Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	Package	I_D T_A = +25°C
20V	0.6Ω @ V_{GS} = 4.5V	X1-DFN1212-3	0.9A
	0.8Ω @ V_{GS} = 2.5V		0.7A
	1.0Ω @ V_{GS} = 1.8V		0.5A
	1.6Ω @ V_{GS} = 1.5V		0.3A

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
- Battery Operated Systems and Solid-State Relays
- Load switch

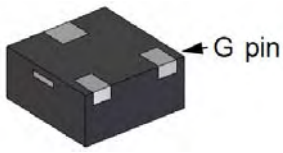
Features

- Low On-Resistance
- Very low Gate Threshold Voltage, 1.0V max
- Low Input Capacitance
- Fast Switching Speed
- 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**

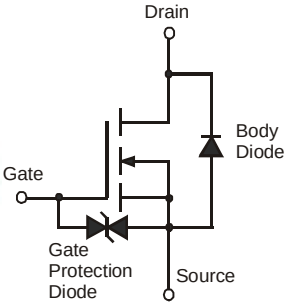
Mechanical Data

- Case: X1-DFN1212-3
- Case Material: Molded Plastic. 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 (e3)
- Terminal Connections: See Diagram
- Weight: 0.005 grams (approximate)

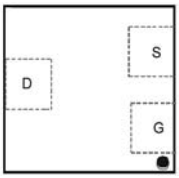
Top View



Bottom View



Equivalent Circuit



Pin-out Top view

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2400UFD-7	X1-DFN1212-3	3000/Tape & Reel

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 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.

Marking Information

K24 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Code	U	V	W	X	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

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Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	0.9 0.7	A
Continuous Drain Current (Note 6) V_{GS} = 2.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	0.7 0.5	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	3.0	A
Maximum Body Diode Forward Current (Note 6)			I_S	0.8	A

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P_D	0.4	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	280	°C/W
Total Power Dissipation (Note 6)		P_D	0.8	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	140	°C/W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta Jc}$	112	°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 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	80 100	nA	V_{DS} = 4.5V, V_{GS} = 0V V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±1.0	µA	V_{GS} = ±4.5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	0.45	—	1.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	—	0.35	0.6	Ω	V_{GS} = 4.5V, I_D = 200mA
		—	0.45	0.8		V_{GS} = 2.5V, I_D = 200mA
		—	0.6	1.0		V_{GS} = 1.8V, I_D = 100mA
		—	0.7	1.6		V_{GS} = 1.5V, I_D = 50mA
Forward Transfer Admittance	$\|Y_{fs}\|$	—	1.4	—	S	V_{DS} = 3V, I_D = 200mA
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 500mA,
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	37.0	—	pF	V_{DS} =16V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	5.7	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	4.2	—	pF	
Gate Resistance	R_g	—	68	—	Ω	V_{DS} = 0V, V_{GS} = 0V,
Total Gate Charge	Q_g	—	0.5	—	nC	V_{GS} = 4.5V, V_{DS} = 10V, I_D = 250mA
Gate-Source Charge	Q_{gs}	—	0.07	—	nC	
Gate-Drain Charge	Q_{gd}	—	0.1	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	4.06	—	ns	V_{DD} = 10V, V_{GS} = 4.5V, R_L = 47Ω, R_G = 10Ω, I_D = 200mA
Turn-On Rise Time	t_r	—	7.28	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	13.74	—	ns	
Turn-Off Fall Time	t_f	—	10.54	—	ns	

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 vias 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.

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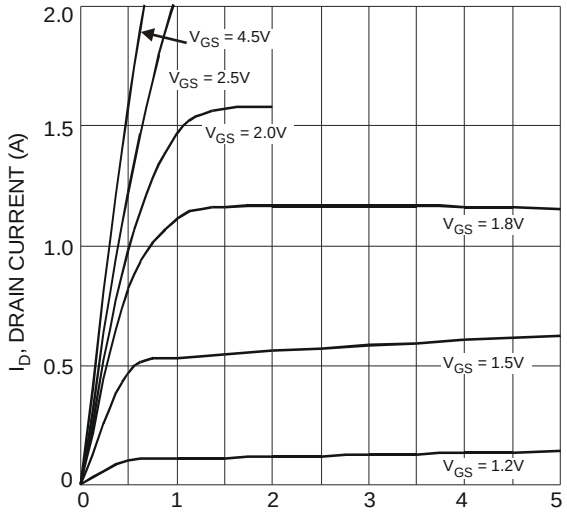

Fig. 1 Typical Output Characteristics

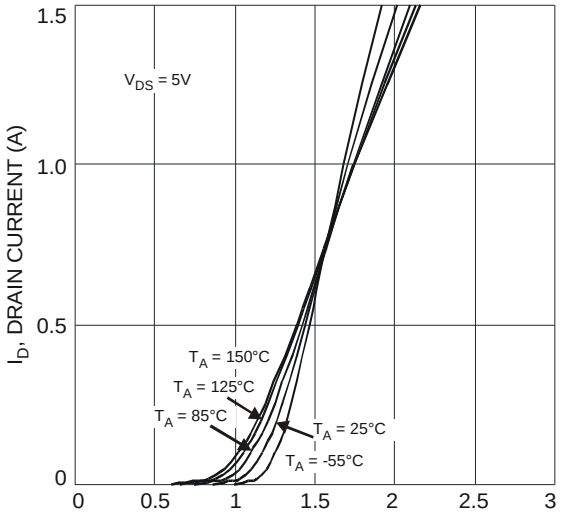

Fig. 2 Typical Transfer Characteristics

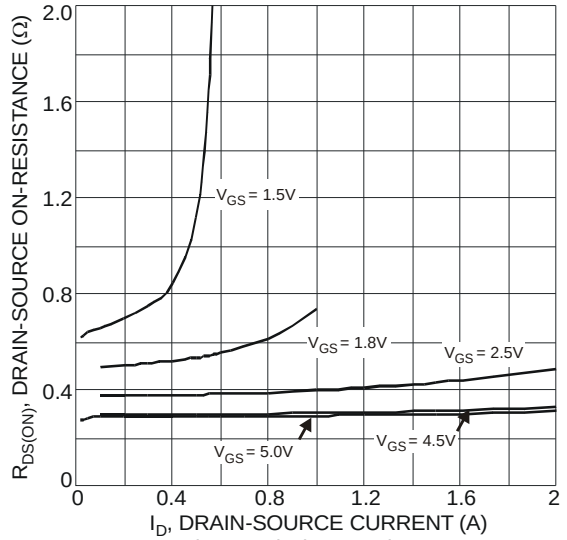

Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

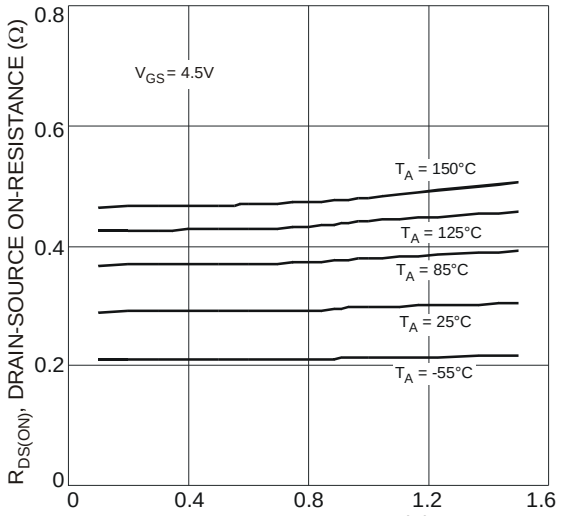

Fig. 4 Typical Drain-Source On-Resistance
vs. Drain Current and Temperature

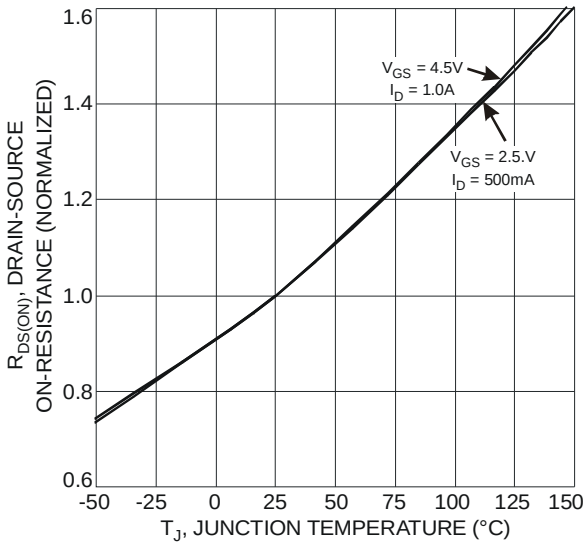

Fig. 5 On-Resistance Variation with Temperature

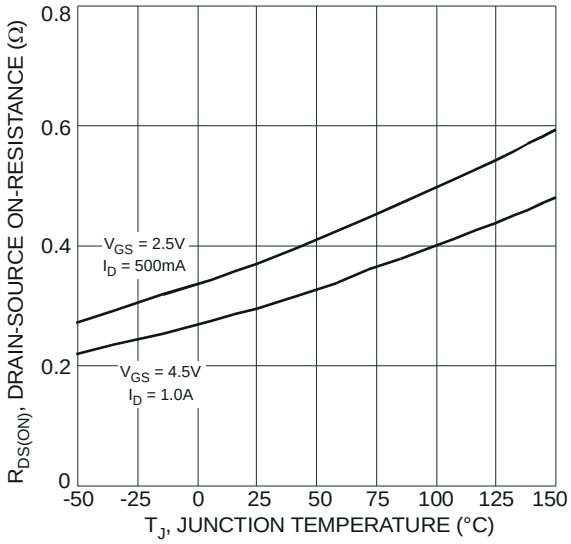

Fig. 6 On-Resistance Variation with Temperature

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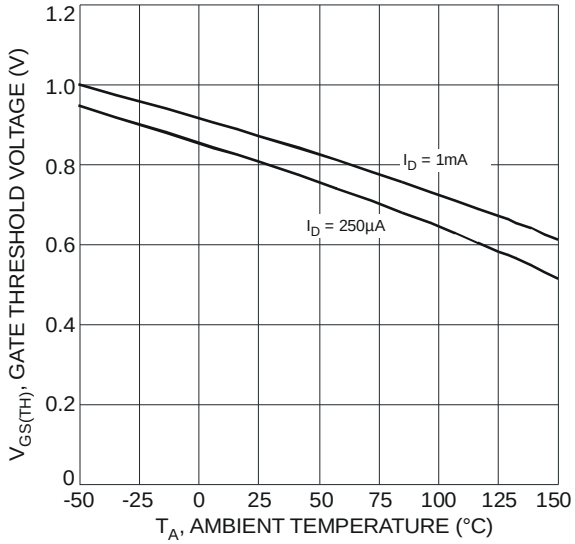

Fig. 7 Gate Threshold Variation vs. Ambient Temperature

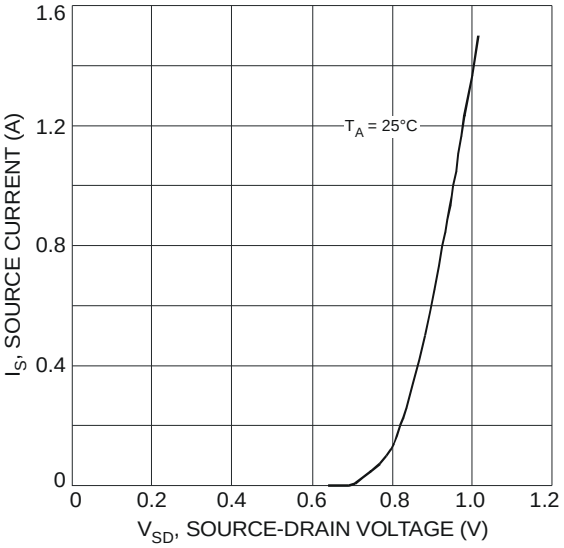

Fig. 8 Diode Forward Voltage vs. Current

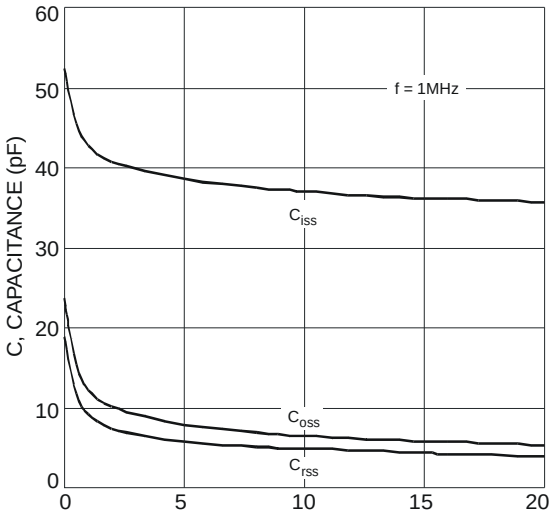

Fig. 9 Typical Capacitance

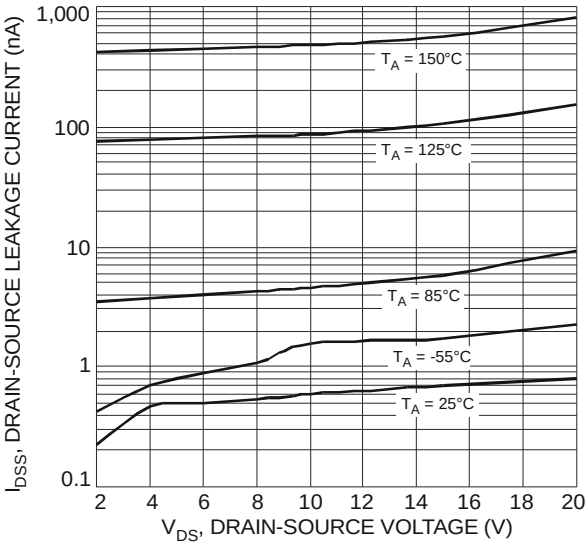

Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

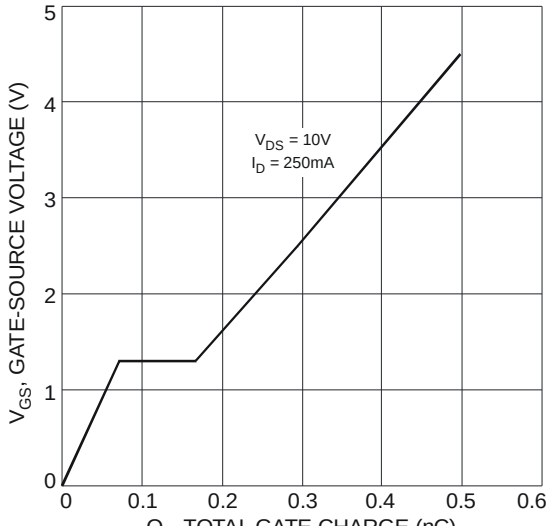

Fig. 11 Gate-Charge Characteristics

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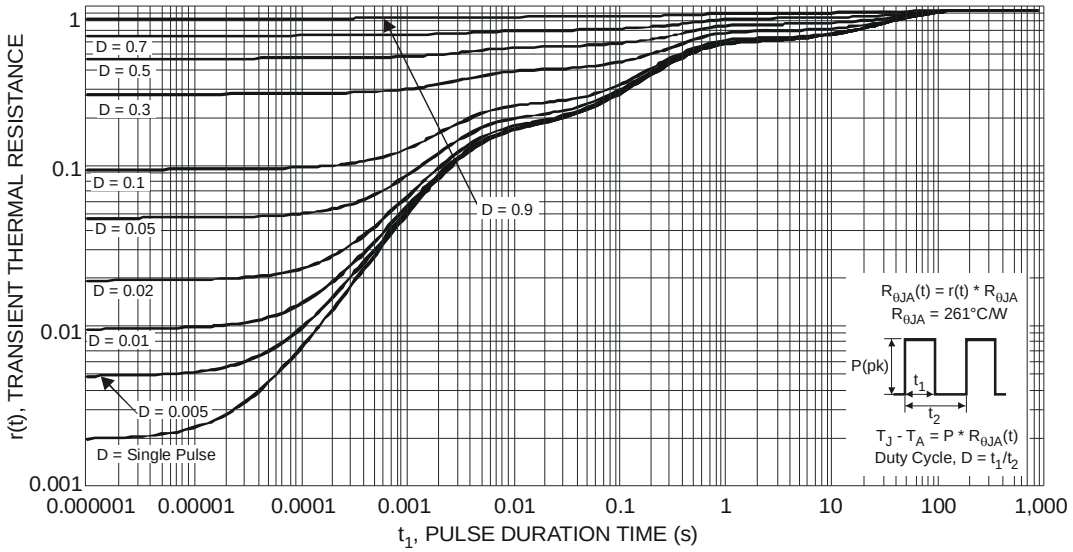
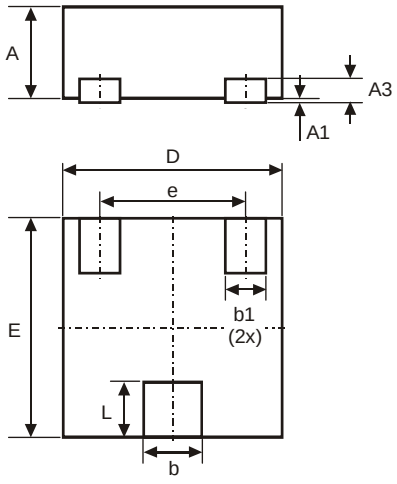


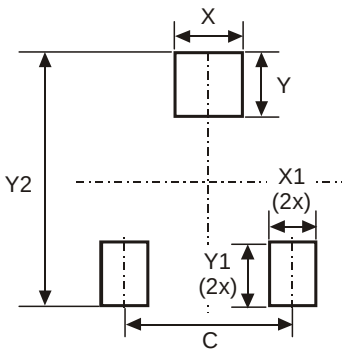
Fig. 12 Transient Thermal Response

Package Outline Dimensions



X1-DFN1212-3			
Dim	**Min**	**Max**	**Typ**
A	0.47	0.53	0.50
A1	0	0.05	0.02
A3	-	-	0.13
b	0.27	0.37	0.32
b1	0.17	0.27	0.22
D	1.15	1.25	1.20
E	1.15	1.25	1.20
e	-	-	0.80
L	0.25	0.35	0.30
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
C	0.80
X	0.42
X1	0.32
Y	0.50
Y1	0.50
Y2	1.50

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