

HCG600FH170D3RE2

1700V/600A Half Bridge IGBT Module

Description

The HCG600FH170D3RE2 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power supply and Motor control.



Features

- Blocking voltage:1700V
- Low saturation voltage $V_{CE(sat)}$
- Low Switching Losses
- 175℃ maximum junction temperature
- Thermistor inside

Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Wind Turbines

Circuit diagram

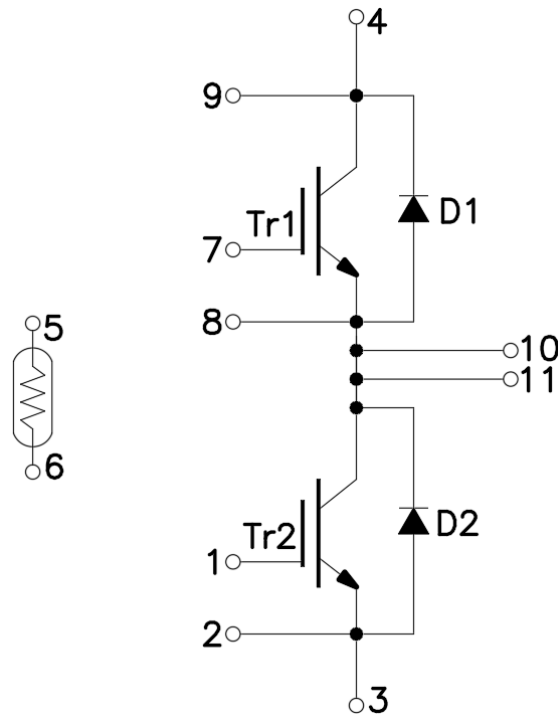


Figure 1. Out drawing & circuit diagram for HCG600FH170D3RE2

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Pin Configuration and Marking Information

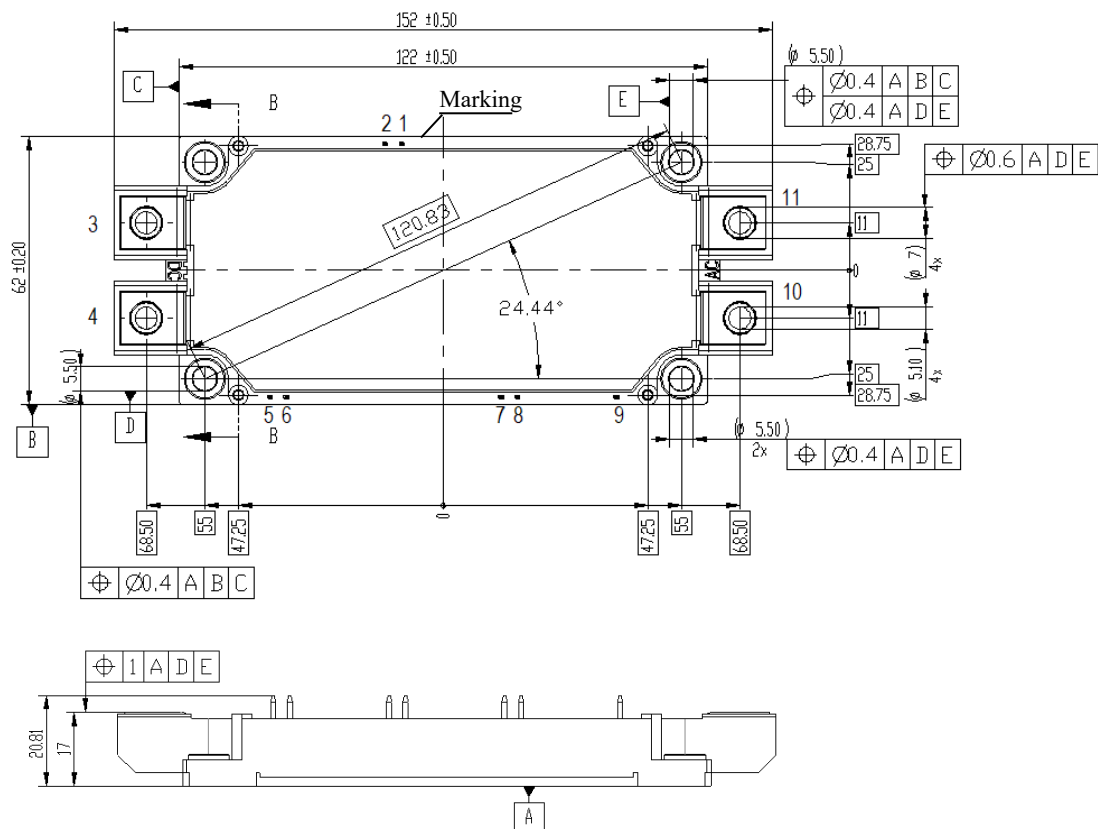


Figure 2. Pin configuration

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Module

Parameter	Conditions	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	14.5 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>225	-
Module lead resistance, terminals–chip	T _C = 25°C	0.8	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	420	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	±30	V
I _C	DC Continuous Collector Current	T _C = 100°C	650	A
I _{CM}	Pulse Collector Current	t _p = 1ms, Note1	1300	A
P _C	Maximum Power Dissipation	T _C = 25°C, T _j = 175°C (IGBT)	4687	W
I _F	Diode Forward Current	-	600	A
I _{FRM}	Repetitive peak forward Current	t _p = 1ms, Note1	1200	A
I ² t	I ² t-value	V _R = 0V, t _p = 10ms, T _j = 125°C (Diode)	20000	A ² s
T _{jmax}	Max junction temperature	-	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
ΔR/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)} (Chip)	Collector-Emitter Saturation Voltage	I _C =600A V _{GE} =15V	T _J =25°C	-	1.60	1.92	V
			T _J =150°C	-	1.88	-	V
			T _J =175°C	-	1.93	-	V
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =24mA, V _{CE} =V _{GE}		5.2	5.8	6.4	V
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	-	-	1.8	uA
C _{ies}	Input Capacitance	V _{CE} =25V V _{GE} =0V f =1MHz	T _J =25°C	-	49.5	-	nF
C _{oes}	Output Capacitance		T _J =25°C	-	1.8	-	nF
C _{res}	Reverse transfer Capacitance		T _J =25°C	-	0.75	-	nF
Q _G	Gate charge	V _{GE} = -15V to +15V		-	6.2	-	uC
R _{Gint}	Internal gate resistor	-	T _J =25°C	-	1.7	-	Ω
t _{d(on)}	Turn-on delay time	V _{CC} =900V I _C = 600A V _{GE} =+15V/-8V R _G =1.0 Ω Inductive load	T _J =25°C	-	205	-	ns
			T _J =150°C	-	207	-	
t _r	Rise time		T _J =25°C	-	125	-	ns
			T _J =150°C	-	188	-	
t _{d(off)}	Turn-off delay time		T _J =25°C	-	570	-	ns
			T _J =150°C	-	735	-	
t _f	Fall time		T _J =25°C	-	370	-	ns
			T _J =150°C	-	680	-	
E _{on}	Turn-on power dissipation		T _J =25°C	-	234	-	mJ
			T _J =150°C	-	383	-	
E _{off}	Turn-off power dissipation		T _J =25°C	-	134	-	mJ
			T _J =150°C	-	205	-	
I _{SC}	SC data	V _{GE} <15V V _{CC} =1000V	T _J =150°C t _p <10us	-	3000	-	A
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-	0.032	-	°C /W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.015	-	°C /W

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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 =600A, V _{GE} =0V	T _j =25°C	-	2.10	V
			T _j =150°C	-	2.32	
			T _j =175°C	-	2.29	
t _{rr}	Reverse recovery time	(Switch side) V _{CC} =900V, I _C =600A V _{GE} =+15V/-8V	T _j =25°C	-	1.03	us
			T _j =150°C	-	1.39	
I _{RM}	Peak reverse recovery Current	R _G =1.0Ω (FRD side)	T _j =25°C	-	210	A
			T _j =150°C	-	277	
Q _{rr}	Recovered charge	V _π =900V, I _F =600A V _{GE} =+15V/-8V	T _j =25°C	-	83	uC
			T _j =150°C	-	192	
E _{rr}	Reverse recovered energy	Inductive load switching operation	T _j =25°C	-	49.7	mJ
			T _j =150°C	-	127	
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)		-	0.060	-	°C/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)		-	0.015	-	°C/W

Test Conditions

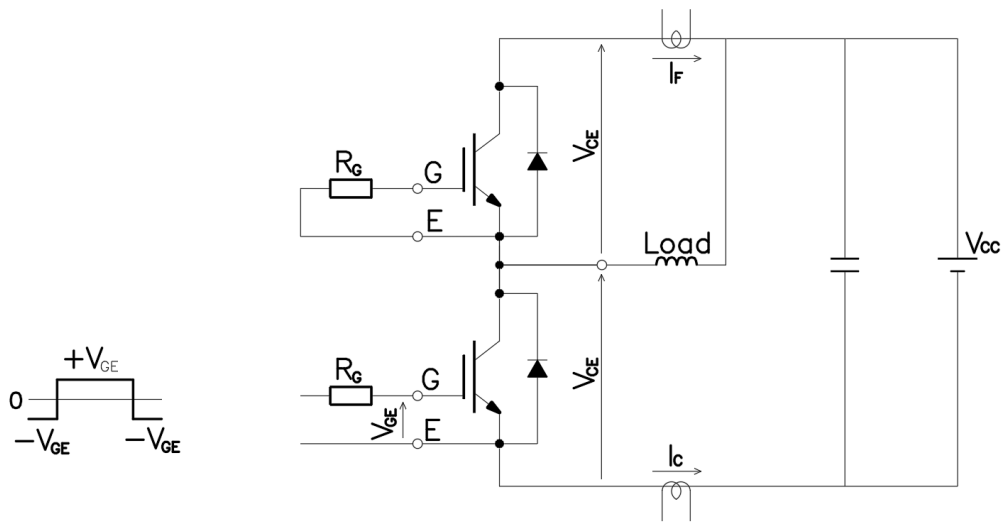


Figure 3. Switching time measure circuit

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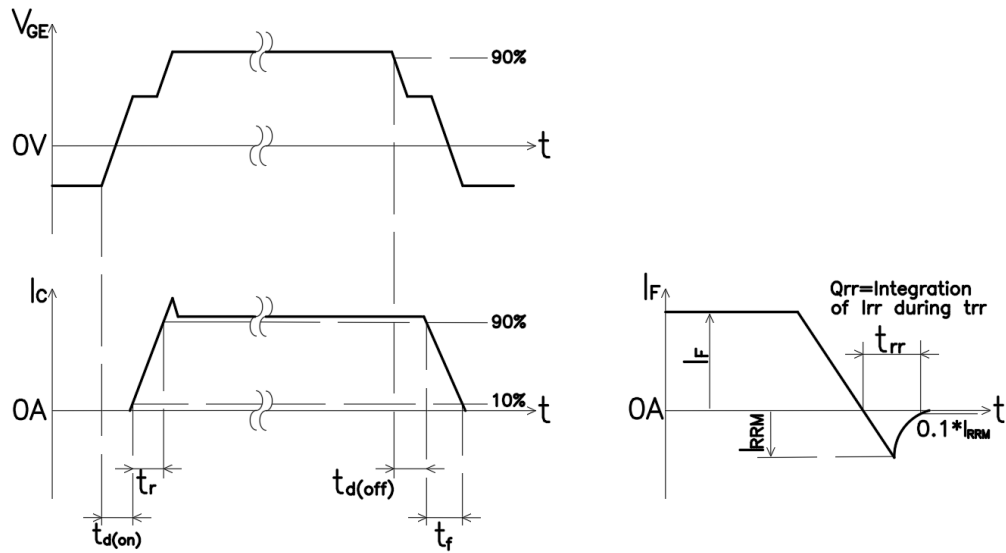
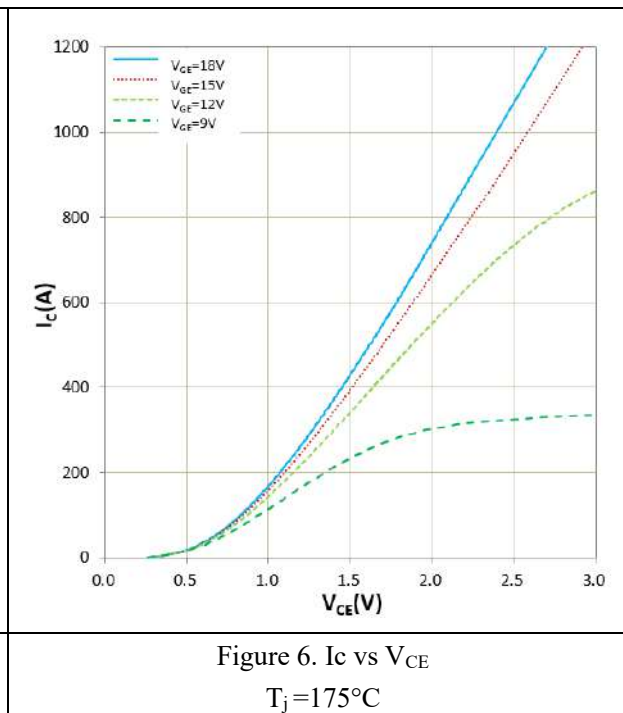
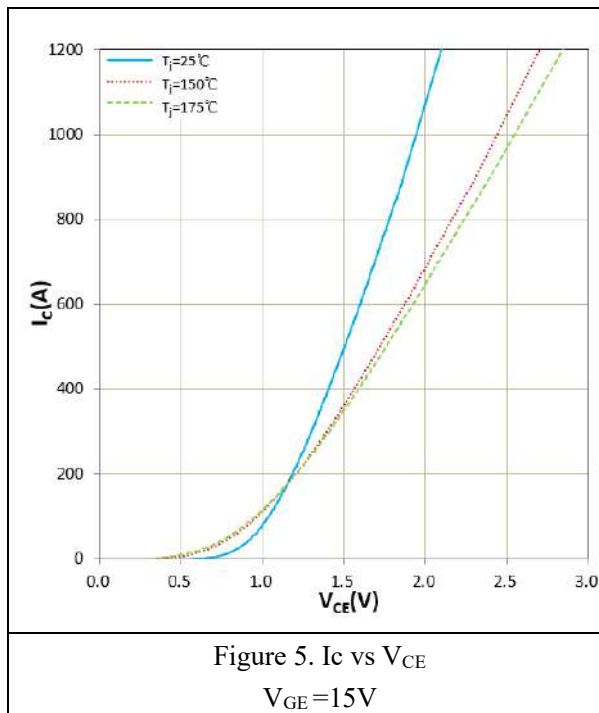


Figure 4. Switching time definition



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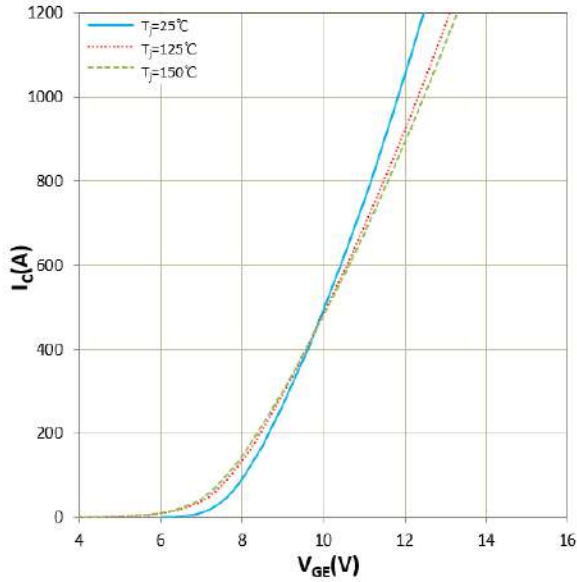


Figure 7. I_C vs V_{GE}
 $V_{CE} = 20\text{V}$

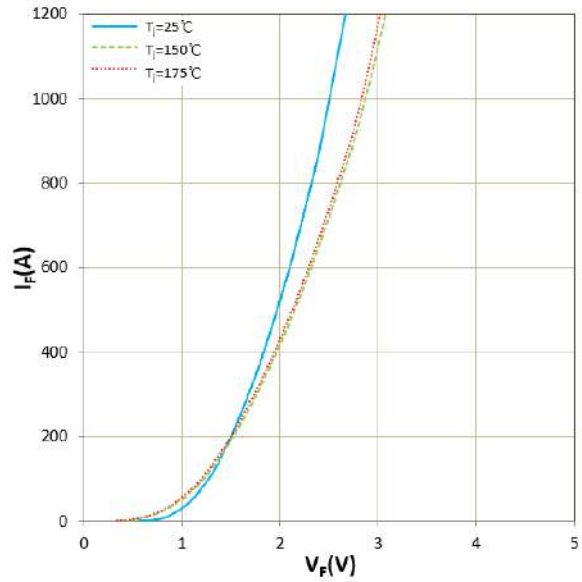


Figure 8. I_F vs V_F

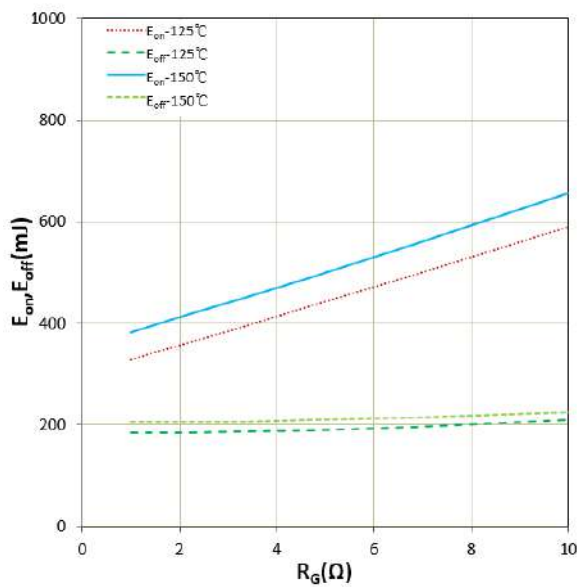


Figure 9. E_{on} , E_{off} vs R_G (Typ)
 $V_{CC} = 900\text{V}$, $V_{GE} = +15\text{V}/-8\text{V}$, $I_C = 600\text{A}$
Inductive Load

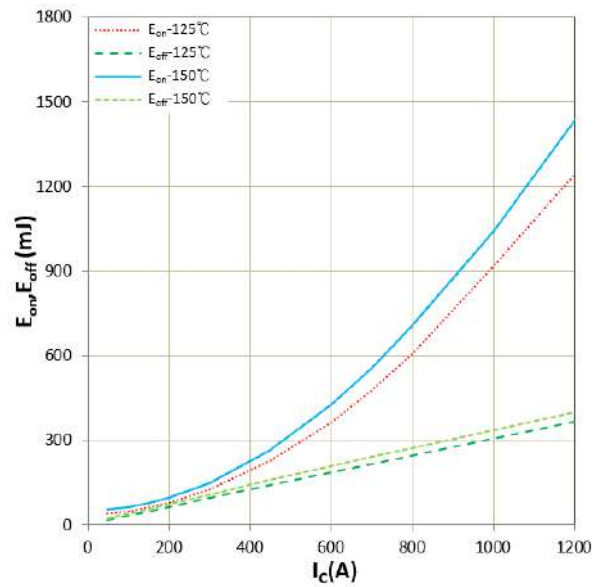


Figure 10 E_{on} , E_{off} vs I_C (Typ)
 $V_{CC} = 900\text{V}$, $V_{GE} = +15\text{V}/-8\text{V}$, $R_G = 1.0\Omega$
Inductive Load

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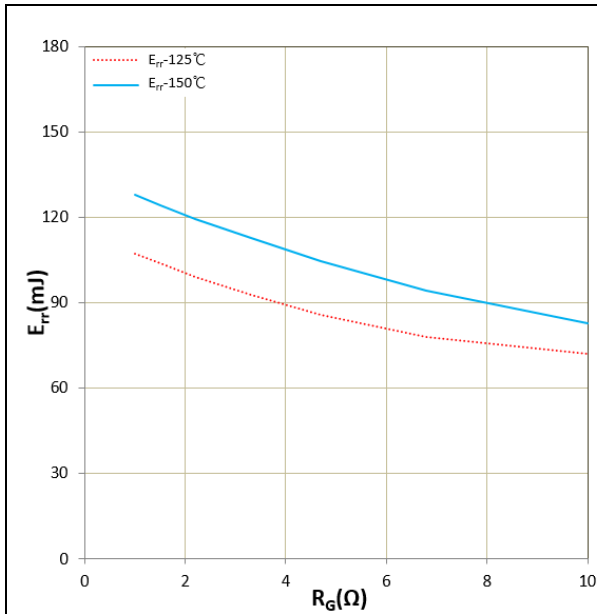


Figure 11. Err vs R_G (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $I_F=600A$
 Inductive Load

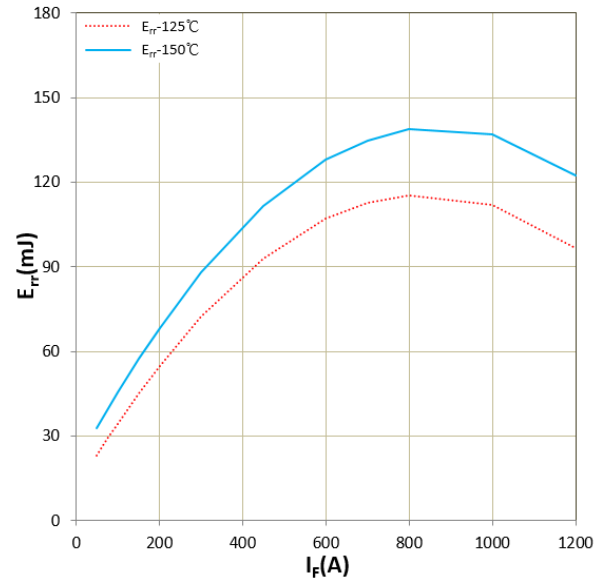


Figure 12. E_{rr} vs I_F (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $R_G=1.0\Omega$
 Inductive Load

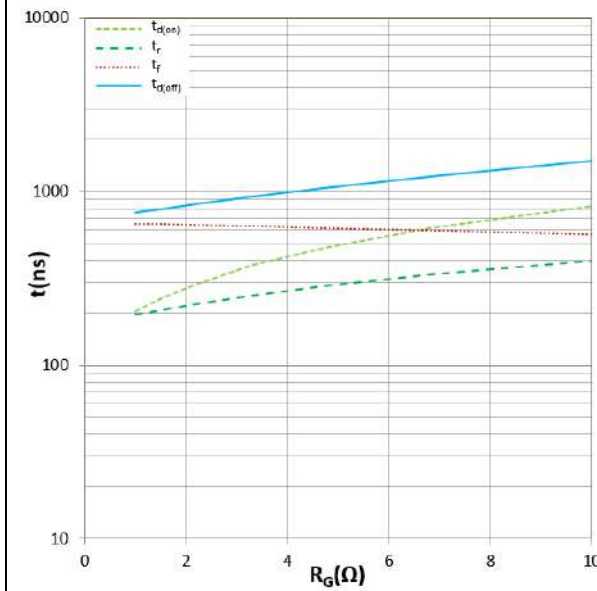


Figure 13. Switching time vs R_G (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $I_C=600A$
 $T_J=150^\circ C$, Inductive Load

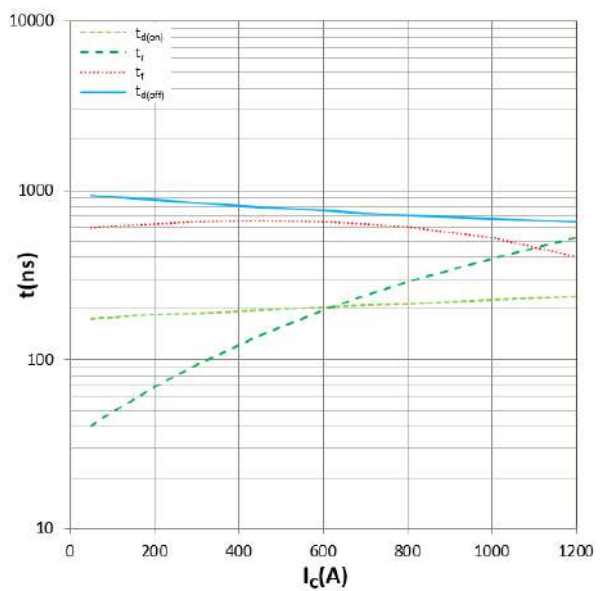


Figure 14. Switching time vs I_C (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $R_G=1.0\Omega$
 $T_J=150^\circ C$, Inductive Load

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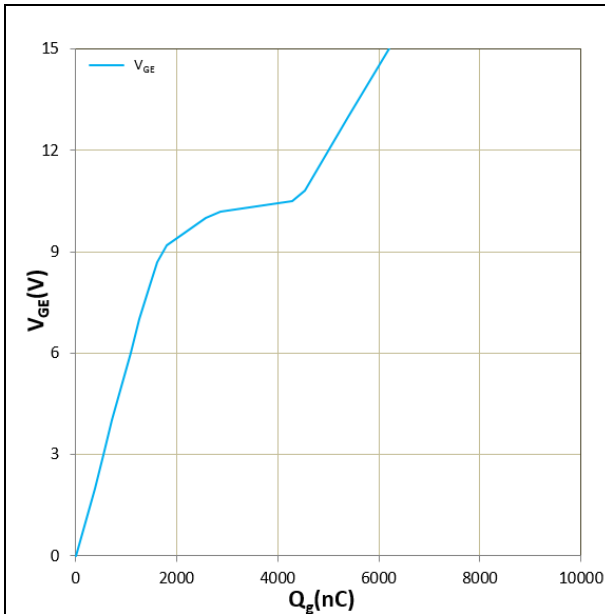


Figure 15. Gate charge

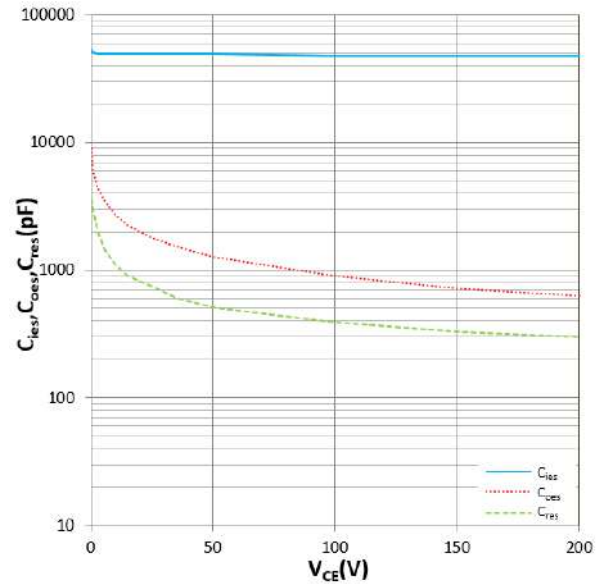


Figure 16. C_{ies} , C_{oes} , C_{res} vs V_{CE}
 $T_j = 25^\circ\text{C}$, $f = 1\text{MHz}$

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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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