FAIRCHILD SEMICONDUCTOR™

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NC7SZ08
TinyLogic™ UHS 2-Input AND Gate

General Description

The NC7SZ08 is a single 2-Input AND Gate from Fairchild's Ultra High Speed 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 very broad V_{CC} operating range. The device is specified to operate over the 1.8V to 5.5V V_{CC} range. The inputs and output are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 6V independent of V_{CC} operating voltage.

Features

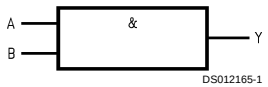
- Space saving SOT23 or SC70 5-lead surface mount package
- Ultra High Speed; T_{PD} 2.7 ns Typ into 50 pF at 5V V_{CC}
- High Output Drive; ±24 mA at 3V V_{CC}
- Broad V_{CC} Operating Range; 1.8V to 5.5V
- Matches the performance of LCX when operated at 3.3V V_{CC}
- Power down high impedance inputs/output
- Overvoltage tolerant inputs facilitate 5V to 3V translation
- Patented noise/EMI reduction circuitry implemented

Ordering Code:

Product Code	Package	Package Drawing	Package Top Mark	Supplied As
NC7SZ08M5	SOT23-5	MA05B	7Z08	250 Units on Tape and Reel
NC7SZ08M5X	SOT23-5	MA05B	7Z08	3k Units on Tape and Reel
NC7SZ08P5	SC70–5	MAA05A	Z08	250 Units on Tape and Reel
NC7SZ08P5X	SC70–5	MAA05A	Z08	3k Units on Tape and Reel

Logic Symbol

IEEE/IEC



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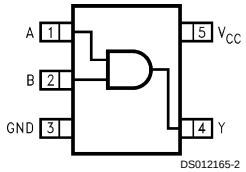
Pin Descriptions

Pin Names	Description
A, B	Inputs
Y	Output

Connection Diagram

Pin Assignment for 5–Lead Packages



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(Top View)

Function Table

Y = AB

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

H = HIGH Logic Level
L = LOW Logic Level

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Absolute Maximum Ratings (Note 1)

Supply Voltage (V_{CC})	−0.5V to +6V
DC Input Voltage (V_{IN})	−0.5V to +6V
DC Output Voltage (V_{OUT})	−0.5V to +6V
DC Input Diode Current (I_{IK})	
@V_{IN} < −0.5V	−50 mA
@ V_{IN} > 6V	+20 mA
DC Output Diode Current (I_{OK})	
@V_{OUT} < −0.5V	−50 mA
@ V_{OUT} > 6V, V_{CC} = GND	+20mA
DC Output Current (I_{OUT})	±50 mA
DC V_{CC}/GND Current (I_{CC}/I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65˚C to +150˚C
Junction Temperature under Bias (T_J)	150˚C
Junction Lead Temp. (T_L)	
(Soldering, 10 sec)	260˚C
Power Dissipation (P_D) @ +85˚C	
SOT23–5	200 mW
SC70–5	150 mW
ESD Tolerance (Human Body Model)	
MIL-STD-883D Method 3015.7	1000V
DC Latchup Tolerance (Jedec Method 17)	
Negative Source Current (NIT)	−500 mA
Positive Source Voltage (PVT)	+8V

Recommended Operating Conditions

Supply Voltage Operating (V_{CC})	1.8V to 5.5V
Supply Voltage Data Retention (V_{CC})	1.5V to 5.5V
Input Voltage (V_{IN})	0V to 5.5V
Output Voltage (V_{OUT})	0V to V_{CC}
Operating Temperature (T_A)	−40˚C to +85˚C
Input Rise and Fall Time (t_r,t_f)	
V_{CC} = 1.8V, 2.5V ±0.2V	0 ns/V to 20 ns/V
V_{CC} = 3.3V ±0.3V	0 ns/V to 10 ns/V
V_{CC} = 5.0V ±0.5V	0 ns/V to 5 ns/V
Thermal Resistance (θ_{JA})	
SOT23–5	300˚C/W
SC70–5	425˚C/W

Note 1: Absolute maximum ratings are DC values beyond which the device may be damaged or have its usefull life impaired. The datasheet specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature and output/input loading variables. Fairchild does not recommend operation outside datasheet specifications.

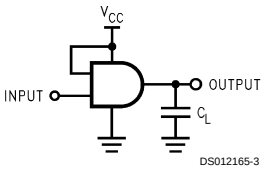
DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	NC7SZ08 T_A = 25˚C			NC7SZ08 T_A = −40˚C to +85˚C		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	High Level Input Voltage	1.8	0.75 V_{CC}			0.75 V_{CC}		V		
		2.3-5.5	0.7 V_{CC}			0.7 V_{CC}				
V_{IL}	Low Level Input Voltage	1.8			0.25 V_{CC}		0.25 V_{CC}	V		
		2.3-5.5			0.3 V_{CC}		0.3 V_{CC}			
V_{OH}	High Level Output Voltage	1.8	1.7	1.8		1.7		VV	$_{IN}$ = V_{IH}	I_{OH} = −100 µA
		2.3	2.2	2.3		2.2				
		3.0	2.9	3.0		2.9				
		4.5	4.4	4.5		4.4				
		2.3	1.9	2.15		1.9		V		I_{OH} = −8 mA
		3.0	2.5	2.80		2.4				I_{OH} = −16 mA
		3.0	2.4	2.68		2.3				I_{OH} = −24 mA
		4.5	3.9	4.20		3.8				I_{OH} = −32 mA
V_{OL}	Low Level Output Voltage	1.8		0.0	0.1		0.1	V	V_{IN} = V_{IL}	I_{OL} = 100 µA
		2.3		0.0	0.1		0.1			
		3.0		0.0	0.1		0.1			
		4.5		0.0	0.1		0.1			
		2.3		0.10	0.3		0.3	V		I_{OL} = 8m A
		3.0		0.15	0.4		0.4			I_{OL} = 16 mA
		3.0		0.22	0.55		0.55			I_{OL} = 24 mA
		4.5		0.22	0.55		0.55			I_{OL} = 32 mA
I_{IN}	Input Leakage Current	0-5.5			±1		±10	µA	V_{IN} = 5.5V, GND	
I_{OFF}	Power Off Leakage Current	0.0			1		10	µA	V_{IN} or V_{OUT} = 5.5V	
I_{CC}	Quiescent Supply Current	1.8-5.5			2.0		10	µA	V_{IN} = 5.5V, GND	

AC Electrical Characteristics

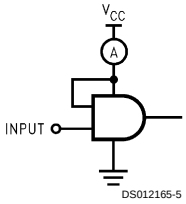
Symbol	Parameter	V_{CC} (V)	NC7SZ08 T_A = +25°C			NC7SZ08 T_A = −40°C to +85°C		Units	Conditions	Fig. No.
			Min	Typ	Max	Min	Max			
t_{PLH},t_{PHL}	Propagation Delay	1.8	2.0	5.2	10	2.0	10.5	ns	C_L = 15 pF, R_L = 1M Ω	*Figures 1, 3*
		2.5 ±0.2	0.8	3.4	7	0.8	7.5			
		3.3 ±0.3	0.5	2.6	4.7	0.5	5.0			
		5.0 ±0.5	0.5	2.2	4.1	0.5	4.4			
t_{PLH},t_{PHL}	Propagation Delay	3.3 ±0.3	1.5	3.3	5.2	1.5	5.5	ns	C_L = 50 pF, R_L = 500Ω	*Figures 1, 3*
		5.0 ±0.5	0.8	2.7	4.5	0.8	4.8			
C_{IN}	Input Capacitance	0		4				pF		
C_{PD}	Power Dissipation Capacitance	3.3		20				pF	(Note 2)	*Figure 2*
		5.0		25						

Note 2: CPD 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. (See *Figure 2* .) C_{PD} is related to I_{CCD} dynamic operating current by the expression: $I_{CCD} = (C_{PD})(V_{CC})(f_{IN})+(I_{CC}$ static)



C_L includes load and stray capacitance
Input PRR = 1.0 MHz, t_w = 500 ns

FIGURE 1. AC Test Circuit



input = Ac Waveform; $t_r = t_f$ = 1.8 ns;
PRR = 10 MHz; Duty Cycle = 50%

FIGURE 2. I_{CCD} Test Circuit

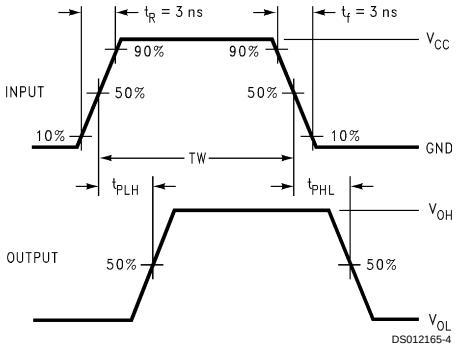
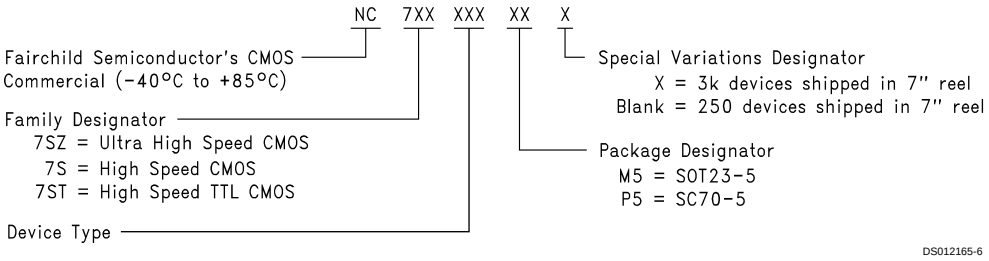


FIGURE 3. AC Waveforms

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



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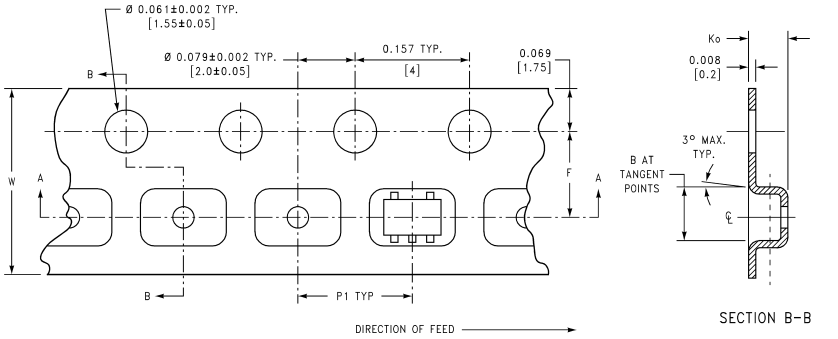
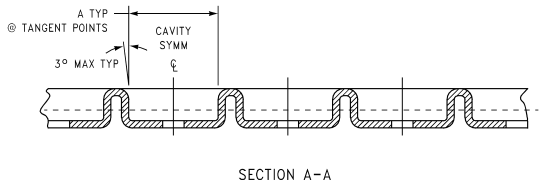
Tape and Reel Specification

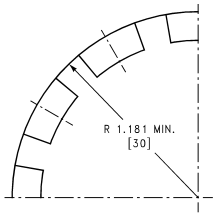
TAPE FORMAT

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
M5, P5	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	250	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed
M5X, P5X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

TAPE DIMENSIONS inches (millimeters)







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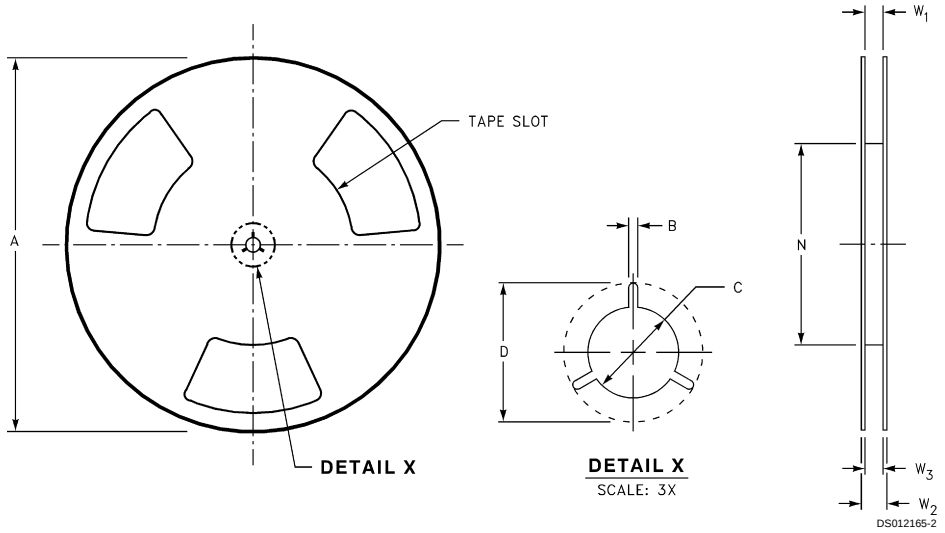
Pkg	Tape Size	DIM A	DIM B	DIM F	DIM K_o	DIM P1	DIM W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ±0.004 (3.5 ±0.10)	0.053 ±0.004 (1.35 ±0.10)	0.157 (4)	0.315 ±0.004 (8 ±0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138 ±0.002 (3.5 ±0.05)	0.055 ±0.004 (1.4 ±0.11)	0.157 (4)	0.315 ±0.012 (8 ±0.3)

Tape and Reel Specification

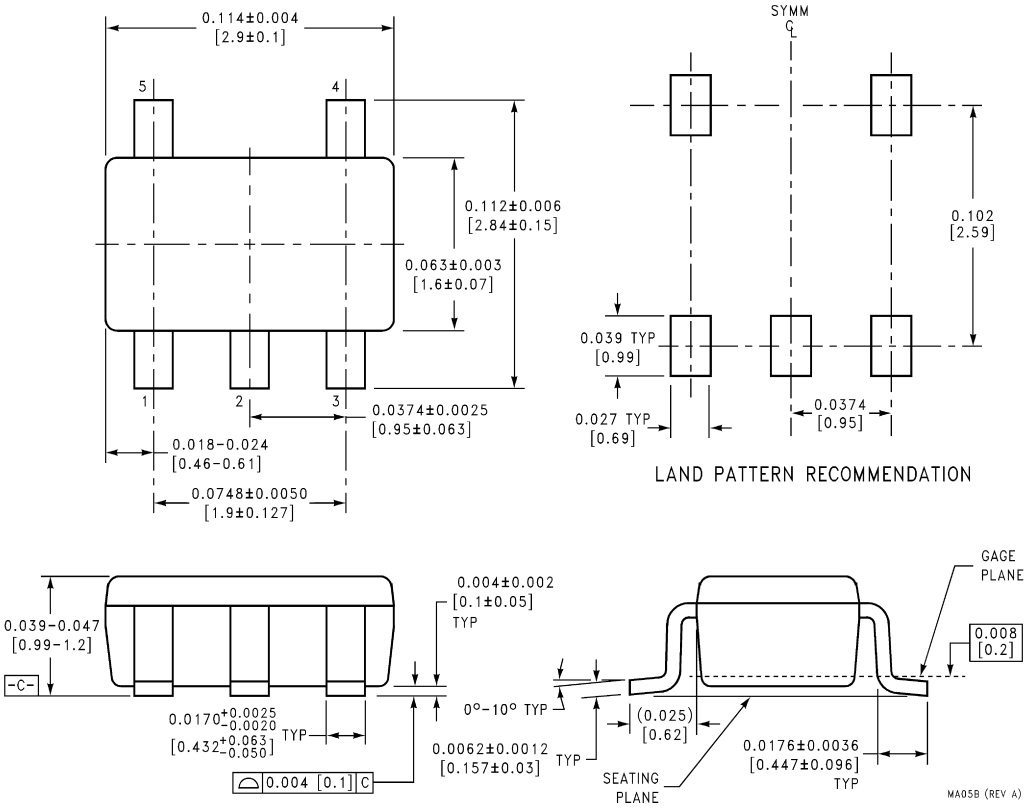
(Continued)

REEL DIMENSIONS inches (millimeters)



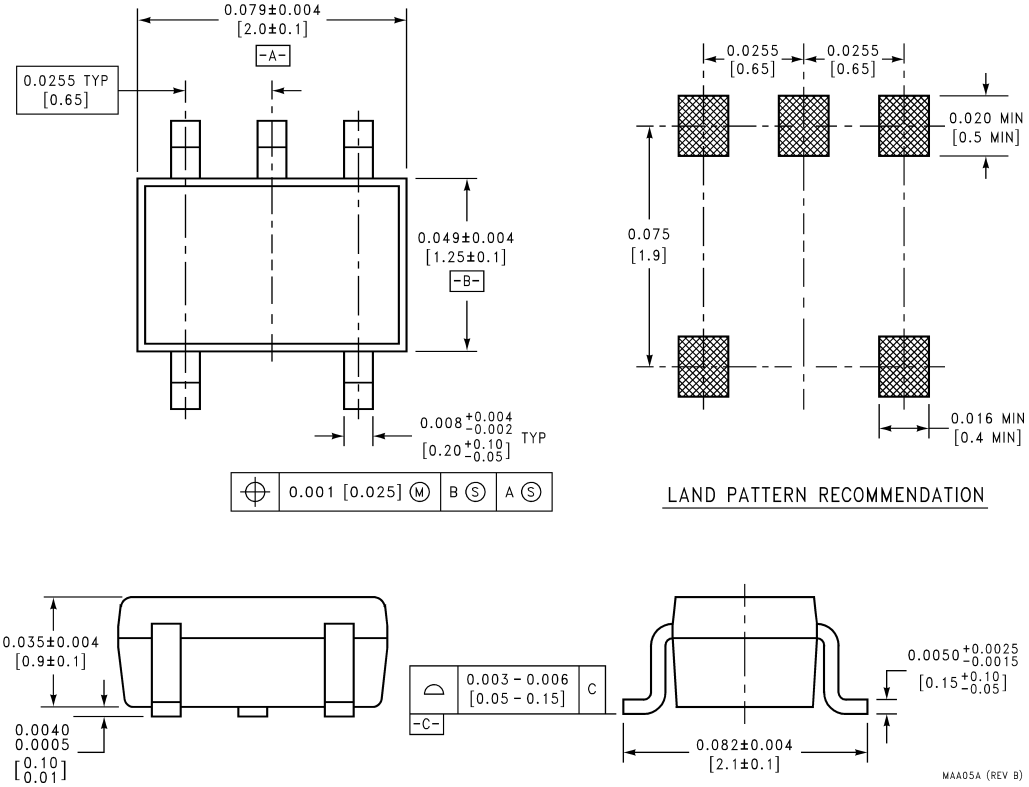
Tape Size	A	B	C	D	N	W1	W2	W3
8m m	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 +0.059/−0.000 (8.40 +1.50/−0.00)	0.567 (14.40)	W1 +0.078/−0.039 (W1 +2.00/−1.00)

Physical Dimensions inches (millimeters) unless otherwise noted



5-Lead Molded SOT23, Enhanced Thermal
Package Number MA05B

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



5-Lead Molded SC70, Enhanced Thermal
Package Number MAA05A

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