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November 2014

NC7SZ11 TinyLogic[®] UHS Three-Input AND Gate

Features

- Ultra-High Speed: t_{PD} 2.7 ns (Typical) into 50 pF at 5V V_{CC}
- High Output Drive: ±24 mA at 3 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Power Down High Impedance Inputs/Outputs
- Over-Voltage Tolerance inputs facilitate 5 V to 3 V Translation
- Proprietary Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SC70 Package

Description

The NC7SZ11 is a single three-input AND Gate from Fairchild's Ultra-High Speed Series of TinyLogic $^{\!\!\circ}$. 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 broad $V_{\rm CC}$ operating range. The device is specified to operate over the 1.65 V to 5.5 V $V_{\rm CC}$ operating range. The inputs and output are high impedance when $V_{\rm CC}$ is 0 V. Inputs tolerate voltages up to 7 V, independent of $V_{\rm CC}$ operating voltage.

Ordering Information

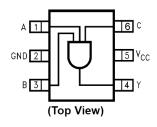
| Part Number | Top Mark | Package | Packing Method |
|-------------|----------|--|------------------------------|
| NC7SZ11P6X | Z11 | 6-Lead SC70, EIAJ SC-88a, 1.25 mm Wide | 3000 Units on Tape & Reel |
| NC7SZ11L6X | E7 | 6-Lead MicroPak™, 1.00 mm Wide | 5000 Units on Tape & Reel |

Connection Diagrams

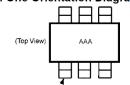


Figure 1. Logic Symbol

Pin Configurations



Pin One Orientation Diagram



Pin One

AAA represents Product Code Top Mark - see ordering code.

Note: Orientation of Top Mark determines Pin One location. Read the Top Product Code Mark left to right, Pin One is the lower left pin (see diagram)

Figure 2. SC70 (Top View)

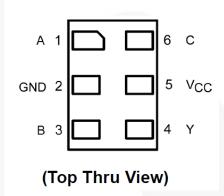


Figure 3. MicroPak (Top Through View)

Pin Definitions

| Pin # SC70 | Pin # MicroPak | Name | Description |
|------------|----------------|------|----------------|
| 1 | 1 | A | Input |
| 2 | 2 | GND | Ground |
| 3 | 3 | В | Input |
| 4 | 4 | Υ | Output |
| 5 | 5 | Vcc | Supply Voltage |
| 6 | 6 | С | Input |

Function Table

Y=ABC

| | Inputs | | Output |
|---|--------|---|--------|
| Α | В | С | Y |
| X | Х | L | L |
| X | L | X | L |
| L | X | Х | L |
| Н | Н | Н | Н |

H = HIGH Logic Level

L = LOW Logic Level

X = Either LOW or HIGH Logic Level

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Par | Min. | Max. | Unit | |
|-------------------------------------|--------------------------------------|--|------|------|-------|
| V _{CC} | Supply Voltage | | -0.5 | 7.0 | V |
| V _{IN} | DC Input Voltage | | -0.5 | 7.0 | V |
| V _{OUT} | DC Output Voltage | | -0.5 | 7.0 | V |
| I _{IK} | DC Input Diode Current | V _{IN} < -0.5 V | | -50 | mA |
| 1 | DC Output Diada Current | V _{OUT} < -0.5 V | | -50 | A |
| I _{OK} | OC Output Diode Current | V _{OUT} > 6 V, V _{CC} =GND | | +20 | mA mA |
| l _{out} | DC Output Current | | | ±50 | mA |
| I _{CC} or I _{GND} | DC V _{CC} or Ground Current | | | ±50 | mA |
| T _{STG} | Storage Temperature Range | | -65 | +150 | °C |
| TJ | Junction Temperature Under E | Bias | | +150 | °C |
| TL | Junction Lead Temperature (S | oldering, 10 Seconds) | | +260 | °C |
| Б | Davier Dissipation at 1959C | SC70-6 | | 150 | \/ |
| P _D | Power Dissipation at +85°C | MicroPak-6 | | 130 | mW |
| FCD | Human Body Model, JESD22- | | 4000 | \/ | |
| Charged Device Model, JESD | | 22-C101 | N N | 2000 | V |

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol | Parameter | Conditions | Min. | Max. | Unit | |
|---------------------------------|-------------------------------|---|------|------|------|--|
| V | Supply Voltage Operating | | 1.65 | 5.50 | V | |
| V_{CC} | Supply Voltage Data Retention | | 1.50 | 5.50 | 7 v | |
| V _{IN} | Input Voltage | | 0 | 5.5 | V | |
| V _{OUT} | Output Voltage | | 0 | Vcc | V | |
| T _A | Operating Temperature | | -40 | +85 | °C | |
| - | | V _{CC} at 1.8 V, 2.5 V ± 0.2 V | 0 | 20 | | |
| t _r , t _f | Input Rise and Fall Times | V_{CC} at 3.3 V \pm 0.3 V | 0 | 10 | ns/V | |
| | | V_{CC} at 5.0 V ± 0.5 V | 0 | 5 | | |
| 0 | Thermal Resistance | SC70-6 | | 425 | °C/W | |
| $\theta_{\sf JA}$ | Thermal Resistance | MicroPak-6 | | 500 | C/VV | |

Note:

1. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

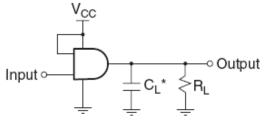
| 0 | D | v | 0 | Т | _A =25° | С | T _A =-40 t | o +85°C | Unit | |
|------------------|------------------------------|----------------------------|---|----------------------|-------------------|----------------------|-----------------------|----------------------|------|--|
| Symbol | Parameter | V _{CC} Conditions | | Min. | Тур. | Max. | Min. | Max. | Unit | |
| | HIGH Level Input | 1.8 ± 0.15 | | 0.75 V _{CC} | | | 0.75 V _{CC} | | | |
| V_{IH} | Voltage | 2.30 to 5.50 | | 0.70 V _{CC} | | | 0.70 V _{CC} | | V | |
| W | LOW Level Input | 1.8 ± 0.15 | | | | 0.25 V _{CC} | | 0.25 V _{CC} | V | |
| V_{IL} | Voltage | 2.30 to 5.50 | | | | 0.30 V _{CC} | | 0.30 V _{CC} | V | |
| | | 1.65 | | 1.55 | 1.65 | | 1.55 | | | |
| | | 2.30 |) | 2.20 | 2.30 | | 2.20 | | | |
| | | 3.00 | V _{IN} =V _{IH} , I _{OH} =-100 μA | 2.90 | 3.00 | | 2.90 | | | |
| | | 4.50 | | 4.40 | 4.50 | | 4.40 | | | |
| V_{OH} | HIGH Level Output Voltage | 1.65 | I _{OH} =-4 mA | 1.29 | 1.52 | _ | 1.29 | | V | |
| | Output Voltage | 2.30 | I _{OH} =-8 mA | 1.90 | 2.15 | | 1.90 | | | |
| | | 3.00 | I _{OH} =-16 mA | 2.50 | 2.80 | 1, 1/1 | 2.40 | | | |
| | | 3.00 | I _{OH} =-24 mA | 2.40 | 2.68 | | 2.30 | | | |
| | | 4.50 | I _{OH} =-32 mA | 3.90 | 4.20 | | 3.80 | | | |
| | | 1.65 | | | 0.00 | 0.10 | | 0.10 | | |
| | / | 2.30 | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | | 0.00 | 0.10 | | 0.10 | | |
| | | 3.00 | $V_{IN}=V_{IL}$, $I_{OL}=100 \mu A$ | | 0.00 | 0.10 | | 0.10 | | |
| | | 4.50 | | | 0.00 | 0.10 | | 0.10 | | |
| V_{OL} | LOW Level Output Voltage | 1.65 | I _{OL} =4 mA | | 0.80 | 0.24 | Y | 0.24 | V | |
| | Cutput Voltage | 2.30 | I _{OL} =8 mA | | 0.10 | 0.30 | | 0.30 | | |
| | | 3.00 | I _{OL} =16 mA | | 0.15 | 0.40 | | 0.40 | | |
| | | 3.00 | I _{OL} =24 mA | | 0.22 | 0.55 | | 0.55 | | |
| | | 4.50 | I _{OL} =32 mA | | 0.22 | 0.55 | | 0.55 | | |
| I _{IN} | Input Leakage Current | 0 to 5.5 | V _{IN} =5.5 V, GND | | | ±1 | | ±10 | μΑ | |
| l _{OFF} | Power Off Leakage Current | 0 | V _{IN} or V _{OUT} =5.5 V | | | 1 | | 10 | μΑ | |
| I _{CC} | Quiescent Supply Current | 1.65 to 5.50 | V _{IN} =5.5 V, GND | | | 2 | / | 20 | μΑ | |

AC Electrical Characteristics

| Symbol Paramete | Parameter | V _{cc} | Conditions | T _A =25°C | | | T _A =-40 to +85°C | | Unit | Eiguro |
|--|---|-----------------|----------------------------------|----------------------|------|------|------------------------------|------|----------|----------|
| | Parameter | | Conditions | Min. | Тур. | Max. | Min. | Max. | Onit | Figure |
| | | 1.80 ± 0.15 | C_L =15 pF, R_L =1M Ω | 2.0 | 9.0 | 18.5 | 2.0 | 19.0 | | |
| | t _{PLH} , t _{PHL} Propagation Delay | 2.50 ± 0.20 | | 0.8 | 4.9 | 10.5 | 0.8 | 11.0 | | |
| | | 3.30 ± 0.30 | | 0.5 | 3.5 | 8.5 | 0.5 | 9.0 | 20 | Figure 4 |
| IPLH, IPHL | | 5.00 ± 0.50 | | 0.5 | 2.5 | 6.5 | 0.5 | 7.0 | ns - | Figure 5 |
| | | 3.30 ± 0.30 | | 1.5 | 4.1 | 8.5 | 1.5 | 9.0 | | |
| | | 5.00 ± 0.50 | R _L =500 Ω | 0.8 | 2.9 | 7.5 | 0.8 | 8.0 | | |
| C _{IN} | Input Capacitance | 0.00 | | | 4 | | | | pF | |
| C _{PD} Power Dissipation Capacitance ⁽²⁾ | 3.30 | | _ | 20 | | | | | Fig C | |
| | 5.00 | | | 25 | | | | pF | Figure 6 | |

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 lading and operating at 50% duty cycle. C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}static).



Notes:

- 3. C_L includes load and stray capacitance.
- 4. Input PRR=1.0 MHz; t_W500 ns.

Figure 4. AC Test Circuit

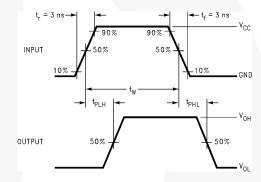
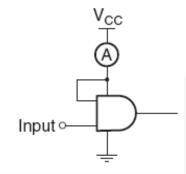


Figure 5. AC Waveforms



Note:

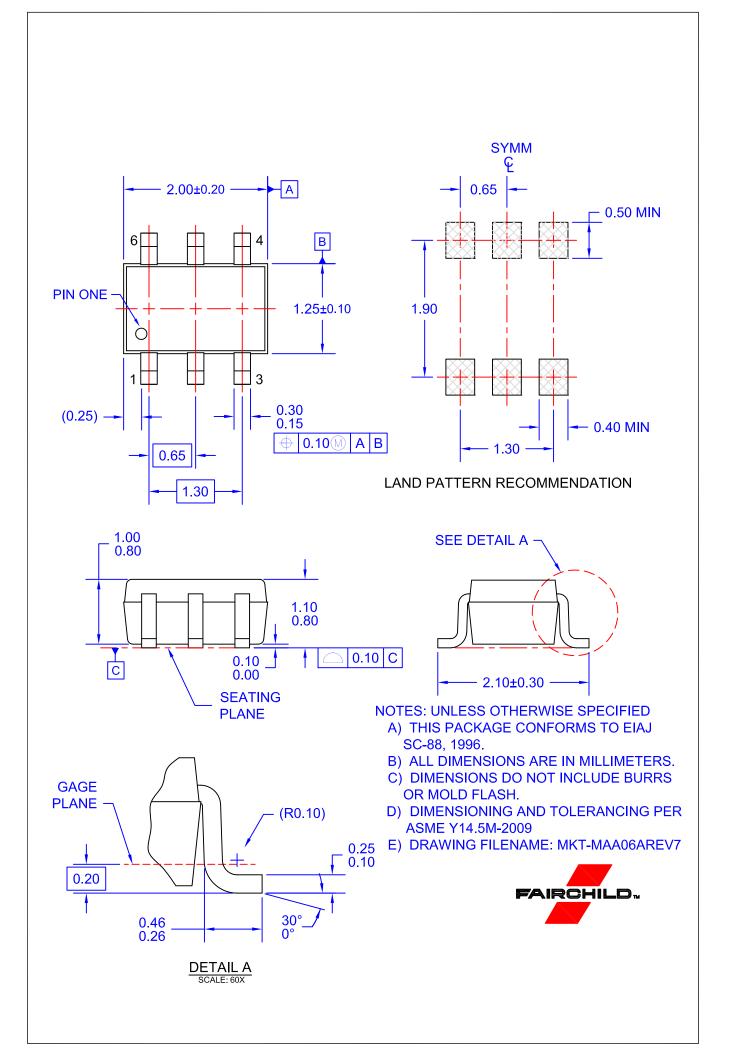
5. Input=AC Waveform; t_r=t_f=1.8 ns; PRR=10 MHz; Duty Cycle=50%.

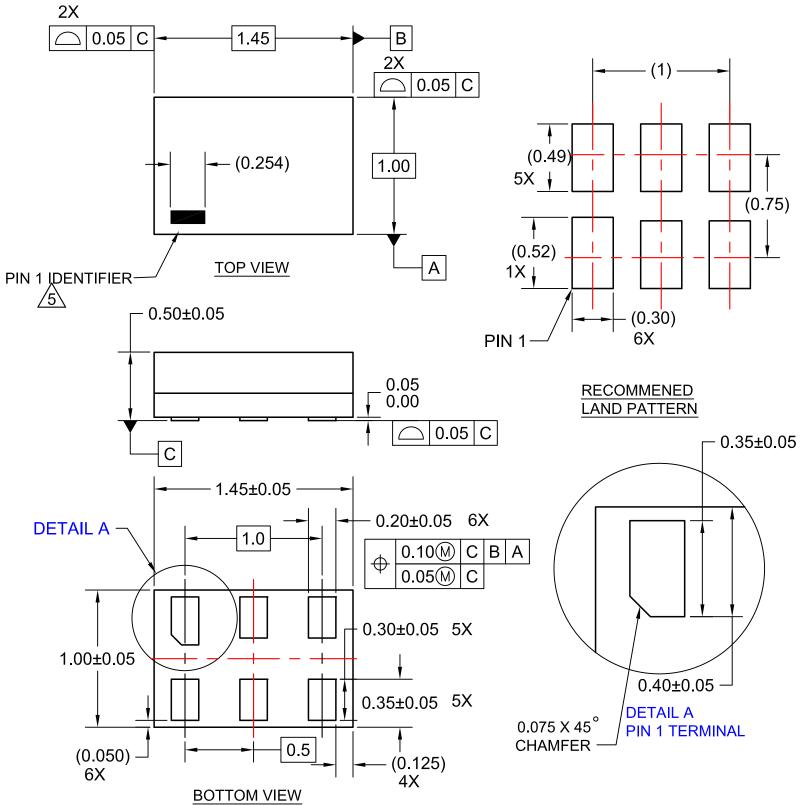
Figure 6. I_{CCD} Test Circuit

Tape and Reel Specifications

| Package Designator | Tape Section | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|----------------------|---------------|-------------------|
| | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| P6X | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |

| Package Designator | Tape Section | Cavity Number | Cavity Status | Cover Type Status | |
|--------------------|--------------------|----------------------|---------------|-------------------|--|
| | Leader (Start End) | 125 (Typical) | Empty | Sealed | |
| L6X | Carrier | 5000 | Filled | Sealed | |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed | |





NOTES:

- 1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
- 2. DIMENSIONS ARE IN MILLIMETERS
- 3. DRAWING CONFORMS TO ASME Y14.5M-2009
- 4. LANDPATTERN RECOMMENDATION PER FSC

5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

6. FILENAME AND REVISION: MAC06AREV6



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