IGBT MODULE (U series)
1200V / 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 (Tc=25°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	Tc=25°C	50	A
				Tc=80°C	35	
		I_{CP}	1ms	Tc=25°C	100	
				Tc=80°C	70	
		-I_C	Duty=70%		50	
		-I_C pulse	1ms		100	
	Collector power disspation	P_C	1 device		205	W
Brake	Collector-Emitter voltage	V_{CES}			1200	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_C	Continuous	Tc=25°C	25	A
				Tc=80°C	15	
		I_{CP}	1ms	Tc=25°C	50	
				Tc=80°C	30	
	Collector power disspation	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		50	A
	Surge current (Non-Repetitive)	I_{FSM}	Tj=150°C, 10ms half sine wave		260	A
	I^2t (Non-Repetitive)	I^2t			338	A^2s
Operating junction temperature		T_j			+150	℃
Storage temperature		T_{stg}			-40 to +125	℃
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 (Tj=25°C unless otherwise specified)**

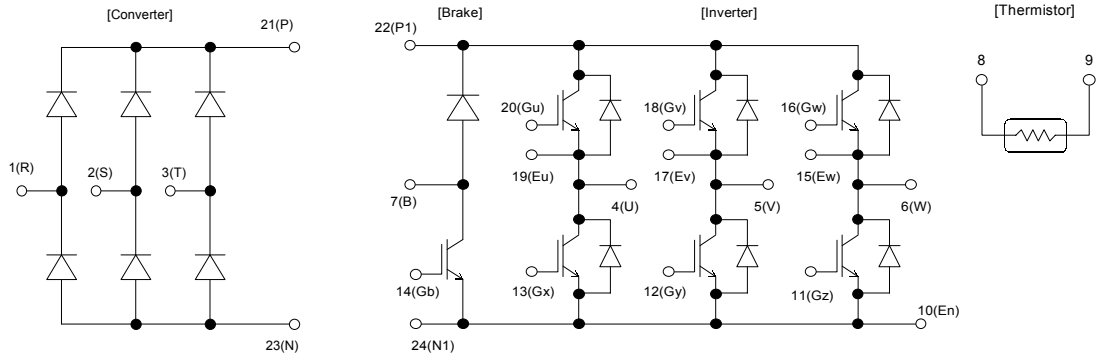
Item		Symbol	Condition		Characteristics Min.	Typ.	Max.	Unit
Inverter	Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V				1.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=±20V				200	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE}=20V, I_C=50mA		4.5	6.5	8.5	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE}=15V, I_C=50A	Tj=25°C		2.40	2.80	V
				Tj=125°C		2.75		
		$V_{CE(sat)}$ (chip)		Tj=25°C		2.00	2.40	
				Tj=125°C		2.35		
	Input capacitance	C_{ies}	V_{GE}=0V, V_{CE}=10V, f=1MHz			4		nF
	Turn-on time	t_{on}	V_{CC}=600V			0.53	1.20	µs
		t_r	I_C=50A			0.43	0.60	
		$t_{r(i)}$	V_{GE}=±15V			0.03		
	Turn-off time	t_{off}	R_G= 33 Ω			0.37	1.00	
		t_f				0.07	0.30	
	Forward on voltage	V_F (terminal)	V_{GE}= 0 V, I_F=50A	Tj=25°C		2.40	2.80	V
				Tj=125°C		2.65		
		V_F (chip)		Tj=25°C		2.00	2.40	
				Tj=125°C		2.25		
	Reverse recovery time	t_{rr}	I_F=50A				0.35	µs
Brake	Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V				1.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=±20V				200	nA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	I_C=25A, V_{GE}=15V	Tj=25°C		2.30	2.80	V
				Tj=125°C		2.75		
		$V_{CE(sat)}$ (chip)		Tj=25°C		2.10	2.60	
				Tj=125°C		2.55		
	Turn-on time	t_{on}	V_{CC}=600V			0.53	1.20	µs
		t_r	I_C=25A			0.43	0.60	
	Turn-off time	t_{off}	V_{GE}=±15V			0.37	1.00	
		t_f	R_G= 68 Ω			0.07	0.30	
	Reverse current	I_{RRM}	V_R=1200V				1.0	mA
Converter	Forward on voltage	V_{FM}	I_F=50 A	terminal		1.55	1.90	V
			V_{GE}=0V	chip		1.40		
	Reverse current	I_{RRM}	V_R=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 Min.	Typ.	Max.	Unit
Thermal resistance (1 device)	Rth(j-c)	Inverter IGBT			0.60	°C/W
		Inverter FWD			0.95	
		Brake IGBT			1.07	
		Converter Diode			0.90	
Contact thermal resistance *	Rth(c-f)	With thermal compound		0.05		

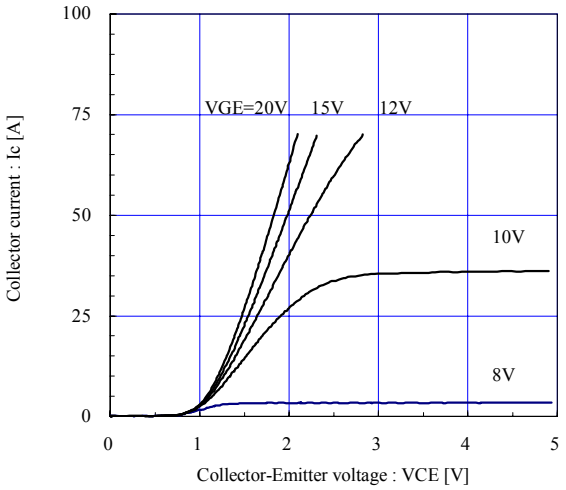
* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Equivalent Circuit Schematic

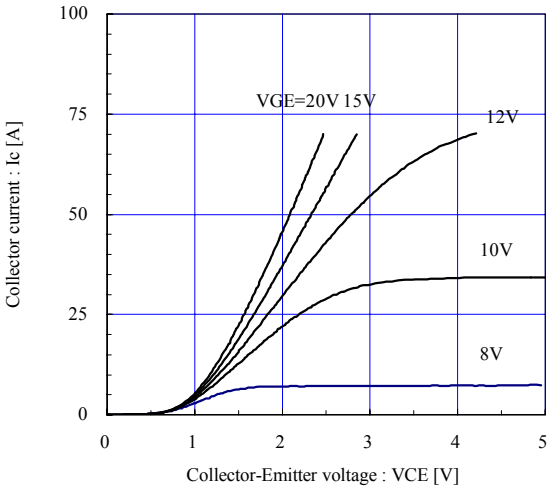


■ Characteristics (Representative)

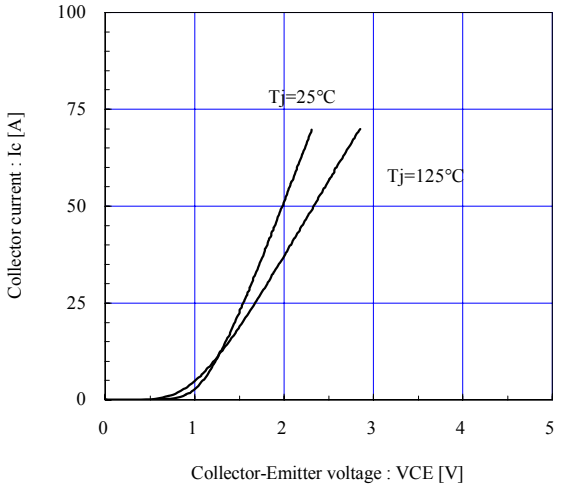
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



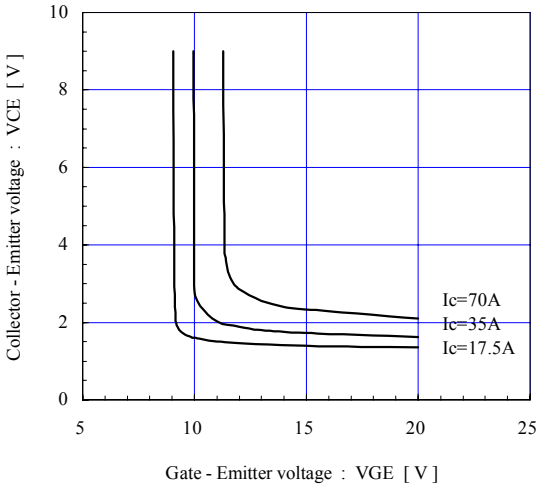
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 125°C / chip



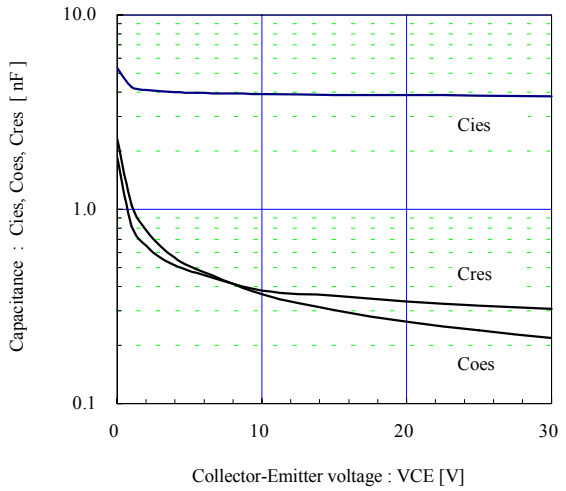
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



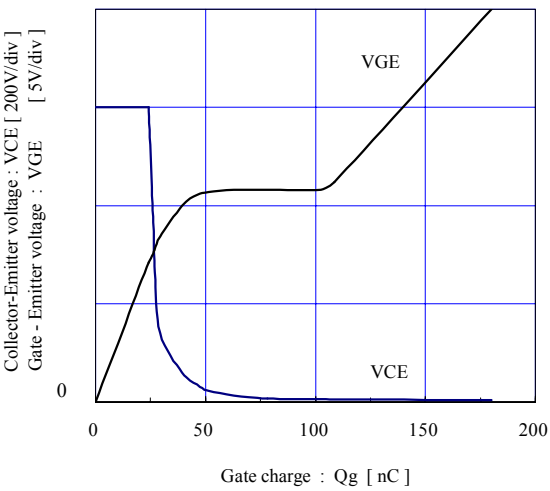
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj=25°C / chip



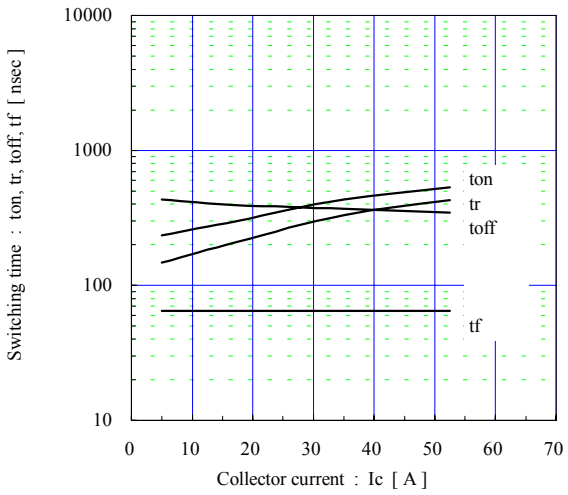
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



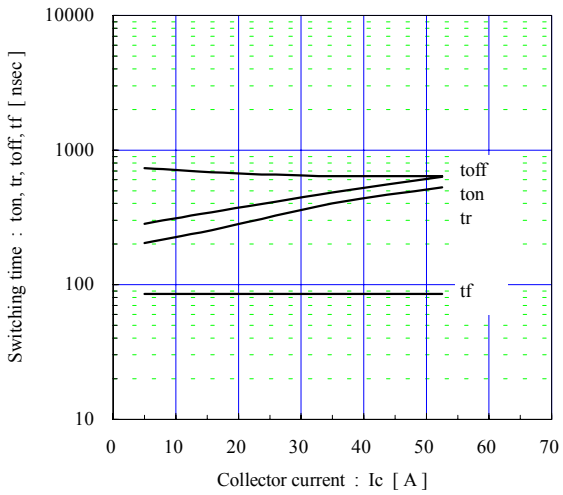
[Inverter]
Dynamic Gate charge (typ.)
Vcc=600V, Ic=50A, Tj= 25°C



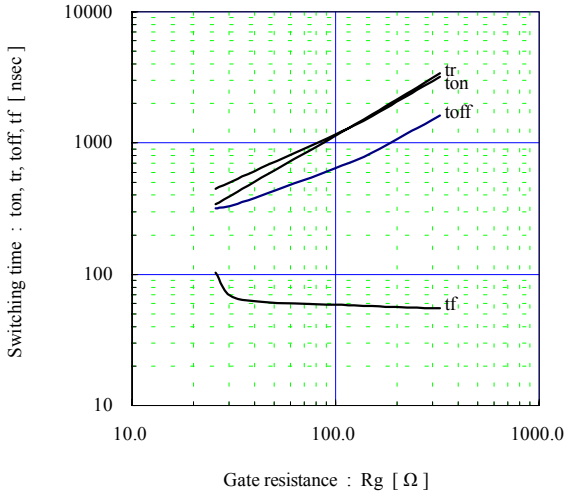
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=33Ω, Tj= 25°C



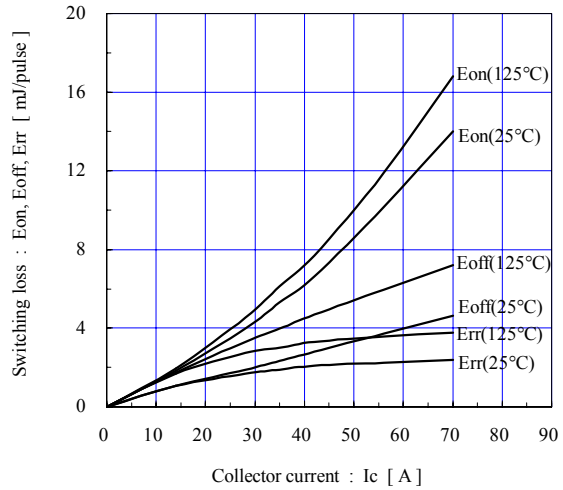
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=33Ω, Tj=125°C



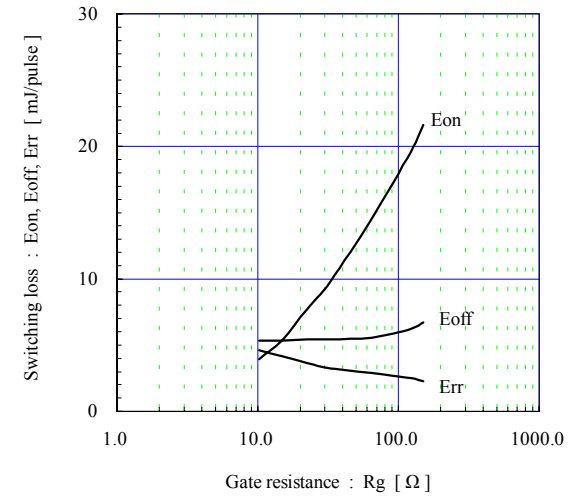
[Inverter]
Switching time vs. Gate resistance (typ.)
Vcc=600V, Ic=50A, VGE=±15V, Tj= 25°C



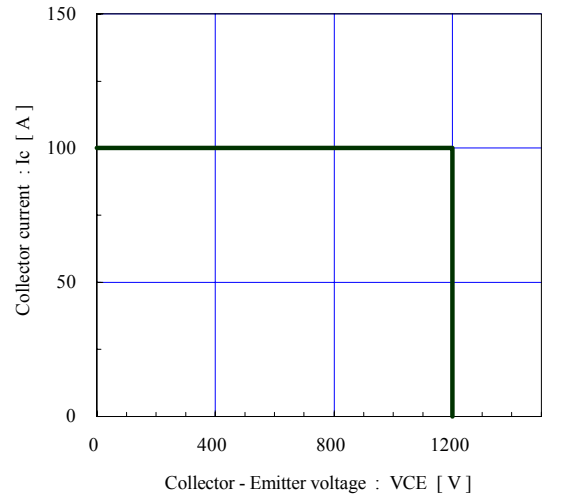
[Inverter]
Switching loss vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=33Ω



[Inverter]
Switching loss vs. Gate resistance (typ.)
Vcc=600V, Ic=50A, VGE=±15V, Tj= 125°C



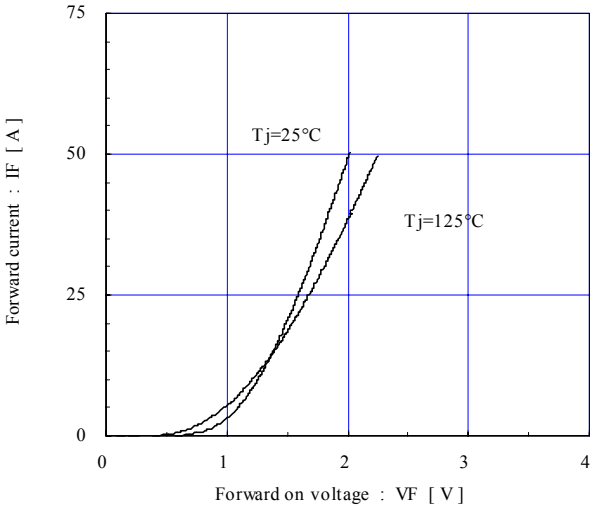
[Inverter]
Reverse bias safe operating area (max.)
+VGE=15V,-VGE <= 15V, RG >= 33Ω ,Tj <= 125°C



[Inverter]

Forward current vs. Forward on voltage (typ.)

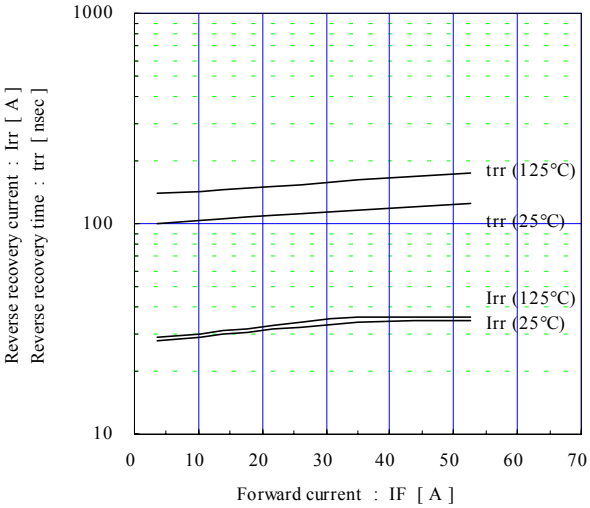
chip



[Inverter]

Reverse recovery characteristics (typ.)

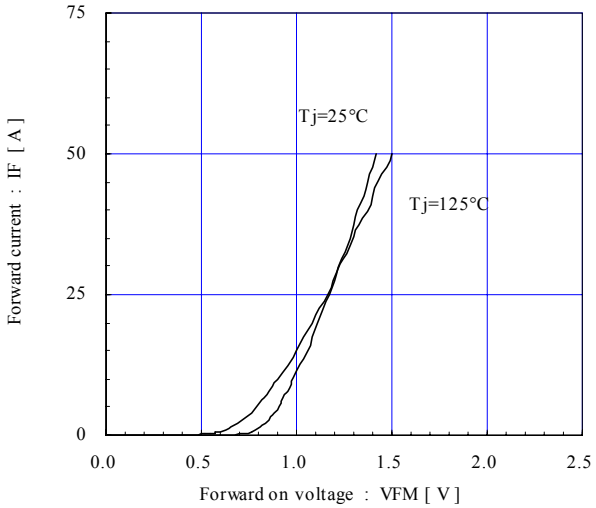
Vcc=600V, VGE=±15V, Rg=33Ω



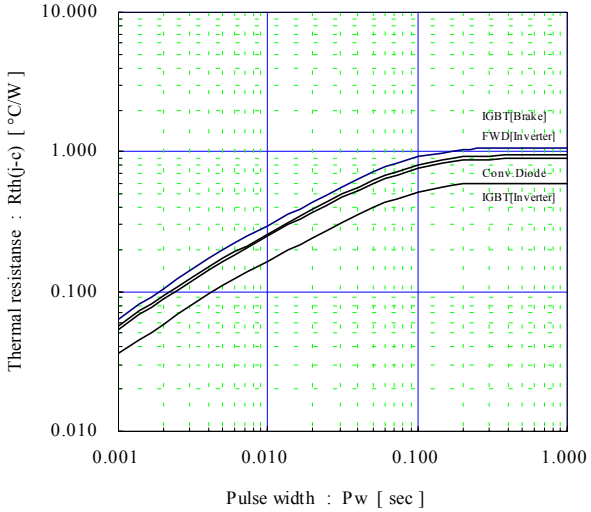
[Converter]

Forward current vs. Forward on voltage (typ.)

chip

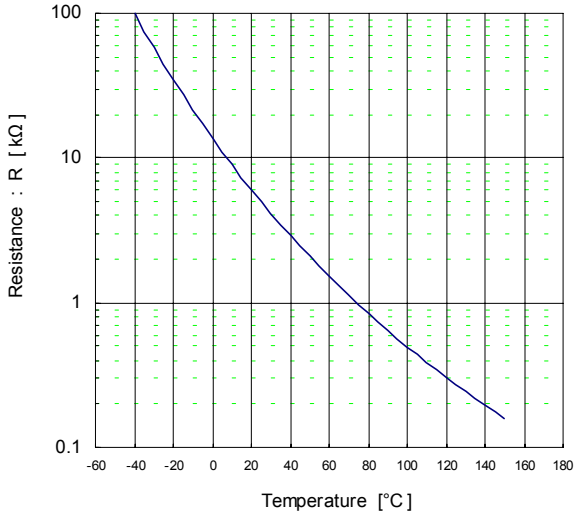


Transient thermal resistance (max.)

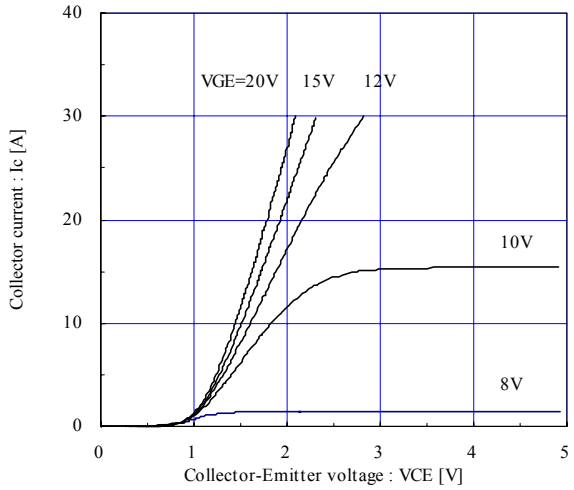


[Thermistor]

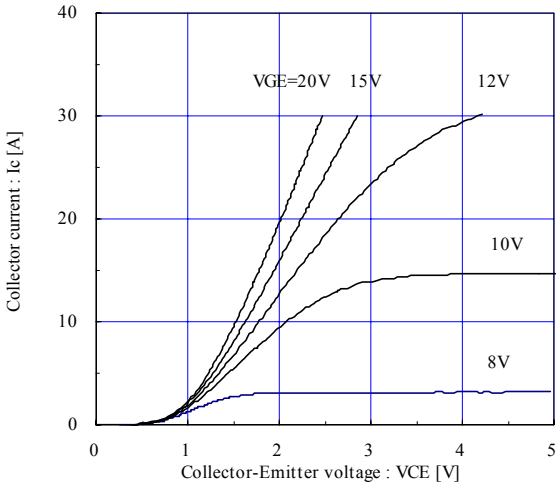
Temperature characteristic (typ.)



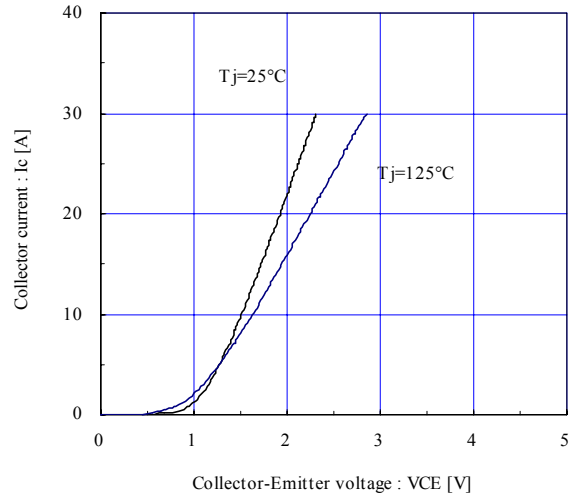
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



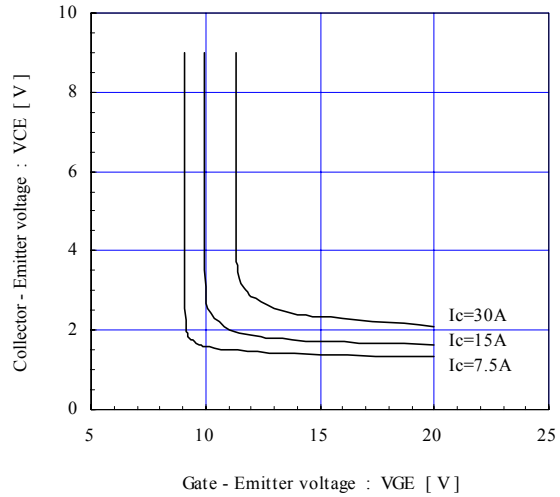
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 125°C / chip



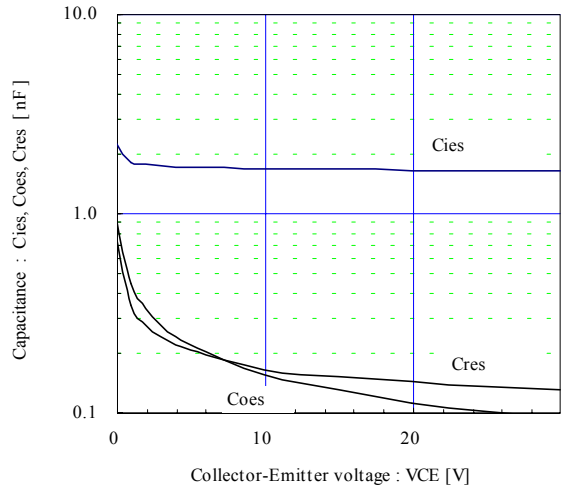
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



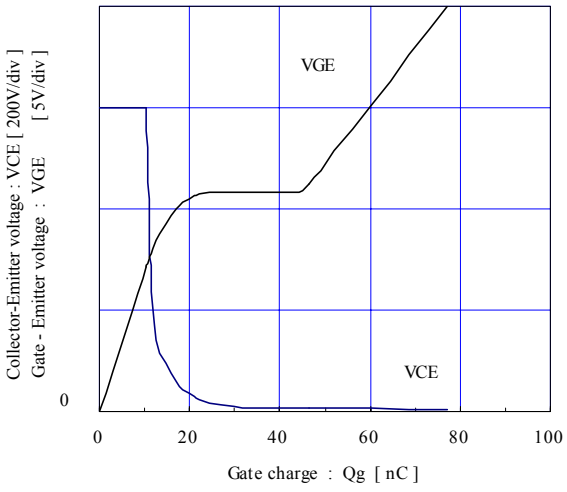
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj=25°C / chip



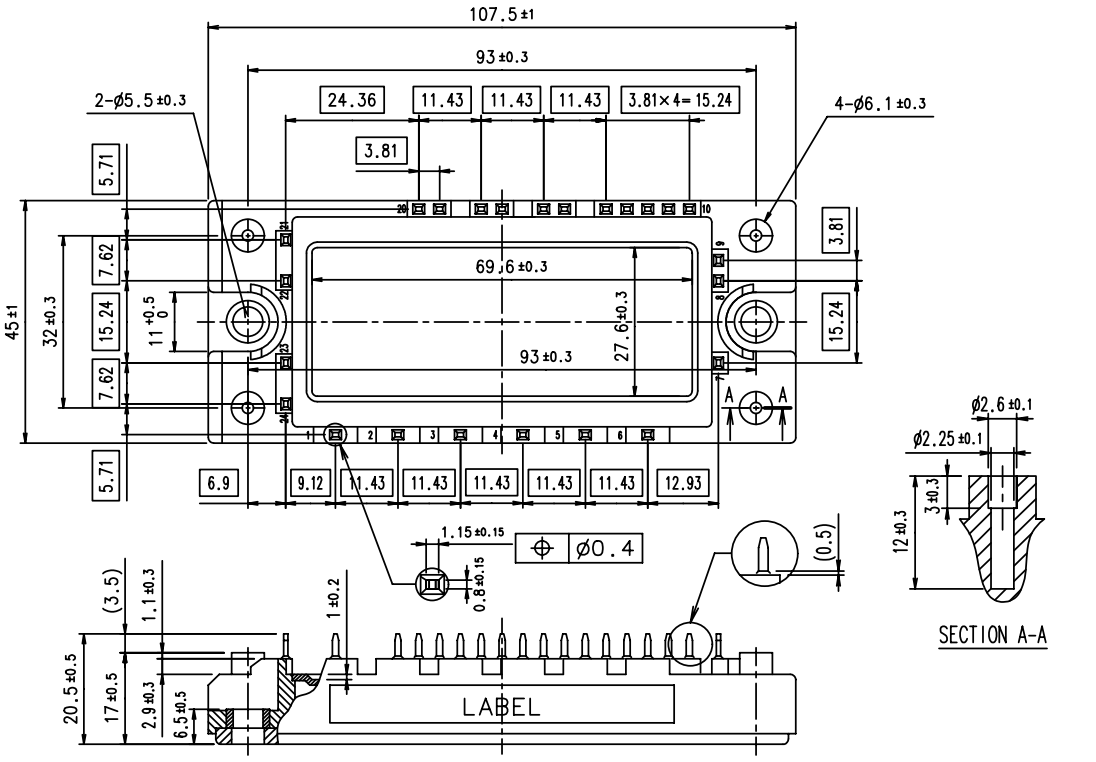
[Brake]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



[Brake]
Dynamic Gate charge (typ.)
Vcc=600V, Ic=25A, Tj= 25°C



■ Outline Drawings, mm



shows theoretical dimension.
( ) shows reference dimension.