

## Features

- Low On-Resistance
- Low Gate Threshold Voltage  $V_{GS(th)} < 1V$
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- **Lead Free/RoHS Compliant (Note 2)**
- **ESD Protected Gate**
- **"Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

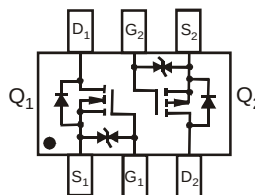


TOP VIEW



BOTTOM VIEW

SOT-563


 TOP VIEW  
Internal Schematic

## Mechanical Data

- Case: SOT-563
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Marking Information: See Page 6
- Ordering Information: See Page 6
- Weight: 0.006 grams (approximate)

## Maximum Ratings N-CHANNEL – $Q_1$ @ $T_A = 25^\circ C$ unless otherwise specified

| Characteristic         | Symbol    | Value                                                  | Unit |
|------------------------|-----------|--------------------------------------------------------|------|
| Drain Source Voltage   | $V_{DSS}$ | 20                                                     | V    |
| Gate-Source Voltage    | $V_{GSS}$ | $\pm 8$                                                | V    |
| Drain Current (Note 1) | $I_D$     | $T_A = 25^\circ C$<br>670<br>$T_A = 85^\circ C$<br>480 | mA   |

## Maximum Ratings P-CHANNEL – $Q_2$ @ $T_A = 25^\circ C$ unless otherwise specified

| Characteristic         | Symbol    | Value                                                    | Unit |
|------------------------|-----------|----------------------------------------------------------|------|
| Drain Source Voltage   | $V_{DSS}$ | -20                                                      | V    |
| Gate-Source Voltage    | $V_{GSS}$ | $\pm 8$                                                  | V    |
| Drain Current (Note 1) | $I_D$     | $T_A = 25^\circ C$<br>-530<br>$T_A = 85^\circ C$<br>-380 | mA   |

## Thermal Characteristics @ $T_A = 25^\circ C$ unless otherwise specified

| Characteristic                                   | Symbol          | Value       | Unit         |
|--------------------------------------------------|-----------------|-------------|--------------|
| Power Dissipation (Note 1)                       | $P_D$           | 400         | mW           |
| Thermal Resistance, Junction to Ambient (Note 1) | $R_{\theta JA}$ | 312.5       | $^\circ C/W$ |
| Operating and Storage Temperature Range          | $T_j, T_{STG}$  | -65 to +150 | $^\circ C$   |

- Notes:
1. Device mounted on FR-4 PCB.
  2. No purposefully added lead.
  3. Diodes Inc.'s "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php).

**Electrical Characteristics N-CHANNEL – Q<sub>1</sub>** @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                      | Symbol              | Min | Typ               | Max                  | Unit | Test Condition                                                                                                                                     |
|-------------------------------------|---------------------|-----|-------------------|----------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 4)</b> |                     |     |                   |                      |      |                                                                                                                                                    |
| Drain-Source Breakdown Voltage      | BV <sub>DSS</sub>   | 20  | —                 | —                    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 10μA                                                                                                        |
| Zero Gate Voltage Drain Current     | I <sub>DSS</sub>    | —   | —                 | 1.0                  | μA   | V <sub>DS</sub> = 16V, 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 4)</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> | —   | 0.4<br>0.5<br>0.7 | 0.55<br>0.70<br>0.90 | Ω    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 540mA<br>V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA<br>V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA |
| Forward Transfer Admittance         | Y <sub>fs</sub>     | 200 | —                 | —                    | mS   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A                                                                                                       |
| Diode Forward Voltage (Note 4)      | V <sub>SD</sub>     | 0.5 | —                 | 1.2                  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 115mA                                                                                                       |
| <b>DYNAMIC CHARACTERISTICS</b>      |                     |     |                   |                      |      |                                                                                                                                                    |
| Input Capacitance                   | C <sub>iss</sub>    | —   | —                 | 150                  | pF   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                                                                          |
| Output Capacitance                  | C <sub>oss</sub>    | —   | —                 | 25                   | pF   |                                                                                                                                                    |
| Reverse Transfer Capacitance        | C <sub>rss</sub>    | —   | —                 | 20                   | pF   |                                                                                                                                                    |

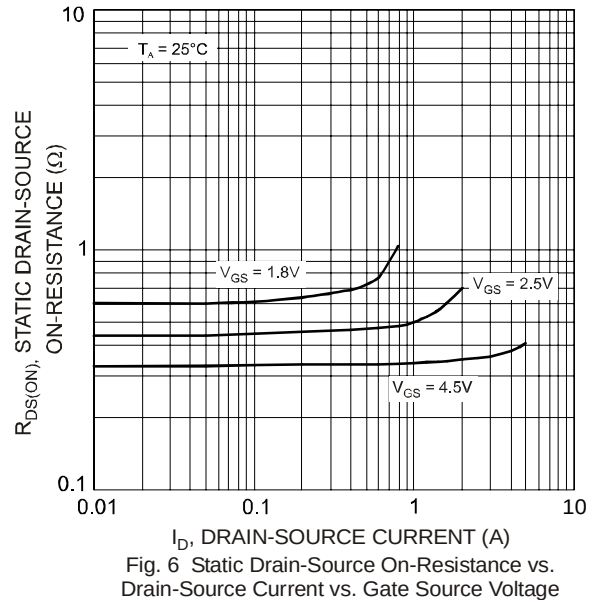
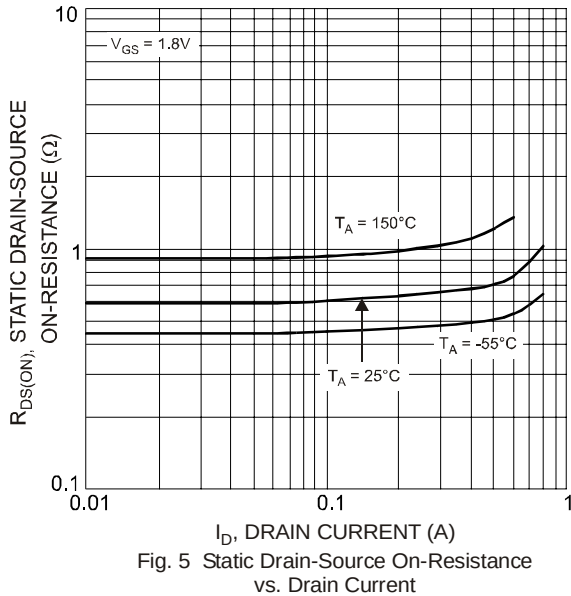
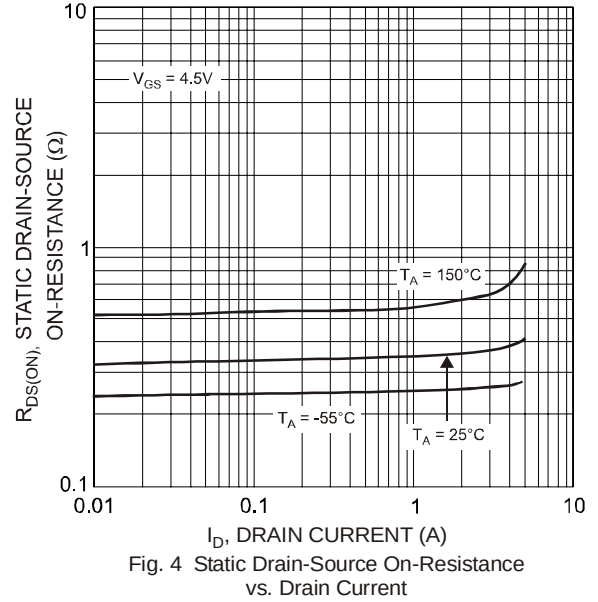
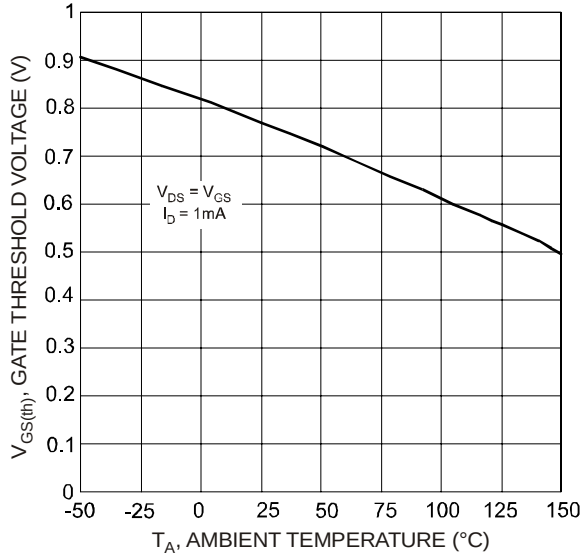
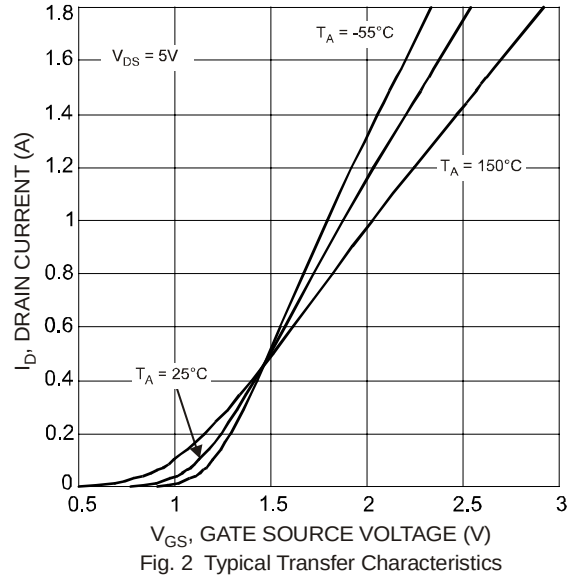
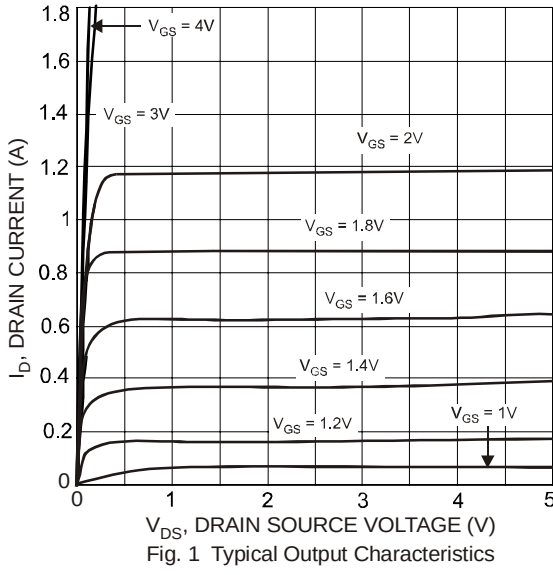
**Electrical Characteristics P-CHANNEL – Q<sub>2</sub>** @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                      | Symbol              | Min  | Typ               | Max               | Unit | Test Condition                                                                                                                                           |
|-------------------------------------|---------------------|------|-------------------|-------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 4)</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>    | —    | —                 | -1.0              | μA   | 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 4)</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> | —    | 0.7<br>1.1<br>1.7 | 0.9<br>1.4<br>2.0 | Ω    | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -430mA<br>V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -300mA<br>V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -150mA |
| Forward Transfer Admittance         | Y <sub>fs</sub>     | 200  | —                 | —                 | mS   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A                                                                                                             |
| Diode Forward Voltage (Note 4)      | V <sub>SD</sub>     | -0.5 | —                 | -1.2              | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -115mA                                                                                                            |
| <b>DYNAMIC CHARACTERISTICS</b>      |                     |      |                   |                   |      |                                                                                                                                                          |
| Input Capacitance                   | C <sub>iss</sub>    | —    | —                 | 175               | pF   | V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                                                                               |
| Output Capacitance                  | C <sub>oss</sub>    | —    | —                 | 30                | pF   |                                                                                                                                                          |
| Reverse Transfer Capacitance        | C <sub>rss</sub>    | —    | —                 | 20                | pF   |                                                                                                                                                          |

Notes: 4. Short duration pulse test used to minimize self-heating effect.

Q1, N-CHANNEL

NEW PRODUCT



Q1, N-CHANNEL, continued

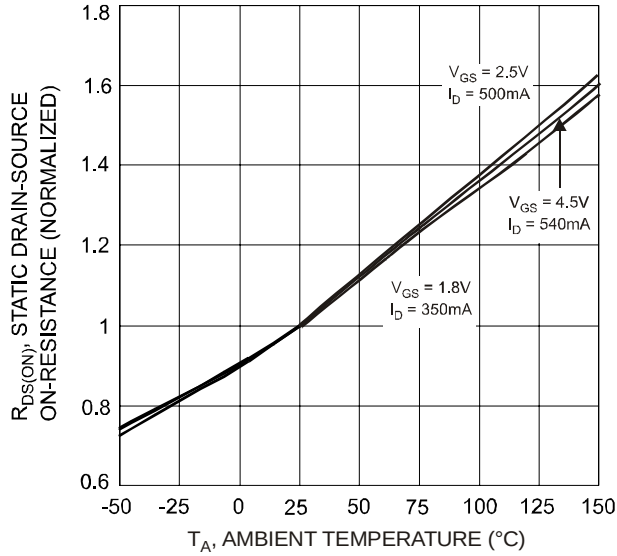


Fig. 7 Static Drain-Source On-State Resistance vs. Ambient Temperature

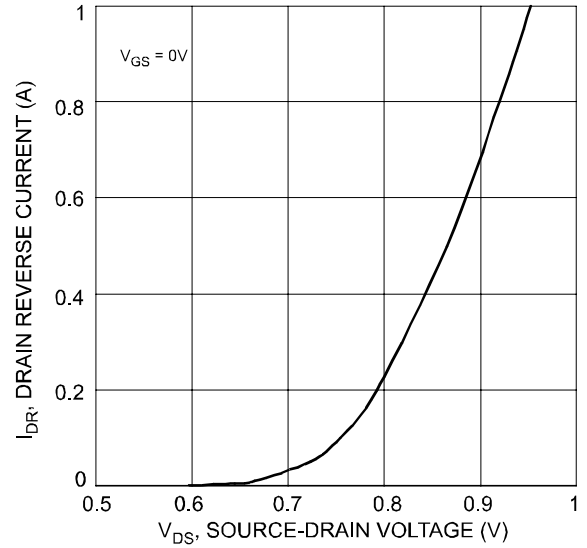


Fig. 8 Drain Reverse Current vs. Source-Drain Voltage

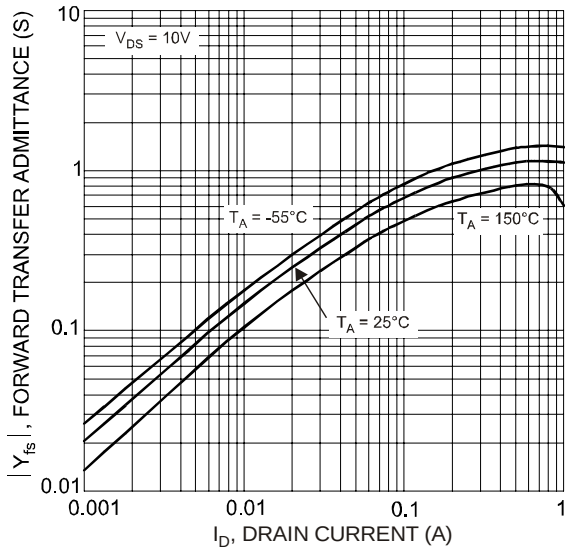


Fig. 9 Forward Transfer Admittance vs. Drain Current

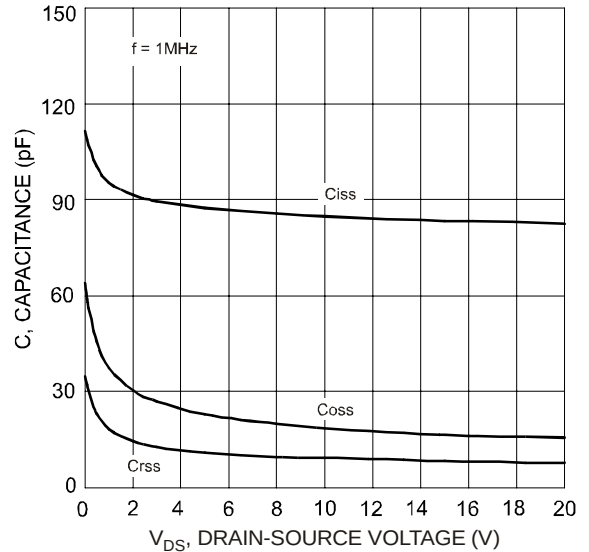
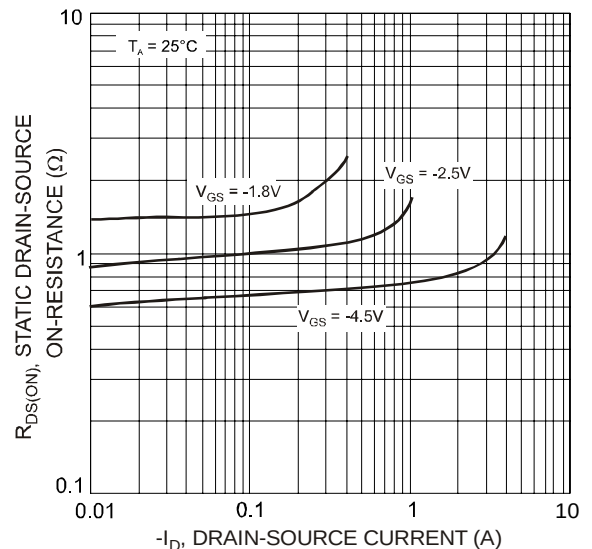
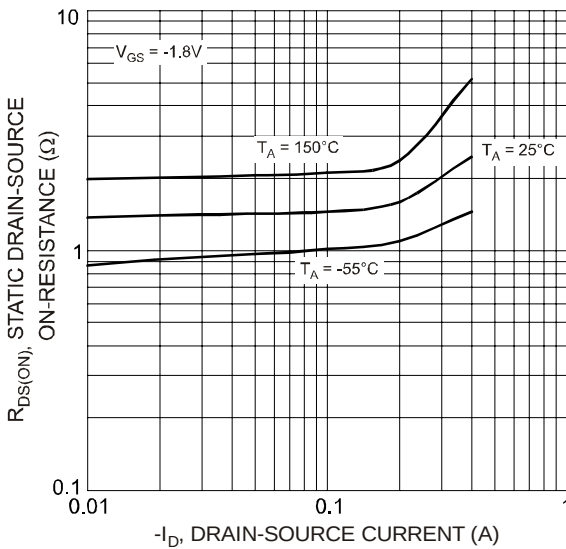
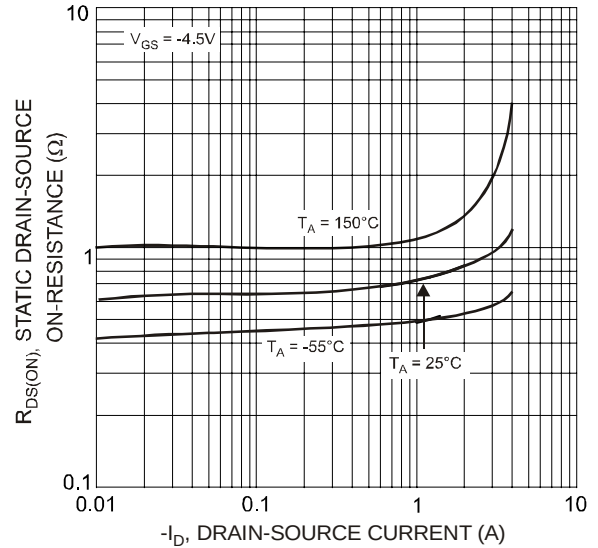
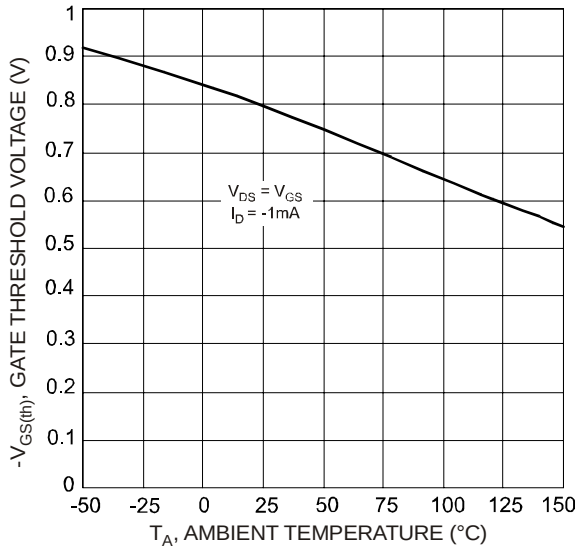
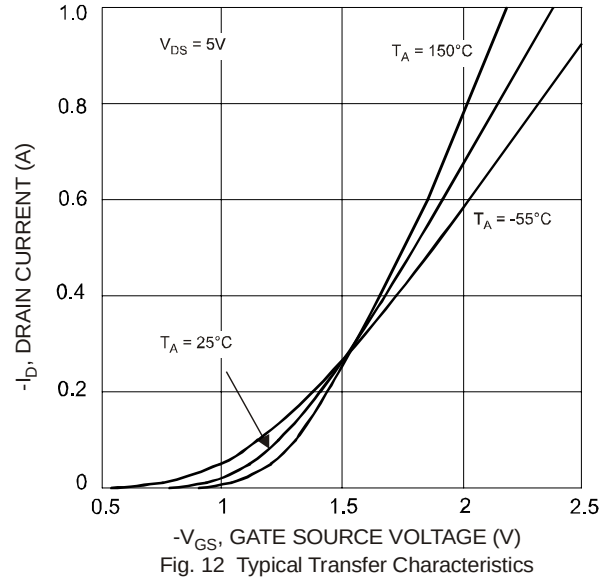
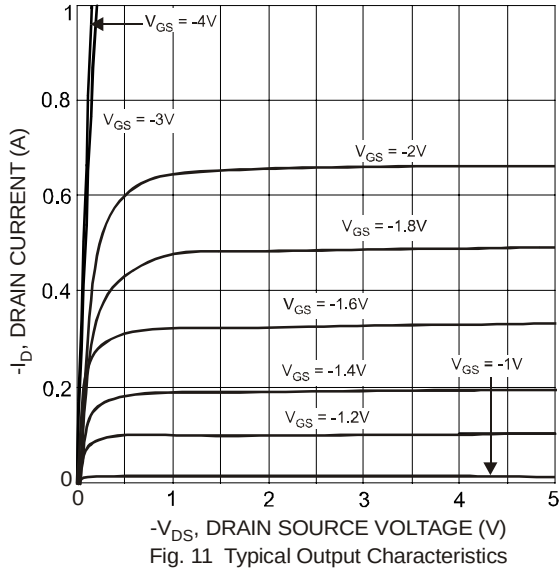


Fig. 10 Typical Capacitance

Q<sub>2</sub>, P-CHANNEL

NEW PRODUCT



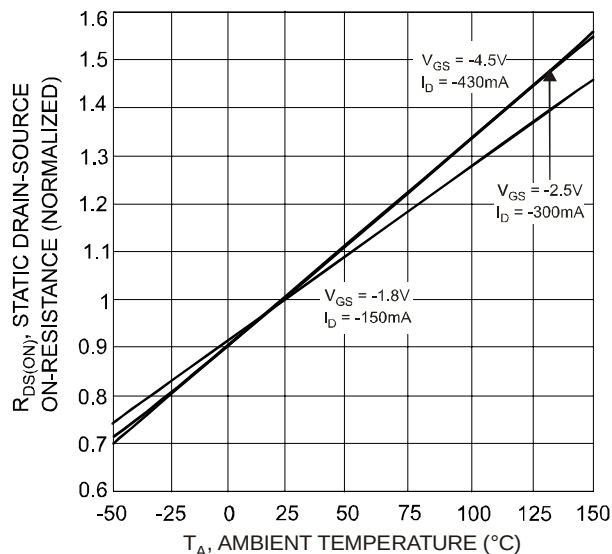
**Q<sub>2</sub>, P-CHANNEL, Continued**


Fig. 17 Static Drain-Source On-State Resistance vs. Ambient Temperature

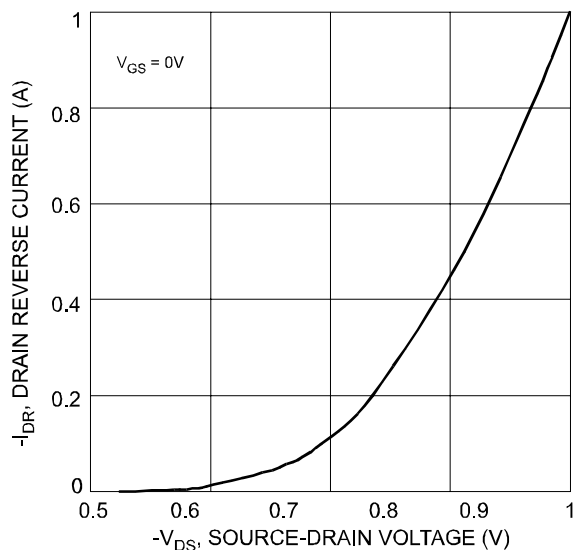


Fig. 18 Drain Reverse Current vs. Source-Drain Voltage

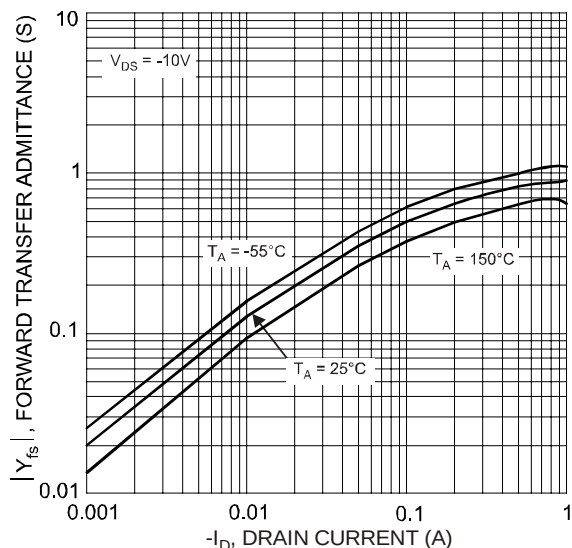


Fig. 19 Forward Transfer Admittance vs. Drain Current

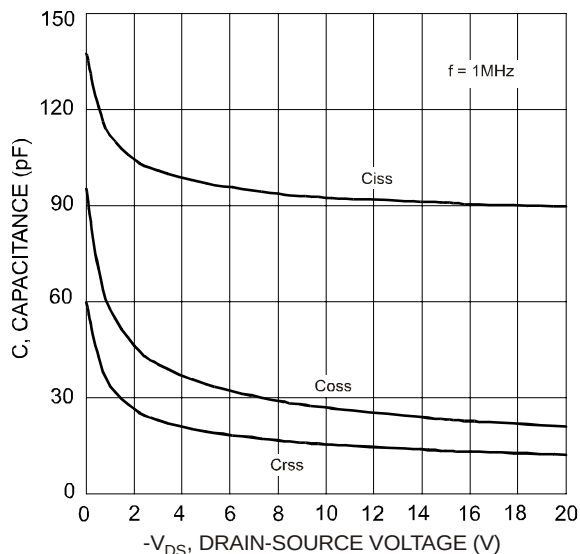
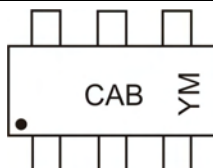


Fig. 20 Typical Capacitance

**Ordering Information** (Note 5)

| Part Number | Case    | Packaging        |
|-------------|---------|------------------|
| DMC2004VK-7 | SOT-563 | 3000/Tape & Reel |

 Notes: 5. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

**Marking Information**


CAB = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: U = 2007  
 M = Month ex: 9 = September

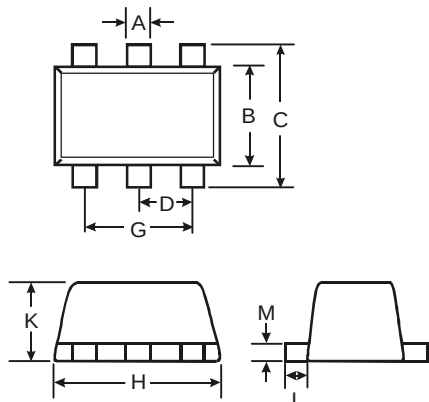
**Date Code Key**

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------|------|------|------|------|------|------|
| Code | U    | V    | W    | X    | Y    | Z    |

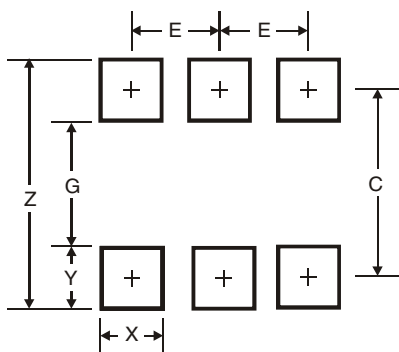
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

## Package Outline Dimensions



| SOT-563              |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | 0.15 | 0.30 | 0.20 |
| B                    | 1.10 | 1.25 | 1.20 |
| C                    | 1.55 | 1.70 | 1.60 |
| D                    | 0.50 |      |      |
| G                    | 0.90 | 1.10 | 1.00 |
| H                    | 1.50 | 1.70 | 1.60 |
| K                    | 0.55 | 0.60 | 0.60 |
| L                    | 0.10 | 0.30 | 0.20 |
| M                    | 0.10 | 0.18 | 0.11 |
| All Dimensions in mm |      |      |      |

## Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 2.2           |
| G          | 1.2           |
| X          | 0.375         |
| Y          | 0.5           |
| C          | 1.7           |
| E          | 0.5           |

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