DFI900HF12I4ME7N

1200V/900A Half Bridge IGBT Module

Description

The DFI900HF12I4ME7N is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power Switching Application and Motor control.

Features

- Blocking voltage:1200V
- Low saturation voltage $V_{CE(sat)}$
- Low Switching Losses
- Thermistor inside

Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Uninterrupted Power Supply

Circuit diagram

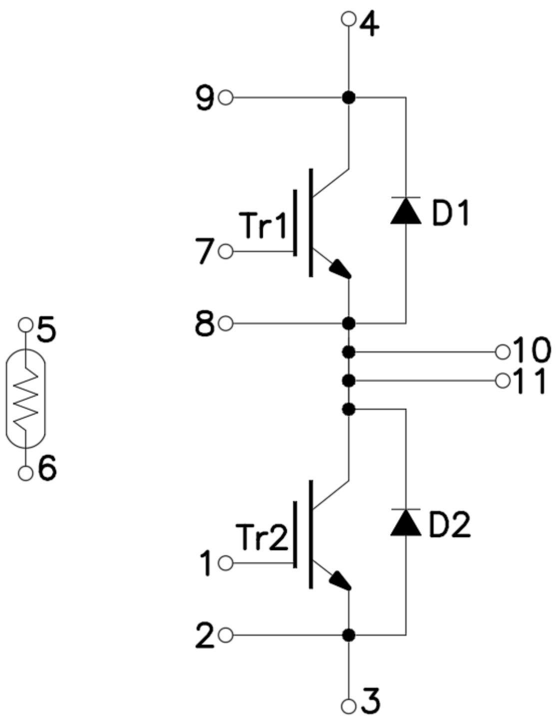

Figure 1. Out drawing & circuit diagram for DFI900HF12I4ME7N

Pin Configuration and Marking Information

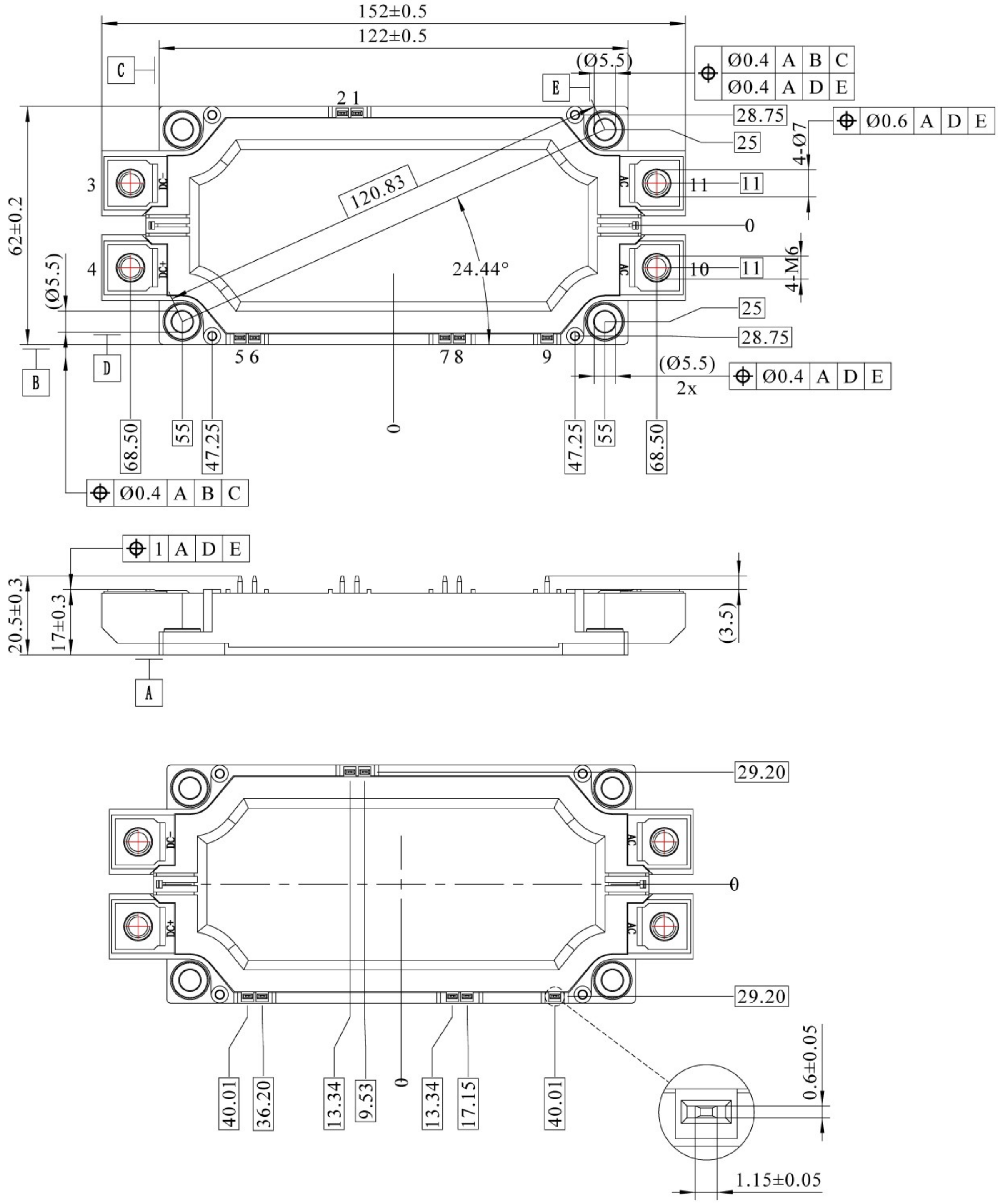

Figure 2. Pin configuration

Module

Parameter	Condition	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	-	>400	-
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	Condition	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, T_j =150°C	900	A
I_{CM}	Pulse Collector Current	t_p =1ms, Note1	1800	A
P_C	Maximum Power Dissipation	T_C =25°C, T_j =150°C(IGBT)	5000	W
I_F	Diode Forward Current	-	900	A
I_{FRM}	Repetitive peak forward Current	t_p =1ms, Note1	1800	A
T_{vjop}	Operating junction temperature	Note2	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Note2: T_{vjop} >150°C is only allowed for operation at overload conditions

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	-	1.72	2.06	V
			T_j =125°C	-	2.00	-	
			T_j =150°C	-	2.10	-	
			T_j =175°C	-	2.18	-	
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C =25mA, V_{CE} =V_{GE}		5.0	-	6.5	V
Q_G	Gate charge	V_{GE} = -15V to +15V		-	7.6	-	uC
R_{Gint}	Internal gate resistor	-	T_j =25°C	-	0.5	-	Ω
C_{ies}	Input Capacitance	V_{CE} =25V, V_{GE} =0V f =1MHz	T_j =25°C	-	133.8	-	nF
C_{oes}	Output Capacitance			-	4.35	-	nF
C_{res}	Reverse transfer Capacitance			-	1.18	-	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 = 900A V_{GE} =+15V/-8V R_g =1.0Ω Inductive load	T_j =25°C	-	289	-	ns
			T_j =150°C	-	325	-	
t_r	Rise time		T_j =25°C	-	110	-	ns
			T_j =150°C	-	138	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	483	-	ns
			T_j =150°C	-	548	-	
t_f	Fall time		T_j =25°C	-	163	-	ns
			T_j=150°C	-	292	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	64.24	-	mJ
			T_j =150°C	-	92.36	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	89.56	-	mJ
			T_j =150°C	-	114.98	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.025	-	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 2.8W/m·K and thickness is 50um.

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

Symbol	Item	Condition		Value Min.	Value Typ.	Value Max.	Unit
V_F	Diode Forward Voltage	I_F =900A V_{GE} =0V	T_j=25°C	-	1.69	2. 03	V
			T_j=125°C	-	1.58	-	
			T_j=150°C	-	1.55	-	
			T_j=175°C	-	1.50	-	
T_{rr}	Reverse recovery time	V_{CC}=600V I_F=900A V_{GE}=+15/-8V R_g=1.0Ω Inductive load switching operation	T_j=25°C	-	685	-	ns
			T_j=150°C	-	864	-	
I_{RM}	Peak reverse recovery Current		T_j=25°C	-	565	-	A
			T_j=150°C	-	609	-	
Q_{rr}	Reverse recovery charge		T_j=25°C	-	0.161	-	uC
			T_j=150°C	-	0.242	-	
E_{rr}	Reverse recovered energy		T_j=25°C	-	75.50	-	mJ
			T_j=150°C	-	112.32	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.045	-	K/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied), Note1			-	0.025	-	K/W

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

Test Conditions

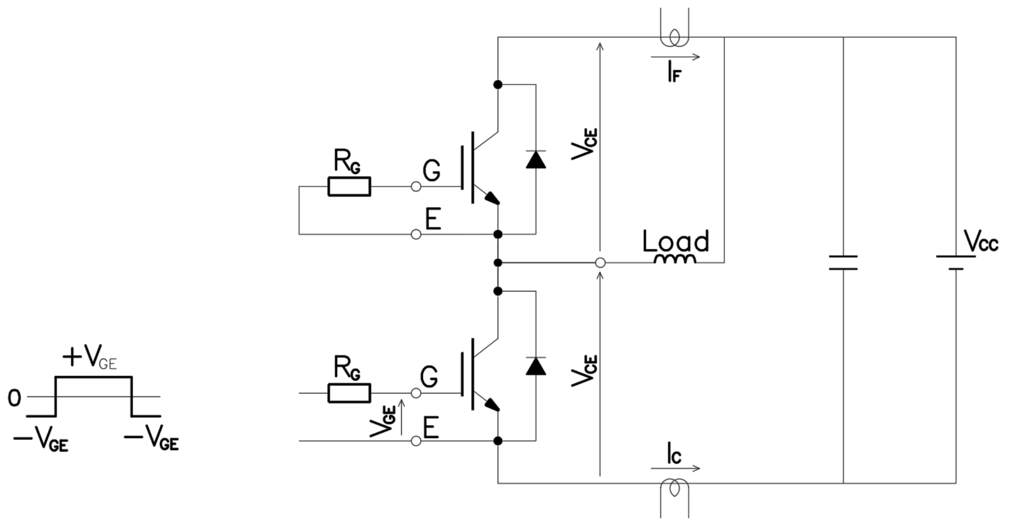

Figure 3. Switching time measure circuit

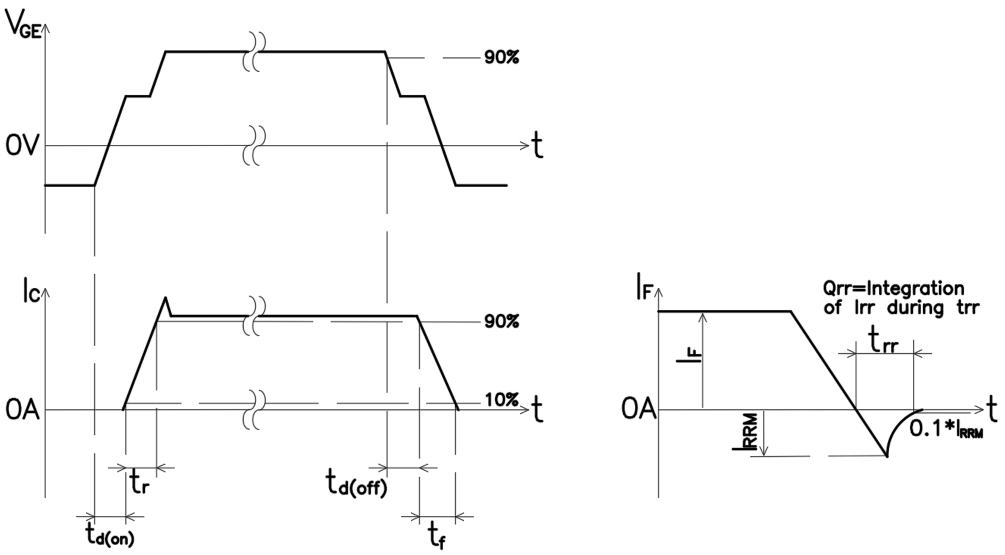

Figure 4. Switching time definition

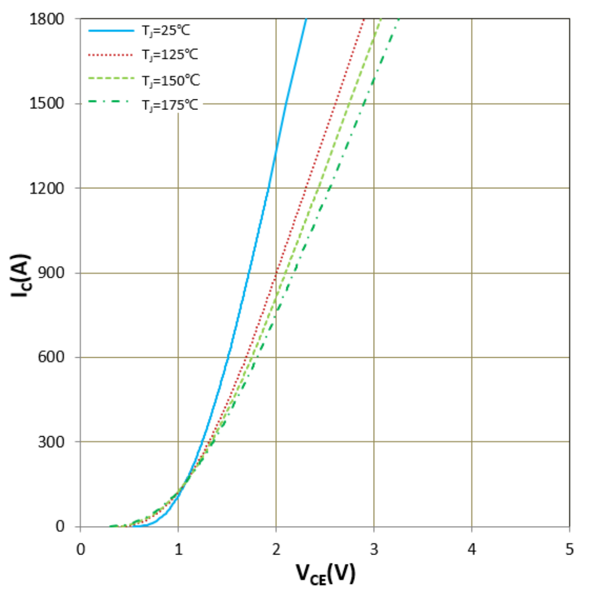

Figure 5. Ic vs V_{CE}

V_{GE} =15V

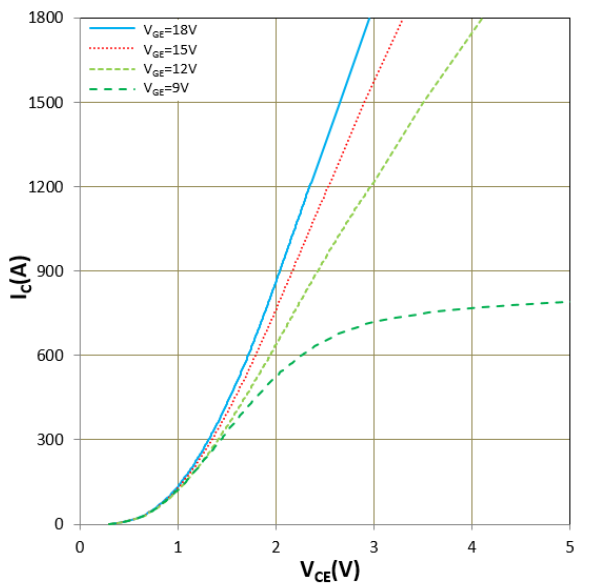

Figure 6. Ic vs V_{CE}

T_j =175°C

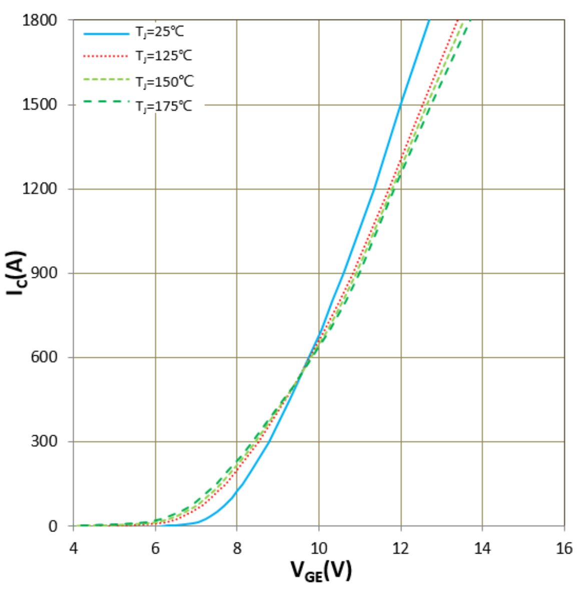

Figure 7. Ic vs V_{GE}
V_{CE} =20V

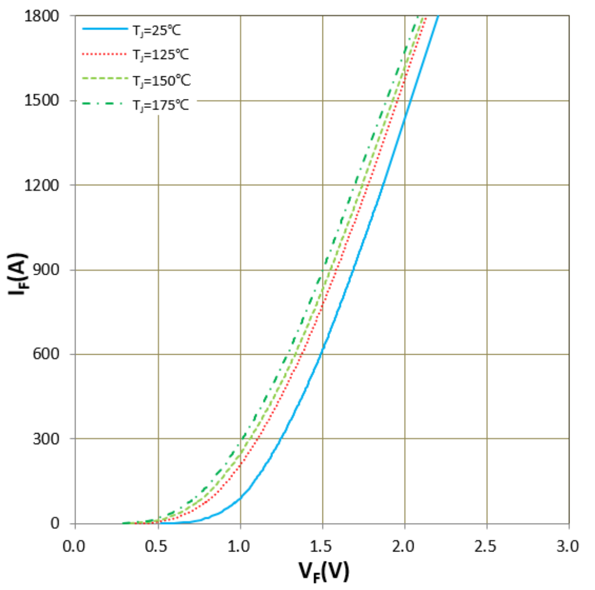

Figure 8. I_F vs V_F

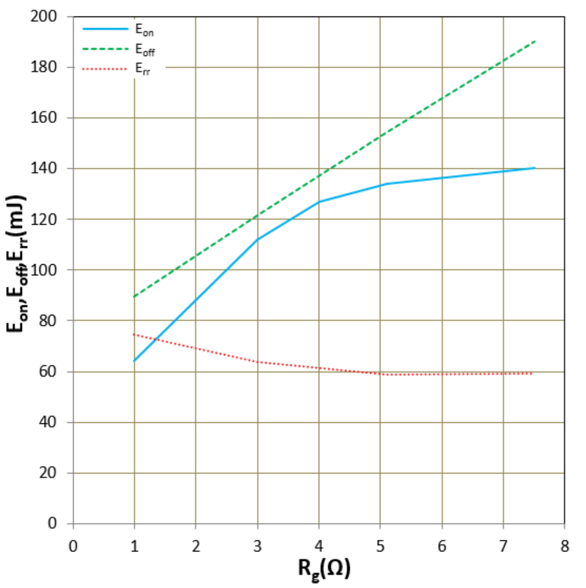

Figure 9. E_{on}, E_{off}, E_{rr} vs R_g (Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, I_C =900A, T_j =25°C
Inductive Load

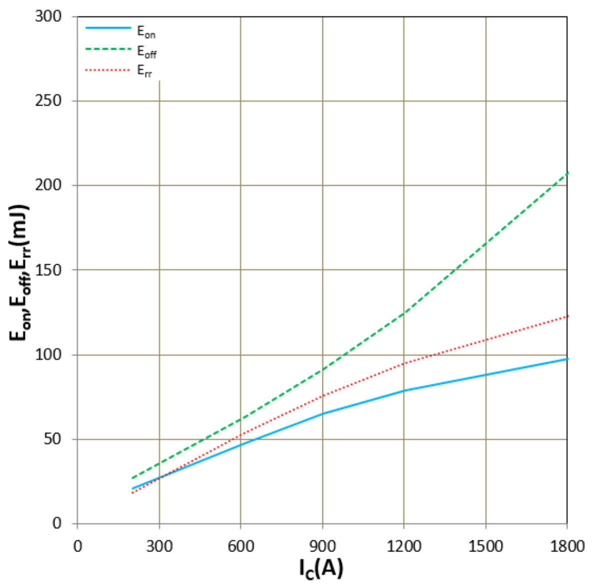

Figure 10. E_{on}, E_{off}, E_{rr} vs Ic (Typ)
V_{CC}=600V, V_{GE} =+15V/-8V, R_g =1.0Ω, T_j =25°C
Inductive Load

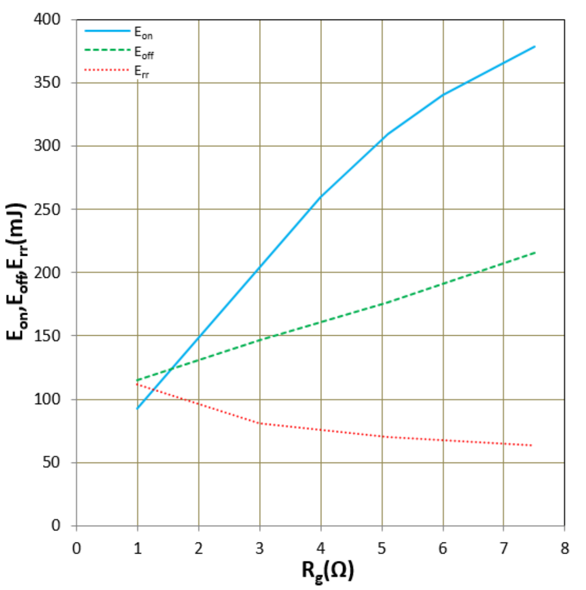

Figure 11. E_{on}, E_{off}, E_{rr} vs R_g (Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, I_C =900A, T_j =150°C
Inductive Load

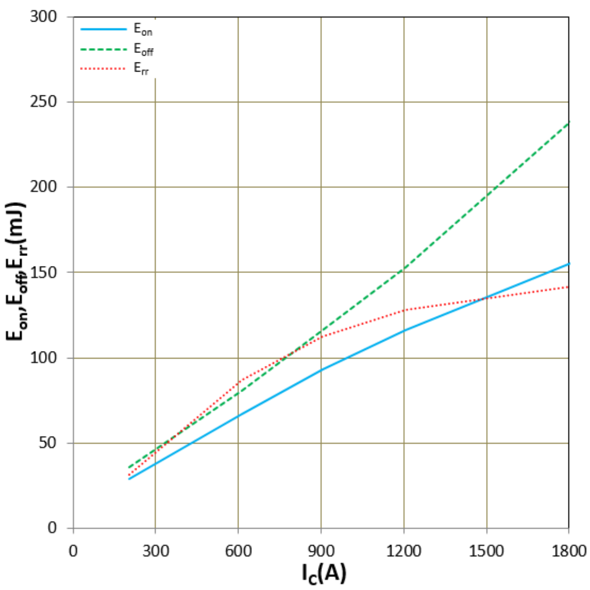

Figure 12. E_{on}, E_{off}, E_{rr} vs Ic (Typ)
V_{CC}=600V, V_{GE} =+15V/-8V, R_g =1.0Ω, T_j =150°C
Inductive Load

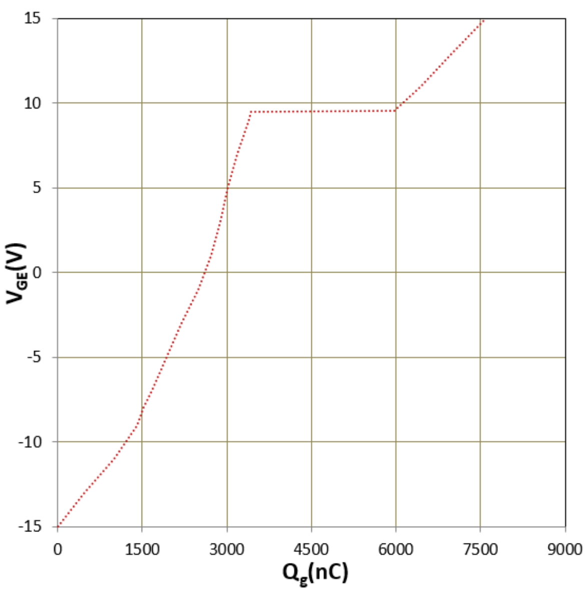

Figure 13. Gate charge
V_{CC} =600V, I_C =900A, T_j =25°C

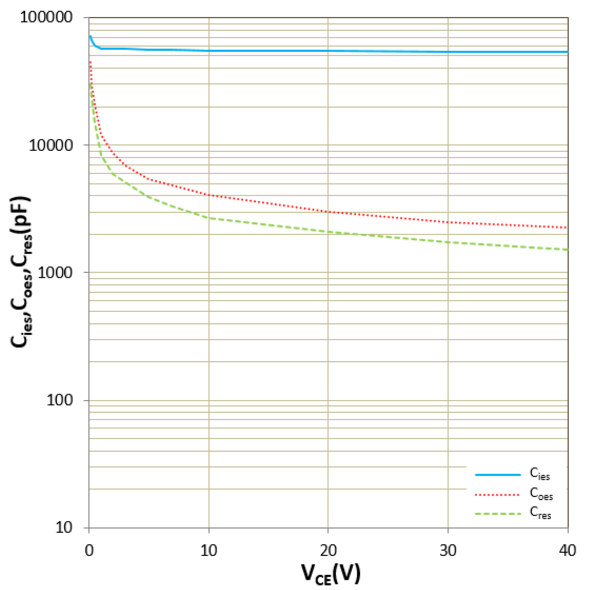

Figure 14. C_{ies}， C_{oes}， C_{res} vs V_{CE}
T_j =25°C, f =1MHz

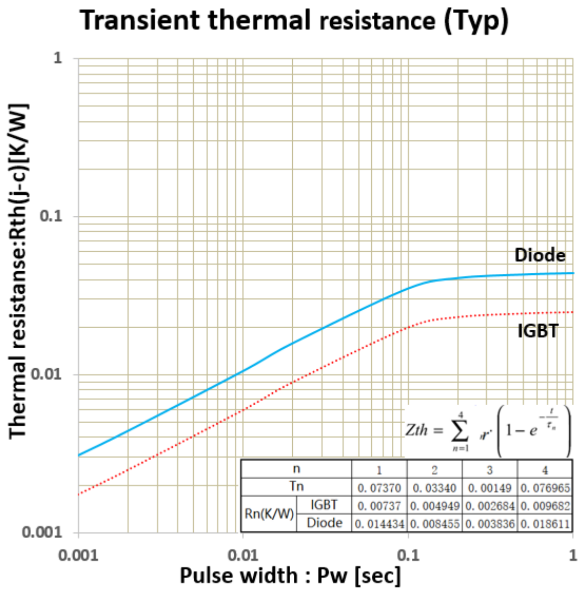

Figure 15. transient thermal impedance
IGBT/Diode

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