

# 6MBI300V-170-50

IGBT Modules

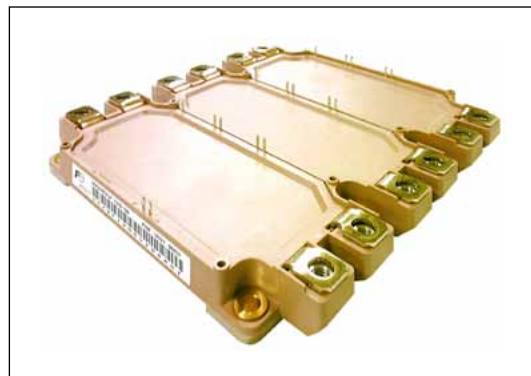
## IGBT MODULE (V series) 1700V / 300A / 6 in one package

### ■ 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	$V_{GES}$			$\pm 20$	V
	Collector current	$I_C$	Continuous	$T_c=25^\circ\text{C}$	450	A
				$T_c=100^\circ\text{C}$	300	
		$I_{C\ pulse}$	1ms		600	
		$-I_C$			300	
		$-I_{C\ pulse}$	1ms		600	
	Collector power dissipation	$P_C$	1 device		1665	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)

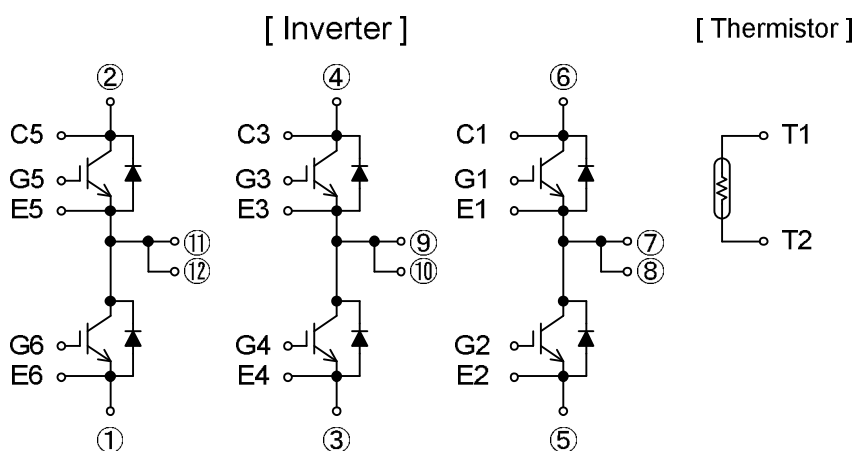
Items		Symbols	Conditions		Characteristics			Units
					min.	typ.	max.	
Inverter	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1700V		-	-	3.0	mA
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V		-	-	600	nA
	Gate-Emitter threshold voltage	V <sub>GE (th)</sub>	V <sub>CE</sub> = 20V, I <sub>C</sub> = 300mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	V <sub>CE (sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>C</sub> = 300A	T <sub>J</sub> =25°C	-	2.45	2.90	V
				T <sub>J</sub> =125°C	-	2.90	-	
				T <sub>J</sub> =150°C	-	2.95	-	
		V <sub>CE (sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>C</sub> = 300A	T <sub>J</sub> =25°C	-	2.00	2.45	
				T <sub>J</sub> =125°C	-	2.45	-	
				T <sub>J</sub> =150°C	-	2.50	-	
	Internal gate resistance	R <sub>G (int)</sub>	-		-	2.50	-	Ω
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz		-	30	-	nF
	Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 900V I <sub>C</sub> = 300A V <sub>GE</sub> = ±15V		-	900	-	nsec
		t <sub>r</sub>			-	400	-	
		t <sub>r (l)</sub>			-	100	-	
	Turn-off time	t <sub>off</sub>	R <sub>G</sub> = 4.7Ω L <sub>S</sub> = 80nH		-	1300	-	nsec
		t <sub>f</sub>			-	100	-	
	Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V, I <sub>F</sub> = 300A	T <sub>J</sub> =25°C	-	2.25	2.70	V
T <sub>J</sub> =125°C				-	2.55	-		
T <sub>J</sub> =150°C				-	2.55	-		
V <sub>F</sub> (chip)		V <sub>GE</sub> = 0V, I <sub>F</sub> = 300A	T <sub>J</sub> =25°C	-	1.80	2.25		
			T <sub>J</sub> =125°C	-	2.10	-		
			T <sub>J</sub> =150°C	-	2.10	-		
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 300A		-	250	-	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

## ● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.090	$^\circ\text{C/W}$
		Inverter FWD	-	-	0.150	
Contact thermal resistance (1device) (*5)	$R_{th(c-f)}$	with Thermal Compound	-	0.0167	-	

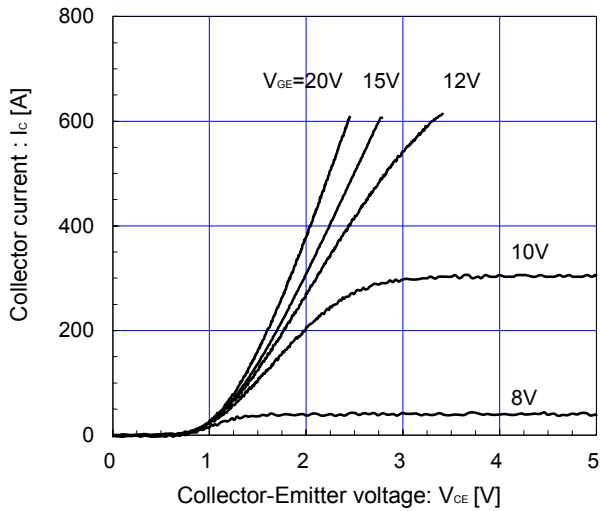
Note \*5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

## ■ Equivalent Circuit Schematic

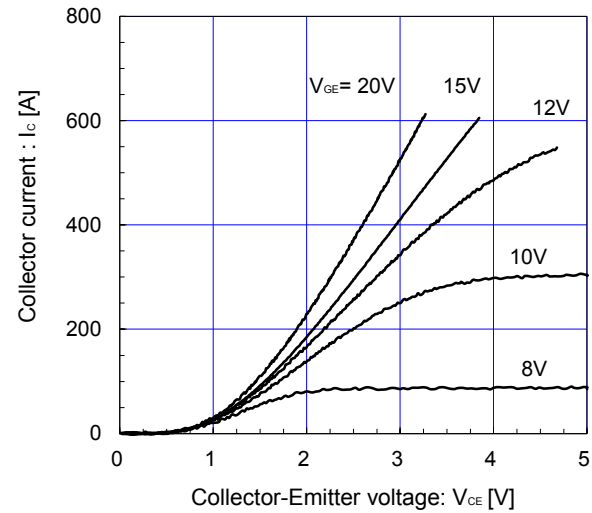


## ■ Characteristics (Representative)

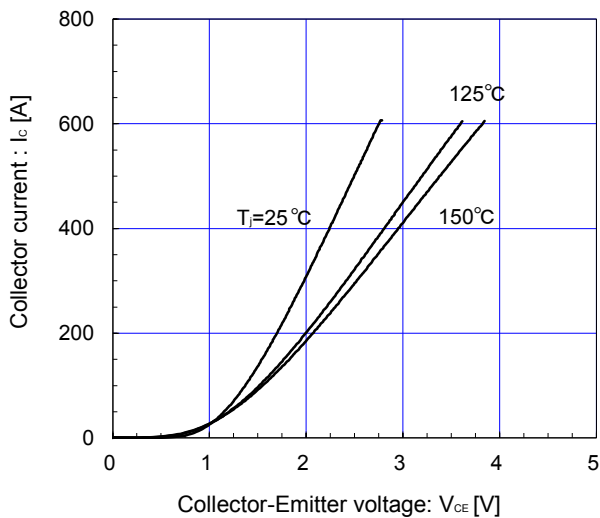
[ Inverter ]  
Collector current vs. Collector-Emittter voltage (typ.)  
 $T_J = 25^\circ\text{C}$  / chip



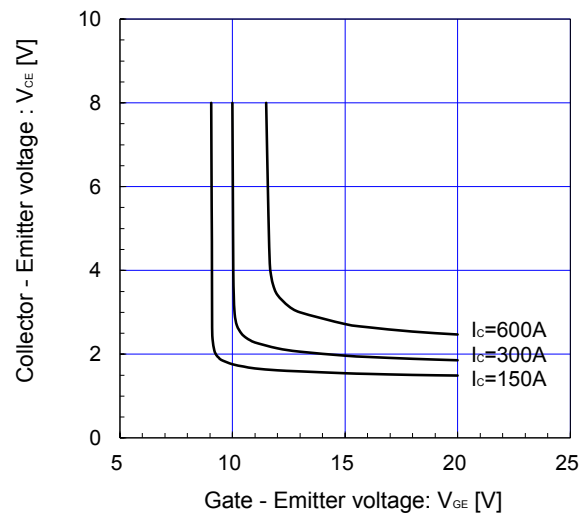
[ Inverter ]  
Collector current vs. Collector-Emittter voltage (typ.)  
 $T_J = 150^\circ\text{C}$  / chip



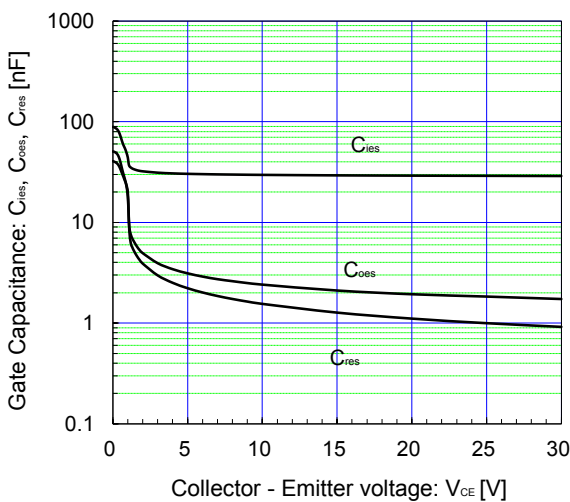
[ Inverter ]  
Collector current vs. Collector-Emittter voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



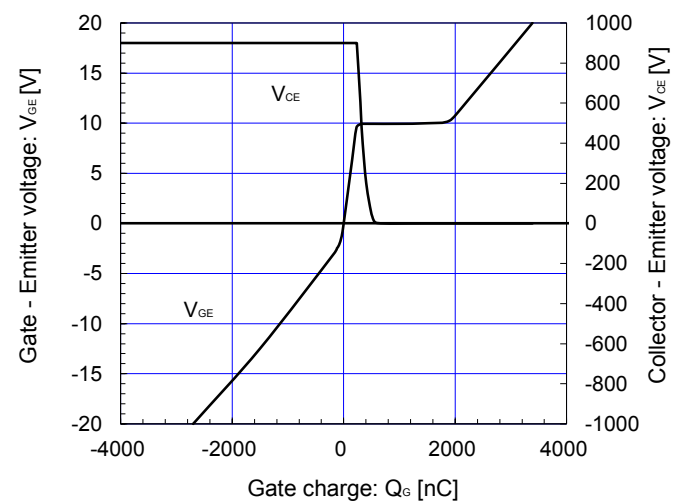
[ Inverter ]  
Collector-Emittter voltage vs. Gate-Emittter voltage (typ.)  
 $T_J = 25^\circ\text{C}$  / chip



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



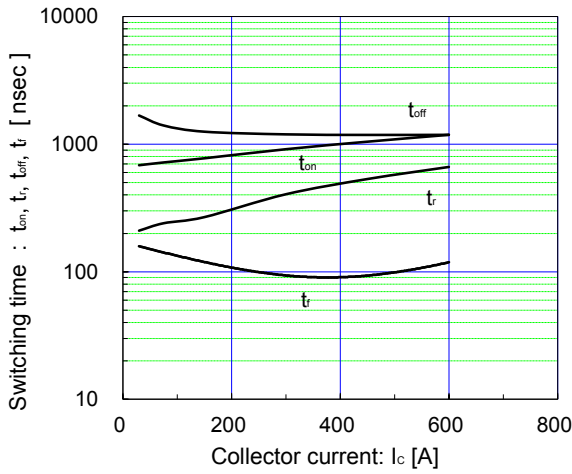
[ Inverter ]  
Dynamic gate charge (typ.)  
 $V_{CC} = 900\text{V}$ ,  $I_C = 300\text{A}$ ,  $T_J = 25^\circ\text{C}$



[ Inverter ]

Switching time vs. Collector current (typ.)

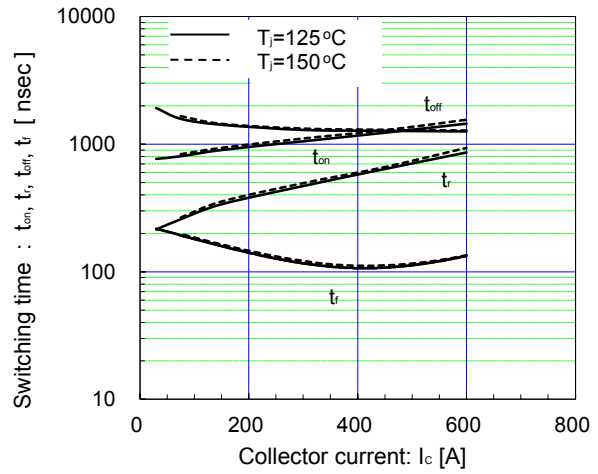
$V_{CC}=900V$ ,  $V_{GE}=\pm 15V$ ,  $R_G=4.7\Omega$ ,  $T_J=25^\circ C$



[ Inverter ]

Switching time vs. Collector current (typ.)

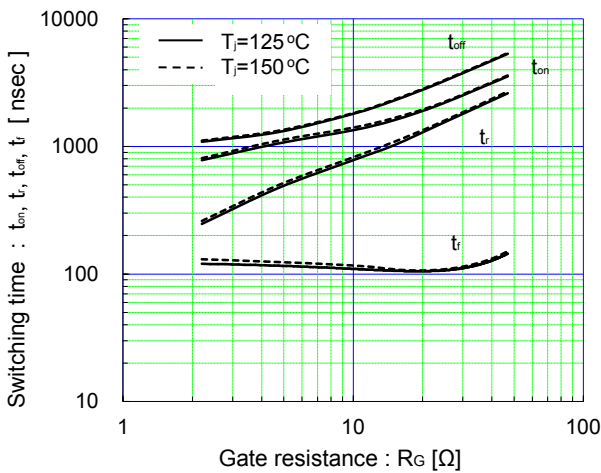
$V_{CC}=900V$ ,  $V_{GE}=\pm 15V$ ,  $R_G=4.7\Omega$ ,  $T_J=125^\circ C, 150^\circ C$



[ Inverter ]

Switching time vs. Gate resistance (typ.)

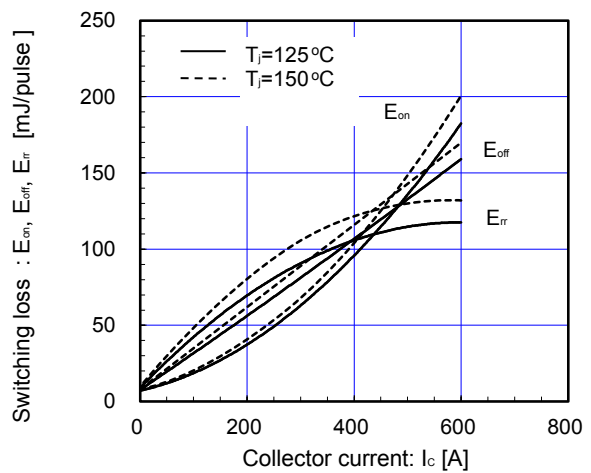
$V_{CC}=900V$ ,  $I_C=300A$ ,  $V_{GE}=\pm 15V$ ,  $T_J=125^\circ C, 150^\circ C$



[ Inverter ]

Switching loss vs. Collector current (typ.)

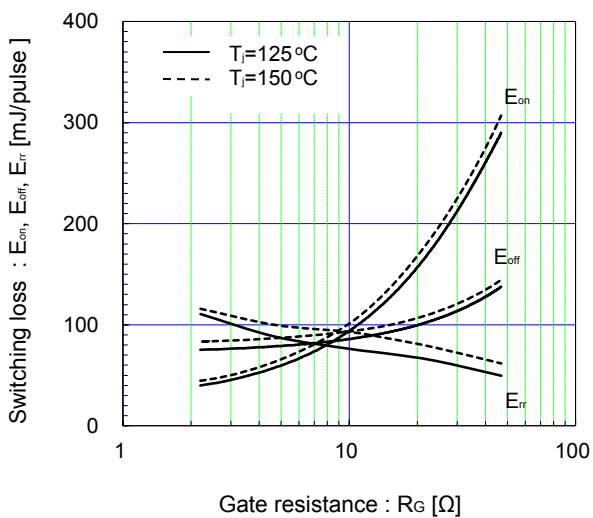
$V_{CC}=900V$ ,  $V_{GE}=\pm 15V$ ,  $R_G=4.7\Omega$ ,  $T_J=125^\circ C, 150^\circ C$



[ Inverter ]

Switching loss vs. Gate resistance (typ.)

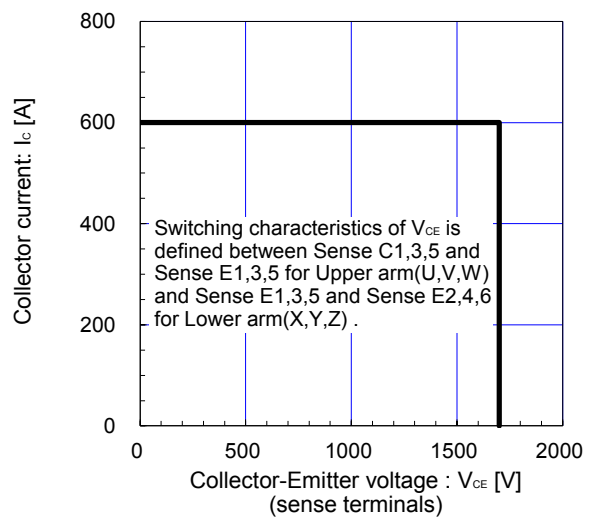
$V_{CC}=900V$ ,  $I_C=300A$ ,  $V_{GE}=\pm 15V$ ,  $T_J=125^\circ C, 150^\circ C$



[ Inverter ]

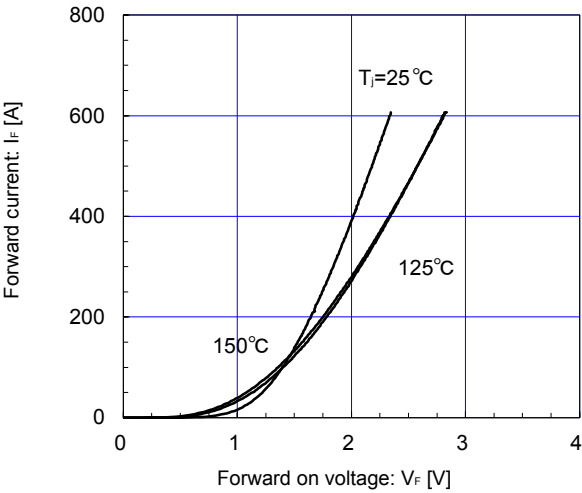
Reverse bias safe operating area (max.)

$+V_{GE}=15V, -V_{GE} \leq 15V, R_G \geq 4.7\Omega, T_J=150^\circ C$



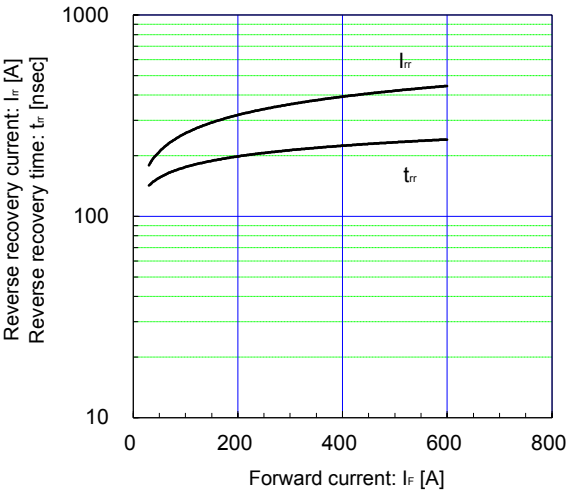
[INVERTER]

Forward Current vs. Forward Voltage (typ.)  
chip



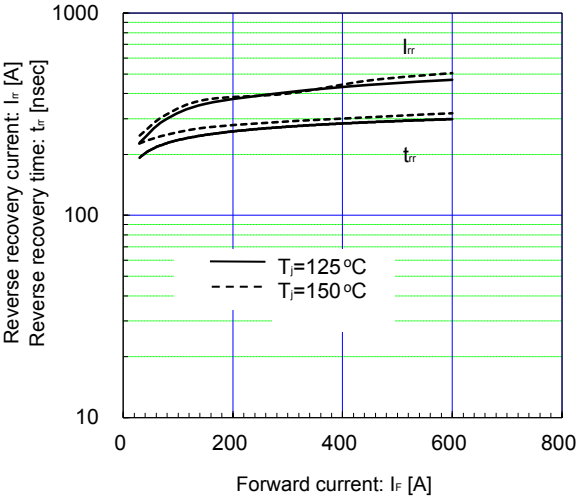
[INVERTER]

Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=900V, V<sub>GE</sub>=±15V, R<sub>G</sub>=4.7Ω, T<sub>J</sub>=25°C

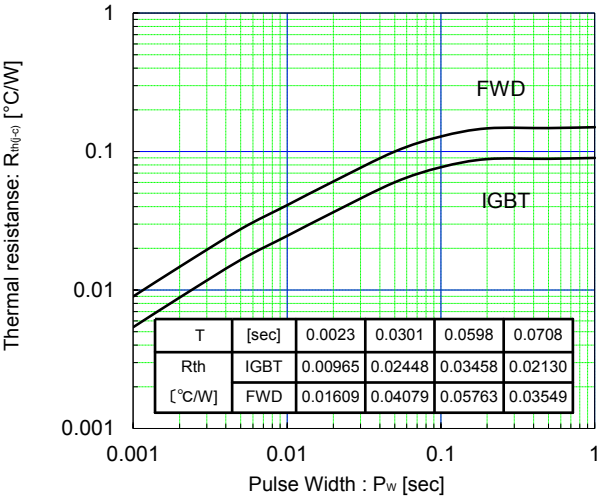


[INVERTER]

Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=900V, V<sub>GE</sub>=±15V, R<sub>G</sub>=4.7Ω, T<sub>J</sub>=125°C, 150°C

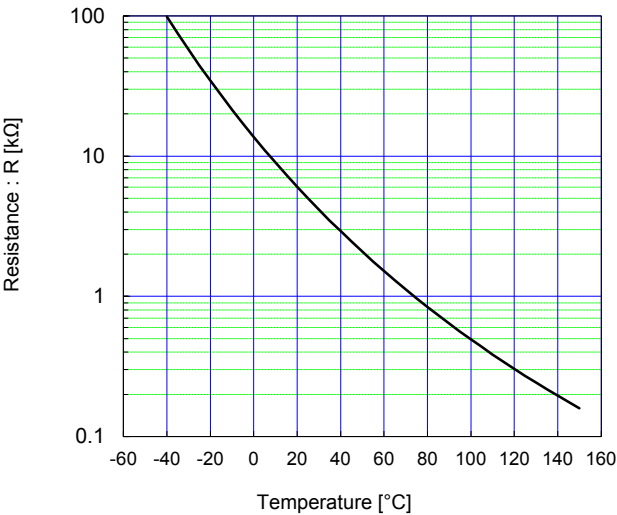


Transient Thermal Resistance (max.)

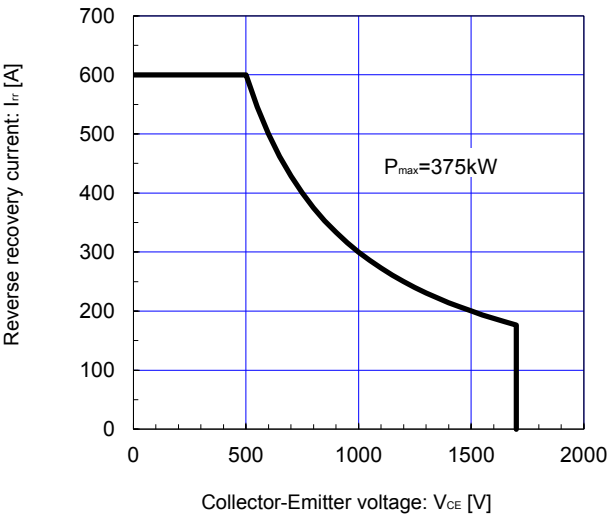


[THERMISTOR]

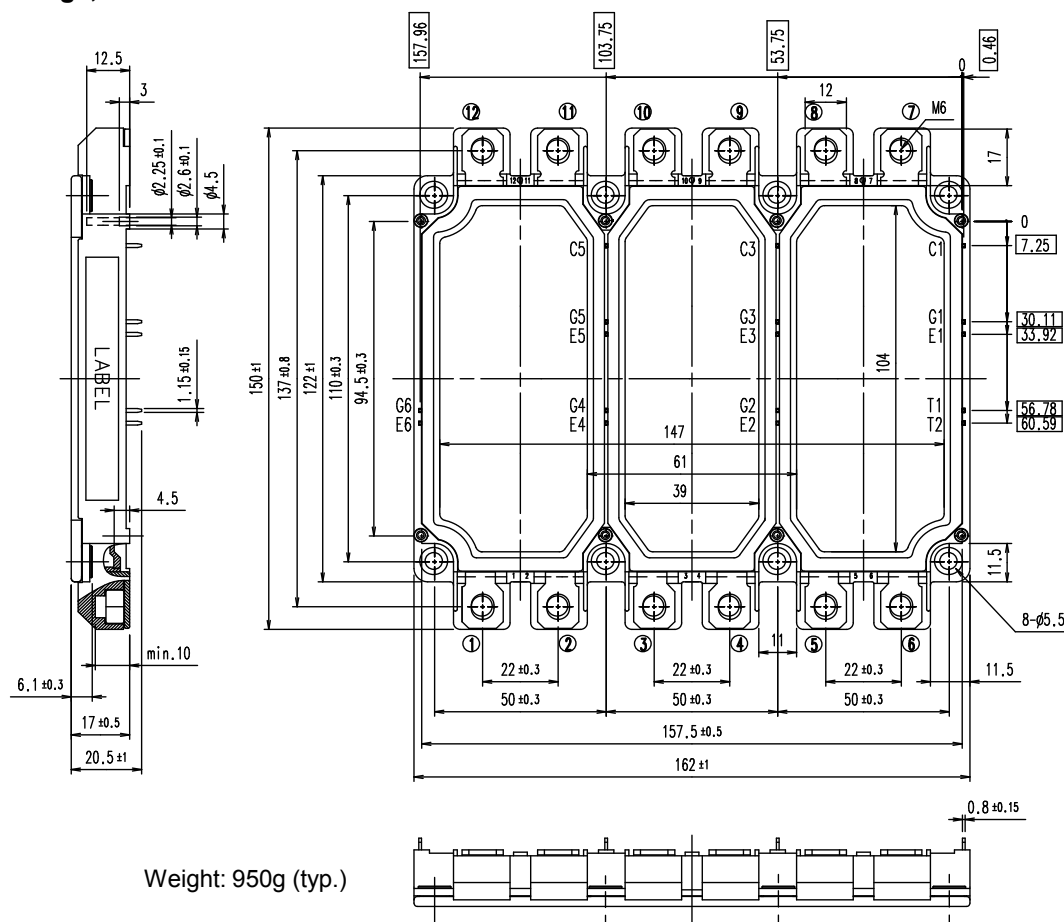
Temperature characteristic (typ.)



FWD safe operating area (max.)  
T<sub>J</sub>=150°C



### ■ Outline Drawings, mm



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