



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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企业微信二维码



企业QQ二维码

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max       | I <sub>D</sub> Max<br>T <sub>C</sub> = +25°C |
|-------------------|-------------------------------|--|
| 60V               | 8mΩ @ V <sub>GS</sub> = 10V   | 70A  |
|                   | 12mΩ @ V <sub>GS</sub> = 4.5V | 50A  |

## Features and Benefits

- Low R<sub>DS(ON)</sub> – ensures on state losses are minimized
- Excellent Q<sub>gd</sub> x R<sub>DS(ON)</sub> Product (FOM)
- Advanced Technology for DC/DC Converters
- Small form factor thermally efficient package enables higher density end products

## Description and Applications

This new generation MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

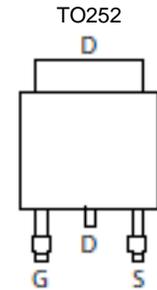
- Power Management Functions
- DC-DC Converters
- Backlighting

## Mechanical Data

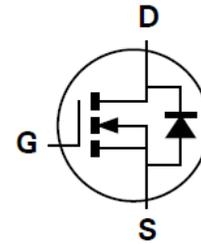
- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 Ⓔ
- Weight: 0.33 grams (Approximate)



Top View



Pin Out Top View



Equivalent Circuit

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

| Characteristic   | Symbol    | Value                      | Unit |
|--|-----------|----------------------------|------|
| Drain-Source Voltage   | $V_{DSS}$ | 60                         | V    |
| Gate-Source Voltage  | $V_{GSS}$ | $\pm 20$                   | V    |
| Continuous Drain Current (Note 5)                              | $I_D$     | $T_A = +25^\circ\text{C}$  | 14.8 |
|  |           | $T_A = +70^\circ\text{C}$  | 11.9 |
| Continuous Drain Current (Note 6)                              | $I_D$     | $T_C = +25^\circ\text{C}$  | 70   |
|  |           | $T_C = +100^\circ\text{C}$ | 50   |
| Maximum Continuous Body Diode Forward Current (Note 6)         | $I_S$     | 60                         | A    |
| Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%) | $I_{DM}$  | 130                        | A    |
| Avalanche Current, L=0.1mH                                     | $I_{AS}$  | 20                         | A    |
| Avalanche Energy, L=0.1mH                                      | $E_{AS}$  | 20                         | mJ   |

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

| Characteristic                                   | Symbol          | Value       | Unit               |
|--|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5)                 | $P_D$           | 3.1         | W                  |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 47          | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6)                 | $P_D$           | 60          | W                  |
| Thermal Resistance, Junction to Case (Note 6)    | $R_{\theta JC}$ | 2.5         | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +175 | $^\circ\text{C}$   |

**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          | $BV_{DSS}$   | 60  | —    | —         | V             | $V_{GS} = 0V, I_D = 1mA$                               |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | —   | —    | 1         | $\mu\text{A}$ | $V_{DS} = 48V, V_{GS} = 0V$                            |
| Gate-Source Leakage                     | $I_{GSS}$    | —   | —    | $\pm 100$ | nA            | $V_{GS} = \pm 20V, V_{DS} = 0V$                        |
| <b>ON CHARACTERISTICS (Note 7)</b>      |              |     |      |           |               |  |
| Gate Threshold Voltage                  | $V_{GS(TH)}$ | 1   | —    | 3         | V             | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                |
| Static Drain-Source On-Resistance       | $R_{DS(ON)}$ | —   | 5.3  | 8         | m $\Omega$    | $V_{GS} = 10V, I_D = 20A$                              |
|   |              | —   | 8.3  | 12        |               | $V_{GS} = 4.5V, I_D = 20A$                             |
| Diode Forward Voltage                   | $V_{SD}$     | —   | 0.9  | 1.2       | V             | $V_{GS} = 0V, I_S = 20A$                               |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b> |              |     |      |           |               |  |
| Input Capacitance                       | $C_{iss}$    | —   | 2090 | —         | pF            | $V_{DS} = 30V, V_{GS} = 0V, f = 1MHz$                  |
| Output Capacitance                      | $C_{oss}$    | —   | 746  | —         |               |  |
| Reverse Transfer Capacitance            | $C_{rss}$    | —   | 38.5 | —         |               |  |
| Gate Resistance                         | $R_g$        | —   | 0.59 | —         | $\Omega$      | $V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$                   |
| Total Gate Charge ( $V_{GS} = 4.5V$ )   | $Q_g$        | —   | 19.3 | —         | nC            | $V_{DS} = 30V, I_D = 20A$                              |
| Total Gate Charge ( $V_{GS} = 10V$ )    | $Q_g$        | —   | 41.3 | —         |               |  |
| Gate-Source Charge                      | $Q_{gs}$     | —   | 6    | —         |               |  |
| Gate-Drain Charge                       | $Q_{gd}$     | —   | 8.8  | —         |               |  |
| Turn-On Delay Time                      | $t_{D(ON)}$  | —   | 5.7  | —         | ns            | $V_{DD} = 30V, V_{GS} = 10V, I_D = 20A, R_G = 3\Omega$ |
| Turn-On Rise Time                       | $t_R$        | —   | 4.3  | —         |               |  |
| Turn-Off Delay Time                     | $t_{D(OFF)}$ | —   | 23.4 | —         |               |  |
| Turn-Off Fall Time                      | $t_F$        | —   | 9.7  | —         |               |  |
| Body Diode Reverse Recovery Time        | $t_{RR}$     | —   | 35.4 | —         | ns            | $I_F = 20A, di/dt = 100A/\mu\text{s}$                  |
| Body Diode Reverse Recovery Charge      | $Q_{RR}$     | —   | 38.2 | —         | nC            |  |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - Device mounted on infinite heat sink and measured by thermal couple attached on bottom heat sink of package.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

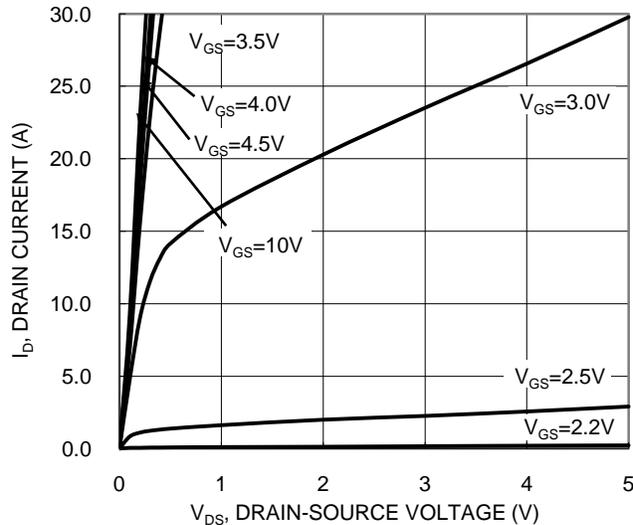


Figure 1. Typical Output Characteristic

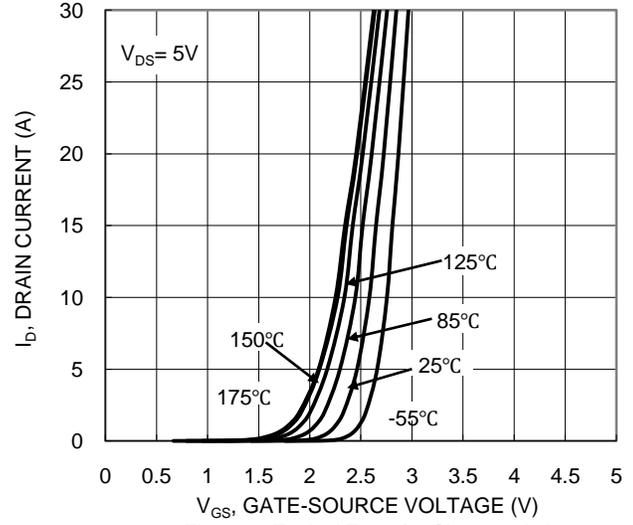


Figure 2. Typical Transfer Characteristic

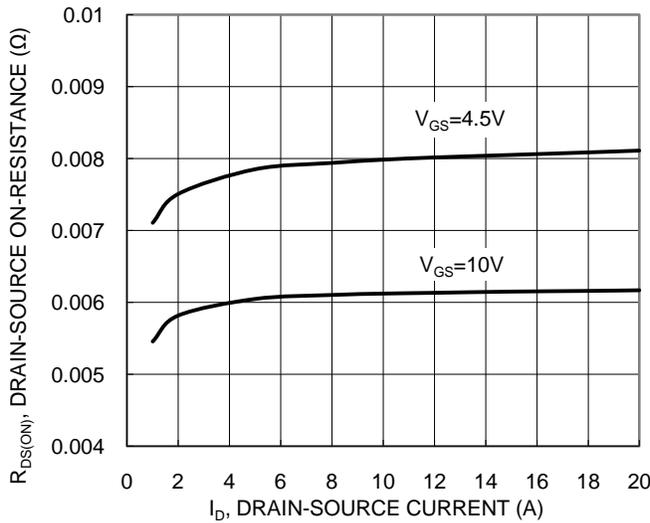


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

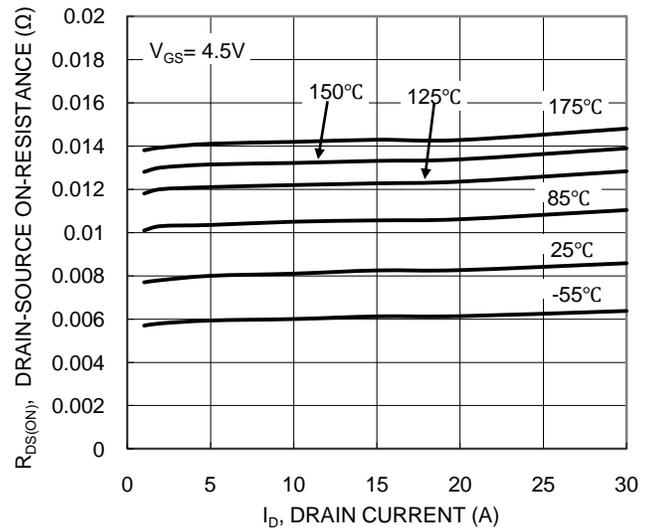


Figure 4. Typical On-Resistance vs. Drain Current and Temperature

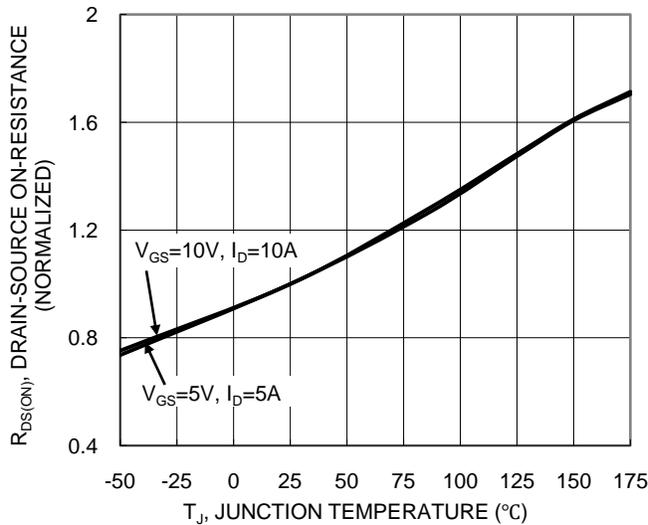


Figure 5. On-Resistance Variation with Temperature

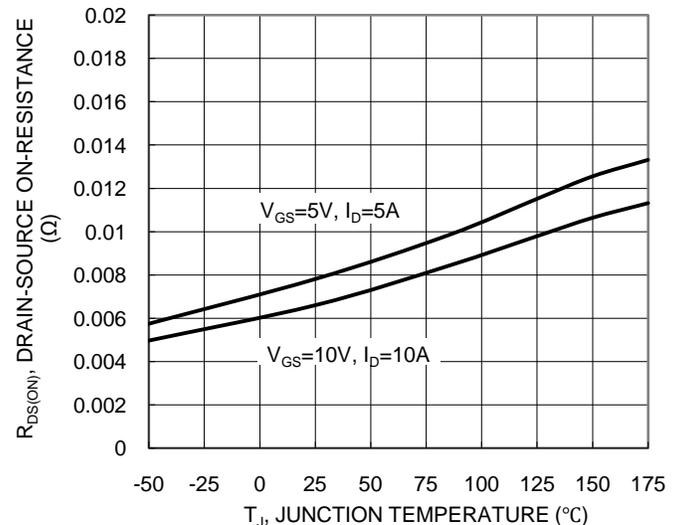


Figure 6. On-Resistance Variation with Temperature

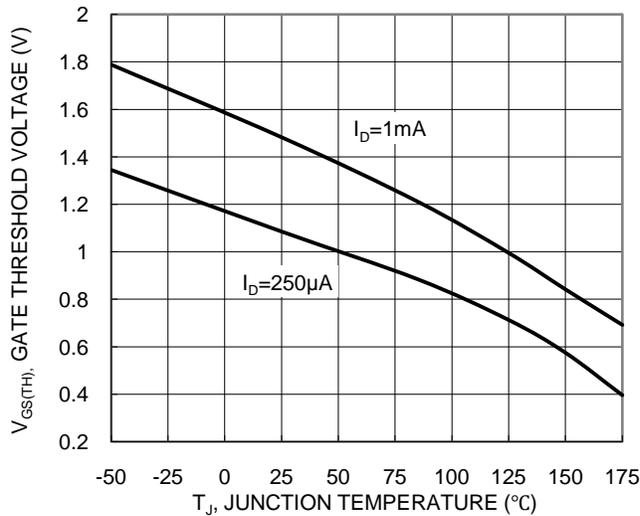


Figure 7. Gate Threshold Variation vs. junction Temperature

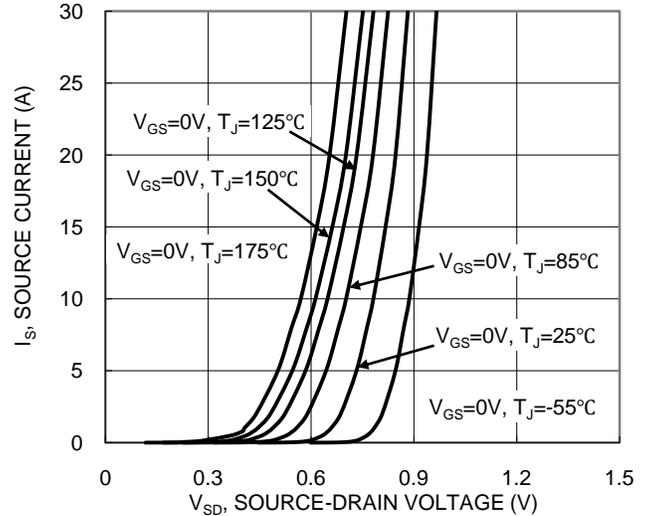


Figure 8. Diode Forward Voltage vs. Current

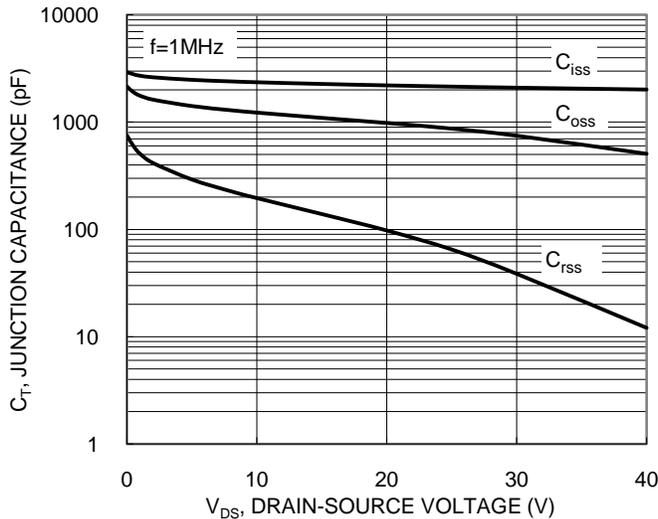


Figure 9. Typical Junction Capacitance

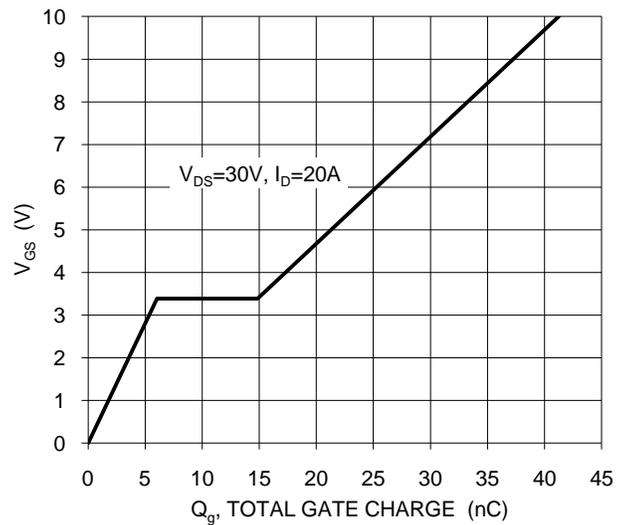


Figure 10. Gate Charge

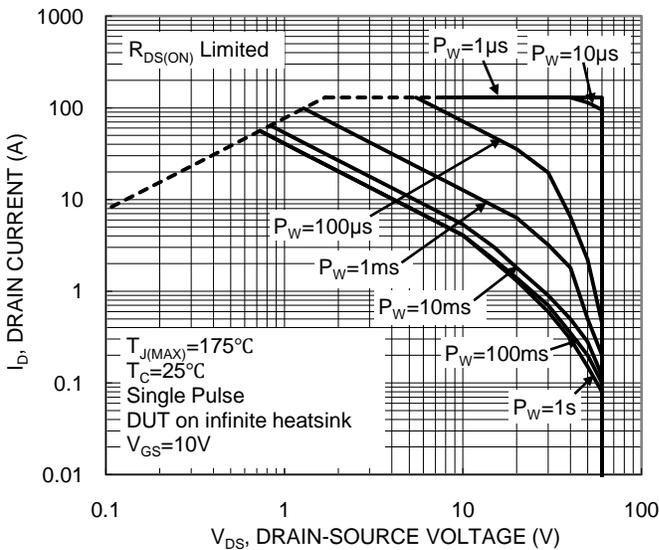


Figure 11. SOA, Safe Operation Area

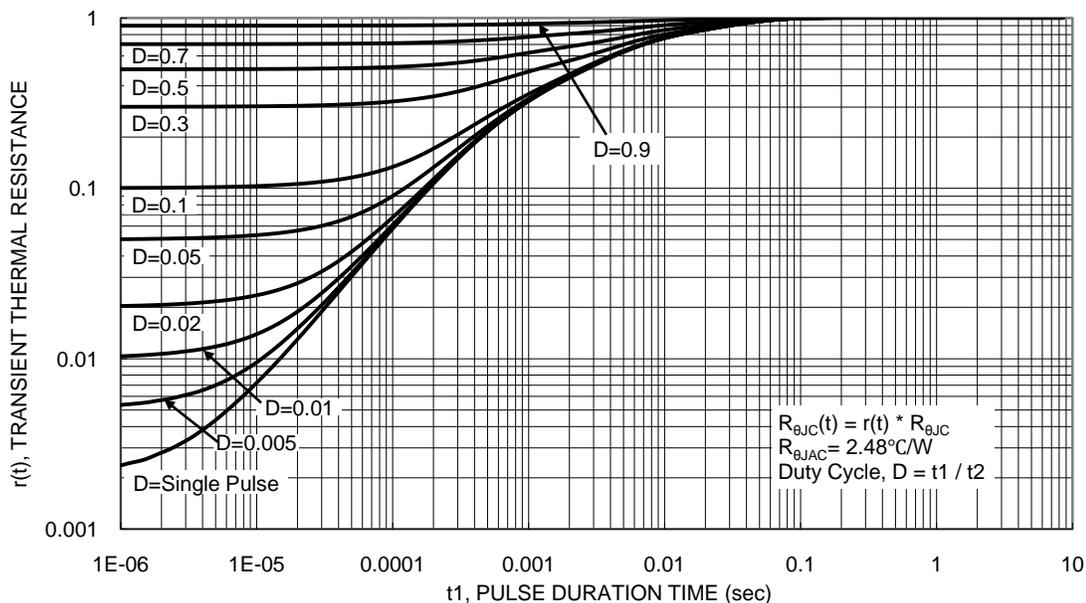
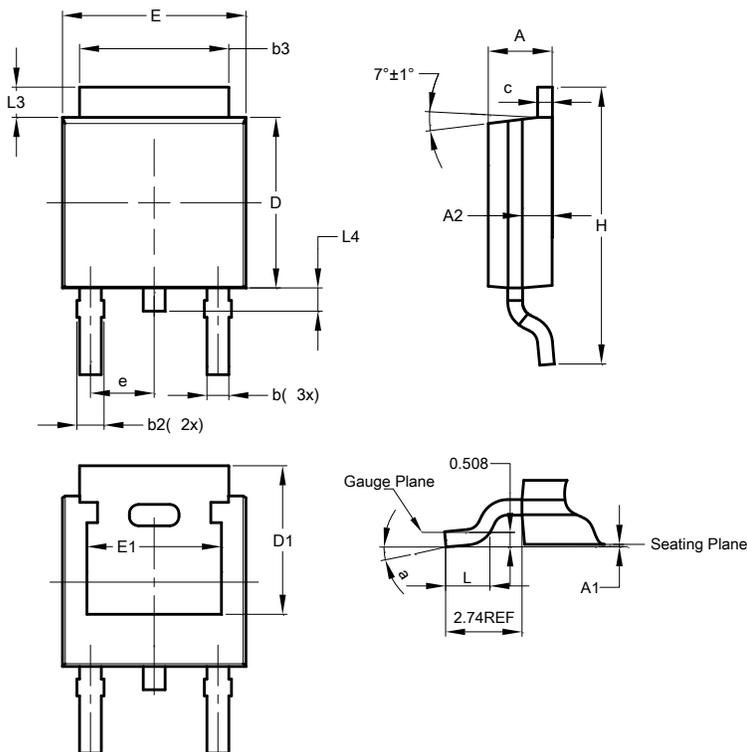


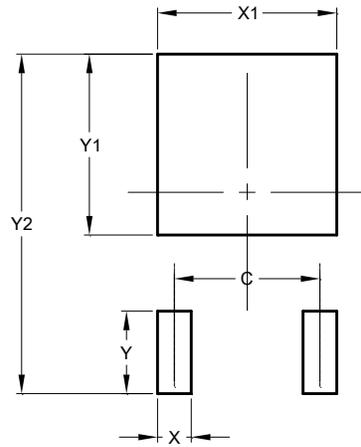
Figure 12. Transient Thermal Resistance

**Package Outline Dimensions**



| TO252 (DPAK)         |      |       |       |
|----------------------|------|-------|-------|
| Dim                  | Min  | Max   | Typ   |
| A                    | 2.19 | 2.39  | 2.29  |
| A1                   | 0.00 | 0.13  | 0.08  |
| A2                   | 0.97 | 1.17  | 1.07  |
| b                    | 0.64 | 0.88  | 0.783 |
| b2                   | 0.76 | 1.14  | 0.95  |
| b3                   | 5.21 | 5.46  | 5.33  |
| c                    | 0.45 | 0.58  | 0.531 |
| D                    | 6.00 | 6.20  | 6.10  |
| D1                   | 5.21 | -     | -     |
| e                    | -    | -     | 2.286 |
| E                    | 6.45 | 6.70  | 6.58  |
| E1                   | 4.32 | -     | -     |
| H                    | 9.40 | 10.41 | 9.91  |
| L                    | 1.40 | 1.78  | 1.59  |
| L3                   | 0.88 | 1.27  | 1.08  |
| L4                   | 0.64 | 1.02  | 0.83  |
| a                    | 0°   | 10°   | -     |
| All Dimensions in mm |      |       |       |

**Suggested Pad Layout**



| Dimensions | Value (in mm) |
|------------|---------------|
| <b>C</b>   | 4.572         |
| <b>X</b>   | 1.060         |
| <b>X1</b>  | 5.632         |
| <b>Y</b>   | 2.600         |
| <b>Y1</b>  | 5.700         |
| <b>Y2</b>  | 10.700        |