

Description

The DFI450HF12I4ME2 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
- 175°C maximum junction temperature
- Thermistor inside

Applications

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

Circuit diagram

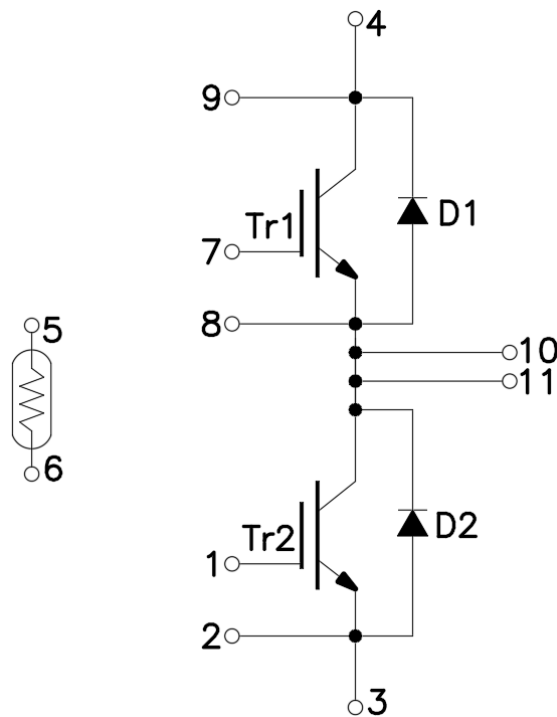


Figure 1. Out drawing & circuit diagram for DFI450HF12I4ME2

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	±20	V
I _C	DC Continuous Collector Current	T _C =100°C	450	A
I _{CM}	Pulse Collector Current	t _p =1ms, Note1	900	A
P _C	Maximum Power Dissipation	T _C =25°C, T _j =175°C(IGBT)	3000	W
I _F	Diode forward Current	T _C =100°C	450	A
I _{FRM}	Repetitive peak forward Current	t _p =1ms, Note1	900	A
T _{SC}	IGBT short circuit withstand time	-	10	us
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
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

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 =450A V _{GE} =15V	T _j =25°C	1.5	1.7	1.9	V			
			T _j =150°C	-	2.15	-	V			
			T _j =175°C	-	2.25	-	V			
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =2mA, V _{CE} =V _{GE}		5.0	5.6	6.2	V			
Q _G	Gate charge	V _{GE} =-15V to +15V		-	3.7	-	uC			
R _{Gint}	Internal gate resistor	-	T _j =25°C	-	1.8	-	Ω			
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V f=100KHz	T _j =25°C	-	47	-	nF			
C _{res}	Reverse transfer Capacitance			-	1.7	-	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	-	-	0.6	uA			
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C = 450A V _{GE} =+15V/-8V R _G =2.2Ω Inductive load	T _j =25°C	-	438	-	ns			
			T _j =125°C	-	450	-				
			T _j =175°C	-	461	-				
t _r	Rise time		V _{CC} =600V I _C = 450A V _{GE} =+15V/-8V R _G =2.2Ω Inductive load	T _j =25°C	-	221	-	ns		
				T _j =125°C	-	273	-			
				T _j =175°C	-	283	-			
t _{d(off)}	Turn-off delay time			V _{CC} =600V I _C = 450A V _{GE} =+15V/-8V R _G =2.2Ω Inductive load	T _j =25°C	-	565	-	ns	
					T _j =125°C	-	599	-		
					T _j =175°C	-	611	-		
t _f	Fall time				V _{CC} =600V I _C = 450A V _{GE} =+15V/-8V R _G =2.2Ω Inductive load	T _j =25°C	-	122	-	ns
						T _j =125°C	-	199	-	
						T _j =175°C	-	287	-	
E _{on}	Turn-on power dissipation	V _{CC} =600V I _C = 450A V _{GE} =+15V/-8V R _G =2.2Ω Inductive load				T _j =25°C	-	101.9	-	mJ
						T _j =125°C	-	131.0	-	
						T _j =175°C	-	161.7	-	
E _{off}	Turn-off power dissipation		V _{CC} =600V I _C = 450A V _{GE} =+15V/-8V R _G =2.2Ω Inductive load			T _j =25°C	-	33.04	-	mJ
						T _j =125°C	-	40.54	-	
						T _j =175°C	-	48.02	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-		0.05	-	°C/W		
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-		0.02	-	°C/W		

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 = 450A, V _{GE} = 0V	T _j = 25°C	-	1.8	-	V
			T _j = 150°C	-	2.0	-	
			T _j = 175°C	-	2.0	-	
t _{rr}	Reverse recovery time	(Switch side) V _{CC} = 600V I _C = 450A	T _j = 25°C	-	0.395	-	us
			T _j = 125°C	-	0.570	-	
			T _j = 175°C	-	0.77	-	
I _{RM}	Peak reverse recovery Current	V _{GE} = +15V/-8V R _G = 2.2Ω (FRD side)	T _j = 25°C	-	157	-	A
			T _j = 125°C	-	160	-	
			T _j = 175°C	-	164	-	
Q _{rr}	Recovered charge	V _{rr} = 600V I _F = 450A V _{GE} = -8V	T _j = 25°C	-	33.74	-	uC
			T _j = 125°C	-	53.38	-	
			T _j = 175°C	-	72.3	-	
E _{rr}	Reverse recovered energy	Inductive load switching operation	T _j = 25°C	-	7.44	-	mJ
			T _j = 125°C	-	13.54	-	
			T _j = 175°C	-	18.37	-	
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)		-	0.02	-	°C/W	

Test Conditions

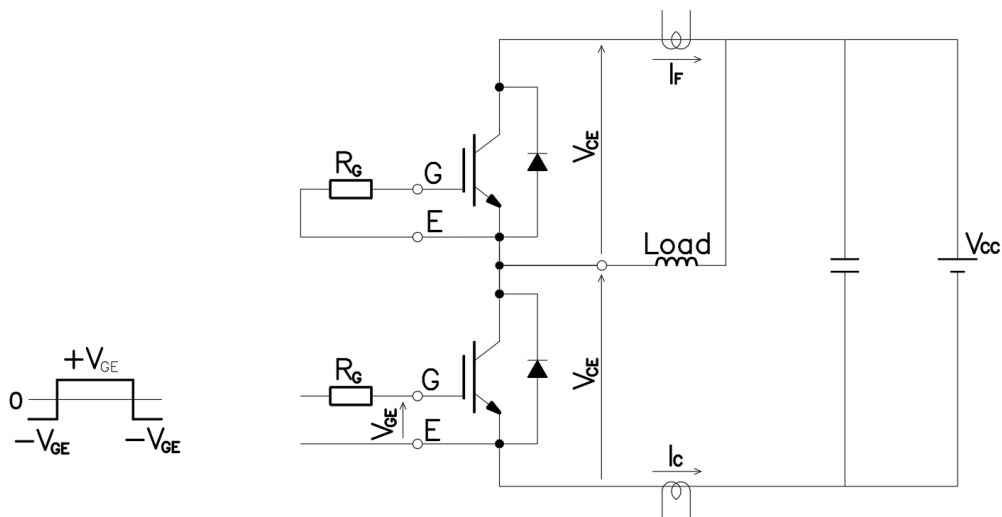


Figure 3. Switching time measure circuit

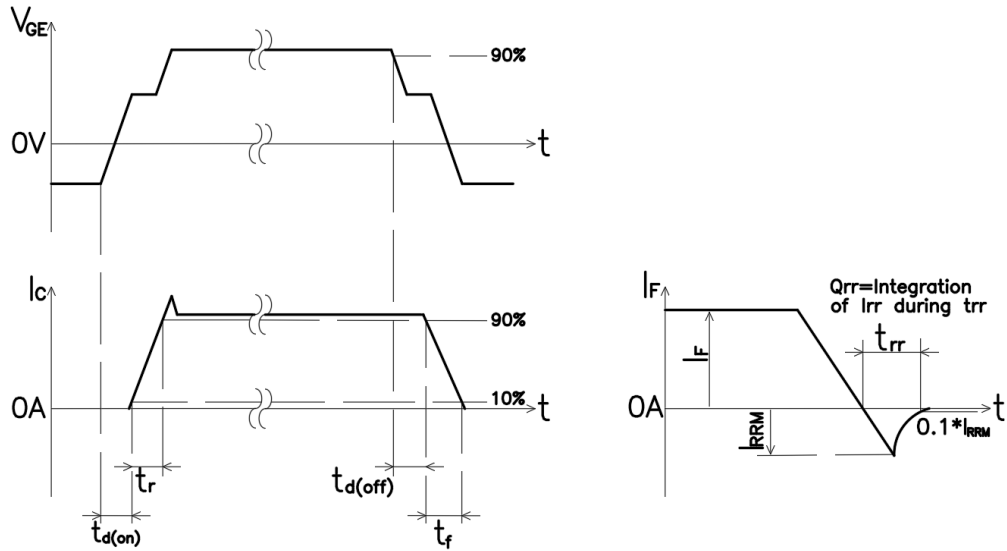


Figure 4. Switching time definition

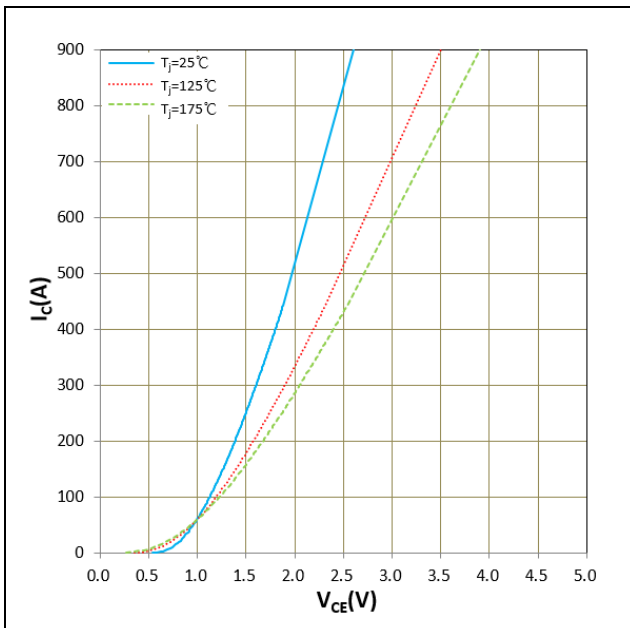


Figure 5. I_c vs V_{CE}
 $V_{GE} = 15V$

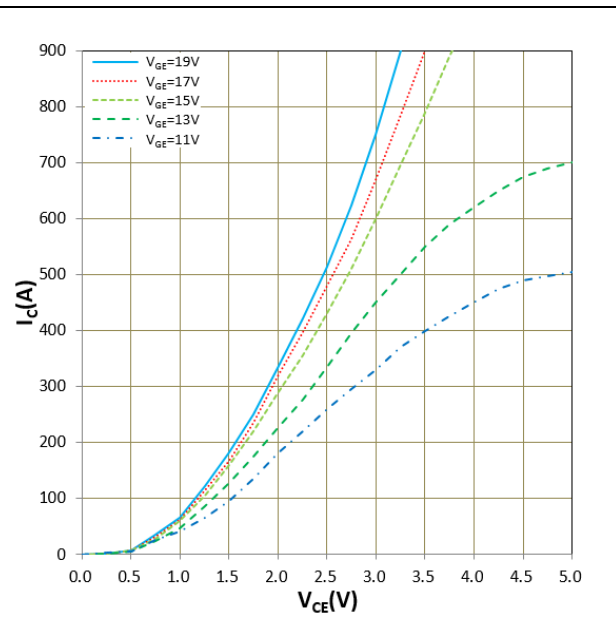


Figure 6. I_c vs V_{CE}
 $T_j = 175^\circ C$

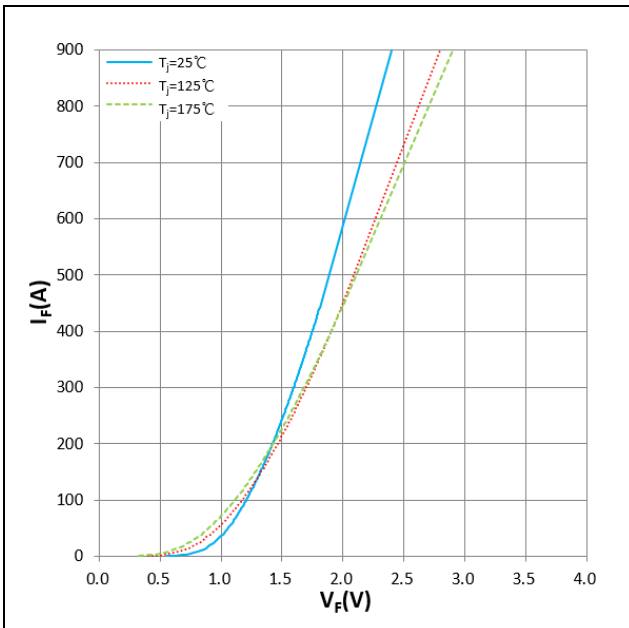


Figure 7. I_F vs V_F

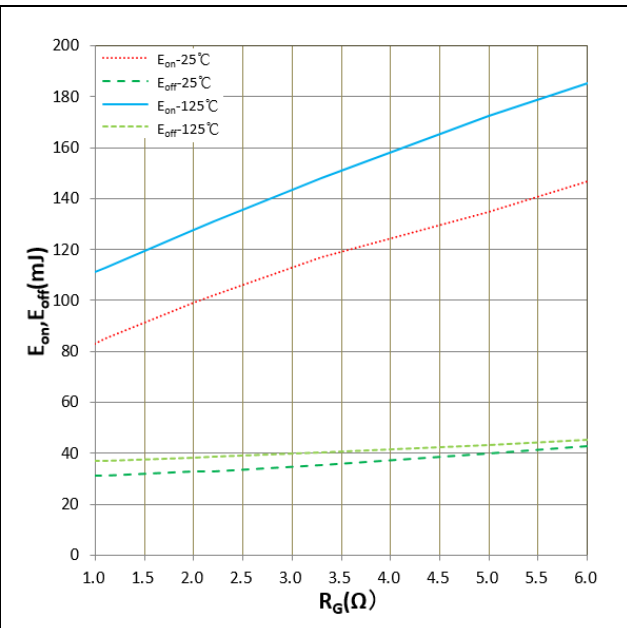


Figure 8. E_{on} , E_{off} vs R_G (Typ)
 $V_{CC}=600\text{V}$, $V_{GE}=+15\text{V}/-8\text{V}$, $I_C=450\text{A}$
 Inductive Load

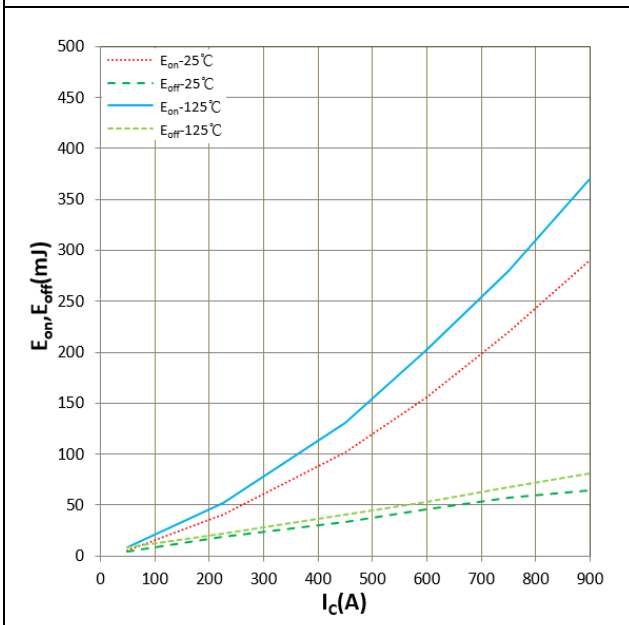


Figure 9. E_{on} , E_{off} vs I_C (Typ)
 $V_{CC}=600\text{V}$, $V_{GE}=+15\text{V}/-8\text{V}$, $R_G=2.2\Omega$
 Inductive Load

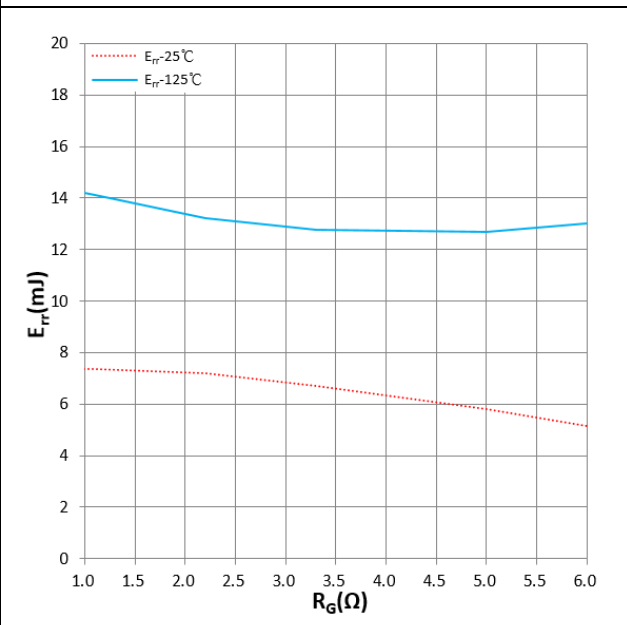


Figure 10. E_{rr} vs R_G (Typ)
 $V_{CC}=600\text{V}$, $V_{GE}=+15\text{V}/-8\text{V}$, $I_F=450\text{A}$
 Inductive Load

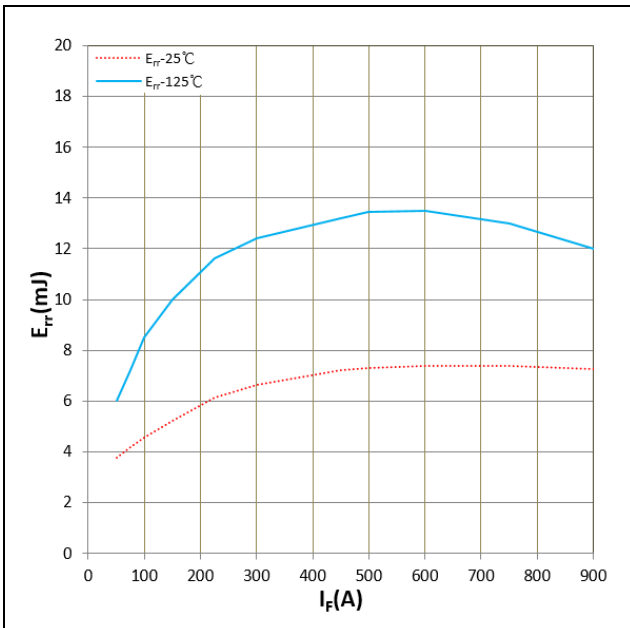


Figure 11. E_{rr} vs I_F (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_G=2.2\Omega$
 Inductive Load

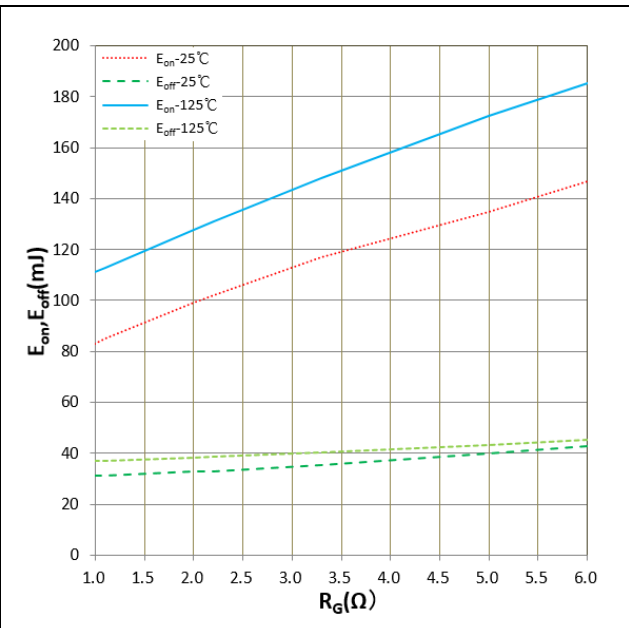


Figure 12. Switching time vs R_G (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=450A$
 $T_j=125^\circ C$, Inductive Load

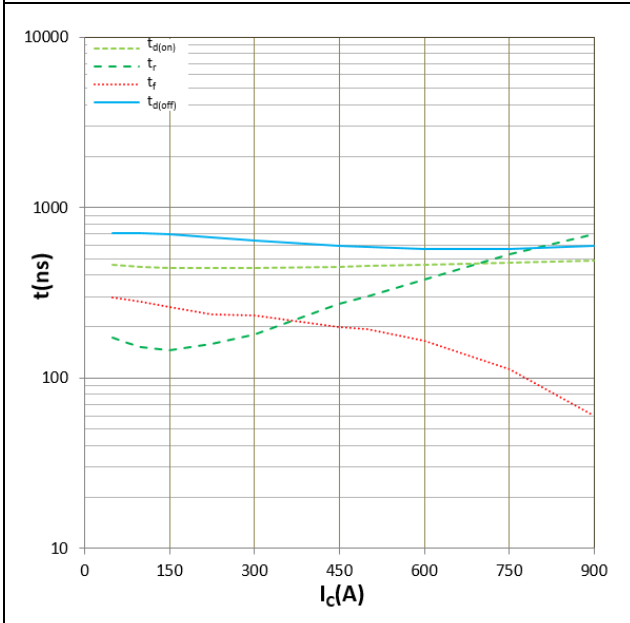


Figure 13. Switching time vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_G=2.2\Omega$
 $T_j=125^\circ C$, Inductive Load

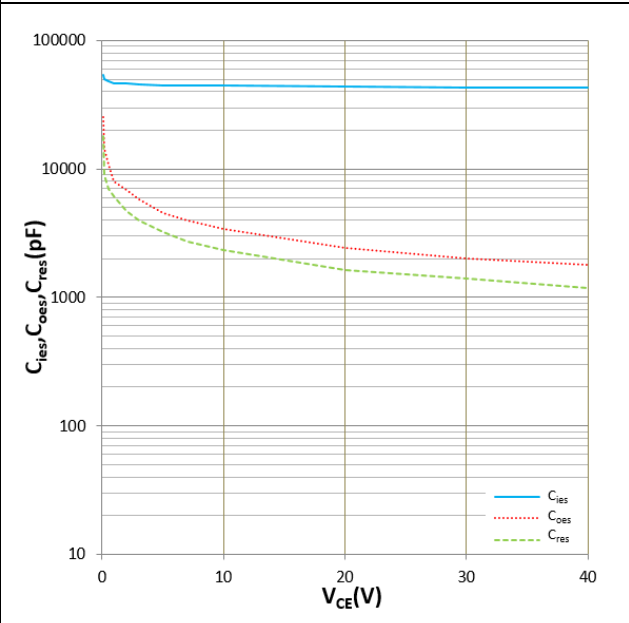


Figure 14. C_{ies} , C_{oes} , C_{res} vs V_{CE}
 $T_j=25^\circ C$, $f=100KHz$

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