2MBI150XAA170-50

IGBT Modules

Power Module (X series)
1700V / 150A / 2-in-1 package



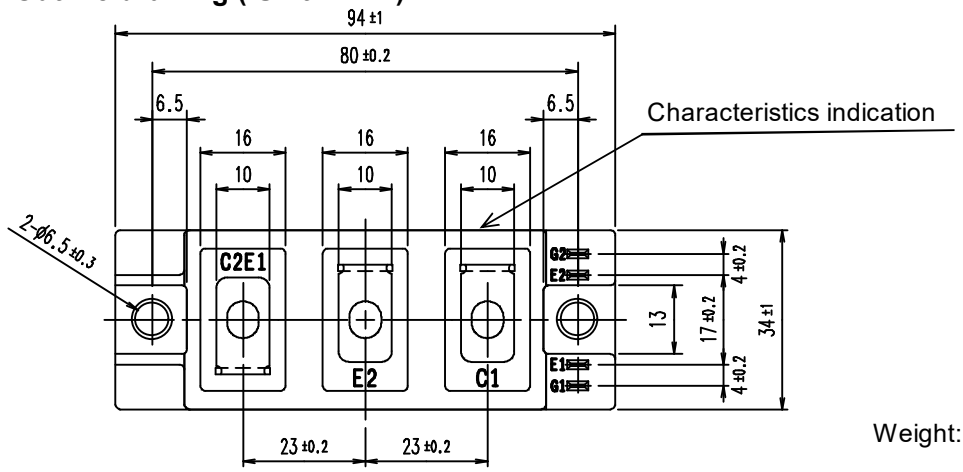
■ Features

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

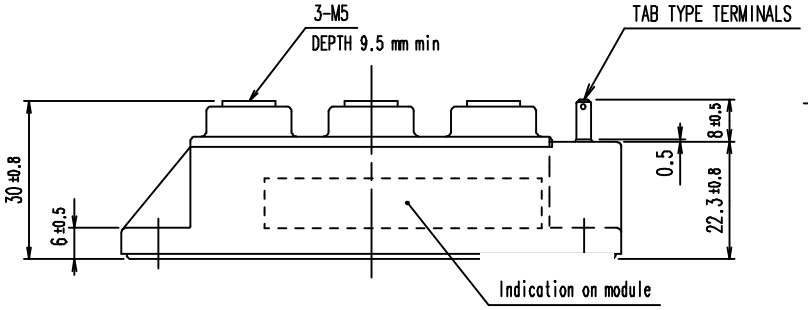
■ Applications

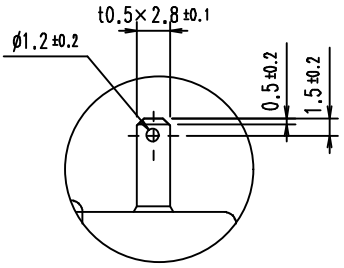
Inverter for Motor Drives, AC and DC Servo Drives
Uniterruptible Power Supply Systems,
Industrial machines,such as Welding machines

■ Outline drawing (Unit : mm)



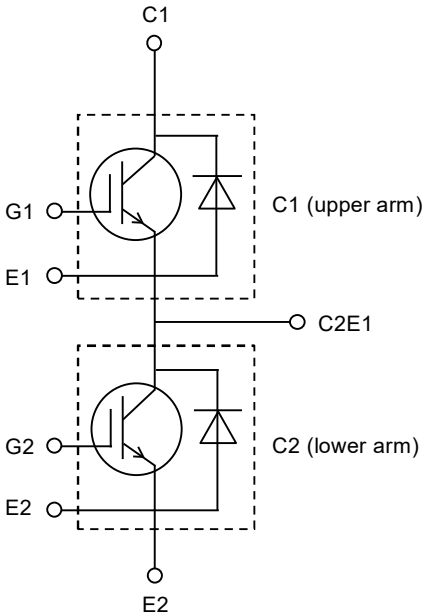
Weight: 180 g(typ.)





DETAIL TAB TYPE TERMINALS

■ Equivalent circuit



FM5F9446a
2023/10

2MBI150XAA170-50

■ 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}			1700	V
Gate-Emitter voltage,Collector-Emitter short-circuited		V_{GES}			±20	V
Collector current		I_C	Continuous	T_c=100°C	150	A
Repetitive peak collector current		I_{CRM}	1ms		300	
Forward current		I_F	Continuous		150	
Repetitive peak forward current		I_{FRM}	1ms		300	
Total power dissipation		P_{tot}	1 device		730	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 terminals and copper base (*1)	V_{isol}	AC: 1min.		4000	Vrms
Mounting torque of screws to heatsink		M_s	M5 or M6		3.0 ~ 5.0	N·m
Mounting torque of screws to terminals		M_t	M5		2.5 ~ 5.0	

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

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

	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}= 1700V		-	-	50	μA
Gate leakage current,Collector-Emitter short-circuited	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-	-	100	nA
Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE}= 20V I_C= 150mA		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE} = 15V I_C= 150A	T_{vj}=25°C	-	1.75	2.20	V
	$V_{CE(sat)}$ (chip)		T_{vj}=25°C	-	1.60	2.05	
			T_{vj}=125°C	-	2.00	-	
			T_{vj}=150°C	-	2.10	-	
			T_{vj}=175°C	-	2.20	-	
Internal gate resistance	r_g	-		-	6.25	-	Ω
Capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	20	-	nF
	C_{oes}			-	0.6	-	
	C_{res}			-	0.13	-	
Gate charge	Q_G	V_{CC} = 900V, I_C = 150A V_{GE} = -15 → +15V		-	1200	-	nC
Forward voltage	V_F (terminal)	V_{GE} = 0V I_F= 150A	T_{vj}=25°C	-	1.85	2.30	V
	V_F (chip)		T_{vj}=25°C	-	1.70	2.15	
			T_{vj}=125°C	-	1.85	-	
			T_{vj}=150°C	-	1.85	-	
			T_{vj}=175°C	-	1.80	-	
Switching time (*1)	$t_{d(on)}$	V_{CC} = 900V I_C, I_F = 150A V_{GE} = ±15V R_G = 2.2 Ω L_S = 30 nH	T_{vj}=25°C	-	425	-	ns
			T_{vj}=125°C	-	455	-	
			T_{vj}=150°C	-	465	-	
			T_{vj}=175°C	-	470	-	
	t_r		T_{vj}=25°C	-	70	-	
			T_{vj}=125°C	-	85	-	
			T_{vj}=150°C	-	90	-	
			T_{vj}=175°C	-	95	-	
	$t_{d(off)}$		T_{vj}=25°C	-	430	-	
			T_{vj}=125°C	-	500	-	
			T_{vj}=150°C	-	515	-	
			T_{vj}=175°C	-	525	-	
	t_f		T_{vj}=25°C	-	440	-	
			T_{vj}=125°C	-	625	-	
			T_{vj}=150°C	-	670	-	
			T_{vj}=175°C	-	720	-	
Reverse recovery time	t_{rr}		T_{vj}=25°C	-	785	-	
			T_{vj}=125°C	-	1200	-	
			T_{vj}=150°C	-	1380	-	
			T_{vj}=175°C	-	1350	-	

(*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
Switching loss (per pulse)	E_{on}	V_{CC} = 900V I_C, I_F = 150A V_{GE} = ±15V R_G = 2.2 Ω L_S = 30 nH	T_{vj}=25°C	-	28.8	-	mJ
			T_{vj}=125°C	-	36.8	-	
			T_{vj}=150°C	-	39.5	-	
			T_{vj}=175°C	-	41.9	-	
	E_{off}		T_{vj}=25°C	-	33.2	-	
			T_{vj}=125°C	-	42.4	-	
			T_{vj}=150°C	-	44.2	-	
			T_{vj}=175°C	-	46.6	-	
	E_{rr}		T_{vj}=25°C	-	16.8	-	
			T_{vj}=125°C	-	30.6	-	
			T_{vj}=150°C	-	35.2	-	
			T_{vj}=175°C	-	40.3	-	

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

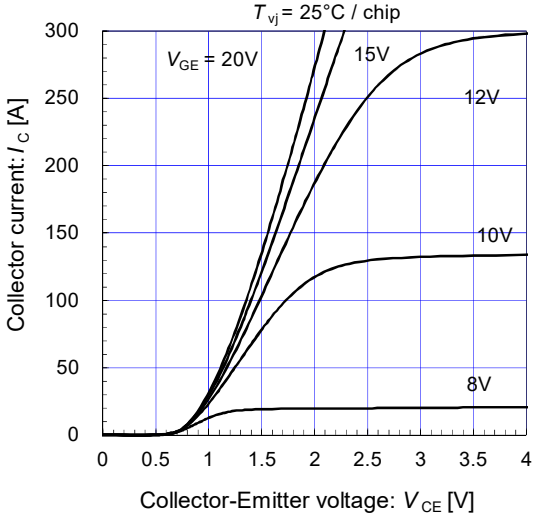
	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	ns
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.205	K/W
		Inverter FWD	-	-	0.323	
Thermal resistance case to heatsink (1IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.050	-	

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

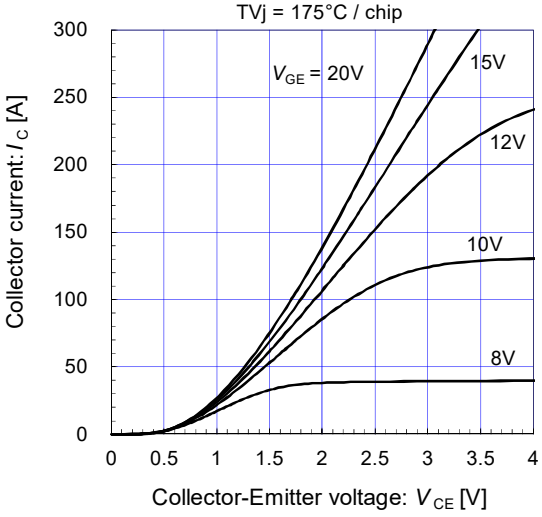
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IGBT Modules

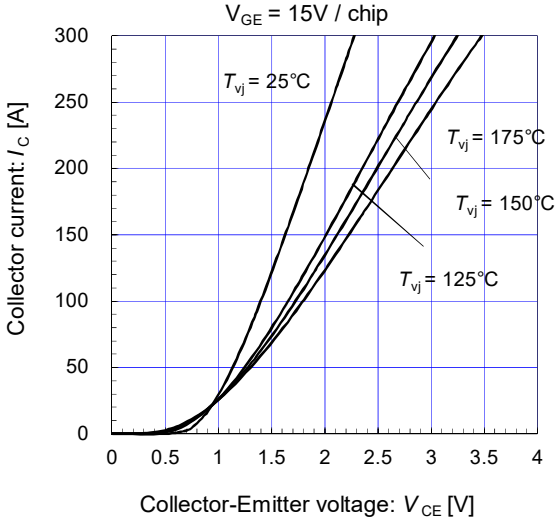
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj} = 25°C / chip



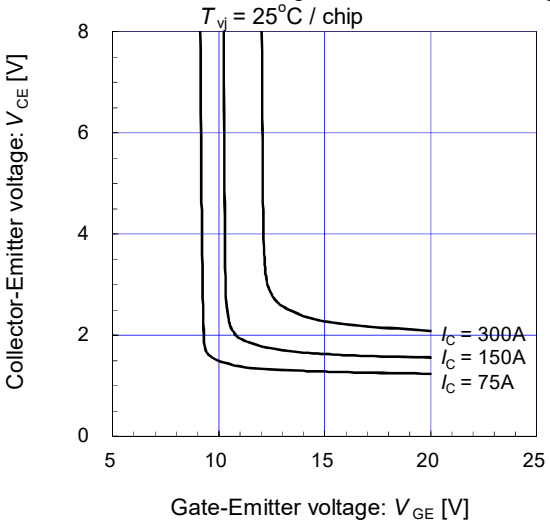
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
TVj = 175°C / chip



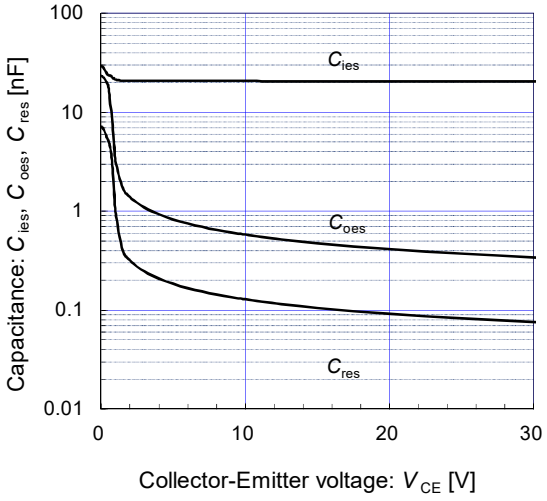
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE} = 15V / chip



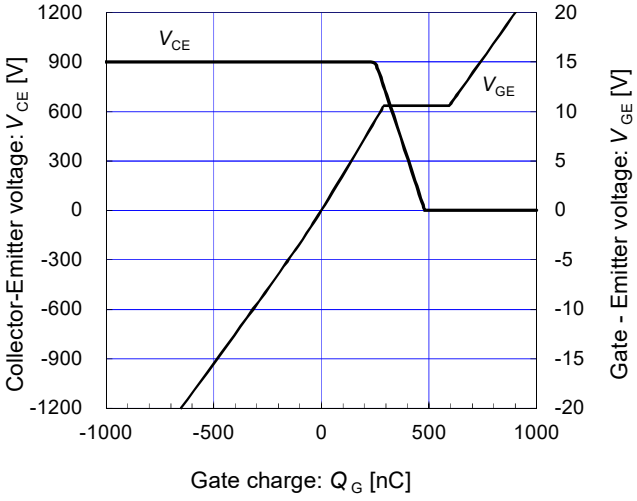
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage
T_{vj} = 25°C / chip



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

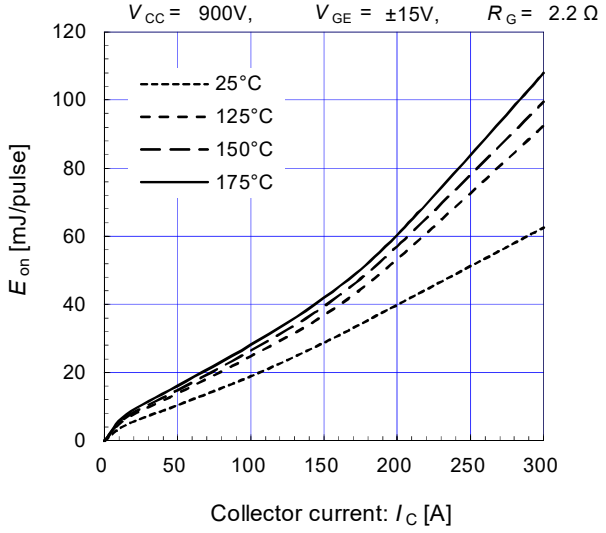


[Inverter]
Dynamic gate charge (typ.)
V_{CC} = 900V, I_C = 150A, T_{vj} = 25°C

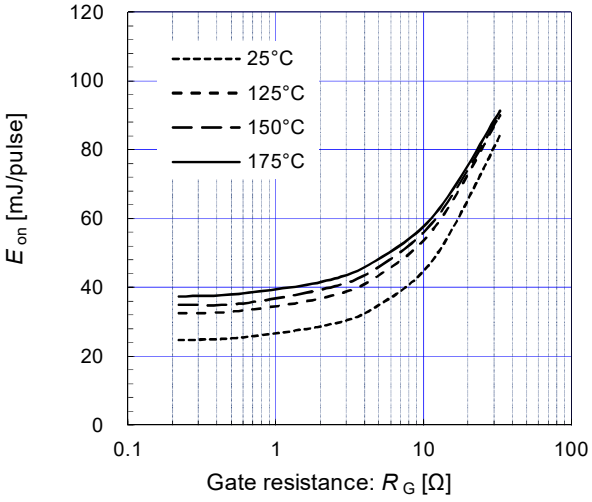


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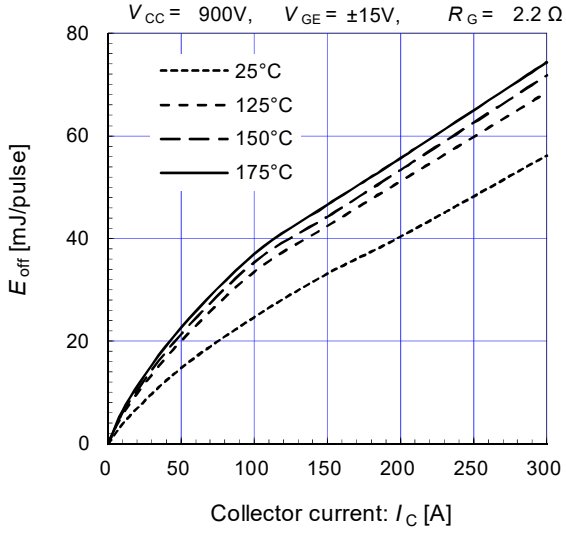
[Inverter]
E_{on} vs. Collector current (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 2.2 Ω



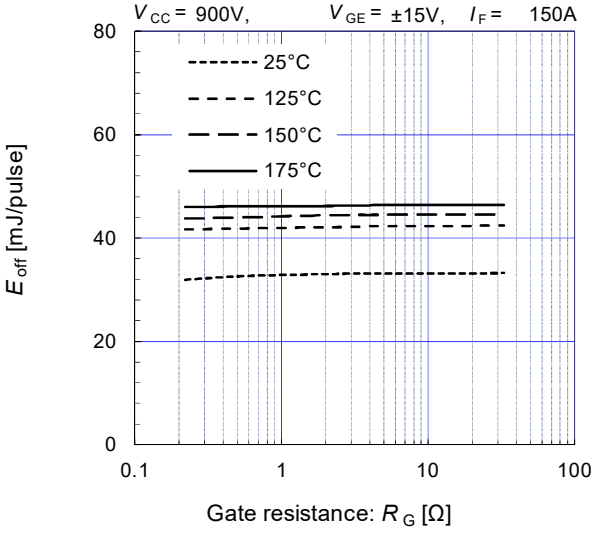
[Inverter]
E_{on} vs. Gate resistance (typ.)
V_{CC} = 900V, V_{GE} = ±15V, I_C = 150A



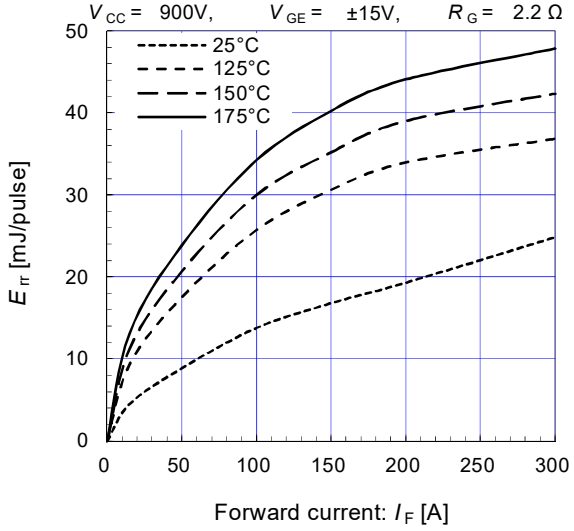
[Inverter]
E_{off} vs. Collector current (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 2.2 Ω



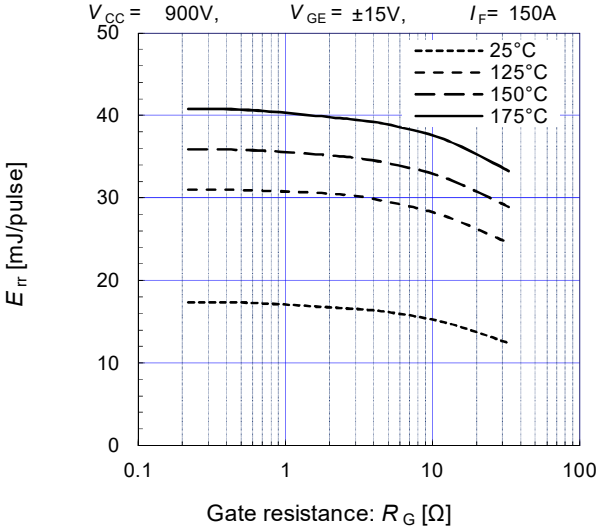
[Inverter]
E_{off} vs. Gate resistance (typ.)
V_{CC} = 900V, V_{GE} = ±15V, I_F = 150A



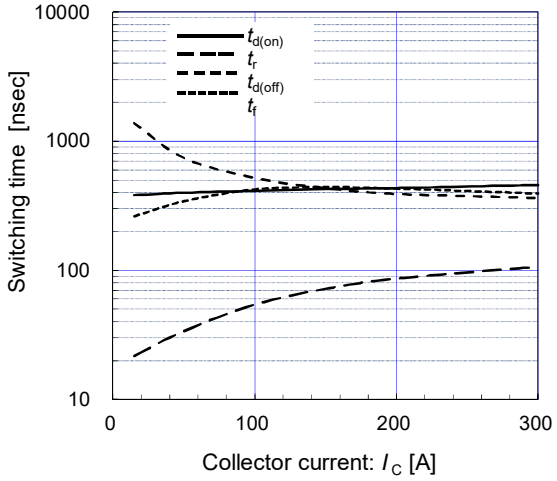
[Inverter]
E_{rr} vs. Forward current (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 2.2 Ω



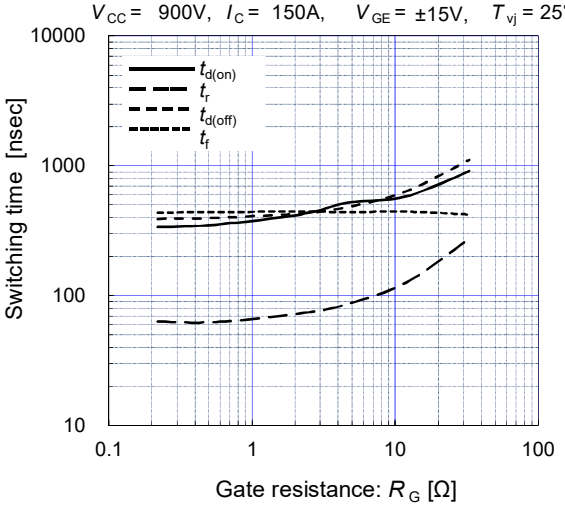
[Inverter]
E_{rr} vs. Gate resistance (typ.)
V_{CC} = 900V, V_{GE} = ±15V, I_F = 150A



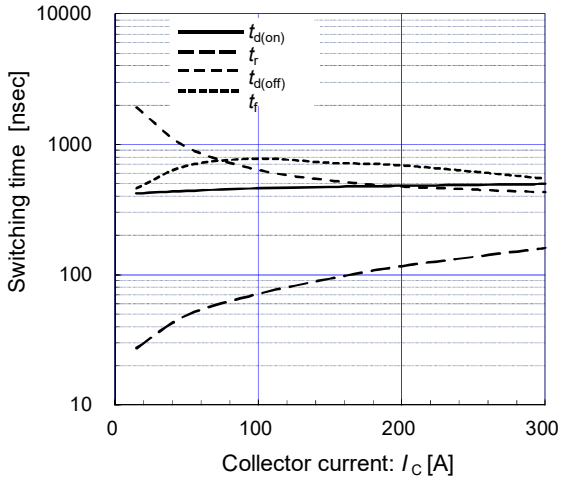
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 900V, R_G = 2.2 Ω, V_{GE} = ±15V, T_{vj} = 25°C



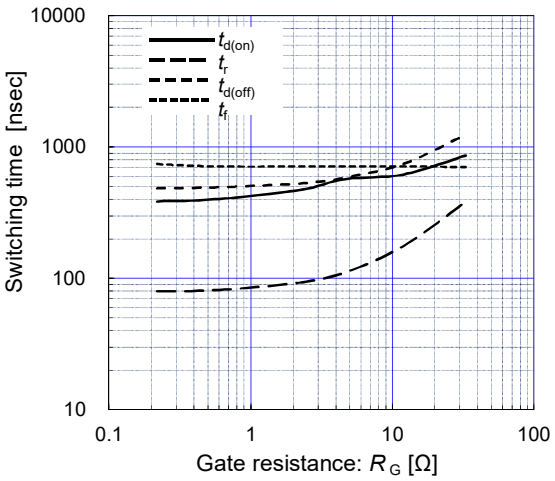
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 900V, I_C = 150A, V_{GE} = ±15V, T_{vj} = 25°C



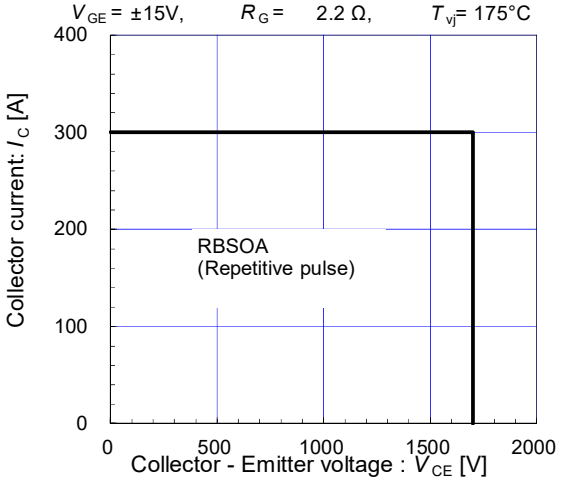
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC} = 900V, R_G = 2.2 Ω, V_{GE} = ±15V, T_{vj} = 175°C



[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC} = 900V, I_C = 150A, V_{GE} = ±15V, T_{vj} = 175°C

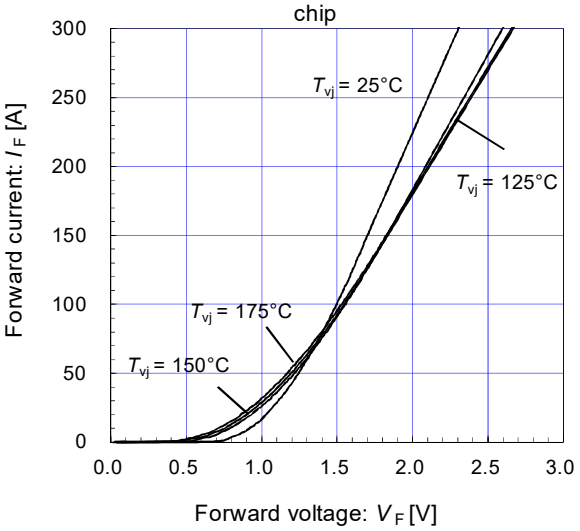


[Inverter]
Reverse bias safe operating area (max.)
V_{GE} = ±15V, R_G = 2.2 Ω, T_{vj} = 175°C

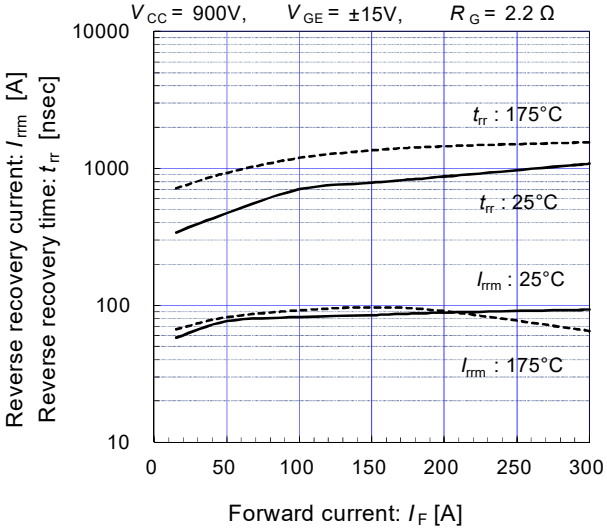


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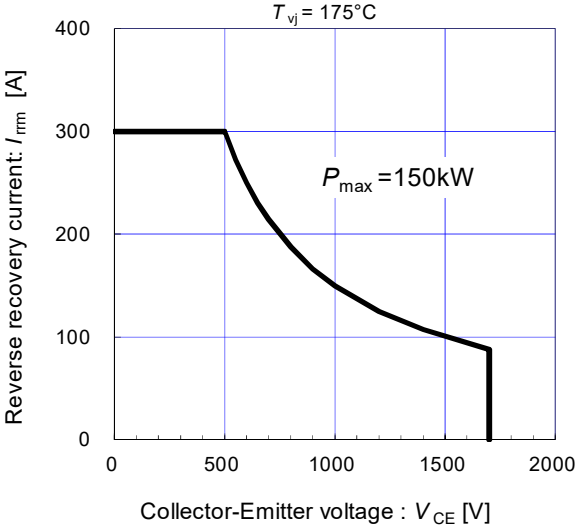
[Inverter]
Forward current vs. Forward voltage (typ.)
chip



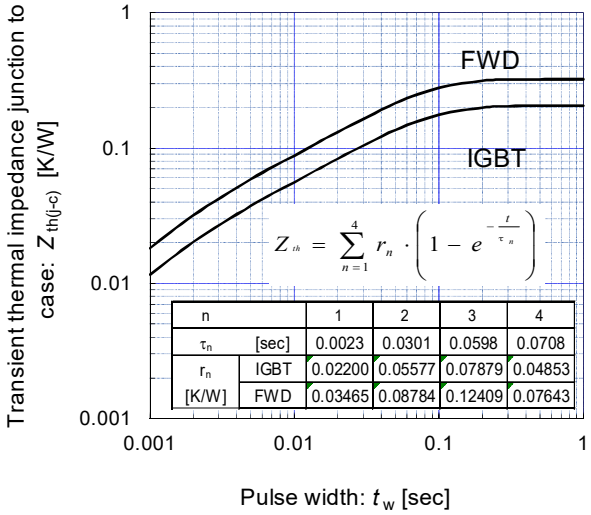
[Inverter]
Reverse recovery characteristics (typ.)
V_{CC} = 900V, V_{GE} = ±15V, R_G = 2.2 Ω



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



[Inverter]
Transient thermal resistance(max.)



n		1	2	3	4
τ_n	[sec]	0.0023	0.0301	0.0598	0.0708
r_n	IGBT	0.02200	0.05577	0.07879	0.04853
[K/W]	FWD	0.03465	0.08784	0.12409	0.07643

Pulse width: t_w [sec]

Warnings

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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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