



#### 25V P-CHANNEL ENHANCEMENT MODE MOSFET

### **Product Summary**

V <sub>(BR)DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub> T <sub>A</sub> = 25°C
251/	$26mΩ @ V_{GS} = -4.5V$	-7.3
-25V	40mΩ @ V <sub>GS</sub> = -1.8V	-6.0

# **Features and Benefits**

- Low R<sub>DS(ON)</sub> ensures on state losses are minimized
- 0.4mm profile ideal for low profile applications
- PCB footprint of 4mm<sup>2</sup>
- Low Input Capacitance
- ESD Protected Gate
- Lead, Halogen, and Antimony Free, RoHS Compliant (Note 1)
- "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

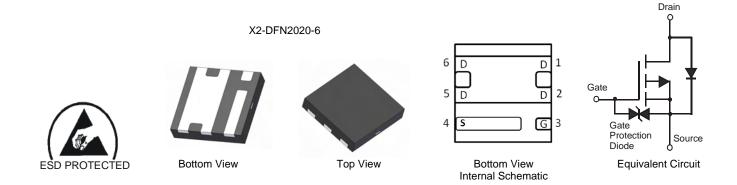
### **Description and Applications**

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

- Load Switching
- Battery Management Application
- Power Management Functions

#### **Mechanical Data**

- Case: X2-DFN2020-6
- 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
- Terminals: Finish NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.006 grams (approximate)



## **Ordering Information (Note 3)**

Part Number	Case	Packaging
DMP2039UFDE4-7	X2-DFN2020-6	3,000/Tape & Reel

Notes:

- 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free.
- 2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com.
- 3. For packaging details, go to our website at http://www.diodes.com.

## **Marking Information**



PD = Product Type Marking Code YM = Date Code Marking Y = Year (ex: Y = 2011) M = Month (ex: 9 = September) Dot Denotes Pin 1

Date Code Key

Year	201	1	2012		2013		2014			2016		2017
Code	Υ		Z		Α		В			D		Е
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	0	N	D



# **Maximum Ratings** @ $T_A = 25$ °C unless otherwise specified

Characteristic	Symbol	Value	Units			
Drain-Source Voltage	V <sub>DSS</sub>	-25	V			
Gate-Source Voltage			V <sub>GSS</sub>	±8	V	
Steady $T_A = 25^{\circ}C$ State $T_A = 70^{\circ}C$			ID	-7.3 -5.8	А	
Continuous Drain Current (Note 5) V <sub>GS</sub> = -4.5V	t<5s	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	-9.2 -7.3	А	
Continuous Durin Courset (Nato 5) \	Steady State	$T_A = 25$ °C $T_A = 70$ °C	I <sub>D</sub>	-6.0 -4.7	А	
Continuous Drain Current (Note 5) V <sub>GS</sub> = -1.8V	t<5s	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	-7.6 -6.0	А	
Pulsed Drain Current (10µs pulse, duty cycle = 1%)	I <sub>DM</sub>	-60	Α			
Continuous Source-Drain Diode Current	I <sub>S</sub>	-2.0	Α			

# Thermal Characteristics @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Value	Units		
Total Bower Discipation (Note 4)	T <sub>A</sub> = 25°C		0.69	W	
Total Power Dissipation (Note 4)	$T_A = 70$ °C	$P_{D}$	0.44	VV	
Thermal Resistance, Junction to Ambient (Note 4)	Steady state	D	182	°C/W	
Thermal Resistance, Junction to Ambient (Note 4)	t<5s	$R_{\theta JA}$	113	C/VV	
Total Power Dissipation (Note 5)	$T_A = 25$ °C	PD	2.4	W	
Total Fower Dissipation (Note 3)	$T_A = 70$ °C	FD	1.5		
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	D	52	°C/W	
Thermal Resistance, Junction to Ambient (Note 5)	t<5s	$R_{\theta JA}$	33	C/VV	
Thermal Resistance, Junction to Case (Note 5)	Steady state	$R_{ heta JC}$	9.1	°C/W	
Operating and Storage Temperature Range		T <sub>J,</sub> T <sub>STG</sub>	-55 to +150	°C	

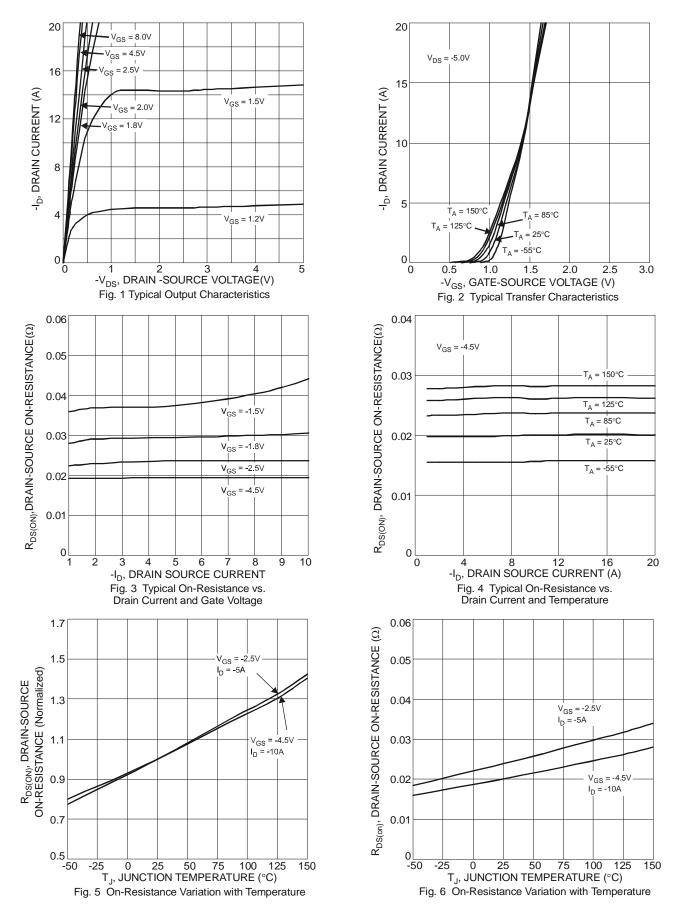
# Electrical Characteristics @TA = 25°C unless otherwise specified

Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-25	_	_	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	_	_	-1	μA	$V_{DS} = -25V, V_{GS} = 0V$
Gate-Source Leakage	I <sub>GSS</sub>	_	_	±10	μA	$V_{GS} = \pm 8.0 V, V_{DS} = 0 V$
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.4	_	-1.0	V	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$
			19	26		$V_{GS} = -4.5V, I_D = -6.4A$
Static Drain-Source On-Resistance	D		24	33	mΩ	$V_{GS} = -2.5V$ , $I_D = -4.8A$
Static Diani-Source On-Resistance	R <sub>DS</sub> (ON)		29	40	1115.2	$V_{GS} = -1.8V, I_D = -2.5A$
			35	70		$V_{GS} = -1.5V, I_D = -1.5A$
Forward Transfer Admittance	Y <sub>fs</sub>		14	_	mS	$V_{DS} = -5V, I_{D} = -4A$
Diode Forward Voltage (Note 5)	$V_{SD}$		-0.7	-1.0	V	$V_{GS} = 0V$ , $I_S = -1A$
DYNAMIC CHARACTERISTICS (Note 7)	_					
Input Capacitance	C <sub>iss</sub>		2530	_	pF	15)( )( 0)(
Output Capacitance	Coss		203	_	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V -f = 1.0MHz
Reverse Transfer Capacitance	$C_{rss}$		177	_	pF	1 = 1.0IVII IZ
Gate Resistance	$R_{g}$		9.1	_	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$
Total Gate Charge	$Q_g$		28.2	_		
Gate-Source Charge	$Q_{gs}$	_	48.7	_	nC	$V_{DS} = -15V, I_{D} = -4.0A$
Gate-Drain Charge	$Q_{gd}$	_	3.2	_		
Turn-On Delay Time	t <sub>D(on)</sub>	_	5.0	_		
Turn-On Rise Time	t <sub>r</sub>		15.1	_	nS	$V_{DD} = -15V$ , $V_{GS} = -4.5V$ , $R_{G} = 1\Omega$ ,
Turn-Off Delay Time	t <sub>D(off)</sub>	_	23.5	_	113	$I_D = -4.0A$
Turn-Off Fall Time	t <sub>f</sub>	_	137.6	_		

4. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided. Notes:

- Device mounted on FR-4 substrate PC board, 2oz copper, with thermal vias to bottom layer 1inch square copper plate
  Short duration pulse test used to minimize self-heating effect
- 7. Guaranteed by design. Not subject to production testing.







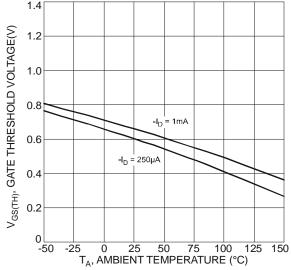
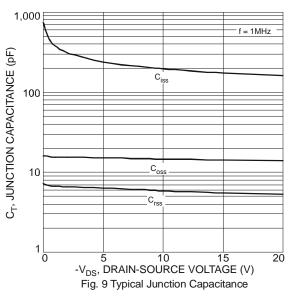
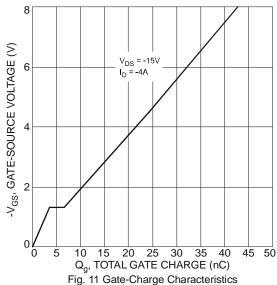
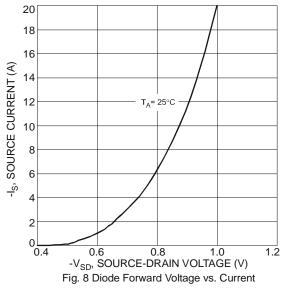


Fig. 7 Gate Threshold Variation vs. Ambient Temperature







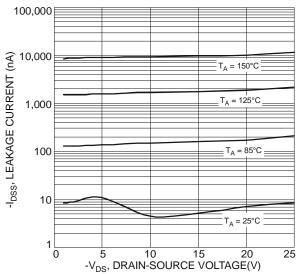
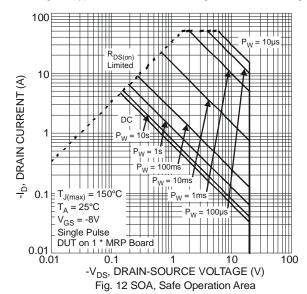
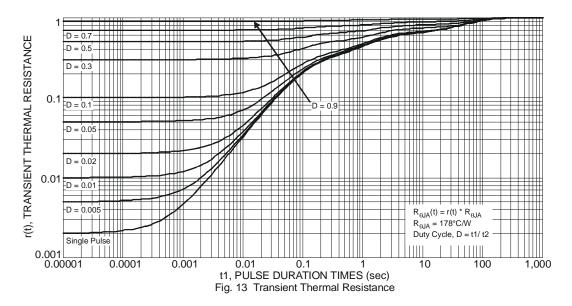


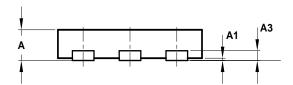
Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

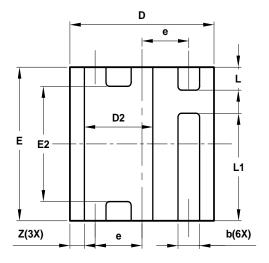






# **Package Outline Dimensions**

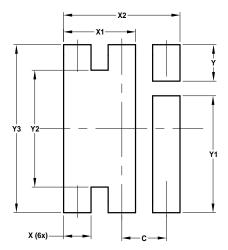




X2-DFN2020-6							
Dim	Min	Max	Тур				
Α		0.40					
A1	0	0.05	0.03				
A3	_	_	0.13				
b	0.25	0.35	0.30				
D	1.95	2.05	2.00				
D2	0.85	1.05	0.95				
Е	1.95	2.05	2.00				
E2	1.40	1.60	1.50				
е	_	_	0.65				
L	0.25	0.35	0.30				
L1	1.35	1.45	1.40				
Z	_	_	0.20				
All Dimensions in mm							



### **Suggested Pad Layout**



Value (in mm)				
0.650				
0.400				
1.050				
1.700				
0.500				
1.600				
1.600				
2.300				

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