

# 2MBI600VXA-120E-54

**IGBT Modules**

## IGBT MODULE (V series) 1200V / 600A / 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
<b>Collector-Emitter voltage</b>	V <sub>CES</sub>		1200	V
<b>Gate-Emitter voltage</b>	V <sub>GES</sub>		±20	V
<b>Inverter</b> <b>Collector current</b>	I <sub>c</sub>	Continuous	T <sub>c</sub> =25°C 800	A
	I <sub>c pulse</sub>	1ms	T <sub>c</sub> =100°C 600	
	-I <sub>c</sub>		1200	
	-I <sub>c pulse</sub>	1ms	600	
<b>Collector power dissipation</b>	P <sub>c</sub>	1 device	1200	W
<b>Junction temperature</b>	T <sub>j</sub>		3350	
<b>Operating junction temperature (under switching conditions)</b>	T <sub>jop</sub>		175	°C
<b>Case temperature</b>	T <sub>c</sub>		150	
<b>Storage temperature</b>	T <sub>stg</sub>		150	
<b>Isolation voltage</b>	V <sub>iso</sub>	AC : 1min.	-40 ~ +150	VAC
<b>Screw torque (*3)</b>	-	M5	4000	N m
		M8	6.0	
		M4	10.0	
			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<sub>j</sub> = 25°C unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V	-	-	4.0	mA	
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	800	nA	
	Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 600mA	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal) (*4)	V <sub>GE</sub> = 15V I <sub>c</sub> = 600A	T <sub>j</sub> = 25°C	-	1.85	2.30	V
				T <sub>j</sub> = 125°C	-	2.15	-	
				T <sub>j</sub> = 150°C	-	2.20	-	
		V <sub>CE(sat)</sub> (chip)		T <sub>j</sub> = 25°C	-	1.75	2.20	
				T <sub>j</sub> = 125°C	-	2.05	-	
	T <sub>j</sub> = 150°C	-	2.10	-				
	Internal gate resistance	R <sub>g(int)</sub>	-	-	1.75	-	Ω	
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	55	-	nF	
	Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 600V I <sub>c</sub> = 600A	-	1000	-	nsec	
		t <sub>r</sub>	V <sub>GE</sub> = ±15V	-	400	-		
Turn-off time	t <sub>r(f)</sub>	R <sub>G</sub> = 2.4Ω	-	150	-	nsec		
	t <sub>off</sub>	L <sub>s</sub> = 70nH	-	1200	-			
Forward on voltage	V <sub>F</sub> (terminal) (*4)	V <sub>GE</sub> = 0V I <sub>F</sub> = 600A	T <sub>j</sub> = 25°C	-	1.80	2.25	V	
			T <sub>j</sub> = 125°C	-	1.95	-		
			T <sub>j</sub> = 150°C	-	1.90	-		
	V <sub>F</sub> (chip)		T <sub>j</sub> = 25°C	-	1.70	2.15		
			T <sub>j</sub> = 125°C	-	1.85	-		
T <sub>j</sub> = 150°C	-	1.80	-					
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 600A	-	200	-	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

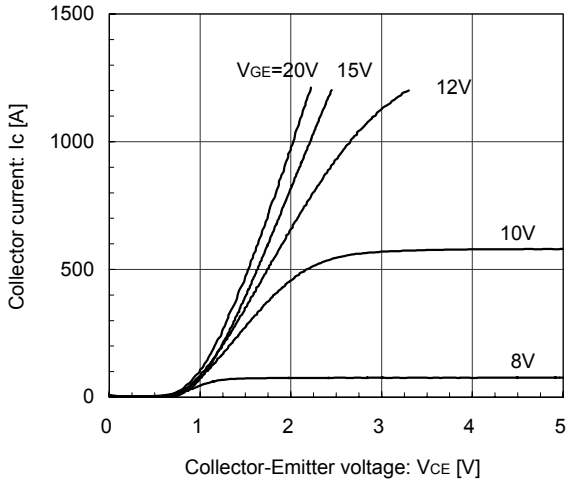
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	Inverter IGBT Inverter FWD	-	-	0.045	°C/W
Contact thermal resistance (1device) (*5)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.0125	-	

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

■ Characteristics (Representative)

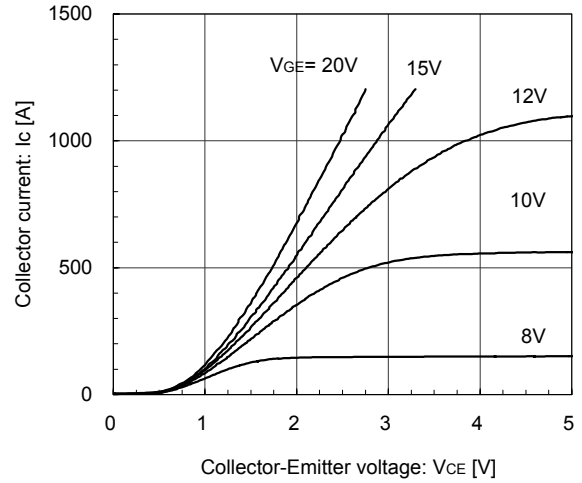
[INVERTER]

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



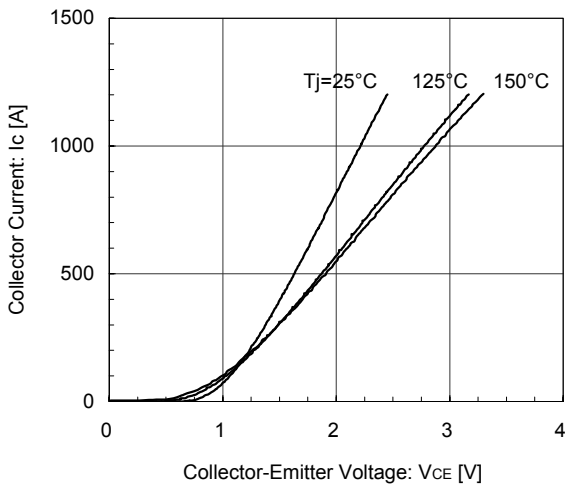
[INVERTER]

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



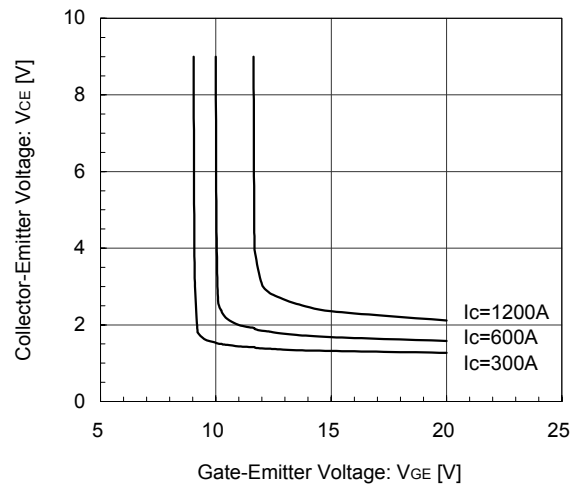
[INVERTER]

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



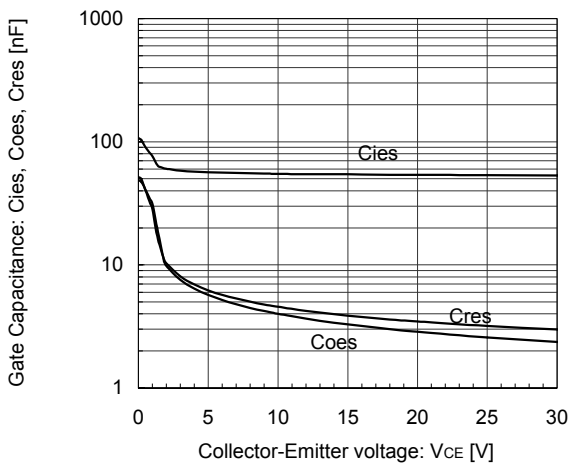
[INVERTER]

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



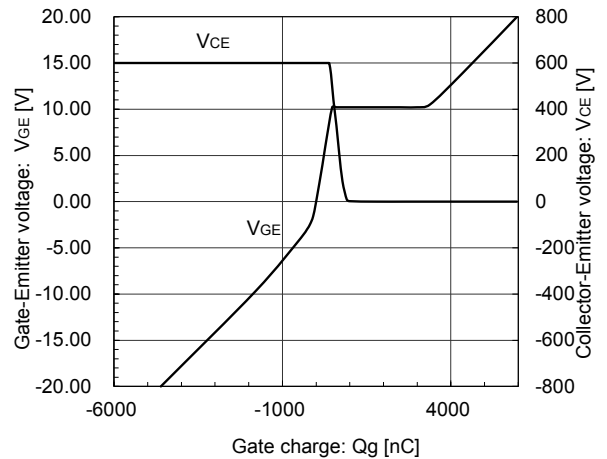
[INVERTER]

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



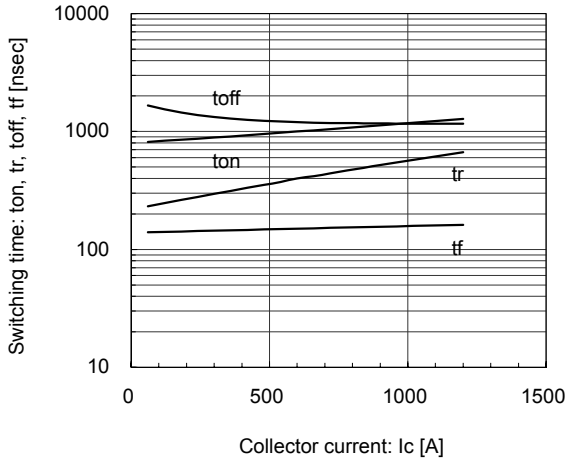
[INVERTER]

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



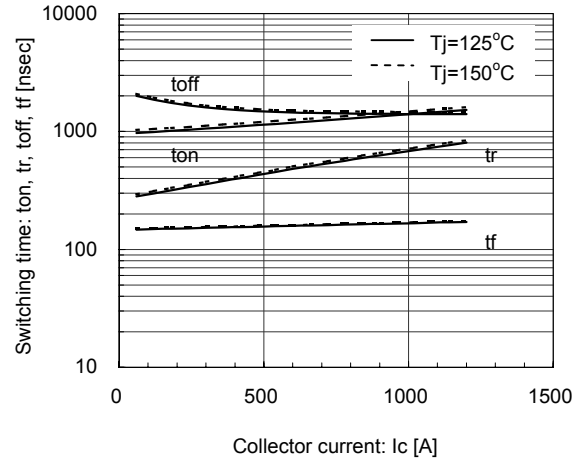
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=2.4\Omega, T_j=25^\circ C$



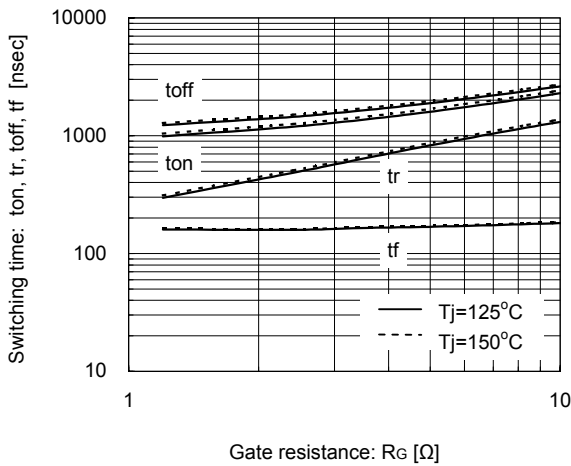
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=2.4\Omega, T_j=125^\circ C, 150^\circ C$



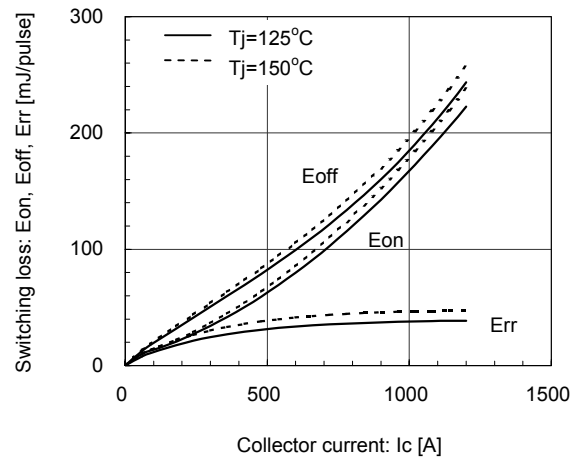
[INVERTER]

Switching time vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=600A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



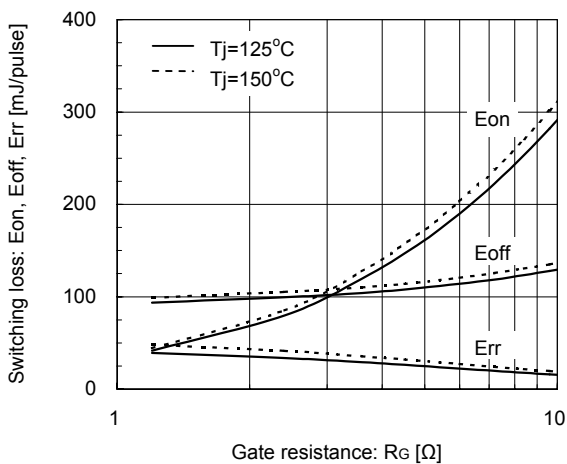
[INVERTER]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=2.4\Omega, T_j=125^\circ C, 150^\circ C$



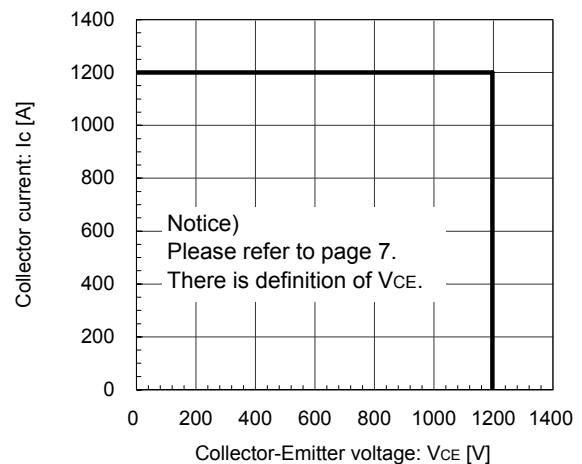
[INVERTER]

Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=600A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



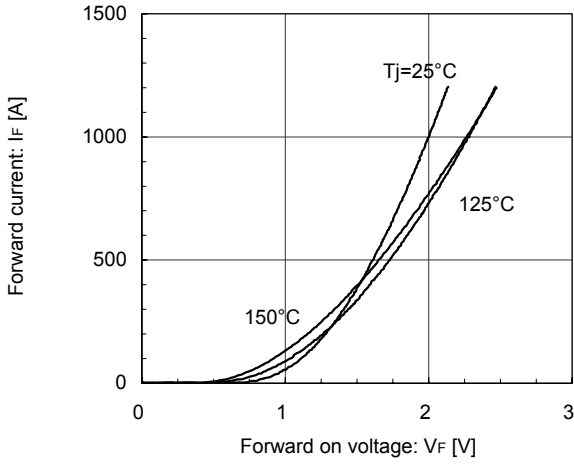
[INVERTER]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_G=2.4\Omega, T_j=150^\circ C$



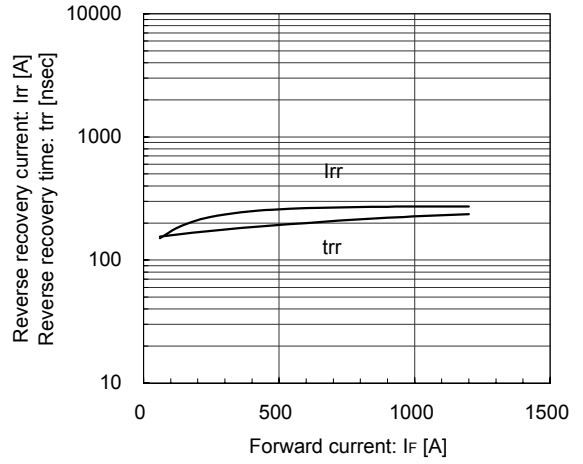
[INVERTER]

Forward Current vs. Forward Voltage (typ.)  
chip



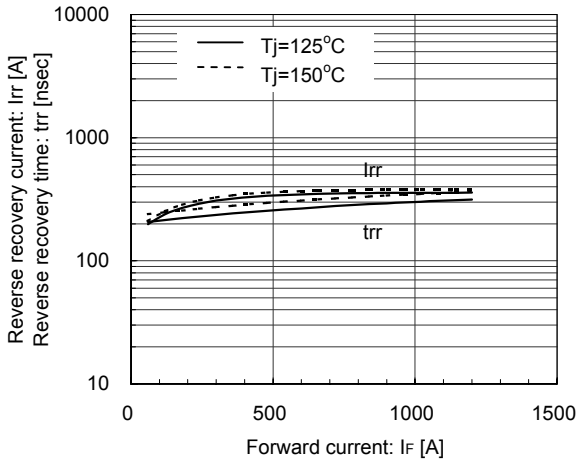
[INVERTER]

Reverse Recovery Characteristics (typ.)  
Vcc=600V, VGE=±15V, RG=2.4Ω, Tj=25°C

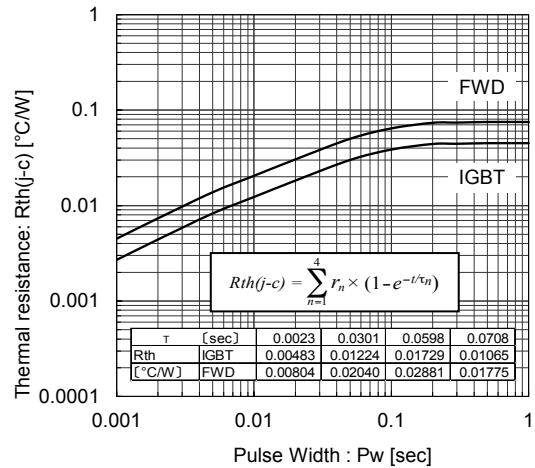


[INVERTER]

Reverse Recovery Characteristics (typ.)  
Vcc=600V, VGE=±15V, RG=2.4Ω, Tj=125°C, 150°C

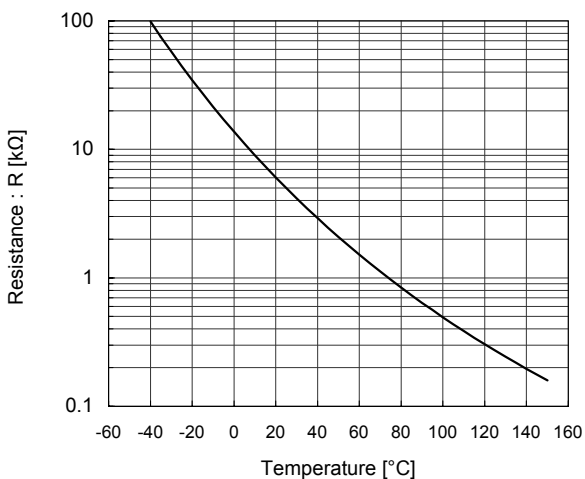


Transient Thermal Resistance (max.)



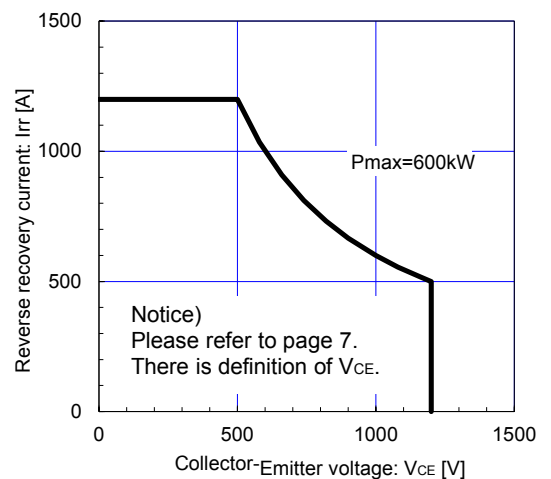
[THERMISTOR]

Temperature characteristic (typ.)

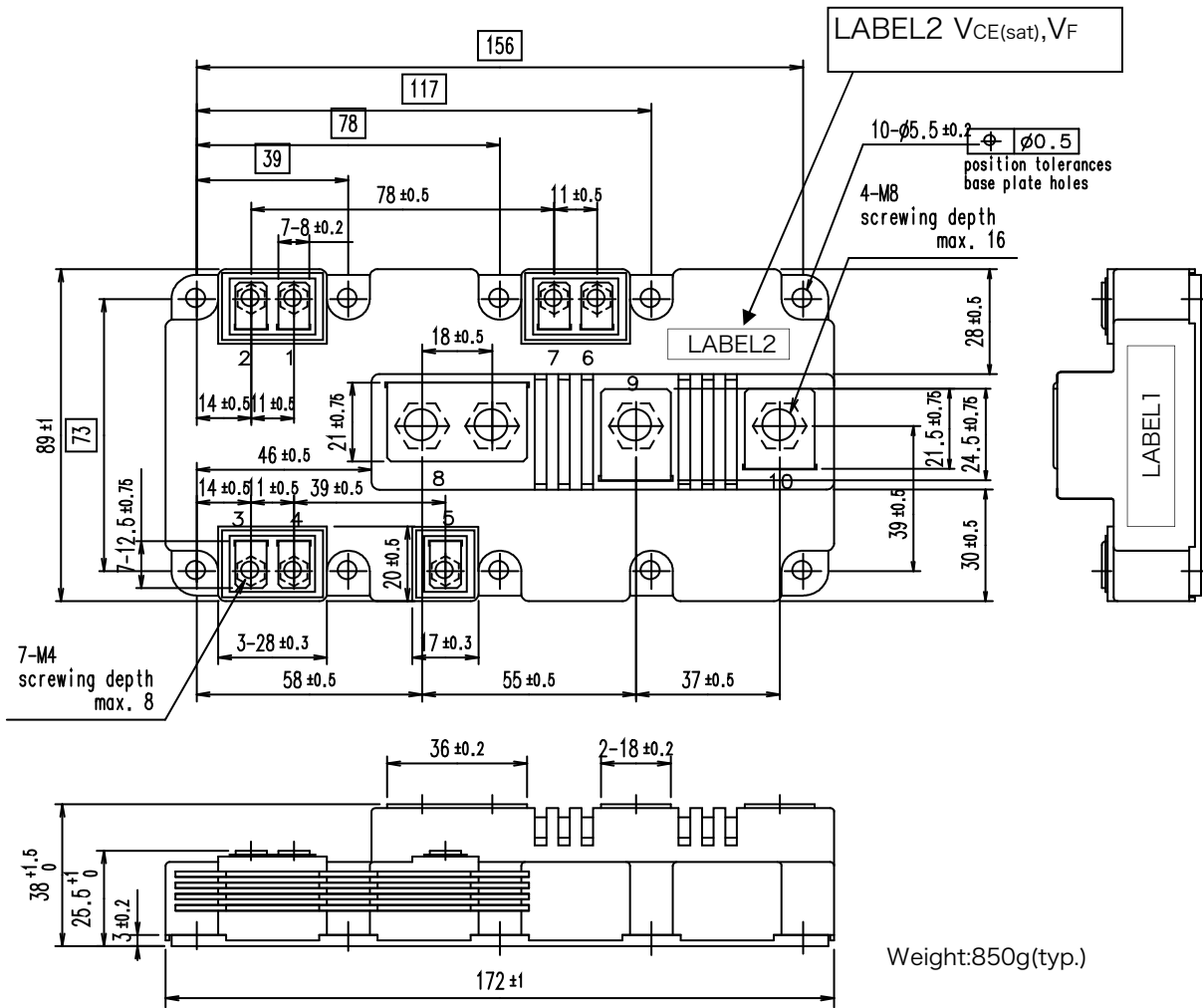


FWD safe operating area (max.)

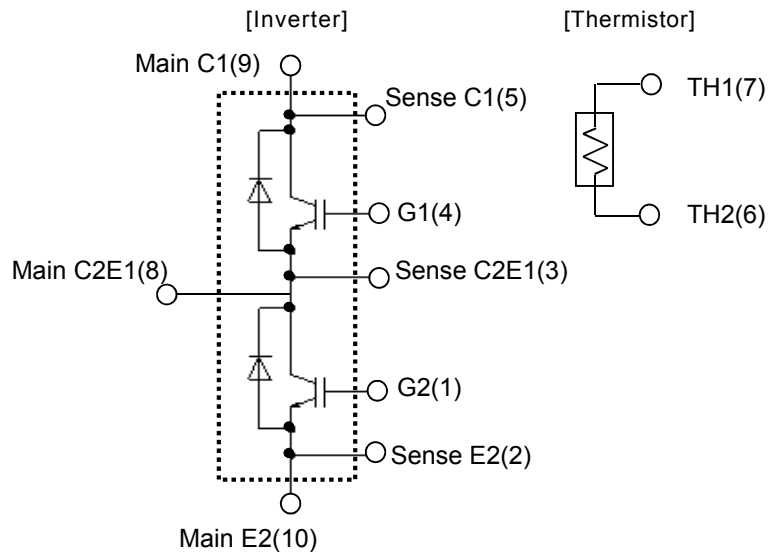
Tj=150°C



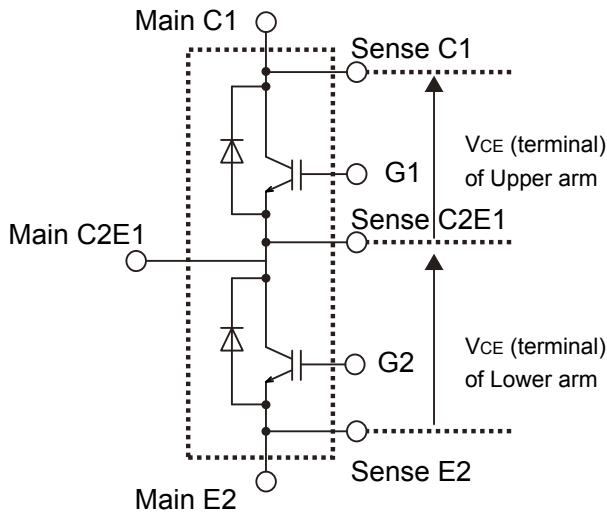
■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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



Fuji defined V<sub>CE</sub> 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<sub>CE</sub> 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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