

IGBT MODULE (U series) 600V / 50A / PIM



■ Features

- Low $V_{CE(sat)}$
- Compact Package
- P.C. Board Mount Module
- 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 ($T_c=25^\circ\text{C}$ unless otherwise specified)

Item		Symbol	Condition	Rating	Unit
Inverter	Collector-Emitter voltage	V _{CES}		600	V
	Gate-Emitter voltage	V _{GES}		±20	V
	Collector current	I _C	Continuous	50	A
		I _{CP}	1ms	100	
		-I _C		50	
		-I _C pulse	1ms	100	
Collector power dissipation	P _C	1 device	187	W	
Brake	Collector-Emitter voltage	V _{CES}		600	V
	Gate-Emitter voltage	V _{GES}		±20	V
	Collector current	I _C	Continuous	20	A
		I _{CP}	1ms	40	A
	Collector power dissipation	P _C	1 device	104	W
	Repetitive peak reverse voltage	V _{RRM}		600	V
Converter	Repetitive peak reverse voltage	V _{RRM}		800	V
	Average output current	I _O	50Hz/60Hz sine wave	50	A
	Surge current (Non-Repetitive)	I _{FSM}	T _J =150°C, 10ms	350	A
	I ² t (Non-Repetitive)	P _t	half sine wave	613	A ² s
Operating junction temperature		T _J		+150	°C
Storage temperature		T _{slg}		-40 to +125	°C
Isolation voltage	between terminal and copper base *2	V _{iso}	AC : 1 minute	AC 2500	V
	between thermistor and others *3			AC 2500	
Mounting screw torque				3.5 *1	N·m

*1 Recommendable value : 2.5 to 3.5 N·m (M5)

*2 All terminals should be connected together when isolation test will be done.

*3 Two thermistor terminals should be connected together, each other terminals should be connected together and shorted to base plate when isolation test will be done.

● Electrical characteristics (T_J=25°C unless otherwise specified)

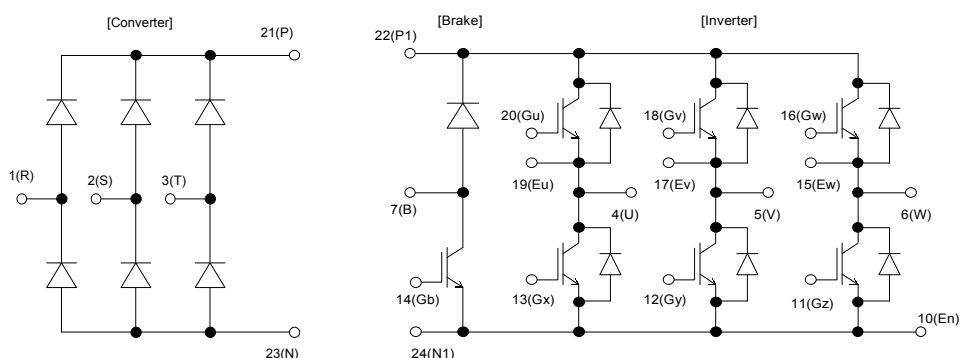
Item		Symbol	Condition		Characteristics			Unit
					Min.	Typ.	Max.	
Inverter	Zero gate voltage collector current	ICES	VCE=600V, VGE=0V		-	-	1.0	mA
	Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V		-	-	200	nA
	Gate-Emitter threshold voltage	VGE(th)	VCE=20V, Ic=50mA		6.2	6.7	7.7	V
	Collector-Emitter saturation voltage	VCE(sat) (terminal)	VGE=15V Ic=50A	Tj=25°C	-	2.25	2.55	V
				Tj=125°C	-	2.45	-	
		VCE(sat) (chip)		Tj=25°C	-	1.85	-	
				Tj=125°C	-	2.15	-	
	Input capacitance	Cies	VGE=0V, VCE=10V, f=1MHz		-	3.6	-	nF
	Turn-on time	ton	VCC=300V Ic=50A VGE=±15V		-	0.42	1.20	μs
		tr			-	0.24	0.60	
		tr(i)			-	0.05	-	
	Turn-off time	toff	RG=68Ω		-	0.42	1.20	
		tf			-	0.03	0.45	
	Forward on voltage	VF (terminal)	VGE=0V If=50A	Tj=25°C	-	2.00	2.35	V
				Tj=125°C	-	2.05	-	
VF (chip)		Tj=25°C		-	1.60	-		
		Tj=125°C		-	1.65	-		
Reverse recovery time	trr	If=50A		-	-	0.35	μs	
Brake	Zero gate voltage collector current	ICES	VCE=600V, VGE=0V		-	-	1.0	mA
	Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V		-	-	200	nA
	Collector-Emitter saturation voltage	VCE(sat) (terminal)	Ic=20A VGE=15V	Tj=25°C	-	1.85	2.15	V
				Tj=125°C	-	2.15	-	
		VCE(sat) (chip)		Tj=25°C	-	1.70	-	
				Tj=125°C	-	2.00	-	
	Turn-on time	ton	VCC=300V Ic=20A		-	0.45	1.20	μs
		tr			-	0.15	0.60	
	Turn-off time	toff	VGE=±15V RG=270Ω		-	0.37	1.20	
		tf			-	0.04	0.45	
Reverse current	IRRM	VR=600V		-	-	1.0	mA	
Converter	Forward on voltage	VFM	If=50A VGE=0V	terminal	-	1.20	1.50	V
				chip	-	1.10	-	
	Reverse current	IRRM	VR=800V		-	-	1.0	mA
Thermistor	Resistance	R	T=25°C		-	5000	-	Ω
			T=100°C		465	495	520	
	B value	B	T=25/50°C		3305	3375	3450	K

● Thermal resistance Characteristics

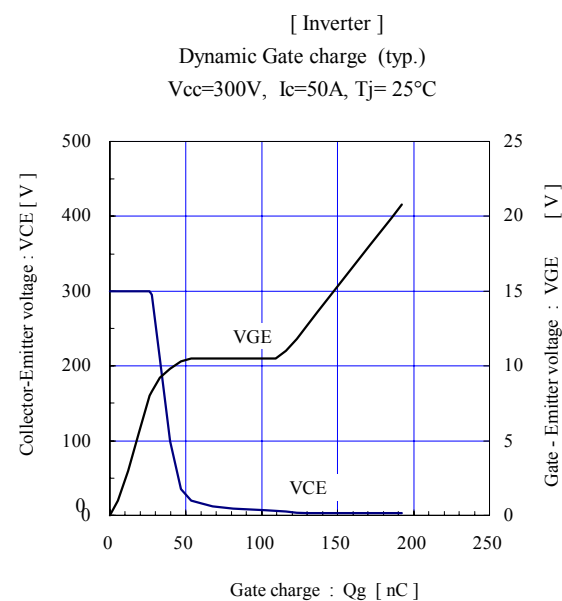
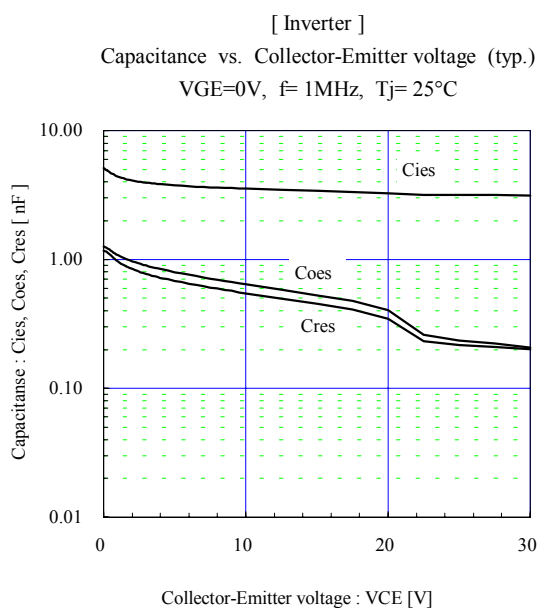
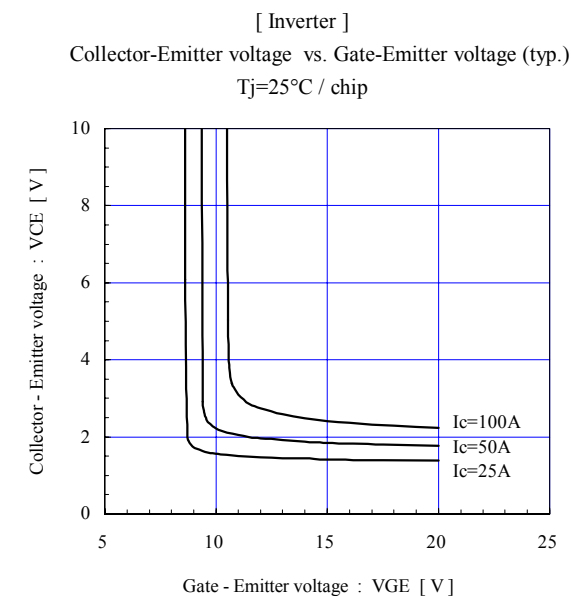
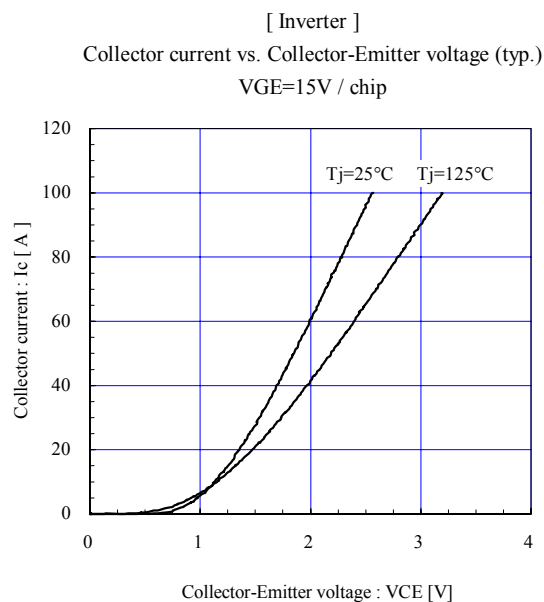
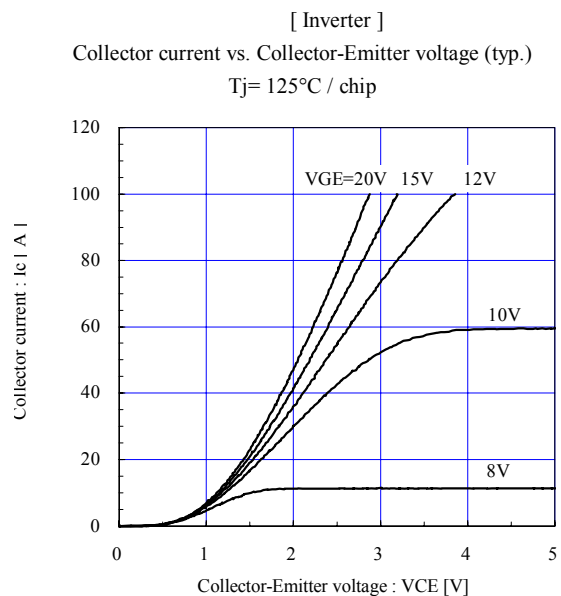
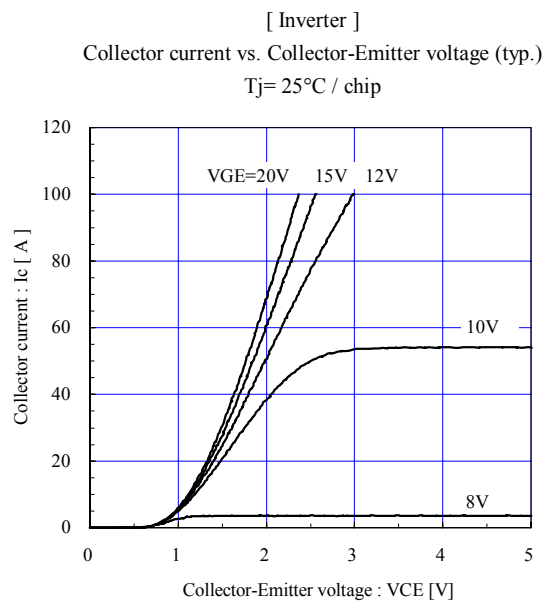
Item	Symbol	Condition	Characteristics			Unit
			Min.	Typ.	Max.	
Thermal resistance (1 device)	R _{th(j-c)}	Inverter IGBT	-	-	0.67	°C/W
		Inverter FWD	-	-	1.10	
		Brake IGBT	-	-	1.20	
		Converter Diode	-	-	0.82	
Contact thermal resistance *	R _{th(c-f)}	With thermal compound	-	0.05		

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

■ Equivalent Circuit Schematic

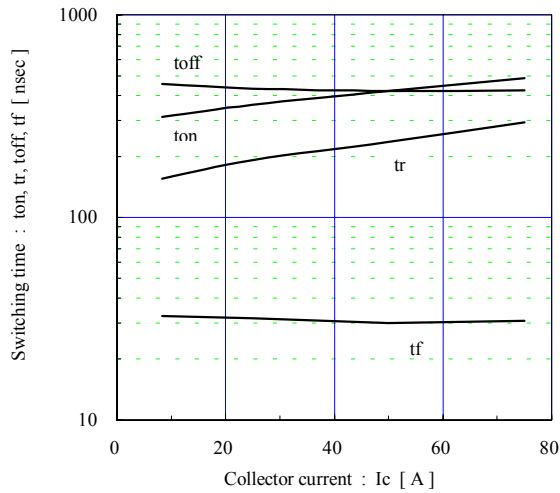


■ Characteristics (Representative)



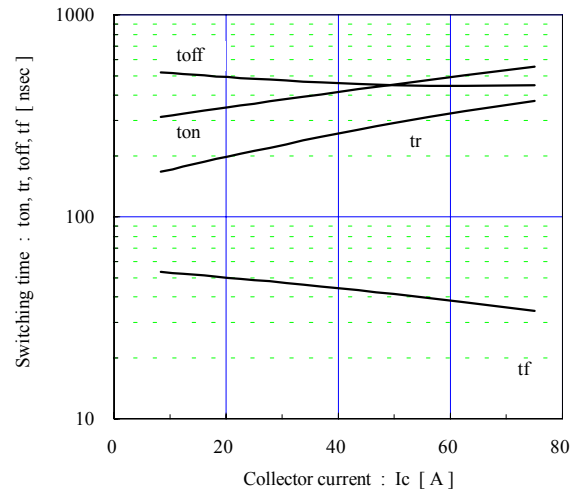
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{cc}=300V$, $V_{GE}=\pm 15V$, $R_g=68\Omega$, $T_j=25^\circ C$



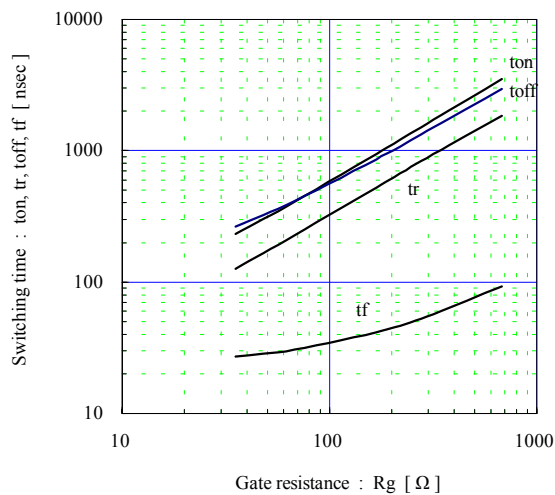
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Switching time vs. Collector current (typ.)
 $V_{cc}=300V$, $V_{GE}=\pm 15V$, $R_g=68\Omega$, $T_j=125^\circ C$



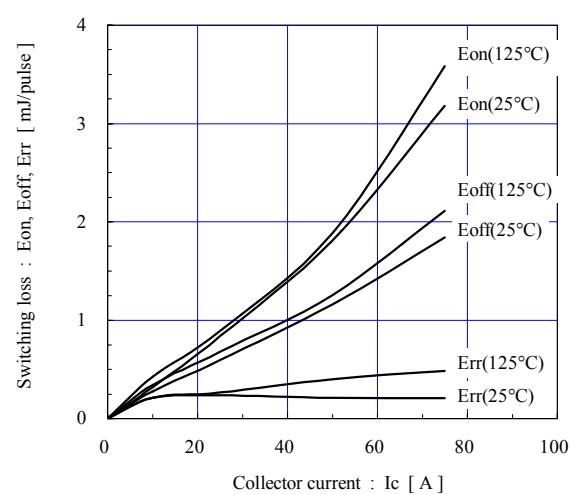
[Inverter]

Switching time vs. Gate resistance (typ.)
 $V_{cc}=300V$, $I_c=50A$, $V_{GE}=\pm 15V$, $T_j=25^\circ C$



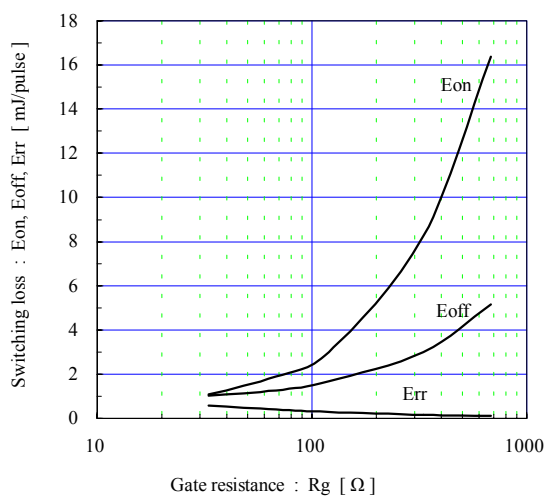
[Inverter]

Switching loss vs. Collector current (typ.)
 $V_{cc}=300V$, $V_{GE}=\pm 15V$, $R_g=68\Omega$



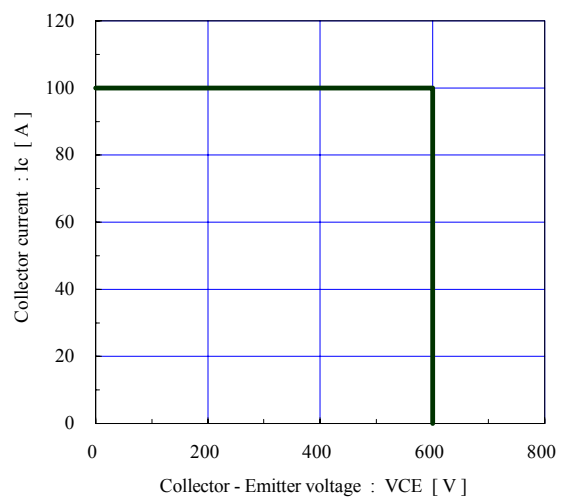
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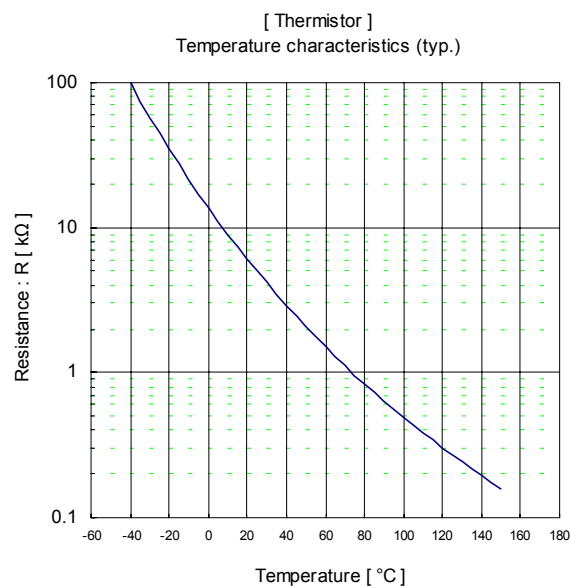
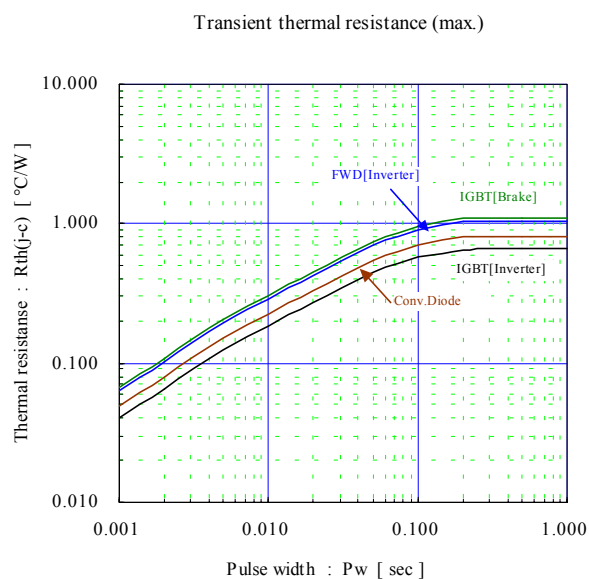
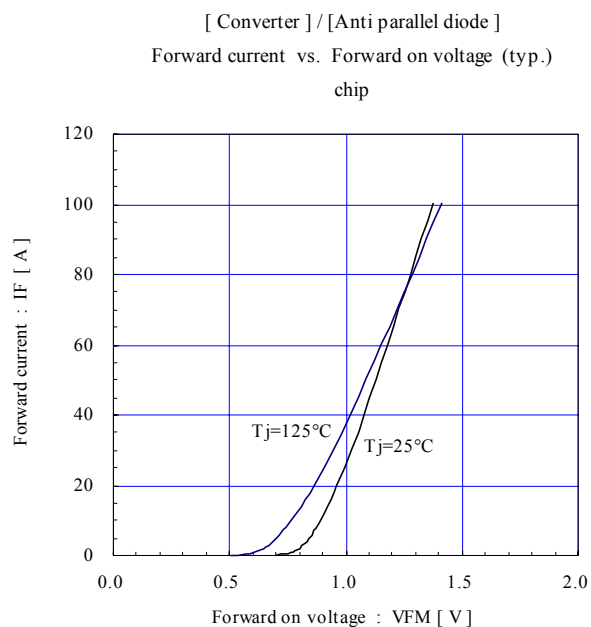
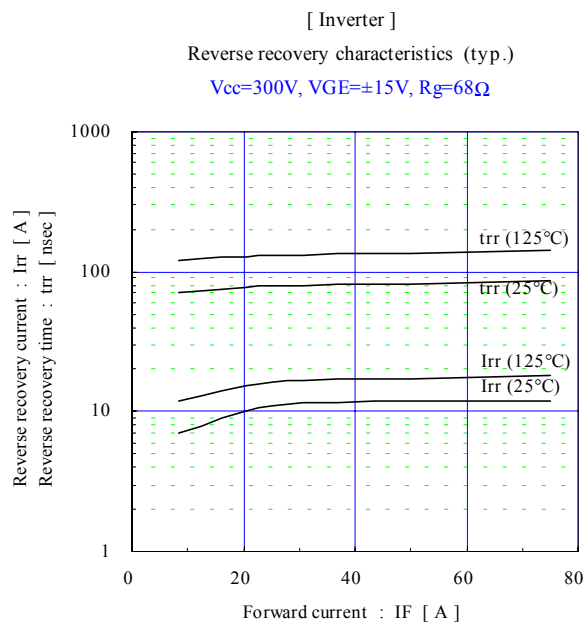
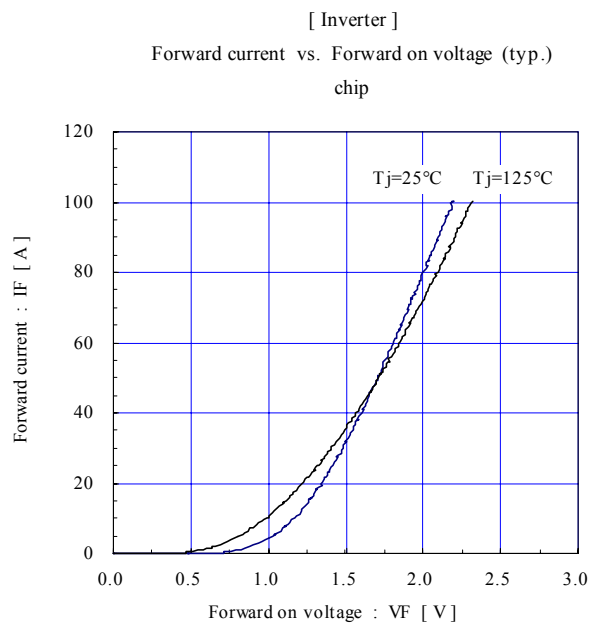
Switching loss vs. Gate resistance (typ.)
 $V_{cc}=300V$, $I_c=50A$, $V_{GE}=\pm 15V$, $T_j=125^\circ C$



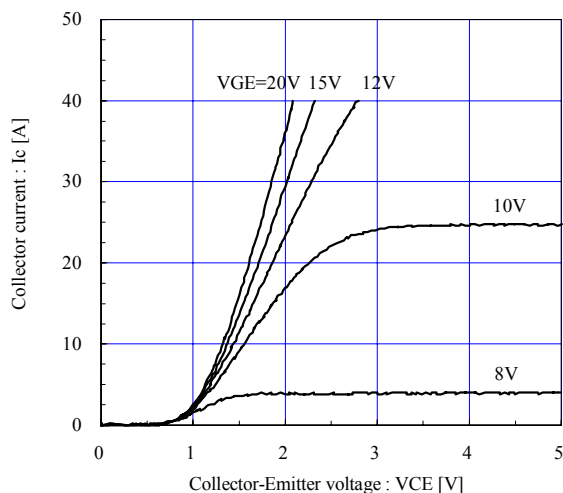
[Inverter]

Reverse bias safe operating area (max.)
 $+V_{GE}=15V$, $-V_{GE} \leq 15V$, $R_g \geq 68\Omega$, $T_j \leq 125^\circ C$

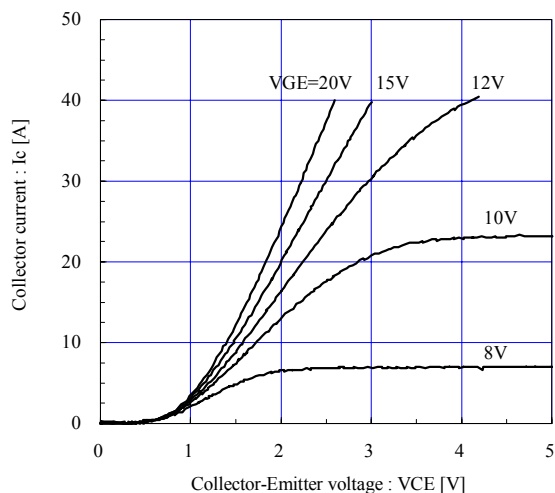




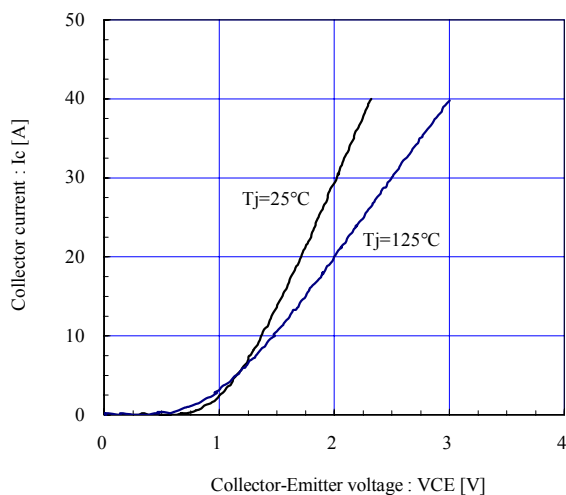
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



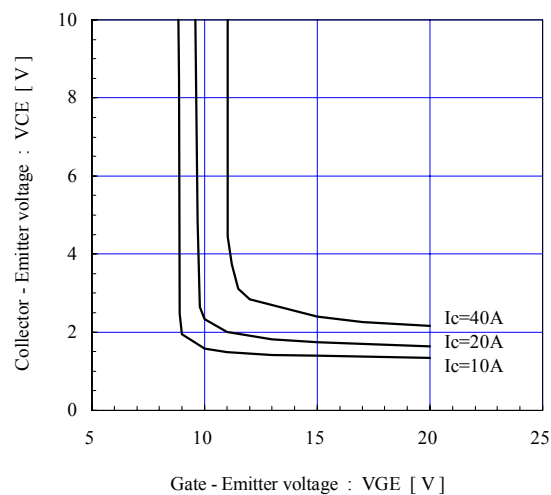
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
 $T_j = 125^\circ\text{C}$ / chip



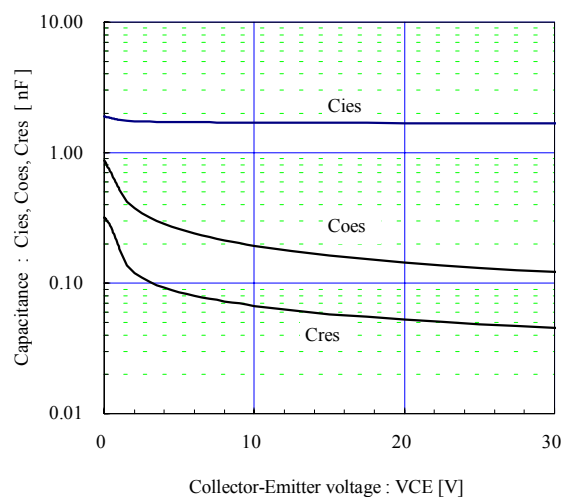
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



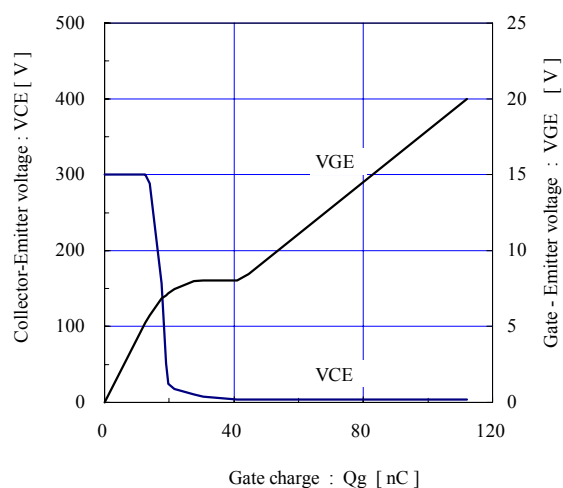
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



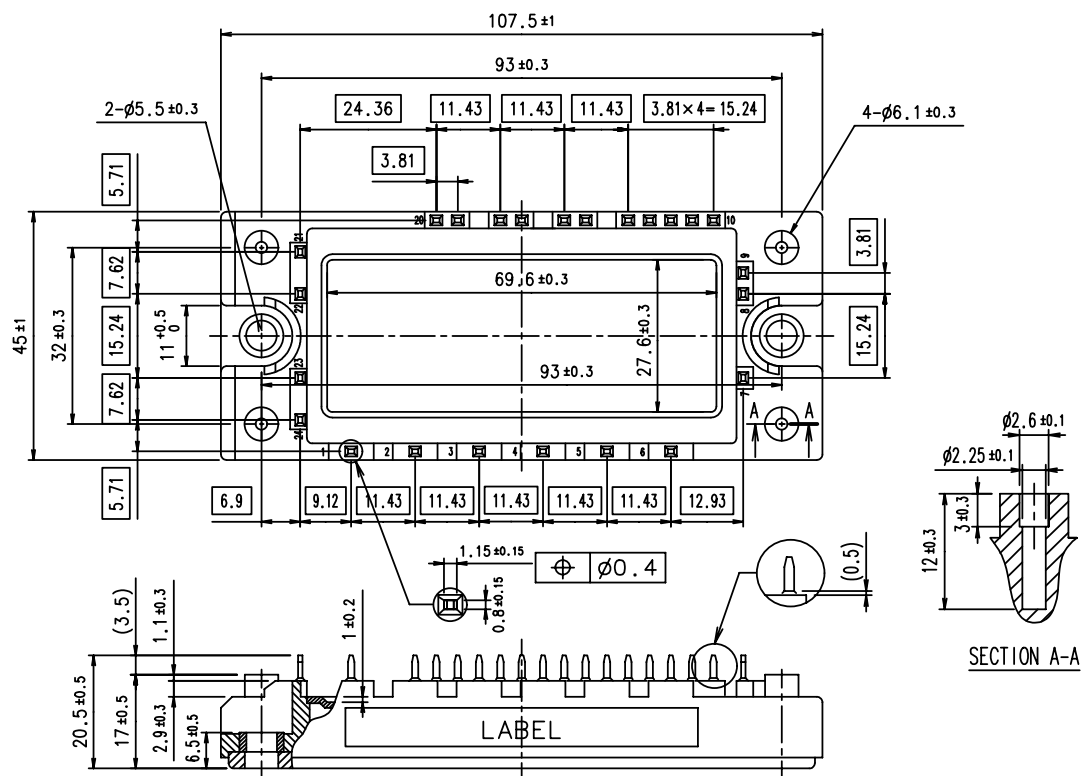
[Brake]
Capacitance vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$



[Brake]
Dynamic Gate charge (typ.)
 $V_{CC} = 300\text{V}$, $I_C = 20\text{A}$, $T_j = 25^\circ\text{C}$



■ Outline Drawings, mm



 shows theoretical dimension.
 () shows reference dimension.