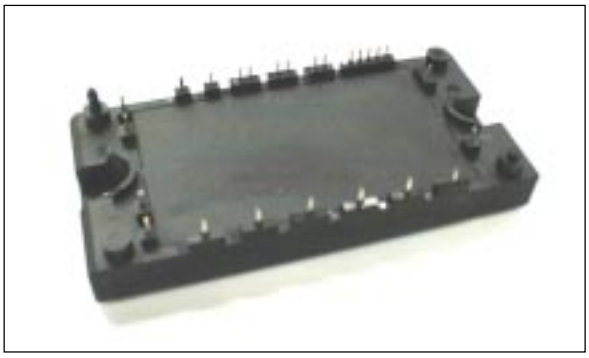
7MBR10SC120

IGBT Modules

PIM/Built-in converter with thyristor and brake (S series)
1200V / 10A / PIM



■ Features

· Low V_{CE}(sat)
· Compact Package
· P.C. Board Mount Module
· Converter Diode Bridge Dynamic Brake Circuit

■ Applications

· Inverter for Motor Drive
· AC and DC Servo Drive Amplifier
· Uninterruptible Power Supply

■ Maximum ratings and characteristics

● Absolute maximum ratings (Tc=25°C unless without 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	15	A
				Tc=80°C	10	
		I_{CP}	1ms	Tc=25°C	30	A
				Tc=80°C	20	
		$-I_C$			10	A
	Collector power disspation	P_C	1 device		75	W
Brake	Collector-Emitter voltage	V_{CES}			1200	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_C	Continuous	Tc=25°C	15	A
				Tc=80°C	10	
		I_{CP}	1ms	Tc=25°C	30	A
				Tc=80°C	20	
	Collector power disspation	P_C	1 device		75	W
	Repetitive peak reverse voltage(Diode)	V_{RRM}			1200	V
Thyristor	Repetitive peak off-state voltage	V_{DRM}			1600	V
	Repetitive peak reverse voltage	V_{RRM}			1600	V
	Average on-state current	$I_{T(AV)}$	50Hz/60Hz sine wave		10	A
	Surge 0n-state current (Non-Repetitive)	I_{TSM}	Tj=125°C, 10ms half sine wave		145	A
	Junction temperature	T_{jw}			125	℃
Converter	Repetitive peak reverse voltage	V_{RRM}			1600	V
	Average output current	I_O	50Hz/60Hz sine wave		10	A
	Surge current (Non-Repetitive)	I_{FSM}	Tj=150°C, 10ms half sine wave		105	A
	I^2t (Non-Repetitive)	I^2t			55	A^2s
Junction temperature (except Thyristor)		T_j			+150	℃
Storage temperature		T_{stg}			-40 to +125	℃
Isolation between terminal and copper base *2		V_{iso}	AC : 1 minute		AC 2500	V
voltage between thermistor and others *3					AC 2500	V
Mounting screw torque					1.7 *1	N·m

*1 Recommendable value : 1.3 to 1.7 N·m (M4)
*2 All terminals should be connected together when isolation test will be done.
*3 Terminal 8 and 9 should be connected together. Terminal 1 to 7 and 10 to 26 should be connected together and shorted to copper base.

● 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				50	µA
	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=10mA		5.5	7.2	8.5	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=10A	chip		2.1		V
				terminal		2.15	2.6	
	Input capacitance	C_{ies}	V_{GE}=0V, V_{CE}=10V, f=1MHz			1200		pF
	Turn-on time	t_{on}	V_{CC}=600V			0.35	1.2	µs
		t_r	I_C=10A			0.25	0.6	
	Turn-off	t_{off}	V_{GE}=±15V			0.45	1.0	
		t_f	R_G=120Ω			0.08	0.3	
	Forward on voltage	V_F	I_F=10A	chip		2.3		V
				terminal		2.35	3.2	
	Reverse recovery time of FRD	t_{rr}	I_F=10A				350	ns
Brake	Zero gate voltage collector current	I_{CES}	V_{CES}=1200V, V_{GE}=0V				50	µA
	Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=±20V				200	nA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	I_C=10A, V_{GE}=15V	chip		2.1		V
				terminal		2.2	2.6	
	Turn-on time	t_{on}	V_{CC}=600V			0.35	1.2	µs
		t_r	I_C=10A			0.25	0.6	
	Turn-off time	t_{off}	V_{GE}=±15V			0.45	1.0	
		t_f	R_G=120Ω			0.08	0.3	
	Reverse current	I_{RRM}	V_R=1200V				50	µA
	off-state current	I_{DM}	V_{DM}=1600V				1.0	mA
Thyristor	Reverse current	I_{RRM}	V_{RM}=1600V				1.0	mA
	Gate trigger current	I_{GT}	V_D=6V, I_T=1A				100	mA
	Gate trigger voltage	V_{GT}	V_D=6V, I_T=1A				2.5	V
	On-state voltage	V_{TM}	I_{TM}=10A	chip		0.92	1.0	V
				terminal		0.95		
Converter	Forward on voltage	V_{FM}	I_F=10A	chip		1.1		V
				terminal		1.2	1.5	
	Reverse current	I_{RRM}	V_R=1600V				50	µA
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

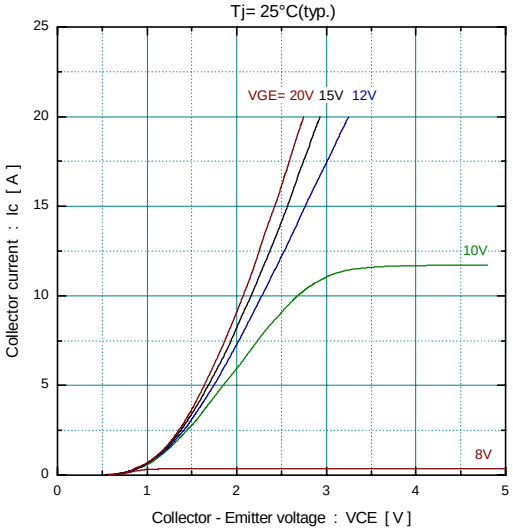
● Thermal resistance Characteristics

Item	Symbol	Condition	Characteristics Min.	Typ.	Max.	Unit
Thermal resistance (1 device)	Rth(j-c)	Inverter IGBT			1.67	°C/W
		Inverter FWD			2.78	
		Brake IGBT			1.67	
		Thyristor			1.00	
		Converter Diode			1.85	
Contact thermal resistance *	Rth(c-f)	With thermal compound		0.05		

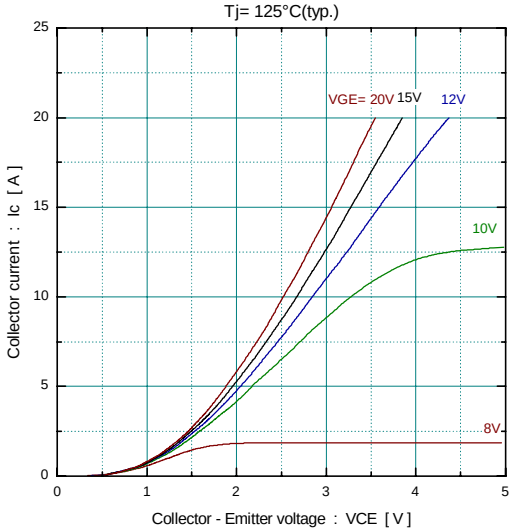
* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Characteristics (Representative)

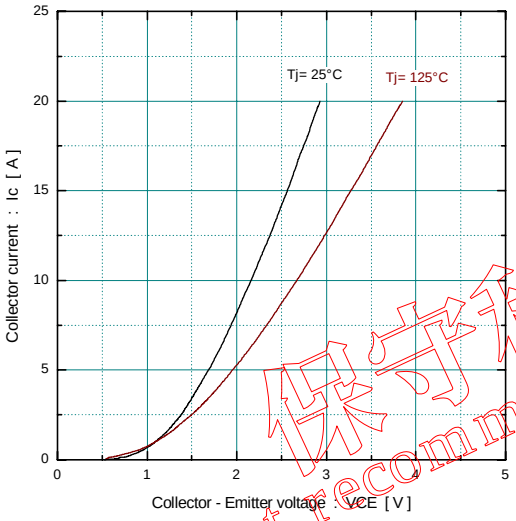
[Inverter]
Collector current vs. Collector-Emitter voltage
Tj= 25°C(typ.)



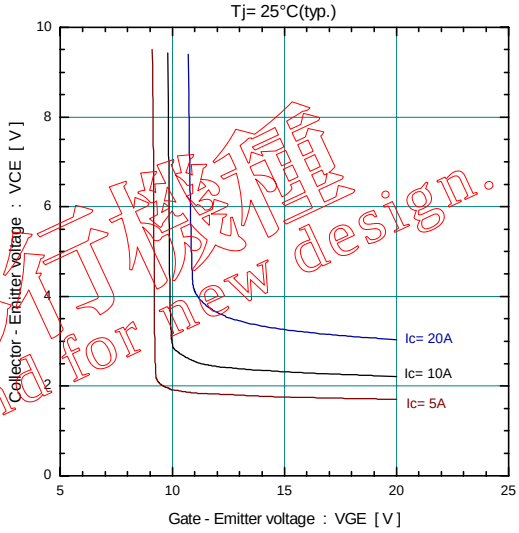
[Inverter]
Collector current vs. Collector-Emitter voltage
Tj= 125°C(typ.)



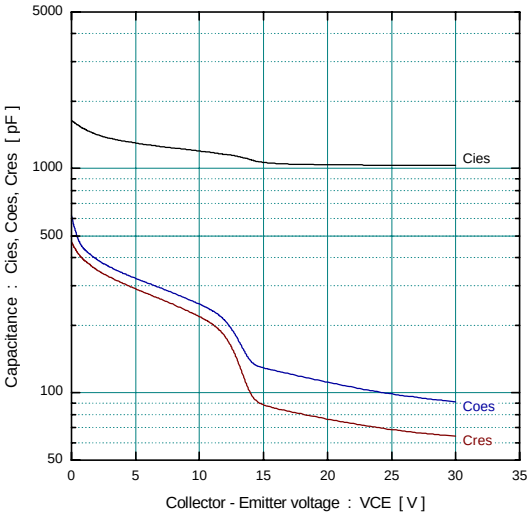
[Inverter]
Collector current vs. Collector-Emitter voltage
VGE=15V (typ.)



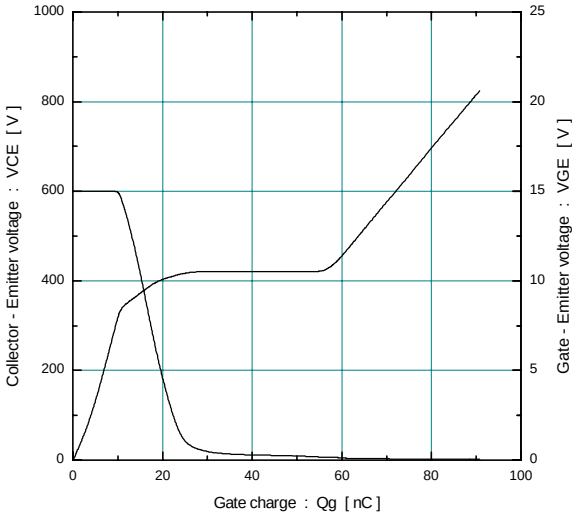
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage
Tj= 25°C(typ.)



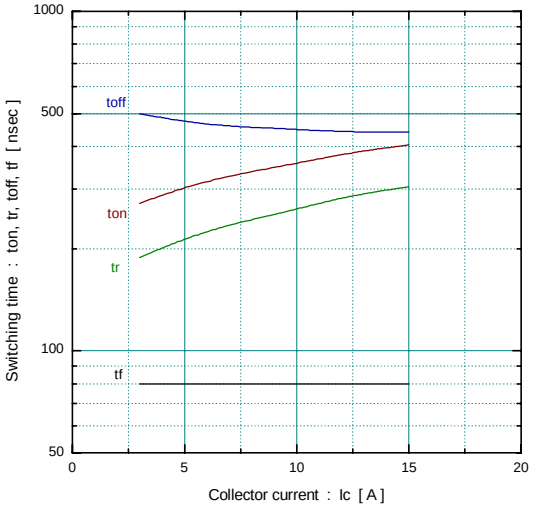
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



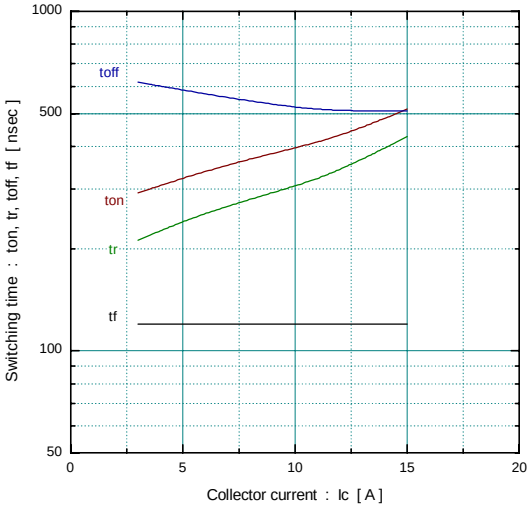
[Inverter]
Dynamic Gate charge (typ.)
Vcc=600V, Ic=10A, Tj= 25°C



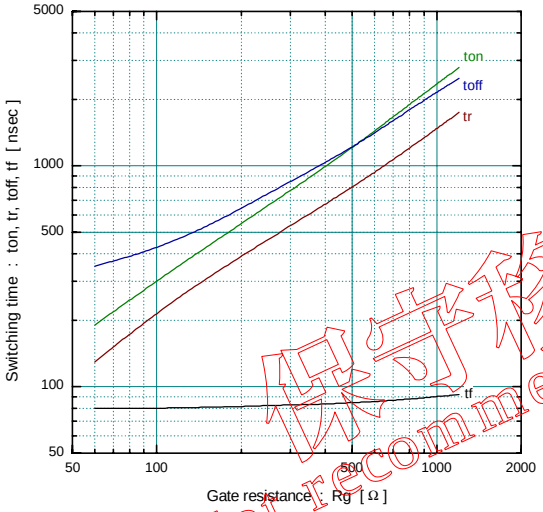
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=120Ω, Tj= 25°C



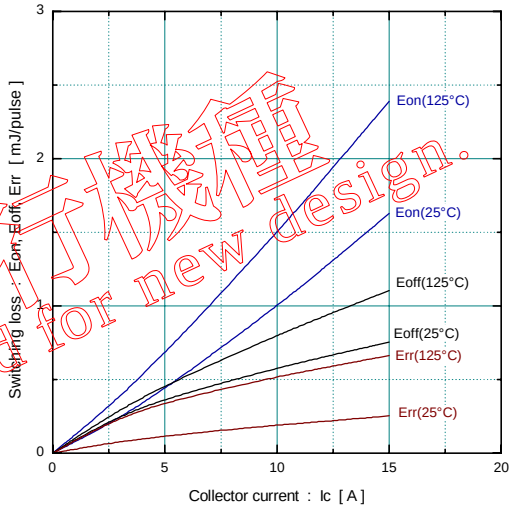
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=120Ω, Tj= 125°C



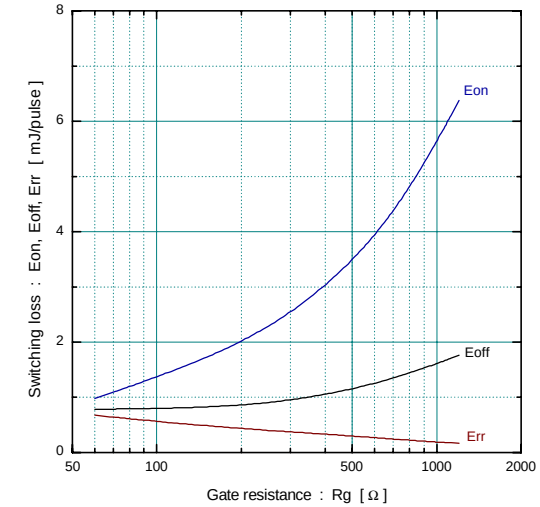
[Inverter]
Switching time vs. Gate resistance (typ.)
Vcc=600V, Ic=10A, VGE=±15V, Tj= 25°C



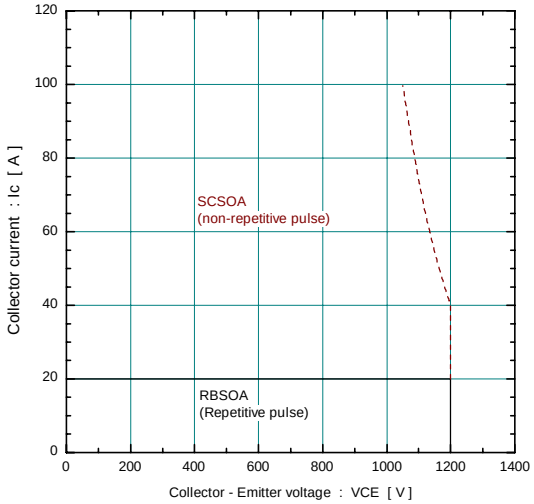
[Inverter]
Switching loss vs. Collector current (typ.)
Vcc=600V, VGE=±15V, Rg=120Ω



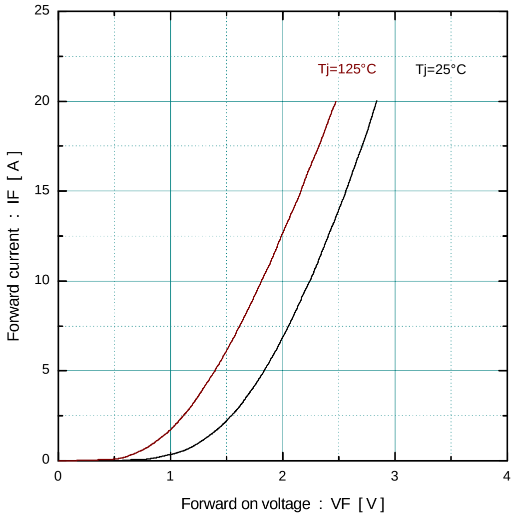
[Inverter]
Switching loss vs. Gate resistance (typ.)
Vcc=600V, Ic=10A, VGE=±15V, Tj= 125°C



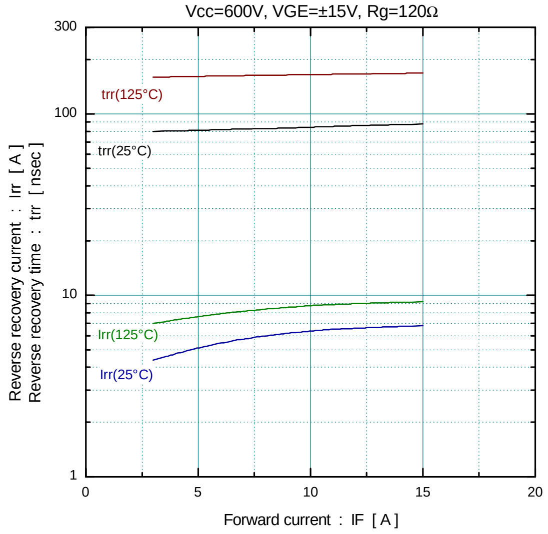
[Inverter]
Reverse bias safe operating area
+VGE=15V, -VGE<=15V, Rg>=120Ω, Tj<=125°C



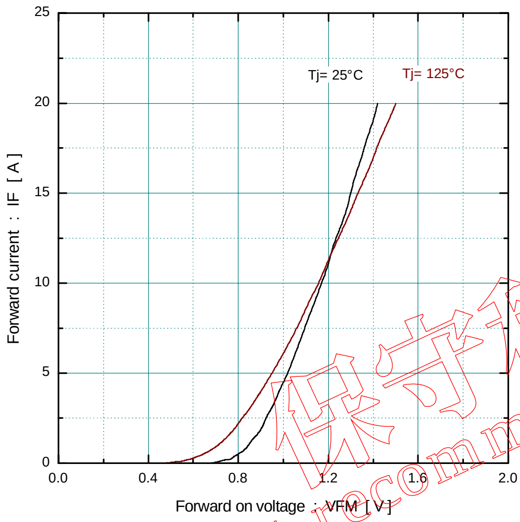
[Inverter]
Forward current vs. Forward on voltage (typ.)



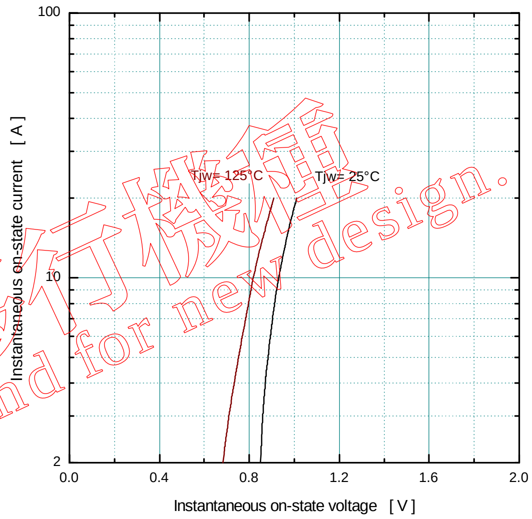
[Inverter]
Reverse recovery characteristics (typ.)
Vcc=600V, VGE=±15V, Rg=120Ω



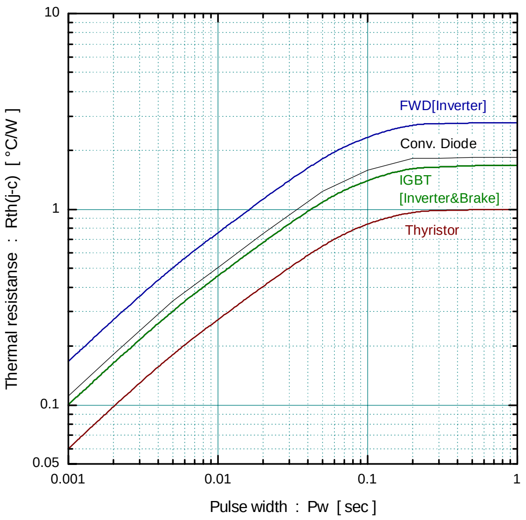
[Converter]
Forward current vs. Forward on voltage (typ.)



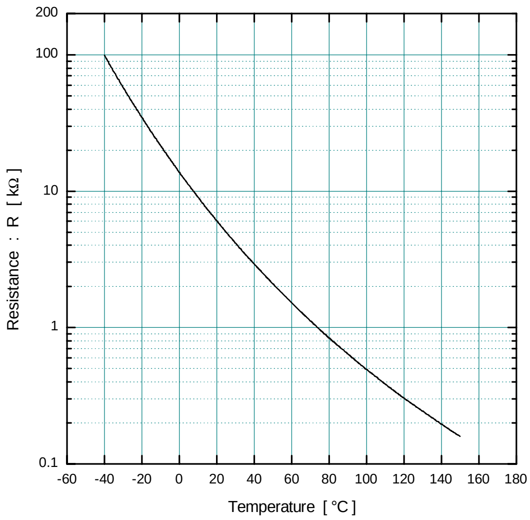
[Thyristor]
On-state current vs. On-state voltage (typ.)



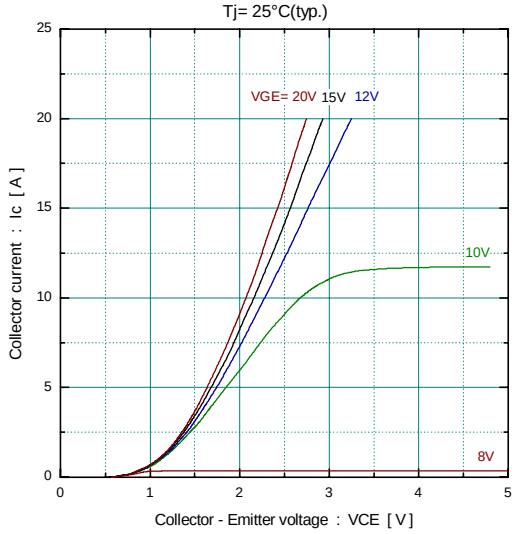
Transient thermal resistance



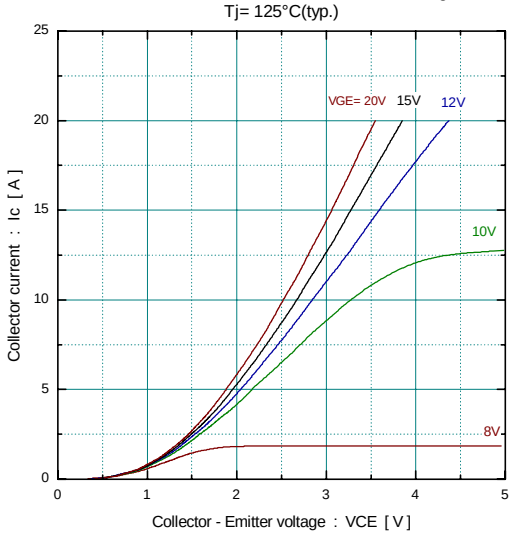
[Thermistor]
Temperature characteristic (typ.)



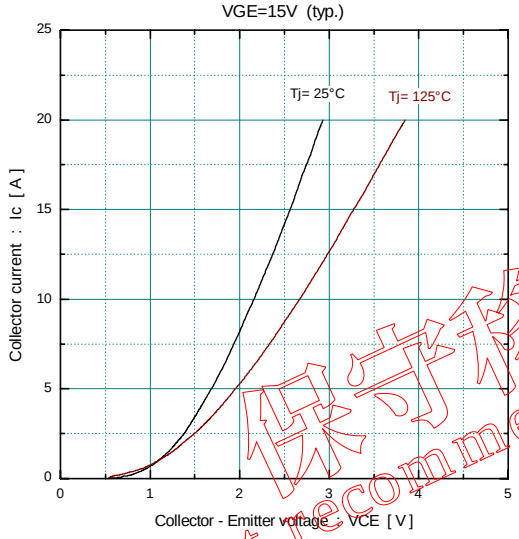
[Brake]
Collector current vs. Collector-Emitter voltage
Tj= 25°C(typ.)



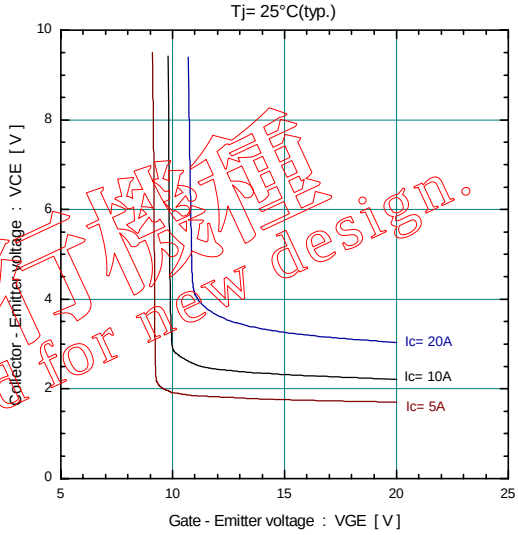
[Brake]
Collector current vs. Collector-Emitter voltage
Tj= 125°C(typ.)



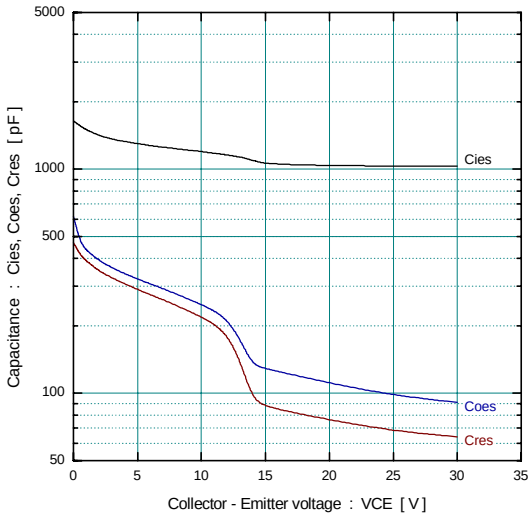
[Brake]
Collector current vs. Collector-Emitter voltage
VGE=15V (typ.)



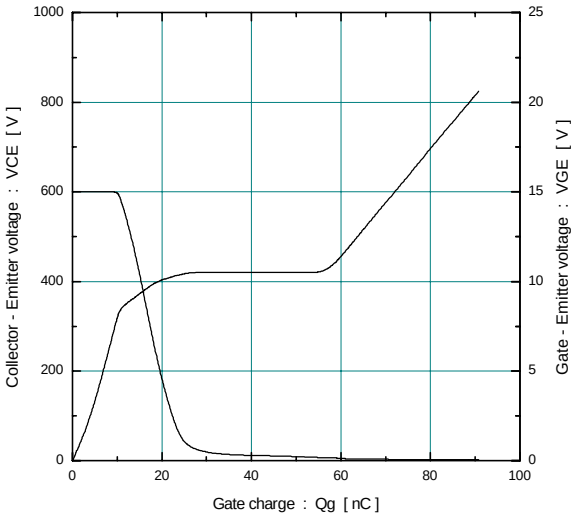
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage
Tj= 25°C(typ.)



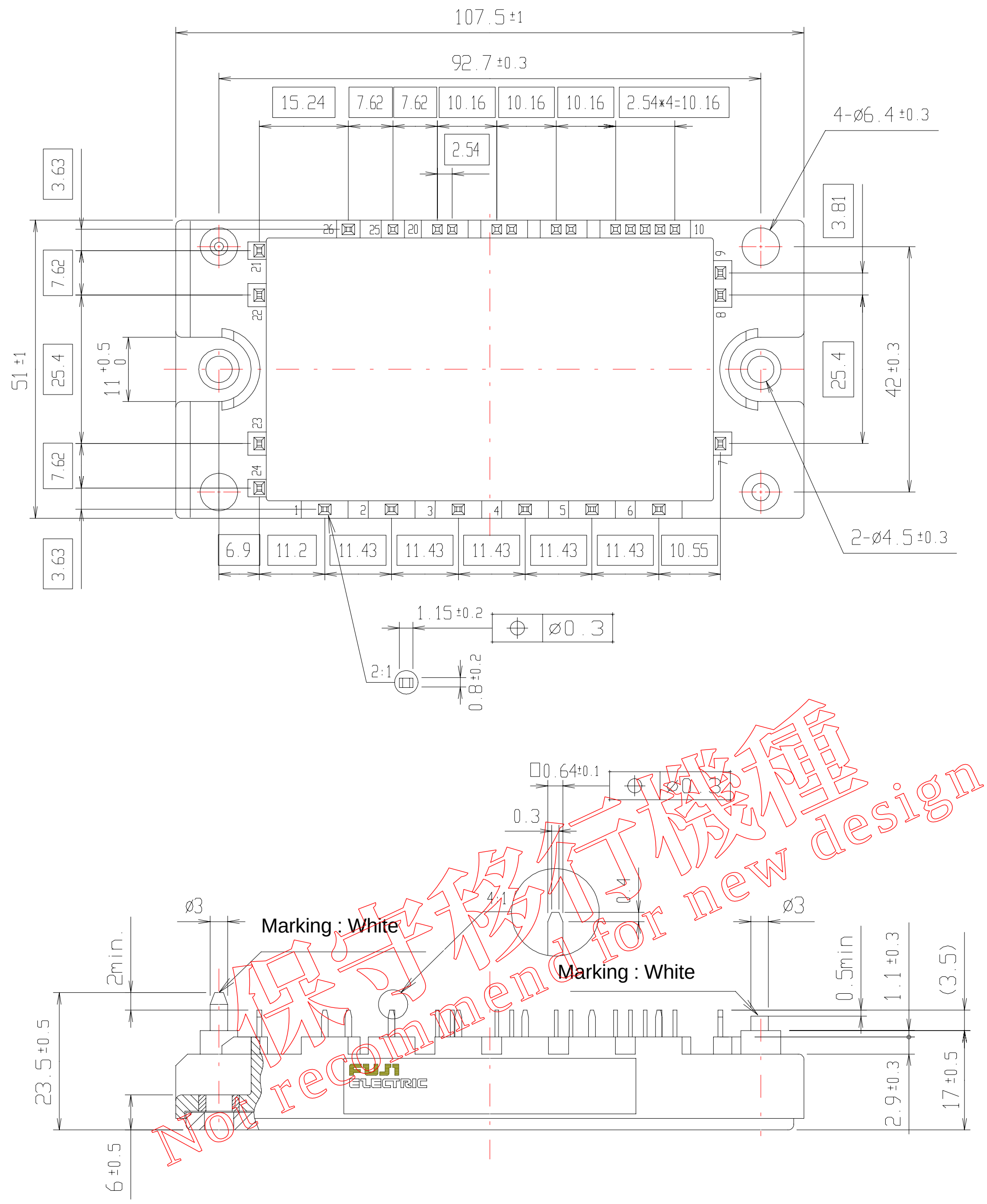
[Brake]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



[Brake]
Dynamic Gate charge (typ.)
Vcc=600V, Ic=10A, Tj= 25°C



■ Outline Drawings, mm



■ Equivalent Circuit Schematic