

Product Summary

BV_{DSS}	$R_{DS(ON)}$ max	I_D max $T_C = +25^\circ C$
-20V	32mΩ @ $V_{GS} = -4.5V$	-13A
	53mΩ @ $V_{GS} = -2.5V$	-10A

Description and Applications

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.

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

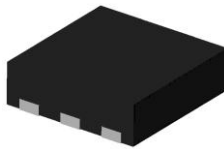
Features and Benefits

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm²
- Low Gate Threshold Voltage
- Low On-Resistance
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**

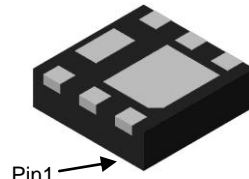
Mechanical Data

- Case: U-DFN2020-6 (Type F)
- 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)

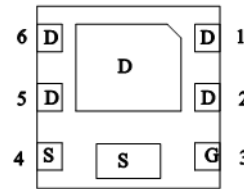
U-DFN2020-6 (Type F)



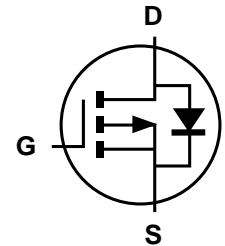
Top View



Bottom View



Pin Out
Bottom View



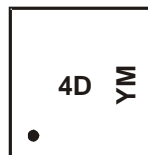
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMP2040UFD-7	U-DFN2020-6 (Type F)	3,000/Tape & Reel
DMP2040UFD-13	U-DFN2020-6 (Type F)	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



4D = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: D = 2016)
 M = Month (ex: 9 = September)

Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022	2023
Code	D	E	F	G	H	I	J	K

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V _{DSS}	-20	V
Gate-Source Voltage			V _{GSS}	±12	V
Continuous Drain Current (Note 6) V _{GS} = -4.5V	Steady State	T _A = +25°C	I _D	-6.1	A
		T _A = +70°C		-4.9	
Continuous Drain Current (Note 7) V _{GS} = -4.5V	Steady State	T _C = +25°C	I _D	-13	A
		T _C = +70°C		-10	
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I _{DM}	-35	A
Continuous Source-Drain Diode Current (Note 6)			I _S	-2.0	A
Avalanche Current (Note 8) L = 0.1mH			I _{AS}	-17	A
Avalanche Energy (Note 8) L = 0.1mH			E _{AS}	14	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T _A = +25°C	P _D	0.8	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	149	°C/W
	t < 10s		95	
Total Power Dissipation (Note 6)	T _A = +25°C	P _D	1.8	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	70	°C/W
	t < 10s		45	
Thermal Resistance, Junction to Case (Note 7)	Steady State	R _{θJC}	16	°C/W
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}	-20	—	—	V	V _{GS} = 0V, I _D = -250µA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-1	µA	V _{DS} = -16V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±12V, V _{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	-0.6	—	-1.5	V	V _{DS} = V _{GS} , I _D = -250µA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	22	32	mΩ	V _{GS} = -4.5V, I _D = -8.9A
		—	31	53		V _{GS} = -2.5V, I _D = -6.9A
Diode Forward Voltage	V _{SD}	—	-0.7	-1.2	V	V _{GS} = 0V, I _S = -2.9A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{ISS}	—	834	—	pF	V _{DS} = -10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{OSS}	—	133	—		
Reverse Transfer Capacitance	C _{RSS}	—	105	—		
Gate Resistance	R _G	—	4.9	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	8.6	—	nC	V _{DS} = -6V, I _D = -8.9A
Total Gate Charge (V _{GS} = -8V)	Q _g	—	19	—		
Gate-Source Charge	Q _{gs}	—	1.5	—		
Gate-Drain Charge	Q _{gd}	—	2.5	—		
Turn-On Delay Time	t _{D(ON)}	—	5.8	—	ns	V _{DD} = -6V, R _L = 6Ω V _{GS} = -4.5V, R _G = 6Ω, I _D = -1A
Turn-On Rise Time	t _r	—	7.7	—		
Turn-Off Delay Time	t _{D(OFF)}	—	28.1	—		
Turn-Off Fall Time	t _f	—	14.6	—		
Body Diode Reverse Recovery Time	t _{RR}	—	9.8	—	ns	I _F = -8.9A, di/dt = -100A/µs
Body Diode Reverse Recovery Charge	Q _{RR}	—	2.7	—	nC	I _F = -8.9A, di/dt = -100A/µs

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - 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).
 - I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

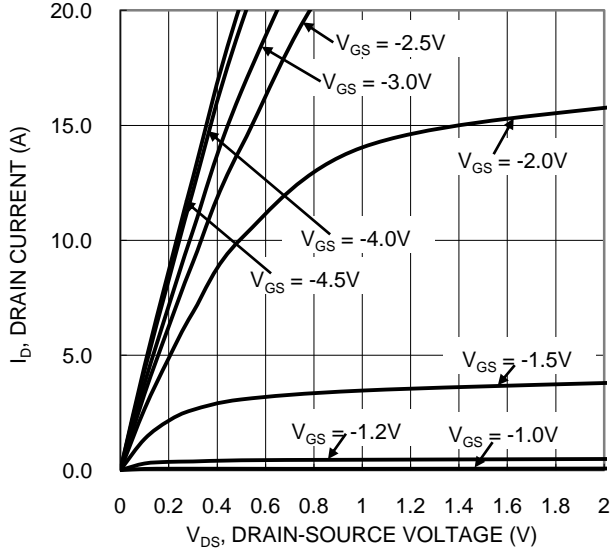


Figure 1. Typical Output Characteristic

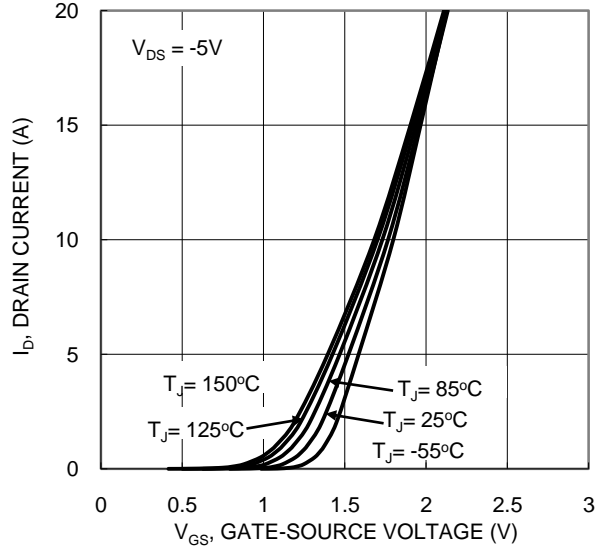


Figure 2. Typical Transfer Characteristic

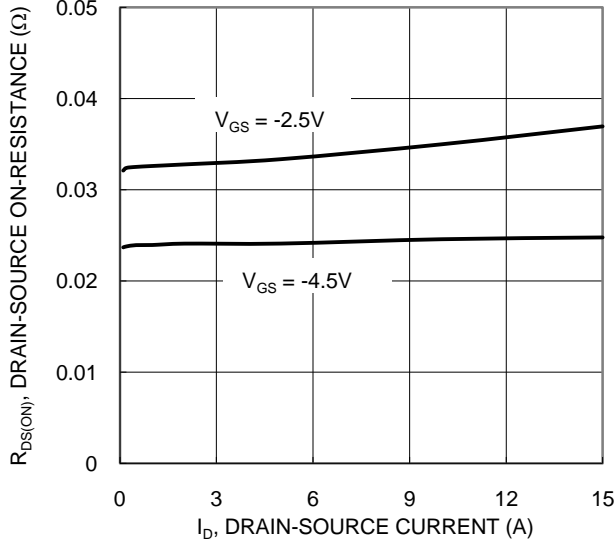


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

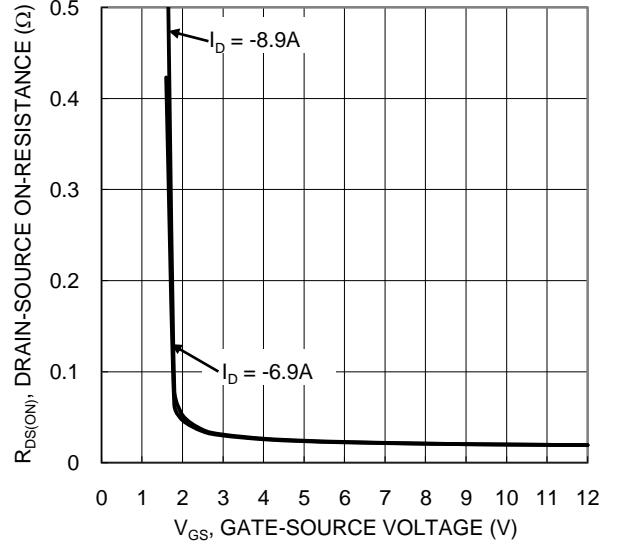


Figure 4. Typical Transfer Characteristic

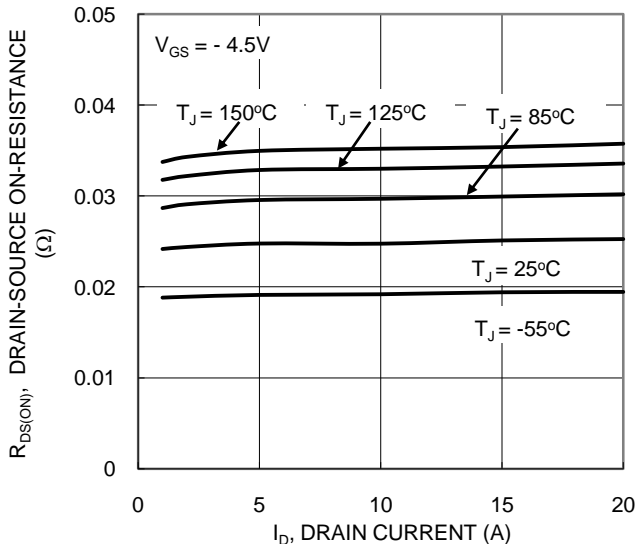


Figure 5. Typical On-Resistance vs Drain Current and Temperature

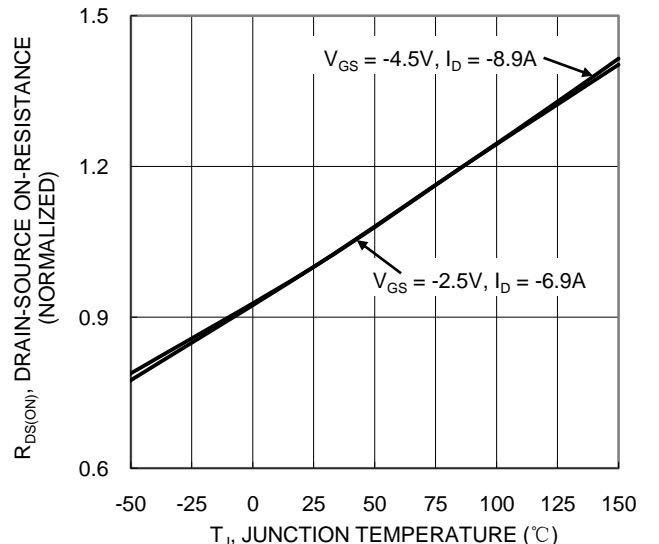
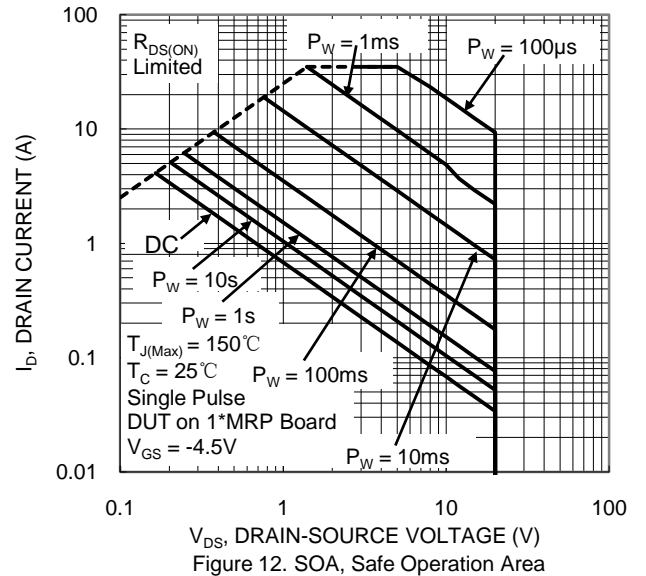
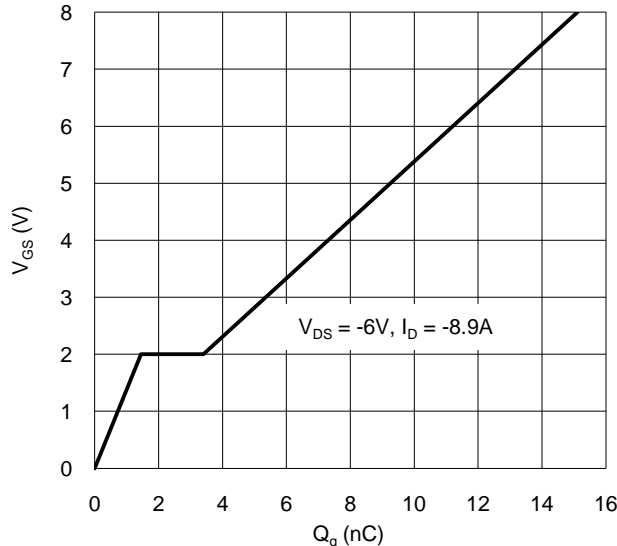
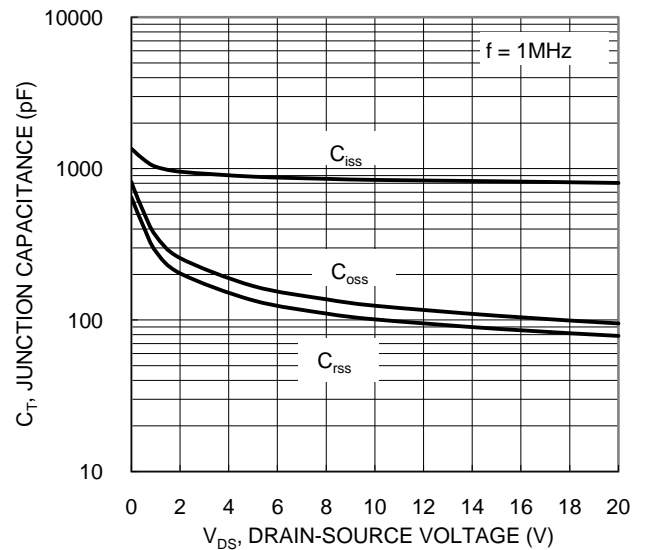
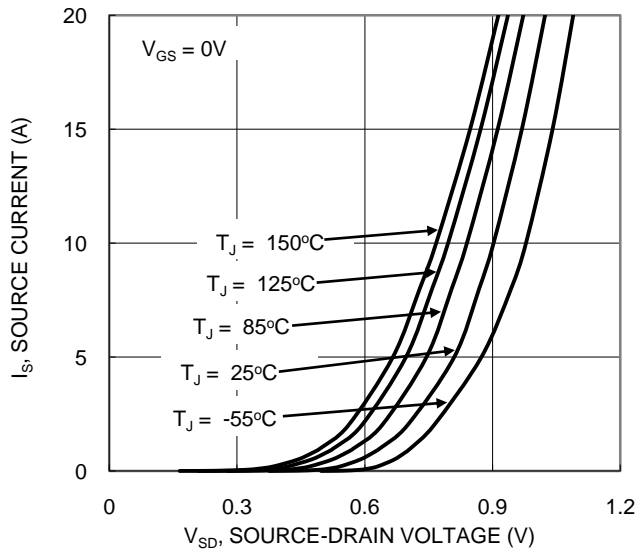
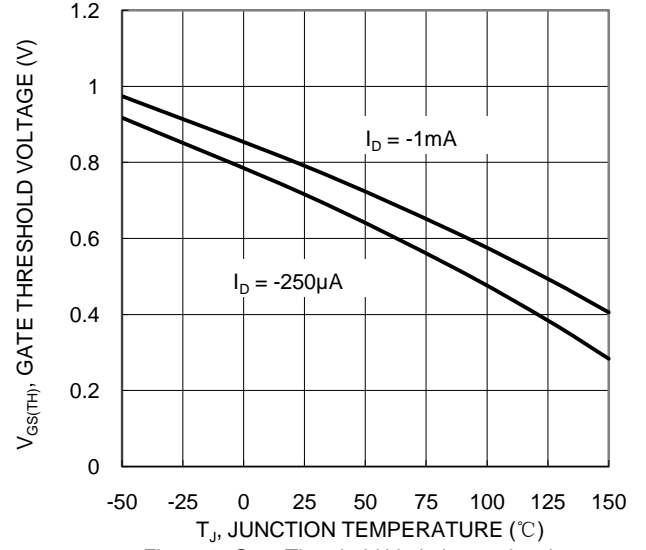
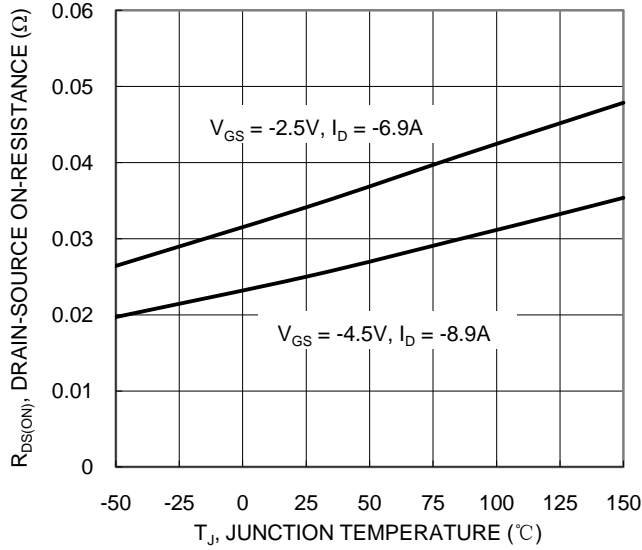


Figure 6. On-Resistance Variation with Temperature



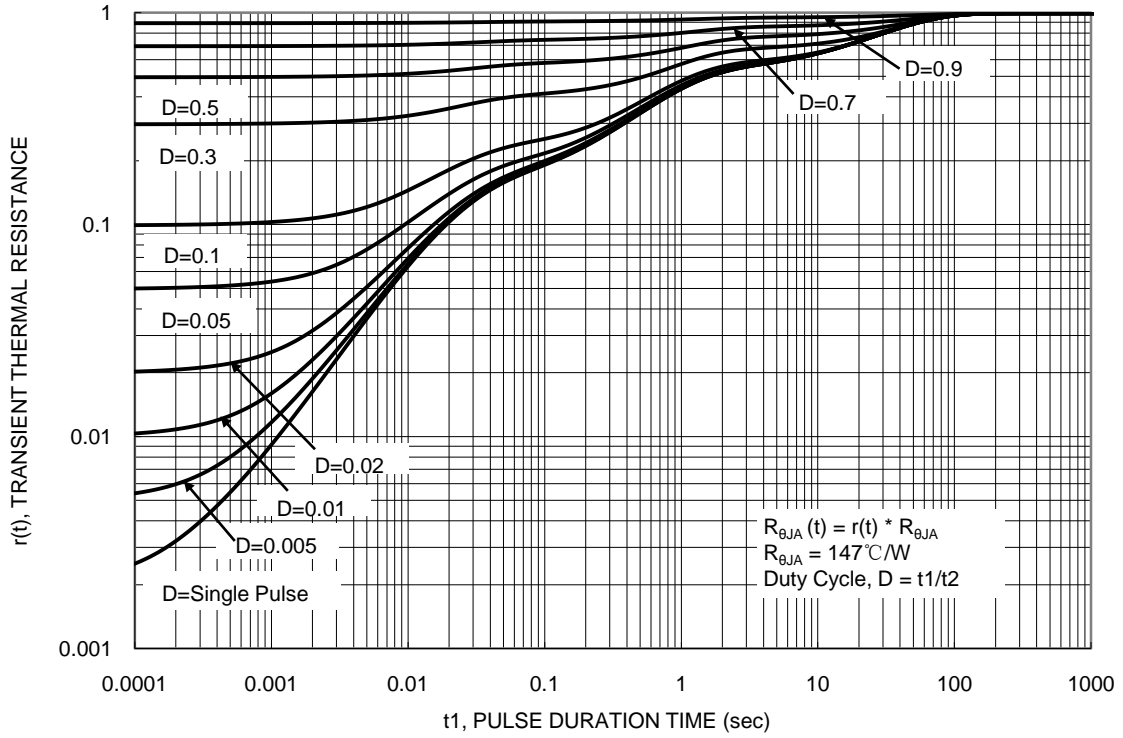
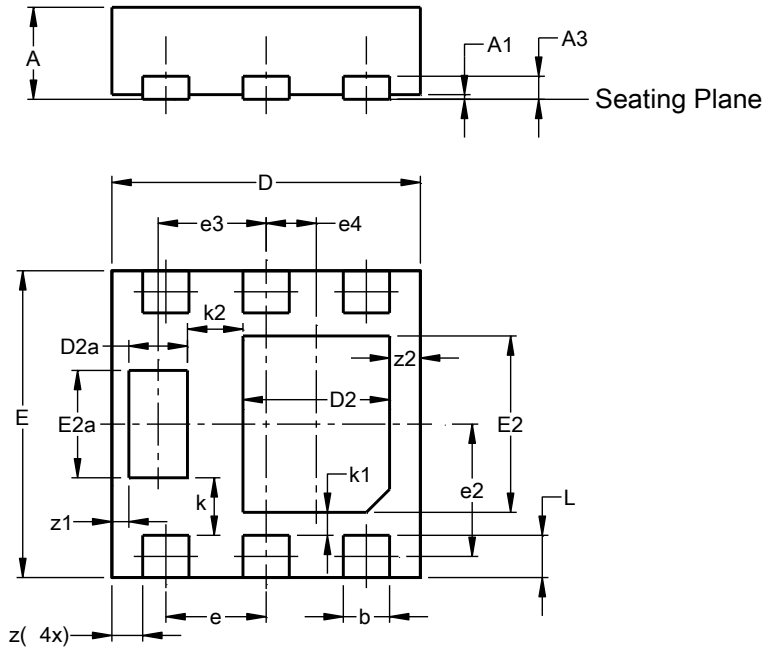


Figure 13. Transient Thermal Resistance

Package Outline Dimension

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

U-DFN2020-6 (Type F)

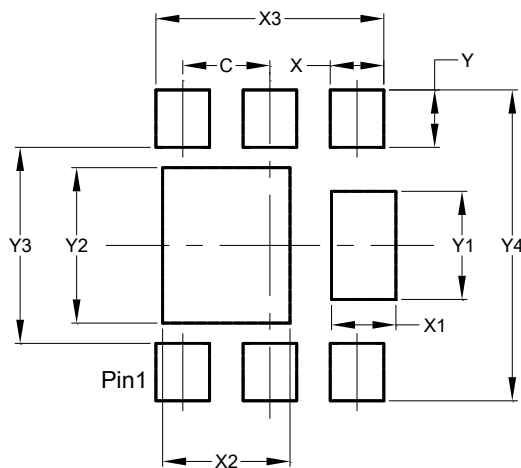


U-DFN2020-6 (Type F)			
Dim	Min	Max	Typ
A	0.57	0.63	0.60
A1	0.00	0.05	0.03
A3	-	-	0.15
b	0.25	0.35	0.30
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
D2a	0.33	0.43	0.38
E	1.95	2.05	2.00
E2	1.05	1.25	1.15
E2a	0.65	0.75	0.70
e	0.65 BSC		
e2	0.863 BSC		
e3	0.70 BSC		
e4	0.325 BSC		
k	0.37 BSC		
k1	0.15 BSC		
k2	0.36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

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

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

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