20V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C
20V	22mΩ @ V_{GS} = 4.5V	7.9A
	26mΩ @ V_{GS} = 2.5V	7.2A
	36mΩ @ V_{GS} = 1.8V	6.1A
	50mΩ @ V_{GS} = 1.5V	5.2A

Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm^2
- Low Gate Threshold Voltage
- Fast Switching Speed
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Description

This MOSFET has been 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

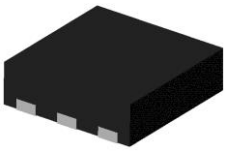
- Battery Management Application
- Power Management Functions
- DC-DC Converters

Mechanical Data

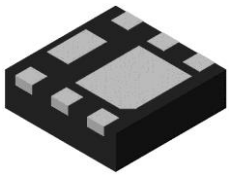
- Case: U-DFN2020-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.0065 grams (Approximate)

U-DFN2020-6 (Type F)

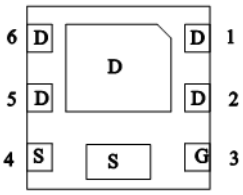




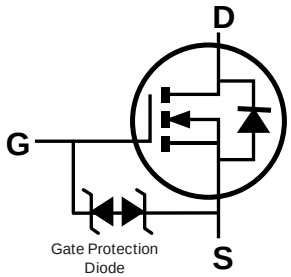
Top View



Bottom View



Pin Out
Bottom View



Internal Schematic

Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Quantity per Reel
DMN2022UFDF-7	NC	7	3,000
DMN2022UFDF-13	NC	13	10,000

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

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Marking Information

Site 1



NC = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: H = 2020)
M = Month (ex: 9 = September)

Date Code Key

Year	2014	…	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	B	…	H	I	J	K	L	M	N	O	P	R

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

Site 2



NC = Product Type Marking Code
YWX = Date Code Marking
Y = Year (ex: 0 = 2020)
W = Week (ex: a = Week 27; z Represents Week 52 and 53)
X = Internal Code (ex: U = Monday)

Date Code Key

Year	2014	…	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	4	…	0	1	2	3	4	5	6	7	8	9

Week	1-26	27-52	53
Code	A-Z	a-z	z

Internal Code	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Code	T	U	V	W	X	Y	Z

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	7.9 6.3	A
	t<5s	T_A = +25°C T_A = +70°C	I_D	9.4 7.5	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	40	A
Continuous Source-Drain Diode Current		T_A = +25°C	I_S	2	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	12	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	8	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.66	W
	T_A = +70°C		0.42	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	188	°C/W
	t<5s		135	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.03	W
	T_A = +70°C		1.31	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	60	°C/W
	t<5s		43	
Thermal Resistance, Junction to Case (Note 6)	Steady State	$R_{\theta JC}$	8.3	
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 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	1	µA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.5	—	1.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	15	22	mΩ	V_{GS} = 4.5V, I_D = 4A
			18	26		V_{GS} = 2.5V, I_D = 4A
			24	36		V_{GS} = 1.8V, I_D = 4A
			35	50		V_{GS} = 1.5V, I_D = 4A
Forward Transfer Admittance	$\|Y_{fs}\|$	—	18	—	S	V_{DS} = 5V, I_D = 12A
Diode Forward Voltage	V_{SD}	—	0.7	1.0	V	V_{GS} = 0V, I_S = 5A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	907	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	98	—		
Reverse Transfer Capacitance	C_{rss}	—	38	—		
Gate Resistance	R_g	—	194	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	9.8	—	nC	V_{DS} = 10V, I_D = 6.5A
Total Gate Charge (V_{GS} = 8V)	Q_g	—	18	—		
Gate-Source Charge	Q_{gs}	—	1.5	—		
Gate-Drain Charge	Q_{gd}	—	1.8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	56	—	ns	V_{DS} = 10V, V_{GS} = 4.5V, R_G = 6Ω, R_L = 10Ω, I_D = 1A
Turn-On Rise Time	t_R	—	87	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	632	—		
Turn-Off Fall Time	t_F	—	239	—		
Reverse Recovery Time	t_{RR}	—	143	—	ns	I_F = 4A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{RR}	—	136	—	nC	I_F = 4A, di/dt = 100A/µs

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

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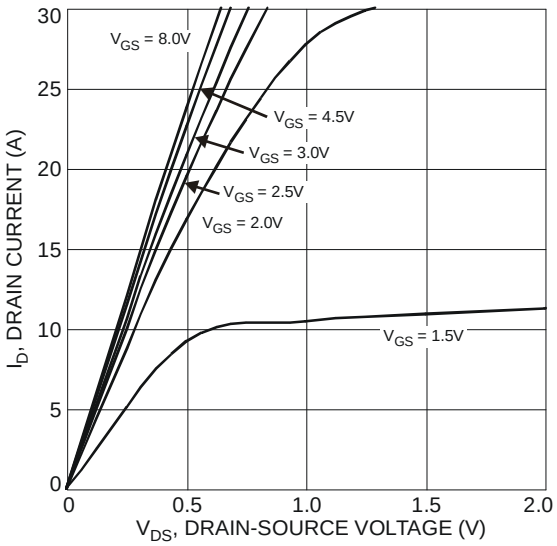

Figure 1 Typical Output Characteristic

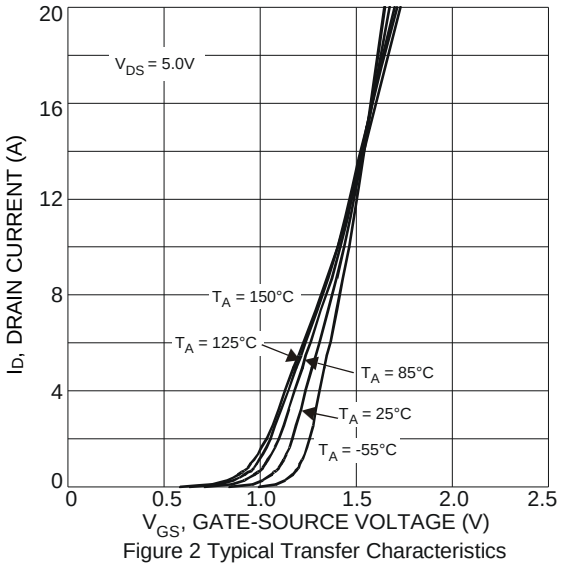

Figure 2 Typical Transfer Characteristics

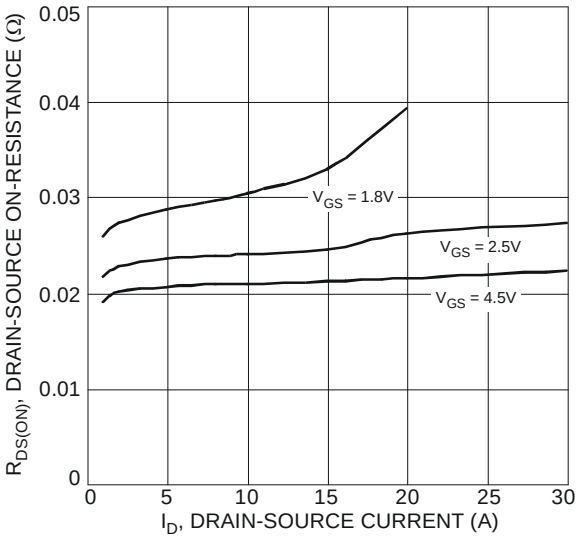

Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

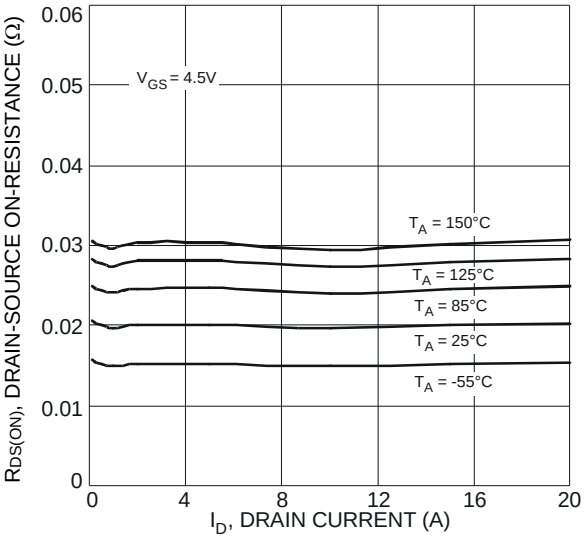

Figure 4 Typical On-Resistance vs. Drain Current and Temperature

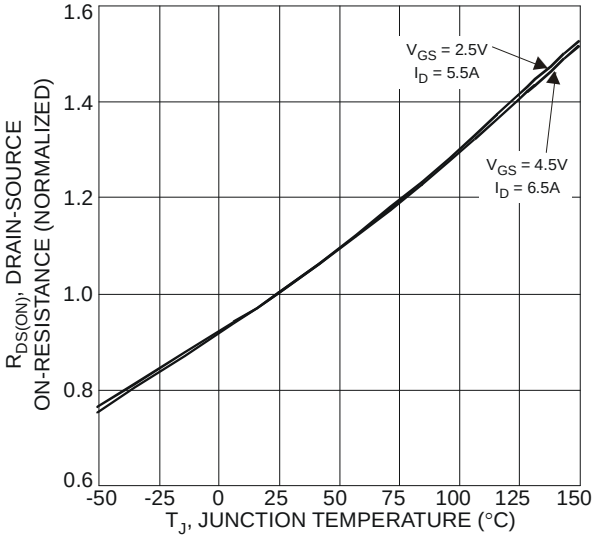

Figure 5 On-Resistance Variation with Temperature

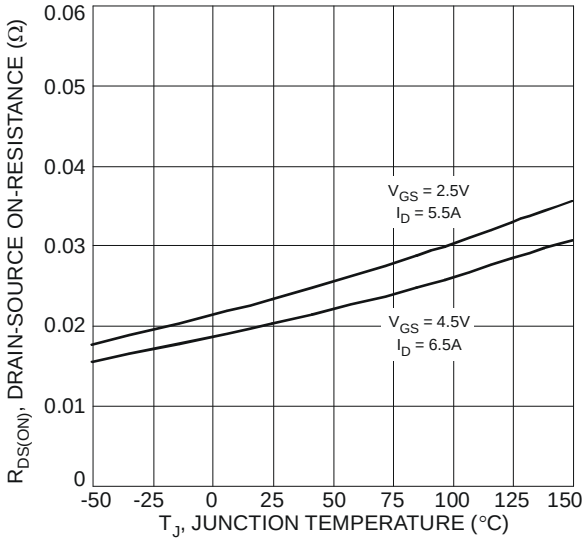

Figure 6 On-Resistance Variation with Temperature

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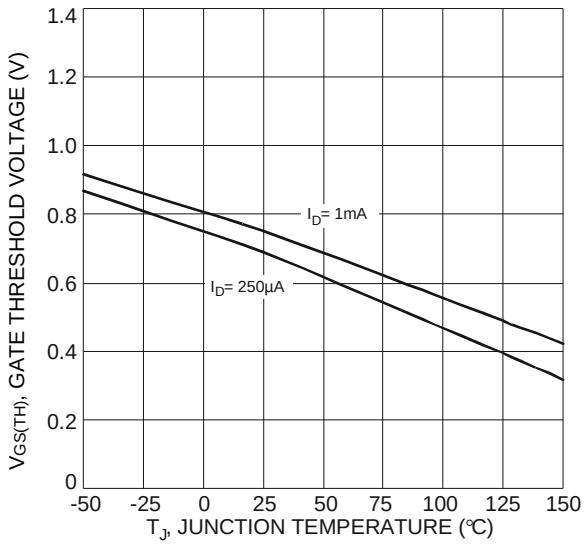

Figure 7 Gate Threshold Variation vs. Junction Temperature

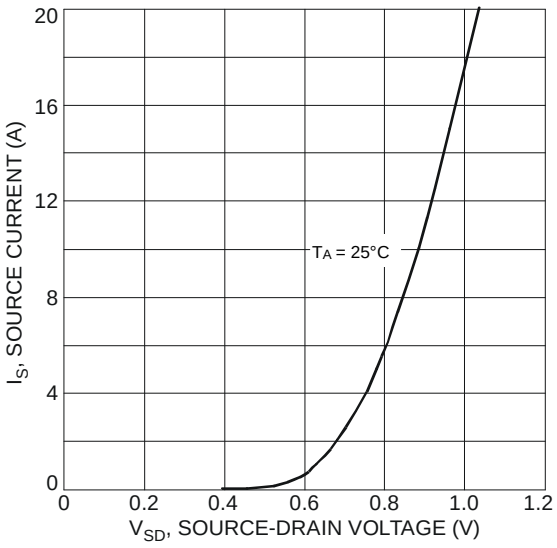

Figure 8 Diode Forward Voltage vs. Current

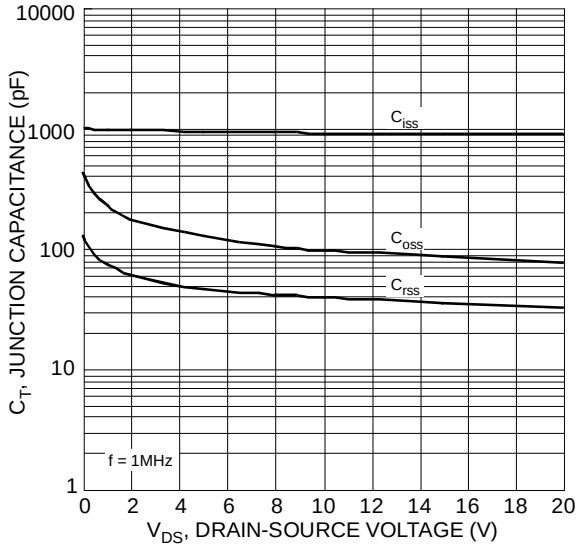

Figure 9 Typical Junction Capacitance

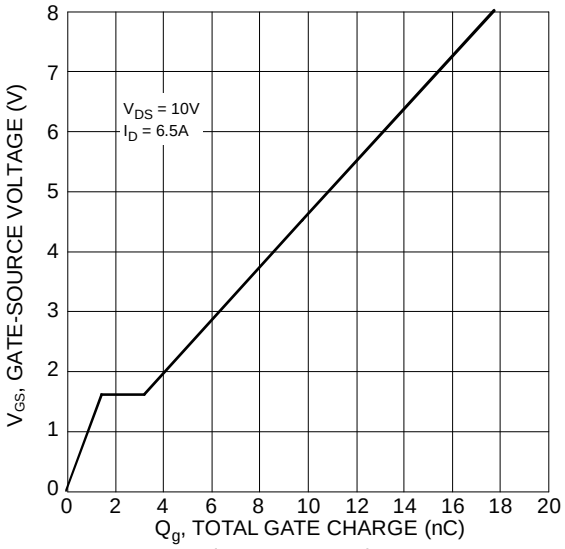

Figure 10 Gate Charge

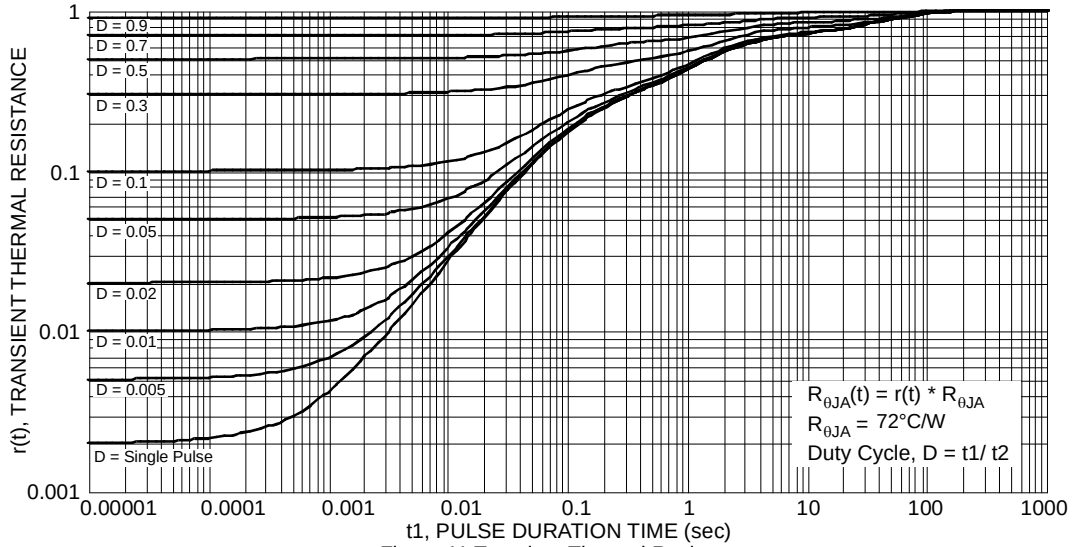

Figure 11 Transient Thermal Resistance

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Package Outline Dimensions

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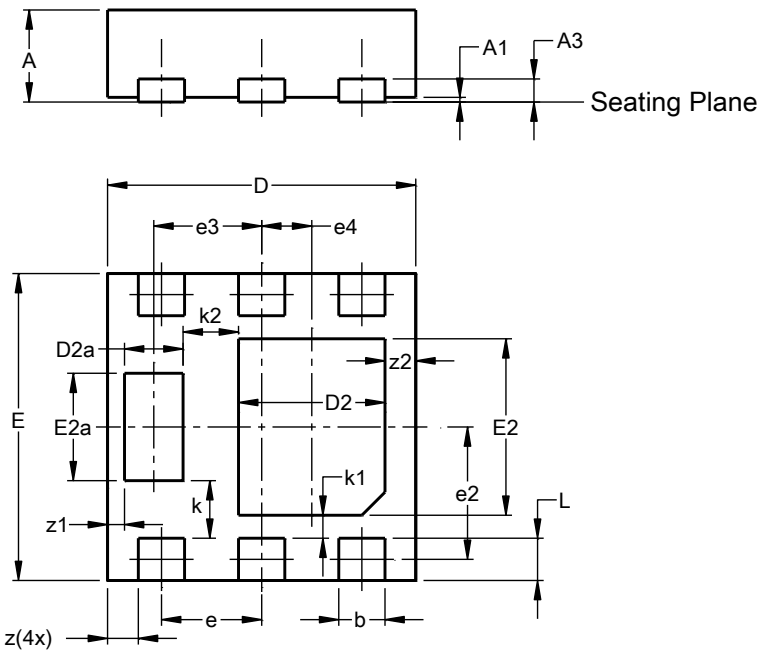
U-DFN2020-6 (Type F)

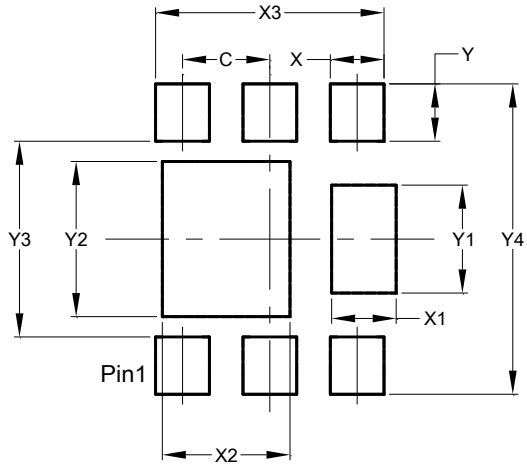


U-DFN2020-6 (Type F)			
Dim	**Min**	**Max**	**Typ**
A	0.57	0.63	0.60
A1	0.00	0.05	0.03
A3	-	-	0.15
b	0.25	0.35	0.30
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
D2a	0.33	0.43	0.38
E	1.95	2.05	2.00
E2	1.05	1.25	1.15
E2a	0.65	0.75	0.70
e	0.65 BSC		
e2	0.863 BSC		
e3	0.70 BSC		
e4	0.325 BSC		
k	0.37 BSC		
k1	0.15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