

2MBI150XAA170-50

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

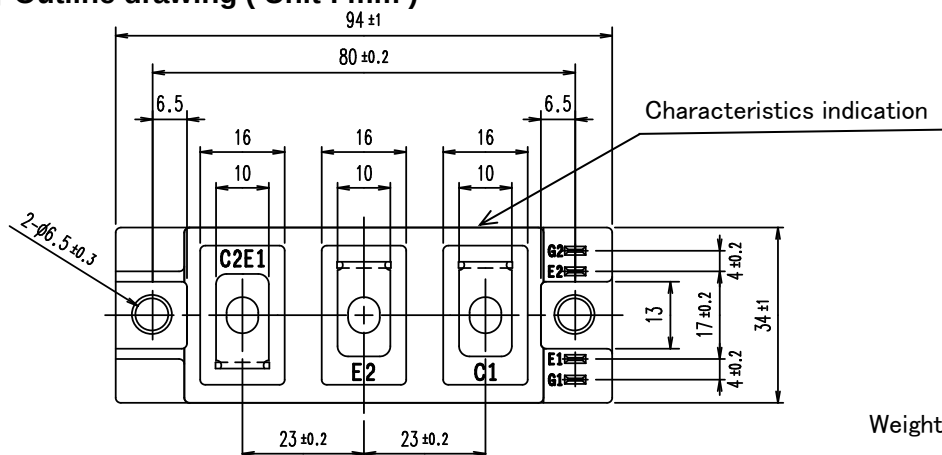
Inverter for Motor Drives, AC and DC Servo Drives

Uninterruptible Power Supply Systems,

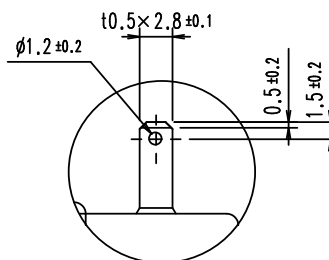
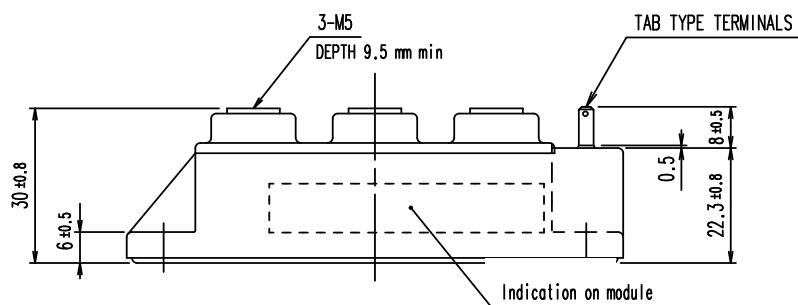
Industrial machines, such as Welding machines



■ Outline drawing (Unit : mm)

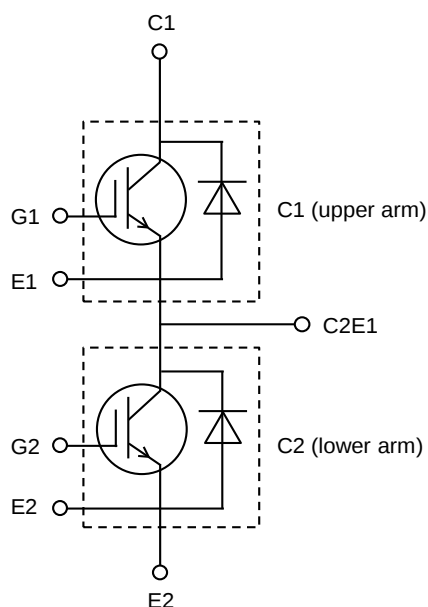


Weight: 180 g(typ.)



DETAIL TAB TYPE TERMINALS

■ 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	Continuous	150	
Repetitive peak forward current		I_{FRM}	1ms	300	
Total power dissipation		P_{tot}	1 device	730	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 terminals and copper base (*1)	V_{isol}	AC: 1min.	4000	Vrms
Mounting torque of screws to heatsink(*2)		M_s	M5 or M6	5.0	N·m
Mounting torque of screws to terminals(*3)		M_t	M5	5.0	

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

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

(*3) Recommendable Value: 2.5 ~ 5.0 N·m (M5)

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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}	$V_{GE} = 0V$ $V_{CE} = 1700V$		-	-	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)	$V_{GE} = 15V$ $I_C = 150A$	$T_{vj}=25^{\circ}C$	-	1.75	2.20	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}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$		-	20	-	nF
	C_{oes}			-	0.6	-	
	C_{res}			-	0.13	-	
Gate charge	Q_G	$V_{CC} = 900V, I_C = 150A$ $V_{GE} = -15 \rightarrow +15V$		-	1200	-	nC
Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 150A$	$T_{vj}=25^{\circ}C$	-	1.85	2.30	V
	V_F (chip)		$T_{vj}= 25^{\circ}C$	-	1.70	2.15	
			$T_{vj}=125^{\circ}C$	-	1.85	-	
			$T_{vj}=150^{\circ}C$	-	1.85	-	
			$T_{vj}=175^{\circ}C$	-	1.80	-	
Switching time (*1)	$t_{d(on)}$	$V_{CC} = 900V$ $I_C, I_F = 150A$ $V_{GE} = \pm 15V$ $R_G = 2.2 \Omega$ $L_S = 30 nH$	$T_{vj}= 25^{\circ}C$	-	425	-	nS
			$T_{vj}=125^{\circ}C$	-	455	-	
			$T_{vj}=150^{\circ}C$	-	465	-	
			$T_{vj}=175^{\circ}C$	-	470	-	
	t_r		$T_{vj}= 25^{\circ}C$	-	70	-	
			$T_{vj}=125^{\circ}C$	-	85	-	
			$T_{vj}=150^{\circ}C$	-	90	-	
			$T_{vj}=175^{\circ}C$	-	95	-	
	$t_{d(off)}$		$T_{vj}= 25^{\circ}C$	-	430	-	
			$T_{vj}=125^{\circ}C$	-	500	-	
			$T_{vj}=150^{\circ}C$	-	515	-	
			$T_{vj}=175^{\circ}C$	-	525	-	
	t_f		$T_{vj}= 25^{\circ}C$	-	440	-	
			$T_{vj}=125^{\circ}C$	-	625	-	
			$T_{vj}=150^{\circ}C$	-	670	-	
			$T_{vj}=175^{\circ}C$	-	720	-	
Reverse recovery time	t_{rr}	$T_{vj}= 25^{\circ}C$	-	785	-		
		$T_{vj}=125^{\circ}C$	-	1200	-		
		$T_{vj}=150^{\circ}C$	-	1380	-		
		$T_{vj}=175^{\circ}C$	-	1350	-		

(*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°C unless otherwise specified)

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Switching loss (per pulse)	E_{on}	$V_{CC} = 900V$ $I_C, I_F = 150A$ $V_{GE} = \pm 15V$ $R_G = 2.2 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}= 25^{\circ}C$	-	28.8	-	mJ
			$T_{vj}=125^{\circ}C$	-	36.8	-	
			$T_{vj}=150^{\circ}C$	-	39.5	-	
			$T_{vj}=175^{\circ}C$	-	41.9	-	
	E_{off}		$T_{vj}= 25^{\circ}C$	-	33.2	-	
			$T_{vj}=125^{\circ}C$	-	42.4	-	
			$T_{vj}=150^{\circ}C$	-	44.2	-	
			$T_{vj}=175^{\circ}C$	-	46.6	-	
	E_{rr}		$T_{vj}= 25^{\circ}C$	-	16.8	-	
			$T_{vj}=125^{\circ}C$	-	30.6	-	
			$T_{vj}=150^{\circ}C$	-	35.2	-	
			$T_{vj}=175^{\circ}C$	-	40.3	-	

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.

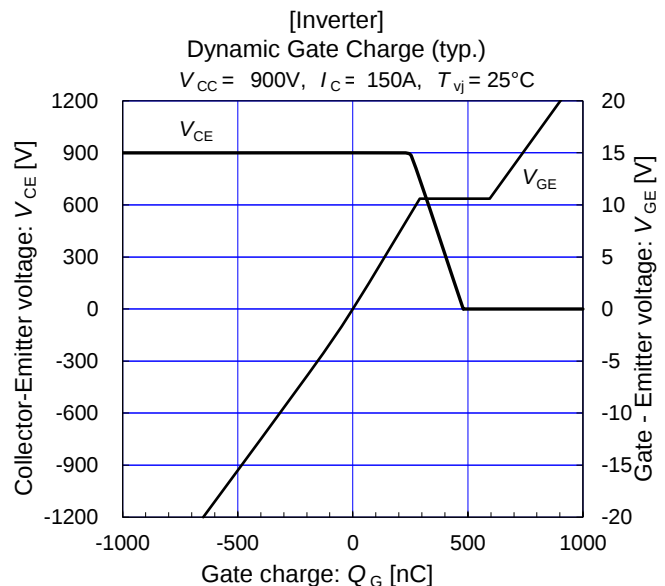
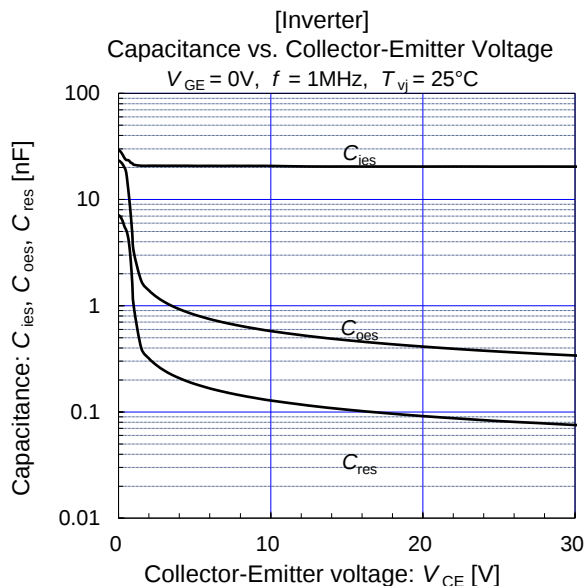
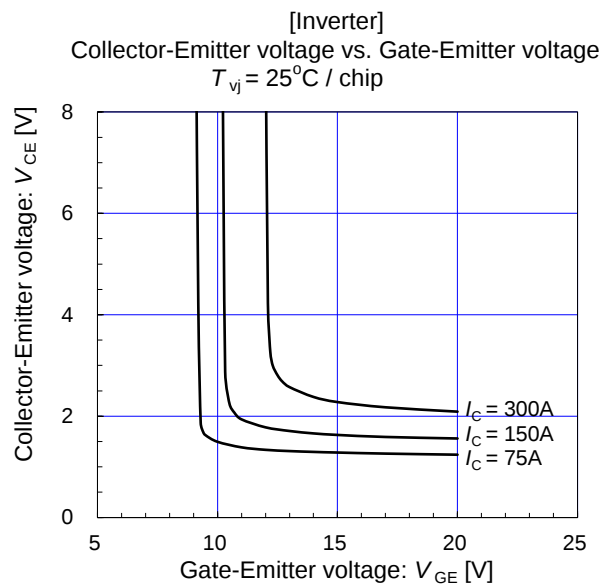
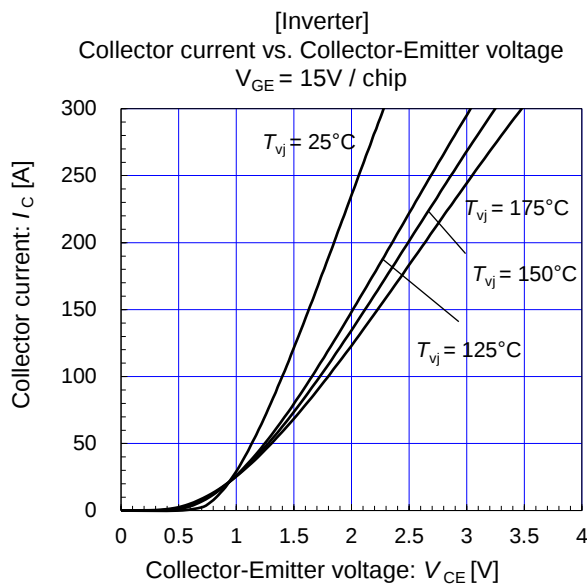
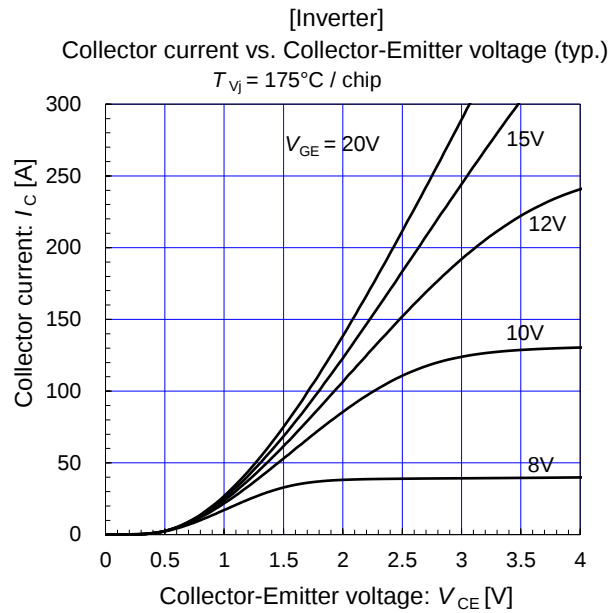
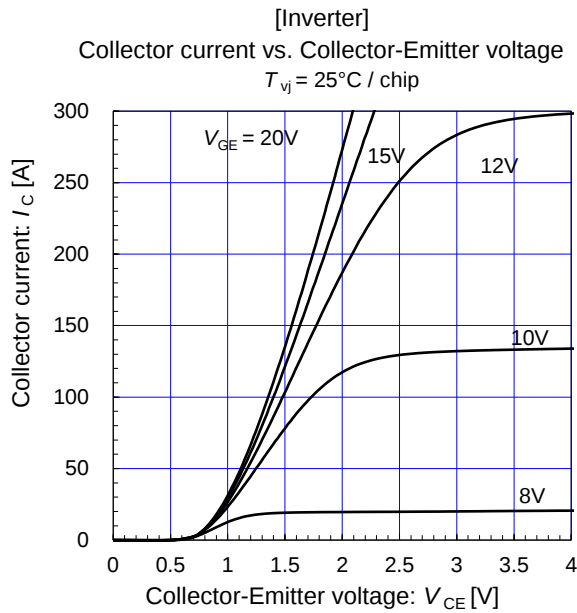
Thermal resistance characteristics

	Symbols	Conditions	Characteristics			ns
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.205	K/W
		Inverter FWD	-	-	0.323	
Thermal resistance case to heatsink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.050	-	

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

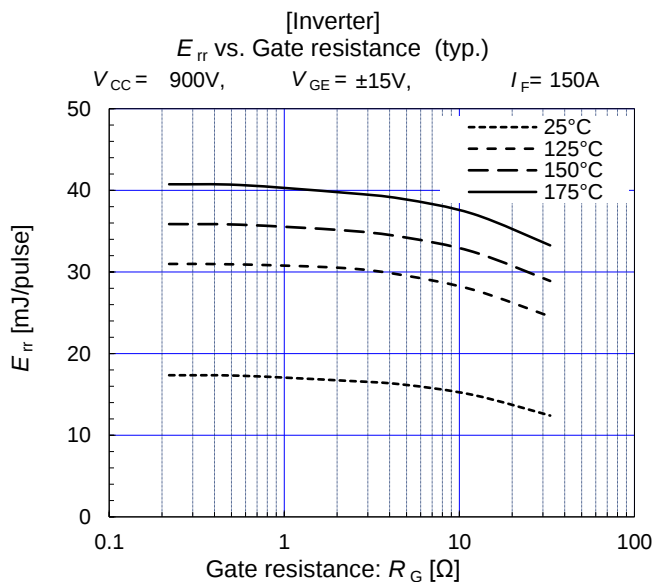
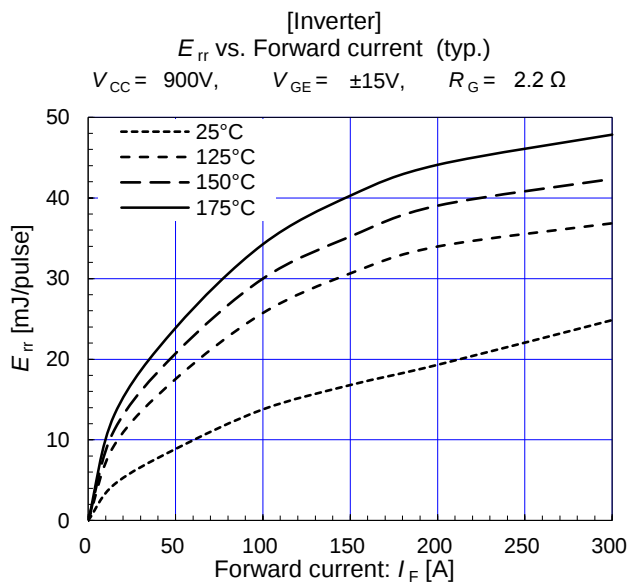
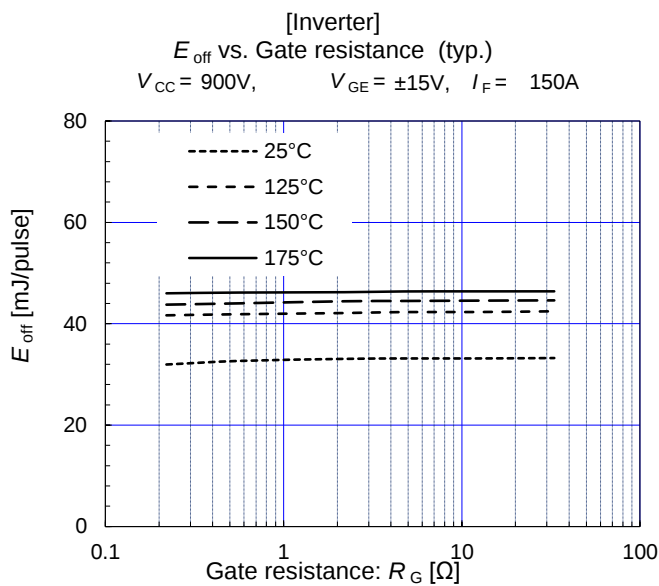
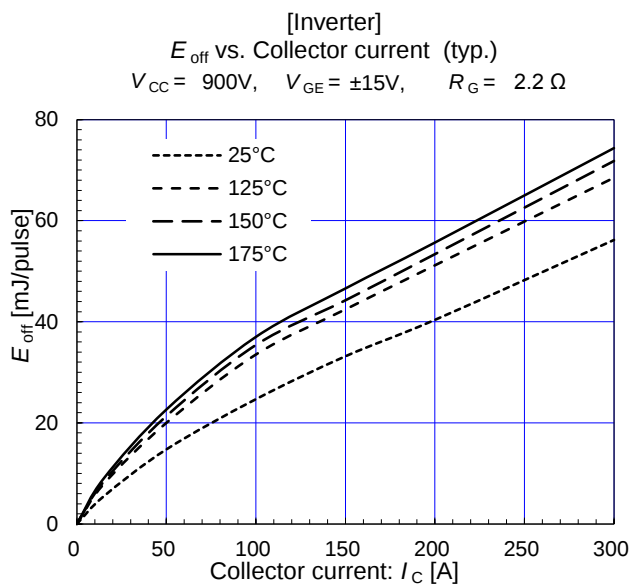
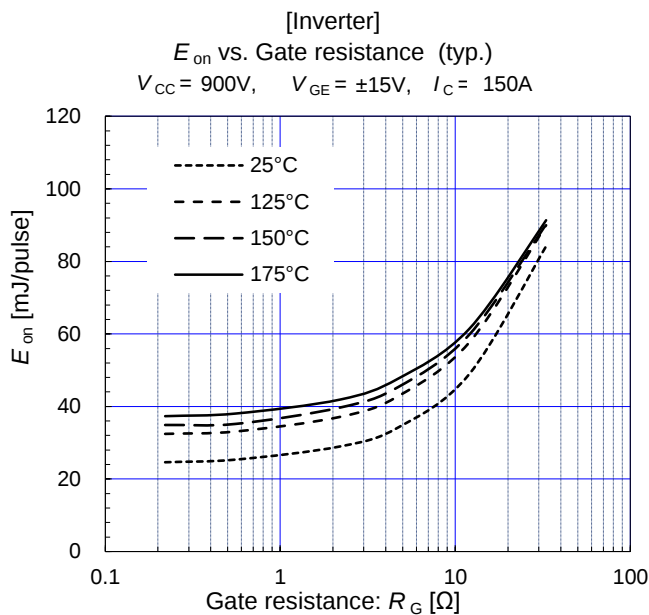
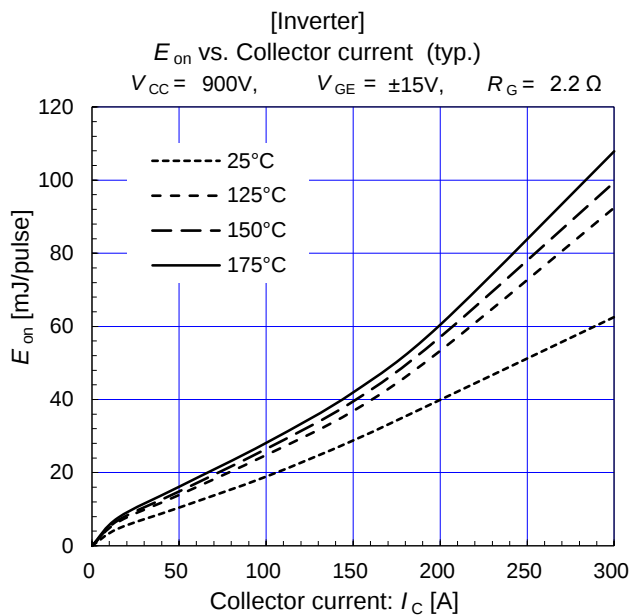
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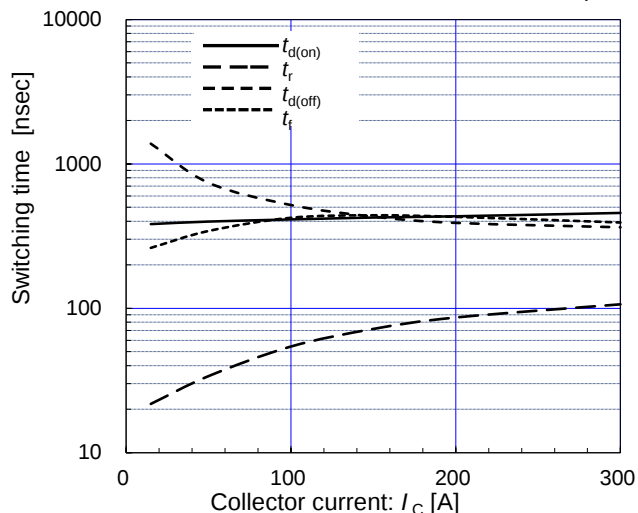
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[Inverter]

Switching time vs. Collector current (typ.)

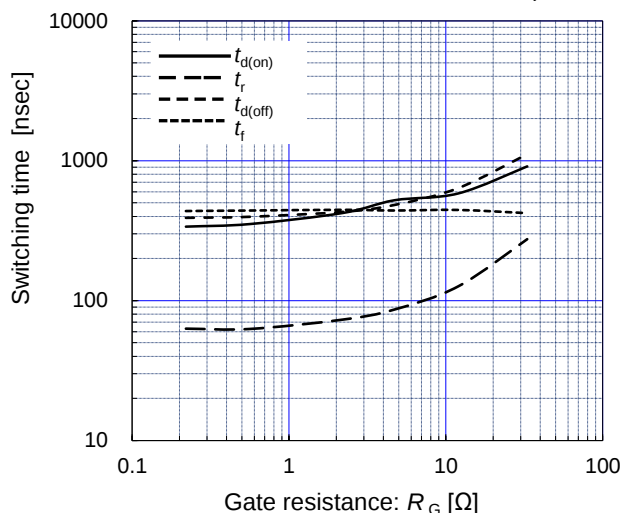
$V_{CC} = 900V$, $R_G = 2.2\ \Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

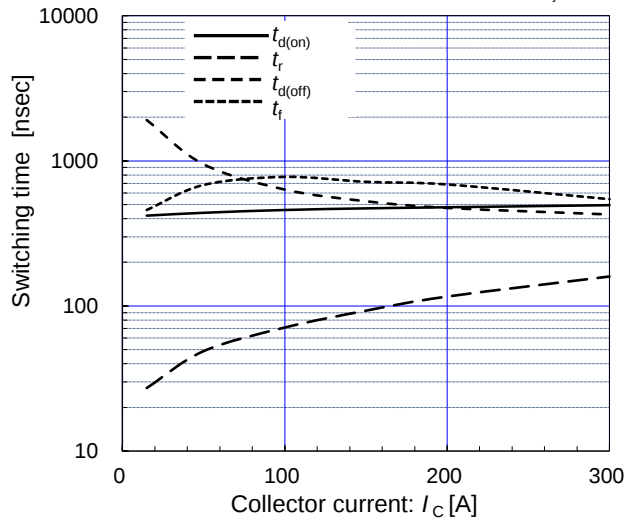
$V_{CC} = 900V$, $I_C = 150A$, $V_{GE} = \pm 15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

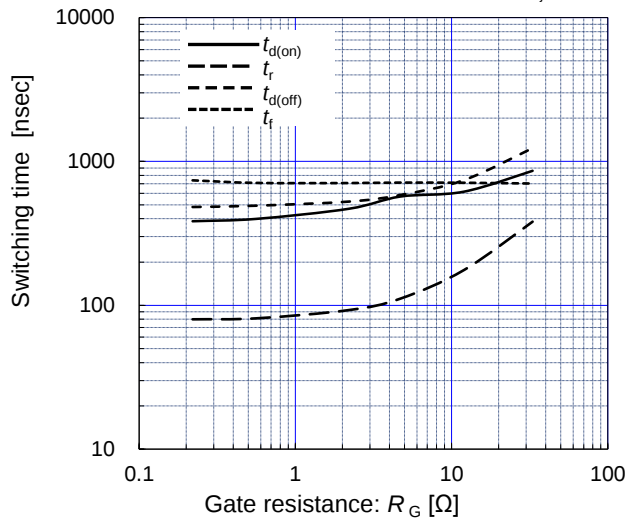
$V_{CC} = 900V$, $R_G = 2.2\ \Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

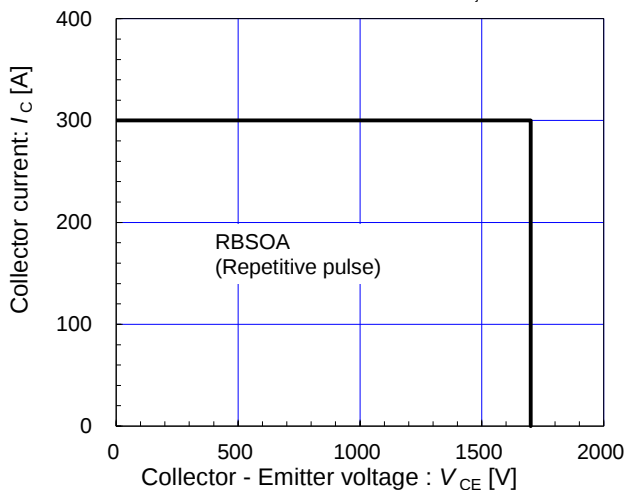
$V_{CC} = 900V$, $I_C = 150A$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



[Inverter]

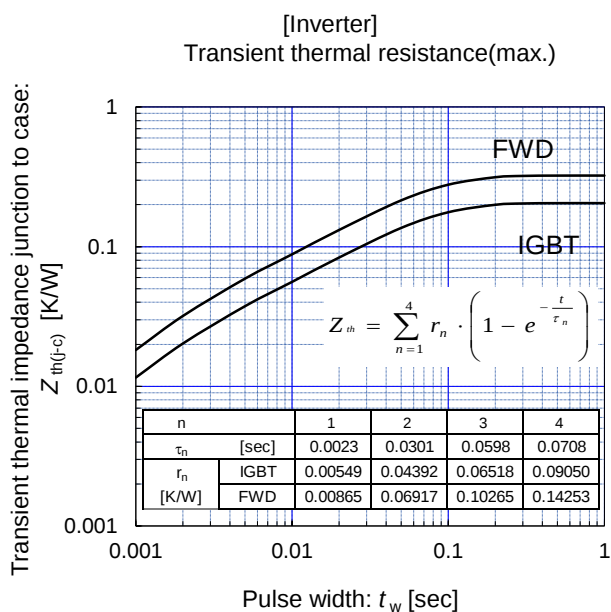
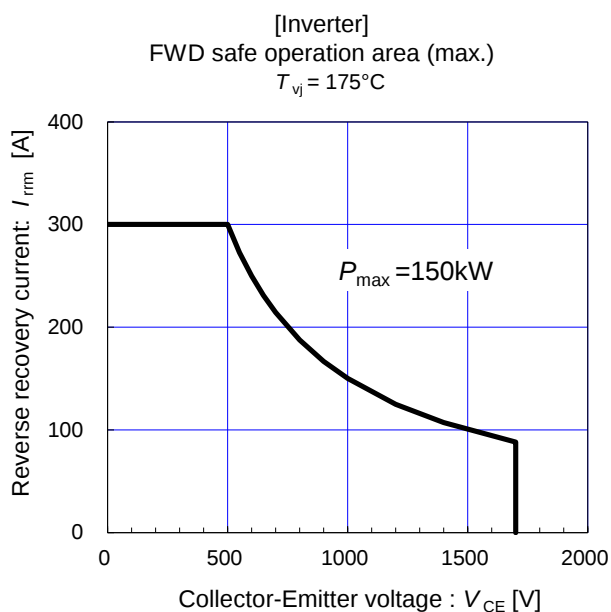
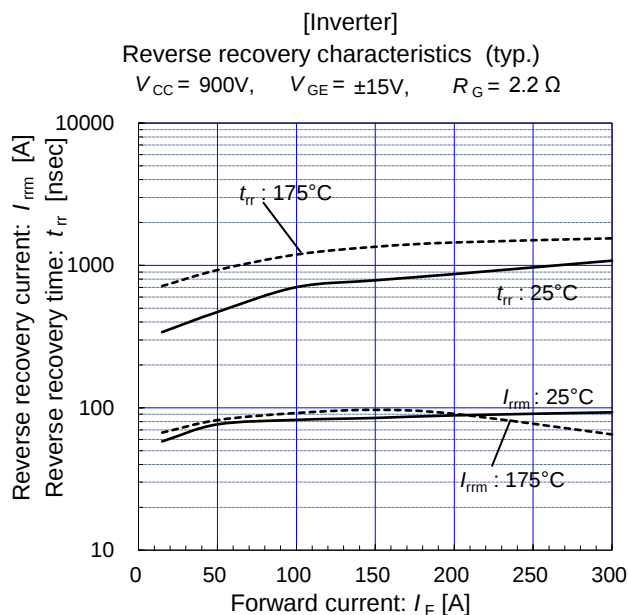
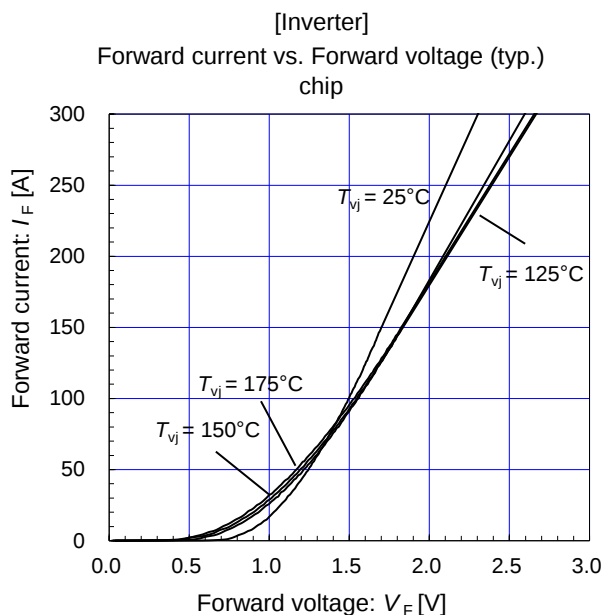
Reverse bias safe operating area (max.)

$V_{GE} = \pm 15V$, $R_G = 2.2\ \Omega$, $T_{vj} = 175^\circ C$



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