2MBI200XHA170-50

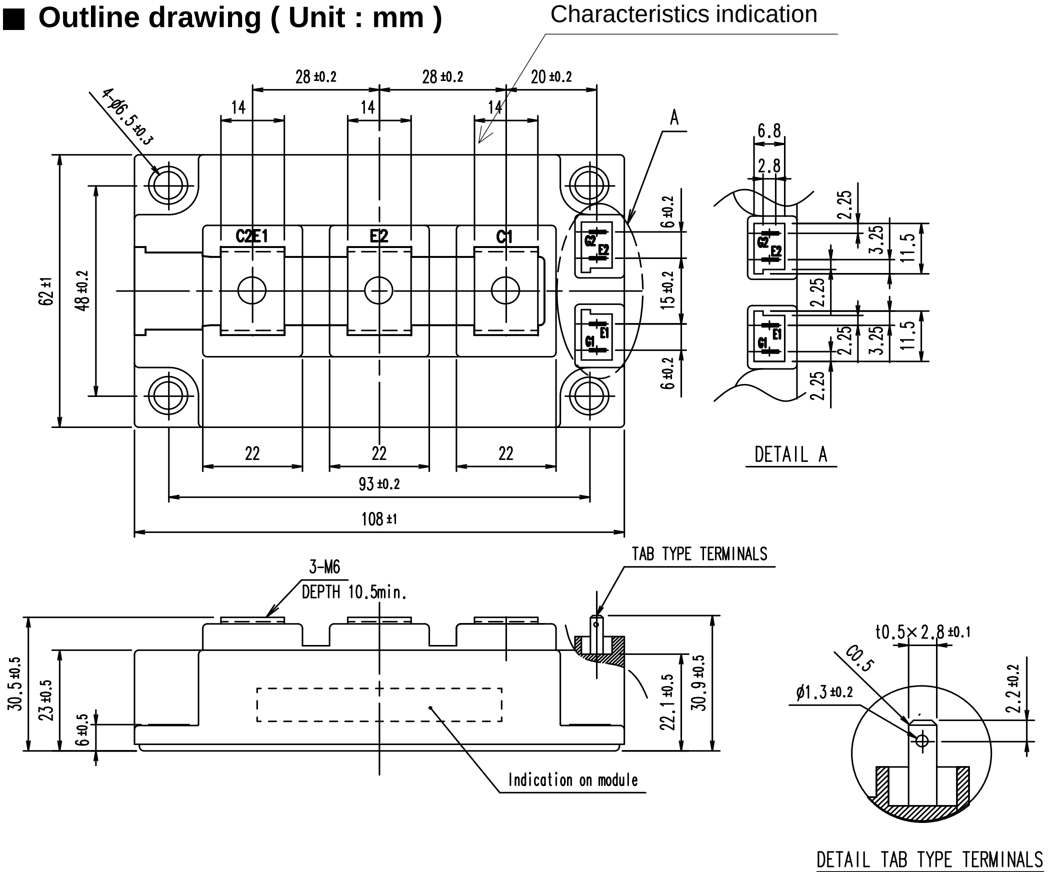
IGBT Modules

Power Module (X series)
1700V / 200A / 2-in-1 package

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

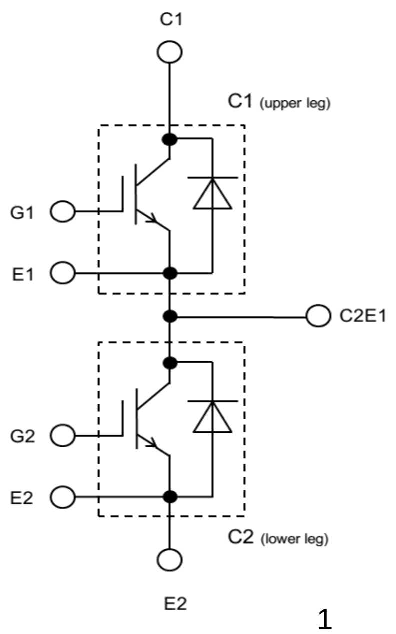
■ Applications
Inverter for Motor Drives, AC and DC Servo Drives
Uniterruptible Power Supply Systems,
Industrial machines,such as Welding machines

■ Outline drawing (Unit : mm)



Weight: 370 g(typ.)

■ Equivalent Circuit



FM5F9448
2019/07

■ Absolute Maximum Ratings (at T_C= 25°C unless otherwise specified)

Items		Symbols	Conditions		Maximum Ratings	Units
Collector-Emitter voltage, Gate-Emitter short-circuited		V_{CES}			1700	V
Gate-Emitter voltage, Collecter-Emitter short-circuited		V_{GES}			±20	V
Collector current		I_C	Continuous	T_C=100°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		1125	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 terminals and copper base (*1)	V_{isol}	AC: 1min.		4000	Vrms
Mounting torque of screws to heatsink (*2)		-	M5 or M6		6.0	N·m
Mounting torque of screws to terminals (*2)			M5		5.0	

(*1) All terminals should be connected together during the test.
(*2) Recommendable Value: Mounting 3.0 ~ 6.0 N·m (M5 or M6)
Recommendable Value: Terminals 2.5 ~ 5.0 N·m (M6)

■ Electrical characteristics (at T_{vj}= 25°C unless otherwise specified)

	Symbols	Conditions		Characteristics min.	typ.	max.	Units
Collector-Emitter cut-off current, Gate-Emitter short-circuited	I_{CES}	V_{GE} = 0V, V_{CE} = 1700V		-	-	100	μA
Gate leakage current, Collector-Emitter short-circuited	I_{GES}	V_{CE}=0V, V_{GE}=±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°C	-	1.75	2.20	V
	$V_{CE(sat)}$ (chip)		T_{vj}=25°C	-	1.65	2.10	
			T_{vj}=125°C	-	2.00	-	
			T_{vj}=150°C	-	2.10	-	
			T_{vj}=175°C	-	2.20	-	
Internal Gate resistance	r_g	-		-	5.00	-	Ω
Capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	27	-	nF
	C_{oes}			-	0.8	-	
	C_{res}			-	0.17	-	
Gate charge	Q_G	V_{CC} = 900V, I_C = 200A, V_{GE} = -15 → +15V		-	1700	-	nC
Forward voltage	V_F (terminal)	V_{GE} = 0V, I_F= 200A	T_{vj}=25°C	-	1.80	2.25	V
	V_F (chip)		T_{vj}= 25°C	-	1.70	2.15	
			T_{vj}=125°C	-	1.85	-	
			T_{vj}=150°C	-	1.85	-	
			T_{vj}=175°C	-	1.80	-	
Switching time (*1)	$t_{d(on)}$	V_{CC} = 900V, I_C, I_F = 200A, V_{GE} = ±15V, R_G = 0.82 Ω, L_S = 30 nH	T_{vj}= 25°C	-	400	-	ns
			T_{vj}=125°C	-	410	-	
			T_{vj}=150°C	-	410	-	
			T_{vj}=175°C	-	415	-	
	t_r		T_{vj}= 25°C	-	95	-	
			T_{vj}=125°C	-	90	-	
			T_{vj}=150°C	-	85	-	
			T_{vj}=175°C	-	85	-	
	$t_{d(off)}$		T_{vj}= 25°C	-	600	-	
			T_{vj}=125°C	-	560	-	
			T_{vj}=150°C	-	550	-	
			T_{vj}=175°C	-	540	-	
	t_f		T_{vj}= 25°C	-	625	-	
			T_{vj}=125°C	-	655	-	
			T_{vj}=150°C	-	660	-	
			T_{vj}=175°C	-	665	-	
Reverse recovery time	t_{rr}		T_{vj}= 25°C	-	235	-	
			T_{vj}=125°C	-	375	-	
			T_{vj}=150°C	-	410	-	
			T_{vj}=175°C	-	475	-	

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

■ Electrical characteristics (at T_{vj}= 25°C unless otherwise specified)

Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
Switching loss (per pulse)	E_{on}	V_{CC} = 900V, I_C, I_F = 200A, V_{GE} = ±15V, R_G = 0.82 Ω, L_S = 30 nH	T_{vj}= 25°C	-	52.7	-	mJ
			T_{vj}=125°C	-	72.2	-	
			T_{vj}=150°C	-	78.6	-	
			T_{vj}=175°C	-	90.3	-	
	E_{off}		T_{vj}= 25°C	-	42.8	-	
			T_{vj}=125°C	-	58.9	-	
			T_{vj}=150°C	-	64.3	-	
			T_{vj}=175°C	-	68.2	-	
	E_{rr}		T_{vj}= 25°C	-	41.4	-	
			T_{vj}=125°C	-	69.5	-	
			T_{vj}=150°C	-	78.9	-	
			T_{vj}=175°C	-	88.3	-	

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 min.	Characteristics typ.	Characteristics max.	ns
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.133	K/W
		Inverter FWD	-	-	0.203	
Thermal resistance case to heat sink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0250	-	

(*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

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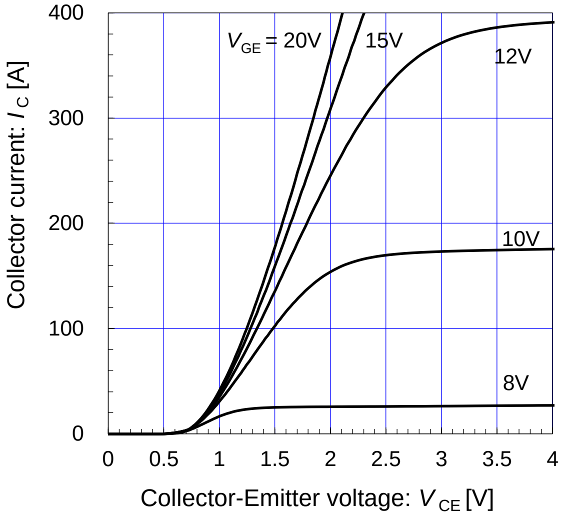
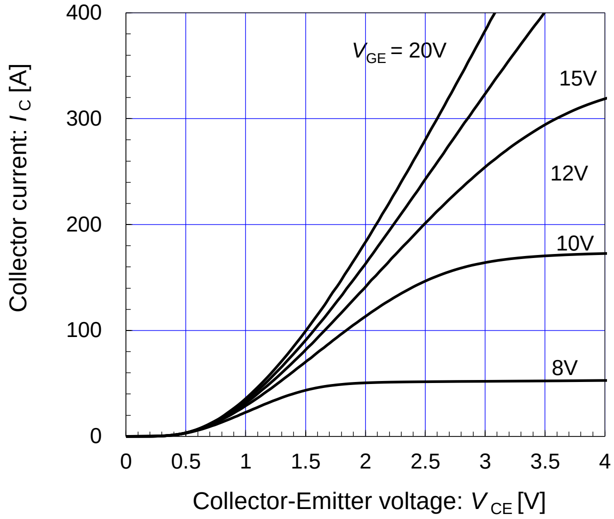
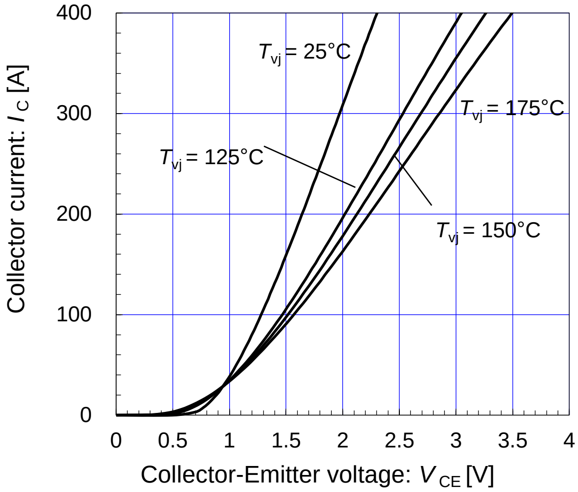
[Inverter]
Collector current vs. Collector-Emitter voltage
T_{vj} = 25°C / chip



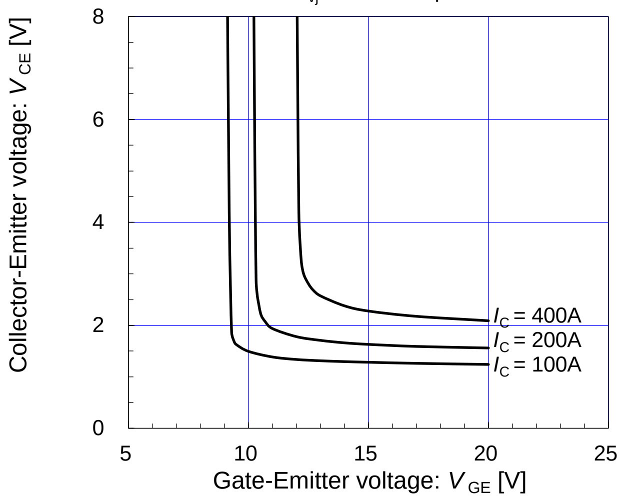
[Inverter]
Collector current vs. Collector-Emitter voltage
T_{vj} = 175°C/ chip



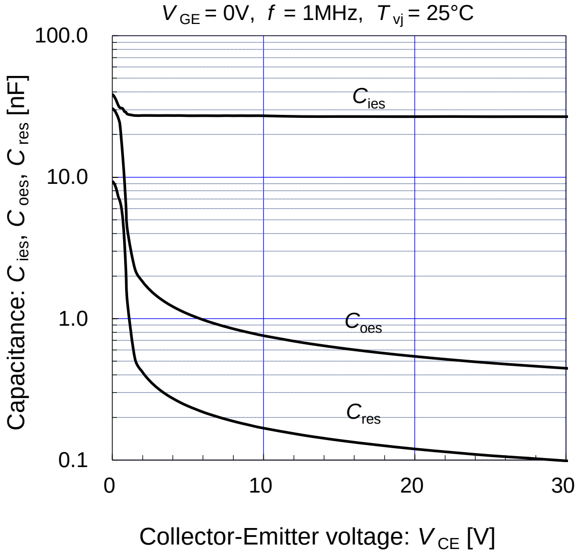
[Inverter]
Collector current vs. Collector-Emitter voltage
V_{GE} = 15V / chip



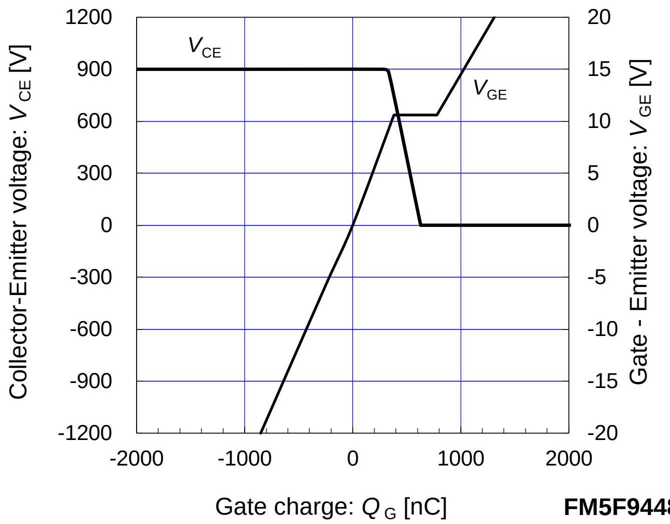
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter
T_{vj} = 25°C / chip



[Inverter]
Capacitance vs. Collector-Emitter Voltage
V_{GE} = 0V, f = 1MHz, T_{vj} = 25°C



[Inverter]
Dynamic Gate Charge (typ.)
V_{CC} = 900V, I_C = 200A, T_{vj} = 25°C



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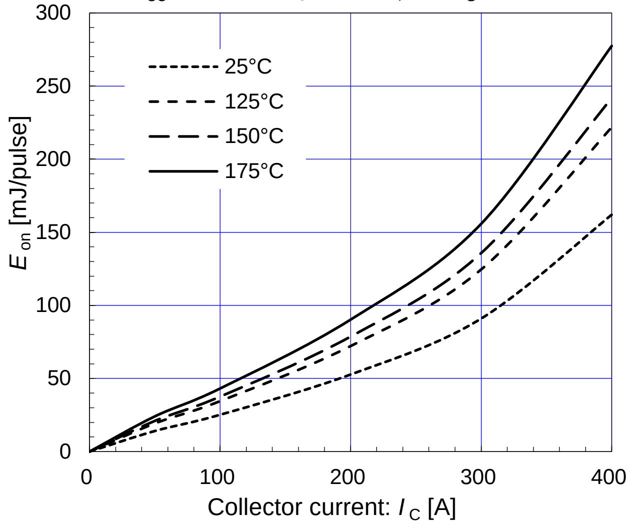
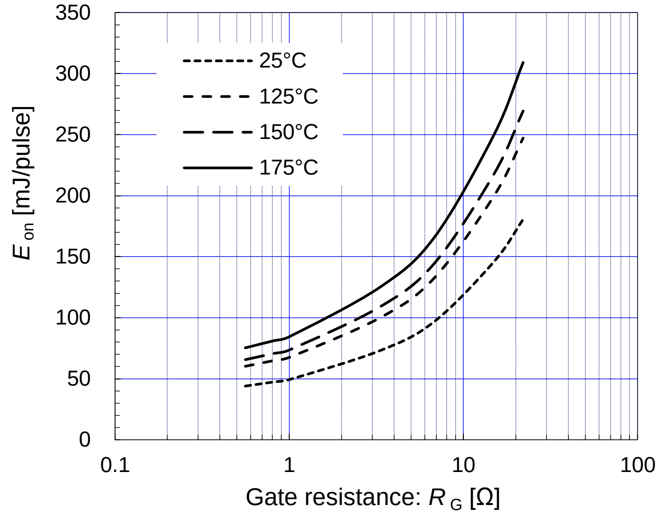
IGBT Modules

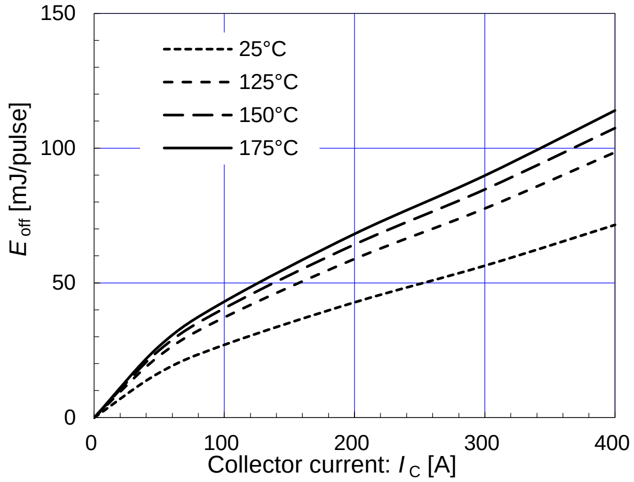
[Inverter]
E_{on} vs. Collector current (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 0.8 Ω



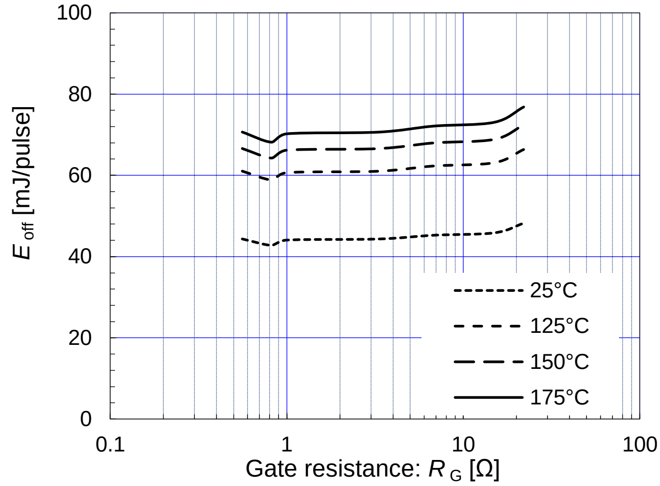
[Inverter]
E_{on} vs. Gate resistance (typ.)
V_{CC} = 900V, V_{GE} = ±15V, I_C = 200A



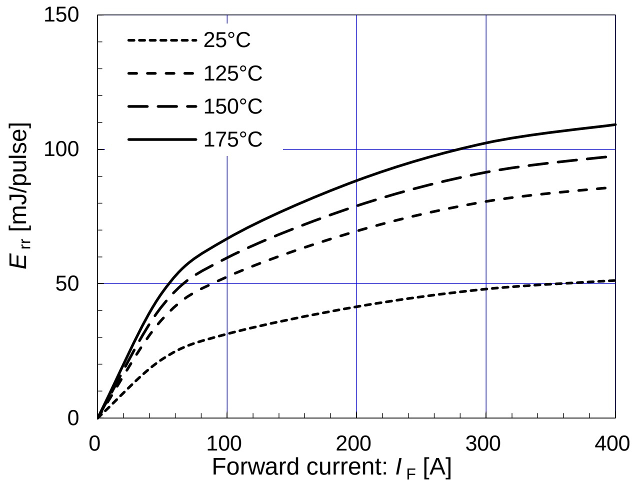
[Inverter]
E_{off} vs. Collector current (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 0.8 Ω



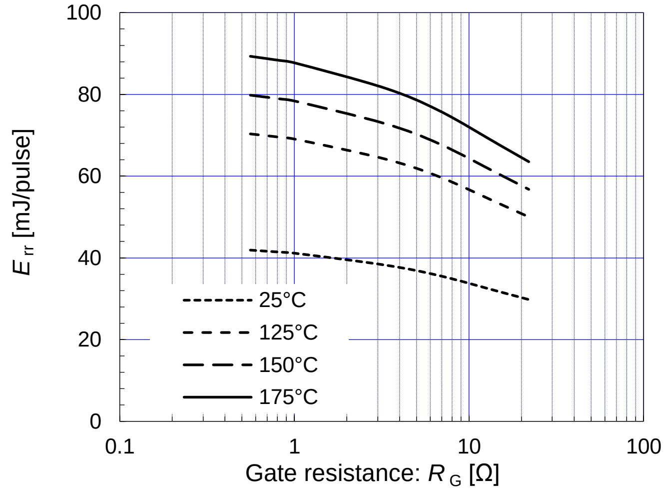
[Inverter]
E_{off} vs. Gate resistance (typ.)
V_{CC} = 900V, V_{GE} = ±15V, I_F = 200A



[Inverter]
E_{rr} vs. Forward current (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 0.8 Ω



[Inverter]
E_{rr} vs. Gate resistance (typ.)
V_{CC} = 900V, V_{GE} = ±15V, I_F = 200A



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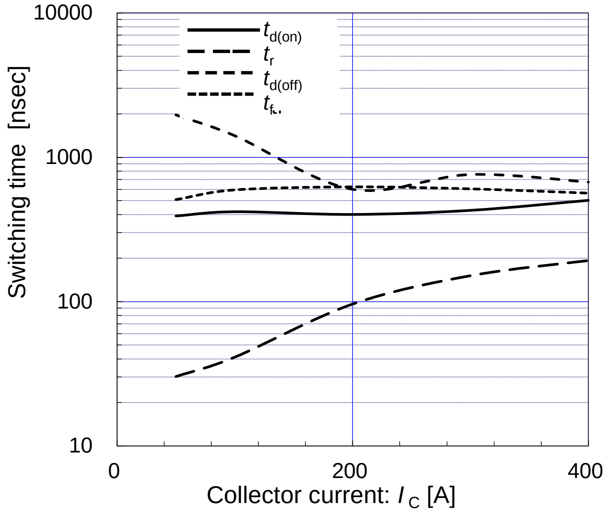
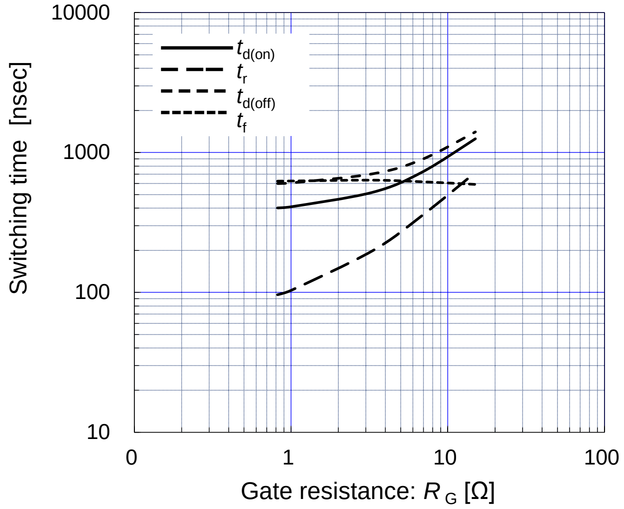
IGBT Modules

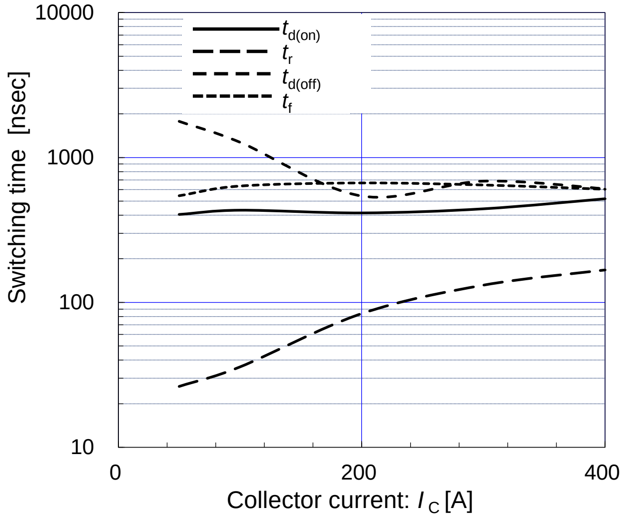
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 900V, R_G = 0.8 Ω V_{GE} = ±15V, T_{vj} = 25°C



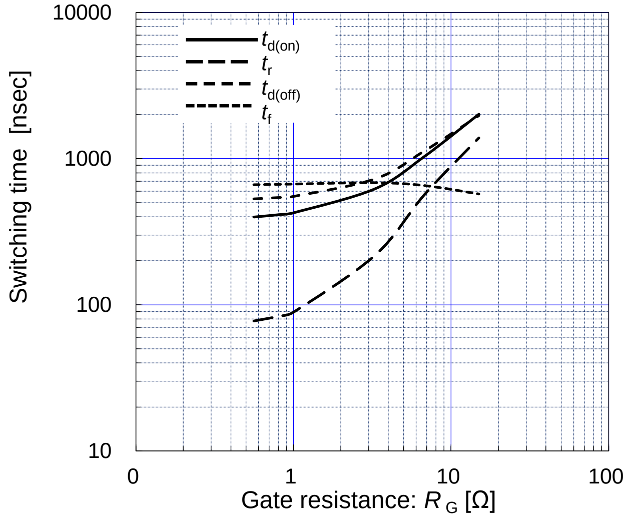
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 900V, I_C = 200A, V_{GE} = ±15V, T_{vj} = 25°C



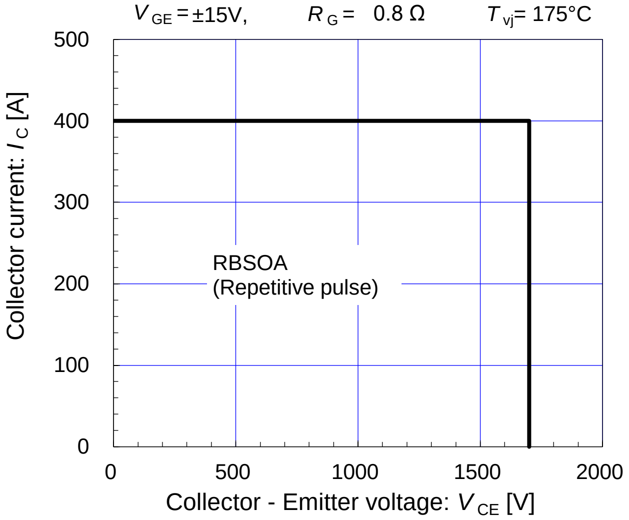
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 900V, R_G = 0.8 Ω V_{GE} = ±15V, T_{vj} = 175°C



[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 900V, I_C = 200A, V_{GE} = ±15V, T_{vj} = 175°C



[Inverter]
Reverse bias safe operating area (max.)
V_{GE} = ±15V, R_G = 0.8 Ω T_{vj} = 175°C



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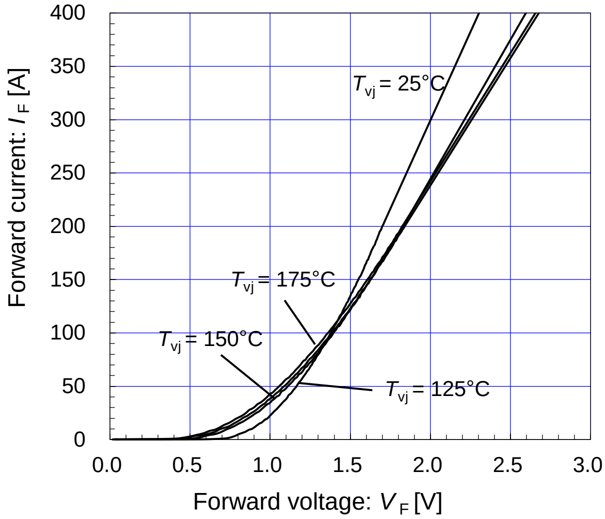
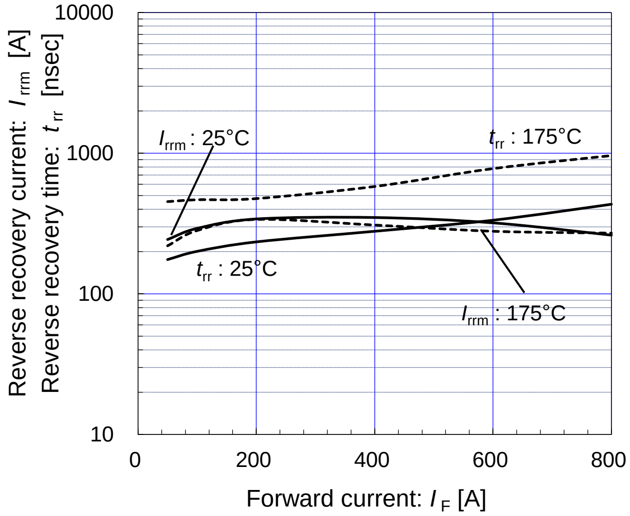
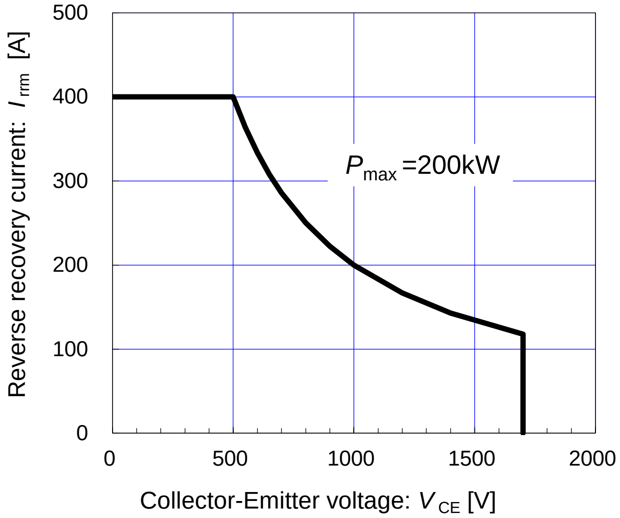
[Inverter]
Forward current vs. Forward voltage (typ.)
chip



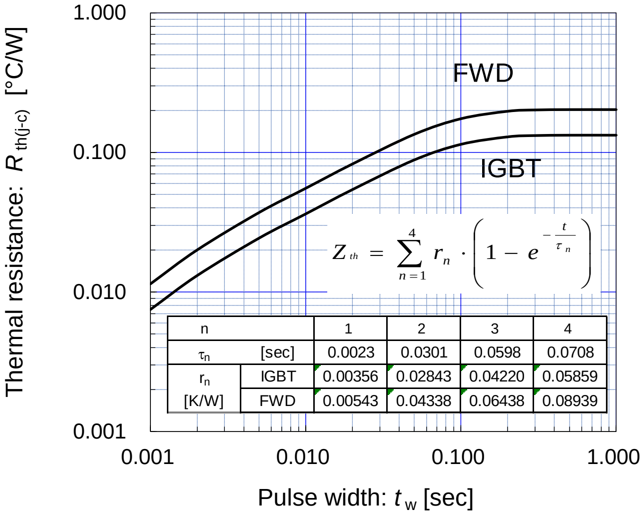
[Inverter]
Reverse recovery characteristics (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 0.8 Ω



[Inverter]
FWD safe operation area (max.)
T_{vj} = 175°C



[Inverter]
Transient thermal resistance(max.)



$$Z_{th} = \sum_{n=1}^{4} r_n \cdot \left(1 - e^{-\frac{t}{\tau_n}}\right)$$

n		1	2	3	4
τ_n	[sec]	0.0023	0.0301	0.0598	0.0708
r_n	IGBT	0.00356	0.02843	0.04220	0.05859
[K/W]	FWD	0.00543	0.04338	0.06438	0.08939

Warnings

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4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
   ・Computers ・OA equipment ・Communications equipment (terminal devices) ・Measurement equipment
   ・Machine tools ・Audiovisual equipment ・Electrical home appliances ・Personal equipment ・Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
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   ・Traffic-signal control equipment ・Gas leakage detectors with an auto-shut-off feature
   ・Emergency equipment for responding to disasters and anti-burglary devices ・Safety devices ・Medical equipment

6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
   ・Space equipment ・Aeronautic equipment ・Nuclear control equipment ・Submarine repeater equipment

7.

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