

# 2MBI100XAA120-50

IGBT Modules

**Power Module (X series)**  
**1200V / 100A / 2-in-1 package**

■ **Features**

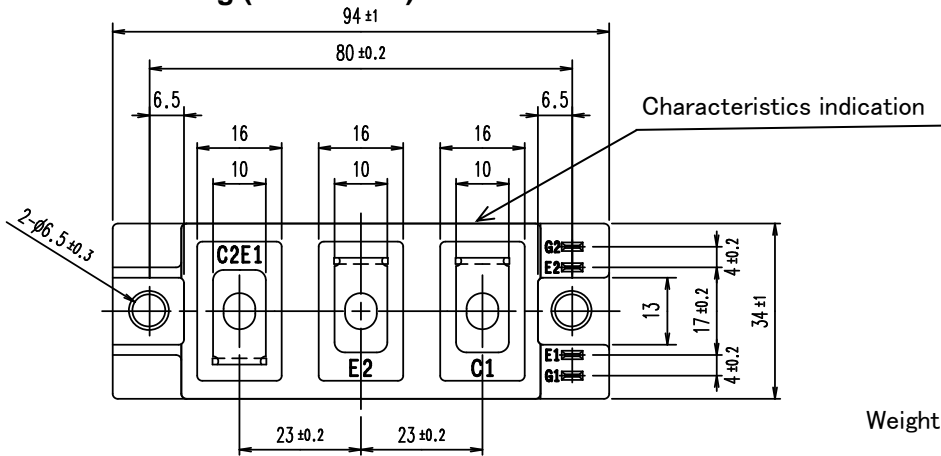
- LOW  $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

■ **Applications**

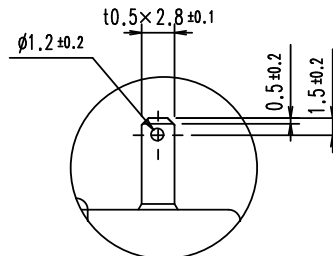
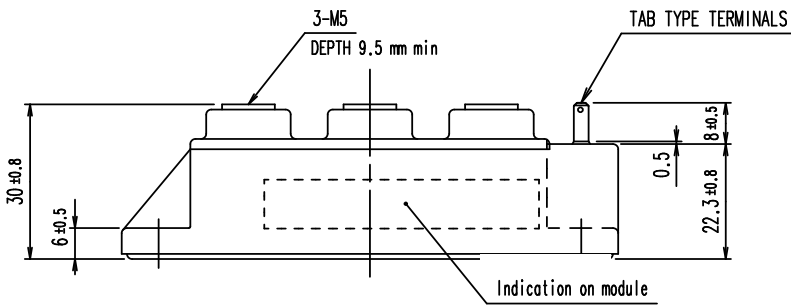
- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems,
- Industrial machines, such as Welding machines



■ **Outline drawing ( Unit : mm )**

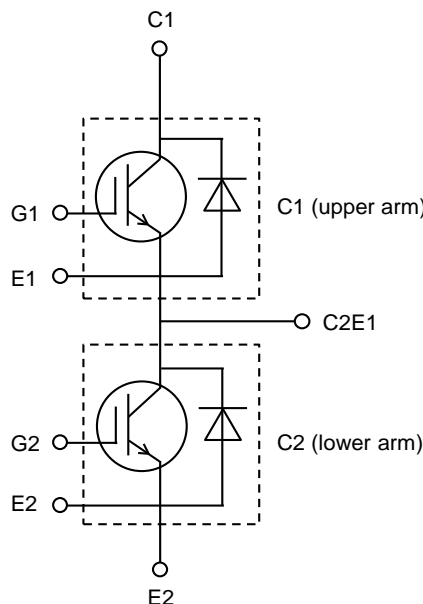


Weight: 180 g(typ.)



DETAIL TAB TYPE TERMINALS

■ **Equivalent Circuit**



# 2MBI100XAA120-50

**IGBT Modules**
**■ Absolute Maximum Ratings (at  $T_C=25^\circ\text{C}$  unless otherwise specified)**

Items		Symbols	Conditions	Maximum Ratings	Units		
Inverter	Collector-emitter voltage, gate-emitter short-circuited	$V_{CES}$		1200	V		
	Gate-emitter voltage, collector-emitter short-circuited	$V_{GES}$		$\pm 20$	V		
	Collector current	$I_C$	Continuous	$T_C=100^\circ\text{C}$	100	A	
	Repetitive peak collector current	$I_{CRM}$	1ms		200		
	Forward current	$I_F$			100		
	Repetitive peak forward current	$I_{FRM}$	1ms		200		
	Total power dissipation		$P_{tot}$	1 device		530	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		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)

# 2MBI100XAA120-50

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

Items	Symbols	Conditions	Characteristics			Units			
			min.	typ.	max.				
Collector-emitter cut-off current,gate-emitter short-circuited	$I_{CES}$	$V_{GE} = 0\text{V}$ $V_{CE} = 1200\text{V}$	-	-	50	$\mu\text{A}$			
Gate leakage current,collector-emitter short-circuited	$I_{GES}$	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-	-	100	nA			
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 100\text{mA}$	6.0	6.5	7.0	V			
Collector-emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 100\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.60	2.05	V		
			$T_{vj}=25^{\circ}\text{C}$	-	1.40	1.85			
	$T_{vj}=125^{\circ}\text{C}$		-	1.70	-				
	$T_{vj}=150^{\circ}\text{C}$		-	1.80	-				
Collector-emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15\text{V}$ $I_C = 100\text{A}$	$T_{vj}=175^{\circ}\text{C}$	-	1.85	-	V		
			$T_{vj}=175^{\circ}\text{C}$	-	1.85	-			
			$T_{vj}=175^{\circ}\text{C}$	-	1.85	-			
			$T_{vj}=175^{\circ}\text{C}$	-	1.85	-			
Internal Gate resistance	$r_g$	-	-	9.00	-	$\Omega$			
Input capacitance	$C_{ies}$	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	12	-	nF			
Output capacitance	$C_{oes}$		-	0.4	-				
Reverse transfer capacitance	$C_{res}$		-	0.10	-				
Gate charge	$Q_G$	$V_{CC} = 600\text{V}, I_C = 100\text{A}$ $V_{GE} = -15 \rightarrow +15\text{V}$	-	0.7	-	$\mu\text{C}$			
Forward voltage	$V_F$ (terminal)	$V_{GE} = 0\text{V}$ $I_F = 100\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.80	2.25	V		
			$T_{vj}=25^{\circ}\text{C}$	-	1.60	2.05			
	$T_{vj}=125^{\circ}\text{C}$		-	1.65	-				
	$T_{vj}=150^{\circ}\text{C}$		-	1.60	-				
Forward voltage	$V_F$ (chip)	$V_{GE} = 0\text{V}$ $I_F = 100\text{A}$	$T_{vj}=175^{\circ}\text{C}$	-	1.60	-	V		
			$T_{vj}=175^{\circ}\text{C}$	-	1.60	-			
			$T_{vj}=175^{\circ}\text{C}$	-	1.60	-			
			$T_{vj}=175^{\circ}\text{C}$	-	1.60	-			
Turn-on delay time(*1)	$t_{d(on)}$	$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/ -15\text{V}$ $R_G = 5.6 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	0.34	-	$\mu\text{s}$		
			$T_{vj}=125^{\circ}\text{C}$	-	0.38	-			
			$T_{vj}=150^{\circ}\text{C}$	-	0.38	-			
			$T_{vj}=175^{\circ}\text{C}$	-	0.39	-			
Rise time(*1)	$t_r$		$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/ -15\text{V}$ $R_G = 5.6 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	0.07		-	
				$T_{vj}=125^{\circ}\text{C}$	-	0.09		-	
				$T_{vj}=150^{\circ}\text{C}$	-	0.09		-	
				$T_{vj}=175^{\circ}\text{C}$	-	0.09		-	
Turn-off delay time(*1)	$t_{d(off)}$			$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/ -15\text{V}$ $R_G = 5.6 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-		0.31	-
					$T_{vj}=125^{\circ}\text{C}$	-		0.36	-
					$T_{vj}=150^{\circ}\text{C}$	-		0.37	-
					$T_{vj}=175^{\circ}\text{C}$	-		0.51	-
Fall time(*1)	$t_f$	$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/ -15\text{V}$ $R_G = 5.6 \Omega$ $L_S = 30 \text{ nH}$			$T_{vj}=25^{\circ}\text{C}$	-	0.16	-	
					$T_{vj}=125^{\circ}\text{C}$	-	0.25	-	
					$T_{vj}=150^{\circ}\text{C}$	-	0.27	-	
					$T_{vj}=175^{\circ}\text{C}$	-	0.26	-	
Reverse recovery time	$t_{rr}$		$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/ -15\text{V}$ $R_G = 5.6 \Omega$ $L_S = 30 \text{ nH}$		$T_{vj}=25^{\circ}\text{C}$	-	0.48	-	
					$T_{vj}=125^{\circ}\text{C}$	-	0.60	-	
					$T_{vj}=150^{\circ}\text{C}$	-	0.63	-	
					$T_{vj}=175^{\circ}\text{C}$	-	0.70	-	

(\*1) Turn-on time ( $t_{on}$ ) =  $t_{d(on)} + t_r$ , Turn-off time ( $t_{off}$ ) =  $t_{d(off)} + t_f$

# 2MBI100XAA120-50

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

Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Turn-on energy	$V_{CC} = 600\text{V}$ $I_C, I_F = 100\text{A}$ $V_{GE} = +15/ -15\text{V}$ $R_G = 5.6 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	8.6	-	mJ	
			$T_{vj}=125^{\circ}\text{C}$	-	12.7	-		
			$T_{vj}=150^{\circ}\text{C}$	-	13.7	-		
			$T_{vj}=175^{\circ}\text{C}$	-	15.3	-		
	Turn-off energy		$E_{off}$	$T_{vj}=25^{\circ}\text{C}$	-	7.4		-
				$T_{vj}=125^{\circ}\text{C}$	-	9.7		-
				$T_{vj}=150^{\circ}\text{C}$	-	10.2		-
				$T_{vj}=175^{\circ}\text{C}$	-	10.8		-
	Reverse recovery energy		$E_{rr}$	$T_{vj}=25^{\circ}\text{C}$	-	2.4		-
				$T_{vj}=125^{\circ}\text{C}$	-	4.9		-
				$T_{vj}=150^{\circ}\text{C}$	-	5.5		-
				$T_{vj}=175^{\circ}\text{C}$	-	6.5		-

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.

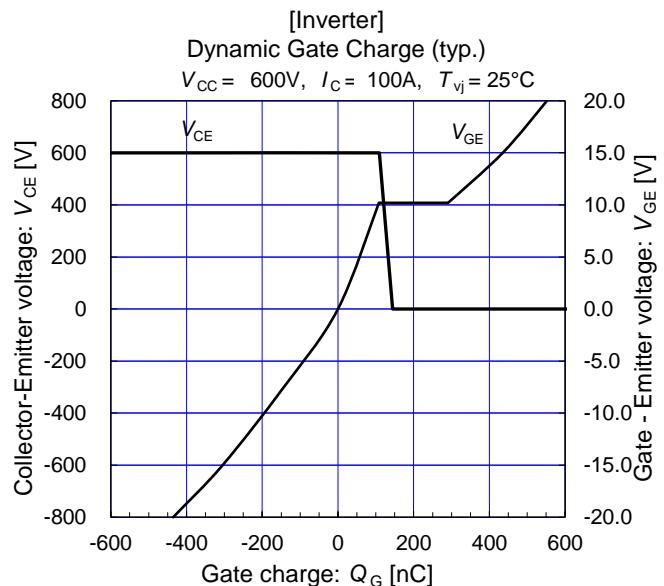
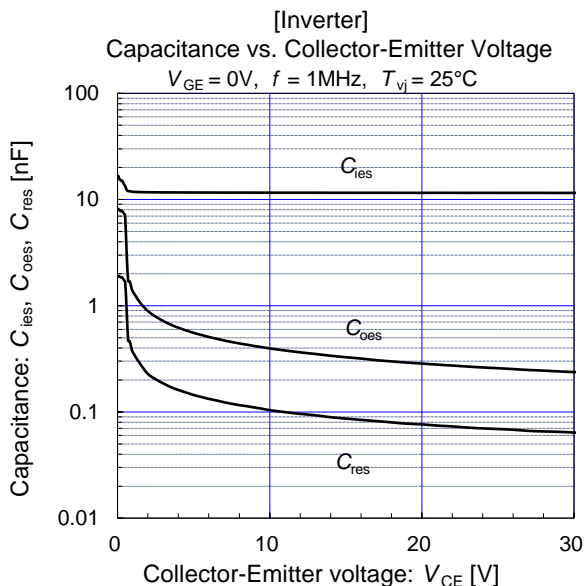
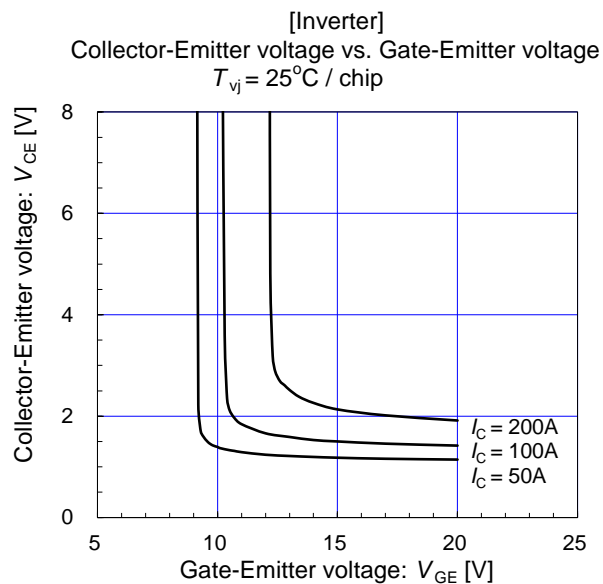
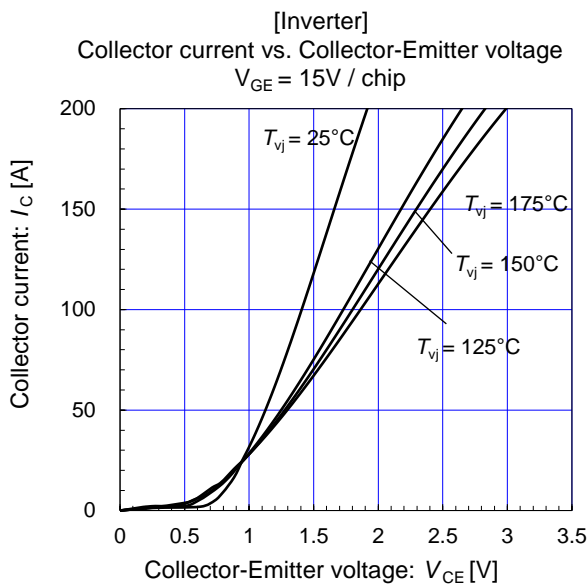
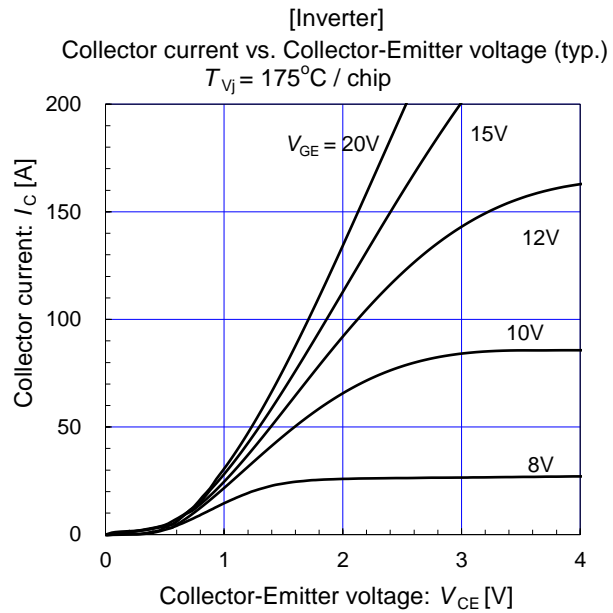
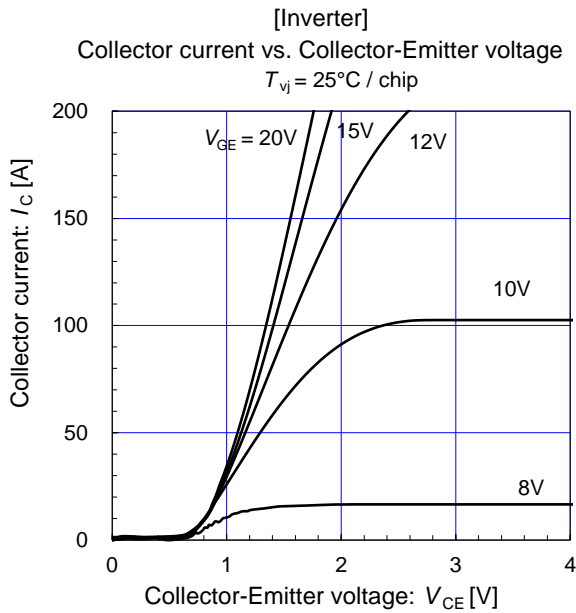
■ Thermal resistance characteristics

	Symbols	Conditions	Characteristics			ns
			min.	typ.	max.	
Thermal resistance junction to case (1device)	$R_{th(j-c)}$	IGBT	-	-	0.281	K/W
		FWD	-	-	0.550	
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.

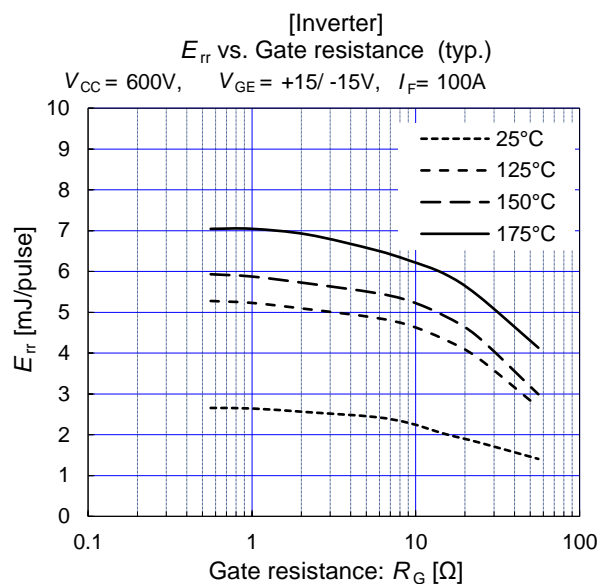
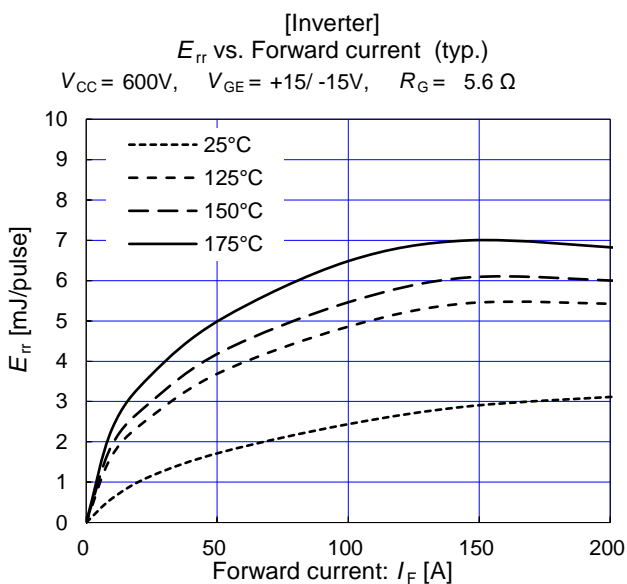
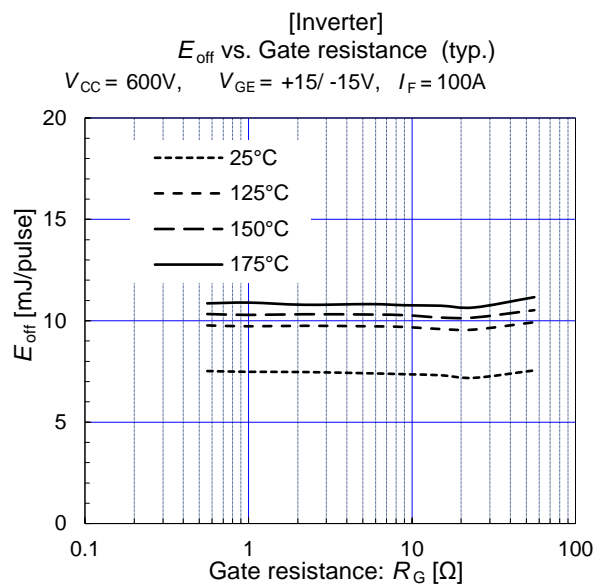
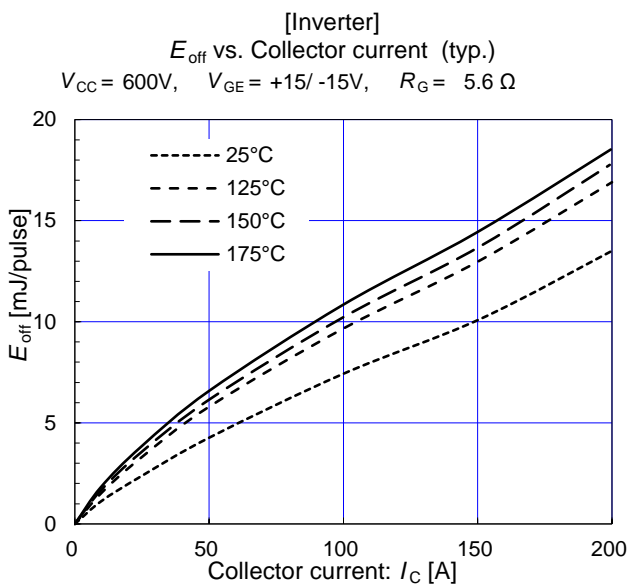
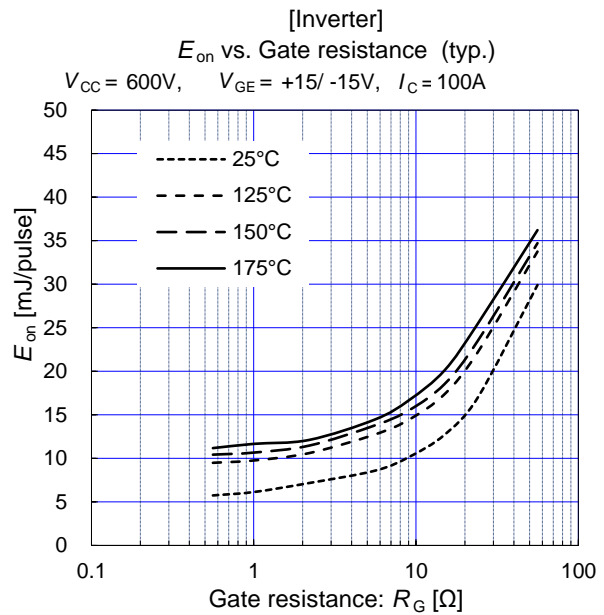
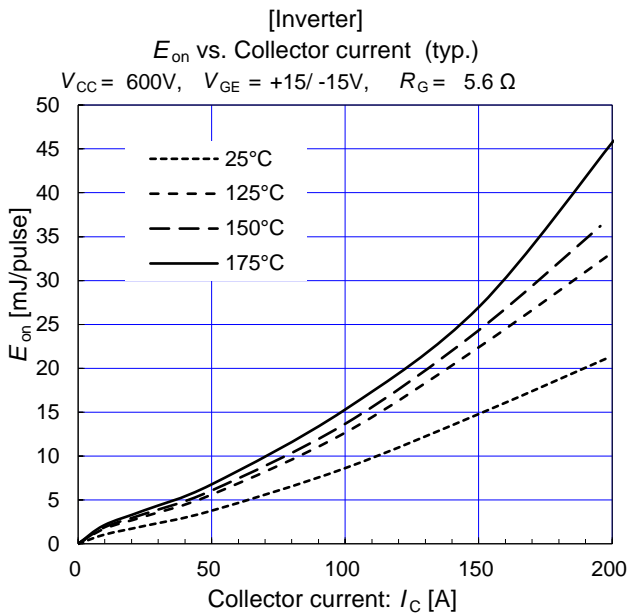
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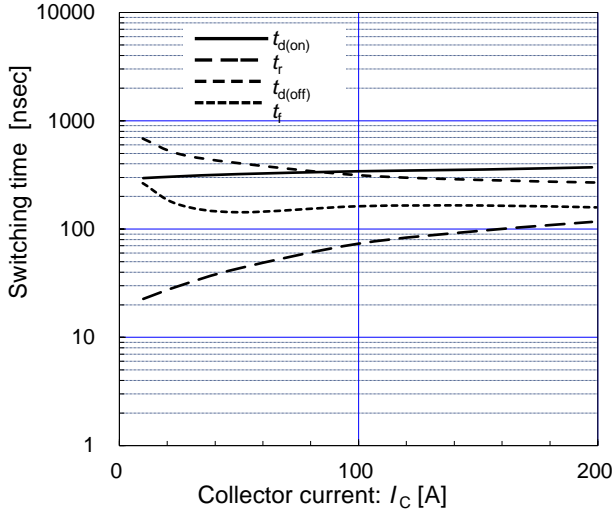
# 2MBI100XAA120-50

IGBT Modules

[Inverter]

Switching time vs. Collector current (typ.)

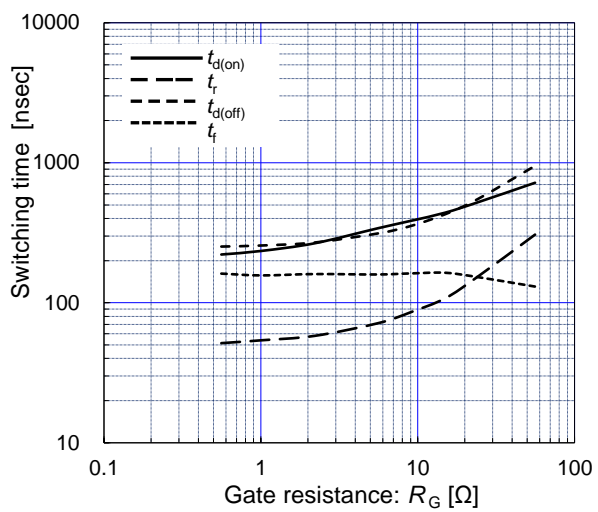
$V_{CC} = 600V, R_G = 5.6 \Omega, V_{GE} = +15V/-15V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

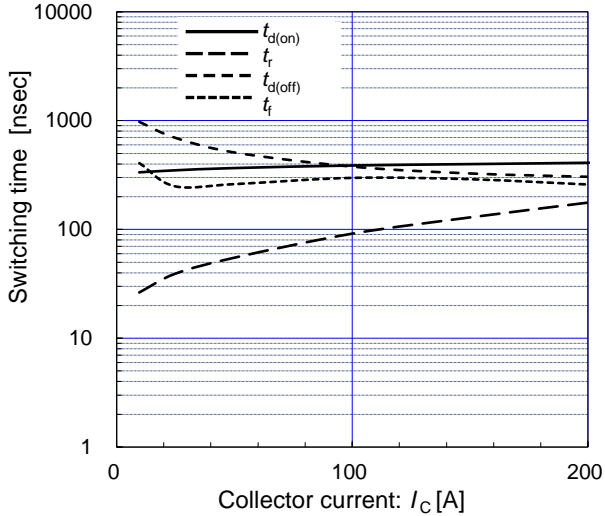
$V_{CC} = 600V, I_C = 100A, V_{GE} = +15V/-15V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

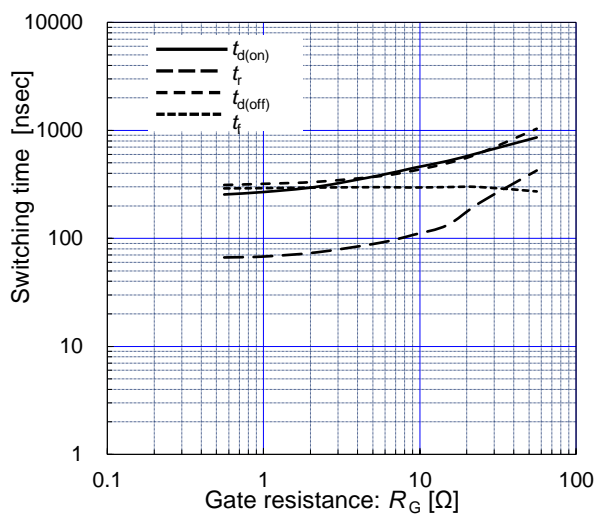
$V_{CC} = 600V, R_G = 5.6 \Omega, V_{GE} = +15V/-15V, T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

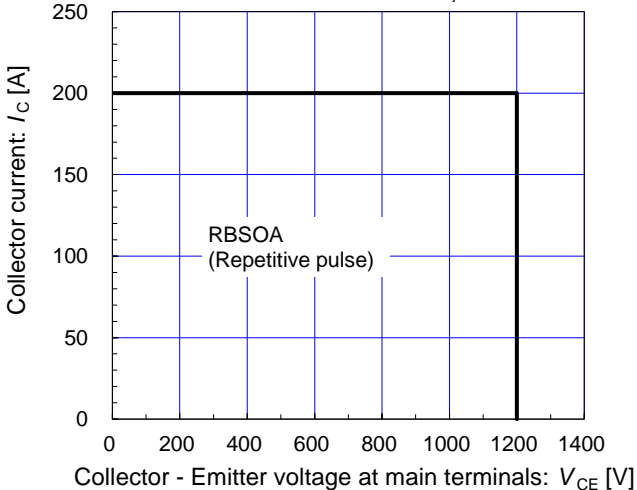
$V_{CC} = 600V, I_C = 100A, V_{GE} = +15V/-15V, T_{vj} = 175^\circ C$



[Inverter]

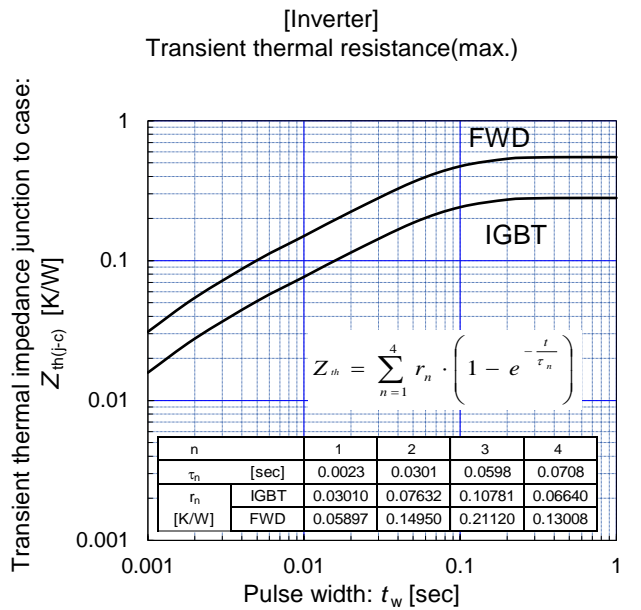
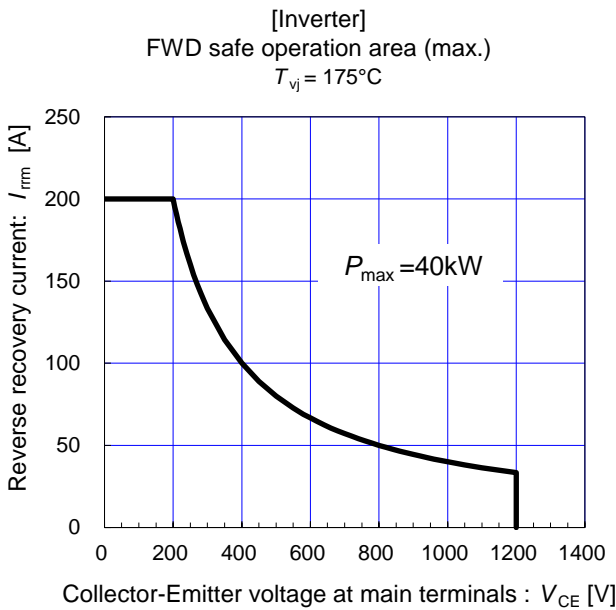
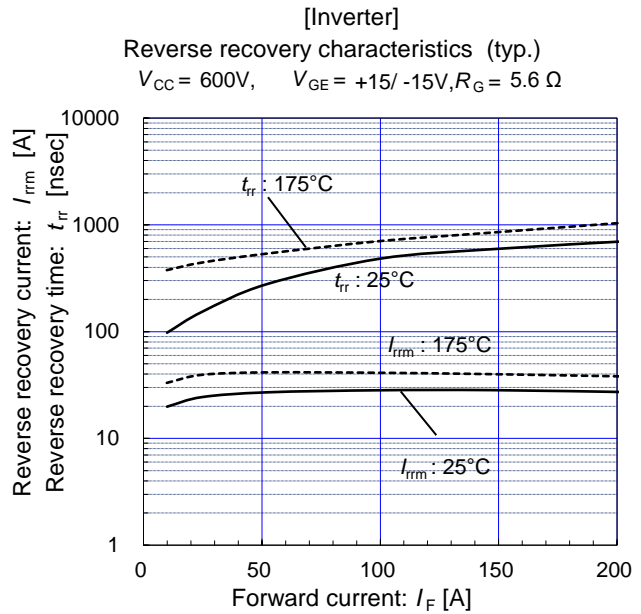
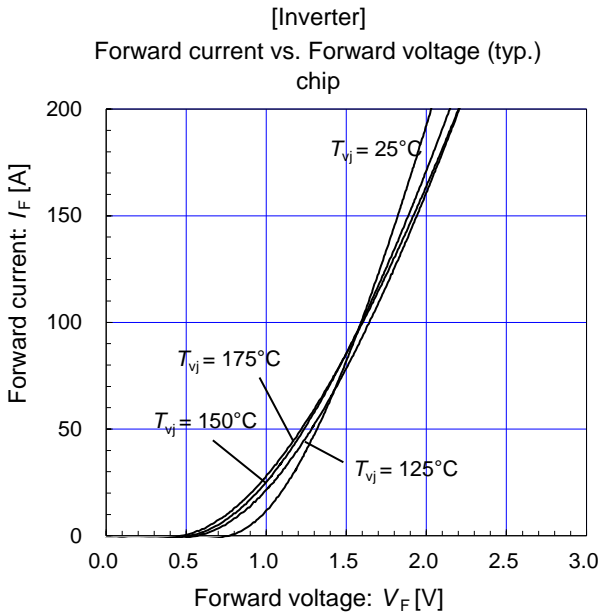
Reverse bias safe operating area (max.)

$V_{GE} = +15V/-15V, R_G = 5.6 \Omega, T_{vj} = 175^\circ C$



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IGBT Modules





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## IGBT Modules

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4 Design Support	<a href="http://www.fujielectric.com/products/semiconductor/model/igbt/technical/">www.fujielectric.com/products/semiconductor/model/igbt/technical/</a>
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