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 (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	35	A
				Tc=80°C	25	
		I_{CP}	1ms	Tc=25°C	70	
				Tc=80°C	50	
		-I_C			35	
		-I_C pulse	1ms		70	
	Collector power disspation	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	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		35	A
	Surge current (Non-Repetitive)	I_{FSM}	Tj=150°C, 10ms		260	A
	I^2t (Non-Repetitive)	I^2t	half sine wave		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)**

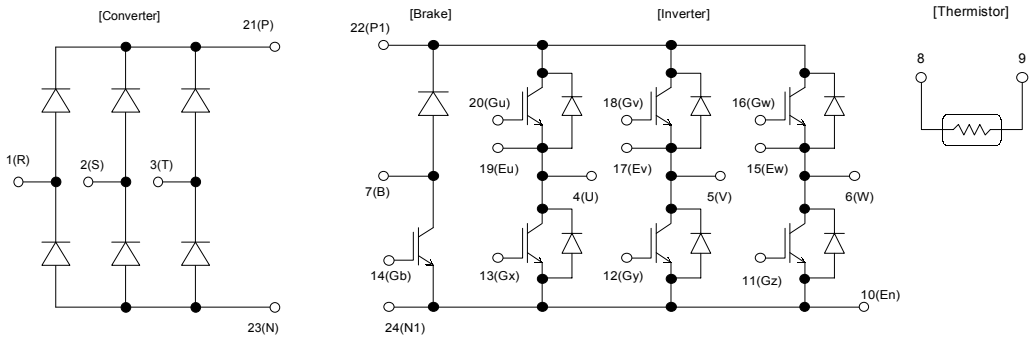
Item		Symbol	Condition		Characteristics Min.	Typ.	Max.	Unit
Inverter	Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V		-	-	1.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-	-	200	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE}=20V, I_C=35mA		4.5	6.5	8.5	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE}=15V, I_C=35A	Tj=25°C	-	2.25	2.70	V
				Tj=125°C	-	2.60	-	
		$V_{CE(sat)}$ (chip)		Tj=25°C	-	1.95	2.40	
				Tj=125°C	-	2.30	-	
	Input capacitance	C_{ies}	V_{GE}=0V, V_{CE}=10V, f=1MHz		-	3	-	nF
	Turn-on time	t_{on}	V_{CC}=600V		-	0.53	1.20	µs
		t_r	I_C=35A		-	0.43	0.60	
		$t_{r(i)}$	V_{GE}=±15V		-	0.03	-	
	Turn-off time	t_{off}	R_G= 43 Ω		-	0.37	1.00	
		t_f			-	0.07	0.30	
	Forward on voltage	V_F (terminal)	V_{GE}= 0 V, I_F=35A	Tj=25°C	-	2.05	2.40	V
				Tj=125°C	-	2.20	-	
		V_F (chip)		Tj=25°C	-	1.75	2.10	
				Tj=125°C	-	1.90	-	
	Reverse recovery time	t_{rr}	I_F=35A		-	-	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	-	2.40	2.90	V
				Tj=125°C	-	2.85	-	
		$V_{CE(sat)}$ (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=35 A, V_{GE}=0V	terminal	-	1.35	1.70	V
				chip	-	1.25	-	
	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	-	-	0.76	°C/W
		Inverter FWD	-	-	1.19	
		Brake IGBT	-	-	1.07	
		Converter Diode	-	-	0.90	
Contact thermal resistance *	Rth(c-f)	With thermal compound	-	0.05	-	

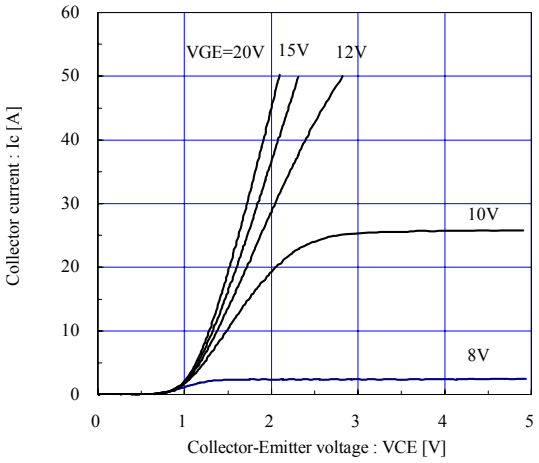
* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Equivalent Circuit Schematic

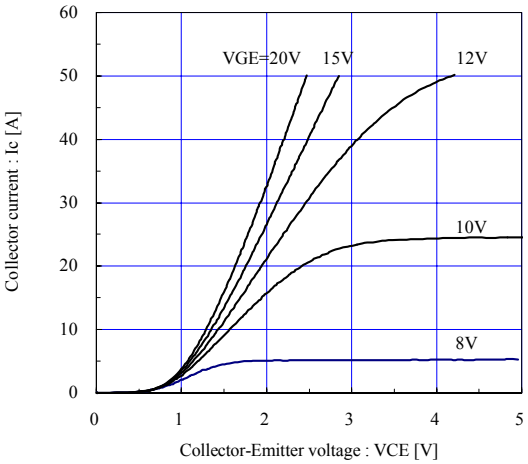


■ Characteristics (Representative)

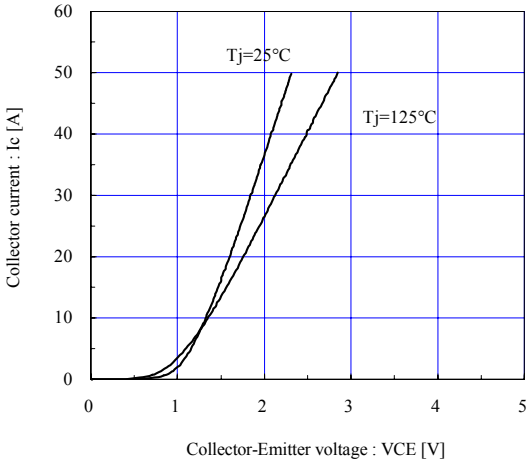
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



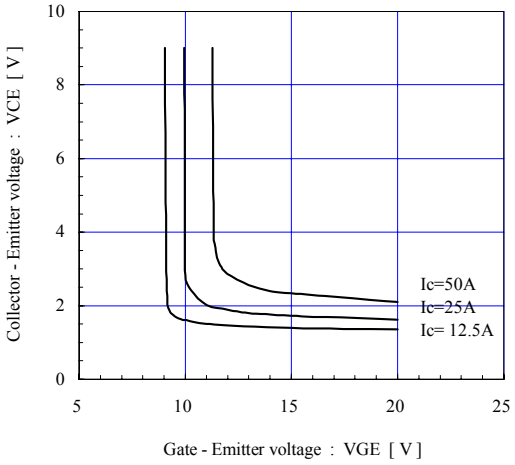
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 125°C / chip



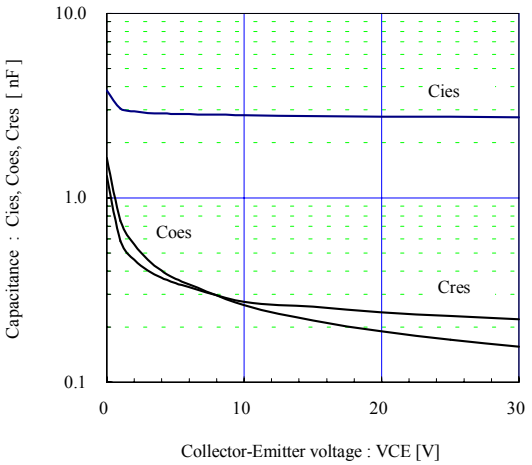
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



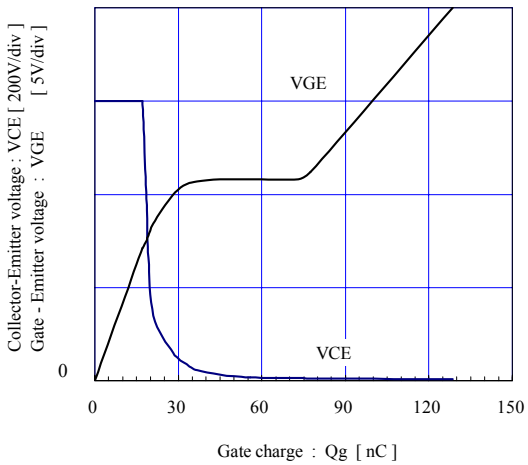
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj=25°C / chip



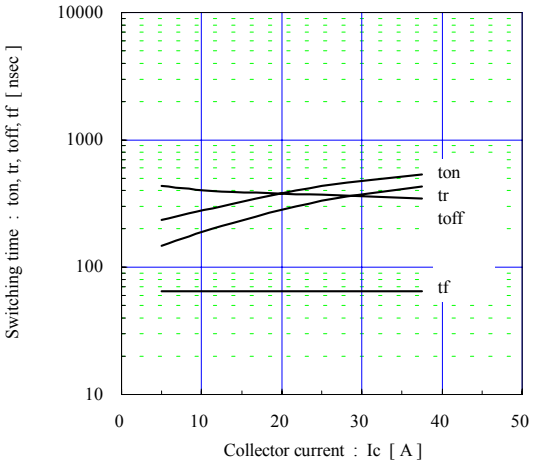
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



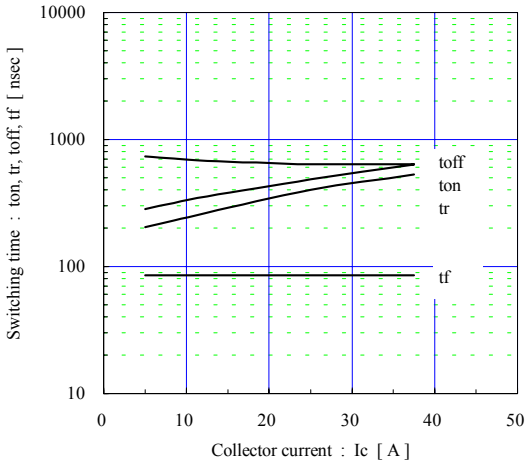
[Inverter]
Dynamic Gate charge (typ.)
Vcc=600V, Ic=35A, Tj= 25°C



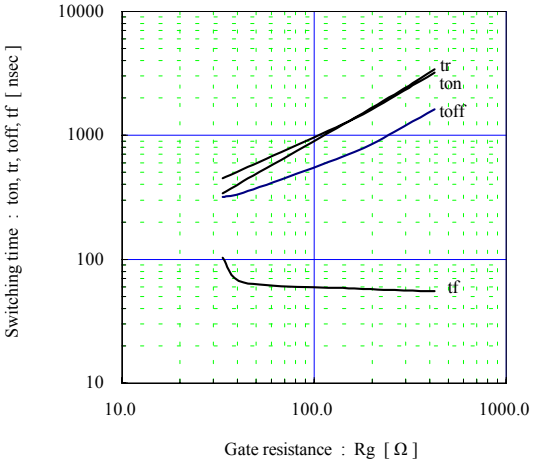
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=43Ω, Tj= 25°C



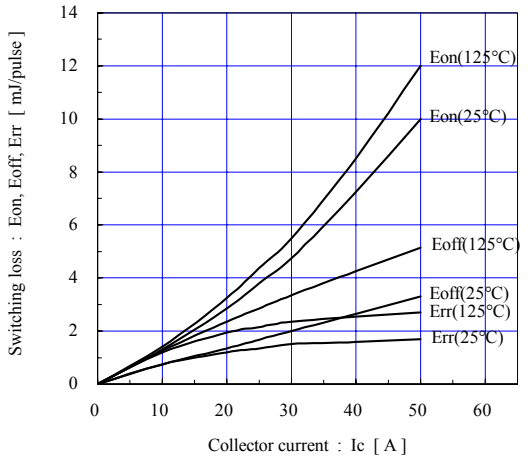
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=43Ω, Tj=125°C



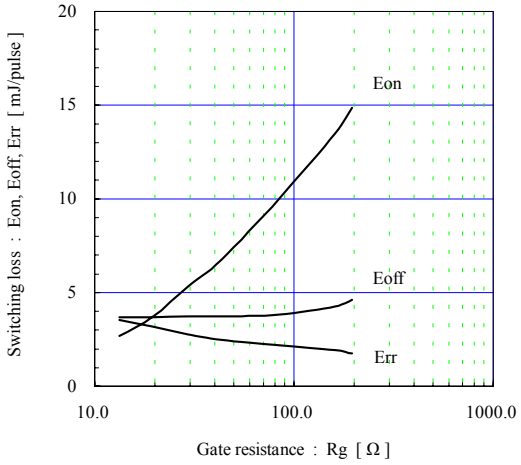
[Inverter]
Switching time vs. Gate resistance (typ.)
Vcc=600V, Ic=35A, VGE=±15V, Tj= 25°C



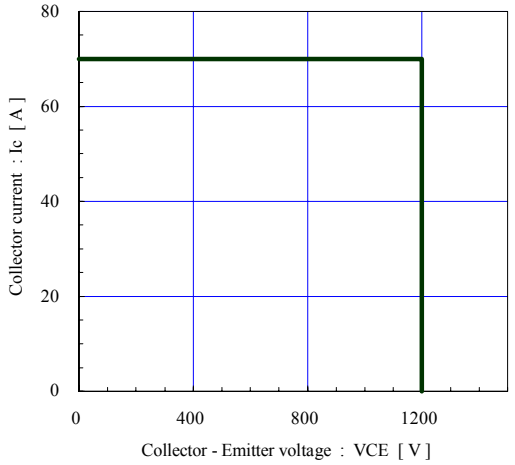
[Inverter]
Switching loss vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=43Ω



[Inverter]
Switching loss vs. Gate resistance (typ.)
Vcc=600V, Ic=35A, VGE=±15V, Tj= 125°C



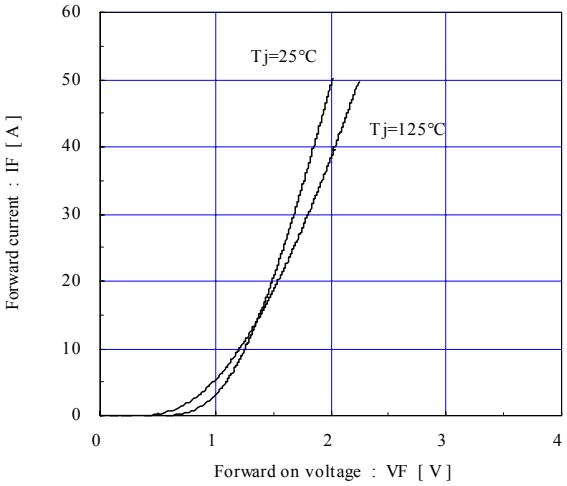
[Inverter]
Reverse bias safe operating area (max.)
+VGE=15V,-VGE <= 15V, RG >= 43Ω ,Tj <= 125°C



[Inverter]

Forward current vs. Forward on voltage (typ.)

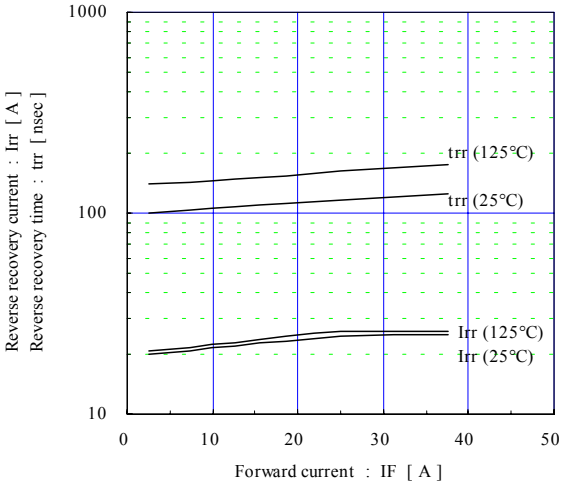
chip



[Inverter]

Reverse recovery characteristics (typ.)

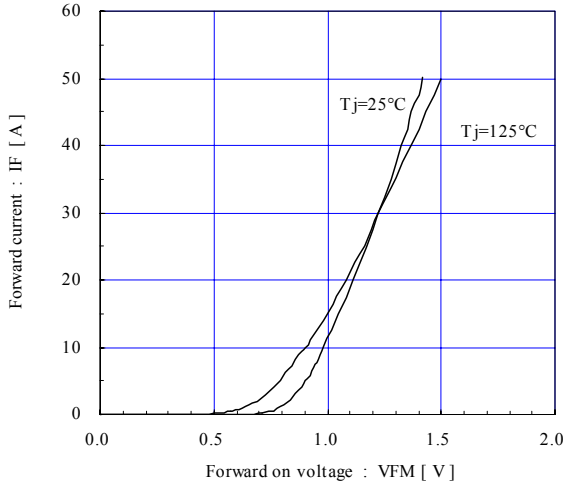
Vcc=600V, VGE=±15V, Rg=43Ω



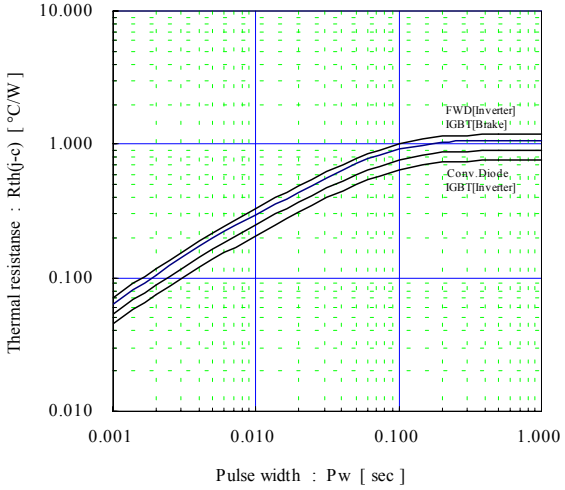
[Converter]

Forward current vs. Forward on voltage (typ.)

chip

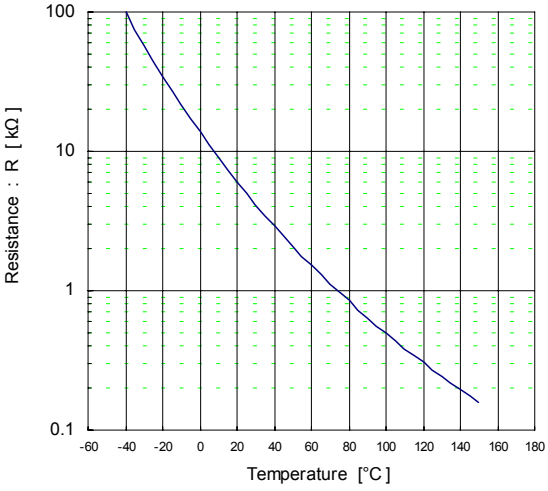


Transient thermal resistance (max.)

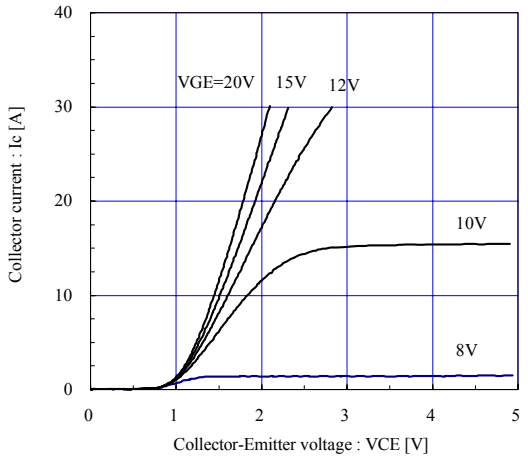


[Thermistor]

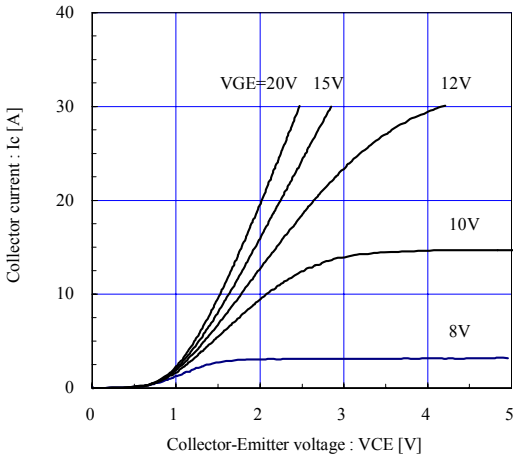
Temperature characteristic (typ.)



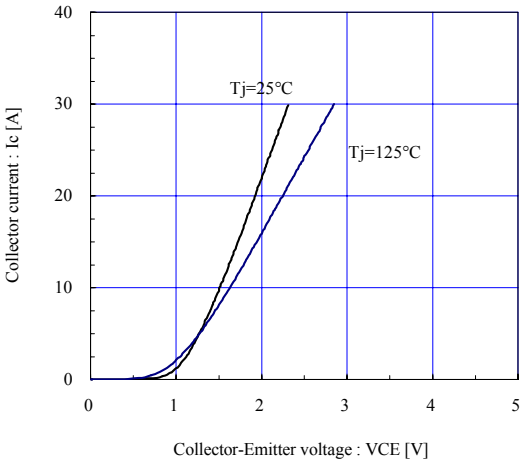
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



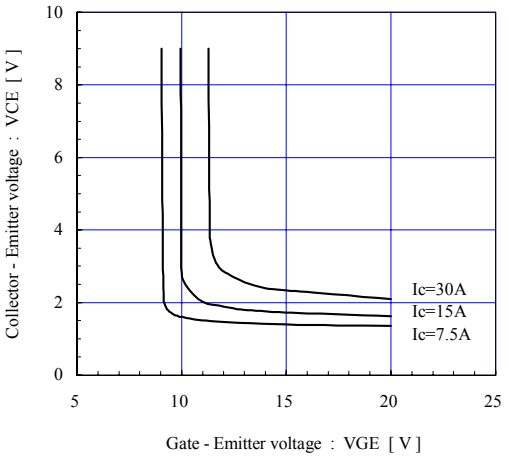
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 125°C / chip



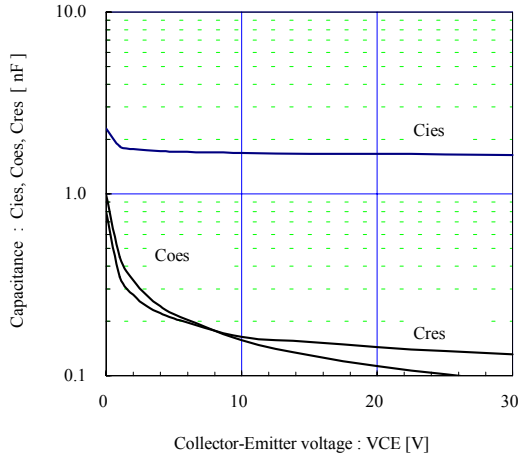
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



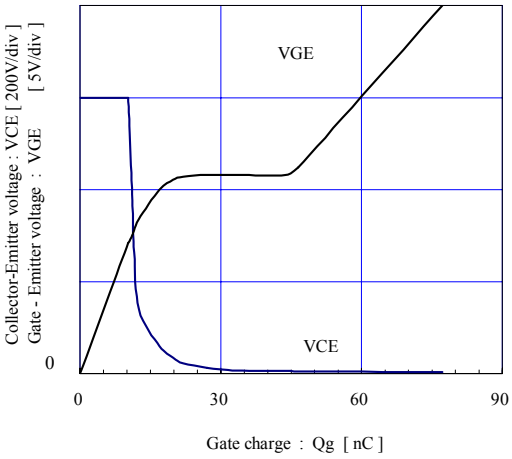
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj=25°C / chip



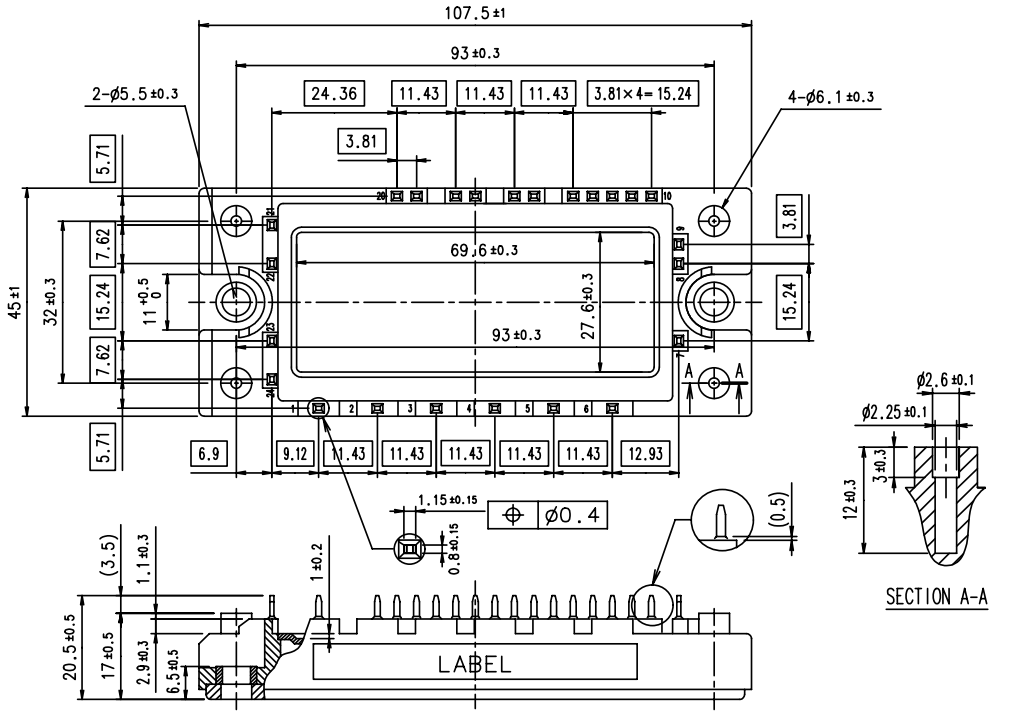
[Brake]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



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



■ Outline Drawings, mm



shows theoretical dimension.
( ) shows reference dimension.