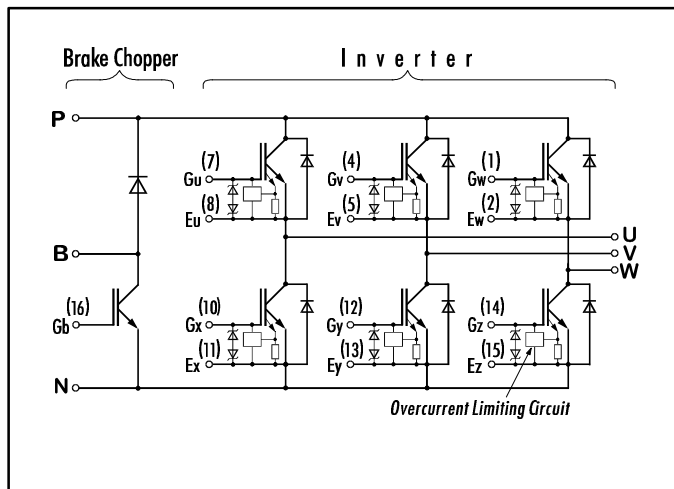


IGBT MODULE (N series)

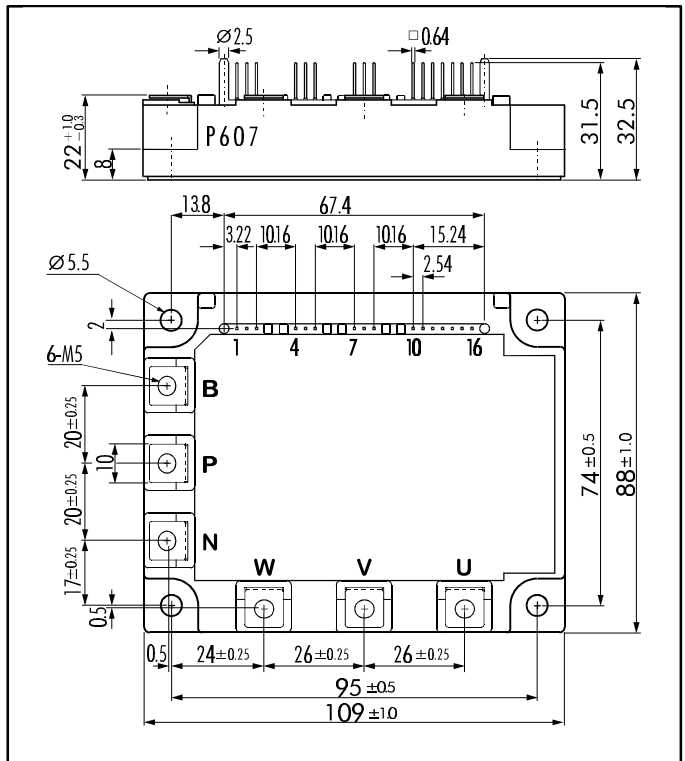
■ Features

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

■ Equivalent Circuit



■ Outline Drawing



■ Absolute Maximum Ratings ($T_c=25^{\circ}\text{C}$)

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	100	A
		$I_{C\ PULSE}$	1ms	200	
	Collector Power Dissipation	P_C	1 device	400	W
Brake Chopper	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
	Repetitive Peak Reverse Voltage	V_{RRM}		600	V
	Average Forward Current	$I_{F(AV)}$		1	A
FWD	Surge Current	I_{FSM}	10ms	50	
Operating Junction Temperature		T_j		+150	$^{\circ}\text{C}$
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($T_j=25^{\circ}\text{C}$)

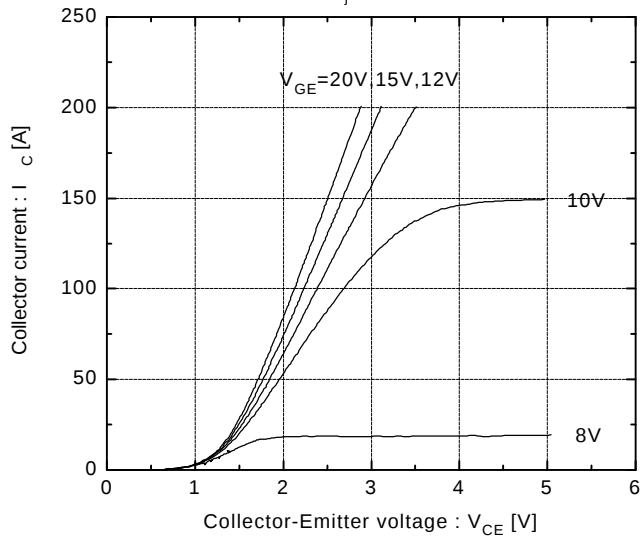
Items		Symbols	Test Conditions	Min.	Max.	Units
Inverter	IGBT	Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=600V$	3.0	mA
		Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$	15	μA
		Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=20V$ $I_C=100mA$	4.5	V
		Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=100A$	2.8	V
		Input capacitance	C_{ies}	$f=1MHz$, $V_{GE}=0V$, $V_{CE}=10V$	6600 (typ.)	pF
		Turn-on Time	t_{on}	$V_{CC}=300V$ $I_C = 100A$	1.2	μs
		Turn-off Time	t_{off}	$V_{GE}=\pm 15V$	1.5	
			t_f	$R_G = 24\Omega$	0.35	
	FWD	Diode Forward On-Voltage	V_F	$I_F=100A$ $V_{GE}=0V$	3.3	V
		Reverse Recovery Time	t_{rr}	$I_F=100A$; $V_{GE}=-10V$; $\frac{di}{dt}=300 \frac{A}{\mu s}$	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		0.31	$^{\circ}\text{C/W}$
		Inverter FRD		0.90	
		Brake IGBT		0.63	
Contact Thermal Resistance	$R_{th(c-f)}$	With Thermal Compound	0.05 (typ.)		

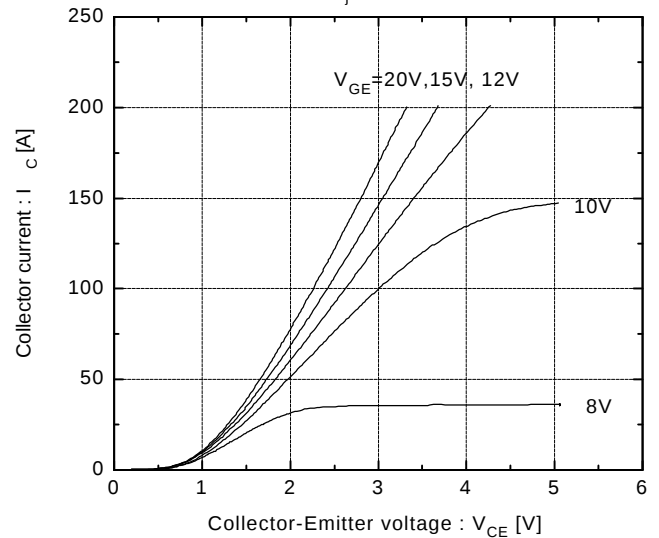
Collector current vs. Collector-Emitter voltage

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



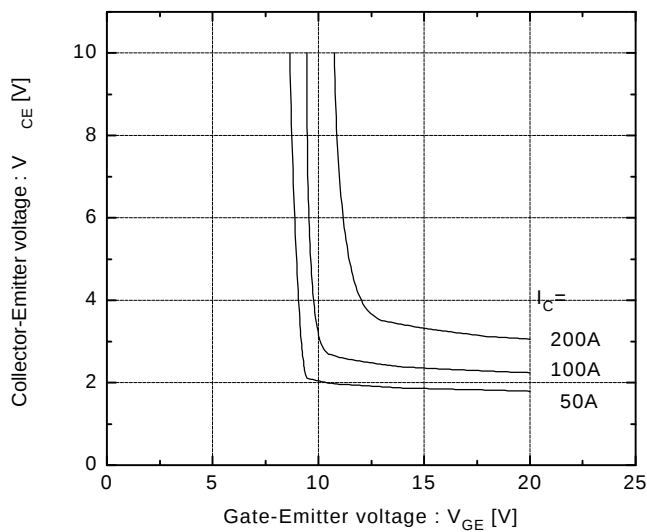
Collector current vs. Collector-Emitter voltage

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



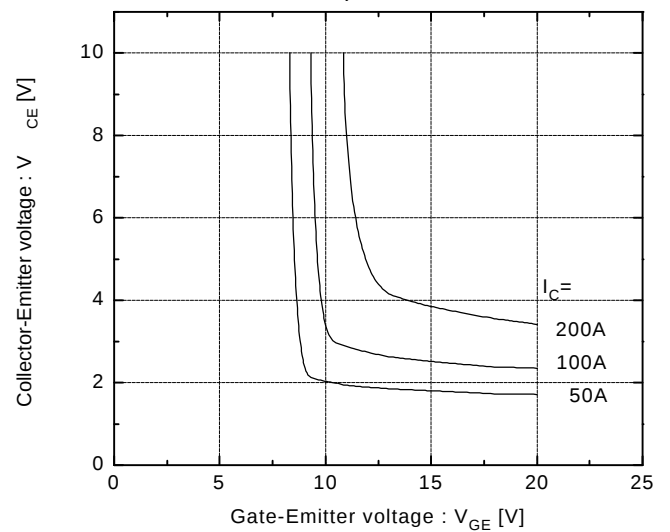
Collector-Emitter vs. Gate-Emitter voltage

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

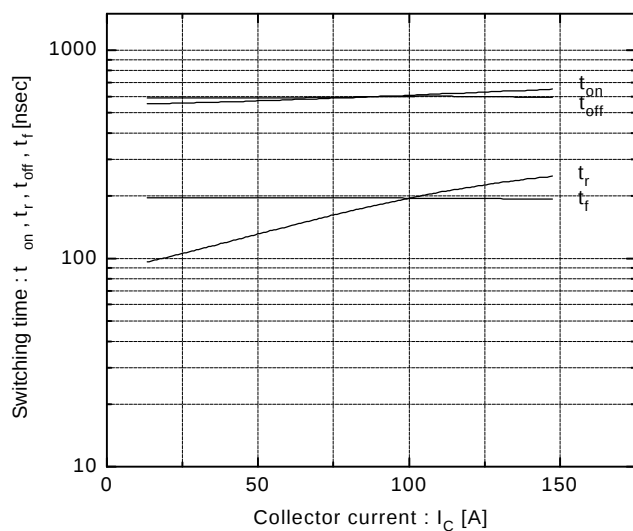


Collector-Emitter vs. Gate-Emitter voltage

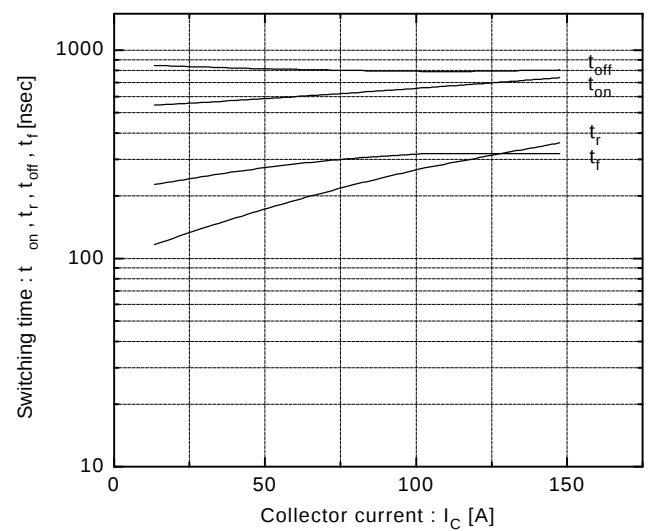
$T_j = 125^\circ\text{C}$



Switching time vs. Collector current
 $V_{CC}=300\text{V}$, $R_G=24\Omega$, $V_{GE}=\pm 15\text{V}$, $T_j=25^\circ\text{C}$

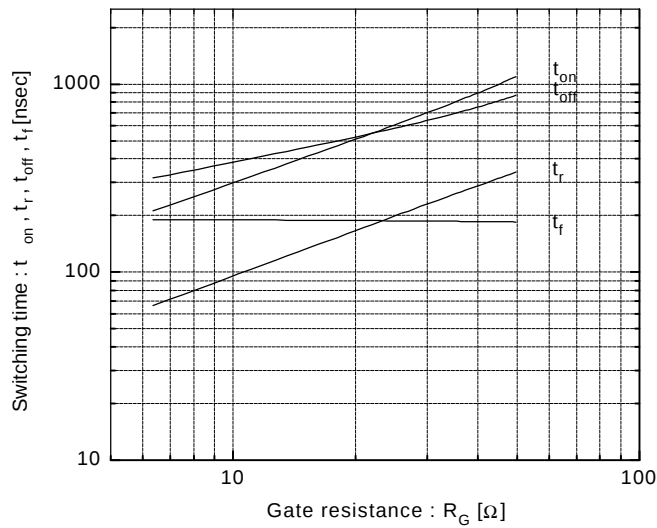


Switching time vs. Collector current
 $V_{CC}=300\text{V}$, $R_G=24\Omega$, $V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$



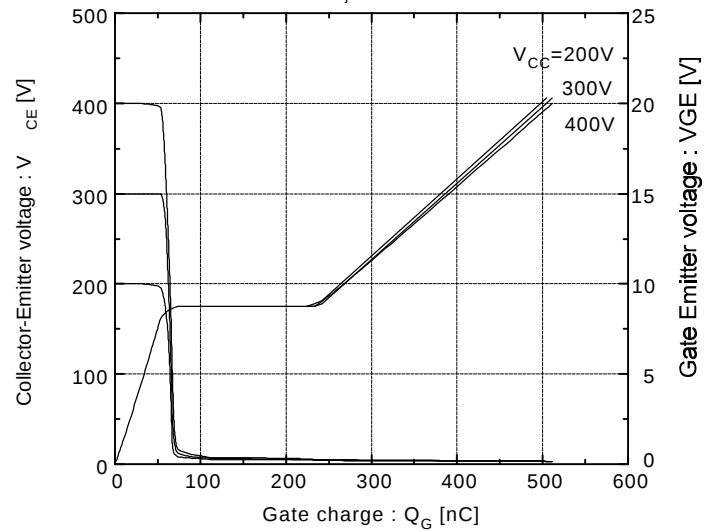
Switching time vs. R_G

$V_{CC}=300V$, $I_C=100A$, $V_{GE}=\pm 15V$, $T_J=25^\circ C$



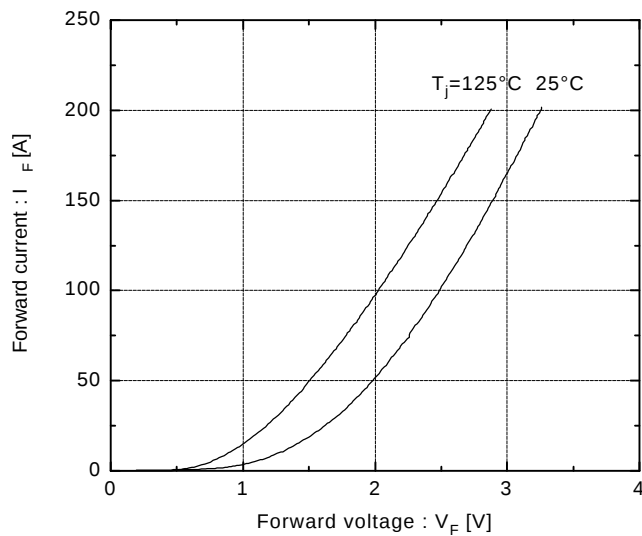
Dynamic input characteristics

$T_J=25^\circ C$



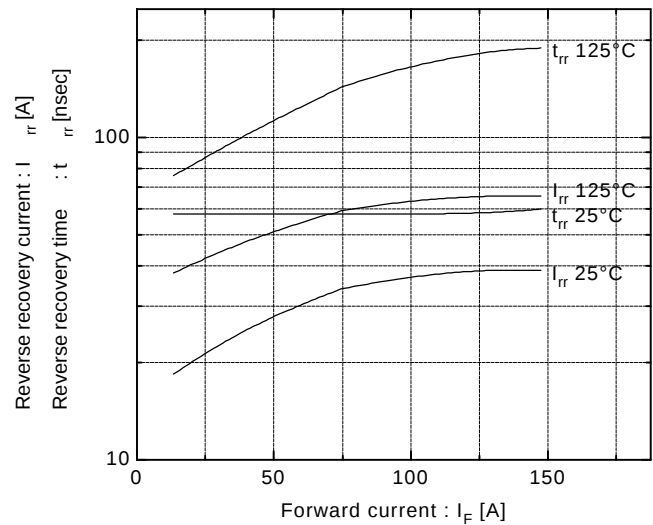
Forward current vs. Forward voltage

$V_{GE}=0V$

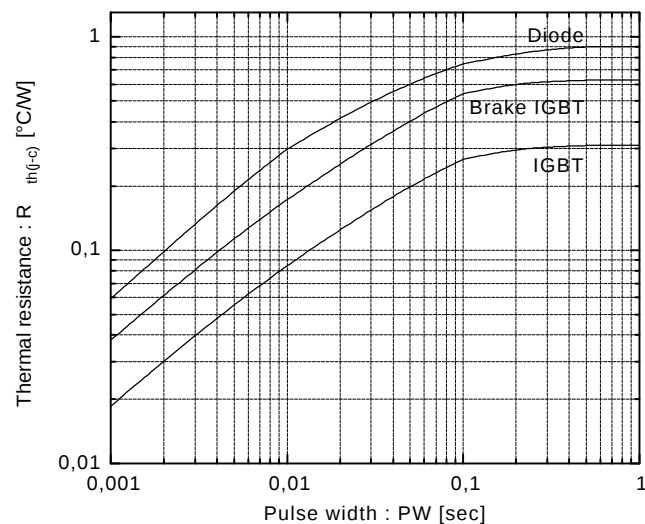


Reverse recovery characteristics

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

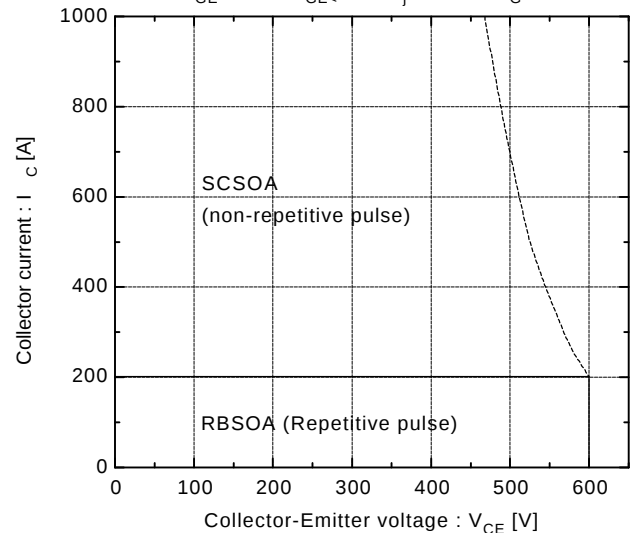


Transient thermal resistance



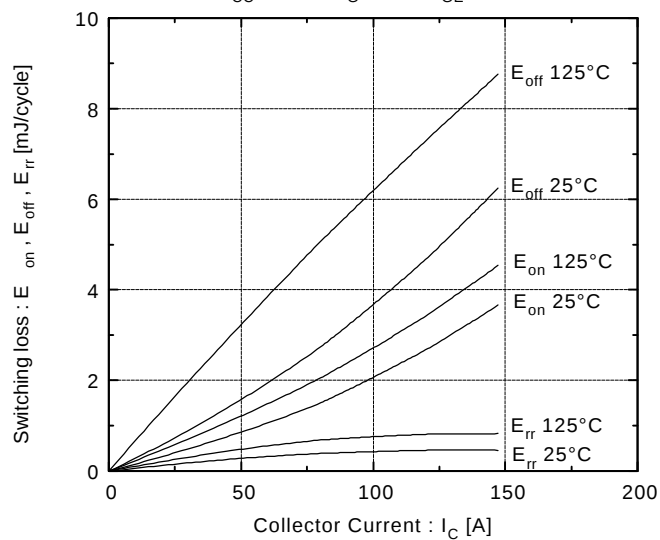
Reversed biased safe operating area

$+V_{GE}=15V$, $-V_{GE}<15V$, $T_J\leq 125^\circ C$, $R_G\geq 24\Omega$



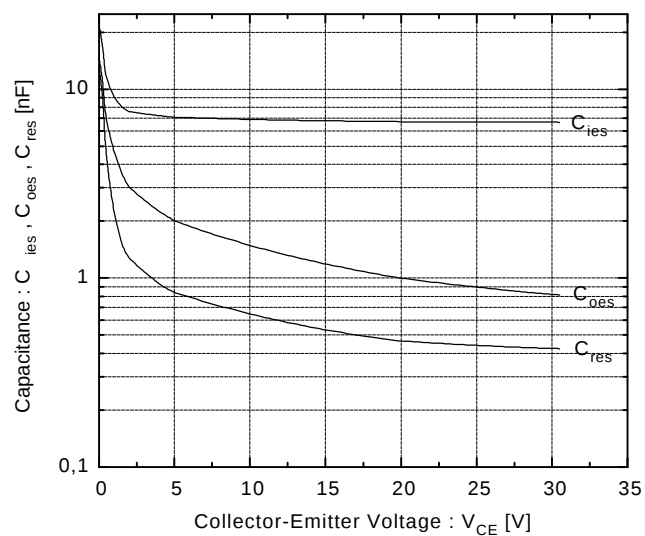
Switching loss vs. Collector current

$V_{CC}=300V$, $R_G=24\Omega$, $V_{GE}=\pm 15V$



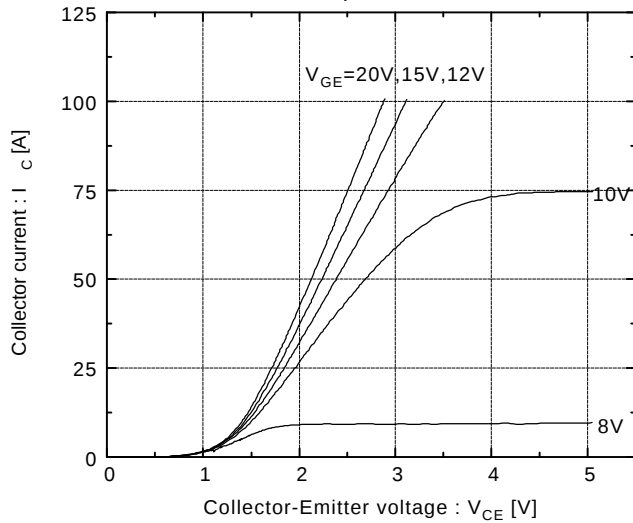
Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$

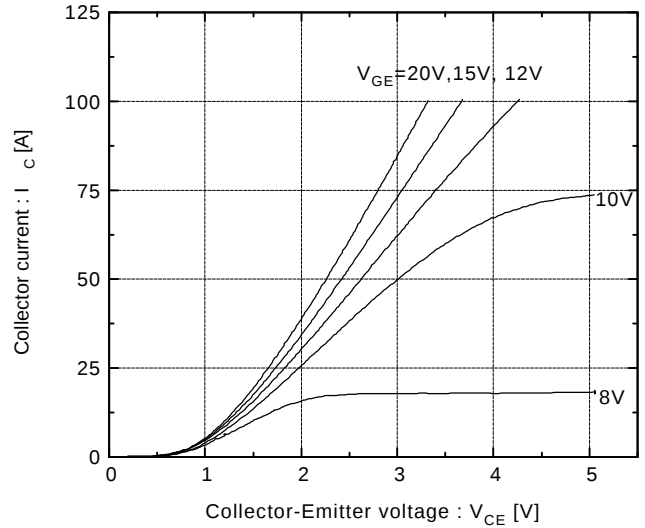


Brake Chopper IGBT

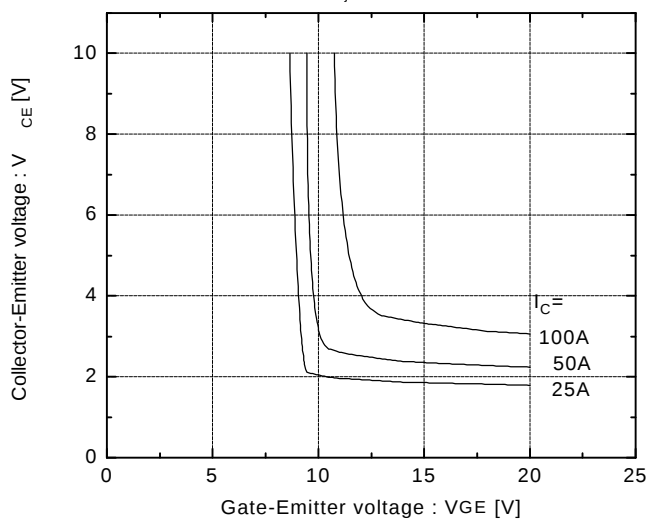
Collector current vs. Collector-Emittor voltage
 $T_J = 25^\circ\text{C}$



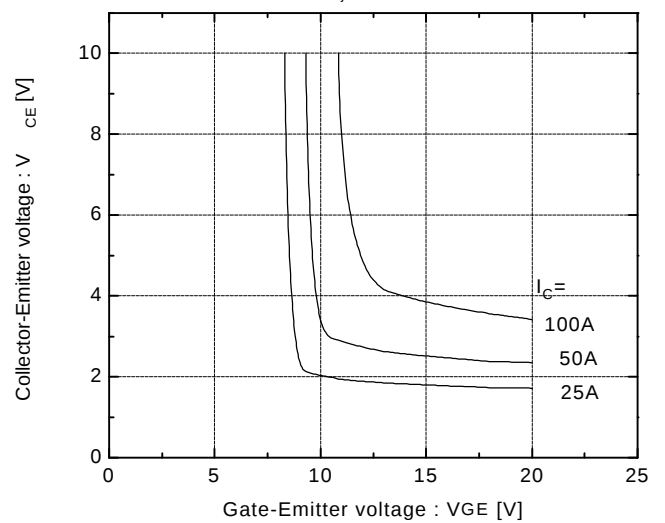
Collector current vs. Collector-Emittor voltage
 $T_J = 125^\circ\text{C}$



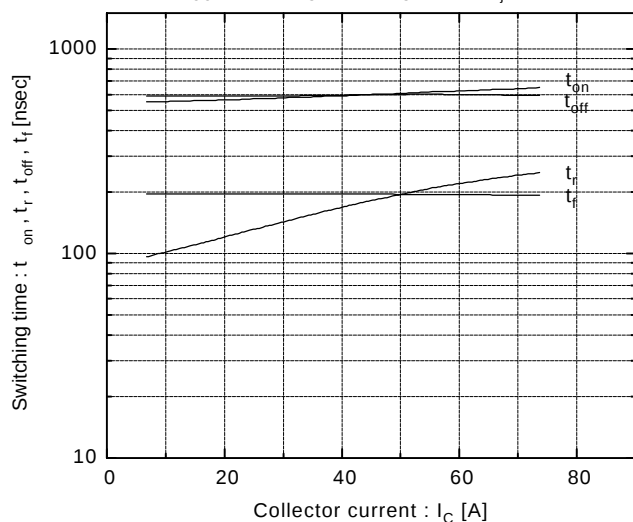
Collector-Emittor vs. Gate-Emittor voltage
 $T_J = 25^\circ\text{C}$



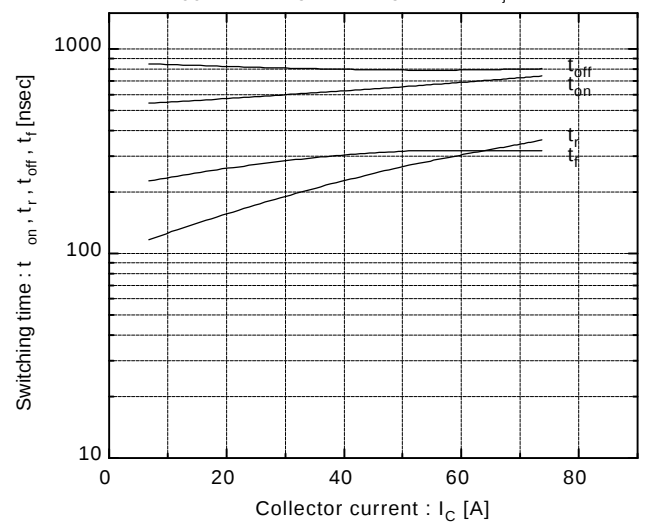
Collector-Emittor vs. Gate-Emittor voltage
 $T_J = 125^\circ\text{C}$



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



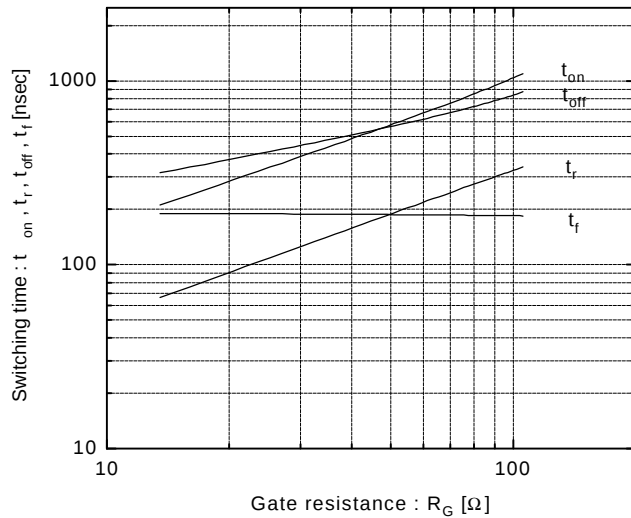
Switching time vs. Collector current
 $V_{CC} = 300\text{V}$, $R_G = 51\Omega$, $V_{GE} = \pm 15\text{V}$, $T_J = 125^\circ\text{C}$



Brake Chopper IGBT

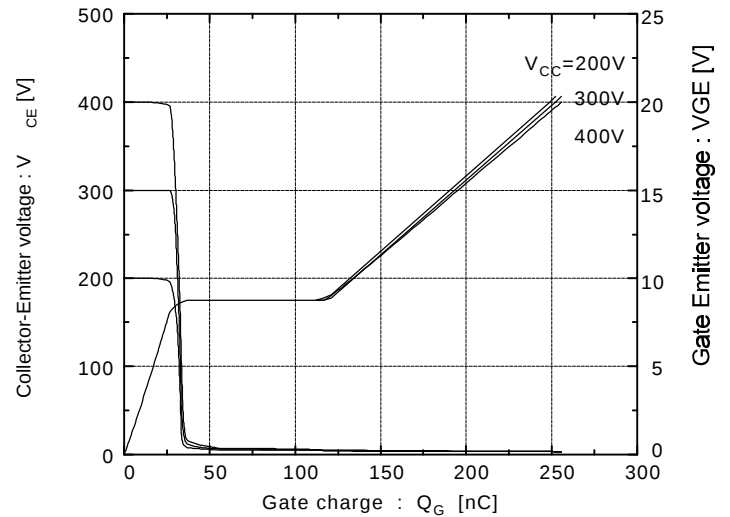
Switching time vs. R_G

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

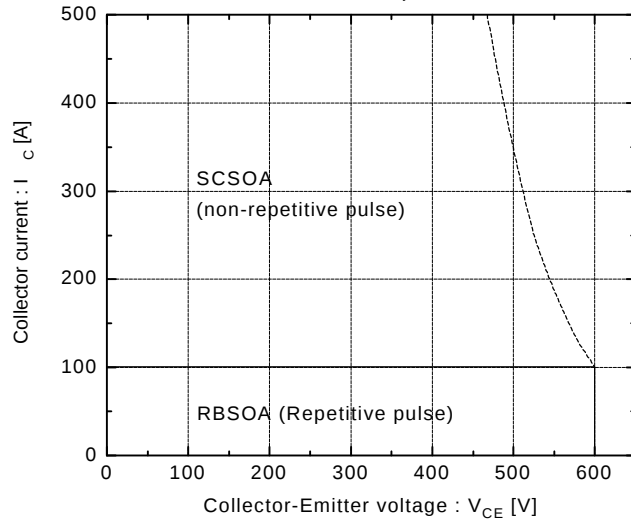


Dynamic input characteristics

$T_J=25^\circ C$

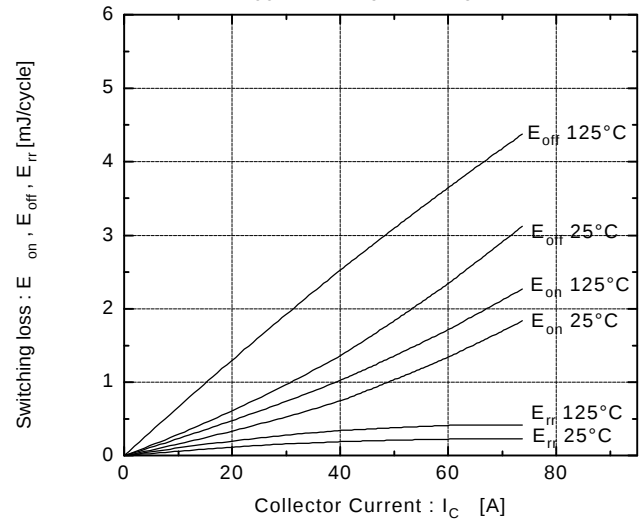


Reversed biased safe operating area
 $+V_{GE}=15V$, $-V_{GE}\leq 15V$, $T_J\leq 125^\circ C$, $R_G\geq 51\Omega$



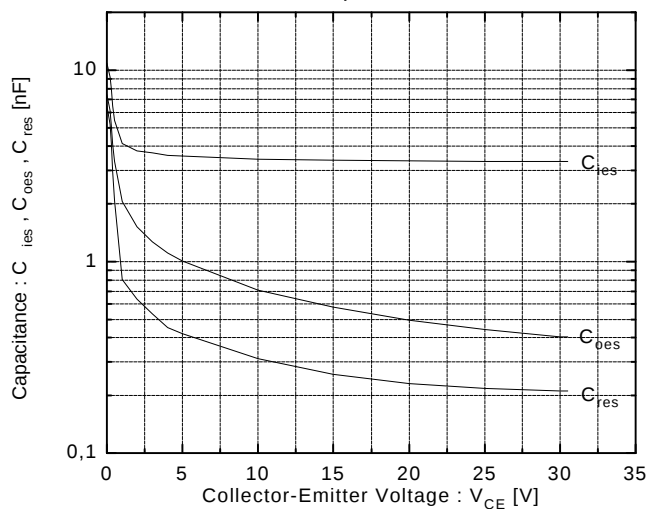
Switching loss vs. Collector current

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



Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$



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