Fuji Electric

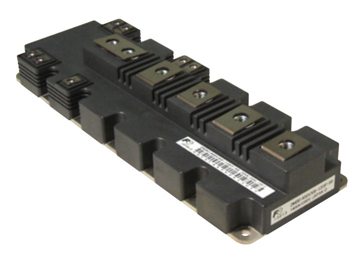
http://www.fujielectric.com/products/semiconductor/

2MBI1400VXB-120E-54

IGBT Modules

IGBT MODULE (V series)

1200V / 1400A / 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}			1200	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_C	Continuous	Tc=25°C	1800	A
				Tc=100°C	1400	
		$I_{C\ pulse}$	1ms		2800	
		$-I_C$			1400	
		$-I_{C\ pulse}$	1ms		2800	
	Collector power dissipation	Pc	1 device		7650	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	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 Tj= 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} = 1200V		-	-	12.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	2400	nA
	Gate-Emitter threshold voltage	$V_{GE\ (th)}$	V_{CE} = 20V, I_C = 1400mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE\ (sat)}$ (terminal) (*4)	V_{GE} = 15V I_C = 1400A	T_j=25°C	-	1.85	2.30	V
				T_j=125°C	-	2.15	-	
				T_j=150°C	-	2.20	-	
		$V_{CE\ (sat)}$ (chip)		T_j=25°C	-	1.75	2.20	
				T_j=125°C	-	2.05	-	
				T_j=150°C	-	2.10	-	
	Internal gate resistance	$Rg_{(int)}$	-		-	0.79	-	Ω
	Input capacitance	Cies	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz		-	128	-	nF
	Turn-on time	ton	V_{CC}=600V, I_c=1400A, V_{GE}=±15V, R_G=1Ω, Ls=60nH		-	1000	-	nsec
		tr			-	400	-	
		tr (i)			-	150	-	
	Turn-off time	toff			-	1200	-	
		tf			-	150	-	
	Forward on voltage	V_F (terminal) (*4)	V_{GE} = 0V I_F = 1400A	T_j=25°C	-	1.90	2.35	V
				T_j=125°C	-	2.05	-	
				T_j=150°C	-	2.00	-	
		V_F (chip)		T_j=25°C	-	1.80	2.25	
				T_j=125°C	-	1.95	-	
				T_j=150°C	-	1.90	-	
	Reverse recovery time	trr	I_F = 1400A		-	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 6 , there is definition of on-state voltage at terminal.

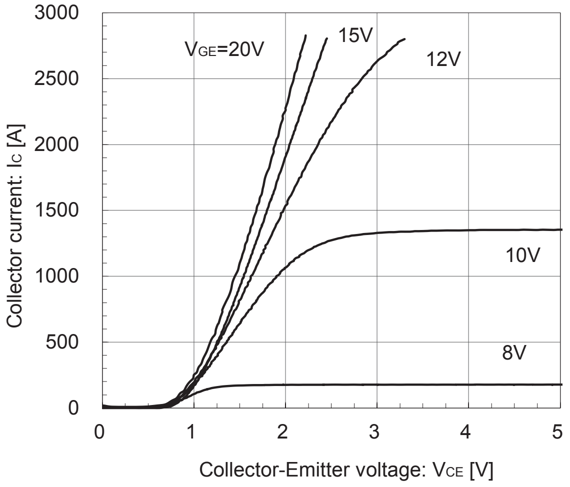
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	Rth(j-c)	Inverter IGBT	-	-	0.0195	°C/W
		Inverter FWD	-	-	0.0360	
Contact thermal resistance (1device) (*5)	Rth(c-f)	with Thermal Compound	-	0.00420	-	

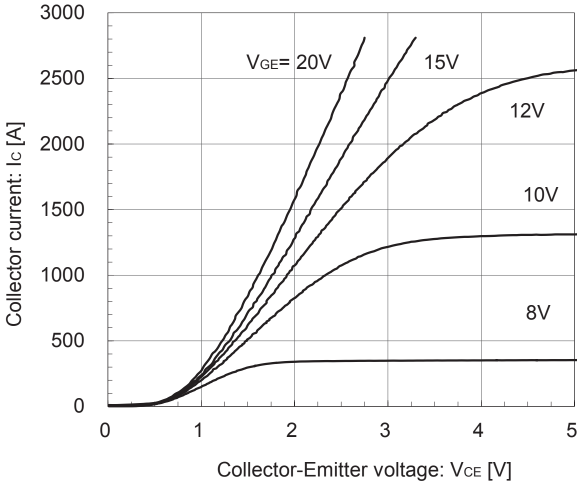
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

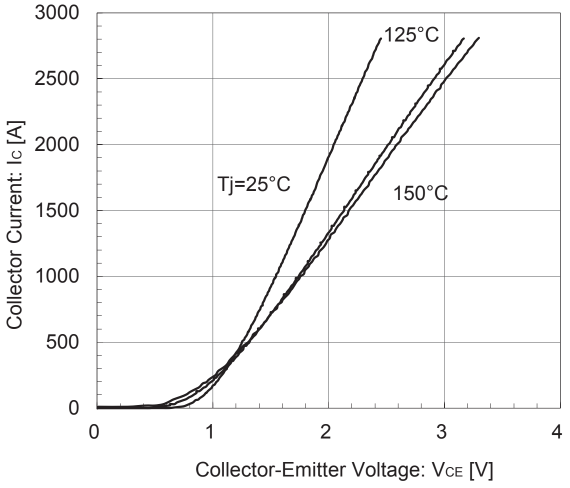
[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



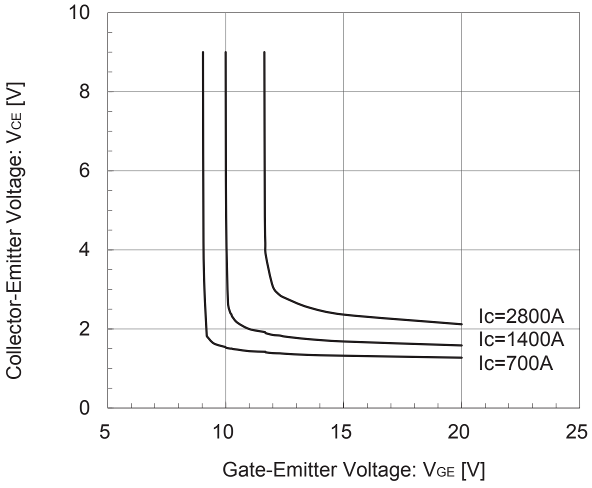
[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



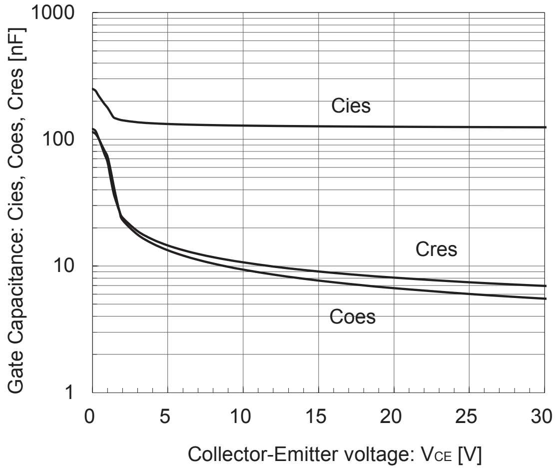
[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
VGE= 15V / chip



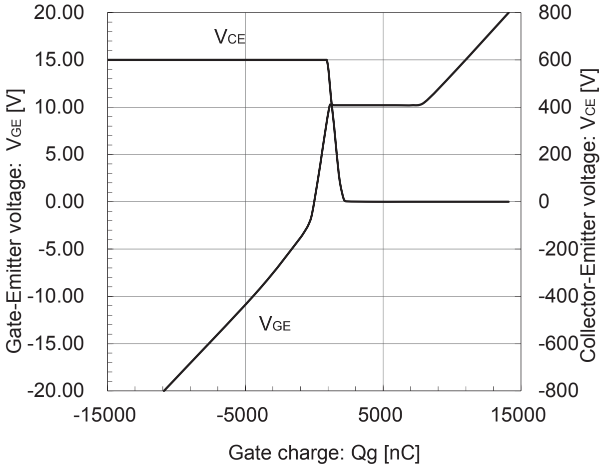
[INVERTER]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



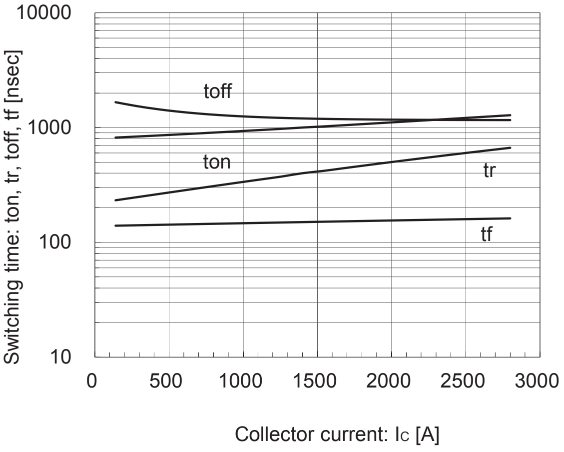
[INVERTER]
Gate Capacitance vs. Collector-Emitter Voltage (typ.)
VGE= 0V, ƒ= 1MHz, Tj= 25°C



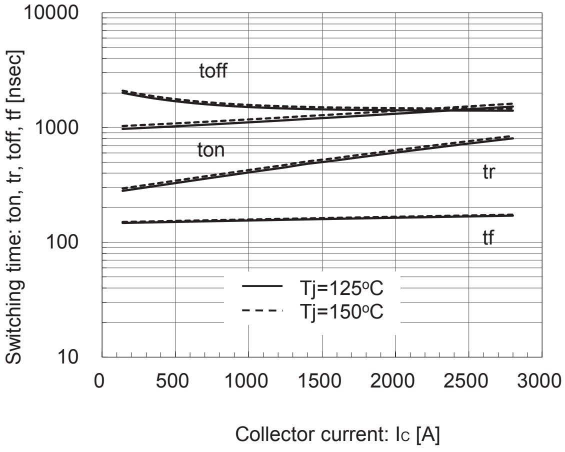
[INVERTER]
Dynamic Gate Charge (typ.)
Vcc=600V, Ic=1400A, Tj= 25°C



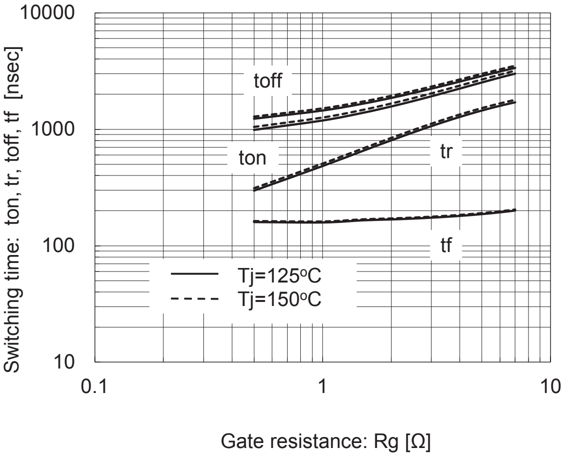
[INVERTER]
Switching time vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, Rg=1Ω, Tj=25°C



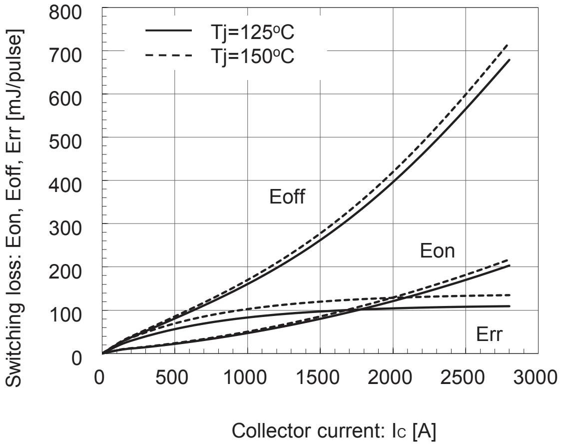
[INVERTER]
Switching time vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, Rg=1Ω, Tj=125°C, 150°C



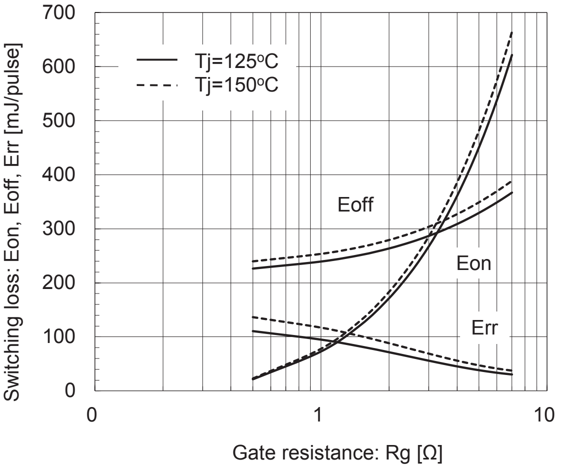
[INVERTER]
Switching time vs. Gate resistance (typ.)
Vcc=600V, Ic=1400A, V_{GE}=±15V, Tj=125°C, 150°C



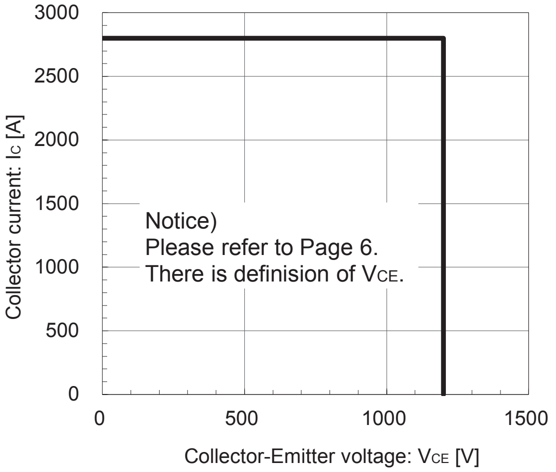
[INVERTER]
Switching loss vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, Rg=1Ω, Tj=125°C, 150°C



[INVERTER]
Switching loss vs. Gate resistance (typ.)
Vcc=600V, Ic=1400A, V_{GE}=±15V, Tj=125°C, 150°C

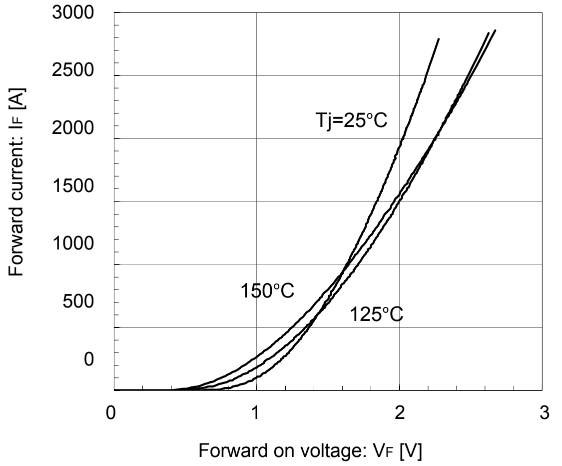


[INVERTER]
Reverse bias safe operating area (max.)
+V_{GE}=15V, -V_{GE}=15V, Rg=1Ω, Tj=150°C

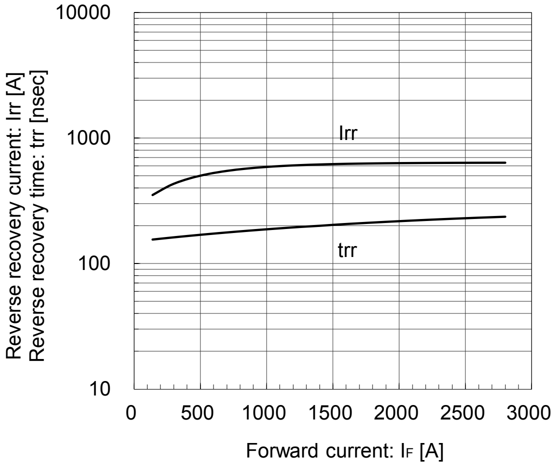


Notice)
Please refer to Page 6.
There is definision of V_{CE}.

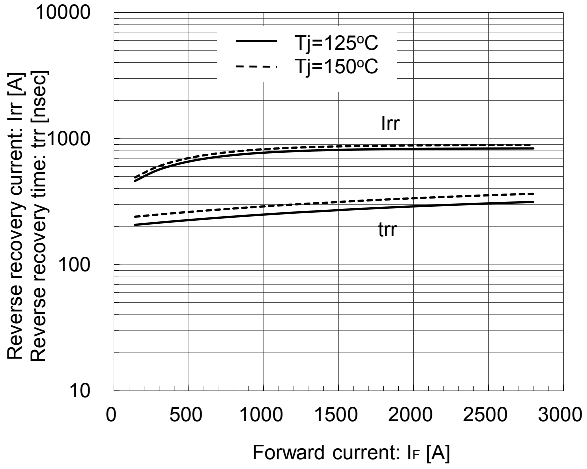
[INVERTER]
Forward Current vs. Forward Voltage (typ.)
chip



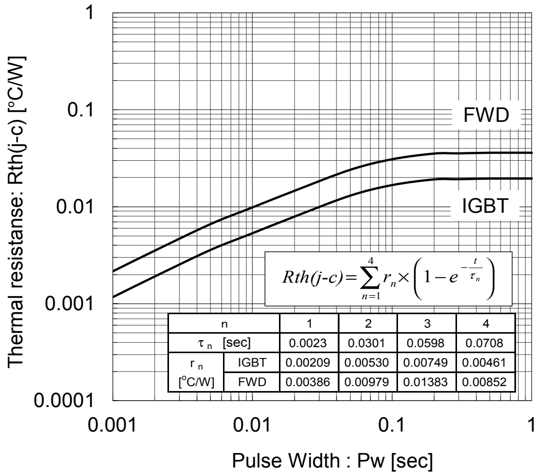
[INVERTER]
Reverse Recovery Characteristics (typ.)
Vcc=600V, VGE=±15V, Rg=1Ω, Tj=25°C



[INVERTER]
Reverse Recovery Characteristics (typ.)
Vcc=600V, VGE=±15V, Rg=1Ω, Tj=125°C, 150°C



Transient Thermal Resistance (max.)

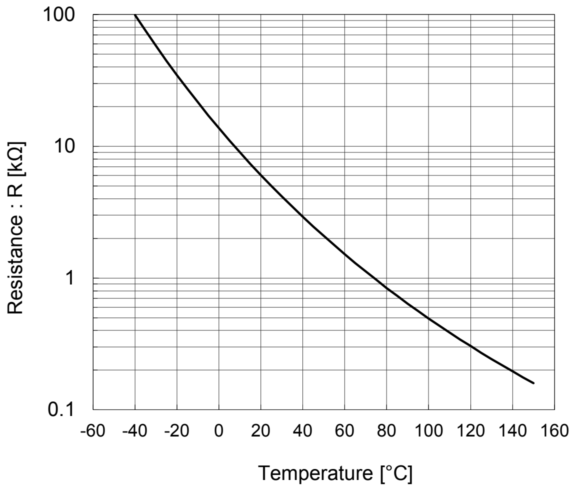


$$Rth(j\text{-}c)=\sum_{n=1}^{4} r_n \times \left(1-e^{-\frac{t}{\tau_n}}\right)$$

n		1	2	3	4
τ_n [sec]		0.0023	0.0301	0.0598	0.0708
r_n [°C/W]	IGBT	0.00209	0.00530	0.00749	0.00461
	FWD	0.00386	0.00979	0.01383	0.00852

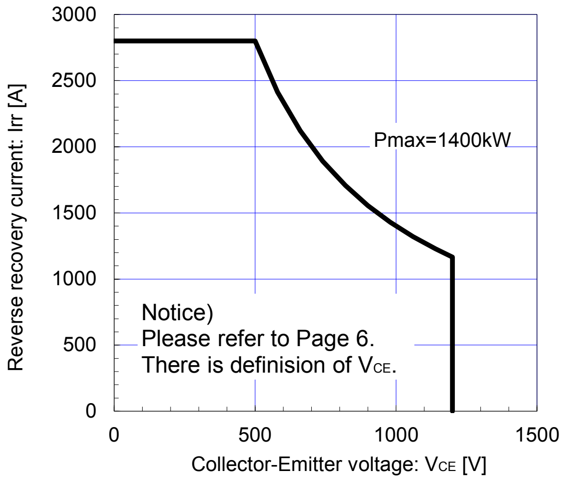
[THERMISTOR]

Temperature characteristic (typ.)



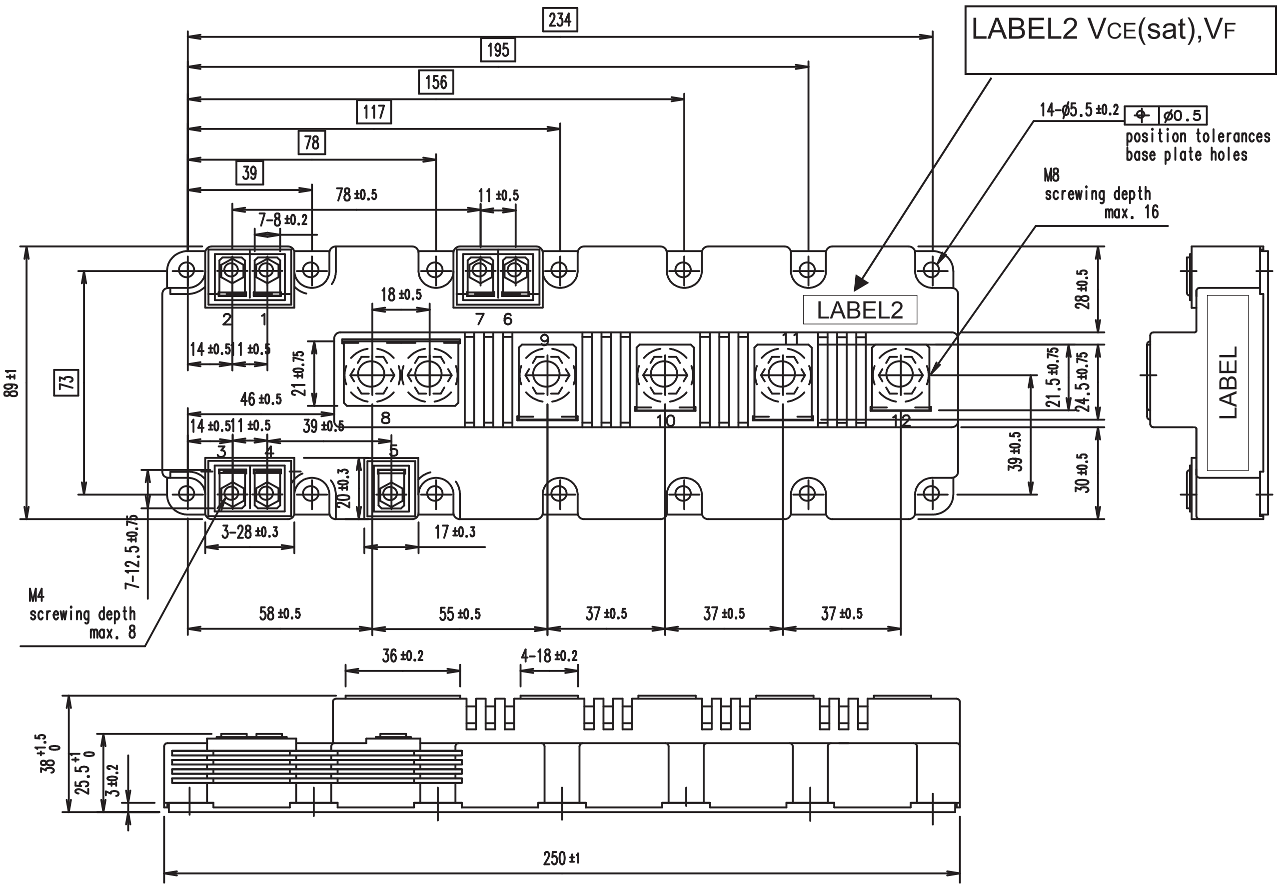
FWD safe operating area (max.)

Tj=150°C



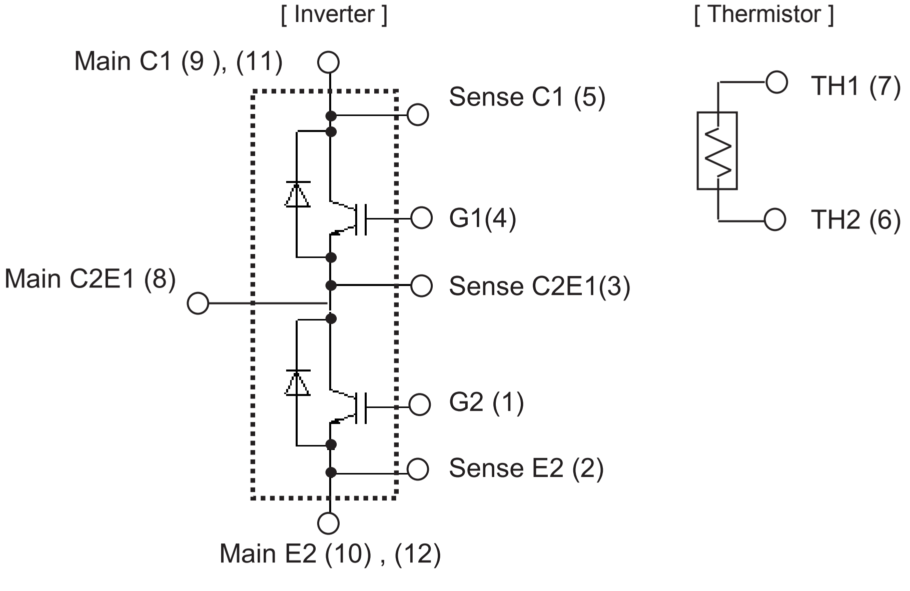
Notice)
Please refer to Page 6.
There is definision of VCE.

■ Outline Drawings, mm

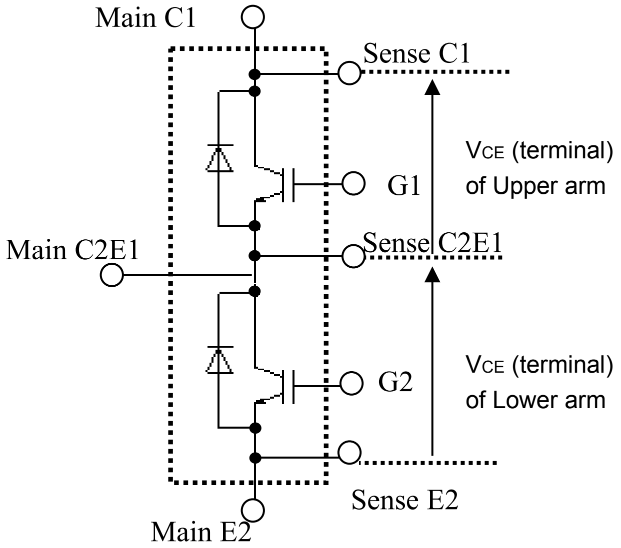


Weight:1250g(typ.)

■ 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 .