

6MBI100XBA120-50

IGBT Modules

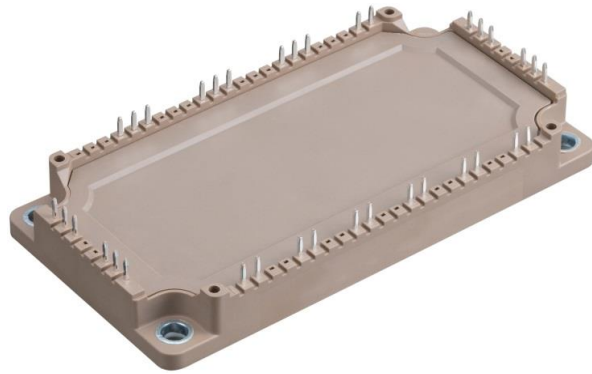
Power Module (X series)
1200V / 100A / 6-in-1 package

■ Features

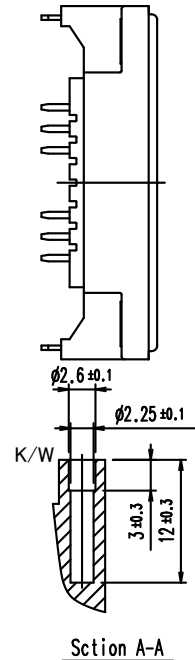
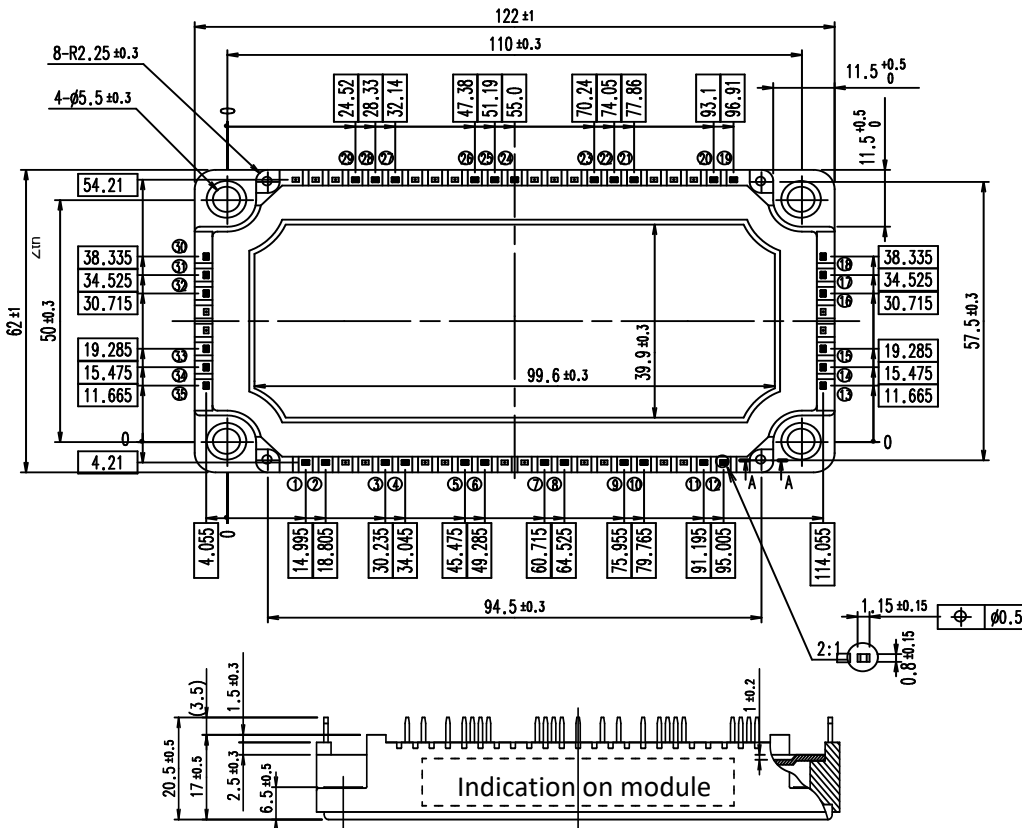
- Low $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant Product

■ Applications

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

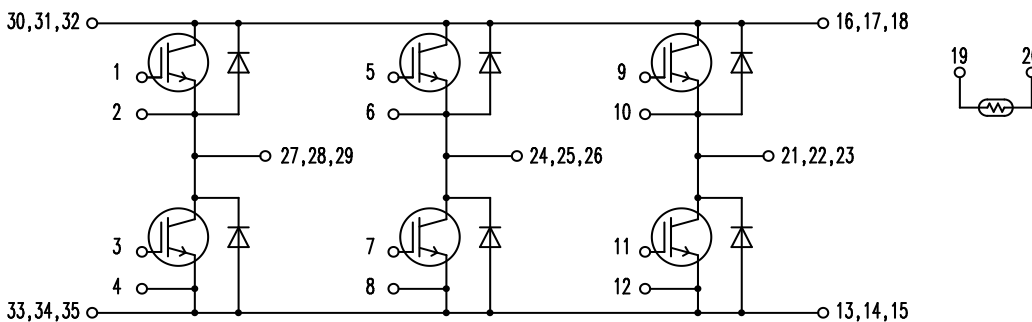


■ Outline drawing (Unit : mm)



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 $T_C=100^\circ\text{C}$	100	A
Repetitive peak collector current		I_{CRM}	1ms	200	
Forward current		I_F	Continuous	100	
Repetitive peak forward current		I_{FRM}	1ms	200	
Total power dissipation		P_{tot}	1 device	440	
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	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 100\text{mA}$	6.0	6.5	7.0	V			
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 100\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.20	V		
			$T_{vj}=25^{\circ}\text{C}$	-	1.45	1.90			
	$T_{vj}=125^{\circ}\text{C}$		-	1.80	-				
	$T_{vj}=150^{\circ}\text{C}$		-	1.85	-				
	$T_{vj}=175^{\circ}\text{C}$		-	1.90	-				
Internal Gate resistance	r_g	-	-	-	5.60	-	Ω		
			Input capacitance	C_{ies}	-	11.6	-	nF	
			Output capacitance	C_{oes}	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	0.4		-
			Reverse transfer capacitance	C_{res}		-	0.10		-
Gate charge	Q_G	$V_{CC} = 600\text{V}, I_C = 100\text{A}$ $V_{GE} = -15 \rightarrow +15\text{V}$	-	740.0		-	nC		
Forward voltage	V_F (terminal)	$V_{GE} = 0\text{V}$ $I_F = 100\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-		2.10	2.55	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	-				
Turn-on delay time (*1)	$t_{d(on)}$	$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/-15\text{V}$ $R_G = 5.1\ \Omega$ $L_S = 30\ \text{nH}$	$T_{vj}=25^{\circ}\text{C}$	-	0.21	-	μs		
			$T_{vj}=125^{\circ}\text{C}$	-	0.25	-			
			$T_{vj}=150^{\circ}\text{C}$	-	0.25	-			
			$T_{vj}=175^{\circ}\text{C}$	-	0.26	-			
Rise time (*1)	t_r		$T_{vj}=25^{\circ}\text{C}$	-	0.05	-			
			$T_{vj}=125^{\circ}\text{C}$	-	0.06	-			
			$T_{vj}=150^{\circ}\text{C}$	-	0.06	-			
			$T_{vj}=175^{\circ}\text{C}$	-	0.06	-			
Turn-off delay time (*1)	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	0.29	-			
			$T_{vj}=125^{\circ}\text{C}$	-	0.32	-			
			$T_{vj}=150^{\circ}\text{C}$	-	0.33	-			
			$T_{vj}=175^{\circ}\text{C}$	-	0.34	-			
Fall time (*1)	t_f		$T_{vj}=25^{\circ}\text{C}$	-	0.10	-			
			$T_{vj}=125^{\circ}\text{C}$	-	0.16	-			
			$T_{vj}=150^{\circ}\text{C}$	-	0.18	-			
			$T_{vj}=175^{\circ}\text{C}$	-	0.20	-			
Reverse recovery time	t_{rr}	$T_{vj}=25^{\circ}\text{C}$	-	0.11	-				
		$T_{vj}=125^{\circ}\text{C}$	-	0.18	-				
		$T_{vj}=150^{\circ}\text{C}$	-	0.22	-				
		$T_{vj}=175^{\circ}\text{C}$	-	0.25	-				

(*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	$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/-15\text{ V}$ $R_G = 5.1\ \Omega$ $L_S = 30\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	7.45	-	mJ	
			$T_{vj}=125^{\circ}\text{C}$	-	10.51	-		
			$T_{vj}=150^{\circ}\text{C}$	-	11.50	-		
			$T_{vj}=175^{\circ}\text{C}$	-	12.79	-		
	Turn-off energy		E_{off}	$T_{vj}=25^{\circ}\text{C}$	-	7.07		-
				$T_{vj}=125^{\circ}\text{C}$	-	8.82		-
				$T_{vj}=150^{\circ}\text{C}$	-	9.55		-
				$T_{vj}=175^{\circ}\text{C}$	-	9.93		-
	Reverse recovery energy		E_{rr}	$T_{vj}=25^{\circ}\text{C}$	-	3.00		-
				$T_{vj}=125^{\circ}\text{C}$	-	4.88		-
				$T_{vj}=150^{\circ}\text{C}$	-	5.88		-
				$T_{vj}=175^{\circ}\text{C}$	-	6.51		-
Thermistor	Resistance	$T = 25^{\circ}\text{C}$	-	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 Zth(j-c) [K/W]

matches design criteria, for example, switching loss, EMC/EMI, spike voltage, surge current and no unexpected oscillation and so on.

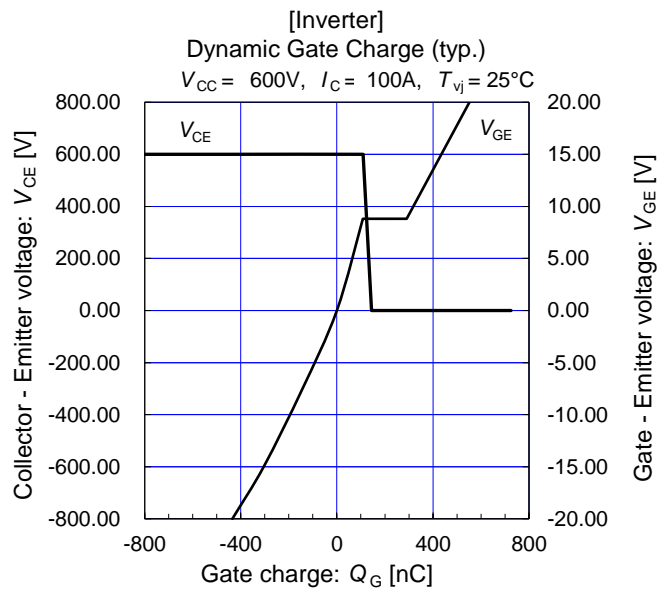
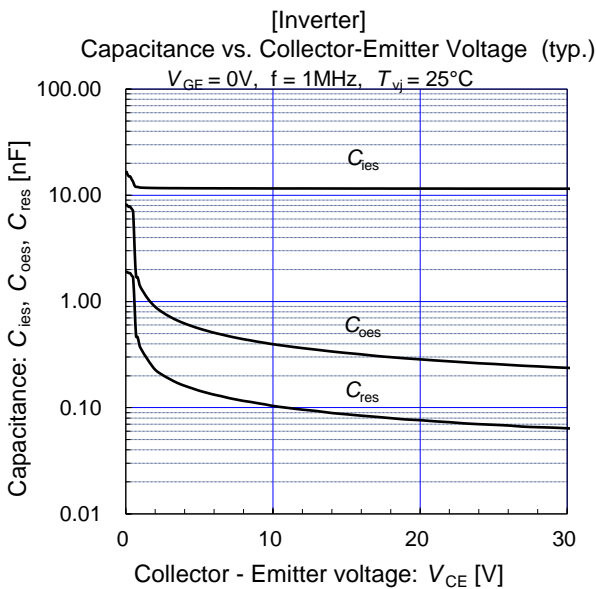
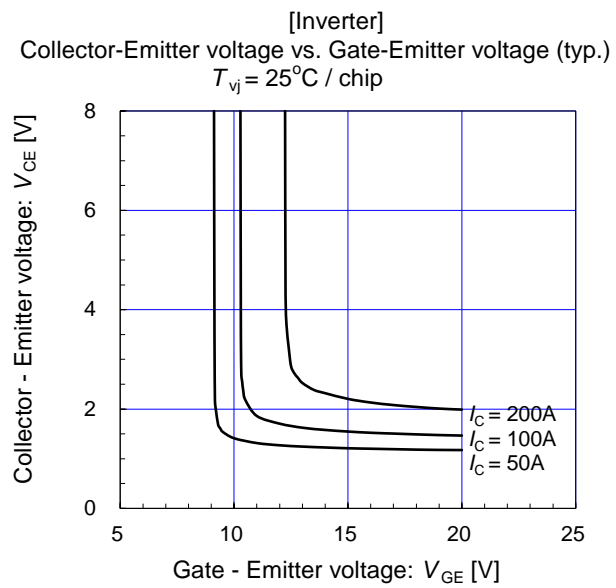
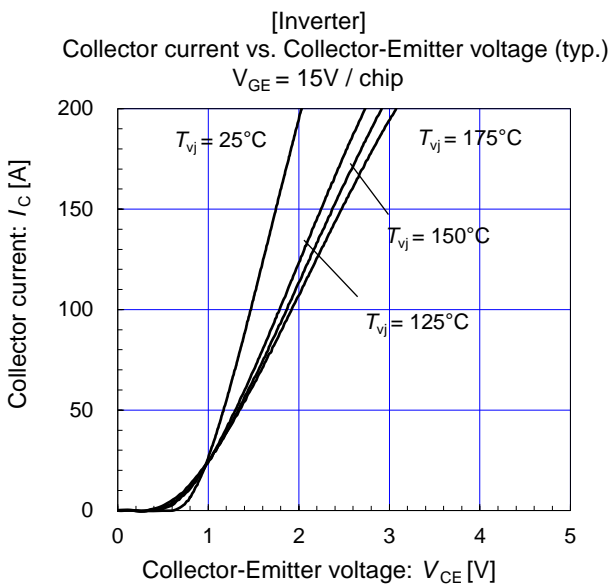
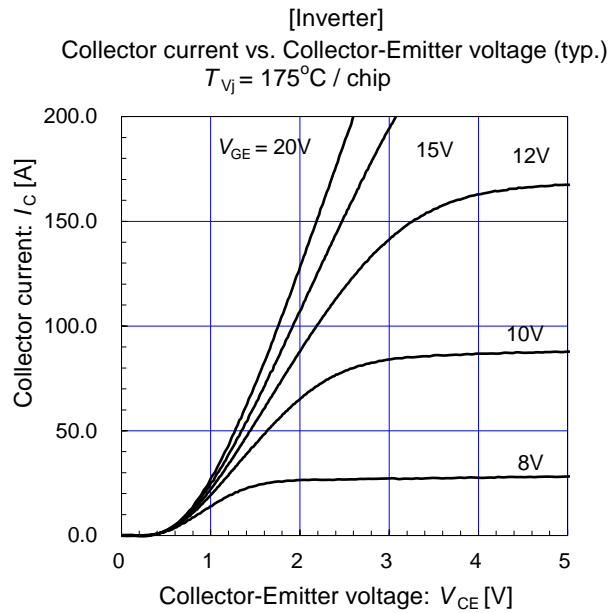
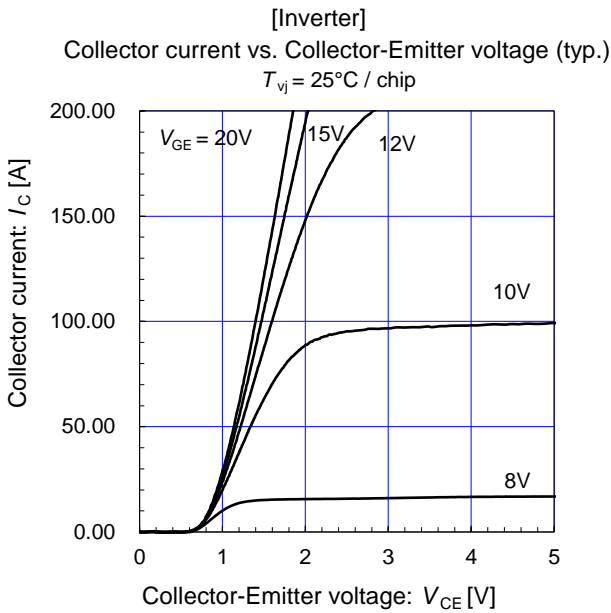
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case (1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.34	K/W
		Inverter FWD	-	-	0.45	
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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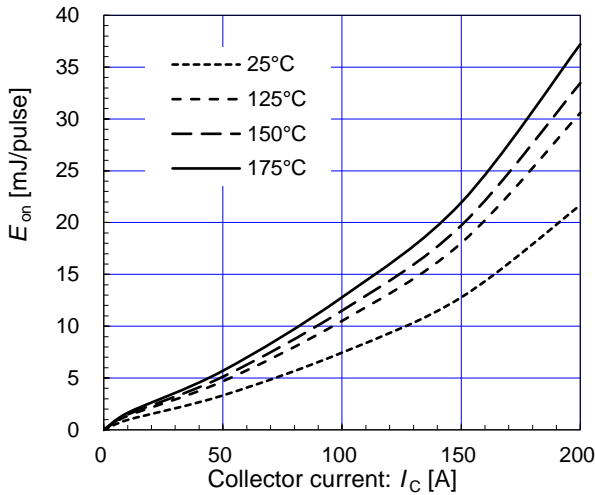
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[Inverter]

E_{on} vs. Collector current (typ.)

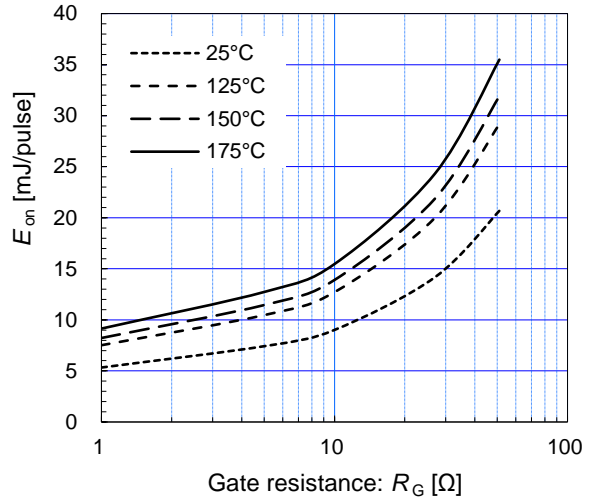
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 5.1\ \Omega$



[Inverter]

E_{on} vs. Gate resistance (typ.)

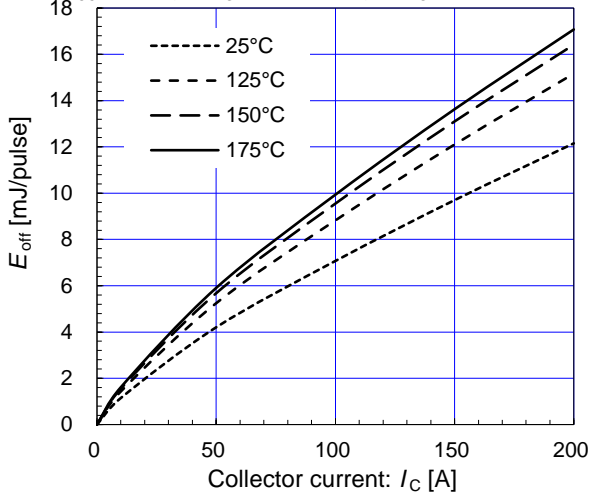
$V_{CC} = 600V, V_{GE} = +15/-15V, I_C = 100A$



[Inverter]

E_{off} vs. Collector current (typ.)

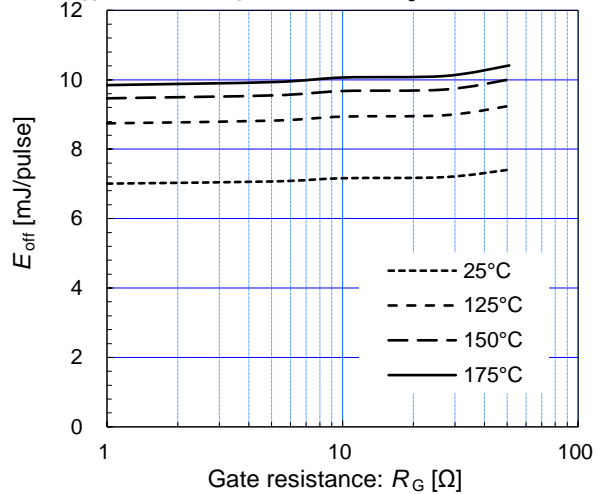
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 5.1\ \Omega$



[Inverter]

E_{off} vs. Gate resistance (typ.)

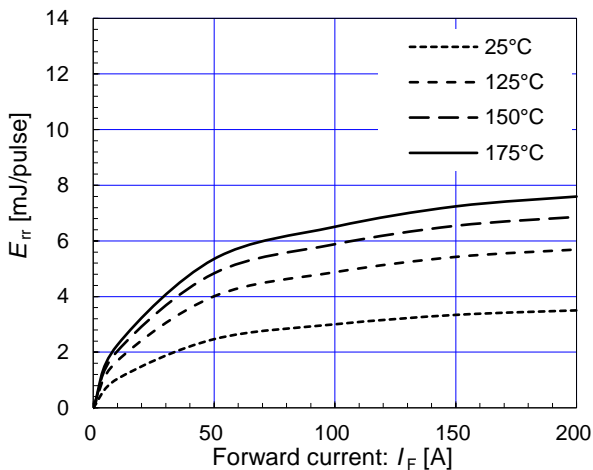
$V_{CC} = 600V, V_{GE} = +15/-15V, I_C = 100A$



[Inverter]

E_{rr} vs. Forward current (typ.)

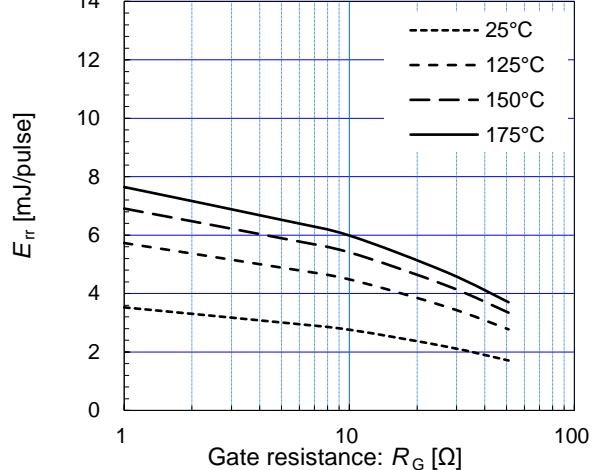
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 5.1\ \Omega$



[Inverter]

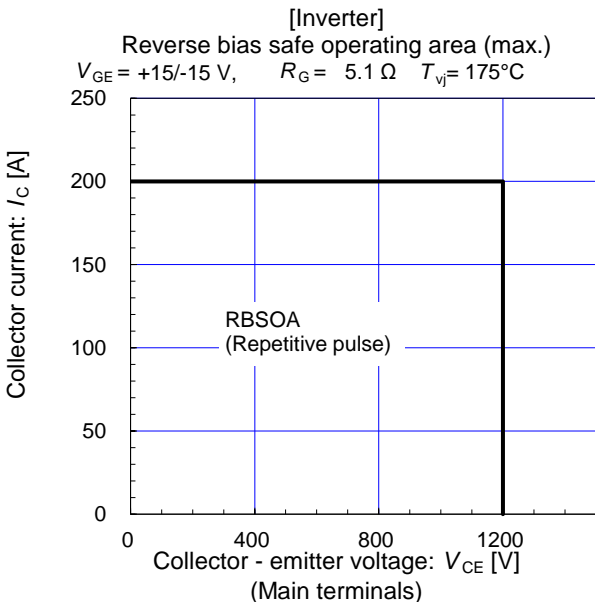
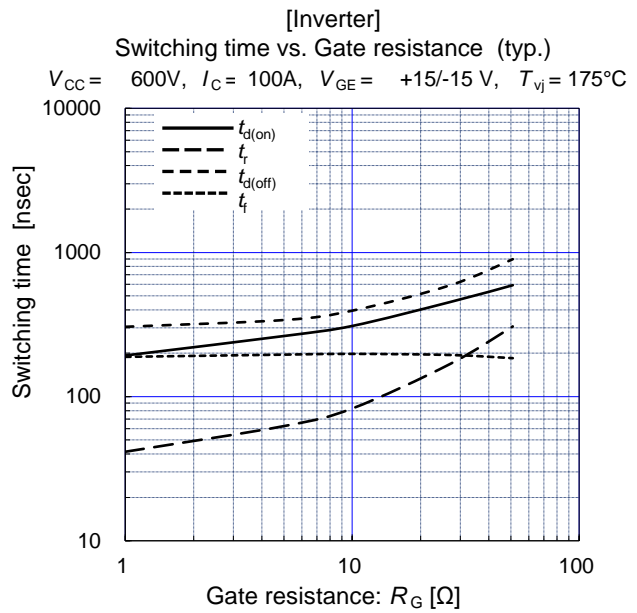
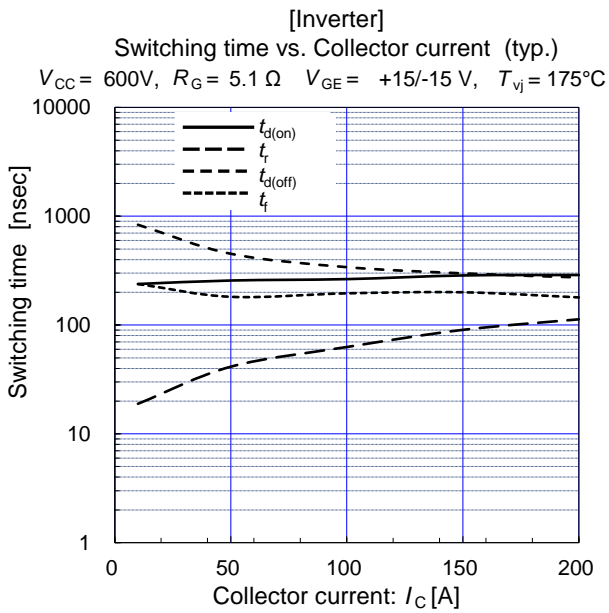
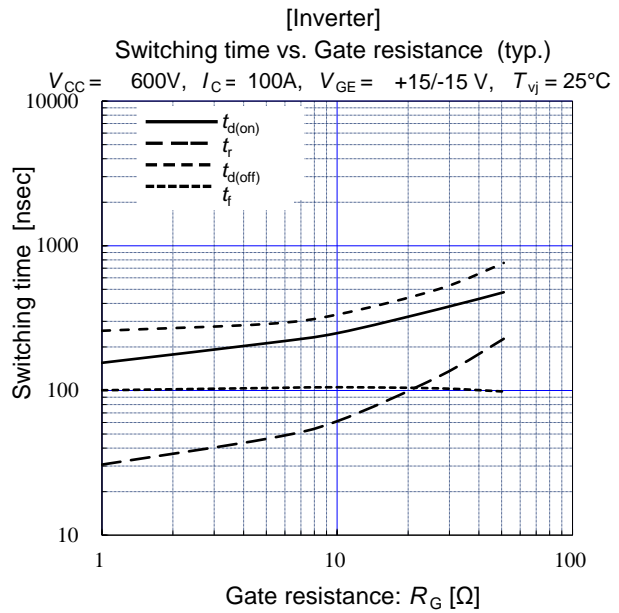
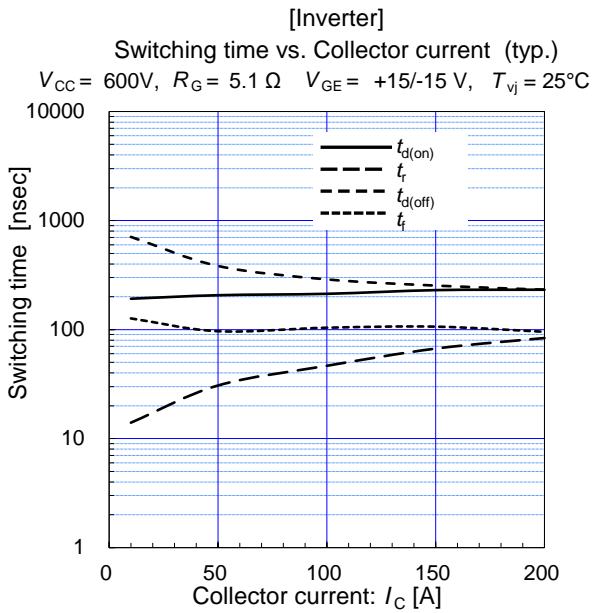
E_{rr} vs. Gate resistance (typ.)

$V_{CC} = 600V, V_{GE} = +15/-15V, I_F = 100A$



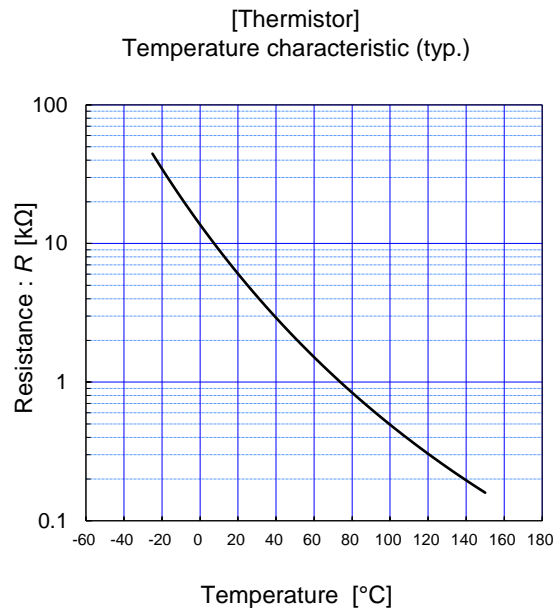
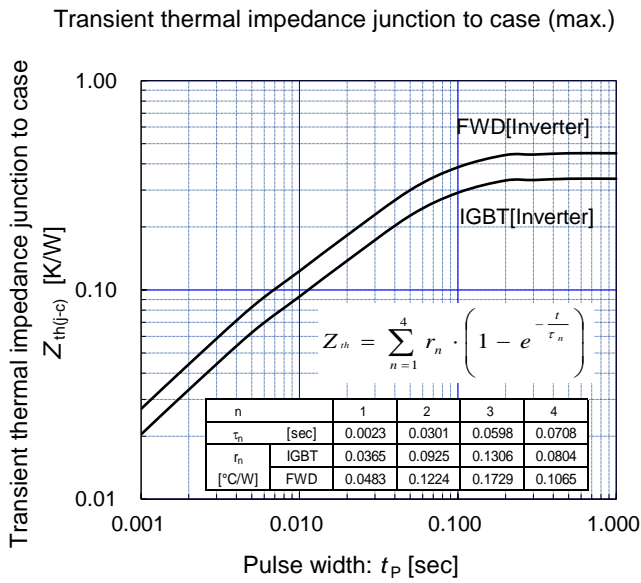
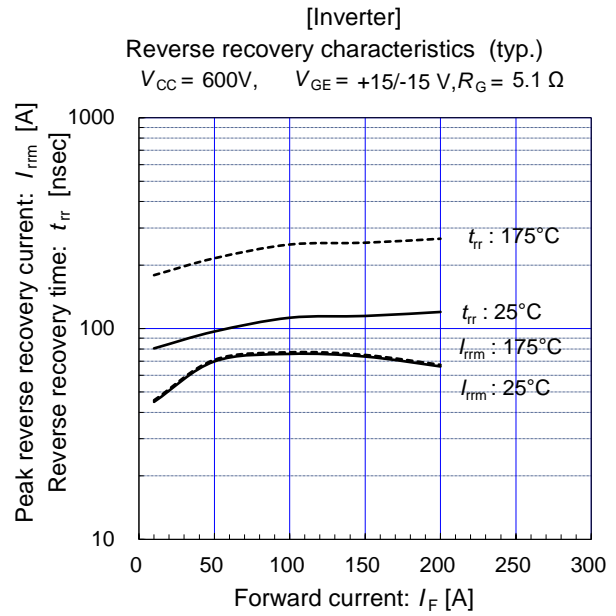
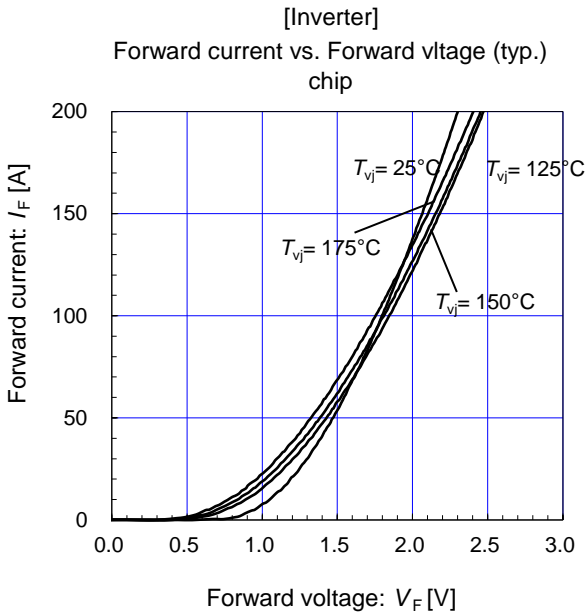
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