

**COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET  
POWERDI®**

**Product Summary**

| Device | V <sub>(BR)DSS</sub> | R <sub>DS(ON)</sub> max         | I <sub>D</sub> max<br>T <sub>A</sub> = +25°C |
|--------|----------------------|---------------------------------|----------------------------------------------|
| Q1     | 60V                  | 85mΩ @ V <sub>GS</sub> = 10V    | 3.1A                                         |
|        |                      | 120mΩ @ V <sub>GS</sub> = 4.5V  | 2.7A                                         |
| Q2     | -60V                 | 150mΩ @ V <sub>GS</sub> = -10V  | -2.4A                                        |
|        |                      | 250mΩ @ V <sub>GS</sub> = -4.5V | -1.8A                                        |

**Description**

This new generation MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>), yet maintain superior switching performance, making it ideal for high efficiency power management applications.

**Applications**

- Power Management Functions
- Analog Switch

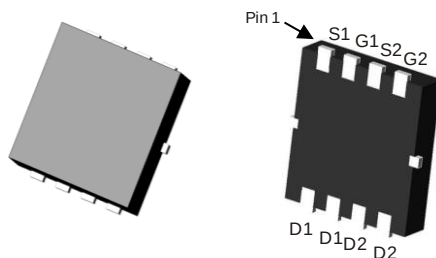
**Features**

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

**Mechanical Data**

- Case: POWERDI®3333-8
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208③
- Weight: 0.072 grams (Approximate)

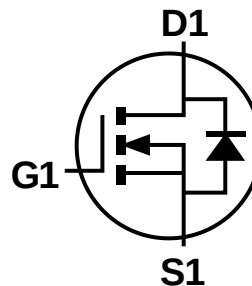
POWERDI3333-8



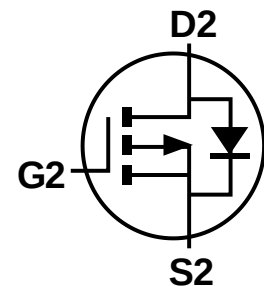
Top View

Bottom View

Equivalent Circuit



N-Channel MOSFET



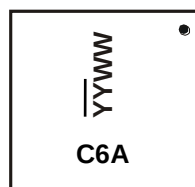
P-Channel MOSFET

**Ordering Information (Note 4)**

| Part Number   | Case          | Packaging         |
|---------------|---------------|-------------------|
| DMC6070LND-7  | POWERDI3333-8 | 2,000/Tape & Reel |
| DMC6070LND-13 | POWERDI3333-8 | 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**



C6A = Product Type Marking Code  
YYWW = Date Code Marking  
YY = Last Two Digits of Year (ex: 15 for 2015)  
WW = Week Code (01 to 53)

**Maximum Ratings Q1 N-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                          |              |                                                  | Symbol           | Value      | Unit |
|---------------------------------------------------------|--------------|--------------------------------------------------|------------------|------------|------|
| Drain-Source Voltage                                    |              |                                                  | V <sub>DSS</sub> | 60         | V    |
| Gate-Source Voltage                                     |              |                                                  | V <sub>GSS</sub> | ±20        | V    |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = 10V | Steady State | T <sub>A</sub> = +25°C                           | I <sub>D</sub>   | 3.1        | A    |
|                                                         |              | T <sub>A</sub> = +70°C                           | I <sub>D</sub>   | 2.5        | A    |
|                                                         | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 3.9<br>3.1 | A    |
| Maximum Body Diode Forward Current (Note 5)             |              |                                                  | I <sub>S</sub>   | 2          | A    |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)      |              |                                                  | I <sub>DM</sub>  | 15         | A    |

**Maximum Ratings Q2 P-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                           |              |                                                  | Symbol           | Value        | Unit |
|----------------------------------------------------------|--------------|--------------------------------------------------|------------------|--------------|------|
| Drain-Source Voltage                                     |              |                                                  | V <sub>DSS</sub> | -60          | V    |
| Gate-Source Voltage                                      |              |                                                  | V <sub>GSS</sub> | ±20          | V    |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = -10V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -2.4<br>-1.9 | A    |
|                                                          | t<10s        | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -2.9<br>-2.3 | A    |
| Maximum Body Diode Forward Current (Note 5)              |              |                                                  | I <sub>S</sub>   | -2           | A    |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)       |              |                                                  | I <sub>DM</sub>  | -12          | A    |

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

| Characteristic                                   |              | Symbol                            | Value       | Unit |
|--------------------------------------------------|--------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 |              | P <sub>D</sub>                    | 1.4         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | R <sub>θJA</sub>                  | 91          | °C/W |
|                                                  | t < 10s      |                                   | 60          |      |
| Thermal Resistance, Junction to Case (Note 5)    |              | R <sub>θJC</sub>                  | 32          |      |
| Operating and Storage Temperature Range          |              | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

Note: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.

**Electrical Characteristics Q1 N-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                         | Symbol              | Min | Typ  | Max  | Unit | Test Condition                                                                              |
|--------------------------------------------------------|---------------------|-----|------|------|------|---------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 6)</b>                    |                     |     |      |      |      |                                                                                             |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | 60  | –    | –    | 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    | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                 |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | –   | –    | ±100 | nA   | V <sub>GS</sub> = ±16V, V <sub>DS</sub> = 0V                                                |
| <b>ON CHARACTERISTICS (Note 6)</b>                     |                     |     |      |      |      |                                                                                             |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | 1   | –    | 3    | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                  |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | –   | 60   | 85   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 1.5A                                                |
|                                                        |                     |     | 72   | 120  |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 0.5A                                               |
| Forward Transfer Admittance                            | Y <sub>fs</sub>     | –   | 3.7  | –    | S    | V <sub>DS</sub> = 5V, I <sub>D</sub> = 1.5A                                                 |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | –   | 0.7  | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 3A                                                   |
| <b>DYNAMIC CHARACTERISTICS (Note 7)</b>                |                     |     |      |      |      |                                                                                             |
| Input Capacitance                                      | C <sub>iss</sub>    | –   | 731  | –    | pF   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                    |
| Output Capacitance                                     | C <sub>oss</sub>    | –   | 34   | –    | pF   |                                                                                             |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | –   | 23   | –    | pF   |                                                                                             |
| Gate Resistance                                        | R <sub>g</sub>      | –   | 1.3  | –    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                        |
| Total Gate Charge (V <sub>GS</sub> = 10V)              | Q <sub>g</sub>      | –   | 11.5 | –    | nC   | V <sub>DS</sub> = 30V, I <sub>D</sub> = 3A                                                  |
| Total Gate Charge (V <sub>GS</sub> = 4.5V)             | Q <sub>g</sub>      | –   | 5.2  | –    | nC   |                                                                                             |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | –   | 2.1  | –    | nC   |                                                                                             |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | –   | 1.5  | –    | nC   |                                                                                             |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | –   | 9.6  | –    | ns   | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 30V,<br>R <sub>G</sub> = 50Ω, R <sub>L</sub> = 20Ω |
| Turn-On Rise Time                                      | t <sub>R</sub>      | –   | 11   | –    | ns   |                                                                                             |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | –   | 61   | –    | ns   |                                                                                             |
| Turn-Off Fall Time                                     | t <sub>F</sub>      | –   | 21   | –    | ns   |                                                                                             |

Notes: 6. Short duration pulse test used to minimize self-heating effect.  
7. Guaranteed by design. Not subject to production testing.

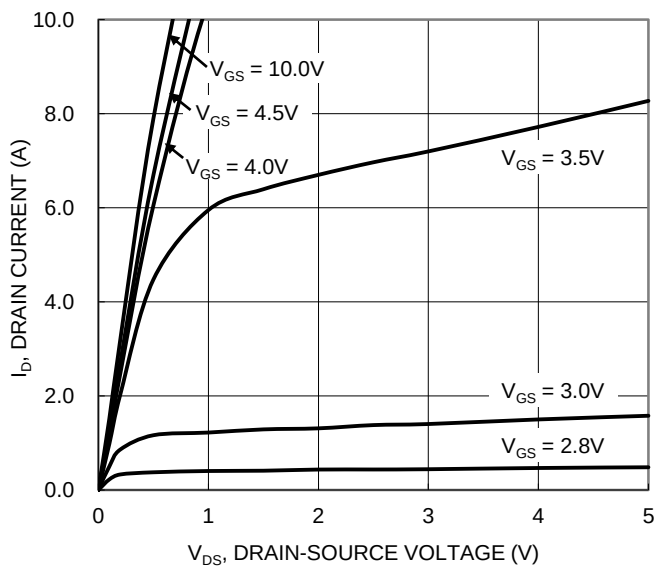


Figure 1. Typical Output Characteristic

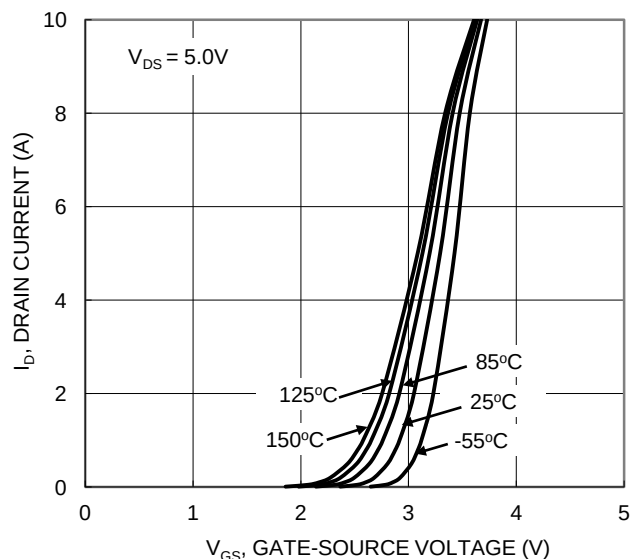


Figure 2. Typical Transfer Characteristic

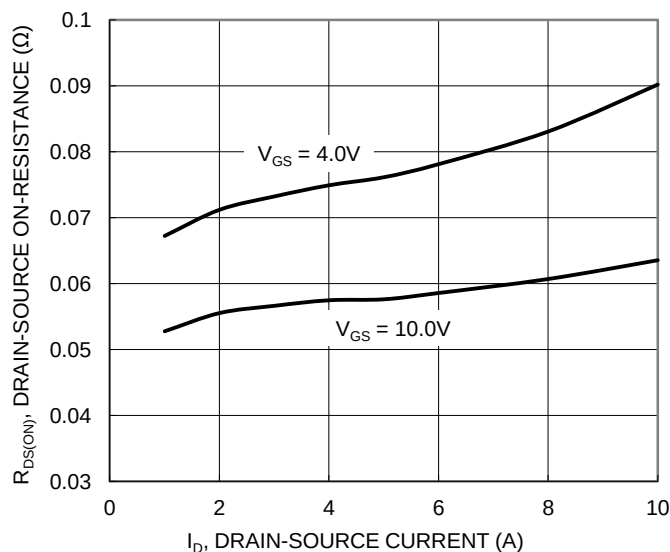


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

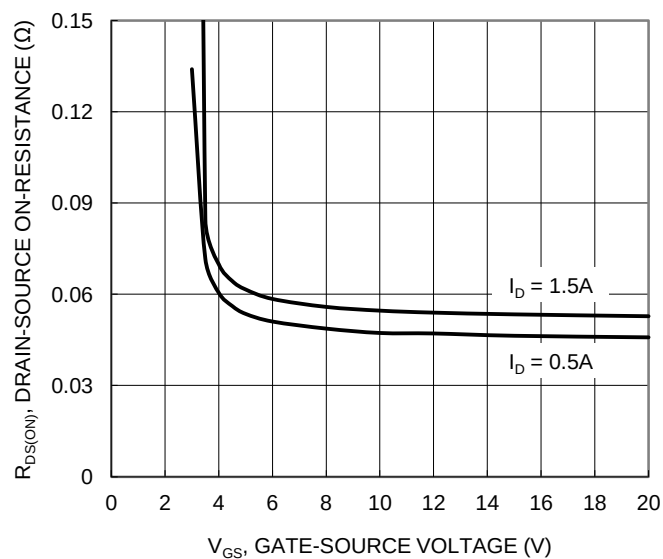


Figure 4. Typical Transfer Characteristic

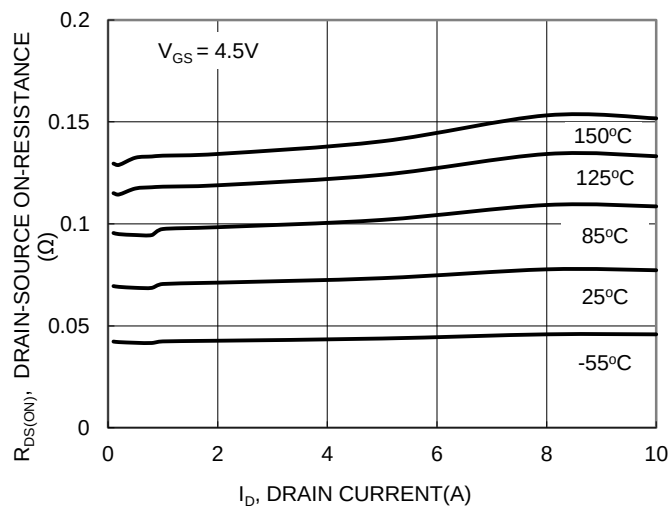


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

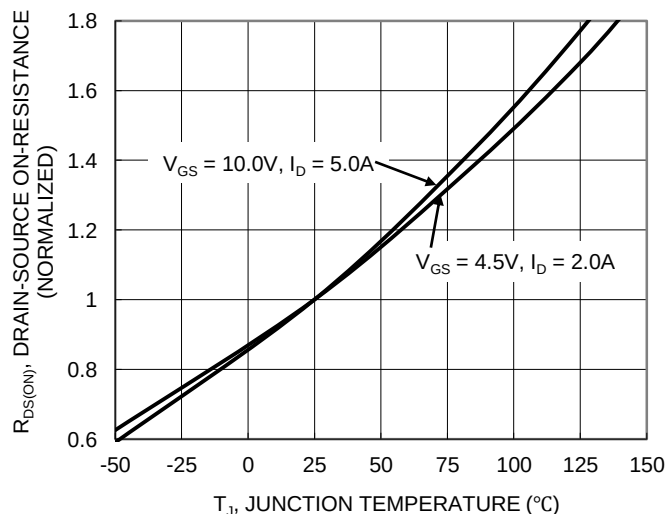
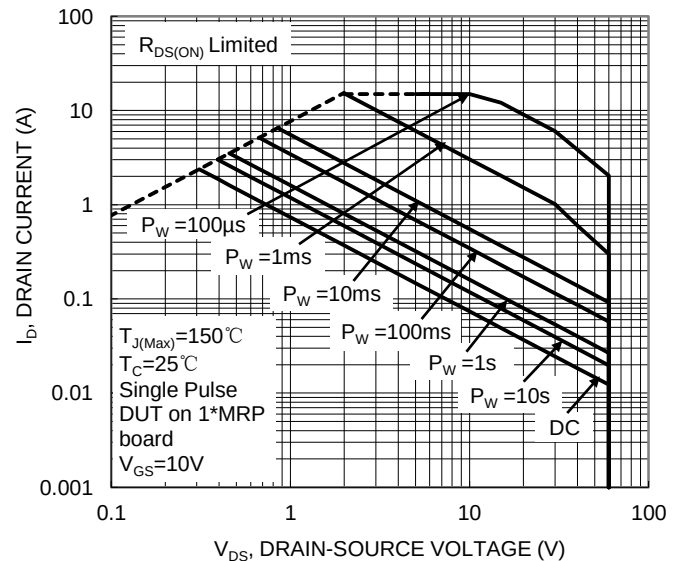
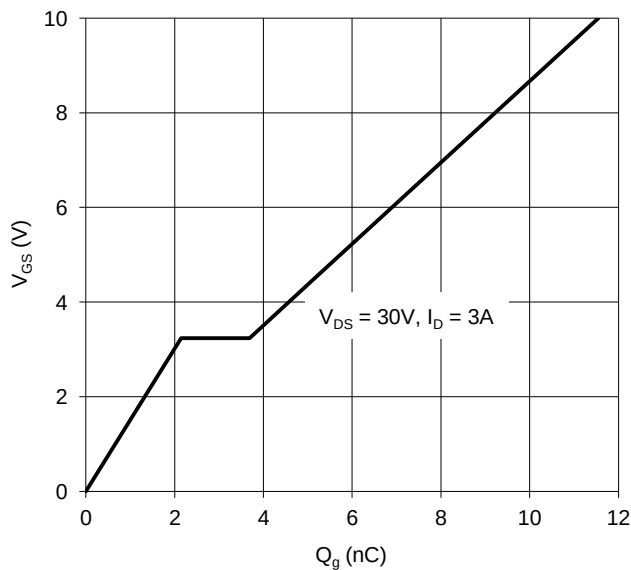
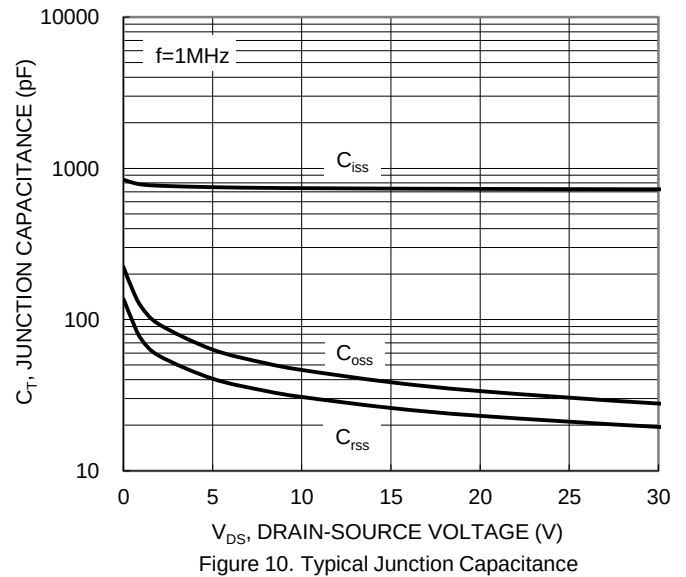
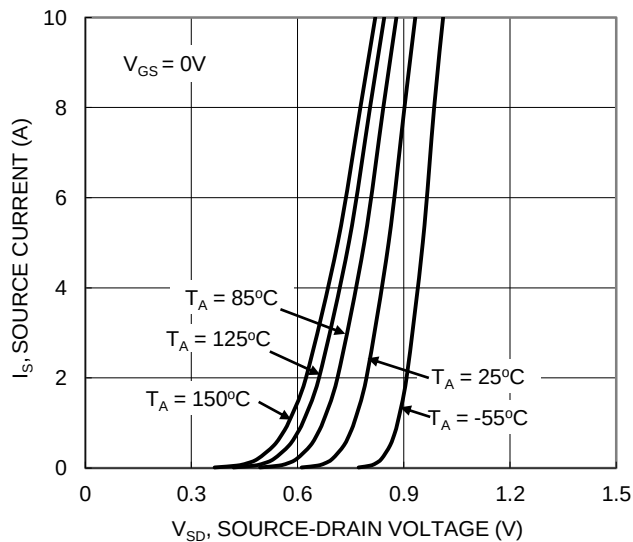
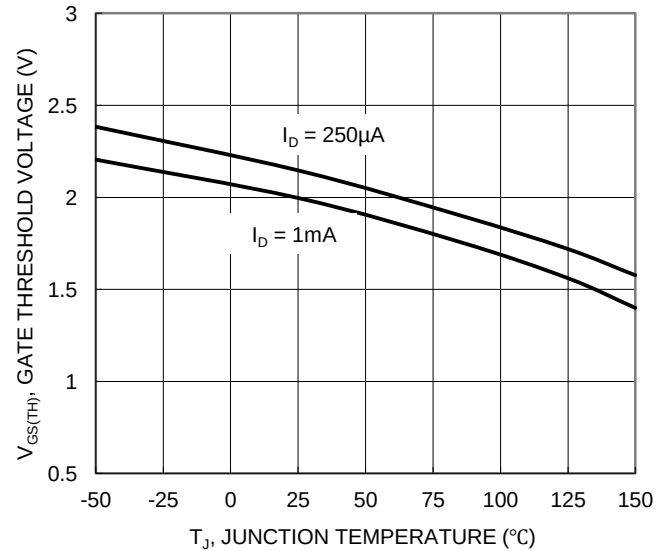
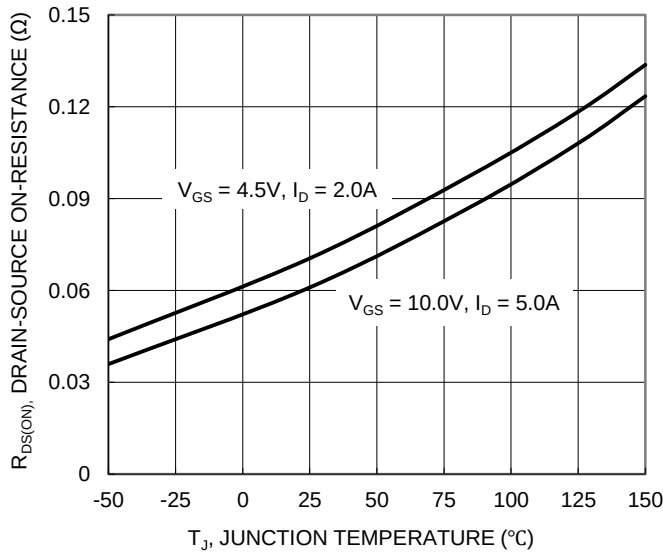


Figure 6. On-Resistance Variation with Temperature



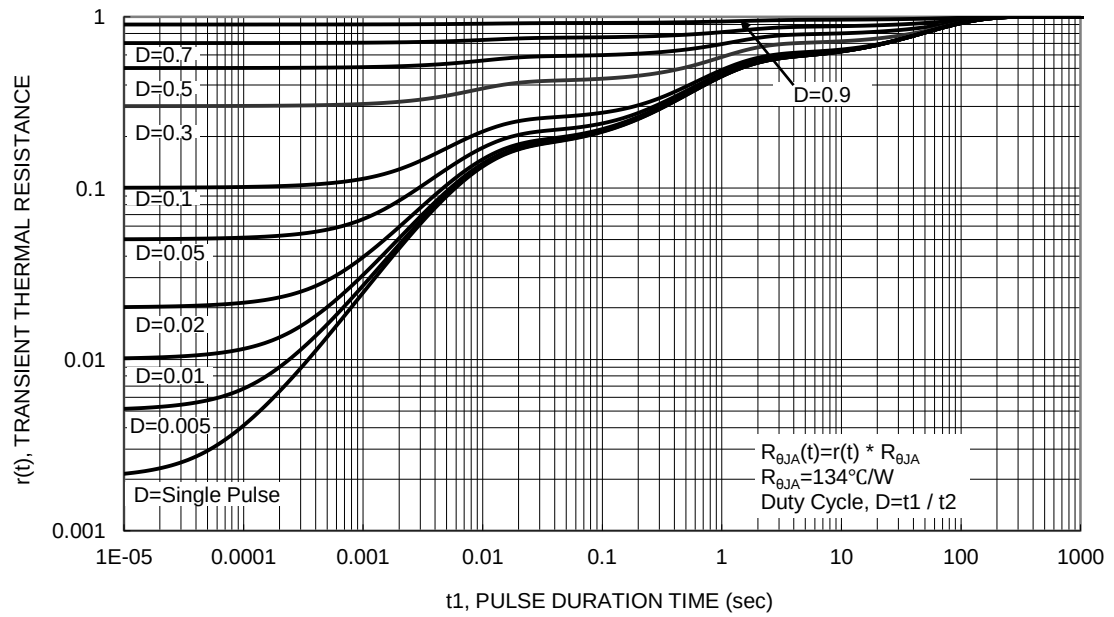


Figure 13. Transient Thermal Resistance

# Electrical Characteristics Q2 P-CHANNEL (@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>   | -60 | –    | –    | 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   | μA   | V <sub>DS</sub> = -60V, V <sub>GS</sub> = 0V                                                  |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | –   | –    | ±100 | nA   | V <sub>GS</sub> = ±16V, V <sub>DS</sub> = 0V                                                  |
| <b>ON CHARACTERISTICS (Note 8)</b>                     |                     |     |      |      |      |                                                                                               |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | -1  | –    | -3   | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                   |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | –   | 115  | 150  | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -1A                                                  |
|                                                        |                     |     | 170  | 250  |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.5A                                               |
| Forward Transfer Admittance                            | Y <sub>fs</sub>     | –   | 2.8  | –    | S    | V <sub>DS</sub> = -5V, I <sub>D</sub> = -1A                                                   |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | –   | -0.7 | -1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -2A                                                    |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>                |                     |     |      |      |      |                                                                                               |
| Input Capacitance                                      | C <sub>iss</sub>    | –   | 612  | –    | pF   | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                     |
| Output Capacitance                                     | C <sub>oss</sub>    | –   | 36   | –    | pF   |                                                                                               |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | –   | 26   | –    | pF   |                                                                                               |
| Gate Resistance                                        | R <sub>g</sub>      | –   | 13   | –    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                          |
| Total Gate Charge (V <sub>GS</sub> = -10V)             | Q <sub>g</sub>      | –   | 8.9  | –    | nC   | V <sub>DS</sub> = -30V, I <sub>D</sub> = -2A                                                  |
| Total Gate Charge (V <sub>GS</sub> = -4.5V)            | Q <sub>g</sub>      | –   | 4.3  | –    | nC   |                                                                                               |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | –   | 1.4  | –    | nC   |                                                                                               |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | –   | 1.7  | –    | nC   |                                                                                               |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | –   | 7.6  | –    | ns   | V <sub>GS</sub> = -10V, V <sub>DS</sub> = -30V,<br>R <sub>G</sub> = 50Ω, I <sub>D</sub> = -1A |
| Turn-On Rise Time                                      | t <sub>R</sub>      | –   | 11.6 | –    | ns   |                                                                                               |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | –   | 79.8 | –    | ns   |                                                                                               |
| Turn-Off Fall Time                                     | t <sub>F</sub>      | –   | 37.8 | –    | ns   |                                                                                               |

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

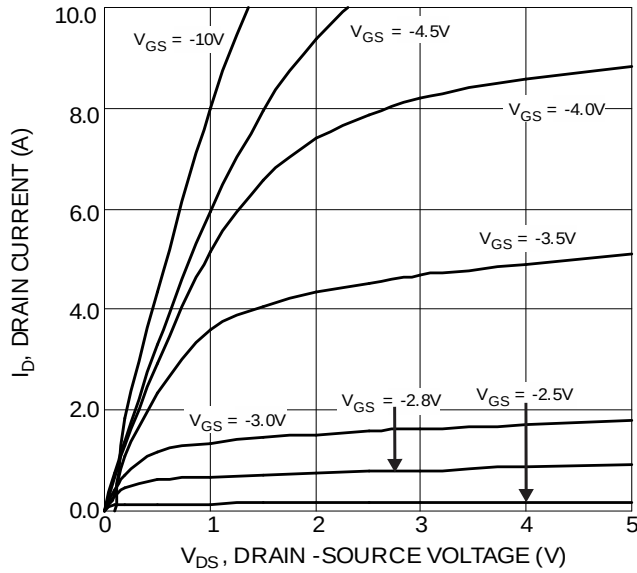


Figure 14 Typical Output Characteristics

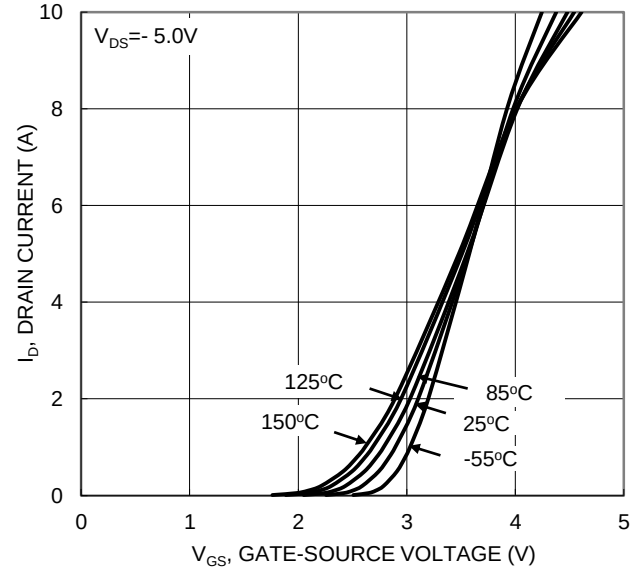


Figure 15. Typical Transfer Characteristic

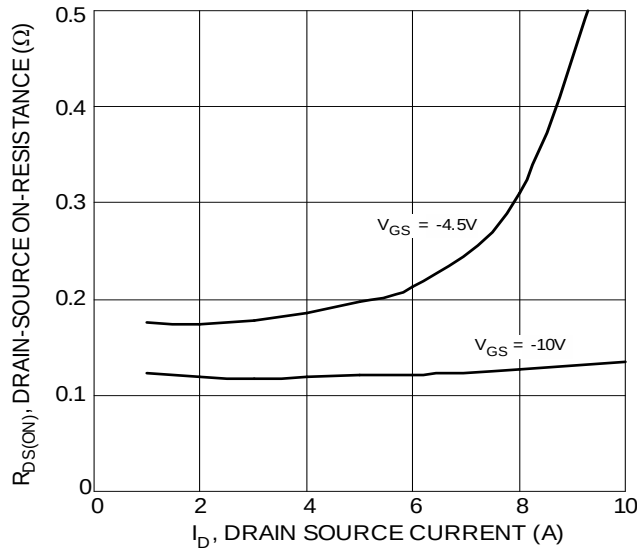


Figure 16 Typical On-Resistance vs. Drain Current and Gate Voltage

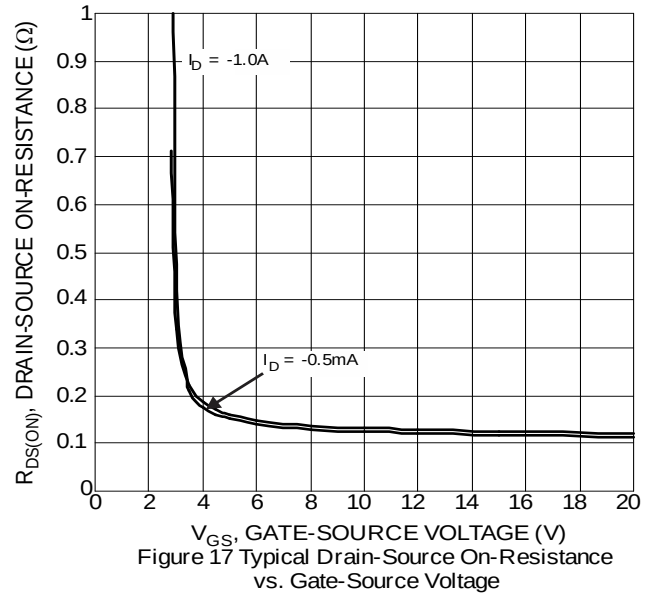


Figure 17 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

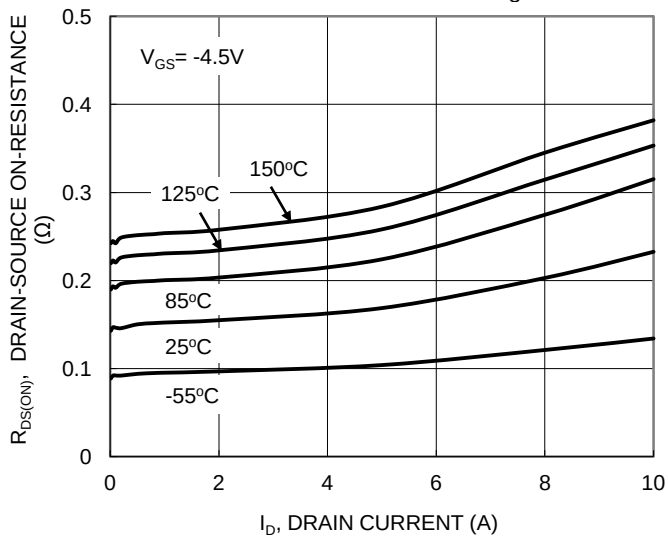


Figure 18. Typical On-Resistance vs. Drain Current and Temperature

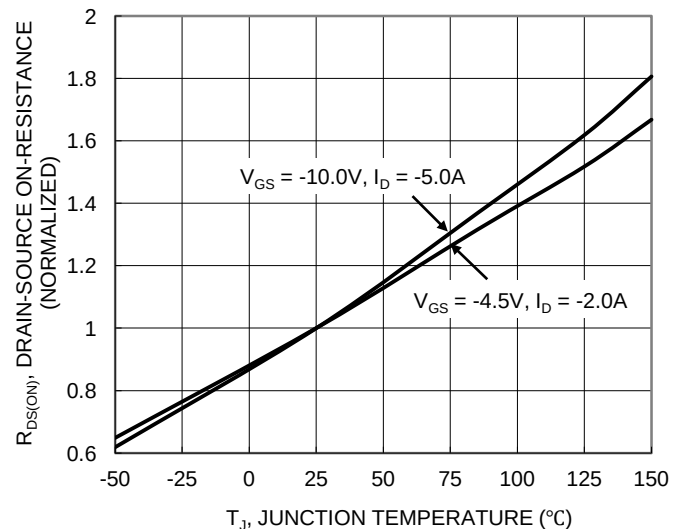


Figure 19. On-Resistance Variation with Temperature



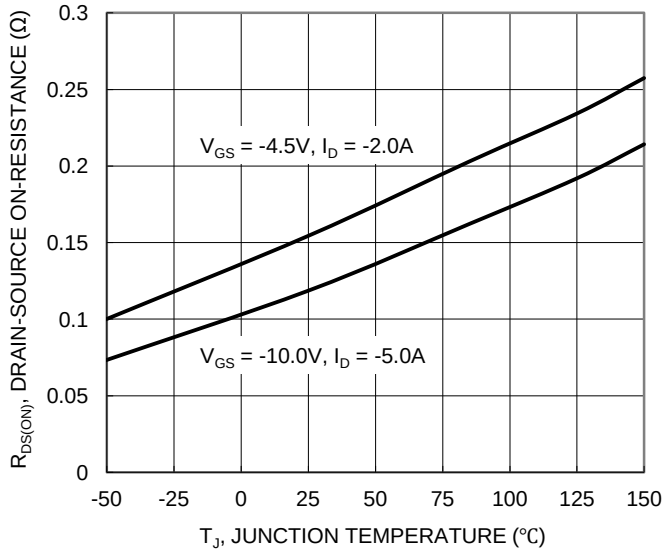


Figure 20. On-Resistance Variation with Temperature

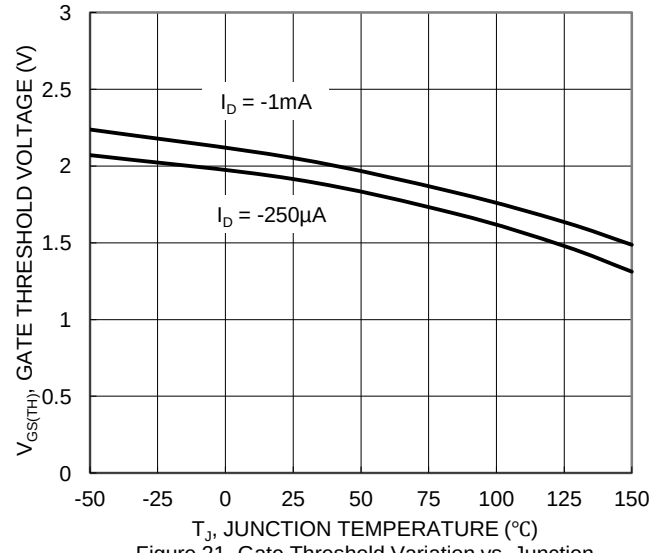


Figure 21. Gate Threshold Variation vs. Junction Temperature

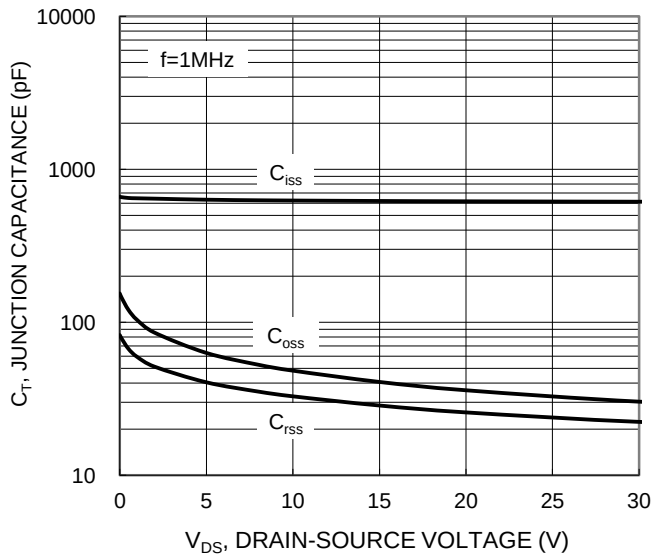


Figure 22. Typical Junction Capacitance

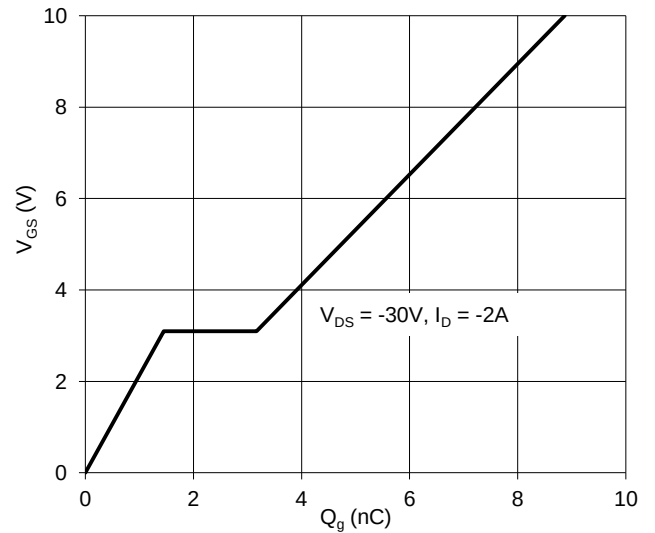


Figure 23. Gate Charge

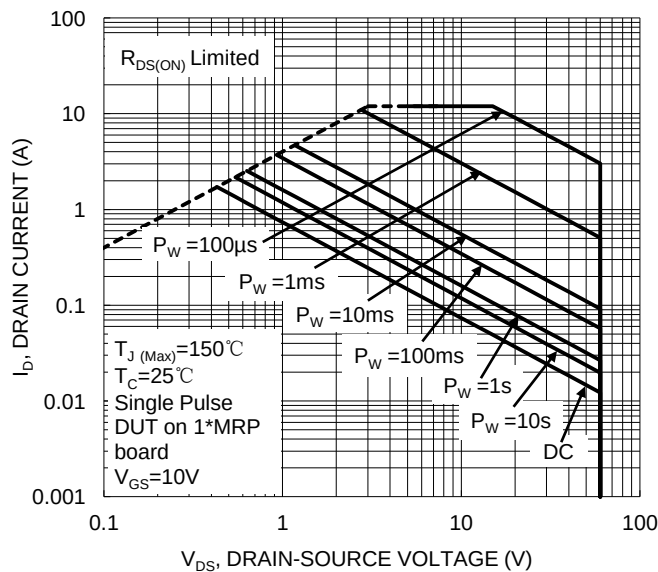


Figure 24. SOA, Safe Operation Area

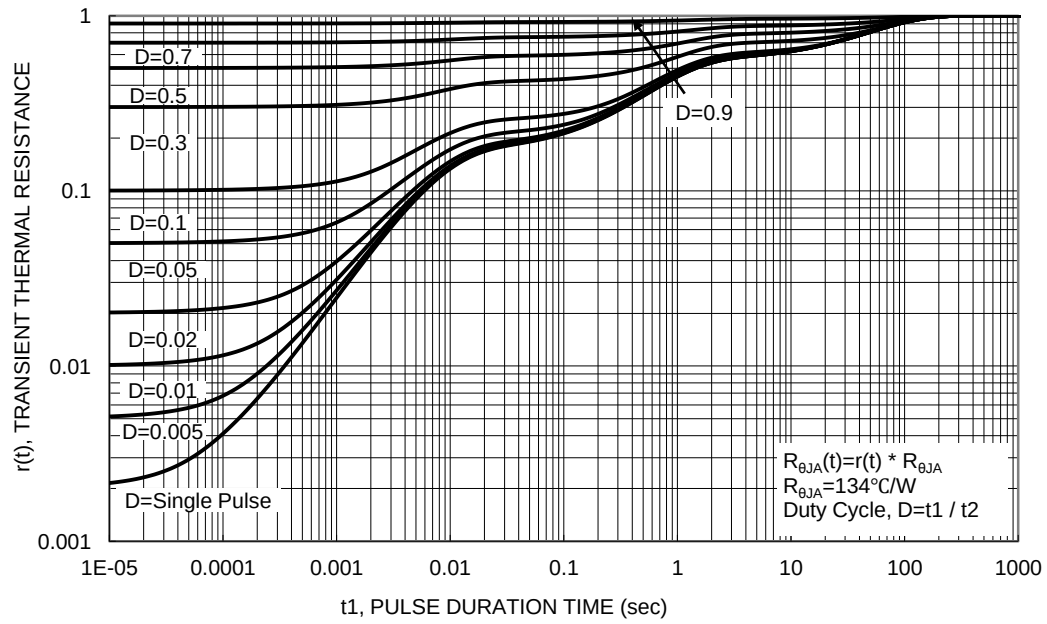
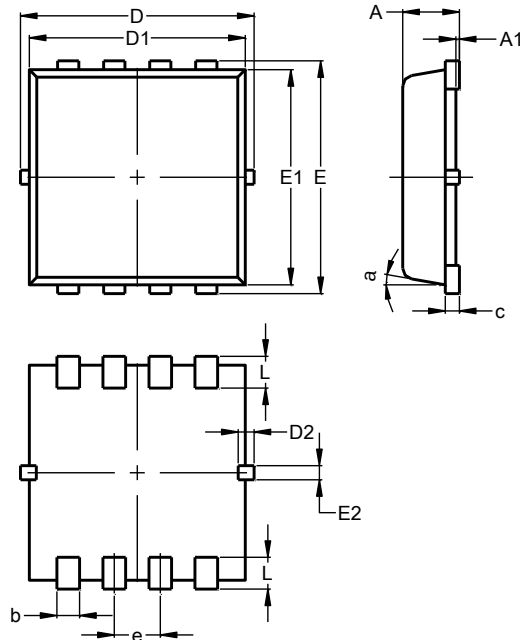


Figure 25. Transient Thermal Resistance

## Package Outline Dimensions

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

**POWERDI3333-8  
(Type UXB)**

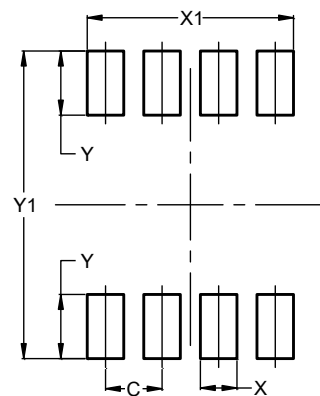


| POWERDI3333-8<br>(Type UXB) |      |      |      |
|-----------------------------|------|------|------|
| Dim                         | Min  | Max  | Typ  |
| A                           | 0.75 | 0.85 | 0.80 |
| A1                          | 0.00 | 0.05 | --   |
| b                           | 0.25 | 0.40 | 0.32 |
| c                           | 0.10 | 0.25 | 0.15 |
| D                           | 3.20 | 3.40 | 3.30 |
| D1                          | 2.95 | 3.15 | 3.05 |
| D2                          | 0.10 | 0.35 | 0.23 |
| E                           | 3.20 | 3.40 | 3.30 |
| E1                          | 2.95 | 3.15 | 3.05 |
| E2                          | 0.10 | 0.30 | 0.20 |
| e                           | --   | --   | 0.65 |
| L                           | 0.35 | 0.55 | 0.45 |
| a                           | 0°   | 12°  | 10°  |
| All Dimensions in mm        |      |      |      |

## Suggested Pad Layout

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

**POWERDI3333-8  
(Type UXB)**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| X          | 0.420         |
| X1         | 2.370         |
| Y          | 0.730         |
| Y1         | 3.500         |

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