Product Summary

$V_{(BR)DSS}$	$R_{DS(on)\ max}$	I_D $T_A = 25°C$
-20V	1.0Ω @ V_{GS} = -4.5V	-700mA
	1.5Ω @ V_{GS} = -2.5V	-600mA
	2.0Ω @ V_{GS} = -1.8V	-500mA
	3.0Ω @ V_{GS} = -1.5V	-380mA

Features and Benefits

- Low On-Resistance
- Very Low Gate Threshold Voltage $V_{GS(TH)}$, 1.0V max
- Low Input Capacitance
- Fast Switching Speed
- Ultra-Small Surfaced Mount Package
- Ultra-low package profile, 0.4mm maximum package height
- 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**

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.

- DC-DC Converters
- Power management functions

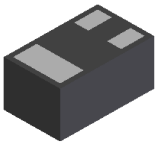
Mechanical Data

- Case: X2-DFN1006-3
- 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: 0.001 grams (approximate)

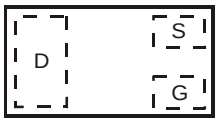


ESD PROTECTED

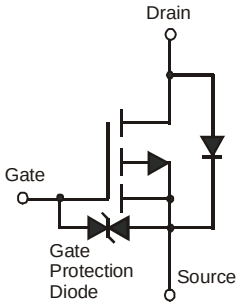
X2-DFN1006-3



Bottom View



Top View
Internal Schematic



Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMP21D5UFB4-7B	X2-DFN1006-3	10,000/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.

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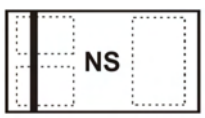

NS = Product Type Marking Code

Top View
Bar Denotes Gate
and Source Side

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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}	±8	V
Continuous Drain Current (Note 6) V_{GS} = -4.5V	Steady State	T_A = 25°C T_A = 70°C	I_D	-700 -600	mA
	t<10s	T_A = 25°C T_A = 70°C	I_D	-850 -670	mA
Continuous Drain Current (Note 6) V_{GS} = -1.8V	Steady State	T_A = 25°C T_A = 70°C	I_D	-500 -400	mA
	t<10s	T_A = 25°C T_A = 70°C	I_D	-600 -550	mA
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	-2	A
Maximum Body Diode continuous Current			I_S	-800	mA

Thermal Characteristics @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P_D	0.46	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	279	°C/W
	t<10s		210	°C/W
Total Power Dissipation (Note 6)		P_D	0.95	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	134	°C/W
	t<10s		100	°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 = -1mA
Zero Gate Voltage Drain Current T_J = 25°C	I_{DSS}	-	-	-100	nA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±1.0	µA	V_{GS} = ±5V, V_{DS} = 0V
		-	-	±5.0		V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.5	-	-1.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	-	0.67	0.97	Ω	V_{GS} = -5V, I_D = -100mA
			0.7	1.0		V_{GS} = -4.5V, I_D = -100mA
		-	0.9	1.5		V_{GS} = -2.5V, I_D = -80mA
		-	1.2	2.0		V_{GS} = -1.8V, I_D = -40mA
		-	1.5	3.0		V_{GS} = -1.5V, I_D = -30mA
		-	5	-		V_{GS} = -1.2V, I_D = -1mA
Forward Transfer Admittance	$\|Y_{fs}\|$	-	0.7	-	S	V_{DS} = -3V, I_D = -100mA
Diode Forward Voltage	V_{SD}	-	-0.75	-1.2	V	V_{GS} = 0V, I_S = -330mA,
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	-	46.1	-	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	7.2	-		
Reverse Transfer Capacitance	C_{rss}	-	4.9	-		
Gate Resistance	R_g	-	14.3	-	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge V_{GS} = -4.5V	Q_g	-	0.5	-	nC	V_{DS} = -10V, I_D = -250mA
Gate-Source Charge	Q_{gs}	-	0.09	-		
Gate-Drain Charge	Q_{gd}	-	0.09	-		
Turn-On Delay Time	$t_{D(on)}$	-	8.5	-	ns	V_{DD} = -3V, V_{GS} = -2.5V, R_L = 300Ω, R_G = 25Ω, I_D = -100mA
Turn-On Rise Time	t_r	-	4.3	-		
Turn-Off Delay Time	$t_{D(off)}$	-	20.2	-		
Turn-Off Fall Time	t_f	-	19.2	-		

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

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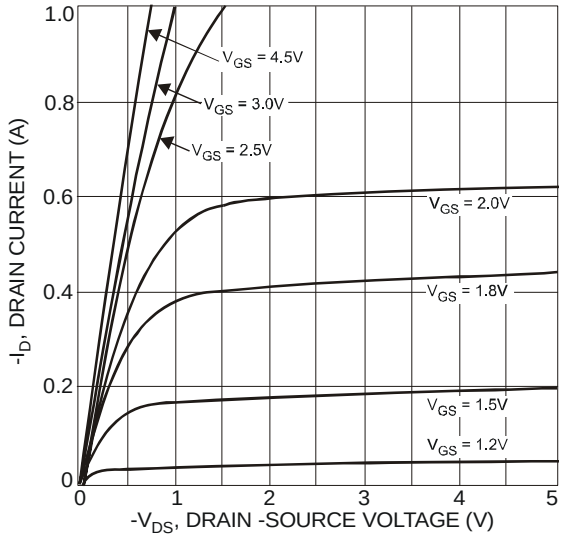

Fig. 1 Typical Output Characteristics

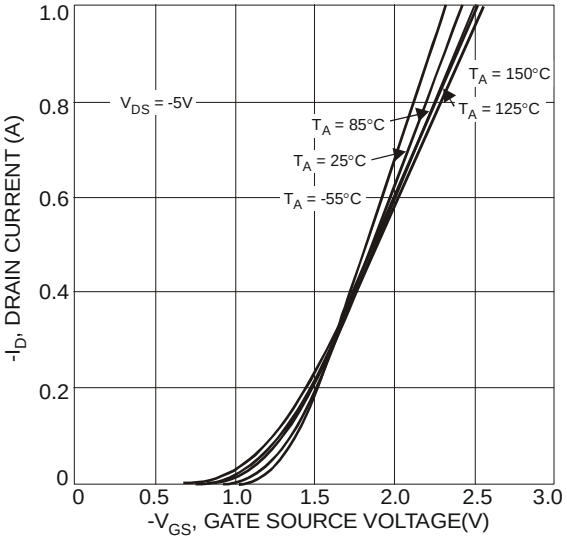

Fig. 2 Typical Transfer Characteristics

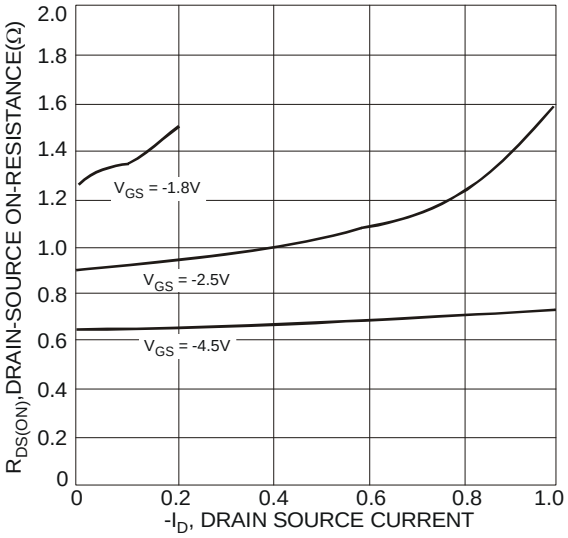

Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

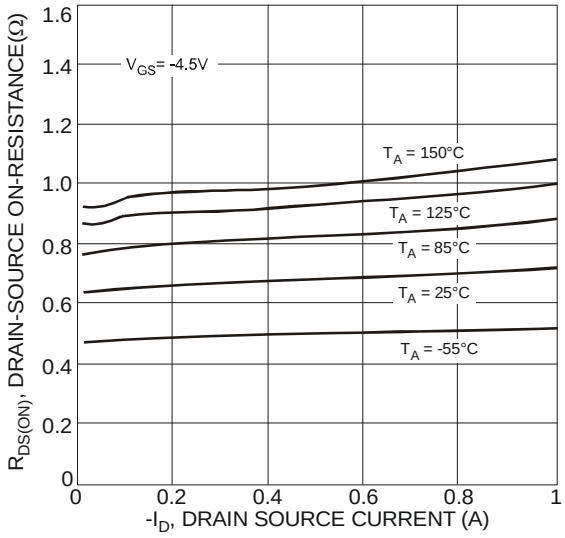

Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

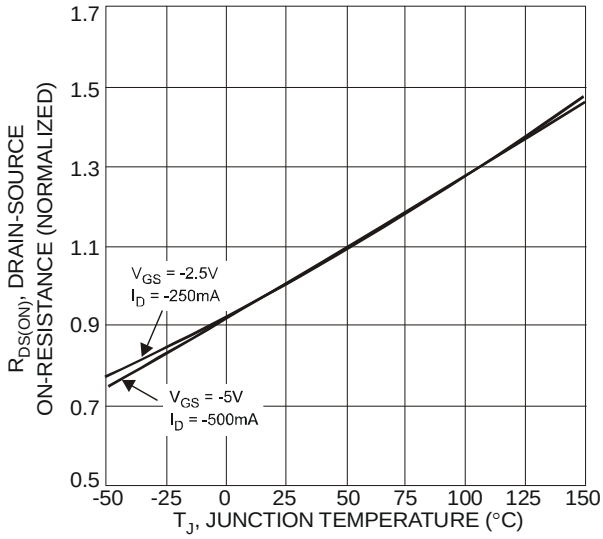

Fig. 5 On-Resistance Variation with Temperature

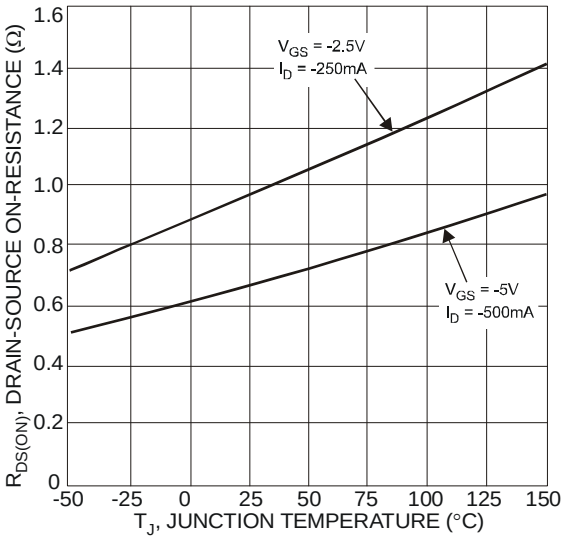

Fig. 6 On-Resistance vs.Temperature

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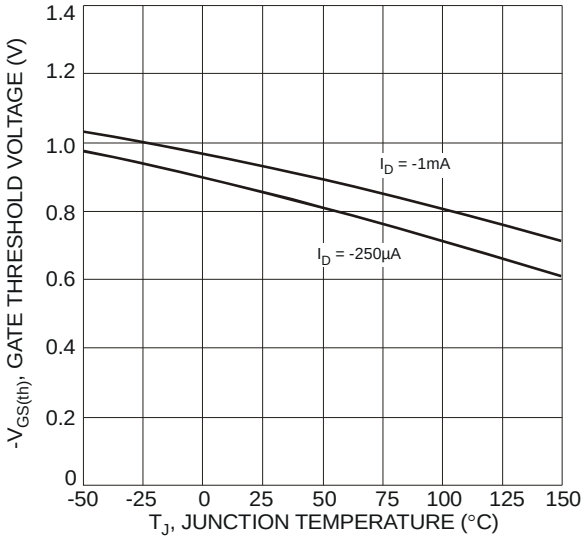

Fig. 7 Gate Threshold Variation vs. Ambient Temperature

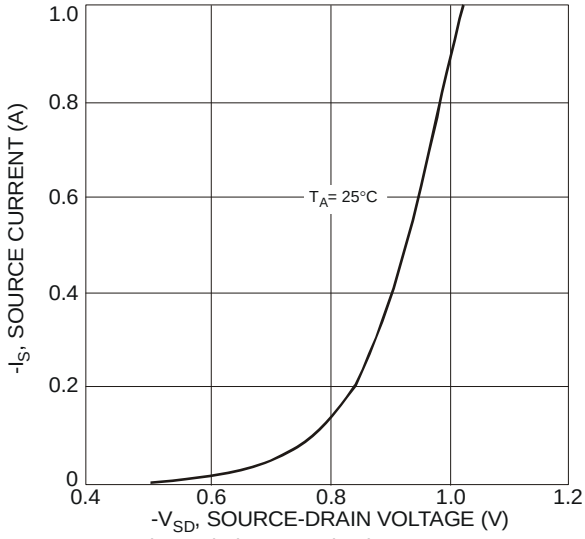

Fig. 8 Diode Forward Voltage vs. Current

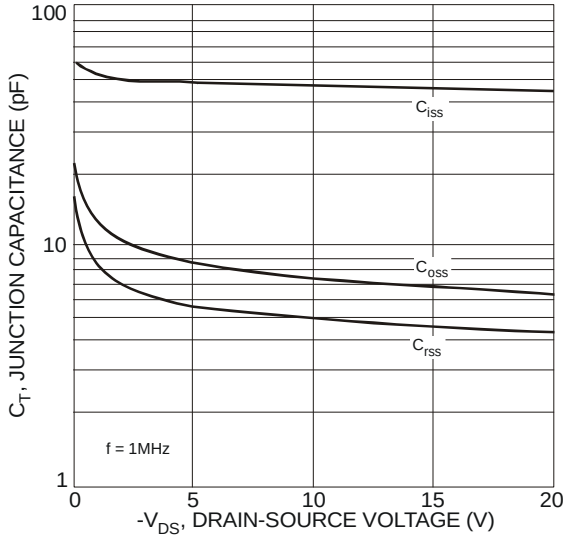

Fig. 9 Typical Junction Capacitance

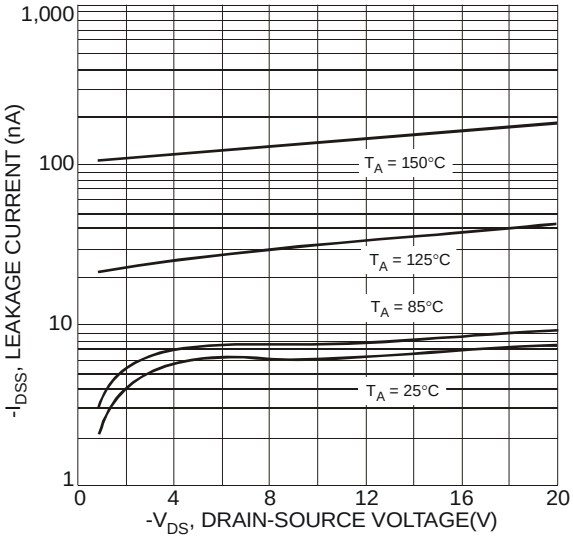

Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

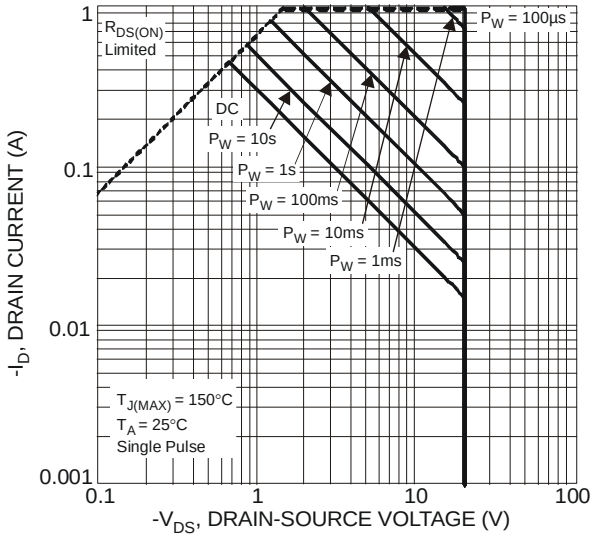

Fig. 11 SOA, Safe Operation Area

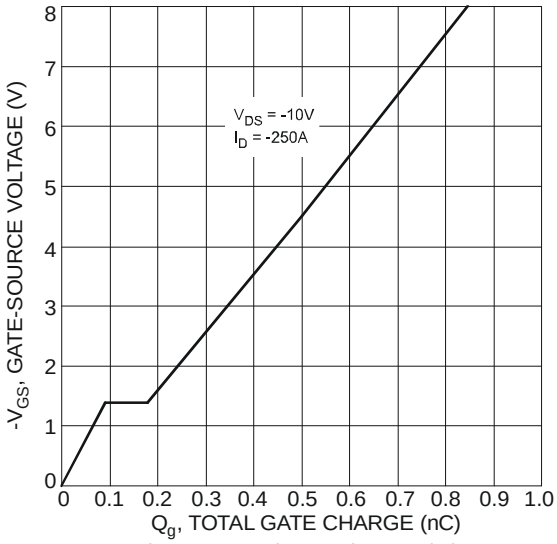

Fig. 12 Gate-Charge Characteristics

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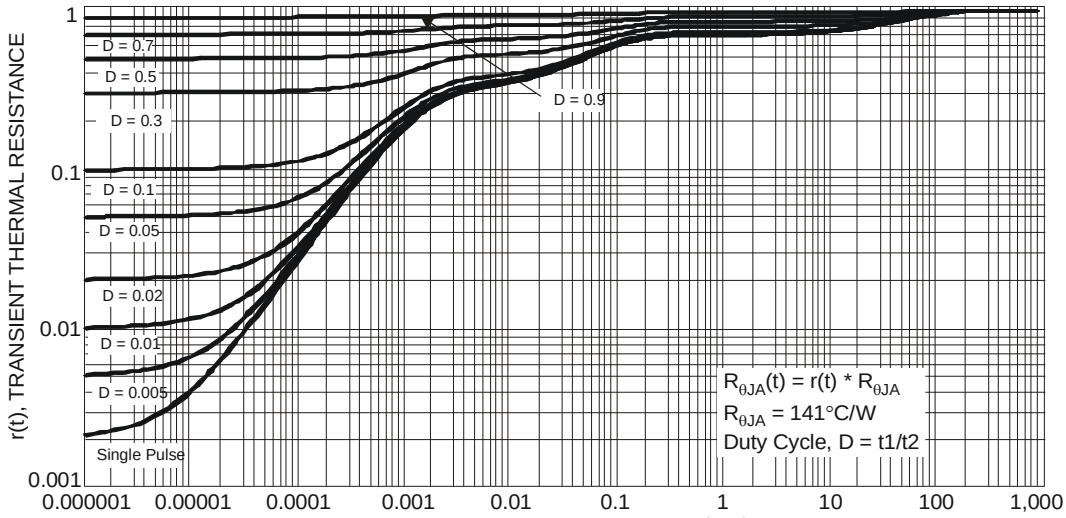
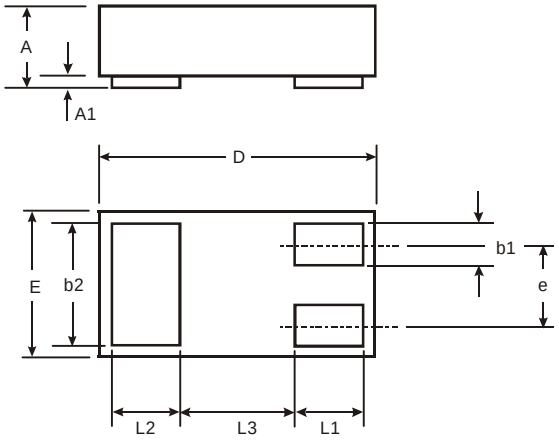


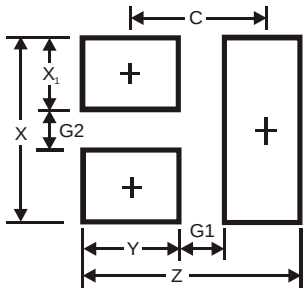
Fig. 13 Transient Thermal Resistance

Package Outline Dimensions



X2-DFN1006-3			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	—
A1	0	0.05	0.02
b1	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.05	1.00
E	0.55	0.65	0.60
e	—	—	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	—	—	0.40
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
Z	1.1
G1	0.3
G2	0.2
X	0.7
X1	0.25
Y	0.4
C	0.7

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