

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> max       | I <sub>D</sub> max<br>T <sub>C</sub> = +25°C |
|-------------------|-------------------------------|----------------------------------------------|
| 60V               | 12mΩ @ V <sub>GS</sub> = 10V  | 60A                                          |
|                   | 18mΩ @ V <sub>GS</sub> = 4.5V | 50A                                          |

## Description and Applications

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

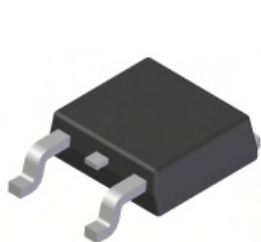
- Body Control Electronics
- DC/DC Converters

## Features

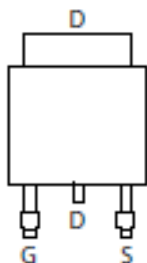
- Rated to +175°C - Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low On-Resistance
- Low Input Capacitance
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

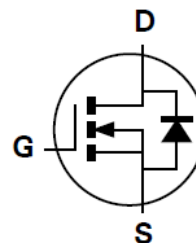
- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.33 grams (Approximate)



Top View



Pin Out Top View



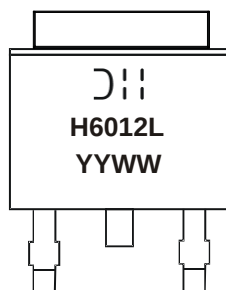
Equivalent Circuit

## Ordering Information (Note 4)

| Part Number    | Case  | Packaging        |
|----------------|-------|------------------|
| DMNH6012LK3-13 | TO252 | 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](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



DII = Manufacturer's Marking  
 H6012L = 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> | ±20      | V    |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V | I <sub>D</sub>   | 60<br>40 | A    |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)     | I <sub>DM</sub>  | 120      | A    |
| Maximum Continuous Body Diode Forward Current (Note 6)  | I <sub>S</sub>   | 2.6      | A    |
| Avalanche Current, L = 0.1mH (Note 7)                   | I <sub>AS</sub>  | 45       | A    |
| Avalanche Energy, L = 0.1mH (Note 7)                    | E <sub>AS</sub>  | 100      | 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>                    | 2.0         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 74          | °C/W |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 3.8         | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 40          | °C/W |
| Thermal Resistance, Junction to Case             | R <sub>θJC</sub>                  | 1.2         | °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 8)</b>                     |                     |     |      |      |      |                                                                                         |
| Drain-Source Breakdown Voltage                          | BV <sub>DSS</sub>   | 60  | —    | —    | 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> = 60V, V <sub>GS</sub> = 0V                                             |
| Gate-Source Leakage                                     | I <sub>GSS</sub>    | —   | —    | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                            |
| <b>ON CHARACTERISTICS (Note 8)</b>                      |                     |     |      |      |      |                                                                                         |
| Gate Threshold Voltage                                  | V <sub>GS(TH)</sub> | 1   | —    | 3    | 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    | 12   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 25A                                             |
|                                                         |                     | —   | 10   | 18   |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 25A                                            |
| Diode Forward Voltage                                   | V <sub>SD</sub>     | —   | 0.7  | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.7A                                             |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>                 |                     |     |      |      |      |                                                                                         |
| Input Capacitance                                       | C <sub>iss</sub>    | —   | 1926 | —    | pF   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V, f = 1MHz                                   |
| Output Capacitance                                      | C <sub>oss</sub>    | —   | 330  | —    | pF   |                                                                                         |
| Reverse Transfer Capacitance                            | C <sub>rss</sub>    | —   | 112  | —    | pF   |                                                                                         |
| Gate Resistance                                         | R <sub>g</sub>      | —   | 2.0  | —    | 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>      | —   | 16.3 | —    | nC   | V <sub>DS</sub> = 30V, I <sub>D</sub> = 25A                                             |
| Total Gate Charge (V <sub>GS</sub> = 10V)               | Q <sub>g</sub>      | —   | 35.2 | —    | nC   |                                                                                         |
| Gate-Source Charge                                      | Q <sub>gs</sub>     | —   | 7.6  | —    | nC   |                                                                                         |
| Gate-Drain Charge                                       | Q <sub>gd</sub>     | —   | 6.9  | —    | nC   |                                                                                         |
| Turn-On Delay Time                                      | t <sub>D(ON)</sub>  | —   | 6.4  | —    | ns   | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 30V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 25A |
| Turn-On Rise Time                                       | t <sub>R</sub>      | —   | 11.9 | —    | ns   |                                                                                         |
| Turn-Off Delay Time                                     | t <sub>D(OFF)</sub> | —   | 16.5 | —    | ns   |                                                                                         |
| Turn-Off Fall Time                                      | t <sub>F</sub>      | —   | 5    | —    | ns   |                                                                                         |
| Body Diode Reverse Recovery Time                        | t <sub>RR</sub>     | —   | 28   | —    | ns   | I <sub>F</sub> = 25A, di/dt = 100A/µs                                                   |
| Body Diode Reverse Recovery Charge                      | Q <sub>RR</sub>     | —   | 23   | —    | nC   |                                                                                         |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

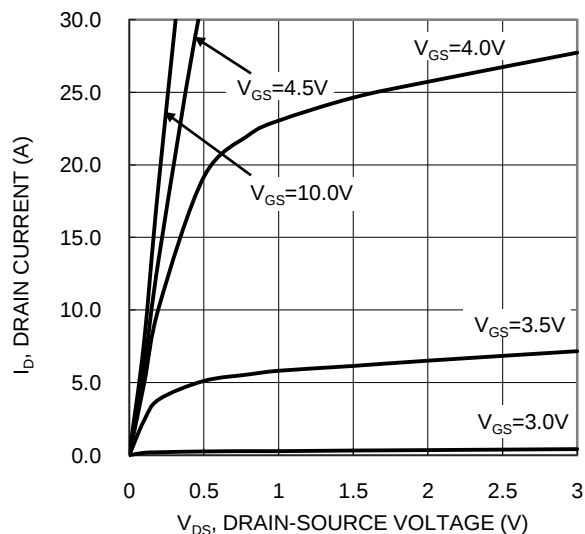


Figure 1. Typical Output Characteristic

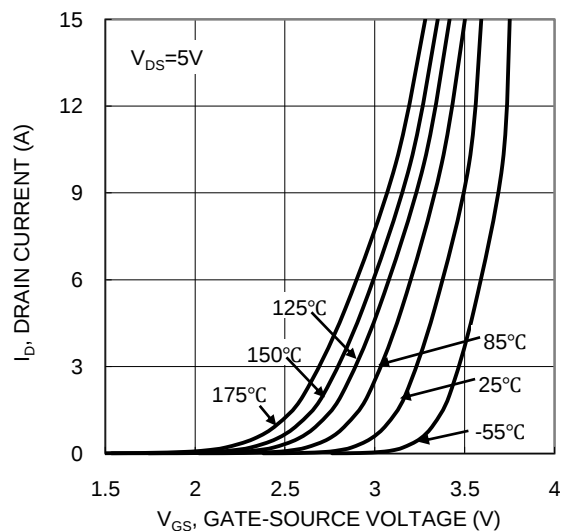


Figure 2. Typical Transfer Characteristic

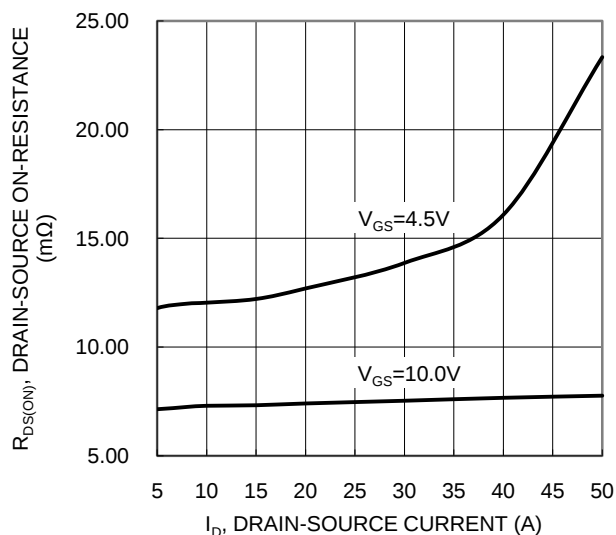


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

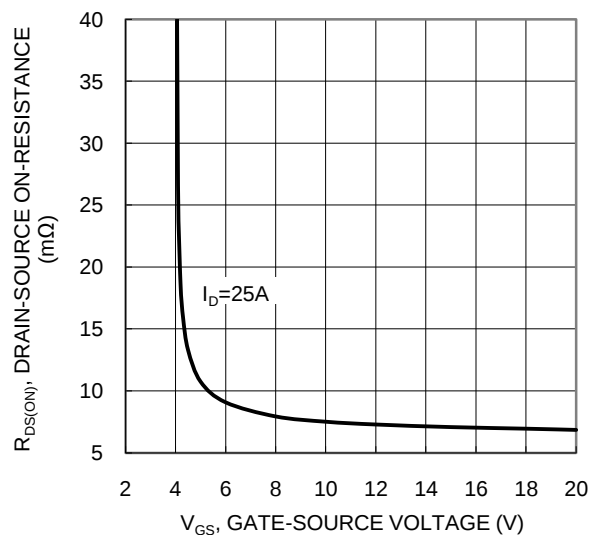


Figure 4. Typical Transfer Characteristic

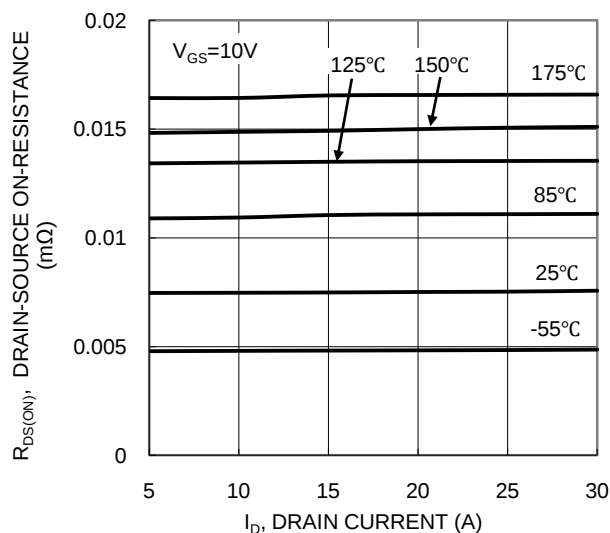


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

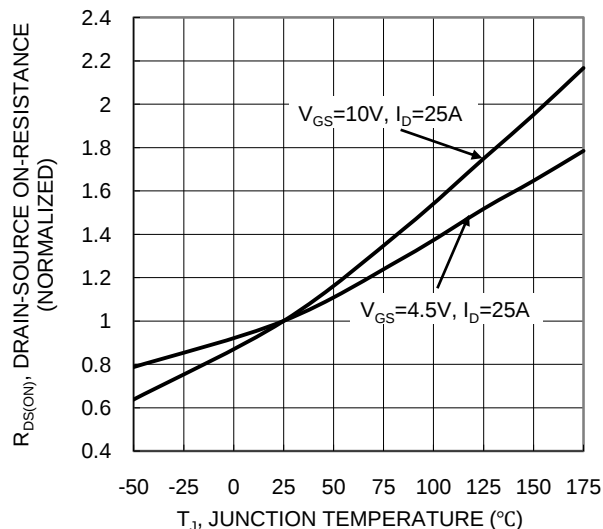
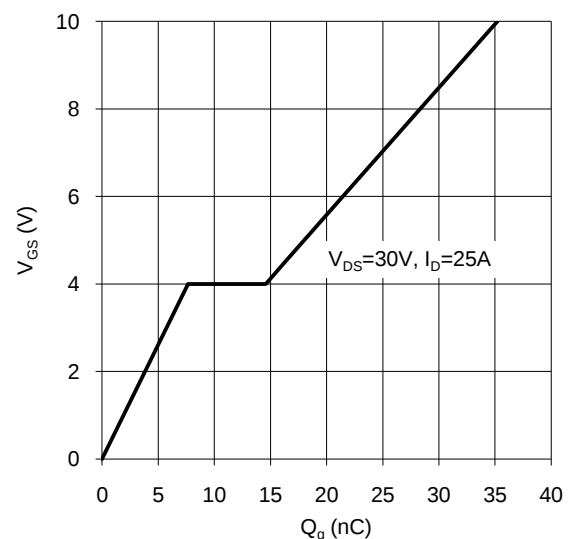
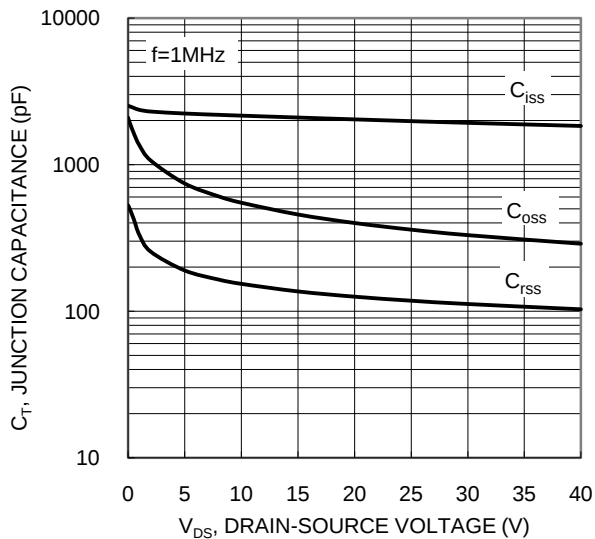
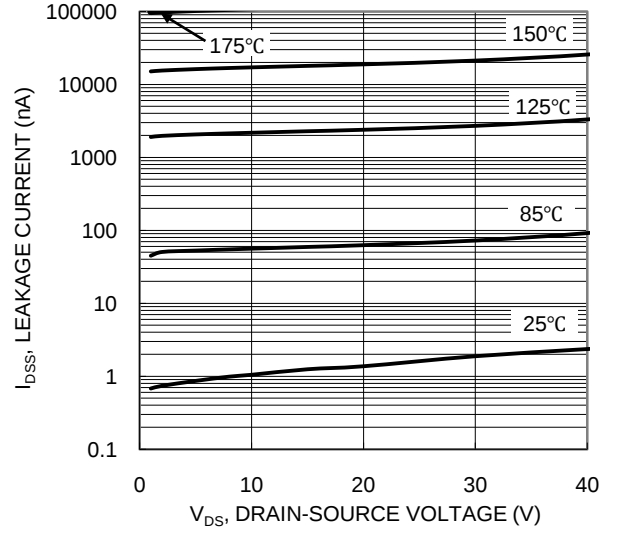
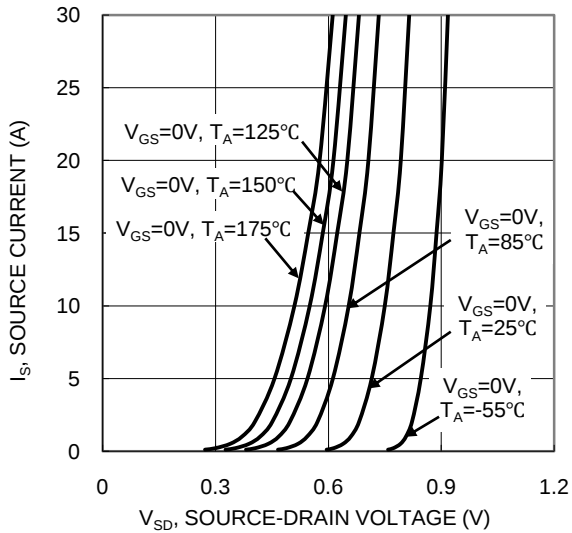
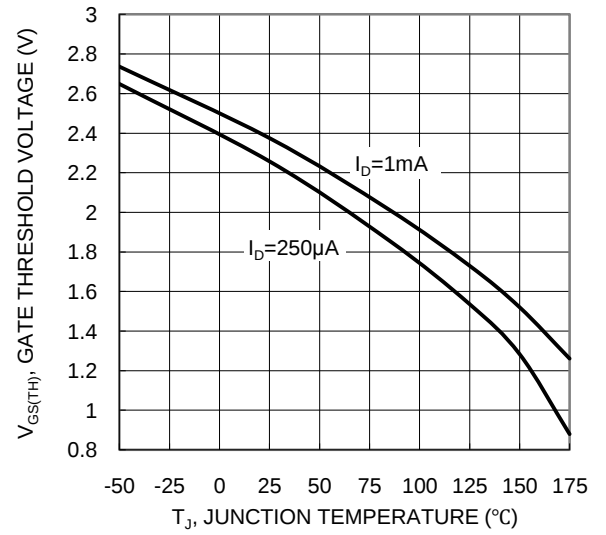
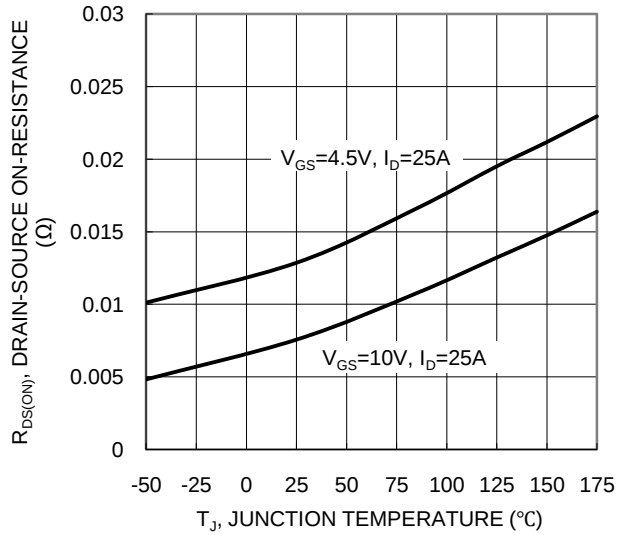
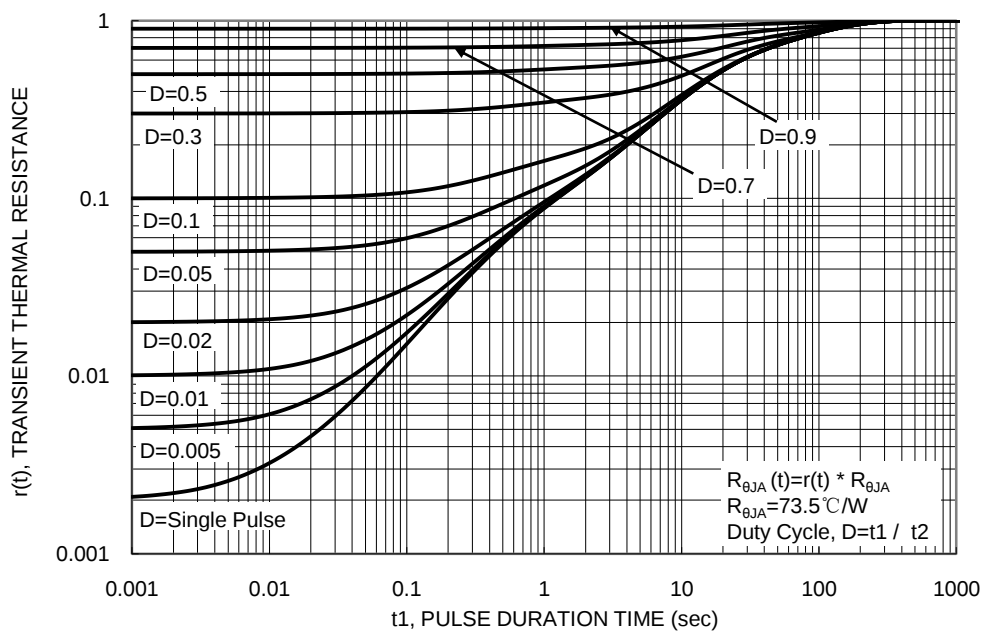
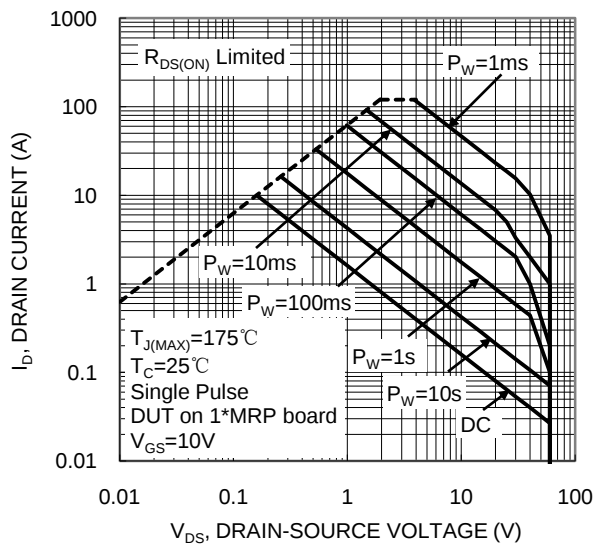


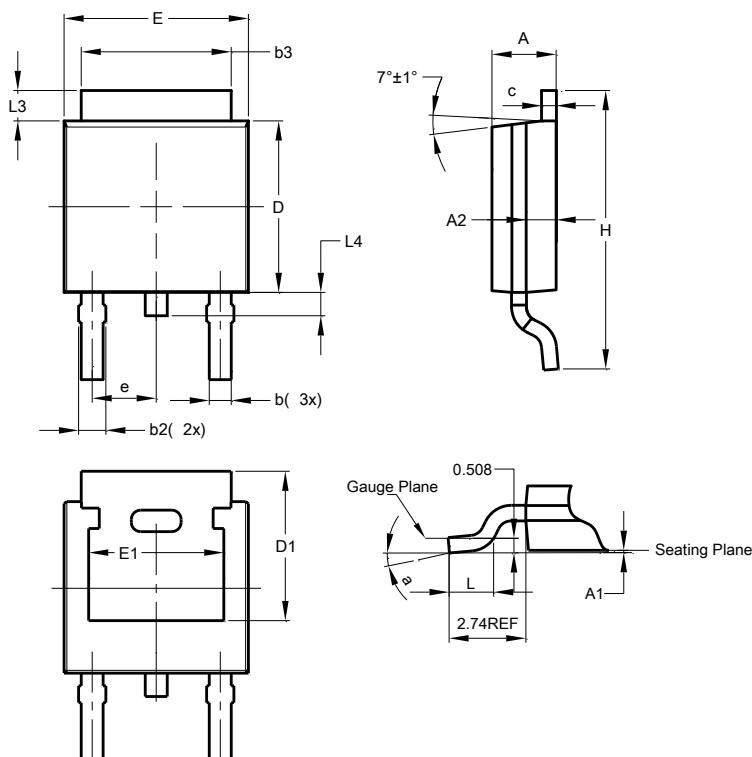
Figure 6. On-Resistance Variation with Temperature





## Package Outline Dimensions

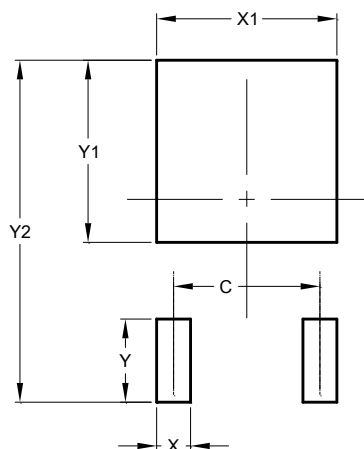
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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



| 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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