650V GaN HEMT

Description

The CC65H600TOAIF Series 650V, 600mΩ 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

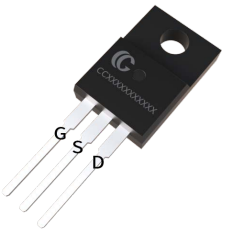
Increased efficiency through fast switching

Increased power density

Reduced system size and weight

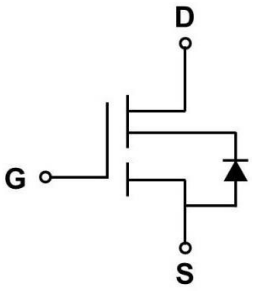
Ordering Information

Part Number	Package	Package Configuration
CC65H600TOAIF	TO220F	Source



Top

Bottom



Circuit Symbol

Features

BV_{DSS}	R_{DSON}	I_{DS}	Q_G
650V	600mΩ	4.8A	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]		4.8	A
	Continuous drain current @T_C=125°C [b]		2.1	
I_{DM}	Pulse drain current (pulse width: 100μs)		8	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	5	°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	-	600	720	mΩ	V_{GS}=10V, I_D=1A, T_J=25°C
		-	1260	-		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}=2.5A
t_{RR}	Reverse recovery time	-	16	-	ns	I_F=2.5A, V_{DD}=400V, dI_F/dt=165A/μs
Q_{RR}	Reverse recovery charge	-	6.8	-	nC	

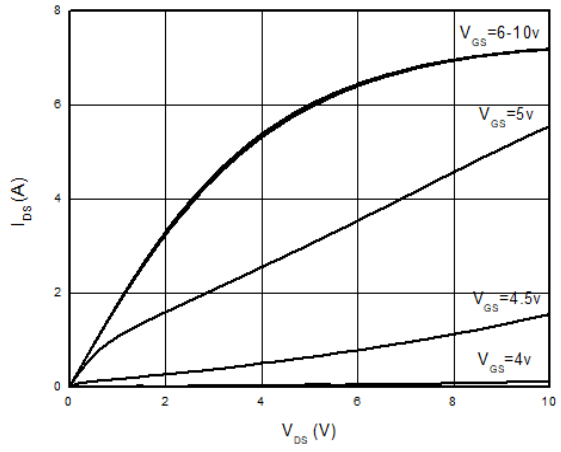


Figure 1. Typical Output Characteristics T_J=25°C

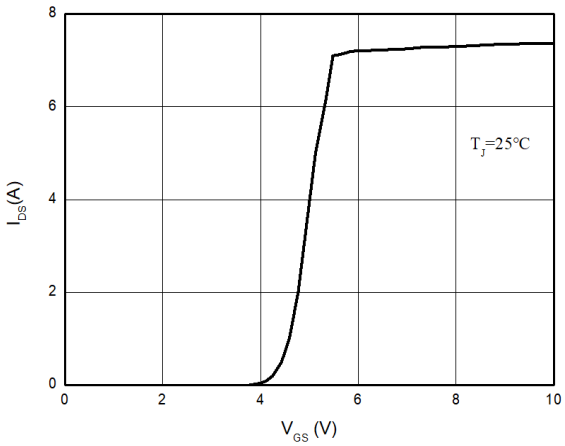


Figure 2. Typical Transfer Characteristics (V_{DS}=10V)

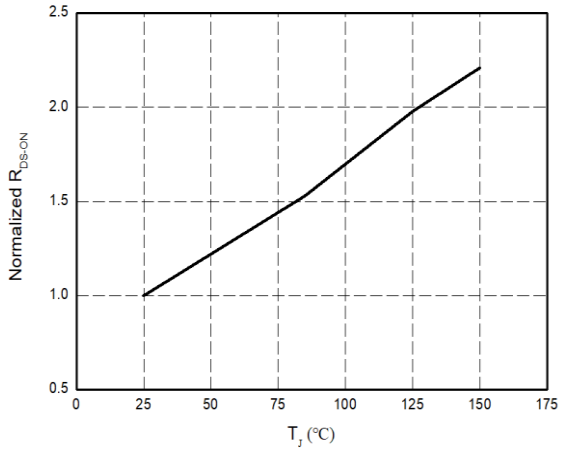


Figure 3. Normalized On-resistance

Typical Characteristics

T_J=25°C unless otherwise stated

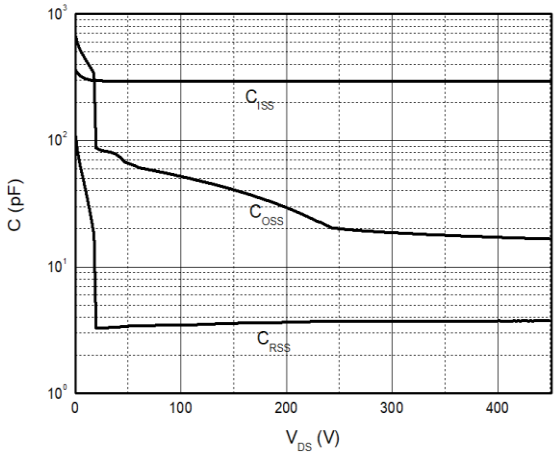


Figure 4. Typical Capacitance (f=1MHz)

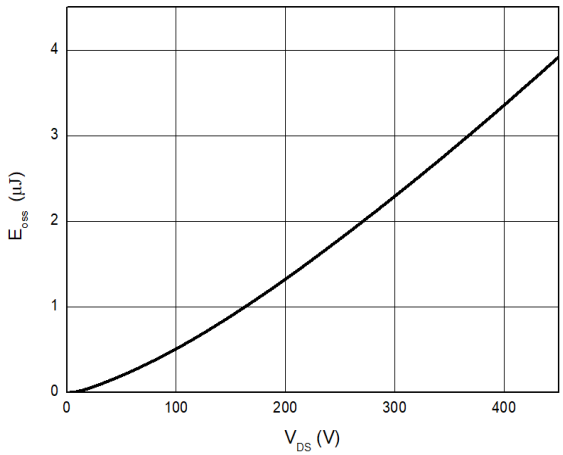


Figure 5. Typical C_{OSS} Stored Energy

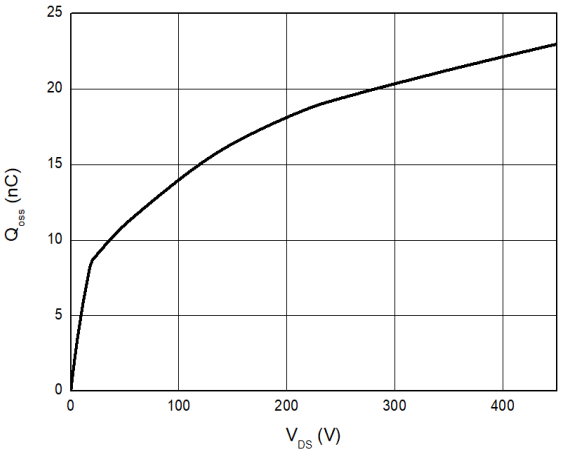


Figure 6. Typical Q_{OSS}

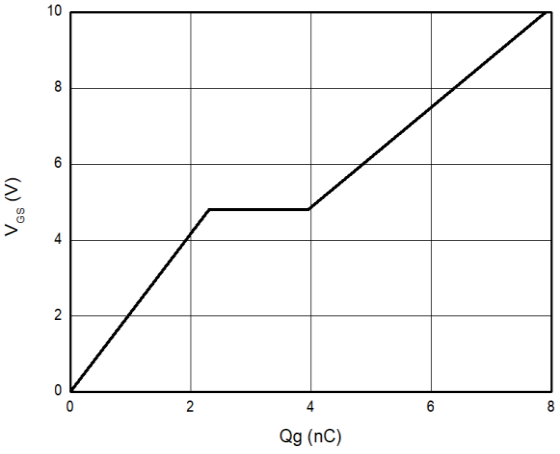


Figure 7. Typical Gate Charge (V_{DS}=400V, I_D=1A)

Typical Characteristics

T_J=25°C unless otherwise stated

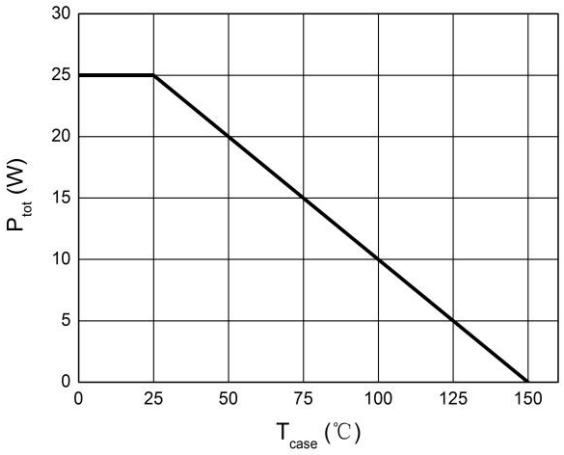


Figure 8. Power Dissipation

Typical Characteristics

T_J=25°C unless otherwise stated

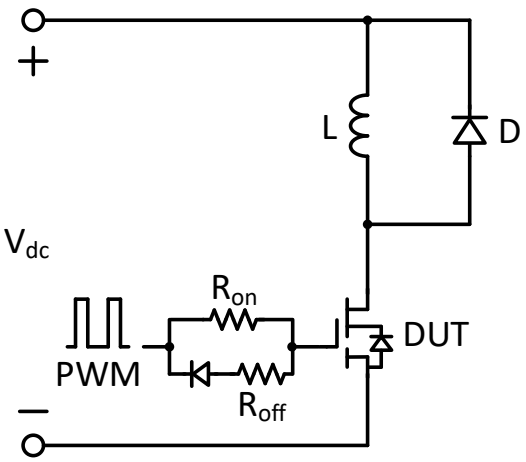


Figure 9. Switching times with inductive load

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

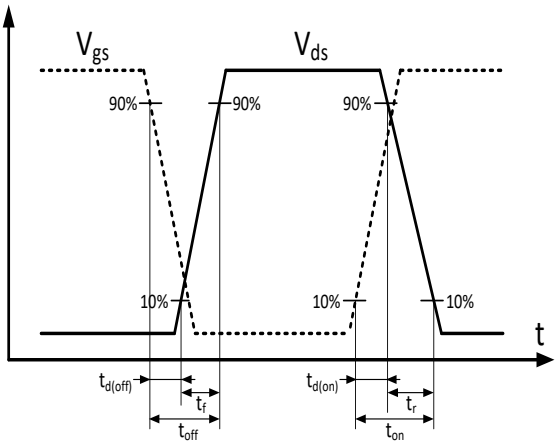
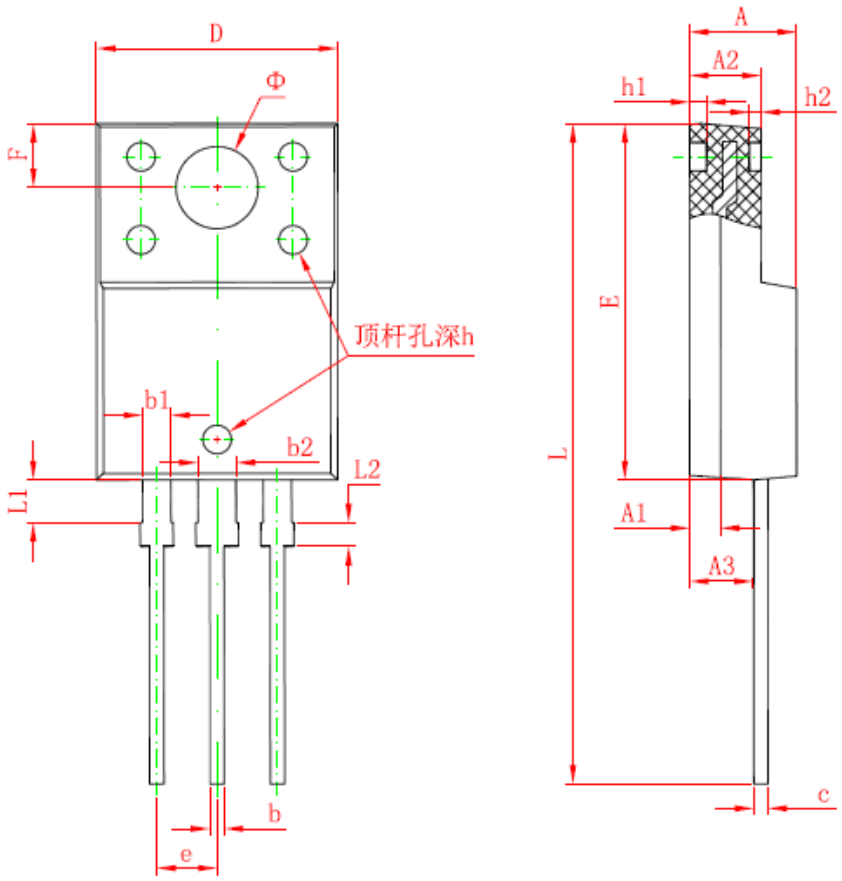


Figure 10. Switching times with waveform

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