



CoreGaN 650V GaN HEMT

Description

The CE65H600DNCI Series 650V, 600mΩ gallium nitride (GaN) FETs are normally-off devices.

Coreenergy 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.

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

Application

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

General Features

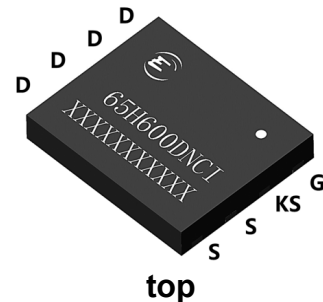
Easy to drive—compatible with standard gate drivers
 Low conduction and switching losses
 RoHS compliant and Halogen-free

Benefits

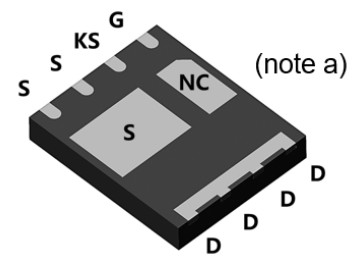
Increased efficiency through fast switching
 Increased power density
 Reduced system size and weight

Ordering Information

| Part Number | Package | Package Configuration |
|--------------|---------|-----------------------|
| CE65H600DNCI | DFN 5*6 | Source |



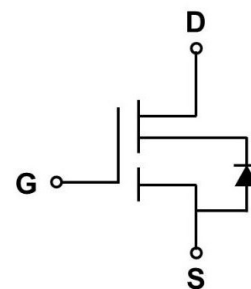
top



bottom

Note :

- a. NC solder pad represents GaN source & MOS Drain; The electrical connection is prohibited.



Circuit Symbol

Features

| BV_{DSS} | $R_{DS(on)}$ | I_{DS} | Q_G |
|------------|--------------|----------|-------|
| 650V | 600mΩ | 4.8A | 8nC |



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: 10 μs) | | 8 | A |
| P_D | Maximum power dissipation @ $T_c=25^\circ\text{C}$ | | 33 | 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 | $^\circ\text{C}$ |

Notes:

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 | 3.7 | $^{\circ}\text{C} / \text{W}$ |



Electrical Parameters

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

| Symbol | Parameter | Min | Typ | Max | Unit | Test Conditions |
|---------------------------------------|--|-----|------|-----------|----------------------|--|
| Forward Device Characteristics | | | | | | |
| $V_{(BL)DSS}$ | Drain-source voltage | 650 | - | - | V | $V_{GS}=0\text{V}$ |
| $V_{GS(th)}$ | Gate threshold voltage | 3.3 | 3.9 | 4.5 | V | $V_{DS}=1\text{V}, I_{DS}=1\text{mA}$ |
| $\Delta V_{GS(th)}/T_J$ | Gate threshold voltage temperature coefficient | - | -7 | - | mV/ $^\circ\text{C}$ | |
| $R_{DS(on)}$ | Drain-source on-Resistance | - | 600 | 720 | m Ω | $V_{GS}=10\text{V}, I_D=1\text{A}, T_J=25^\circ\text{C}$ |
| | | - | 1260 | - | | $V_{GS}=10\text{V}, I_D=1\text{A}, T_J=150^\circ\text{C}$ |
| I_{DSS} | Drain-to-source leakage current | - | 1 | 10 | μA | $V_{DS}=650\text{V}, V_{GS}=0\text{V}, T_J=25^\circ\text{C}$ |
| | | - | 5 | 100 | | $V_{DS}=650\text{V}, V_{GS}=0\text{V}, T_J=150^\circ\text{C}$ |
| I_{GSS} | Gate-to-source forward leakage current | - | - | ± 100 | nA | $V_{GS}=\pm 20\text{V}$ |
| C_{ISS} | Input capacitance | - | 331 | - | pF | $V_{GS}=0\text{V}, V_{DS}=400\text{V}, f=1\text{MHz}$ |
| C_{OSS} | Output capacitance | - | 11 | - | | |
| C_{RSS} | Reverse capacitance | - | 1.2 | - | | |
| Q_G | Total gate charge | - | 8 | - | nC | $V_{DS}=400\text{V}, V_{GS}=0\text{V to }10\text{V}, I_D=1\text{A}$ |
| Q_{GS} | Gate-source charge | - | 1.7 | - | | |
| Q_{GD} | Gate-drain charge | - | 4 | - | | |
| Q_{OSS} | Output charge | - | 14 | - | nC | $V_{GS}=0\text{V}, V_{DS}=0\text{V to }400\text{V}, f=1\text{MHz}$ |
| $t_{D(on)}$ | Turn-on delay | - | 3.2 | - | ns | $V_{DS}=400\text{V}, V_{GS}=0\text{V to }10\text{V}, I_D=2.1\text{A},$ $R_{G-on(ext)}=6.8\Omega, R_{G-off(ext)}=2.2\Omega,$ $L=250\mu\text{H}$ |
| t_R | Rise time | - | 5.5 | - | | |
| $t_{D(off)}$ | Turn-off delay | - | 7.4 | - | | |
| t_F | Fall time | - | 27 | - | | |



Electrical Parameters

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

| Symbol | Parameter | Min | Typ | Max | Unit | Test Conditions |
|---------------------------------------|------------------------------|-----|-----|-----|------|--|
| Reverse Device Characteristics | | | | | | |
| V_{SD} | Source-Drain reverse voltage | - | 2.3 | - | V | $V_{GS}=0\text{V}$, $I_{SD}=2.5\text{A}$ |
| t_{RR} | Reverse recovery time | - | 14 | - | ns | $I_F=2.5\text{A}$, $V_{DD}=400\text{V}$, $dI_F/dt=165\text{A}/\mu\text{s}$ |
| Q_{RR} | Reverse recovery charge | - | 6.5 | - | nC | |



Typical Characteristics

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

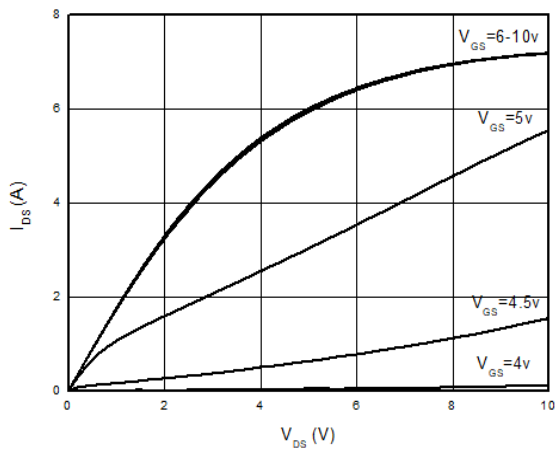


Figure 1. Typical Output Characteristics $T_j=25^\circ\text{C}$

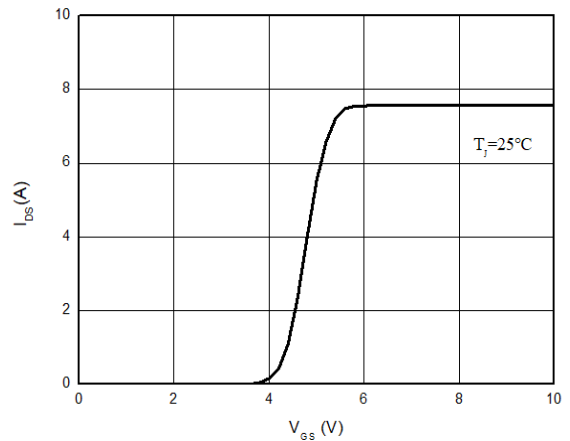


Figure 2. Typical Transfer Characteristics ($V_{DS}=10V$)

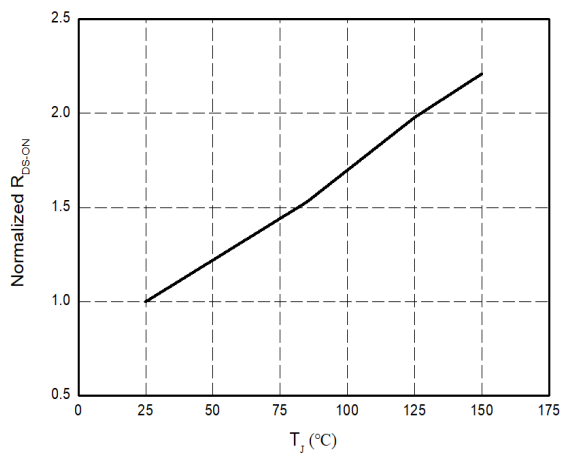


Figure 3. Normalized On-resistance

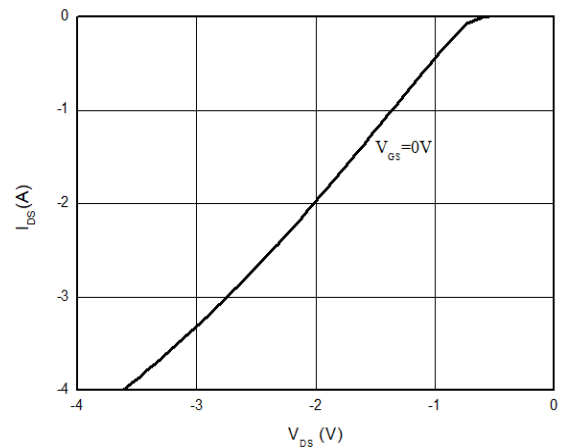


Figure 4. Channel Reverse Characteristics $T_j=25^\circ\text{C}$



Typical Characteristics

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

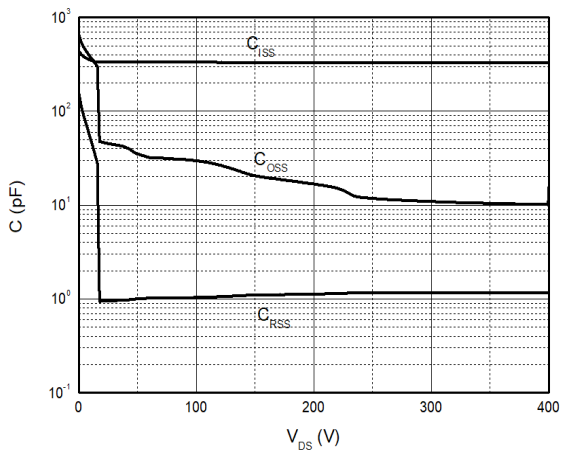


Figure 5. Typical Capacitance (f=1MHz)

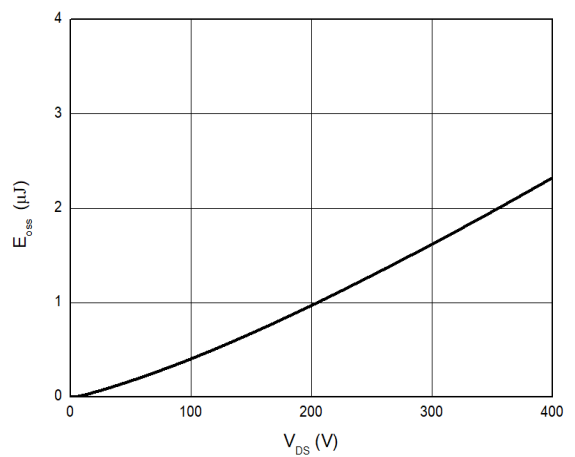


Figure 6. Typical C_{oss} Stored Energy

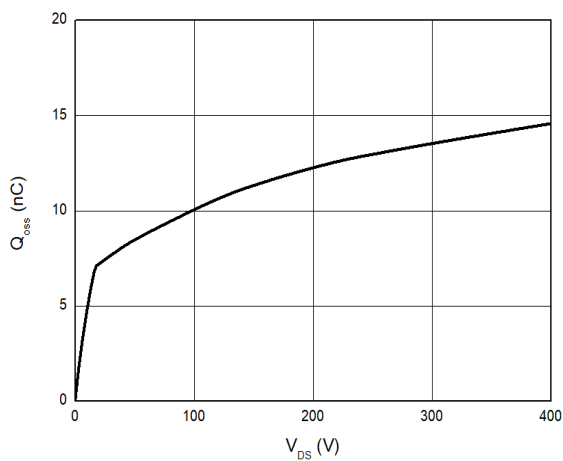


Figure 7. Typical Q_{oss}

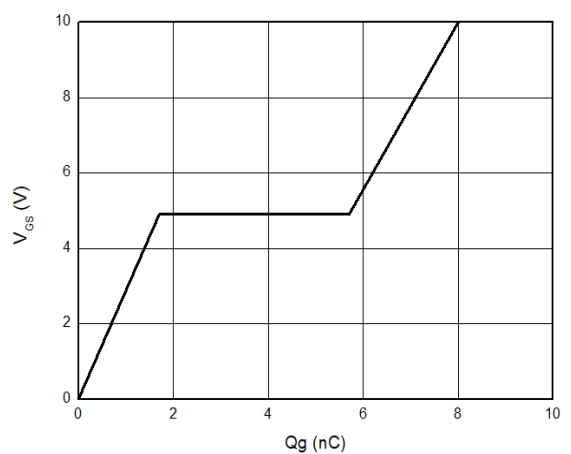


Figure 8. Typical Gate Charge ($V_{DS}=400\text{V}$, $I_D=1\text{A}$)

Typical Characteristics

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

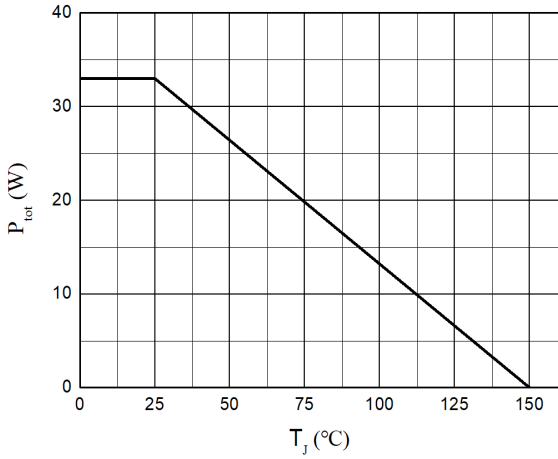


Figure 9. Power Dissipation

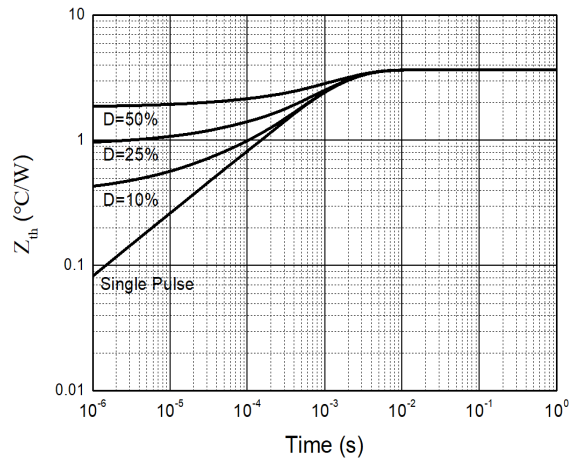


Figure 10. Transient Thermal Resistance

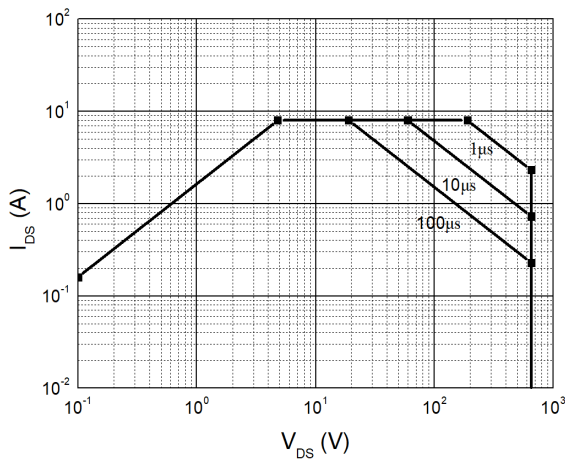


Figure 11. Safe Operating Area $T_j=25^\circ\text{C}$

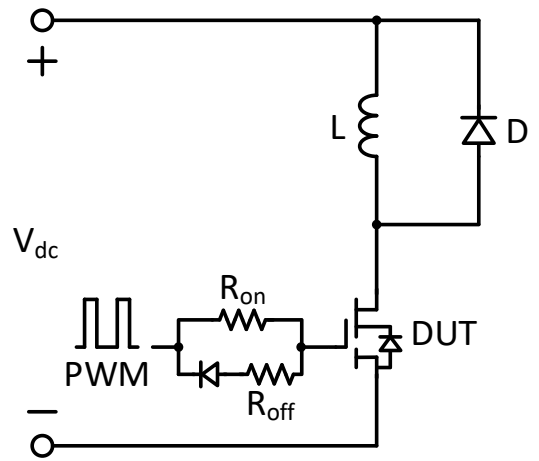


Figure 12 Switching times with inductive load

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

Typical Characteristics

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

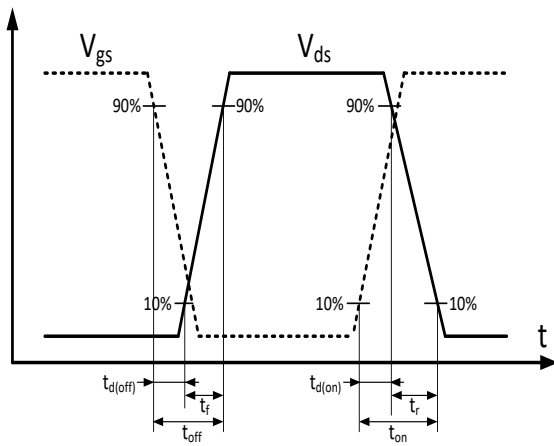
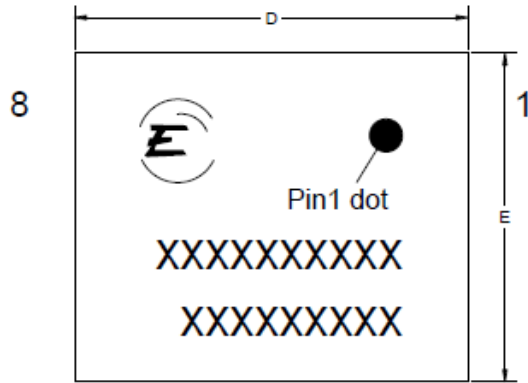


Figure 13. Switching times with waveform

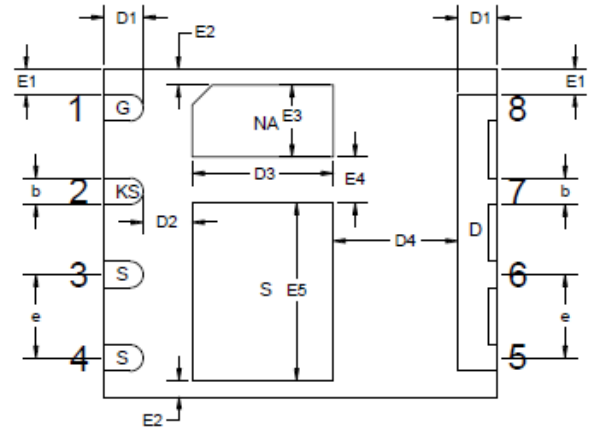


PACKAGE DIMENSIONS

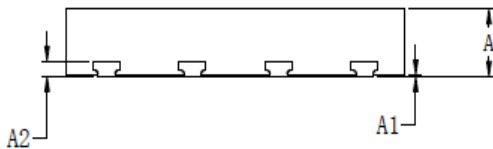
TOP VIEW



BOTTOM VIEW



Side View(left/right)



| Symbol | Min. (mm) | Mean. (mm) | Max. (mm) |
|--------|-----------|------------|-----------|
| A | 0.850 | 0.900 | 0.950 |
| A1 | 0.000 | 0.020 | 0.050 |
| A2 | 0.203REF | | |
| D | 5.900 | 6.000 | 6.100 |
| E | 4.900 | 5.000 | 5.100 |
| D1 | 0.500 | 0.600 | 0.700 |
| D2 | 0.650 | 0.750 | 0.850 |
| D3 | 2.050 | 2.150 | 2.250 |
| D4 | 1.800 | 1.900 | 2.000 |
| E1 | 0.295 | 0.395 | 0.495 |
| E2 | 0.195 | 0.295 | 0.395 |
| E3 | 0.990 | 1.090 | 1.190 |
| E4 | 0.600 | 0.700 | 0.800 |
| E5 | 2.610 | 2.710 | 2.810 |
| b | 0.300 | 0.400 | 0.500 |
| e | 1.170 | 1.270 | 1.370 |



CE65H600DNCI

Revision history

Major changes since the last revision

| Revision | Date | Description of changes |
|----------|------------|------------------------|
| 1.0 | 2023-12-25 | Initial release |