

## IGBT MODULE (U series)

### 600V / 75A / 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 <sub>CES</sub>		600	V
	Gate-Emitter voltage	V <sub>GES</sub>		±20	V
	Collector current	I <sub>C</sub>	Continuous	75	A
		I <sub>CP</sub>	1ms	150	
		-I <sub>C</sub>		75	
		-I <sub>C</sub> pulse	1ms	150	
		Collector power dissipation	P <sub>C</sub>	1 device	
Brake	Collector-Emitter voltage	V <sub>CES</sub>		600	V
	Gate-Emitter voltage	V <sub>GES</sub>		±20	V
	Collector current	I <sub>C</sub>	Continuous	30	A
		I <sub>CP</sub>	1ms	60	A
	Collector power dissipation	P <sub>C</sub>	1 device	133	W
	Repetitive peak reverse voltage	V <sub>RRM</sub>		600	V
	Converter	Repetitive peak reverse voltage	V <sub>RRM</sub>		800
Average output current		I <sub>O</sub>	50Hz/60Hz sine wave	75	A
Surge current (Non-Repetitive)		I <sub>FSM</sub>	T <sub>J</sub> =150°C, 10ms	525	A
I <sub>θt</sub> (Non-Repetitive)		I <sub>θt</sub>	half sine wave	1378	A <sup>2</sup> s
Operating junction temperature		T <sub>J</sub>		+150	°C
Storage temperature		T <sub>stg</sub>		-40 to +125	°C
Isolation voltage	between terminal and copper base *2	V <sub>iso</sub>	AC : 1 minute	AC 2500	V
	between thermistor and others *3			AC 2500	V
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<sub>j</sub>=25°C unless otherwise specified)

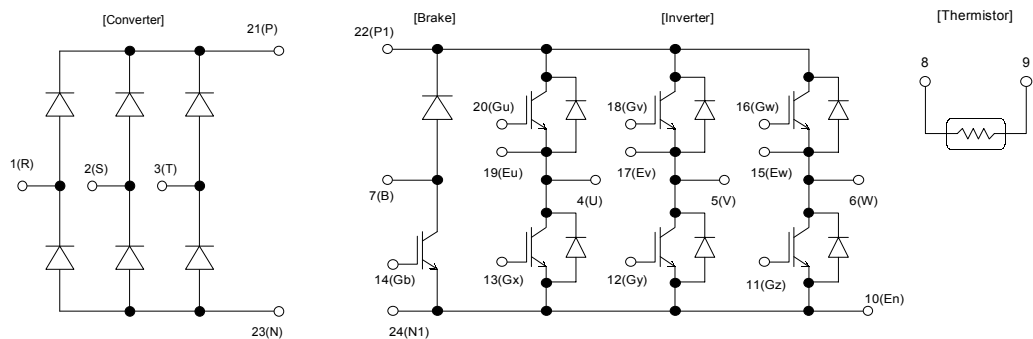
Item		Symbol	Condition		Characteristics			Unit
					Min.	Typ.	Max.	
Inverter	Zero gate voltage collector current	ICES	VCE=600V, VGE=0V		-	-	1.0	mA
	Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V		-	-	200	nA
	Gate-Emitter threshold voltage	VGE(th)	VCE=20V, IC=75mA		6.2	6.7	7.7	V
	Collector-Emitter saturation voltage	VCE(sat) (terminal)	VGE=15V IC=75A	TJ=25°C	-	2.20	2.50	V
				TJ=125°C	-	2.40	-	
		VCE(sat) (chip)		TJ=25°C	-	1.85	-	
				TJ=125°C	-	2.15	-	
	Input capacitance	Cies	VGE=0V, VCE=10V, f=1MHz		-	5.4	-	nF
	Turn-on time	ton	VCC=300V IC=75A VGE=±15V RG=47Ω		-	0.42	1.20	μs
		tr			-	0.24	0.60	
		tr(i)			-	0.05	-	
		toff			-	0.42	1.20	
	Turn-off time	tr			-	0.03	0.45	
		VF (terminal)	VGE=0V IF=75A	TJ=25°C	-	1.95	2.30	V
				TJ=125°C	-	2.00	-	
				VF (chip)	TJ=25°C	-	1.60	
	TJ=125°C				-	1.65	-	
	Reverse recovery time	trr	IF=75A		-	-	0.35	μs
	Brake	Zero gate voltage collector current	ICES	VCE=600V, VGE=0V		-	-	1.0
Gate-Emitter leakage current		IGES	VCE=0V, VGE=±20V		-	-	200	nA
Collector-Emitter saturation voltage		VCE(sat) (terminal)	IC=30A VGE=15V	TJ=25°C	-	2.00	2.30	V
				TJ=125°C	-	2.30	-	
		VCE(sat) (chip)		TJ=25°C	-	1.85	-	
				TJ=125°C	-	2.15	-	
Turn-on time		ton	VCC=300V IC=30A VGE=±15V RG=120Ω		-	0.42	1.20	μs
		tr			-	0.24	0.60	
		toff			-	0.42	1.20	
		tr			-	0.03	0.45	
Reverse current	IRRM	VR=600V		-	-	1.0	mA	
Converter	Forward on voltage	VFM	IF=75A	terminal	-	1.20	1.50	V
			VGE=0V	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 <sub>th(j-c)</sub>	Inverter IGBT	-	-	0.49	°C/W
		Inverter FWD	-	-	0.79	
		Brake IGBT	-	-	0.94	
		Converter Diode	-	-	0.66	
Contact thermal resistance *	R <sub>th(c-f)</sub>	With thermal compound	-	0.05	-	

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

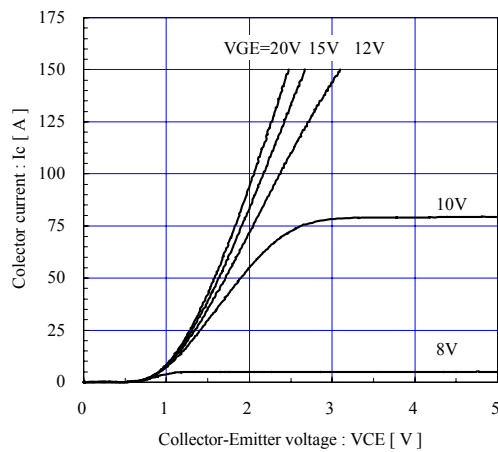
## ■ Equivalent Circuit Schematic



## ■ Characteristics (Representative)

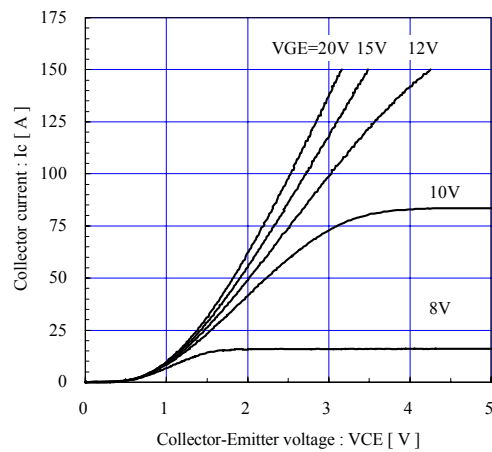
[ Inverter ]

Collector current vs. Collector-Emittor voltage (typ.)

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

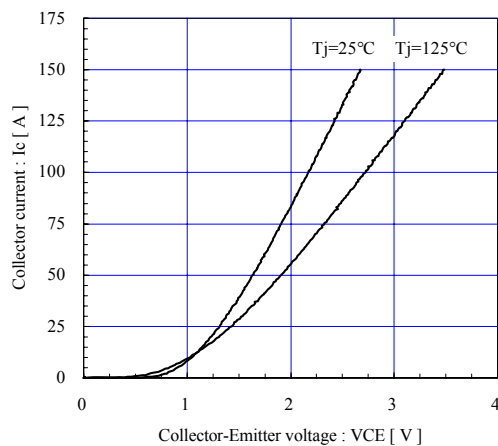
[ Inverter ]

Collector current vs. Collector-Emittor voltage (typ.)

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

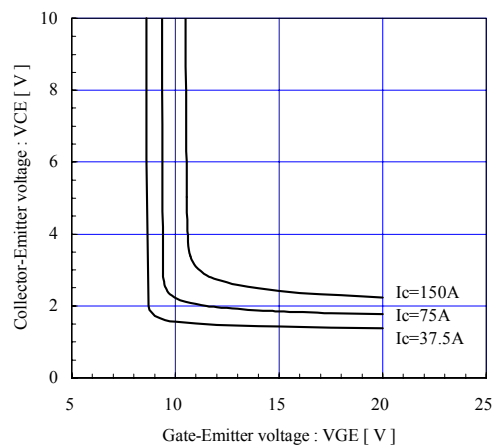
[ Inverter ]

Collector current vs. Collector-Emittor voltage (typ.)

 $V_{GE} = 15\text{V}$  / chip

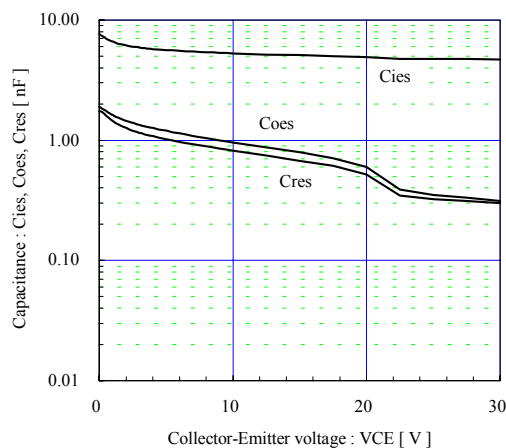
[ Inverter ]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)

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

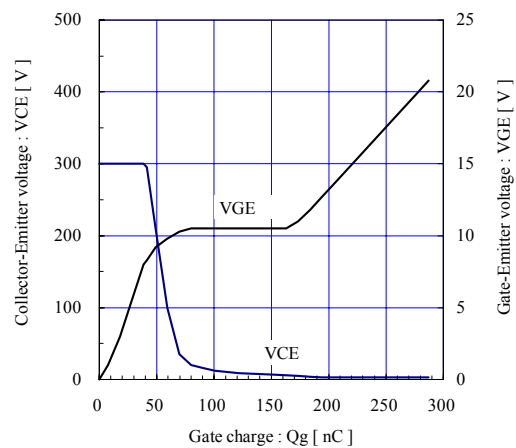
[ Inverter ]

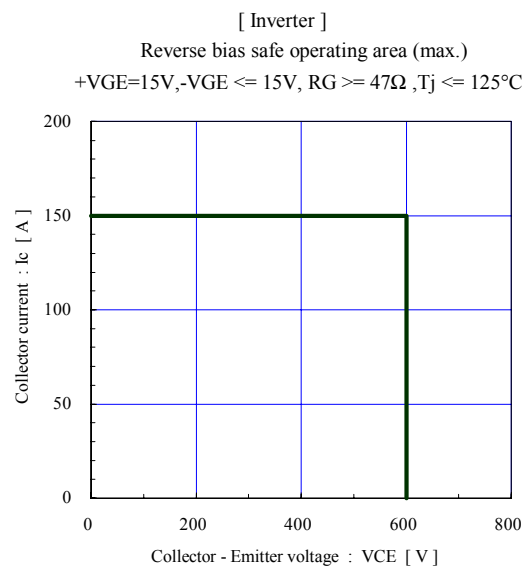
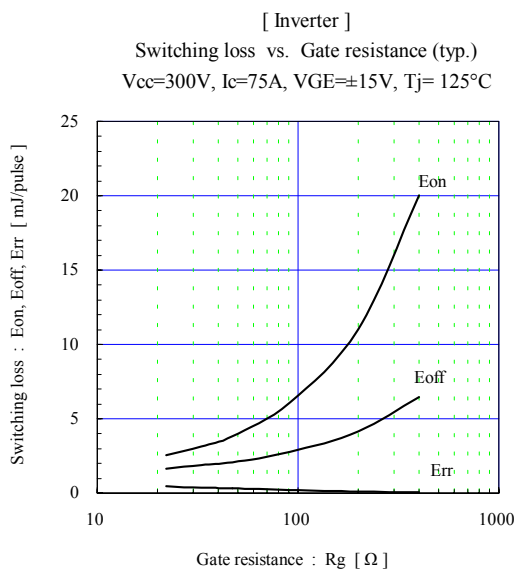
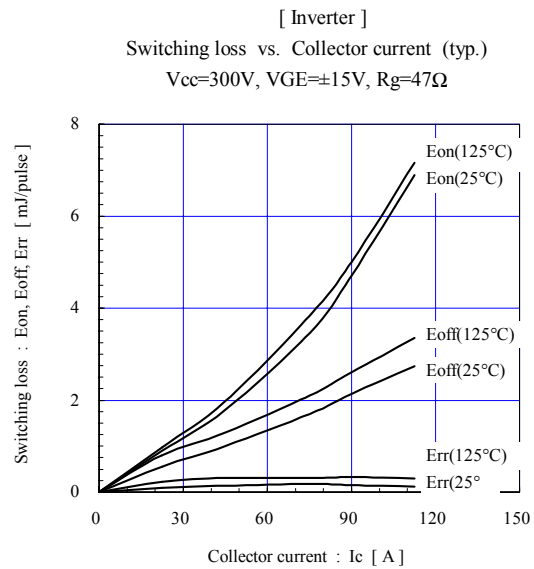
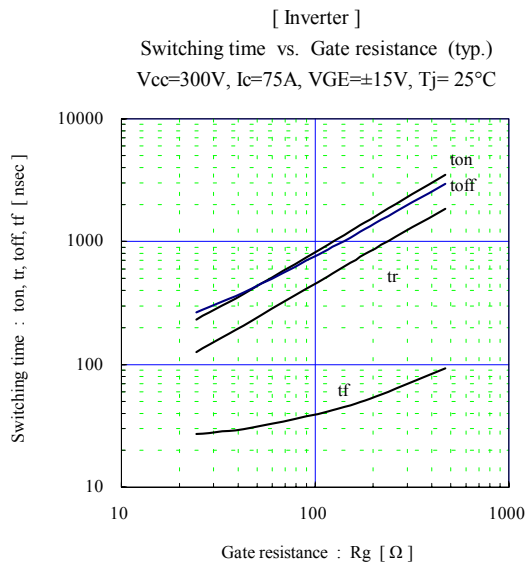
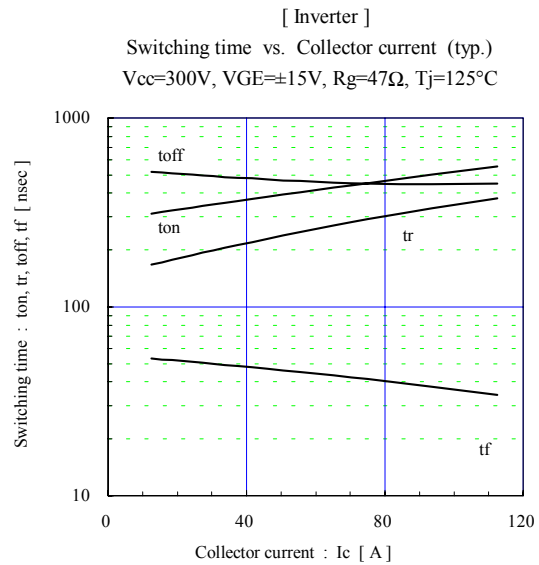
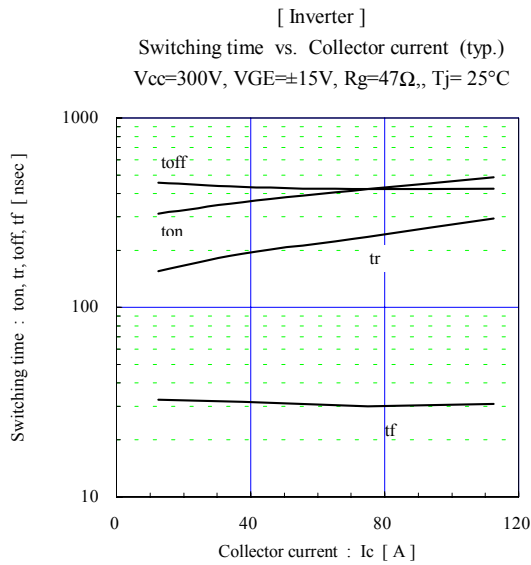
Capacitance vs. Collector-Emittor voltage (typ.)

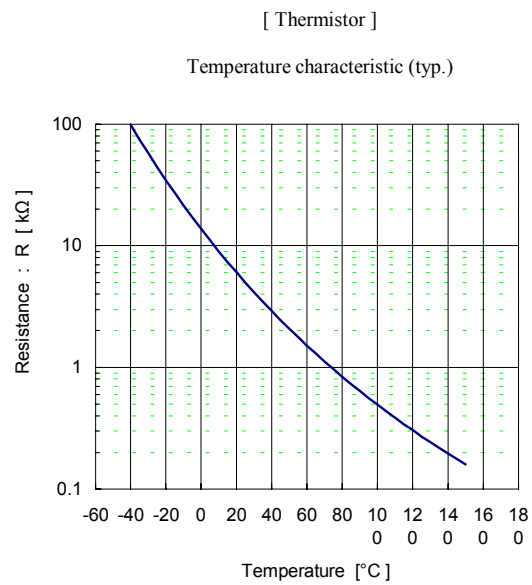
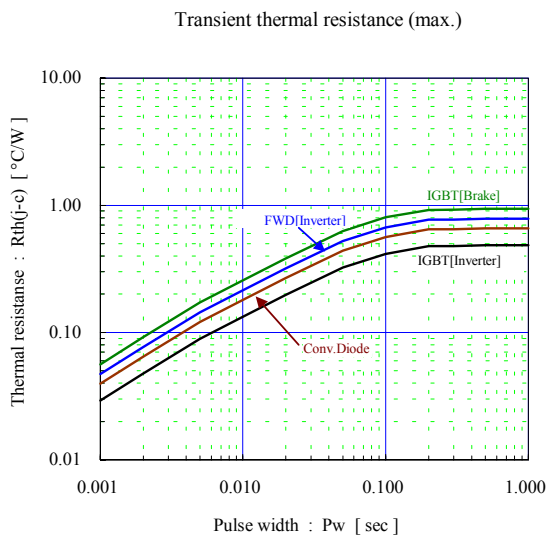
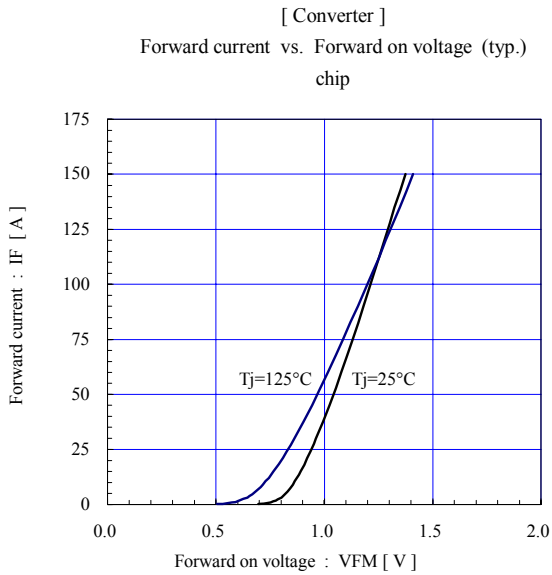
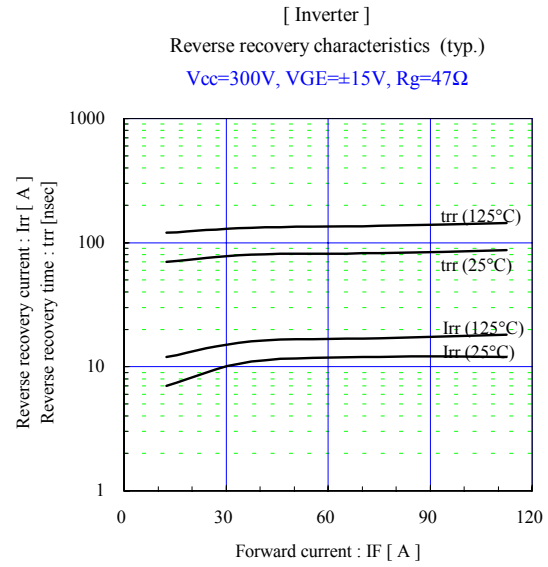
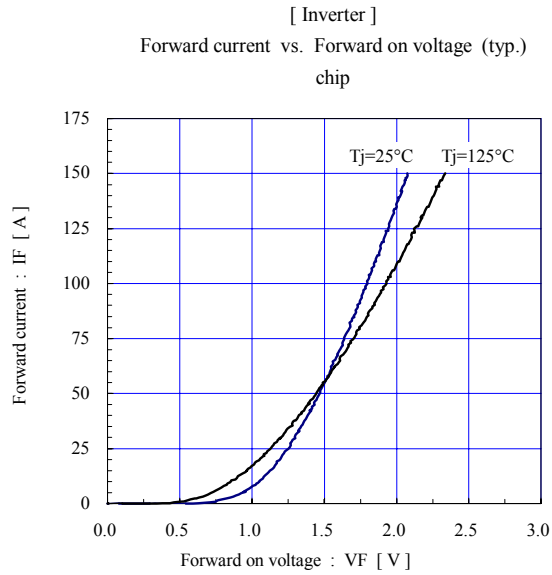
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$ 

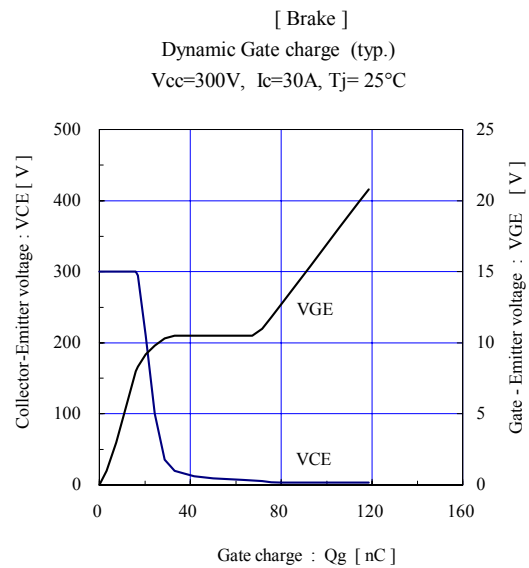
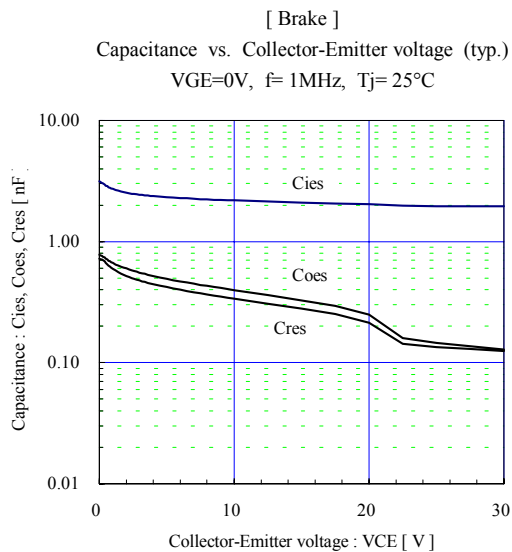
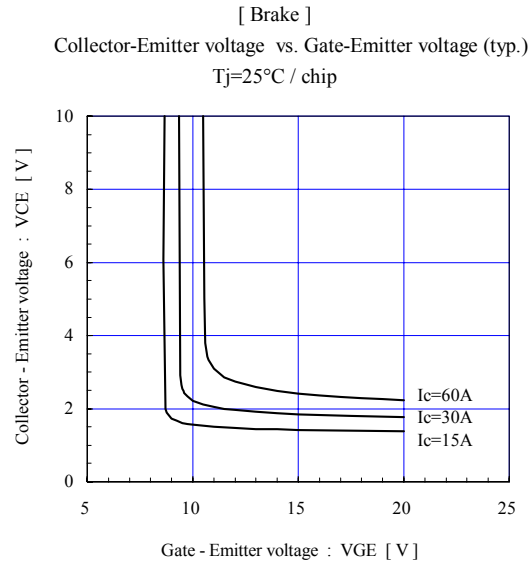
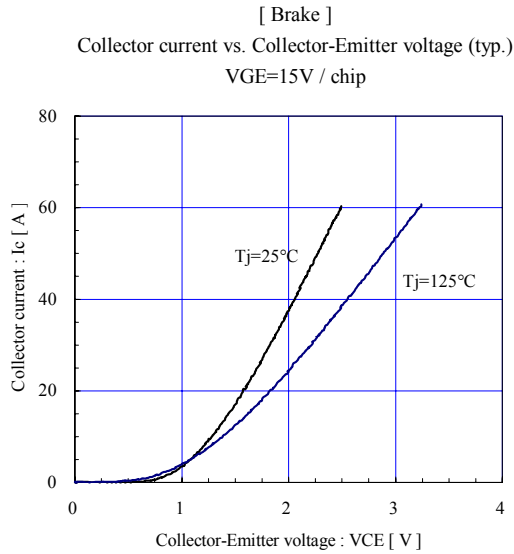
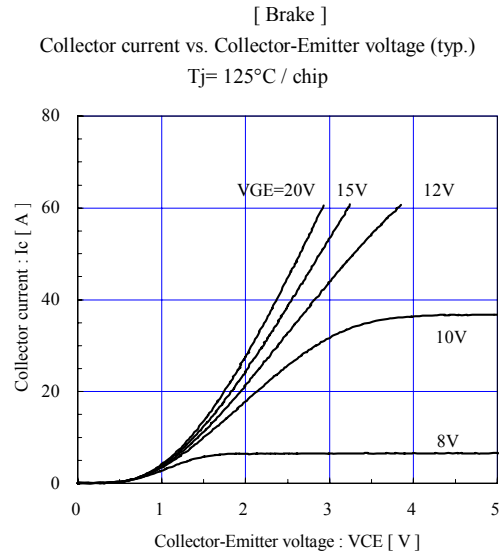
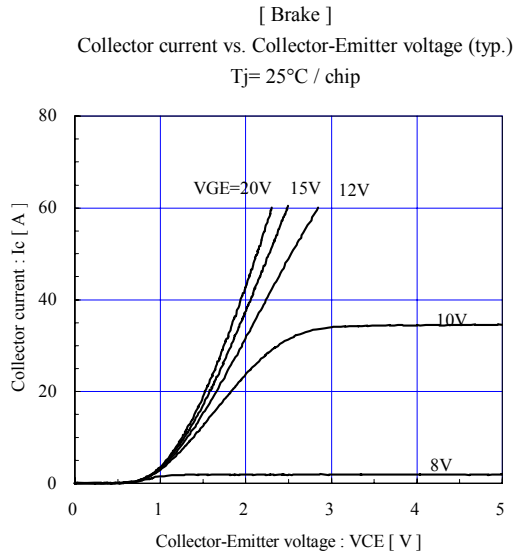
[ Inverter ]

Dynamic Gate charge (typ.)

 $V_{ce} = 300\text{V}$ ,  $I_c = 75\text{A}$ ,  $T_j = 25^\circ\text{C}$ 







### ■ Outline Drawings, mm

