

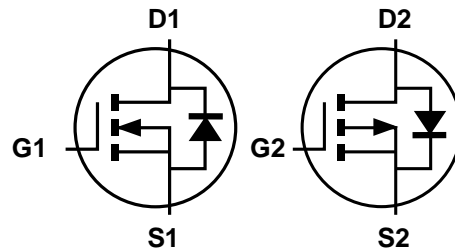
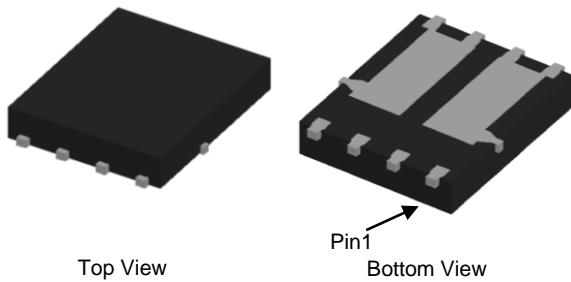
Product Summary

| Device | V _{(BR)DSS} | R _{DS(ON)} | I _D T _A = +25°C |
|--------|----------------------|--------------------------------|--|
| Q1 | 12V | 17mΩ @ V _{GS} = 4.5V | 9.5A |
| | | 25mΩ @ V _{GS} = 2.5V | 7.8A |
| Q2 | -12V | 32mΩ @ V _{GS} = -4.5V | -6.9A |
| | | 53mΩ @ V _{GS} = -2.5V | -5.4A |

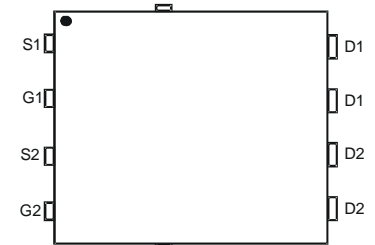
Description and Applications

This new generation Complementary Pair Enhancement Mode MOSFET has been designed to minimize R_{DS(on)} and yet maintain superior switching performance. This device is ideal for use in Notebook battery power management and Loadswitch.

- Notebook Battery Power Management
- DC-DC Converters
- Loadswitch



Q1 N-Channel MOSFET Q2 P-Channel MOSFET



Top View
Pin Configuration

Features and Benefits

- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low R_{DS(ON)} – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- **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**

Mechanical Data

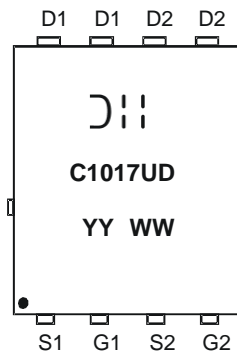
- Case: POWERDI5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.097 grams (approximate)

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|---------------|--------------------|
| DMC1017UPD-13 | POWERDI5060-8 | 2500 / Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant
 2. See http://www.diodes.com/quality/lead_free.html 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 <http://www.diodes.com/products/packages.html>.

Marking Information



⌋⌋⌋ = Manufacturer's Marking
 C1017UD = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 13 = 2013)
 WW = Week (01 - 53)

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

| Characteristic | | Symbol | Q1 Value | Q2 Value | Units |
|--|------------------|-----------|--------------|--------------|-------|
| Drain-Source Voltage | | V_{DSS} | 12 | -12 | V |
| Gate-Source Voltage | | V_{GSS} | ± 8 | ± 8 | V |
| Continuous Drain Current (Note 5) $V_{GS} = 4.5\text{V}$ | Steady State | I_D | 9.5 7.6 | -6.9 -5.5 | A |
| | $t < 10\text{s}$ | I_D | 13.0 10.4 | -9.4 -7.5 | A |
| Maximum Body Diode Forward Current | | I_S | 2 | -2 | A |
| Pulsed Drain Current (10 μs pulse, duty cycle = 1%) | | I_{DM} | 50 | -35 | A |
| Avalanche Current (Note 6) $L = 0.1\text{mH}$ | | I_{AS} | 9.7 | -9.2 | A |
| Avalanche Energy (Note 6) $L = 0.1\text{mH}$ | | E_{AS} | 4.7 | 4.3 | mJ |

Thermal Characteristics

| Characteristic | Symbol | Value | Units |
|--|-----------------|---------------------------|--------------------|
| Total Power Dissipation (Note 5) | P_D | $T_A = +25^\circ\text{C}$ | 2.3 |
| | | $T_A = +70^\circ\text{C}$ | 1.5 |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | Steady state | 54 |
| | | $t < 10\text{s}$ | 29 |
| Thermal Resistance, Junction to Case (Note 5) | $R_{\theta JC}$ | 4.1 | $^\circ\text{C/W}$ |
| 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 | I_{DSS} | — | — | 1 | μA | $V_{DS} = 12\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 0.6 | — | 1.5 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | — | 9.6 | 17 | m Ω | $V_{GS} = 4.5\text{V}, I_D = 11.8\text{A}$ |
| | | — | 11 | 25 | | $V_{GS} = 2.5\text{V}, I_D = 9.8\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | 0.7 | 1.2 | V | $V_{GS} = 0\text{V}, I_S = 2.9\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | — | 1787 | — | pF | $V_{DS} = 6\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 297 | — | | |
| Reverse Transfer Capacitance | C_{rss} | — | 265 | — | | |
| Gate Resistance | R_G | — | 1.6 | — | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Total Gate Charge ($V_{GS} = 4.5\text{V}$) | Q_g | — | 18.6 | — | nC | $V_{DS} = 6\text{V}, I_D = 11.8\text{A}$ |
| Total Gate Charge ($V_{GS} = 10\text{V}$) | Q_g | — | 35.4 | — | | |
| Gate-Source Charge | Q_{gs} | — | 2.7 | — | | |
| Gate-Drain Charge | Q_{gd} | — | 3.8 | — | | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 6.9 | — | nS | $V_{DD} = 6\text{V}, R_L = 6\Omega, V_{GS} = 4.5\text{V}, R_G = 6\Omega, I_D = 1\text{A}$ |
| Turn-On Rise Time | t_r | — | 10.9 | — | | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 70.3 | — | | |
| Turn-Off Fall Time | t_f | — | 31.8 | — | | |
| Body Diode Reverse Recovery Time | t_{rr} | — | 13.1 | — | nS | $I_F = 11.8\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |
| Body Diode Reverse Recovery Charge | Q_{rr} | — | 2.2 | — | nC | $I_F = 11.8\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep $T_J = 25^\circ\text{C}$.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

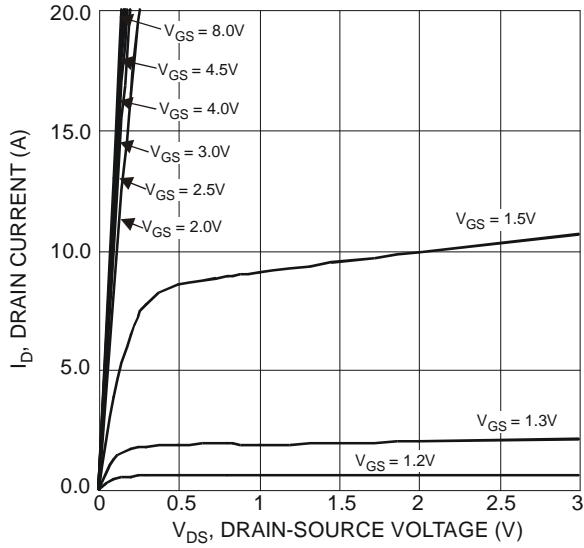


Figure 1 Typical Output Characteristics

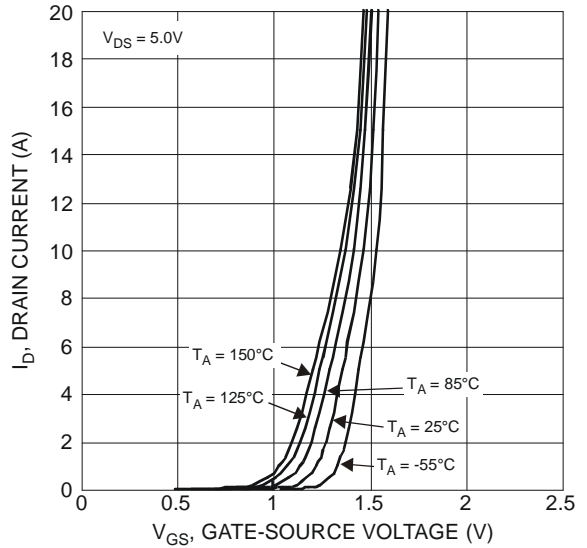


Figure 2 Typical Transfer Characteristics

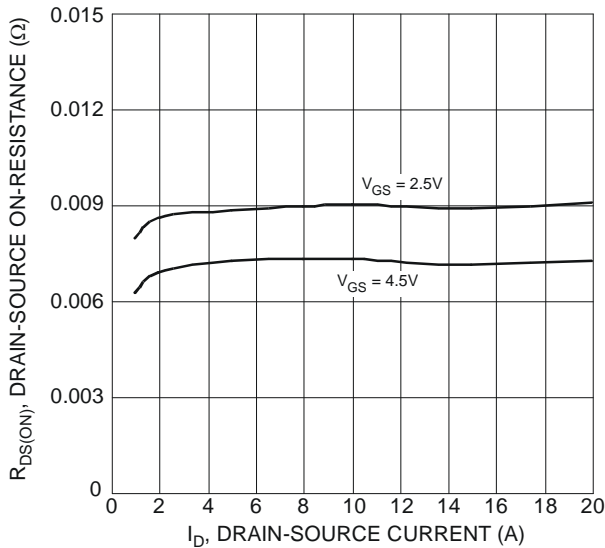


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

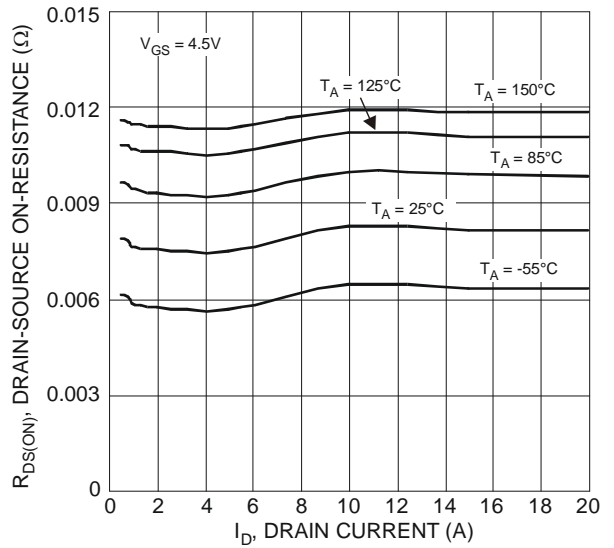


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

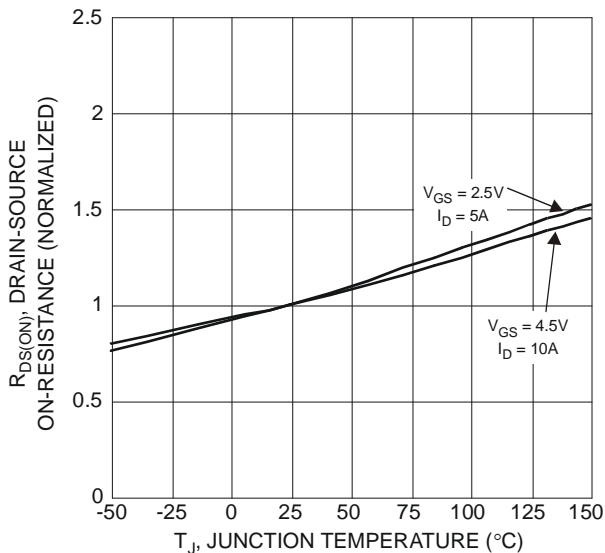


Figure 5 On-Resistance Variation with Temperature

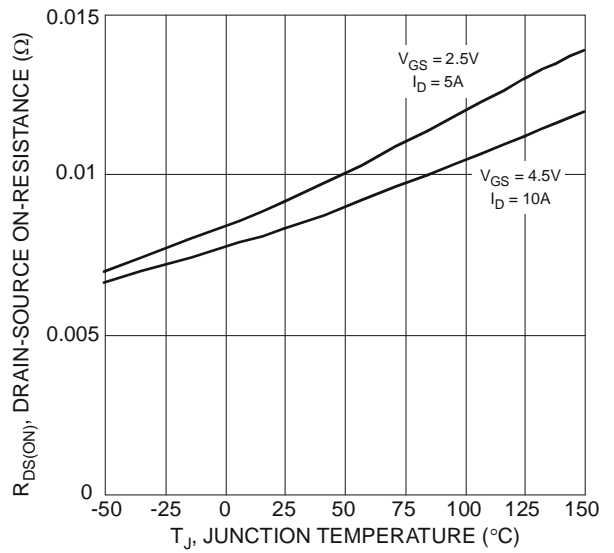


Figure 6 On-Resistance Variation with Temperature

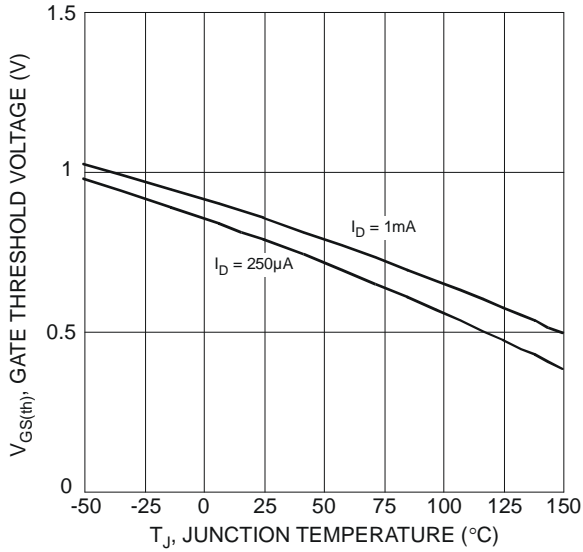


Figure 7 Gate Threshold Variation vs. Ambient Temperature

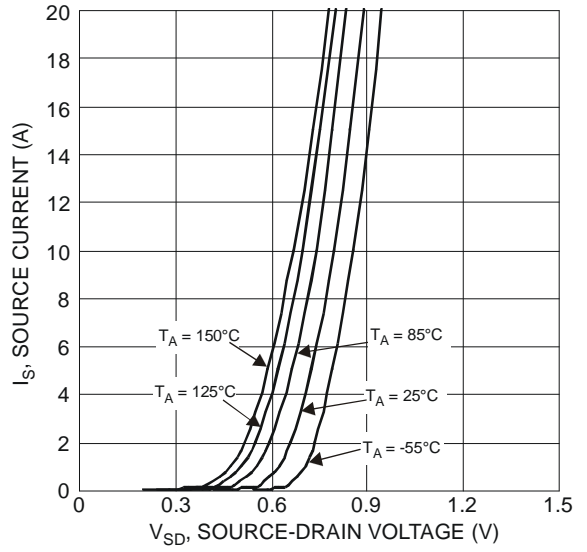


Figure 8 Diode Forward Voltage vs. Current

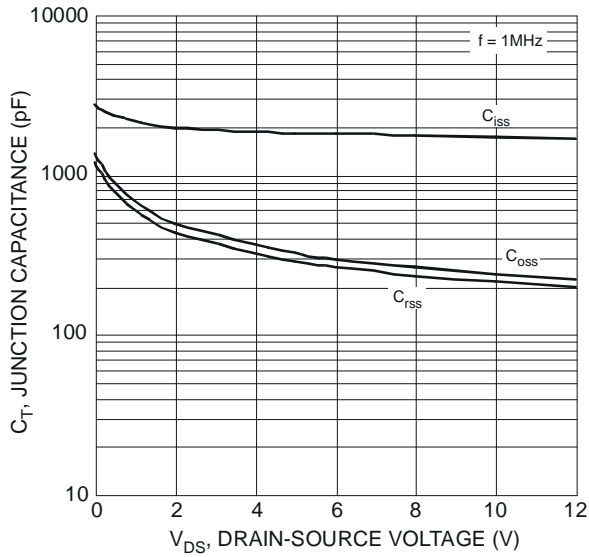


Figure 9 Typical Junction Capacitance

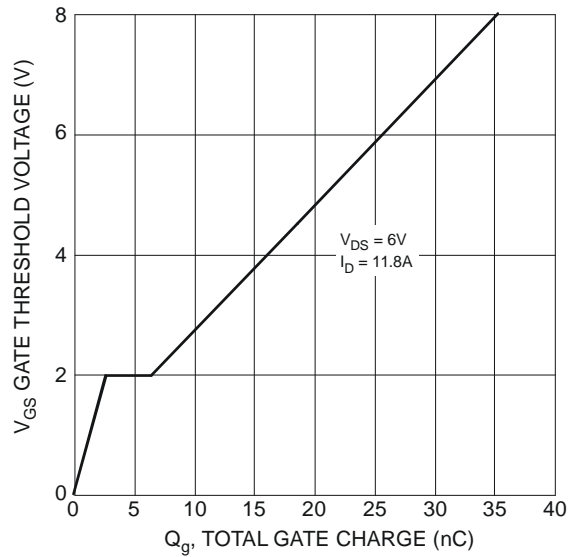
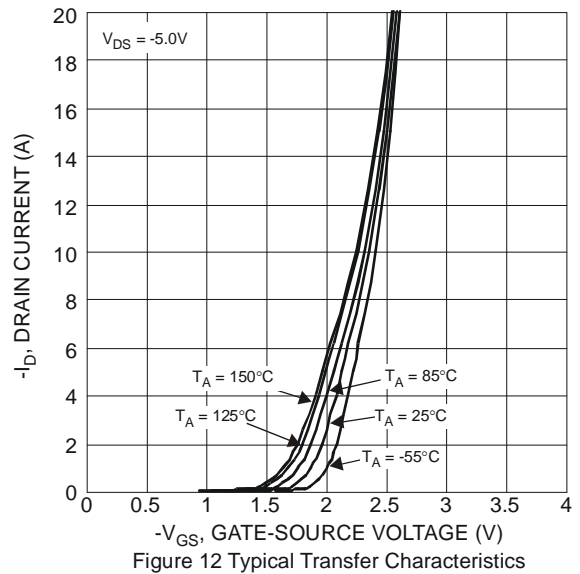
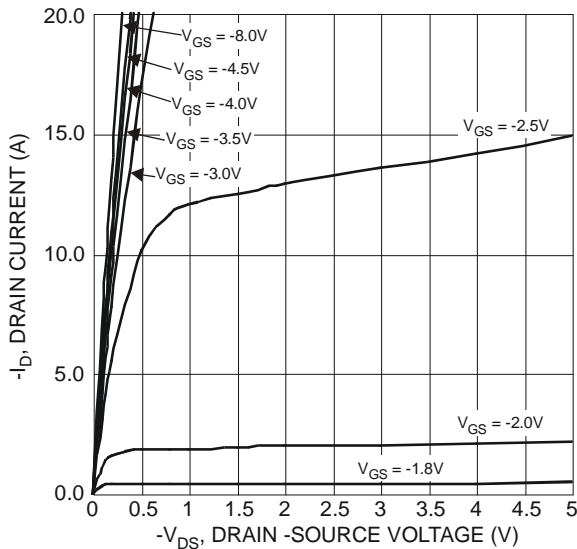


Figure 10 Gate Charge

Electrical Characteristics Q2 P-Channel (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|------|------|-----------|------------|---|
| OFF CHARACTERISTICS (Note 6) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | -12 | — | — | V | $V_{GS} = 0V, I_D = -250\mu A$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | -1 | μA | $V_{DS} = -12V, V_{GS} = 0V$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 8V, V_{DS} = 0V$ |
| ON CHARACTERISTICS (Note 6) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -0.6 | — | -1.5 | V | $V_{DS} = V_{GS}, I_D = -250\mu A$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | — | 21 | 32 | m Ω | $V_{GS} = -4.5V, I_D = -8.9A$ |
| | | — | 41 | 53 | | $V_{GS} = -2.5V, I_D = -6.9A$ |
| Diode Forward Voltage | V_{SD} | — | -0.7 | -1.2 | V | $V_{GS} = 0V, I_S = -2.9A$ |
| DYNAMIC CHARACTERISTICS (Note 7) | | | | | | |
| Input Capacitance | C_{iss} | — | 2100 | — | pF | $V_{DS} = -6V, V_{GS} = 0V, f = 1.0MHz$ |
| Output Capacitance | C_{oss} | — | 872 | — | | |
| Reverse Transfer Capacitance | C_{rss} | — | 626 | — | | |
| Gate Resistance | R_G | — | 23.1 | — | Ω | $V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$ |
| Total Gate Charge ($V_{GS} = -4.5V$) | Q_g | — | 23.7 | — | nC | $V_{DS} = -6V, I_D = -8.9A$ |
| Total Gate Charge ($V_{GS} = -8V$) | Q_g | — | 38.8 | — | | |
| Gate-Source Charge | Q_{gs} | — | 5.3 | — | | |
| Gate-Drain Charge | Q_{gd} | — | 9.8 | — | | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 10.6 | — | nS | $V_{DD} = -6V, R_L = 6\Omega, V_{GS} = -4.5V, R_G = 6\Omega, I_D = -1A$ |
| Turn-On Rise Time | t_r | — | 25.5 | — | | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 144 | — | | |
| Turn-Off Fall Time | t_f | — | 129 | — | | |
| Body Diode Reverse Recovery Time | t_{rr} | — | 48.9 | — | nS | $I_F = -8.9A, di/dt = -100A/\mu s$ |
| Body Diode Reverse Recovery Charge | Q_{rr} | — | 15.3 | — | nC | $I_F = -8.9A, di/dt = -100A/\mu s$ |

Notes: 6. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep $T_J = 25^\circ\text{C}$.
 7. Short duration pulse test used to minimize self-heating effect.



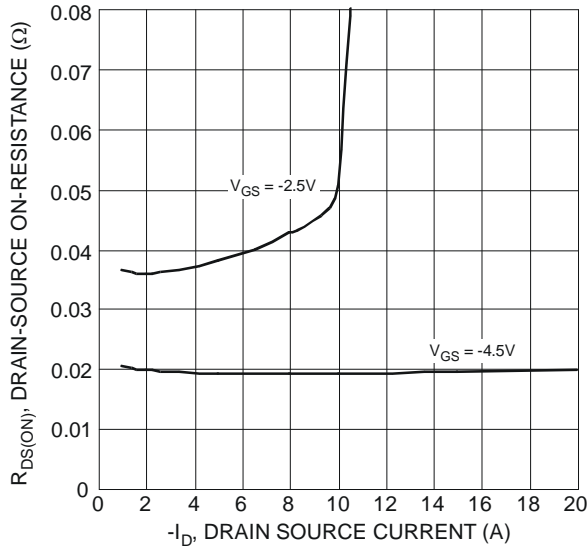


Figure 13 Typical On-Resistance vs. Drain Current and Gate Voltage

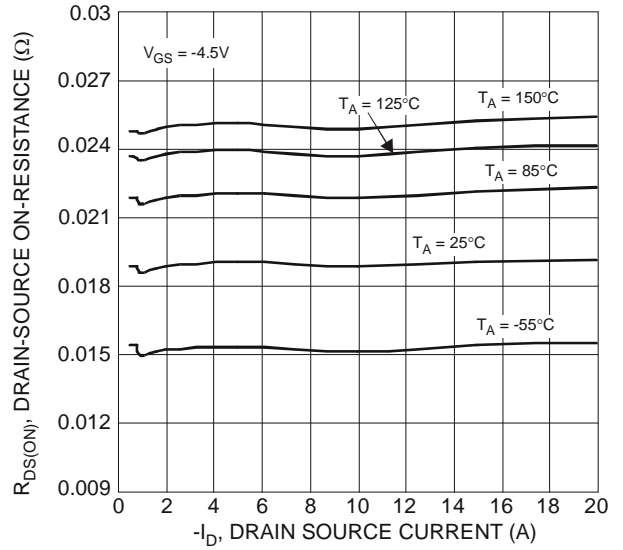


Figure 14 Typical On-Resistance vs. Drain Current and Temperature

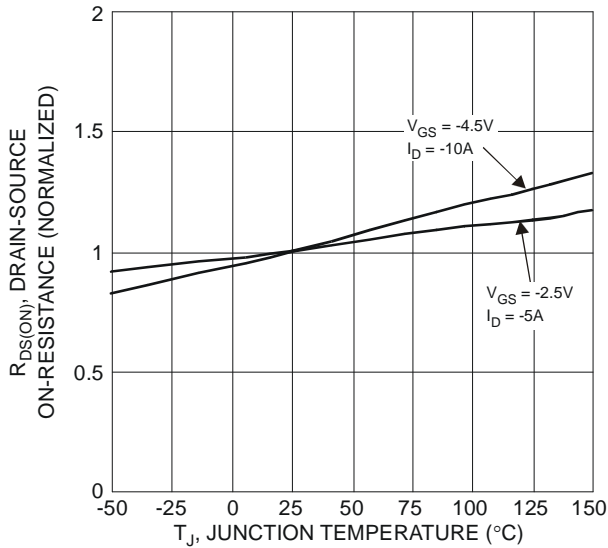


Figure 15 On-Resistance Variation with Temperature

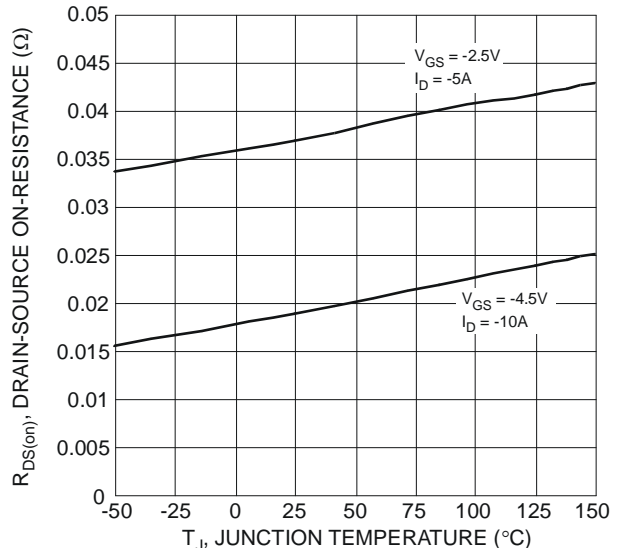


Figure 16 On-Resistance Variation with Temperature

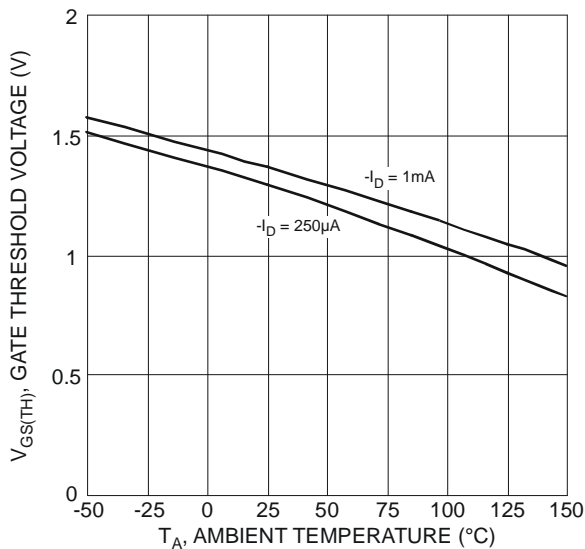


Figure 17 Gate Threshold Variation vs. Ambient Temperature

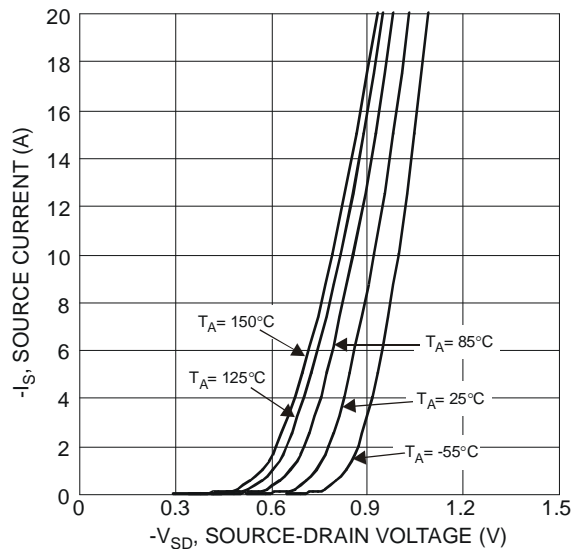


Figure 18 Diode Forward Voltage vs. Current

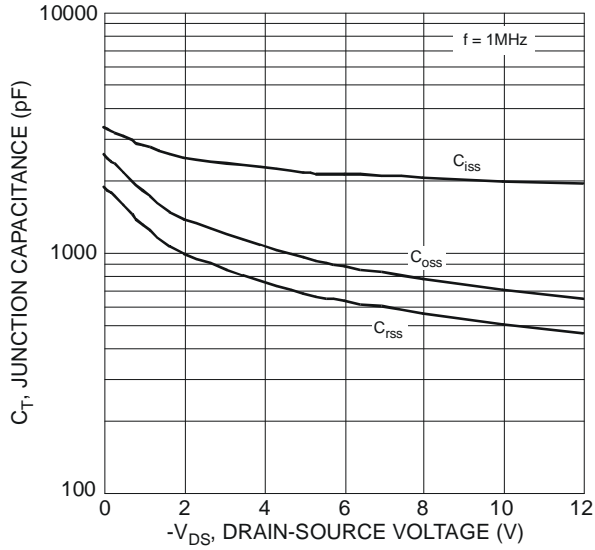


Figure 19 Typical Junction Capacitance

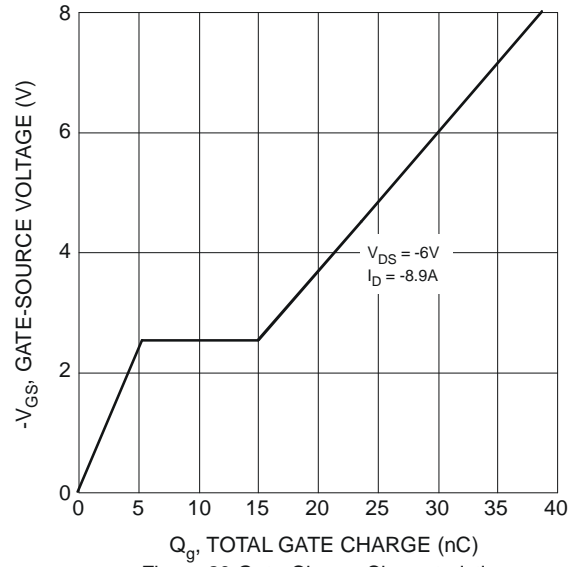


Figure 20 Gate-Charge Characteristics

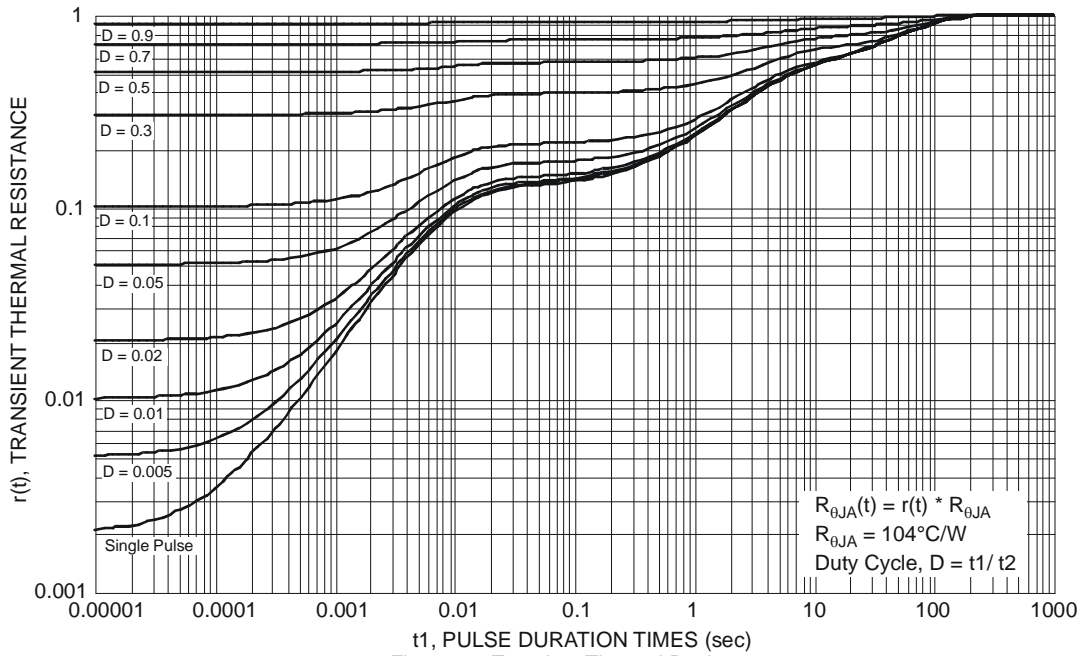
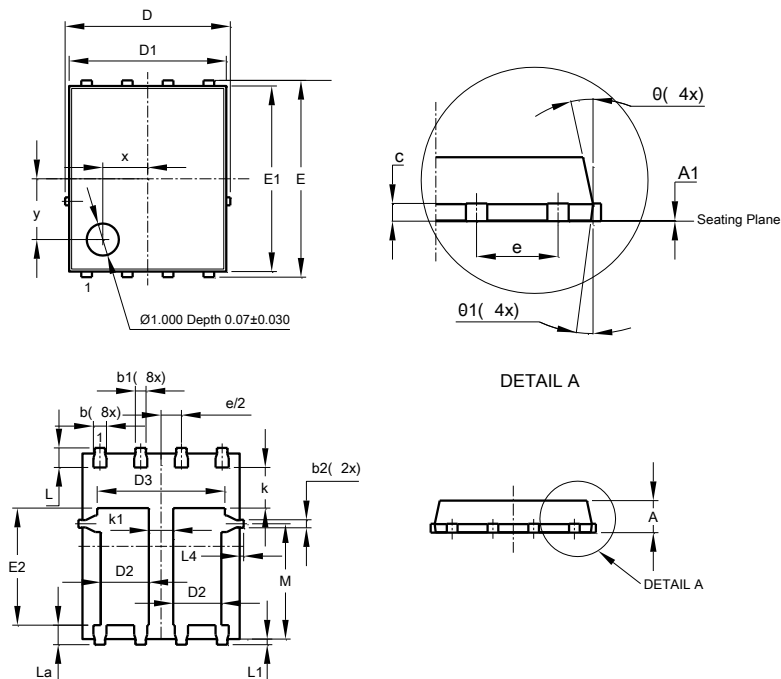


Figure 21 Transient Thermal Resistance

Package Outline Dimensions

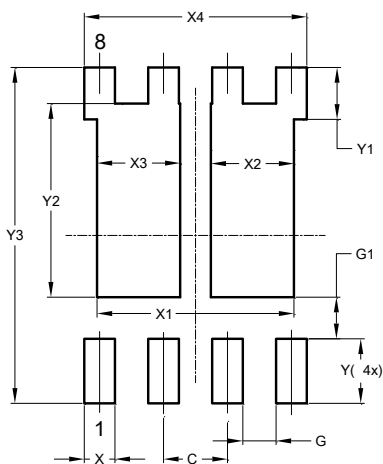
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| PowerDI5060-8 | | | |
|----------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0 | 0.05 | 0.02 |
| b | 0.33 | 0.51 | 0.41 |
| b1 | 0.300 | 0.366 | 0.333 |
| b2 | 0.20 | 0.35 | 0.25 |
| c | 0.23 | 0.33 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.85 | 4.95 | 4.90 |
| D2 | 1.40 | 1.60 | 1.50 |
| D3 | - | - | 3.98 |
| E | 6.15 BSC | | |
| E1 | 5.75 | 5.85 | 5.80 |
| E2 | 3.56 | 3.76 | 3.66 |
| e | 1.27BSC | | |
| k | - | - | 1.27 |
| k1 | 0.56 | - | - |
| L | 0.51 | 0.71 | 0.61 |
| La | 0.51 | 0.71 | 0.61 |
| L1 | 0.05 | 0.20 | 0.175 |
| L4 | - | - | 0.125 |
| M | 3.50 | 3.71 | 3.605 |
| x | - | - | 1.400 |
| y | - | - | 1.900 |
| θ | 10° | 12° | 11° |
| θ1 | 6° | 8° | 7° |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 1.270 |
| G | 0.660 |
| G1 | 0.820 |
| X | 0.610 |
| X1 | 3.910 |
| X2 | 1.650 |
| X3 | 1.650 |
| X4 | 4.420 |
| Y | 1.270 |
| Y1 | 1.020 |
| Y2 | 3.810 |
| Y3 | 6.610 |

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