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Diodes Incorporated
DMP6185SK3-13

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DIODES INCORPORATED

Lead-free Green

**DMP6185SK3**

**60V P-CHANNEL ENHANCEMENT MODE MOSFET**

NEW PRODUCT

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$ | $I_D$ $T_C$ = +25°C |
|---|---|---|
| -60V | 150mΩ @ $V_{GS}$ = -10V | -9.4A |
| | 185mΩ @ $V_{GS}$ = -4.5V | -8.5A |

## Description

This 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.

## Applications

- Backlighting
- DC-DC Converters
- Power management functions

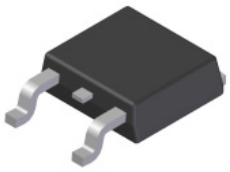
## Features

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- **Totally Lead-Free & Fully RoHS compliant (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

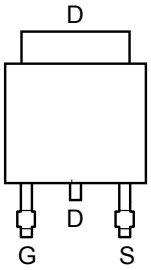
## Mechanical Data

- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.33 grams (approximate)

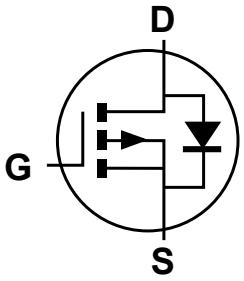
TO252



Top View




Top View
Pin-Out



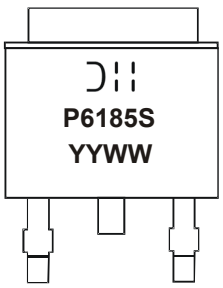

Equivalent Circuit

## Ordering Information (Notes 4)

| Product | Case | Packaging |
|---|---|---|
| DMP6185SK3-13 | TO252 | 2,500/Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at http://www.diodes.com/products/packages.html .

## Marking Information




= Manufacturer's Marking
P6185S = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 13 = 2013)
WW = Week (01 - 53)

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

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -60 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = -10V | Steady State | $T_C$ = +25°C<br>$T_C$ = +100°C | $I_D$ | -3.6<br>-2.8 | A |
| Maximum Body Diode Continuous Current | | | $I_S$ | -2 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | $I_{DM}$ | -15 | A |
| Avalanche Current (Notes 7) L = 0.1mH | | | $I_{AS}$ | -16 | A |
| Avalanche Energy (Notes 7) L = 0.1mH | | | $E_{AS}$ | 13 | mJ |

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

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 1.6 | W |
| | $T_A$ = +70°C | | 1.0 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | $R_{\theta JA}$ | 75 | °C/W |
| | t<10s | | 38 | |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 2.8 | W |
| | $T_A$ = +70°C | | 1.8 | |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state | $R_{\theta JA}$ | 44 | °C/W |
| | t<10s | | 20 | |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 6.2 | |
| 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 | $BV_{DSS}$ | -60 | — | — | V | $V_{GS}$ = 0V, $I_D$ = -250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | -1 | µA | $V_{DS}$ = -48V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -1.0 | — | -3.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | — | 120 | 150 | mΩ | $V_{GS}$ = -10V, $I_D$ = -12A |
| | | | 150 | 185 | | $V_{GS}$ = -4.5V, $I_D$ = -8A |
| Diode Forward Voltage | $V_{SD}$ | — | -0.75 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -1A |
| **DYNAMIC CHARACTERISTICS** (Note 9) | | | | | | |
| Input Capacitance | Ciss | — | 708 | — | pF | $V_{DS}$ = -30V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | Coss | — | 39 | — | pF | |
| Reverse Transfer Capacitance | Crss | — | 32 | — | pF | |
| Gate Resistance | Rg | — | 17 | 40 | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = -4.5V) | Qg | — | 6.2 | — | nC | $V_{DS}$ = -30V, $I_D$ = -12A |
| Total Gate Charge ($V_{GS}$ = -10V) | Qg | — | 14 | — | nC | |
| Gate-Source Charge | Qgs | — | 2.8 | — | nC | |
| Gate-Drain Charge | Qgd | — | 3.1 | — | nC | |
| Turn-On Delay Time | tD(on) | — | 5.2 | — | ns | $V_{DS}$ = -30V, $R_L$ = 2.5Ω<br>$V_{GS}$ = -10V, $R_G$ = 3Ω |
| Turn-On Rise Time | tr | — | 23 | — | ns | |
| Turn-Off Delay Time | tD(off) | — | 33 | — | ns | |
| Turn-Off Fall Time | tf | — | 39 | — | ns | |
| Body Diode Reverse Recovery Time | trr | — | 22 | — | ns | $I_F$ = -12A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Qrr | — | 17 | — | nC | |

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

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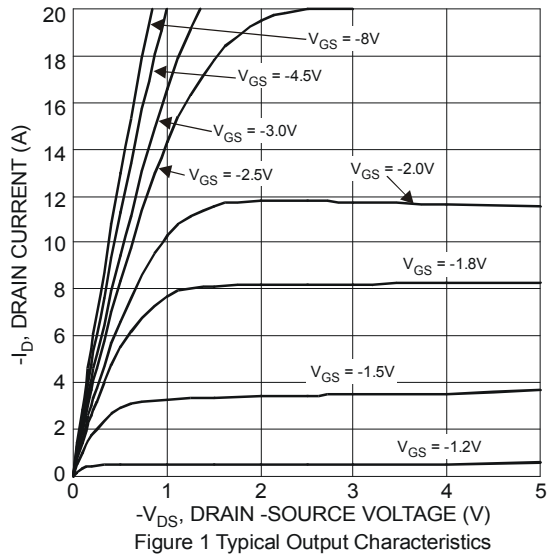


Figure 1 Typical Output Characteristics

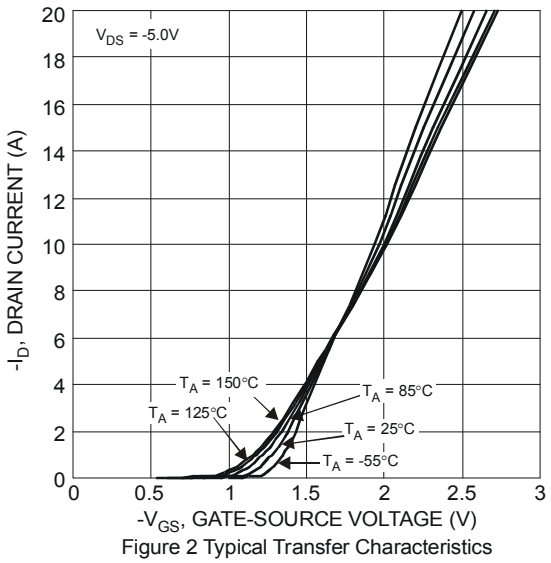


Figure 2 Typical Transfer Characteristics

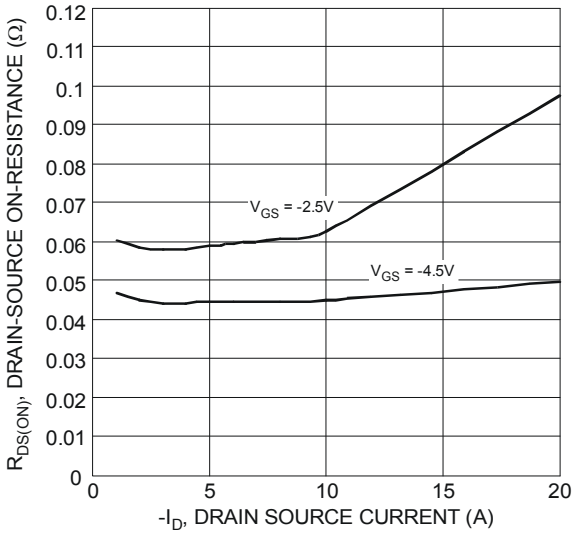


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

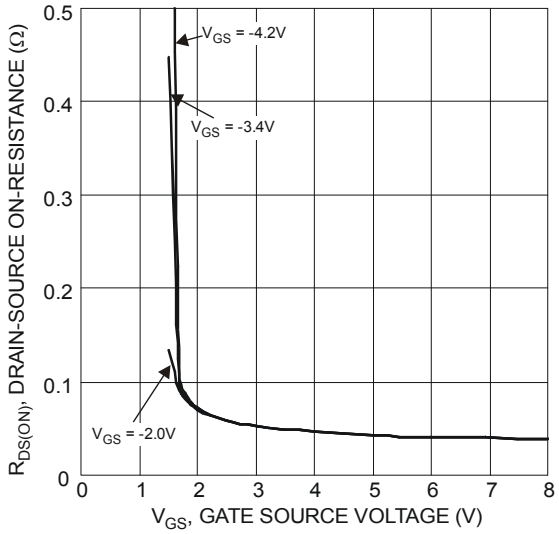


Figure 4 Typical Transfer Characteristics

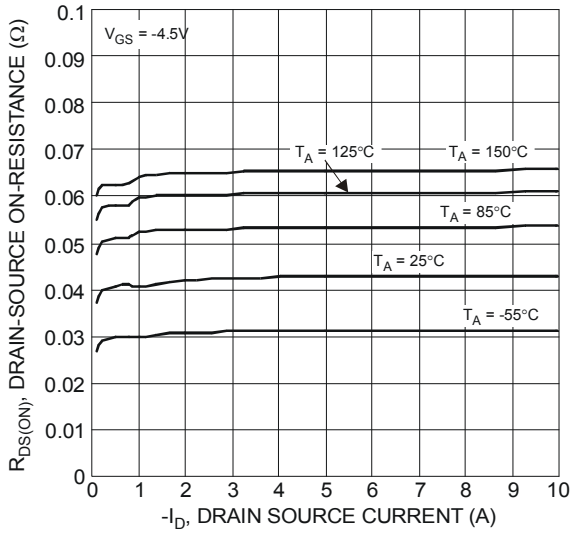


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

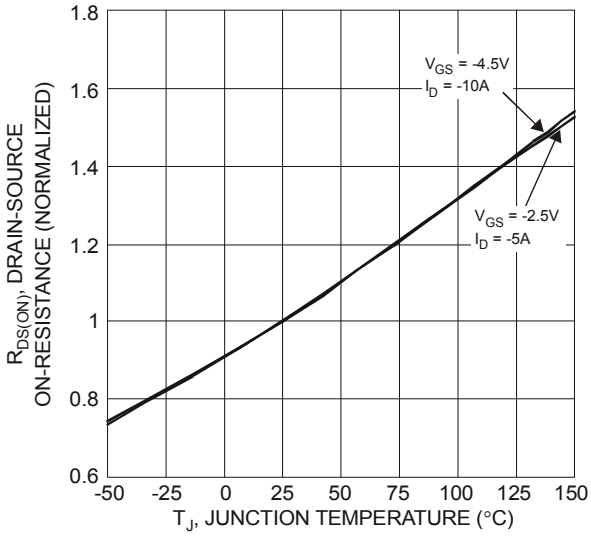


Figure 6 On-Resistance Variation with Temperature

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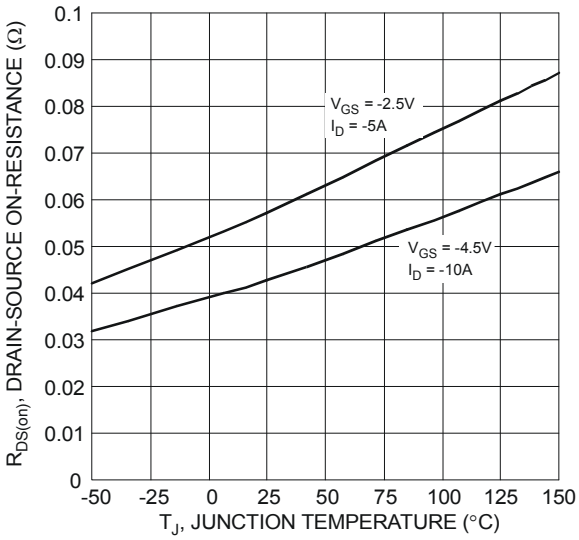


Figure 7 On-Resistance Variation with Temperature

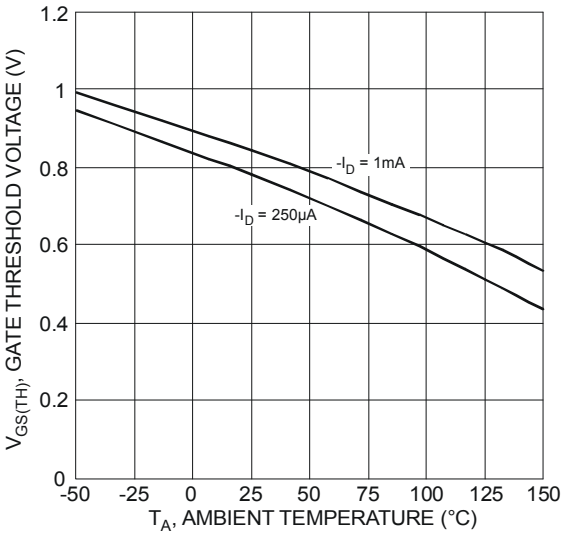


Figure 8 Gate Threshold Variation vs. Ambient Temperature

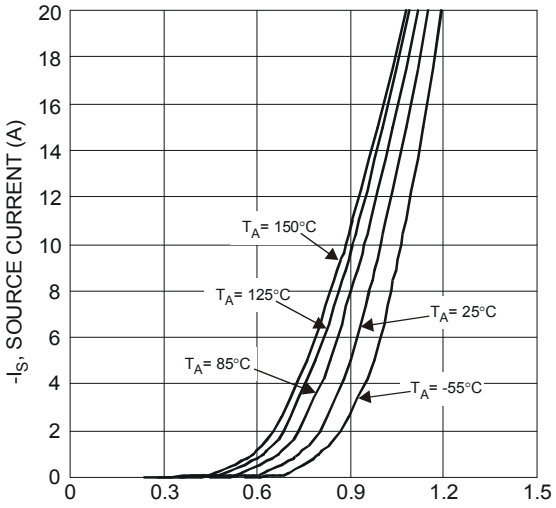


Figure 9 Diode Forward Voltage vs. Current

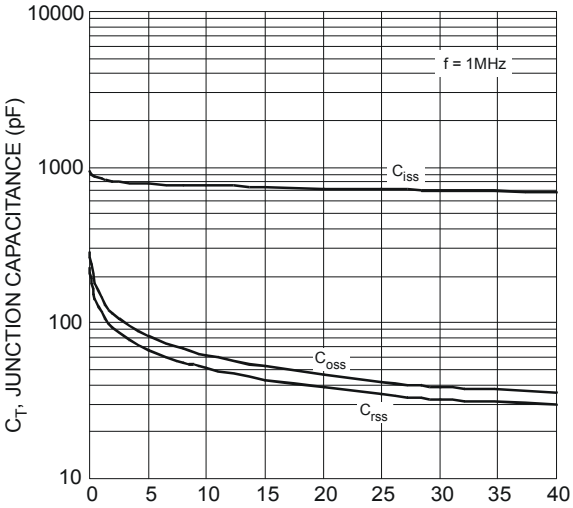


Figure 10 Typical Junction Capacitance

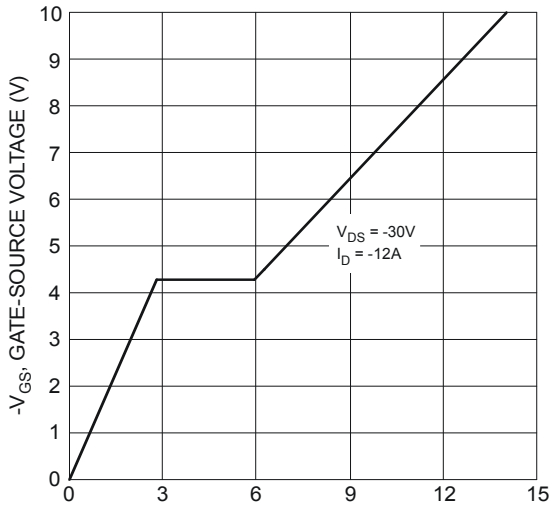


Figure 11 Gate-Charge Characteristics

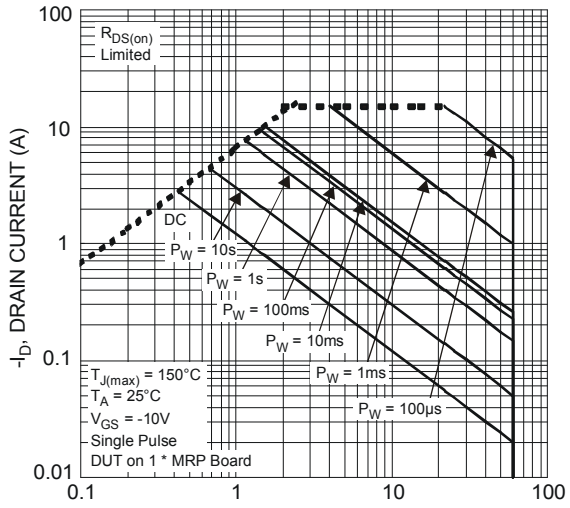


Figure 12 SOA, Safe Operation Area

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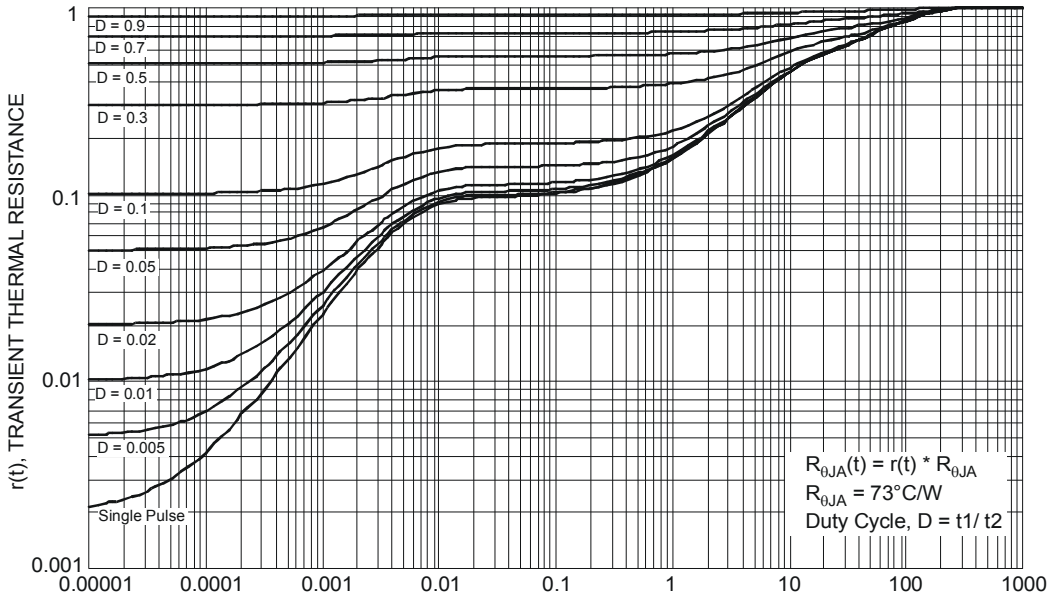
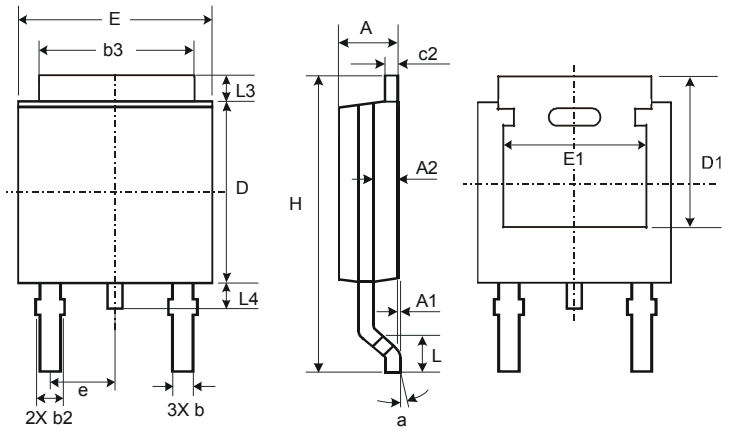



Figure 13 Transient Thermal Resistance

## Package Outline Dimensions

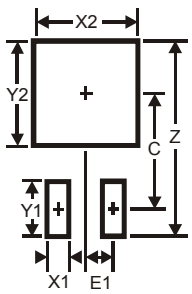
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.




| TO252 | | | |
|---|---|---|---|
| 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 |
| c2 | 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

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for latest version.




| Dimensions | Value (in mm) |
|---|---|
| Z | 11.6 |
| X1 | 1.5 |
| X2 | 7.0 |
| Y1 | 2.5 |
| Y2 | 7.0 |
| C | 6.9 |
| E1 | 2.3 |

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