

2MBI1000XRNF120-50

IGBT Modules

Power Module (X series)
1200V / 1000A / 2-in-1 package

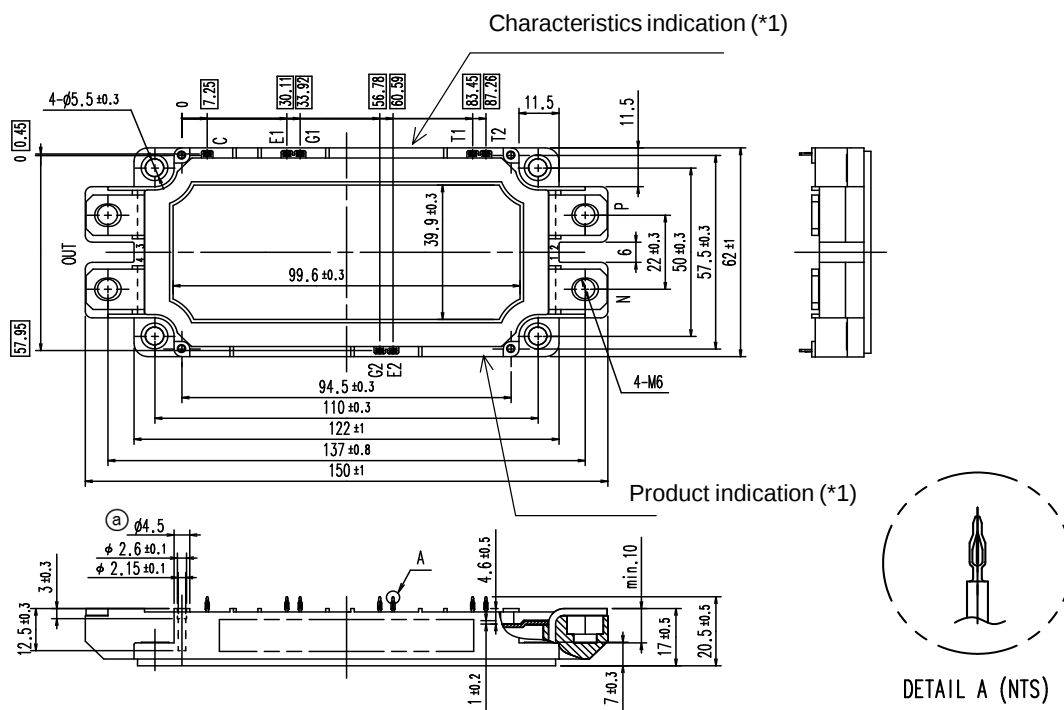
■ Features

- LOW $V_{CE(sat)}$
- Low Inductance Module structure
- Solder pin terminals

■ Applications

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

■ Outline drawing (Unit : mm)

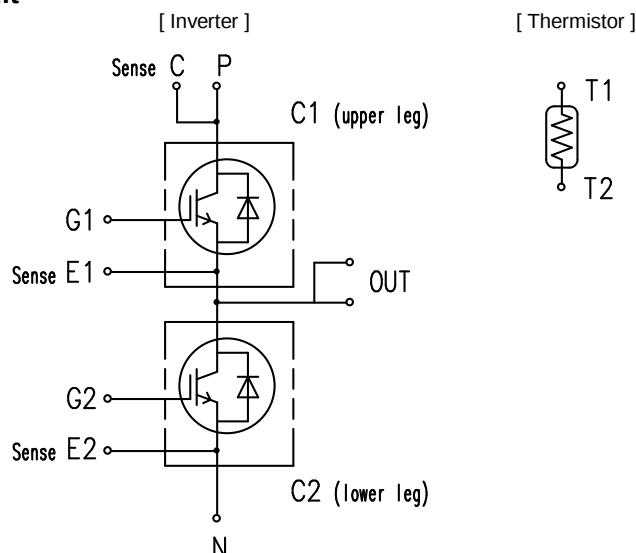


NOTE) shows theoretical dimension and tolerance is ± 0.5

(*1) Please refer to section 9.

Weight: 350 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
Inverter	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 $T_c = 100^\circ\text{C}$	1000	A
	Repetitive peak collector current	I_{CRM}	1ms	2000	
	Reverse-conducting current	I_{RC}	Continuous	1000	
	Repetitive peak reverse-conducting current	I_{RCRM}	1ms	2000	
	Total power dissipation	P_{tot}	1 device	8330	W
	Virtual junction temperature	T_{vj}		175	$^\circ\text{C}$
	Operating virtual junction temperature (under switching conditions)	T_{vjop}		175	
	Case temperature	T_c		150	
Storage temperature		T_{stg}		-40 ~ 150	
Isolation voltage	between terminals and copper base (*1) between thermistor and others (*2)	V_{isol}	AC: 1min.	4000	Vrms
Mounting torque for screws to heatsink (*3)		M_s	M5	6.0	N·m
Mounting torque for terminal screws (*3)		M_t	M6	6.0	

(*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·n (M5)
Recommendable Value: Terminals 3.5 ~ 6.0 N·n (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.	
Inverter	Collector-Emitter cut-off current, Gate-Emitter short-circuited	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 1200V$		-	-	200	μA
	Gate leakage current, Collector-Emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$		-	-	400	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 1000mA$		5.75	6.40	7.00	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 1000A$	$T_{vj}=25^{\circ}C$	-	2.80	3.35	V
		$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}C$	-	1.60	2.05	
				$T_{vj}=125^{\circ}C$	-	1.90	-	
				$T_{vj}=150^{\circ}C$	-	2.00	-	
				$T_{vj}=175^{\circ}C$	-	2.05	-	
	Internal Gate resistance	r_g	-		-	0.95	-	Ω
	Input capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$		-	126	-	nF
	Output capacitance	C_{oes}			-	5.3	-	
	Reverse transfer capacitance	C_{res}			-	1.19	-	
	Gate charge	Q_G	$V_{CC} = 600V, I_C = 1000A$ $V_{GE} = -15 \rightarrow +15V$		-	7.8	-	μC
	Reverse-conducting voltage	V_{RC} (terminal)	$V_{GE} = 0V$ $I_{RC} = 1000A$	$T_{vj}=25^{\circ}C$	-	2.90	3.45	V
		V_{RC} (chip)		$T_{vj}= 25^{\circ}C$	-	1.70	2.15	
				$T_{vj}=125^{\circ}C$	-	1.90	-	
				$T_{vj}=150^{\circ}C$	-	1.90	-	
				$T_{vj}=175^{\circ}C$	-	1.90	-	
	Turn-on delay time(*1)	$t_{d(on)}$	$V_{CC} = 600V$ $I_C, I_{RC} = 1000A$ $V_{GE} = \pm 15V$ $R_G = 0.5\Omega$ $L_S = 35\text{ nH}$	$T_{vj}= 25^{\circ}C$	-	0.36	-	μs
	Rise time	t_r		$T_{vj}=125^{\circ}C$	-	0.40	-	
$T_{vj}=150^{\circ}C$				-	0.42	-		
$T_{vj}=175^{\circ}C$				-	0.43	-		
Turn-off delay time(*2)				$t_{d(off)}$	$T_{vj}= 25^{\circ}C$	-	0.10	
	$T_{vj}=125^{\circ}C$	-			0.11	-		
	$T_{vj}=150^{\circ}C$	-			0.11	-		
	$T_{vj}=175^{\circ}C$	-			0.12	-		
Fall time	t_f	$T_{vj}= 25^{\circ}C$		-	0.50	-		
		$T_{vj}=125^{\circ}C$		-	0.53	-		
		$T_{vj}=150^{\circ}C$		-	0.53	-		
		$T_{vj}=175^{\circ}C$		-	0.54	-		
Forward recovery time	t_{fr}	$T_{vj}= 25^{\circ}C$		-	0.09	-		
		$T_{vj}=125^{\circ}C$		-	0.13	-		
		$T_{vj}=150^{\circ}C$		-	0.14	-		
		$T_{vj}=175^{\circ}C$		-	0.15	-		
		$T_{vj}= 25^{\circ}C$		-	0.30	-		
		$T_{vj}=125^{\circ}C$		-	0.38	-		
		$T_{vj}=150^{\circ}C$		-	0.40	-		
		$T_{vj}=175^{\circ}C$		-	0.45	-		

(*1) Turn on time (t_{on}) = $t_{d(on)} + t_r$

(*2) Turn off time (t_{off}) = $t_{d(off)} +$

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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 (per puls)	E_{on}	$V_{\text{CC}} = 600\text{V}$ $I_{\text{C}}, I_{\text{RC}} 1000\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $R_{\text{G}} = 0.5\Omega$ $L_{\text{S}} = 35 \text{ nH}$	$T_{\text{vj}}=25^{\circ}\text{C}$	-	60.6	-	mJ
				$T_{\text{vj}}=125^{\circ}\text{C}$	-	85.2	-	
				$T_{\text{vj}}=150^{\circ}\text{C}$	-	91.0	-	
				$T_{\text{vj}}=175^{\circ}\text{C}$	-	97.3	-	
	Turn-off energy (per puls)	E_{off}		$T_{\text{vj}}=25^{\circ}\text{C}$	-	93.9	-	
				$T_{\text{vj}}=125^{\circ}\text{C}$	-	116.0	-	
				$T_{\text{vj}}=150^{\circ}\text{C}$	-	120.5	-	
				$T_{\text{vj}}=175^{\circ}\text{C}$	-	124.8	-	
	Forward recovery energy (per puls)	E_{fr}		$T_{\text{vj}}=25^{\circ}\text{C}$	-	46.0	-	
				$T_{\text{vj}}=125^{\circ}\text{C}$	-	72.8	-	
				$T_{\text{vj}}=150^{\circ}\text{C}$	-	77.9	-	
				$T_{\text{vj}}=175^{\circ}\text{C}$	-	84.2	-	
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.

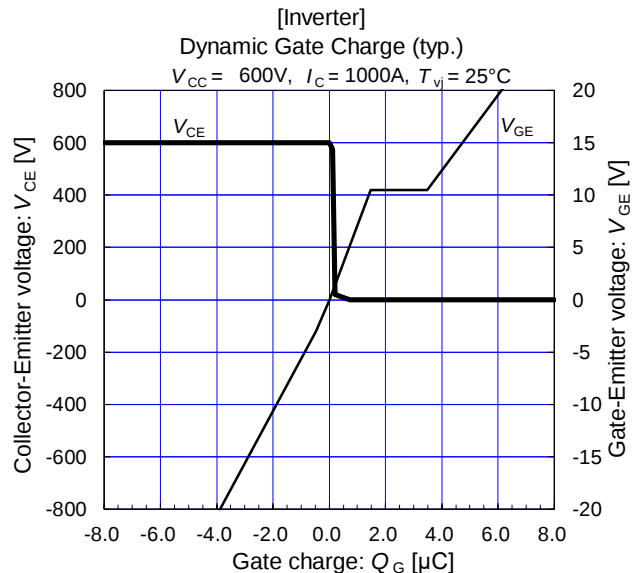
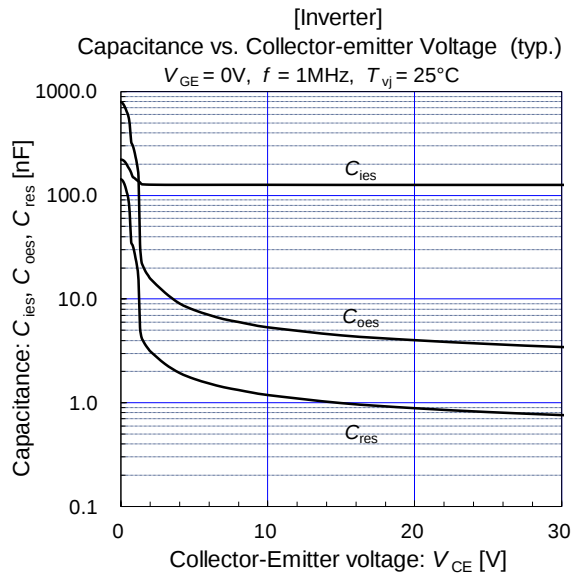
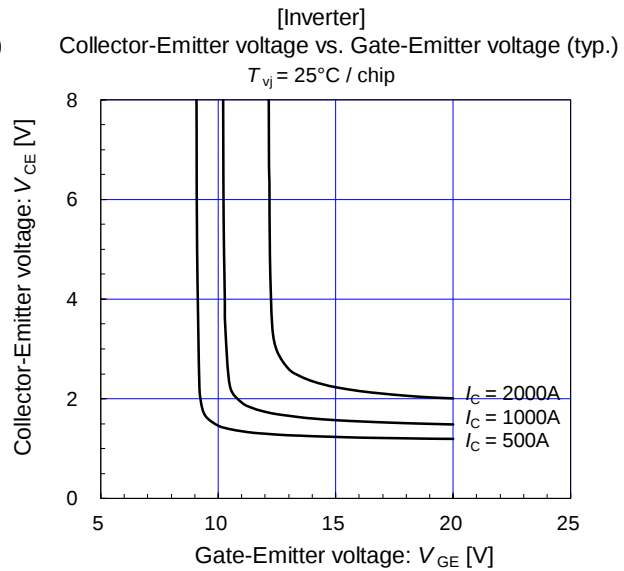
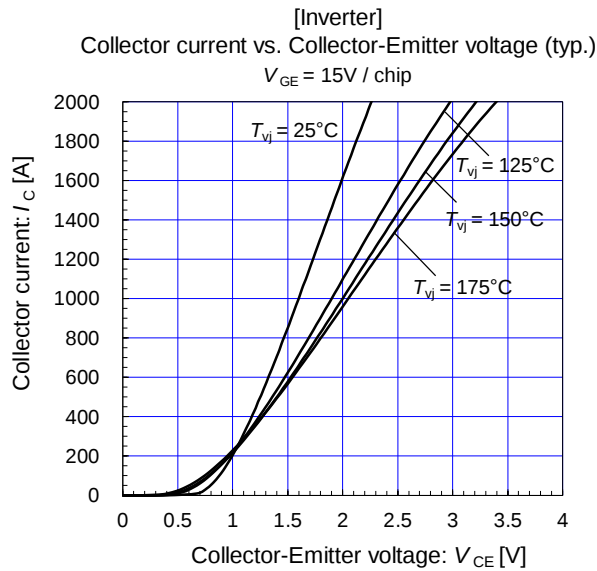
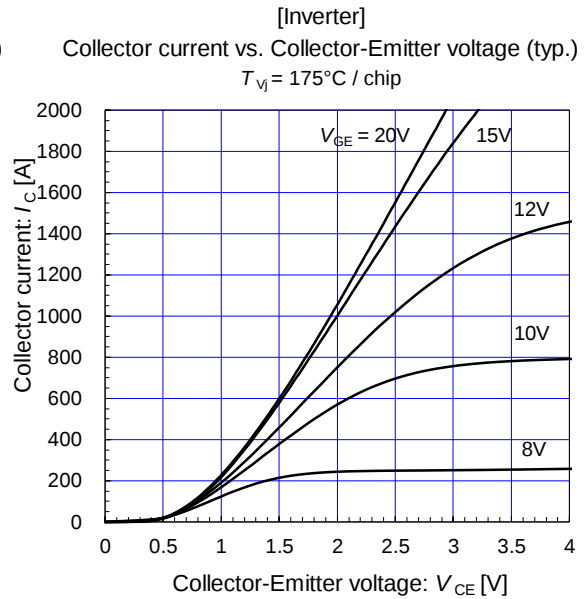
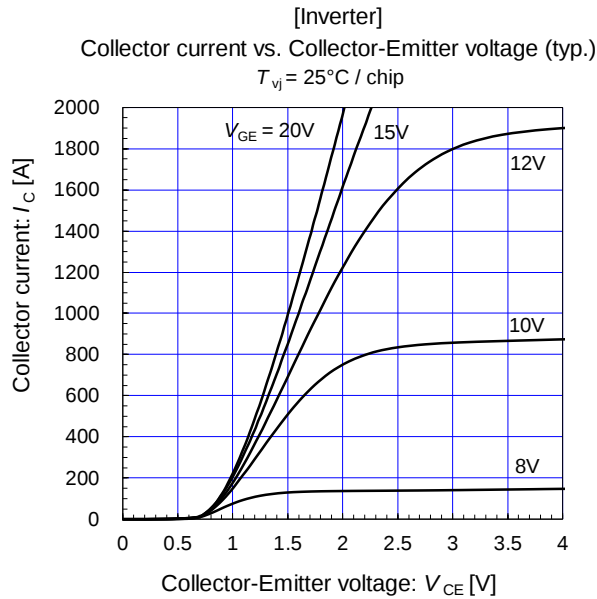
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case(1 device)	$R_{th(j-c)}$	Inverter RC-IGBT	-	-	0.018	K/W
Thermal resistance case to heatsink(1 IGBT+1 FWD)(*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0200	-	

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

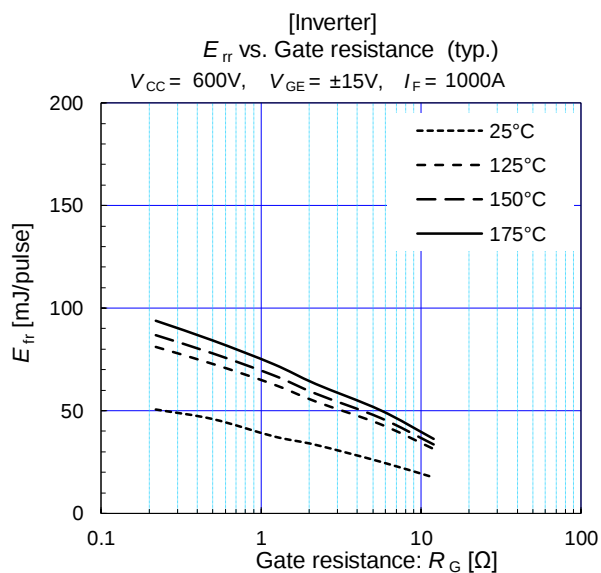
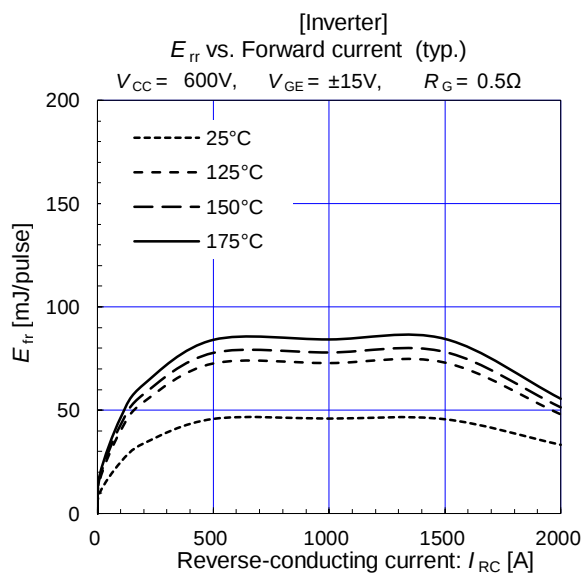
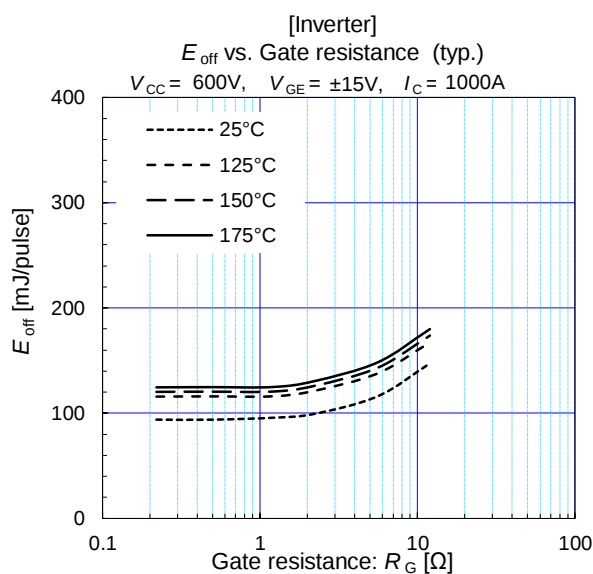
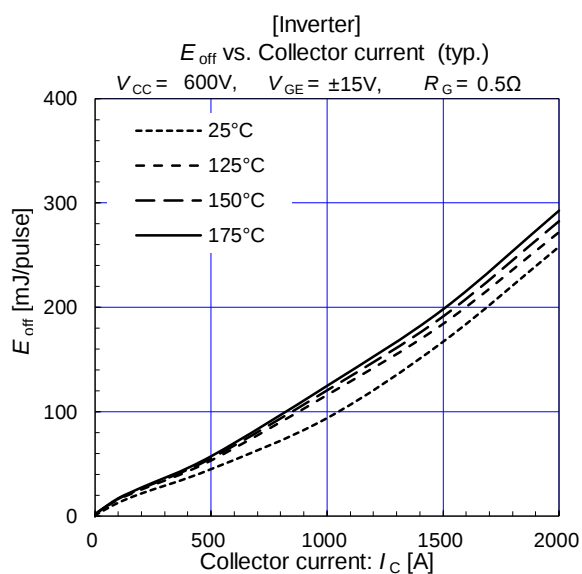
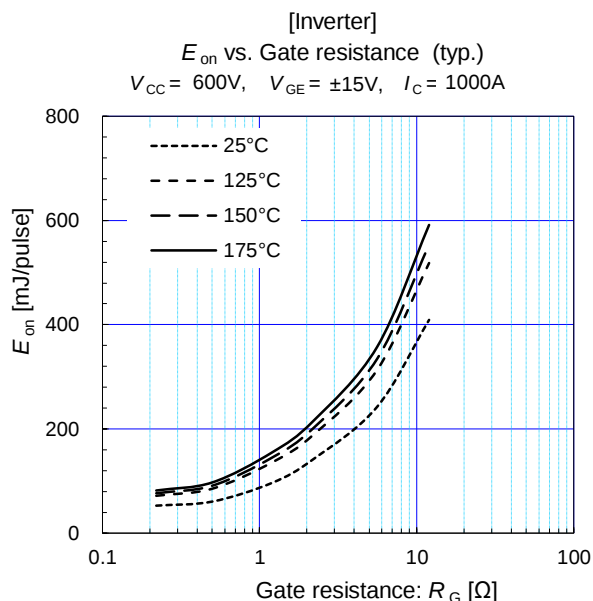
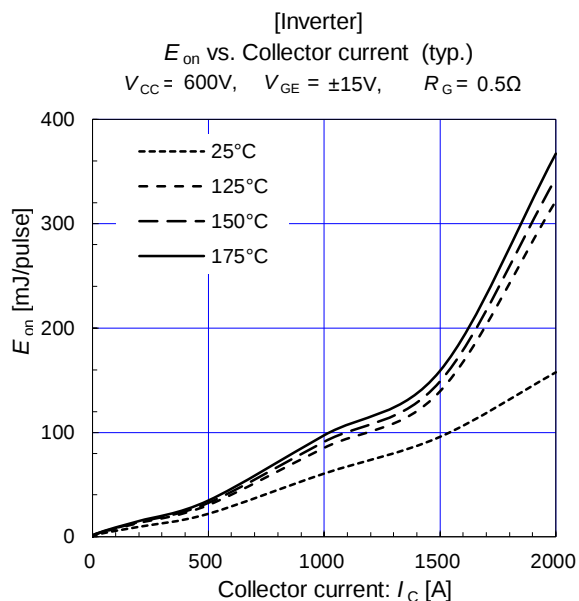
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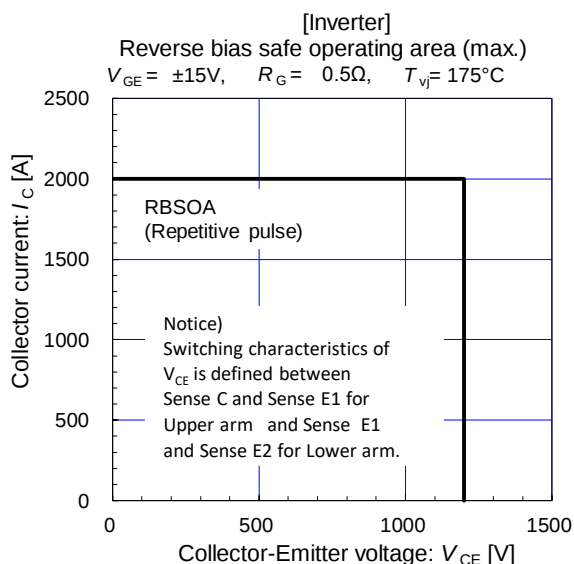
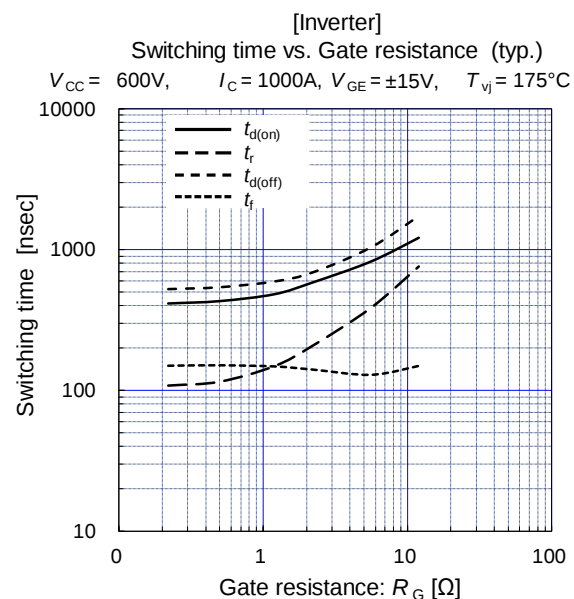
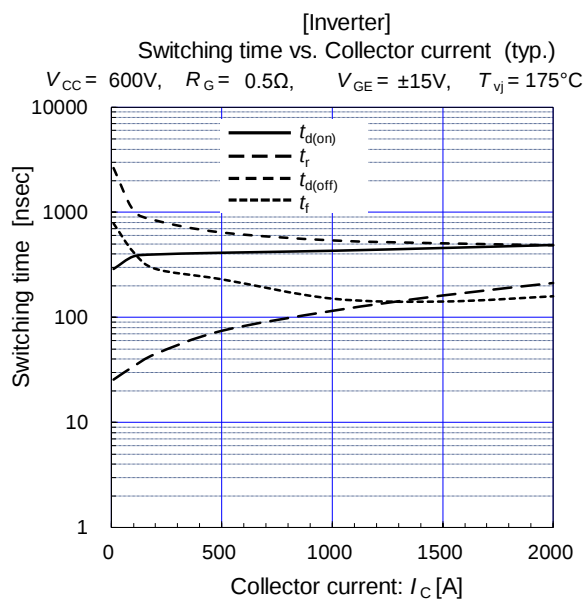
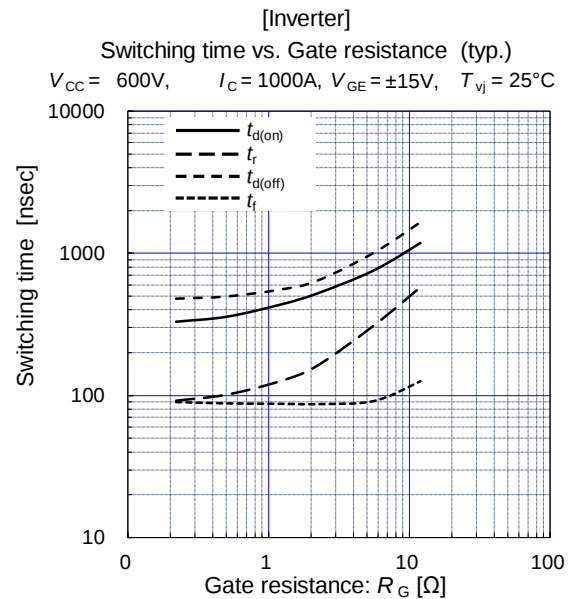
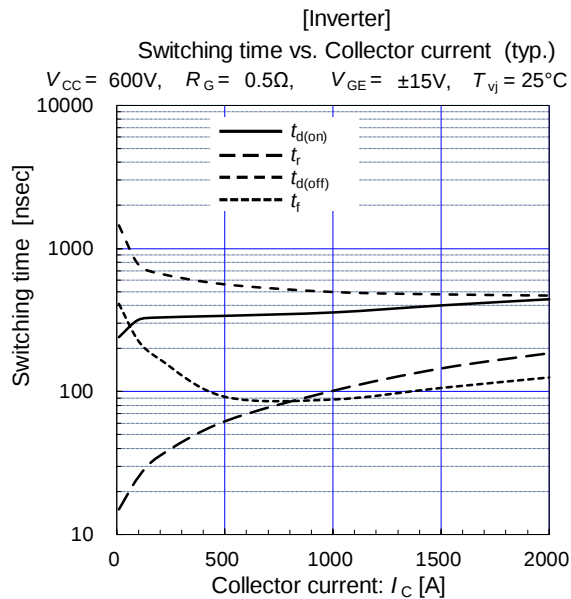
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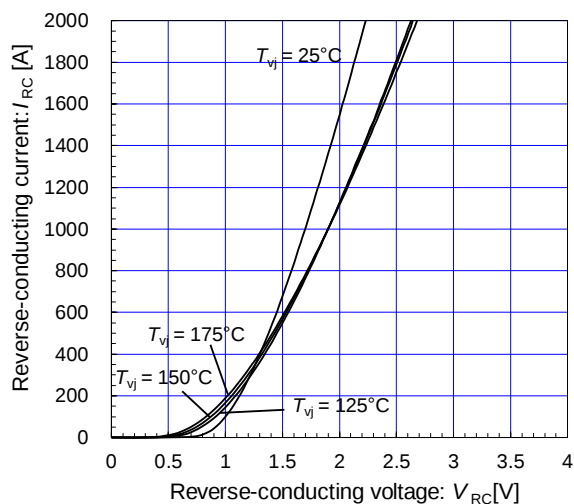
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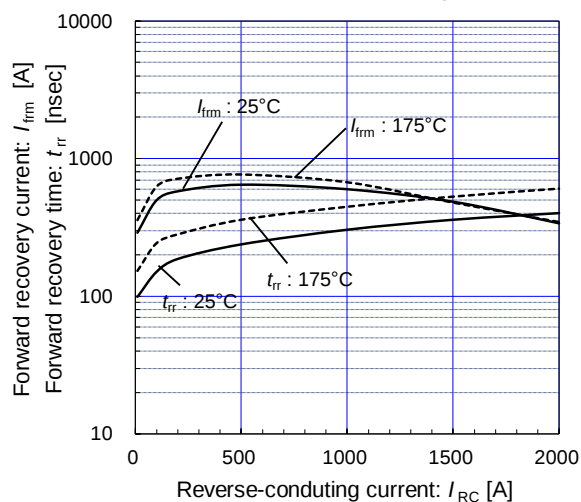
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[Inverter]
Reverse-conducting current vs. Reverse-conducting voltage
(typ.) chip

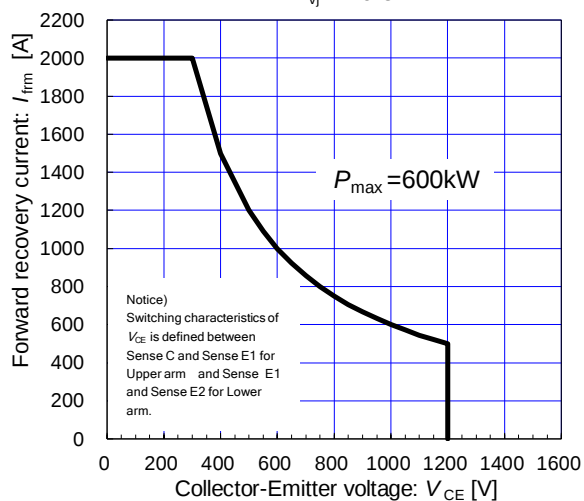


[Inverter]
Forward recovery characteristics (typ.)

$V_{CC} = 600V$, $V_{GE} = \pm 15V$, $R_G = 0.5\Omega$

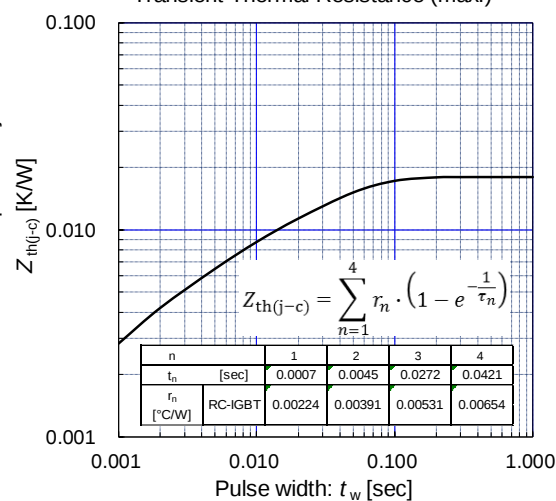


[Inverter]
FWD safe operation area (typ.)
 $T_{vj} = 175^\circ C$

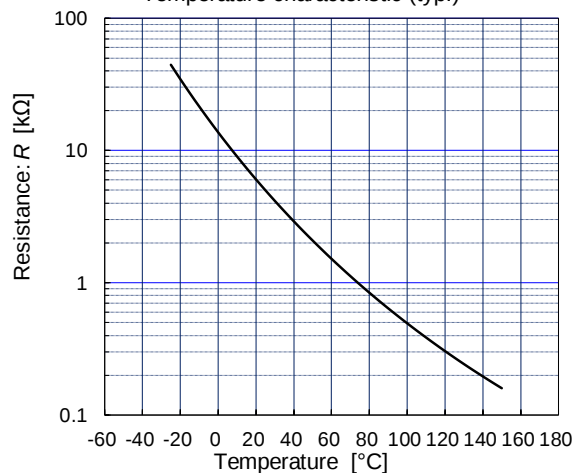


Transient thermal impedance junction to case

[Inverter]
Transient Thermal Resistance (max.)



[Thermistor]
Temperature characteristic (typ.)



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