

Description

The DFI300HF12DFH1 offer lower losses and higher energy for application such as motor drive, inverter and soft switching applications.



Features

- 1200V300A, $V_{CE(sat)}(typ.) = 1.60V$
- Lower losses and higher energy
- High speed switching

Applications

- Motor drive
- Inverter
- Welding machines
- Power supply
- UPS

Circuit diagram

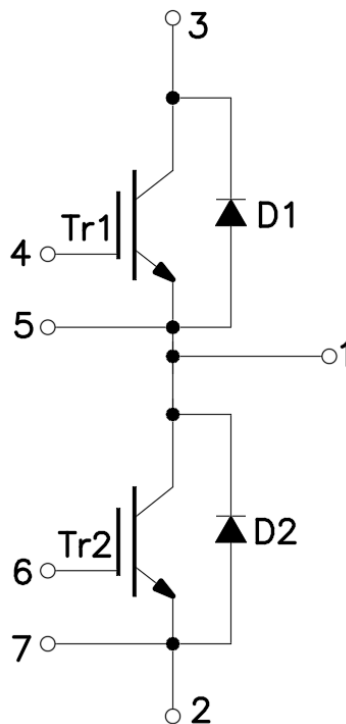


Figure 1. Out drawing & circuit diagram for DFI300HF12DFH1

Pin Configuration and Marking Information

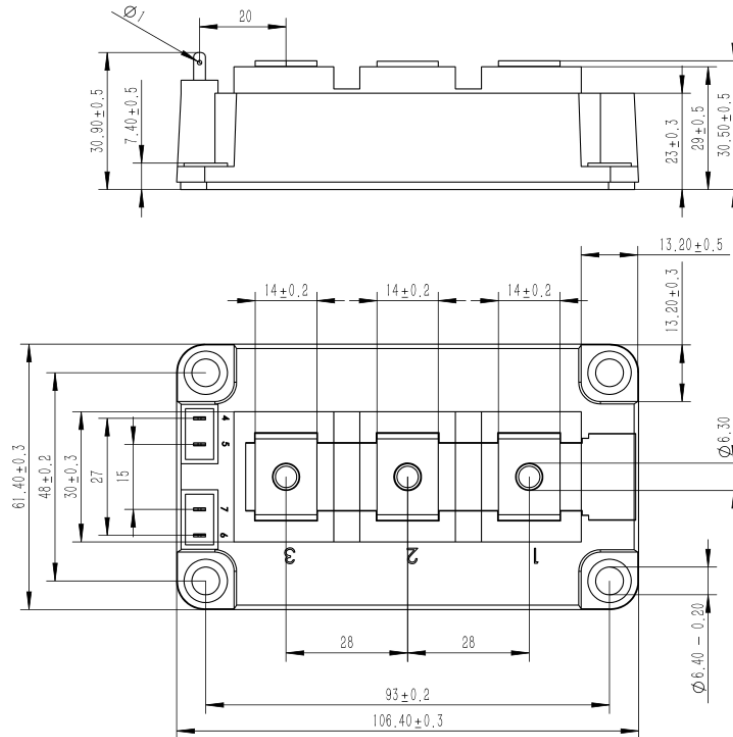


Figure 2. Pin configuration

Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t =1 min	3.4	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink	47	mm
	terminal to terminal	26	
Clearance	terminal to heatsink	29	mm
	terminal to terminal	14	
CTI	-	>200	-
Module lead resistance, terminals – chip	T _C =25°C	0.8	mΩ
Mounting torque for module mounting	M6	3 to 6	Nm
Weight	-	315	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	±20V	V
I _C	DC Continuous Collector Current	T _C =95°C	300	A
I _{CM}	Pulse Collector Current	t _p =1ms, Note1	600	A
P _C	Maximum Power Dissipation	T _C =25°C, T _{jmax} =175°C(IGBT)	1667	W
I _F	Diode Forward Current	-	300	A
I _{FRM}	Repetitive peak forward Current	t _p =1ms, Note1	600	A
T _{jmax}	junction temperature	-	-40 to 175	°C
T _{vjop}	Operating junction temperature	-	-40 to 150	°C
T _{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

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

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =300A V _{GE} =15V	T _j =25°C	-	1.60	1.92	V
			T _j =125°C	-	1.92	-	V
			T _j =150°C	-	2.00	-	V
			T _j =175°C	-	2.35	-	V
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =6mA, V _{CE} =V _{GE}	5.0	5.8	6.5	V	
Q _G	Gate charge	V _{GE} = -15V to +15V	-	3.5	-	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	-	43.2	-	nF
C _{oes}	Output Capacitance			-	1.17	-	nF
C _{res}	Reverse transfer Capacitance			-	0.33	-	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	uA
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C =300A V _{GE} =+15V/-8V R _{Gon} = R _{Goff} =2.0Ω Inductive load	T _j =25°C	-	337	-	ns
			T _j =125°C	-	385	-	
			T _j =175°C	-	403	-	
t _r	Rise time		T _j =25°C	-	101	-	ns
			T _j =125°C	-	131	-	
			T _j =175°C	-	145	-	
t _{d(off)}	Turn-off delay time		T _j =25°C	-	411	-	ns
			T _j =125°C	-	452	-	
			T _j =175°C	-	480	-	
t _f	Fall time	T _j =25°C	-	217	-	ns	
		T _j =125°C	-	276	-		
		T _j =175°C	-	291	-		
E _{on}	Turn-on power dissipation	T _j =25°C	-	10.63	-	mJ	
		T _j =125°C	-	16.76	-		
		T _j =175°C	-	22.62	-		
E _{off}	Turn-off power dissipation	T _j =25°C	-	30.23	-	mJ	
		T _j =125°C	-	34.28	-		
		T _j =175°C	-	36.68	-		
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)		-	0.09	-	°C/W	
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1		-	0.015	-	°C/W	

Note1: Assumes Thermal Conductivity of grease is 2.8 W/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 = 300A, V _{GE} = 0V	T _j = 25°C	-	1.59	1.91	V
			T _j = 125°C	-	1.51	-	
			T _j = 150°C	-	1.59	-	
			T _j = 175°C	-	1.66	-	
t _{rr}	Reverse recovery time	(Switch side) V _{CC} = 600V I _C = 300A	T _j = 25°C	-	0.472	-	us
			T _j = 125°C	-	0.717	-	
			T _j = 175°C	-	0.889	-	
I _{RM}	Peak reverse recovery Current	V _{GE} = +15V/-8V R _G = 2.0Ω (FRD side)	T _j = 25°C	-	256	-	A
			T _j = 125°C	-	310	-	
			T _j = 175°C	-	342	-	
Q _{rr}	Recovered charge	V _{rr} = 600V I _F = 300A V _{GE} = -8V	T _j = 25°C	-	49.37	-	uC
			T _j = 125°C	-	78.50	-	
			T _j = 175°C	-	101.3	-	
E _{rr}	Reverse recovered energy	Inductive load switching operation	T _j = 25°C	-	26.87	-	mJ
			T _j = 125°C	-	42.31	-	
			T _j = 175°C	-	52.62	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)		-	0.12	-	°C/W	
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied), Note1		-	0.015	-	°C/W	

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

Test Conditions

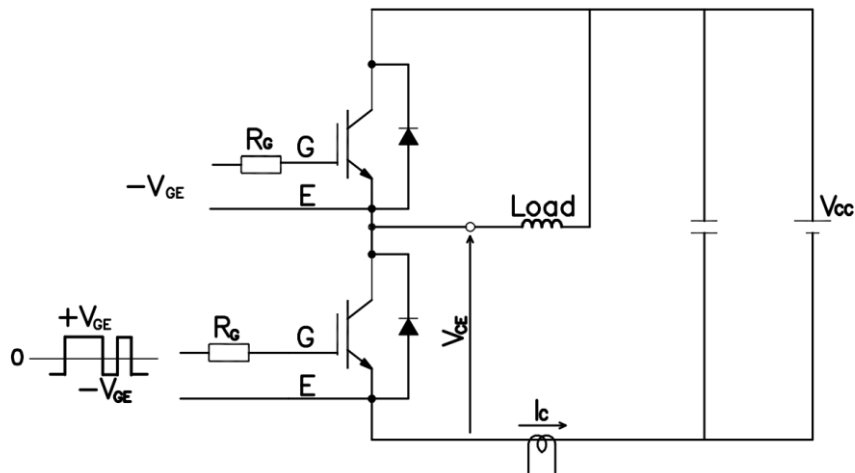


Figure 3. Switching time measure circuit

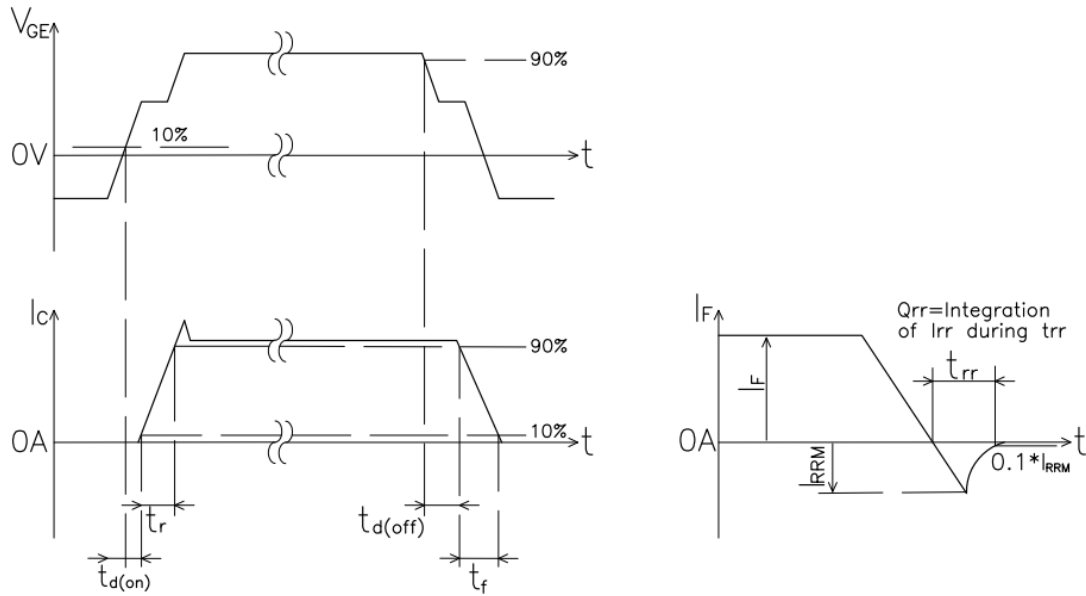
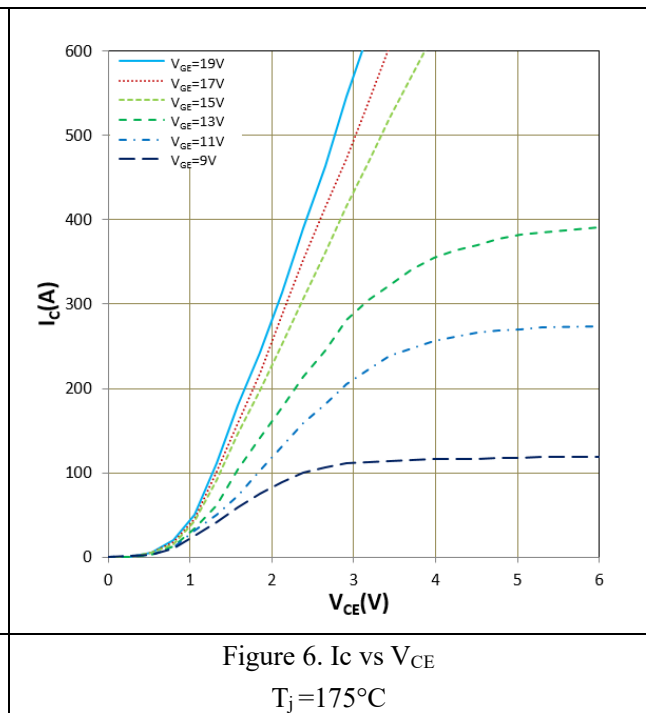
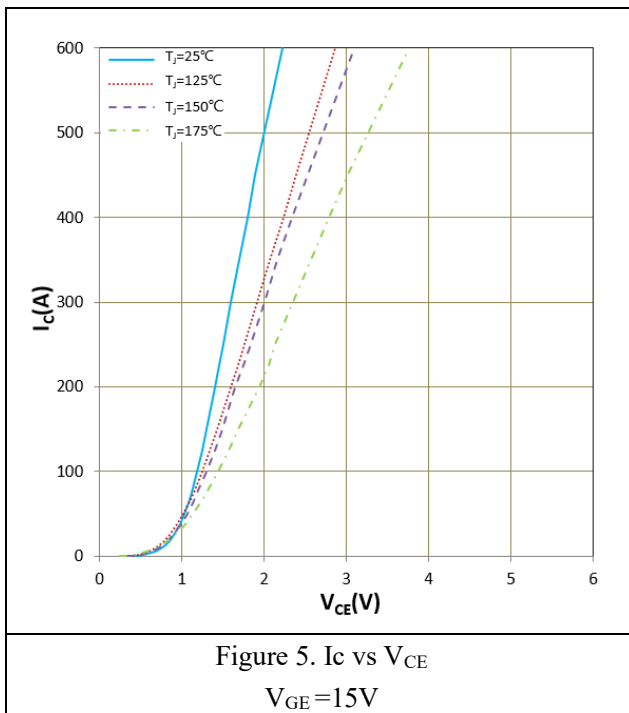


Figure 4. Switching time definition



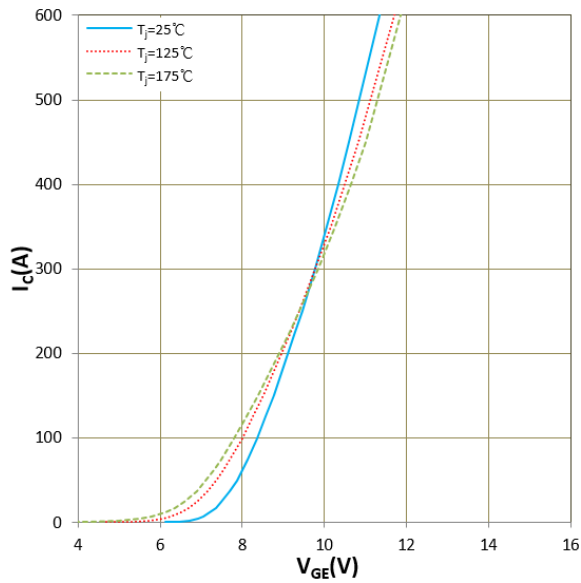


Figure 7. I_c vs V_{GE}
 $V_{CE}=20V$

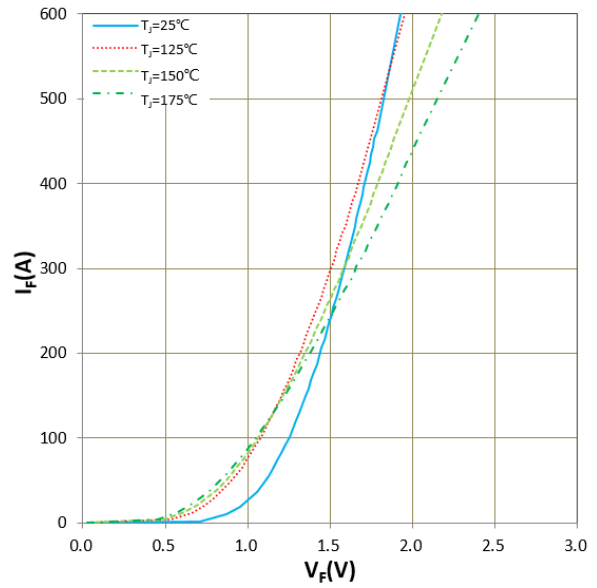


Figure 8. I_F vs V_F

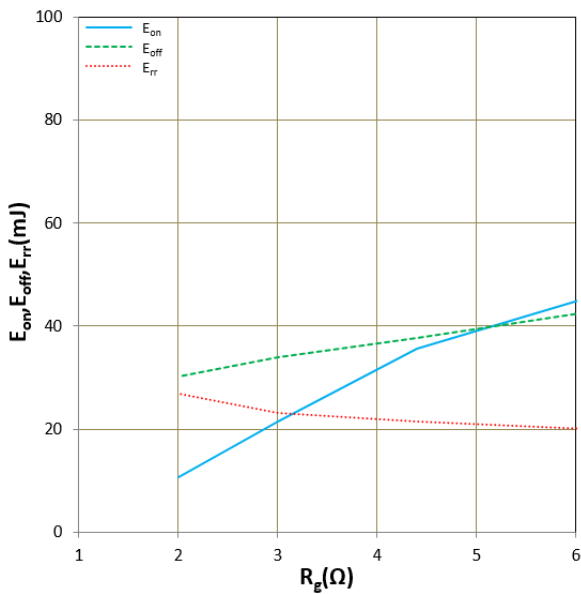


Figure 9. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_c=300A$, $T_j=25^\circ C$
Inductive Load

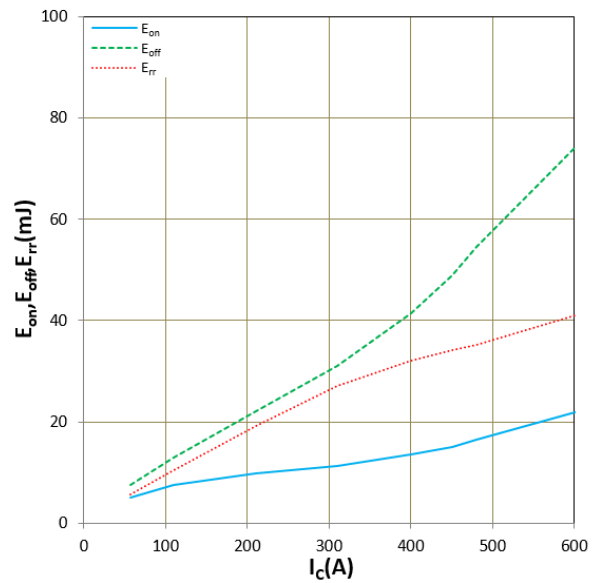


Figure 10. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=2.0\Omega$, $T_j=25^\circ C$
Inductive Load

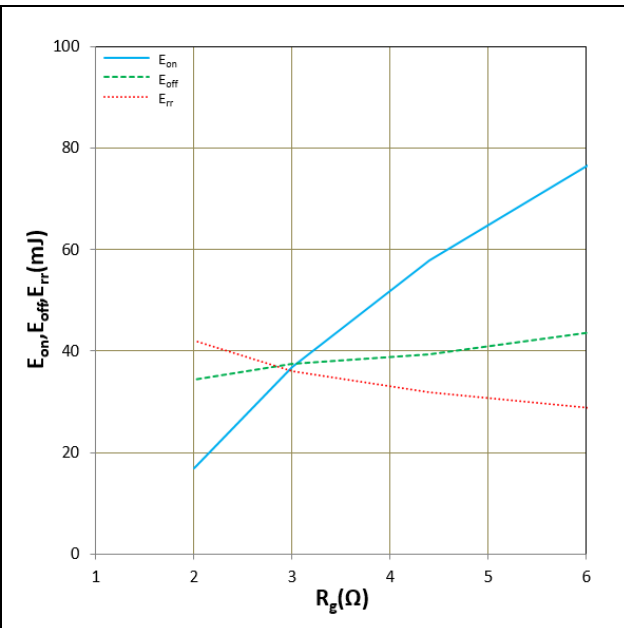


Figure 11. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=300A$, $T_j=125^\circ C$
 Inductive Load

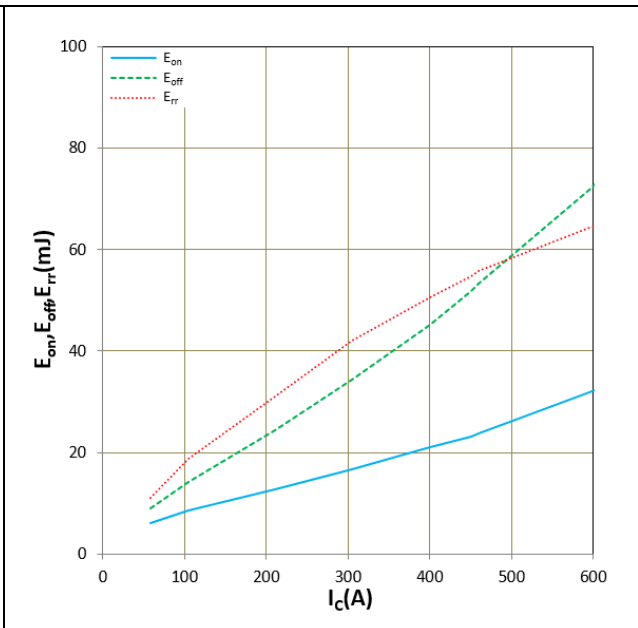


Figure 12. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=2.0\Omega$, $T_j=125^\circ C$
 Inductive Load

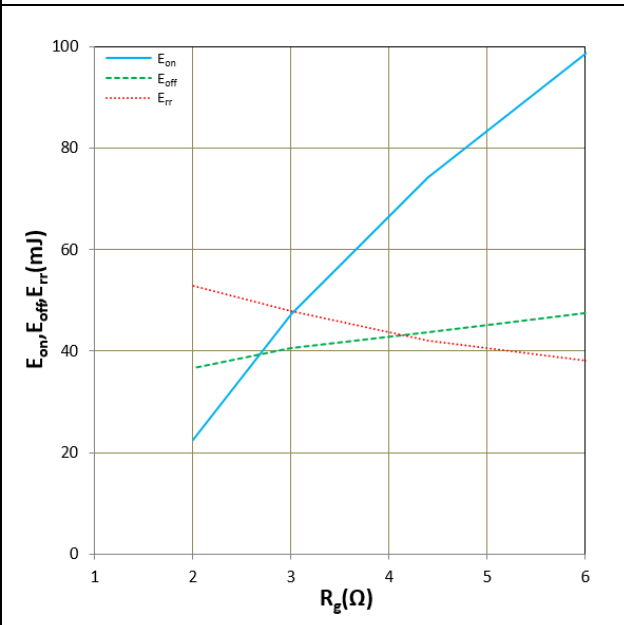


Figure 13. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=300A$, $T_j=175^\circ C$
 Inductive Load

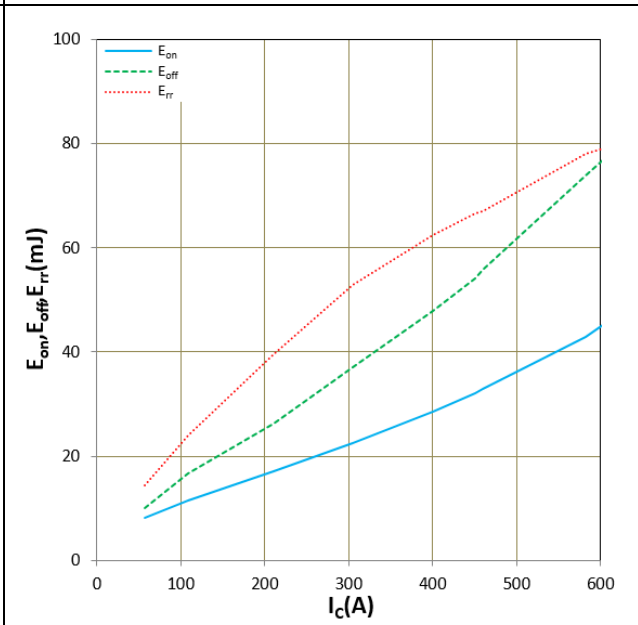


Figure 14. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=2.0\Omega$, $T_j=175^\circ C$
 Inductive Load

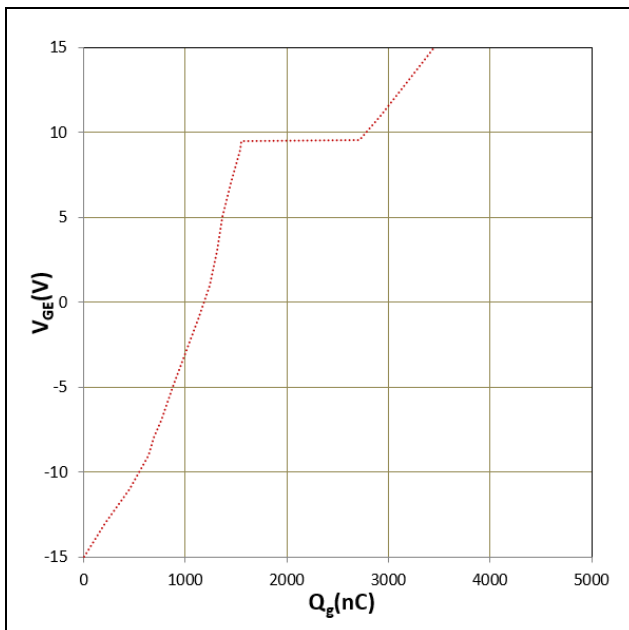


Figure 15. Gate charge

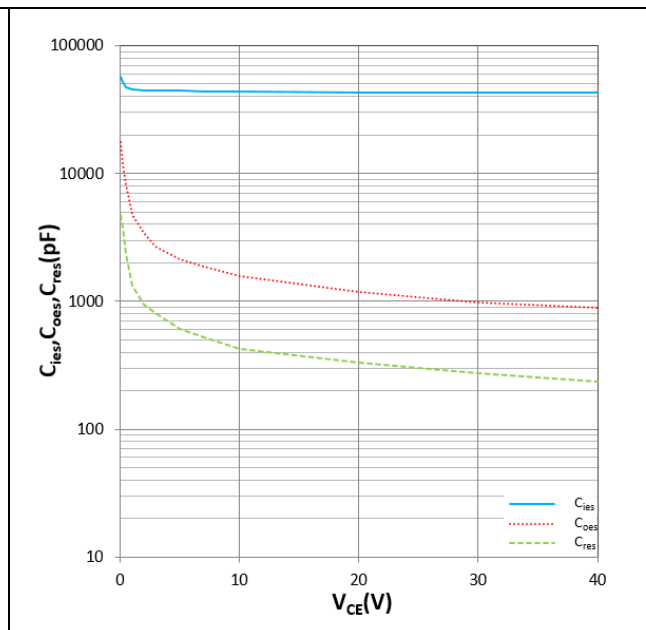


Figure 16. C_{ies} , C_{oes} , C_{res} vs V_{ce}
 $T_j = 25^\circ\text{C}$, $f = 1\text{MHz}$

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