

## Product Summary

| $BV_{DSS}$ | $R_{DS(on)}$ max                       | $I_D$ max<br>$T_A = +25^\circ\text{C}$<br>(Note 6) |
|------------|----------------------------------------|----------------------------------------------------|
| -40V       | 25m $\Omega$ @ $V_{GS} = -10\text{V}$  | -8.6A                                              |
|            | 45m $\Omega$ @ $V_{GS} = -4.5\text{V}$ | -7.0A                                              |

## Description

This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

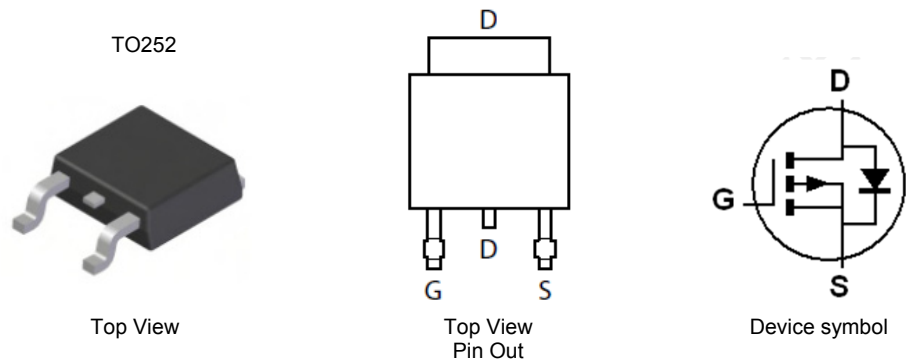
- Motor Control
- Backlighting
- DC-DC Converters
- Printer Equipment

## Features

- Low On-Resistance
- Fast Switching Speed
- Low Input/Output Leakage
- **Lead-Free Finish; RoHS compliant (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Available (Note 4)**

## Mechanical Data

- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See diagram below
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208 
- Weight: 0.315 grams (approximate)

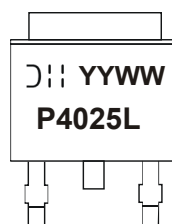


## Ordering Information (Note 4 & 5)

| Part Number    | Compliance | Case  | Packaging         |
|----------------|------------|-------|-------------------|
| DMP4025LK3Q-13 | Automotive | 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](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. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_grade\\_definitions/](http://www.diodes.com/quality/product_grade_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



 = Manufacturer's Marking  
 P4025L = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 10 = 2010)  
 WW = Week (01 - 53)

**Maximum Ratings** (@T<sub>A</sub> = +25°C unless otherwise specified.)

| Characteristic                         |                        |                                  | Symbol           | Value | Units |
|----------------------------------------|------------------------|----------------------------------|------------------|-------|-------|
| Drain-Source Voltage                   |                        |                                  | V <sub>DSS</sub> | -40   | V     |
| Gate-Source Voltage                    |                        |                                  | V <sub>GSS</sub> | ±20   |       |
| Continuous Drain Current               | V <sub>GS</sub> = -10V | (Notes 7)                        | I <sub>D</sub>   | -8.6  | A     |
|                                        |                        | T <sub>A</sub> = +70°C (Notes 7) |                  | -6.9  |       |
|                                        |                        | (Notes 6)                        |                  | -6.7  |       |
| Pulsed Drain Current                   | V <sub>GS</sub> = -10V | (Notes 8)                        | I <sub>DM</sub>  | -35   |       |
| Continuous Source Current (Body diode) |                        | (Notes 8)                        | I <sub>S</sub>   | -8.6  |       |
| Pulsed Source Current (Body diode)     |                        | (Notes 8)                        | I <sub>SM</sub>  | -35   |       |

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

| Characteristic                          |           | Symbol                            | Value       | Unit |
|-----------------------------------------|-----------|-----------------------------------|-------------|------|
| Power Dissipation                       | (Notes 6) | P <sub>D</sub>                    | 1.7         | W    |
|                                         | (Notes 7) |                                   | 2.78        |      |
| Thermal Resistance, Junction to Ambient | (Notes 6) | R <sub>θJA</sub>                  | 74          | °C/W |
|                                         | (Notes 7) |                                   | 45          |      |
| Thermal Resistance, Junction to Case    | (Notes 7) | R <sub>θJC</sub>                  | 7.1         |      |
| Thermal Resistance, Junction to Lead    | (Notes 9) | R <sub>θJL</sub>                  | 1.43        |      |
| Operating and Storage Temperature Range |           | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes:
6. For a device surface mounted on minimum recommended FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
  7. Same as note (5), except the device is surface mounted on 25mm X 25mm X 1.6mm FR4 PCB.
  8. Repetitive rating on 25mm X 25mm FR4 PCB, D=0.02, pulse width 300μs – pulse width by maximum junction temperature.
  9. Thermal resistance from junction to solder-point (at the end of the drain lead).

## Thermal Characteristics

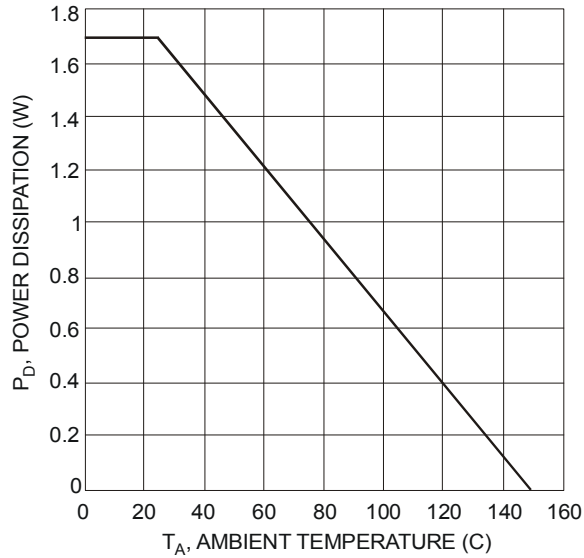


Figure 1. Power Dissipation vs. Ambient Temperature

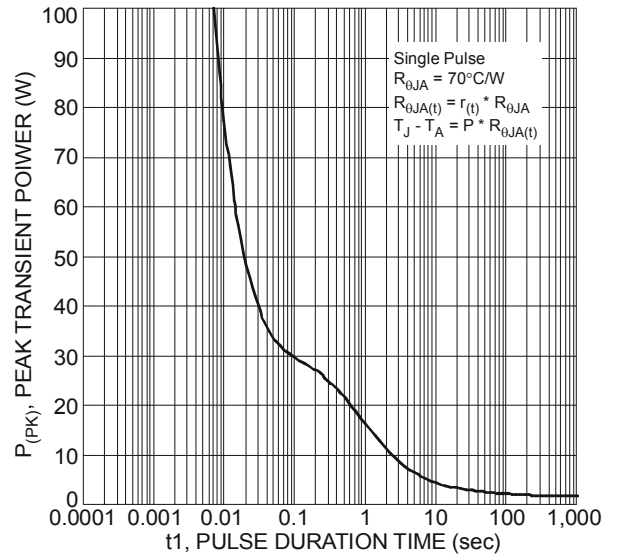


Figure 2. Single Pulse Maximum Power Dissipation

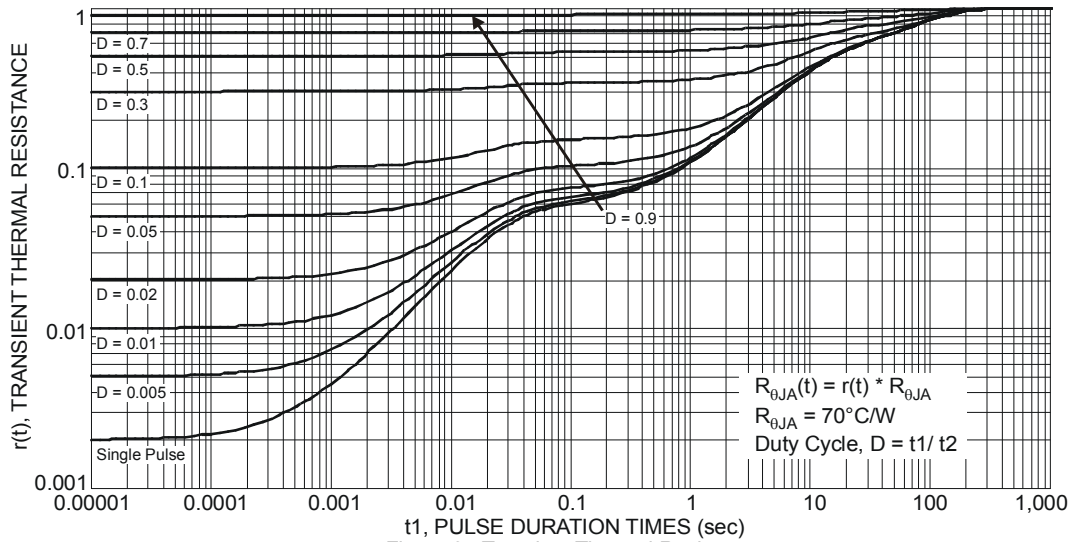


Figure 3. Transient Thermal Resistance

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

| Characteristic                              | Symbol              | Min  | Typ  | Max  | Unit | Test Condition                                                         |
|---------------------------------------------|---------------------|------|------|------|------|------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS</b>                  |                     |      |      |      |      |                                                                        |
| Drain-Source Breakdown Voltage              | BV <sub>DSS</sub>   | -40  | —    | —    | V    | I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V                          |
| Zero Gate Voltage Drain Current             | I <sub>DSS</sub>    | —    | —    | -1   | μA   | V <sub>DS</sub> = -40V, 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</b>                   |                     |      |      |      |      |                                                                        |
| Gate Threshold Voltage                      | V <sub>GS(th)</sub> | -0.8 | -1.3 | -1.8 | V    | I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>             |
| Static Drain-Source On-Resistance (Note 10) | R <sub>DS(on)</sub> | —    | 18   | 25   | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -3A                           |
|                                             |                     |      | 30   | 45   |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3A                          |
| Forward Transconductance (Notes 10 & 11)    | g <sub>fs</sub>     | —    | 16.6 | —    | S    | V <sub>DS</sub> = -5V, I <sub>D</sub> = -3A                            |
| Diode Forward Voltage (Note 10)             | V <sub>SD</sub>     | —    | -0.7 | -1   | V    | I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V                             |
| <b>DYNAMIC CHARACTERISTICS (Note 11)</b>    |                     |      |      |      |      |                                                                        |
| Input Capacitance                           | C <sub>iss</sub>    | —    | 1643 | —    | pF   | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V<br>f = 1MHz               |
| Output Capacitance                          | C <sub>oss</sub>    | —    | 179  | —    |      |                                                                        |
| Reverse Transfer Capacitance                | C <sub>rss</sub>    | —    | 128  | —    |      |                                                                        |
| Gate Resistance                             | R <sub>g</sub>      | —    | 6.43 | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                   |
| Total Gate Charge (Note 12)                 | Q <sub>g</sub>      | —    | 14   | —    | nC   | V <sub>DS</sub> = -20V<br>I <sub>D</sub> = -3A                         |
| Total Gate Charge (Note 12)                 | Q <sub>g</sub>      | —    | 33.7 | —    |      |                                                                        |
| Gate-Source Charge (Note 12)                | Q <sub>gs</sub>     | —    | 5.5  | —    |      |                                                                        |
| Gate-Drain Charge (Note 12)                 | Q <sub>gd</sub>     | —    | 7.3  | —    |      |                                                                        |
| Turn-On Delay Time (Note 12)                | t <sub>D(on)</sub>  | —    | 6.9  | —    | ns   | V <sub>DD</sub> = -20V, V <sub>GS</sub> = -10V<br>I <sub>D</sub> = -3A |
| Turn-On Rise Time (Note 12)                 | t <sub>r</sub>      | —    | 14.7 | —    |      |                                                                        |
| Turn-Off Delay Time (Note 12)               | t <sub>D(off)</sub> | —    | 53.7 | —    |      |                                                                        |
| Turn-Off Fall Time (Note 12)                | t <sub>f</sub>      | —    | 30.9 | —    |      |                                                                        |

Notes:  
 10. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%.  
 11. For design aid only, not subject to production testing.  
 12. Switching characteristics are independent of operating junction temperatures.

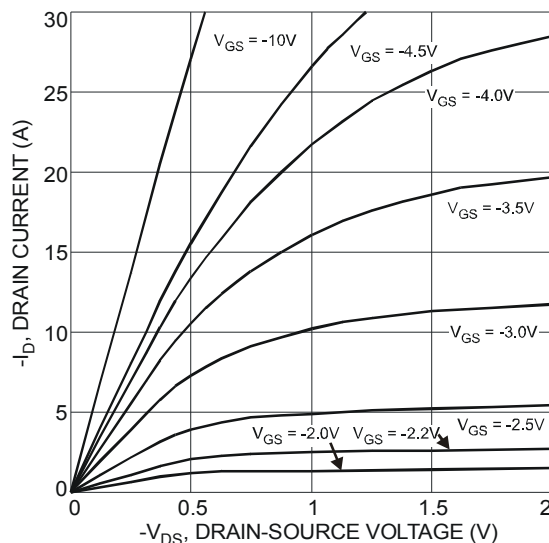
**Typical Characteristics**


Figure 4. Typical Output Characteristic

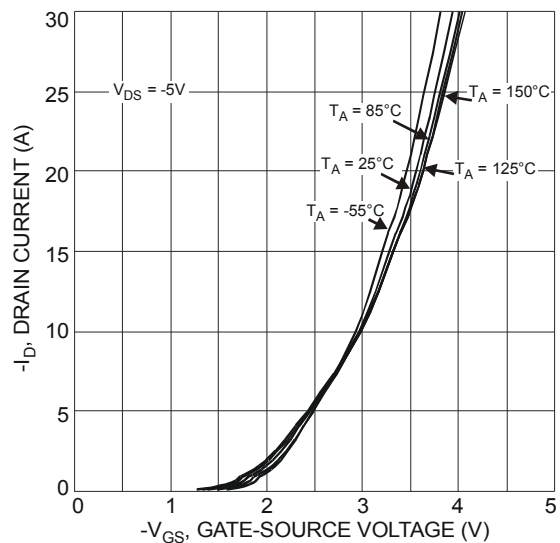


Figure 5. Typical Transfer Characteristic

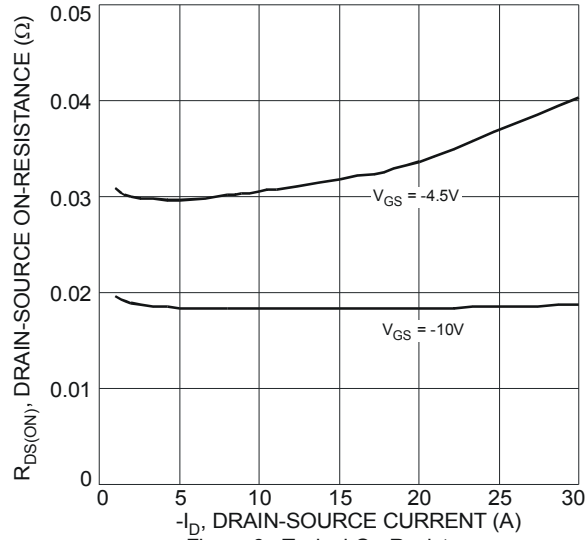


Figure 6. Typical On-Resistance vs. Drain Current and Gate Voltage

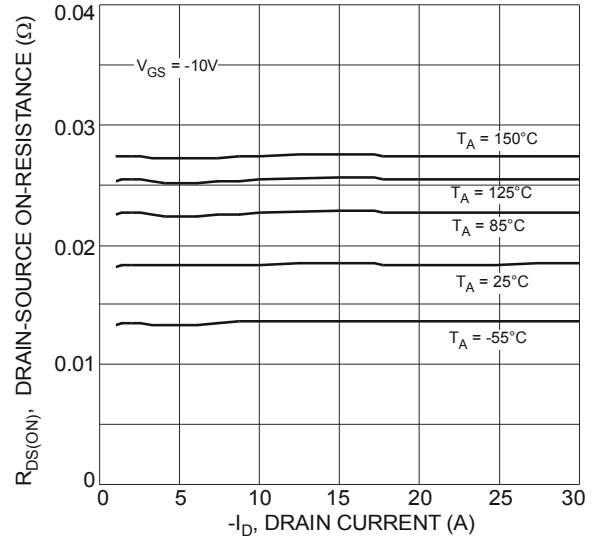


Figure 7. Typical On-Resistance vs. Drain Current and Temperature

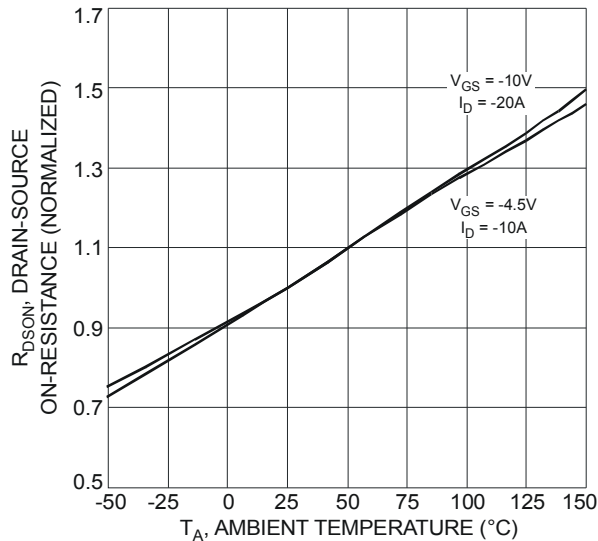


Figure 8. On-Resistance Variation with Temperature

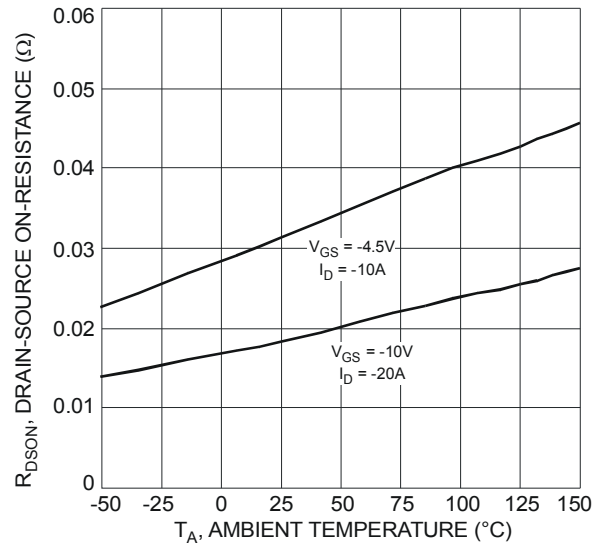


Figure 9. On-Resistance Variation with Temperature

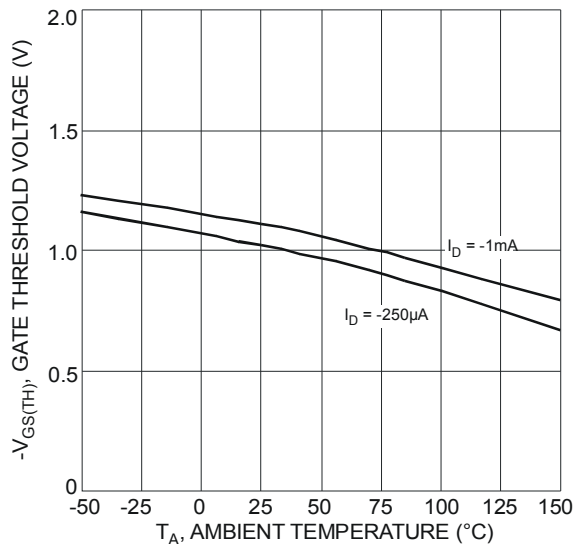


Figure 10. Gate Threshold Variation vs. Ambient Temperature

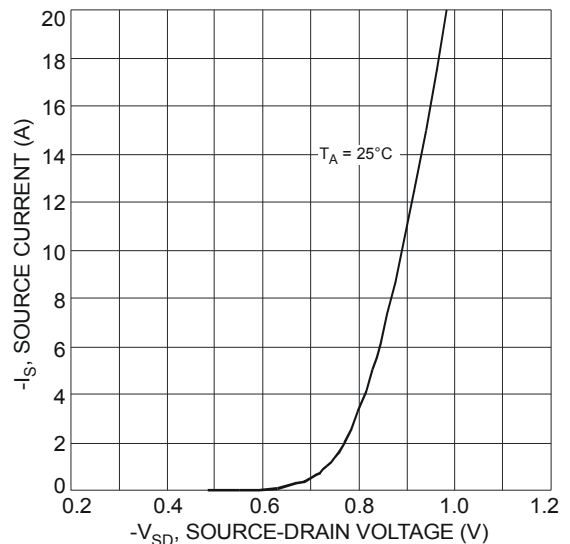


Figure 11. Diode Forward Voltage vs. Current

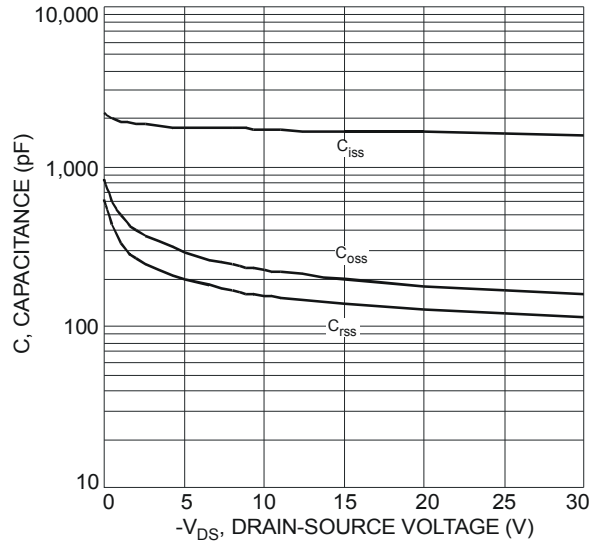


Figure 12. Typical Total Capacitance

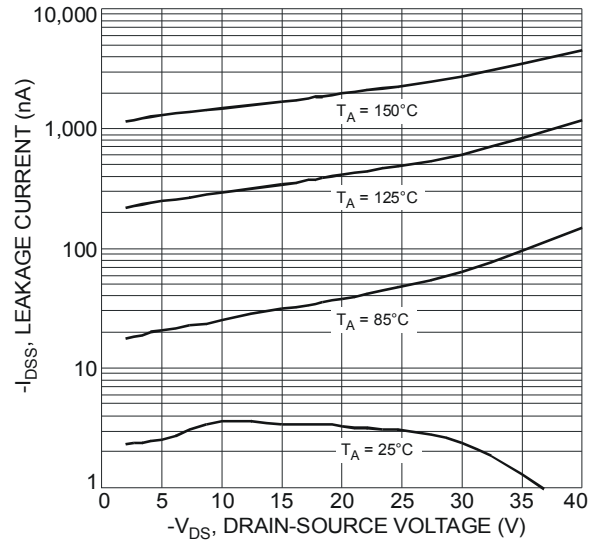


Figure 13. Typical Leakage Current vs. Drain-Source Voltage

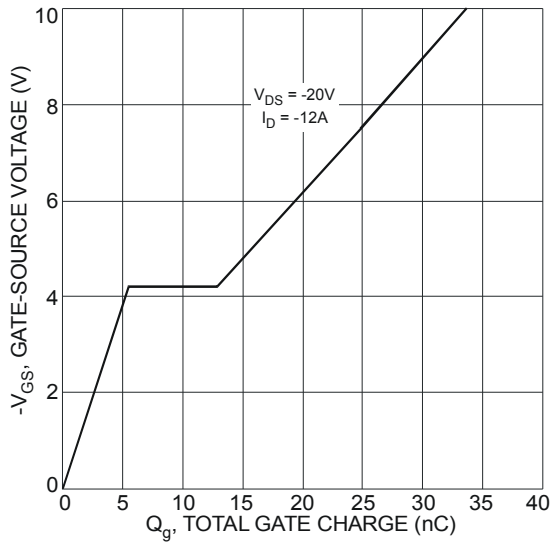


Figure 14. Gate-Charge Characteristics

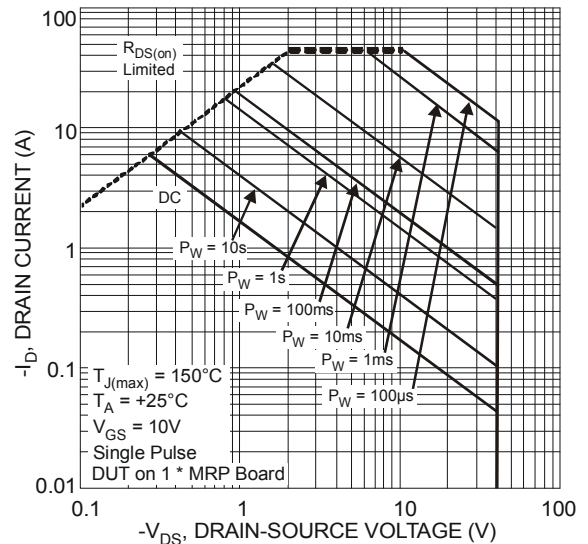
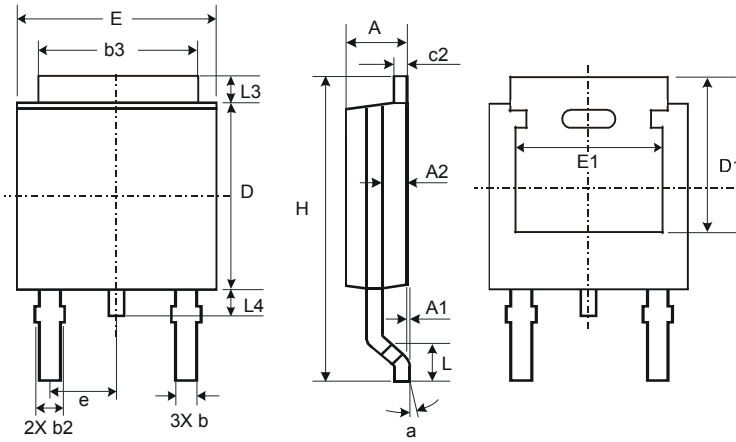


Figure 15. SOA, Safe Operation Area

## Package Outline Dimensions

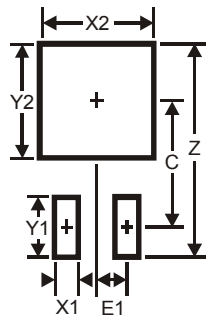
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| TO252                |      |       |       |
|----------------------|------|-------|-------|
| 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  |
| c2                   | 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) |
|------------|---------------|
| Z          | 11.6          |
| X1         | 1.5           |
| X2         | 7.0           |
| Y1         | 2.5           |
| Y2         | 7.0           |
| C          | 6.9           |
| E1         | 2.3           |

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