



**THE DATASHEET OF
DMTH4004LK3-13**



Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D Max T _C = +25°C (Note 9) |
|-------------------|------------------------------|--|
| 40V | 3mΩ @ V _{GS} = 10V | 100A |
| | 5mΩ @ V _{GS} = 4.5V | 100A |

Description

This MOSFET is 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

- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

Features

- Rated to 175° C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low R_{dson} – Minimizes Power Losses
- Low Q_g – Minimizes Switching Losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **An Automotive-Compliant Part is Available Under Separate Datasheet ([DMTH4004LK3Q](#))**

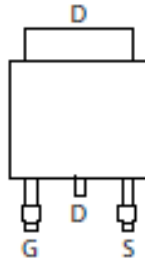
Mechanical Data

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

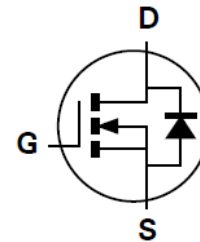
TO252 (DPAK)



Top View



Pin Out Top View



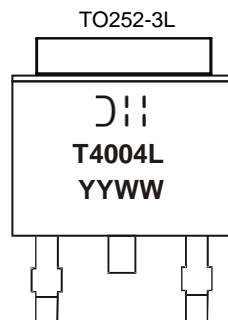
Equivalent Circuit

Ordering Information (Notes 4)

| Part Number | Case | Packaging |
|----------------|-------|-------------------|
| DMTH4004LK3-13 | TO252 | 2,500/Tape & Reel |

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
 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
 T4004L = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Two Digits of Year
 (ex: 15 = 2015)
 WW = Week Code (01 to 53)

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

| Characteristic | Symbol | Value | Unit |
|--|------------------|---------------------------------|------|
| Drain-Source Voltage | V _{DSS} | 40 | V |
| Gate-Source Voltage | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 6), V _{GS} = 10V | I _D | T _C = +25°C (Note 9) | 100 |
| | | T _C = +100°C | 100 |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%) | I _{DM} | 200 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | I _S | 100 | A |
| Avalanche Current, L = 0.2mH | I _{AS} | 30 | A |
| Avalanche Energy, L = 0.2mH | E _{AS} | 90 | mJ |

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

| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | P _D | 3.9 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | R _{θJA} | 38 | °C/W |
| Total Power Dissipation (Note 6) | P _D | 180 | W |
| Thermal Resistance, Junction to Case (Note 6) | R _{θJC} | 0.8 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +175 | °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} | 40 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current, T _J = +25°C | I _{DSS} | — | — | 1 | μA | V _{DS} = 32V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 1 | — | 3 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 2.4 | 3 | mΩ | V _{GS} = 10V, I _D = 50A |
| | | — | 4 | 5 | mΩ | V _{GS} = 4.5V, I _D = 50A |
| Diode Forward Voltage | V _{SD} | — | 0.7 | 1.2 | V | V _{GS} = 0V, I _S = 50A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iss} | — | 4,450 | — | pF | V _{DS} = 25V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{oss} | — | 1,407 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 74 | — | pF | |
| Gate Resistance | R _g | — | 0.7 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 35 | — | nC | V _{DS} = 20V, I _D = 30A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 83 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 10 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 11.2 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 5.9 | — | ns | V _{GS} = 10V, V _{DS} = 20V, R _g = 1.6Ω, I _D = 30A |
| Turn-On Rise Time | t _r | — | 13.2 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 25.8 | — | ns | |
| Turn-Off Fall Time | t _f | — | 7.9 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 48 | — | ns | I _F = 50A, di/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 72 | — | nC | I _F = 50A, di/dt = 100A/μs |

- Notes:
- Device mounted with exposed drain pad on 25mm by 25mm 2oz copper on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady state.
 - Thermal resistance from junction to solder point (on the exposed drain pin).
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.
 - Package Limited.

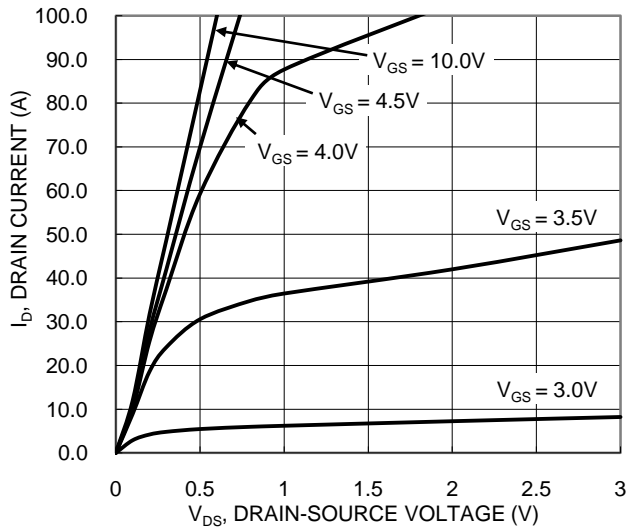


Figure 1. Typical Output Characteristic

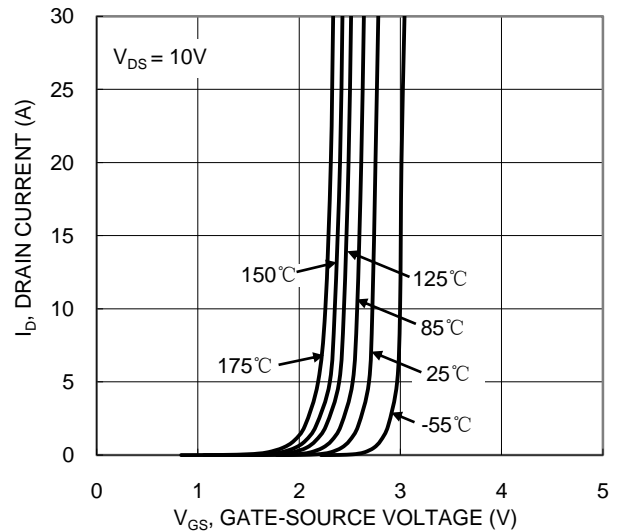


Figure 2. Typical Transfer Characteristic

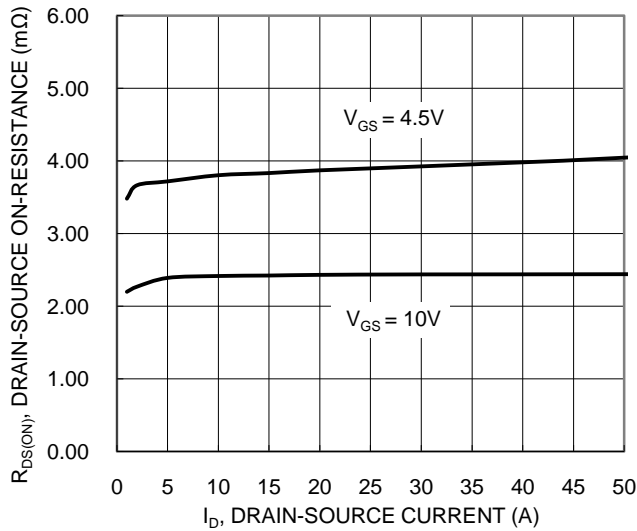


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

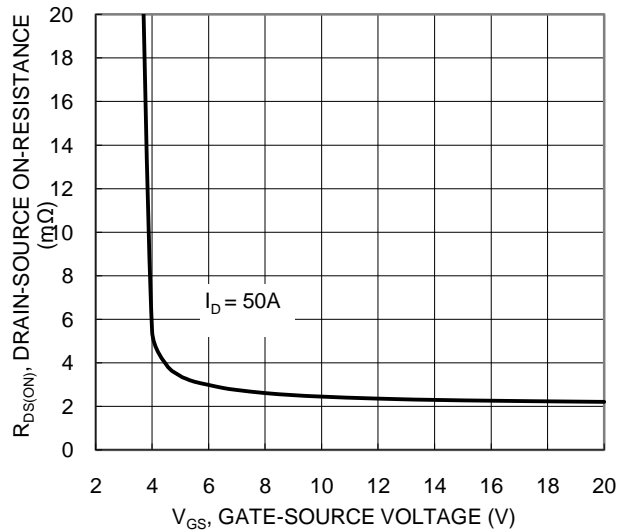


Figure 4. Typical Transfer Characteristic

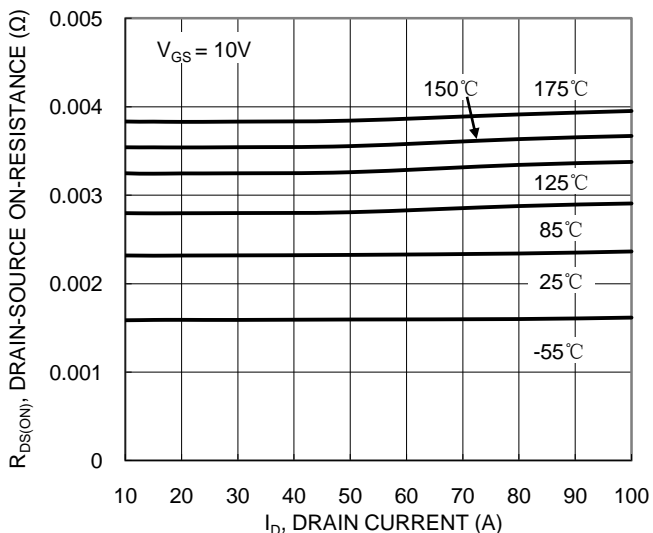


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

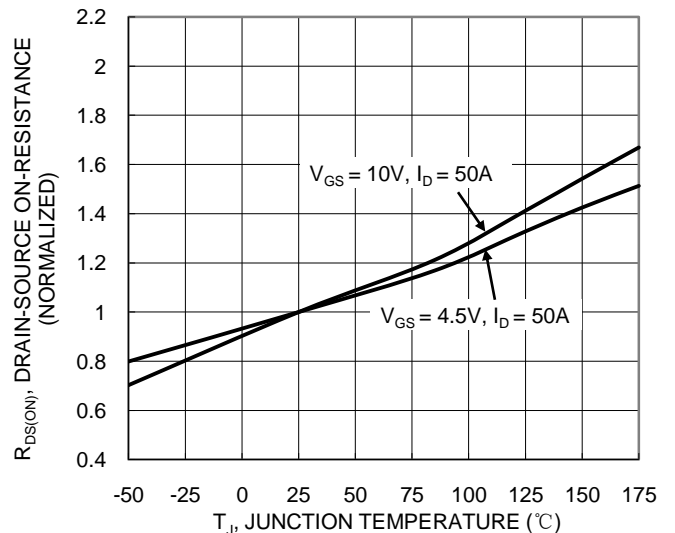


Figure 6. On-Resistance Variation with Temperature

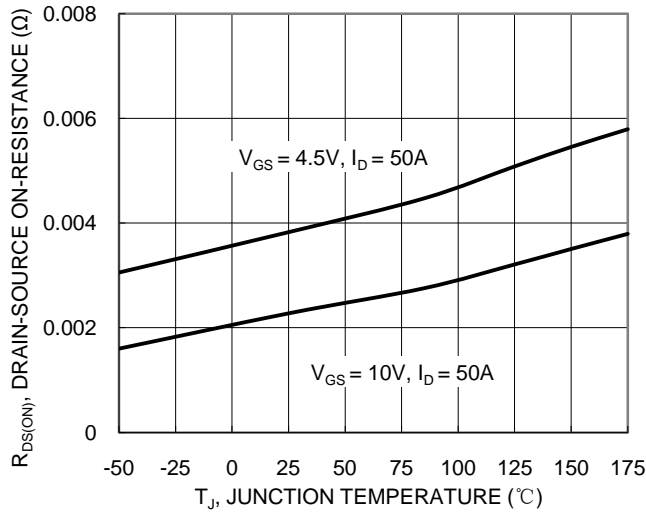


Figure 7. On-Resistance Variation with Temperature

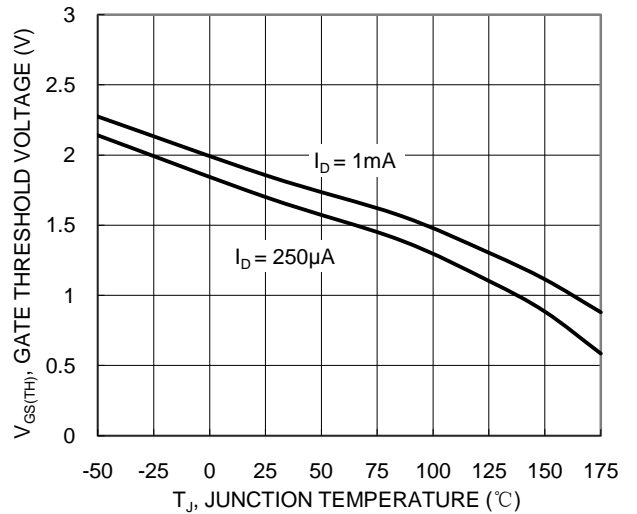


Figure 8. Gate Threshold Variation vs. Temperature

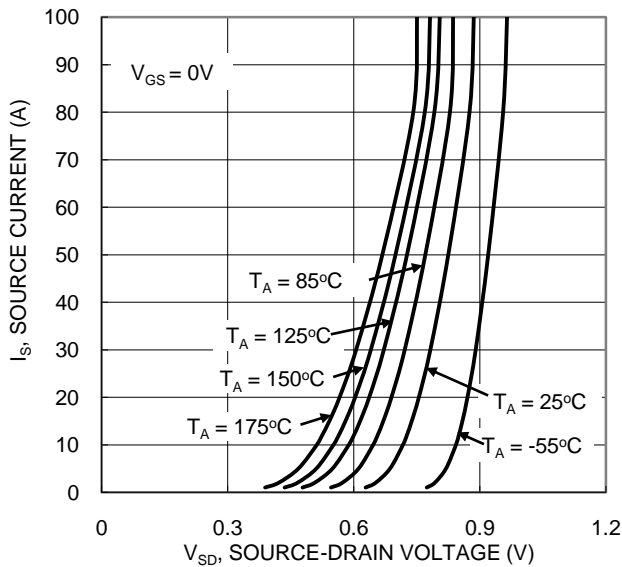


Figure 9. Diode Forward Voltage vs. Current

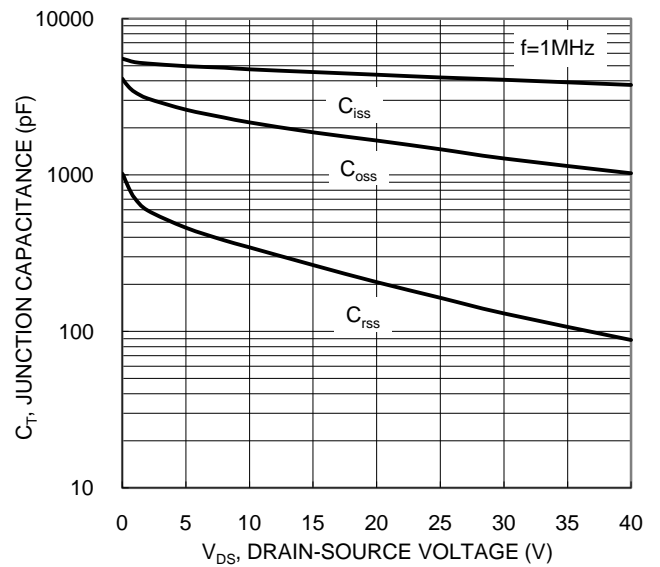


Figure 10. Typical Junction Capacitance

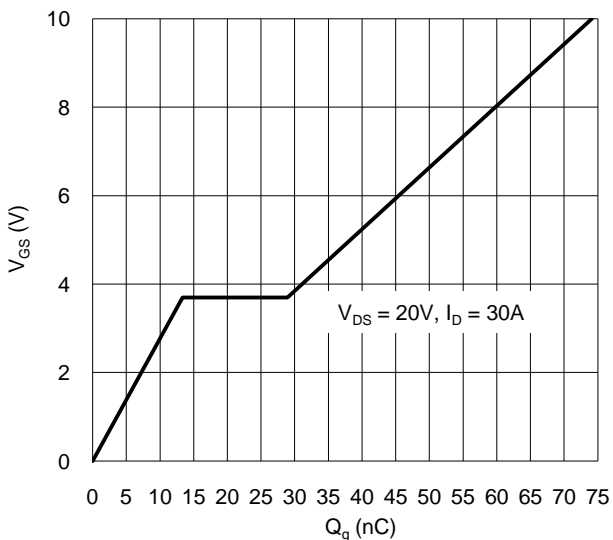


Figure 11. Gate Charge

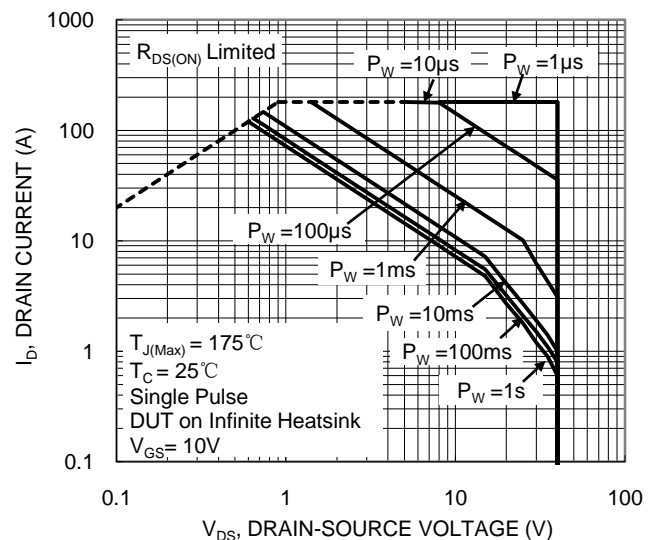


Figure 12. SOA, Safe Operation Area

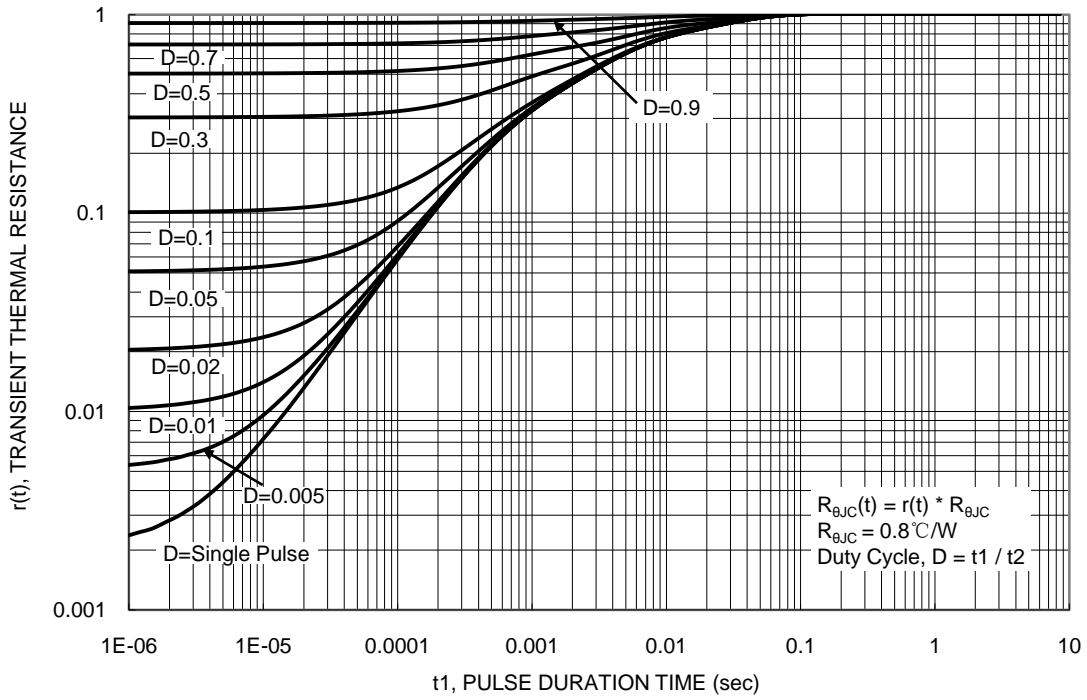
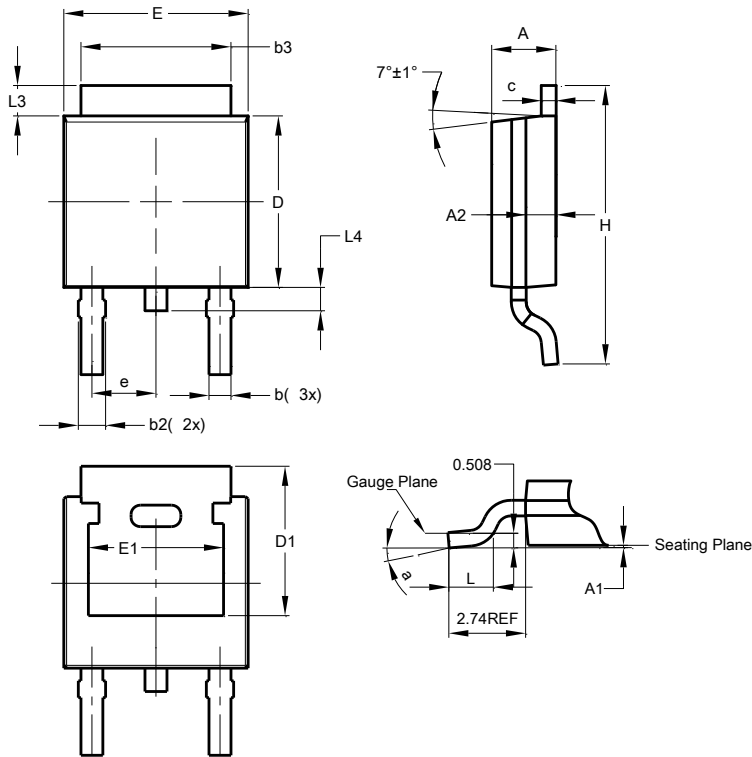


Figure 13. Transient Thermal Resistance

Package Outline

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

TO252 (DPAK)



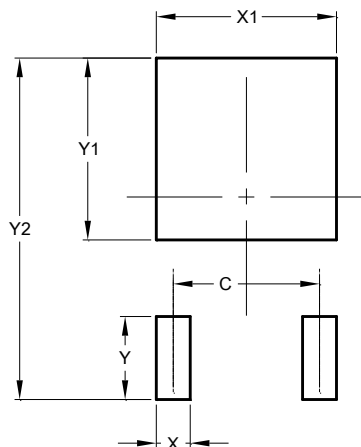
| TO252 (DPAK) | | | |
|-----------------------------|------|-------|-------|
| Dim | Min | Max | Typ |
| A | 2.19 | 2.39 | 2.29 |
| A1 | 0.00 | 0.13 | 0.08 |
| A2 | 0.97 | 1.17 | 1.07 |
| b | 0.64 | 0.88 | 0.783 |
| b2 | 0.76 | 1.14 | 0.95 |
| b3 | 5.21 | 5.46 | 5.33 |
| c | 0.45 | 0.58 | 0.531 |
| 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 | | | |

NEW PRODUCT

Suggested Pad Layout

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

TO252 (DPAK)



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

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