

# 7MBR35VP120-50

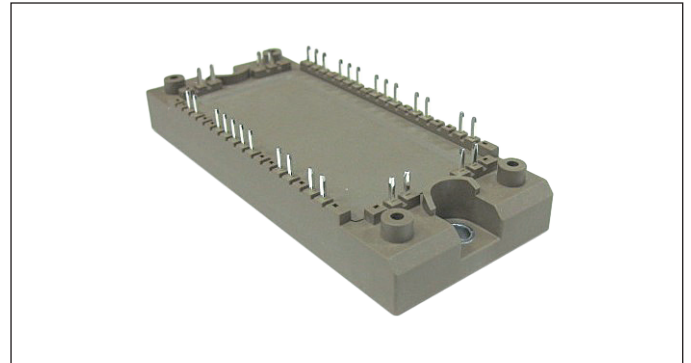
## IGBT MODULE (V series) 1200V / 35A / PIM

### ■ Features

- Low  $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant product

### ■ Applications

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



### ■ Maximum Ratings and Characteristics

#### ● Absolute Maximum Ratings (at $T_c=25^\circ\text{C}$ unless otherwise specified)

Items		Symbols	Conditions		Maximum ratings	Units
Inverter	Collector-Emitter voltage	$V_{CES}$			1200	V
	Gate-Emitter voltage	$V_{GES}$			$\pm 20$	V
	Collector current	$I_c$	Continuous	$T_c=80^\circ\text{C}$	35	A
		$I_{cp}$	1ms	$T_c=80^\circ\text{C}$	70	
		$-I_c$			35	
$-I_c$ pulse		1ms		70		
Collector power dissipation	$P_c$	1 device		210	W	
Brake	Collector-Emitter voltage	$V_{CES}$			1200	V
	Gate-Emitter voltage	$V_{GES}$			$\pm 20$	V
	Collector current	$I_c$	Continuous	$T_c=80^\circ\text{C}$	25	A
		$I_{cp}$	1ms	$T_c=80^\circ\text{C}$	50	
	Collector power dissipation	$P_c$	1 device		170	W
Repetitive peak reverse voltage (Diode)	$V_{RRM}$			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)	$I_{FSM}$	10ms, $T_j=150^\circ\text{C}$		260	A
	$I^2t$ (Non-Repetitive)	$I^2t$	half sine wave		338	$\text{A}^2\text{s}$
Junction temperature	$T_j$	Inverter, Brake		175	$^\circ\text{C}$	
		Converter		150		
Operating junction temperature (under switching conditions)	$T_{jop}$	Inverter, Brake		150		
		Converter		150		
Case temperature	$T_c$			125		
Storage temperature	$T_{stg}$			-40 to +125		
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	$V_{iso}$	AC : 1min.		2500	VAC
Screw torque	Mounting (*3)	-	M5		3.5	N m

Note \*1: All terminals should be connected together during the test.

Note \*2: Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

Note \*3: Recommendable value : 2.5-3.5 Nm (M5)

● Electrical characteristics (at Tj= 25°C unless otherwise specified)

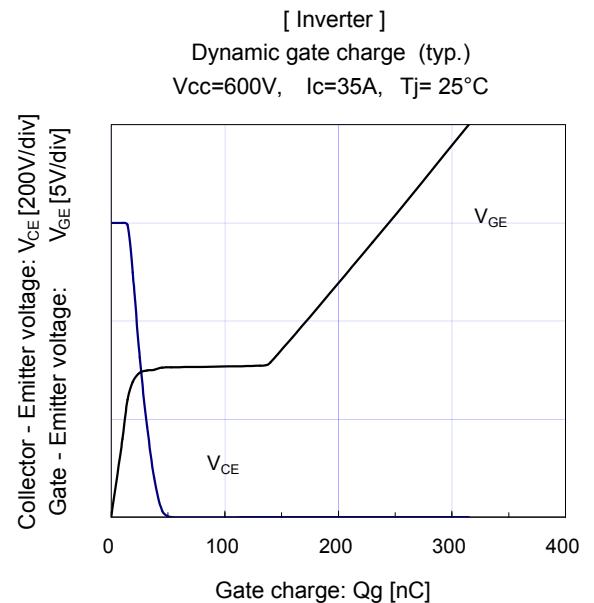
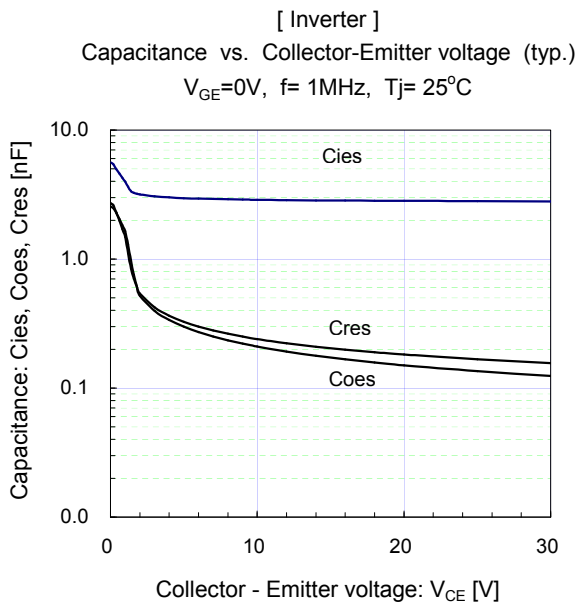
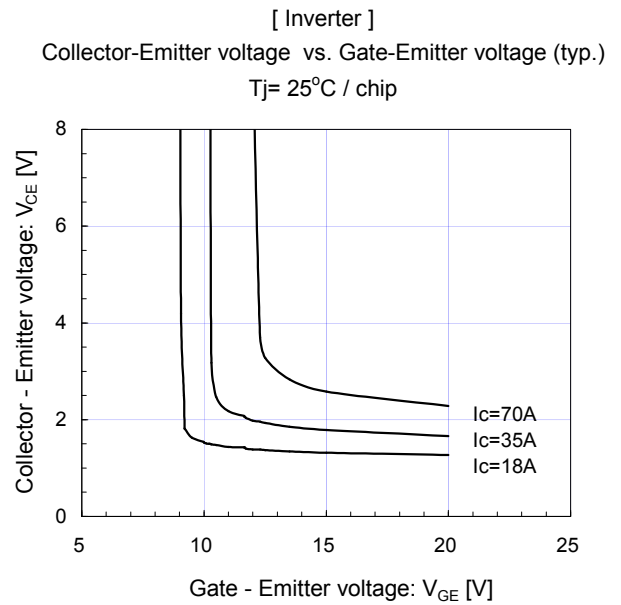
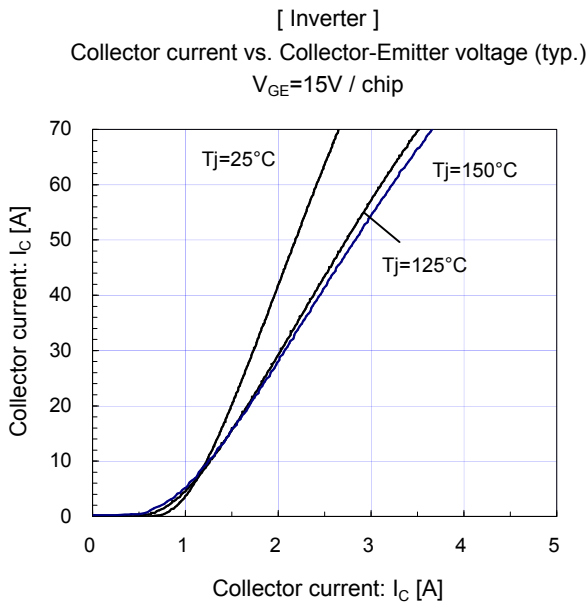
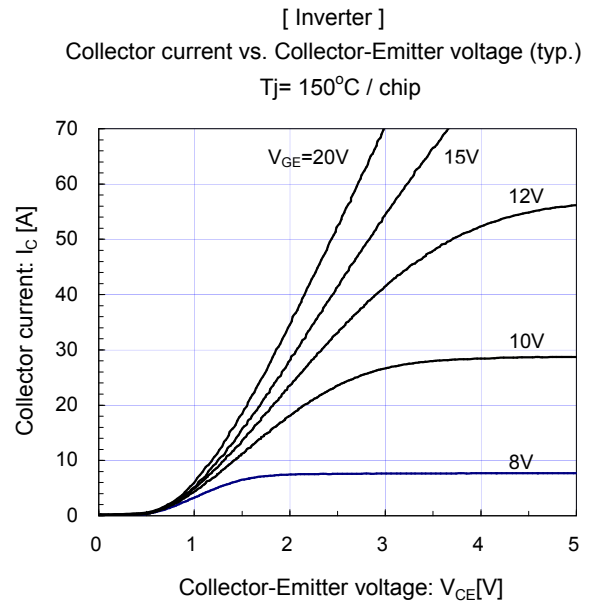
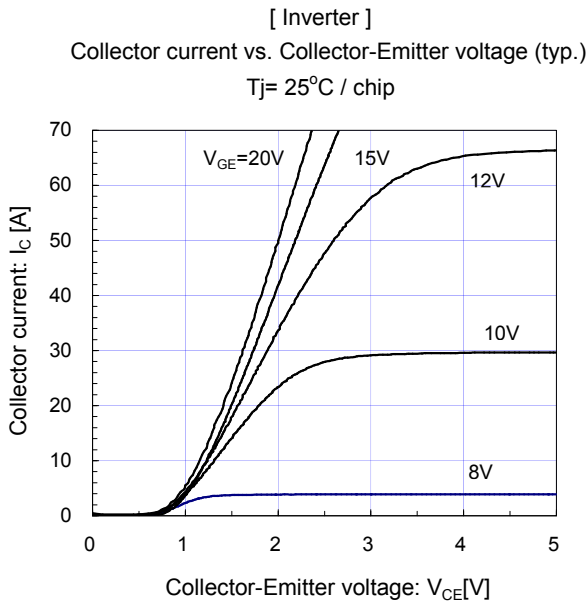
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V, V_{CE} = 1200V$	-	-	1.0	mA	
	Gate-Emitter leakage current	$I_{GES}$	$V_{GE} = 0V, V_{GE} = \pm 20V$	-	-	200	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 35mA$	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 35A$	Tj=25°C	-	2.15	2.60	V
				Tj=125°C	-	2.50	-	
				Tj=150°C	-	2.55	-	
		$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 35A$	Tj=25°C	-	1.85	2.30	
				Tj=125°C	-	2.20	-	
	Input capacitance	$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	2.9	-	nF	
				Turn-on time	$t_{on}$	-	0.39	1.20
	Turn-off time	$t_{off}$	$V_{CE} = 600V$ $I_c = 35A$ $V_{GE} = +15 / -15V$ $R_G = 27\Omega$	-	0.09	0.60		
				$t_f$	-	0.03	-	
	Forward on voltage	$V_F$ (terminal)	$I_F = 35A$	Tj=25°C	-	2.00	2.45	V
				Tj=125°C	-	2.15	-	
				Tj=150°C	-	2.10	-	
$V_F$ (chip)		$I_F = 35A$	Tj=25°C	-	1.70	2.15		
			Tj=125°C	-	1.85	-		
Reverse recovery time	$t_{rr}$	$I_F = 35A$	-	-	0.1	μs		
Brake	Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V$ $V_{CE} = 1200V$	-	-	1.0	mA	
	Gate-Emitter leakage current	$I_{GES}$	$V_{CE} = 0V$ $V_{GE} = +20 / -20V$	-	-	200	nA	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 25A$	Tj=25°C	-	2.05	2.50	V
				Tj=125°C	-	2.40	-	
				Tj=150°C	-	2.45	-	
		$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 25A$	Tj=25°C	-	1.85	2.30	
				Tj=125°C	-	2.20	-	
	Turn-on time	$t_{on}$	$V_{CE} = 600V$ $I_c = 25A$	-	0.39	1.20	μs	
				Turn-off time	$t_{off}$	-		0.09
	Reverse current	$t_f$	$V_{GE} = +15 / -15V$ $R_G = 39\Omega$	-	0.53	1.00		
$t_{rr}$				-	0.06	0.30		
Forward on voltage	$V_{FM}$ (chip)	$I_F = 35A$	terminal	-	1.65	2.10	V	
Reverse current	$I_{RRM}$	$V_R = 1600V$	chip	-	1.35	-	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

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	Rth(j-c)	Inverter IGBT	-	-	0.72	°C/W
		Inverter FWD	-	-	0.91	
		Brake IGBT	-	-	0.89	
		Converter Diode	-	-	0.88	
Contact thermal resistance (1device) (*4)	Rth(c-f)	with Thermal Compound	-	0.05	-	

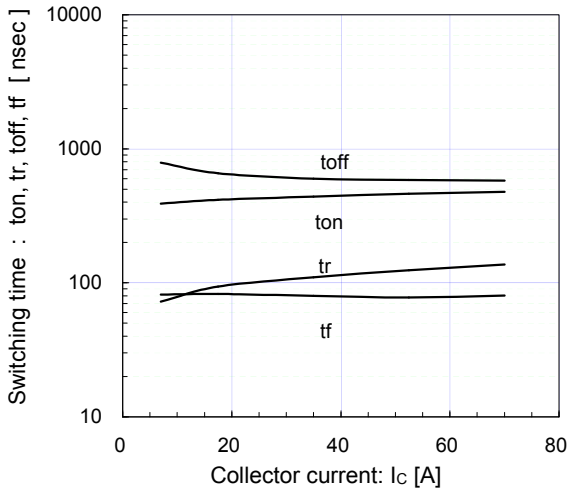
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



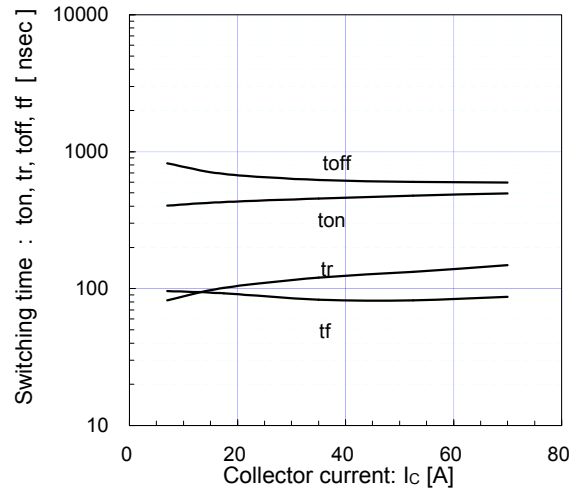
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=27\Omega, T_j=125^\circ C$



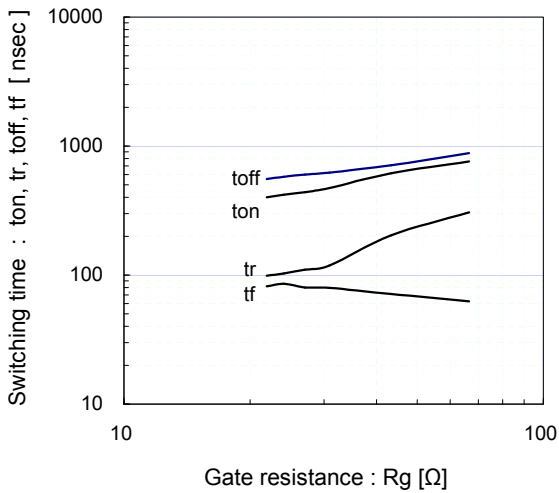
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=27\Omega, T_j=150^\circ C$



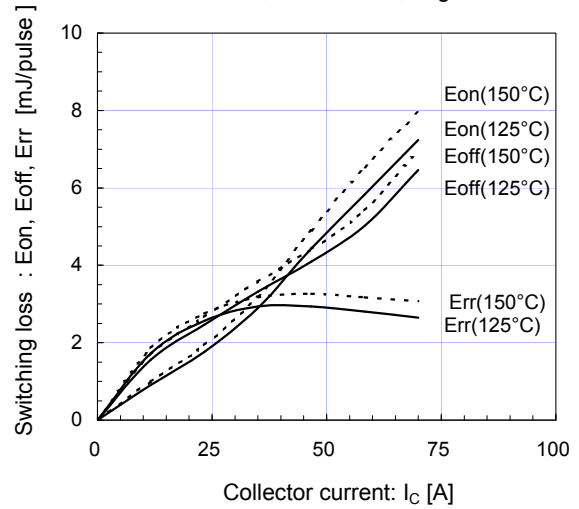
[ Inverter ]

Switching time vs. gate resistance (typ.)  
 $V_{cc}=600V, I_C=35A, V_{GE}=\pm 15V, T_j=125^\circ C$



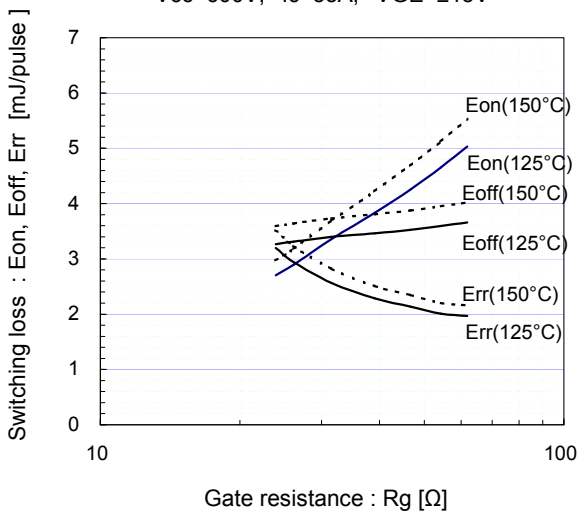
[ Inverter ]

Switching loss vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=27\Omega$



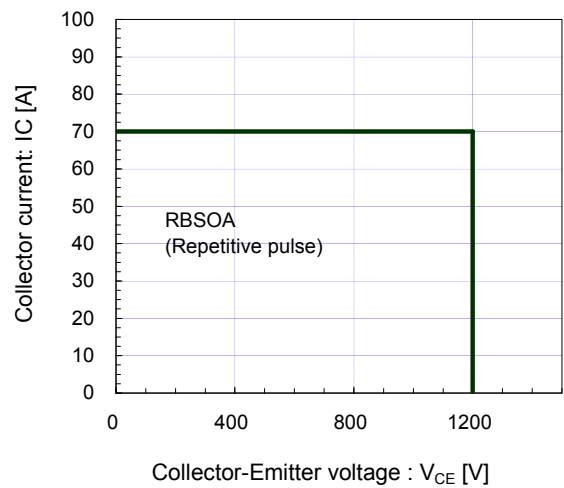
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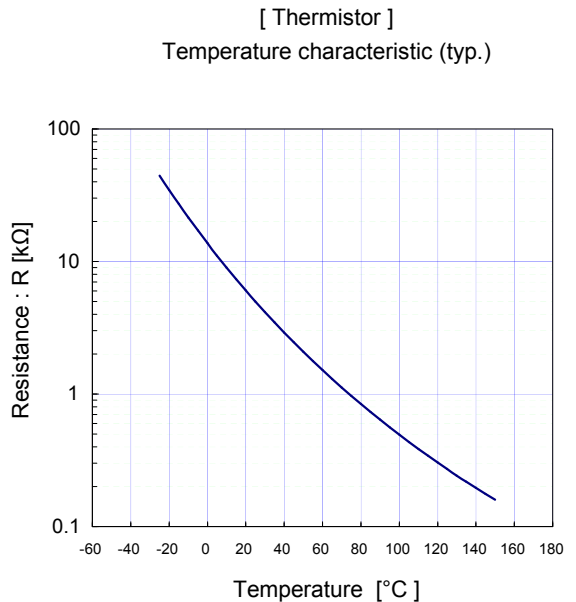
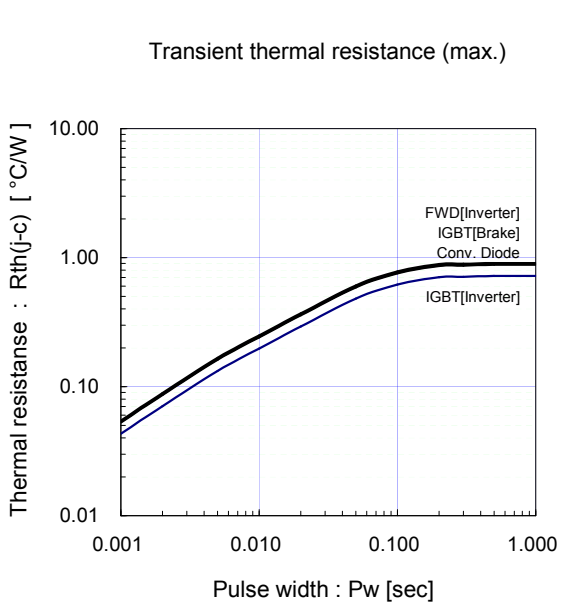
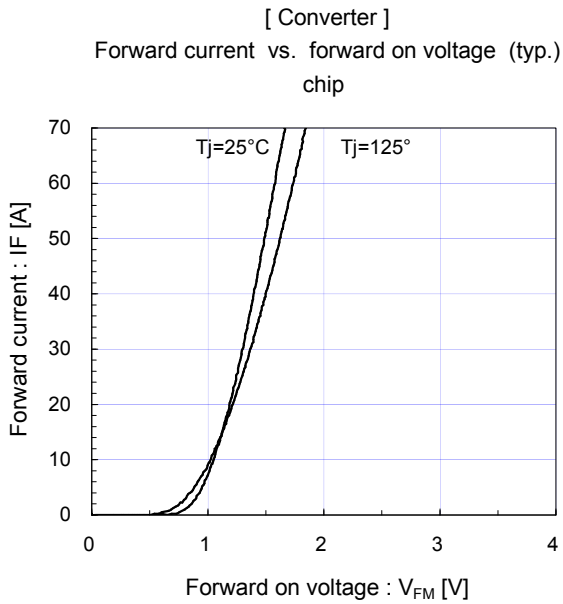
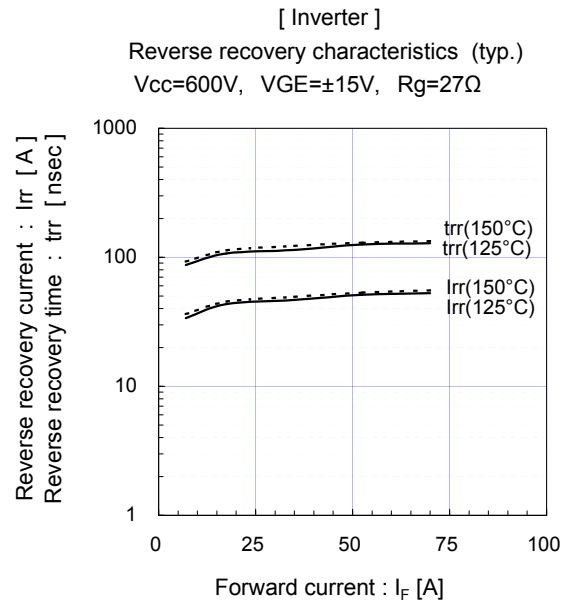
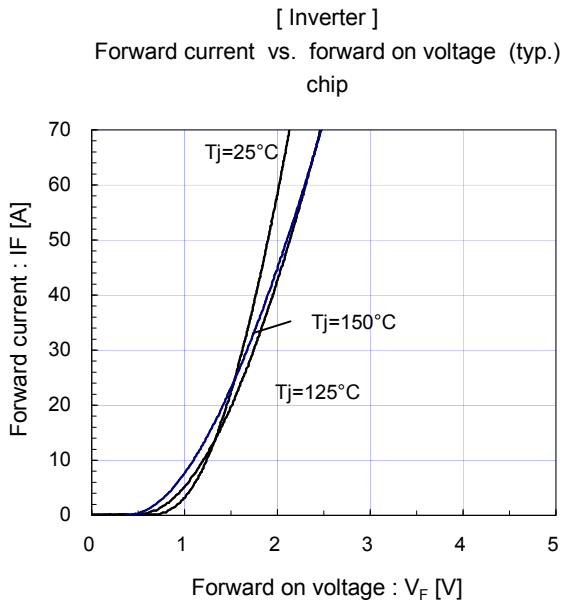
Switching loss vs. gate resistance (typ.)  
 $V_{cc}=600V, I_C=35A, V_{GE}=\pm 15V$



[ Inverter ]

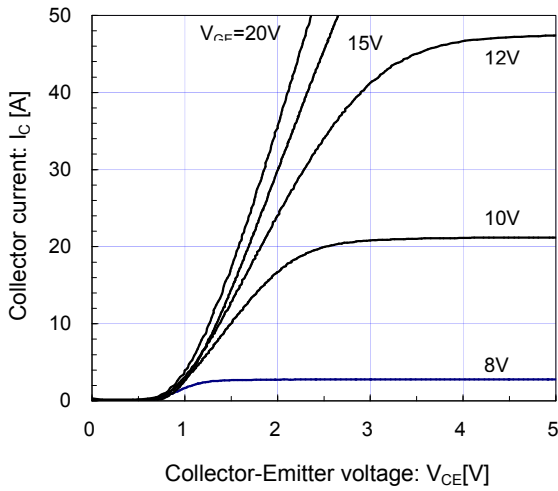
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_g \geq 27\Omega, T_j \leq 125^\circ C$





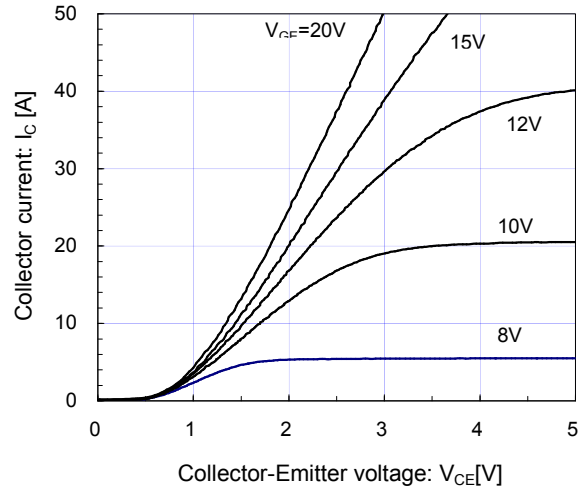
[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)  
Tj= 25°C / chip



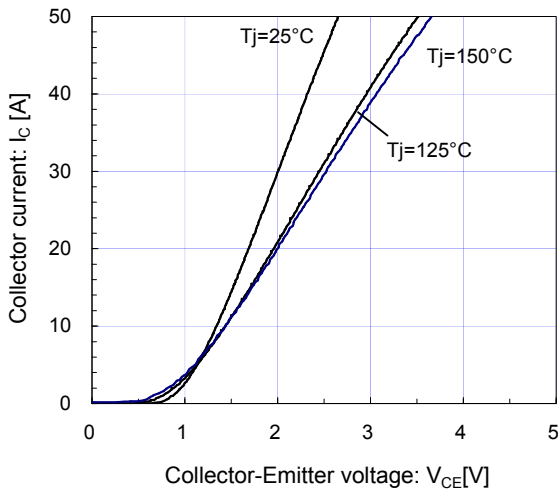
[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)  
Tj= 150°C / chip



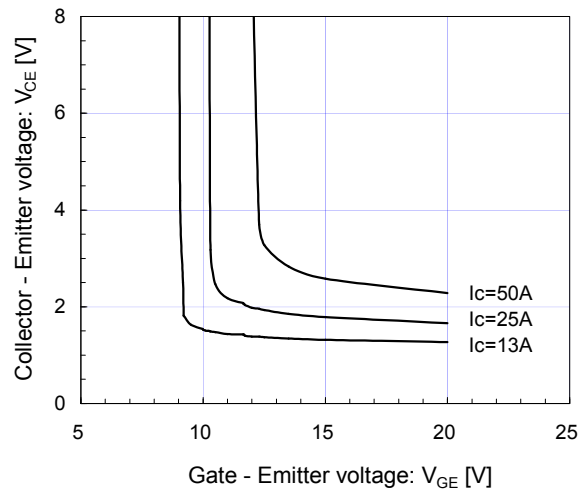
[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)  
VGE=15V / chip



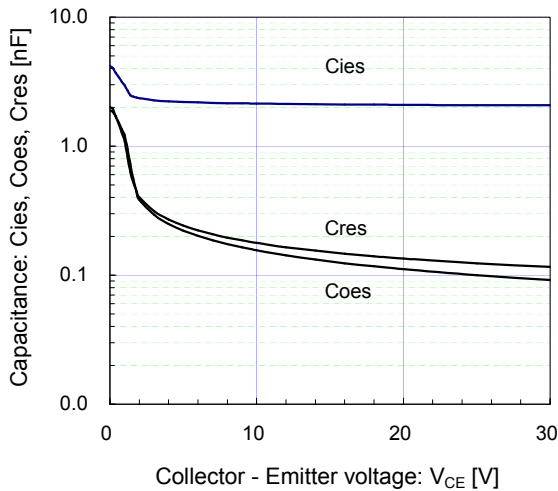
[ Brake ]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
Tj= 25°C / chip



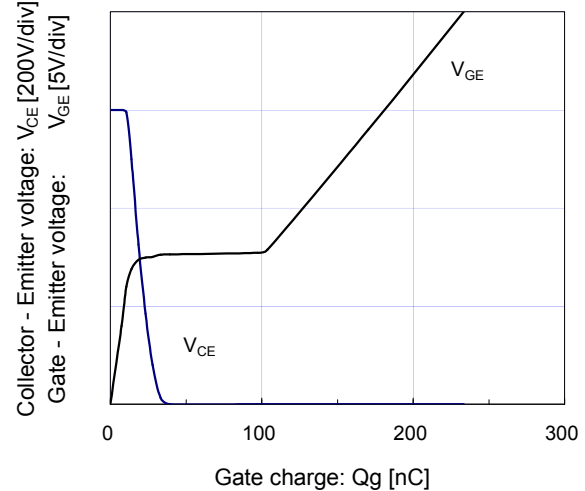
[ Brake ]

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



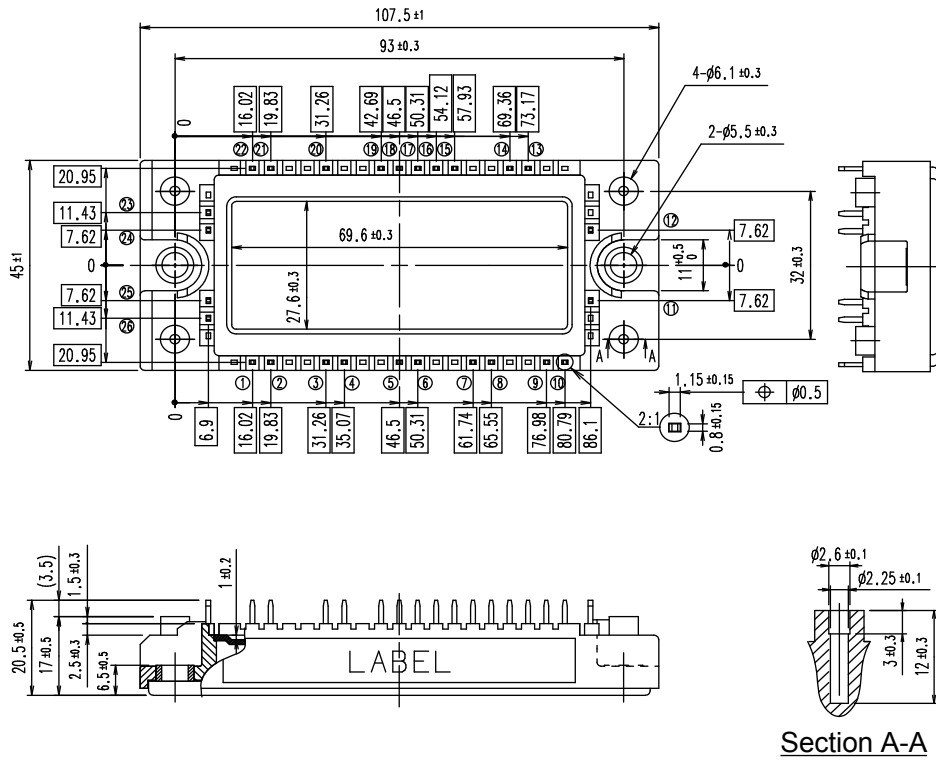
[ Brake ]

Dynamic gate charge (typ.)  
Vcc=600V, Ic=35A, Tj= 25°C



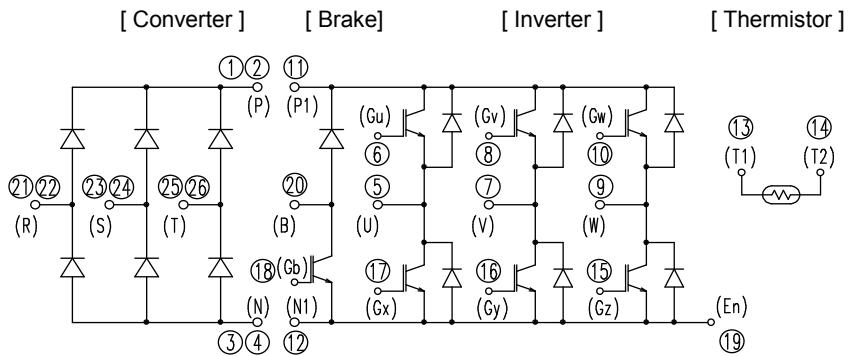
Outline Drawings, mm

□ shows theoretical dimension.  
 ( ) shows reference dimension.



Section A-A

Equivalent Circuit Schematic



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