

2MBI1800XXF120P-50

IGBT Modules

Power Module (X series)
1200V / 1800A / 2-in-1 package

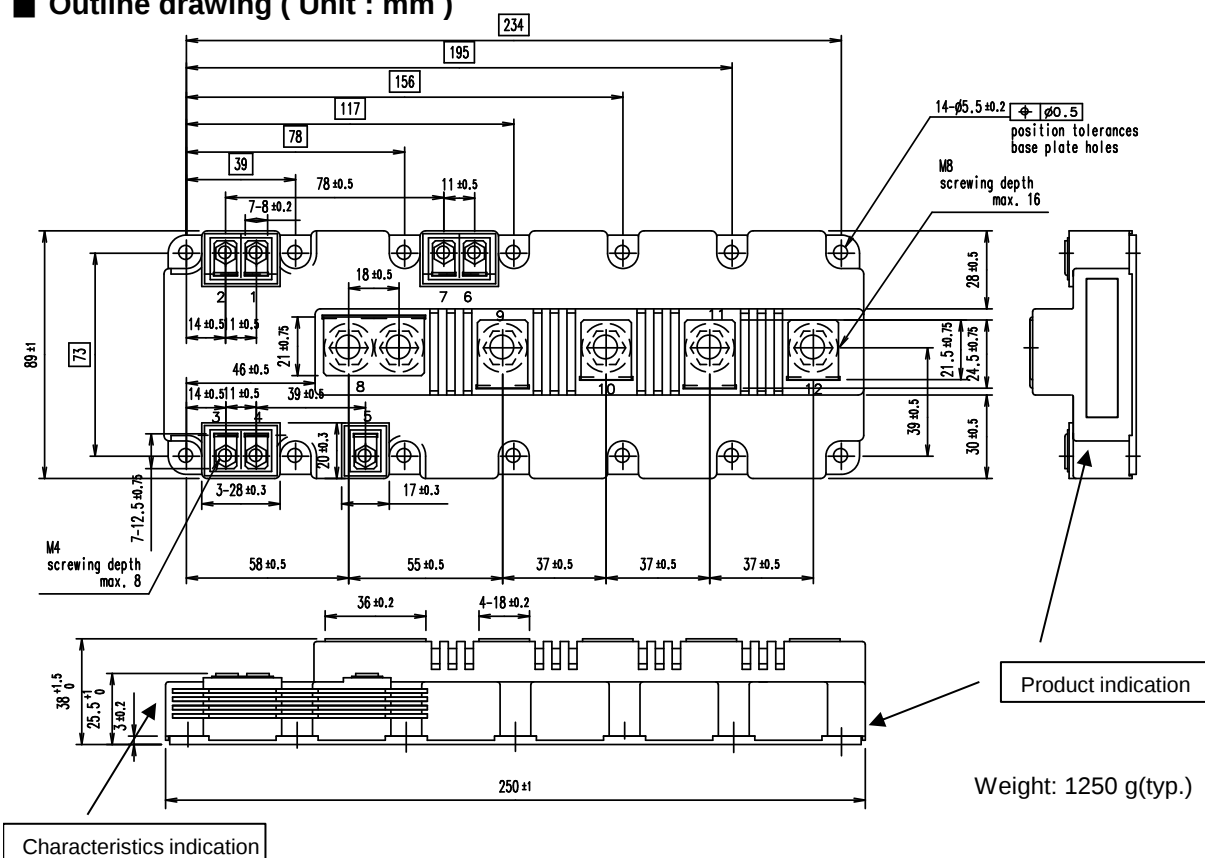
■ Features

- 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

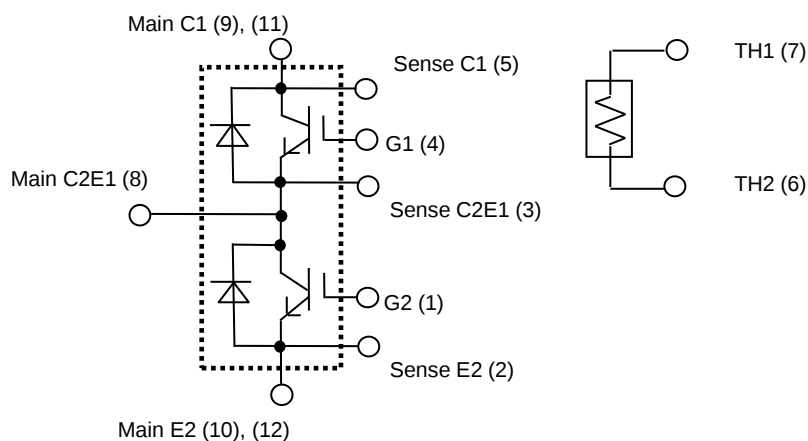
■ Outline drawing (Unit : mm)



■ Equivalent Circuit

[Inverter]

[Thermistor]



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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}	1200		V	
	Gate-emitter voltage, collector-emitter short-circuited		V_{GES}	±20		V	
	Collector current		I_C	Continuous	$T_C=100^{\circ}\text{C}$	1800	A
	Repetitive peak collector current		I_{CRM}	1ms		3600	
	Forward current		I_F	1800			
	Repetitive peak forward current		I_{FRM}	1ms	3600		
	Total power dissipation		P_{tot}	1 device		10.7	W
	Virtual junction temperature		T_{vj}	175		$^{\circ}\text{C}$	
	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.	
Inverter	Collector-emitter cut-off current, gate-emitter short-circuited	I_{CES}	$V_{\text{GE}} = 0\text{V}$ $V_{\text{CE}} = 1200\text{V}$		-	-	600	μA
	Gate leakage current, collector-emitter short-circuited	I_{GES}	$V_{\text{CE}}\!=\!0\text{V}$, $V_{\text{GE}}\!=\!\pm 20\text{V}$		-	-	1200	nA
	Gate-Emitter threshold voltage	$V_{\text{GE(th)}}$	$V_{\text{CE}} = 20\text{V}$ $I_{\text{C}} = 1800\text{mA}$		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{\text{CE(sat)}}$ (terminal)	$V_{\text{GE}} = 15\text{V}$ $I_{\text{C}} = 1800\text{A}$	$T_{\text{vj}}\!=\!25^{\circ}\text{C}$	-	1.50	1.95	V
		$V_{\text{CE(sat)}}$ (chip)		$T_{\text{vj}}\!=\!25^{\circ}\text{C}$	-	1.45	1.90	
				$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	1.70	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	1.75	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	1.85	-	
	Internal gate resistance	r_{g}	-		-	2.08	-	Ω
	Capacitance	C_{ies}	$V_{\text{CE}}\!=\!10\text{V}$, $V_{\text{GE}}\!=\!0\text{V}$, $f\!=\!1\text{MHz}$		-	192	-	nF
		C_{oes}			-	6.5	-	
		C_{res}			-	1.7	-	
	Gate charge	Q_{G}	$V_{\text{CC}} = 600\text{V}$, $I_{\text{C}} = 1800\text{A}$ $V_{\text{GE}} = -15 \rightarrow +15\text{V}$		-	12.4	-	μC
	Forward voltage	V_{F} (terminal)	$V_{\text{GE}} = 0\text{V}$ $I_{\text{F}} = 1800\text{A}$	$T_{\text{vj}}\!=\!25^{\circ}\text{C}$	-	1.65	2.10	V
		V_{F} (chip)		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	1.60	2.05	
				$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	1.65	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	1.60	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	1.60	-	
	Switching time (*1)	$t_{\text{d(on)}}$	$V_{\text{CC}} = 600\text{V}$ $I_{\text{C}}, I_{\text{F}} = 1800\text{A}$ $V_{\text{GE}} = +15/-15\text{ V}$ $R_{\text{G}} = +0.56/-0.56\ \Omega$ $L_{\text{S}} = 40\text{ nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	1.10	-	μs
				$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	1.10	-	
$T_{\text{vj}}\!=\!150^{\circ}\text{C}$				-	1.10	-		
$T_{\text{vj}}\!=\!175^{\circ}\text{C}$				-	1.10	-		
t_{r}		$T_{\text{vj}} = 25^{\circ}\text{C}$		-	0.20	-		
		$T_{\text{vj}}\!=\!125^{\circ}\text{C}$		-	0.22	-		
		$T_{\text{vj}}\!=\!150^{\circ}\text{C}$		-	0.22	-		
		$T_{\text{vj}}\!=\!175^{\circ}\text{C}$		-	0.22	-		
$t_{\text{d(off)}}$		$T_{\text{vj}} = 25^{\circ}\text{C}$		-	0.90	-		
		$T_{\text{vj}}\!=\!125^{\circ}\text{C}$		-	0.94	-		
		$T_{\text{vj}}\!=\!150^{\circ}\text{C}$		-	0.96	-		
		$T_{\text{vj}}\!=\!175^{\circ}\text{C}$		-	0.97	-		
t_{f}		$T_{\text{vj}} = 25^{\circ}\text{C}$		-	0.16	-		
		$T_{\text{vj}}\!=\!125^{\circ}\text{C}$		-	0.17	-		
		$T_{\text{vj}}\!=\!150^{\circ}\text{C}$		-	0.18	-		
		$T_{\text{vj}}\!=\!175^{\circ}\text{C}$		-	0.20	-		
Reverse recovery time	t_{rr}	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	0.29	-			
		$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	0.47	-			
		$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	0.49	-			
		$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	0.52	-			

(*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}	$V_{\text{CC}} = 600\text{V}$ $I_{\text{C}}, I_{\text{F}} = 1800\text{A}$ $V_{\text{GE}} = +15/-15\text{ V}$ $R_{\text{G}} = +0.56/-0.56\ \Omega$ $L_{\text{S}} = 40\text{ nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	165	-	mJ
				$T_{\text{vj}} = 125^{\circ}\text{C}$	-	248	-	
				$T_{\text{vj}} = 150^{\circ}\text{C}$	-	258	-	
				$T_{\text{vj}} = 175^{\circ}\text{C}$	-	278	-	
		E_{off}	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	246	-		
			$T_{\text{vj}} = 125^{\circ}\text{C}$	-	313	-		
			$T_{\text{vj}} = 150^{\circ}\text{C}$	-	330	-		
			$T_{\text{vj}} = 175^{\circ}\text{C}$	-	340	-		
		E_{rr}	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	71	-		
			$T_{\text{vj}} = 125^{\circ}\text{C}$	-	111	-		
			$T_{\text{vj}} = 150^{\circ}\text{C}$	-	132	-		
			$T_{\text{vj}} = 175^{\circ}\text{C}$	-	146	-		
Thermistor	Resistance	R	$T = 25^{\circ}\text{C}$	-	5000	-	Ω	
			$T = 100^{\circ}\text{C}$	465	495	520		
	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.

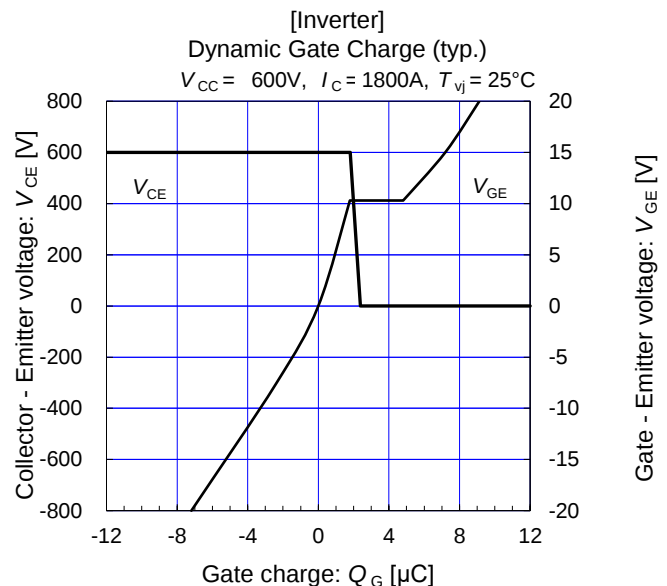
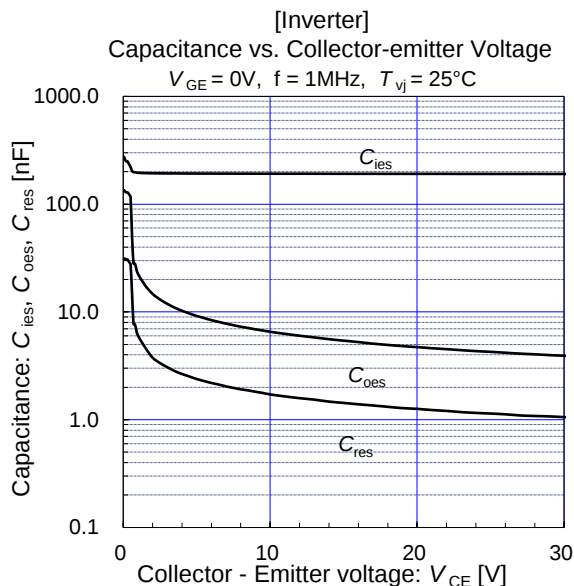
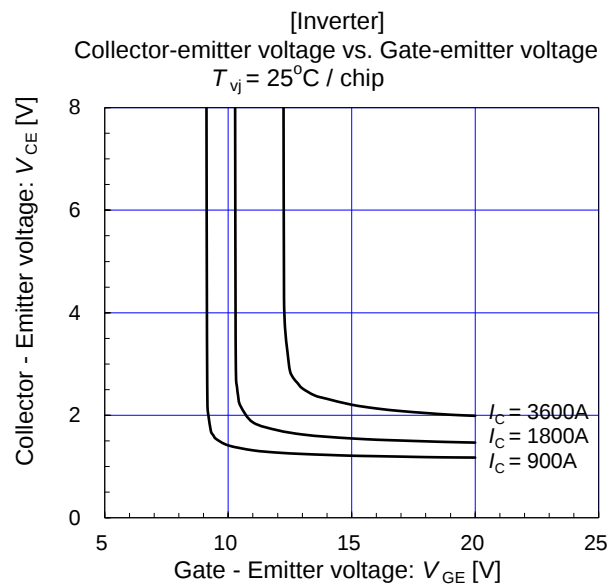
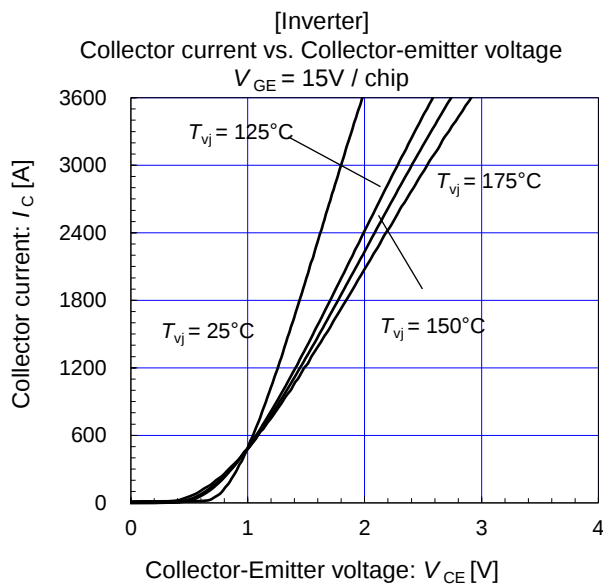
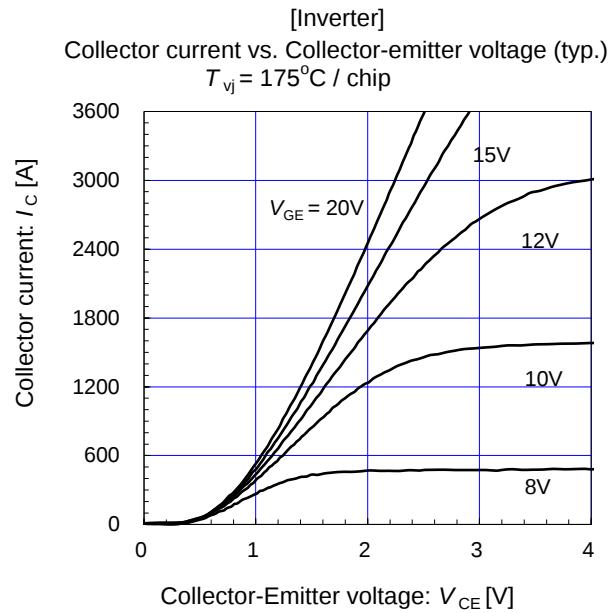
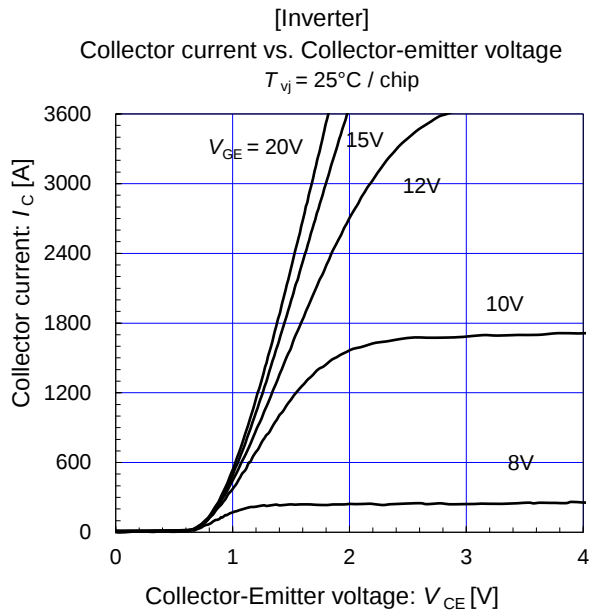
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case(1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	14.0	K/kW
		Inverter FWD	-	-	23.0	
Thermal resistance case to heatsink(1 IGBT+1 FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	4.2	-	

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

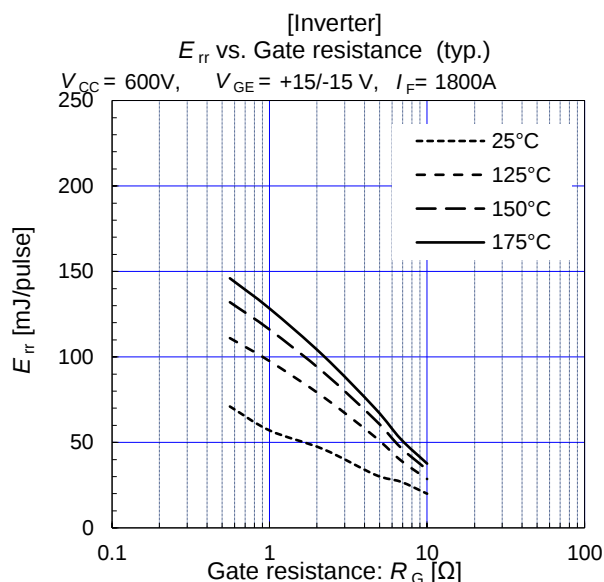
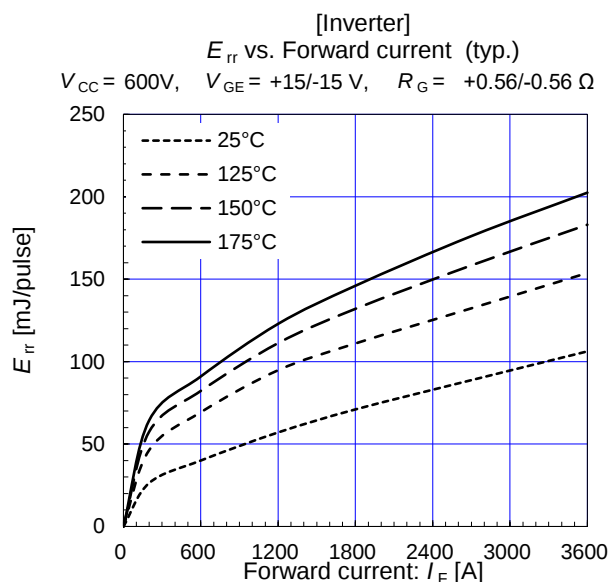
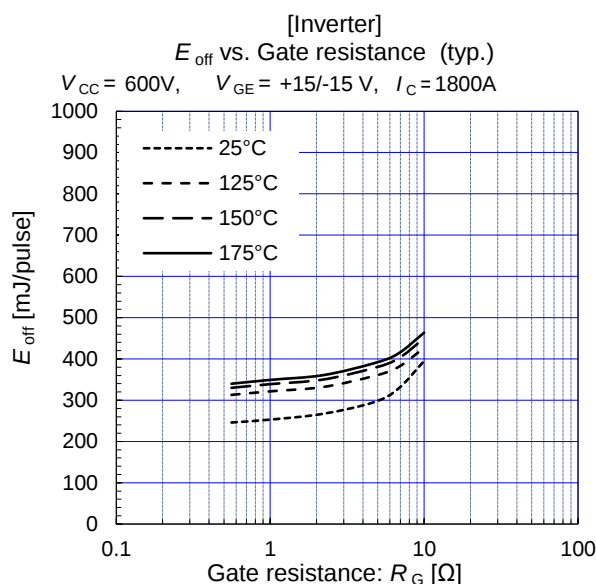
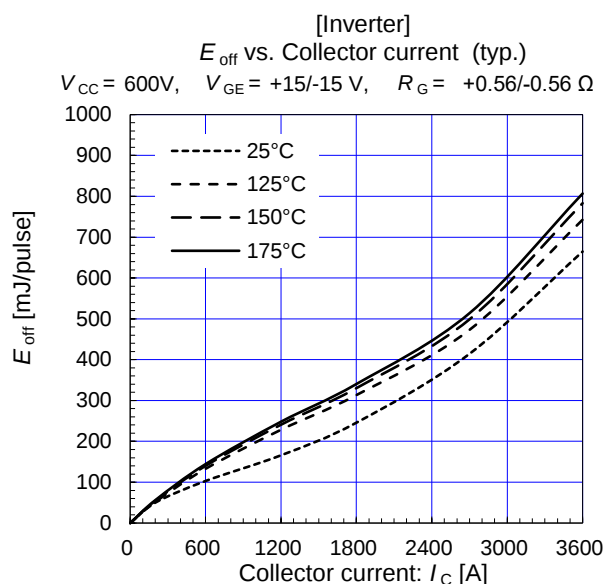
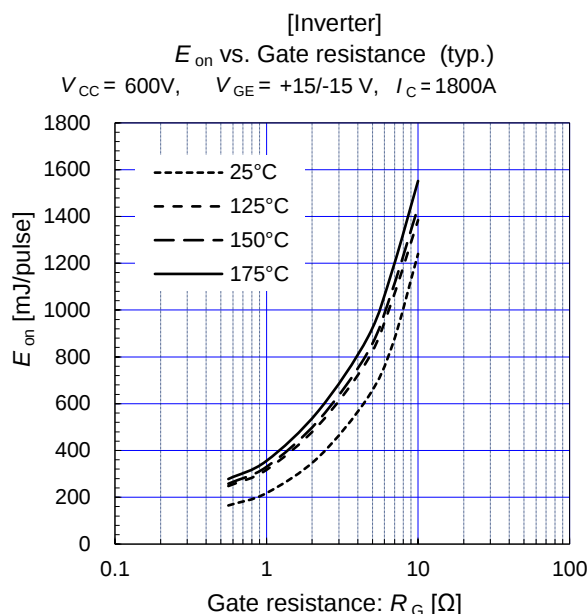
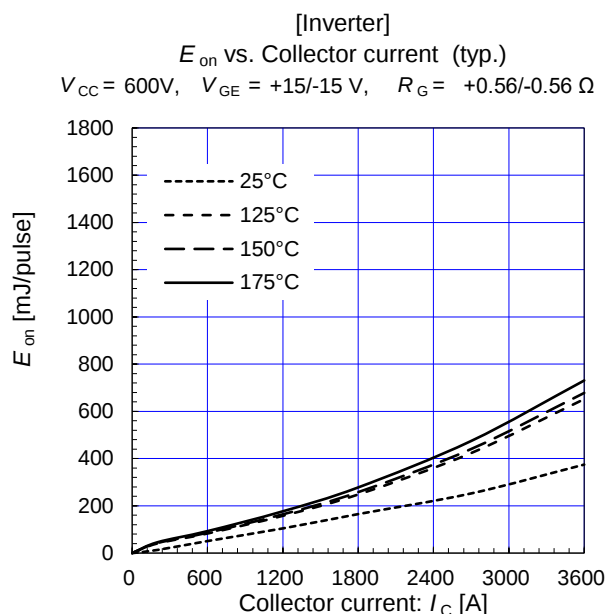
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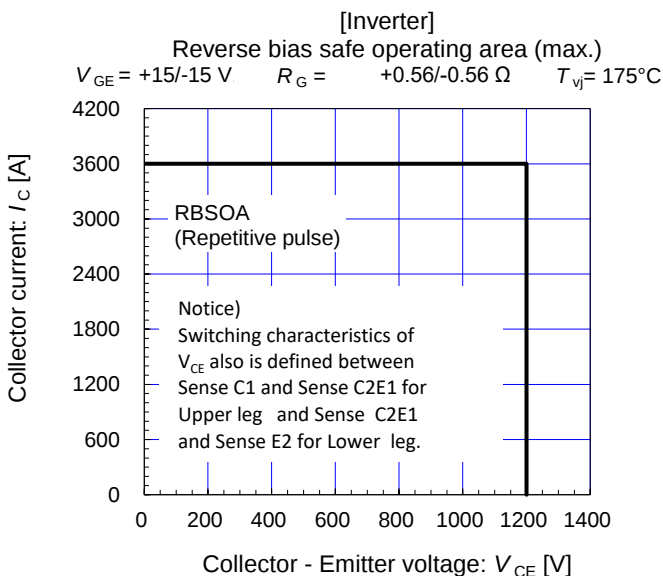
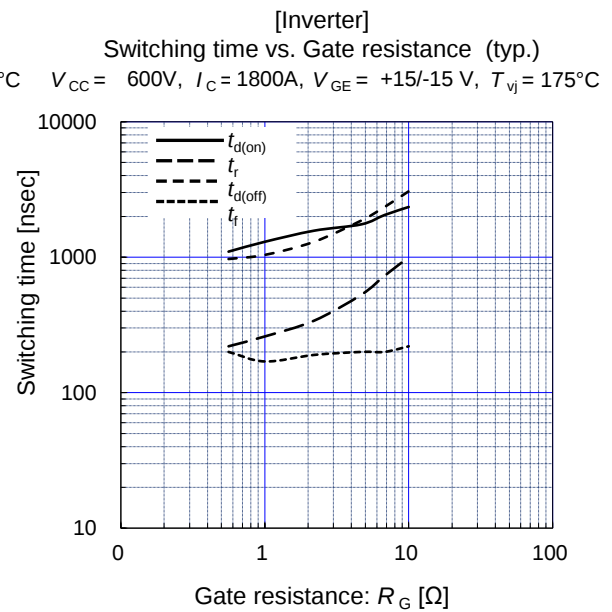
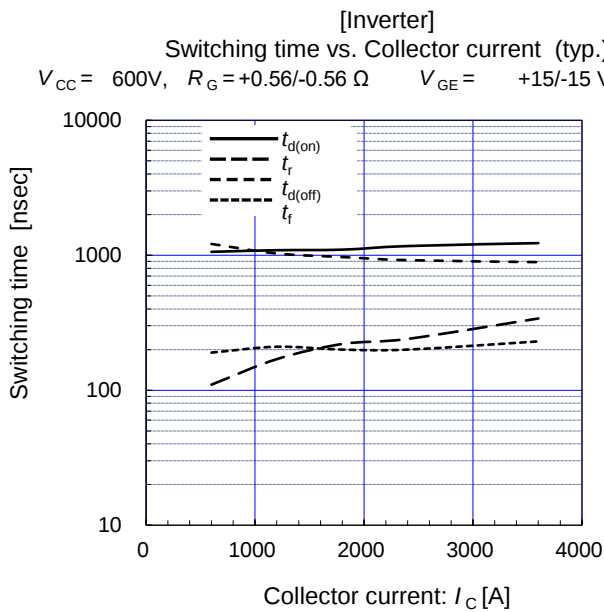
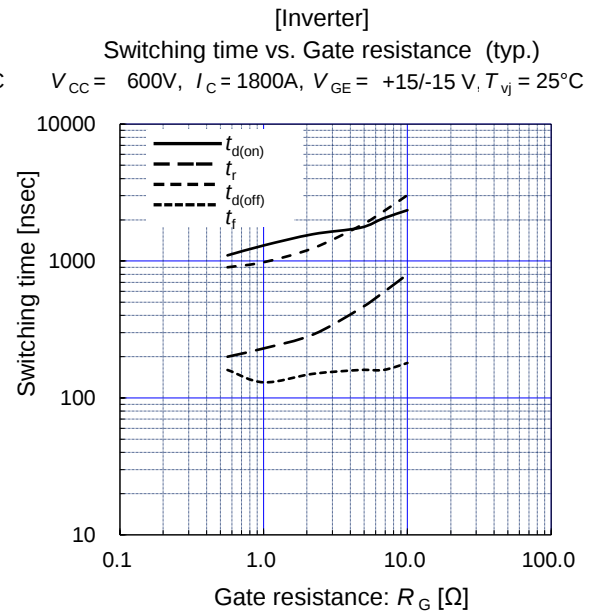
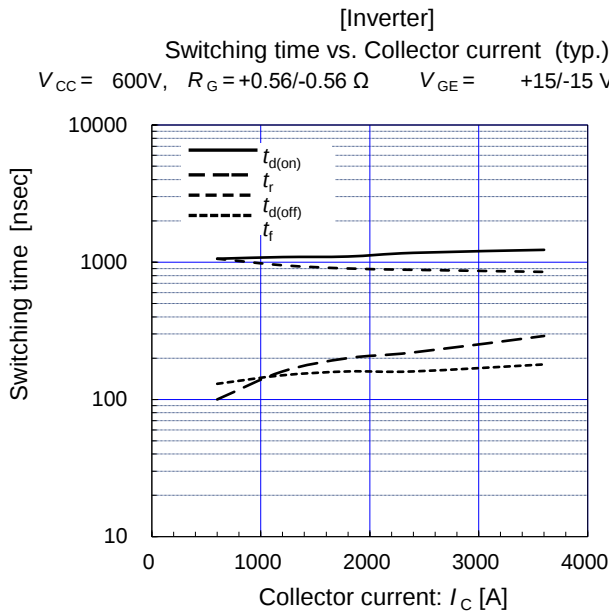
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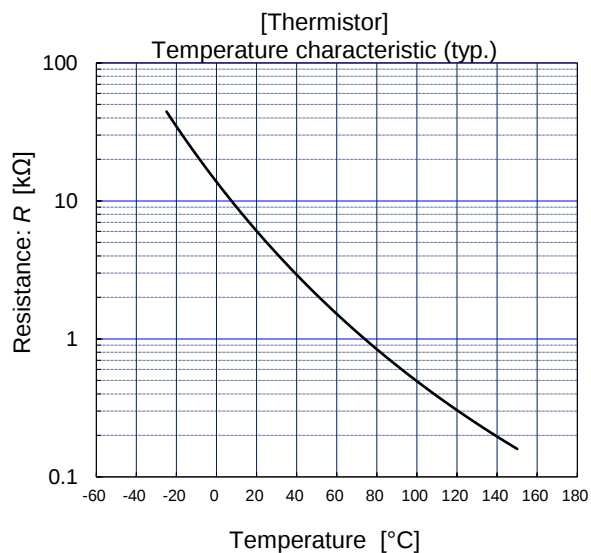
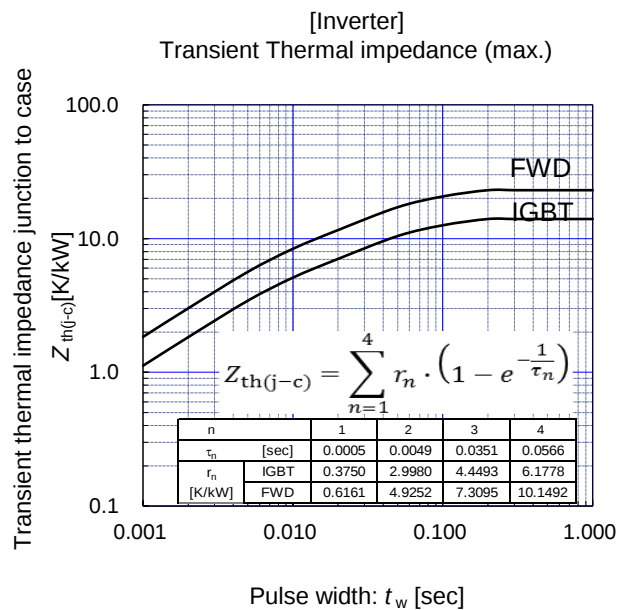
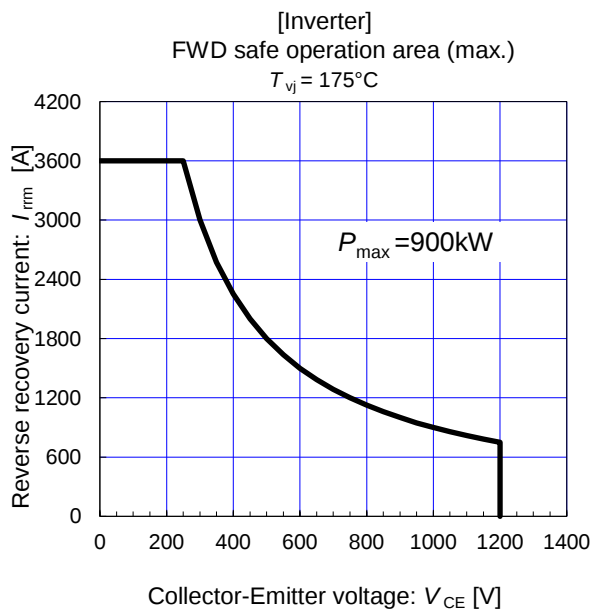
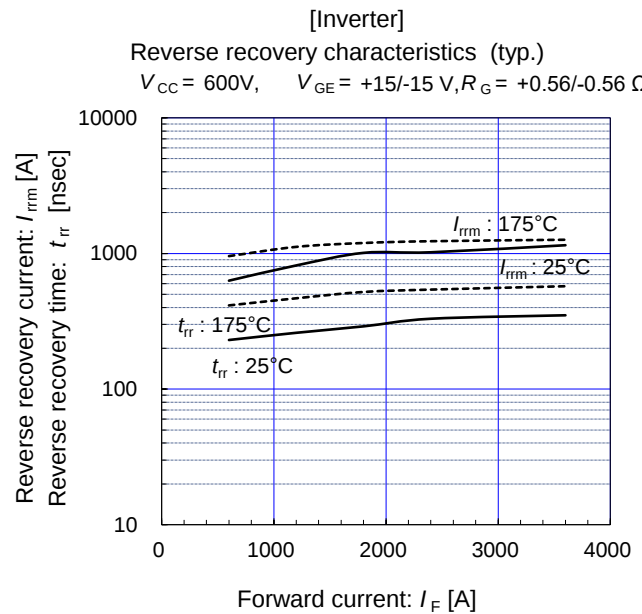
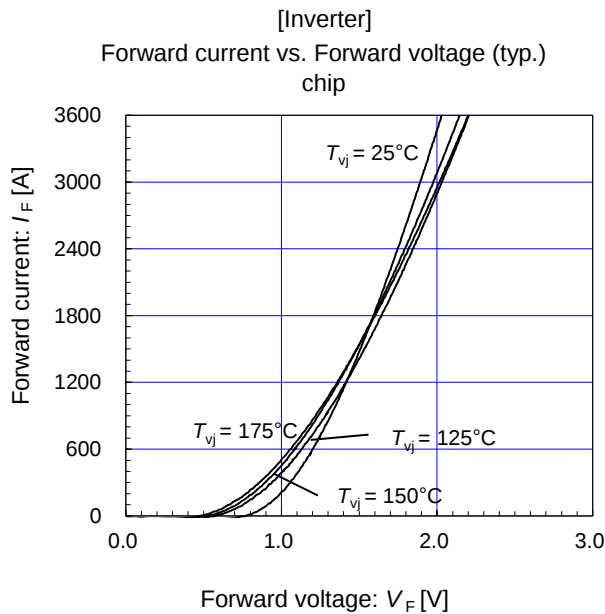
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