

Product Summary

| Device | BV _{DSS} | R _{DS(ON)} | I _D T _A = +25°C |
|-----------------|-------------------|---------------------------------|--|
| Q1 N-Channel | 12V | 25mΩ @ V _{GS} = 4.5V | 6.1A |
| | | 32mΩ @ V _{GS} = 2.5V | 5.4A |
| | | 40mΩ @ V _{GS} = 1.8V | 4.9A |
| Q2 P-Channel | -20V | 80mΩ @ V _{GS} = -4.5V | -3.5A |
| | | 100mΩ @ V _{GS} = -2.5V | -3.1A |
| | | 140mΩ @ V _{GS} = -1.8V | -2.6A |
| | | 210mΩ @ V _{GS} = -1.5V | -2.1A |

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

- Backlighting
- DC-DC Converters
- Power Management Functions

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD Protected Gate**
- **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 [contact us](mailto:contact@diodes.com) or your local Diodes representative.**
<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

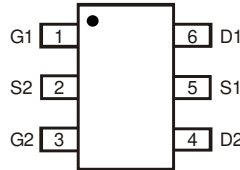
- Case: TSOT26
- Case Material: Molded Plastic, "Green" Molding Compound.
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe.
Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.013 grams (Approximate)



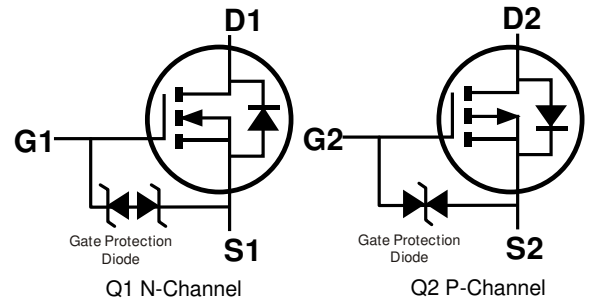
ESD PROTECTED



Top View



Top View



Q1 N-Channel

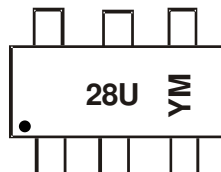
Q2 P-Channel

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|--------|--------------------|
| DMC1028UVT-7 | TSOT26 | 3,000/Tape & Reel |
| DMC1028UVT-13 | TSOT26 | 10,000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. 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.
 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



28U = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: G = 2019)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|------|------|------|------|------|------|------|------|------|------|
| Code | E | F | G | H | I | J | K | L | M |

| 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 |

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

| Characteristic | | | Symbol | Q1 N-Channel | Q2 P-Channel | Unit |
|---|-----------------|---------------------------|-----------|-----------------|-----------------|------|
| Drain-Source Voltage | | | V_{DSS} | 12 | -20 | V |
| Gate-Source Voltage | | | V_{GSS} | ± 8 | ± 8 | V |
| Continuous Drain Current (Note 6) | Steady State | $T_A = +25^\circ\text{C}$ | I_D | 6.1 | -3.5 | A |
| N-Channel: $V_{GS} = 4.5\text{V}$ P-Channel: $V_{GS} = -4.5\text{V}$ | | $T_A = +70^\circ\text{C}$ | | 4.7 | -2.7 | |
| Maximum Continuous Body Diode Forward Current (Note 6) | | | I_S | 1.4 | -1.4 | A |
| Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%) | | | I_{DM} | 35 | -20 | A |

Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|--|-----------------|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5) | | P_D | 0.8 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 157 | $^\circ\text{C/W}$ |
| | $t < 5\text{s}$ | | 102 | |
| Total Power Dissipation (Note 6) | | P_D | 1.2 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 108 | $^\circ\text{C/W}$ |
| | $t < 5\text{s}$ | | 64 | |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 18 | |
| Operating and Storage Temperature Range | | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|-----|------|----------|---------------|---|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 12 | — | — | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$ | I_{DSS} | — | — | 1.0 | μA | $V_{DS} = 12\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 10 | μA | $V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.4 | — | 1 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 17 | 25 | m Ω | $V_{GS} = 4.5\text{V}, I_D = 5.2\text{A}$ |
| | | — | 21 | 32 | | $V_{GS} = 2.5\text{V}, I_D = 4.8\text{A}$ |
| | | — | 30 | 40 | | $V_{GS} = 1.8\text{V}, I_D = 2.5\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | 0.7 | 1.2 | V | $V_{GS} = 0\text{V}, I_S = 1\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{ISS} | — | 787 | — | pF | $V_{DS} = 6\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$ |
| Output Capacitance | C_{OSS} | — | 203 | — | pF | |
| Reverse Transfer Capacitance | C_{RSS} | — | 177 | — | pF | |
| Gate Resistance | R_G | — | 4.8 | — | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Total Gate Charge ($V_{GS} = 4.5\text{V}$) | Q_G | — | 10.5 | — | nC | $V_{DS} = 6\text{V}, I_D = 6.8\text{A}$ |
| Total Gate Charge ($V_{GS} = 8\text{V}$) | | — | 18.5 | — | nC | |
| Gate-Source Charge | Q_{GS} | — | 1.2 | — | nC | |
| Gate-Drain Charge | Q_{GD} | — | 2.9 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 4.6 | — | ns | |
| Turn-On Rise Time | t_R | — | 9.4 | — | ns | $V_{DD} = 6\text{V}, V_{GS} = 4.5\text{V},$ $R_L = 1.1\Omega, R_G = 1\Omega$ |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 15.7 | — | ns | |
| Turn-Off Fall Time | t_F | — | 3.7 | — | ns | |
| Body Diode Reverse Recovery Time | t_{RR} | — | 12.0 | — | ns | $I_S = 5.4\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |
| Body Diode Reverse Recovery Charge | Q_{RR} | — | 1.8 | — | nC | $I_S = 5.4\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |

- 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.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

Electrical Characteristics – Q2 P-CHANNEL (@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 _J = +25°C | I _{DSS} | — | — | -1.0 | μA | V _{DS} = -20V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±10 | μA | V _{GS} = ±8V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | -0.4 | — | -1 | V | V _{DS} = V _{GS} , I _D = -250μA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 55 | 80 | mΩ | V _{GS} = -4.5V, I _D = -3.8A |
| | | — | 70 | 100 | | V _{GS} = -2.5V, I _D = -3.3A |
| | | — | 88 | 140 | | V _{GS} = -1.8V, I _D = -1.0A |
| | | — | 110 | 210 | | V _{GS} = -1.5V, I _D = -0.5A |
| Diode Forward Voltage | V _{SD} | — | -0.7 | -1.2 | V | V _{GS} = 0V, I _S = -1A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{ISS} | — | 576 | — | pF | V _{DS} = -10V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{OSS} | — | 87 | — | pF | |
| Reverse Transfer Capacitance | C _{RSS} | — | 71 | — | pF | |
| Gate Resistance | R _G | — | 15 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = -4.5V) | Q _G | — | 6.7 | — | nC | V _{DS} = -10V, I _D = -4.9A |
| Total Gate Charge (V _{GS} = -8V) | | — | 11.5 | — | nC | |
| Gate-Source Charge | Q _{GS} | — | 1.0 | — | nC | |
| Gate-Drain Charge | Q _{GD} | — | 2.0 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 3.5 | — | ns | V _{DD} = -10V, V _{GS} = -4.5V, R _L = 2.6Ω, R _G = 1Ω |
| Turn-On Rise Time | t _R | — | 3.6 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 20.8 | — | ns | |
| Turn-Off Fall Time | t _F | — | 12.7 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 13.1 | — | ns | I _S = -3.9A, di/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 3.9 | — | nC | I _S = -3.9A, di/dt = 100A/μs |

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

Typical Characteristics – Q1 N-CHANNEL

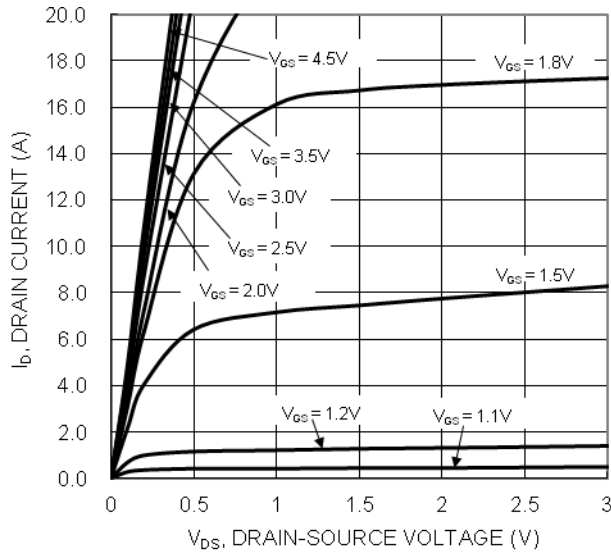


Figure 1 Typical Output Characteristic

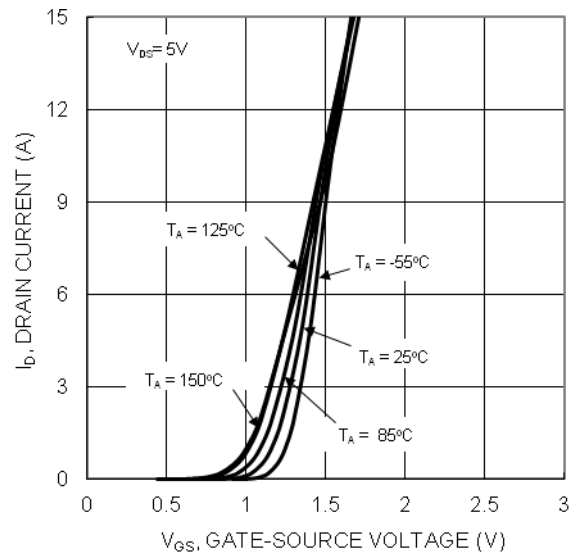


Figure 2 Typical Transfer Characteristic

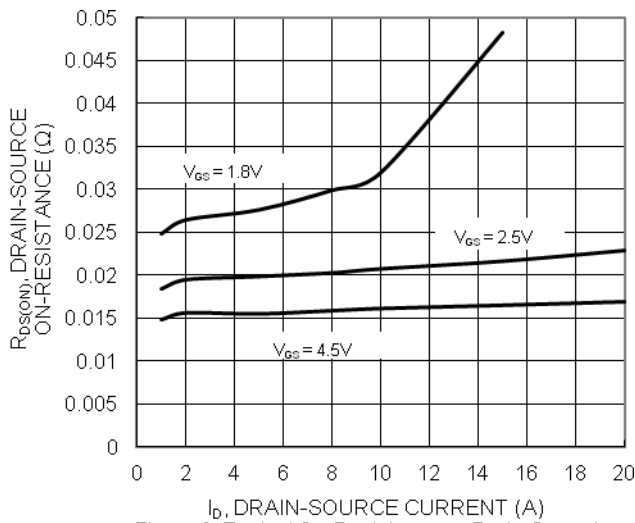


Figure 3 Typical On-Resistance vs Drain Current and Gate Voltage

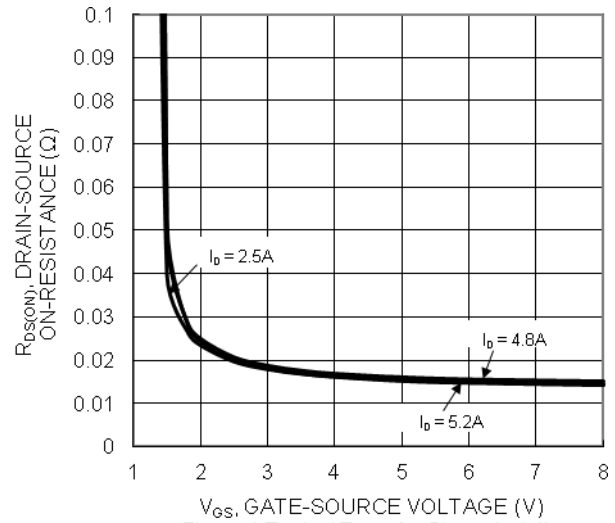


Figure 4 Typical Transfer Characteristic

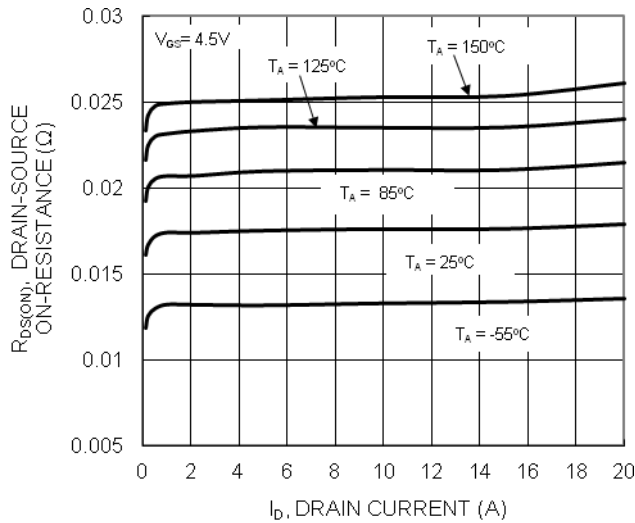


Figure 5 Typical On-Resistance vs Drain Current and Temperature

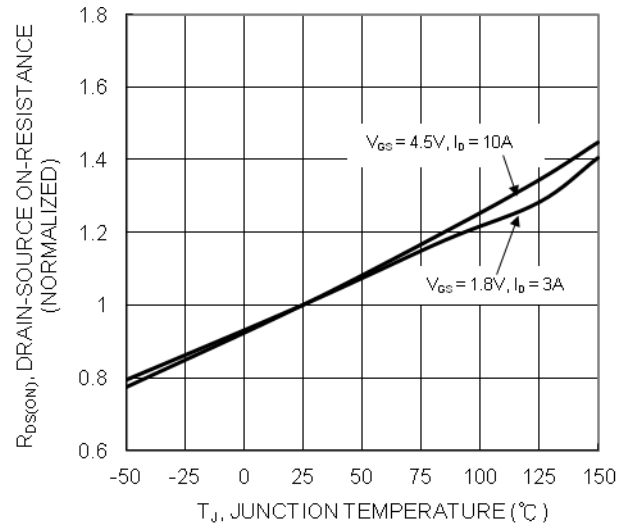


Figure 6 On-Resistance Variation with Temperature

Typical Characteristics – Q1 N-CHANNEL (continued)

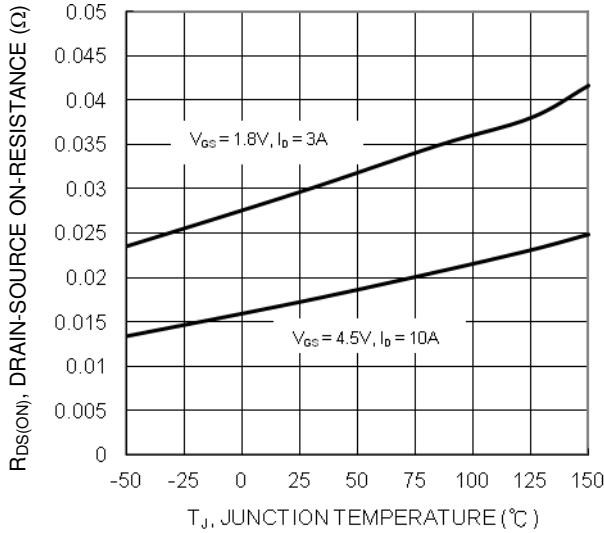


Figure 7 On-Resistance Variation with Temperature

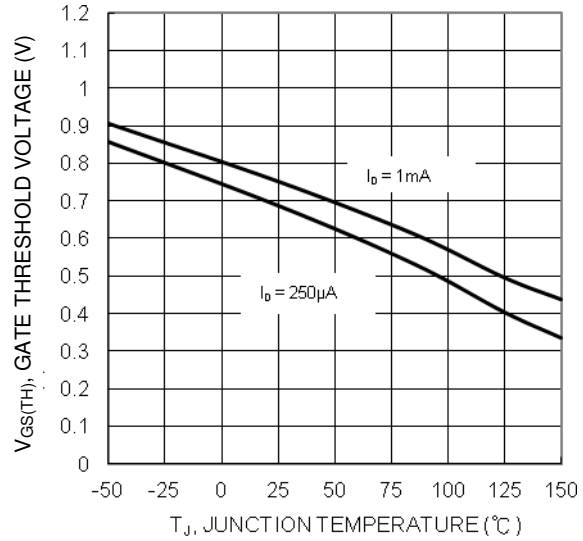


Figure 8 Gate Threshold Variation vs Junction Temperature

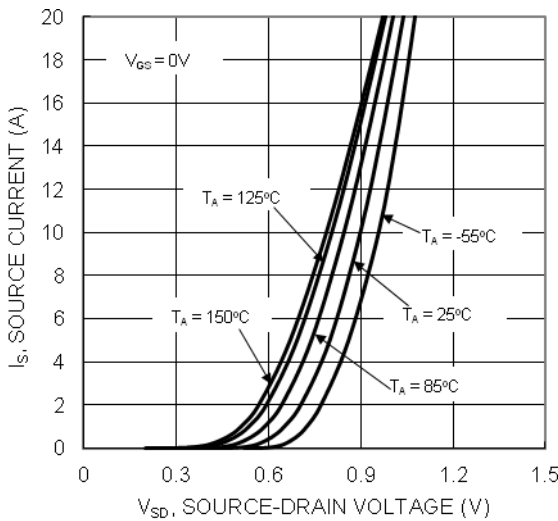


Figure 9 Diode Forward Voltage vs. Current

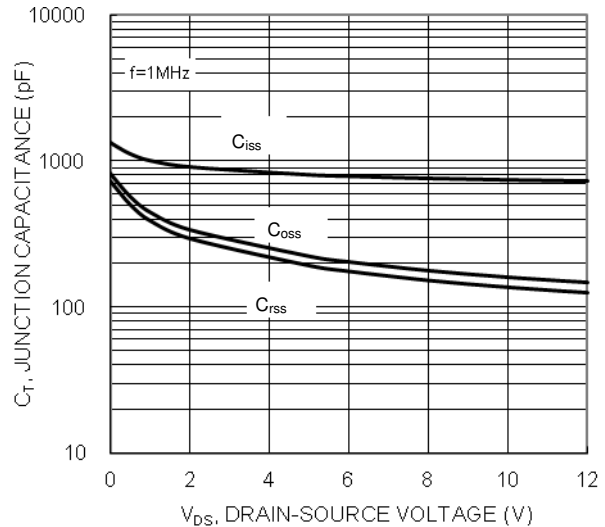


Figure 10 Typical Junction Capacitance

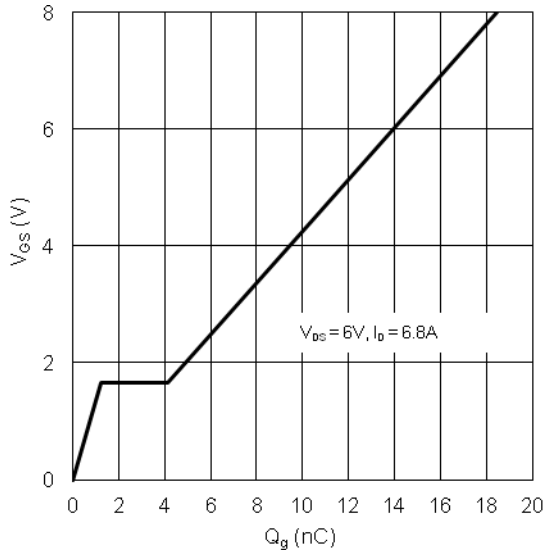


Figure 11 Gate Charge

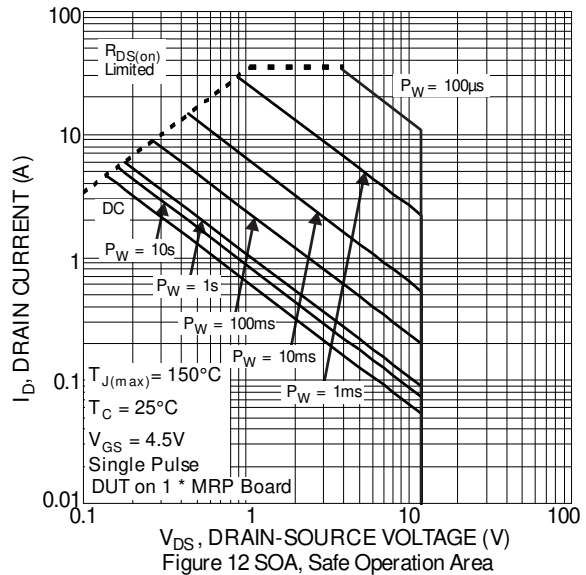


Figure 12 SOA, Safe Operation Area

Typical Characteristics – Q2 P-CHANNEL

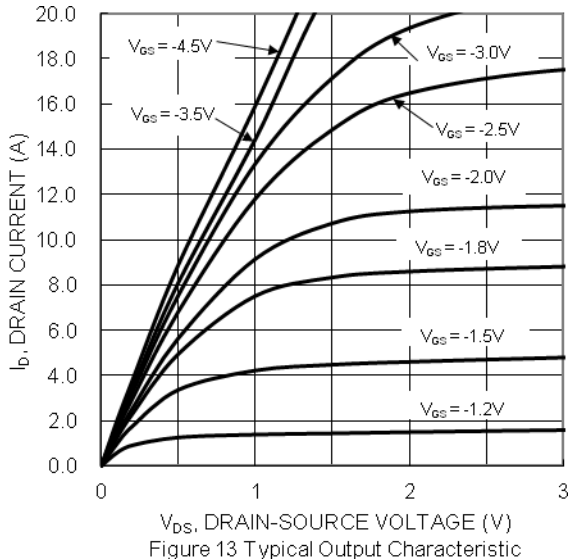


Figure 13 Typical Output Characteristic

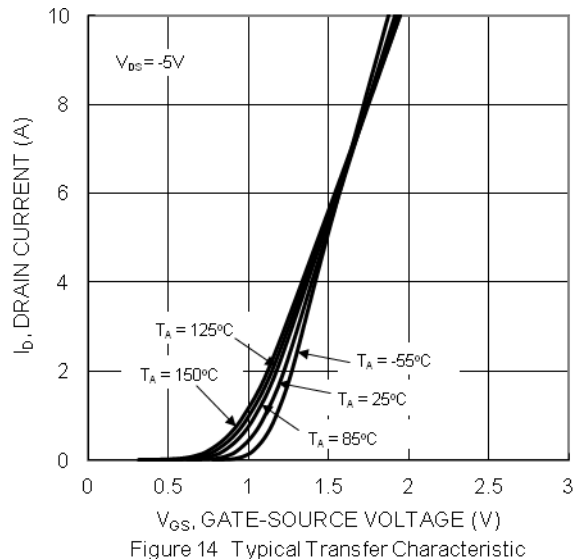


Figure 14 Typical Transfer Characteristic

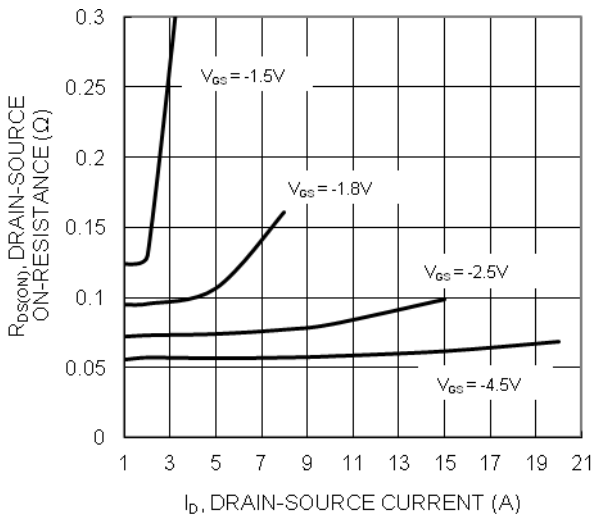


Figure 15 Typical On-Resistance vs Drain Current and Gate Voltage

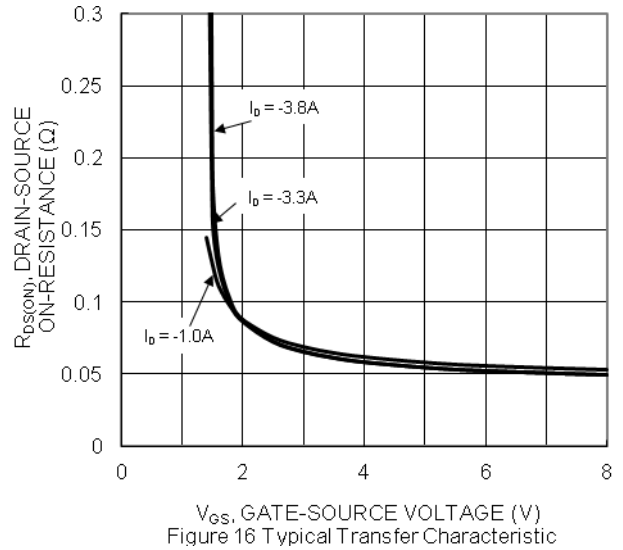


Figure 16 Typical Transfer Characteristic

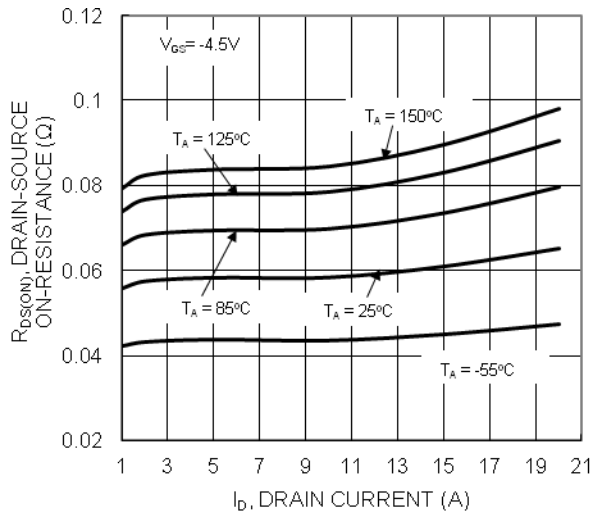


Figure 17 Typical On-Resistance vs Drain Current and Temperature

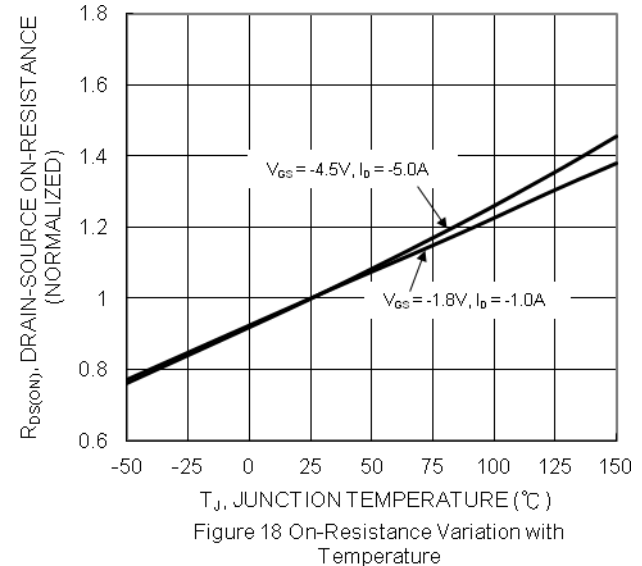
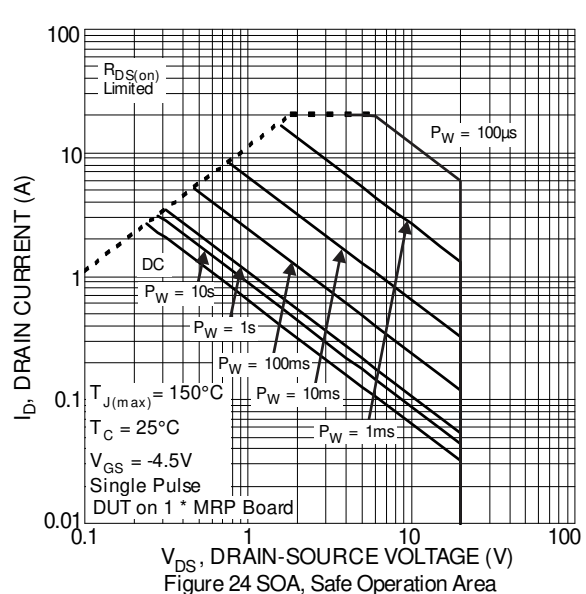
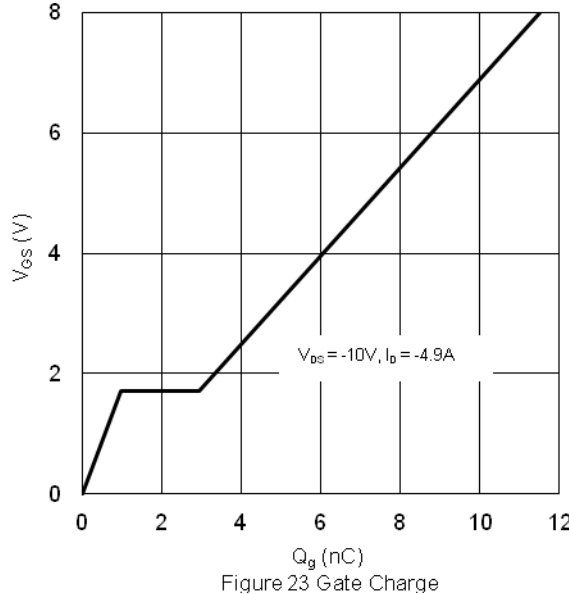
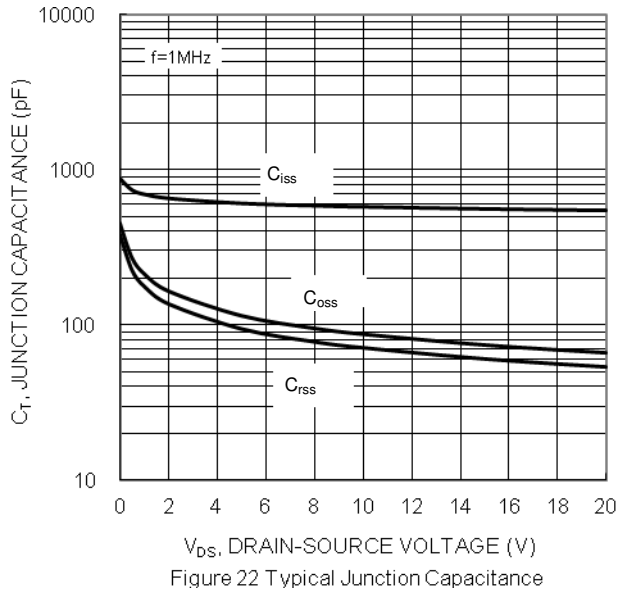
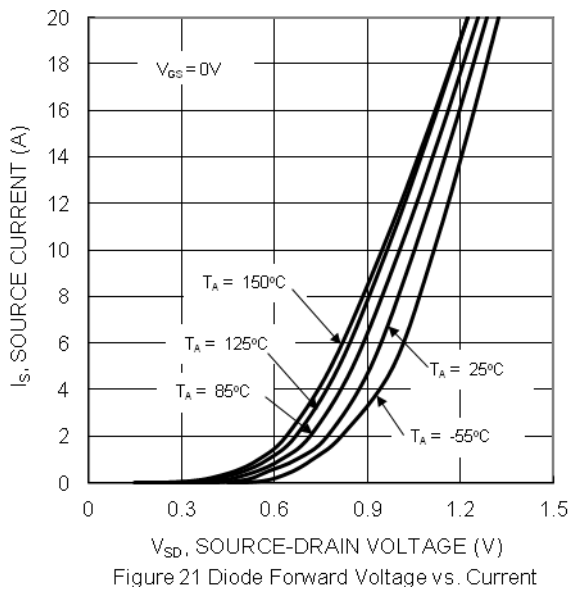
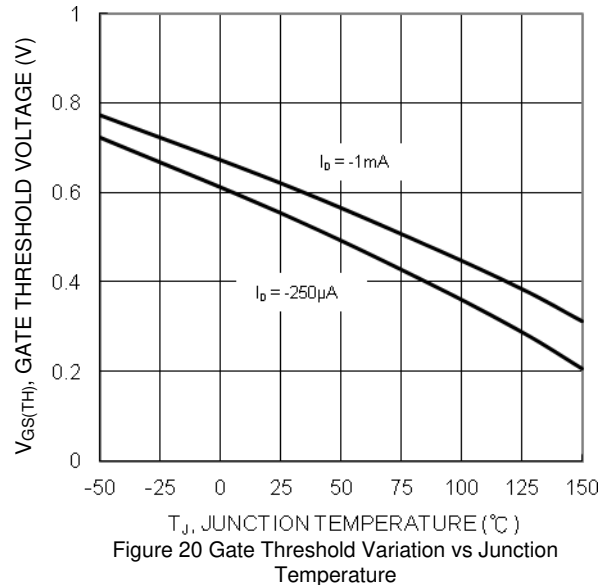
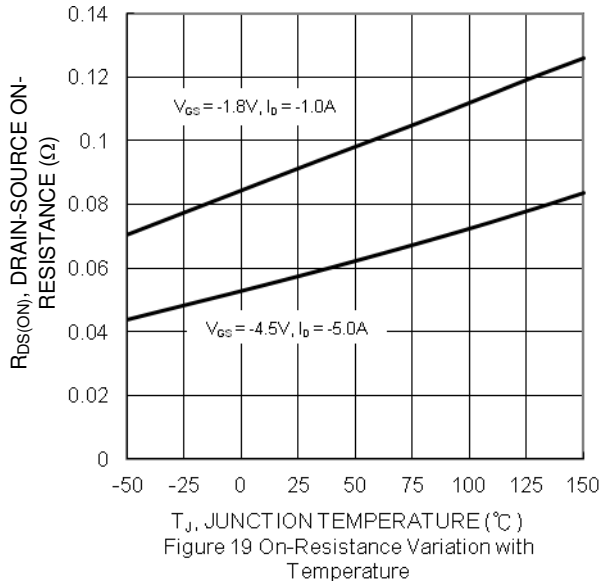
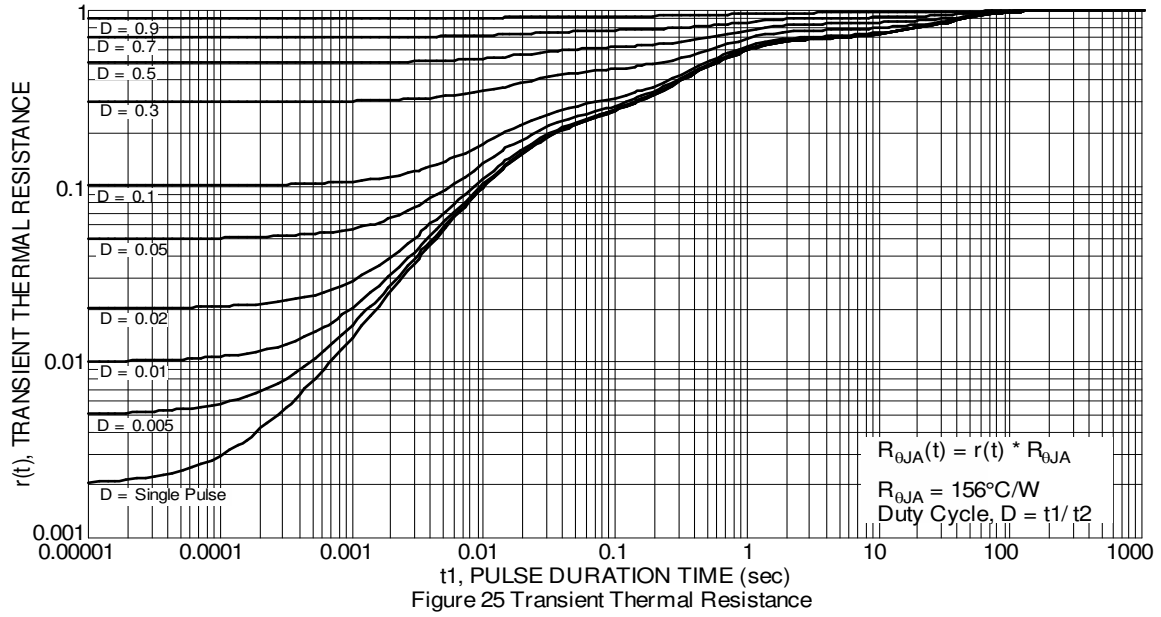


Figure 18 On-Resistance Variation with Temperature

Typical Characteristics – Q2 P-CHANNEL (continued)

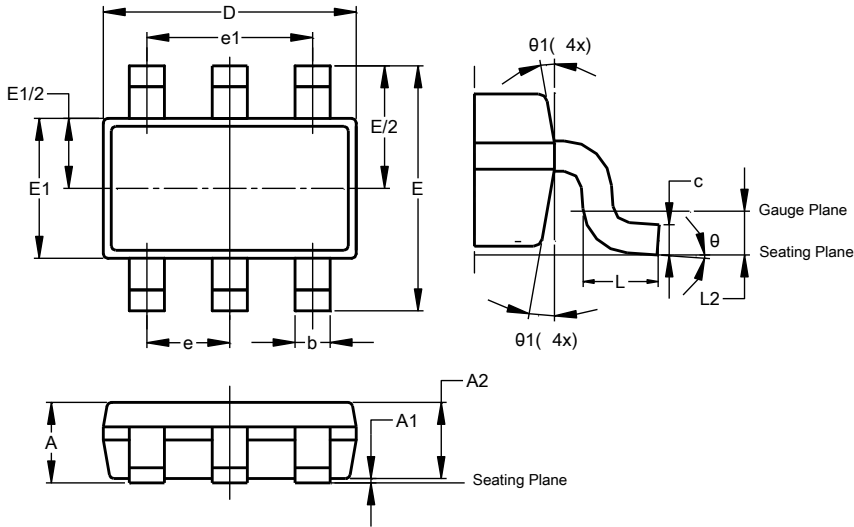




Package Outline Dimensions

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

TSOT26

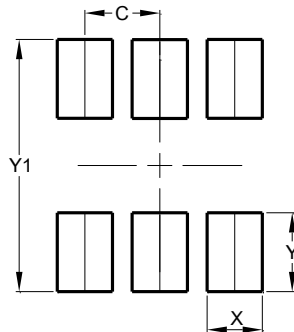


| TSOT26 | | | |
|-----------------------------|-----------|-------|-------|
| Dim | Min | Max | Typ |
| A | – | 1.00 | – |
| A1 | 0.010 | 0.100 | – |
| A2 | 0.840 | 0.900 | – |
| D | 2.800 | 3.000 | 2.900 |
| E | 2.800 BSC | | |
| E1 | 1.500 | 1.700 | 1.600 |
| b | 0.300 | 0.450 | – |
| c | 0.120 | 0.200 | – |
| e | 0.950 BSC | | |
| e1 | 1.900 BSC | | |
| L | 0.30 | 0.50 | – |
| L2 | 0.250 BSC | | |
| θ | 0° | 8° | 4° |
| θ_1 | 4° | 12° | – |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

TSOT26



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.950 |
| X | 0.700 |
| Y | 1.000 |
| Y1 | 3.199 |

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