

Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
20V	0.99Ω @ V _{GS} = 4.5V	0.78A
	1.2Ω @ V _{GS} = 2.5V	0.71A
	1.8Ω @ V _{GS} = 1.8V	0.58A

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- 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 MOSFET is 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.

- Battery Charging
- Power Management Functions
- DC-DC Converters

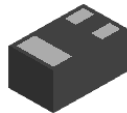
Mechanical Data

- Case: X1-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 Indicator: See Diagram
- Terminals: Finish — NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208 **e4**
- Weight: 0.001 grams (Approximate)

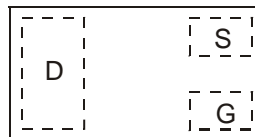


ESD protected Gate

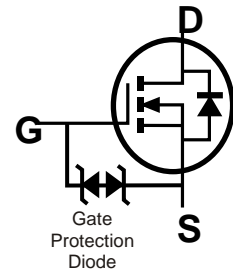
X1-DFN1006-3



Bottom View



Top View
Package Pin Configuration



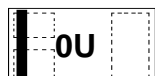
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2990UFB-7B	X1-DFN1006-3	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



Top View
Bar Denotes Gate and Source Side

0U = Part Marking Code

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

Characteristic			Symbol	Value	Unit
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	I _D	0.78	A
		T _A = +70°C		0.62	
Maximum Continuous Body Diode Forward Current (Note 6)			I _S	0.72	A
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)			I _{DM}	1.5	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Total Power Dissipation (Note 5)			P _D	0.52	W
Thermal Resistance, Junction to Ambient (Note 5)		Steady State	R _{θJA}	239	°C/W
Total Power Dissipation (Note 6)			P _D	0.92	W
Thermal Resistance, Junction to Ambient (Note 6)		Steady State	R _{θJA}	137	°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}	—	—	100	nA	V _{DS} = 16V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±1	μA	V _{GS} = ±5V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(TH)}	0.4	0.74	1.0	V	V _{DS} = V _{GS} , I _D = 250A
Static Drain-Source On-Resistance	R _{DS(ON)}	—	496	990	mΩ	V _{GS} = 4.5V, I _D = 100mA
			606	1200		V _{GS} = 2.5V, I _D = 50mA
			761	1800		V _{GS} = 1.8V, I _D = 20mA
			—			V _{GS} = 0V, I _S = 150mA
Diode Forward Voltage	V _{SD}	—	0.8	1.0	V	V _{GS} = 0V, I _S = 150mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iSS}	—	31	—	pF	V _{DS} = 15V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	3.6	—	pF	
Reverse Transfer Capacitance	C _{rSS}	—	2.5	—	pF	
Gate Resistance	R _g	—	187	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge	Q _g	—	0.41	—	nC	V _{GS} = 4.5V, V _{DS} = 10V, I _D = 250mA
Gate-Source Charge	Q _{gs}	—	0.06	—	nC	
Gate-Drain Charge	Q _{gd}	—	0.05	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	4.5	—	ns	V _{DD} = 15V, V _{GS} = 4.5V, R _G = 2Ω, I _D = 200mA
Turn-On Rise Time	t _R	—	3.5	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	24	—	ns	
Turn-Off Fall Time	t _F	—	12	—	ns	
Reverse Recovery Time	t _{RR}	—	7.1	—	ns	I _F = 200mA, di/dt = 100A/μs
Reverse Recovery Charge	Q _{RR}	—	1.2	—	nC	

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
 - Device mounted on minimum recommended pad layout test board, 10μs pulse duty cycle = 1%.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

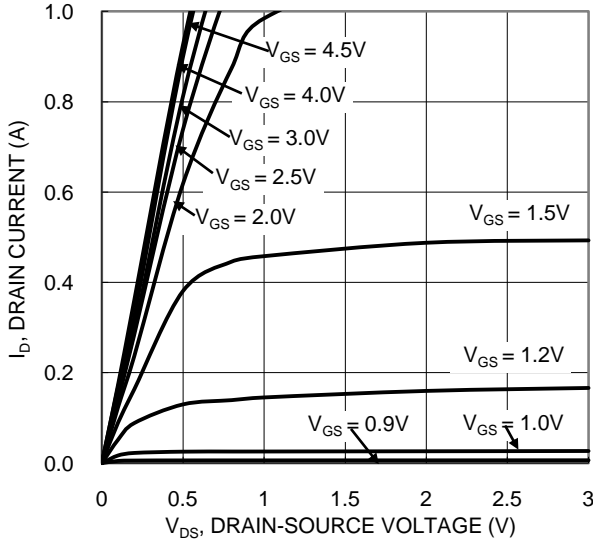


Figure 1. Typical Output Characteristic

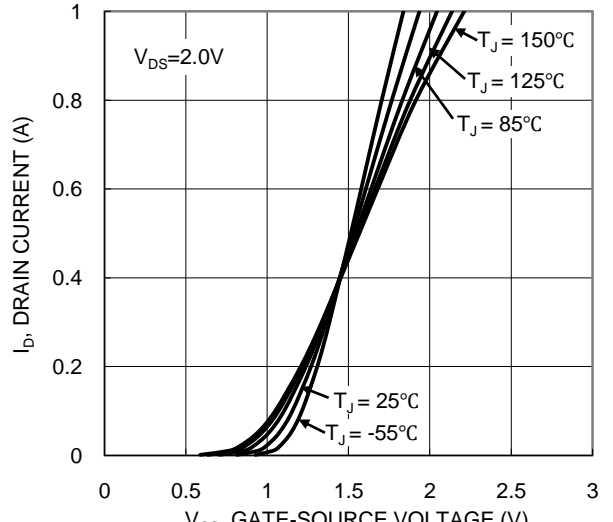


Figure 2. Typical Transfer Characteristic

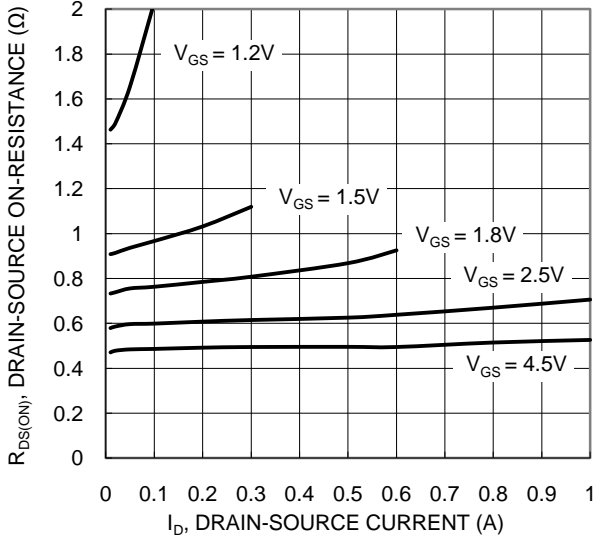


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

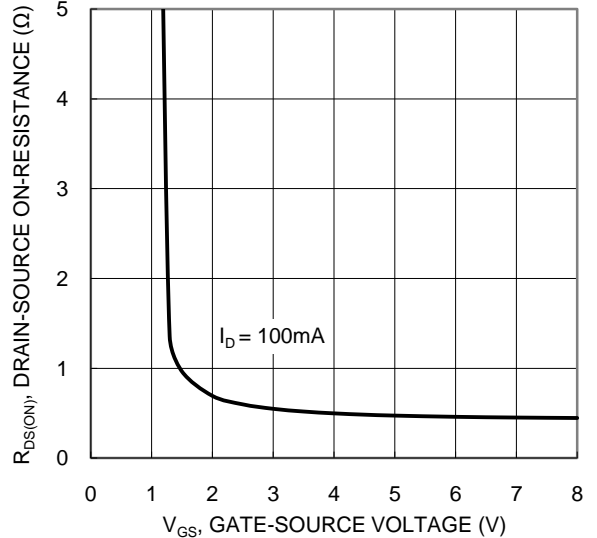


Figure 4. Typical Transfer Characteristic

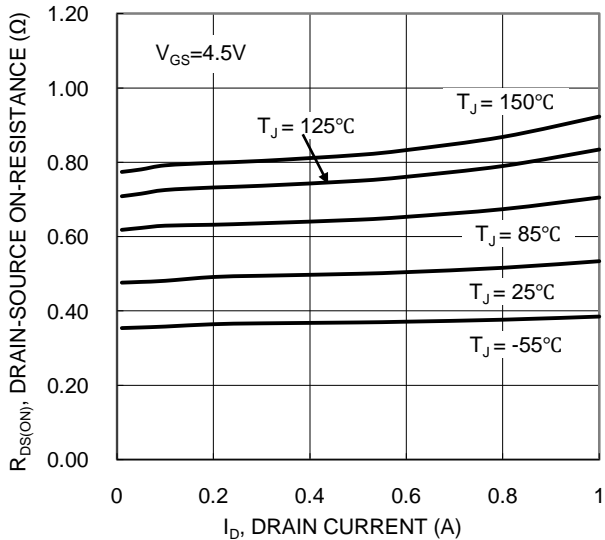


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

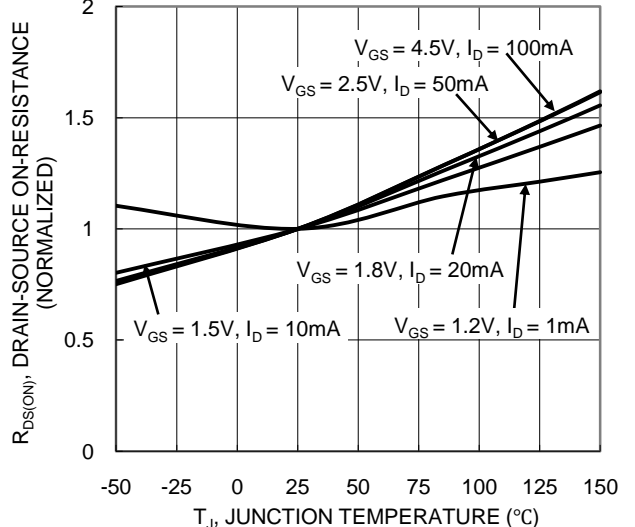


Figure 6. On-Resistance Variation with Temperature

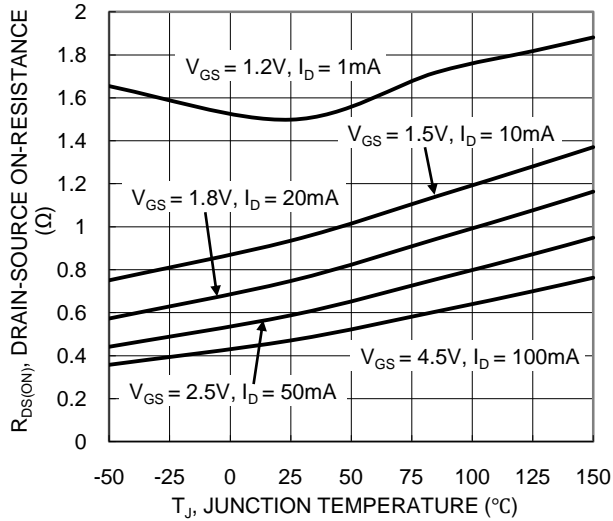


Figure 7. On-Resistance Variation with Temperature

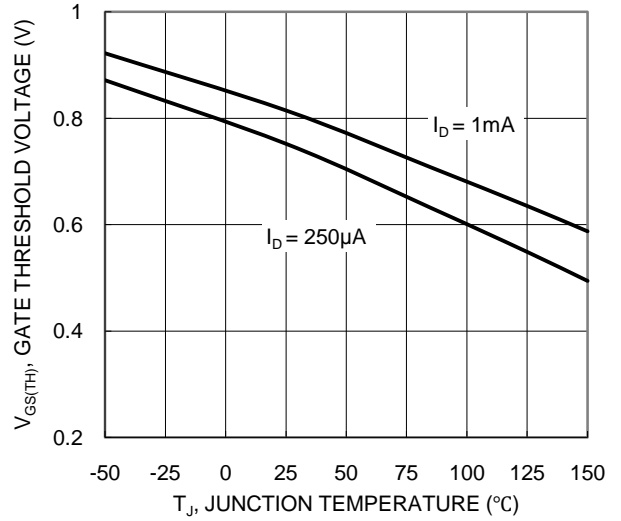


Figure 8. Gate Threshold Variation vs. Junction Temperature

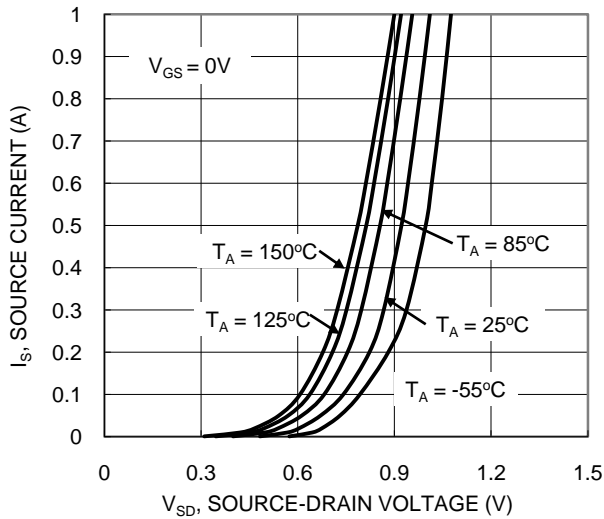


Figure 9. Diode Forward Voltage vs. Current

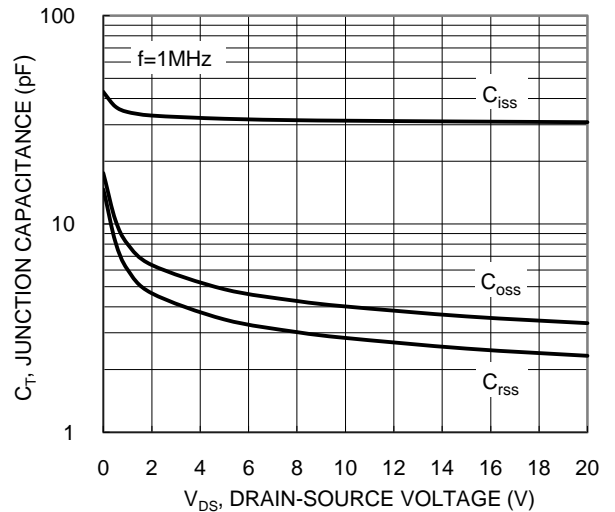


Figure 10. Typical Junction Capacitance

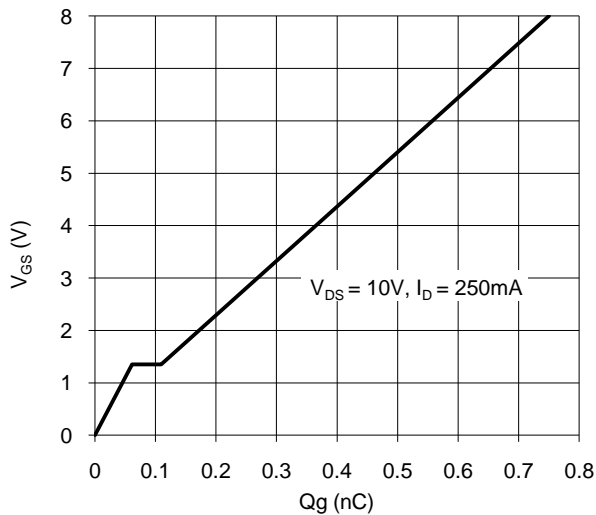


Figure 11. Gate Charge

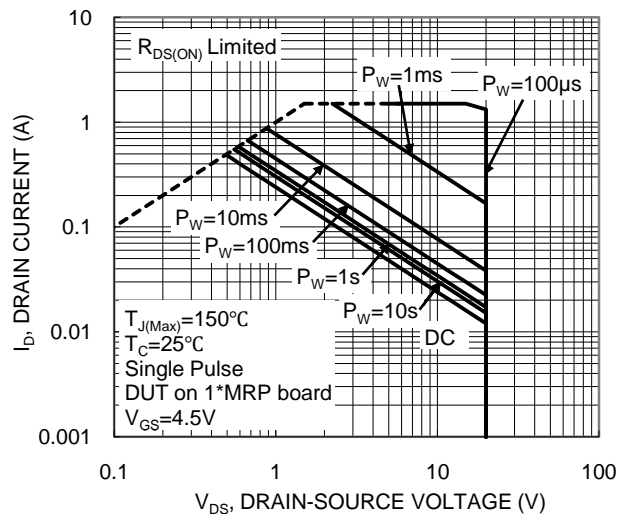


Figure 12. SOA, Safe Operation Area

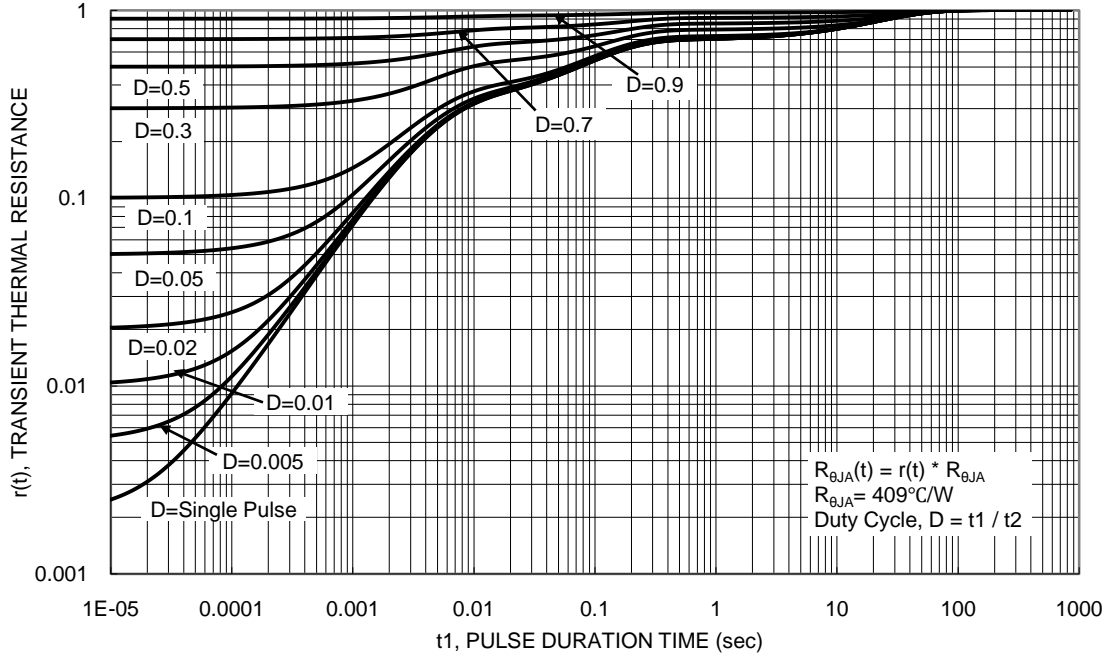
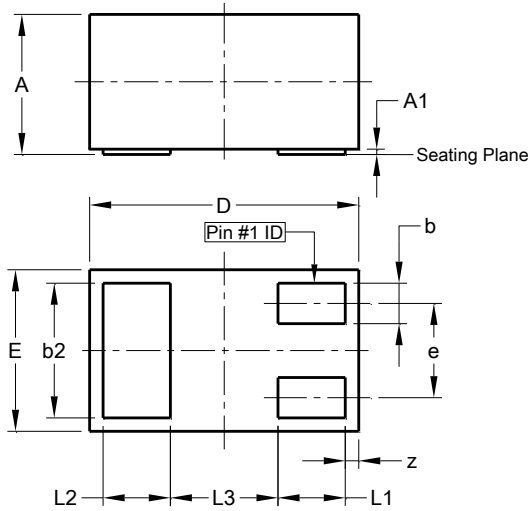


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

X1-DFN1006-3

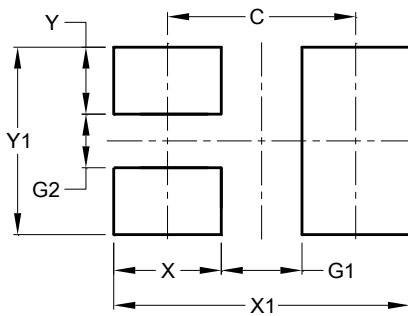


X1-DFN1006-3			
Dim	Min	Max	Typ
A	0.47	0.53	0.50
A1	0.00	0.05	0.03
b	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.075	1.00
E	0.55	0.675	0.60
e	-	-	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	-	-	0.40
z	0.02	0.08	0.05
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

X1-DFN1006-3



Dimensions	Value (in mm)
C	0.70
G1	0.30
G2	0.20
X	0.40
X1	1.10
Y	0.25
Y1	0.70

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