

# 6MBI200XBA120-50

IGBT Modules

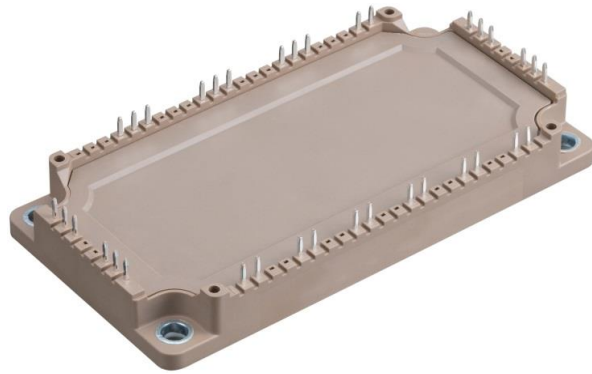
Power Module (X series)  
1200V / 200A / 6-in-1 package

■ Features

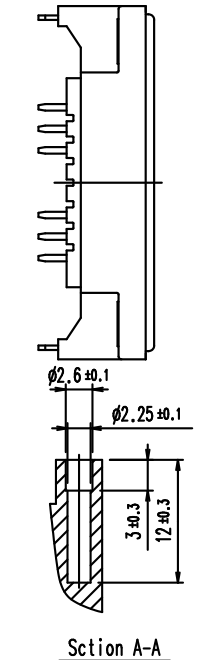
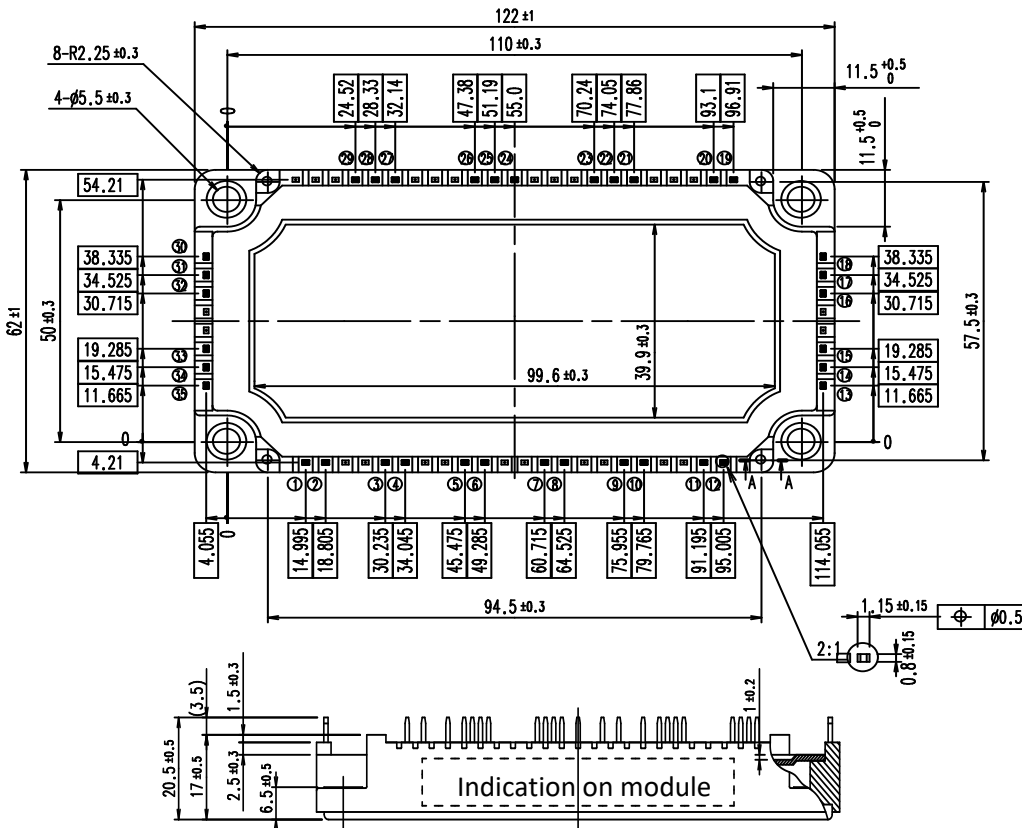
- Low  $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant Product

■ Applications

- Inverter for Motor Drives,
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply

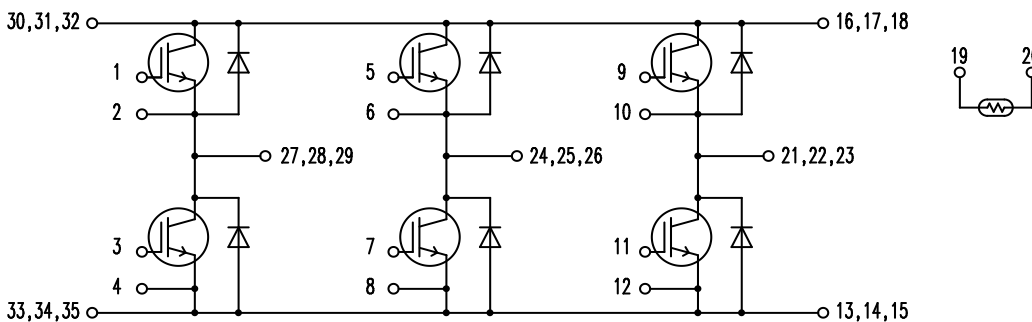


■ Outline drawing ( Unit : mm )



Weight: 310 g(typ.)

■ Equivalent Circuit



# 6MBI200XBA120-50

**IGBT Modules**
**■ 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		$V_{CES}$		1200	V
Gate-emitter voltage, collector-emitter short-circuited		$V_{GES}$		$\pm 20$	V
Collector current		$I_C$	Continuous $T_C=80^\circ\text{C}$	200	A
Repetitive peak collector current		$I_{CRM}$	1ms	400	
Forward current		$I_F$	Continuous	200	
Repetitive peak forward current		$I_{FRM}$	1ms	400	
Total power dissipation		$P_{tot}$	1 device	750	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 terminal and copper base (*1)	$V_{isol}$	AC: 1min.	4000	Vrms
	between thermistor and others (*2)				
Mounting torque of screws to heatsink (*3)		$M_s$	M5	6.0	N·m

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

(\*2) Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

(\*3) Recommendable value : Mounting 2.5 ~ 6.0 N·m (M5)

# 6MBI200XBA120-50

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	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 200\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 200\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.15	2.65	V
			$T_{vj}=25^{\circ}\text{C}$	-	1.45	1.90	
	$T_{vj}=125^{\circ}\text{C}$		-	1.80	-		
	$T_{vj}=150^{\circ}\text{C}$		-	1.90	-		
	$T_{vj}=175^{\circ}\text{C}$		-	1.95	-		
Internal Gate resistance	$r_g$	-	-	5.00	-	$\Omega$	
			-	21.3	-	nF	
Input capacitance	$C_{ies}$	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	0.7	-		
Output capacitance	$C_{oes}$		-	0.19	-		
Reverse transfer capacitance	$C_{res}$		-	-	-		
Gate charge	$Q_G$		$V_{CC} = 600\text{V}, I_C = 200\text{A}$ $V_{GE} = -15 \rightarrow +15\text{V}$	-	1400.0	-	nC
Forward voltage	$V_F$ (terminal)	$V_{GE} = 0\text{V}$ $I_F = 200\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.50	3.00	V
			$T_{vj}=25^{\circ}\text{C}$	-	1.80	2.25	
	$T_{vj}=125^{\circ}\text{C}$		-	1.85	-		
	$T_{vj}=150^{\circ}\text{C}$		-	1.80	-		
	$T_{vj}=175^{\circ}\text{C}$		-	1.75	-		
Turn-on delay time (*1)	$t_{d(on)}$	$V_{CC} = 600\text{V}$ $I_C, I_F = 200\text{A}$ $V_{GE} = +15/-15\text{V}$ $R_G = 1.8\ \Omega$ $L_S = 30\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	0.27	-	$\mu\text{s}$
			$T_{vj}=125^{\circ}\text{C}$	-	0.30	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.31	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.32	-	
Rise time (*1)	$t_r$		$T_{vj}=25^{\circ}\text{C}$	-	0.08	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.09	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.09	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.10	-	
Turn-off delay time (*1)	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	0.34	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.39	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.40	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.41	-	
Fall time (*1)	$t_f$		$T_{vj}=25^{\circ}\text{C}$	-	0.12	-	
			$T_{vj}=125^{\circ}\text{C}$	-	0.13	-	
			$T_{vj}=150^{\circ}\text{C}$	-	0.19	-	
			$T_{vj}=175^{\circ}\text{C}$	-	0.10	-	
Reverse recovery time	$t_{rr}$	$T_{vj}=25^{\circ}\text{C}$	-	0.18	-		
		$T_{vj}=125^{\circ}\text{C}$	-	0.23	-		
		$T_{vj}=150^{\circ}\text{C}$	-	0.26	-		
		$T_{vj}=175^{\circ}\text{C}$	-	0.28	-		

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

# 6MBI200XBA120-50

IGBT Modules

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Inverter	$E_{on}$	$V_{CC} = 600\text{V}$ $I_C, I_F = 200\text{A}$ $V_{GE} = +15/-15\text{V}$ $R_G = 1.8\ \Omega$ $L_S = 30\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	16.48	-	mJ
			$T_{vj}=125^{\circ}\text{C}$	-	23.94	-	
			$T_{vj}=150^{\circ}\text{C}$	-	26.79	-	
			$T_{vj}=175^{\circ}\text{C}$	-	29.69	-	
	$E_{off}$		$T_{vj}=25^{\circ}\text{C}$	-	14.91	-	
			$T_{vj}=125^{\circ}\text{C}$	-	19.28	-	
			$T_{vj}=150^{\circ}\text{C}$	-	20.51	-	
			$T_{vj}=175^{\circ}\text{C}$	-	21.46	-	
	$E_{rr}$		$T_{vj}=25^{\circ}\text{C}$	-	5.80	-	
			$T_{vj}=125^{\circ}\text{C}$	-	9.83	-	
			$T_{vj}=150^{\circ}\text{C}$	-	10.60	-	
			$T_{vj}=175^{\circ}\text{C}$	-	12.09	-	
Thermistor	Resistance	$T = 25^{\circ}\text{C}$	-	5000	-	$\Omega$	
		$T = 100^{\circ}\text{C}$	465	495	520		
	B value	$T = 25/50^{\circ}\text{C}$	3305	3375	3450	K	

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.

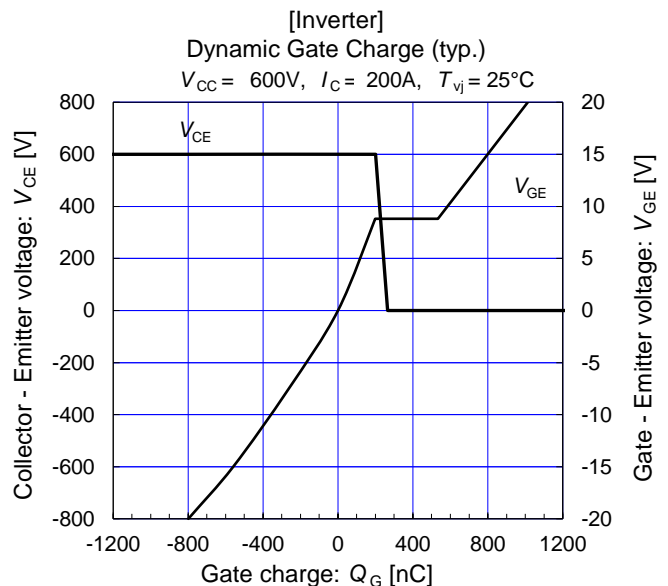
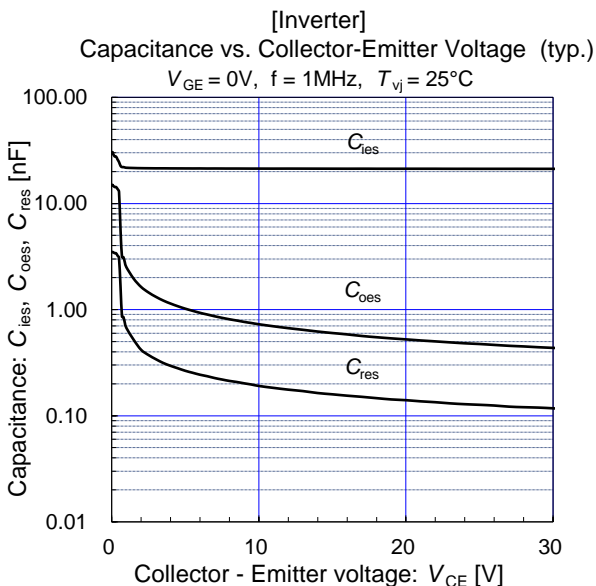
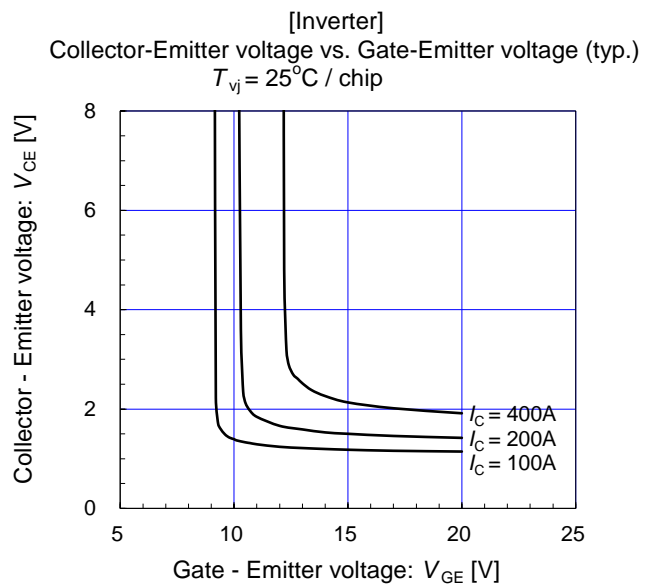
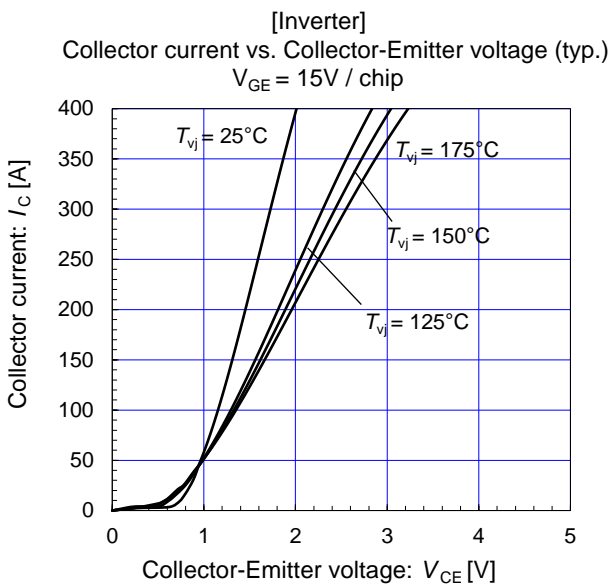
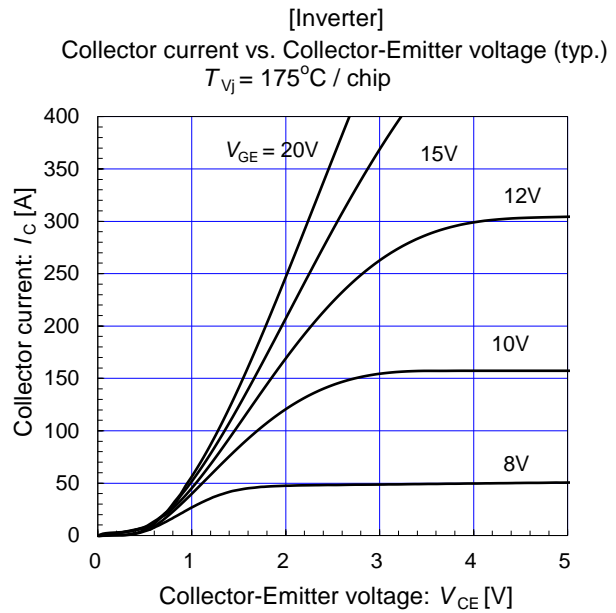
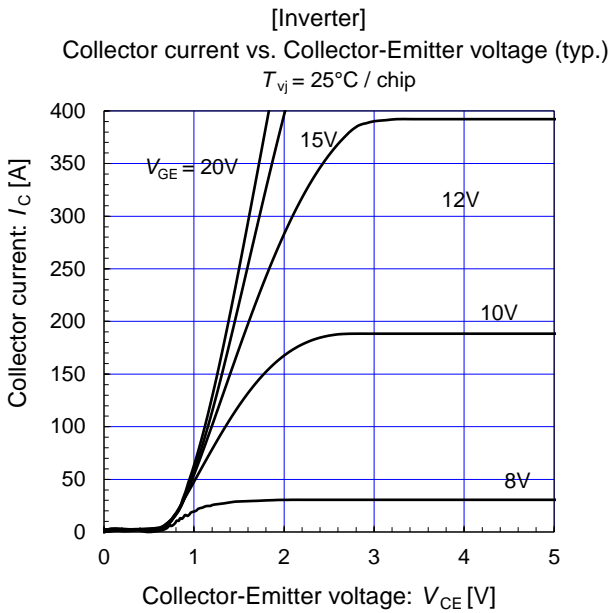
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case (1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.20	K/W
		Inverter FWD	-	-	0.26	
Thermal resistance case to heatsink (1 IGBT + 1 FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.05	-	

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

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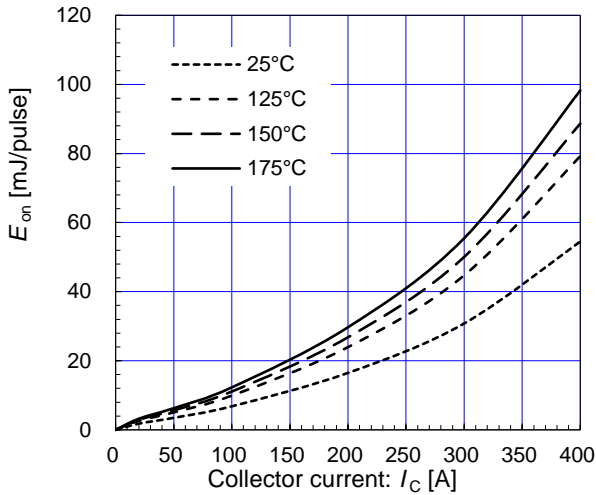
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IGBT Modules

[Inverter]

$E_{on}$  vs. Collector current (typ.)

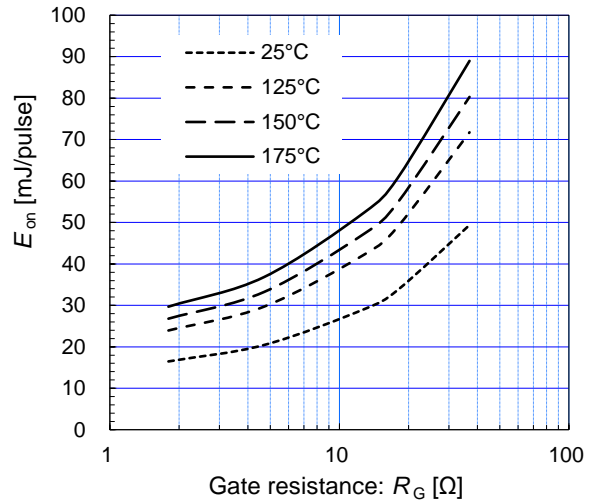
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 1.8\ \Omega$



[Inverter]

$E_{on}$  vs. Gate resistance (typ.)

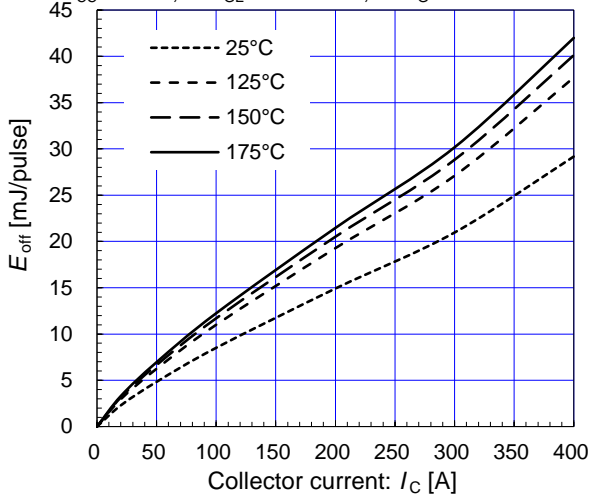
$V_{CC} = 600V, V_{GE} = +15/-15V, I_C = 200A$



[Inverter]

$E_{off}$  vs. Collector current (typ.)

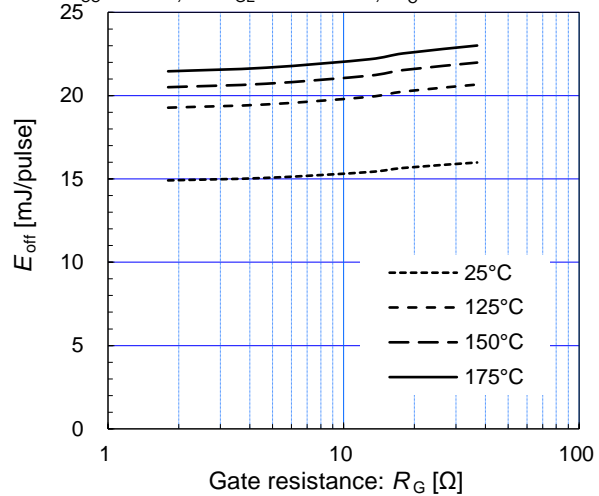
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 1.8\ \Omega$



[Inverter]

$E_{off}$  vs. Gate resistance (typ.)

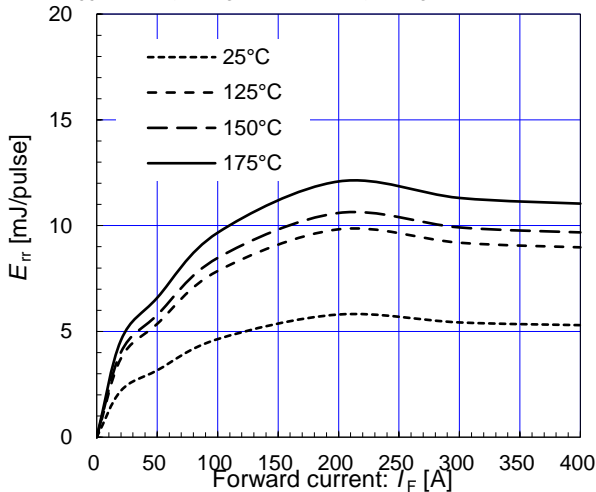
$V_{CC} = 600V, V_{GE} = +15/-15V, I_C = 200A$



[Inverter]

$E_{rr}$  vs. Forward current (typ.)

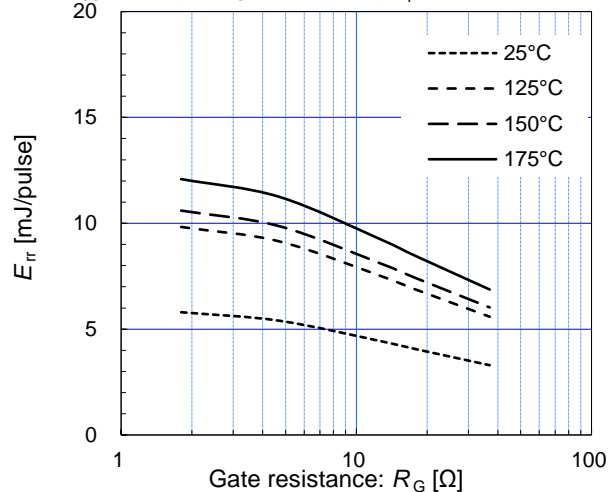
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 1.8\ \Omega$



[Inverter]

$E_{rr}$  vs. Gate resistance (typ.)

$V_{CC} = 600V, V_{GE} = +15/-15V, I_F = 200A$



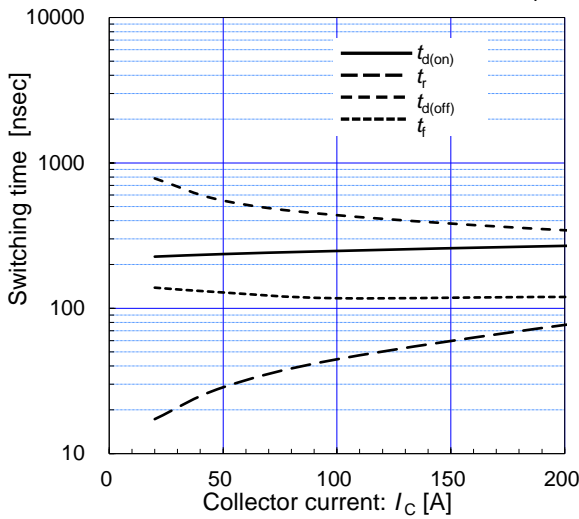
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IGBT Modules

[Inverter]

Switching time vs. Collector current (typ.)

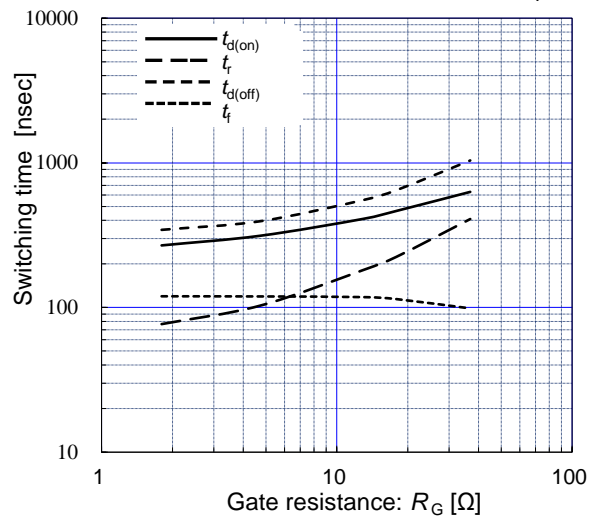
$V_{CC} = 600V, R_G = 1.8 \Omega, V_{GE} = +15/-15 V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

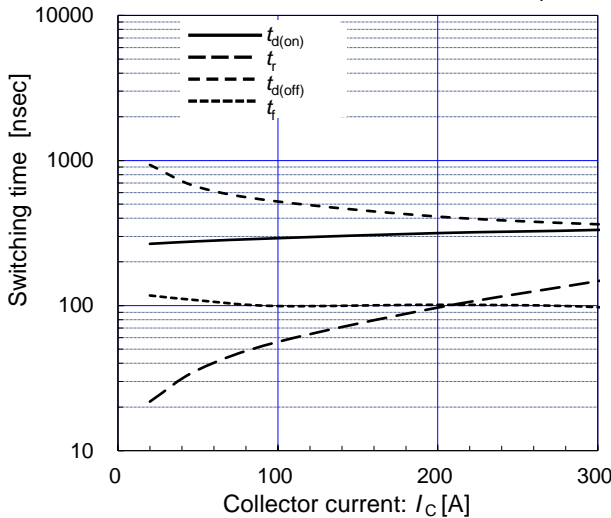
$V_{CC} = 600V, I_C = 200A, V_{GE} = +15/-15 V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

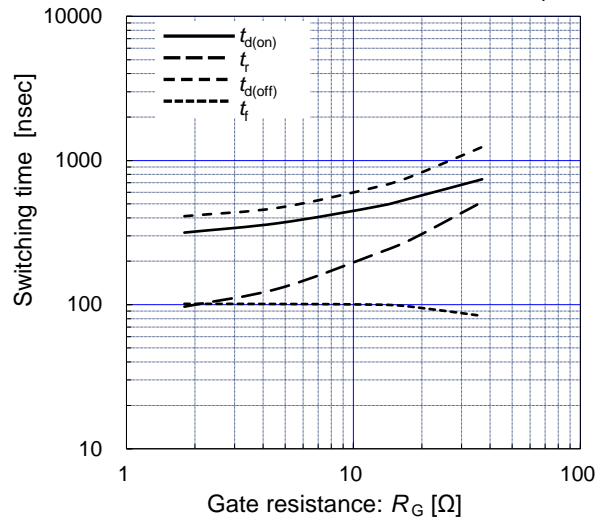
$V_{CC} = 600V, R_G = 1.8 \Omega, V_{GE} = +15/-15 V, T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

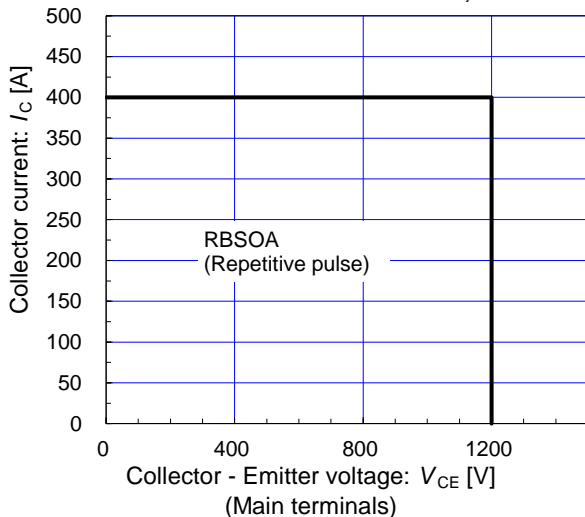
$V_{CC} = 600V, I_C = 200A, V_{GE} = +15/-15 V, T_{vj} = 175^\circ C$



[Inverter]

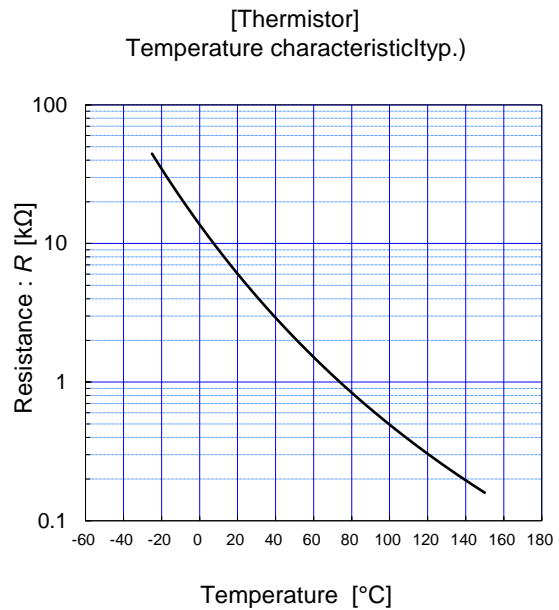
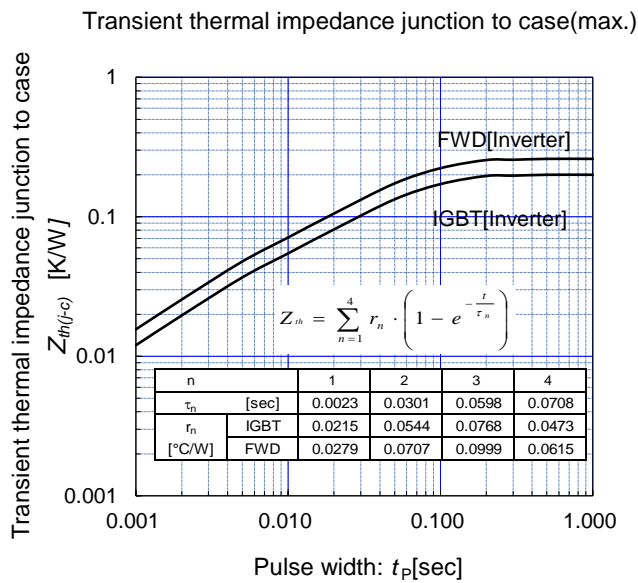
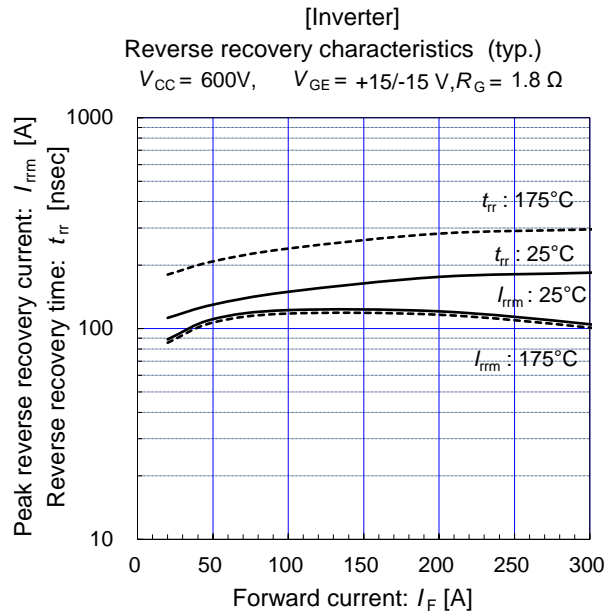
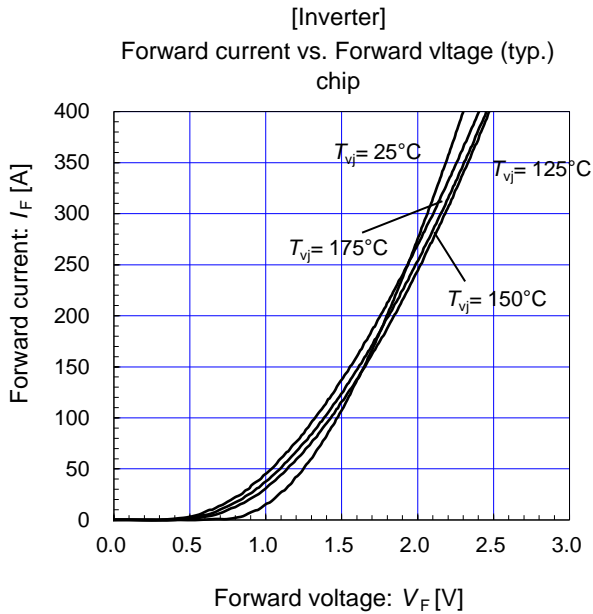
Reverse bias safe operating area (max.)

$V_{GE} = +15/-15 V, R_G = 1.8 \Omega, T_{vj} = 175^\circ C$



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2 产品信息	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/">www.fujielectric.com.cn/products/semiconductor/model/</a>
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4 技术信息	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/technical/">www.fujielectric.com.cn/products/semiconductor/model/igbt/technical/</a>
5 安装说明书	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/mounting/">www.fujielectric.com.cn/products/semiconductor/model/igbt/mounting/</a>
6 IGBT 损耗模拟软件	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation/">www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation/</a>
7 富士电机技报	<a href="http://www.fujielectric.com.cn/products/semiconductor/journal/">www.fujielectric.com.cn/products/semiconductor/journal/</a>
8 产品咨询	<a href="http://www.fujielectric.com/contact/">www.fujielectric.com/contact/</a>
9 产品更改和停产信息	<a href="http://www.fujielectric.com.cn/products/semiconductor/discontinued/">www.fujielectric.com.cn/products/semiconductor/discontinued/</a>