



# NC7NZ04 TinyLogic® UHS Inverter

## Features

- Ultra-High Speed:  $t_{PD}$  2.4ns (Typical) into 50pF at 5V  $V_{CC}$
- High Output Drive:  $\pm 24mA$  at 3V  $V_{CC}$
- Broad  $V_{CC}$  Operating Range: 1.65V to 5.5V
- Power-Down, High-Impedance Inputs / Outputs
- Over-Voltage Tolerance Inputs Facilitate 5V to 3V Translation
- Proprietary Noise / EMI Reduction Circuitry
- Space-Saving MicroPak™ and US8 Surface Mount Packages

## Description

The NC7NZ04 is a triple inverter from Fairchild's Ultra-High Speed (UHS) series of TinyLogic®. The device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive while maintaining low static power dissipation over a broad  $V_{CC}$  operating range. The device is specified to operate over the 1.65V to 5.5V  $V_{CC}$  operating range. The inputs and output are high impedance when  $V_{CC}$  is 0V. Inputs tolerate voltages up to 7V, independent of  $V_{CC}$  operating voltage.

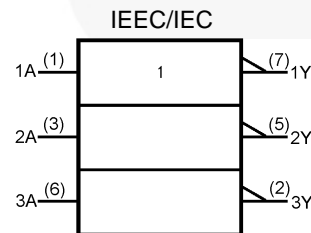


Figure 1. Logic Symbol

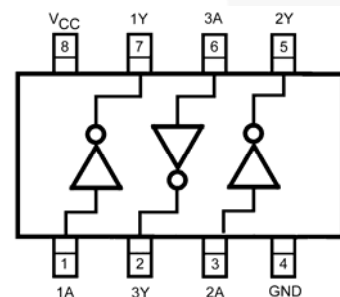


Figure 2. Connection Diagram

## Ordering Information

Part Number	Top Mark	Package	Packing Method
NC7NZ04K8X	NZ04	8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide	3000 Units on Tape & Reel
NC7NZ04L8X	T3	8-Lead MicroPak™, 1.6mm Wide	5000 Units on Tape & Reel

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## Pin Configurations

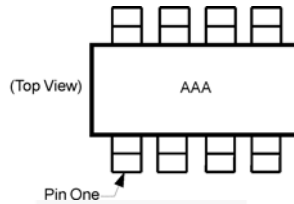


Figure 3. US8

### Notes:

1. AAA represents product code top mark (see ordering table).
2. Orientation of top mark determines pin one location. Reading the top product code mark left to right, pin one is the lower left pin.

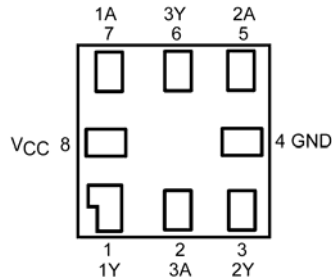


Figure 4. MicroPak™ (Top Through View)

## Pin Definitions

Pin # US8	Pin # MicroPak™	Name	Description
1	7	1A	Input
2	6	3Y	Output
3	5	2A	Input
4	4	GND	Ground
5	3	2Y	Output
6	2	3A	Input
7	1	1Y	Output
8	8	V <sub>CC</sub>	Supply Voltage

## Function Table

Y = /A

Inputs	Output
A	Y
L	H
H	L

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage	-0.5	7.0	V
V <sub>IN</sub>	DC Input Voltage	-0.5	7.0	V
V <sub>OUT</sub>	DC Output Voltage	-0.5	7.0	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> < -0.5V	-50	mA
		V <sub>IN</sub> > 6.0V	+20	
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> < -0.5V	-50	mA
		V <sub>OUT</sub> > 6V, V <sub>CC</sub> =GND	+20	
I <sub>OUT</sub>	DC Output Current		±50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current		±50	mA
T <sub>STG</sub>	Storage Temperature Range	-65	+150	°C
T <sub>J</sub>	Junction Temperature Under Bias		+150	°C
T <sub>L</sub>	Junction Lead Temperature (Soldering, 10 Seconds)		+260	°C
P <sub>D</sub>	Power Dissipation at +85°C		250	mW
ESD	Human Body Model, JEDEC:JESD22-A114		4000	V
	Charge Device Model, JEDEC:JESD22-C101		2000	

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Conditions	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage Operating		1.65	5.50	V
	Supply Voltage Data Retention		1.5	5.5	
V <sub>IN</sub>	Input Voltage		0	5.5	V
V <sub>OUT</sub>	Output Voltage		0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature		-40	+85	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Times	V <sub>CC</sub> at 1.8V, 2.5V ± 0.2V	0	20	ns/V
		V <sub>CC</sub> at 3.3V ± 0.3V	0	10	
		V <sub>CC</sub> at 5.0V ± 0.5V	0	5	
θ <sub>JA</sub>	Thermal Resistance	US8		250	°C/W
		MicroPak™		287	

**Note:**

- Unused inputs must be held HIGH or LOW. They may not float.

### DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =25°C			T <sub>A</sub> =-40 to 85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
V <sub>IH</sub>	HIGH Level Input Voltage	1.80 ± 0.15		0.75V <sub>CC</sub>			0.75V <sub>CC</sub>		V
		2.30 to 5.50		0.70V <sub>CC</sub>			0.70V <sub>CC</sub>		
V <sub>IL</sub>	LOW Level Input Voltage	1.80 ± 0.15				0.25V <sub>CC</sub>		0.25V <sub>CC</sub>	V
		2.30 to 5.50				0.30V <sub>CC</sub>		0.30V <sub>CC</sub>	
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	V <sub>IN</sub> =V <sub>IL</sub> , I <sub>OH</sub> =-100μA	1.55	1.65		1.55		V
		2.30		2.20	2.30		2.20		
		3.00		2.90	3.00		2.90		
		4.50		4.40	4.50		4.40		
		1.65	I <sub>OH</sub> =-4mA	1.29	1.52		1.29		
		2.30	I <sub>OH</sub> =-8mA	1.90	2.15		1.90		
		3.00	I <sub>OH</sub> =-16mA	2.40	2.80		2.40		
		3.00	I <sub>OH</sub> =-24mA	2.30	2.68		2.30		
		4.50	I <sub>OH</sub> =-32mA	3.80	4.20		3.80		
V <sub>OL</sub>	LOW Level Output Voltage	1.65	V <sub>IN</sub> =V <sub>IH</sub> , I <sub>OL</sub> =100μA		0.00	0.10		0.10	V
		2.30			0.00	0.10		0.10	
		3.00			0.00	0.10		0.10	
		4.50			0.00	0.10		0.10	
		1.65	I <sub>OL</sub> =4mA		0.80	0.24		0.24	
		2.30	I <sub>OL</sub> =8mA		0.10	0.30		0.30	
		3.00	I <sub>OL</sub> =16mA		0.15	0.40		0.40	
		3.00	I <sub>OL</sub> =24mA		0.22	0.55		0.55	
		4.50	I <sub>OL</sub> =32mA		0.22	0.55		0.55	
I <sub>IN</sub>	Input Leakage Current	0 to 5.5	0 ≤ V <sub>IN</sub> ≤ 5.5V			±1		±1	μA
I <sub>OFF</sub>	Power-Off Leakage Current	0	V <sub>IN</sub> or V <sub>OUT</sub> =5.5V			1		10	μA
I <sub>CC</sub>	Quiescent Supply Current	1.65 to 5.50	V <sub>IN</sub> =5.5V, GND			1		10	μA

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =25°C			T <sub>A</sub> =-40 to 85°C		Units	Figure
				Min.	Typ.	Max.	Min.	Max.		
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay	1.80 ± 0.15	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	1.8	4.4	9.5	2.0	10.0	ns	Figure 5 Figure 6
		2.50 ± 0.20		0.8	2.9	5.1	0.8	5.6		
		3.30 ± 0.30		0.5	2.1	3.4	0.5	3.8		
		5.00 ± 0.50		0.5	1.8	2.8	0.5	3.1		
		3.30 ± 0.30	C <sub>L</sub> =50pF, R <sub>L</sub> =500Ω	1.2	2.9	4.5	1.2	5.0		
		5.00 ± 0.50		0.8	2.4	3.6	0.8	4.0		
C <sub>IN</sub>	Input Capacitance	0			2.5				pF	
C <sub>PD</sub>	Power Dissipation Capacitance <sup>(4)</sup>	3.30			9				pF	Figure 7
		5.00			11					

**Note:**

4. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression: I<sub>CCD</sub>=(C<sub>PD</sub>)(V<sub>CC</sub>)(f<sub>IN</sub>)+(I<sub>CC</sub>static).

## Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V <sub>CC</sub>	T <sub>A</sub> =25°C	Unit
				Typ.	
V <sub>OLP</sub>	Quiet Output Dynamic Peak V <sub>OL</sub>	C <sub>L</sub> =50pF, V <sub>IH</sub> =5.0V, V <sub>IL</sub> =0V	5.0	0.8	V
V <sub>OLV</sub>	Quiet Output Dynamic Valley V <sub>OL</sub>		5.0	-0.8	V

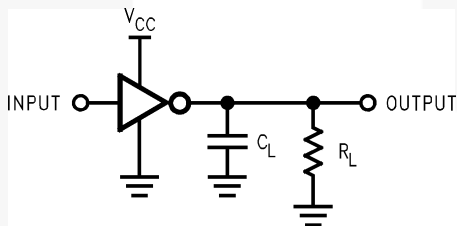


Figure 5. AC Test Circuit

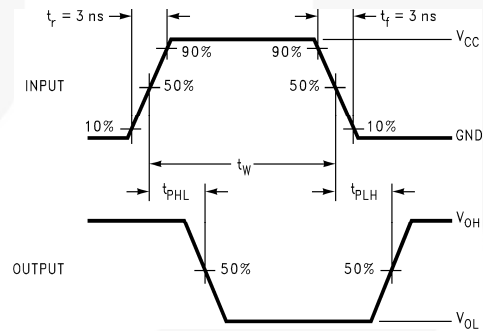


Figure 6. AC Waveforms

**Note:**

5. C<sub>L</sub> includes load and stray capacitance; inputs PRR=1.0MHz, t<sub>w</sub>=500ns.

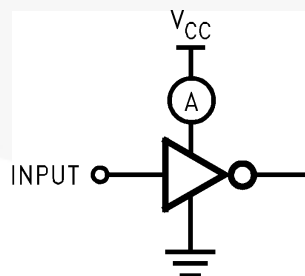
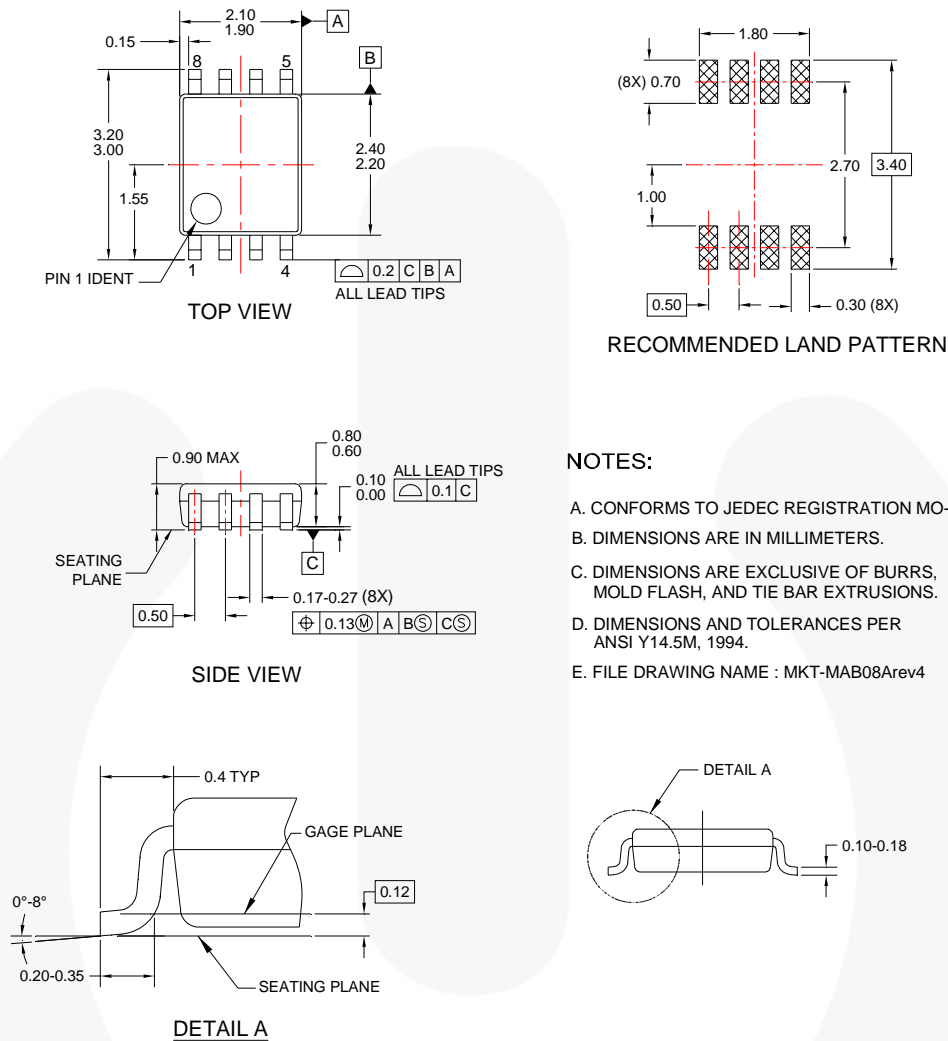


Figure 7. I<sub>CCD</sub> Test Circuit

**Note:**

6. Input=AC Waveform; t<sub>r</sub>=t<sub>f</sub>=1.8ns; PRR=10MHz; Duty Cycle =50%.

## Physical Dimensions



### NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1994.
- E. FILE DRAWING NAME : MKT-MAB08Arev4

**Figure 8. 8-Lead US8, JEDEC MO-187, Variation CA, 3.1mm Wide**

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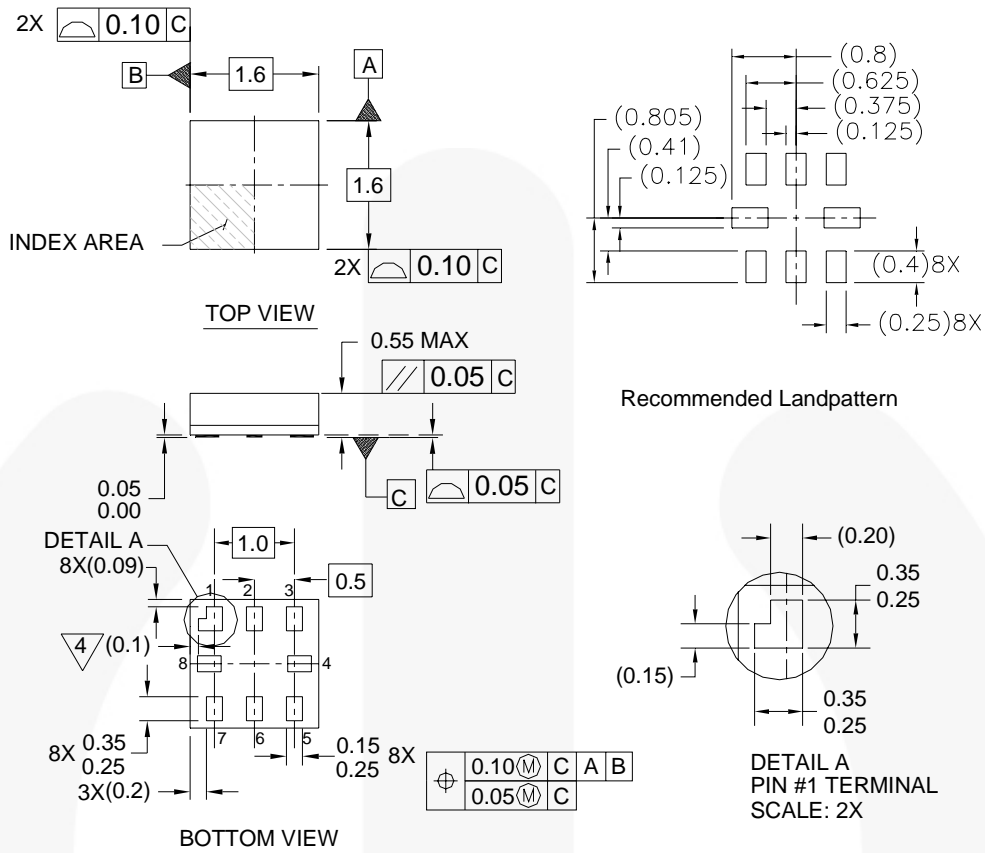
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:  
<http://www.fairchildsemi.com/packaging/>.

## Tape and Reel Specification

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:  
[http://www.fairchildsemi.com/packaging/US8\\_Pack\\_TNR.pdf](http://www.fairchildsemi.com/packaging/US8_Pack_TNR.pdf)

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

## Physical Dimensions



**Notes:**

1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
4. PIN 1 FLAG, END OF PACKAGE OFFSET
5. DRAWING FILE NAME: MKT-MAC08AREV4

MAC08AREV4

**Figure 9. 8-Lead, MicroPak™, 1.0mm Wide**

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Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:  
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## Tape and Reel Specification





Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:  
[http://www.fairchildsemi.com/products/logic/pdf/micropak\\_tr.pdf](http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf)

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



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#### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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