DFI300HF17DFRE1

1700V/300A Half Bridge IGBT Module

Description

The DFI300HF17DFRE1 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°C
- Lower losses and higher energy
- High speed switching

Applications

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

Circuit diagram

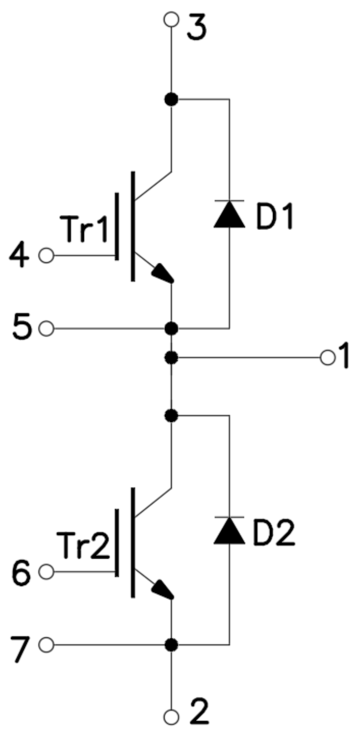


Figure 1. Out drawing & circuit diagram for DFI300HF17DFRE1

Pin Configuration and Marking Information

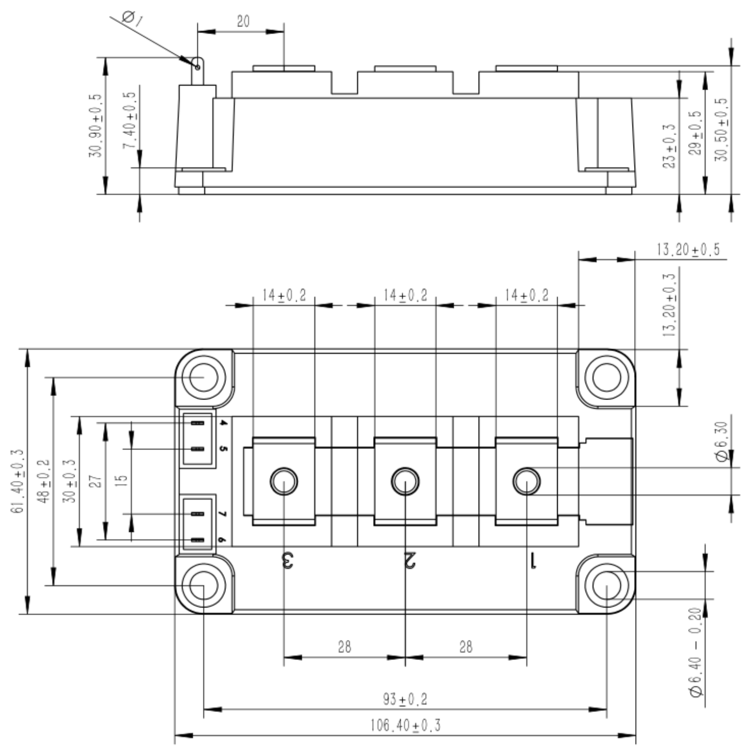


Figure 2. Pin configuration

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
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	R2 = R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))]	-	3375	-	K
$B_{25/80}$	B-value	R2 = R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))]	-	3411	-	K
$B_{25/100}$	B-value	R2 = R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	-	3433	-	K

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

Symbol	Item	Condition		Value Min.	Value Typ.	Value Max.	Unit
$V_{CE(sat)}$	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, V_{GE} =0V, f =1MHz	T_j =25°C	-	28.0	-	nF
C_{oes}	Output Capacitance			-	1.02	-	nF
C_{res}	Reverse transfer Capacitance			-	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.

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

Symbol	Item	Condition		Value Min.	Value Typ.	Value Max.	Unit
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
			Tj =175°C	-	2.10	-	V
t_{rr}	Reverse recovery time	(Switch side) V_{CC}=900V, I_C=300A V_{GE}=+15V/-8V, R_G=1.5Ω (FRD side) V_{rr}=900V, I_F=300A V_{GE}=-8V Inductive load switching operation	Tj =25°C	-	730	-	ns
			Tj =150°C	-	1059	-	ns
I_{RM}	Peak reverse recovery Current		Tj =25°C	-	134	-	A
			Tj =150°C	-	168	-	A
Q_{rr}	Recovered charge		Tj=25°C	-	53	-	uC
			Tj =150°C	-	124	-	uC
E_{rr}	Reverse recovered energy		Tj =25°C	-	35.9	-	mJ
			Tj =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

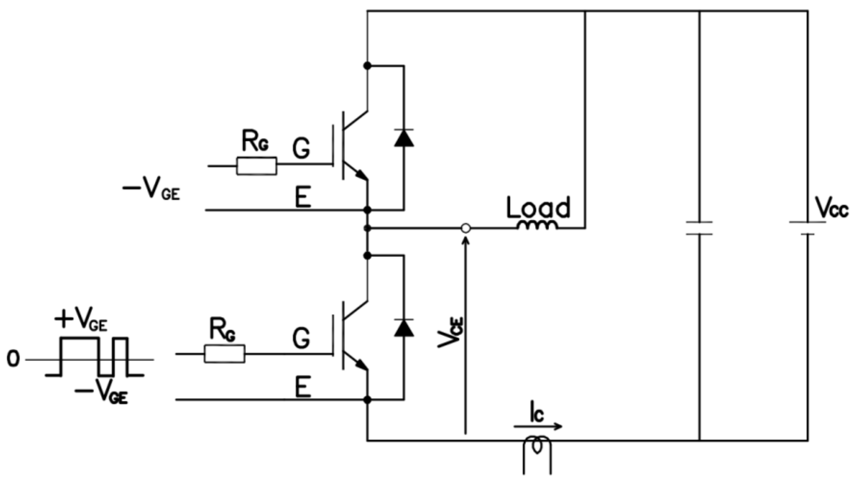


Figure 3. Switching time measure circuit

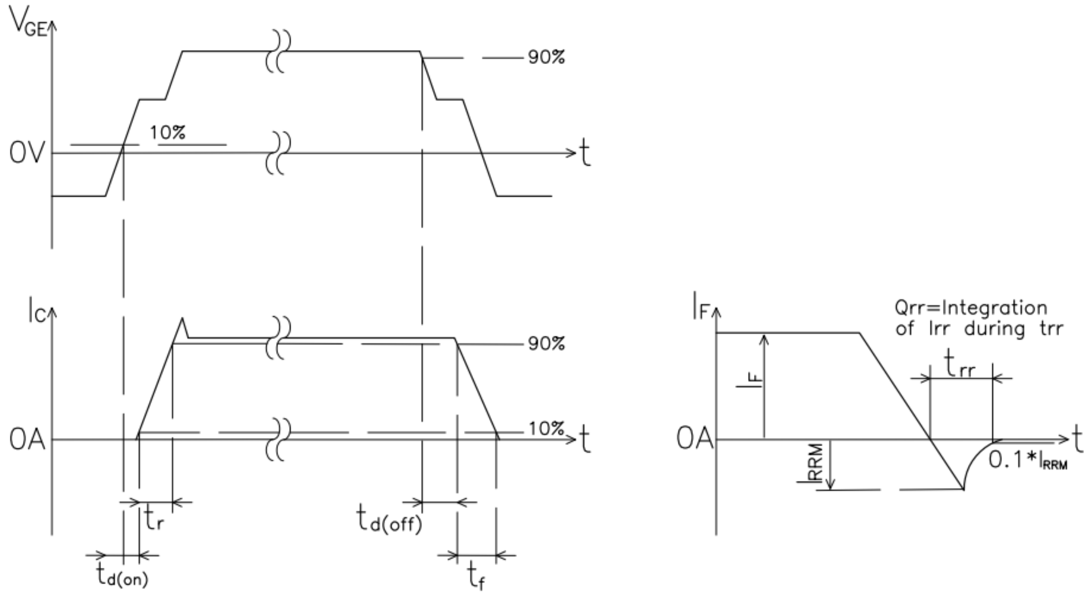
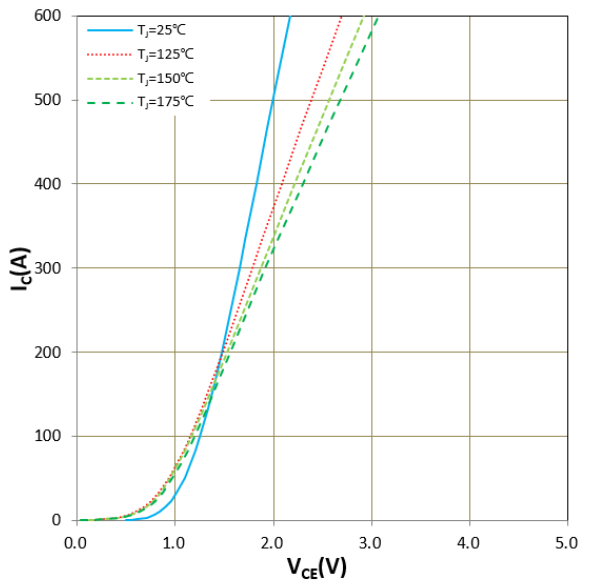


Figure 4. Switching time definition



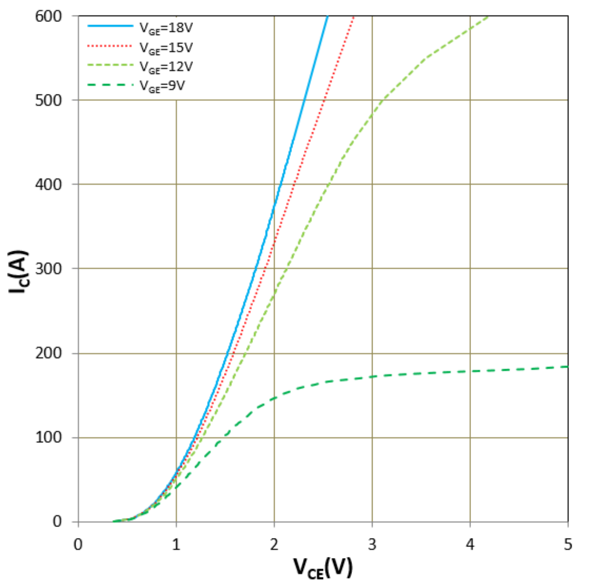


Figure 5. Ic vs V_{CE} V_{GE} =15V	Figure 6. Ic vs V_{CE} T_j =175°C

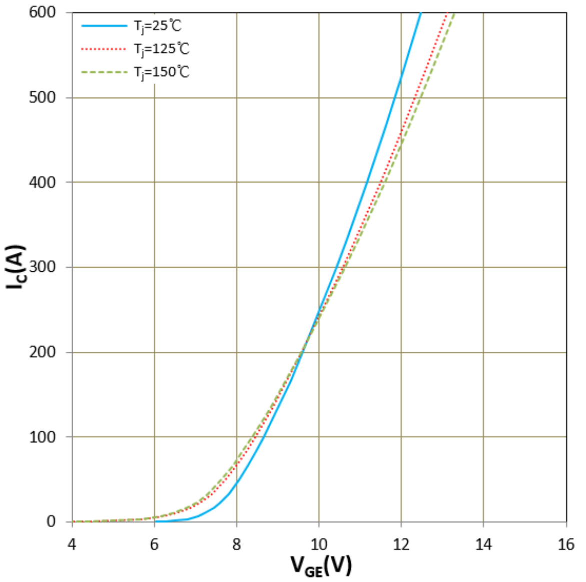


Figure 7. Ic vs V_{GE}

V_{CE} =20V

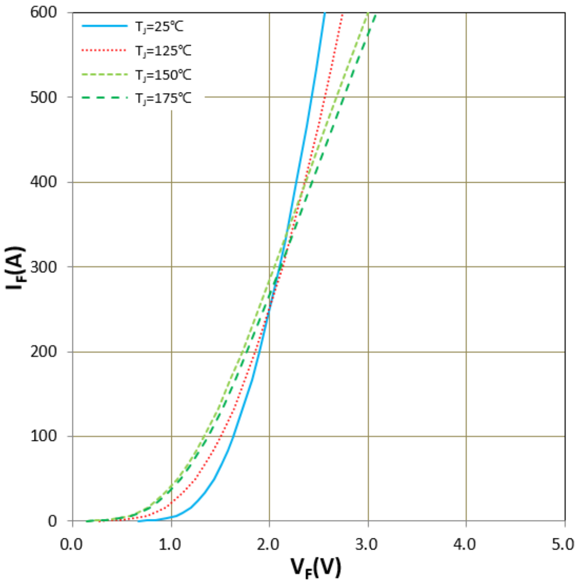


Figure 8. I_F vs V_F

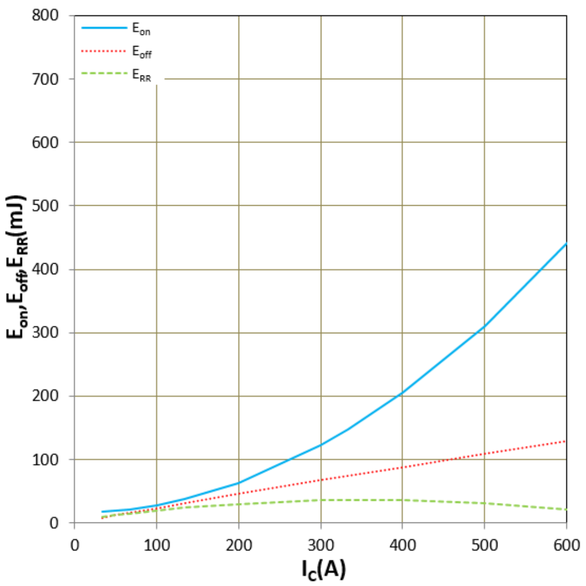


Figure 9. E_{on}, E_{off}, E_{rr} vs Ic(Typ)

V_{CC}=900V, V_{GE} =+15V/-8V, R_g =1.5Ω, T_j =25°C

Inductive Load

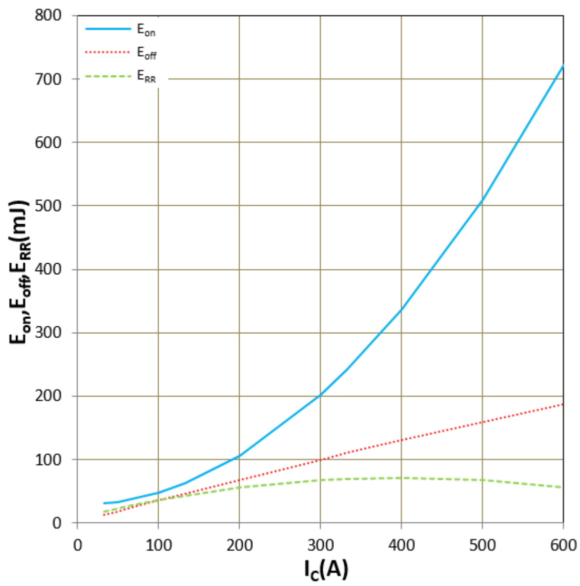


Figure 10. E_{on}, E_{off}, E_{rr} vs Ic(Typ)

V_{CC}=900V, V_{GE} =+15V/-8V, R_g =1.5Ω, T_j =150°C

Inductive Load

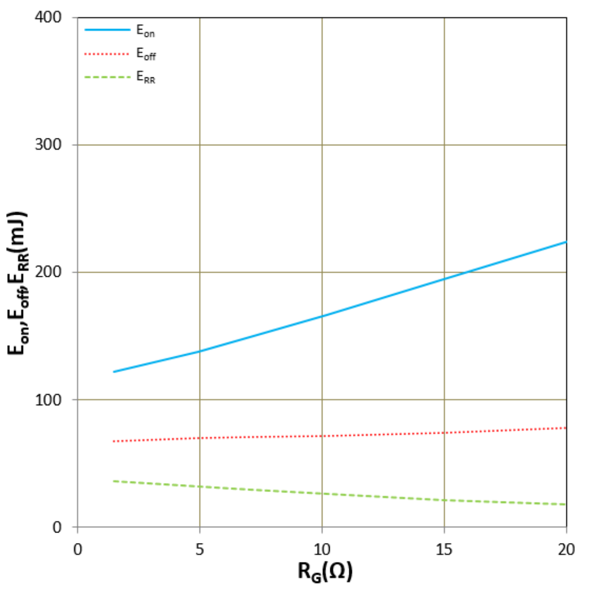


Figure 11. E_{on}, E_{off}, E_{rr} vs R_g(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =300A, T_j =25°C
Inductive Load

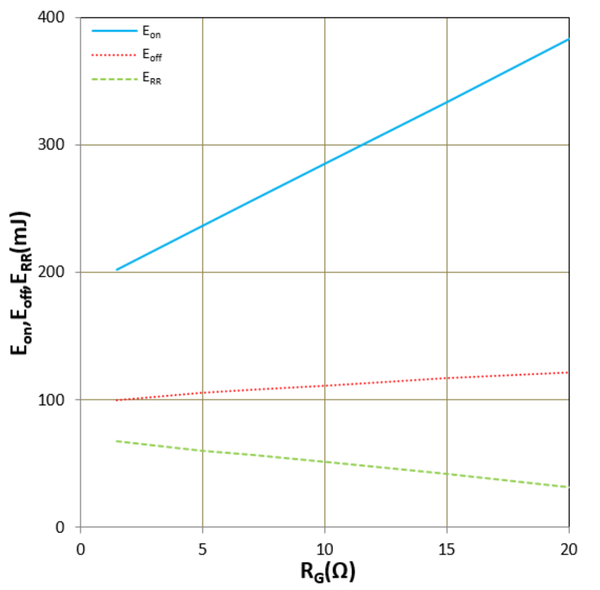


Figure 12. E_{on}, E_{off}, E_{rr} vs R_g(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =300A, T_j =150°C
Inductive Load

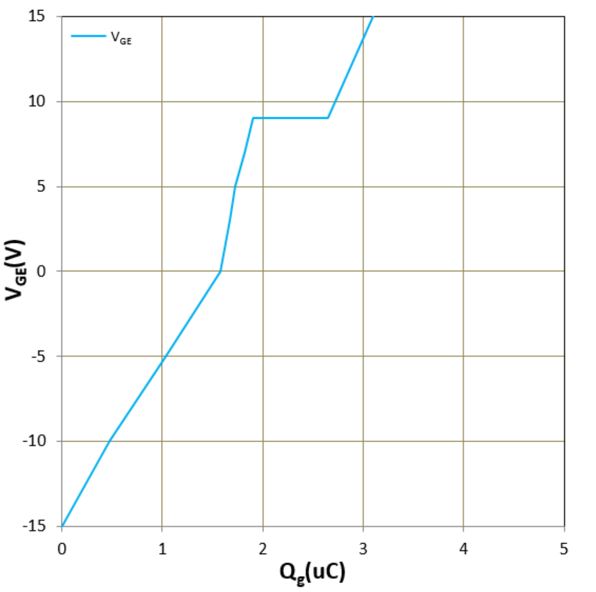


Figure 13. Gate charge

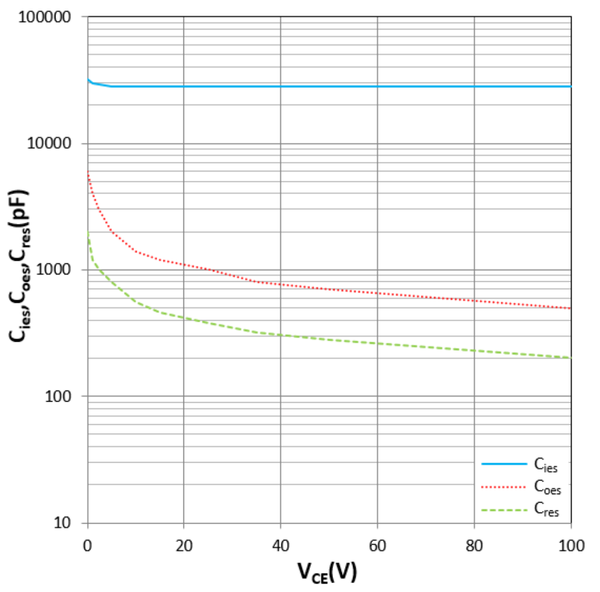


Figure 14. C_{ies}， C_{oes}， C_{res} vs V_{CE}
T_j =25°C, f =1MHz

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