

2MBI200XBE120-50

IGBT Modules

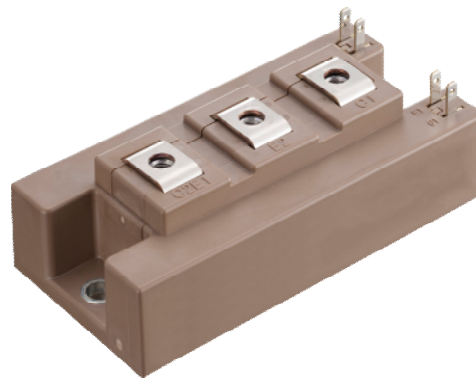
Power Module (X series)
1200V / 200A / 2-in-1 package

■ Features

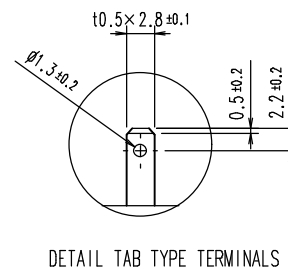
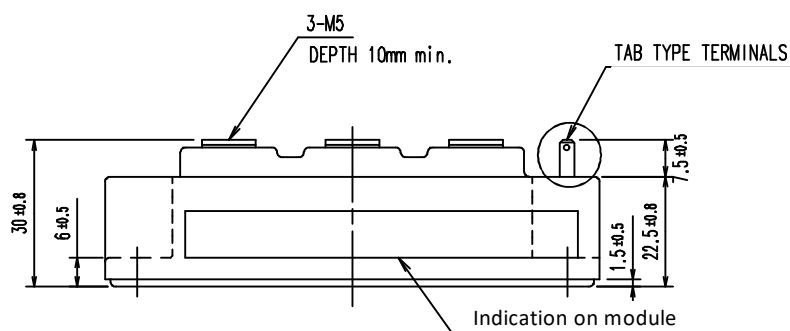
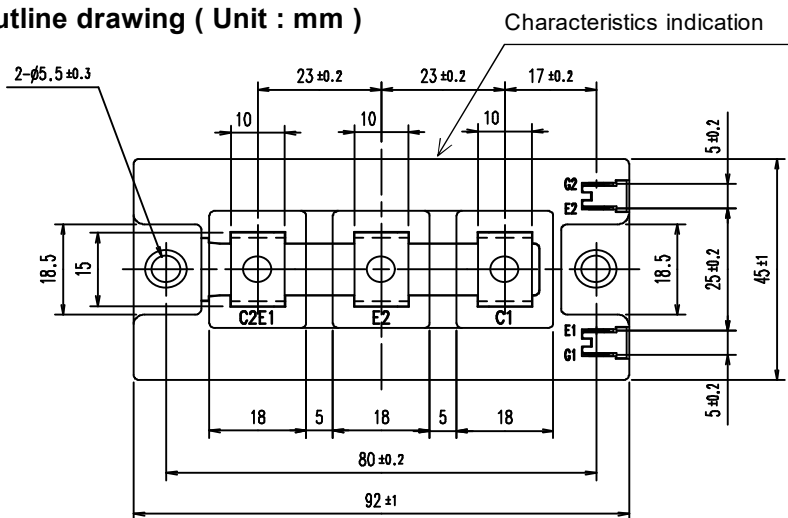
- Low $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

■ Applications

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

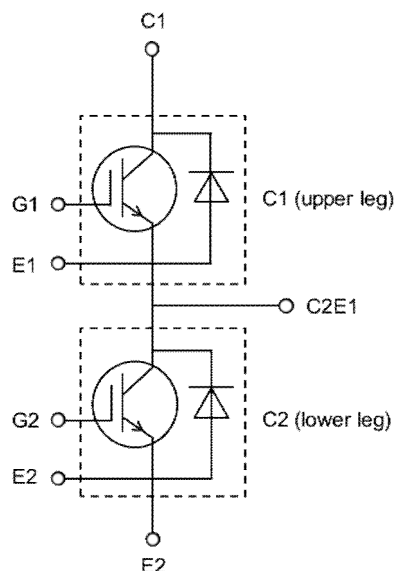


■ Outline drawing (Unit : mm)



Weight: 240 g(typ.)

■ 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
Inverter	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		200	
	Repetitive peak forward current	I_{FRM}	1ms	400	
	Total power dissipation	P_{tot}	1 device	1485	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
Mounting torque of screws to heat sink		M_s	M5	2.5 ~ 3.5	N m
Mounting torque of screws to terminals		M_t	M5	2.5 ~ 3.5	

(*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)

Items		Symbols	Conditions		Characteristics			Units
					min.	typ.	max.	
Inverter	Collector-Emitter cut-off current, Gate-Emitter short-circuited	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 1200V$		-	-	100	μA
	Gate leakage current, Collector-Emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$		-	-	200	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 200mA$		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 200A$	$T_{vj}=25^{\circ}C$	-	1.55	2.00	V
		$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}C$	-	1.40	1.85	
				$T_{vj}=125^{\circ}C$	-	1.75	-	
				$T_{vj}=150^{\circ}C$	-	1.80	-	
				$T_{vj}=175^{\circ}C$	-	1.85	-	
	Internal gate resistance	r_g	-		-	2.80	-	Ω
	Capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$		-	23	-	nF
		C_{oes}			-	0.8	-	
		C_{res}			-	0.21	-	
	Gate charge	Q_G	$V_{CC} = 600V, I_C = 200A$ $V_{GE} = -15 \rightarrow +15V$		-	1.5	-	μC
	Forward voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F = 200A$	$T_{vj}=25^{\circ}C$	-	1.75	2.20	V
		V_F (chip)		$T_{vj}=25^{\circ}C$	-	1.60	2.05	
				$T_{vj}=125^{\circ}C$	-	1.65	-	
				$T_{vj}=150^{\circ}C$	-	1.60	-	
				$T_{vj}=175^{\circ}C$	-	1.60	-	
	Turn-on delay time(*1)	$t_{d(on)}$	$V_{CC} = 600V$ $I_C, I_F = 200A$ $V_{GE} = +15/ -15V$ $R_G = 2.7 \Omega$ $L_S = 30 \text{ nH}$	$T_{vj} = 25^{\circ}C$	-	0.32	-	μs
$T_{vj}=125^{\circ}C$				-	0.35	-		
$T_{vj}=150^{\circ}C$				-	0.36	-		
$T_{vj}=175^{\circ}C$				-	0.37	-		
Rise time(*1)	t_r	$T_{vj} = 25^{\circ}C$		-	0.06	-		
		$T_{vj}=125^{\circ}C$		-	0.07	-		
		$T_{vj}=150^{\circ}C$		-	0.07	-		
		$T_{vj}=175^{\circ}C$		-	0.08	-		
Turn-off delay time(*1)	$t_{d(off)}$	$T_{vj} = 25^{\circ}C$		-	0.36	-		
		$T_{vj}=125^{\circ}C$		-	0.40	-		
		$T_{vj}=150^{\circ}C$		-	0.42	-		
		$T_{vj}=175^{\circ}C$		-	0.43	-		
Fall time(*1)	t_f	$T_{vj} = 25^{\circ}C$		-	0.13	-		
		$T_{vj}=125^{\circ}C$		-	0.21	-		
		$T_{vj}=150^{\circ}C$		-	0.23	-		
		$T_{vj}=175^{\circ}C$		-	0.25	-		
Reverse recovery time	t_{rr}	$T_{vj} = 25^{\circ}C$	-	0.28	-			
		$T_{vj}=125^{\circ}C$	-	0.49	-			
		$T_{vj}=150^{\circ}C$	-	0.55	-			
		$T_{vj}=175^{\circ}C$	-	0.60	-			

(*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.	
Inverter	Turn-on energy	E_{on}	$V_{\text{CC}} = 600\text{V}$ $I_{\text{C}}, I_{\text{F}} = 200\text{A}$ $V_{\text{GE}} = +15/-15\text{V}$ $R_{\text{G}} = 2.7\ \Omega$ $L_{\text{S}} = 30\ \text{nH}$	$T_{\text{vj}} = 25^{\circ}\text{C}$	-	19.0	-	mJ
				$T_{\text{vj}} = 125^{\circ}\text{C}$	-	26.4	-	
				$T_{\text{vj}} = 150^{\circ}\text{C}$	-	28.3	-	
				$T_{\text{vj}} = 175^{\circ}\text{C}$	-	30.1	-	
	Turn-off energy	E_{off}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	17.7	-	
				$T_{\text{vj}} = 125^{\circ}\text{C}$	-	20.7	-	
				$T_{\text{vj}} = 150^{\circ}\text{C}$	-	21.5	-	
				$T_{\text{vj}} = 175^{\circ}\text{C}$	-	22.2	-	
	Reverse recovery energy	E_{rr}		$T_{\text{vj}} = 25^{\circ}\text{C}$	-	7.8	-	
				$T_{\text{vj}} = 125^{\circ}\text{C}$	-	12.7	-	
				$T_{\text{vj}} = 150^{\circ}\text{C}$	-	13.9	-	
				$T_{\text{vj}} = 175^{\circ}\text{C}$	-	15.2	-	

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.

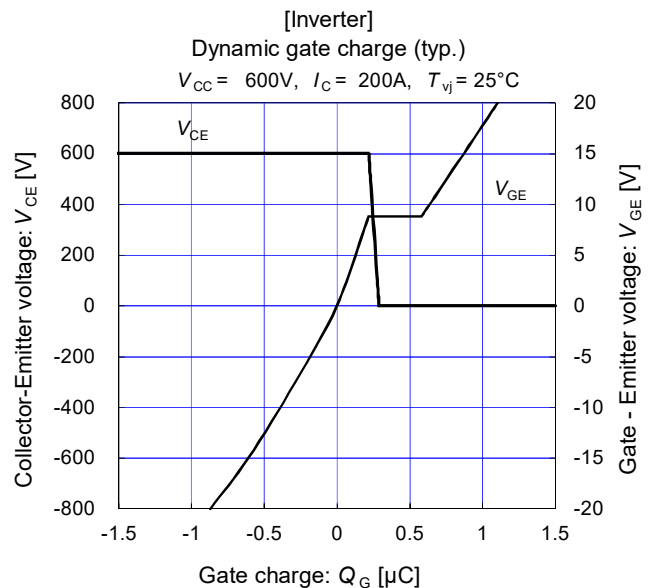
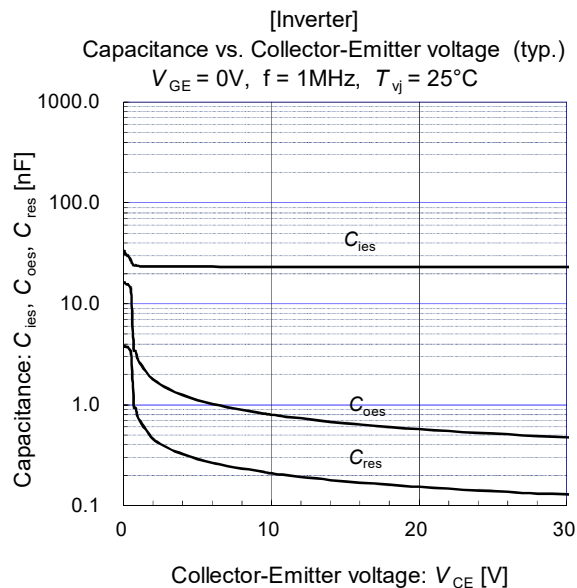
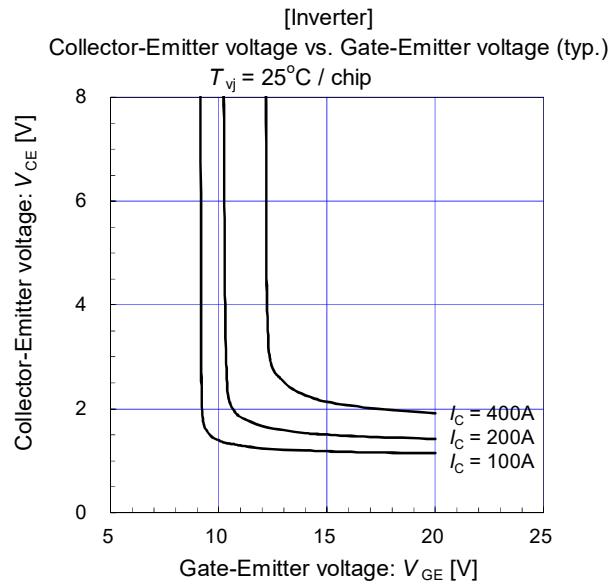
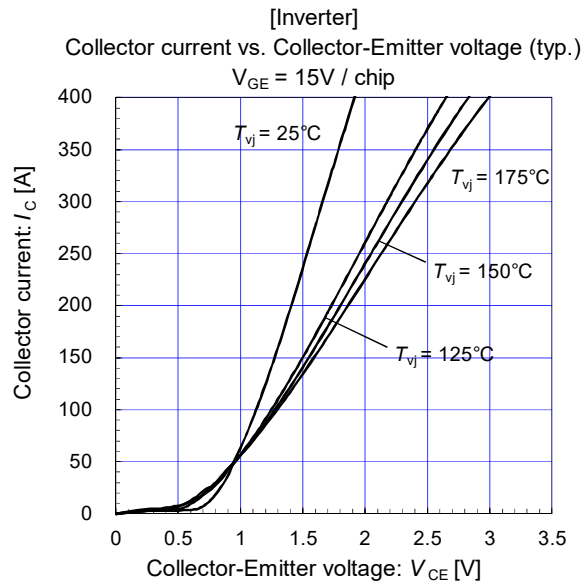
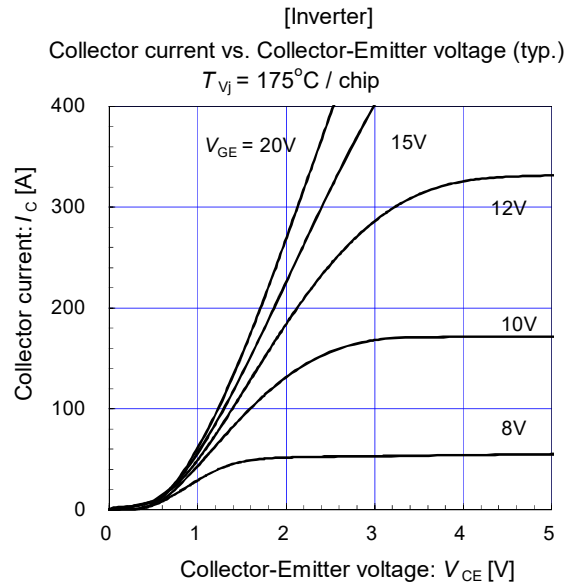
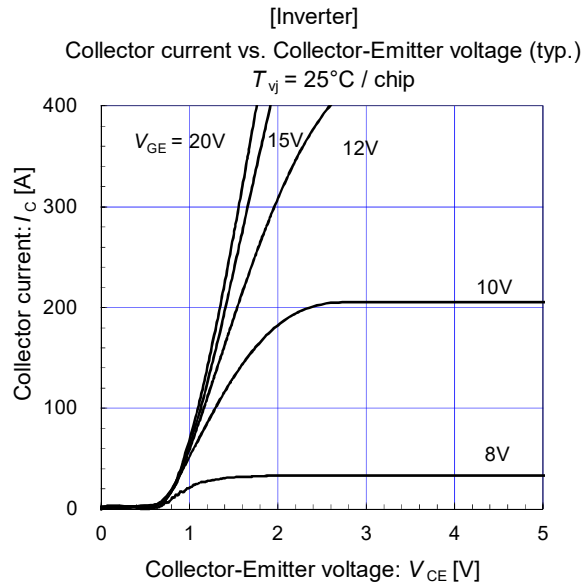
■ Thermal resistance characteristics

	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.101	K/W
		Inverter FWD	-	-	0.169	
Thermal resistance case to heat sink (1 IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.025	-	

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

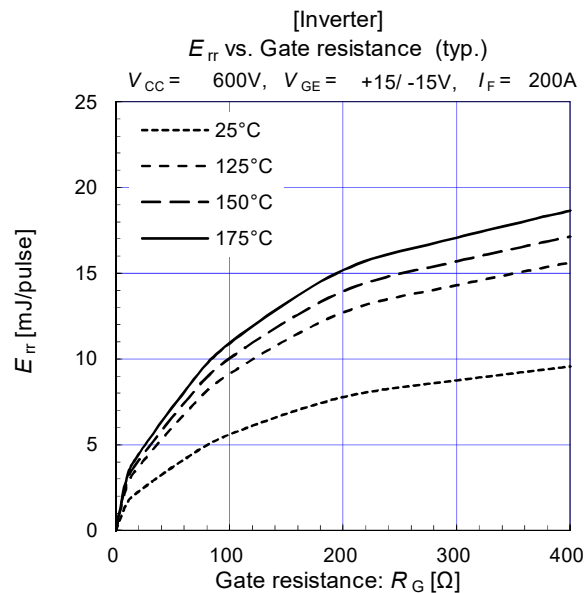
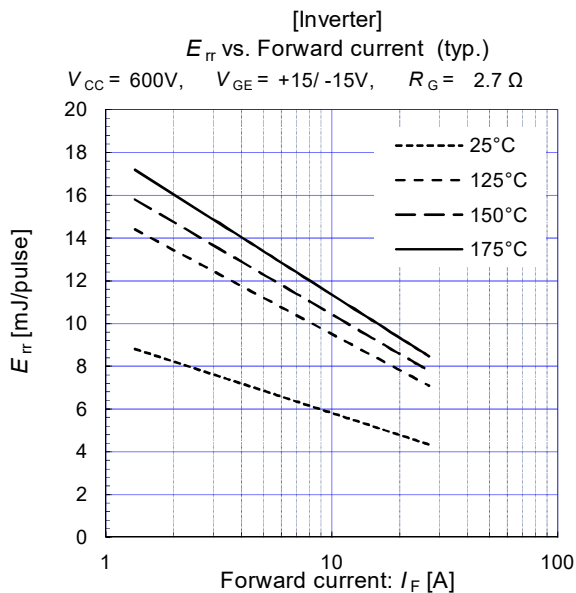
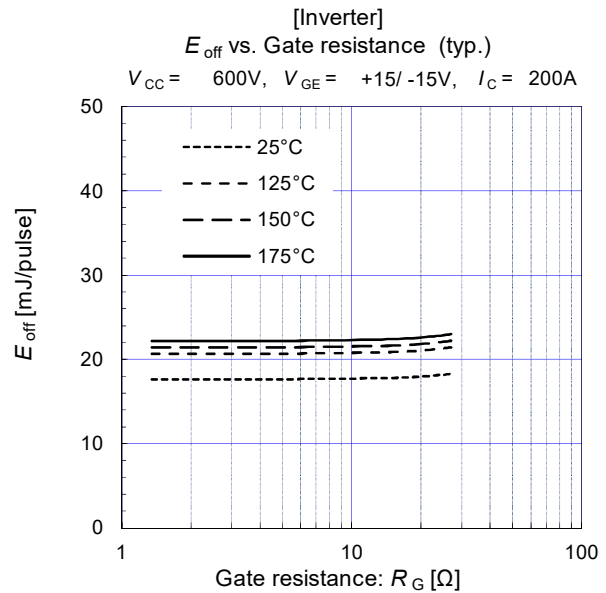
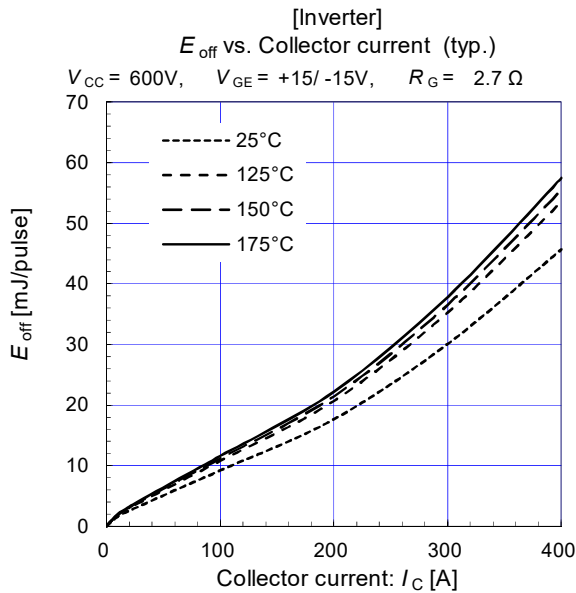
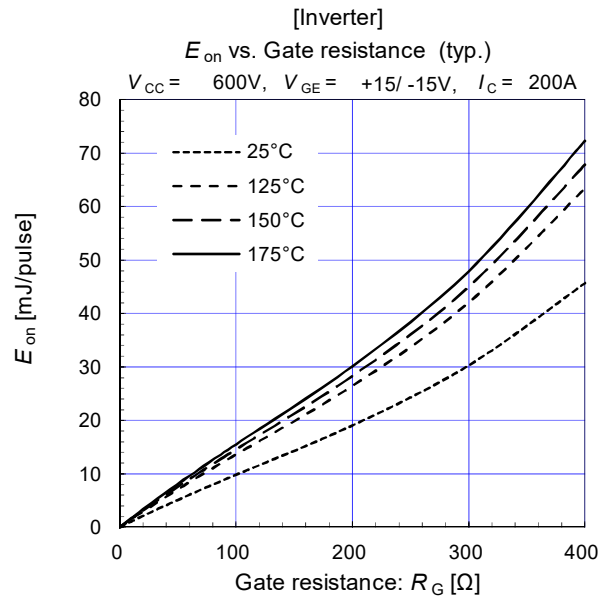
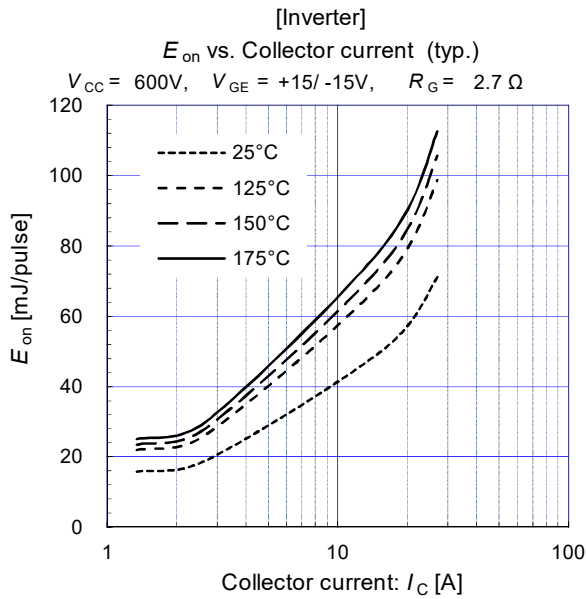
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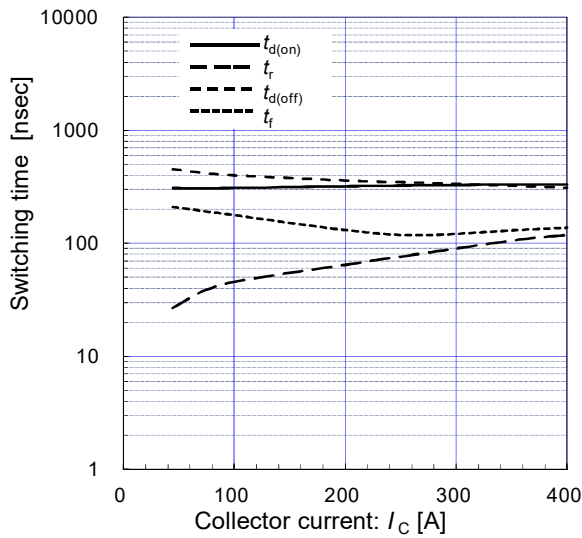
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[Inverter]

Switching time vs. Collector current (typ.)

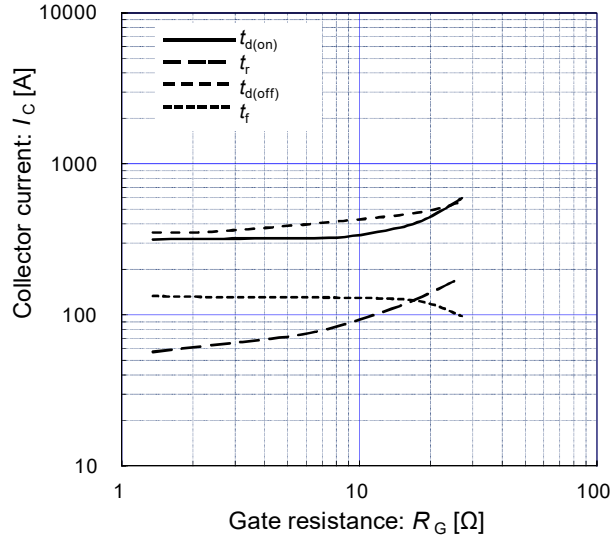
$V_{CC} = 600V$, $R_G = 2.7\Omega$, $V_{GE} = +15/-15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

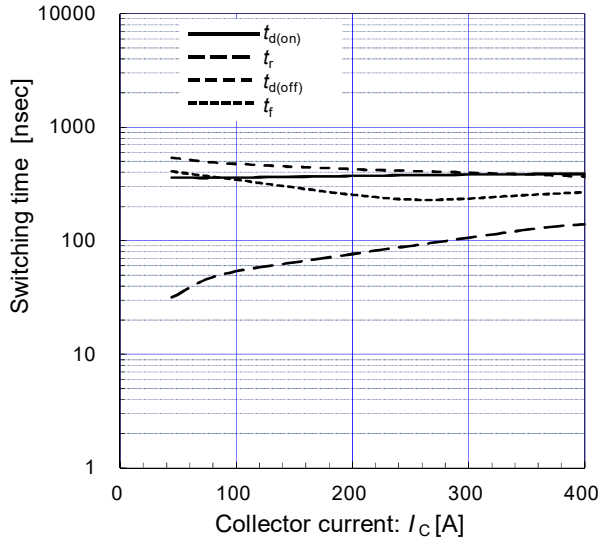
$V_{CC} = 600V$, $I_C = 200A$, $V_{GE} = +15/-15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

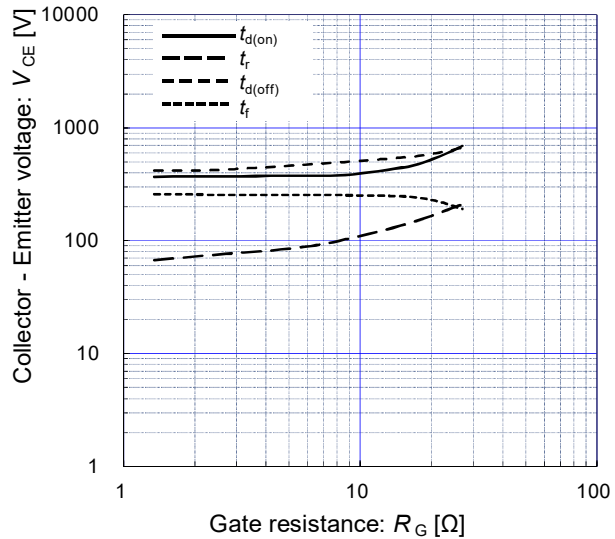
$V_{CC} = 600V$, $R_G = 2.7\Omega$, $V_{GE} = +15/-15V$, $T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

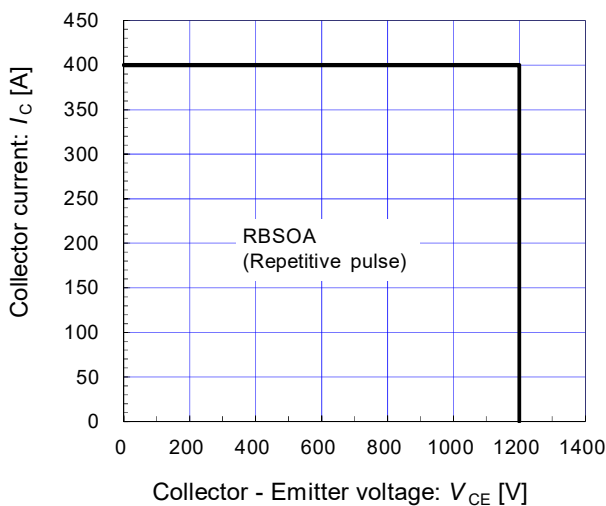
$V_{CC} = 600V$, $I_C = 200A$, $V_{GE} = +15/-15V$, $T_{vj} = 175^\circ C$



[Inverter]

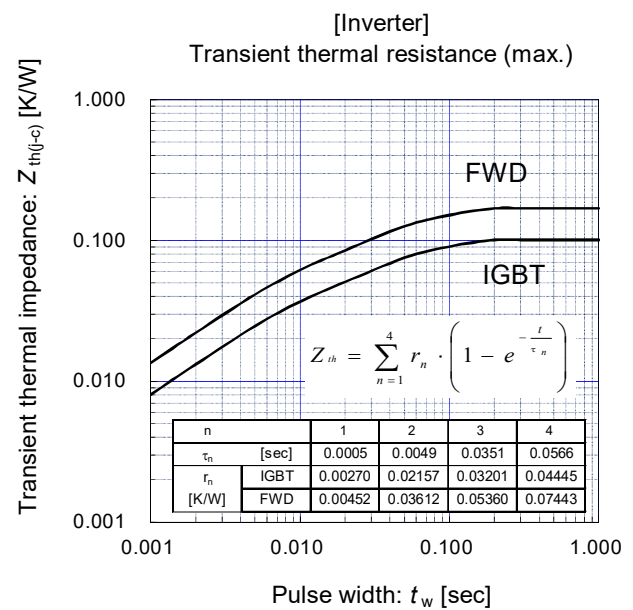
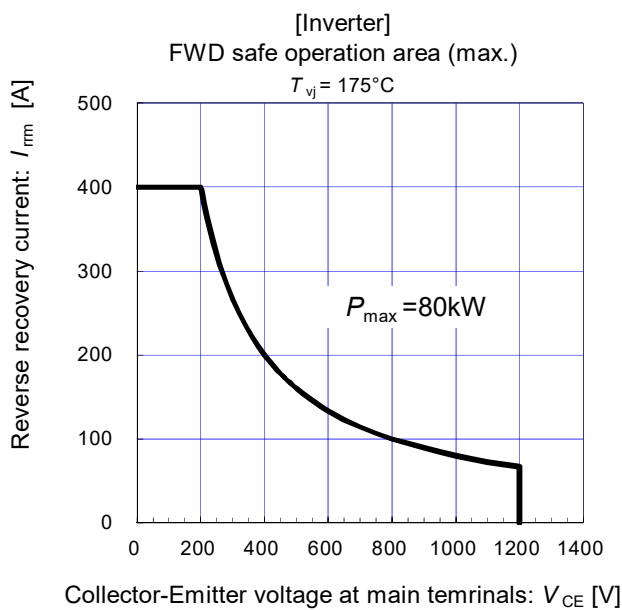
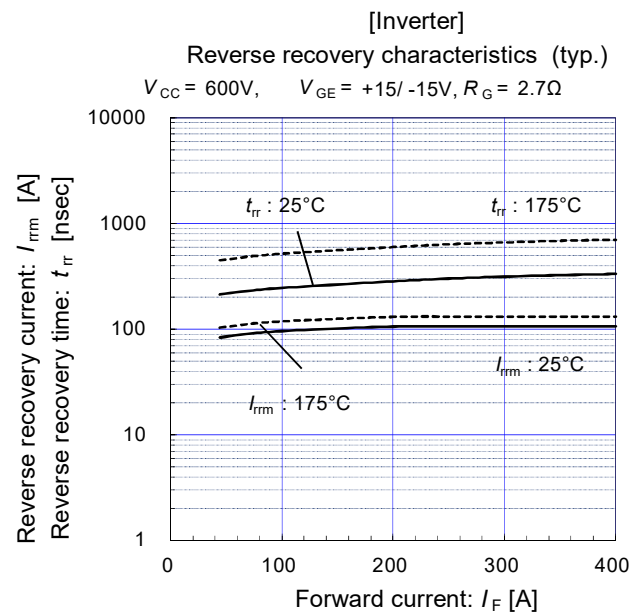
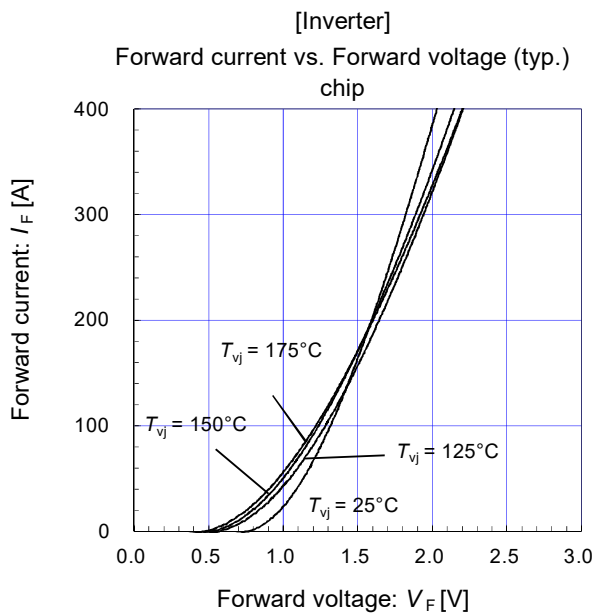
Reverse bias safe operating area (max.)

$V_{GE} = +15/-15V$, $R_G = 2.7\Omega$, $T_{vj} = 175^\circ C$



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