

September 2009

# NC7SZ32 TinyLogic<sup>®</sup> UHS Two-Input OR Gate

### **Features**

- Ultra-High Speed: t<sub>PD</sub> 2.4ns (Typical) into 50pF at 5V V<sub>CC</sub>
- High Output Drive: ±24mA at 3V V<sub>CC</sub>
- Broad V<sub>CC</sub> Operating Range: 1.65V to 5.5V
- Matches Performance of LCX Operated at 3.3V V<sub>CC</sub>
- Power Down High-Impedance Inputs/Outputs
- Over-Voltage Tolerance inputs facilitate 5V to 3V Translation
- Proprietary Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SOT23 and SC70 Packages

### Description

The NC7SZ32 is a single two-input OR gate from Fairchild's Ultra-High Speed (UHS) series of TinyLogic  $^{\! 8}$ . 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  $V_{\rm CC}$  operating range. The device is specified to operate over the 1.65V to 5.5V  $V_{\rm CC}$  operating range. The inputs and output are high impedance when  $V_{\rm CC}$  is 0V. Inputs tolerate voltages up to 6V, independent of  $V_{\rm CC}$  operating voltage.

## **Ordering Information**

Part Number	Top Mark	<b>©</b> Eco Status	Package	Packing Method
NC7SZ32M5X	7Z32	RoHS	5-Lead SOT23, JEDEC MO-178 1.6mm	3000 Units on Tape & Reel
NC7SZ32P5X	Z32	RoHS	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SZ32L6X	НН	RoHS	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SZ32FHX	НН	Green	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

For Fairchild's definition of Eco Status, please visit: <a href="http://www.fairchildsemi.com/company/green/rohs\_green.html">http://www.fairchildsemi.com/company/green/rohs\_green.html</a>.

## **Connection Diagrams**

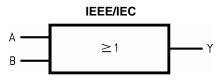
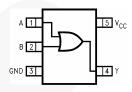
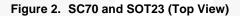


Figure 1. Logic Symbol

## **Pin Configurations**





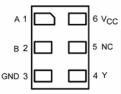


Figure 3. MicroPak (Top Through View)

## **Pin Definitions**

Pin # SC70 / SOT23	Pin # MicroPak	Name	Description
1	1	А	Input
2	2	В	Input
3	3	GND	Ground
4	4	Υ	Output
5	6	Vcc	Supply Voltage
	5	NC	No Connect

### **Function Table**

Y=A+B

In	puts	Output
Α	В	Y
L	L	L
L	Н	Н
Н	L	Н
Н	Н	Н

H = HIGH Logic Level

L = LOW Logic Level

## **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	Para	ameter	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage		-0.5	6.0	V
V <sub>IN</sub>	DC Input Voltage		-0.5	6.0	V
V <sub>OUT</sub>	DC Output Voltage		-0.5	6.0	V
I	DC Input Diode Current	V <sub>IN</sub> < -0.5V		-50	mA
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> > 6.0V		+20	IIIA
1	DC Output Diada Current	V <sub>OUT</sub> < -0.5V		-50	mA.
l <sub>OK</sub>	DC Output Diode Current	$V_{OUT} > 6V, V_{CC} = GND$		+20	IIIA
l <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
$T_J$	Junction Temperature Under B	ias		+150	°C
$T_L$	Junction Lead Temperature (Se	oldering, 10 Seconds)		+260	°C
		SOT-23		200	
$P_{D}$	Power Dissipation at +85°C	SC70-5		150	mW
FD	Power Dissipation at +65 C	MicroPak-6	\ \	130	IIIVV
		MicroPak2-6		120	
ESD	Human Body Model, JEDEC:JESD22-A114			4000	V
ESD	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	Supply Voltage Operating		1.65	5.50	V	
V <sub>CC</sub>	Supply Voltage Data Retention		1.50	5.50	7 °	
V <sub>IN</sub>	Input Voltage		0	5.5	V	
V <sub>OUT</sub>	Output Voltage		0	Vcc	V	
T <sub>A</sub>	Operating Temperature		-40	+85	°C	
		V <sub>CC</sub> =1.8V, 2.5V ± 0.2V	0	20		
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Times	$V_{CC}=3.3V \pm 0.3V$	0	10	ns/V	
		$V_{CC}$ =5.0V ± 0.5V	0	5		
		SOT-23		300		
		SC70-5		425	]	
$\theta_{\sf JA}$	Thermal Resistance	MicroPak-6		500	- °C/W	
		MicroPak2-6		560		

#### Note:

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

## **DC Electrical Characteristics**

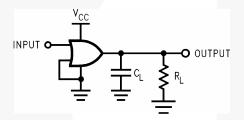
0	hal Daramatar V		V Conditions	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C		Units
Symbol Parameter		V <sub>CC</sub> Conditions		Min.	Тур.	Max.	Min.	Max.	Units
	HIGH Level Input	1.65 to 1.95		0.75V <sub>CC</sub>			0.75V <sub>CC</sub>		
$V_{IH}$	Voltage	2.30 to 5.50		0.70V <sub>CC</sub>			0.70V <sub>CC</sub>		V
\/	LOW Level Input	1.65 to 1.95				0.25V <sub>CC</sub>		0.25V <sub>CC</sub>	V
$V_{IL}$	Voltage	2.30 to 5.50				0.30V <sub>CC</sub>		0.30V <sub>CC</sub>	V
		1.65		1.55	1.65		1.55		
		1.80		1.70	1.80		1.70		
		2.30	V <sub>IN</sub> =V <sub>IH</sub> , I <sub>OH</sub> =-100µA	2.20	2.30		2.20		
		3.00		2.90	3.00		2.90		
.,	HIGH Level	4.50		4.40	4.50		4.40		.,
$V_{OH}$	Output Voltage	1.65	I <sub>OH</sub> =-4mA	1.29	1.52		1.29		V
		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		
	/	1.65			0.00	0.10		0.10	
		1.80			0.00	0.10	\	0.10	
		2.30	V <sub>IN</sub> =V <sub>IL</sub> , I <sub>OL</sub> =100μA		0.00	0.10		0.10	
	<i>[</i> -	3.00			0.00	0.10	1	0.10	
.,	LOW Level	4.50			0.00	0.10		0.10	
$V_{OL}$	Output Voltage	1.65	I <sub>OL</sub> =4mA		0.80	0.24		0.24	V
		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	V <sub>IN</sub> =5.5V, GND			±1		±10	μΑ
I <sub>OFF</sub>	Power Off Leakage Current	0	V <sub>IN</sub> or V <sub>OUT</sub> =5.5V			1		10	μΑ
Icc	Quiescent Supply Current	1.65 to 5.50	V <sub>IN</sub> =5.5V, GND			2.0		20	μΑ

### **AC Electrical Characteristics**

Symbol	Parameter	V	Conditions	7	Γ <sub>A</sub> =25°C	;	T <sub>A</sub> =-40 1	to +85°C	Units	Eiguro
Symbol	Parameter	V <sub>cc</sub>	Conditions	Min.	Тур.	Max.	Min.	Max.	Ullits	Figure
		1.65		2.0	5.5	12.0	2.0	12.7		
		1.80	_	2.0	4.6	10.0	2.0	10.5		
		$2.50 \pm 0.30$	$C_L=15pF$ , $R_L=1M\Omega$	0.8	3.0	7.0	0.8	7.5		
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay $3.30 \pm 0.30$ $5.00 \pm 0.50$		0.5	2.4	4.7	0.5	5.0	ns	Figure 4 Figure 5	
			0.5	1.9	4.1	0.5	4.4		1 19 11 1	
		$3.30 \pm 0.30$	C <sub>L</sub> =50pF,	1.5	3.0	5.2	1.5	5.5		
			R <sub>L</sub> =500Ω	0.8	2.4	4.5	0.8	4.8		
C <sub>IN</sub>	Input Capacitance	0.00			4				pF	
C	Power Dissipation	3.30			20				2	Figure 6
C <sub>PD</sub>	Capacitance <sup>(2)</sup>	5.00			26				pF	rigule 6

#### Note:

2.  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption ( $I_{CCD}$ ) at no output loading and operating at 50% duty cycle.  $C_{PD}$  is related to  $I_{CCD}$  dynamic operating current by the expression:  $I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}\text{static})$ .



### Note:

3.  $C_L$  includes load and stray capacitance. Input PRR=10MHz  $t_w$ =500ns.

Figure 4. AC Test Circuit

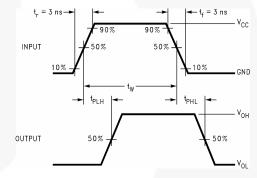
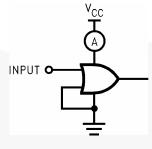


Figure 5. AC Waveforms



#### Note:

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

Figure 6. I<sub>CCD</sub> Test Circuit

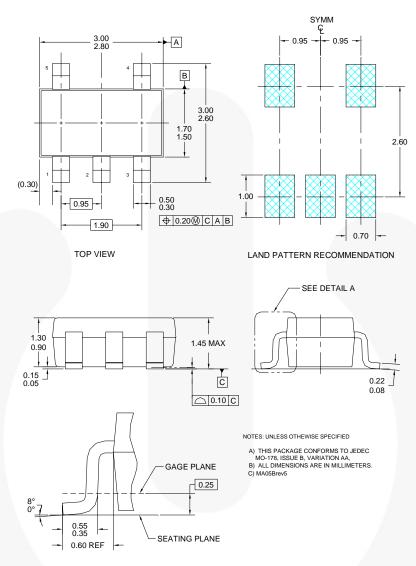


Figure 7. 5-Lead SOT23, JEDEC MO-178 1.6mm

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### **Tape and Reel Specifications**

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: http://www.fairchildsemi.com/packaging/SOT23-5L\_tr.pdf.

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
	Leader (Start End)	125 (Typical)	Empty	Sealed
M5X	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

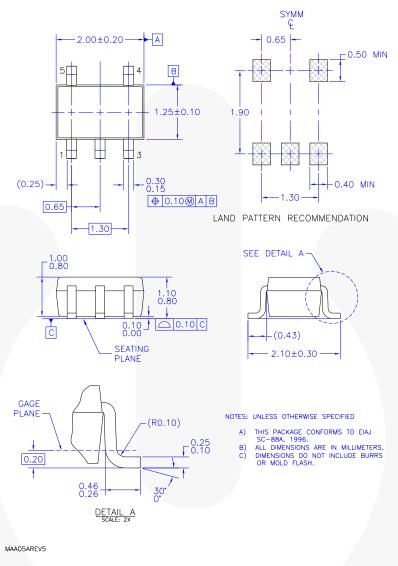


Figure 8. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide

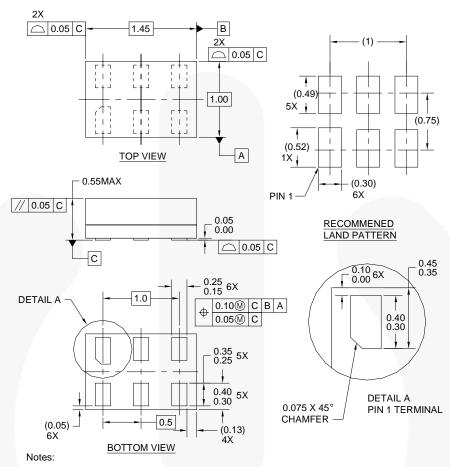
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Package Designator	Tape Section	<b>Cavity Number</b>	Cavity Status	Cover Type Status
	Leader (Start End)	125 (Typical)	Empty	Sealed
P5X	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed



- 1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
- 2. DIMENSIONS ARE IN MILLIMETERS
- 3. DRAWING CONFORMS TO ASME Y14.5M-1994

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Figure 9. 6-Lead, MicroPak™, 1.0mm Wide

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Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status	
	Leader (Start End)	125 (Typical)	Empty	Sealed	
L6X	Carrier	5000	Filled	Sealed	
	Trailer (Hub End)	75 (Typical)	Empty	Sealed	

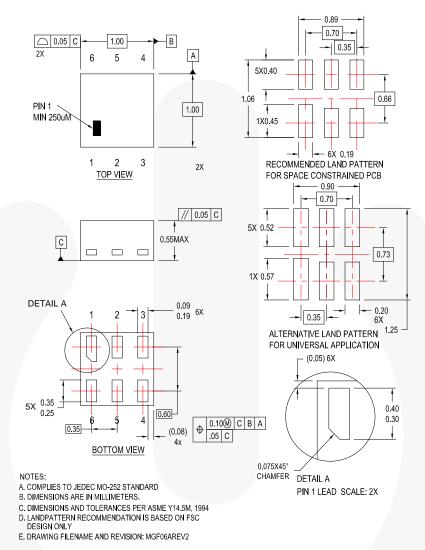


Figure 10.6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch

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Package Designator	Tape Section	<b>Cavity Number</b>	Cavity Status	Cover Type Status	
	Leader (Start End)	125 (Typical)	Empty	Sealed	
FHX	Carrier	5000	Filled	Sealed	
	Trailer (Hub End)	75 (Typical)	Empty	Sealed	





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