

1MBI1000VXB-170EH-54

IGBT Modules

IGBT MODULE (V series) 1700V / 1000A / 1 in one package

■ Features

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

■ Applications

- NPC 3-level Inverter
- Active PFC
- Industrial 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}		1700	V	
Gate-Emitter voltage	V_{GES}		± 20	V	
Collector current	I_c	Continuous	$T_c=25^\circ\text{C}$ 1400	A	
	I_c pluse	1ms	$T_c=100^\circ\text{C}$ 1000		
	$-I_c$		2000		
	$-I_c$ pluse	1ms	1000		
Collector Power Dissipation	P_c	1 device	6250	W	
Reverse voltage for FWD	V_R		1700	V	
Forward current for FWD	I_F	Continuous	1000	A	
	I_F pulse	1ms	2000		
Junction temperature	T_j		175	°C	
Operating junction temperature (under switching conditions)	T_{jop}		150		
Case temperature	T_c		150		
Storage temperature	T_{stg}		-40 ~ +150		
Isolation voltage	between terminal and copper base (*1)	V_{iso}	AC : 1min.	4000	VAC
	between thermistor and others (*2)				
Screw Torque (*3)	Mounting	-	M5	6.0	N m
	Main Terminals	-	M8	10.0	
	Sense Terminals	-	M4	2.1	

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

Note *2: Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

Note *3: Recommendable Value : Mounting 3.0 ~ 6.0 Nm (M5)
 Recommendable Value : Main Terminals 8.0 ~ 10.0 Nm (M8)
 Recommendable Value : Sense Terminals 1.8 ~ 2.1 Nm (M4)

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

Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
IGBT+Inverse Diode	Zero gate voltage collector current	I _{CEs}	V _{CE} = 1700V V _{GE} = 0V	-	-	6.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V V _{GE} = ±20V	-	-	1200	nA	
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V I _c = 1000mA	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (terminal) (*4)	I _c = 1000A V _{GE} = 15V	T _J = 25°C	-	2.10	2.55	V
				T _J = 125°C	-	2.50	-	
		T _J = 150°C		-	2.55	-		
		T _J = 25°C		-	2.00	2.45		
		T _J = 125°C		-	2.40	-		
	V _{CE(sat)} (chip)	T _J = 150°C	-	2.45	-			
	Internal gate resistance	R _{G(int)}	-	-	1.17	-	Ω	
Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	94	-	nF		
Turn-on time	t _{on}	V _{CC} = 900V I _c = 1000A	-	1250	-	nsec		
	t _r	V _{GE} = ±15V	-	500	-			
	t _{r(t)}	R _G = +1.2 / -1.8 Ω	-	150	-			
	t _{off}	L _S = 60nH	-	1550	-			
Turn-off time	t _r	-	-	150	-	nsec		
	t _r	-	-	150	-			
Forward on voltage	V _F (terminal) (*4)	I _F = 1000A V _{GE} = 0V	T _J = 25°C	-	1.95	2.40	V	
			T _J = 125°C	-	2.20	-		
	T _J = 150°C		-	2.15	-			
	T _J = 25°C		-	1.85	2.30			
	T _J = 125°C		-	2.10	-			
V _F (chip)	T _J = 150°C	-	2.05	-				
Reverse recovery time	t _{rr}	I _F = 1000A	-	240	-	nsec		
Reverse Current	I _R	V _{CE} = 1700V	-	-	3.0	mA		
FWD	V _F (terminal) (*4)	I _F = 1000A V _{GE} = 0V	T _J = 25°C	-	1.95	2.40	V	
			T _J = 125°C	-	2.20	-		
	T _J = 150°C		-	2.15	-			
	T _J = 25°C		-	1.85	2.30			
	T _J = 125°C		-	2.10	-			
V _F (chip)	T _J = 150°C	-	2.05	-				
Reverse recovery time	t _{rr}	I _F = 1000A	-	240	-	nsec		
Thermistor	Resistance	R	T = 25°C	-	5000	-	Ω	
		T = 100°C	465	495	520			
B value	B	T = 25/50°C	3305	3375	3450	K		

Note *4: Fuji defined V_{CE} value of terminal by using Sense C1 and Sense C2E1 for Upper arm and Sense C2E1 and Sense E2 for Lower arm.

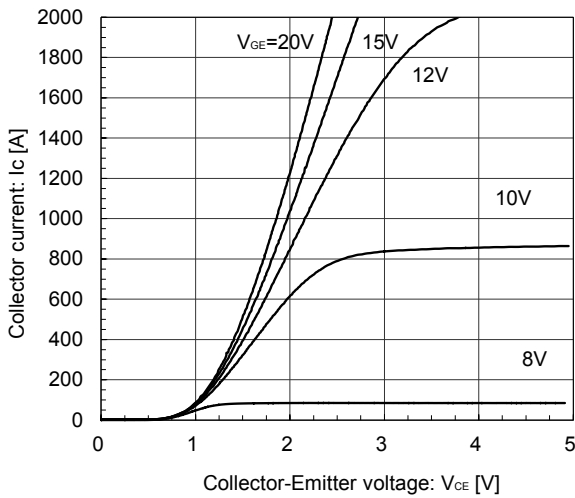
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1device)	R _{th(j-c)}	Inverter IGBT	-	-	0.024	°C/W
		Inverse Diode	-	-	0.048	
		FWD	-	-	0.048	
Contact thermal resistance (1device) (*5)	R _{th(c-f)}	with Thermal Compound	-	0.0083	-	

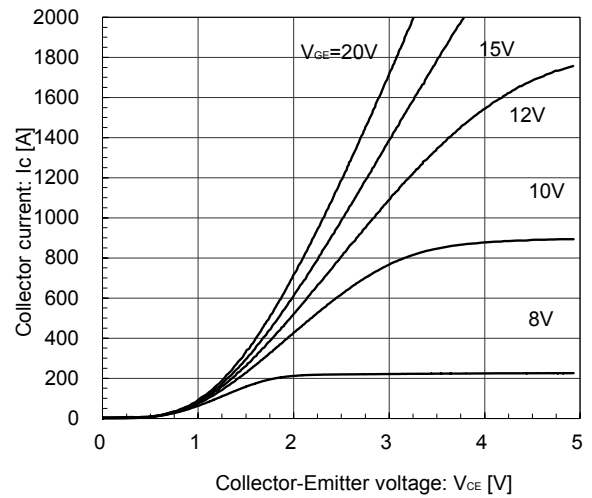
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

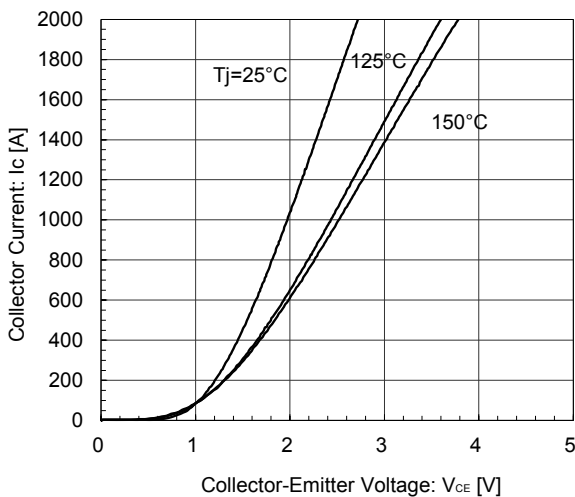
Collector current vs. Collector-Emittor voltage (typ.)
T_j = 25°C / chip



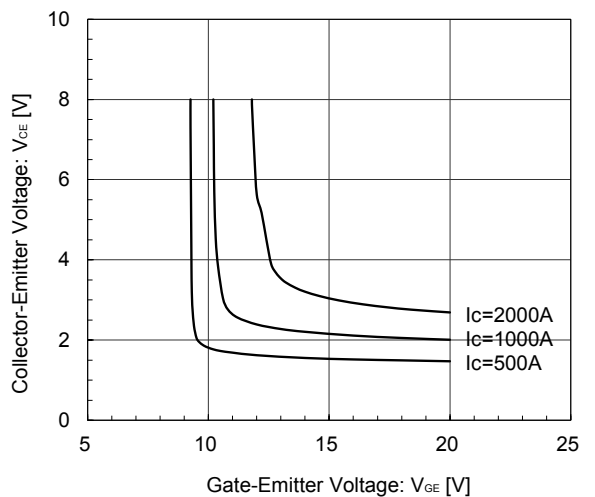
Collector current vs. Collector-Emittor voltage (typ.)
T_j = 150°C / chip



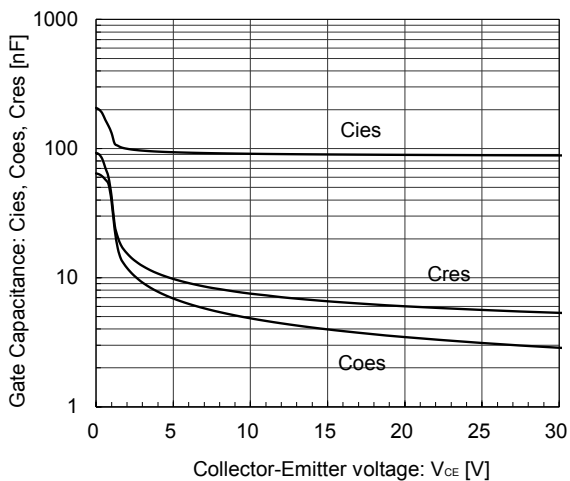
Collector current vs. Collector-Emittor voltage (typ.)
V_{ge} = 15V / chip



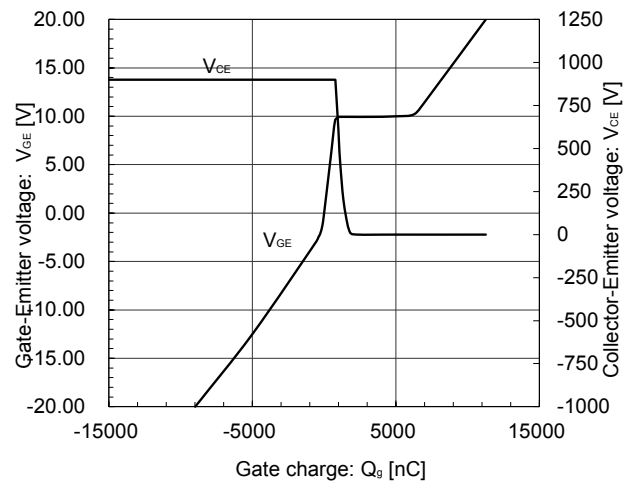
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
T_j = 25°C / chip



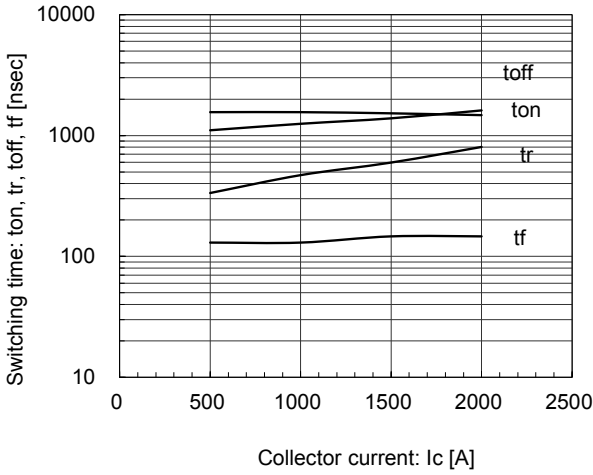
Gate Capacitance vs. Collector-Emittor Voltage (typ.)
V_{ge} = 0V, f = 1MHz, T_j = 25°C



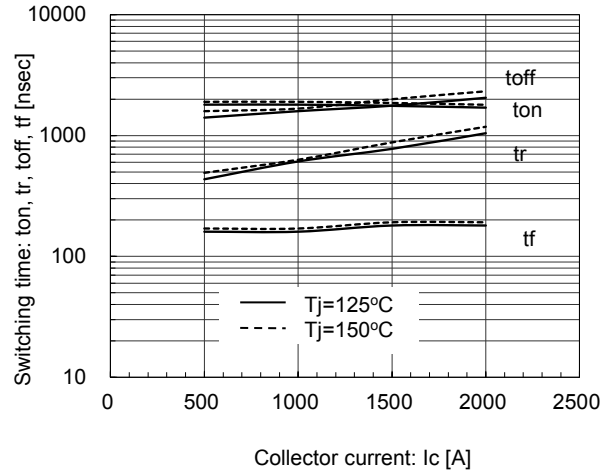
Dynamic Gate Charge (typ.)
V_{cc} = 900V, I_c = 1000A, T_j = 25°C



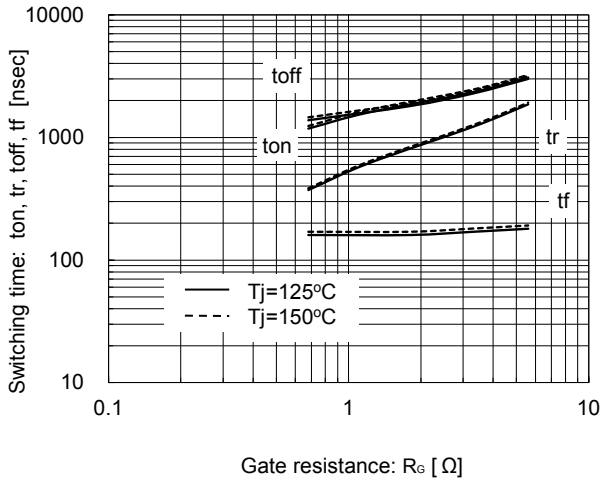
Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=+1.2/-1.8\Omega, T_j=25^\circ C$



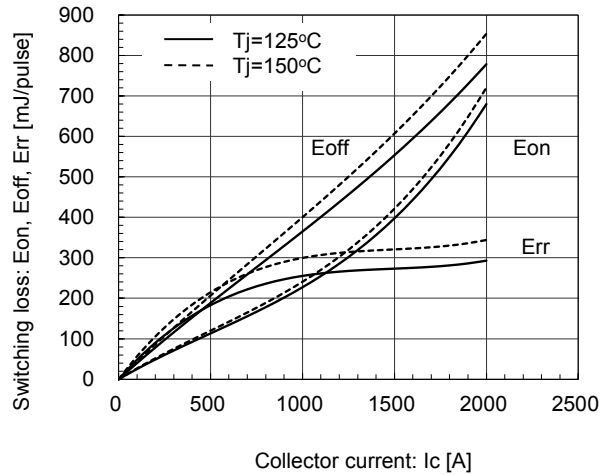
Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=+1.2/-1.8\Omega, T_j=125^\circ C, 150^\circ C$



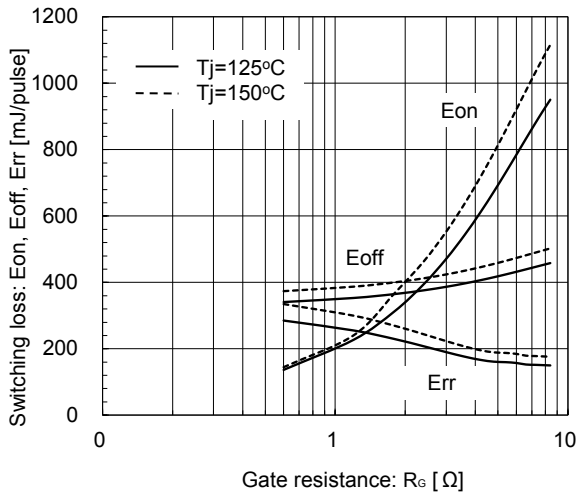
Switching time vs. Gate resistance (typ.)
 $V_{CC}=900V, I_c=1000A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



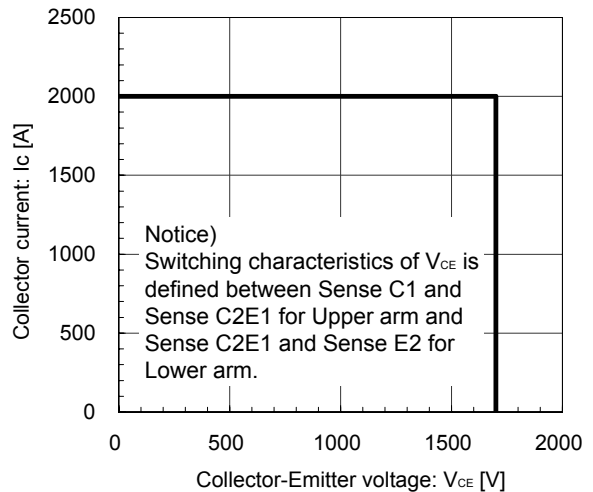
Switching loss vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=+1.2/-1.8\Omega, T_j=125^\circ C, 150^\circ C$

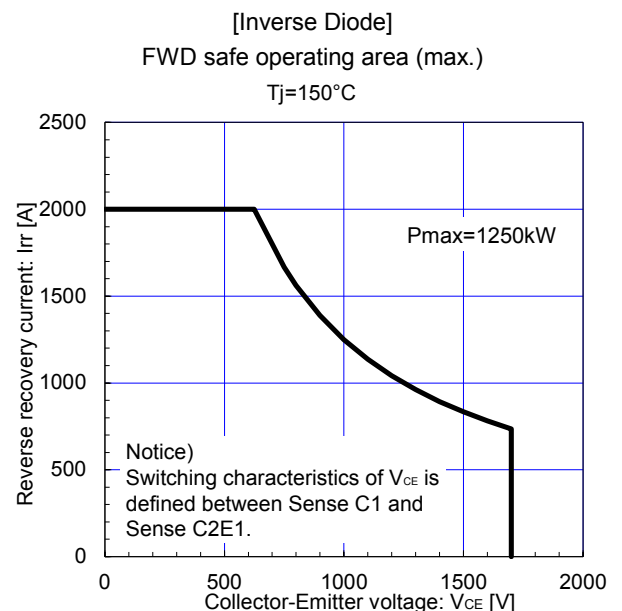
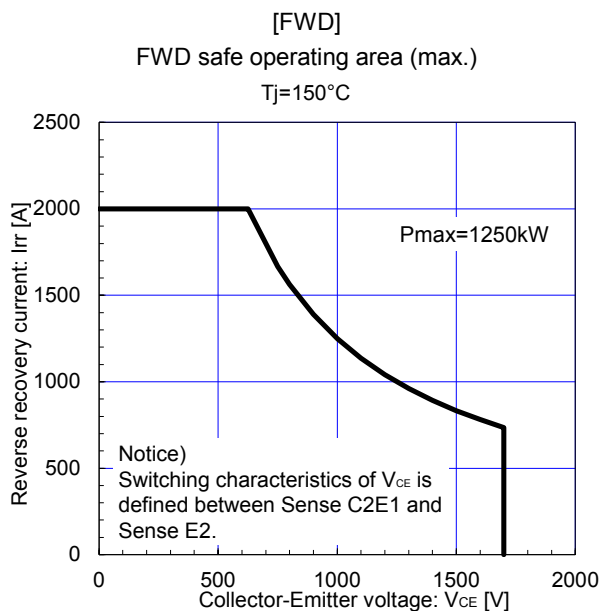
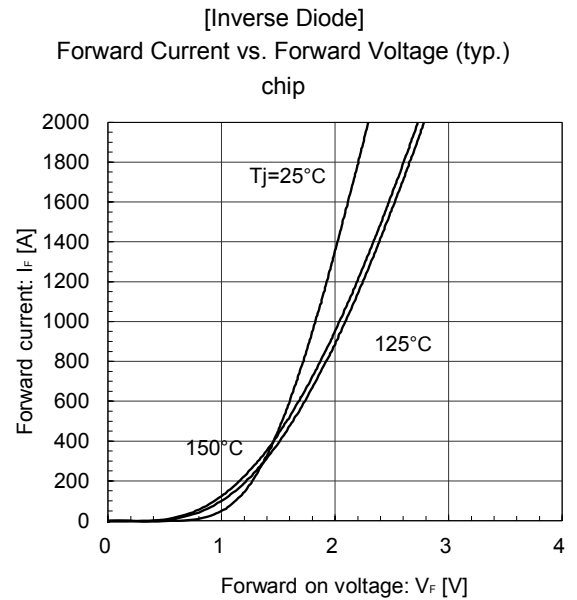
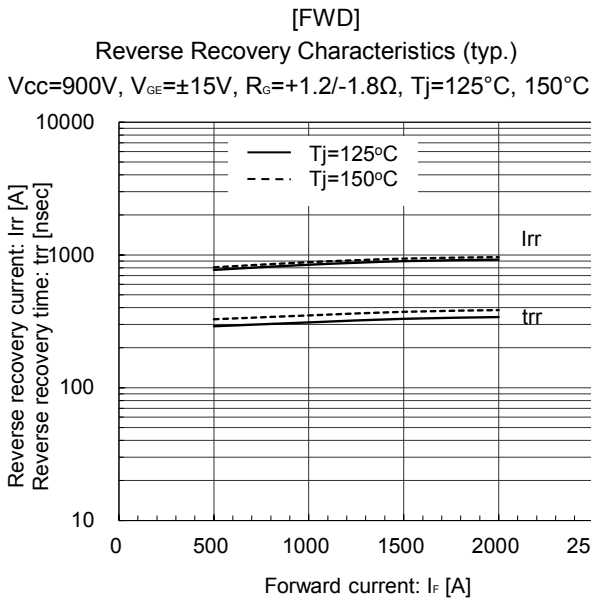
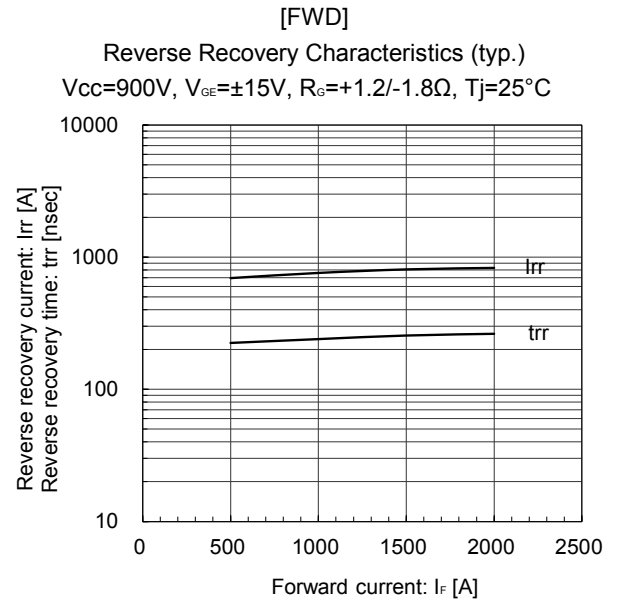
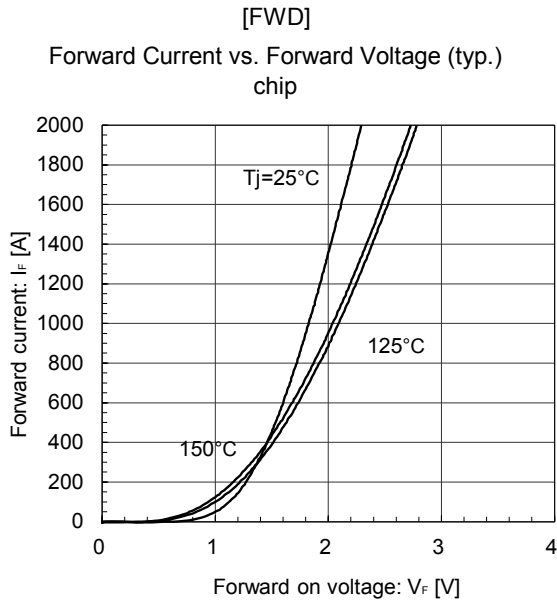


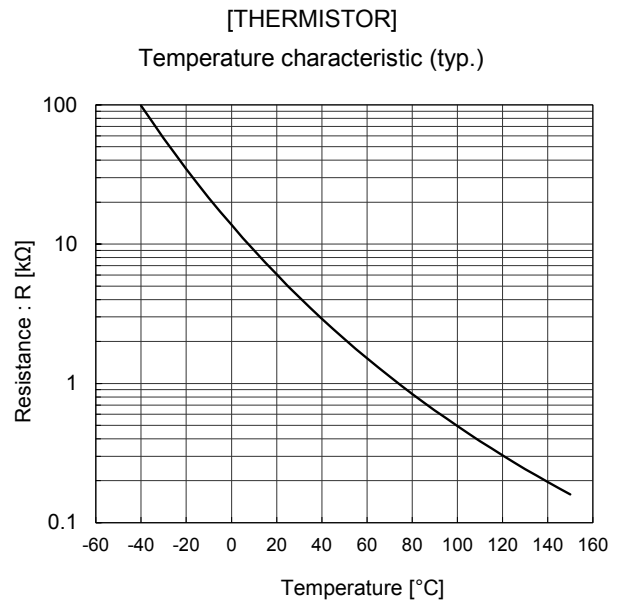
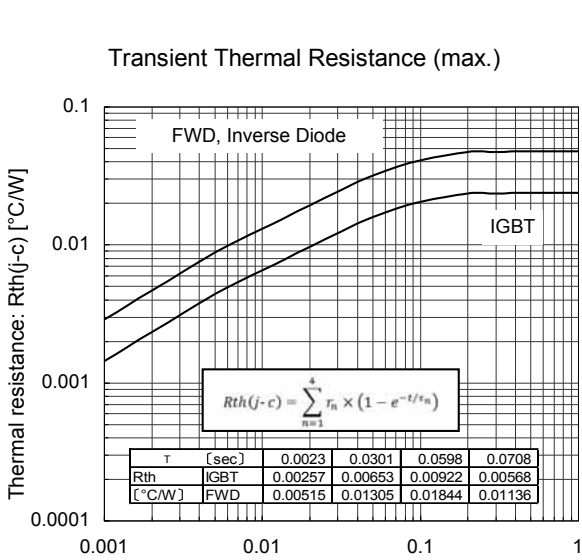
Switching loss vs. Gate resistance (typ.)
 $V_{CC}=900V, I_c=1000A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



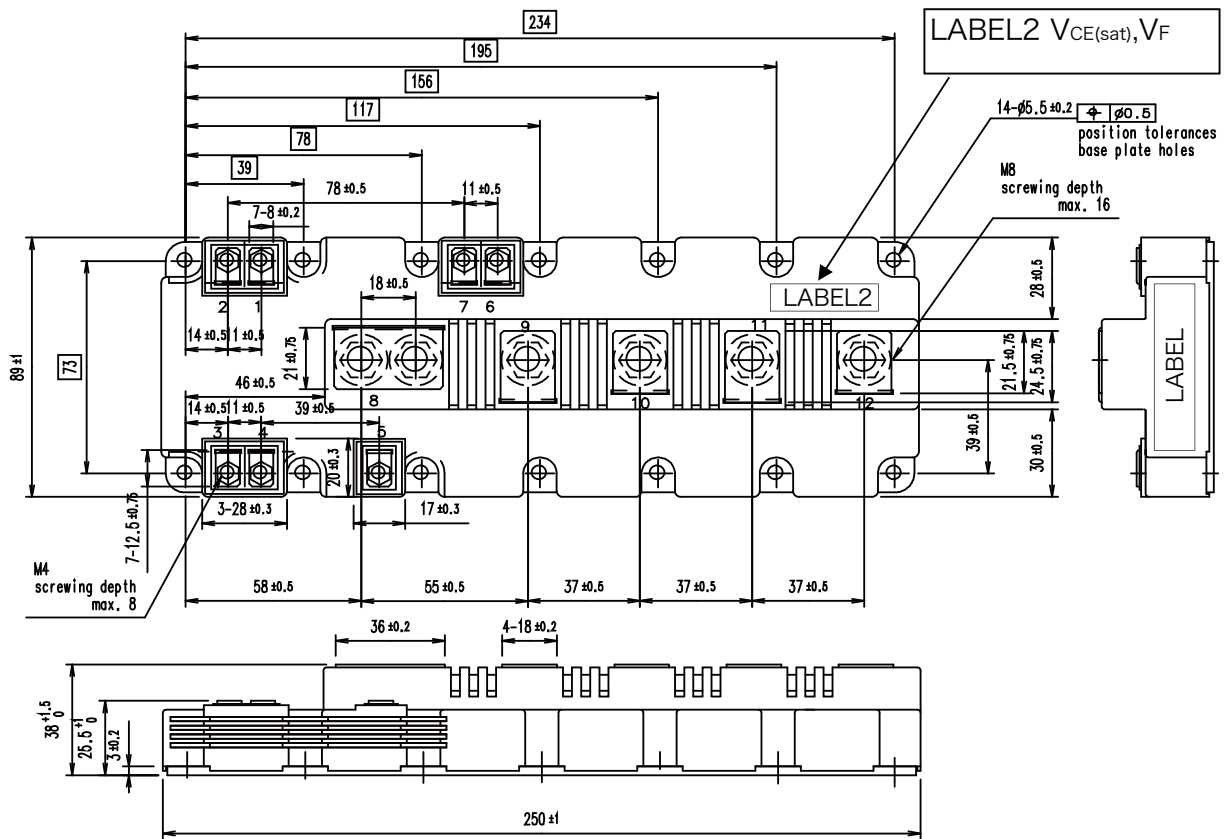
Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE}=\pm 15V, R_G=+1.2/-1.8\Omega, T_j=150^\circ C$





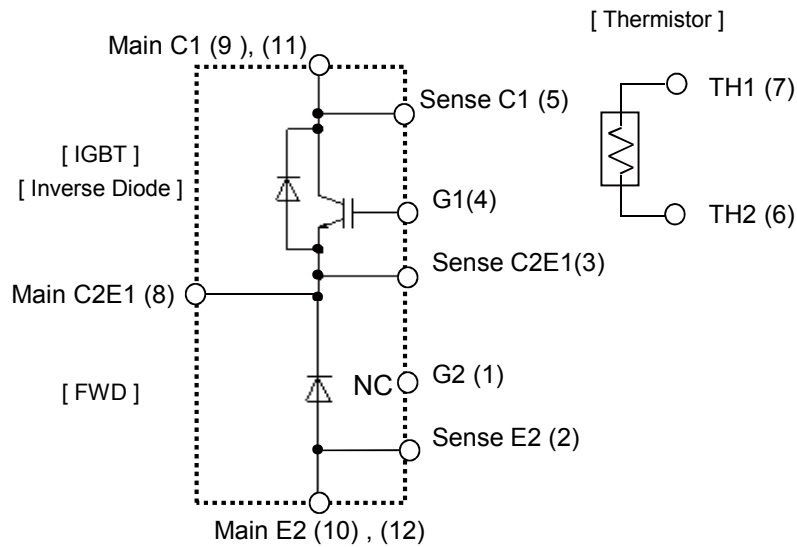


■ Outline Drawings, mm



Weight: 1250g(typ.)

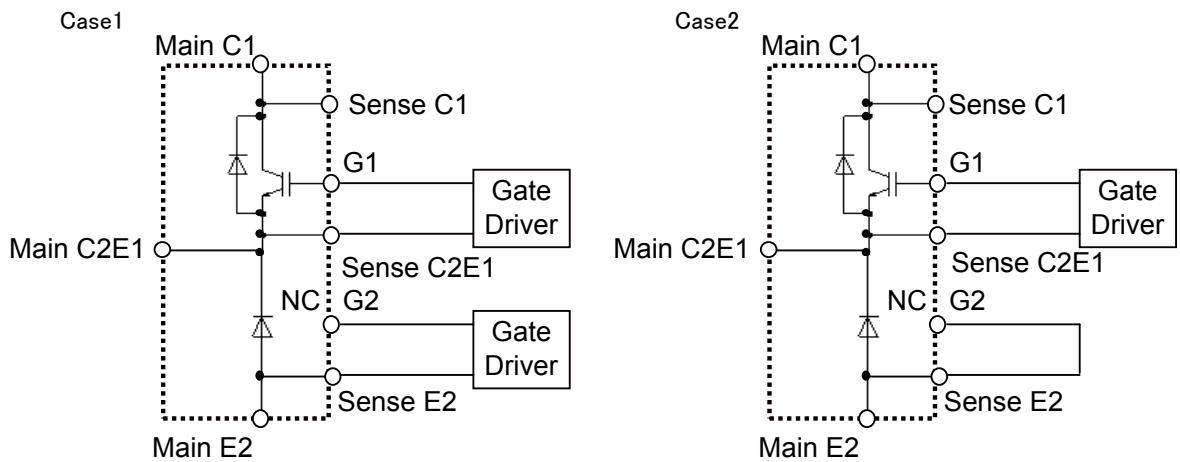
■ Equivalent Circuit Schematic



NOTICE

There is recommendation of wiring for NC terminal as follows.

■ Fuji recommends wire connection of CASE1 or CASE2 to fix NC terminal voltage.



Case1
NC terminal (G2) and sense E2 should be connected by Gate-Driver.

Case2
NC terminal (G2) and sense E2 should be connected by wire.

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IGBT Modules

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