

HCG300FH170E3RE1

1700V/300A Half Bridge IGBT Module

Description

The HCG300FH170E3RE1 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips and offers lower losses and higher energy for the applications such as motor drive, inverter and welding machines.



Features

- 1700V300A
- $V_{CE(sat)} (typ.) = 1.65V @ 25^{\circ}C$
- Lower losses and higher energy
- High speed switching

Applications

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

Circuit diagram

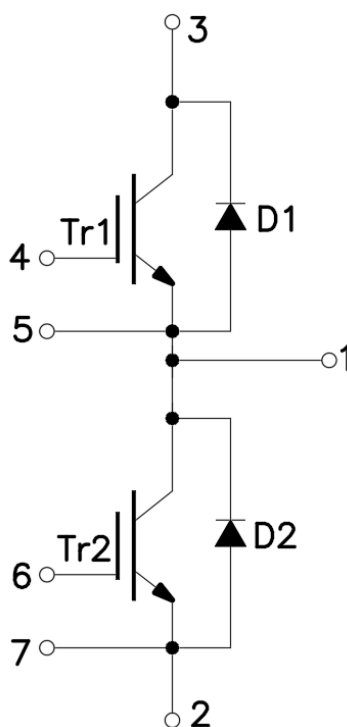


Figure 1. Out drawing & circuit diagram for HCG300FH170E3RE1

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Pin Configuration and Marking Information

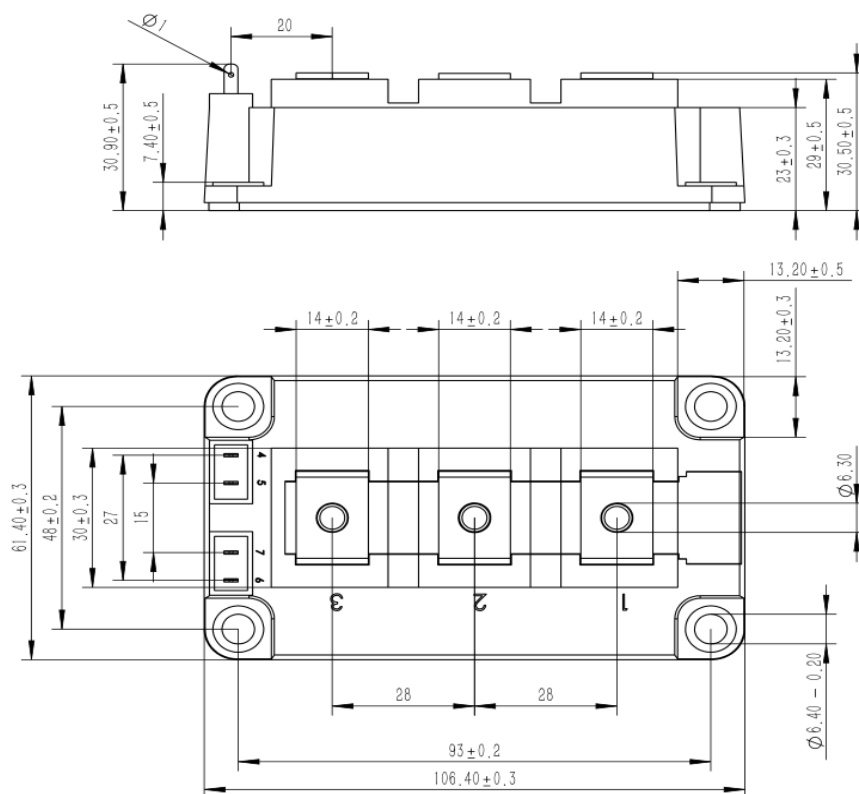


Figure 2. Pin configuration

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Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	4.0	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	47 26	mm
Clearance	terminal to heatsink terminal to terminal	29 14	mm
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	1700	V
V _{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I _C	DC Continuous Collector Current	T _C =125°C	300	A
I _{CM}	Pulse Collector Current	t _p =1ms, Note1	1200	A
P _C	Maximum Power Dissipation	T _C =25°C, IGBT	2143	W
I _F	Diode Forward Current	-	300	A
I _{FRM}	Repetitive peak forward Current	t _p =1ms, Note1	600	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
R/R	Deviation of R ₁₀₀	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

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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	-	1.65	1.90	V	
			T _J =125°C	-	1.78	-	V	
			T _J =150°C	-	1.87	-	V	
			T _J =175°C	-	1.91	-	V	
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =12mA, V _{CE} =V _{GE}		5.0	6.0	-	V	
Q _G	Gate charge	V _{GE} = -15V to +15V, V _{CC} =900V		-	3.1	-	uC	
R _{Gint}	Internal gate resistor	-	T _J =25°C	-	-	-	Ω	
C _{ies}	Input Capacitance	V _{CE} =25V,	T _J =25°C	-	28.0	-	nF	
C _{oes}	Output Capacitance	V _{GE} =0V		-	1.02	-	nF	
C _{res}	Reverse transfer Capacitance	f=1MHz		-	0.38	-	nF	
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} =20V, V _{CE} =0V		T _J =25°C	-	-	1	uA
t _{d(on)}	Turn-on delay time	V _{CC} =900V I _C =300A V _{GE} =+15V/-8V R _{Gon} = R _{Goff} =1.5Ω Inductive load	T _J =25°C	-	279	-	ns	
			T _J =150°C	-	304	-	ns	
t _r	Rise time		T _J =25°C	-	160	-	ns	
			T _J =150°C	-	192	-	ns	
t _{d(off)}	Turn-off delay time		T _J =25°C	-	630	-	ns	
			T _J =150°C	-	749	-	ns	
t _f	Fall time		T _J =25°C	-	380	-	ns	
			T _J =150°C	-	638	-	ns	
E _{on}	Turn-on power dissipation		T _J =25°C	-	122.3	-	mJ	
			T _J =150°C	-	202.1	-	mJ	
E _{off}	Turn-off power dissipation		T _J =25°C	-	67.2	-	mJ	
			T _J =150°C	-	99.9	-	mJ	
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-	0.070	-	°C /W	
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.020	-	°C /W	

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

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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	-	2.10	-	V
			T _j =125°C	-	2.12	-	V
			T _j =150°C	-	2.05	-	V
			T _j =175°C	-	2.10	-	V
t _{rr}	Reverse recovery time	(Switch side) V _{CC} =900V, I _C =300A	T _j =25°C	-	730	-	ns
			T _j =150°C	-	1059	-	ns
I _{RM}	Peak reverse recovery Current	V _{GE} =+15V/-8V, R _G =1.5Ω (FRD side)	T _j =25°C	-	134	-	A
			T _j =150°C	-	168	-	A
Q _{rr}	Recovered charge	V _{rr} =900V, I _F =300A V _{GE} =-8V	T _j =25°C	-	53	-	uC
			T _j =150°C	-	124	-	uC
E _{rr}	Reverse recovered energy	Inductive load switching operation	T _j =25°C	-	35.9	-	mJ
			T _j =150°C	-	60.3	-	mJ
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)			-	0.118	-	°C/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied), Note1			-	0.025	-	°C/W

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

Test Conditions

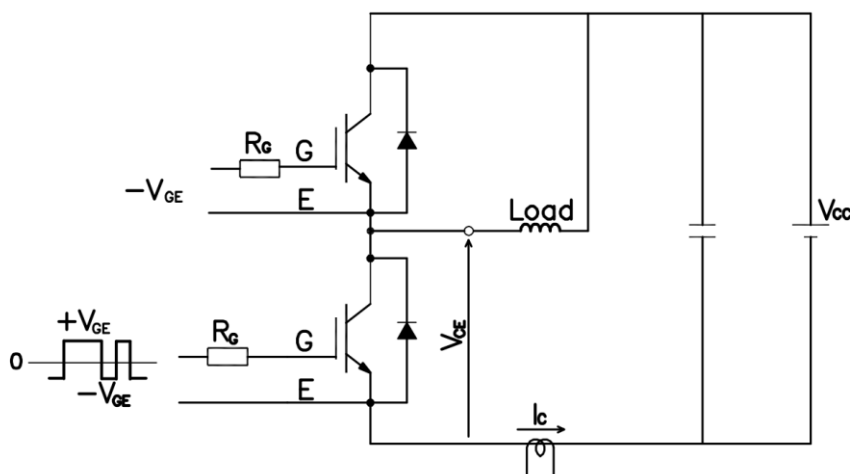


Figure 3. Switching time measure circuit

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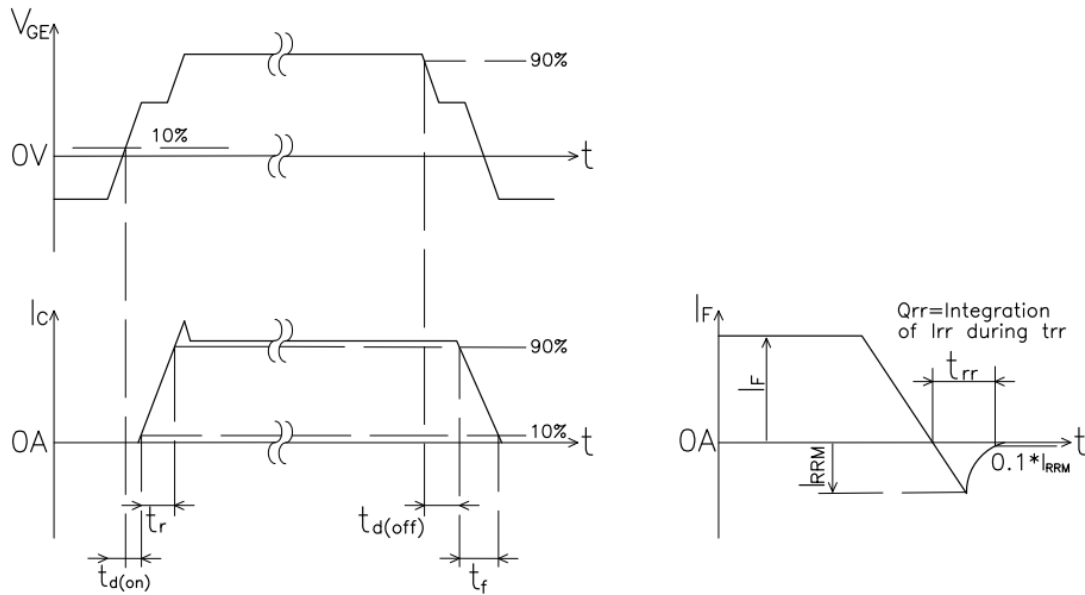
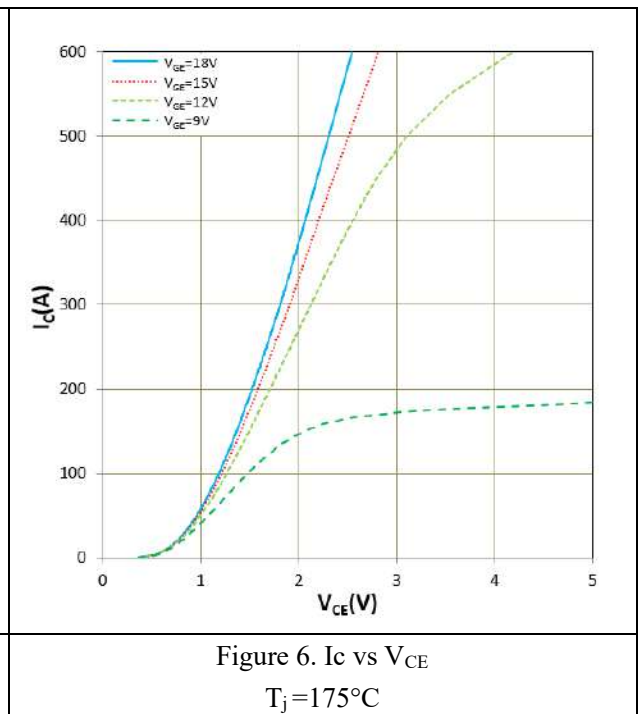
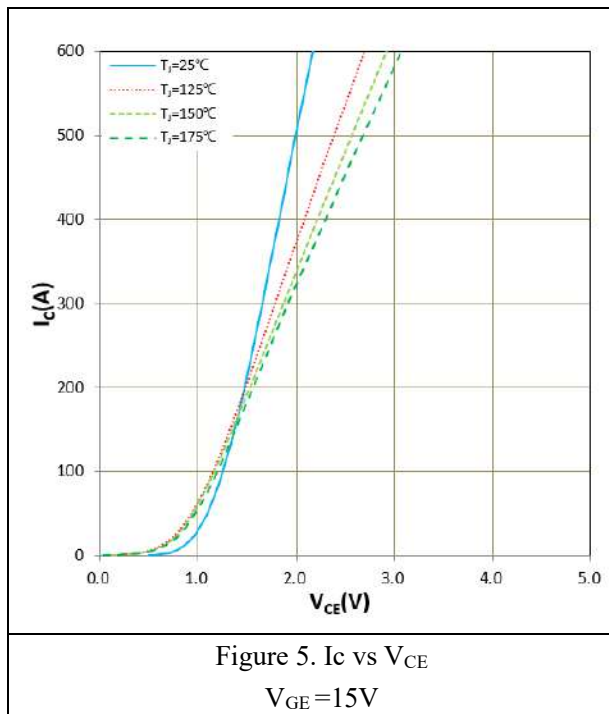


Figure 4. Switching time definition



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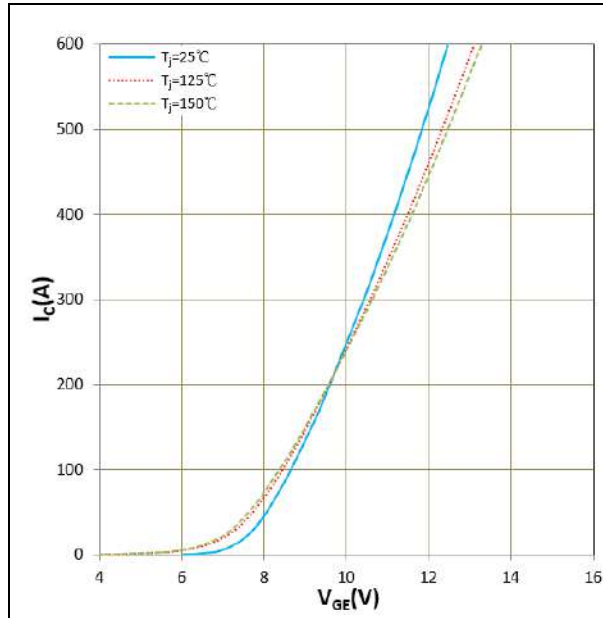


Figure 7. I_C vs V_{GE}
 $V_{CE}=20\text{V}$

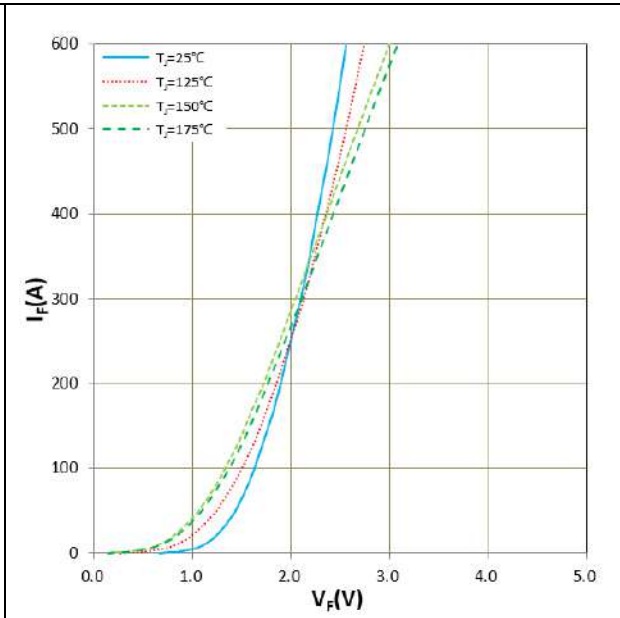


Figure 8. I_F vs V_F

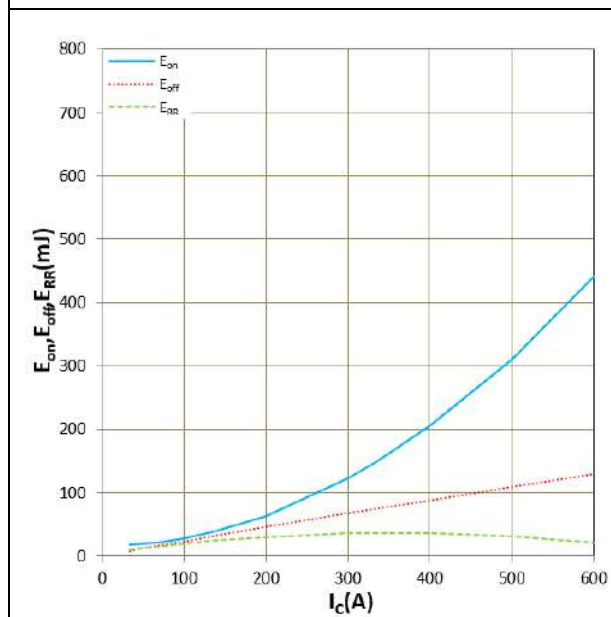


Figure 9. E_{on} , E_{off} , E_{tr} vs I_C (Typ)
 $V_{CC}=900\text{V}$, $V_{GE}=+15\text{V}/-8\text{V}$, $R_g=1.5\Omega$, $T_j=25^\circ\text{C}$
Inductive Load

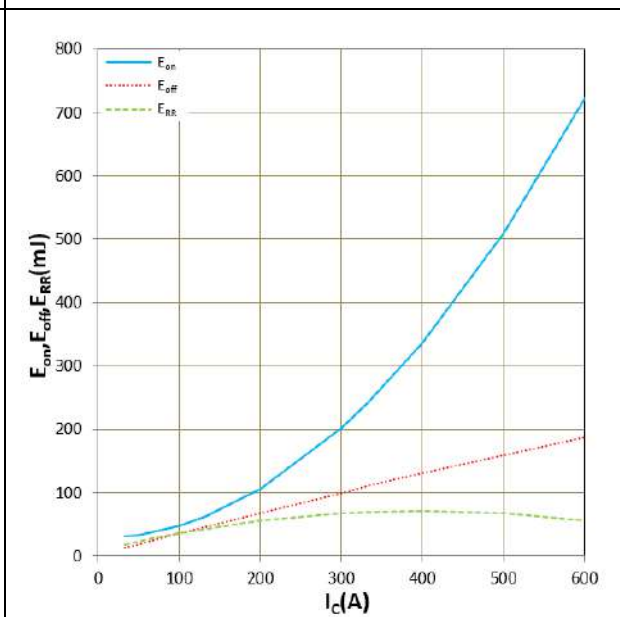


Figure 10. E_{on} , E_{off} , E_{tr} vs I_C (Typ)
 $V_{CC}=900\text{V}$, $V_{GE}=+15\text{V}/-8\text{V}$, $R_g=1.5\Omega$, $T_j=150^\circ\text{C}$
Inductive Load

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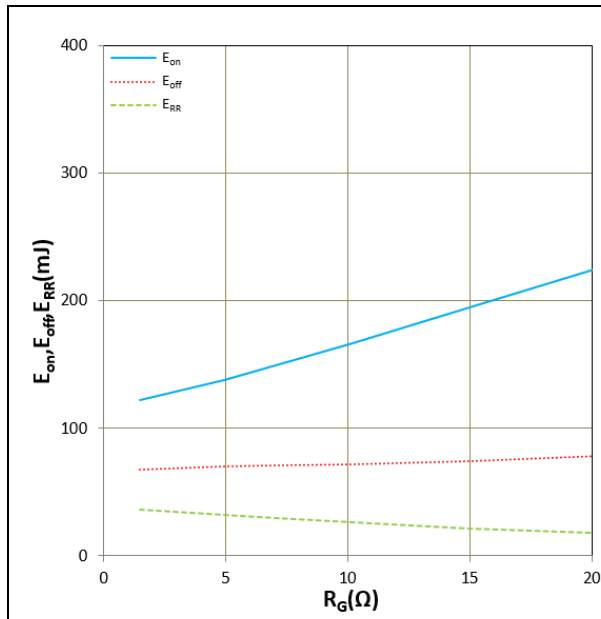


Figure 11. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $I_C=300A$, $T_j=25^{\circ}C$
Inductive Load

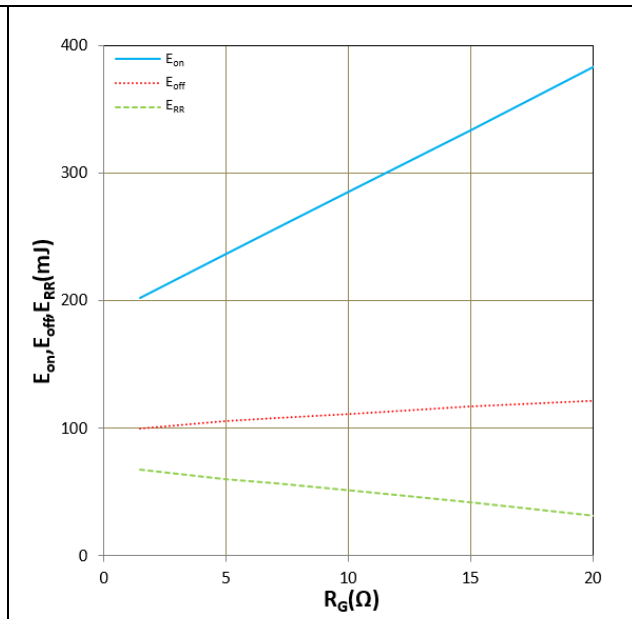


Figure 12. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $I_C=300A$, $T_j=150^{\circ}C$
Inductive Load

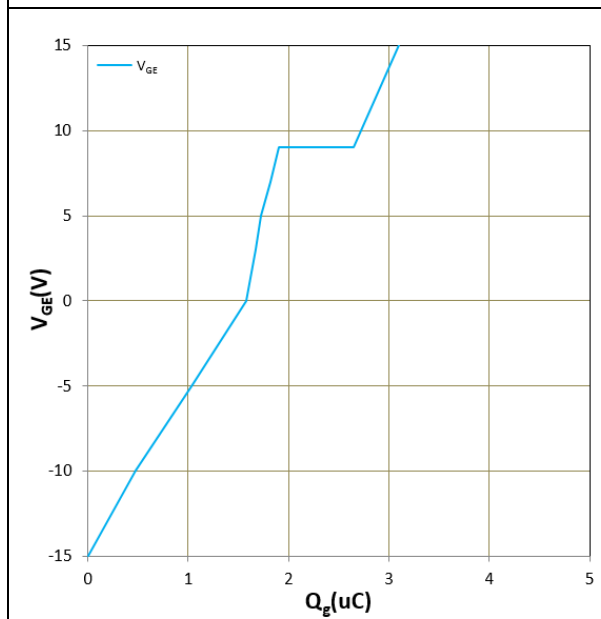


Figure 13. Gate charge

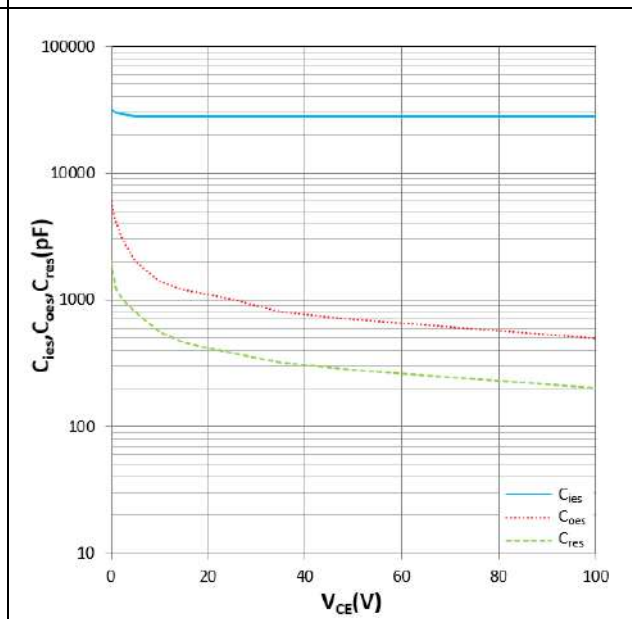


Figure 14. C_{ies} , C_{oes} , C_{res} vs V_{CE}
 $T_j=25^{\circ}C$, $f=1MHz$

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Changes to this product data sheet are reserved.

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Revision History

Document Version	Description of Changes
RevX.0.1	Released

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