

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_A = +25^\circ\text{C}$
40V	20m $\Omega$ @ $V_{GS} = 10\text{V}$	8.0A
	28m $\Omega$ @ $V_{GS} = 4.5\text{V}$	6.7A

## Description and Applications

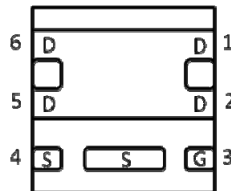
This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- General Purpose Interfacing Switch
- Power Management Functions

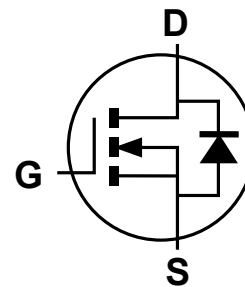
U-DFN2020-6 Type E



Bottom View



Pin Out



Equivalent Circuit

## Features and Benefits

- 0.6mm profile – ideal for low profile applications
- PCB footprint of 4mm<sup>2</sup>
- Low Gate Threshold Voltage
- 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**

## Mechanical Data

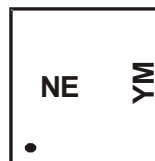
- Case: U-DFN2020-6 Type E
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.0065 grams (approximate)

## Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Quantity per reel
DMN4020LFDE-7	NE	7	3,000
DMN4020LFDE-7	NE	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](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



NE = 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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	40	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	8.0 6.3	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	9.5 7.5	A
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	6.7 5.3	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	8.0 6.4	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I <sub>DM</sub>	32	A
Maximum Body Diode Continuous Current			I <sub>S</sub>	2.5	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.66	W
	T <sub>A</sub> = +70°C		0.42	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	189	°C/W
	t < 10s		132	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	2.03	W
	T <sub>A</sub> = +70°C		1.31	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R <sub>θJA</sub>	61	°C/W
	t < 10s		43	
Thermal Resistance, Junction to Case (Note 6)		R <sub>θJC</sub>	9.3	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	-	-	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	-	-	1	µA	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.4	-	2.4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	-	15	20	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 8A V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4A
			20	28		
Diode Forward Voltage	V <sub>SD</sub>	-	0.7	1	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	-	1060	-	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	84	-	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	-	58	-	pF	
Gate Resistance	R <sub>g</sub>	-	1.6	-	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	-	8.8	-	nC	V <sub>DS</sub> = 20V, I <sub>D</sub> = 8A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	-	19.1	-	nC	
Gate-Source Charge	Q <sub>gs</sub>	-	3.0	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>	-	2.5	-	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	-	5.3	-	ns	V <sub>DS</sub> = 20V, R <sub>L</sub> = 2.5Ω V <sub>GS</sub> = 10V, R <sub>G</sub> = 3Ω
Turn-On Rise Time	t <sub>r</sub>	-	7.1	-	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	-	15.1	-	ns	
Turn-Off Fall Time	t <sub>f</sub>	-	4.8	-	ns	
Reverse Recovery Time	t <sub>rr</sub>	-	10.5	-	ns	I <sub>F</sub> = 8A, di/dt = 100A/µs
Reverse Recovery Charge	Q <sub>rr</sub>	-	4.15	-	nC	

- Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate
  7. Short duration pulse test used to minimize self-heating effect
  8. Guaranteed by design. Not subject to production testing

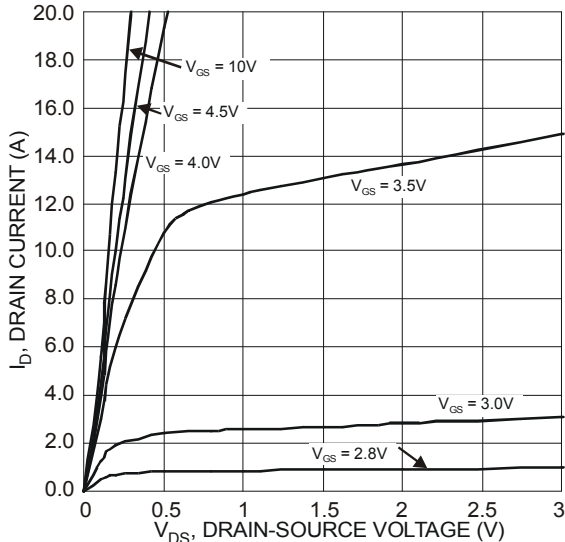


Figure 1 Typical Output Characteristic

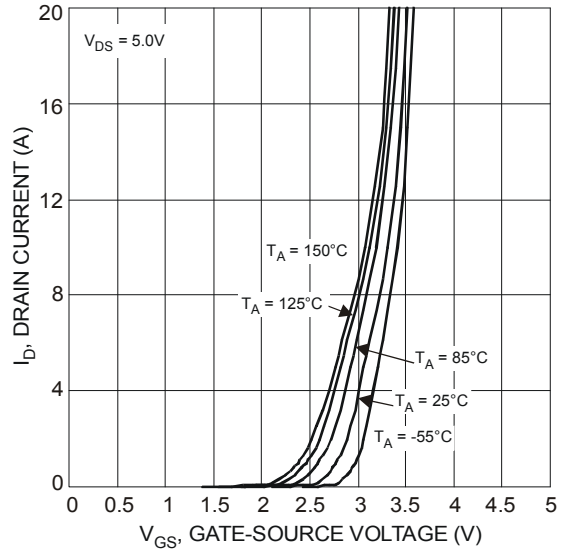


Figure 2 Typical Transfer Characteristics

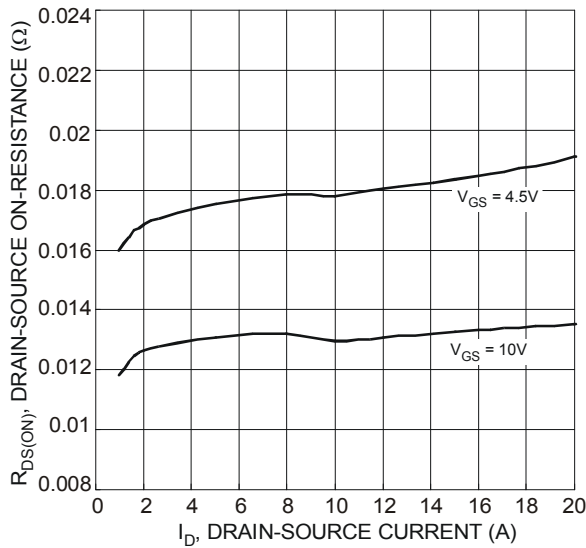


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

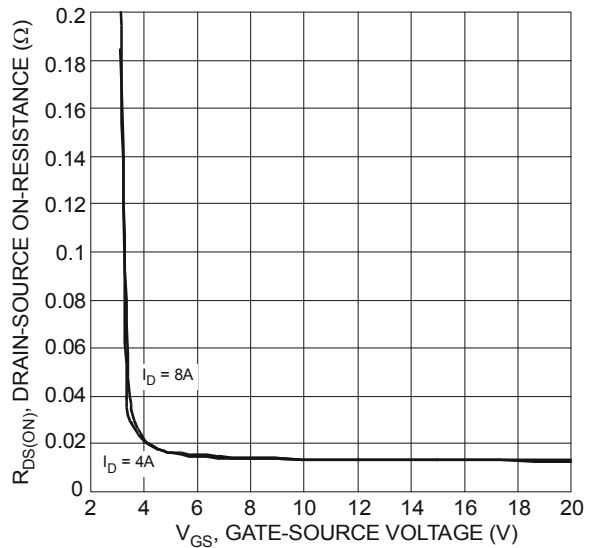


Figure 4 Typical Transfer Characteristics

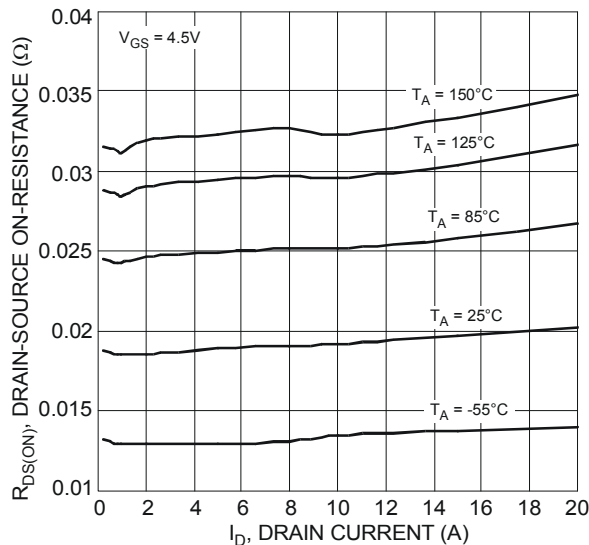


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

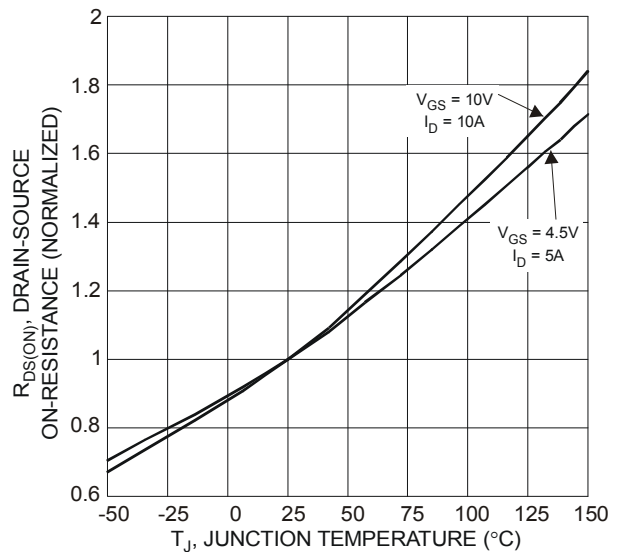


Figure 6 On-Resistance Variation with Temperature

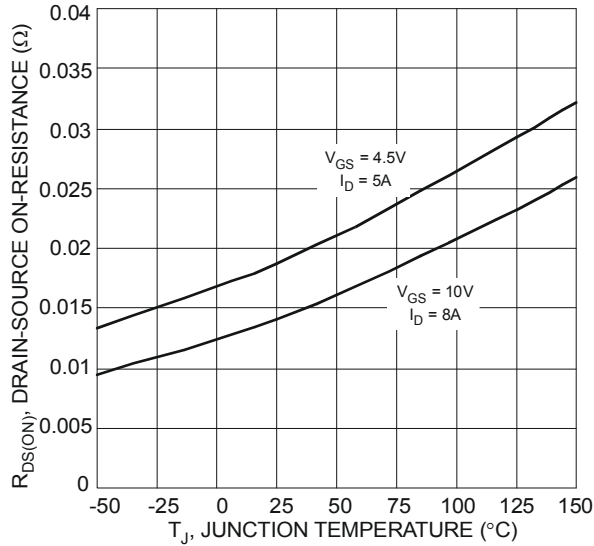


Figure 7 On-Resistance Variation with Temperature

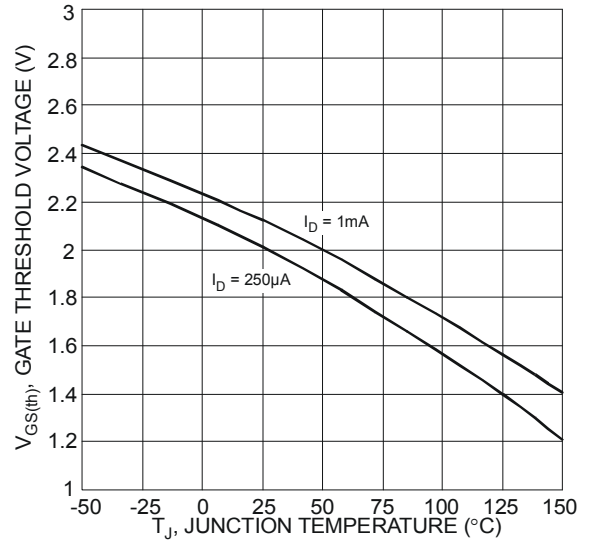


Figure 8 Gate Threshold Variation vs. Ambient Temperature

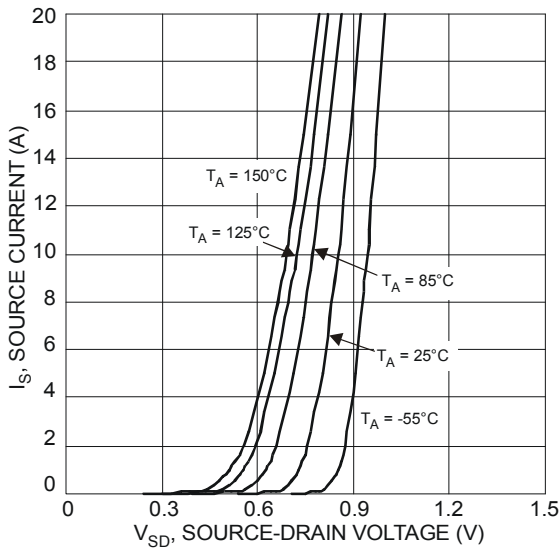


Figure 9 Diode Forward Voltage vs. Current

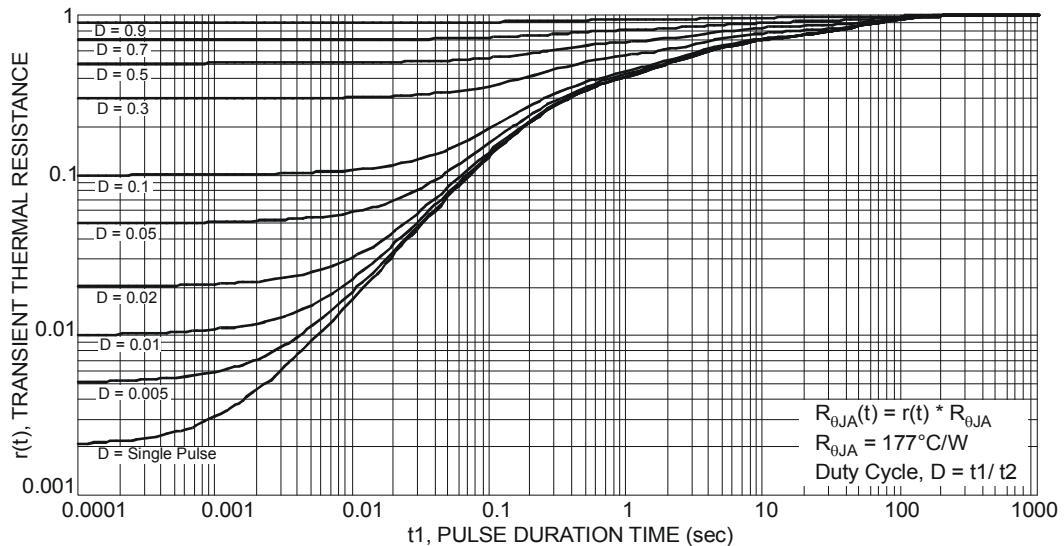
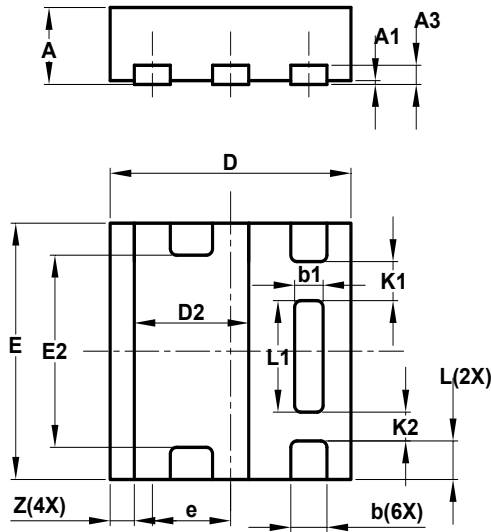


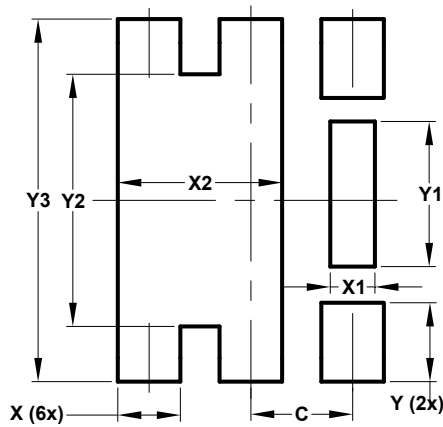
Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**



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**



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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