

# 2MBI300XNB120-50

IGBT Modules

**Power Module (X series)**  
**1200V / 300A / 2-in-1 package**

■ **Features**

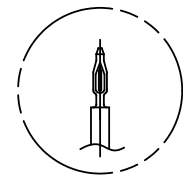
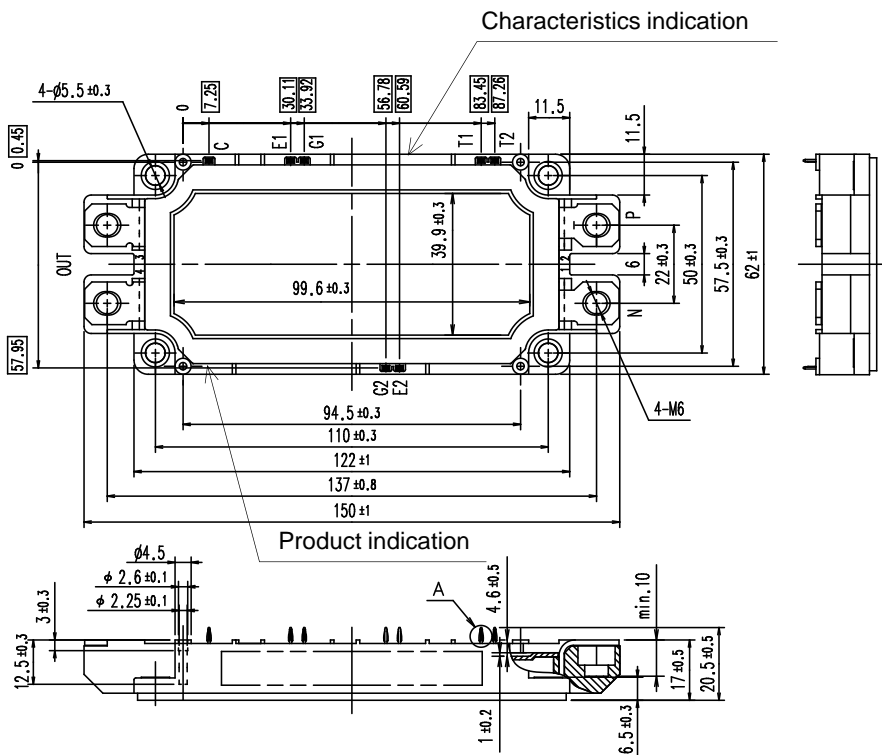
- Low  $V_{CE(sat)}$
- Low Inductance Module structure
- Press fit pin terminals

■ **Applications**

- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems, Wind Turbines, PV Power Conditioning Systems



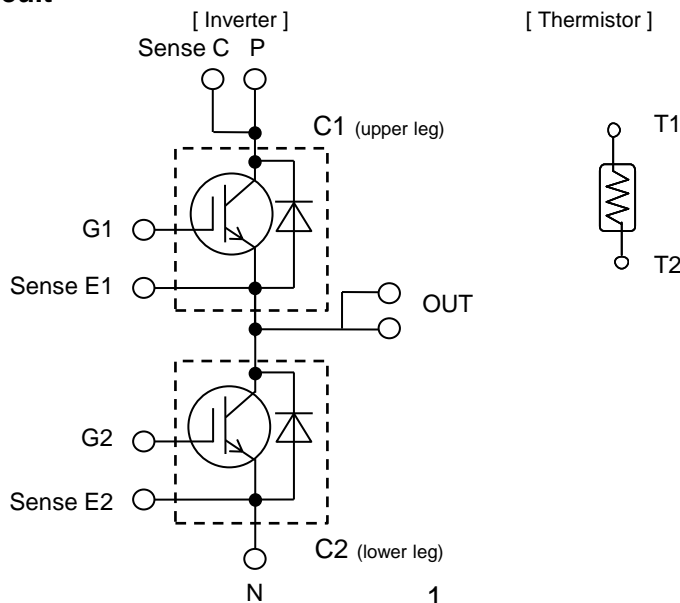
■ **Outline drawing ( Unit : mm )**



DETAIL A (NTS)

Weight: 350 g(typ.)

■ **Equivalent Circuit**



# 2MBI300XNB120-50

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

Items		Symbols	Conditions	Maximum Ratings	Units
Inverter	Collector-emitter voltage, gate-emitter short-circuited	$V_{CES}$		1200	V
	Gate-emitter voltage, collector-emitter short-circuited	$V_{GES}$		$\pm 20$	V
	Collector current	$I_C$	Continuous   $T_C=100^\circ\text{C}$	300	A
	Repetitive peak collector current	$I_{CRM}$	1ms	600	
	Forward current	$I_F$		300	
	Repetitive peak forward current	$I_{FRM}$	1ms	600	
	Total power dissipation	$P_{tot}$	1 device	1325	W
	Virtual junction temperature	$T_{vj}$		175	°C
	Operating junction temperature (under switching conditions)	$T_{vjop}$		175	
	Case temperature	$T_C$		125	
Storage temperature	$T_{stg}$		-40 ~ 125		
Isolation voltage	between terminal and copper base (*1)	$V_{isol}$	AC: 1min.	2500	Vrms
	between thermistor and others (*2)				
Mounting torque of screws to heatsink (*3)		$M_s$	M5	6.0	N·m
Mounting torque of screws to terminals (*3)		$M_t$	M6	6.0	

(\*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:       : Mounting torque of screws to heatsink       2.5 ~ 6.0 N·m (M5)  
 Recommendable Value:       : Mounting torque of screws to terminals       3.5 ~ 6.0 N·m (M6)

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Collector-emitter cut-off current, gate-emitter short-circuited	$I_{CES}$	$V_{GE} = 0\text{V}$ $V_{CE} = 1200\text{V}$	-	-	150	$\mu\text{A}$	
Gate leakage current, collector-emitter short-circuited	$I_{GES}$	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-	-	300	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 300\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.20	V
			$T_{vj}=25^{\circ}\text{C}$	-	1.40	1.85	
	$T_{vj}=125^{\circ}\text{C}$		-	1.70	-		
	$T_{vj}=150^{\circ}\text{C}$		-	1.80	-		
	$T_{vj}=175^{\circ}\text{C}$		-	1.85	-		
Internal gate resistance	$r_g$	-	-	3.00	-	$\Omega$	
	Capacitance	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	$C_{ies}$	-	35	-	nF
			$C_{oes}$	-	1.2	-	
$C_{res}$			-	0.31	-		
Gate charge	$Q_G$	$V_{CC} = 600\text{V}, I_C = 300\text{A}$ $V_{GE} = -15 \rightarrow +15\text{V}$	-	2.2	-	$\mu\text{C}$	
Inverter Forward voltage	$V_F$ (terminal)	$V_{GE} = 0\text{V}$ $I_F = 300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.95	2.40	V
			$T_{vj}=25^{\circ}\text{C}$	-	1.60	2.05	
	$T_{vj}=125^{\circ}\text{C}$		-	1.65	-		
	$T_{vj}=150^{\circ}\text{C}$		-	1.60	-		
	$T_{vj}=175^{\circ}\text{C}$		-	1.60	-		
Switching time (*1)	$t_{d(on)}$	$V_{CC} = 600\text{V}$ $I_C, I_F = 300\text{A}$ $V_{GE} = +15/-15\text{V}$ $R_G = \pm 1\Omega$ $L_S = 35\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	0.26	-	$\mu\text{s}$
			$T_{vj}=125^{\circ}\text{C}$	-	0.28	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.32	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.34	-	
	$t_r$		$T_{vj}=25^{\circ}\text{C}$	-	0.08	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.09	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.09	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.09	-	
	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	0.36	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.39	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.42	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.42	-	
	$t_f$		$T_{vj}=25^{\circ}\text{C}$	-	0.05	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.08	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.08	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.09	-	
Reverse recovery time	$t_{rr}$	$T_{vj}=25^{\circ}\text{C}$	-	0.13	-		
		$T_{vj}=125^{\circ}\text{C}$	-	0.26	-		
		$T_{vj}=150^{\circ}\text{C}$	-	0.31	-		
		$T_{vj}=175^{\circ}\text{C}$	-	0.35	-		

(\*1) Turn on time ( $t_{on}$ ) =  $t_{d(on)} + t_r$ , Turn off time ( $t_{off}$ ) =  $t_{d(off)} + t_f$

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Inverter Switching loss (per pulse)	$E_{on}$	$V_{CC} = 600\text{V}$ $I_C, I_F = 300\text{A}$ $V_{GE} = +15/-15\text{V}$ $R_G = \pm 1\Omega$ $L_S = 35\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	24.1	-	mJ
			$T_{vj}=125^{\circ}\text{C}$	-	37.7	-	
			$T_{vj}=150^{\circ}\text{C}$	-	42.8	-	
			$T_{vj}=175^{\circ}\text{C}$	-	45.0	-	
	$E_{off}$		$T_{vj}=25^{\circ}\text{C}$	-	22.9	-	
			$T_{vj}=125^{\circ}\text{C}$	-	28.5	-	
			$T_{vj}=150^{\circ}\text{C}$	-	31.5	-	
			$T_{vj}=175^{\circ}\text{C}$	-	32.2	-	
	$E_{rr}$		$T_{vj}=25^{\circ}\text{C}$	-	10.6	-	
			$T_{vj}=125^{\circ}\text{C}$	-	18.8	-	
			$T_{vj}=150^{\circ}\text{C}$	-	21.1	-	
			$T_{vj}=175^{\circ}\text{C}$	-	22.6	-	
Thermistor Resistance	$R$	$T = 25^{\circ}\text{C}$	-	5000	-	$\Omega$	
		$T = 100^{\circ}\text{C}$	465	495	520		
Thermistor B value	$B$	$T = 25/ 50^{\circ}\text{C}$	3305	3375	3450	K	

NOTICE:

The external gate resistance ( $R_G$ ) shown above 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.

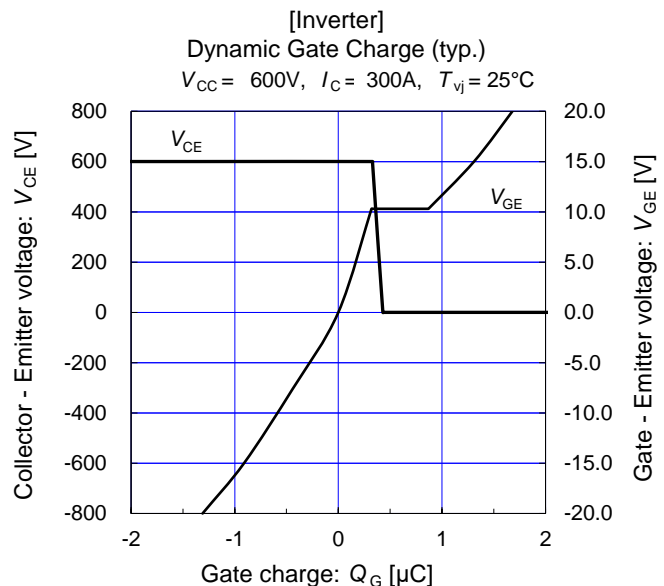
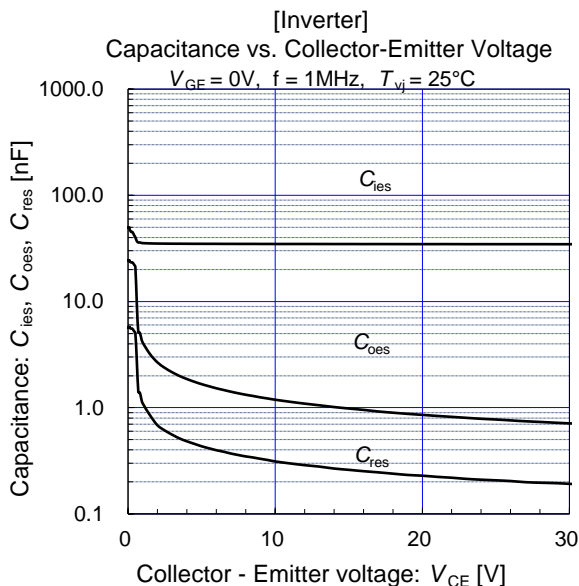
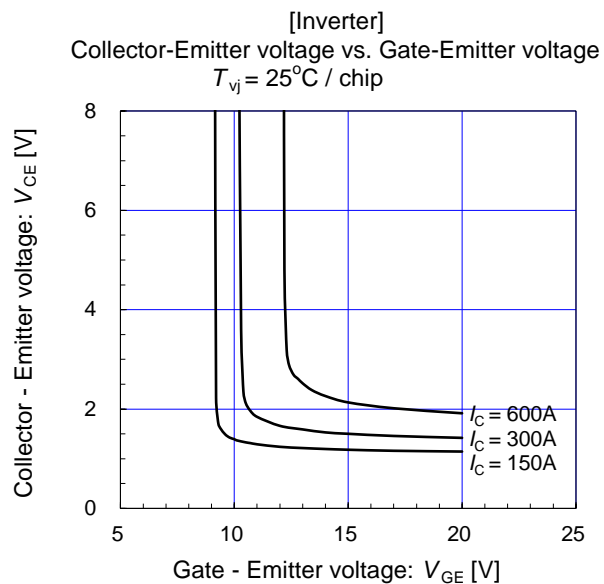
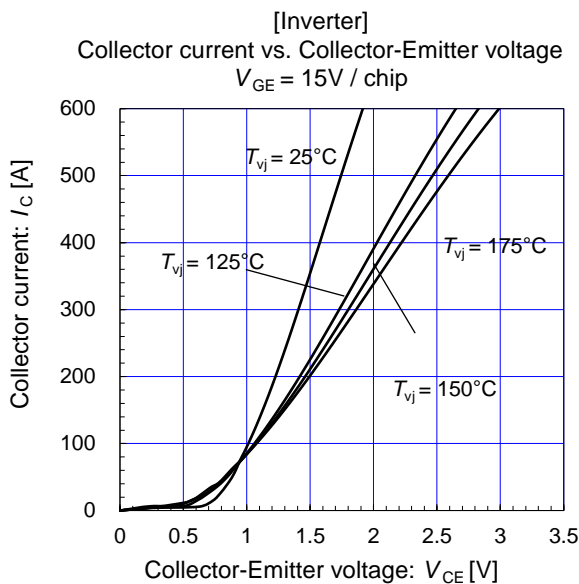
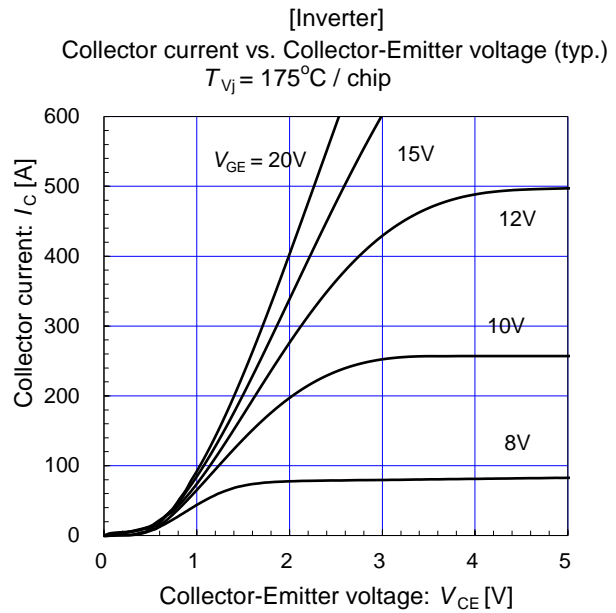
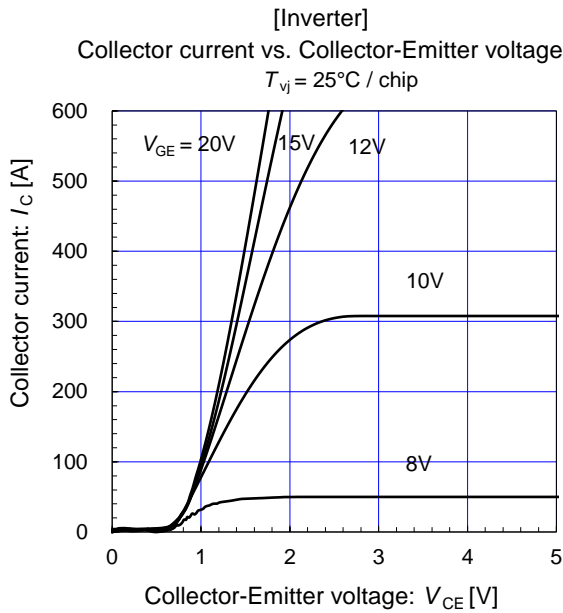
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case(1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.113	K/W
		Inverter FWD	-	-	0.160	
Thermal resistance case to heatsink(1 IGBT+1 FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0167	-	

(\*1) This is the value which is defined mounting on the additional heatsink with thermal grease.

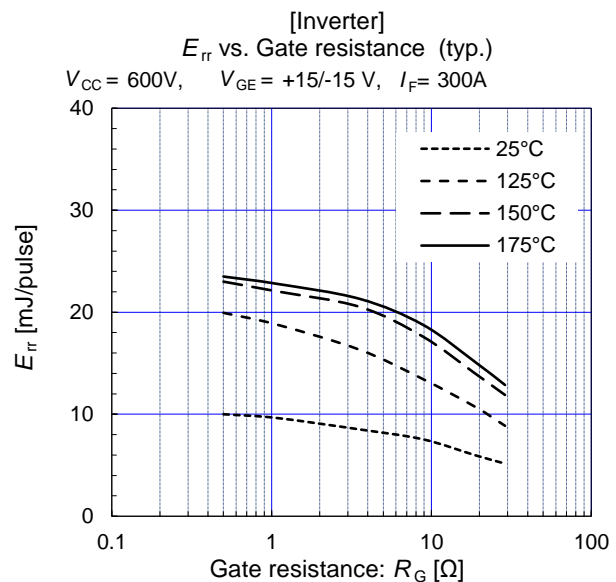
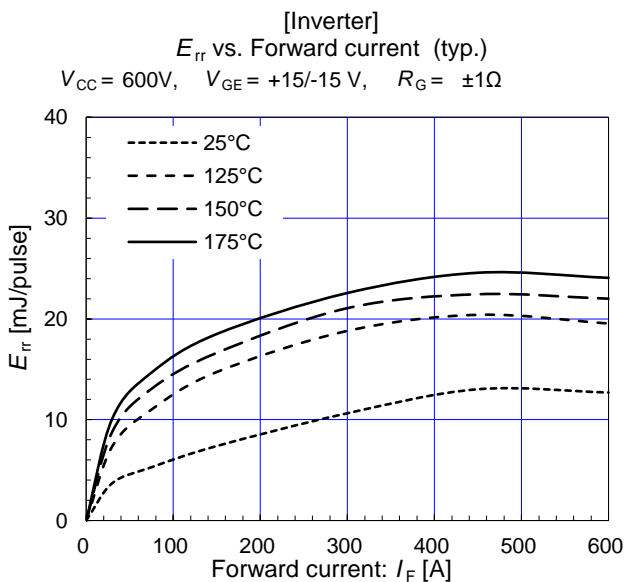
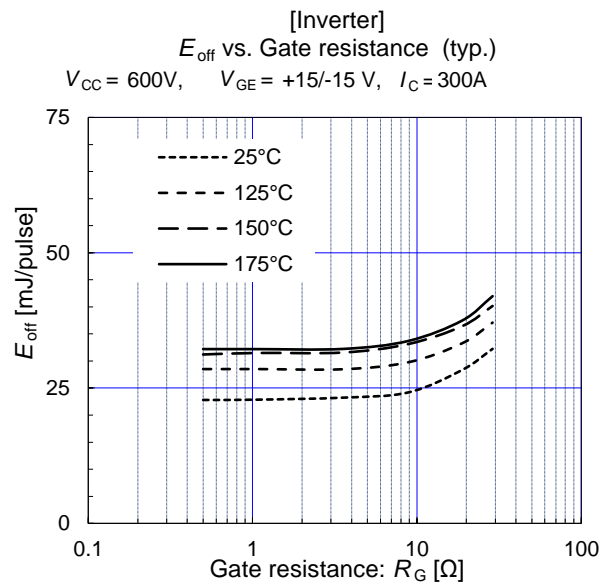
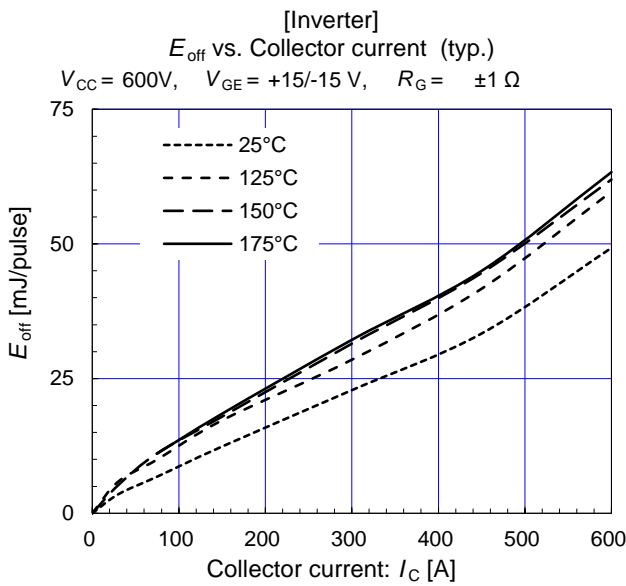
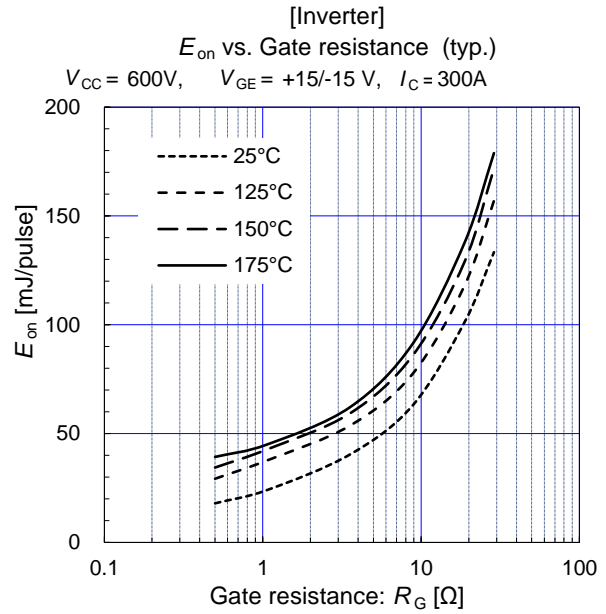
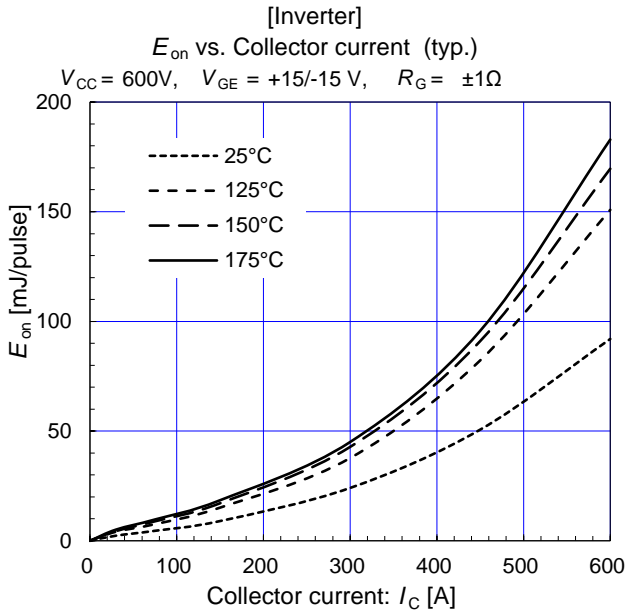
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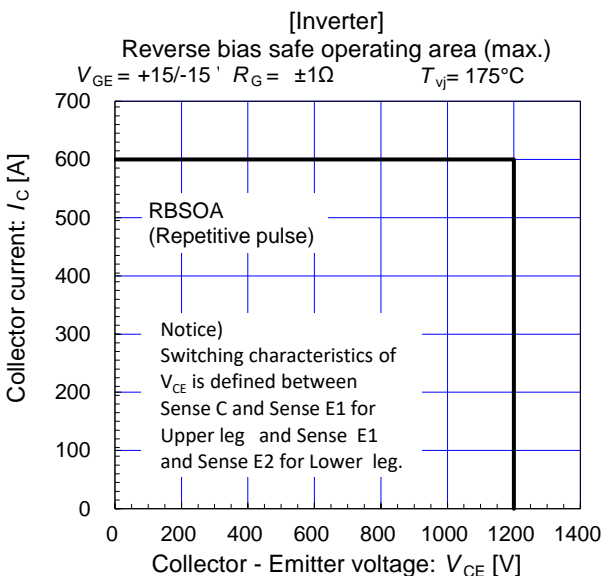
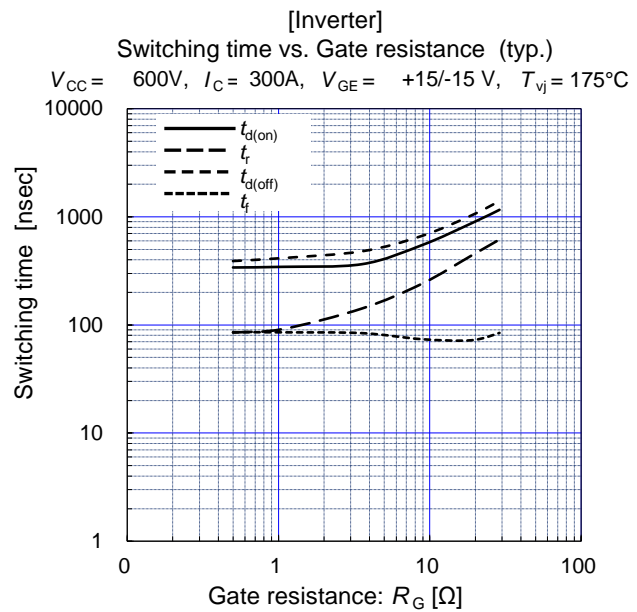
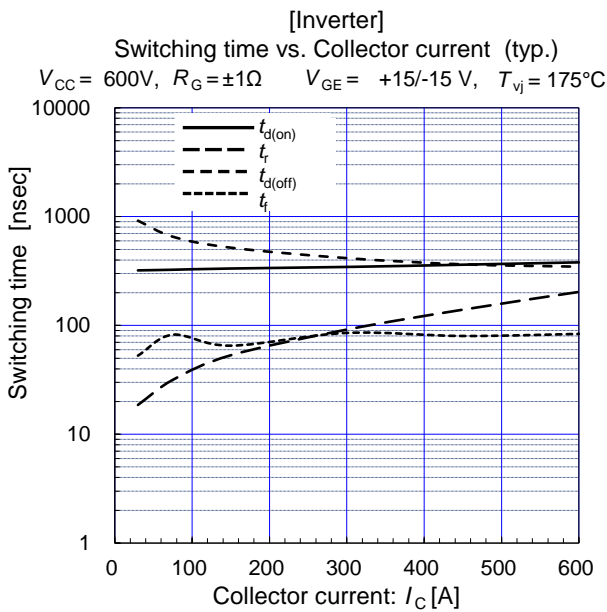
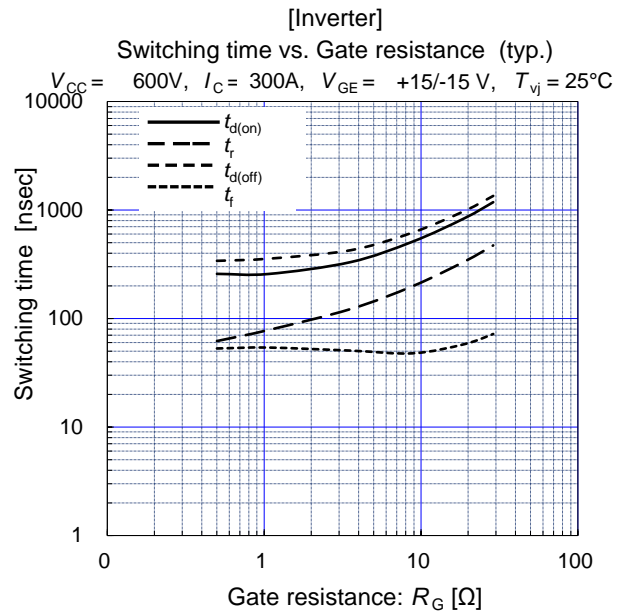
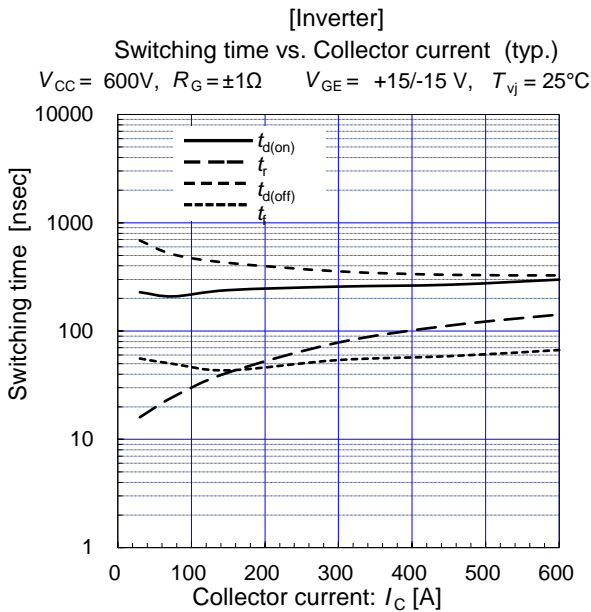
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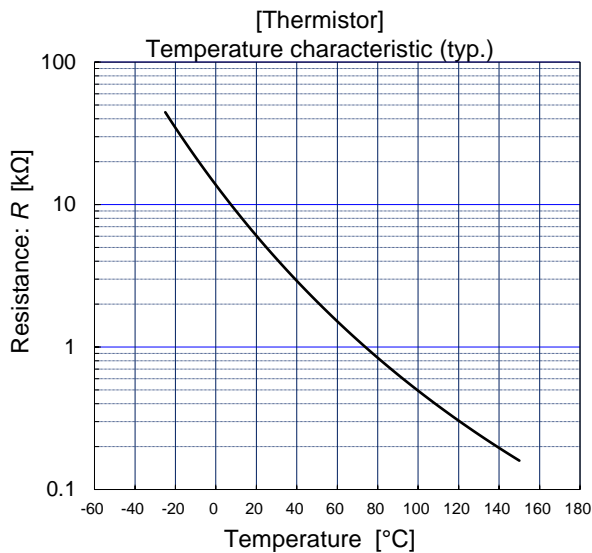
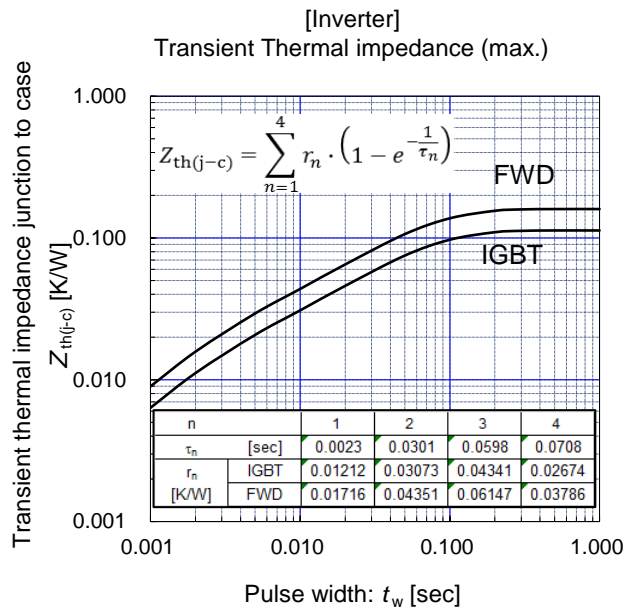
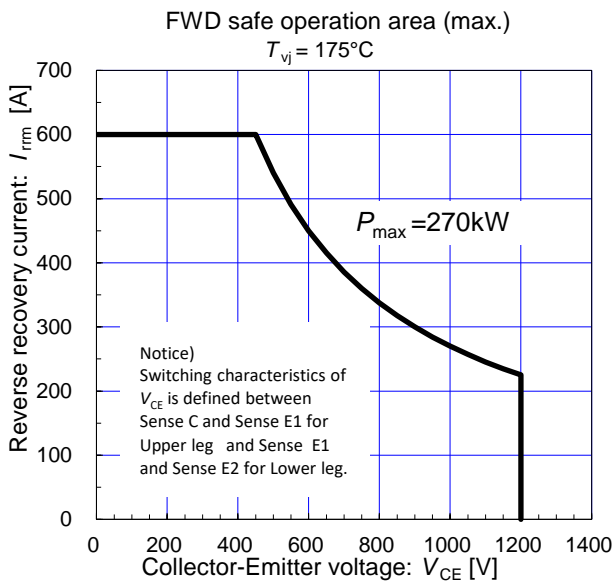
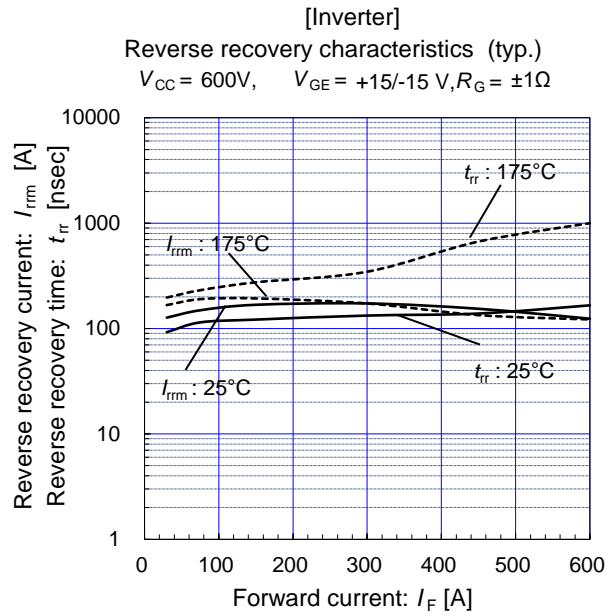
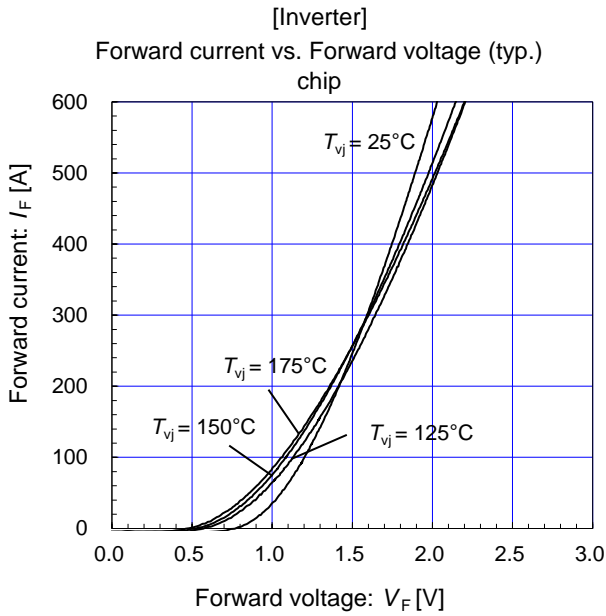
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