

6MBI450V-170-50

IGBT Modules

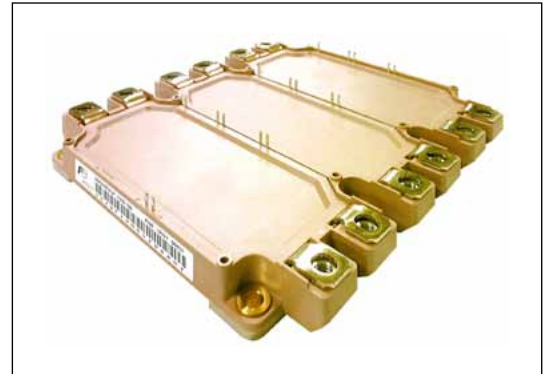
IGBT MODULE (V series) 1700V / 450A / 6 in one package

■ Features

- Compact Package
- P.C.Board Mount
- Low $V_{CE(sat)}$

■ 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 $T_c=25^\circ\text{C}$ 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	$T_c=25^\circ\text{C}$	600
				$T_c=100^\circ\text{C}$	450
		$I_{C,pulse}$	1ms	900	A
		$-I_C$		450	
		$-I_{C,pulse}$	1ms	900	
Collector power dissipation	P_C	1 device	2500	W	
Junction temperature	T_j		175	$^\circ\text{C}$	
Operating junction temperature (under switching conditions)	T_{jop}		150		
Case temperature	T_c		125		
Storage temperature	T_{stg}		-40 ~ 125		
Isolation voltage	Between terminal and copper base (*1)	V_{iso}	AC : 1min.	3400	VAC
	Between thermistor and others (*2)				
Screw torque	Mounting (*3)	-	3.5	N m	
	Terminals (*4)	-	4.5		

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 : 2.5-3.5 Nm (M5)

Note *4: Recommendable Value : 3.5-4.5 Nm (M6)

● Electrical characteristics (at $T_J = 25^\circ\text{C}$ unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V, V_{CE} = 1700V$	-	-	3.0	mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	600	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_C = 450mA$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 450A$	$T_J = 25^\circ\text{C}$	-	2.65	3.10	V
			$T_J = 125^\circ\text{C}$	-	3.10	-	
			$T_J = 150^\circ\text{C}$	-	3.15	-	
	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 450A$	$T_J = 25^\circ\text{C}$	-	2.00	2.45	
			$T_J = 125^\circ\text{C}$	-	2.45	-	
			$T_J = 150^\circ\text{C}$	-	2.50	-	
Internal gate resistance	$R_{G(int)}$	-	-	1.67	-	Ω	
Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	40	-	nF	
Turn-on time	t_{on}	$V_{CC} = 900V$ $I_C = 450A$ $V_{GE} = \pm 15V$	-	900	-	nsec	
	t_r		-	400	-		
	$t_{r(i)}$		-	100	-		
Turn-off time	t_{off}	$R_G = 3.3\Omega$ $L_S = 80nH$	-	1300	-	nsec	
	t_f		-	100	-		
Forward on voltage	V_F (terminal)	$V_{GE} = 0V, I_F = 450A$	$T_J = 25^\circ\text{C}$	-	2.45	2.90	V
			$T_J = 125^\circ\text{C}$	-	2.75	-	
			$T_J = 150^\circ\text{C}$	-	2.70	-	
	V_F (chip)	$V_{GE} = 0V, I_F = 450A$	$T_J = 25^\circ\text{C}$	-	1.80	2.25	
			$T_J = 125^\circ\text{C}$	-	2.10	-	
			$T_J = 150^\circ\text{C}$	-	2.05	-	
Reverse recovery time	t_{rr}	$I_F = 450A$	-	250	-	nsec	
Resistance	R	$T = 25^\circ\text{C}$	-	5000	-	Ω	
		$T = 100^\circ\text{C}$	465	495	520		
B value	B	$T = 25 / 50^\circ\text{C}$	3305	3375	3450	K	

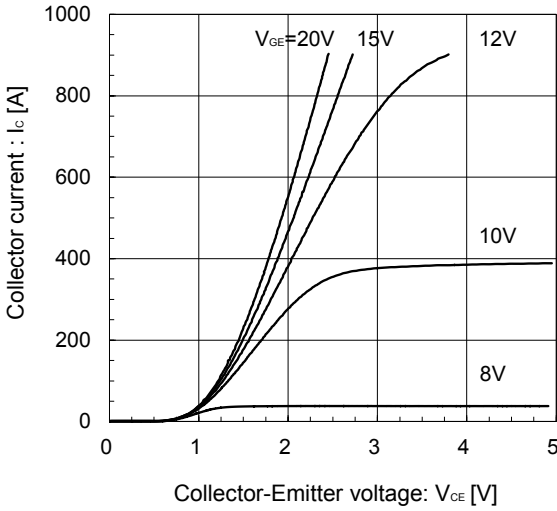
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.06	$^\circ\text{C/W}$
		Inverter FWD	-	-	0.10	
Contact thermal resistance (1device) (*5)	$R_{th(c-f)}$	with Thermal Compound	-	0.0167	-	

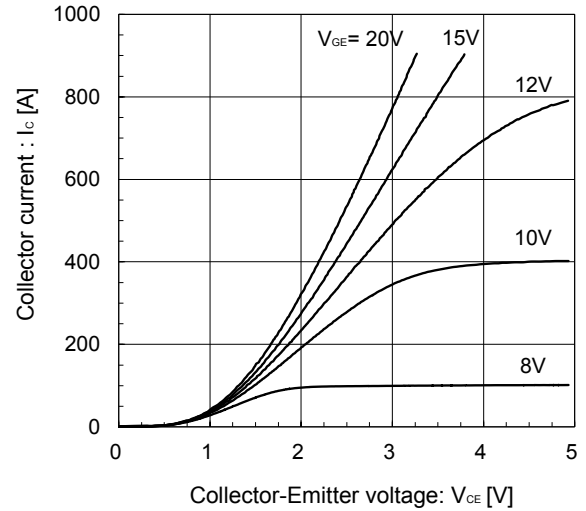
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

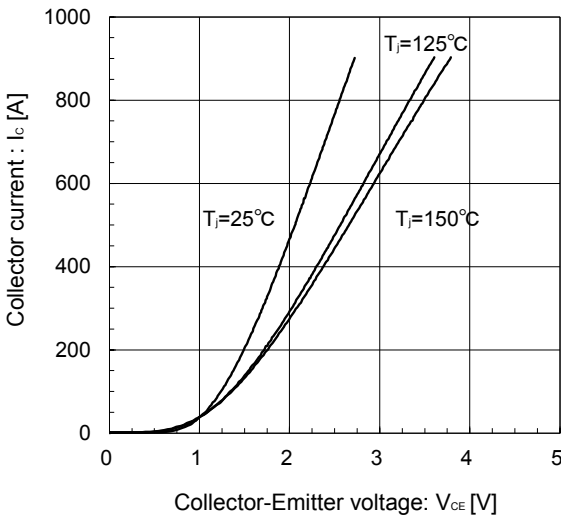
[Inverter]
Collector current vs. Collector-Emittor voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



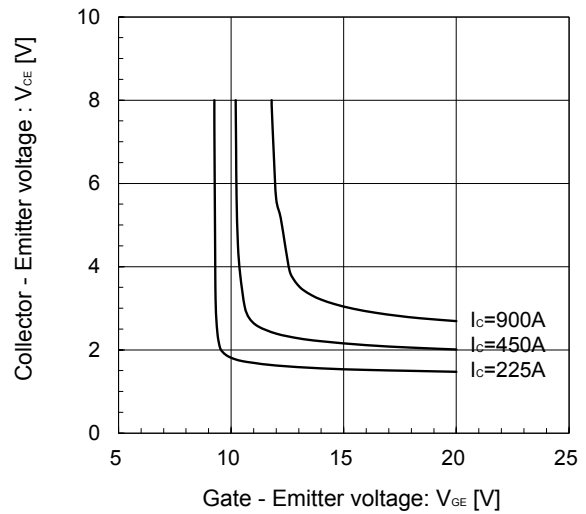
[Inverter]
Collector current vs. Collector-Emittor voltage (typ.)
 $T_j = 150^\circ\text{C}$ / chip



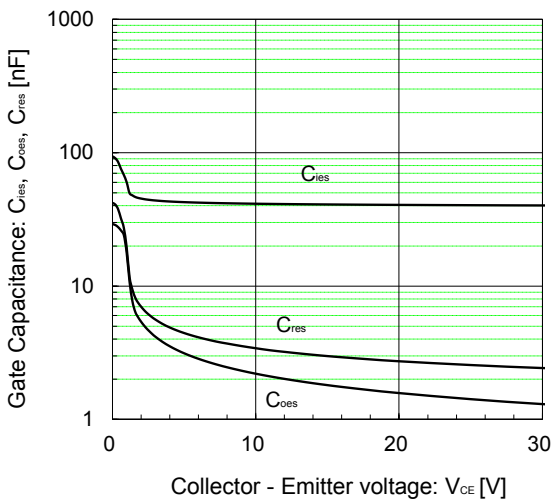
[Inverter]
Collector current vs. Collector-Emittor voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



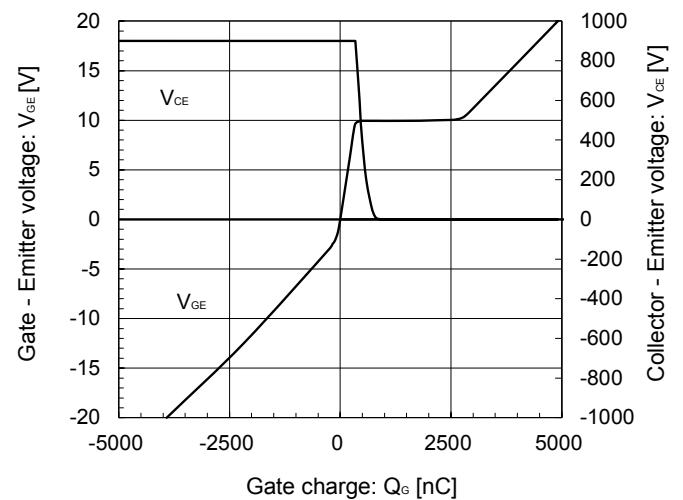
[Inverter]
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



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

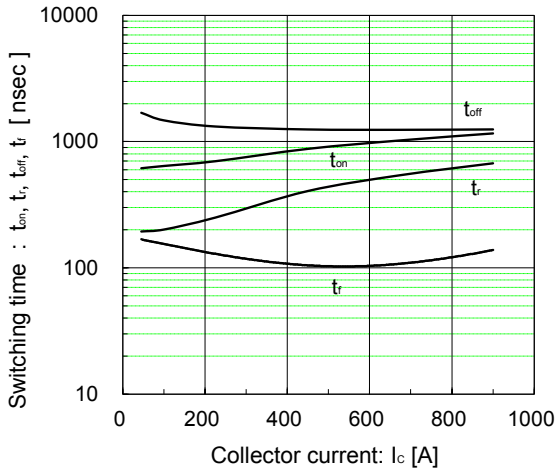


[Inverter]
Dynamic gate charge (typ.)
 $V_{CC} = 900\text{V}$, $I_c = 450\text{A}$, $T_j = 25^\circ\text{C}$



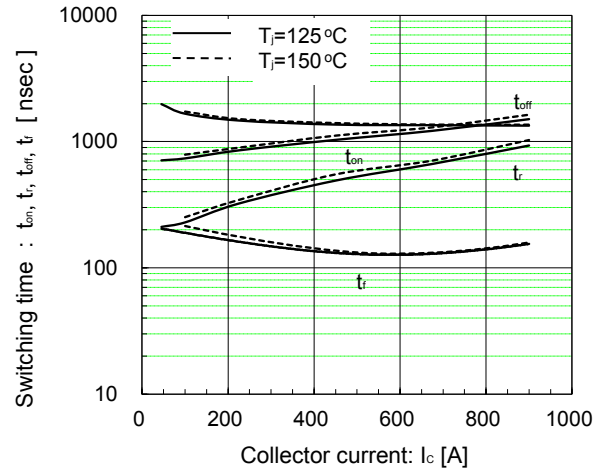
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=25^\circ C$



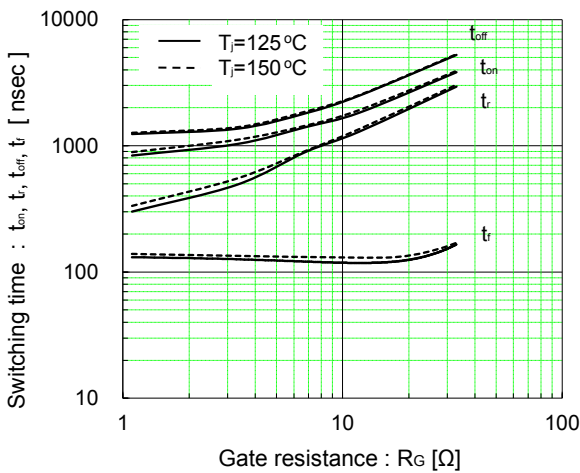
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=125^\circ C, 150^\circ C$



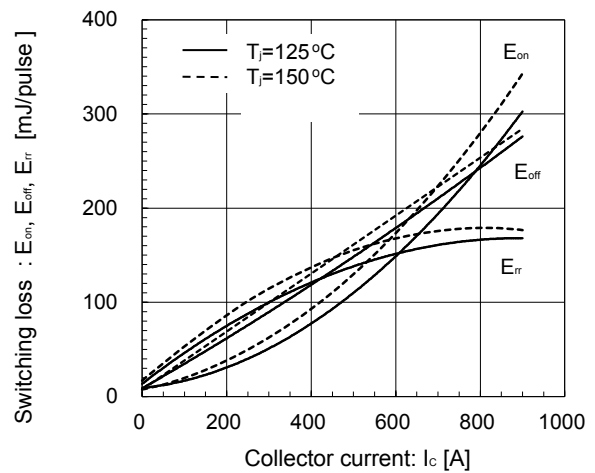
[Inverter]

Switching time vs. Gate resistance (typ.)
 $V_{CC}=900V, I_C=450A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



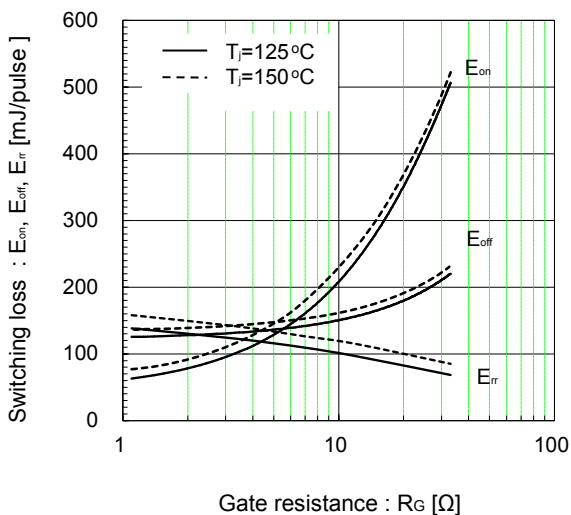
[Inverter]

Switching loss vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=125^\circ C, 150^\circ C$



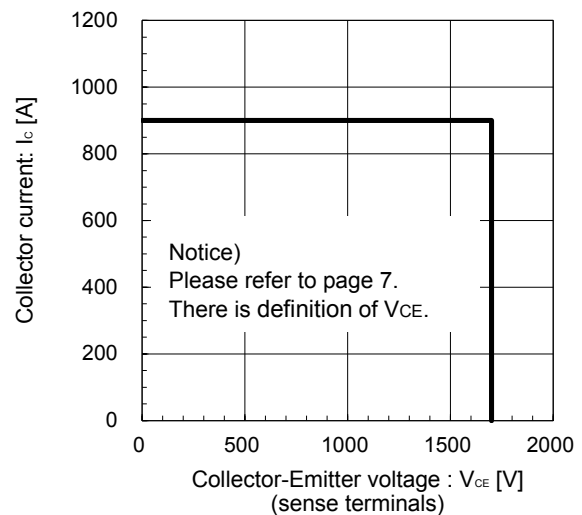
[Inverter]

Switching loss vs. Gate resistance (typ.)
 $V_{CC}=900V, I_C=450A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



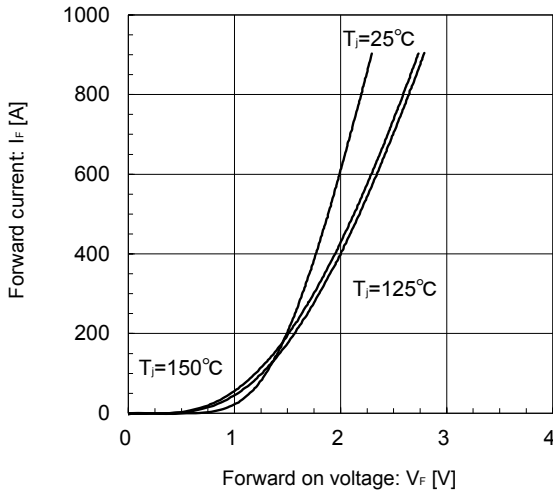
[Inverter]

Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \le 15V, R_G \ge 3.3\Omega, T_J=150^\circ C$



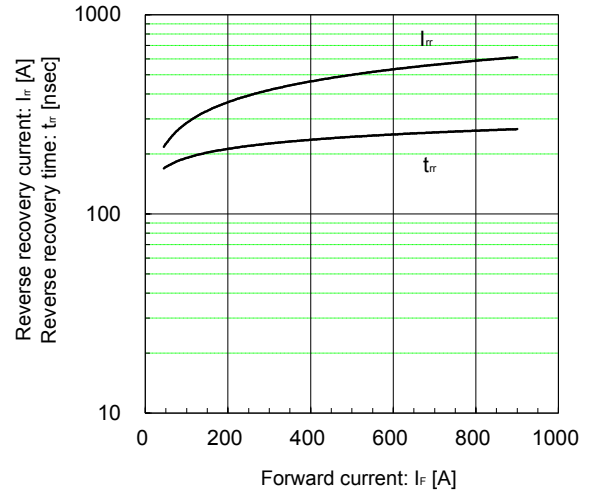
[INVERTER]

Forward Current vs. Forward Voltage (typ.)
chip



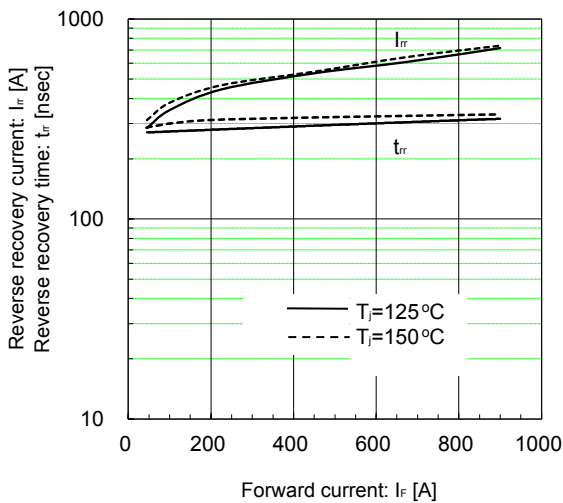
[INVERTER]

Reverse Recovery Characteristics (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=25^\circ C$

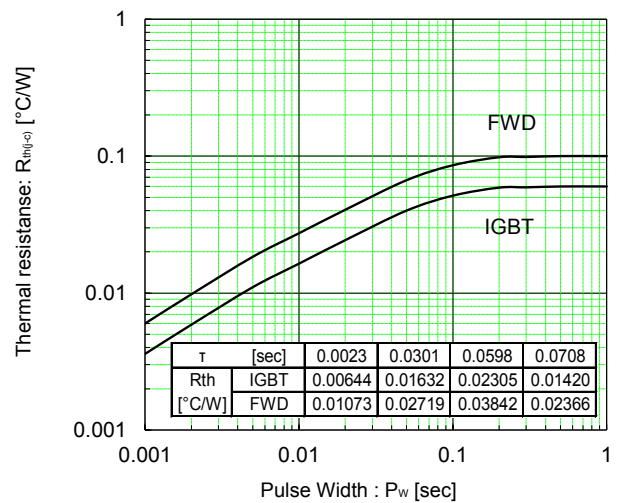


[INVERTER]

Reverse Recovery Characteristics (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=125^\circ C, 150^\circ C$

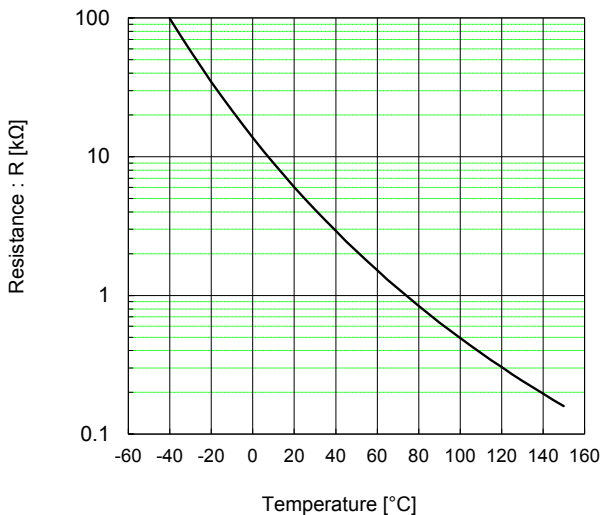


Transient Thermal Resistance (max.)



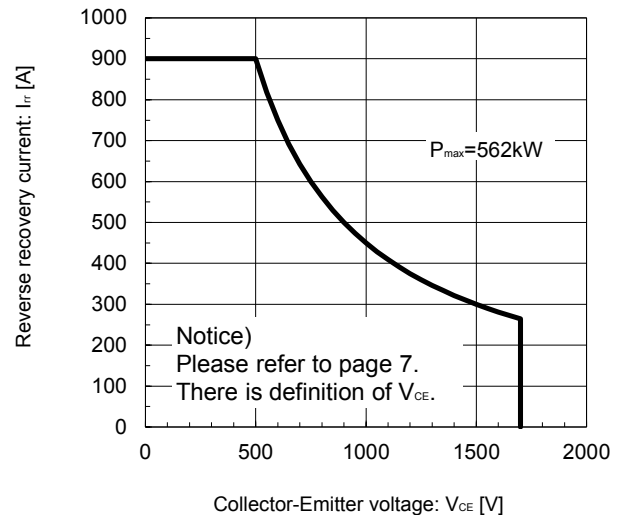
[THERMISTOR]

Temperature characteristic (typ.)

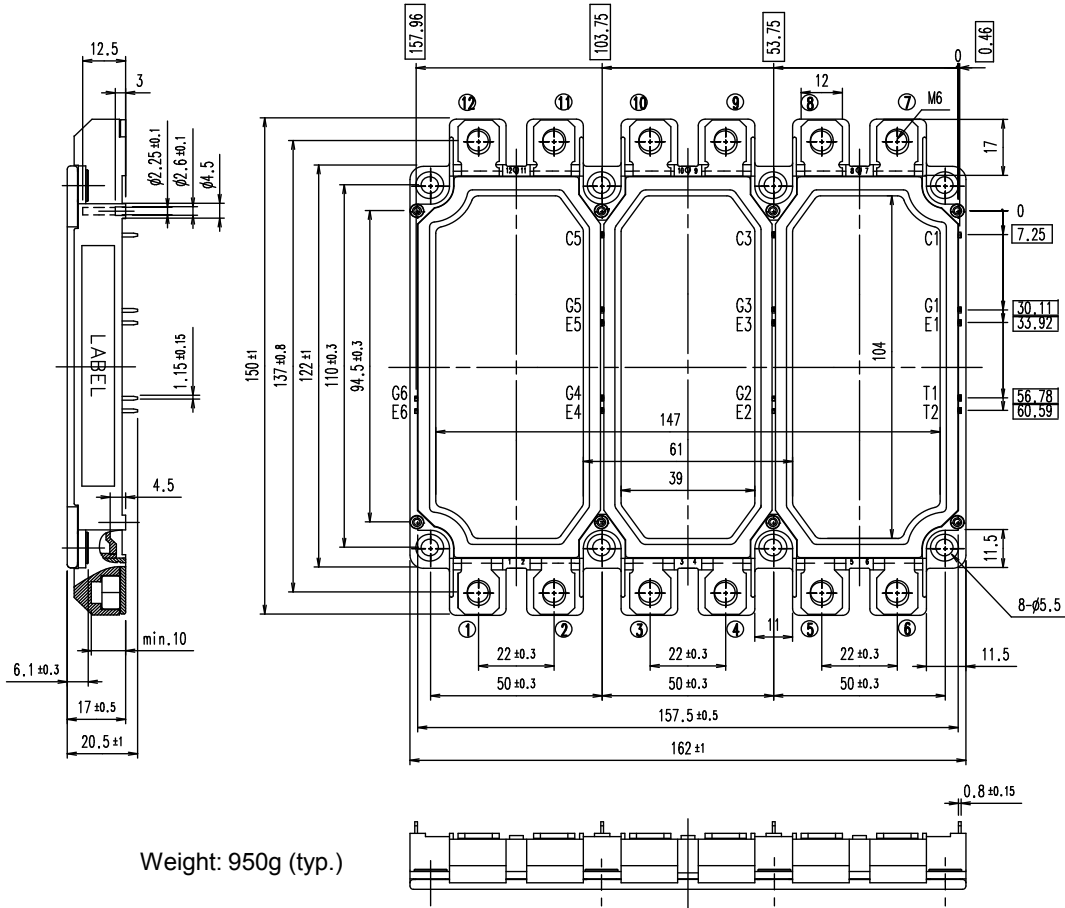


FWD safe operating area (max.)

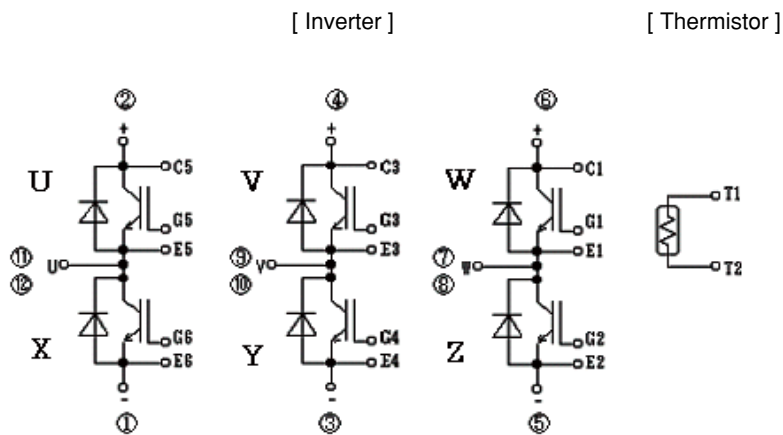
$T_J=150^\circ C$



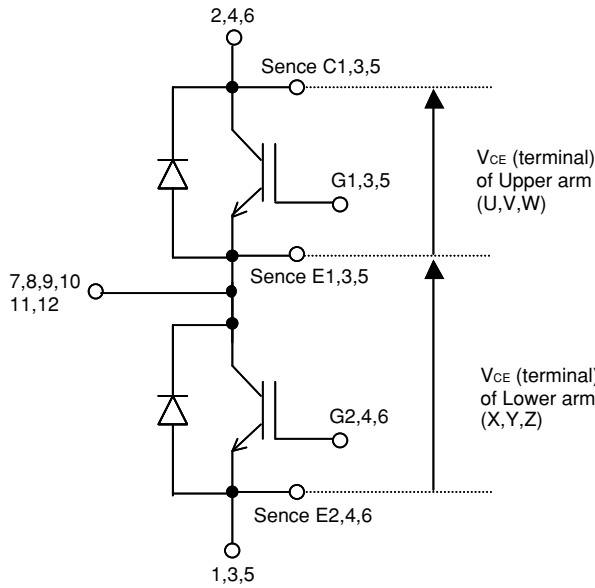
■ Outline Drawings, mm



■ Equivalent Circuit



■ Definition of switching characteristics



Switching characteristics of V_{CE} is defined between Sense C1,3,5 and Sense E1,3,5 for Upper arm(U,V,W) and Sense E1,3,5 and Sense E2,4,6 for Lower arm(X,Y,Z) .

Please use these terminals whenever measure spike voltage.

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• Machine tools	• Audiovisual equipment	• Electrical home appliances	• Personal equipment
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IGBT Modules

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