DFI600HF12I4ME1

1200V/600A Half Bridge IGBT Module

Description

The DFI600HF12I4ME1 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power supply and Motor control.

Features

- Blocking voltage:1200V
- Low saturation voltage $V_{CE(sat)}$
- Low Switching Losses
- 175°C maximum junction temperature
- Thermistor inside

Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Wind Turbine

Circuit diagram

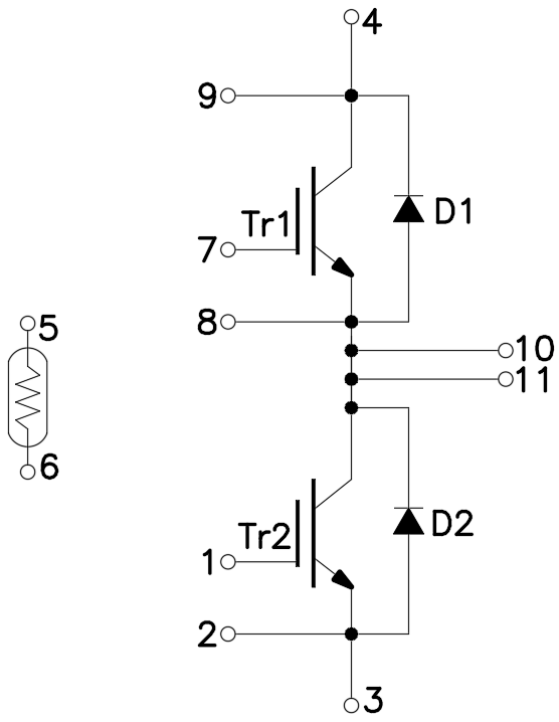


Figure 1. Out drawing & circuit diagram for DFI600HF12I4ME1

Pin Configuration and Marking Information

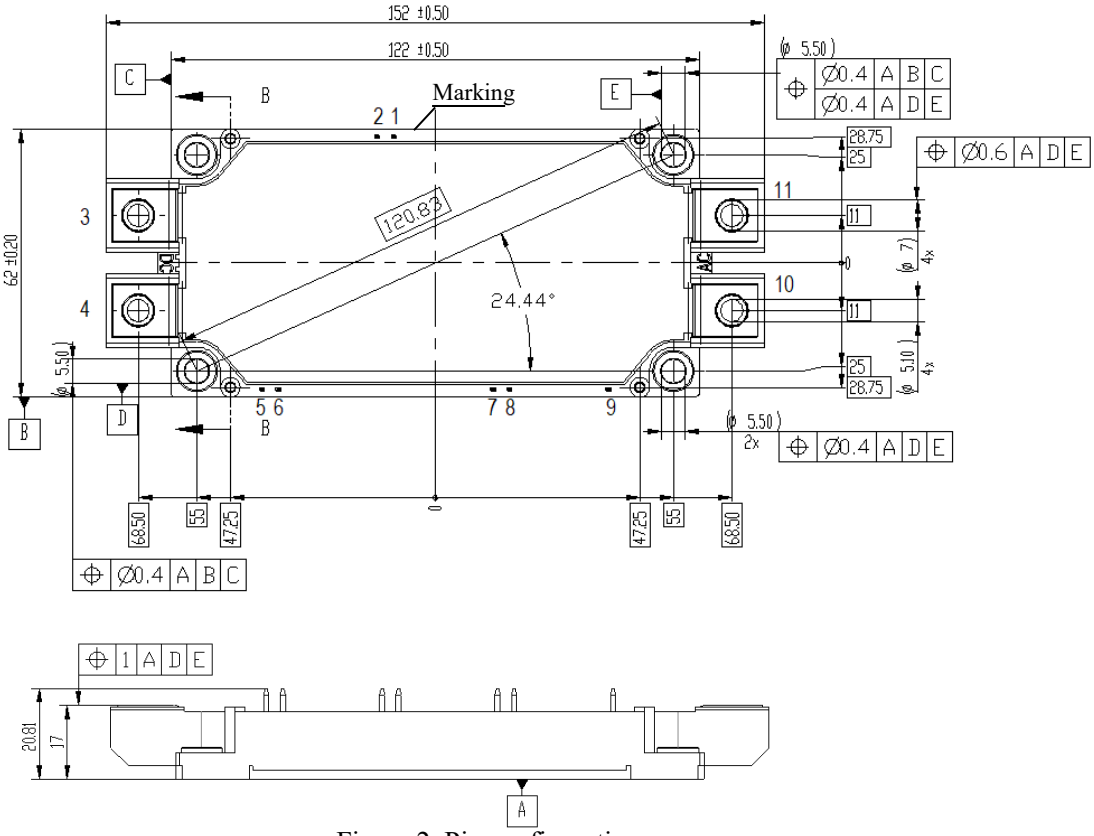


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t =1min	3.4	KV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	14.5 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>200	-
Module lead resistance, terminals – chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	420	g

Maximum Ratings (T_j=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I_C	DC Continuous Collector Current	T_C=100°C	800	A
I_{CM}	Pulse Collector Current	t_p=1ms, Note1	1600	A
P_C	Maximum Power Dissipation	T_C=25°C, T_j=175°C(IGBT)	5000	W
I_F	Diode Forward Current	-	700	A
I_{FRM}	Repetitive peak forward Current	t_p=1ms, Note1	1400	A
I^2t	I^2t-value	V_R=0V, t_p=10ms, T_j=125°C(Diode)	40000	A^2s
I^2t	I^2t-value	V_R=0V, t_p=10ms, T_j=150°C(Diode)	37500	A^2s
T_j	junction temperature	-	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	T_C=25°C	-	5	-	kΩ
ΔR/R	Deviation of R100	T_C=100°C, R_{100}=493Ω	-5	-	5	%
P_{25}	Power dissipation	T_C=25°C	-	-	20	mW
$B_{25/50}$	B-value	R2 = R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))]	-	3375	-	K
$B_{25/80}$	B-value	R2 = R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))]	-	3411	-	K
$B_{25/100}$	B-value	R2 = R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	-	3433	-	K

IGBT Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
$V_{CE(sat)}$ (Chip)	Collector-Emitter Saturation Voltage	I_C=600A, V_{GE}=15V	T_j=25°C	-	1.65	1.95	V
			T_j=150°C	-	1.85	-	V
			T_j=175°C	-	1.90	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C=25mA, V_{CE}=V_{GE}		5.0	-	6.8	V
Q_G	Gate charge	V_{GE}= -15V to +15V		-	4.4	-	uC
R_{Gint}	Internal gate resistor	-	T_j=25°C	-	1.1	-	Ω
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz	T_j=25°C	-	52	-	nF
C_{res}	Reverse transfer Capacitance			-	1.85	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE}=1200V, V_{GE}=0V	T_j=25°C	-	-	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = 20V, V_{CE}=0V	T_j=25°C	-	-	1.5	uA
$t_{d(on)}$	Turn-on delay time	V_{CC}=600V, I_C = 600A, V_{GE}=+15V/-8V, R_G=1.0Ω, Inductive load	T_j=25°C	-	215	-	ns
			T_j=125°C	-	220	-	
			T_j=175°C	-	220	-	
t_r	Rise time		T_j=25°C	-	60	-	ns
			T_j=125°C	-	73	-	
			T_j=175°C	-	75	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	490	-	ns
			T_j=125°C	-	565	-	
			T_j=175°C	-	610	-	
t_f	Fall time		T_j=25°C	-	85	-	ns
			T_j=125°C	-	185	-	
			T_j=175°C	-	295	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	73.31	-	mJ
			T_j=125°C	-	103.2	-	
			T_j=175°C	-	121.6	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	50.40	-	mJ
			T_j=125°C	-	65.79	-	
			T_j=175°C	-	80.39	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.03	-	K/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.02	-	K/W

Freewheeling Diode Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
V_F	Diode Forward Voltage	I_F =600A, V_{GE} =0V	T_j=25°C	-	1. 7	2. 1	V
			T_j=150°C	-	1. 7	-	
			T_j=175°C	-	1.65	-	
t_{rr}	Reverse recovery time	(Switch side) V_{CC} =600V I_C =600A V_{GE} =+15V/-8V R_G =1.0Ω (FRD side) V_{rr} =600V I_F =600A V_{GE} =-8V Inductive load switching operation	T_j=25°C	-	0.51	-	us
			T_j=125°C	-	0.675	-	
			T_j=175°C	-	0.9	-	
I_{RM}	Peak reverse recovery Current		T_j=25°C	-	333	-	A
			T_j=125°C	-	300	-	
			T_j=175°C	-	291	-	
Q_{rr}	Recovered charge		T_j=25°C	-	54.43	-	uC
			T_j=125°C	-	85.92	-	
			T_j=175°C	-	120.81	-	
E_{rr}	Reverse recovered energy		T_j=25°C	-	17.65	-	mJ
			T_j=125°C	-	28.16	-	
			T_j=175°C	-	41.15	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.05	-	K/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.022	-	K/W

Test Conditions

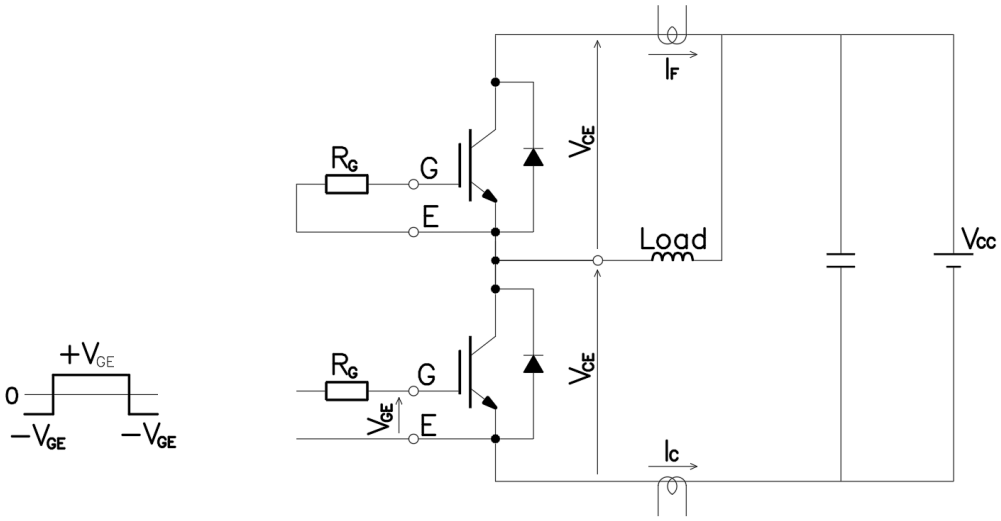


Figure 3. Switching time measure circuit

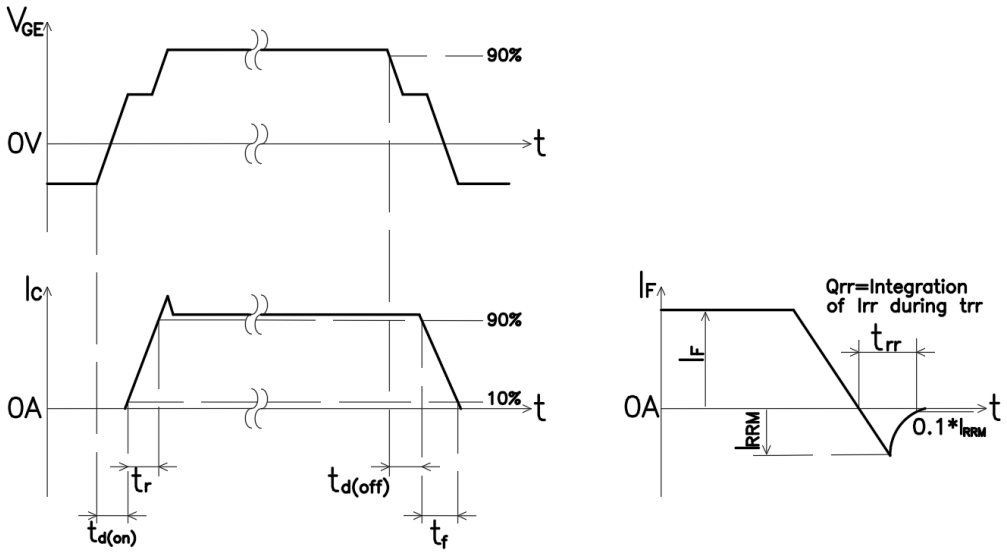


Figure 4. Switching time definition

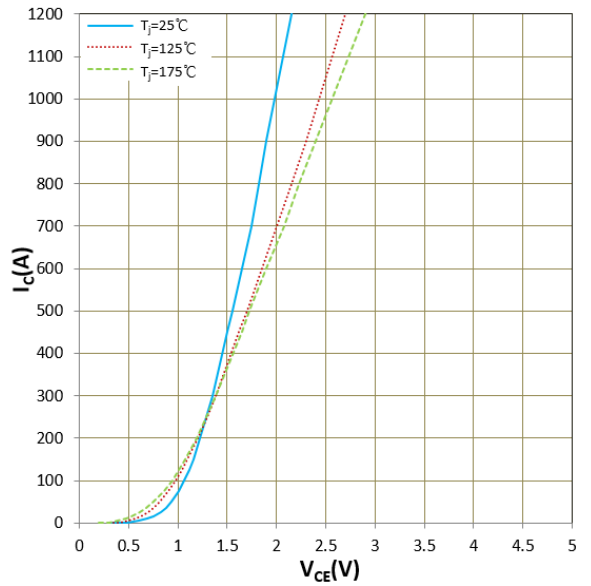


Figure 5. Ic vs V_{CE}
V_{GE}=15V

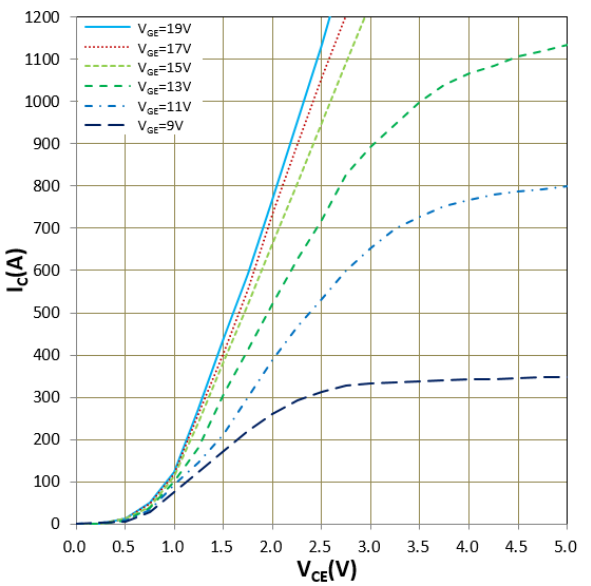


Figure 6. Ic vs V_{CE}
T_j=175°C

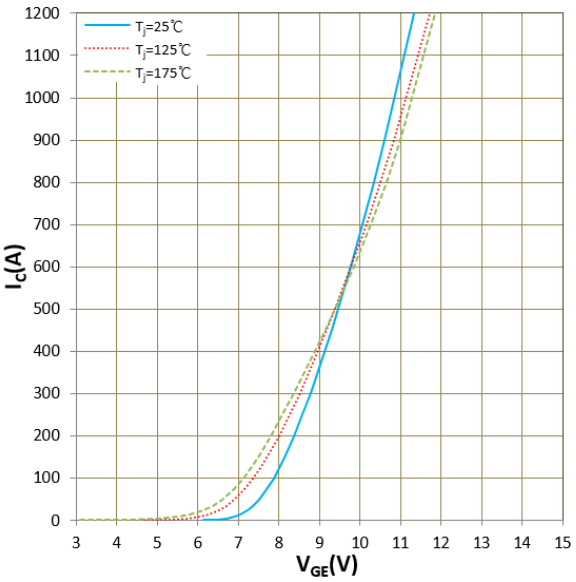


Figure 7. Ic vs V_{GE}
V_{CE} =20V

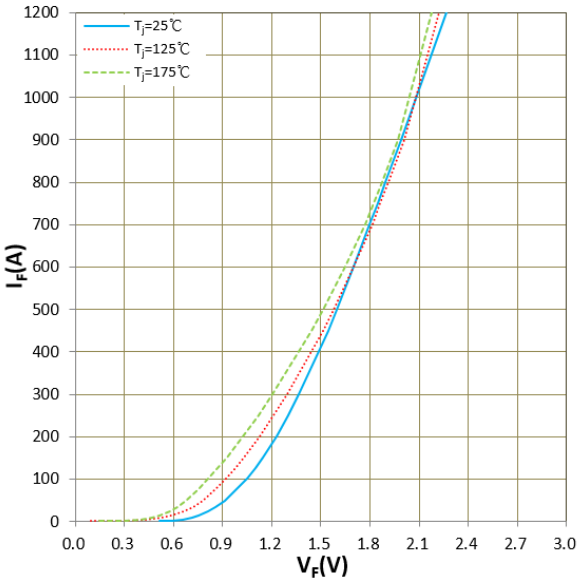


Figure 8. I_F vs V_F

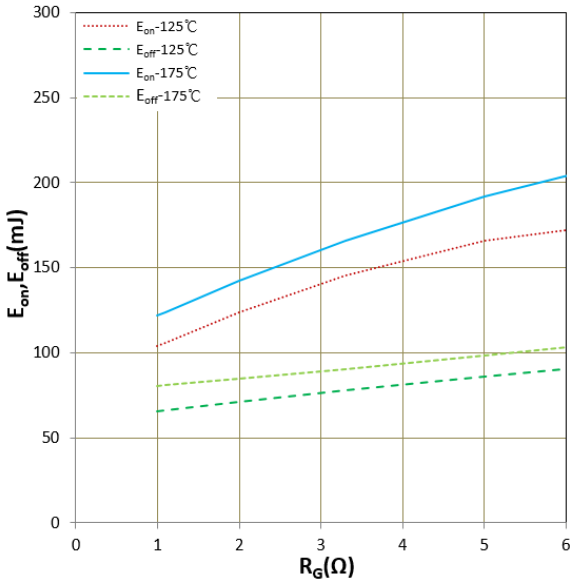


Figure 9. E_{on}, E_{off} vs R_G(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, I_C =600A
Inductive Load

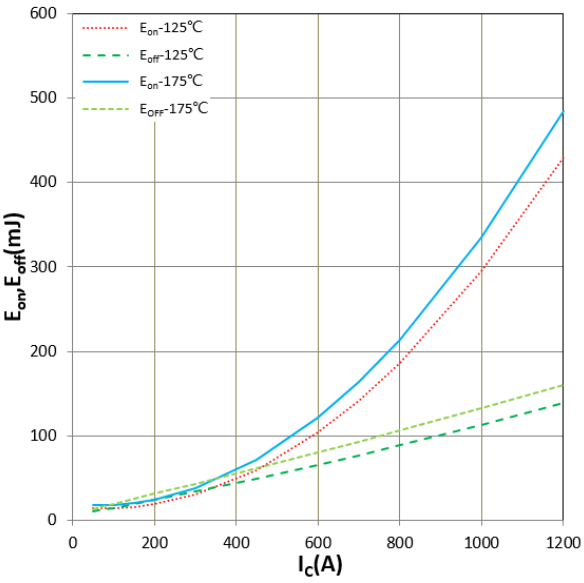


Figure 10. E_{on}, E_{off} vs Ic(Typ)
V_{CC}=600V, V_{GE} =+15V/-8V, R_G =1.0Ω
Inductive Load

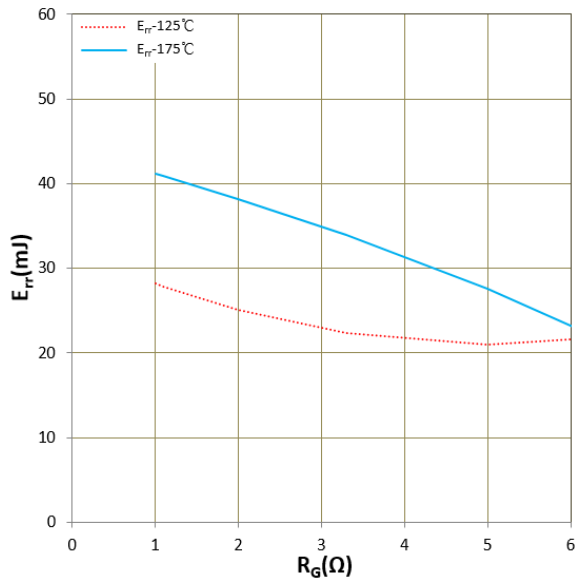


Figure 11. Err vs R_G(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, I_F =600A
Inductive Load

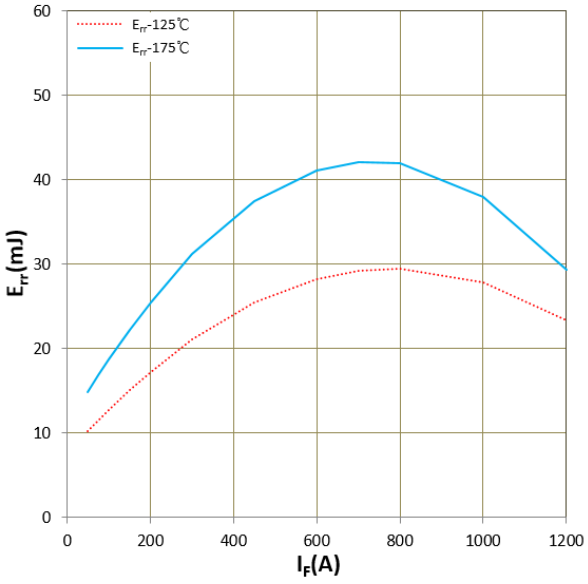


Figure 12. E_{rr} vs I_F(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, R_G =1.0Ω
Inductive Load

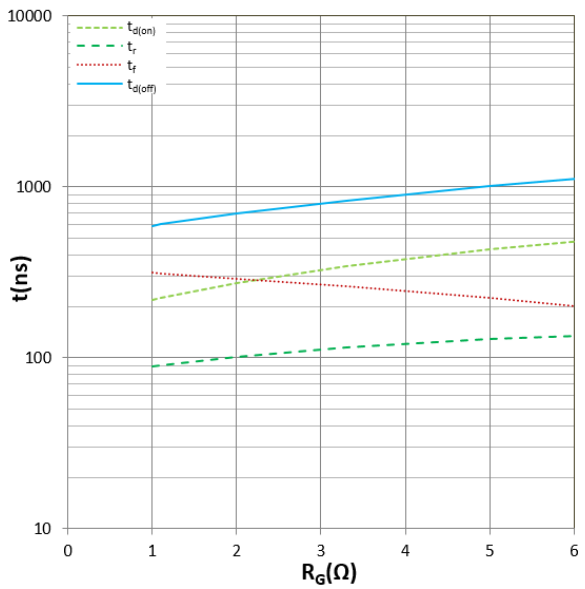


Figure 13. Switching time vs R_G(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, I_C =600A
T_j =175°C, Inductive Load

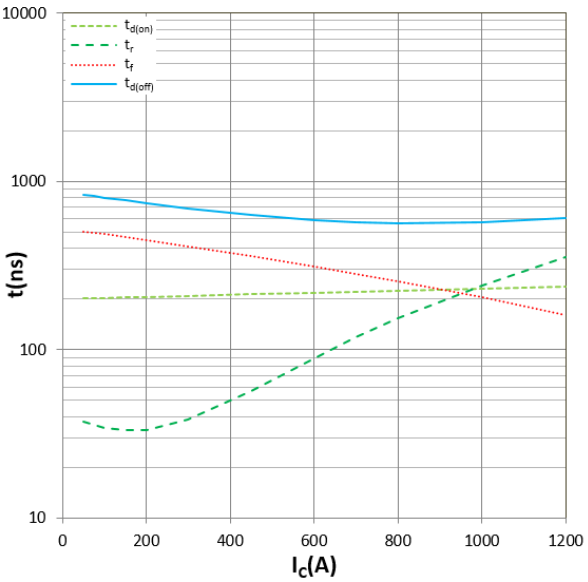


Figure 14. Switching time vs Ic(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, R_G =1.0Ω
T_j =175°C, Inductive Load

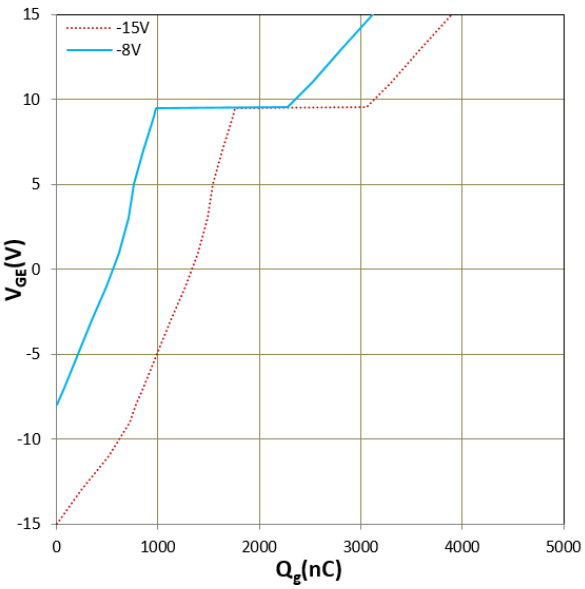


Figure 15. Gate charge

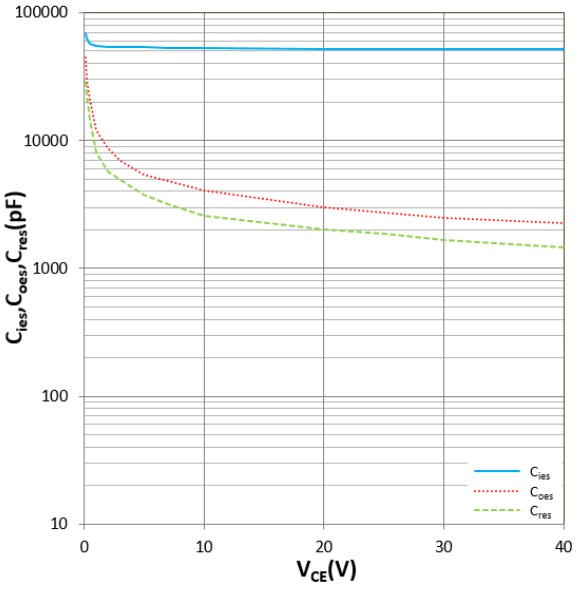
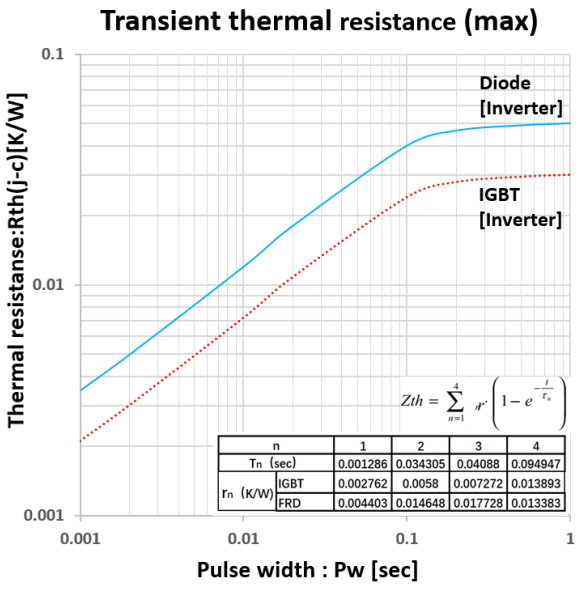


Figure 16. C_{ies}, C_{oes}, C_{res} vs V_{CE}
T_j =25°C, f =1MHz



n		1	2	3	4
τ_n (sec)		0.001286	0.034305	0.04088	0.094947
r_n (K/W)	IGBT	0.002762	0.0058	0.007272	0.013893
	FRD	0.004403	0.014648	0.017728	0.013383

Figure 17. transient thermal impedance
IGBT/Diode

IMPORTANT NOTICE：

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The data contained in this document is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the product's suitability for the intended application and the completeness of the product data concerning such application.

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