

6MBI150XBA120-50

IGBT Modules

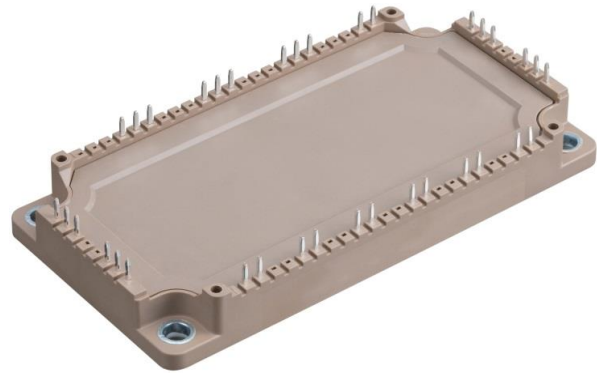
Power Module (X series)
1200V / 150A / 6-in-1 package

■ Features

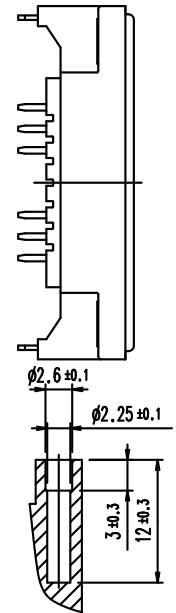
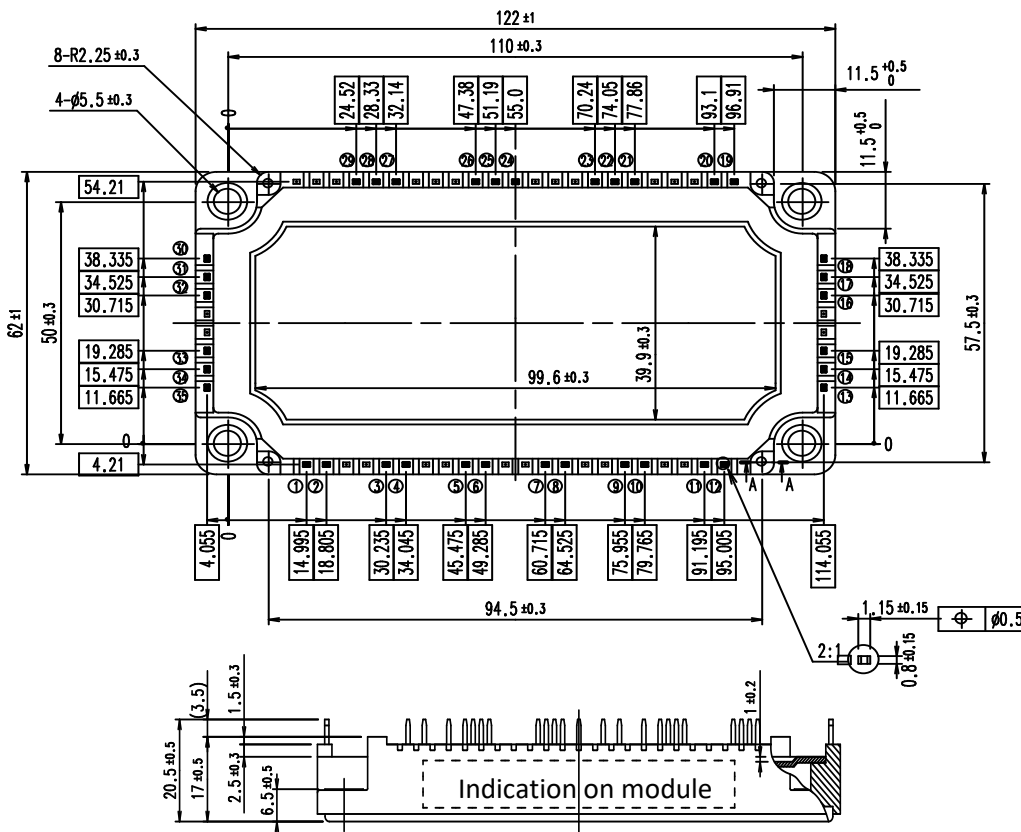
- Low $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant Product

■ Applications

- Inverter for Motor Drives,
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply



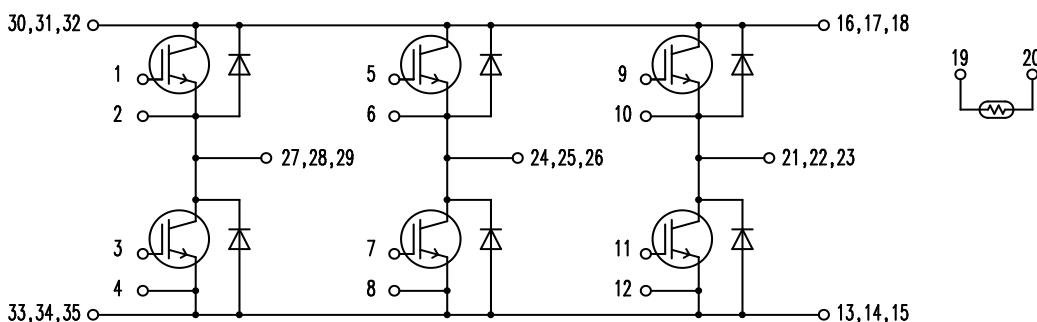
■ Outline drawing (Unit : mm)



Section A-A

Weight: 310 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}		1200	V
Gate-emitter voltage, collector-emitter short-circuited		V_{GES}		± 20	V
Collector current		I_C	Continuous $T_C=100^\circ\text{C}$	150	A
Repetitive peak collector current		I_{CRM}	1ms	300	
Forward current		I_F	Continuous	150	
Repetitive peak forward current		I_{FRM}	1ms	300	
Total power dissipation		P_{tot}	1 device	625	
Virtual junction temperature		T_{vj}		175	$^\circ\text{C}$
Operating virtual junction temperature		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.	4000	Vrms
	between thermistor and others (*2)				
Mounting torque of screws to heatsink (*3)		M_s	M5	6.0	N·m

(*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 2.5 ~ 6.0 N·m (M5)

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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}	$V_{GE} = 0\text{V}$ $V_{CE} = 1200\text{V}$	-	-	50	μA	
Gate leakage current, collector-emitter short-circuited	I_{GES}	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-	-	100	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 150\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 150\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.85	2.35	V
			$T_{vj}=25^{\circ}\text{C}$	-	1.40	1.85	
	$T_{vj}=125^{\circ}\text{C}$		-	1.75	-		
	$T_{vj}=150^{\circ}\text{C}$		-	1.80	-		
	$T_{vj}=175^{\circ}\text{C}$		-	1.85	-		
	$V_{CE(sat)}$ (chip)						
Internal Gate resistance	r_g	-	-	6.00	-	Ω	
Input capacitance	C_{ies}	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	17.4	-	nF	
Output capacitance	C_{oes}		-	0.6	-		
Reverse transfer capacitance	C_{res}		-	0.16	-		
Gate charge	Q_G		$V_{CC} = 600\text{V}, I_C: 150\text{A}$ $V_{GE} = -15 \rightarrow +15\text{V}$	-	1100		-
Forward voltage	V_F (terminal)	$V_{GE} = 0\text{V}$ $I_F = 150\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.25	2.75	V
			$T_{vj}=25^{\circ}\text{C}$	-	1.80	2.25	
	$T_{vj}=125^{\circ}\text{C}$		-	1.85	-		
	$T_{vj}=150^{\circ}\text{C}$		-	1.80	-		
	$T_{vj}=175^{\circ}\text{C}$		-	1.75	-		
	V_F (chip)						
Turn-on delay time (*1)	$t_{d(on)}$	$V_{CC} = 600\text{V}$ $I_C, I_F = 150\text{A}$ $V_{GE} = +15/-15\text{V}$ $R_G = 2.4\ \Omega$ $L_S = 30\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	0.31	-	μs
			$T_{vj}=125^{\circ}\text{C}$	-	0.35	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.36	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.37	-	
Rise time (*1)	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	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.10	-	
Turn-off delay time (*1)	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	0.35	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.39	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.40	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.42	-	
Fall time (*1)	t_f		$T_{vj}=25^{\circ}\text{C}$	-	0.15	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.16	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.23	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.12	-	
Reverse recovery time	t_{rr}	$T_{vj}=25^{\circ}\text{C}$	-	0.18	-		
		$T_{vj}=125^{\circ}\text{C}$	-	0.23	-		
		$T_{vj}=150^{\circ}\text{C}$	-	0.26	-		
		$T_{vj}=175^{\circ}\text{C}$	-	0.28	-		

(*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	Turn-on energy	$V_{CC} = 600\text{V}$ $I_C, I_F = 150\text{A}$ $V_{GE} = +15/-15\text{V}$ $R_G = 2.4\ \Omega$ $L_S = 30\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	12.36	-	mJ	
			$T_{vj}=125^{\circ}\text{C}$	-	17.95	-		
			$T_{vj}=150^{\circ}\text{C}$	-	20.09	-		
			$T_{vj}=175^{\circ}\text{C}$	-	22.27	-		
	Turn-off energy		E_{off}	$T_{vj}=25^{\circ}\text{C}$	-	11.18		-
				$T_{vj}=125^{\circ}\text{C}$	-	14.46		-
				$T_{vj}=150^{\circ}\text{C}$	-	15.38		-
				$T_{vj}=175^{\circ}\text{C}$	-	16.09		-
	Reverse recovery energy		E_{rr}	$T_{vj}=25^{\circ}\text{C}$	-	4.35		-
				$T_{vj}=125^{\circ}\text{C}$	-	7.37		-
				$T_{vj}=150^{\circ}\text{C}$	-	7.95		-
				$T_{vj}=175^{\circ}\text{C}$	-	9.07		-
Thermistor	Resistance	$T = 25^{\circ}\text{C}$	-	5000	-	Ω		
		$T = 100^{\circ}\text{C}$	465	495	520			
	B value	$T = 25/ 50^{\circ}\text{C}$	3305	3375	3450	K		

NOTICE:

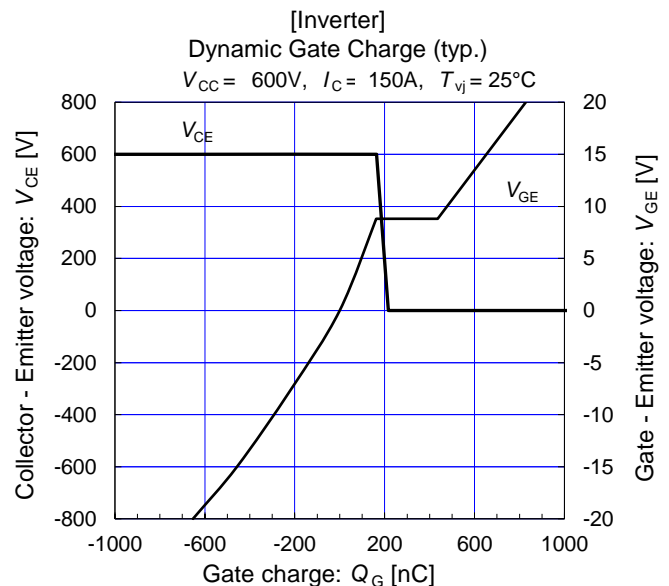
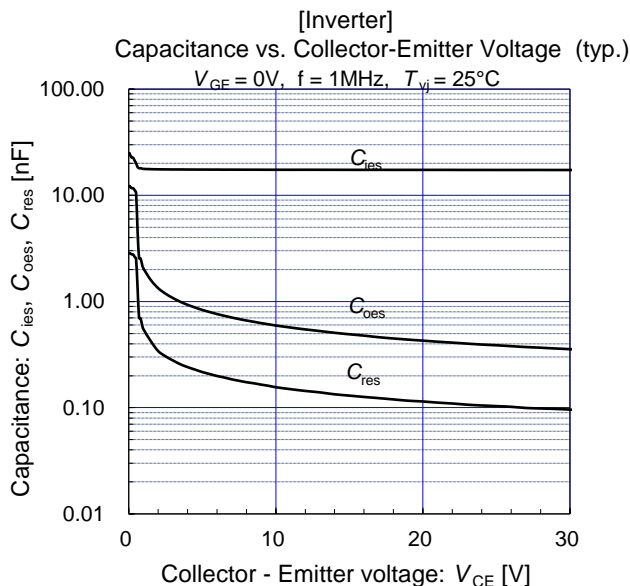
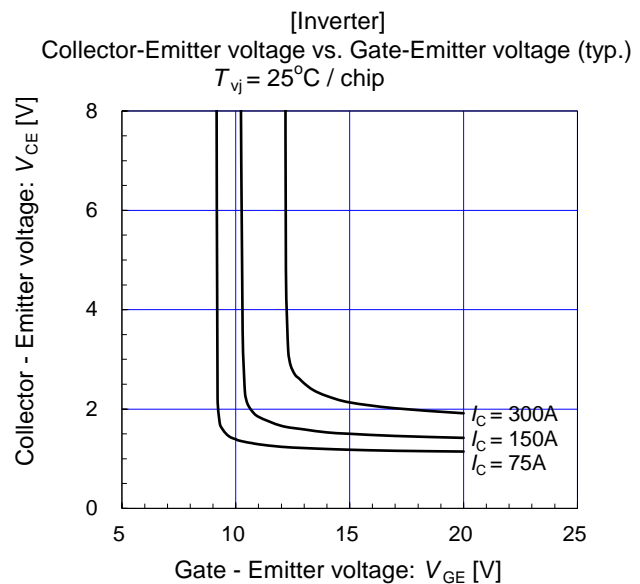
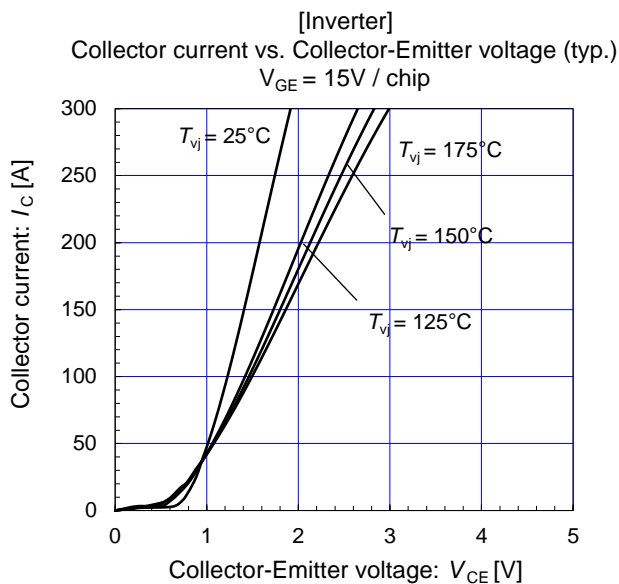
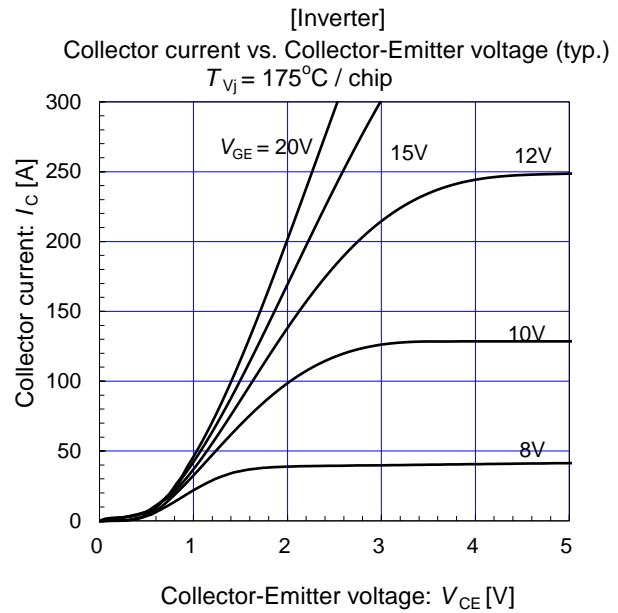
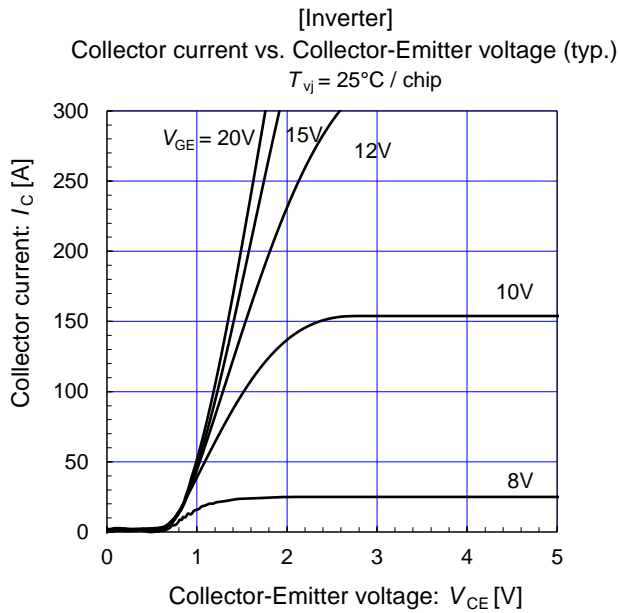
The external gate resistance (R_G) shown above is one of our recommended value for the purpose of minimum switching loss. However the optimum R_G depends on circuit configuration and/or environment. We recommend that the R_G has to be carefully chosen based on consideration if IGBT module matches design 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	-	-	0.24	K/W
		Inverter FWD	-	-	0.33	
Thermal resistance case to heatsink (1 IGBT + 1 FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.05	-	

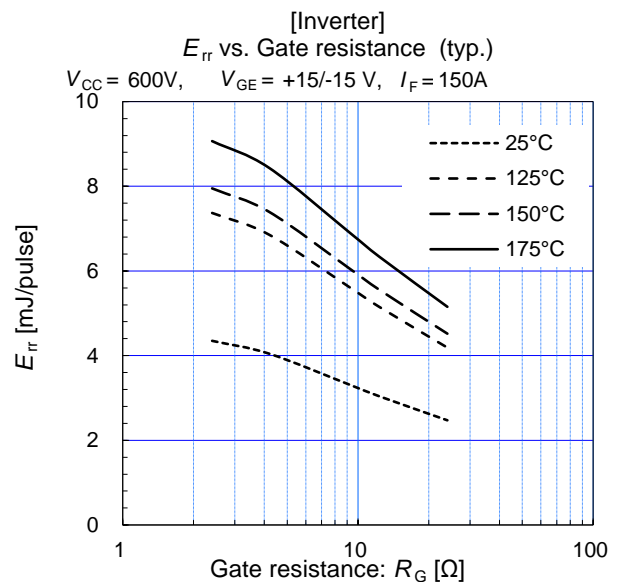
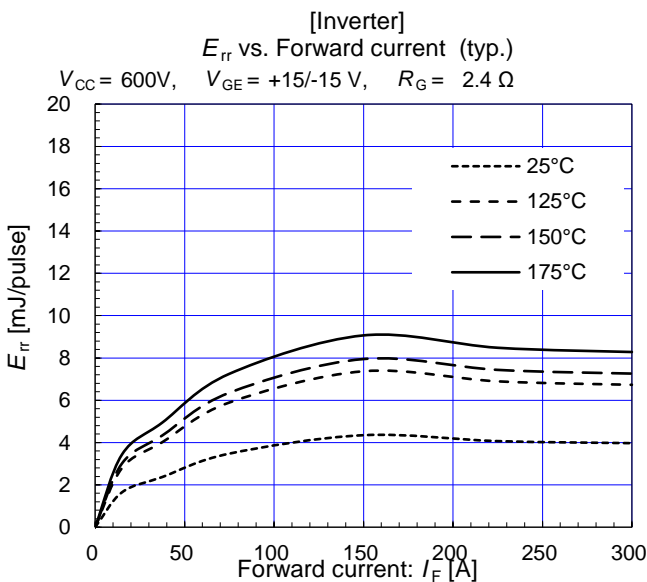
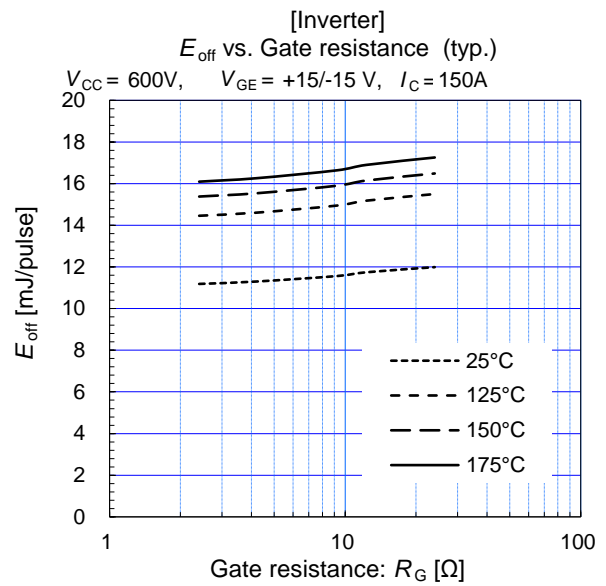
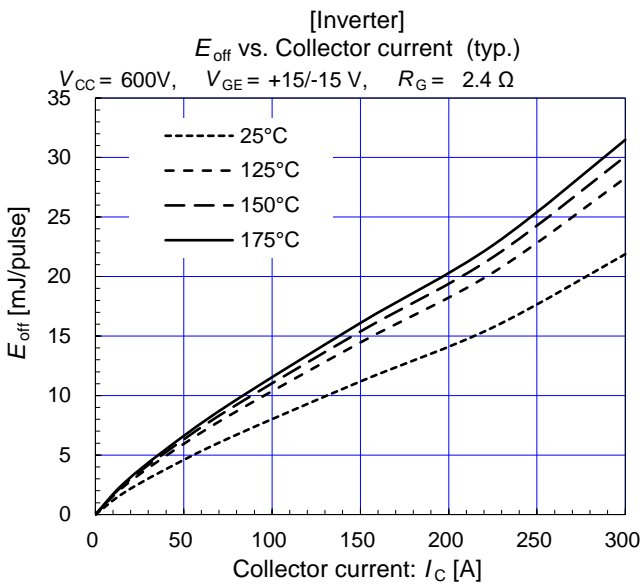
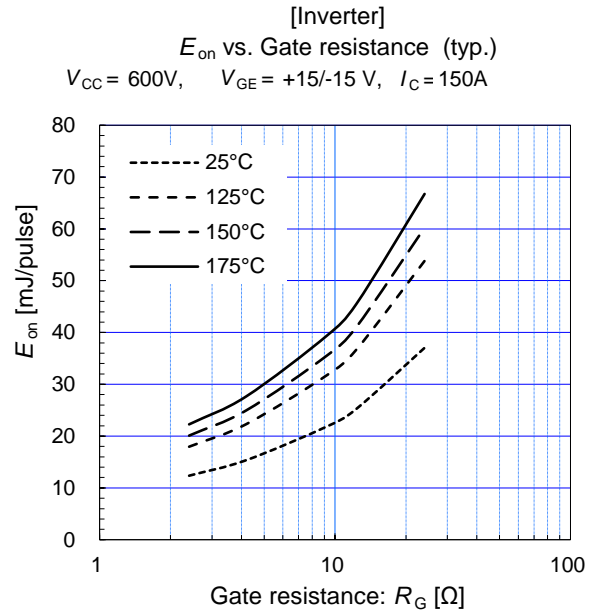
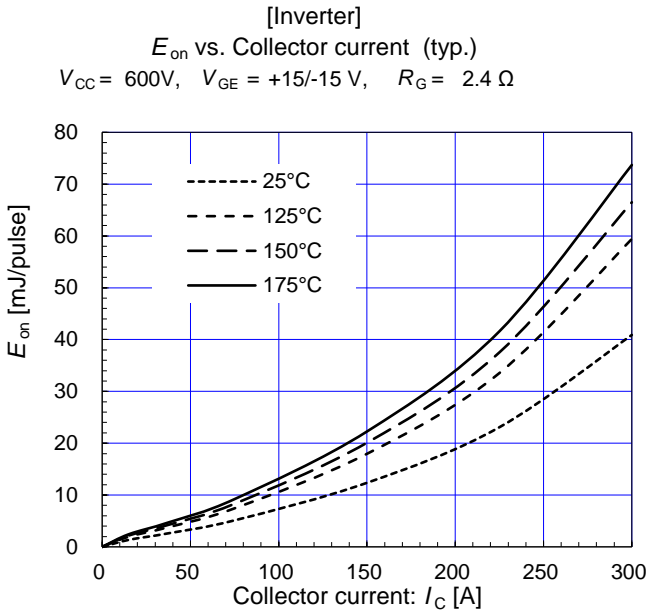
(*1) This is the value which is defined mounting on the additional heatsink with thermal grease.

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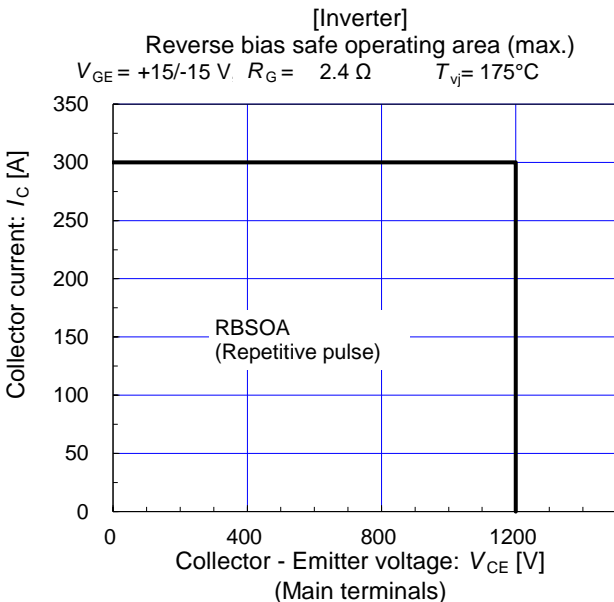
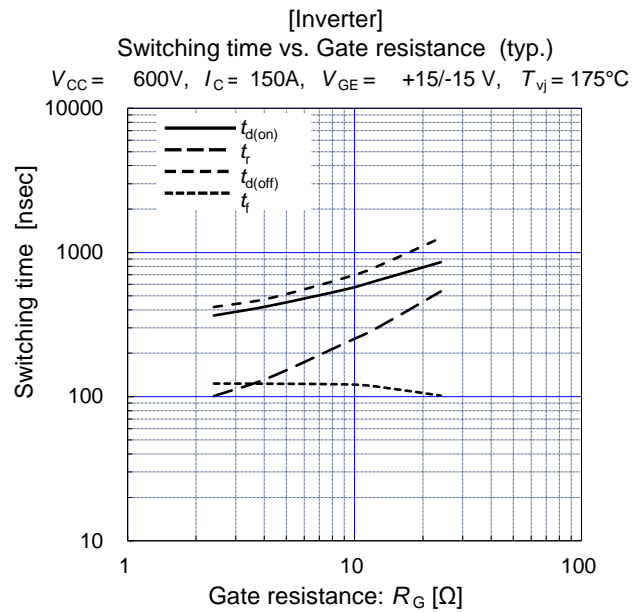
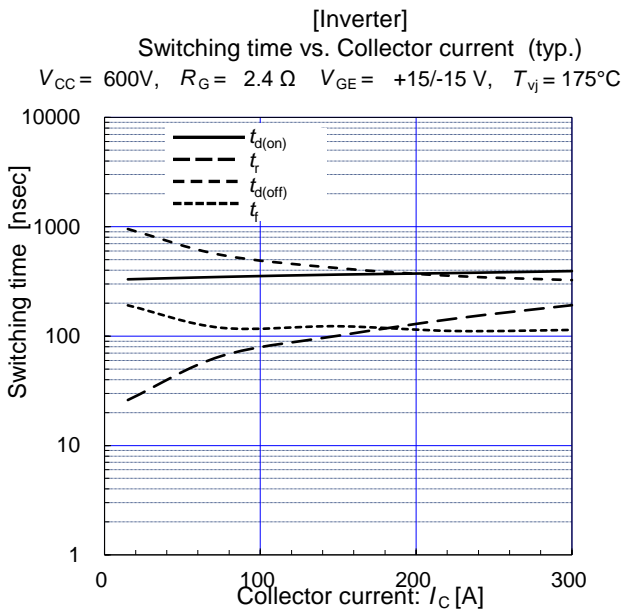
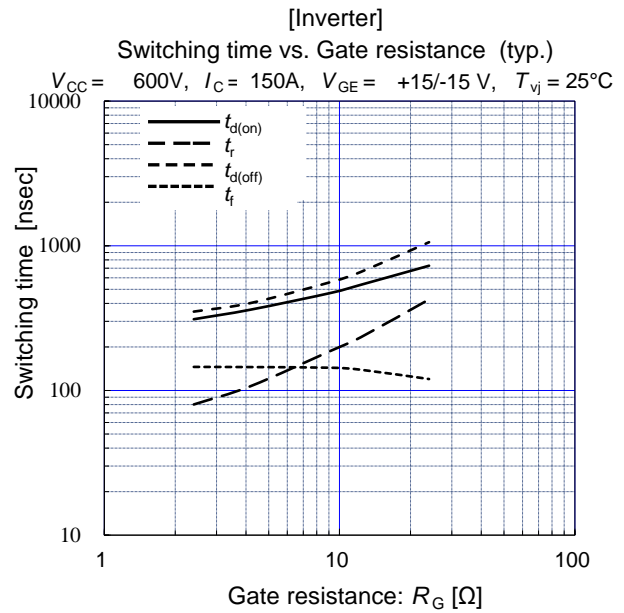
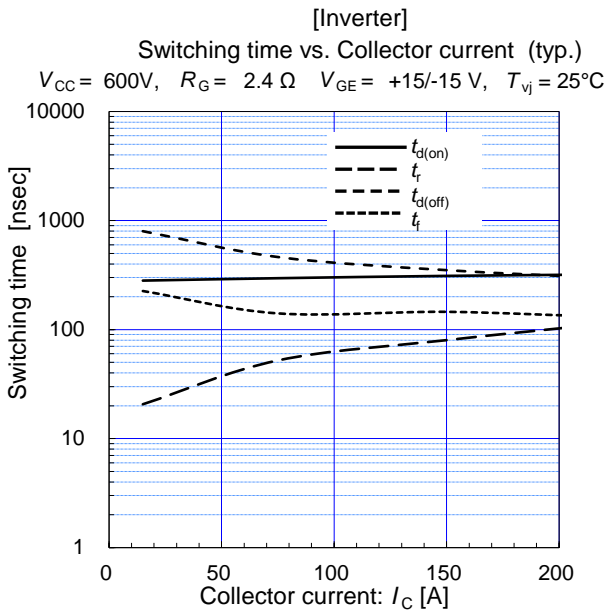


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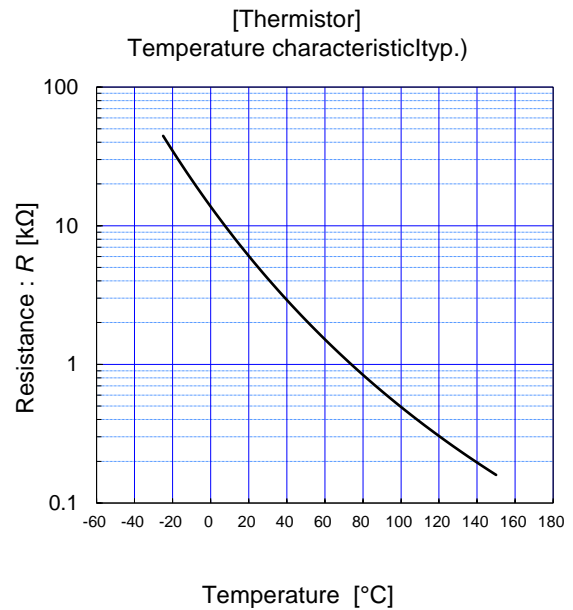
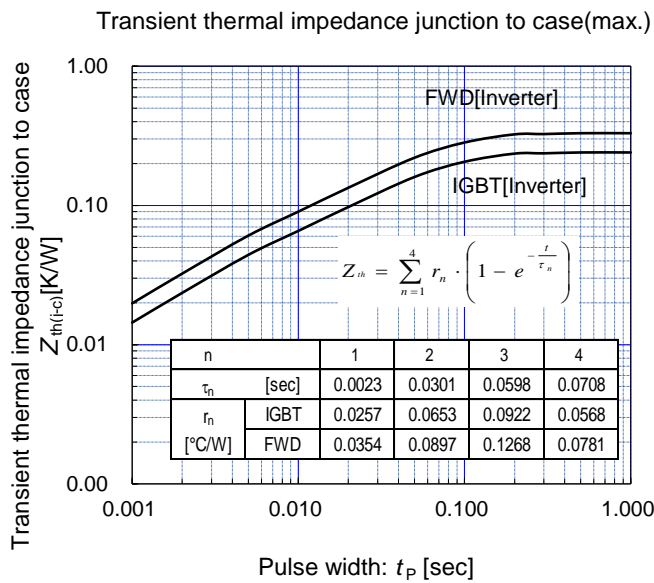
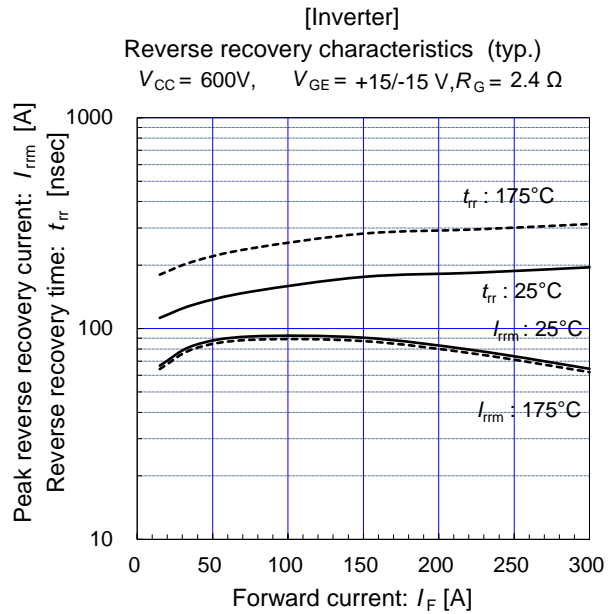
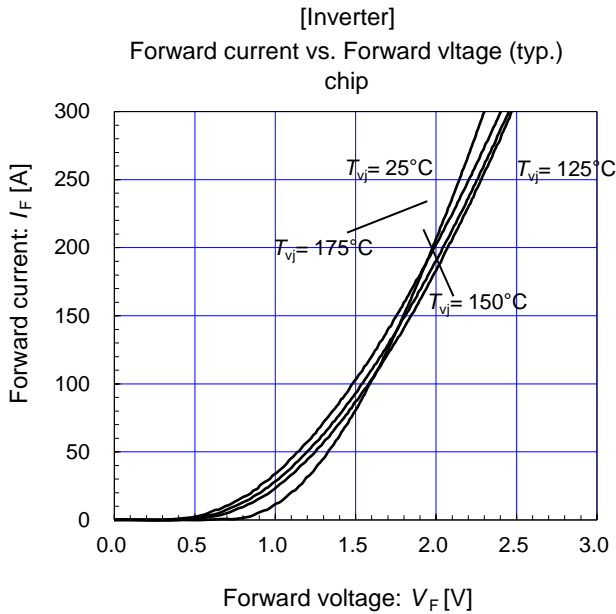


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