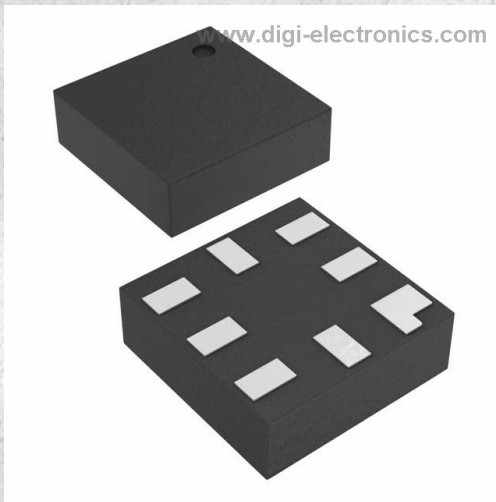


# NC7WP02L8X Datasheet



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	NC7WP02L8X-DG
Manufacturer	<a href="#">onsemi</a>
Manufacturer Product Number	NC7WP02L8X
Description	IC GATE NOR 2CH 2-INP 8MICROPAK
Detailed Description	NOR Gate IC 2 Channel 8-MicroPak™



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

Manufacturer Product Number:

NC7WP02L8X

Series:

7WP

Logic Type:

NOR Gate

Number of Inputs:

2

Voltage - Supply:

0.9V ~ 3.6V

Current - Output High, Low:

2.6mA, 2.6mA

Input Logic Level - High:

1.6V ~ 2V

Operating Temperature:

-40°C ~ 85°C

Supplier Device Package:

8-MicroPak™

Base Product Number:

7WP02

Manufacturer:

onsemi

Product Status:

Obsolete

Number of Circuits:

2

Features:

-

Current - Quiescent (Max):

900 nA

Input Logic Level - Low:

0.7V ~ 0.9V

Max Propagation Delay @ V, Max CL:

7ns @ 3.3V, 30pF

Mounting Type:

Surface Mount

Package / Case:

8-UFQFN

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99





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Please note. As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (\_), the underscore (\_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (\_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.onsemi.com](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto:Fairchild_questions@onsemi.com).

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October 2003  
Revised August 2024

# NC7WP02

## TinyLogic® ULP Dual 2-Input NOR Gate

### General Description

The NC7WP02 is a dual 2-Input NOR Gate from Fairchild's Ultra Low Power (ULP) series of TinyLogic®. Ideal for applications where battery life is critical, this product is designed for ultra low power consumption within the V<sub>CC</sub> operating range of 0.9V to 3.6V V<sub>CC</sub>.

The internal circuit is composed of a minimum of inverter stages, including the output buffer, to enable ultra low static and dynamic power.

The NC7WP02 is designed for optimized power and speed, and is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining extremely low CMOS power dissipation.

### Features

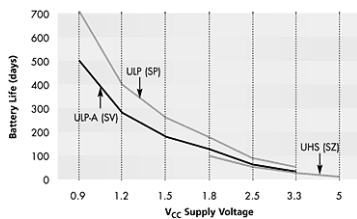
- Space saving US8 package
- Ultra small MicroPak™ Pb-Free package
- 0.9V to 3.6V V<sub>CC</sub> supply operation
- 3.6V overvoltage tolerant I/O's (V<sub>CC</sub> from 0.9V to 3.6V)
- t<sub>PD</sub>
  - 3 ns typ for 3.0V to 3.6V V<sub>CC</sub>
  - 4 ns typ for 2.7V to 3.0V V<sub>CC</sub>
  - 5 ns typ for 1.6V to 1.8V V<sub>CC</sub>
  - 6 ns typ for 1.0V to 1.60V V<sub>CC</sub>
  - 9 ns typ for 1.10V to 1.30V V<sub>CC</sub>
  - 24 ns typ for 0.90V V<sub>CC</sub>
- Power- high impedance inputs and outputs
- Static Drive (I<sub>OH</sub>/I<sub>OL</sub>)
  - ±2.6 mA @ 3.0V V<sub>CC</sub>
  - ±2.1 mA @ 2.30V V<sub>CC</sub>
  - ±1.5 mA @ 1.35V V<sub>CC</sub>
  - ±1.0 mA @ 1.40V V<sub>CC</sub>
  - ±0.5 mA @ 1.10V V<sub>CC</sub>
  - ±20 µA @ 0.9V V<sub>CC</sub>
- Low noise switching using design techniques of Quiet Series™ noise/EMI reduction circuitry
- Ultra low dynamic power

### Ordering Code

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7WP02K8X	MAB08A	WP02	8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide	3k Units on Tape and Reel
NC7WP02L8X	MAC08A	Y4	Pb-Free 8-Lead MicroPak, 1.6 mm Wide	5k Units on Tape and Reel

Pb-Free package per JEDEC J-STD-020B.

### Battery Life vs. V<sub>CC</sub> Supply Voltage



TinyLogic ULP and ULP-A with up to 50% less power consumption can extend your battery life significantly.

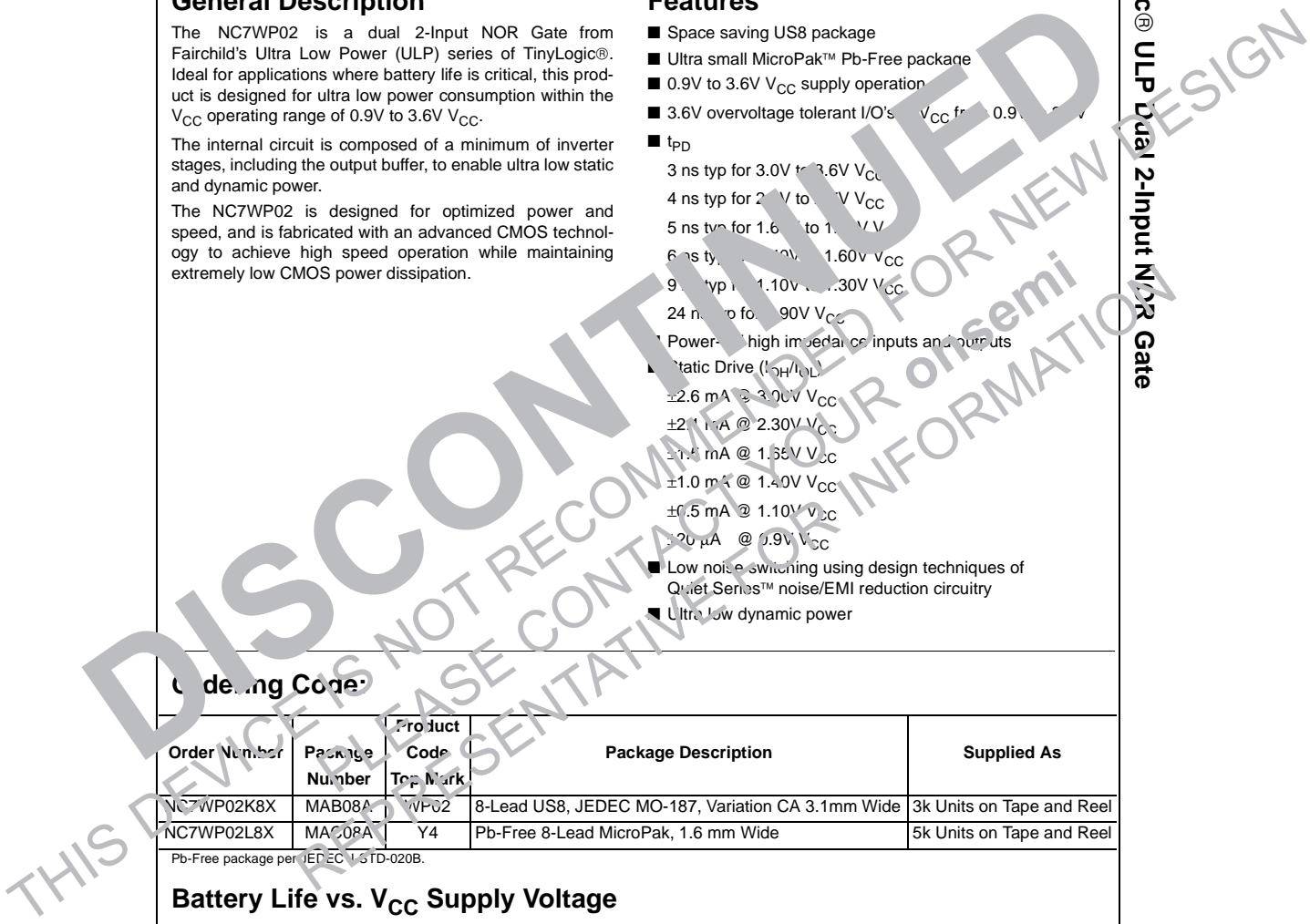
$$\text{Battery Life} = (V_{\text{battery}} \cdot I_{\text{battery}} \cdot 9) / (P_{\text{device}}) / 24\text{hrs/day}$$

$$\text{Where, } P_{\text{device}} = (I_{\text{CC}} \cdot V_{\text{CC}}) + (C_{\text{PD}} + C_{\text{L}}) \cdot V_{\text{CC}}^2 \cdot f$$

Assumes ideal 3.6V Lithium Ion battery with current rating of 900mAh and derated 90% and device frequency at 10MHz, with C<sub>L</sub> = 15 pF load

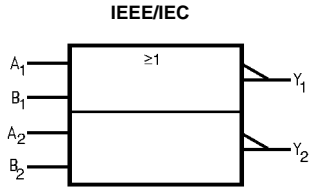
TinyLogic® is a registered trademark, and Quiet Series™ and MicroPak™ are trademarks of Fairchild Semiconductor Corporation.

NC7WP02 TinyLogic® ULP Dual 2-Input NOR Gate



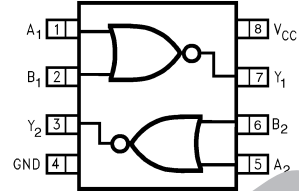
NC7WP02

**Logic Symbol**



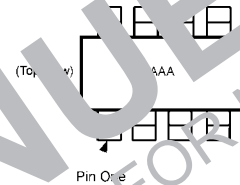
**Connection Diagrams**

**Pin Assignments for US8**



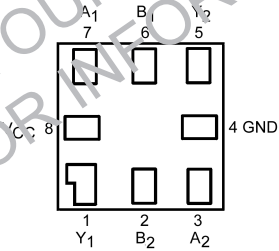
(Top View)

**Pin One Orientation Diagram**



AAA = Present Product Code Top Mark - see ordering code  
**Note:** Orientation of Top Mark determines Pin One location. Read the top product code mark, left to right, Pin One is the lower left pin (see diagram).

**Pad Assignments for MicroPak**



(Top Through View)

**Pin Descriptions**

Pin Names	Description
A <sub>n</sub> , B <sub>n</sub>	Input
Y <sub>n</sub>	Output

**Function Table**

$$Y = \overline{A + B}$$

Inputs		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

H = HIGH Logic Level  
 L = LOW Logic Level

DISCONTINUED

THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN

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Absolute Maximum Ratings (Note 1)		Recommended Operating Conditions (Note 3)	
Supply Voltage ( $V_{CC}$ )	-0.5V to +4.6V	Supply Voltage	0.9V to 3.6V
DC Input Voltage ( $V_{IN}$ )	-0.5V to +4.6V	Input Voltage ( $V_{IN}$ )	0V to 3.6V
DC Output Voltage ( $V_{OUT}$ )		Output Voltage ( $V_{OUT}$ )	
HIGH or LOW State (Note 2)	-0.5V to $V_{CC}$ +0.5V	HIGH or LOW State	0V to $V_{CC}$
$V_{CC} = 0V$	-0.5V to 4.6V	$V_{CC} = 0V$	0V to 3.6V
DC Input Diode Current ( $I_{IK}$ ) $V_{IN} < 0V$	$\pm 50$ mA	Output Current in $I_{OH}/I_{OL}$	
DC Output Diode Current ( $I_{OK}$ )		$V_{CC} = 3.0V$ to 3.6V	$\pm 2.6$ mA
$V_{OUT} > 0V$	-50 mA	$V_{CC} = 2.3V$ to 2.7V	$\pm 1.5$ mA
$V_{OUT} < V_{CC}$	+50 mA	$V_{CC} = 1.65V$ to 1.95V	$\pm 1.5$ mA
DC Output Source/Sink Current ( $I_{OH}/I_{OL}$ )	$\pm 50$ mA	$V_{CC} = 1.40V$ to 1.60V	$\pm 1.0$ mA
DC $V_{CC}$ or Ground Current per		$V_{CC} = 1.10V$ to 1.30V	$\pm 1.0$ mA
Supply Pin ( $I_{CC}$ or Ground)	$\pm 50$ mA	$V_{CC} = 0.9V$	$\pm 20$ $\mu$ A
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C	Free Air Operating Temperature ( $T_A$ )	-65°C to +85°C
		Minimum Input Edge Rate ( $\Delta t/\Delta V$ )	10 ns/V
		$V_{IN} = 0.8V$ to 1.1V, $V_{CC} = 3.0V$	

**Note 1:** Absolute Maximum Ratings are those values beyond which the safe operation of the device is not guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

**Note 2:**  $I_{O}$  Absolute Maximum Rating must be observed.

**Note 3:** Unused inputs must be held HIGH or LOW. They may not float.

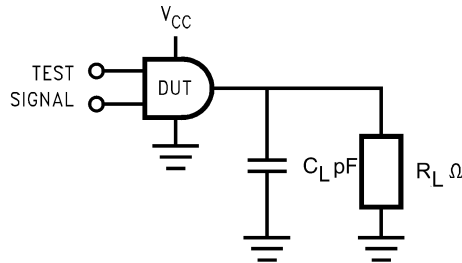
### DC Electrical Characteristics

Symbol	Parameter	$V_{CC}$ (V)	$T_A = -25^\circ C$		$T_A = -40^\circ C$ to $+85^\circ C$		Units	Conditions
			Min	Max	Min	Max		
$V_{IH}$	HIGH Level Input Voltage	$1.10 \leq V_{CC} \leq 1.40$	$0.65 \times V_{CC}$		$0.35 \times V_{CC}$		V	
		$1.40 \leq V_{CC} \leq 1.60$	$0.65 \times V_{CC}$		$0.65 \times V_{CC}$			
		$1.65 \leq V_{CC} \leq 1.95$	$0.65 \times V_{CC}$		$1.65 \times V_{CC}$			
		$2.30 \leq V_{CC} \leq 2.70$	1.5		1.6			
		$3.00 \leq V_{CC} \leq 3.60$	2.1		2.1			
$V_{OL}$	LOW Level Output Voltage	$1.10 \leq V_{CC} \leq 1.30$		$0.35 \times V_{CC}$		$0.35 \times V_{CC}$	V	
		$1.40 \leq V_{CC} \leq 1.60$		$0.35 \times V_{CC}$		$0.35 \times V_{CC}$		
		$1.65 \leq V_{CC} \leq 1.95$		$0.35 \times V_{CC}$		$0.35 \times V_{CC}$		
		$2.30 \leq V_{CC} \leq 2.70$		0.7		0.7		
		$3.00 \leq V_{CC} \leq 3.60$		0.9		0.9		
$V_{OH}$	HIGH Level Output Voltage	0.90	$V_{CC} - 0.1$		$V_{CC} - 0.1$		V	$I_{OH} = -20 \mu A$
		$1.10 \leq V_{CC} \leq 1.30$	$V_{CC} - 0.1$		$V_{CC} - 0.1$			
		$1.40 \leq V_{CC} \leq 1.60$	$V_{CC} - 0.1$		$V_{CC} - 0.1$			
		$1.65 \leq V_{CC} \leq 1.95$	$V_{CC} - 0.1$		$V_{CC} - 0.1$			
		$2.30 \leq V_{CC} \leq 2.70$	$V_{CC} - 0.1$		$V_{CC} - 0.1$			
		$3.00 \leq V_{CC} \leq 3.60$	$V_{CC} - 0.1$		$V_{CC} - 0.1$			
		$1.10 \leq V_{CC} \leq 1.30$	$0.75 \times V_{CC}$		$0.70 \times V_{CC}$			
		$1.40 \leq V_{CC} \leq 1.60$	1.07		0.99			
		$1.65 \leq V_{CC} \leq 1.95$	1.24		1.22			
		$2.30 \leq V_{CC} \leq 2.70$	1.95		1.87			
$3.00 \leq V_{CC} \leq 3.60$	2.61		2.55					

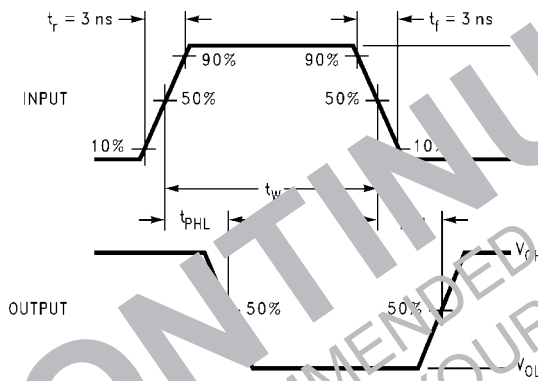
NC7WP02

DC Electrical Characteristics (Continued)									
Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units	Conditions	
			Min	Max	Min	Max			
V <sub>OL</sub>	LOW Level Output Voltage	0.90		0.1		0.1	V	I <sub>OL</sub> = 20 μA	
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		0.1		0.1			
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		0.1		0.1			
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		0.1		0.1			
		2.30 ≤ V <sub>CC</sub> ≤ 2.70		0.1		0.1			
		3.00 ≤ V <sub>CC</sub> ≤ 3.60		0.1		0.1			
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	0.30 x V <sub>CC</sub>		0.30 x V <sub>CC</sub>				
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	0.31		0.37				
1.65 ≤ V <sub>CC</sub> ≤ 1.95	0.31		0.35						
2.30 ≤ V <sub>CC</sub> ≤ 2.70	0.31		0.31						
3.00 ≤ V <sub>CC</sub> ≤ 3.60	0.31		0.33						
I <sub>IN</sub>	Input Leakage Current	0.90 to 3.60		±0.1		5	μA	V <sub>I</sub> ≤ 3.6V	
I <sub>OFF</sub>	Power Off Leakage Current	0		0.5		0.5	μA	0 ≤ (V <sub>I</sub> , V <sub>O</sub> ) ≤ 3.6V	
I <sub>CC</sub>	Quiescent Supply Current	0.90 to 3.60		0.9		0.9	μA	V <sub>I</sub> = V <sub>CC</sub> or GND	
AC Electrical Characteristics									
Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units	Conditions	Figure Number
			Min	Max	Min	Max			
t <sub>PHL</sub> t <sub>PLH</sub>	Propagation Delay	0.90	2.4	9.0	3.5	30.9	ns	C <sub>L</sub> = 10 pF R <sub>L</sub> = 1 MΩ	Figures 1, 2
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	4.0	9.0	3.5	30.9			
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	2.0	6.0	1.5	13.9			
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	1.0	5.0	1.0	12.1			
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	1.0	4.0	0.8	9.0			
		3.00 ≤ V <sub>CC</sub> ≤ 3.60	1.0	3.0	0.5	6.9			
t <sub>PHL</sub> t <sub>PLH</sub>	Propagation Delay	0.90	27.0	10.0	4.5	33.9	ns	C <sub>L</sub> = 15 pF R <sub>L</sub> = 1 MΩ	Figures 1, 2
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	5.0	10.0	4.5	33.9			
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	3.0	7.0	2.5	16.0			
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	2.0	5.0	2.0	12.6			
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	1.5	4.0	1.0	8.2			
		3.00 ≤ V <sub>CC</sub> ≤ 3.60	1.0	3.0	0.5	7.0			
t <sub>PL</sub>	Propagation Delay	0.90	34.0	12.0	5.0	43.0	ns	C <sub>L</sub> = 30 pF R <sub>L</sub> = 1 MΩ	Figures 1, 2
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	6.0	12.0	5.0	43.0			
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	4.0	8.0	3.0	18.0			
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	2.0	6.0	2.0	14.0			
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	1.0	5.0	1.0	10.0			
		3.00 ≤ V <sub>CC</sub> ≤ 3.60	0.8	4.0	0.5	8.9			
C <sub>IN</sub>	Input Capacitance	0		2.0			pF		
C <sub>OUT</sub>	Output Capacitance	0		4.0			pF		
C <sub>PD</sub>	Power Dissipation Capacitance	0.9 to 3.60		6.0			pF	V <sub>I</sub> = 0V or V <sub>CC</sub> , f = 10 MHz	

**AC Loading and Waveforms**



**FIGURE 1. AC Test Circuit**



**FIGURE 2. AC Waveforms**

Symbol	$V_{CC}$					
	3.3V ± 0.2V	2.5V ± 0.2V	1.8V ± 0.15V	1.5V ± 0.13V	1.2V ± 0.10V	0.9V
$V_m$	1.5	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$

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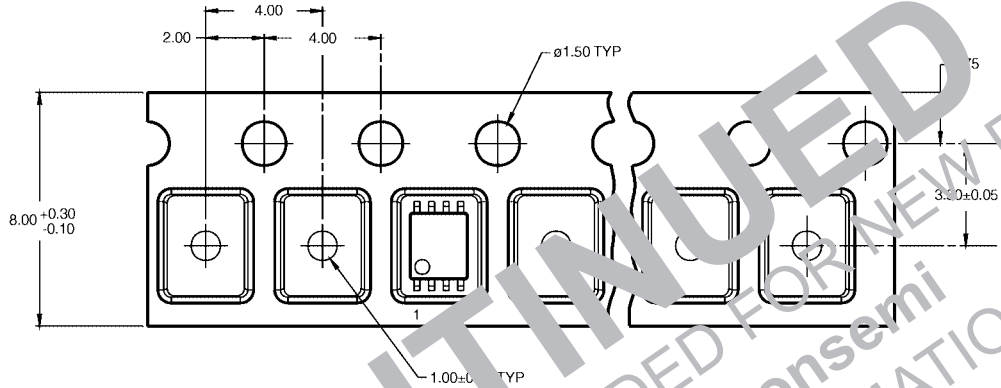
NCT7WP02

**Tape and Reel Specification**

**TAPE FORMAT for US8**

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
K8X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

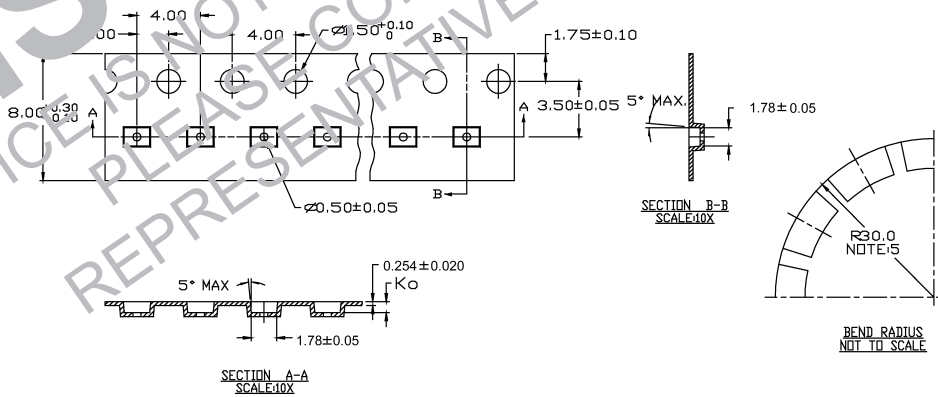
**TAPE DIMENSIONS** inches (millimeters)



**TAPE FORMAT for MicroPak**

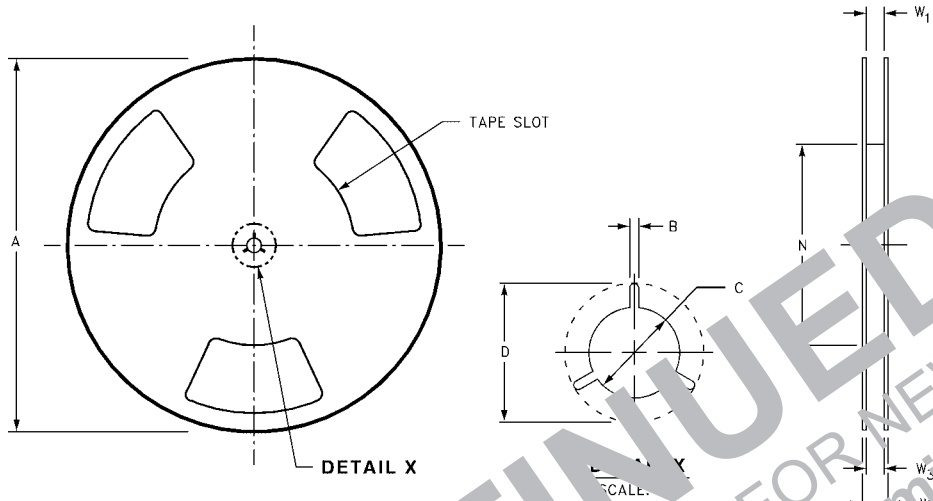
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L8X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

**TAPE DIMENSIONS** inches (millimeters)



NC7WP02

**Tape and Reel Specification** (Continued)  
**REEL DIMENSIONS** inches (millimeters)

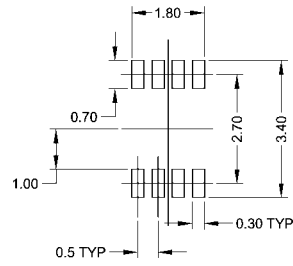
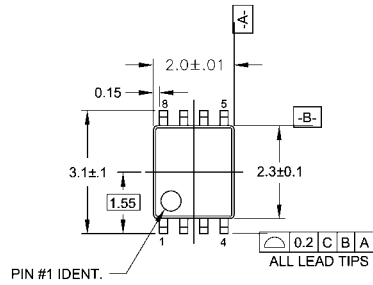


Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.750 (20.20)	2.16 (55.00)	0.331 ± 0.059/-0.000 (8.40 ± 1.51/-0.00)	0.561 (14.10)	W1 ± 0.073/-0.039 (1.85 ± 2.00/-1.00)

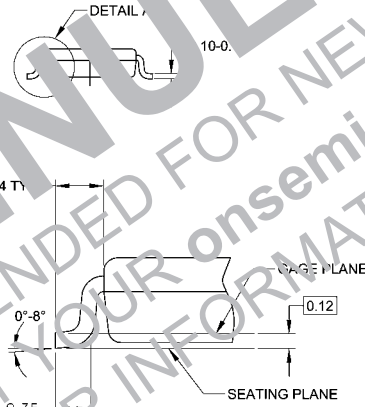
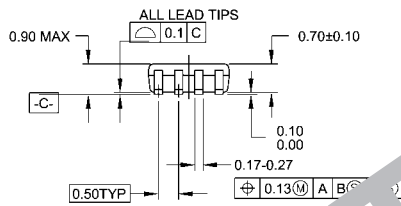
**DISCONTINUED**  
 THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
 PLEASE CONTACT YOUR onsemi REPRESENTATIVE FOR INFORMATION

NC7WP02

**Physical Dimensions** inches (millimeters) unless otherwise noted



**LAND PATTERN RECOMMENDATION**



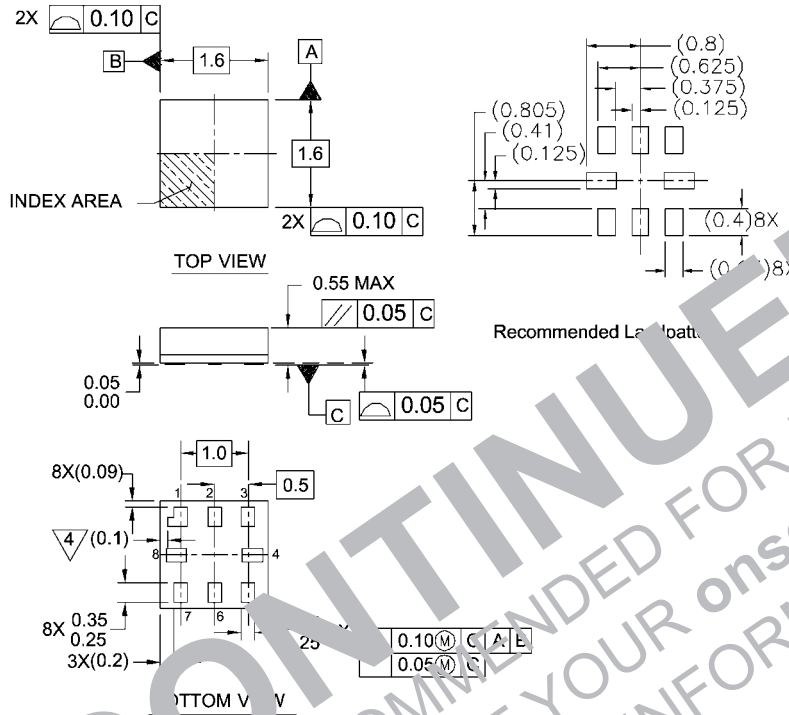
**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND LEAD BAR EXTENSIONS.
- D. DIMENSIONS TOLERANCE PER ANSI Y14.5M, 1986.

MAB08ARE/C

8 Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide  
Package Number MAB08A

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



- Notes:
1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAAD
  2. DIMENSIONS ARE IN MILLIMETERS
  3. DRAWING CONFORMS TO ASME Y14.1-1994
  4. 45° MIN FLAG, END OF PACKAGE OFFSET.

MAC08AREVC

25-Free 8-Lead MicroPak, 1.6 mm Wide  
Package Number MAC08A

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