

2MBI650VXA-170E-54

IGBT Modules

IGBT MODULE (V series) 1700V / 650A / 2 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	
Inverter	Collector-Emitter voltage	V _{CES}	1700	V	
	Gate-Emitter voltage	V _{GES}	±20	V	
	Collector current	I _c	Continuous	T _c =25°C 900 T _c =100°C 650	A
		I _{c pulse}	1ms	1300	
		-I _c		650	
	Collector power dissipation	-I _{c pulse}	1ms	1300	W
		P _c	1 device	4150	
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.			
Inverter	Zero gate voltage collector current	I _{CEs}	V _{GE} = 0V, V _{CE} = 1700V	-	-	4.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	800	nA	
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 650mA	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (terminal) (*4)	V _{GE} = 15V I _c = 650A	T _j = 25°C	-	2.10	2.55	V
				T _j = 125°C	-	2.50	-	
				T _j = 150°C	-	2.55	-	
		V _{CE(sat)} (chip)		T _j = 25°C	-	2.00	2.45	
				T _j = 125°C	-	2.40	-	
	T _j = 150°C	-	2.45	-				
	Internal gate resistance	R _{g(int)}	-	-	1.75	-	Ω	
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	63	-	nF	
	Turn-on time	t _{on}	V _{CC} = 900V I _c = 650A	-	1250	-	nsec	
		t _r		-	500	-		
		t _{r(i)}	V _{GE} = ±15V	-	150	-		
	Turn-off time	t _{off}	R _G = +1.8/-2.7Ω	-	1550	-	nsec	
t _f		L _s = 70nH	-	150	-			
			-	150	-			
Forward on voltage	V _F (terminal) (*4)	V _{GE} = 0V I _F = 650A	T _j = 25°C	-	1.95	2.40	V	
			T _j = 125°C	-	2.20	-		
			T _j = 150°C	-	2.15	-		
	V _F (chip)		T _j = 25°C	-	1.85	2.30		
			T _j = 125°C	-	2.10	-		
T _j = 150°C	-	2.05	-					
Reverse recovery time	t _{rr}	I _F = 650A	-	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: Please refer to page 7, there is definition of on-state voltage at terminal.

● Thermal resistance characteristics

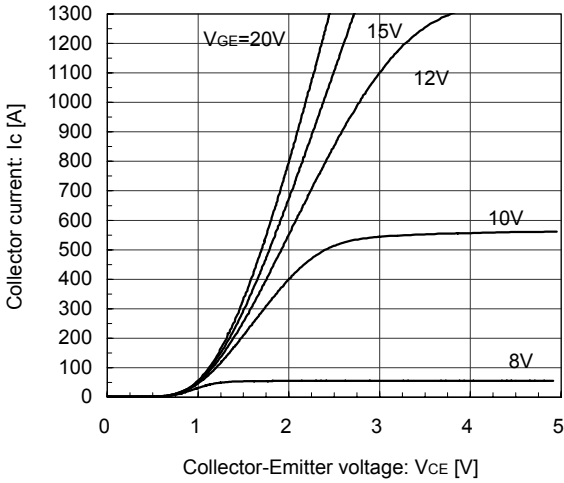
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	Inverter IGBT Inverter FWD	-	-	0.036	°C/W
Contact thermal resistance (1device) (*5)	R _{th(c-f)}	with Thermal Compound	-	0.0125	-	

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

■ Characteristics (Representative)

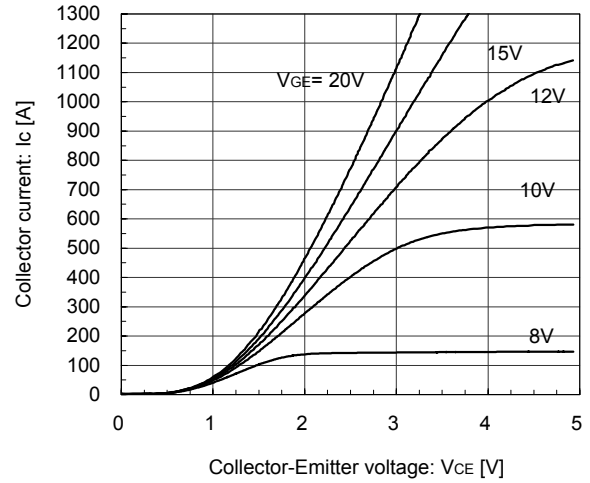
[INVERTER]

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



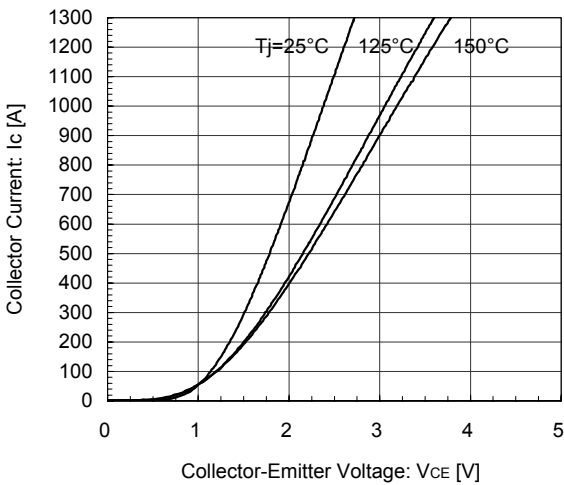
[INVERTER]

Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



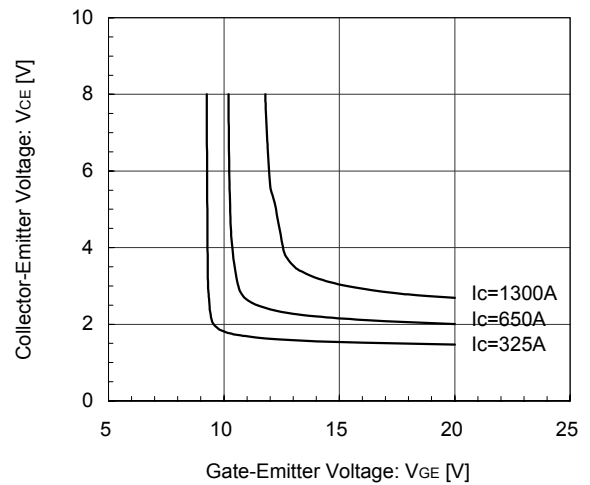
[INVERTER]

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



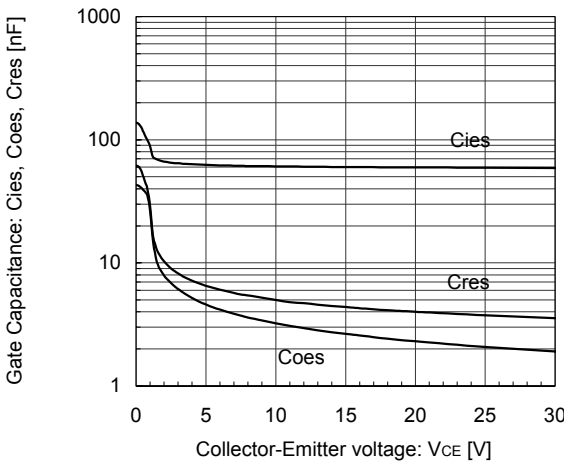
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Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



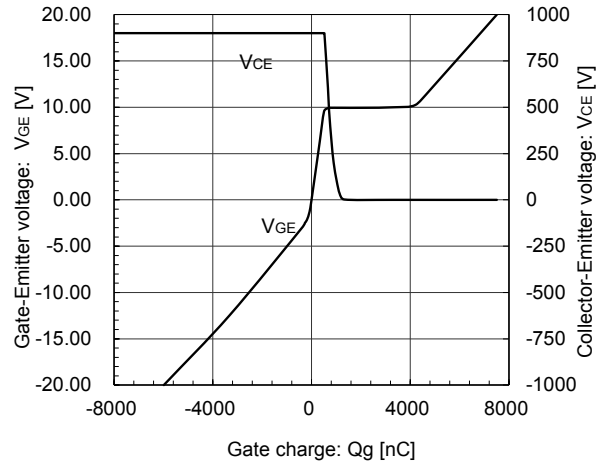
[INVERTER]

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



[INVERTER]

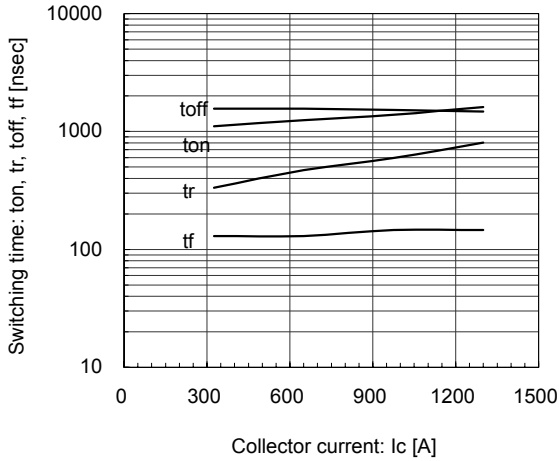
Dynamic Gate Charge (typ.)
Vcc=900V, Ic=650A, Tj= 25°C



[INVERTER]

Switching time vs. Collector current (typ.)

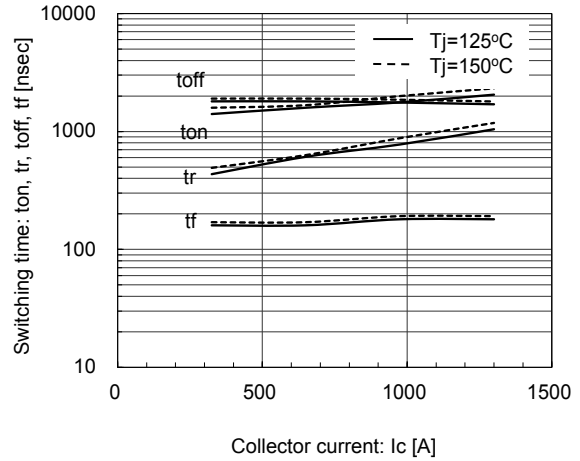
V_{CC}=900V, V_{GE}=±15V, R_G=+1.8/-2.7Ω, T_J=25°C



[INVERTER]

Switching time vs. Collector current (typ.)

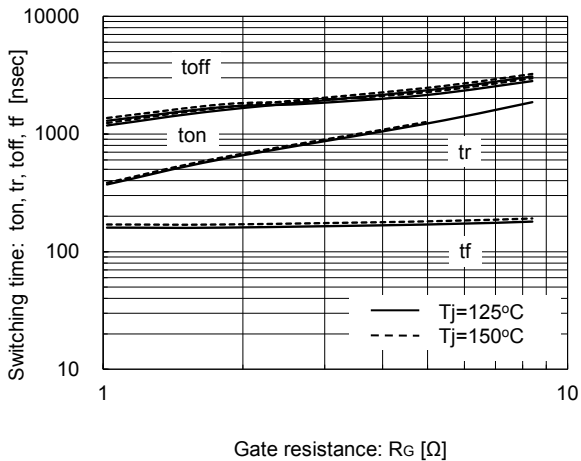
V_{CC}=900V, V_{GE}=±15V, R_G=+1.8/-2.7Ω, T_J=125°C, 150°C



[INVERTER]

Switching time vs. Gate resistance (typ.)

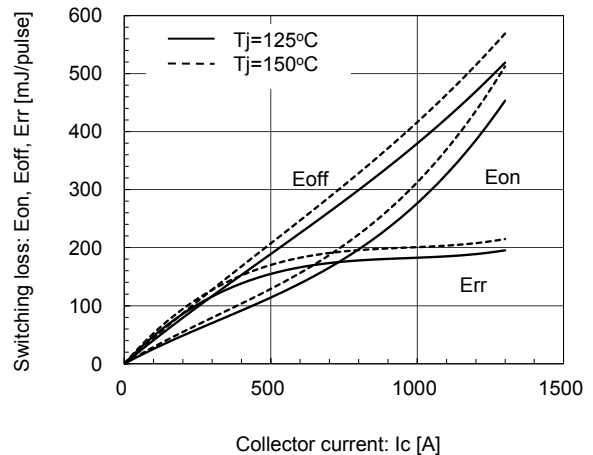
V_{CC}=900V, I_C=650A, V_{GE}=±15V, T_J=125°C, 150°C



[INVERTER]

Switching loss vs. Collector current (typ.)

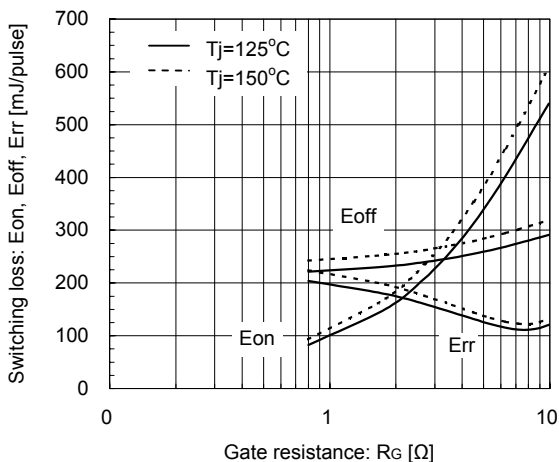
V_{CC}=900V, V_{GE}=±15V, R_G=+1.8/-2.7Ω, T_J=125°C, 150°C



[INVERTER]

Switching loss vs. Gate resistance (typ.)

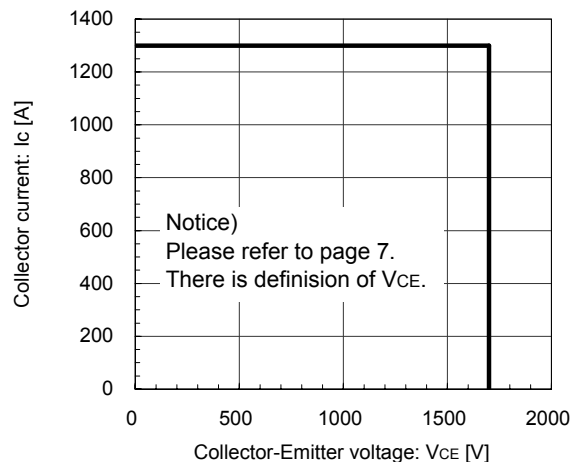
V_{CC}=900V, I_C=650A, V_{GE}=±15V, T_J=125°C, 150°C

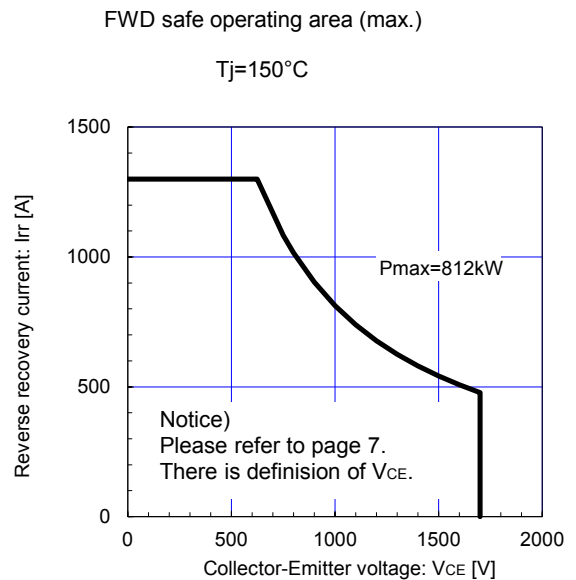
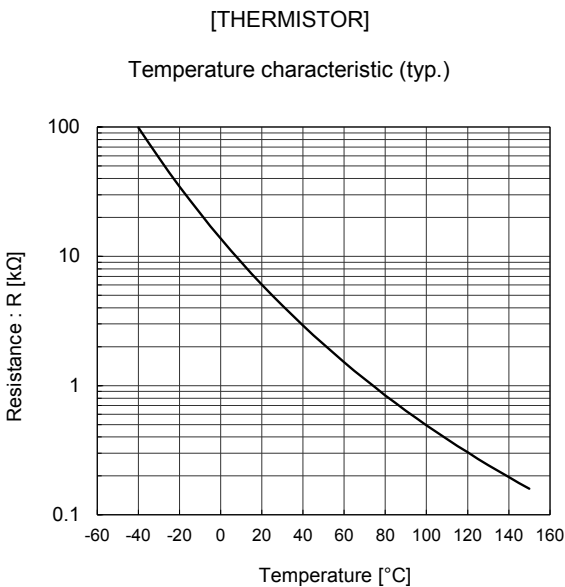
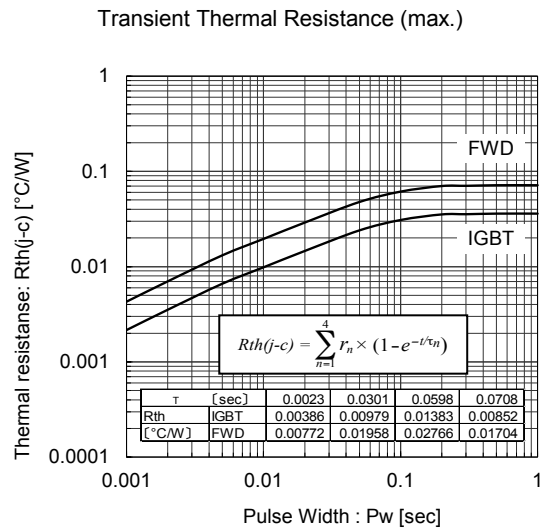
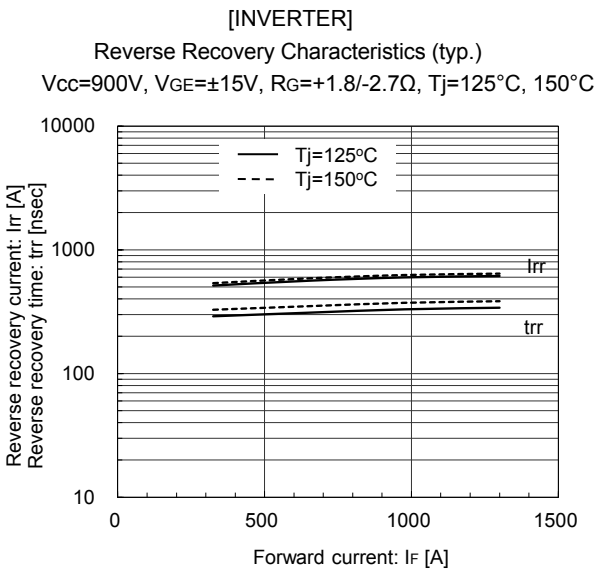
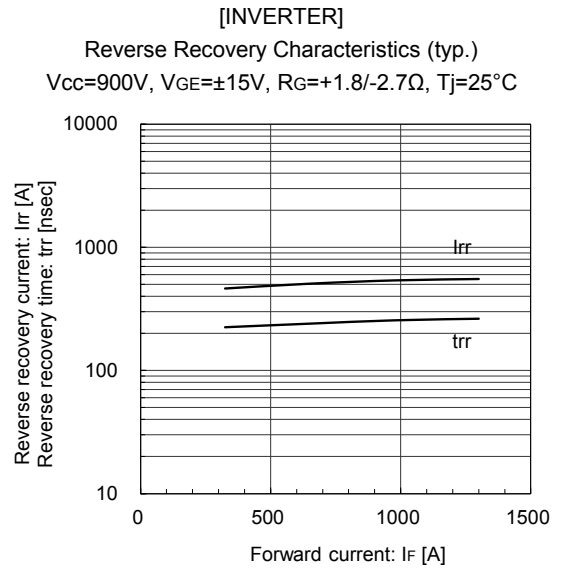
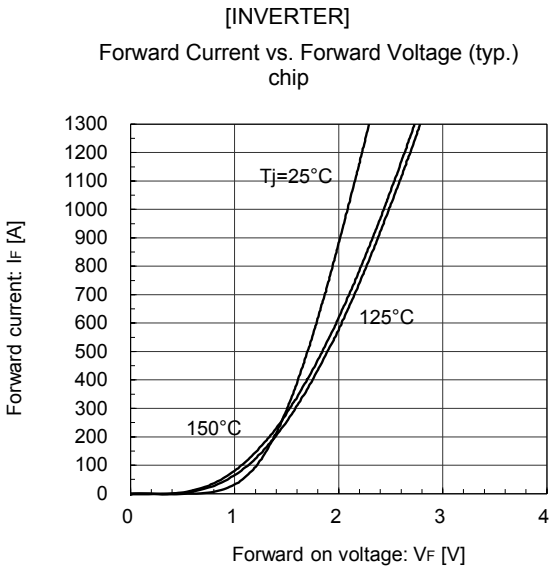


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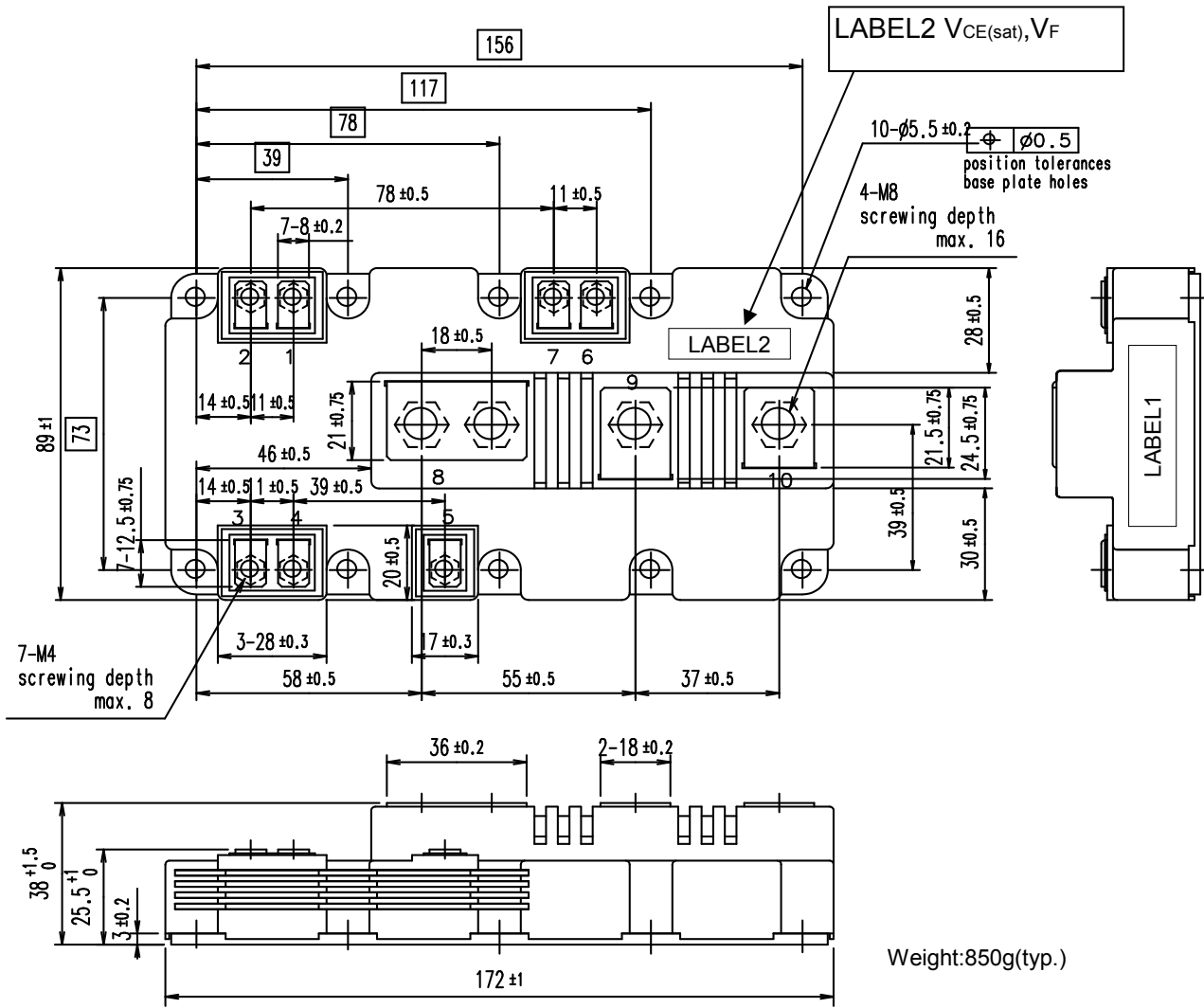
Reverse bias safe operating area (max.)

+V_{GE}=15V, -V_{GE}=15V, R_G=+1.8/-2.7Ω, T_J=150°C

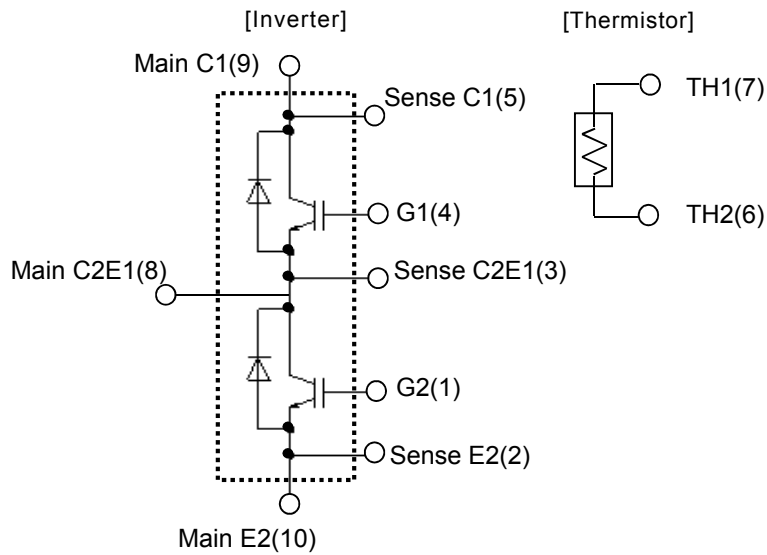




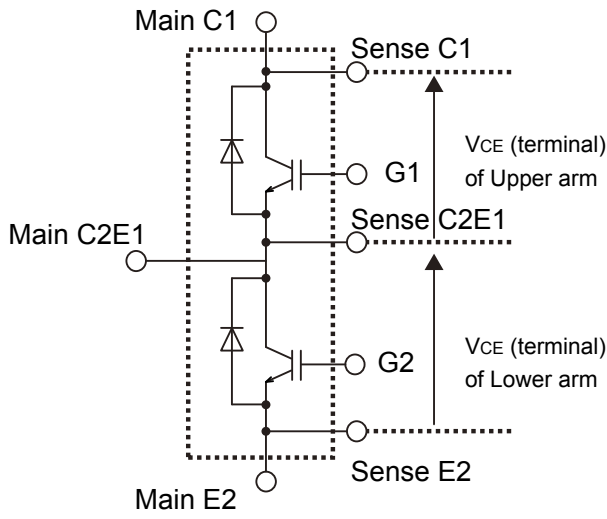
■ Outline Drawings, mm



■ Equivalent Circuit Schematic



■ Definition of on-state voltage at terminal and switching characteristics



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 .

Switching characteristics of V_{CE} also is defined between Sense C1 and Sense C2E1 for Upper arm and Sense C2E1 and Sense E2 for Lower arm .

Please use these terminals whenever measure spike voltage and on-state voltage .

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