

Description

The DFI500HF17DFRE1 offer lower losses and higher energy for soft switching applications.



Features

- 1700V500 A, $V_{CE(sat)}$ (typ.) =1.8V
- Lower losses and higher energy
- Excellent short-circuit capability
- 62mm half bridge module

Applications

- Motor drive
- Inverter
- Power supply
- Wind Turbines

Circuit diagram

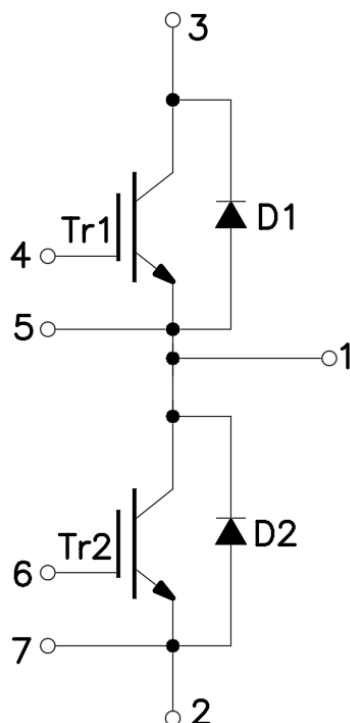


Figure 1. Out drawing & circuit diagram for DFI500HF17DFRE1

Pin Configuration and Marking Information

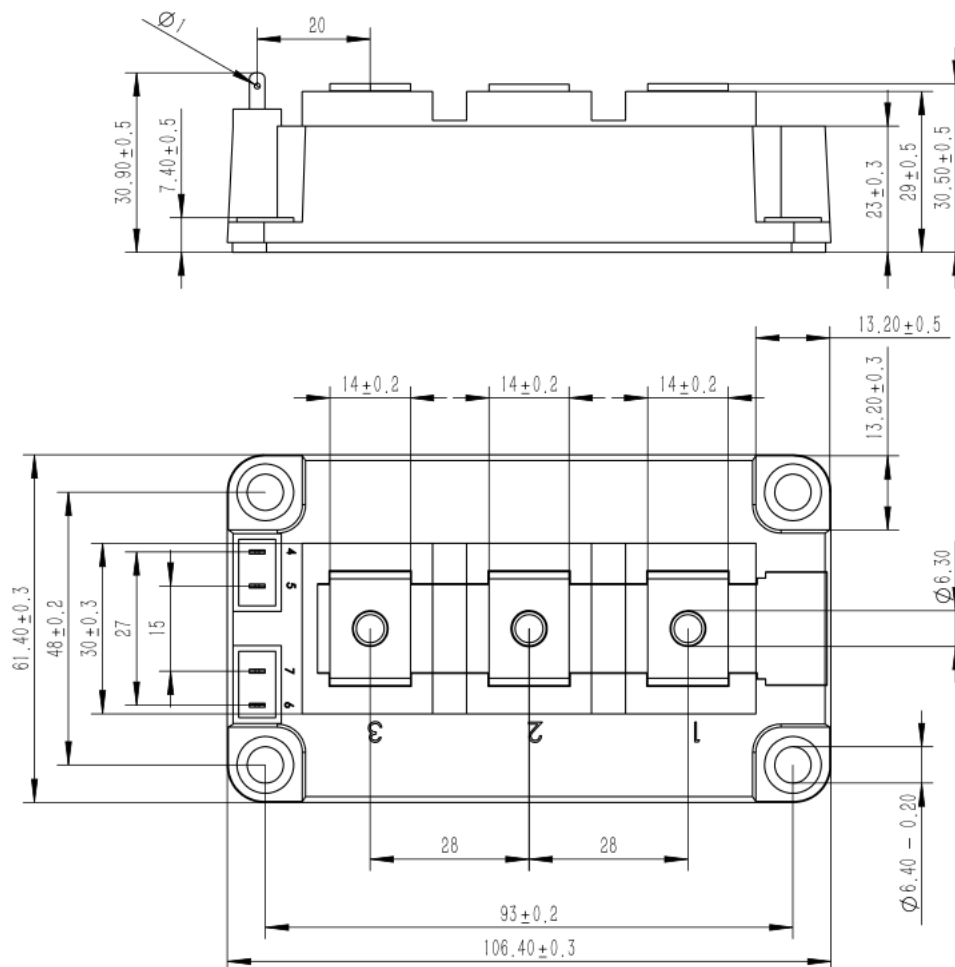


Figure 2. Pin configuration

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	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 (IGBT, $T_j = 25^\circ\text{C}$ 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	$\pm 20\text{V}$	V
I_C	DC Continuous Collector Current	$T_C = 80^\circ\text{C}$	500	A
I_{CM}	Pulse Collector Current	$t_p = 1\text{ms}$, Note1	1000	A
P_C	Maximum Power Dissipation	$T_C = 25^\circ\text{C}$, $T_j = 150^\circ\text{C}$ (IGBT)	1645	W
I_F	Diode forward Current	-	500	A
I_{FRM}	Repetitive peak forward Current	$t_p = 1\text{ms}$, Note1	1000	A
I^2t	I^2t -value	$V_R = 0\text{V}$, $t_p = 10\text{ms}$, $T_j = 125^\circ\text{C}$ (Diode)	20000	A^2s
T_{jmax}	Max junction temperature	-	175	$^\circ\text{C}$
T_{jop}	Operating junction temperature	-	-40 to 150	$^\circ\text{C}$
T_{stg}	Storage temperature	-	-40 to 125	$^\circ\text{C}$

Note1: Pulse width limited by maximum junction temperature

IGBT Electrical characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =500A V _{GE} =15V	T _J =25°C	-	1.8	-	V
			T _J =125°C	-	2.2	-	V
			T _J =150°C	-	2.3	-	V
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =24mA, V _{CE} =V _{GE}		5.2	5.8	6.4	V
Q _G	Gate charge	V _{GE} = -15V to +15V		-	4.2	-	uC
R _{Gint}	Internal gate resistor	f=1M, V _{pp} =1V	T _J =25°C	-	2.55	-	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V f =1MHz	T _J =25°C	-	33	-	nF
C _{oes}	Output Capacitance			-	1.2	-	nF
C _{res}	Reverse transfer Capacitance			-	0.5	-	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	-	-	1.2	uA
t _{d(on)}	Turn-on delay time	V _{CC} =900V I _C = 500A V _{GE} =+15V/-8V R _{Gon} = R _{Goff} =1Ω Inductive load	T _J =25°C	-	240	-	ns
			T _J =150°C	-	244	-	
t _r	Rise time		T _J =25°C	-	84	-	ns
			T _J =150°C	-	102	-	
t _{d(off)}	Turn-off delay time		T _J =25°C	-	546	-	ns
			T _J =150°C	-	656	-	
t _f	Fall time		T _J =25°C	-	368	-	ns
			T _J =150°C	-	536	-	
E _{on}	Turn-on power dissipation		T _J =25°C	-	114	-	mJ
			T _J =150°C	-	177	-	

E _{off}	Turn-off power dissipation		T _j = 25°C	-	103	-	mJ
			T _j = 150°C	-	138	-	
I _{SC}	SC data	V _{GE} < 15V V _{CC} = 1000V	T _j = 150°C t _p < 10us	-	2000	-	A
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-	0.075	-	°C/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.025	-	°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 =500A, V _{GE} =0V	T _j =25°C	-	1.82	-	V
			T _j =150°C	-	1.86	-	
t _{rr}	Diode Reverse Recovery Time	(Switch side) V _{CC} =900V, I _C =500A	T _j =25°C		264		ns
			T _j =150°C		546		
I _{RM}	Peak reverse recovery Current	V _{GE} =+15V/-8V R _{Gon} = R _{Goff} =1Ω	T _j =25°C	-	865	-	A
			T _j =150°C	-	742	-	
Q _{rr}	Recovered charge	(FRD side) V _{rr} =900V, I _F =500A	T _j =25°C	-	132	-	uC
			T _j =150°C	-	155	-	
E _{rr}	Reverse recovered energy	V _{GE} =+15V/-8V Inductive load switching operation	T _j =25°C	-	79.2	-	mJ
			T _j =150°C	-	74.1	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)			-	0.075	-	°C/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.025	-	°C/W

Test Conditions

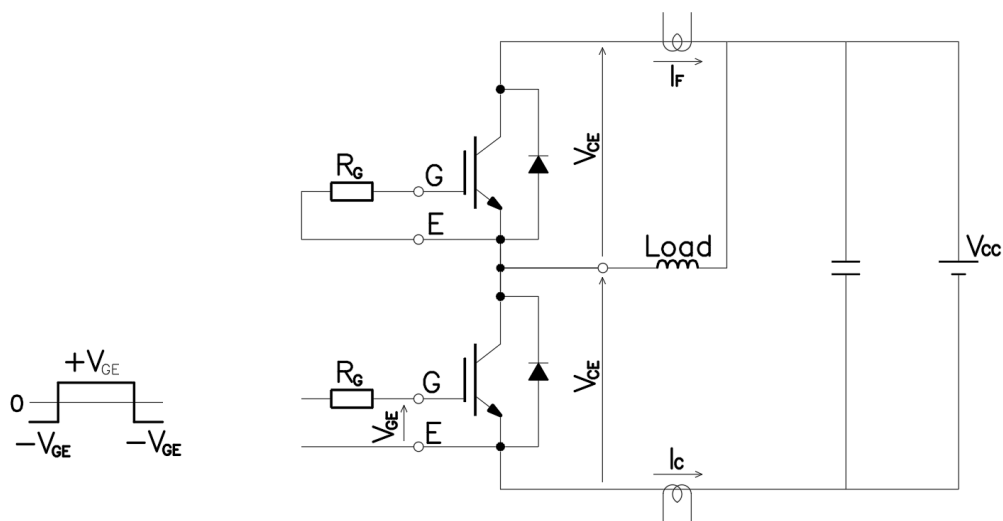


Figure 3. Switching time measure circuit

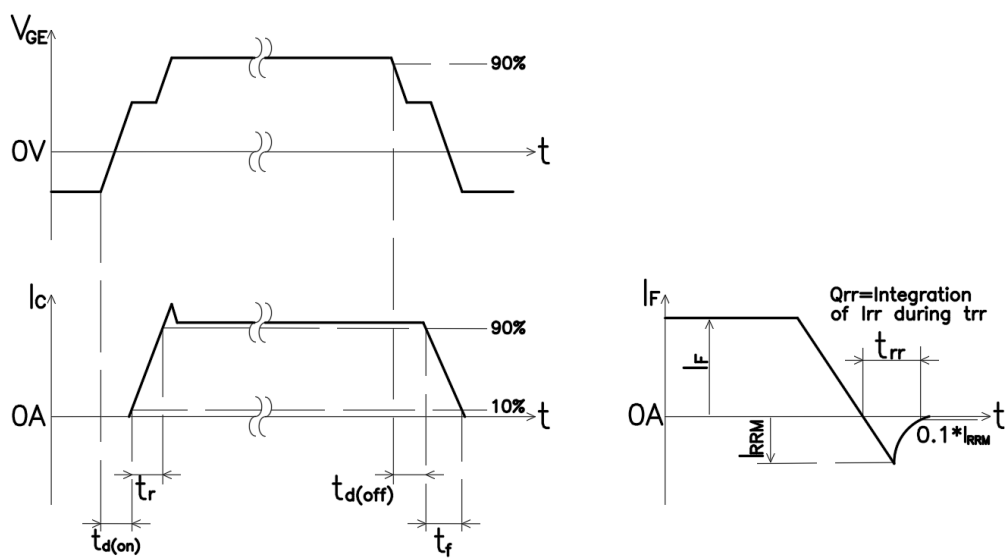


Figure 4. Switching time definition

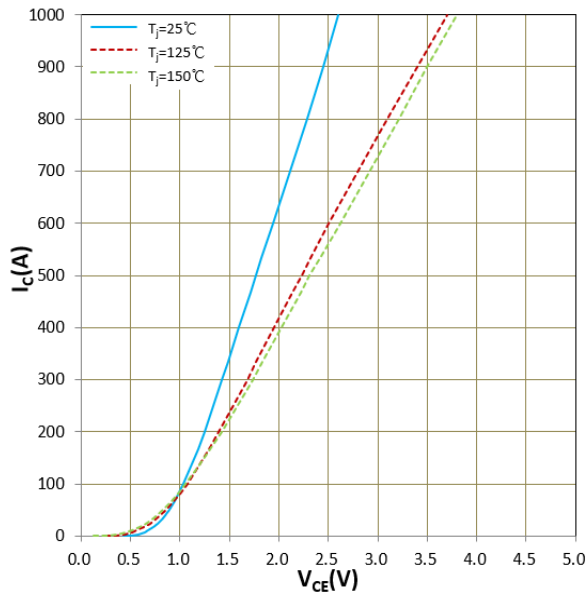


Figure 5. I_c vs V_{ce}
 $V_{ge} = 15\text{V}$

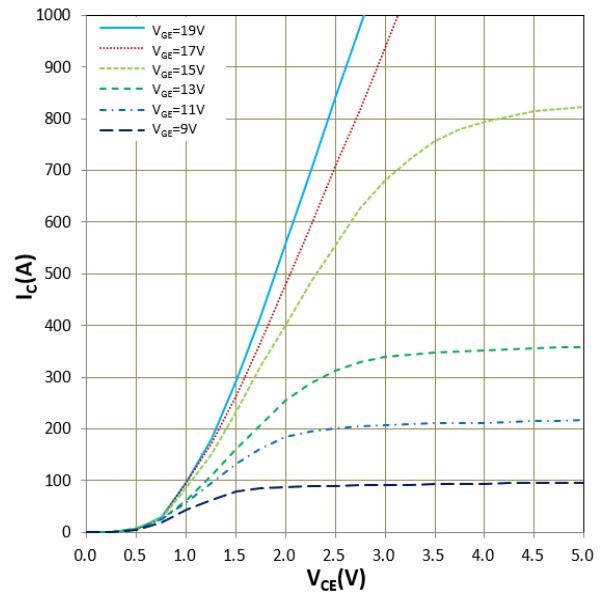


Figure 6. I_c vs V_{ce}
 $T_j = 150^\circ\text{C}$

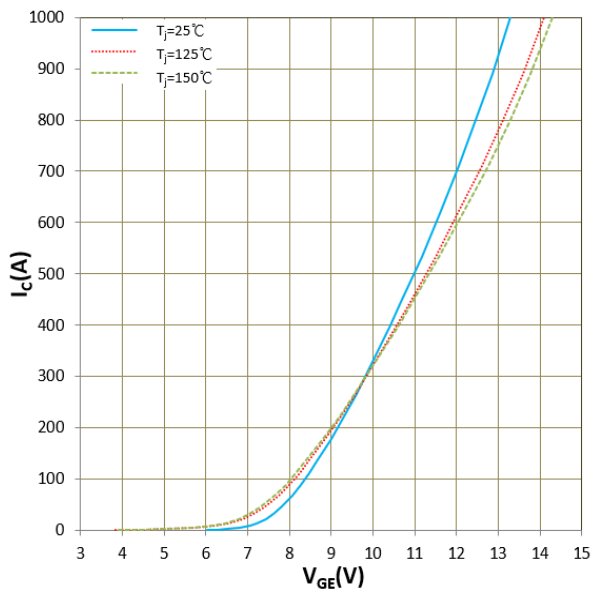


Figure 7. I_c vs V_{ge}
 $V_{ce} = 20\text{V}$

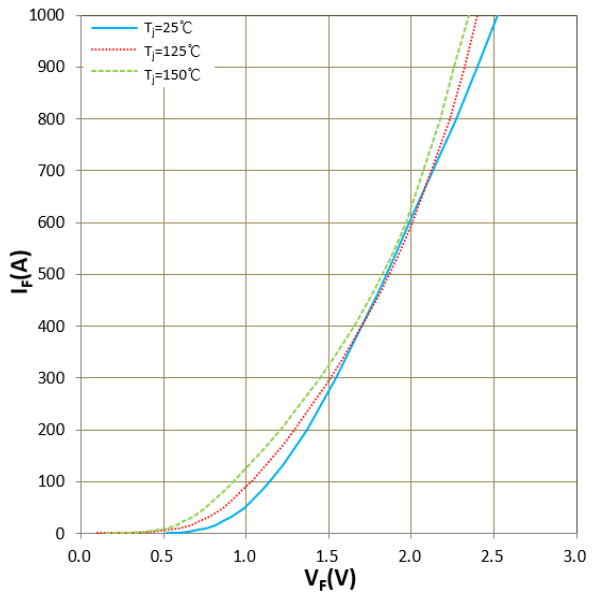


Figure 8. I_F vs V_F

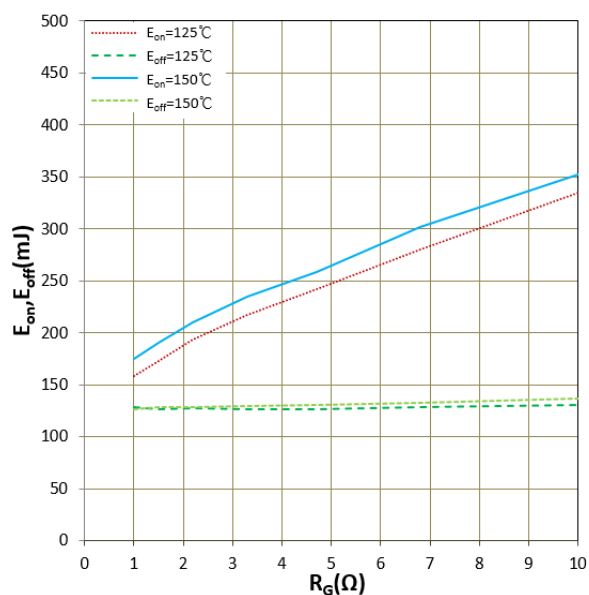


Figure 9. E_{on} , E_{off} vs R_G (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $I_C = 500A$
 Inductive Load

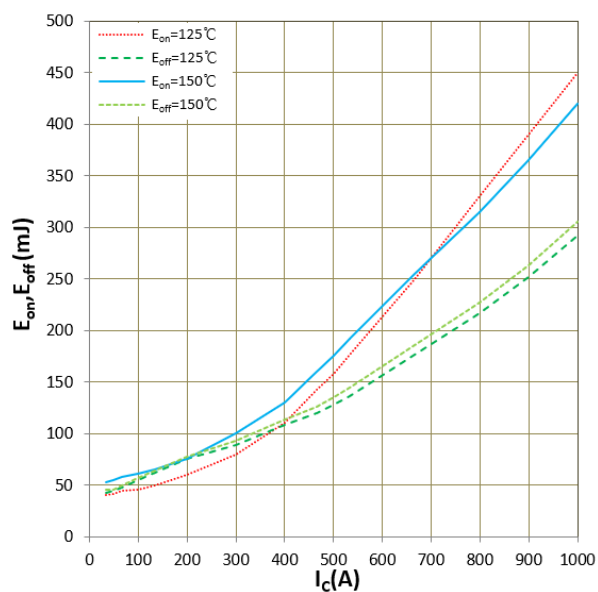


Figure 10 E_{on} , E_{off} vs I_C (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $R_{Gon} = R_{Goff} = 1\Omega$
 Inductive Load

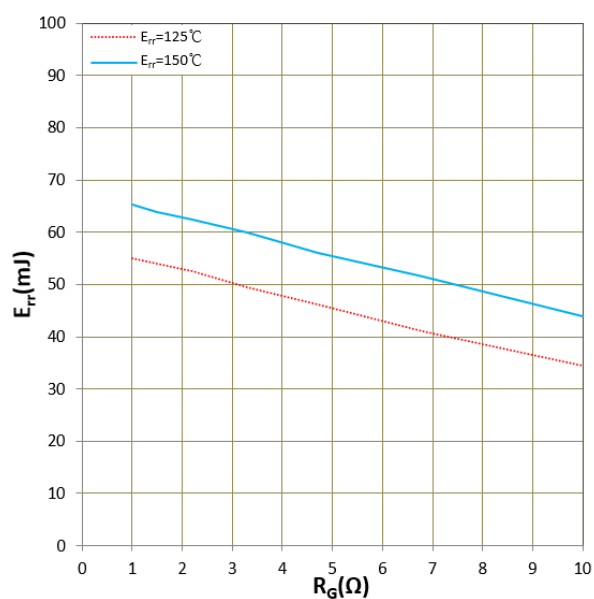


Figure 11. E_{rr} vs R_G (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $I_F = 500A$
 Inductive Load

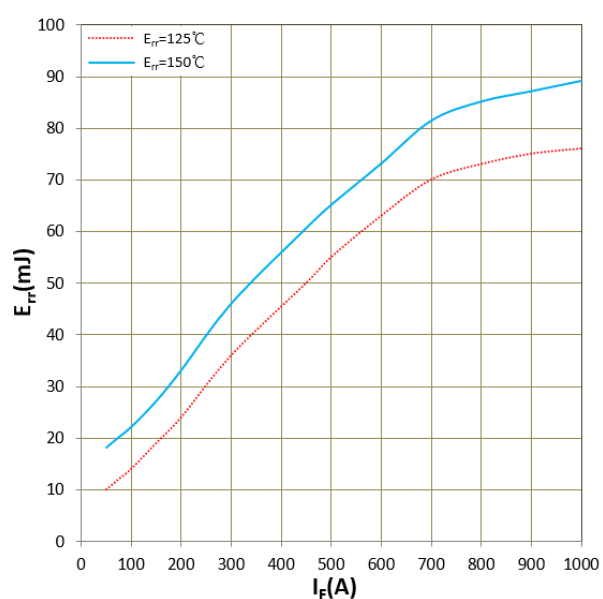


Figure 12. E_{rr} vs I_F (Typ)
 $V_{CC}=900V$, $V_{GE}=+15V/-8V$, $R_{Gon} = R_{Goff} = 1\Omega$
 Inductive Load

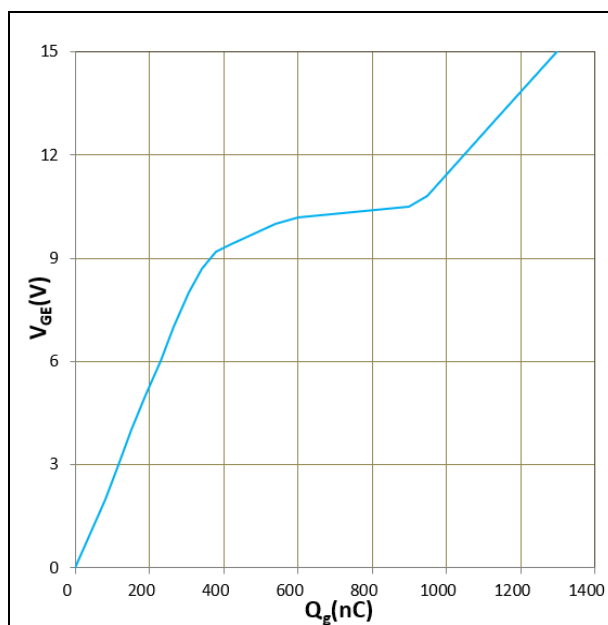


Figure 13. Gate charge

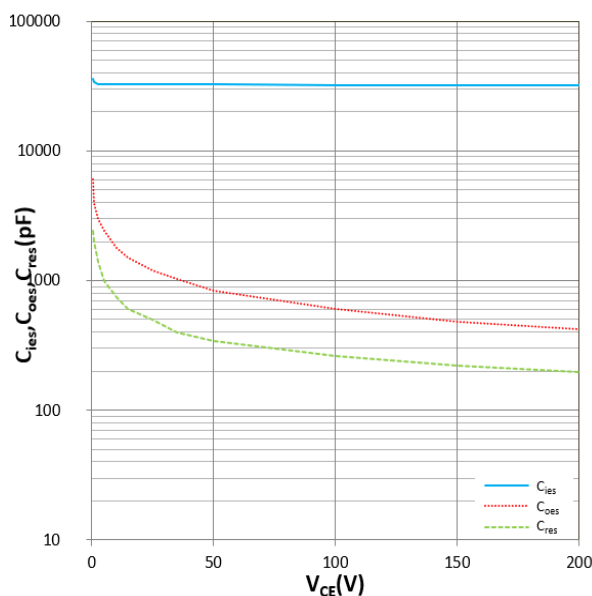


Figure 14. C_{ies} , C_{oes} , C_{res} vs V_{CE}
 $T_j = 25^\circ\text{C}$, $f = 1\text{MHz}$

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