

6MBI200XBE120-50

IGBT Modules

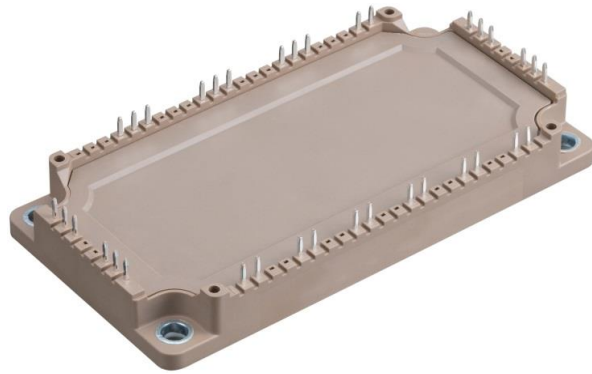
Power Module (X series)
1200V / 200A / 6-in-1 package

■ Features

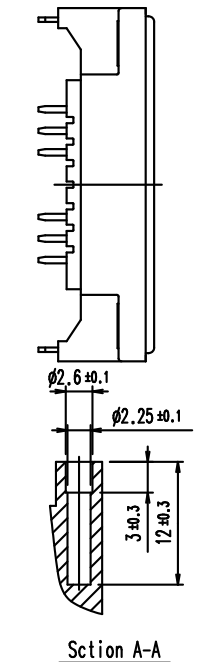
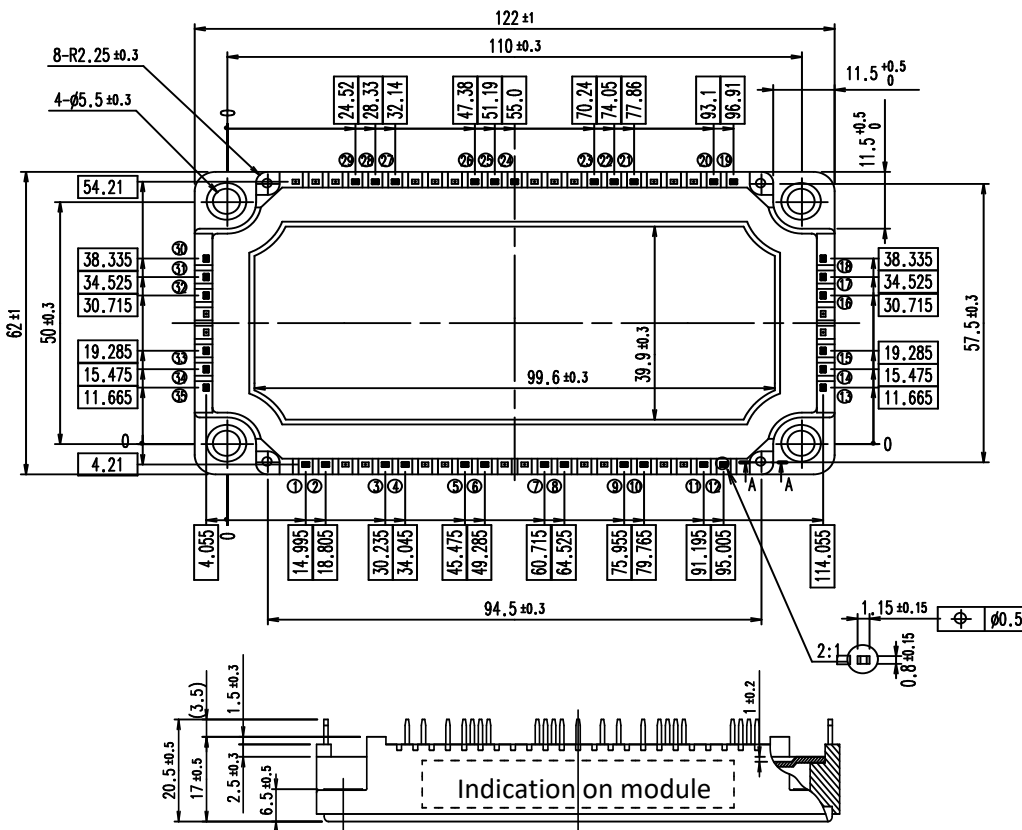
- Low $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant Product

■ Applications

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

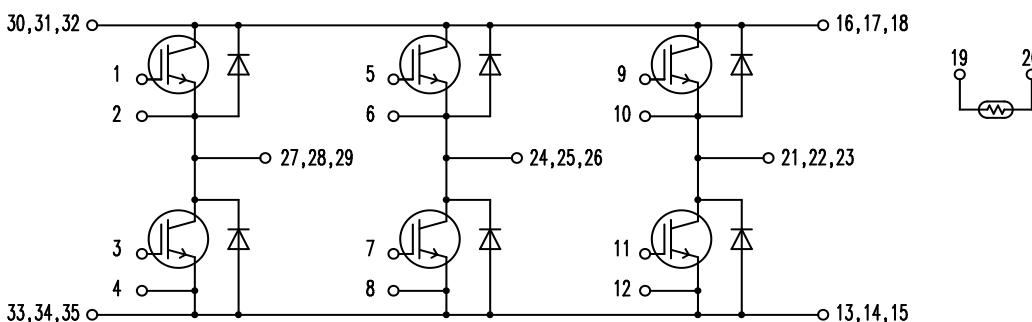


■ Outline drawing (Unit : mm)



Weight: 310 g(typ.)

■ Equivalent Circuit



6MBI200XBE120-50

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}		± 20	V
Collector current		I_C	Continuous $T_C=100^\circ\text{C}$	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	1000	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 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)

6MBI200XBE120-50

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}	$V_{GE} = 0V$ $V_{CE} = 1200V$	-	-	50	μA	
Gate leakage current, collector-emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	100	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 200\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 200A$	$T_{vj}=25^{\circ}\text{C}$	-	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	-	Ω	
			-	21.3	-	nF	
Input capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1\text{MHz}$	-	0.73	-		
Output capacitance	C_{oes}		-	0.19	-		
Reverse transfer capacitance	C_{res}		-	-	-		
Gate charge	Q_G		$V_{CC} = 600V, I_C = 200A$ $V_{GE} = -15 \rightarrow +15V$	-	1400	-	nC
Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 200A$	$T_{vj}=25^{\circ}\text{C}$	-	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)	$t_{d(on)}$	$V_{CC} = 600V$ $I_C, I_F = 200A$ $V_{GE} = +15/-15 V$ $R_G = 1.8 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	0.27	-	μs
			$T_{vj}=125^{\circ}\text{C}$	-	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}) = $t_{d(off)} + t_f$

6MBI200XBE120-50

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	-	Ω	
		$T = 100^{\circ}\text{C}$	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.

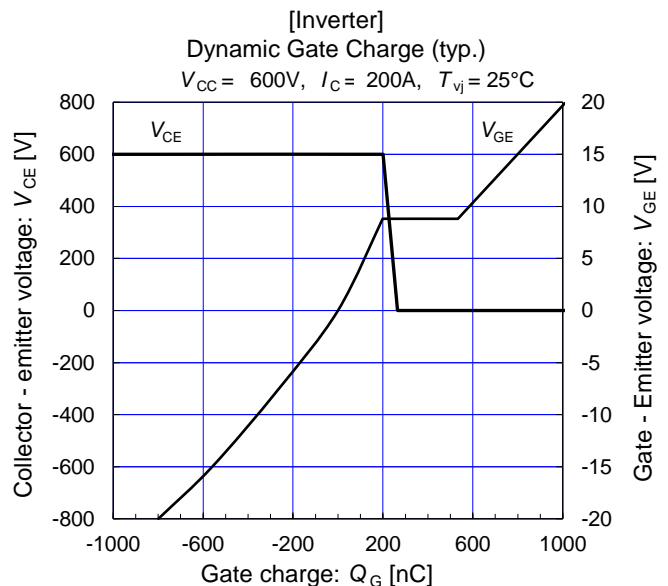
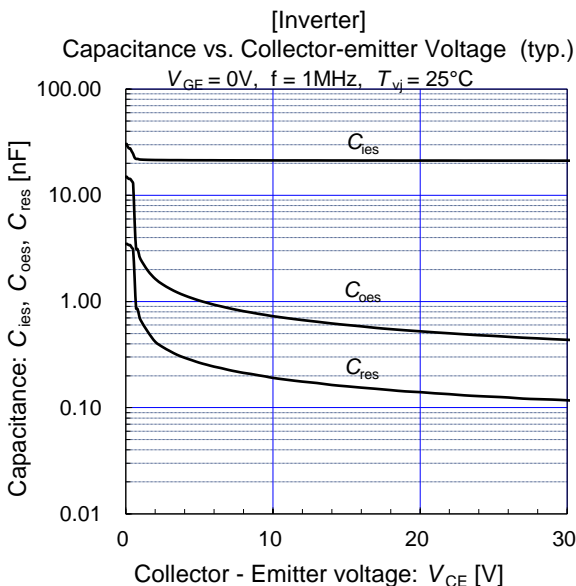
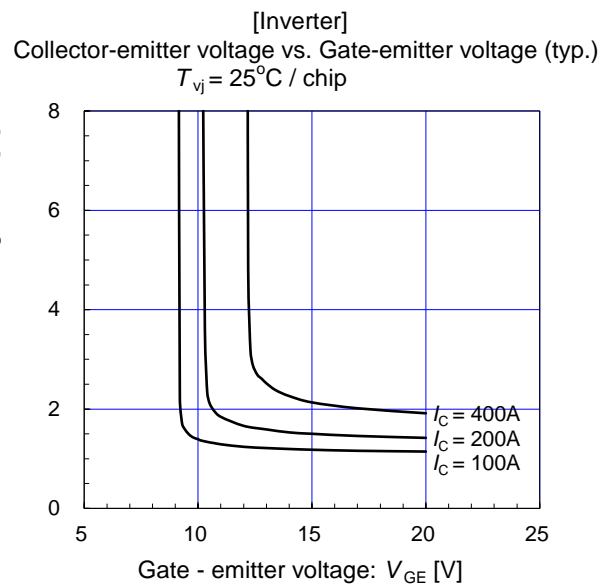
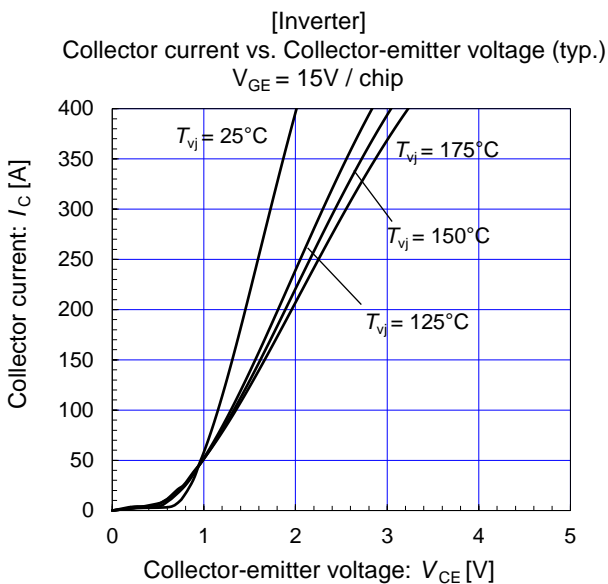
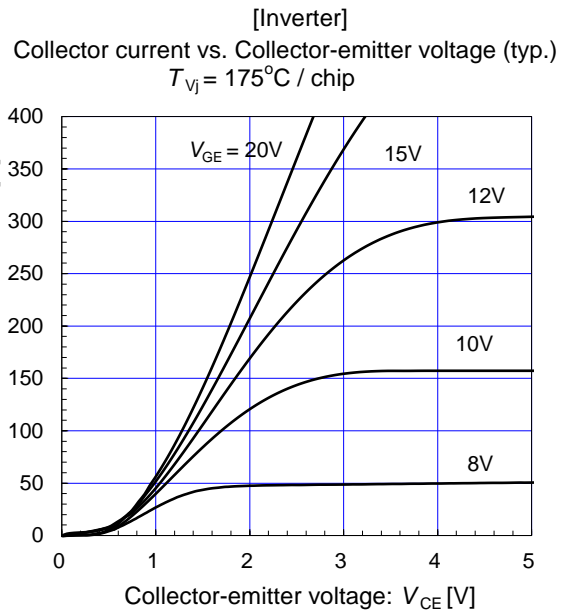
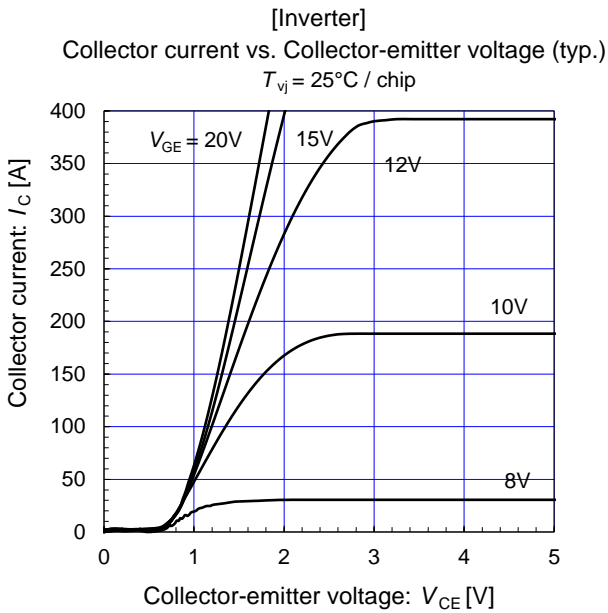
■ Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case (1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.15	K/W
		Inverter FWD	-	-	0.16	
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.

6MBI200XBE120-50

IGBT Modules



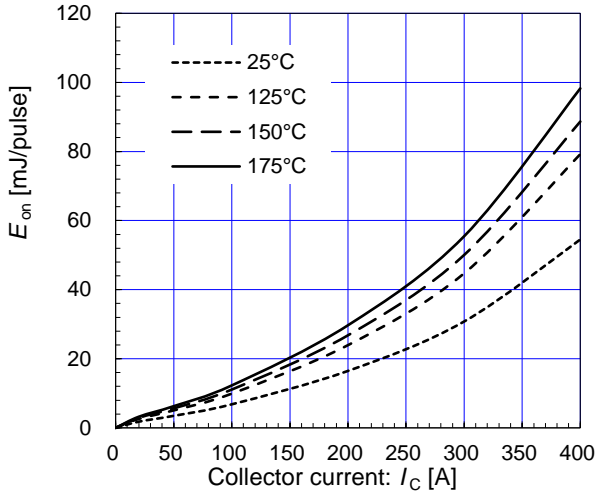
6MBI200XBE120-50

IGBT Modules

[Inverter]

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

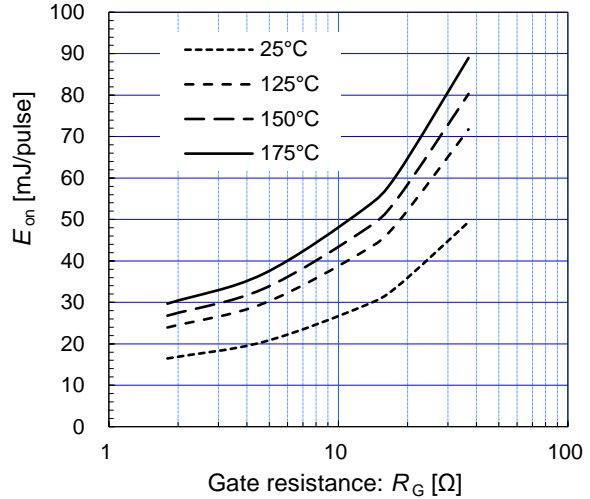
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 1.8\ \Omega$



[Inverter]

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

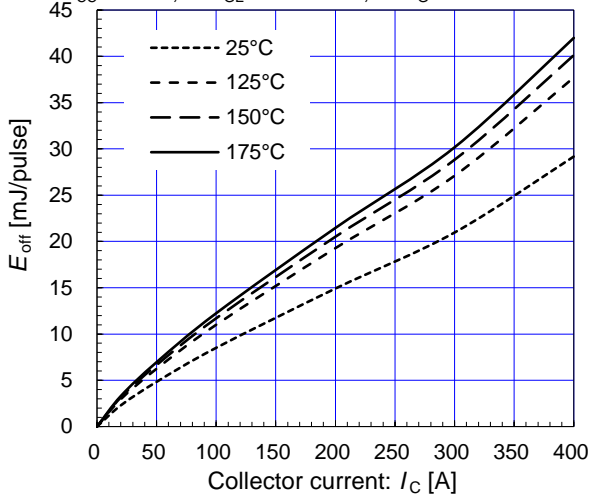
$V_{CC} = 600V, V_{GE} = +15/-15V, I_C = 200A$



[Inverter]

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

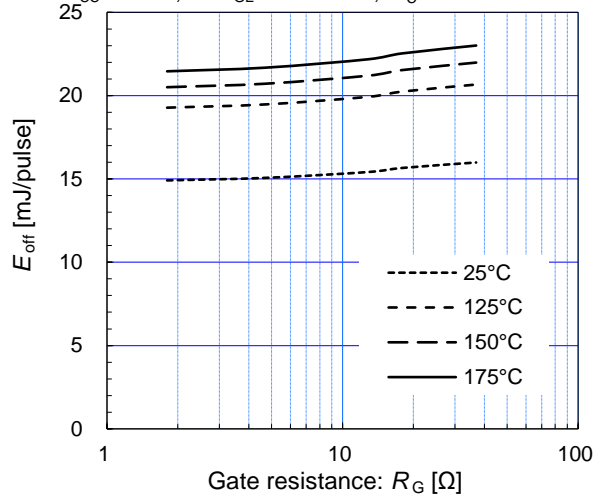
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 1.8\ \Omega$



[Inverter]

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

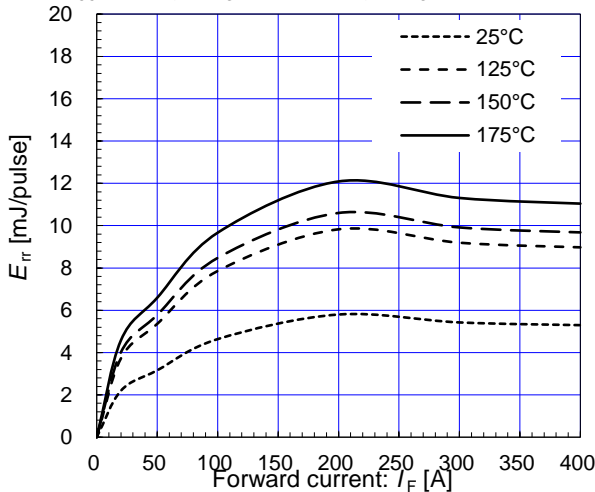
$V_{CC} = 600V, V_{GE} = +15/-15V, I_C = 200A$



[Inverter]

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

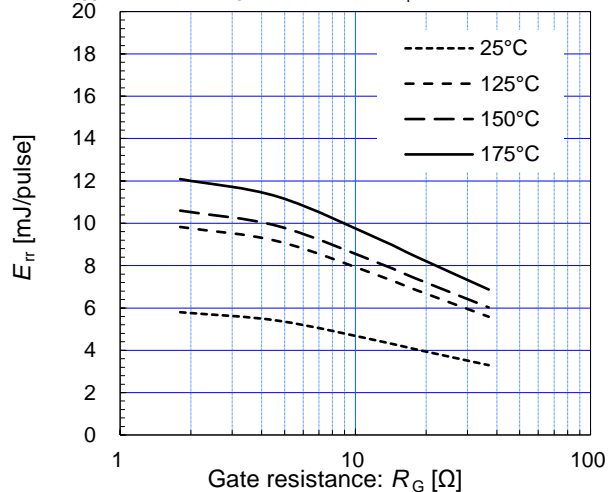
$V_{CC} = 600V, V_{GE} = +15/-15V, R_G = 1.8\ \Omega$



[Inverter]

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

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



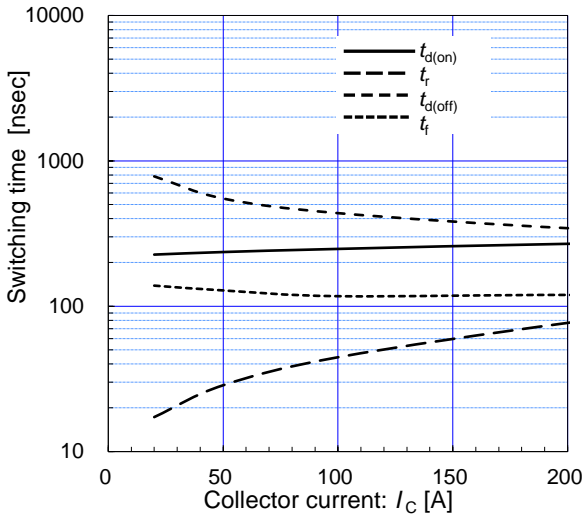
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[Inverter]

Switching time vs. Collector current (typ.)

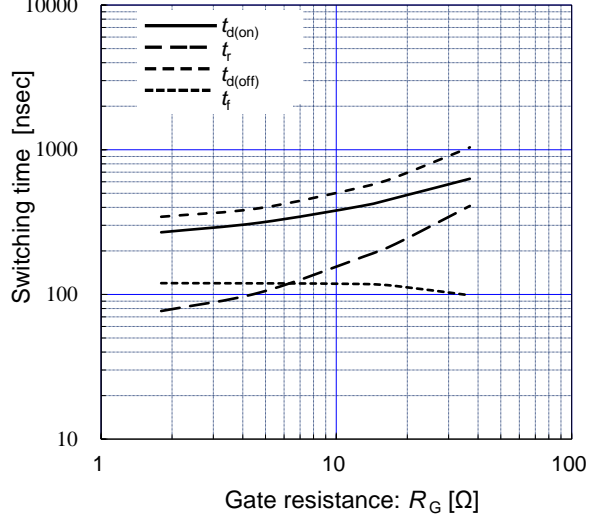
$V_{CC} = 600V, R_G = 1.8 \Omega, V_{GE} = +15/-15 V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

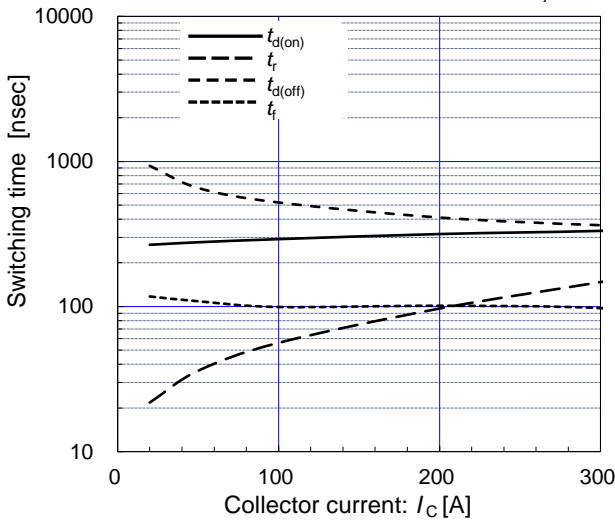
$V_{CC} = 600V, I_C = 200A, V_{GE} = +15/-15 V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

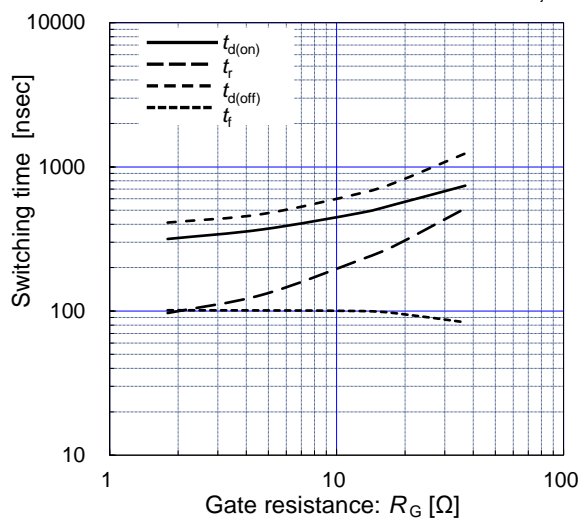
$V_{CC} = 600V, R_G = 1.8 \Omega, V_{GE} = +15/-15 V, T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

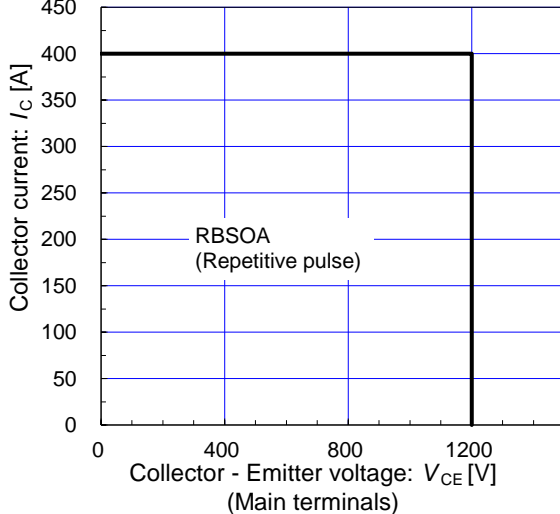
$V_{CC} = 600V, I_C = 200A, V_{GE} = +15/-15 V, T_{vj} = 175^\circ C$



[Inverter]

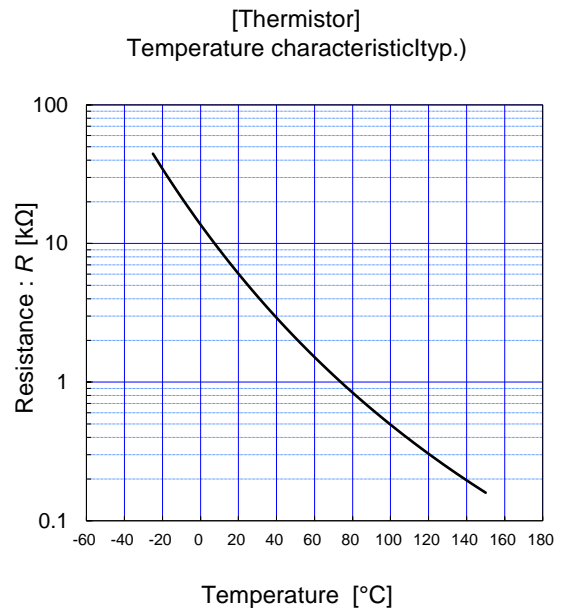
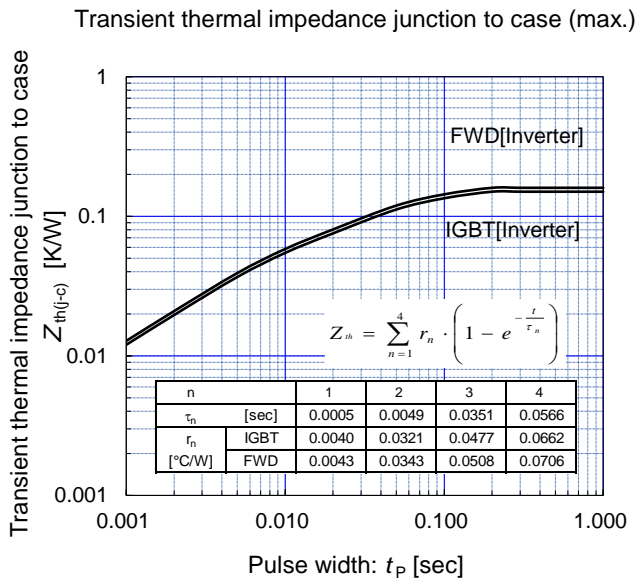
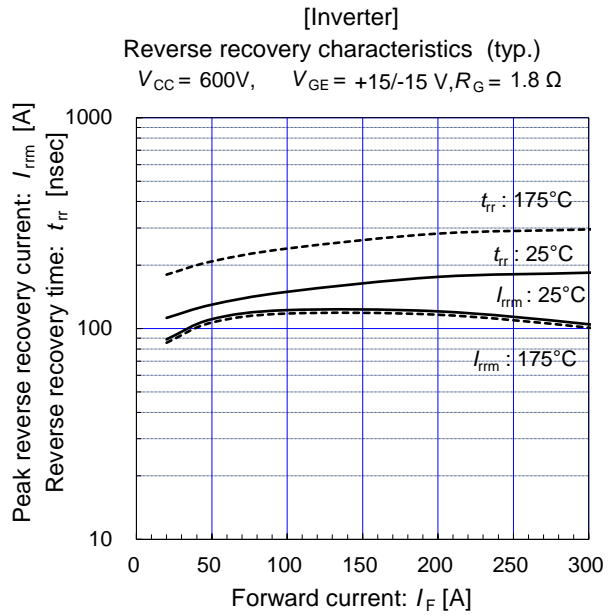
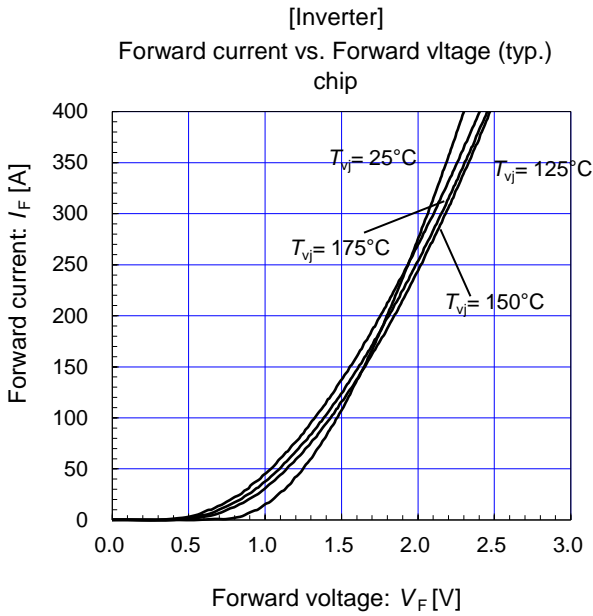
Reverse bias safe operating area (max.)

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



6MBI200XBE120-50

IGBT Modules



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