

## Product Summary

| Device | BV <sub>DSS</sub> | R <sub>DS(ON)</sub>             | I <sub>D</sub> @T <sub>A</sub> = +25°C |
|--------|-------------------|---------------------------------|--|
| Q1     | 20V               | 0.45Ω @ V <sub>GS</sub> = 4.5V  | 1066mA                                 |
| Q2     | -20V              | 0.75Ω @ V <sub>GS</sub> = -4.5V | -845mA                                 |

## Description

This new generation MOSFET has been 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

- Battery operated systems and solid-state relays
- Drivers: relays, solenoids, lamps, hammers, displays, memories, transistors, etc.
- Power supply converter circuits

## Features and Benefits

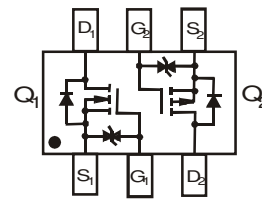
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- ESD Protected
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**

## Mechanical Data

- Package: SOT363
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 **e3**
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)



Top View



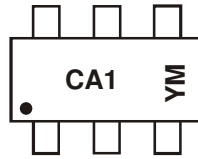
Top View  
Internal Schematic

## Ordering Information (Note 4)

| Part Number  | Compliance | Package | Packing |             |
|--------------|------------|---------|---------|-------------|
|              |            |         | Qty.    | Carrier     |
| DMG1016UDW-7 | Standard   | SOT363  | 3000    | Tape & Reel |

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  - 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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



CA1 = Product Type Marking Code  
 YM or  $\bar{Y}M$  = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: J = 2022)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2009 | ... | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|------|------|-----|------|------|------|------|------|------|------|------|------|------|
| Code | W    | ... | J    | K    | L    | M    | N    | O    | P    | R    | S    | T    |

| 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   |

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

| Characteristic                                   | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 330         | mW   |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 379         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

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

| Characteristic                                     | Symbol           | Value      | Unit |
|--|------------------|------------|------|
| Drain-Source Voltage                               | V <sub>DSS</sub> | 20         | V    |
| Gate-Source Voltage                                | V <sub>GSS</sub> | ±6         | V    |
| Continuous Drain Current (Note 5)                  | I <sub>D</sub>   | TA = +25°C | 1066 |
|  |                  | TA = +85°C | 690  |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | I <sub>DM</sub>  | 3.2        | A    |

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

| Characteristic                                     | Symbol           | Value      | Unit |
|--|------------------|------------|------|
| Drain-Source Voltage                               | V <sub>DSS</sub> | -20        | V    |
| Gate-Source Voltage                                | V <sub>GSS</sub> | ±6         | V    |
| Continuous Drain Current (Note 5)                  | I <sub>D</sub>   | TA = +25°C | -845 |
|  |                  | TA = +85°C | -548 |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | I <sub>DM</sub>  | -2.2       | A    |

Notes: 5. Device mounted on FR-4 PCB with minimum recommended pad layout.

**Electrical Characteristics N-CHANNEL – Q1** (@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>   | 20  | —     | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA   |
| Zero Gate Voltage Drain Current @T <sub>C</sub> = +25°C | I <sub>DSS</sub>    | —   | —     | 100  | nA   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                                     | I <sub>GSS</sub>    | —   | —     | ±1.0 | μA   | V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS (Note 6)</b>                      |                     |     |       |      |      |  |
| Gate Threshold Voltage                                  | V <sub>GS(TH)</sub> | 0.5 | —     | 1.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                   |
| Static Drain-Source On-Resistance                       | R <sub>DS(ON)</sub> | —   | 0.3   | 0.45 | Ω    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 600mA   |
|   |                     |     | 0.4   | 0.6  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA   |
|   |                     |     | 0.5   | 0.75 |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA   |
| Forward Transfer Admittance                             | Y <sub>fs</sub>     | —   | 1.4   | —    | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA  |
| Diode Forward Voltage (Note 6)                          | V <sub>SD</sub>     | —   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA   |
| <b>DYNAMIC CHARACTERISTICS (Note 7)</b>                 |                     |     |       |      |      |  |
| Input Capacitance                                       | C <sub>iss</sub>    | —   | 60.67 | —    | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                   |
| Output Capacitance                                      | C <sub>oss</sub>    | —   | 9.68  | —    | pF   |  |
| Reverse Transfer Capacitance                            | C <sub>rss</sub>    | —   | 5.37  | —    | pF   |  |
| Total Gate Charge                                       | Q <sub>g</sub>      | —   | 736.6 | —    | nC   | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V,<br>I <sub>D</sub> = 250mA                     |
| Gate-Source Charge                                      | Q <sub>gs</sub>     | —   | 93.6  | —    | nC   |  |
| Gate-Drain Charge                                       | Q <sub>gd</sub>     | —   | 116.6 | —    | nC   |  |
| Turn-On Delay Time                                      | t <sub>D(ON)</sub>  | —   | 5.1   | —    | ns   | V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V,<br>R <sub>L</sub> = 47Ω, R <sub>G</sub> = 10Ω |
| Turn-On Rise Time                                       | t <sub>R</sub>      | —   | 7.4   | —    | ns   |  |
| Turn-Off Delay Time                                     | t <sub>D(OFF)</sub> | —   | 26.7  | —    | ns   |  |
| Turn-Off Fall Time                                      | t <sub>F</sub>      | —   | 12.3  | —    | ns   |  |

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

**N-CHANNEL – Q1**

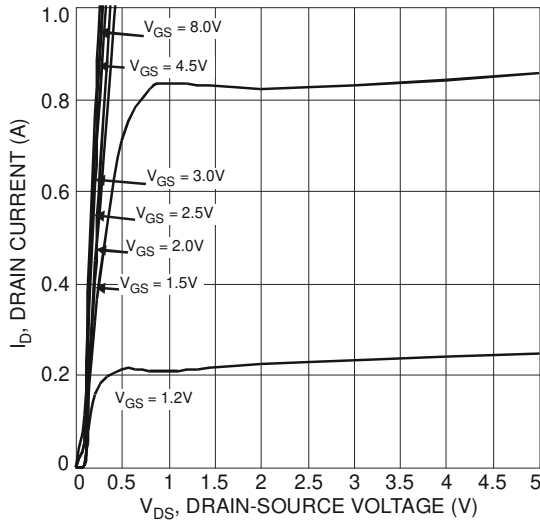


Fig. 1 Typical Output Characteristic

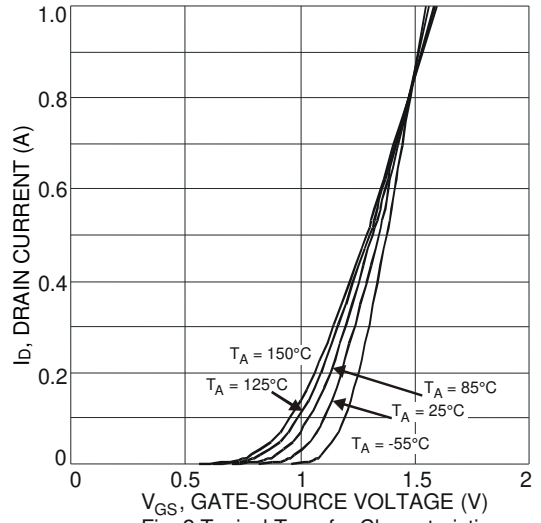


Fig. 2 Typical Transfer Characteristic

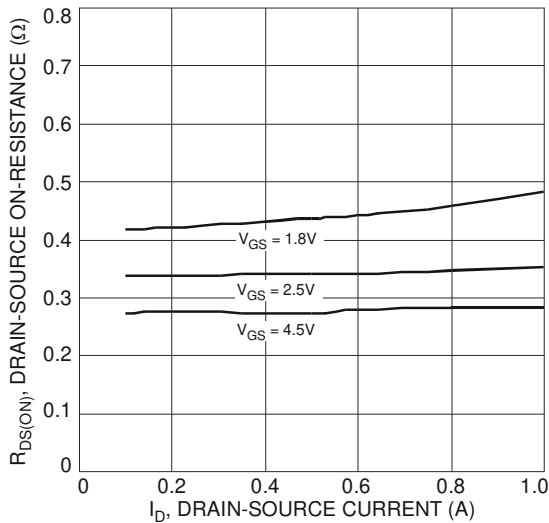


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

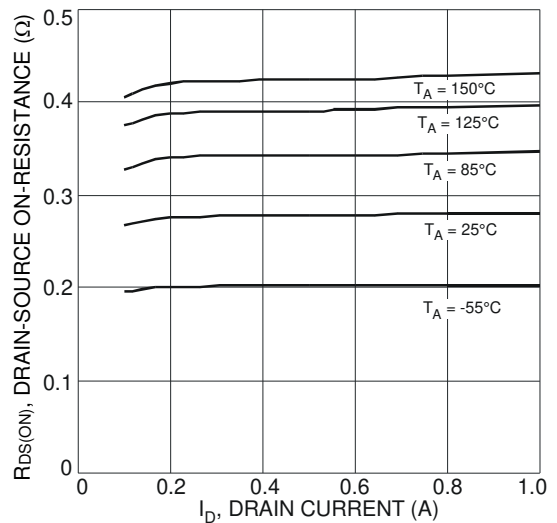


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

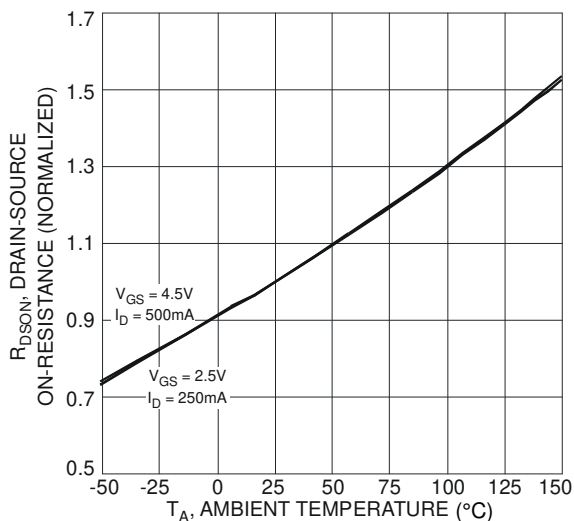


Fig. 5 On-Resistance Variation with Temperature

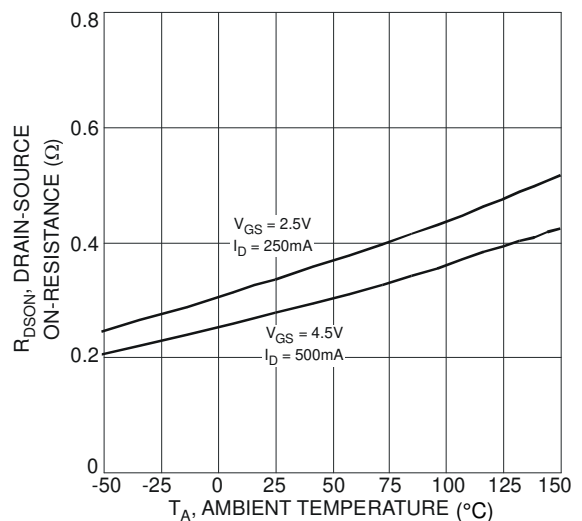


Fig. 6 On-Resistance Variation with Temperature

**N-CHANNEL – Q1** (continued)

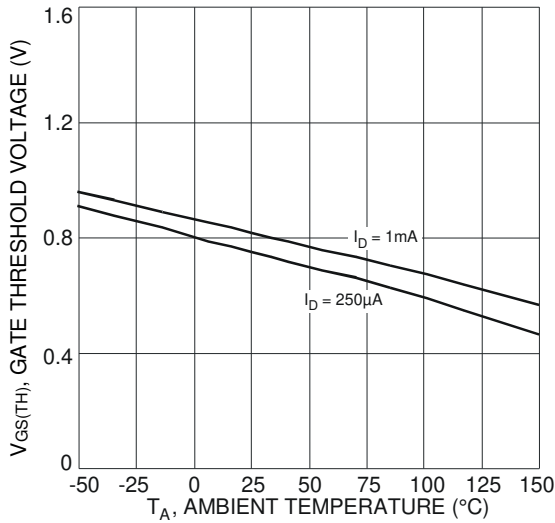


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

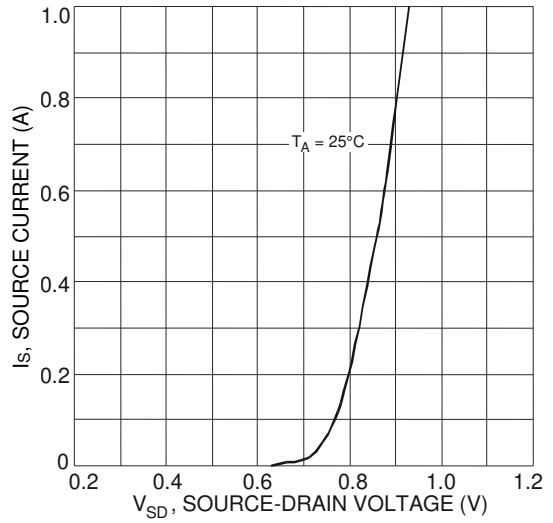


Fig. 8 Diode Forward Voltage vs. Current

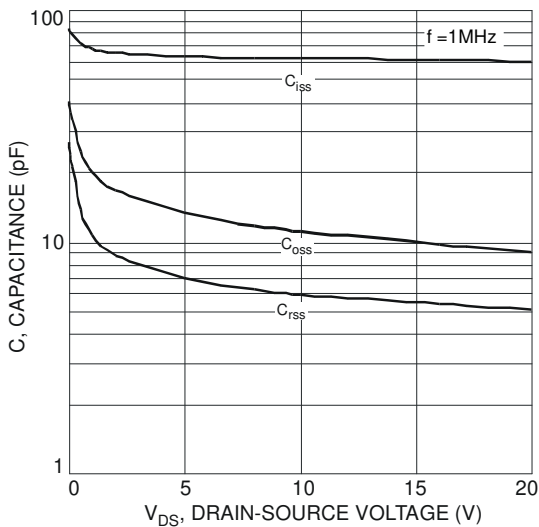


Fig. 9 Typical Total Capacitance

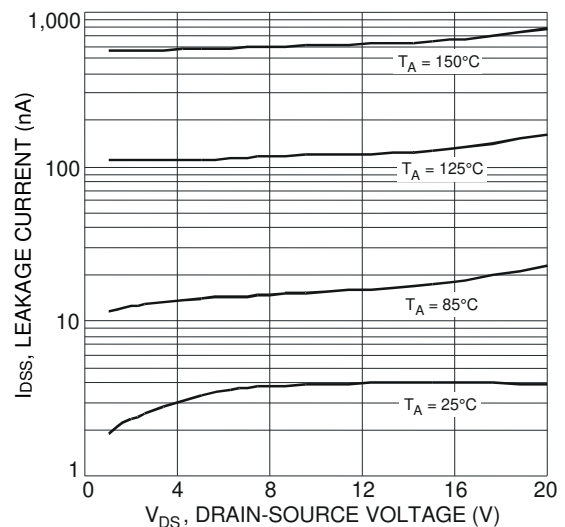


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

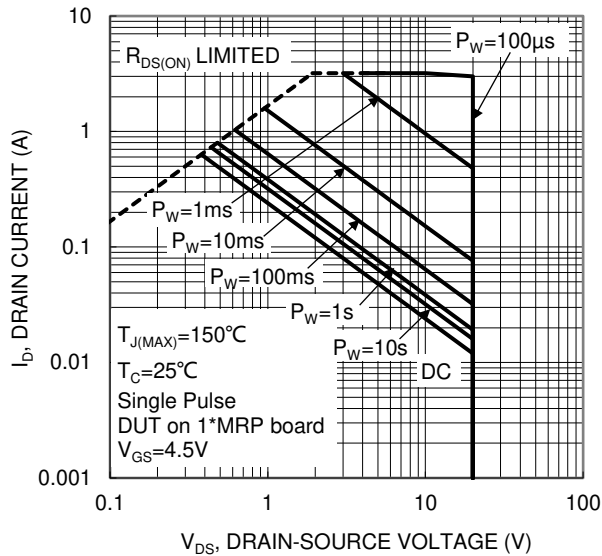


Figure 11. SOA, Safe Operation Area

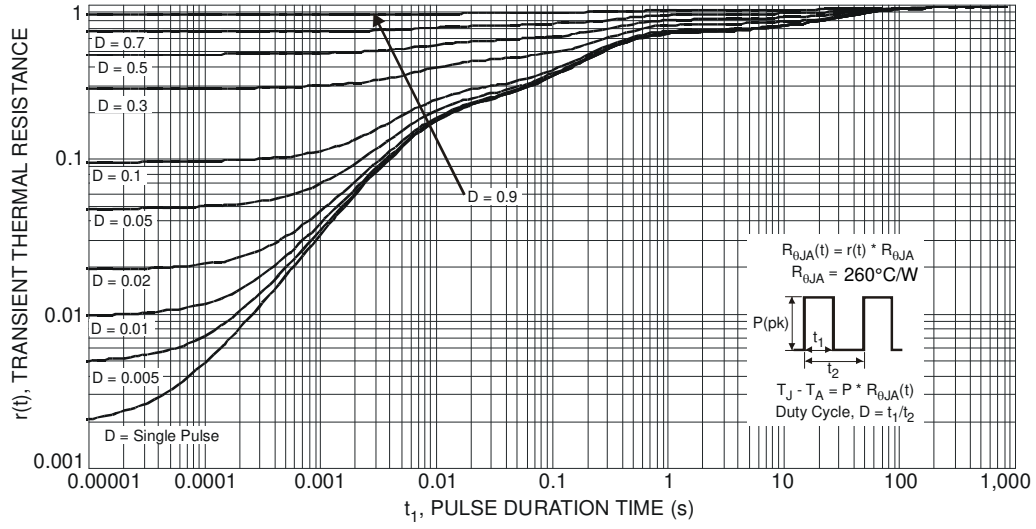


Fig. 12 Transient Thermal Response

**Electrical Characteristics P-CHANNEL – Q2** (@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>   | -20  | —     | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA  |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>    | —    | —     | -100 | nA   | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V   |
| Gate-Source Leakage                     | I <sub>GSS</sub>    | —    | —     | ±2.0 | μA   | V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS (Note 6)</b>      |                     |      |       |      |      |  |
| Gate Threshold Voltage                  | V <sub>GS(TH)</sub> | -0.5 | —     | -1.0 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                    |
| Static Drain-Source On-Resistance       | R <sub>DS(ON)</sub> | —    | 0.5   | 0.75 | Ω    | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -430mA   |
|   |                     |      | 0.7   | 1.05 |      | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -300mA   |
|   |                     |      | 1.0   | 1.5  |      | V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -150mA   |
| Forward Transfer Admittance             | Y <sub>fs</sub>     | —    | 0.9   | —    | S    | V <sub>DS</sub> = -10V, I <sub>D</sub> = -250mA  |
| Diode Forward Voltage (Note 6)          | V <sub>SD</sub>     | —    | -0.8  | -1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -150mA  |
| <b>DYNAMIC CHARACTERISTICS (Note 7)</b> |                     |      |       |      |      |  |
| Input Capacitance                       | C <sub>iss</sub>    | —    | 59.76 | —    | pF   | V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                    |
| Output Capacitance                      | C <sub>oss</sub>    | —    | 12.07 | —    | pF   |  |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    | —    | 6.36  | —    | pF   |  |
| Total Gate Charge                       | Q <sub>g</sub>      | —    | 622.4 | —    | pC   | V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -10V,<br>I <sub>D</sub> = -250mA                    |
| Gate-Source Charge                      | Q <sub>gs</sub>     | —    | 100.3 | —    | pC   |  |
| Gate-Drain Charge                       | Q <sub>gd</sub>     | —    | 132.2 | —    | pC   |  |
| Turn-On Delay Time                      | t <sub>D(ON)</sub>  | —    | 5.1   | —    | ns   | V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V,<br>R <sub>G</sub> = 10Ω, R <sub>L</sub> = 47Ω |
| Turn-On Rise Time                       | t <sub>R</sub>      | —    | 8.1   | —    | ns   |  |
| Turn-Off Delay Time                     | t <sub>D(OFF)</sub> | —    | 28.4  | —    | ns   |  |
| Turn-Off Fall Time                      | t <sub>F</sub>      | —    | 20.72 | —    | ns   |  |

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

**P-CHANNEL – Q2**

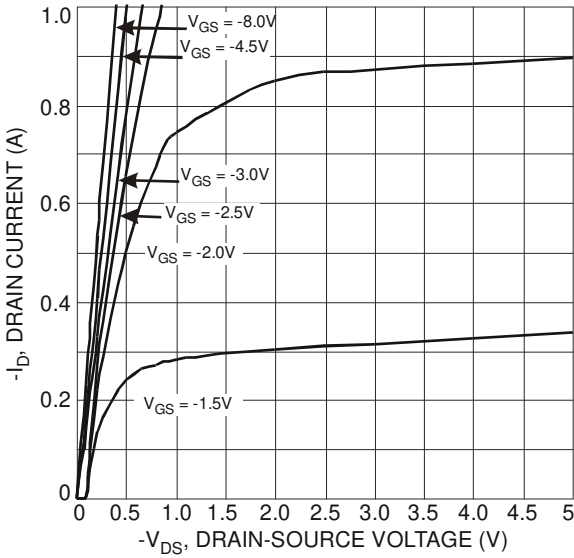


Fig. 13 Typical Output Characteristic

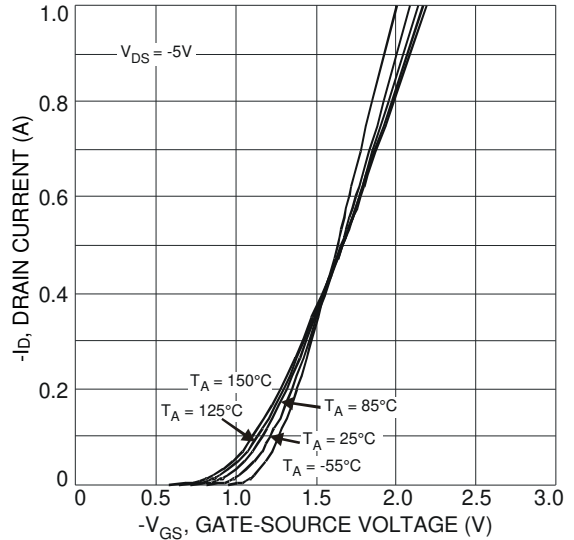


Fig. 14 Typical Transfer Characteristic

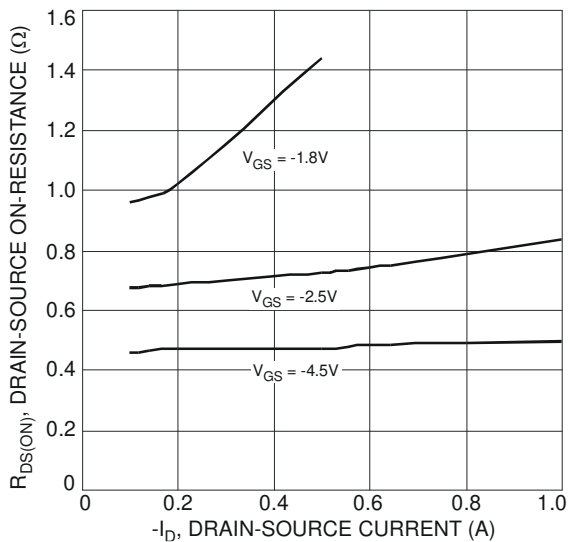


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

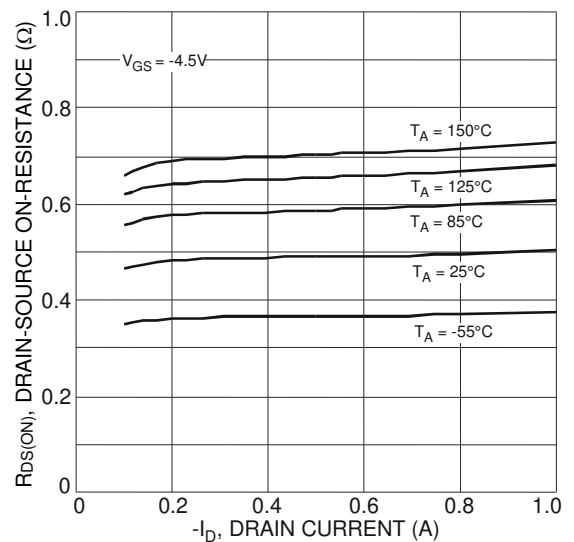


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

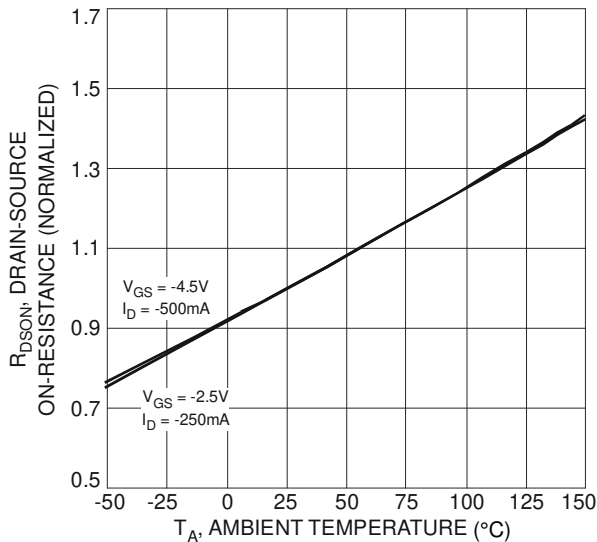


Fig. 17 On-Resistance Variation with Temperature

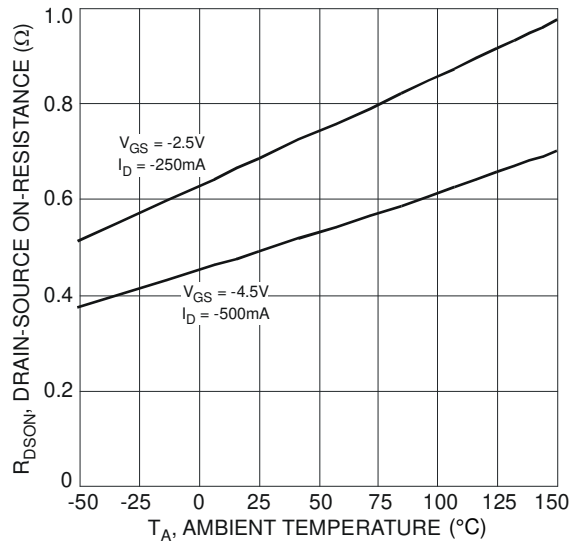


Fig. 18 On-Resistance Variation with Temperature



**P-CHANNEL – Q2** (continued)

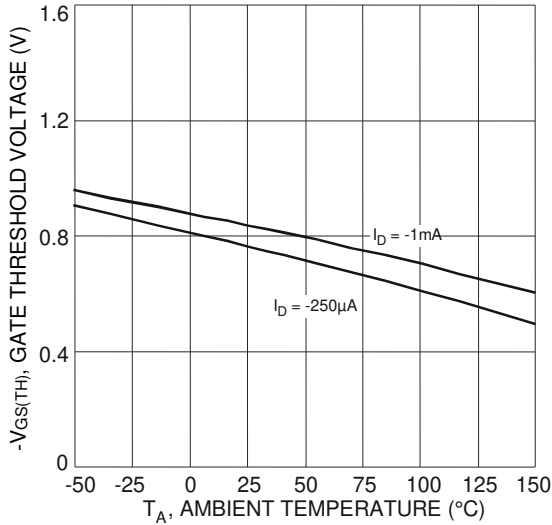


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

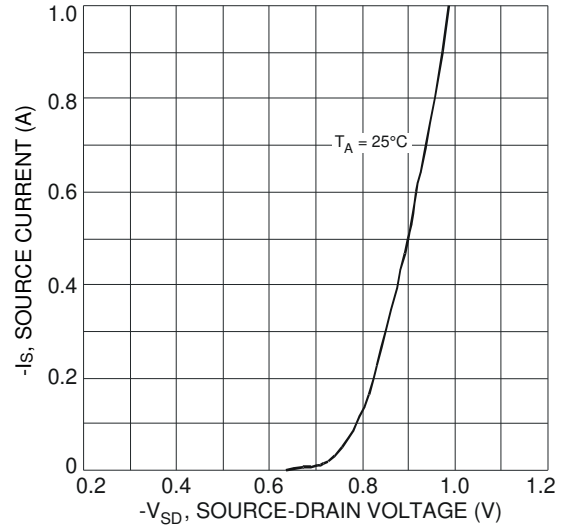


Fig. 20 Diode Forward Voltage vs. Current

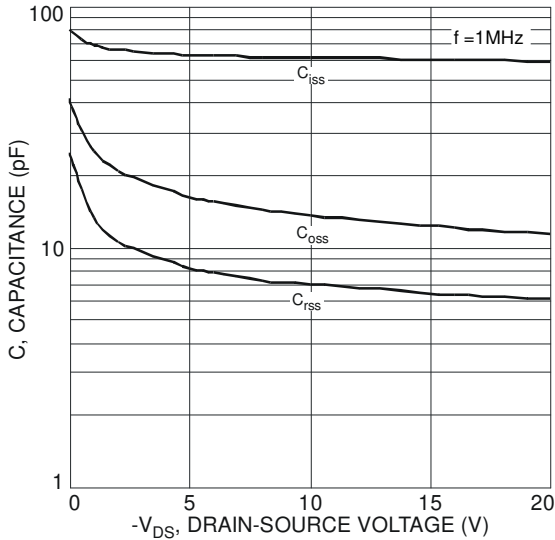


Fig. 21 Typical Total Capacitance

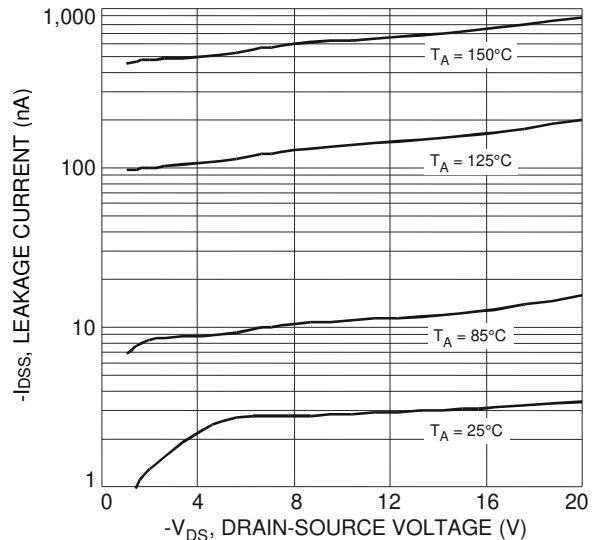


Fig. 22 Typical Leakage Current vs. Drain-Source Voltage

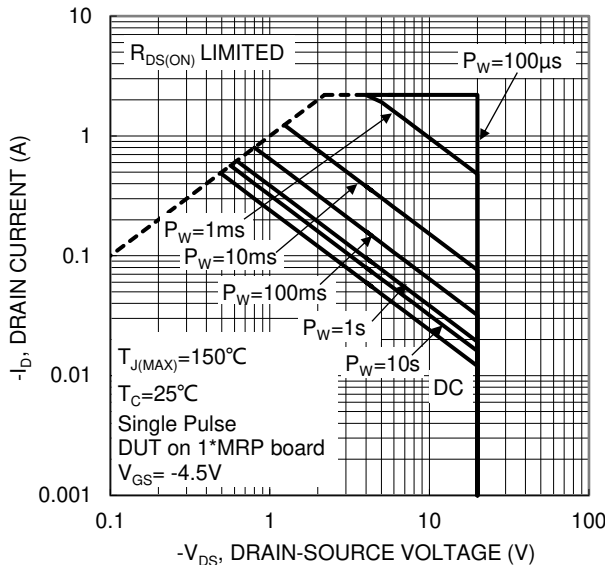


Figure 23. SOA, Safe Operation Area

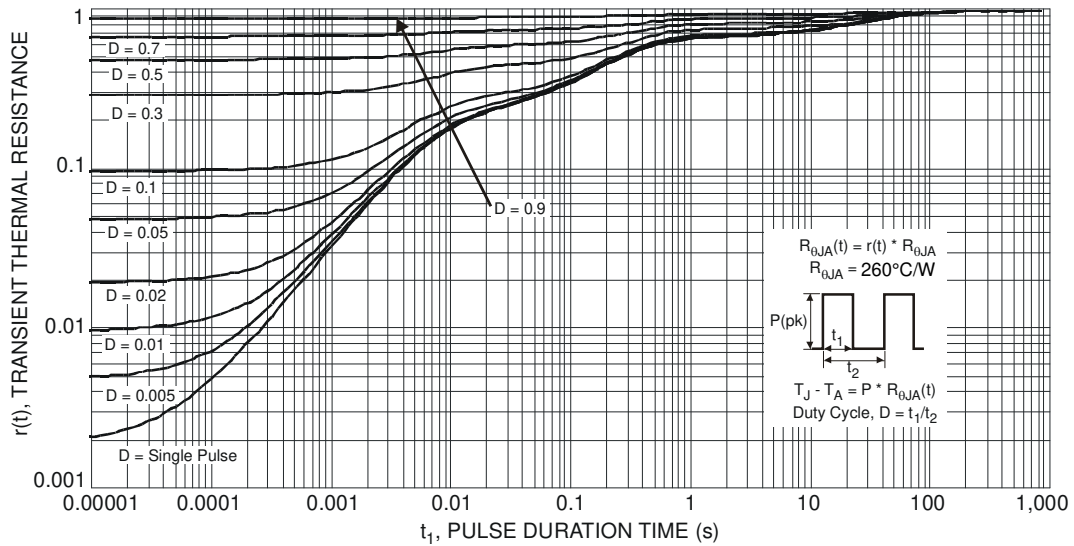
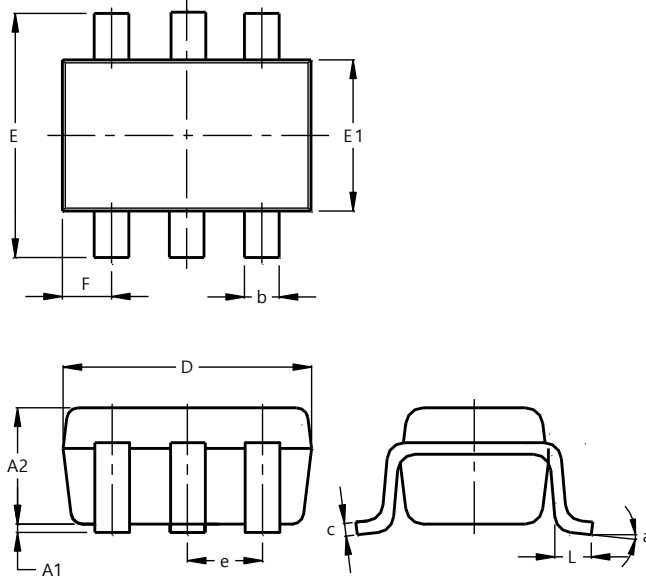


Fig. 24 Transient Thermal Response

## Package Outline Dimensions

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

### SOT363

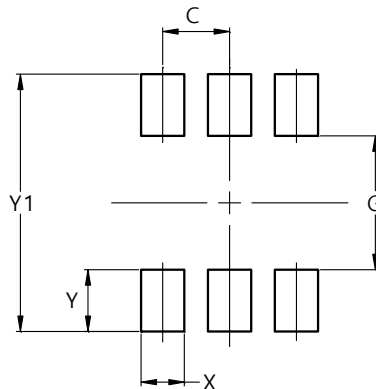


| SOT363               |           |      |       |
|----------------------|-----------|------|-------|
| Dim                  | Min       | Max  | Typ   |
| A1                   | 0.00      | 0.10 | 0.05  |
| A2                   | 0.90      | 1.00 | 0.95  |
| b                    | 0.10      | 0.30 | 0.25  |
| c                    | 0.10      | 0.22 | 0.11  |
| D                    | 1.80      | 2.20 | 2.15  |
| E                    | 2.00      | 2.20 | 2.10  |
| E1                   | 1.15      | 1.35 | 1.30  |
| e                    | 0.650 BSC |      |       |
| F                    | 0.40      | 0.45 | 0.425 |
| L                    | 0.25      | 0.40 | 0.30  |
| a                    | 0°        | 8°   | --    |
| All Dimensions in mm |           |      |       |

## Suggested Pad Layout

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

### SOT363



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 1.300         |
| X          | 0.420         |
| Y          | 0.600         |
| Y1         | 2.500         |

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