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

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max<br>$T_A$ = +25°C |
|---|---|---|
| 30V | 30mΩ @ $V_{GS}$ = 10V | 6.2A |
| | 42mΩ @ $V_{GS}$ = 4.5V | 5.2A |

## Features and Benefits

- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust Application
- Low On-Resistance – Minimizes Power Losses
- Low Gate Charge – Minimizes Switching Losses
- Small Form Factor Low Profile Package – Increased Power Density

## Description and Applications

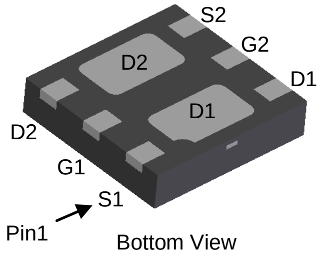
This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and ideal for use in:

- Body Control Electronics
- Power Management Functions
- DC-DC Converters

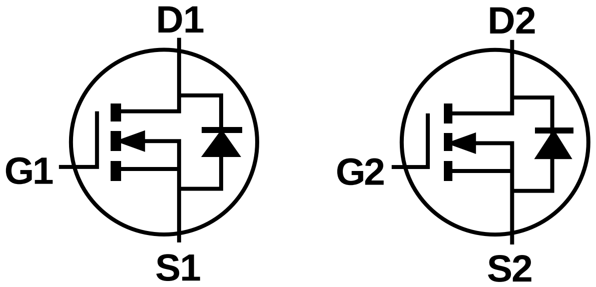
## Mechanical Data

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

U-DFN2020-6



Bottom View



Internal Schematic

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 7) $V_{GS}$ = 10V | Steady State | $T_A$ = +25°C<br>$T_A$ = +75°C | $I_D$ | 6.2<br>5.0 | A |
| Maximum Continuous Body Diode Forward Current (Note 7) | | | $I_S$ | 2 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 25 | A |
| Avalanche Current (Note 8) L = 0.1mH | | | $I_{AS}$ | 12 | A |
| Avalanche Energy (Note 8) L = 0.1mH | | | $E_{AS}$ | 10 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 6) | | $P_D$ | 1.0 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state | $R_{\theta JA}$ | 127 | °C/W |
| | t<10s | | 75 | |
| Total Power Dissipation (Note 7) | | $P_D$ | 1.7 | W |
| Thermal Resistance, Junction to Ambient (Note 7) | Steady state | $R_{\theta JA}$ | 72 | °C/W |
| | t<10s | | 43 | |
| Thermal Resistance, Junction to Case (Note 7) | | $R_{\theta JC}$ | 9 | |
| Operating and Storage Temperature Range | | $T_J, T_{STG}$ | -55 to +150 | °C |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 9)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 30 | - | - | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current $T_J$ = +25°C | $I_{DSS}$ | - | - | 1.0 | µA | $V_{DS}$ = 30V, $V_{GS}$ = 0V |
| Zero Gate Voltage Drain Current $T_J$ = +150°C (Note 10) | $I_{DSS}$ | - | - | 100 | µA | $V_{DS}$ = 30V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 9)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1.0 | 1.5 | 2.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | - | 25 | 30 | mΩ | $V_{GS}$ = 10V, $I_D$ = 5.8A |
| | | | 30 | 42 | | $V_{GS}$ = 4.5V, $I_D$ = 4.8A |
| Diode Forward Voltage | $V_{SD}$ | - | 0.75 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 1A |
| **DYNAMIC CHARACTERISTICS (Note 10)** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 500 | - | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V,<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | - | 52 | - | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 44 | - | pF | |
| Gate Resistance | $R_g$ | - | 2.3 | - | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | - | 5.0 | - | nC | $V_{DS}$ = 15V, $I_D$ = 5.8A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | - | 10.6 | - | nC | |
| Gate-Source Charge | $Q_{gs}$ | - | 1.3 | - | nC | |
| Gate-Drain Charge | $Q_{gd}$ | - | 1.8 | - | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | - | 2.2 | - | ns | $V_{DD}$ = 15V, $V_{GS}$ = 10V,<br>$R_L$ = 2.6Ω, $R_G$ = 3Ω |
| Turn-On Rise Time | $t_R$ | - | 2.6 | - | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | - | 9.7 | - | ns | |
| Turn-Off Fall Time | $t_F$ | - | 2.0 | - | ns | |

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

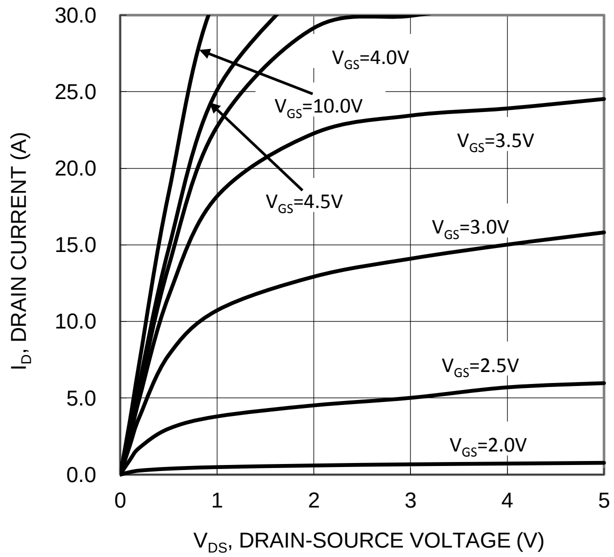


Figure 1. Typical Output Characteristic

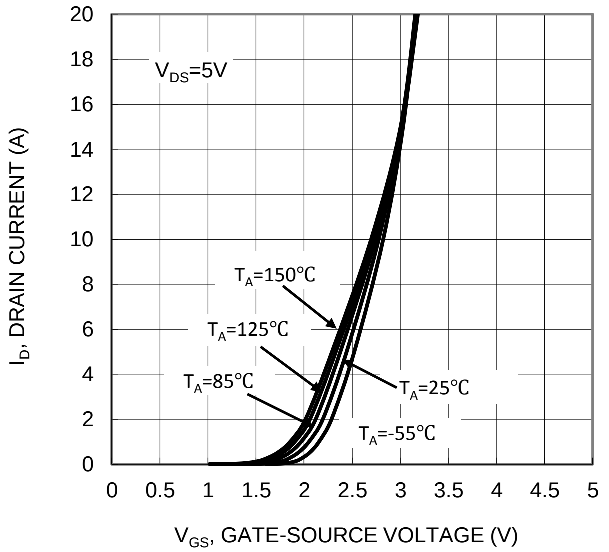


Figure 2. Typical Transfer Characteristic

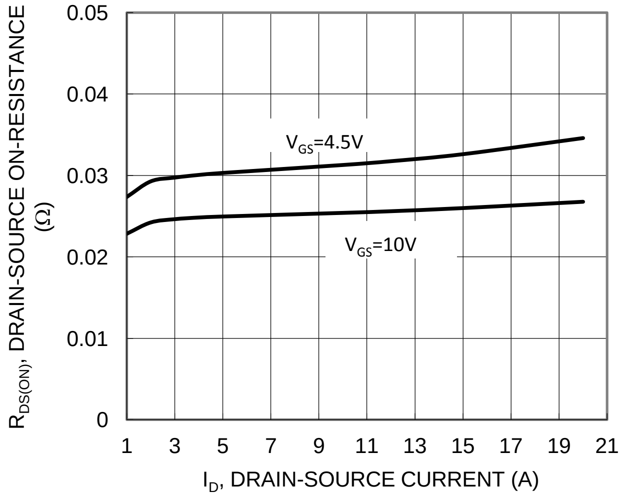


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

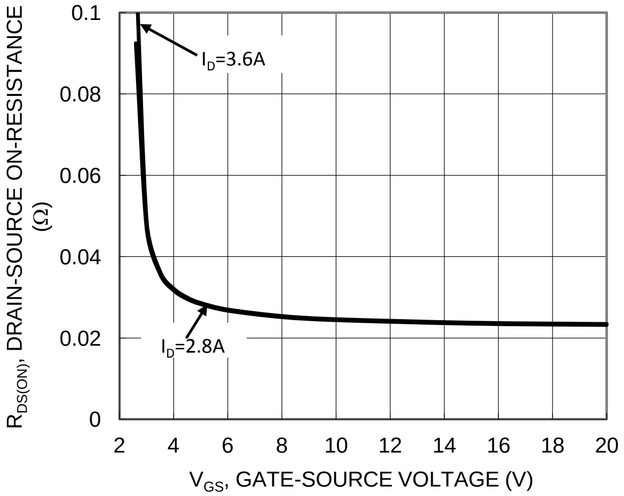


Figure 4. Typical Transfer Characteristic

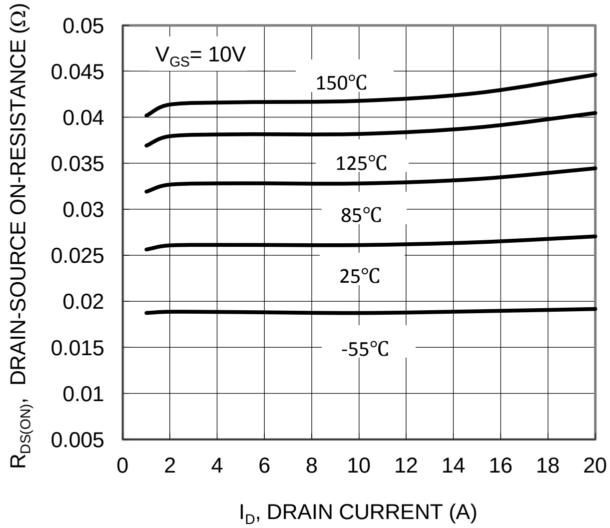


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

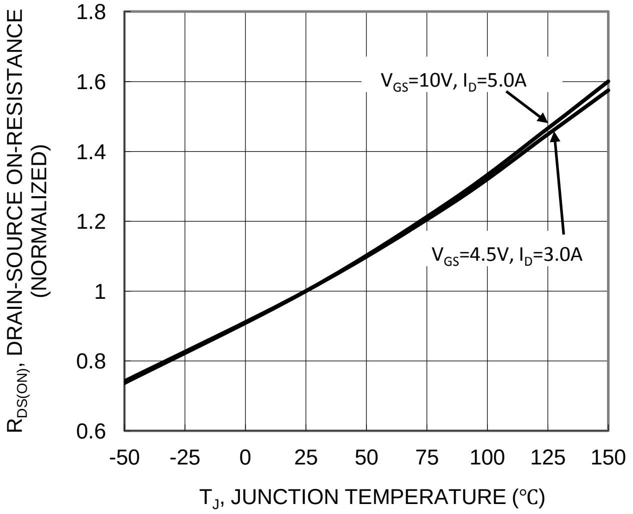


Figure 6. On-Resistance Variation with Temperature

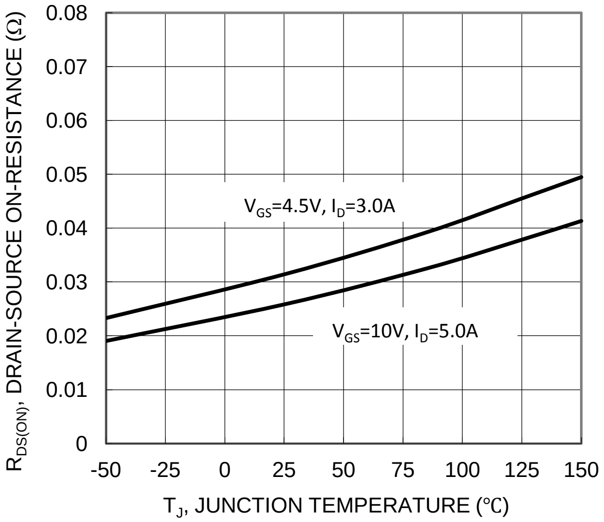


Figure 7. On-Resistance Variation with Temperature

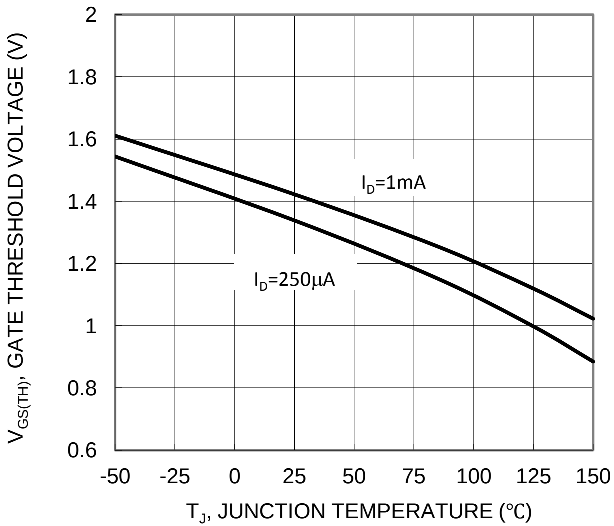


Figure 8. Gate Threshold Variation vs Junction Temperature

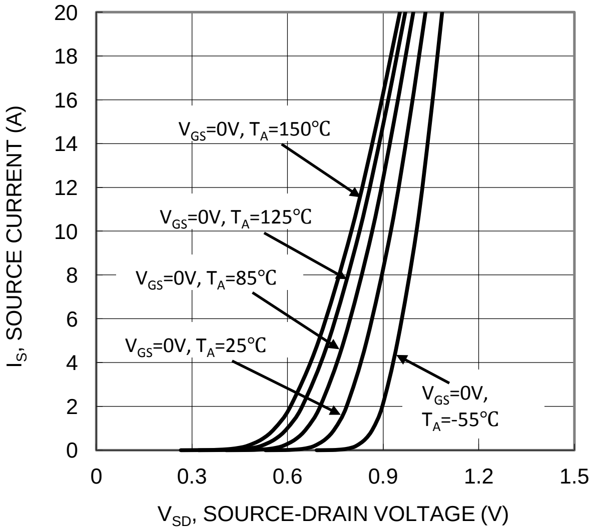


Figure 9. Diode Forward Voltage vs. Current

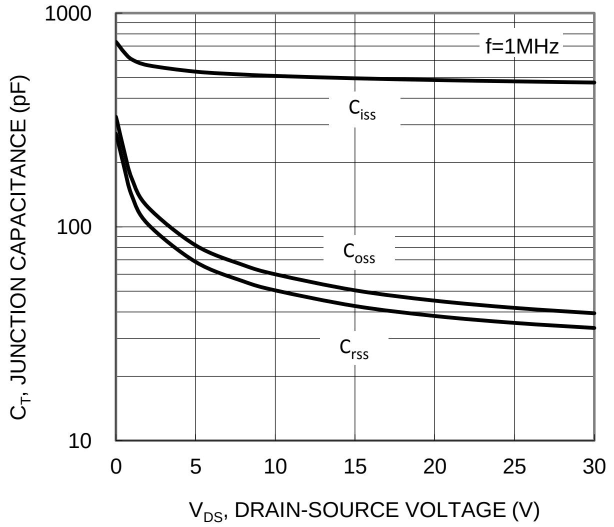


Figure 10. Typical Junction Capacitance

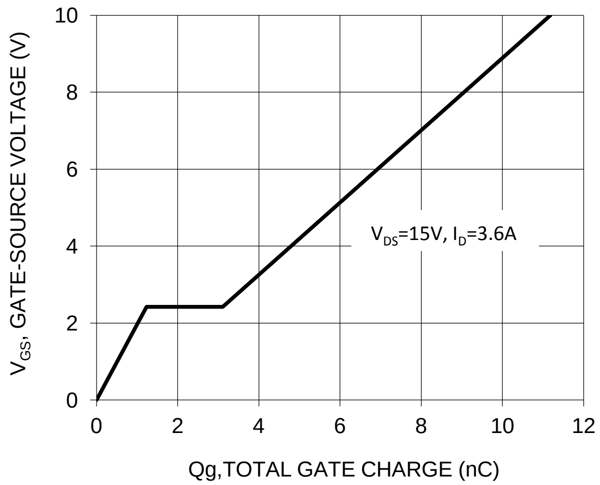


Figure 11. Gate Charge

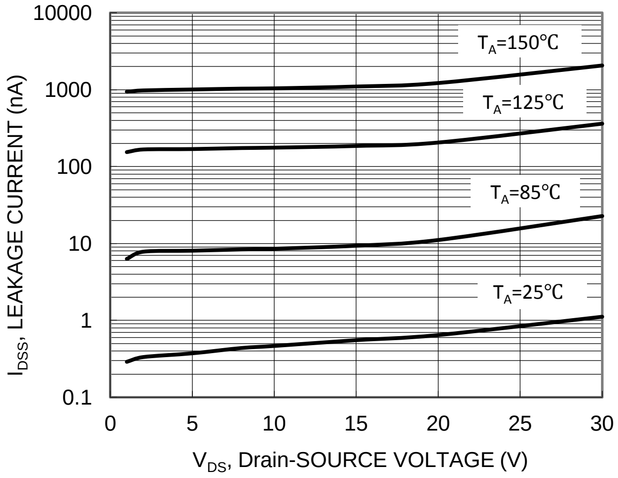


Figure 12. Typical Drain-Source Leakge Current vs. Voltage

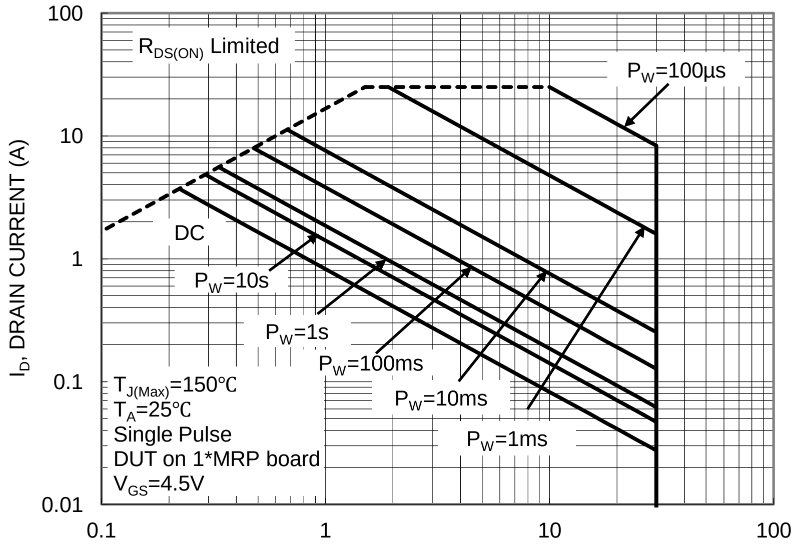


Figure 13. SOA, Safe Operation Area

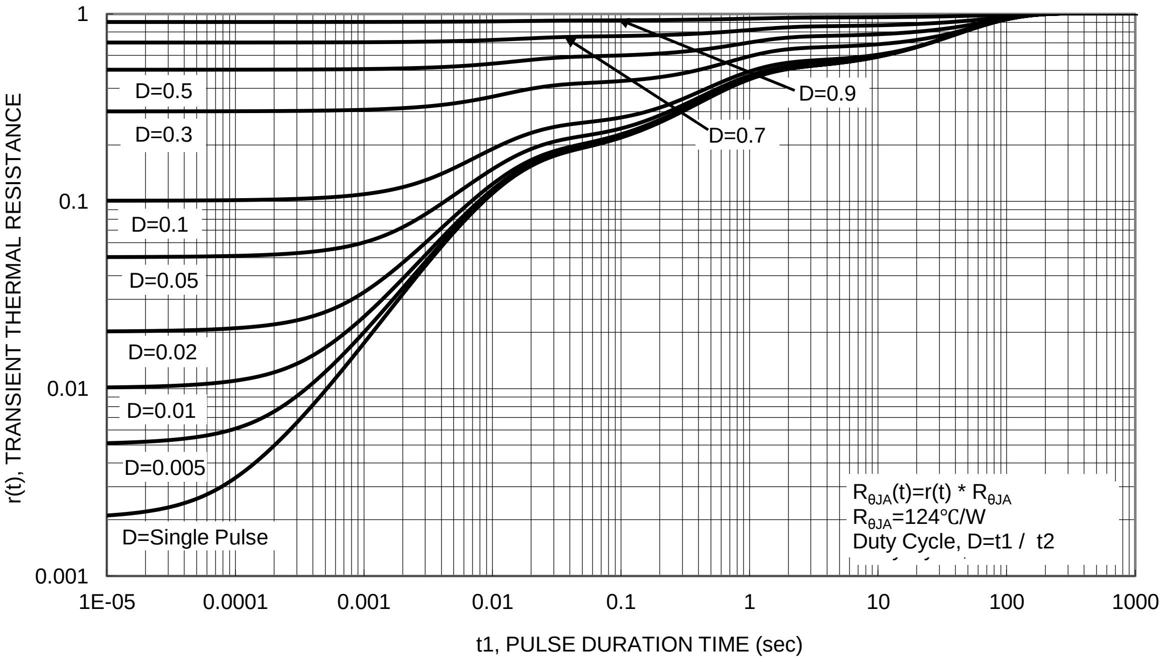
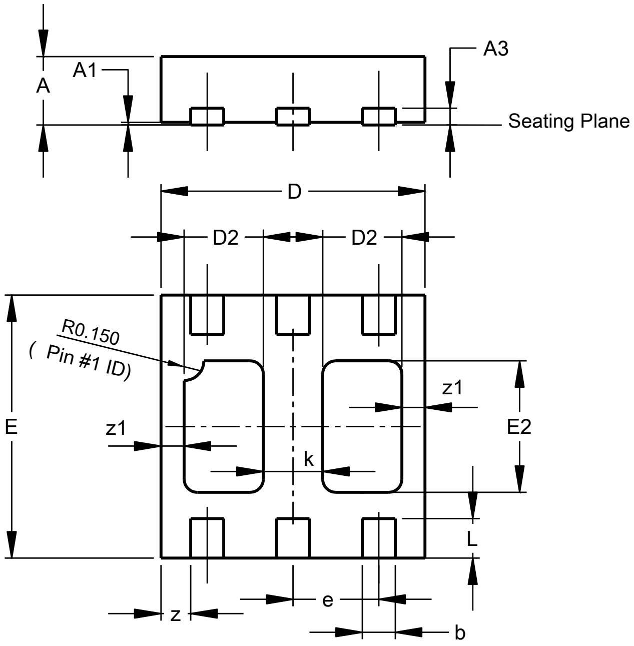


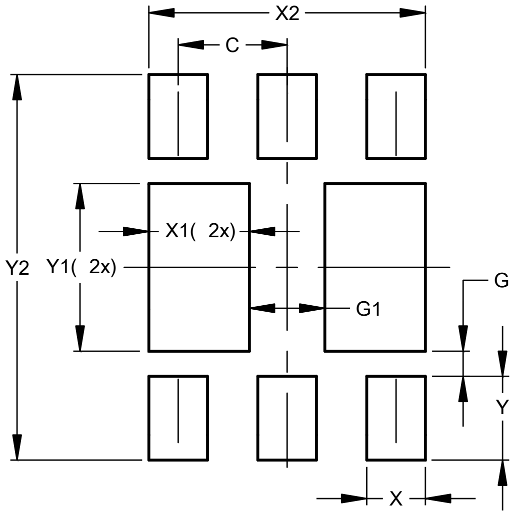
Figure 14. Transient Thermal Resistance

## Package Outline Dimensions



| U-DFN2020-6<br>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** | - | - | 0.15 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout



| 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 |