

Description

The DFI900HF12I4A1 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

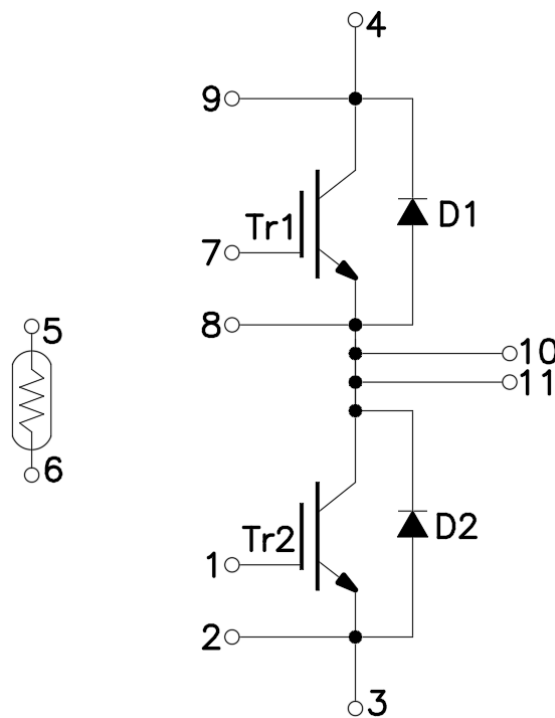


Figure 1. Out drawing & circuit diagram for DFI900HF12I4A1

Pin Configuration and Marking Information

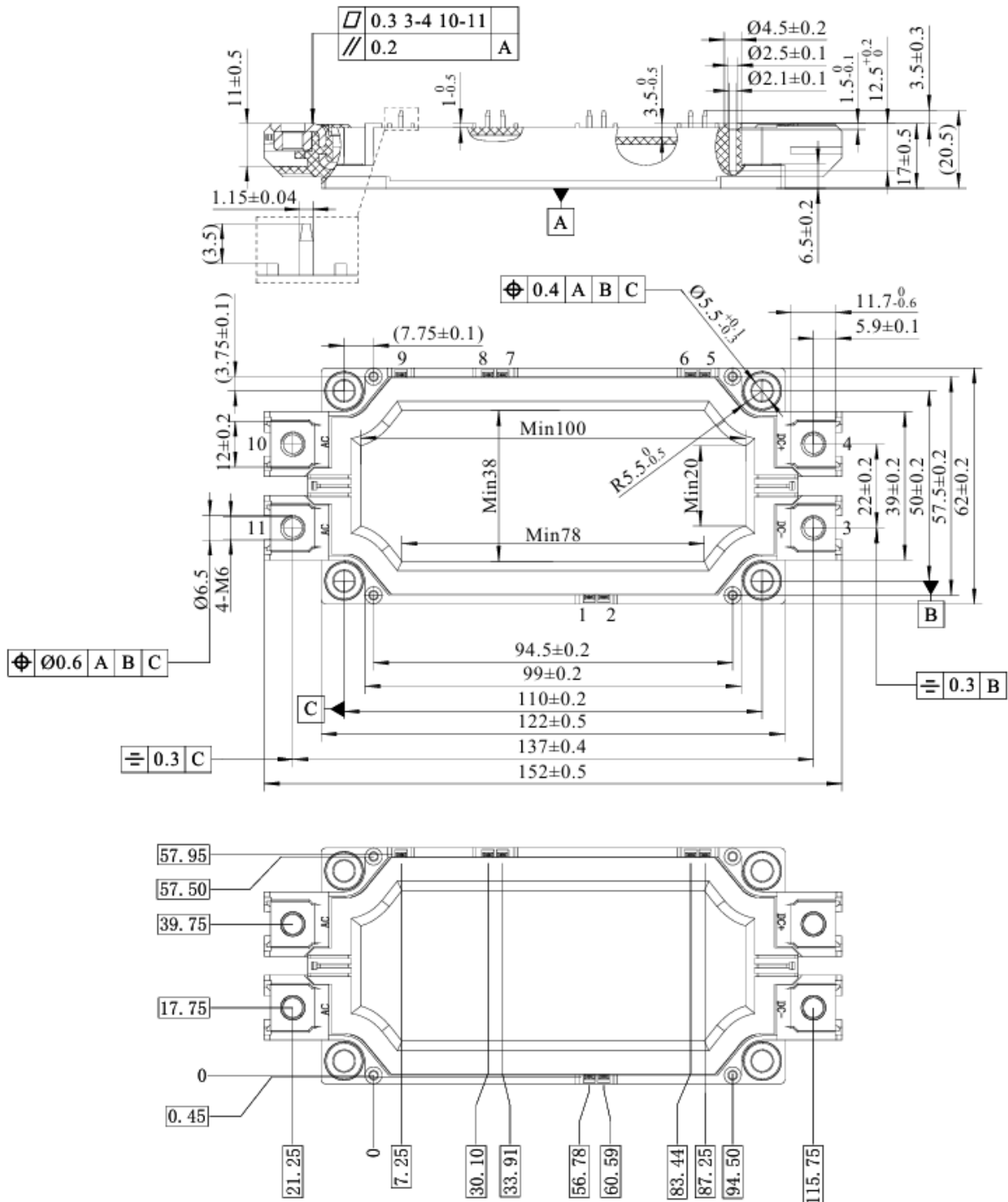


Figure 2. Pin configuration

Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	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	0.95	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 =75°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)	3204	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	R ₂ = R ₂₅ exp [B _{25/50} (1/T ₂ - 1/(298,15 K))]	-	3375	-	K
B _{25/80}	B-value	R ₂ = R ₂₅ exp [B _{25/80} (1/T ₂ - 1/(298,15 K))]	-	3411	-	K
B _{25/100}	B-value	R ₂ = R ₂₅ exp [B _{25/100} (1/T ₂ - 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	-	1.6	2.06	V
			T _j =125°C	-	1.75	-	
			T _j =150°C	-	1.9	-	
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =25mA, V _{CE} =V _{GE}		-	5	-	V
Q _G	Gate charge	V _{GE} = -15V to +15V		-	6	-	uC
R _{Gint}	Internal gate resistor	-	T _j =25°C	-	1	-	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V f=1MHz	T _j =25°C	-	114	-	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} = ± 20 V	T _j =25°C	-	-	0.1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = 20V, V _{CE} =0V	T _j =25°C	-	-	5	nA
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C = 900A V _{GE} =+15V/-8V R _g =7.5Ω Inductive load	T _j =25°C	-	300	-	ns
			T _j =125°C	-	350	-	
			T _j =150°C	-	350	-	
t _r	Rise time		T _j =25°C	70	-	200	ns
			T _j =125°C	90	-	275	
			T _j =150°C	100	-	300	
t _{d(off)}	Turn-off delay time		T _j =25°C	-	400	-	ns
			T _j =125°C	-	475	-	
			T _j =150°C	-	500	-	
t _f	Fall time	T _j =25°C	-	190	-	ns	
		T _j =125°C	-	200	-		
		T _j =150°C	-	200	-		
E _{on}	Turn-on power dissipation	T _j =25°C	105	-	-	mJ	
		T _j =125°C	150	-	-		
		T _j =150°C	168	-	240		
E _{off}	Turn-off power dissipation	T _j =25°C	-	132	-	mJ	
		T _j =125°C	-	170	-		
		T _j =150°C	-	192	-		
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-	0.048	-	K/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied), Note1			-	0.029	-	K/W

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

Freewheeling Diode Electrical characteristics ($T_j=25^\circ\text{C}$ unless otherwise specified, chip)

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max.		
V_F	Diode Forward Voltage	$I_F=900\text{A}$ $V_{GE}=0\text{V}$	$T_j=25^\circ\text{C}$	-	1.65		V
			$T_j=125^\circ\text{C}$	-	-	-	
			$T_j=150^\circ\text{C}$	-	1.7	-	
T_{rr}	Reverse recovery time		$T_j=25^\circ\text{C}$	-	-	-	ns
			$T_j=125^\circ\text{C}$	-	-	-	
			$T_j=150^\circ\text{C}$	-	-	800	
I_{RM}	Peak reverse recovery Current	$V_{CC}=600\text{V}$ $I_F=900\text{A}$ $V_{GE}=+15/-8\text{V}$	$T_j=25^\circ\text{C}$	-	966	-	A
			$T_j=125^\circ\text{C}$	-	-	-	
			$T_j=150^\circ\text{C}$	-	1041	-	
Q_{rr}	Reverse recovery charge	$R_g=7.5\Omega$ Inductive load switching operation	$T_j=25^\circ\text{C}$	-	104	-	uC
			$T_j=125^\circ\text{C}$	-	-	-	
			$T_j=150^\circ\text{C}$	-	180	-	
E_{rr}	Reverse recovered energy		$T_j=25^\circ\text{C}$	-	54	-	mJ
			$T_j=125^\circ\text{C}$	-	62	-	
			$T_j=150^\circ\text{C}$	-	84	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)		-	0.087	-	K/W	
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied), Note1		-	0.048	-	K/W	

Note1: Assumes Thermal Conductivity of grease is $2.8\text{W/m}\cdot\text{K}$ and thickness is $50\mu\text{m}$.

Test Conditions

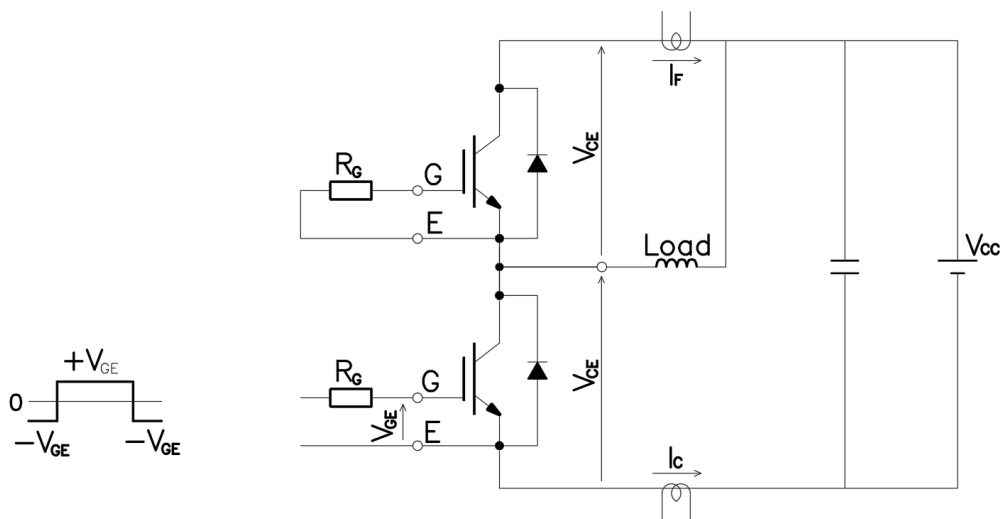


Figure 3. Switching time measure circuit

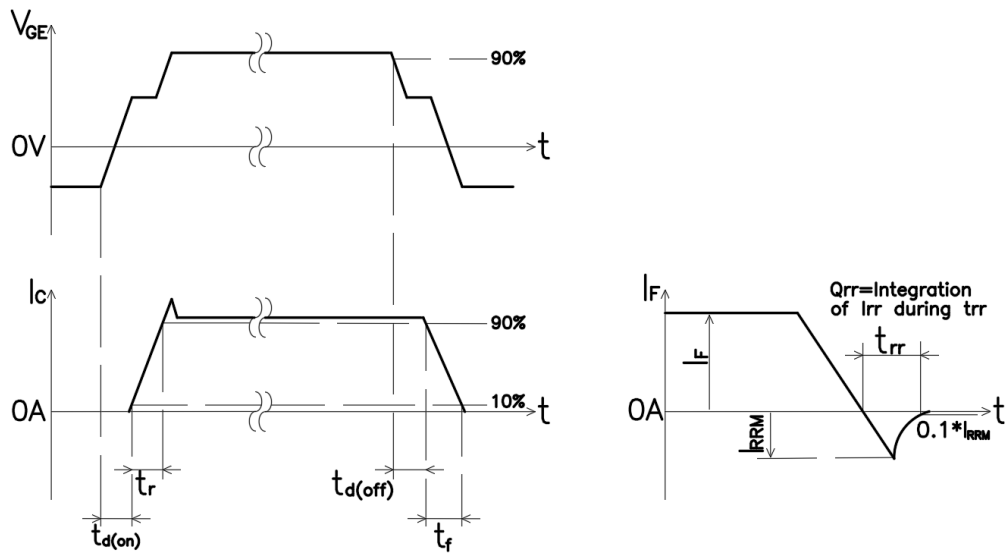
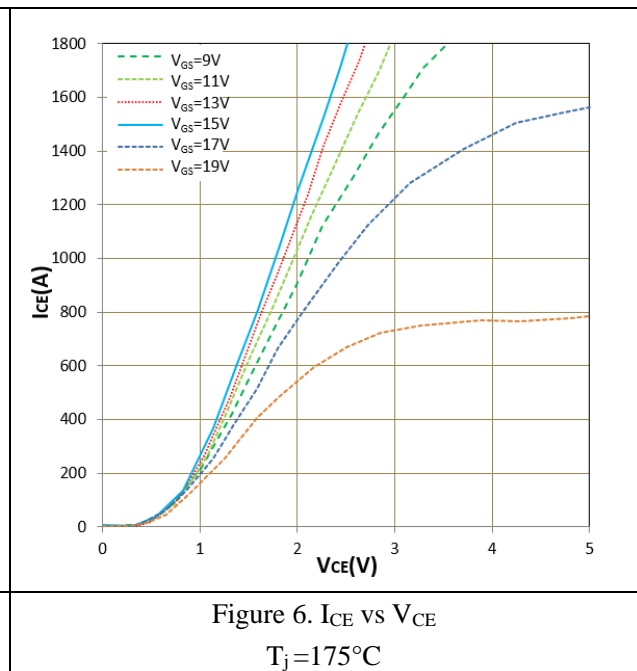
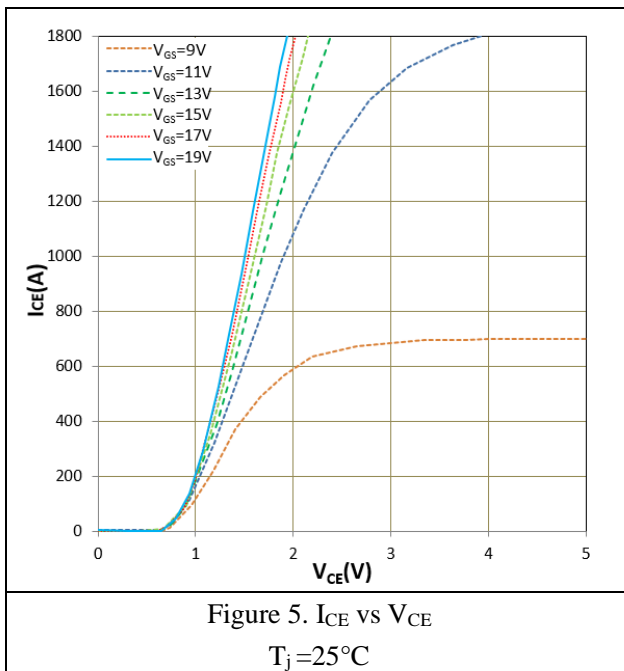


Figure 4. Switching time definition



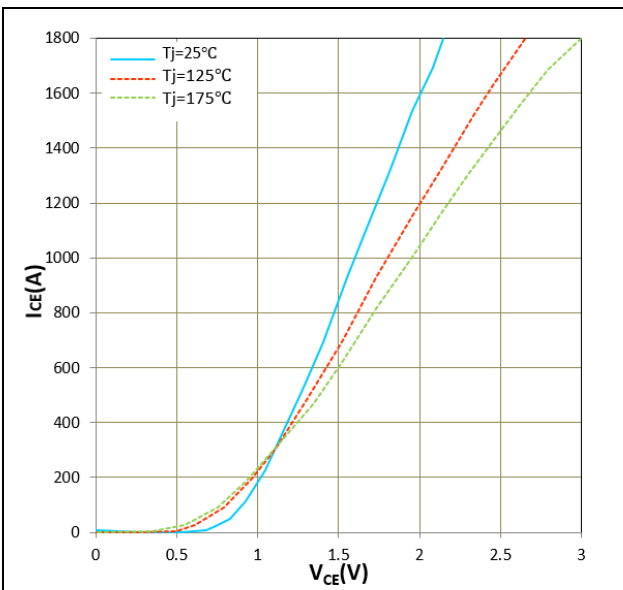


Figure 7. I_{CE} vs V_{CE}
 $V_{GE} = 15V$

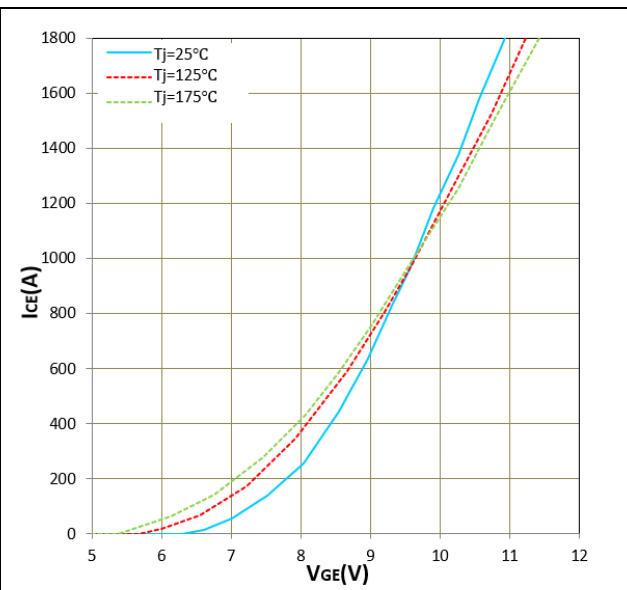


Figure 8. I_{CE} vs V_{GE}
 $V_{GE} = V_{CE}$

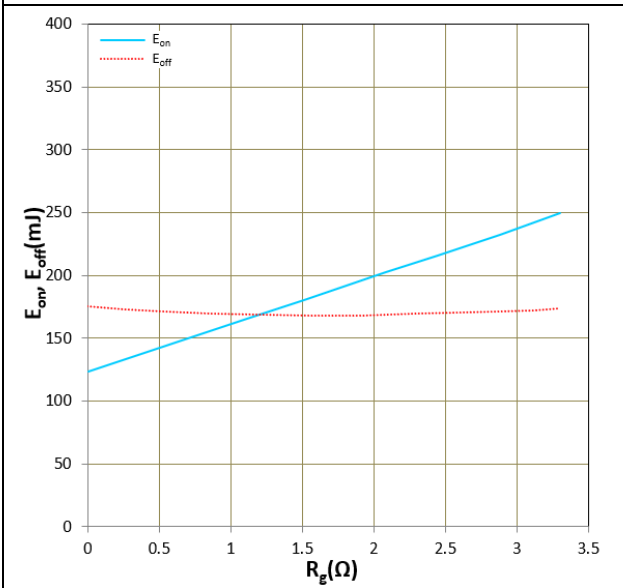


Figure 9. E_{on} , E_{off} vs R_g (Typ)
 $V_{CC} = 600V$, $V_{GE} = +15V/-8V$, $I_C = 900A$, $T_j = 125^\circ C$
Inductive Load

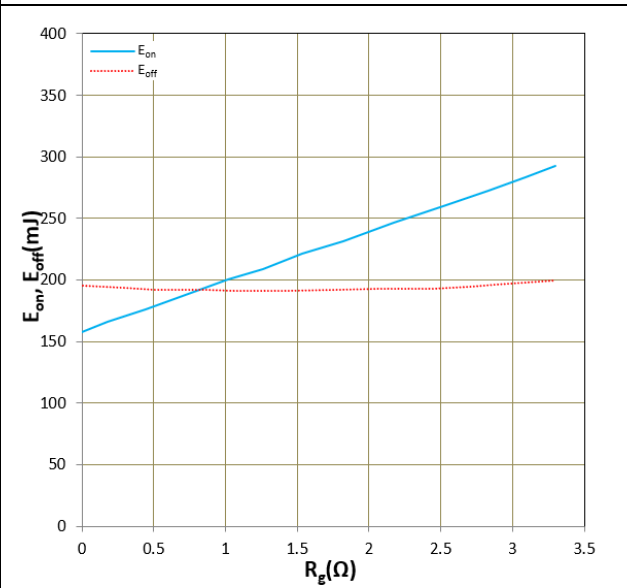


Figure 10. E_{on} , E_{off} , E_{tr} vs R_g (Typ)
 $V_{CC} = 600V$, $V_{GE} = +15V/-8V$, $I_C = 900A$, $T_j = 175^\circ C$
Inductive Load

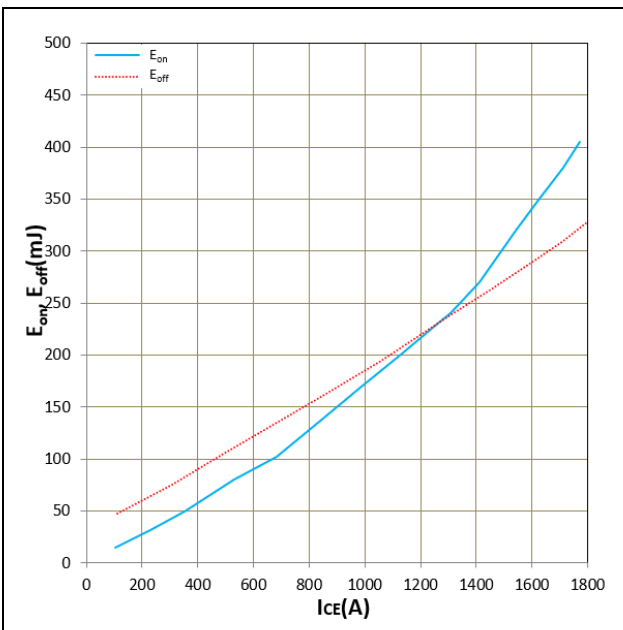


Figure 11. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=7.5\Omega$, $T_j=25^\circ C$
 Inductive Load

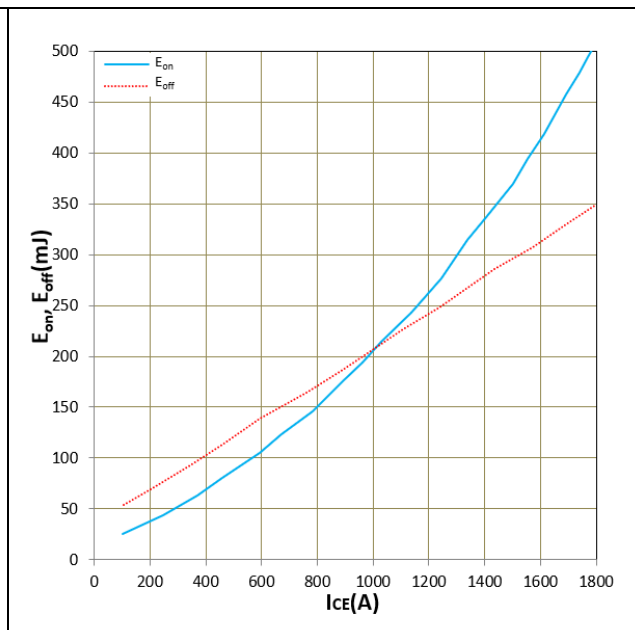


Figure 12. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=7.5\Omega$, $T_j=175^\circ C$
 Inductive Load

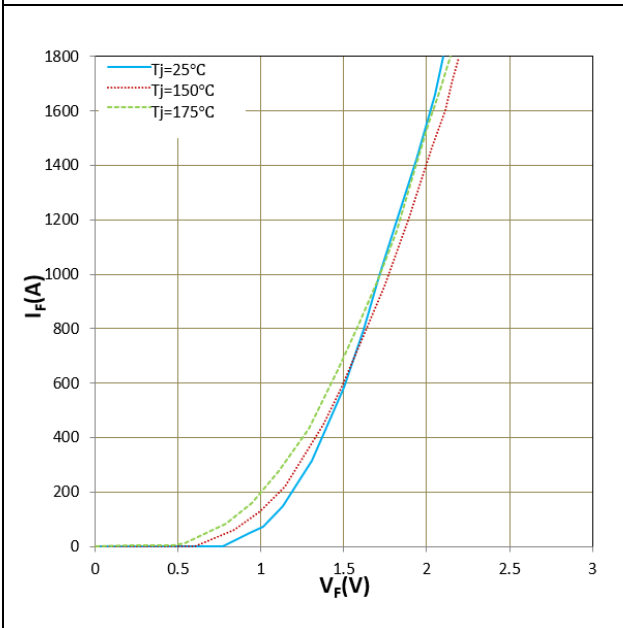


Figure 13. I_F vs V_F

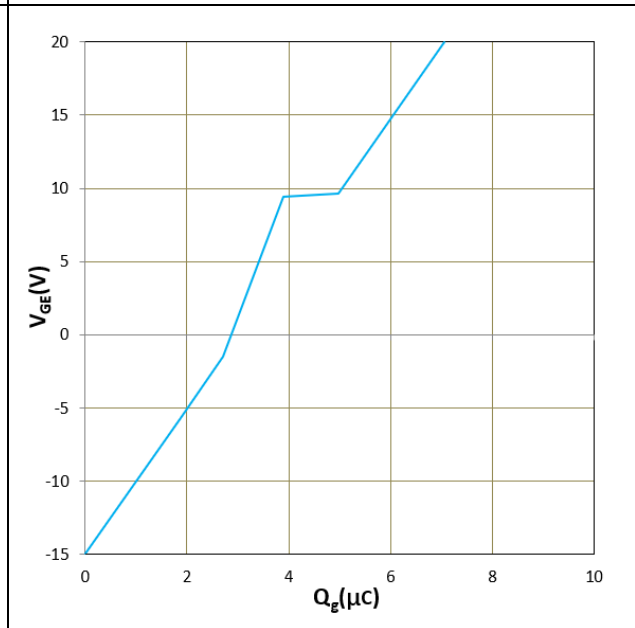
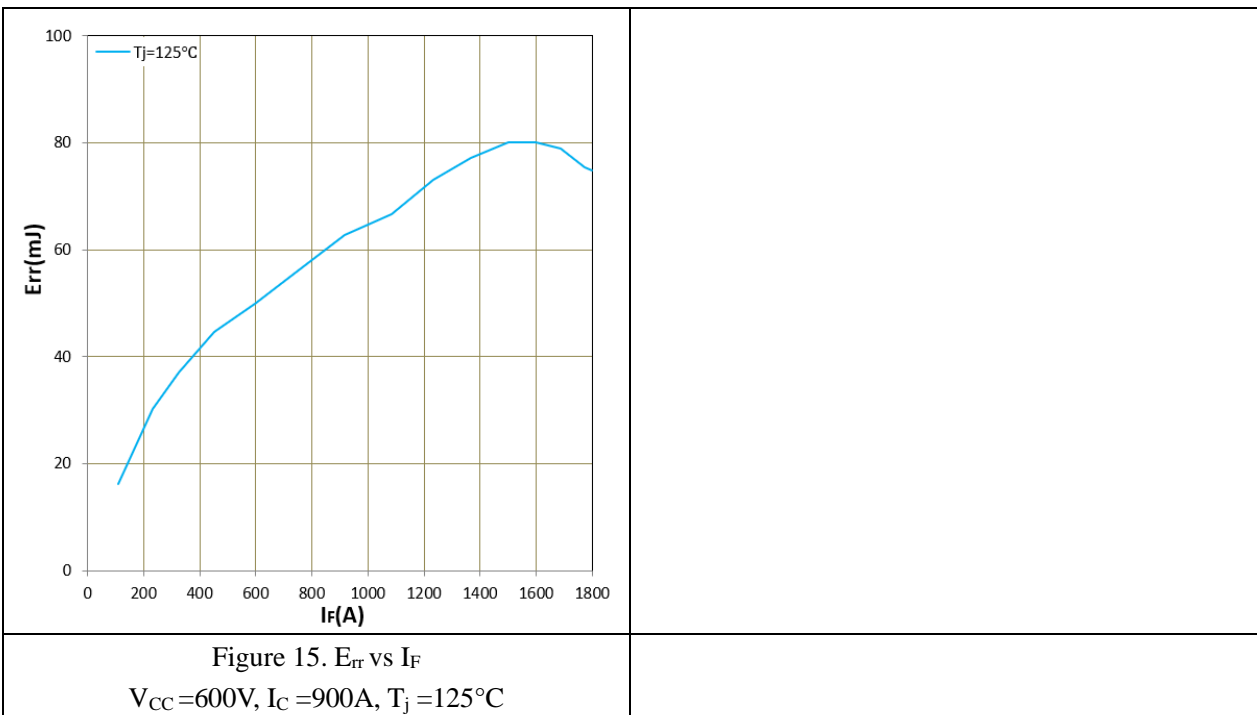


Figure 14. Gate charge
 $V_{CC}=600V$, $I_c=900A$, $T_j=25^\circ C$



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