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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®. 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_{CC} operating range. The device is specified to operate over the 1.65 V to 5.5 V V_{CC} operating range. The inputs and output are high impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 7 V, independent of V_{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

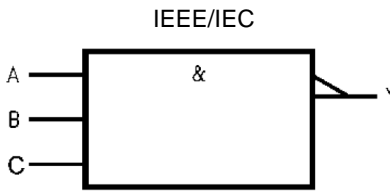
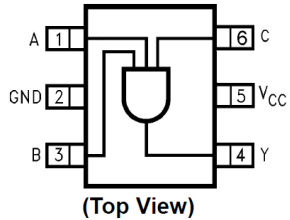
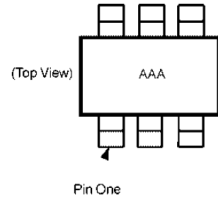


Figure 1. Logic Symbol

Pin Configurations



Pin One Orientation Diagram



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)

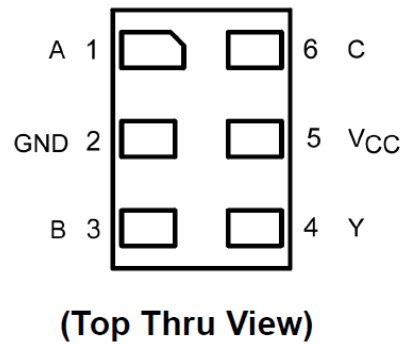


Figure 3. MicroPak (Top Through View)

Pin Definitions

| Pin # SC70 | Pin # MicroPak | Name | Description |
|------------|----------------|-----------------|----------------|
| 1 | 1 | A | Input |
| 2 | 2 | GND | Ground |
| 3 | 3 | B | Input |
| 4 | 4 | Y | Output |
| 5 | 5 | V _{CC} | Supply Voltage |
| 6 | 6 | C | Input |

Function Table

Y=ABC

| Inputs | | | Output |
|--------|---|---|--------|
| A | B | C | Y |
| X | X | L | L |
| X | L | X | L |
| L | X | X | L |
| H | H | H | H |

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 | Parameter | | 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 |
| I _{OK} | DC Output Diode Current | V _{OUT} < -0.5 V | | -50 | mA |
| | | V _{OUT} > 6 V, V _{CC} =GND | | +20 | |
| I _{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 |
| T _J | Junction Temperature Under Bias | | | +150 | °C |
| T _L | Junction Lead Temperature (Soldering, 10 Seconds) | | | +260 | °C |
| P _D | Power Dissipation at +85°C | SC70-6 | | 150 | mW |
| | | MicroPak-6 | | 130 | |
| ESD | Human Body Model, JESD22-A114 | | | 4000 | V |
| | Charged Device Model, JESD22-C101 | | | 2000 | |

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 _{CC} | Supply Voltage Operating | | 1.65 | 5.50 | V |
| | Supply Voltage Data Retention | | 1.50 | 5.50 | |
| V _{IN} | Input Voltage | | 0 | 5.5 | V |
| V _{OUT} | Output Voltage | | 0 | V _{CC} | V |
| T _A | Operating Temperature | | -40 | +85 | °C |
| t _r , t _f | Input Rise and Fall Times | V _{CC} at 1.8 V, 2.5 V ± 0.2 V | 0 | 20 | ns/V |
| | | V _{CC} at 3.3 V ± 0.3 V | 0 | 10 | |
| | | V _{CC} at 5.0 V ± 0.5 V | 0 | 5 | |
| θ _{JA} | Thermal Resistance | SC70-6 | | 425 | °C/W |
| | | MicroPak-6 | | 500 | |

Note:

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

DC Electrical Characteristics

| Symbol | Parameter | V _{CC} | Conditions | T _A =25°C | | | T _A =-40 to +85°C | | Unit |
|------------------|---------------------------|-----------------|---|----------------------|-----------------------------|----------------------|------------------------------|----------------------|------|
| | | | | Min. | Typ. | Max. | Min. | Max. | |
| V _{IH} | HIGH Level Input Voltage | 1.8 ± 0.15 | | 0.75 V _{CC} | | | 0.75 V _{CC} | | V |
| | | 2.30 to 5.50 | | 0.70 V _{CC} | | | 0.70 V _{CC} | | |
| V _{IL} | LOW Level Input Voltage | 1.8 ± 0.15 | | | | 0.25 V _{CC} | | 0.25 V _{CC} | V |
| | | 2.30 to 5.50 | | | | 0.30 V _{CC} | | 0.30 V _{CC} | |
| V _{OH} | HIGH Level Output Voltage | 1.65 | V _{IN} =V _{IH} , I _{OH} =-100 μA | 1.55 | 1.65 | | 1.55 | | V |
| | | 2.30 | | 2.20 | 2.30 | | 2.20 | | |
| | | 3.00 | | 2.90 | 3.00 | | 2.90 | | |
| | | 4.50 | | 4.40 | 4.50 | | 4.40 | | |
| | | 1.65 | I _{OH} =-4 mA | 1.29 | 1.52 | | 1.29 | | |
| | | 2.30 | I _{OH} =-8 mA | 1.90 | 2.15 | | 1.90 | | |
| | | 3.00 | I _{OH} =-16 mA | 2.50 | 2.80 | | 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 | | |
| V _{OL} | LOW Level Output Voltage | 1.65 | V _{IN} =V _{IL} , I _{OL} =100 μA | | 0.00 | 0.10 | | 0.10 | V |
| | | 2.30 | | | 0.00 | 0.10 | | 0.10 | |
| | | 3.00 | | | 0.00 | 0.10 | | 0.10 | |
| | | 4.50 | | | 0.00 | 0.10 | | 0.10 | |
| | | 1.65 | I _{OL} =4 mA | | 0.80 | 0.24 | | 0.24 | |
| | | 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 | |
| I _{OFF} | Power Off Leakage Current | 0 | V _{IN} or V _{OUT} =5.5 V | | | 1 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | 1.65 to 5.50 | V _{IN} =5.5 V, GND | | | 2 | | 20 | μA |

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} | Conditions | T _A =25°C | | | T _A =-40 to +85°C | | Unit | Figure | |
|-------------------------------------|--|-----------------|--|---|------|------|------------------------------|------|------|----------------------|-----|
| | | | | Min. | Typ. | Max. | Min. | Max. | | | |
| t _{PLH} , t _{PHL} | Propagation Delay | 1.80 ± 0.15 | C _L =15 pF, R _L =1M Ω | 2.0 | 9.0 | 18.5 | 2.0 | 19.0 | ns | Figure 4 Figure 5 | |
| | | 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 | | | |
| | | 5.00 ± 0.50 | | 0.5 | 2.5 | 6.5 | 0.5 | 7.0 | | | |
| | | 3.30 ± 0.30 | | C _L =50 pF, R _L =500 Ω | 1.5 | 4.1 | 8.5 | 1.5 | | | 9.0 |
| | | 5.00 ± 0.50 | | | 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 | | | | pF | Figure 6 | |
| | | 5.00 | | | 25 | | | | | | |

Note:

- 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. C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}Static).

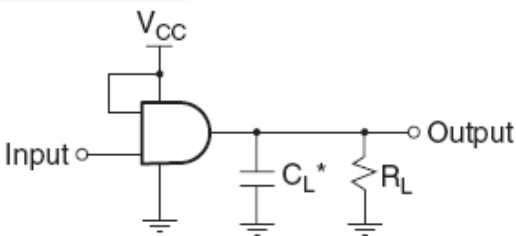


Figure 4. AC Test Circuit

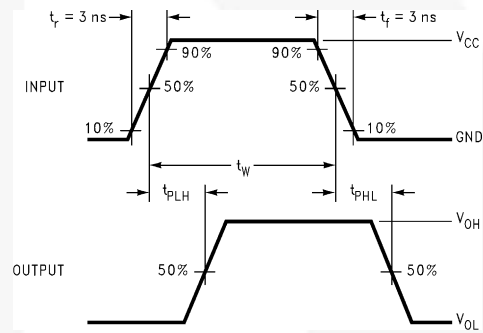


Figure 5. AC Waveforms

Notes:

- C_L includes load and stray capacitance.
- Input PRR=1.0 MHz; t_w500 ns.

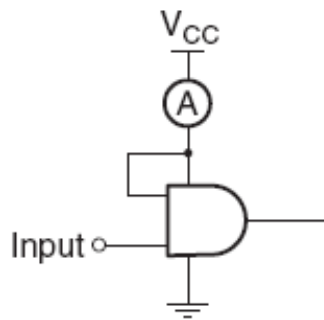


Figure 6. I_{CCD} Test Circuit

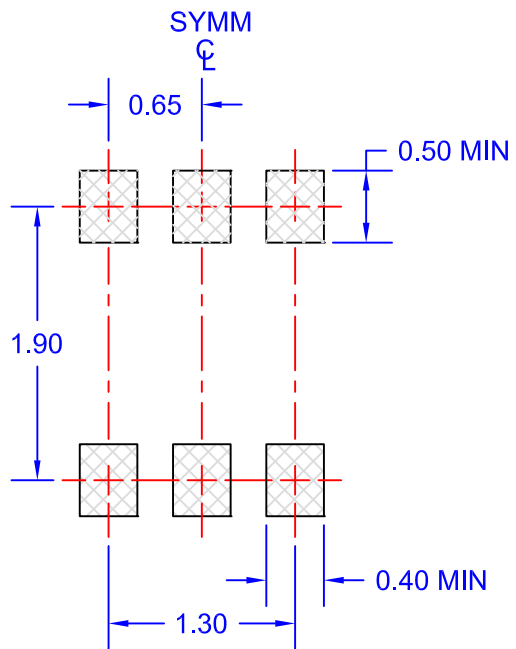
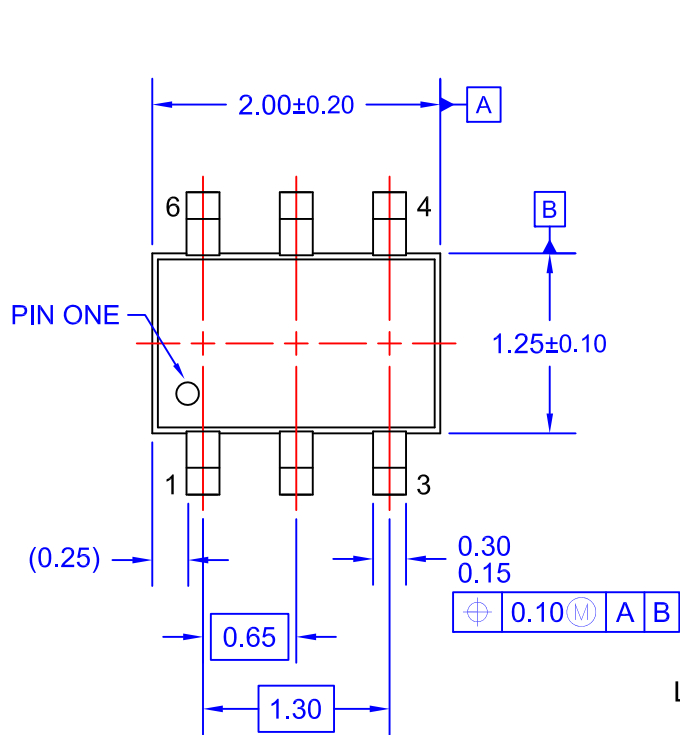
Note:

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

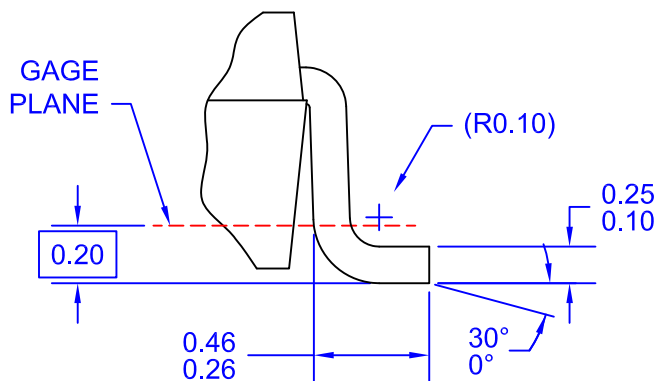
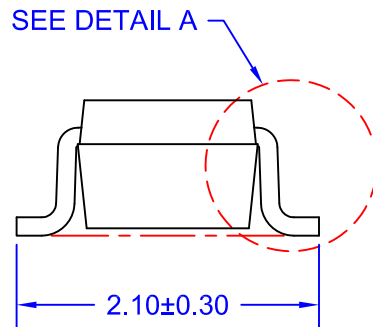
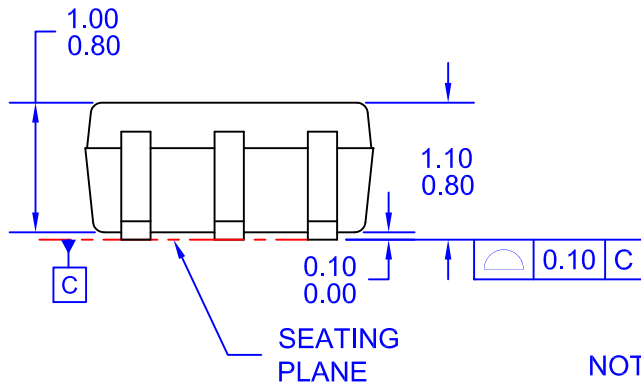
Tape and Reel Specifications

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

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



LAND PATTERN RECOMMENDATION



DETAIL A
SCALE: 60X

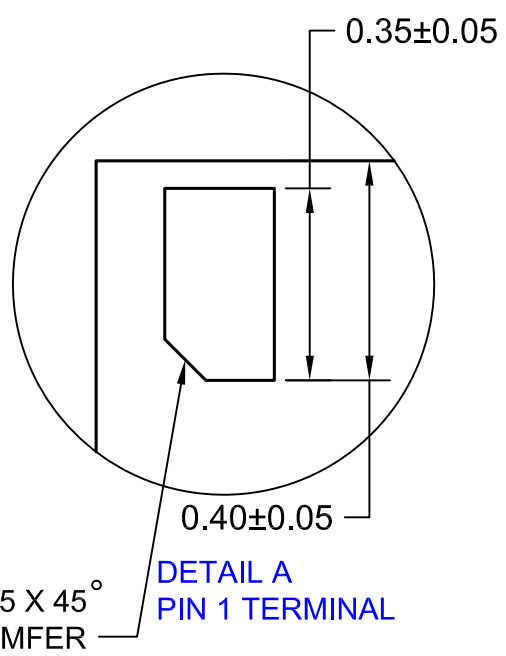
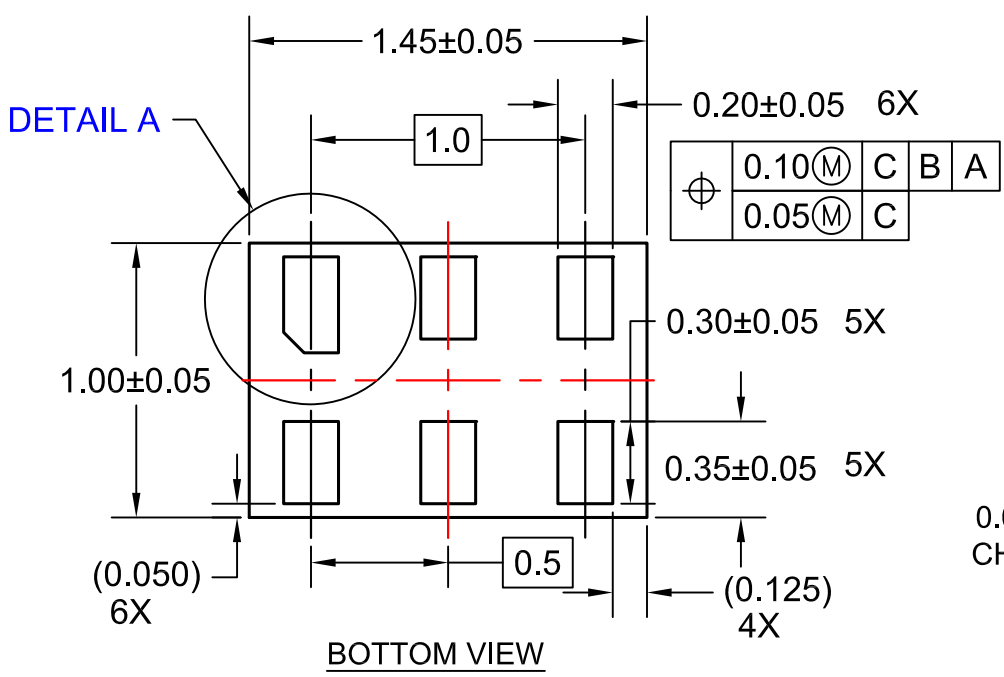
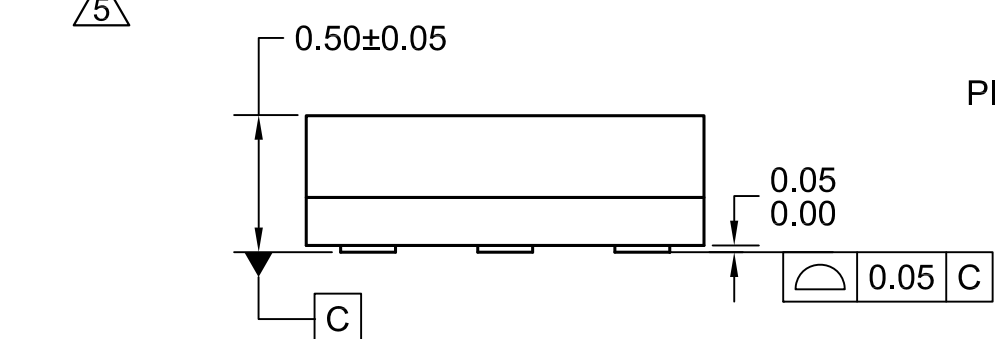
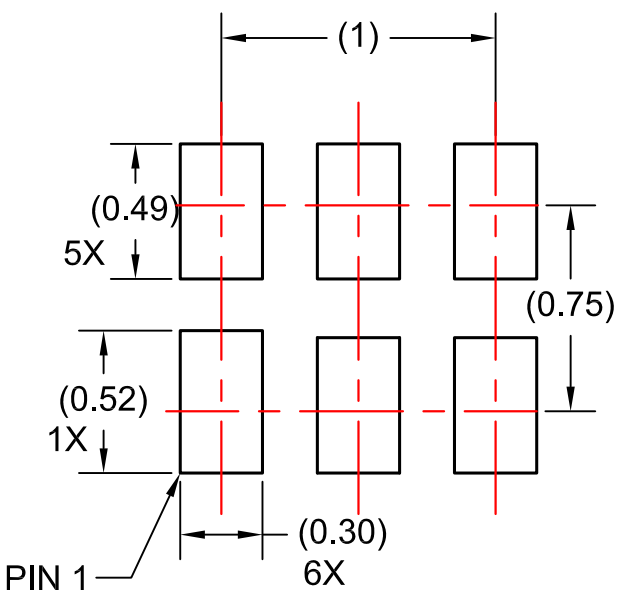
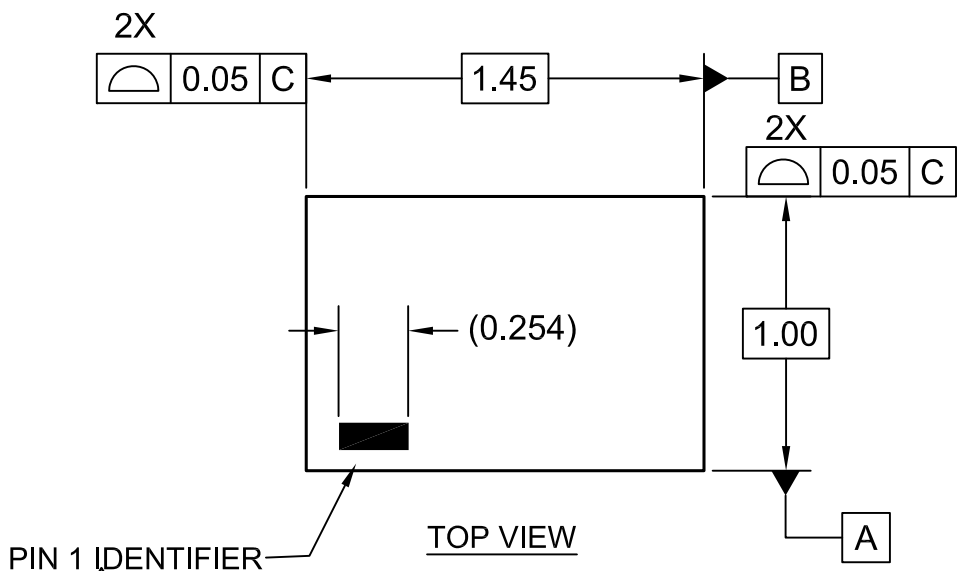
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