

NC7SZ125 TinyLogic® UHS Buffer with 3-STATE Output

General Description

The NC7SZ125 is a single buffer with 3-STATE output 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 1.65V to 5.5V range.

The inputs and output are high impedance above ground when V_{CC} is 0V. Inputs tolerate voltages up to 6V independent of V_{CC} operating voltage. The output tolerates voltages above V_{CC} when in the 3-STATE condition.

Features

- Space saving SOT23 or SC70 5-lead package
- Ultra small MicroPak™ Pb-Free leadless package
- Ultra High Speed; t_{PD} 2.6 ns Typ into 50 pF at 5V V_{CC}
- High Output Drive; ± 24 mA at 3V V_{CC}
- Broad V_{CC} Operating Range; 1.65V 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 Number	Package Drawing	Product Code Top Mark	Package Description	Supplied As
NC7SZ125M5X	MA05B	7Z25	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7SZ125M5X_NL (Note 1)	MA05B	7Z25	Pb-Free 5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7SZ125P5X	MAA05A	Z25	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7SZ125P5X_NL (Note 1)	MAA05A	Z25	Pb-Free 5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7SZ125L6X	MAC06A	DD	Pb-Free 6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Pb-Free package per JEDEC J-STD-020B.

Note 1: "_NL" indicates Pb-Free product (per JEDEC J-STD-020B). Device is available in Tape and Reel only.

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MicroPak™ is a trademark of Fairchild Semiconductor Corporation.

NC7SZ125 TinyLogic® UHS Buffer with 3-STATE Output

Pin Descriptions

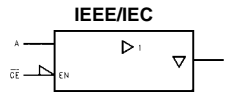
Pin Names	Description
A, \overline{OE}	Inputs
Y	Output
NC	No Connect

Function Table

Inputs		Output
\overline{OE}	In A	Out Y
L	L	L
L	H	H
H	X	Z

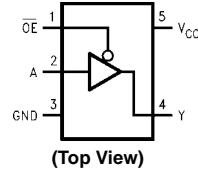
H = HIGH Logic Level
 L = LOW Logic Level
 X = HIGH or LOW Logic Level
 Z = HIGH Impedance State

Logic Symbol

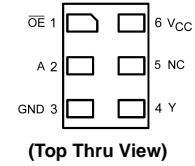


Connection Diagrams

Pin Assignment for SC70 and SOT23



Pad Assignment for MicroPak



Absolute Maximum Ratings (Note 2)		Recommended Operating Conditions (Note 3)	
Supply Voltage (V_{CC})	-0.5V to +6V	Supply Voltage Operating (V_{CC})	1.65V to 5.5V
DC Input Voltage (V_{IN})	-0.5V to +6V	Supply Voltage Data Retention (V_{CC})	1.5V to 5.5V
DC Output Voltage (V_{OUT})	-0.5V to +6V	Input Voltage (V_{IN})	0V to 5.5V
DC Input Diode Current (I_{IK})		Output Voltage (V_{OUT})	
@ $V_{IN} < -0.5V$	-50 mA	Active State	0V to V_{CC}
@ $V_{IN} > 6V$	+20 mA	3-STATE	0V to 5.5V
DC Output Diode Current (I_{OK})		Operating Temperature (T_A)	-40°C to +85°C
@ $V_{OUT} < -0.5V$	-50 mA	Input Rise and Fall Time (t_r, t_f)	
@ $V_{OUT} > 6V, V_{CC} = GND$	+20 mA	$V_{CC} = 1.8V, 2.5V \pm 0.2V$	0 ns/V to 20 ns/V
DC Output Current (I_{OUT})	± 50 mA	$V_{CC} = 3.3V \pm 0.3V$	0 ns/V to 10 ns/V
DC V_{CC}/GND Current (I_{CC}/I_{GND})	± 50 mA	$V_{CC} = 5.0V \pm 0.5V$	0 ns/V to 5 ns/V
Storage Temperature (T_{STG})	-65°C to +150°C	Thermal Resistance (θ_{JA})	
Junction Temperature under Bias (T_J)	150°C	SOT23-5	300°C/W
Junction Lead Temperature (T_L); (Soldering, 10 seconds)	260°C	SC70-5	425°C/W
Power Dissipation (P_D) @ +85°C		Note 2: 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.	
SOT23-5	200 mW	Note 3: Unused inputs must be held HIGH or LOW. They may not float.	
SC70-5	150 mW		

DC Electrical Characteristics

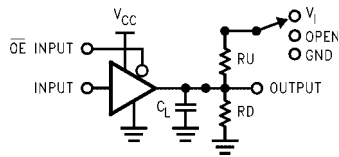
Symbol	Parameter	V_{CC} (V)	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	HIGH Level Input Voltage	1.65 to 1.95 2.3 to 5.5	0.75 V_{CC} 0.7 V_{CC}			0.75 V_{CC} 0.7 V_{CC}		V		
V_{IL}	LOW Level Input Voltage	1.65 to 1.95 2.3 to 5.5	0.25 V_{CC} 0.3 V_{CC}			0.25 V_{CC} 0.3 V_{CC}		V		
V_{OH}	HIGH Level Output Voltage	1.65	1.55	1.65	1.55		V	$V_{IN} = V_{IH}$	$I_{OH} = -100 \mu\text{A}$	
		1.8	1.7	1.8	1.7					
		2.3	2.2	2.3	2.2					
		3.0	2.9	3.0	2.9					
		4.5	4.4	4.5	4.4					
	1.65	1.29	1.52	1.29		V		$I_{OH} = -4 \text{ mA}$ $I_{OH} = -8 \text{ mA}$ $I_{OH} = -16 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -32 \text{ mA}$		
	2.3	1.9	2.15	1.9						
	3.0	2.4	2.80	2.4						
	3.0	2.3	2.68	2.3						
	4.5	3.8	4.20	3.8						
V_{OL}	LOW Level Output Voltage	1.65	0.0		0.0		V	$V_{IN} = V_{IL}$	$I_{OL} = 100 \mu\text{A}$	
		1.8	0.0		0.1					
		2.3	0.0		0.1					
		3.0	0.0		0.1					
		4.5	0.0		0.1					
	1.65	0.08	0.24	0.24		V		$I_{OL} = 4 \text{ mA}$ $I_{OL} = 8 \text{ mA}$ $I_{OL} = 16 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 32 \text{ mA}$		
	2.3	0.10	0.3	0.3						
	3.0	0.15	0.4	0.4						
	3.0	0.22	0.55	0.55						
	4.5	0.22	0.55	0.55						
I_{IN}	Input Leakage Current	0 to 5.5	± 1		± 10		μA	$0 \leq V_{IN} \leq 5.5V$		
I_{OZ}	3-STATE Output Leakage	1.65 to 5.5	± 1		± 10		μA	$V_{IN} = V_{IH}$ or V_{IL} $0 \leq V_O \leq 5.5V$		
I_{OFF}	Power Off Leakage Current	0.0	1		10		μA	V_{IN} or $V_{OUT} = 5.5V$		
I_{CC}	Quiescent Supply Current	1.65 to 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	Figure Number
			Min	Typ	Max	Min	Max			
t _{PLH} t _{PHL}	Propagation Delay	1.65	2.0	6.4	13.2	2.0	13.8	ns	C _L = 15 pF, R _D = 1 MΩ, S ₁ = OPEN	Figures 1, 3
		1.8	2.0	5.3	11.0	2.0	11.5			
		2.5 ± 0.2	0.8	3.4	7.5	0.8	8.0			
		3.3 ± 0.3	0.5	2.5	5.2	0.5	5.5			
		5.0 ± 0.5	0.5	2.1	4.5	0.5	4.8			
t _{PLH} t _{PHL}	Propagation Delay	3.3 ± 0.3	1.5	3.2	5.7	1.5	6.0	ns	C _L = 50 pF, R _D = 500Ω, S ₁ = OPEN	Figures 1, 3
		5.0 ± 0.5	0.8	2.6	5.0	0.8	5.3			
t _{PZL} t _{PZH}	Output Enable Time	1.65	2.0	8.4	15.0	2.0	15.6	ns	C _L = 50 pF, R _D = 500Ω R _U = 500Ω S ₁ = GND for t _{PZH} S ₁ = V _{IN} for t _{PZL} V _{IN} = 2 × V _{CC}	Figures 1, 3
		1.8	2.0	7.0	12.5	2.0	13			
		2.5 ± 0.2	1.5	4.6	8.5	1.5	9			
		3.3 ± 0.3	1.5	3.5	6.2	1.5	6.5			
		5.0 ± 0.5	0.8	2.8	5.5	0.8	5.8			
t _{PLZ} t _{PHZ}	Output Disable Time	1.65	2.0	6.5	13.2	2.0	14.5	ns	C _L = 50 pF, R _D = 500Ω R _U = 500Ω S ₁ = GND for t _{PHZ} S ₁ = V _{IN} for t _{PLZ} V _{IN} = 2 × V _{CC}	Figures 1, 3
		1.8	2.0	5.4	11	2.0	12			
		2.5 ± 0.2	1.5	3.5	8	1.5	8.5			
		3.3 ± 0.3	1.0	2.8	5.7	1.0	6			
		5.0 ± 0.5	0.5	2.1	4.7	0.5	5.0			
C _{IN}	Input Capacitance	0	4					pF		
C _{OUT}	Output Capacitance	0	8							
C _{PD}	Power Dissipation Capacitance	3.3	17					pF	(Note 4)	Figure 2
		5.0	24							

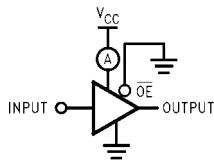
Note 4: C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CC}static).

AC Loading and Waveforms



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

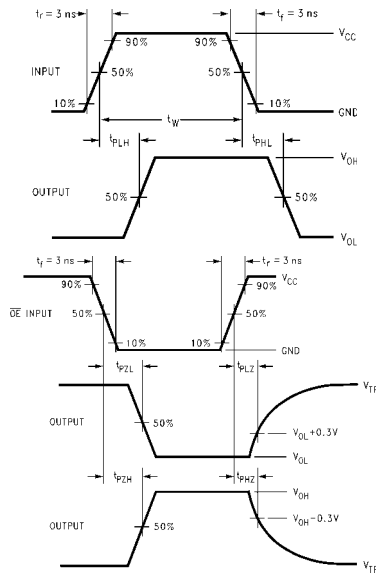


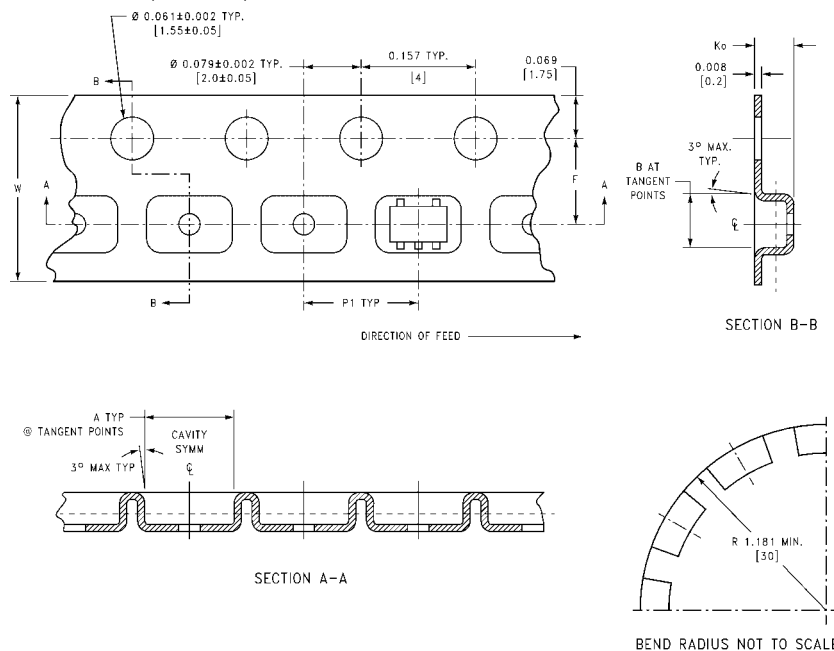
FIGURE 3. AC Waveforms

Tape and Reel Specification

TAPE FORMAT FOR SOT23, SC70

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

TAPE DIMENSIONS inches (millimeters)

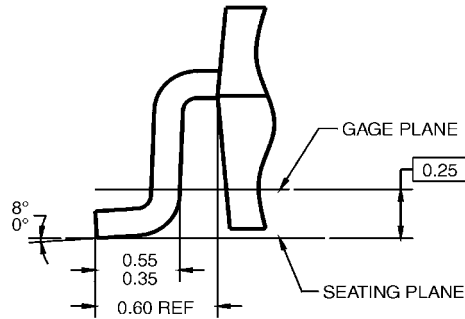
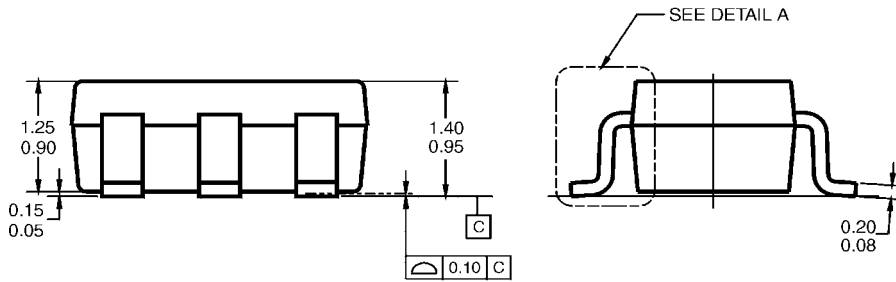


Package	Tape Size	DIM A	DIM B	DIM F	DIM K ₀	DIM P1	DIM W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ± 0.004 (3.5 ± 0.10)	0.053 ± 0.004 (1.35 ± 0.10)	0.157 (4)	0.315 ± 0.004 (8 ± 0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138 ± 0.002 (3.5 ± 0.05)	0.055 ± 0.004 (1.4 ± 0.11)	0.157 (4)	0.315 ± 0.012 (8 ± 0.3)

Physical Dimensions inches (millimeters) unless otherwise noted



LAND PATTERN RECOMMENDATION



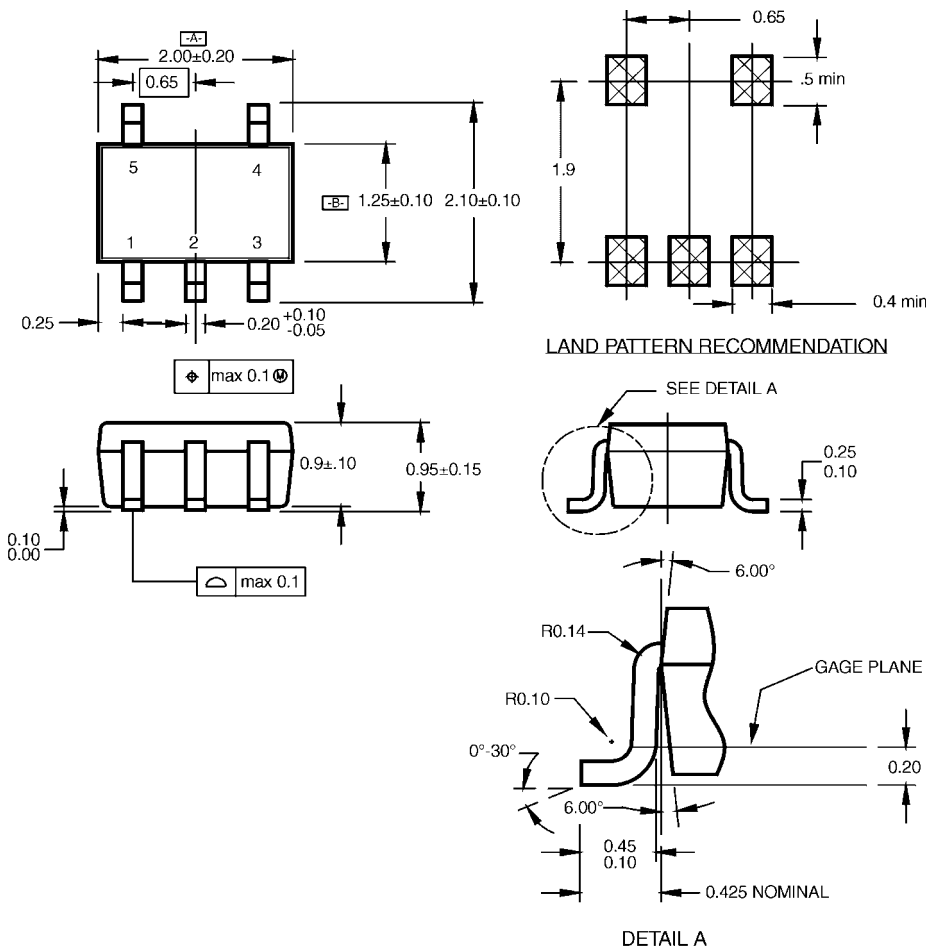
DETAIL A

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

- 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.

MA05BRevC

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



NOTES:

- A. CONFORMS TO EIAJ REGISTERED OUTLINE DRAWING SC88A.
- B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.
- C. DIMENSIONS ARE IN MILLIMETERS.

MAA05ARevC

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

