

2MBI400XEE170-50

IGBT Modules

Power Module (X series)
1700V / 400A / 2-in-1 package

■ **Features**

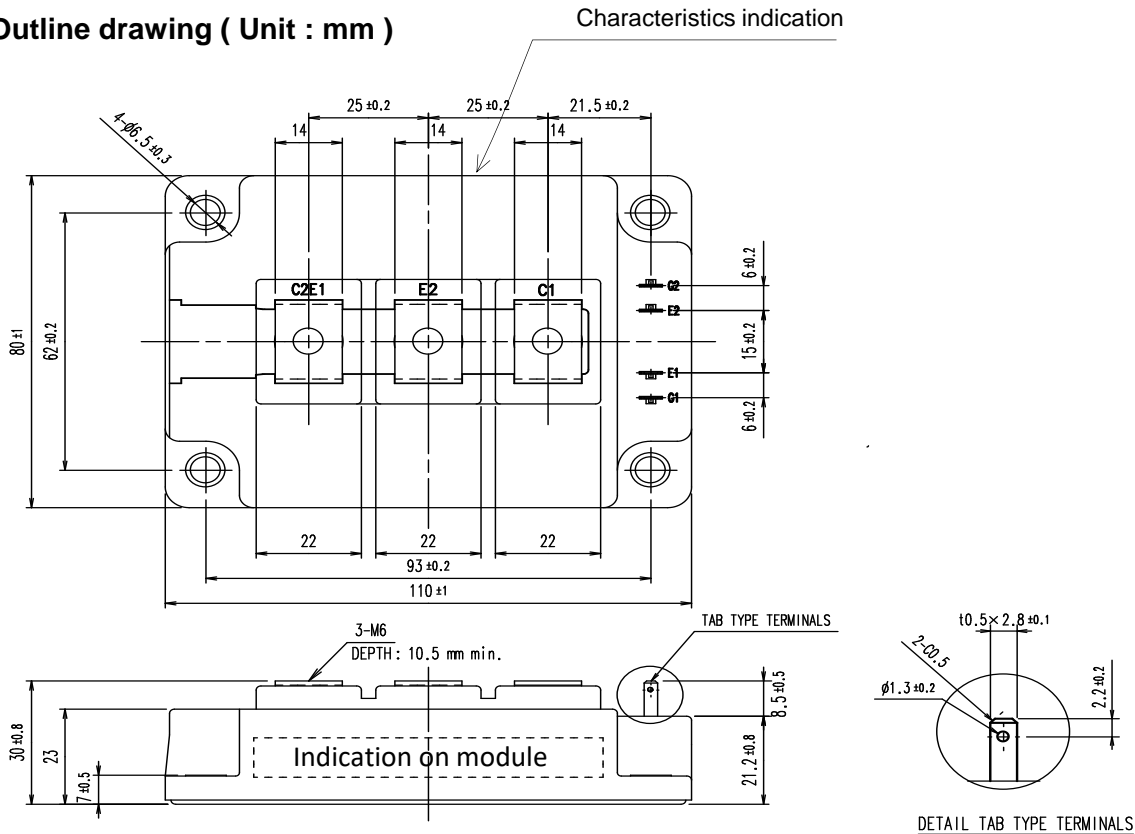
- Low $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

■ **Applications**

- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems,
- Industrial machines, such as Welding machines



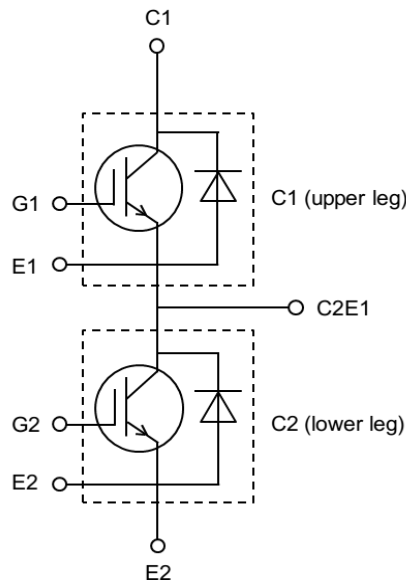
■ **Outline drawing (Unit : mm)**



DETAIL TAB TYPE TERMINALS

Weight: 470 g(typ.)

■ **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, Gate-Emitter short-circuited	V_{CES}		1700	V
Gate-Emitter voltage, Collector-Emitter short-circuited	V_{GES}		± 20	V
Collector current	I_C	Continuous $T_C=100^\circ\text{C}$	400	A
Repetitive peak collector current	I_{CRM}	1ms	800	
Forward current	I_F		400	
Repetitive peak forward current	I_{FRM}	1ms	800	
Total power dissipation	P_{tot}	1 device	3665	W
Virtual Junction temperature	T_{vj}		175	°C
Operating virtual junction temperature	T_{vjop}		175	
Case temperature	T_C		125	
Storage temperature	T_{stg}		-40 ~ 125	
Isolation voltage between terminals and copper base (*1)	V_{isol}	AC: 1min.	4000	Vrms
Mounting torque of screws to heat sink (*2)	M_s	M5 or M6	6.0	N m
Mounting torque of screws to terminals (*2)	M_t	M5	5.0	

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

(*2) Recommendable Value: Mounting 3.0 ~ 6.0N·m (M5 or M6)
 Recommendable Value: Terminals 2.5 ~ 5.0 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}	$V_{GE} = 0V$ $V_{CE} = 1700V$	-	-	200	μA	
Gate leakage current, Collector-Emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	400	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 400\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 400A$	$T_{vj}=25^{\circ}\text{C}$	-	1.85	2.30	V
	$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}\text{C}$	-	1.65	2.10	
			$T_{vj}=125^{\circ}\text{C}$	-	2.00	-	
			$T_{vj}=150^{\circ}\text{C}$	-	2.10	-	
			$T_{vj}=175^{\circ}\text{C}$	-	2.20	-	
Internal gate resistance	r_g	-	-	2.50	-	Ω	
Capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1\text{MHz}$	-	56	-	nF	
	C_{oes}		-	1.6	-		
	C_{res}		-	0.38	-		
Gate charge	Q_G	$V_{CC} = 900V, I_C = 400A$ $V_{GE} = -15 \rightarrow +15V$	-	3300	-	nC	
Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 400A$	$T_{vj}=25^{\circ}\text{C}$	-	1.90	2.35	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)	$t_{d(on)}$	$V_{CC} = 900V$ $I_C, I_F = 400A$ $V_{GE} = \pm 15V$ $R_G = 0.56 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	450	-	ns
			$T_{vj}=125^{\circ}\text{C}$	-	460	-	
			$T_{vj}=150^{\circ}\text{C}$	-	460	-	
			$T_{vj}=175^{\circ}\text{C}$	-	465	-	
	t_r		$T_{vj}=25^{\circ}\text{C}$	-	85	-	
			$T_{vj}=125^{\circ}\text{C}$	-	80	-	
			$T_{vj}=150^{\circ}\text{C}$	-	75	-	
			$T_{vj}=175^{\circ}\text{C}$	-	75	-	
	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	650	-	
			$T_{vj}=125^{\circ}\text{C}$	-	610	-	
			$T_{vj}=150^{\circ}\text{C}$	-	600	-	
			$T_{vj}=175^{\circ}\text{C}$	-	590	-	
	t_f		$T_{vj}=25^{\circ}\text{C}$	-	640	-	
			$T_{vj}=125^{\circ}\text{C}$	-	670	-	
			$T_{vj}=150^{\circ}\text{C}$	-	675	-	
			$T_{vj}=175^{\circ}\text{C}$	-	685	-	
Reverse recovery time	t_{rr}	$T_{vj}=25^{\circ}\text{C}$	-	280	-		
		$T_{vj}=125^{\circ}\text{C}$	-	455	-		
		$T_{vj}=150^{\circ}\text{C}$	-	500	-		
		$T_{vj}=175^{\circ}\text{C}$	-	580	-		

(*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.		
Switching loss (per pulse)	E_{on}	$V_{CC} = 900\text{V}$ $I_C, I_F = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $R_G = 0.56 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	97.5	-	mJ
			$T_{vj}=125^{\circ}\text{C}$	-	119.9	-	
			$T_{vj}=150^{\circ}\text{C}$	-	125.5	-	
			$T_{vj}=175^{\circ}\text{C}$	-	131.1	-	
	E_{off}		$T_{vj}=25^{\circ}\text{C}$	-	99.0	-	
			$T_{vj}=125^{\circ}\text{C}$	-	122.4	-	
			$T_{vj}=150^{\circ}\text{C}$	-	128.2	-	
			$T_{vj}=175^{\circ}\text{C}$	-	134.1	-	
	E_{rr}		$T_{vj}=25^{\circ}\text{C}$	-	71.1	-	
			$T_{vj}=125^{\circ}\text{C}$	-	110.5	-	
			$T_{vj}=150^{\circ}\text{C}$	-	120.3	-	
			$T_{vj}=175^{\circ}\text{C}$	-	130.1	-	

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.

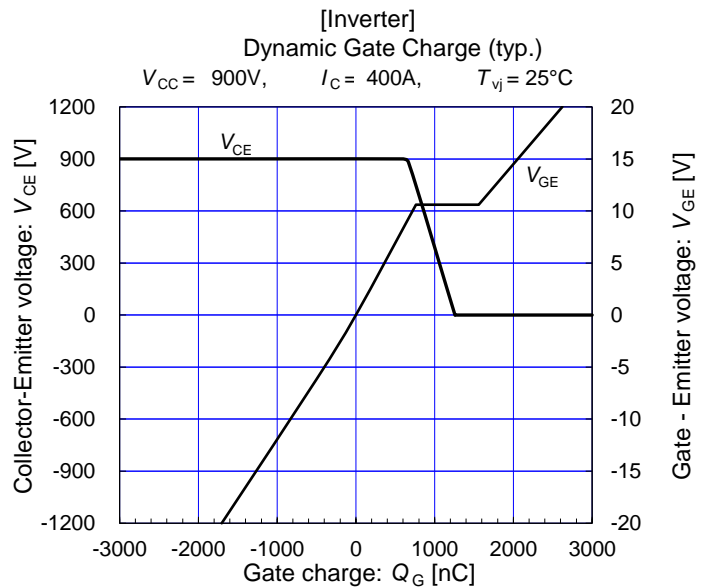
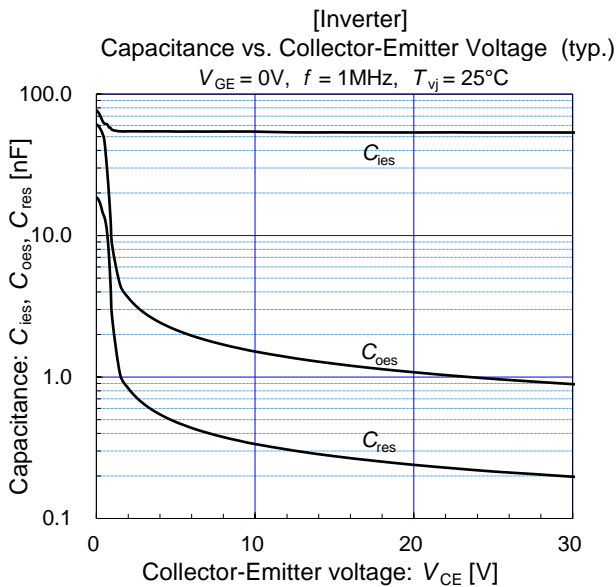
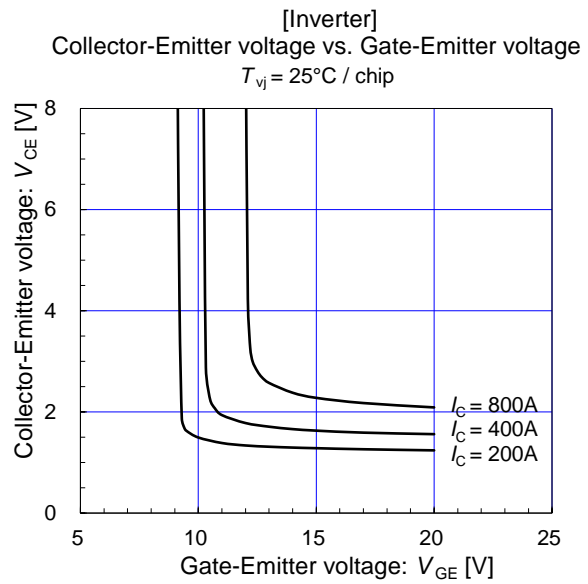
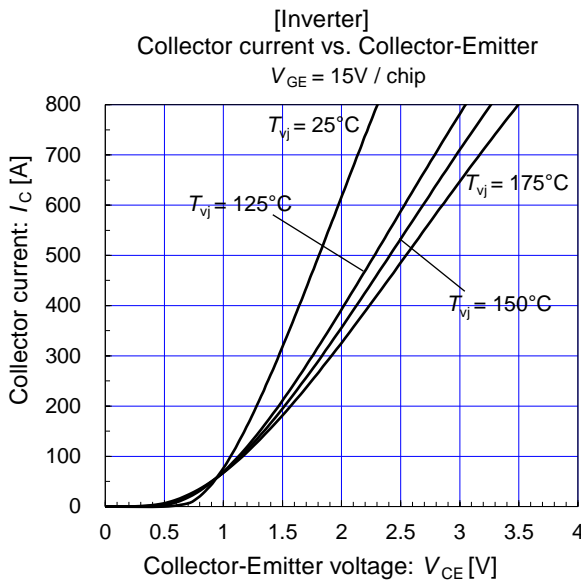
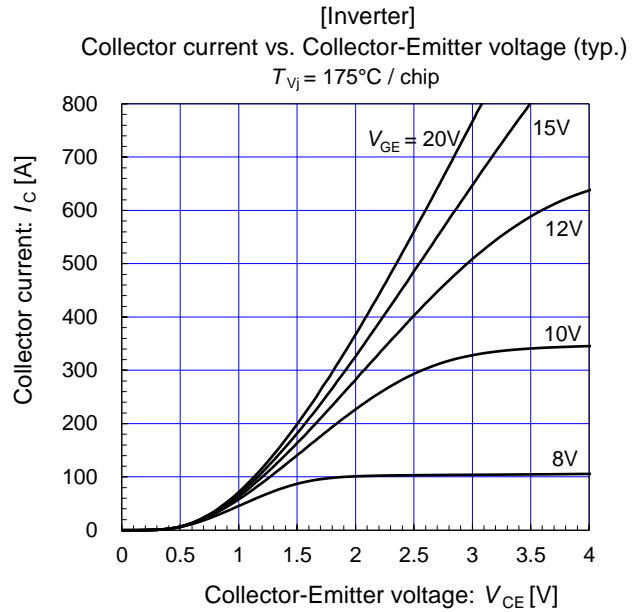
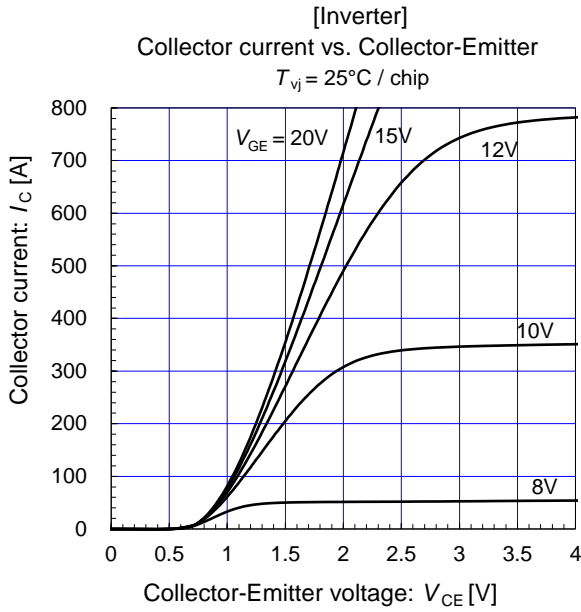
■ Thermal resistance characteristics

	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.041	K/W
		Inverter FWD	-	-	0.068	
Thermal resistance case to heat sink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0125	-	

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

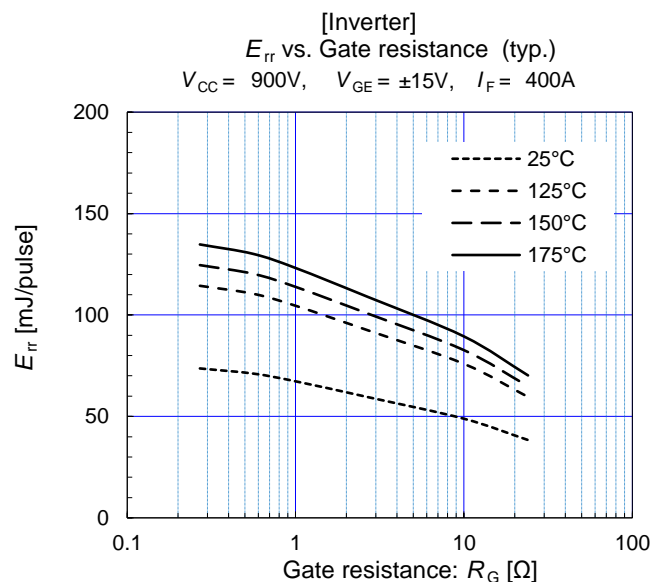
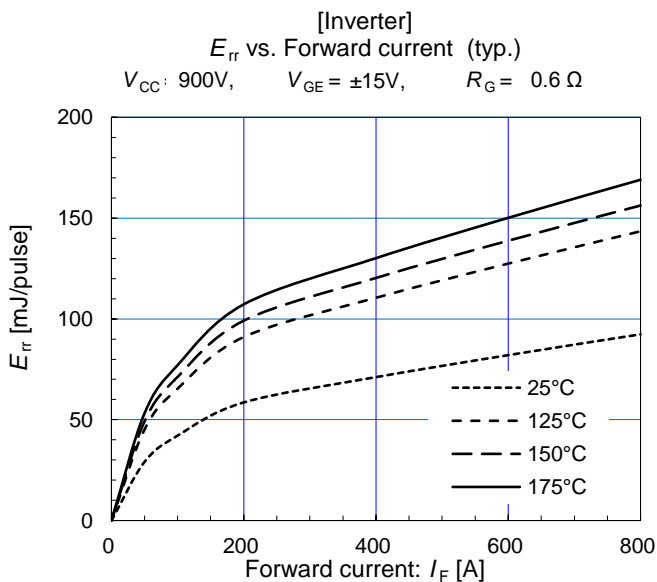
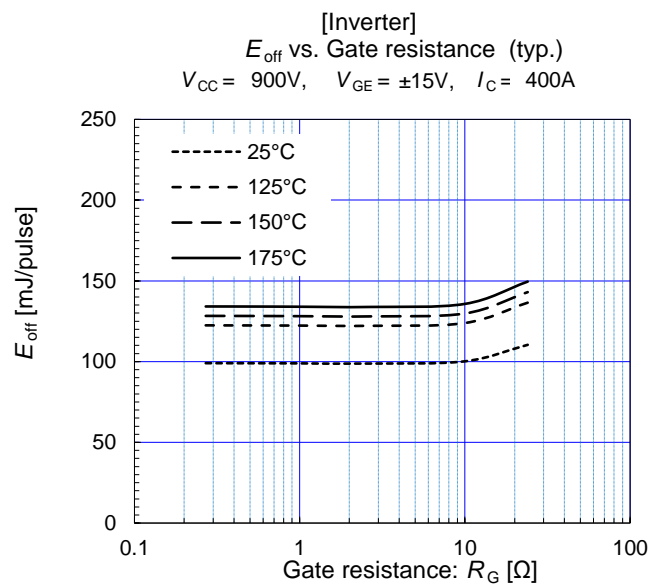
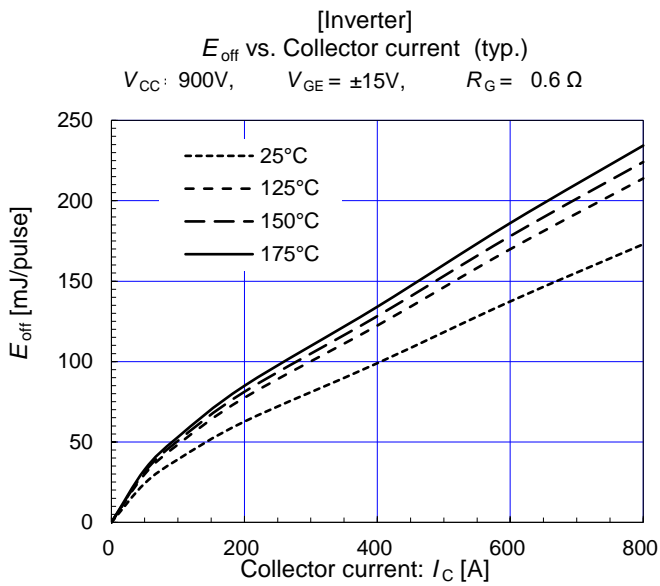
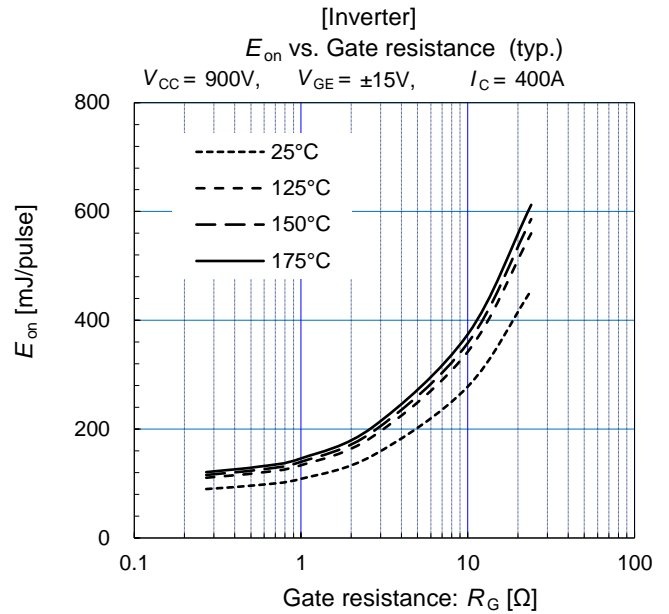
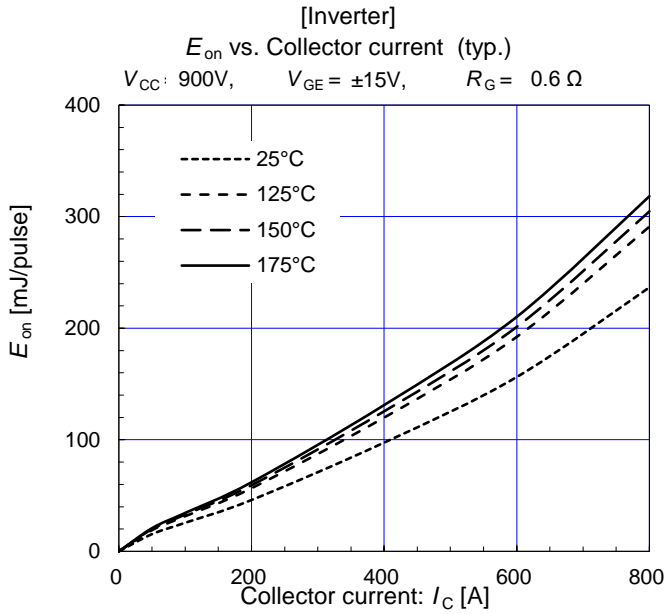
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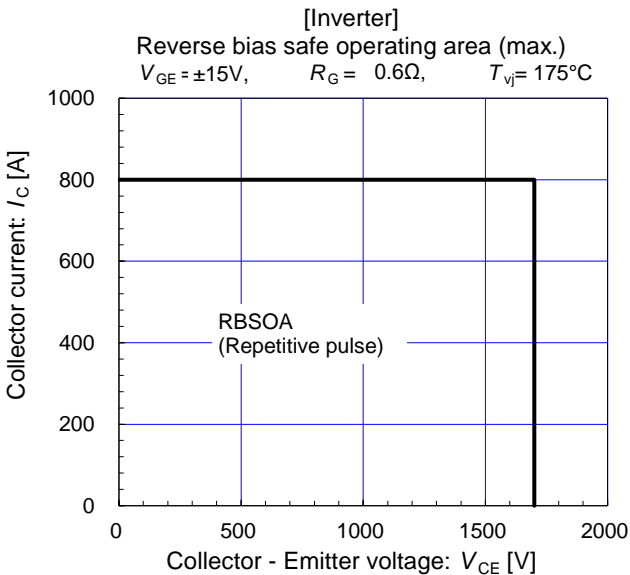
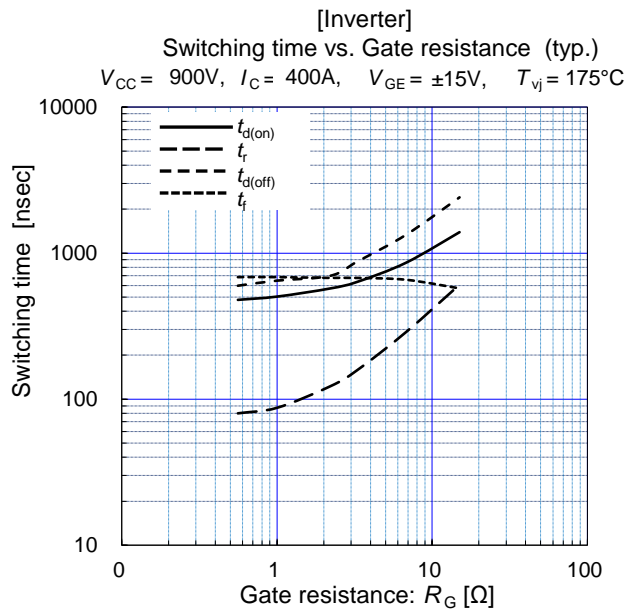
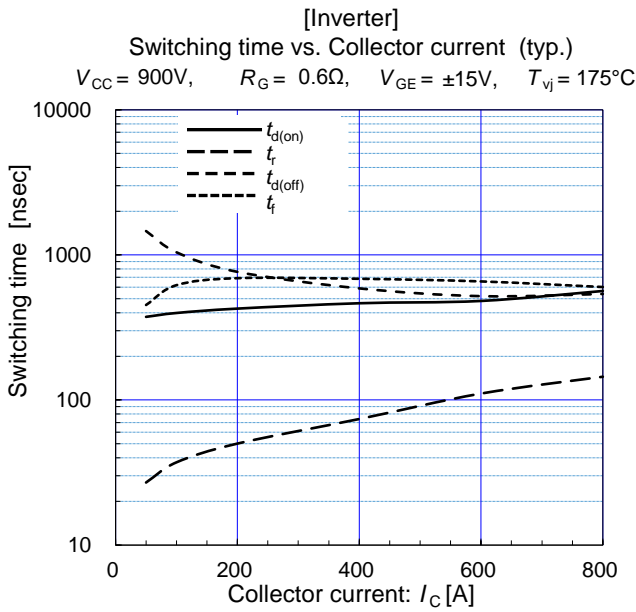
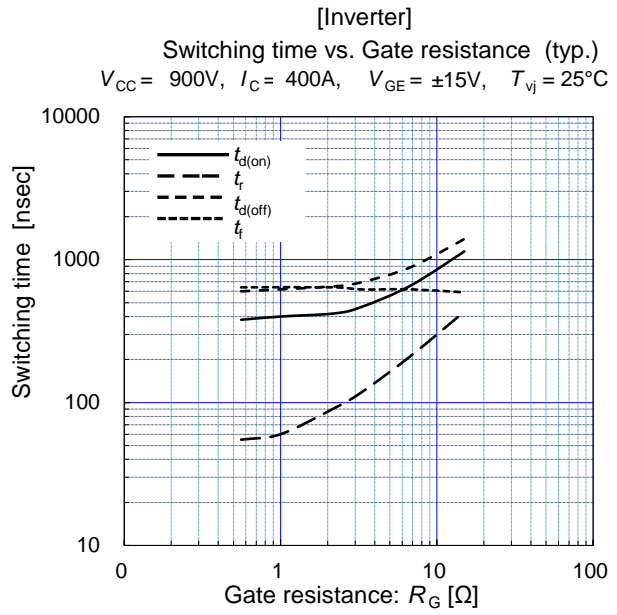
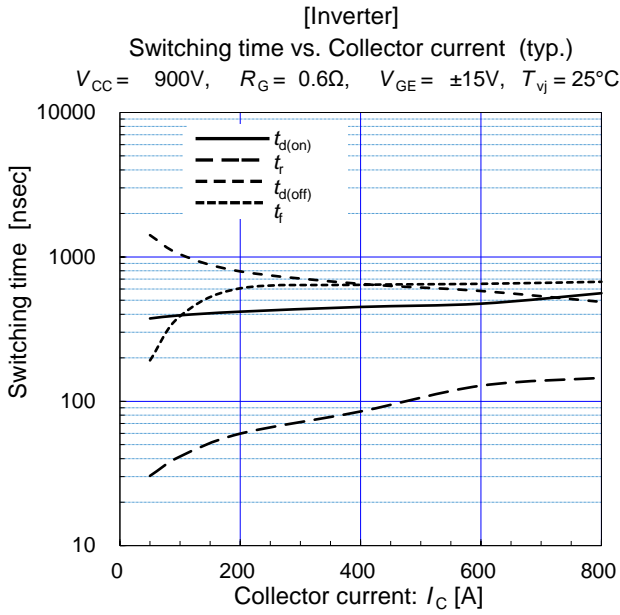
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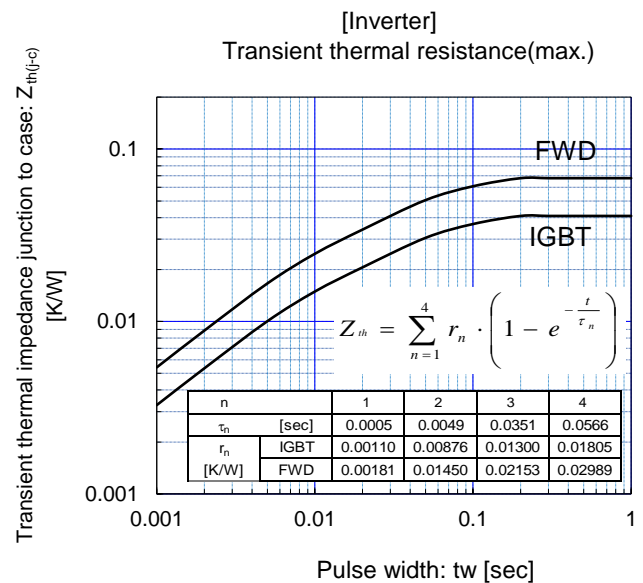
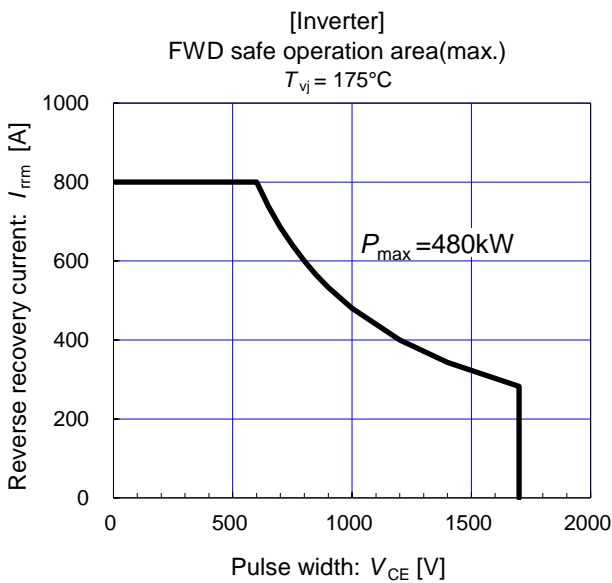
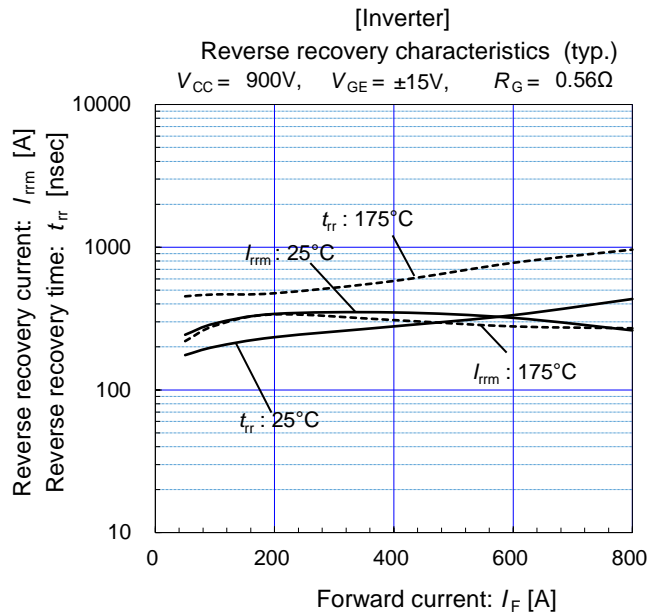
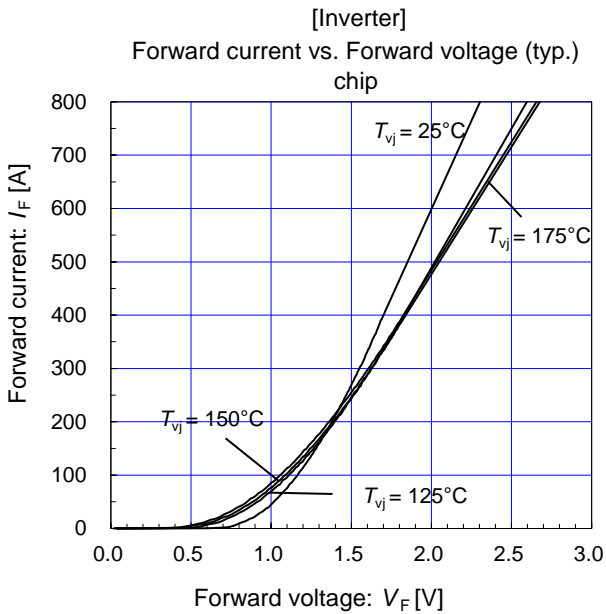
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