

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on) \max}$ | I_D $T_A = 25^\circ\text{C}$ |
|---------------|--|-----------------------------------|
| -40V | 11m Ω @ $V_{GS} = -10\text{V}$ | -17.0A |
| | 15m Ω @ $V_{GS} = -4.5\text{V}$ | -14.5A |

Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- "Green" component and RoHS compliant (Note 1)
- Qualified to AEC-Q101 Standards for High Reliability

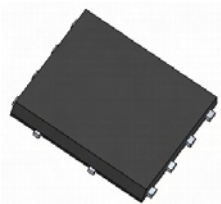
Description and Applications

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.

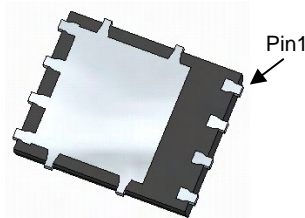
- DC-DC Converters
- Power management functions
- Analog Switch

Mechanical Data

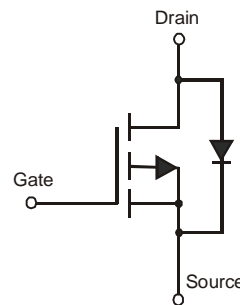
- Case: POWERDI®5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – 100% matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.097 grams (approximate)



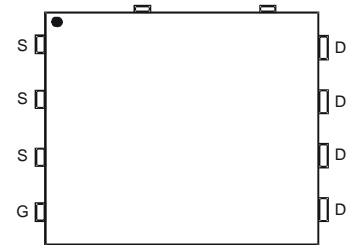
Top View



Bottom View



Internal Schematic



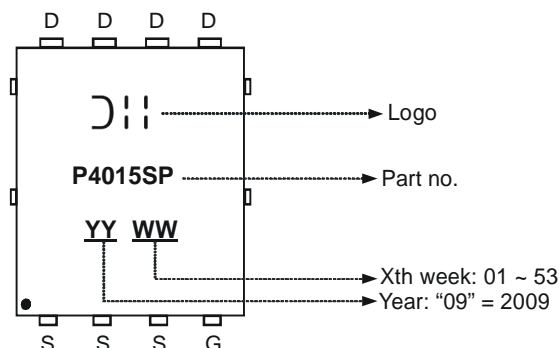
Top View
Pin Configuration

Ordering Information (Note 2)

| Part Number | Case | Packaging |
|---------------|----------------|--------------------|
| DMP4015SPS-13 | POWERDI®5060-8 | 2500 / Tape & Reel |

- Notes: 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2). All applicable RoHS exemptions applied.
2. For packaging details, go to our website at <http://www.diodes.com>.

Marking Information



Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | | | Symbol | Value | Units |
|--|------------------|--|-----------|----------------|-------|
| Drain-Source Voltage | | | V_{DSS} | -40 | V |
| Gate-Source Voltage | | | V_{GSS} | ± 25 | V |
| Continuous Drain Current (Note 3) $V_{GS} = -10\text{V}$ | Steady State | $T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$ | I_D | -8.5 -6.8 | A |
| | $t < 10\text{s}$ | $T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$ | I_D | -13.0 -10.5 | A |
| Continuous Drain Current (Note 4) $V_{GS} = -10\text{V}$ | Steady State | $T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$ | I_D | -11.0 -8.7 | A |
| | $t < 10\text{s}$ | $T_A = 25^\circ\text{C}$ $T_A = 70^\circ\text{C}$ | I_D | -17.0 -13.5 | A |
| Pulsed Drain Current (10 μs pulse, duty cycle = 1%) | | | I_{DM} | -100 | A |
| Maximum Body Diode Continuous Current (Note 4) | | | I_S | -3.5 | A |
| Avalanche Current (Note 5) | | | I_{AS} | -22 | A |
| Avalanche Energy (Note 5) | | | E_{AS} | 242 | mJ |

Thermal Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | | Symbol | Value | Units |
|--|--------------------------|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 3) | $T_A = 25^\circ\text{C}$ | P_D | 1.3 | W |
| | $T_A = 70^\circ\text{C}$ | | 0.8 | |
| Thermal Resistance, Junction to Ambient (Note 3) | Steady state | $R_{\theta JA}$ | 96.4 | $^\circ\text{C/W}$ |
| | $t < 10\text{s}$ | | 40.6 | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 4) | $T_A = 25^\circ\text{C}$ | P_D | 2.1 | W |
| | $T_A = 70^\circ\text{C}$ | | 1.4 | |
| Thermal Resistance, Junction to Ambient (Note 4) | Steady state | $R_{\theta JA}$ | 55.0 | $^\circ\text{C/W}$ |
| | $t < 10\text{s}$ | | 24.0 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case (Note 4) | | $R_{\theta JC}$ | 4.15 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

Electrical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|------|-------|-----------|---------------|--|
| OFF CHARACTERISTICS (Note 6) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | -40 | — | — | V | $V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | -1 | μA | $V_{DS} = -40\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 25\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 6) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -1.5 | -2.0 | -2.5 | V | $V_{DS} = V_{GS}, I_D = -250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | — | 7 | 11 | m Ω | $V_{GS} = -10\text{V}, I_D = -9.8\text{A}$ |
| | | — | 9 | 15 | | $V_{GS} = -4.5\text{V}, I_D = -9.8\text{A}$ |
| Forward Transfer Admittance | $ Y_{fs} $ | — | 26 | — | S | $V_{DS} = -20\text{V}, I_D = -9.8\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | -0.7 | -1.0 | V | $V_{GS} = 0\text{V}, I_S = -1\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 7) | | | | | | |
| Input Capacitance | C_{iss} | — | 4234 | — | pF | $V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$ $f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 1036 | — | | |
| Reverse Transfer Capacitance | C_{rss} | — | 526 | — | | |
| Gate Resistance | R_G | — | 7.77 | — | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Total Gate Charge | Q_g | — | 47.5 | — | nC | $V_{DS} = -20\text{V}, V_{GS} = -5\text{V}$ $I_D = -9.8\text{A}$ |
| Gate-Source Charge | Q_{gs} | — | 14.2 | — | | |
| Gate-Drain Charge | Q_{gd} | — | 13.5 | — | | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 13.2 | — | ns | $V_{GS} = -10\text{V}, V_{DD} = -20\text{V}, R_G = 6\Omega,$ $I_D = -1\text{A}, R_L = 20\Omega$ |
| Turn-On Rise Time | t_r | — | 10.0 | — | | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 302.7 | — | | |
| Turn-Off Fall Time | t_f | — | 137.9 | — | | |

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate
 - UIS in production with $L = 0.1\text{mH}$, $T_J = 25^\circ\text{C}$
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to production testing.

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DMP4015SPS

Document number: DS35518 Rev. 6 - 2

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 February 2012
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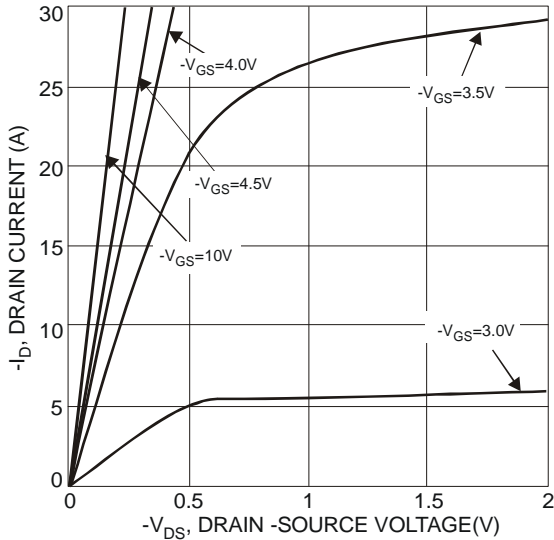


Fig. 1 Typical Output Characteristics

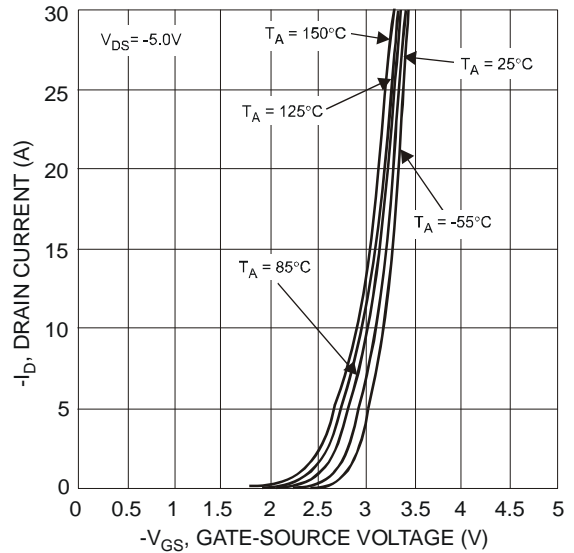


Fig. 2 Typical Transfer Characteristics

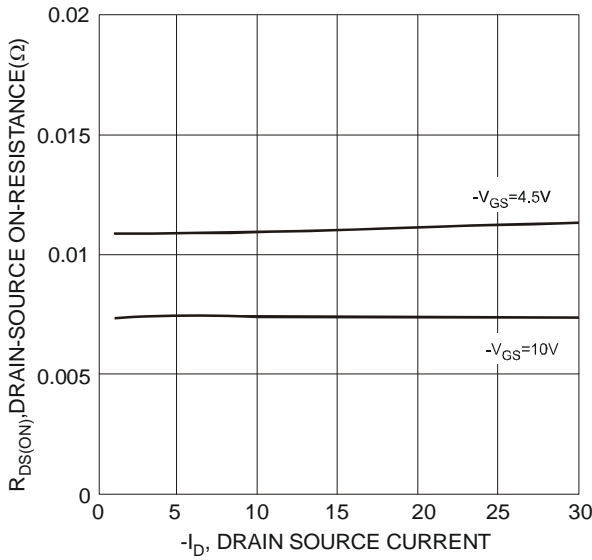


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

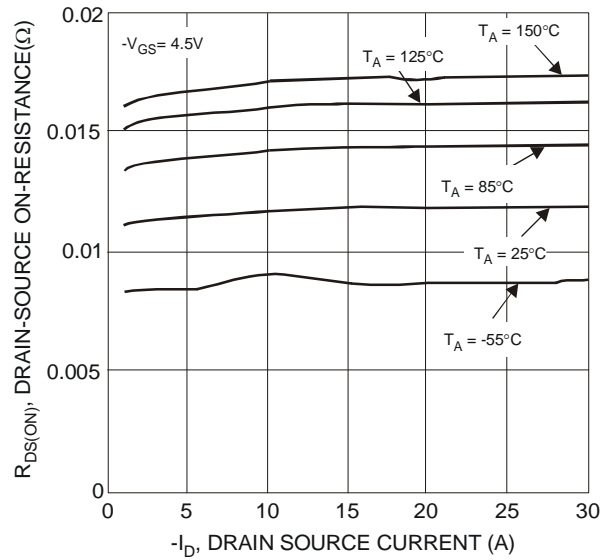


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

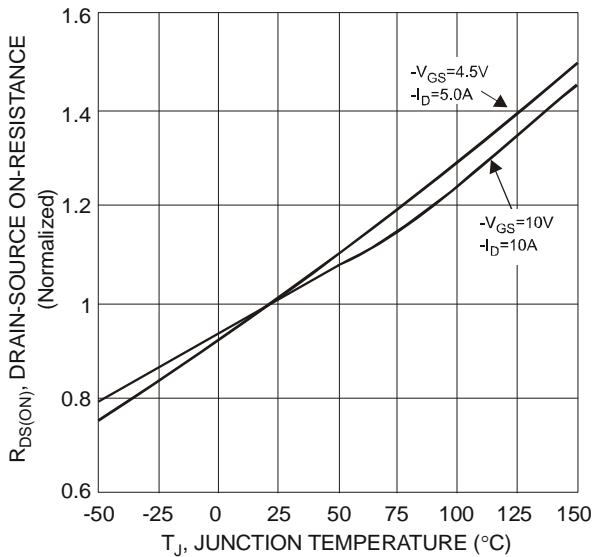


Fig. 5 On-Resistance Variation with Temperature

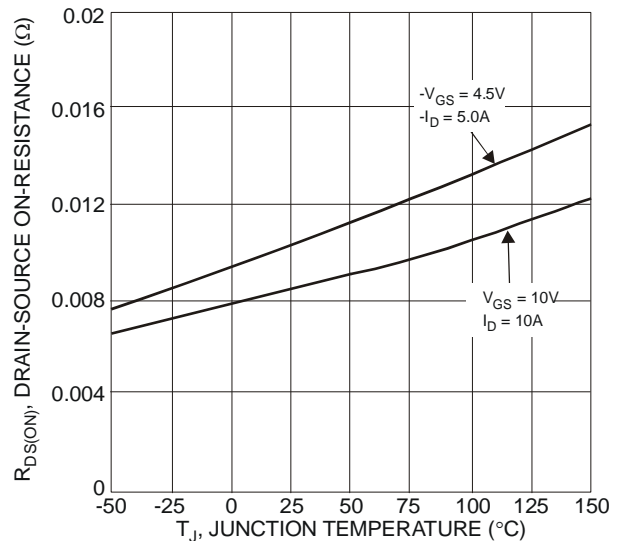


Fig. 6 On-Resistance Variation with Temperature

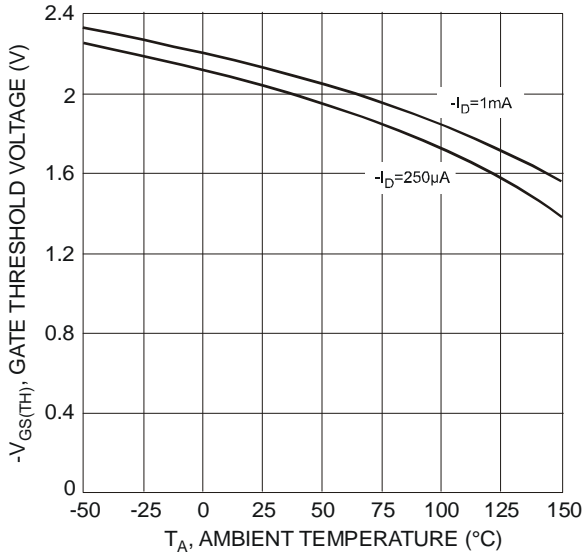


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

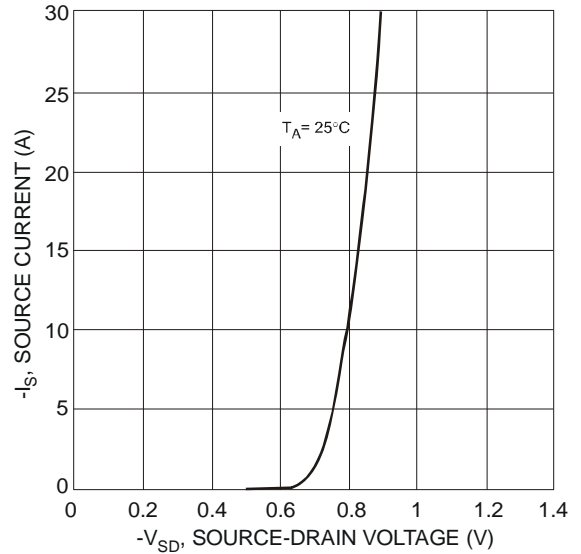


Fig. 8 Diode Forward Voltage vs. Current

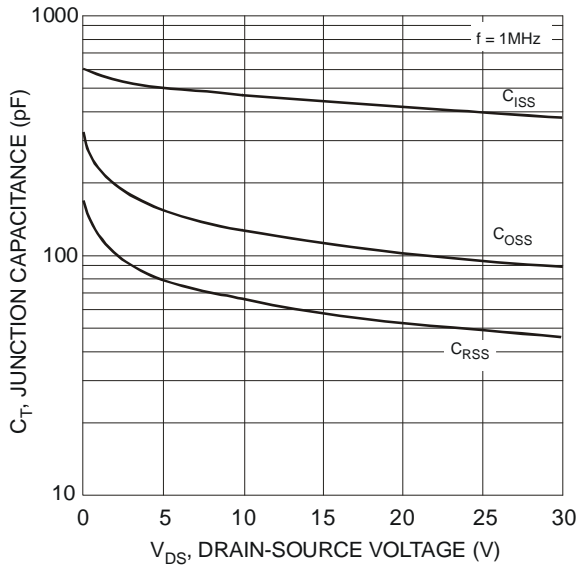


Fig. 9 Typical Junction Capacitance

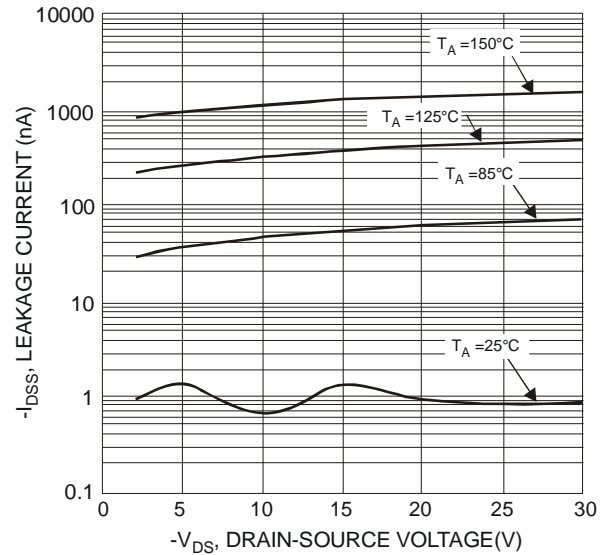


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

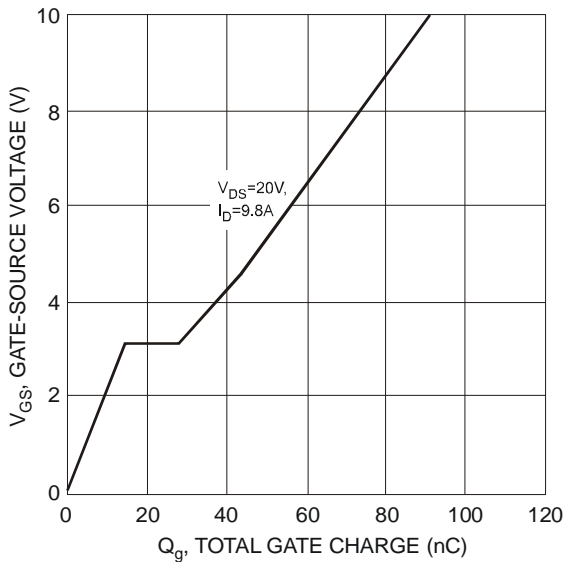


Fig. 11 Gate-Charge Characteristics

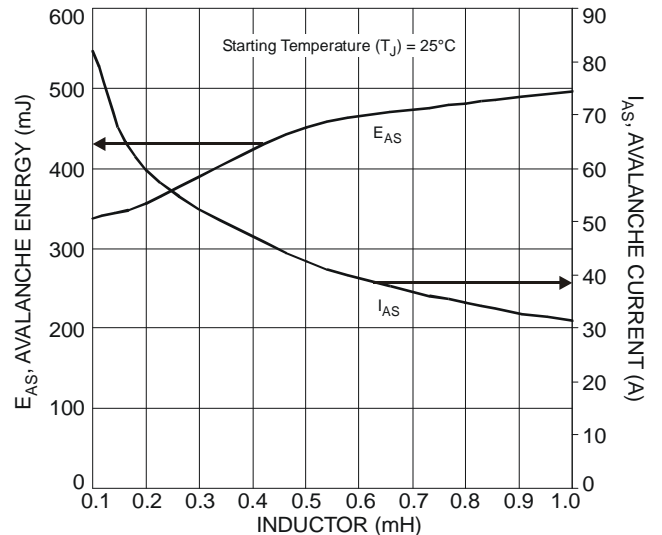
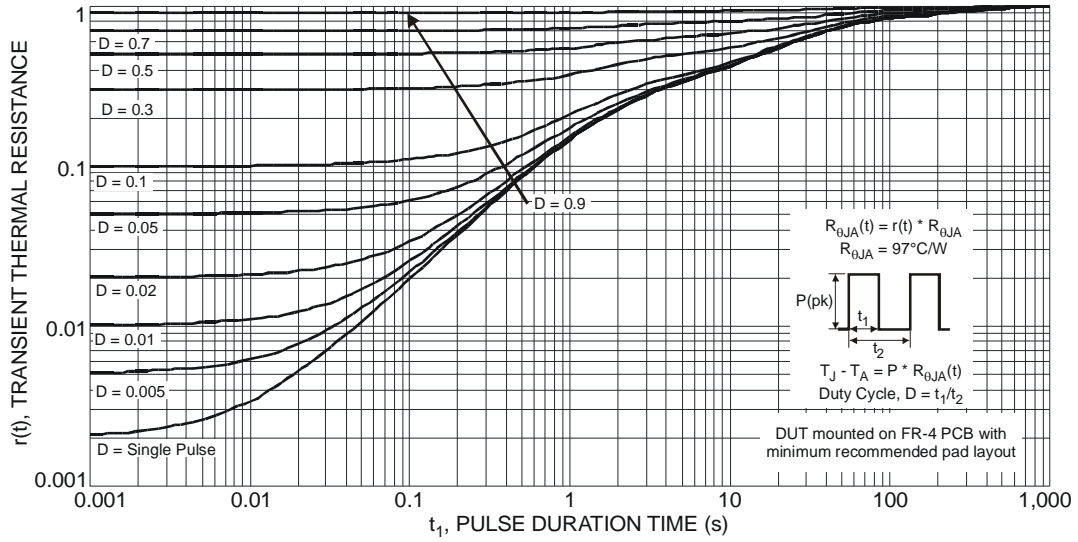
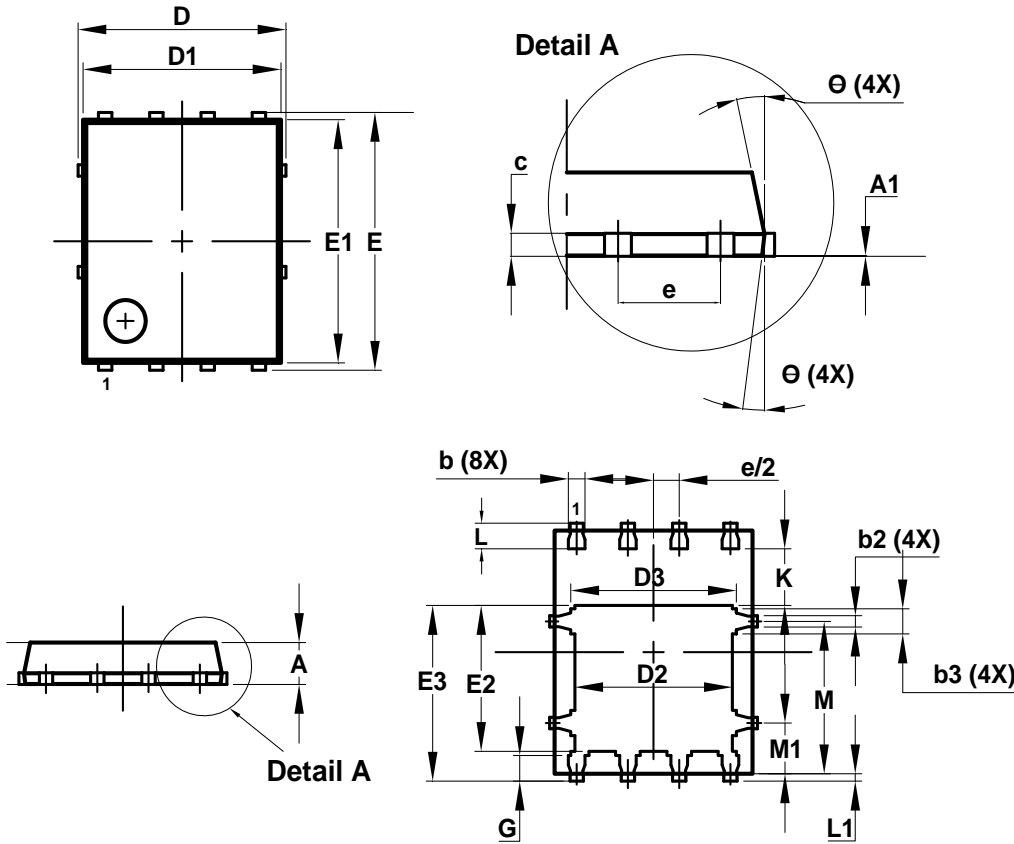


Fig. 12 Single-Pulse Avalanche Tested

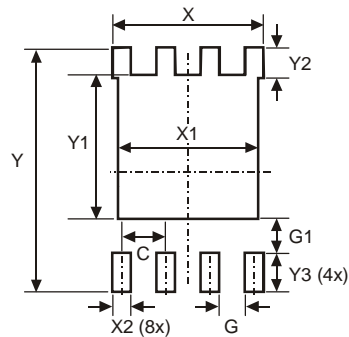


Package Outline Dimensions



| POWERDI®5060-8 | | | |
|-----------------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0.00 | 0.05 | — |
| b | 0.33 | 0.51 | 0.41 |
| b2 | 0.200 | 0.350 | 0.273 |
| b3 | 0.40 | 0.80 | 0.60 |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70 | 5.10 | 4.90 |
| D2 | 3.70 | 4.10 | 3.90 |
| D3 | 3.90 | 4.30 | 4.10 |
| E | 6.15 BSC | | |
| E1 | 5.60 | 6.00 | 5.80 |
| E2 | 3.28 | 3.68 | 3.48 |
| E3 | 3.99 | 4.39 | 4.19 |
| e | 1.27 BSC | | |
| G | 0.51 | 0.71 | 0.61 |
| K | 0.51 | — | — |
| L | 0.51 | 0.71 | 0.61 |
| L1 | 0.050 | 0.20 | 0.175 |
| M | 3.235 | 4.035 | 3.635 |
| M1 | 1.00 | 1.40 | 1.21 |
| θ | 10° | 12° | 11° |
| θ1 | 6° | 8° | 7° |
| All Dimensions in mm | | | |

Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 1.270 |
| G | 0.660 |
| G1 | 0.820 |
| X | 4.420 |
| X1 | 4.100 |
| X2 | 0.610 |
| Y | 6.610 |
| Y1 | 3.810 |
| Y2 | 1.020 |
| Y3 | 1.270 |

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