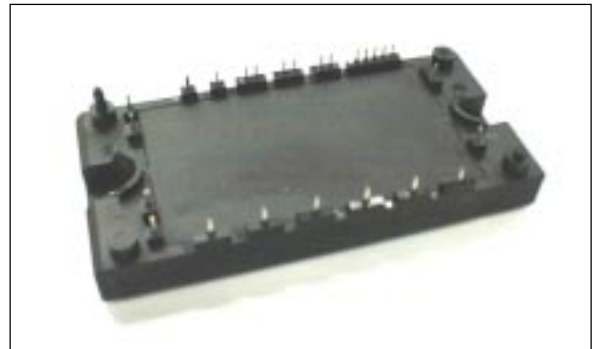


### PIM/Built-in converter with thyristor and brake (S series) 1200V / 10A / PIM



#### ■ 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 ( $T_c=25^\circ\text{C}$ unless without specified)

Item	Symbol	Condition	Rating	Unit	
Inverter	Collector-Emitter voltage	$V_{CES}$	1200	V	
	Gate-Emitter voltage	$V_{GES}$	$\pm 20$	V	
	Collector current	$I_c$	Continuous	$T_c=25^\circ\text{C}$ 15	A
				$T_c=80^\circ\text{C}$ 10	
		$I_{CP}$	1ms	$T_c=25^\circ\text{C}$ 30	A
				$T_c=80^\circ\text{C}$ 20	
	$-I_c$		10	A	
Collector power dissipation	$P_c$	1 device	75	W	
Brake	Collector-Emitter voltage	$V_{CES}$	1200	V	
	Gate-Emitter voltage	$V_{GES}$	$\pm 20$	V	
	Collector current	$I_c$	Continuous	$T_c=25^\circ\text{C}$ 15	A
				$T_c=80^\circ\text{C}$ 10	
		$I_{CP}$	1ms	$T_c=25^\circ\text{C}$ 30	A
				$T_c=80^\circ\text{C}$ 20	
Collector power dissipation	$P_c$	1 device	75	W	
Thyristor	Repetitive peak reverse voltage(Diode)	$V_{RRM}$	1200	V	
	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 On-state current (Non-Repetitive)	$I_{TSM}$	$T_j=125^\circ\text{C}$ , 10ms half sine wave 145	A	
	Junction temperature	$T_{jw}$		125	$^\circ\text{C}$
Converter	Repetitive peak reverse voltage	$V_{RRM}$	1600	V	
	Average output current	$I_o$	50Hz/60Hz sine wave 10	A	
	Surge current (Non-Repetitive)	$I_{FSM}$	$T_j=150^\circ\text{C}$ , 10ms 105	A	
	$I_{\rho t}$ (Non-Repetitive)	$I_{\rho t}$	half sine wave 55	$\text{A}^2\text{s}$	
Junction temperature (except Thyristor)	$T_j$		+150	$^\circ\text{C}$	
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$	
Isolation between terminal and copper base *2 voltage between thermistor and others *3	$V_{iso}$	AC : 1 minute	AC 2500	V	
			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)

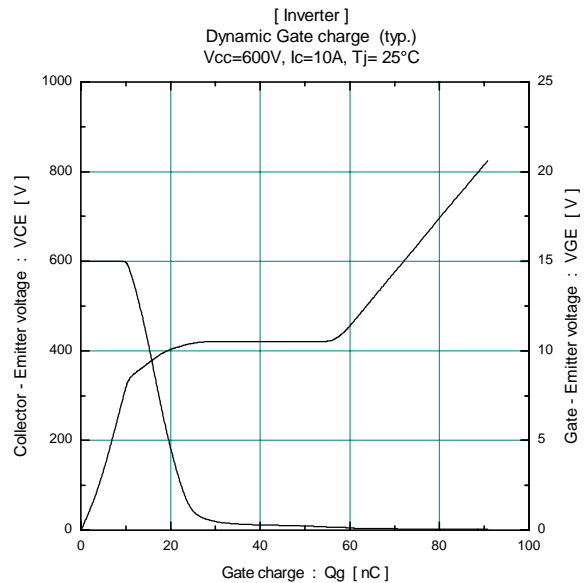
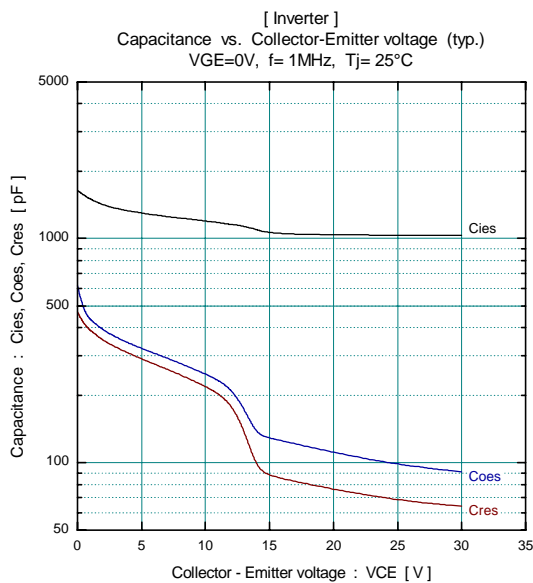
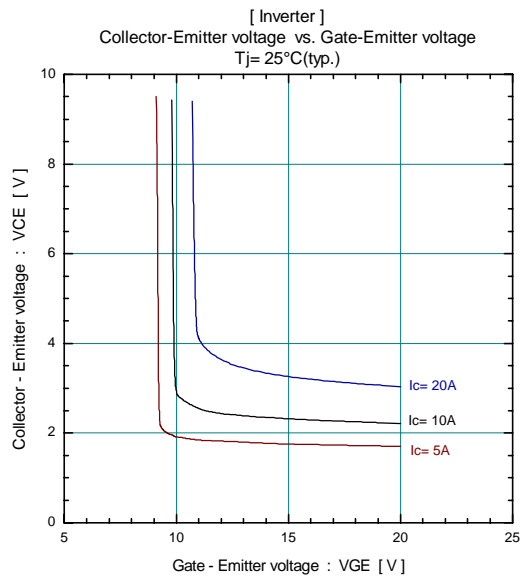
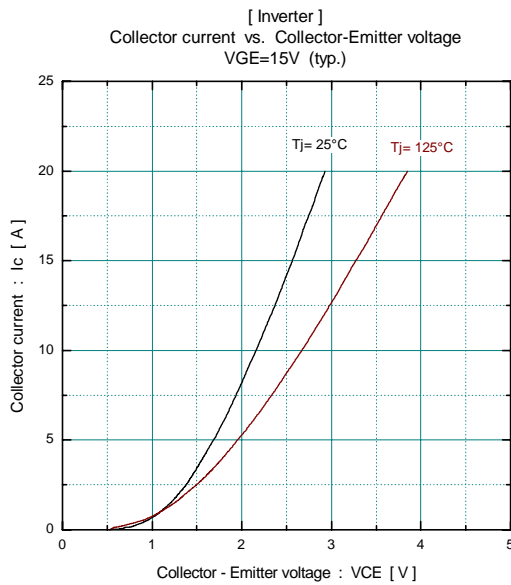
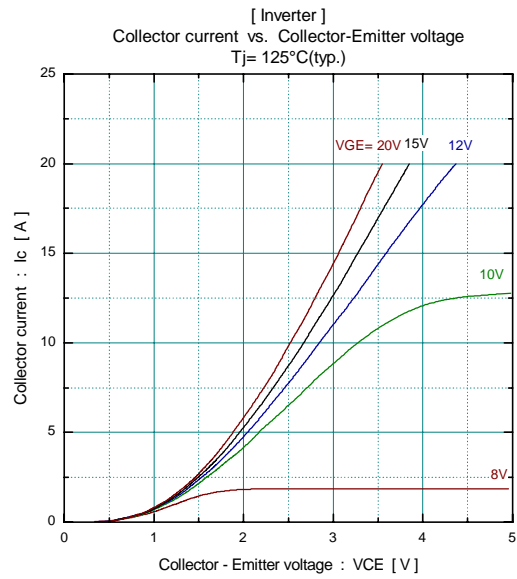
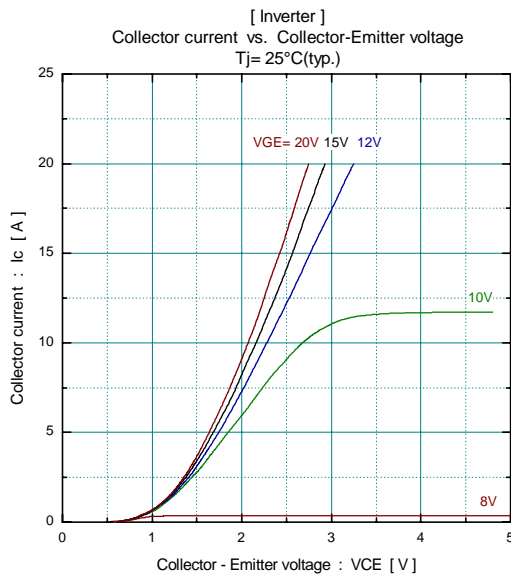
Item	Symbol	Condition	Characteristics			Unit		
			Min.	Typ.	Max.			
Inverter	Zero gate voltage collector current	ICES	VCE=1200V, VGE=0V		50	μA		
	Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V		200	nA		
	Gate-Emitter threshold voltage	VGE(th)	VCE=20V, Ic=10mA		5.5	7.2	8.5	V
	Collector-Emitter saturation voltage	VCE(sat)	VGE=15V, Ic=10A	chip	2.1		V	
				terminal	2.15	2.6		
	Input capacitance	Cies	VGE=0V, VCE=10V, f=1MHz		1200		pF	
	Turn-on time	ton	VCC=600V		0.35	1.2	μs	
		tr	Ic=10A		0.25	0.6		
	Turn-off	toff	VGE=±15V		0.45	1.0		
		tf	RG=120Ω		0.08	0.3		
Forward on voltage	VF	IF=10A	chip	2.3		V		
			terminal	2.35	3.2			
Reverse recovery time of FRD	trr	IF=10A			350	ns		
Brake	Zero gate voltage collector current	ICES	VCEs=1200V, VGE=0V		50	μA		
	Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V		200	nA		
	Collector-Emitter saturation voltage	VCE(sat)	Ic=10A, VGE=15V	chip	2.1		V	
				terminal	2.2	2.6		
	Turn-on time	ton	VCC=600V		0.35	1.2	μs	
		tr	Ic=10A		0.25	0.6		
	Turn-off time	toff	VGE=±15V		0.45	1.0		
		tf	RG=120Ω		0.08	0.3		
	Reverse current	IRRM	VR=1200V			50	μA	
	off-state current	IDM	VDM=1600V			1.0	mA	
Thyristor	Reverse current	IRRM	VRM=1600V			1.0	mA	
	Gate trigger current	IGT	VD=6V, IT=1A			100	mA	
	Gate trigger voltage	VGT	VD=6V, IT=1A			2.5	V	
	On-state voltage	VTM	ITM=10A	chip	0.92	1.0	V	
				terminal	0.95			
Converter	Forward on voltage	VFM	IF=10A	chip	1.1		V	
				terminal	1.2	1.5		
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

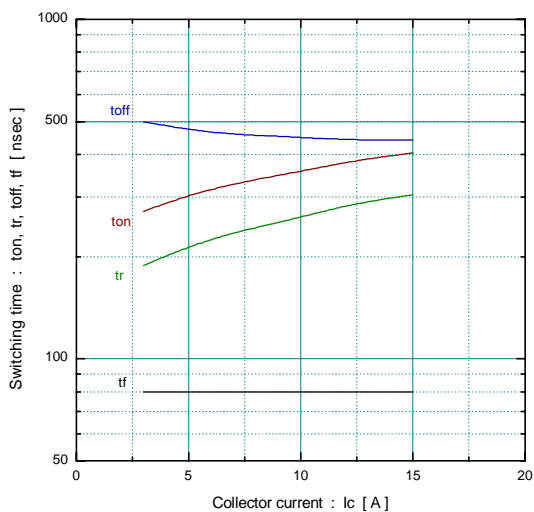
Item	Symbol	Condition	Characteristics			Unit
			Min.	Typ.	Max.	
Thermal resistance ( 1 device )	Rth(j-c)	Inverter IGBT			1.67	°C/W
		Inverter FWD			2.78	
		Brake IGBT			1.67	
		Thyristor			1.00	
		Converter Diode			1.85	
Contact thermal resistance *	Rth(c-f)	With thermal compound		0.05		

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

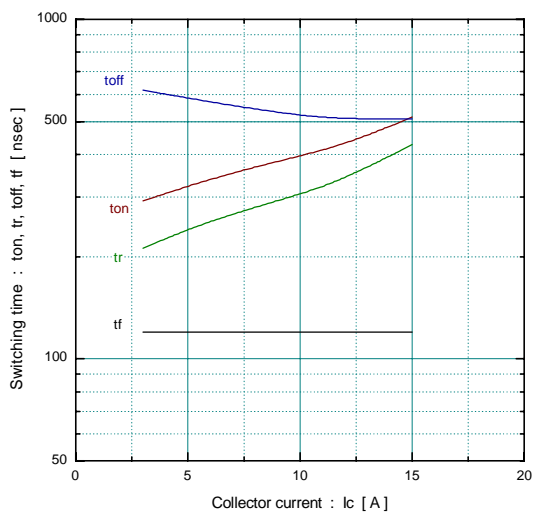
■ Characteristics (Representative)



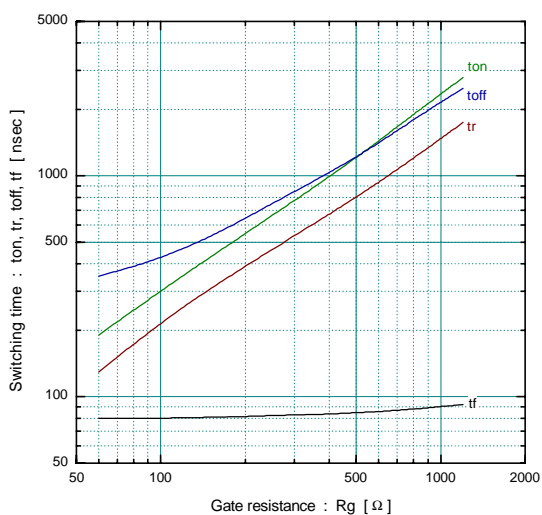
[ Inverter ]  
 Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=120\Omega, T_j=25^\circ C$



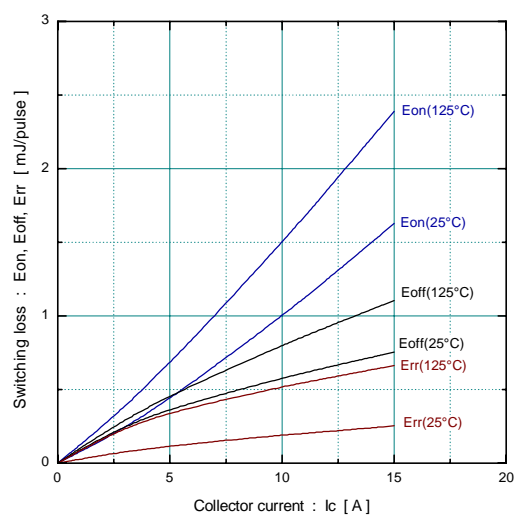
[ Inverter ]  
 Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=120\Omega, T_j=125^\circ C$



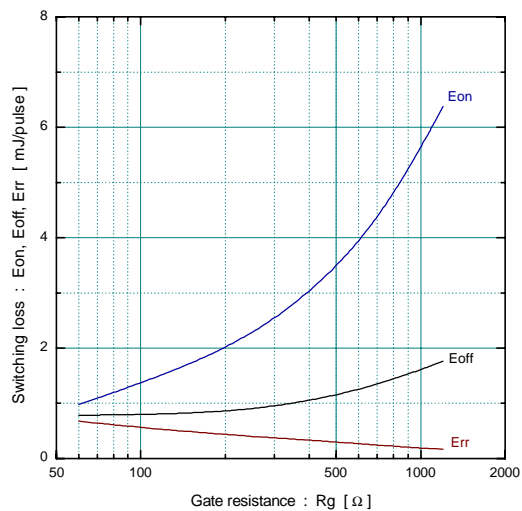
[ Inverter ]  
 Switching time vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=10A, V_{GE}=\pm 15V, T_j=25^\circ C$



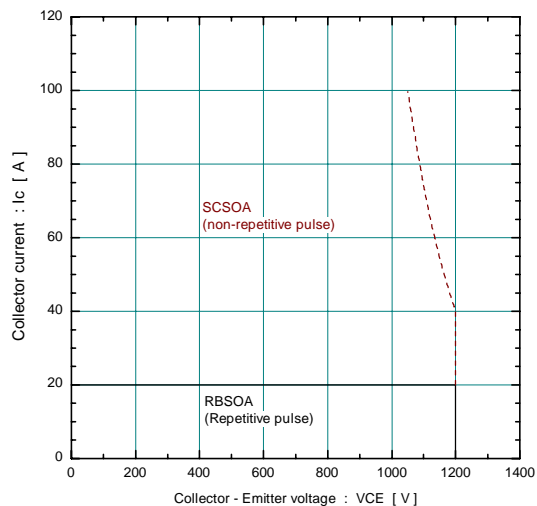
[ Inverter ]  
 Switching loss vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=120\Omega$

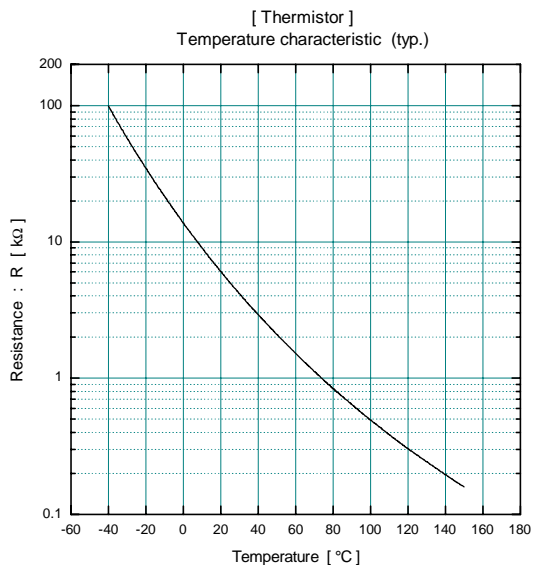
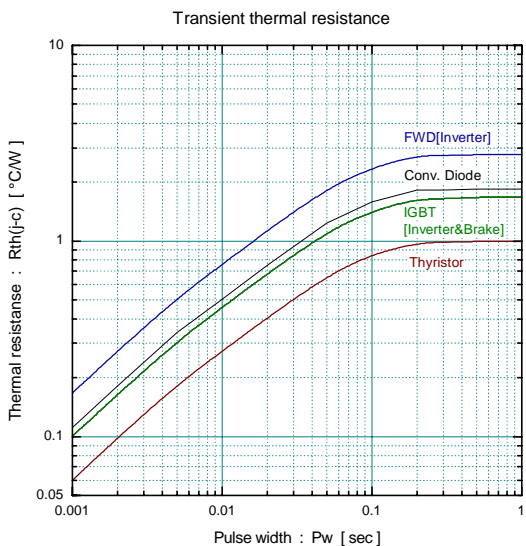
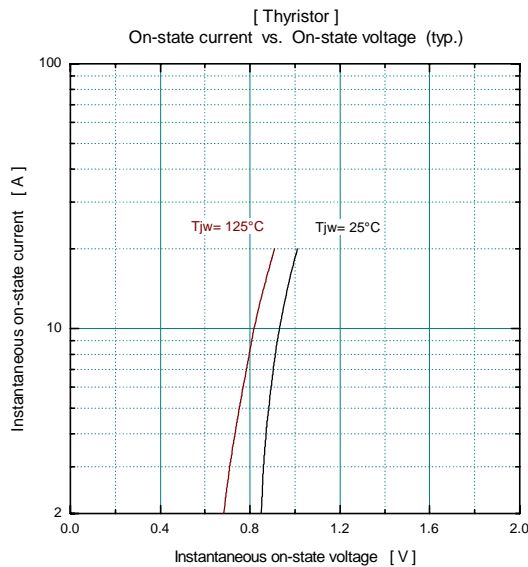
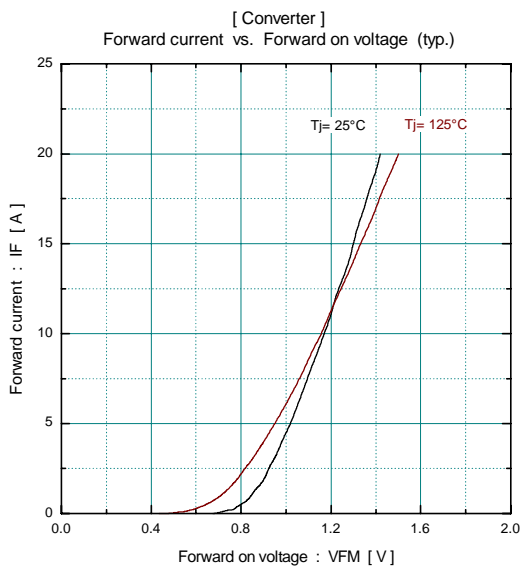
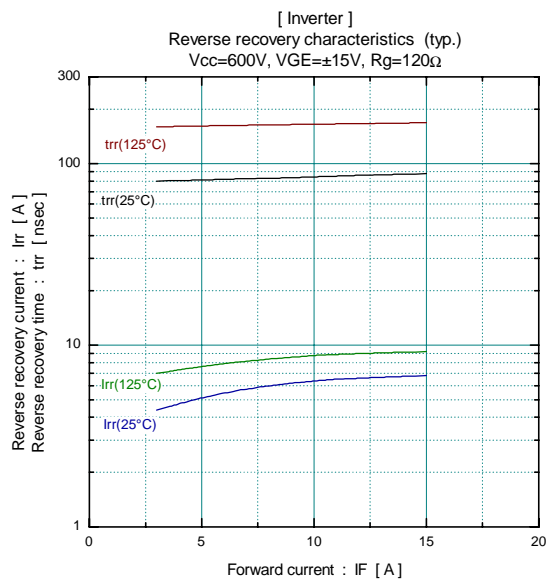
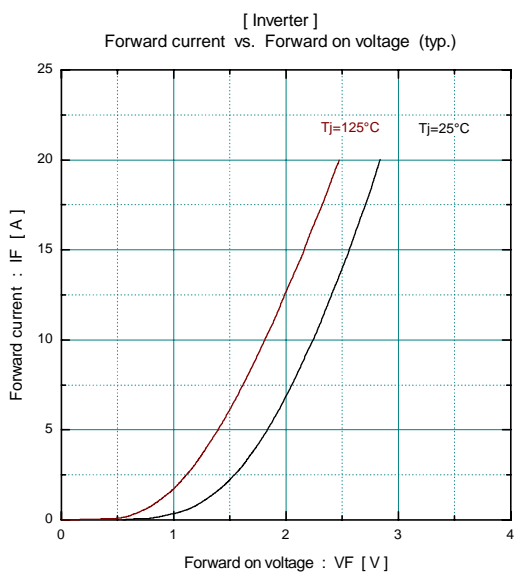


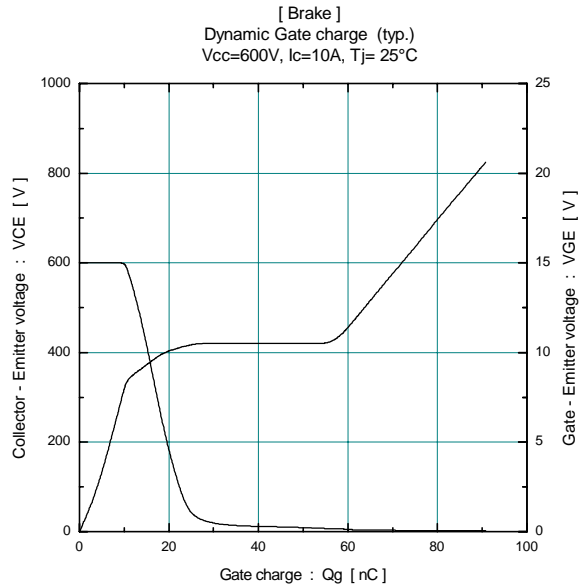
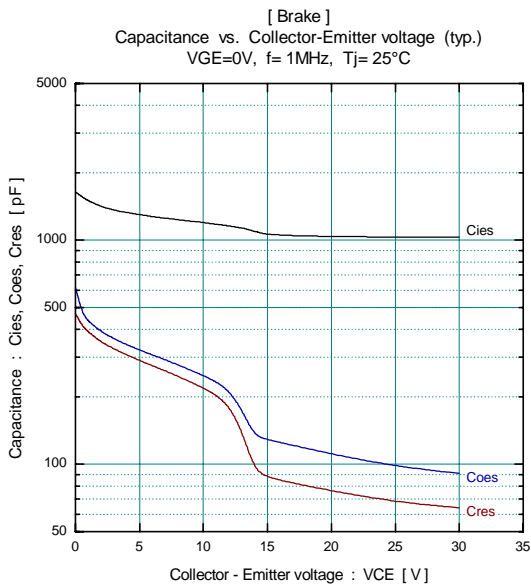
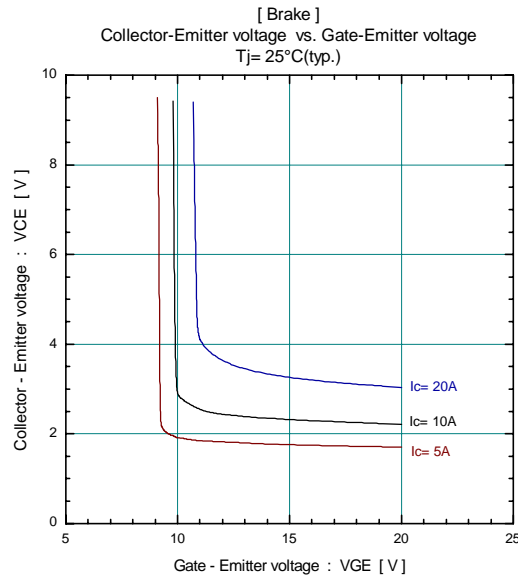
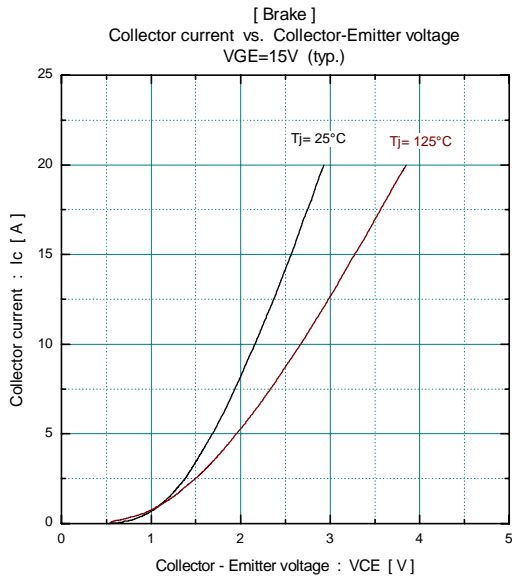
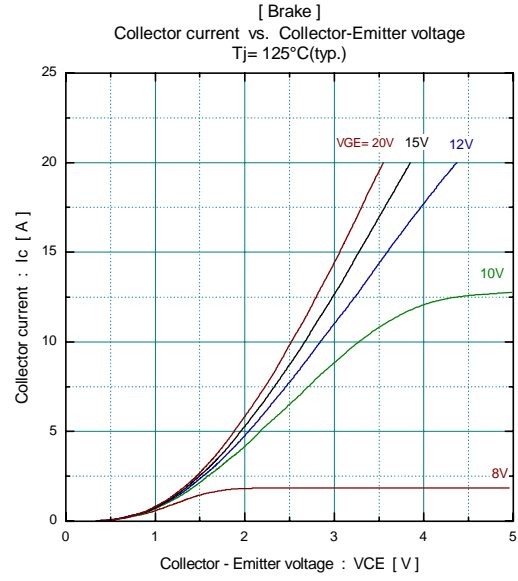
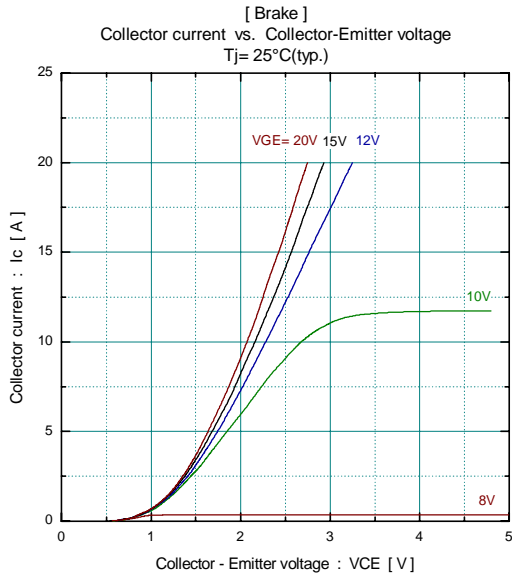
[ Inverter ]  
 Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=10A, V_{GE}=\pm 15V, T_j=125^\circ C$



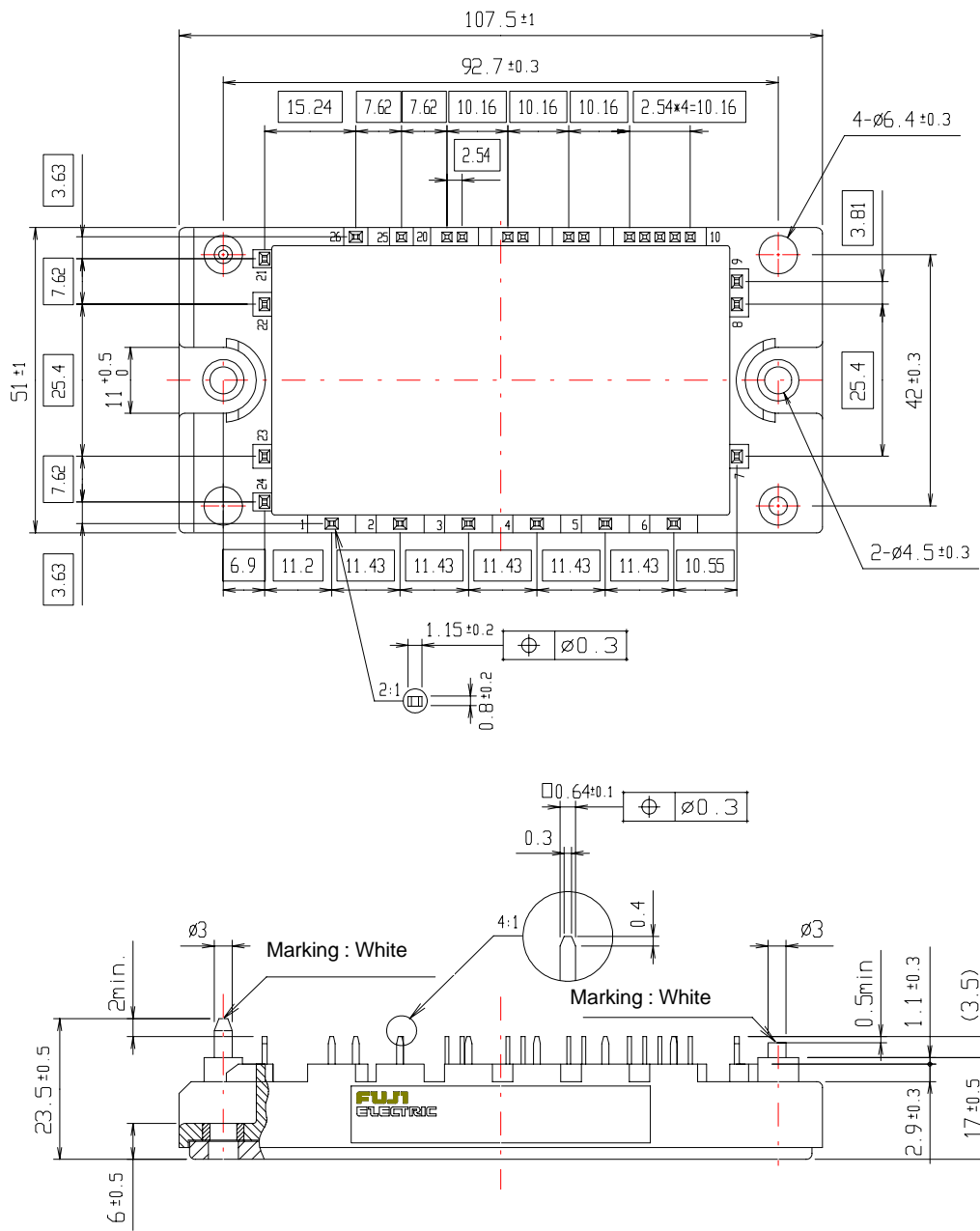
[ Inverter ]  
 Reverse bias safe operating area  
 $+V_{GE}=15V, -V_{GE}\leq -15V, R_g\geq 120\Omega, T_j\leq 125^\circ C$







■ Outline Drawings, mm



■ Equivalent Circuit Schematic

