25V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)\ max}$	I_D $T_A = 25°C$
-25V	26mΩ @ V_{GS} = -4.5V	-7.3
	40mΩ @ V_{GS} = -1.8V	-6.0

Features and Benefits

- Low $R_{DS(ON)}$ – ensures on state losses are minimized
- 0.4mm profile – ideal for low profile applications
- PCB footprint of $4mm^2$
- 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 on-state 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

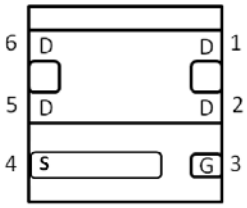
- Case: X2-DFN2020-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.006 grams (approximate)

X2-DFN2020-6

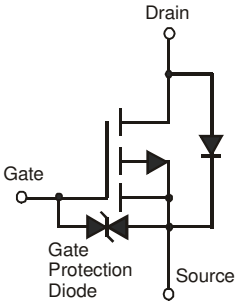
ESD PROTECTED

Bottom View

Top View



Bottom View
Internal Schematic



Equivalent Circuit

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	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°C unless otherwise specified

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-25	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 5) V_{GS} = -4.5V	Steady State	T_A = 25°C T_A = 70°C	I_D	-7.3 -5.8	A
	t<5s	T_A = 25°C T_A = 70°C	I_D	-9.2 -7.3	A
Continuous Drain Current (Note 5) V_{GS} = -1.8V	Steady State	T_A = 25°C T_A = 70°C	I_D	-6.0 -4.7	A
	t<5s	T_A = 25°C T_A = 70°C	I_D	-7.6 -6.0	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	-60	A
Continuous Source-Drain Diode Current			I_S	-2.0	A

Thermal Characteristics @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 4)	T_A = 25°C	P_D	0.69	W
	T_A = 70°C		0.44	
Thermal Resistance, Junction to Ambient (Note 4)	Steady state	$R_{\theta JA}$	182	°C/W
	t<5s		113	
Total Power Dissipation (Note 5)	T_A = 25°C	P_D	2.4	W
	T_A = 70°C		1.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	52	°C/W
	t<5s		33	
Thermal Resistance, Junction to Case (Note 5)	Steady state	$R_{\theta JC}$	9.1	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	-25	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1	µA	V_{DS} = -25V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±8.0V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.4	—	-1.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	—	19	26	mΩ	V_{GS} = -4.5V, I_D = -6.4A
		—	24	33		V_{GS} = -2.5V, I_D = -4.8A
		—	29	40		V_{GS} = -1.8V, I_D = -2.5A
		—	35	70		V_{GS} = -1.5V, I_D = -1.5A
Forward Transfer Admittance	$\|Y_{fs}\|$	—	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_{iss}	—	2530	—	pF	V_{DS} = -15V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	203	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	177	—	pF	
Gate Resistance	R_g	—	9.1	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge	Q_g	—	28.2	—	nC	V_{DS} = -15V, I_D = -4.0A
Gate-Source Charge	Q_{gs}	—	48.7	—		
Gate-Drain Charge	Q_{gd}	—	3.2	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.0	—	nS	V_{DD} = -15V, V_{GS} = -4.5V, R_G = 1Ω, I_D = -4.0A
Turn-On Rise Time	t_r	—	15.1	—		
Turn-Off Delay Time	$t_{D(off)}$	—	23.5	—		
Turn-Off Fall Time	t_f	—	137.6	—		

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

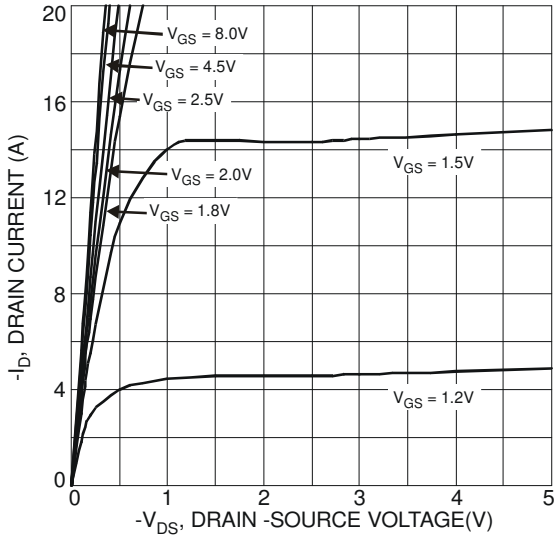


Fig. 1 Typical Output Characteristics

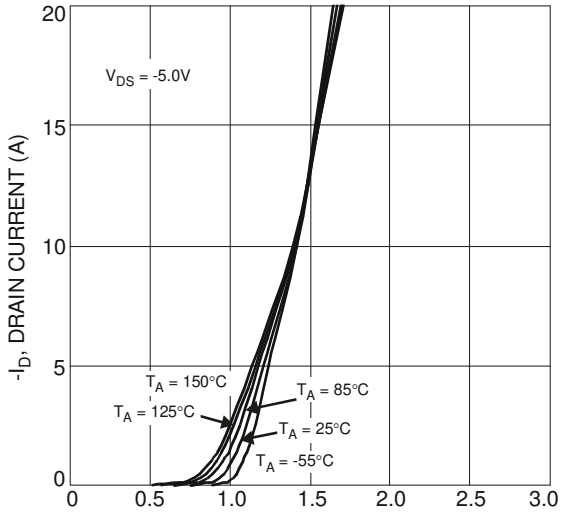


Fig. 2 Typical Transfer Characteristics

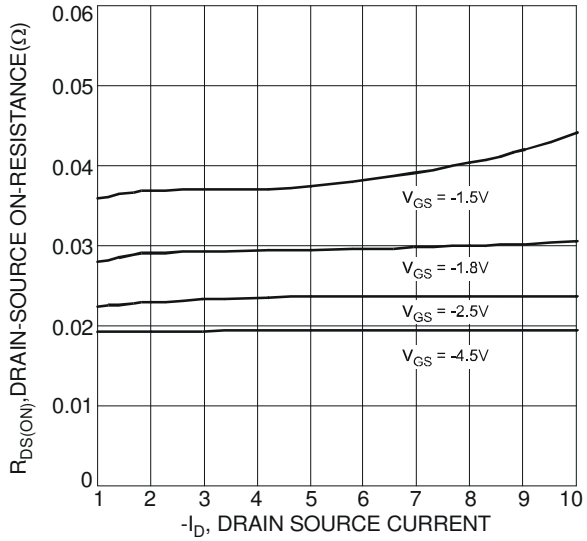


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

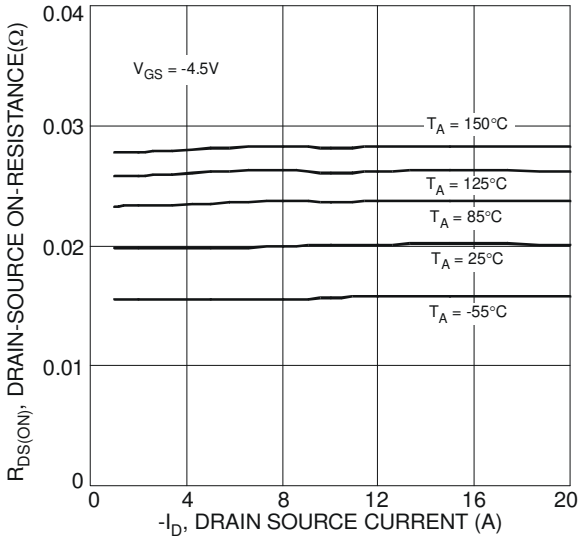


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

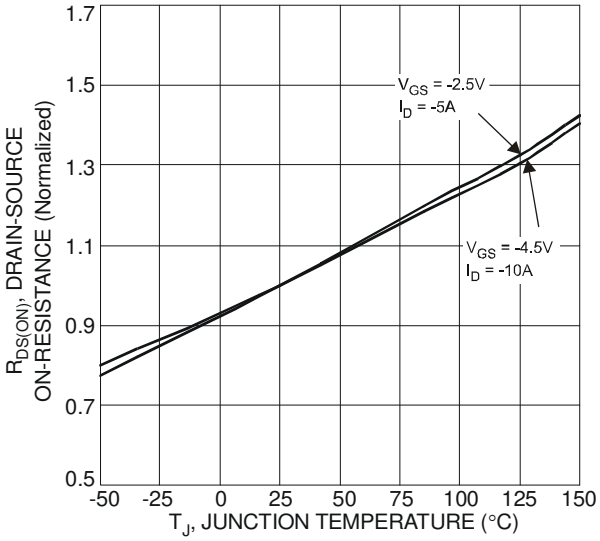


Fig. 5 On-Resistance Variation with Temperature

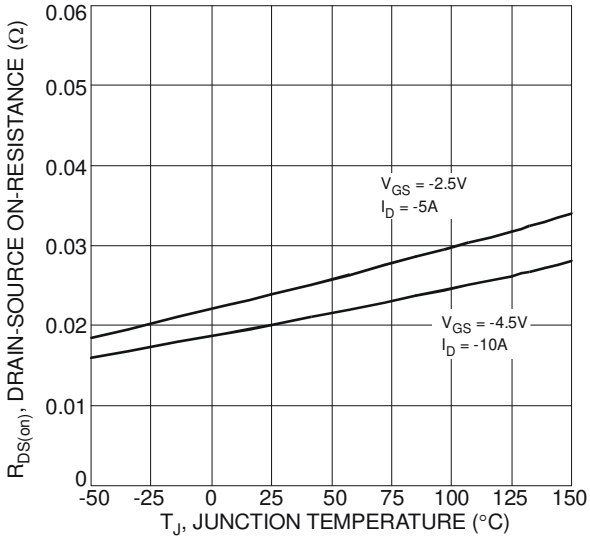


Fig. 6 On-Resistance Variation with Temperature

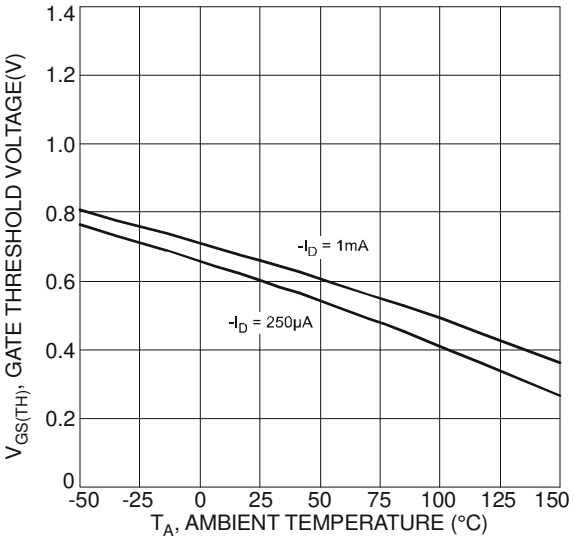


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

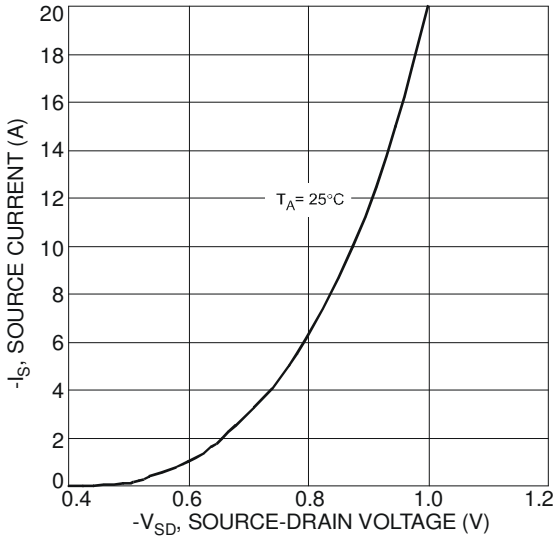


Fig. 8 Diode Forward Voltage vs. Current

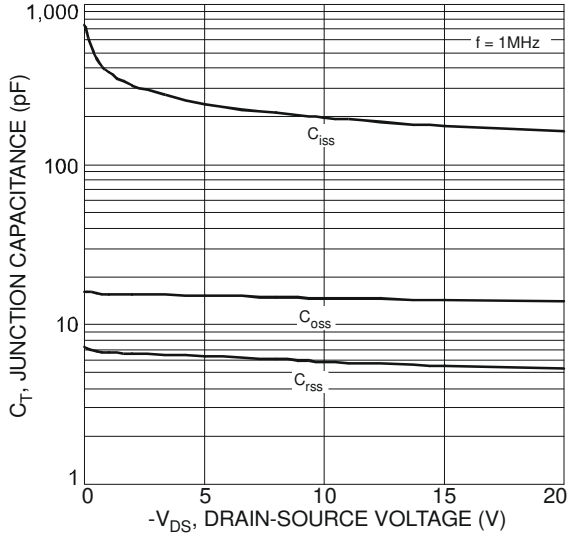


Fig. 9 Typical Junction Capacitance

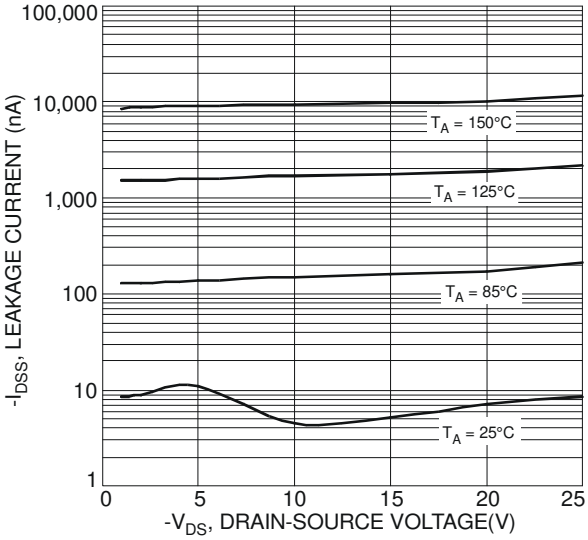


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

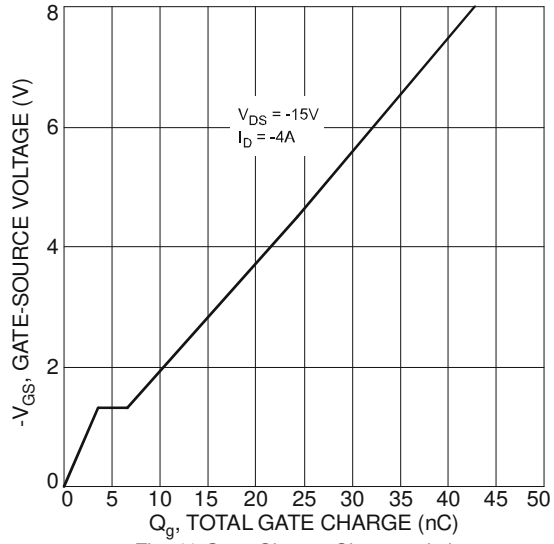


Fig. 11 Gate-Charge Characteristics

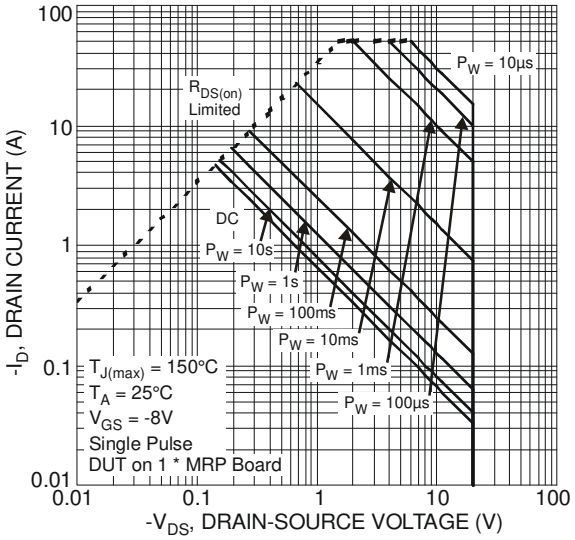


Fig. 12 SOA, Safe Operation Area

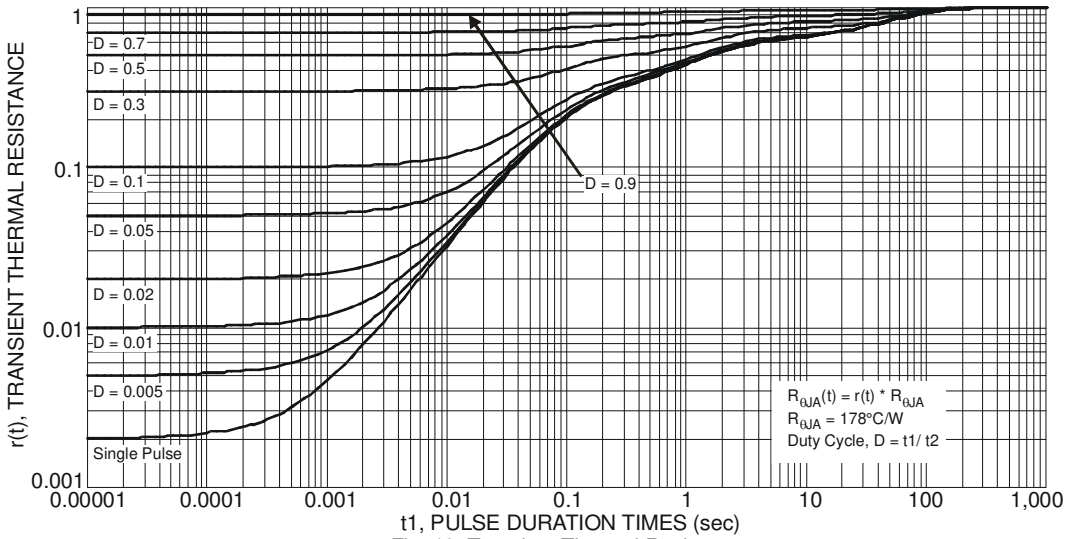
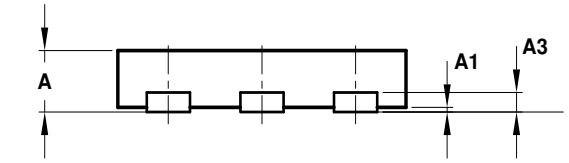
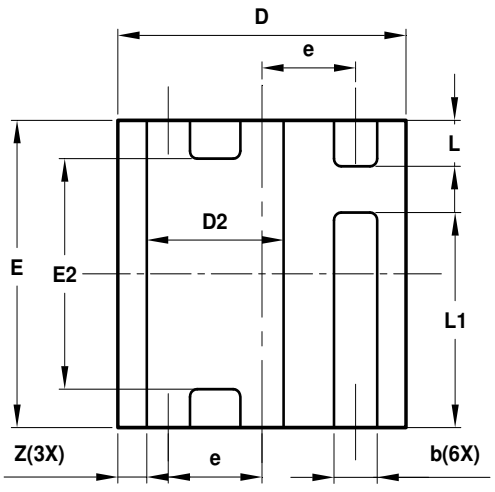


Fig. 13 Transient Thermal Resistance

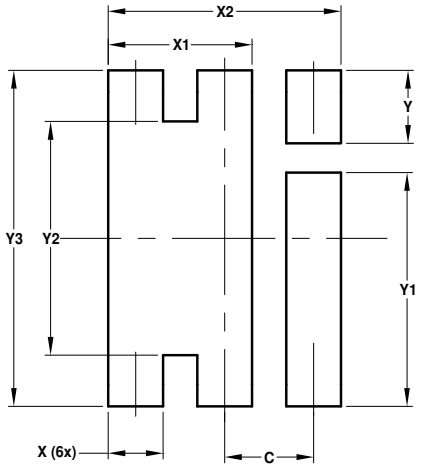
Package Outline Dimensions





X2-DFN2020-6			
Dim	**Min**	**Max**	**Typ**
A	–	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
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	1.35	1.45	1.40
Z	–	–	0.20
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
C	0.650
X	0.400
X1	1.050
X2	1.700
Y	0.500
Y1	1.600
Y2	1.600
Y3	2.300