

2MBI75XAA170-50

IGBT Modules

Power Module (X series)
1700V / 75A / 2-in-1 package

■ Features

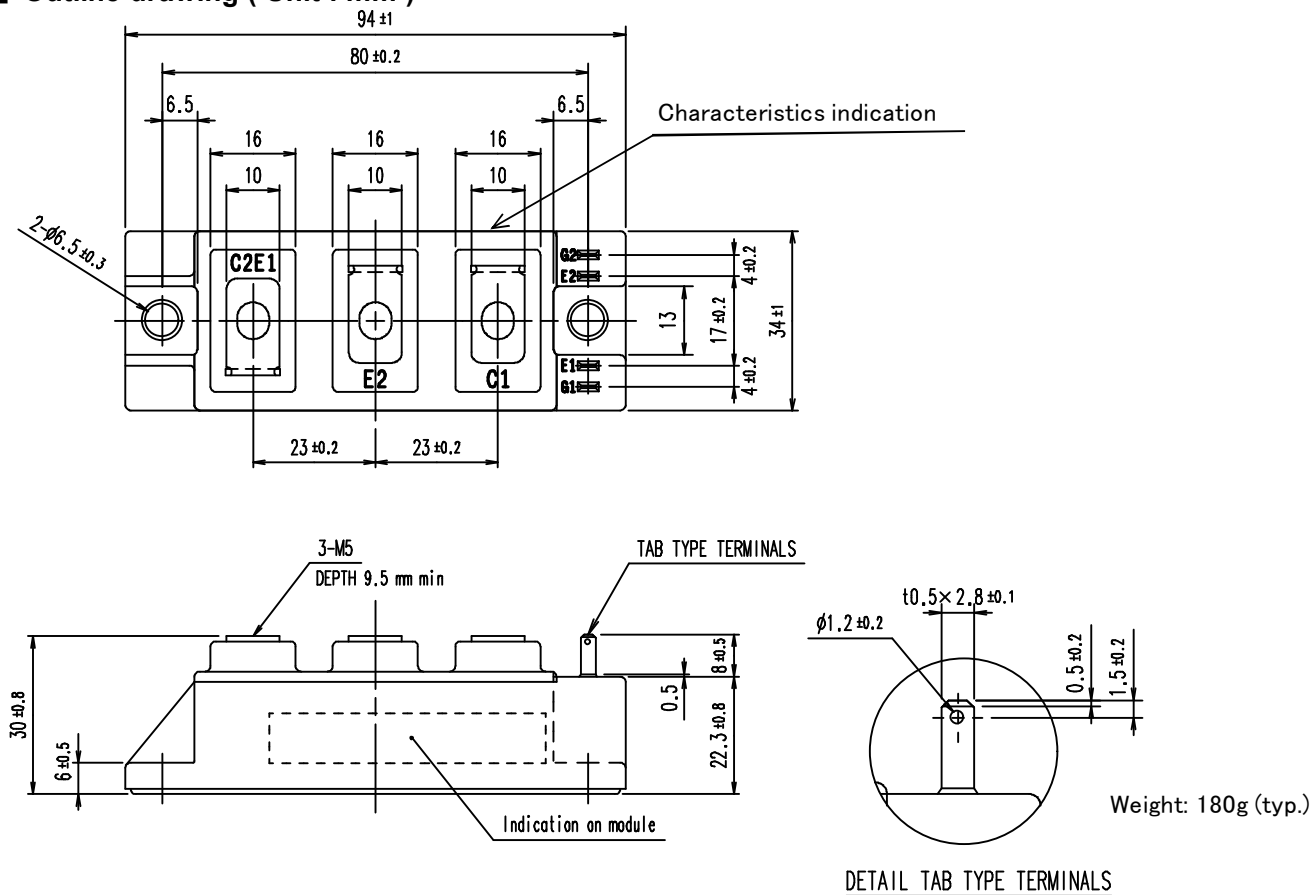
- Low $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

■ Applications

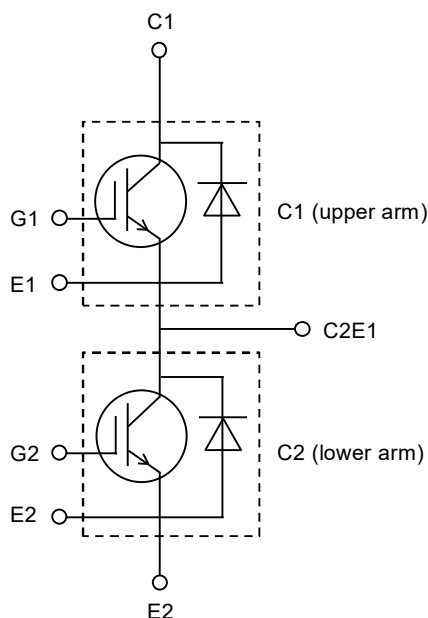
- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems,
- Industrial machines, such as Welding machines



■ 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	$T_c = 100^\circ\text{C}$	75	A
Repetitive peak collector current		I_{CRM}	1ms		150	
Forward current		I_F			75	
Repetitive peak forward current		I_{FRM}	1ms		150	
Total power dissipation		P_{tot}	1 device		460	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		M_s	M5 or M6		3.0 ~ 5.0	N·m
Mounting torque of screws to terminals		M_t	M5		2.5 ~ 5.0	

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

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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	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 75mA$		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 75A$	$T_{vj}=25^{\circ}C$	-	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	-		-	12.50	-	Ω
Capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$		-	10	-	nF
	C_{oes}			-	0.3	-	
	C_{res}			-	0.06	-	
Gate charge	Q_G	$V_{CC} = 900V, I_C = 75A$ $V_{GE} = -15 \rightarrow +15V$		-	600	-	nC
Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F= 75A$	$T_{vj}=25^{\circ}C$	-	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)	$t_{d(on)}$	$V_{CC} = 900V$ $I_C, I_F = 75A$ $V_{GE} = \pm 15V$ $R_G = 4.7 \Omega$ $L_S = 30 nH$	$T_{vj}= 25^{\circ}C$	-	375	-	ns
			$T_{vj}=125^{\circ}C$	-	415	-	
			$T_{vj}=150^{\circ}C$	-	420	-	
			$T_{vj}=175^{\circ}C$	-	425	-	
	t_r		$T_{vj}= 25^{\circ}C$	-	70.0	-	
			$T_{vj}=125^{\circ}C$	-	85	-	
			$T_{vj}=150^{\circ}C$	-	85	-	
			$T_{vj}=175^{\circ}C$	-	90	-	
	$t_{d(off)}$		$T_{vj}= 25^{\circ}C$	-	405	-	
			$T_{vj}=125^{\circ}C$	-	465	-	
			$T_{vj}=150^{\circ}C$	-	480	-	
			$T_{vj}=175^{\circ}C$	-	490	-	
	t_f		$T_{vj}= 25^{\circ}C$	-	445	-	
			$T_{vj}=125^{\circ}C$	-	650	-	
			$T_{vj}=150^{\circ}C$	-	675	-	
			$T_{vj}=175^{\circ}C$	-	730	-	
	Reverse recovery time		t_{rr}	$T_{vj}= 25^{\circ}C$	-	785	
$T_{vj}=125^{\circ}C$		-		1175	-		
$T_{vj}=150^{\circ}C$		-		1305	-		
$T_{vj}=175^{\circ}C$		-		1410	-		

(*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.	
Switching loss (per pulse)	E_{on}	$V_{\text{CC}} = 900\text{V}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	16.2	-	mJ
		$I_{\text{C}}, I_{\text{F}} = 75\text{A}$	$T_{\text{vj}} = 125^{\circ}\text{C}$	-	20.5	-	
		$V_{\text{GE}} = \pm 15\text{V}$	$T_{\text{vj}} = 150^{\circ}\text{C}$	-	21.6	-	
		$R_{\text{G}} = 4.7\ \Omega$	$T_{\text{vj}} = 175^{\circ}\text{C}$	-	22.6	-	
	E_{off}	$L_{\text{S}} = 30\ \text{nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	16.0	-	
			$T_{\text{vj}} = 125^{\circ}\text{C}$	-	21.7	-	
			$T_{\text{vj}} = 150^{\circ}\text{C}$	-	22.6	-	
			$T_{\text{vj}} = 175^{\circ}\text{C}$	-	23.6	-	
	E_{rr}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	8.6	-	
			$T_{\text{vj}} = 125^{\circ}\text{C}$	-	15.6	-	
			$T_{\text{vj}} = 150^{\circ}\text{C}$	-	18.0	-	
			$T_{\text{vj}} = 175^{\circ}\text{C}$	-	20.6	-	

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.

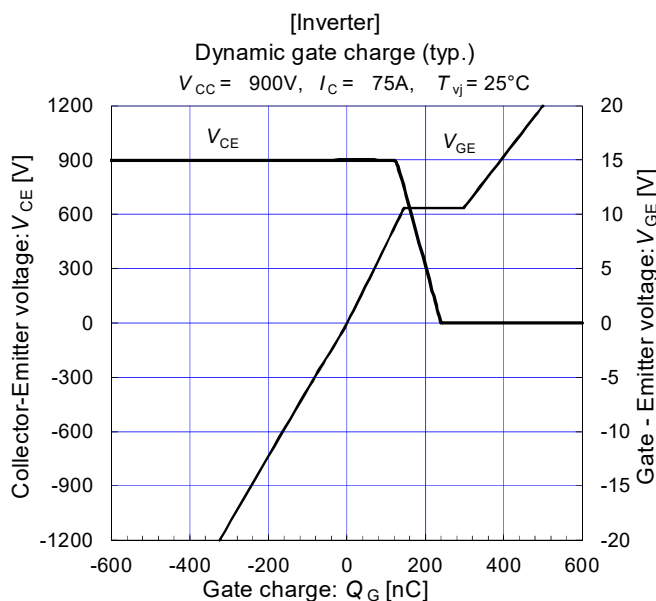
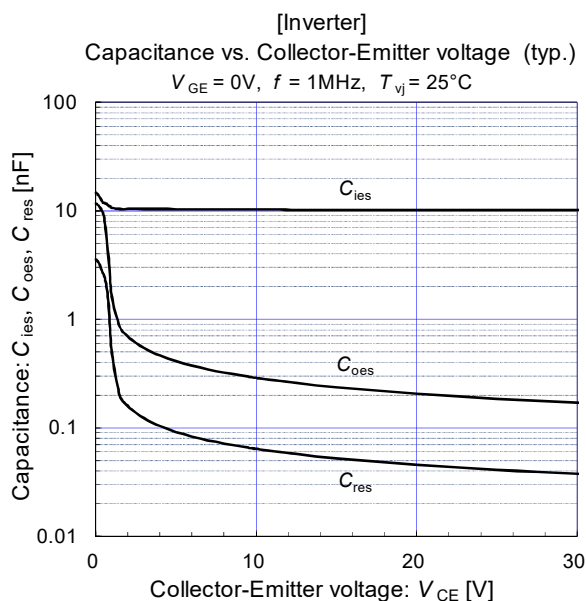
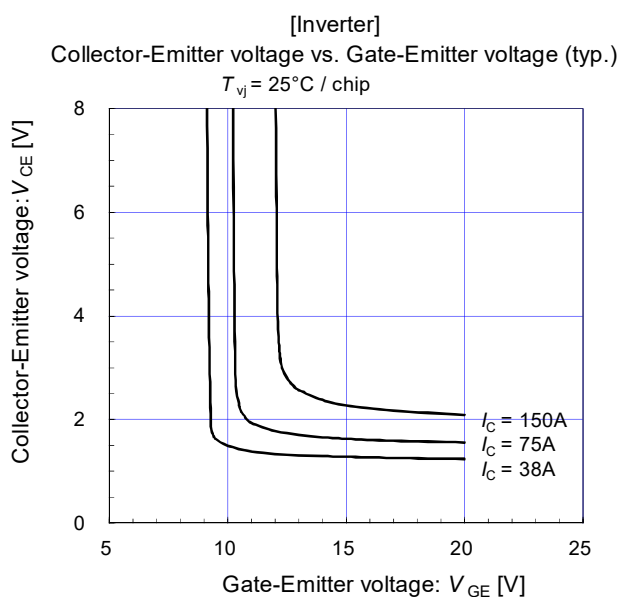
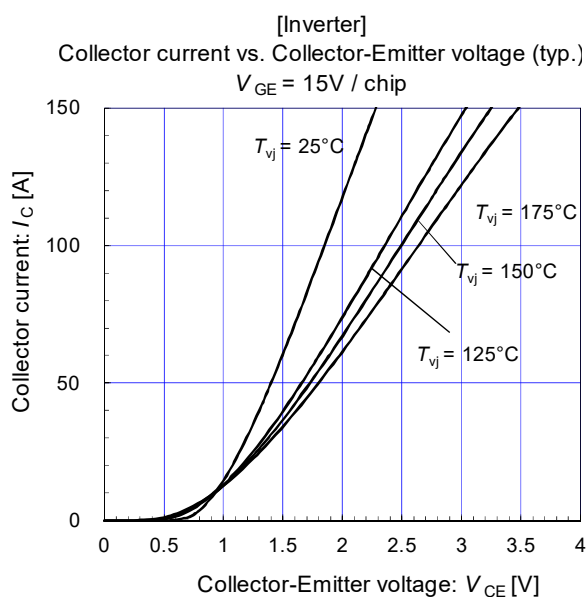
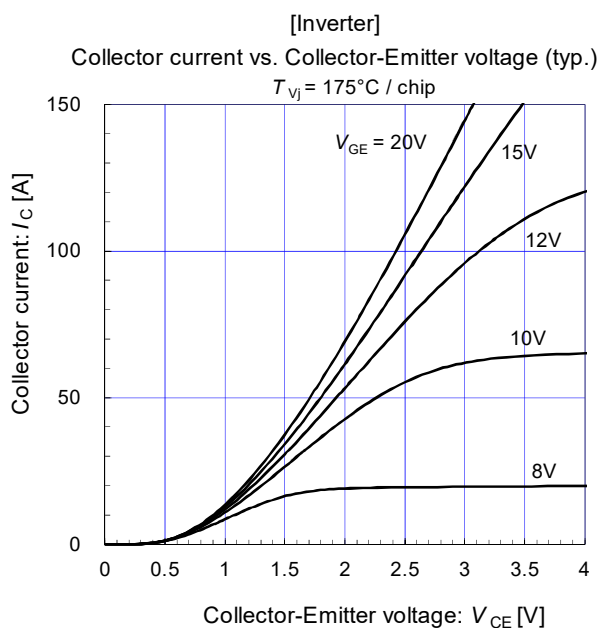
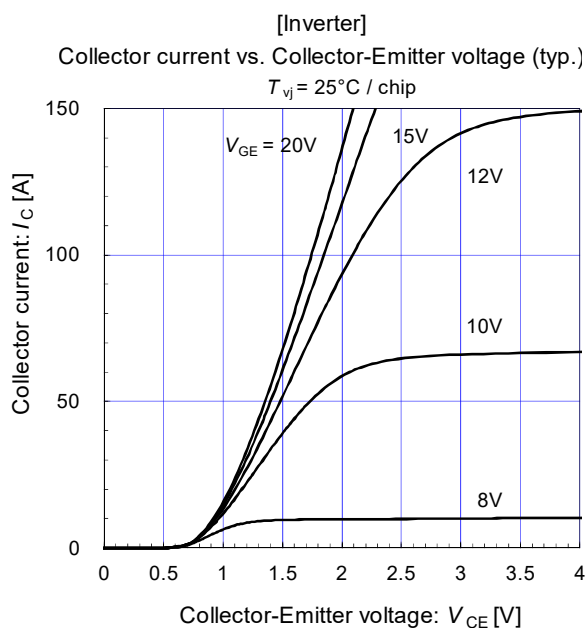
■ Thermal resistance characteristics

	Symbols	Conditions	Characteristics			ns
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.324	K/W
		Inverter FWD	-	-	0.539	
Thermal resistance case to heatsink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m ² ·K) thermal grease	-	0.050	-	

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

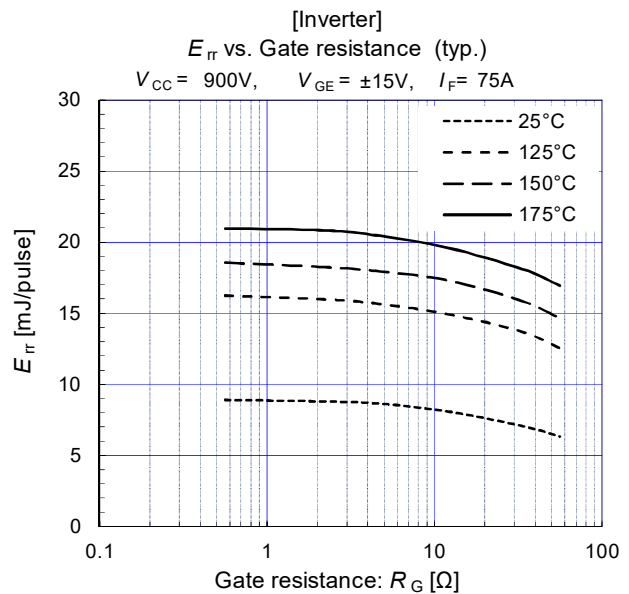
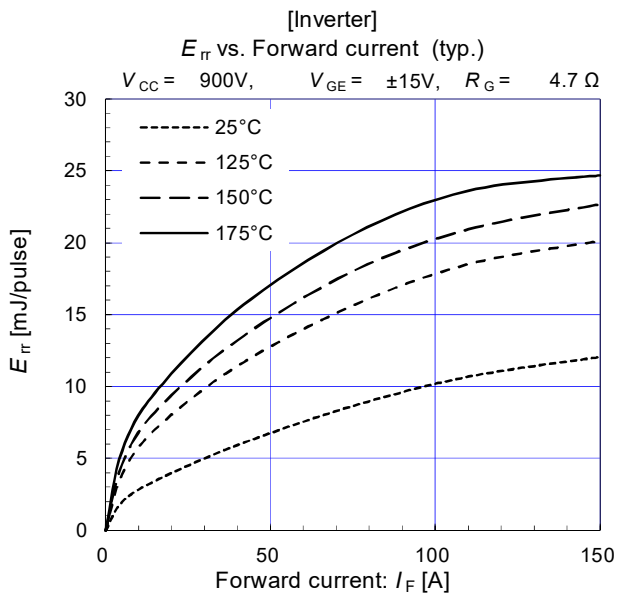
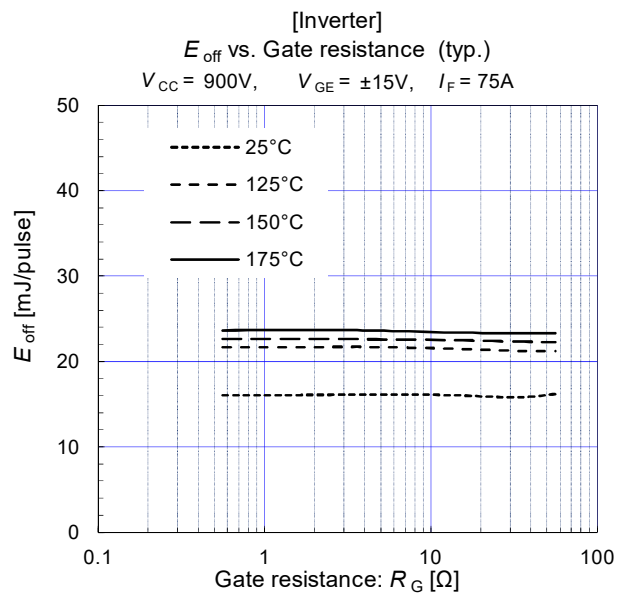
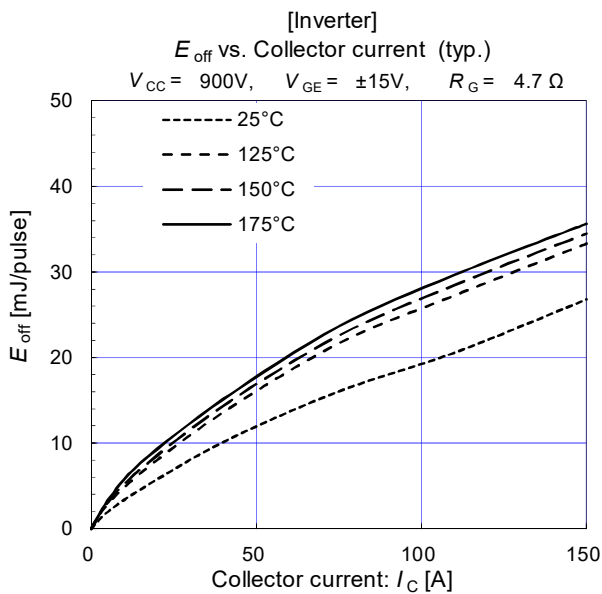
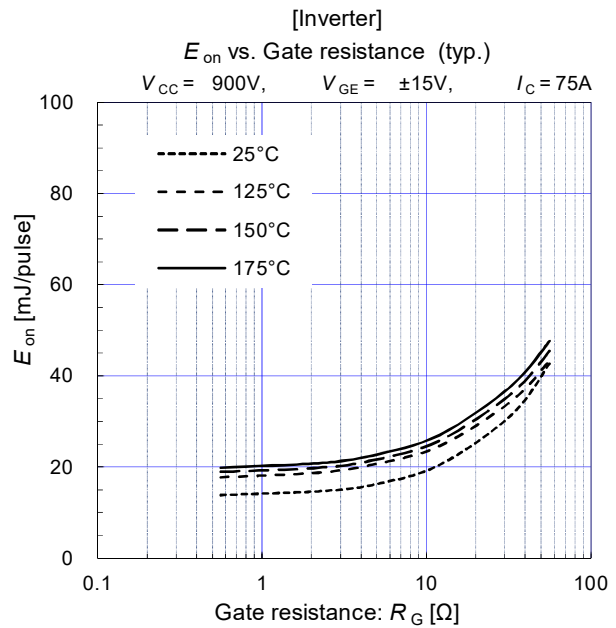
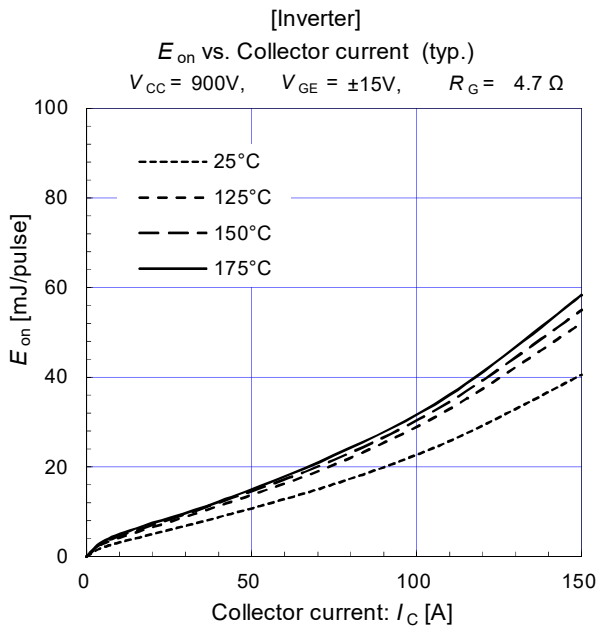
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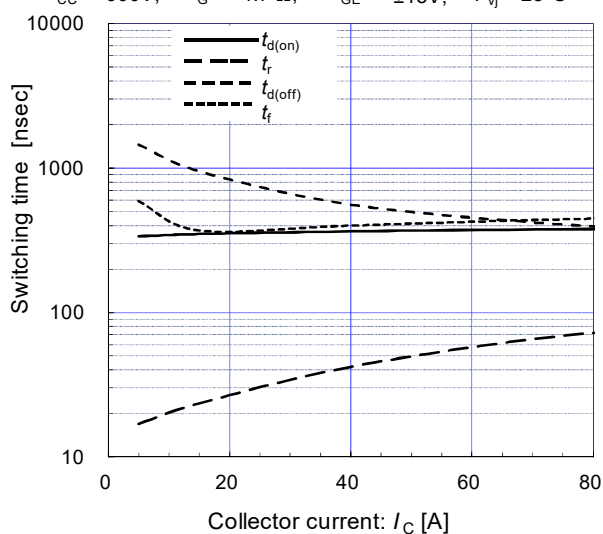
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[Inverter]

Switching time vs. Collector current (typ.)

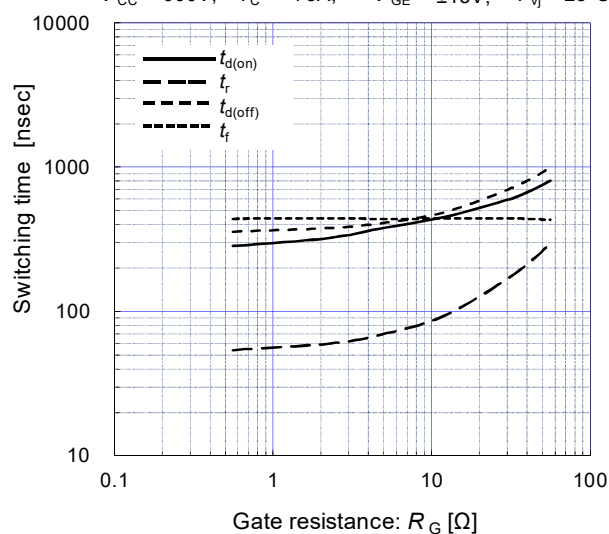
$V_{CC} = 900V$, $R_G = 4.7\ \Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

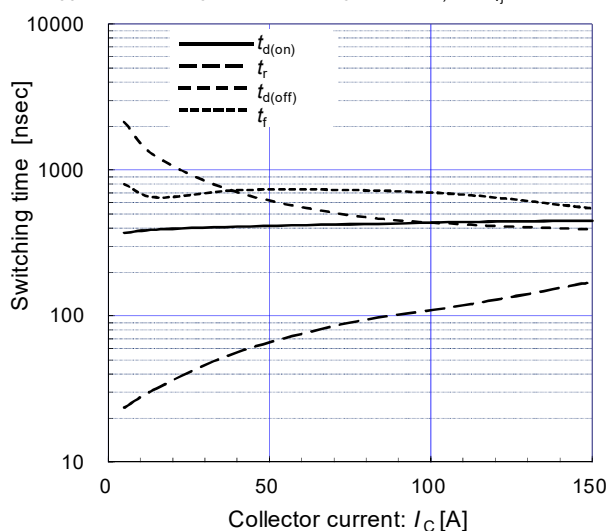
$V_{CC} = 900V$, $I_C = 75A$, $V_{GE} = \pm 15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

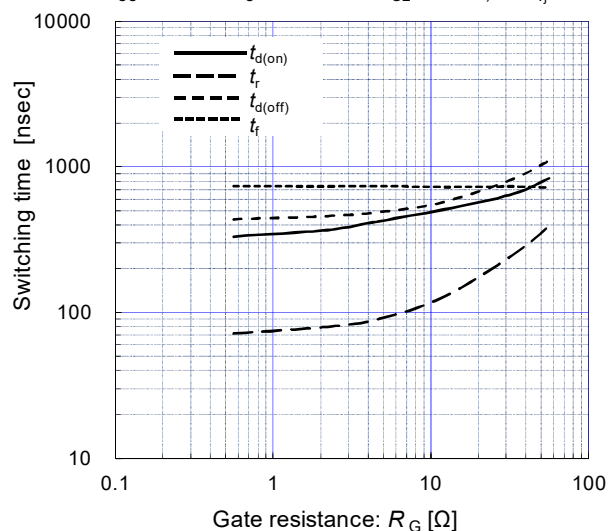
$V_{CC} = 900V$, $R_G = 4.7\ \Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

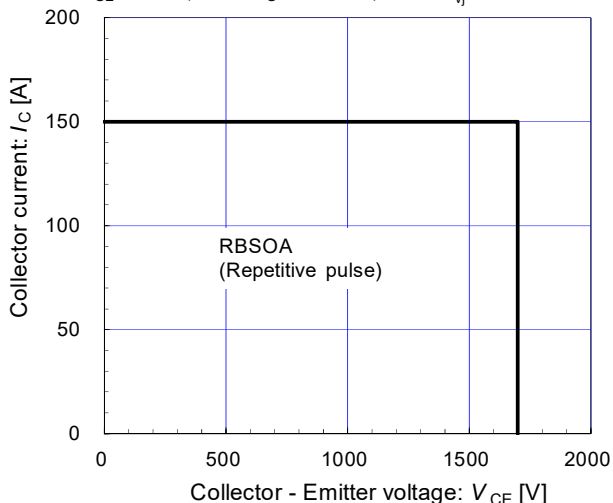
$V_{CC} = 900V$, $I_C = 75A$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



[Inverter]

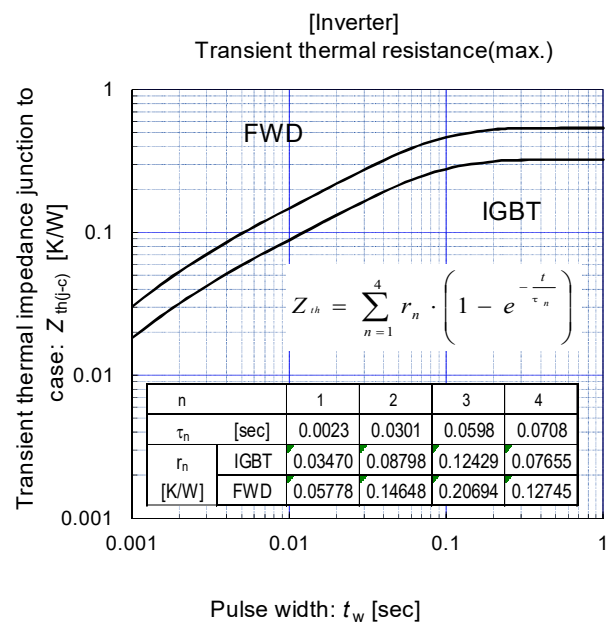
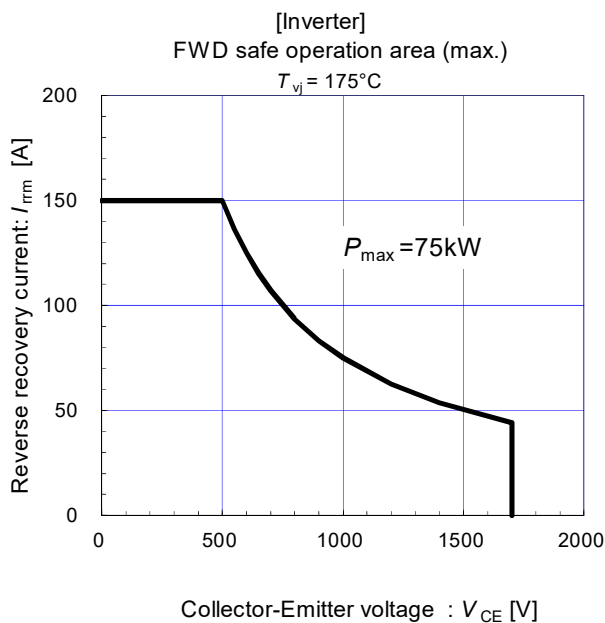
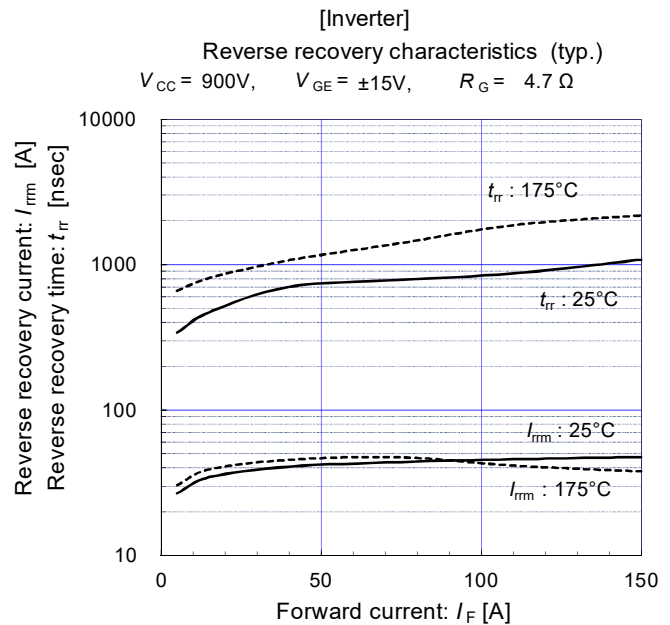
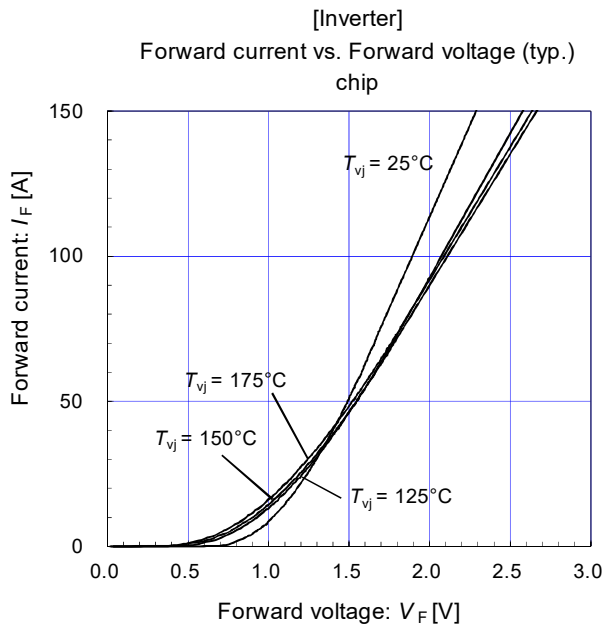
Reverse bias safe operating area (max.)

$V_{GE} = \pm 15V$, $R_G = 4.7\ \Omega$, $T_{vj} = 175^\circ C$



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