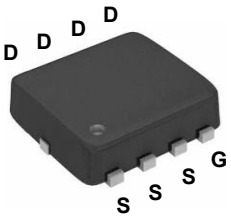
GOOD-ARK SEMICONDUCTOR

# GSGN0648

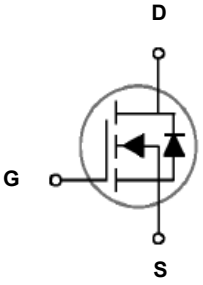
**65V N-Channel MOSFET**

## Main Product Characteristics

| | |
|---|---|
| $BV_{DSS}$ | 65V |
| $R_{DS(ON)}$ | 10.8mΩ |
| $I_D$ | 48A |




PPAK 3x3




Schematic Diagram

## Features and Benefits

- Advanced MOSFET process technology
- Ideal for high efficiency switched mode power supplies
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery

RoHS Compliant

## Description

The GSGN0648 utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supply and a wide variety of other applications.

## Absolute Maximum Ratings ($T_C$=25°C unless otherwise specified)

| Parameter | Symbol | Max. | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 65 | V |
| Gate-Source Voltage | $V_{GS}$ | +20 / - 12 | V |
| Drain Current – Continuous ($T_C$=25°C) | $I_D$ | 48 | A |
| Drain Current – Continuous ($T_C$=100°C) | | 30.4 | A |
| Drain Current – Pulsed[1] | $I_{DM}$ | 192 | A |
| Single Pulse Avalanced Energy[2] | $E_{AS}$ | 51.2 | mJ |
| Single Pulse Avalanced Current[2] | $I_{AS}$ | 32 | A |
| Power Dissipation ($T_C$=25°C) | $P_D$ | 42 | W |
| Power Dissipation – Derate above 25°C | | 0.33 | W/°C |
| Storage Temperature Range | $T_{STG}$ | -55 to 150 | °C |
| Operating Junction Temperature Range | $T_J$ | -55 to 150 | °C |
| Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 62 | °C/W |
| Thermal Resistance Junction to Case | $R_{\theta JC}$ | 2.98 | °C/W |

## Electrical Characteristics ($T_C$=25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 65 | - | - | V |
| $BV_{DSS}$ Temperature Coefficient | $\triangle BV_{DSS}/\triangle T_J$ | Reference to 25°C, $I_D$=1mA | - | 0.03 | - | V/°C |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=60V, $V_{GS}$=0V, $T_J$=25℃ | - | - | 1 | uA |
| | | $V_{DS}$=48V, VGS=0V, $T_J$=85℃ | - | - | 10 | uA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | - | - | 100 | nA |
| Static Drain-Source On-Resistance[3] | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=15A | - | 9 | 10.8 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=12A | - | 16.3 | 19.5 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$, $I_D$=250uA | 1 | 1.6 | 2.5 | V |
| VGS(th) Temperature Coefficient | $\triangle V_{GS(th)}$ | | - | -5 | - | mV/°C |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$=10V, $I_D$=3A | - | 6 | - | S |
| Total Gate Charge[3,4] | $Q_g$ | $V_{DS}$=30V, $V_{GS}$=10V, $I_D$=15A | - | 15.3 | 30.6 | nC |
| Gate-Source Charge[3,4] | $Q_{gs}$ | | - | 2.4 | 5.8 | |
| Gate-Drain Charge[3,4] | $Q_{gd}$ | | - | 5.4 | 10.8 | |
| Turn-On Delay Time[3,4] | $T_{d(on)}$ | $V_{DD}$=30V, $V_{GS}$=10V, $R_G$=3.3Ω, $I_D$=1A | - | 10 | 20 | ns |
| Rise Time[3,4] | $T_r$ | | - | 13.5 | 27 | |
| Turn-Off Delay Time[3,4] | $T_{d(off)}$ | | - | 28 | 56 | |
| Fall Time[3,4] | $T_f$ | | - | 20 | 40 | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=30V, $V_{GS}$=0V, F=1MHz | - | 945 | 1890 | pF |
| Output Capacitance | $C_{oss}$ | | - | 275 | 550 | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 26 | 52 | |
| Gate Resistance | $R_g$ | $V_{GS}$=0V, $V_{DS}$=0V, F=1MHz | - | 0.3 | - | Ω |

**Source-Drain Ratings and Characteristics**

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Continuous Source Current | $I_S$ | $V_G$=$V_D$=0V, Force Current | - | - | 48 | A |
| Pulsed Source Current[3] | $I_{SM}$ | | - | - | 96 | A |
| Diode Forward Voltage[3] | $V_{SD}$ | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | - | - | 1 | V |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}$=50V,$V_{GS}$=10V,L=0.1mH,$I_{AS}$=32A.,$R_G$=25Ω, Starting $T_J$=25°C.
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
4. Essentially independent of operating temperature.

## Typical Electrical and Thermal Characteristic Curves

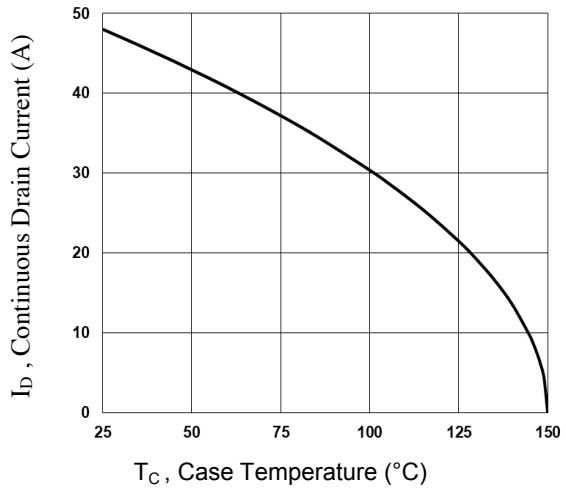



**Figure 1. Continuous Drain Current vs. $T_C$**

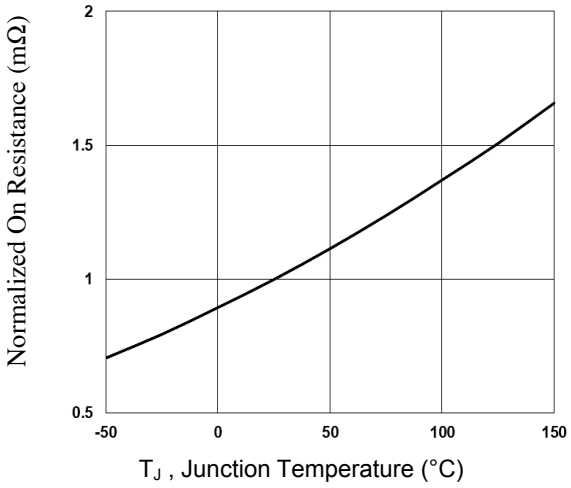



**Figure 2. Normalized RDSON ss. $T_J$**

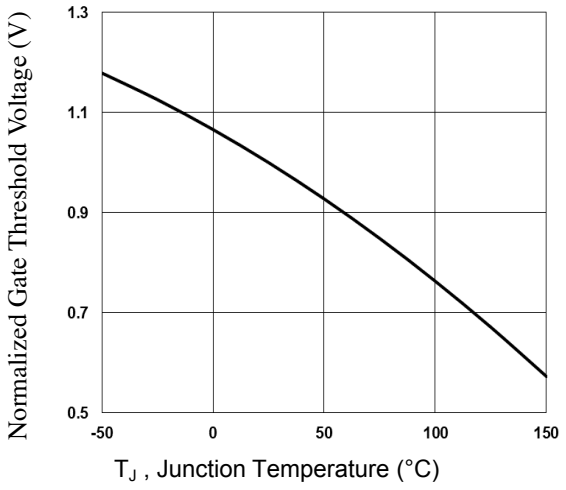



**Figure 3. Normalized $V_{th}$ vs. $T_J$**

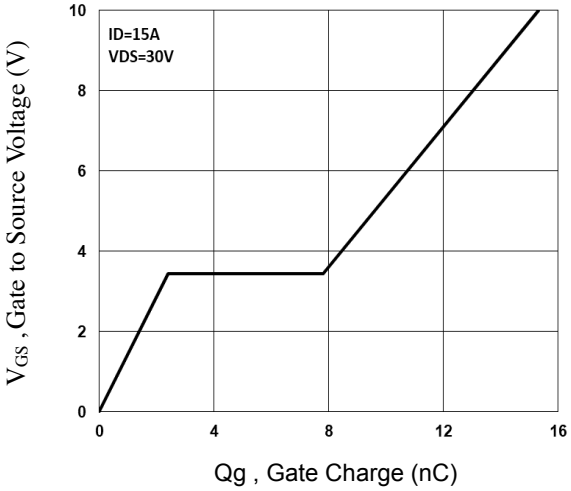



**Figure 4. Gate Charge Waveform**

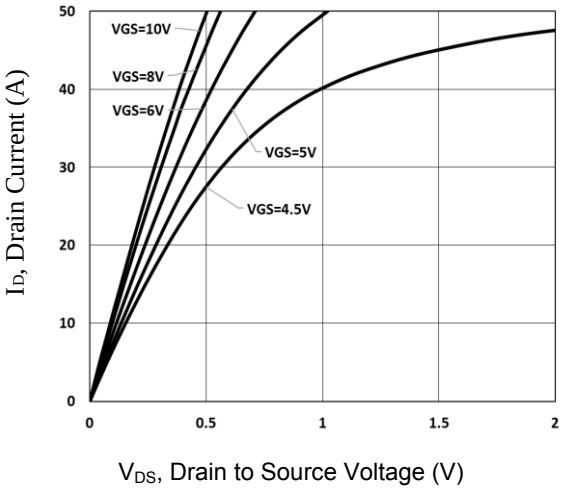



**Figure 5. Typical Outpt Characteristics**

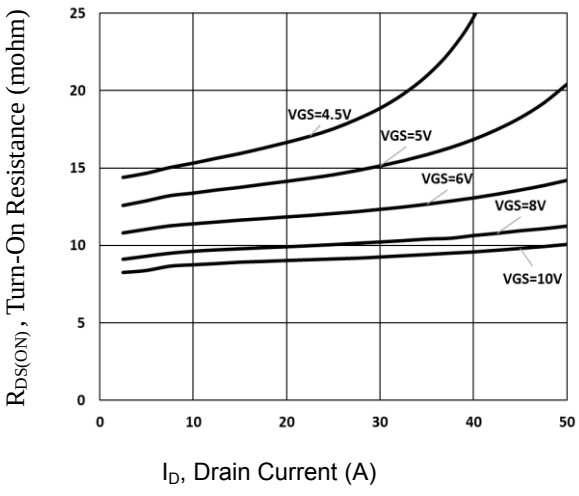



**Figure 6. Turn-on Resistance vs.$I_D$**

## Typical Electrical and Thermal Characteristic Curves

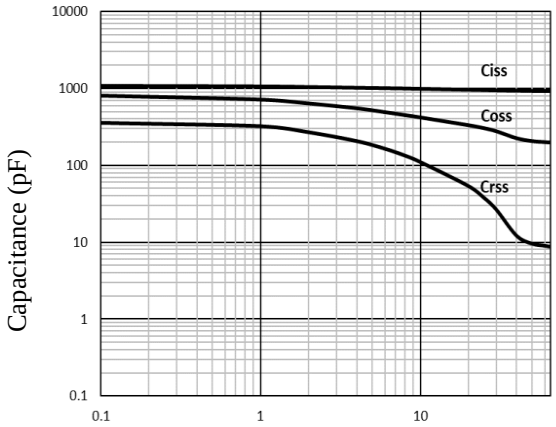



**Figure 7. Capacitance Characteristics**

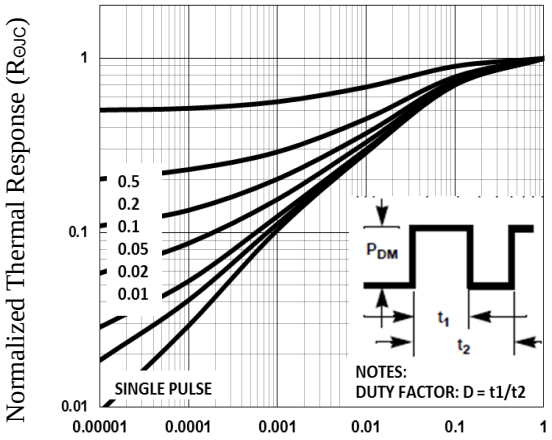



**Fig.8 Normalized Transient Response**

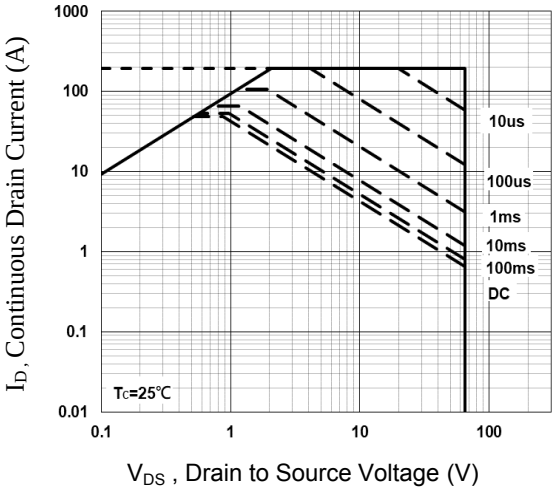



**Fig.9 Maximum Safe Operation Area**

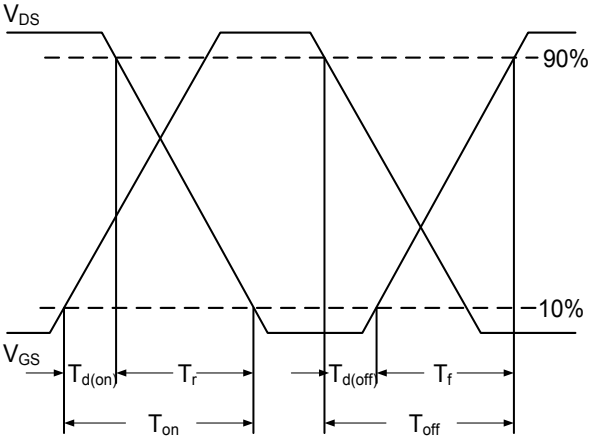



**Figure 10. Switching Time Waveform**

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$

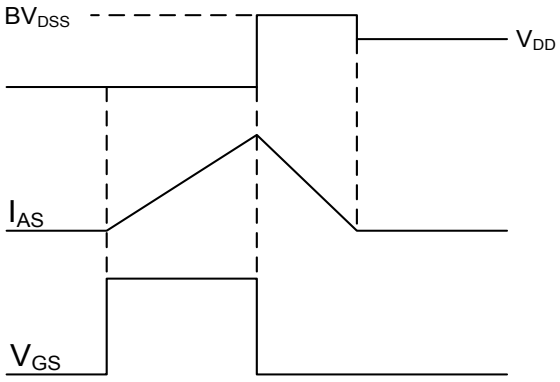



**Figure 11. EAS Waveform**

GOOD-ARK SEMICONDUCTOR

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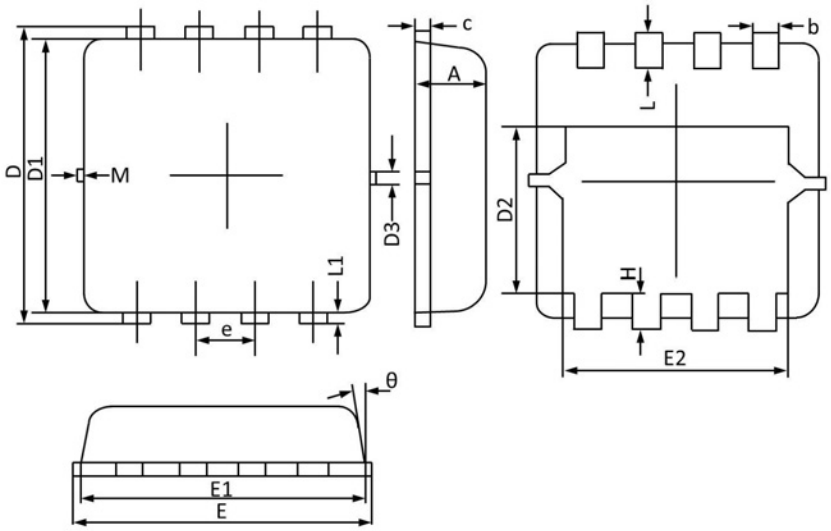
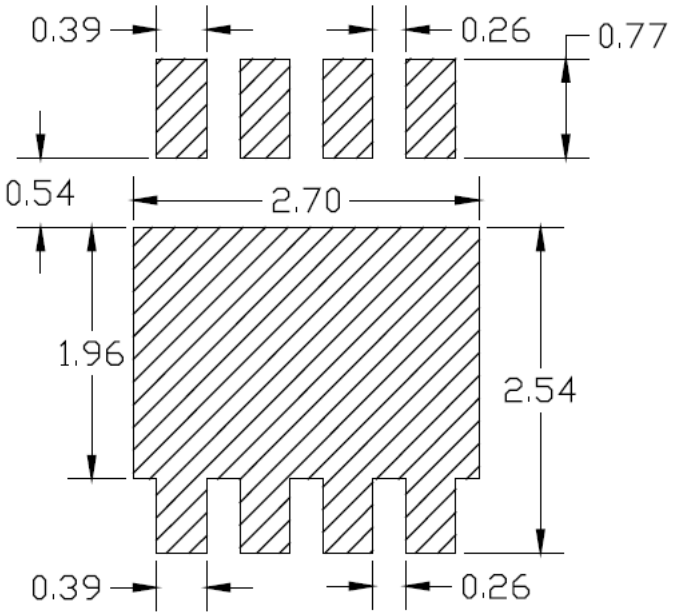
**65V N-Channel MOSFET**

## Package Outline Dimensions (PPAK 3x3)




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| b | 0.250 | 0.350 | 0.010 | 0.013 |
| c | 0.100 | 0.250 | 0.004 | 0.009 |
| D | 3.250 | 3.450 | 0.128 | 0.135 |
| D1 | 3.000 | 3.200 | 0.119 | 0.125 |
| D2 | 1.780 | 1.980 | 0.070 | 0.077 |
| D3 | 0.130 REF | | 0.005 REF | |
| E | 3.200 | 3.400 | 0.126 | 0.133 |
| E1 | 3.000 | 3.200 | 0.119 | 0.125 |
| E2 | 2.390 | 2.590 | 0.094 | 0.102 |
| e | 0.650BSC | | 0.026BSC | |
| H | 0.300 | 0.500 | 0.011 | 0.019 |
| L | 0.300 | 0.500 | 0.011 | 0.019 |
| L1 | 0.130 REF | | 0.005 REF | |
| θ | 0° | 12° | 0° | 12° |
| M | 0.150 REF | | 0.006 REF | |

## Recommended Pad Layout




unit : mm