

650V GaN HEMT

Description

The CC65H600TOEI 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

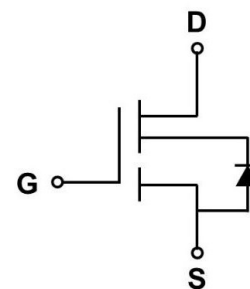
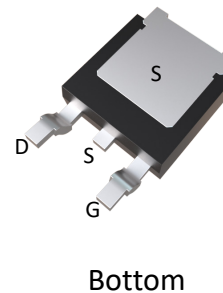
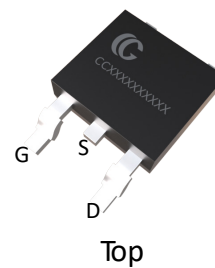
Increased efficiency through fast switching

Increased power density

Reduced system size and weight

Ordering Information

Part Number	Package	Package Configuration
CC65H600TOEI	TO252	Source



Circuit Symbol

Features

BV_{DSS}	$R_{DS(ON)}$	I_{DS}	Q_G
650V	600mΩ	4.8A	7.9nC

Absolute Maximum Ratings

$T_c=25^\circ\text{C}$ unless otherwise stated

Symbol	Parameter	Limit value	Unit	
V_{DSS}	Drain to source voltage ($T_J = -55^\circ\text{C}$ to 150°C)	650		
$V_{(TR)DSS}$	Drain to source voltage-transient ^a	800	V	
V_{GSS}	Gate to source voltage	-20 ~ +20		
I_D	Continuous drain current @ $T_c=25^\circ\text{C}$ ^b	4.8	A	
	Continuous drain current @ $T_c=125^\circ\text{C}$ ^b	2.1		
I_{DM}	Pulse drain current (pulse width: 100 μs)	8	A	
P_D	Maximum power dissipation @ $T_c=25^\circ\text{C}$	32	W	
T_c	Operating temperature	Case	-55 ~ 150	$^\circ\text{C}$
T_J		Junction	-55 ~ 150	$^\circ\text{C}$
T_S	Storage temperature	-55 ~ 150	$^\circ\text{C}$	

a. In off-state, spike duty cycle $D < 0.01$, spike duration $< 1\mu\text{s}$

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
ΔV _{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	

Typical Characteristics

$T_J=25^\circ\text{C}$ unless otherwise stated

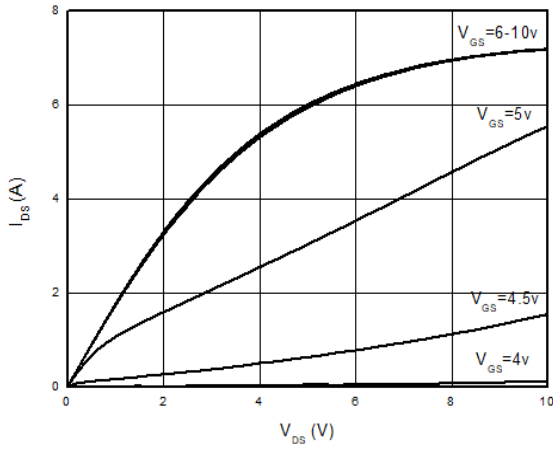


Figure 1. Typical Output Characteristics $T_J=25^\circ\text{C}$

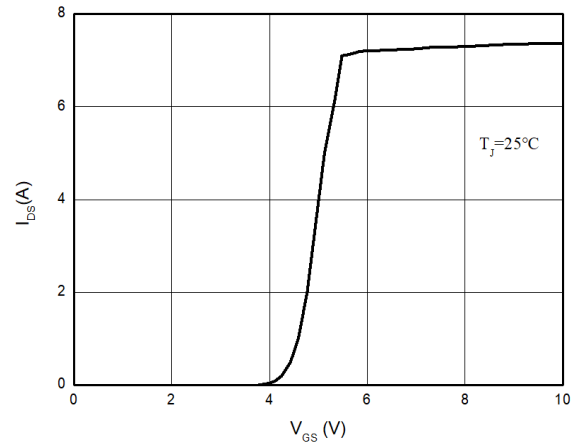


Figure 2. Typical Transfer Characteristics ($V_{DS}=10V$)

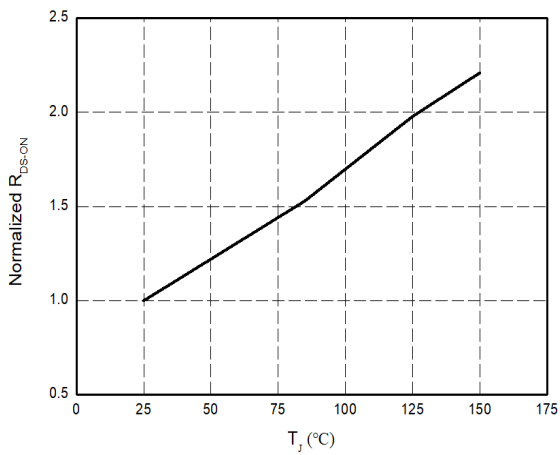


Figure 3. Normalized On-resistance

Typical Characteristics

$T_J=25^\circ\text{C}$ unless otherwise stated

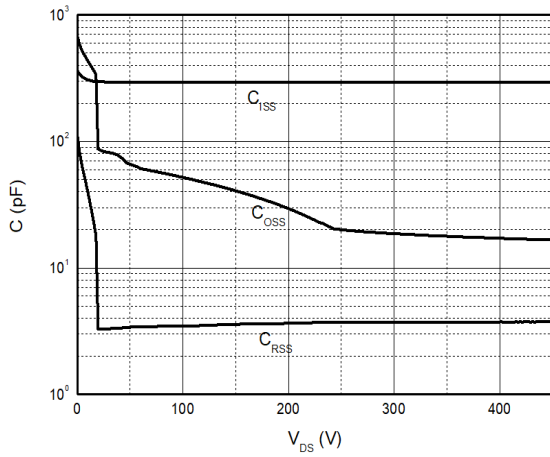


Figure 4. Typical Capacitance (f=1MHz)

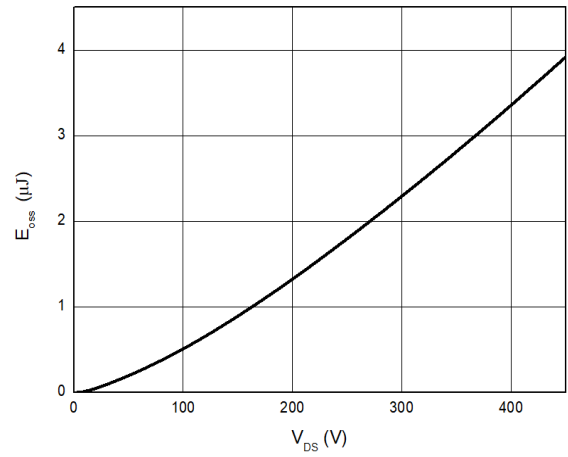


Figure 5. Typical C_{OSS} Stored Energy

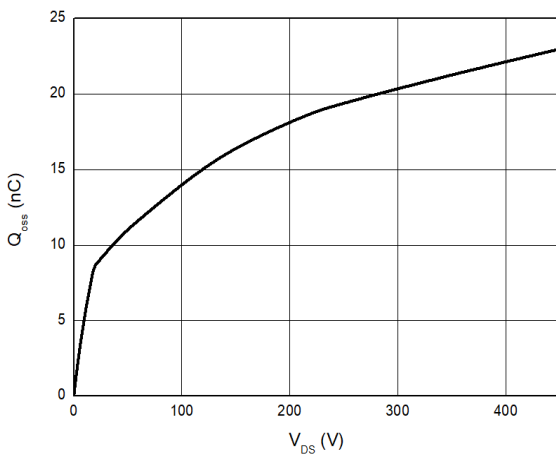


Figure 6. Typical Q_{OSS}

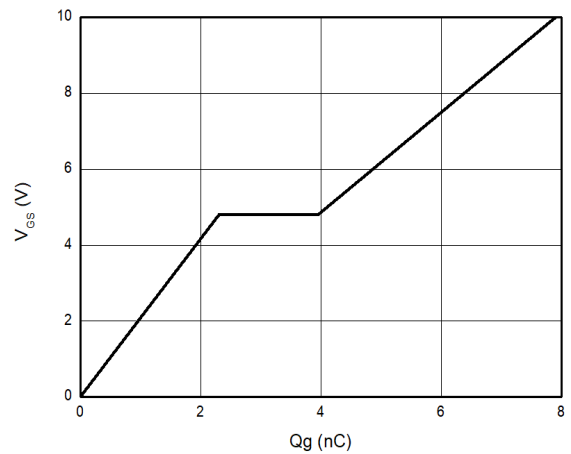


Figure 7. Typical Gate Charge ($V_{DS}=400\text{V}$, $I_D=1\text{A}$)

Typical Characteristics

$T_J=25^{\circ}\text{C}$ unless otherwise stated

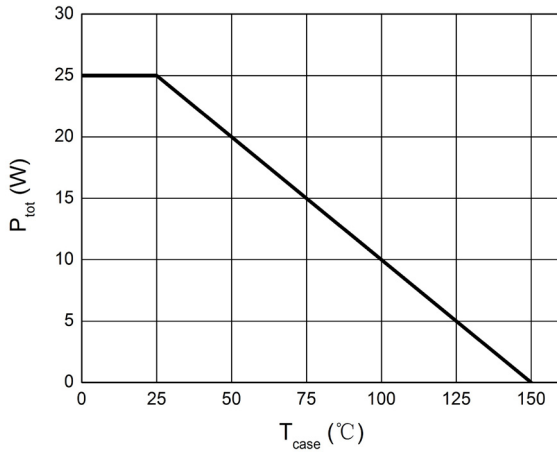


Figure 8. Power Dissipation

Typical Characteristics

$T_J=25^\circ\text{C}$ unless otherwise stated

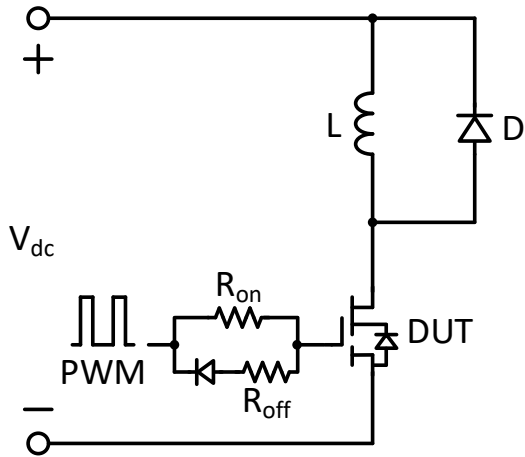


Figure 9. Switching times with inductive load

$V_{DS}=400\text{V}$, $V_{GS}=0\text{V to }10\text{V}$, $I_D=2.1\text{A}$,

$R_{G-on(ext)}=6.8\Omega$, $R_{G-off(ext)}=2.2\Omega$, $L=250\mu\text{H}$

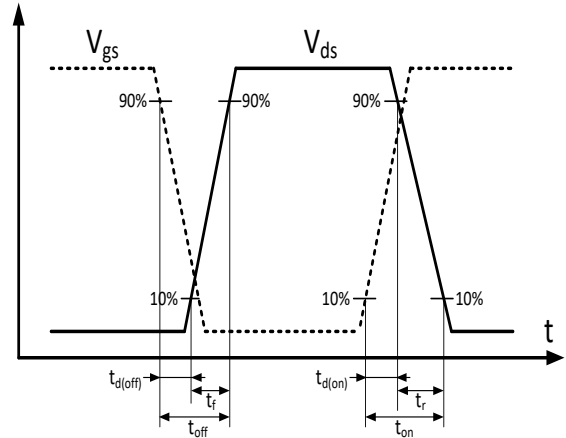
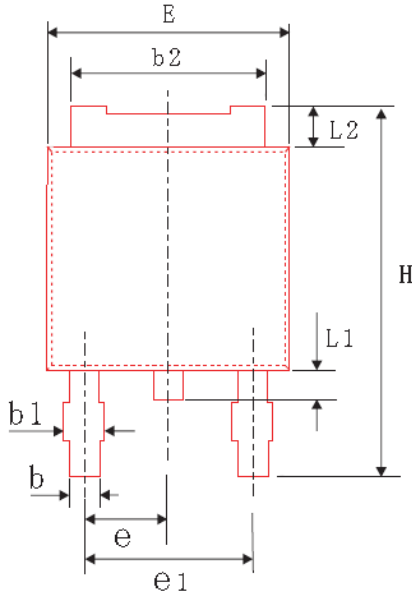


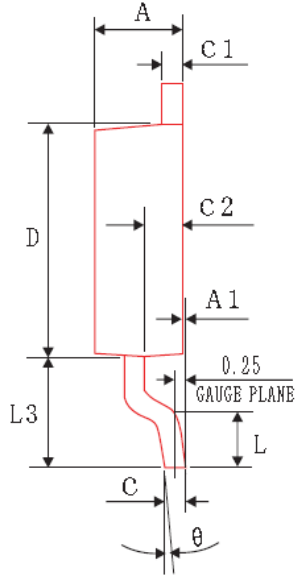
Figure 10. Switching times with waveform

PACKAGE DIMENSIONS

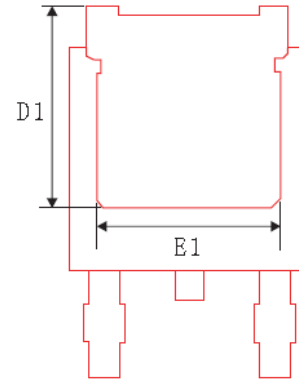
TO252-2L



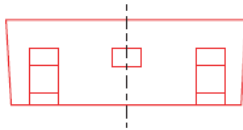
TOP VIEW



SIDE VIEW



BOTTOM VIEW



SIDE VIEW

COMMON DIMENSIONS
(UNITS OF MEASURE-mm)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	0.05	0.10
b	0.762	0.812	0.862
b1	---	---	1.10
b2	5.23	5.33	5.43
c	0.458	0.508	0.558
C1	0.458	0.508	0.558
C2	0.80	1.00	1.20
D	6.00	6.10	6.20
D1	5.25	5.45	5.65
H	10.00	10.10	10.20
E	6.50	6.60	6.70
E1	4.75	4.85	4.95
e1	4.37	4.57	4.77
L	---	---	1.45
L1	0.60	0.75	0.90
L2	0.90	1.10	1.30
L3	2.80	3.00	3.20
θ	0°	4°	8°
e	2.285 BSC		