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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®. 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

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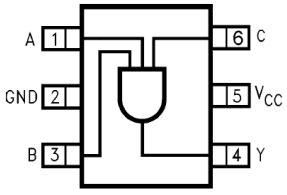
Connection Diagrams

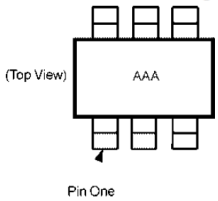
Figure 1. Logic Symbol

Pin Configurations



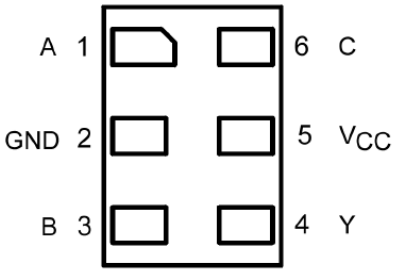
(Top View)

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)



(Top Thru 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

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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.

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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		±10	µA
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

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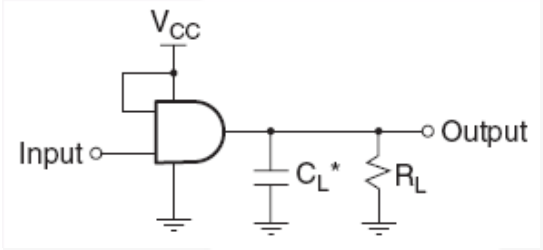
AC Electrical Characteristics

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:

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

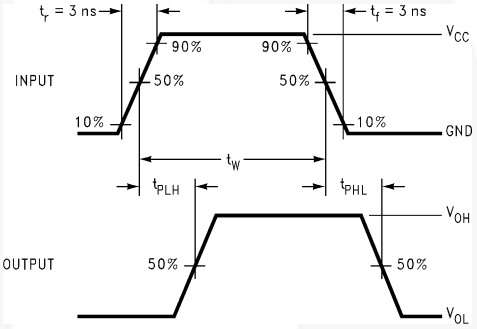
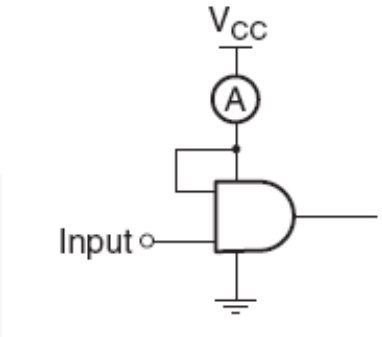


Figure 5. AC Waveforms



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
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

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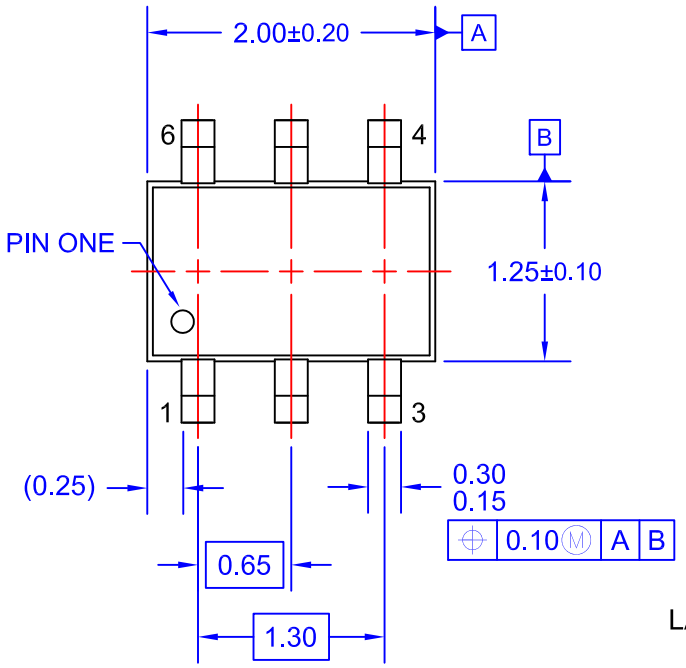

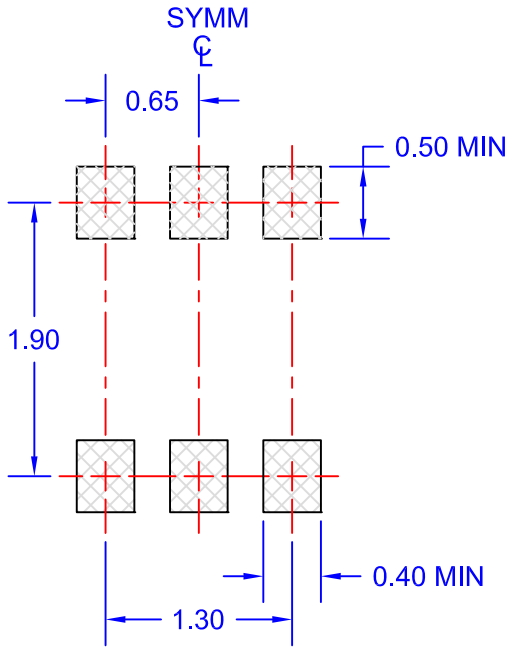

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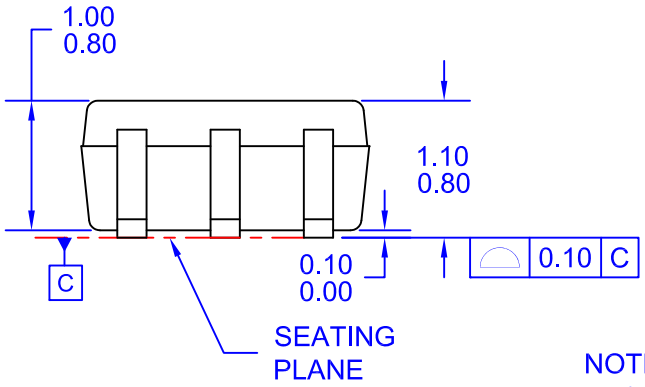

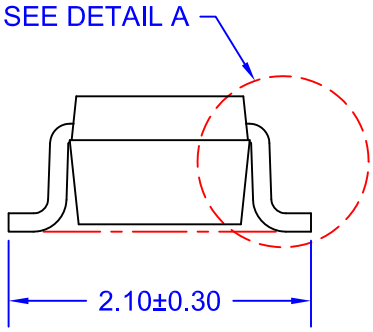

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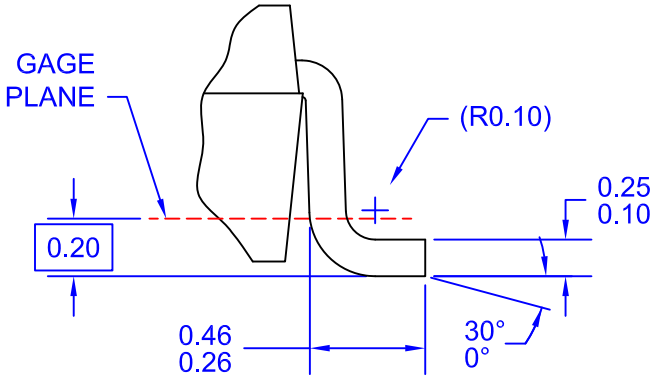

DETAIL A
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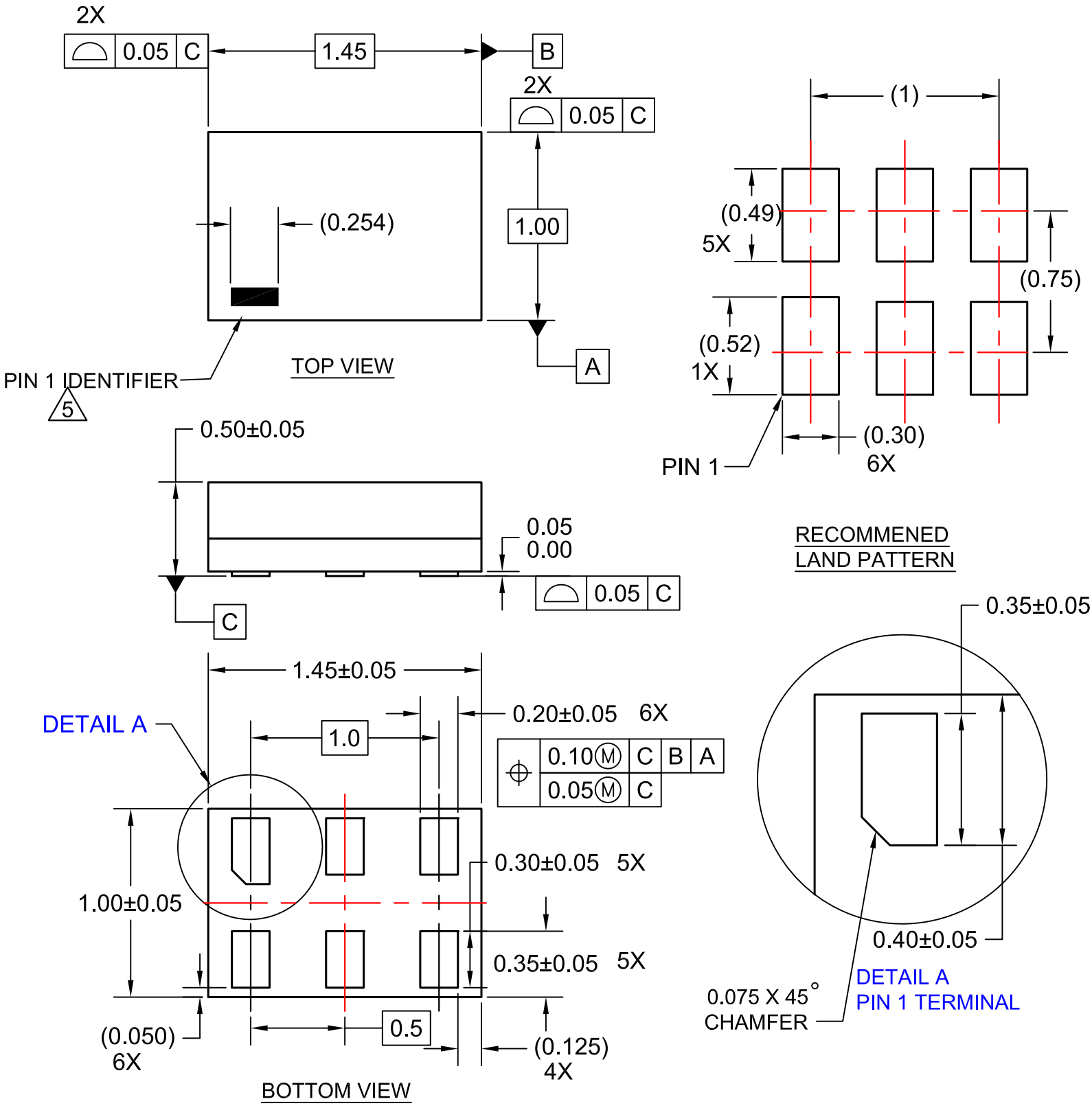

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