20V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)\ max}$	$I_{D\ max}$ T_A = +25°C
20V	9.5mΩ @ V_{GS} = 4.5V	11.7A
	11mΩ @ V_{GS} = 2.5V	10.8A

Description

This new generation 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

- General Purpose Interfacing Switch
- Power Management Functions

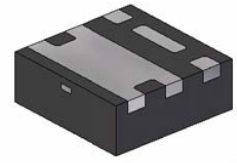
Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm^2
- Low Gate Threshold Voltage
- Low On-Resistance
- ESD Protected Gate
- **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**

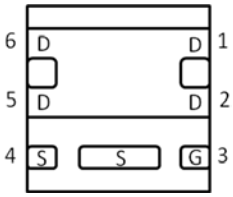
Mechanical Data

- 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)

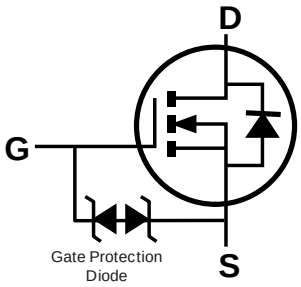
U-DFN2020-6



Bottom View



Bottom View
Pin Out



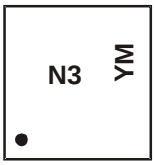
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Quantity per reel
DMN2011UFDE-7	N3	7	3,000
DMN2011UFDE-13	N3	13	10,000

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



N3 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: A = 2013)
M = Month (ex: 9 = September)

Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

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 T_A = +70°C	I_D	11.7 9.3	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	14.2 11.4	A
Continuous Drain Current (Note 6) V_{GS} = 2.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	10.8 8.7	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	13.2 10.6	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	80	A
Maximum Body Diode Continuous Current			I_S	2.5	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	18	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	17	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.61	W
	T_A = +70°C		0.39	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	209	°C/W
	t<10s		142	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.97	W
	T_A = +70°C		1.27	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	64	°C/W
	t<10s		43	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	9.8	
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} = 16V, V_{GS} = 0V
Zero Gate Voltage Drain Current T_J = +150°C (Note 9)	I_{DSS}	—	—	100	μA	V_{DS} = 16V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	μA	V_{GS} = ±10V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	0.4	—	1.0	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	6.5	9.5	mΩ	V_{GS} = 4.5V, I_D = 7A
			7.5	11		V_{GS} = 2.5V, I_D = 7A
			10	20		V_{GS} = 1.8V, I_D = 5A
			15	35		V_{GS} = 1.5V, I_D = 3A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 8.5A
On State Drain Current (Note 9)	$I_{D(ON)}$	20	—	—	A	V_{DS} ≦5V, V_{GS} = 4.5V
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	2248	3372	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	295	443	pF	
Reverse Transfer Capacitance	C_{rss}	—	265	398	pF	
Gate Resistance	R_g	—	1.5	3	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	24	36	nC	V_{DS} = 10V, I_D = 8.5A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	56	84	nC	
Gate-Source Charge	Q_{gs}	—	3.5	6	nC	
Gate-Drain Charge	Q_{gd}	—	5.1	8	nC	
Turn-On Delay Time	$t_{D(on)}$	—	3.6	6	ns	V_{DS} = 10V, I_D = 8.5A V_{GS} = 4.5V, R_G = 1.8Ω
Turn-On Rise Time	t_r	—	2.6	4	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	21.6	33	ns	
Turn-Off Fall Time	t_f	—	13.5	21	ns	
Reverse Recovery Time	T_{rr}	—	12.8	20	ns	I_F = 8.5A, di/dt = 210A/μs
Reverse Recovery Charge	Q_{rr}	—	6.9	11	nC	

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} rating 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.

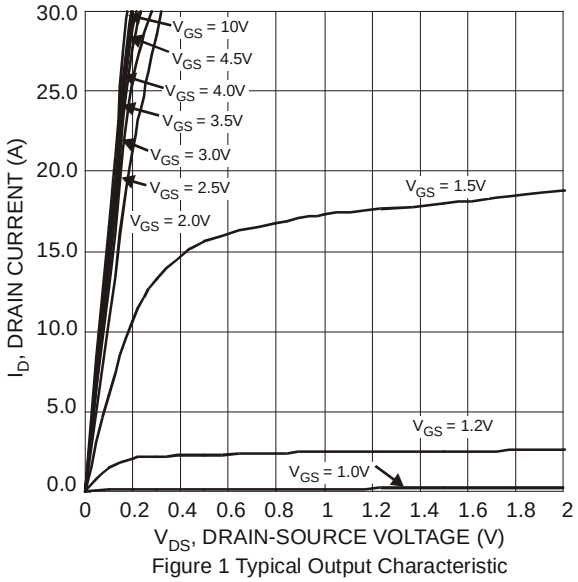


Figure 1 Typical Output Characteristic

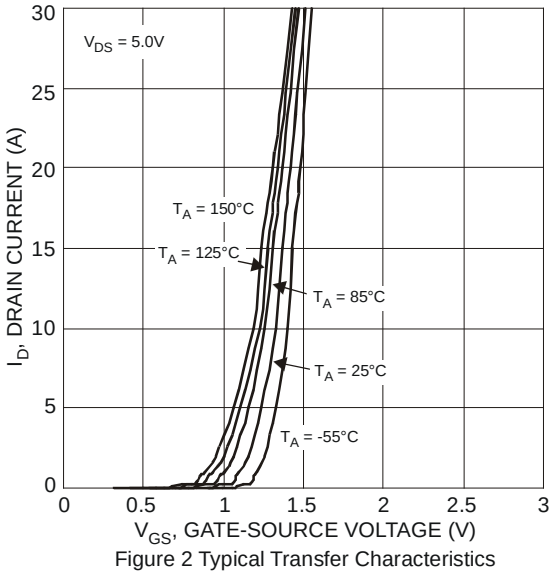


Figure 2 Typical Transfer Characteristics

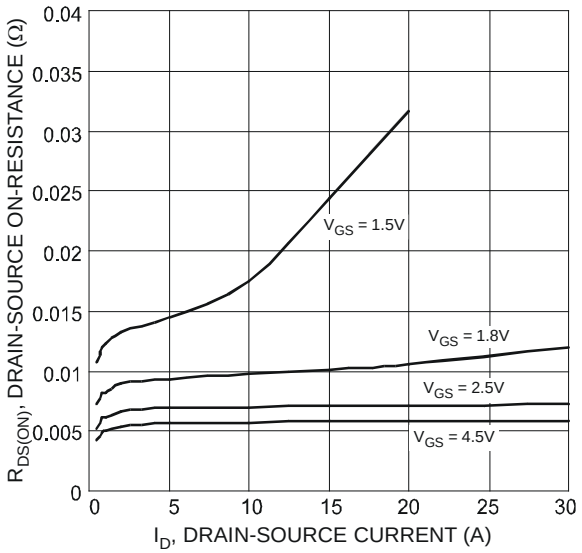


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

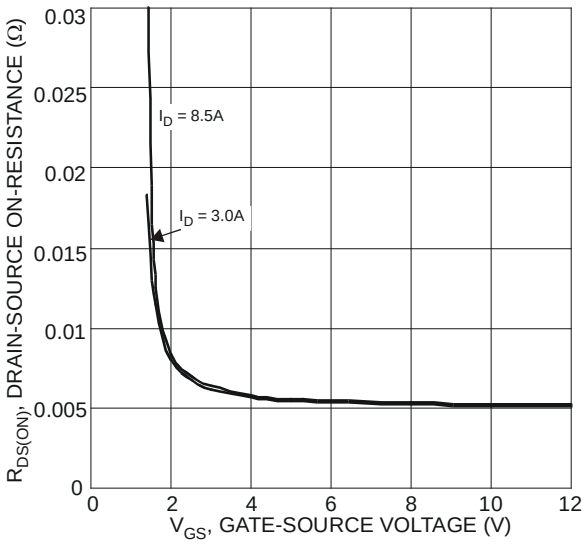


Figure 4 Typical Transfer Characteristics

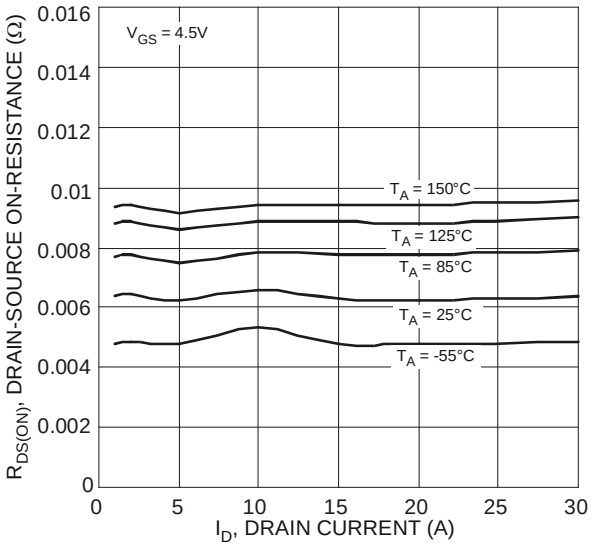


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

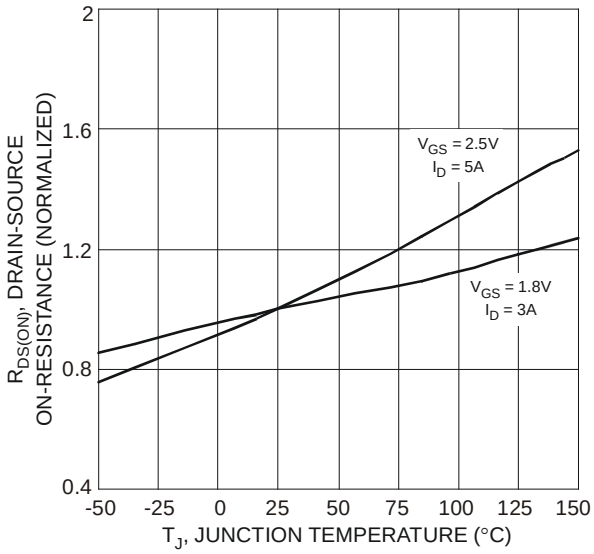


Figure 6 On-Resistance Variation with Temperature

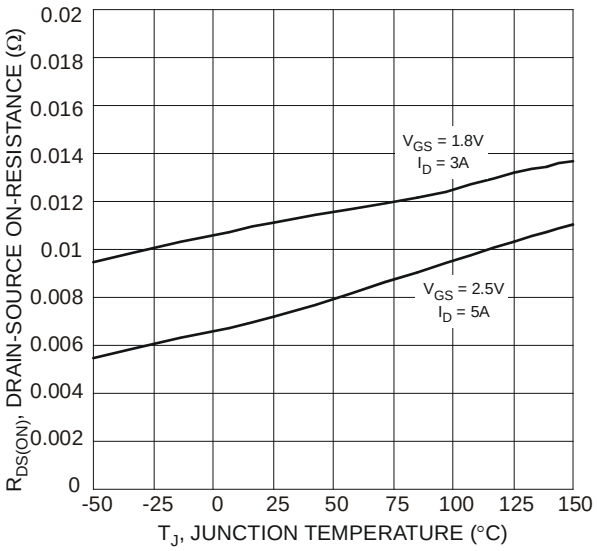


Figure 7 On-Resistance Variation with Temperature

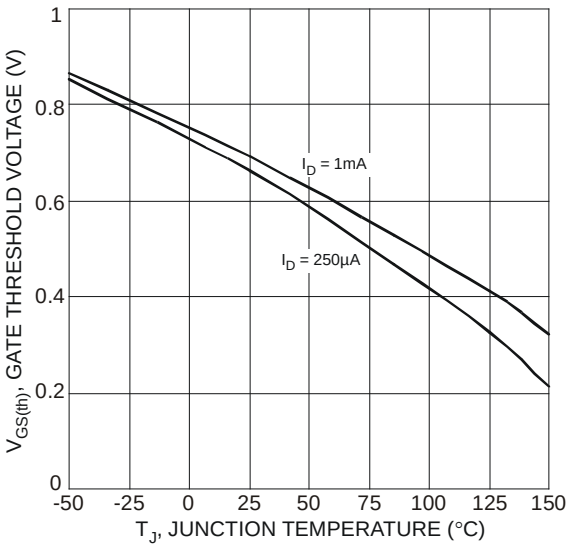


Figure 8 Gate Threshold Variation vs. Ambient Temperature

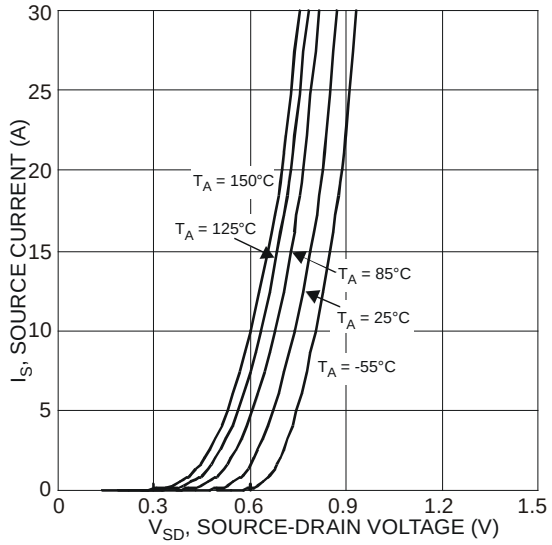


Figure 9 Diode Forward Voltage vs. Current

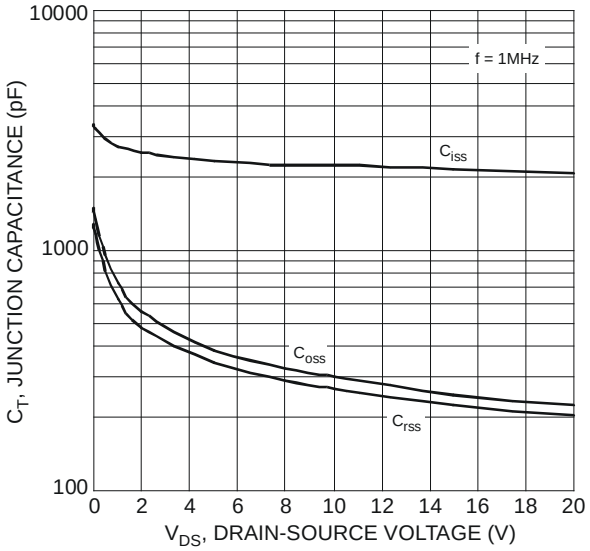


Figure 10 Typical Junction Capacitance

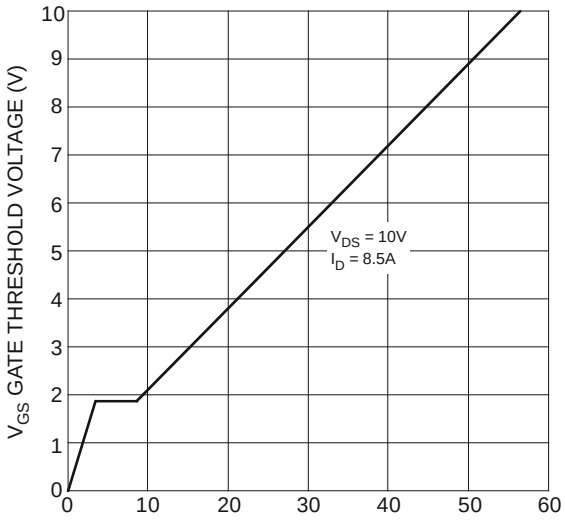


Figure 11 Gate Charge

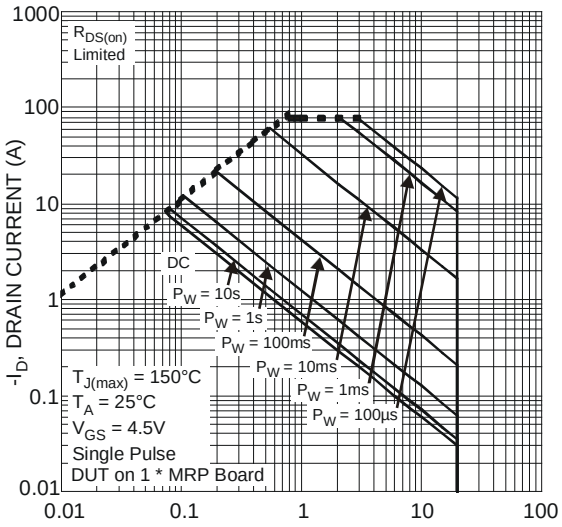


Figure 12 SOA, Safe Operation Area

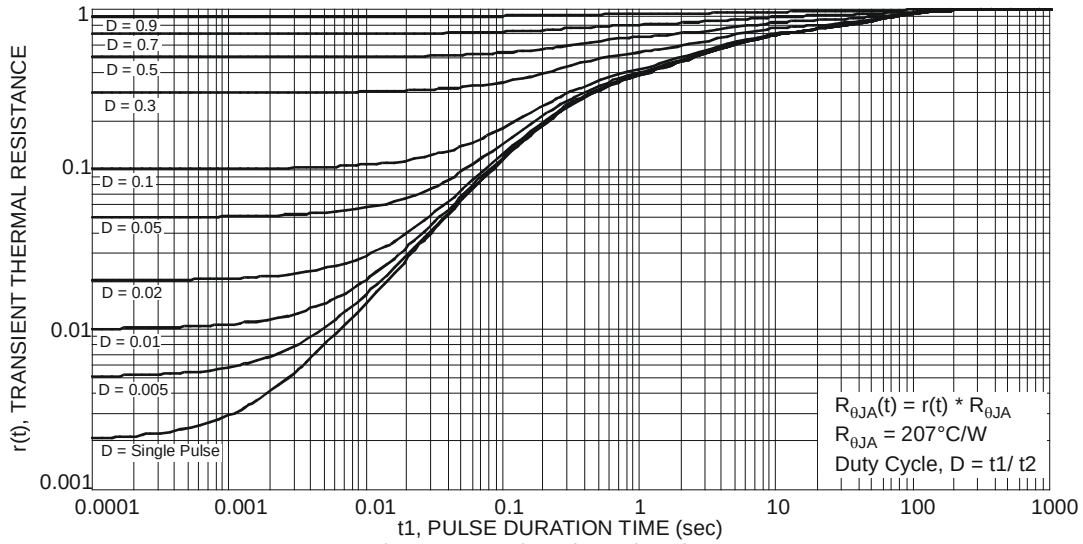
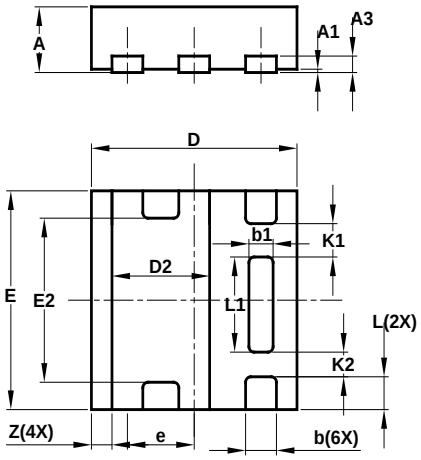


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

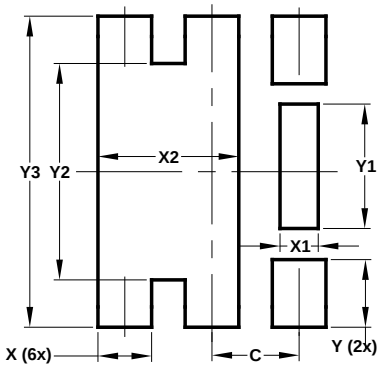
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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 AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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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