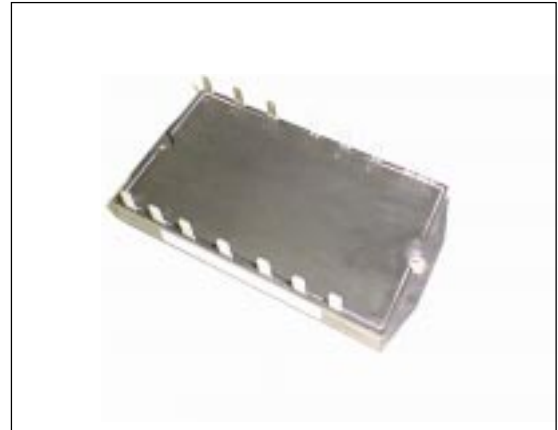


### IGBT MODULE

1200V / 10A / PIM



#### ■ Features

- High Speed Switching
- Voltage Drive
- Low Inductance Module Structure
- Converter Diode Bridge Dynamic Brake Circuit

#### ■ Applications

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

#### ■ Maximum ratings and characteristics

● Absolute maximum ratings (Tc=25°C unless without specified)

Item	Symbol	Condition	Rating	Unit	
Inverter	Collector-Emitter voltage	V <sub>CES</sub>	1200	V	
	Gate-Emitter voltage	V <sub>GES</sub>	±20	V	
	Collector current	I <sub>C</sub>	Continuous	10	A
		I <sub>CP</sub>	1ms	20	A
		-I <sub>C</sub>		10	A
Collector power dissipation	P <sub>C</sub>	1 device	60	W	
Brake	Collector-Emitter voltage	V <sub>CES</sub>	1200	V	
	Gate-Emitter voltage	V <sub>GES</sub>	±20	V	
	Collector current	I <sub>C</sub>	Continuous	5	A
		I <sub>CP</sub>	1ms	12.5	A
	Collector power dissipation	P <sub>C</sub>	1 device	40	W
	Repetitive peak reverse voltage	V <sub>R<sub>RRM</sub></sub>		1200	V
	Average forward current	I <sub>F(AV)</sub>		1	A
Surge current	I <sub>FSM</sub>	10ms	50	A	
Converter	Repetitive peak reverse voltage	V <sub>R<sub>RRM</sub></sub>	1600	V	
	Non-Repetitive peak reverse voltage	V <sub>R<sub>RSM</sub></sub>	1700	V	
	Average output current	I <sub>O</sub>	50Hz/60Hz sine wave	25	A
	Surge current (Non-Repetitive)	I <sub>FSM</sub>	T <sub>j</sub> =150°C, 10ms	320	A
	I <sup>2</sup> t (Non-Repetitive)		T <sub>j</sub> =150°C, 10ms	512	A <sup>2</sup> s
Operating junction temperature	T <sub>j</sub>		+150	°C	
Storage temperature	T <sub>stg</sub>		-40 to +125	°C	
Isolation voltage	V <sub>iso</sub>	AC : 1 minute	AC 2500	V	
Mounting screw torque			1.7 * <sub>1</sub>	N·m	

\*<sub>1</sub> Recommendable value : 1.3 to 1.7 N·m (M4)

### ● Electrical characteristics (T<sub>j</sub>=25°C unless without specified)

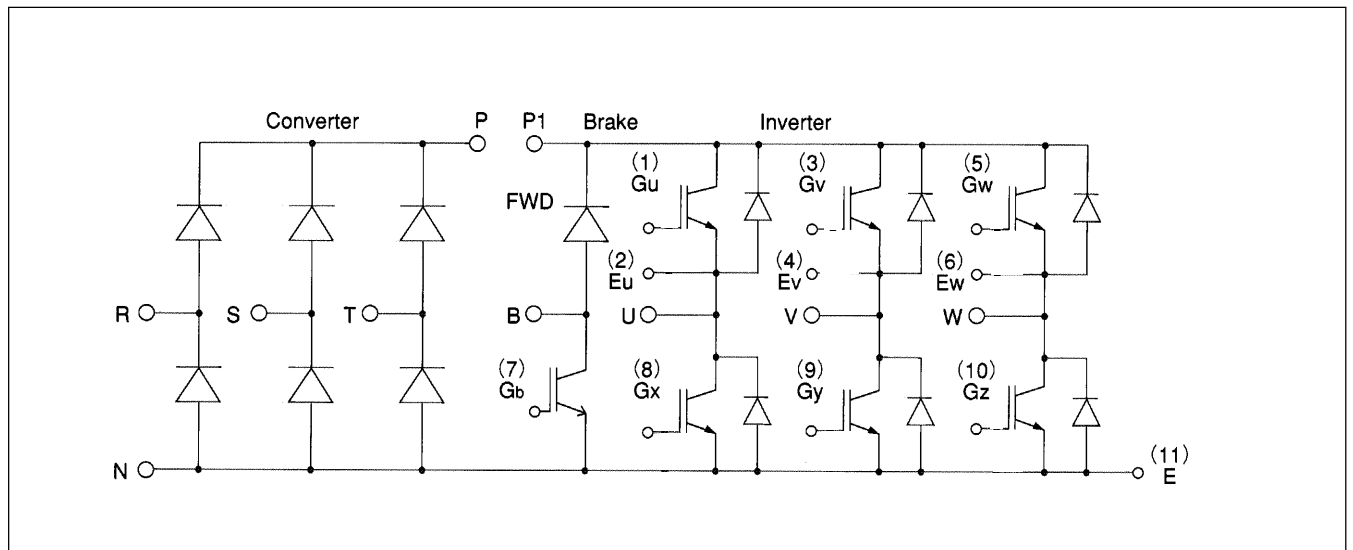
Item	Symbol	Condition	Characteristics			Unit	
			Min.	Typ.	Max.		
Inverter (IGBT)	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V			1.0	mA
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V			0.1	μA
	Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> =20V, I <sub>c</sub> =10mA			4.5	V
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub>	V <sub>GE</sub> =15V, I <sub>c</sub> =10A			3.3	V
	Collector-Emitter voltage	-V <sub>CE</sub>	-I <sub>c</sub> =10A			3.0	V
	Input capacitance	C <sub>ies</sub>	V <sub>GE</sub> =0V, V <sub>CE</sub> =10V, f=1MHz			2100	pF
	Switching time	t <sub>on</sub>	V <sub>CC</sub> =600V			1.2	μs
		t <sub>r</sub>	I <sub>c</sub> =10A			0.6	μs
		t <sub>off</sub>	V <sub>GE</sub> =±15V			1.5	μs
		t <sub>f</sub>	R <sub>G</sub> =62 ohm			0.5	μs
Reverse recovery time of FRD	t <sub>rr</sub>	I <sub>F</sub> =10A			0.35	μs	
Brake (IGBT)	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>CE(s)</sub> =1200V, V <sub>GE</sub> =0V			1.0	mA
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V			0.1	μA
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub>	I <sub>c</sub> =5A, V <sub>GE</sub> =15V			3.55	V
	Switching time	t <sub>on</sub>	V <sub>CC</sub> =600V			0.8	μs
		t <sub>r</sub>	I <sub>c</sub> =5A			0.6	μs
		t <sub>off</sub>	V <sub>GE</sub> =±15V			1.5	μs
t <sub>f</sub>		R <sub>G</sub> =120 ohm			0.5	μs	
Brake (FWD)	Reverse current	I <sub>RRM</sub>	V <sub>R</sub> =1200V			1	mA
	Reverse recovery time	t <sub>rr</sub>				0.6	μs
Converter	Forward voltage	V <sub>FM</sub>	I <sub>F</sub> =25A			1.4	V
	Reverse current	I <sub>RRM</sub>	V <sub>R</sub> =1600V			1.0	mA

### ● Thermal Characteristics

Item	Symbol	Condition	Characteristics			Unit
			Min.	Typ.	Max.	
Thermal resistance ( 1 device )	R <sub>th(j-c)</sub>	Inverter IGBT			1.67	°C/W
		Inverter FRD			3.30	
		Brake IGBT			3.12	
		Converter Diode			3.40	
Contact thermal resistance *	R <sub>th(c-f)</sub>	With thermal compound		0.05		

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

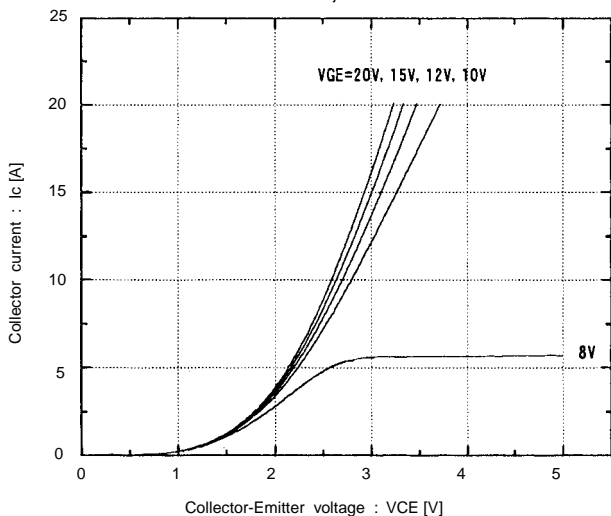
### ■ Equivalent Circuit Schematic



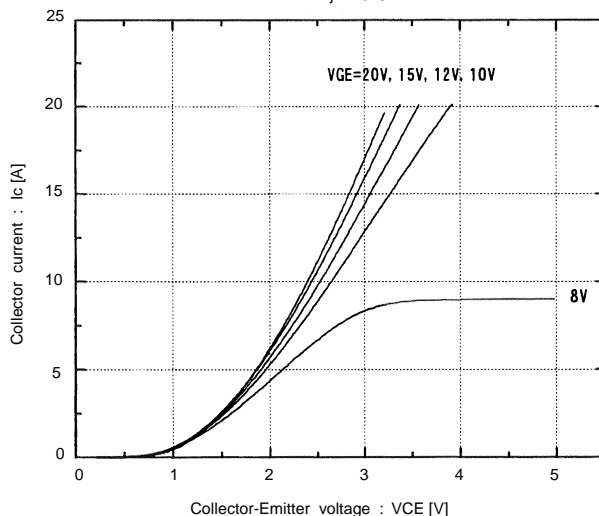
■ Characteristics (Representative)

● Inverter

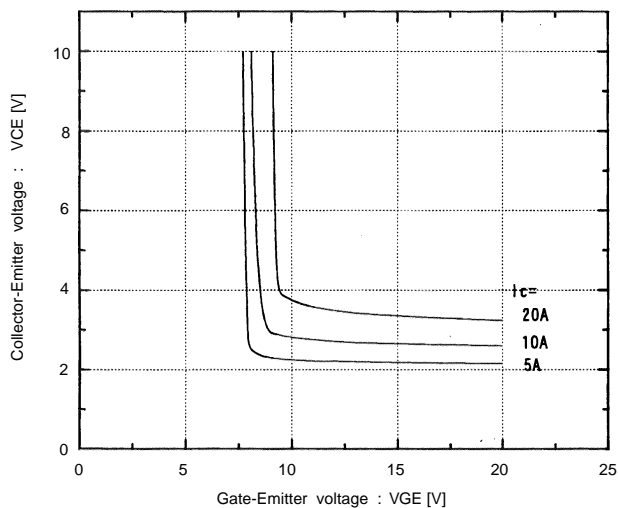
Collector current vs. Collector-Emitter voltage  
T<sub>J</sub>=25°C



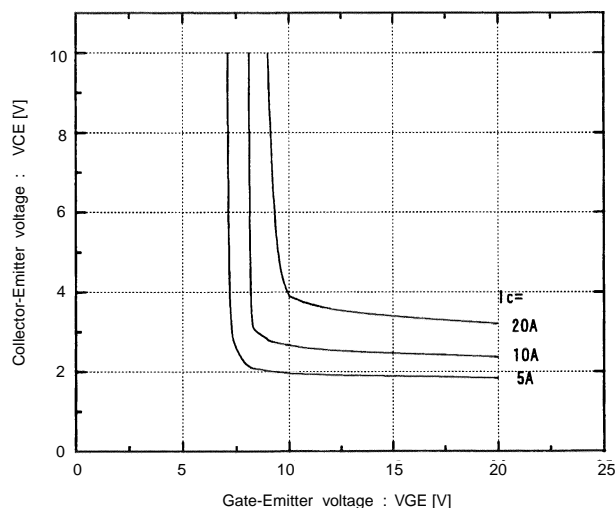
Collector current vs. Collector-Emitter voltage  
T<sub>J</sub>=125°C



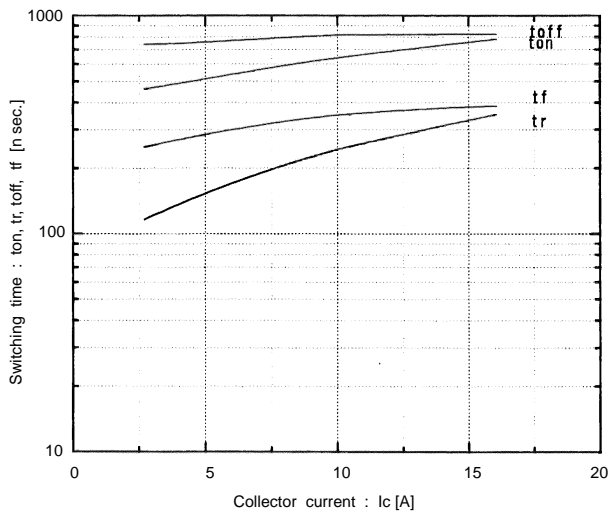
Collector-Emitter vs. Gate-Emitter voltage  
T<sub>J</sub>=25°C



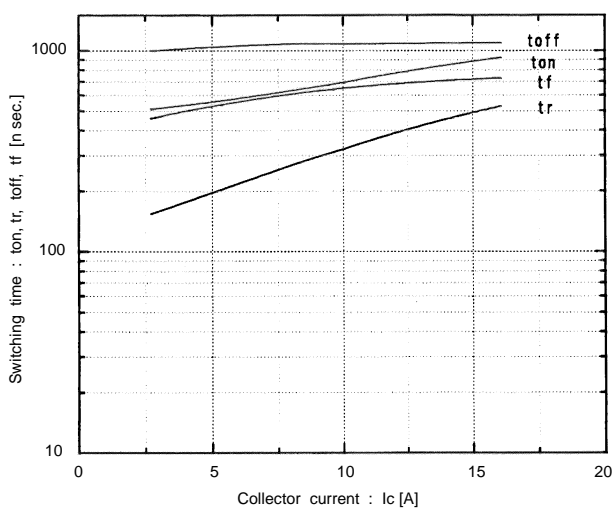
Collector-Emitter vs. Gate-Emitter voltage  
T<sub>J</sub>=125°C



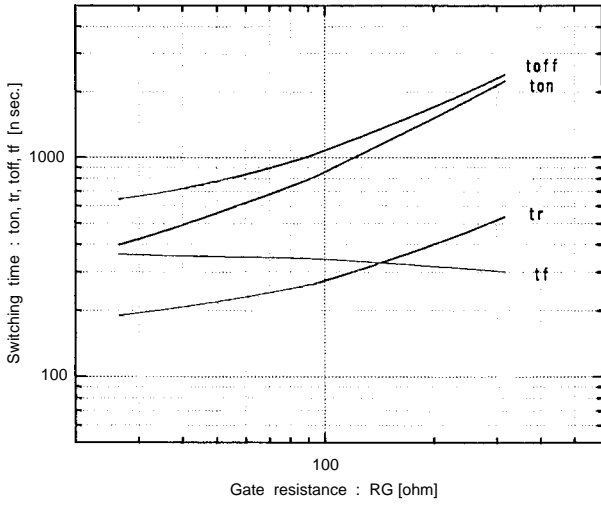
Switching time vs. Collector current  
V<sub>cc</sub>=600V, R<sub>G</sub>=62 ohm, V<sub>GE</sub>=±15V, T<sub>J</sub>=25°C



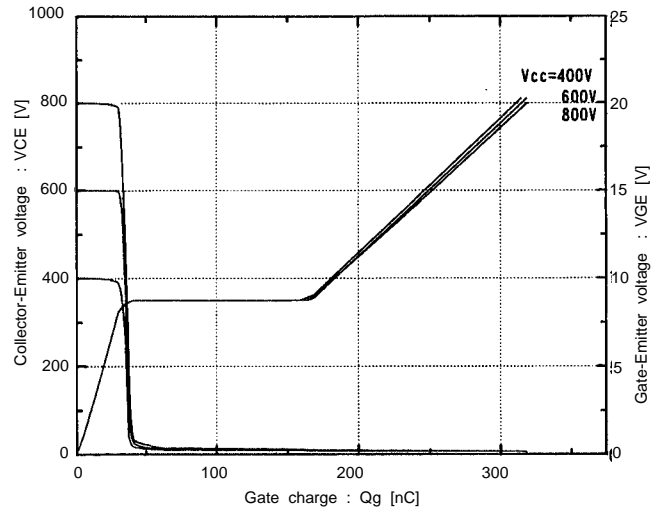
Switching time vs. Collector current  
V<sub>cc</sub>=600V, R<sub>G</sub>=62 ohm, V<sub>GE</sub>=±15V, T<sub>J</sub>=125°C



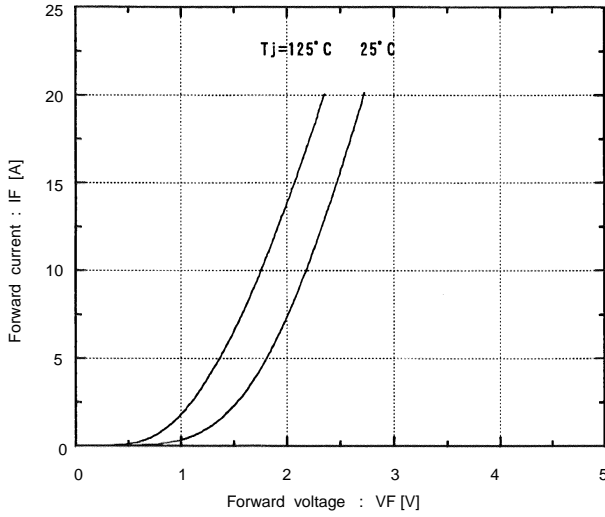
Switching time vs. RG  
 $V_{cc}=600V, I_c=10A, V_{GE}=\pm 15V, T_j=25^\circ C$



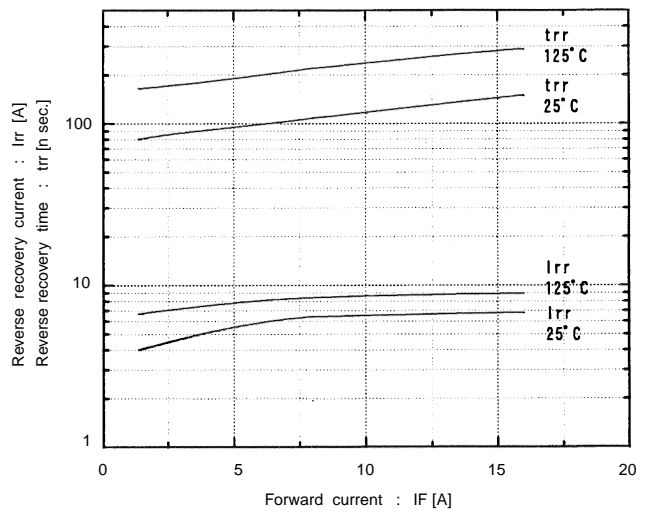
Dynamic input characteristics  
 $T_j=25^\circ C$



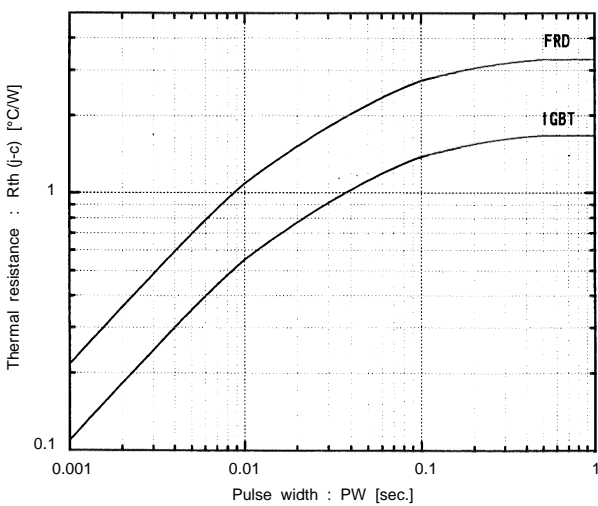
Forward current vs. Forward voltage  
 $V_{GE}=0V$



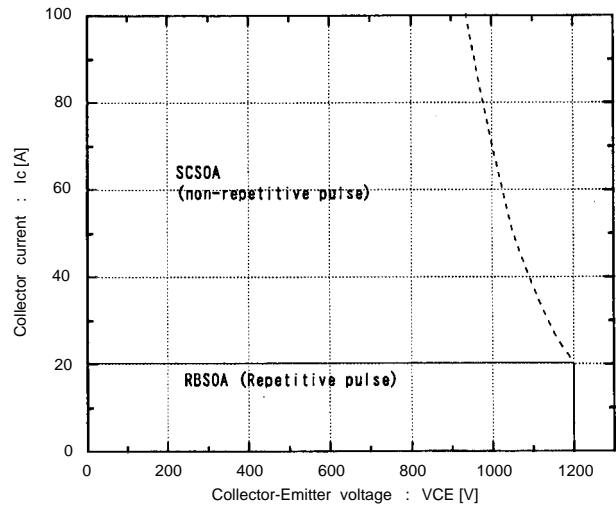
Reverse recovery characteristics  
 $t_{rr}, I_{rr}$  vs.  $I_F$



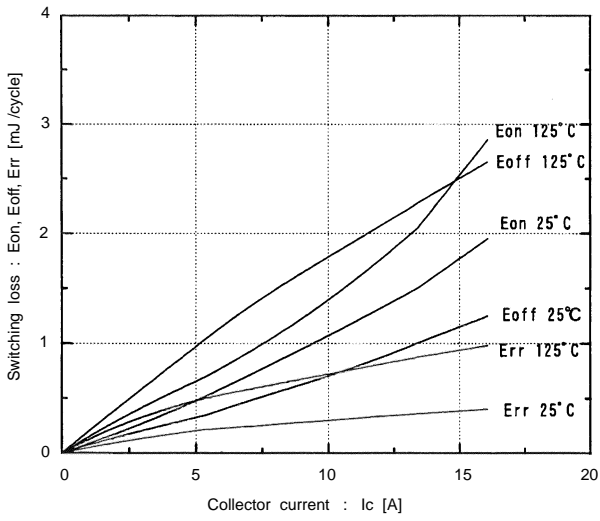
Transient thermal resistance



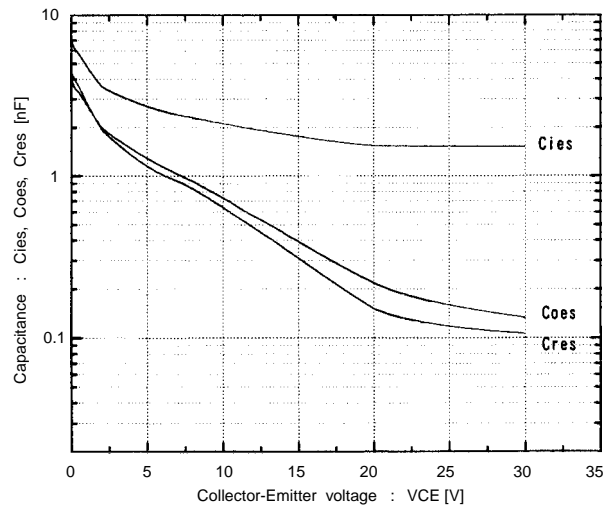
Reversed biased safe operating area  
 $+V_{GE}=15V, -V_{GE} \le 15V, T_j \le 125^\circ C, R_G \ge 62 \text{ ohm}$



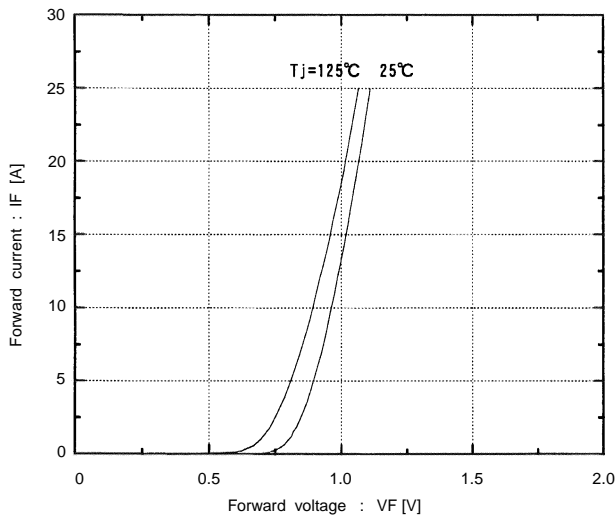
Switching loss vs. Collector current  
 $V_{cc}=600V, R_G=62\text{ ohm}, V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage  
 $T_j=25^\circ C$

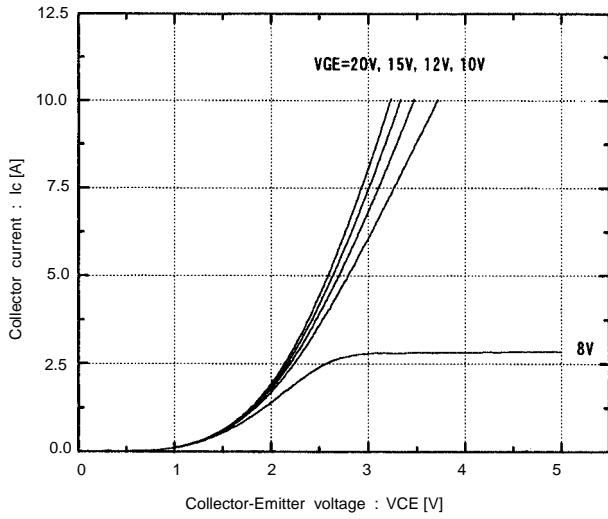


Converter Diode  
 Forward current vs. Forward voltage

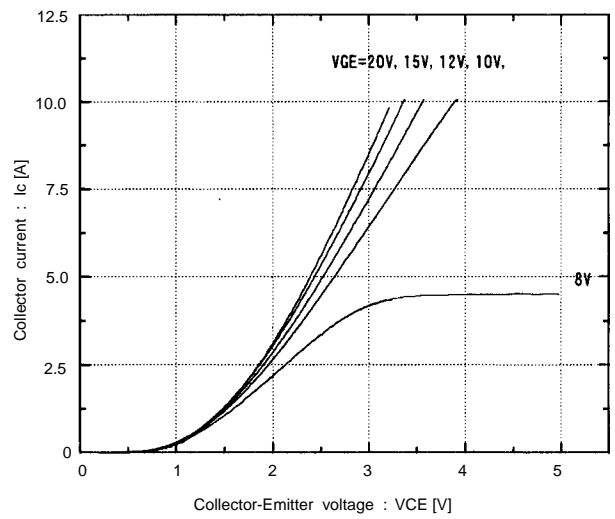


● Brake

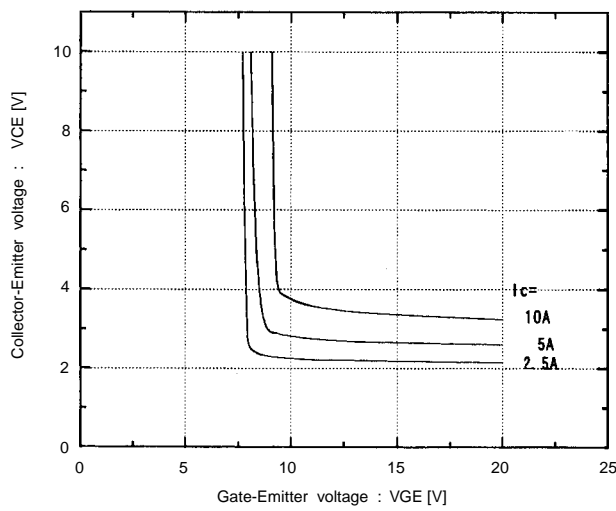
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=25°C



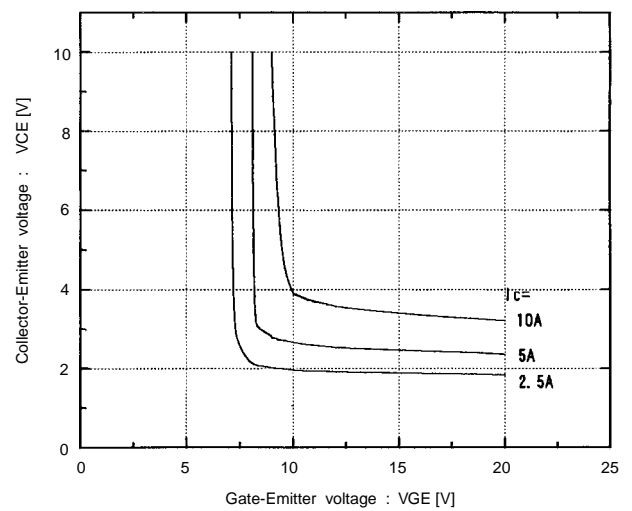
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=125°C



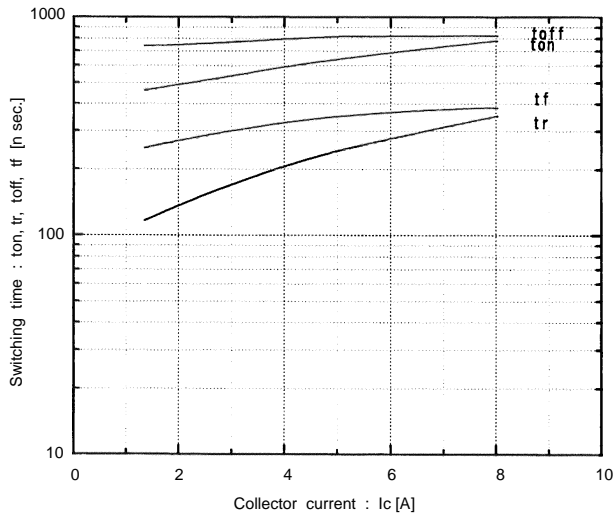
Collector-Emitter vs. Gate-Emitter voltage  
T<sub>j</sub>=25°C



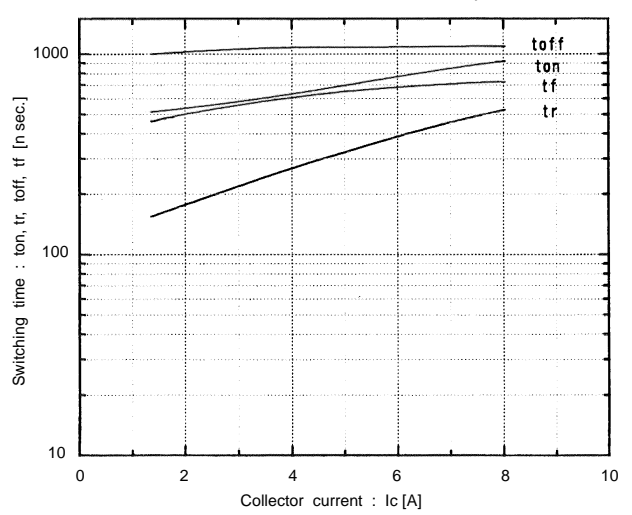
Collector-Emitter vs. Gate-Emitter voltage  
T<sub>j</sub>=125°C



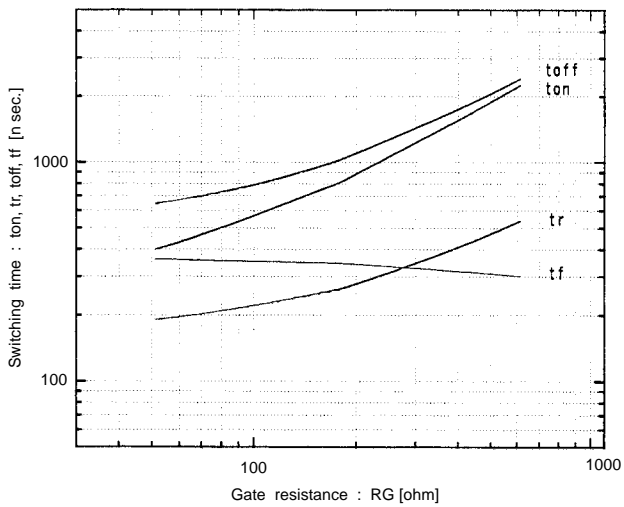
Switching time vs. Collector current  
V<sub>cc</sub>=600V, R<sub>G</sub>=120 ohm, V<sub>GE</sub>=±15V, T<sub>j</sub>=25°C



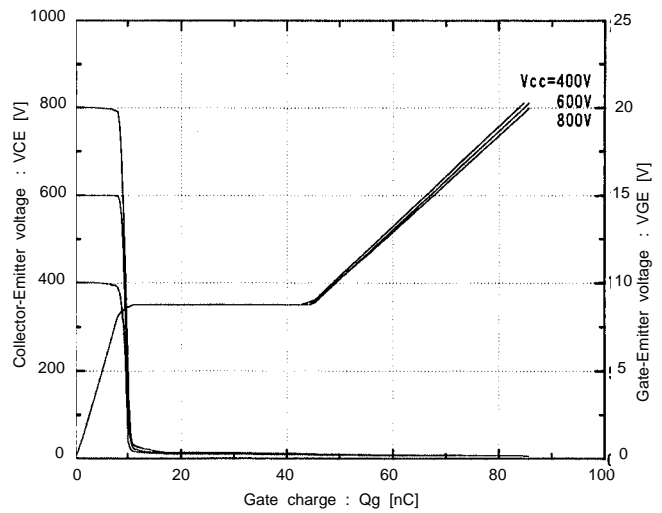
Switching time vs. Collector current  
V<sub>cc</sub>=600V, R<sub>G</sub>=120 ohm, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C



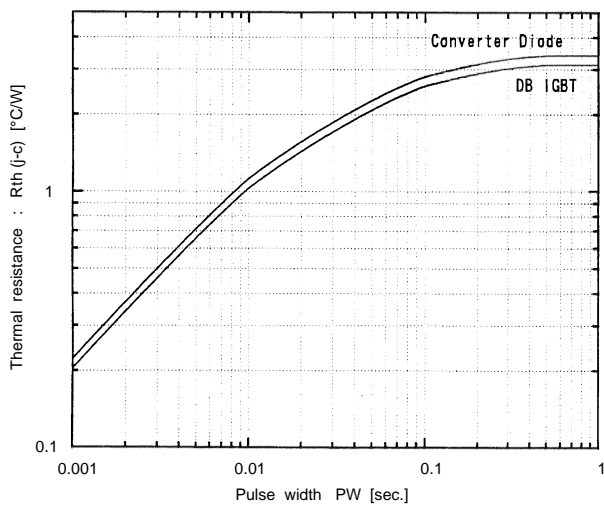
Switching time vs.  $R_G$   
 $V_{CC}=600V, I_c=5A, V_{GE}=\pm 15V, T_j=25^\circ C$



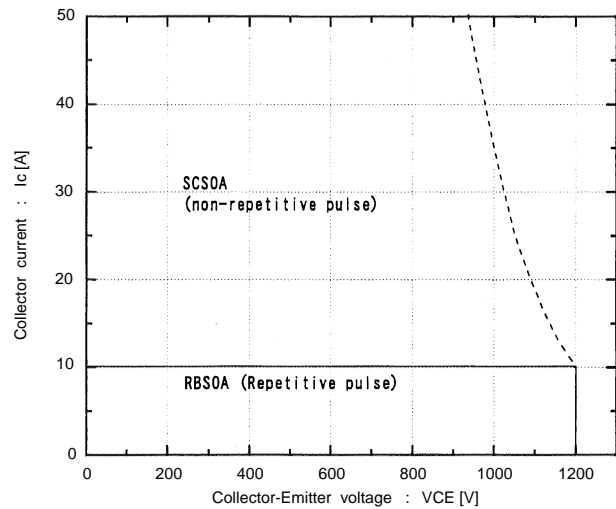
Dynamic input characteristics  
 $T_j=25^\circ C$



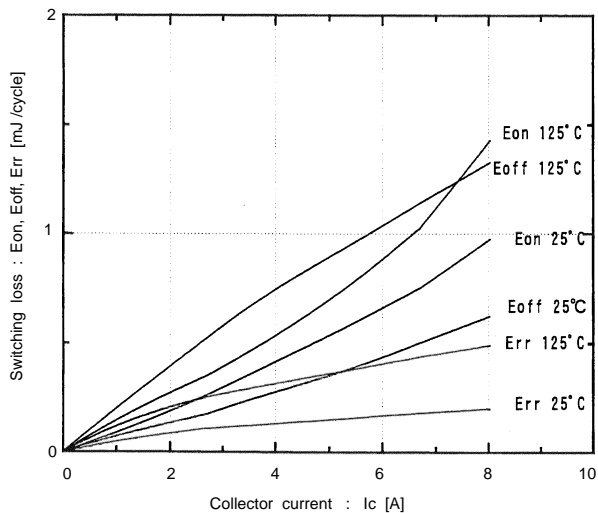
Transient thermal resistance



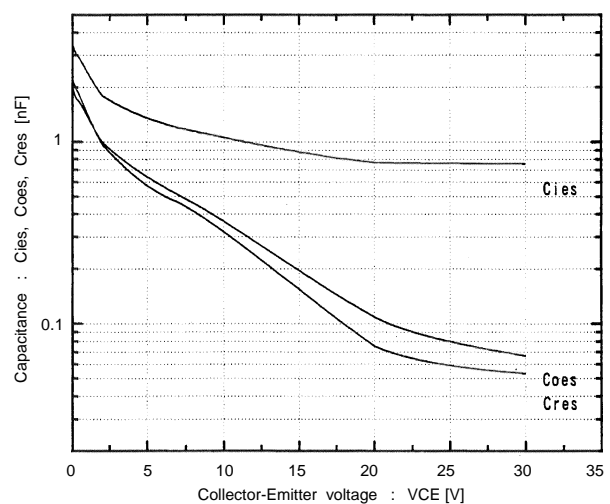
Reversed biased safe operating area  
 $+V_{GE}=15V, -V_{GE} \le 15V, T_j \le 125^\circ C, R_G \ge 120 \text{ ohm}$



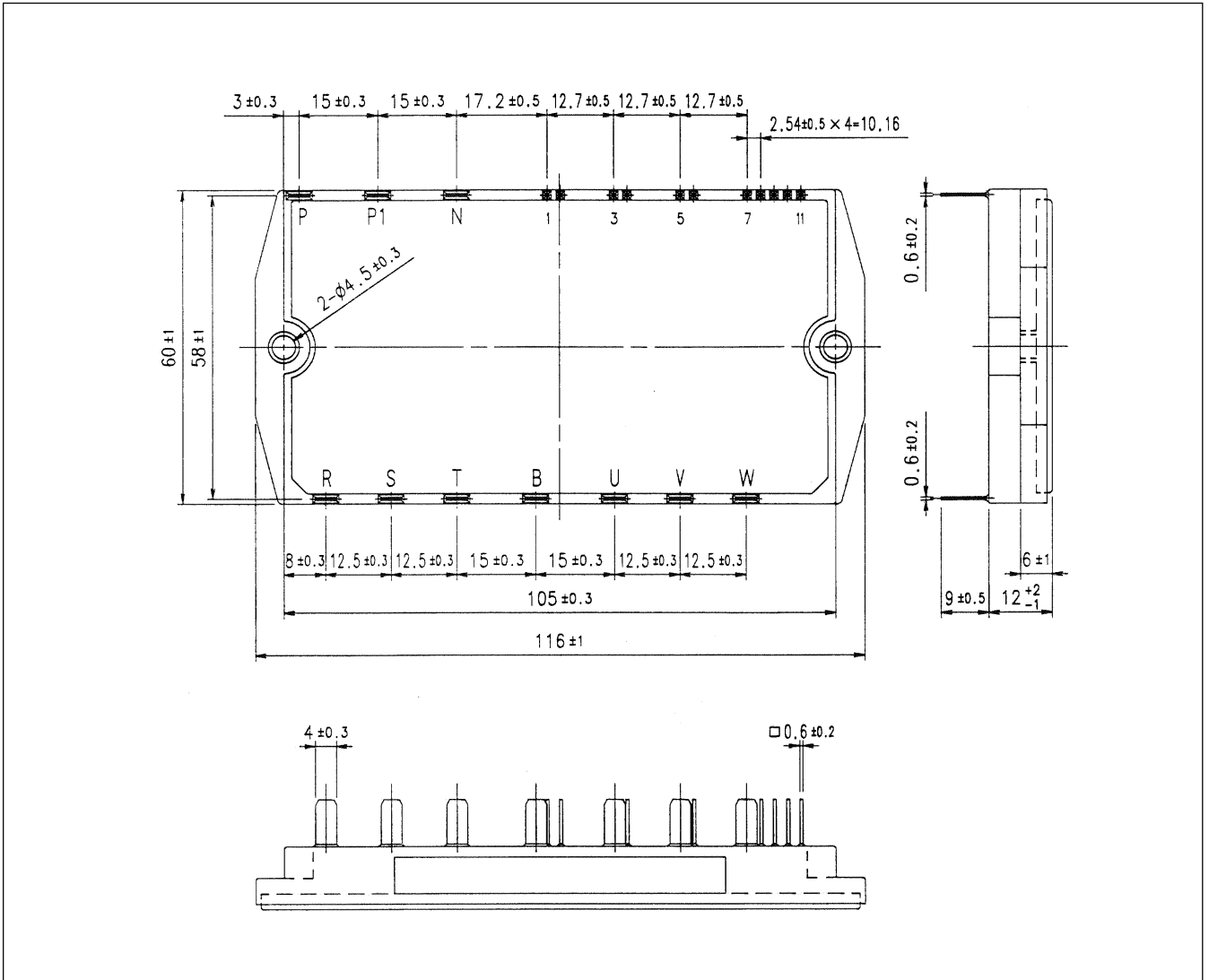
Switching loss vs. Collector current  
 $V_{CC}=600V, R_G=120 \text{ ohm}, V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage  
 $T_j=25^\circ C$



■ Outline Drawings, mm





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