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## **ON Semiconductor**®

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## NC7SZ05 TinyLogic<sup>®</sup> UHS Inverter, Open Drain Output

### Features

**FAIRCHILD** 

- Ultra-High Speed: t<sub>PD</sub> 1.9ns (Typical) into 50pF at 5V V<sub>CC</sub>
- Open Drain Output for OR Tied Applications
- High Output Drive: +24mA at 3V V<sub>CC</sub>
- Broad V<sub>CC</sub> Operating Range: 1.65V to 5.5V
- Matches Performance of LCX Operated at 3.3V V<sub>CC</sub>
- Power Down High-Impedance Inputs/Outputs
- Over-Voltage Tolerance Inputs Facilitate 5V to 3V Translation
- Proprietary Noise/EMI Reduction Circuitry Implemented
- Ultra-Small MicroPak<sup>™</sup> Packages
- Space-Saving SOT23 and SC70 Packages

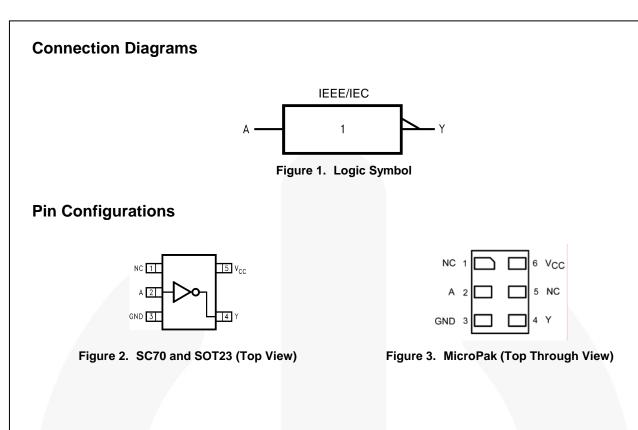
## Description

The NC7SZ05 is a single inverter with open drain output stage from Fairchild's Ultra-High Speed series of TinyLogic<sup>®</sup>. 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 1.65V to 5.5V  $V_{CC}$  operating 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. The open drain output stage tolerates voltages up to 6V, independent of  $V_{CC}$  when in the high-impedance state.

5				
Part Number	Top Mark	Eco Status	Package	Packing Method
NC7SZ05M5X	7Z05	RoHS	5-Lead SOT23, JEDEC MO-178 1.6mm	3000 Units on Tape & Reel
NC7SZ05P5X	Z05	RoHS	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SZ05L6X	C6	RoHS	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SZ05FHX	C6	Green	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

## **Ordering Information**

Ø For Fairchild's definition of Eco Status, please visit: <u>http://www.fairchildsemi.com/company/green/rohs\_green.html</u>.



## **Pin Definitions**

Pin # SC70 / SOT23	Pin # MicroPak	Name	Description
1	1,5	NC	No Connect
2	2	A	Input
3	3	GND	Ground
4	4	Y	Output
5	6	V <sub>cc</sub>	Supply Voltage

## **Function Table**

Y = /A

Inputs	Output
Α	Y
L	*H
Н	

H = HIGH Logic Level

L = LOW Logic Level

\*H = High Impedance Output State, Open Drain

NC7SZ05 — TinyLogic<sup>®</sup> UHS Inverter, Open Drain Output

## **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	Para	ameter	Min.	Max.	Unit
V <sub>cc</sub>	Supply Voltage		-0.5	6.0	V
V <sub>IN</sub>	DC Input Voltage		-0.5	6.0	V
V <sub>OUT</sub>	DC Output Voltage		-0.5	6.0	V
I	DC Input Diada Current	V <sub>IN</sub> < -0.5V		-50	~^^
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> > 6.0V		+20	mA
	DC Output Diada Current	V <sub>OUT</sub> < -0.5V		-50	
I <sub>OK</sub>	DC Output Diode Current	$V_{OUT} > 6V, V_{CC}=GND$		+20	mA
I <sub>OUT</sub>	DC Output Current			±50	mA
$I_{CC}$ or $I_{GND}$	DC V <sub>CC</sub> or Ground Current			±50	mA
T <sub>STG</sub>	Storage Temperature Range		-65	+150	°C
TJ	Junction Temperature Under B	ias		+150	°C
TL	Junction Lead Temperature (Se	oldering, 10 Seconds)		+260	°C
		SOT-23		200	
P	Devuer Dissinction at + 85%C	SC70-5		150	
PD	Power Dissipation at +85°C	MicroPak-6		130	mW
		MicroPak2-6		120	
FOD	Human Body Model, JEDEC:JE	ESD22-A114		4000	v
ESD	Charge Device Model, JEDEC:	JESD22-C101		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	
N/	Supply Voltage Operating		1.65	5.50	V	
V <sub>cc</sub>	Supply Voltage Data Retention		1.50	5.50	V	
V <sub>IN</sub>	Input Voltage		0	5.5	V	
V <sub>OUT</sub>	Output Voltage		0	5.5	V	
T <sub>A</sub>	Operating Temperature		-40	+85	°C	
	Input Rise and Fall TimeS	V <sub>CC</sub> at 1.8V, 2.5V ± 0.2V	0	20	$\leq$	
t <sub>r</sub> , t <sub>f</sub>		V <sub>CC</sub> at 3.3V ± 0.3V	0	10	ns/V	
		V <sub>CC</sub> at 5.0V ± 0.5V	0	5		
		SOT-23		300		
0	Thermal Desistance	SC70-5		425	00000	
$\theta_{JA}$	Thermal Resistance	MicroPak-6		500	°C/W	
		MicroPak2-6		560	1	

Note:

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

Symbol Parame				T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C			
	Parameter	V <sub>cc</sub>	Conditions	Min.	Тур.	Max.	Min.	Max.	Units	
V <sub>IH</sub> HIGH Level Input Voltage	HIGH Level Input	1.65 to 1.95		0.75V <sub>CC</sub>			$0.75V_{CC}$		v	
	2.30 to 5.50		0.70V <sub>CC</sub>			$0.70V_{CC}$		V		
V	LOW Level Input	1.65 to 1.95				$0.25V_{CC}$		0.25V <sub>CC</sub>	V	
V <sub>IL</sub>	Voltage	2.30 to 5.50				$0.30V_{CC}$		0.30V <sub>CC</sub>	v	
I <sub>LKG</sub>	HIGH Level Output Leakage Current	1.65 to 5.50	V <sub>IN</sub> =V <sub>IL</sub> , V <sub>OUT</sub> =V <sub>CC</sub> or GND			±5		±10	μA	
	1.65			0.00	0.10		0.10			
	1.80			0.00	0.10		0.10			
		2.30	V <sub>IN</sub> =V <sub>IH</sub> , I <sub>OL</sub> =100		0.00	0.10		0.10		
		3.00			0.00	0.10		0.10		
Vol	LOW Level	4.50			0.00	0.10		0.10	V	
VOL	Output Voltage	1.65	I <sub>OL</sub> =4mA		0.80	0.24		0.24	v	
		2.30	I <sub>OL</sub> =8mA		0.10	0.30		0.30		
		3.00	I <sub>OL</sub> =16mA		0.15	0.40		0.40		
		3.00	I <sub>OL</sub> =24mA		0.22	0.55		0.55		
		4.50	I <sub>OL</sub> =32mA		0.22	0.55		0.55		
I <sub>IN</sub>	Input Leakage Current	0 to 5.5	$0 \le V_{\text{IN}} \le 5.5 V$			±1		±10	μA	
I <sub>OFF</sub>	Power Off Leakage Current	0	V <sub>IN</sub> or V <sub>OUT</sub> =5.5V			1		10	μA	
Icc	Quiescent Supply Current	1.65 to 5.50	V <sub>IN</sub> =5.5V, GND			2		20	μA	

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ic <sup>®</sup> UHS Inverter, Open Drain Output
า Drain Out
put

0	Demonster	N/		Τ <sub>A</sub> =+25°C		T <sub>A</sub> =-40 to +85°C			<b>-</b> :	
Symbol Parameter	Parameter	V <sub>cc</sub>	Conditions	Min.	Тур.	Max.	Min.	Max.	Units	Figure
		1.65		1.5	5.5	12.9	1.5	13.4		
		1.80	$C_L=50pF$ ,	1.5	4.6	10.5	1.5	11.0		
t <sub>PZL</sub>		2.50 ± 0.20	RU=500Ω, RD-500Ω,	0.8	3.0	7.0	0.8	7.5	- ns	Figure 4 Figure 5
	Propagation Delay	3.30 ± 0.30	V <sub>IN</sub> =2•V <sub>CC</sub>	0.8	2.4	5.0	0.8	5.2		
		5.00 ± 0.50		0.5	1.9	4.3	0.5	4.5		
	Propagation Delay	1.65		1.5	5.0	12.9	1.5	13.4		
		1.80		1.5	4.1	10.5	1.5	11.0		
t <sub>PLZ</sub>		$2.50 \pm 0.20$		0.8	2.5	7.0	0.8	7.5		
		$3.30 \pm 0.30$	V <sub>IN</sub> =2•V <sub>CC</sub>	0.8	2.1	5.0	0.8	5.2		
		$5.00 \pm 0.50$		0.5	1.2	4.3	0.5	4.5		
CIN	Input Capacitance	0.00			4.0				pF	
C <sub>OUT</sub>	Output Capacitance	0.00			6.0				pF	
C	Power Dissipation	3.30			3.6					Figuro 6
C <sub>PD</sub>	Capacitance <sup>(2)</sup>	5.00			6.5				pF	Figure 6

#### Note:

 C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output lading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression: I<sub>CCD</sub>=(C<sub>PD</sub>)(V<sub>CC</sub>)(f<sub>IN</sub>)+(I<sub>CC</sub>static).

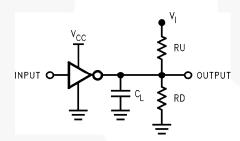
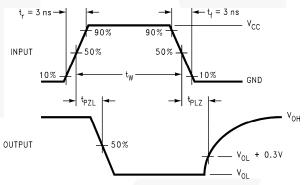
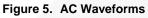
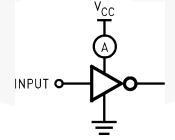


Figure 4. AC Test Circuit



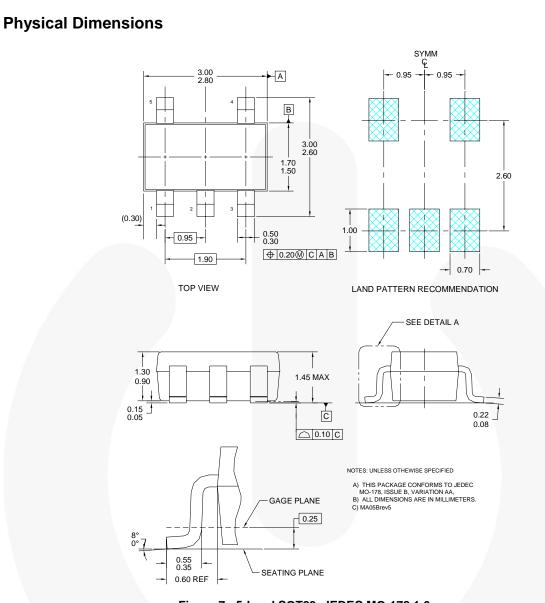


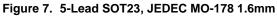


#### Note:

Input=AC Waveform; tr=tf=1.8ns; PRR=10MHz; Duty Cycle =50%.







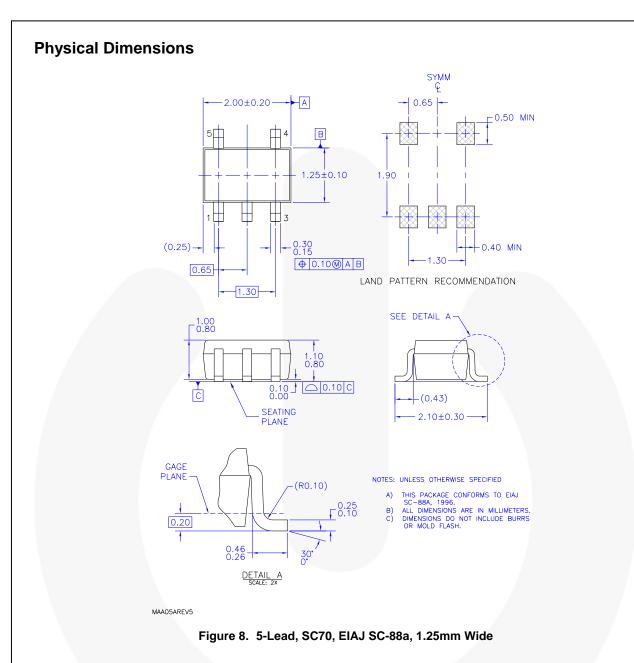
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## **Tape and Reel Specifications**

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Package Designator Tape Sectio		Cavity Number	Cavity Status	Cover Type Status
	Leader (Start End)	125 (Typical)	Empty	Sealed
M5X	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed



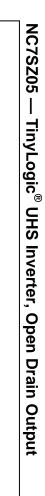
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Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status	
	Leader (Start End)	125 (Typical)	Empty	Sealed	
P5X	Carrier	3000	Filled	Sealed	
	Trailer (Hub End)	75 (Typical)	Empty	Sealed	



#### **Physical Dimensions** 2X □ 0.05 C 1.45 В 2X (1)△ 0.05 C (0.49 1.00 5X (0.75)T. (0.52) А TOP VIEW 1X | 0.55MAX (0.30)PIN 1 6X // 0.05 C 0.05 RECOMMENED LAND PATTERN □ 0.05 C С 0.45 0.35 0.10 6X 0.25 0.15 6X DETAIL A 1.0 0.10 C B A Φ 0.40 0.05 🕅 C 0.35 5X 0.25 5X 0.40 5X 0.30 DETAIL A 0.075 X 45° **PIN 1 TERMINAL** CHAMFER 0.5 (0.05) (0.13)ο 6Χ 4X BOTTOM VIEW Notes: 1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD 2. DIMENSIONS ARE IN MILLIMETERS 3. DRAWING CONFORMS TO ASME Y14.5M-1994 MAC06AREVC Figure 9. 6-Lead, MicroPak<sup>™</sup>, 1.0mm Wide

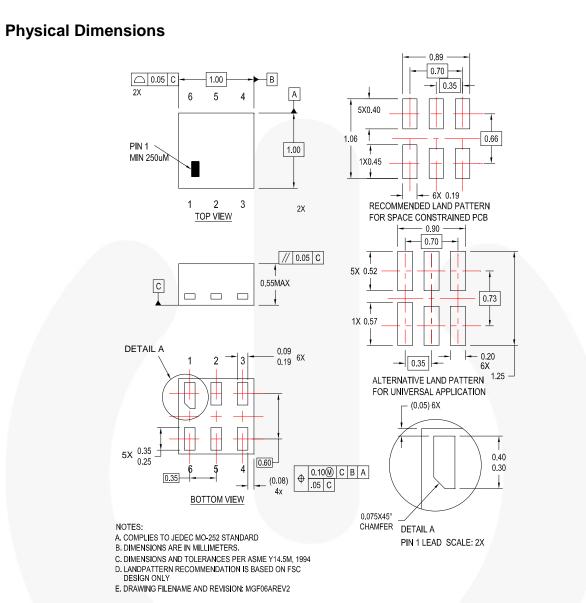
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## Tape and Reel Specifications

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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



#### Figure 10.6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch

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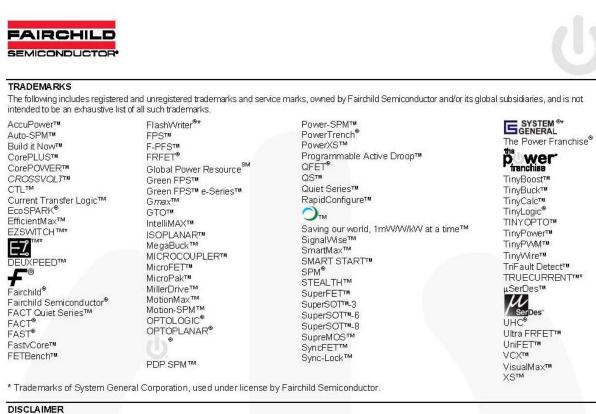
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Package Designator Tape Section		Cavity Number	Cavity Status	Cover Type Status	
	Leader (Start End)	125 (Typical)	Empty	Sealed	
FHX	Carrier	5000	Filled	Sealed	
	Trailer (Hub End)	75 (Typical)	Empty	Sealed	

NC7SZ05 — TinyLogic<sup>®</sup> UHS Inverter, Open Drain Output



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Datasheet Identification	Product Status	Definition
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