# -20V P-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)\ max}$ | $I_D$ $T_A = 25°C$ |
|---|---|---|
| -20V | 35mΩ @ $V_{GS}$ = -4.5V | -6.0A |
| | 45mΩ @ $V_{GS}$ = -2.5V | -5.2A |

## Features and Benefits

- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- ESD protected Up To 3KV
- **Lead, Halogen, and Antimony Free, RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## 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.

- DC-DC Converters
- Motor Control
- Power management functions
- Analog Switch

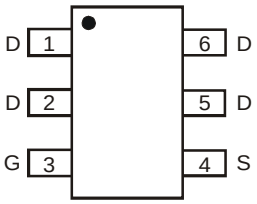
## Mechanical Data

- Case: TSOT26
- Case 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 – MatteTin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.0013 grams (approximate)

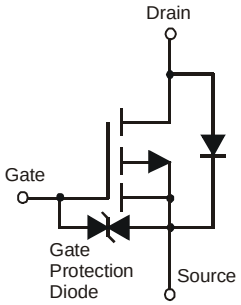
ESD PROTECTED TO 3kV

TSOT26

Top View




Top View
Pin-Out



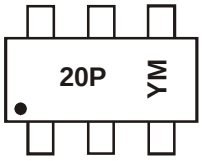

Equivalent Circuit

## Ordering Information (Note 3)

| Part Number | Case | Packaging |
|---|---|---|
| DMP2035UVT-7 | TSOT26 | 3,000/Tape & Reel |
| DMP2035UVT-13 | TSOT26 | 10,000/Tape & Reel |

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free.
2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com.
3. For packaging details, go to our website at http://www.diodes.com.

## Marking Information




20P = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Code | Y | Z | A | B | C | D | E |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

## Maximum Ratings @$T_A$ = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±12 | 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>-4.8 | A |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | -7.2<br>-5.7 | A |
| Continuous Drain Current (Note 5) $V_{GS}$ = -2.5V | Steady State | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | -5.2<br>-4.1 | A |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | -6.2<br>-4.9 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | $I_S$ | -2.0 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | $I_{DM}$ | -24 | A |

## Thermal Characteristics @$T_A$ = 25°C unless otherwise specified

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 4) | | $P_D$ | 1.2 | W |
| Thermal Resistance, Junction to Ambient (Note 4) | Steady State | $R_{\theta JA}$ | 106 | °C/W |
| | t<10s | | 74 | |
| Total Power Dissipation (Note 5) | | $P_D$ | 2.0 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 65 | °C/W |
| | t<10s | | 46 | |
| Thermal Resistance, Junction to Case (Note 5) | Steady State | $R_{\theta JC}$ | 11.8 | |
| 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 6)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | -20 | — | — | V | $V_{GS}$ = 0V, $I_D$ = -250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | -1 | µA | $V_{DS}$ = -20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 6)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -0.4 | -0.7 | -1.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Gate Threshold Voltage Temperature Coefficient | $\triangle V_{GS(th)}/\triangle T_J$ | — | 2.5 | — | mV/°C | $I_D$ = -250µA , Referenced to 25°C |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | — | 23 | 35 | mΩ | $V_{GS}$ = -4.5V, $I_D$ = -4.0A |
| | | — | 30 | 45 | | $V_{GS}$ = -2.5V, $I_D$ = -4.0A |
| | | — | 41 | 62 | | $V_{GS}$ = -1.8V, $I_D$ = -2.0A |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | — | 18 | — | S | $V_{DS}$ = -5V, $I_D$ = -5.5A |
| Diode Forward Voltage (Note 5) | $V_{SD}$ | — | -0.7 | -1.0 | V | $V_{GS}$ = 0V, $I_S$ = -1A |
| **DYNAMIC CHARACTERISTICS (Note 7)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 1610 | 2400 | pF | $V_{DS}$ = -10V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 157 | 210 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 145 | 200 | | |
| Gate Resistance | $R_G$ | — | 9.4 | 14.1 | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge | $Q_g$ | — | 15.4 | 23.1 | nC | $V_{DS}$ = -10V, $V_{GS}$ = -4.5V<br>$I_D$ = -4A |
| Gate-Source Charge | $Q_{gs}$ | — | 2.5 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 3.3 | — | | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 17 | 33 | ns | $V_{GS}$ = -4.5V, $V_{DS}$ = -10V, $R_G$ = 6Ω,<br>$I_D$ = -1A, $R_L$ = 10Ω |
| Turn-On Rise Time | $t_r$ | — | 12 | 19 | | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 94 | 150 | | |
| Turn-Off Fall Time | $t_f$ | — | 42 | 64 | | |
| Reverse Recovery Time | $t_{rr}$ | — | 14 | 25 | ns | $I_F$ =-4.5A, di/dt=100A/µS |
| Reverse Recovery Charge | $Q_{rr}$ | — | 4 | 8 | nC | |

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

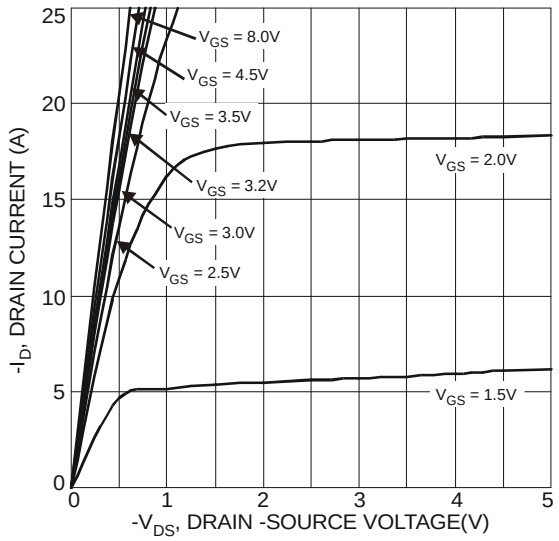



Fig. 1 Typical Output Characteristics

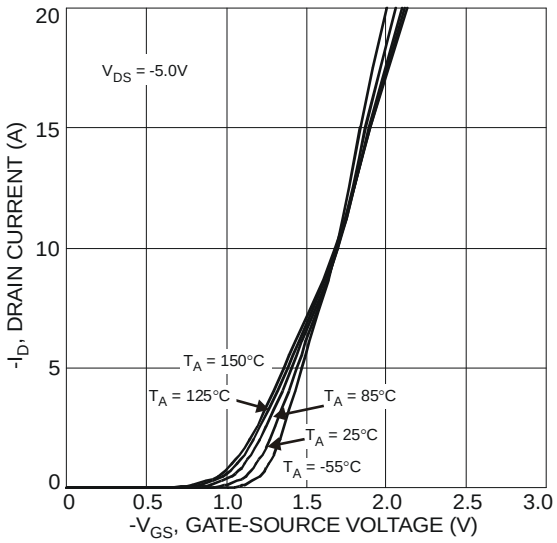



Fig. 2 Typical Transfer Characteristics

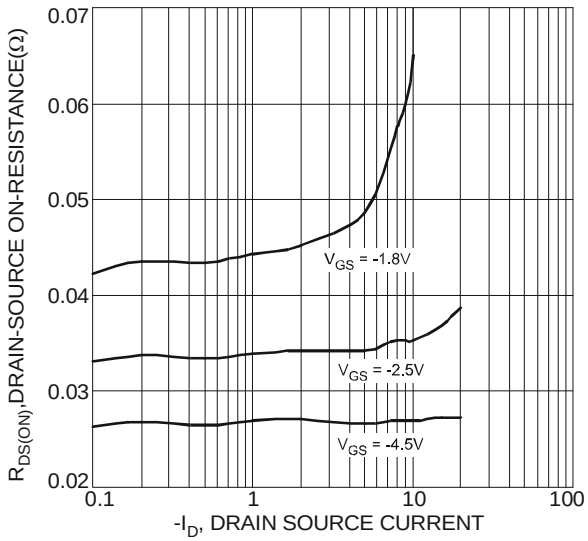



Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

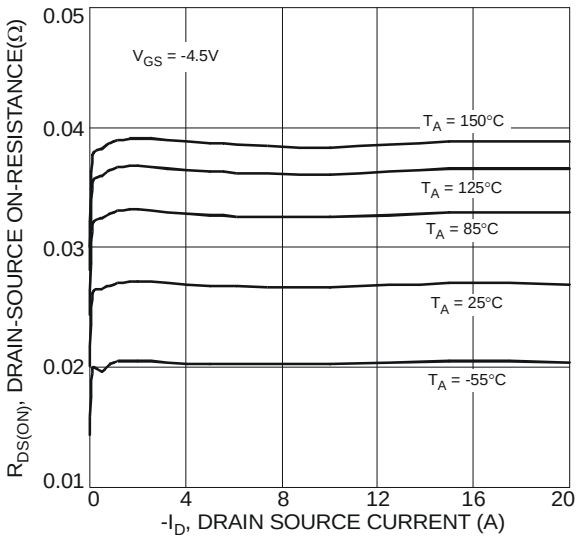



Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

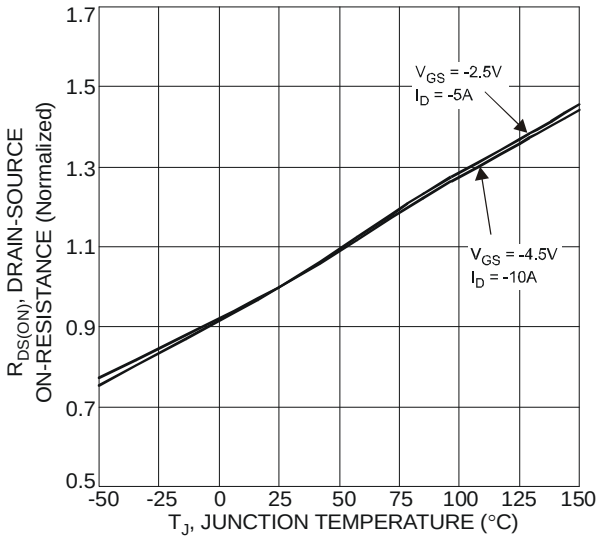



Fig. 5 On-Resistance Variation with Temperature

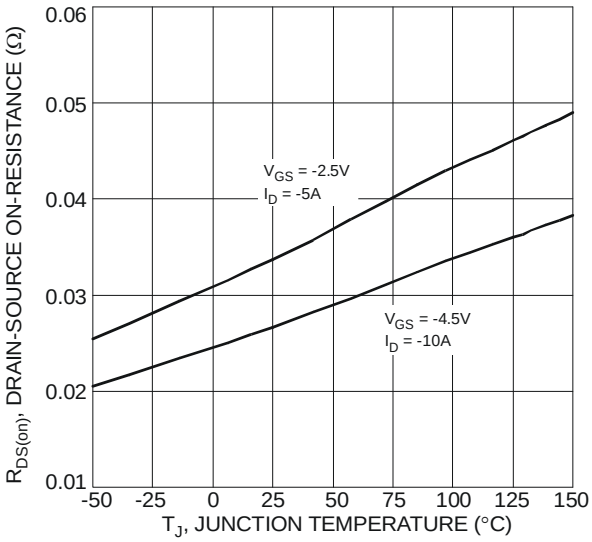



Fig. 6 On-Resistance Variation with Temperature

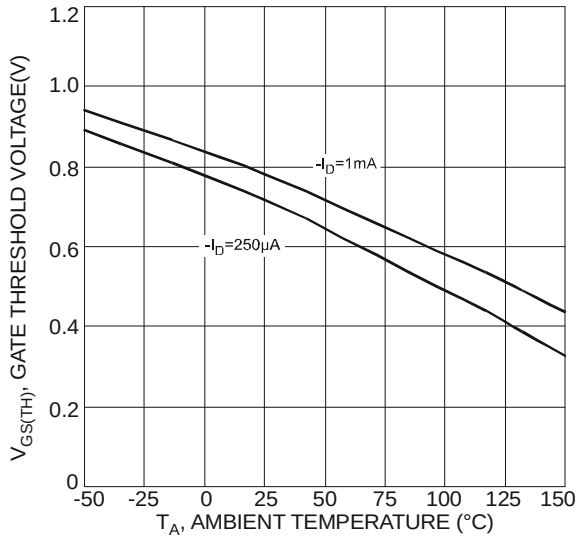



Fig. 7 Gate Threshold Variation vs. Ambient Temperature

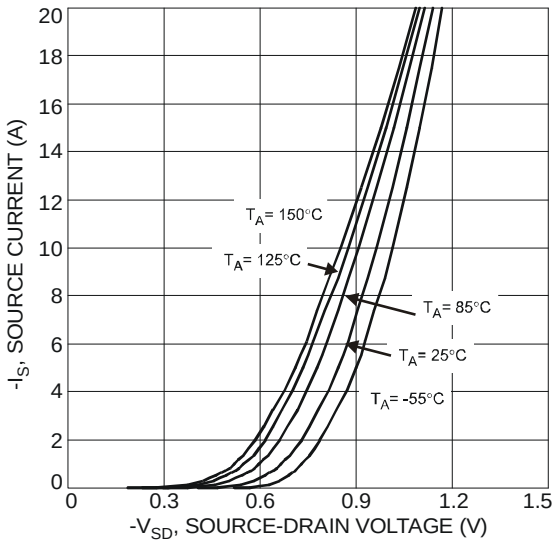



Fig. 8 Diode Forward Voltage vs. Current

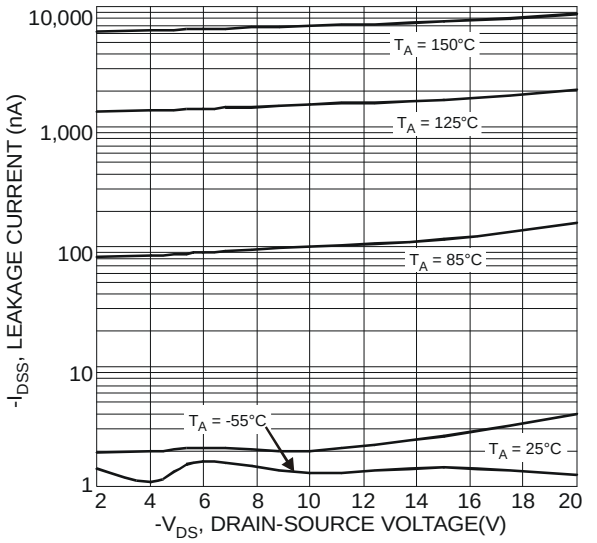



Fig. 9 Typical Drain-Source Leakage Current vs. Voltage

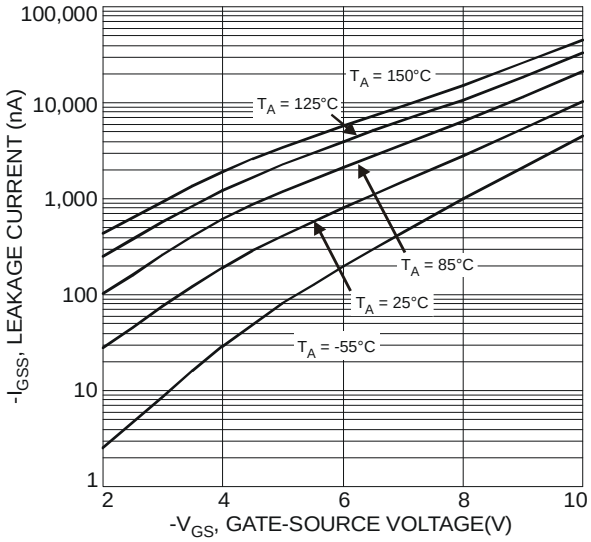



Fig. 10 Typical Gate-Source Leakage Current vs. Voltage

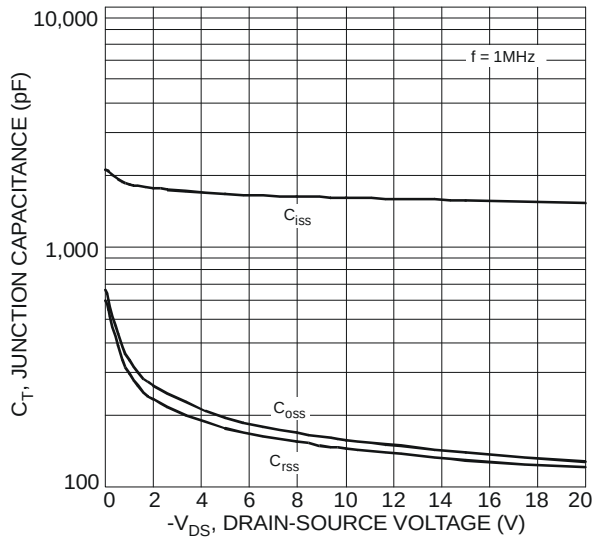



Fig. 11 Typical Junction Capacitance

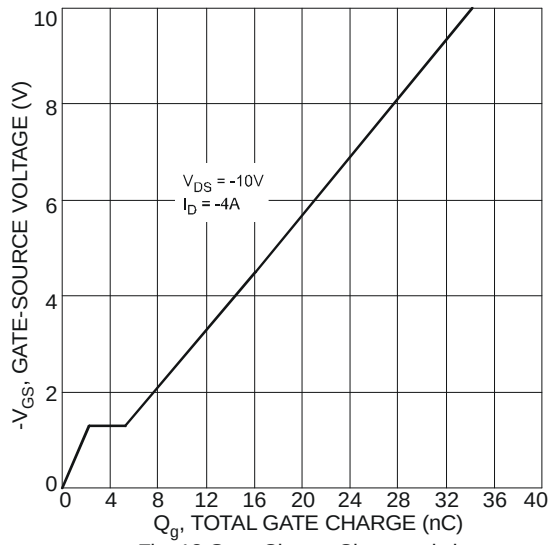



Fig. 12 Gate-Charge Characteristics

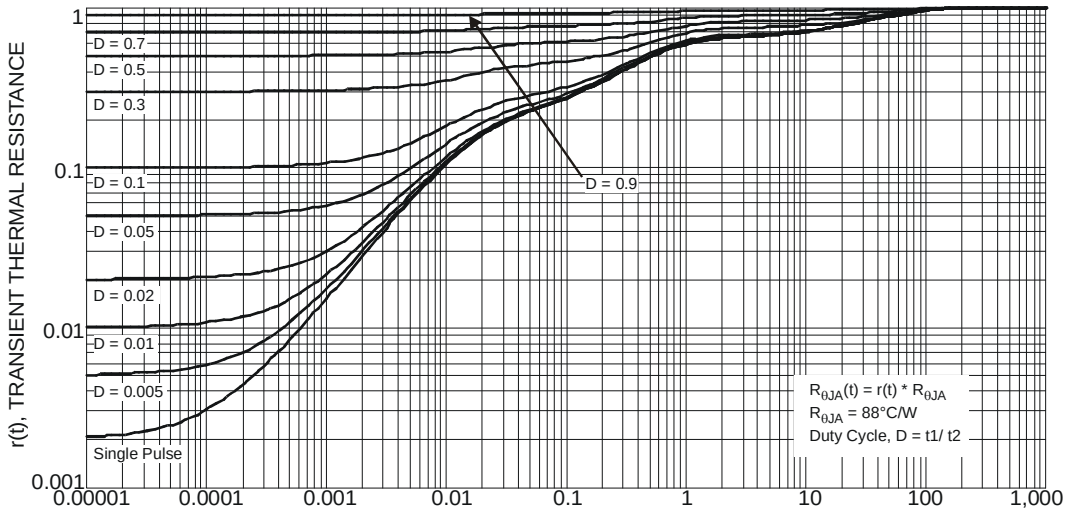
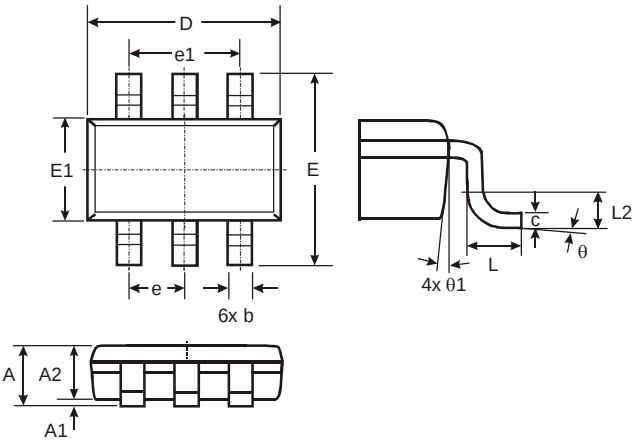


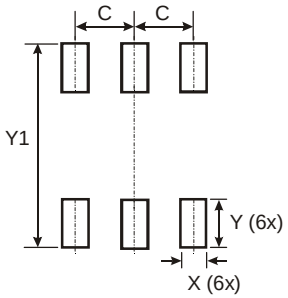

Fig. 13 Transient Thermal Resistance

## Package Outline Dimensions




| TSOT26 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | – | 1.00 | – |
| **A1** | 0.01 | 0.10 | – |
| **A2** | 0.84 | 0.90 | – |
| **D** | – | – | 2.90 |
| **E** | – | – | 2.80 |
| **E1** | – | – | 1.60 |
| **b** | 0.30 | 0.45 | – |
| **c** | 0.12 | 0.20 | – |
| **e** | – | – | 0.95 |
| **e1** | – | – | 1.90 |
| **L** | 0.30 | 0.50 | |
| **L2** | – | – | 0.25 |
| **θ** | 0° | 8° | 4° |
| **θ1** | 4° | 12° | – |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.950 |
| **X** | 0.700 |
| **Y** | 1.000 |
| **Y1** | 3.199 |

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