

2MSI450VAN-120-53

SiC Hybrid Modules

Power Module (V-series IGBT & SiC SBD Hybrid type)
1200V / 450A / 2-in-1 package

■ **Features**

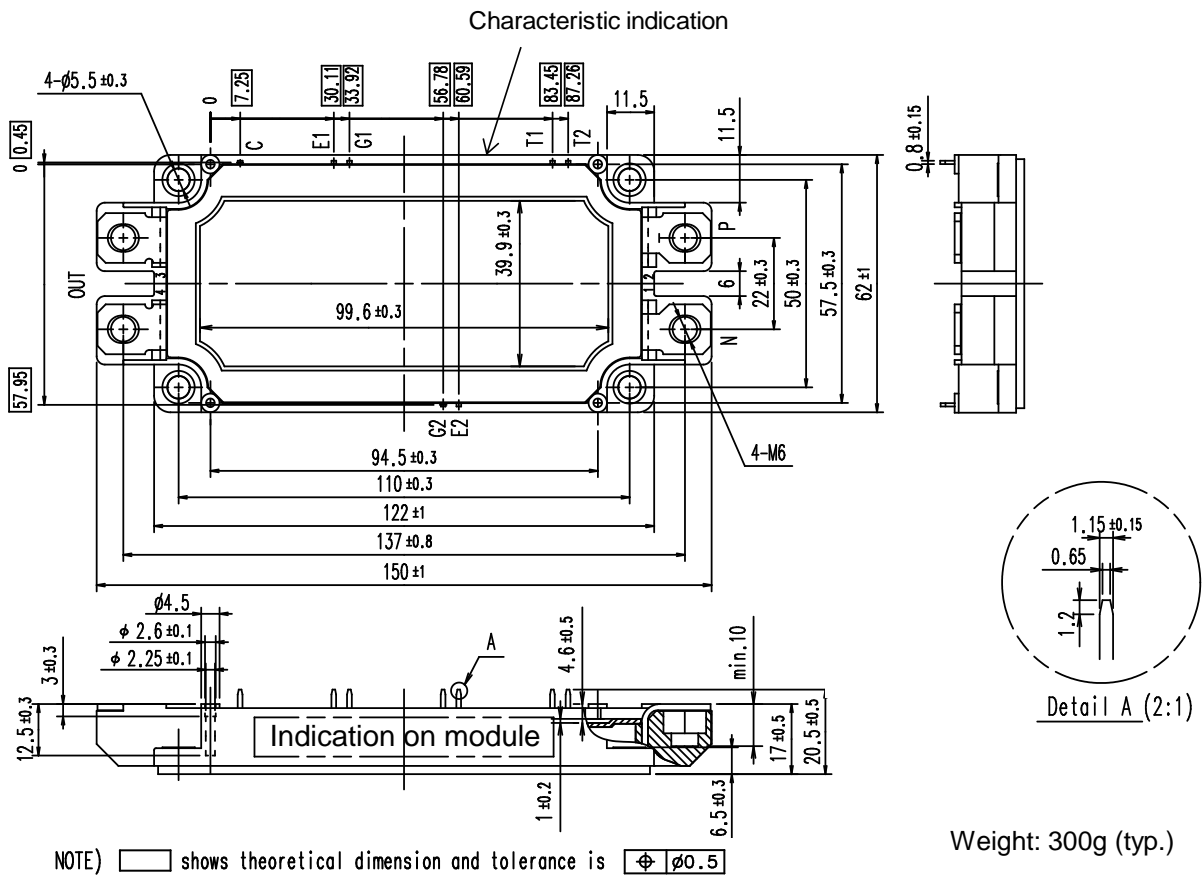
- High speed switching
- Voltage drive
- Low switching loss
- Low inductance module structure

■ **Applications**

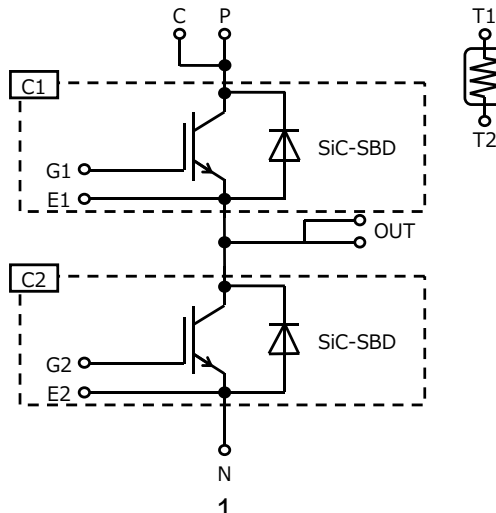
- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Active Front End



■ **Outline drawing (Unit : mm)**



■ **Equivalent Circuit**



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

Items	Symbols	Conditions	Maximum Ratings	Units	
Collector-Emitter voltage	V_{CES}		1200	V	
Gate-Emitter voltage	V_{GES}		± 20	V	
Collector current	I_C	Continuous	$T_c = 25^\circ\text{C}$	600	A
			$T_c = 100^\circ\text{C}$	450	
	I_C pulse	1 ms	900		
	$-I_C$		450		
	$-I_C$ pulse	1 ms	900		
Collector power dissipation	P_C	1 device	3135	W	
Junction temperature	T_{vj}		175	°C	
Operating junction temperature (under switching conditions)	T_{vjop}		150		
Case temperature	T_c		125		
Storage temperature	T_{stg}		-40 ~ 125		
Isolation voltage	between terminal and copper base (*1)	V_{iso}	AC: 1 min.	2500	Vrms
	between thermistor and others (*2)				
Screw Torque	Mounting (*3)	-	3.5	N m	
	Terminals (*4)	-	4.5		

(*1) All terminals should be connected together during the test.

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

(*3) Recommendable Value : 2.5-3.5 Nm (M5)

(*4) Recommendable Value : 3.5-4.5 Nm (M6)

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■ Electrical characteristics (at $T_{vj}= 25^{\circ}\text{C}$ unless otherwise specified)
NOTICE:

The external gate resistance (R_G) shown below is one of our recommended value for the purpose of minimum switching loss. However the optimum R_G depends on circuit configuration and/or environment. We recommend that the R_G has to be carefully chosen based on consideration if IGBT module matches design criteria, for example, switching loss, EMC/EMI, spike voltage, surge current and no unexpected oscillation and so on.

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage Collector current	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}$	-	-	5.0	mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$	-	-	600	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{ V}, I_C = 450\text{ mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{ V}, I_C = 450\text{ A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.35	2.80	V
			$T_{vj}=125^{\circ}\text{C}$	-	2.75	-	
			$T_{vj}=150^{\circ}\text{C}$	-	2.85	-	
	$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.20	
			$T_{vj}=125^{\circ}\text{C}$	-	2.05	-	
Internal gate resistance	$r_{g(int)}$	-	-	1.67	-	Ω	
Input capacitance	C_{ies}	$V_{CE} = 10\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$	-	36	-	nF	
Turn-on time	t_{on}	$V_{CC} = 600\text{ V}, I_C = 450\text{ A}, V_{GE} = \pm 15\text{ V}, R_G = 0.52\Omega,$	-	360	-	nsec	
	t_r		-	100	-		
	$t_{r(i)}$		-	70	-		
Turn-off time	t_{off}	$L_s = 80\text{ nH}$	-	720	-	nsec	
	t_f		-	70	-		
Forward voltage	V_F (terminal)	$V_{GE} = 0\text{ V}, I_F = 450\text{ A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.20	2.50	V
			$T_{vj}=125^{\circ}\text{C}$	-	2.60	-	
			$T_{vj}=150^{\circ}\text{C}$	-	2.80	-	
	V_F (chip)		$T_{vj}=25^{\circ}\text{C}$	-	1.60	1.90	
			$T_{vj}=125^{\circ}\text{C}$	-	1.90	-	
Reverse recovery time	t_{rr}	$I_F = 450\text{ A}$	-	60	-	nsec	
Thermistor	Resistance	R	$T = 25^{\circ}\text{C}$	-	5000	-	Ω
	B value	B	$T = 100^{\circ}\text{C}$	465	495	520	
			$T = 25/50^{\circ}\text{C}$		3375	3450	K

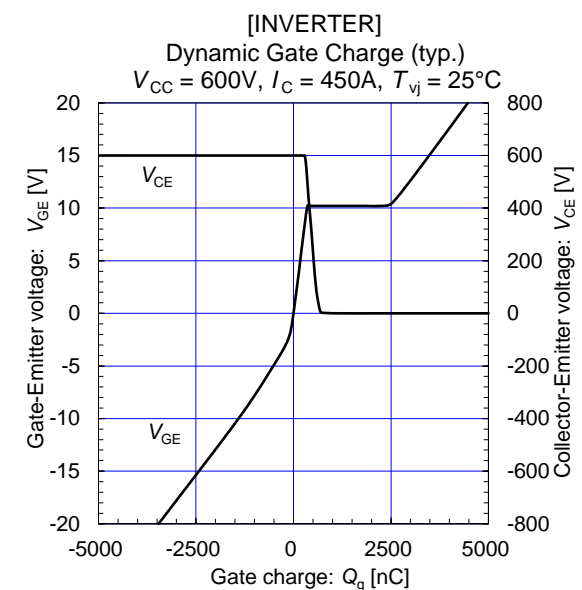
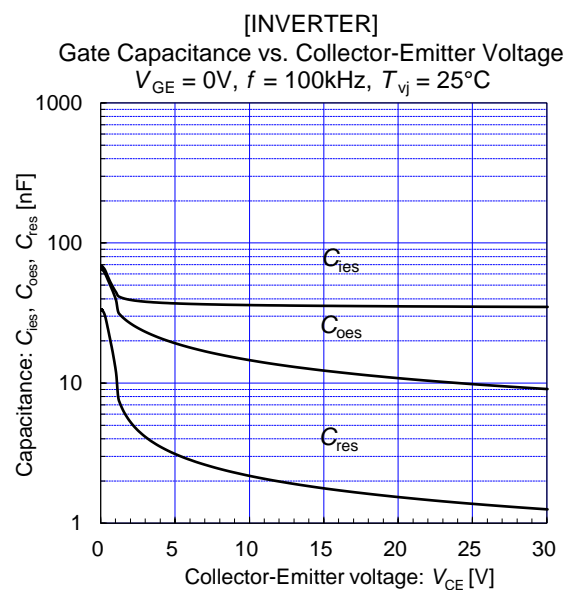
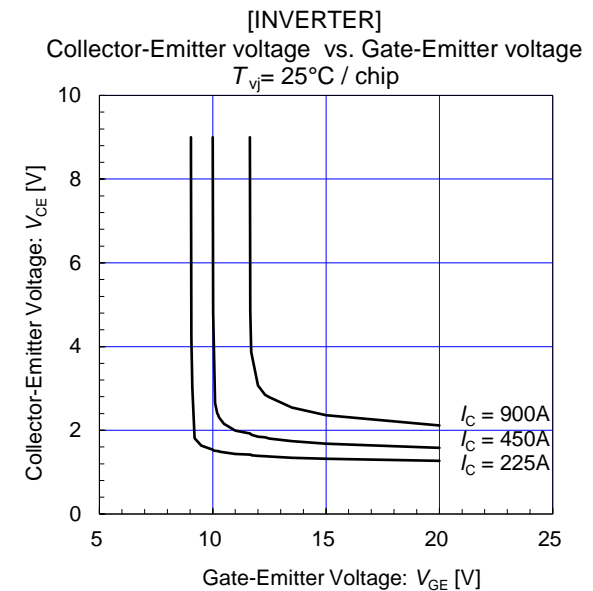
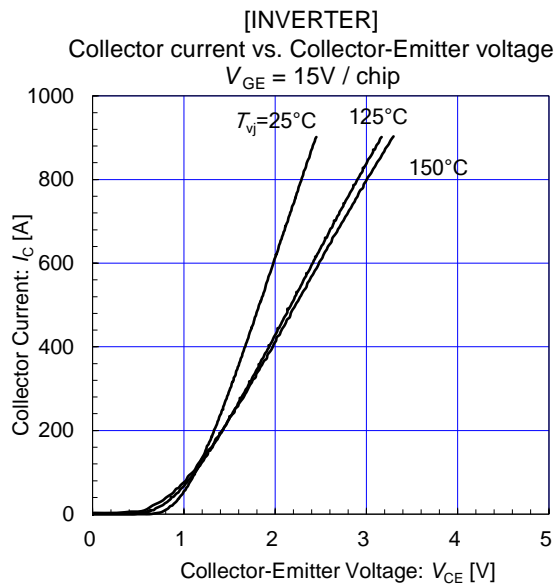
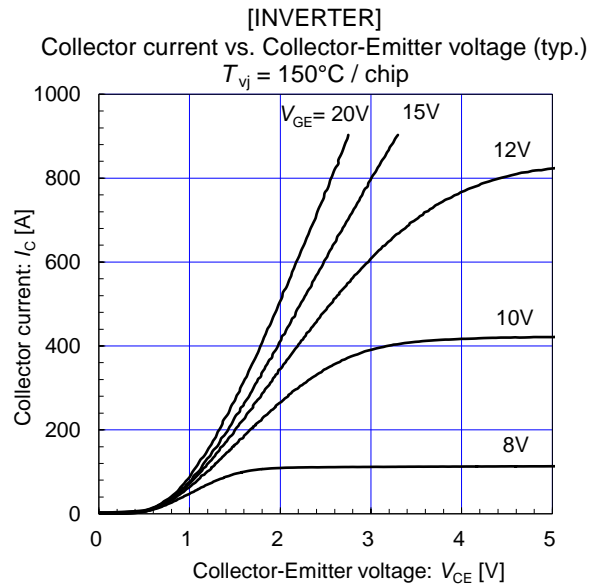
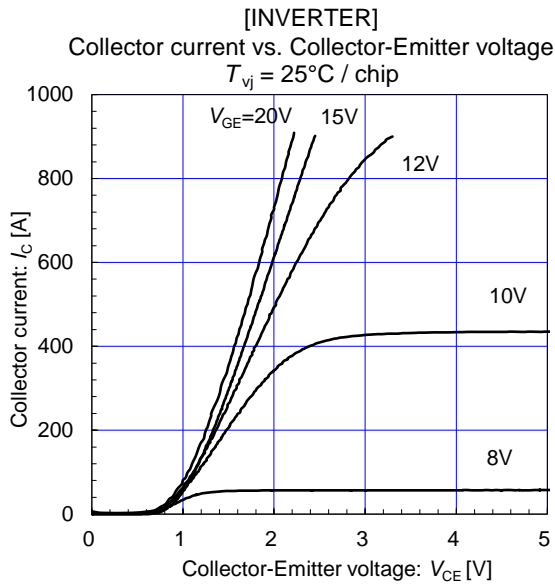
5. Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.048	$^{\circ}\text{C/W}$
		Inverter FWD	-	-	0.070	
Contact thermal resistance (1 device) (*1)	$R_{th(c-f)}$	with Thermal Compound	-	0.0167	-	

(*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

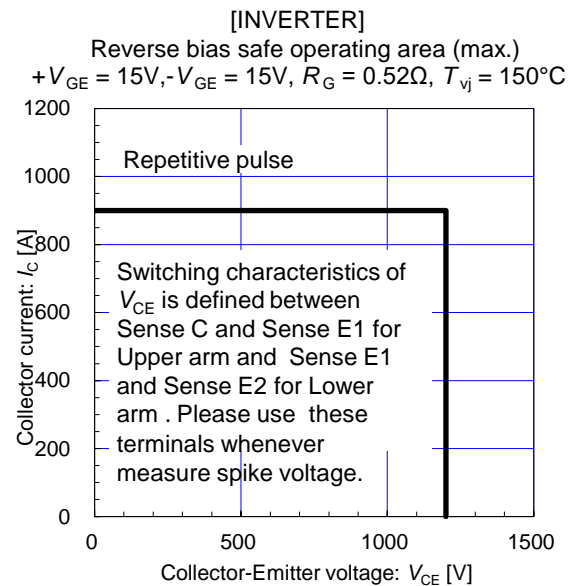
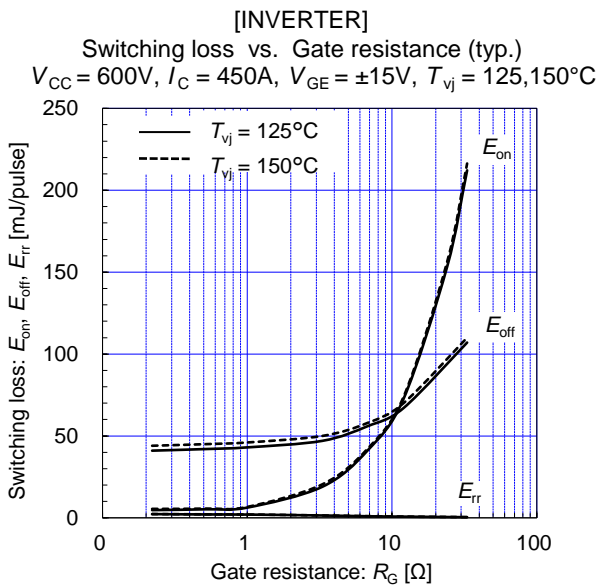
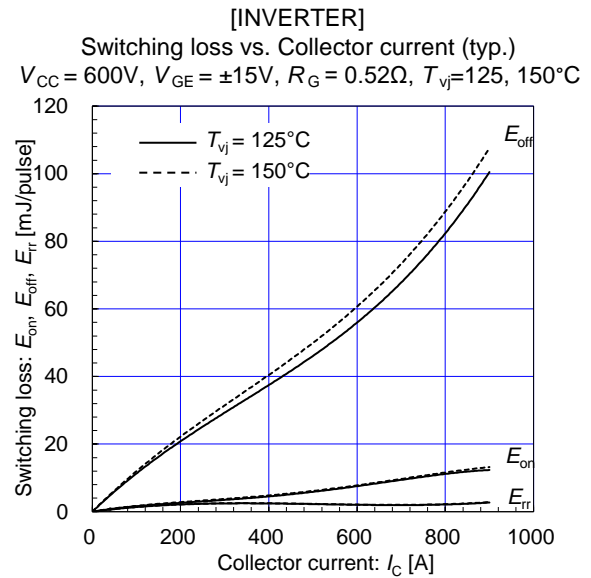
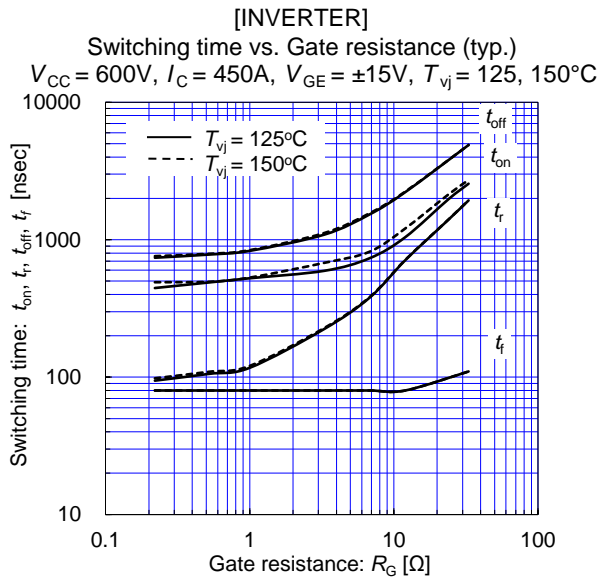
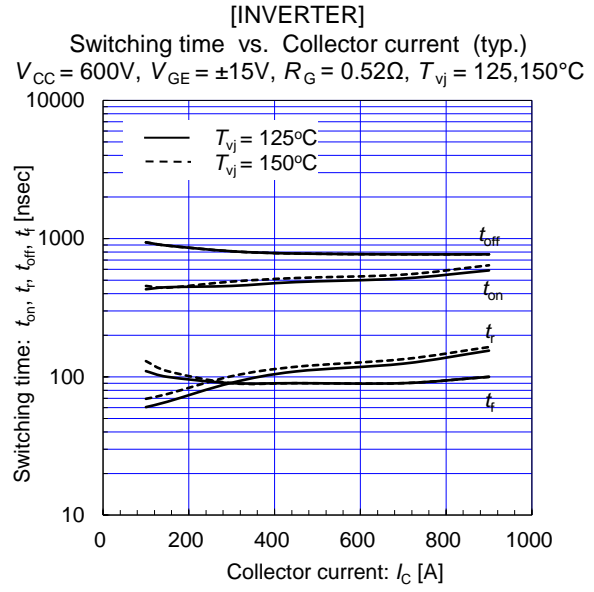
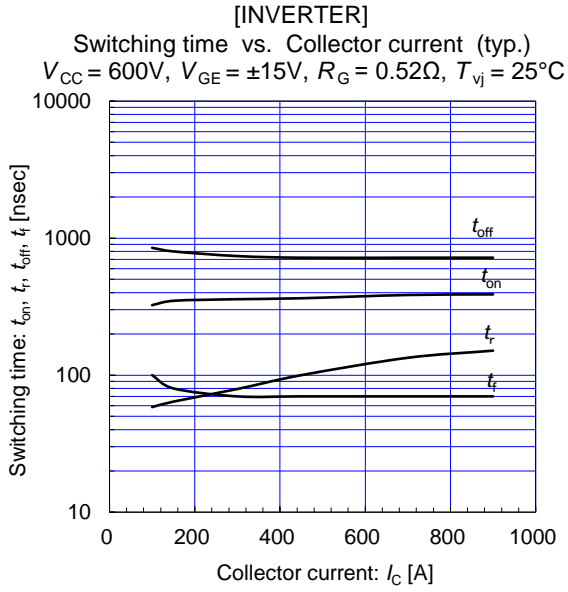
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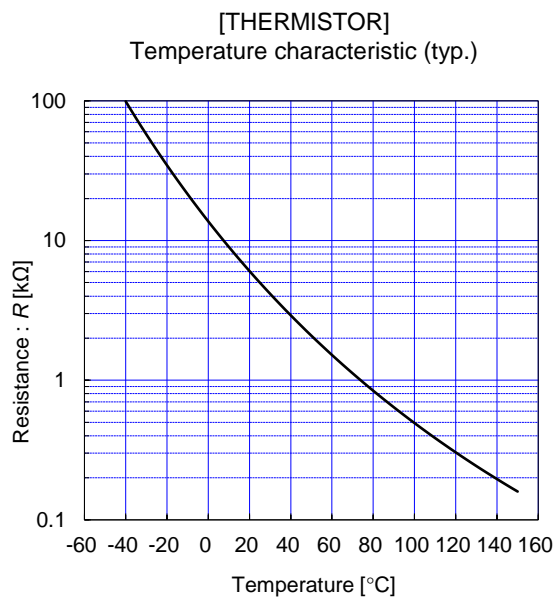
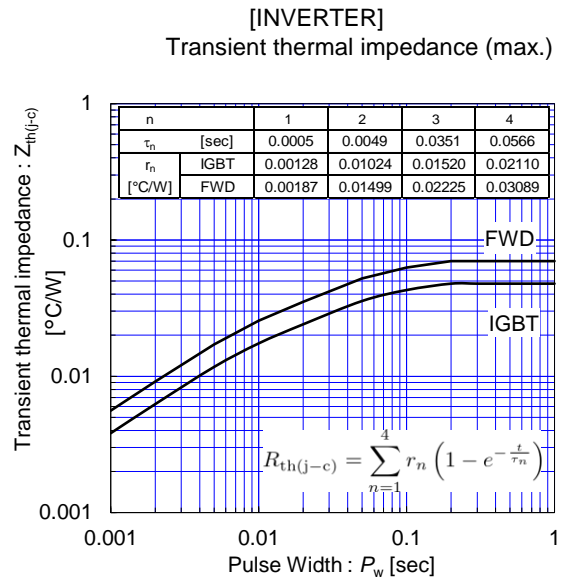
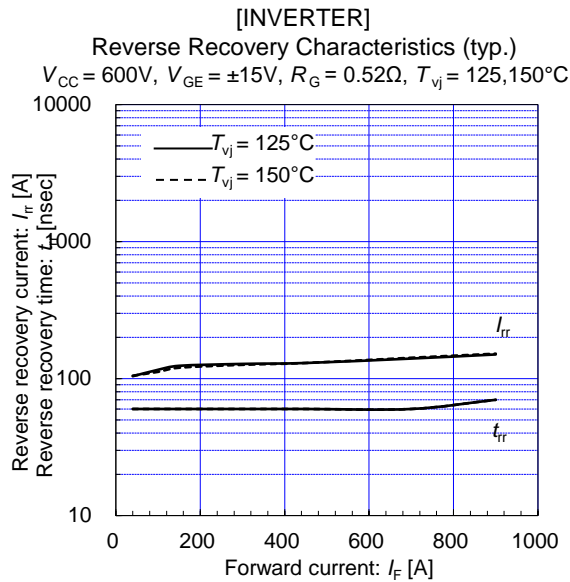
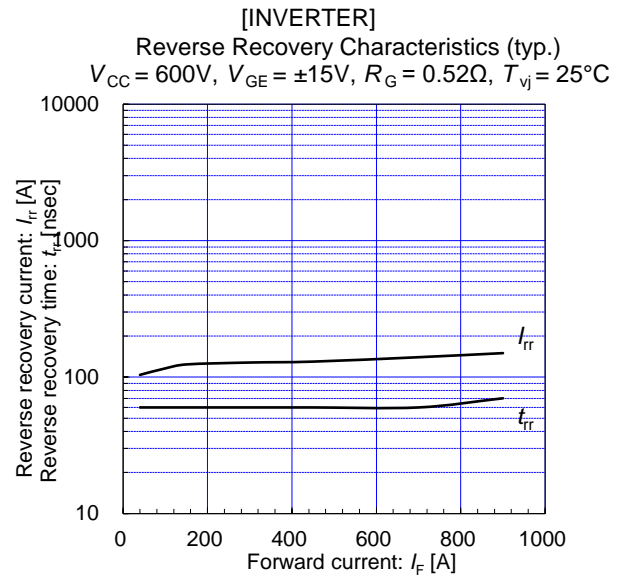
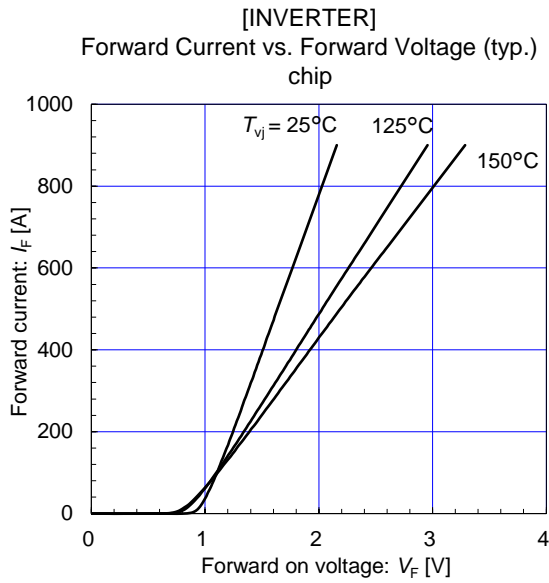
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