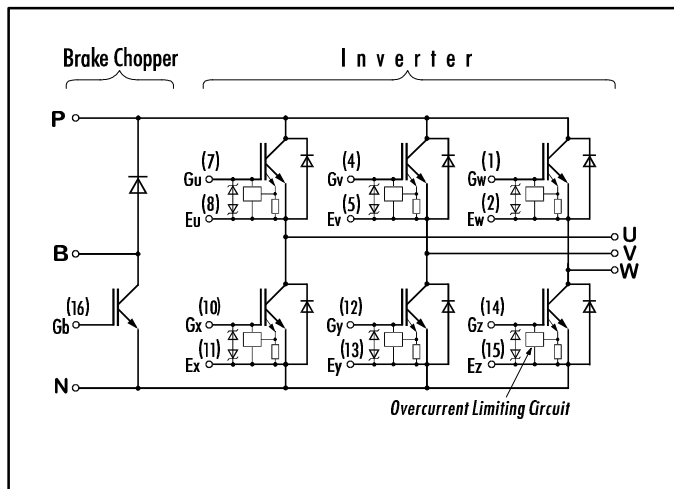


IGBT MODULE (N series)

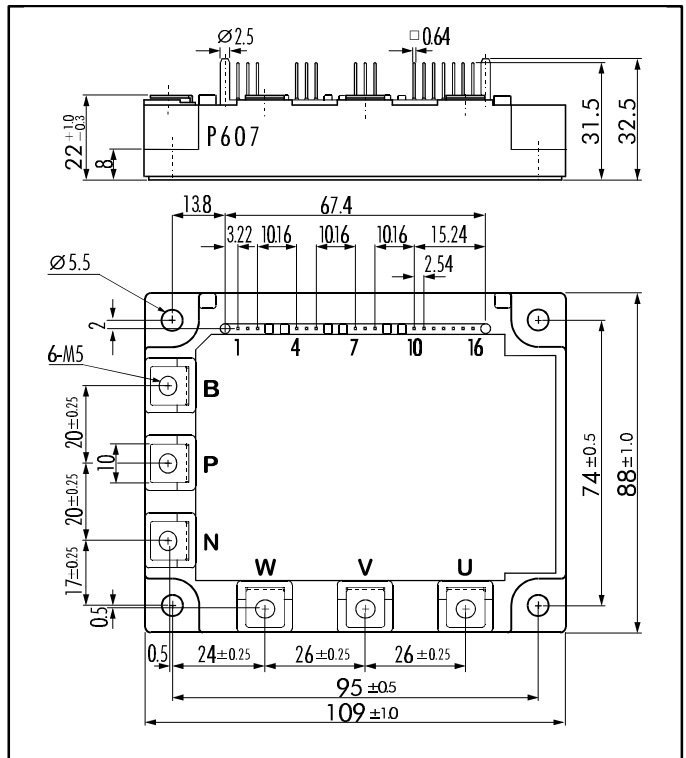
■ Features

- Including Brake Chopper
- Square RBSOA
- Low Saturation Voltage
- Overcurrent Limiting Function
(4 ~ 5 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}		1200	V	
	Gate -Emitter Voltage	V _{GES}		± 20		
	Collector Current	I _C	Continuous	40	A	
		I _{C PULSE}	1ms	80		
		-I _{C PULSE}	Continuous	40		
	Collector Power Dissipation	P _C	1 device	320	W	
Brake Chopper	IGBT	Collector-Emitter Voltage	V _{CES}		1200	V
		Gate -Emitter Voltage	V _{CES}		± 20	
		Collector Current	I _C	Continuous	15	A
			I _{C PULSE}	1ms	30	
	Collector Power Dissipation	P _C	1 device	120	W	
	FWD	Repetitive Peak Reverse Voltage	V _{RRM}		1200	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 ($T_j=25^{\circ}\text{C}$)

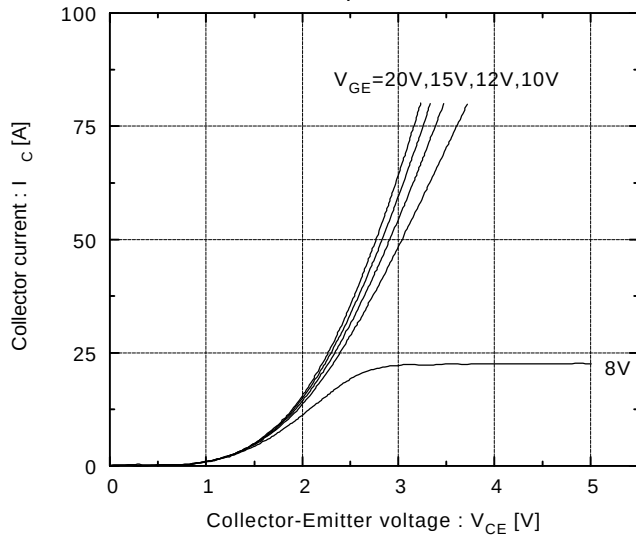
Items		Symbols	Test Conditions	Min.	Max.	Units		
Inverter	IGBT	Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=1200V$		3.0	mA	
		Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$		15	μA	
		Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=20V$ $I_C=40mA$	4.5	7.5	V	
		Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=40A$		3.3		
		Input capacitance	C_{ies}	$f=1MHz$, $V_{GE}=0V$, $V_{CE}=10V$	6200 (typ.)		pF	
		Turn-on Time	t_{on}	$V_{CC}=600V$ $I_C = 40A$ $V_{GE}=\pm 15V$ $R_G = 24\Omega$		1.2	μS	
			Turn-off Time		t_{off}			1.5
					t_f			0.5
	FWD				Diode Forward On-Voltage	V_F		$I_F=40A$ $V_{GE}=0V$
		Reverse Recovery Time	t_{rr}	$I_F=40A$; $V_{GE}=-10V$; $\frac{-di}{dt}=120 \frac{A}{\mu s}$		350	ns	
Brake Chopper	IGBT	Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=1200V$		1.0	mA	
		Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$		100	nA	
		Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=15A$		3.3	V	
		Turn-on Time	t_{on}	$V_{CC}=600V$ $I_C = 15A$ $V_{GE}=\pm 15V$ $R_G = 82\Omega$		1.2	μS	
			Turn-off Time		t_{off}			1.5
					t_f			0.5
	FWD	Reverse Current	I_{RRM}	$V_R=1200V$		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	$^{\circ}\text{C/W}$
		Inverter FRD		0.85	
		Brake IGBT		1.04	
Contact Thermal Resistance	$R_{th(c-f)}$	With Thermal Compound	0.05 (typ.)		

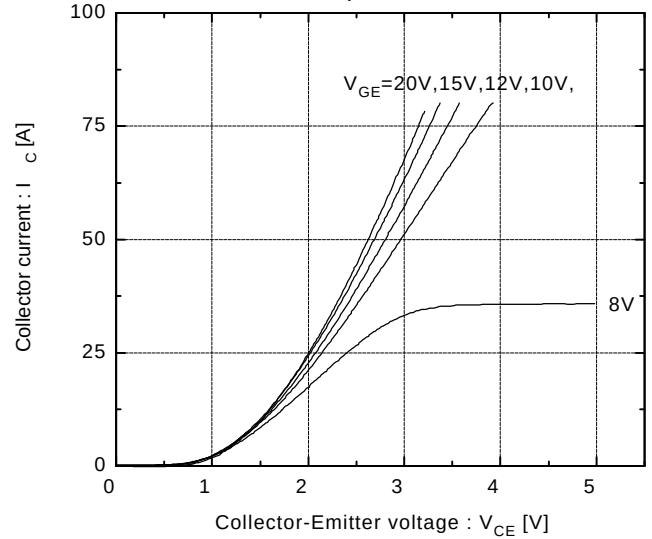
Collector current vs. Collector-Emitter voltage

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



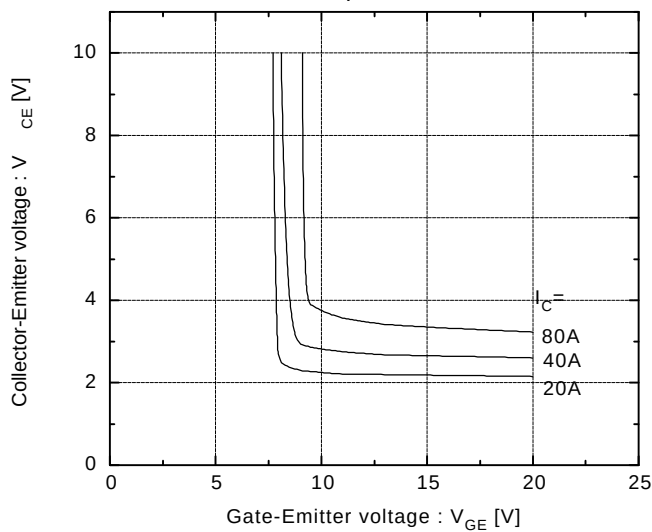
Collector current vs. Collector-Emitter voltage

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



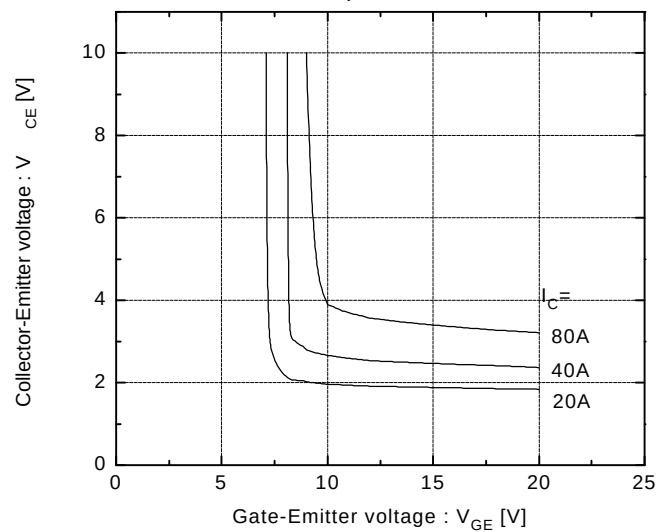
Collector-Emitter vs. Gate-Emitter voltage

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



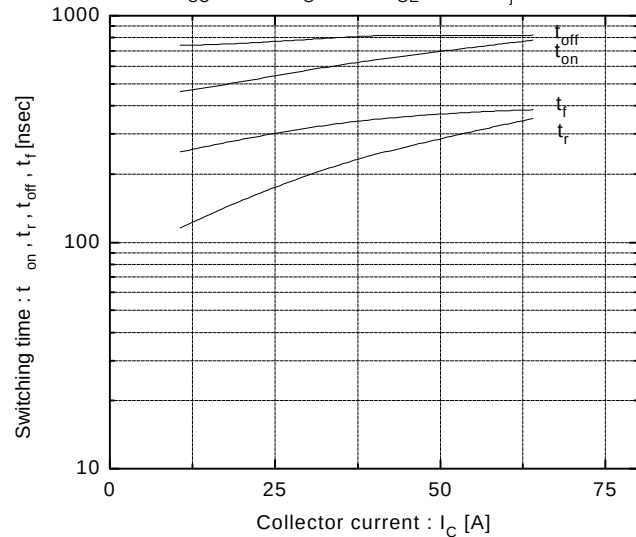
Collector-Emitter vs. Gate-Emitter voltage

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



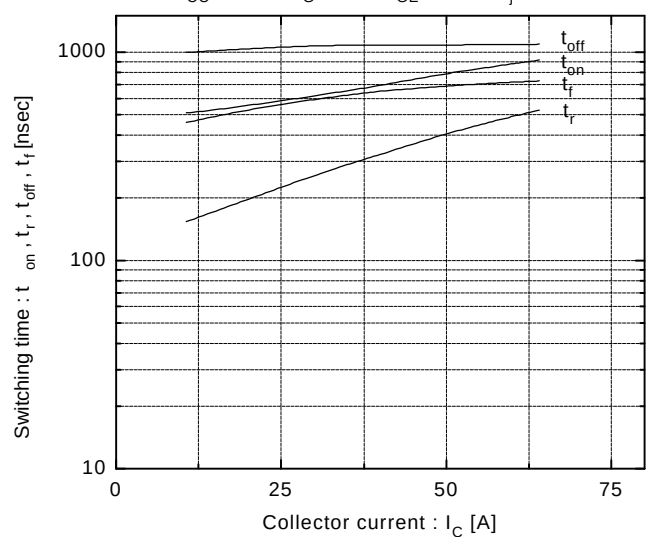
Switching time vs. Collector current

$V_{CC} = 600V, R_G = 24\Omega, V_{GE} = \pm 15V, T_j = 25^\circ\text{C}$



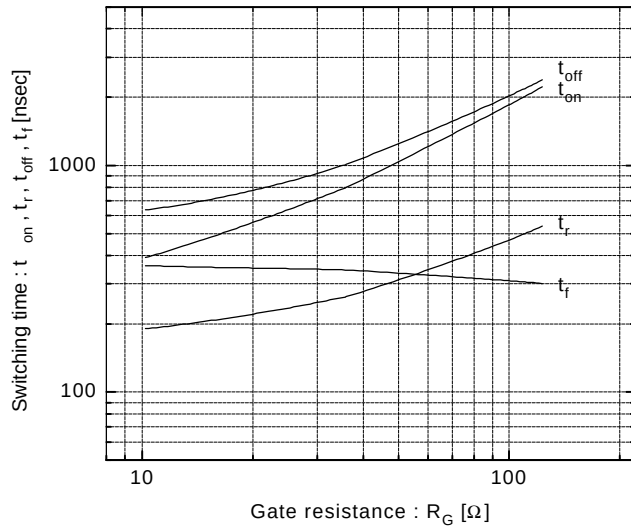
Switching time vs. Collector current

$V_{CC} = 600V, R_G = 24\Omega, V_{GE} = \pm 15V, T_j = 125^\circ\text{C}$



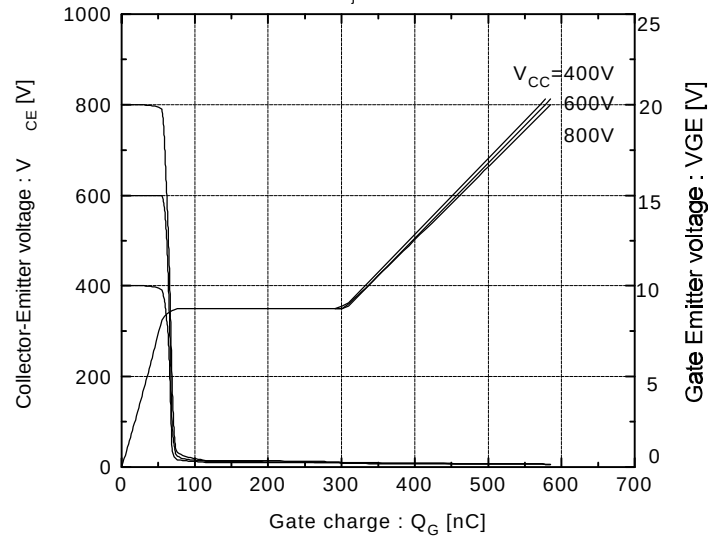
Switching time vs. R_G

$V_{CC}=600V$, $I_C=40A$, $V_{GE}=\pm 15V$, $T_J=25^\circ C$



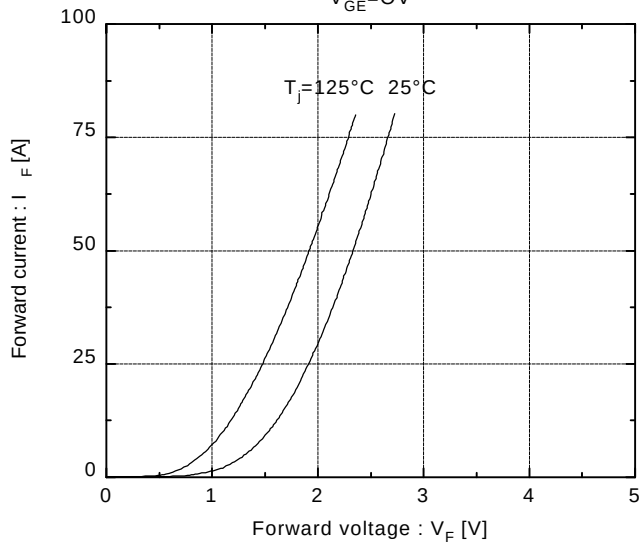
Dynamic input characteristics

$T_J=25^\circ C$



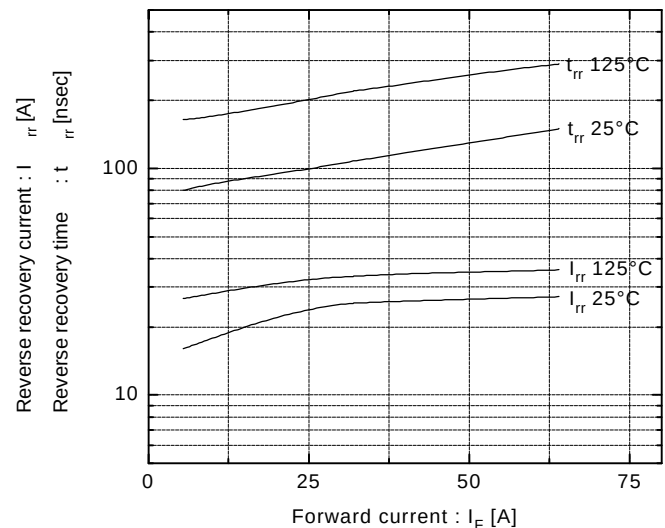
Forward current vs. Forward voltage

$V_{GE}=0V$

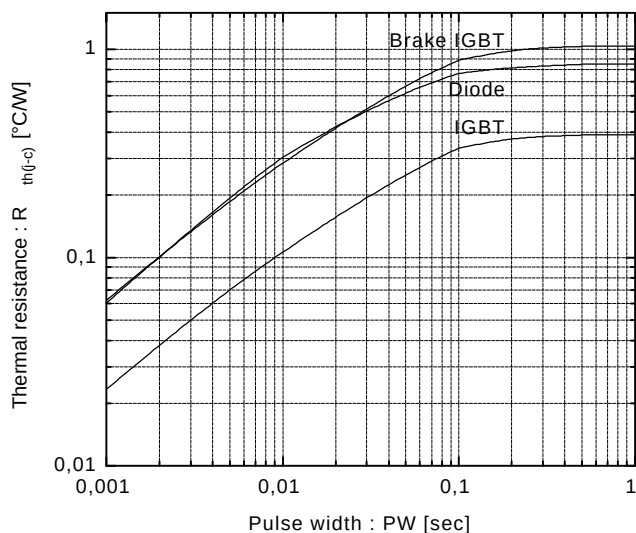


Reverse recovery characteristics

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

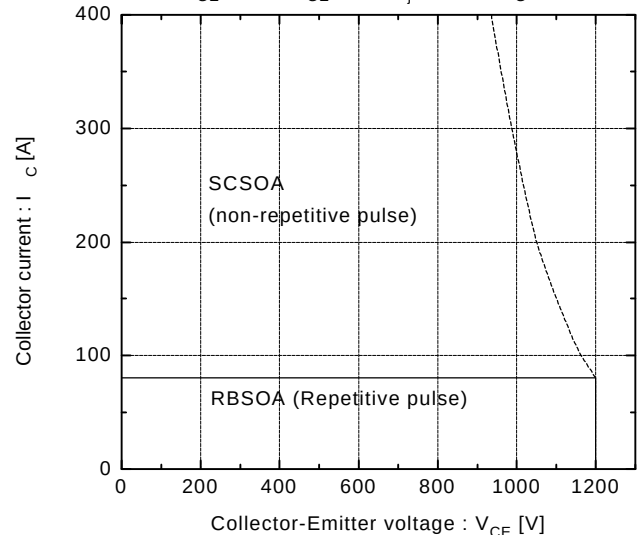


Transient thermal resistance



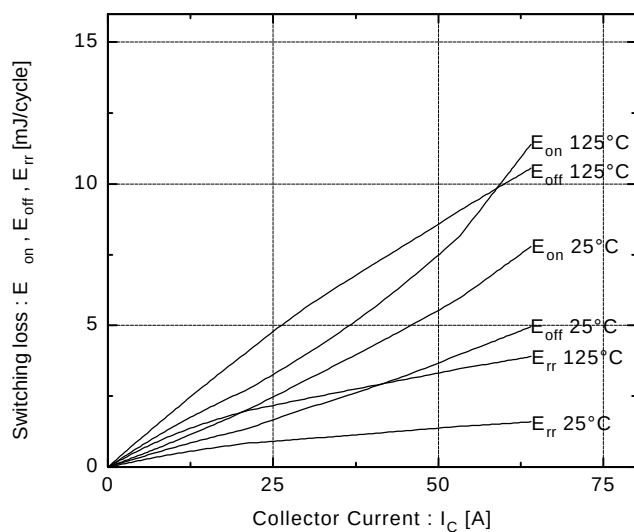
Reversed biased safe operating area

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



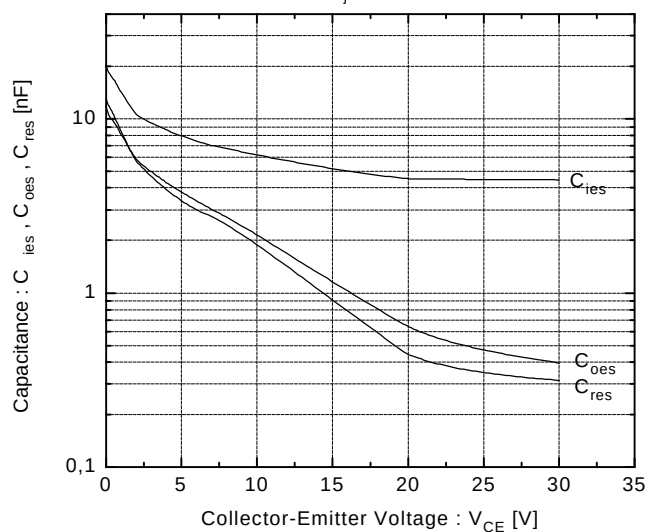
Switching loss vs. Collector current

$V_{CC}=600V$, $R_G=24\Omega$, $V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage

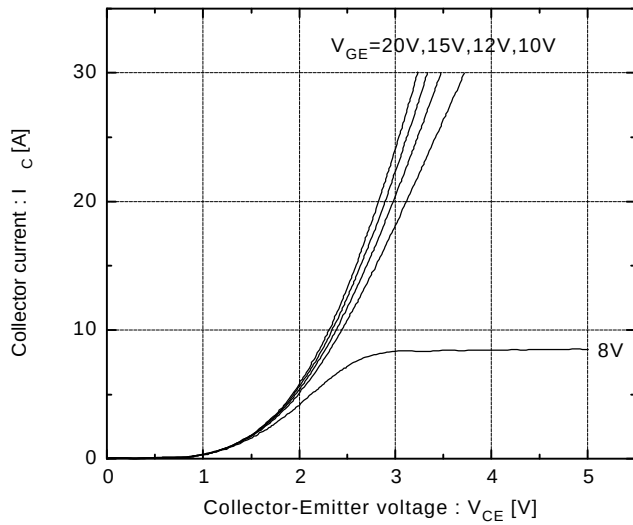
$T_j=25^\circ C$



Brake Chopper IGBT

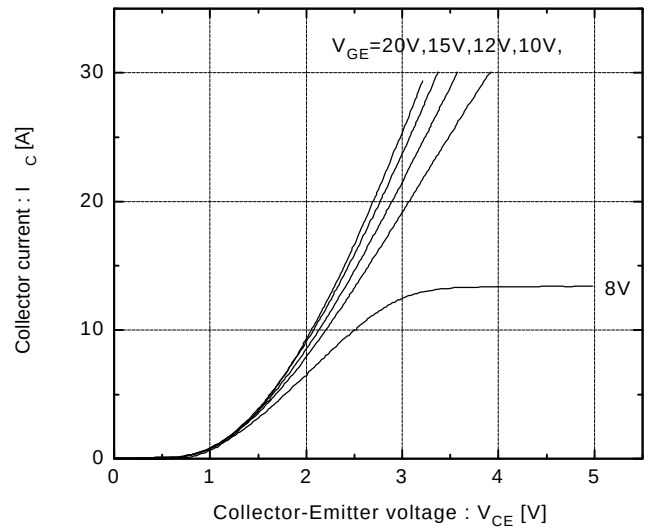
Collector current vs. Collector-Emitter voltage

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



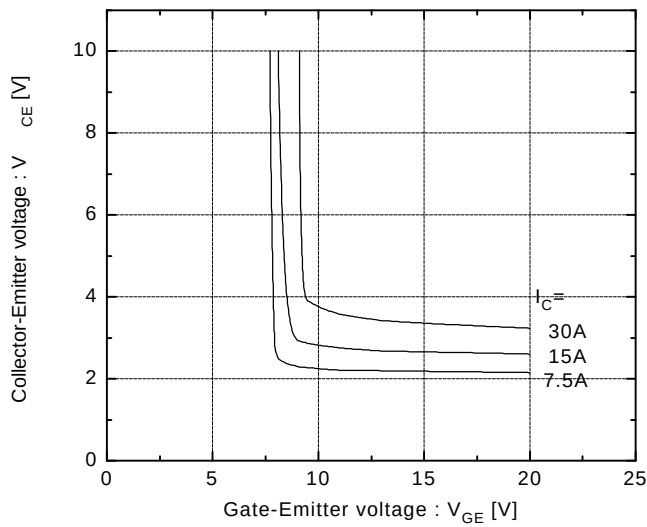
Collector current vs. Collector-Emitter voltage

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



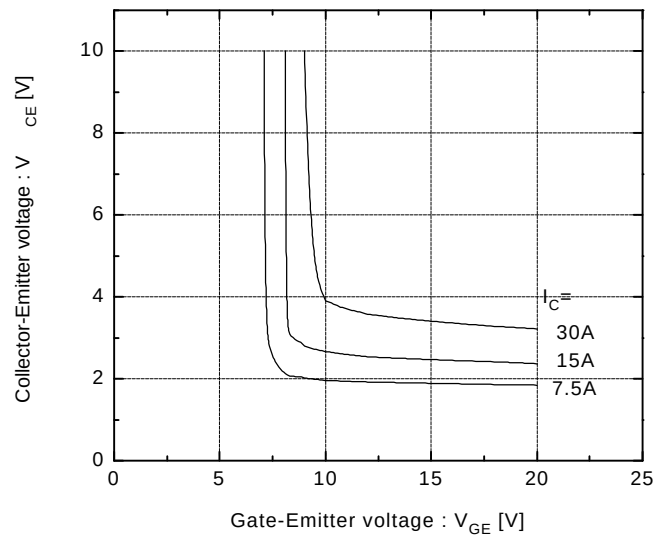
Collector-Emitter vs. Gate-Emitter voltage

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



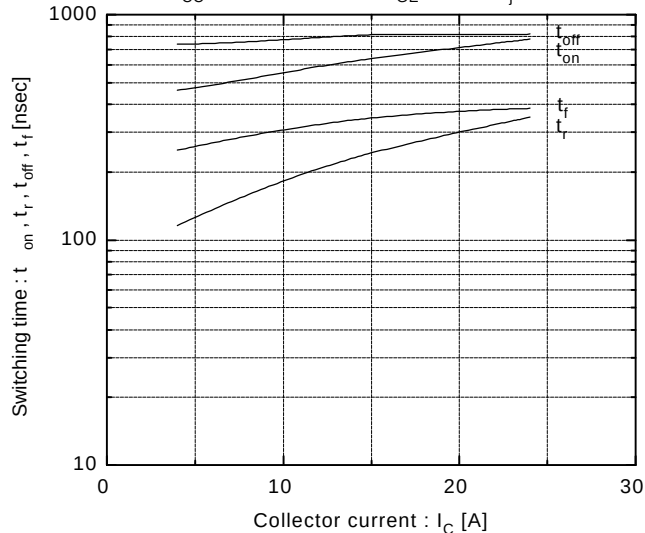
Collector-Emitter vs. Gate-Emitter voltage

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



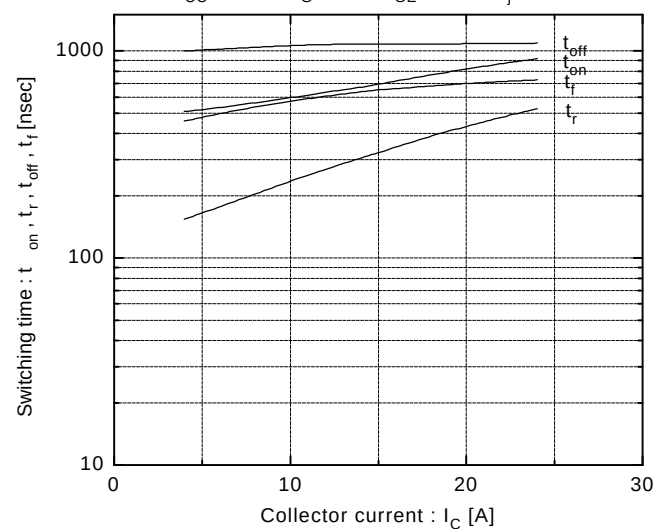
Switching time vs. Collector current

$V_{CC} = 600V, R_G = 82\Omega, V_{GE} = \pm 15V, T_j = 25^\circ\text{C}$

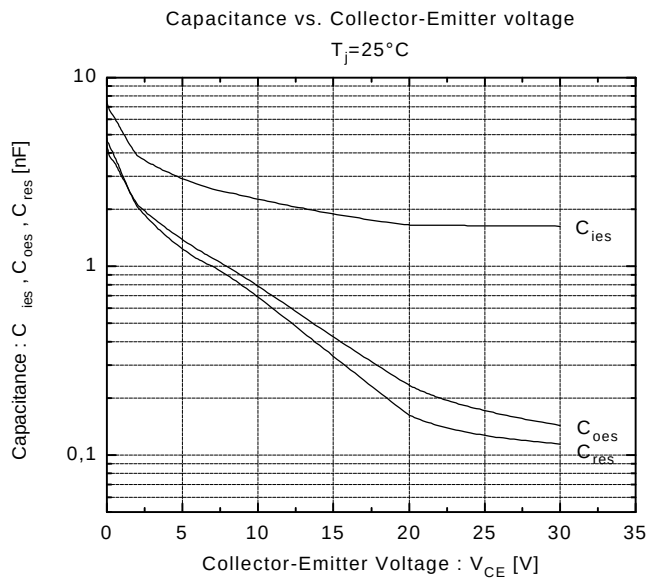
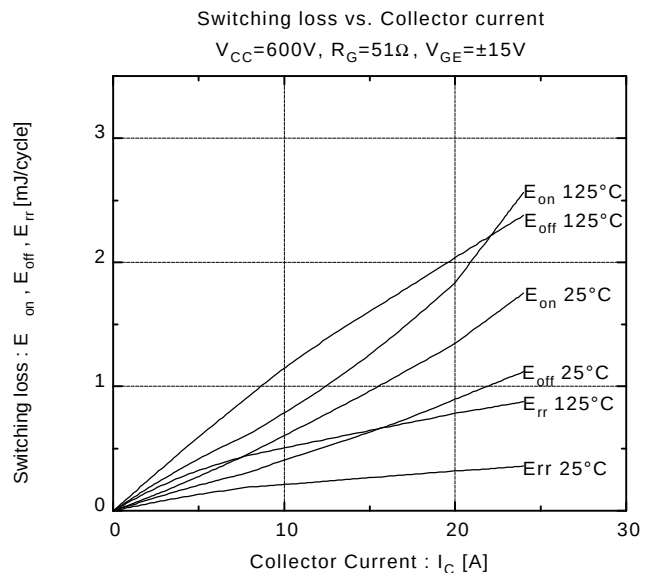
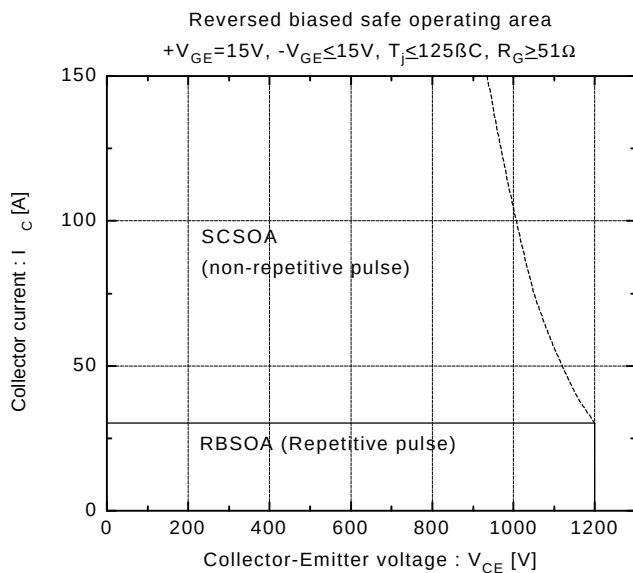
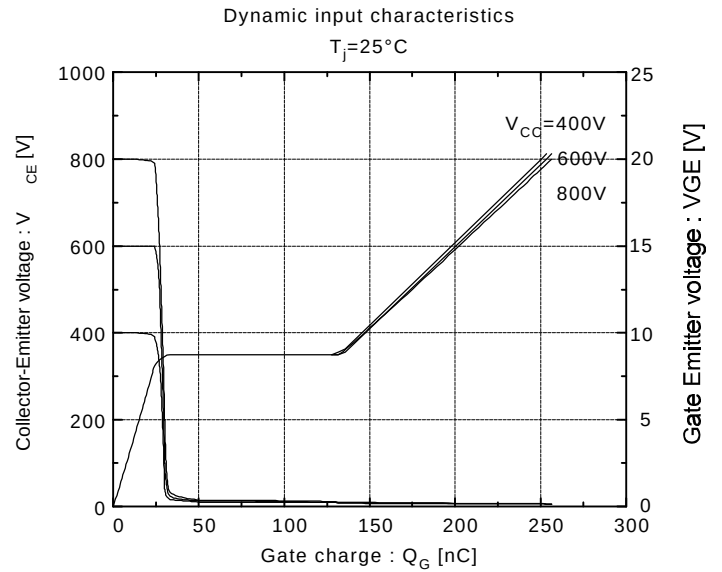
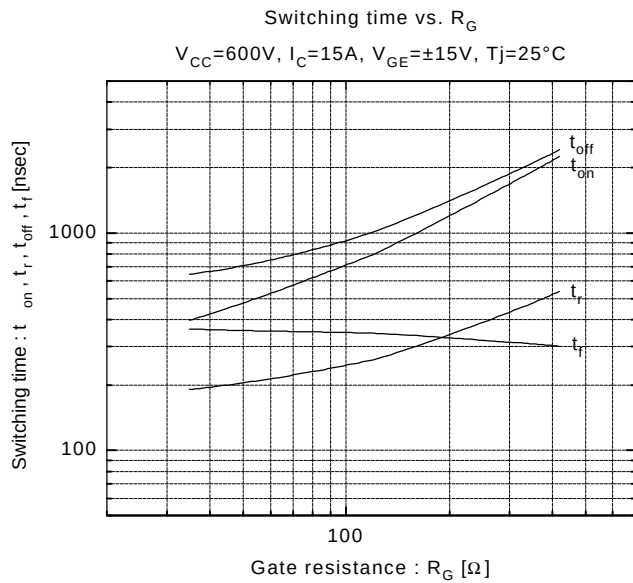


Switching time vs. Collector current

$V_{CC} = 600V, R_G = 82\Omega, V_{GE} = \pm 15V, T_j = 125^\circ\text{C}$



Brake Chopper IGBT



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