DFI900HF17I4RE1N

1700V/900A Half Bridge IGBT Module

Description

The DFI900HF17I4RE1N 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:1700V
- Enhanced FRD
- 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 Turbines

Circuit diagram

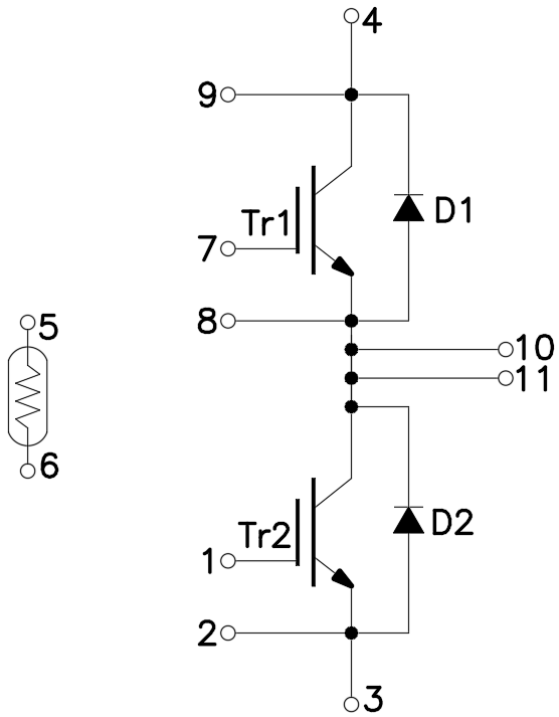


Figure 1. Out drawing & circuit diagram for DFI900HF17I4RE1N

Pin Configuration and Marking Information

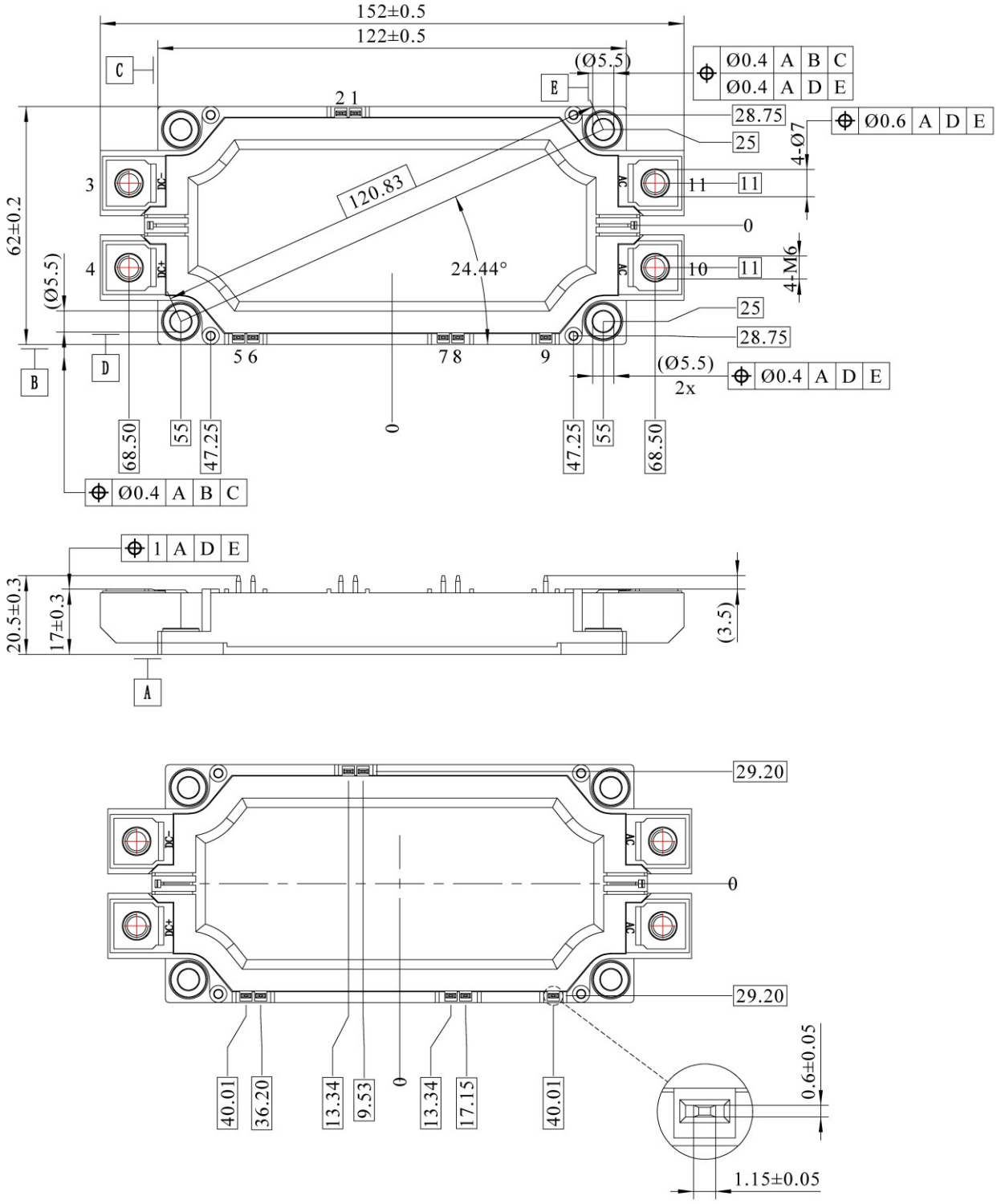


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	4.0	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	-	600	-
Module lead resistance, terminals–chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	350	g

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

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1700	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±30	V
I_C	DC Continuous Collector Current	T_C =105°C	900	A
I_{CM}	Pulse Collector Current	t_p =1ms, Note1	1800	A
P_C	Maximum Power Dissipation	T_C =25°C	5769	W
I_F	Diode Forward Current	-	900	A
I_{FRM}	Repetitive peak forward Current	t_p =1ms, Note1	1800	A
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=900A, V_{GE}=15V	T_j=25°C	-	1.55	-	V
			T_j=150°C	-	1.90	-	V
			T_j=175°C	-	1.95	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C=34mA, V_{CE}=10V	T_j=25°C	5.0	5.5	6.5	V
I_{CES}	Collector- Emitter Cut off Current	V_{CE}=1700V, V_{GE}=0V	T_j=25°C	-	-	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=±30V, V_{CE}=0V	T_j=25°C	-	-	2	uA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz	T_j=25°C	-	62.0	-	nF
C_{oes}	Output Capacitance		T_j=25°C	-	2.3	-	nF
C_{res}	Reverse transfer Capacitance		T_j=25°C	-	0.9	-	nF
Q_G	Gate charge	V_{GE}= -15V to +15V	T_j=25°C	-	7.8	-	uC
R_{Gint}	Internal gate resistor	-	T_j=25°C	-	1.3	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{CC}=900V, I_C=900A, V_{GE}=+15V/-8V, R_G=1.0Ω, Inductive load	T_j=25°C	-	251	-	ns
			T_j=125°C	-	246	-	
			T_j=150°C	-	242	-	
t_r	Rise time		T_j=25°C	-	287	-	ns
			T_j=125°C	-	299	-	
			T_j=150°C	-	305	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	1202	-	ns
			T_j=125°C	-	1508	-	
			T_j=150°C	-	1595	-	
t_f	Fall time		T_j=25°C	-	608	-	ns
			T_j=125°C	-	1131	-	
			T_j=150°C	-	1273	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	420.5	-	mJ
			T_j=125°C	-	532.2	-	
			T_j=150°C	-	566.8	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	304.9	-	mJ
			T_j=125°C	-	387.2	-	
			T_j=150°C	-	408.3	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.026	-	K/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.015	-	K/W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
V_F (Chip)	Diode Forward Voltage	I_F=900A, V_{GE}=0V	T_j=25°C	-	2.00	-	V
			T_j=150°C	-	2.03	-	
			T_j=175°C	-	1.87	-	
t_{rr}	Reverse recovery time	(Switch side) V_{CC}=900V, I_C=900A V_{GE}=+15V/-8V R_G=1.0Ω (FRD side) V_{rr}=900V, I_F=900A V_{GE}=+15V/-8V Inductive load switching operation	T_j=25°C	-	913	-	us
			T_j=125°C	-	1198	-	
			T_j=150°C	-	1329	-	
I_{RM}	Peak reverse recovery Current		T_j=25°C	-	249	-	A
			T_j=125°C	-	324	-	
			T_j=150°C	-	343	-	
Q_{rr}	Recovered charge		T_j=25°C	-	99	-	uC
			T_j=125°C	-	193	-	
			T_j=150°C	-	225	-	
E_{rr}	Reverse recovered energy		T_j=25°C	-	50.6	-	mJ
			T_j=125°C	-	109.5	-	
			T_j=150°C	-	129.2	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.038	-	K/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.020	-	K/W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um

Test Conditions

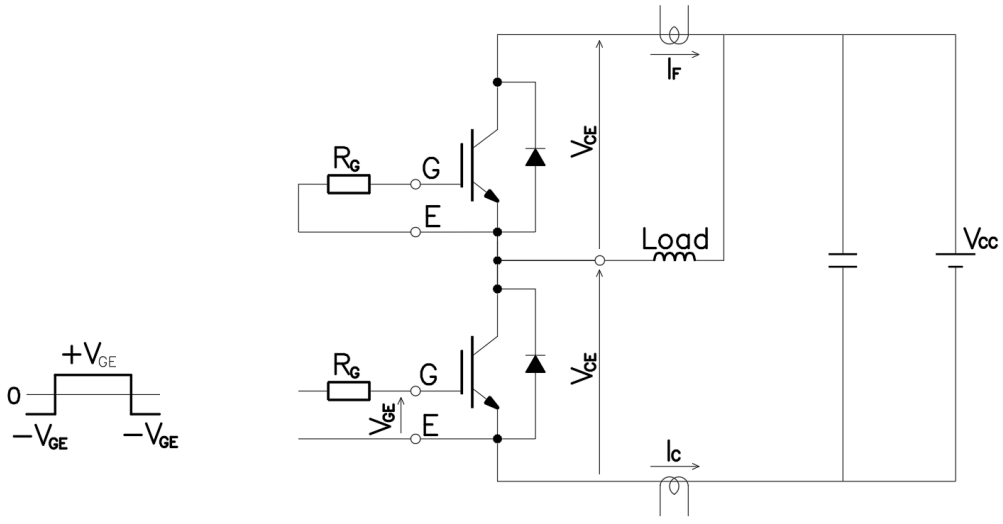


Figure 3. Switching time measure circuit

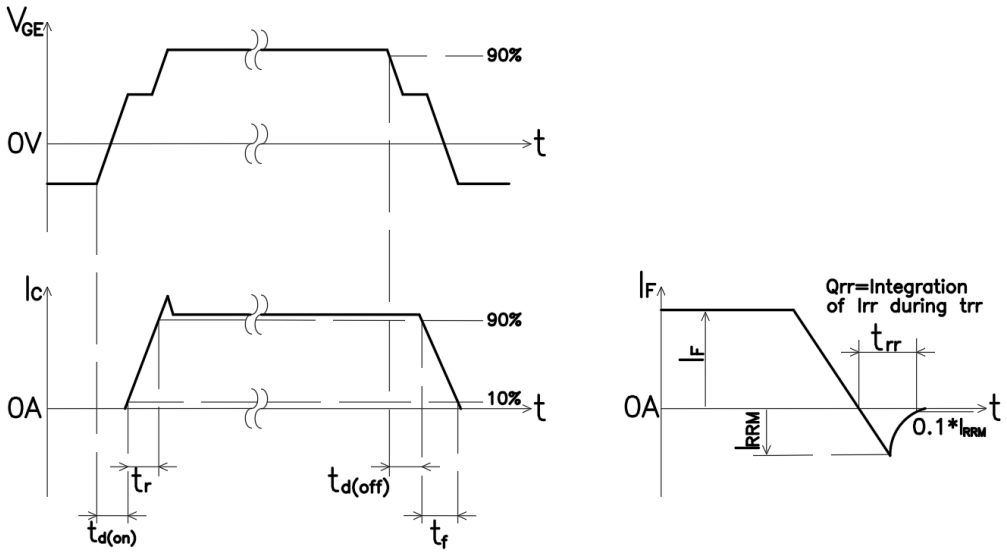


Figure 4. Switching time definition

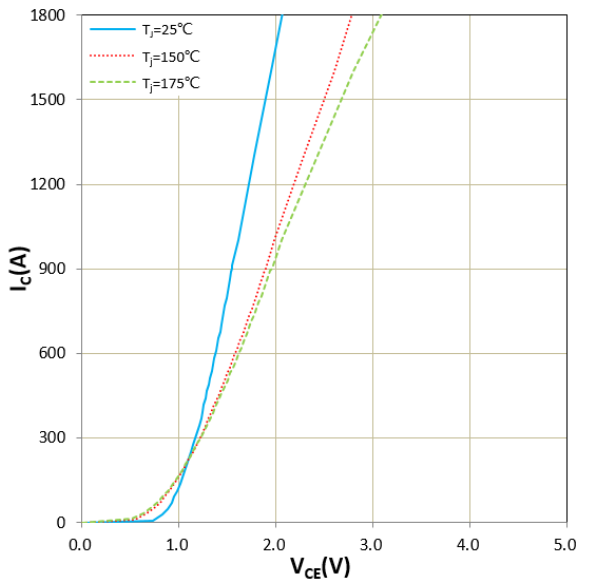


Figure 5. Ic vs V_{CE}
V_{GE}=15V

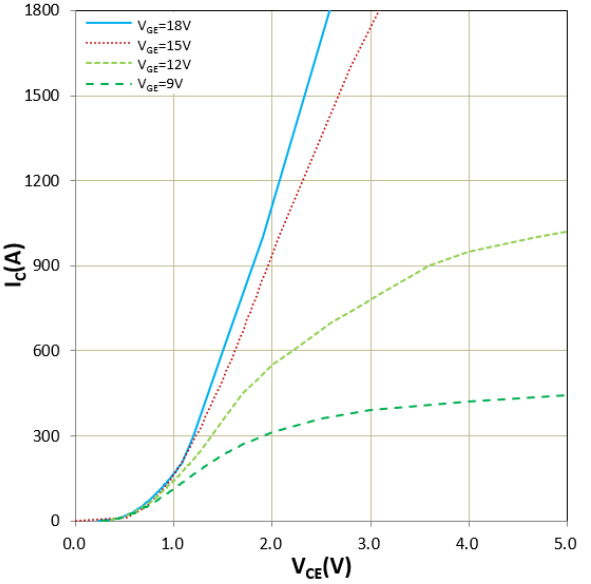


Figure 6. Ic vs V_{CE}
T_j=175°C

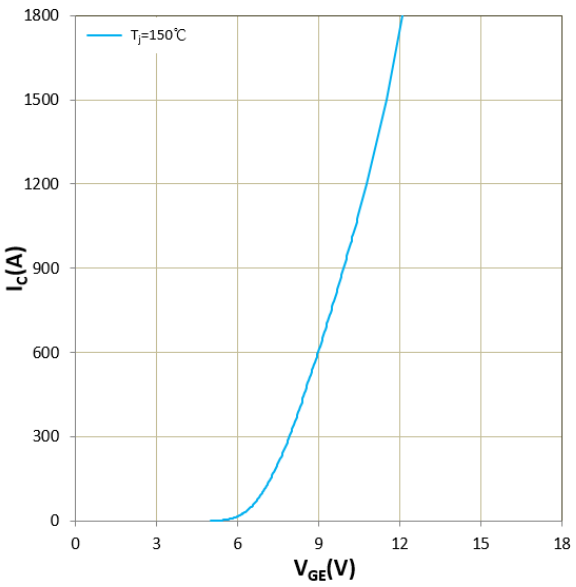


Figure 7. Ic vs V_{GE}
V_{CE} =20V

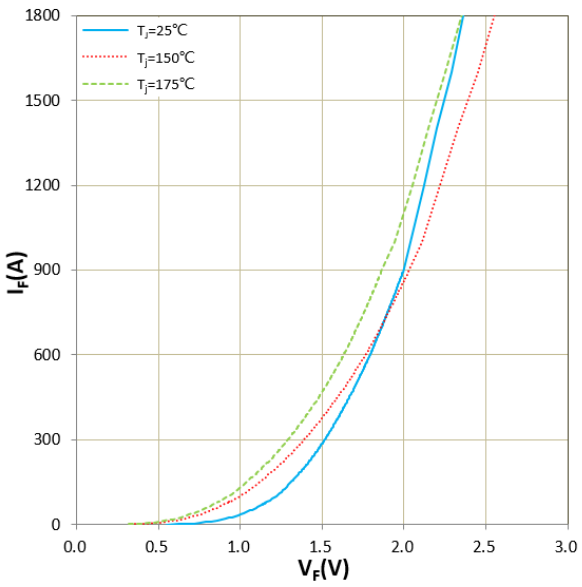


Figure 8. I_F vs V_F

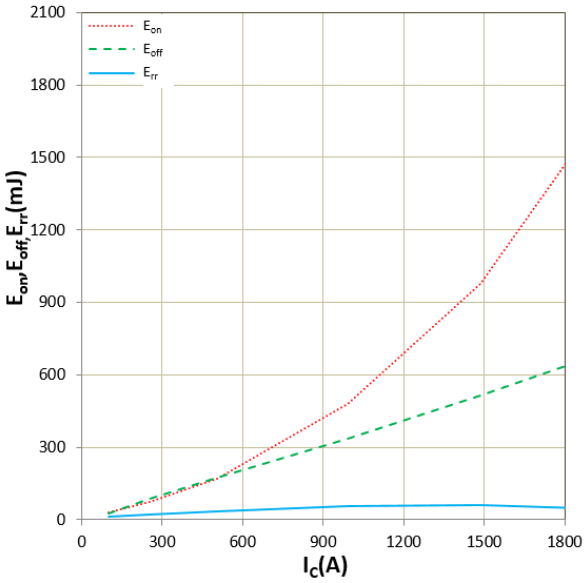


Figure 9. E_{on}, E_{off}, Err vs Ic(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, R_G =1.0Ω
T_j =25°C, Inductive Load

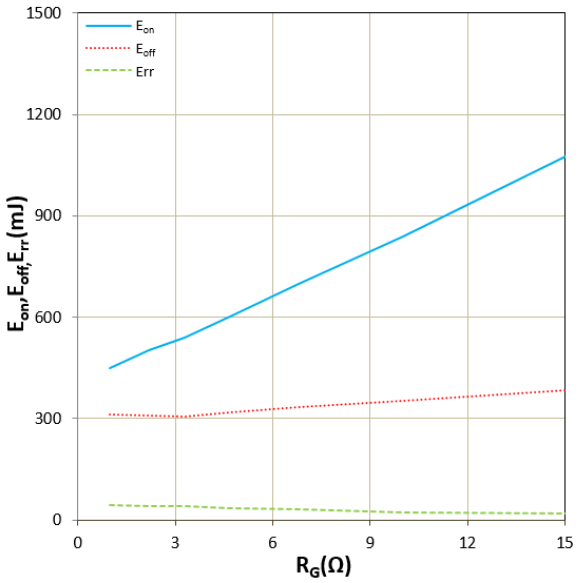


Figure 10. E_{on}, E_{off}, Err vs R_G(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =900A
T_j =25°C, Inductive Load

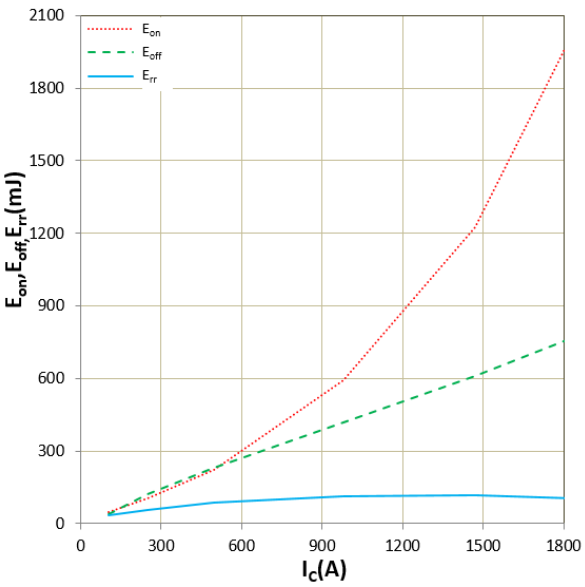


Figure 11. E_{on}, E_{off} vs Ic(Typ)
V_{CC}=900V, V_{GE} =+15V/-8V, R_G =1.0Ω
T_j =125°C, nductive Load

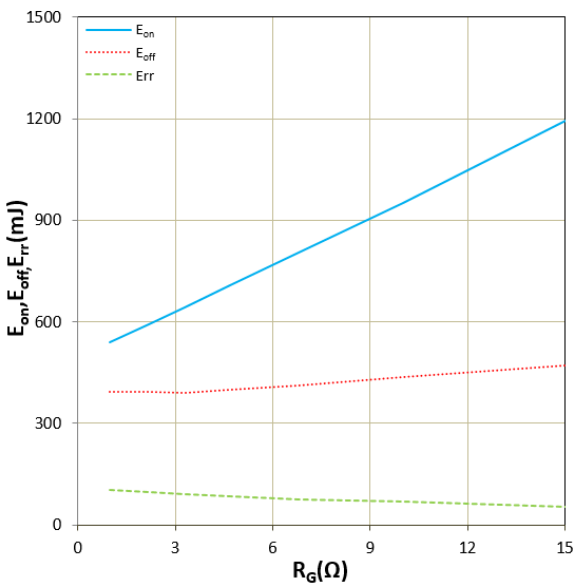


Figure 12. E_{on}, E_{off}, Err vs R_G(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =900A
T_j =125°C, Inductive Load

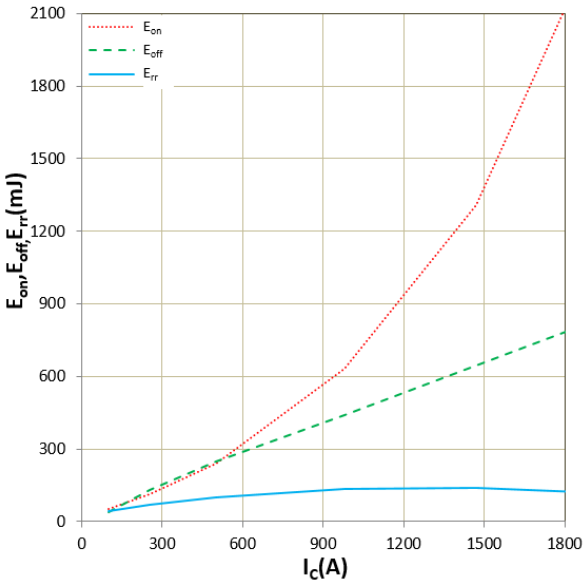


Figure 13. E_{on}, E_{off} vs Ic(Typ)
V_{CC}=900V, V_{GE} =+15V/-8V, R_G =1.0Ω
T_j =150°C, nductive Load

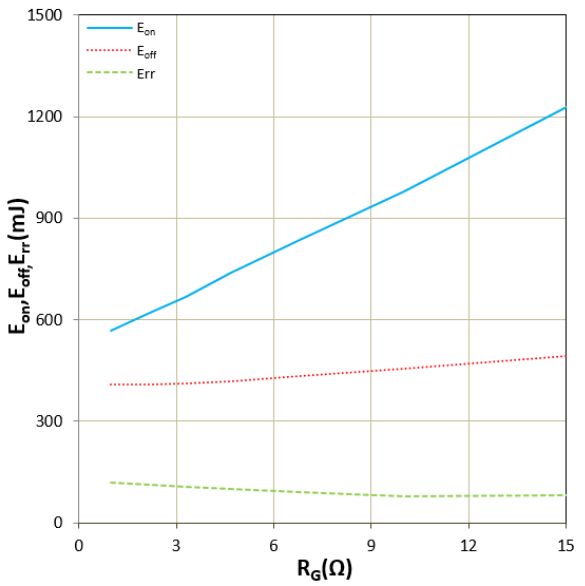


Figure 14. E_{on}, E_{off}, Err vs R_G(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =900A
T_j =150°C, Inductive Load

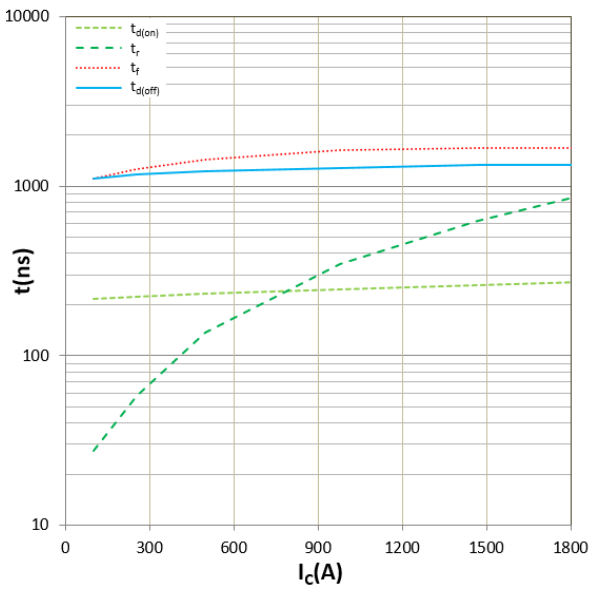


Figure 15. Switching time vs Ic(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, R_G =1.0Ω
T_j =150°C , Inductive Load

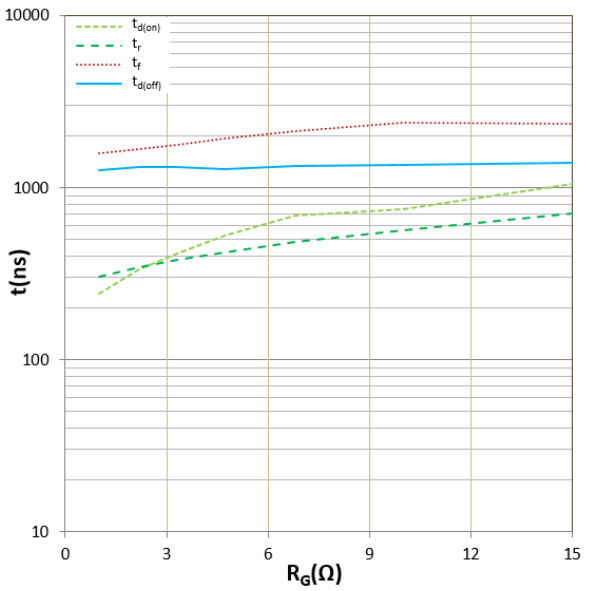


Figure 16. Switching time vs R_G(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =900A
T_j =150°C, Inductive Load

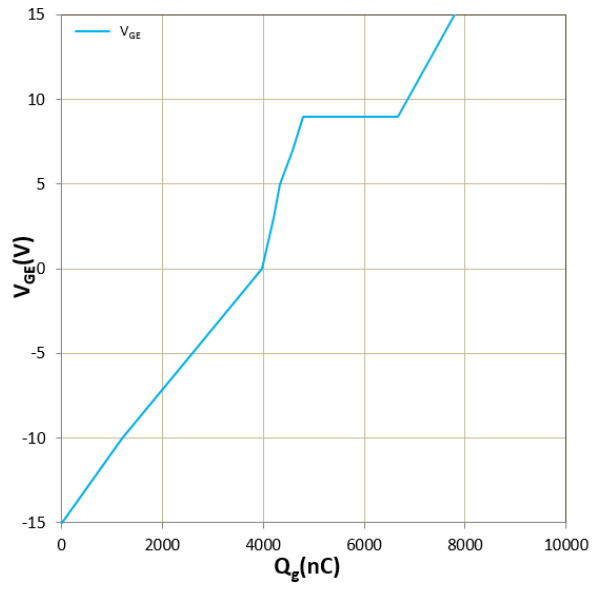


Figure 17. Gate charge

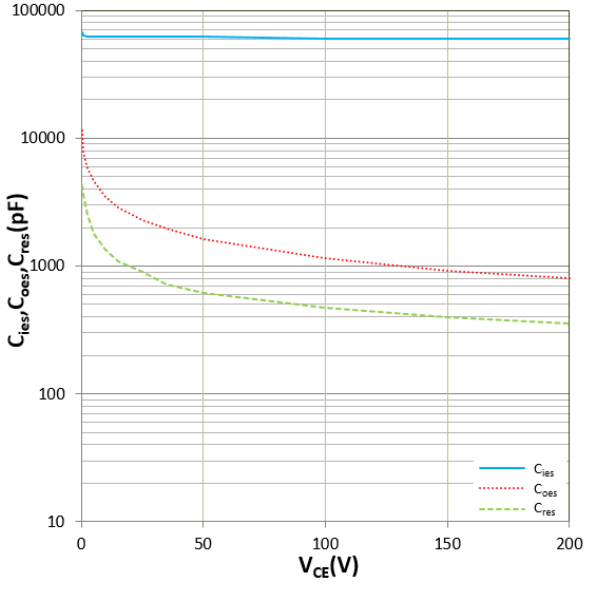
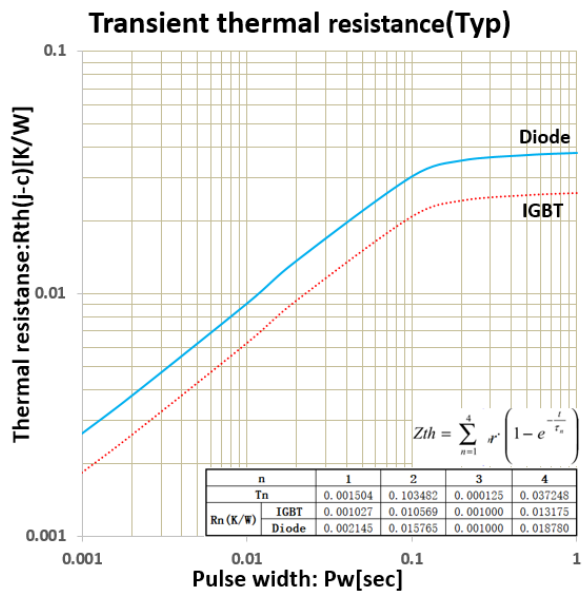


Figure 18. C_{ies}, C_{oes}, C_{res} vs V_{CE}
T_j =25°C, f =1MHz



n		1	2	3	4
Tn		0. 001504	0. 103482	0. 000125	0. 037248
Rn (K/W)	IGBT	0. 001027	0. 010569	0. 001000	0. 013175
	Diode	0. 002145	0. 015765	0. 001000	0. 018780

Figure 19. transient thermal impedance IGBT/Diode

IMPORTANT NOTICE:

This product data sheet describes the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively under the terms and conditions of the supply agreement. There will be no guarantee or of any kind for the product and its characteristics.

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Changes to this product data sheet are reserved.

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