

Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D Max T _C = +25°C |
|-------------------|-----------------------------|--|
| 40V | 6mΩ @ V _{GS} = 10V | 140A |

Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

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

Features

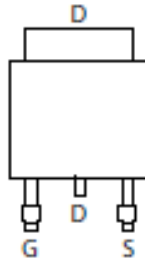
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low Q_g – Minimizes Switching Loss
- Low R_{DS(ON)} – Minimizes On State Loss
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

Mechanical Data

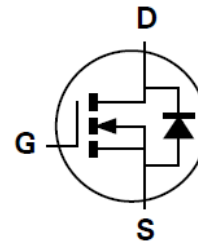
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.315 grams (Approximate)



Top View



Pin Out Top View



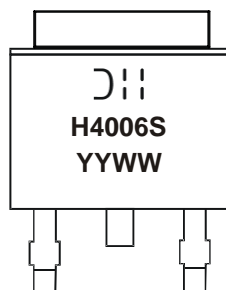
Equivalent Circuit

Ordering Information (Note 5)

| Part Number | Case | Packaging |
|-----------------|--------------|------------------|
| DMNH4006SK3Q-13 | TO252 (DPAK) | 2500/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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to http://www.diodes.com/product_compliance_definitions.html.
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



D = Manufacturer's Marking
 H4006S = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Two Digits of Year
 (ex: 16 = 2016)
 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, V _{GS} = 10V (Note 7) | I _D | T _A = +25°C T _A = +70°C | 20 16 | A |
| Continuous Drain Current, V _{GS} = 10V (Note 8) | | T _C = +25°C T _C = +100°C | 140 100 | A |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | I _{DM} | 200 | A | |
| Maximum Continuous Body Diode Forward Current (Note 8) | I _S | 120 | A | |
| Avalanche Current, L = 0.1mH (Note 9) | I _{AS} | 64 | A | |
| Avalanche Energy, L = 0.1mH (Note 9) | E _{AS} | 208 | mJ | |

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

| Characteristic | Symbol | Value | Unit | |
|--|-----------------------------------|--------------|------|------|
| Total Power Dissipation (Note 6) | P _D | 2.2 | W | |
| Thermal Resistance, Junction to Ambient (Note 6) | R _{θJA} | Steady State | 68 | °C/W |
| | | t < 10s | 29 | |
| Total Power Dissipation (Note 7) | P _D | 3.6 | W | |
| Thermal Resistance, Junction to Ambient (Note 7) | R _{θJA} | Steady State | 42 | °C/W |
| | | t < 10s | 21 | |
| Thermal Resistance, Junction to Case (Note 8) | R _{θJC} | 0.8 | | |
| 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 10) | | | | | | |
| 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} = 40V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 10) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 2 | — | 4 | V | V _{DS} = V _{GS} , I _D = 250µA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | — | 6 | mΩ | V _{GS} = 10V, I _D = 86A |
| Diode Forward Voltage | V _{SD} | — | 0.7 | 1.2 | V | V _{GS} = 0V, I _S = 1.0A |
| DYNAMIC CHARACTERISTICS (Note 11) | | | | | | |
| Input Capacitance | C _{iss} | — | 2280 | — | pF | V _{DS} = 25V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{oss} | — | 556 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 282 | — | pF | |
| Gate Resistance | R _g | — | 1.7 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 6V) | Q _g | — | 32 | — | nC | V _{DS} = 32V, I _D = 86A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 51 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 9.6 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 20.4 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 7.7 | — | ns | V _{GS} = 10V, V _{DS} = 20V, R _g = 3.5Ω, I _D = 86A |
| Turn-On Rise Time | t _R | — | 9.3 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 18 | — | ns | |
| Turn-Off Fall Time | t _F | — | 8.1 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 32 | — | ns | I _F = 50A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 28 | — | nC | I _F = 50A, di/dt = 100A/µs |

- Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 7. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 8. Thermal resistance from junction to soldering point (on the exposed drain pad).
 9. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 10. Short duration pulse test used to minimize self-heating effect.
 11. Guaranteed by design. Not subject to product testing.

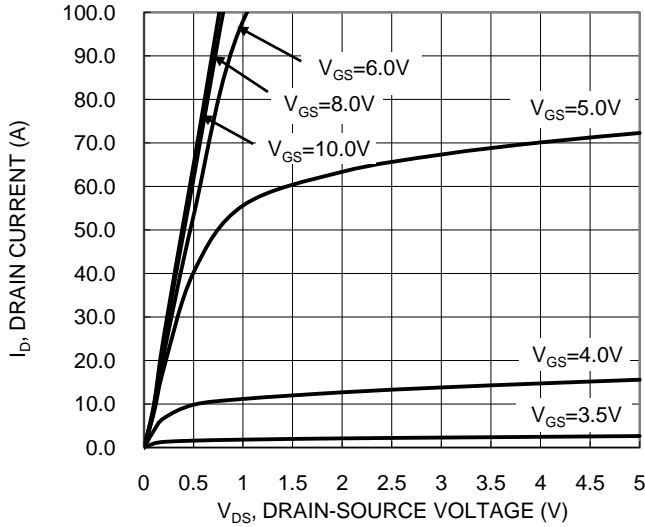


Figure 1. Typical Output Characteristic

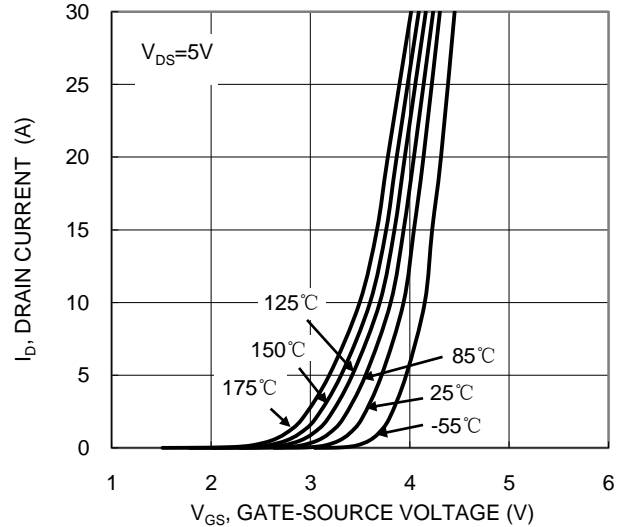


Figure 2. Typical Transfer Characteristic

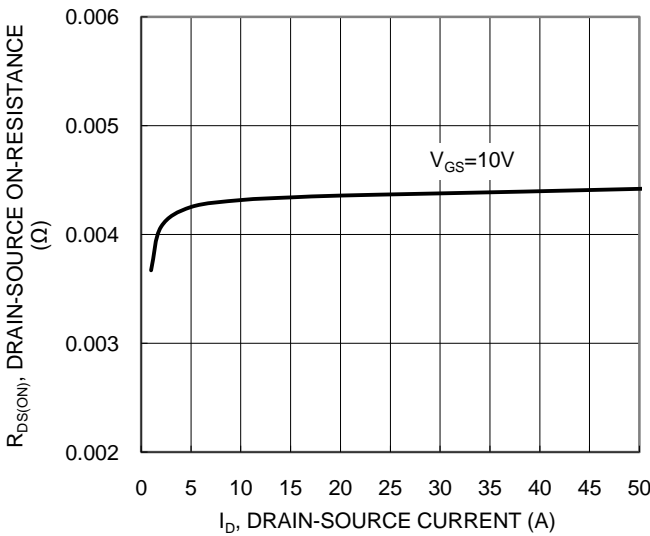


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

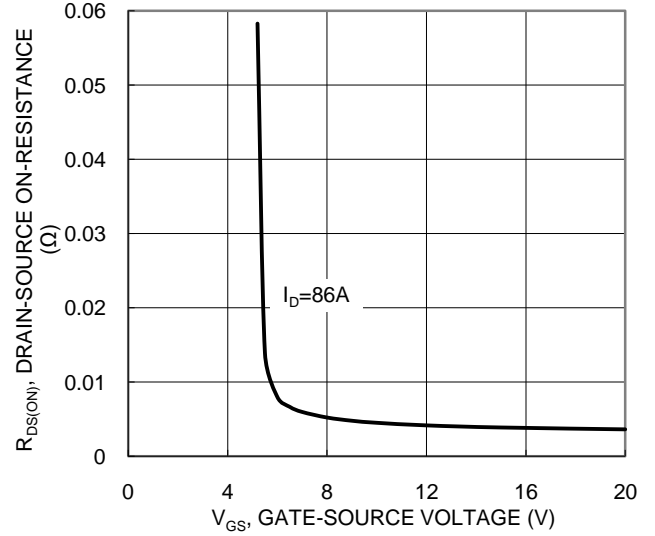


Figure 4. Typical Transfer Characteristic

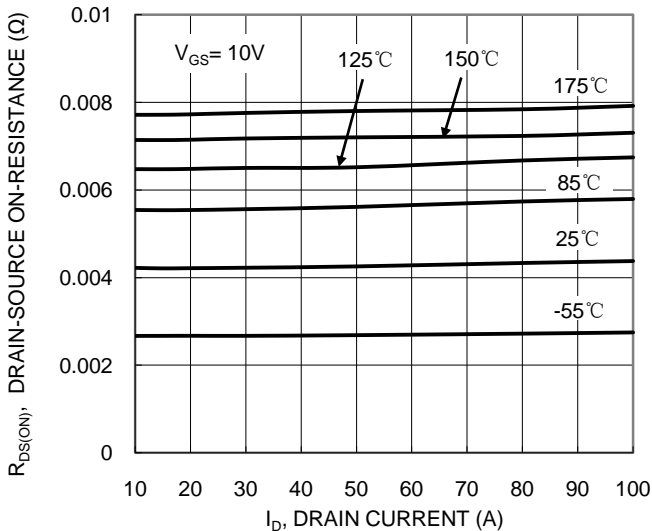


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

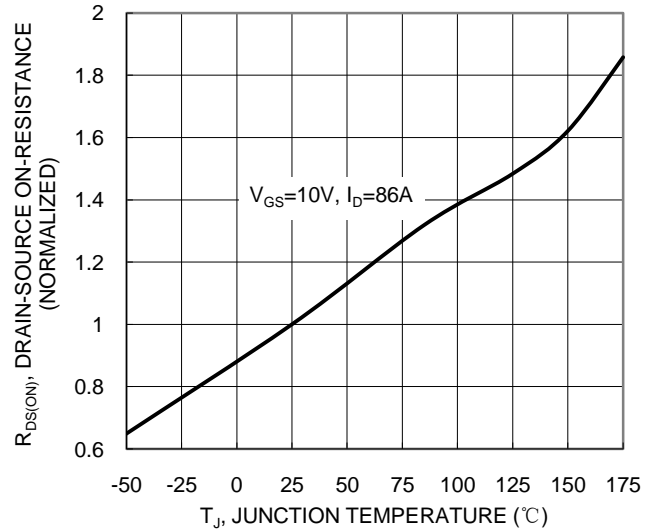


Figure 6. On-Resistance Variation with Junction Temperature

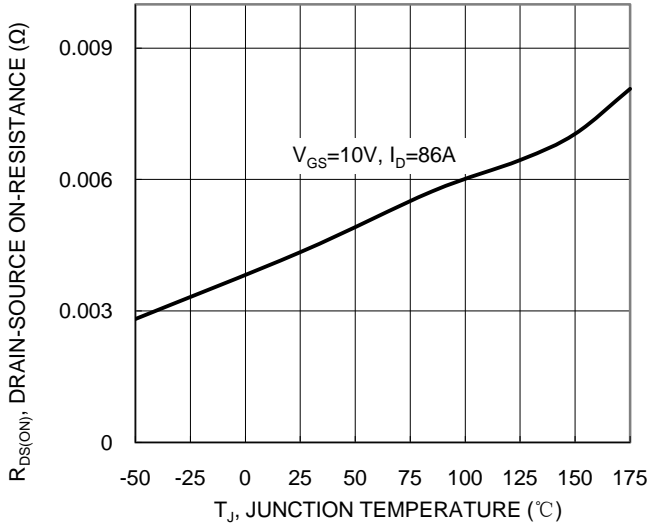


Figure 7. On-Resistance Variation with Junction Temperature

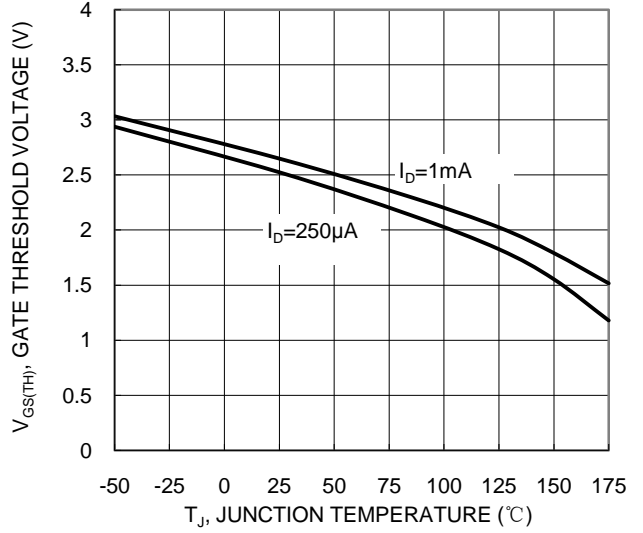


Figure 8. Gate Threshold Variation vs. Junction Temperature

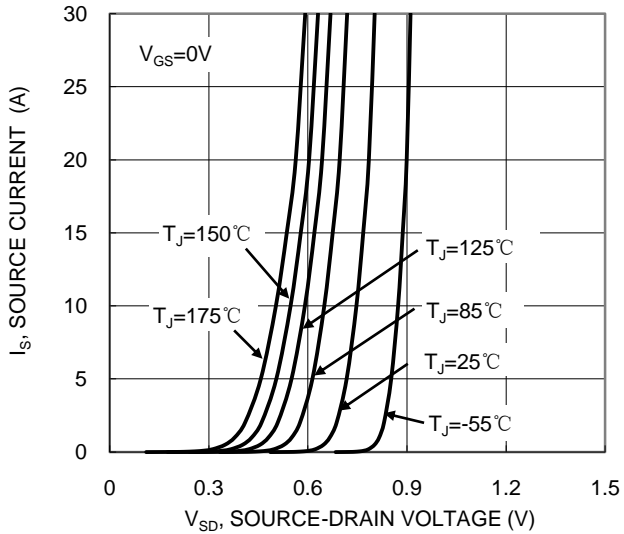


Figure 9. Diode Forward Voltage vs. Current

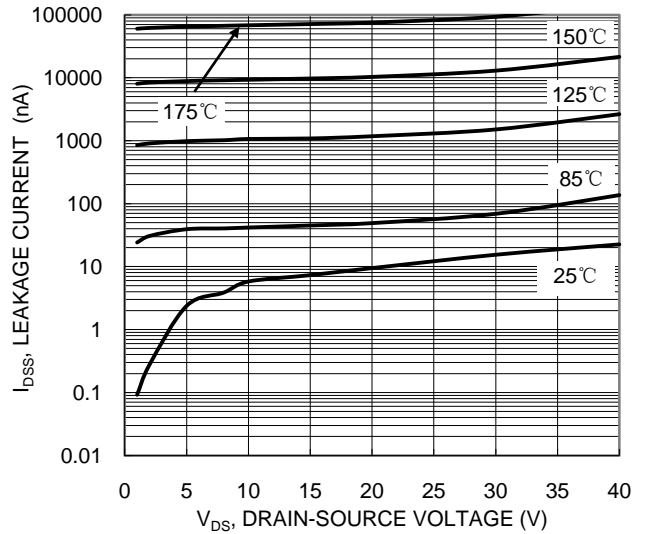


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

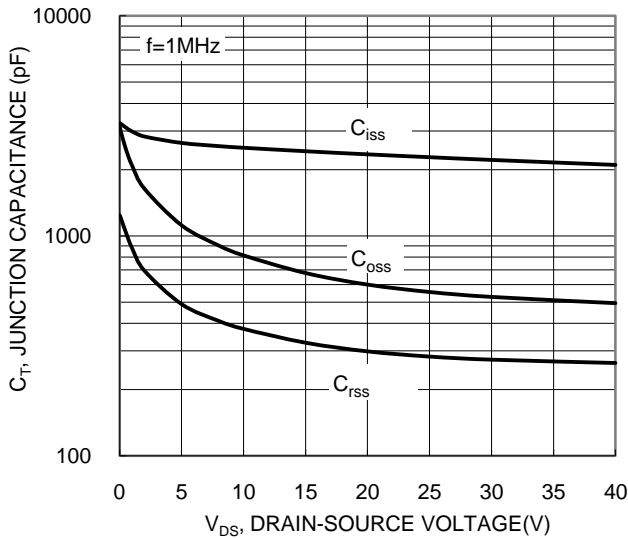


Figure 11. Typical Junction Capacitance

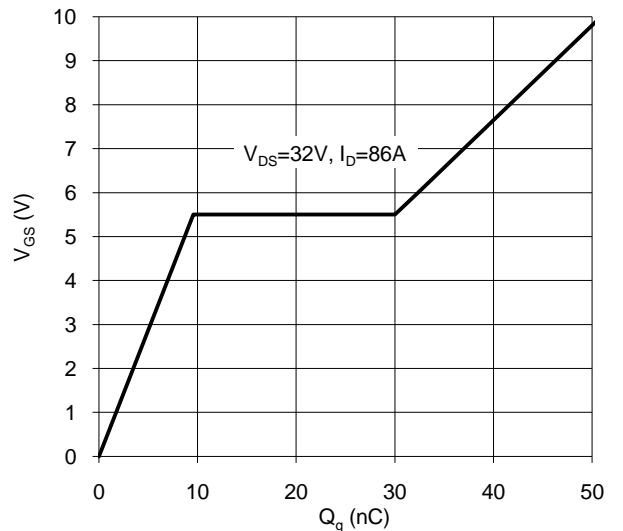


Figure 12. Gate Charge

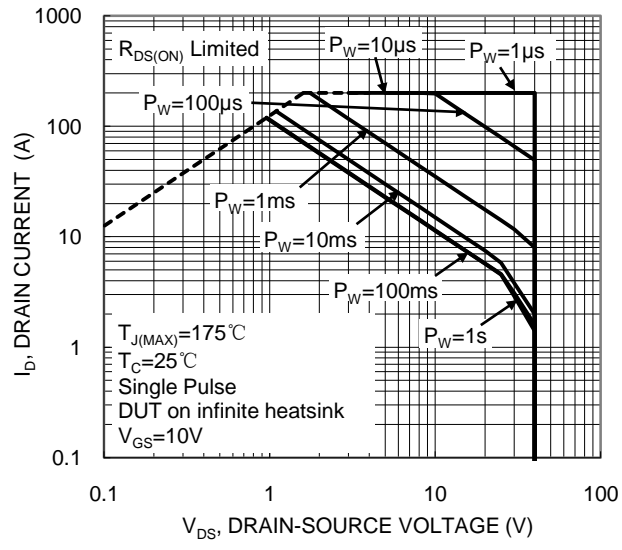


Figure 13. SOA, Safe Operation Area

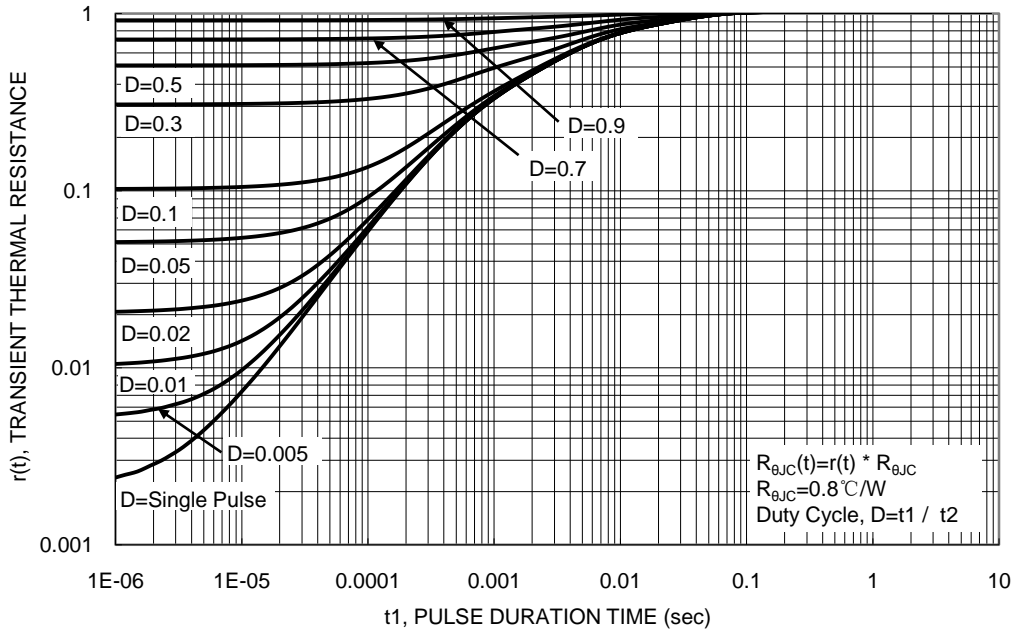
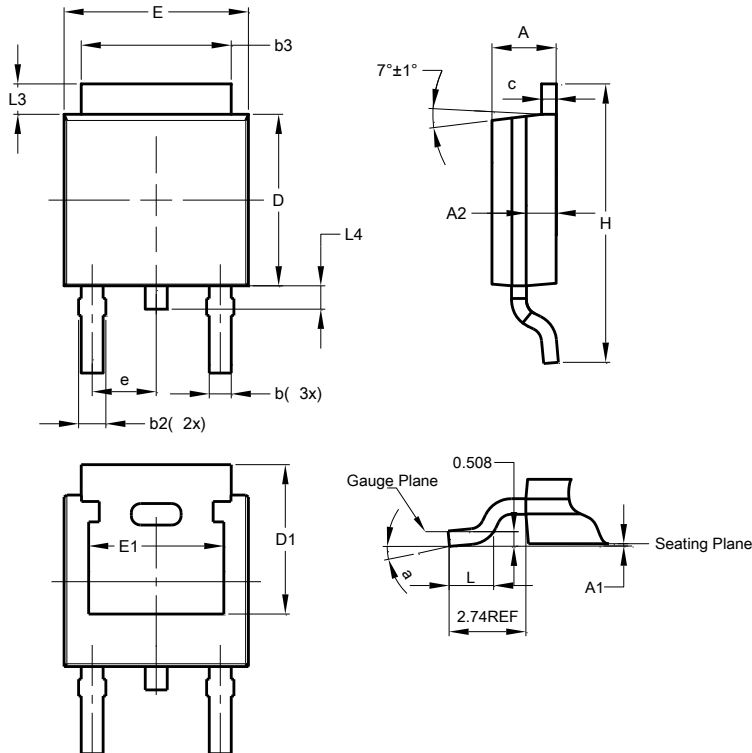


Figure 14. Transient Thermal Resistance

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

TO252 (DPAK)

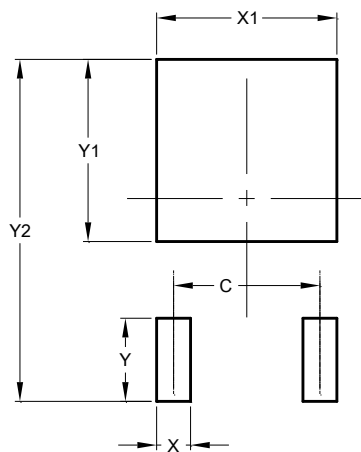


| TO252 (DPAK) | | | |
|-----------------------------|------|-------|-------|
| Dim | Min | Max | Typ |
| A | 2.19 | 2.39 | 2.29 |
| A1 | 0.00 | 0.13 | 0.08 |
| A2 | 0.97 | 1.17 | 1.07 |
| b | 0.64 | 0.88 | 0.783 |
| b2 | 0.76 | 1.14 | 0.95 |
| b3 | 5.21 | 5.46 | 5.33 |
| c | 0.45 | 0.58 | 0.531 |
|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

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> 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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