

Product Summary

BV _{DSS}	R _{DS(ON)} MAX	I _D MAX T _A = +25°C
60V	38mΩ @ V _{GS} = 10V	6.5A
	47mΩ @ V _{GS} = 4.5V	5.2A

Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Power Management Functions
- DC-DC Converters
- Backlighting

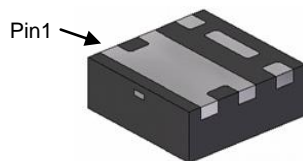
Features and Benefits

- 100% Unclamped Inductive Switch (UIS) Test in Production
- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm²
- Low On-Resistance
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

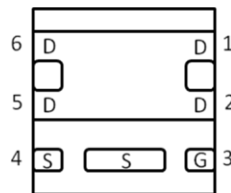
Mechanical Data

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

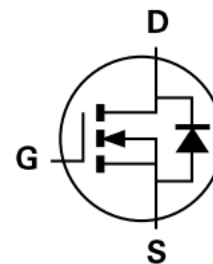
U-DFN2020-6 (Type E)



Bottom View



Pin Out
Bottom View



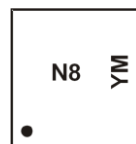
Equivalent Circuit

Ordering Information (Note 5)

Part Number	Case	Packaging
DMN6040SFDEQ-7	U-DFN2020-6 (Type E)	3,000 / Tape & Reel
DMN6040SFDEQ-13	U-DFN2020-6 (Type E)	10,000 / Tape & Reel

- 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 http://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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
 5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



N8 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: F = 2018)
 M = Month (ex: 9 = September)

Date Code Key

Year	2018	2019	2020	2021	2022	2023	2024
Code	F	G	H	I	J	K	L

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	Unit	
Drain-Source Voltage	V _{DSS}	60	V	
Gate-Source Voltage	V _{GSS}	±20	V	
Continuous Drain Current (Note 7) V _{GS} = 10V	Steady State	T _A = +25°C T _A = +70°C	5.3 4.1	A
	t < 10s	T _A = +25°C T _A = +70°C	6.5 5.1	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	30	A	
Maximum Body Diode Continuous Current	I _S	2.5	A	
Avalanche Current (Note 8) L = 0.1mH	I _{AR}	14.2	A	
Avalanche Energy (Note 8) L = 0.1mH	E _{AR}	10	mJ	

Thermal Characteristics

Characteristic	Symbol	Value	Unit	
Total Power Dissipation (Note 6)	P _D	T _A = +25°C	0.66	W
		T _A = +70°C	0.42	
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	Steady State	189	°C/W
		t < 10s	132	
Total Power Dissipation (Note 7)	P _D	T _A = +25°C	2.03	W
		T _A = +70°C	1.31	
Thermal Resistance, Junction to Ambient (Note 7)	R _{θJA}	Steady State	61	°C/W
		t < 10s	43	
Thermal Resistance, Junction to Case (Note 7)	R _{θJC}	9.3	°C	
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}	60	—	—	V	V _{GS} = 0V, I _D = 250µA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	100	nA	V _{DS} = 60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	1	—	3	V	V _{DS} = V _{GS} , I _D = 250µA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	30	38	mΩ	V _{GS} = 10V, I _D = 4.3A
		—	35	47		V _{GS} = 4.5V, I _D = 4A
Forward Transfer Admittance	Y _{fs}	—	4.5	—	S	V _{DS} = 10V, I _D = 4.3A
Diode Forward Voltage	V _{SD}	—	0.7	1.2	V	V _{GS} = 0V, I _S = 1A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{iss}	—	1287	—	pF	V _{DS} = 25V, V _{GS} = 0V f = 1.0MHz
Output Capacitance	C _{oss}	—	57	—		
Reverse Transfer Capacitance	C _{rss}	—	44	—		
Gate Resistance	R _g	—	1.2	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge (V _{GS} = 10V)	Q _g	—	22.4	—	nC	V _{DS} = 30V, I _D = 4.3A
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	10.4	—		
Gate-Source Charge	Q _{gs}	—	4.9	—		
Gate-Drain Charge	Q _{gd}	—	3.0	—		
Turn-On Delay Time	t _{D(ON)}	—	6.6	—	ns	V _{GS} = 10V, V _{DD} = 30V, R _g = 6Ω, I _D = 4.3A
Turn-On Rise Time	t _r	—	8.1	—		
Turn-Off Delay Time	t _{D(OFF)}	—	20.1	—		
Turn-Off Fall Time	t _f	—	4.0	—		
Body Diode Reverse Recovery Time	t _{RR}	—	18	—	ns	I _S = 4.3A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q _{RR}	—	11.9	—	nC	I _S = 4.3A, di/dt = 100A/µs

- 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_{AR} and E_{AR} ratings 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.

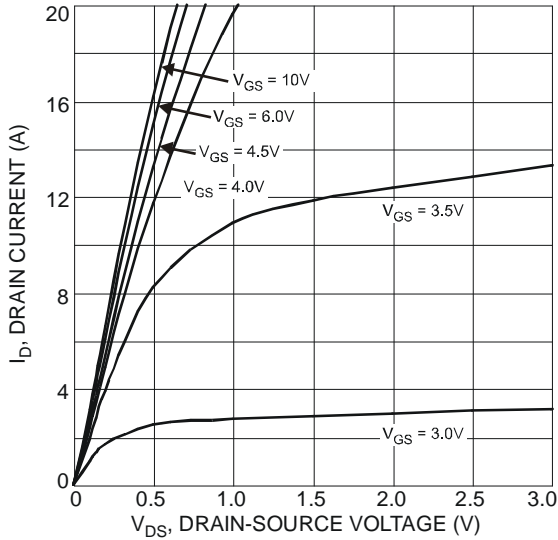


Fig. 1 Typical Output Characteristic

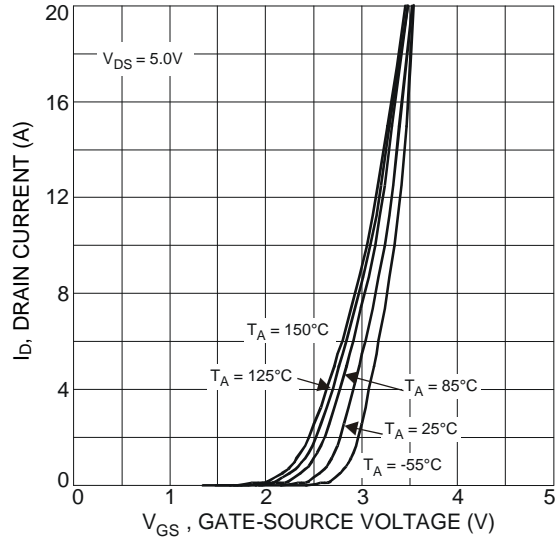


Fig. 2 Typical Transfer Characteristics

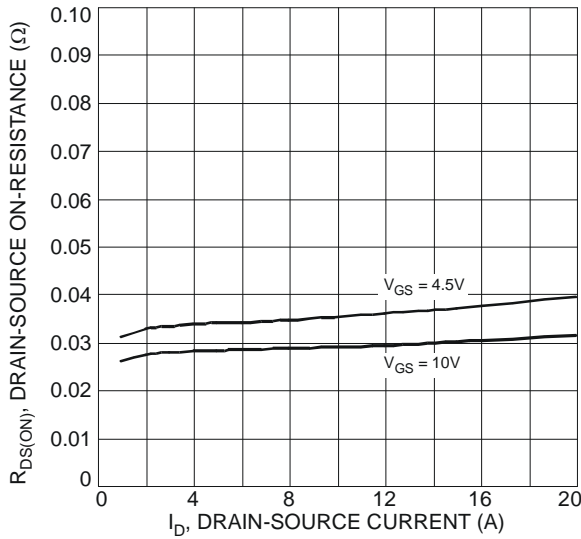


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

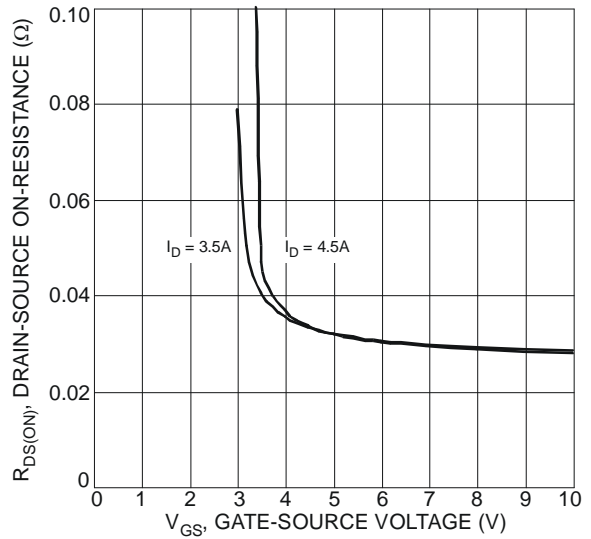


Fig. 4 Typical On-Resistance vs. Drain Current and Gate Voltage

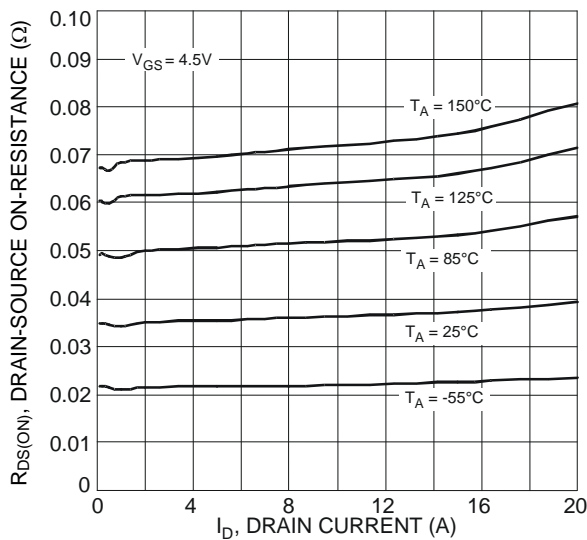


Fig. 5 Typical On-Resistance vs. Drain Current and Temperature

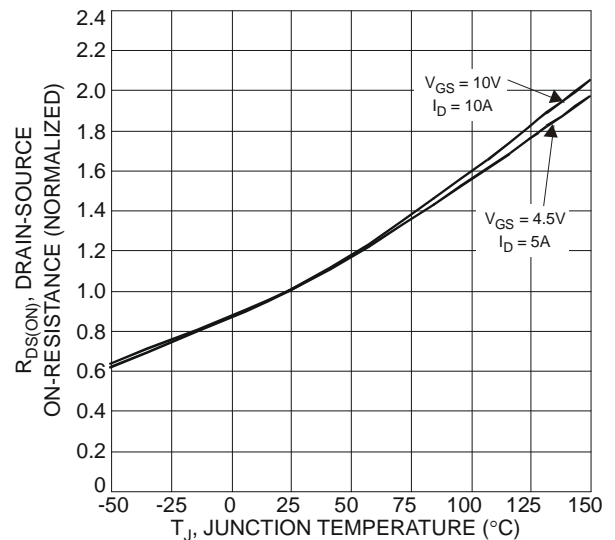


Fig. 6 On-Resistance Variation with Temperature

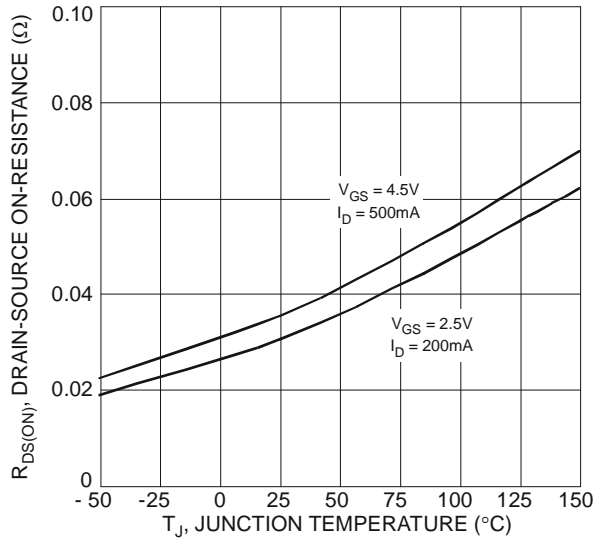


Fig. 7 On-Resistance Variation with Temperature

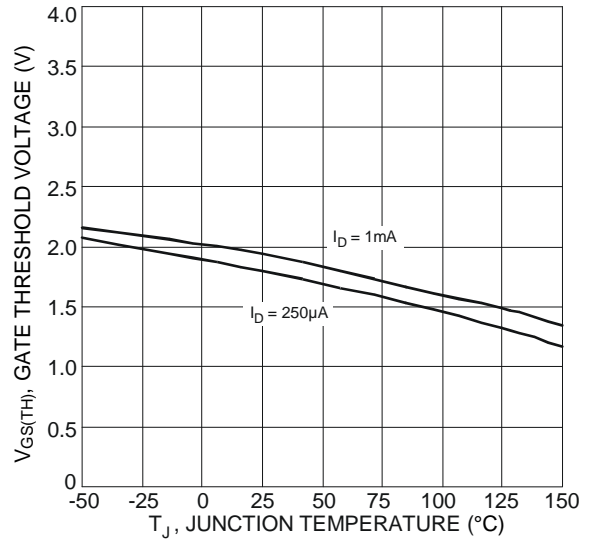


Fig. 8 Gate Threshold Variation vs. Junction Temperature

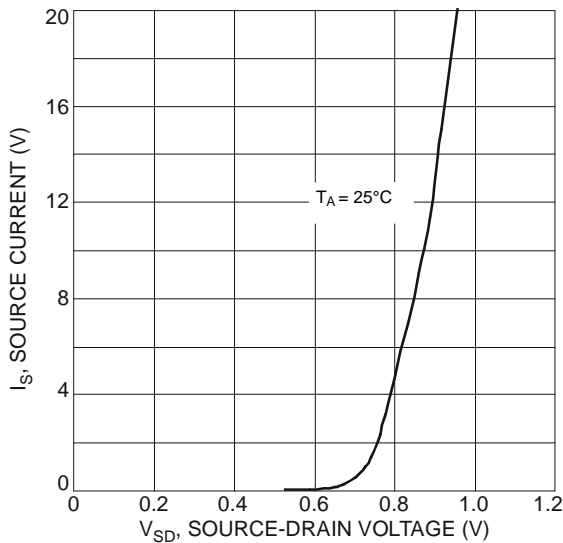


Fig. 9 Diode Forward Voltage vs. Current

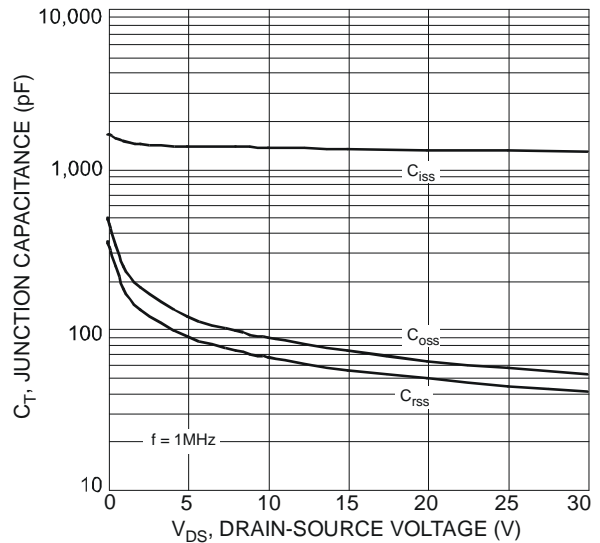


Fig. 10 Typical Junction Capacitance

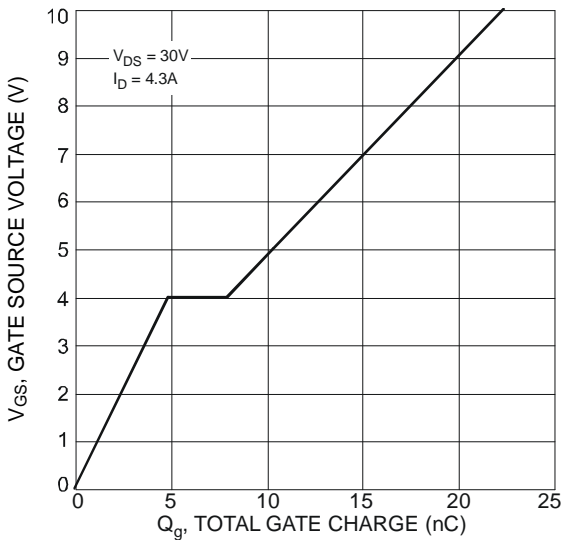


Fig. 11 Gate Charge

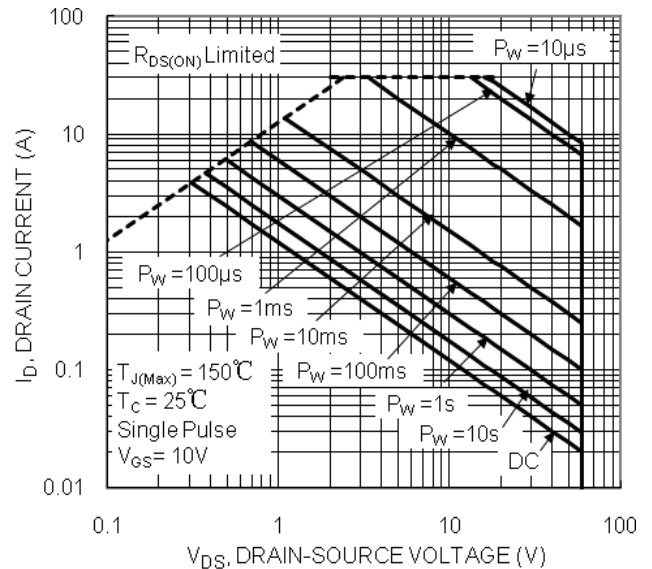


Fig. 12. SOA, Safe Operation Area

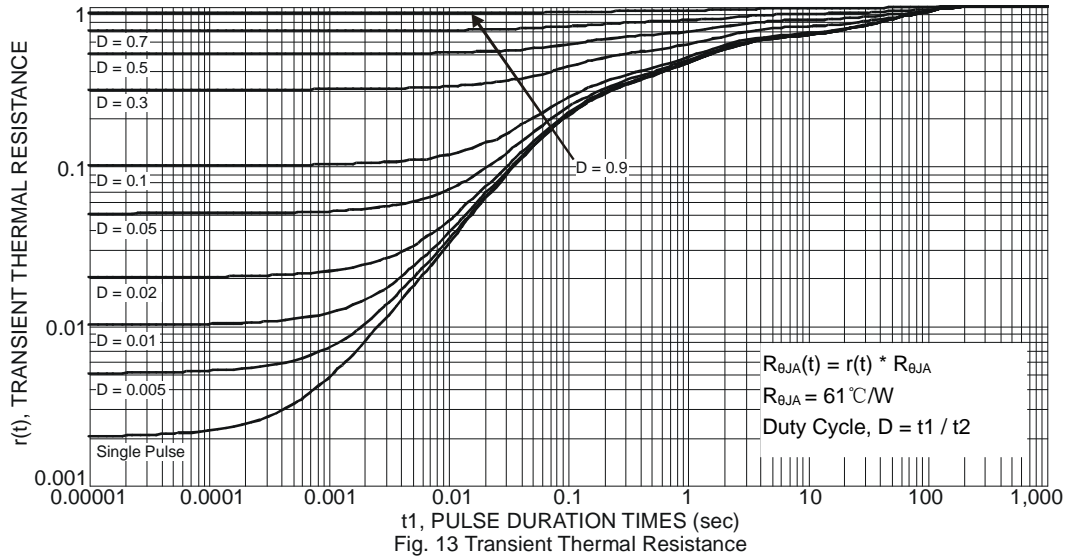
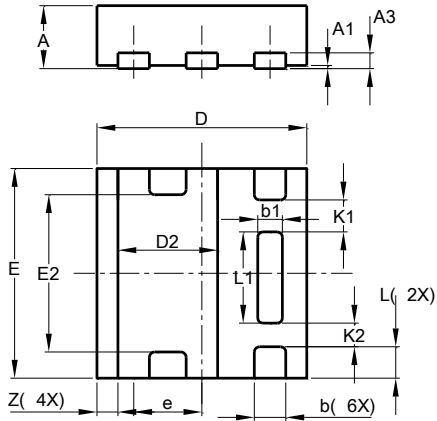


Fig. 13 Transient Thermal Resistance

Package Outline Dimensions

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

U-DFN2020-6 (Type E)

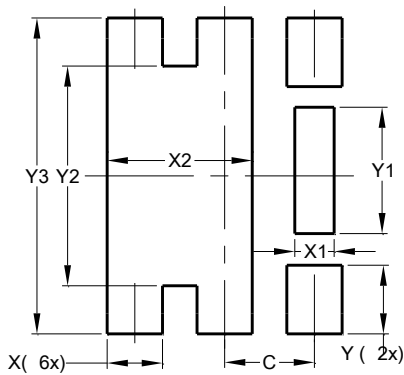


U-DFN2020-6 (Type E)			
Dim	Min	Max	Typ
A	0.57	0.63	0.60
A1	0	0.05	0.03
A3	-	-	0.15
b	0.2	0.35	0.30
b1	0.185	0.285	0.235
D	1.95	2.05	2.00
D2	0.85	1.05	0.95
E	1.95	2.05	2.00
E2	1.40	1.60	1.50
e	-	-	0.65
L	0.25	0.35	0.30
L1	0.82	0.92	0.87
K1	-	-	0.305
K2	-	-	0.225
Z	-	-	0.20
All Dimensions in mm			

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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