

2MBI150XHA170-50

IGBT Modules

Power Module (X series)
1700V / 150A / 2-in-1 package

■ Features

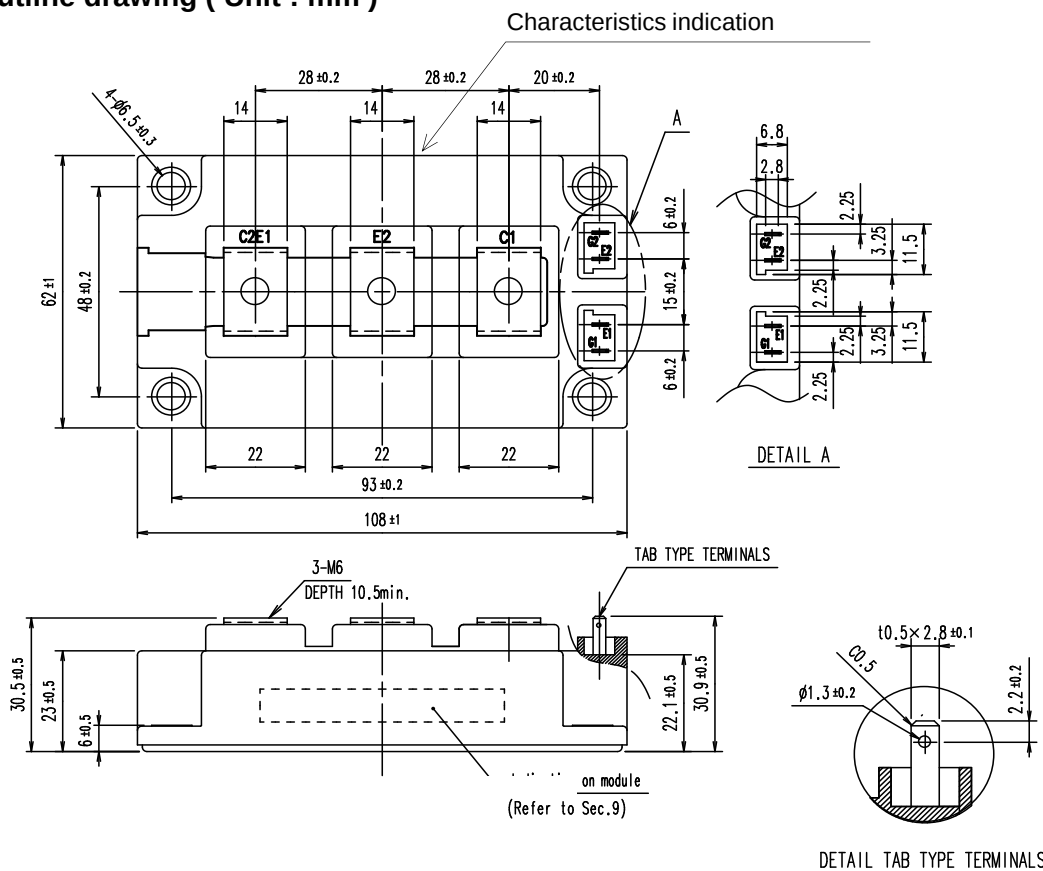
- LOW $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

■ Applications

Inverter for Motor Drives, AC and DC Servo Drives
 Uninterruptible Power Supply Systems,
 Industrial machines, such as Welding machines

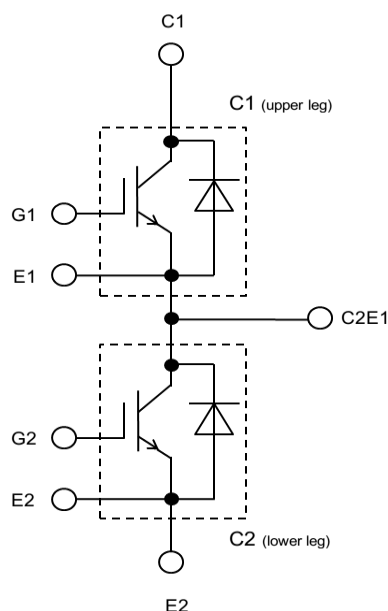


■ Outline drawing (Unit : mm)



Weight: 370 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}			1700	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			150	
Repetitive peak forward current		I_{FRM}	1ms		300	
Total power dissipation		P_{tot}	1 device		925	W
Virtual junction temperature		T_{vj}			175	°C
Operating virtual junction temperature		T_{vjop}			175	
Case temperature		T_c			125	
Storage temperature		T_{stg}			-40 ~ 125	
Isolation voltage	between terminals and copper base (*1)	V_{isol}	AC: 1min.		4000	Vrms
Mounting torque of screws to heatsink (*2)		-	M5 or M6		6.0	N·m
Mounting torque of screws to terminals (*2)			M5		5.0	

(*1) All terminals should be connected together during the test.

(*2) Recommendable Value: Mounting 3.0 ~ 6.0 N·m (M5 or M6)
Recommendable Value: Terminals 2.5 ~ 5.0 N·m (M6)

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5. Electrical characteristics (at $T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Collector-Emitter cut-off current, Gate-Emitter short-circuited	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 1700V$		-	-	100	μA
Gate leakage current, Collector-Emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$		-	-	200	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)	$V_{GE} = 15V$ $I_C = 150A$	$T_{vj}=25^{\circ}C$	-	1.70	2.15	V
	$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}C$	-	1.60	2.05	
			$T_{vj}=125^{\circ}C$	-	2.00	-	
			$T_{vj}=150^{\circ}C$	-	2.10	-	
			$T_{vj}=175^{\circ}C$	-	2.20	-	
Internal Gate resistance	r_g	-		-	6.25	-	Ω
Capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$		-	21	-	nF
	C_{oes}			-	0.6	-	
	C_{res}			-	0.13	-	
Gate charge	Q_G	$V_{CC} = 900V, I_C = 150A$ $V_{GE} = -15 \rightarrow +15V$		-	1300	-	nC
Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 150A$	$T_{vj}=25^{\circ}C$	-	1.80	2.25	V
	V_F (chip)		$T_{vj}=25^{\circ}C$	-	1.70	2.15	
			$T_{vj}=125^{\circ}C$	-	1.80	-	
			$T_{vj}=150^{\circ}C$	-	1.85	-	
			$T_{vj}=175^{\circ}C$	-	1.80	-	
Switching time (*1)	$t_{d(on)}$	$V_{CC} = 900V$ $I_C, I_F = 150A$ $V_{GE} = \pm 15V$ $R_G = 1\Omega$ $L_S = 30\text{ nH}$	$T_{vj}=25^{\circ}C$	-	370	-	ns
			$T_{vj}=125^{\circ}C$	-	445	-	
			$T_{vj}=150^{\circ}C$	-	395	-	
			$T_{vj}=175^{\circ}C$	-	395	-	
	t_r		$T_{vj}=25^{\circ}C$	-	90	-	
			$T_{vj}=125^{\circ}C$	-	65	-	
			$T_{vj}=150^{\circ}C$	-	70	-	
			$T_{vj}=175^{\circ}C$	-	130	-	
	$t_{d(off)}$		$T_{vj}=25^{\circ}C$	-	425	-	
			$T_{vj}=125^{\circ}C$	-	480	-	
			$T_{vj}=150^{\circ}C$	-	495	-	
			$T_{vj}=175^{\circ}C$	-	505	-	
	t_f		$T_{vj}=25^{\circ}C$	-	495	-	
			$T_{vj}=125^{\circ}C$	-	610	-	
			$T_{vj}=150^{\circ}C$	-	645	-	
			$T_{vj}=175^{\circ}C$	-	635	-	
Reverse recovery time	t_{rr}	$T_{vj}=25^{\circ}C$	-	200	-		
		$T_{vj}=125^{\circ}C$	-	360	-		
		$T_{vj}=150^{\circ}C$	-	400	-		
		$T_{vj}=175^{\circ}C$	-	465	-		

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■ Electrical characteristics (at $T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Switching loss (per pulse)	E_{on}	$V_{\text{CC}} = 900\text{V}$ $I_{\text{C}}, I_{\text{F}} = 150\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $R_{\text{G}} = 1\ \Omega$ $L_{\text{S}} = 30\ \text{nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	37.5	-	mJ
			$T_{\text{vj}} = 125^{\circ}\text{C}$	-	48.8	-	
			$T_{\text{vj}} = 150^{\circ}\text{C}$	-	52.5	-	
			$T_{\text{vj}} = 175^{\circ}\text{C}$	-	55.8	-	
	E_{off}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	29.4	-	
			$T_{\text{vj}} = 125^{\circ}\text{C}$	-	41.2	-	
			$T_{\text{vj}} = 150^{\circ}\text{C}$	-	45.1	-	
			$T_{\text{vj}} = 175^{\circ}\text{C}$	-	47.2	-	
	E_{rr}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	18.0	-	
			$T_{\text{vj}} = 125^{\circ}\text{C}$	-	38.4	-	
			$T_{\text{vj}} = 150^{\circ}\text{C}$	-	45.1	-	
			$T_{\text{vj}} = 175^{\circ}\text{C}$	-	52.7	-	

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			ns
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.162	K/W
		Inverter FWD	-	-	0.245	
Thermal resistance case to heat sink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0250	-	

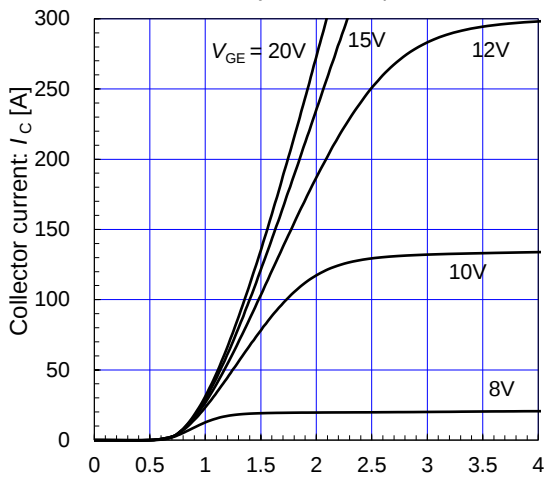
(*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

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[Inverter]

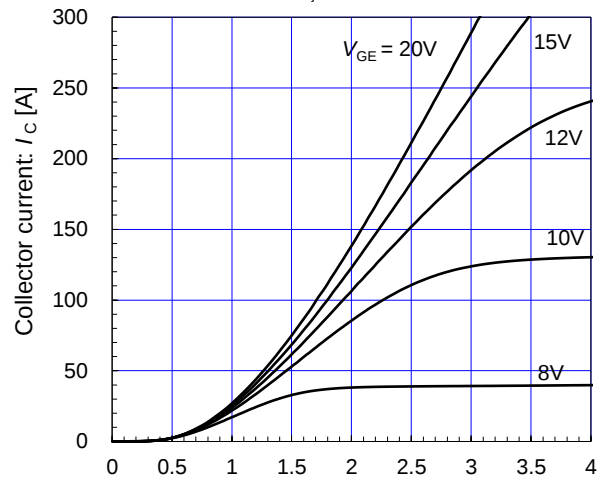
Collector current vs. Collector-Emitter voltage (typ.)
 $T_{vj} = 25^{\circ}\text{C} / \text{chip}$



Collector-Emitter voltage: V_{CE} [V]

[Inverter]

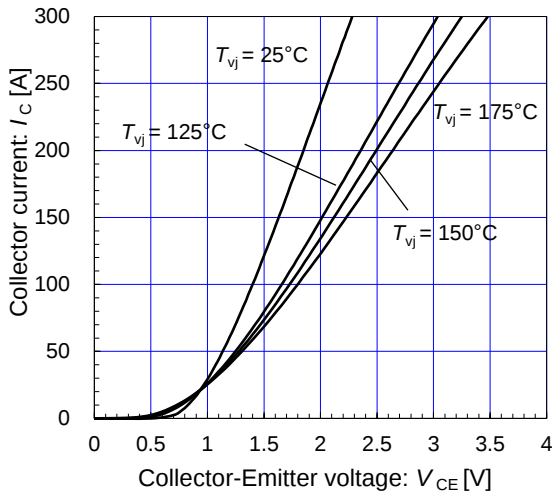
Collector current vs. Collector-Emitter voltage
 $T_{vj} = 175^{\circ}\text{C} / \text{chip}$



Collector-Emitter voltage: V_{CE} [V]

[Inverter]

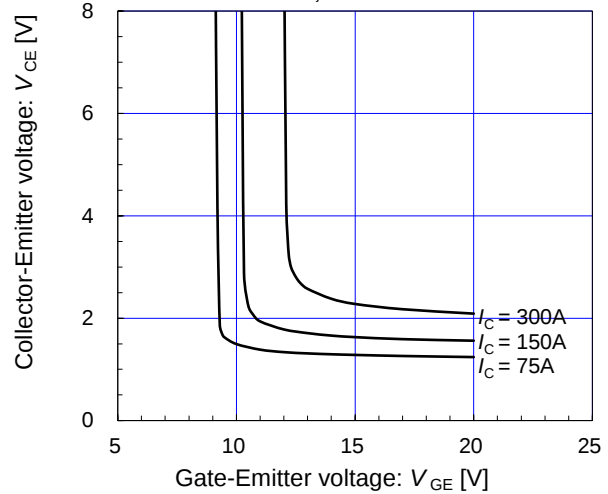
Collector current vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 15\text{V} / \text{chip}$



Collector-Emitter voltage: V_{CE} [V]

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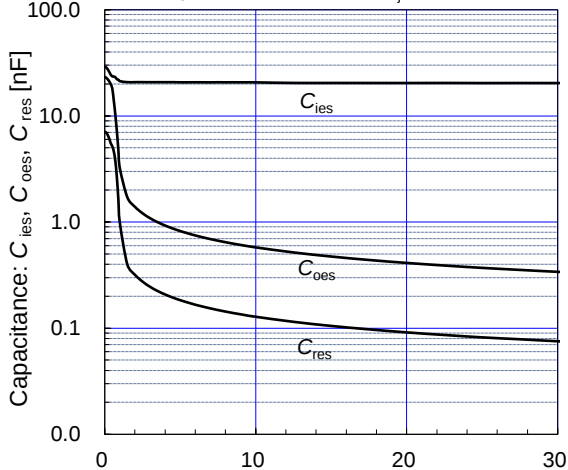
Collector-Emitter voltage vs. Gate-Emitter
 $T_{vj} = 25^{\circ}\text{C} / \text{chip}$



Gate-Emitter voltage: V_{GE} [V]

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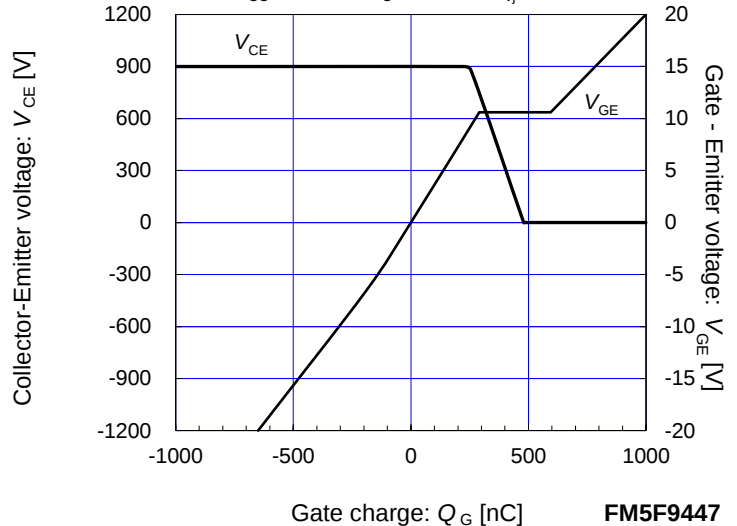
Capacitance vs. Collector-Emitter Voltage (typ.)
 $V_{GE} = 0\text{V}, f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}$



Collector-Emitter voltage: V_{CE} [V]

[Inverter]

Dynamic Gate Charge (typ.)
 $V_{CC} = 900\text{V}, I_C = 150\text{A}, T_{vj} = 25^{\circ}\text{C}$

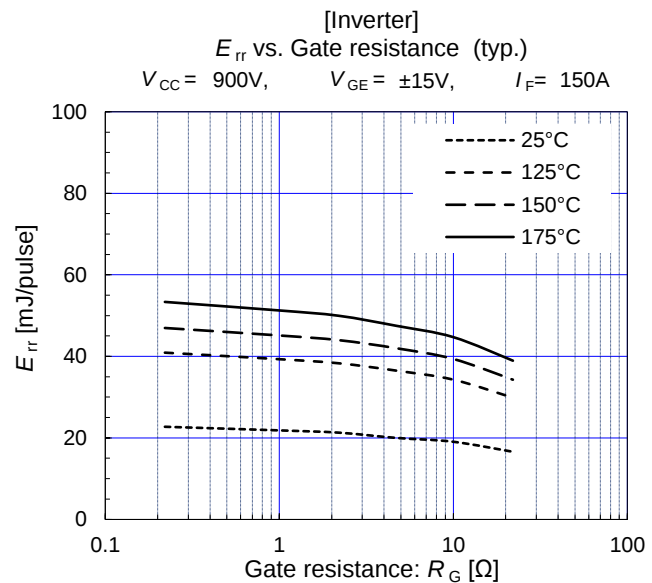
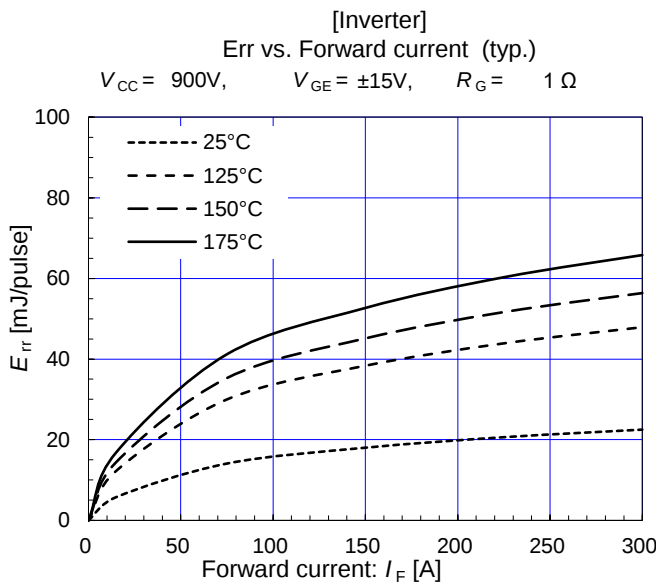
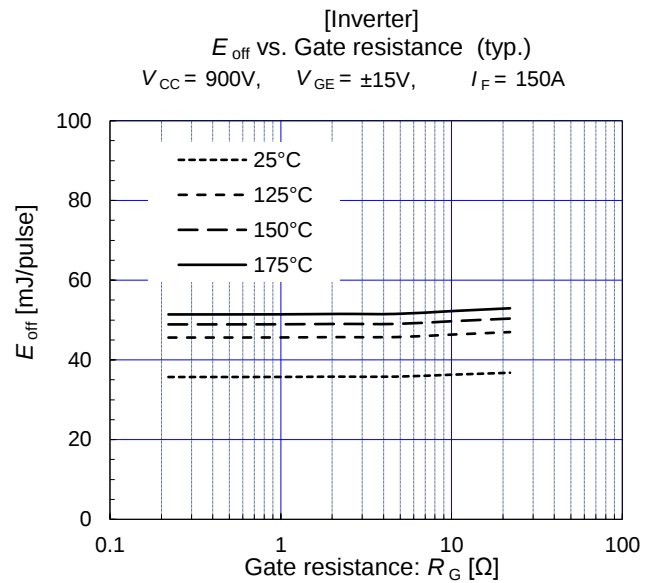
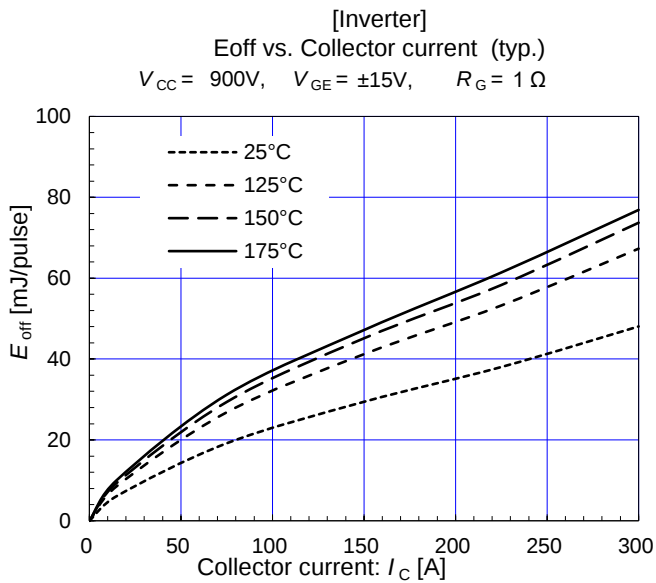
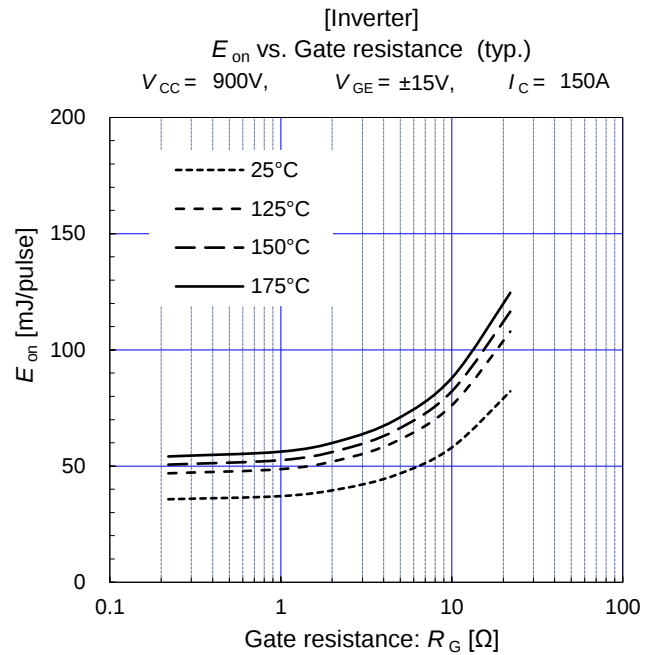
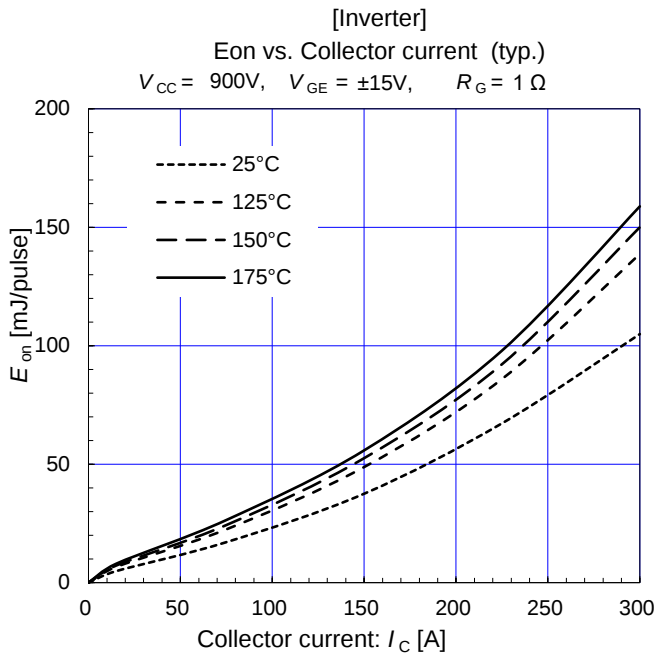


Gate charge: Q_G [nC]

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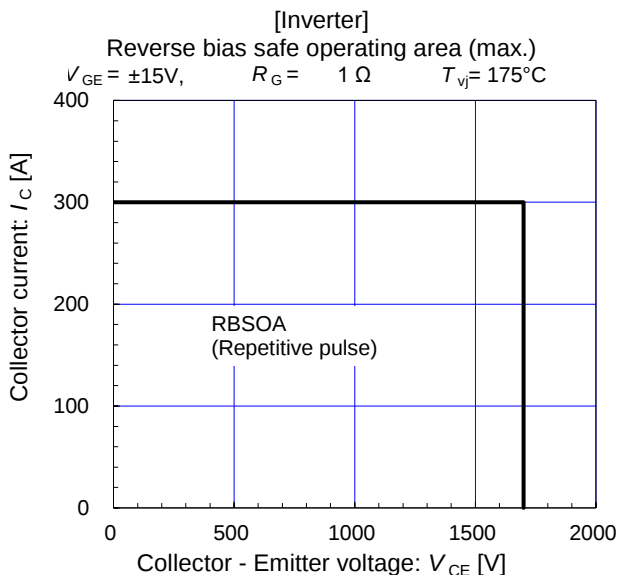
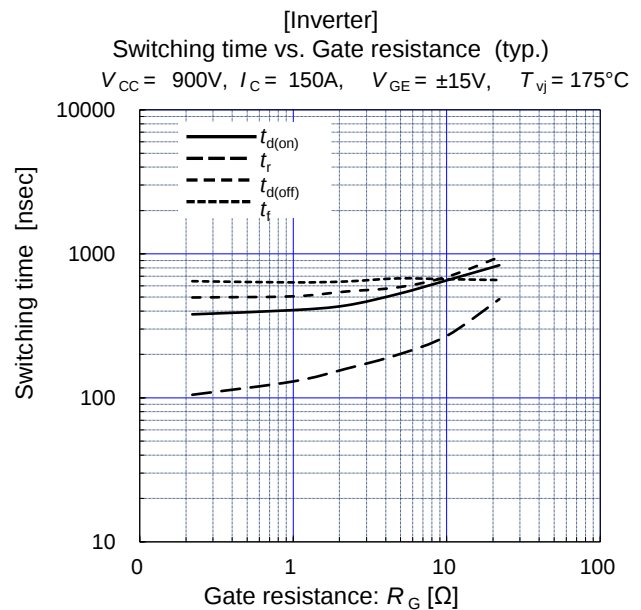
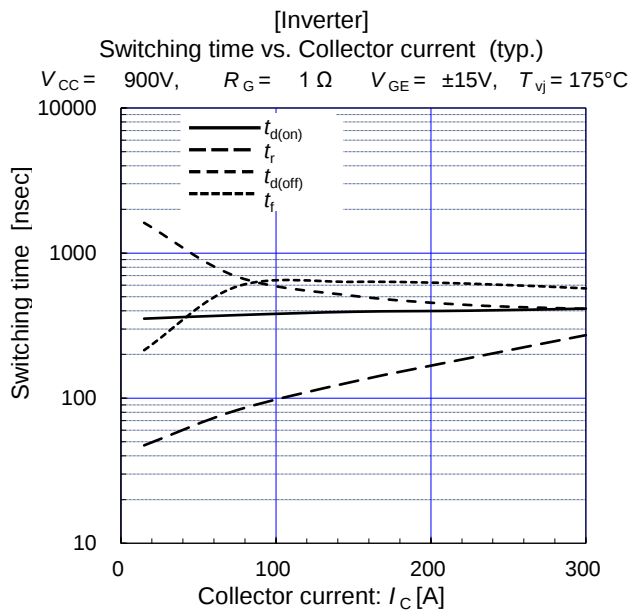
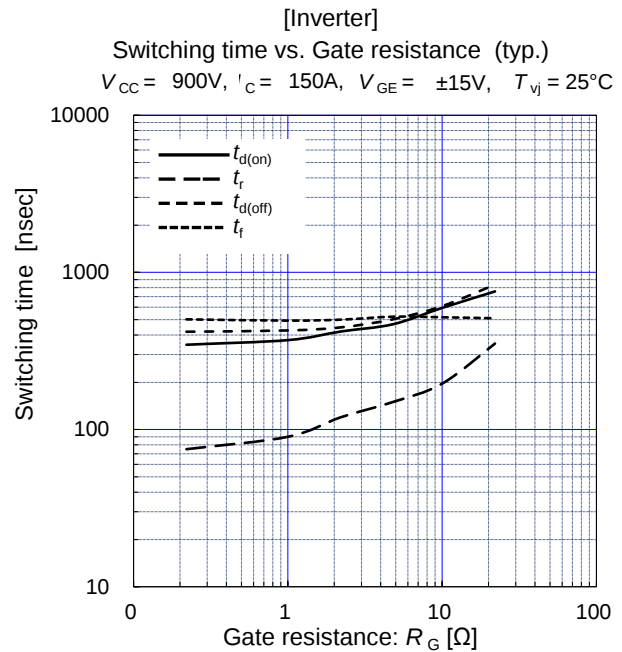
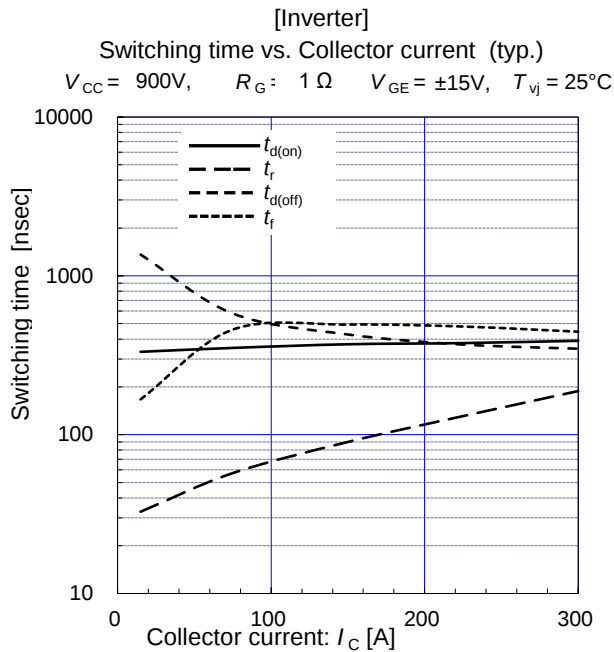
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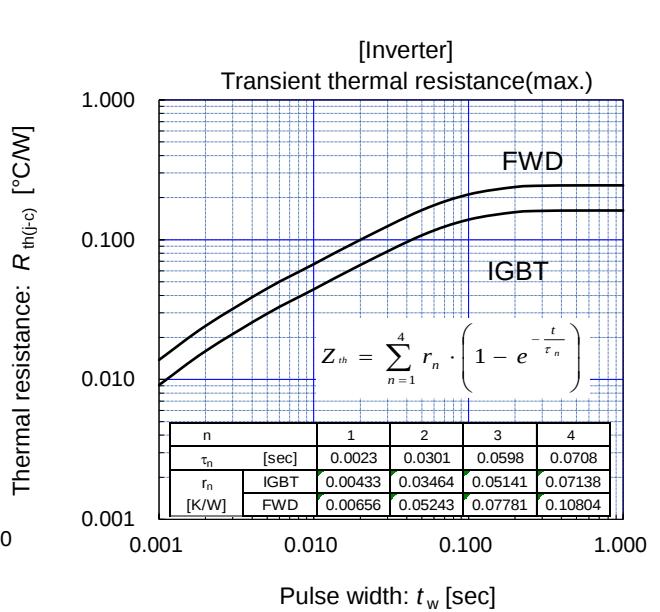
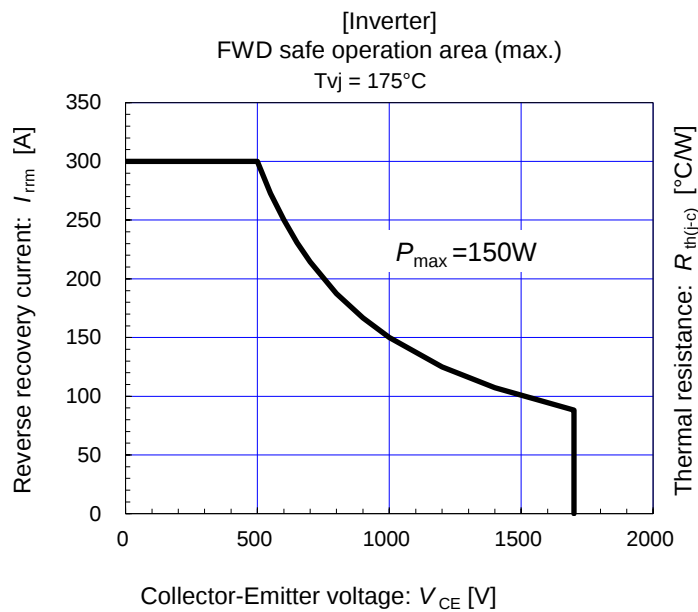
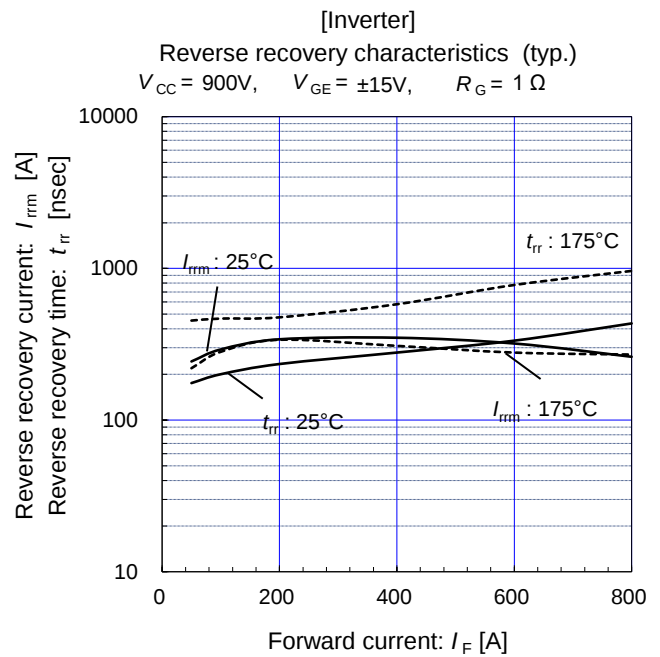
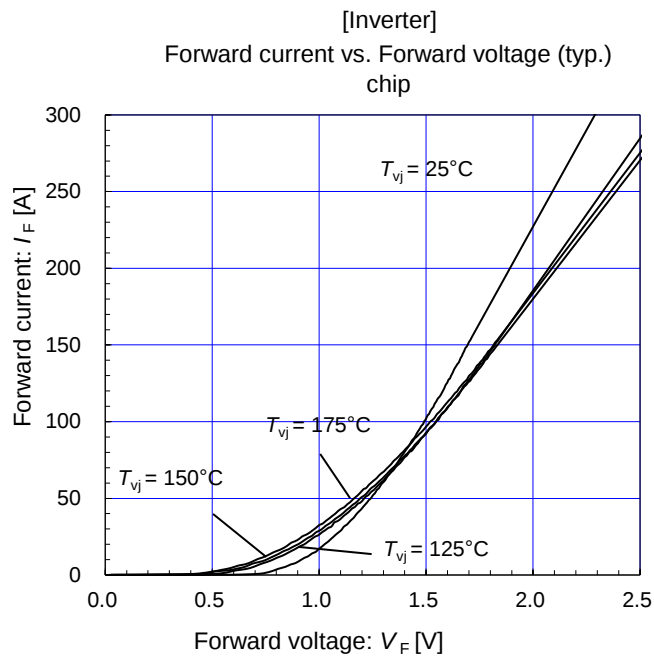
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