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September 2009

NC7SZ08 TinyLogic[®] UHS Two-Input AND Gate

Features

- Ultra-High Speed: t_{PD} 2.7ns (Typical) into 50pF at 5V V_{CC}
- High Output Drive: ±24mA at 3V V_{CC}
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Matches Performance of LCX Operated at 3.3V V_{CC}
- 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 NC7SZ08 is a single two-input AND gate from Fairchild's Ultra-High Speed (UHS) series of TinyLogic B. 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 devise 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	© Eco Status	Package	Packing Method
NC7SZ08M5X	7Z08	RoHS	5-Lead SOT23, JEDEC MO-178 1.6mm	3000 Units on Tape & Reel
NC7SZ08P5X	Z08	RoHS	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SZ08L6X	GG	RoHS	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SZ08FHX	GG	Green	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

For Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Connection Diagrams



Figure 1. Logic Symbol

Pin Configurations

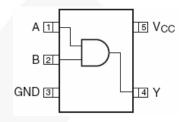


Figure 2. SC70 and SOT23 (Top View)

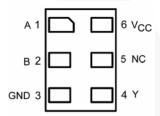


Figure 3. MicroPak (Top Through View)

Pin Definitions

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

Function Table

Y=AB

Inp	uts	Output
Α	В	Υ
L	L	L
L	Н	L
Н	L	L
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 _{CC}	Supply Voltage		-0.5	6.0	V
V _{IN}	DC Input Voltage		-0.5	6.0	V
V _{OUT}	DC Output Voltage		-0.5	6.0	V
I	DC Input Diode Current	V _{IN} < -0.5V		-50	mA
I _{IK}	DC Input Diode Current	V _{IN} > 6.0V		+20	IIIA
1	DC Output Diodo Current	V _{OUT} < -0.5V		-50	m Λ
I _{OK}	DC Output Diode Current	$V_{OUT} > 6V, V_{CC} = GND$		+20	mA mA
l _{out}	DC Output Current			±50	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current			±50	mA
T _{STG}	Storage Temperature Range		-65	+150	°C
T_J	Junction Temperature Under B	ias		+150	°C
T_L	Junction Lead Temperature (So	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, JESD22-A	Human Body Model, JESD22-A114			
ESD	Charged Device Model, JESD2	2-C101		2000	V

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 _{CC}	Supply Voltage Data Retention		1.50	5.50	7 V	
V _{IN}	Input Voltage		0	5.5	V	
V _{OUT}	Output Voltage		0	Vcc	V	
T _A	Operating Temperature		-40	+85	°C	
		V _{CC} at 1.8V, 2.5V ± 0.2V	0	20		
t_r,t_f	Input Rise and Fall Times	V _{CC} at 3.3V ± 0.3V	0	10	ns/V	
		V _{CC} at 5.0V ± 0.5V	0	5		
		SOT-23		300		
0	The word Desistance	SC70-5		425] 。	
$\theta_{\sf JA}$	Thermal Resistance	MicroPak-6		500	°C/W	
		MicroPak2-6		560	1	

Note:

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

DC Electrical Characteristics

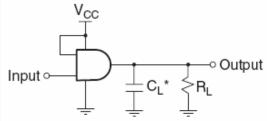
Comple of	Oh all Dansens stan		V Conditions	T _A =25°C			T _A =-40 to +85°C		l linita
Symbol Parameter		V _{CC}	V _{cc} Conditions		Тур.	Max.	Min.	Max.	Units
	HIGH Level Input	1.65 to 1.95		0.75V _{CC}			0.75V _{CC}		
V_{IH}	Voltage	2.30 to 5.50		0.70V _{CC}			0.70V _{CC}		V
\/	LOW Level Input	1.65 to 1.95				0.25V _{CC}		0.25V _{CC}	V
V_{IL}	Voltage	2.30 to 5.50				0.30V _{CC}		0.30V _{CC}	V
		1.65		1.55	1.65		1.55		
		1.80		1.70	1.80		1.70		
		2.30	V _{IN} =V _{IH} , I _{OH} =-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
V_{OH}	Output Voltage	1.65	I _{OH} =-4mA	1.29	1.52		1.29		
		2.30	I _{OH} =-8mA	1.90	2.15		1.90		
	<i>(</i>	3.00	I _{OH} =-16mA	2.50	2.80		2.40		
		3.00	I _{OH} =-24mA	2.40	2.68		2.30		
		4.50	I _{OH} =-32mA	3.90	4.20		3.80		
		1.65			0.00	0.10		0.10	
	7	1.80			0.00	0.10		0.10	
		2.30	V _{IN} =V _{IL} , I _{OL} =100μA		0.00	0.10	V	0.10	
	(4)	3.00			0.00	0.10		0.10	
.,	LOW Level	4.50			0.00	0.10		0.10	V
V_{OL}	Output Voltage	1.65	I _{OL} =4mA		0.80	0.24		0.24	
		2.30	I _{OL} =8mA		0.10	0.30		0.30	
		3.00	I _{OL} =16mA		0.15	0.40		0.40	
	3.00		I _{OL} =24mA		0.22	0.55		0.55	
		4.50	I _{OL} =32mA		0.22	0.55		0.55	
I _{IN}	Input Leakage Current	0 to 5.5	V _{IN} =5.5V, GND			±1		±10	μΑ
I _{OFF}	Power Off Leakage Current	0	V _{IN} or V _{OUT} =5.5V			1		10	μΑ
Icc	Quiescent Supply Current	1.65 to 5.50	V _{IN} =5.5V, GND			2		20	μΑ

AC Electrical Characteristics

Symbol	Parameter	V _{cc}	Conditions	Т	_A =25°C		T _A =-40 t	to +85°C	Units	Figure	
Syllibol	Farameter	V CC	Conditions	Min.	Тур.	Max.	Min.	Max.	Ullits	rigure	
		1.65		2.0	6.3	12.0	2.0	12.7			
		1.80	$C_{L}=15pF,$ $C_{L}=1M\Omega$ $C_{L}=1M\Omega$ $C_{L}=100$ $C_{L}=100$ $C_{L}=100$ $C_{L}=100$	2.0	5.2	10.0	2.0	10.5	7 1		
		2.50 ± 0.20		0.8	3.4	7.0	0.8	7.5			
t _{PLH} , t _{PHL}	Propagation Delay	3.30 ± 0.30		0.5	2.6	4.7	0.5	5.0		Figure 4 Figure 5	
		5.00 ± 0.50			0.5	2.2	4.1	0.5	4.4]	3
		3.30 ± 0.30		1.5	3.3	5.2	1.5	5.5			
		5.00 ± 0.50		0.8	2.7	4.5	0.8	4.8			
C _{IN}	Input Capacitance	0.00			4				pF		
C	Power Dissipation	3.30)		20				, E	Figure 6	
OPD	Capacitance ⁽²⁾				25				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 lading and operating at 50% duty cycle. C_{PD} is related to I_{CCD} dynamic operating current by the expression: $I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}\text{static})$.



Notes:

- 3. C_L includes load and stray capacitance.
- 4. Input PRR=1.0MHz; tw500ns.

Figure 4. AC Test Circuit

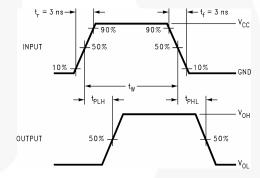
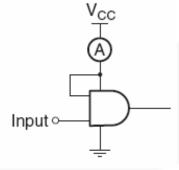


Figure 5. AC Waveforms



Note:

5. Input=AC Waveform; t_r=t_f=1.8ns; PRR=10MHz; Duty Cycle=50%.

Figure 6. I_{CCD} Test Circuit

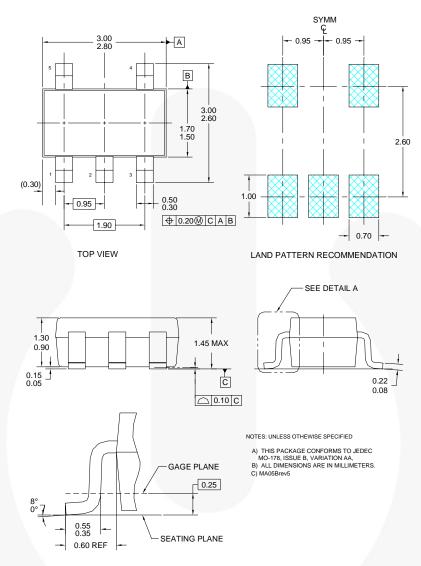


Figure 7. 5-Lead SOT23, JEDEC MO-178 1.6mm

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

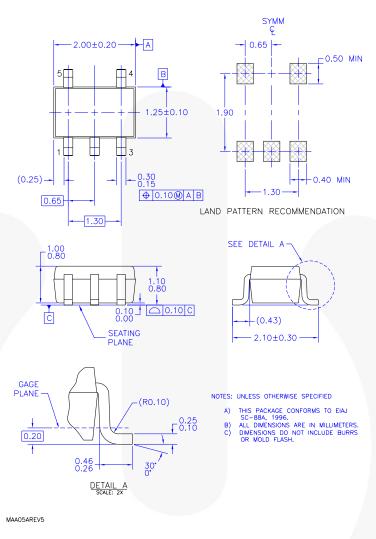


Figure 8. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide

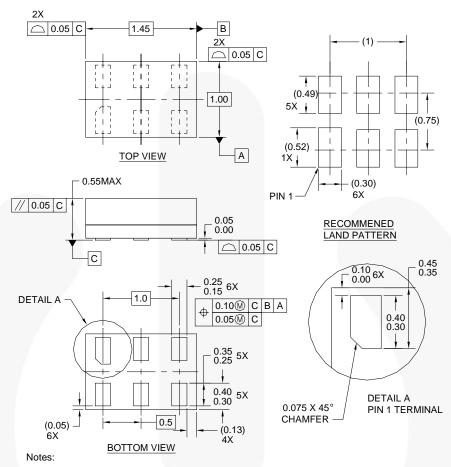
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Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
	Leader (Start End)	125 (Typical)	Empty	Sealed
P5X	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed



- 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

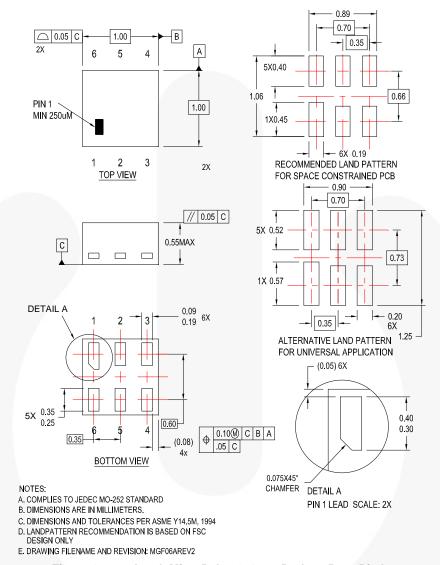


Figure 10. 6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch

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Tape and Reel Specification

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Package Designator	Tape Section	Cavity Number	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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