

2MBI650VXA-170E-50

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	Tc=25°C 900	A
				Tc=100°C 650	
		I _c pulse	1ms	1300	
		-I _c		650	
	-I _c pulse	1ms	1300		
Collector power dissipation	P _c	1 device	4150	W	
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	V _{iso}	AC : 1min.	4000	VAC	
					between terminal and copper base (*1) 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 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} = 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	Tj=25°C	-	2.10	2.55	V
			Tj=125°C	-	2.50	-	
			Tj=150°C	-	2.55	-	
	Tj=25°C		-	2.00	2.45		
	Tj=125°C		-	2.40	-		
	Tj=150°C		-	2.45	-		
	V _{CE(sat)} (chip)		-	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	ton	V _{CC} = 900V	-	1.25	-	μsec	
	tr	I _c = 650A	-	0.50	-		
	tr (i)	V _{GE} = ±15V	-	0.15	-		
Turn-off time	toff	R _G = +1.8/-2.7Ω	-	1.55	-	μsec	
	tf	L _s =70nH	-	0.15	-		
Forward on voltage	V _F (terminal) (*4)	V _{GE} = 0V I _F = 650A	Tj=25°C	-	1.95	2.40	V
			Tj=125°C	-	2.20	-	
			Tj=150°C	-	2.15	-	
	Tj=25°C		-	1.85	2.30		
	Tj=125°C		-	2.10	-		
	Tj=150°C		-	2.05	-		
	V _F (chip)		-	2.05	-		
Reverse recovery time	trr	I _F = 650A	-	0.24	-	μsec	
Thermistor	Resistance	T=25°C	-	5000	-	Ω	
		T=100°C	465	495	520		
	B value	T=25/50°C	3305	3375	3450	K	

Note *4: Please refer to page 6, there is definition of on-state voltage at terminal.

● Thermal resistance characteristics

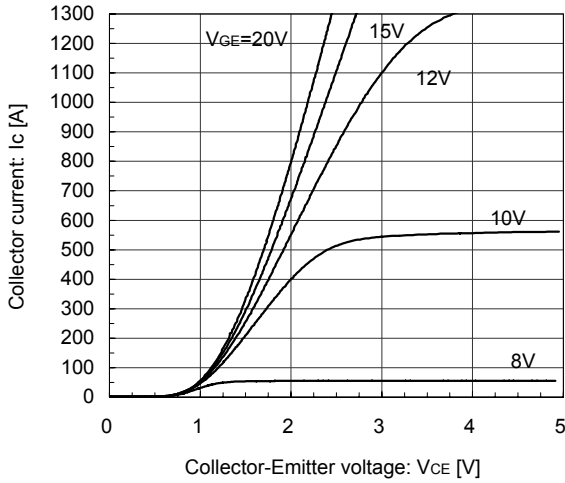
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	Inverter IGBT	-	-	0.036	°C/W
		Inverter FWD	-	-	0.072	
Contact thermal resistance (1device) (*5)	R _{th(c-f)}	with Thermal Compound	-	0.0125	-	

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

■ Characteristics (Representative)

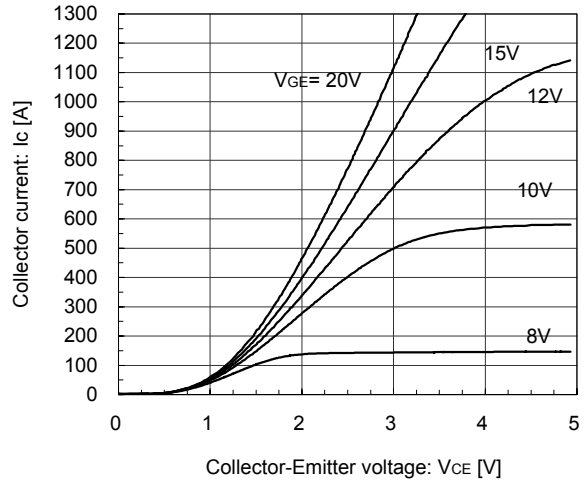
[INVERTER]

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



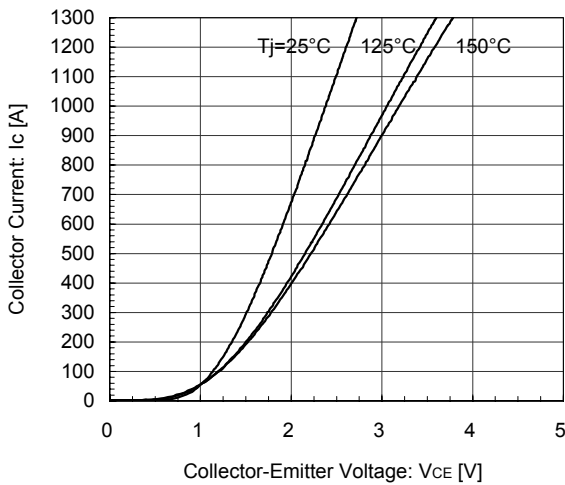
[INVERTER]

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



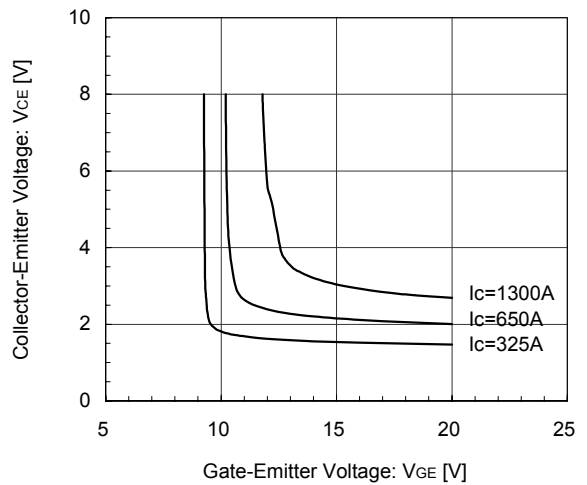
[INVERTER]

Collector current vs. Collector-Emittter voltage (typ.)
Vge= 15V / chip



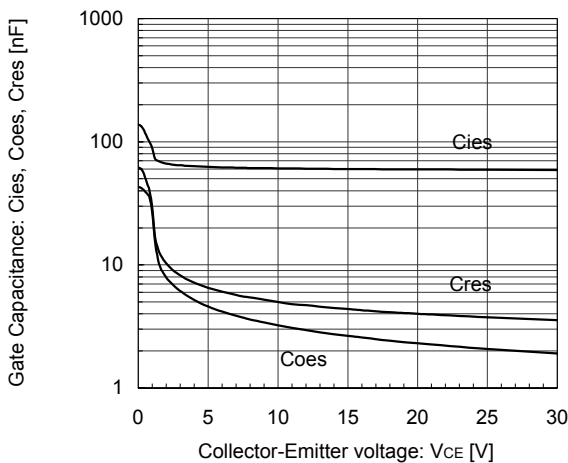
[INVERTER]

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



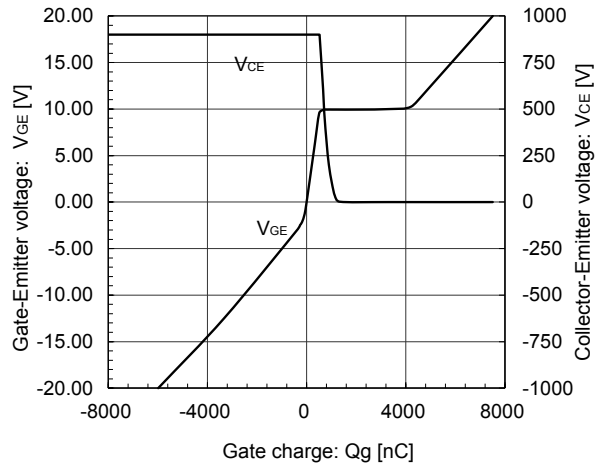
[INVERTER]

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



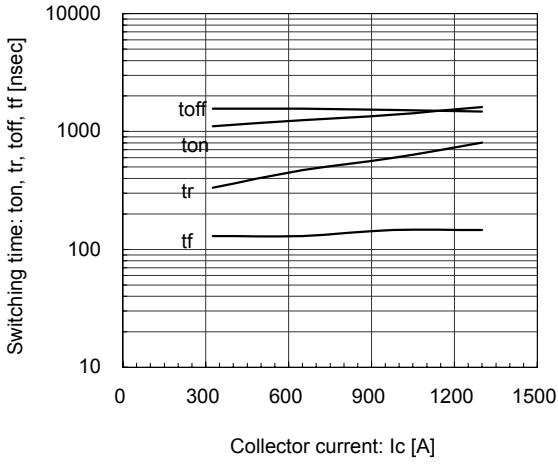
[INVERTER]

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



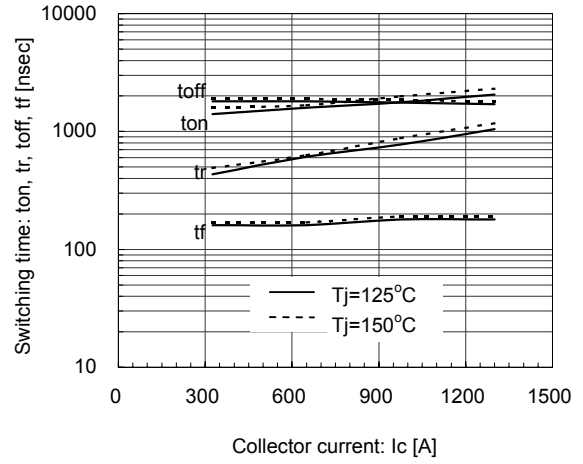
[INVERTER]

Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=+1.8/-2.7\Omega, T_J=25^\circ C$



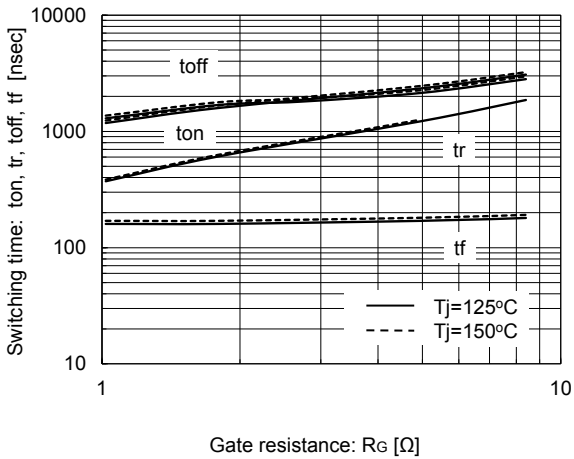
[INVERTER]

Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=+1.8/-2.7\Omega, T_J=125^\circ C, 150^\circ C$



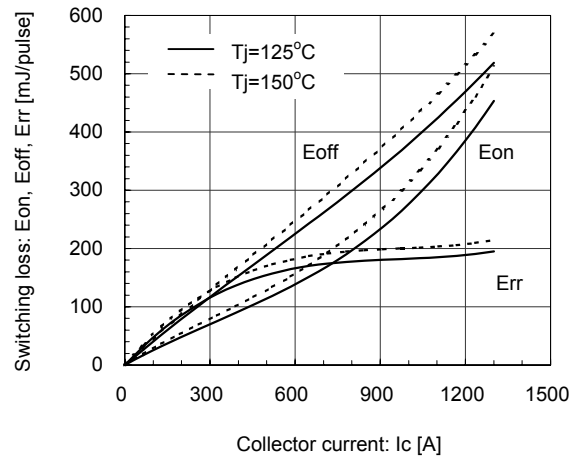
[INVERTER]

Switching time vs. Gate resistance (typ.)
 $V_{CC}=900V, I_C=650A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



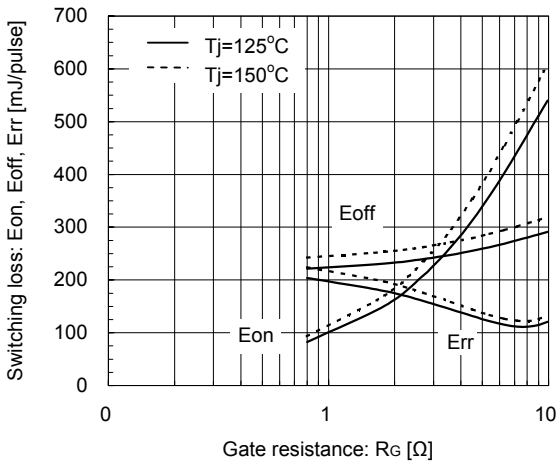
[INVERTER]

Switching loss vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=+1.8/-2.7\Omega, T_J=125^\circ C, 150^\circ C$



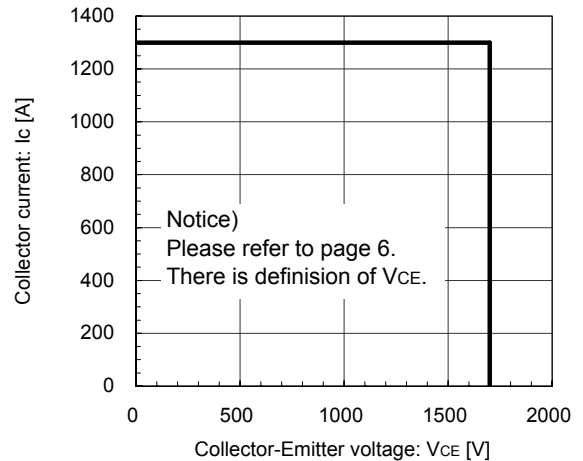
[INVERTER]

Switching loss vs. Gate resistance (typ.)
 $V_{CC}=900V, I_C=650A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



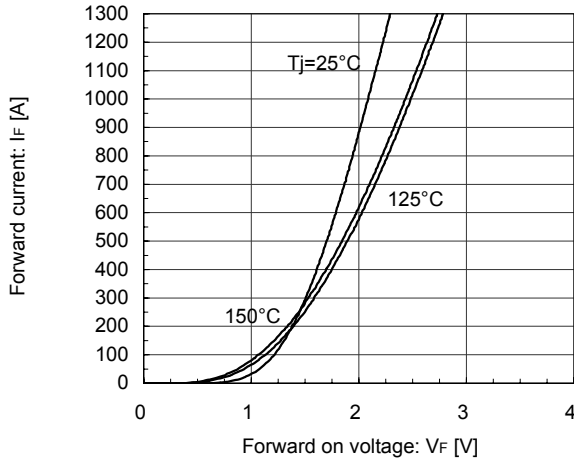
[INVERTER]

Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE}=15V, R_G=+1.8/-2.7\Omega, T_J=150^\circ C$



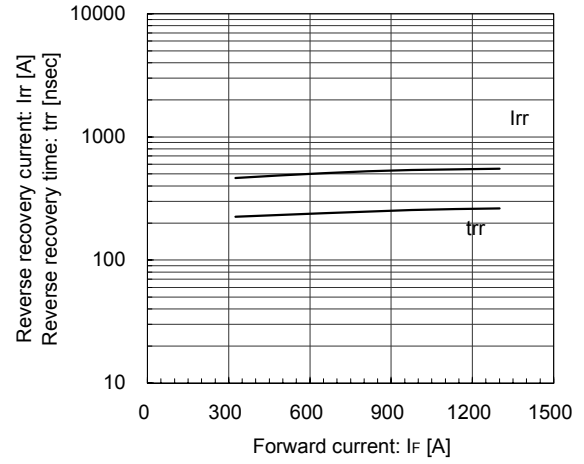
[INVERTER]

Forward Current vs. Forward Voltage (typ.)
chip



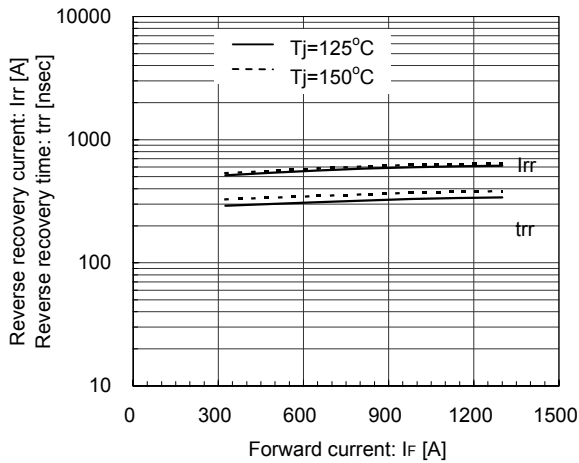
[INVERTER]

Reverse Recovery Characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=+1.8/-2.7Ω, T_J=25°C

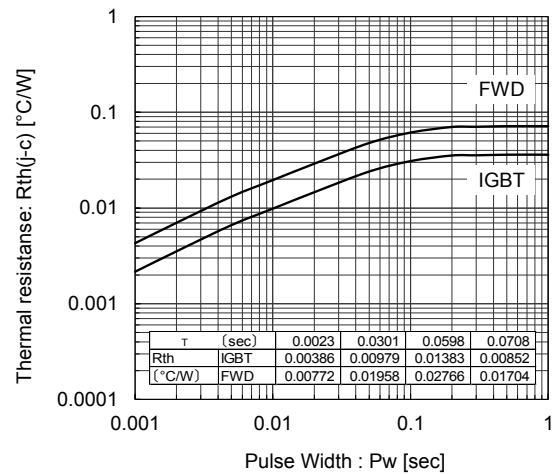


[INVERTER]

Reverse Recovery Characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=+1.8/-2.7Ω, T_J=125°C, 150°C

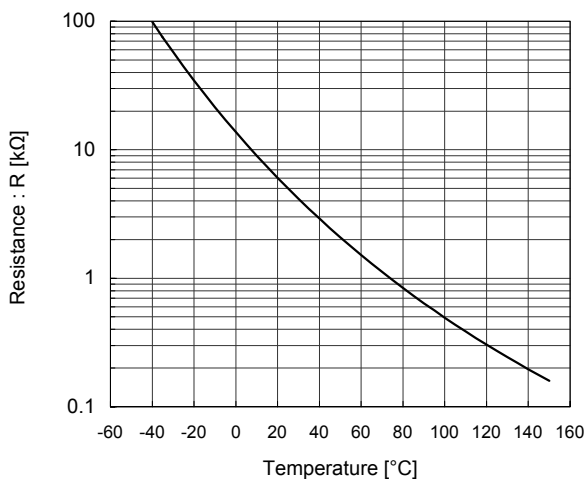


Transient Thermal Resistance (max.)



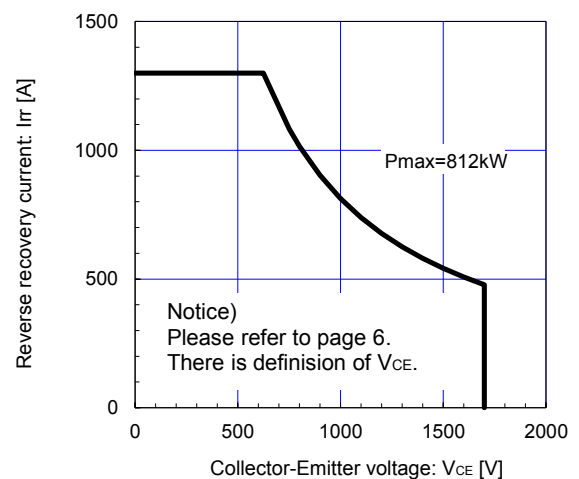
[THERMISTOR]

Temperature characteristic (typ.)

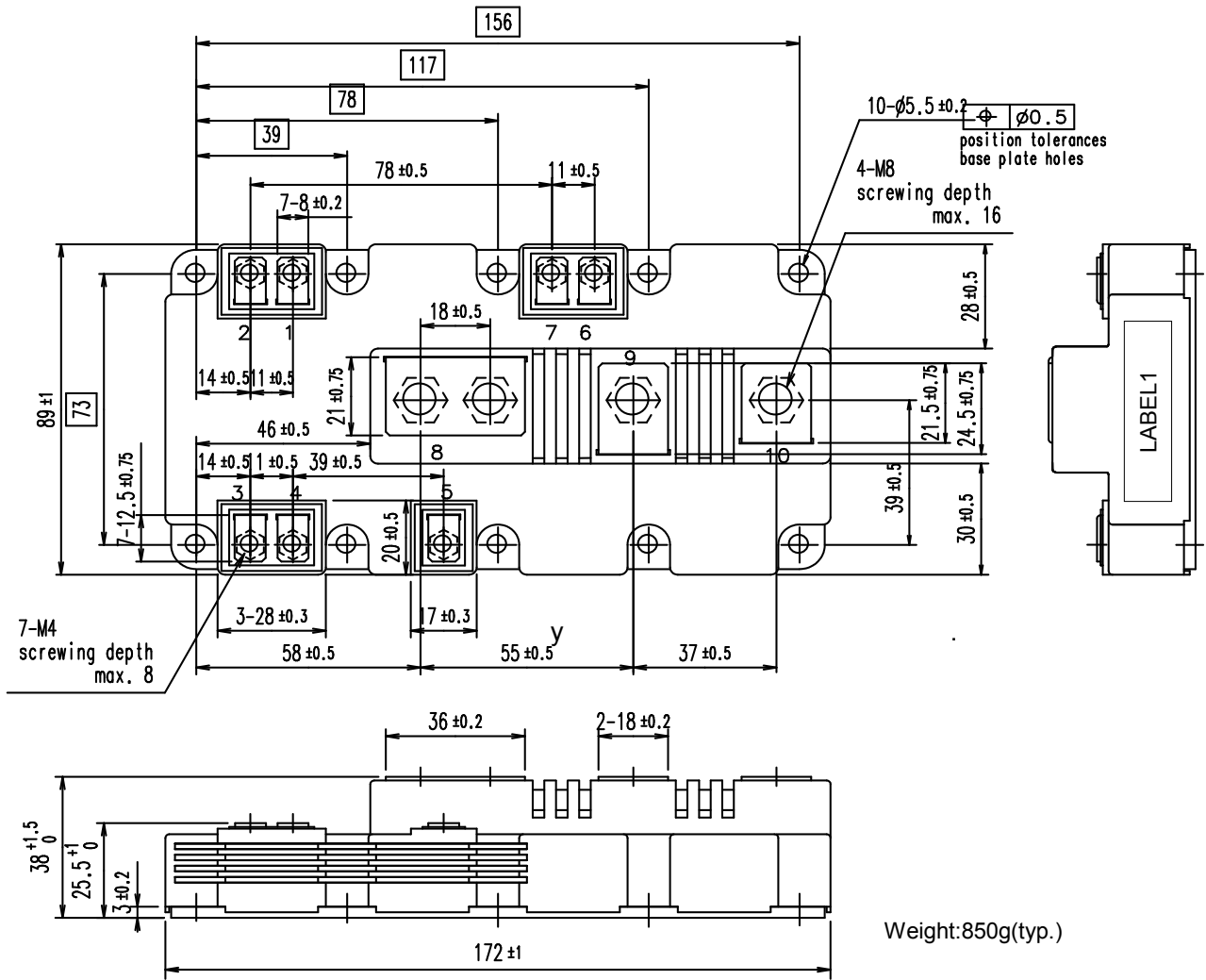


FWD safe operating area (max.)

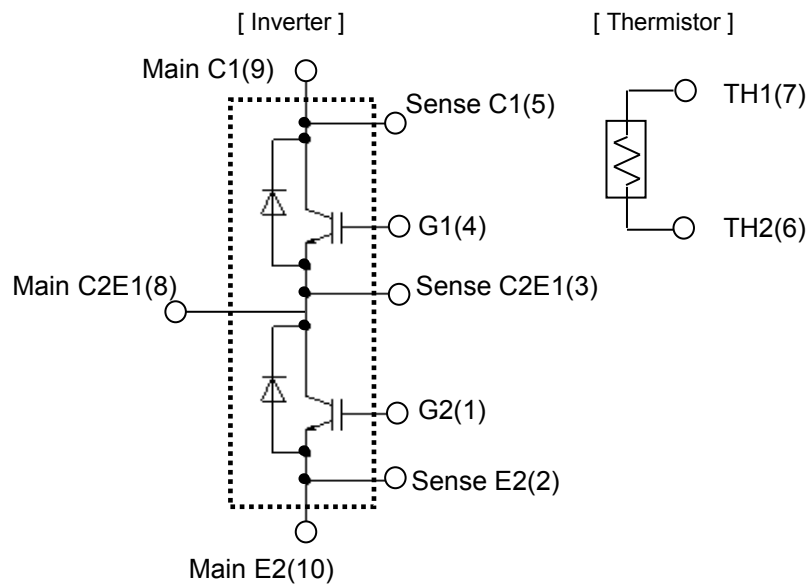
T_J=150°C



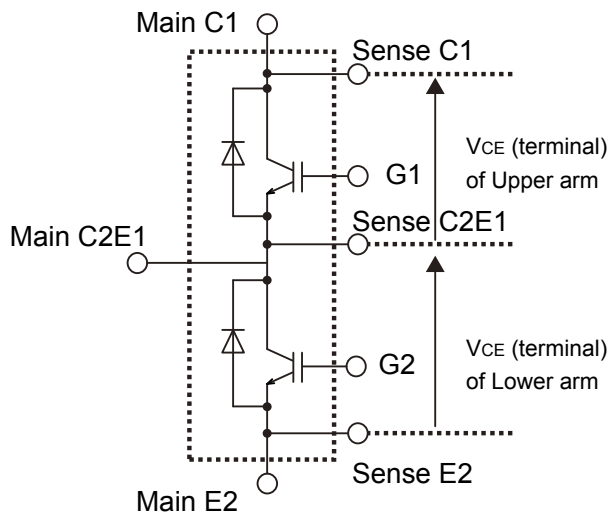
■ Outline Drawings (Unit: mm)



■ Equivalent Circuit



■ 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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IGBT Modules

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