

2MBI1400XB170-50

IGBT Modules

Power Module (X series)
1700V / 1400A / 2-in-1 package

■ **Features**

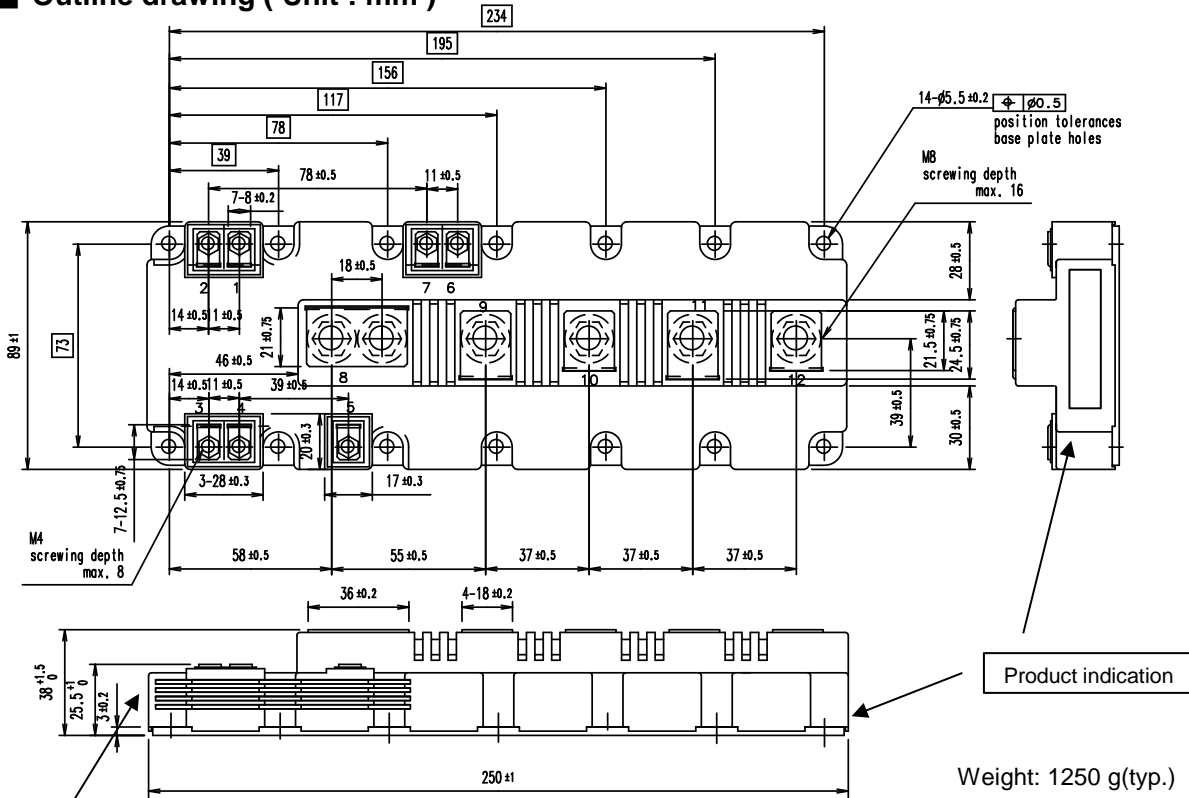
- Low $V_{CE(sat)}$
- Low Inductance Module structure

■ **Applications**

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



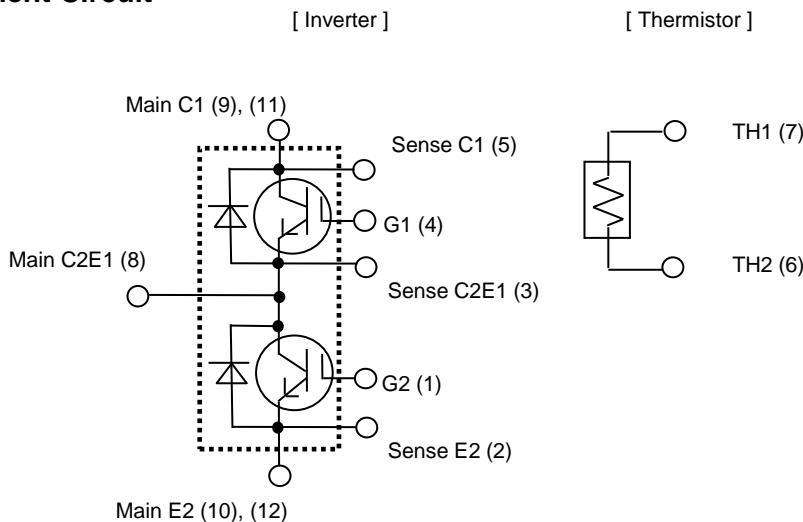
■ **Outline drawing (Unit : mm)**



Weight: 1250 g (typ.)

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 $T_c=95^\circ\text{C}$	1400	A
	Repetitive peak collector current	I_{CRM}	1ms	2800	
	Forward current	I_F		1400	
	Repetitive peak forward current	I_{FRM}	1ms	2800	
	Total power dissipation	P_{tot}	1 device	6.9	kW
	Virtual junction temperature	T_{vj}		175	
	Operating virtual junction temperature (under switching conditions)	T_{vjop}		175	
	Case temperature	T_c		150	$^\circ\text{C}$
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-eEmitter cut-off current, Gate-Emitter short-circuited	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 1700V$	-	-	600	μA	
Gate leakage current, Collector-emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	1200	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 1400\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 1400A$	$T_{vj}=25^{\circ}\text{C}$	-	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	-	-	2.50	-	Ω	
Capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1\text{MHz}$	-	-	236	-	nF
	C_{oes}		-	-	6.1	-	
	C_{res}		-	-	1.7	-	
Gate charge	Q_G	$V_{CC} = 900V, I_C = 1400A$ $V_{GE} = -15 \rightarrow +15V$	-	12.7	-	μC	
Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 1400A$	$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.20	V
	V_F (chip)		$T_{vj}=25^{\circ}\text{C}$	-	1.70	2.15	
			$T_{vj}=125^{\circ}\text{C}$	-	1.85	-	
			$T_{vj}=150^{\circ}\text{C}$	-	1.85	-	
			$T_{vj}=175^{\circ}\text{C}$	-	1.80	-	
Switching time (*1)	$t_{d(on)}$	$V_{CC} = 900V$ $I_C, I_F = 1400A$ $V_{GE} = \pm 15V$ $R_G = 0.27/0.82 \Omega$ $L_S = 40 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	1.11	-	μs
			$T_{vj}=125^{\circ}\text{C}$	-	1.09	-	
			$T_{vj}=150^{\circ}\text{C}$	-	1.09	-	
			$T_{vj}=175^{\circ}\text{C}$	-	1.09	-	
	t_r		$T_{vj}=25^{\circ}\text{C}$	-	0.16	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.18	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.18	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.18	-	
	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	1.02	-	
			$T_{vj}=125^{\circ}\text{C}$	-	1.07	-	
			$T_{vj}=150^{\circ}\text{C}$	-	1.09	-	
			$T_{vj}=175^{\circ}\text{C}$	-	1.10	-	
	t_f		$T_{vj}=25^{\circ}\text{C}$	-	0.20	-	
$T_{vj}=125^{\circ}\text{C}$		-	0.44	-			
$T_{vj}=150^{\circ}\text{C}$		-	0.50	-			
$T_{vj}=175^{\circ}\text{C}$		-	0.56	-			
Reverse recovery time	t_{rr}	$T_{vj}=25^{\circ}\text{C}$	-	0.38	-		
		$T_{vj}=125^{\circ}\text{C}$	-	0.52	-		
		$T_{vj}=150^{\circ}\text{C}$	-	0.56	-		
		$T_{vj}=175^{\circ}\text{C}$	-	0.60	-		

(*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}	$V_{CC} = 900\text{V}$ $I_C, I_F = 1400\text{A}$ $V_{GE} = \pm 15\text{V}$ $R_G = 0.27/0.82\ \Omega$ $L_S = 40\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	381	-	mJ
				$T_{vj}=125^{\circ}\text{C}$	-	488	-	
				$T_{vj}=150^{\circ}\text{C}$	-	548	-	
				$T_{vj}=175^{\circ}\text{C}$	-	614	-	
		E_{off}		$T_{vj}=25^{\circ}\text{C}$	-	359	-	
				$T_{vj}=125^{\circ}\text{C}$	-	465	-	
				$T_{vj}=150^{\circ}\text{C}$	-	492	-	
				$T_{vj}=175^{\circ}\text{C}$	-	519	-	
		E_{rr}		$T_{vj}=25^{\circ}\text{C}$	-	203	-	
				$T_{vj}=125^{\circ}\text{C}$	-	344	-	
				$T_{vj}=150^{\circ}\text{C}$	-	372	-	
				$T_{vj}=175^{\circ}\text{C}$	-	426	-	
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.

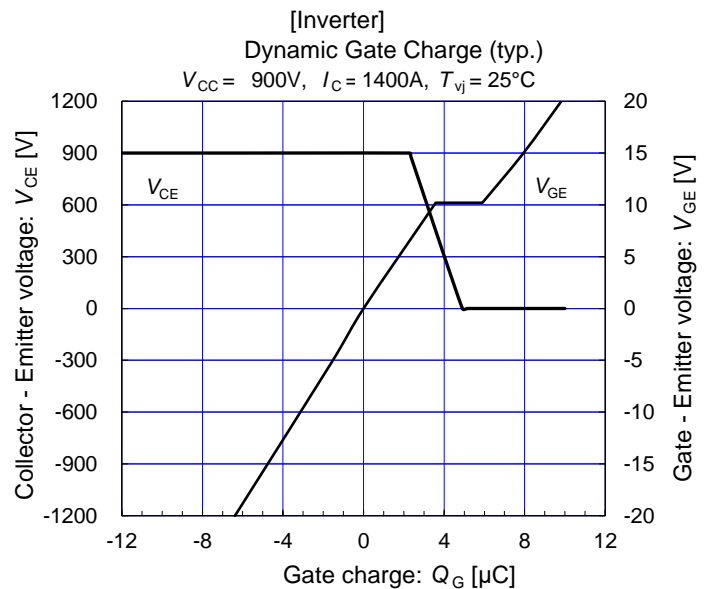
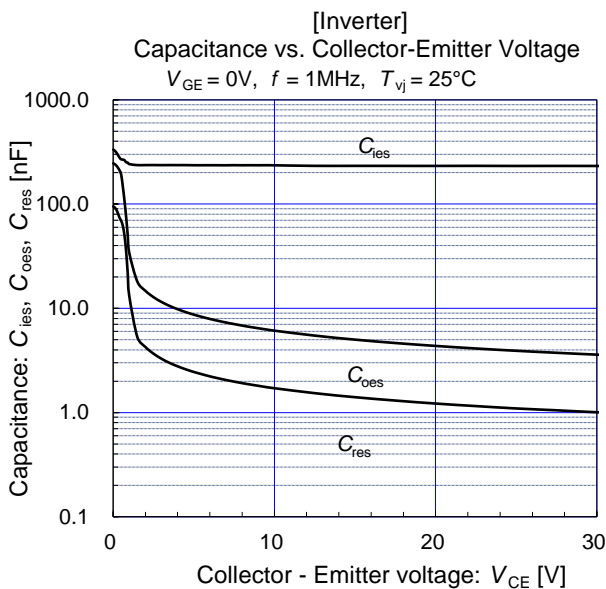
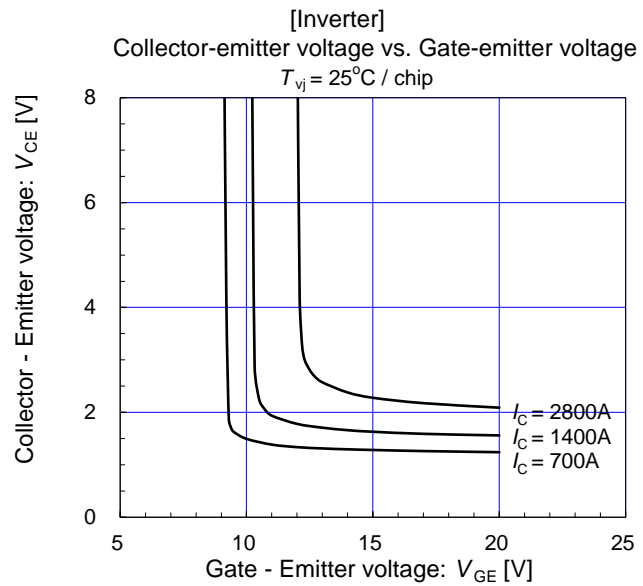
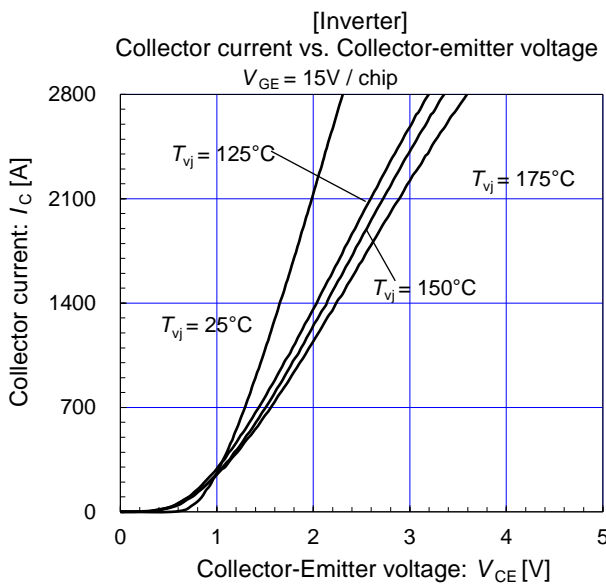
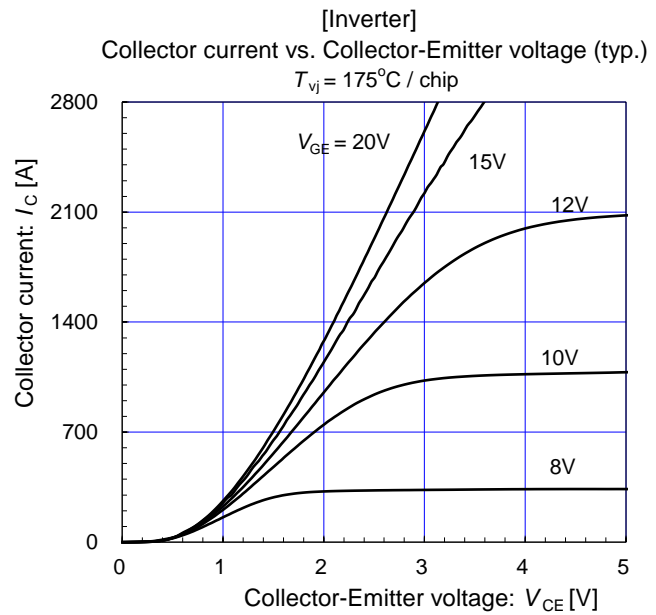
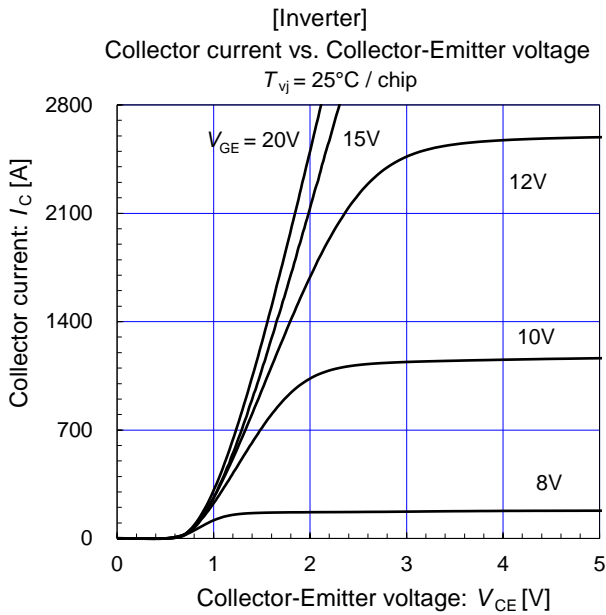
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case(1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	21.5	K/kW
		Inverter FWD	-	-	38.0	
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.

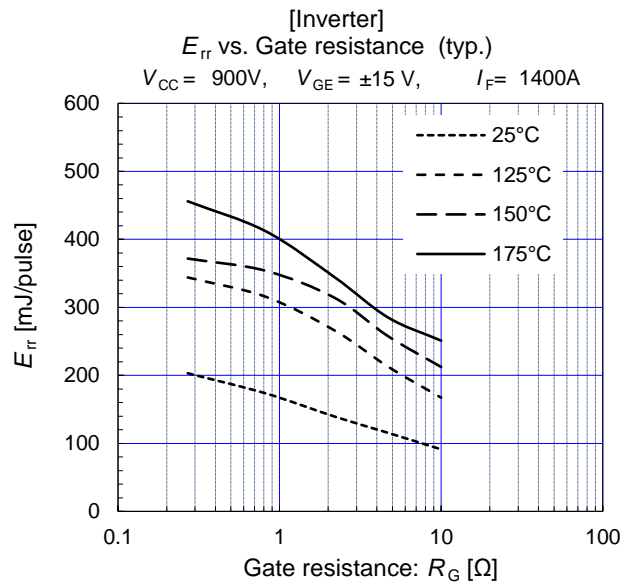
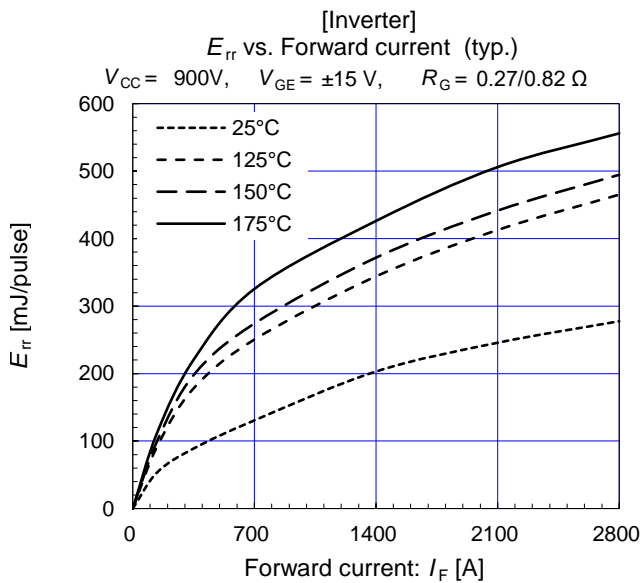
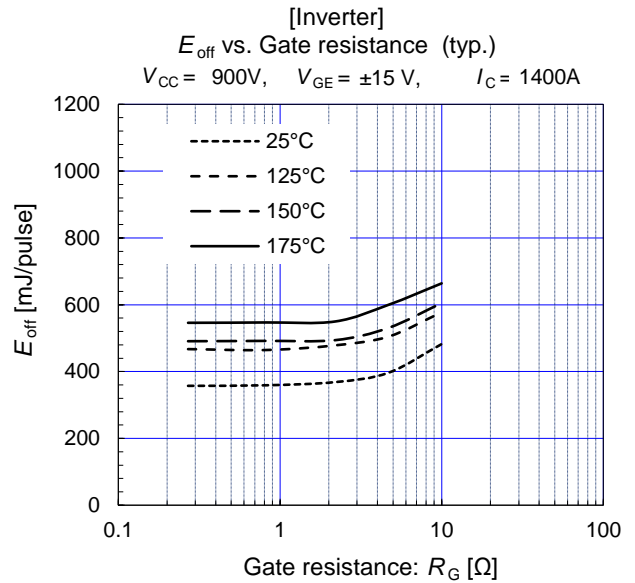
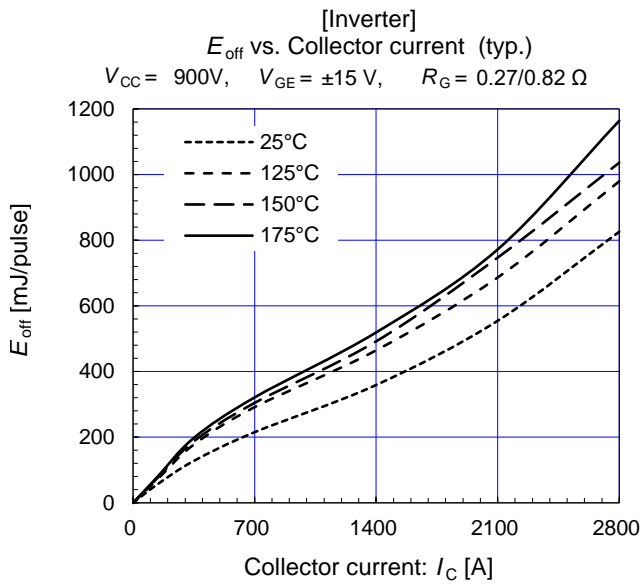
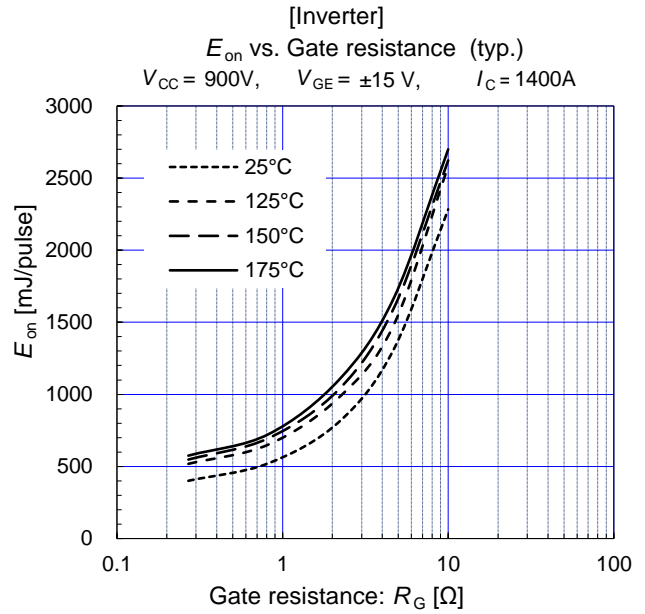
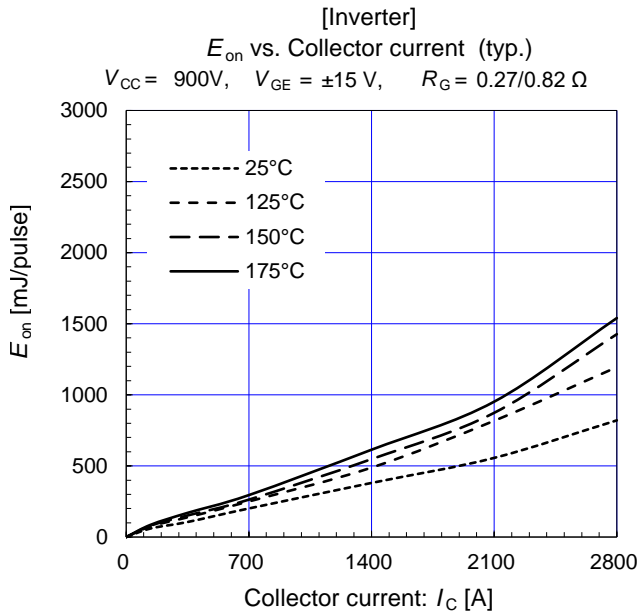
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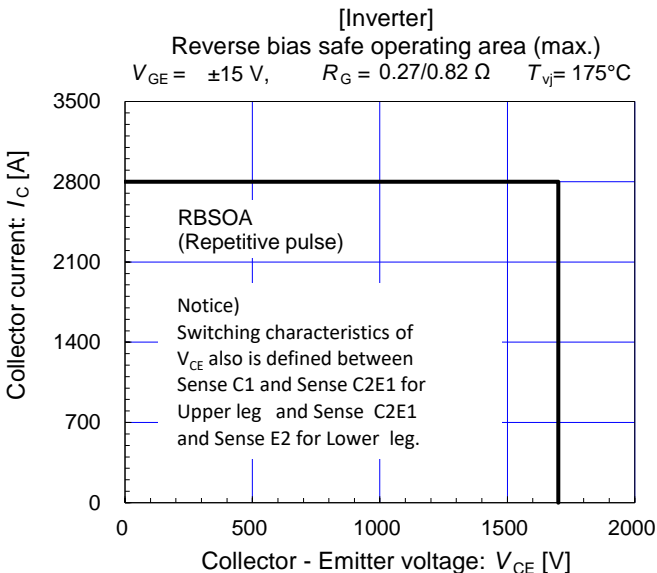
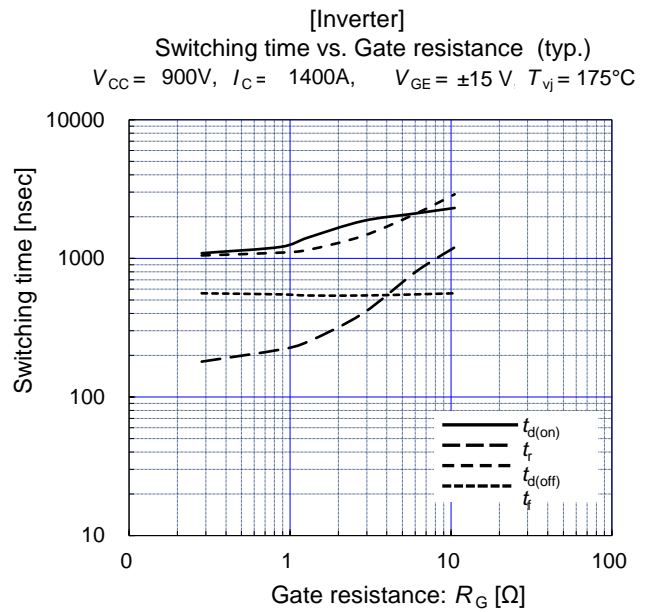
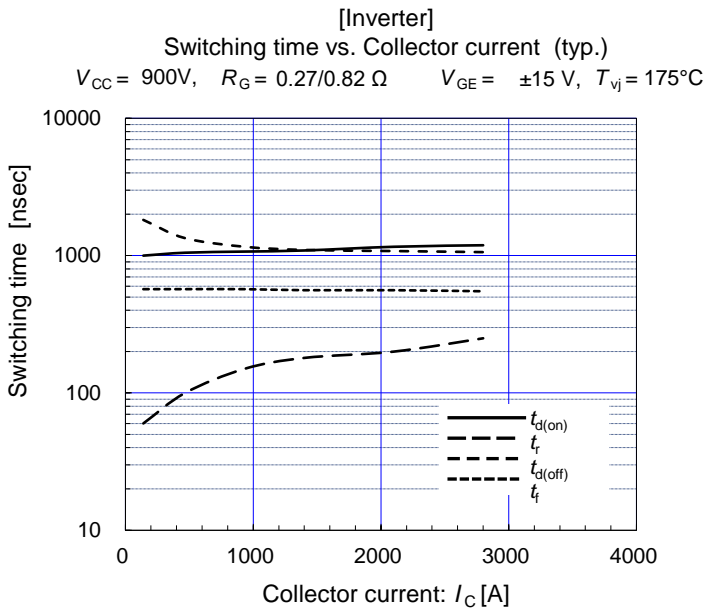
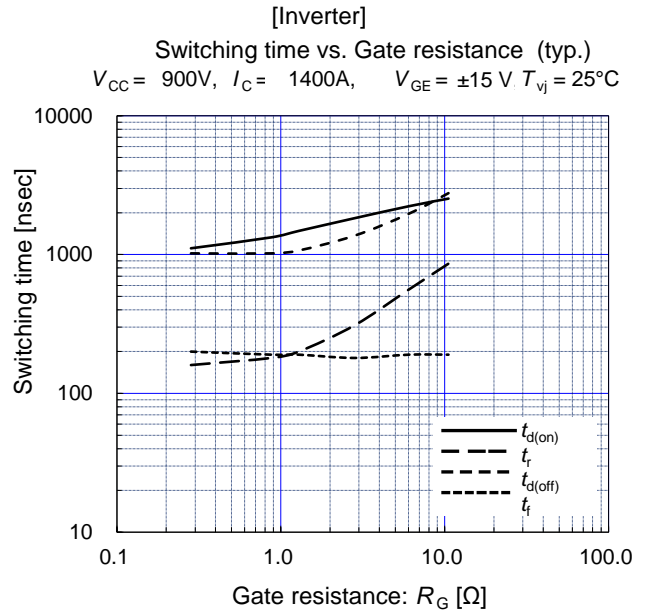
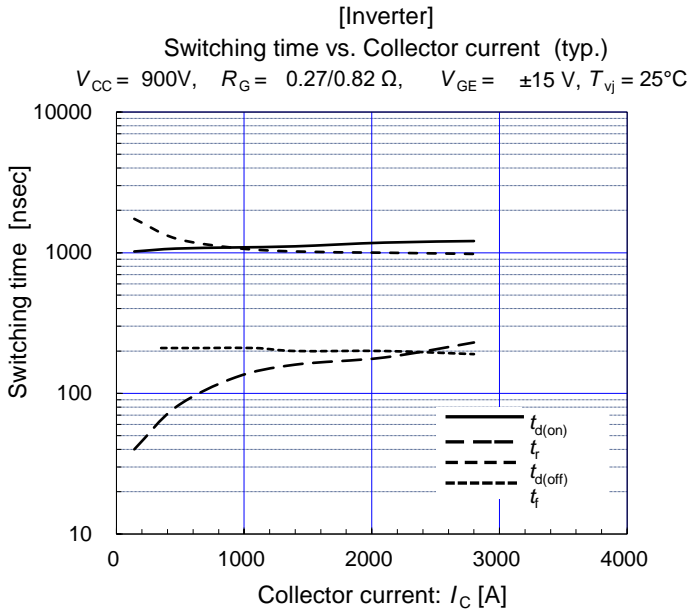
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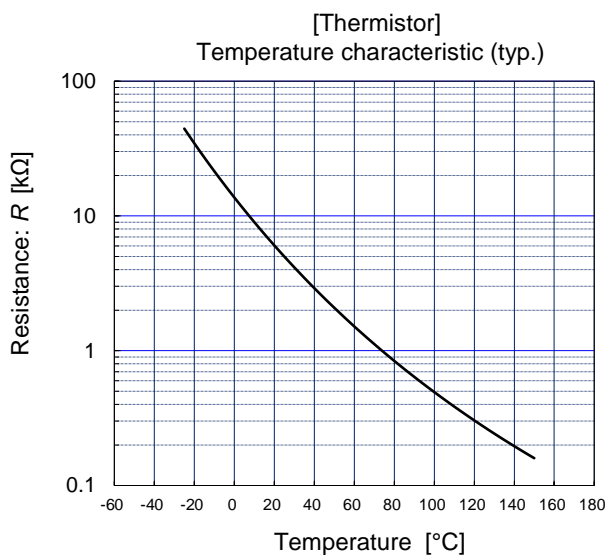
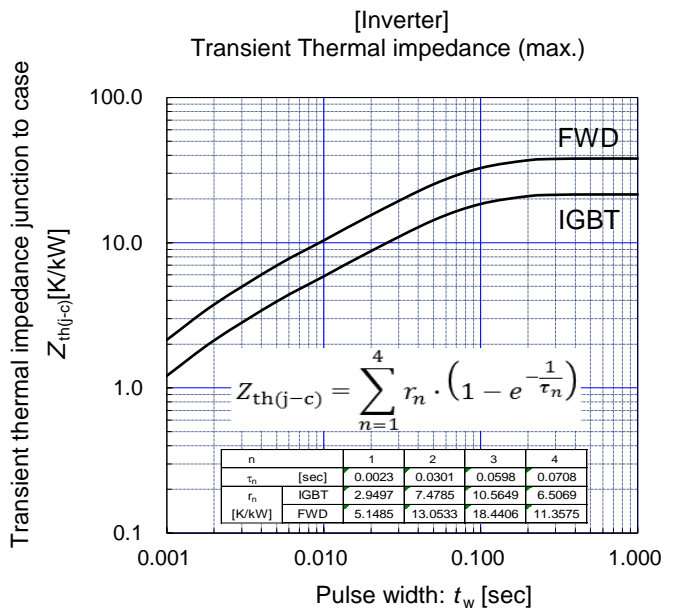
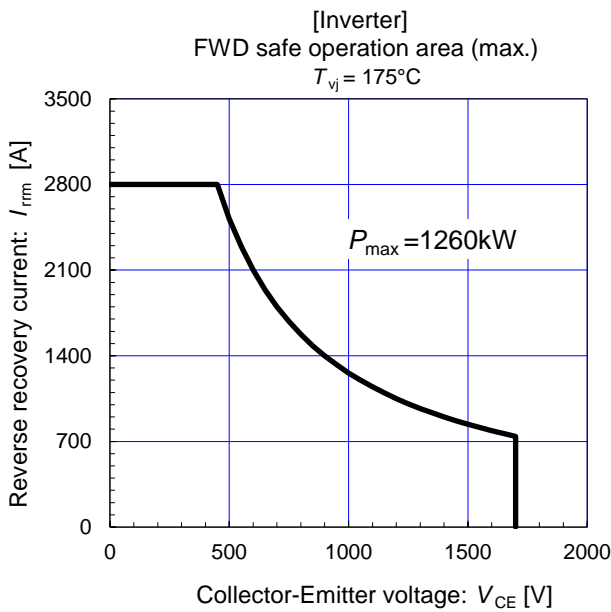
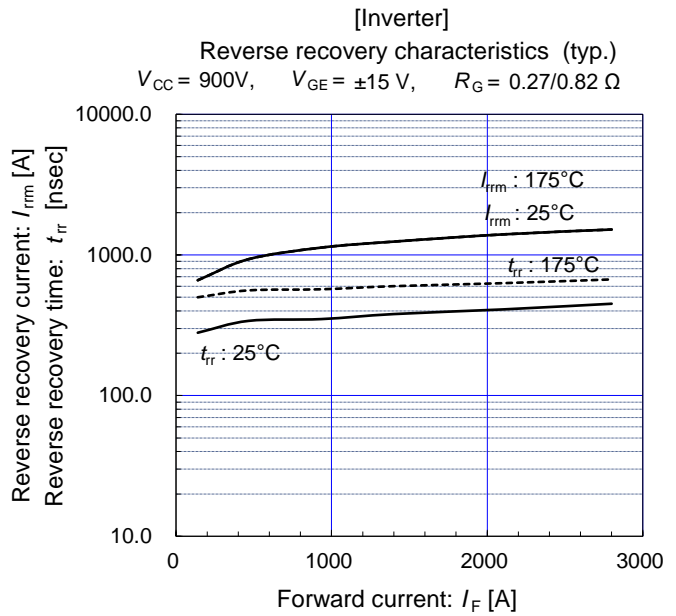
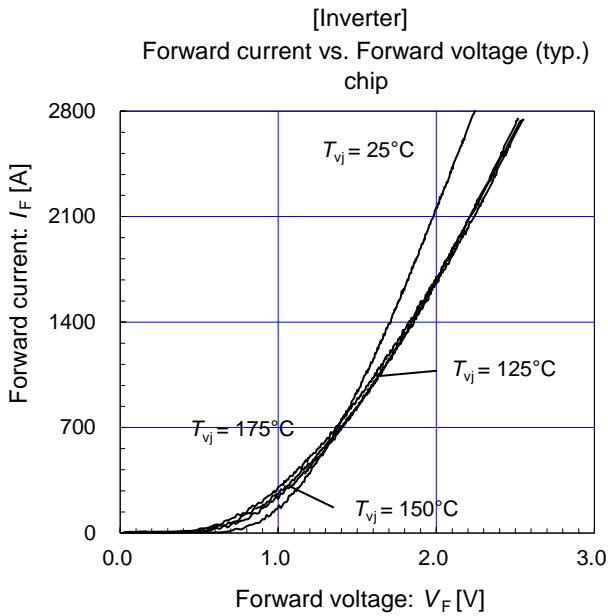
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