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

| $V_{(BR)DSS}$ | Max $R_{DS(ON)}$ | Max $I_D$ $T_A = +25°C$ |
|---|---|---|
| 20V | 0.040Ω @ $V_{GS}$ = 4.5V | 5.4A |
| | 0.055Ω @ $V_{GS}$ = 2.5V | 4.6A |
| | 0.075Ω @ $V_{GS}$ = 1.8V | 4.0A |

## Description and Applications

This new generation trench MOSFET from Zetex features low on-resistance achievable with low gate drive.

- DC - DC Converters
- Power Management Functions
- Disconnect Switches
- Motor Control

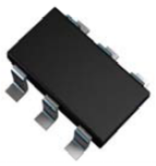
## Features and Benefits

- Low On-resistance
- Fast Switching Speed
- Low Gate Drive Capability

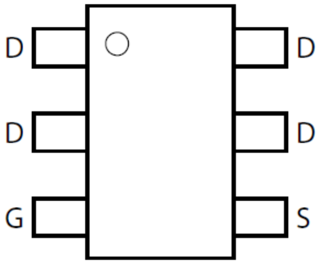
## Mechanical Data

- Case: SOT26
- 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 e3
- Weight: 0.015 grams (Approximate)

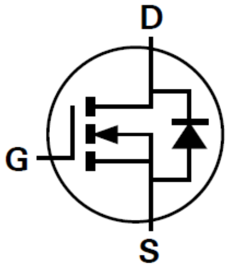
SOT26



Top View



Pinout Top-view



Device Symbol

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

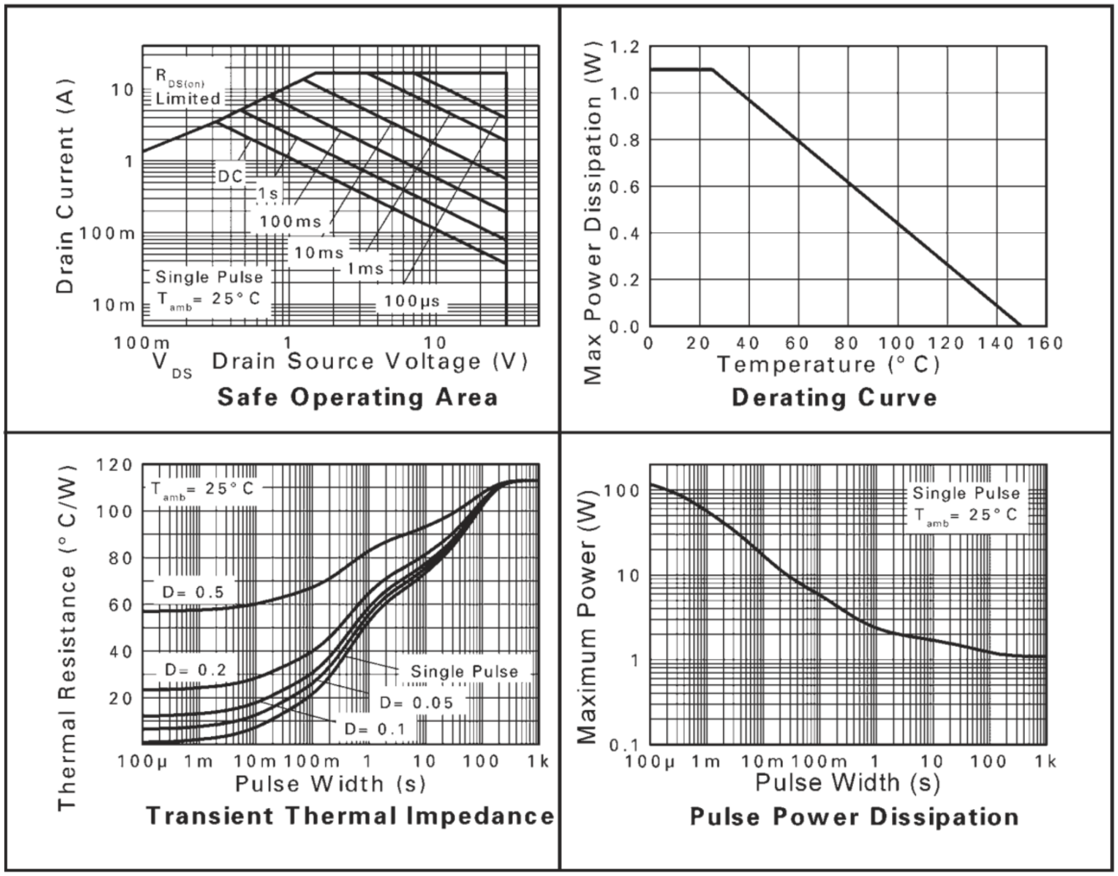
| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 20 | V |
| Gate-Source Voltage | | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current | $V_{GS}$ = 4.5V | $T_A$ = +25°C (Note 6) | $I_D$ | 5.4 | A |
| | | $T_A$ = +70°C (Note 6) | | 4.3 | |
| | | $T_A$ = +25°C (Note 5) | | 4.3 | |
| Pulsed Drain Current (Note 7) | | | $I_{DM}$ | 26 | A |
| Continuous Source Current (Body Diode) (Note 6) | | | $I_S$ | 2.8 | A |
| Pulsed Source Current (Body Diode) (Note 7) | | | $I_{SM}$ | 26 | A |

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation at $T_A$ = +25°C (Note 5)<br>Linear derating factor (Note 5) | $P_D$ | 1.1<br>8.8 | W<br>mW/°C |
| Power Dissipation at $T_A$ = +25°C (Note 6)<br>Linear derating factor (Note 6) | $P_D$ | 1.7<br>13.7 | W<br>mW/°C |
| Junction to Ambient (Note 5) | $R_{\theta JA}$ | 113 | °C/W |
| Junction to Ambient (Note 6) | $R_{\theta JA}$ | 73 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

Notes:
5. For a device surface mounted on 25mm x 25mm FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions.
6. For a device surface mounted on FR-4 PCB measured at t≦10 secs.
7. Repetitive rating 25mm x 25mm FR-4 PCB, D = 0.02, pulse width 300µs - pulse width limited by maximum junction temperature.

## Thermal Characteristics

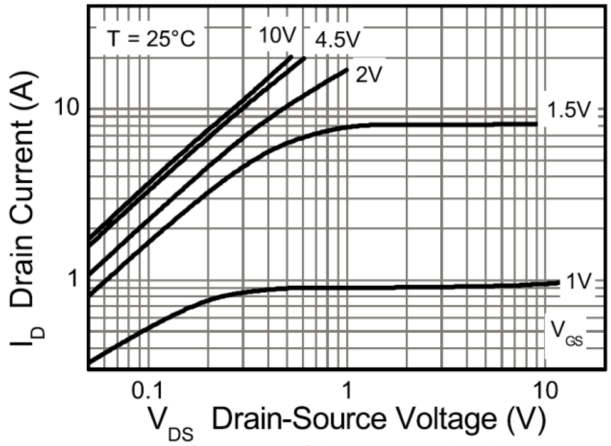


## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

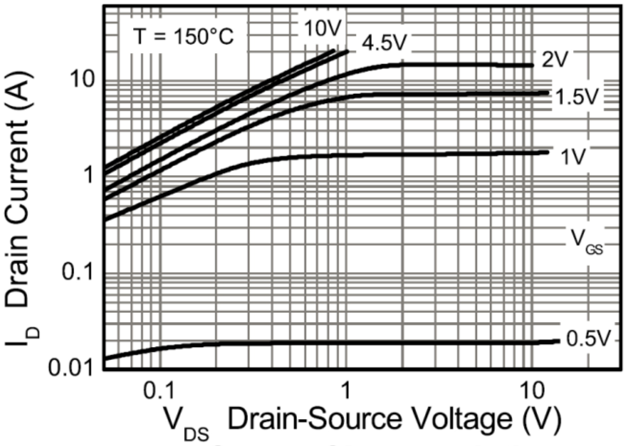
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-source Breakdown Voltage | $BV_{DSS}$ | 20 | — | — | V | $I_D$ = 250μA, $V_{GS}$ = 0V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | μA | $V_{DS}$ = 20V, $V_{GS}$ = 0V |
| Gate-body Leakage | $I_{GSS}$ | — | — | 100 | nA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| Diode Forward Voltage (Note 8) | $V_{SD}$ | — | 0.67 | 0.95 | V | $T_J$ = +25°C , $I_S$ = 1.8A, $V_{GS}$ = 0V |
| **ON CHARACTERISTICS** | | | | | | |
| Gate-source Threshold Voltage | $V_{GS(th)}$ | 0.4 | — | 1.0 | V | $I_D$ = 250μA, $V_{DS}$ = $V_{GS}$ |
| Static Drain-source On-state Resistance (Note 8) | $R_{DS(ON)}$ | — | — | 0.040 | Ω | $V_{GS}$ = 4.5V, $I_D$ = 4.3A |
| | | | | 0.055 | | $V_{GS}$ = 2.5V, $I_D$ = 3.7A |
| | | | | 0.075 | | $V_{GS}$ = 1.8V, $I_D$ = 3.2A |
| Forward Transconductance (Notes 8 & 10) | $g_{fs}$ | — | 13.5 | — | S | $V_{DS}$ = 10V, $I_D$ = 4.3A |
| **DYNAMIC CHARACTERISTICS** (Notes 9 & 10) | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 1160 | — | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V<br>f = 1MHz |
| Output Capacitance | $C_{oss}$ | — | 210 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 136 | — | pF | |
| Total Gate Charge | $Q_g$ | — | 14.5 | — | nC | $V_{GS}$ = 4.5V, $V_{DS}$ = 10V<br>$I_D$ = 4.3A |
| Gate-source Charge | $Q_{gs}$ | — | 2.0 | — | nC | |
| Gate-drain Charge | $Q_{gd}$ | — | 2.8 | — | nC | |
| Reverse Recovery Time (Note 10) | $t_{rr}$ | — | 10.8 | — | ns | $T_J$ = +25°C, $I_F$=2.8A,<br>di/dt= 100A/μs |
| Reverse Recovery Charge (Note 10) | $Q_{rr}$ | — | 3.4 | — | nC | |
| Turn-on Delay Time | $t_{d(on)}$ | — | 2.9 | — | ns | $V_{DD}$ = 10V, $V_{GS}$ = 4.5V<br>$I_D$ = 1A, $R_G$ = 6.0Ω |
| Turn-on Rise Time | $t_r$ | — | 6.4 | — | ns | |
| Turn-off Delay Time | $t_{d(off)}$ | — | 16.0 | — | ns | |
| Turn-off Fall Time | $t_f$ | — | 11.2 | — | ns | |

Notes:
8. Measured under pulsed conditions. Width=300μs. Duty cycle ≤ 2%.
9. Switching characteristics are independent of operating junction temperature.
10. For design aid only, not subject to production testing.

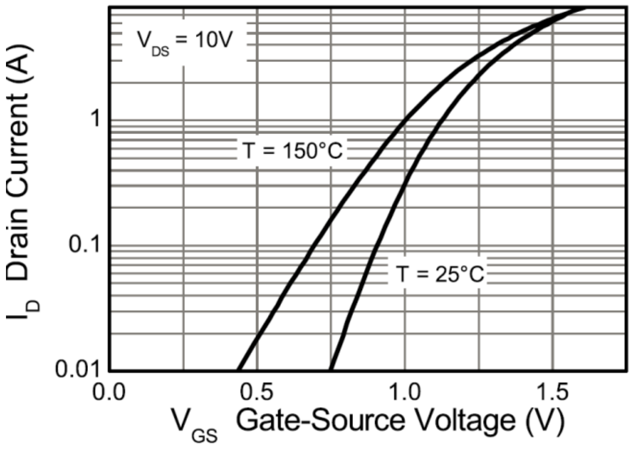
## Typical Characteristics



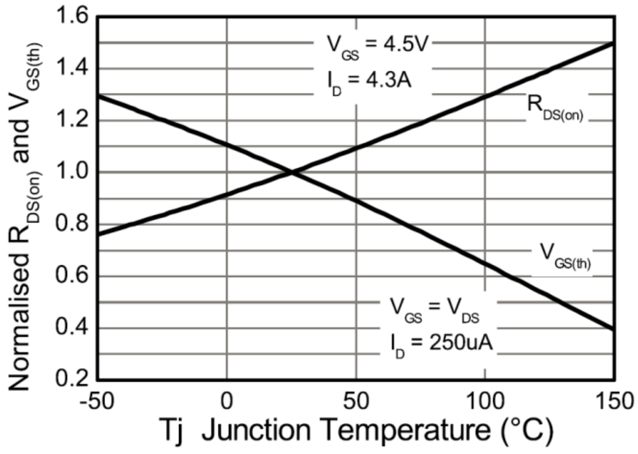
**Output Characteristics**



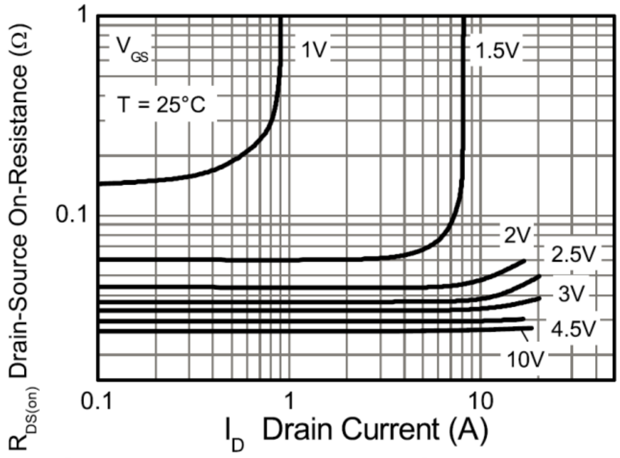
**Output Characteristics**



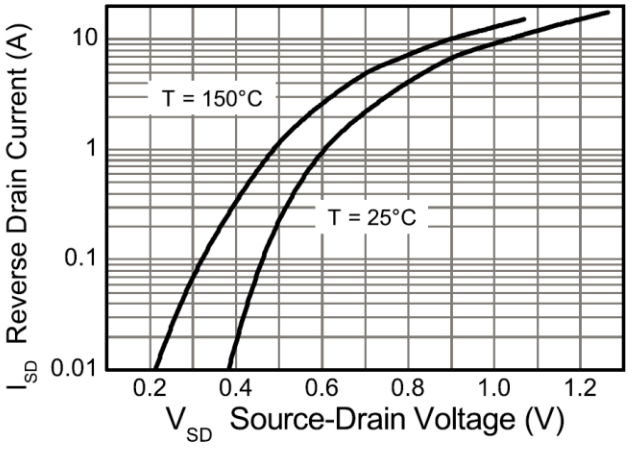
**Typical Transfer Characteristics**



**Normalised Curves v Temperature**

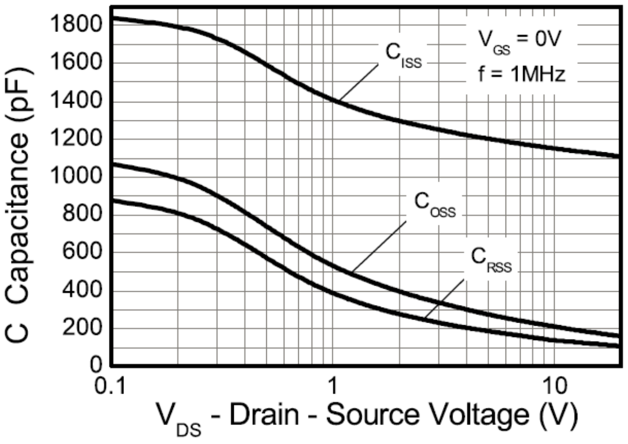


**On-Resistance v Drain Current**

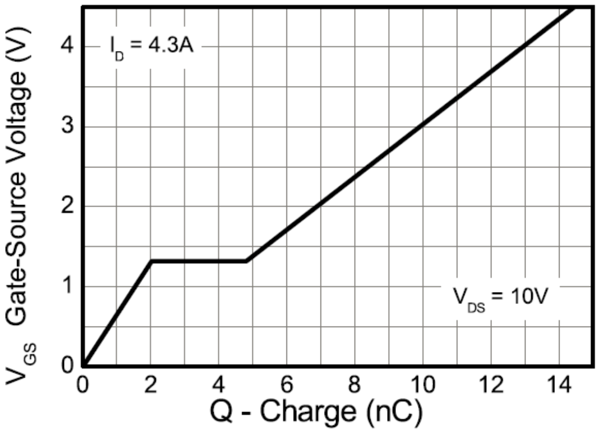


**Source-Drain Diode Forward Voltage**

## Typical Characteristics (Cont.)

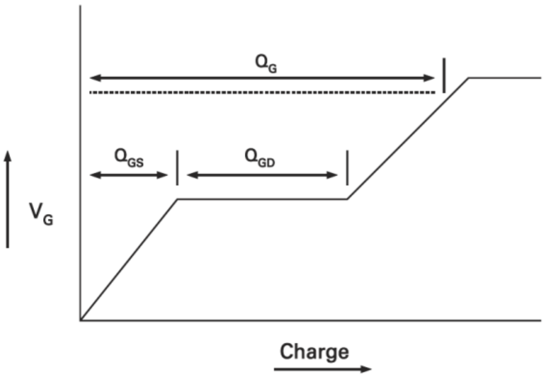


**Capacitance v Drain-Source Voltage**

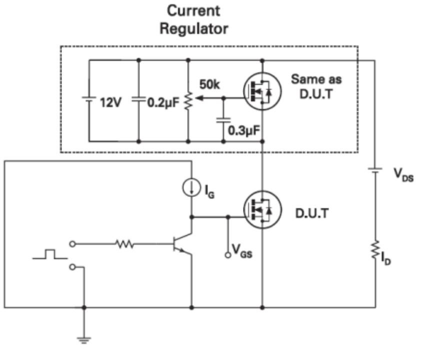


**Gate-Source Voltage v Gate Charge**

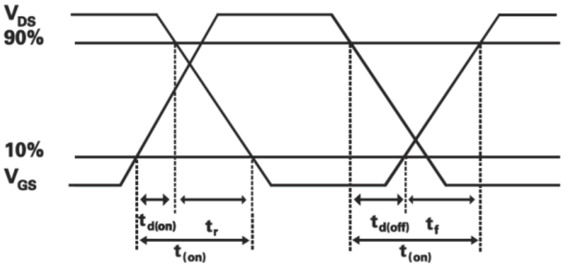
## Test Circuits



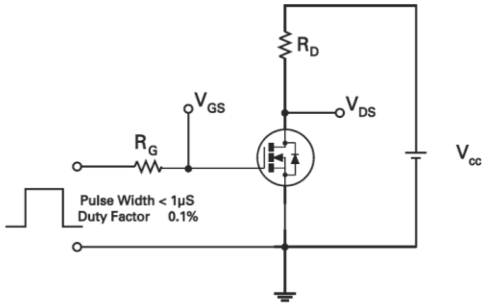
**Basic Gate Charge Waveform**



**Gate Charge Test Circuit**

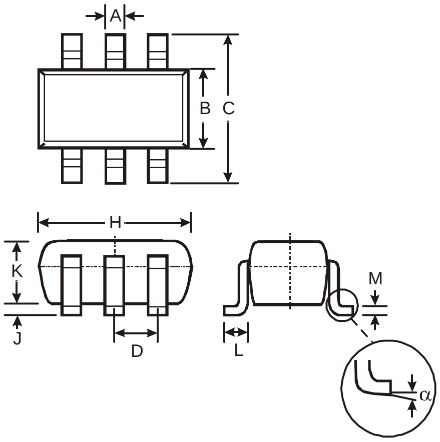


**Switching Time Waveforms**



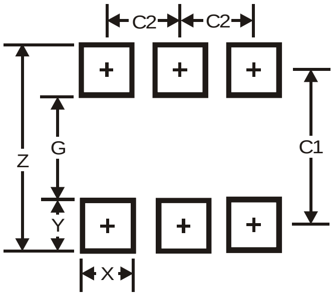
**Switching Time Test Circuit**

## Package Outline Dimensions



| SOT26 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.35 | 0.50 | 0.38 |
| **B** | 1.50 | 1.70 | 1.60 |
| **C** | 2.70 | 3.00 | 2.80 |
| **D** | — | — | 0.95 |
| **H** | 2.90 | 3.10 | 3.00 |
| **J** | 0.013 | 0.10 | 0.05 |
| **K** | 1.00 | 1.30 | 1.10 |
| **L** | 0.35 | 0.55 | 0.40 |
| **M** | 0.10 | 0.20 | 0.15 |
| **α** | 0° | 8° | — |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout



| Dimensions | Value (in mm) |
|---|---|
| **Z** | 3.20 |
| **G** | 1.60 |
| **X** | 0.55 |
| **Y** | 0.80 |
| **C1** | 2.40 |
| **C2** | 0.95 |