650V GaN HEMT

Description

The CC65H270TOAIF Series 650V, 270mΩ gallium nitride (GaN) FETs are normally-off devices.

Classicchip GaN FETs offer better efficiency through lower gate charge, faster switching speeds, and lower dynamic onresistance, delivering significant advantages over traditional silicon (Si) devices.

Classicchip is a leading-edge wide band gap supplier with world-class innovation .

Automotive

- Adapter
- Renewable energy
- Telecom and data-com
- Servo motors
- Industrial
- Automotive

General Features

Easy to drive—compatible with standard gate drivers

Low conduction and switching losses

RoHS compliant and Halogen-free

Benefits

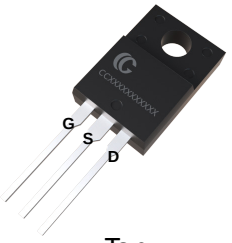
Increased efficiency through fast switching

Increased power density

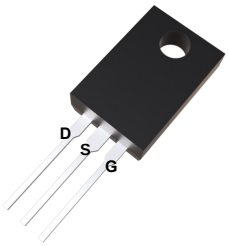
Reduced system size and weight

Ordering Information

Part Number	Package	Package Configuration
CC65H270TOAIF	TO220F	Source



Top



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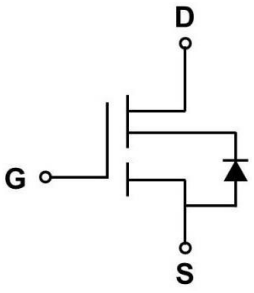


Circuit Symbol

Features

BV_{DSS}	R_{DSON}	I_{DS}	Q_G
650V	270mΩ	7.9A	7.9nC

Absolute Maximum Ratings

T_C=25°C unless otherwise stated

Symbol	Parameter		Limit value	Unit
V_{DSS}	Drain to source voltage (T_J = -55°C to 150°C)		650	V
$V_{(TR)DSS}$	Drain to source voltage-transient [a]		800	
V_{GSS}	Gate to source voltage		-20~+20	
I_D	Continuous drain current @T_C=25°C [b]		7.9	A
	Continuous drain current @T_C=125°C [b]		3.5	
I_{DM}	Pulse drain current (pulse width: 100μs)		14	A
P_D	Maximum power dissipation @ T_C=25°C		32	W
T_C	Operating temperature	Case	-55~150	°C
T_J		Junction	-55~150	°C
T_S	Storage temperature		-55~150	°C

a. In off-state, spike duty cycle D<0.01, spike duration <1μs

b. For increased stability at high current operation

Thermal Resistance

Symbol	Parameter	Limit value	Unit
$R_{\theta JC}$	Junction-to-case	3.9	°C /W

Electrical Parameters

T_J=25°C unless otherwise stated

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Forward Device Characteristics						
$V_{(BL)DSS}$	Drain-source voltage	650	-	-	V	V_{GS}= 0V
$V_{GS(th)}$	Gate threshold voltage	-	4	-	V	V_{DS}=1V, I_{DS}=1mA
$\triangle V_{GS(th)}/T_J$	Gate threshold voltage temperature coefficient	-	-7	-	mV/°C	
$R_{DS(on)}$	Drain-source on-resistance	-	270	320	mΩ	V_{GS}=10V, I_D=1A, T_J=25°C
		-	570	-		V_{GS}=10V, I_D=1A, T_J=150°C
I_{DSS}	Drain-to-source leakage current	-	-	10	μA	V_{DS}=650V, V_{GS}= 0V, T_J=25°C
		-	-	100		V_{DS}=650V, V_{GS}= 0V, T_J=150°C
I_{GSS}	Gate-to-source forward leakage current	-	-	±100	nA	V_{GS}=±20V
C_{ISS}	Input capacitance	-	293	-	pF	V_{GS}=0V, V_{DS}=400V, f=1MHz
C_{OSS}	Output capacitance	-	17	-		
C_{RSS}	Reverse capacitance	-	3.74	-		
Q_G	Total gate charge	-	7.9	-	nC	V_{DS}=400V, V_{GS}=0V to 10V, I_D=1A
Q_{GS}	Gate-source charge	-	2.31	-		
Q_{GD}	Gate-drain charge	-	1.65	-		
Q_{OSS}	Output charge	-	22.2	-	nC	V_{GS}=0V, V_{DS}=0V to 400V, f=1MHz
$t_{D(on)}$	Turn-on delay	-	3.2	-	ns	V_{DS}=400V, V_{GS}=0V to 10V, I_D=2.1A, $R_{G-on(ext)}$=6.8Ω, $R_{G-off(ext)}$=2.2Ω, L=250μH
t_R	Rise time	-	5.5	-		
$t_{D(off)}$	Turn-off delay	-	7.4	-		
t_F	Fall time	-	27	-		

Electrical Parameters

T_J=25°C unless otherwise stated

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
Reverse Device Characteristics						
V_{SD}	Source-Drain reverse voltage	-	2.3	-	V	V_{GS}=0V, I_{SD}=5A
t_{RR}	Reverse recovery time	-	14	-	ns	I_F=10A, V_{DD}=400V, dI_F/dt=165A/μs
Q_{RR}	Reverse recovery charge	-	6.5	-	nC	

Typical Characteristics

T_J=25°C unless otherwise stated

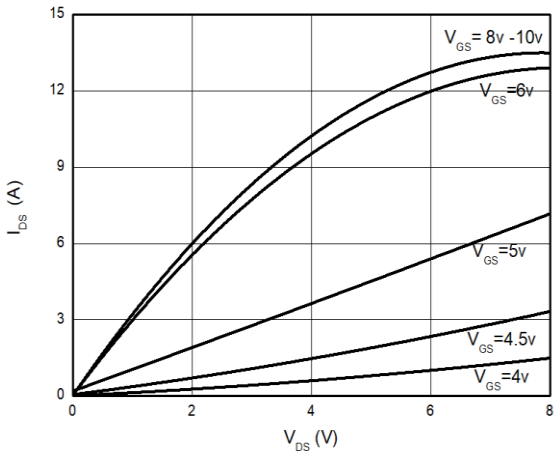


Figure 1. Typical Output Characteristics T_J=25°C

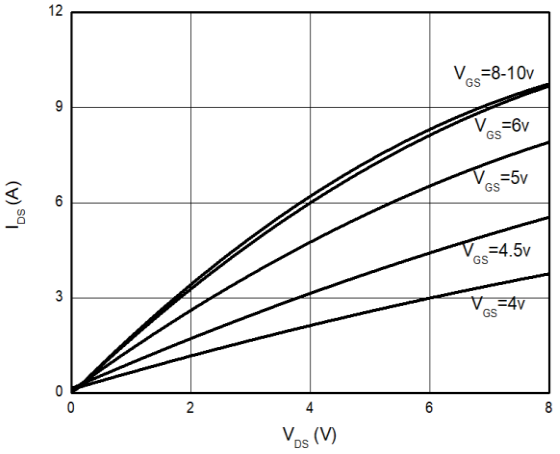


Figure 2. Typical Output Characteristics T_J=125°C

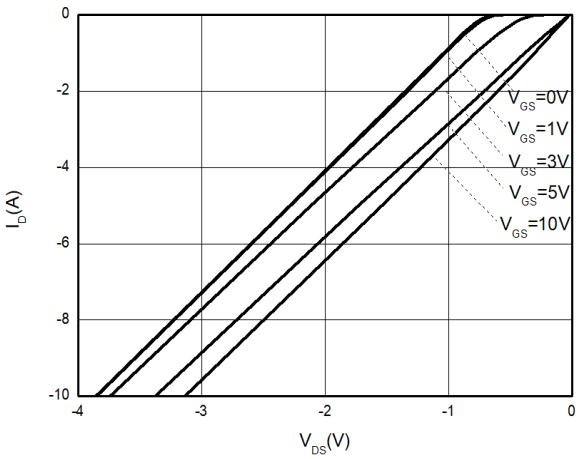


Figure 3. Channel Reverse Characteristics T_J=25°C

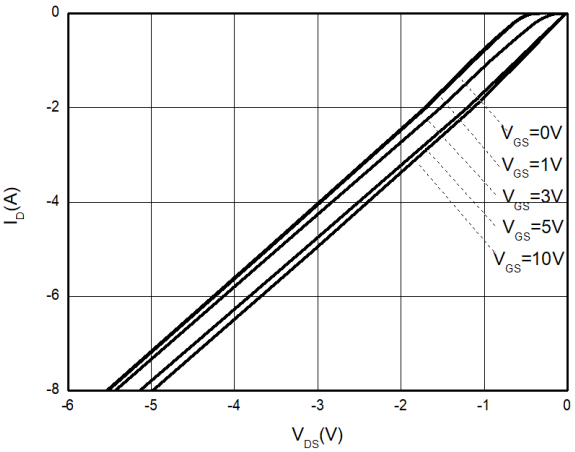


Figure 4. Channel Reverse Characteristics T_J=125°C

Typical Characteristics

T_J=25°C unless otherwise stated

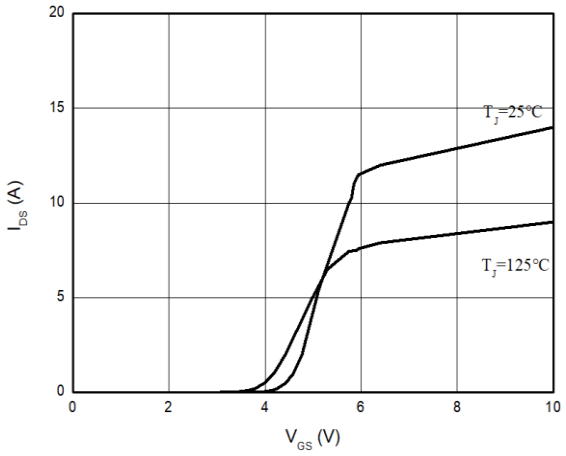


Figure 5. Typical Transfer Characteristics (V_{DS}=5V)

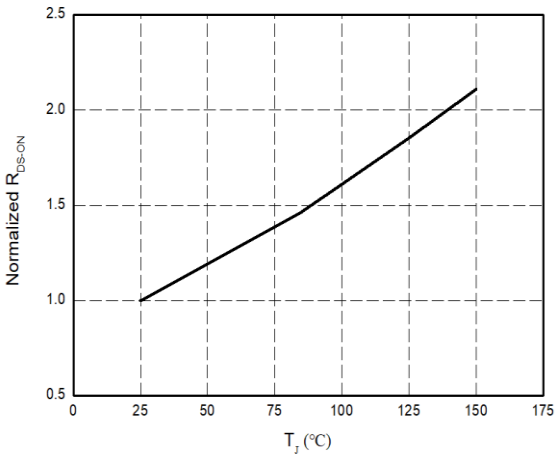


Figure 6. Normalized On-resistance

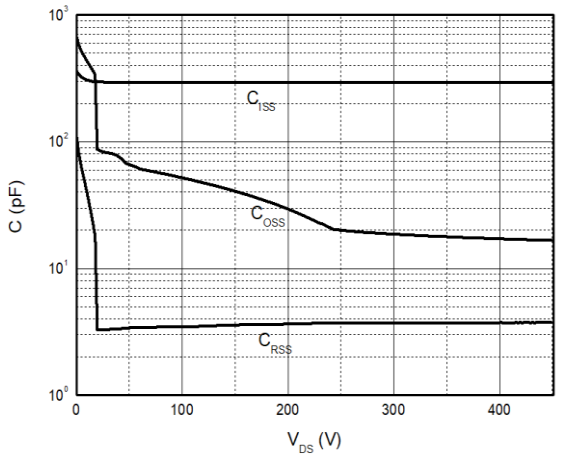


Figure 7. Typical Capacitance (f=1MHz)

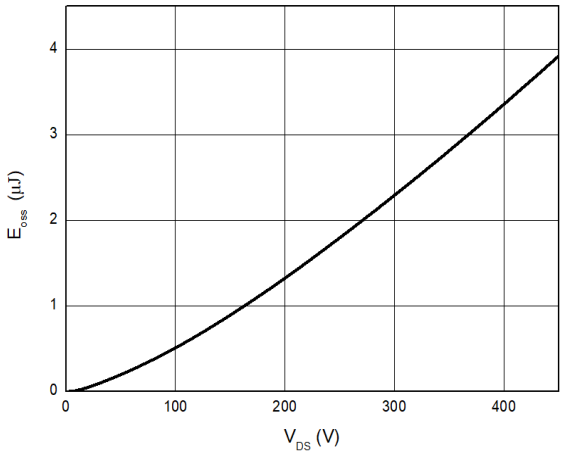


Figure 8. Typical C_{OSS} Stored Energy

Typical Characteristics

T_J=25°C unless otherwise stated

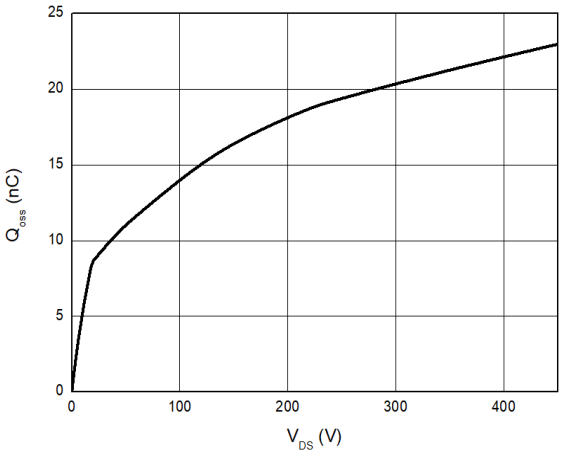


Figure 9. Typical Q_{OSS}

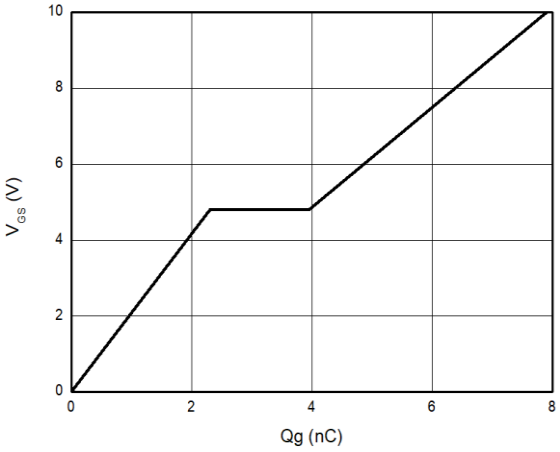


Figure 10. Typical Gate Charge (V_{DS}=400V, I_D=1A)

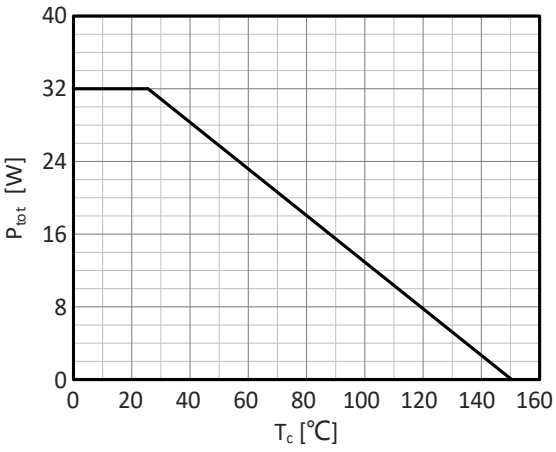


Figure 11. Power Dissipation

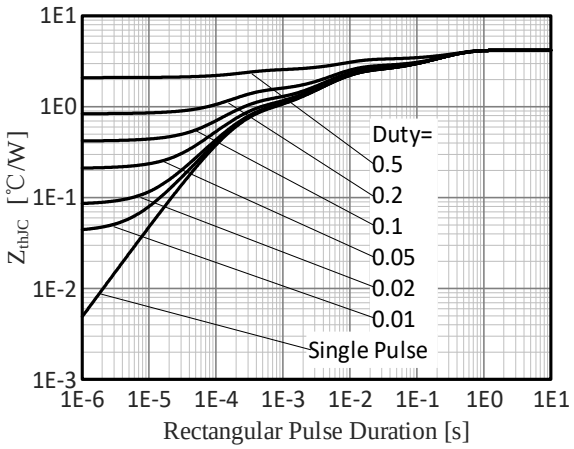


Figure 12. Transient Thermal Resistance

Typical Characteristics

T_J=25°C unless otherwise stated

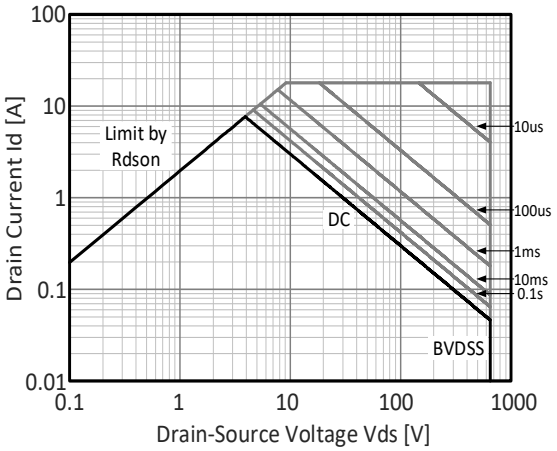


Figure 13. Safe Operating Area T_C=25°C

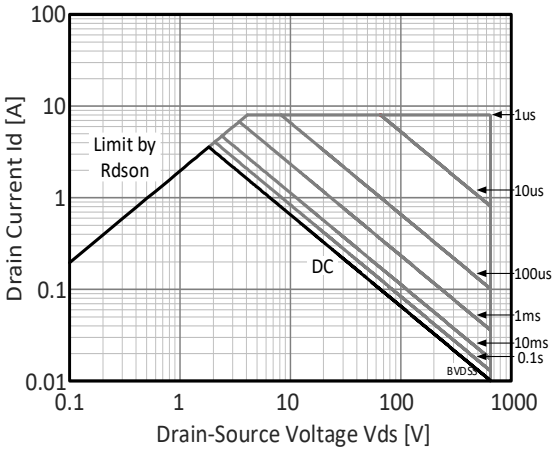


Figure 14. Safe Operating Area T_C=125°C

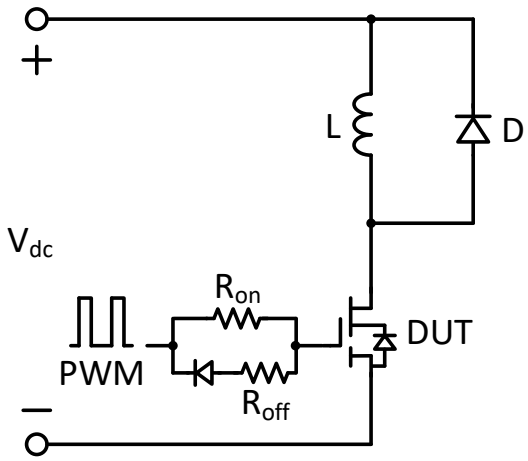


Figure 15. Switching times with inductive load

V_{DS}=400V, V_{GS}=0V to 10V, I_D=2.1A,
$R_{G\text{-}on(ext)}$=6.8Ω, $R_{G\text{-}off(ext)}$=2.2Ω, L=250μH

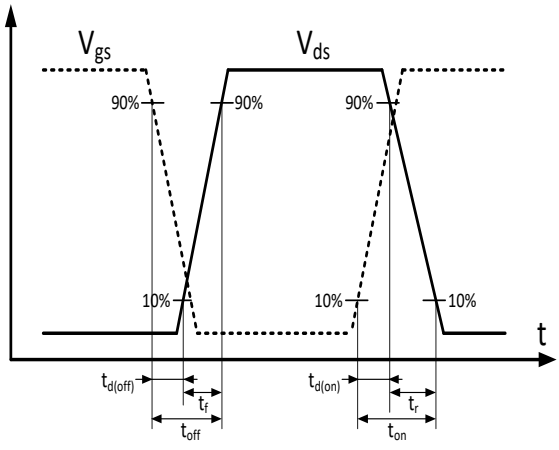
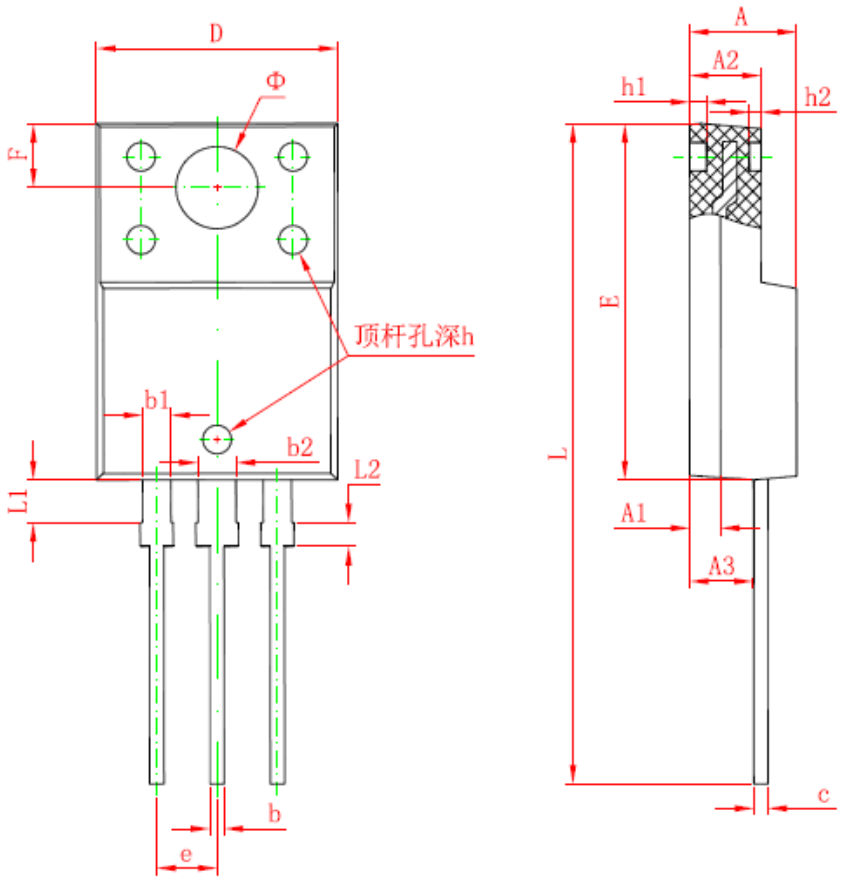


Figure 16. Switching times with waveform

PACKAGE DIMENSIONS

TO220F-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	1.300 REF.		0.051 REF.	
A2	2.800	3.200	0.110	0.126
A3	2.500	2.900	0.098	0.114
b	0.500	0.750	0.020	0.030
b1	1.100	1.350	0.043	0.053
b2	1.500	1.750	0.059	0.069
c	0.500	0.750	0.020	0.030
D	9.960	10.360	0.392	0.408
E	14.800	15.200	0.583	0.598
e	2.540 TYP.		0.100 TYP.	
F	2.700 REF.		0.106 REF.	
Φ	3.500 REF.		0.138 REF.	
h	0.000	0.300	0.000	0.012
h1	0.800 REF.		0.031 REF.	
h2	0.500 REF.		0.020 REF.	
L	28.000	28.400	1.102	1.118
L1	1.700	1.900	0.067	0.075
L2	0.900	1.100	0.035	0.043