优尚

YOUSHANG SEMICONDUCTOR

# 设计研发新型功率器件

## 各类小信号开关

## 中低压及高压大电流等场效应管

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## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | $I_D$ max<br>$T_A$ = +25°C |
|---|---|---|
| 30V | 18mΩ @ $V_{GS}$ = 10V | 9.0A |
| | 30mΩ @ $V_{GS}$ = 4.5V | 7.0A |

## Description and Applications

This MOSFET has been designed to minimize the on-state resistance ($R_{DS(on)}$) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

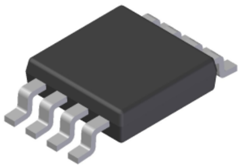
## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage

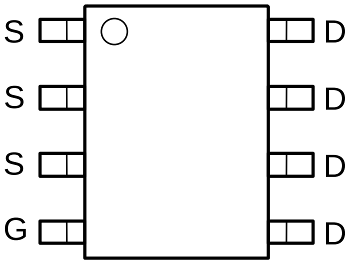
## Mechanical Data

- Case: SO-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (Approximate)

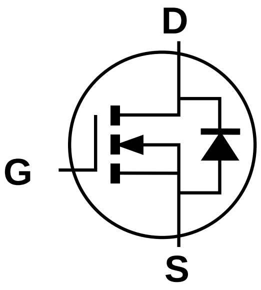
SO-8



Top View



Top View
Internal Schematic



Equivalent circuit

## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±25 | V |
| Drain Current (Note 6) | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 9.0<br>6.75 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 40 | A |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Total Power Dissipation (Note 5) | $P_D$ | 1.7 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 73 | °C/W |
| Total Power Dissipation (Note 6) | $P_D$ | 2.5 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 50 | °C/W |
| Operating and Storage Temperature Range | $T_J, T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 7)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 30V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | —<br>— | —<br>— | ±100<br>±1 | nA<br>µA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V<br>$V_{GS}$ = ±25V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 1 | — | 2.1 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | — | 15.7<br>26.4 | 18<br>30 | mΩ | $V_{GS}$ = 10V, $I_D$ = 9A<br>$V_{GS}$ = 4.5V, $I_D$ = 7A |
| Forward Transconductance | $g_{fs}$ | — | 5.8 | — | S | $V_{DS}$ = 10V, $I_D$ = 9A |
| Diode Forward Voltage | $V_{SD}$ | 0.5 | 0.7 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 2.1A |
| **DYNAMIC CHARACTERISTICS** (Note 8) | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 741 | — | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 124 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 95 | — | pF | |
| Gate Resistance | $R_G$ | 0.30 | 0.88 | 2.5 | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| **SWITCHING CHARACTERISTICS** (Note 8) | | | | | | |
| Total Gate Charge | $Q_g$ | — | 7.6 | 12 | nC | $V_{DS}$ = 15V, $V_{GS}$ = 4.5V, $I_D$ = 9A |
| | | — | 16.7 | 25 | | $V_{DS}$ = 15V, $V_{GS}$ = 10V, $I_D$ = 9A |
| Gate-Source Charge | $Q_{gs}$ | — | 1.9 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 5.2 | — | | |
| Turn-On Delay Time | $t_{d(on)}$ | — | 4.0 | — | ns | $V_{GS}$ = 10V, $V_{DS}$ = 15V,<br>$R_L$ = 15Ω, $R_G$ = 6Ω |
| Rise Time | $t_r$ | — | 4.4 | — | | |
| Turn-Off Delay Time | $t_{d(off)}$ | — | 23.0 | — | | |
| Fall Time | $t_f$ | — | 9.4 | — | | |

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

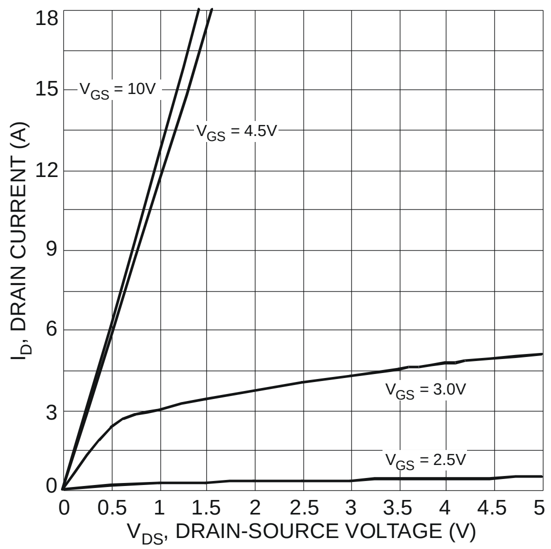


Fig. 1 Typical Output Characteristic

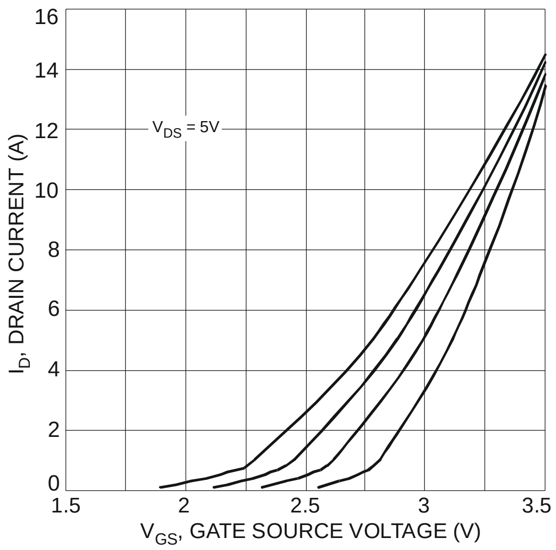


Fig. 2 Typical Transfer Characteristics

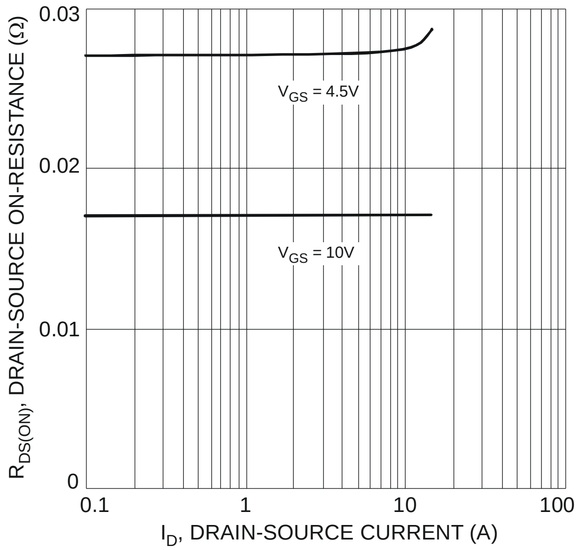


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

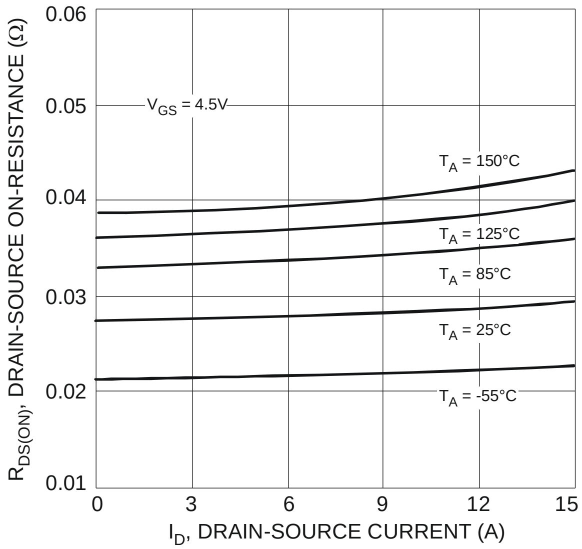


Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

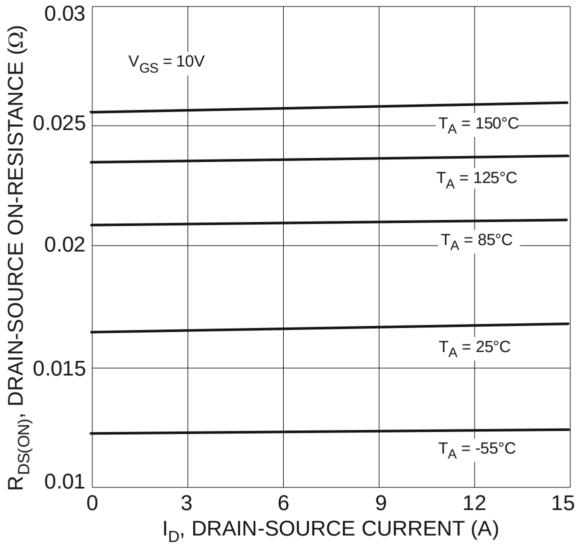


Fig. 5 Typical On-Resistance
vs. Drain Current and Temperature

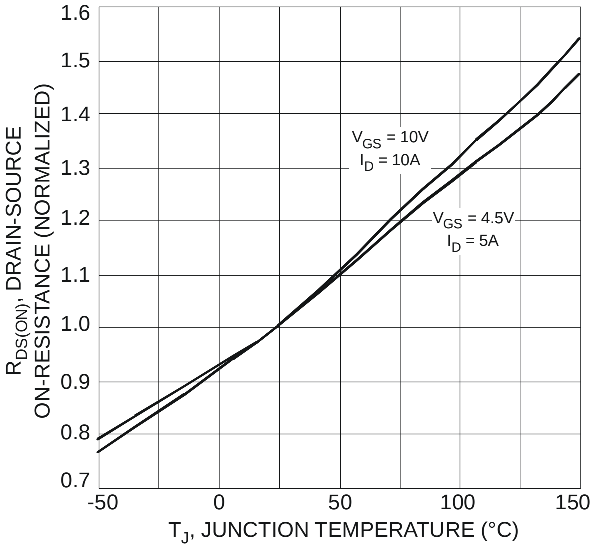


Fig. 6 On-Resistance Variation with Temperature

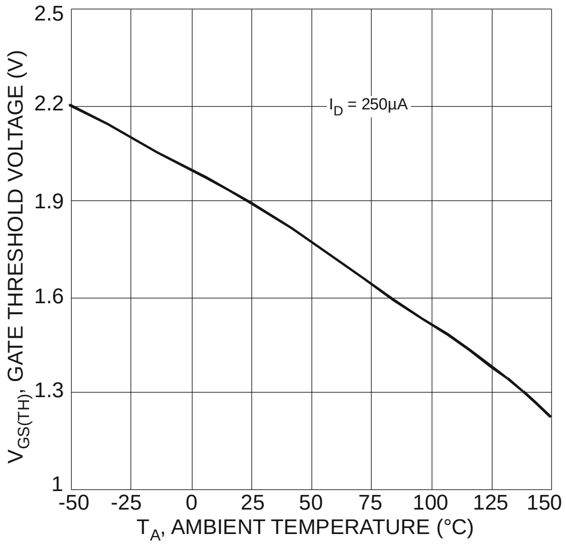


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

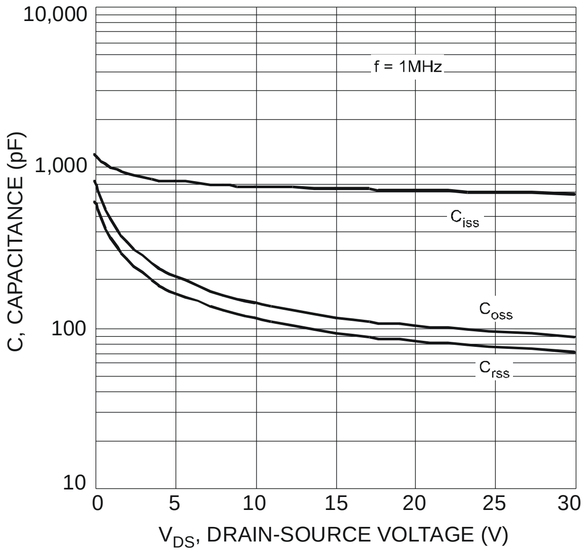


Fig. 8 Total Capacitance

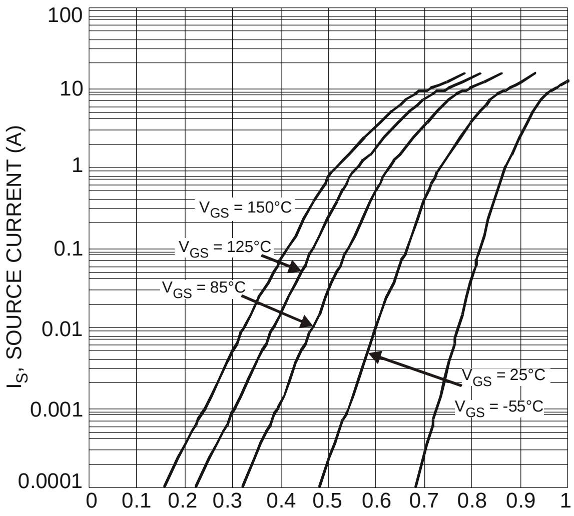


Fig. 9 Diode Forward Voltage vs. Current

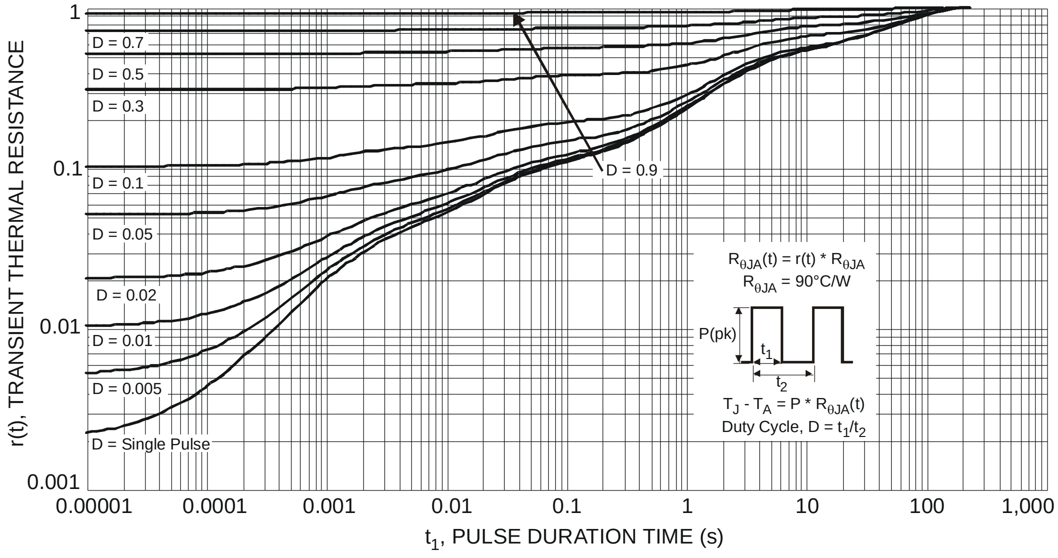
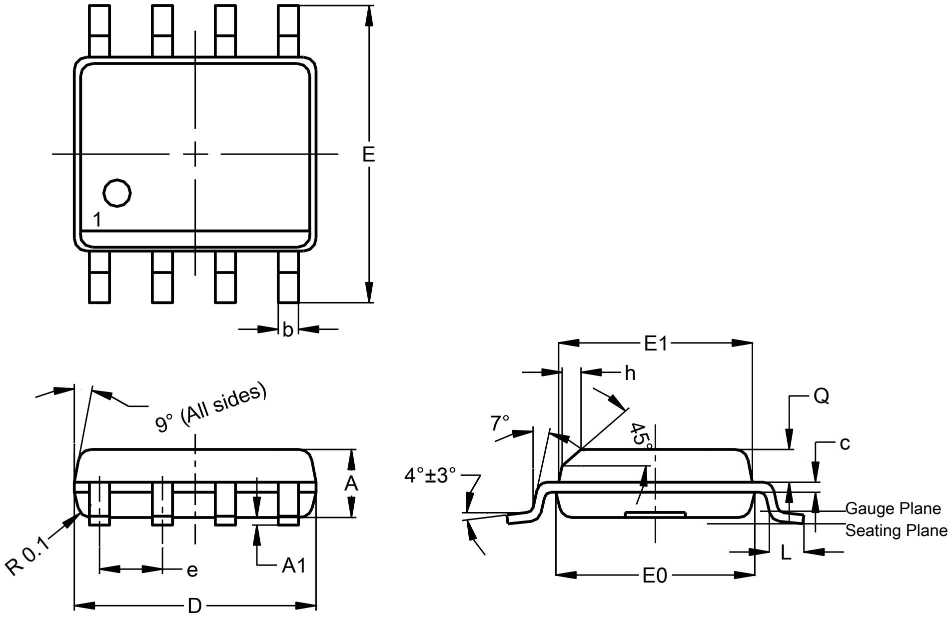


Fig. 10 Transient Thermal Response

## Package Outline Dimensions

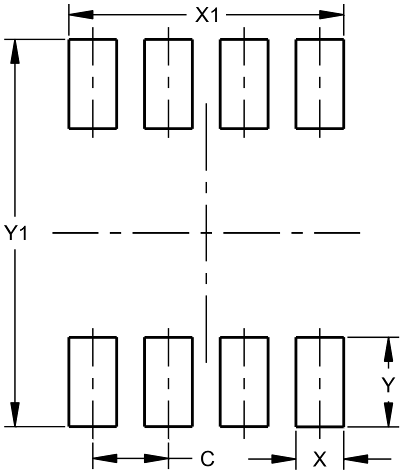
**SO-8**



| SO-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.40 | 1.50 | 1.45 |
| **A1** | 0.10 | 0.20 | 0.15 |
| **b** | 0.30 | 0.50 | 0.40 |
| **c** | 0.15 | 0.25 | 0.20 |
| **D** | 4.85 | 4.95 | 4.90 |
| **E** | 5.90 | 6.10 | 6.00 |
| **E1** | 3.80 | 3.90 | 3.85 |
| **E0** | 3.85 | 3.95 | 3.90 |
| **e** | -- | -- | 1.27 |
| **h** | - | -- | 0.35 |
| **L** | 0.62 | 0.82 | 0.72 |
| **Q** | 0.60 | 0.70 | 0.65 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

**SO-8**



| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.27 |
| **X** | 0.802 |
| **X1** | 4.612 |
| **Y** | 1.505 |
| **Y1** | 6.50 |