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TinyLogic ULP-A Buffer with Three-State Output

NC7SV126

The NC7SV126 is a single 3–State buffer in tiny footprint packages. The device is designed to operate for $V_{CC} = 0.9 \text{ V}$ to 3.6 V.

Features

- Designed for 0.9 V to 3.6 V V_{CC} Operation
- 1.8 ns t_{PD} at 3.3 V (Typ)
- Inputs/Outputs Over-Voltage Tolerant up to 3.6 V
- I_{OFF} Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.3 V
- Available in SC/SC-88A and MicroPakTM Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

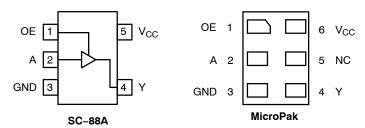


Figure 1. Pinout (Top View)



Figure 2. Logic Symbol

UN

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MARKING DIAGRAM



SIP6 1.45 x1.0 MicroPak CASE 127EB



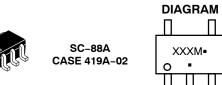
MARKING

CC = Specific Device Code

KK = 2-Digit Lot Run Traceability Code

XY = 2-Digit Date Code

= Assembly Plant Code



XXX = Specific Device Code
M = Date Code

= Pb-Free Package

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

PIN ASSIGNMENT

Pin	SC88A	MicroPak
1	OE	OE
2	А	А
3	GND	GND
4	Υ	Υ
5	V _{CC}	NC
6	-	V _{CC}

FUNCTION TABLE

Inp	Output	
OE	Α	Υ
Н	L	L
Н	Н	Н
L	Х	Z

X = Don't Care

1

MAXIMUM RATINGS

Symbol	Characteristics	Value	Unit	
V _{CC}	DC Supply Voltage		-0.5 to +4.3	V
V _{IN}	DC Input Voltage		-0.5 to +4.3	V
V _{OUT}		-Mode (High or Low State) Tri-State Mode (Note 1) r-Down Mode (V _{CC} = 0 V)	-0.5 to V _{CC} + 0.5 -0.5 to +4.3 -0.5 to +4.3	V
I _{IK}	DC Input Diode Current	V _{IN} < GND	-50	mA
I _{OK}	DC Output Diode Current	V _{OUT} < GND	-50	mA
I _{OUT}	DC Output Source/Sink Current		±50	mA
I _{CC} or I _{GND}	DC Supply Current per Supply Pin or Ground Pin		±50	mA
T _{STG}	Storage Temperature Range		-65 to +150	°C
TL	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
TJ	Junction Temperature Under Bias		+150	°C
θJA	Thermal Resistance (Note 2)	SC-88A MicroPak	377 154	°C/W
P _D	Power Dissipation in Still Air	SC-88A MikroPak	332 812	mW
MSL	Moisture Sensitivity		Level 1	-
F _R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	-
V _{ESD}	ESD Withstand Voltage (Note 3)	Human Body Model Charged Device Model	2000 1000	V
I _{Latchup}	Latchup Performance (Note 4)	_	±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- Applicable to devices with outputs that may be tri-stated.
 Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow per JESD51-7.
 HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A. (Machine Model) be discontinued.
- 4. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Param	Min	Max	Unit	
V _{CC}	Positive DC Supply Voltage		0.9	3.6	V
V _{IN}	DC Input Voltage		0	3.6	٧
V _{OUT}	DC Output Voltage	Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode (V _{CC} = 0 V)	0 0 0	V _{CC} 3.6 3.6	
T _A	Operating Temperature Range		-40	+85	°C
t _r , t _f	Input Transition Rise and Fall Time	V _{CC} = 3.3 V ±0.3 V	0	10	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

				т	T _A = 25°C		$T_A = -40^{\circ}$	C to +85°C	
Symbol	Parameter	Condition	V _{CC} (V)	Min	Тур	Max	Min	Max	Unit
V_{IH}	High-Level Input		0.9	-	0.5	-	_	_	V
	Voltage		1.1 to 1.3	0.65 x V _{CC}	_	-	0.65 x V _{CC}	_	1
			1.4 to 1.6	0.65 x V _{CC}	-	-	0.65 x V _{CC}	-	
			1.65 – 1.95	0.65 x V _{CC}	-	-	0.65 x V _{CC}	-	1
			2.3 to < 2.7	1.6	-	_	1.6	-	1
			2.7 to 3.6	2.0	-	-	2.0	-	
V _{IL}	Low-Level Input		0.9	-	0.5	-	-	-	V
	Voltage		1.1 to 1.3	-	-	0.35 x V _{CC}	-	0.35 x V _{CC}	1
			1.4 to 1.6	-	_	0.35 x V _{CC}	-	0.35 x V _{CC}	1
			1.65 – 1.95	-	_	0.35 x V _{CC}	-	0.35 x V _{CC}	1
			2.3 to < 2.7	-	_	0.7	-	0.7	1
			2.7 to 3.6	-	_	0.8	_	0.8	1
V _{OH}	High-Level Output	$V_{IN} = V_{IH}$ or V_{IL}							V
· · ·	Voltage	I _{OH} = -100 μA	0.9	-	V _{CC} - 0.1	-	-	-	
			1.1 to 3.6	V _{CC} – 0.1	_	_	V _{CC} - 0.1	_	1
			1.4 to 1.6	V _{CC} - 0.1	-	-	V _{CC} - 0.1	-	1
			1.65 to 1.95	V _{CC} - 0.2	-	_	V _{CC} - 0.2	-	1
			2.3 to < 2.7	V _{CC} - 0.2	-	-	V _{CC} - 0.2	-	1
			2.7 to 3.6	V _{CC} - 0.2	_	-	V _{CC} - 0.2	-	1
		I _{OH} = −2 mA	1.1 o 1.3	0.75 x V _{CC}	_	-	0.75 x V _{CC}	_	1
		I _{OH} = -4 mA	1.4 to 1.6	0.75 x V _{CC}	_	-	0.75 x V _{CC}	-	1
		I _{OH} = -6 mA	1.65 to 1.95	1.25	_	-	1.25	_	1
			2.3 to < 2.7	2.0	_	-	2.0	_	1
		I _{OH} = -12 mA	2.3 to < 2.7	1.8	_	_	1.8	_	1
			2.7 to 3.6	2.2	_	_	2.2	_	
		I _{OH} = -18 mA	2.3 to < 2.7	1.7	_	_	1.7	_	1
			2.7 to 3.6	2.4	_	_	2.4	_	1
		I _{OH} = -24 mA	2.7 to 3.6	2.2	_	_	2.2	_	
V _{OL}	Low-Level Output	$V_{IN} = V_{IH}$ or V_{IL}							V
02	Voltage	I _{OL} = 100 μA	0.9	-	0.1	_	_	_	
		,	1.1 to 3.6	-	_	0.1	_	0.1	٧
			1.4 to 1.6	-	_	0.1	_	0.1	V
			1.65 to 1.95	-	_	0.2	_	0.2	V
			2.3 to < 2.7	-	_	0.2	_	0.2	V
			2.7 to 3.6	-	_	0.2	_	0.2	V
		I _{OL} = 2 mA	1.1 o 1.3	-	_	0.25 x V _{CC}	_	0.25 x V _{CC}	V
		I _{OL} = 4 mA	1.4 to 1.6	_	_	0.25 x V _{CC}	_	0.25 x V _{CC}	V
		I _{OL} = 6 mA	1.65 to 1.95	-	_	0.3	_	0.3	
		I _{OL} = 12 mA	2.3 to < 2.7	_	-	0.4	_	0.4	
			2.7 to 3.6	-	_	0.4	-	0.4	
		I _{OL} = 18 mA	2.3 to < 2.7	_	_	0.6	_	0.6	
			2.7 to 3.6	_	_	0.4	_	0.4	
		I _{OL} = 24 mA	2.7 to 3.6	-	_	0.55	_	0.55	1

DC ELECTRICAL CHARACTERISTICS (continued)

				Т	T _A = 25°C		T _A = -40°C to +85°C		
Symbol	Parameter	Condition	V _{CC} (V)	Min	Тур	Max	Min	Max	Unit
I _{IN}	Input Leakage Current	V _{IN} = 3.6 V or GND	0.9 to 3.6	-	-	±0.1	-	±0.5	μΑ
I _{OZ}	3-State Output Leakage Current	V _{OUT} = 0 V to 3.6 V	0.9 to 3.6	-	-	±0.5	-	±0.5	μΑ
I _{OFF}	Power Off Leakage Current	V _{IN} = 3.6 V or V _{OUT} = 3.6 V	0	_	-	0.5	-	0.5	μΑ
Icc	Quiescent Supply Current	V _{IN} = V _{CC} or GND	0.9 to 3.6	-	-	0.9	-	0.9	μΑ

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

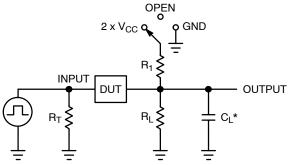
AC ELECTRICAL CHARACTERISTICS

				T _A = 25°C		2	T _A = -40°C	C to +85°C	
Symbol	Parameter	Condition	V _{CC} (V)	Min	Тур	Max	Min	Max	Unit
t _{PLH} , t _{PHL}	Propagation Delay,	$R_L = 1 M\Omega$, $C_L = 15 pF$	0.9	-	17.6	-	-	-	ns
	A to Y (Figures 3 and 4)	$R_L = 2 \text{ k}\Omega$, $C_L = 15 \text{ pF}$	1.10 to 1.30	-	6.3	12.6	-	14.9	
			1.40 to 1.60	-	3.8	5.3	-	5.7	
		$R_L = 500 \ \Omega, \ C_L = 30 \ pF$	1.65 to 1.95	-	3.0	4.3	-	4.6	
			2.3 to 2.7	-	2.1	2.8	-	3.0	
			2.7 to 3.6	-	1.8	2.6	-	2.8	
t _{PZH} , t _{PZL}		$C_L = 30 \text{ pF}$ $R_1 = R_L = 1 \text{ k}\Omega$	0.9	-	19.7	-	-	-	ns
	OE to Y (Figures 3 and 4)		1.10 to 1.30	-	6.0	9.7	-	16.4	
	,		1.40 to 1.60	-	3.5	6.0	-	7.5	
			1.65 to 1.95	-	2.7	4.5	-	5.0	
			2.3 to 2.7	-	2.0	3.0	-	3.4	
			2.7 to 3.6	-	1.7	2.6	-	2.9	
t_{PHZ} , t_{PLZ}	Output Disable Time,	C _L = 30 pF	0.9	-	10.3	-	-	-	ns
	OE to Y (Figures 3 and 4)	$R_1 = R_L = 1 \text{ k}\Omega$	1.10 to 1.30	-	4.9	9.5	-	14.0	
	('9" ',		1.40 to 1.60	-	3.3	5.5	-	7.0	
			1.65 to 1.95	-	3.0	5.6	-	5.8	
			2.3 to 2.7	-	2.5	4.2	-	5.0	
			2.7 to 3.6	-	2.9	3.9	-	4.2	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition	Typical (T _A = 25°C)	Unit
C _{IN}	Input Capacitance	V _{CC} = 0 V	2.0	pF
C _{OUT}	Output Capacitance	V _{CC} = 0 V	4.5	pF
C _{PD}	Power Dissipation Capacitance (Note 5)	10 MHz, V_{CC} = 0.9 to 3.6 V, V_{IN} = 0 V or V_{CC}	20	pF

^{5.} C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no–load dynamic power consumption: P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

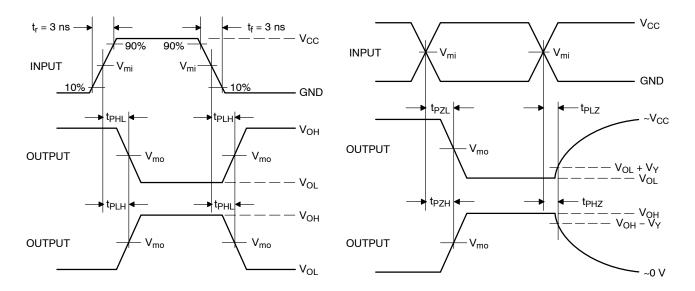


Test	Switch Position
t _{PLH} / t _{PHL}	Open
t _{PLZ} / t _{PZL}	2 x V _{CC}
t _{PHZ} / t _{PZH}	GND

C_L includes probe and jig capacitance

 R_T is Z_{OUT} of pulse generator (typically 50 Ω) f=1 MHz

Figure 3. Test Circuit



		V		
V _{CC} , V	V _{mi} , V	t _{PLH} , t _{PHL}	t _{PZL} , t _{PLZ} , t _{PZH} , t _{PHZ}	V _Y , V
0.9	V _{CC} /2	V _{CC} / 2	V _{CC} / 2	0.1
1.1 to 1.3	V _{CC} /2	V _{CC} / 2	V _{CC} / 2	0.1
1.4 to 1.6	V _{CC} /2	V _{CC} / 2	V _{CC} / 2	0.1
1.65 to 1.95	V _{CC} /2	V _{CC} / 2	V _{CC} / 2	0.15
2.3 to 2.7	V _{CC} /2	V _{CC} / 2	V _{CC} / 2	0.15
3.0 to 3.6	1.5	1.5	1.5	0.3

Figure 4. Switching Waveforms

ORDERING INFORMATION

Device	Package	Marking	Pin 1 Orientation (See below)	Shipping [†]
NC7SV126P5X	SC-88A	V26	Q4	3000 / Tape & Reel
NC7SV126L6X	MicroPak	H7	Q4	5000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

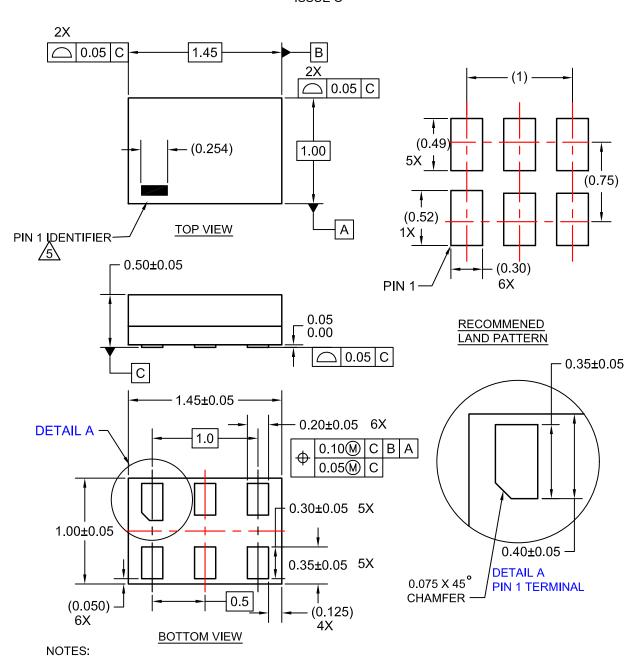
Pin 1 Orientation in Tape and Reel

Direction of Feed



PACKAGE DIMENSIONS

SIP6 1.45X1.0 CASE 127EB ISSUE O

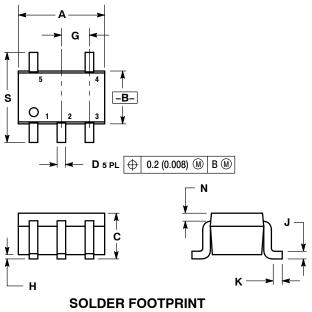


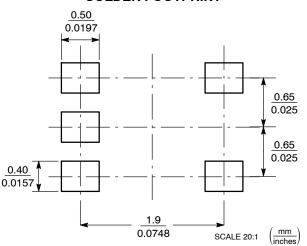
- 1, CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
- 2. DIMENSIONS ARE IN MILLIMETERS
- 3. DRAWING CONFORMS TO ASME Y14.5M-2009
 4. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY

OTHER LINE IN THE MARK CODE LAYOUT.

PACKAGE DIMENSIONS

SC-88A (SC-70-5/SOT-353) CASE 419A-02 **ISSUE L**





NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. 2. CONTROLLING DIMENSION: INCH. 3. 419A-01 OBSOLETE. NEW STANDARD

- 419A-02.

 4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE

	INCHES		MILLIN	IETERS	
DIM	MIN	MAX	MIN	MAX	
Α	0.071	0.087	1.80	2.20	
В	0.045	0.053	1.15	1.35	
С	0.031	0.043	0.80	1.10	
D	0.004	0.012	0.10	0.30	
G	0.026	BSC	0.65 BSC		
Н		0.004		0.10	
J	0.004	0.010	0.10	0.25	
K	0.004	0.012	0.10	0.30	
N	0.008 REF		0.20	REF	
S	0.079	0.087	2.00	2.20	

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

= Date Code

= Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:	STYLE 2:	STYLE 3:	STYLE 4:	STYLE 5:
PIN 1. BASE	PIN 1. ANODE	PIN 1. ANODE 1	PIN 1. SOURCE 1	PIN 1. CATHODE
2. EMITTER	2. EMITTER	2. N/C	2. DRAIN 1/2	2. COMMON ANODE
3. BASE	3. BASE	3. ANODE 2	3. SOURCE 1	3. CATHODE 2
4. COLLECTOR5. COLLECTOR	 COLLECTOR CATHODE 	4. CATHODE 2 5. CATHODE 1	4. GATE 1 5. GATE 2	 CATHODE 3 CATHODE 4

STYLE 9: STYLE 6: STYLE 7: STYLE 8: Note: Please refer to datasheet for PIN 1. ANODE 2. CATHODE 3. ANODE 4. ANODE 5. ANODE PIN 1. EMITTER 2 2. BASE 2 3. EMITTER 1 4. COLLECTOR PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR PIN 1. CATHODE 2. COLLECTOR 3. N/C 4. BASE style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment. 5. COLLECTOR 2/BASE 1 5. COLLECTOR 5. EMITTER

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CD4502BE 5962-8982101PA 5962-9052201PA 74LVC1G125FW4-7 NL17SH17P5T5G NL17SH125P5T5G NLV37WZ07USG

RHRXH162244K1 74AUP1G34FW5-7 74AUP1G07FW5-7 74LVC2G126RA3-7 NLX2G17CMUTCG 74LVCE1G125FZ4-7 Le87501NQC

74AUP1G126FW5-7 TC74HC4050AP(F) 74LVCE1G07FZ4-7 NLX3G16DMUTCG NLX2G06AMUTCG NLVVHC1G50DFT2G

NLU2G17AMUTCG LE87100NQC LE87290YQC LE87290YQCT LE87511NQC LE87511NQCT LE87557NQC LE87557NQCT

LE87614MQC LE87614MQCT 74AUP1G125FW5-7 NLU2G16CMUTCG MC74LCX244MN2TWG NLV74VHC125DTR2G