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

| $BV_{DSS}$ | Max $R_{DS(ON)}$ | Max $I_D$ @ $T_A$ = +25°C |
|---|---|---|
| -30V | 1Ω @ $V_{GS}$ = -4.5V | -0.62A |
| | 1.5Ω @ $V_{GS}$ = -2.5V | -0.5A |
| | 2Ω @ $V_{GS}$ = -1.8V | -0.44A |

## Features and Benefits

- Low Gate Threshold Voltage
- Fast Switching Speed
- ESD Protected Gate

## 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.

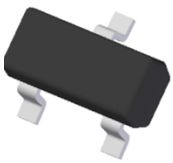
- Load switches in portable electronics

## Mechanical Data

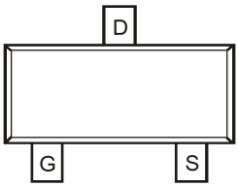
- Package: SOT23
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Terminals Connections: See Diagram Below
- Weight: 0.009 grams (Approximate)

**ESD Protected Gate**

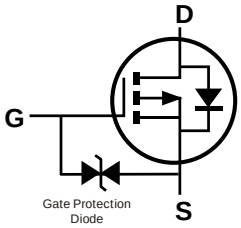
SOT23



Top View




Top View
Internal Schematic




Equivalent Circuit

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -30 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±8 | V |
| Continuous Drain Current | Steady State | $T_A$ = +25°C (Note 5)<br>$T_A$ = +70°C (Note 5) | $I_D$ | -0.62<br>-0.5 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | $I_S$ | -0.65 | A |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | -2 | A |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 6) | | $P_D$ | 0.46 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 274 | °C/W |
| Total Power Dissipation (Note 5) | | $P_D$ | 0.58 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 214 | °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 $T_J$ = +25°C | $I_{DSS}$ | — | — | -1 | μA | $V_{DS}$ = -30V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | μA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | -0.5 | — | -1.1 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 0.6 | 1 | Ω | $V_{GS}$ = -4.5V, $I_D$ = -400mA |
| | | | 0.8 | 1.5 | | $V_{GS}$ = -2.5V, $I_D$ = -200mA |
| | | | 0.9 | 2 | | $V_{GS}$ = -1.8V, $I_D$ = -100mA |
| Diode Forward Voltage | $V_{SD}$ | — | -0.8 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -300mA |
| **DYNAMIC CHARACTERISTICS** (Note 8) | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 54 | — | pF | $V_{DS}$ = -15V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 10.9 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 5.8 | — | pF | |
| Total Gate Charge | $Q_g$ | — | 1.0 | — | nC | $V_{GS}$ = -4.5V, $V_{DS}$ = -15V, $I_D$=-1A |
| Total Gate Charge | $Q_g$ | — | 1.6 | — | nC | $V_{GS}$ = -8V, $V_{DS}$ = -15V<br>$I_D$ = -1A |
| Gate-Source Charge | $Q_{gs}$ | — | 0.2 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 0.1 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 3.8 | — | ns | $V_{DD}$ = -10V, $R_L$ = 10Ω<br>$V_{GS}$ = -4.5V, $R_G$ = 6Ω |
| Turn-On Rise Time | $t_R$ | — | 11 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 45 | — | ns | |
| Turn-Off Fall Time | $t_F$ | — | 20 | — | ns | |

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

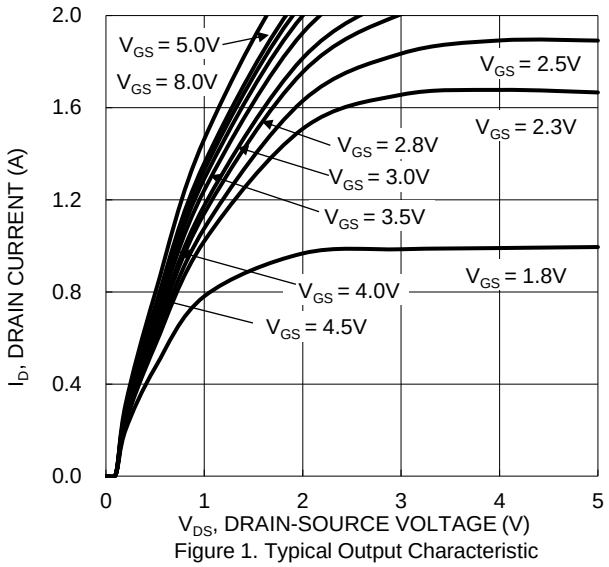


Figure 1. Typical Output Characteristic

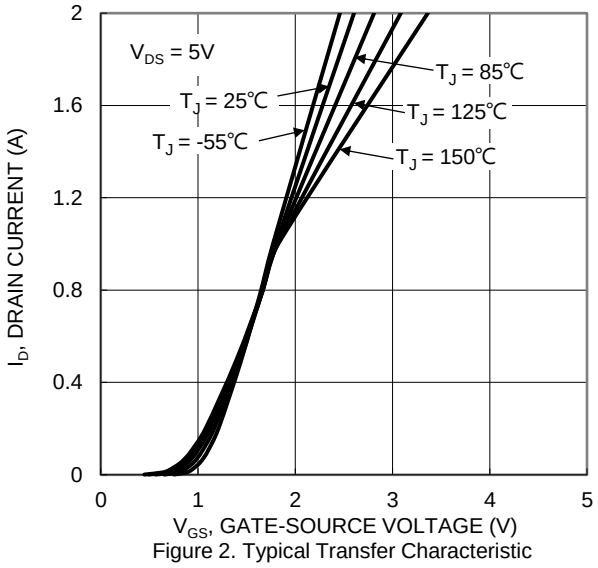


Figure 2. Typical Transfer Characteristic

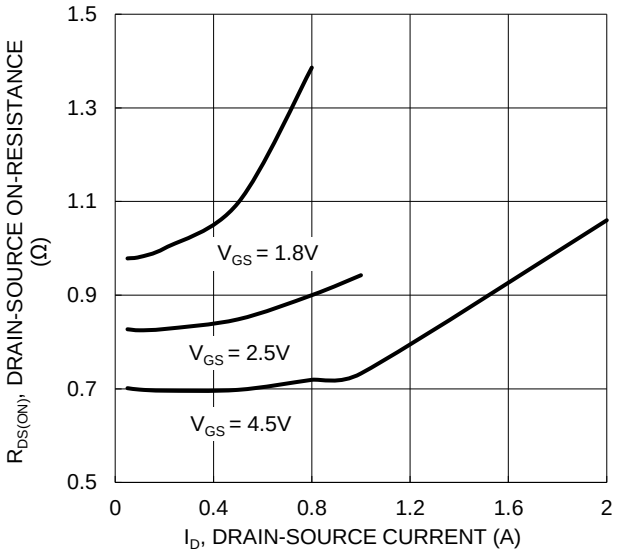


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

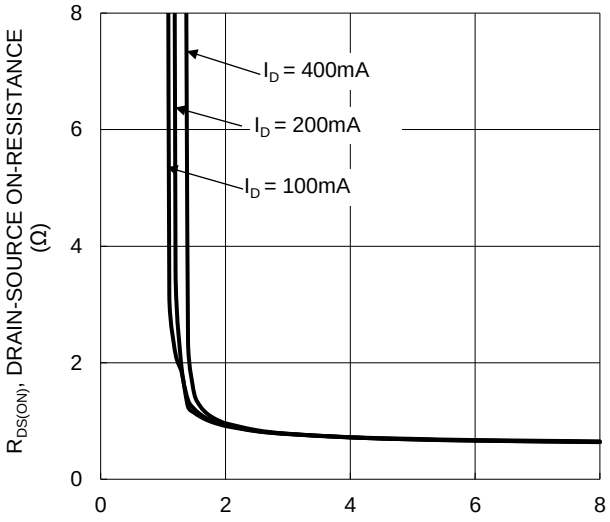


Figure 4. Typical Transfer Characteristic

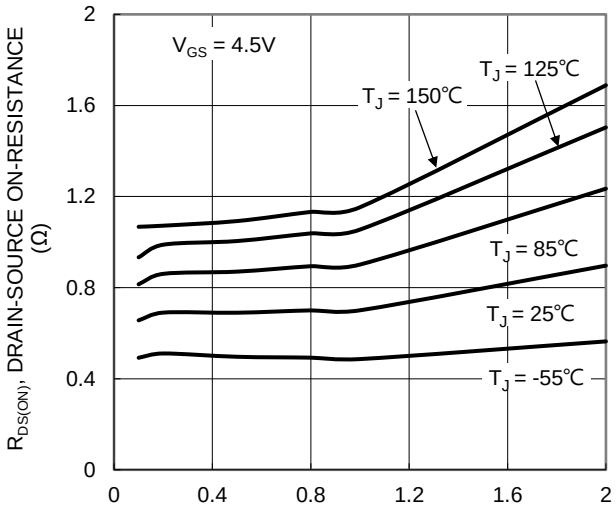


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

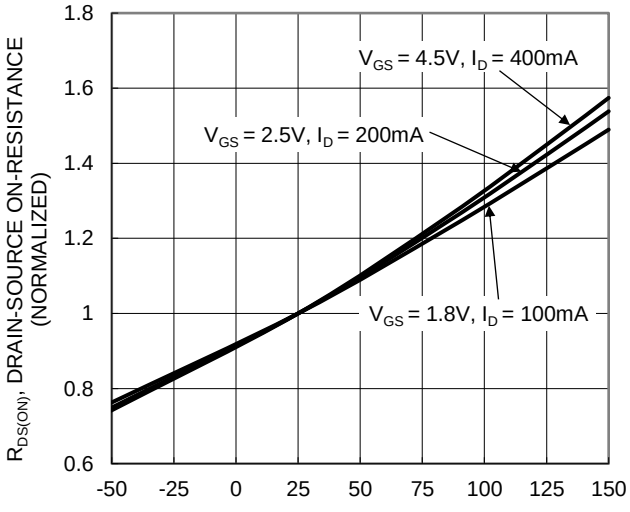


Figure 6. On-Resistance Variation with Junction Temperature

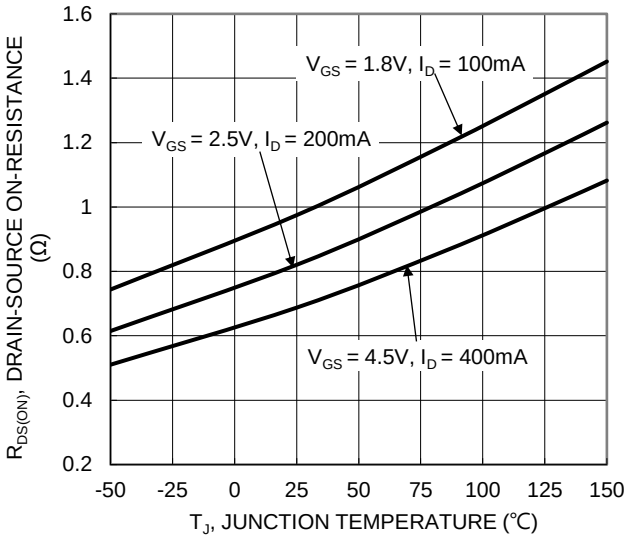


Figure 7. On-Resistance Variation with Junction Temperature

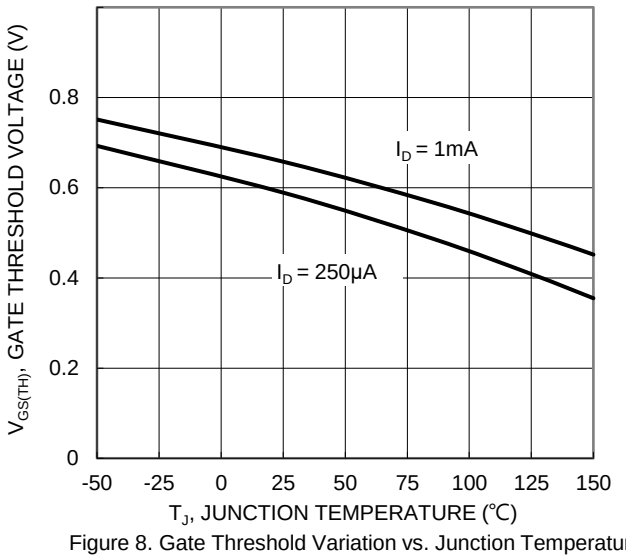


Figure 8. Gate Threshold Variation vs. Junction Temperature

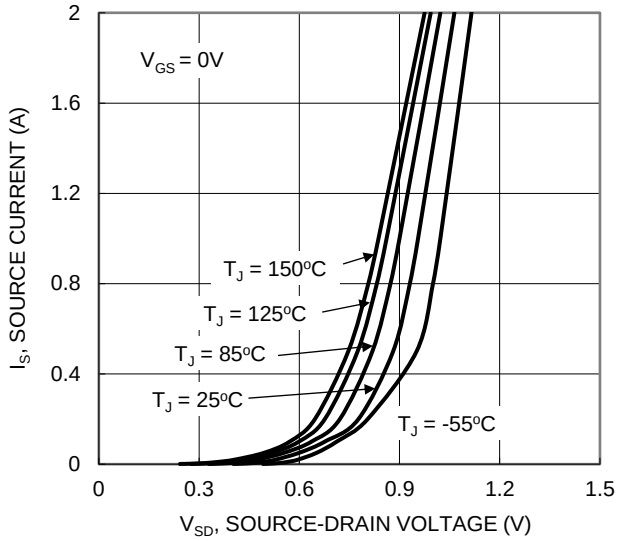


Figure 9. Diode Forward Voltage vs. Current

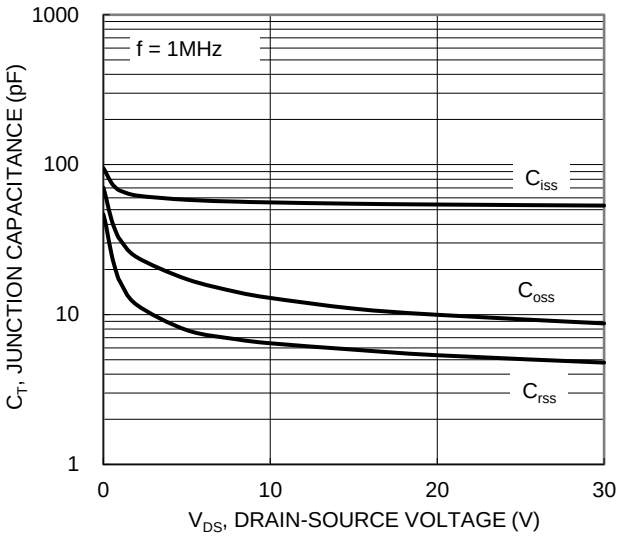


Figure 10. Typical Junction Capacitance

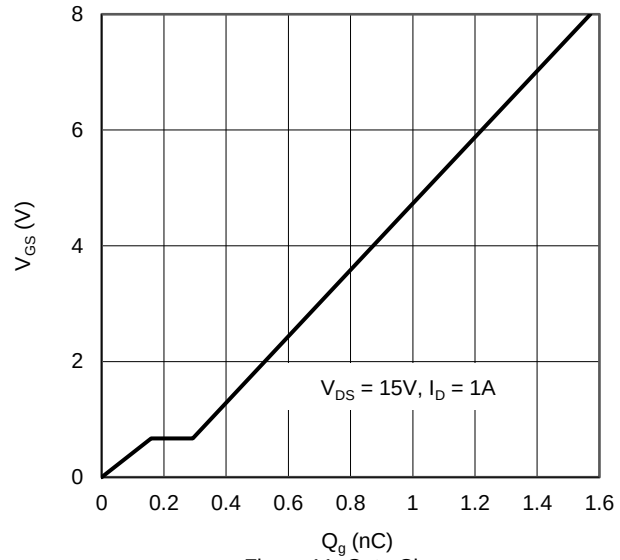


Figure 11. Gate Charge

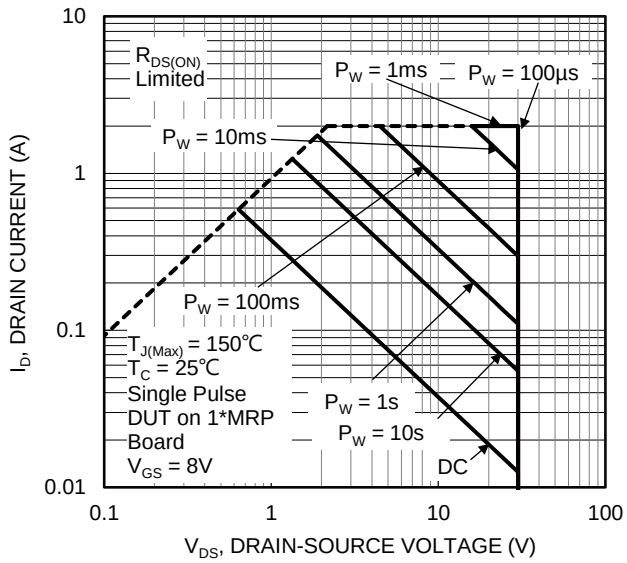


Figure 12. SOA, Safe Operation Area

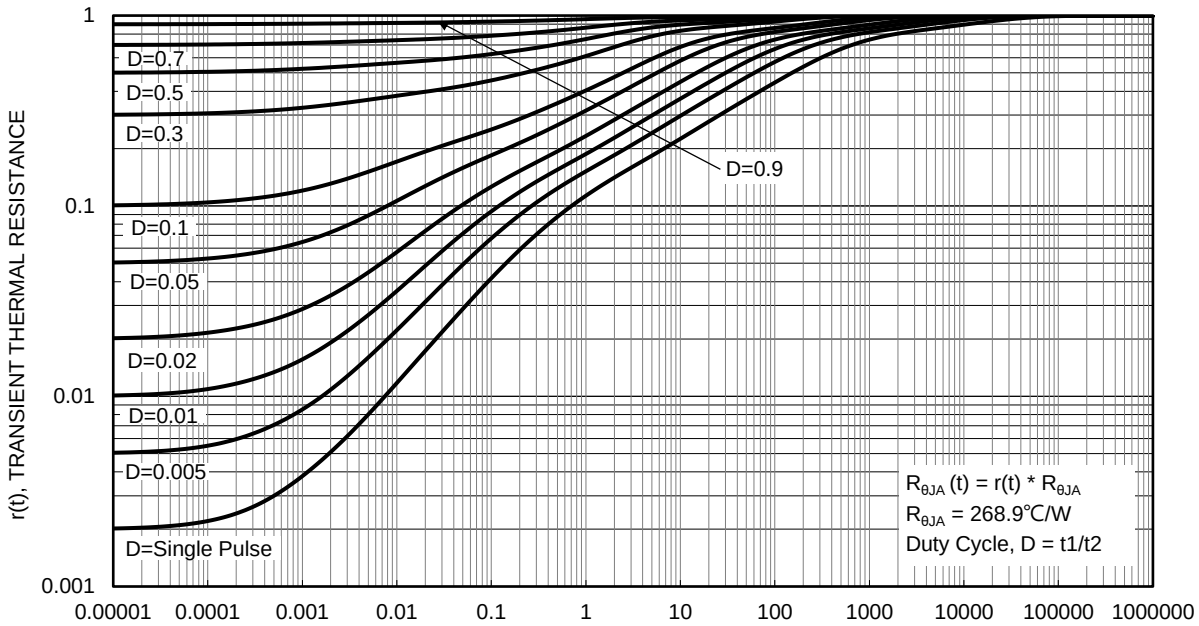
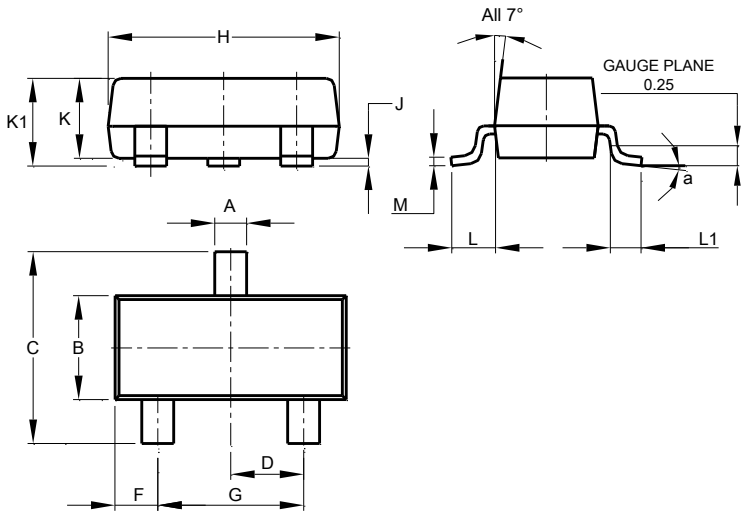



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

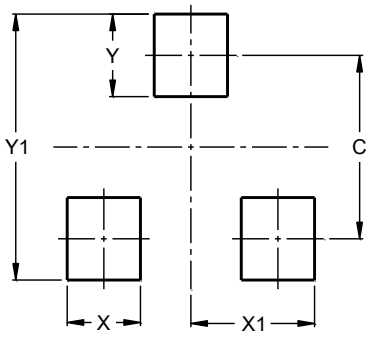
**SOT23**




| 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 |
| **a** | 0° | 8° | – |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

**SOT23**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 2.0 |
| **X** | 0.8 |
| **X1** | 1.35 |
| **Y** | 0.9 |
| **Y1** | 2.9 |