

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ max}$	$I_D \text{ max}$ $T_A = +25^\circ\text{C}$
20V	14 mΩ @ $V_{GS} = 4.5\text{V}$	9 A
	20 mΩ @ $V_{GS} = 2.5\text{V}$	7.5 A

## 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

- Power management functions
- Load Switch

## Features and Benefits

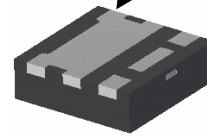
- Typical off board profile of 0.5mm - ideally suited for thin applications
- Low  $R_{DS(ON)}$  - minimizes conduction losses
- PCB footprint of 2.56mm<sup>2</sup>
- ESD Protected Gate
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 standards for High Reliability

## Mechanical Data

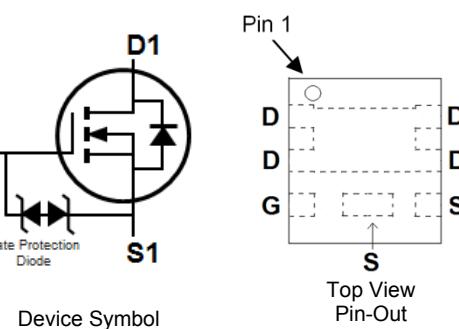
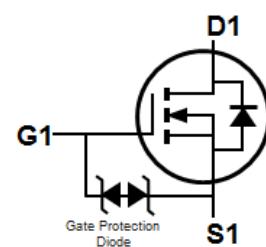
- Case: X1-DFN1616-6 Type E
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Lead Free Plating (NiPdAu Finish over Copper leadframe).
- Terminals: Solderable per MIL-STD-202, Method 208 **e4**
- Weight: 0.04 grams (approximate)



Top View



Bottom View


 Top View  
Pin-Out

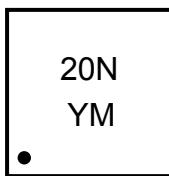
## Ordering Information (Note 4)

Product	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN2020UFCL-7	7	8	3,000

## Notes:

- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- 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.
- Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



20N = 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** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	20	V
Gate-Source Voltage			$V_{GSS}$	$\pm 10$	V
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	$I_D$	9	A
Pulsed Drain Current (Note 7)			$I_{DM}$	7.1	A
				45	A

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	$P_D$	0.61	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 5)	$R_{\theta JA}$	205	°C/W
Power Dissipation (Note 6)	$P_D$	2.0	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 6)	$R_{\theta JA}$	62	°C/W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C

**Electrical Characteristics N-CHANNEL – Q1** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$I_{DSS}$	—	—	1.0	$\mu\text{A}$	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	10	$\mu\text{A}$	$V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	$V_{GS(\text{th})}$	0.4	—	0.9	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(\text{ON})}$	—	10 12 14	14 20 26	$\text{m}\Omega$	$V_{GS} = 4.5\text{V}, I_D = 9\text{A}$ $V_{GS} = 2.5\text{V}, I_D = 7.5\text{A}$ $V_{GS} = 1.8\text{V}, I_D = 7\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 1.6\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	1788	—	$\text{pF}$	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	162	—	$\text{pF}$	
Reverse Transfer Capacitance	$C_{rss}$	—	150	—	$\text{pF}$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Gate Resistance	$R_g$	—	1.36	—	$\Omega$	
Total Gate Charge	$Q_g$	—	21.5	—	$\text{nC}$	$V_{GS} = 4.5\text{V}, V_{DS} = 10\text{V}, I_D = 3\text{A}$
Gate-Source Charge	$Q_{gs}$	—	2.2	—	$\text{nC}$	
Gate-Drain Charge	$Q_{gd}$	—	2.3	—	$\text{nC}$	$V_{DD} = 10\text{V}, V_{GS} = 4.5\text{V}, I_D = 4\text{A}$ $R_g = 2\Omega$
Turn-On Delay Time	$t_{D(\text{on})}$	—	3.8	—	$\text{ns}$	
Turn-On Rise Time	$t_r$	—	5.7	—	$\text{ns}$	
Turn-Off Delay Time	$t_{D(\text{off})}$	—	33	—	$\text{ns}$	
Turn-Off Fall Time	$t_f$	—	6.8	—	$\text{ns}$	

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. Repetitive rating, pulse width limited by junction temperature.

8. Short duration pulse test used to minimize self-heating effect.

9. Guaranteed by design. Not subject to product testing.

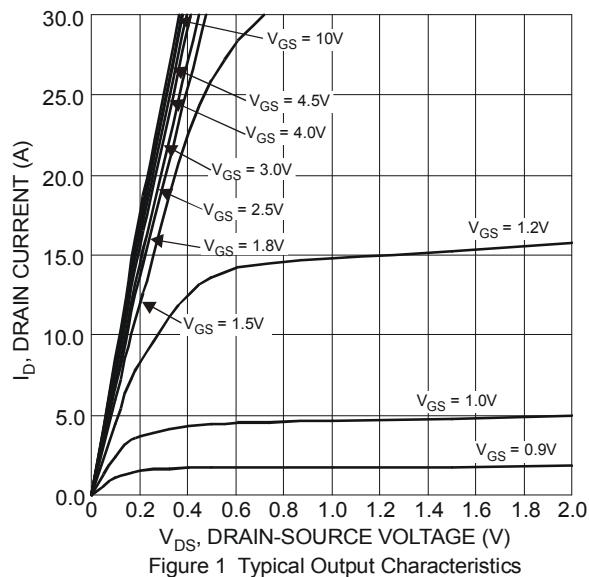


Figure 1 Typical Output Characteristics

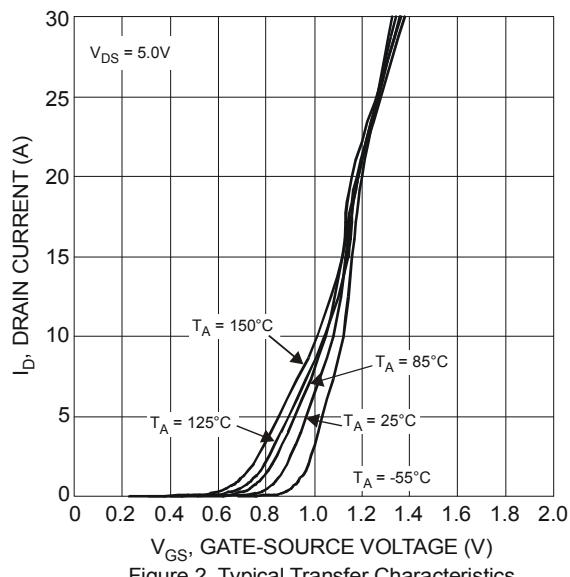


Figure 2 Typical Transfer Characteristics

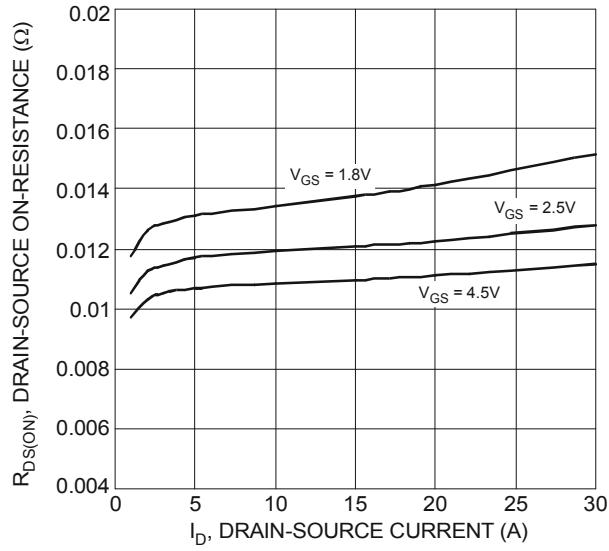


Figure 3 Typical On-Resistance vs.  
Drain Current and Gate Voltage

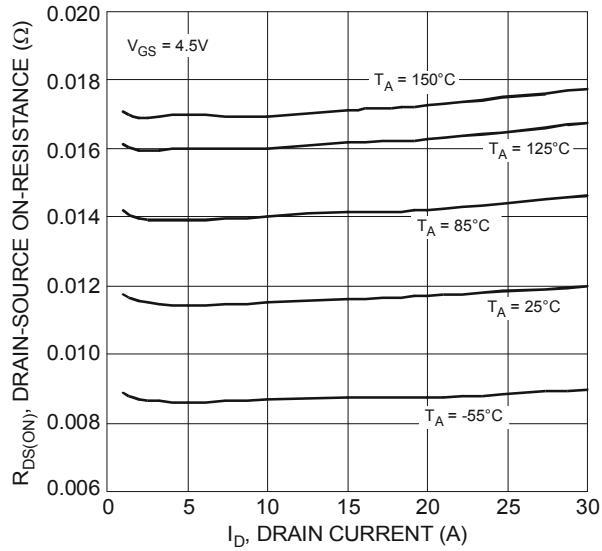


Figure 4 Typical On-Resistance vs.  
Drain Current and Temperature

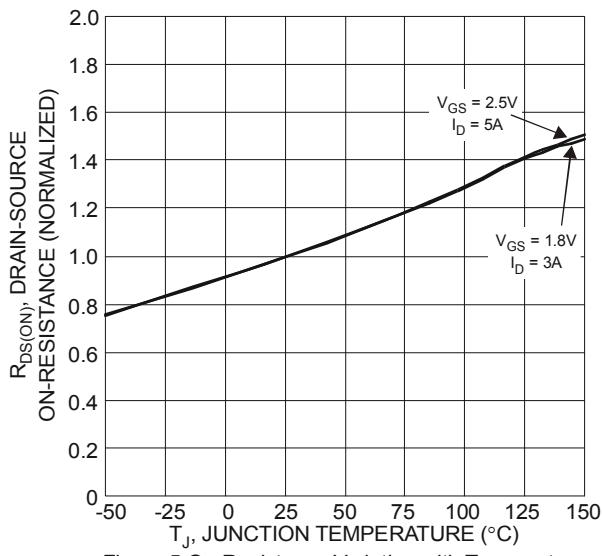


Figure 5 On-Resistance Variation with Temperature

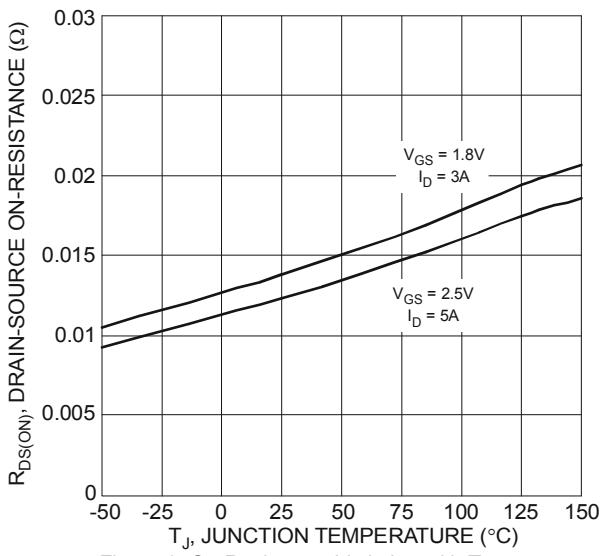


Figure 6 On-Resistance Variation with Temperature

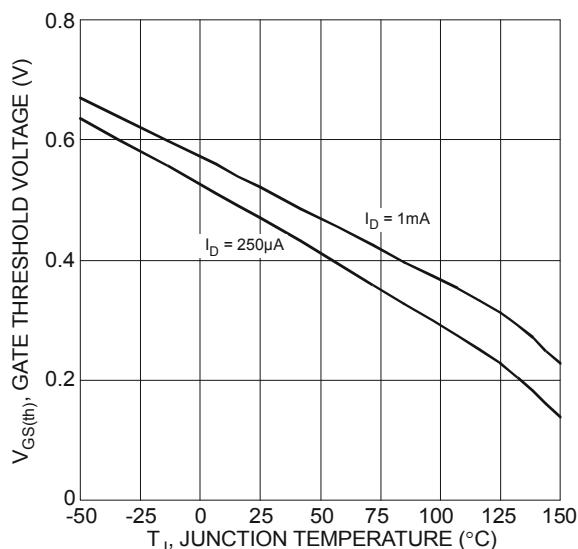


Figure 7 Gate Threshold Variation vs. Ambient Temperature

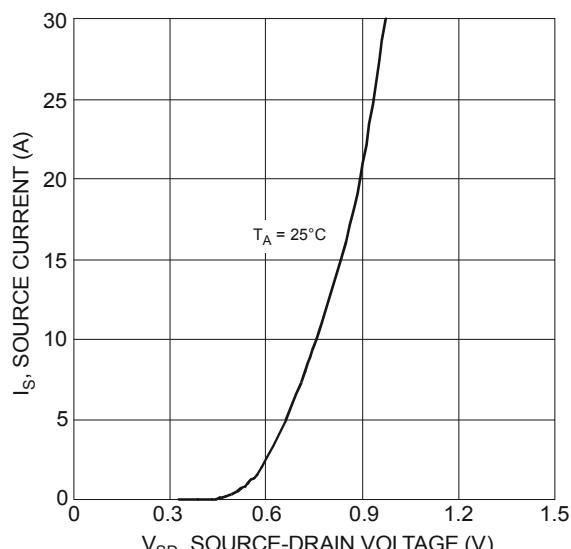


Figure 8 Diode Forward Voltage vs. Current

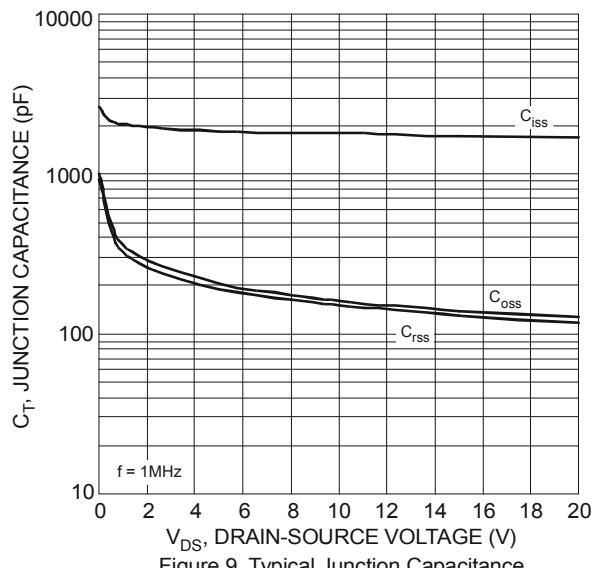


Figure 9 Typical Junction Capacitance

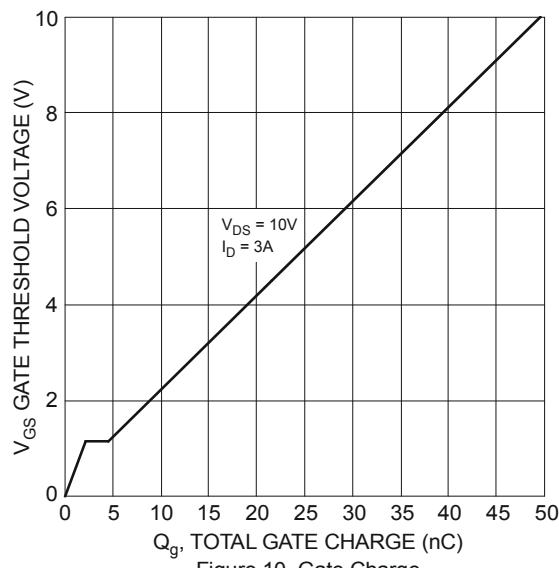


Figure 10 Gate Charge

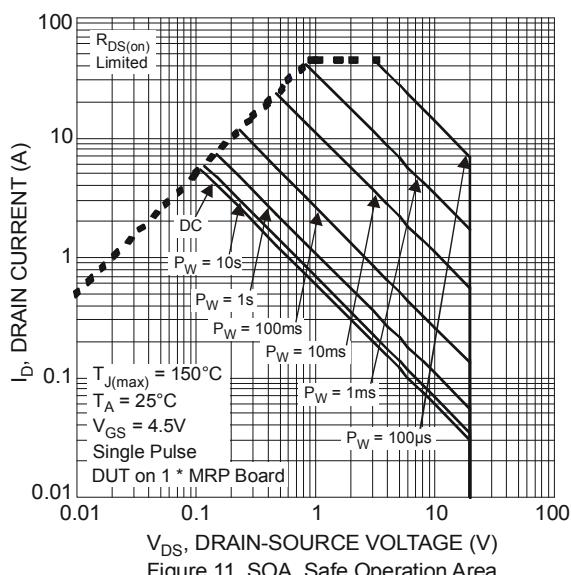
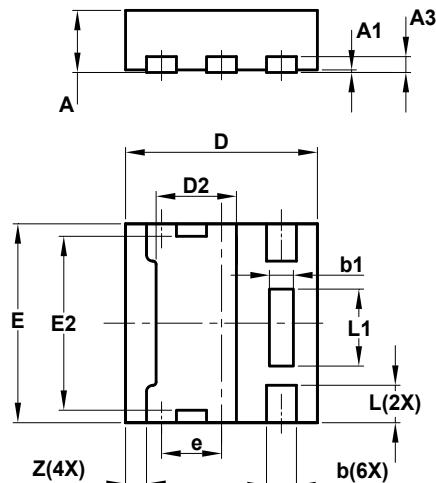


Figure 11 SOA, Safe Operation Area

## Package Outline Dimensions

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

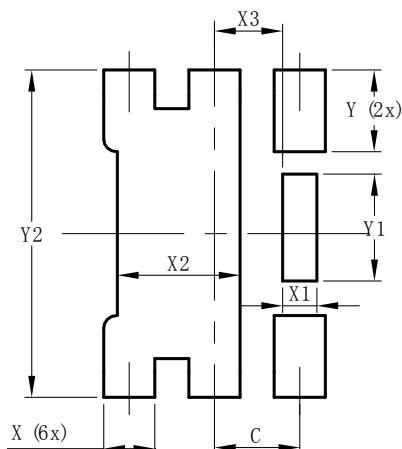


X1-DFN1616-6 Type E			
Dim	Min	Max	Typ
A	0.47	0.53	0.50
A1	0	0.05	0.02
A3	—	—	0.13
b	0.20	0.30	0.25
b1	0.10	0.30	0.20
D	1.55	1.65	1.60
D2	0.57	0.77	0.67
E	1.55	1.65	1.60
E2	1.30	1.50	1.40
e	—	—	0.50
L	0.25	0.35	0.30
L1	0.52	0.72	0.62
Z	—	—	0.175

All Dimensions in mm

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for latest version.



Dimensions	Value (in mm)
C	0.500
X	0.300
X1	0.200
X2	0.720
X3	0.400
Y	0.475
Y1	0.620
Y2	1.900

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