

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	A
				T _c =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 _{JP}		150		
Case temperature		T _C		150		
Storage temperature		T _{stg}		-40 ~ +150		
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	V _{iso}	AC : 1min.	4000	VAC	
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	-	
	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		-	1250	-	nsec
		t _r	I _c = 650A		-	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	-	
	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	-		
Reverse recovery time	t _{rr}	I _F = 650A		-	240	-	μs	
Thermistor	Resistance	R	T=25°C T=100°C		- 465	5000 495	- 520	Ω
	B value	B	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

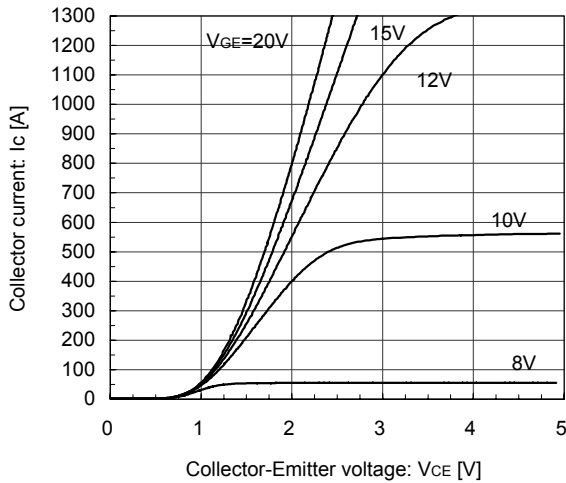
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	Inverter IGBT	-	-	0.036	°C/W
		Inverter FWD	-	-	0.072	
Contact thermal resistance (1device) (*5)	R _{th(c-f)}	with Thermal Compound	-	0.0125	-	

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

■ Characteristics (Representative)

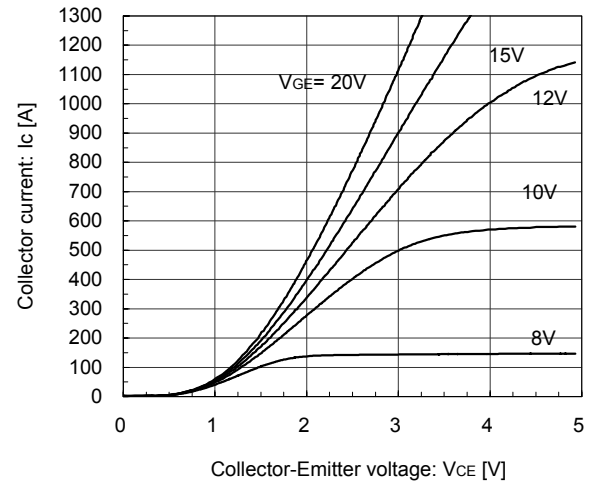
[INVERTER]

Collector current vs. Collector-Emitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



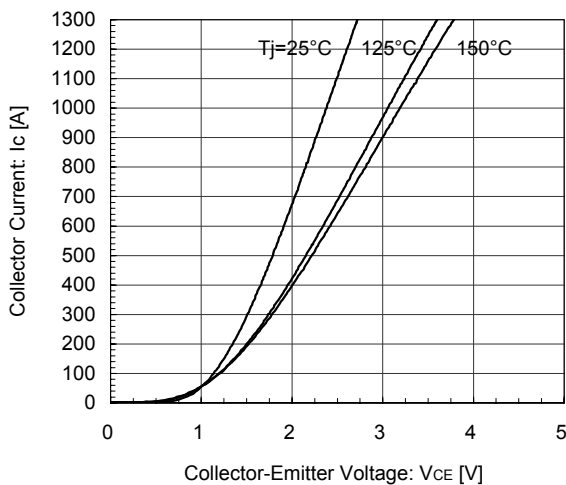
[INVERTER]

Collector current vs. Collector-Emitter voltage (typ.)
 $T_j = 150^\circ\text{C}$ / chip



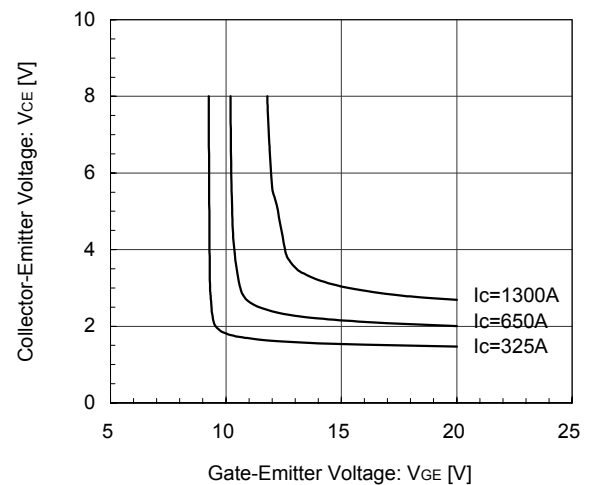
[INVERTER]

Collector current vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 15V$ / chip



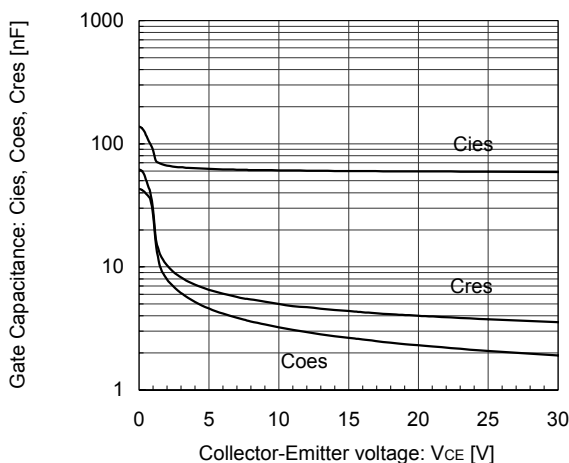
[INVERTER]

Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



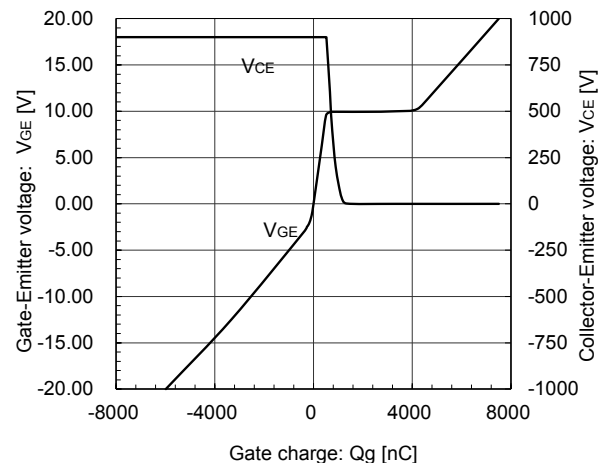
[INVERTER]

Gate Capacitance vs. Collector-Emitter Voltage (typ.)
 $V_{GE} = 0V, f = 1\text{MHz}, T_j = 25^\circ\text{C}$



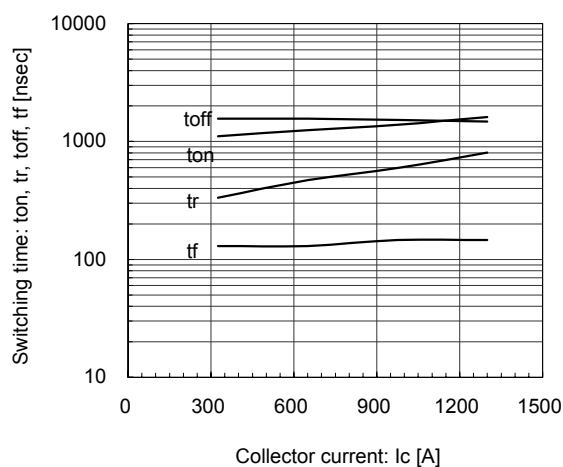
[INVERTER]

Dynamic Gate Charge (typ.)
 $V_{CC} = 900V, I_c = 650A, T_j = 25^\circ\text{C}$



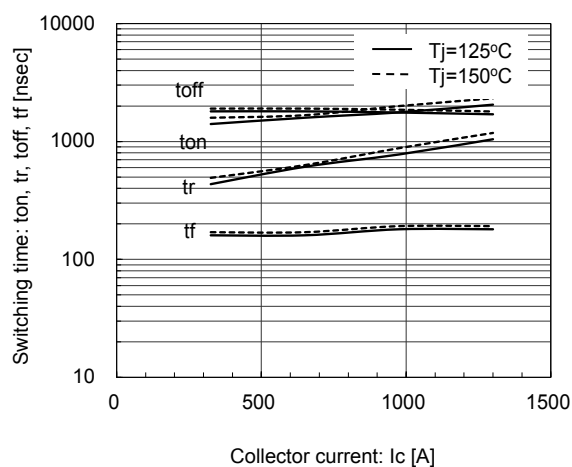
[INVERTER]

Switching time vs. Collector current (typ.)

 $V_{CC}=900V$, $V_{GE}=\pm 15V$, $R_G=+1.8/-2.7\Omega$, $T_J=25^\circ C$ 

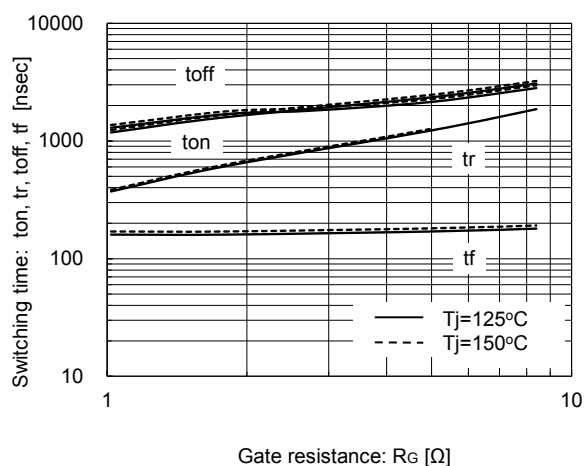
[INVERTER]

Switching time vs. Collector current (typ.)

 $V_{CC}=900V$, $V_{GE}=\pm 15V$, $R_G=+1.8/-2.7\Omega$, $T_J=125^\circ C, 150^\circ C$ 

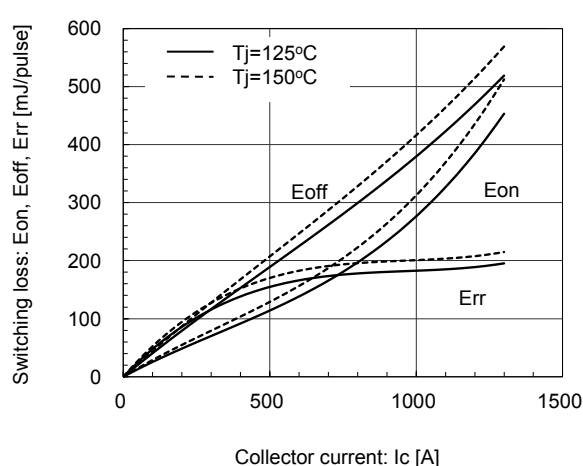
[INVERTER]

Switching time vs. Gate resistance (typ.)

 $V_{CC}=900V$, $I_C=650A$, $V_{GE}=\pm 15V$, $T_J=125^\circ C, 150^\circ C$ 

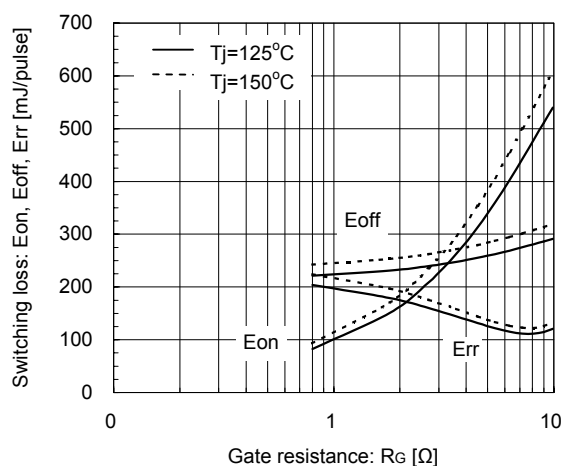
[INVERTER]

Switching loss vs. Collector current (typ.)

 $V_{CC}=900V$, $V_{GE}=\pm 15V$, $R_G=+1.8/-2.7\Omega$, $T_J=125^\circ C, 150^\circ C$ 

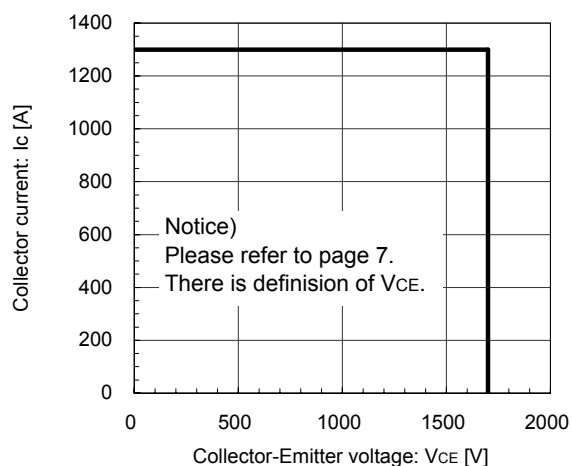
[INVERTER]

Switching loss vs. Gate resistance (typ.)

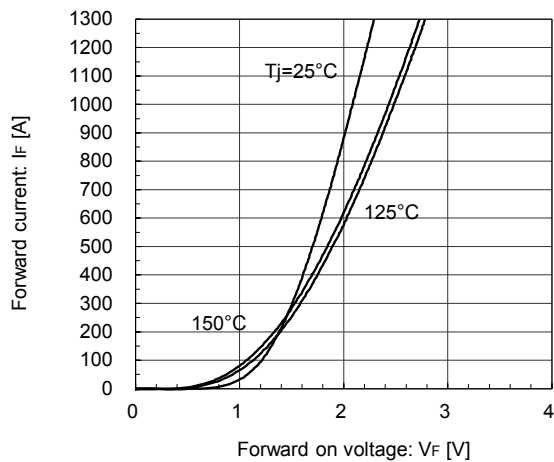
 $V_{CC}=900V$, $I_C=650A$, $V_{GE}=\pm 15V$, $T_J=125^\circ C, 150^\circ C$ 

[INVERTER]

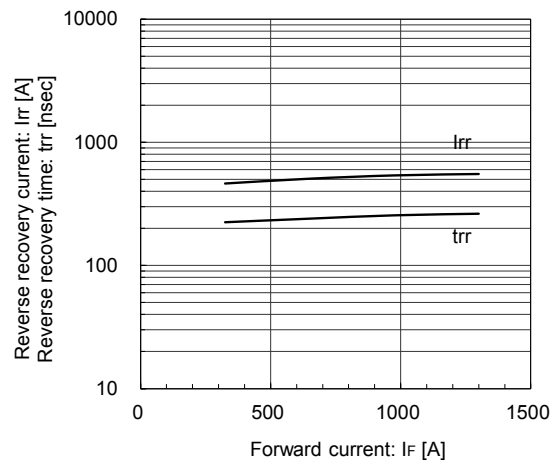
Reverse bias safe operating area (max.)

 $+V_{GE}=15V$, $-V_{GE}=15V$, $R_G=+1.8/-2.7\Omega$, $T_J=150^\circ C$ 

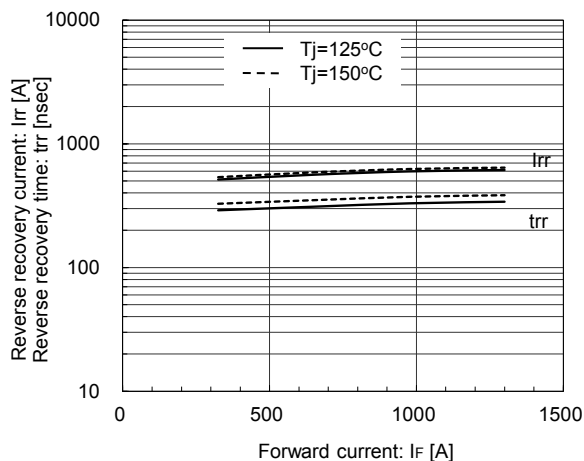
[INVERTER]

Forward Current vs. Forward Voltage (typ.)
chip

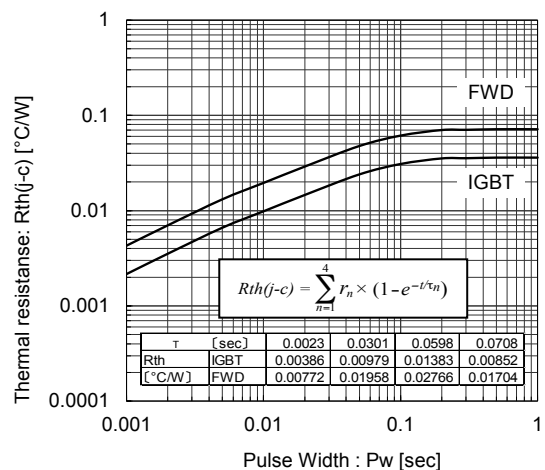
[INVERTER]

Reverse Recovery Characteristics (typ.)
Vcc=900V, VGE=±15V, RG=+1.8/-2.7Ω, Tj=25°C

[INVERTER]

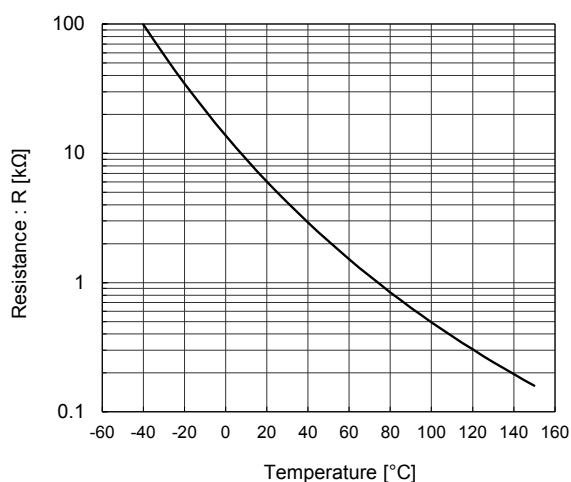
Reverse Recovery Characteristics (typ.)
Vcc=900V, VGE=±15V, RG=+1.8/-2.7Ω, Tj=125°C, 150°C

Transient Thermal Resistance (max.)



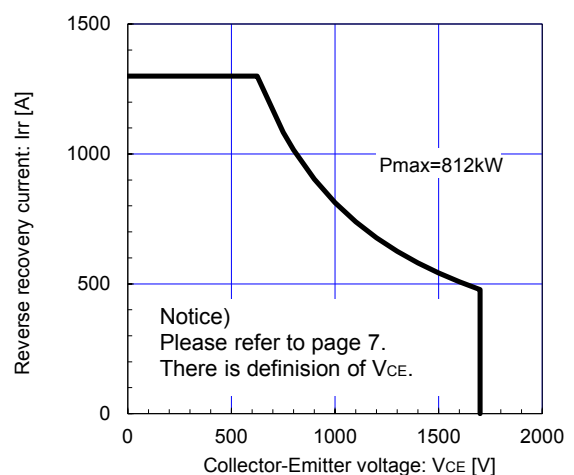
[THERMISTOR]

Temperature characteristic (typ.)

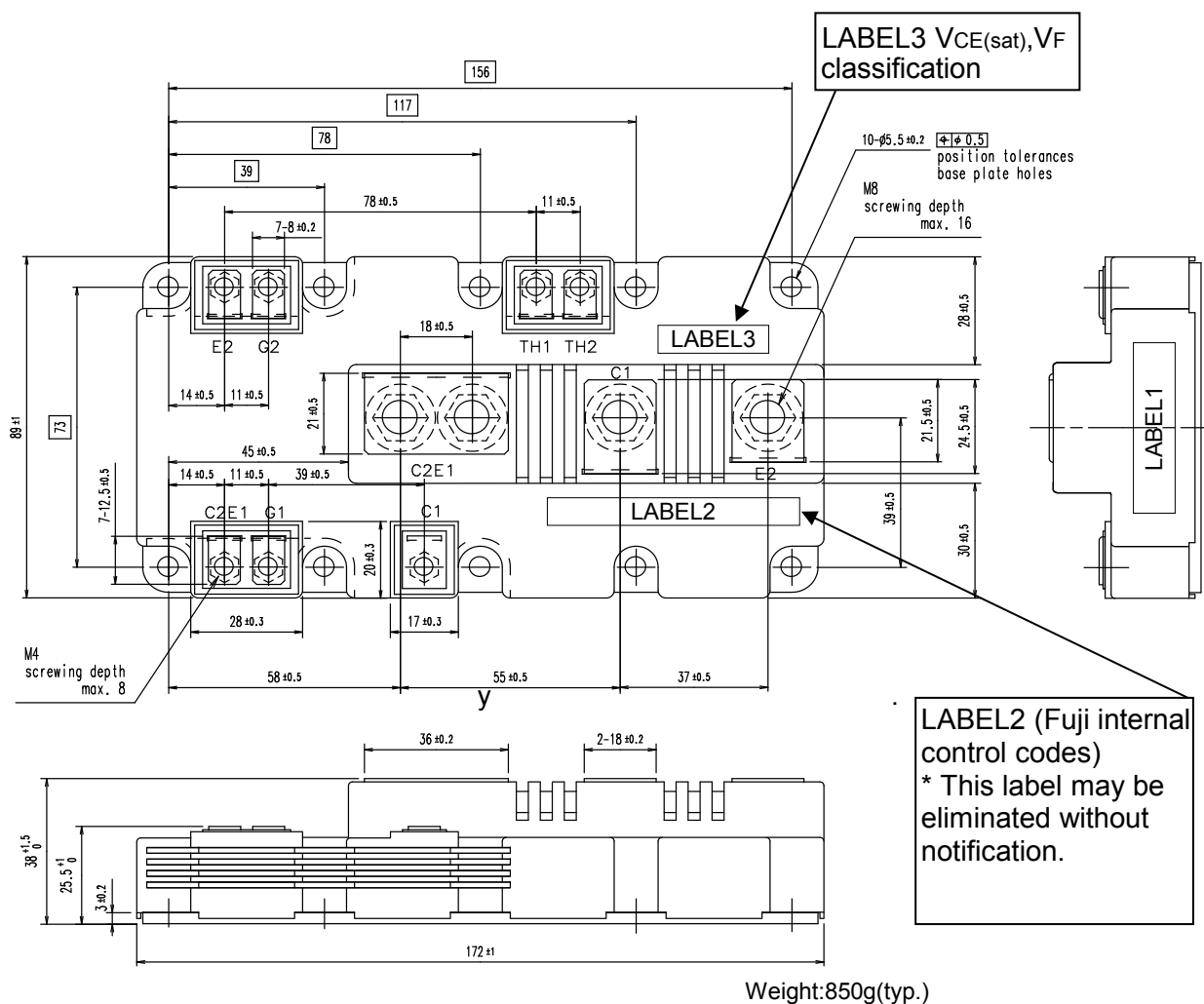


FWD safe operating area (max.)

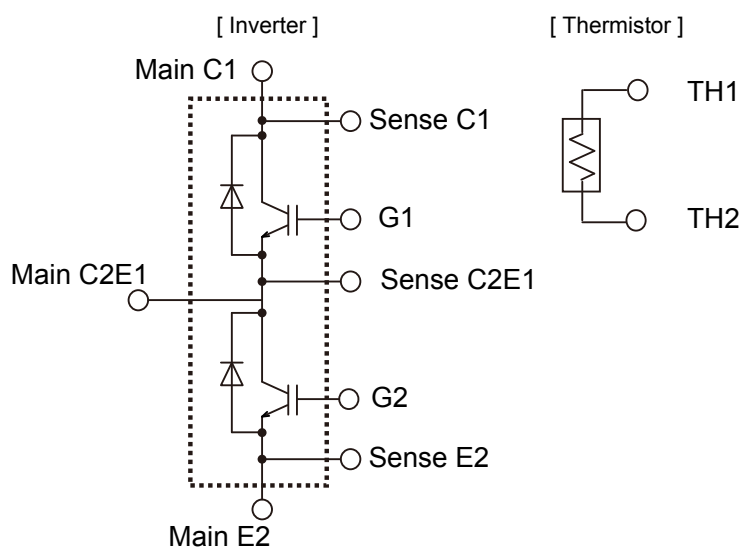
Tj=150°C



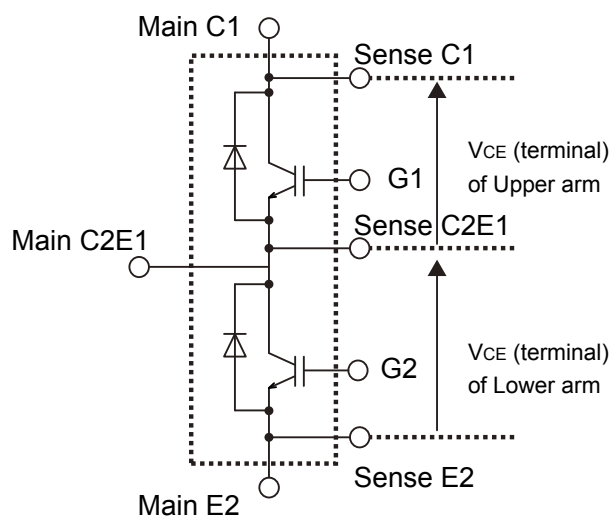
Outline Drawings, mm



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 .

WARNING

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