2MBI600XDE120-50

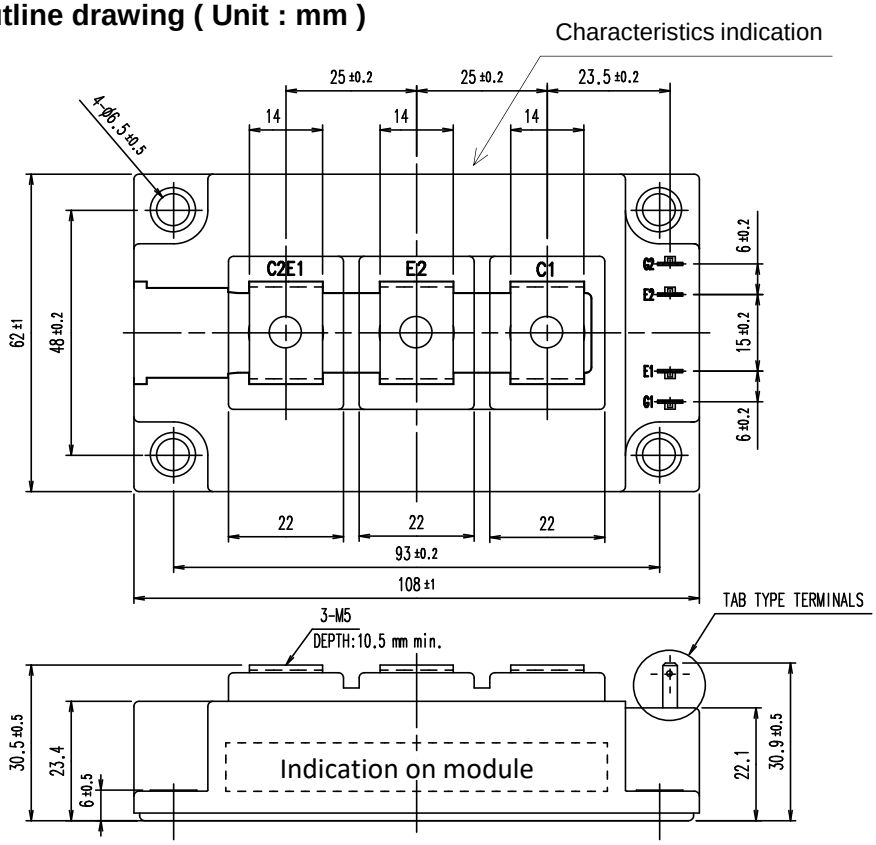
IGBT Modules

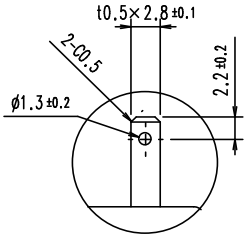
Power Module (X series)
1200V / 600A / 2-in-1 package

■ 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)

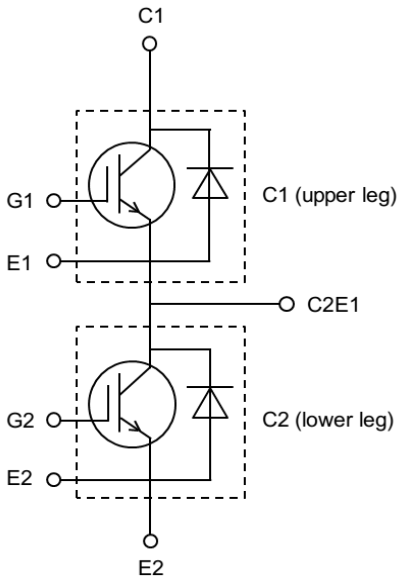




DETAIL TAB TYPE TERMINALS

Weight: 370g(typ.)

■ Equivalent Circuit



■ 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	600	A
Repetitive peak collector current		I_{CRM}	1ms		1200	
Forward current		I_F			600	
Repetitive peak forward current		I_{FRM}	1ms		1200	
Total power dissipation		P_{tot}	1 device		3655	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	M6		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.	typ.	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 = 600mA		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE} = 15V I_C= 600A	T_{vj}=25°C	-	1.70	2.15	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	-		-	1.63	-	Ω
Input capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	63	-	nF
Output capacitance	C_{oes}			-	2.1	-	
Reverse transfer capacitance	C_{res}			-	0.56	-	
Gate charge	Q_G	V_{CC} = 600V, I_C = 600A V_{GE} = -15 → +15V		-	4000	-	nC
Forward voltage	V_F (terminal)	V_{GE} = 0V I_F= 600A	T_{vj}=25°C	-	1.85	2.30	V
	V_F (chip)		T_{vj}= 25°C	-	1.60	2.05	
			T_{vj}=125°C	-	1.70	-	
			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 = 600A V_{GE} = +15/ -15V R_G = 0.56 Ω L_S = 30 nH	T_{vj}= 25°C	-	400	-	ns
			T_{vj}=125°C	-	410	-	
			T_{vj}=150°C	-	415	-	
			T_{vj}=175°C	-	420	-	
Rise time (*1)	t_r		T_{vj}= 25°C	-	95	-	
			T_{vj}=125°C	-	100	-	
			T_{vj}=150°C	-	100	-	
			T_{vj}=175°C	-	105	-	
Turn-off delay time (*1)	$t_{d(off)}$		T_{vj}= 25°C	-	370	-	
			T_{vj}=125°C	-	405	-	
			T_{vj}=150°C	-	415	-	
			T_{vj}=175°C	-	420	-	
Fall time (*1)	t_f		T_{vj}= 25°C	-	105	-	
			T_{vj}=125°C	-	170	-	
			T_{vj}=150°C	-	185	-	
			T_{vj}=175°C	-	210	-	
Reverse recovery time	t_{rr}		T_{vj}= 25°C	-	295	-	
			T_{vj}=125°C	-	285	-	
			T_{vj}=150°C	-	590	-	
			T_{vj}=175°C	-	635	-	

(*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
Turn-on energy	E_{on}	V_{CC} = 600V I_C, I_F = 600A V_{GE} = +15/ -15V R_G = 0.56 Ω L_S = 30 nH	T_{vj}= 25°C	-	30.0	-	mJ
			T_{vj}=125°C	-	48.7	-	
			T_{vj}=150°C	-	53.4	-	
			T_{vj}=175°C	-	59.7	-	
Turn-off energy	E_{off}		T_{vj}= 25°C	-	38.7	-	
			T_{vj}=125°C	-	50.5	-	
			T_{vj}=150°C	-	53.5	-	
			T_{vj}=175°C	-	55.3	-	
Reverse recovery energy	E_{rr}		T_{vj}= 25°C	-	15.8	-	
			T_{vj}=125°C	-	28.2	-	
			T_{vj}=150°C	-	31.3	-	
			T_{vj}=175°C	-	34.3	-	

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

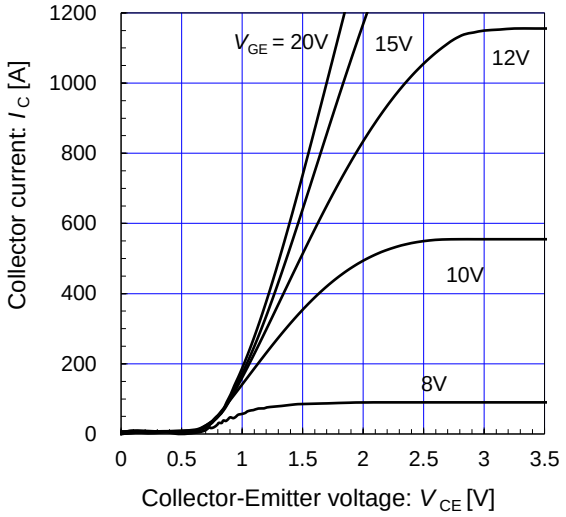
	Symbols	Conditions	Characteristics min.	typ.	max.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.041	K/W
		Inverter FWD	-	-	0.056	
Thermal resistance case to heat sink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0125	-	

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

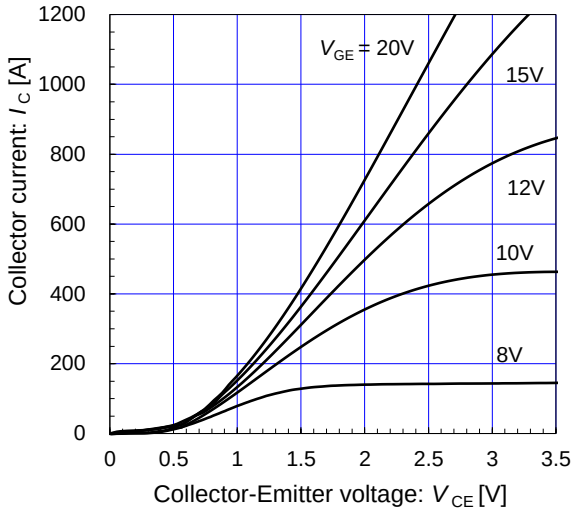
2MBI600XDE120-50

IGBT Modules

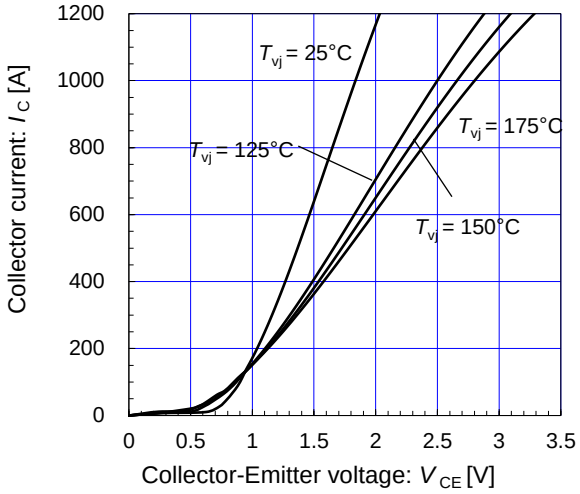
[Inverter]
Collector current vs. Collector-Emitter voltage
T_{vj} = 25°C / chip



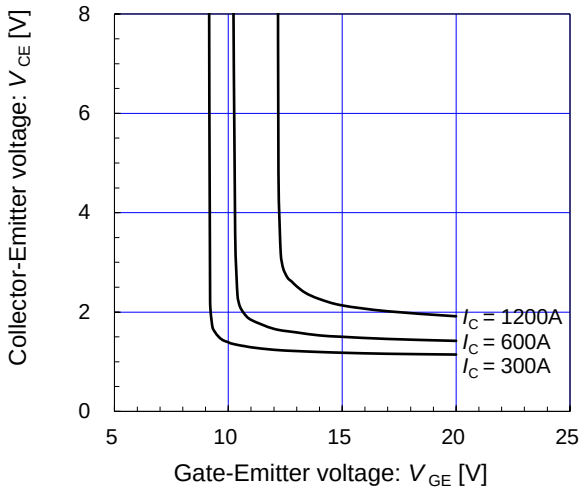
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_{Vj} = 175°C / chip



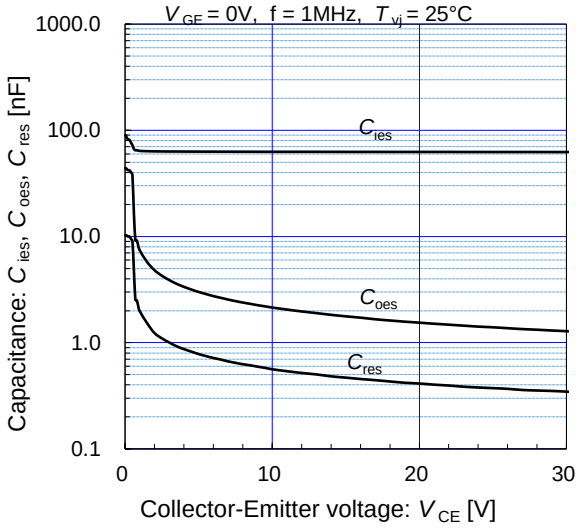
[Inverter]
Collector current vs. Collector-Emitter voltage
V_{GE} = 15V / chip



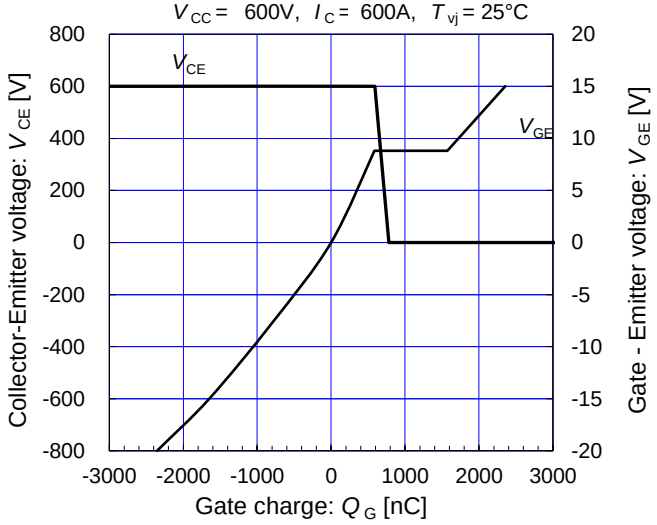
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage
T_{vj} = 25°C / chip



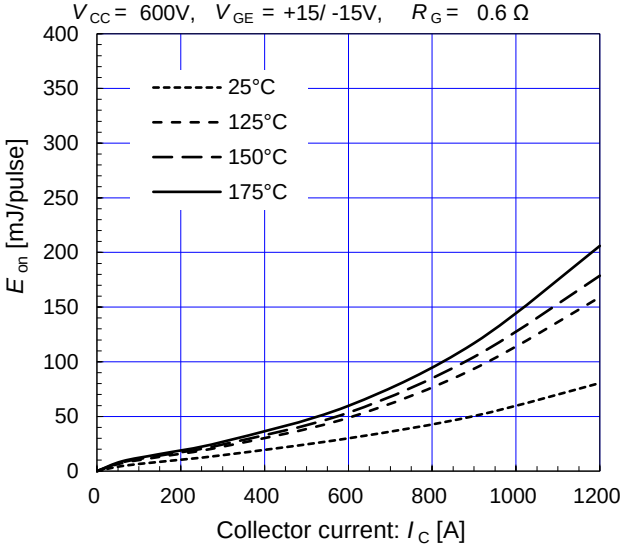
[Inverter]
Capacitance vs. Collector-Emitter Voltage
V_{GE} = 0V, f = 1MHz, T_{vj} = 25°C



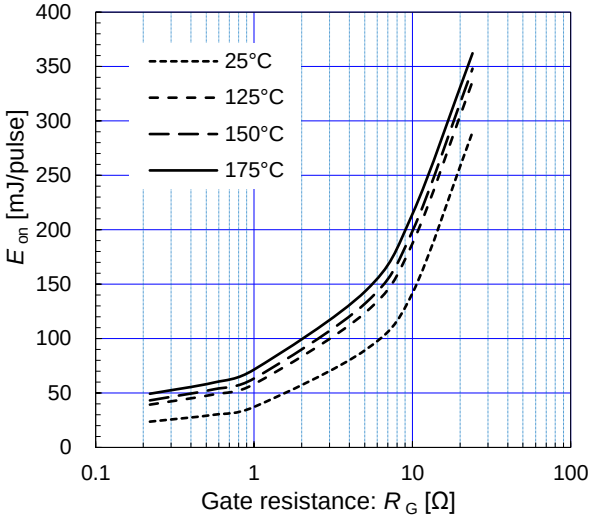
[Inverter]
Dynamic Gate Charge (typ.)
V_{CC} = 600V, I_C = 600A, T_{vj} = 25°C



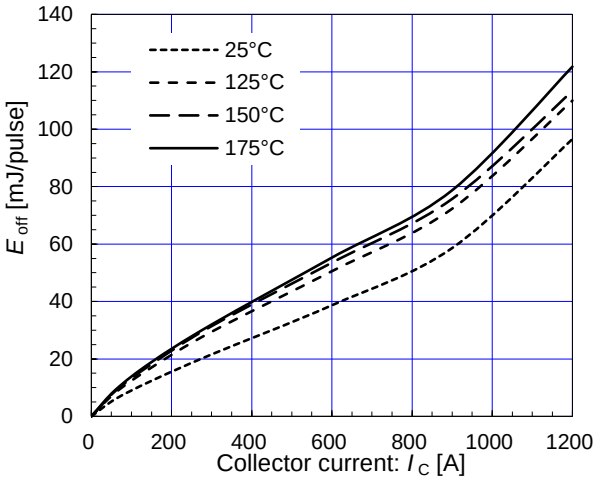
[Inverter]
E_{on} vs. Collector current (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 0.6 Ω



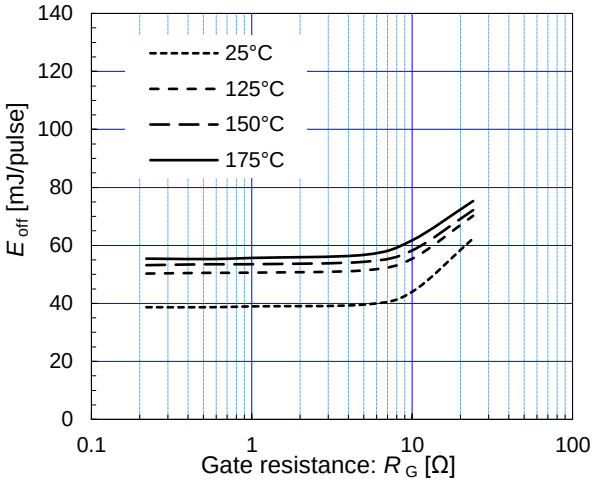
[Inverter]
E_{on} vs. Gate resistance (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, I_C = 600A



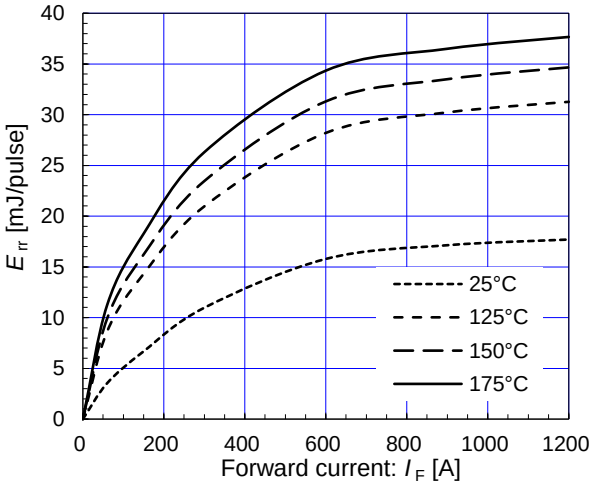
[Inverter]
E_{off} vs. Collector current (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 0.6 Ω



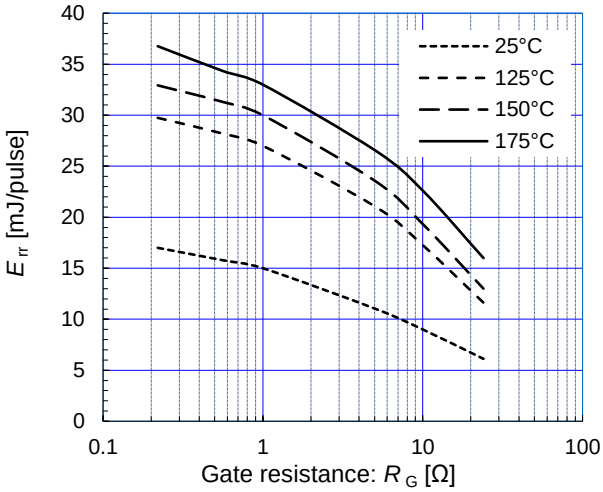
[Inverter]
E_{off} vs. Gate resistance (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, I_C = 600A



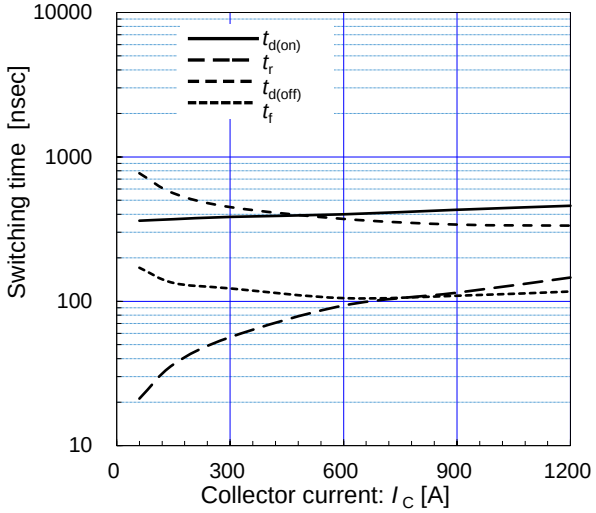
[Inverter]
E_{rr} vs. Forward current (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 0.6 Ω



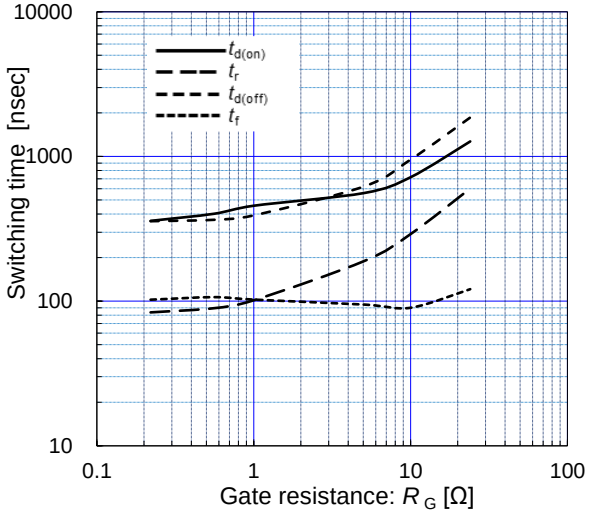
[Inverter]
E_{rr} vs. Gate resistance (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, I_F = 600A



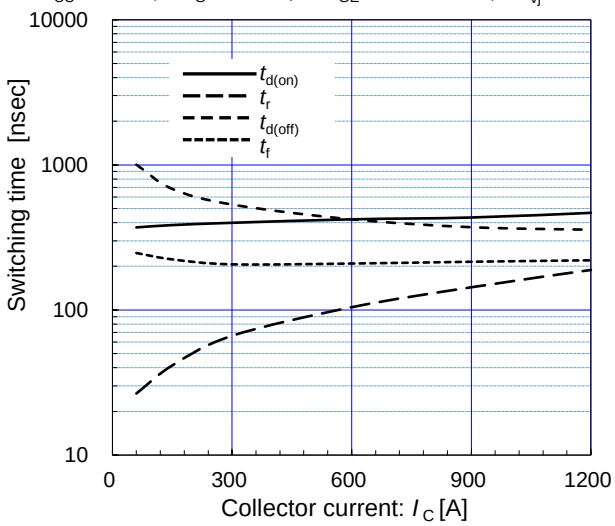
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 600V, R_G = 0.56 Ω V_{GE} = +15/ -15V, T_{vj} = 25°C



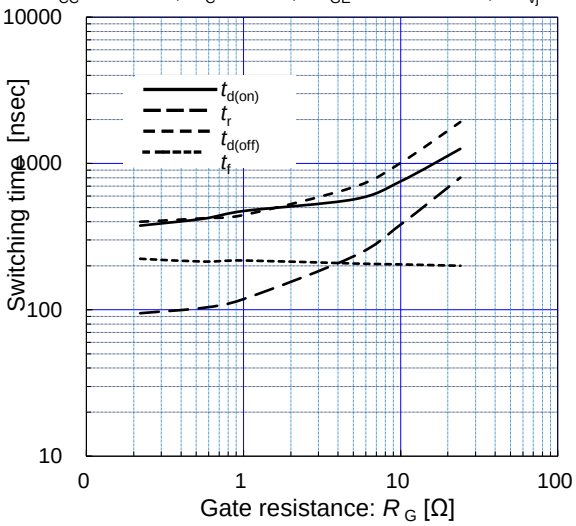
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 600V, I_C = 600A, V_{GE} = +15/ -15V, T_{vj} = 25°C



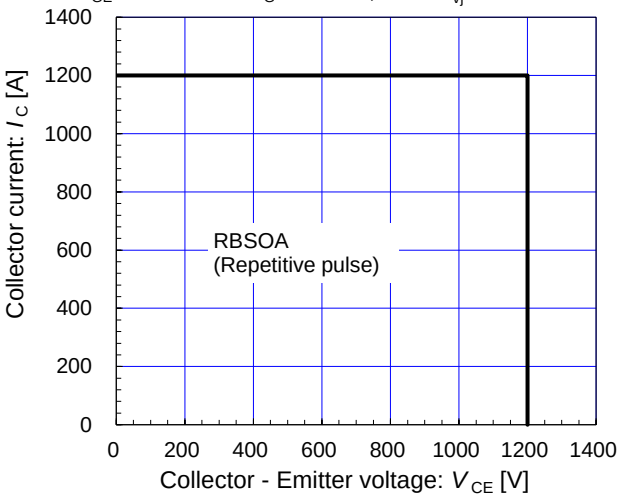
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 600V, R_G = 0.56Ω, V_{GE} = +15/ -15V, T_{vj} = 175°C



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



[Inverter]
Reverse bias safe operating area (max.)
V_{GE} = +15/ -15V R_G = 0.56Ω, T_{vj}= 175°C



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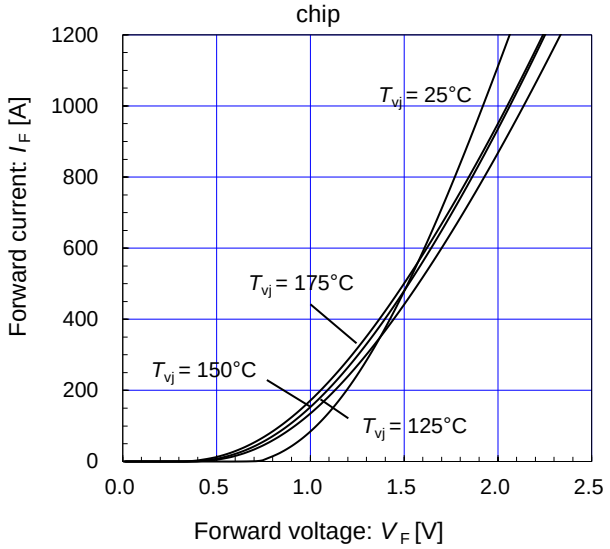
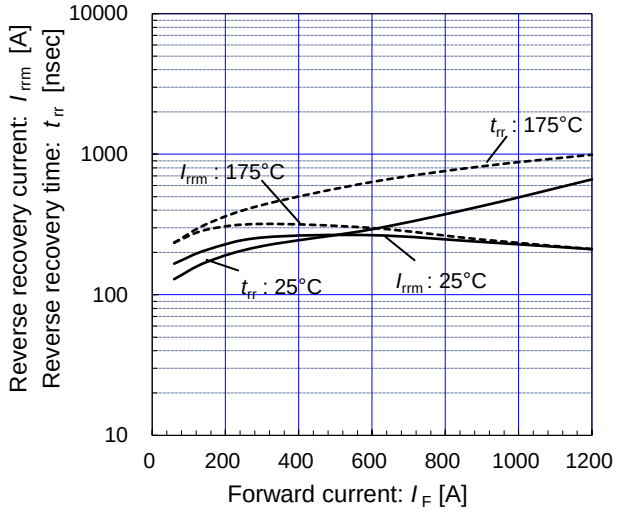
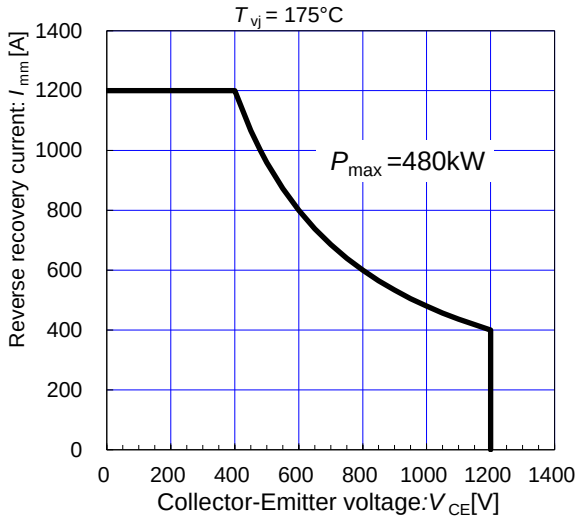
[Inverter]
Forward current vs. Forward voltage (typ.)
chip



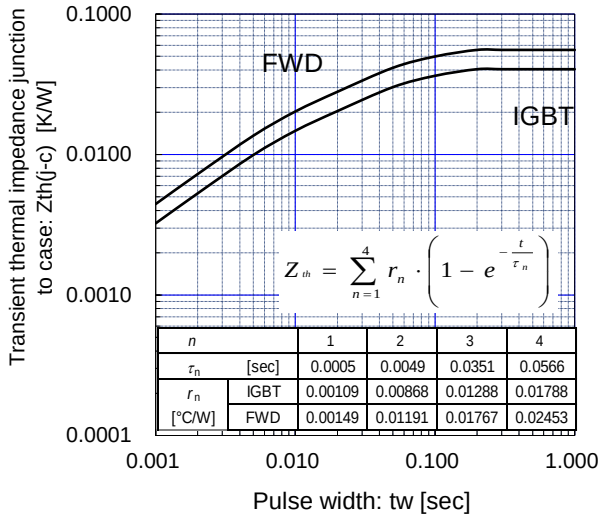
[Inverter]
Reverse recovery characteristics (typ.)
V_{CC} = 600V, V_{GE} = +15/ -15V, R_G = 0.56Ω



[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]	0.0005	0.0049	0.0351	0.0566
r_n [°C/W]	IGBT	0.00109	0.00868	0.01288	0.01788
	FWD	0.00149	0.01191	0.01767	0.02453

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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・Computers ・OA equipment ・Communications equipment (terminal devices) ・Measurement equipment
・Machine tools ・Audiovisual equipment ・Electrical home appliances ・Personal equipment ・Industrial robots etc.

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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

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富士電機 Innovating Energy Technology

Technical Information

IGBT Modules

- Please refer to URLs below for futher information about products, application manuals and design support.
- 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。
- 本データシートに記載されていない製品情報，アプリケーションマニュアル，デザインサポートは以下のURLをご参照下さい。

FUJI ELECTRIC Power Semiconductor WEB site

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Europe	www.fujielectric-europe.com/en/power_semiconductor/
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6 IGBT Loss Simulation Software	www.fujielectric.com/products/semiconductor/model/igbt/simulation/
7 Fuji Electric Journal	www.fujielectric.com/products/semiconductor/journal/
8 Contact	www.fujielectric.com/contact/
9 Revised and discontinued product information	www.fujielectric.com/products/semiconductor/discontinued/

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