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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 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
NC7SZ125M5	MA05B	7Z25	5-Lead SOT23, JEDEC MO-178, 1.6mm	250 Units on Tape and Reel
NC7SZ125M5X	MA05B	7Z25	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7SZ125P5	MAA05A	Z25	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	250 Units on Tape and Reel
NC7SZ125P5X	MAA05A	Z25	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel

Logic Symbol

IEEE/IEC
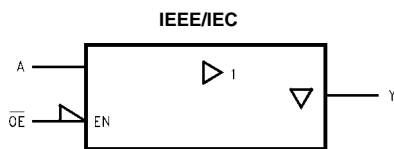
Connection Diagram

(Top View)
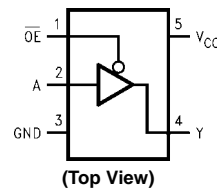
Pin Descriptions

Pin Names	Description
A, $\overline{OE}$	Inputs
Y	Output

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

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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_L);	
(Soldering, 10 seconds)	260°C
Power Dissipation (P_D) @ +85°C	
SOT23-5	200 mW
SC70-5	150 mW

Recommended Operating Conditions (Note 2)

Supply Voltage Operating (V_{CC})	1.65V 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})	
Active State	0V to V_{CC}
3-STATE	0V to 5.5V
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 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.

Note 2: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = +25°C			T_A = −40°C to +85°C		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	HIGH Level Input Voltage	1.65 to 1.95	0.75 V_{CC}			0.75 V_{CC}		V		
		2.3 to 5.5	0.7 V_{CC}			0.7 V_{CC}				
V_{IL}	LOW Level Input Voltage	1.65 to 1.95			0.25 V_{CC}		0.25 V_{CC}	V		
		2.3 to 5.5			0.3 V_{CC}		0.3 V_{CC}			
V_{OH}	HIGH Level Output Voltage	1.65	1.55	1.65		1.55			V_{IN} = V_{IH}	I_{OH} = −100 µA
		1.8	1.7	1.8		1.7		V		
		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				I_{OH} = −4 mA
		2.3	1.9	2.15		1.9				I_{OH} = −8 mA
		3.0	2.4	2.80		2.4		V		I_{OH} = −16 mA
		3.0	2.3	2.68		2.3				I_{OH} = −24 mA
		4.5	3.8	4.20		3.8				I_{OH} = −32 mA
V_{OL}	LOW Level Output Voltage	1.65		0.0	0.1		0.0		V_{IN} = V_{IL}	I_{OL} = 100 µA
		1.8		0.0	0.1		0.1			
		2.3		0.0	0.1		0.1	V		
		3.0		0.0	0.1		0.1			
		4.5		0.0	0.1		0.1			
		1.65		0.08	0.24		0.24			I_{OL} = 4 mA
		2.3		0.10	0.3		0.3			I_{OL} = 8 mA
		3.0		0.15	0.4		0.4	V		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 to 5.5			±1		±10	µA	$0 \le V_{IN} \le 5.5V$	
I_{OZ}	3-STATE Output Leakage	1.65 to 5.5			±1		±10	µA	V_{IN} = V_{IH} or V_{IL} $0 \le V_O \le 5.5V$	
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	Fig. No.
			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, $R_D = 500$Ω, $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, RD = 500Ω RU = 500Ω $S_1 = $ GND for t_{PZH} $S_1 = V_{IN}$ for t_{PZL} $V_{IN} = 2$ x 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, RD = 500Ω RU = 500Ω $S_1 = $ GND for t_{PHZ} $S_1 = V_{IN}$ for t_{PLZ} $V_{IN} = 2$ x 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 3)	Figure 2
		5.0		24						

Note 3: 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
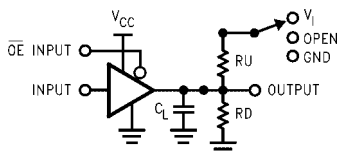
C_L includes load and stray capacitance

Input PRR = 1.0 MHz; $t_W = 500$ ns

FIGURE 1. AC Test Circuit
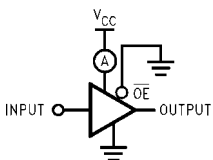
Input = AC Waveform; $t_r = t_f = 1.8$ ns;

PRR = 10 MHz; Duty Cycle = 50%

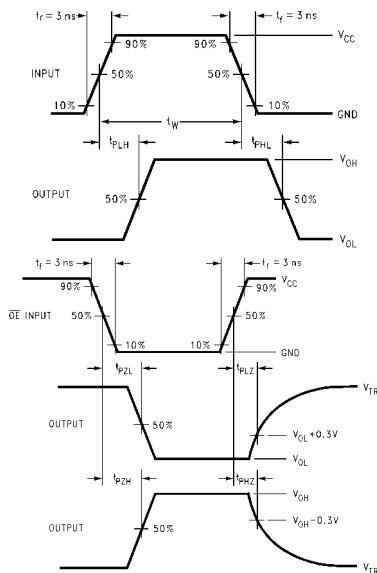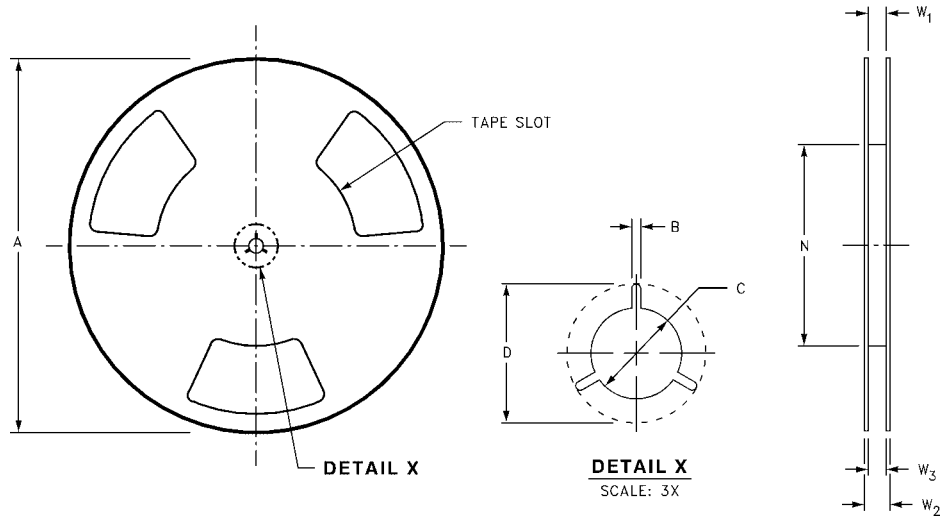**FIGURE 2. I_{CCD} Test Circuit**


FIGURE 3. AC Waveforms

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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)

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)

Tape and Reel Specification (Continued)

REEL DIMENSIONS inches (millimeters)

DETAIL X

DETAIL X
SCALE: 3X

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)

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Physical Dimensions inches (millimeters) unless otherwise noted

SYMM

LAND PATTERN RECOMMENDATION

SEE DETAIL A
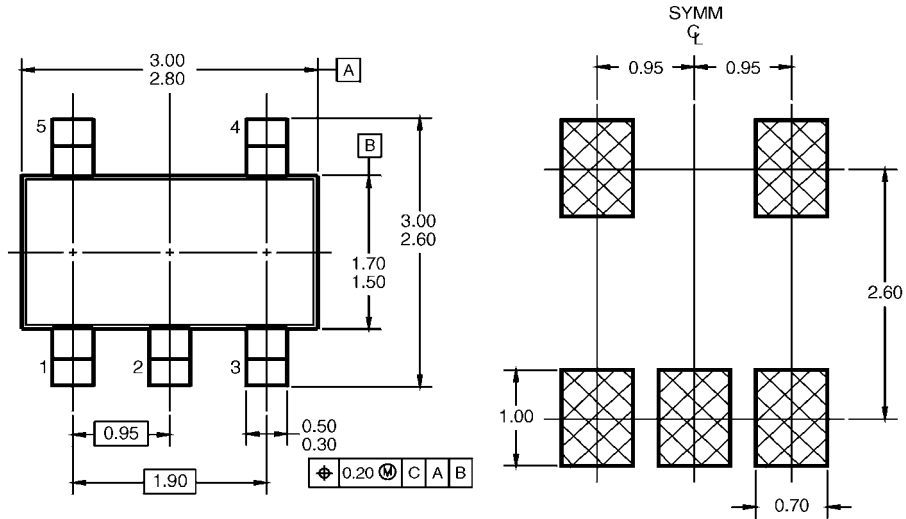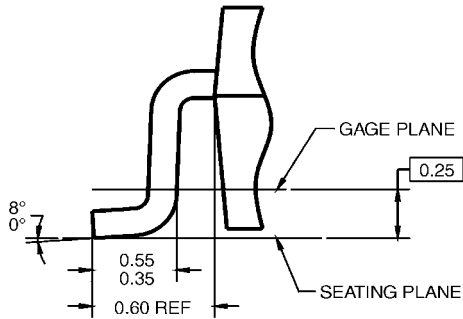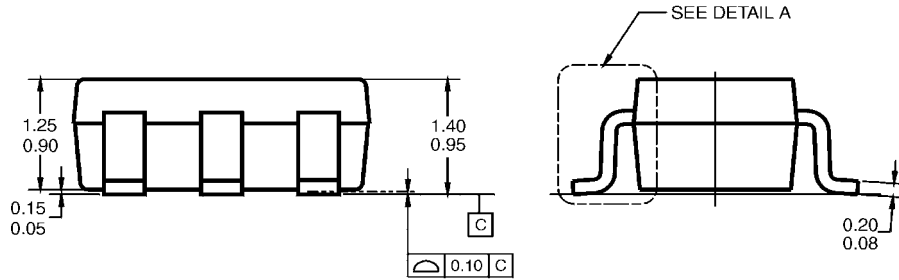
NOTES: UNLESS OTHERWISE SPECIFIED
  A) THIS PACKAGE CONFORMS TO JEDEC
     MO-178, ISSUE B, VARIATION AA,
     DATED JANUARY 1999.
  B) ALL DIMENSIONS ARE IN MILLIMETERS.

GAGE PLANE

0.25

SEATING PLANE

MA05BRevC

DETAIL A

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

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

LAND PATTERN RECOMMENDATION

SEE DETAIL A

DETAIL A
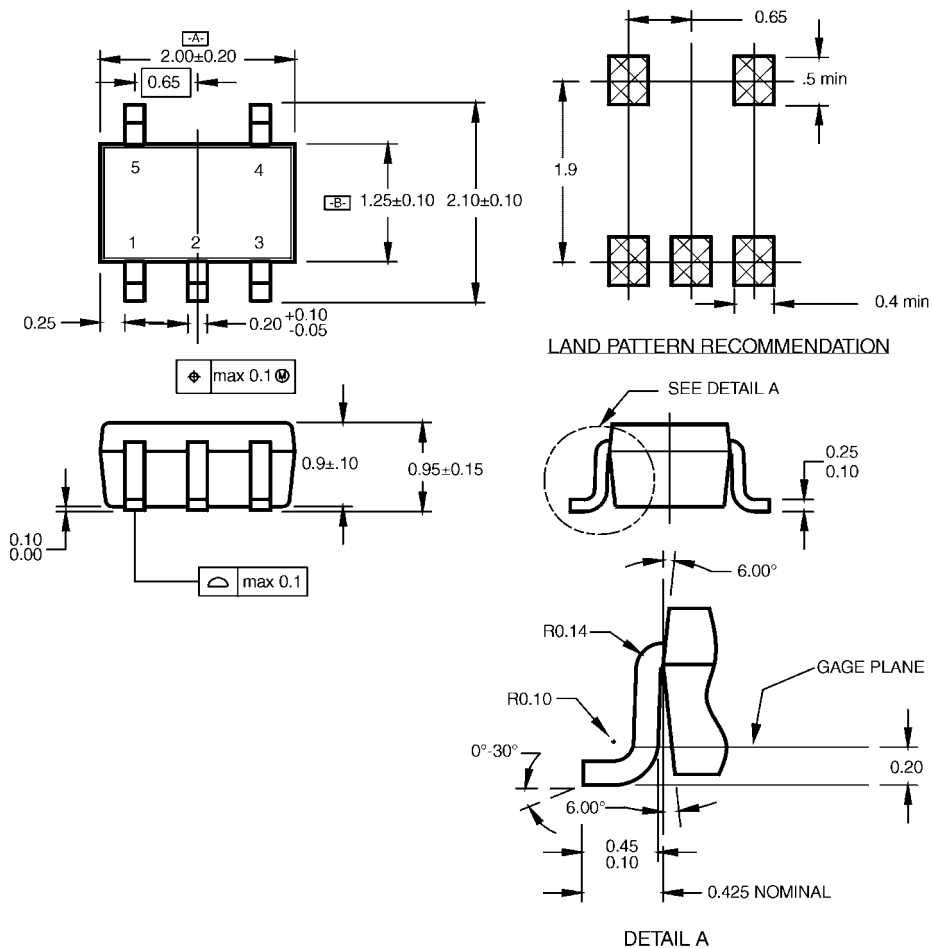
MAA05ARevC

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

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

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