DFI900HF12I4A1

1200V/900A Half Bridge IGBT Module

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

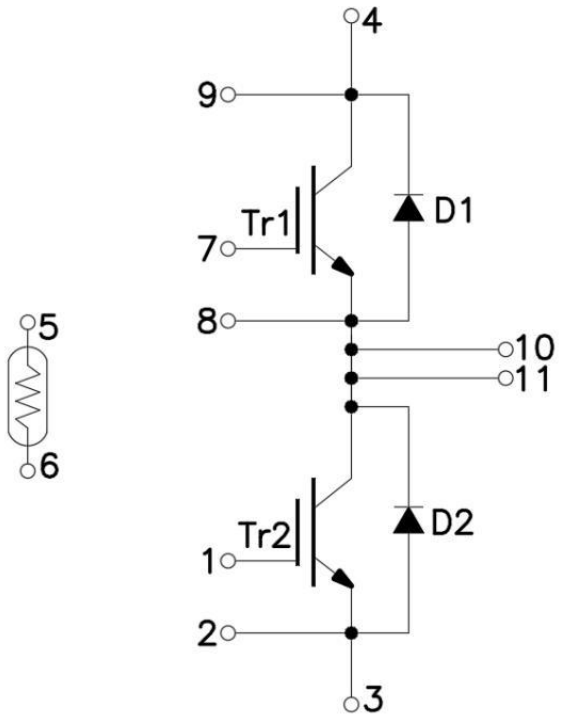

Figure 1. Out drawing & circuit diagram for DFI900HF12I4A1

Pin Configuration and Marking Information

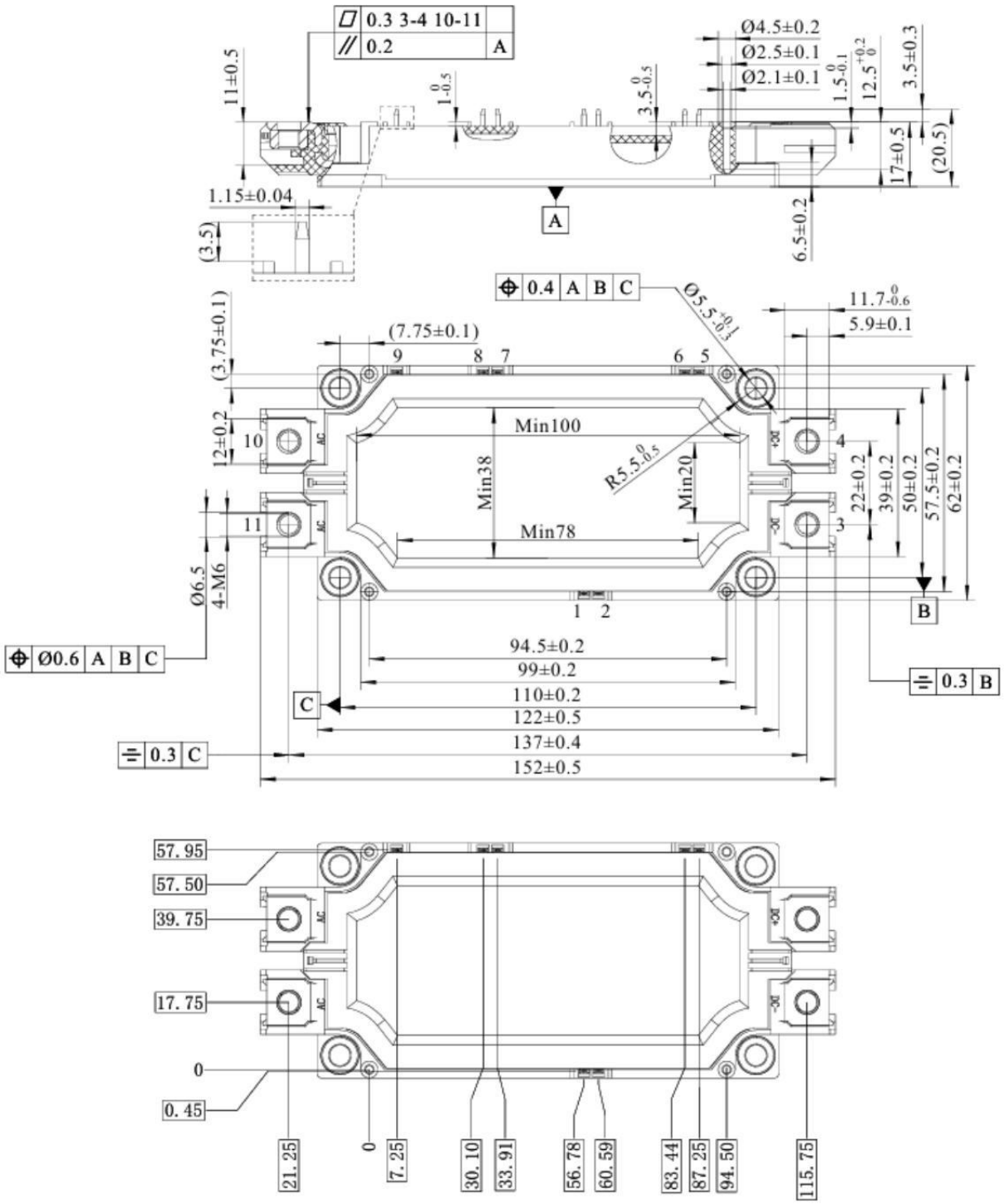

Figure 2. Pin configuration

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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	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	-	1.6	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		
			T_j =25°C	105	-	-	

E_{on}	Turn-on power dissipation		T_j =125°C	150	-	-	mJ
			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°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
V_F	Diode Forward Voltage	I_F =900A V_{GE} =0V	T_j =25°C	-	1.65		V
			T_j =125°C	-	-	-	
			T_j =150°C	-	1.7	-	
T_{rr}	Reverse recovery time	V_{CC} =600V I_F =900A V_{GE} =+15/-8V R_g =7.5Ω Inductive load switching operation	T_j =25°C	-	-	-	ns
			T_j =125°C	-	-	-	
			T_j =150°C	-	-	800	
I_{RM}	Peak reverse recovery Current		T_j =25°C	-	966	-	A
			T_j =125°C	-	-	-	
			T_j =150°C	-	1041	-	
Q_{rr}	Reverse recovery charge		T_j =25°C	-	104	-	uC
			T_j =125°C	-	-	-	
			T_j =150°C	-	180	-	
E_{rr}	Reverse recovered energy		T_j =25°C	-	54	-	mJ
			T_j =125°C	-	62	-	
			T_j =150°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 2.8W/m ・ K and thickness is 50um.

Test Conditions

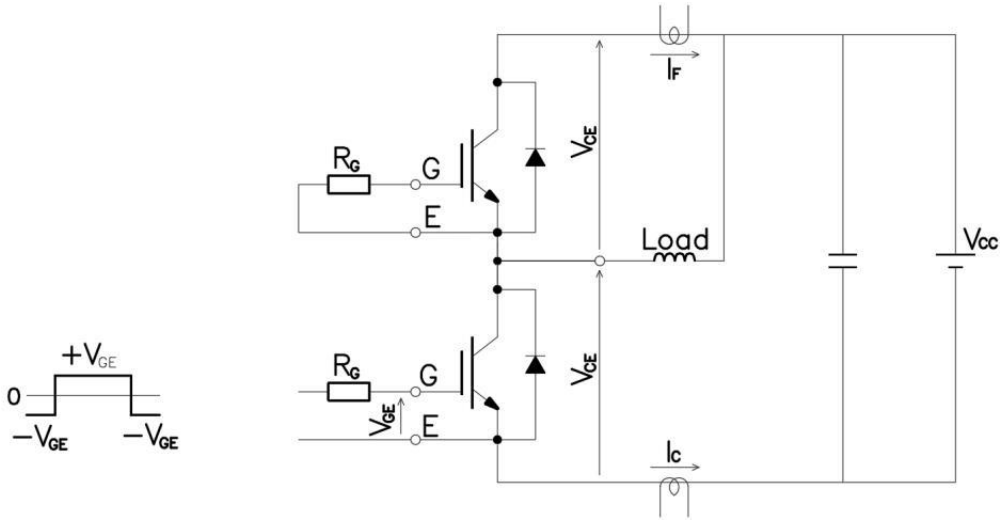

Figure 3. Switching time measure circuit

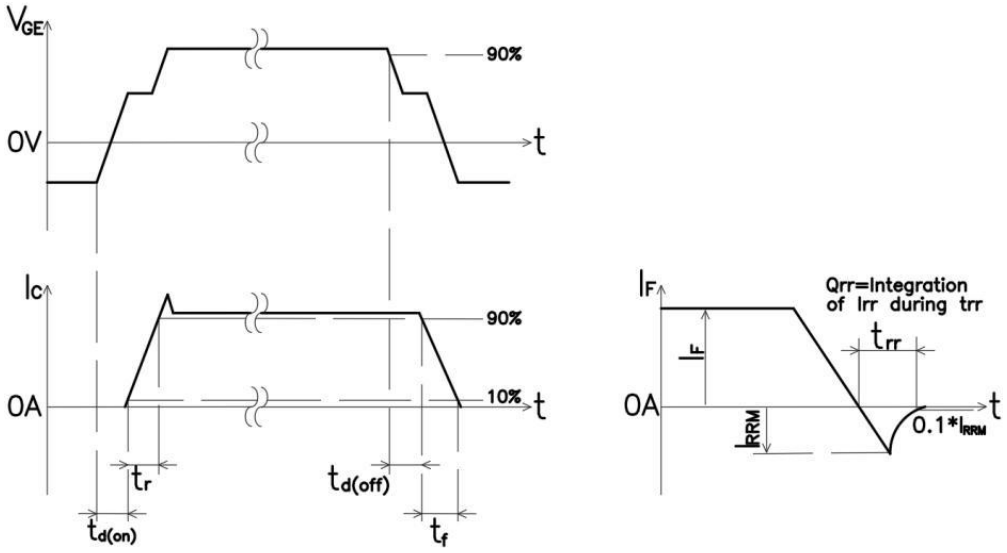

Figure 4. Switching time definition

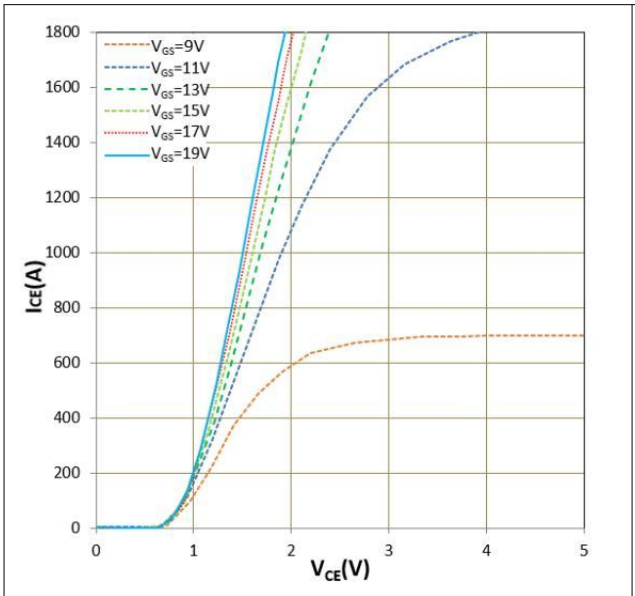

Figure 5. I_{CE} vs V_{CE}

T_j =25°C

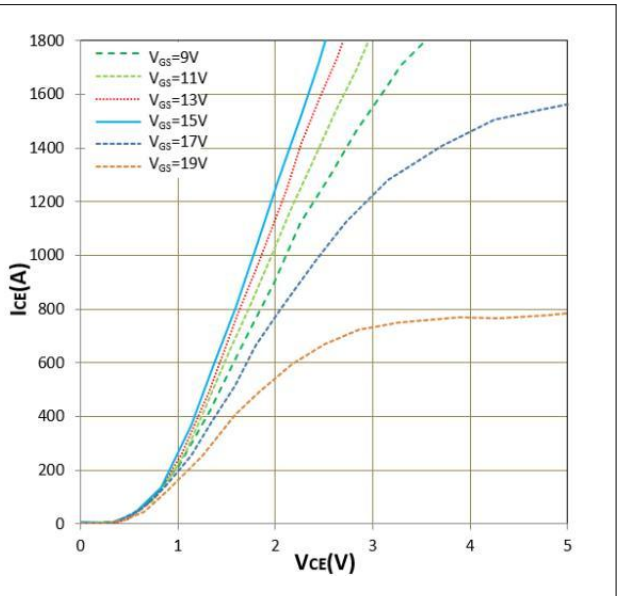

Figure 6. I_{CE} vs V_{CE}

T_j =175°C

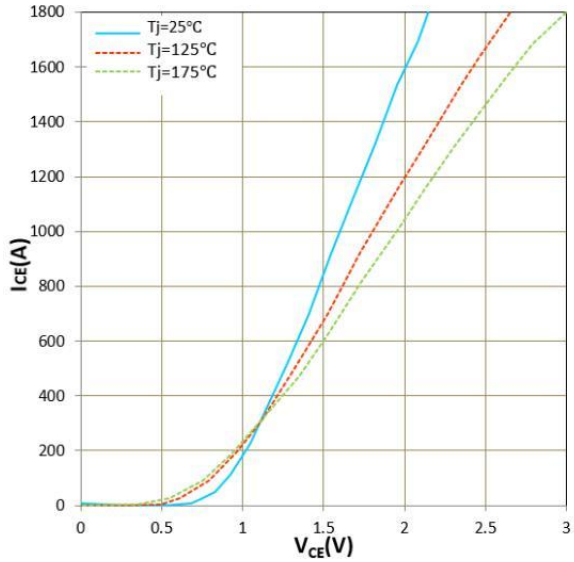

Figure 7. I_{CE} vs V_{CE}

V_{GE} =15V

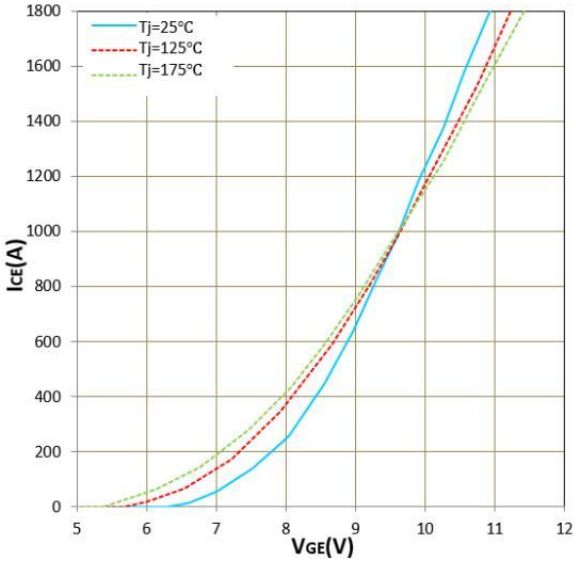

Figure 8. I_{CE} vs V_{GE}

V_{GE} = V_{CE}

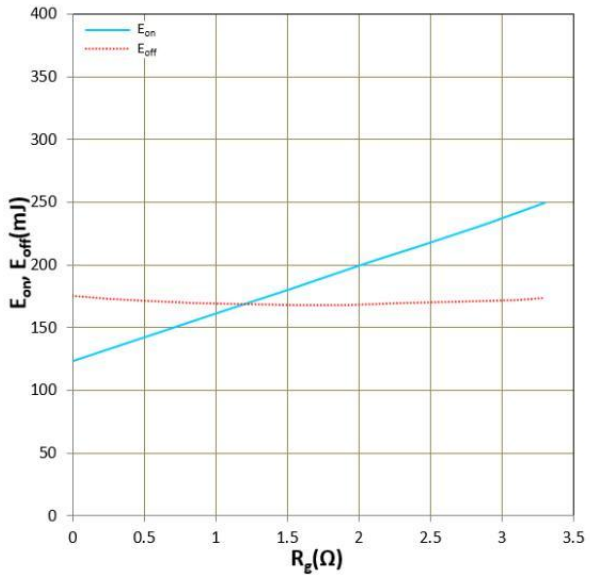

Figure 9. E_{on}, E_{off} vs R_g (Typ)

V_{CC} =600V, V_{GE} =+15V/-8V, I_C =900A, T_j =125°C

Inductive Load

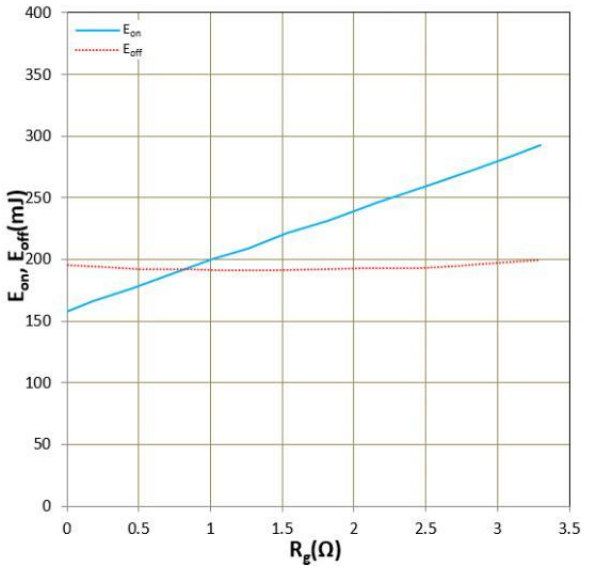

Figure 10. E_{on}, E_{off}, E_{rr} vs R_g (Typ)

V_{CC} =600V, V_{GE} =+15V/-8V, I_C =900A, T_j =175°C

Inductive Load

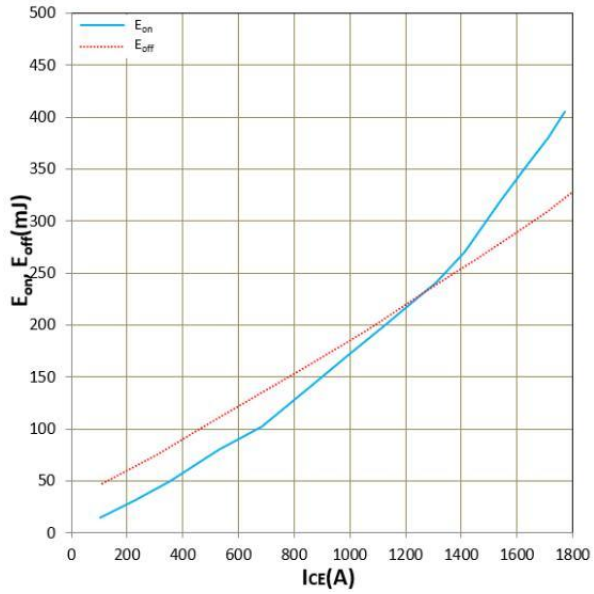

Figure 11. E_{on}, E_{off}, E_{rr} vs Ic (Typ)

V_{CC}=600V, V_{GE}=+15V/-8V, R_g=7.5Ω, T_j =25°C

Inductive Load

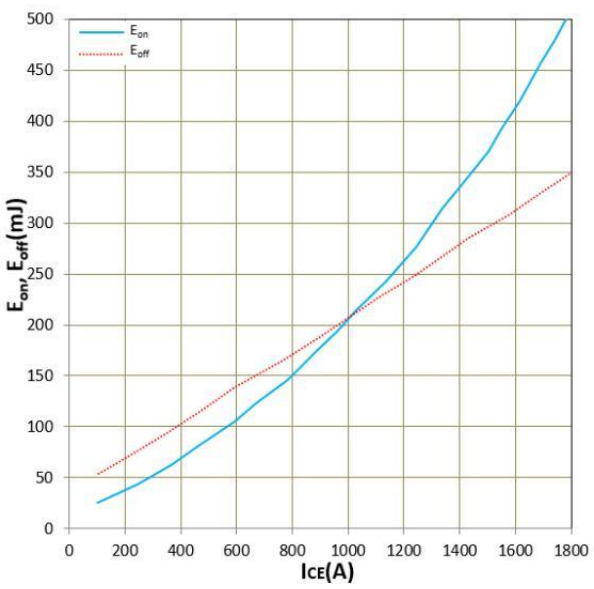

Figure 12. E_{on}, E_{off}, E_{rr} vs Ic (Typ)

V_{CC}=600V, V_{GE}=+15V/-8V, R_g=7.5Ω, T_j =175°C

Inductive Load

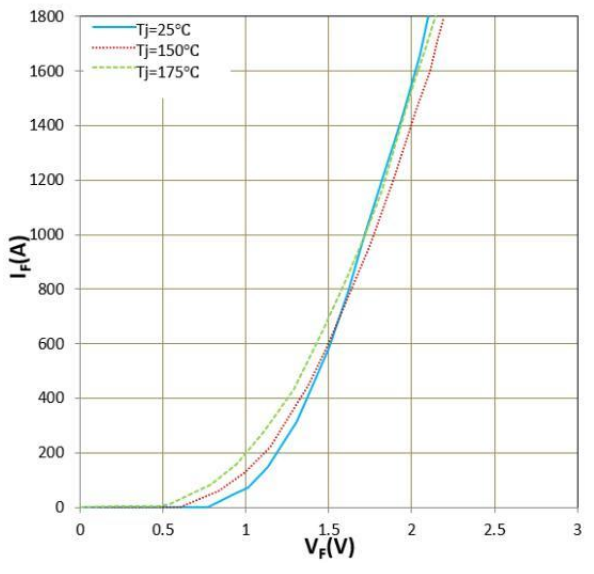

Figure 13. I_F vs V_F

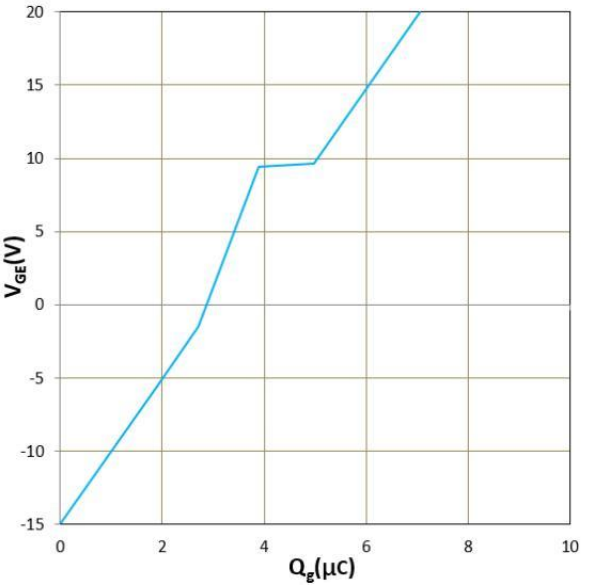

Figure 14. Gate charge

V_{CC}=600V, I_C =900A, T_j =25°C

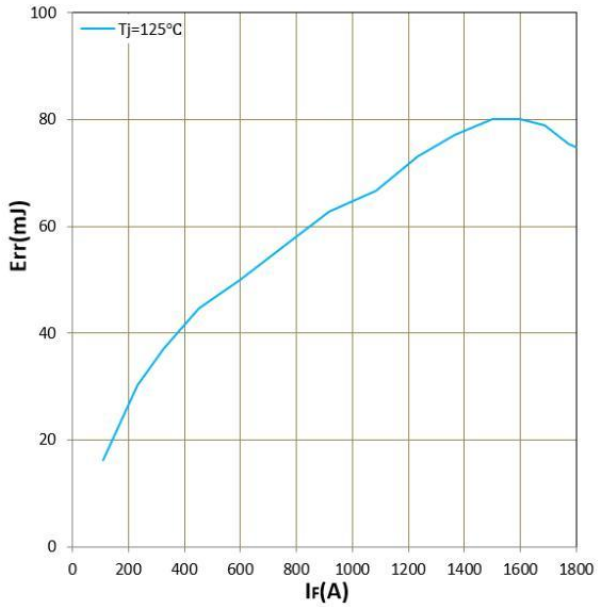

Figure 15. E_{rr} vs I_F

V_{CC} =600V, I_C =900A, T_j =125°C

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