

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max                | $I_D$ Max<br>$T_C = +25^\circ\text{C}$ |
|------------|---------------------------------|--|
| 60V        | 10mΩ @ $V_{GS} = 10\text{V}$    | 59A                                    |
|            | 12.8mΩ @ $V_{GS} = 4.5\text{V}$ | 52A                                    |

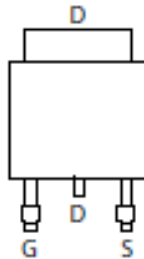
## Description and Applications

This new generation 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.

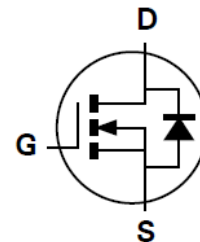
- Power Management Functions
- DC-DC Converters
- Backlighting



Top View



Pin Out Top View



Equivalent Circuit

## Features

- Rated to  $+175^\circ\text{C}$  – Ideal for High Ambient Temperature Environments
- Low  $R_{DS(ON)}$  – Ensures on State Losses are Minimized
- Excellent  $Q_{gd} \times R_{DS(ON)}$  Product (FOM)
- Advanced Technology for DC/DC Converters
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- 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 ([DMTH6009LK3Q](#))**

## Mechanical Data

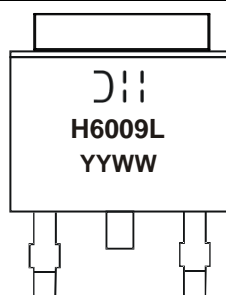
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.33 grams (Approximate)

## Ordering Information (Note 4)

| Part Number    | Case         | Packaging         |
|----------------|--------------|-------------------|
| DMTH6009LK3-13 | TO252 (DPAK) | 2,500/Tape & Reel |

- Notes:
- EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  - See [http://www.diodes.com/quality/lead\\_free.html](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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



= Manufacturer's Marking  
 H6009L = 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<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic  | Symbol           | Value                          | Unit |
|---|------------------|--------------------------------|------|
| Drain-Source Voltage                                    | V <sub>DSS</sub> | 60                             | V    |
| Gate-Source Voltage                                     | V <sub>GSS</sub> | ±16                            | V    |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = 10V | I <sub>D</sub>   | T <sub>A</sub> = +25°C<br>14.2 | A    |
|   |                  | T <sub>A</sub> = +70°C<br>11.9 |      |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V | I <sub>D</sub>   | T <sub>C</sub> = +25°C<br>59   | A    |
|   |                  | T <sub>C</sub> = +70°C<br>49   |      |
| Maximum Continuous Body Diode Forward Current (Note 6)  | I <sub>S</sub>   | 80                             | A    |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)      | I <sub>DM</sub>  | 90                             | A    |
| Avalanche Current, L=0.1mH                              | I <sub>AS</sub>  | 20.3                           | A    |
| Avalanche Energy, L=0.1mH                               | E <sub>AS</sub>  | 20.6                           | mJ   |

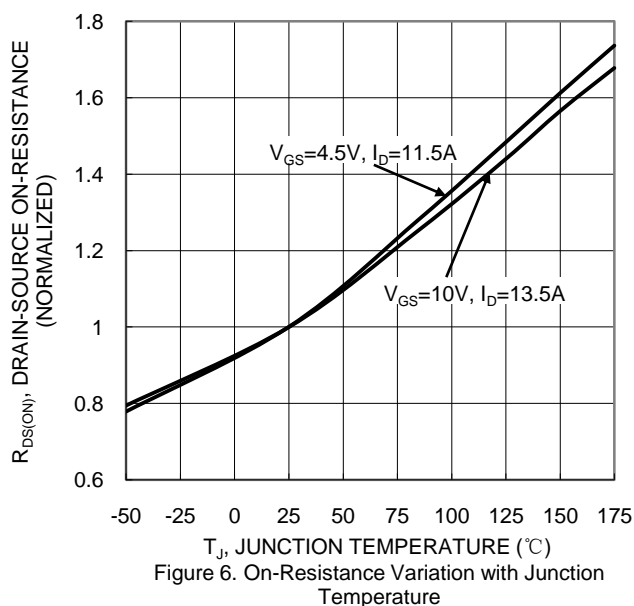
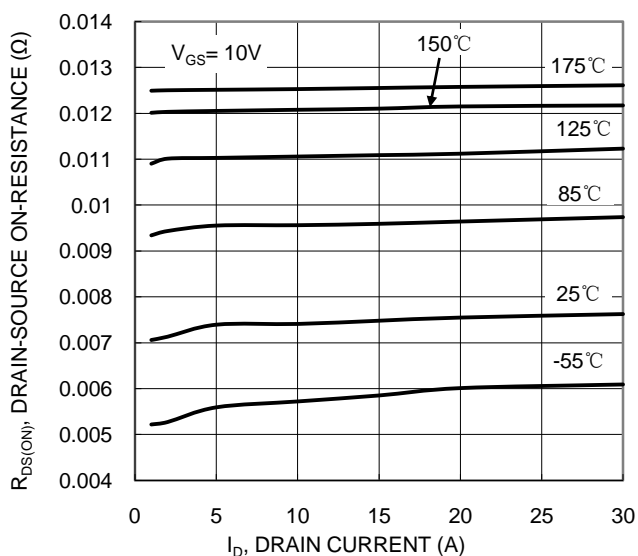
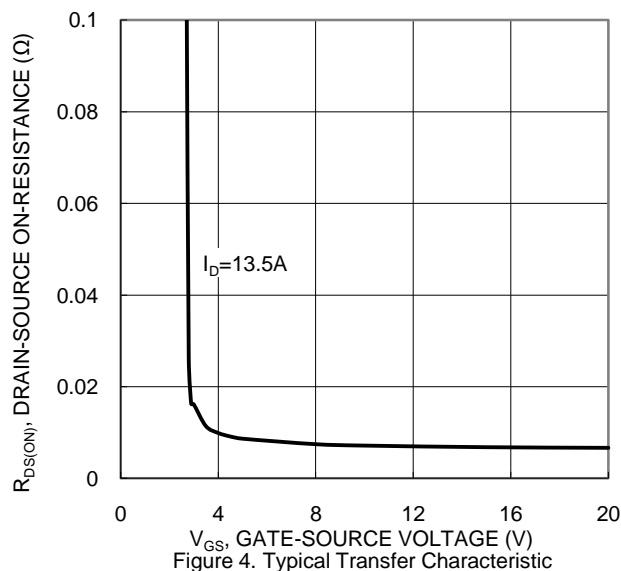
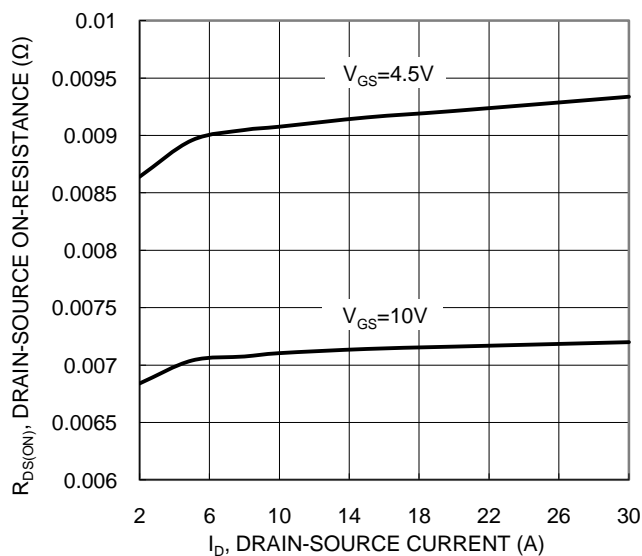
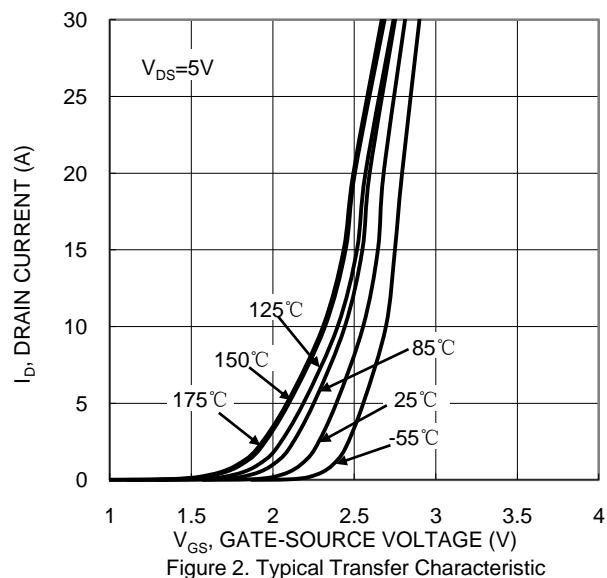
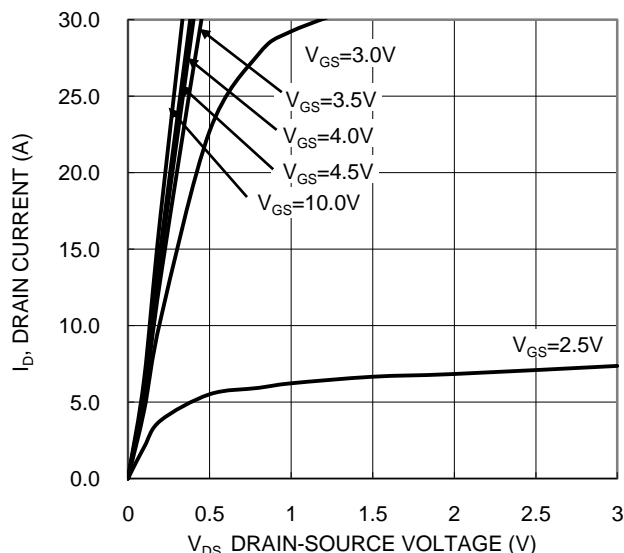
**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

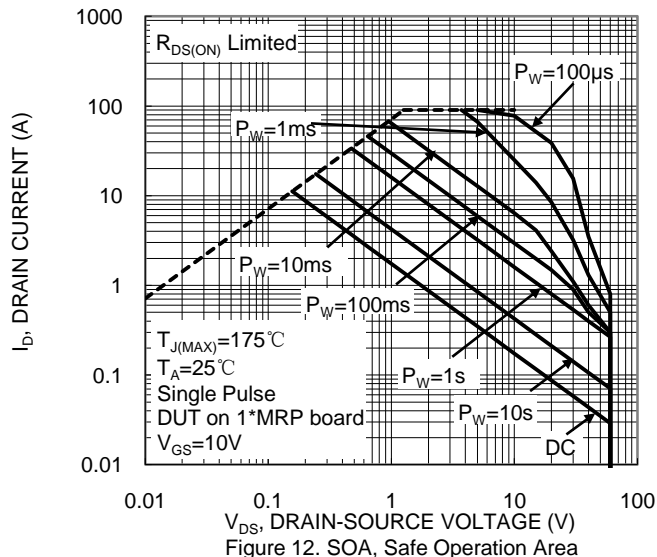
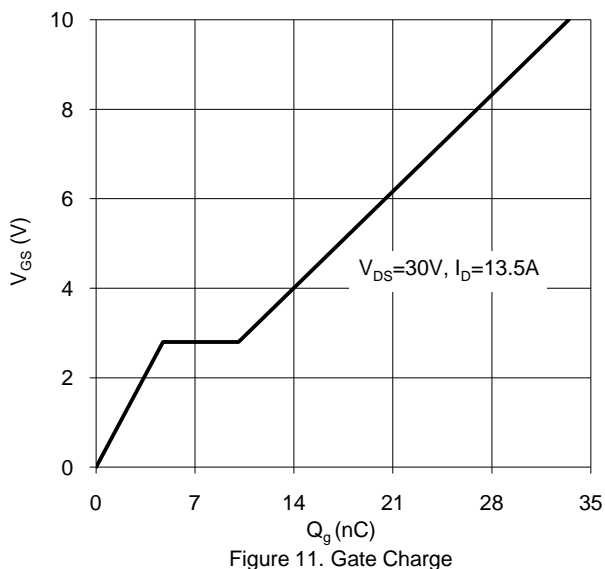
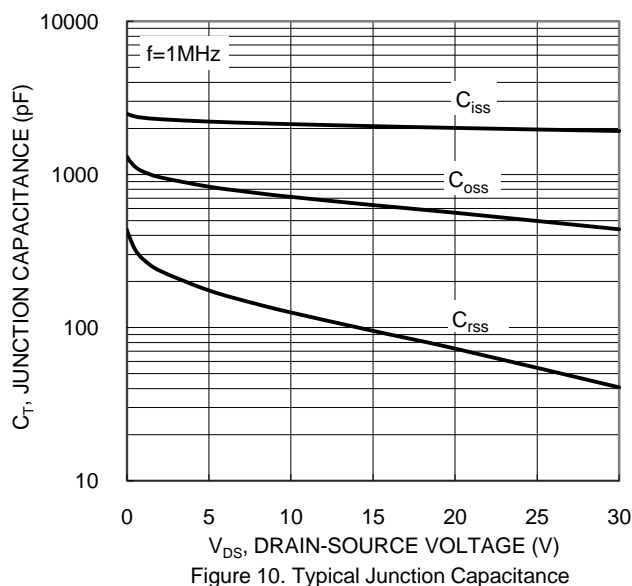
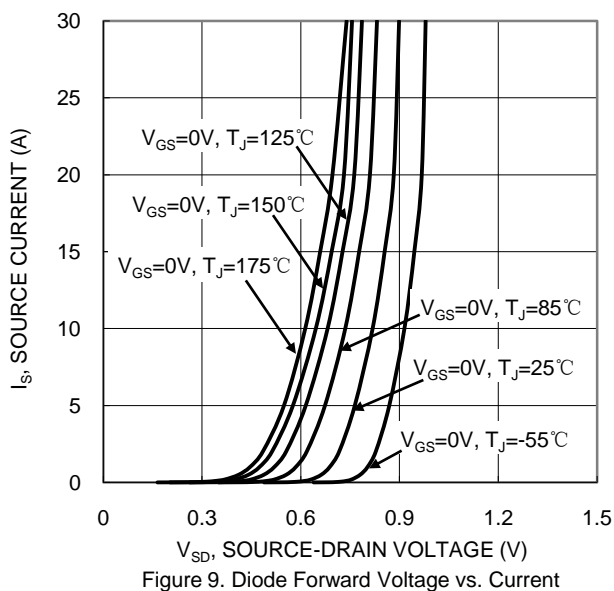
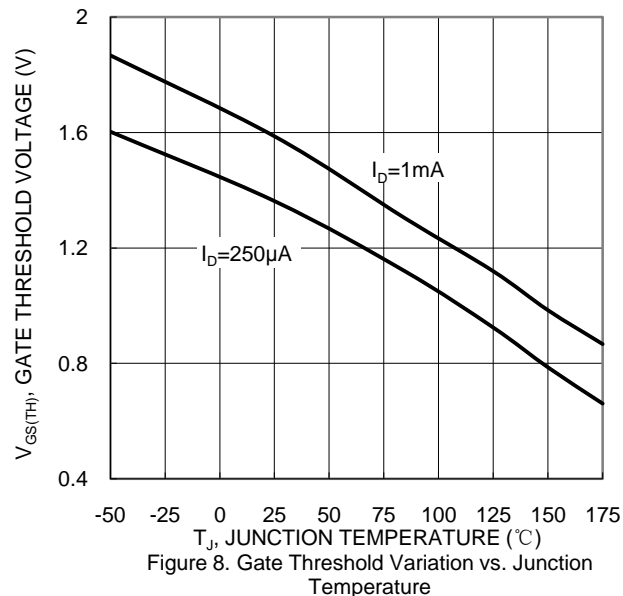
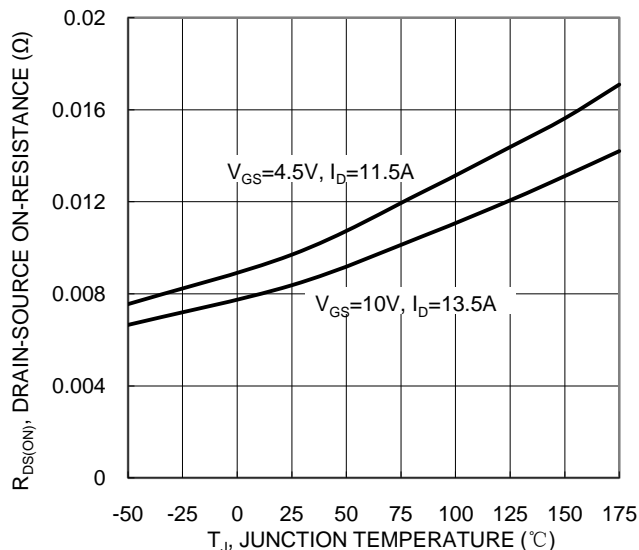
| Characteristic                                   | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 3.2         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 47          | °C/W |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 60          | W    |
| Thermal Resistance, Junction to Case (Note 6)    | R <sub>θJC</sub>                  | 2.5         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +175 | °C   |

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                             | Symbol              | Min | Typ   | Max  | Unit | Test Condition   |
|--|---------------------|-----|-------|------|------|--|
| <b>OFF CHARACTERISTICS (Note 7)</b>        |                     |     |       |      |      |  |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 60  | -     | -    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA   |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | -   | -     | 1    | µA   | V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | -   | -     | ±100 | nA   | V <sub>GS</sub> = ±16V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS (Note 7)</b>         |                     |     |       |      |      |  |
| Gate Threshold Voltage                     | V <sub>GS(TH)</sub> | 0.7 | 1.4   | 2    | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                   |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | -   | 8.3   | 10   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 13.5A  |
|  |                     | -   | 9.6   | 12.8 | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 11.5A   |
| Diode Forward Voltage                      | V <sub>SD</sub>     | -   | 0.9   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>    |                     |     |       |      |      |  |
| Input Capacitance                          | C <sub>iss</sub>    | -   | 1,925 | -    | pF   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                     |
| Output Capacitance                         | C <sub>oss</sub>    | -   | 438   | -    |      |  |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | -   | 41    | -    |      |  |
| Gate Resistance                            | R <sub>g</sub>      | -   | 1.7   | -    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz   |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>g</sub>      | -   | 15.6  | -    | nC   | V <sub>DS</sub> = 30V, I <sub>D</sub> = 13.5A  |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>g</sub>      | -   | 33.5  | -    |      |  |
| Gate-Source Charge                         | Q <sub>gs</sub>     | -   | 4.7   | -    |      |  |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | -   | 5.3   | -    |      |  |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | -   | 4.5   | -    | ns   | V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V,<br>R <sub>g</sub> = 6Ω, I <sub>D</sub> = 13.5A |
| Turn-On Rise Time                          | t <sub>R</sub>      | -   | 8.6   | -    |      |  |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | -   | 35.9  | -    |      |  |
| Turn-Off Fall Time                         | t <sub>F</sub>      | -   | 15.7  | -    |      |  |
| Body Diode Reverse Recovery Time           | t <sub>RR</sub>     | -   | 18.2  | -    | ns   | I <sub>F</sub> = 13.5A, di/dt = 400A/µs  |
| Body Diode Reverse Recovery Charge         | Q <sub>RR</sub>     | -   | 33.1  | -    | nC   |  |

- Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.  
6. Device mounted on infinite heat sink and measured by thermal couple attached on bottom heat sink of package.  
7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.





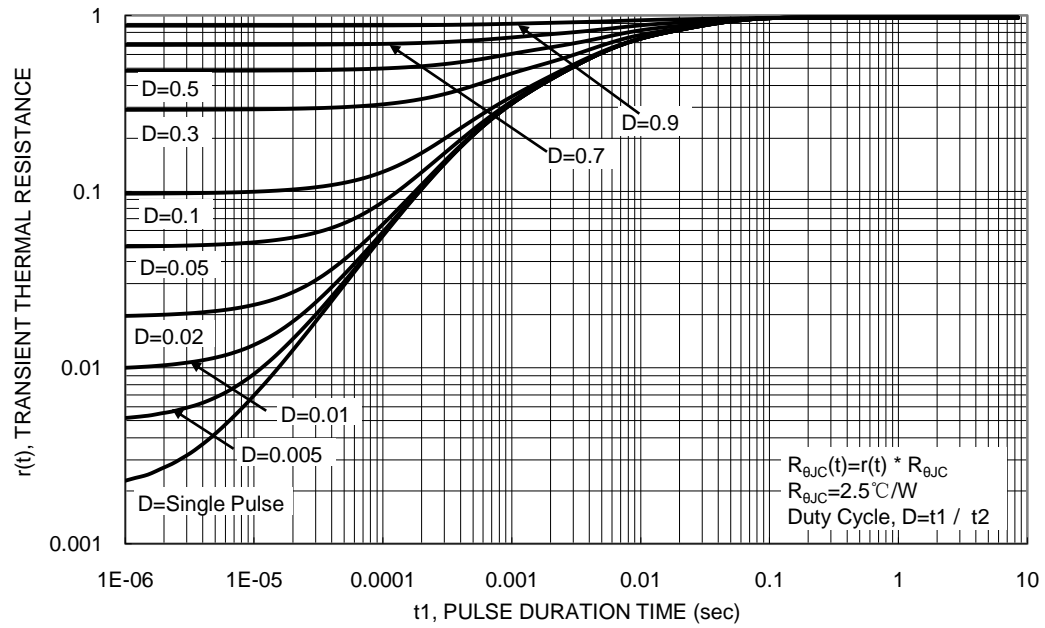
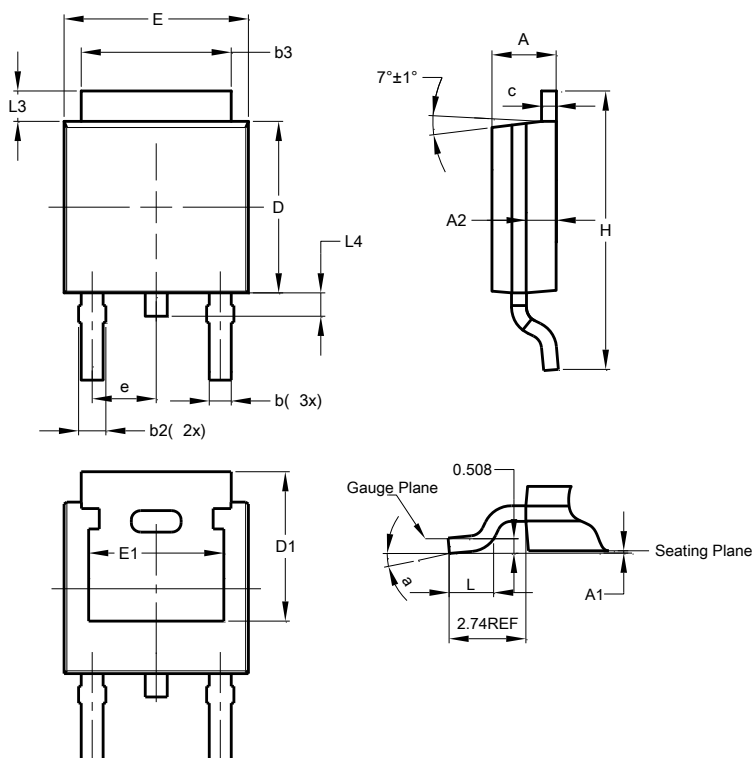


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

### TO252 (DPAK)

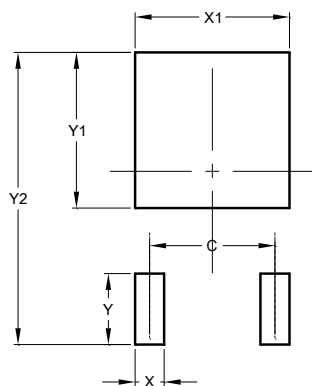


| TO252 (DPAK)         |      |       |       |
|----------------------|------|-------|-------|
| Dim                  | Min  | Max   | Typ   |
| A                    | 2.19 | 2.39  | 2.29  |
| A1                   | 0.00 | 0.13  | 0.08  |
| A2                   | 0.97 | 1.17  | 1.07  |
| b                    | 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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