

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET
Product Summary

| Device | BV _{DSS} | R _{DS(ON)} | I _D @T _A = +25°C |
|--------|-------------------|---------------------------------|--|
| Q1 | 20V | 0.45Ω @ V _{GS} = 4.5V | 1066mA |
| Q2 | -20V | 0.75Ω @ V _{GS} = -4.5V | -845mA |

Description

This new generation 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

- Battery Operated Systems and Solid-State Relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Power Supply Converter Circuits

Features and Benefits

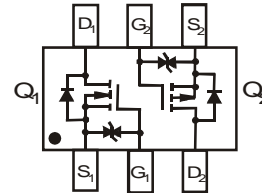
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- ESD Protected
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 Standards for High Reliability**
- PPAP Capable (Note 4)**

Mechanical Data

- Case: SOT363
- Case 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)



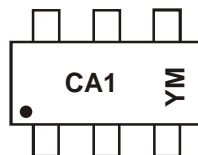
Top View


 Top View
Internal Schematic

Ordering Information (Note 5)

| Part Number | Compliance | Case | Packaging |
|---------------|------------|--------|------------------|
| DMG1016UDW-7 | Standard | SOT363 | 3000/Tape & Reel |
| DMG1016UDWQ-7 | Automotive | 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.
 - 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 <https://www.diodes.com/quality/>.
 - 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: F = 2018)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2008 | 2009 | 2010 | ~ | 2018 | 2019 | 2020 | 2021 | 2022 |
|------|------|------|------|---|------|------|------|------|------|
| Code | V | W | X | ~ | F | G | H | I | J |

| 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 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|--|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 6) | P_D | 330 | mW |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 379 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

Maximum Ratings N-CHANNEL – Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit | |
|--|--------------|---------------------------|------|----|
| Drain-Source Voltage | V_{DSS} | 20 | V | |
| Gate-Source Voltage | V_{GSS} | ± 6 | V | |
| Continuous Drain Current (Note 6) | Steady State | $T_A = +25^\circ\text{C}$ | 1066 | mA |
| | | $T_A = +85^\circ\text{C}$ | 690 | |
| Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%) | I_{DM} | 3.2 | A | |

Maximum Ratings P-CHANNEL – Q2 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit | |
|--|--------------|---------------------------|------|----|
| Drain-Source Voltage | V_{DSS} | -20 | V | |
| Gate-Source Voltage | V_{GSS} | ± 6 | V | |
| Continuous Drain Current (Note 6) | Steady State | $T_A = +25^\circ\text{C}$ | -845 | mA |
| | | $T_A = +85^\circ\text{C}$ | -548 | |
| Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%) | I_{DM} | -2.2 | A | |

Electrical Characteristics N-CHANNEL – Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|-----|-------|-----------|---------------|--|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 20 | — | — | V | $V_{GS} = 0V, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | 100 | nA | $V_{DS} = 20V, V_{GS} = 0V$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 1.0 | μA | $V_{GS} = \pm 4.5V, V_{DS} = 0V$ |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.5 | — | 1.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 0.3 | 0.45 | Ω | $V_{GS} = 4.5V, I_D = 600\text{mA}$ |
| | | | 0.4 | 0.6 | | $V_{GS} = 2.5V, I_D = 500\text{mA}$ |
| | | | 0.5 | 0.75 | | $V_{GS} = 1.8V, I_D = 350\text{mA}$ |
| Forward Transfer Admittance | $ Y_{fs} $ | — | 1.4 | — | S | $V_{DS} = 10V, I_D = 400\text{mA}$ |
| Diode Forward Voltage (Note 7) | V_{SD} | — | 0.7 | 1.2 | V | $V_{GS} = 0V, I_S = 150\text{mA}$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | — | 60.67 | — | pF | $V_{DS} = 10V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 9.68 | — | pF | |
| Reverse Transfer Capacitance | C_{rss} | — | 5.37 | — | pF | |
| Total Gate Charge | Q_g | — | 736.6 | — | nC | $V_{GS} = 4.5V, V_{DS} = 10V,$ $I_D = 250\text{mA}$ |
| Gate-Source Charge | Q_{gs} | — | 93.6 | — | nC | |
| Gate-Drain Charge | Q_{gd} | — | 116.6 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 5.1 | — | ns | $V_{DD} = 10V, V_{GS} = 4.5V,$ $R_L = 47\Omega, R_G = 10\Omega$ |
| Turn-On Rise Time | t_R | — | 7.4 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 26.7 | — | ns | |
| Turn-Off Fall Time | t_F | — | 12.3 | — | ns | |

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to production testing.

N-CHANNEL – Q1

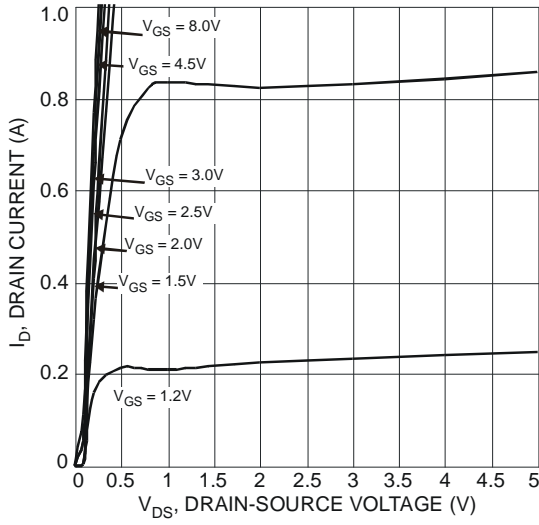


Fig. 1 Typical Output Characteristic

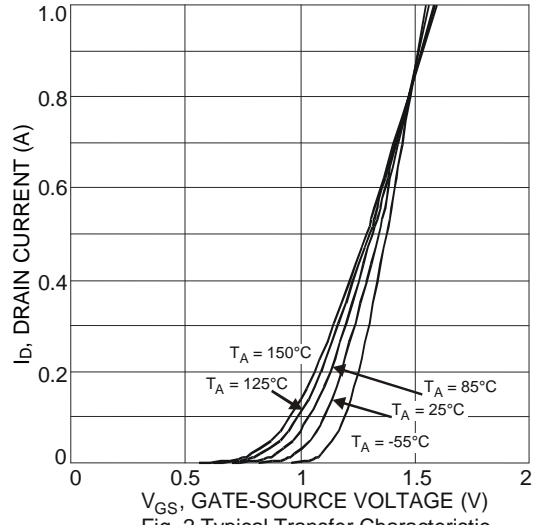


Fig. 2 Typical Transfer Characteristic

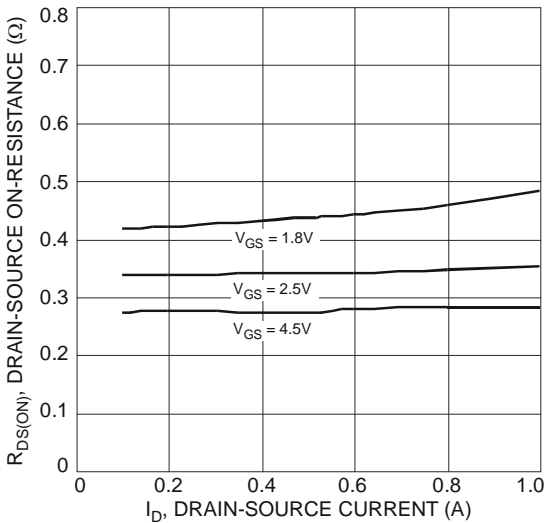


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

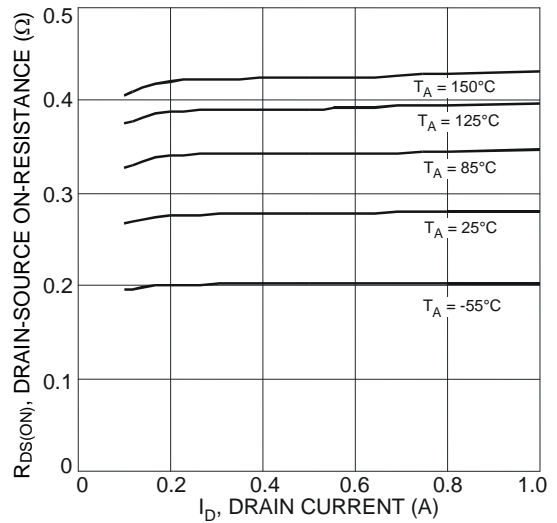


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

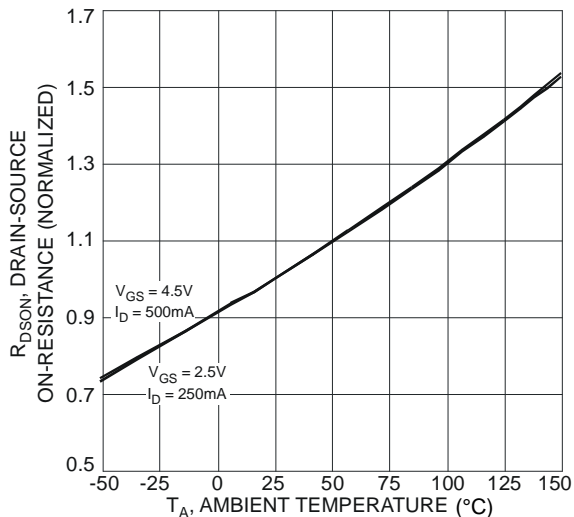


Fig. 5 On-Resistance Variation with Temperature

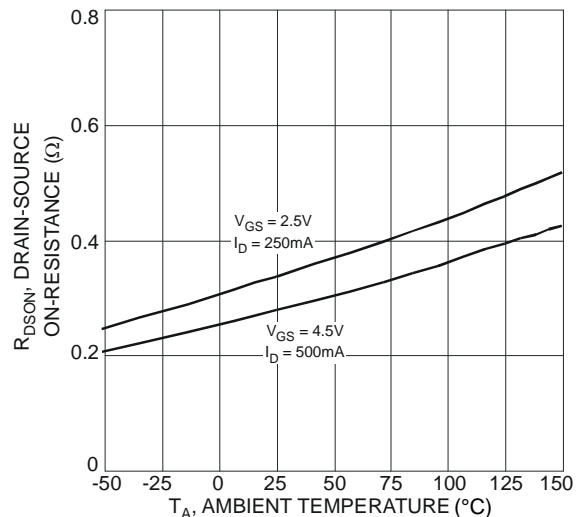


Fig. 6 On-Resistance Variation with Temperature

N-CHANNEL – Q1 (Cont.)

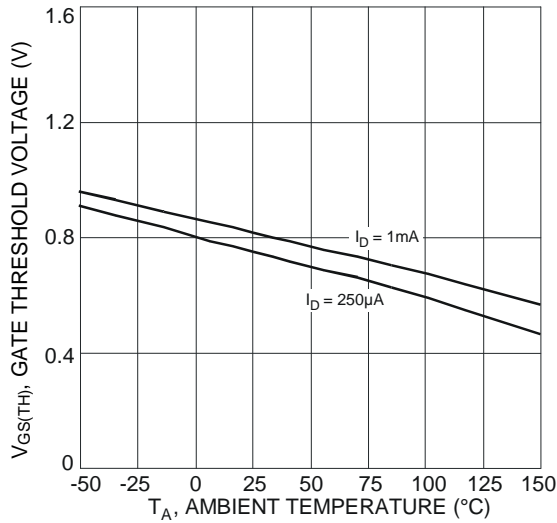


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

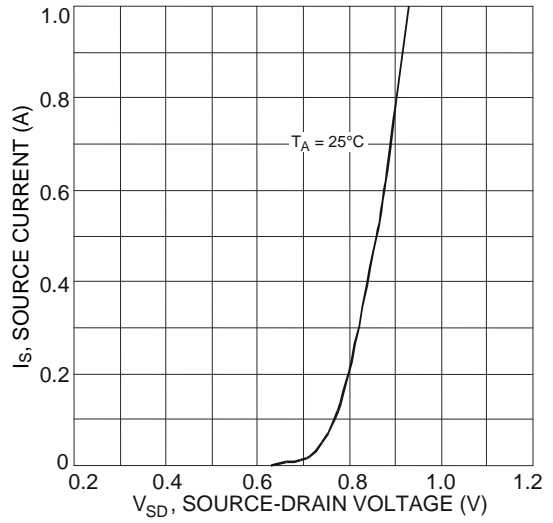


Fig. 8 Diode Forward Voltage vs. Current

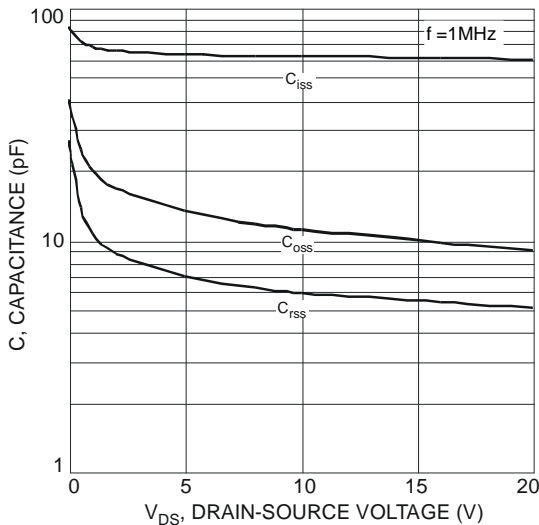


Fig. 9 Typical Total Capacitance

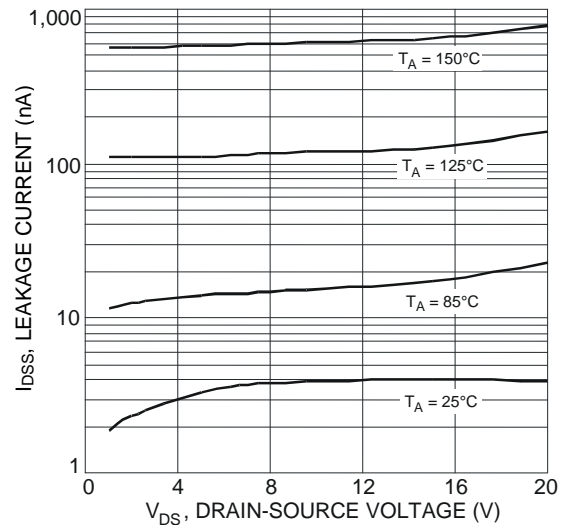


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

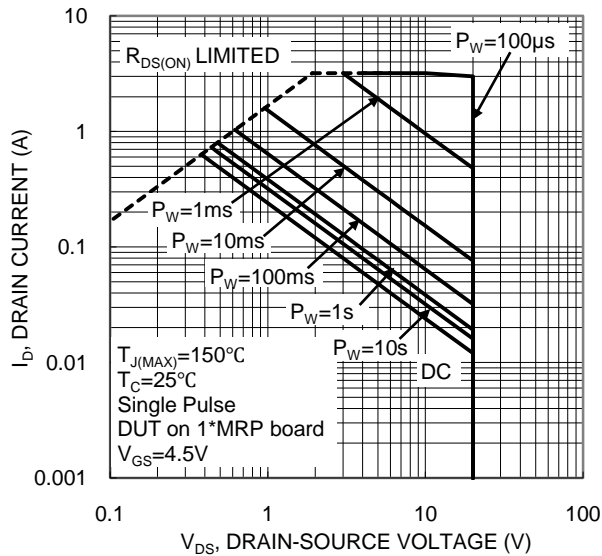


Figure 11. SOA, Safe Operation Area

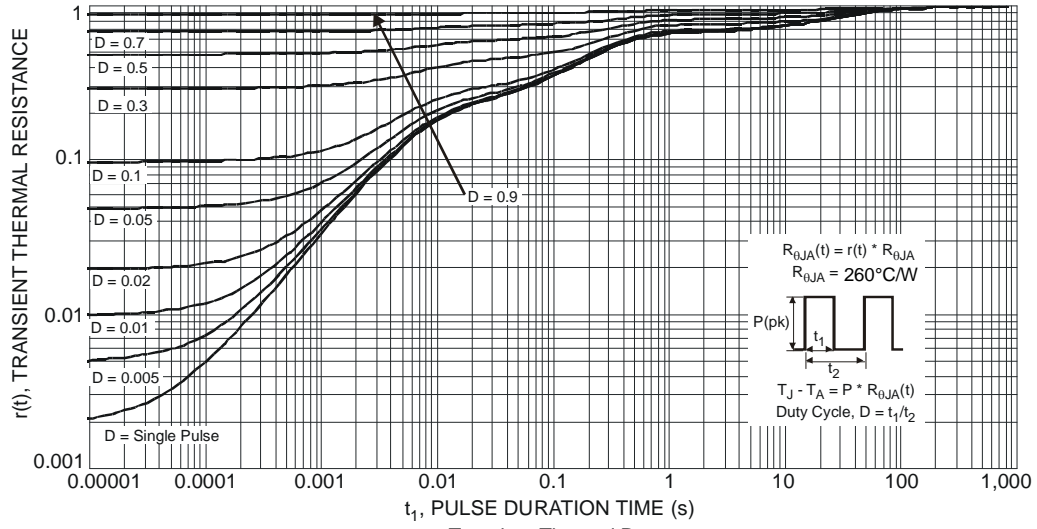


Fig. 12 Transient Thermal Response

Electrical Characteristics P-CHANNEL – Q2 (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---------------------|------|-------|------|------|--|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -20 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| Zero Gate Voltage Drain Current @T _C = +25°C | I _{DSS} | — | — | -100 | nA | V _{DS} = -20V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±2.0 | μA | V _{GS} = ±4.5V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | -0.5 | — | -1.0 | V | V _{DS} = V _{GS} , I _D = -250μA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 0.5 | 0.75 | Ω | V _{GS} = -4.5V, I _D = -430mA |
| | | | 0.7 | 1.05 | | V _{GS} = -2.5V, I _D = -300mA |
| | | | 1.0 | 1.5 | | V _{GS} = -1.8V, I _D = -150mA |
| Forward Transfer Admittance | Y _{fs} | — | 0.9 | — | S | V _{DS} = -10V, I _D = -250mA |
| Diode Forward Voltage (Note 7) | V _{SD} | — | -0.8 | -1.2 | V | V _{GS} = 0V, I _S = -150mA |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iss} | — | 59.76 | — | pF | V _{DS} = -16V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 12.07 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 6.36 | — | pF | |
| Total Gate Charge | Q _g | — | 622.4 | — | pC | V _{GS} = -4.5V, V _{DS} = -10V, I _D = -250mA |
| Gate-Source Charge | Q _{gs} | — | 100.3 | — | pC | |
| Gate-Drain Charge | Q _{gd} | — | 132.2 | — | pC | |
| Turn-On Delay Time | t _{D(ON)} | — | 5.1 | — | ns | V _{DS} = -10V, V _{GS} = -4.5V, R _G = 10Ω, R _L = 47Ω |
| Turn-On Rise Time | t _R | — | 8.1 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 28.4 | — | ns | |
| Turn-Off Fall Time | t _F | — | 20.72 | — | ns | |

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

P-CHANNEL – Q2

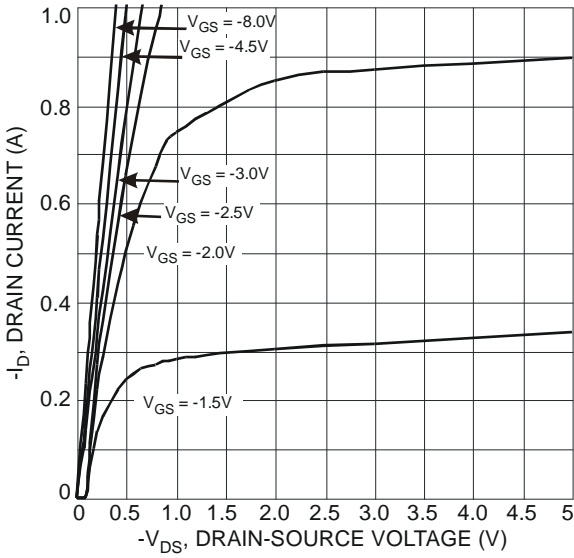


Fig. 13 Typical Output Characteristic

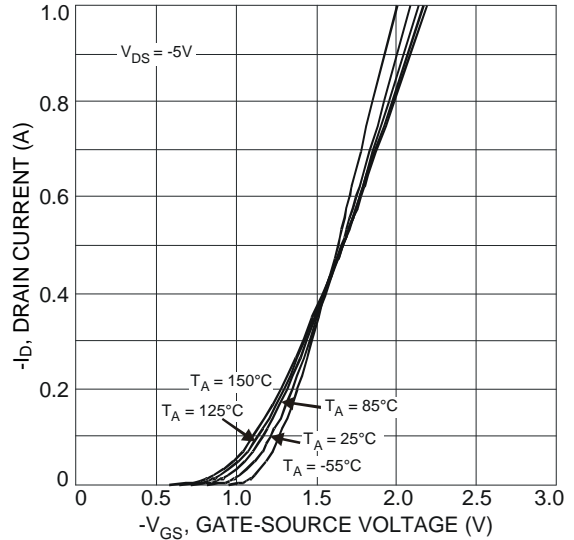


Fig. 14 Typical Transfer Characteristic

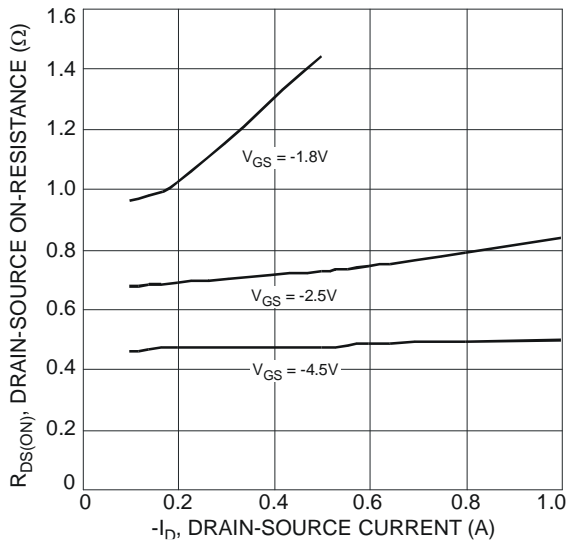


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

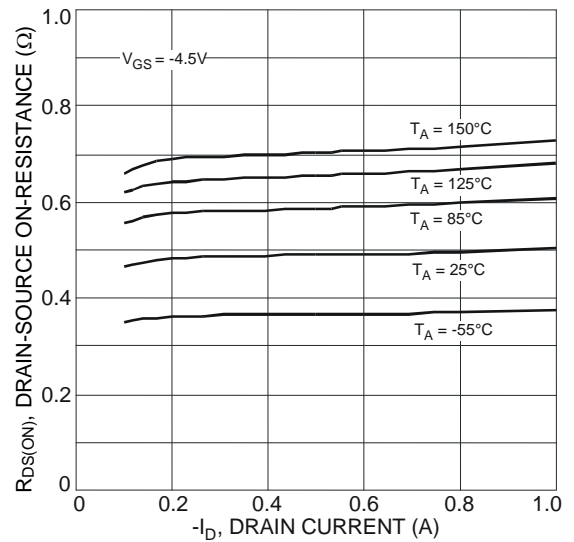


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

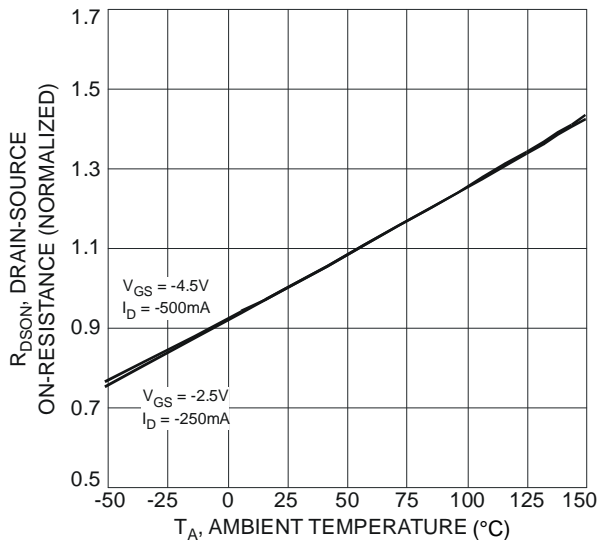


Fig. 17 On-Resistance Variation with Temperature

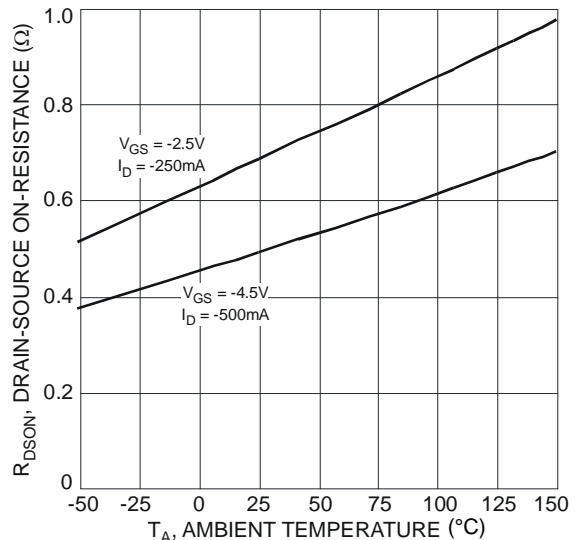


Fig. 18 On-Resistance Variation with Temperature

P-CHANNEL – Q2 (Cont.)

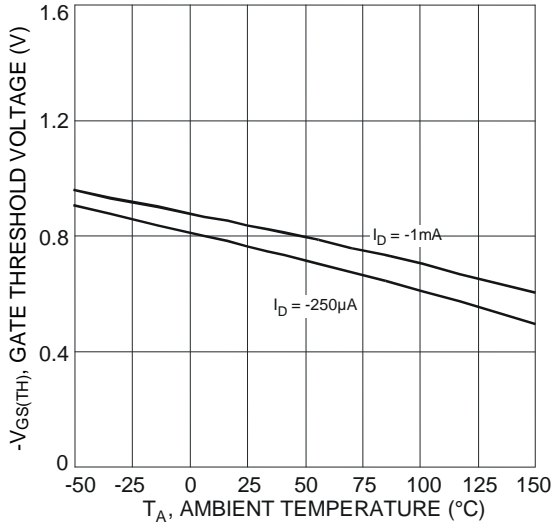


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

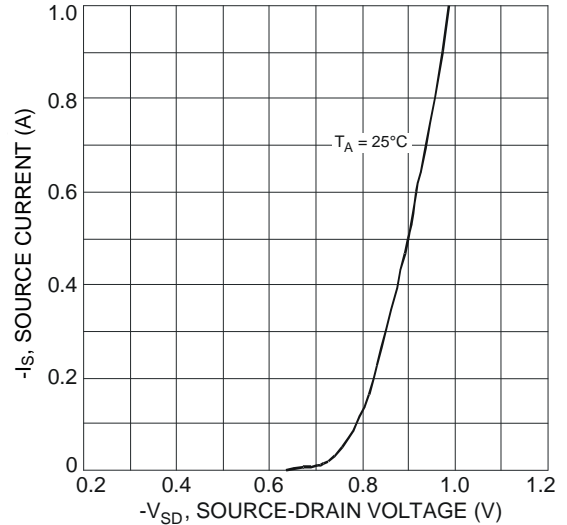


Fig. 20 Diode Forward Voltage vs. Current

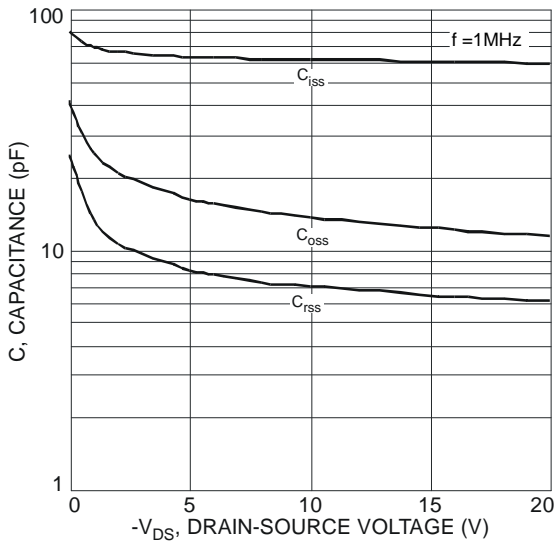


Fig. 21 Typical Total Capacitance

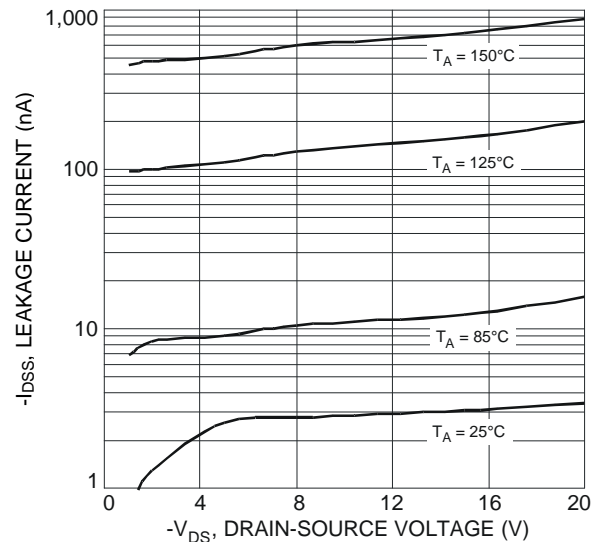


Fig. 22 Typical Leakage Current vs. Drain-Source Voltage

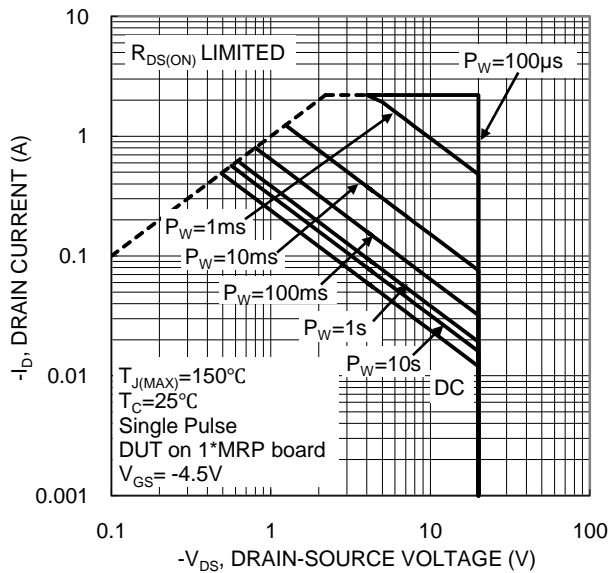


Figure 23. SOA, Safe Operation Area

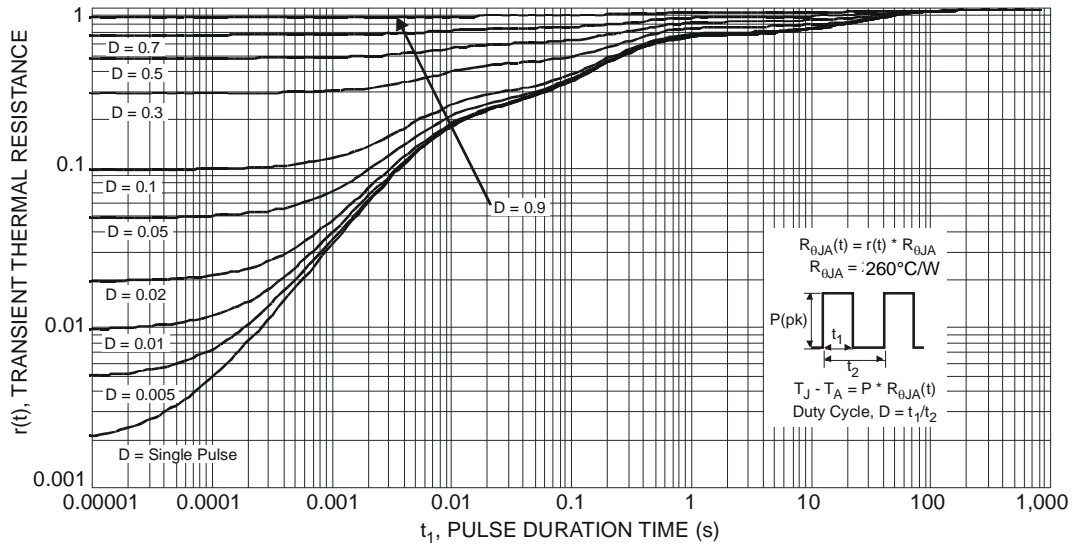
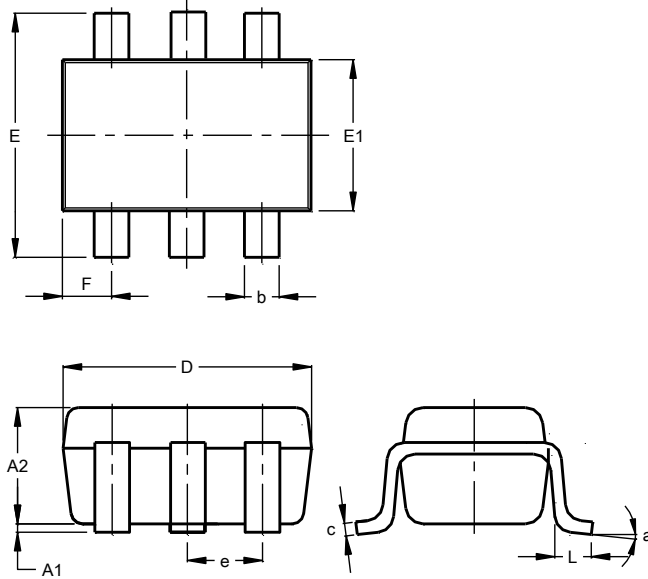


Fig. 24 Transient Thermal Response

Package Outline Dimensions

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

SOT363

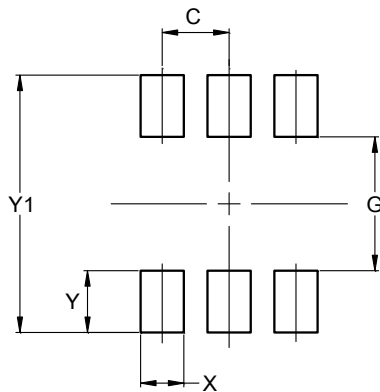


| SOT363 | | | |
|----------------------|-----------|------|-------|
| Dim | Min | Max | Typ |
| A1 | 0.00 | 0.10 | 0.05 |
| A2 | 0.90 | 1.00 | 0.95 |
| b | 0.10 | 0.30 | 0.25 |
| c | 0.10 | 0.22 | 0.11 |
| D | 1.80 | 2.20 | 2.15 |
| E | 2.00 | 2.20 | 2.10 |
| E1 | 1.15 | 1.35 | 1.30 |
| e | 0.650 BSC | | |
| 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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