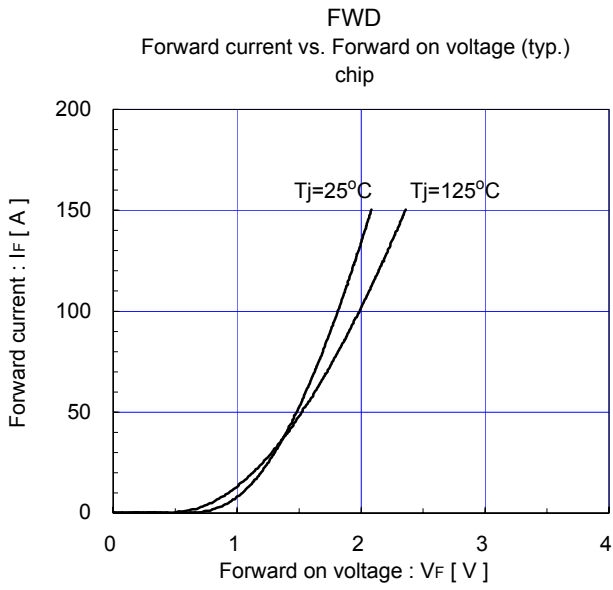


Switching loss vs. Gate resistance (typ.)
 $V_{CC}=600V, I_c=50A, V_{GE}=\pm 15V, T_j=125^\circ C$

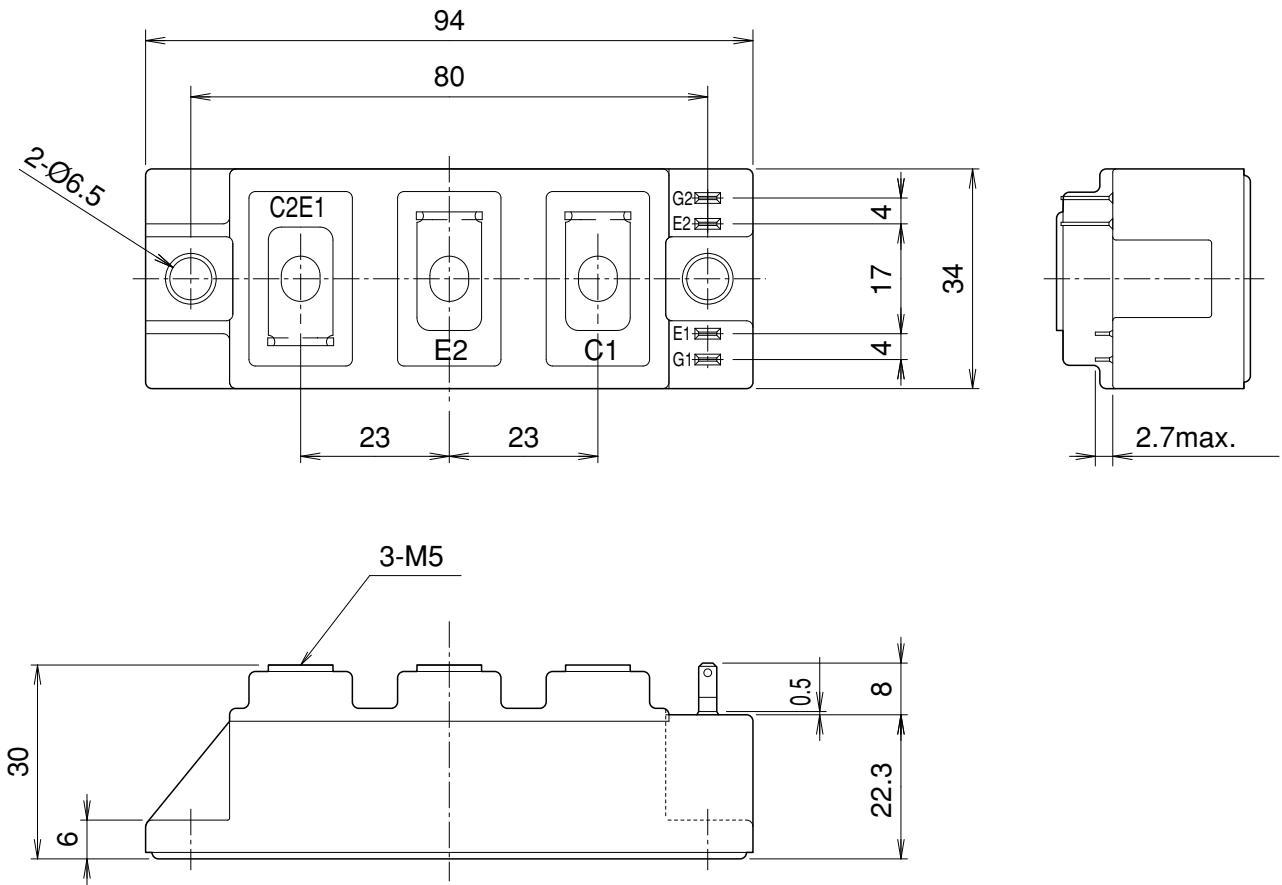


Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \le 15V, R_G \ge 22\Omega, T_j \le 125^\circ C$

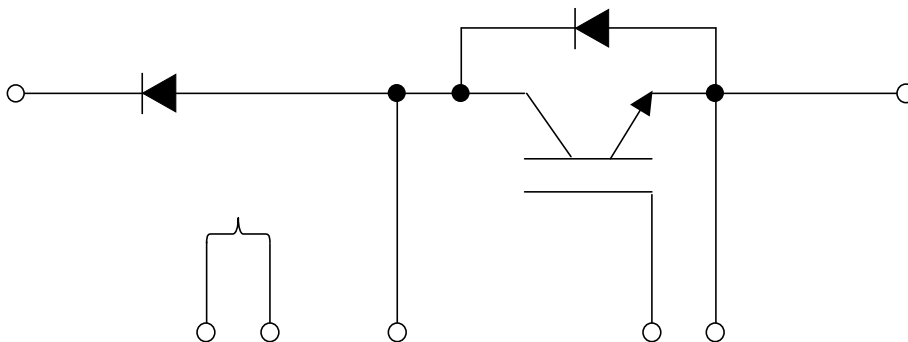




■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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