

2MBI800XNF120-50

IGBT Modules

Power Module (X series)
1200V / 800A / 2-in-1 package

■ Features

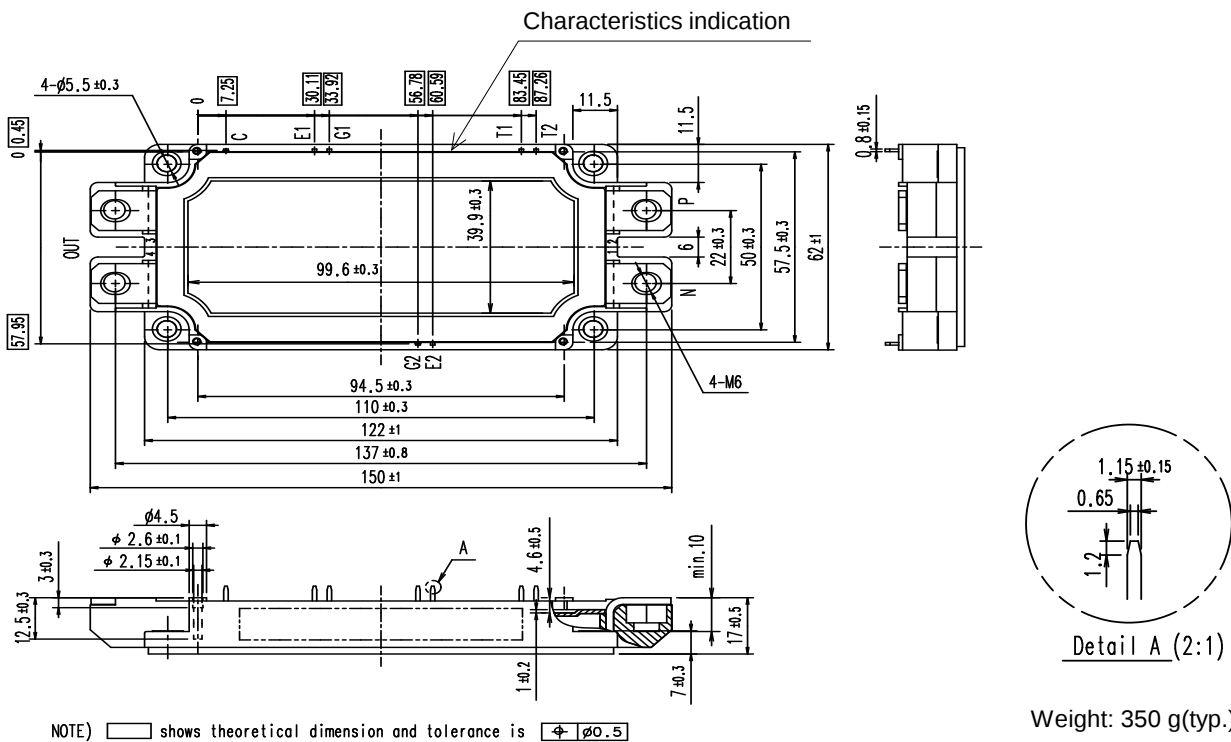
- Low $V_{CE(sat)}$
- Low Inductance Module structure
- Solderless press-fit terminals

■ Applications

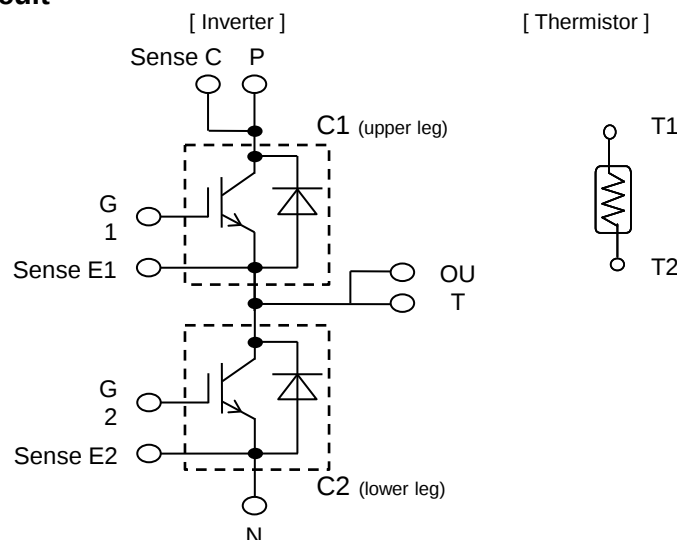
- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems, Wind Turbines, PV Power Conditioning Systems



■ Outline drawing (Unit : mm)



■ 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	V_{CES}		1200	V
	Gate-Emitter voltage	V_{GES}		± 20	V
	Collector current	I_C	Continuous $T_c = 100^\circ\text{C}$	800	A
		I_{CRM}	1ms	1600	
	Forward current	I_F		800	
		I_{FRM}	1ms	1600	
	Collector power dissipation	P_C	1 device	4050	
	Junction temperature	T_{vj}		175	W
	Operating junction temperature (under switching conditions)	T_{vjop}		175	$^\circ\text{C}$
	Case temperature	T_c		125	
Storage temperature		T_{stg}		-40 ~ 125	
Isolation voltage	between terminal and copper base (*1)	V_{iso}	AC: 1min.	4000	Vrms
	between thermistor and others (*2)				
Screw Torque(*3)	Mounting	-	M5	6.0	N m
	Terminals		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

(*3) Recommendable Value: Mounting 2.5 ~ 6.0 N·m (M5)

Recommendable Value: Terminals 3.5 ~ 6.0 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.	
Inverter	Zero gate voltage Collector current	I_{CES}	$V_{\text{GE}} = 0\text{V}$ $V_{\text{CE}} = 1200\text{V}$		-	-	150	mA
	Gate-Emitter leakage current	I_{GES}	$V_{\text{CE}}\!=\!0\text{V}$, $V_{\text{GE}}\!=\!\pm 20\text{V}$		-	-	300	nA
	Gate-Emitter threshold voltage	$V_{\text{GE(th)}}$	$V_{\text{CE}} = 20\text{V}$ $I_{\text{C}} = 800\text{mA}$		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{\text{CE(sat)}}$ (terminal)	$V_{\text{GE}} = 15\text{V}$ $I_{\text{C}} = 800\text{A}$	$T_{\text{vj}}\!=\!25^{\circ}\text{C}$	-	2.45	2.90	V
				$T_{\text{vj}}\!=\!25^{\circ}\text{C}$	-	1.45	1.90	
		$V_{\text{CE(sat)}}$ (chip)		$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	1.80	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	1.90	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	1.95	-	
	Internal gate	R_{G}	-		-	1.17	-	Ω
	Capacitance	C_{ies}	$V_{\text{CE}}\!=\!10\text{V}$, $V_{\text{GE}}\!=\!0\text{V}$, $f\!=\!1\text{MHz}$		-	85	-	nF
		C_{oes}			-	2.9	-	
		C_{res}			-	0.76	-	
	Gate charge	Q_{G}	$V_{\text{CC}} = 600\text{V}$, $I_{\text{C}} = 800\text{A}$ $V_{\text{GE}} = -15 \rightarrow +15\text{V}$		-	5.5	-	μC
	Forward on voltage	V_{F} (terminal)	$V_{\text{GE}} = 0\text{V}$ $I_{\text{F}}\!=\!800\text{A}$	$T_{\text{vj}}\!=\!25^{\circ}\text{C}$	-	2.60	3.05	V
				$T_{\text{vj}} = 25^{\circ}\text{C}$	-	1.60	2.05	
		V_{F} (chip)		$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	1.65	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	1.60	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	1.60	-	
	Switching time (*1)	$t_{\text{d(on)}}$	$V_{\text{CC}} = 600\text{V}$ I_{C} , $I_{\text{F}}\!=\!800\text{A}$ $V_{\text{GE}} = +15/\text{-}15\text{V}$ $R_{\text{G}} = 0.5\ \Omega$ $L_{\text{S}} = 35\ \text{nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	0.47	-	μs
				$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	0.48	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	0.49	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	0.51	-	
		t_{r}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	0.10	-	
				$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	0.11	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	0.12	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	0.12	-	
		$t_{\text{d(off)}}$		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	0.45	-	
				$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	0.49	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	0.50	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	0.52	-	
		t_{f}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	0.08	-	
				$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	0.10	-	
				$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	0.10	-	
				$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	0.11	-	
	Reverse recovery time	t_{rr}	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	0.19	-		
			$T_{\text{vj}}\!=\!125^{\circ}\text{C}$	-	0.29	-		
			$T_{\text{vj}}\!=\!150^{\circ}\text{C}$	-	0.32	-		
			$T_{\text{vj}}\!=\!175^{\circ}\text{C}$	-	0.37	-		

(*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	Switching loss (per pulse)	E_{on}	$V_{\text{CC}} = 600\text{V}$	$T_{\text{vj}}=25^{\circ}\text{C}$	-	41.7	-	mJ
			$I_{\text{C}}, I_{\text{F}} = 800\text{A}$	$T_{\text{vj}}=125^{\circ}\text{C}$	-	70.2	-	
			$V_{\text{GE}} = +15/ -15\text{V}$	$T_{\text{vj}}=150^{\circ}\text{C}$	-	81.1	-	
			$R_{\text{G}} = 0.5\ \Omega$	$T_{\text{vj}}=175^{\circ}\text{C}$	-	90.4	-	
		E_{off}	$L_{\text{S}} = 35\ \text{nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	77.6	-	
			$T_{\text{vj}}=125^{\circ}\text{C}$	-	92.5	-		
			$T_{\text{vj}}=150^{\circ}\text{C}$	-	94.9	-		
			$T_{\text{vj}}=175^{\circ}\text{C}$	-	100.5	-		
		E_{rr}	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	31.0	-		
			$T_{\text{vj}}=125^{\circ}\text{C}$	-	52.9	-		
			$T_{\text{vj}}=150^{\circ}\text{C}$	-	60.2	-		
			$T_{\text{vj}}=175^{\circ}\text{C}$	-	67.8	-		
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.

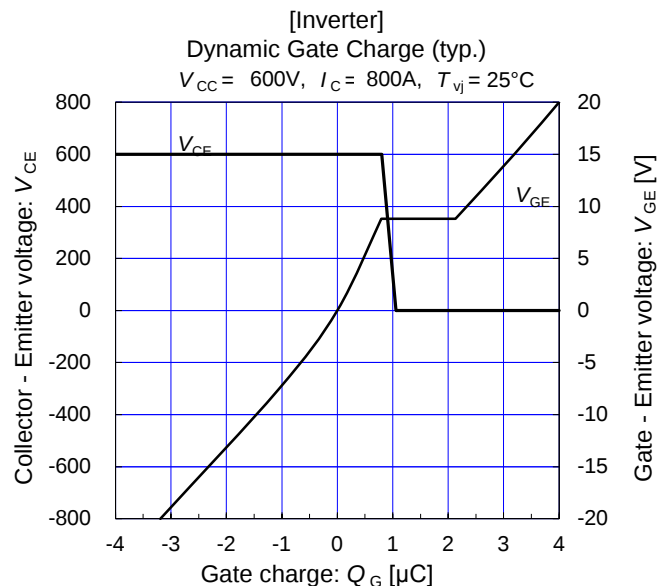
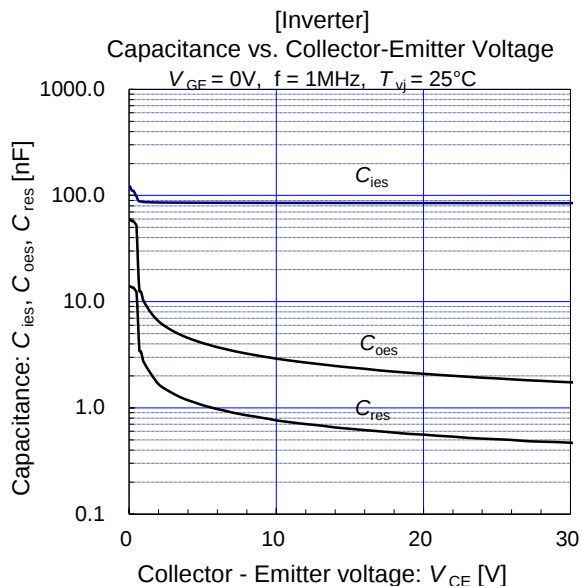
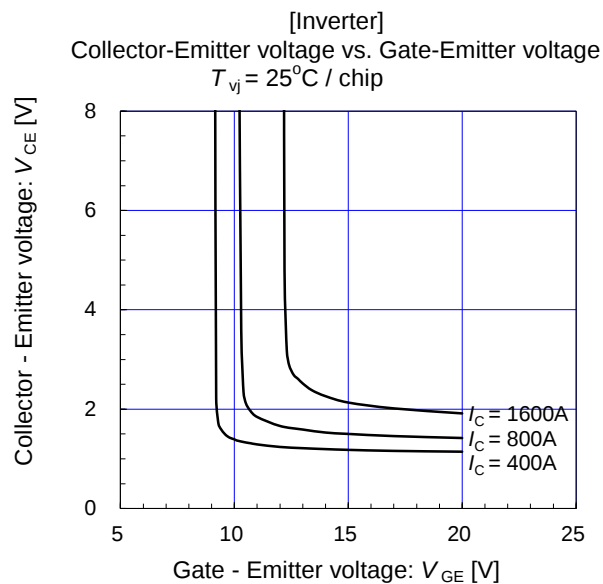
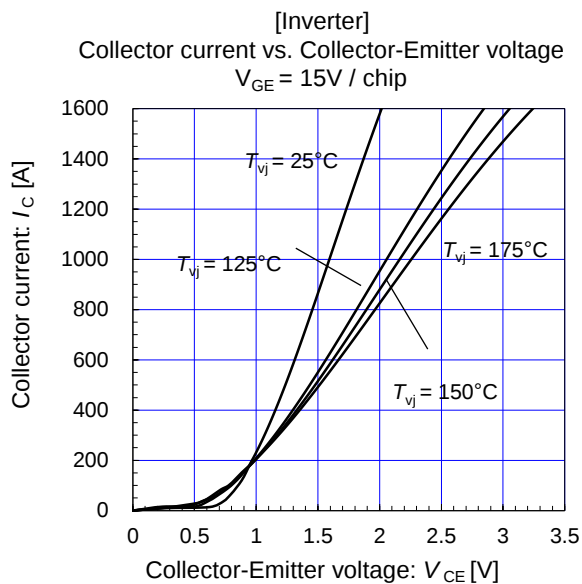
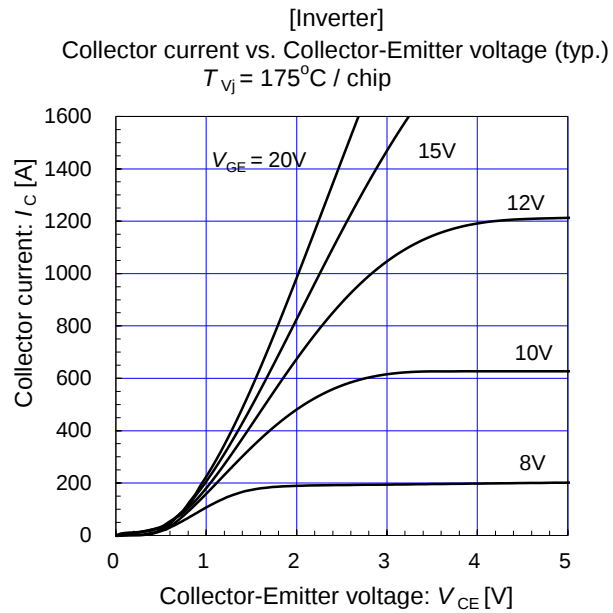
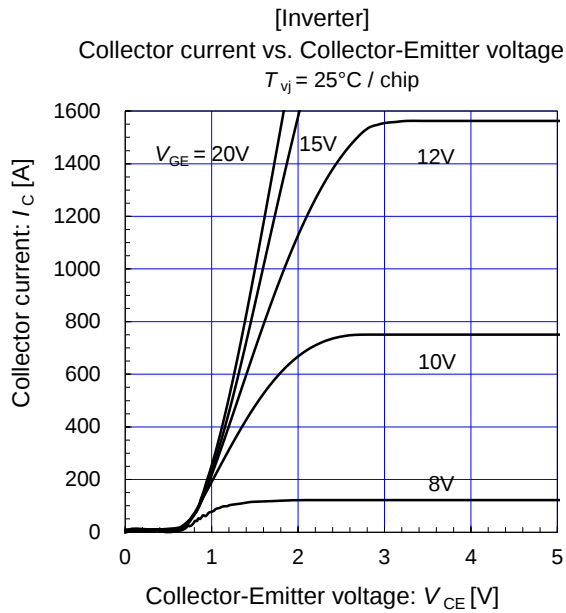
■ Thermal resistance characteristics

	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.037	$^{\circ}\text{C/W}$
		Inverter FWD	-	-	0.044	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	with 1 W/(m·K) thermal grease	-	0.0167	-	

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

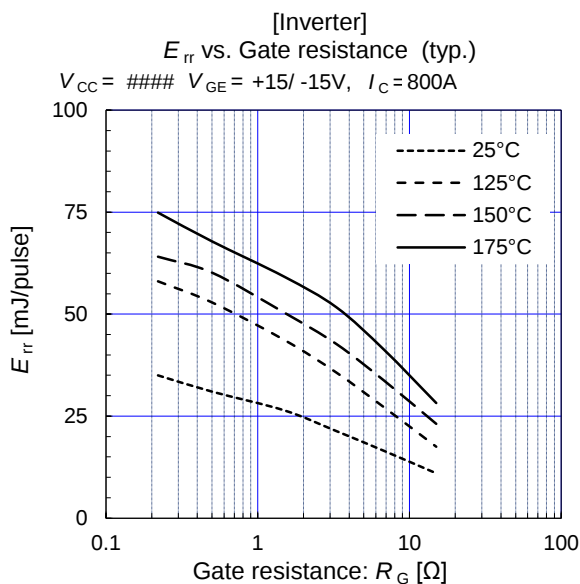
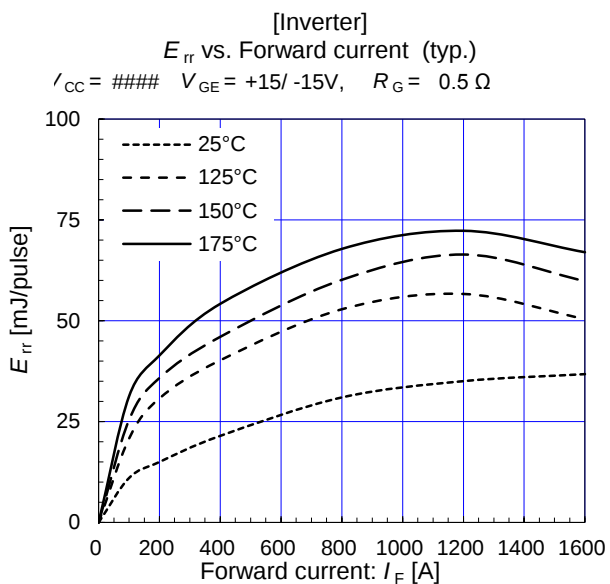
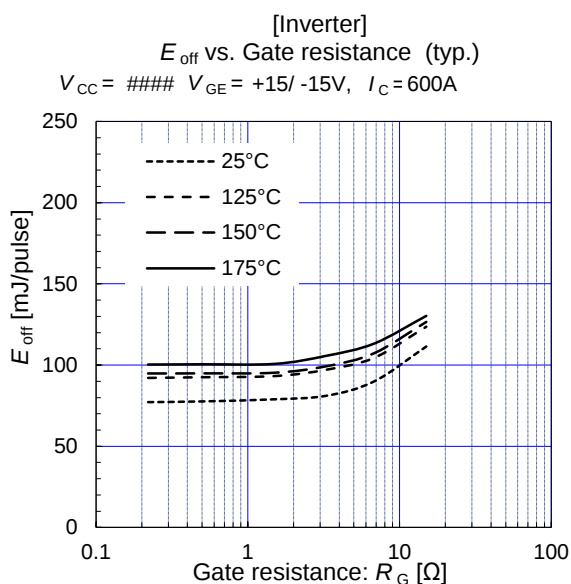
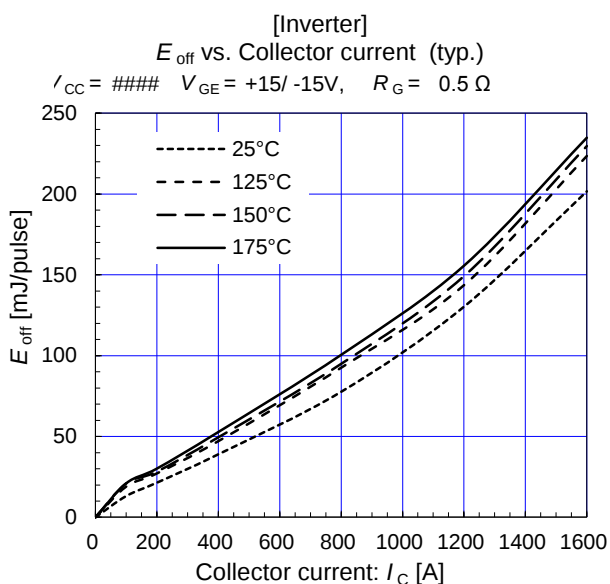
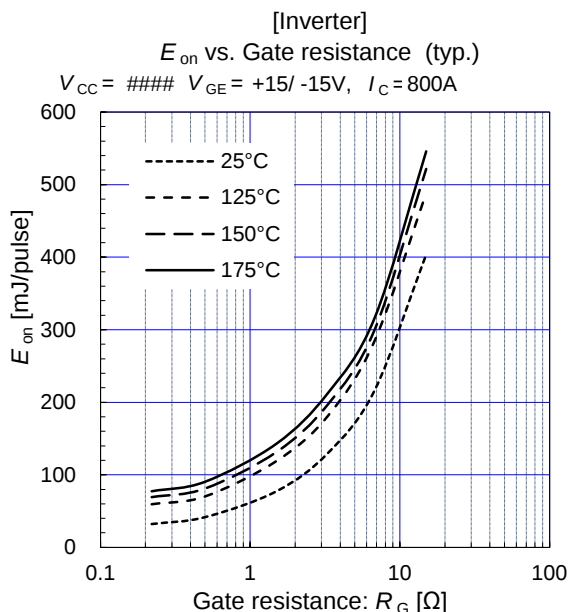
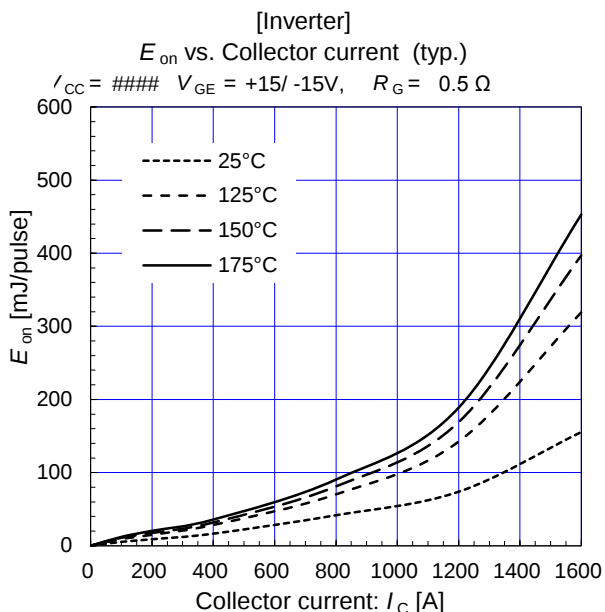
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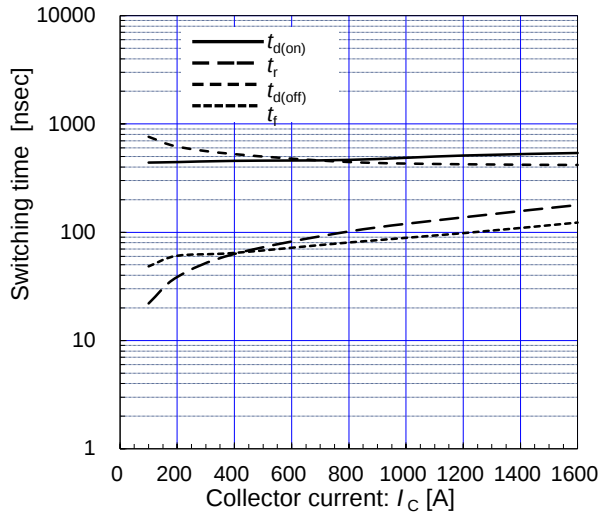
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[Inverter]

Switching time vs. Collector current (typ.)

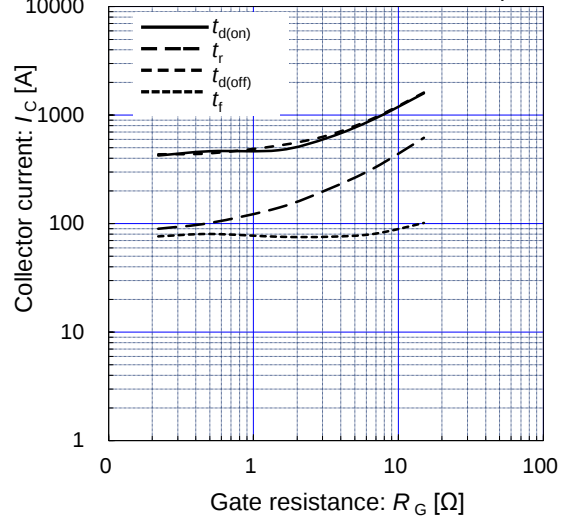
$V_{CC} = 600V$, $R_G = 0.5\Omega$, $V_{GE} = +15/-15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

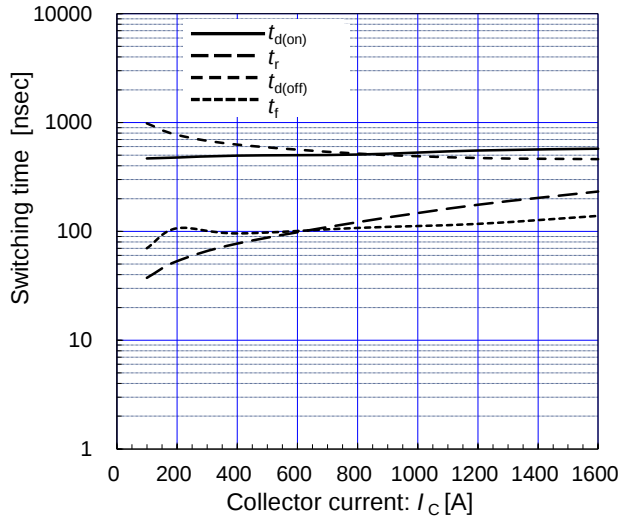
$V_{CC} = 600V$, $I_C = 800A$, $V_{GE} = +15/-15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

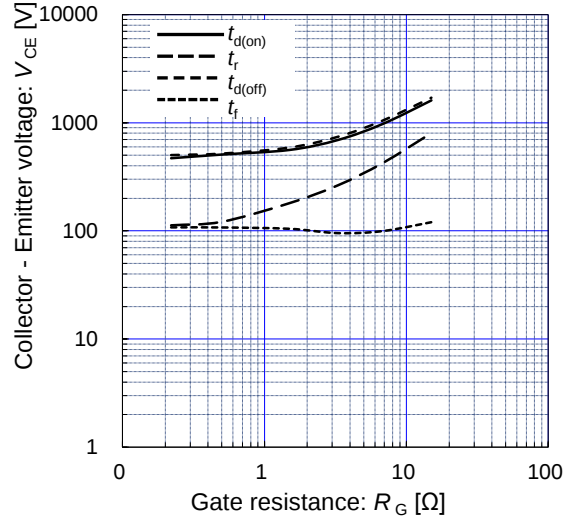
$V_{CC} = 600V$, $R_G = 0.5\Omega$, $V_{GE} = +15/-15V$, $T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

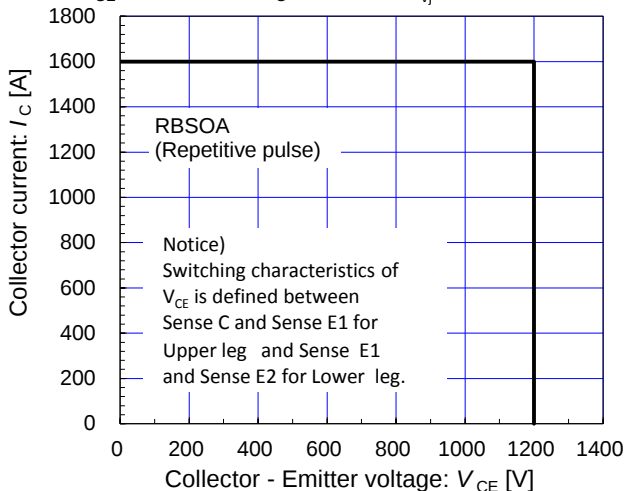
$V_{CC} = 600V$, $I_C = 800A$, $V_{GE} = +15/-15V$, $T_{vj} = 175^\circ C$



[Inverter]

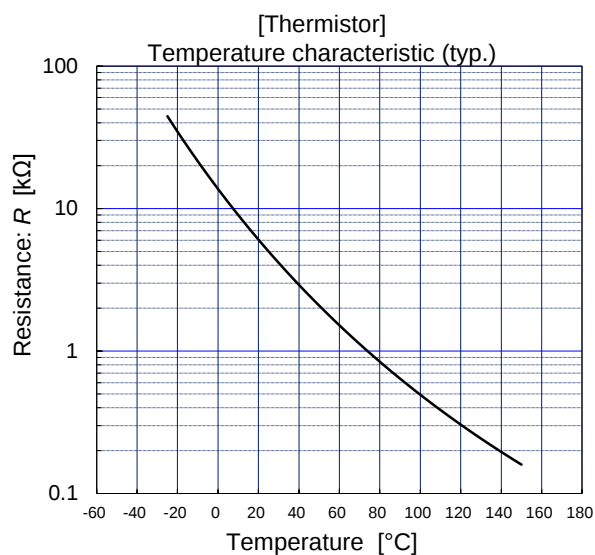
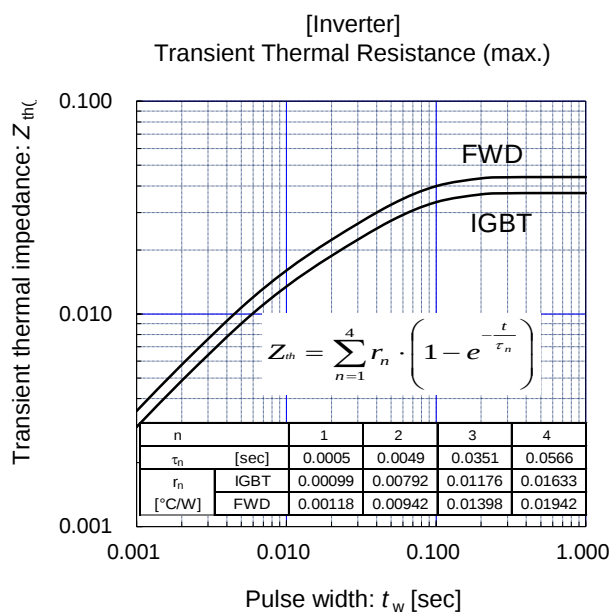
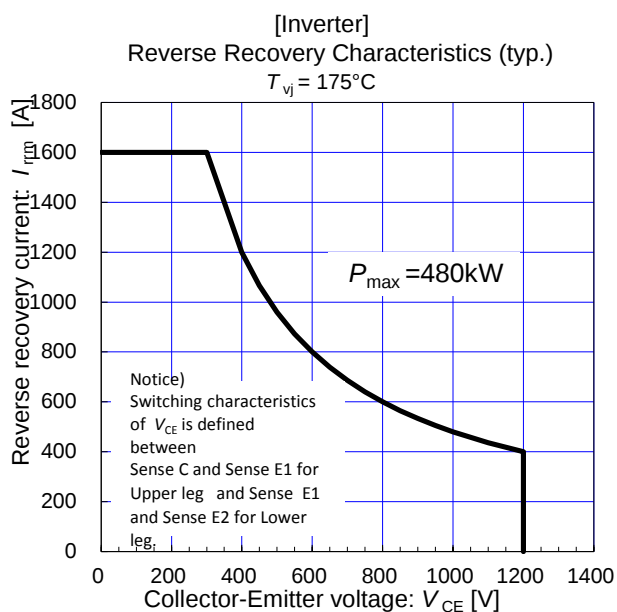
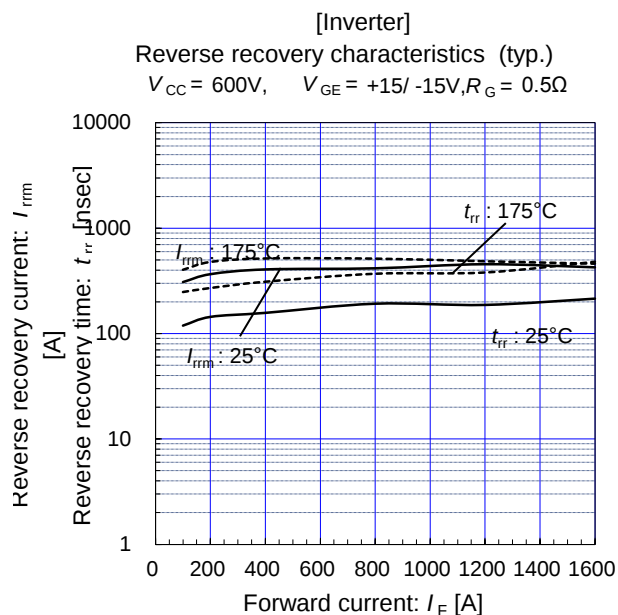
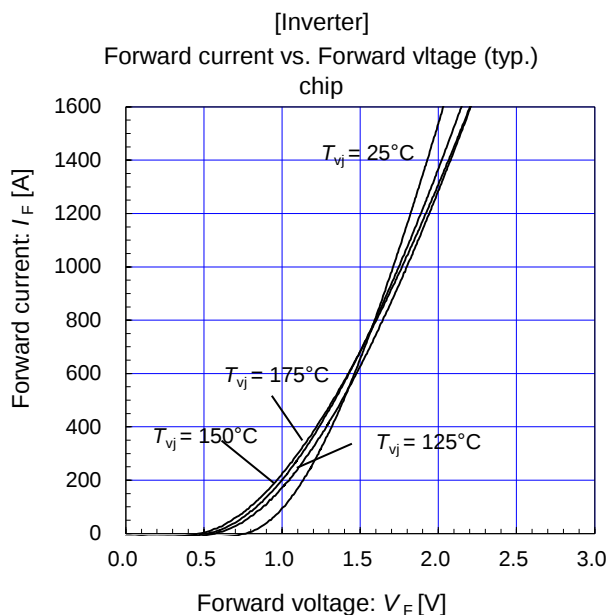
Reverse bias safe operating area (max.)

$V_{GE} = +15/-15V$, $R_G = 0.5\Omega$, $T_{vj} = 175^\circ C$



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