

**DUAL N-CHANNEL ENHANCEMENT MODE MOSFET**
**Product Summary**

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ Max         | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|--------------------------|------------------------------|
| 24V           | 7mΩ @ $V_{GS} = 4.5V$    | 11.0A                        |
|               | 7.8mΩ @ $V_{GS} = 4.0V$  | 10.8A                        |
|               | 8.2mΩ @ $V_{GS} = 3.7V$  | 10.6A                        |
|               | 9.5mΩ @ $V_{GS} = 3.1V$  | 10.5A                        |
|               | 10.5mΩ @ $V_{GS} = 2.5V$ | 10.0A                        |

**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**

- Power Management Functions
- Battery Pack
- Load Switch

**Features**

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- **ESD Protected Gate > 2KV**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

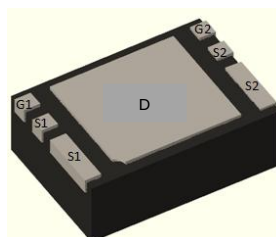
**Mechanical Data**

- Case: U-DFN2535-6
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.012 grams (Approximate)

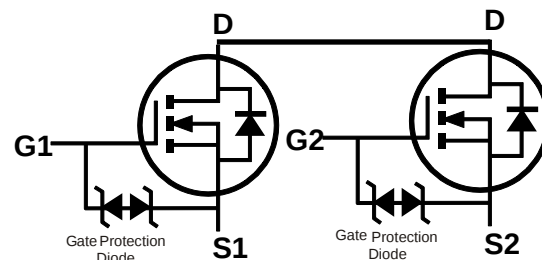
NEW PRODUCT



U-DFN2535-6



Bottom View



Equivalent Circuit

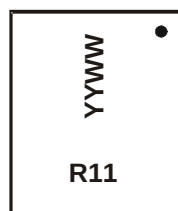
**Ordering Information** (Note 4)

| Part Number  | Case        | Packaging           |
|--------------|-------------|---------------------|
| DMN2010UDZ-7 | U-DFN2535-6 | 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](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**

U-DFN2535-6



R11 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 15 for 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> | 24      | V    |
| Gate-Source Voltage                                      |              |                                                  | V <sub>GSS</sub> | ±8      | V    |
| 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>   | 11<br>9 | A    |
| Maximum Continuous Body Diode Forward Current (Note 6)   |              |                                                  | I <sub>S</sub>   | 2       | A    |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)      |              |                                                  | I <sub>DM</sub>  | 65      | A    |
| Avalanche Current (Note 7) L = 0.1mH                     |              |                                                  | I <sub>AS</sub>  | 34      | A    |
| Avalanche Energy (Note 7) L = 0.1mH                      |              |                                                  | E <sub>AS</sub>  | 57      | mJ   |

**Thermal Characteristics**

| Characteristic                                   |                        | Symbol                            | Value       | Unit |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 0.7         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State           | R <sub>θJA</sub>                  | 184         | °C/W |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.6         | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State           | R <sub>θJA</sub>                  | 78          | °C/W |
| Thermal Resistance, Junction to Case             |                        | R <sub>θJC</sub>                  | 16.4        | °C/W |
| Operating and Storage Temperature Range          |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °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>   | 24  | -     | -    | 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>    | -   | -     | 1.0  | µA   | V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V                                                  |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | -   | -     | ±10  | µA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V                                                  |
| <b>ON CHARACTERISTICS (Note 8)</b>                     |                     |     |       |      |      |                                                                                              |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | 0.3 | -     | 1.5  | 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    | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5.5A                                                |
|                                                        |                     |     | -     | 7.8  |      | V <sub>GS</sub> = 4.0V, I <sub>D</sub> = 5.5A                                                |
|                                                        |                     |     | -     | 8.2  |      | V <sub>GS</sub> = 3.7V, I <sub>D</sub> = 5.5A                                                |
|                                                        |                     |     | -     | 9.5  |      | V <sub>GS</sub> = 3.1V, I <sub>D</sub> = 5.5A                                                |
|                                                        |                     |     | -     | 10.5 |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 5.5A                                                |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | -   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A                                                    |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>                |                     |     |       |      |      |                                                                                              |
| Input Capacitance                                      | C <sub>ISS</sub>    | -   | 2,665 | -    | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                   |
| Output Capacitance                                     | C <sub>OSS</sub>    | -   | 323   | -    | pF   |                                                                                              |
| Reverse Transfer Capacitance                           | C <sub>RSS</sub>    | -   | 31.1  | -    | pF   |                                                                                              |
| Gate Resistance                                        | R <sub>g</sub>      | -   | 1.1   | -    | 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>      | -   | 33.2  | -    | nC   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 5.5A                                                 |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | -   | 3.6   | -    | nC   |                                                                                              |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | -   | 5.6   | -    | nC   |                                                                                              |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | -   | 7.5   | -    | ns   | V <sub>DD</sub> = 16V, I <sub>D</sub> = 5.5A,<br>V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 6Ω |
| Turn-On Rise Time                                      | t <sub>R</sub>      | -   | 20    | -    | ns   |                                                                                              |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | -   | 93    | -    | ns   |                                                                                              |
| Turn-Off Fall Time                                     | t <sub>F</sub>      | -   | 49    | -    | ns   |                                                                                              |

- 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.

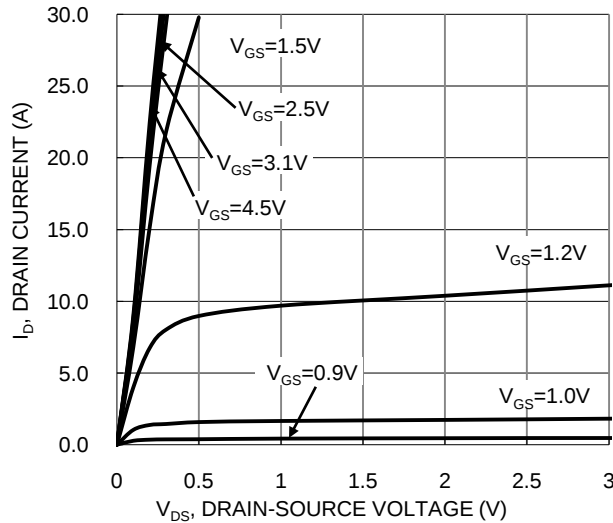


Figure 1. Typical Output Characteristic

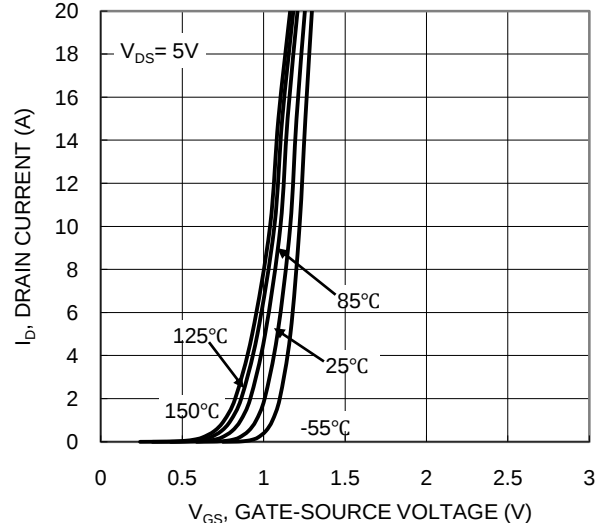


Figure 2. Typical Transfer Characteristic

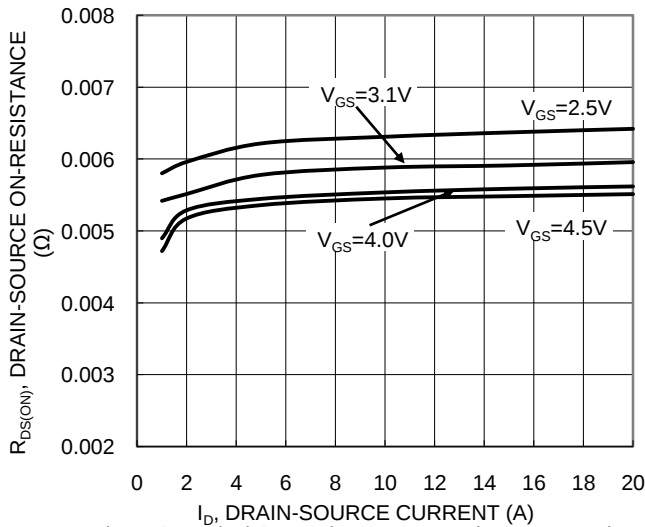


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

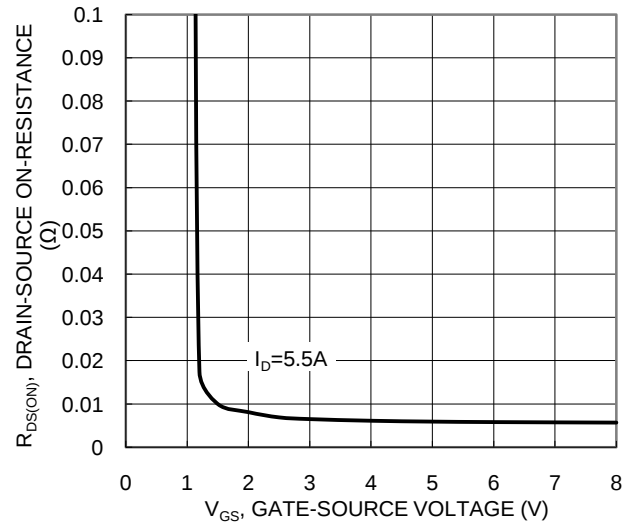


Figure 4. Typical Transfer Characteristic

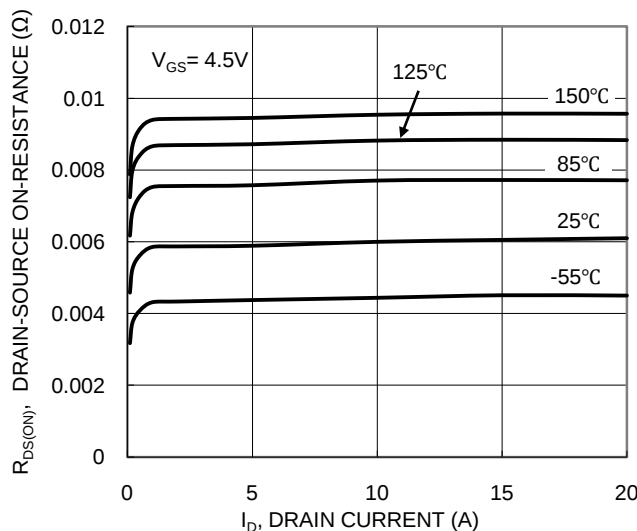


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

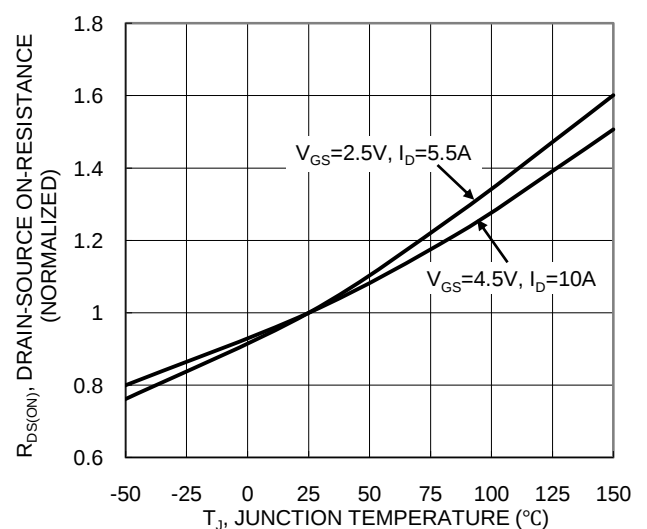


Figure 6. On-Resistance Variation with Temperature

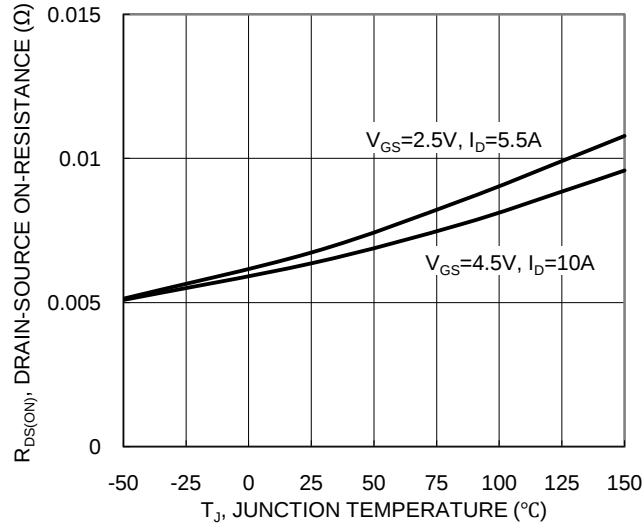


Figure 7. On-Resistance Variation with Temperature

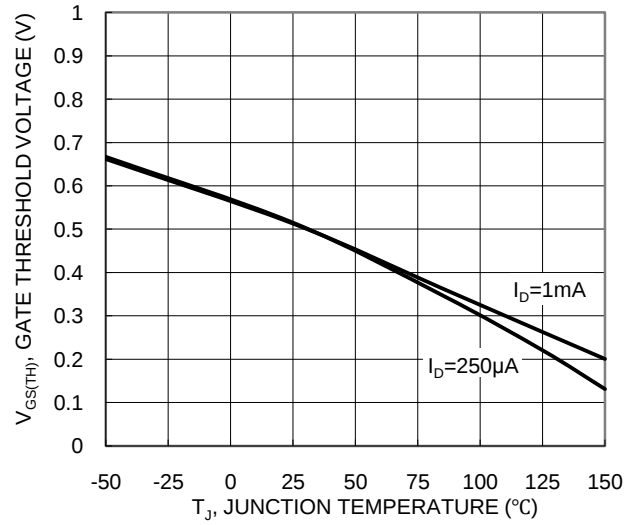


Figure 8. Gate Threshold Variation vs. Temperature

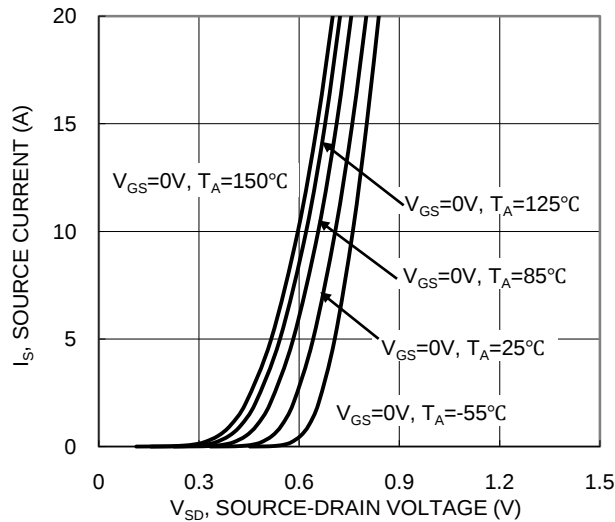


Figure 9. Diode Forward Voltage vs. Current

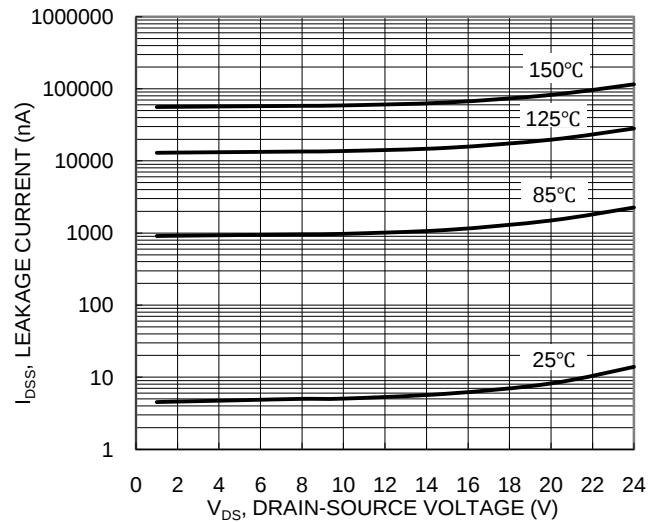


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

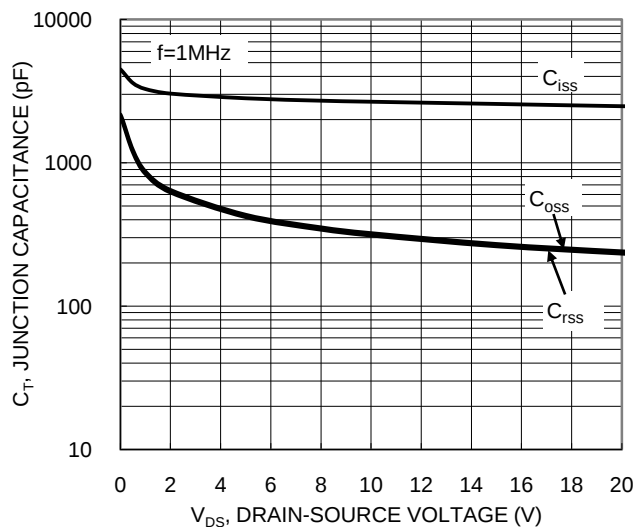


Figure 11. Typical Junction Capacitance

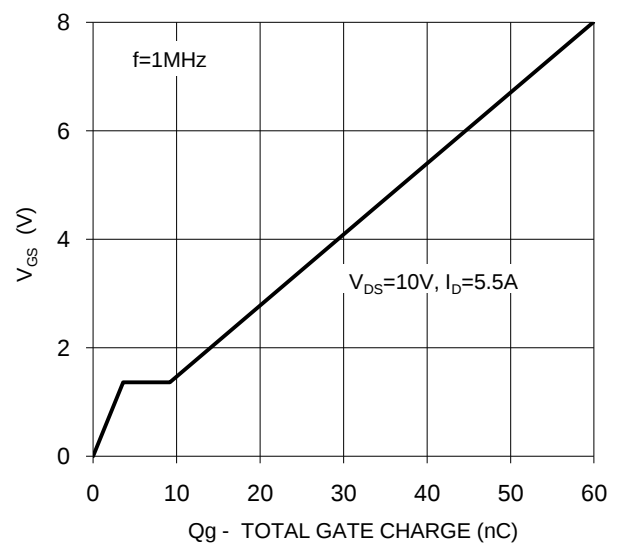
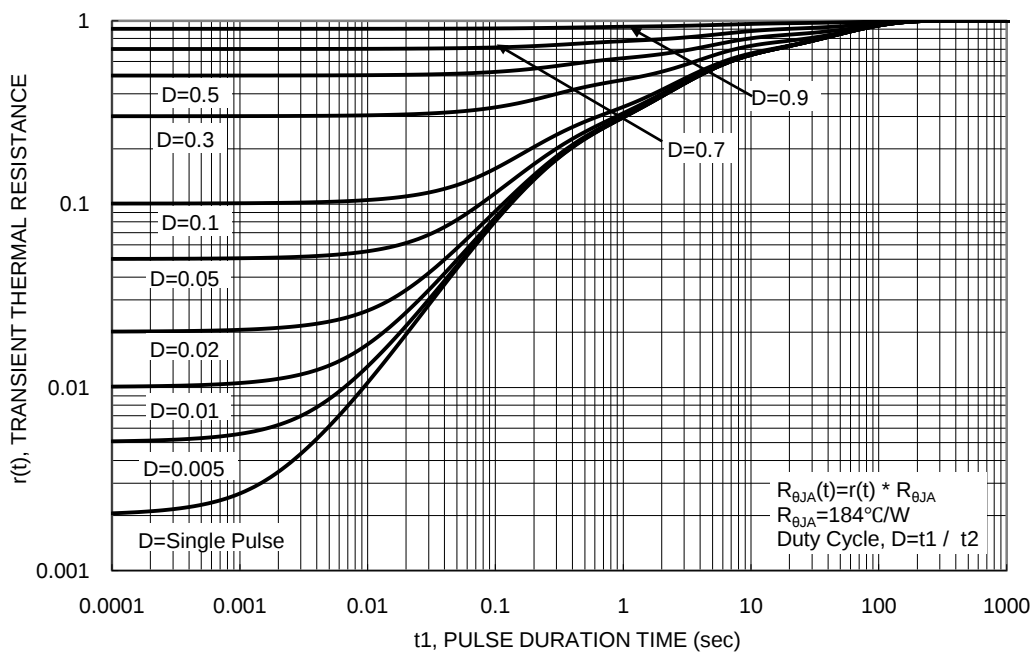
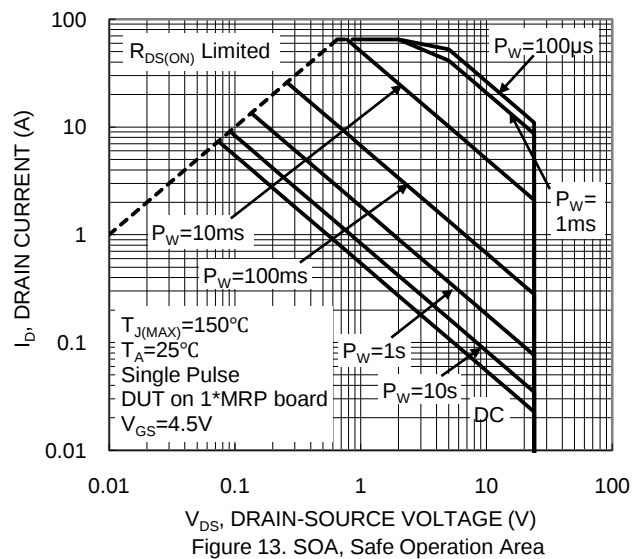
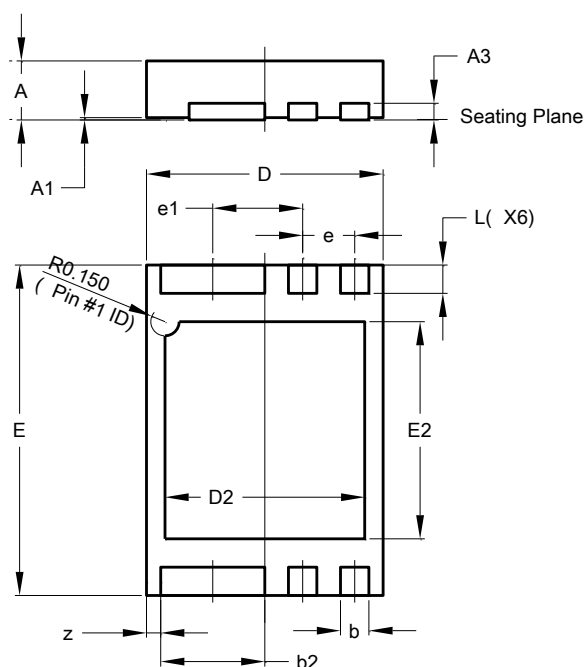


Figure 12. Gate Charge



## Package Outline Dimensions

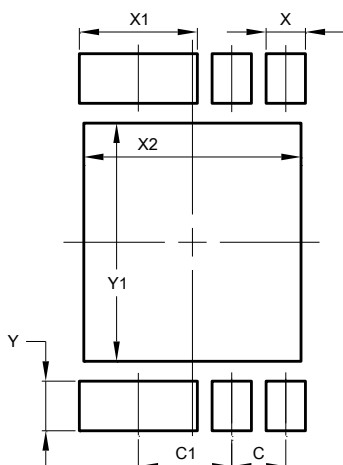
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| U-DFN2535-6<br>(Type B) |      |      |       |
|-------------------------|------|------|-------|
| Dim                     | Min  | Max  | Typ   |
| A                       | 0.50 | 0.60 | -     |
| A1                      | 0.00 | 0.05 | 0.02  |
| A3                      | -    | -    | 0.127 |
| b                       | 0.25 | 0.35 | 0.30  |
| b2                      | 1.05 | 1.15 | 1.10  |
| D                       | 2.45 | 2.55 | 2.50  |
| D2                      | 2.01 | 2.21 | 2.11  |
| E                       | 3.45 | 3.55 | 3.50  |
| E2                      | 2.20 | 2.40 | 2.30  |
| e                       | -    | -    | 0.55  |
| e1                      | -    | -    | 0.95  |
| L                       | 0.25 | 0.35 | 0.30  |
| z                       | -    | -    | 0.15  |
| All Dimensions in mm    |      |      |       |

## Suggested Pad Layout

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



| Dimensions | Value<br>(in mm) |
|------------|------------------|
| C          | 0.550            |
| C1         | 0.950            |
| X          | 0.400            |
| X1         | 1.200            |
| X2         | 2.210            |
| Y          | 0.500            |
| Y1         | 2.400            |

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