

# 7MBR35VM120-50

**IGBT Modules**

## IGBT MODULE (V series)

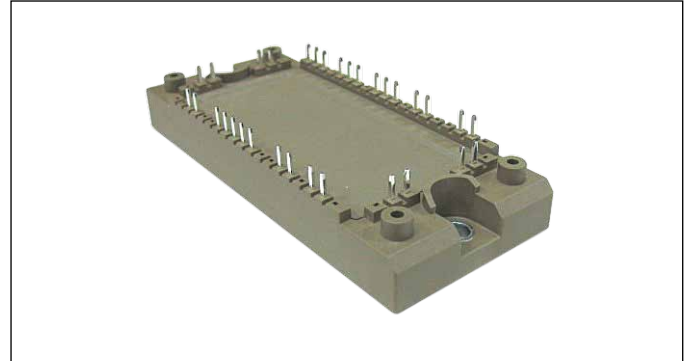
### 1200V / 35A / PIM

#### ■ 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 $T_c=100^\circ\text{C}$	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.	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  $T_j = 25^\circ\text{C}$  unless otherwise specified)

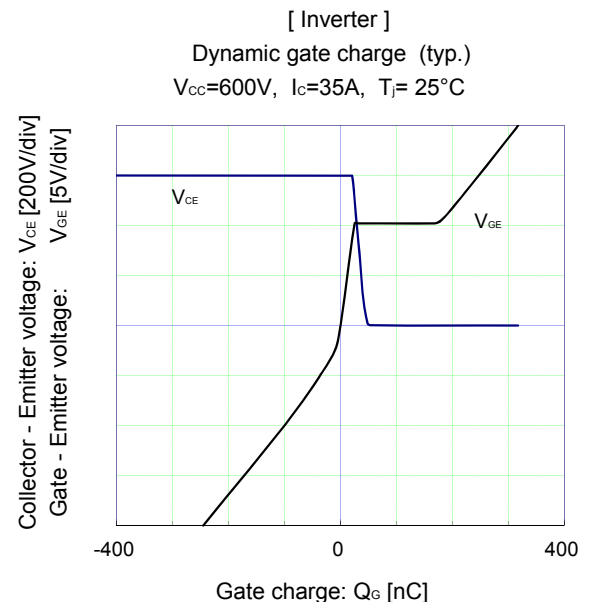
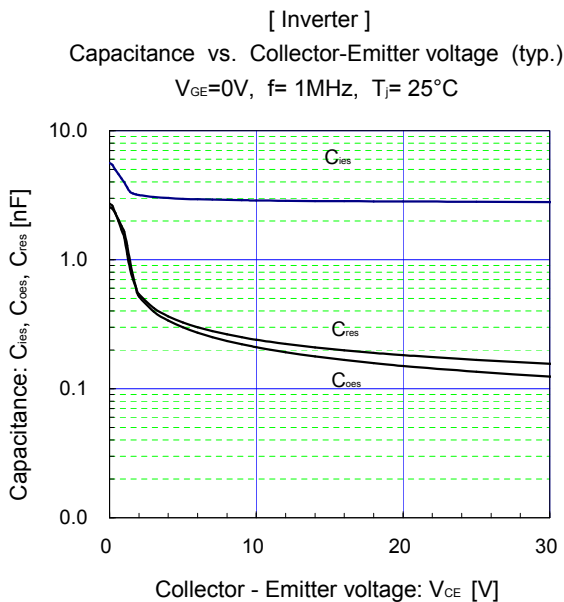
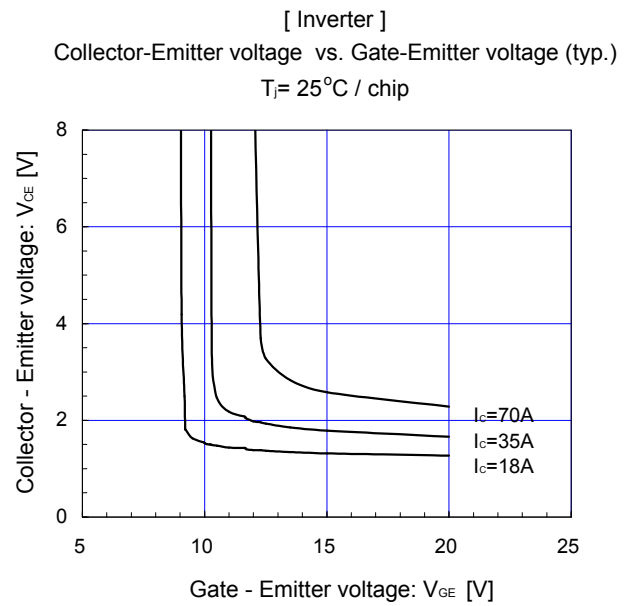
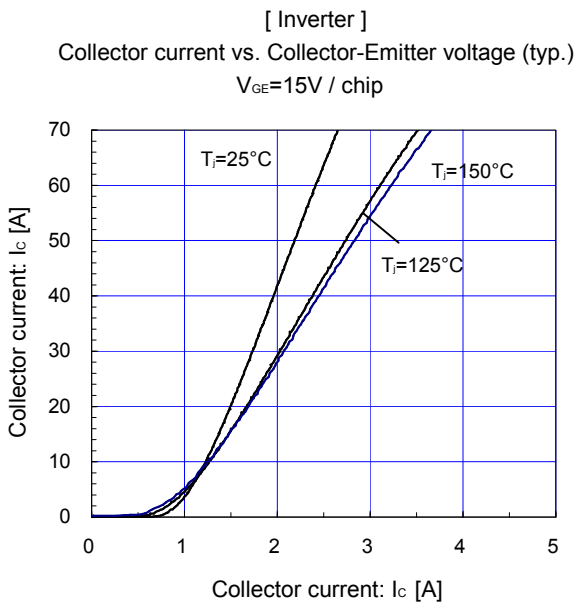
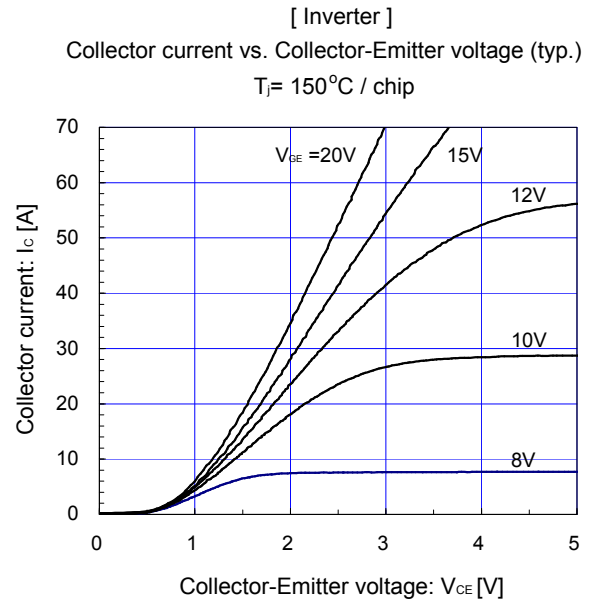
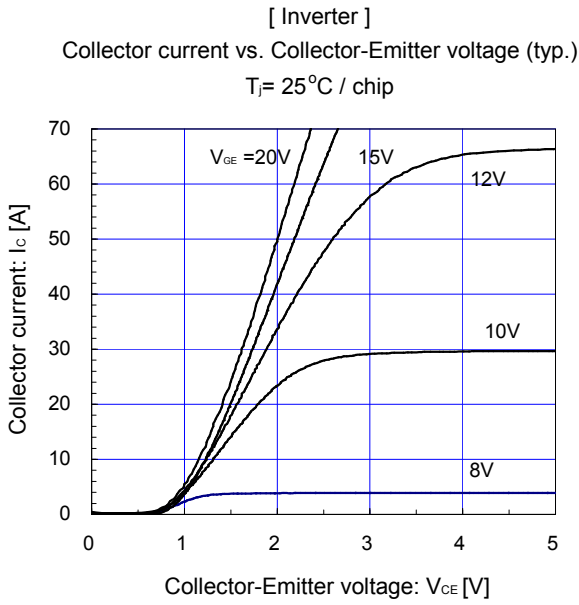
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V, V_{CE} = 1200V$	-	-	1.0	mA	
	Gate-Emitter leakage current	$I_{GES}$	$V_{GE} = 0V, V_{GE} = \pm 20V$	-	-	200	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 35mA$	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 35A$	$T_j = 25^\circ\text{C}$	-	2.15	2.60	V
				$T_j = 125^\circ\text{C}$	-	2.50	-	
				$T_j = 150^\circ\text{C}$	-	2.55	-	
		$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 35A$	$T_j = 25^\circ\text{C}$	-	1.85	2.30	
				$T_j = 125^\circ\text{C}$	-	2.20	-	
	$T_j = 150^\circ\text{C}$	-	2.25	-				
	Internal gate resistance	$R_{G(int)}$	-	-	0	-	$\Omega$	
	Input capacitance	$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	2.9	-	nF	
	Turn-on time	$t_{on}$	$V_{CC} = 600V$ $I_c = 35A$	-	0.39	1.20	$\mu s$	
		$t_r$		-	0.09	0.60		
		$t_{r(i)}$		-	0.03	-		
	Turn-off time	$t_{off}$	$V_{GE} = +15 / -15V$ $R_G = 27\Omega$	-	0.53	1.00	$\mu s$	
$t_f$		-		0.06	0.30			
Forward on voltage	$V_F$ (terminal)	$I_F = 35A$	$T_j = 25^\circ\text{C}$	-	2.00	2.45	V	
			$T_j = 125^\circ\text{C}$	-	2.15	-		
			$T_j = 150^\circ\text{C}$	-	2.10	-		
	$V_F$ (chip)	$I_F = 35A$	$T_j = 25^\circ\text{C}$	-	1.70	2.15		
			$T_j = 125^\circ\text{C}$	-	1.85	-		
$T_j = 150^\circ\text{C}$	-	1.80	-					
Reverse recovery time	$t_{rr}$	$I_F = 35A$	-	-	0.35	$\mu s$		
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)	$V_{GE} = 15V$ $I_c = 25A$	$T_j = 25^\circ\text{C}$	-	2.05	2.50	V
				$T_j = 125^\circ\text{C}$	-	2.40	-	
				$T_j = 150^\circ\text{C}$	-	2.45	-	
		$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 25A$	$T_j = 25^\circ\text{C}$	-	1.85	2.30	
				$T_j = 125^\circ\text{C}$	-	2.20	-	
	$T_j = 150^\circ\text{C}$	-	2.25	-				
	Internal gate resistance	$R_{G(int)}$	-	-	0	-	$\Omega$	
	Turn-on time	$t_{on}$	$V_{CE} = 600V$ $I_c = 25A$	-	0.39	1.20	$\mu s$	
		$t_r$		-	0.09	0.60		
	Turn-off time	$t_{off}$	$V_{GE} = +15 / -15V$ $R_G = 39\Omega$	-	0.53	1.00	$\mu s$	
		$t_f$		-	0.06	0.30		
	Reverse current	$I_{RRM}$	$V_R = 1200V$	-	-	1.00	mA	
	Converter	Forward on voltage	$I_F = 35A$	terminal	-	1.65	2.10	V
chip				-	1.35	-		
Reverse current	$I_{RRM}$	$V_R = 1600V$	-	-	1.0	mA		
Thermistor	Resistance	$T = 25^\circ\text{C}$	-	5000	-	$\Omega$		
		$T = 100^\circ\text{C}$	465	495	520			
B value	B	$T = 25 / 50^\circ\text{C}$	3305	3375	3450	K		

## ● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.72	$^\circ\text{C/W}$
		Inverter FWD	-	-	0.91	
		Brake IGBT	-	-	0.89	
		Converter Diode	-	-	0.88	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	with Thermal Compound	-	0.05	-	

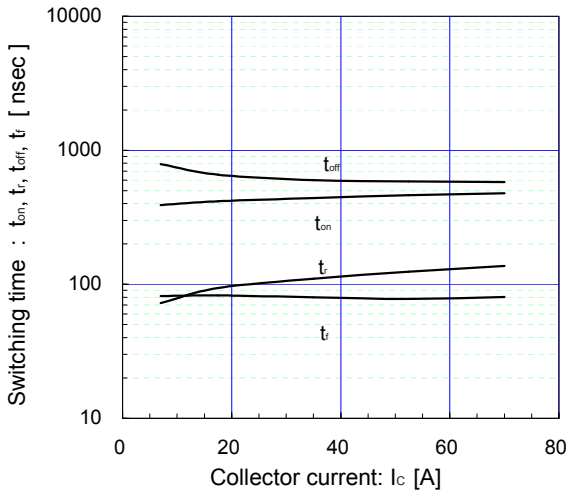
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



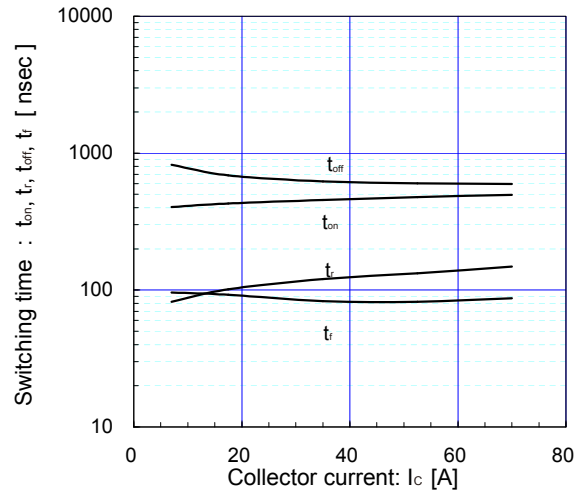
[ Inverter ]

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



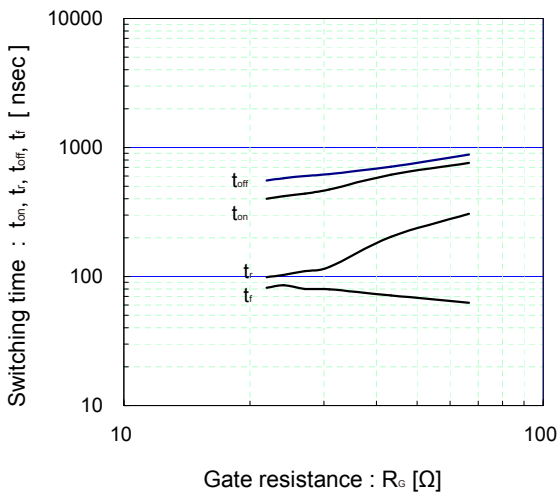
[ Inverter ]

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



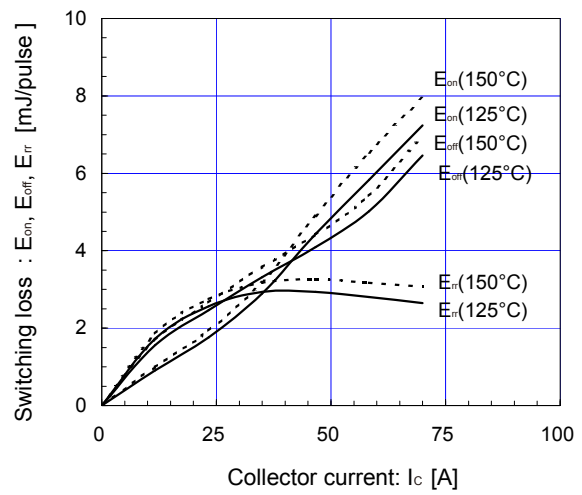
[ Inverter ]

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



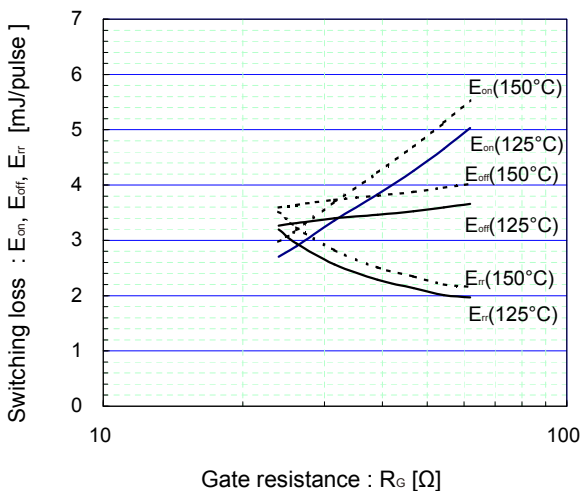
[ Inverter ]

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



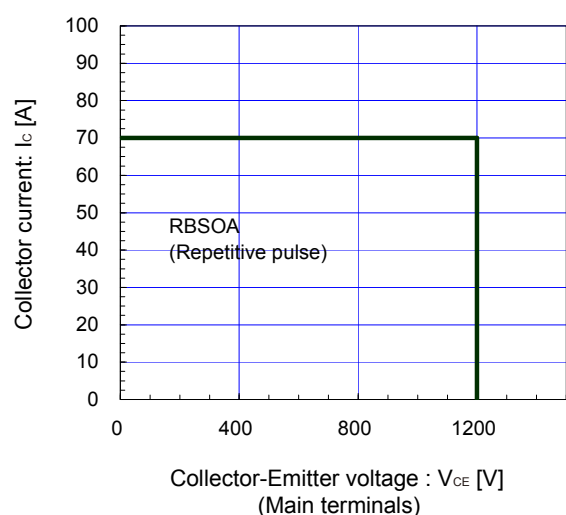
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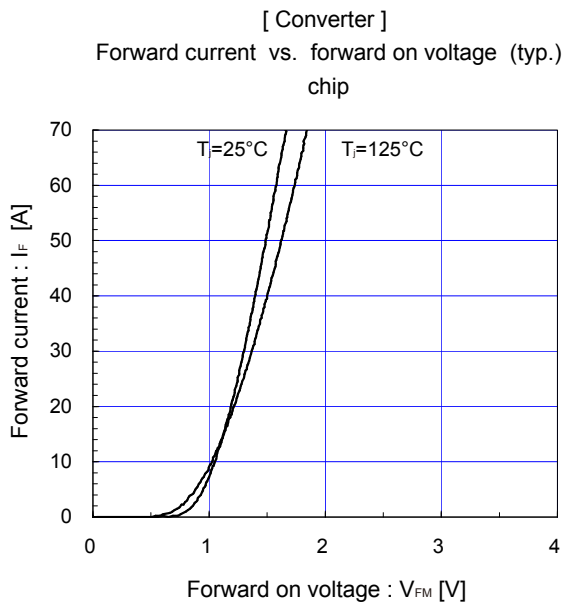
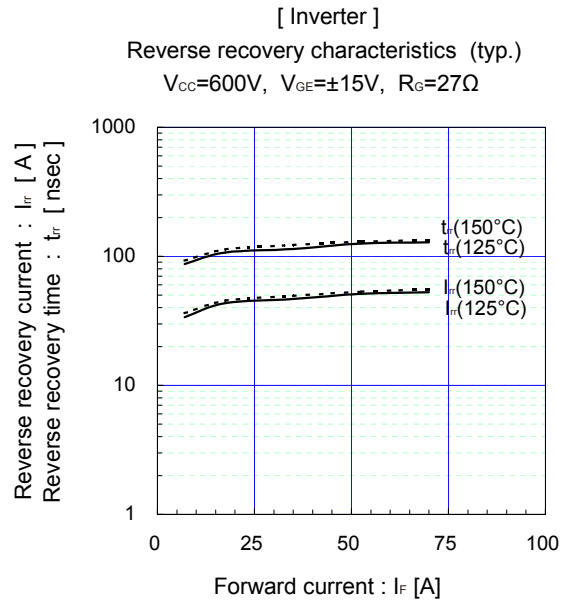
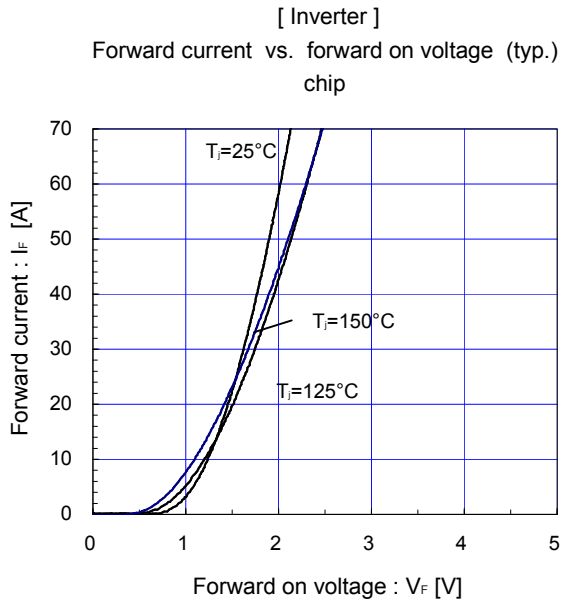
Switching loss vs. gate resistance (typ.)  
 $V_{CC}=600V, I_c=35A, V_{GE}=\pm 15V$



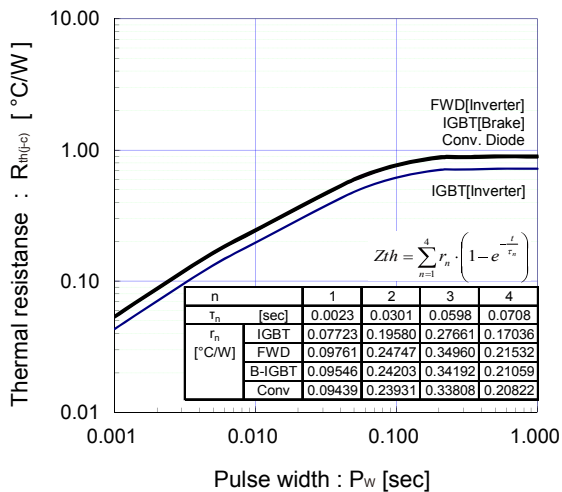
[ Inverter ]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_G \ge 27\Omega, T_J=150^\circ C$

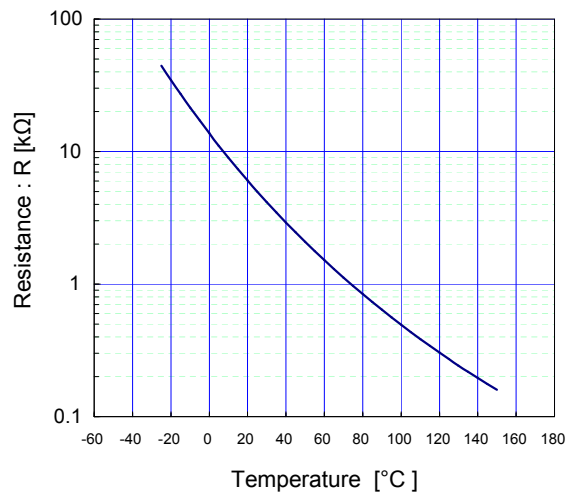


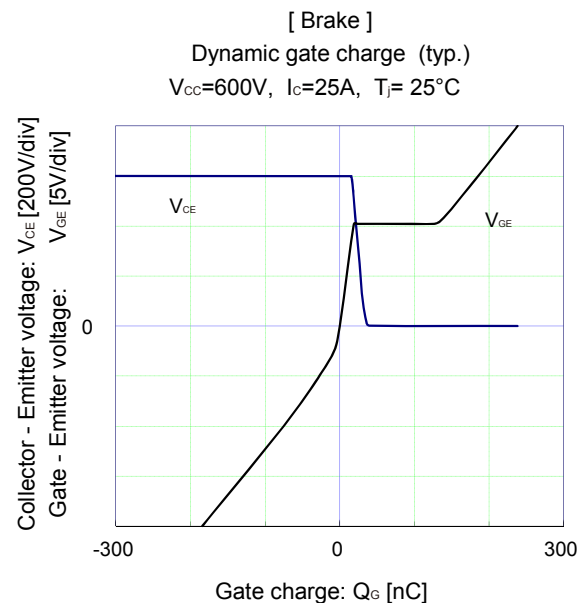
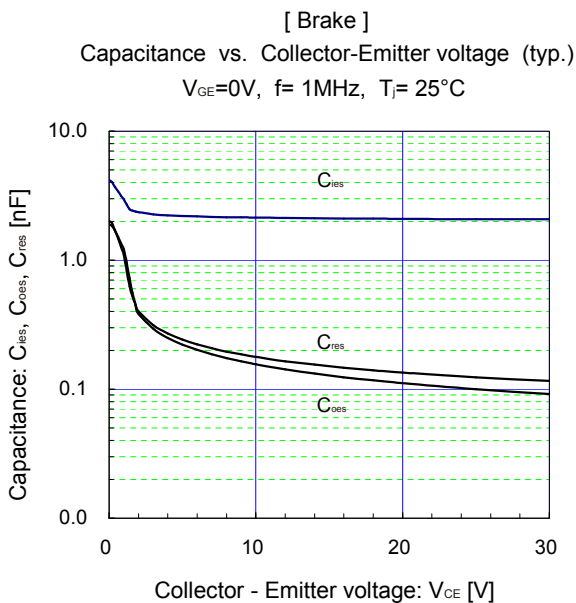
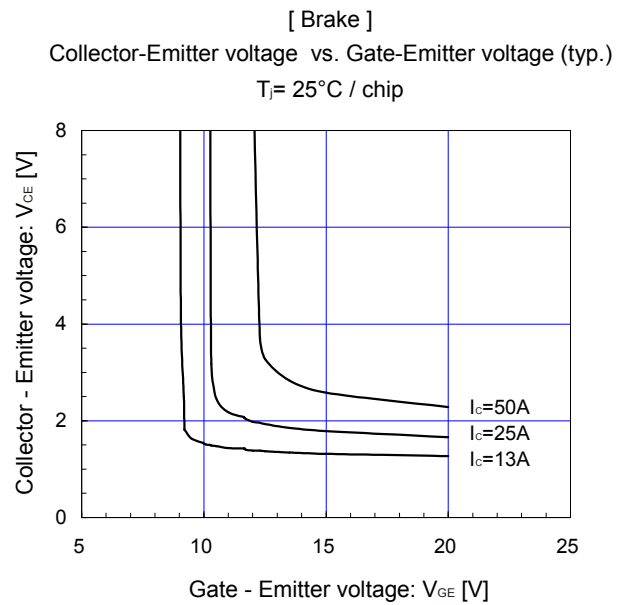
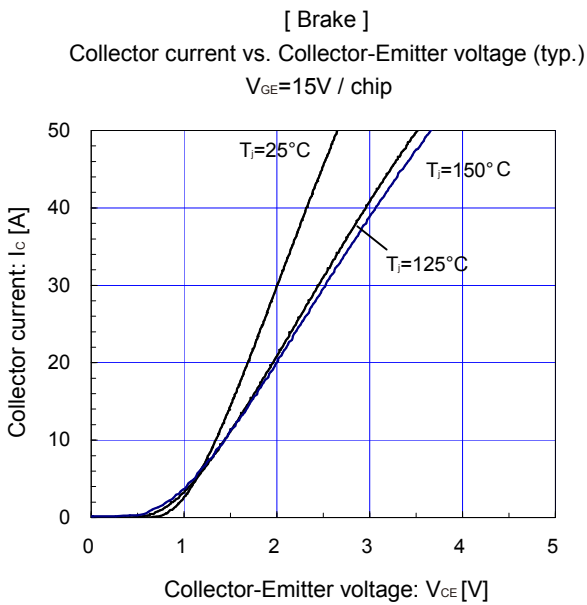
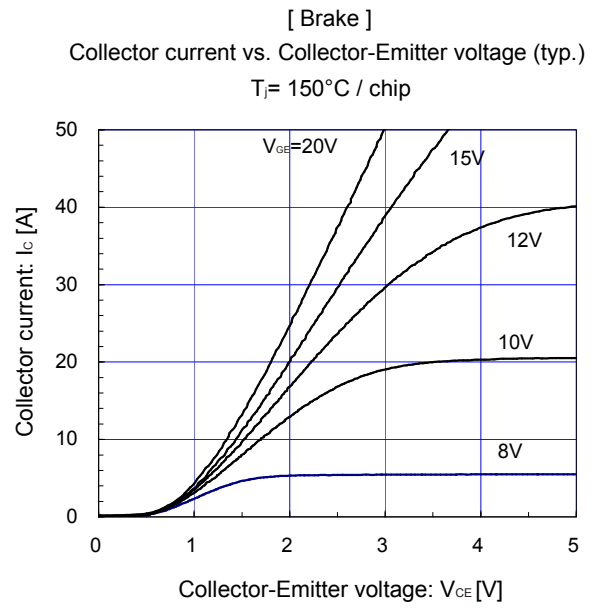
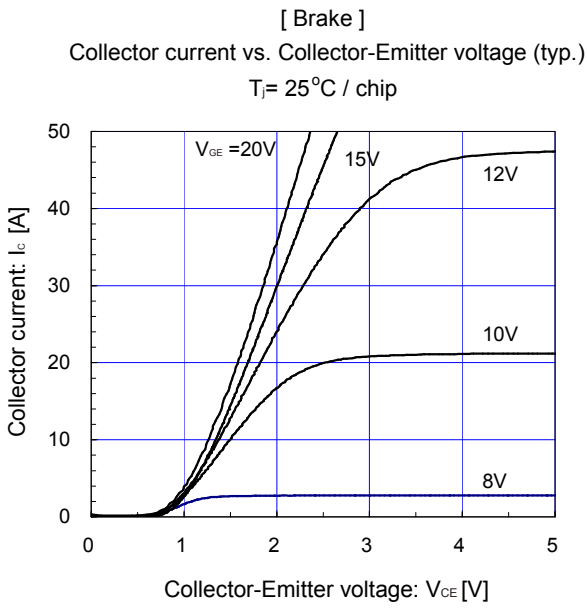


Transient thermal resistance (max.)

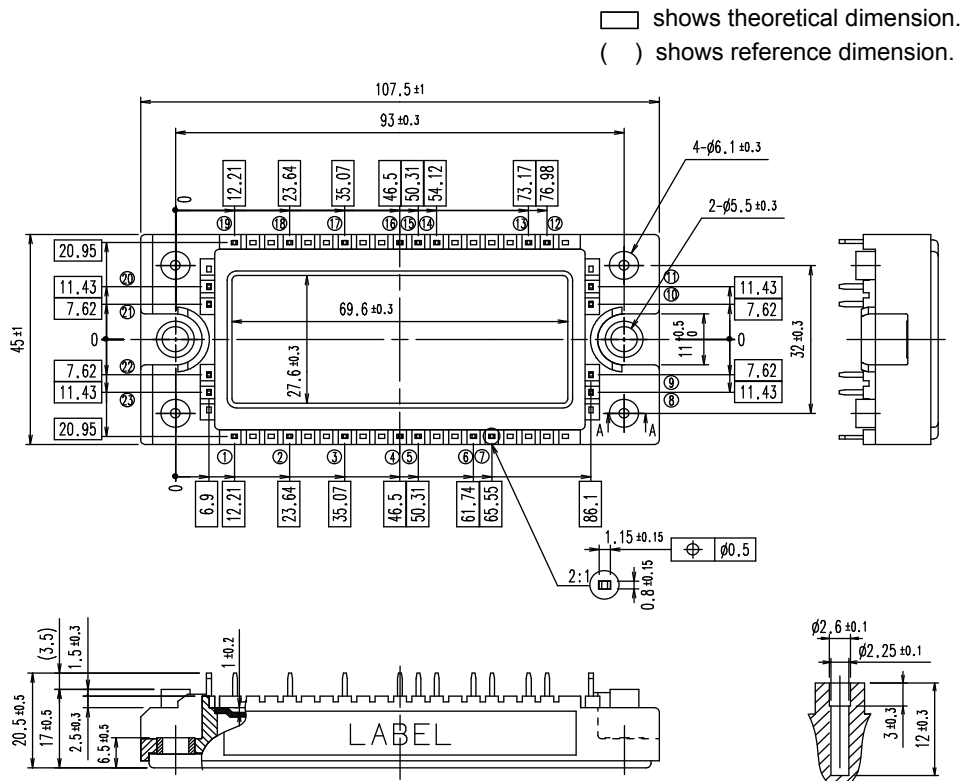


[ Thermistor ]  
Temperature characteristic (typ.)



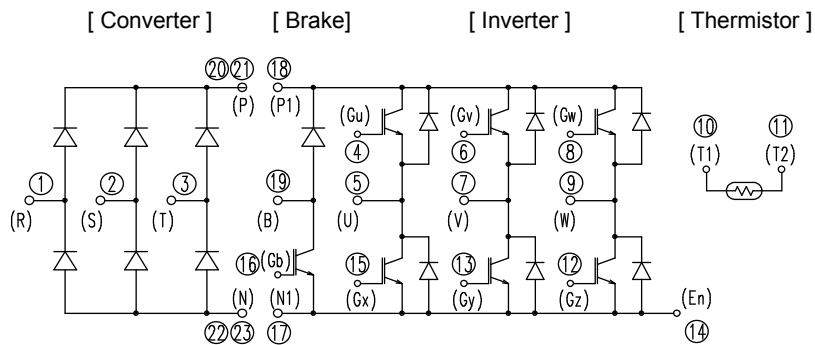


■ Outline Drawings (Unit : mm)



Section A-A  
 Weight: 200g(typ.)

■ Equivalent Circuit



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## IGBT Modules

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