



YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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企业微信二维码



企业QQ二维码

Product Summary

| BV_{DSS} | $R_{DS(ON)}$ | I_D $T_C = +25^\circ C$ |
|------------|------------------------|------------------------------|
| 60V | 8mΩ @ $V_{GS} = 10V$ | 80A |
| | 12mΩ @ $V_{GS} = 4.5V$ | 64.5A |

Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- Low $R_{DS(ON)}$ – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- Wettable Flank for Improved Optical Inspection

Description and Applications

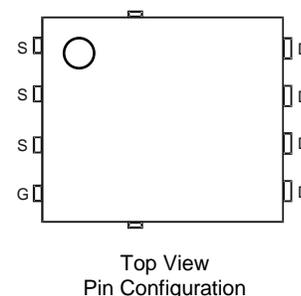
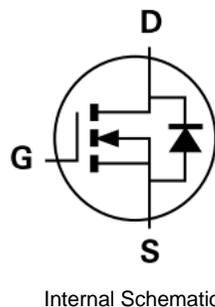
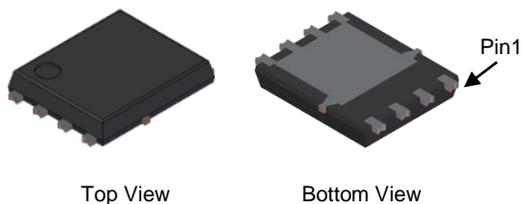
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Engine management systems
- Body control electronics
- DC-DC converters

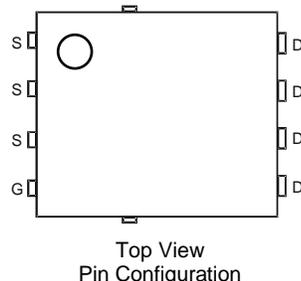
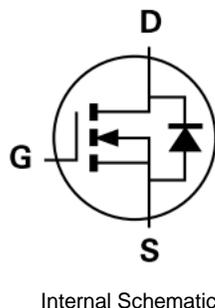
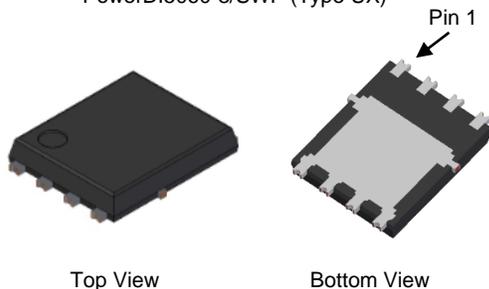
Mechanical Data

- Package: PowerDI®5060-8
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish – Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 Ⓜ3
- Weight: 0.097 grams (Approximate)

PowerDI5060-8 (SWP) (Type Q)



PowerDI5060-8/SWP (Type UX)



Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|------------------|--------------------------------|------|
| Drain-Source Voltage | V _{DSS} | 60 | V |
| Gate-Source Voltage | V _{GSS} | ±20 | V |
| Continuous Drain Current, V _{GS} = 10V (Note 5) | I _D | T _A = +25°C 15.5 | A |
| | | T _A = +100°C 11 | |
| Continuous Drain Current, V _{GS} = 10V (Note 6) | I _D | T _C = +25°C 80 | A |
| | | T _C = +100°C 56 | |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%) | I _{DM} | 320 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | I _S | 80 | A |
| Pulsed Body Diode Forward Current (10μs Pulse, Duty Cycle = 1%) | I _{SM} | 320 | A |
| Avalanche Current, L = 0.1mH | I _{AS} | 20 | A |
| Avalanche Energy, L = 0.1mH | E _{AS} | 20 | mJ |

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 6. Thermal resistance from junction to soldering point (on the exposed drain pad).

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|--|------------------------------------|-------------|--------------------|
| Total Power Dissipation (Note 5) | $T_A = +25^\circ\text{C}$ P_D | 2.9 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 52 | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6) | $T_C = +25^\circ\text{C}$ P_D | 75 | W |
| Thermal Resistance, Junction to Case (Note 6) | $R_{\theta JC}$ | 2.0 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +175 | $^\circ\text{C}$ |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|-----|-------|-----------|---------------|---|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 60 | — | — | V | $V_{GS} = 0V, I_D = 1mA$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | 1 | μA | $V_{DS} = 48V, V_{GS} = 0V$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 20V, V_{DS} = 0V$ |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | — | 3 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 5.3 | 8 | m Ω | $V_{GS} = 10V, I_D = 20A$ |
| | | — | 7.9 | 12 | | $V_{GS} = 4.5V, I_D = 20A$ |
| Diode Forward Voltage | V_{SD} | — | 0.8 | 1.2 | V | $V_{GS} = 0V, I_S = 20A$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | — | 2,090 | — | pF | $V_{DS} = 30V, V_{GS} = 0V,$ $f = 1MHz$ |
| Output Capacitance | C_{oss} | — | 746 | — | | |
| Reverse Transfer Capacitance | C_{rss} | — | 38.5 | — | | |
| Gate Resistance | R_g | — | 0.59 | — | Ω | $V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$ |
| Total Gate Charge ($V_{GS} = 4.5V$) | Q_g | — | 19.3 | — | nC | $V_{DS} = 30V, I_D = 20A$ |
| Total Gate Charge ($V_{GS} = 10V$) | Q_g | — | 41.3 | — | | |
| Gate-Source Charge | Q_{gs} | — | 6 | — | | |
| Gate-Drain Charge | Q_{gd} | — | 8.8 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 5.7 | — | ns | $V_{DD} = 30V, V_{GS} = 10V,$ $I_D = 20A, R_g = 3\Omega$ |
| Turn-On Rise Time | t_r | — | 4.3 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 23.4 | — | | |
| Turn-Off Fall Time | t_f | — | 9.7 | — | | |
| Body Diode Reverse Recovery Time | t_{RR} | — | 35.4 | — | ns | $I_f = 20A, di/dt = 100A/\mu\text{s}$ |
| Body Diode Reverse Recovery Charge | Q_{RR} | — | 38.2 | — | nC | |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

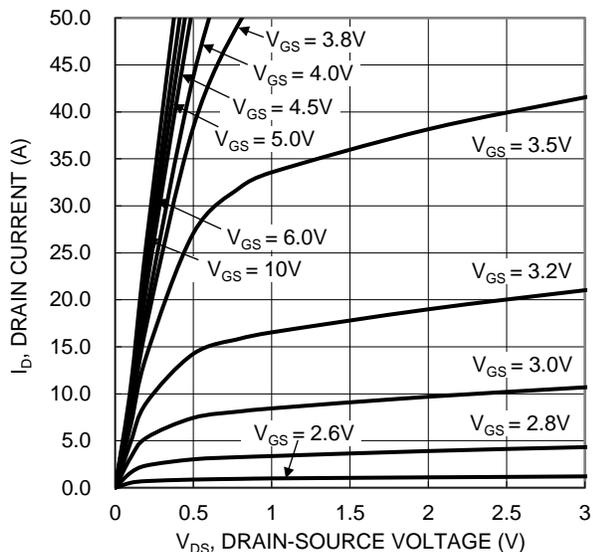


Figure 1. Typical Output Characteristic

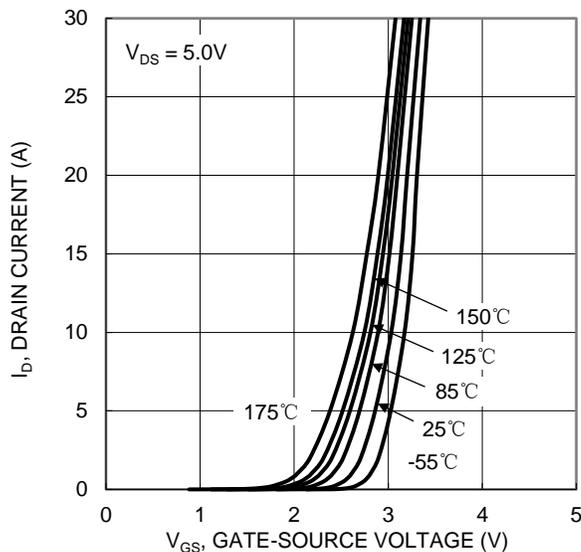


Figure 2. Typical Transfer Characteristic

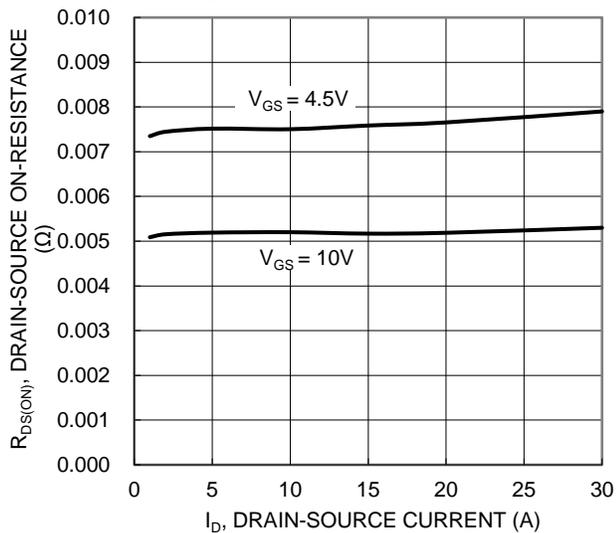


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

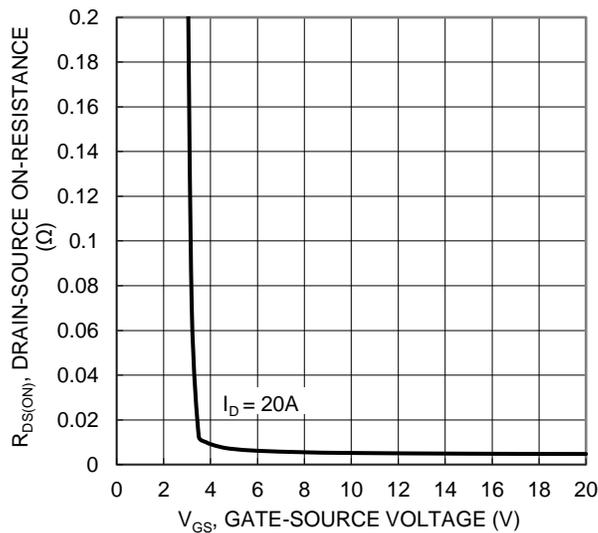


Figure 4. Typical Transfer Characteristic

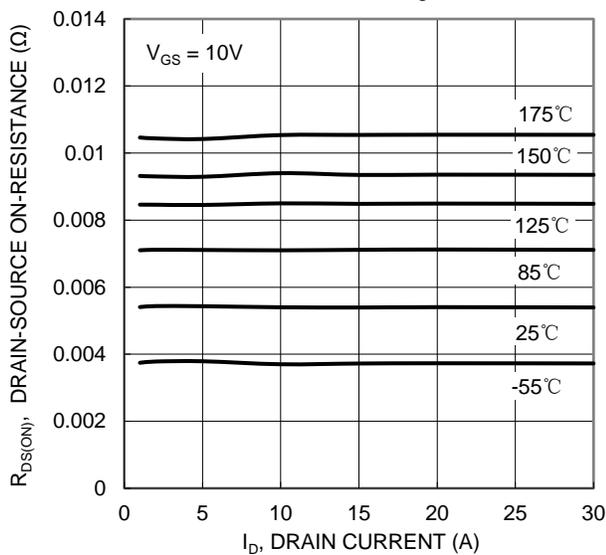


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

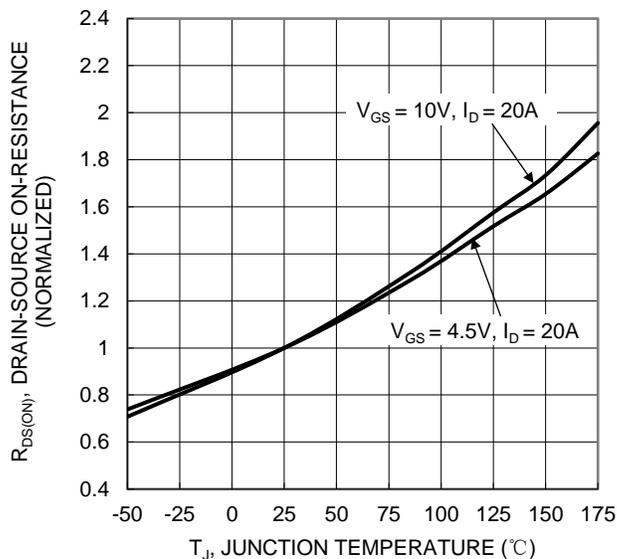


Figure 6. On-Resistance Variation with Temperature

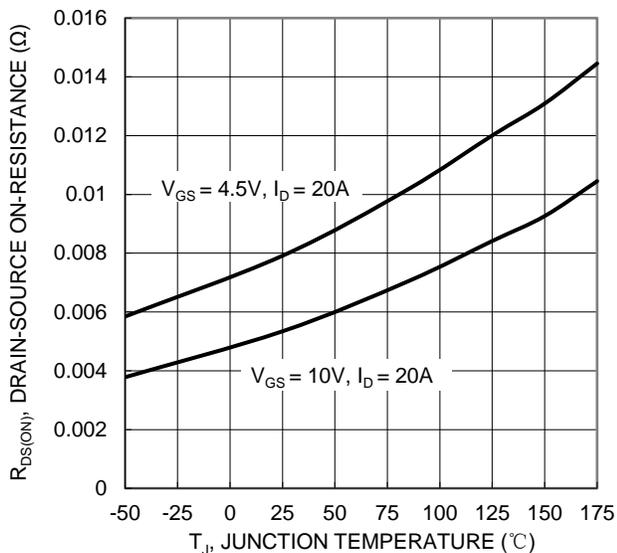


Figure 7. On-Resistance Variation with Temperature

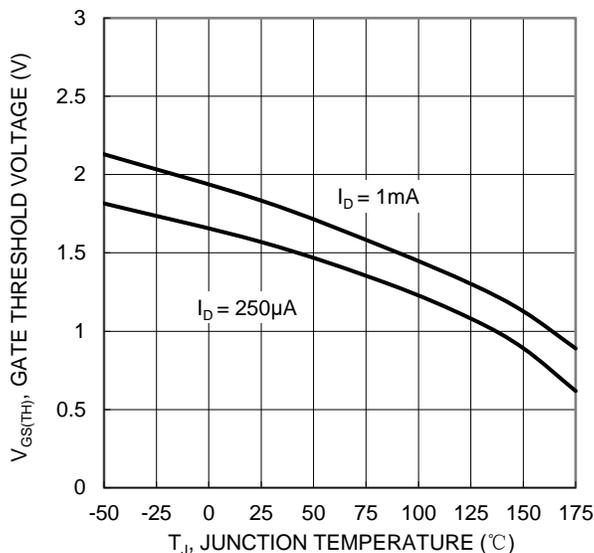


Figure 8. Gate Threshold Variation vs. Junction Temperature

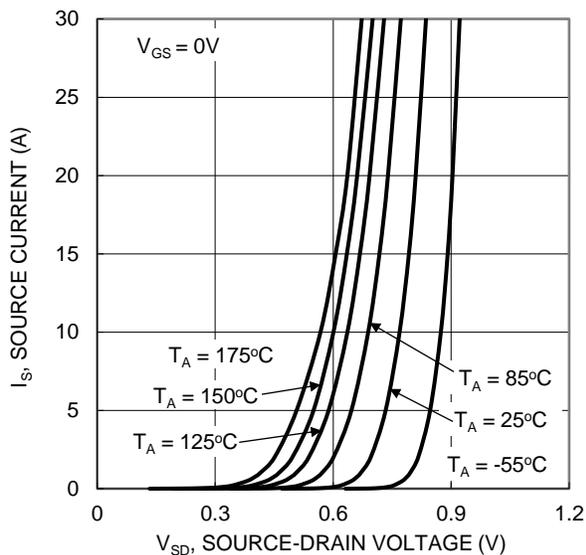


Figure 9. Diode Forward Voltage vs. Current

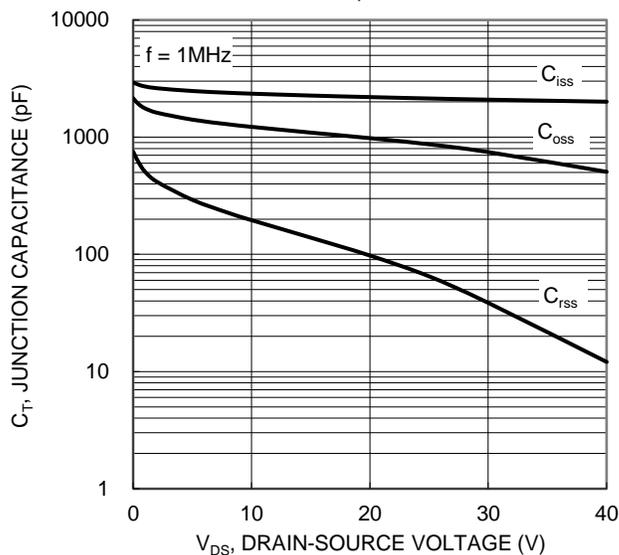


Figure 10. Typical Junction Capacitance

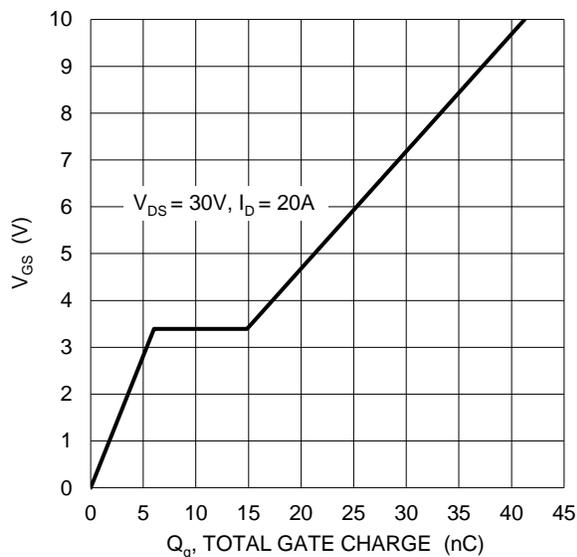


Figure 11. Gate Charge

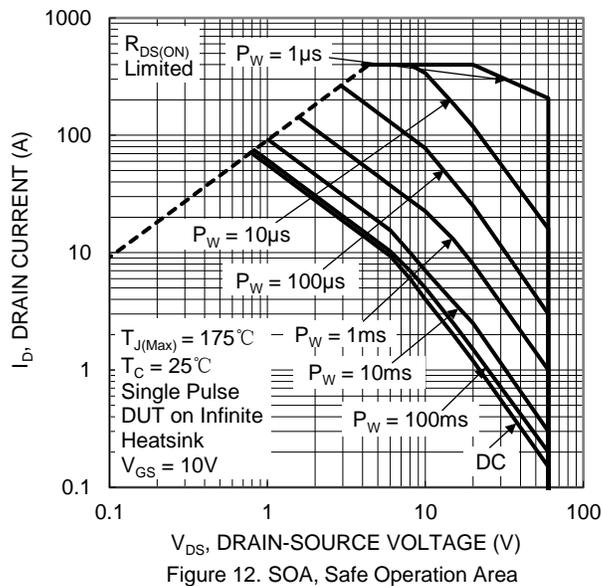


Figure 12. SOA, Safe Operation Area

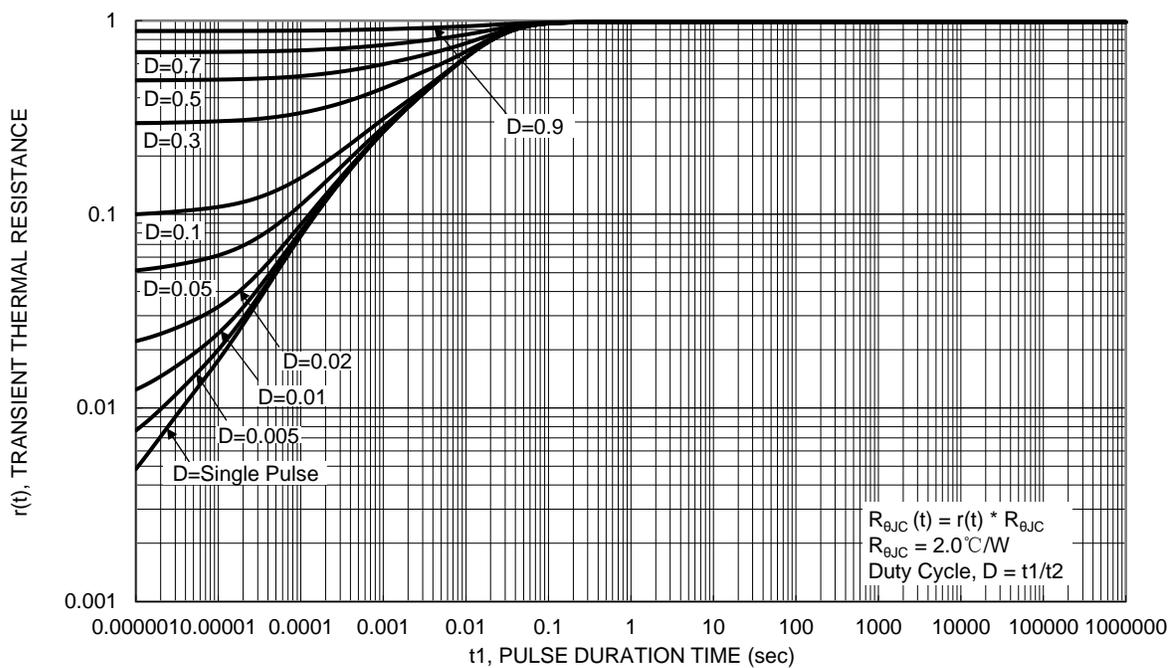
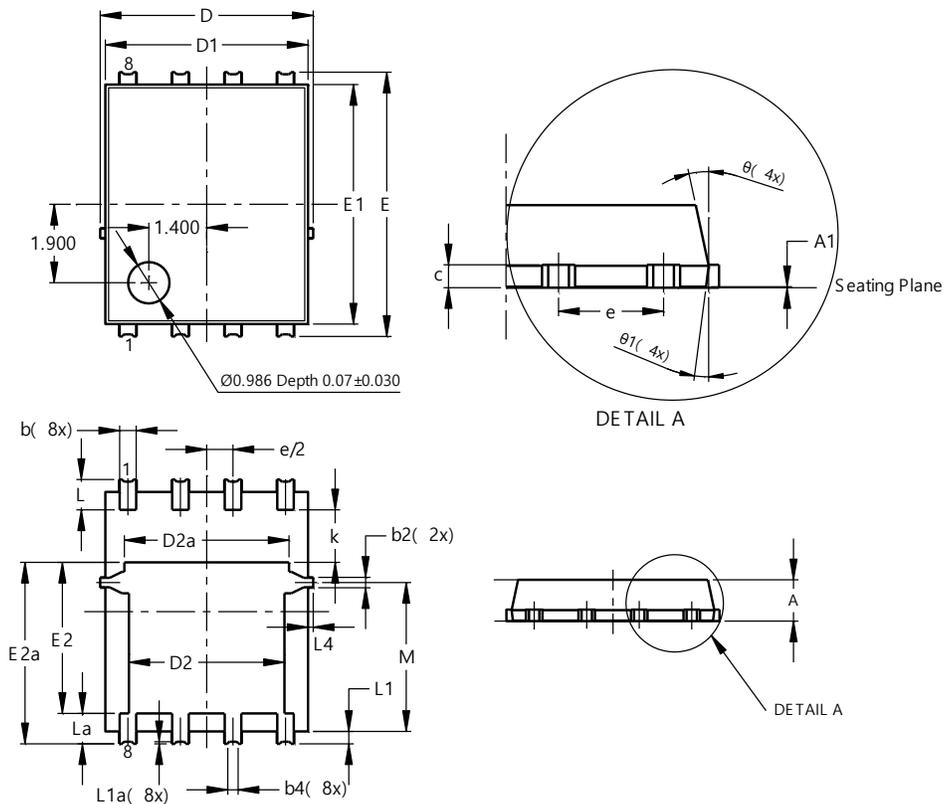
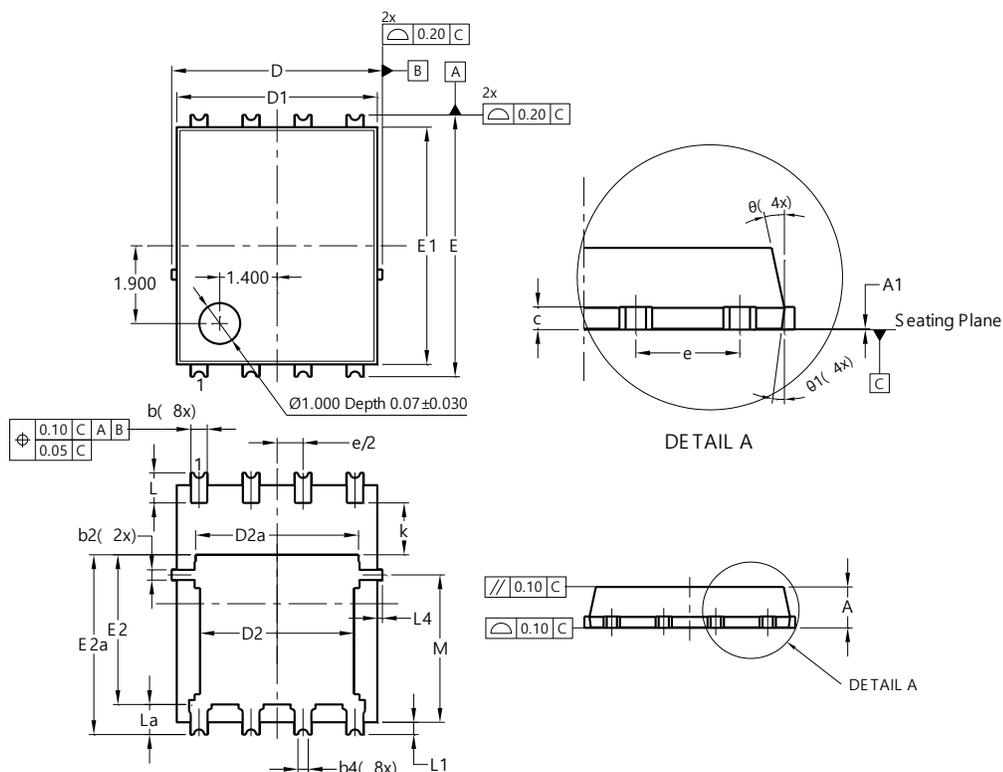


Figure 13. Transient Thermal Resistance

Package Outline Dimensions
PowerDI5060-8 (SWP) (Type Q)


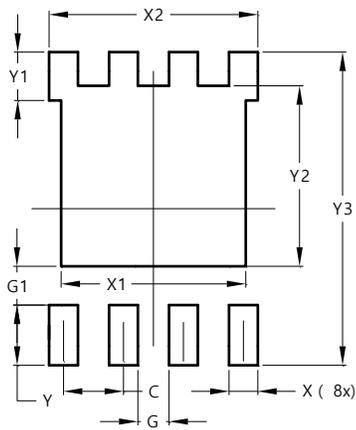
| PowerDI5060-8 (SWP) (Type Q) | | | |
|---------------------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0 | 0.05 | -- |
| b | 0.30 | 0.50 | 0.41 |
| b2 | 0.20 | 0.35 | 0.25 |
| b4 | 0.25REF | | |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70 | 5.10 | 4.90 |
| D2 | 3.56 | 3.96 | 3.76 |
| D2a | 3.78 | 4.18 | 3.98 |
| E | 6.40 BSC | | |
| E1 | 5.60 | 6.00 | 5.80 |
| E2 | 3.46 | 3.86 | 3.66 |
| E2a | 4.195 | 4.595 | 4.395 |
| e | 1.27BSC | | |
| k | 1.05 | -- | -- |
| L | 0.635 | 0.835 | 0.735 |
| La | 0.635 | 0.835 | 0.735 |
| L1 | 0.200 | 0.400 | 0.300 |
| L1a | 0.050REF | | |
| L4 | 0.025 | 0.225 | 0.125 |
| M | 3.205 | 4.005 | 3.605 |
| θ | 10° | 12° | 11° |
| θ1 | 6° | 8° | 7° |
| All Dimensions in mm | | | |

PowerDI5060-8/SWP (Type UX)


| PowerDI5060-8/SWP (Type UX) | | | |
|--------------------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0 | 0.05 | -- |
| b | 0.30 | 0.50 | 0.41 |
| b2 | 0.20 | 0.35 | 0.25 |
| b4 | 0.25REF | | |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70 | 5.10 | 4.90 |
| D2 | 3.56 | 3.96 | 3.76 |
| D2a | 3.78 | 4.18 | 3.98 |
| E | 6.40 BSC | | |
| E1 | 5.60 | 6.00 | 5.80 |
| E2 | 3.46 | 3.86 | 3.66 |
| E2a | 4.195 | 4.595 | 4.395 |
| e | 1.27BSC | | |
| k | 1.05 | -- | -- |
| L | 0.635 | 0.835 | 0.735 |
| La | 0.635 | 0.835 | 0.735 |
| L1 | 0.200 | 0.400 | 0.300 |
| L4 | 0.025 | 0.225 | 0.125 |
| M | 3.205 | 4.005 | 3.605 |
| θ | 10° | 12° | 11° |
| θ1 | 6° | 8° | 7° |
| All Dimensions in mm | | | |

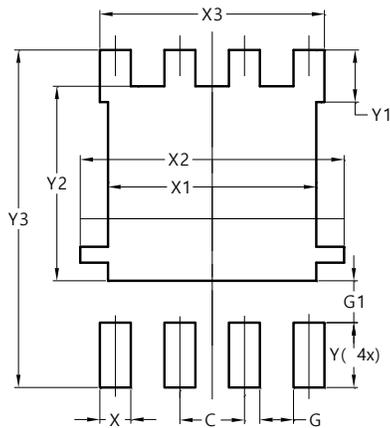
Suggested Pad Layout

PowerDI5060-8 (SWP) (Type Q)



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

PowerDI5060-8/SWP (Type UX)



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 1.270 |
| G | 0.660 |
| G1 | 0.820 |
| X | 0.610 |
| X1 | 4.100 |
| X2 | 5.190 |
| X3 | 4.420 |
| Y | 1.270 |
| Y1 | 1.020 |
| Y2 | 3.810 |
| Y3 | 6.610 |