

6MBI150XBA120-50

IGBT Modules

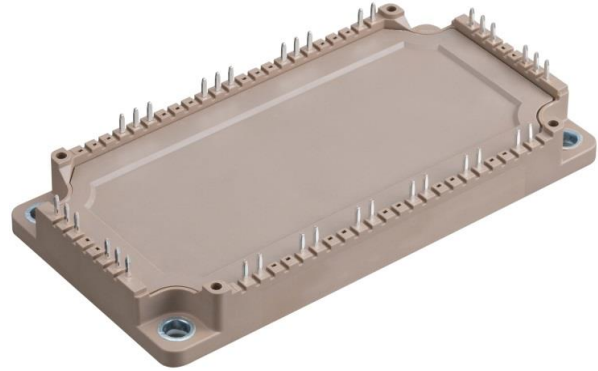
Power Module (X series)
1200V / 150A / 6-in-1 package

■ Features

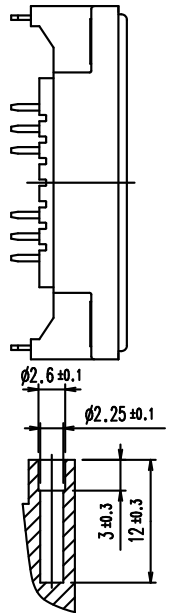
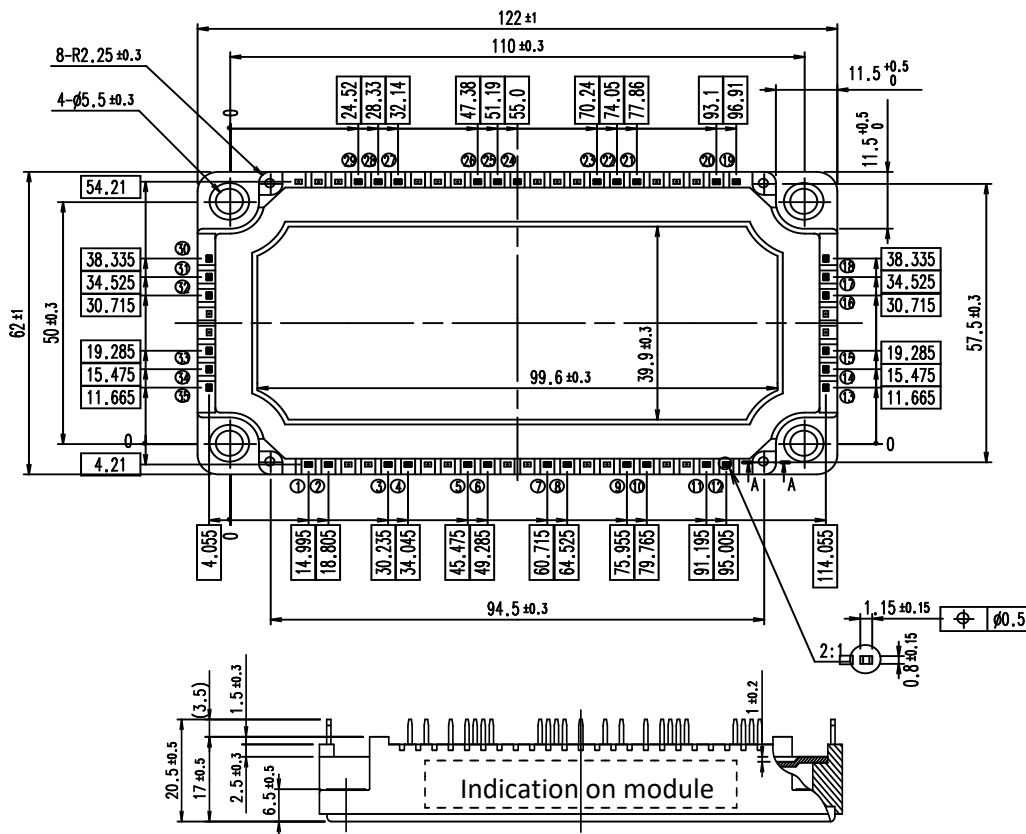
LOW $V_{CE(sat)}$
 Compact Package
 P.C.Board Mount Module
 Converter Diode Bridge Dynamic Brake Circuit
 RoHS compliant Product

■ Applications

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



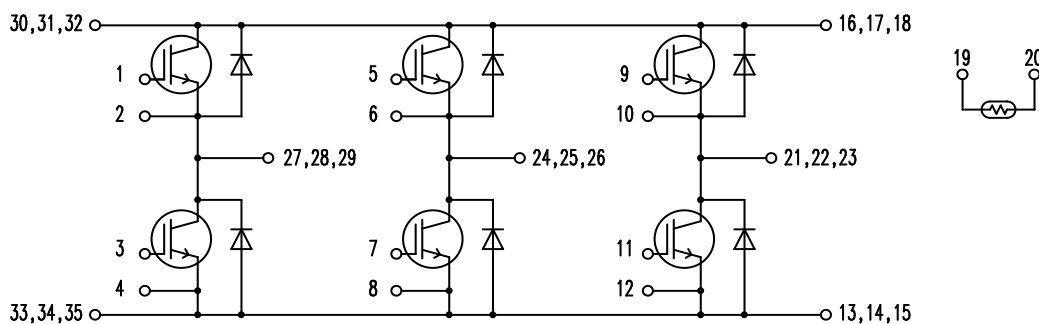
■ Outline drawing (Unit : mm)



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	W
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°C unless otherwise specified)

Items		Symbols	Conditions		Characteristics			Units
					min.	typ.	max.	
Inverter	Collector-emitter cut-off current, gate-emitter short-circuited	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 1200V$		-	-	50	μA
	Gate leakage current , collector-emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$		-	-	100	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 150mA$		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 150A$	$T_{vj}=25^{\circ}C$	-	1.85	2.35	V
		$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}C$	-	1.40	1.85	
				$T_{vj}=125^{\circ}C$	-	1.75	-	
				$T_{vj}=150^{\circ}C$	-	1.80	-	
				$T_{vj}=175^{\circ}C$	-	1.85	-	
	Internal Gate resistance	r_g	-		-	6.00	-	Ω
	Input capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$		-	17.4	-	nF
	Output capacitance	C_{oes}			-	0.6	-	
	Reverse transfer capacitance	C_{res}			-	0.16	-	
	Gate charge	Q_G	$V_{CC} = 600V, I_C = 150A$ $V_{GE} = -15 \rightarrow +15V$		-	1100	-	nC
	Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 150A$	$T_{vj}=25^{\circ}C$	-	2.25	2.75	V
		V_F (chip)		$T_{vj}=25^{\circ}C$	-	1.80	2.25	
				$T_{vj}=125^{\circ}C$	-	1.85	-	
				$T_{vj}=150^{\circ}C$	-	1.80	-	
				$T_{vj}=175^{\circ}C$	-	1.75	-	
	Turn-on delay time (*1)	$t_{d(on)}$	$V_{CC} = 600V$ $I_C, I_F = 150A$ $V_{GE} = +15/-15 V$ $R_G = 2.4 \Omega$ $L_S = 30 nH$	$T_{vj}=25^{\circ}C$	-	0.31	-	μs
	Rise time (*1)	t_r		$T_{vj}=125^{\circ}C$	-	0.35	-	
				$T_{vj}=150^{\circ}C$	-	0.36	-	
				$T_{vj}=175^{\circ}C$	-	0.37	-	
				$T_{vj}=25^{\circ}C$	-	0.08	-	
	Turn-off delay time (*1)	$t_{d(off)}$		$T_{vj}=125^{\circ}C$	-	0.09	-	
$T_{vj}=150^{\circ}C$				-	0.09	-		
$T_{vj}=175^{\circ}C$				-	0.10	-		
$T_{vj}=25^{\circ}C$				-	0.35	-		
Fall time (*1)	t_f	$T_{vj}=125^{\circ}C$		-	0.39	-		
		$T_{vj}=150^{\circ}C$		-	0.40	-		
		$T_{vj}=175^{\circ}C$		-	0.42	-		
		$T_{vj}=25^{\circ}C$		-	0.15	-		
Reverse recovery time	t_{rr}	$T_{vj}=125^{\circ}C$		-	0.16	-		
		$T_{vj}=150^{\circ}C$		-	0.23	-		
		$T_{vj}=175^{\circ}C$		-	0.12	-		
		$T_{vj}=25^{\circ}C$	-	0.18	-			
		$T_{vj}=125^{\circ}C$	-	0.23	-			
		$T_{vj}=150^{\circ}C$	-	0.26	-			
		$T_{vj}=175^{\circ}C$	-	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	E_{on}	$V_{\text{CC}} = 600\text{V}$ $I_{\text{C}}, I_{\text{F}} = 150\text{A}$ $V_{\text{GE}} = +15/-15 \text{ V}$ $R_{\text{G}} = 2.4 \, \Omega$ $L_{\text{S}} = 30 \text{ nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	12.36	-	mJ
				$T_{\text{vj}} = 125^{\circ}\text{C}$	-	17.95	-	
				$T_{\text{vj}} = 150^{\circ}\text{C}$	-	20.09	-	
				$T_{\text{vj}} = 175^{\circ}\text{C}$	-	22.27	-	
	Turn-off energy	E_{off}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	11.18	-	
				$T_{\text{vj}} = 125^{\circ}\text{C}$	-	14.46	-	
				$T_{\text{vj}} = 150^{\circ}\text{C}$	-	15.38	-	
				$T_{\text{vj}} = 175^{\circ}\text{C}$	-	16.09	-	
	Reverse recovery energy	E_{rr}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	4.35	-	
				$T_{\text{vj}} = 125^{\circ}\text{C}$	-	7.37	-	
				$T_{\text{vj}} = 150^{\circ}\text{C}$	-	7.95	-	
				$T_{\text{vj}} = 175^{\circ}\text{C}$	-	9.07	-	
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.

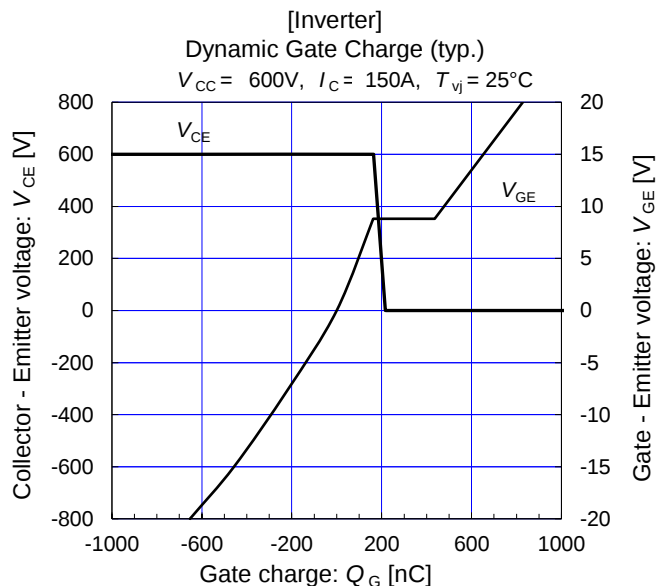
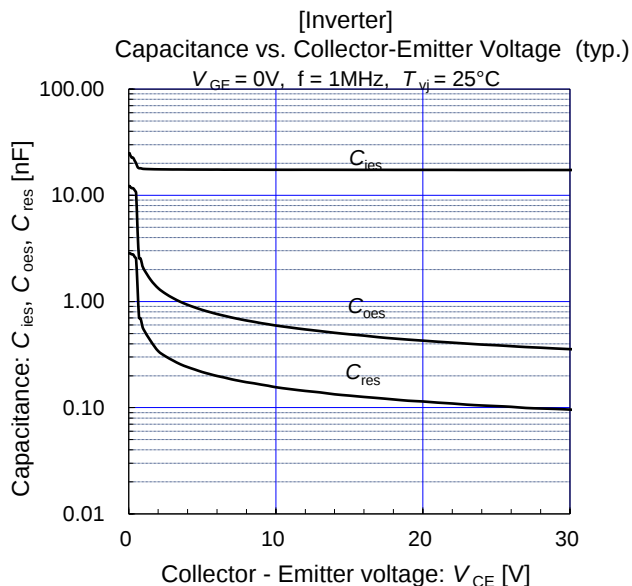
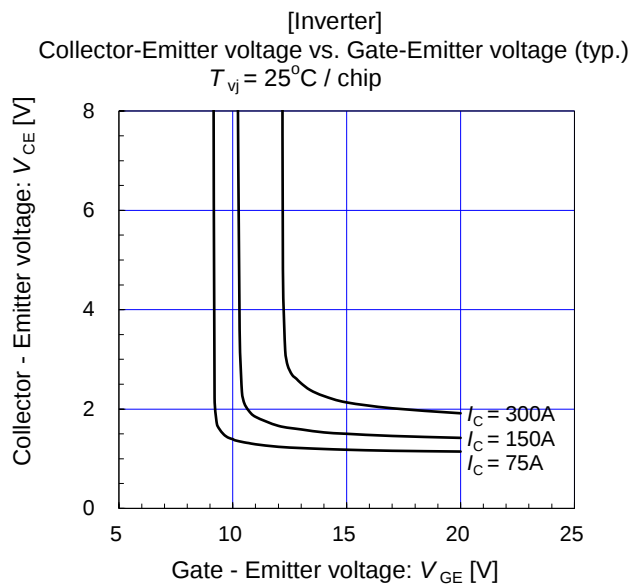
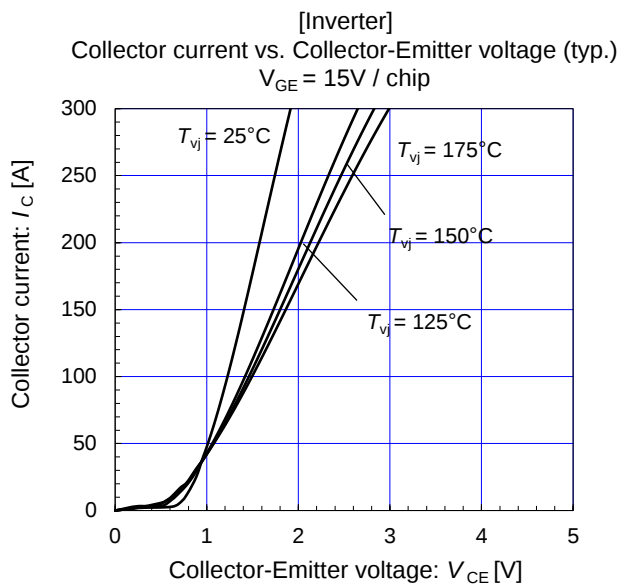
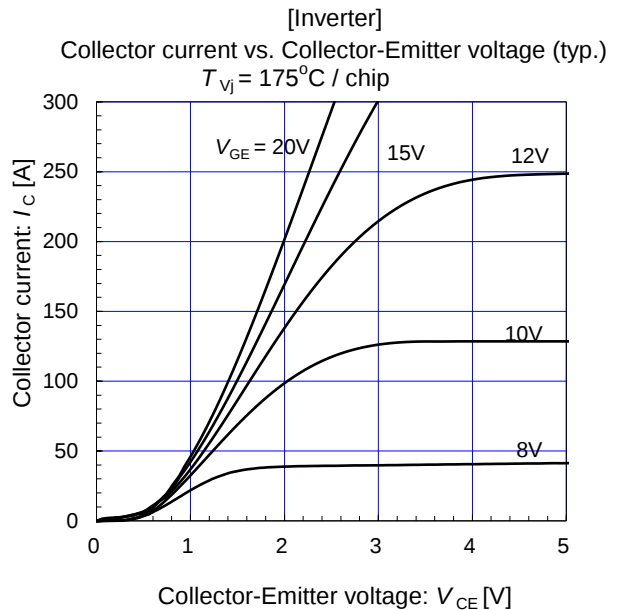
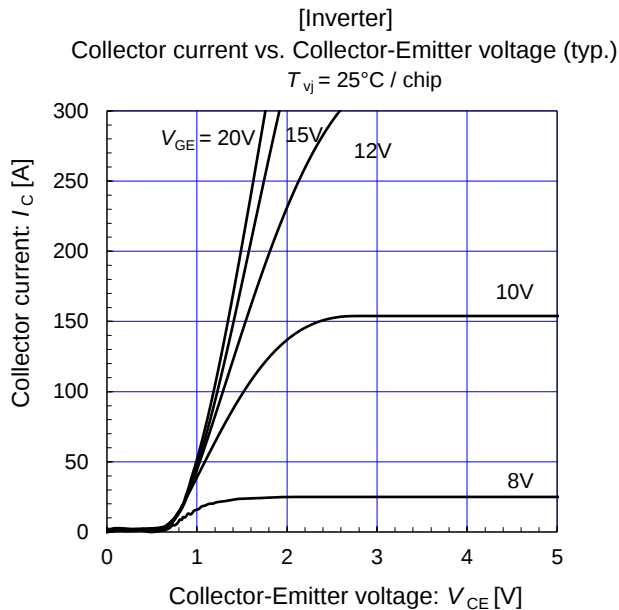
Thermal resistance characteristics

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

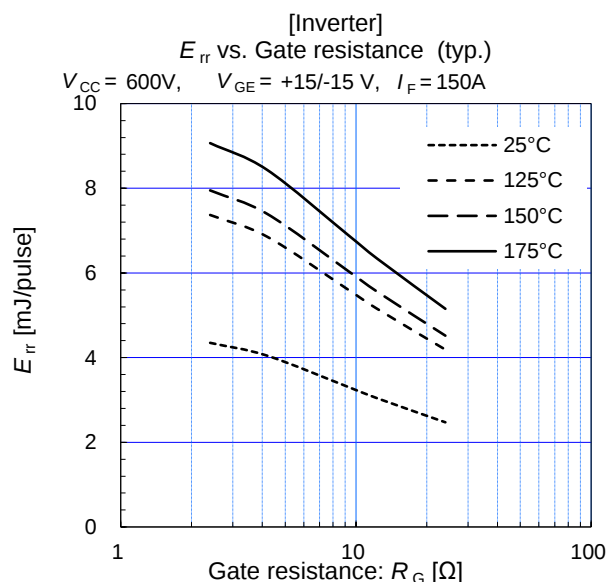
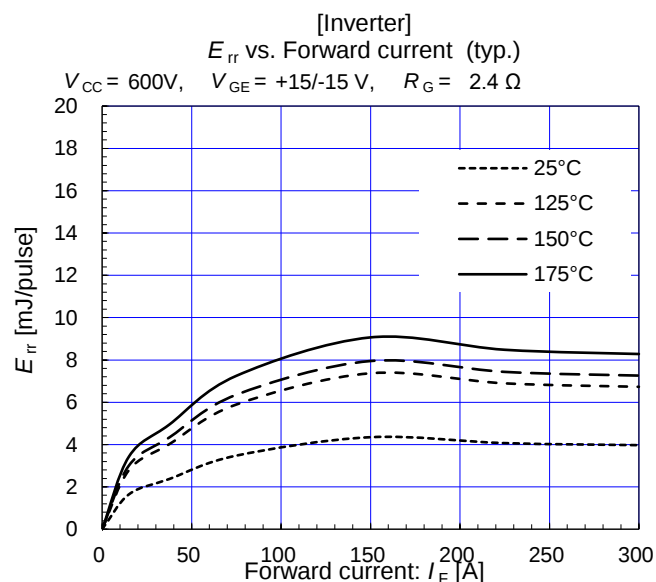
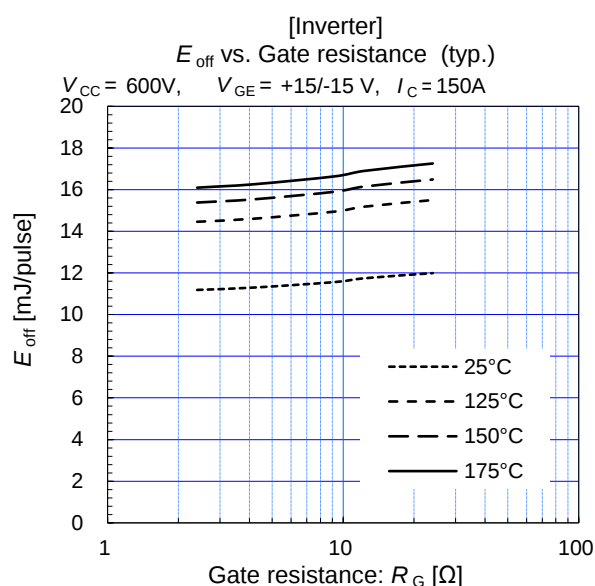
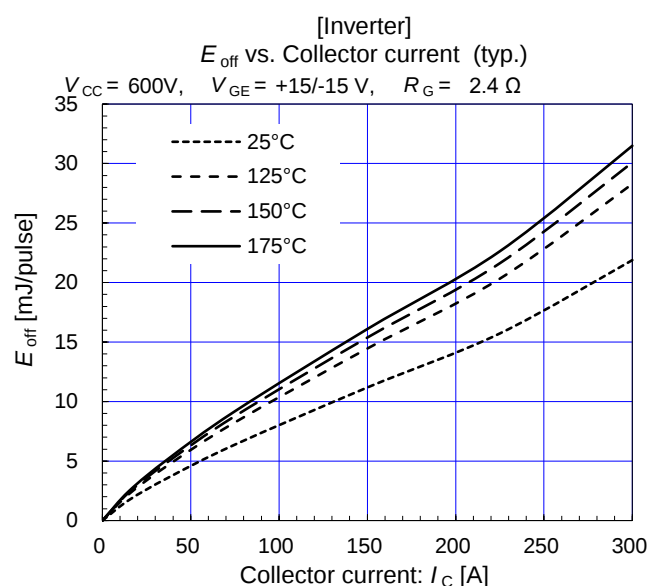
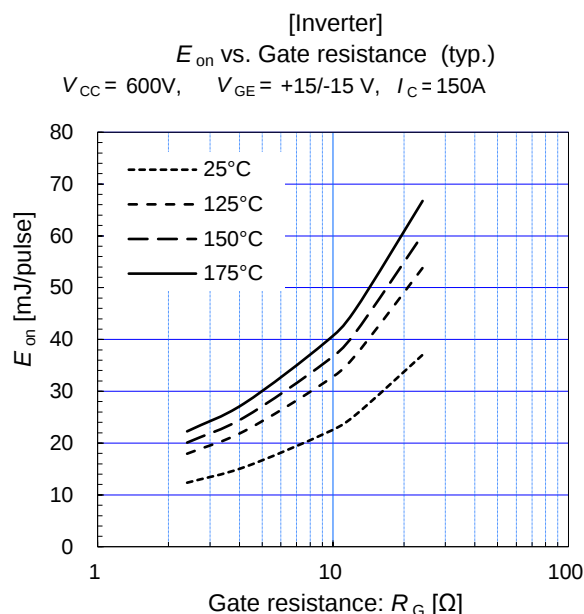
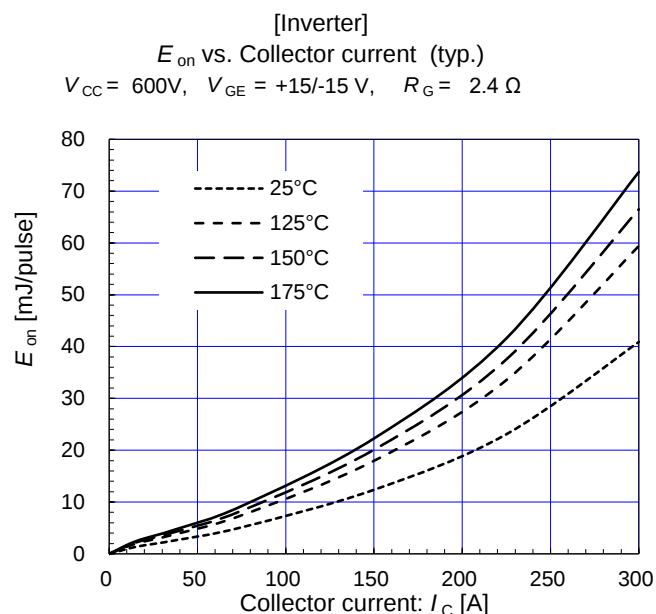
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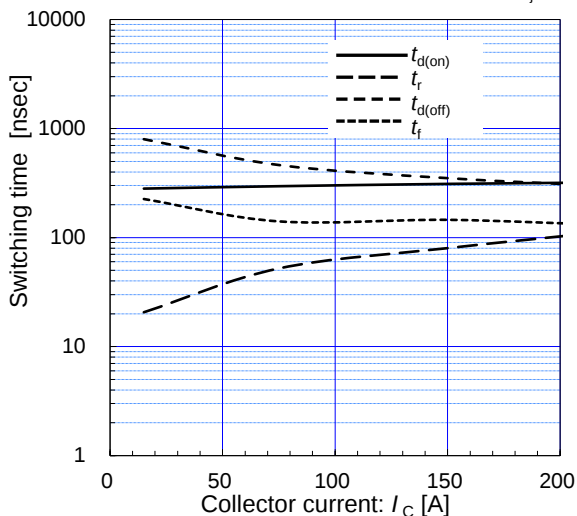
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[Inverter]

Switching time vs. Collector current (typ.)

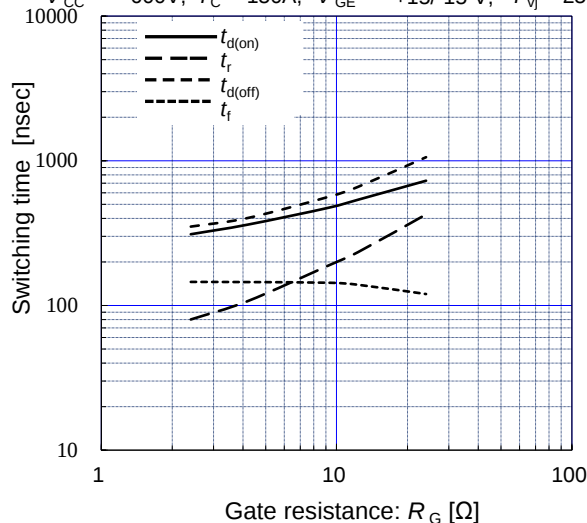
$V_{CC} = 600V$, $R_G = 2.4 \Omega$, $V_{GE} = +15/-15 V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

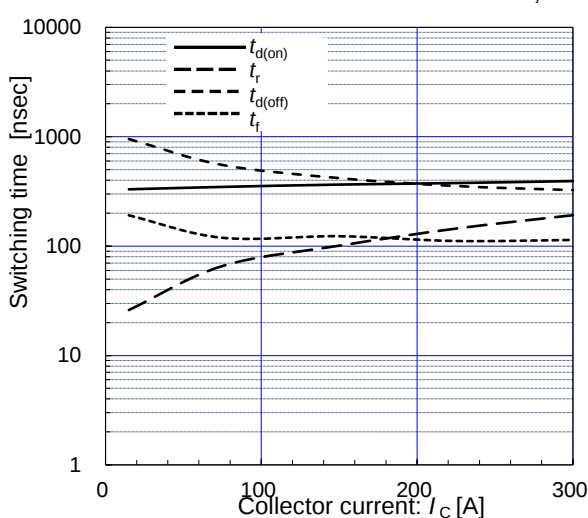
$V_{CC} = 600V$, $I_C = 150A$, $V_{GE} = +15/-15 V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

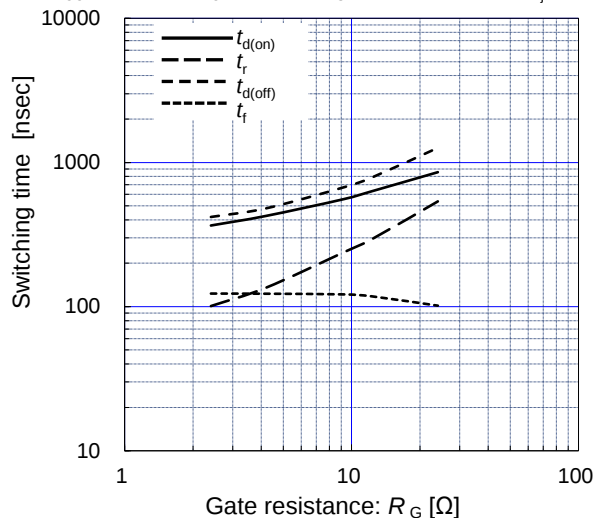
$V_{CC} = 600V$, $R_G = 2.4 \Omega$, $V_{GE} = +15/-15 V$, $T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

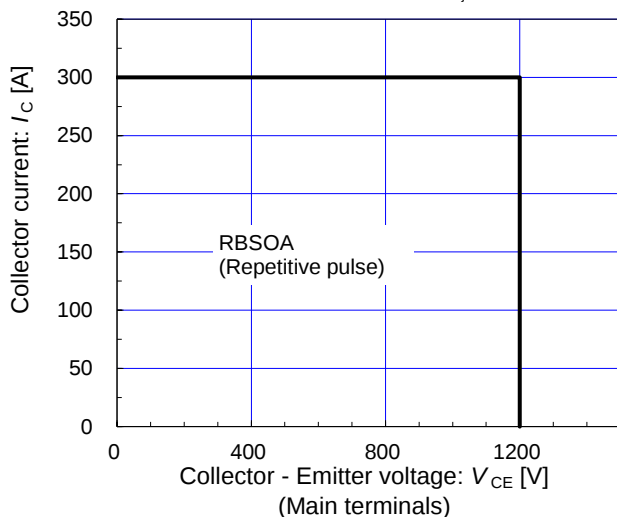
$V_{CC} = 600V$, $I_C = 150A$, $V_{GE} = +15/-15 V$, $T_{vj} = 175^\circ C$



[Inverter]

Reverse bias safe operating area (max.)

$V_{GE} = +15/-15 V$, $R_G = 2.4 \Omega$, $T_{vj} = 175^\circ C$

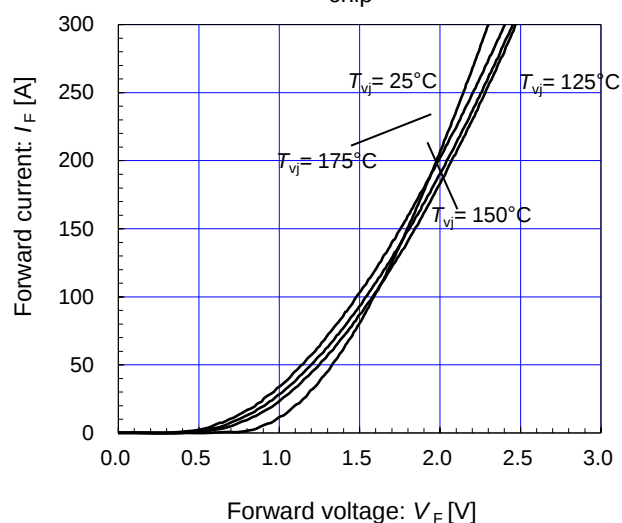


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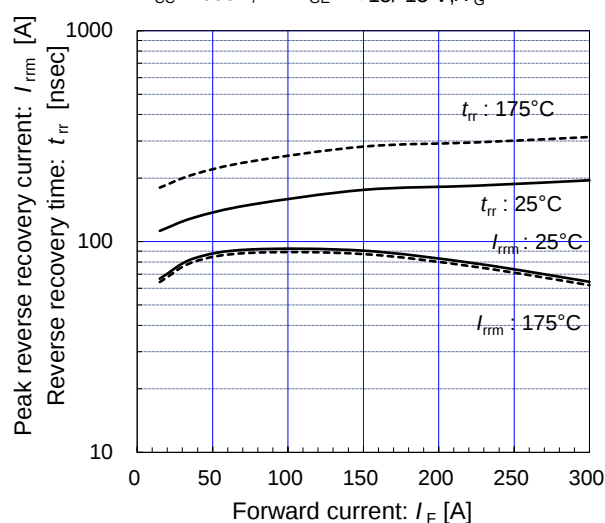
[Inverter]

Forward current vs. Forward vltage (typ.)
chip

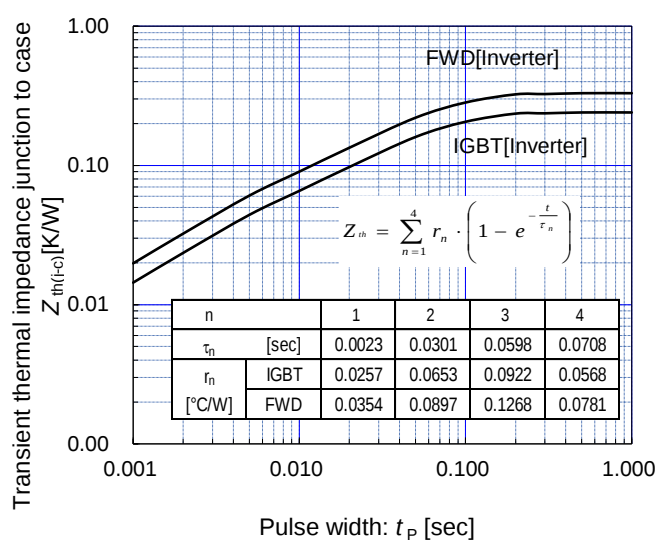


[Inverter]

Reverse recovery characteristics (typ.)
 $V_{CC} = 600V$, $V_{GE} = +15/-15V$, $R_G = 2.4\Omega$

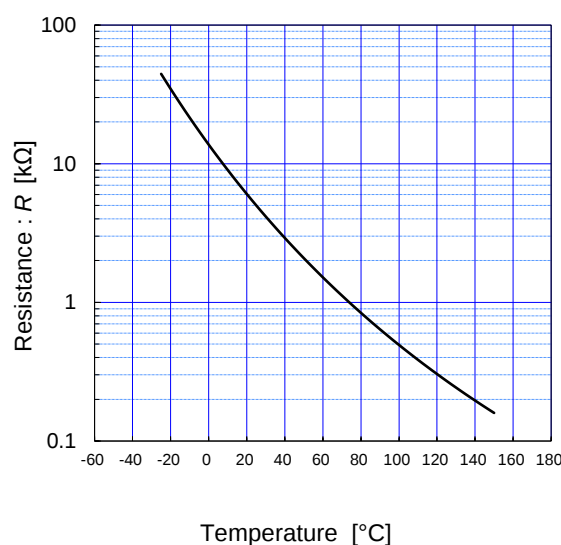


Transient thermal impedance junction to case(max.)



[Thermistor]

Temperature characteristic(typ.)



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IGBT Modules

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