

2MBI1000XB170-50

IGBT Modules

Power Module (X series)
1700V / 1000A / 2-in-1 package

■ **Features**

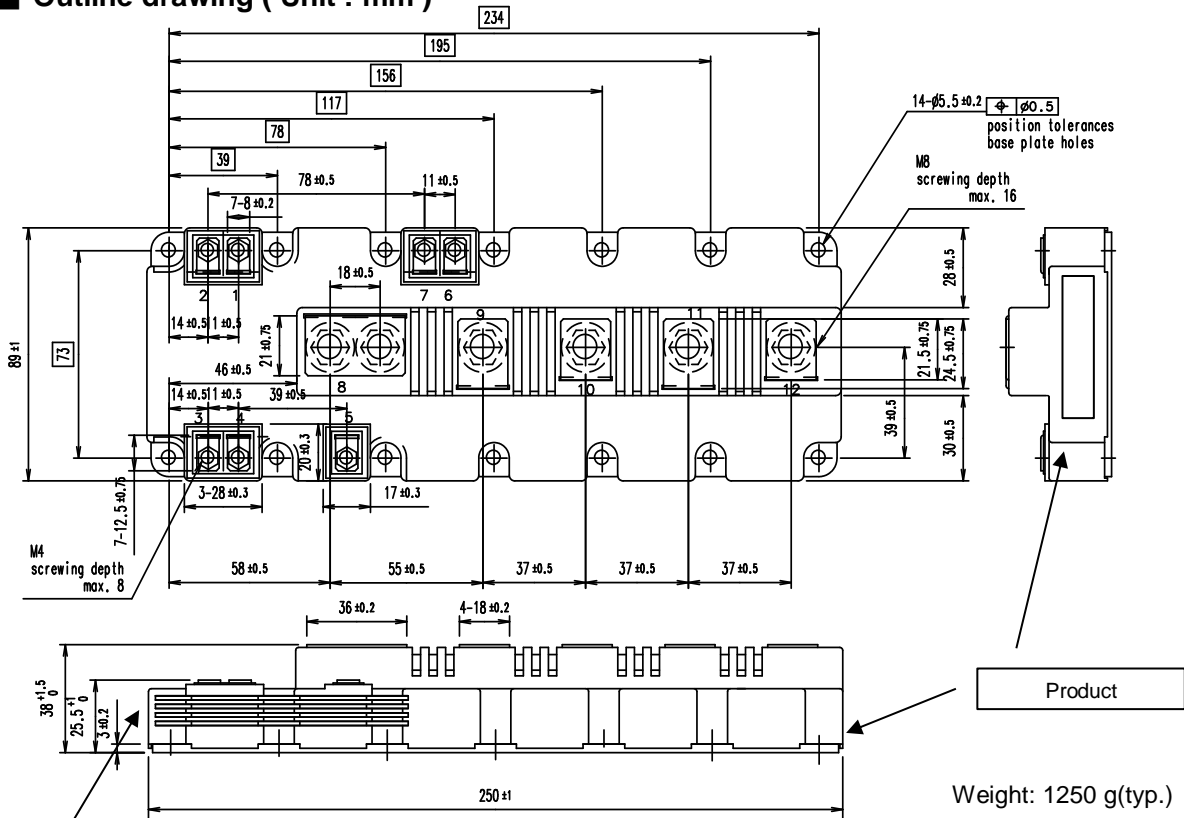
- Low $V_{CE(sat)}$
- Low Inductance Module structure

■ **Applications**

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

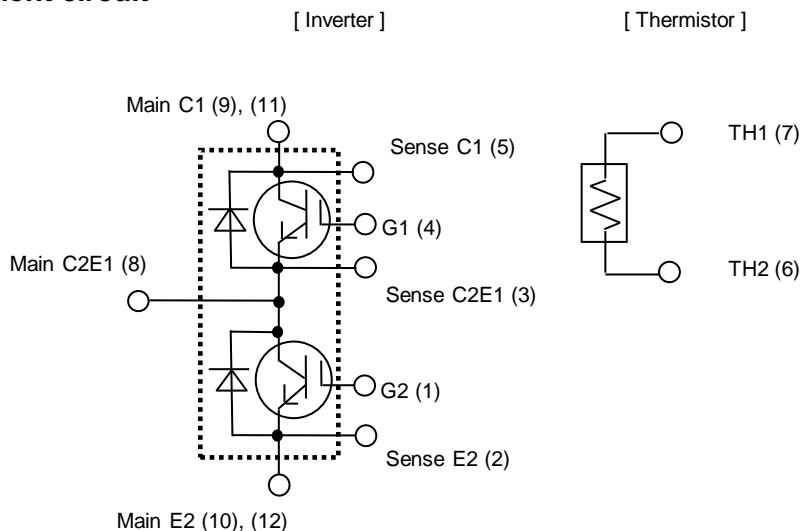


■ **Outline drawing (Unit : mm)**



Characteristics indication

■ **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
Inverter	Collector-Emitter voltage, Gate-Emitter short-circuited	V_{CES}		1700	V
	Gate-Emitter voltage, Collector-Emitter short-circuited	V_{GES}		± 20	V
	Collector current	I_C	Continuous $T_c=75^\circ\text{C}$	1000	A
	Repetitive peak collector current	I_{CRM}	1ms	2000	
	Forward current	I_F		1000	
	Repetitive peak forward current	I_{FRM}	1ms	2000	
	Total power dissipation	P_{tot}	1 device	3.7	
	Virtual junction temperature	T_{vj}		175	°C
	Operating virtual junction temperature (under switching conditions)	T_{vjop}		175	
	Case temperature	T_c		150	
Storage temperature	T_{stg}		-40 ~ 150		
Isolation voltage	between terminal and copper base (*1)	V_{isol}	AC: 1min.	4000	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 main terminals (*3)		M_t	M8	10.0	
Mounting torque of screws to sense terminals (*3)			M4	2.1	

(*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 3.0 ~ 6.0 N·m (M5)
 : Mounting torque of screws to main terminals 8.0~ 10.0 N·m (M8)
 : Mounting torque of screws to sense terminals 1.8~ 2.1 N·m (M4)

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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}	$V_{GE} = 0\text{V}$ $V_{CE} = 1700\text{V}$	-	-	300	μA	
Gate leakage current, Collector-Emitter short-circuited	I_{GES}	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-	-	600	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 1000\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 1000\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.70	2.15	V
	$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}\text{C}$	-	1.65	2.10	
			$T_{vj}=125^{\circ}\text{C}$	-	2.05	-	
			$T_{vj}=150^{\circ}\text{C}$	-	2.15	-	
			$T_{vj}=175^{\circ}\text{C}$	-	2.25	-	
Internal gate resistance	r_g	-	-	4.17	-	Ω	
Capacitance	C_{ies}	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	-	137	-	nF
	C_{oes}		-	-	4.0	-	
	C_{res}		-	-	0.7	-	
Gate charge	Q_G	$V_{CC} = 900\text{V}, I_C = 1000\text{A}$ $V_{GE} = -15 \rightarrow +15\text{V}$	-	9.4	-	μC	
Forward voltage	V_F (terminal) (*1)	$V_{GE} = 0\text{V}$ $I_F = 1000\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.80	2.25	V
			$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.20	
	$T_{vj}=125^{\circ}\text{C}$		-	1.95	-		
	$T_{vj}=150^{\circ}\text{C}$		-	1.95	-		
	$T_{vj}=175^{\circ}\text{C}$		-	1.90	-		
Switching time (*1)	$t_{d(on)}$	$V_{CC} = 900\text{V}$ $I_C, I_F = 1000\text{A}$ $V_{GE} = \pm 15\text{V}$ $R_G = +0.22/-0.22\Omega$ $L_S = 40\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	1.23	-	μs
			$T_{vj}=125^{\circ}\text{C}$	-	1.21	-	
			$T_{vj}=150^{\circ}\text{C}$	-	1.22	-	
			$T_{vj}=175^{\circ}\text{C}$	-	1.24	-	
	t_r		$T_{vj}=25^{\circ}\text{C}$	-	0.16	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.19	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.19	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.22	-	
	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	0.95	-	
			$T_{vj}=125^{\circ}\text{C}$	-	1.00	-	
			$T_{vj}=150^{\circ}\text{C}$	-	1.01	-	
			$T_{vj}=175^{\circ}\text{C}$	-	1.00	-	
	t_f		$T_{vj}=25^{\circ}\text{C}$	-	0.38	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.64	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.69	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.74	-	
Reverse recovery time	t_{rr}	$T_{vj}=25^{\circ}\text{C}$	-	0.44	-		
		$T_{vj}=125^{\circ}\text{C}$	-	0.73	-		
		$T_{vj}=150^{\circ}\text{C}$	-	0.81	-		
		$T_{vj}=175^{\circ}\text{C}$	-	0.79	-		

(*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}	$V_{CC} = 900\text{V}$ $I_C, I_F = 1000\text{A}$ $V_{GE} = \pm 15\text{V}$ $R_G = +0.22/-0.22\Omega$ $L_S = 40\text{nH}$	$T_{vj}=25^{\circ}\text{C}$	-	394	-	mJ
			$T_{vj}=125^{\circ}\text{C}$	-	470	-	
			$T_{vj}=150^{\circ}\text{C}$	-	513	-	
			$T_{vj}=175^{\circ}\text{C}$	-	559	-	
	E_{off}		$T_{vj}=25^{\circ}\text{C}$	-	250	-	
			$T_{vj}=125^{\circ}\text{C}$	-	328	-	
			$T_{vj}=150^{\circ}\text{C}$	-	353	-	
			$T_{vj}=175^{\circ}\text{C}$	-	374	-	
	E_{rr}		$T_{vj}=25^{\circ}\text{C}$	-	115	-	
			$T_{vj}=125^{\circ}\text{C}$	-	204	-	
			$T_{vj}=150^{\circ}\text{C}$	-	237	-	
			$T_{vj}=175^{\circ}\text{C}$	-	259	-	
Thermistor Resistance	R	$T = 25^{\circ}\text{C}$	-	5000	-	Ω	
		$T = 100^{\circ}\text{C}$	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.

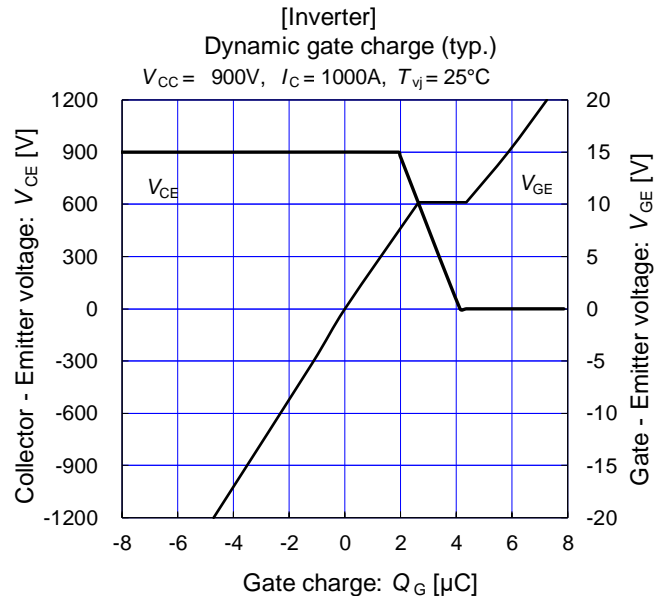
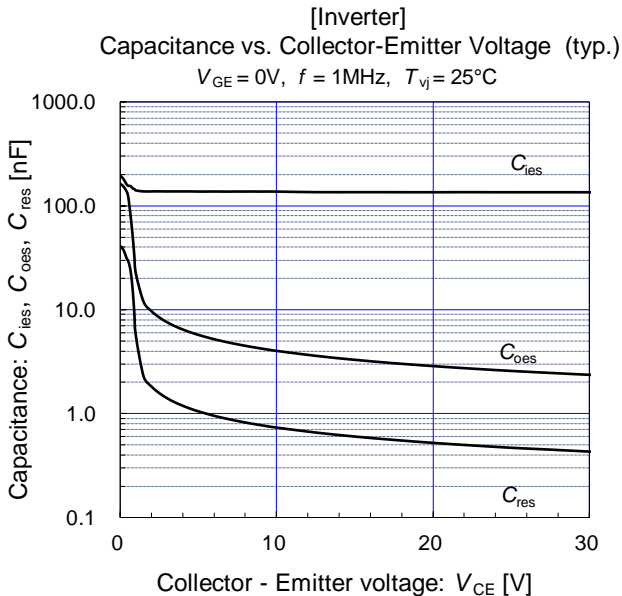
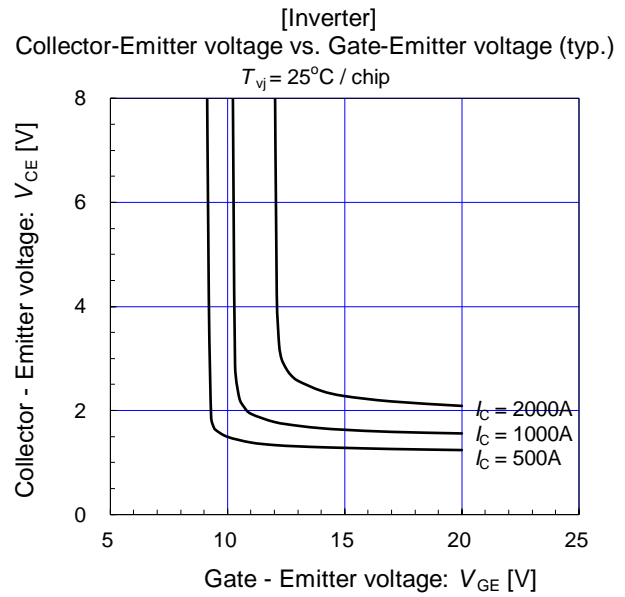
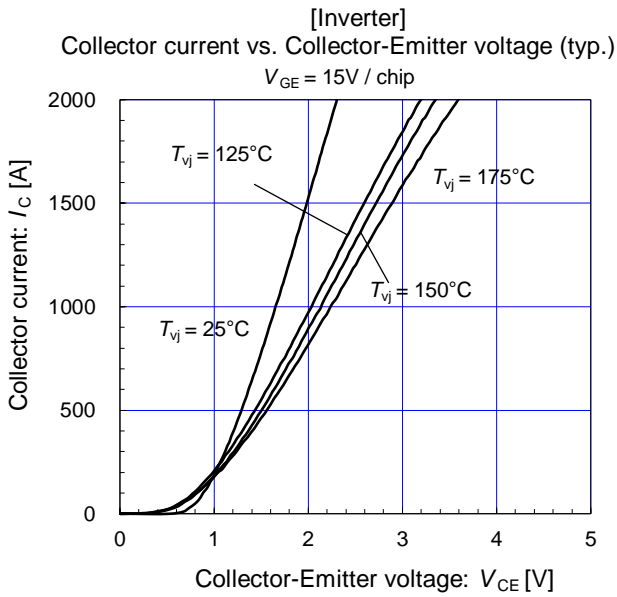
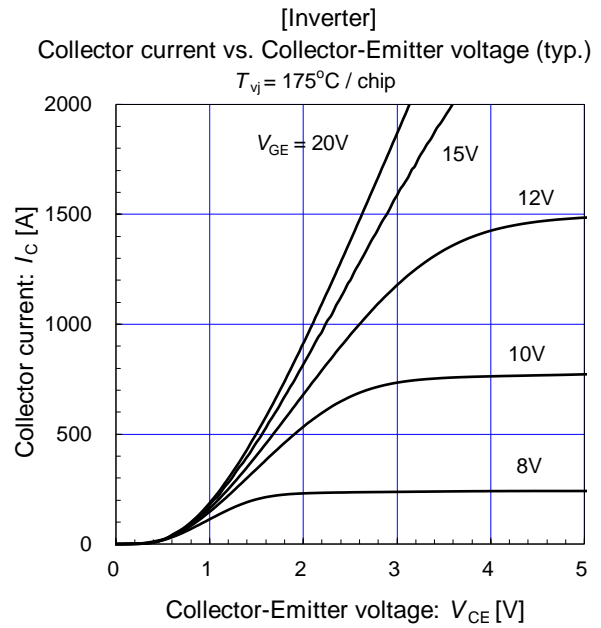
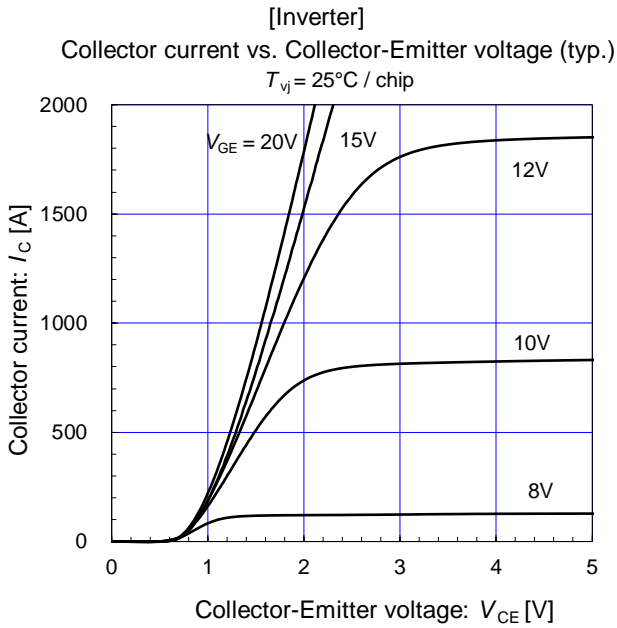
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case(1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	40.0	K/kW
		Inverter FWD	-	-	60.0	
Thermal resistance case to heatsink(1 IGBT+1 FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	8.3	-	

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

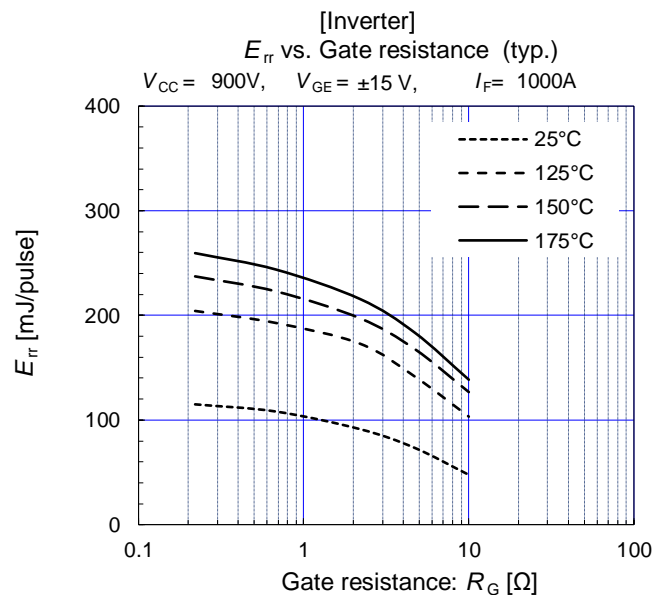
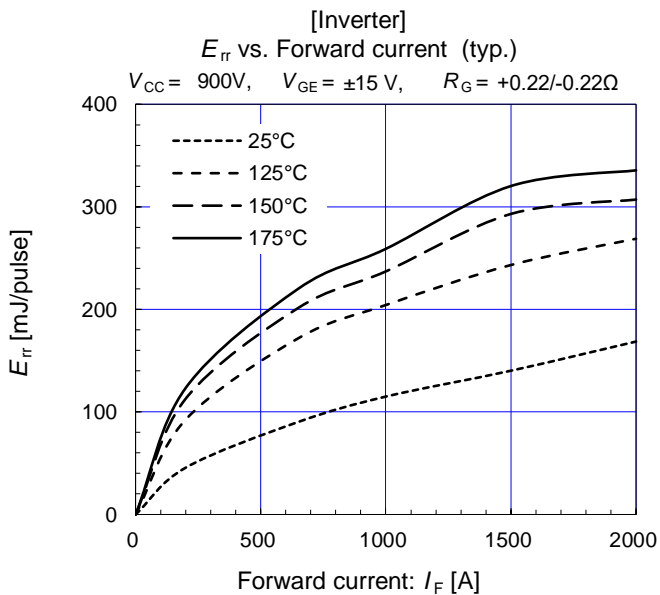
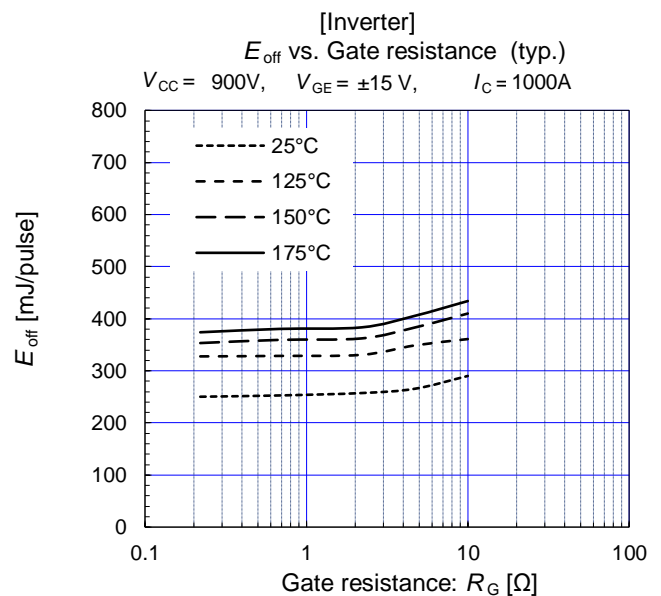
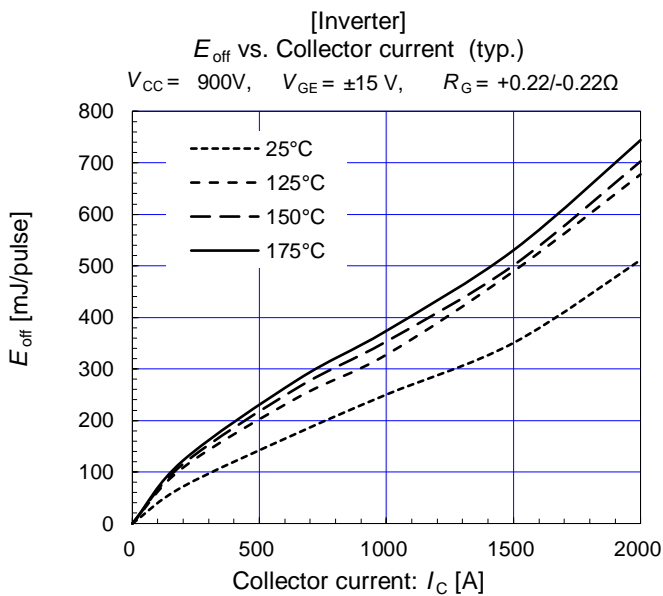
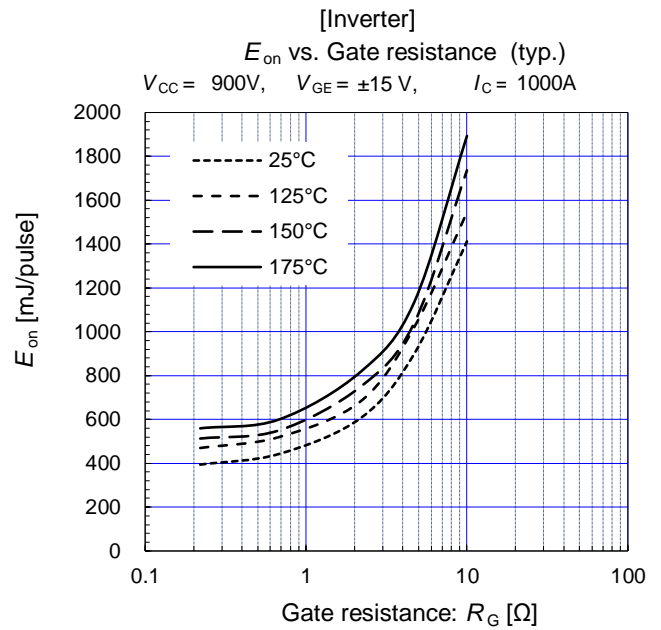
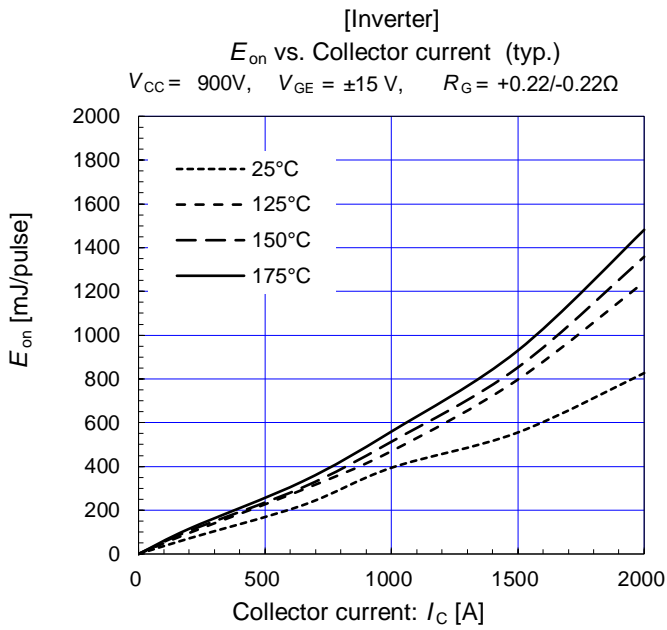
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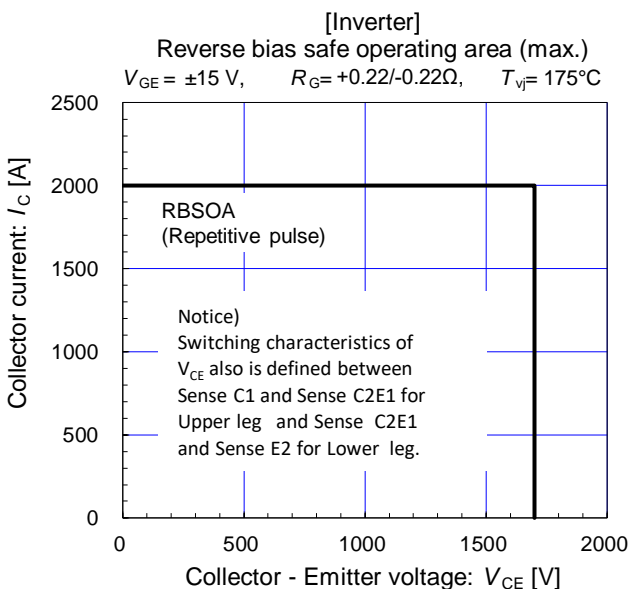
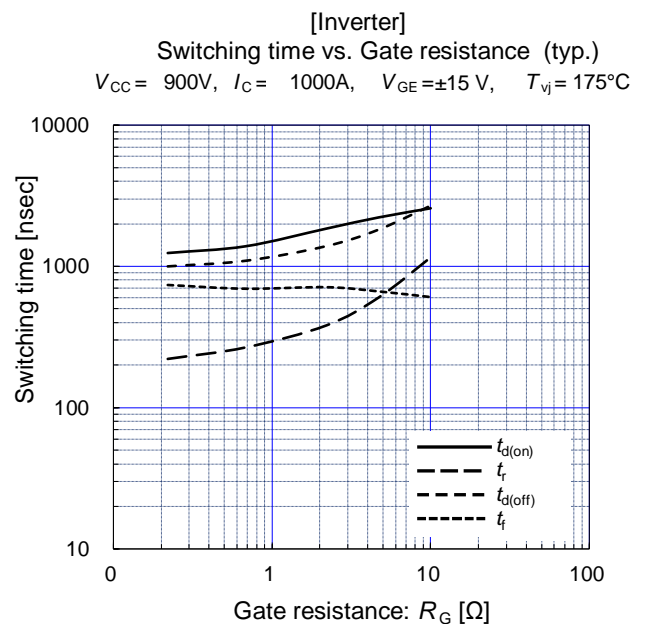
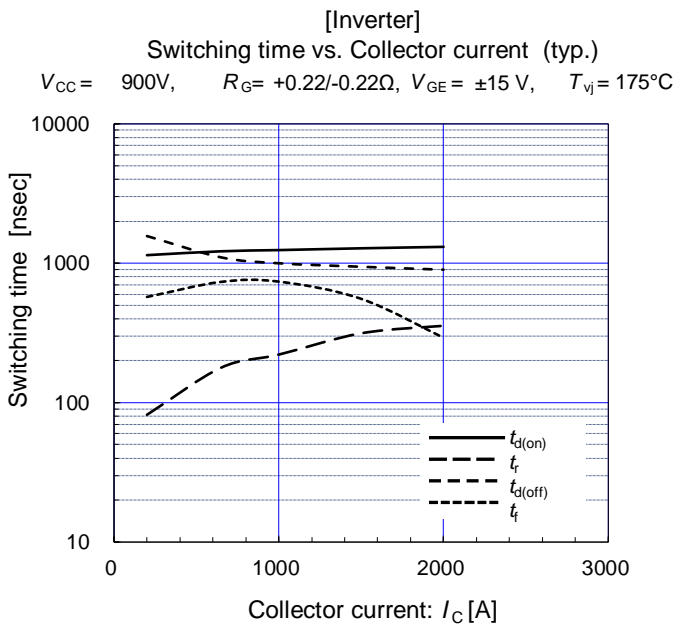
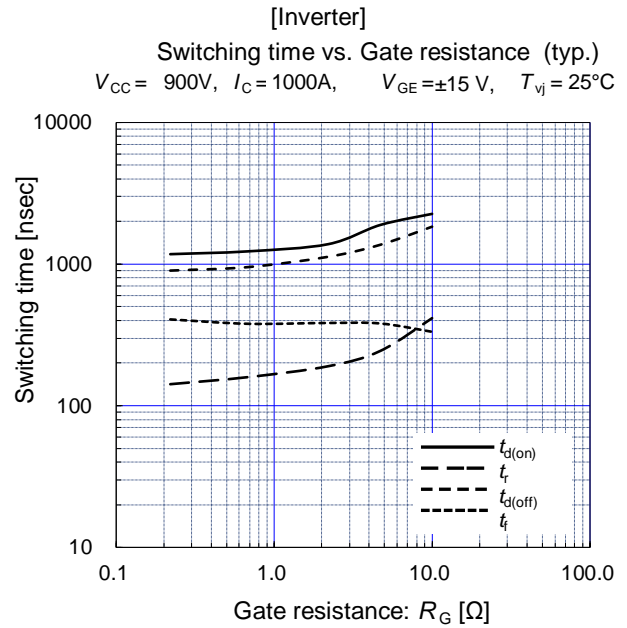
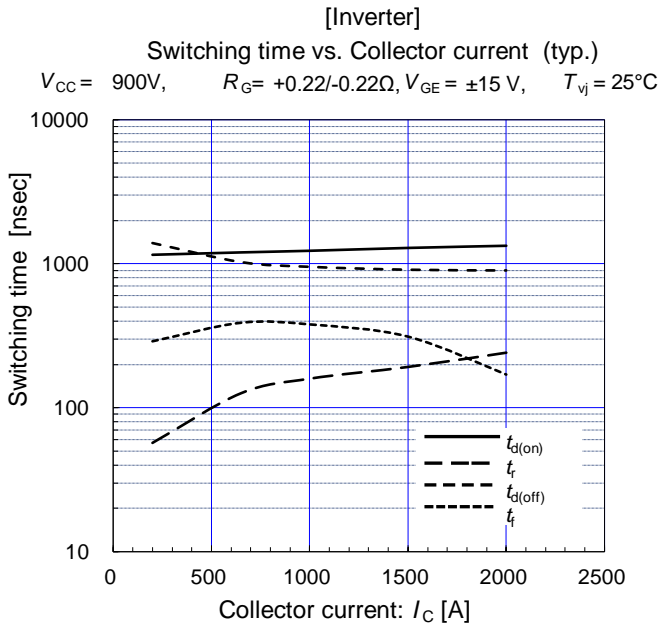
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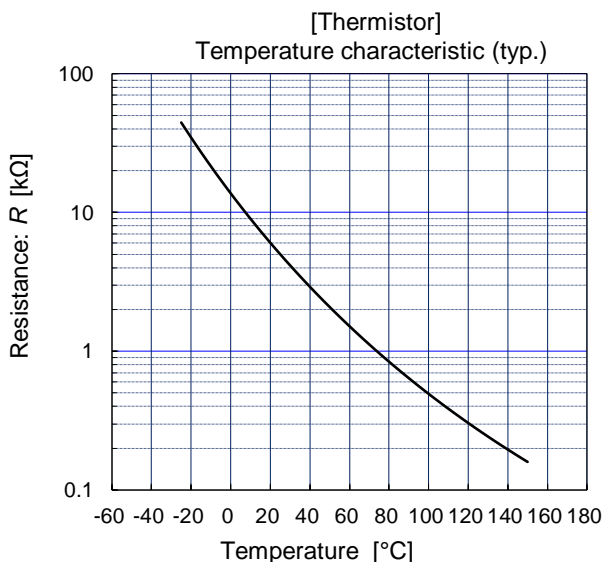
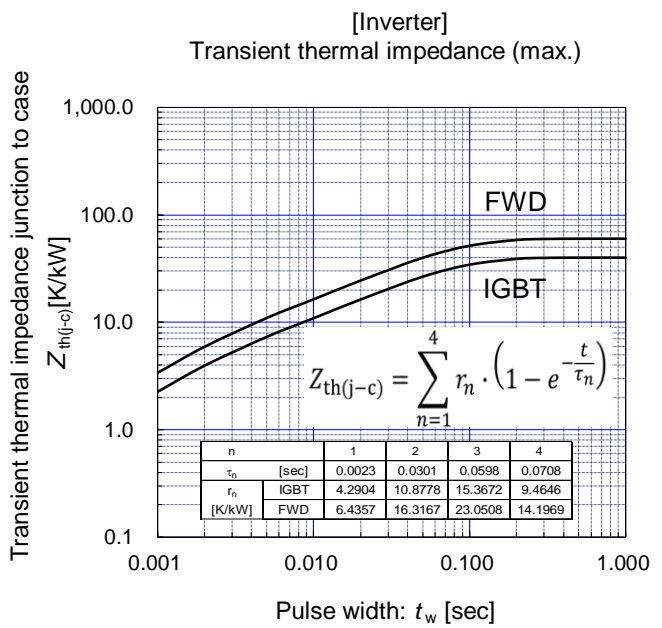
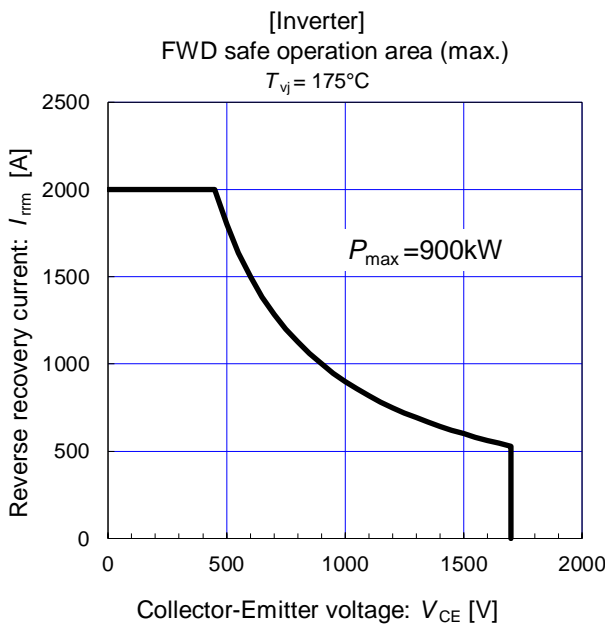
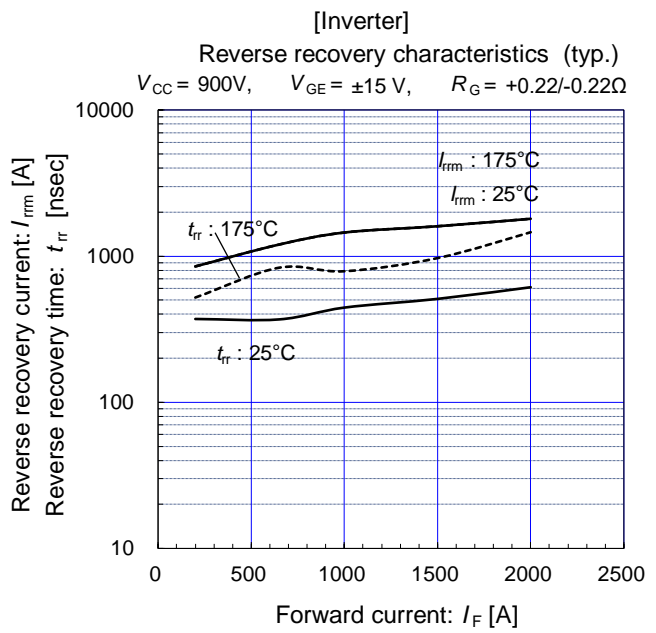
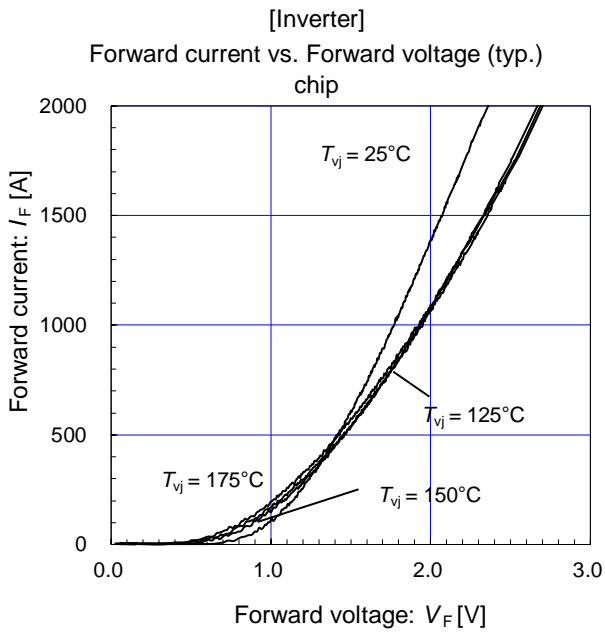
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