优尚

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

0755-83047638
ysbdt@szyoushang.cn
www.szyoushang.cn

企业微信二维码

企业QQ二维码

## Product Summary

| **$BV_{DSS}$** | **$R_{DS(ON)}$ Max** | **$I_D$ Max<br>$T_C$ = +25°C** |
|---|---|---|
| 100V | 4.9mΩ @ $V_{GS}$ = 10V | 115A |

## Features

- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed

## Description

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Motor controls
- DC-DC converters
- Power management

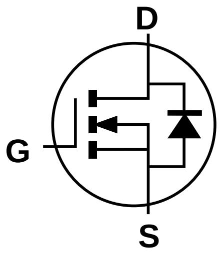
## Mechanical Data

- 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
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 ⓔ3
- Weight: 0.097 grams (Approximate)

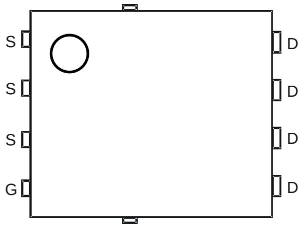
PowerDI5060-8/SWP (Type UX)

Top View

Bottom View



Internal Schematic



Top View
Pin Configuration

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 100 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current, $V_{GS}$ = 10V (Note 5) | Steady State | $T_A$ = +25°C | $I_D$ | 21 | A |
| | | $T_A$ = +100°C | | 15 | |
| Continuous Drain Current, $V_{GS}$ = 10V (Note 6) | Steady State | $T_C$ = +25°C | $I_D$ | 115 | A |
| | | $T_C$ = +100°C | | 81 | |
| Pulsed Drain Current (10µs Pulse, $T_C$ = +25°C, Package Limited) | | | $I_{DM}$ | 460 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | | $I_S$ | 115 | A |
| Pulsed Body Diode Forward Current (10µs Pulse, $T_C$ = +25°C, Package Limited) | | | $I_{SM}$ | 460 | A |
| Avalanche Current, L = 0.3mH | | | $I_{AS}$ | 41 | A |
| Avalanche Energy, L = 0.3mH | | | $E_{AS}$ | 252 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 4.7 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | | $R_{\theta JA}$ | 32 | °C/W |
| Total Power Dissipation (Note 6) | $T_C$ = +25°C | $P_D$ | 136 | W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 1.1 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +175 | °C |

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).

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 7)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 100 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 10mA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 80V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 2 | — | 4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 3.1 | 4.9 | mΩ | $V_{GS}$ = 10V, $I_D$ = 30A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.8 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 30A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 4327 | — | pF | $V_{DS}$ = 50V, $V_{GS}$ = 0V<br>f = 1MHz |
| Output Capacitance | $C_{oss}$ | — | 1335 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 39 | — | | |
| Gate Resistance | $R_G$ | — | 2.1 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge | $Q_g$ | — | 66 | — | nC | $V_{DD}$ = 50V, $I_D$ = 30A<br>$V_{GS}$ = 10V |
| Gate-Source Charge | $Q_{gs}$ | — | 18 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 17 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 15.2 | — | ns | $V_{DD}$ = 50V, $V_{GS}$ = 10V<br>$I_D$ = 30A, $R_G$ = 4.7Ω, $R_L$ = 1.1Ω |
| Turn-On Rise Time | $t_R$ | — | 26.4 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 44.9 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 28.2 | — | | |
| Reverse-Recovery Time | $t_{RR}$ | — | 63 | — | ns | $I_F$ = 22.5A, di/dt = 100A/µs |
| Reverse-Recovery Charge | $Q_{RR}$ | — | 136 | — | nC | |

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

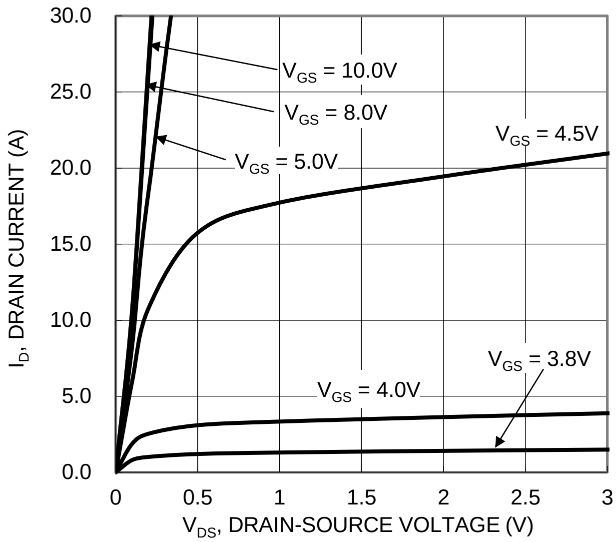


Figure 1. Typical Output Characteristic

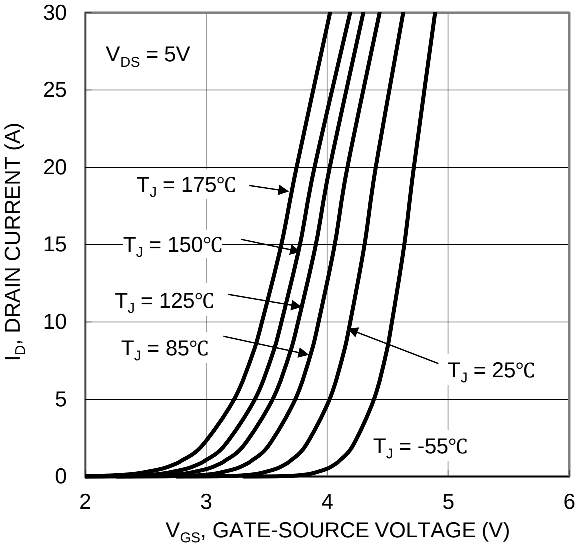


Figure 2. Typical Transfer Characteristic

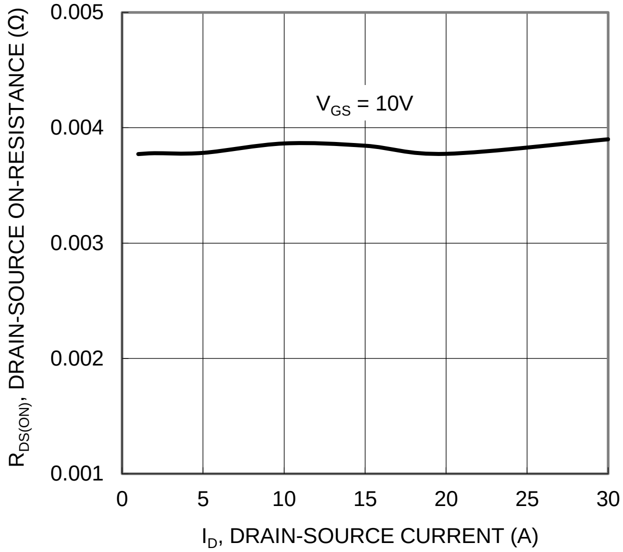


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

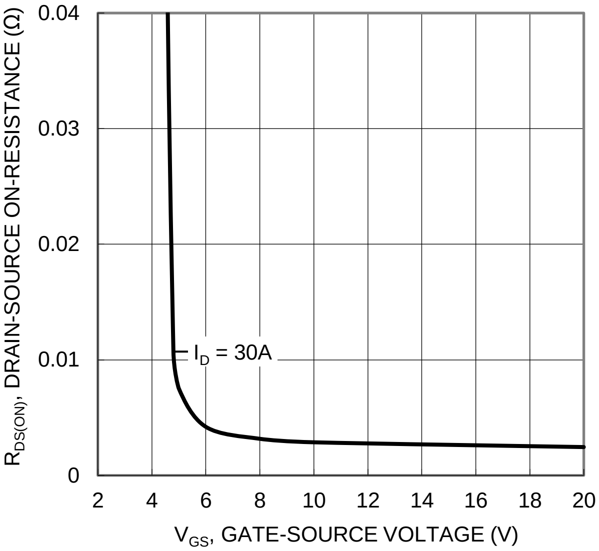


Figure 4. Typical Transfer Characteristic

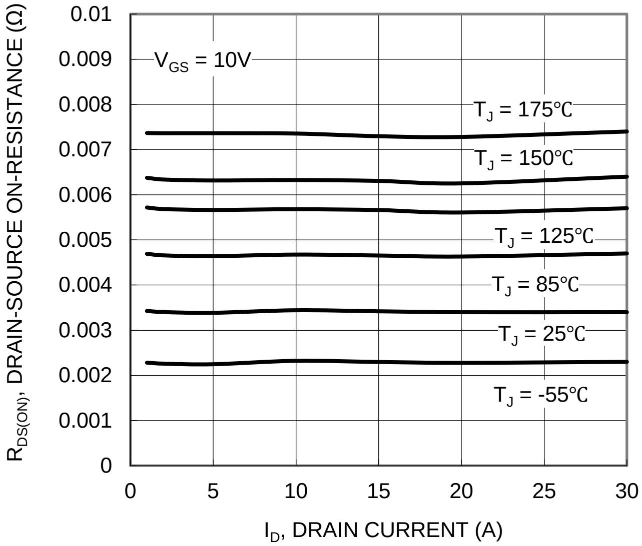


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

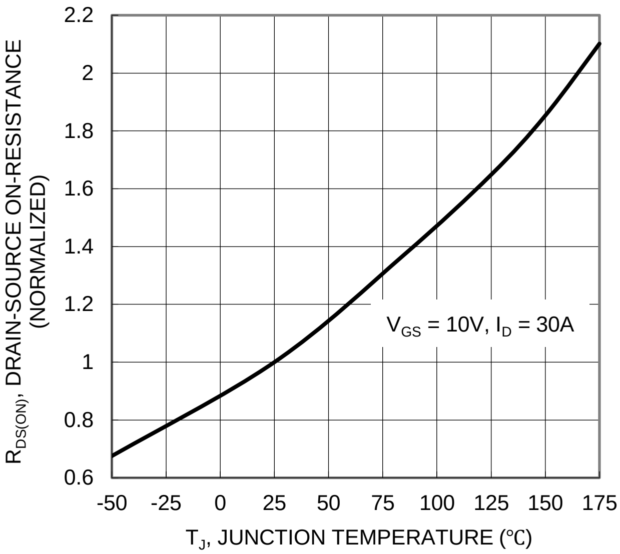


Figure 6. On-Resistance Variation with Junction Temperature

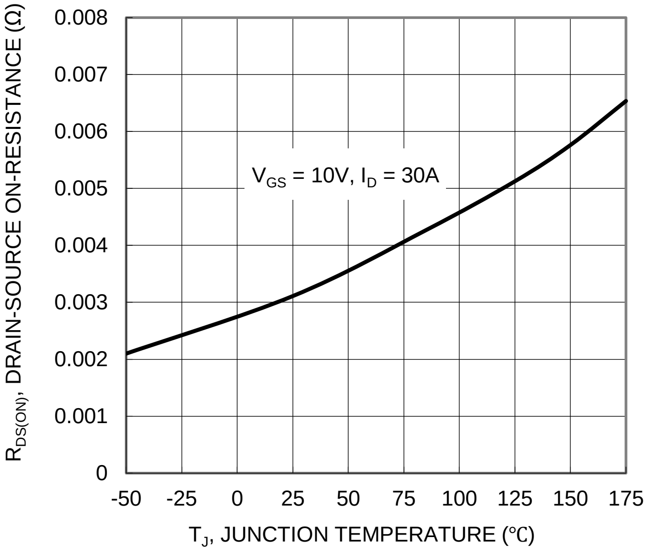


Figure 7. On-Resistance Variation with Junction Temperature

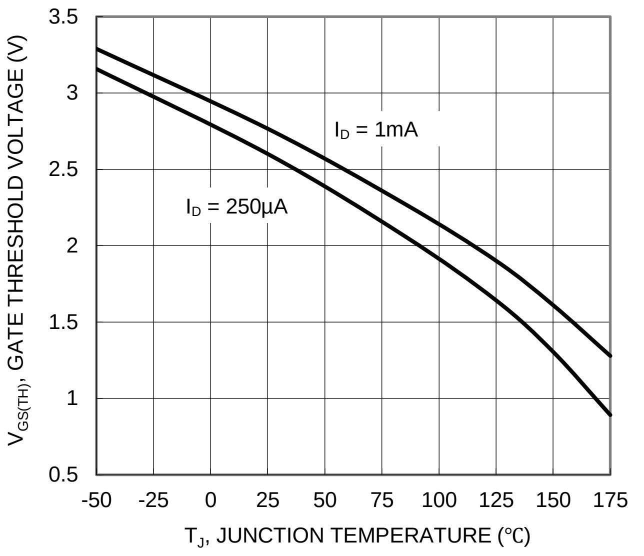


Figure 8. Gate Threshold Variation vs. Junction Temperature

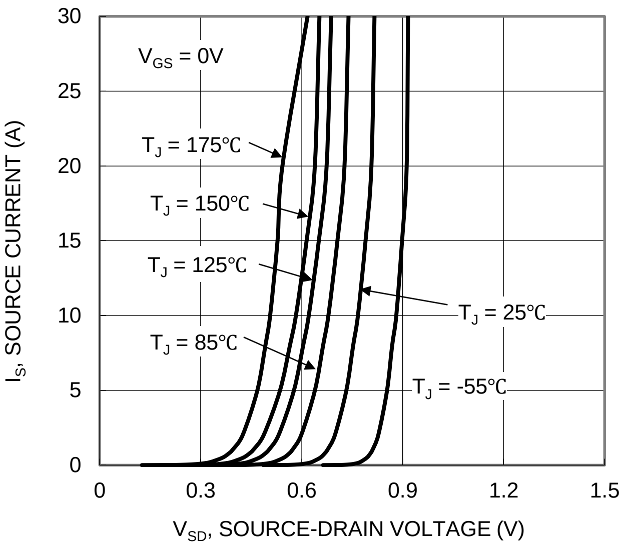


Figure 9. Diode Forward Voltage vs. Current

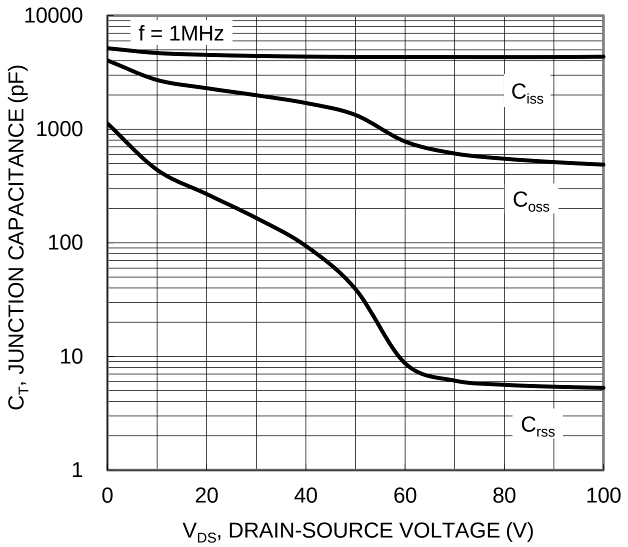


Figure 10. Typical Junction Capacitance

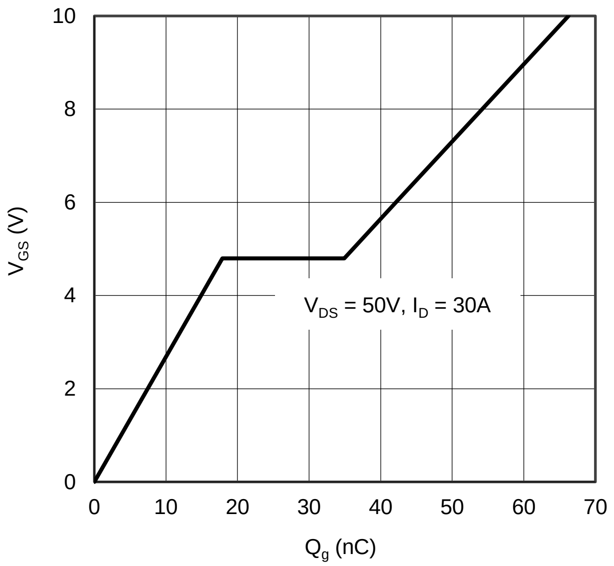


Figure 11. Gate Charge

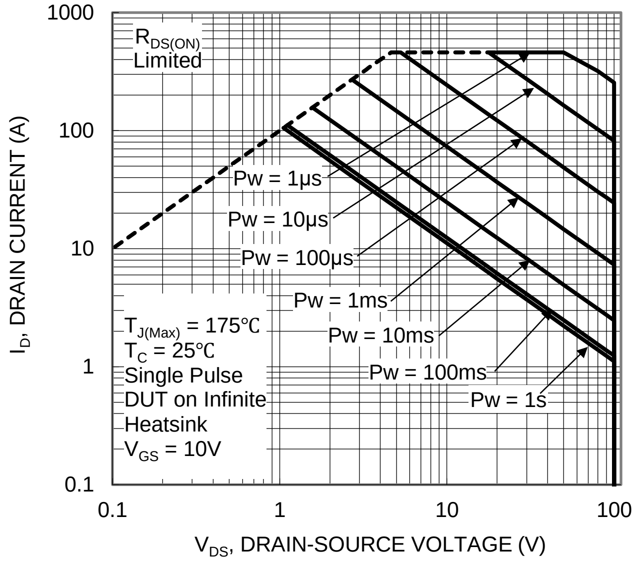


Figure 12. SOA, Safe Operation Area

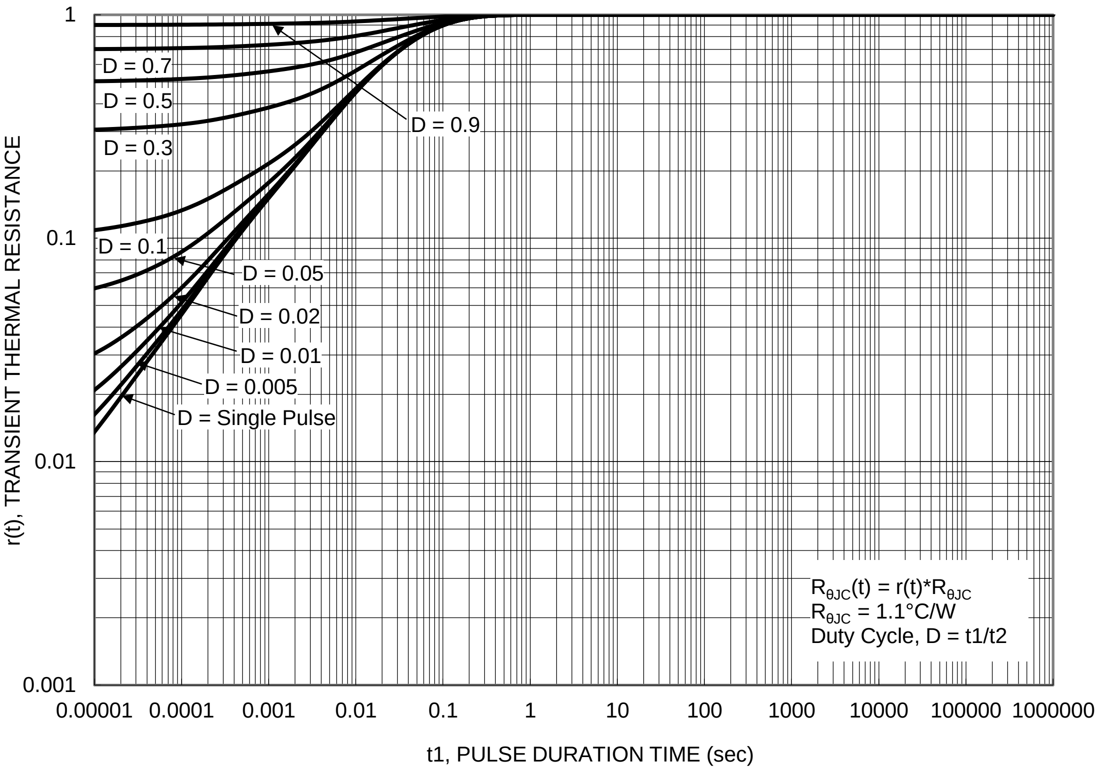
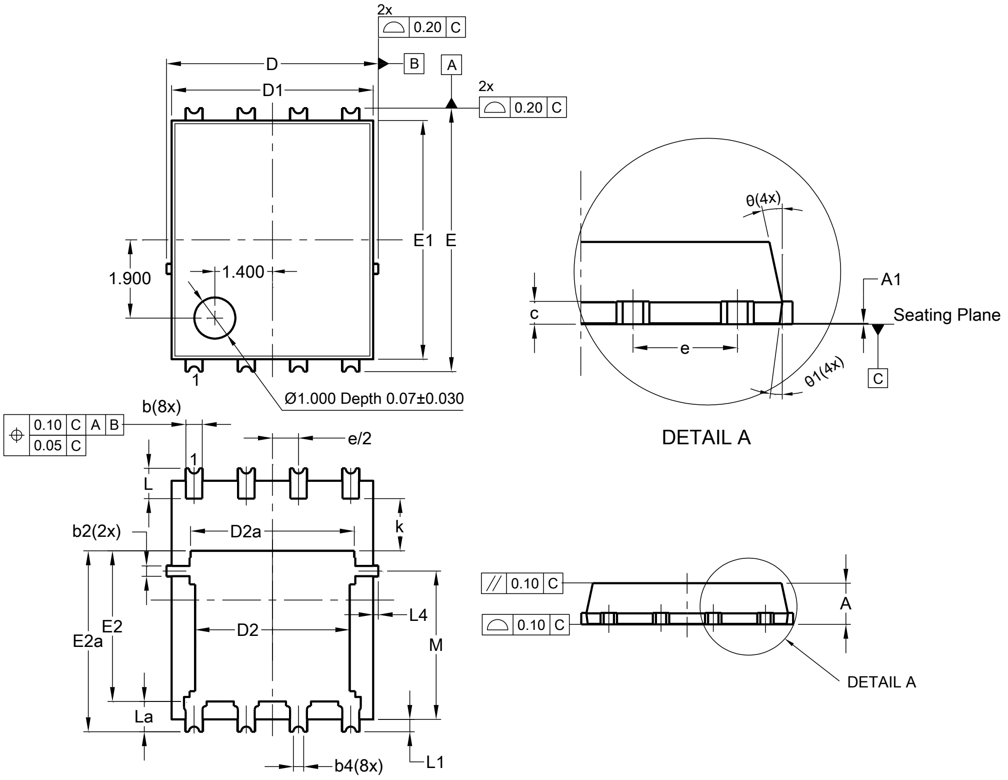


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

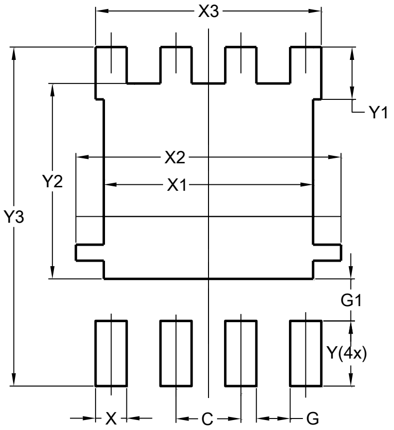
**PowerDI5060-8/SWP (Type UX)**



| 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 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 |