

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$                       | $I_D$<br>$T_A = +25^\circ\text{C}$ |
|---------------|------------------------------------|------------------------------------|
| -50V          | $6\Omega @ V_{GS} = -4\text{ V}$   | -200mA                             |
|               | $8\Omega @ V_{GS} = -2.5\text{ V}$ | -160mA                             |

## Description

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.

## Applications

- DC-DC Converters
- Power Management Functions
- Battery Operated Systems and Solid-State Relays

## Features and Benefits

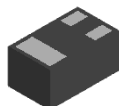
- Low On-Resistance
- ESD Protected Gate
- Low Input/Output Leakage
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

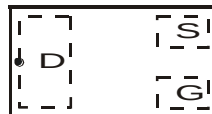
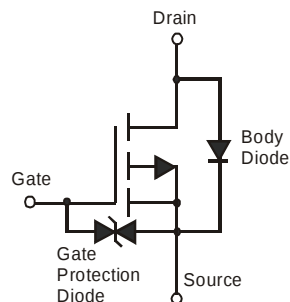
- Case: X1-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208 (e4)
- Terminal Connections: See Diagram
- Weight: 0.001 grams (Approximate)



X1-DFN1006-3



Bottom View


 Top View  
Internal Schematic


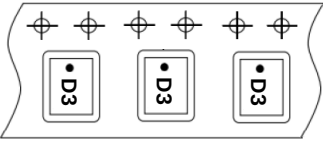
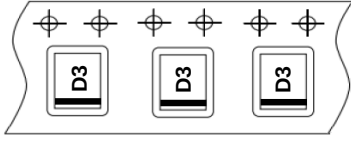
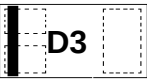
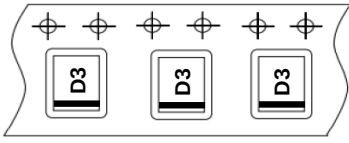
Equivalent Circuit

## Ordering Information (Note 4)

| Part Number   | Case         | Packaging          |
|---------------|--------------|--------------------|
| DMP56D0UFB-7  | X1-DFN1006-3 | 3,000/Tape & Reel  |
| DMP56D0UFB-7B | X1-DFN1006-3 | 10,000/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

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DMP56D0UFB-7  | <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>Top View<br/>Dot Denotes Drain Side</p> </div> <div style="text-align: center;"> <p>From date code 1527 (YYWW),<br/>this changes to:</p>  <p>Top View<br/>Bar Denotes Gate and Source Side</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;">   </div> |
| DMP56D0UFB-7B | <div style="text-align: center; margin-bottom: 10px;">  <p>Top View<br/>Bar Denotes Gate and Source Side</p> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-bottom: 10px;">  </div> <div style="text-align: right;"> D3 = Part Marking Code </div>                                                                                                                                                                                                                                                                                                                        |

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

| Characteristic                |        |                        | Symbol           | Value | Units |
|-------------------------------|--------|------------------------|------------------|-------|-------|
| Drain-Source Voltage          |        |                        | V <sub>DSS</sub> | -50   | V     |
| Gate-Source Voltage           |        |                        | V <sub>GSS</sub> | ±8    | V     |
| Drain Current (Note 5)        | Steady | T <sub>A</sub> = +25°C | I <sub>D</sub>   | -200  | mA    |
| Pulsed Drain Current (Note 6) |        |                        | I <sub>DM</sub>  | -700  | mA    |

## Thermal Characteristics

| Characteristic                                                           | Symbol                            | Value       | Units |
|--------------------------------------------------------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                                         | P <sub>D</sub>                    | 425         | mW    |
| Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 5) | R <sub>θJA</sub>                  | 275         | °C/W  |
| Operating and Storage Temperature Range                                  | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

Notes:

5. Device mounted on FR-4 PCB. t ≤ 5 sec.
6. Pulse width ≤ 10μs, Duty Cycle ≤ 1%.

# 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>   | -50  | —        | —      | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                                       |
| Zero Gate Voltage Drain Current          | I <sub>DSS</sub>    | —    | —        | -10    | μA   | V <sub>DS</sub> = -50V, V <sub>GS</sub> = 0V                                                        |
| Gate-Source Leakage                      | I <sub>GSS</sub>    | —    | —        | ±1     | μA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V                                                         |
| <b>ON CHARACTERISTICS (Note 7)</b>       |                     |      |          |        |      |                                                                                                     |
| Gate Threshold Voltage                   | V <sub>GS(th)</sub> | -0.5 | —        | -1.2   | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                         |
| Static Drain-Source On-Resistance        | R <sub>DS(on)</sub> | —    | 4.6<br>6 | 6<br>8 | Ω    | V <sub>GS</sub> = -4.0V, I <sub>D</sub> = -100mA<br>V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -80mA |
| Forward Transfer Admittance              | Y <sub>fs</sub>     | 100  | —        | —      | mS   | V <sub>DS</sub> = -5V, I <sub>D</sub> = -100mA                                                      |
| Diode Forward Voltage (Note 7)           | V <sub>SD</sub>     | —    | —        | -1.2   | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -100mA                                                       |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>  |                     |      |          |        |      |                                                                                                     |
| Input Capacitance                        | C <sub>iSS</sub>    | —    | 50.54    | —      | pF   | V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                         |
| Output Capacitance                       | C <sub>oss</sub>    | —    | 3.49     | —      | pF   |                                                                                                     |
| Reverse Transfer Capacitance             | C <sub>rss</sub>    | —    | 2.42     | —      | pF   |                                                                                                     |
| Gate Resistance                          | R <sub>G</sub>      | —    | 201      | —      | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                           |
| Total Gate Charge V <sub>GS</sub> = 4.5V | Q <sub>g</sub>      | —    | 0.58     | —      | nC   | V <sub>GS</sub> = -4V, V <sub>DS</sub> = -25V,<br>I <sub>D</sub> = -100mA                           |
| Gate-Source Charge                       | Q <sub>gs</sub>     | —    | 0.09     | —      | nC   |                                                                                                     |
| Gate-Drain Charge                        | Q <sub>gd</sub>     | —    | 0.14     | —      | nC   |                                                                                                     |
| Turn-On Delay Time                       | t <sub>D(on)</sub>  | —    | 4.46     | —      | nS   | V <sub>DD</sub> = -30V, I <sub>D</sub> = -0.27A,<br>V <sub>GEN</sub> = -4V, R <sub>GEN</sub> = 6Ω   |
| Turn-On Rise Time                        | t <sub>r</sub>      | —    | 6.63     | —      | nS   |                                                                                                     |
| Turn-Off Delay Time                      | t <sub>D(off)</sub> | —    | 21.9     | —      | nS   |                                                                                                     |
| Turn-Off Fall Time                       | t <sub>f</sub>      | —    | 15.0     | —      | nS   |                                                                                                     |

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to production testing.

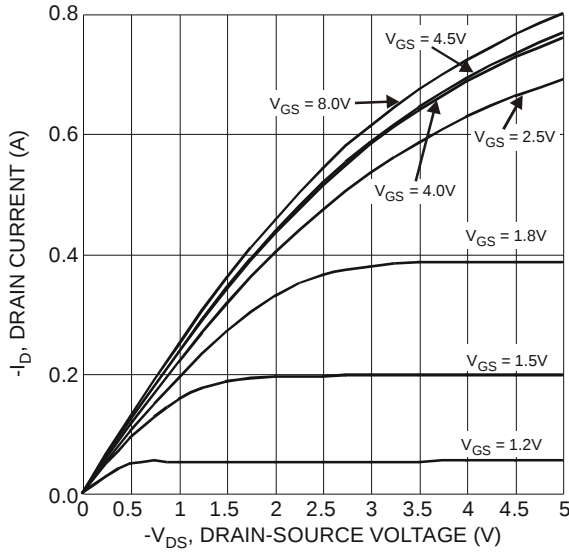


Figure 1 Typical Output Characteristics

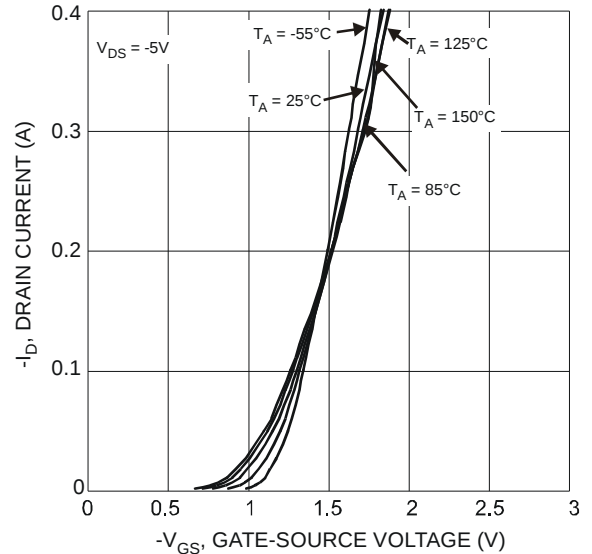


Figure 2 Typical Transfer Characteristics

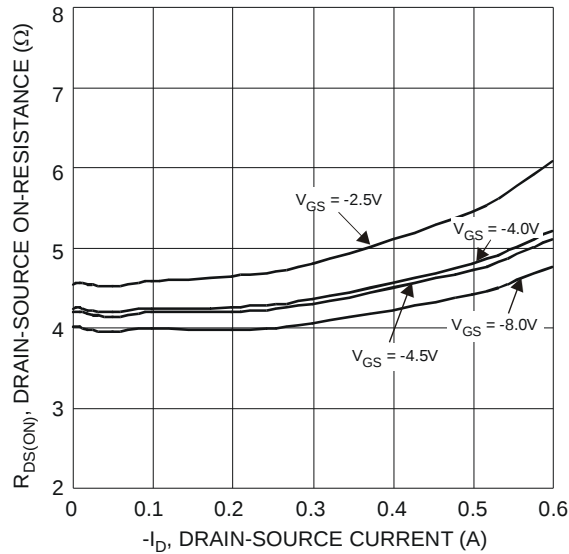


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

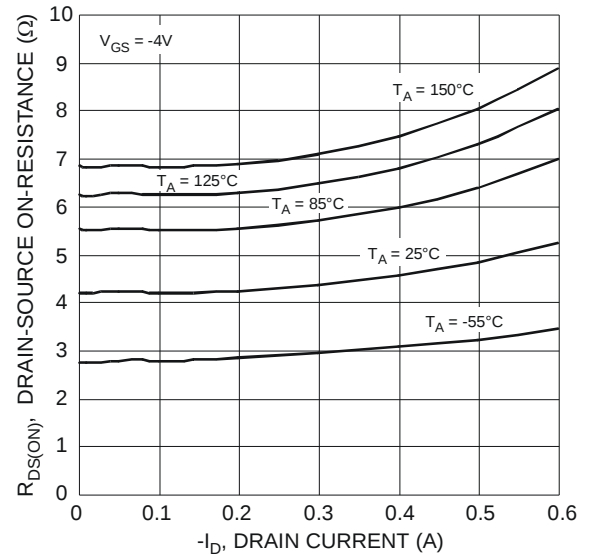


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

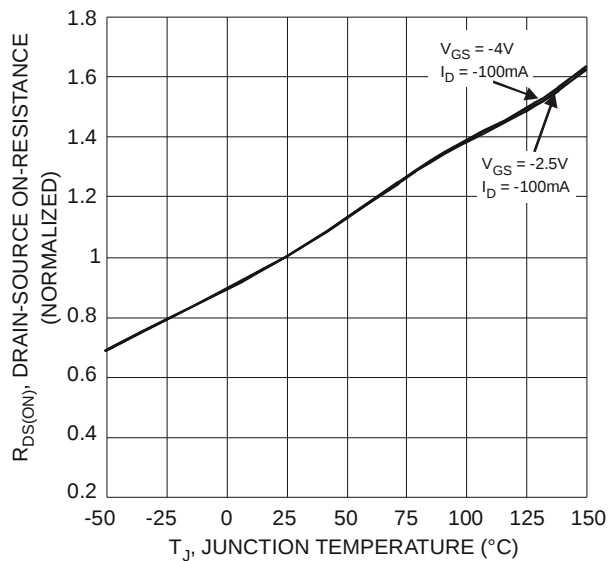


Figure 5 On-Resistance Variation with Temperature

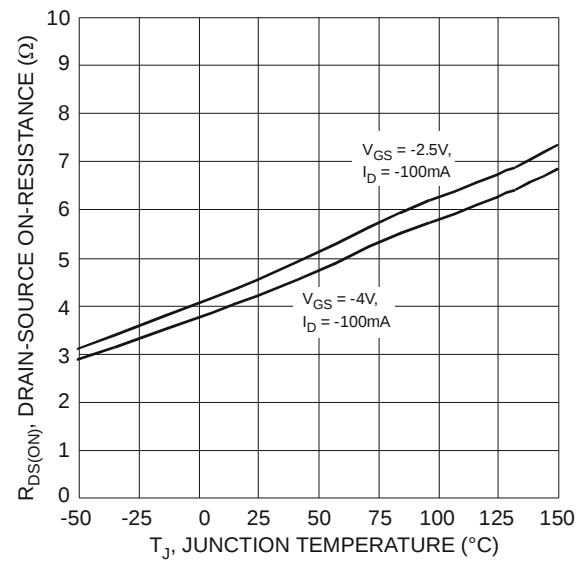


Figure 6 On-Resistance Variation with Temperature

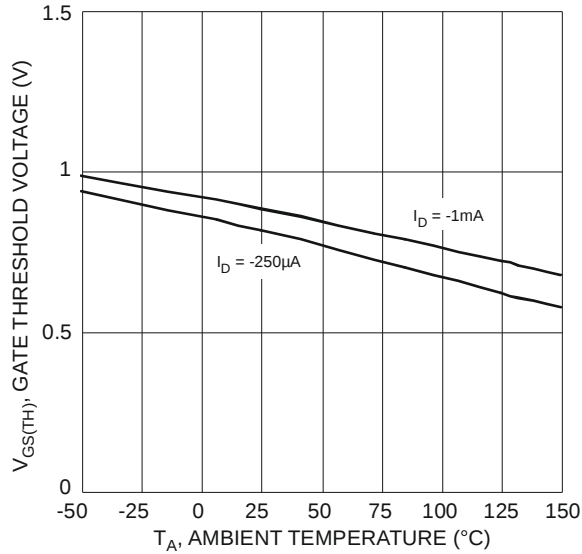


Figure 7 Gate Threshold Variation vs. Ambient Temperature

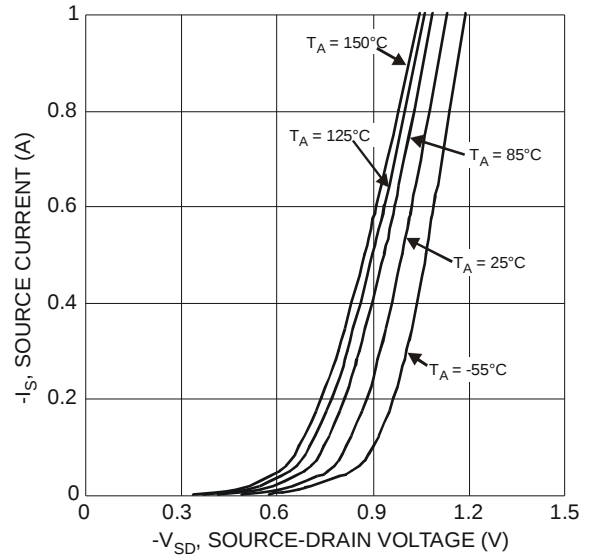


Figure 8 Diode Forward Voltage vs. Current

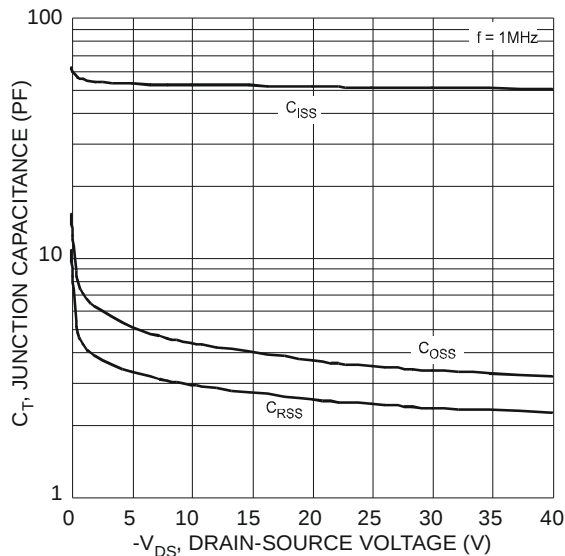


Figure 9 Typical Junction Capacitance

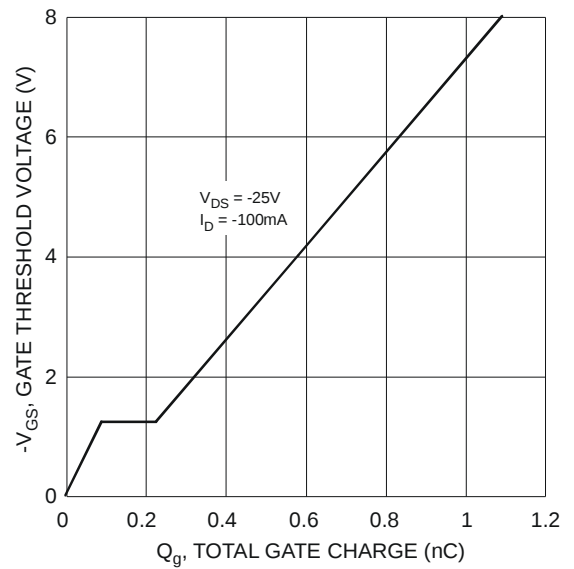
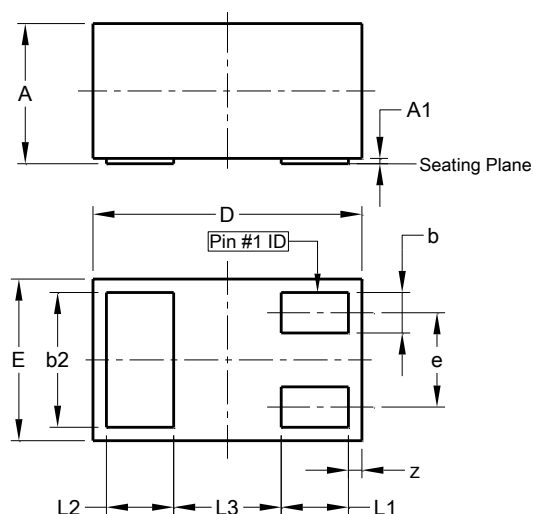


Figure 10 Gate Charge Characteristics

## Package Outline Dimensions

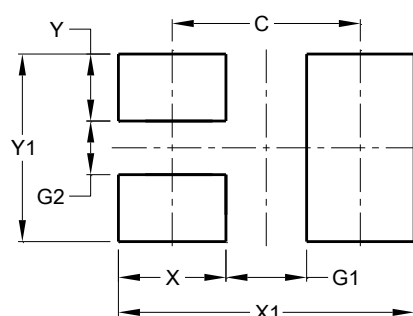
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| X1-DFN1006-3         |      |       |      |
|----------------------|------|-------|------|
| Dim                  | Min  | Max   | Typ  |
| A                    | 0.47 | 0.53  | 0.50 |
| A1                   | 0.00 | 0.05  | 0.03 |
| b                    | 0.10 | 0.20  | 0.15 |
| b2                   | 0.45 | 0.55  | 0.50 |
| D                    | 0.95 | 1.075 | 1.00 |
| E                    | 0.55 | 0.675 | 0.60 |
| e                    | -    | -     | 0.35 |
| L1                   | 0.20 | 0.30  | 0.25 |
| L2                   | 0.20 | 0.30  | 0.25 |
| L3                   | -    | -     | 0.40 |
| z                    | 0.02 | 0.08  | 0.05 |
| 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          | 0.70          |
| G1         | 0.30          |
| G2         | 0.20          |
| X          | 0.40          |
| X1         | 1.10          |
| Y          | 0.25          |
| Y1         | 0.70          |

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