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

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max<br>$T_A$ = +25°C |
|---|---|---|
| -20V | 30mΩ @ $V_{GS}$ = -4.5V | -6.0A |
|  | 39mΩ @ $V_{GS}$ = -2.5V | -5.5A |

## Features and Benefits

- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- ESD Protected

## Description and Applications

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

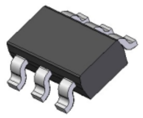
- DC-DC converters
- Motor controls
- Power-management functions
- Analog switches

## Mechanical Data

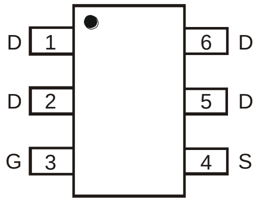
- Package: TSOT26
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Lead-Frame; Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.013 grams (Approximate)

ESD PROTECTED

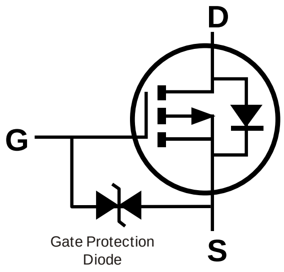
TSOT26



Top View



Top View
Pin-Out



Equivalent Circuit

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±8 | V |
| Continuous Drain Current (Note 5) $V_{GS}$ = -4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | -6.0<br>-5.0 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | -40 | A |
| Continuous Source-Drain Diode Current (Note 5) | | | $I_S$ | -2,2 | A |
| Avalanche Current (Note 6) L = 0.1mH | | | $I_{AS}$ | -21 | A |
| Avalanche Energy (Note 6) L = 0.1mH | | | $E_{AS}$ | 23 | mJ |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 7) | $T_A$ = +25°C | $P_D$ | 1.1 | W |
| | $T_A$ = +70°C | | 0.7 | |
| Thermal Resistance, Junction to Ambient (Note 7) | Steady State | $R_{\theta JA}$ | 108 | °C/W |
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 1.5 | W |
| | $T_A$ = +70°C | | 1.0 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 81 | °C/W |
| Thermal Resistance, Junction to Case (Note 5) | Steady State | $R_{\theta JC}$ | 16 | |
| 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 8)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | -20 | — | — | V | $V_{GS}$ = 0V, $I_D$ = -250µA |
| Zero Gate Voltage Drain Current $T_J$ = +25°C | $I_{DSS}$ | — | — | -1 | µA | $V_{DS}$ = -16V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | -0.4 | — | -1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 24 | 30 | mΩ | $V_{GS}$ = -4.5V, $I_D$ = -6.4A |
| | | | 31 | 39 | | $V_{GS}$ = -2.5V, $I_D$ = -4.8A |
| | | | 41 | 58 | | $V_{GS}$ = -1.8V, $I_D$ = -2.5A |
| Diode Forward Voltage | $V_{SD}$ | — | -0.7 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -1.0A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 1,808 | — | pF | $V_{DS}$ = -15V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 155 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 117 | — | | |
| Gate Resistance | $R_g$ | — | 32 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = -4.5V) | $Q_g$ | — | 20.5 | — | nC | $V_{DS}$ = -10V, $V_{GS}$ = -4.5V<br>$I_D$ = -4.0A |
| Gate-Source Charge | $Q_{gs}$ | — | 2.8 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 4.1 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 9.1 | — | ns | $V_{DS}$ = -10V, $V_{GS}$ = -4.5V<br>$R_g$ = 6Ω, $I_D$ = -1.0A |
| Turn-On Rise Time | $t_R$ | — | 12.3 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 120 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 54 | — | | |
| Reverse Recovery Time | $t_{RR}$ | — | 23.1 | — | ns | $I_F$ = -1.0A, dI/dt = 100A/µs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 8.3 | — | nC | $I_F$ = -1.0A, dI/dt = 100A/µs |

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.
6. $I_{AS}$ and $E_{AS}$ ratings are based on low frequency and duty cycles to keep $T_J$ = +25°C.
7. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing

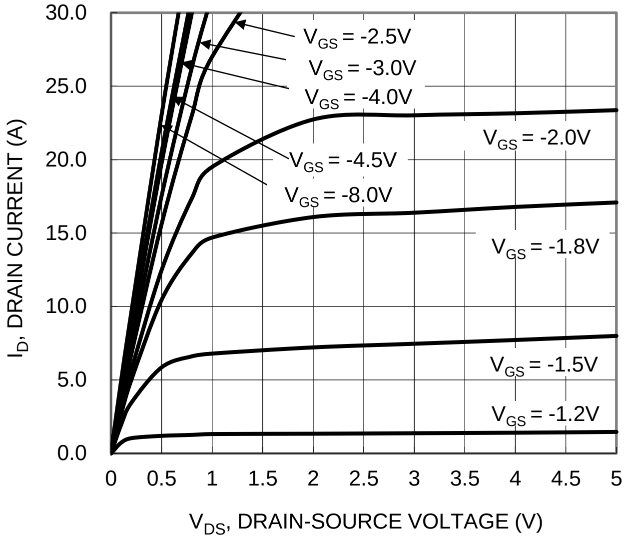


Figure 1. Typical Output Characteristic

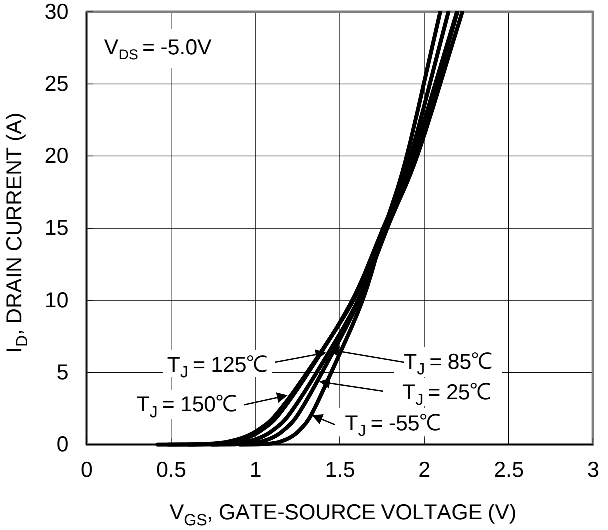


Figure 2. Typical Transfer Characteristic

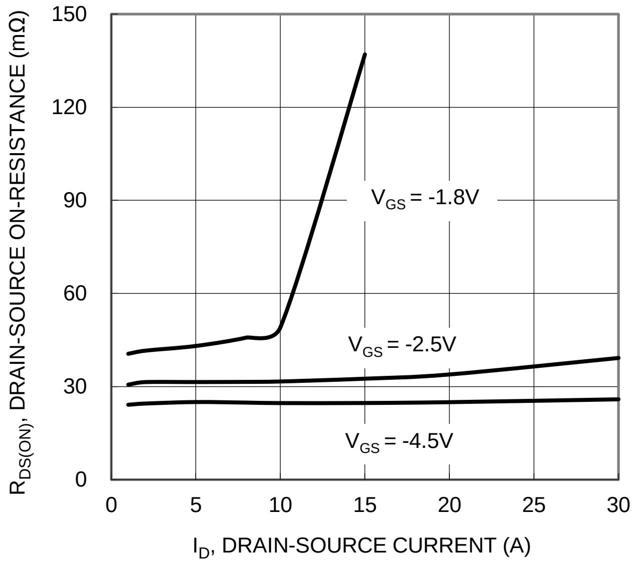


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

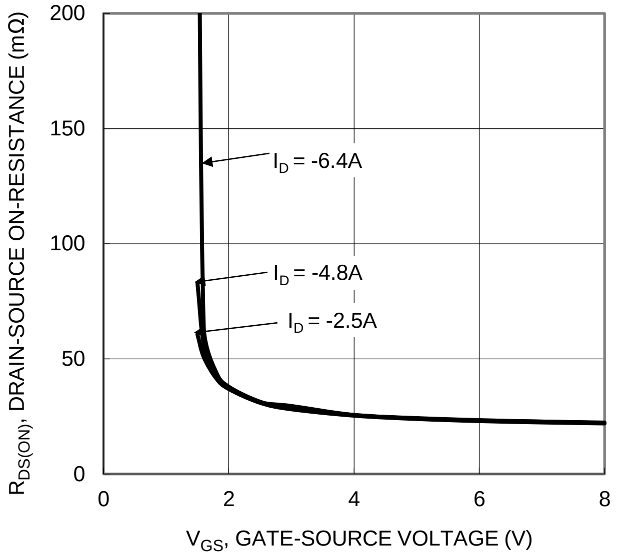


Figure 4. Typical Transfer Characteristic

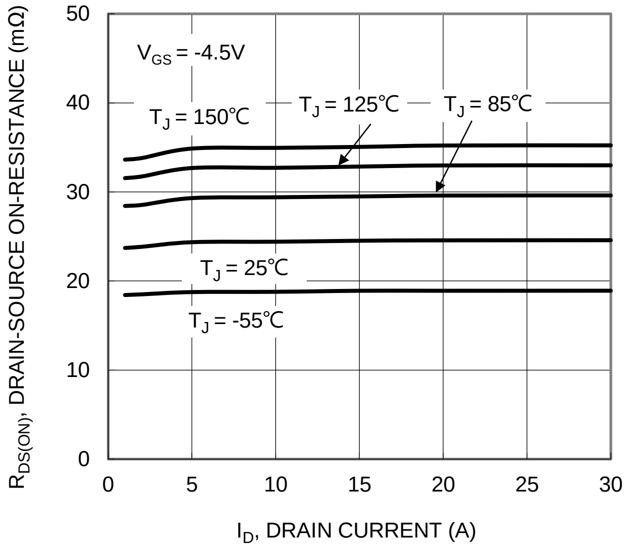


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

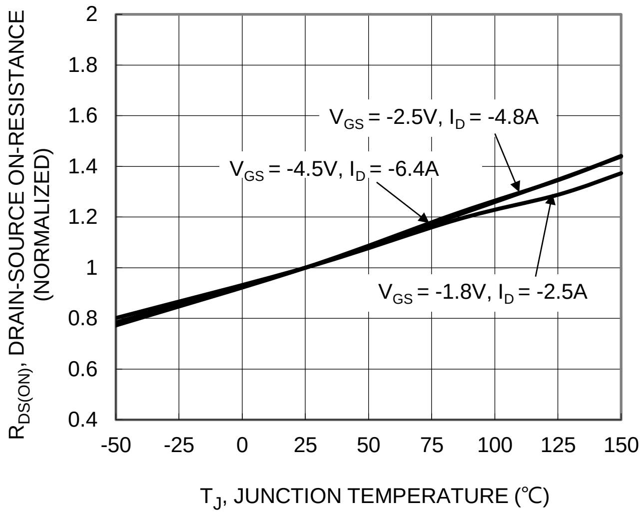


Figure 6. On-Resistance Variation with Temperature

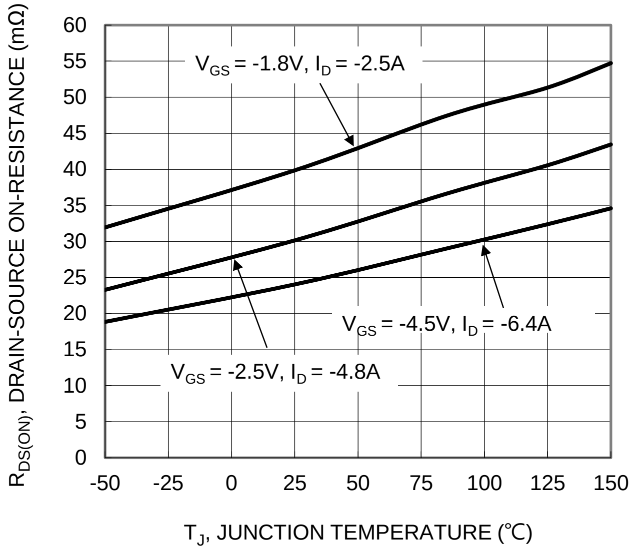


Figure 7. On-Resistance Variation with Temperature

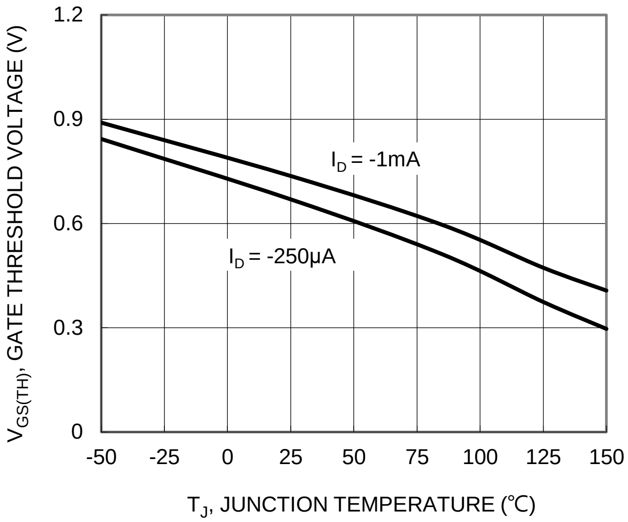


Figure 8. Gate Threshold Variation vs. Junction Temperature

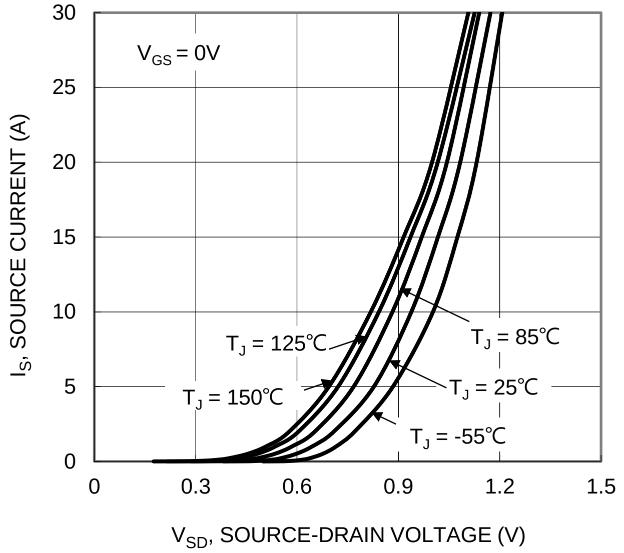


Figure 9. Diode Forward Voltage vs. Current

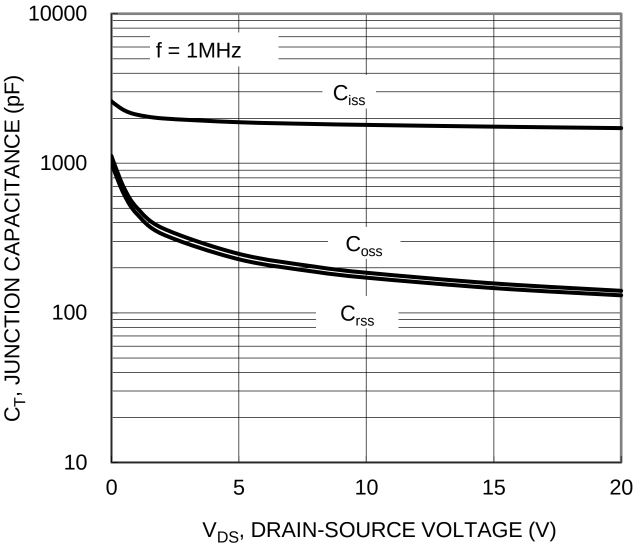


Figure 10. Typical Junction Capacitance

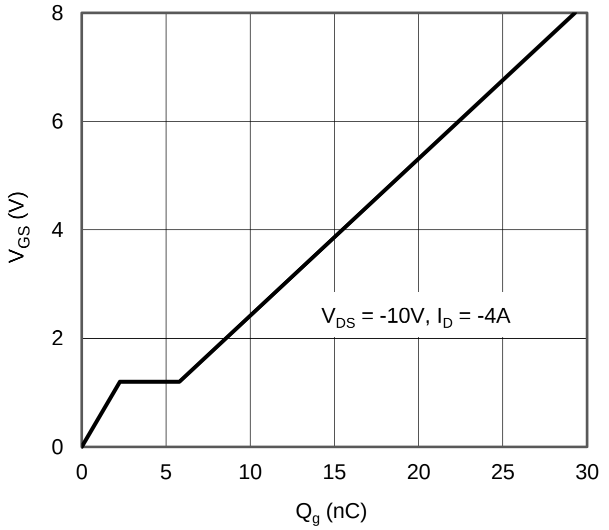


Figure 11. Gate Charge

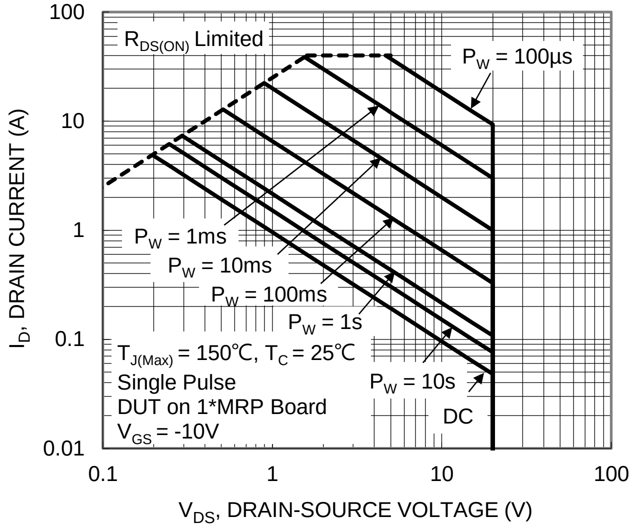


Figure 12. SOA, Safe Operation Area

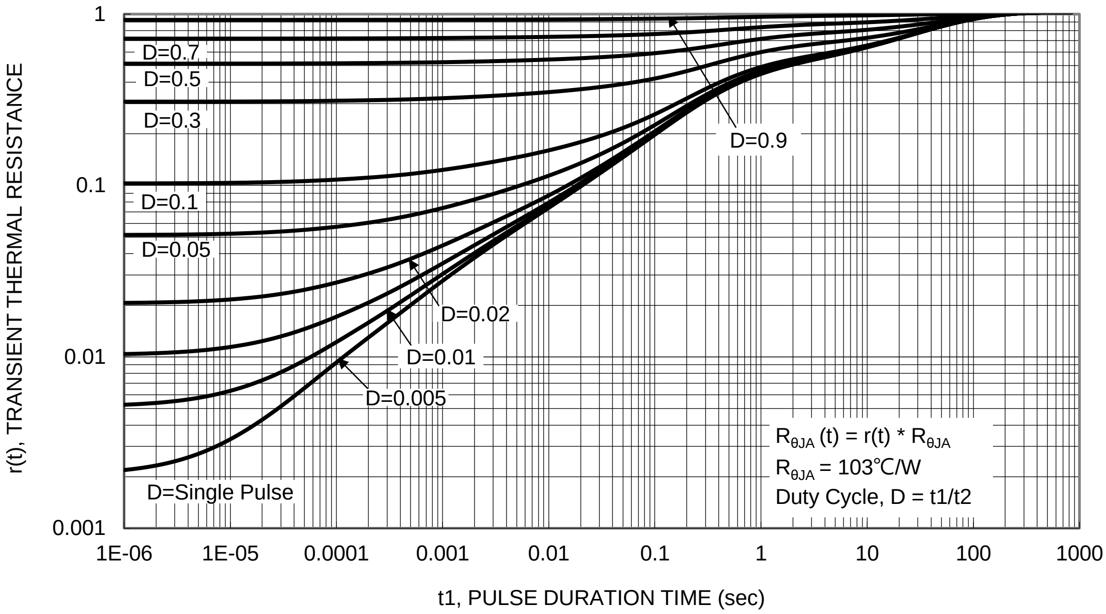
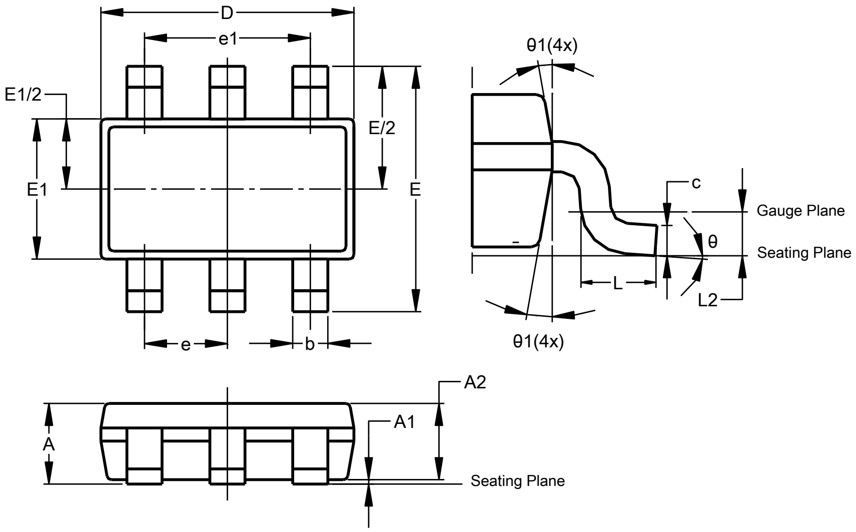


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

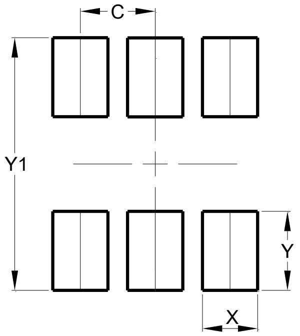
**TSOT26**



| TSOT26 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | – | 1.00 | – |
| **A1** | 0.010 | 0.100 | – |
| **A2** | 0.840 | 0.900 | – |
| **D** | 2.800 | 3.000 | 2.900 |
| **E** | 2.800 BSC | | |
| **E1** | 1.500 | 1.700 | 1.600 |
| **b** | 0.300 | 0.450 | – |
| **c** | 0.120 | 0.200 | – |
| **e** | 0.950 BSC | | |
| **e1** | 1.900 BSC | | |
| **L** | 0.30 | 0.50 | – |
| **L2** | 0.250 BSC | | |
| **θ** | 0° | 8° | 4° |
| **θ1** | 4° | 12° | – |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

**TSOT26**



| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.950 |
| **X** | 0.700 |
| **Y** | 1.000 |
| **Y1** | 3.200 |