# 650V GaN HEMT

## Description

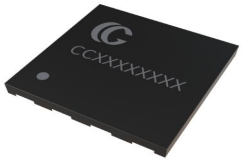
The CC65H160DNGI Series 650V, 160mΩ gallium nitride (GaN) FETs are normally-off devices.

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

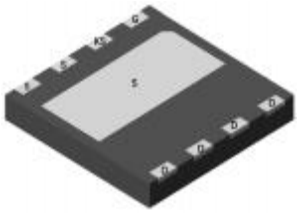
Classicchip is a leading-edge wide band gap supplier with world-class innovation .

## Ordering Information

| Part Number | Package | Package Configuration |
|---|---|---|
| CC65H160DNGI | DFN 8*8 | Source |



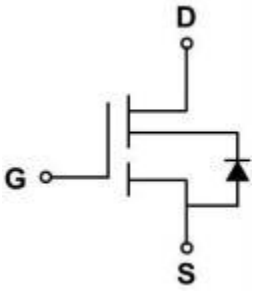

Top



Bottom

## Automotive

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




Circuit Symbol

## 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

## Features

| $BV_{DSS}$ | $R_{DSON}$ | $I_{DS}$ | $Q_G$ |
|---|---|---|---|
| 650V | 160mΩ | 16A | 7.8nC |

# 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] | | 16 | A |
| | Continuous drain current @$T_C$=125。C [b] | | 7 | |
| $I_{DM}$ | Pulse drain current (pulse width: 100μs) | | 23 | A |
| $P_D$ | Maximum power dissipation @ $T_C$=25。C | | 78 | 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 | 1.6 | °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 | - | 1.7 | - | V | $V_{DS}$=1V, $I_{DS}$=1mA |
| $\triangle V_{GS(th)}/T_J$ | Gate threshold voltage temperature coefficient | - | -6.8 | - | mV/。C | |
| $R_{DS(on)}$ | Drain-source on-resistance | - | 160 | 190 | mΩ | $V_{GS}$=10V, $I_D$=1A, $T_J$=25。C |
| | | - | 340 | - | | $V_{GS}$=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 | - | 378 | - | pF | $V_{GS}$=0V, $V_{DS}$=400V, f=1MHz |
| $C_{OSS}$ | Output capacitance | - | 23 | - | | |
| $C_{RSS}$ | Reverse capacitance | - | 0.97 | - | | |
| $Q_G$ | Total gate charge | - | 7.8 | - | nC | $V_{DS}$=400V, $V_{GS}$=0V to 10V, $I_D$=1A |
| $Q_{GS}$ | Gate-source charge | - | 1.1 | - | | |
| $Q_{GD}$ | Gate-drain charge | - | 1.8 | - | | |
| $Q_{OSS}$ | Output charge | - | 36 | - | nC | $V_{GS}$=0V, $V_{DS}$=0V to 400V, f=1MHz |
| $t_{D(on)}$ | Turn-on delay | - | 2.5 | - | 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 | - | 7 | - | | |
| $t_{D(off)}$ | Turn-off delay | - | 9.7 | - | | |
| $t_F$ | Fall time | - | 28 | - | | |

# 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 | - | 2.5 | - | V | $V_{GS}$=0V, $I_{SD}$=10A |
| $t_{RR}$ | Reverse recovery time | - | 13 | - | ns | $I_F$=10A, $V_{DD}$=400V, $dI_F/dt$=165A/μs |
| $Q_{RR}$ | Reverse recovery charge | - | 3.2 | - | nC | |

# Typical Characteristics

$T_J$=25。C unless otherwise stated

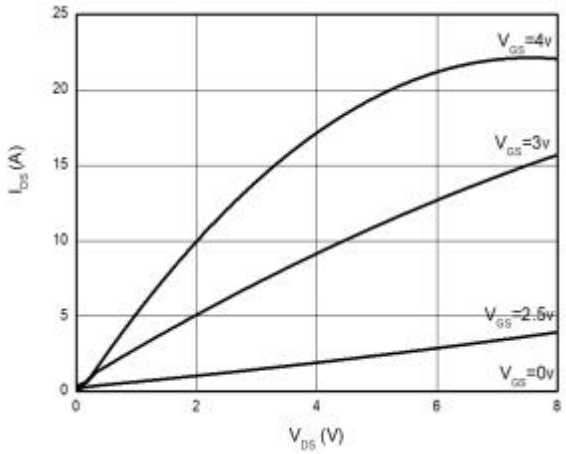



**Figure 1. Typical Output Characteristics $T_J$=25。C**

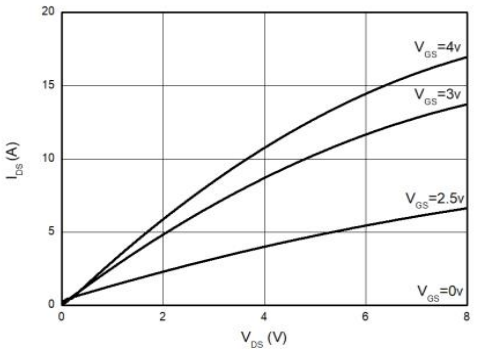



**Figure 2. Typical Output Characteristics $T_J$=125。C**

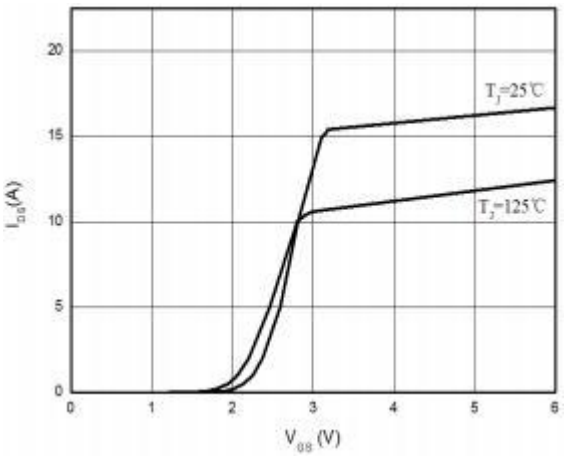



**Figure 3. Typical Transfer Characteristics ($V_{DS}$=5V)**

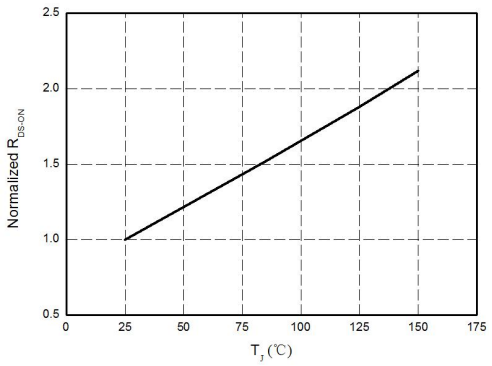



**Figure 4. Normalized On-resistance**

# Typical Characteristics

TJ=25。C unless otherwise stated

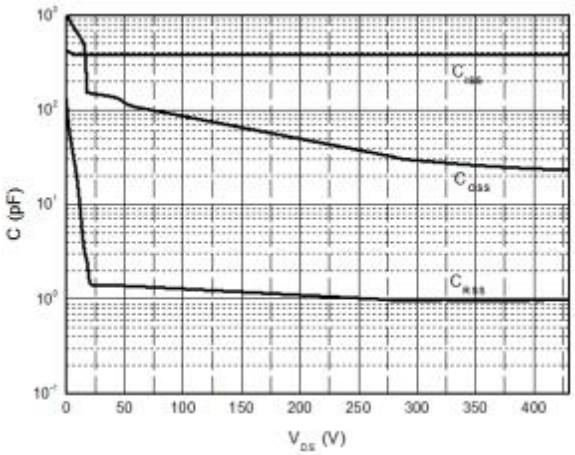



Figure 5. Typical Capacitance (f=1MHz)

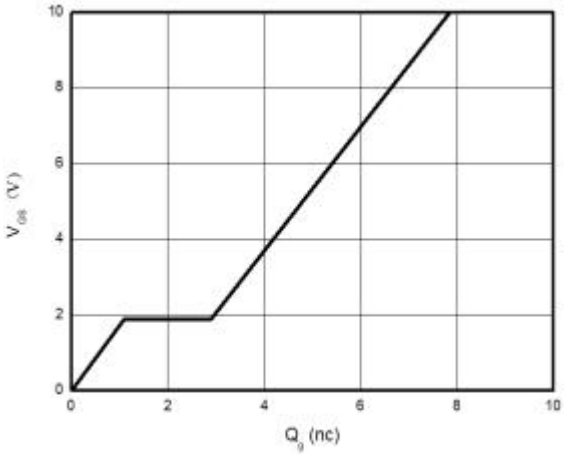



Figure 6. Typical Gate Charge (VDS=400V, ID=1A)

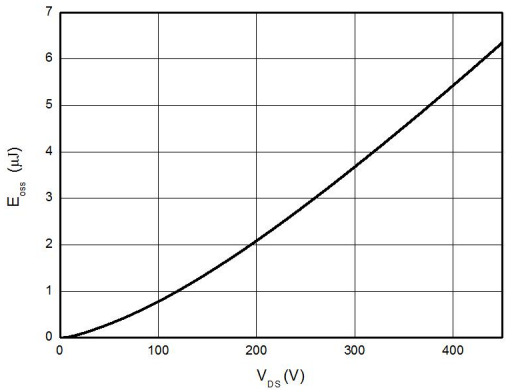



Figure 7. Typical Coss Stored Energy

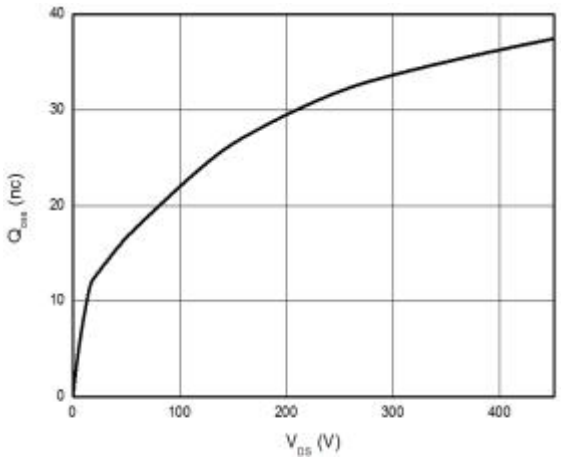



Figure 8. Typical Qoss

# Typical Characteristics

TJ=25。C unless otherwise stated

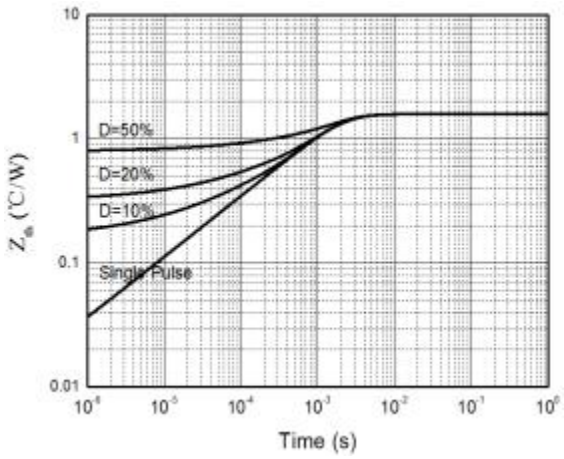



Figure 9. Transient Thermal Resistance

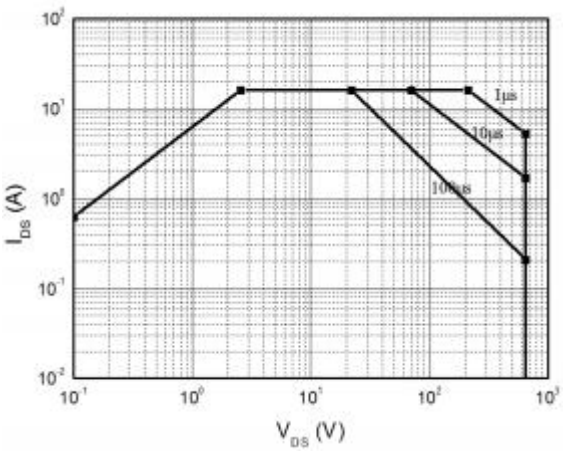



Figure 10. Safe Operating Area TJ=25。C

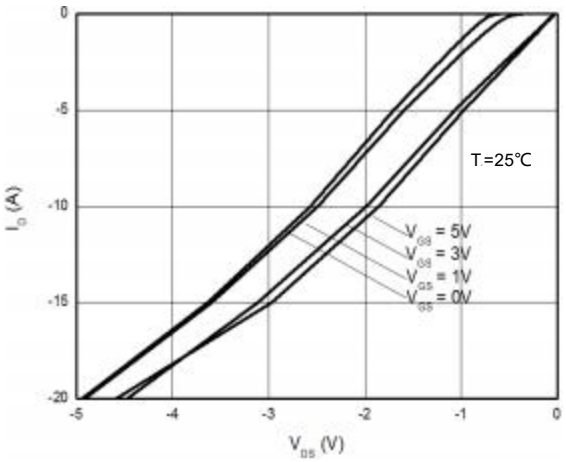



Figure 11. Channel Reverse Characteristics TJ=25。C

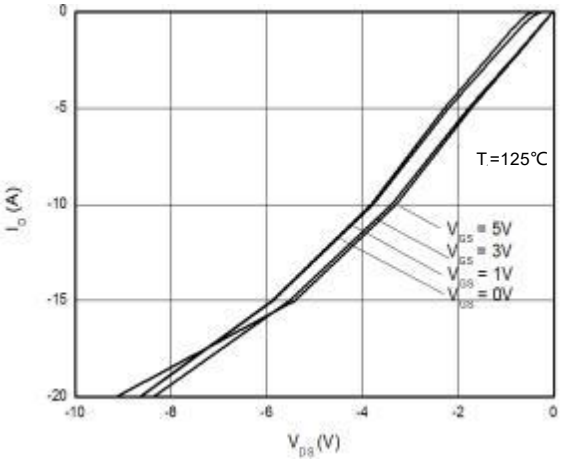
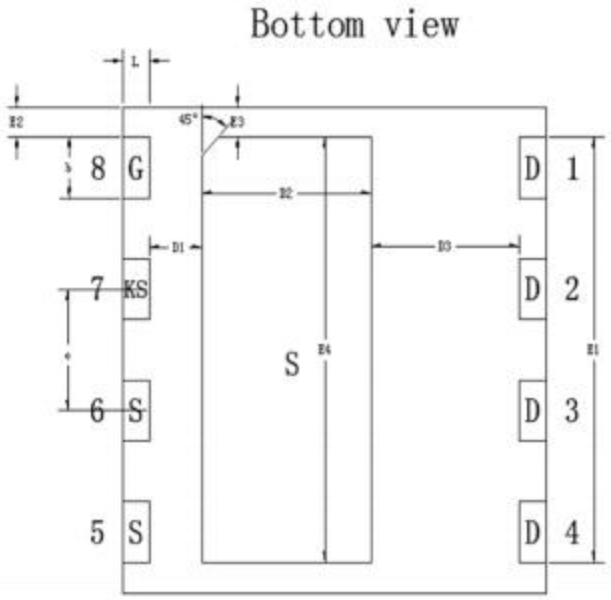
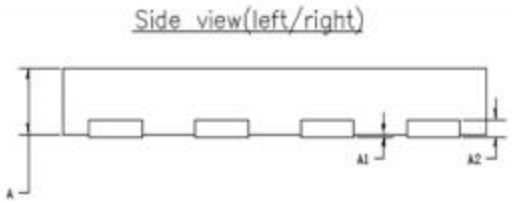



Figure 12 Channel Reverse Characteristics TJ=125。C

# PACKAGE DIMENSIONS

DFN8x8-8L-1.10-A


| Symbol | Min. (mm) | Mean. (mm) | Max. (mm) |
|---|---|---|---|
| A | 1.05 | 1.10 | 1.15 |
| A1 | 0 | 0.02 | 0.05 |
| A2 | | 0.203REF | |
| D | 7.9 | 8 | 8.1 |
| E | 7.9 | 8 | 8.1 |
| D1 | 0.9 | 1 | 1.1 |
| D2 | 3.1 | 3.2 | 3.3 |
| D3 | 2.7 | 2.8 | 2.9 |
| E1 | 6.9 | 7 | 7.1 |
| E2 | 0.4 | 0.5 | 0.6 |
| E3 | 0.4 | 0.5 | 0.6 |
| E4 | 6.9 | 7 | 7.1 |
| e | 1.9 | 2 | 2.1 |
| b | 0.9 | 1 | 1.1 |
| L | 0.4 | 0.5 | 0.6 |