

HCG900FF120E3ME7

1200V/900A Half Bridge IGBT Module

Description

The HCG900FF120E3ME7 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: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

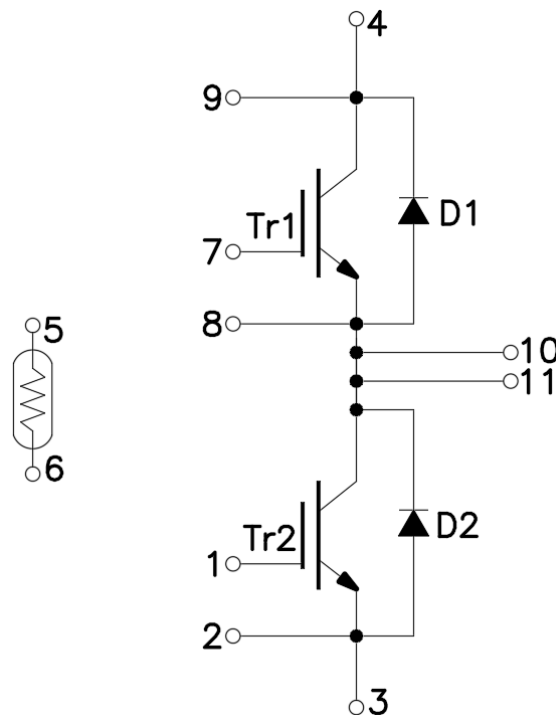


Figure 1. Out drawing & circuit diagram for HCG900FF120E3ME7

HCG900FF120E3ME7

1200V/900A Half Bridge IGBT Module

Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f=50Hz, t=1min	3.4	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	-	>400	-
Module lead resistance, terminals – chip	T _c =25°C	0.8	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)	3125	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

HCG900FF120E3ME7

1200V/900A Half Bridge IGBT Module

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	-	1.72	2.06	V	
			T _j =125°C	-	2.00	-		
			T _j =150°C	-	2.10	-		
			T _j =175°C	-	2.18	-		
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =25mA, V _{CE} =V _{GE}	5.0	-	6.5	V		
Q _G	Gate charge	V _{GE} = -15V to +15V	-	7.6	-	uC		
R _{Gint}	Internal gate resistor	-	T _j =25°C	-	0.5	-	Ω	
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V f=1MHz	T _j =25°C	-	133.8	-	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} =0V	T _j =25°C	-	-	1	mA	
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = 20V, V _{CE} =0V	T _j =25°C	-	-	1.5	uA	
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C = 900A V _{GE} =+15V/-8V R _g =1.0Ω Inductive load	T _j =25°C	-	289	-	ns	
			T _j =150°C	-	325	-		
t _r	Rise time		T _j =25°C	-	110	-	ns	
			T _j =150°C	-	138	-		
t _{d(off)}	Turn-off delay time		T _j =25°C	-	483	-	ns	
			T _j =150°C	-	548	-		
t _f	Fall time		T _j =25°C	-	163	-	ns	
			T _j =150°C	-	292	-		
E _{on}	Turn-on power dissipation		T _j =25°C	-	64.24	-	mJ	
			T _j =150°C	-	92.36	-		
E _{off}	Turn-off power dissipation		T _j =25°C	-	89.56	-	mJ	
			T _j =150°C	-	114.98	-		
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)				-	0.040	-	K/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied), Note1				-	0.015	-	K/W

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

HCG900FF120E3ME7

1200V/900A Half Bridge IGBT Module

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	$I_F=900\text{A}$ $V_{GE}=0\text{V}$	$T_j=25^\circ\text{C}$	-	1.69	2.03	V
			$T_j=125^\circ\text{C}$	-	1.58	-	
			$T_j=150^\circ\text{C}$	-	1.55	-	
			$T_j=175^\circ\text{C}$	-	1.50	-	
T_{rr}	Reverse recovery time	$V_{CC}=600\text{V}$	$T_j=25^\circ\text{C}$	-	685	-	ns
			$T_j=150^\circ\text{C}$	-	864	-	
I_{RM}	Peak reverse recovery Current	$I_F=900\text{A}$ $V_{GE}=+15/-8\text{V}$	$T_j=25^\circ\text{C}$	-	565	-	A
			$T_j=150^\circ\text{C}$	-	609	-	
Q_{rr}	Reverse recovery charge	$R_g=1.0\Omega$ Inductive load	$T_j=25^\circ\text{C}$	-	0.161	-	uC
			$T_j=150^\circ\text{C}$	-	0.242	-	
E_{rr}	Reverse recovered energy	switching operation	$T_j=25^\circ\text{C}$	-	75.50	-	mJ
			$T_j=150^\circ\text{C}$	-	112.32	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)		-	0.072	-	K/W	
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied), Note1		-	0.025	-	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

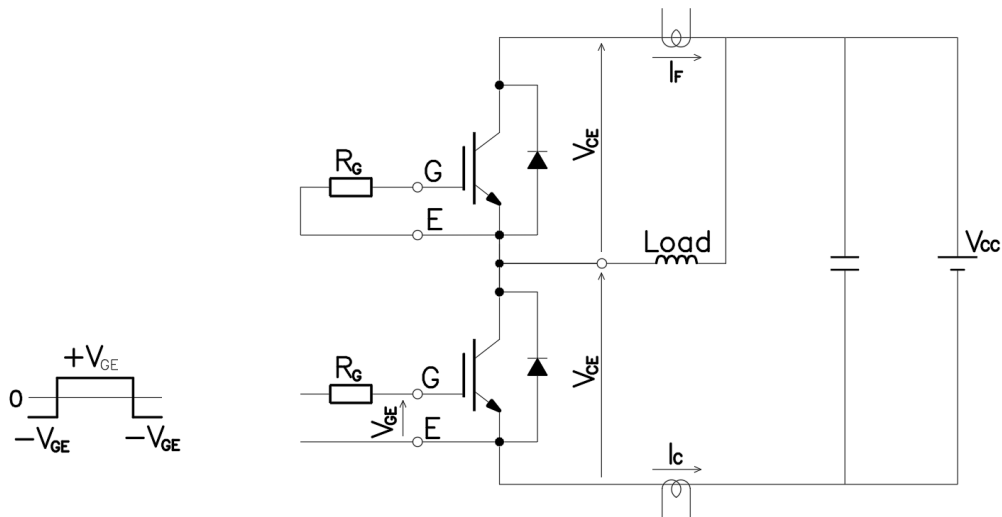


Figure 3. Switching time measure circuit

HCG900FF120E3ME7

1200V/900A Half Bridge IGBT Module

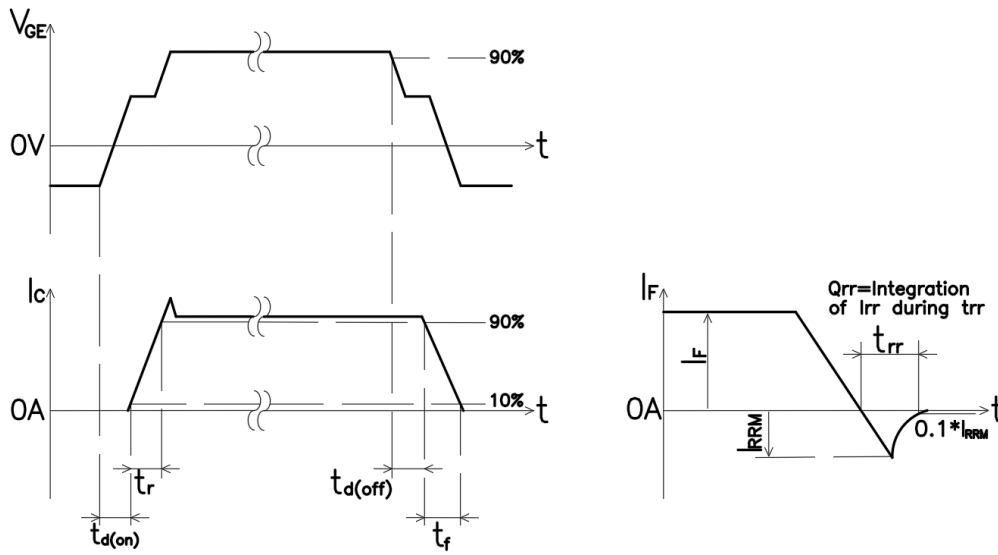


Figure 4. Switching time definition

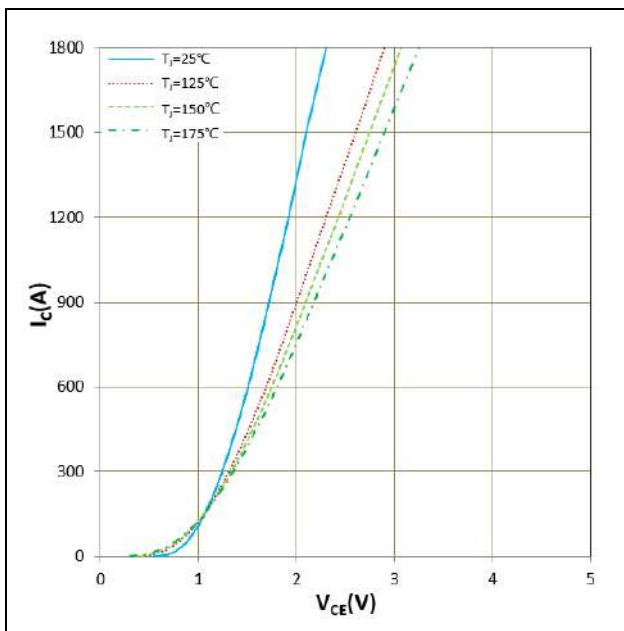


Figure 5. I_c vs V_{CE}
 $V_{GE} = 15V$

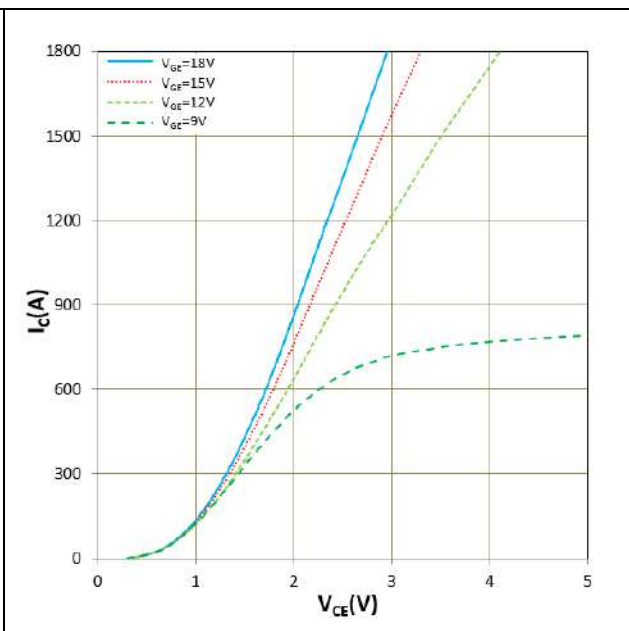


Figure 6. I_c vs V_{CE}
 $T_j = 175^\circ C$

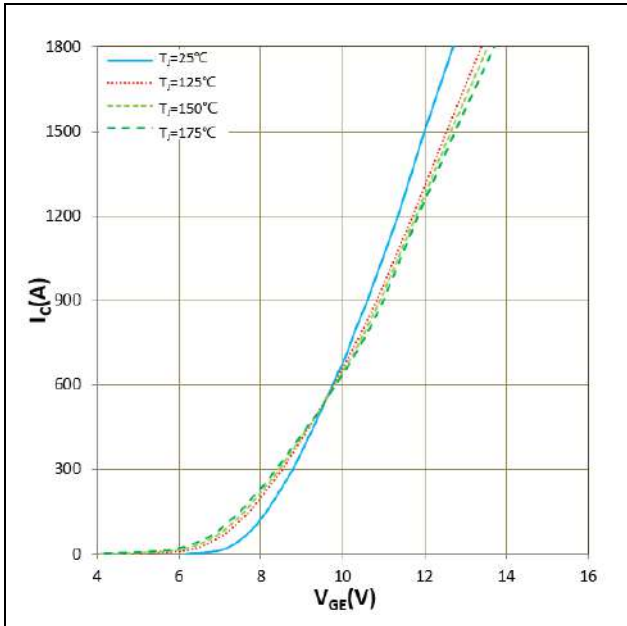
HCG900FF120E3ME7
1200V/900A Half Bridge IGBT Module


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

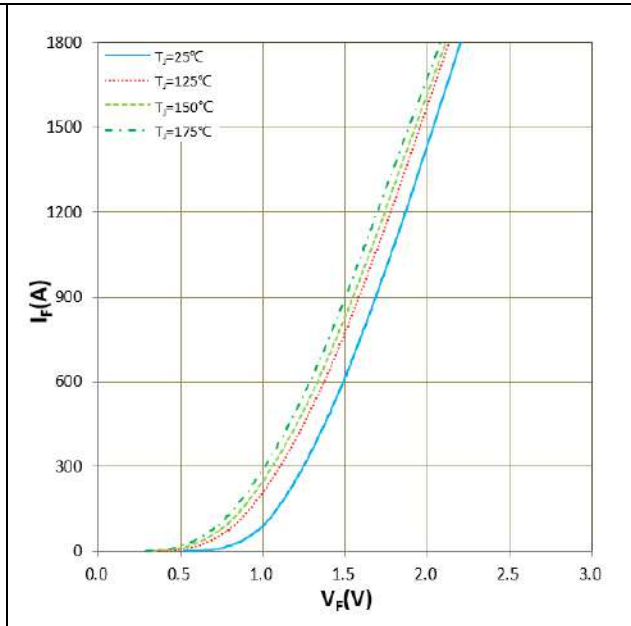


Figure 8. I_f vs V_F

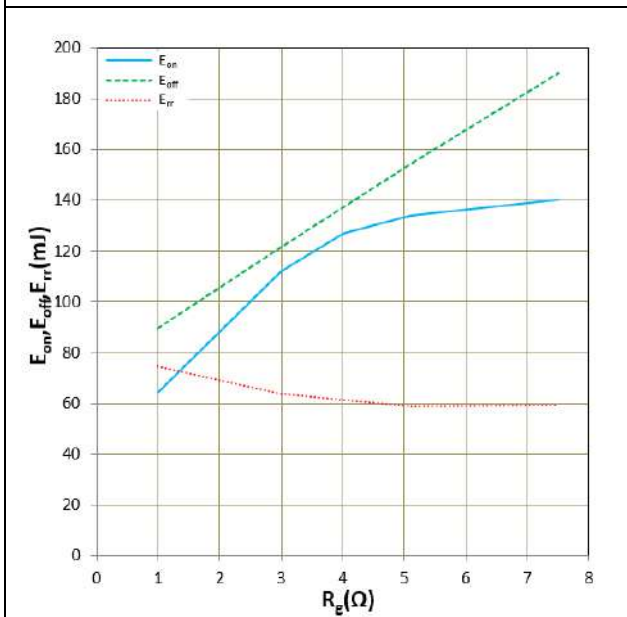


Figure 9. E_{on} , E_{off} , E_{tr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_c=900A$, $T_j=25^\circ C$
Inductive Load

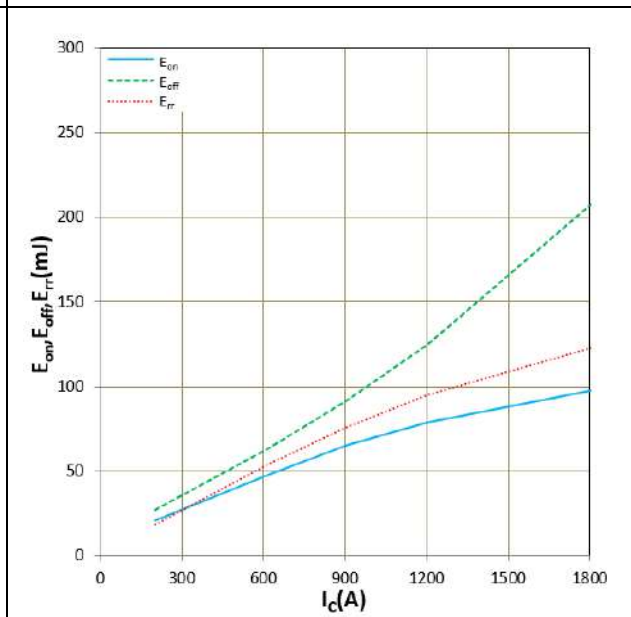


Figure 10. E_{on} , E_{off} , E_{tr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=1.0\Omega$, $T_j=25^\circ C$
Inductive Load

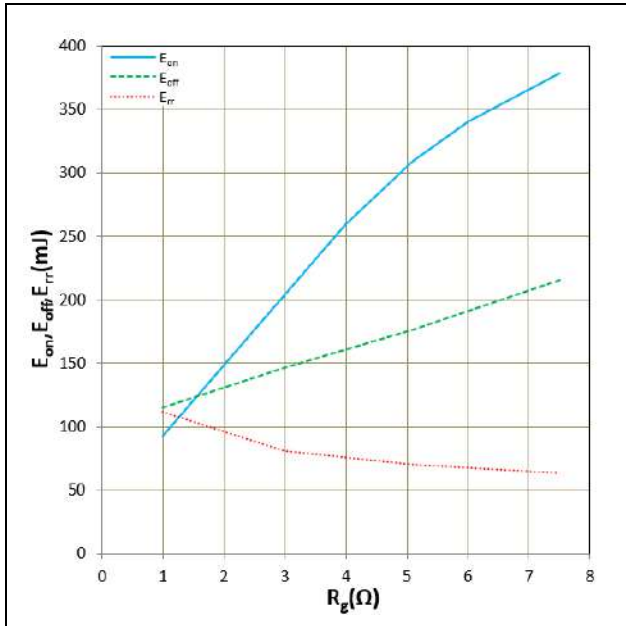
HCG900FF120E3ME7
1200V/900A Half Bridge IGBT Module


Figure 11. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=900A$, $T_j=150^\circ C$
 Inductive Load

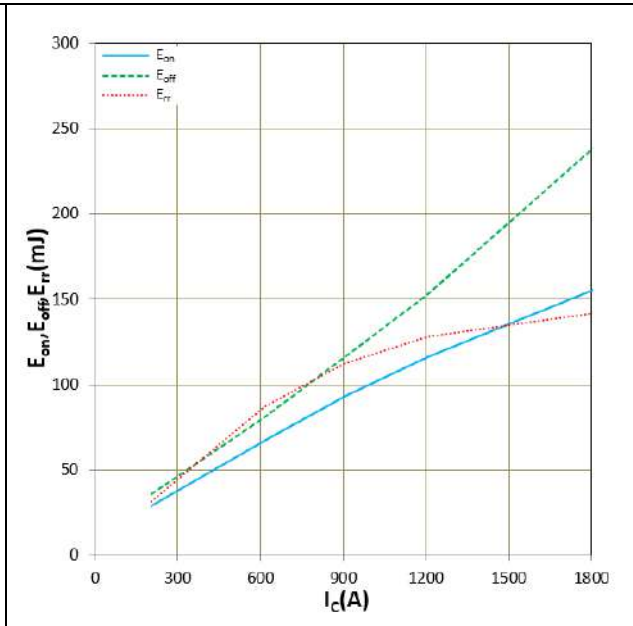


Figure 12. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=1.0\Omega$, $T_j=150^\circ C$
 Inductive Load

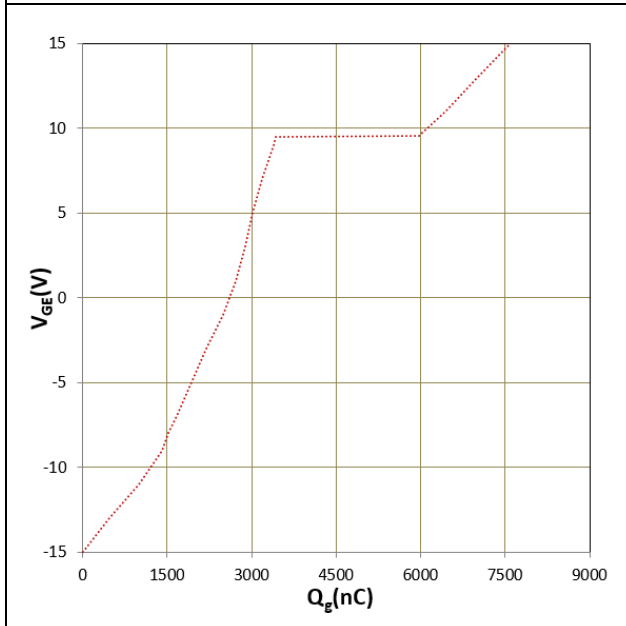


Figure 13. Gate charge
 $V_{CC}=600V$, $I_C=900A$, $T_j=25^\circ C$

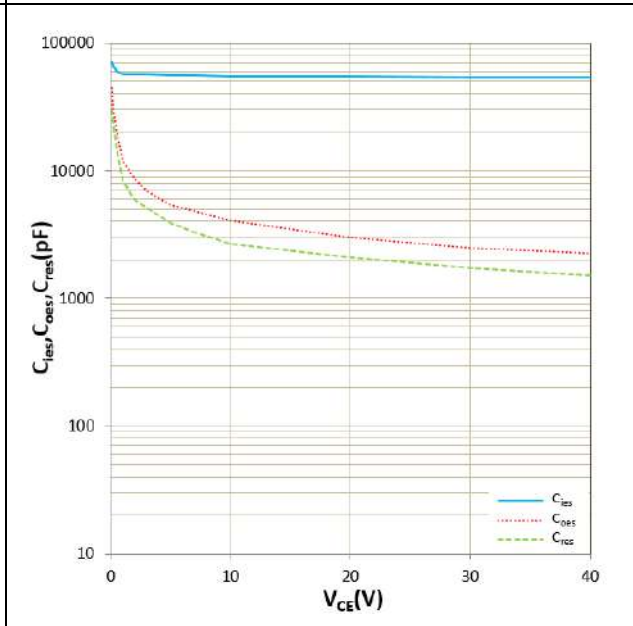
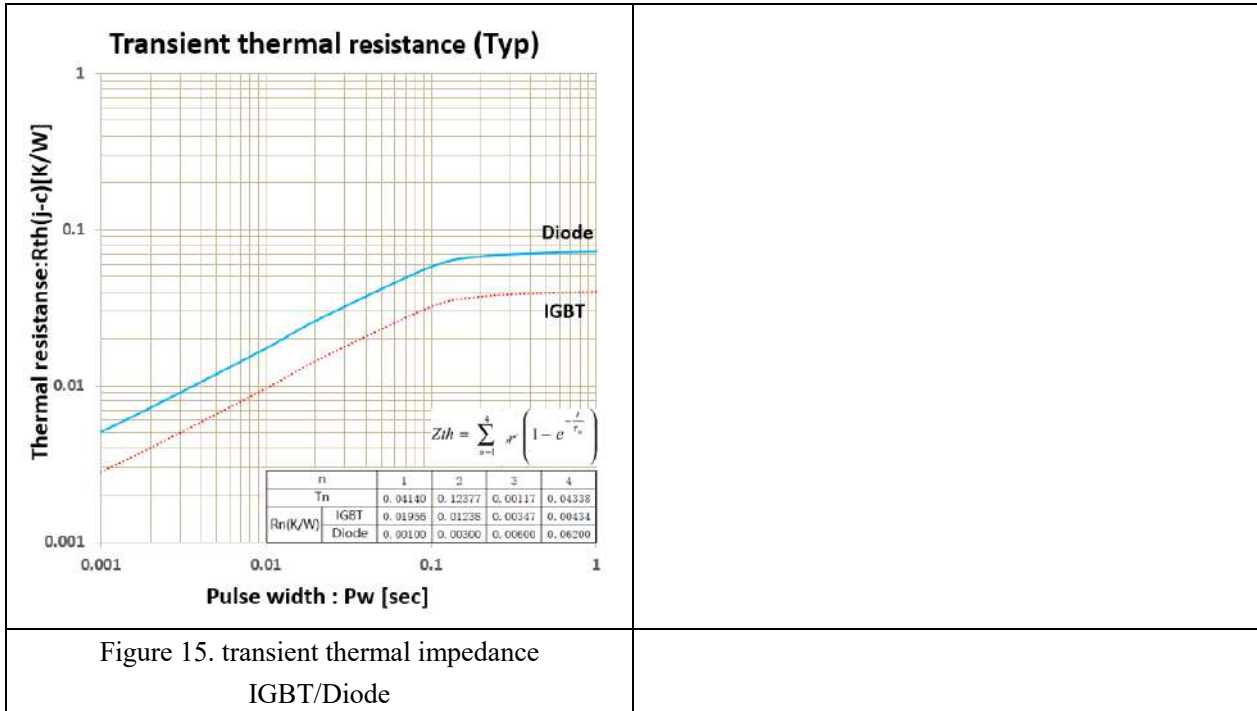


Figure 14. C_{ies} , C_{oes} , C_{res} vs V_{CE}
 $T_j=25^\circ C$, $f=1MHz$

HCG900FF120E3ME7

1200V/900A Half Bridge IGBT Module



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