



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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Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
24V	6.0mΩ @ V _{GS} = 10V	14.1A
	7.2mΩ @ V _{GS} = 4.5V	12.9A
	12.5mΩ @ V _{GS} = 2.5V	9.8A

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)}) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

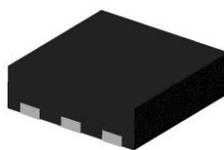
Applications

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

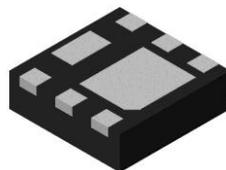
Mechanical Data

- 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)

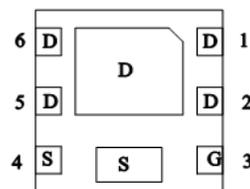
U-DFN2020-6 (Type F)



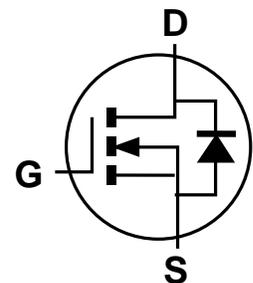
Top View



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}	24	V
Gate-Source Voltage			V_{GSS}	± 12	V
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	14.1	A
		$T_A = +70^\circ\text{C}$		11.2	
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	70	A
Continuous Source-Drain Diode Current (Note 6)			I_S	2	A
Avalanche Current (Note 7) $L = 0.1\text{mH}$			I_{AS}	26	A
Avalanche Energy (Note 7) $L = 0.1\text{mH}$			E_{AS}	36	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	$R_{\theta JA}$	149	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	1.8	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	70	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_C = +25^\circ\text{C}$	P_D	12.5	W
Thermal Resistance, Junction to Case (Note 6)	Steady State	$R_{\theta JC}$	12	$^\circ\text{C/W}$
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}	24	—	—	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	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.55	—	1.45	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	4.8	6	m Ω	$V_{GS} = 10\text{V}, I_D = 9\text{A}$
		—	5.8	7.2		$V_{GS} = 4.5\text{V}, I_D = 8\text{A}$
		—	9.6	12.5		$V_{GS} = 2.5\text{V}, I_D = 5\text{A}$
Diode Forward Voltage	V_{SD}	—	0.65	1.0	V	$V_{GS} = 0\text{V}, I_S = 2\text{A}$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1683	—	pF	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	581	—		
Reverse Transfer Capacitance	C_{rss}	—	559	—		
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	—	29.6	—	nC	$V_{DD} = 15\text{V}, I_D = 9\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	—	53.7	—		
Gate-Source Charge	Q_{gs}	—	4.2	—		
Gate-Drain Charge	Q_{gd}	—	13.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.9	—	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	—	9.6	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	30.8	—		
Turn-Off Fall Time	t_f	—	38.6	—		
Reverse Recovery Time	t_{RR}	—	11.2	—	ns	$I_F = 1.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{RR}	—	22.9	—	nC	

- 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.

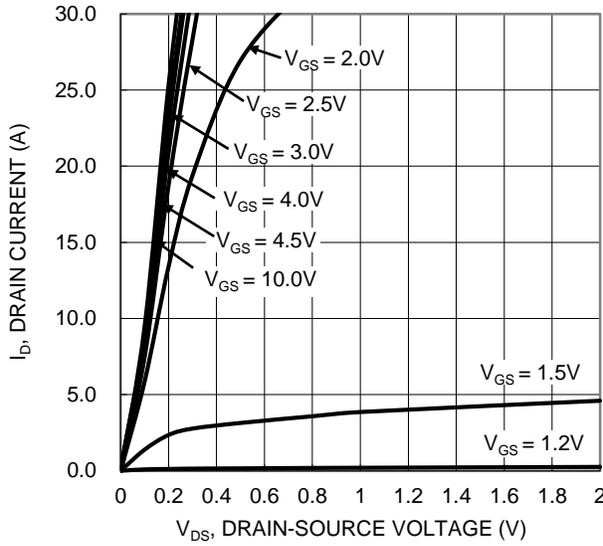


Figure 1. Typical Output Characteristic

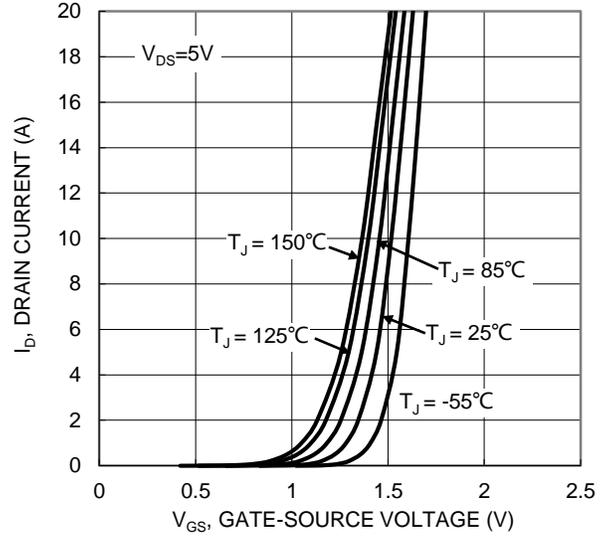


Figure 2. Typical Transfer Characteristic

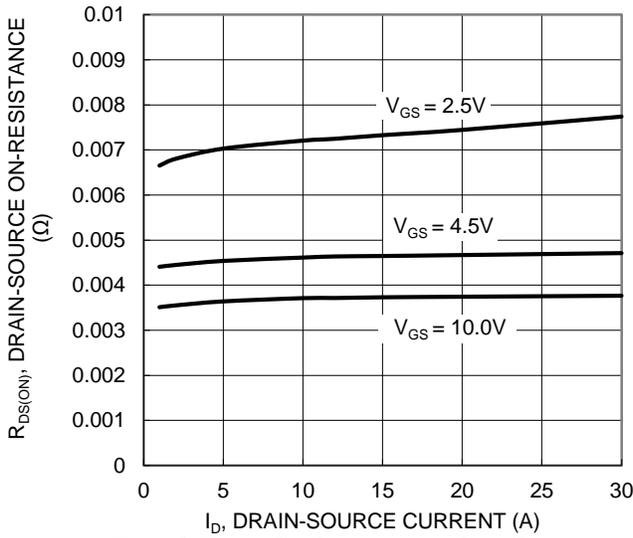


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

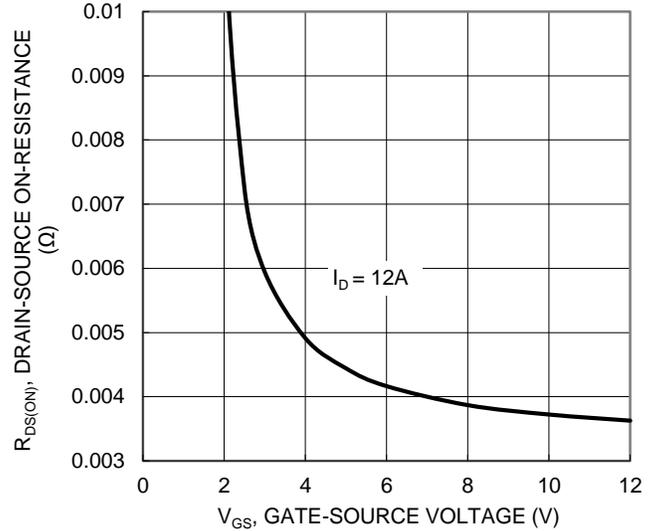


Figure 4. Typical Transfer Characteristic

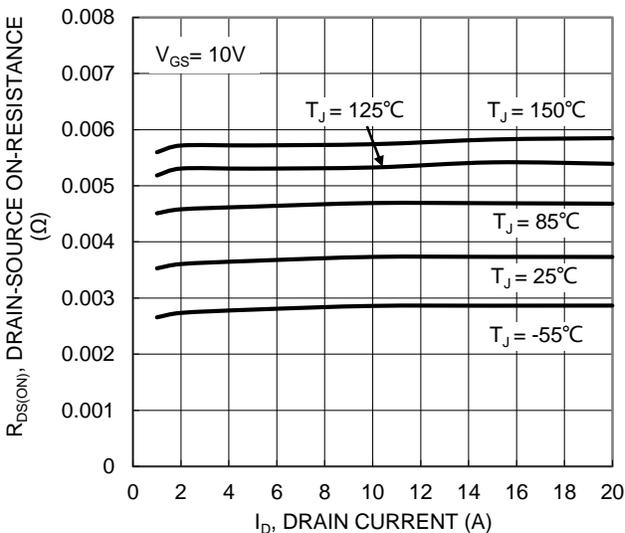


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

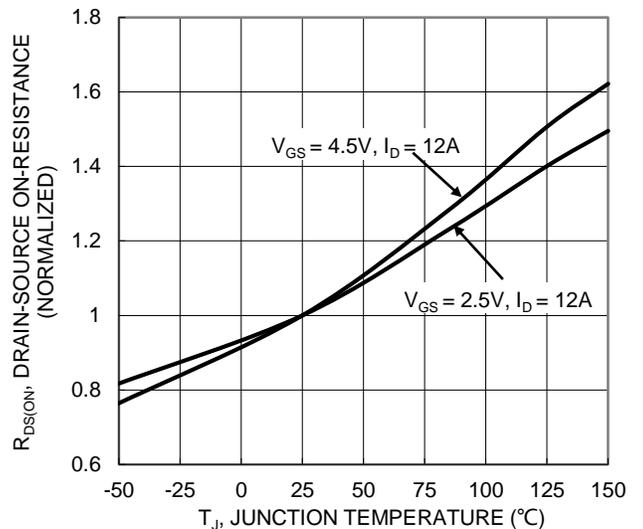


Figure 6. On-Resistance Variation with Temperature

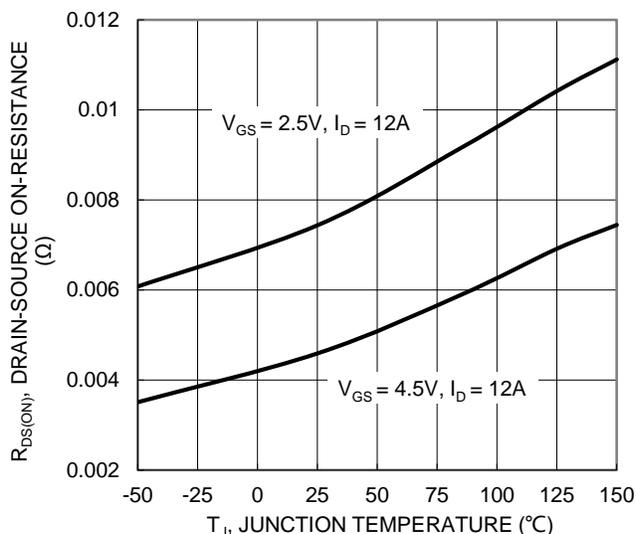


Figure 7. On-Resistance Variation with Temperature

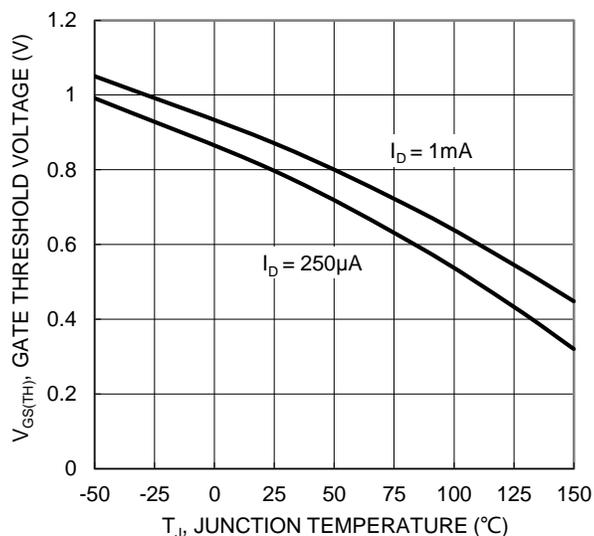


Figure 8. Gate Threshold Variation vs. Junction Temperature

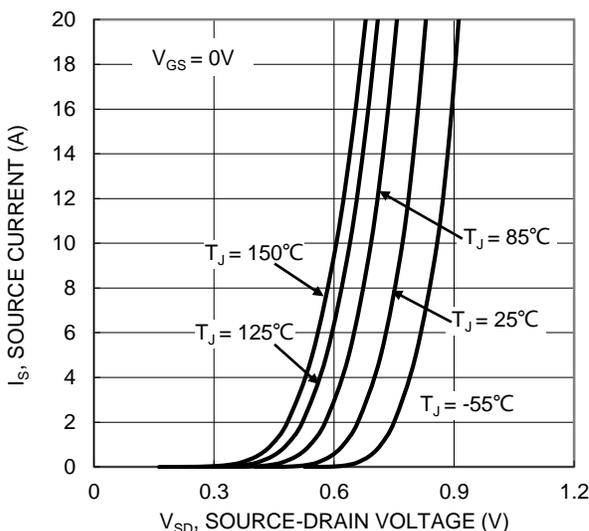


Figure 9. Diode Forward Voltage vs. Current

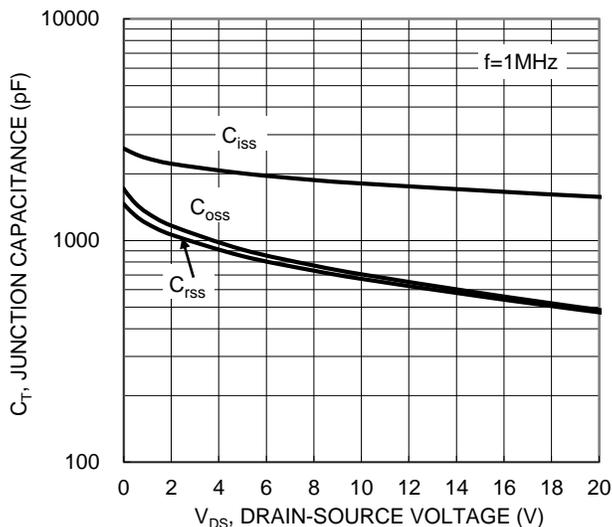


Figure 10. Typical Junction Capacitance

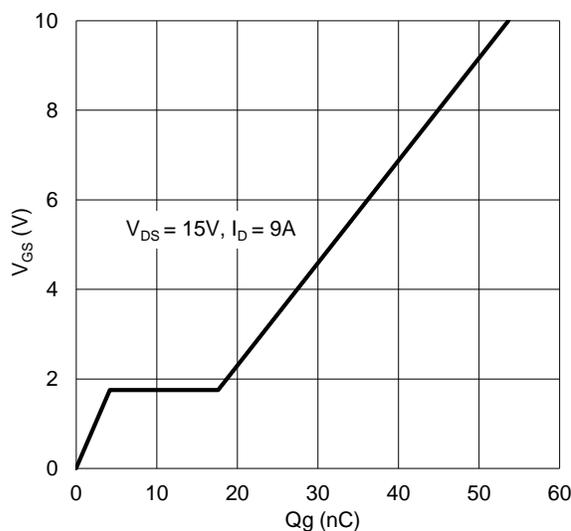


Figure 11. Gate Charge

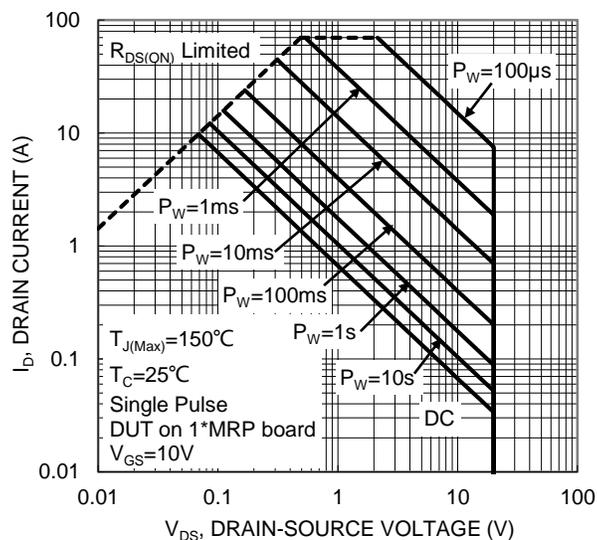


Figure 12. SOA, Safe Operation Area

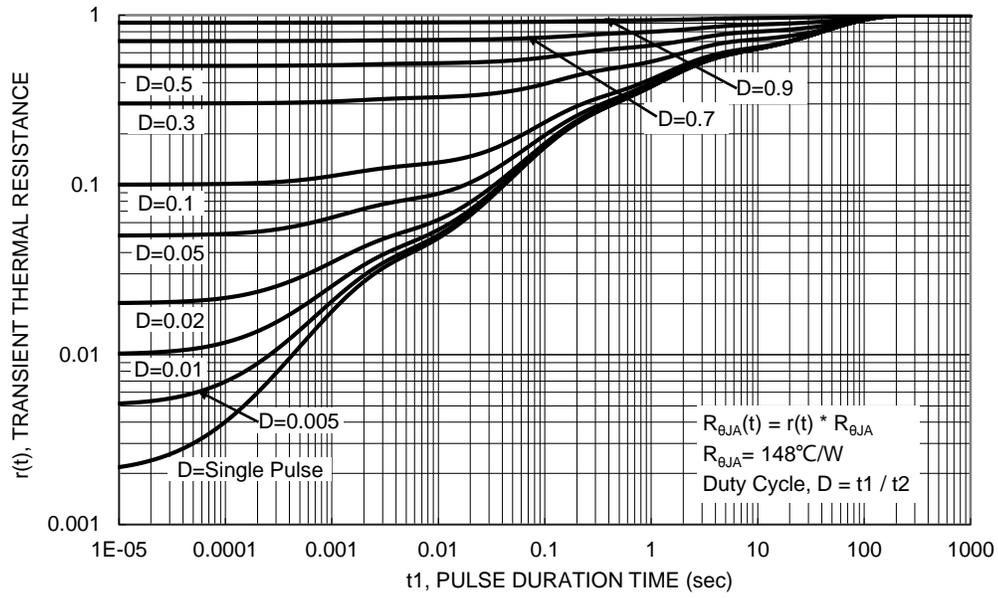
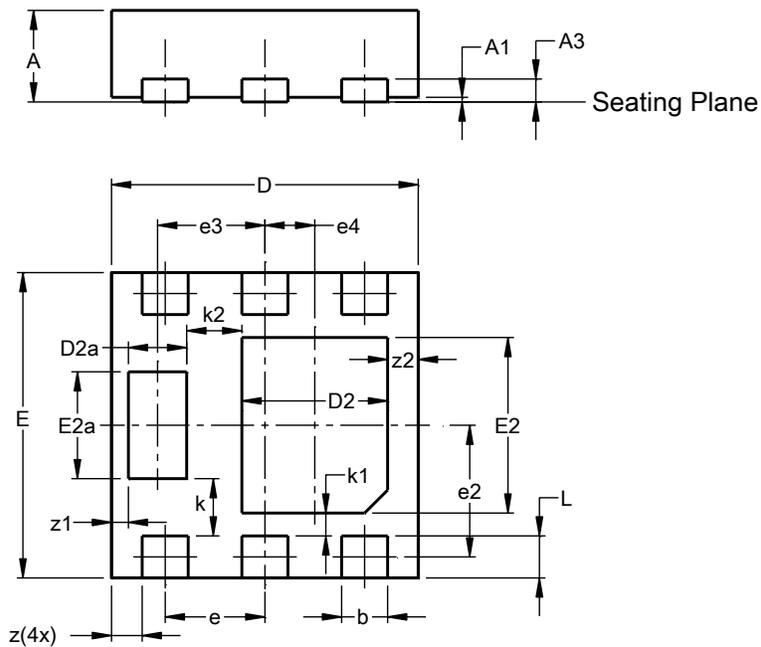


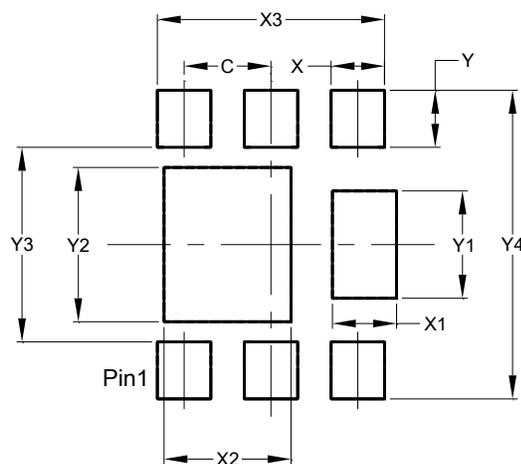
Figure 13. Transient Thermal Resistance

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