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

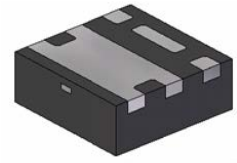
- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm^2
- Low Gate Threshold Voltage
- Low On-Resistance
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

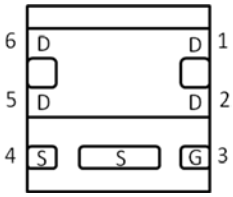
- Case: U-DFN2020-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.0065 grams (Approximate)



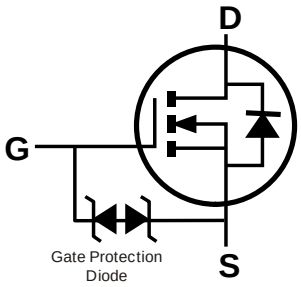
U-DFN2020-6



Bottom View



Bottom View
Pin Out



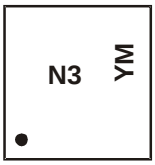
Equivalent Circuit

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

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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

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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.

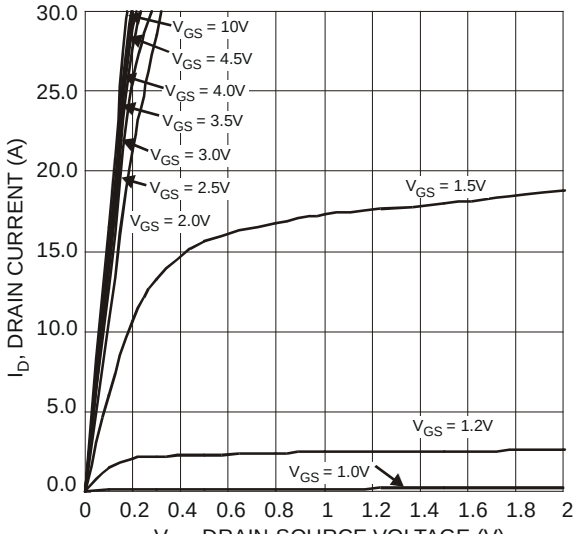


Figure 1 Typical Output Characteristic

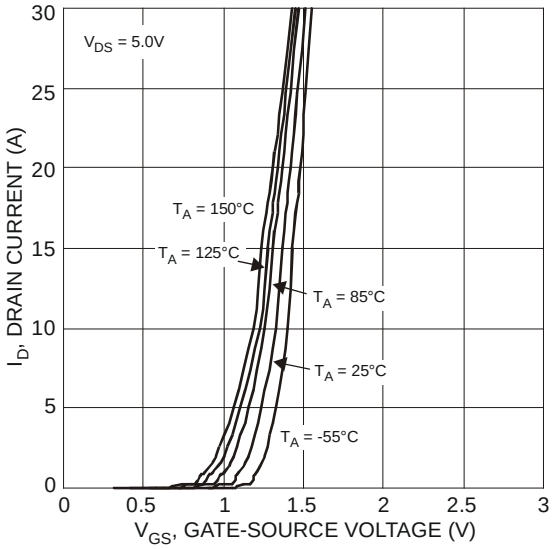


Figure 2 Typical Transfer Characteristics

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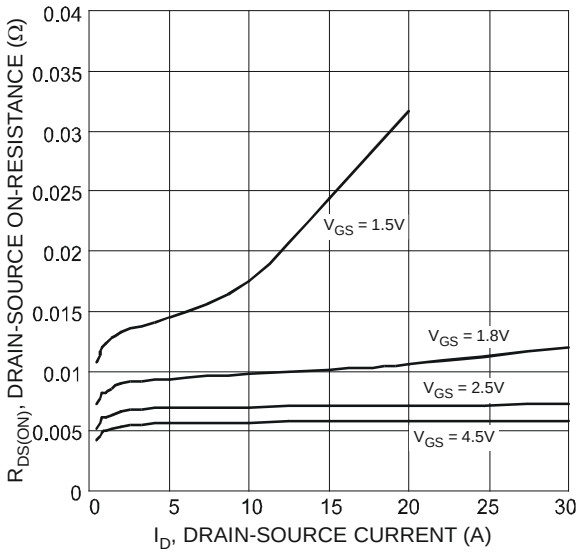


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

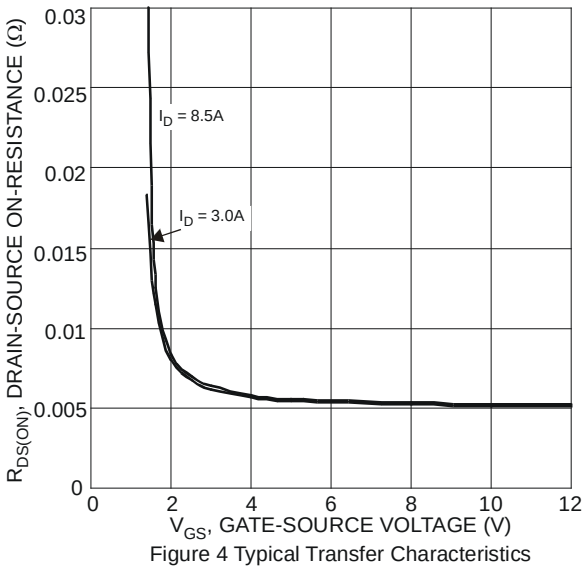


Figure 4 Typical Transfer Characteristics

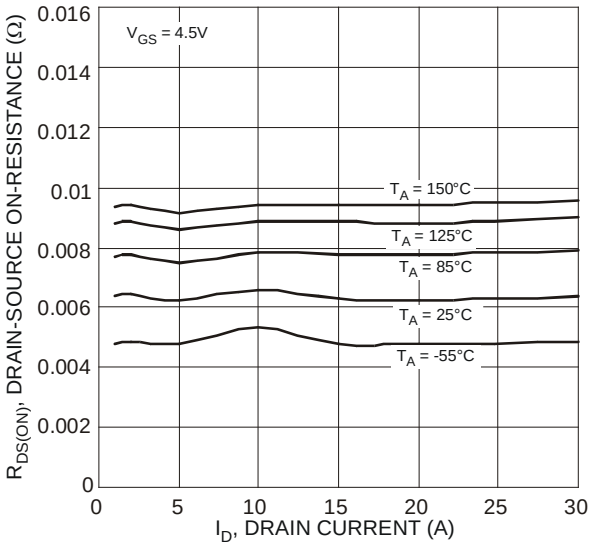


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

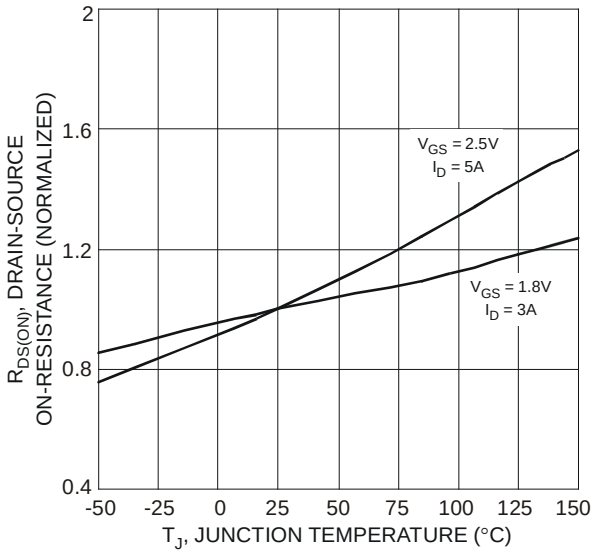


Figure 6 On-Resistance Variation with Temperature

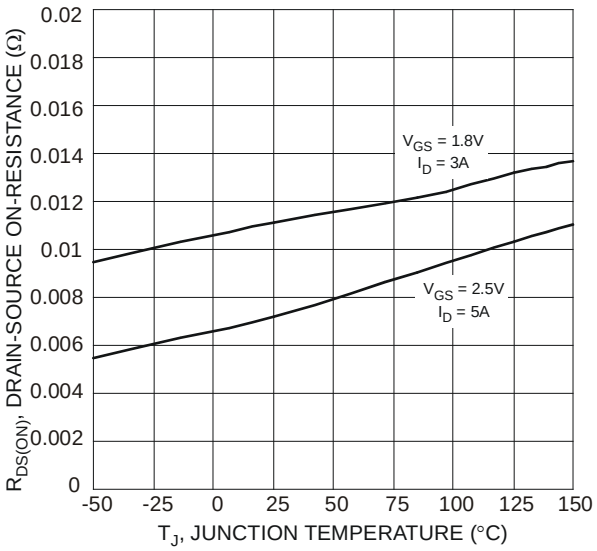


Figure 7 On-Resistance Variation with Temperature

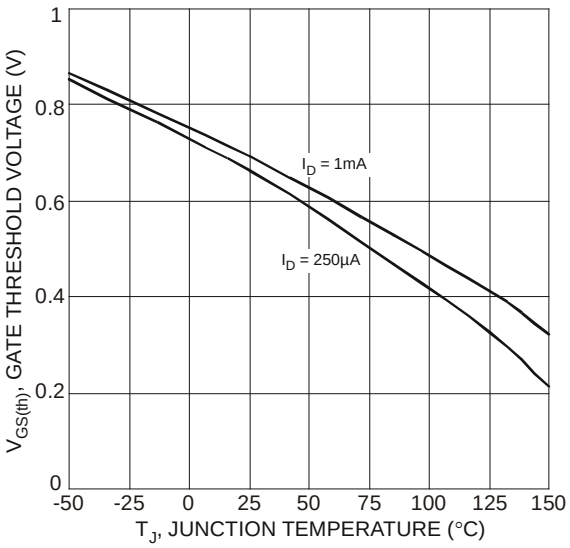


Figure 8 Gate Threshold Variation vs. Ambient Temperature

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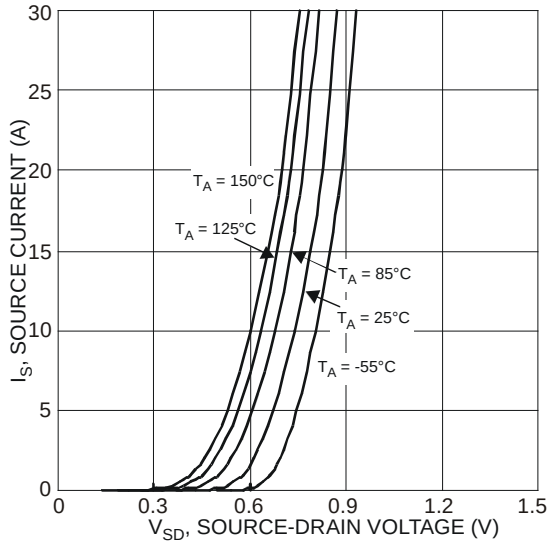


Figure 9 Diode Forward Voltage vs. Current

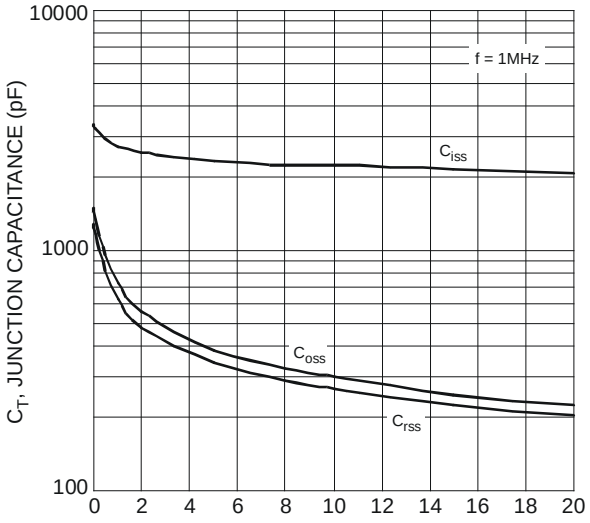


Figure 10 Typical Junction Capacitance

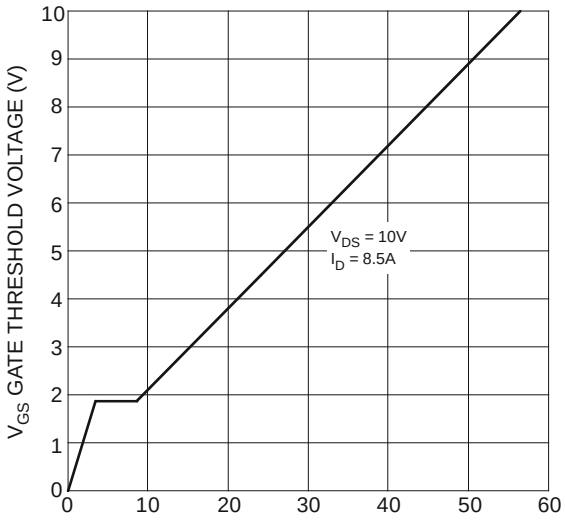


Figure 11 Gate Charge

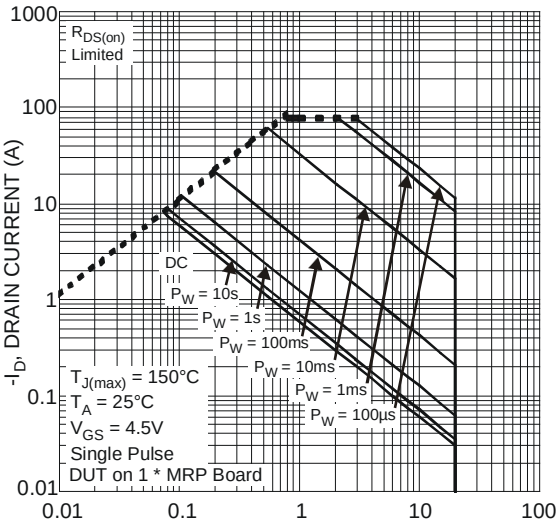


Figure 12 SOA, Safe Operation Area

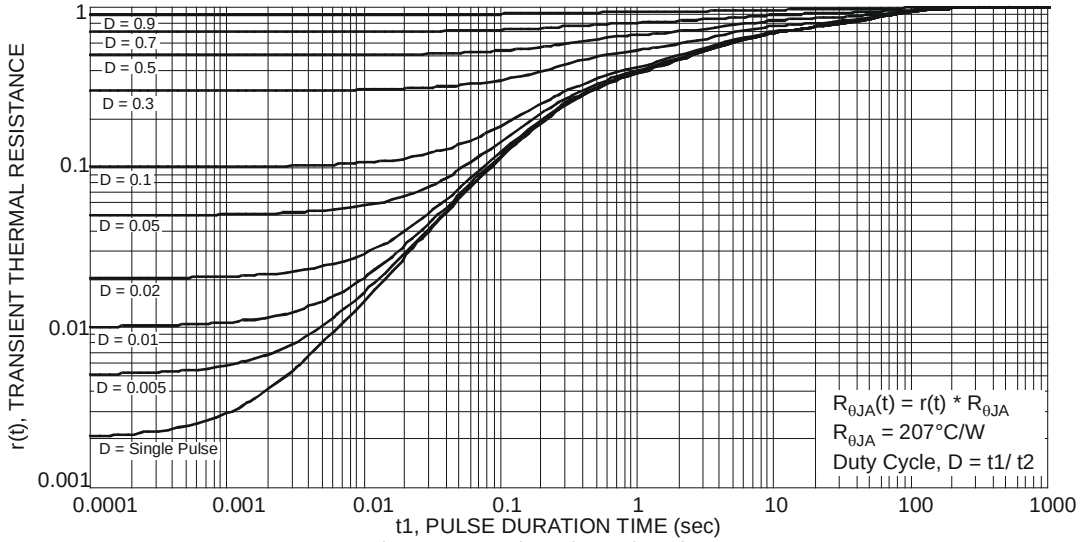
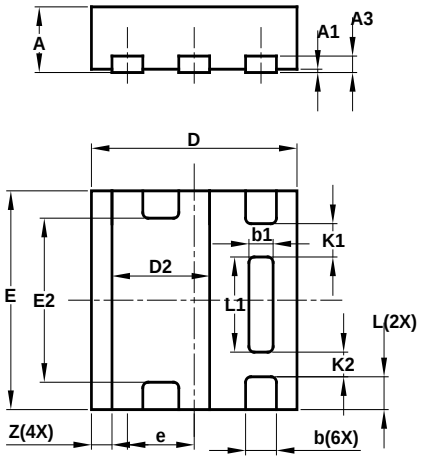


Figure 13 Transient Thermal Resistance

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Package Outline Dimensions

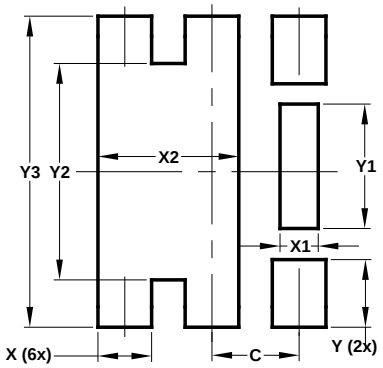
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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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