

IGBT MODULE (U series) 1200V / 35A / 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}	1200	V		
	Gate-Emitter voltage	V_{GES}	± 20	V		
	Collector current	I_C	Continuous	$T_C=25^{\circ}\text{C}$	35	A
				$T_C=80^{\circ}\text{C}$	25	
		I_{CP}	1ms	$T_C=25^{\circ}\text{C}$	70	
				$T_C=80^{\circ}\text{C}$	50	
		$-I_C$		35		
$-I_C$ pulse	1ms	70				
Collector power dissipation	P_C	1 device	160	W		
Brake	Collector-Emitter voltage	V_{CES}	1200	V		
	Gate-Emitter voltage	V_{GES}	± 20	V		
	Collector current	I_C	Continuous	$T_C=25^{\circ}\text{C}$	25	A
				$T_C=80^{\circ}\text{C}$	15	
		I_{CP}	1ms	$T_C=25^{\circ}\text{C}$	50	
				$T_C=80^{\circ}\text{C}$	30	
	Collector power dissipation	P_C	1 device	115	W	
Repetitive peak reverse voltage	V_{RRM}		1200	V		
Converter	Repetitive peak reverse voltage	V_{RRM}	1600	V		
	Average output current	I_o	50Hz/60Hz sine wave	35	A	
	Surge current (Non-Repetitive)	I_{FSM}	$T_J=150^{\circ}\text{C}$, 10ms	360	A	
	I^2t (Non-Repetitive)	P^2t	half sine wave	648	A^2s	
Operating junction temperature		T_J	+150	$^{\circ}\text{C}$		
Storage temperature		T_{slg}	-40 to +125	$^{\circ}\text{C}$		
Isolation voltage	between terminal and copper base *2	V_{iso}	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_j=25°C unless otherwise specified)

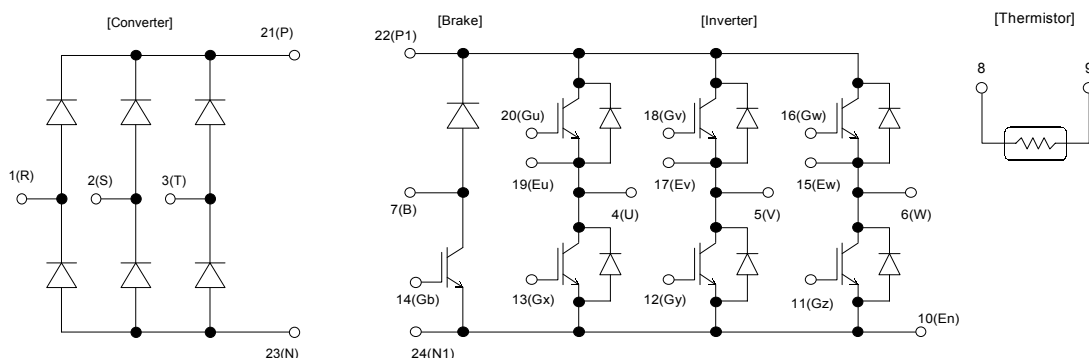
Item		Symbol	Condition		Characteristics			Unit
					Min.	Typ.	Max.	
Inverter	Zero gate voltage collector current	ICES	VCE=1200V, VGE=0V		-	-	1.0	mA
	Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V		-	-	200	nA
	Gate-Emitter threshold voltage	VGE(th)	VCE=20V, Ic=35mA		4.5	6.5	8.5	V
	Collector-Emitter saturation voltage	VCE(sat) (terminal)	VGE=15V Ic=35A	Tj=25°C	-	2.15	2.60	V
				Tj=125°C	-	2.50	-	
		VCE(sat) (chip)	Tj=25°C	-	1.95	2.40		
			Tj=125°C	-	2.30	-		
	Input capacitance	Cies	VGE=0V, VCE=10V, f=1MHz		-	3	-	nF
	Turn-on time	ton	VCC=600V		-	0.53	1.20	µs
		tr	Ic=35A		-	0.43	0.60	
		tr(i)	VGE=±15V		-	0.03	-	
	Turn-off time	toff	RG= 43 Ω		-	0.37	1.00	
		tf			-	0.07	0.30	
	Forward on voltage	VF (terminal)	VGE= 0 V If=35A	Tj=25°C	-	1.95	2.30	V
				Tj=125°C	-	2.10	-	
VF (chip)		Tj=25°C	-	1.75	2.10			
		Tj=125°C	-	1.90	-			
Reverse recovery time	trr	If=35A		-	-	0.35	µs	
Brake	Zero gate voltage collector current	ICES	VCE=1200V, VGE=0V		-	-	1.0	mA
	Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V		-	-	200	nA
	Collector-Emitter saturation voltage	VCE(sat) (terminal)	Ic=25A VGE=15V	Tj=25°C	-	2.30	2.80	V
				Tj=125°C	-	2.75	-	
		VCE(sat) (chip)	Tj=25°C	-	2.10	2.60		
			Tj=125°C	-	2.55	-		
	Turn-on time	ton	VCC=600V		-	0.53	1.20	µs
		tr	Ic=25A		-	0.43	0.60	
	Turn-off time	toff	VGE=±15V		-	0.37	1.00	
		tf	RG= 68 Ω		-	0.07	0.30	
	Reverse current	IRRM	VR=1200V		-	-	1.0	mA
Converter	Forward on voltage	VFM	If=35A	terminal	-	1.20	1.50	V
			VGE=0V	chip	-	1.10	-	
	Reverse current	IRRM	VR=1600V		-	-	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

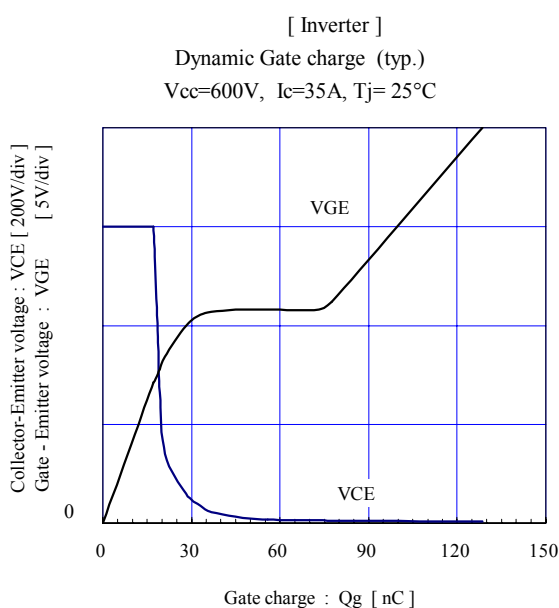
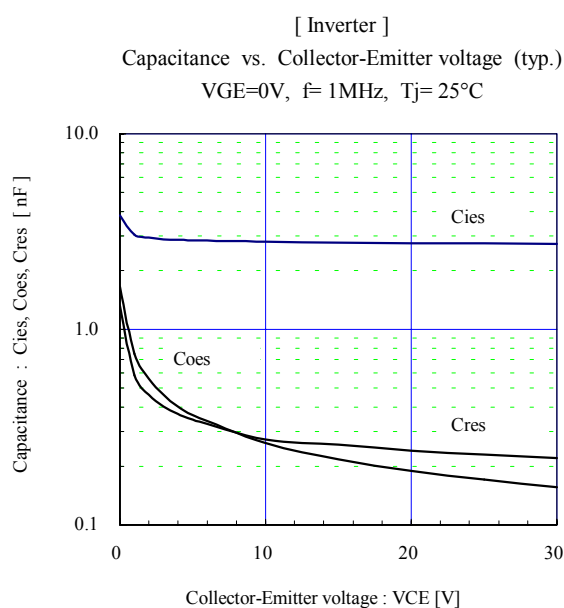
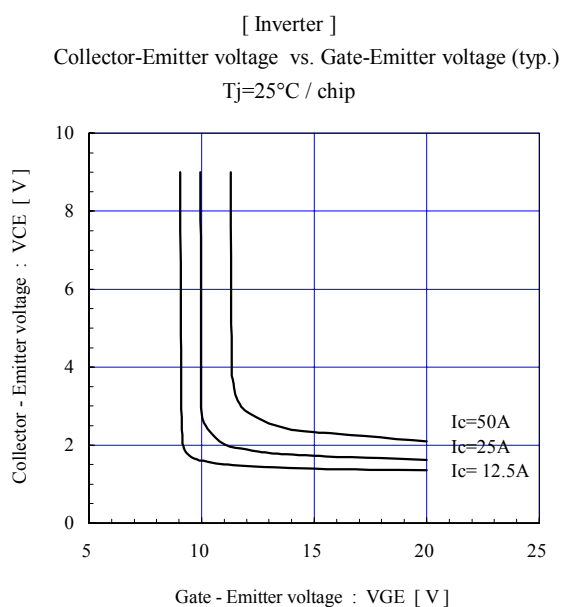
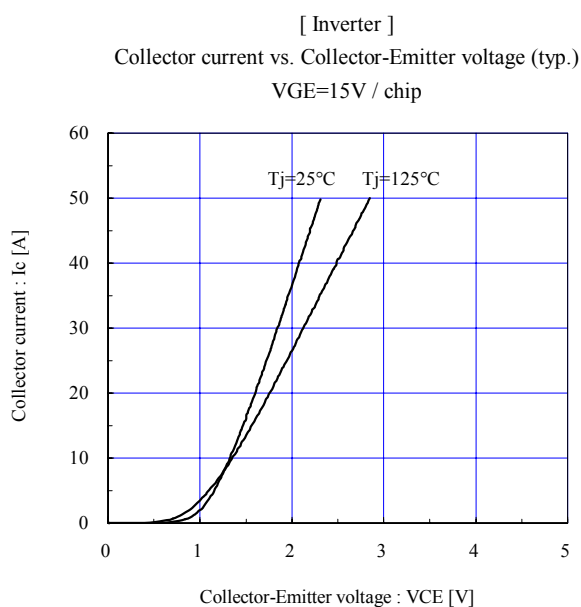
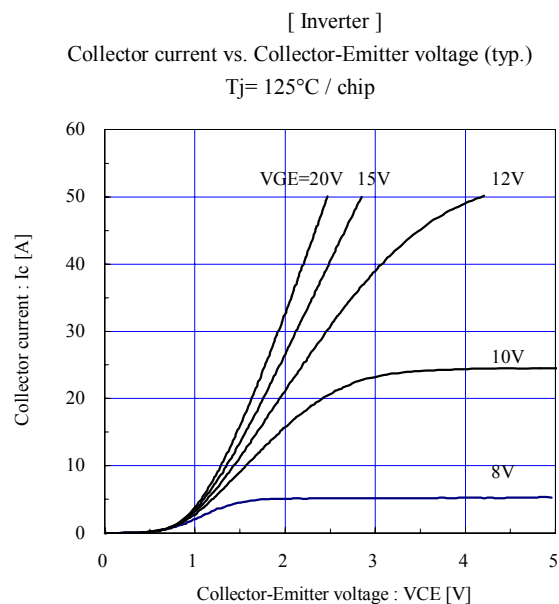
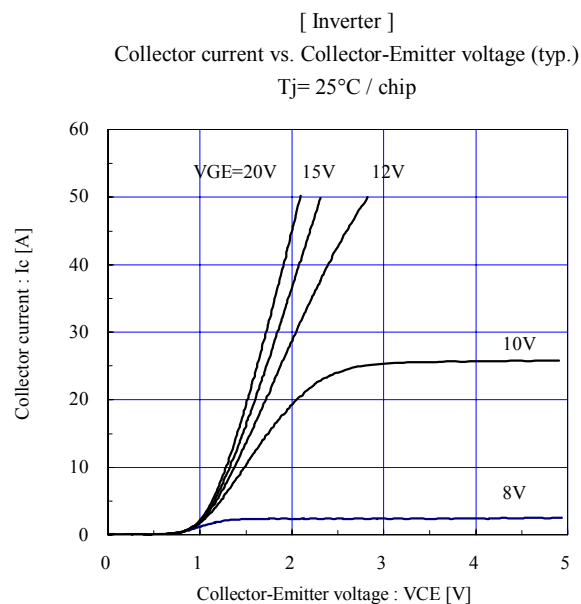
Item	Symbol	Condition	Characteristics			Unit
			Min.	Typ.	Max.	
Thermal resistance (1 device)	R _{th(j-c)}	Inverter IGBT	-	-	0.76	°C/W
		Inverter FWD	-	-	1.19	
		Brake IGBT	-	-	1.07	
		Converter Diode	-	-	0.73	
		With thermal compound	-	0.05	-	
Contact thermal resistance *	R _{th(c-f)}	With thermal compound	-	0.05	-	

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

■ Equivalent Circuit Schematic

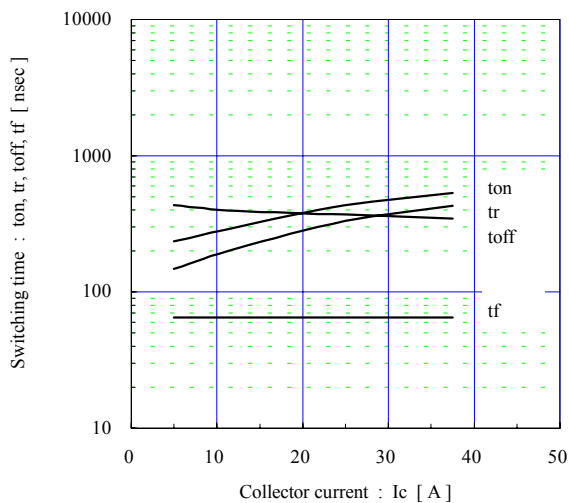


■ Characteristics (Representative)



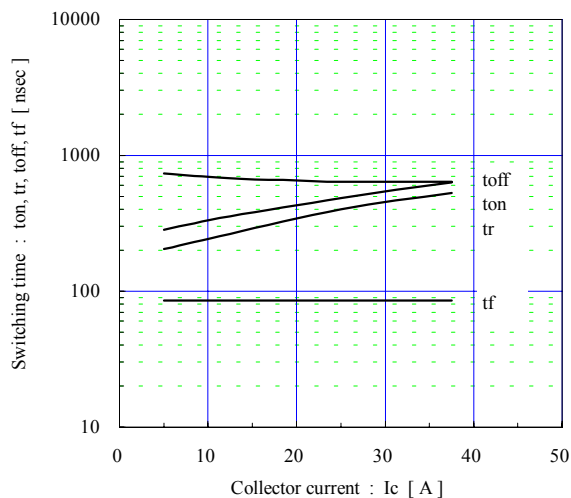
[Inverter]

Switching time vs. Collector current (typ.)
V_{cc}=600V, V_{GE}=±15V, R_g=43Ω, T_j= 25°C



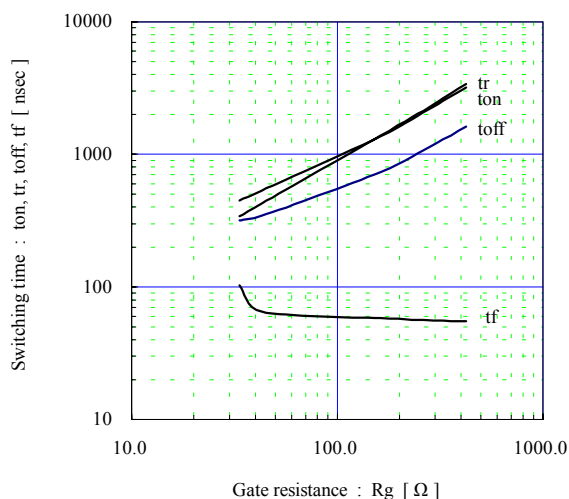
[Inverter]

Switching time vs. Collector current (typ.)
V_{cc}=600V, V_{GE}=±15V, R_g=43Ω, T_j=125°C



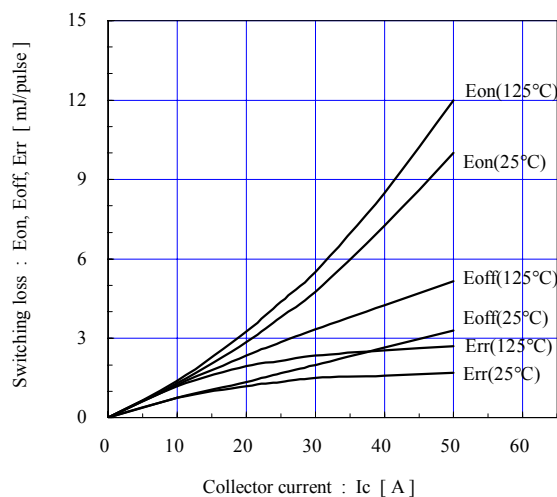
[Inverter]

Switching time vs. Gate resistance (typ.)
V_{cc}=600V, Ic=35A, V_{GE}=±15V, T_j= 25°C



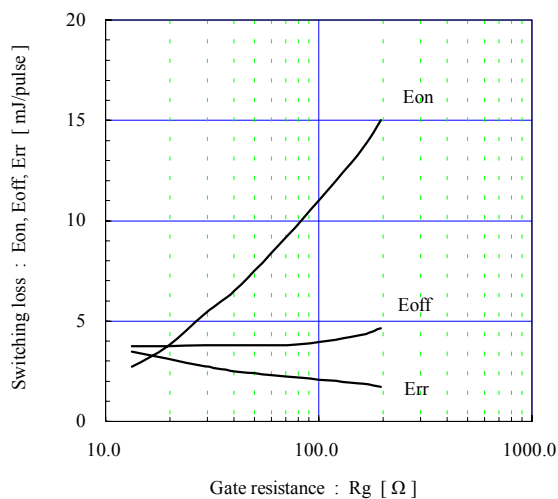
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Switching loss vs. Collector current (typ.)
V_{cc}=600V, V_{GE}=±15V, R_g=43Ω



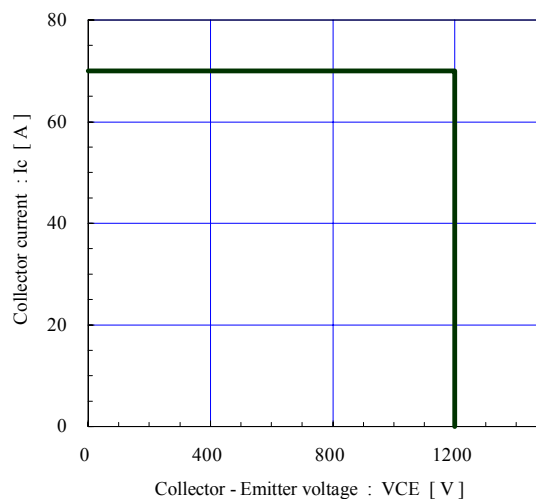
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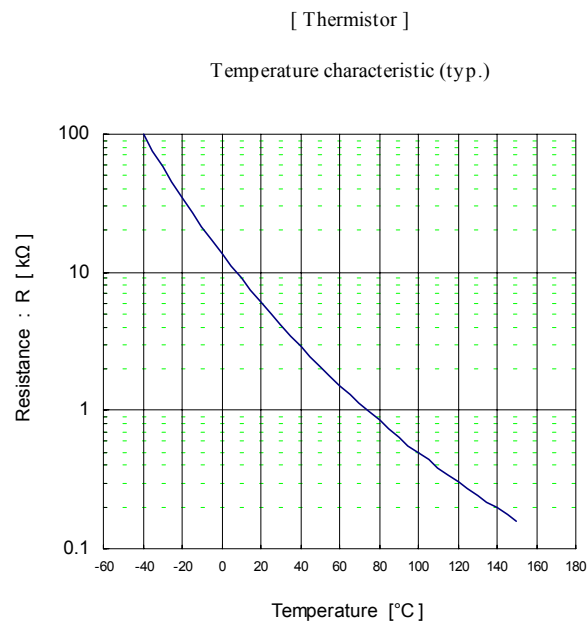
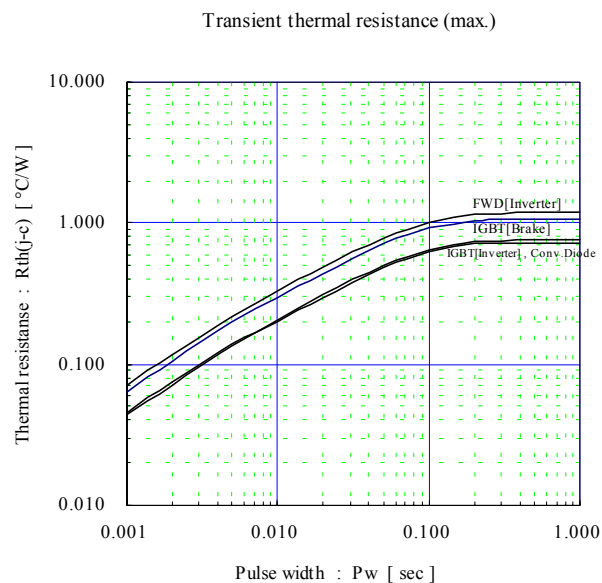
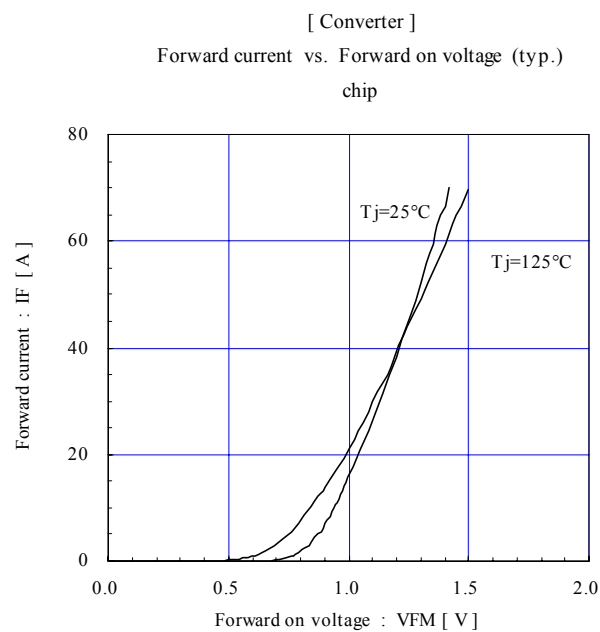
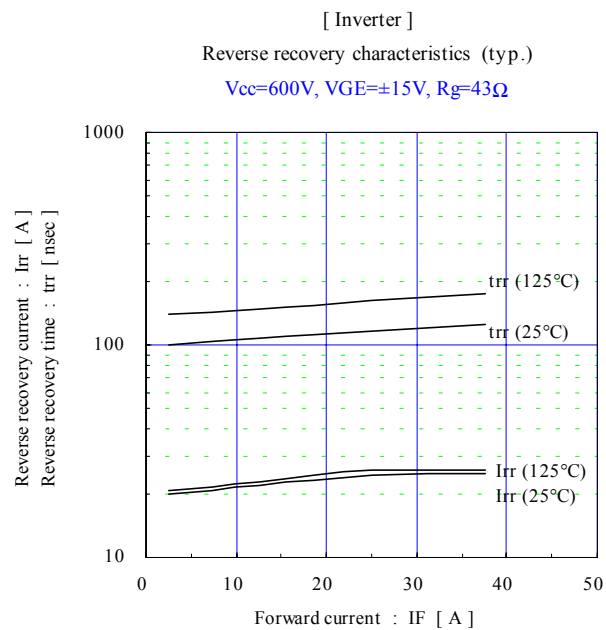
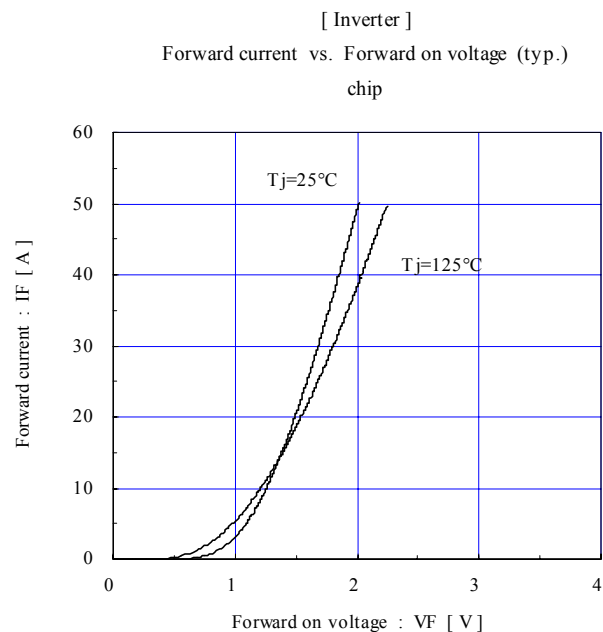
Switching loss vs. Gate resistance (typ.)
V_{cc}=600V, Ic=35A, V_{GE}=±15V, T_j= 125°C



[Inverter]

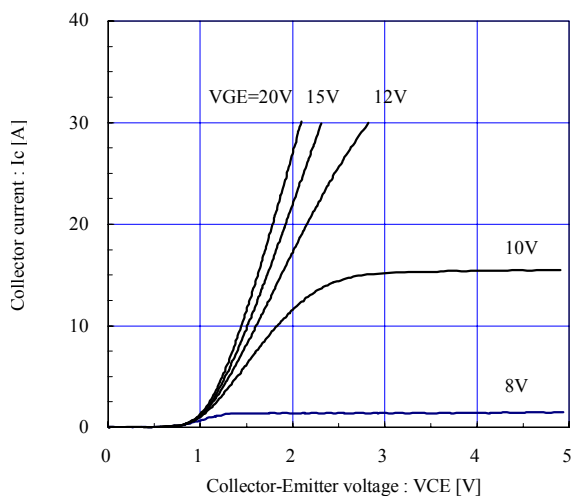
Reverse bias safe operating area (max.)
+V_{GE}=15V, -V_{GE} ≤ 15V, R_g ≥ 43Ω, T_j ≤ 125°C





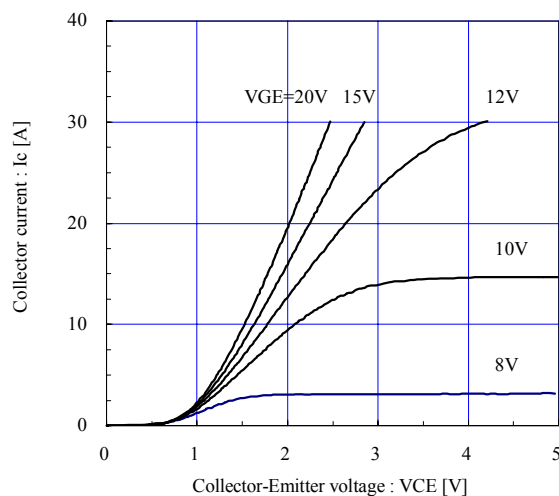
[Brake]

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

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

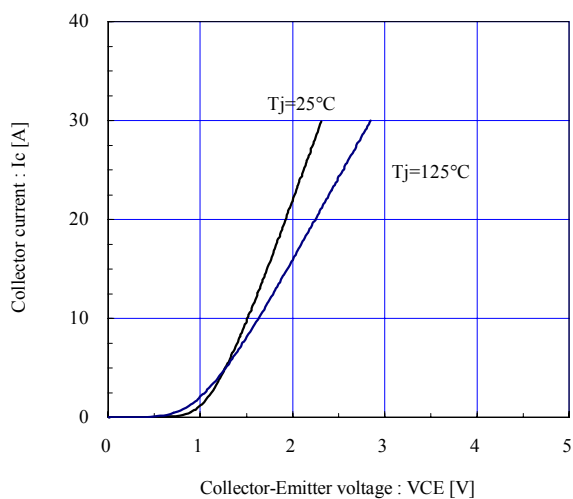
[Brake]

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

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

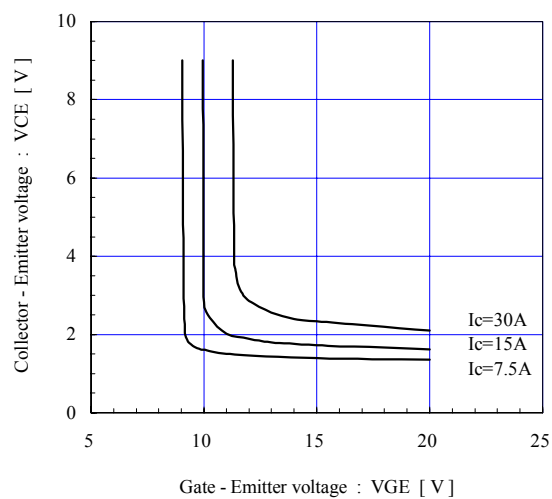
[Brake]

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

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

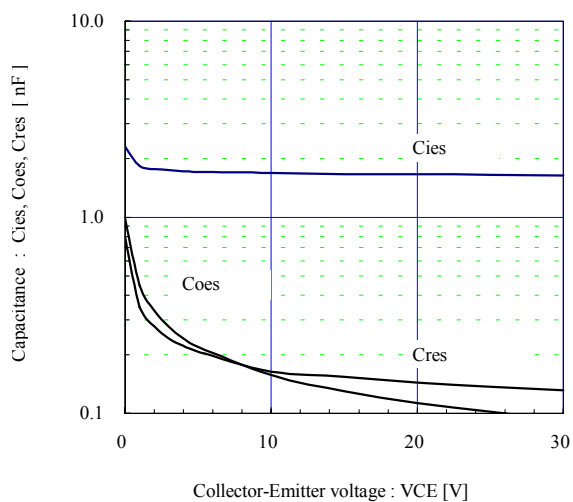
[Brake]

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

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

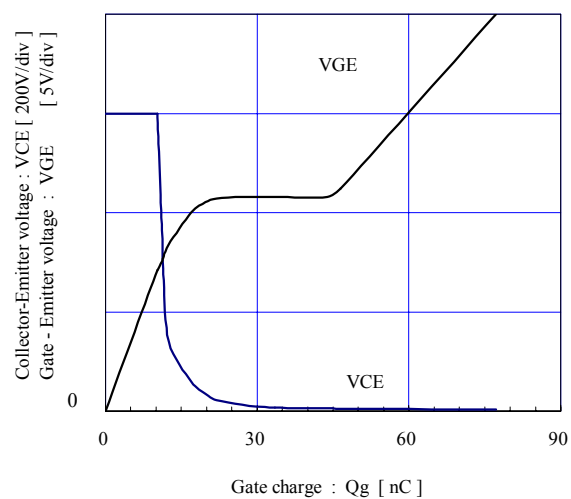
[Brake]

Capacitance vs. Collector-Emittor voltage (typ.)

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

[Brake]

Dynamic Gate charge (typ.)

 $V_{CC} = 600\text{V}$, $I_c = 25\text{A}$, $T_j = 25^\circ\text{C}$ 

■ Outline Drawings, mm

