## Product Summary

| Device | $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ MAX $T_A$ = +25°C |
|---|---|---|---|
| Q1 N-Channel | 20V | 25mΩ @ $V_{GS}$ = 4.5V | 6.0A |
| | | 35mΩ @ $V_{GS}$ = 2.5V | 5.1A |
| Q2 P-Channel | -20V | 75mΩ @ $V_{GS}$ = -4.5V | -3.5A |
| | | 140mΩ @ $V_{GS}$ = -2.5V | -2.5A |

## Features

- PCB Footprint of 4mm$^2$
- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Maximum Height
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Description and Applications

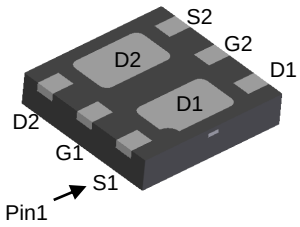
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, which makes it ideal for high-efficiency power management applications.

- Load Switch
- Power Management Functions
- Portable Power Adaptors

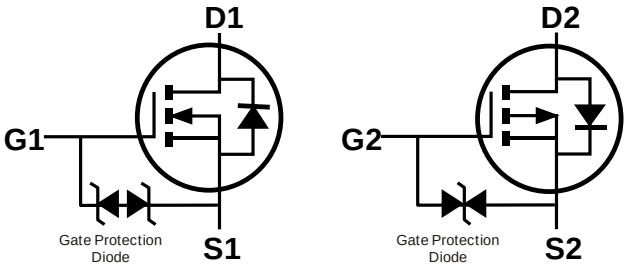
## Mechanical Data

- Case: U-DFN2020-6 (Type B)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)

U-DFN2020-6 (Type B)




Bottom View




N-Channel MOSFET P-Channel MOSFET

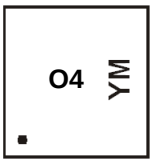
Internal Schematic

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMC2025UFDB-7 | U-DFN2020-6 (Type B) | 3000/Tape & Reel |
| DMC2025UFDB-13 | U-DFN2020-6 (Type B) | 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, see https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information




O4 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: F = 2018)
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 |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## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Q1 N-CHANNEL | Q2 P-CHANNEL | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 20 | -20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±10 | ±8 | V |
| Continuous Drain Current (Note 6)<br>N-Channel: $V_{GS}$ = 4.5V<br>P-Channel: $V_{GS}$ = -4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 6.0<br>4.8 | -3.5<br>-2.8 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | | $I_S$ | 2 | -1.0 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 20 | -10 | A |
| Avalanche Current (L = 0.1mH) (Note 7) | | | $I_{AS}$ | 8 | -13 | A |
| Avalanche Energy (L = 0.1mH) (Note 7) | | | $E_{AS}$ | 8 | 8.5 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 0.7 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\Theta JA}$ | 178 | °C/W |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 1.4 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\Theta JA}$ | 92 | °C/W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\Theta JC}$ | 30 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics Q1 N-CHANNEL (@ $T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 8)** | | | | | | |
| 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 | µA | $V_{DS}$ = 20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±10V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.5 | — | 1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | — | 25 | mΩ | $V_{GS}$ = 4.5V, $I_D$ = 4A |
| | | | — | 35 | | $V_{GS}$ = 2.5V, $I_D$ = 4A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.7 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 5A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 486 | — | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 92 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 77 | — | | |
| Gate Resistance | $R_g$ | — | 3.2 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | — | 5.9 | — | nC | $V_{DS}$ = 10V, $I_D$ = 6.5A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | — | 12.3 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 0.8 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 2.2 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 3.4 | — | ns | $V_{DS}$ = 10V, $V_{GS}$ = 4.5V, $R_g$ = 6Ω, $R_L$ = 10Ω, $I_D$ = 1A |
| Turn-On Rise Time | $t_R$ | — | 5.4 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 17.6 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 9.3 | — | | |
| Reverse Recovery Time | $t_{RR}$ | — | 7.7 | — | ns | $I_F$ = 1A, di/dt = 100A/µs |
| Reverse Recovery Charge | $Q_{RR}$ | —- | 1.5 | — | nC | $I_F$ = 1A, di/dt = 100A/µs |


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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 8)** | | | | | | |
| 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 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | -0.35 | — | -1.4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | — | 75 | mΩ | $V_{GS}$ = -4.5V, $I_D$ = -2.9A |
| | | — | — | 140 | | $V_{GS}$ = -2.5V, $I_D$ = -2.3A |
| Diode Forward Voltage | $V_{SD}$ | — | — | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -3.0A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 642 | — | pF | $V_{DS}$ = -10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 98 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 87 | — | pF | |
| Gate Resistance | $R_g$ | — | 26.5 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = -4.5V) | $Q_g$ | — | 8.8 | — | nC | $V_{DS}$ = -10V, $I_D$ = -3.7A |
| Total Gate Charge ($V_{GS}$ = -8V) | | — | 15 | — | nC | |
| Gate-Source Charge | $Q_{gs}$ | — | 0.9 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 2.9 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 5.5 | — | ns | $V_{DD}$ = -10V, $V_{GS}$ = -4.5V, $R_L$ = 3.3Ω, $R_g$ = 1Ω |
| Turn-On Rise Time | $t_R$ | — | 22.6 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 34.1 | — | ns | |
| Turn-Off Fall Time | $t_F$ | — | 34.3 | — | ns | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | — | 13 | — | ns | $I_S$ = -3.0A, dI/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | — | 3.3 | — | nC | $I_S$ = -3.0A, dI/dt = 100A/μs |

Notes:
5. Device mounted on FR-4 substrate PCB, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PCB, 2oz copper, with 1inch square copper plate.
7. $I_{AS}$ and $E_{AS}$ ratings are based on low frequency and duty cycles to keep $T_J$ = +25°C.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.


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## Typical Characteristics—N-CHANNEL

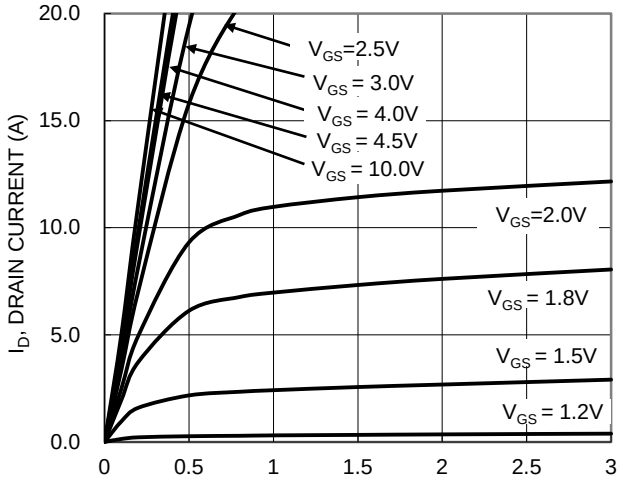


Figure 1. Typical Output Characteristic

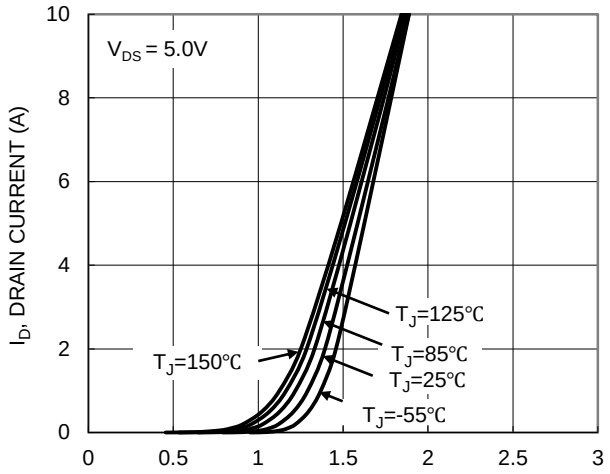


Figure 2. Typical Transfer Characteristic

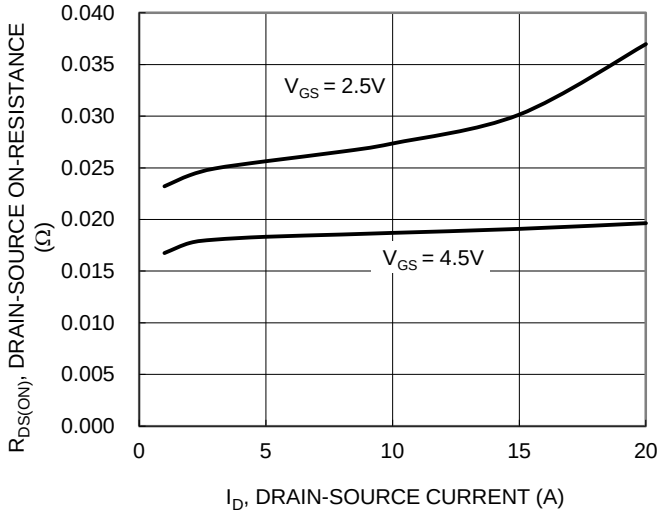


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

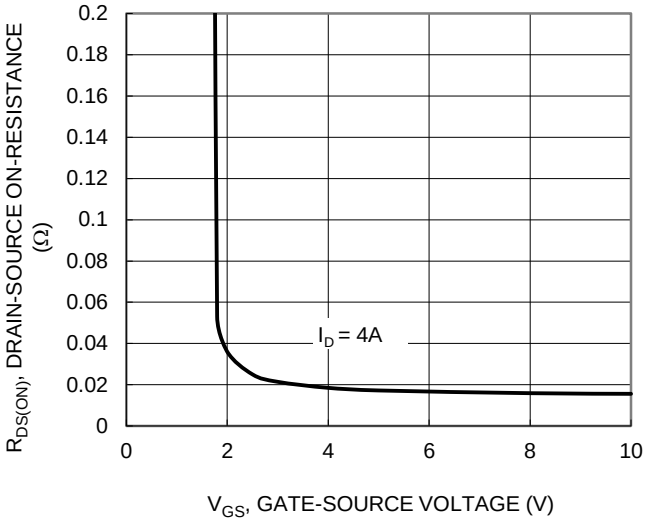


Figure 4. Typical Transfer Characteristic

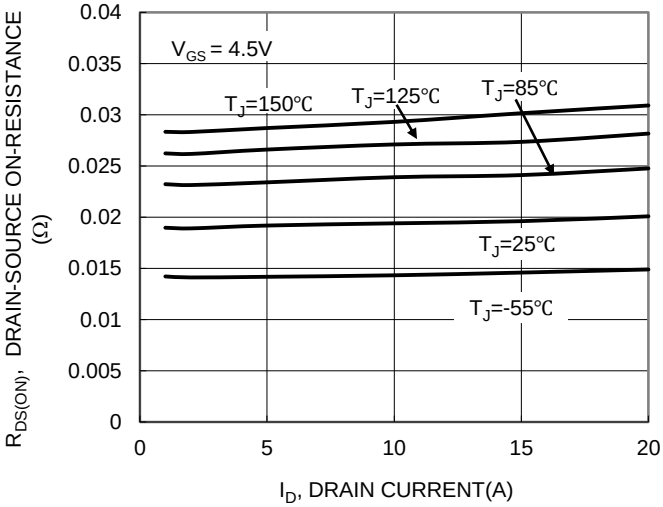


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

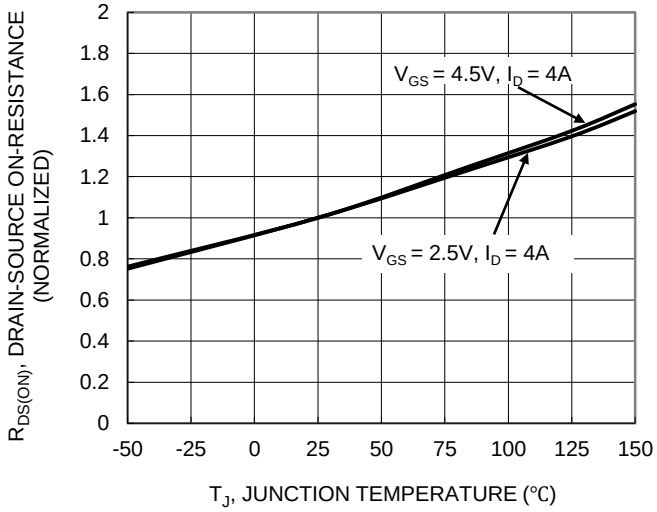


Figure 6. On-Resistance Variation with Temperature


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## Typical Characteristics—N-CHANNEL (continued)

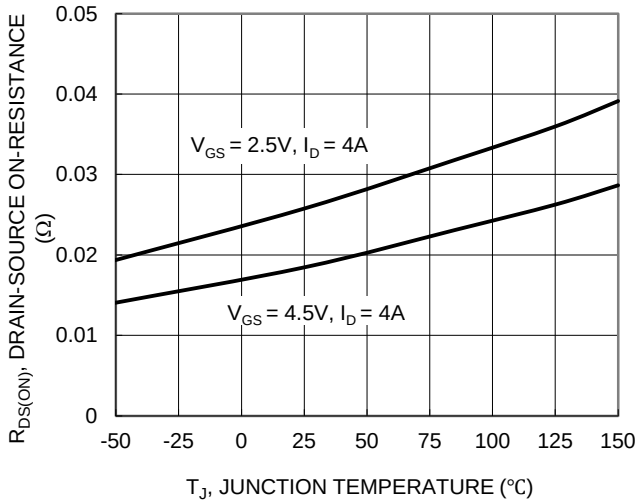


Figure 7. On-Resistance Variation with Temperature

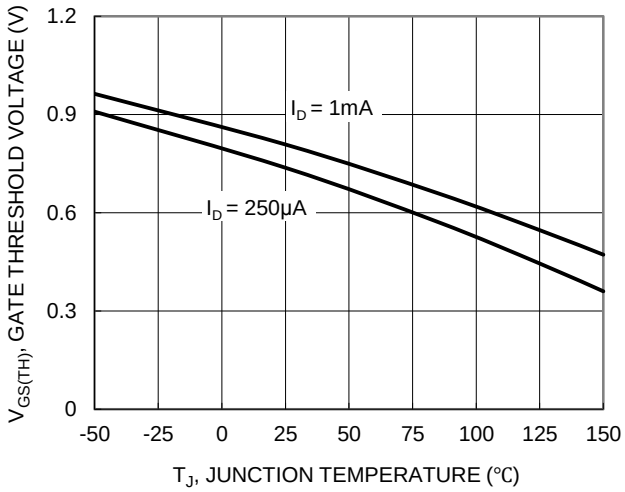


Figure 8. Gate Threshold Variation vs. Junction Temperature

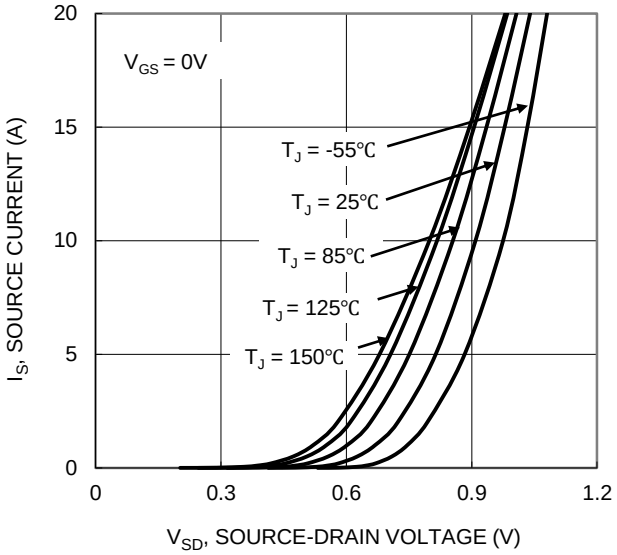


Figure 9. Diode Forward Voltage vs. Current

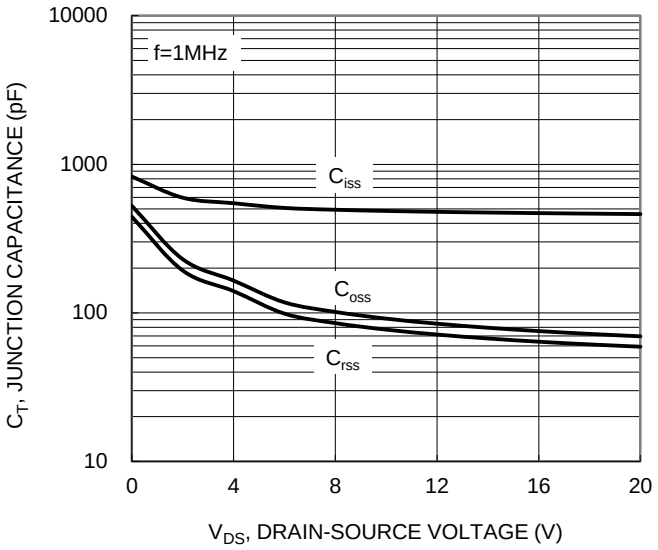


Figure 10. Typical Junction Capacitance

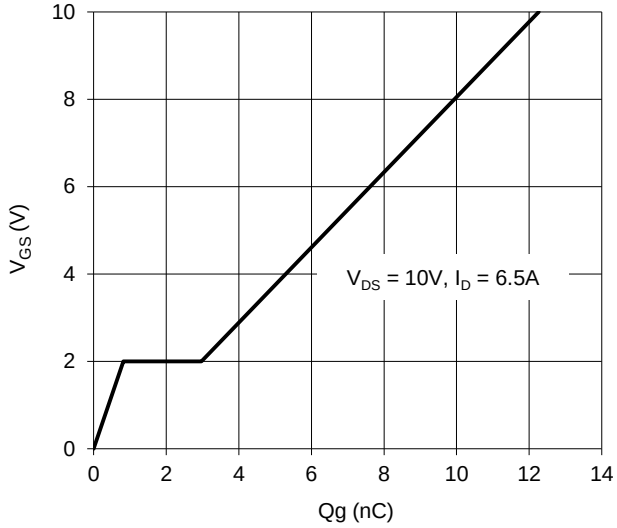


Figure 11. Gate Charge

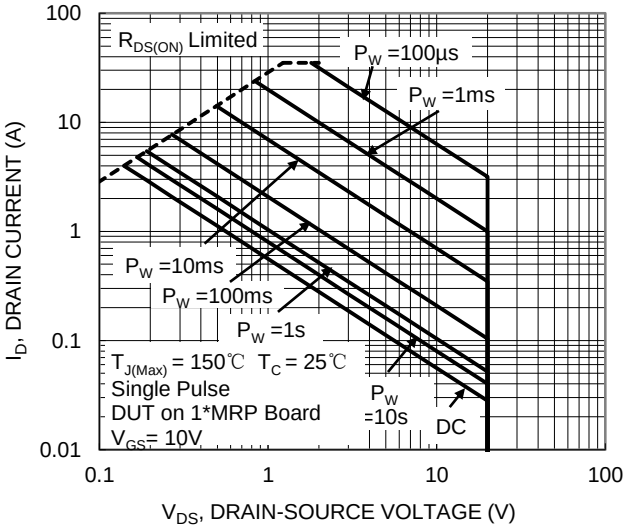


Figure 12. SOA, Safe Operation Area


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## Typical Characteristics—P-CHANNEL

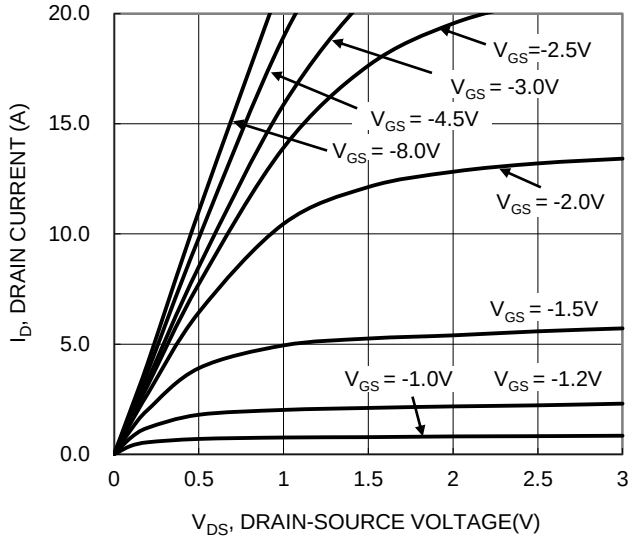


Figure 13. Typical Output Characteristic

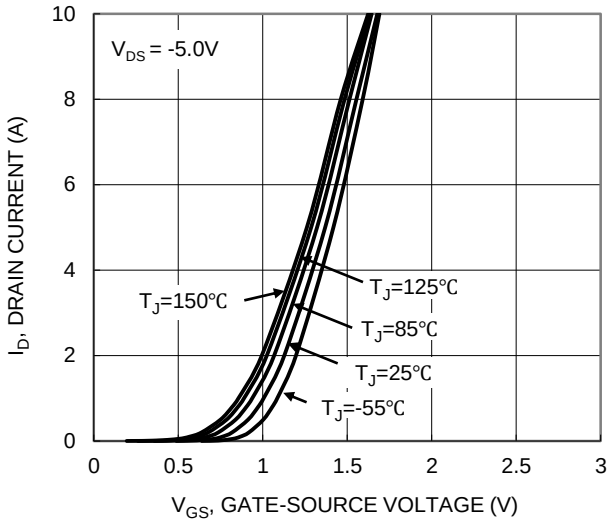


Figure 14. Typical Transfer Characteristic

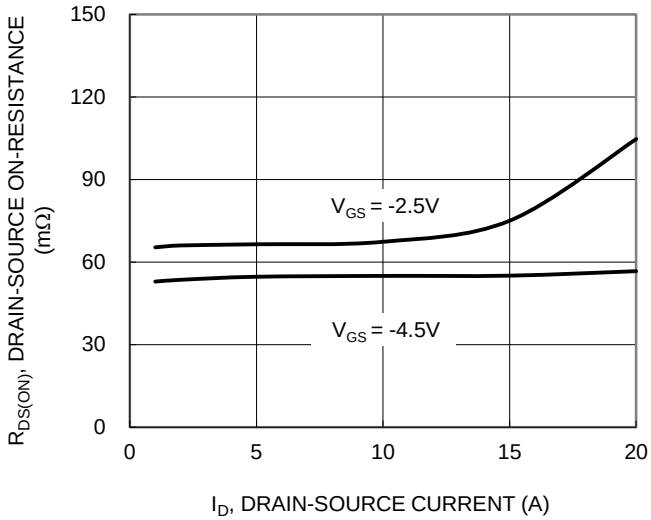


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

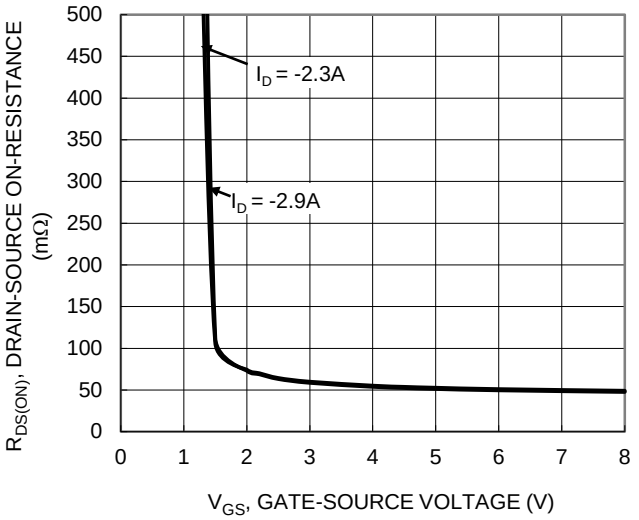


Figure 16. Typical Transfer Characteristic

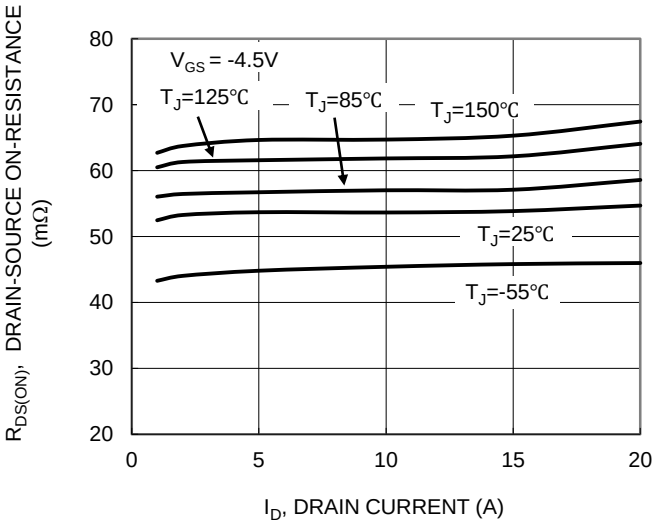


Figure 17. Typical On-Resistance vs. Drain Current and Temperature

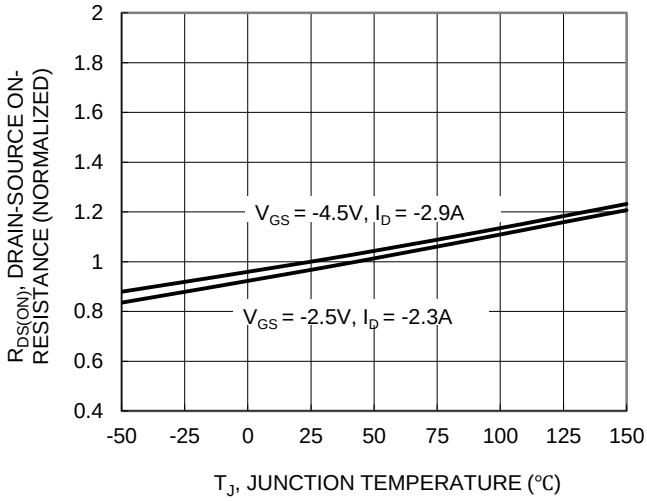


Figure 18. On-Resistance Variation with Temperature


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## Typical Characteristics—P-CHANNEL (continued)

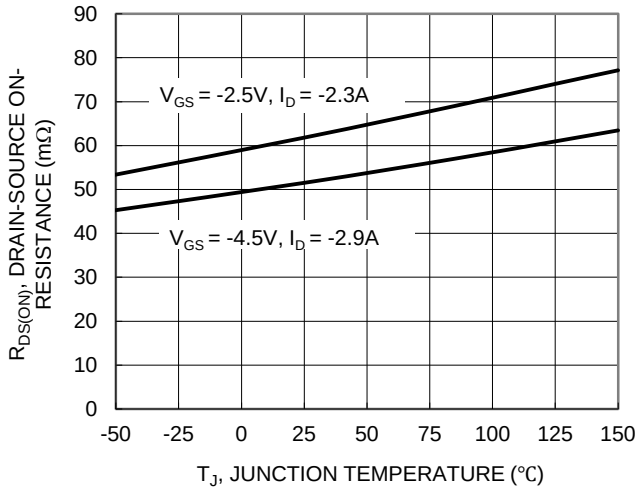


Figure 19. On-Resistance Variation with Temperature

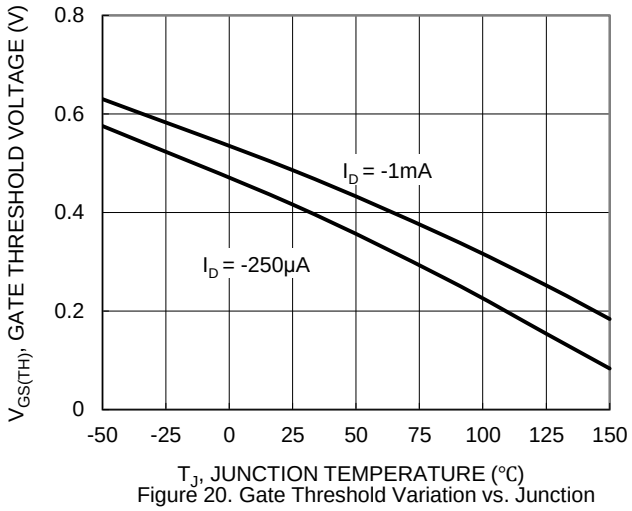


Figure 20. Gate Threshold Variation vs. Junction Temperature

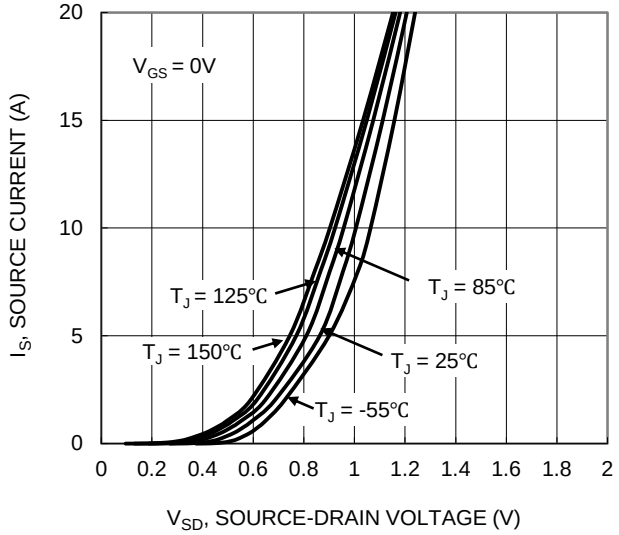


Figure 21. Diode Forward Voltage vs. Current

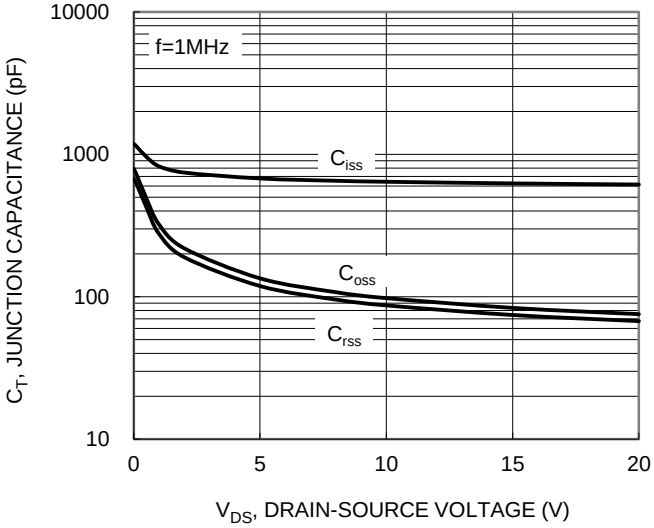


Figure 22. Typical Junction Capacitance

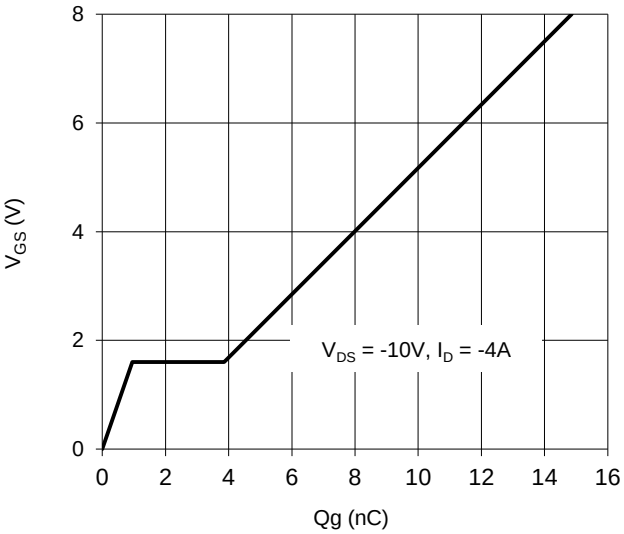


Figure 23. Gate Charge

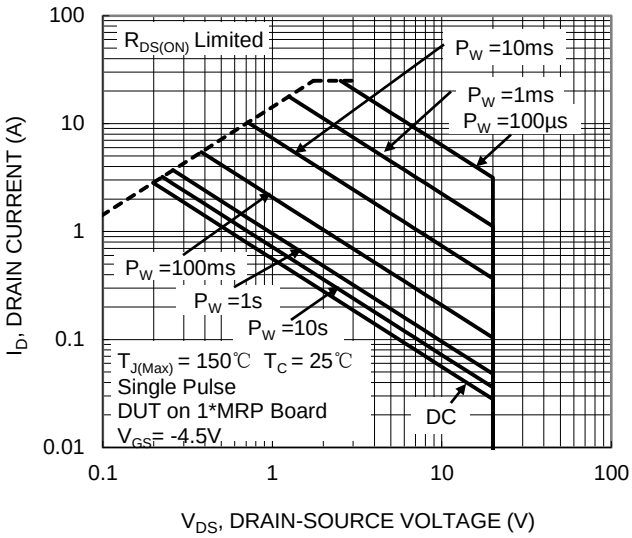


Figure 24. SOA, Safe Operation Area


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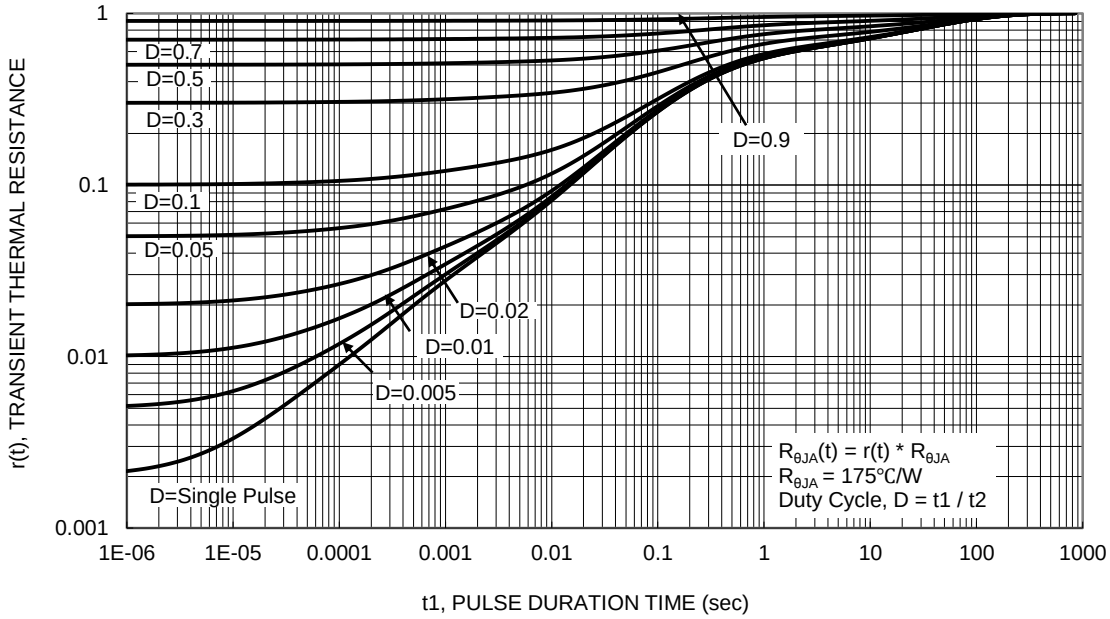


Figure 25. Transient Thermal Resistance


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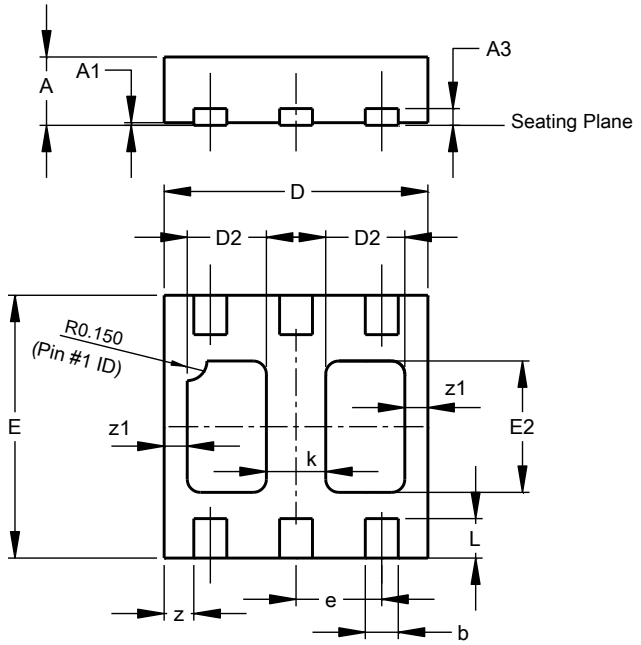
## Package Outline Dimensions

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

**U-DFN2020-6 (Type B)**

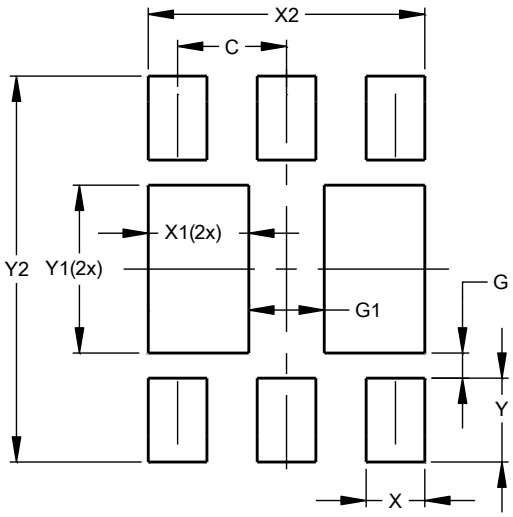



| U-DFN2020-6 Type B | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.545 | 0.605 | 0.575 |
| **A1** | 0.00 | 0.05 | 0.02 |
| **A3** | — | — | 0.13 |
| **b** | 0.20 | 0.30 | 0.25 |
| **D** | 1.95 | 2.075 | 2.00 |
| **D2** | 0.50 | 0.70 | 0.60 |
| **e** | — | — | 0.65 |
| **E** | 1.95 | 2.075 | 2.00 |
| **E2** | 0.90 | 1.10 | 1.00 |
| **k** | — | — | 0.45 |
| **L** | 0.25 | 0.35 | 0.30 |
| **z** | — | — | 0.225 |
| **z1** | — | — | 0.175 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**U-DFN2020-6 (Type B)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **G** | 0.150 |
| **G1** | 0.450 |
| **X** | 0.350 |
| **X1** | 0.600 |
| **X2** | 1.650 |
| **Y** | 0.500 |
| **Y1** | 1.000 |
| **Y2** | 2.300 |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