FAIRCHILD SEMICONDUCTOR®

December 2006

NC7SZ08
TinyLogic® UHS 2-Input AND Gate

Features

- Space saving SOT23 or SC70 5-lead package
- Ultra small MicroPak™ Pb-Free leadless package
- Ultra High Speed; t_{PD} 2.7ns Typ. into 50pF at 5V V_{CC}
- High Output Drive; ±24mA 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
- All packages are Pb-Free

General Description

The NC7SZ08 is a single 2-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 very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The inputs and output are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 6V independent of V_{CC} operating voltage.

Ordering Information

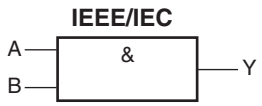
Order Number	Package Number	Product Code Top Mark	Pb-Free	Package Description	Supplied As
NC7SZ08M5X	MA05B	7Z08	Yes	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7SZ08M5_NL(1)	MA05B	7Z08	Yes	Pb-Free 5-Lead SOT23, JEDEC MO-178, 1.6mm	250 Units on Tape and Reel
NC7SZ08M5X_NL(2)	MA05B	7Z08	Yes	Pb-Free 5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7SZ08P5X	MAA05A	Z08	Yes	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7SZ08P5_NL (1)	MAA05A	Z08	Yes	Pb-Free 5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	250 Units on Tape and Reel
NC7SZ08P5X_NL (2)	MAA05A	Z08	Yes	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel
NC7SZ08L6X	MAC06A	GG	Yes	Pb-Free 6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Notes:

Pb-Free package per JEDEC J-STD-020B.

1. "_NL" indicates lead-free product (per JEDEC J-STD-020B).
2. "_NL" indicates lead-free product (per JEDEC J-STD-020B). Device is available in Tape and Reel only.

Logic Symbol

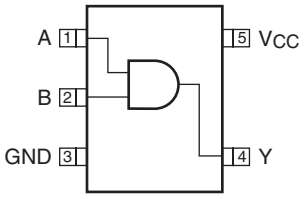


Pin Descriptions

Pin Name	Description
A, B	Data Inputs
Y	Outputs
NC	No Connect

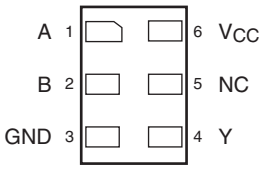
Connection Diagrams

Pin Assignment for SC70 and SOT23



(Top View)

Pad Assignments for MicroPak



(Top Through View)

Function Table

Y = AB

Inputs		Output
A	**B**	**Y**
L	L	L
L	H	L
H	L	L
H	H	H

H = HIGH Logic Level L = LOW Logic Level

Absolute Maximum Ratings

The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	-0.5V to +6V
V_{IN}	DC Input Voltage	-0.5V to +6V
V_{OUT}	DC Output Voltage	-0.5V to +6V
I_{IK}	DC Input Diode Current @ V_{IN} < -0.5V @ V_{IN} > 6V	 -50mA +20mA
I_{OK}	DC Output Diode Current @ V_{OUT} < -0.5V @ V_{OUT} > 6V, V_{CC} = GND	 -50mA +20mA
I_{OUT}	DC Output Current	±50mA
I_{CC}/I_{GND}	DC V_{CC}/GND Current	±50mA
T_{STG}	Storage Temperature	-65°C to +150°C
T_J	Junction Temperature under Bias	150°C
T_L	Junction Lead Temperature (Soldering, 10 seconds)	260°C
P_D	Power Dissipation @ +85°C SOT23-5 SC70-5	 200mW 150mW

Recommended Operating Conditions(3)

Symbol	Parameter	Rating
V_{CC}	Supply Voltage Operation	1.65V to 5.5V
V_{CC}	Supply Voltage Data Retention	1.5V to 5.5V
V_{IN}	Input Voltage	0V to 5.5V
V_{OUT}	Output Voltage	0V to V_{CC}
T_A	Operating Temperature	-40°C to +85°C
t_r, t_f	Input Rise and Fall Time V_{CC} = 1.8V, 2.5V ±0.2V V_{CC} = 3.3V ±0.3V V_{CC} = 5.0V ±0.5V	 0ns/V to 20ns/V 0ns/V to 10ns/V 0ns/V to 5ns/V
θ_{JA}	Thermal Resistance SOT23-5 SC70-5	 300°C/W 425°C/W

Notes:

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

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	T_A = +25°C Min.	+25°C Typ.	+25°C Max.	−40°C to +85°C Min.	−40°C to +85°C Max.	Units
V_{IH}	HIGH Level Input Voltage		1.65 to 1.95	0.75 x V_{CC}			0.75 x V_{CC}		V
			2.3 to 5.5	0.7 x V_{CC}			0.7 x V_{CC}		
V_{IL}	LOW Level Input Voltage		1.65 to 1.95			0.25 x V_{CC}		0.25 x V_{CC}	V
			2.3 to 5.5			0.3 x V_{CC}		0.3 x V_{CC}	
V_{OH}	HIGH Level Output Voltage VIN	V_{IN} = V_{IH}, I_{OH} = -100µA	1.65	1.55	1.65		1.55		V
			1.8	1.7	1.8		1.7		
			2.3	2.2	2.3		2.2		
			3.0	2.9	3.0		2.9		
			4.5	4.4	4.5		4.4		
		I_{OH} = -4mA	1.65	1.29	1.52		1.29		
		I_{OH} = -8mA	2.3	1.9	2.15		1.9		
		I_{OH} = -16mA	3.0	2.5	2.80		2.4		
		I_{OH} = -24mA	3.0	2.4	2.68		2.3		
		I_{OH} = -32mA	4.5	3.9	4.20		3.8		
V_{OL}	LOW Level Output Voltage	V_{IN} = V_{IL}, I_{OL} = 100µA	1.65		0.0	0.1		0.1	V
			1.8		0.0	0.1		0.1	
			2.3		0.0	0.1		0.1	
			3.0		0.0	0.1		0.1	
			4.5		0.0	0.1		0.1	
		I_{OL} = 4mA	1.65		0.08	0.24		0.24	
		I_{OL} = 8mA	2.3		0.10	0.3		0.3	
		I_{OL} = 16mA	3.0		0.15	0.4		0.4	
		I_{OL} = 24mA	3.0		0.22	0.55		0.55	
		I_{OL} = 32mA	4.5		0.22	0.55		0.55	
I_{IN}	Input Leakage Current	V_{IN} = 5.5V, GND	0 to 5.5			±1		±10	µA
I_{OFF}	Power Off Leakage Current	V_{IN} or V_{OUT} = 5.5V	0.0			1		10	µA
I_{CC}	Quiescent Supply Current	V_{IN} = 5.5V, GND	1.65 to 5.5			2.0		20	µA

AC Electrical Characteristics

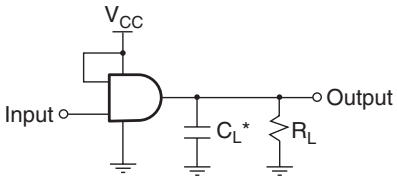
Symbol	Parameter	Conditions	V_{CC} (V)	T_A = +25°C Min.	+25°C Typ.	+25°C Max.	−40°C to +85°C Min.	−40°C to +85°C Max.	Units	Figure Number
t_{PLH}, t_{PHL}	Propagation Delay	C_L = 15pF, R_L = 1MΩ	1.65	2.0	6.3	12	2.0	12.7	ns	Figure 1 Figure 3
			1.8	2.0	5.2	10	2.0	10.5		
			2.5±0.2	0.8	3.4	7	0.8	7.5		
			3.3±0.3	0.5	2.6	4.7	0.5	5.0		
			5.0±0.5	0.5	2.2	4.1	0.5	4.4		
		C_L = 50pF, R_L = 500Ω	3.3±0.3	1.5	3.3	5.2	1.5	5.5		
			5.0±0.5	0.8	2.7	4.5	0.8	4.8		
C_{IN}	Input Capacitance		0		4				pF	
C_{PD}	Power Dissipation Capacitance	Note 2	3.3		20				pF	Figure 2
			5.0		25					

Note:

2. CPD 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:

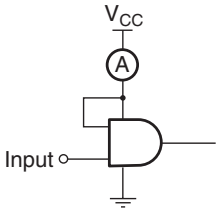
   $I_{CCD} = (C_{PD})\ (V_{CC})\ (f_{IN}) + (I_{CC}$ static)

AC Loading and Waveforms



*C_L includes load and stray capacitance.
Input PRR = 1.0MHz; t_W = 500ns

Figure 1. AC Test Circuit



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

Figure 2. I_{CCD} Test Circuit

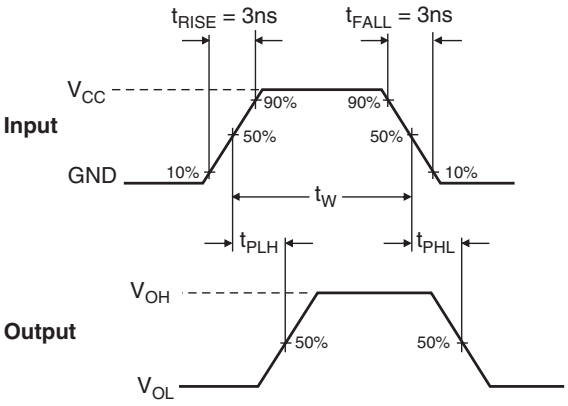


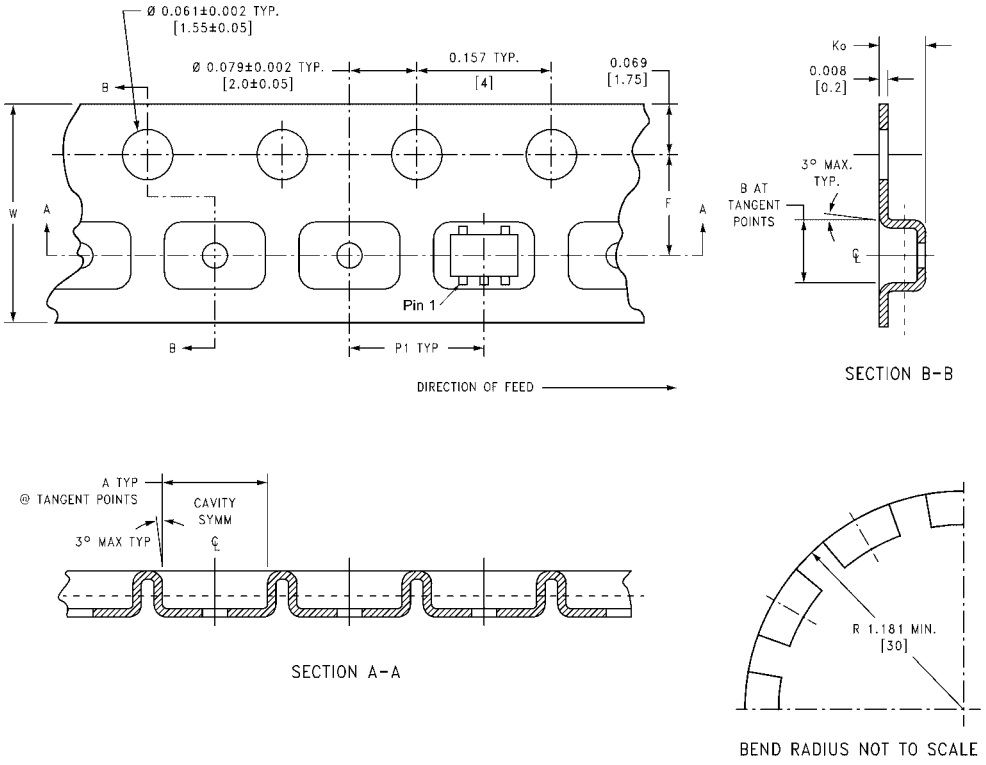
Figure 3. AC Waveforms

Tape and Reel Specification

Tape Format for SC70 and SOT23

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
M5X, P5X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

Tape Dimension inches (millimeters)



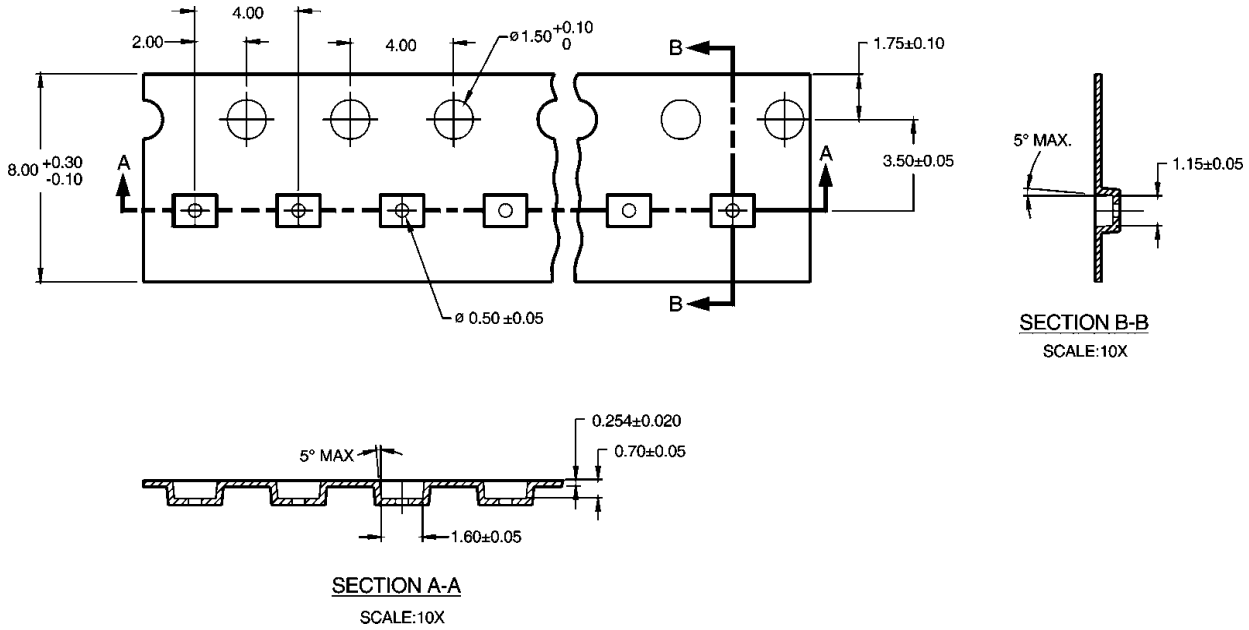
Package	Tape Size	Dim A	Dim B	Dim F	Dim K_O	Dim P1	Dim W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138±0.004 (3.5±0.10)	0.053±0.004 (1.35±0.10)	0.157 (4)	0.315±0.004 (8±0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138±0.002 (3.5±0.05)	0.055±0.004 (1.4±0.11)	0.157 (4)	0.315±0.012 (8±0.3)

Tape and Reel Specification (Continued)

Tape Format for MicroPak

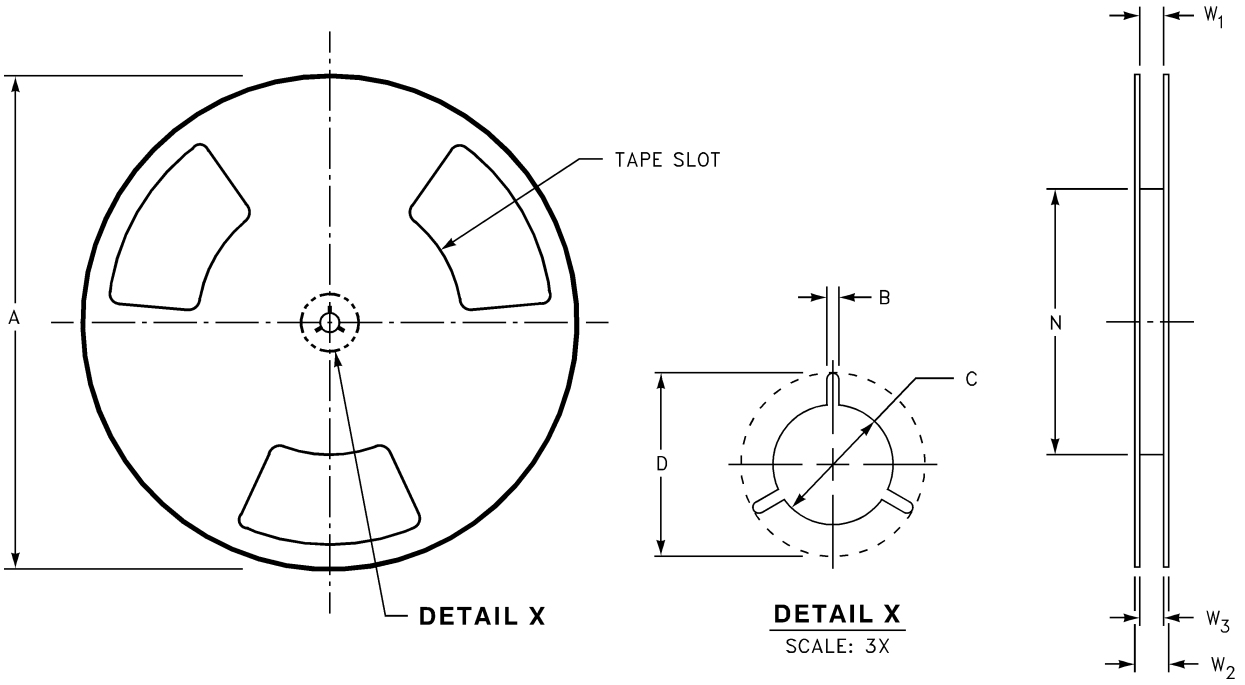
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
P6X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

Tape Dimension millimeters



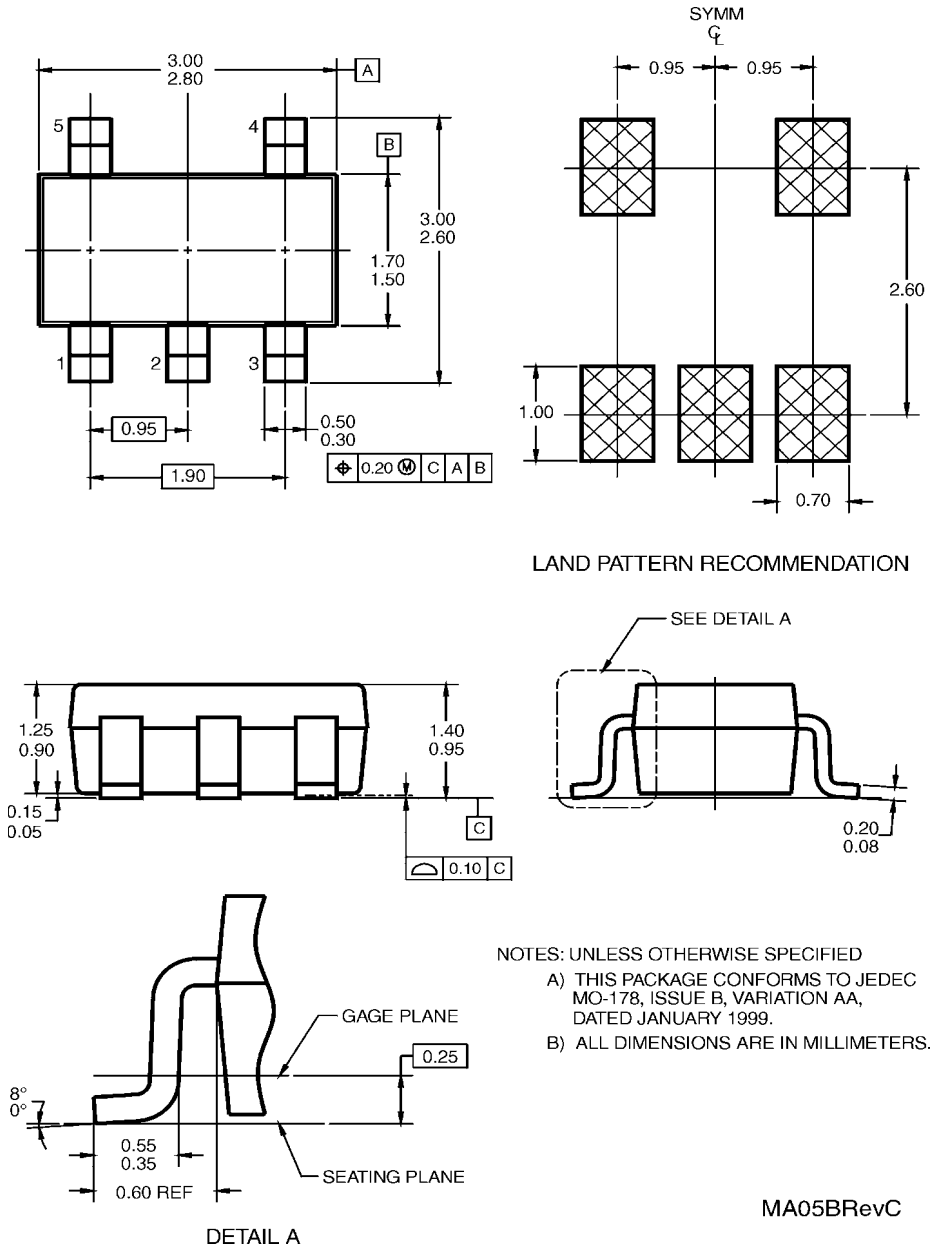
Tape and Reel Specification (Continued)

Reel Dimension for MicroPak inches (millimeters)



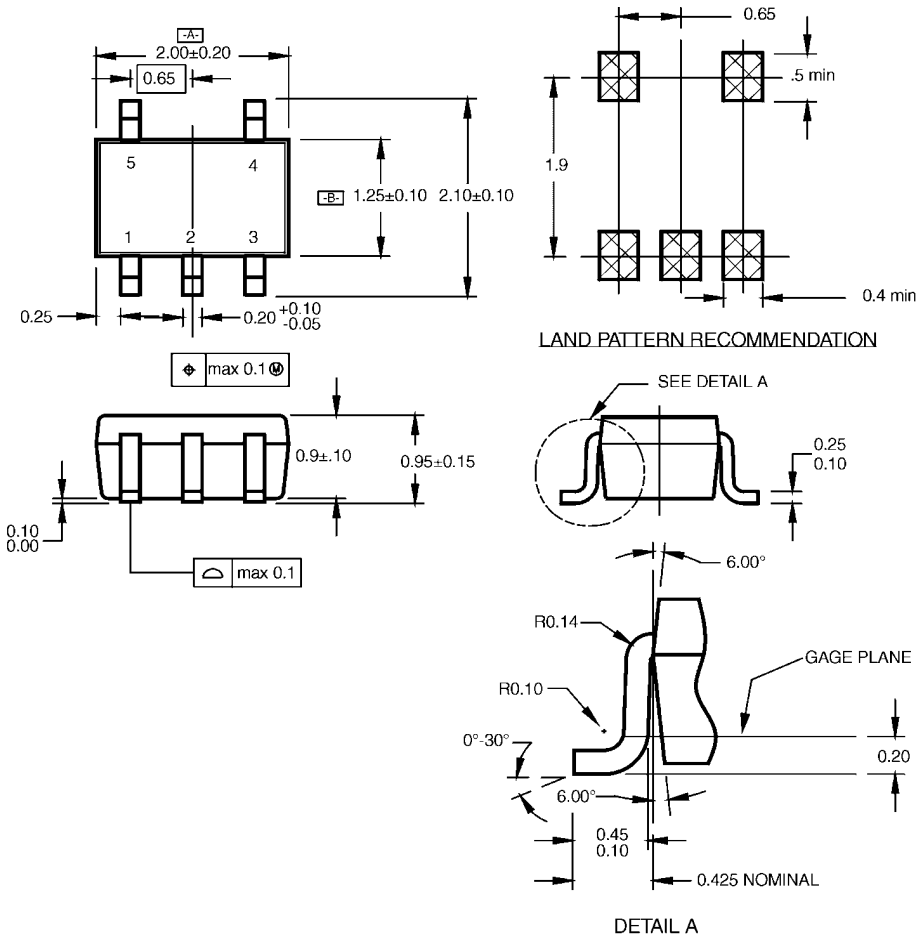
Tape Size	A	B	C	D	N	W1	W2	W3
8mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/–0.000 (8.40 + 1.50/–0.00)	0.567 (14.40)	W1 + 0.078/–0.039 (W1 + 2.00/–1.00)

Physical Dimensions millimeters unless otherwise noted



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

Physical Dimensions millimeters unless otherwise noted (Continued)



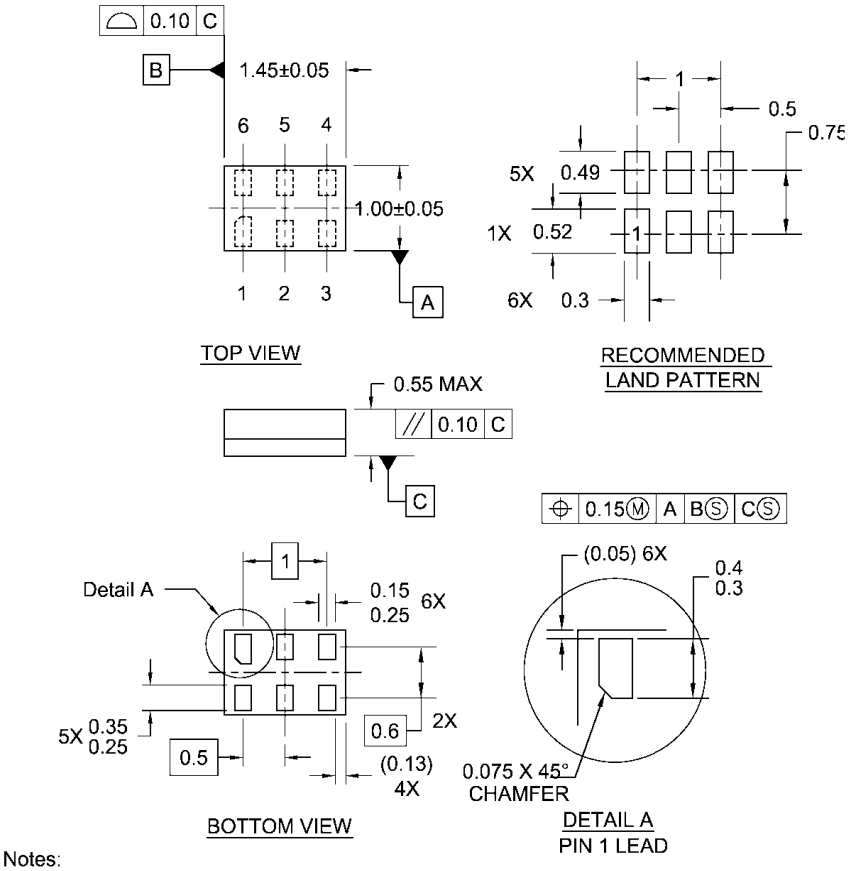
NOTES:

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

MAA05ARevC

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

Physical Dimensions millimeters unless otherwise noted (Continued)



Notes:

1. JEDEC PACKAGE REGISTRATION IS ANTICIPATED
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994

MAC06ARevB

6-Lead MicroPak, 1.0mm Wide
Package Number MAC06A

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