

# NUC2401MN

## Integrated Common Mode Choke with Integrated ESD Protection

### Description

The NUC2401MN is an Integrated Common Mode Filter for the elimination of common mode noise in high speed data line applications such as IEEE1394, USB2.0 and other LVDS type applications. ESD protection is integrated into the Common mode filter for superior protection and significant part count reduction.

### Features

- Common mode EMI Filtering and ESD Protection
- Integration of 5 Discrete components
- $\pm 12$  kV ESD Protection per IEC61000-4-2 (Contact Discharge)
- DFN: 2.0 x 2.2 mm Package
- Moisture Sensitivity Level 1
- ESD Rating: Machine Model (MM) = 1.6 kV;  
Human Body Model (HBM) = 16 kV
- This is a Pb-Free Device

### Benefits

- Reduces EMI/RFI Emissions on a Data Line
- Integrated Solution offers Cost and Space Savings
- Reduces Parasitic Inductances Which Offer a More “Ideal” Common Mode Filtering
- Integrated Solution Improves System Reliability

### Applications

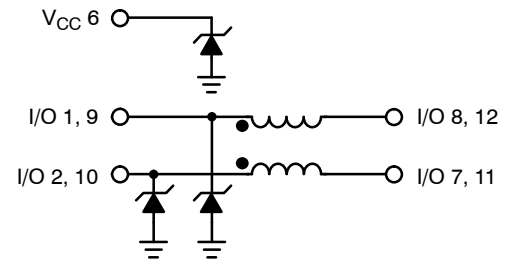
- High Speed Differential Data Lines
- USB2.0
- IEEE1394
- LVDS
- MIPI
- MDDI



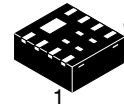
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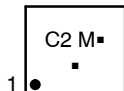
### SIMPLIFIED SCHEMATIC



### MARKING DIAGRAM



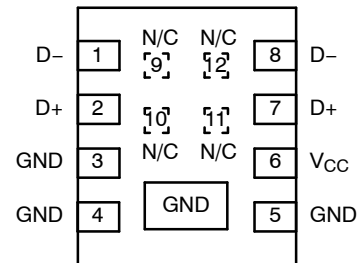
DFN8  
CASE 506BL



C2 = Specific Device Code  
M = Date Code  
▪ = Pb-Free Device

(Note: Microdot may be in either location)

### PIN CONNECTIONS\*



(Top View)

\*NOTE: Pins 1 and 9, Pins 2 and 10, Pins 7 and 11, Pins 8 and 12 are internally connected in pairs. It is recommended not to solder to Pins 9, 10, 11, 12.

### ORDERING INFORMATION

Device	Package	Shipping†
NUC2401MNTAG	DFN8 (Pb-Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# NUC2401MN

## MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Value	Units
ESD Discharge IEC61000-4-2 Contact Discharge	$V_{PP}$	$\pm 12$	kV
Operating Temperature Range	$T_{OP}$	-40 to 85	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-55 to 125	$^\circ\text{C}$
Maximum Lead Temperature for Soldering Purposes (1/8" from Case for 10 Seconds)	$T_L$	260	$^\circ\text{C}$
DC Current per Line	$I_{LINE}$	100	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Reverse Working Voltage	$V_{RWM}$				5.0	V
Breakdown Voltage	$V_{BR}$	$I_R = 1 \text{ mA}$	6.0	7.6	8.6	V
Leakage Current	$I_R$	$V_{RWM} = 5.5 \text{ V}$			2.0	$\mu\text{A}$
Maximum Peak Pulse Current	$I_{PP}$	8x20 $\mu\text{s}$ Waveform			12	A
Clamping Voltage	$V_C$	$I_{PP} = 5 \text{ A}$			10	V
Resistance Pin 1 to Pin 8	$R_A$			2.2	5.0	$\Omega$
Resistance Pin 2 to Pin 7	$R_B$			2.2	5.0	$\Omega$
Capacitance (Note 1)	$C_{LINE 1}$			0.8	1.0	pF
Capacitance (Note 2)	$C_{LINE 2}$			0.8	1.0	pF
Common Mode Cut-Off Frequency (Note 3)	$f_{3dB}$	(Above this Frequency, Appreciable Common Mode Attenuation Occurs)		40		MHz
Common Mode Impedance	$Z_C$	@ 100 MHz		90		$\Omega$

1. Measured at  $25^\circ\text{C}$ ,  $V_R = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$ , Pins 1 or 4 to GND.
2. Measured at  $25^\circ\text{C}$ ,  $V_R = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$ , Pins 8 or 5 to GND.
3. 50  $\Omega$  source and 50  $\Omega$  load termination.

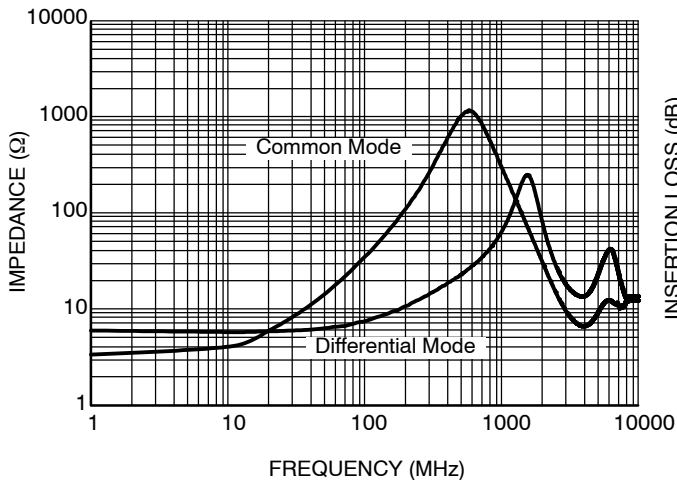


Figure 1. Impedance Characteristics vs. Frequency

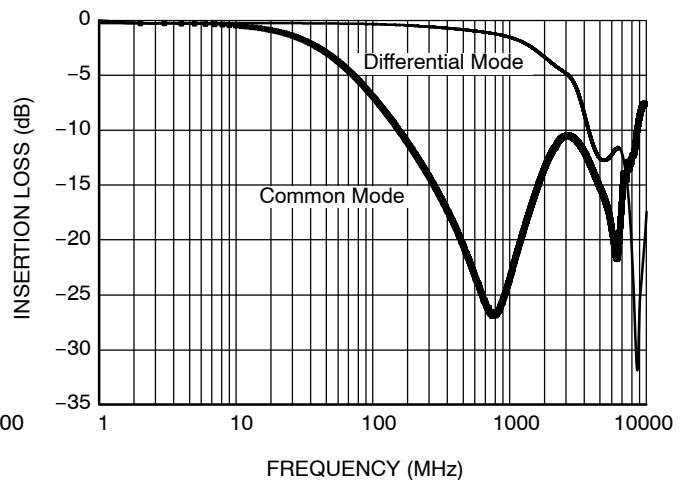
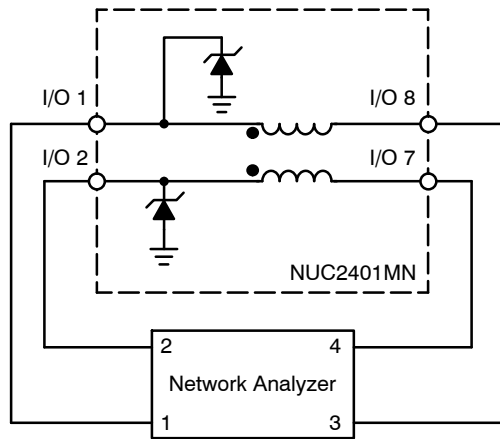


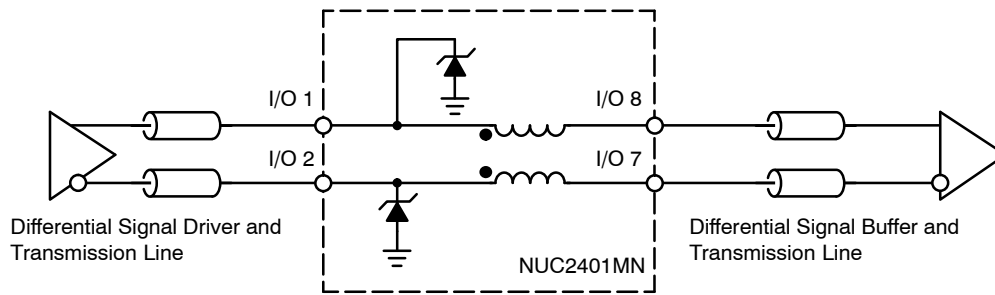
Figure 2. Insertion Loss Characteristics vs. Frequency

# NUC2401MN



Normal (Differential) Mode

**Figure 3. Normal (Differential) Mode Test Configuration**

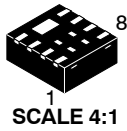


**Figure 4. Application Circuit**

# MECHANICAL CASE OUTLINE

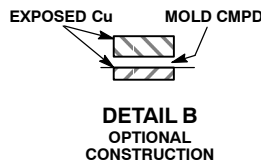
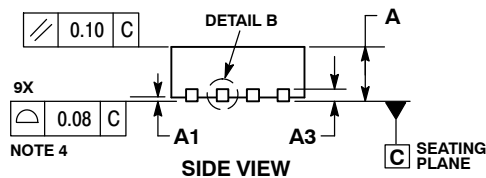
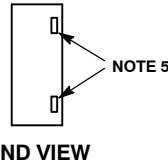
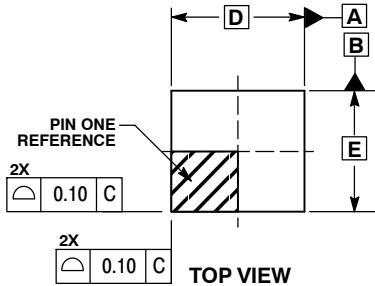
## PACKAGE DIMENSIONS

ON Semiconductor®



DFN8, 2.2x2, 0.5P  
CASE 506BL-01  
ISSUE O

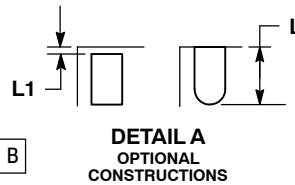
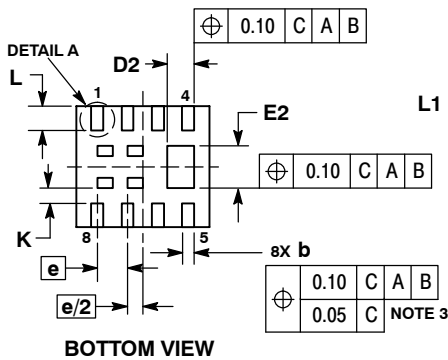
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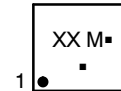
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. EXPOSED ENDS OF THE TERMINALS ARE ELECTRICALLY ACTIVE.

MILLIMETERS		
DIM	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.15	0.25
D	2.20 BSC	
D2	0.34	0.54
E	2.00 BSC	
E2	0.60	0.80
e	0.50 BSC	
K	0.20	---
L	0.30	0.50
L1	---	0.15

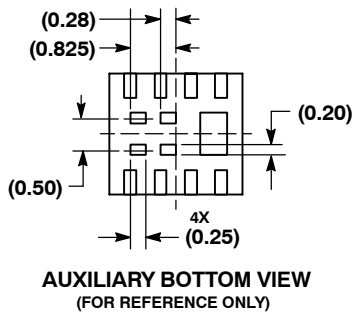


GENERIC MARKING DIAGRAM\*

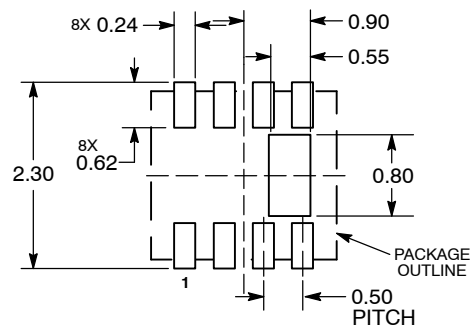


- XX = Specific Device Code
- M = Date Code
- = Pb-Free Device

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.



SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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STATUS:	ON SEMICONDUCTOR STANDARD	
NEW STANDARD:		
DESCRIPTION:	DFN8, 2.2X2.0, 0.5P	PAGE 1 OF 2



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