



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



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Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D Max T _A = +25°C |
|-------------------|-------------------------------|--|
| 30V | 7mΩ @ V _{GS} = 10V | 14.1A |
| | 10mΩ @ V _{GS} = 4.5V | 11.8A |
| | 15mΩ @ V _{GS} = 3.7V | 9.6A |

Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm²
- Low Gate Threshold Voltage
- Fast Switching Speed

Description

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.

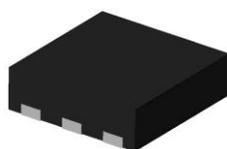
Applications

- Battery Management Application
- Power Management Functions
- DC-DC Converters

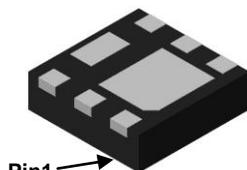
Mechanical Data

- 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 over Copper Leadframe. Solderable per MIL-STD-202, Method 208 ^(e4)
- Weight: 0.0065 grams (Approximate)

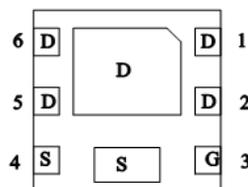
U-DFN2020-6 (Type F)



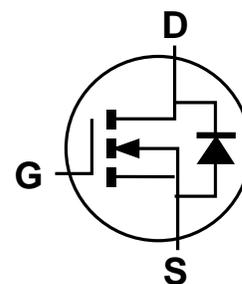
Top View



Bottom View



Pin Out
Bottom View



Internal Schematic

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, 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 6) $V_{GS} = 10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ | I_D | 14.1 | A |
| | | $T_A = +70^\circ\text{C}$ | | 12.5 | |
| Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%) | | | I_{DM} | 80 | A |
| Continuous Source-Drain Diode Current (Note 6) | | $T_A = +25^\circ\text{C}$ | I_S | 2 | A |
| Avalanche Current (Note 7) $L = 0.1\text{mH}$ | | | I_{AS} | 25 | A |
| Avalanche Energy (Note 7) $L = 0.1\text{mH}$ | | | E_{AS} | 31 | mJ |

Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|--|---------------------------|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5) | $T_A = +25^\circ\text{C}$ | P_D | 0.8 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 155 | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6) | $T_A = +25^\circ\text{C}$ | P_D | 2.1 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 60 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case (Note 6) | $T_C = +25^\circ\text{C}$ | $R_{\theta JC}$ | 6.9 | $^\circ\text{C/W}$ |
| 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 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 30 | — | — | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current ($T_J = +25^\circ\text{C}$) | I_{DSS} | — | — | 1 | μA | $V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = +20\text{V}, V_{DS} = 0\text{V}$ $V_{GS} = -16\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1.0 | — | 3.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 5.8 | 7 | m Ω | $V_{GS} = 10\text{V}, I_D = 9\text{A}$ |
| | | | 7.8 | 10 | | $V_{GS} = 4.5\text{V}, I_D = 8\text{A}$ |
| | | | 9.3 | 15 | | $V_{GS} = 3.7\text{V}, I_D = 5\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | 0.7 | 1.0 | V | $V_{GS} = 0\text{V}, I_S = 2\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C_{ISS} | — | 1,155 | — | pF | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$ |
| Output Capacitance | C_{OSS} | — | 456 | — | | |
| Reverse Transfer Capacitance | C_{RSS} | — | 72 | — | | |
| 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 | — | 8.4 | — | nC | $V_{DD} = 15\text{V}, I_D = 9\text{A}$ |
| Total Gate Charge ($V_{GS} = 10\text{V}$) | Q_G | — | 16.7 | — | | |
| Gate-Source Charge | Q_{GS} | — | 2.2 | — | | |
| Gate-Drain Charge | Q_{GD} | — | 3.5 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 3.5 | — | ns | $V_{DD} = 15\text{V}, V_{GS} = 10\text{V},$ $R_G = 3\Omega, I_D = 9\text{A}$ |
| Turn-On Rise Time | t_R | — | 5.5 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 13.5 | — | | |
| Turn-Off Fall Time | t_F | — | 4.6 | — | | |
| Reverse Recovery Time | t_{RR} | — | 19.3 | — | | |
| Reverse Recovery Charge | Q_{RR} | — | 8.6 | — | nC | $I_F = 1.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - I_{AS} and E_{AS} ratings 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.

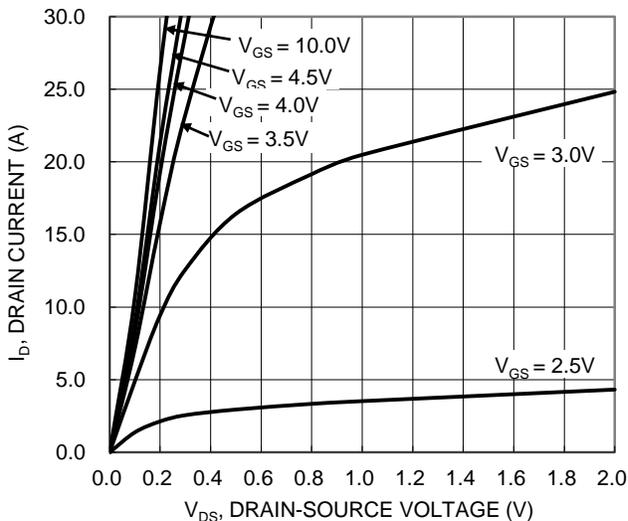


Figure 1. Typical Output Characteristic

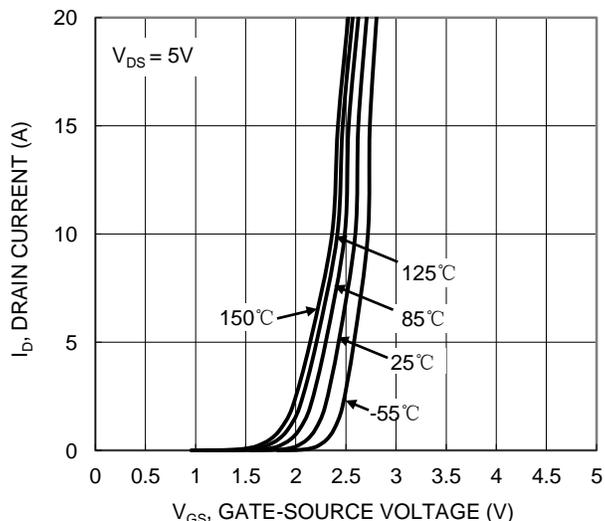


Figure 2. Typical Transfer Characteristic

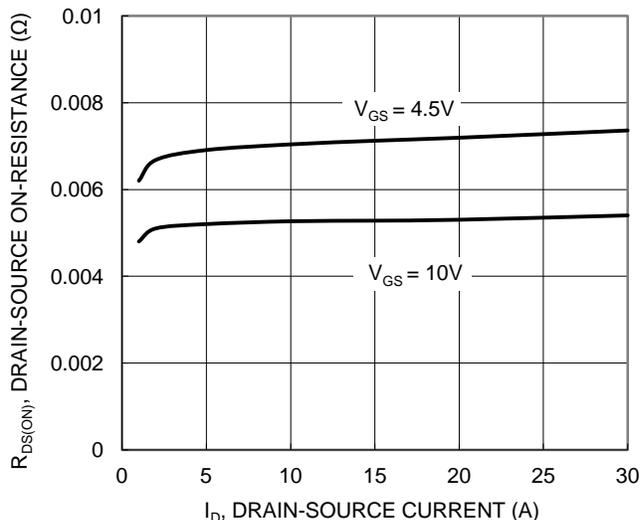


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

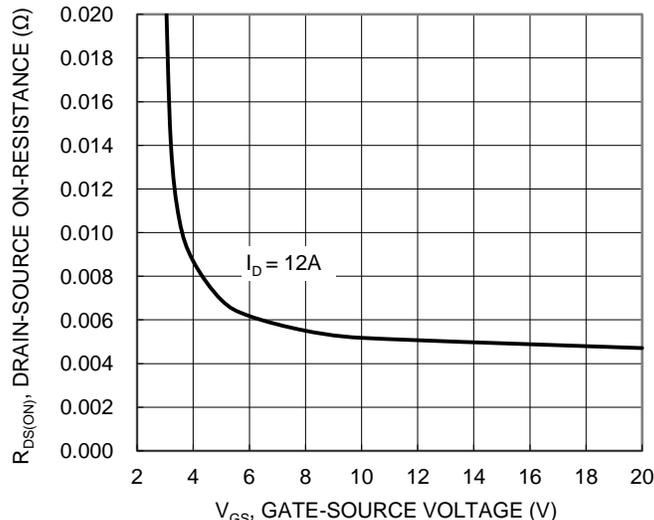


Figure 4. Typical Transfer Characteristic

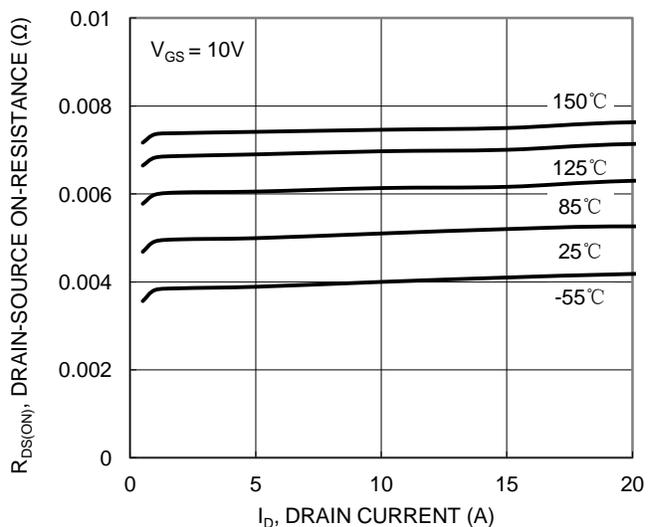


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

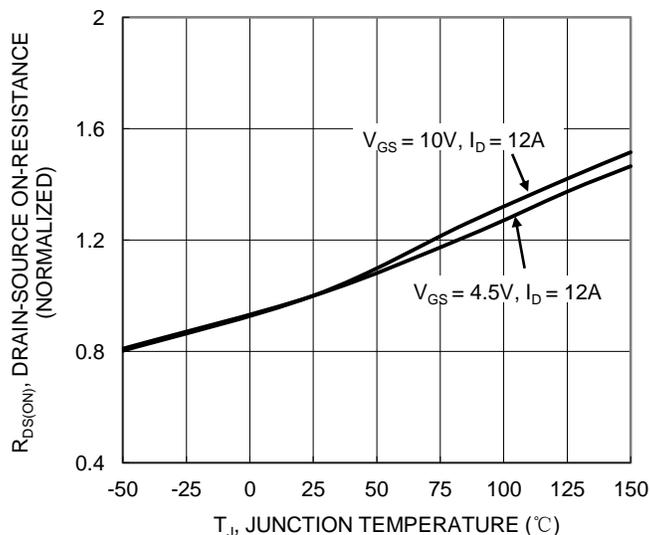


Figure 6. On-Resistance Variation with Temperature

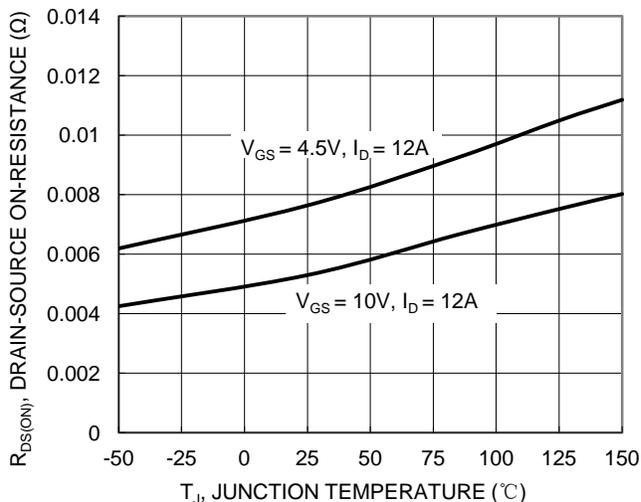


Figure 7. On-Resistance Variation with Temperature

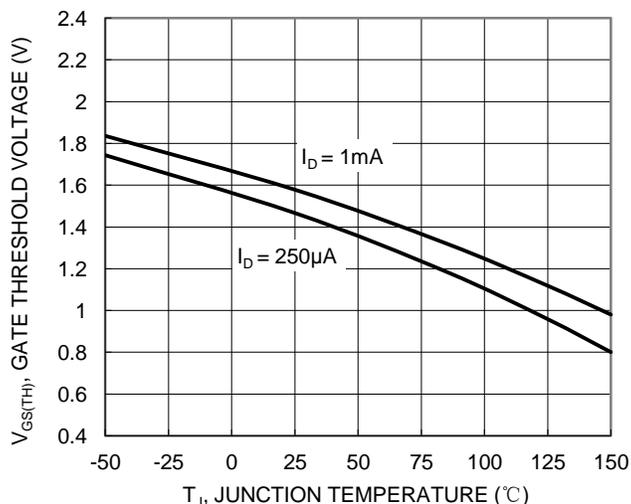


Figure 8. Gate Threshold Variation vs. Junction Temperature

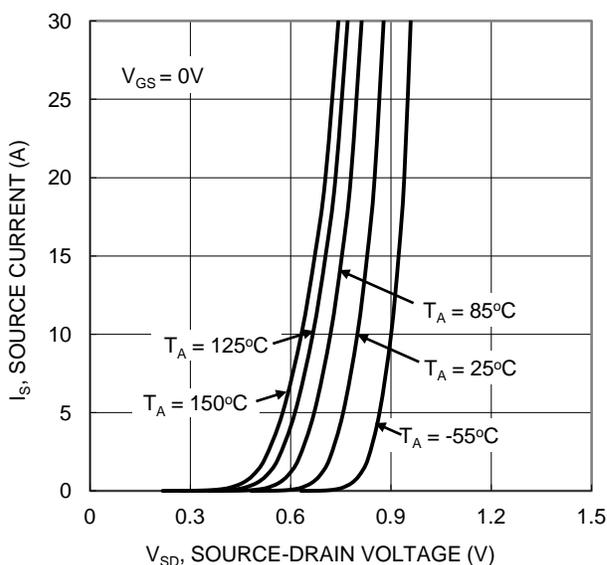


Figure 9. Diode Forward Voltage vs. Current

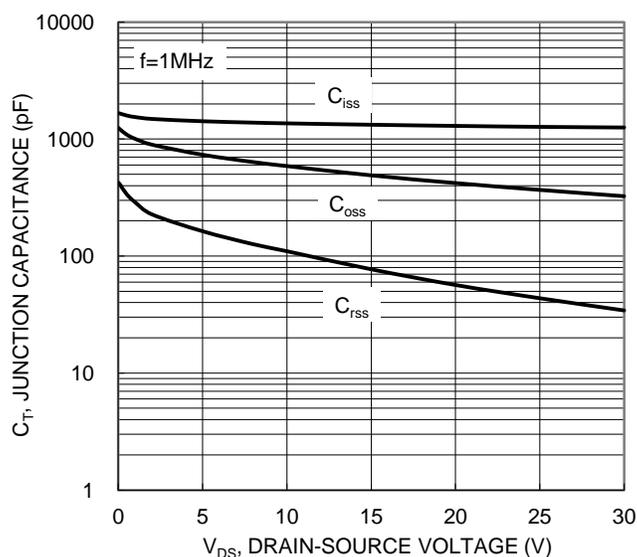


Figure 10. Typical Junction Capacitance

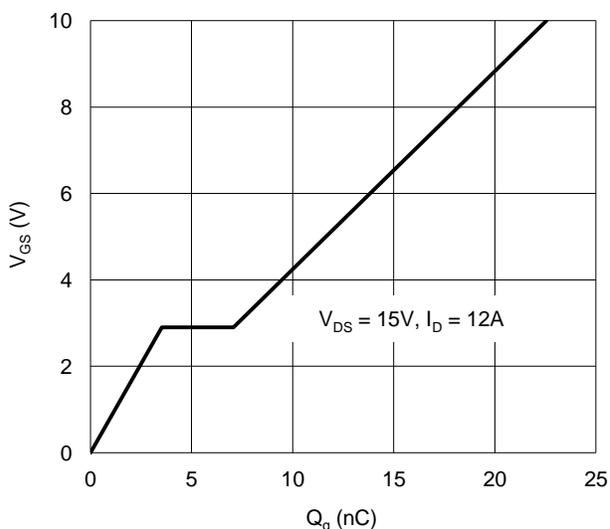


Figure 11. Gate Charge

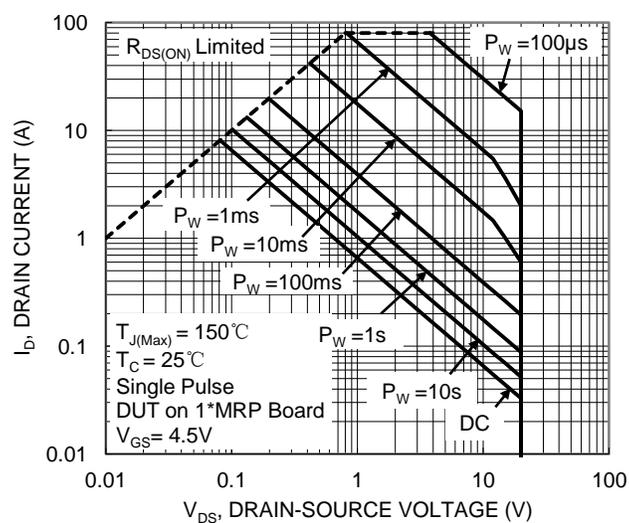


Figure 12. SOA, Safe Operation Area

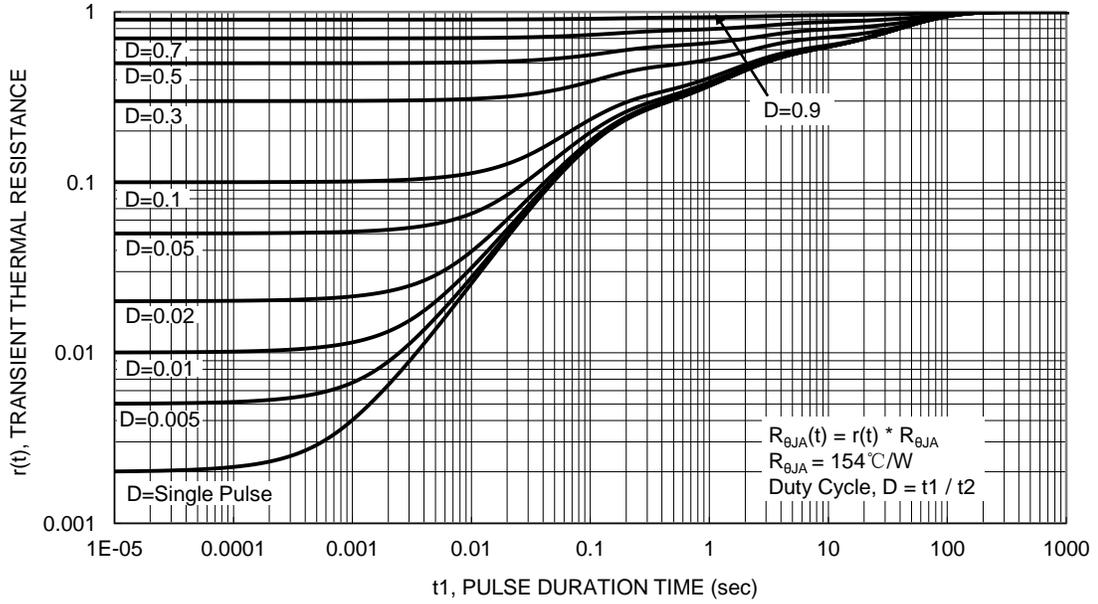
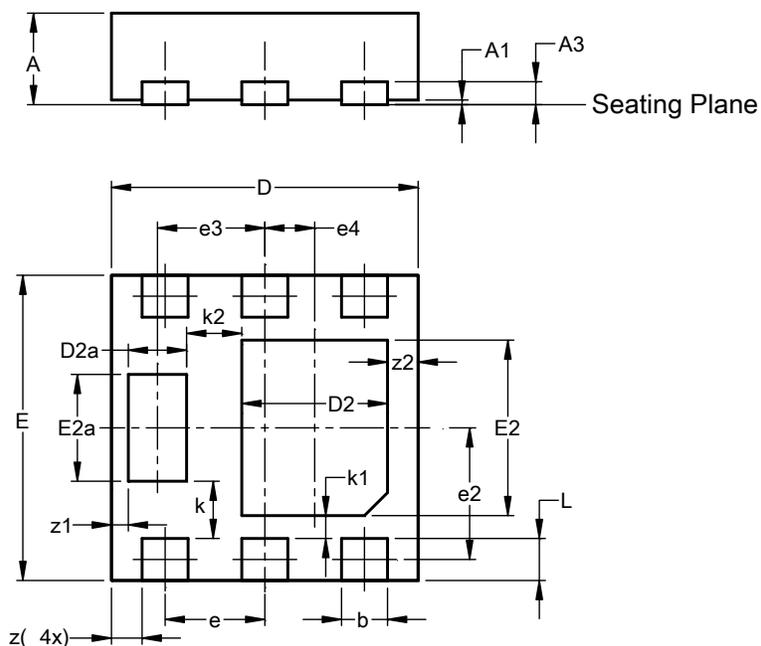


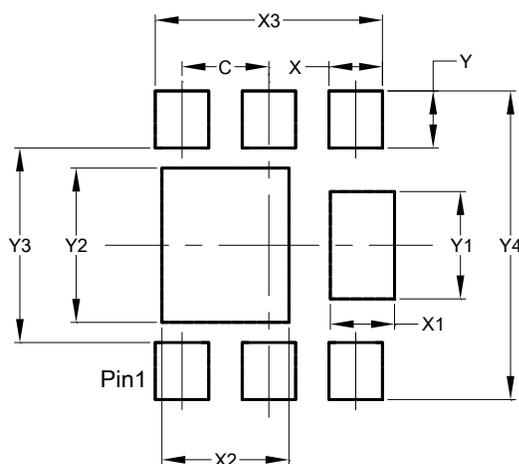
Figure 13. Transient Thermal Resistance

Package Outline Dimensions

U-DFN2020-6 (Type F)


| U-DFN2020-6 (Type F) | | | |
|-------------------------|-----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.57 | 0.63 | 0.60 |
| A1 | 0.00 | 0.05 | 0.03 |
| A3 | - | - | 0.15 |
| b | 0.25 | 0.35 | 0.30 |
| D | 1.95 | 2.05 | 2.00 |
| D2 | 0.85 | 1.05 | 0.95 |
| D2a | 0.33 | 0.43 | 0.38 |
| E | 1.95 | 2.05 | 2.00 |
| E2 | 1.05 | 1.25 | 1.15 |
| E2a | 0.65 | 0.75 | 0.70 |
| e | 0.65 BSC | | |
| e2 | 0.863 BSC | | |
| e3 | 0.70 BSC | | |
| e4 | 0.325 BSC | | |
| k | 0.37 BSC | | |
| k1 | 0.15 BSC | | |
| k2 | 0.36 BSC | | |
| L | 0.225 | 0.325 | 0.275 |
| z | 0.20 BSC | | |
| z1 | 0.110 BSC | | |
| z2 | 0.20 BSC | | |
| All Dimensions in mm | | | |

Suggested Pad Layout

U-DFN2020-6 (Type F)


| Dimensions | Value (in mm) |
|------------|------------------|
| C | 0.650 |
| X | 0.400 |
| X1 | 0.480 |
| X2 | 0.950 |
| X3 | 1.700 |
| Y | 0.425 |
| Y1 | 0.800 |
| Y2 | 1.150 |
| Y3 | 1.450 |
| Y4 | 2.300 |