

## Dual N-CHANNEL ENHANCEMENT MODE MOSFET

### Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ max}$	$I_D \text{ max}$ $T_A = +25^\circ\text{C}$
20V	11.5mΩ @ $V_{GS} = 4.5\text{V}$	10 A
	14mΩ @ $V_{GS} = 2.5\text{V}$	9 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

- General Purpose Interfacing Switch
- Power Management Functions

### Features and Benefits

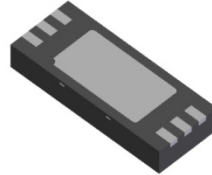
- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected**
- Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 Standards for High Reliability**

### Mechanical Data

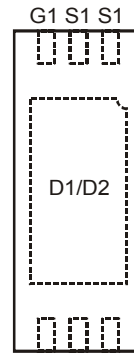
- Case: W-DFN5020-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.03 grams (approximate)



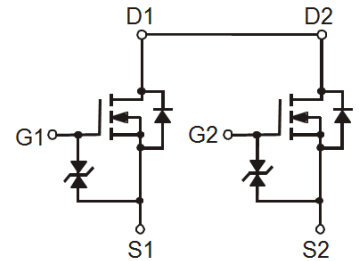
Top View



Bottom View



Top View  
Pin-Out



Equivalent Circuit

### Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2013UFX-7	W-DFN5020-6	3000 / Tape & Reel

- 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



FX = Product Type Marking Code  
YM = Date Code Marking  
Y = Year (ex: X = 2010)  
M = Month (ex: 9 = September)

#### Date Code Key

Year	2010	2011	2012	2013	2014	2015	2016
Code	X	Y	Z	A	B	C	D

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	Unit
Drain-Source Voltage			V <sub>DSS</sub>	20	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	10 8	A
Continuous Drain Current (Note 5) V <sub>GS</sub> = 2.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	9 7	A
Pulsed Drain Current (Note 7)			I <sub>DM</sub>	80	A

**Thermal Characteristics**

Characteristic	Symbol	Max	Unit
Power Dissipation (Note 5)	P <sub>D</sub>	0.78	W
Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 5)	R <sub>θJA</sub>	163	°C/W
Power Dissipation (Note 6)	P <sub>D</sub>	2.14	W
Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 6)	R <sub>θJA</sub>	59	°C/W
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 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	20	—	—	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> = 16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.5	—	1.1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	8.4	11.5	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 8.5A
			8.5	12.0		V <sub>GS</sub> = 4.0V, I <sub>D</sub> = 8.5A
			8.6	12.5		V <sub>GS</sub> = 3.5V, I <sub>D</sub> = 8.5A
			9.0	13.5		V <sub>GS</sub> = 3.1V, I <sub>D</sub> = 8A
			9.6	14.0		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 8A
Forward Transfer Admittance	Y <sub>fs</sub>	—	18.2	—	S	V <sub>DS</sub> = 5V, I <sub>D</sub> = 4A
Diode Forward Voltage	V <sub>SD</sub>	—	—	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 8.5A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	2607	—	pF	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	255	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	236	—	pF	
Gate Resistance	R <sub>g</sub>	—	1.2	—	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>	—	32.4	—	nC	V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.5A
Total Gate Charge (V <sub>GS</sub> = 8V)	Q <sub>g</sub>	—	57.4	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	3.5	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	4.0	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	8.6	—	ns	V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.5A V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 1.8Ω
Turn-On Rise Time	t <sub>r</sub>	—	20.3	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	42.5	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	13.7	—	ns	

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

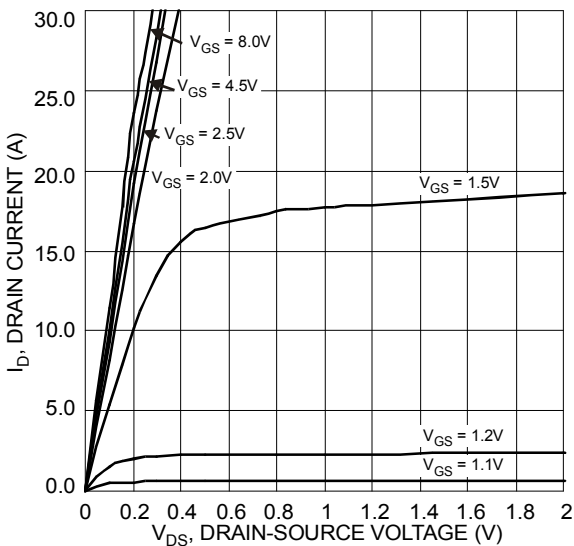


Figure 1 Typical Output Characteristic

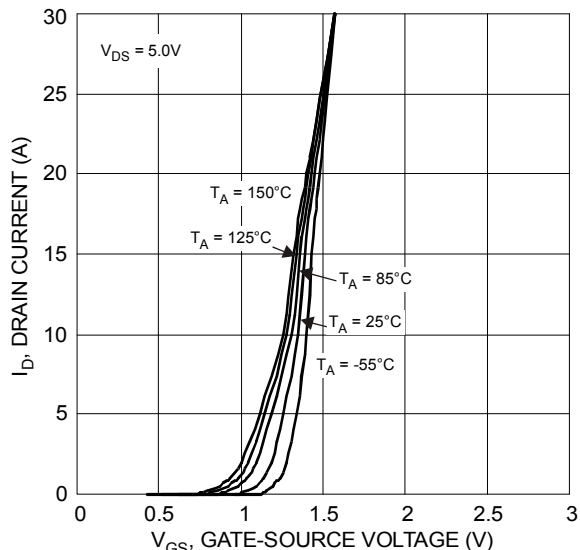


Figure 2 Typical Transfer Characteristics

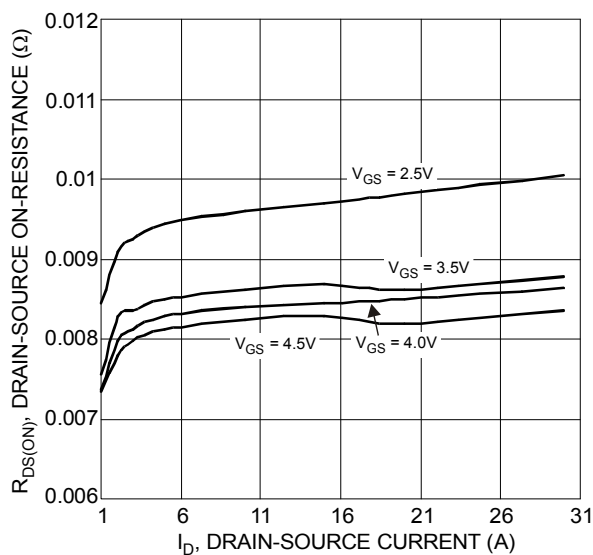


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

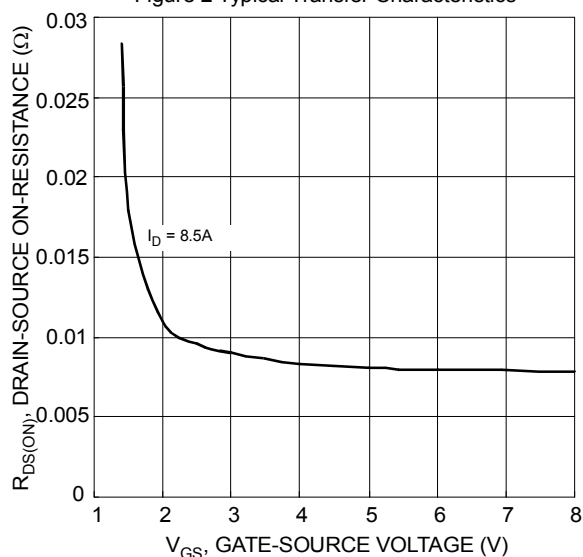


Figure 4 Typical Transfer Characteristic

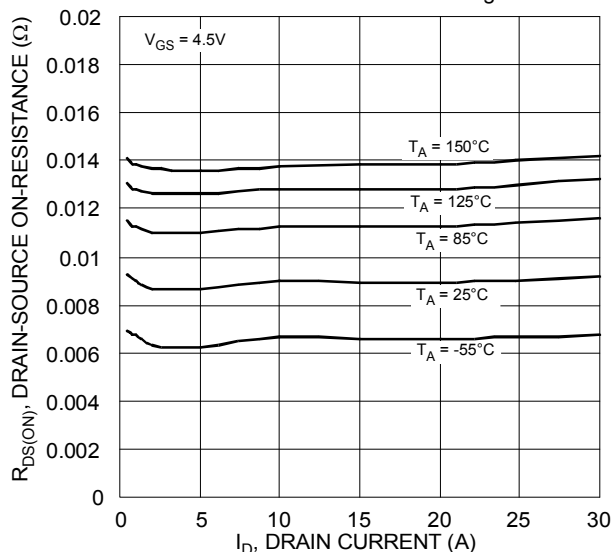


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

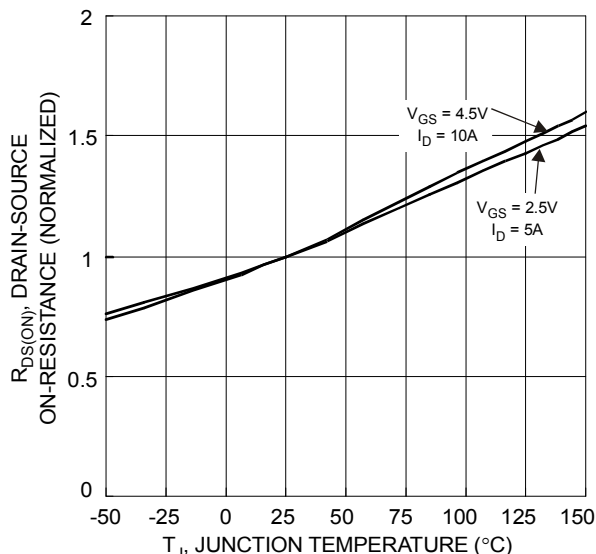


Figure 6 On-Resistance Variation with Temperature

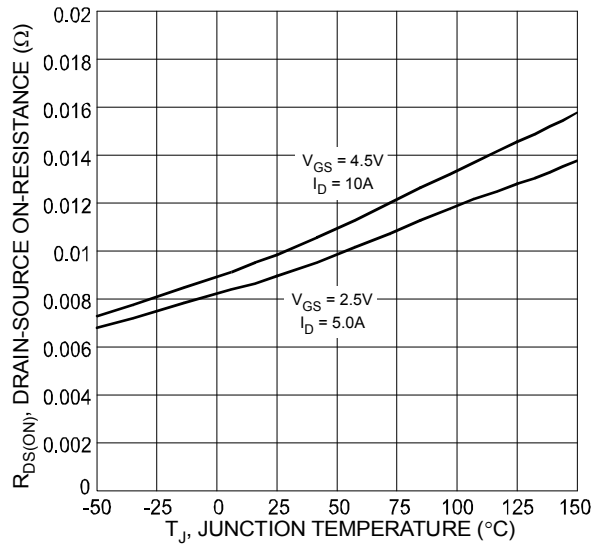


Figure 7 On-Resistance Variation with Temperature

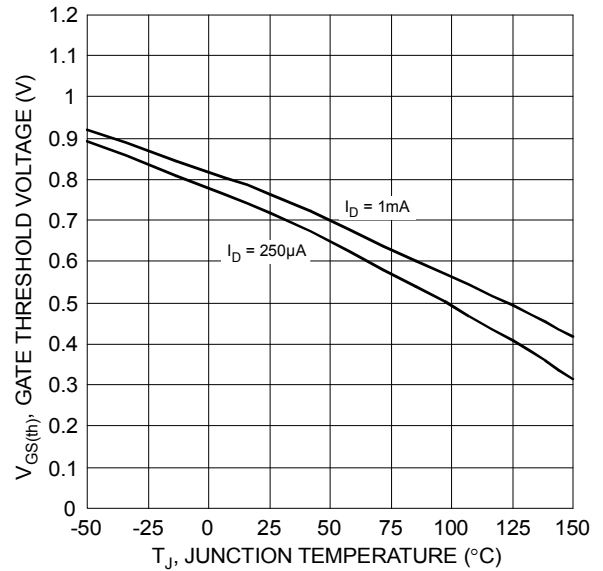


Figure 8 Gate Threshold Variation vs. Ambient Temperature

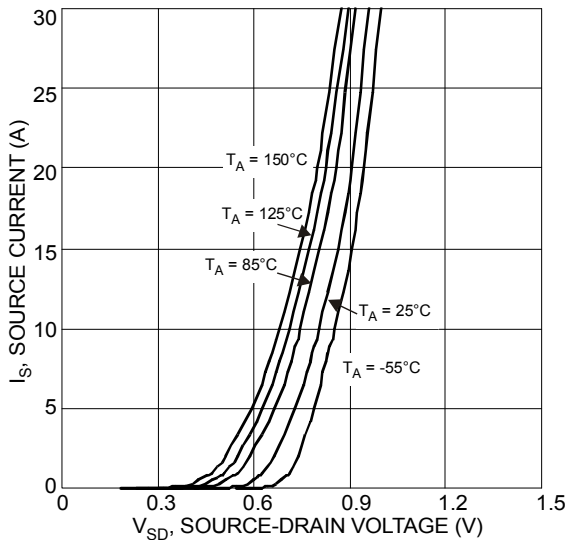


Figure 9 Diode Forward Voltage vs. Current

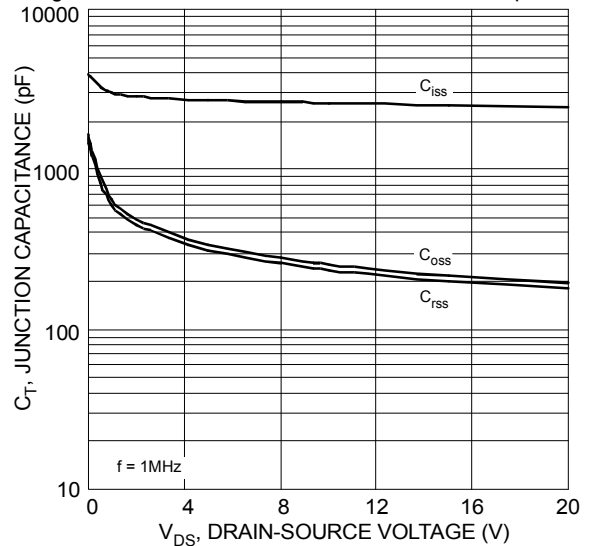


Figure 10 Typical Junction Capacitance

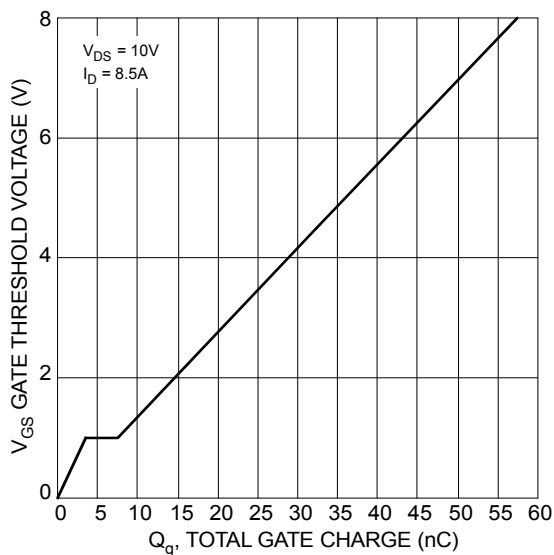
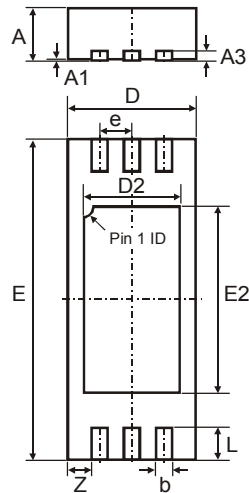


Figure 11 Gate Charge

## Package Outline Dimensions

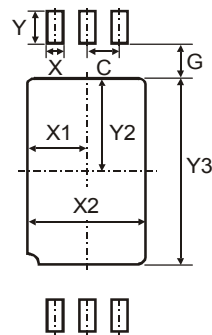
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



W-DFN5020-6			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0	0.05	0.02
A3	—	—	0.15
b	0.20	0.30	0.25
D	1.90	2.10	2.00
D2	1.40	1.60	1.50
e	—	—	0.50
E	4.90	5.10	5.00
E2	2.80	3.00	2.90
L	0.35	0.65	0.50
Z	—	—	0.375
All Dimensions in mm			

## Suggested Pad Layout

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



Dimensions	Value (in mm)
C	0.50
G	0.35
X	0.35
X1	0.90
X2	1.80
Y	0.70
Y2	1.60
Y3	3.20

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