



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

| $V_{(BR)DSS}$ | $R_{DS(on) \max}$                           | $I_D$<br>$T_A = +25^\circ\text{C}$ |
|---------------|---|------------------------------------|
| -30V          | $70\text{m}\Omega @ V_{GS} = -10\text{V}$   | -3.8A                              |
|               | $120\text{m}\Omega @ V_{GS} = -4.5\text{V}$ | -3.0A                              |

## Features and Benefits

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

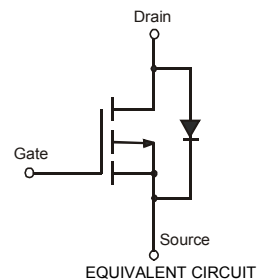
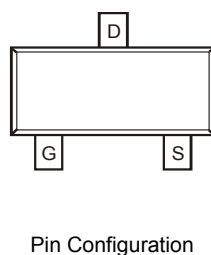
## Description and Applications

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

- Power management functions
- Analog Switch
- Load Switch
- Boost Switch

## Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)



**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                                |              |                           | Symbol    | Value    | Units |
|---|--------------|---------------------------|-----------|----------|-------|
| Drain-Source Voltage                          |              |                           | $V_{DSS}$ | -30      | V     |
| Gate-Source Voltage                           |              |                           | $V_{GSS}$ | $\pm 20$ | V     |
| Drain Current (Note 5) $V_{GS} = -10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ | $I_D$     | -3.8     | A     |
|   |              | $T_A = +70^\circ\text{C}$ |           | -2.9     |       |
| Pulsed Drain Current (Note 6)                 |              |                           | $I_{DM}$  | -11      | A     |

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic   | Symbol          | Value       | Units                     |
|--|-----------------|-------------|---------------------------|
| Total Power Dissipation (Note 5)   | $P_D$           | 1.08        | W                         |
| Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 5) | $R_{\theta JA}$ | 115         | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range                                      | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$          |

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                            | Symbol       | Min  | Typ  | Max       | Unit       | Test Condition  |
|---|--------------|------|------|-----------|------------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>       |              |      |      |           |            |   |
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | -30  | —    | —         | V          | $V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$                                     |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | —    | —    | -800      | nA         | $V_{DS} = -30\text{V}, V_{GS} = 0\text{V}$                                      |
| Gate-Source Leakage                       | $I_{GSS}$    | —    | —    | $\pm 100$ | nA         | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$                                   |
| <b>ON CHARACTERISTICS (Note 7)</b>        |              |      |      |           |            |   |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | -1.0 | -1.8 | -2.1      | V          | $V_{DS} = V_{GS}, I_D = -250\mu\text{A}$  |
| Static Drain-Source On-Resistance         | $R_{DS(on)}$ | —    | 56   | 70        | m $\Omega$ | $V_{GS} = -10\text{V}, I_D = -3.8\text{A}$                                      |
|   |              |      | 98   | 120       |            | $V_{GS} = -4.5\text{V}, I_D = -3.0\text{A}$                                     |
| Forward Transfer Admittance               | $ Y_{fs} $   | —    | 3.6  | —         | S          | $V_{DS} = -5\text{V}, I_D = -2.7\text{A}$                                       |
| Diode Forward Voltage (Note 6)            | $V_{SD}$     | —    | —    | -1.26     | V          | $V_{GS} = 0\text{V}, I_S = -2.7\text{A}$  |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>   |              |      |      |           |            |   |
| Input Capacitance                         | $C_{iss}$    | —    | 336  | 1008      | pF         | $V_{DS} = -25\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$                   |
| Output Capacitance                        | $C_{oss}$    | —    | 70   | 210       | pF         |   |
| Reverse Transfer Capacitance              | $C_{rss}$    | —    | 49   | 147       | pF         |   |
| Gate Resistance                           | $R_G$        | —    | 4.6  | —         | $\Omega$   | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$                       |
| <b>SWITCHING CHARACTERISTICS (Note 8)</b> |              |      |      |           |            |   |
| Total Gate Charge                         | $Q_g$        | —    | 4.0  | 8.0       | nC         | $V_{DS} = -15\text{V}, V_{GS} = -4.5\text{V}, I_D = -3.8\text{A}$               |
|   |              |      | 7.8  | —         |            | $V_{DS} = -15\text{V}, V_{GS} = -10\text{V}, I_D = -3.8\text{A}$                |
| Gate-Source Charge                        | $Q_{gs}$     | —    | 1.0  | —         | ns         | $V_{DS} = -15\text{V}, V_{GS} = -10\text{V}, I_D = -1\text{A}, R_G = 6.0\Omega$ |
| Gate-Drain Charge                         | $Q_{gd}$     | —    | 2.5  | —         |            |   |
| Turn-On Delay Time                        | $t_{d(on)}$  | —    | 6.0  | 12.0      | ns         | $V_{DS} = -15\text{V}, V_{GS} = -10\text{V}, I_D = -1\text{A}, R_G = 6.0\Omega$ |
| Rise Time                                 | $t_r$        | —    | 5.0  | 10.0      |            |   |
| Turn-Off Delay Time                       | $t_{d(off)}$ | —    | 17.6 | 35.2      |            |   |
| Fall Time                                 | $t_f$        | —    | 9.5  | 19.0      |            |   |

- Notes:
- Device mounted on FR-4 PCB on 2 oz., 0.5 in.<sup>2</sup> copper pads and  $t \leq 5$  sec.
  - Pulse width  $\leq 10\mu\text{s}$ , Duty Cycle  $\leq 1\%$ .
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

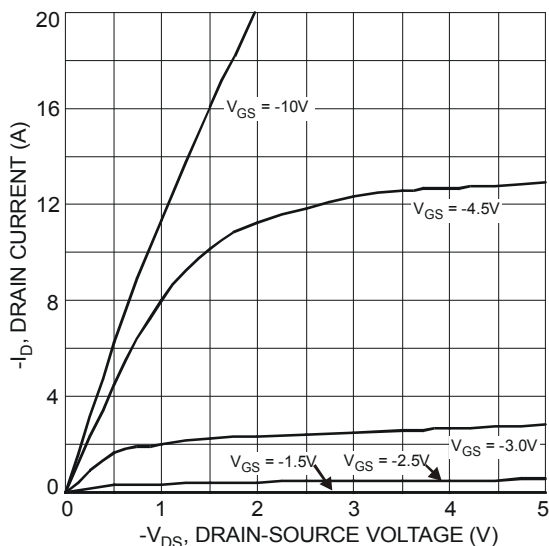


Fig. 1 Typical Output Characteristics

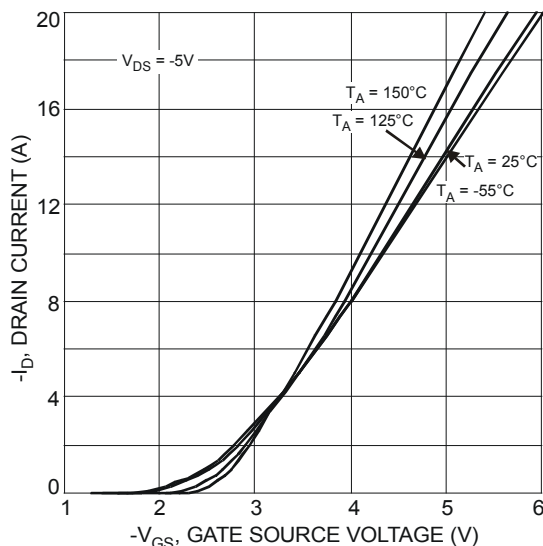


Fig. 2 Typical Transfer Characteristics

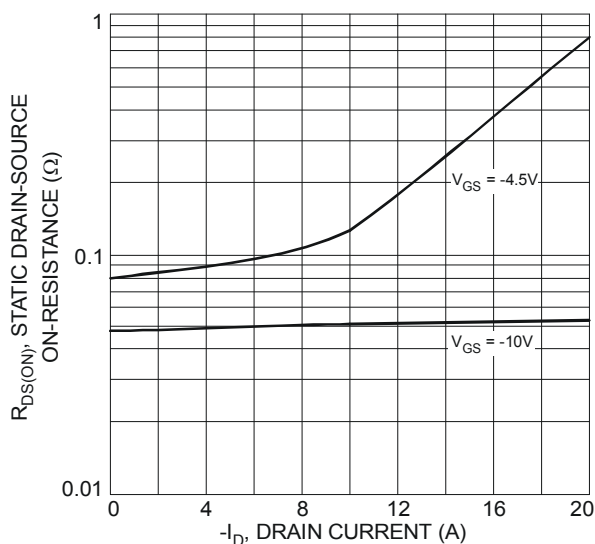


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

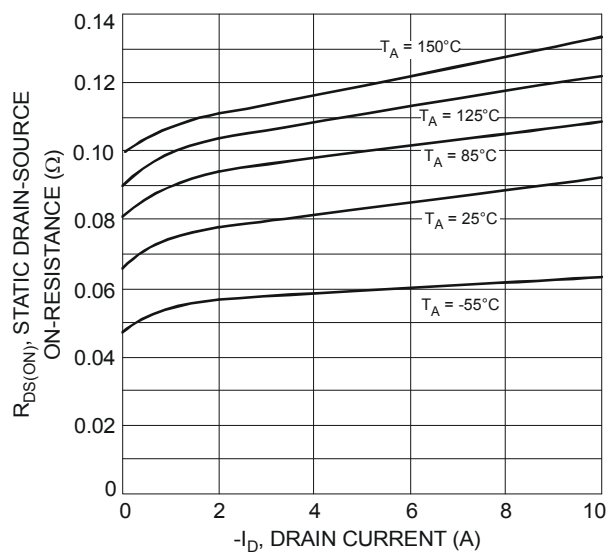


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

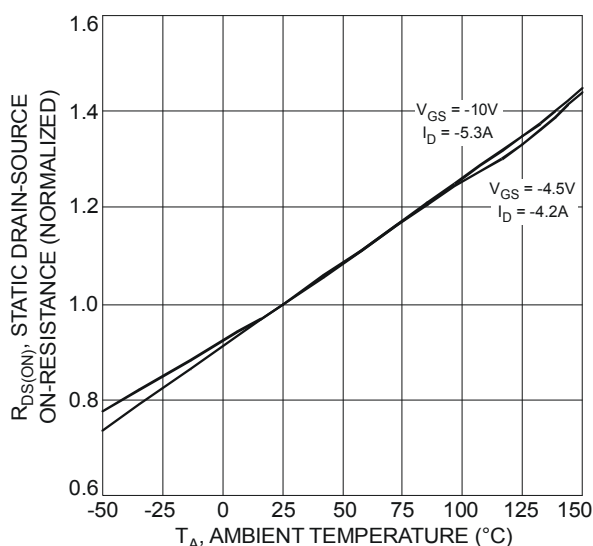


Fig. 5 On-Resistance Variation with Temperature

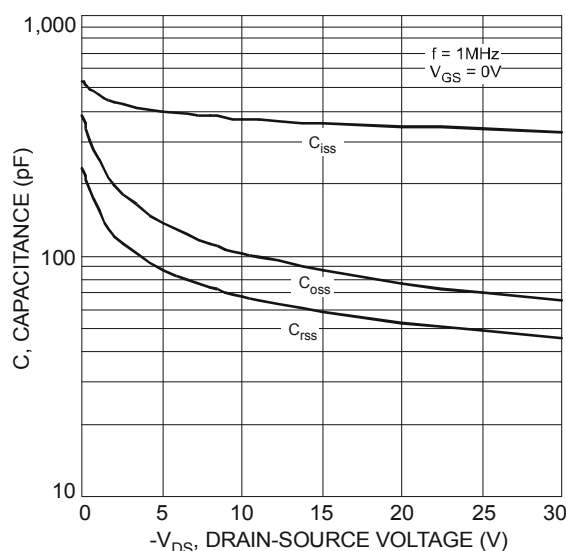


Fig. 6 Typical Capacitance

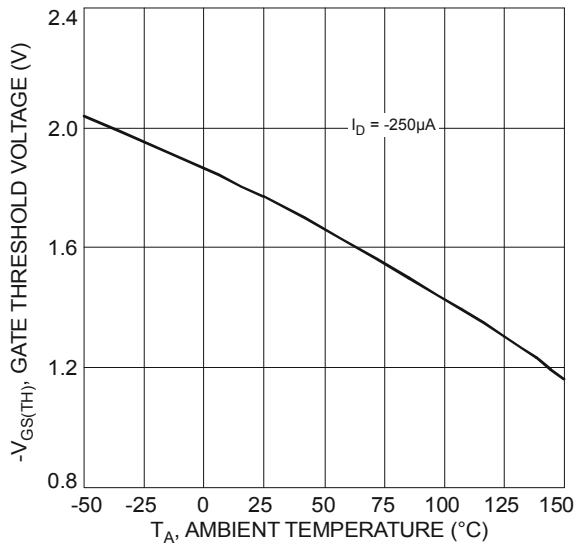


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

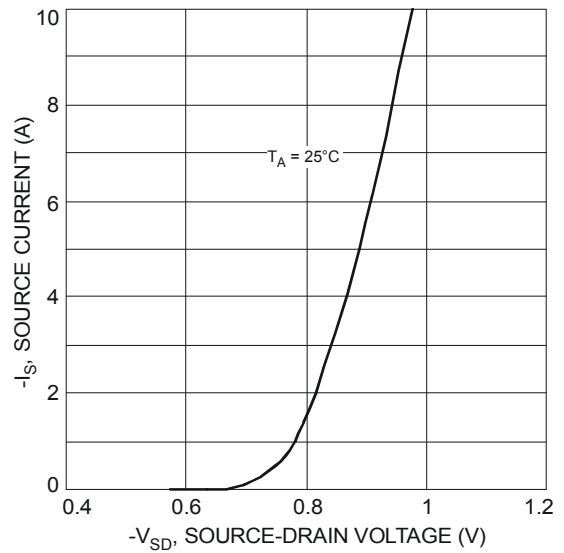


Fig. 8 Diode Forward Voltage vs. Current

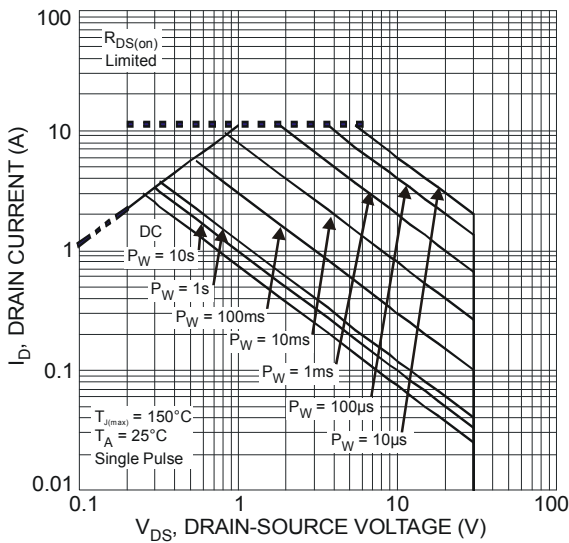
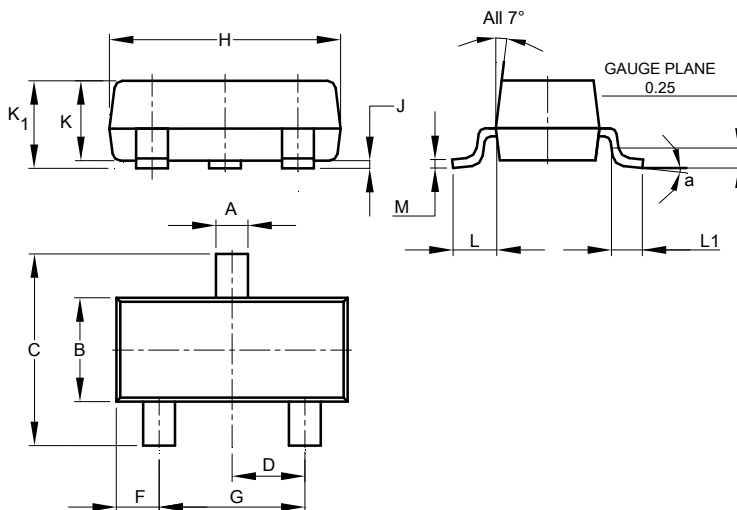


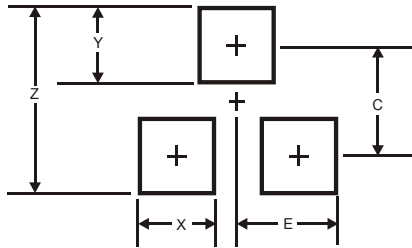
Fig. 9 Safe Operation Area

### Package Outline Dimensions



| SOT23                |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 0.37  | 0.51  | 0.40  |
| B                    | 1.20  | 1.40  | 1.30  |
| C                    | 2.30  | 2.50  | 2.40  |
| D                    | 0.89  | 1.03  | 0.915 |
| F                    | 0.45  | 0.60  | 0.535 |
| G                    | 1.78  | 2.05  | 1.83  |
| H                    | 2.80  | 3.00  | 2.90  |
| J                    | 0.013 | 0.10  | 0.05  |
| K                    | 0.890 | 1.00  | 0.975 |
| K1                   | 0.903 | 1.10  | 1.025 |
| L                    | 0.45  | 0.61  | 0.55  |
| L1                   | 0.25  | 0.55  | 0.40  |
| M                    | 0.085 | 0.150 | 0.110 |
| α                    | 8°    |       |       |
| All Dimensions in mm |       |       |       |

### Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 2.9           |
| X          | 0.8           |
| Y          | 0.9           |
| C          | 2.0           |
| E          | 1.35          |