

Product Summary

BV _{DSS}	R _{DS(ON)} MAX	Package	I _D T _A = +25°C
20V	11mΩ @ V _{GS} = 4.5V	U-DFN2020-6 (Type E)	10.5A
	13mΩ @ V _{GS} = 2.5V	U-DFN2020-6 (Type E)	9.4A
	30mΩ @ V _{GS} = 1.8V	U-DFN2020-6 (Type E)	6.5A
	50mΩ @ V _{GS} = 1.5V	U-DFN2020-6 (Type E)	5.5A

Description

This new generation 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

- General Purpose Interfacing Switch
- Power Management Functions

Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm²
- Low Gate Threshold Voltage
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **The DMN2013UFDEQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

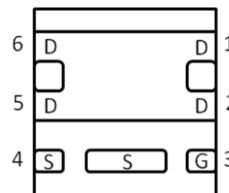
- Case: U-DFN2020-6
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (e4)
- Weight: 0.0065 grams (Approximate)



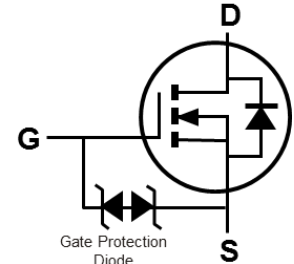
U-DFN2020-6 (Type E)



Bottom View



Pin Out



Equivalent Circuit

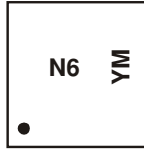
Ordering Information (Note 4)

Part Number	Compliance	Case	Quantity per Reel
DMN2013UFDEQ-7	Automotive	U-DFN2020-6 (Type E)	3,000
DMN2013UFDEQ-13	Automotive	U-DFN2020-6 (Type E)	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/>.

Marking Information

Site 1



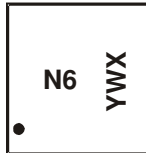
N6 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: H = 2020)
 M = Month (ex: 9 = September)

Date Code Key

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Code	H	I	J	K	L	M	N	O	P	R	S	T

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



N6 = 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	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Code	0	1	2	3	4	5	6	7	8	9	0	1

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

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, 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) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	10.5 8.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	12.5 10.0	A
Continuous Drain Current (Note 6) $V_{GS} = 2.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	9.4 7.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	11.2 8.8	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	80	A
Maximum Body Diode Continuous Current			I_S	2.5	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	0.66	W
	$T_A = +70^\circ\text{C}$		0.42	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	189	$^\circ\text{C/W}$
	$t < 10\text{s}$		132	
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	2.03	W
	$T_A = +70^\circ\text{C}$		1.31	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	61	$^\circ\text{C/W}$
	$t < 10\text{s}$		43	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	9.3	
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 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	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	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 2	μA	$V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.5	—	1.1	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	8.4	11	$\text{m}\Omega$	$V_{GS} = 4.5\text{V}, I_D = 8.5\text{A}$
			9.8	13		
			12	30		
			15	50		
			—	—		
Forward Transfer Admittance	$ Y_{fs} $	—	10	—	S	$V_{DS} = 5\text{V}, I_D = 4\text{A}$
Diode Forward Voltage	V_{SD}	—	—	1.2	V	$V_{GS} = 0\text{V}, I_S = 8.5\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	2453	—	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	275	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	257	—	pF	
Gate Resistance	R_g	—	1.2	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	14.3	—	nC	$V_{DS} = 10\text{V}, I_D = 8.5\text{A}$
Total Gate Charge ($V_{GS} = 8\text{V}$)	Q_g	—	25.8	—	nC	
Gate-Source Charge	Q_{gs}	—	1.8	—	nC	
Gate-Drain Charge	Q_{gd}	—	2.1	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	9.9	—	ns	
Turn-On Rise Time	t_R	—	24.5	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	66.4	—	ns	$V_{DS} = 10\text{V}, I_D = 8.5\text{A}$ $V_{GS} = 4.5\text{V}, R_G = 1.8\Omega$
Turn-Off Fall Time	t_F	—	20.8	—	ns	

- 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.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to production testing.

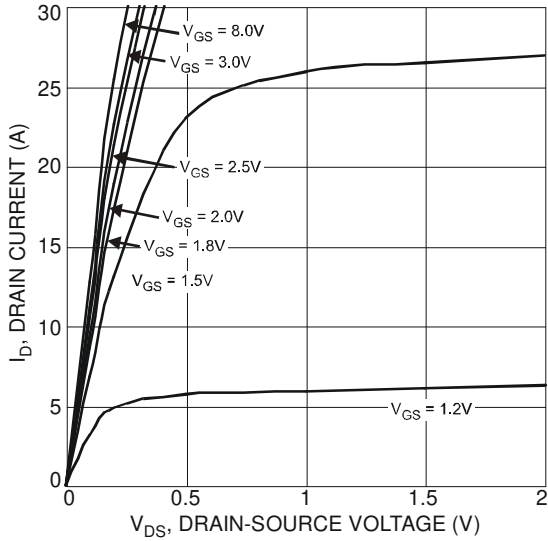


Fig. 1 Typical Output Characteristic

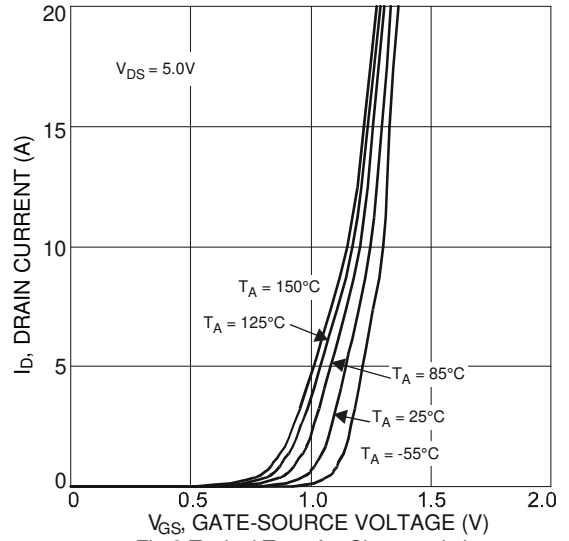


Fig. 2 Typical Transfer Characteristics

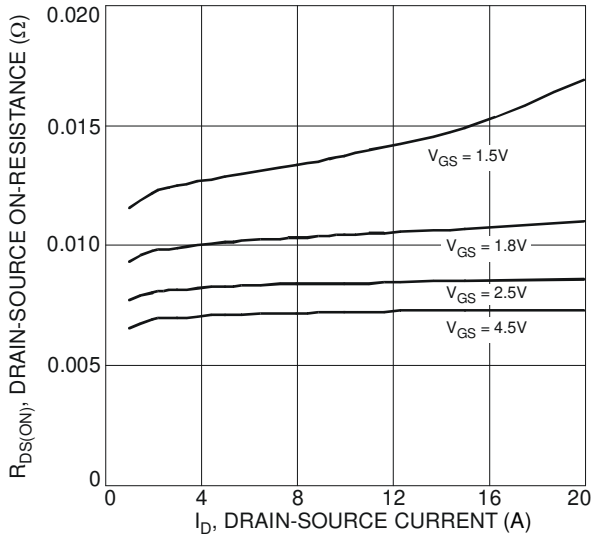


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

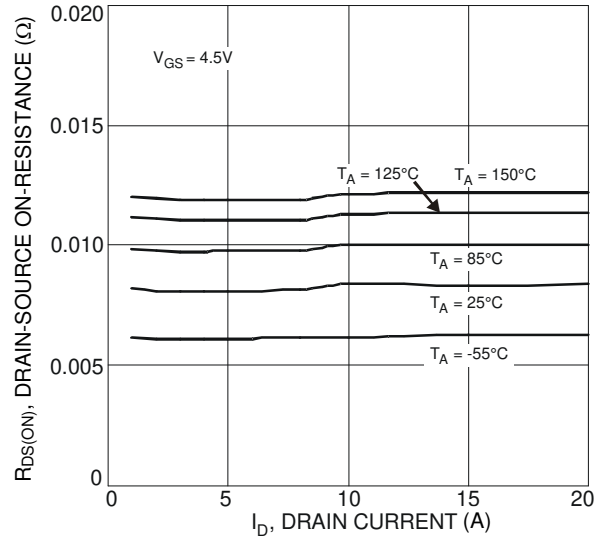


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

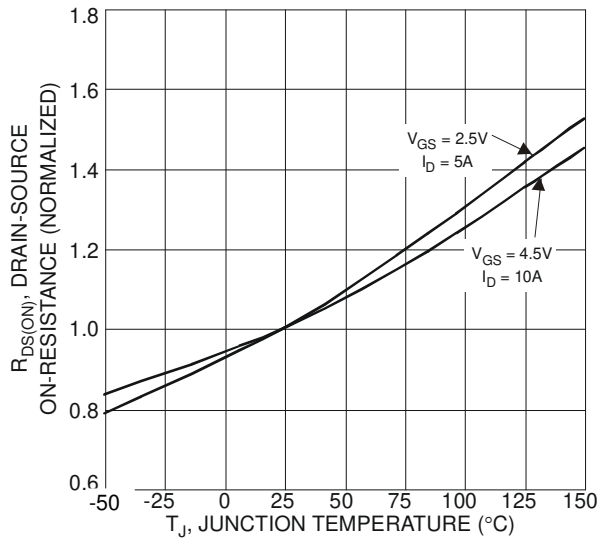


Fig. 5 On-Resistance Variation with Temperature

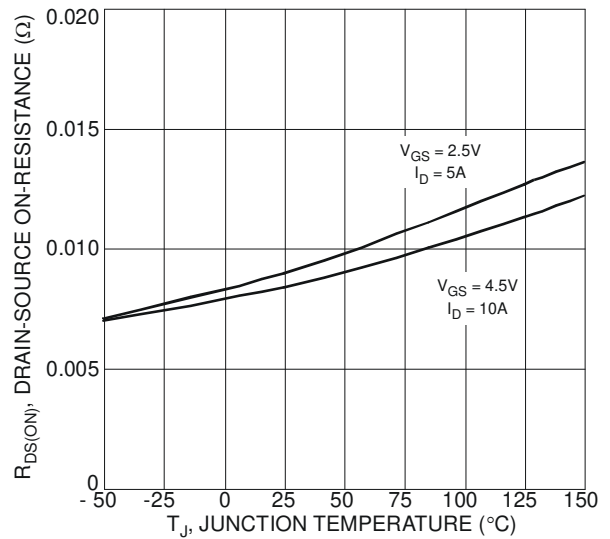


Fig. 6 On-Resistance Variation with Temperature

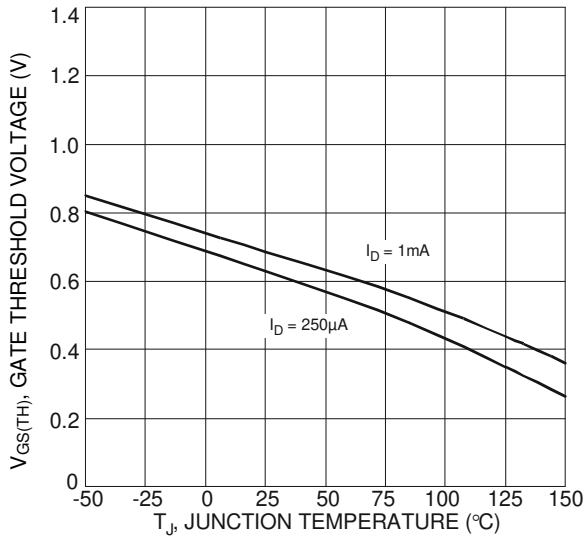


Fig. 7 Gate Threshold Variation vs. Junction Temperature

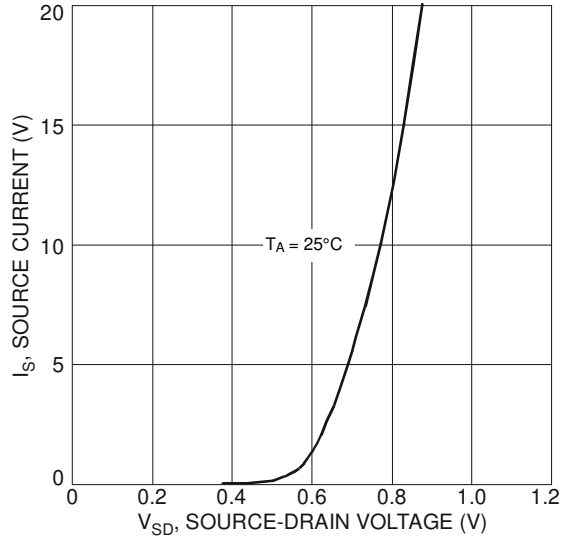


Fig. 8 Diode Forward Voltage vs. Current

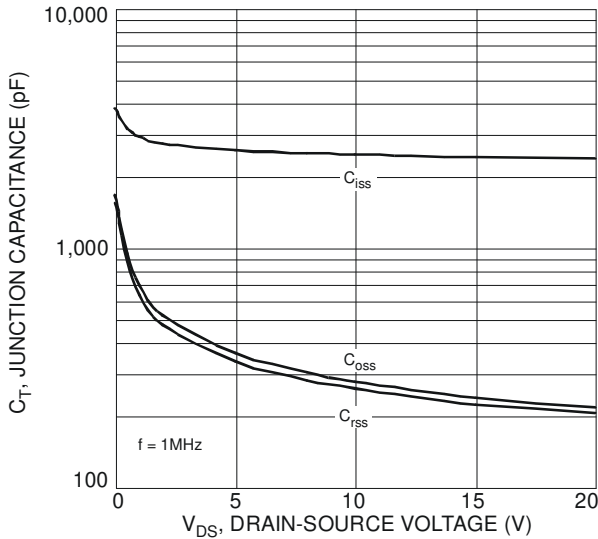


Fig. 9 Typical Junction Capacitance

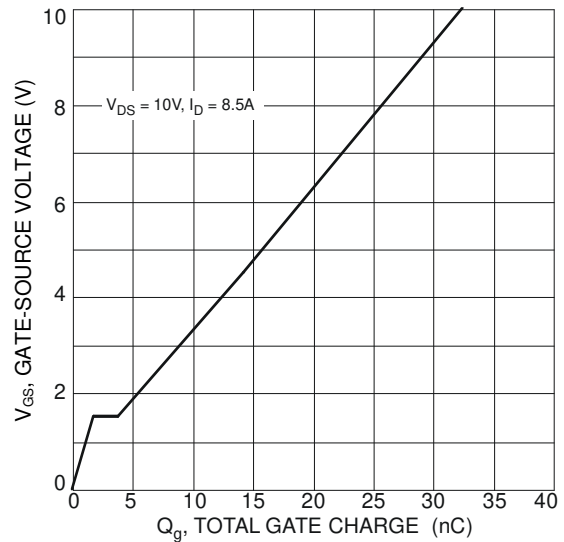


Fig. 10 Gate Charge

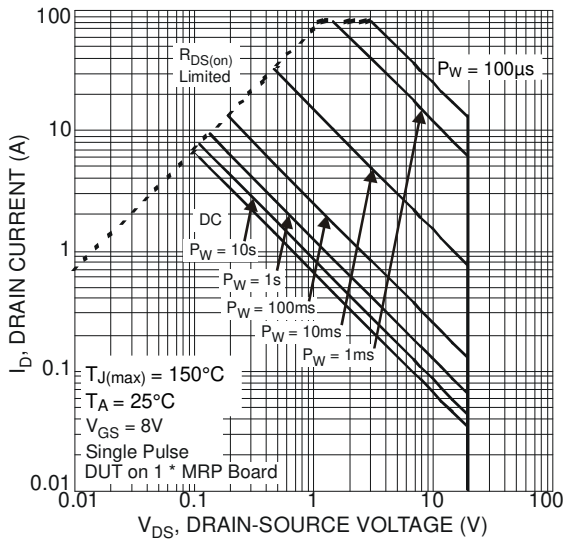
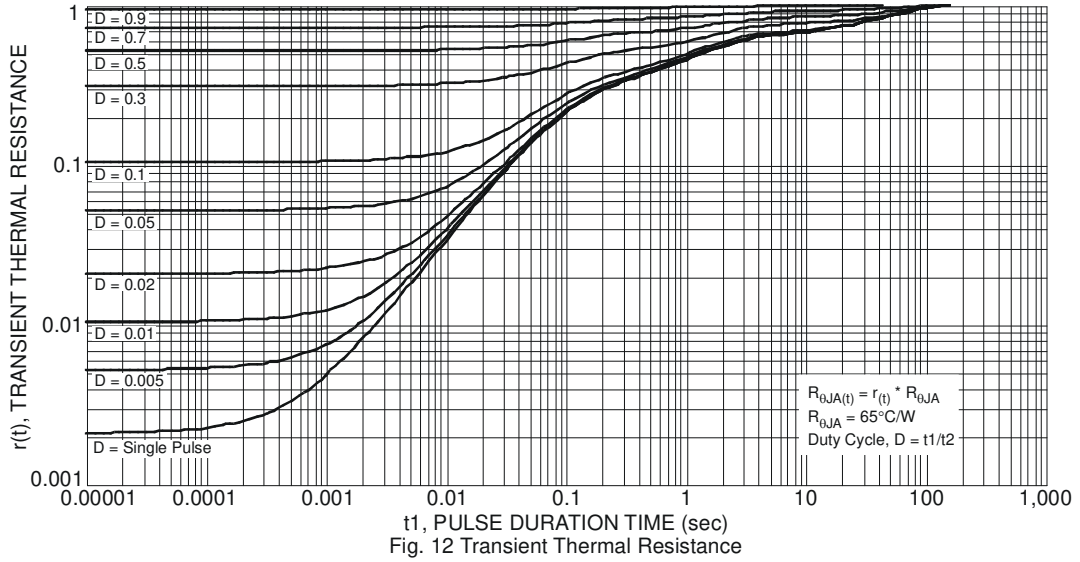


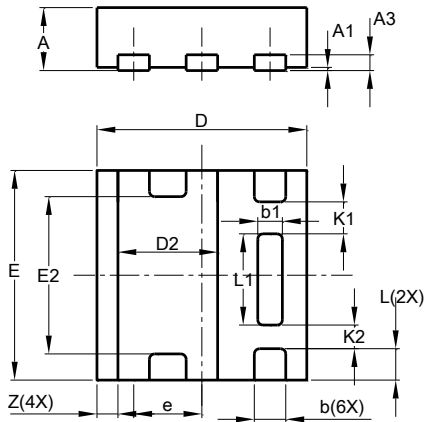
Fig. 11 SOA, Safe Operation Area



Package Outline Dimensions

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

U-DFN2020-6 (Type E)

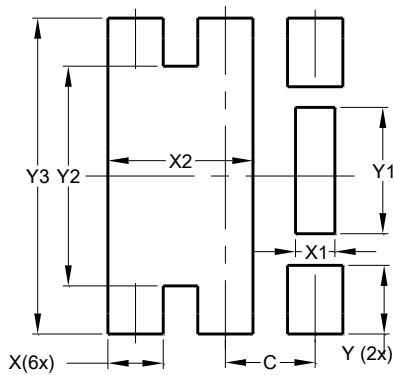


U-DFN2020-6 Type E			
Dim	Min	Max	Typ
A	0.57	0.63	0.60
A1	0	0.05	0.03
A3	-	-	0.15
b	0.25	0.35	0.30
b1	0.185	0.285	0.235
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
E	1.95	2.05	2.00
E2	1.40	1.60	1.50
e	-	-	0.65
L	0.25	0.35	0.30
L1	0.82	0.92	0.87
K1	-	-	0.305
K2	-	-	0.225
Z	-	-	0.20
All Dimensions in mm			

Suggested Pad Layout

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

U-DFN2020-6 (Type E)



Dimensions	Value (in mm)
C	0.650
X	0.400
X1	0.285
X2	1.050
Y	0.500
Y1	0.920
Y2	1.600
Y3	2.300

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