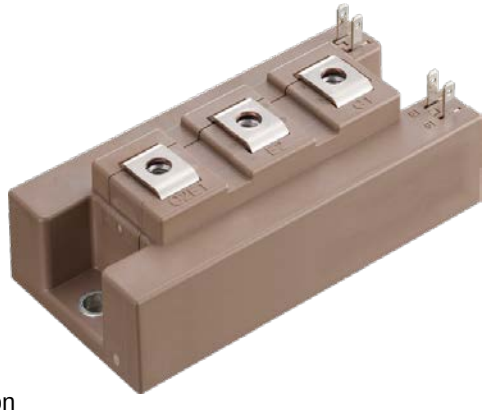
2MBI400XBE065-50

IGBT Modules

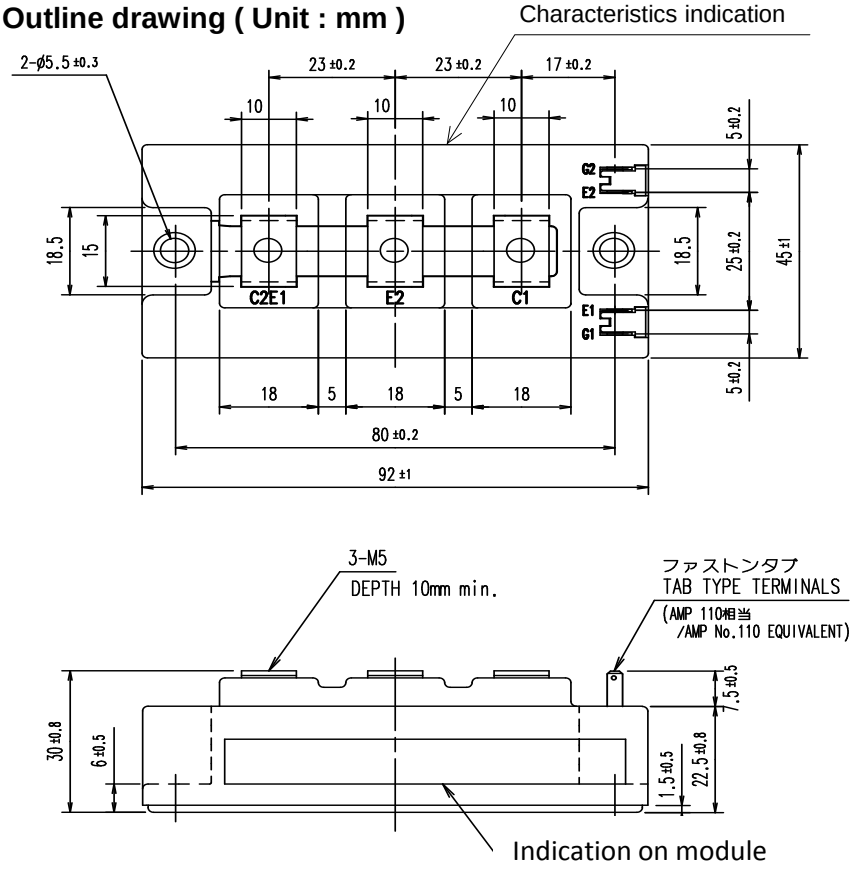
Power Module (X series)
650V / 400A / 2-in-1 package



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

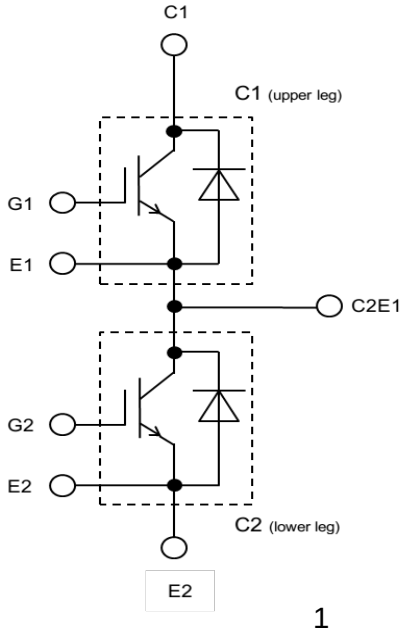
■ Applications
Inverter for Motor Drives, AC and DC Servo Drives
Uniterruptible Power Supply Systems,
Industrial machines,such as Welding machines

■ Outline drawing (Unit : mm)



Weight: 270 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
Inverter	Collector-Emitter voltage		V_{CES}			650	V
	Gate-Emitter voltage		V_{GES}			±20	V
	Collector current		I_C	Continuous	T_C=100°C	400	A
			I_{CRM}	1ms		800	
	Forward current		I_F			400	
			I_{FRM}	1ms		800	
	Collector power dissipation		P_c	1 device		1740	W
	Junction temperature		T_{vj}			175	°C
	Operating virtual junction temperature (under switching conditions)		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
Screw torque (*2)	Mounting		-	M5		3.5	N m
	Terminals			M5		3.5	

(*1) All terminals should be connected together during the test.
(*2) Recommendable Value: Mounting 2.5 ~ 3.5 N·m (M5)
Recommendable Value: Terminals 2.5 ~ 3.5 N·m (M5)

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

	Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
Inverter	Zero Gate voltage collector current	I_{CES}	V_{GE} = 0V V_{CE} = 650V		-	-	100	μA
	Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-	-	200	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20V I_C = 400mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE} = 15V I_C= 400A	T_{vj}=25°C	-	1.55	2.00	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	-	
	Internal gate	r_g	-		-	1.50	-	Ω
	Capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	46	-	nF
		C_{oes}			-	1.8	-	
		C_{res}			-	0.62	-	
	Gate charge	Q_G	V_{CC} = 300V, I_C = 400A V_{GE} = -15 → +15V		-	3.3	-	μC
	Forward on voltage	V_F (terminal)	V_{GE} = 0V I_F= 400A	T_{vj}=25°C	-	1.80	2.25	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	-	
	Switching time (*1)	$t_{d(on)}$	V_{CC} = 300V I_C, I_F = 400A V_{GE} = +15/ -15V R_G = (on)3.3Ω/(off)10Ω L_S = 30 nH	T_{vj}= 25°C	-	0.35	-	μs
				T_{vj}=125°C	-	0.39	-	
				T_{vj}=150°C	-	0.40	-	
				T_{vj}=175°C	-	0.41	-	
		t_r		T_{vj}= 25°C	-	0.12	-	
				T_{vj}=125°C	-	0.14	-	
				T_{vj}=150°C	-	0.14	-	
				T_{vj}=175°C	-	0.15	-	
		$t_{d(off)}$		T_{vj}= 25°C	-	0.68	-	
				T_{vj}=125°C	-	0.76	-	
				T_{vj}=150°C	-	0.78	-	
				T_{vj}=175°C	-	0.79	-	
		t_f		T_{vj}= 25°C	-	0.07	-	
				T_{vj}=125°C	-	0.09	-	
				T_{vj}=150°C	-	0.10	-	
				T_{vj}=175°C	-	0.10	-	
	Reverse recovery time	t_{rr}		T_{vj}= 25°C	-	0.11	-	
				T_{vj}=125°C	-	0.20	-	
				T_{vj}=150°C	-	0.22	-	
				T_{vj}=175°C	-	0.24	-	

(*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
Inverter	Switching loss (per pulse)	E_{on}	V_{CC} = 300V I_C, I_F = 400A V_{GE} = +15/ -15V R_G = (on)3.3Ω/(off)10Ω L_S = 30 nH	T_{vj}= 25°C	-	11.3	-	mJ
				T_{vj}=125°C	-	17.1	-	
				T_{vj}=150°C	-	18.6	-	
				T_{vj}=175°C	-	20.0	-	
		E_{off}		T_{vj}= 25°C	-	18.7	-	
				T_{vj}=125°C	-	21.7	-	
				T_{vj}=150°C	-	22.7	-	
				T_{vj}=175°C	-	24.3	-	
		E_{rr}		T_{vj}= 25°C	-	1.6	-	
				T_{vj}=125°C	-	3.5	-	
				T_{vj}=150°C	-	3.9	-	
				T_{vj}=175°C	-	4.4	-	

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 junction to case (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.086	°C/W
		Inverter FWD	-	-	0.118	
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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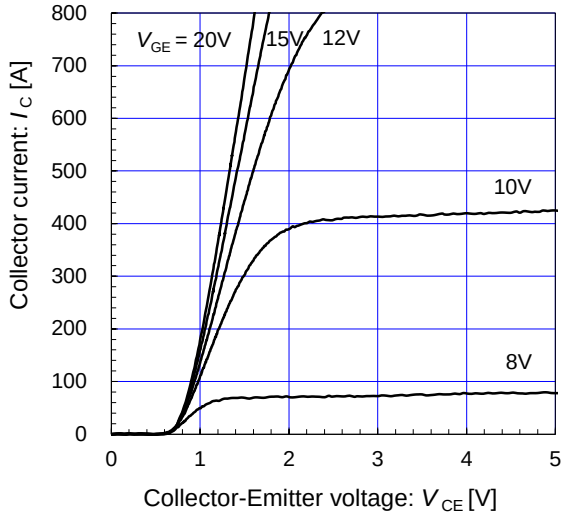
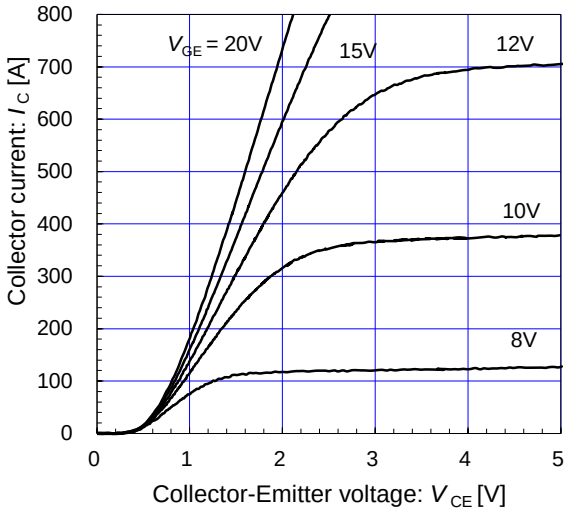
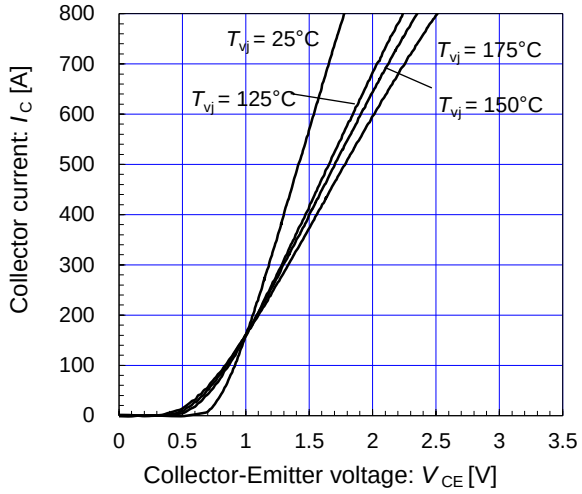
[Inverter]
Collector current vs. Collector-Emitter voltage
T_{vj} = 25°C / chip



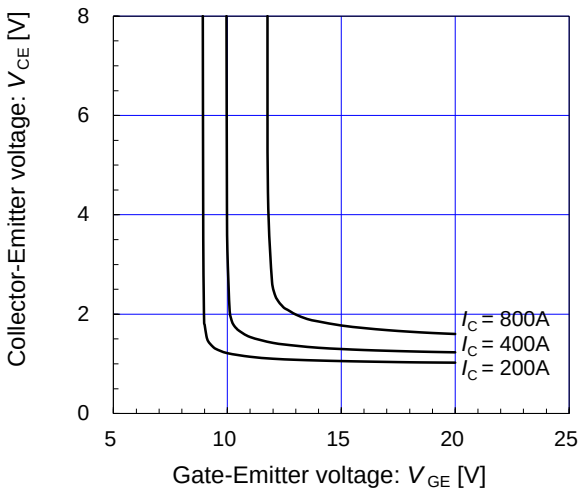
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj} = 175°C / chip



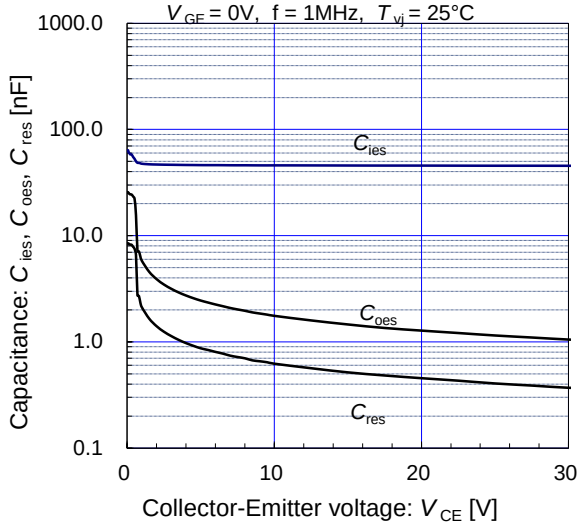
[Inverter]
Collector current vs. Collector-Emitter voltage
V_{GE} = 15V / chip



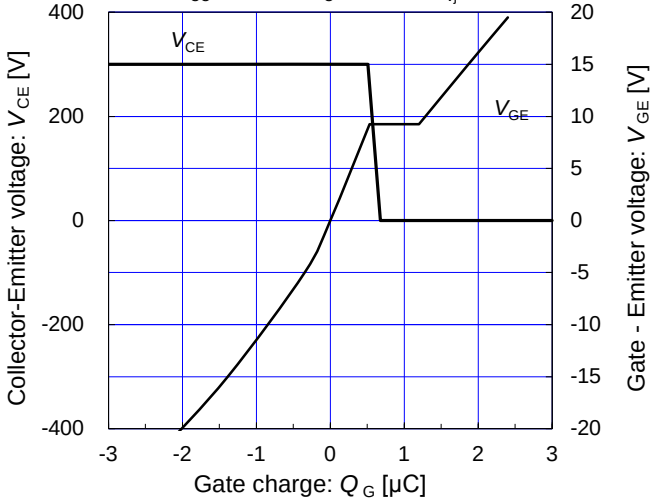
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage
T_{vj} = 25°C / chip



[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 = 400A, T_{vj} = 25°C



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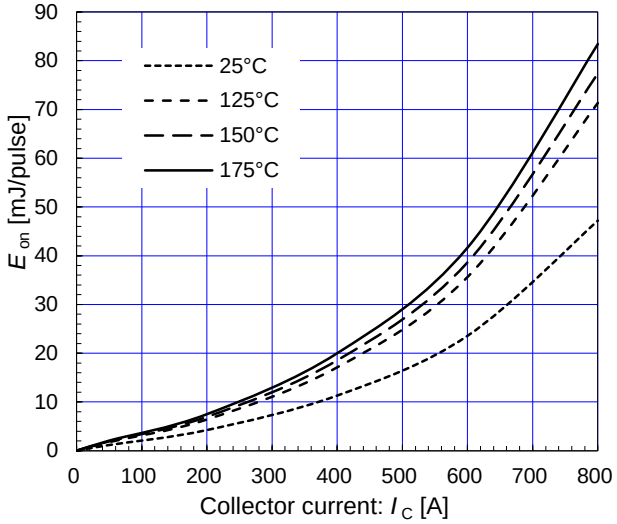
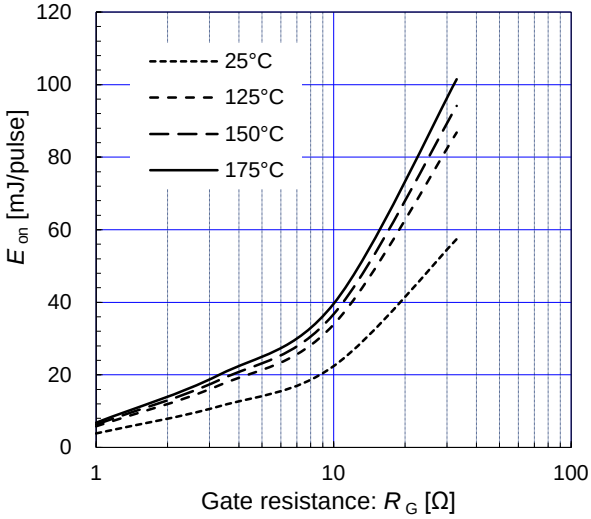
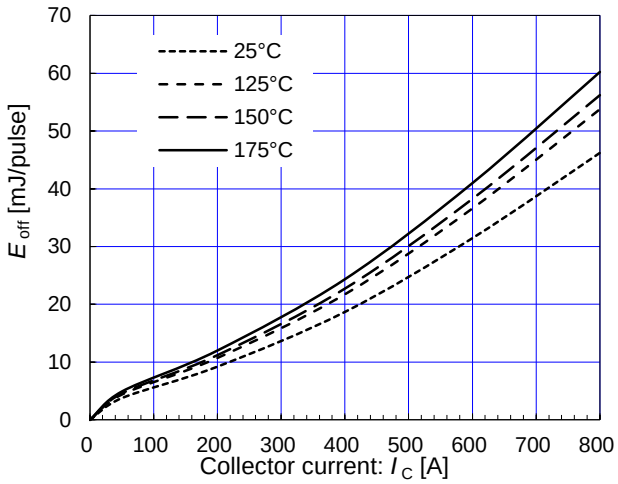
[Inverter]
E_{on} vs. Collector current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 3.3/10Ω



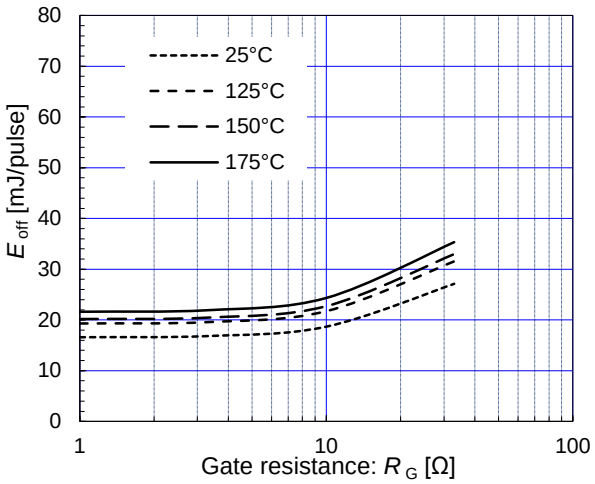
[Inverter]
E_{on} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_C = 400A



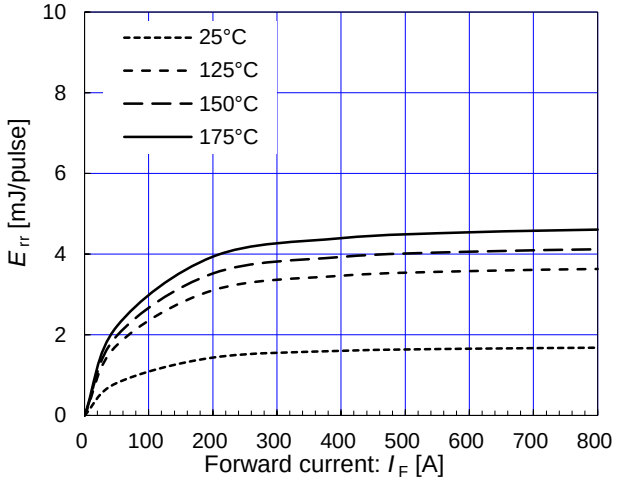
[Inverter]
E_{off} vs. Collector current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 3.3/10Ω



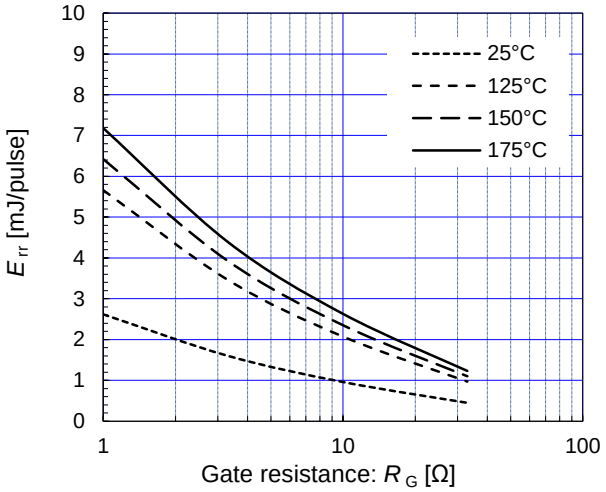
[Inverter]
E_{off} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_C = 400A



[Inverter]
E_{rr} vs. Forward current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 3.3/10Ω



[Inverter]
E_{rr} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_C = 400A



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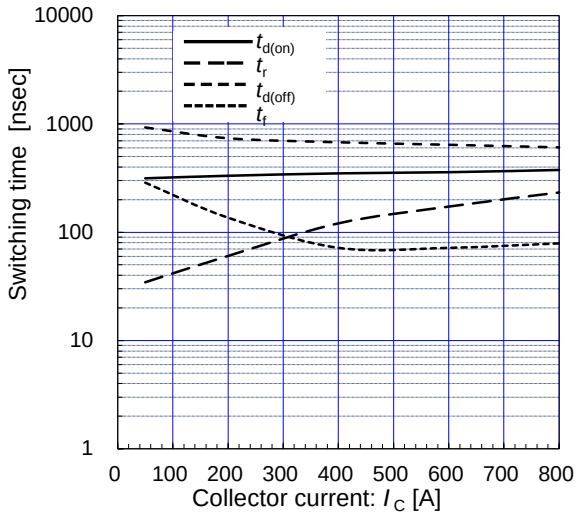
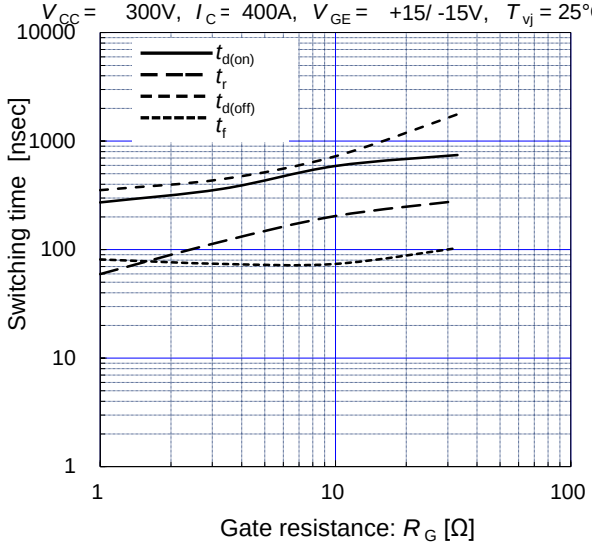
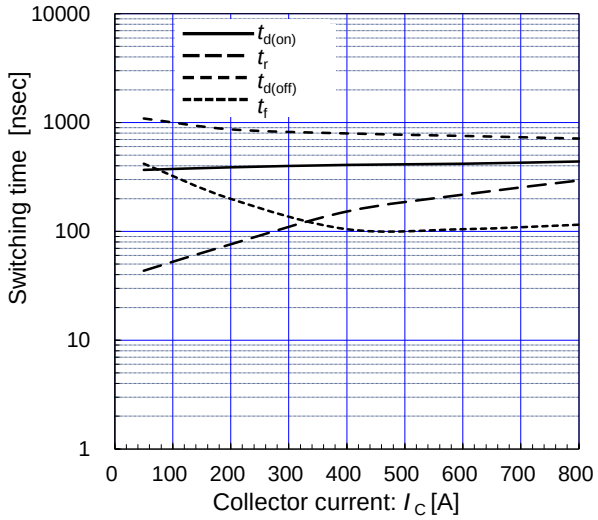
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 300V, R_G = 3.3/10Ω, V_{GE} = +15/ -15V, T_{vj} = 25°C



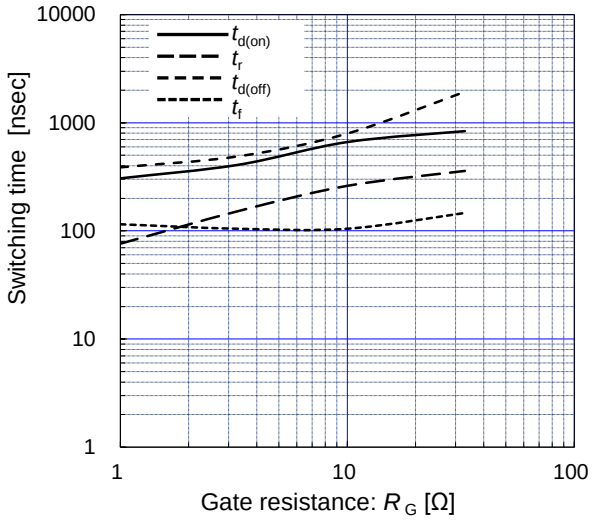
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 300V, I_C = 400A, V_{GE} = +15/ -15V, T_{vj} = 25°C



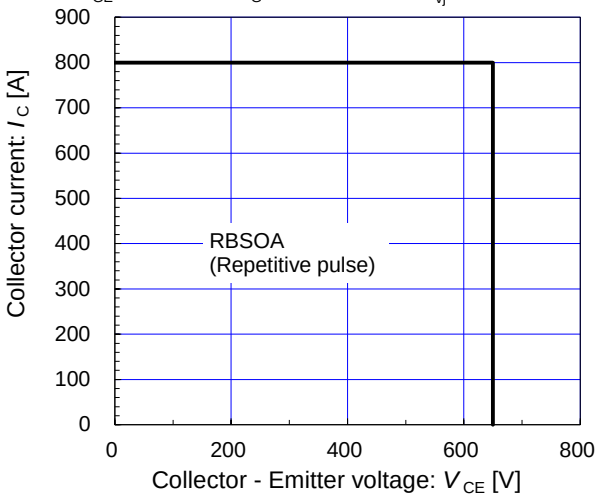
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 300V, R_G = 3.3/10Ω, V_{GE} = +15/ -15V, T_{vj} = 175°C



[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 300V, I_C = 400A, V_{GE} = +15/ -15V, T_{vj} = 175°C



[Inverter]
Reverse bias safe operating area (max.)
V_{GE} = +15/ -15V, R_G = 10Ω, T_{vj} = 175°C



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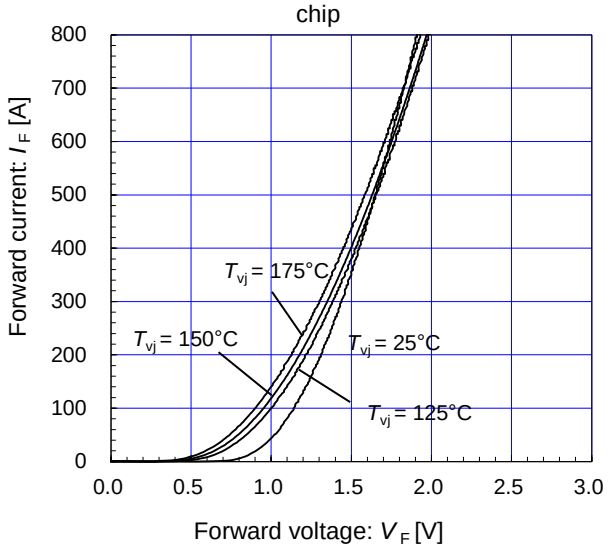
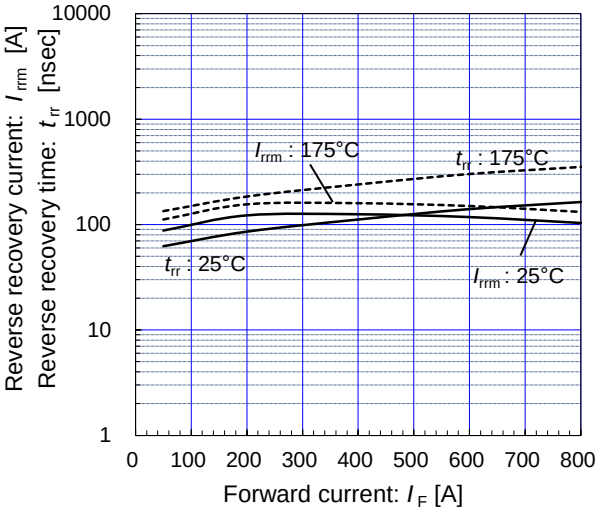
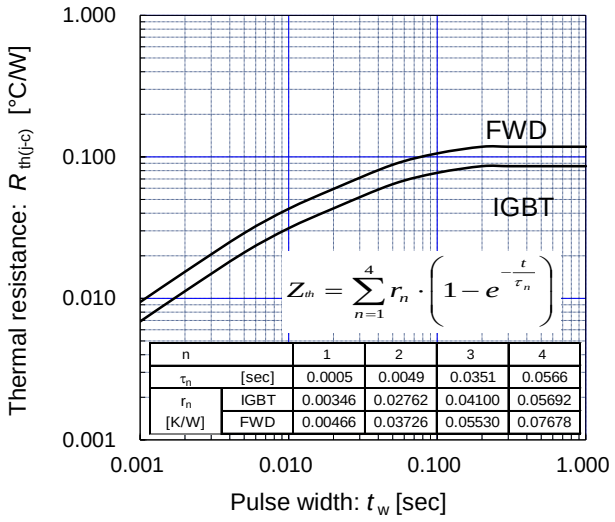
[Inverter]
Forward current vs. Forward voltage (typ.)
chip



[Inverter]
Reverse recovery characteristics (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 3.3Ω



[Inverter]
Transient thermal resistance(max.)



n		1	2	3	4
τ_n	[sec]	0.0005	0.0049	0.0351	0.0566
r_n [K/W]	IGBT	0.00346	0.02762	0.04100	0.05692
	FWD	0.00466	0.03726	0.05530	0.07678

Warnings

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of 2/2018. 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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