

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ max	I_D $T_A = 25^\circ C$
20V	0.4Ω @ $V_{GS} = 4.5V$	1.5A
	0.5Ω @ $V_{GS} = 2.5V$	1.3A
	0.7Ω @ $V_{GS} = 1.8V$	1.1A

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

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 Surface 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**

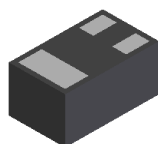
Mechanical Data

- 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 @4
- Weight: 0.001 grams (approximate)

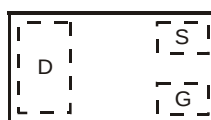


ESD PROTECTED

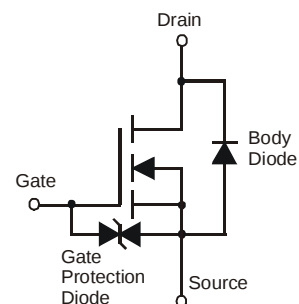
X2-DFN1006-3



Bottom View



Top View
Internal Schematic



Equivalent Circuit

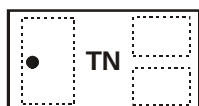
Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2501UFB4-7	X2-DFN1006-3	3,000/Tape & Reel
DMN2501UFB4-7B	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/quality/lead_free.html 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>.

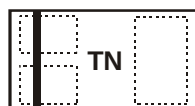
Marking Information

DMN2501UFB4-7



Top View
Dot Denotes
Drain Side

DMN2501UFB4-7B



Top View
Bar Denotes Gate
and Source Side

TN = Product Type Marking Code

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 5) V _{GS} = 4.5V	Steady State	T _A = 25°C T _A = 70°C	I _D	1.0 0.8	A
	t<10s	T _A = 25°C T _A = 70°C	I _D	1.2 0.9	A
Continuous Drain Current (Note 6) V _{GS} = 4.5V	Steady State	T _A = 25°C T _A = 70°C	I _D	1.5 1.2	A
	t<10s	T _A = 25°C T _A = 70°C	I _D	1.8 1.4	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I _{DM}	6	A
Maximum Body Diode continuous Current			I _S	1	A

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T _A = 25°C	P _D	0.5	W
	T _A = 70°C		0.3	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R _{θJA}	251	°C/W
	t<10s		188	
Total Power Dissipation (Note 6)	T _A = 25°C	P _D	1.2	W
	T _A = 70°C		0.7	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R _{θJA}	110	°C/W
	t<10s		82	
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} = 20V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	-	-	±1	µA	V _{GS} = ±6V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(th)}	0.5	0.76	1.0	V	V _{DS} = V _{GS} , I _D = 250µA
Static Drain-Source On-Resistance	R _{DS(on)}	-	170	400	mΩ	V _{GS} = 4.5V, I _D = 600mA
			200	500		V _{GS} = 2.5V, I _D = 500mA
			260	700		V _{GS} = 1.8V, I _D = 350mA
Forward Transfer Admittance	Y _{fs}	-	1.4	-	S	V _{DS} = 10V, I _D = 400mA
Diode Forward Voltage	V _{SD}	-	0.7	1.2	V	V _{GS} = 0V, I _S = 150mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	-	82	-	pF	V _{DS} = 16V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	-	12	-	pF	
Reverse Transfer Capacitance	C _{rss}	-	10	-	pF	
Gate resistance	R _g	-	83	-	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	-	1.1	-	nC	V _{DS} = 10V, I _D = 250mA
Total Gate Charge (V _{GS} = 10V)	Q _g	-	2.0	-	nC	
Gate-Source Charge	Q _{gs}	-	0.14	-	nC	
Gate-Drain Charge	Q _{gd}	-	0.19	-	nC	
Turn-On Delay Time	t _{D(on)}	-	6.6	-	ns	V _{DD} = 10V, V _{GS} = 4.5V, R _L = 47Ω, R _G = 10Ω, I _D = 200mA
Turn-On Rise Time	t _r	-	6.4	-	ns	
Turn-Off Delay Time	t _{D(off)}	-	40.4	-	ns	
Turn-Off Fall Time	t _f	-	17.3	-	ns	

- 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.

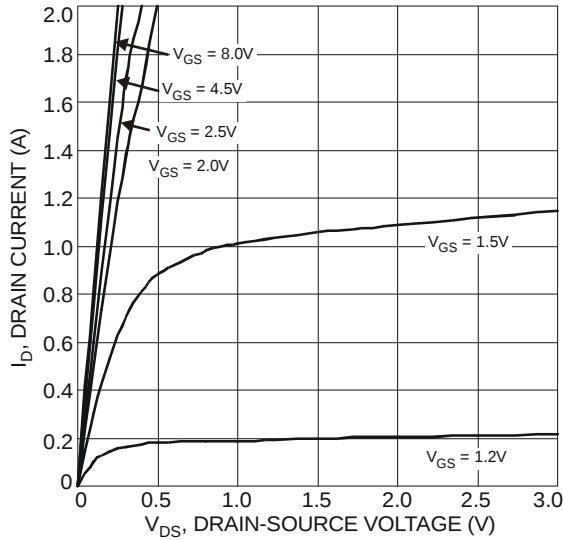


Fig. 1 Typical Output Characteristic

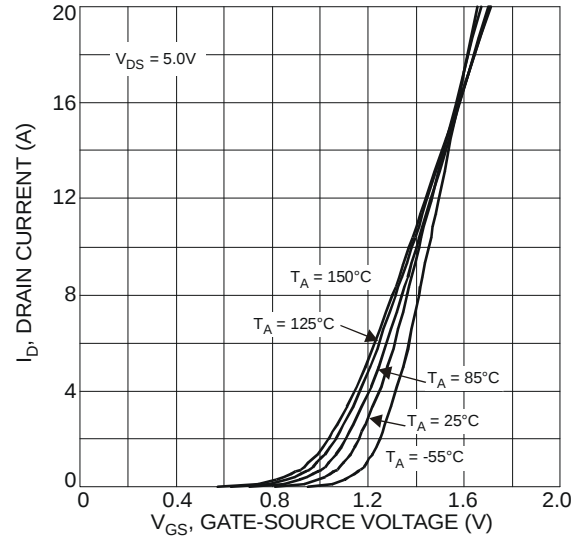


Fig. 2 Typical Transfer Characteristics

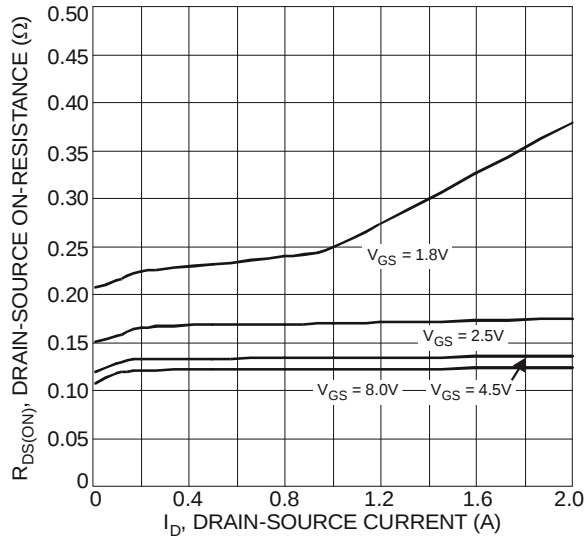


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

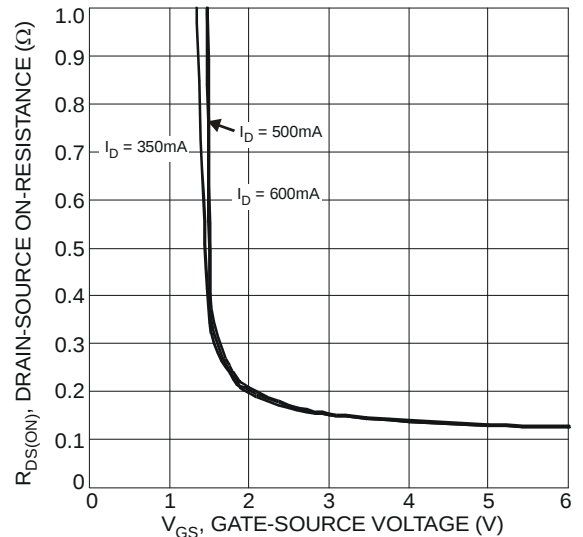


Fig. 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

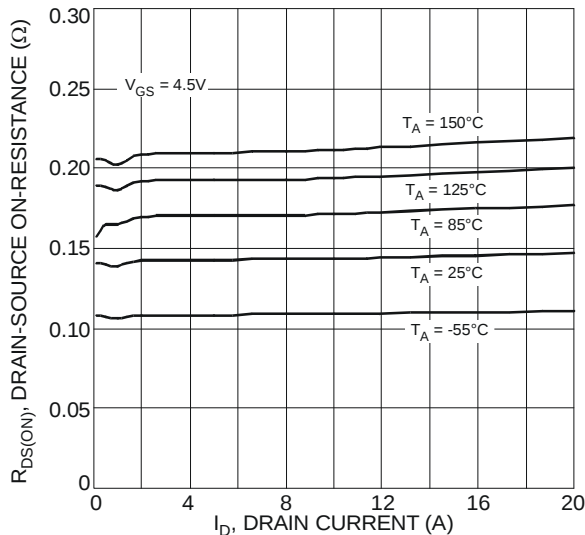


Fig. 5 Typical On-Resistance vs. Drain Current and Temperature

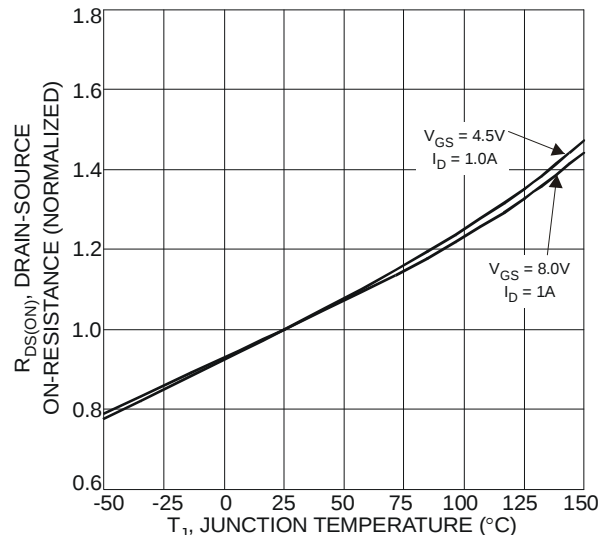


Fig. 6 On-Resistance Variation with Temperature

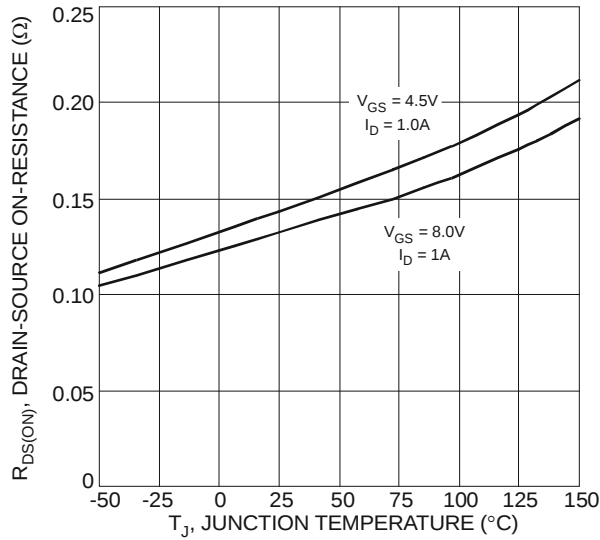


Fig. 7 On-Resistance Variation with Temperature

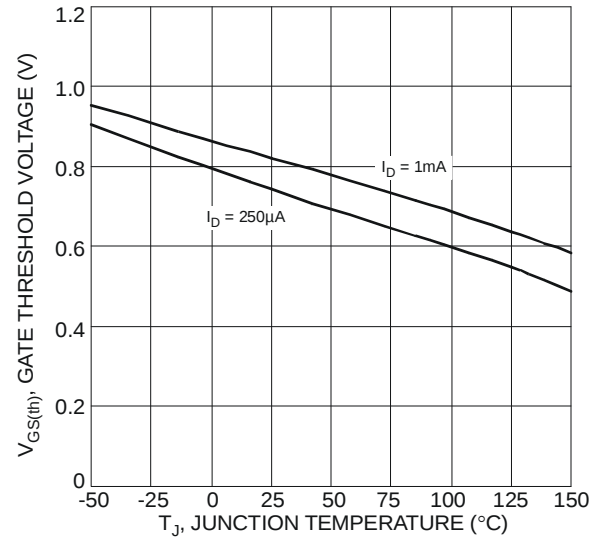


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

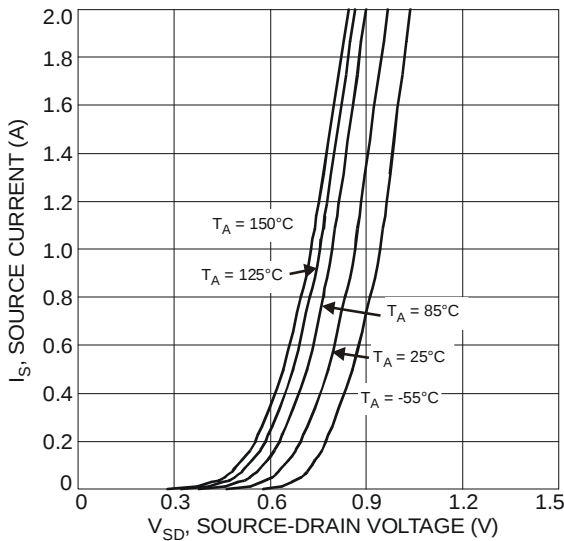


Fig. 9 Diode Forward Voltage vs. Current

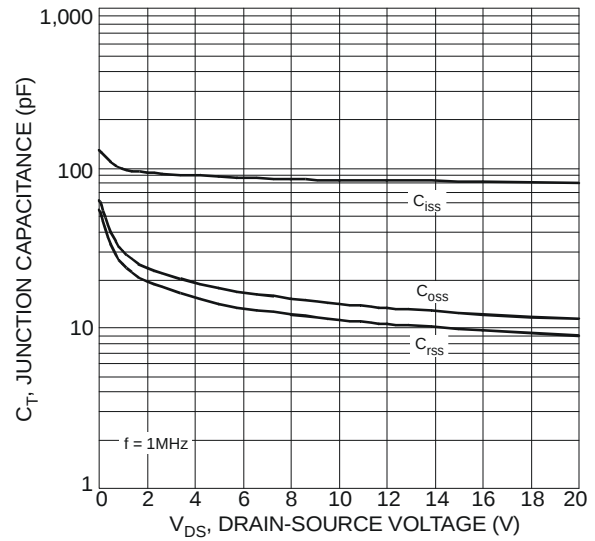


Fig. 10 Typical Junction Capacitance

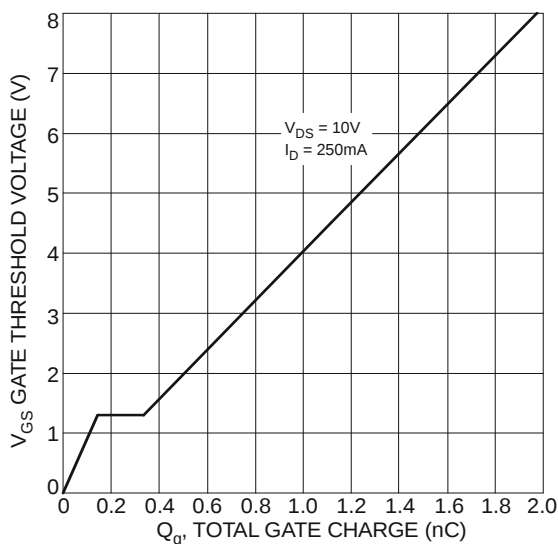


Fig. 11 Gate Charge

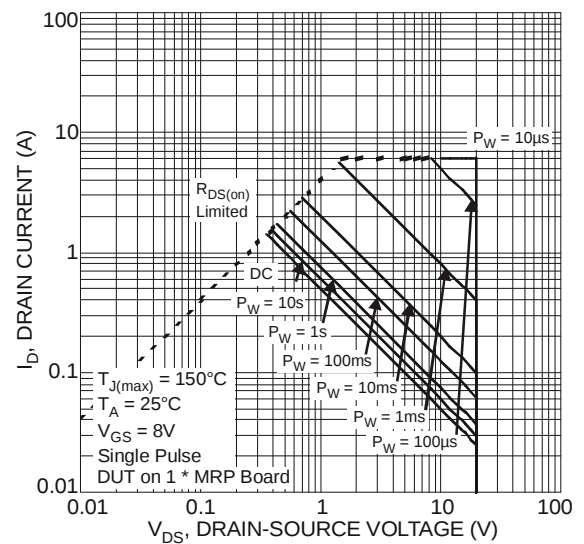
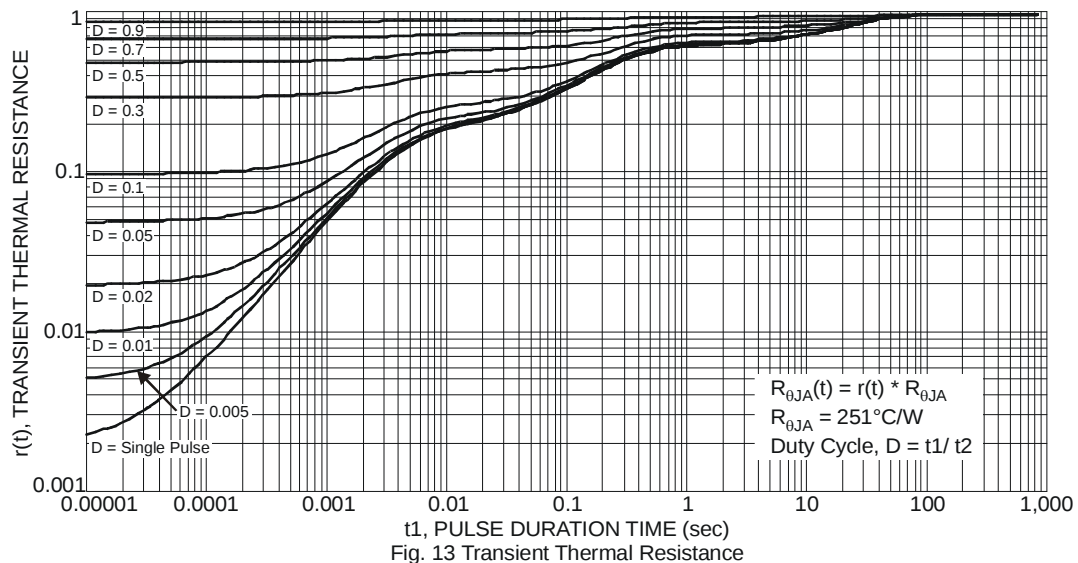
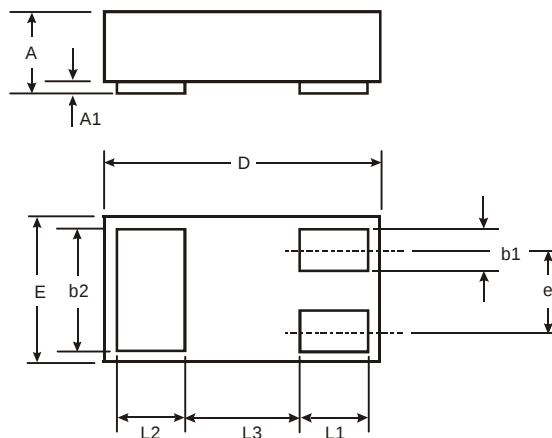


Fig. 12 SOA, Safe Operation Area



Package Outline Dimensions

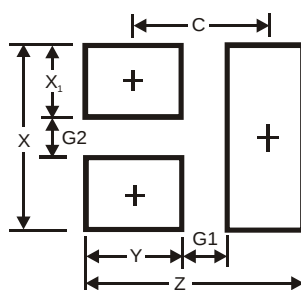
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



X2-DFN1006-3			
Dim	Min	Max	Typ
A	—	0.40	—
A1	0	0.05	0.03
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

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



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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