60V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	I_D Max @ T_A = +25°C
60V	1.4Ω @ V_{GS} = 10V	0.41A
	1.6Ω @ V_{GS} = 4.5V	0.38A

Description

This MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

- Load switches
- Portable applications
- Power management functions

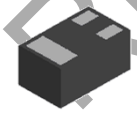
Features and Benefits

- Footprint of just 0.6mm^2 – Thirteen Times Smaller than SOT23
- Low On-Resistance
- Low Gate Threshold Voltage
- Fast Switching Speed
- Ultra-Small Surface Mount Package
- ESD Protected Gate 200V
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. https://www.diodes.com/quality/product-definitions/**

Mechanical Data

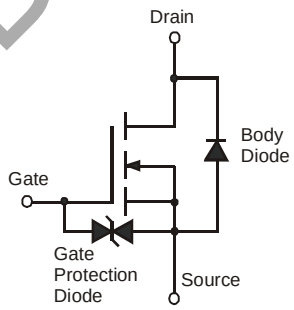
- Package: X1-DFN1006-3
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.001 grams (Approximate)

X1-DFN1006-3



Bottom View

Top View
Internal Schematic



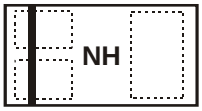
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
DMN62D1SFB-7B	X1-DFN1006-3	NH	7	8	10,000	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



NH = Product Type Marking Code

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 5)	V_{GS} = 10V	T_A = +25°C T_A = +85°C	I_D	0.41 0.30	A
Pulsed Drain Current (Note 6)			I_{DM}	2.64	A

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

Characteristic		Symbol	Value	Unit
Power Dissipation (Note 5)		P_D	0.47	W
Thermal Resistance, Junction to Ambient	@T_A =+25°C	$R_{\theta JA}$	258	°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}	60	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	100	nA	V_{DS} = 60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	— —	— —	10 1	µA	V_{GS} = ±20V, V_{DS} = 0V V_{GS} = ±5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.3	1.6	2.3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	1.40 1.60	Ω	V_{GS} = 10V, I_D = 40mA V_{GS} = 4.5V, I_D = 35mA
Forward Transfer Admittance	$\|Y_{fs}\|$	100	—	—	mS	V_{DS} = 5V, I_D = 40mA
Diode Forward Voltage	V_{SD}	—	0.7	1.1	V	V_{GS} = 0V, I_S = 300mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	40	80	pF	V_{DS} = 40V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	3.5	7	pF	
Reverse Transfer Capacitance	C_{rss}	—	2.8	5.6	pF	
Gate Resistance	R_g	—	81.3	200	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	—	0.73	1.5	nC	V_{GS} = 4.5V; V_{DS} = 50V, I_D = 1A
Total Gate Charge	Q_g	—	1.39	2.8	nC	V_{GS} = 10V; V_{DS} = 50V, I_D = 1A
Gate-Source Charge	Q_{gs}	—	0.2	0.4	nC	V_{GS} = 10V; V_{DS} = 50V, I_D = 1A
Gate-Drain Charge	Q_{gd}	—	0.23	0.5	nC	V_{GS} = 10V; V_{DS} = 50V, I_D = 1A
Turn-On Delay Time	$t_{D(ON)}$	—	3.89	10	ns	V_{DS} = 50V, I_D = 1A V_{GS} = 10V, R_G = 6Ω
Turn-On Rise Time	t_R	—	4.93	10	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	18.80	40	ns	
Turn-Off Fall Time	t_F	—	11.96	25	ns	

Notes: 5. Device mounted on FR-4 PCB, with minimum recommended pad layout.
6. Device mounted on minimum recommended pad layout test board, 10µs pulse duty cycle = 1%.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

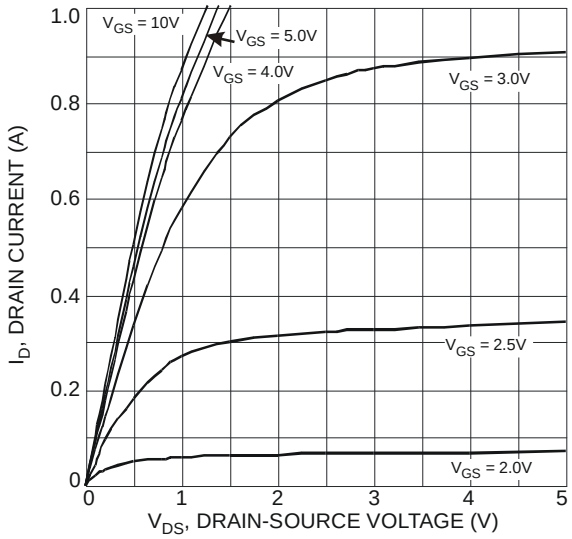


Fig. 1 Typical Output Characteristic

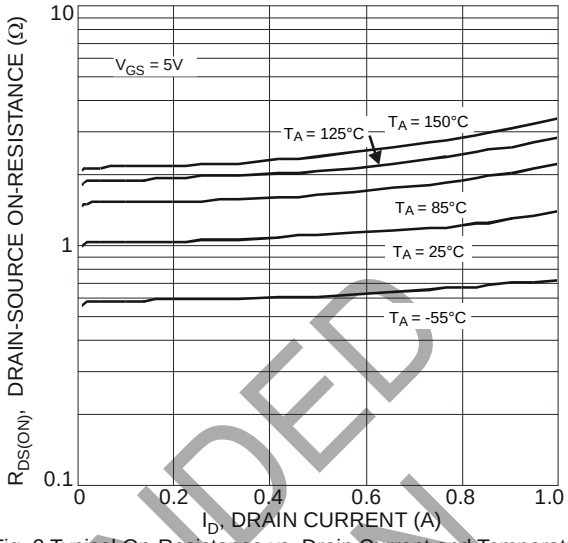


Fig. 2 Typical On-Resistance vs. Drain Current and Temperature

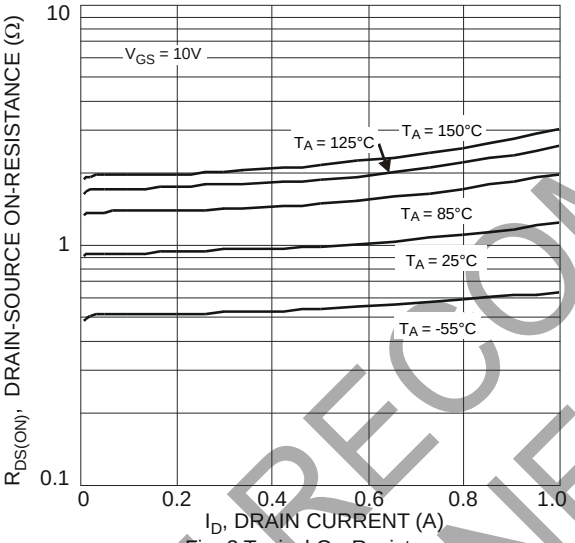


Fig. 3 Typical On-Resistance vs. Drain Current and Temperature

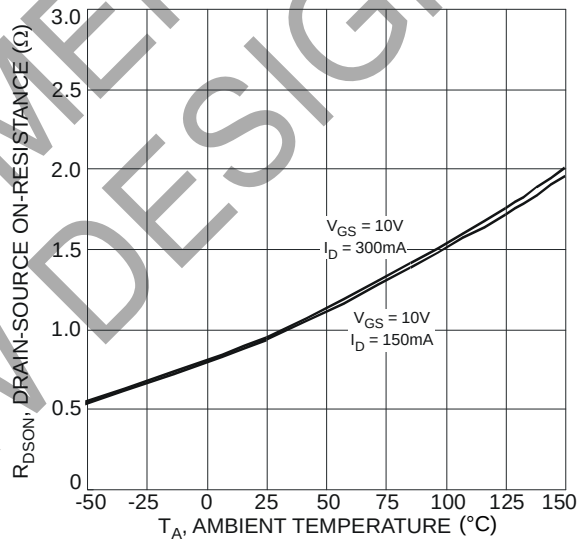


Fig. 4 On-Resistance Variation with Temperature

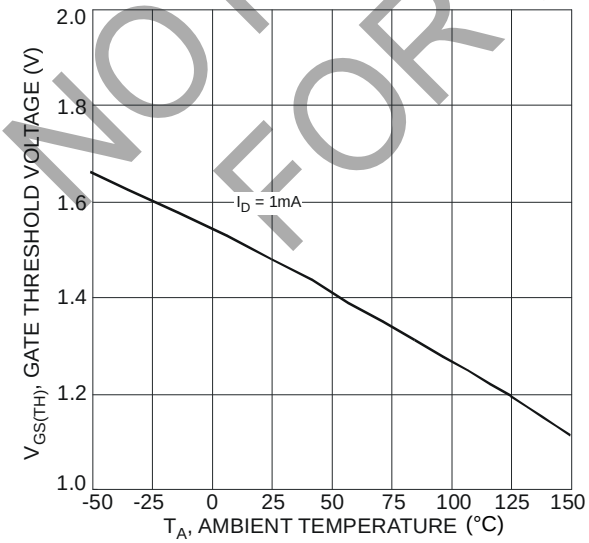


Fig. 5 Gate Threshold Variation vs. Ambient Temperature

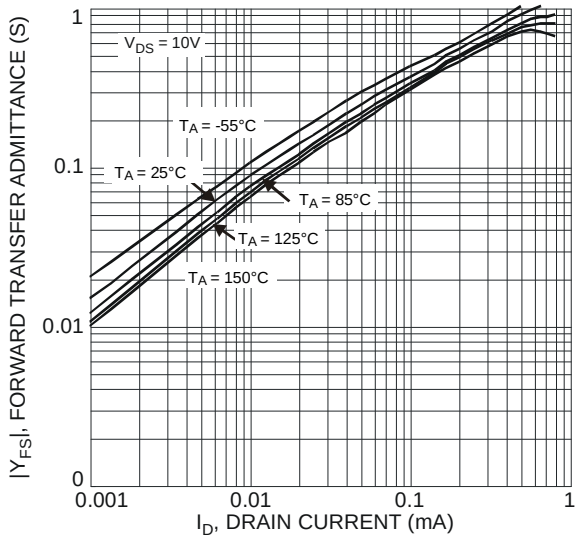


Fig. 6 Forward Transfer Admittance vs. Drain Current

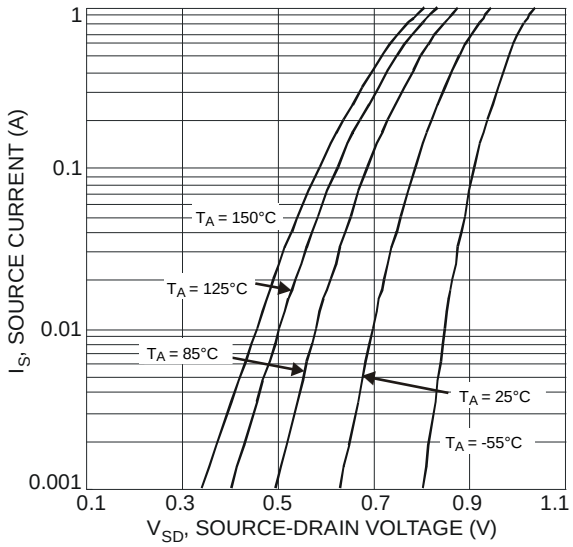


Fig. 7 Diode Forward Voltage vs. Current

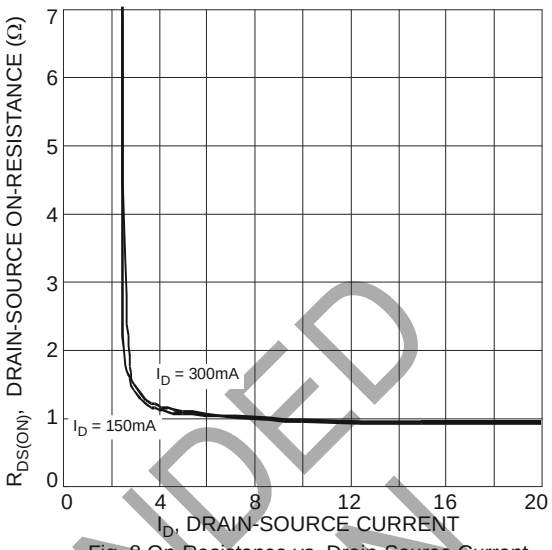


Fig. 8 On-Resistance vs. Drain-Source Current

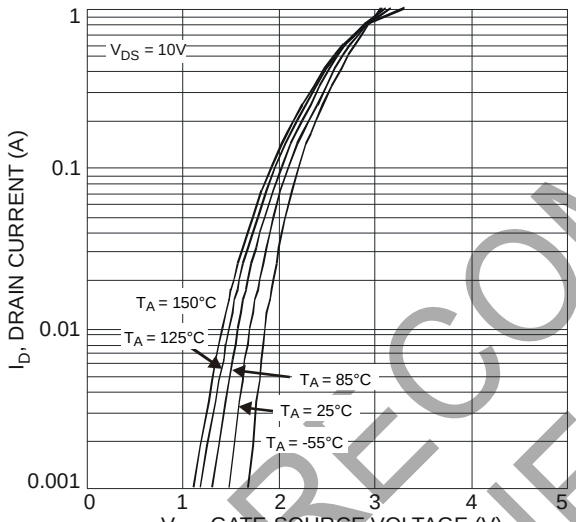


Fig. 9 Typical Transfer Characteristic

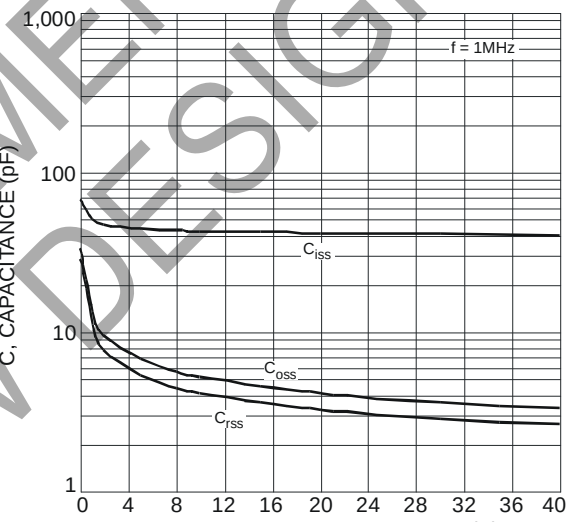


Fig. 10 Typical Total Capacitance

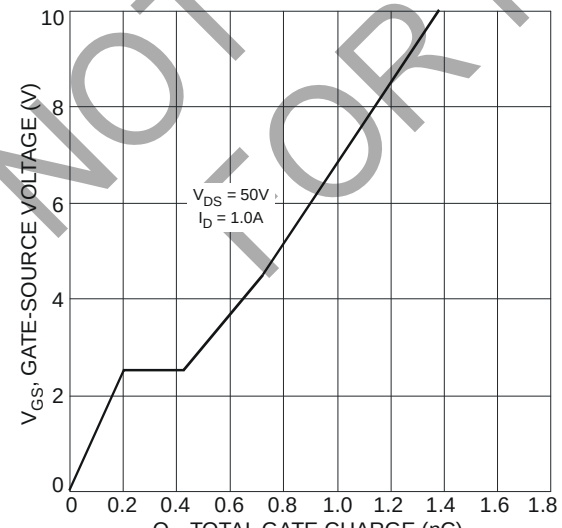


Fig. 11 Gate-Charge Characteristics

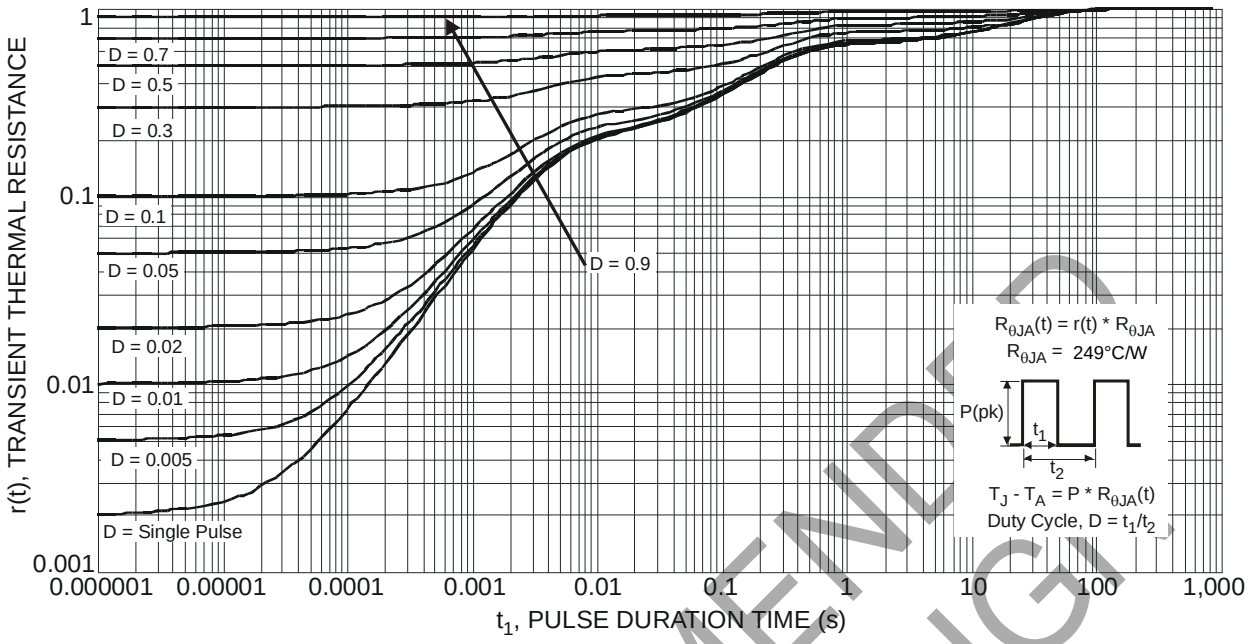
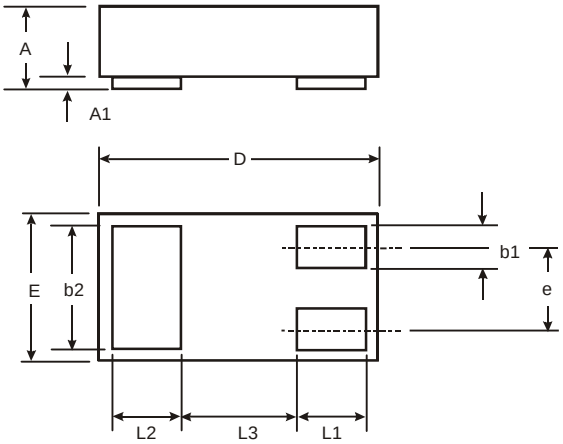


Fig. 12 Transient Thermal Response

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	0.05	0.03
b1	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
All Dimensions in mm			

Suggested Pad Layout

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

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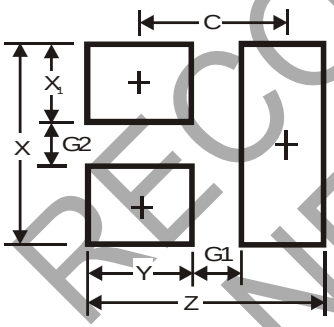

Dimensions	Value (in mm)
Z	1.1
G1	0.3
G2	0.2
X	0.7
X1	0.25
Y	0.4
C	0.7

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