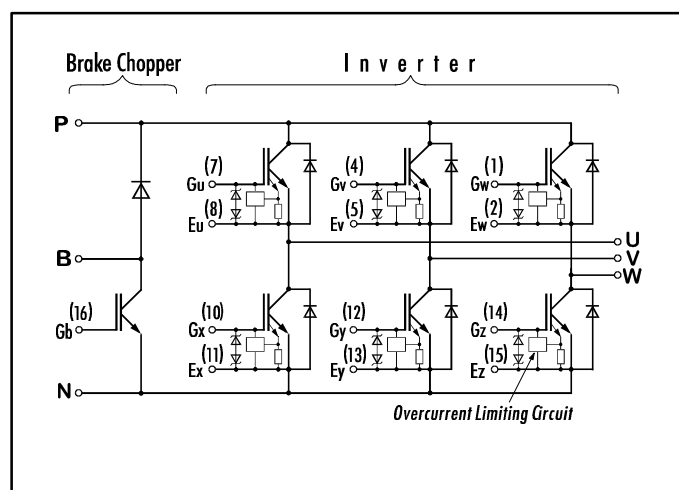


IGBT MODULE (N series)

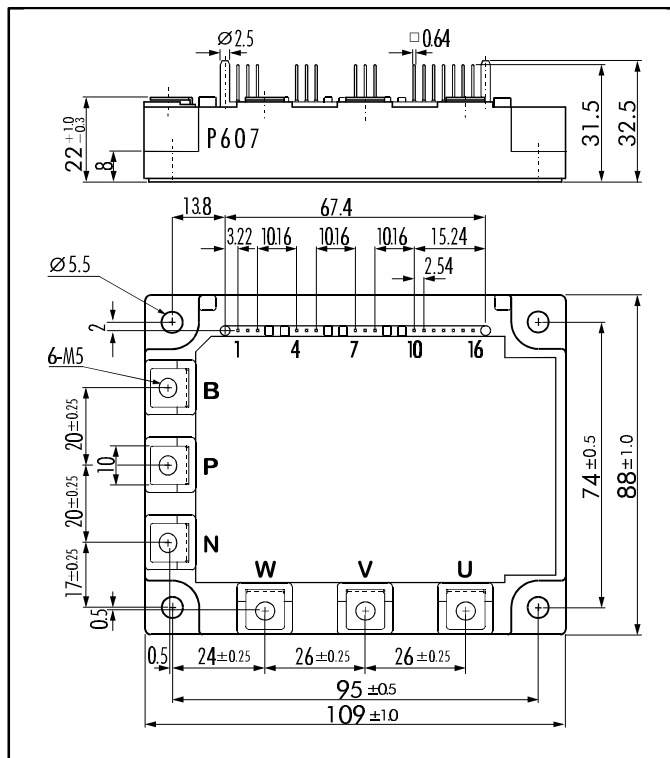
■ Features

- *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 _{CES}		± 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 _{Stq}		-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 ($T_j=25^{\circ}\text{C}$)

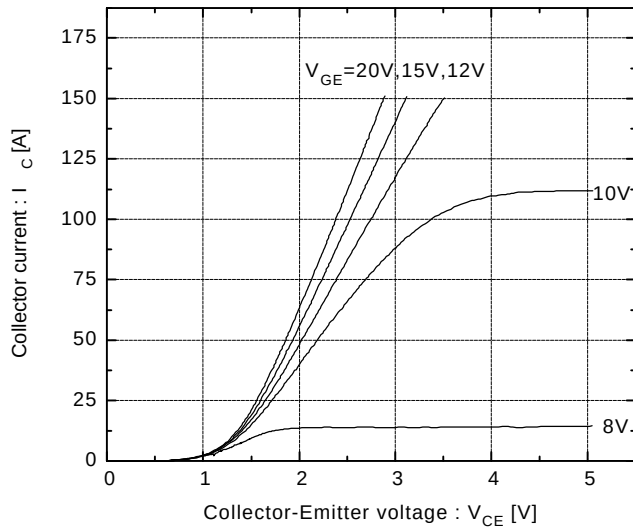
Items		Symbols	Test Conditions	Min.	Max.	Units
Inverter	IGBT	Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=600V$	3.0	mA
		Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$	15	μA
		Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=20V$ $I_C=75mA$	4.5	7.5
		Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=75A$	2.8	V
		Input capacitance	C_{ies}	$f=1MHz$, $V_{GE}=0V$, $V_{CE}=10V$	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 Forward On-Voltage	V_F	$I_F=75A$ $V_{GE}=0V$	3.0	V
		Reverse Recovery Time	t_{rr}	$I_F=75A$; $V_{GE}=-10V$; $\frac{-di}{dt}=225 \frac{A}{\mu s}$	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	Reverse Current	I_{RRM}	$V_R=600V$	1.0	mA
		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	°C/W
		Inverter FRD		0.90	
		Brake IGBT		0.63	
Contact Thermal Resistance	R _{th(c-f)}	With Thermal Compound	0.05 (typ.)		

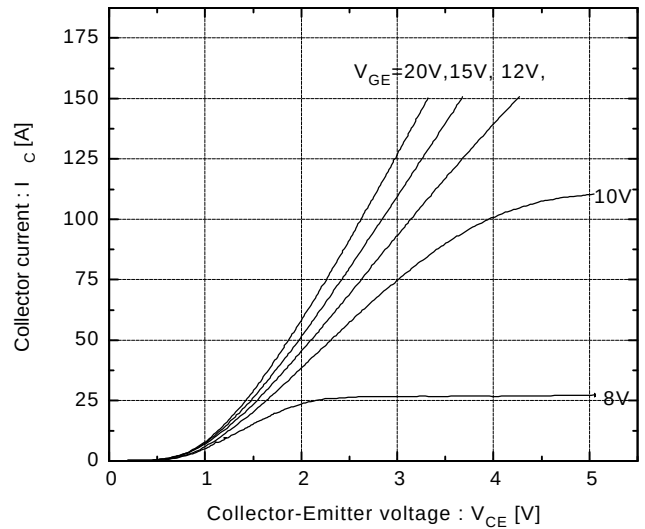
Collector current vs. Collector-Emitter voltage

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



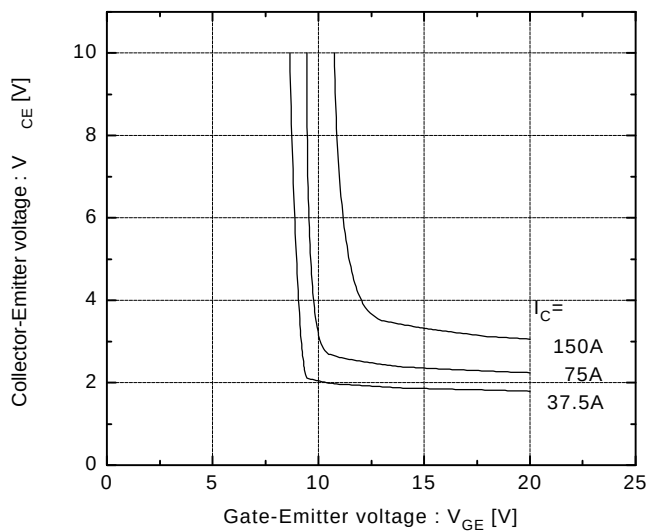
Collector current vs. Collector-Emitter voltage

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



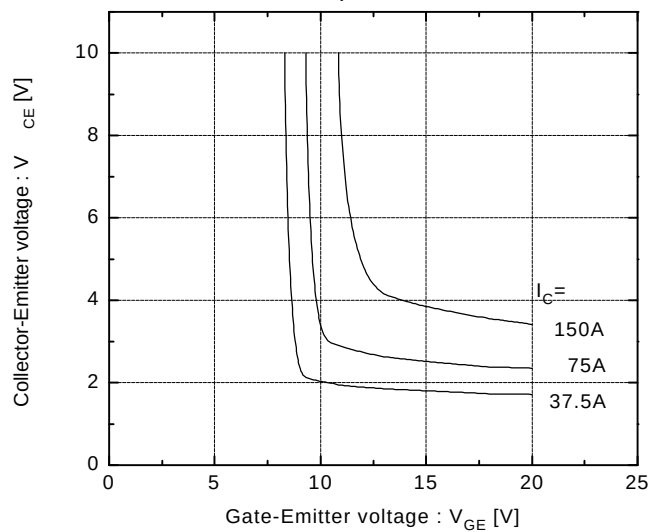
Collector-Emitter vs. Gate-Emitter voltage

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



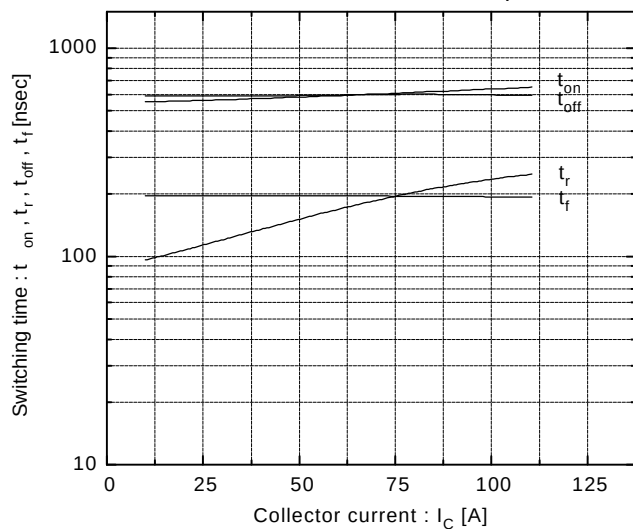
Collector-Emitter vs. Gate-Emitter voltage

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



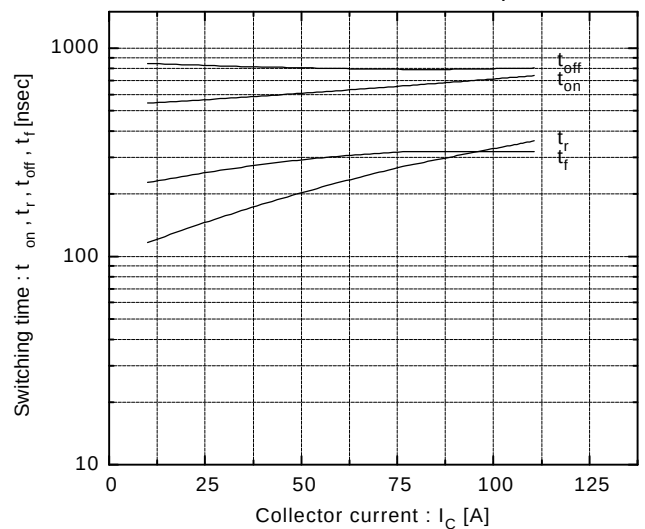
Switching time vs. Collector current

$V_{CC}=300\text{V}$, $R_G=33\Omega$, $V_{GE}=\pm 15\text{V}$, $T_j=25^\circ\text{C}$



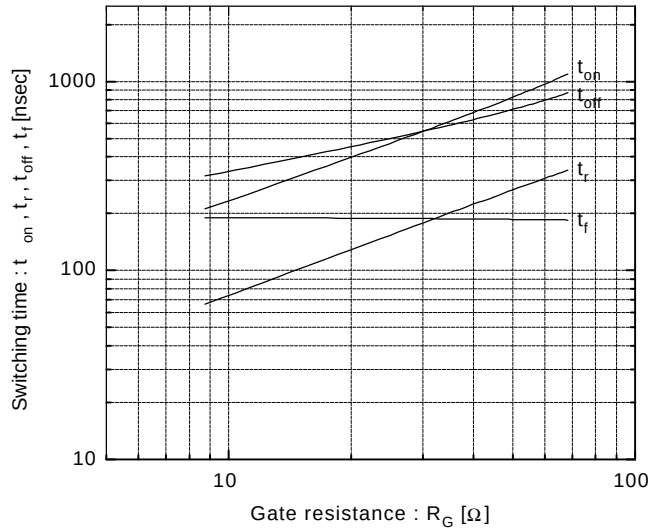
Switching time vs. Collector current

$V_{CC}=300\text{V}$, $R_G=33\Omega$, $V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$



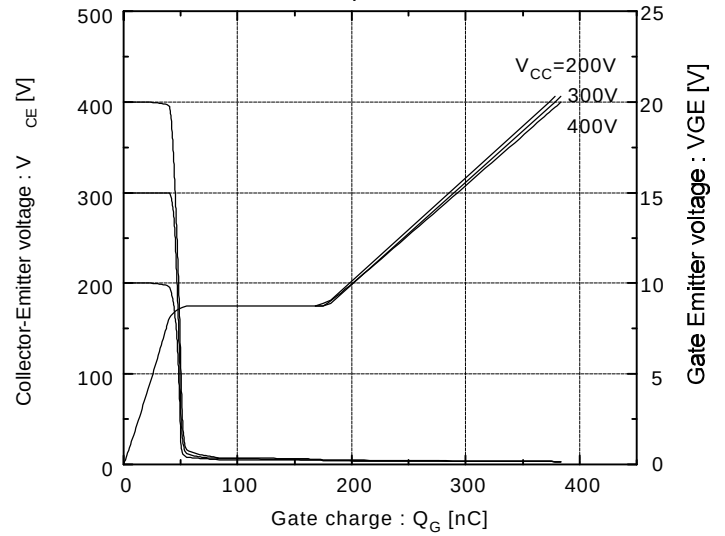
Switching time vs. R_G

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



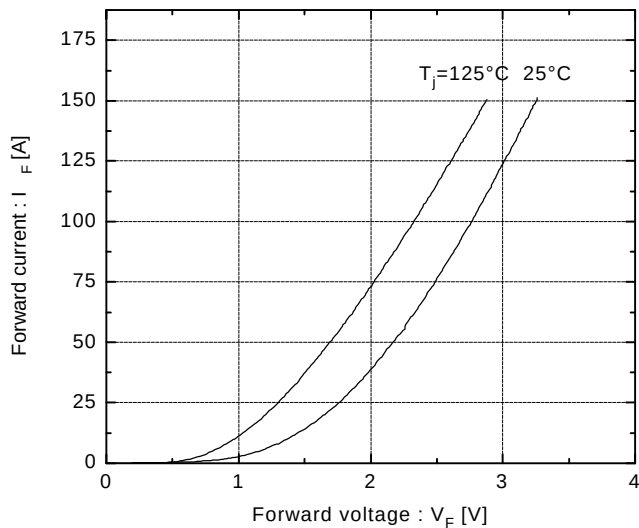
Dynamic input characteristics

$T_J=25^\circ C$



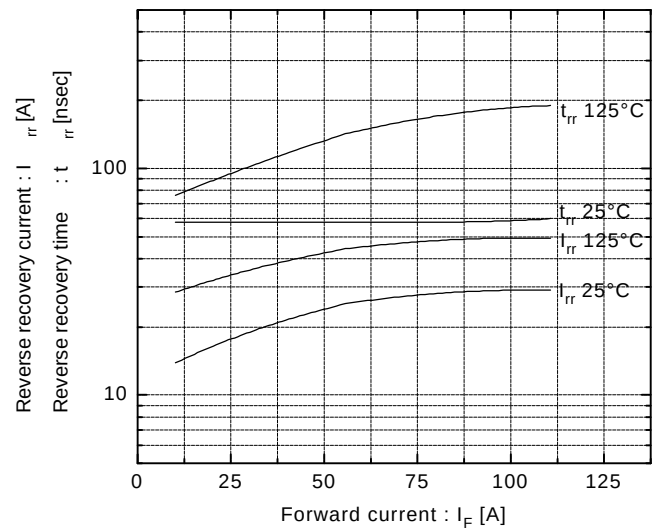
Forward current vs. Forward voltage

$V_{GE}=0V$

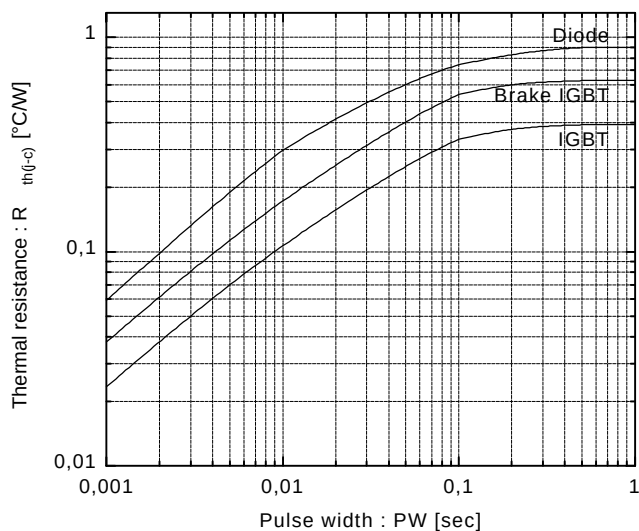


Reverse recovery characteristics

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

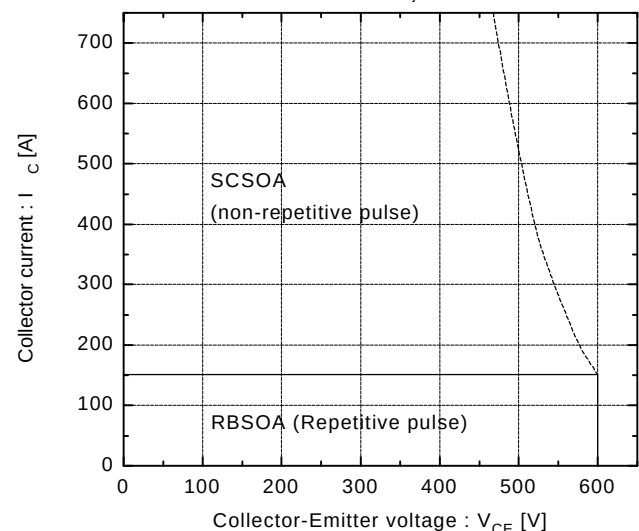


Transient thermal resistance



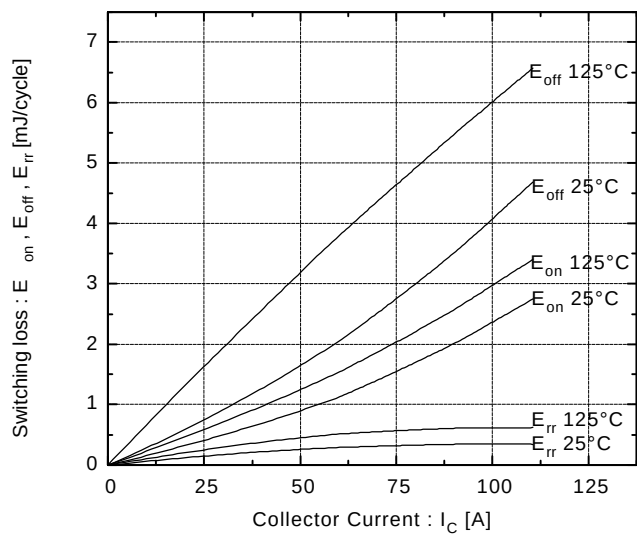
Reversed biased safe operating area

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



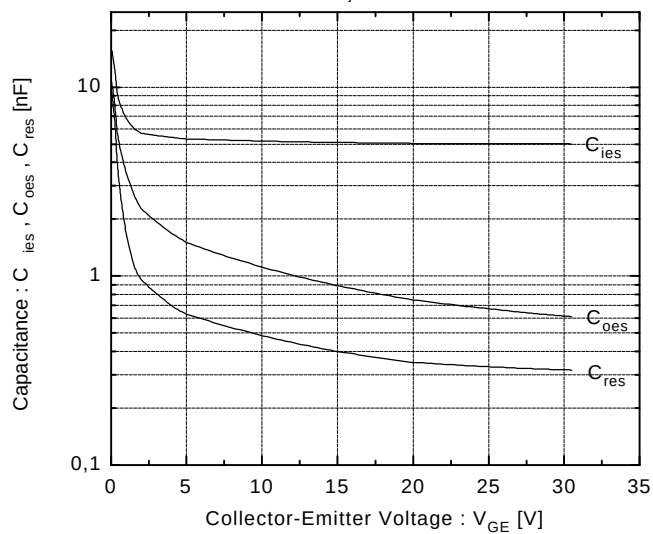
Switching loss vs. Collector current

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



Capacitance vs. Collector-Emitter voltage

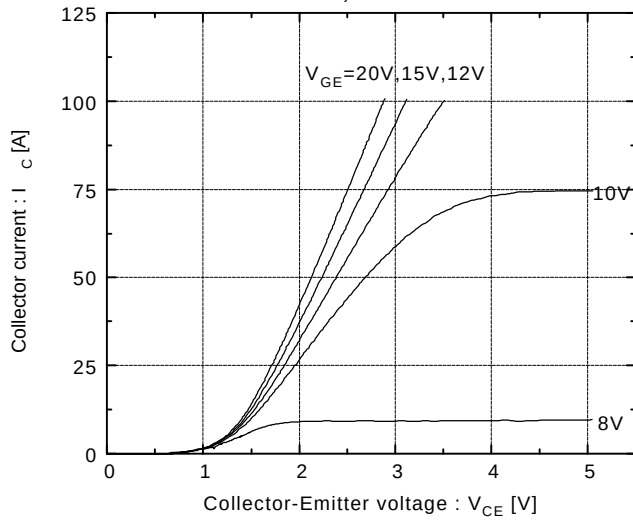
$T_j=25^\circ C$



Brake Chopper IGBT

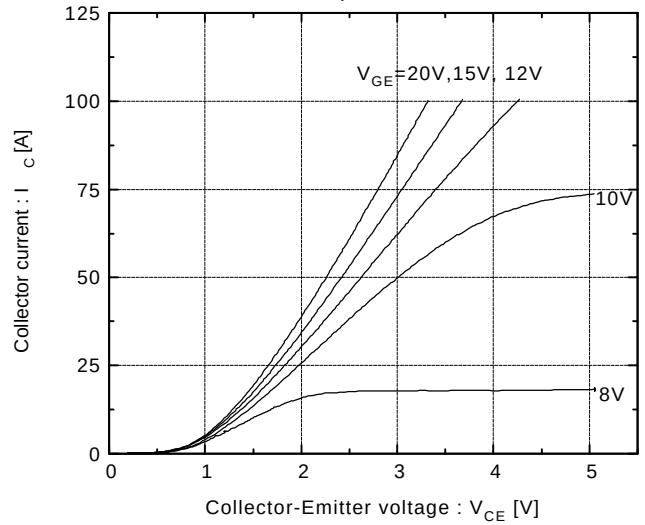
Collector current vs. Collector-Emmitter voltage

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



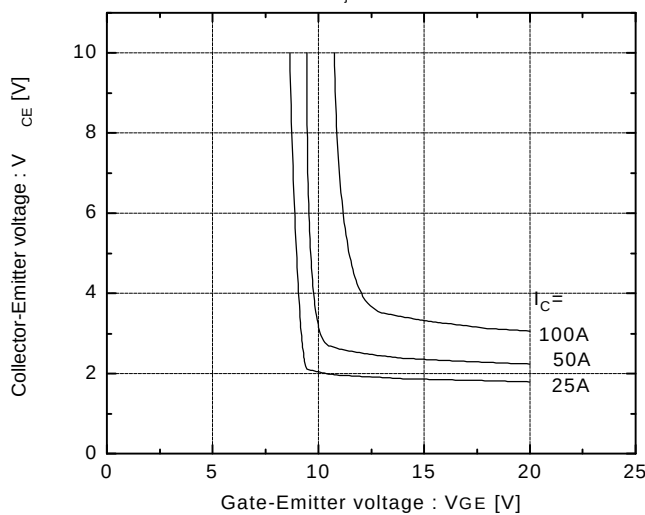
Collector current vs. Collector-Emmitter voltage

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



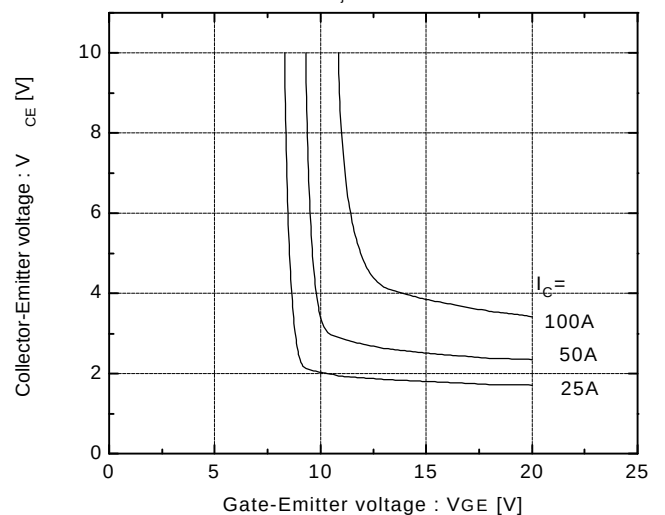
Collector-Emmitter vs. Gate-Emmitter voltage

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

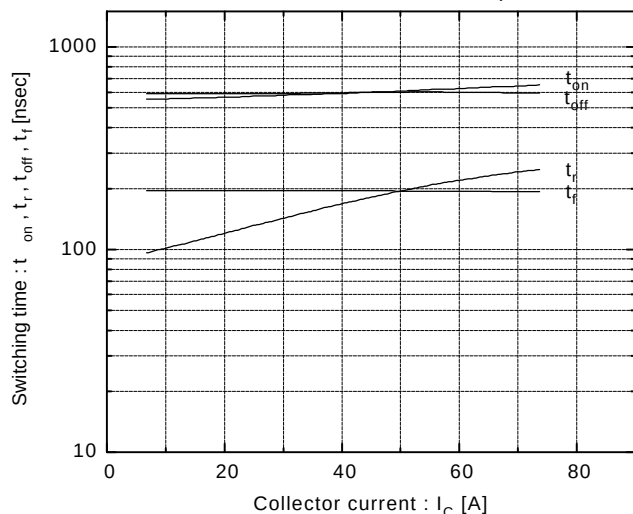


Collector-Emmitter vs. Gate-Emmitter voltage

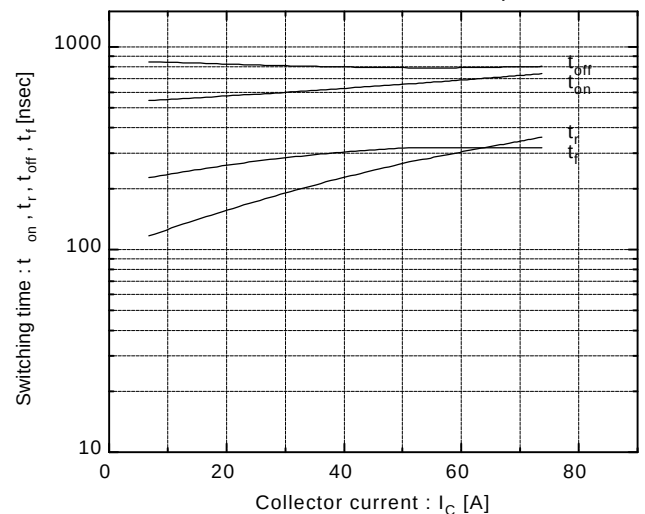
$T_j = 125^\circ\text{C}$



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



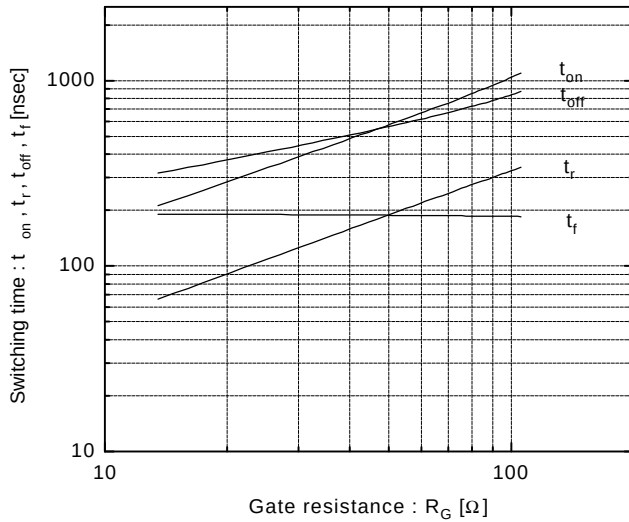
Switching time vs. Collector current
 $V_{CC}=300\text{V}$, $R_G=51\Omega$, $V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$



Brake Chopper IGBT

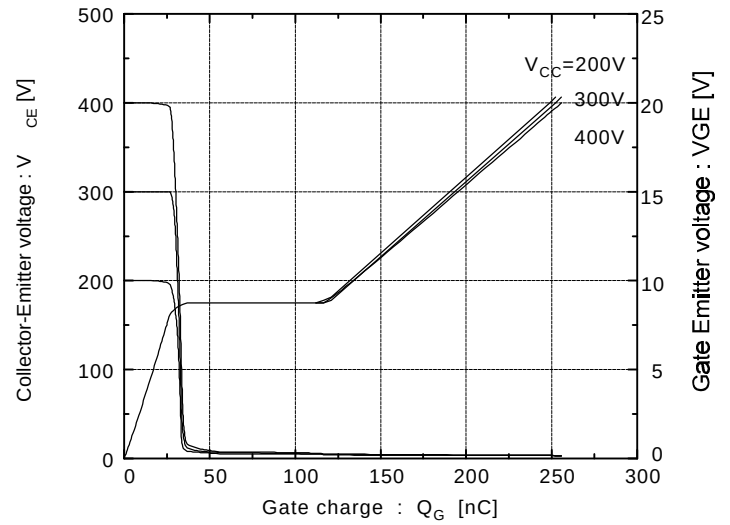
Switching time vs. R_G

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

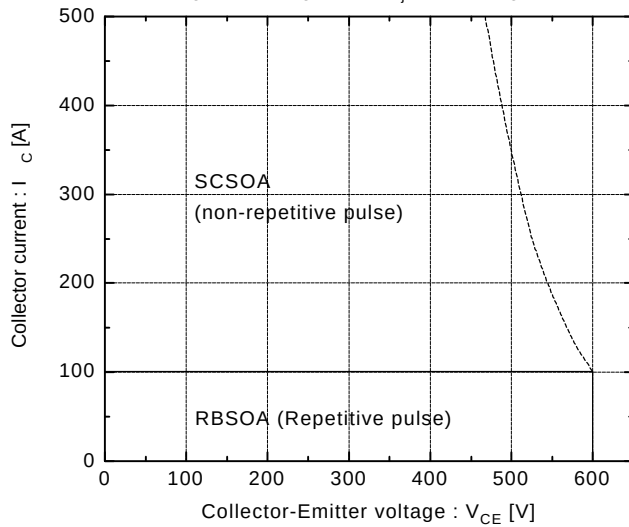


Dynamic input characteristics

$T_J=25^\circ C$

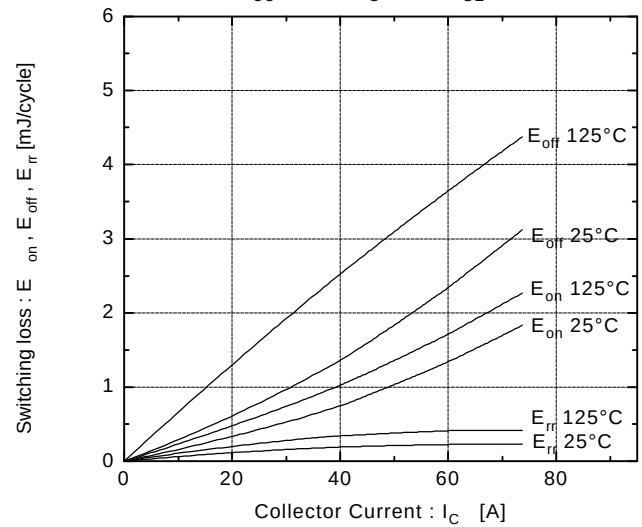


Reversed biased safe operating area
 $+V_{GE}=15V$, $-V_{GE}\leq 15V$, $T_J\leq 125^\circ C$, $R_G\geq 51\Omega$



Switching loss vs. Collector current

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



Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$

