2MBI450XEE120-50

IGBT Modules

Power Module (X series)
1200V / 450A / 2-in-1 package

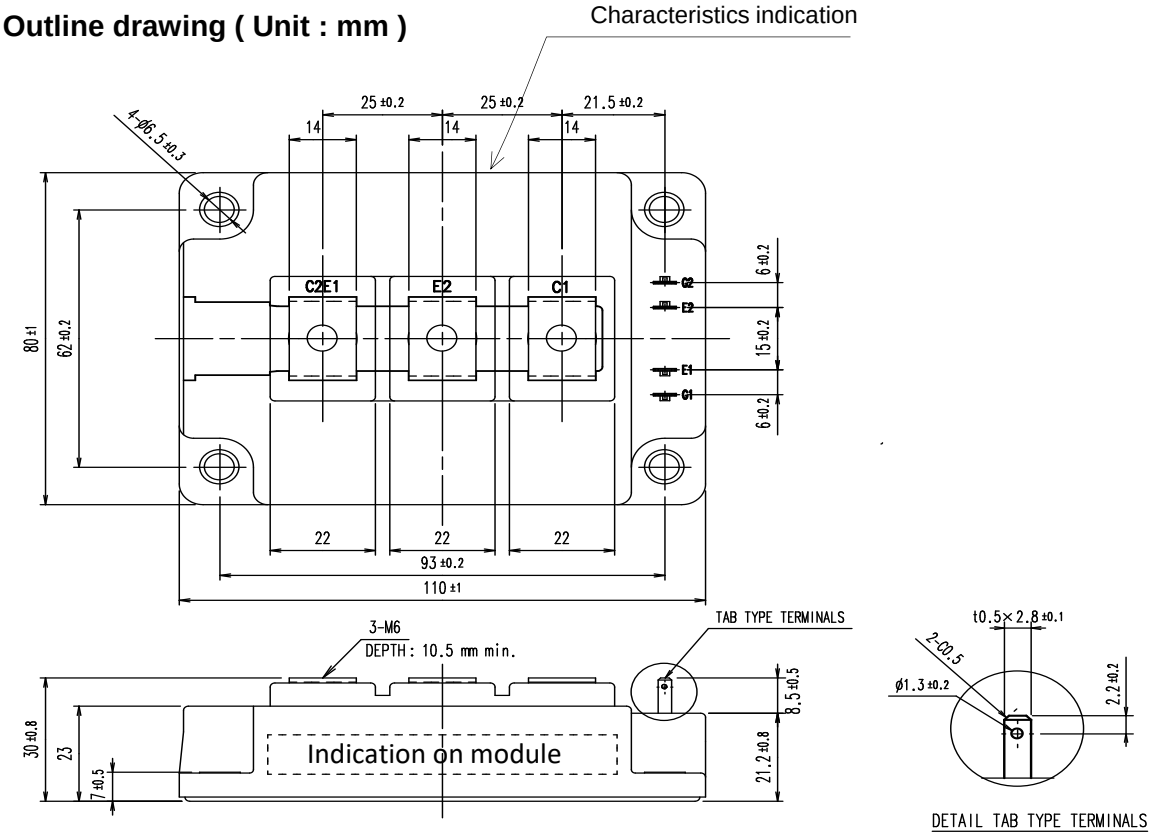
■ Features

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

■ Applications

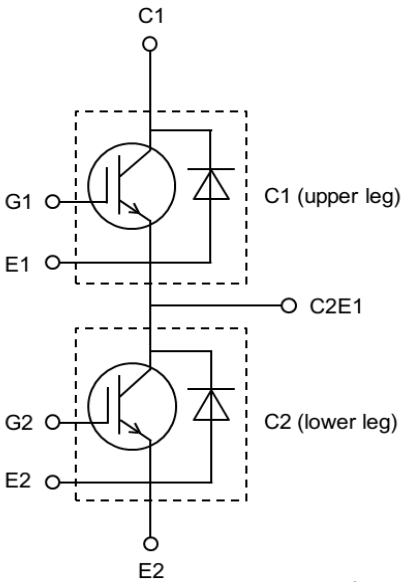
Inverter for Motor Drives, AC and DC Servo Drives
Uniterruptible Power Supply Systems,
Industrial machines,such as Welding machines

■ Outline drawing (Unit : mm)



Weight: 470 g(typ.)

■ Equivalent Circuit



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■ 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}		1200	V
Gate-Emitter voltage,Collector-Emitter short-circuited		V_{GES}		±20	V
Collector current		I_C	Continuous T_C=100°C	450	A
Repetitive peak collector current		I_{CRM}	1ms	900	
Forward current		I_F		450	
Repetitive peak forward current		I_{FRM}	1ms	900	
Total power dissipation		P_{tot}	1 device	3000	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
Mounting torque of screws to heat sink(*2)		M_s	M5 or M6	6.0	N m
Mounting torque of screws to terminals)(*2)		M_t	M5	5.0	

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

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

Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
Collector-Emitter cut -off current,Gate-Emitter short - circuited	I_{CES}	V_{GE} = 0V V_{CE} = 1200V		-	-	200	μA
Gate leakage current,Collector-Emitter short-circuited	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-	-	400	nA
Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20V I_C = 450mA		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE} = 15V I_C= 450A	T_{vj}=25°C	-	1.65	2.10	V
	$V_{CE(sat)}$ (chip)		T_{vj}=25°C	-	1.45	1.90	
			T_{vj}=125°C	-	1.85	-	
			T_{vj}=150°C	-	1.90	-	
			T_{vj}=175°C	-	2.00	-	
Internal gate resistance	r_g	-		-	2.25	-	Ω
Input capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	46	-	nF
Output capacitance	C_{oes}			-	1.6	-	
Reverse transfer capacitance	C_{res}			-	0.42	-	
Gate charge	Q_G	V_{CC} = 600V, I_C = 450A V_{GE} = -15 → +15V		-	2950	-	nC
Forward voltage	V_F (terminal)	V_{GE} = 0V I_F= 450A	T_{vj}=25°C	-	1.85	2.30	V
	V_F (chip)		T_{vj}= 25°C	-	1.65	2.10	
			T_{vj}=125°C	-	1.65	-	
			T_{vj}=150°C	-	1.65	-	
			T_{vj}=175°C	-	1.60	-	
Turn-on delay time (*1)	$t_{d(on)}$	V_{CC} = 600V I_C, I_F = 450A V_{GE} = +15/ -15V R_G = 1 Ω L_S = 30 nH	T_{vj}= 25°C	-	350	-	ns
			T_{vj}=125°C	-	390	-	
			T_{vj}=150°C	-	400	-	
			T_{vj}=175°C	-	415	-	
Rise time (*1)	t_r		T_{vj}= 25°C	-	85	-	
			T_{vj}=125°C	-	110	-	
			T_{vj}=150°C	-	115	-	
			T_{vj}=175°C	-	110	-	
Turn-off delay time (*1)	$t_{d(off)}$		T_{vj}= 25°C	-	340	-	
			T_{vj}=125°C	-	380	-	
			T_{vj}=150°C	-	390	-	
			T_{vj}=175°C	-	390	-	
Fall time (*1)	t_f		T_{vj}= 25°C	-	140	-	
			T_{vj}=125°C	-	210	-	
			T_{vj}=150°C	-	225	-	
			T_{vj}=175°C	-	245	-	
Reverse recovery time	t_{rr}		T_{vj}= 25°C	-	235	-	
			T_{vj}=125°C	-	560	-	
			T_{vj}=150°C	-	640	-	
			T_{vj}=175°C	-	690	-	

(*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.	Characteristics typ.	Characteristics max.	Units
Turn-on energy	E_{on}	V_{CC} = 600V I_C, I_F = 450A V_{GE} = +15/ -15V R_G = 1 Ω L_S = 30 nH	T_{vj}= 25°C	-	36.7	-	mJ
			T_{vj}=125°C	-	55.7	-	
			T_{vj}=150°C	-	60.4	-	
			T_{vj}=175°C	-	66.8	-	
Turn-off energy	E_{off}		T_{vj}= 25°C	-	29.4	-	
			T_{vj}=125°C	-	37.8	-	
			T_{vj}=150°C	-	39.9	-	
			T_{vj}=175°C	-	40.7	-	
Reverse recovery energy	E_{rr}		T_{vj}= 25°C	-	10.4	-	
			T_{vj}=125°C	-	19.9	-	
			T_{vj}=150°C	-	22.3	-	
			T_{vj}=175°C	-	25.7	-	

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.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.050	K/W
		Inverter FWD	-	-	0.084	
Thermal resistance case to heat sink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0125	-	

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

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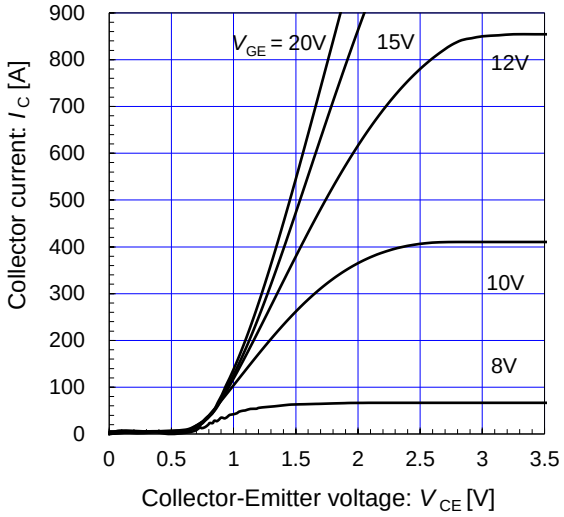
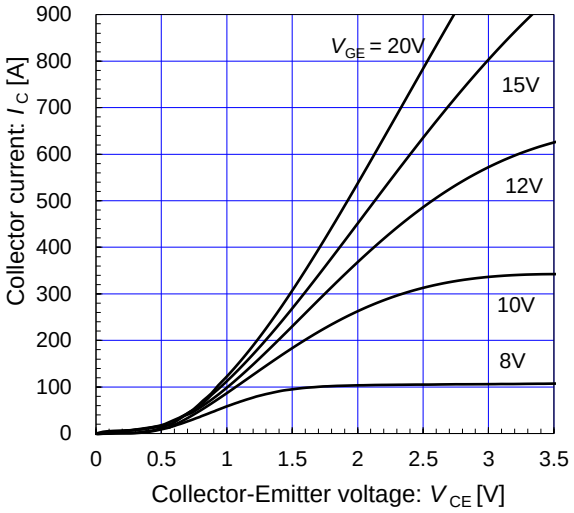
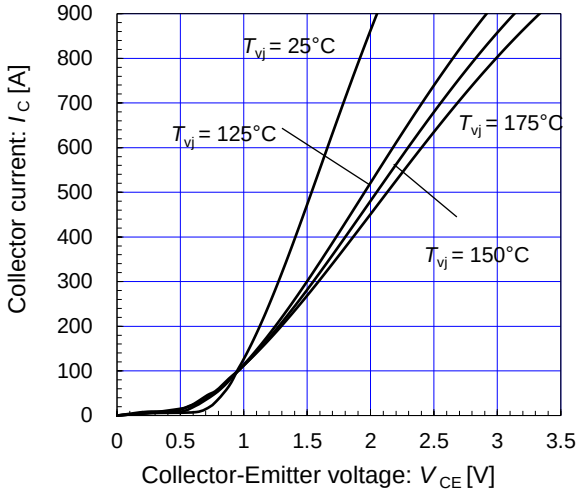
[Inverter]
Collector current vs. Collector-Emitter voltage
T_{vj} = 25°C / chip



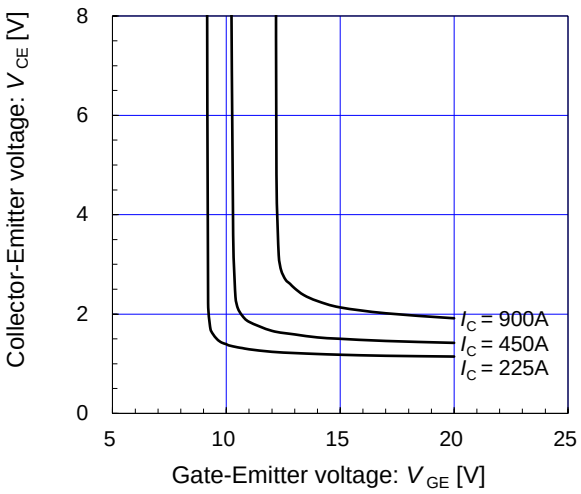
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj} = 175°C / chip



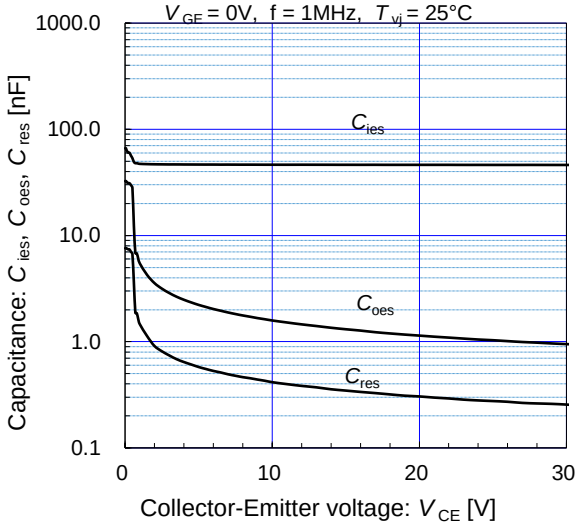
[Inverter]
Collector current vs. Collector-Emitter voltage
V_{GE} = 15V / chip



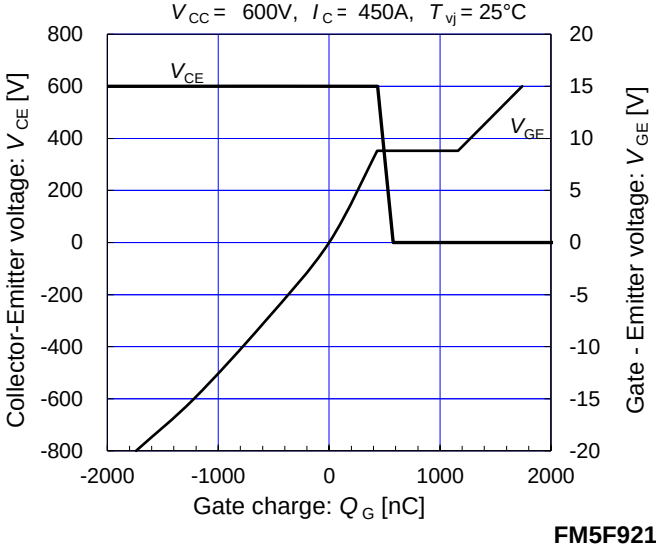
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage
T_{vj} = 25°C / chip



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



[Inverter]
Dynamic Gate Charge (typ.)
V_{CC} = 600V, I_C = 450A, T_{vj} = 25°C



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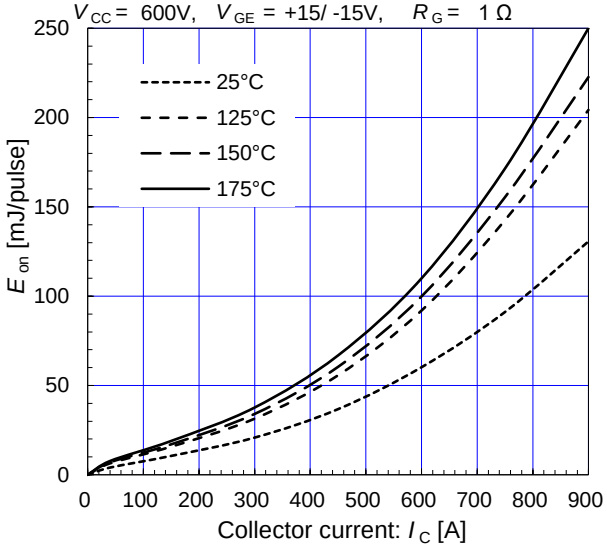
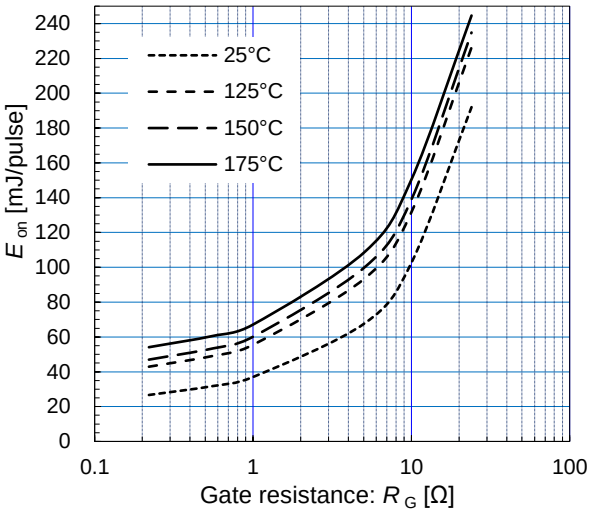
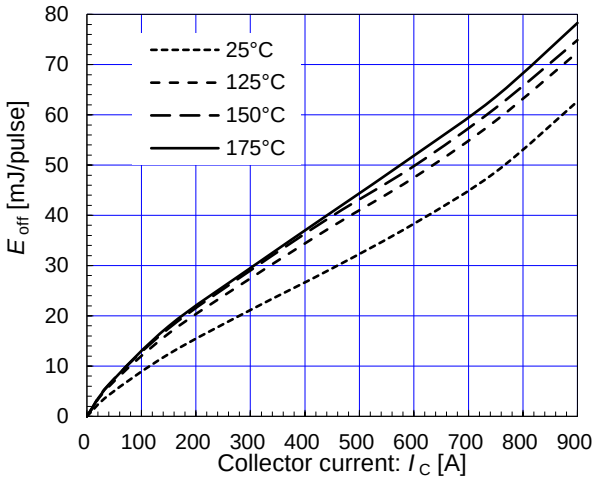
[Inverter]
E_{on} vs. Collector current (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 1 Ω



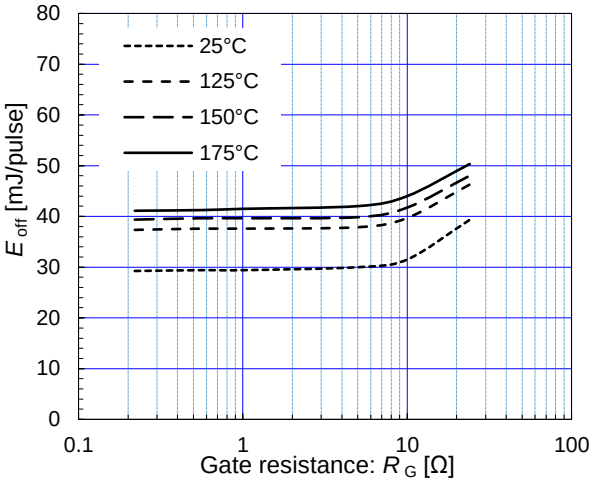
[Inverter]
E_{on} vs. Gate resistance (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, I_C = 450A



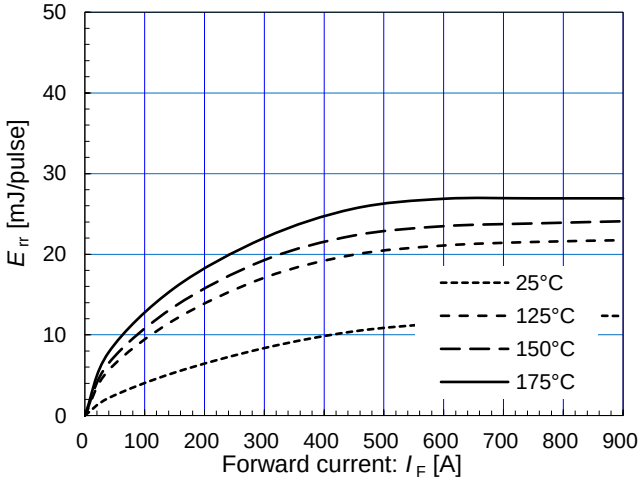
[Inverter]
E_{off} vs. Collector current (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 1 Ω



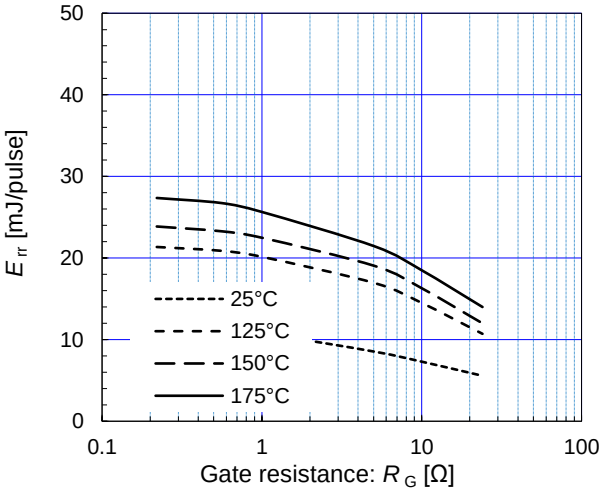
[Inverter]
E_{off} vs. Gate resistance (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, I_C = 450A



[Inverter]
E_{rr} vs. Forward current (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 1 Ω



[Inverter]
E_{rr} vs. Gate resistance (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, I_F = 450A



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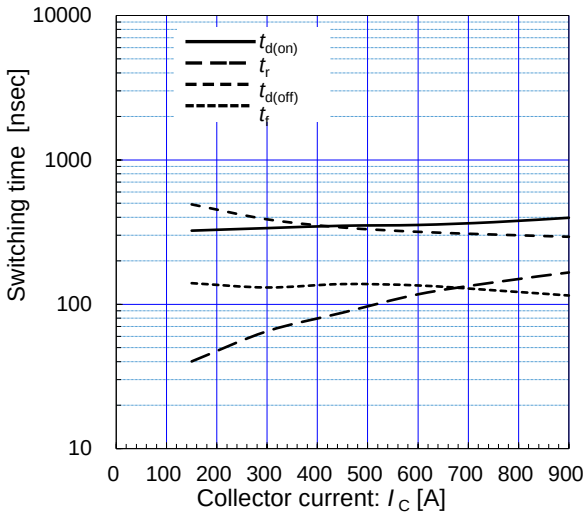
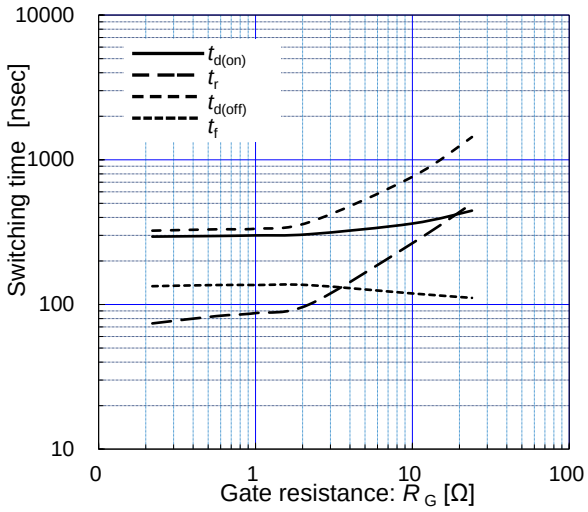
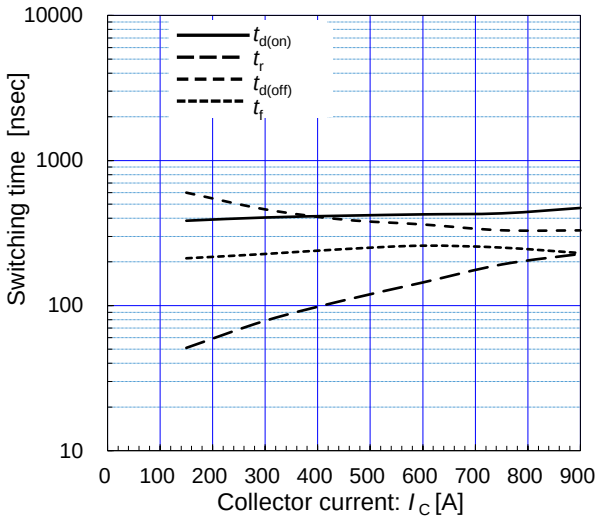
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 600V, R_G = 1Ω, V_{GE} = +15/ -15V, T_{vj} = 25°C



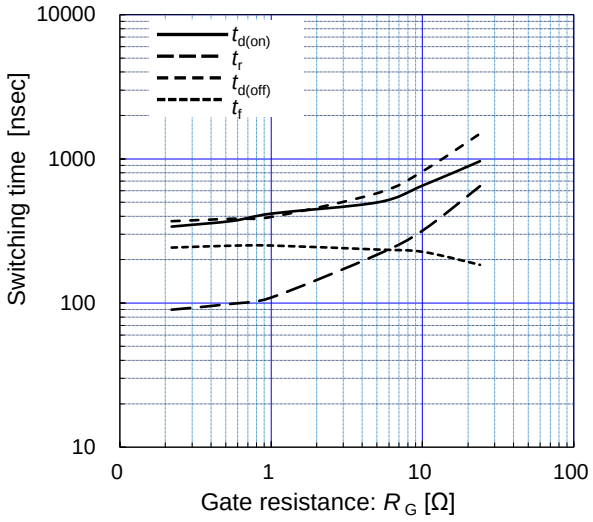
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 600V, I_C = 450A, V_{GE} = +15/ -15V, T_{vj} = 25°C



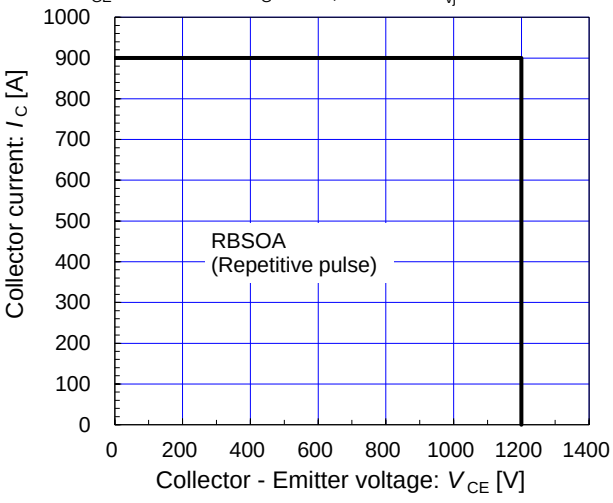
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 600V, R_G = 1Ω, V_{GE} = +15/ -15V, T_{vj} = 175°C



[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 600V, I_C = 450A, V_{GE} = +15/ -15V, T_{vj} = 175°C



[Inverter]
Reverse bias safe operating area (max.)
V_{GE} = +15/ -15V R_G = 1Ω, T_{vj} = 175°C



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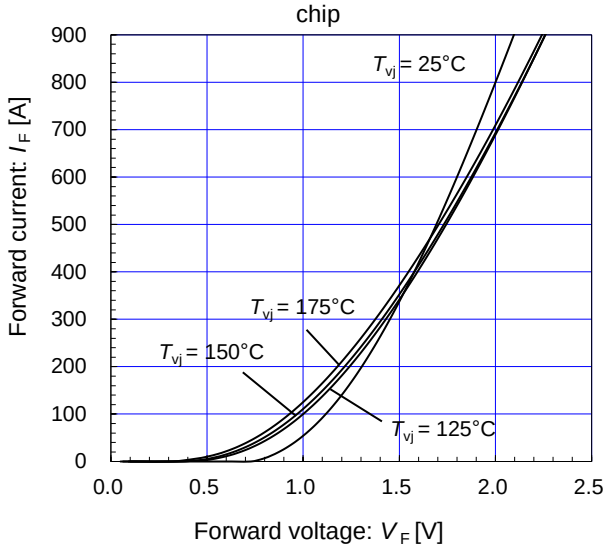
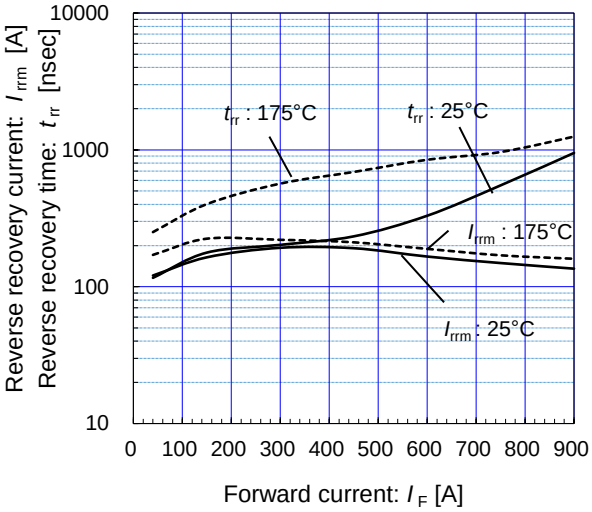
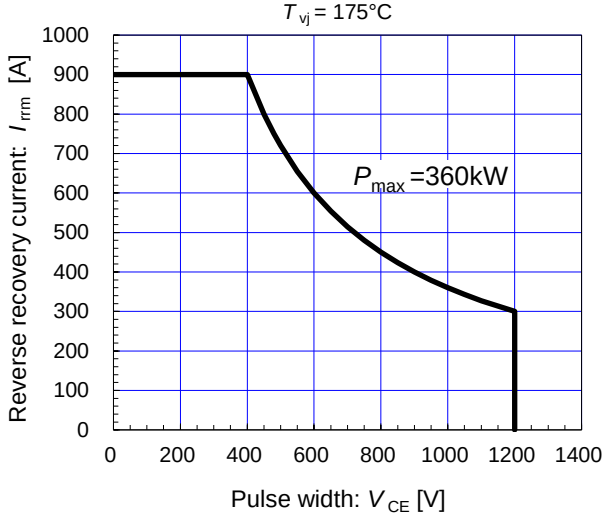
[Inverter]
Forward current vs. Forward voltage (typ.)
chip



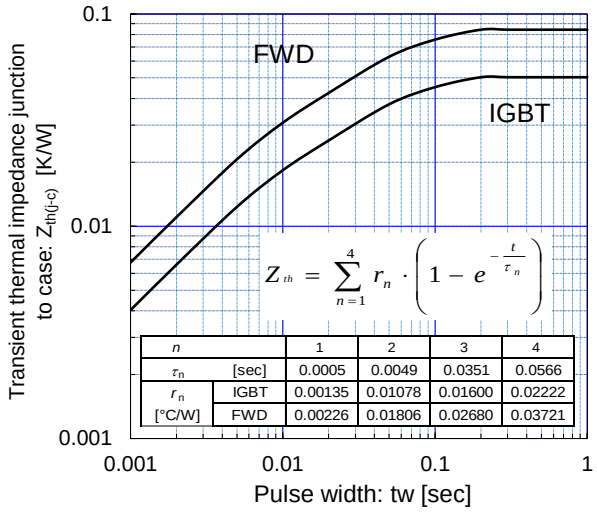
[Inverter]
Reverse recovery characteristics (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 1Ω



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



[Inverter]
Transient thermal resistance(max.)



n		1	2	3	4
τ_n	[sec]	0.0005	0.0049	0.0351	0.0566
r_n [°C/W]	IGBT	0.00135	0.01078	0.01600	0.02222
	FWD	0.00226	0.01806	0.02680	0.03721

Warnings

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of 2/2019. 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.

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富士電機 Innovating Energy Technology

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IGBT Modules

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- 关于本规格书中没有记载的产品信息，应用手册，技术信息等，请参考以下链接。
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6 IGBT Loss Simulation Software	www.fujielectric.com/products/semiconductor/model/igbt/simulation/
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