2MBI150XAA065-50

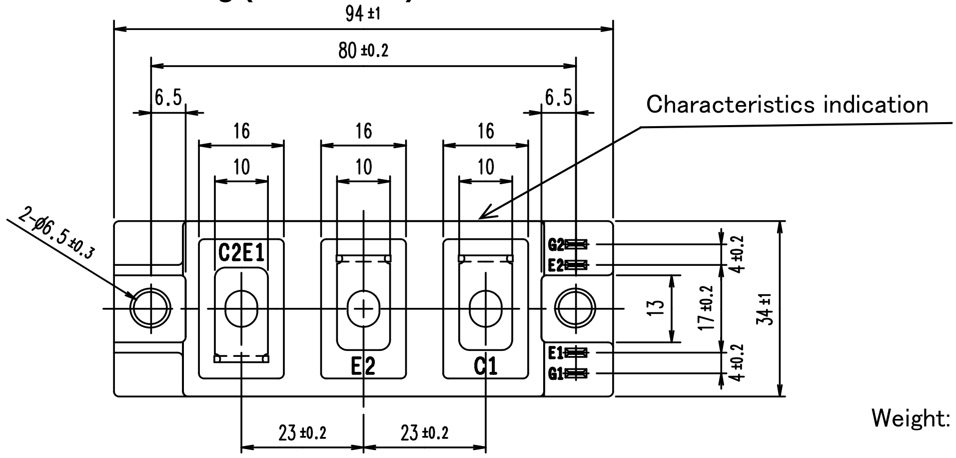
IGBT Modules

Power Module (X series)
650V / 150A / 2-in-1 package

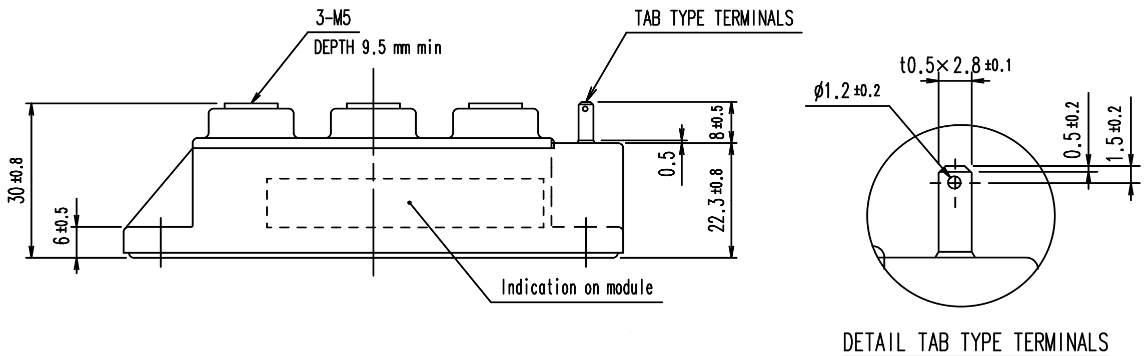
■ Features
- Low $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

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

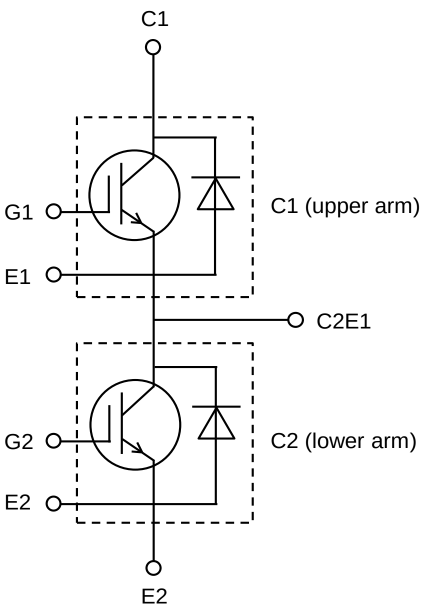
■ Outline drawing (Unit : mm)



Weight: 180 g(typ.)



■ Equivalent Circuit



FM5F9203
2019/05

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

Items			Symbols	Conditions		Maximum Ratings	Units
Inverter	Collector-emitter voltage,gate-emitter short-circuited		V_{CES}			650	V
Inverter	Gate-emitter voltage,collector-emitter short-circuited		V_{GES}			±20	V
Inverter	Collector current		I_C	Continuous	T_C=100°C	150	A
Inverter	Repetitive peak collector current		I_{CRM}	1ms		300	A
Inverter	Forward current		I_F			150	A
Inverter	Repetitive peak forward current		I_{FRM}	1ms		300	A
Inverter	Total power dissipation		P_{tot}	1 device		500	W
Inverter	Virtual junction temperature		T_{vj}			175	°C
Inverter	Operating virtual junction temperature		T_{vjop}			175	°C
Case temperature			T_c			125	°C
Storage temperature			T_{stg}			-40 ~ 125	°C
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	N·m

(*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)

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

	Items	Symbols	Conditions		Characteristics min.	typ.	max.	Units
Inverter	Collector-emitter cut-off current,gate-emitter short-circuited	I_{CES}	V_{GE} = 0V, V_{CE} = 650V		-	-	50	μA
Inverter	Gate leakage current,collector-emitter short-circuited	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-	-	100	nA
Inverter	Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20V, I_C = 150mA		6.0	6.5	7.0	V
Inverter	Collector-emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE} = 15V, I_C= 150A	T_{vj}=25°C	-	1.45	1.90	V
		$V_{CE(sat)}$ (chip)		T_{vj}=25°C	-	1.30	1.75	
				T_{vj}=125°C	-	1.45	-	
				T_{vj}=150°C	-	1.50	-	
				T_{vj}=175°C	-	1.55	-	
Inverter	Internal gate resistance	r_g	-		-	4.50	-	Ω
Inverter	Input capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	17	-	nF
Inverter	Output capacitance	C_{oes}			-	0.7	-	
Inverter	Reverse transfer capacitance	C_{res}			-	0.23	-	
Inverter	Gate charge	Q_G	V_{CC} = 300V, I_C = 150A, V_{GE} = -15 → +15V		-	1.2	-	μC
Inverter	Forward voltage	V_F (terminal)	V_{GE} = 0V, I_F= 150A	T_{vj}=25°C	-	1.70	2.15	V
		V_F (chip)		T_{vj}= 25°C	-	1.55	2.00	
				T_{vj}=125°C	-	1.50	-	
				T_{vj}=150°C	-	1.50	-	
				T_{vj}=175°C	-	1.45	-	
Inverter	Turn-on delay time(*1)	$t_{d(on)}$	V_{CC} = 300V, I_C, I_F = 150A, V_{GE} = +15/ -15V, R_G = 9.1 Ω, L_S = 30 nH	T_{vj}= 25°C	-	0.31	-	μs
				T_{vj}=125°C	-	0.35	-	
				T_{vj}=150°C	-	0.36	-	
				T_{vj}=175°C	-	0.36	-	
Inverter	Rise time(*1)	t_r		T_{vj}= 25°C	-	0.10	-	
				T_{vj}=125°C	-	0.12	-	
				T_{vj}=150°C	-	0.12	-	
				T_{vj}=175°C	-	0.13	-	
Inverter	Turn-off delay time(*1)	$t_{d(off)}$		T_{vj}= 25°C	-	0.35	-	
				T_{vj}=125°C	-	0.38	-	
				T_{vj}=150°C	-	0.38	-	
				T_{vj}=175°C	-	0.39	-	
Inverter	Fall time(*1)	t_f		T_{vj}= 25°C	-	0.12	-	
				T_{vj}=125°C	-	0.18	-	
				T_{vj}=150°C	-	0.19	-	
				T_{vj}=175°C	-	0.22	-	
Inverter	Reverse recovery time	t_{rr}		T_{vj}= 25°C	-	0.15	-	
				T_{vj}=125°C	-	0.26	-	
				T_{vj}=150°C	-	0.29	-	
				T_{vj}=175°C	-	0.33	-	

(*1) 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.	typ.	max.	Units
Inverter	Turn-on energy	E_{on}	V_{CC} = 300V, I_C, I_F = 150A, V_{GE} = +15/ -15V, R_G = 9.1 Ω, L_S = 30 nH	T_{vj}= 25°C	-	4.1	-	mJ
				T_{vj}=125°C	-	6.4	-	
				T_{vj}=150°C	-	7.0	-	
				T_{vj}=175°C	-	7.8	-	
	Turn-off energy	E_{off}		T_{vj}= 25°C	-	4.0	-	
				T_{vj}=125°C	-	5.3	-	
				T_{vj}=150°C	-	5.6	-	
				T_{vj}=175°C	-	5.9	-	
	Reverse recovery energy	E_{rr}		T_{vj}= 25°C	-	0.5	-	
				T_{vj}=125°C	-	0.9	-	
				T_{vj}=150°C	-	1.0	-	
				T_{vj}=175°C	-	1.2	-	

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 min.	typ.	max.	ns
Thermal resistance junction to case (1device)	$R_{th(j-c)}$	IGBT	-	-	0.300	K/W
		FWD	-	-	0.569	
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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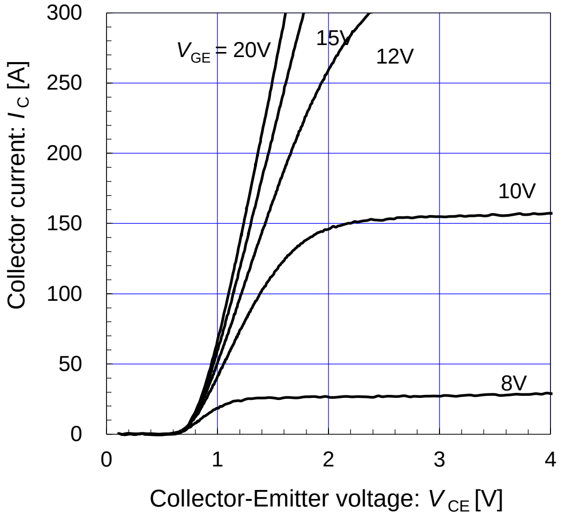
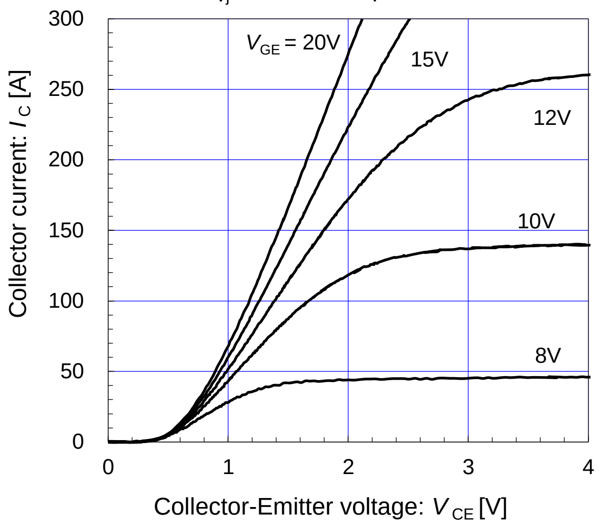
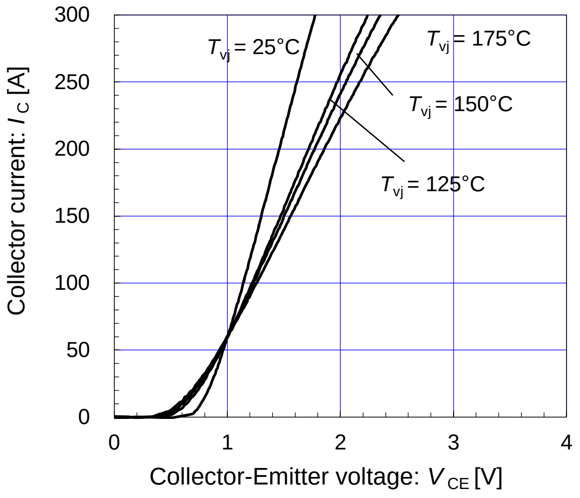
[Inverter]
Collector current vs. Collector-Emitter voltage
T_{vj} = 25°C / chip



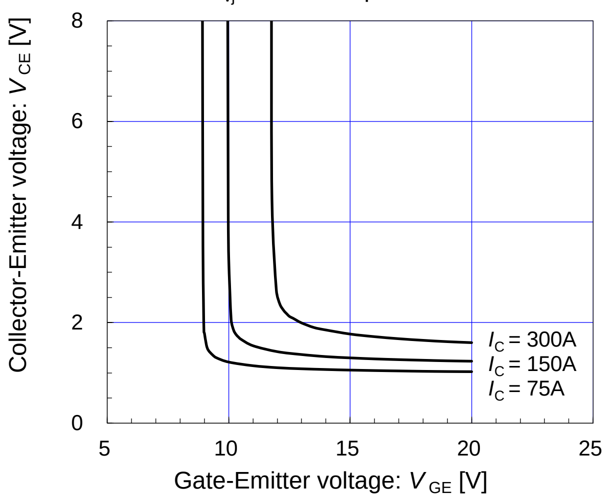
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj} = 175°C / chip



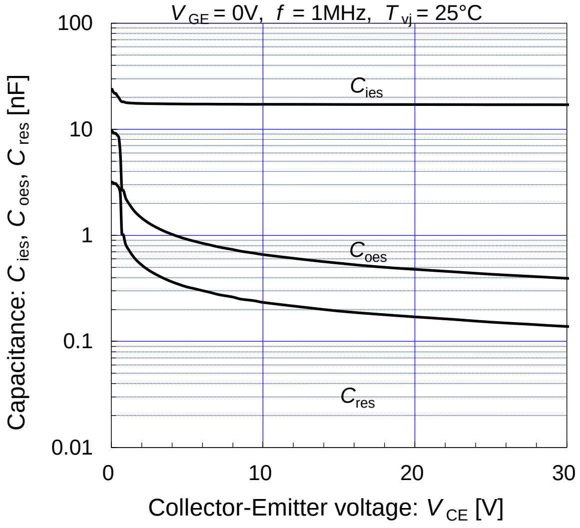
[Inverter]
Collector current vs. Collector-Emitter voltage
V_{GE} = 15V / chip



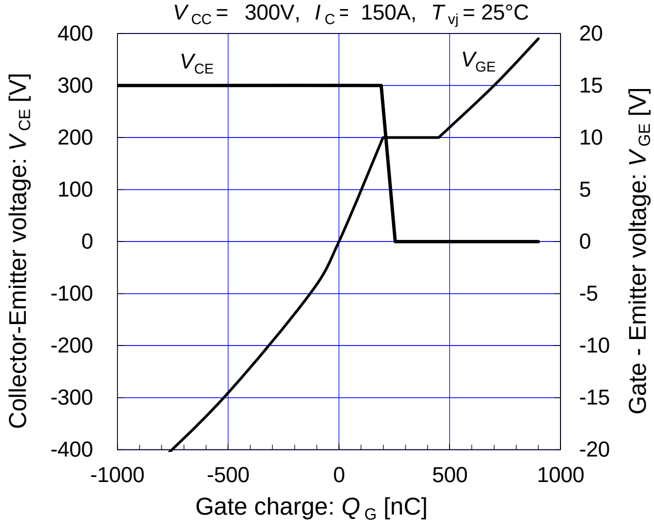
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage
T_{vj} = 25°C / chip



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



[Inverter]
Dynamic Gate Charge (typ.)
V_{CC} = 300V, I_C = 150A, T_{vj} = 25°C



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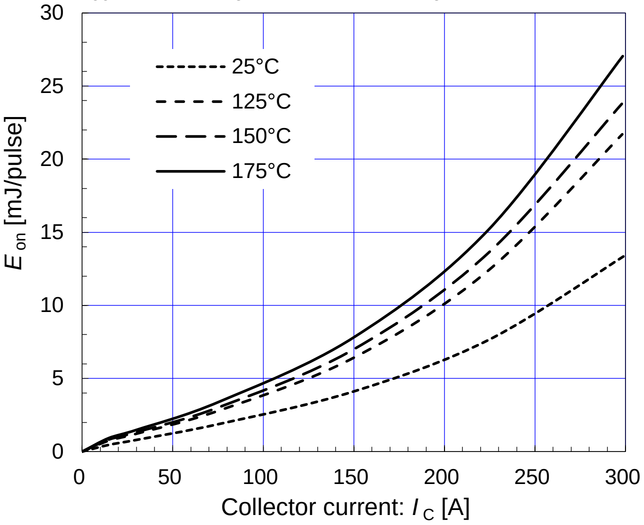
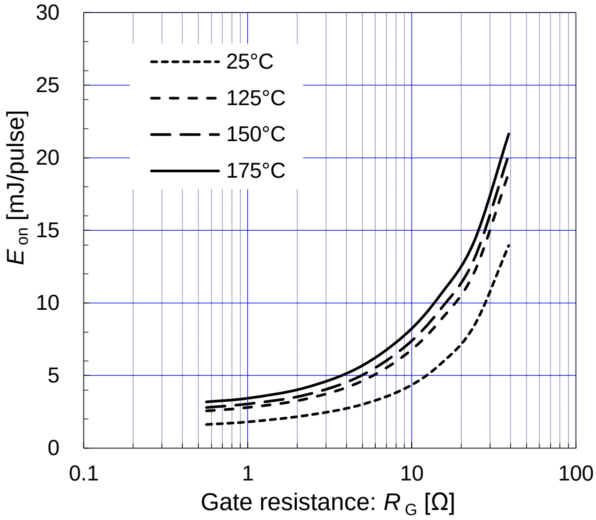
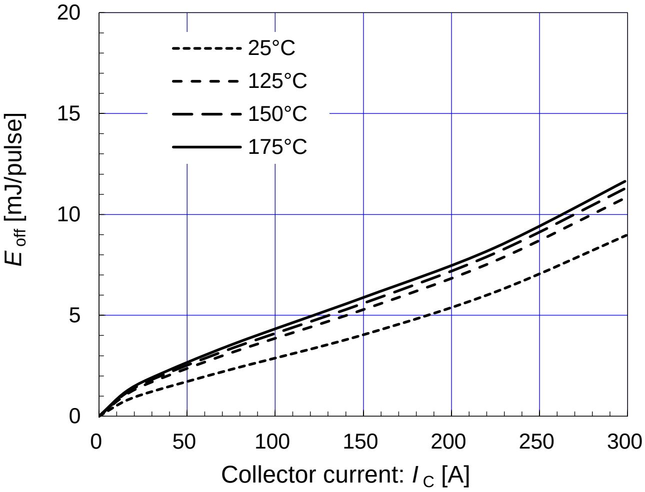
[Inverter]
E_{on} vs. Collector current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 9.1 Ω



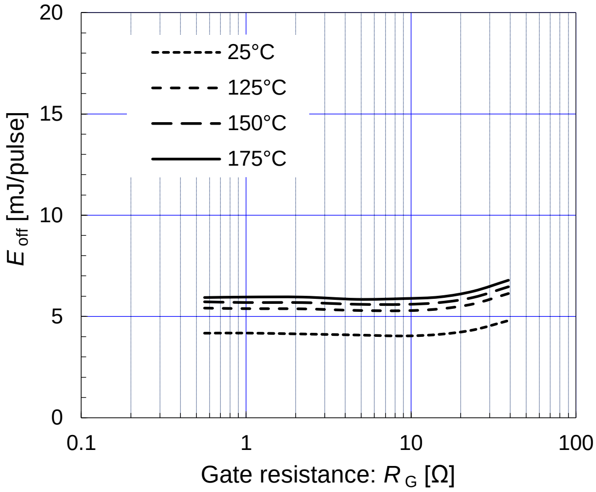
[Inverter]
E_{on} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_C = 150A



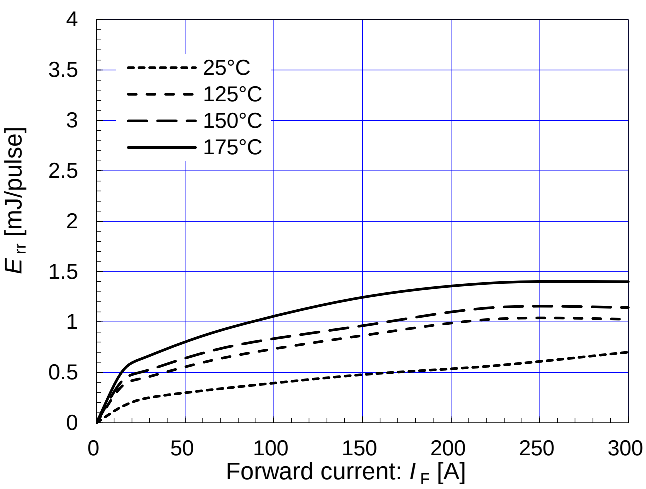
[Inverter]
E_{off} vs. Collector current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 9.1 Ω



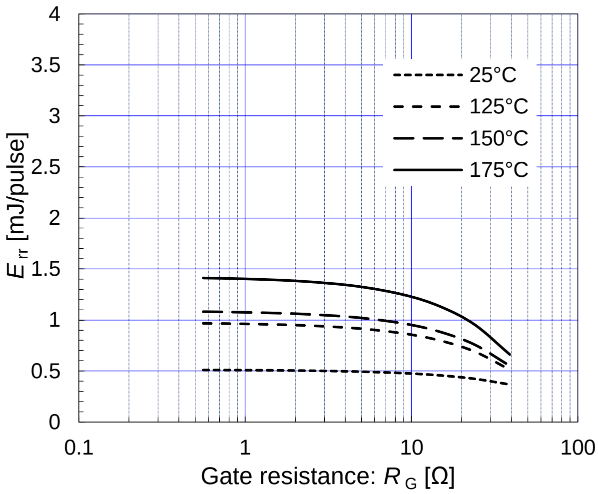
[Inverter]
E_{off} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_F = 150A



[Inverter]
E_{rr} vs. Forward current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 9.1 Ω



[Inverter]
E_{rr} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_F = 150A



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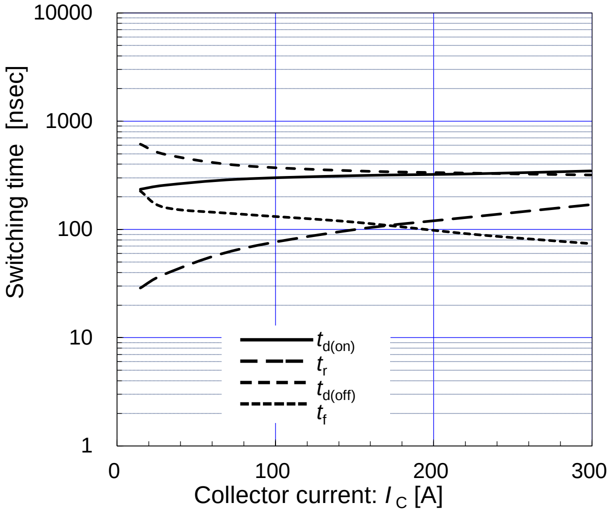
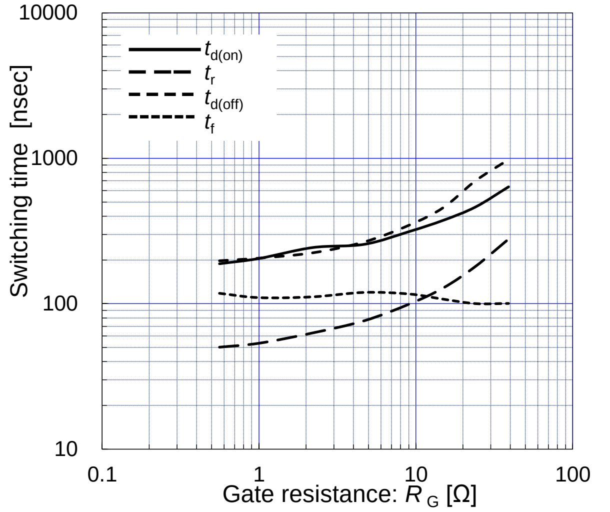
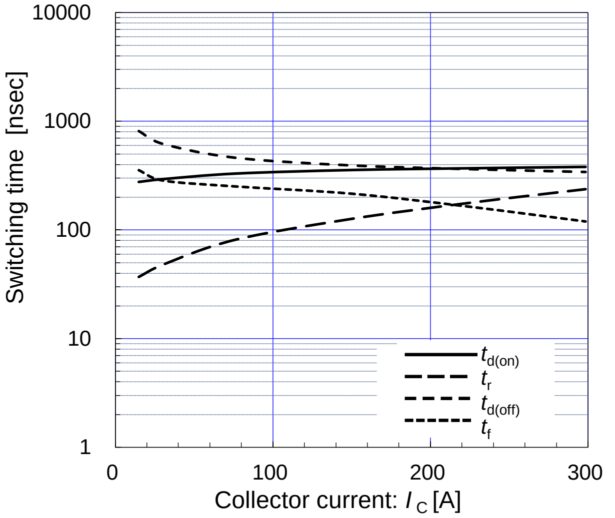
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 300V, R_G = 9.1 Ω V_{GE} = +15/ -15V, T_{vj} = 25°C



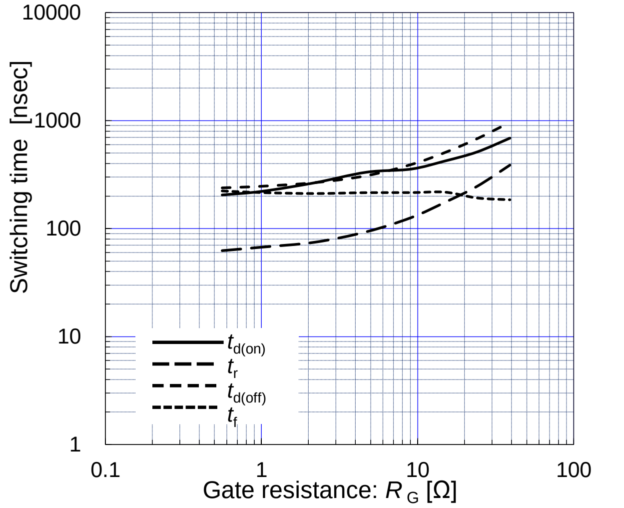
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 300V, I_C = 150A, V_{GE} = +15/ -15V, T_{vj} = 25°C



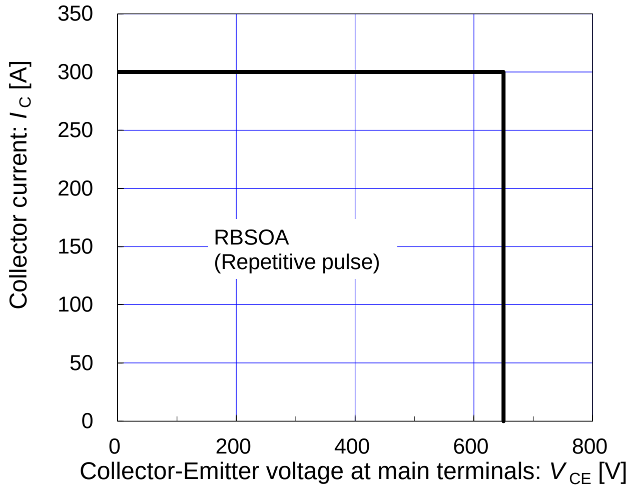
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 300V, R_G = 9.1 Ω V_{GE} = +15/ -15V, T_{vj} = 175°C



[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 300V, I_C = 150A, V_{GE} = +15/ -15V, T_{vj} = 175°C



[Inverter]
Reverse bias safe operating area (max.)
V_{GE} = +15/ -15V, R_G = 9.1 Ω T_{vj}= 175°C



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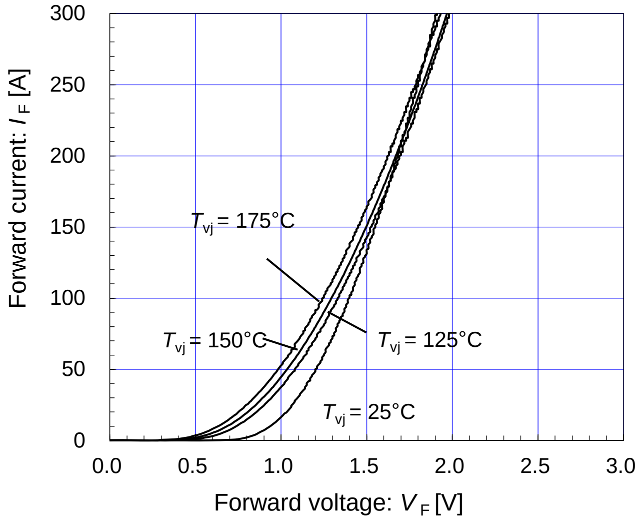
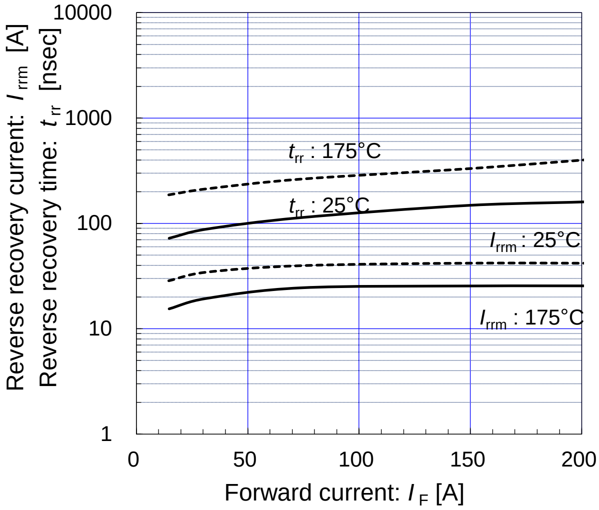
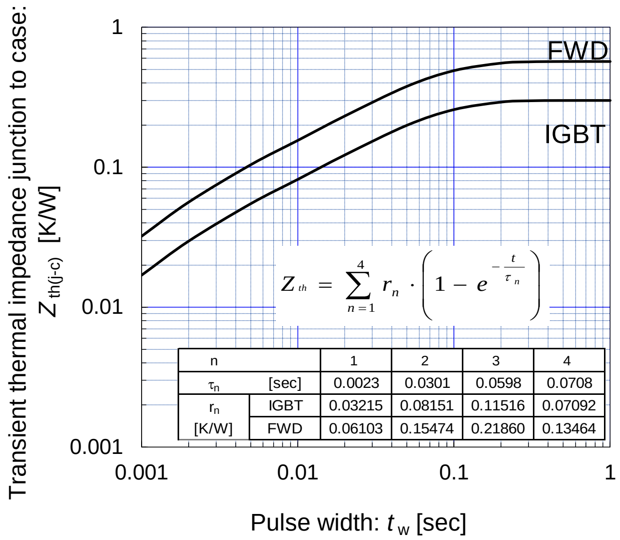
[Inverter]
Forward current vs. Forward voltage (typ.)
chip



[Inverter]
Reverse recovery characteristics (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 9.1 Ω



[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	0.03215	0.08151	0.11516	0.07092
[K/W]	FWD	0.06103	0.15474	0.21860	0.13464

Warnings

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of 5/2019. The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sure to obtain the latest specifications.

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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.
・Transportation equipment (mounted on cars and ships) ・Trunk communications equipment
・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.

8. If you have any question about any portion in this Catalog, ask Fuji Electric Co., Ltd. or its sales agents before using the product. Neither Fuji Electric Co., Ltd. nor its agents shall be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.

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IGBT Modules

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