

# 7MBR15VKA060-50

**IGBT Modules**

## IGBT MODULE (V series)

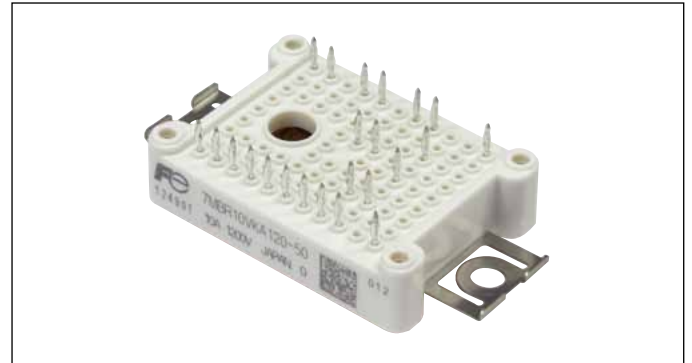
### 600V / 10A / PIM

#### ■ 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	$V_{CES}$	600	V	
	Gate-Emitter voltage	$V_{GES}$	$\pm 20$	V	
	Collector current	$I_c$	Continuous $T_c=100^\circ\text{C}$	15	A
		$I_{cp}$	1ms $T_c=80^\circ\text{C}$	30	
		$-I_c$		15	
	$-I_{c\ pulse}$	1ms	30		
Collector power dissipation	$P_c$	1 device	85	W	
Brake	Collector-Emitter voltage	$V_{CES}$	600	V	
	Gate-Emitter voltage	$V_{GES}$	$\pm 20$	V	
	Collector current	$I_c$	Continuous $T_c=80^\circ\text{C}$	15	A
		$I_{cp}$	1ms $T_c=80^\circ\text{C}$	30	
	Collector power dissipation	$P_c$	1 device	85	W
Repetitive peak reverse voltage (Diode)	$V_{RRM}$		600	V	
Converter	Repetitive peak reverse voltage	$V_{RRM}$	800	V	
	Average output current	$I_o$	50Hz/60Hz, sine wave	15	A
	Surge current (Non-Repetitive)	$I_{FSM}$	10ms, $T_j=150^\circ\text{C}$	360	A
	$I^2t$ (Non-Repetitive)	$I^2t$	half sine wave	660	$\text{A}^2\text{s}$
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		
Storage temperature	$T_{stg}$		-40 to +125		
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	$V_{iso}$	AC : 1min.	VAC	
Screw torque	Mounting (*3)	-	M4	1.7	Nm

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 : 1.3-1.7 Nm (M4)

● 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> = 600V	-	-	1.0	mA	
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	200	nA	
	Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 15mA	6.2	6.7	7.2	V	
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 15A	T <sub>j</sub> = 25°C	-	1.95	2.35	V
				T <sub>j</sub> = 125°C	-	2.35	-	
				T <sub>j</sub> = 150°C	-	2.45	-	
		V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 15A	T <sub>j</sub> = 25°C	-	1.75	2.15	
				T <sub>j</sub> = 125°C	-	2.15	-	
	T <sub>j</sub> = 150°C	-	2.25	-				
	Internal gate resistance	R <sub>G(int)</sub>	-	-	0	-	Ω	
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	0.9	-	nF	
	Turn-on time	ton	V <sub>CC</sub> = 300V I <sub>c</sub> = 15A V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 22Ω	-	0.08	1.20	μs	
		tr		-	0.06	0.60		
		tr(i)		-	0.02	-		
	Turn-off time	toff	R <sub>G</sub> = 22Ω	-	0.14	1.20	μs	
tf		-		0.02	0.45			
Forward on voltage	V <sub>F</sub> (terminal)	I <sub>F</sub> = 15A	T <sub>j</sub> = 25°C	-	1.95	2.35	V	
			T <sub>j</sub> = 125°C	-	1.90	-		
			T <sub>j</sub> = 150°C	-	1.90	-		
	V <sub>F</sub> (chip)	I <sub>F</sub> = 15A	T <sub>j</sub> = 25°C	-	1.75	2.15		
			T <sub>j</sub> = 125°C	-	1.70	-		
T <sub>j</sub> = 150°C	-	1.70	-					
Reverse recovery time	trr	I <sub>F</sub> = 15A	-	-	0.35	μs		
Brake	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>GE</sub> = 0V V <sub>CE</sub> = 600V	-	-	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> = 15A	T <sub>j</sub> = 25°C	-	1.95	2.35	V
				T <sub>j</sub> = 125°C	-	2.35	-	
				T <sub>j</sub> = 150°C	-	2.45	-	
		V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 15A	T <sub>j</sub> = 25°C	-	1.75	2.15	
				T <sub>j</sub> = 125°C	-	2.15	-	
	T <sub>j</sub> = 150°C	-	2.25	-				
	Internal gate resistance	R <sub>G(int)</sub>	-	-	0	-	Ω	
	Turn-on time	ton	V <sub>CE</sub> = 300V I <sub>c</sub> = 15A	-	0.08	1.20	μs	
tr		-		0.06	0.60			
Turn-off time	toff	V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 22Ω	-	0.14	1.20	μs		
	tf		-	0.02	0.45			
Reverse current	IRRM	V <sub>R</sub> = 600V	-	-	1.00	mA		
Converter	Forward on voltage	I <sub>F</sub> = 15A	terminal	-	1.20	1.65	V	
			chip	-	1.00	-		
Reverse current	IRRM	V <sub>R</sub> = 800V	-	-	1.00	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

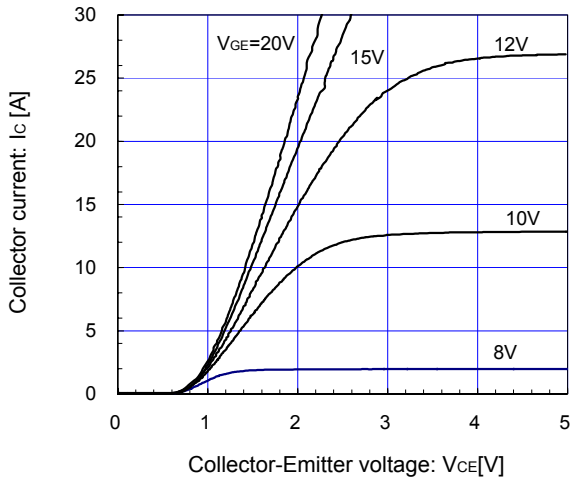
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	Inverter IGBT	-	-	1.80	°C/W
		Inverter FWD	-	-	2.31	
		Brake IGBT	-	-	1.80	
		Converter Diode	-	-	1.35	
Contact thermal resistance (1device) (*4)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.05	-	

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

■ Characteristics (Representative)

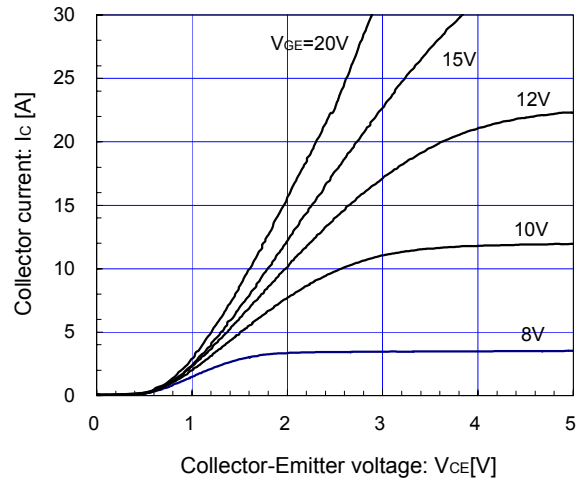
[ Inverter ]

Collector current vs. Collector-Emittor voltage (typ.)  
T<sub>j</sub> = 25°C / chip



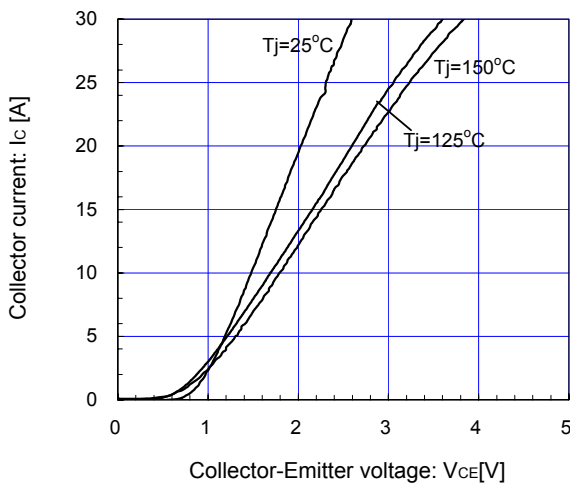
[ Inverter ]

Collector current vs. Collector-Emittor voltage (typ.)  
T<sub>j</sub> = 150°C / chip



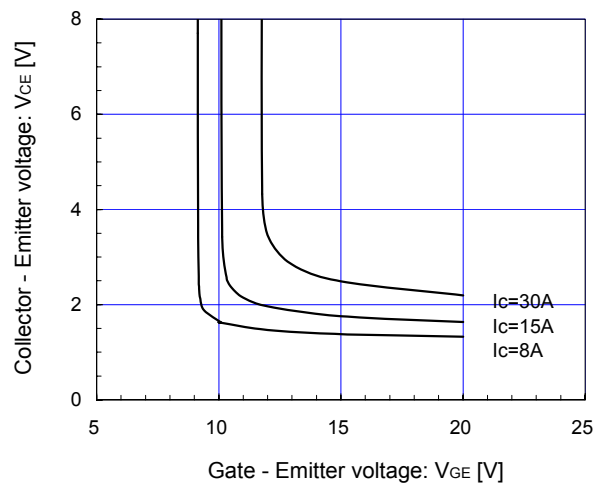
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Collector current vs. Collector-Emittor voltage (typ.)  
V<sub>GE</sub> = 15V / chip



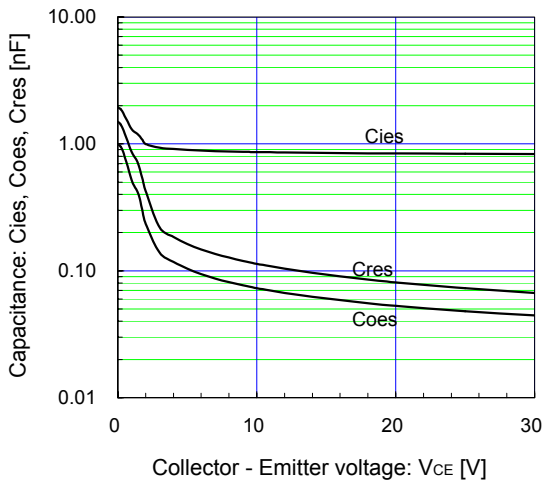
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Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
T<sub>j</sub> = 25°C / chip



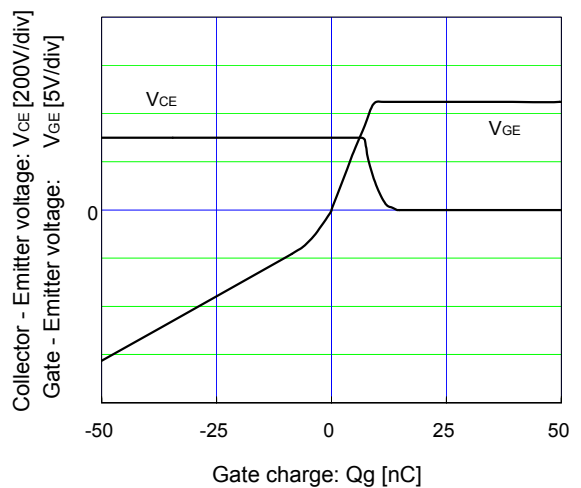
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Capacitance vs. Collector-Emittor voltage (typ.)  
V<sub>GE</sub> = 0V, f = 1MHz, T<sub>j</sub> = 25°C



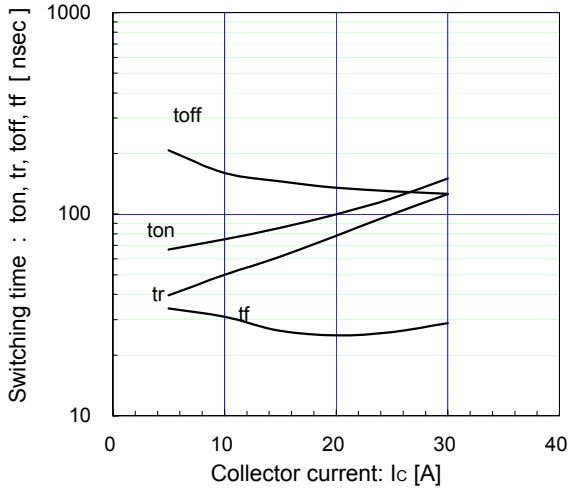
[ Inverter ]

Dynamic gate charge (typ.)  
V<sub>CC</sub> = 300V, I<sub>c</sub> = 15A, T<sub>j</sub> = 25°C



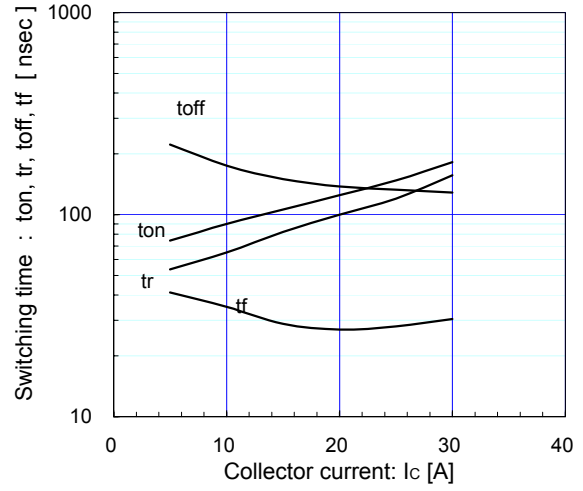
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_g=22\Omega, T_j=125^\circ C$



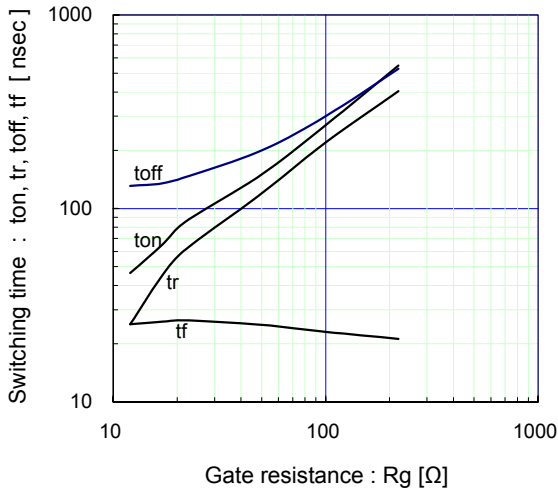
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Switching time vs. Collector current (typ.)  
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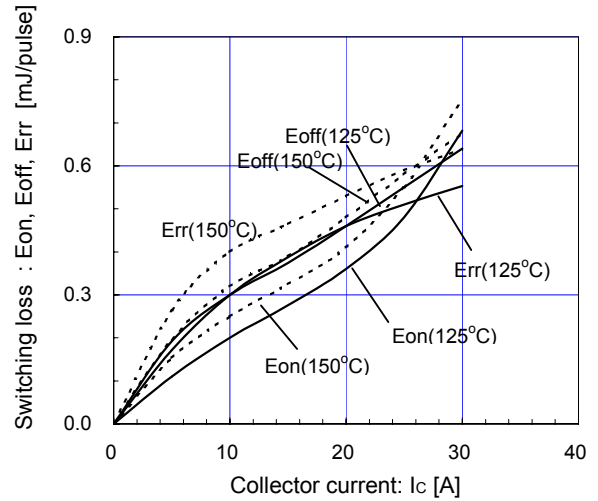
[ Inverter ]

Switching time vs. gate resistance (typ.)  
 $V_{CC}=300V, I_c=15A, V_{GE}=\pm 15V, T_j=125^\circ C$



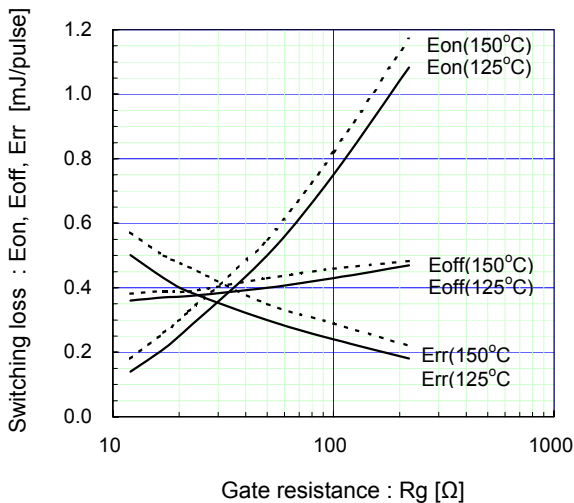
[ Inverter ]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_g=22\Omega$



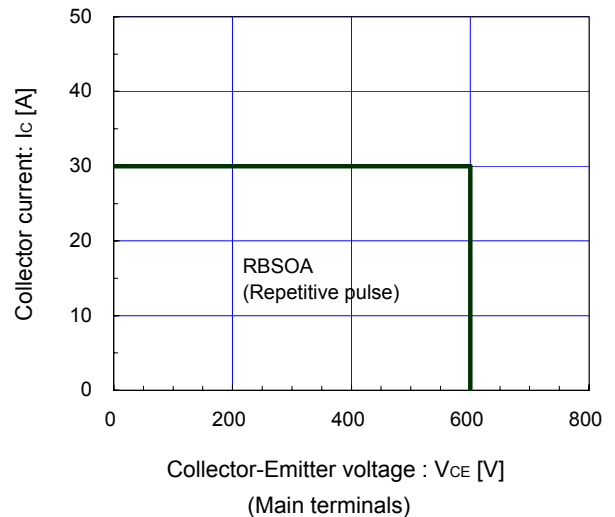
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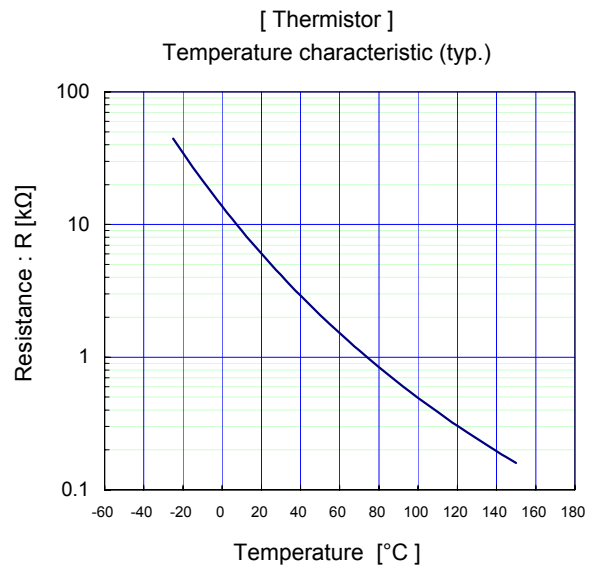
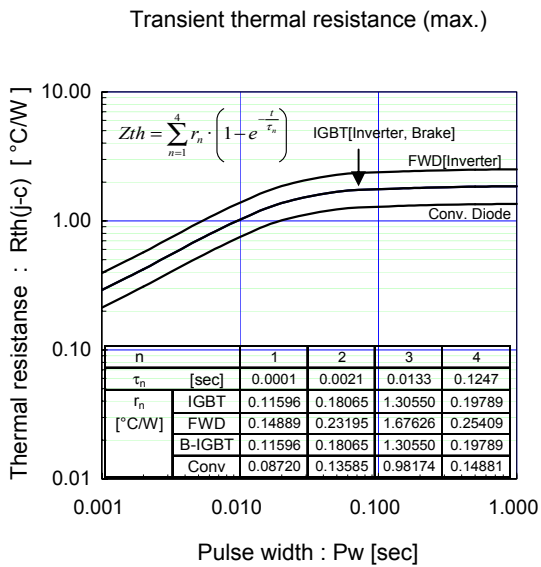
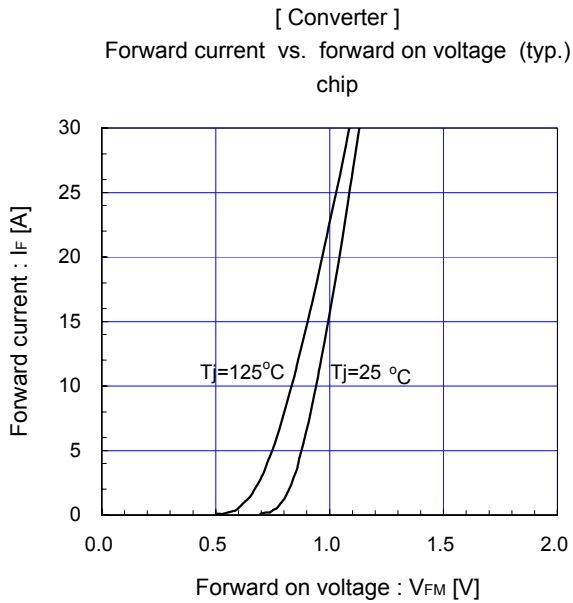
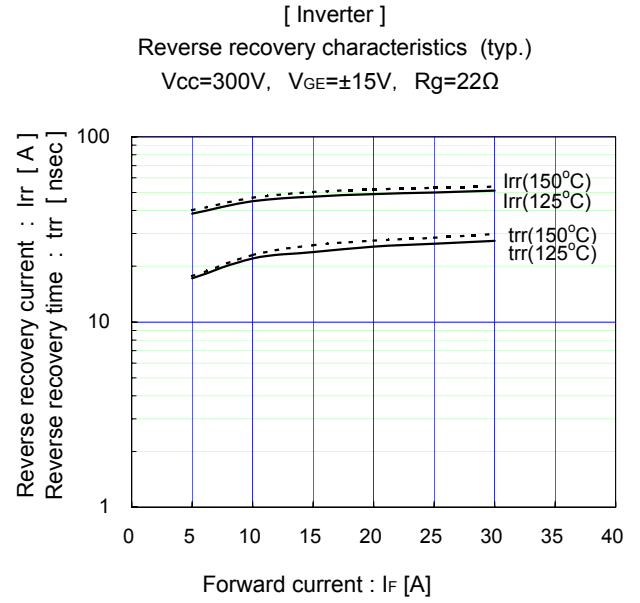
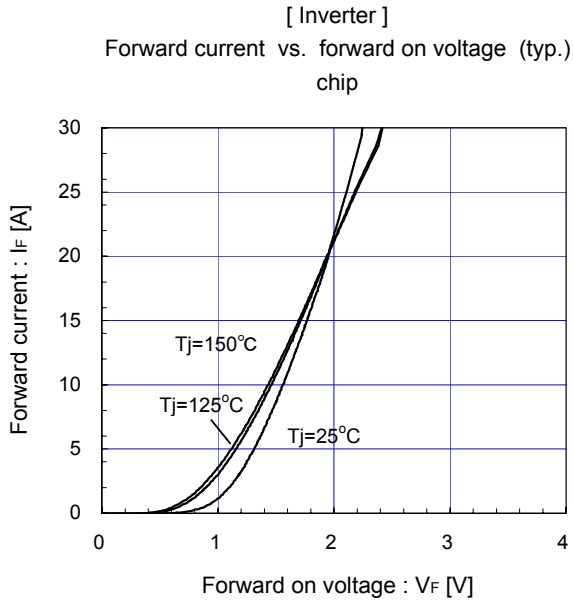
Switching loss vs. gate resistance (typ.)  
 $V_{CC}=300V, I_c=15A, V_{GE}=\pm 15V$



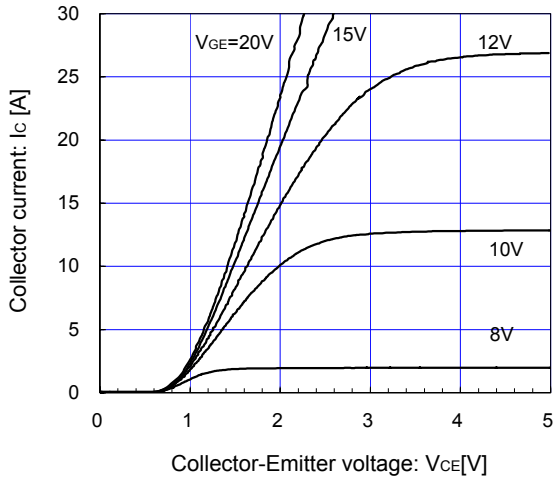
[ Inverter ]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_g \ge 22\Omega, T_j = 150^\circ C$

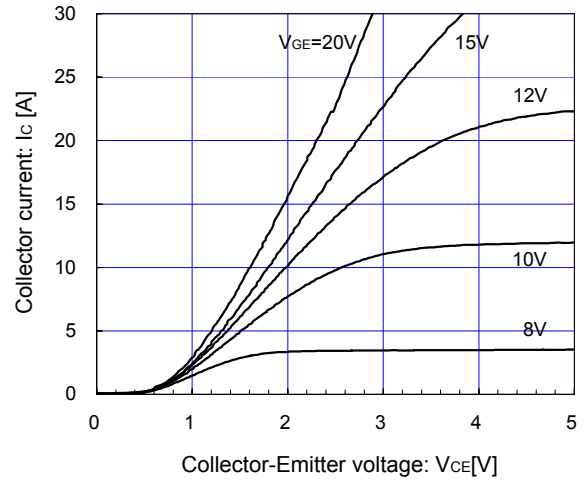




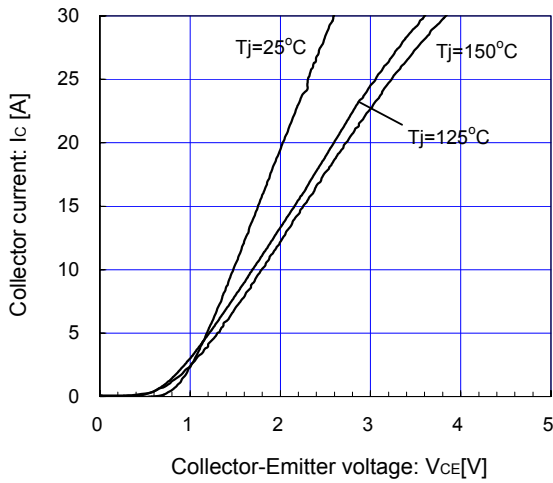
[ Brake ]  
Collector current vs. Collector-Emittter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



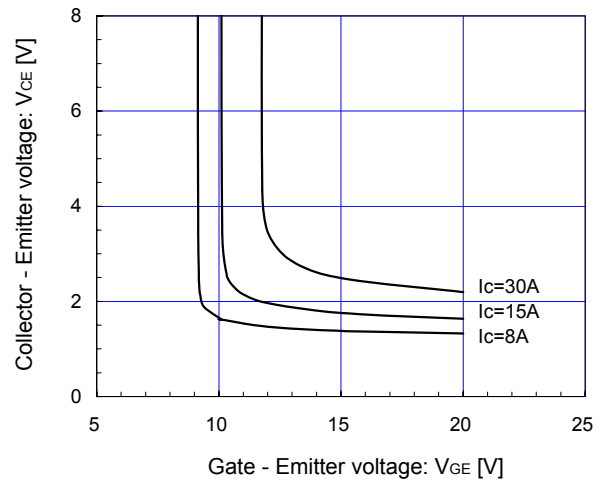
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Collector current vs. Collector-Emittter voltage (typ.)  
 $T_j = 150^\circ\text{C}$  / chip



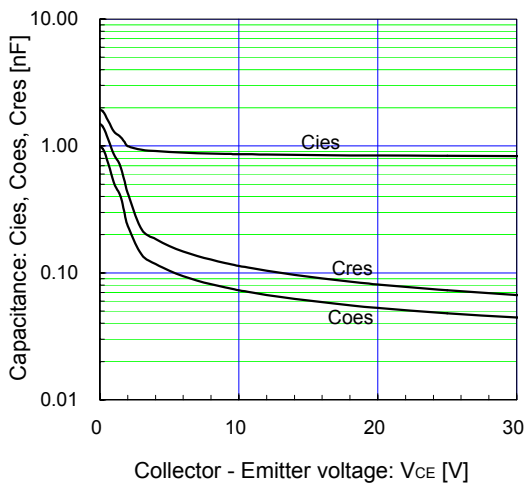
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Collector current vs. Collector-Emittter voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



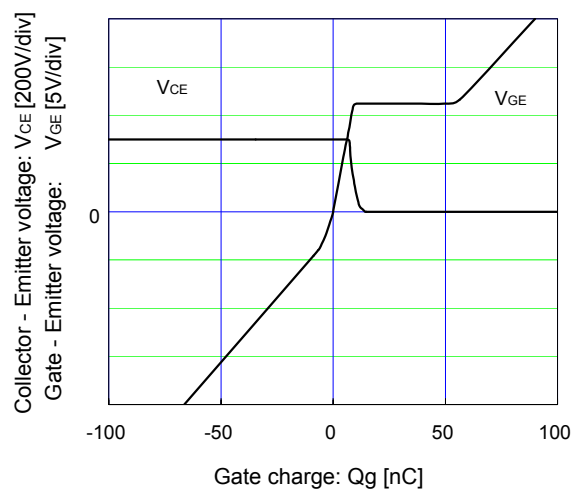
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Collector-Emittter voltage vs. Gate-Emittter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



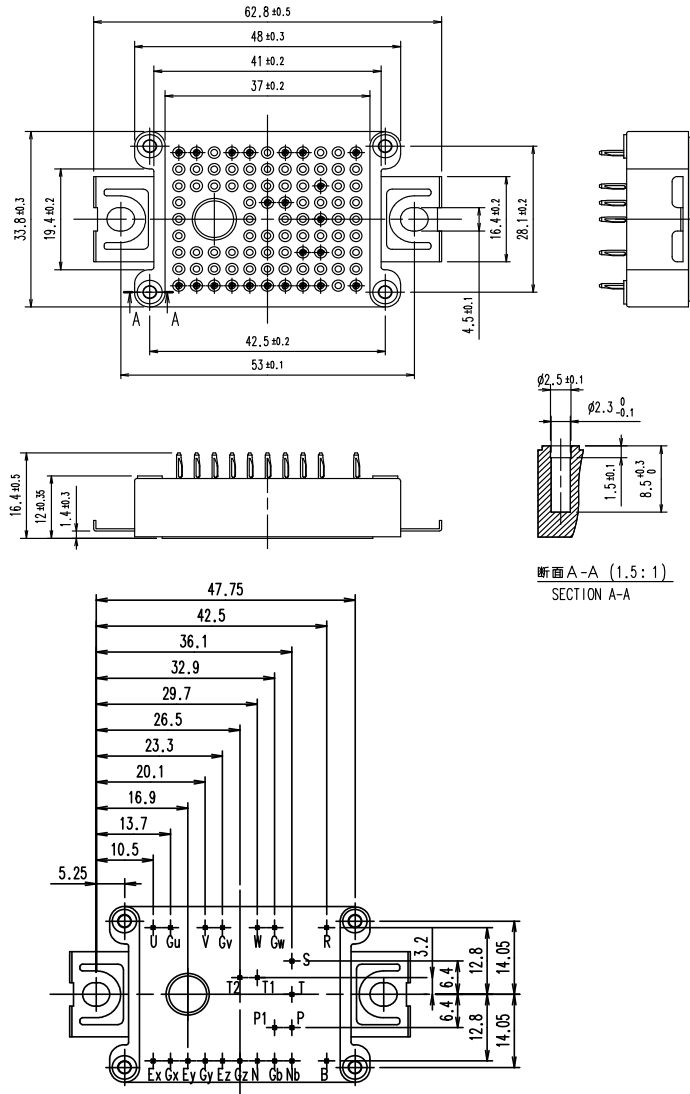
[ Brake ]  
Capacitance vs. Collector-Emittter voltage (typ.)  
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$



[ Brake ]  
Dynamic gate charge (typ.)  
 $V_{CC} = 300\text{V}$ ,  $I_C = 15\text{A}$ ,  $T_j = 25^\circ\text{C}$



■ Outline Drawings, mm

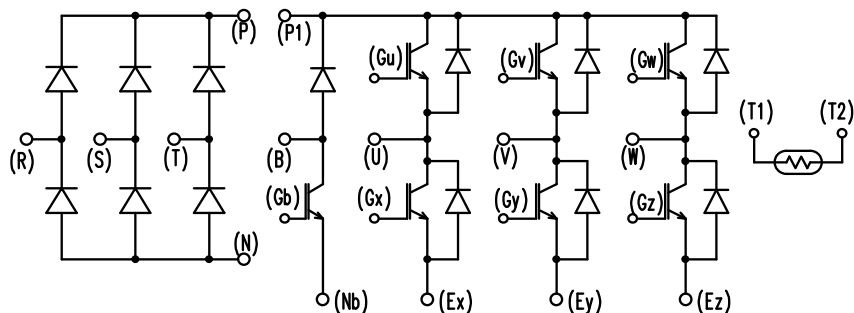


断面A-A (1.5:1)  
SECTION A-A

Weight: 25g(typ.)

■ Equivalent Circuit Schematic

[ Converter ]      [ Brake ]      [ Inverter ]      [ Thermistor ]



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