

# 7MBR75VB120-50

**IGBT Modules**

## IGBT MODULE (V series)

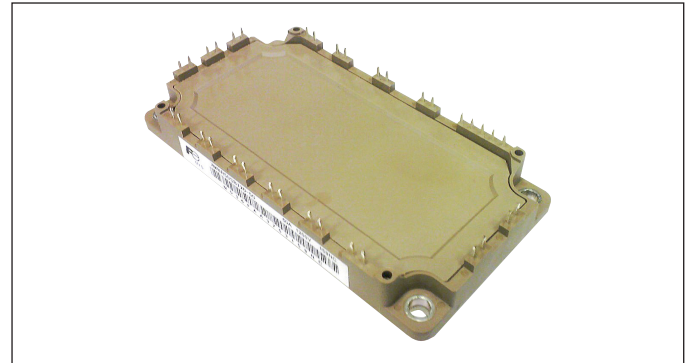
### 1200V / 75A / PIM

#### ■ Features

- Low  $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant product

#### ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply



#### ■ 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	$V_{CES}$		1200	V	
	Gate-Emitter voltage	$V_{GES}$		$\pm 20$	V	
	Collector current	$I_c$	Continuous	$T_c=100^\circ\text{C}$	75	A
		$I_{cp}$	1ms	$T_c=80^\circ\text{C}$	150	
		$-I_c$			75	
$-I_{c\ pulse}$		1ms		150		
Collector power dissipation	$P_c$	1 device		385	W	
Brake	Collector-Emitter voltage	$V_{CES}$		1200	V	
	Gate-Emitter voltage	$V_{GES}$		$\pm 20$	V	
	Collector current	$I_c$	Continuous	$T_c=80^\circ\text{C}$	50	A
		$I_{cp}$	1ms	$T_c=80^\circ\text{C}$	100	
	Collector power dissipation	$P_c$	1 device		280	W
Repetitive peak reverse voltage (Diode)	$V_{RRM}$			1200	V	
Converter	Repetitive peak reverse voltage	$V_{RRM}$		1600	V	
	Average output current	$I_o$	50Hz/60Hz, sine wave	75	A	
	Surge current (Non-Repetitive)	$I_{FSM}$	10ms, $T_j=150^\circ\text{C}$	520	A	
	$I^2t$ (Non-Repetitive)	$I^2t$	half sine wave	1352	$\text{A}^2\text{s}$	
Junction temperature	$T_j$	Inverter, Brake		175	$^\circ\text{C}$	
		Converter		150		
Operating junction temperature (under switching conditions)	$T_{jop}$	Inverter, Brake		150		
		Converter		150		
Case temperature	$T_c$			125		
Maximum junction temperature	$T_{jmax}$			175		
Operating temperature (under switching conditions)	$T_{jop}$			150		
Storage temperature	$T_{stg}$			-40 ~ +125		
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	$V_{iso}$	AC : 1min.	2500		VAC
Screw torque	Mounting (*3)	-	M5	3.5		N m

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)

● 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	-	-	1.0	mA	
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = ±20V	-	-	200	nA	
	Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 75mA	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> = 75A	T <sub>j</sub> =25°C	-	2.35	2.80	V
				T <sub>j</sub> =125°C	-	2.70	-	
				T <sub>j</sub> =150°C	-	2.75	-	
		V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 75A	T <sub>j</sub> =25°C	-	1.85	2.30	
				T <sub>j</sub> =125°C	-	2.20	-	
	T <sub>j</sub> =150°C	-	2.25	-				
	Internal gate resistance	R <sub>g(int)</sub>	-	-	10	-	Ω	
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	6.0	-	nF	
	Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 600V I <sub>c</sub> = 75A V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 2.2Ω	-	0.39	1.20	μs	
		t <sub>r</sub>		-	0.09	0.60		
		t <sub>r(i)</sub>		-	0.03	-		
	Turn-off time	t <sub>off</sub>	R <sub>G</sub> = 2.2Ω	-	0.53	1.00	μs	
t <sub>r</sub>		-		0.06	0.30			
Forward on voltage	V <sub>F</sub> (terminal)	I <sub>F</sub> = 75A	T <sub>j</sub> =25°C	-	2.20	2.65	V	
			T <sub>j</sub> =125°C	-	2.35	-		
			T <sub>j</sub> =150°C	-	2.30	-		
	V <sub>F</sub> (chip)	I <sub>F</sub> = 75A	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> = 75A	-	-	0.35	μs		
Brake	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>GE</sub> = 0V V <sub>CE</sub> = 1200V	-	-	1.0	mA	
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V V <sub>GE</sub> = +20 / -20V	-	-	200	nA	
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>j</sub> =25°C	-	2.20	2.65	V
				T <sub>j</sub> =125°C	-	2.55	-	
				T <sub>j</sub> =150°C	-	2.60	-	
		V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>j</sub> =25°C	-	1.85	2.30	
				T <sub>j</sub> =125°C	-	2.20	-	
	T <sub>j</sub> =150°C	-	2.25	-				
	Internal gate resistance	R <sub>g(int)</sub>	-	-	4	-	Ω	
	Turn-on time	t <sub>on</sub>	V <sub>CE</sub> = 600V I <sub>c</sub> = 50A	-	0.39	1.20	μs	
t <sub>r</sub>		-		0.09	0.60			
Turn-off time	t <sub>off</sub>	V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 15Ω	-	0.53	1.00	μs		
	t <sub>r</sub>		-	0.06	0.30			
Reverse current	I <sub>RRM</sub>	V <sub>R</sub> = 1200V	-	-	1.00	mA		
Converter	Forward on voltage	I <sub>F</sub> = 75A	terminal	-	1.90	2.35	V	
			chip	-	1.40	-		
Reverse current	I <sub>RRM</sub>	V <sub>R</sub> = 1600V	-	-	1.0	mA		
Thermistor	Resistance	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

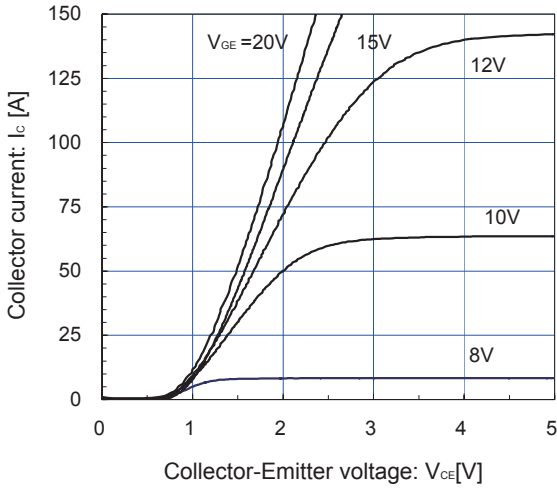
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	Inverter IGBT	-	-	0.39	°C/W
		Inverter FWD	-	-	0.55	
		Brake IGBT	-	-	0.54	
		Converter Diode	-	-	0.43	
Contact thermal resistance (1device) (*4)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.05	-	

Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

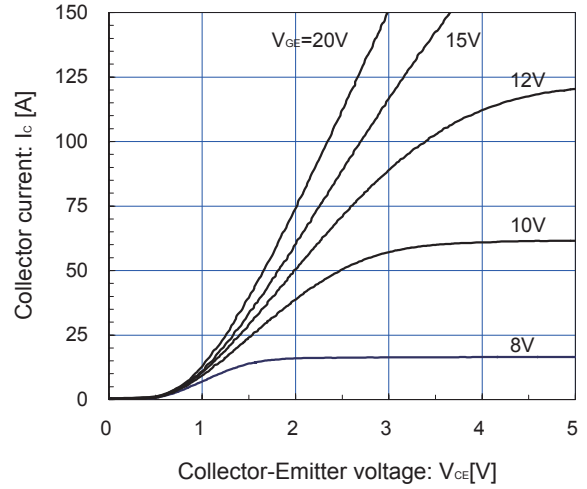
[ Inverter ]

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



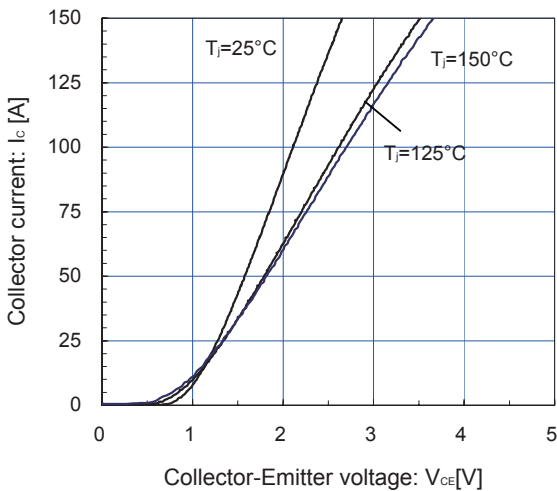
[ Inverter ]

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



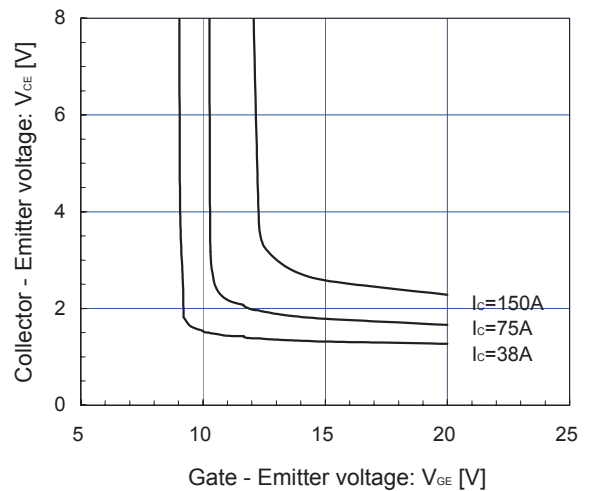
[ Inverter ]

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



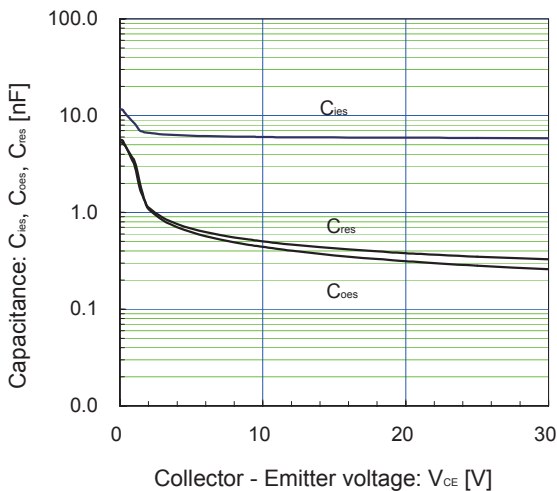
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Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



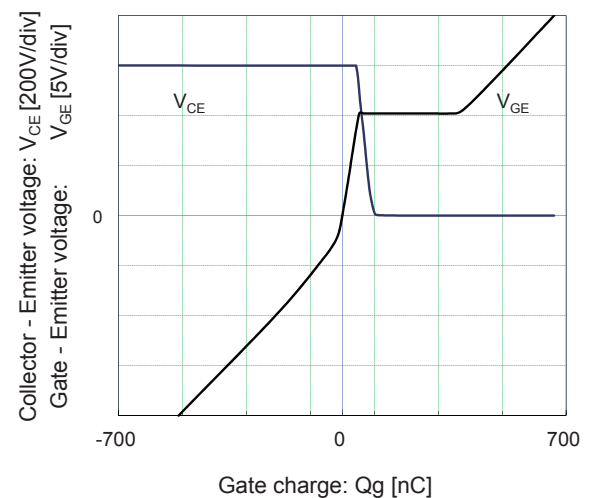
[ Inverter ]

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



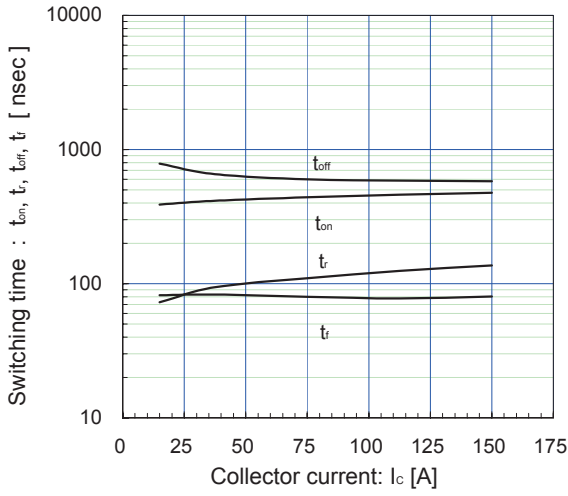
[ Inverter ]

Dynamic gate charge (typ.)  
 $V_{CC} = 600\text{V}$ ,  $I_c = 75\text{A}$ ,  $T_j = 25^\circ\text{C}$



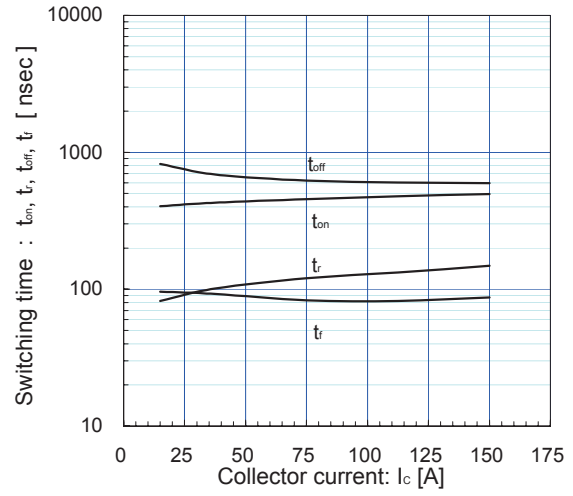
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=2.2\Omega, T_J=125^\circ C$



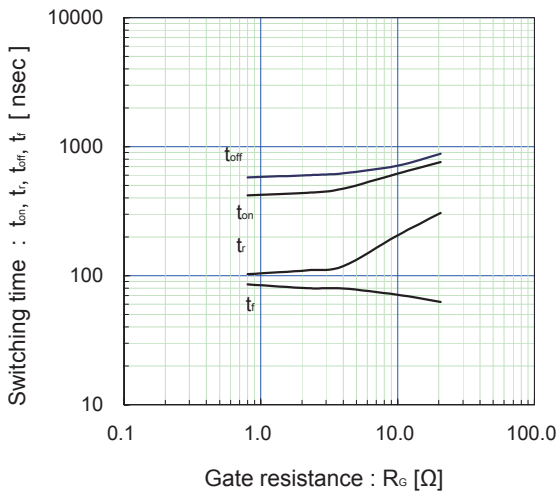
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=2.2\Omega, T_J=150^\circ C$



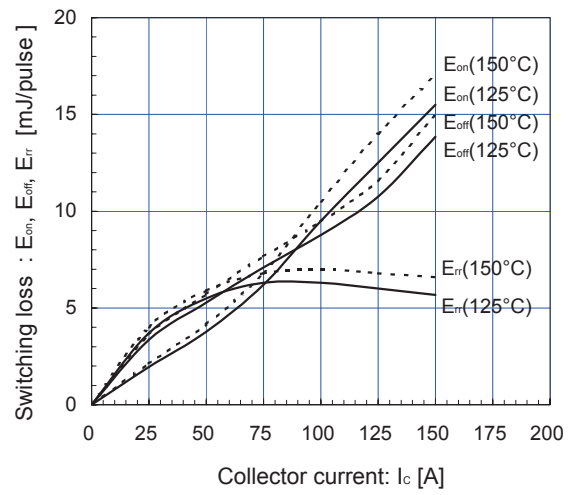
[ Inverter ]

Switching time vs. gate resistance (typ.)  
 $V_{CC}=600V, I_c=75A, V_{GE}=\pm 15V, T_J=125^\circ C$



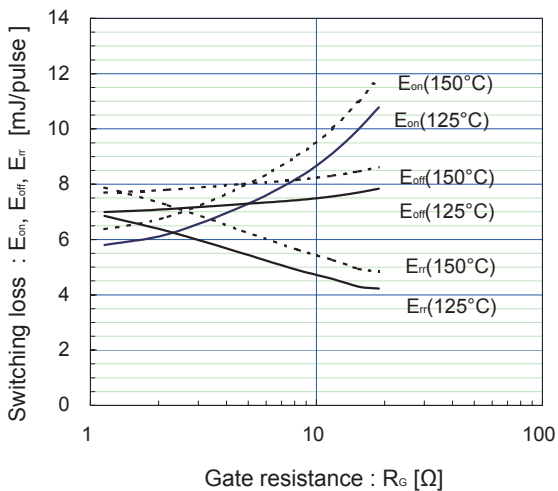
[ Inverter ]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=2.2\Omega$



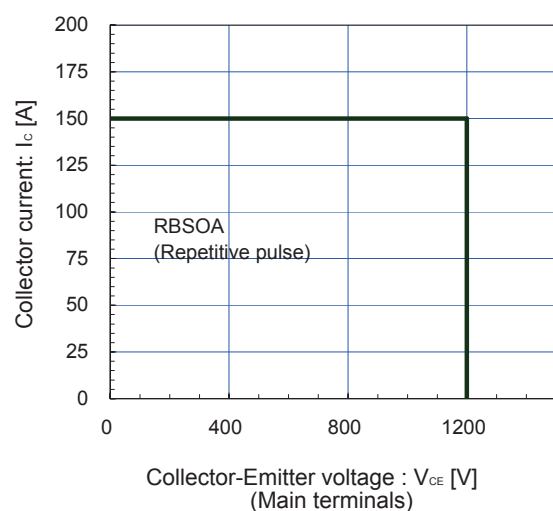
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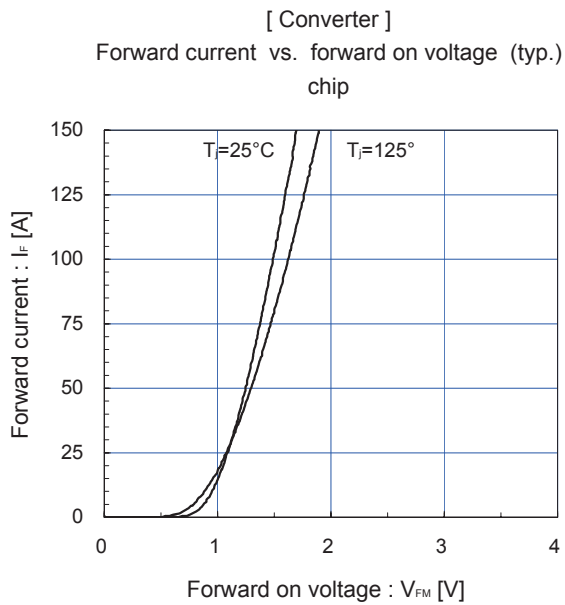
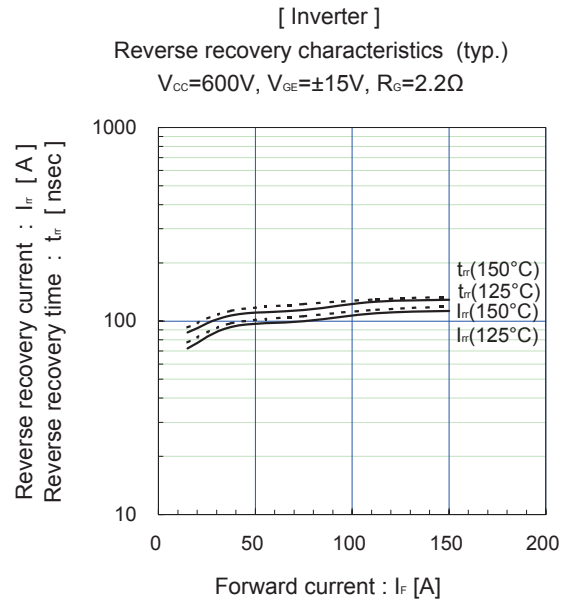
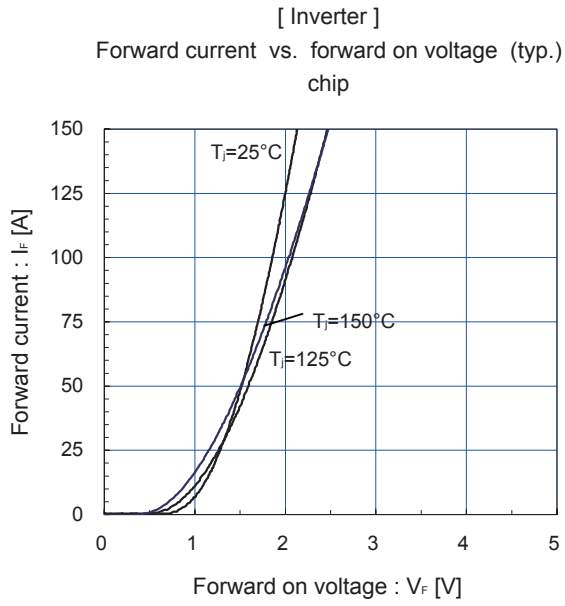
Switching Loss vs. gate resistance (typ.)  
 $V_{CC}=600V, I_c=75A, V_{GE}=\pm 15V$



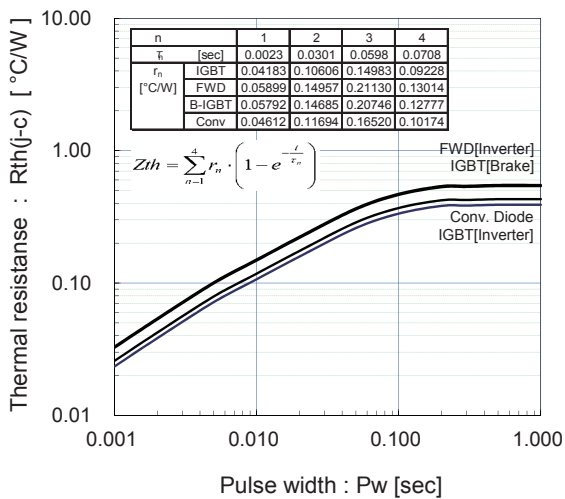
[ Inverter ]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_G \geq 2.2\Omega, T_J=150^\circ C$

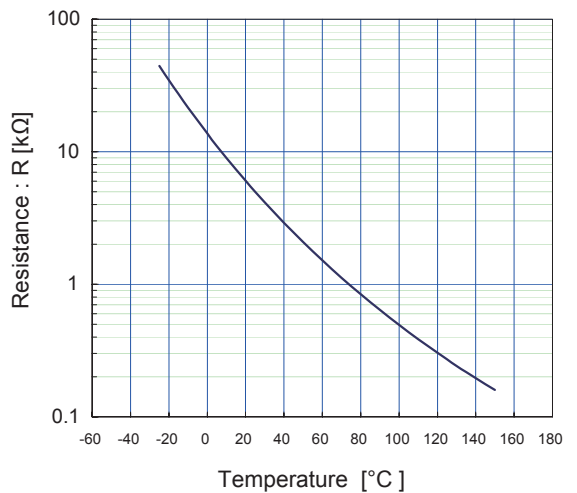




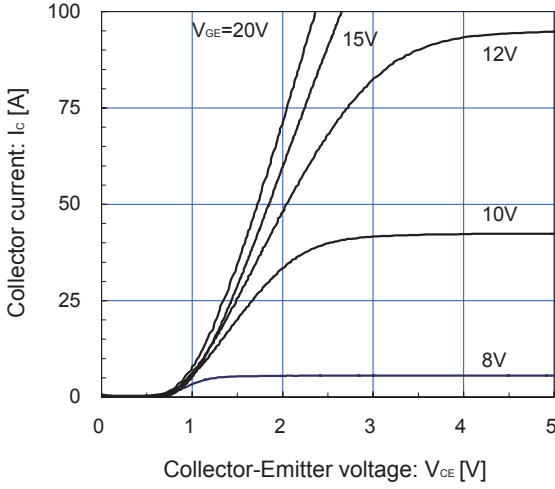
Transient thermal resistance (max.)



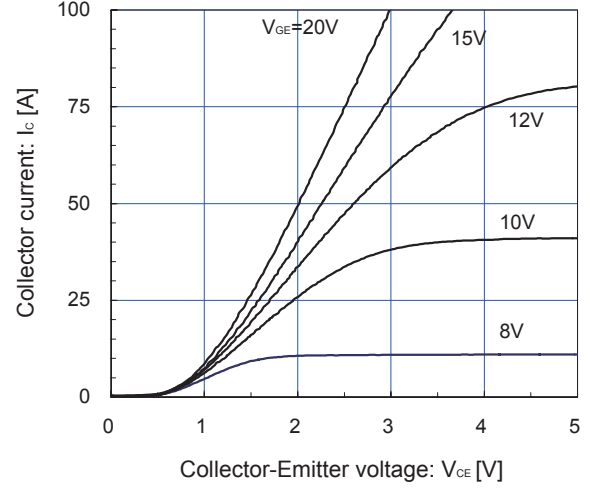
[ Thermistor ]  
Temperature characteristic (typ.)



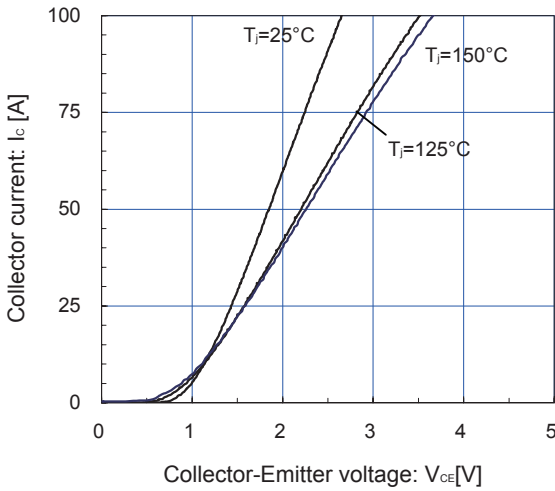
[ Brake ]  
 Collector current vs. Collector-Emittor voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



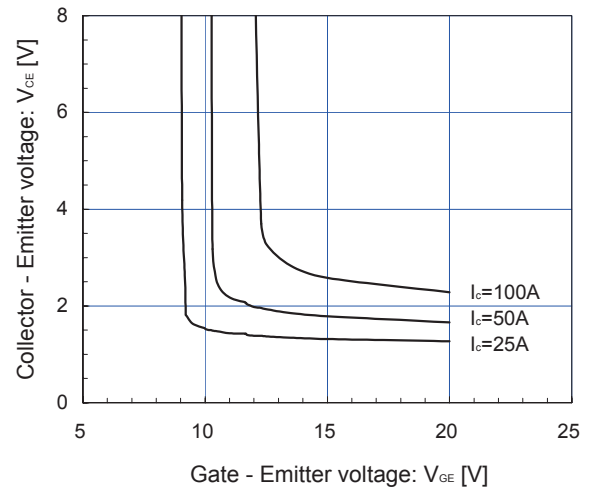
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 Collector current vs. Collector-Emittor voltage (typ.)  
 $T_j = 150^\circ\text{C}$  / chip



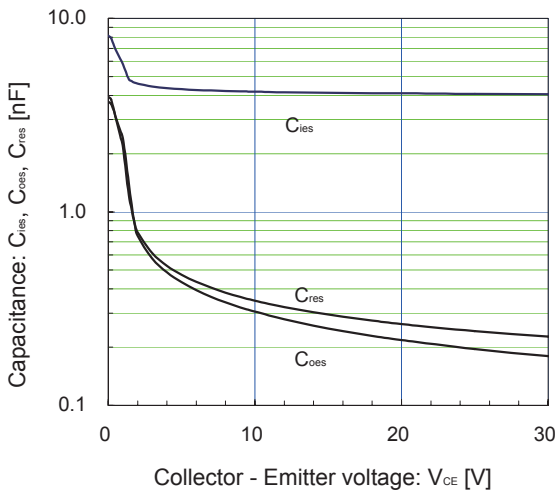
[ Brake ]  
 Collector current vs. Collector-Emittor voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



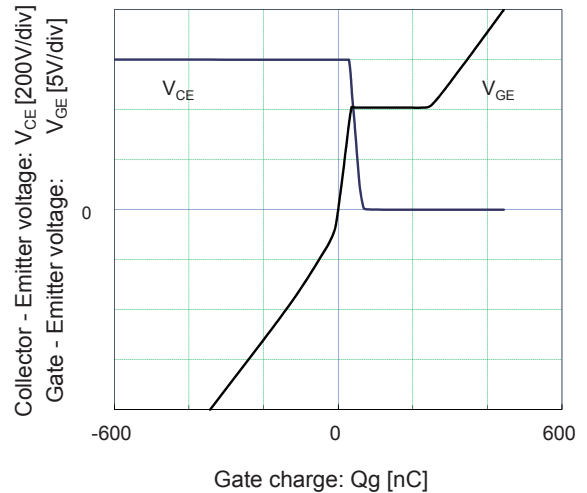
[ Brake ]  
 Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



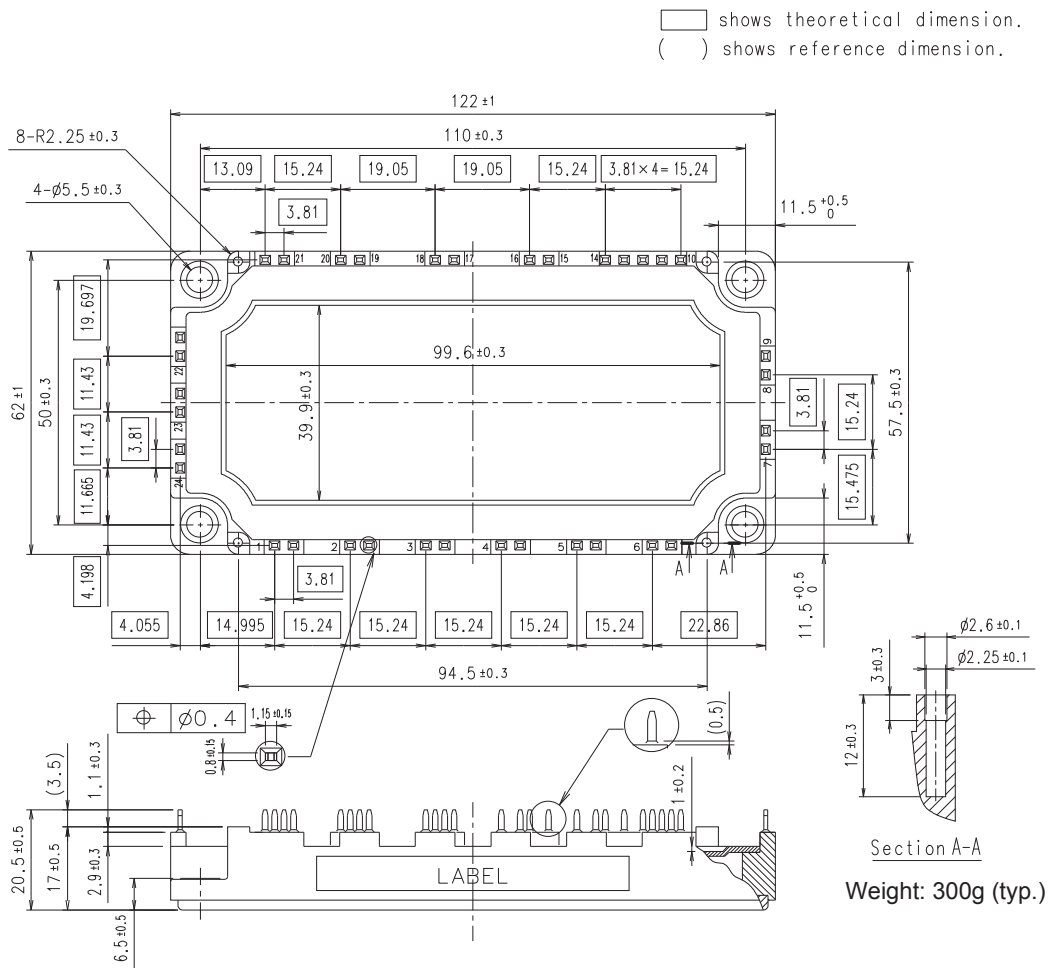
[ Brake ]  
 Capacitance vs. Collector-Emittor voltage (typ.)  
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$



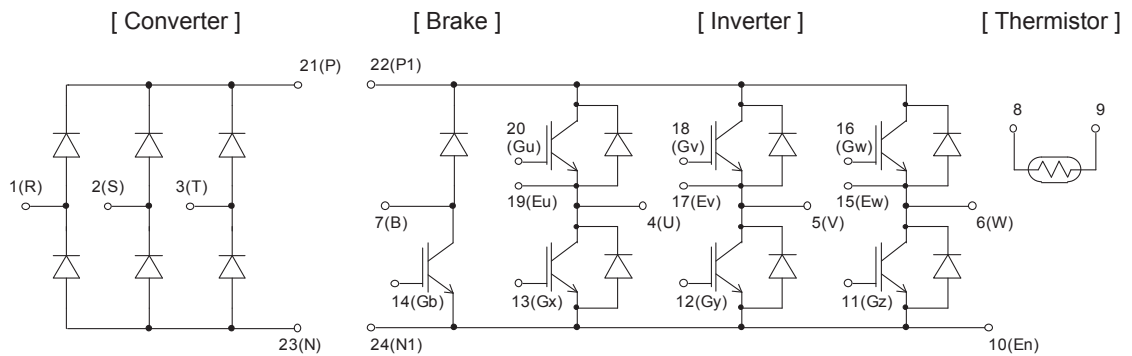
[ Brake ]  
 Dynamic gate charge (typ.)  
 $V_{CC} = 600\text{V}$ ,  $I_c = 50\text{A}$ ,  $T_j = 25^\circ\text{C}$



Outline Drawings (Unit: mm)



Equivalent Circuit



**WARNING**

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