

NC7SZ38

TinyLogic™ UHS 2-Input NAND Gate (Open Drain Output)

General Description

The NC7SZ38 is a single 2-Input NAND Gate with open drain output stage 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. The open drain output stage will tolerate voltages up to 6V independent of V_{CC} when in the high impedance state.

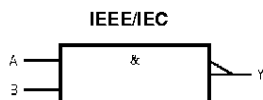
Features

- Space saving SOT23 or SC70 5-lead package
- Open Drain output stage for OR tied applications
- Ultra High Speed; t_{PD} 2.4 ns Typ into 50 pF at 5V V_{CC}
- High Output Sink 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

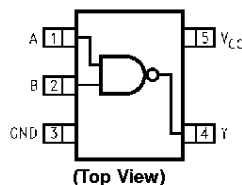
Ordering Code:

Order Number	Package Number	Package Top Mark	Package Description	Supplied As
NC7SZ38M5	MA05B	7Z38	5-Lead SOT23, JEDEC MO-178, 1.6mm	250 Units on Tape and Reel
NC7SZ38M5X	MA05B	7Z38	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7SZ38P5	MAA05A	Z38	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	250 Units on Tape and Reel
NC7SZ38P5X	MAA05A	Z38	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel

Logic Symbol



Connection Diagram



Pin Descriptions

Pin Names	Description
A, B	Inputs
Y	Output

Function Table

$Y = \overline{AB}$

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

H = HIGH Logic Level
L = LOW Logic Level
*H = HIGH Impedance output state (Open Drain)

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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
@ $V_{OUT} > 6V$, $V_{CC} = GND$	+20 mA
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 Temperature (T_1); (Soldering, 10 seconds)	260°C
Power Dissipation (P_D) @ +85°C	
SOT23-5	200 mW
SC70-5	150 mW

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)	
$V_{CC} = 1.8V$, $2.5V \pm 0.2V$	0 ns/V to 20 ns/V
$V_{CC} = 3.3V \pm 0.3V$	0 ns/V to 10 ns/V
$V_{CC} = 5.0V \pm 0.5V$	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 useful 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)	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	HIGH Level Input Voltage	1.8 2.3 to 5.5	0.75 V_{CC} 0.7 V_{CC}			0.75 V_{CC} 0.7 V_{CC}		V		
V_{IL}	LOW Level Input Voltage	1.8 2.3 to 5.5			0.25 V_{CC} 0.3 V_{CC}	0.25 V_{CC} 0.3 V_{CC}		V		
I_{LKG}	HIGH Level Output Leakage	5.5			±5		±10	µA	$V_{IN} = V_{IL}$ $V_{OUT} = V_{CC}$ or GND	
V_{OL}	LOW Level Output Voltage	1.8		0.0	0.1		0.1	V	$V_{IN} = V_{IH}$	$I_{OL} = 100 \mu\text{A}$
		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		$I_{OL} = 8 \text{ mA}$
		3.0		0.15	0.4		0.4			$I_{OL} = 16 \text{ mA}$
		3.0		0.22	0.55		0.55			$I_{OL} = 24 \text{ mA}$
		4.5		0.22	0.55		0.55			$I_{OL} = 32 \text{ mA}$
I_{IN}	Input Leakage Current	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	5.5			2.0		20	µA	$V_{IN} = 5.5V$, GND	

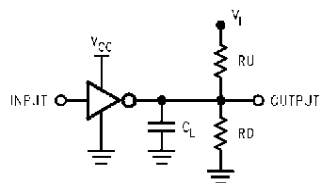
AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	T _A = +25°C			T _A = -40°C to +85°C		Units	Conditions	Fig. No.
			Min	Typ	Max	Min	Max			
t _{pZL}	Propagation Delay	1.8	1.5	5.4	10.5	1.5	11.0	ns	C _L = 50 pF R _U = 500Ω R _D = 500Ω V _I = 2 × V _{CC}	Figure 1, Figure 3
		2.5 ± 0.2	0.8	3.5	7.0	0.8	7.5			
		3.3 ± 0.3	0.8	2.8	5.0	0.8	5.2			
		5.0 ± 0.5	0.5	2.2	4.3	0.5	4.5			
t _{pLZ}	Propagation Delay	1.8	1.5	4.6	10.5	1.5	11.0	ns	C _L = 50 pF R _U = 500Ω R _D = 500Ω V _I = 2 × V _{CC}	Figure 1, Figure 3
		2.5 ± 0.2	0.8	3.0	7.0	0.8	7.5			
		3.3 ± 0.3	0.8	2.1	5.0	0.8	5.2			
		5.0 ± 0.5	0.5	1.3	4.3	0.5	4.5			
C _{IN}	Input Capacitance	0		4				pF		
C _{OUT}	Output Capacitance	0		5				pF		
C _{PD}	Power Dissipation	3.3		5.1				pF	(Note 2)	Figure 2
	Capacitance	5.0		7.3						

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. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression

$$I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CC \text{ static}})$$

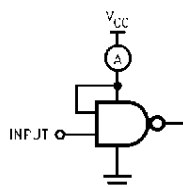
AC Loading and Waveforms



C_L includes load and stray capacitance

Input PRR = 10 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

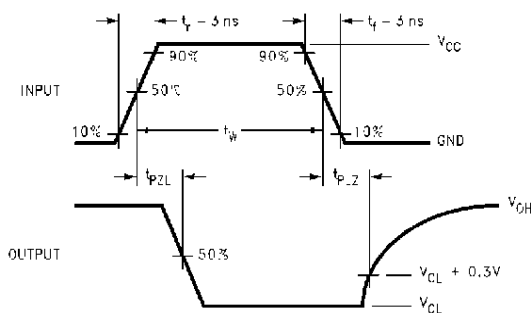
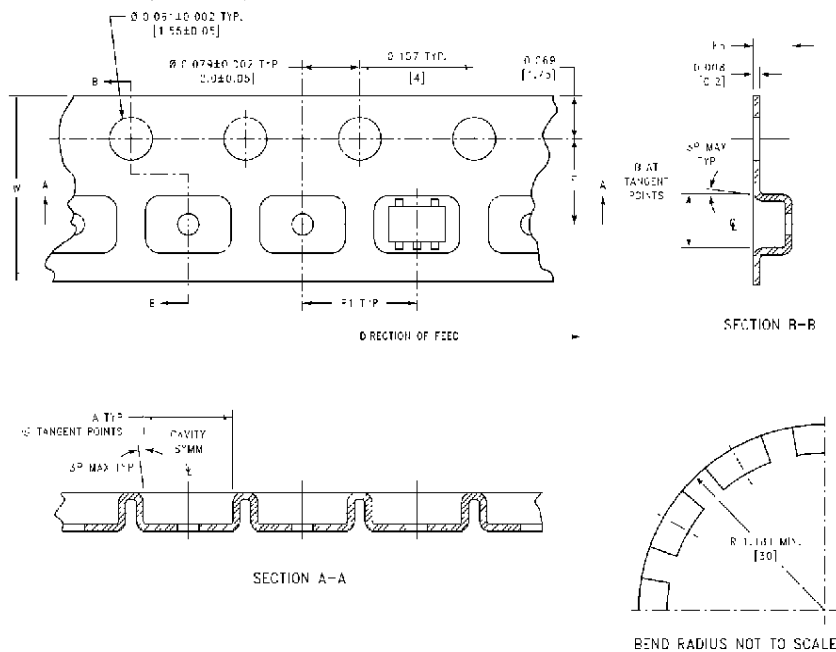


FIGURE 3. AC Waveforms

TAPE FORMAT

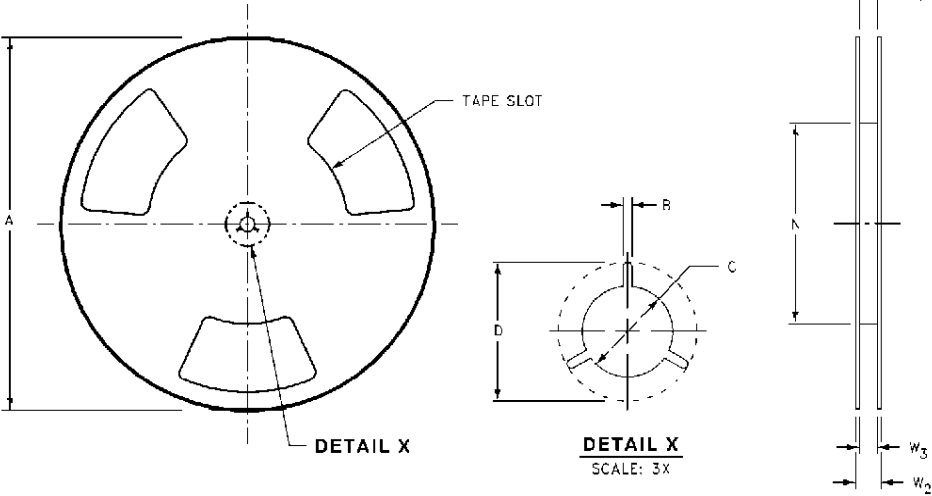
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
M5, P5	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	250	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed
M5X, P5X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)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

TAPE DIMENSIONS inches (millimeters)



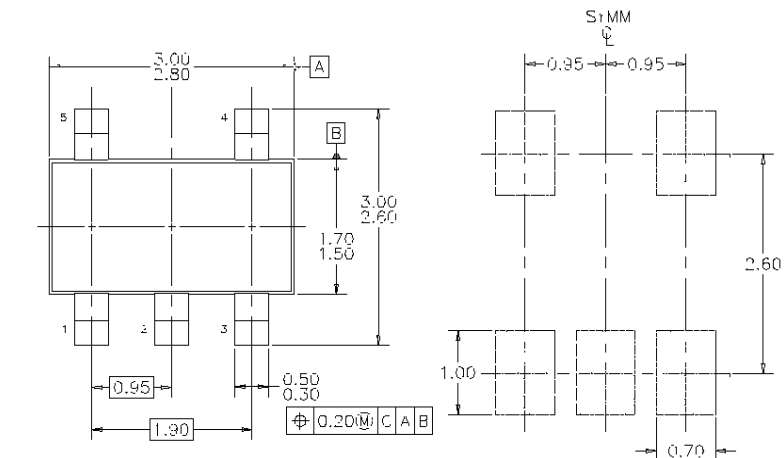
Package	Tape Size	DIM A	DIM B	DIM F	DIM K _o	DIM P1	DIM W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138 ± 0.002 (3.5 ± 0.05)	0.055 ± 0.004 (1.4 ± 0.11)	0.157 (4)	0.315 ± 0.012 (8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

REEL DIMENSIONS inches (millimeters)

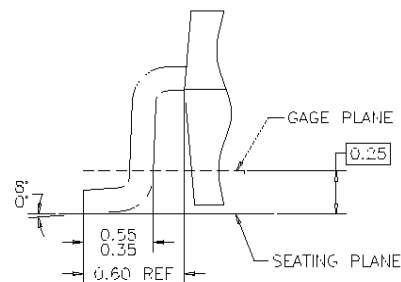
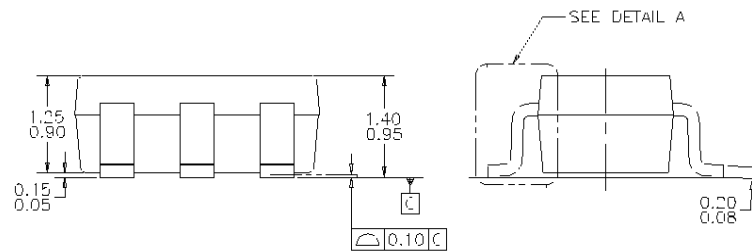


Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/-0.000 (8.40 + 1.50/-0.00)	0.567 (14.40)	W1 + 0.078/-0.039 (W1 + 2.00/-1.00)

Physical Dimensions inches (millimeters) unless otherwise noted



LAND PATTERN RECOMMENDATION

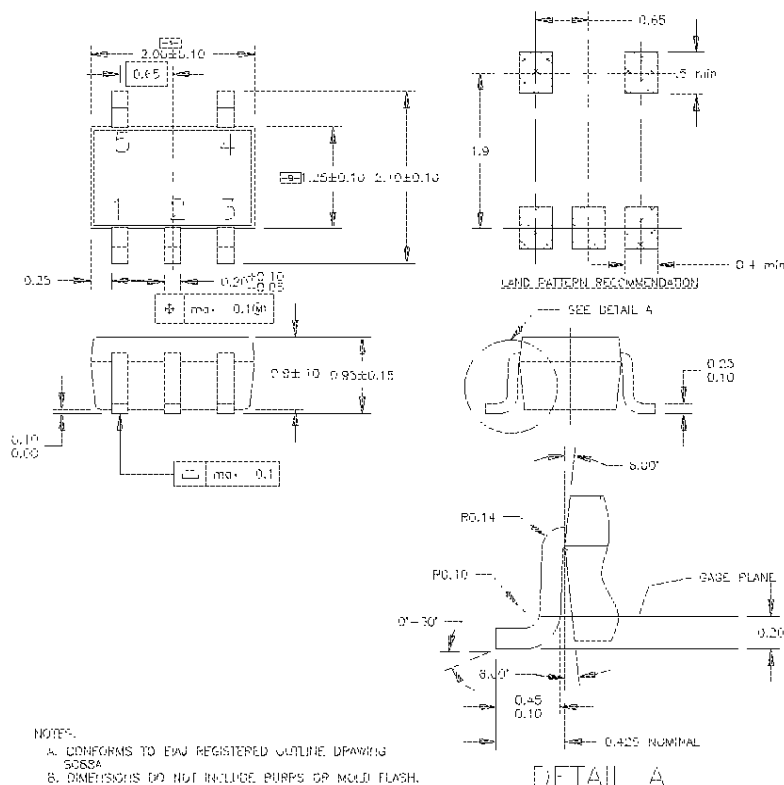


NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC MO-178, ISSUE B, VARIATION AA, DATED JANUARY 1999.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.

**5-Lead SOT23, JEDEC MO-178, 1.6mm
Package Number MA05B**

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



5-Lead SC70, EIAJ SC-88a, 1.25mm Wide
Package Number MAA05A

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