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30V N-CHANNEL ENHANCEMENT MODE MOSFET WITH SCHOTTKY DIODE  
PowerDI3333-8

### Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$                   | Package                     | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|--------------------------------|-----------------------------|------------------------------|
| 30V           | 10m $\Omega$ @ $V_{GS} = 10V$  | PowerDI <sup>®</sup> 3333-8 | 12A                          |
|               | 15m $\Omega$ @ $V_{GS} = 4.5V$ |                             | 9.5A                         |

### Description

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.

### Applications

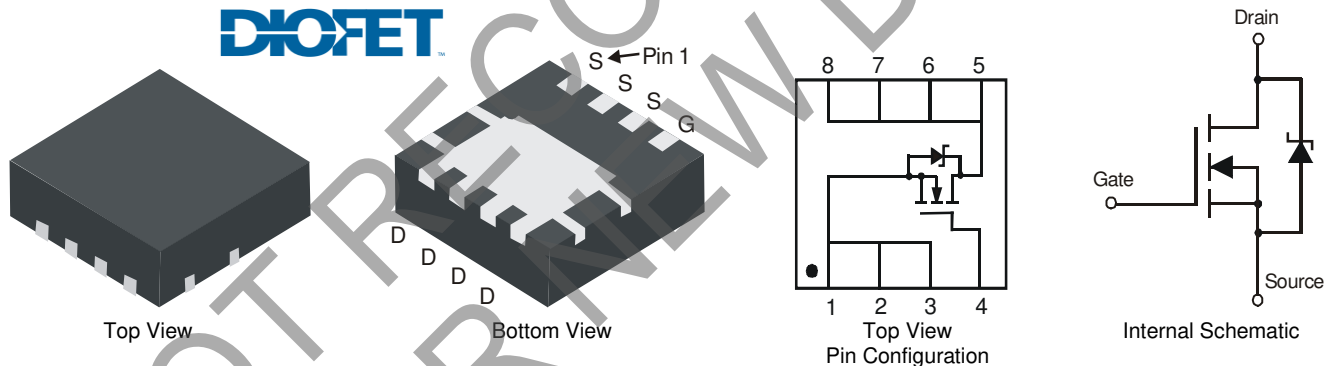
- Backlighting
- Power Management Functions
- DC-DC Converters

### Features

- DIOFET utilizes a unique patented process to monolithically integrate a MOSFET and a Schottky in a single die to deliver:
  - Low  $R_{DS(ON)}$  – minimize conduction losses
  - Low  $V_{SD}$  – reducing the losses due to body diode conduction
  - Low  $Q_{rr}$  – lower  $Q_{rr}$  of the integrated Schottky reduces body diode switching losses
  - Low gate capacitance ( $Q_g/Q_{gs}$ ) ratio – reduces risk of shoot-through or cross conduction currents at high frequencies
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- **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**

### Mechanical Data

- Case: PowerDI3333-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See diagram
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.072 grams (approximate)

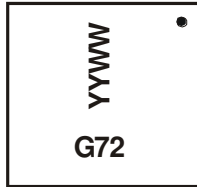


### Ordering Information (Note 4)

| Part Number   | Case          | Packaging        |
|---------------|---------------|------------------|
| DMG7702SFG-7  | PowerDI3333-8 | 2000/Tape & Reel |
| DMG7702SFG-13 | PowerDI3333-8 | 3000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



G72 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 11 = 2011)  
 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> | 30           | V    |
| Gate-Source Voltage                                      |              |  | V <sub>GSS</sub> | ±20          | V    |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V  | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 12<br>9.5    | A    |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 16.0<br>12.7 | A    |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 9.5<br>7.5   | A    |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 13.0<br>10.3 | A    |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%)       |              |  | I <sub>DM</sub>  | 90           | A    |
| Maximum Continuous Body Diode Forward Current (Note 6)   |              |  | I <sub>S</sub>   | 3.5          | A    |
| Avalanche Current (Note 7) L = 0.1mH                     |              |  | I <sub>AR</sub>  | 17           | A    |
| Repetitive Avalanche Energy (Note 7) L = 0.1mH           |              |  | E <sub>AR</sub>  | 43           | mJ   |

## Thermal Characteristics

| Characteristic                                   |                        | Symbol                            | Value       | Unit |
|--|------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 0.89        | W    |
|  | T <sub>A</sub> = +70°C |                                   | 0.55        |      |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state           | R <sub>θJA</sub>                  | 145         | °C/W |
|  | t < 10s                |                                   | 74          |      |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 2.2         | W    |
|  | T <sub>A</sub> = +70°C |                                   | 1.3         |      |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state           | R <sub>θJA</sub>                  | 58          | °C/W |
|  | t < 10s                |                                   | 31          |      |
| Thermal Resistance, Junction to Case (Note 6)    |                        | R <sub>θJC</sub>                  | 11          |      |
| Operating and Storage Temperature Range          |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.  
 6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1 inch square copper plate.  
 7. I<sub>AR</sub> and E<sub>AR</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C

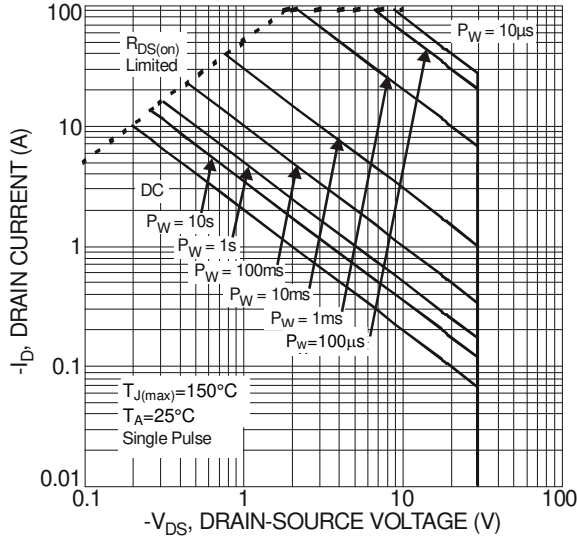


Fig. 1 SOA, Safe Operation Area

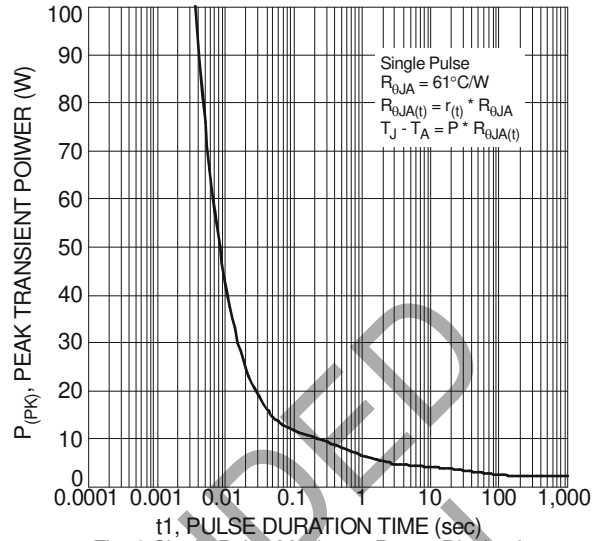


Fig. 2 Single Pulse Maximum Power Dissipation

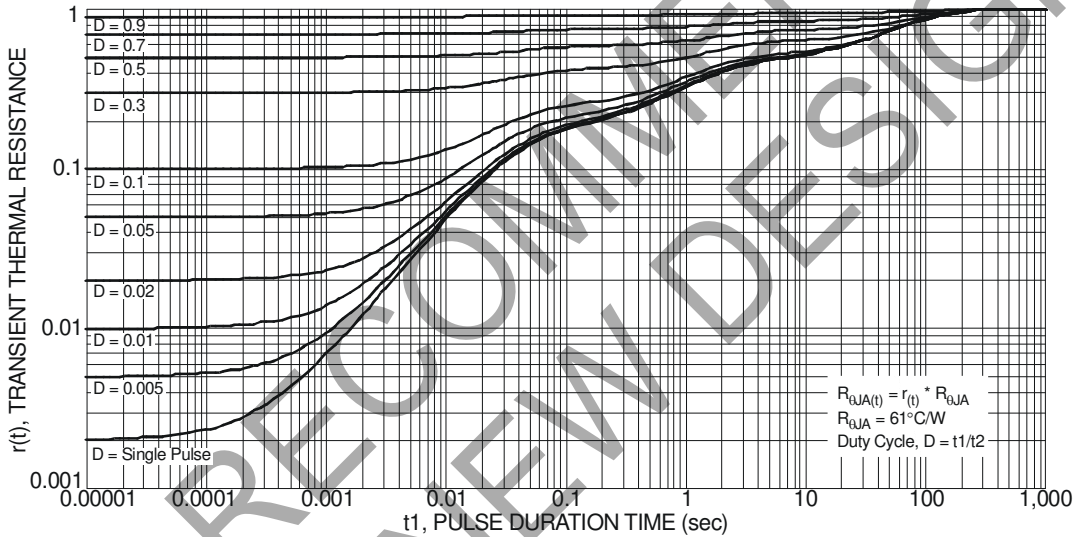
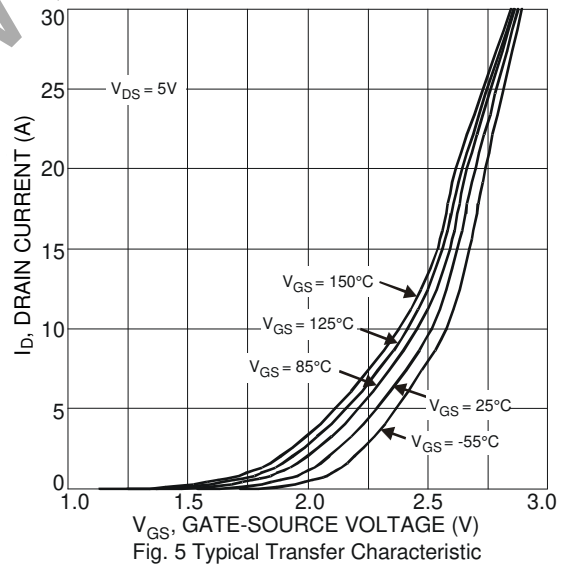
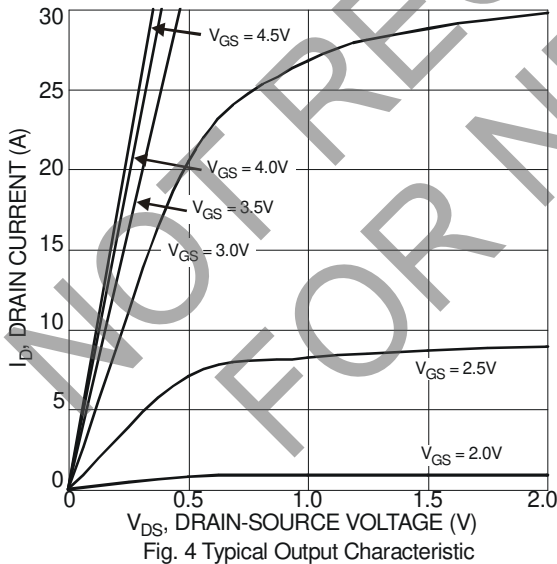


Fig. 3 Transient Thermal Resistance

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

| Characteristic                           | Symbol              | Min  | Typ  | Max  | Unit | Test Condition   |
|--|---------------------|------|------|------|------|--|
| <b>OFF CHARACTERISTICS (Note 8)</b>      |                     |      |      |      |      |  |
| Drain-Source Breakdown Voltage           | BV <sub>DSS</sub>   | 30   | -    | -    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA   |
| Zero Gate Voltage Drain Current          | I <sub>DSS</sub>    | -    | -    | 100  | μA   | V <sub>DS</sub> = 30V, 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> | 1.0  | 1.5  | 2.5  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                               |
| Static Drain-Source On-Resistance        | R <sub>DS(on)</sub> | -    | 7.3  | 10   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 13.5A  |
|  |                     | -    | 10   | 15   |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 11A   |
| Forward Transfer Admittance              | Y <sub>fs</sub>     | -    | 22   | -    | S    | V <sub>DS</sub> = 5V, I <sub>D</sub> = 10.0A   |
| Diode Forward Voltage                    | V <sub>SD</sub>     | -    | 0.45 | 0.55 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A  |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>  |                     |      |      |      |      |  |
| Input Capacitance                        | C <sub>iss</sub>    | -    | 1296 | 4310 | pF   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1.0MHz                                  |
| Output Capacitance                       | C <sub>oss</sub>    | -    | 415  | -    | pF   |  |
| Reverse Transfer Capacitance             | C <sub>rss</sub>    | -    | 204  | -    | pF   |  |
| Gate Resistance                          | R <sub>g</sub>      | 0.26 | 1.6  | 2.7  | 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>      | -    | 14.7 | -    | nC   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 13.5A                     |
| Total Gate Charge V <sub>GS</sub> = 10V  | Q <sub>g</sub>      | -    | 31.6 | -    | nC   |  |
| Gate-Source Charge                       | Q <sub>gs</sub>     | -    | 3.5  | -    | nC   |  |
| Gate-Drain Charge                        | Q <sub>gd</sub>     | -    | 5.0  | -    | nC   |  |
| Turn-On Delay Time                       | t <sub>D(on)</sub>  | -    | 15.8 | -    | ns   | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 8.8A |
| Turn-On Rise Time                        | t <sub>r</sub>      | -    | 27.8 | -    | ns   |  |
| Turn-Off Delay Time                      | t <sub>D(off)</sub> | -    | 29.7 | -    | ns   |  |
| Turn-Off Fall Time                       | t <sub>f</sub>      | -    | 13.6 | -    | ns   |  |
| Reverse Recovery Time                    | t <sub>rr</sub>     | -    | 13.1 | -    | ns   |  |
| Reverse Recovery Charge                  | Q <sub>rr</sub>     | -    | 4.3  | -    | nC   | I <sub>F</sub> = 13.5A, di/dt = 100A/μs  |

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



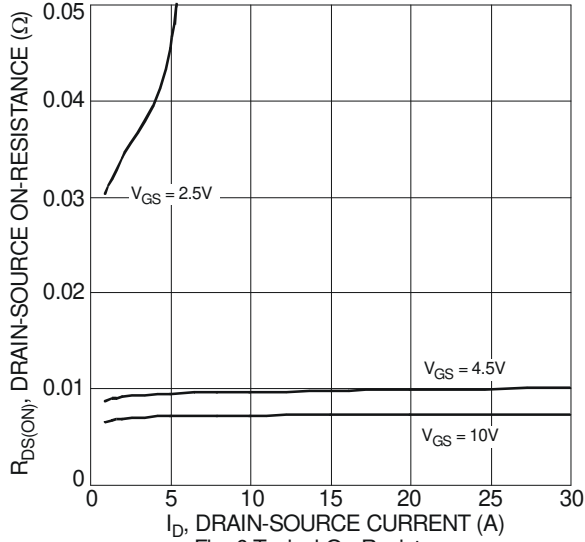


Fig. 6 Typical On-Resistance vs. Drain Current and Gate Voltage

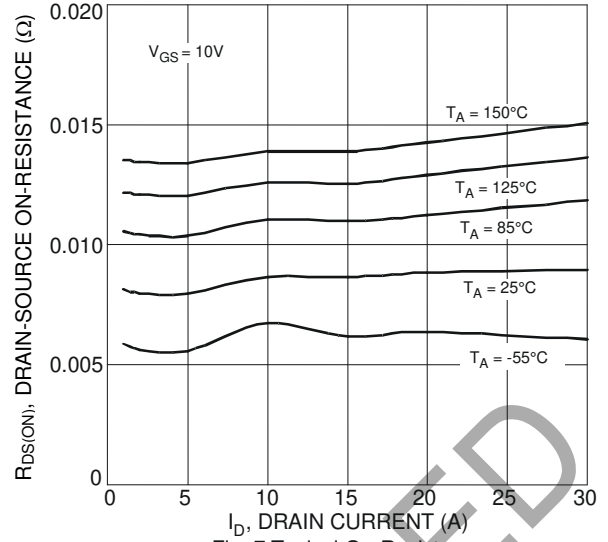


Fig. 7 Typical On-Resistance vs. Drain Current and Temperature

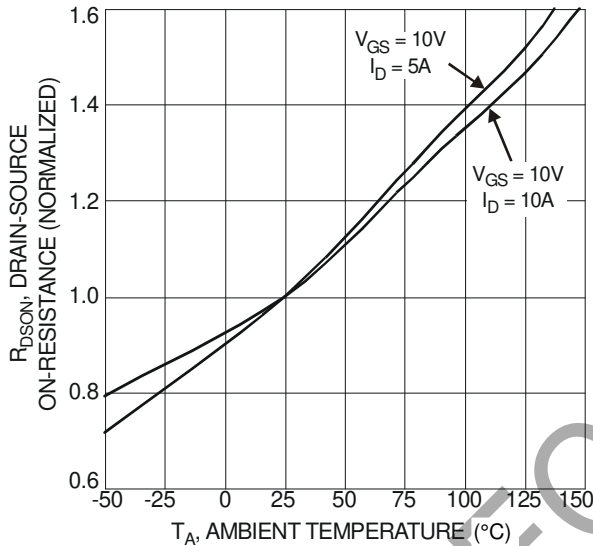


Fig. 8 On-Resistance Variation with Temperature

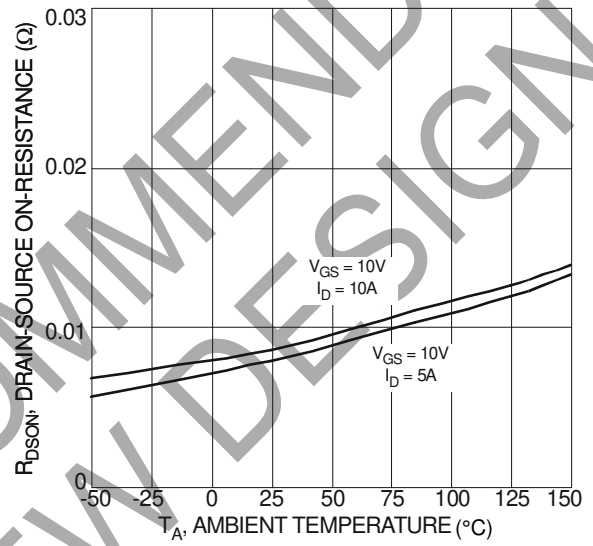


Fig. 9 On-Resistance Variation with Temperature

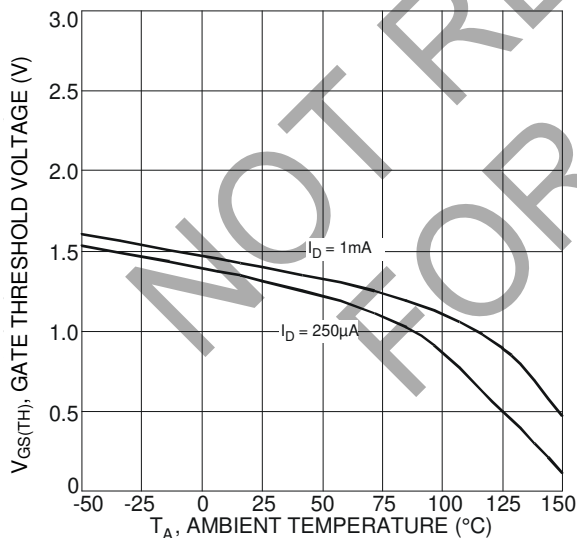


Fig. 10 Gate Threshold Variation vs. Ambient Temperature

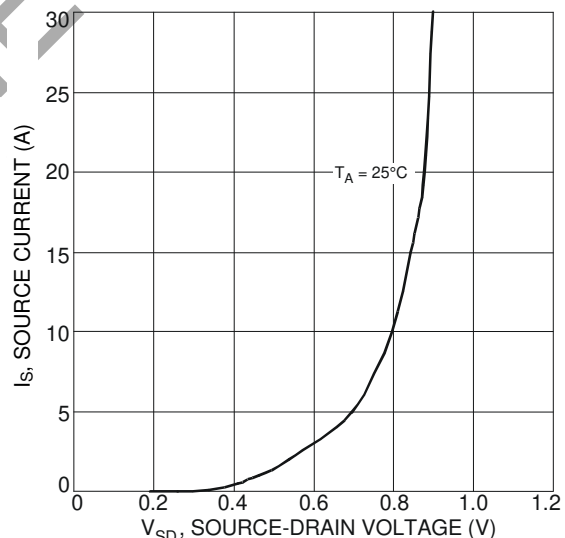


Fig. 11 Diode Forward Voltage vs. Current

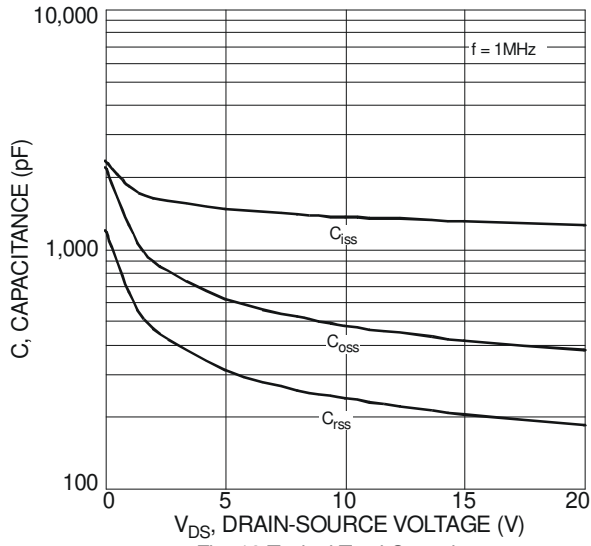


Fig. 12 Typical Total Capacitance

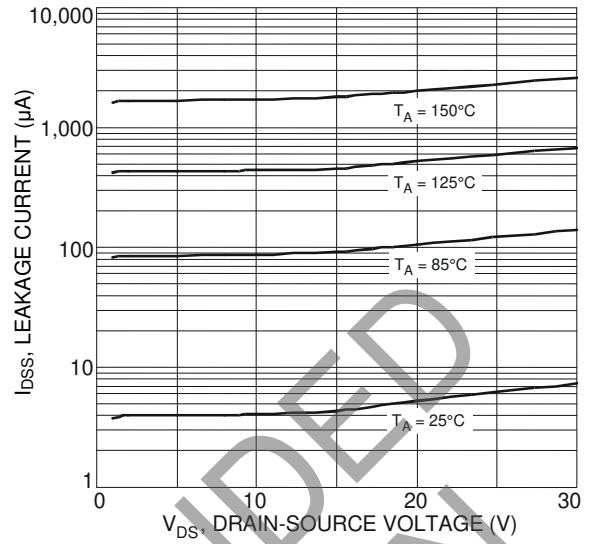


Fig. 13 Typical Leakage Current vs. Drain-Source Voltage

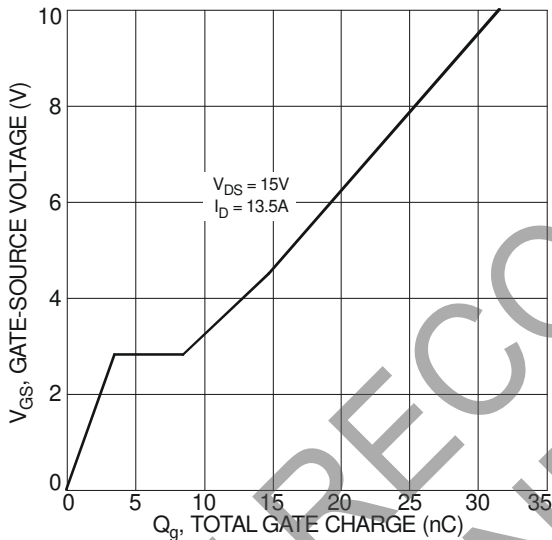
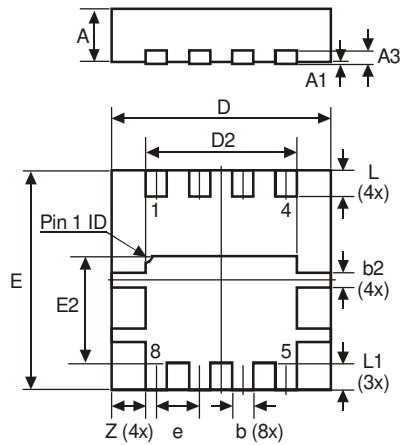


Fig. 14 Gate-Source Voltage vs. Total Gate Charge

NOT RECOMMENDED FOR NEW DESIGN

### Package Outline Dimensions

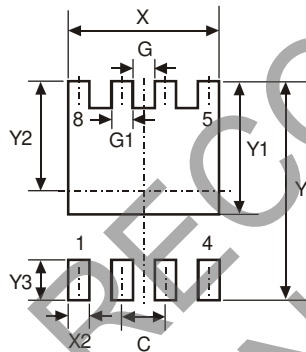
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



| PowerDI3333-8               |      |      |       |
|-----------------------------|------|------|-------|
| Dim                         | Min  | Max  | Typ   |
| D                           | 3.25 | 3.35 | 3.30  |
| E                           | 3.25 | 3.35 | 3.30  |
| D2                          | 2.22 | 2.32 | 2.27  |
| E2                          | 1.56 | 1.66 | 1.61  |
| A                           | 0.75 | 0.85 | 0.80  |
| A1                          | 0    | 0.05 | 0.02  |
| A3                          | -    | -    | 0.203 |
| b                           | 0.27 | 0.37 | 0.32  |
| b2                          | -    | -    | 0.20  |
| L                           | 0.35 | 0.45 | 0.40  |
| L1                          | -    | -    | 0.39  |
| e                           | -    | -    | 0.65  |
| Z                           | -    | -    | 0.515 |
| <b>All Dimensions in mm</b> |      |      |       |

### Suggested Pad Layout

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



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 0.230         |
| G1         | 0.420         |
| Y          | 3.700         |
| Y1         | 2.250         |
| Y2         | 1.850         |
| Y3         | 0.700         |
| X          | 2.370         |
| X2         | 0.420         |

NOT FOR NEW DESIGN



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