

6MBI450V-170-50

IGBT Modules

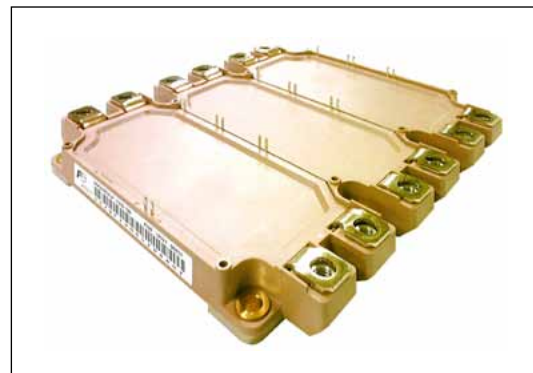
IGBT MODULE (V series) 1700V / 450A / 6 in one package

■ 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	A
				$T_c=100^\circ\text{C}$	450	
		$I_{C\ pulse}$	1ms		900	
		$-I_C$			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.		
Inverter	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)	$V_{GE} = 15V$ $I_C = 450A$	$T_J=25^{\circ}C$	-	2.65	3.10	V	
				$T_J=125^{\circ}C$	-	3.10	-		
				$T_J=150^{\circ}C$	-	3.15	-		
		$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 450A$	$T_J=25^{\circ}C$	-	2.00	2.45		
				$T_J=125^{\circ}C$	-	2.45	-		
				$T_J=150^{\circ}C$	-	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}	$V_{CC} = 900V$ $I_C = 450A$ $V_{GE} = \pm 15V$ $R_G = 3.3\Omega$ $L_S = 80nH$		-	900	-	nsec	
		t_r			-	400	-		
		$t_{r(l)}$			-	100	-		
		Turn-off time			t_{off}	-	1300		-
					t_r	-	100		-
Forward on voltage					V_F (terminal)	$V_{GE} = 0V, I_F = 450A$	$T_J=25^{\circ}C$		-
	$T_J=125^{\circ}C$	-	2.75	-					
	$T_J=150^{\circ}C$	-	2.70	-					
	V_F (chip)	$V_{GE} = 0V, I_F = 450A$	$T_J=25^{\circ}C$	-	1.80	2.25			
			$T_J=125^{\circ}C$	-	2.10	-			
			$T_J=150^{\circ}C$	-	2.05	-			
Reverse recovery time	t_{rr}	$I_F = 450A$		-	250	-	nsec		
Thermistor	Resistance	R	$T = 25^{\circ}C$		-	5000	-	Ω	
		$T = 100^{\circ}C$		465	495	520			
	B value	B	$T = 25 / 50^{\circ}C$		3305	3375	3450	K	

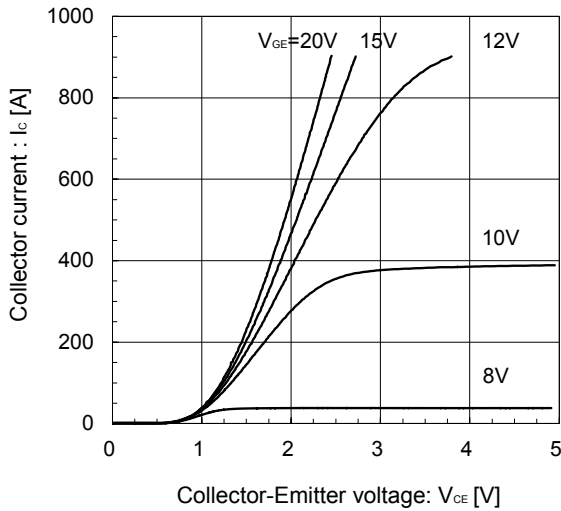
● Thermal resistance characteristics

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	-	

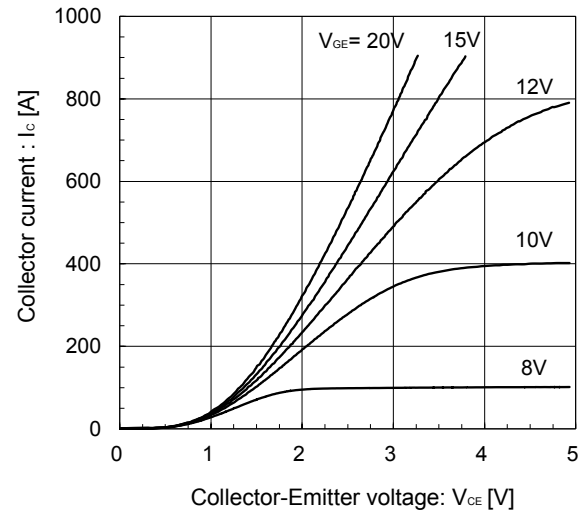
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

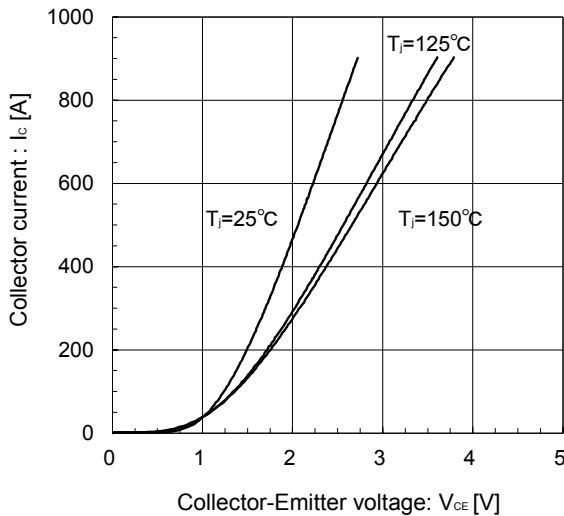
[Inverter]
Collector current vs. Collector-Emittter voltage (typ.)
 $T_J = 25^\circ\text{C}$ / chip



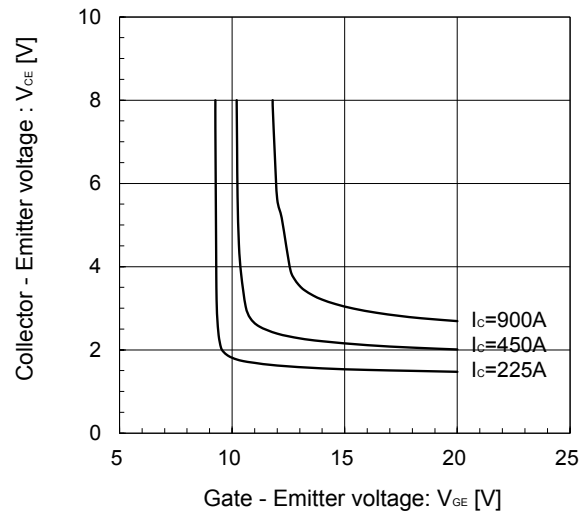
[Inverter]
Collector current vs. Collector-Emittter voltage (typ.)
 $T_J = 150^\circ\text{C}$ / chip



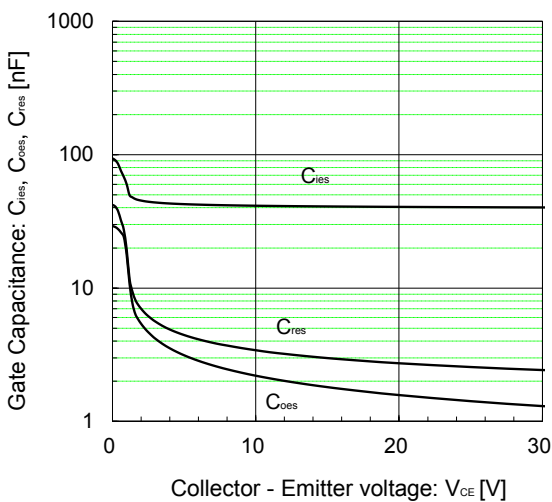
[Inverter]
Collector current vs. Collector-Emittter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



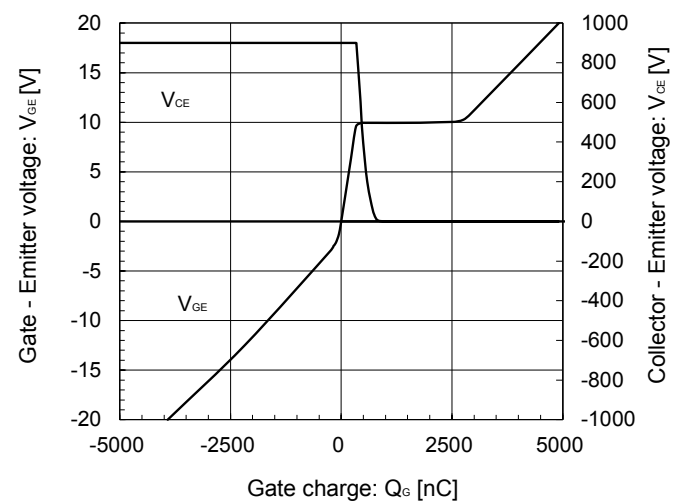
[Inverter]
Collector-Emittter voltage vs. Gate-Emittter voltage (typ.)
 $T_J = 25^\circ\text{C}$ / chip



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

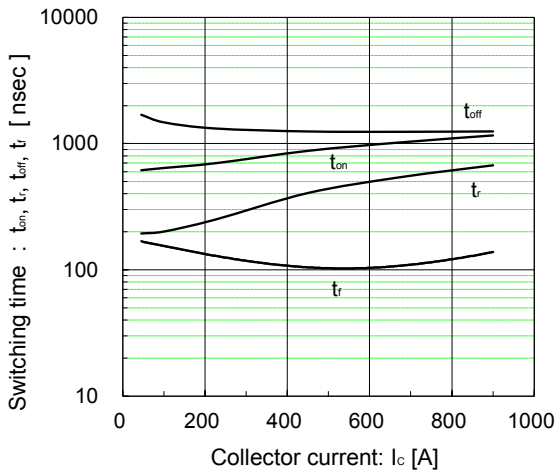


[Inverter]
Dynamic gate charge (typ.)
 $V_{CE} = 900\text{V}$, $I_C = 450\text{A}$, $T_J = 25^\circ\text{C}$



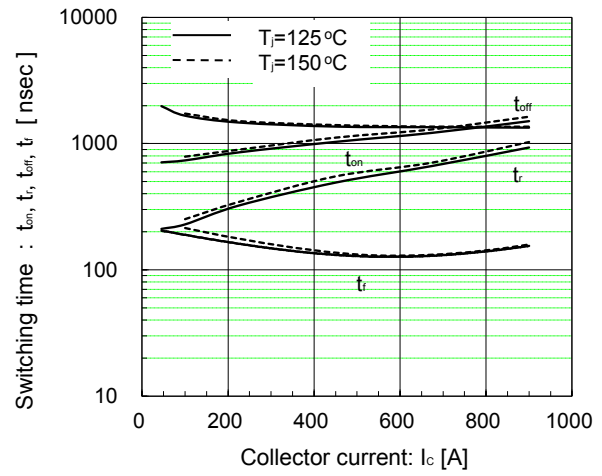
[Inverter]

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



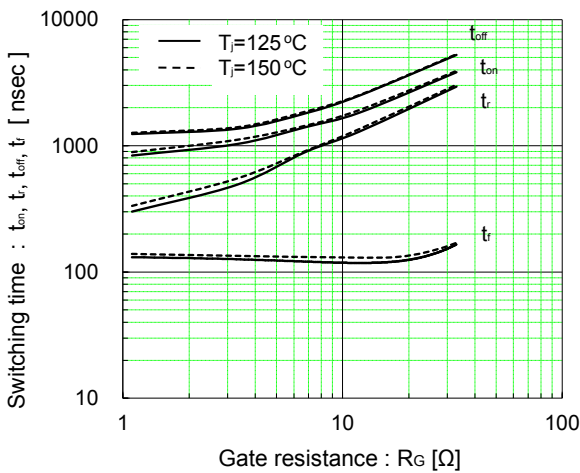
[Inverter]

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



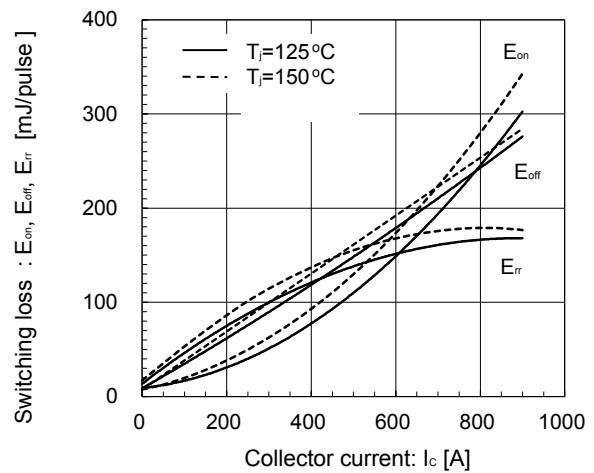
[Inverter]

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



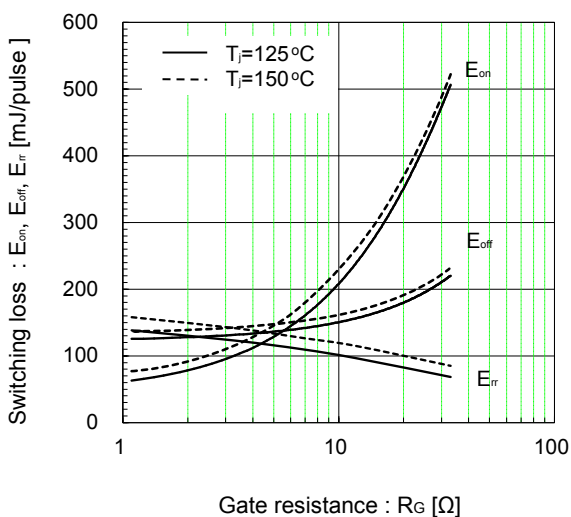
[Inverter]

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



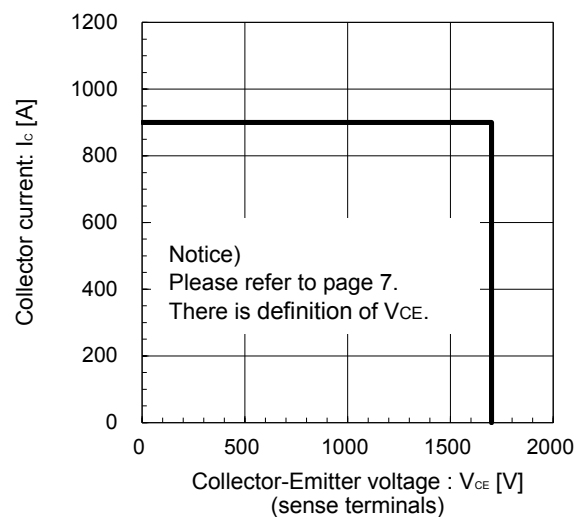
[Inverter]

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



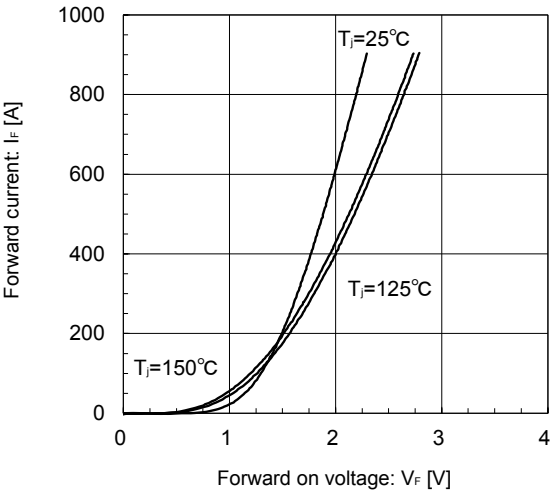
[Inverter]

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



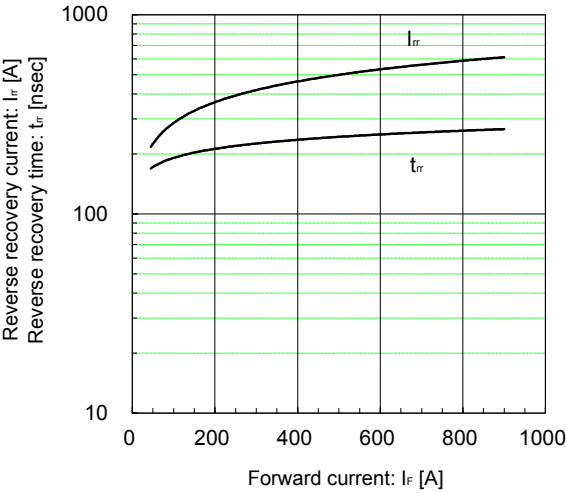
[INVERTER]

Forward Current vs. Forward Voltage (typ.)
chip



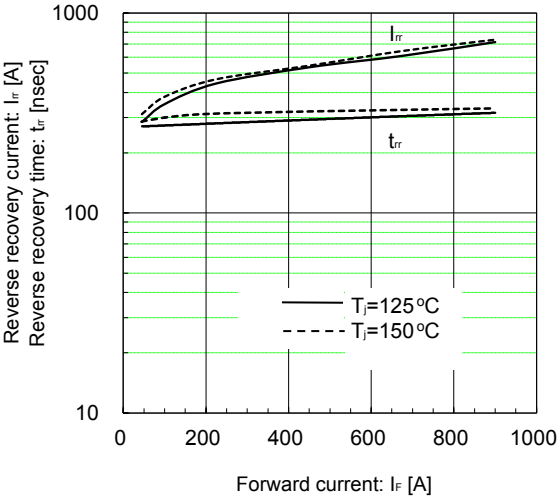
[INVERTER]

Reverse Recovery Characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=3.3Ω, T_J=25°C

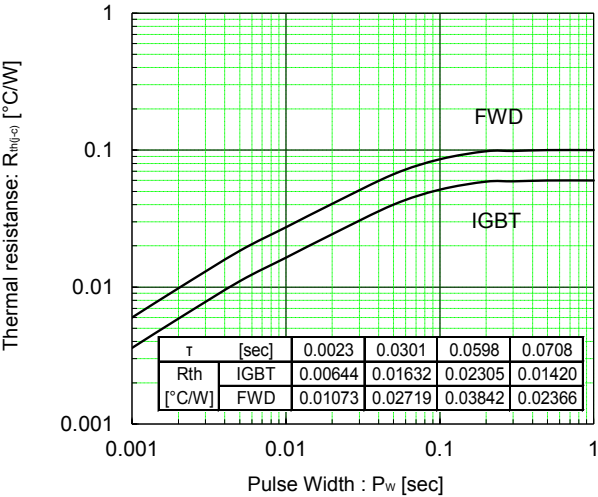


[INVERTER]

Reverse Recovery Characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=3.3Ω, T_J=125°C, 150°C

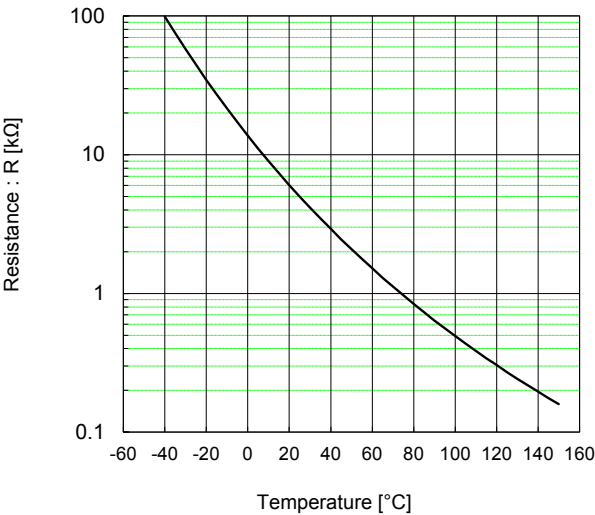


Transient Thermal Resistance (max.)



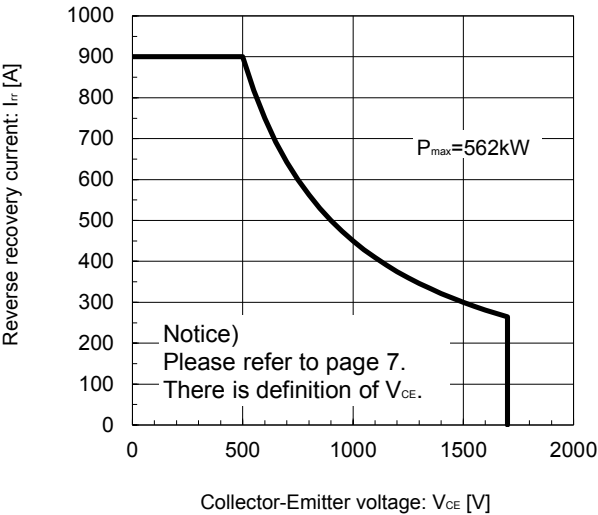
[THERMISTOR]

Temperature characteristic (typ.)

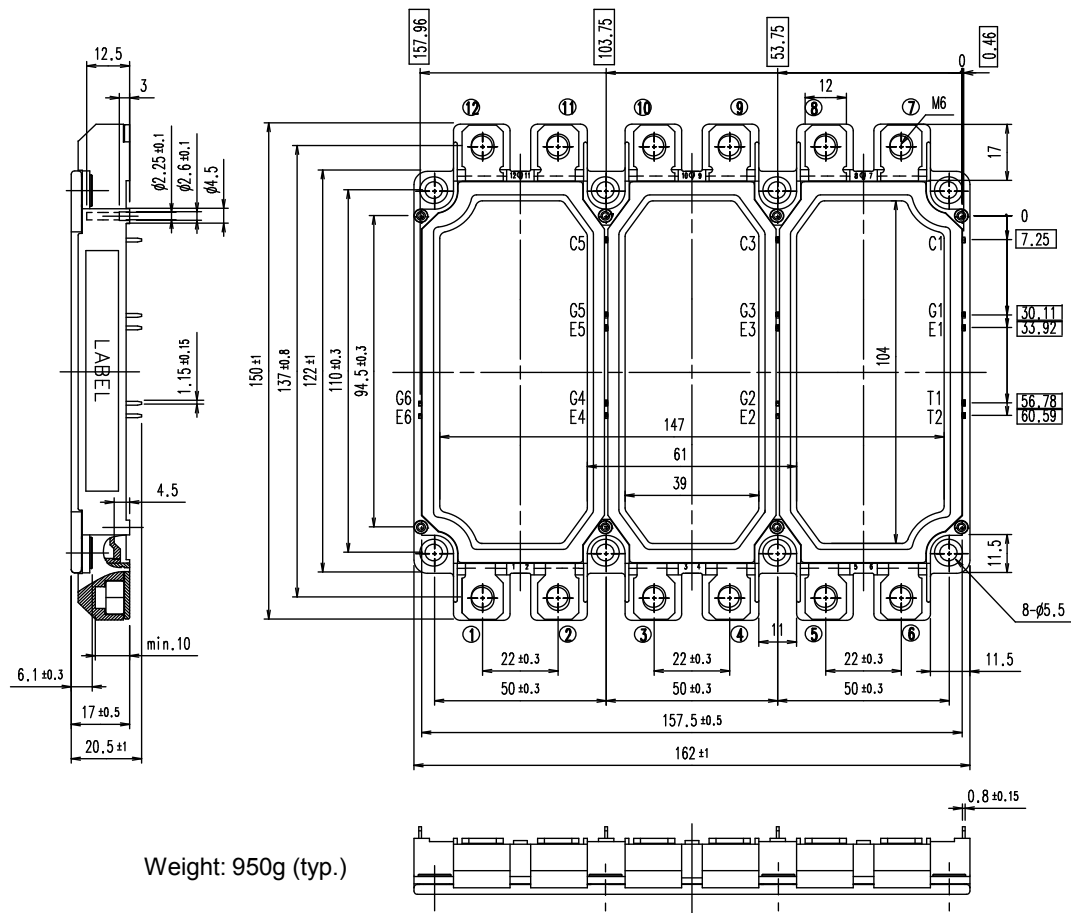


FWD safe operating area (max.)

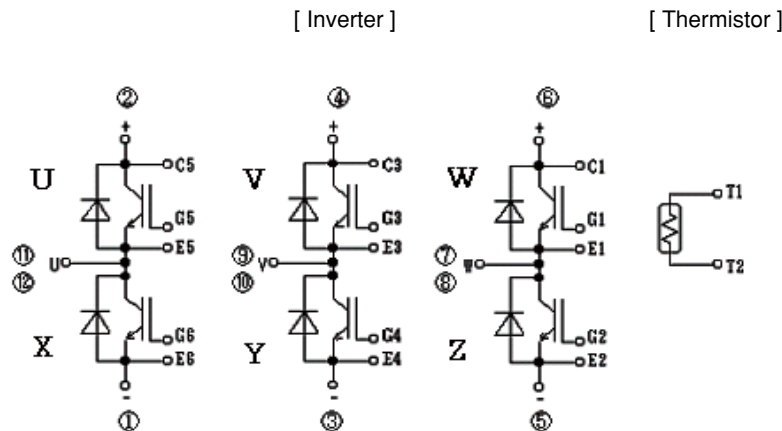
T_J=150°C



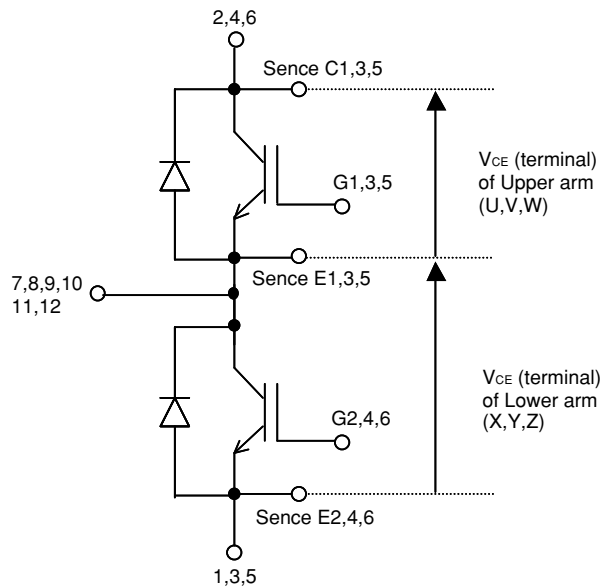
Outline Drawings, mm



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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IGBT Modules

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