

2MBI300XHA170-50

IGBT Modules

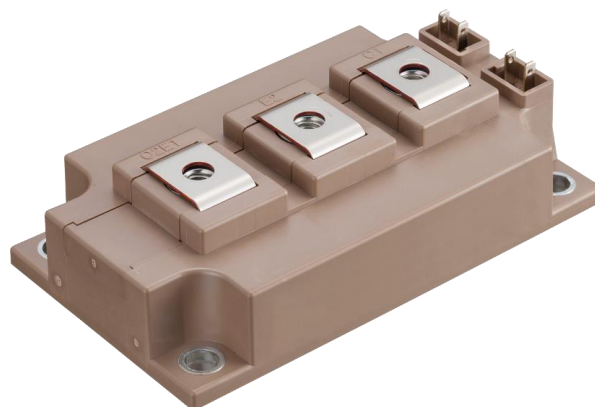
Power Module (X series)
1700V / 300A / 2-in-1 package

■ Features

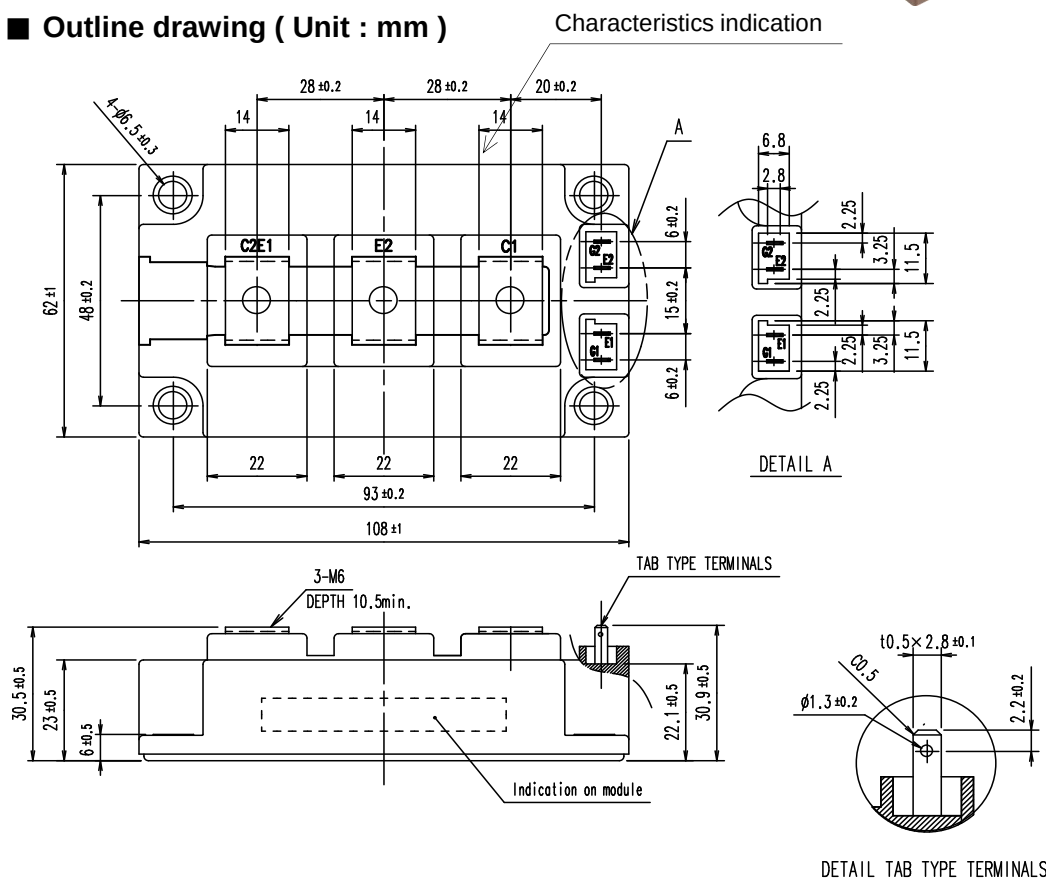
- LOW $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

■ Applications

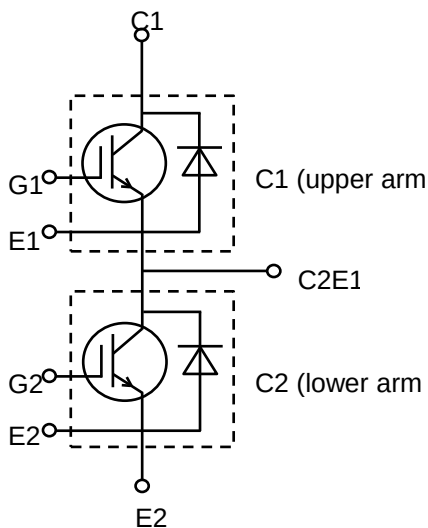
- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems,
- Industrial machines, such as Welding machines



■ Outline drawing (Unit : mm)



■ 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	$T_c=100^{\circ}\text{C}$	300	A
Repetitive peak collector current		I_{CRM}	1ms		600	
Forward current		I_F			300	
Repetitive peak forward current		I_{FRM}	1ms		600	
Total power dissipation		P_{tot}	1 device		1685	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 heat sink (*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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Electrical characteristics (at Tvj= 25°C unless otherwise specified)

	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Collector-Emitter cut-off current, Gate-Emitter short-circuited	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 1700V$		-	-	200	μA
Gate leakage current, Collector-Emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$		-	-	400	nA
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 300mA$		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 300A$	$T_{vj}=25^{\circ}C$	-	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	-		-	3.13	-	Ω
Capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$		-	41	-	nF
	C_{oes}			-	1.2	-	
	C_{res}			-	0.26	-	
Gate charge	Q_G	$V_{CC} = 900V, I_C = 300A$ $V_{GE} = -15 \rightarrow +15V$		-	2500	-	nC
Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 300A$	$T_{vj}=25^{\circ}C$	-	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)	$t_{d(on)}$	$V_{CC} = 900V$ $I_C, I_F = 300A$ $V_{GE} = \pm 15V$ $R_G = 0.68 \Omega$ $L_S = 30 nH$	$T_{vj}= 25^{\circ}C$	-	440	-	ns
			$T_{vj}=125^{\circ}C$	-	450	-	
			$T_{vj}=150^{\circ}C$	-	450	-	
			$T_{vj}=175^{\circ}C$	-	450	-	
	t_r		$T_{vj}= 25^{\circ}C$	-	80	-	
			$T_{vj}=125^{\circ}C$	-	70	-	
			$T_{vj}=150^{\circ}C$	-	70	-	
			$T_{vj}=175^{\circ}C$	-	70	-	
	$t_{d(off)}$		$T_{vj}= 25^{\circ}C$	-	620	-	
			$T_{vj}=125^{\circ}C$	-	580	-	
			$T_{vj}=150^{\circ}C$	-	570	-	
			$T_{vj}=175^{\circ}C$	-	560	-	
	t_f		$T_{vj}= 25^{\circ}C$	-	595	-	
			$T_{vj}=125^{\circ}C$	-	625	-	
			$T_{vj}=150^{\circ}C$	-	630	-	
			$T_{vj}=175^{\circ}C$	-	635	-	
Reverse recovery time	t_{rr}	$T_{vj}= 25^{\circ}C$	-	290	-		
		$T_{vj}=125^{\circ}C$	-	475	-		
		$T_{vj}=150^{\circ}C$	-	520	-		
		$T_{vj}=175^{\circ}C$	-	605	-		

(*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}	$V_{CC} = 900V$ $I_C, I_F = 300A$ $V_{GE} = \pm 15V$ $R_G = 0.68 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}= 25^{\circ}C$	-	60.5	-	mJ
			$T_{vj}=125^{\circ}C$	-	82.9	-	
			$T_{vj}=150^{\circ}C$	-	90.3	-	
			$T_{vj}=175^{\circ}C$	-	103.6	-	
	E_{off}		$T_{vj}= 25^{\circ}C$	-	64.3	-	
			$T_{vj}=125^{\circ}C$	-	88.5	-	
			$T_{vj}=150^{\circ}C$	-	96.6	-	
			$T_{vj}=175^{\circ}C$	-	102.4	-	
	E_{rr}		$T_{vj}= 25^{\circ}C$	-	44.0	-	
			$T_{vj}=125^{\circ}C$	-	73.9	-	
			$T_{vj}=150^{\circ}C$	-	83.8	-	
			$T_{vj}=175^{\circ}C$	-	93.8	-	

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.

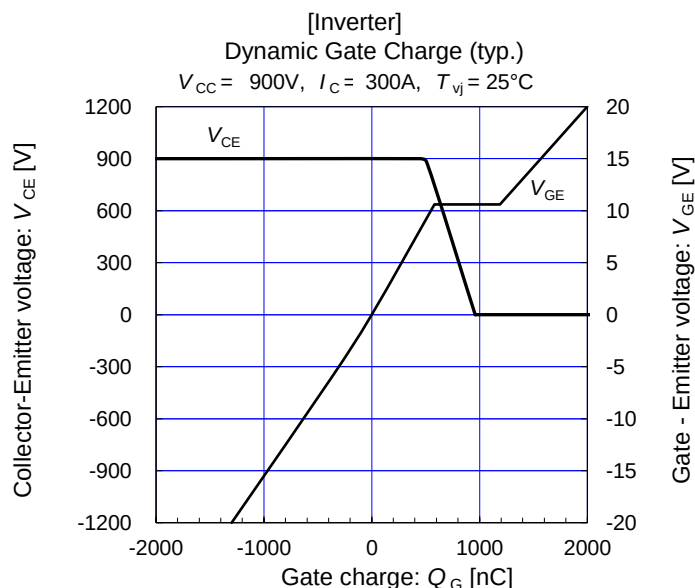
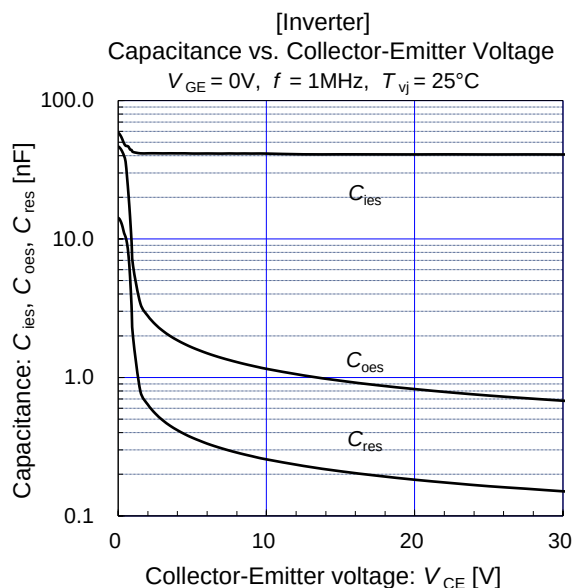
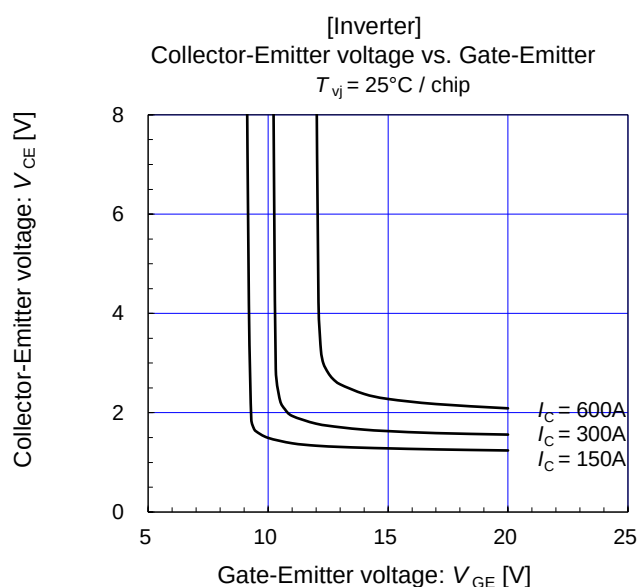
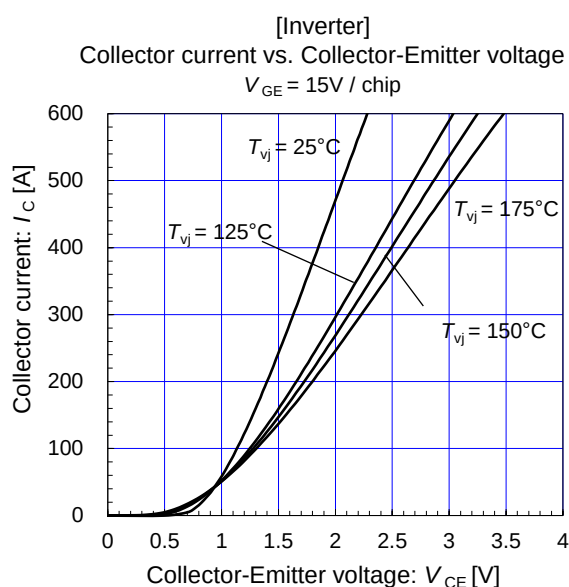
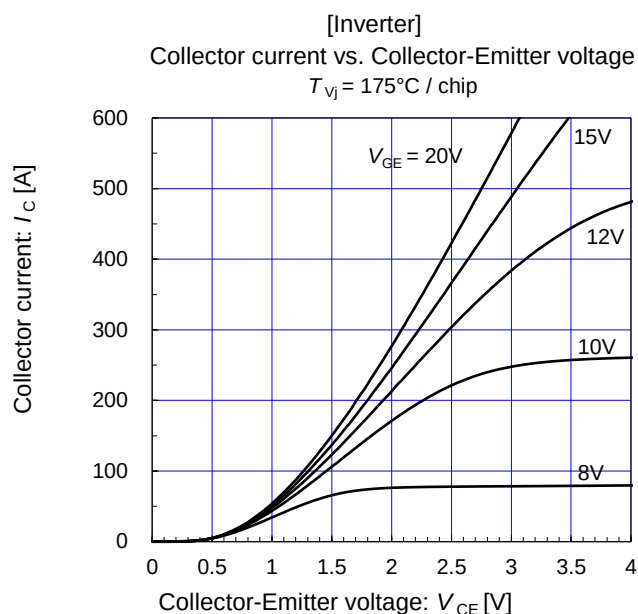
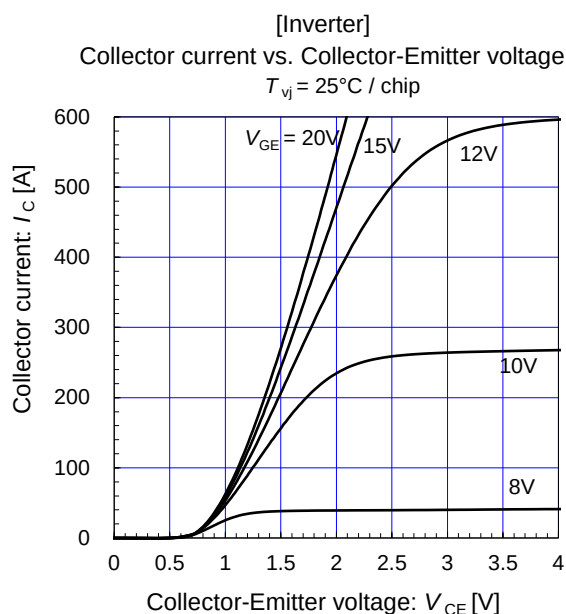
Thermal resistance characteristics

	Symbols	Conditions	Characteristics			ns
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.089	K/W
		Inverter FWD	-	-	0.135	
Thermal resistance case to heat sink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0125	-	

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

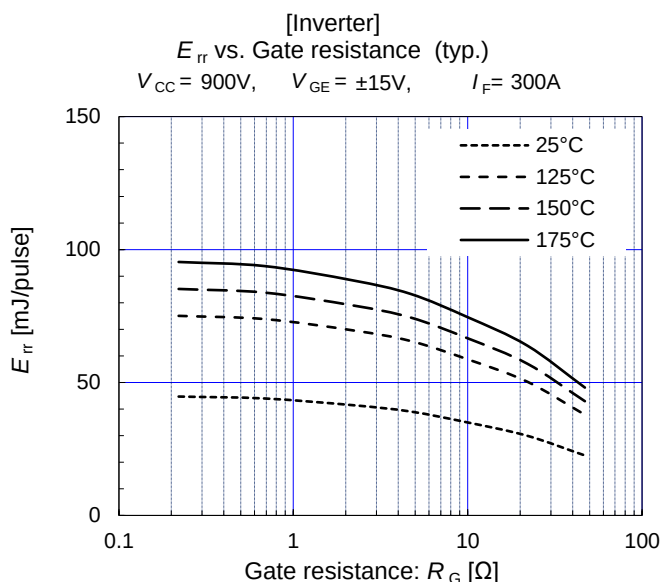
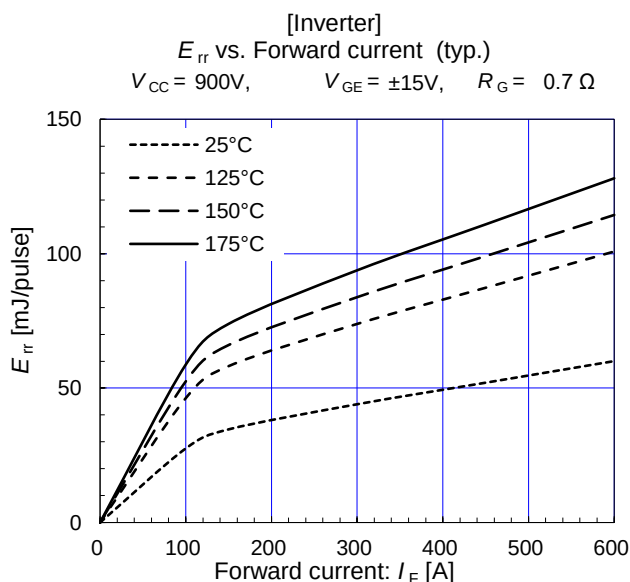
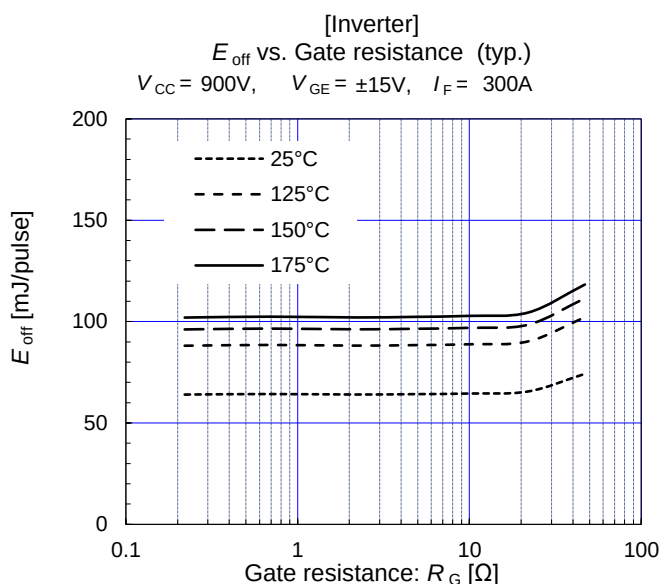
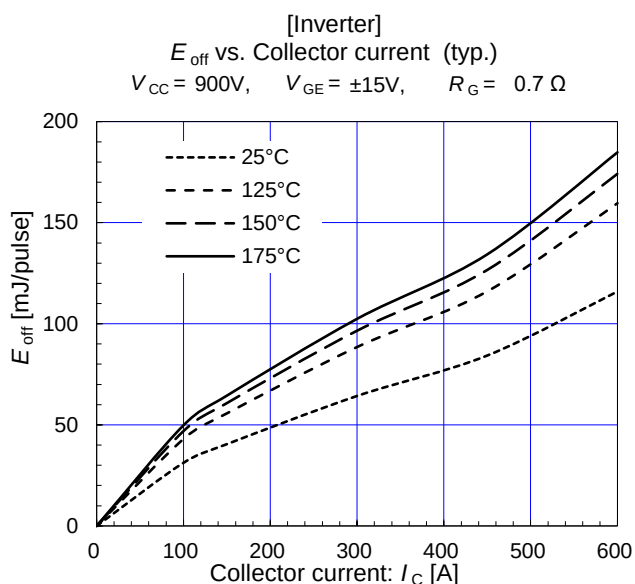
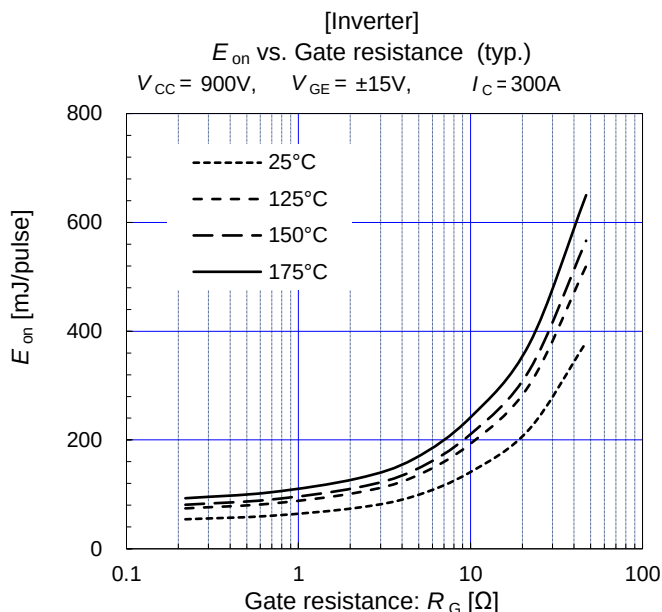
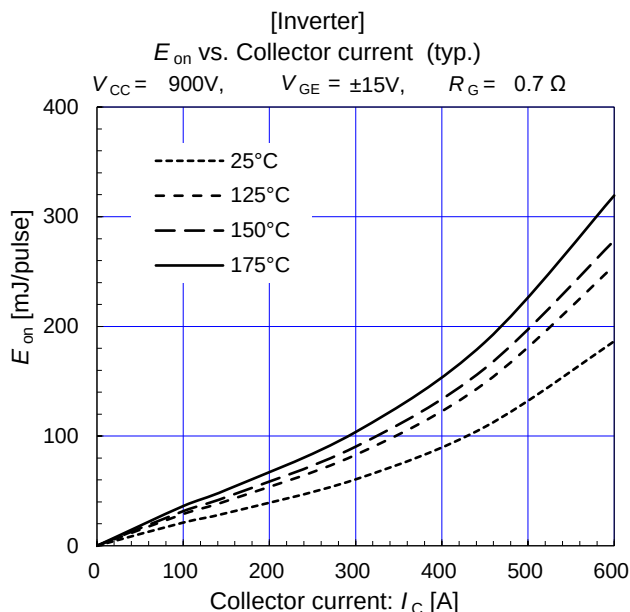
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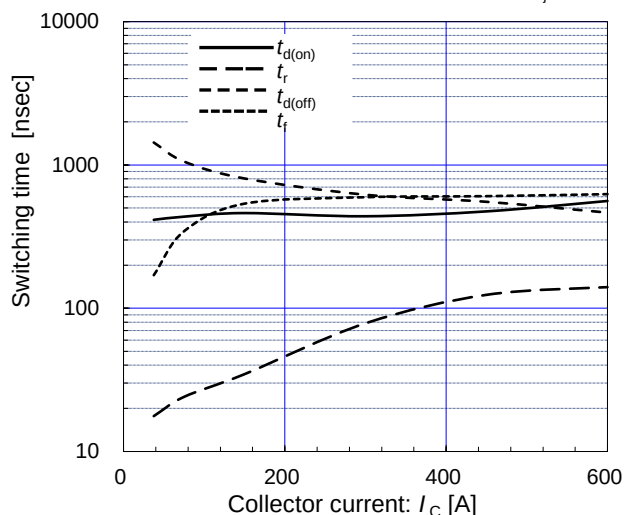
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[Inverter]

Switching time vs. Collector current (typ.)

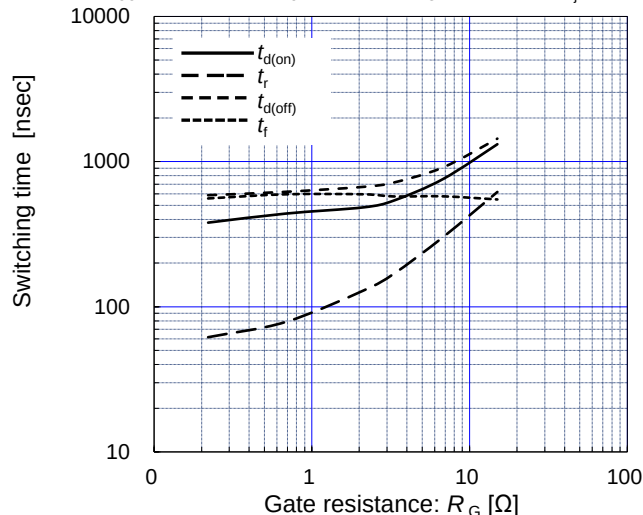
$V_{CC} = 900V$, $R_G = 0.68 \Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

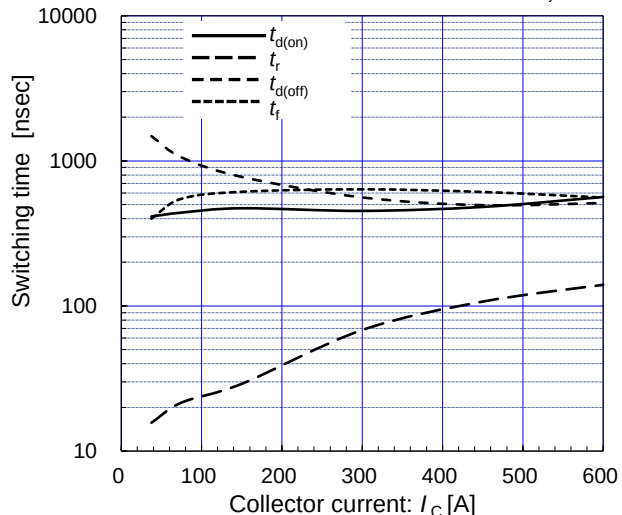
$V_{CC} = 900V$, $I_C = 300A$, $V_{GE} = \pm 15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

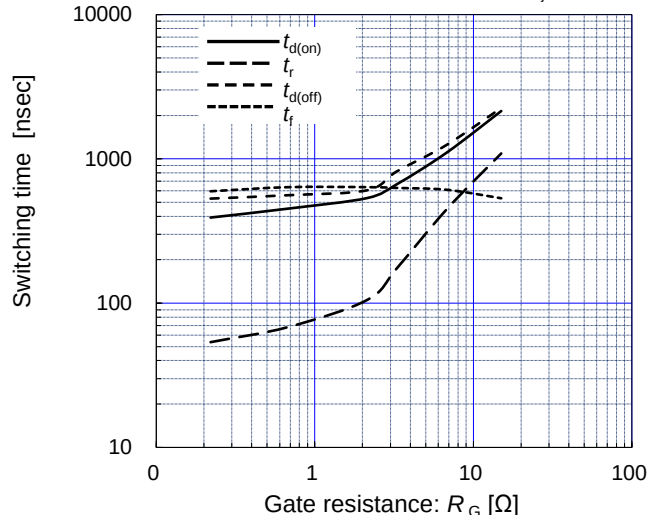
$V_{CC} = 900V$, $R_G = 0.7 \Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

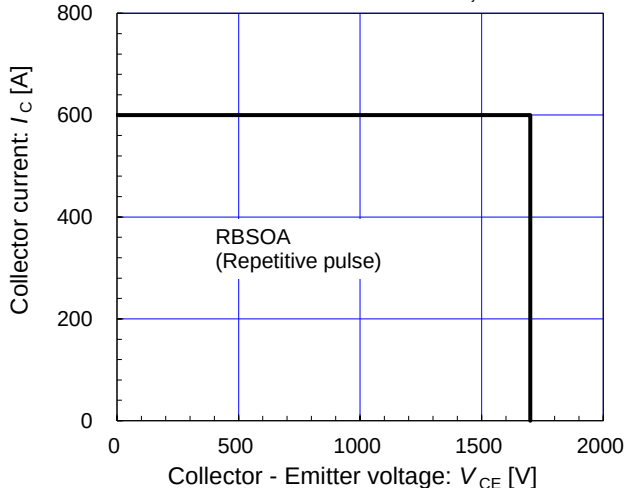
$V_{CC} = 900V$, $I_C = 300A$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



[Inverter]

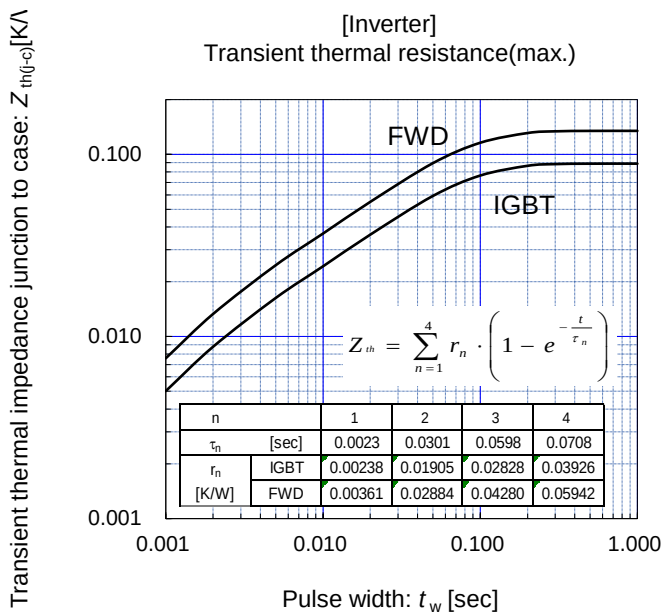
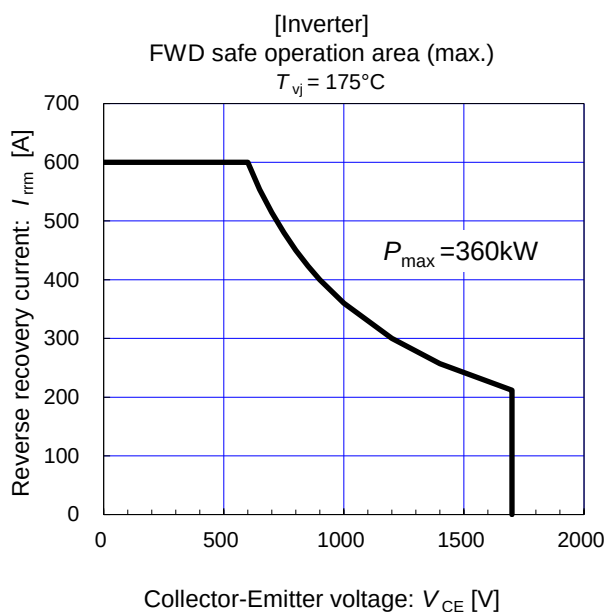
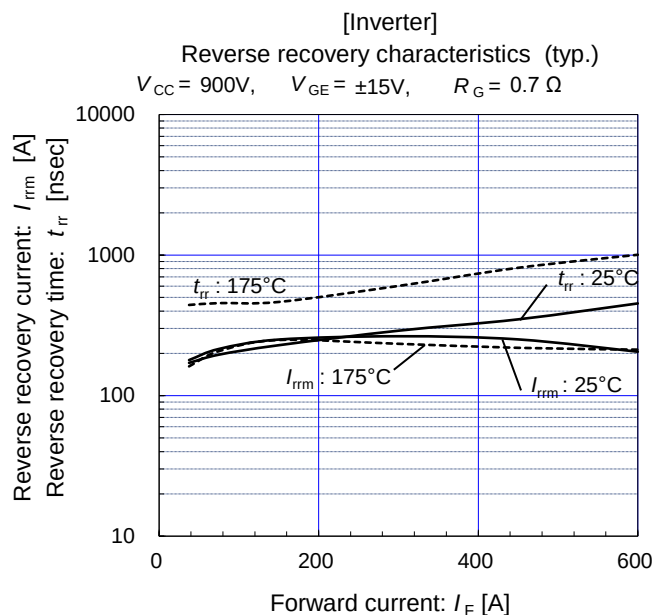
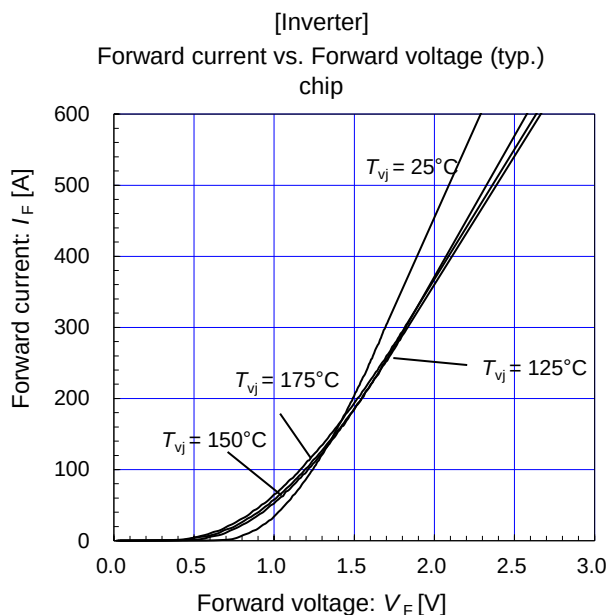
Reverse bias safe operating area (max.)

$V_{GE} = \pm 15V$, $R_G = 0.68 \Omega$, $T_{vj} = 175^\circ C$



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