## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | $I_D$ max<br>$T_A$ = +25°C |
|---|---|---|
| -20V | 54mΩ @ $V_{GS}$ = -4.5V | -2.5A |
| | 90mΩ @ $V_{GS}$ = -1.8V | -1.8A |

## Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD Protected Up To 3kV**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Description and Applications

This MOSFET has been 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.

- Backlighting
- Power Management Functions
- DC-DC Converters

## Mechanical Data

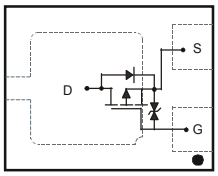
- Case: X2-DFN2015-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 e4
- Terminals Connections: See Diagram Below
- Weight: 0.008 grams (approximate)

X2-DFN2015-3


ESD PROTECTED TO 3kV


Top View


Bottom View



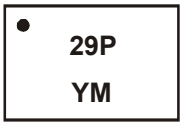
Internal Schematic

## Ordering Information (Note 4 & 5)

| Part Number | Compliance | Case | Packaging |
|---|---|---|---|
| DMP2069UFY4Q-7 | Automotive | X2-DFN2015-3 | 3,000/Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See 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/.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

## Marking Information




29P = Marking Code
YM = Date Code Marking
Y = Year (ex: W = 2009)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| Code | W | X | Y | Z | A | B | C |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |


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## Maximum Ratings @$T_A$ = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±8 | V |
| Continuous Drain Current (Note 6) | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | -2.5<br>-2.2 | A |
| Pulsed Drain Current (Note 7) | | | $I_{DM}$ | -12 | A |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 6) | $P_D$ | 0.53 | W |
| Thermal Resistance, Junction to Ambient @$T_A$ = +25°C | $R_{\theta JA}$ | 231 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics @$T_A$ = +25°C unless otherwise specified

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 8)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | -20 | — | — | V | $V_{GS}$ = 0V, $I_D$ = -250µA |
| Zero Gate Voltage Drain Current $T_J$ = +25°C | $I_{DSS}$ | — | — | -1.0 | µA | $V_{DS}$ = -20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -0.3 | -0.55 | -1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 36 | 54 | mΩ | $V_{GS}$ = -4.5V, $I_D$ = -2.5A |
| | | | 46 | 69 | | $V_{GS}$ = -2.5V, $I_D$ = -2.2A |
| | | | 60 | 90 | | $V_{GS}$ = -1.8V, $I_D$ = -2.0A |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | — | 8 | — | S | $V_{DS}$ = -5V, $I_D$ = -2.5A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 214 | — | pF | $V_{DS}$ = -10V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 104 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 25 | — | pF | |
| Gate Resistnace | $R_g$ | — | 250 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| **SWITCHING CHARACTERISTICS (Note 9)** | | | | | | |
| Total Gate Charge | $Q_g$ | — | 9.1 | — | nC | $V_{GS}$ = -4.5V, $V_{DS}$ = -10V, $I_D$ = -4A |
| Gate-Source Charge | $Q_{gs}$ | — | 1.5 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 1.7 | — | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 80.4 | 160 | ns | $V_{DS}$ = -10V, $V_{GS}$ = -4.5V,<br>$R_D$ = 2.5Ω, $R_G$ = 3.0Ω |
| Turn-On Rise Time | $t_r$ | — | 155.1 | 210 | ns | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 688.1 | 1376 | ns | |
| Turn-Off Fall Time | $t_f$ | — | 423.8 | 848 | ns | |

Notes: 6. Device mounted on FR-4 PCB with minimum recommended pad layout.
7. Repetitive rating, pulse width limited by junction temperature.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to production testing.


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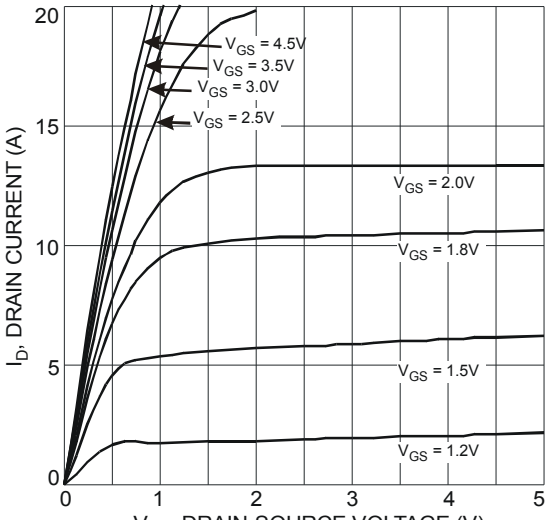



Fig. 1 Typical Output Characteristic

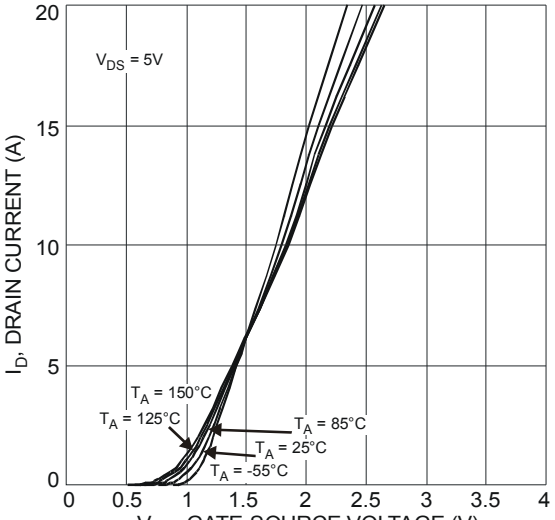



Fig. 2 Typical Transfer Characteristic

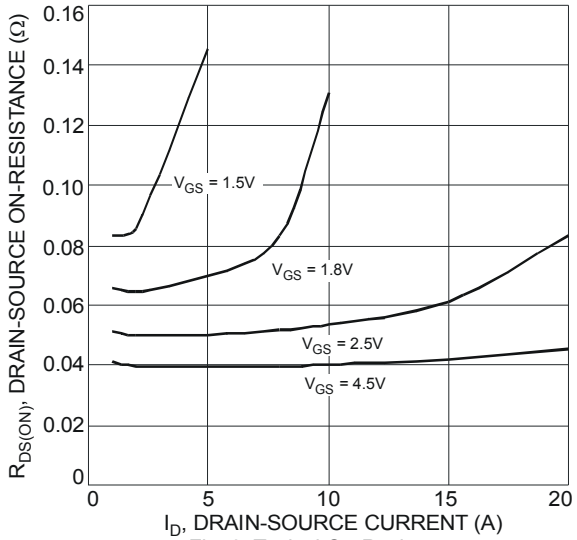



Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

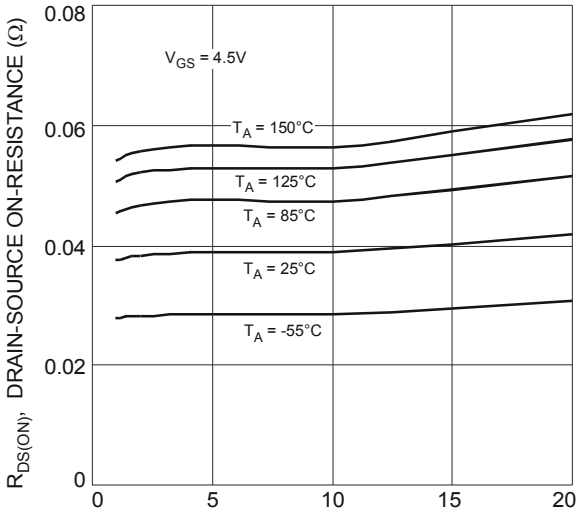



Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

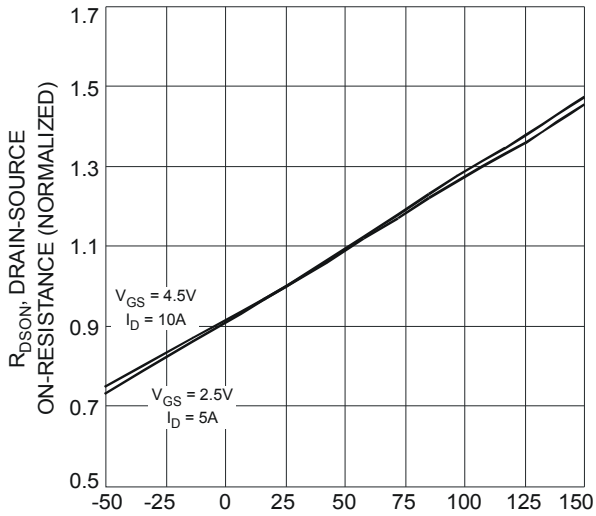



Fig. 5 On-Resistance Variation with Temperature

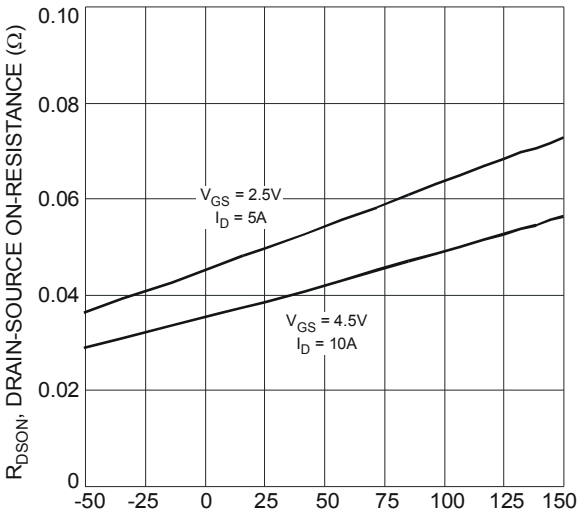



Fig. 6 On-Resistance Variation with Temperature


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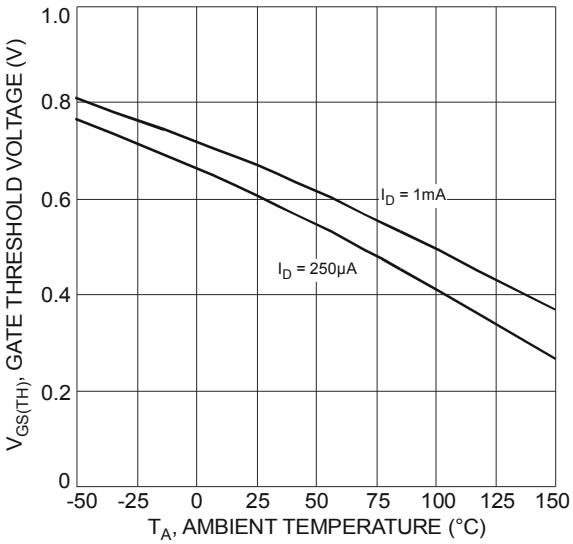



Fig. 7 Gate Threshold Variation vs. Ambient Temperature

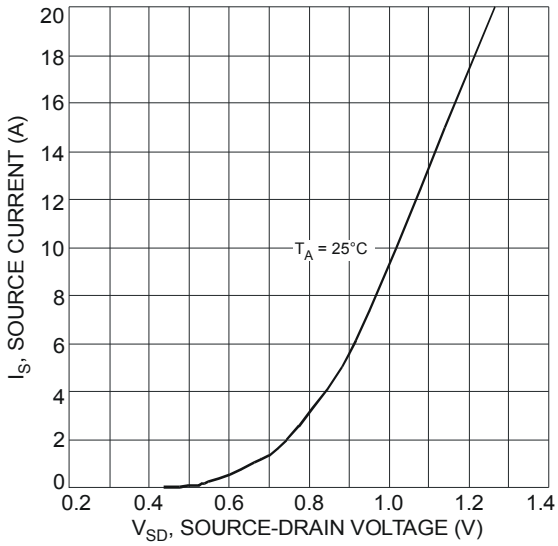



Fig. 8 Diode Forward Voltage vs. Current

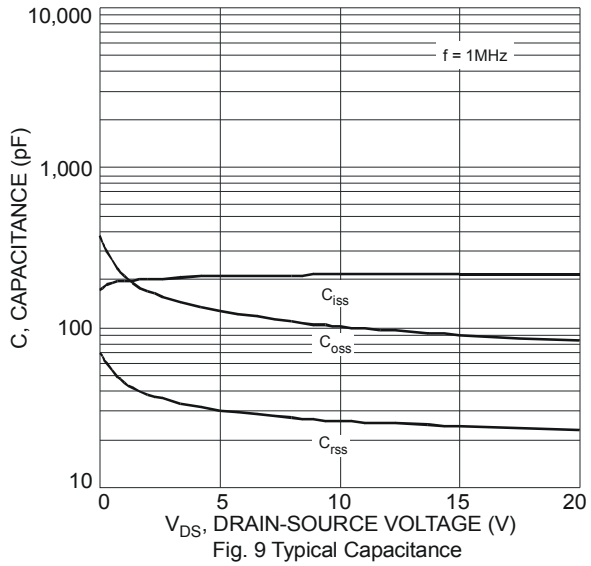



Fig. 9 Typical Capacitance

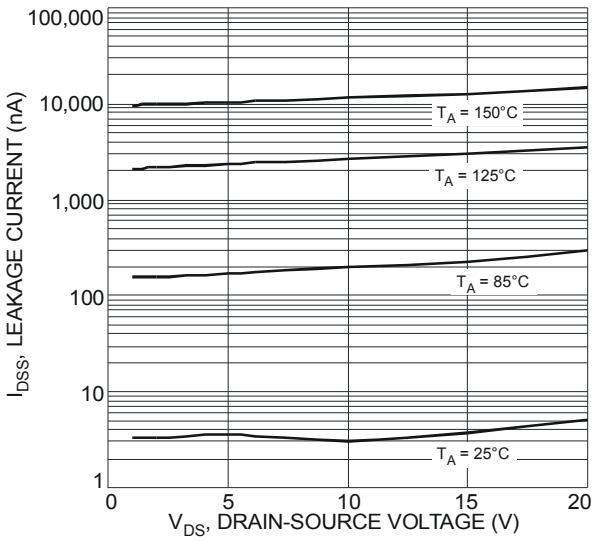



Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

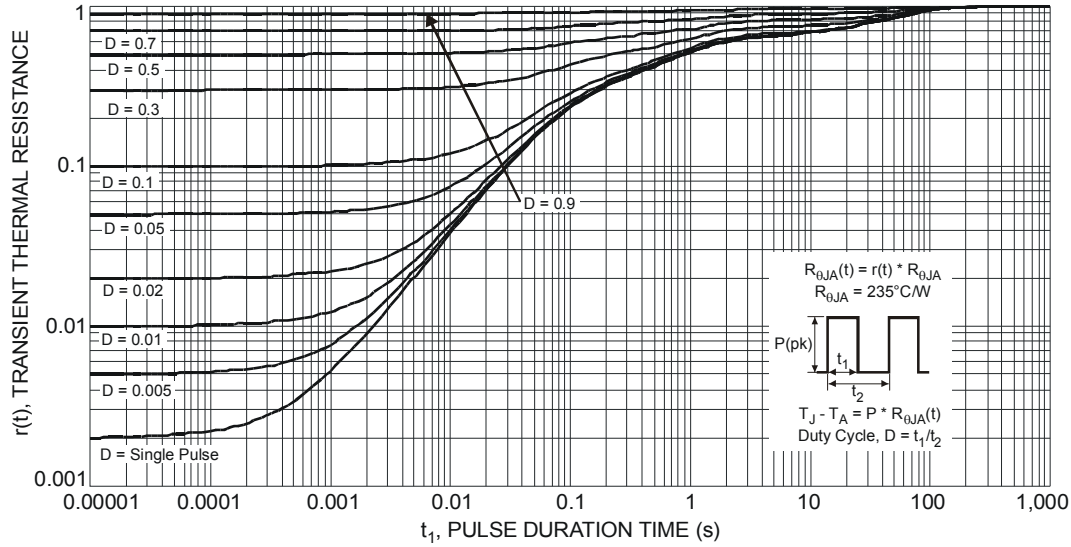
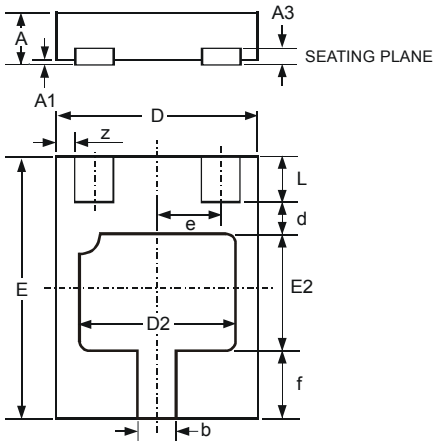



Fig. 11 Transient Thermal Response


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## Package Outline Dimensions

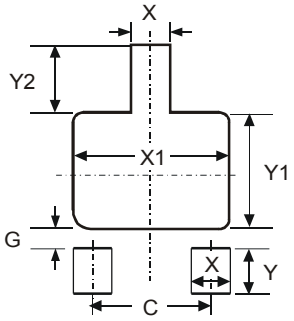
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.




| X2-DFN2015-3 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | – | 0.40 | – |
| **A1** | 0 | 0.05 | 0.02 |
| **A3** | – | – | 0.13 |
| **b** | 0.20 | 0.30 | 0.25 |
| **d** | – | – | 0.30 |
| **D** | 1.45 | 1.575 | 1.50 |
| **D2** | 1.00 | 1.20 | 1.10 |
| **e** | – | – | 0.50 |
| **E** | 1.95 | 2.075 | 2.00 |
| **E2** | 0.70 | 0.90 | 0.80 |
| **f** | – | – | 0.60 |
| **L** | 0.25 | 0.35 | 0.30 |
| **z** | – | – | 0.125 |
| **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** | 1.00 |
| **G** | 0.15 |
| **X** | 0.31 |
| **X1** | 1.30 |
| **Y** | 0.50 |
| **Y1** | 1.00 |
| **Y2** | 0.65 |


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