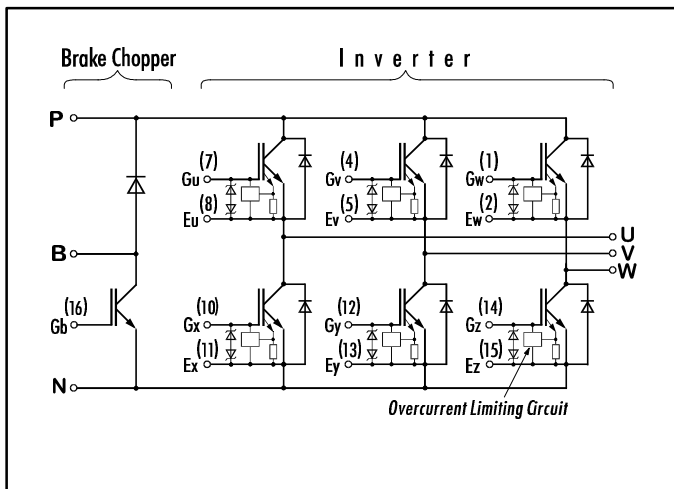


IGBT MODULE (N series)

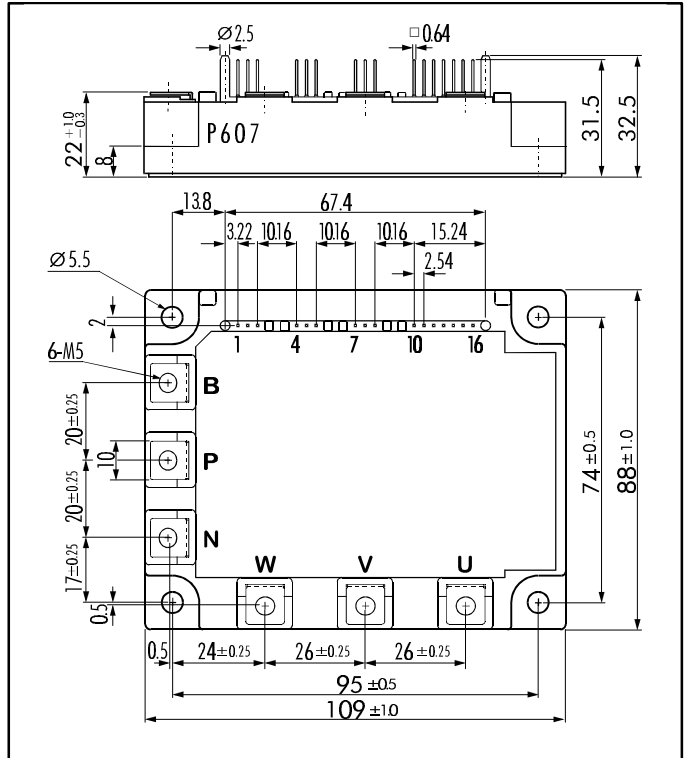
■ Features

- Including Brake Chopper
- Square RBSOA
- Low Saturation Voltage
- Overcurrent Limiting Function
(~ 3 Times Rated Current)

■ Equivalent Circuit



■ Outline Drawing



■ Absolute Maximum Ratings (T_c=25°C)

		Items	Symbols	Test Conditions	Ratings	Units		
Inverter		Collector-Emitter Voltage	V _{CES}		600	V		
		Gate -Emitter Voltage	V _{GES}		± 20			
		Collector Current	I _C	Continuous	75	A		
			I _{C PULSE}	1ms	150			
				-I _{C PULSE}	Continuous	75		
		Collector Power Dissipation	P _C	1 device	320	W		
Brake Chopper	IGBT	Collector-Emitter Voltage	V _{CES}		600	V		
		Gate -Emitter Voltage	V _{GES}		± 20			
		Collector Current	I _C	Continuous	50	A		
			I _{C PULSE}	1ms	100			
				Collector Power Dissipation	P _C	1 device	200	W
		FWD		Repetitive Peak Reverse Voltage	V _{RRM}		600	V
				Average Forward Current	I _{F(AV)}		1	A
	Surge Current		I _{FSM}	10ms	50			
		Operating Junction Temperature	T _j		+150	°C		
		Storage Temperature	T _{Stg}		-40 ~ +125			
		Isolation Voltage	V _{ISO}	A.C. 1min.	2500	V		
		Mounting Screw Torque *1			3.5	Nm		
		Terminal Screw Torque *1			3.5			

Note: *1:Recommendable Value; 2.5 ~ 3.5 Nm (M5)

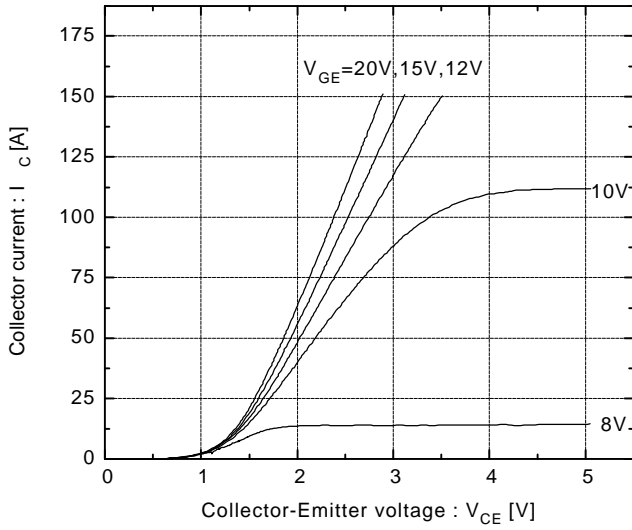
■ Electrical Characteristics ($T_j=25^\circ\text{C}$)

Items		Symbols	Test Conditions	Min.	Max.	Units	
Inverter	IGBT	Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=600V$		3.0	mA
		Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$		15	μA
		Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=20V$ $I_C=75\text{mA}$	4.5	7.5	V
		Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=75A$		2.8	V
		Input capacitance	C_{ies}	$f=1\text{MHz}$, $V_{GE}=0V$, $V_{CE}=10V$	4950 (typ.)		pF
		Turn-on Time	t_{on}	$V_{CC}=300V$ $I_C = 75A$		1.2	μs
			Turn-off Time	t_{off}	$V_{GE}=\pm 15V$	1.5	
	t_f	$R_G = 33\Omega$		0.35			
FWD	Diode	Diode Forward On-Voltage	V_F	$I_F=75A$ $V_{GE}=0V$		3.0	V
		Reverse Recovery Time	t_{rr}	$I_F=75A$; $V_{GE}=-10V$; $^{-dI/dt}=225 \text{ A}/\mu\text{s}$		300	ns
Brake Chopper	IGBT	Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=600V$		1.0	mA
		Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$		100	nA
		Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=50A$		2.8	V
		Turn-on Time	t_{on}	$V_{CC}=300V$ $I_C = 50A$		1.2	μs
			Turn-off Time	t_{off}	$V_{GE}=\pm 15V$	1.5	
				t_f	$R_G = 51\Omega$	0.35	
		FWD	Diode	Reverse Current	I_{RRM}	$V_R=600V$	
Reverse Recovery Time	t_{rr}					600	ns

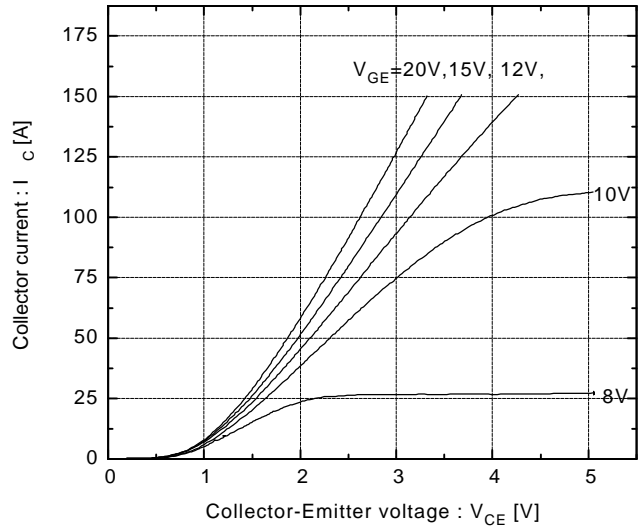
■ Thermal Characteristics

Items	Symbols	Test Conditions	Min.	Max.	Units
Thermal Resistance (1 device)	$R_{th(f-c)}$	Inverter IGBT		0.39	$^\circ\text{C/W}$
		Inverter FRD		0.90	
		Brake IGBT		0.63	
Contact Thermal Resistance	$R_{th(c-f)}$	With Thermal Compound	0.05 (typ.)		

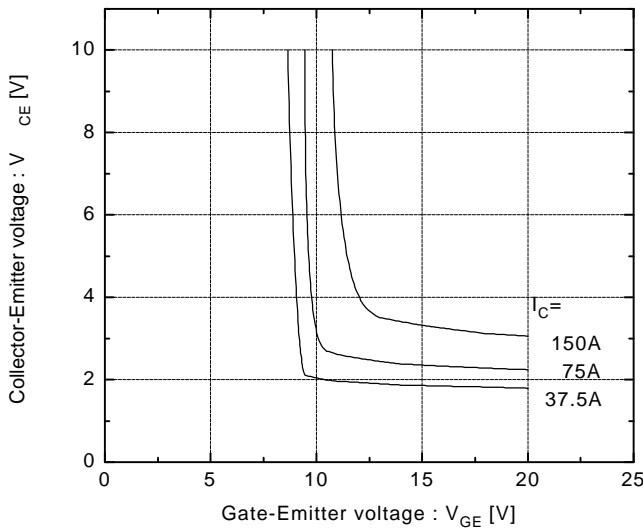
Collector current vs. Collector-Emitter voltage
 $T_j=25^\circ\text{C}$



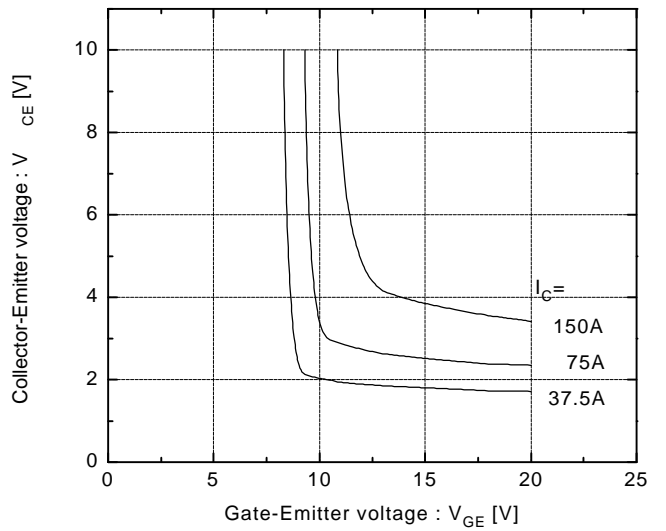
Collector current vs. Collector-Emitter voltage
 $T_j=125^\circ\text{C}$



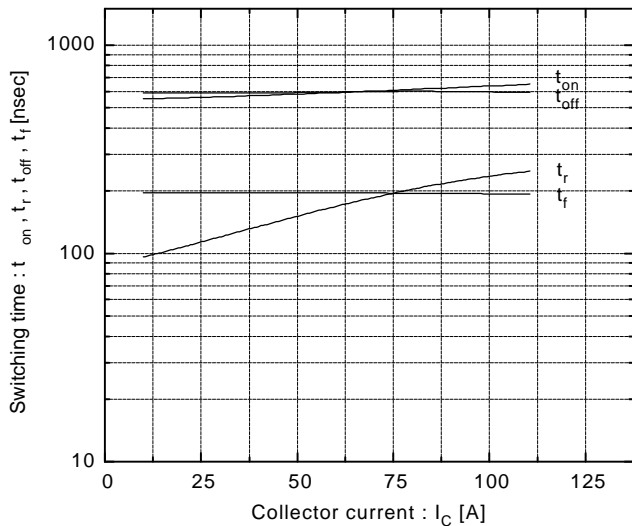
Collector-Emitter vs. Gate-Emitter voltage
 $T_j=25^\circ\text{C}$



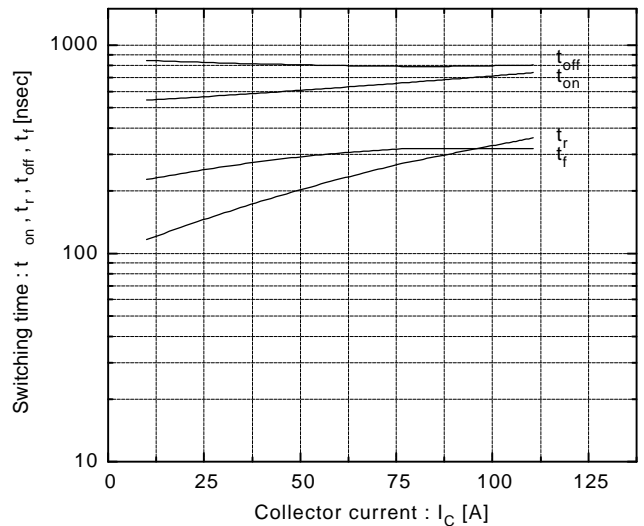
Collector-Emitter vs. Gate-Emitter voltage
 $T_j=125^\circ\text{C}$



Switching time vs. Collector current
 $V_{CC}=300\text{V}, R_G=33\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$

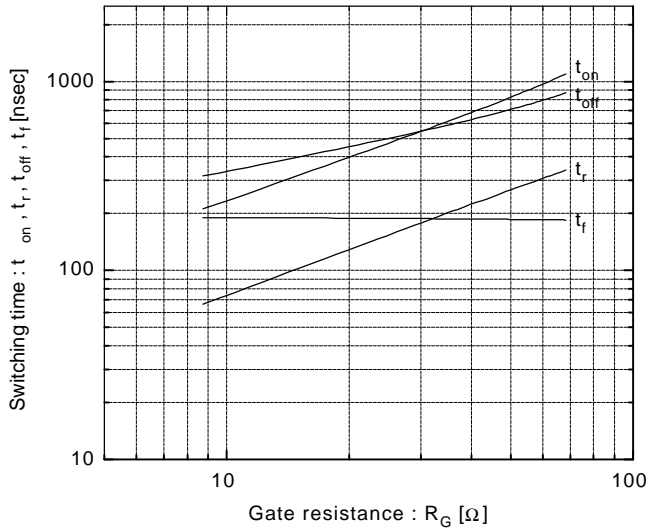


Switching time vs. Collector current
 $V_{CC}=300\text{V}, R_G=33\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$



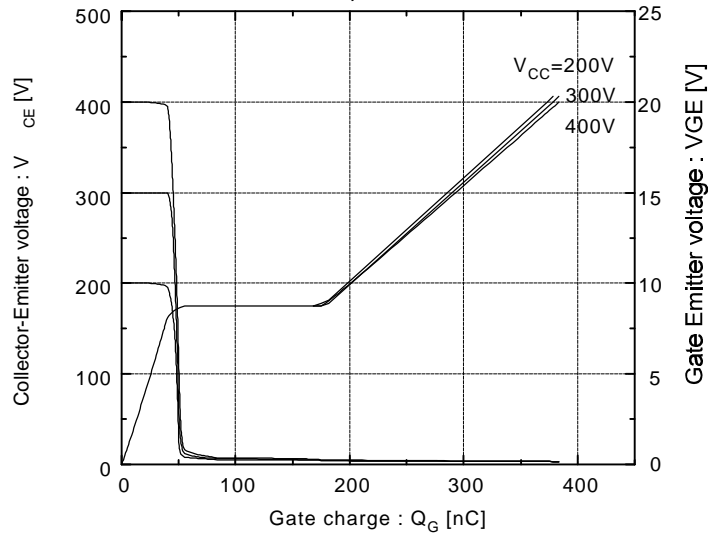
Switching time vs. R_G

$V_{CC}=300V, I_C=75A, V_{GE}=\pm 15V, T_J=25^\circ C$



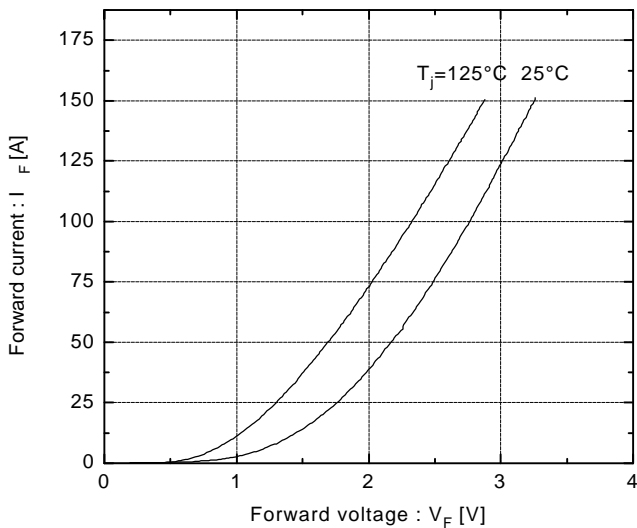
Dynamic input characteristics

$T_J=25^\circ C$



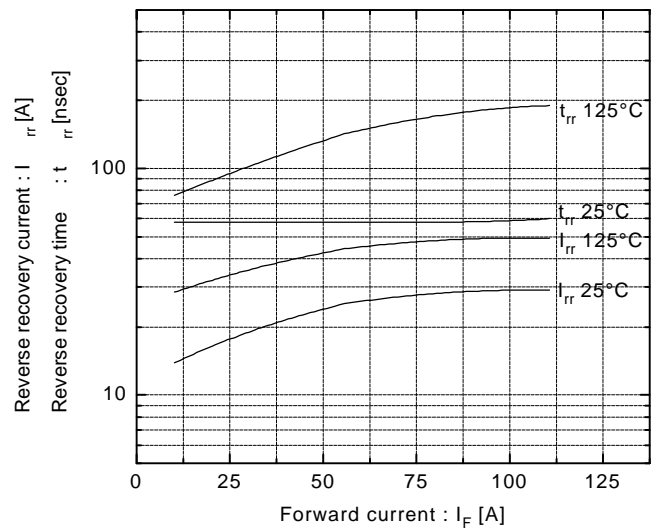
Forward current vs. Forward voltage

$V_{GE}=0V$

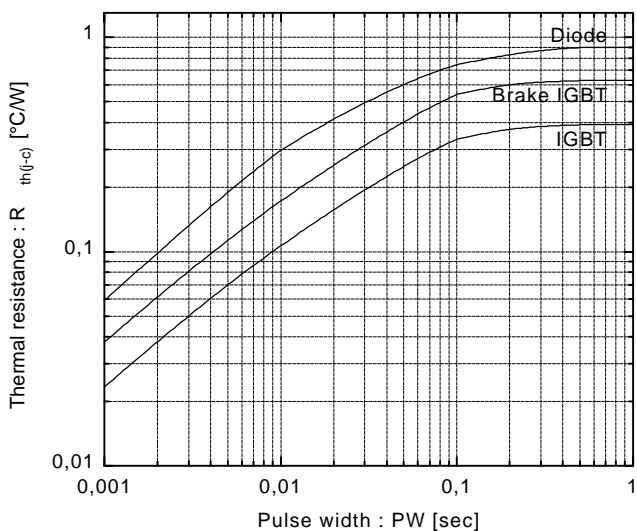


Reverse recovery characteristics

t_{rr}, I_{rr} vs. I_F

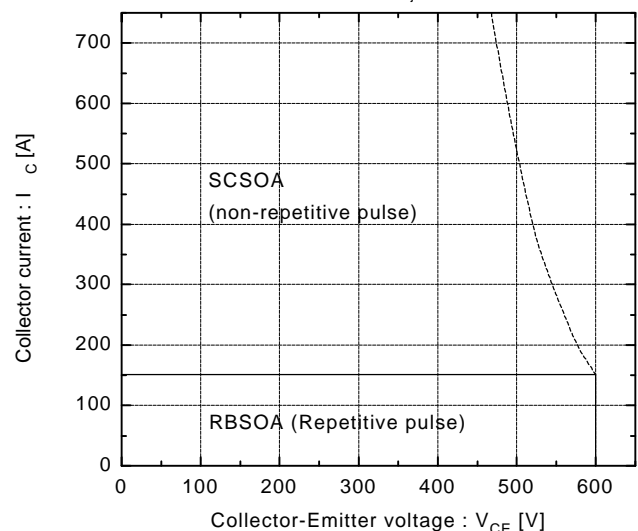


Transient thermal resistance



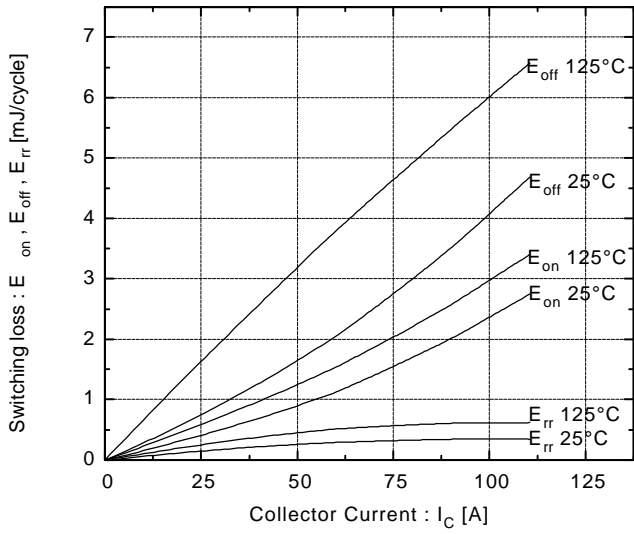
Reversed biased safe operating area

$+V_{GE}=15V, -V_{GE}\leq 15V, T_J\leq 125^\circ C, R_G\geq 33\Omega$



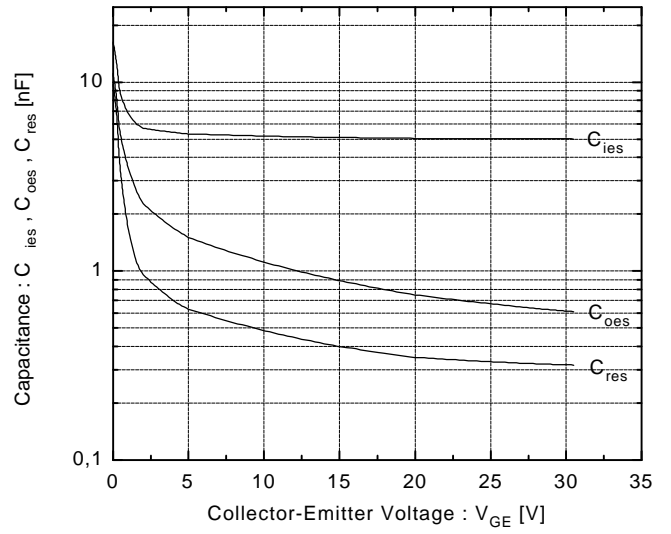
Switching loss vs. Collector current

$V_{CC}=300V, R_G=33\Omega, V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage

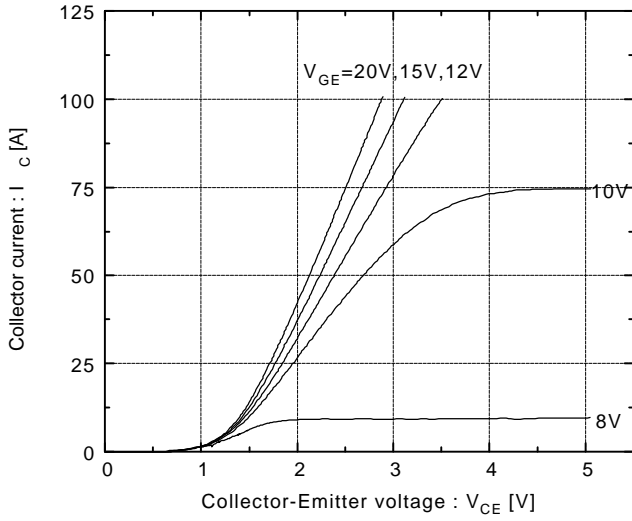
$T_j=25^\circ C$



Brake Chopper IGBT

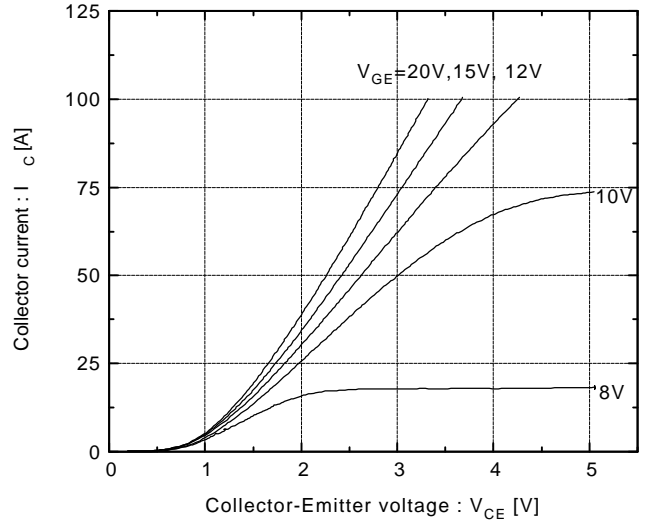
Collector current vs. Collector-Emmitter voltage

$T_j=25^\circ\text{C}$



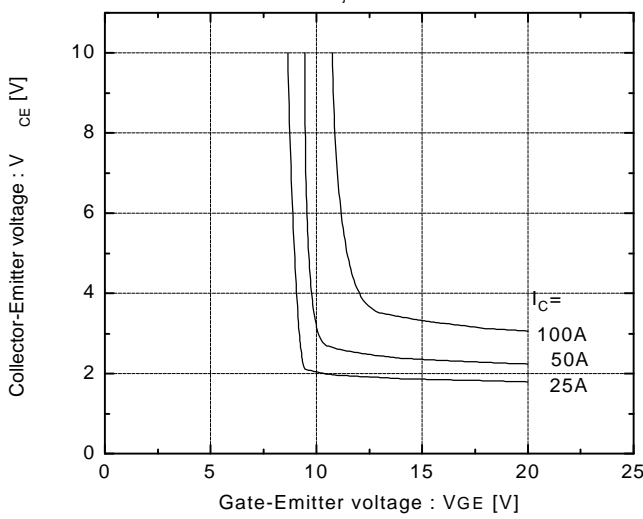
Collector current vs. Collector-Emmitter voltage

$T_j=125^\circ\text{C}$



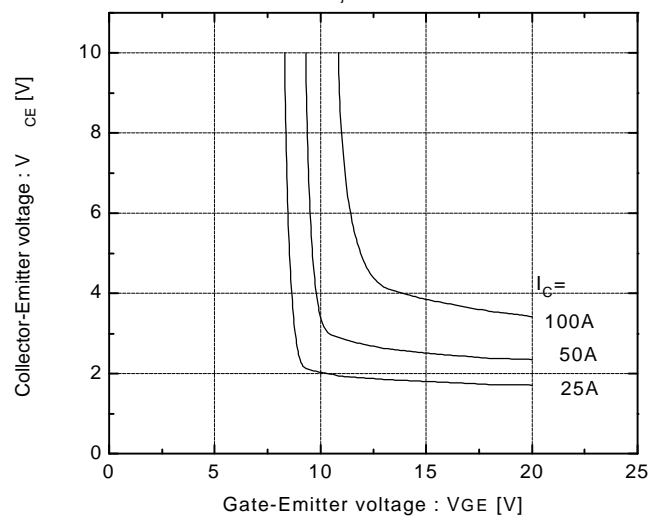
Collector-Emmitter vs. Gate-Emmitter voltage

$T_j=25^\circ\text{C}$

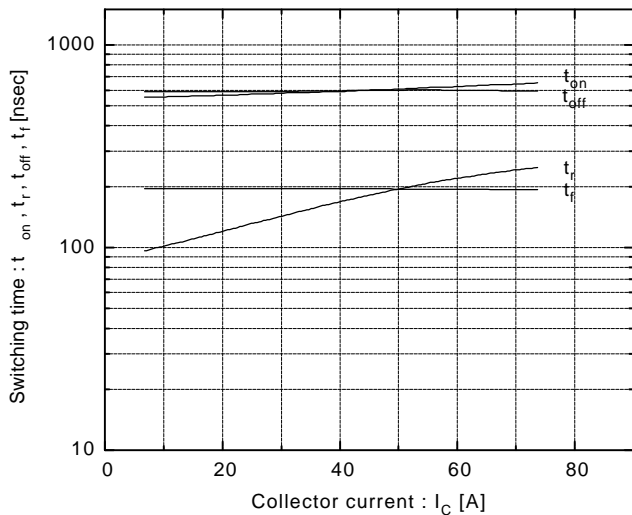


Collector-Emmitter vs. Gate-Emmitter voltage

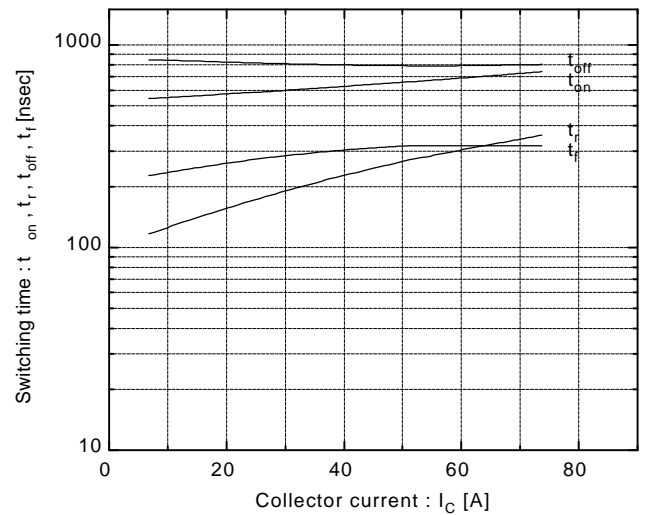
$T_j=125^\circ\text{C}$



Switching time vs. Collector current
 $V_{CC}=300\text{V}, R_G=51\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$



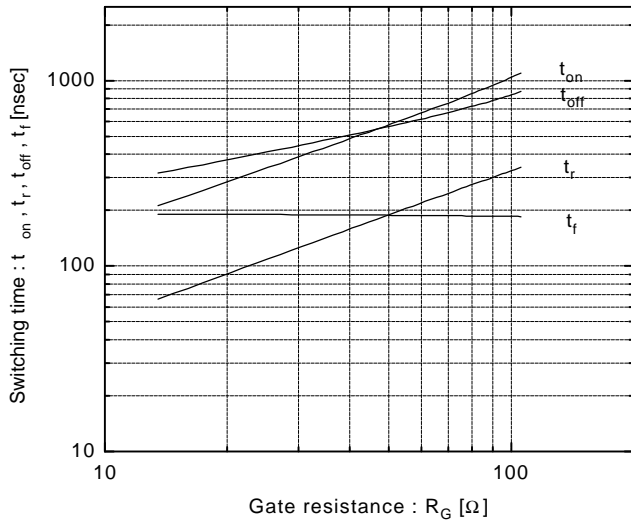
Switching time vs. Collector current
 $V_{CC}=300\text{V}, R_G=51\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$



Brake Chopper IGBT

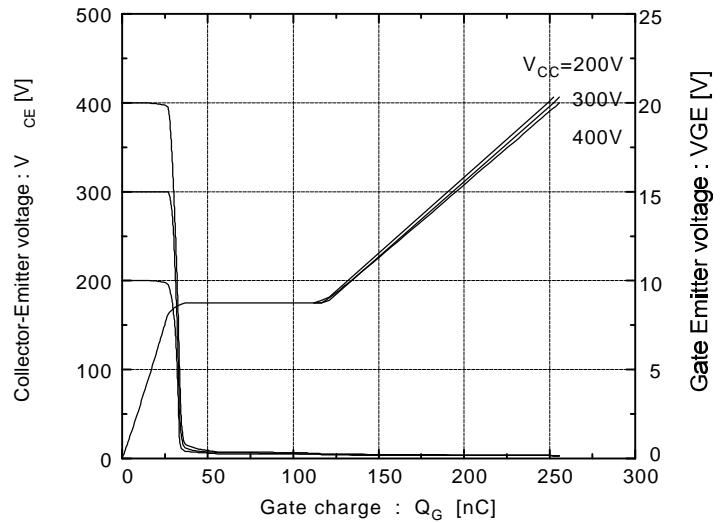
Switching time vs. R_G

$V_{CC}=300V, I_C=50A, V_{GE}=\pm 15V, T_J=25^\circ C$

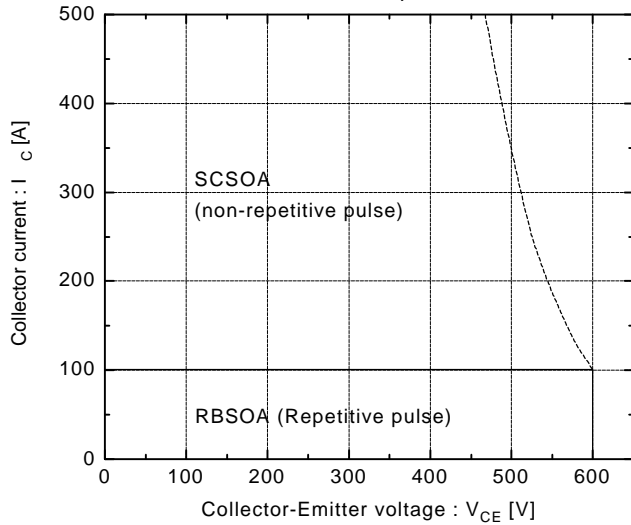


Dynamic input characteristics

$T_J=25^\circ C$

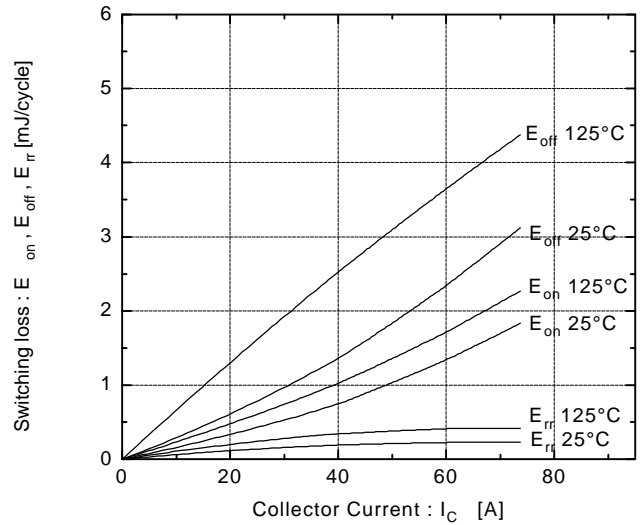


Reversed biased safe operating area
 $+V_{GE}=15V, -V_{GE}\leq 15V, T_J\leq 125^\circ C, R_G\geq 51\Omega$



Switching loss vs. Collector current

$V_{CC}=300V, R_G=51\Omega, V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$

