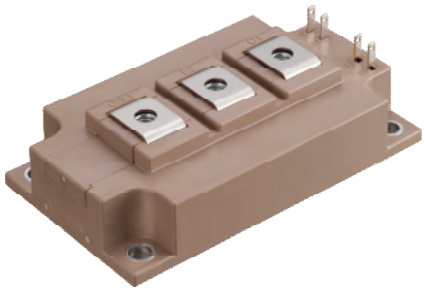
2MBI600XDE065-50

IGBT Modules

Power Module (X series)
650V / 600A / 2-in-1 package



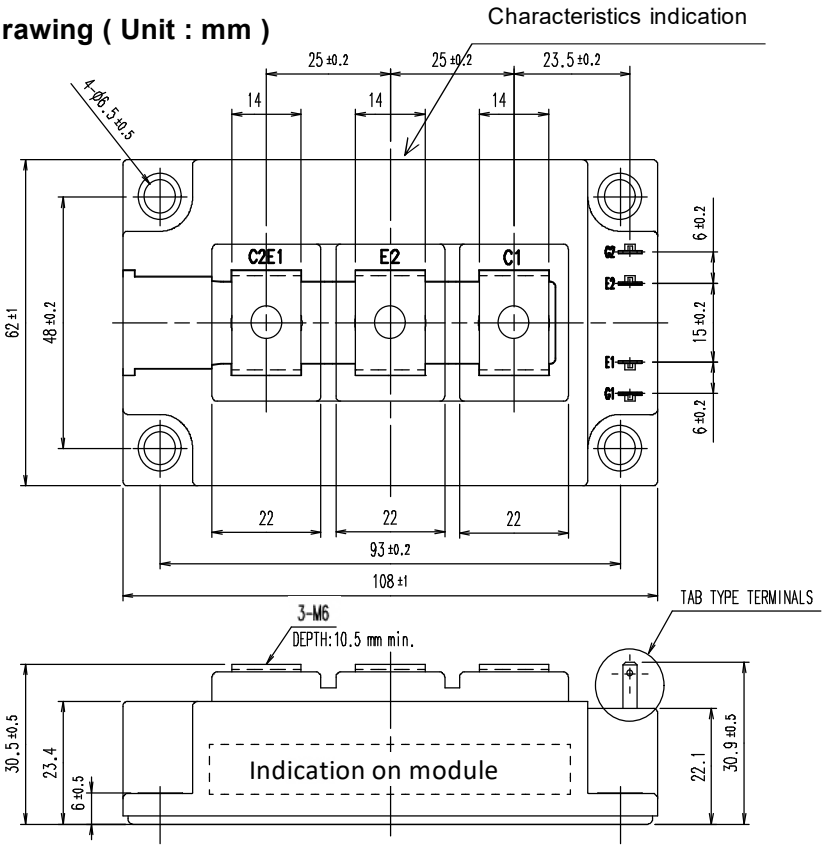
■ Features

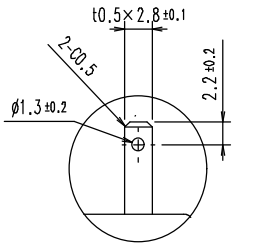
Low $V_{CE(sat)}$
High speed switching
Low Inductance Module structure

■ Applications

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

■ Outline drawing (Unit : mm)

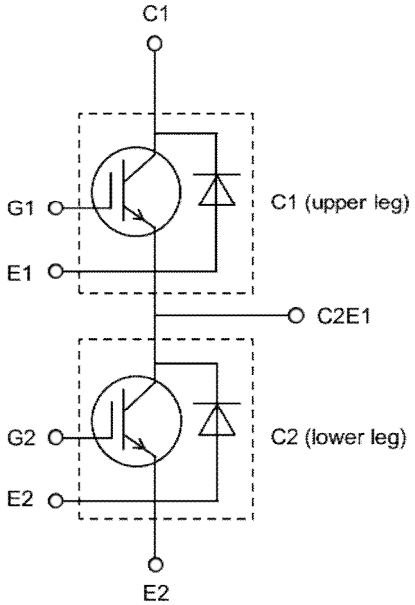




DETAIL TAB TYPE TERMINALS

Weight: 370g(typ.)

■ Equivalent circuit



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2024/04

■ 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}			650	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		2775	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		M_s	M5 or M6		3.0 ~ 6.0	N m
Mounting torque of screws to terminals)		M_t	M6		2.5 ~ 5.0	

(*1) All terminals should be connected together during the test.

■ 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} = 650V		-	-	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	-	1.55	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 resistance	r_g	-		-	0.94	-	Ω
Input capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	69	-	nF
Output capacitance	C_{oes}			-	2.6	-	
Reverse transfer capacitance	C_{res}			-	0.93	-	
Gate charge	Q_G	V_{CC} = 300V, I_C = 600A V_{GE} = -15 → +15V		-	4.9	-	μC
Forward voltage	V_F (terminal)	V_{GE} = 0V I_F=600A	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	-	
Turn-on delay time (*1)	$t_{d(on)}$	V_{CC} = 300V I_C, I_F = 600A V_{GE} = +15/ -15V R_G = 3.3 Ω L_S = 30 nH	T_{vj}=25°C	-	0.39	-	μs
			T_{vj}=125°C	-	0.44	-	
			T_{vj}=150°C	-	0.45	-	
			T_{vj}=175°C	-	0.46	-	
Rise time (*1)	t_r		T_{vj}=25°C	-	0.15	-	
			T_{vj}=125°C	-	0.17	-	
			T_{vj}=150°C	-	0.17	-	
			T_{vj}=175°C	-	0.18	-	
Turn-off delay time (*1)	$t_{d(off)}$		T_{vj}=25°C	-	0.49	-	
			T_{vj}=125°C	-	0.52	-	
			T_{vj}=150°C	-	0.53	-	
			T_{vj}=175°C	-	0.54	-	
Fall time (*1)	t_f		T_{vj}=25°C	-	0.09	-	
			T_{vj}=125°C	-	0.11	-	
			T_{vj}=150°C	-	0.12	-	
			T_{vj}=175°C	-	0.12	-	
Reverse recovery time	t_{rr}		T_{vj}=25°C	-	0.10	-	
			T_{vj}=125°C	-	0.17	-	
			T_{vj}=150°C	-	0.19	-	
			T_{vj}=175°C	-	0.21	-	

(*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} = 300V I_C, I_F = 600A V_{GE} = +15/ -15V R_G = 3.3 Ω L_S = 30 nH	T_{vj}=25°C	-	15.4	-	mJ
			T_{vj}=125°C	-	18.9	-	
			T_{vj}=150°C	-	19.5	-	
			T_{vj}=175°C	-	20.1	-	
Turn-off energy	E_{off}		T_{vj}=25°C	-	31.0	-	
			T_{vj}=125°C	-	34.2	-	
			T_{vj}=150°C	-	35.0	-	
			T_{vj}=175°C	-	35.8	-	
Reverse recovery energy	E_{rr}		T_{vj}=25°C	-	4.1	-	
			T_{vj}=125°C	-	6.9	-	
			T_{vj}=150°C	-	7.7	-	
			T_{vj}=175°C	-	8.4	-	

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.

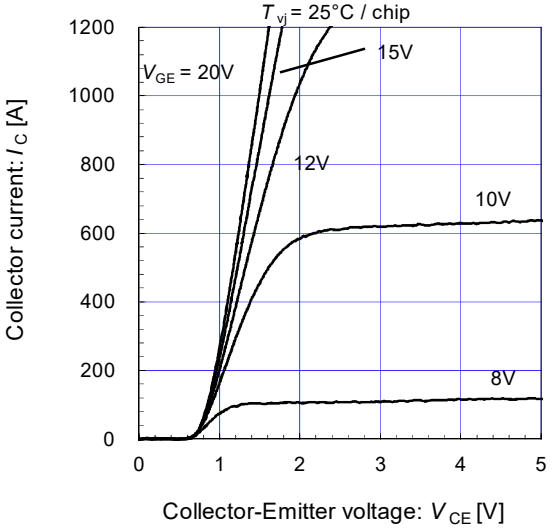
■Thermal resistance characteristics

	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.054	K/W
		Inverter FWD	-	-	0.087	
Thermal resistance case to heat sink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0125	-	

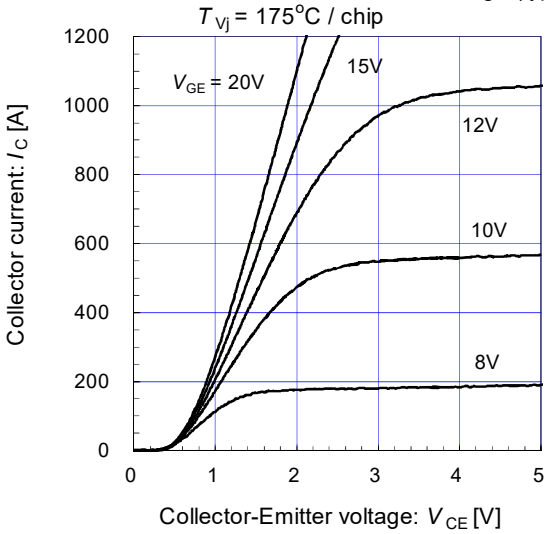
(*1) This is the value which is defined mounting on the additional heat sink with thermal grease.

2MBI600XDE065-50

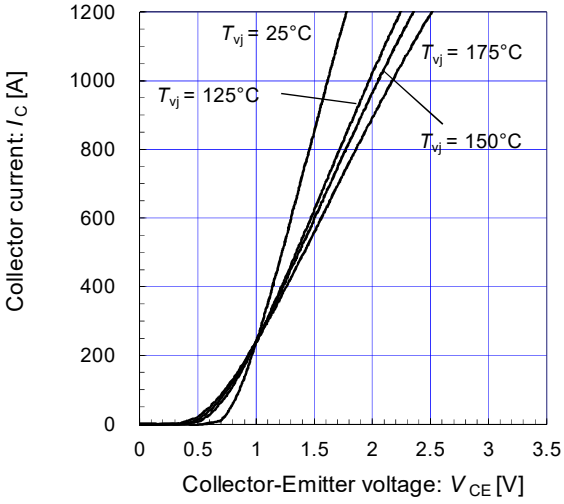
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj} = 25°C / chip



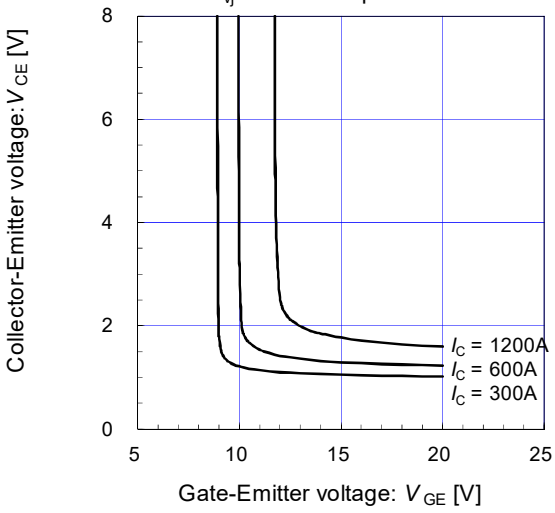
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_{Vj} = 175°C / chip



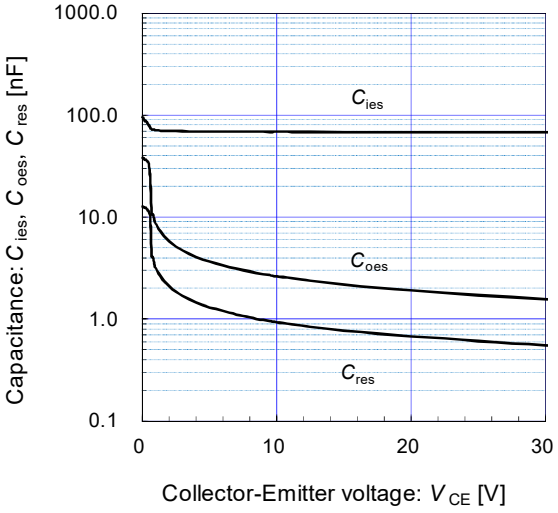
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE} = 15V / chip



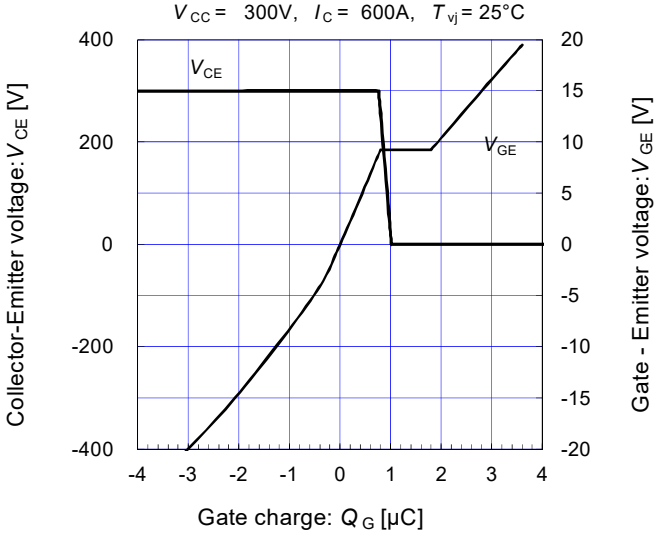
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_{vj} = 25°C / chip



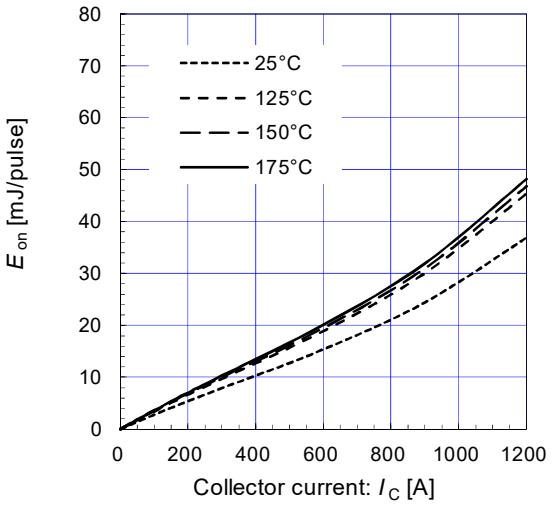
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
V_{GE} = 0V, f = 1MHz, T_{vj} = 25°C



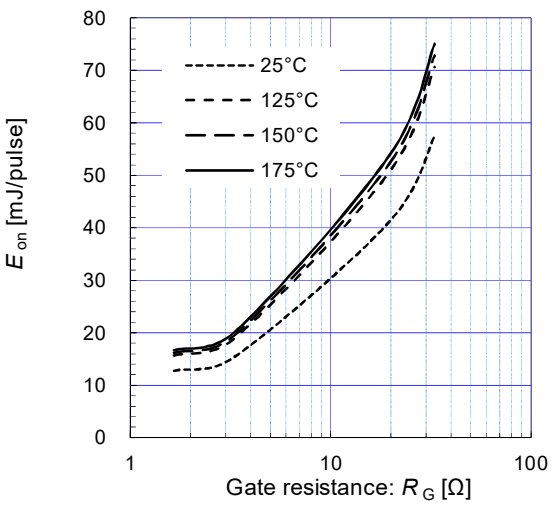
[Inverter]
Dynamic gate charge (typ.)
V_{CC} = 300V, I_C = 600A, T_{vj} = 25°C



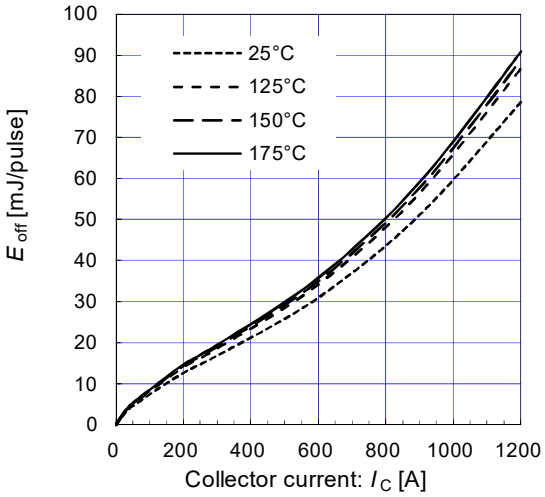
[Inverter]
E_{on} vs. Collector current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 3.3 Ω



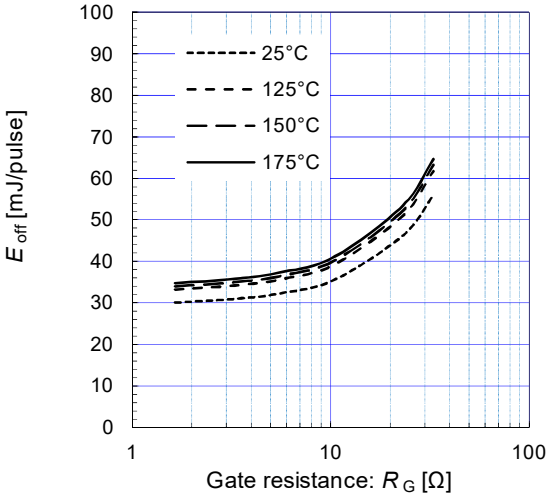
[Inverter]
E_{on} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_C = 600A



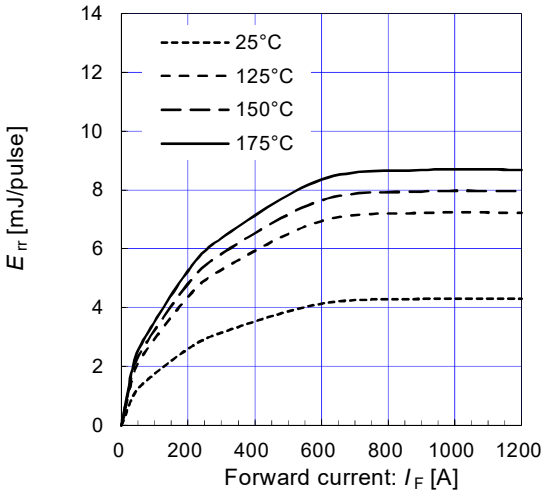
[Inverter]
E_{off} vs. Collector current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 3.3 Ω



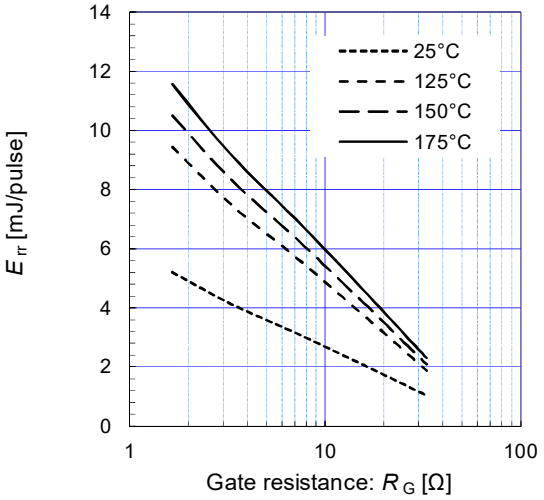
[Inverter]
E_{off} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_C = 600A



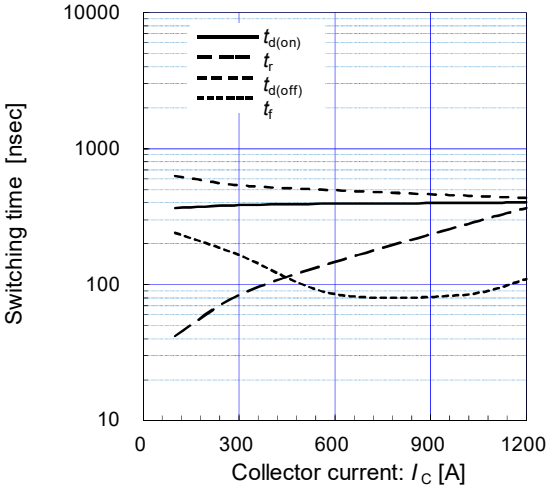
[Inverter]
E_{rr} vs. Forward current (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, R_G = 3.3 Ω



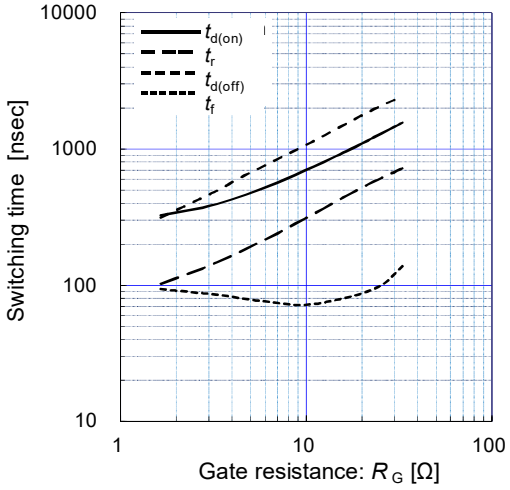
[Inverter]
E_{rr} vs. Gate resistance (typ.)
V_{CC} = 300V, V_{GE} = +15/ -15V, I_F = 600A



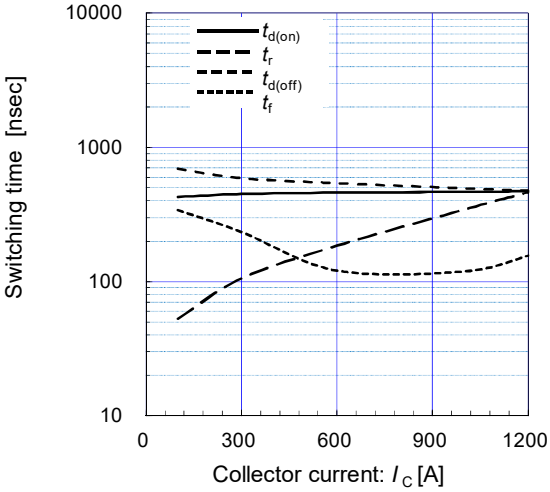
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 300V, R_G = 3.3Ω, V_{GE} = +15/ -15V, T_{vj} = 25°C



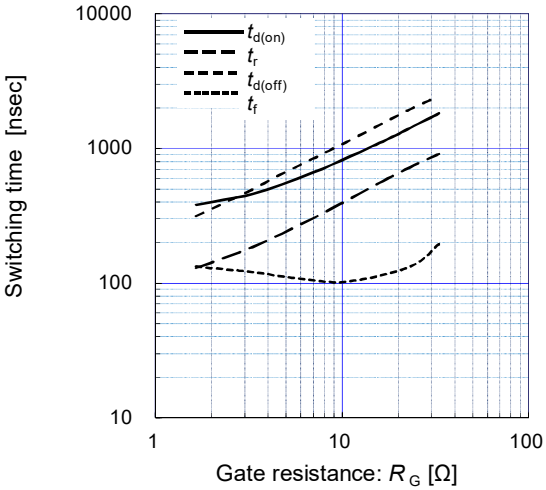
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 300V, I_C = 600A, V_{GE} = +15/ -15V, T_{vj} = 25°C



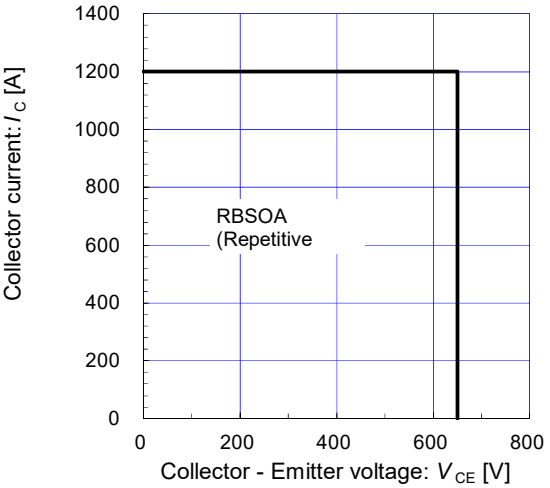
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 300V, R_G = 3.3Ω, V_{GE} = +15/ -15V, T_{vj} = 175°C



[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 300V, I_C = 600A, V_{GE} = +15/ -15V, T_{vj} = 175°C

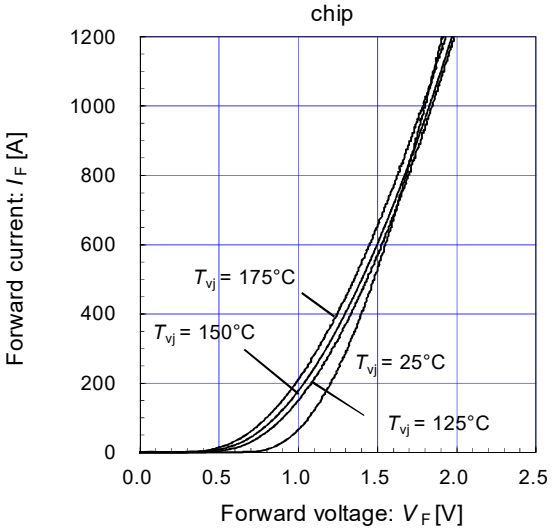


[Inverter]
Reverse bias safe operating area (max.)
V_{GE} = +15/ -15V, R_G = 3.3Ω, T_{vj} = 175°C

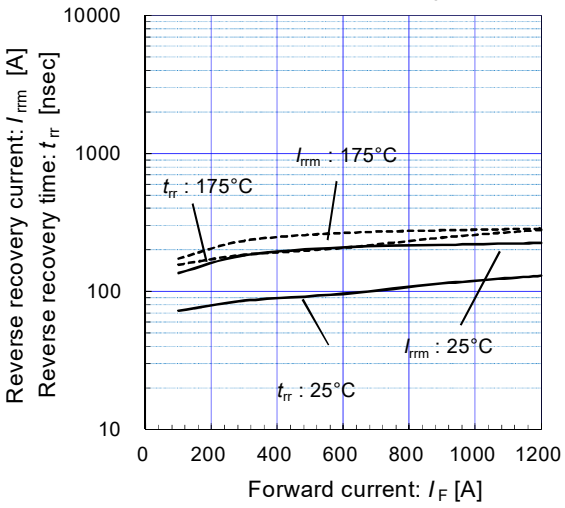


2MBI600XDE065-50

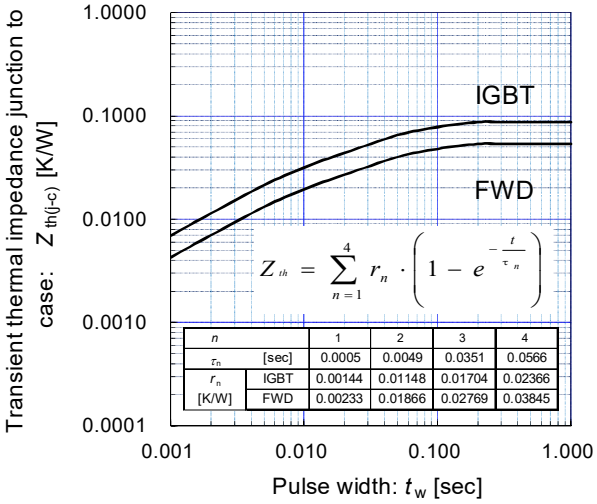
[Inverter]
Forward current vs. Forward voltage (typ.)
chip



[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	0.00144	0.01148	0.01704	0.02366
	FWD	0.00233	0.01866	0.02769	0.03845

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・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

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IGBT Modules

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5 安装说明书	www.fujielectric.com/products/semiconductor/cn/model/igbt/mounting/
6 IGBT 损耗模拟软件	www.fujielectric.com/products/semiconductor/cn/model/igbt/simulation/
7 富士电机技报	www.fujielectric.com/products/semiconductor/cn/journal/
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