

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON) \max}$	Package	$I_b$ $T_A = +25^\circ\text{C}$
-20V	1.0Ω @ $V_{GS} = -4.5\text{V}$	X1-DFN1212-3	-600mA
	1.5Ω @ $V_{GS} = -2.5\text{V}$		-500mA
	2.0Ω @ $V_{GS} = -1.8\text{V}$		-400mA
	3.0Ω @ $V_{GS} = -1.5\text{V}$		-250mA

## 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

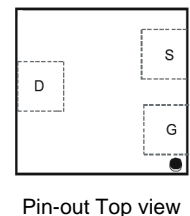
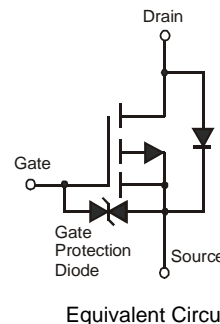
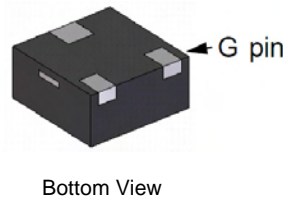
- DC-DC Converters
- Power Management Functions

## Features

- Low On-Resistance
- Very Low Gate Threshold Voltage  $V_{GS(TH)}$ , 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: NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 (e4)
- Terminal Connections: See Diagram
- Weight: 0.005 grams (approximate)

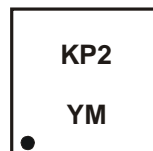


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMP21D5UFD-7	X1-DFN1212-3	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> 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>.

## Marking Information



KP2 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	-20	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = -4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-600 -500	mA
Continuous Drain Current (Note 6) V <sub>GS</sub> = -1.8V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-400 -300	mA
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	-2	A
Maximum Body Diode continuous Current			I <sub>S</sub>	-800	mA

**Thermal Characteristics**

Characteristic			Symbol	Value	Units
Total Power Dissipation (Note 5)			P <sub>D</sub>	0.4	W
Thermal Resistance, Junction to Ambient (Note 5)		Steady state	R <sub>θJA</sub>	280	°C/W
Total Power Dissipation (Note 6)			P <sub>D</sub>	0.8	W
Thermal Resistance, Junction to Ambient (Note 6)		Steady state	R <sub>θJA</sub>	140	°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 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -1mA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	—	—	-80 -100	nA	V <sub>DS</sub> = -4.5V, V <sub>GS</sub> = 0V V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10.0	μA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.5	—	-1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	0.7	1.0	Ω	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -100mA
		—	0.9	1.5		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -80mA
		—	1.2	2.0		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -40mA
		—	1.5	3.0		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -30mA
		—	5	—		V <sub>GS</sub> = -1.2V, I <sub>D</sub> = -1mA
Forward Transfer Admittance	Y <sub>fs</sub>	—	0.7	—	S	V <sub>DS</sub> = -3V, I <sub>D</sub> = -100mA
Diode Forward Voltage	V <sub>SD</sub>	—	-0.75	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -330mA,
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>ISS</sub>	—	46.1	—	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	7.2	—		
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	4.9	—		
Total Gate Charge V <sub>GS</sub> = -4.5V	Q <sub>g</sub>	—	0.5	—	nC	V <sub>DS</sub> = -10V, I <sub>D</sub> = -250mA
Total Gate Charge V <sub>GS</sub> = -8V	Q <sub>g</sub>	—	0.8	—		
Gate-Source Charge	Q <sub>GS</sub>	—	0.1	—		
Gate-Drain Charge	Q <sub>GD</sub>	—	0.1	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	8.5	—	ns	V <sub>DD</sub> = -3V, V <sub>GS</sub> = -2.5V, R <sub>L</sub> = 300Ω, R <sub>G</sub> = 25Ω, I <sub>D</sub> = -100mA
Turn-On Rise Time	t <sub>r</sub>	—	4.3	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	20.2	—		
Turn-Off Fall Time	t <sub>f</sub>	—	19.2	—		

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

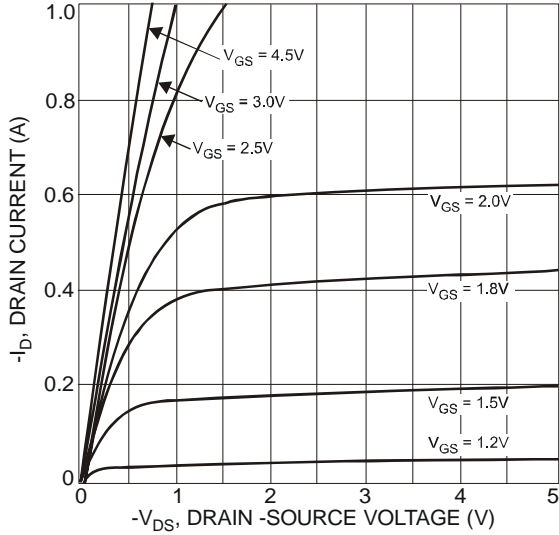


Fig. 1 Typical Output Characteristics

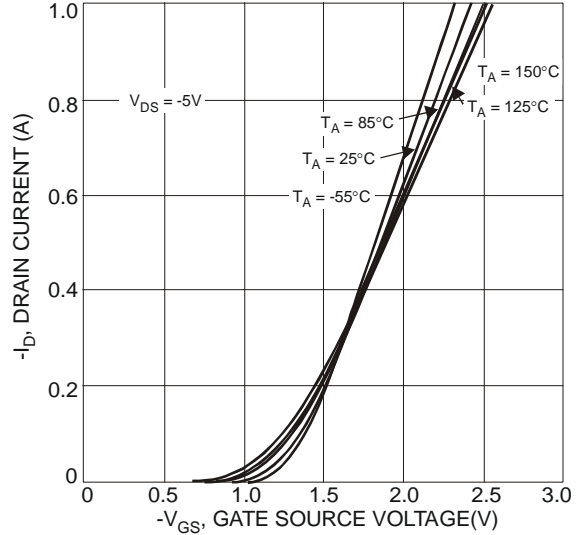


Fig. 2 Typical Transfer Characteristics

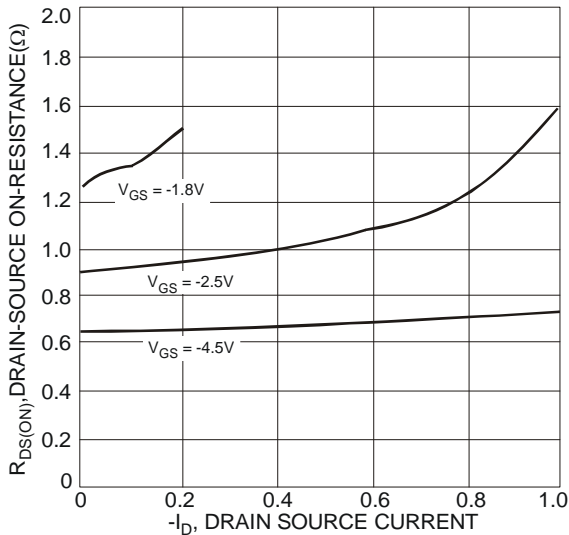


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

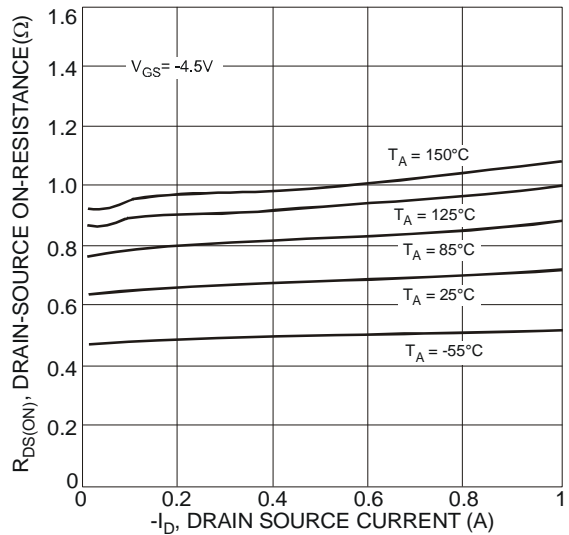


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

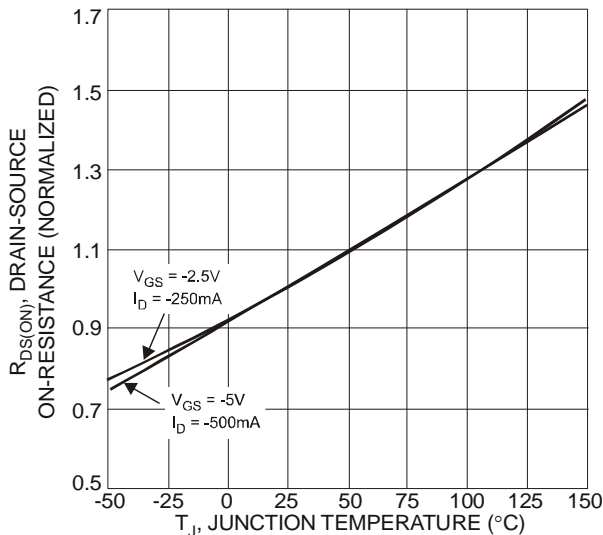


Fig. 5 On-Resistance Variation with Temperature

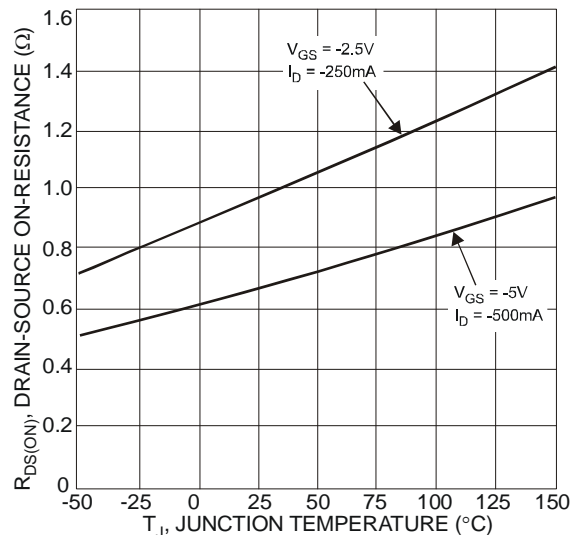


Fig. 6 On-Resistance vs. Temperature

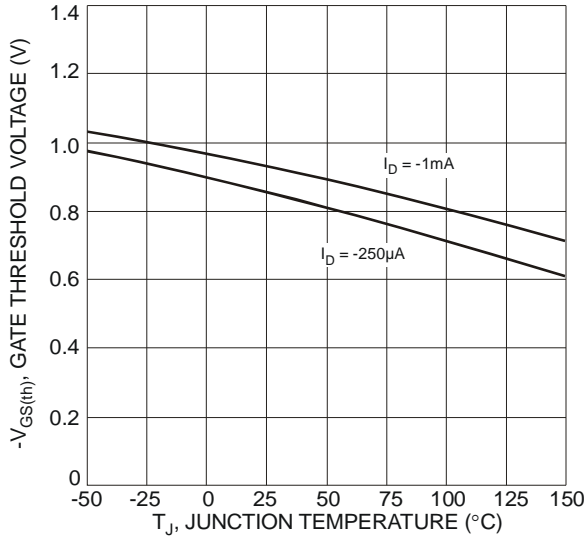


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

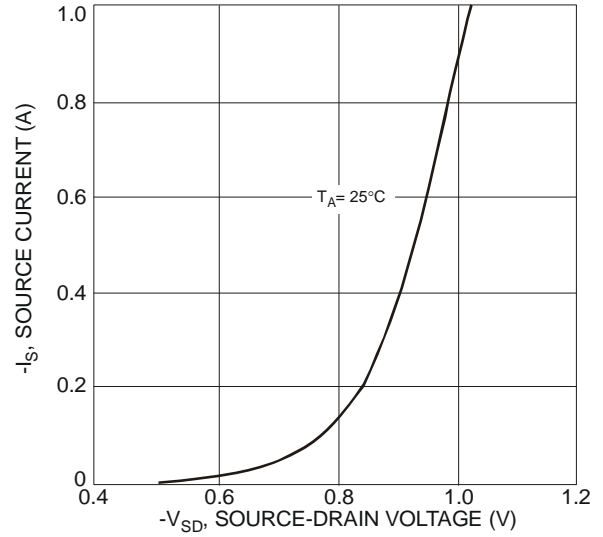


Fig. 8 Diode Forward Voltage vs. Current

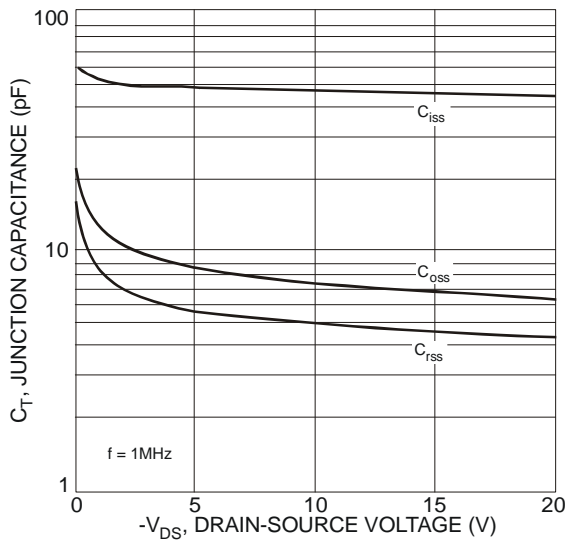


Fig. 9 Typical Junction Capacitance

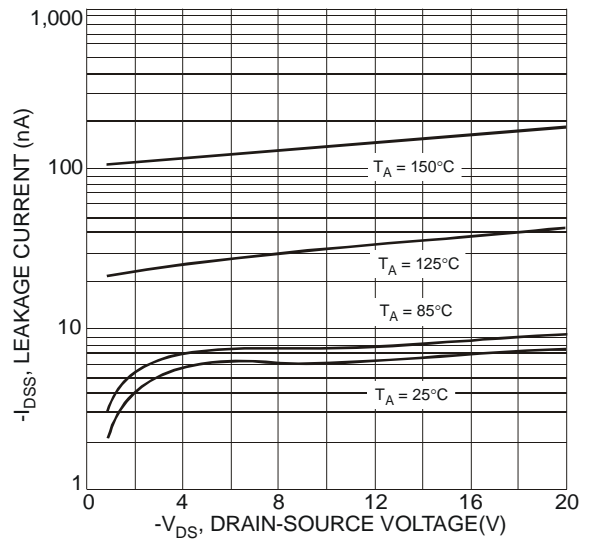


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

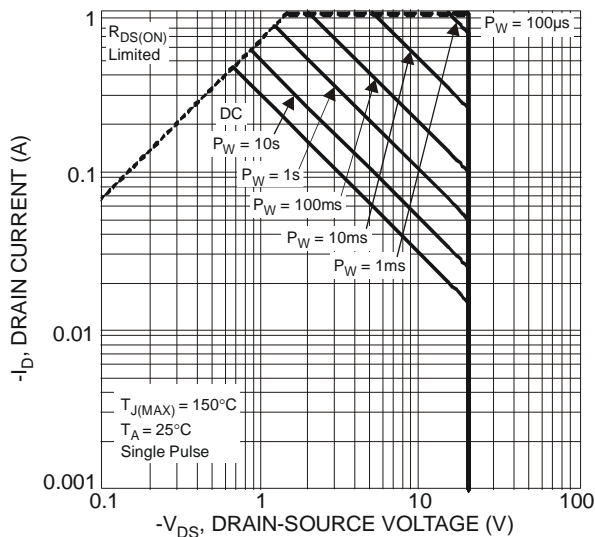


Fig. 11 SOA, Safe Operation Area

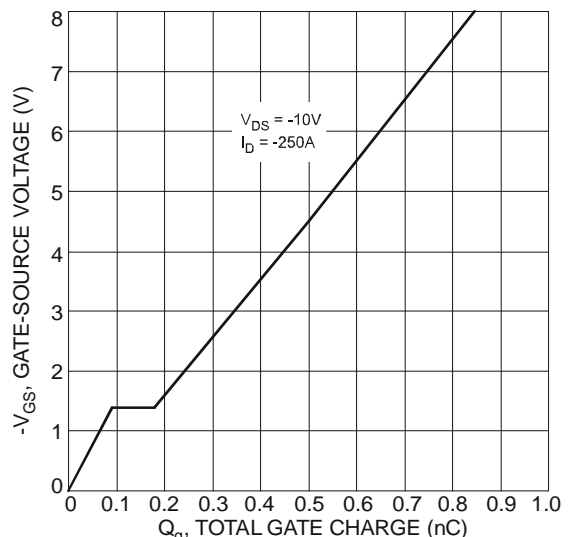
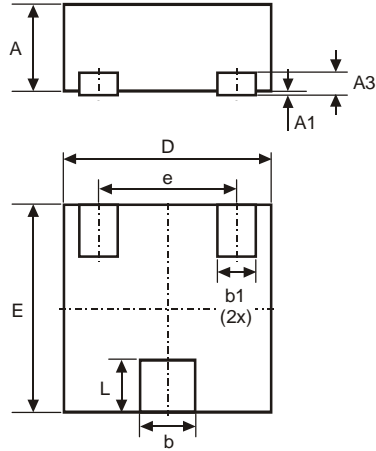


Fig. 12 Gate-Charge Characteristics

## Package Outline Dimensions

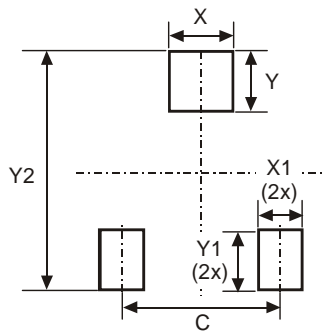
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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
<b>All Dimensions in mm</b>			

## Suggested Pad Layout

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



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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