

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$               | $I_D$<br>$T_C = +25^\circ C$ |
|------------|----------------------------|------------------------------|
| 600V       | $4.5\Omega @ V_{GS} = 10V$ | 2.5A                         |

## Description

This new generation MOSFET features low on-resistance and fast switching, making it ideal for high efficiency power management applications.

## Applications

- Motor Control
- Backlighting
- DC-DC Converters
- Power Management Functions

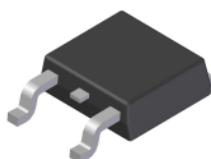
## Features

- Low Input Capacitance
- High  $BV_{DSS}$  Rating for Power Application
- Low Input/Output Leakage
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

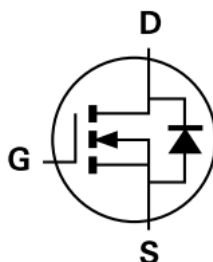
## Mechanical Data

- Case: TO252 (DPAK) (Type TH)
- Case Material: Molded Plastic, UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208<sup>(3)</sup>
- Terminal Connections: See Diagram Below
- Weight: TO252 (DPAK) (Type TH) – 0.33 grams (Approximate)

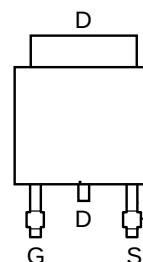
TO252 (DPAK) (Type TH)



Top View



Equivalent Circuit



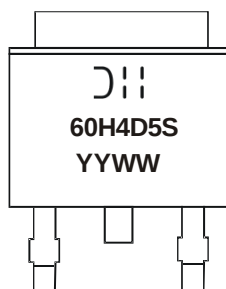
Top View  
Pin Out Configuration

## Ordering Information (Note 4)

| Part Number     | Case                   | Packaging         |
|-----------------|------------------------|-------------------|
| DMN60H4D5SK3-13 | TO252 (DPAK) (Type TH) | 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](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



Δ = Manufacturer's Marking  
 60H4D5S = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY or YY = Last Two Digits of Year (ex: 17 = 2017)  
 WW or 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> | 600   | V    |
| Gate-Source Voltage                                        |                 |                         | V <sub>GSS</sub> | ±30   | V    |
| Continuous Drain Current (Note 5)<br>V <sub>GS</sub> = 10V | Steady<br>State | T <sub>C</sub> = +25°C  | I <sub>D</sub>   | 2.5   | A    |
|                                                            |                 | T <sub>C</sub> = +100°C |                  | 1.6   |      |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)         |                 |                         | I <sub>DM</sub>  | 2.6   | A    |
| Avalanche Current (Note 6)                                 | L = 60mH        |                         | I <sub>AS</sub>  | 1.0   | A    |
| Avalanche Energy (Note 6)                                  | L = 60mH        |                         | E <sub>AS</sub>  | 33    | mJ   |
| Peak Diode Recovery dv/dt (Note 7)                         |                 |                         | dv/dt            | 5     | V/ns |

**Thermal Characteristics**

| Characteristic                                |                         | Symbol                            | Max         | Unit |
|-----------------------------------------------|-------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 5)                    | T <sub>C</sub> = +25°C  | P <sub>D</sub>                    | 41          | W    |
|                                               | T <sub>C</sub> = +100°C |                                   | 16          |      |
| Thermal Resistance, Junction to Case (Note 5) | T <sub>C</sub> = +25°C  | R <sub>θJC</sub>                  | 3.0         | °C/W |
| Operating and Storage Temperature Range       |                         | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °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>   | 600 | —     | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                |
| Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C | I <sub>DSS</sub>    | —   | —     | 1    | μA   | V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V                                                |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | —   | —     | ±100 | nA   | V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V                                                |
| <b>ON CHARACTERISTICS (Note 7)</b>                     |                     |     |       |      |      |                                                                                             |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | 2.0 | —     | 4.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                  |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | —   | —     | 4.5  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 1.0A                                                |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | —   | —     | 1.5  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 2.0A                                                 |
| <b>DYNAMIC CHARACTERISTICS (Note 6)</b>                |                     |     |       |      |      |                                                                                             |
| Input Capacitance                                      | C <sub>iss</sub>    | —   | 273.5 | —    | pF   | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                  |
| Output Capacitance                                     | C <sub>oss</sub>    | —   | 30.8  | —    |      |                                                                                             |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | —   | 4.2   | —    |      |                                                                                             |
| Gate Resistance                                        | R <sub>g</sub>      | —   | 3.5   | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz                                      |
| Total Gate Charge                                      | Q <sub>g</sub>      | —   | 8.2   | —    | nC   | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 480V,<br>I <sub>D</sub> = 2A                       |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —   | 1.1   | —    |      |                                                                                             |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —   | 3.7   | —    |      |                                                                                             |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | —   | 9.8   | —    | ns   | V <sub>GS</sub> = 10V, V <sub>DD</sub> = 300V,<br>R <sub>G</sub> = 25Ω, I <sub>D</sub> = 2A |
| Turn-On Rise Time                                      | t <sub>R</sub>      | —   | 10.5  | —    | ns   |                                                                                             |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | —   | 33.4  | —    | ns   |                                                                                             |
| Turn-Off Fall Time                                     | t <sub>F</sub>      | —   | 13.2  | —    | ns   | dI/dt = 100A/μs, V <sub>GS</sub> = 0V,<br>I <sub>F</sub> = 2A                               |
| Body Diode Reverse Recovery Time                       | t <sub>RR</sub>     | —   | 172   | —    | ns   |                                                                                             |
| Body Diode Reverse Recovery Charge                     | Q <sub>RR</sub>     | —   | 682   | —    | μC   |                                                                                             |

- Notes:
5. Device mounted on an infinite heatsink.
  6. Guaranteed by design. Not subject to production testing.
  7. Short duration pulse test used to minimize self-heating effect.

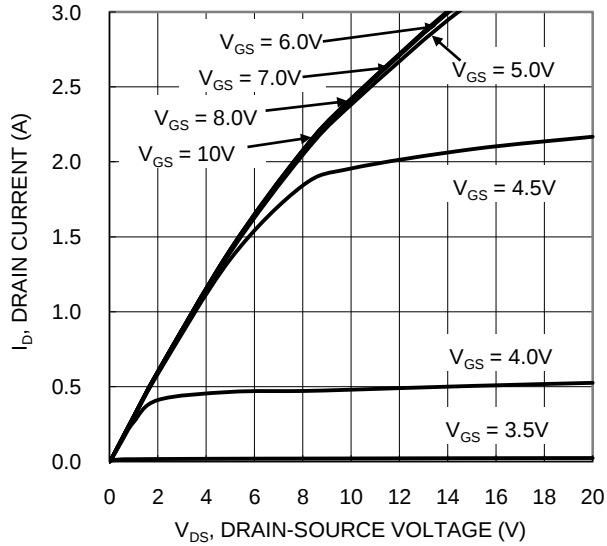


Figure 1. Typical Output Characteristic

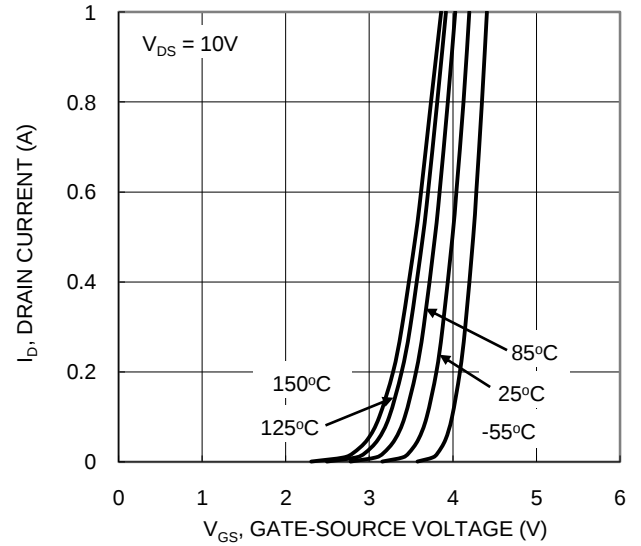


Figure 2. Typical Transfer Characteristic

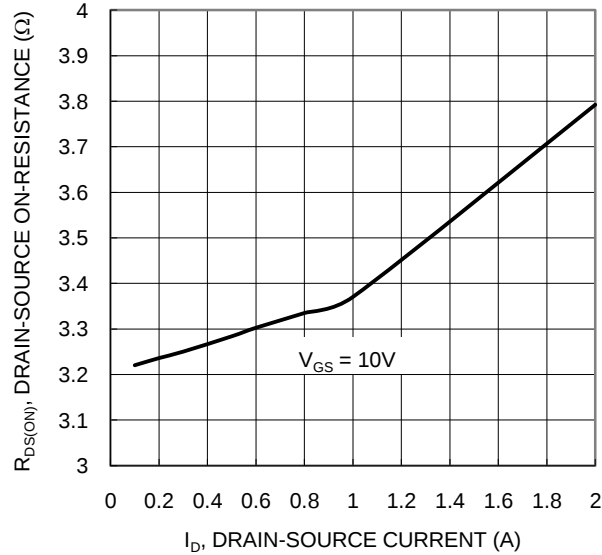


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

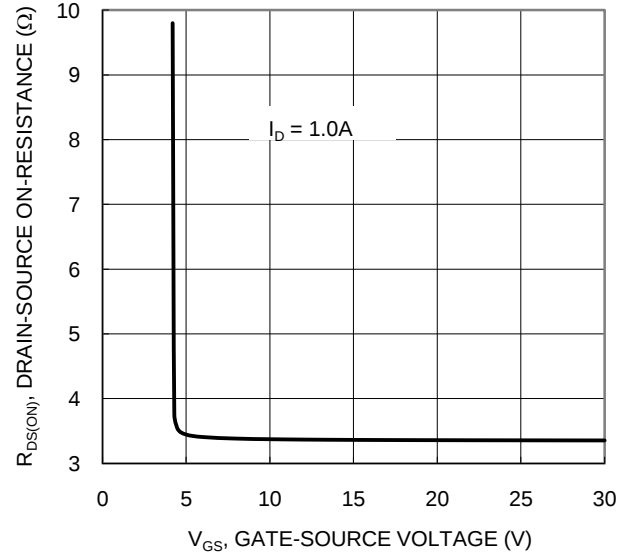


Figure 4. Typical Transfer Characteristic

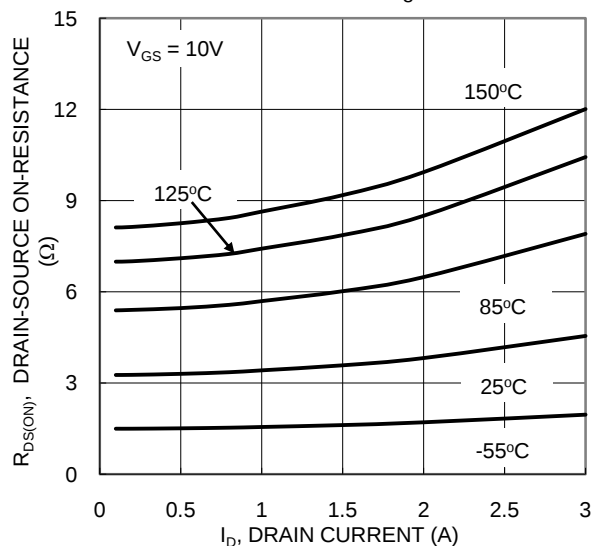


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

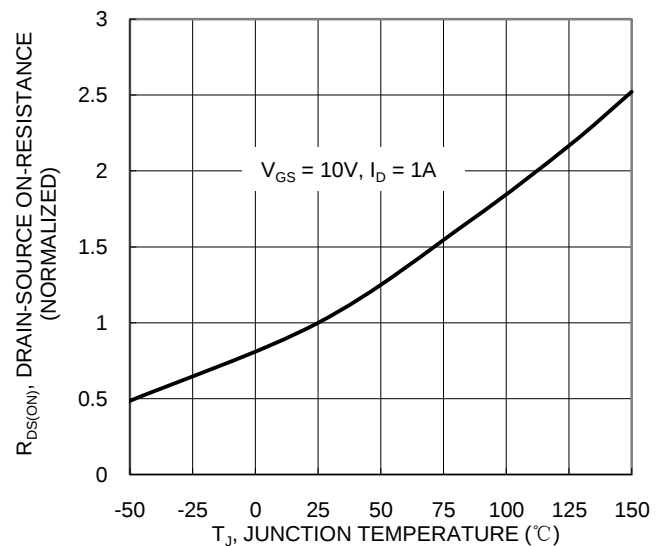
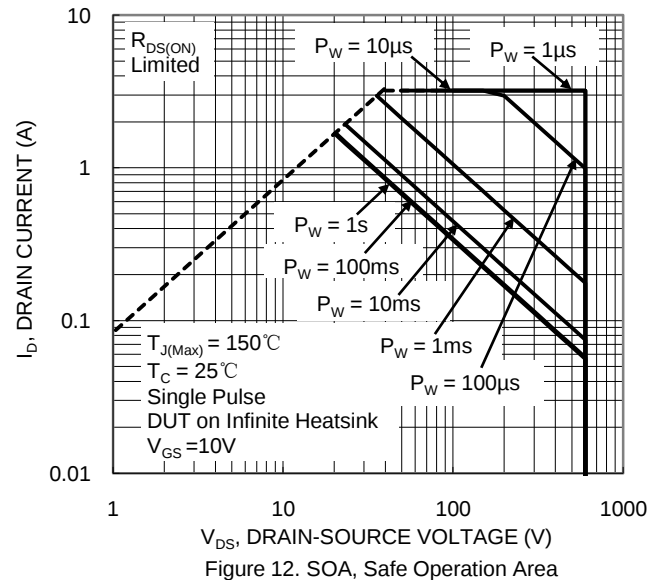
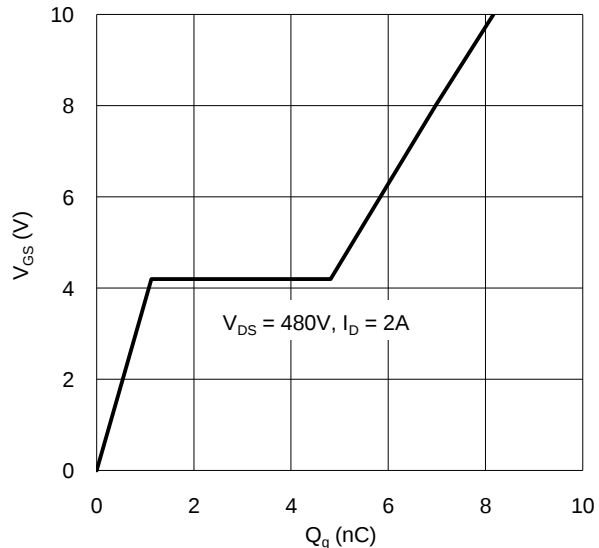
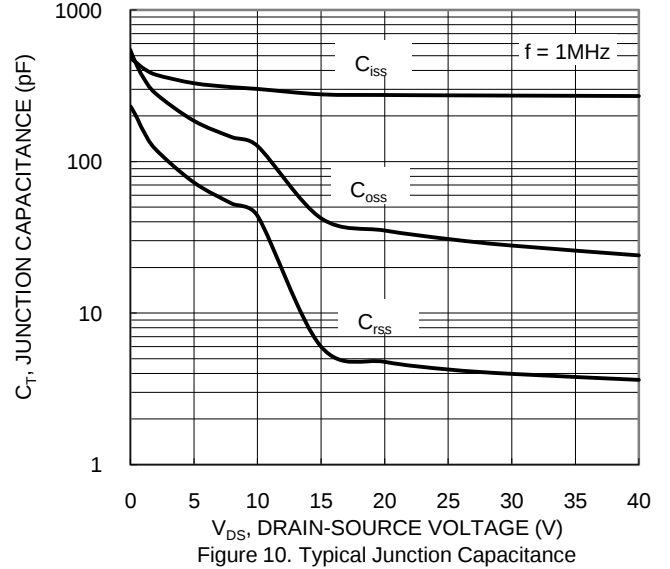
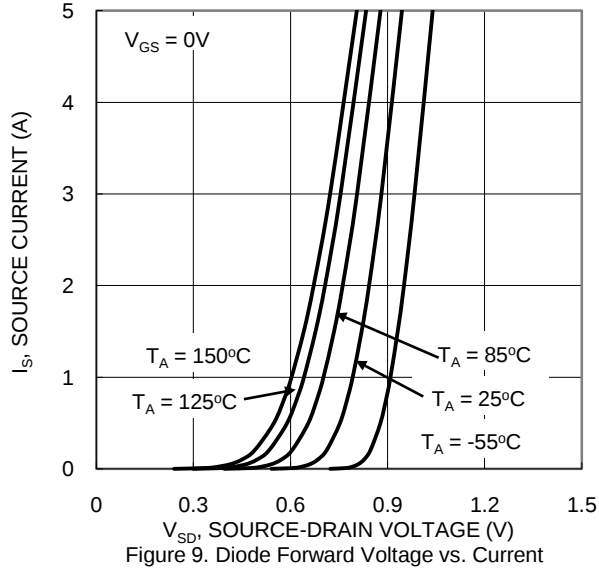
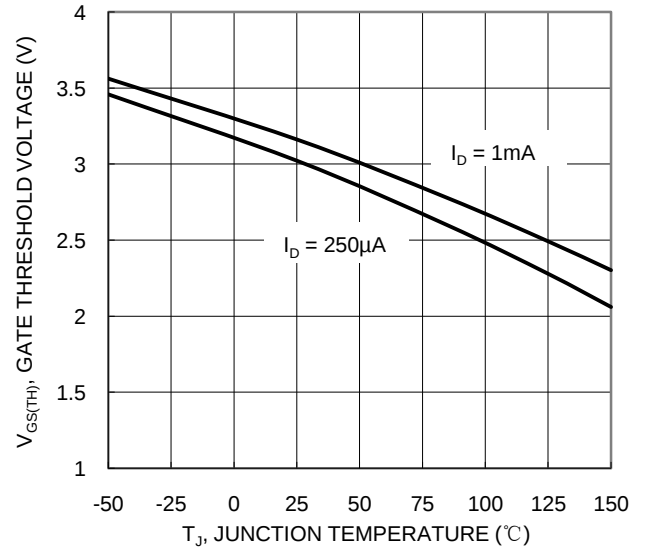
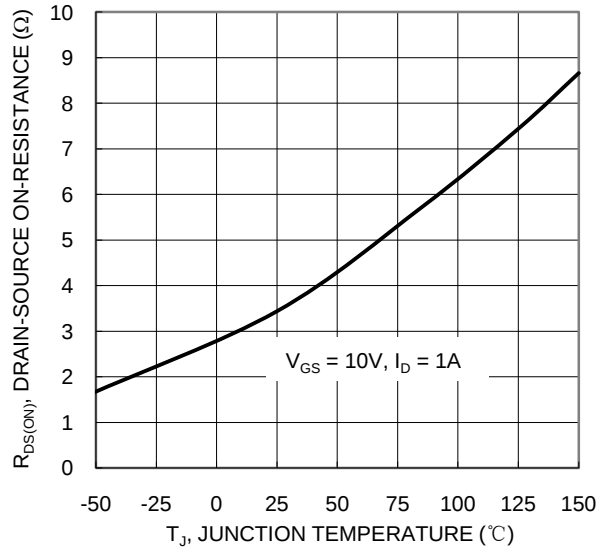


Figure 6. On-Resistance Variation with Temperature



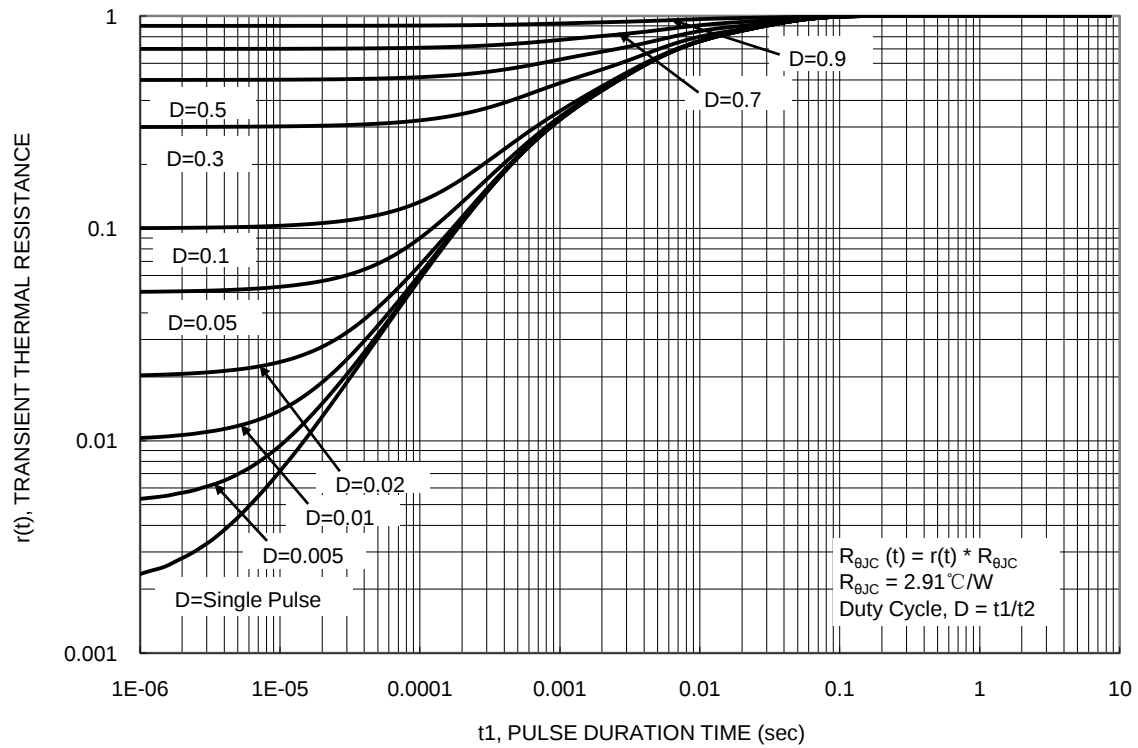
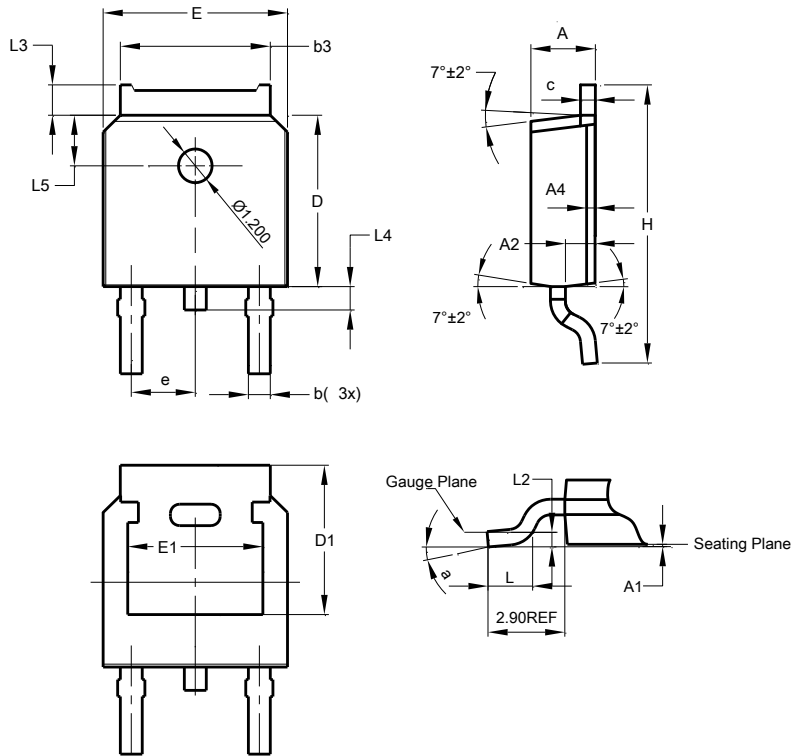


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

### TO252 (DPAK) (Type TH)

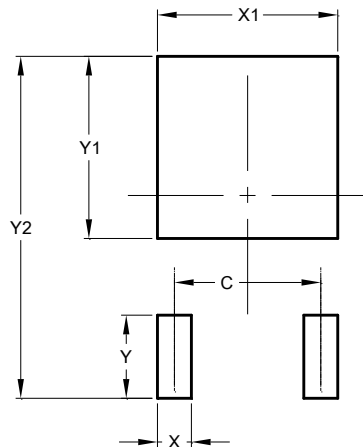


| TO252 (DPAK)<br>(Type TH) |           |       |       |
|---------------------------|-----------|-------|-------|
| Dim                       | Min       | Max   | Typ   |
| A                         | 2.20      | 2.38  | 2.30  |
| A1                        | 0.00      | 0.10  | -     |
| A2                        | 0.97      | 1.17  | 1.07  |
| A4                        | 0.10 REF  |       |       |
| b                         | 0.72      | 0.85  | 0.78  |
| b3                        | 5.23      | 5.45  | 5.33  |
| c                         | 0.47      | 0.58  | 0.53  |
| D                         | 6.00      | 6.20  | 6.10  |
| D1                        | 5.30 REF  |       |       |
| e                         | 2.286 BSC |       |       |
| E                         | 6.50      | 6.70  | 6.60  |
| E1                        | 4.70      | 4.92  | 4.83  |
| H                         | 9.90      | 10.10 | 10.30 |
| L                         | 1.40      | 1.70  | 1.60  |
| L2                        | 0.51 BSC  |       |       |
| L3                        | 0.90      | 1.25  | -     |
| L4                        | 0.60      | 1.00  | 0.80  |
| L5                        | 1.70      | 1.90  | 1.80  |
| a                         | 0°        | 8°    | -     |
| All Dimensions in mm      |           |       |       |

## Suggested Pad Layout

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

### TO252 (DPAK) (Type TH)



| 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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