

Is Now Part of



## **ON Semiconductor**®

# To learn more about ON Semiconductor, please visit our website at <u>www.onsemi.com</u>

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (\_), the underscore (\_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (\_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at <a href="https://www.onsemi.com">www.onsemi.com</a>. Please email any questions regarding the system integration to <a href="https://www.onsemi.com">Fairchild\_questions@onsemi.com</a>.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor data sheets and/or specifications can and ovary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and easonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or una



## NC7SZ38 TinyLogic<sup>®</sup> UHS 2-Input NAND Gate, Open Drain Output

#### **Features**

- Ultra-High Speed: t<sub>PD</sub> 2.4ns (Typical) into 50pF at 5V V<sub>CC</sub>
- Open Drain Output Stage for OR Tied Applications
- High Output Sink 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
- Ultra-Small MicroPak<sup>™</sup> Packages
- Space-Saving SOT23 and SC70 Packages

#### Description

The NC7SZ38 is a single 2-Input NAND gate 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 very broad Vcc operating range. The device is specified to operate over the 1.65V to 5.5V V<sub>CC</sub> range. The inputs and output are high impedance when V<sub>CC</sub> is 0V. Inputs tolerate voltages up to 6V independent of V<sub>CC</sub> operating voltage. The open drain output stage tolerates voltages up to 6V independent of V<sub>CC</sub> when in the high impedance state.

Ordering	Information
----------	-------------

_				
Part Number	Top Mark	Eco Status	Package	Packing Method
NC7SZ38M5X	7Z38	RoHS	5-Lead SOT23, JEDEC MO-178 1.6mm	3000 Units on Tape & Reel
NC7SZ38P5X	Z38	RoHS	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SZ38L6X	A6	RoHS	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SZ38FHX	A6	Green	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

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

### **Pin Definitions**

**Pin Configurations** 

GND 3

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

### **Function Table**

Y=/AB

Inj	outs	Output
A	В	Y
L	L	*H
L	н	*H
Н	L	*H
Н	Н	L

H = HIGH Logic Level

L = LOW Logic Level

\*H = High Impedance Output State, Open Drain

NC7SZ38 — UHS 2-Input NAND Gate, Open Drain Output

NC7SZ38 — UHS 2-Input NAND Gate, 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
l	DC Input Diada Current	V <sub>IN</sub> < -0.5V		-50	mA
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> > 6.0V		+20	mA
	I <sub>OK</sub> DC Output Diode Current	V <sub>OUT</sub> < -0.5V		-50	~^^
IOK	DC Output Diode Current	$V_{OUT} > 6V, V_{CC}=GND$		+20	mA
IOUT	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	
Р	Dower Dissinction at 185°C	SC70-5		150	
PD	Power Dissipation at +85°C	MicroPak-6		130	mW
		MicroPak2-6		120	
	Human Body Model, JEDEC:JE	SD22-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
Vout	Output Voltage		0	5.5	V
T <sub>A</sub>	Operating Temperature		-40	+85	°C
		V <sub>CC</sub> =1.8V, 2.5V ± 0.2V	0	20	$\leq$
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Times	$V_{CC}=3.3V \pm 0.3V$	0	10	ns/V
		$V_{CC}=5.0V \pm 0.5V$	0	5	
		SOT-23		300	
0	Thermal Resistance	SC70-5		425	_ ∘c/w
$ heta_{JA}$		MicroPak-6		500	0.0/00
		MicroPak2-6		560	

Note:

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

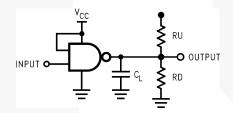
Currench al	Devenueter	V		T,	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C		
Symbol	Parameter	V <sub>cc</sub>	Conditions	Min.	Тур.	Max.	Min.	Max.	- Units	
M	HIGH Level Input 1.65 to 1.95			$0.75V_{CC}$			$0.75V_{CC}$		V	
VIH	Voltage	2.30 to 5.50		$0.70V_{CC}$			$0.70V_{CC}$		V	
VIL	LOW Level Input	1.65 to 1.95				$0.25V_{CC}$		$0.25V_{CC}$	V	
VIL	Voltage	2.30 to 5.50				$0.30V_{CC}$		0.30V <sub>CC</sub>	v	
I <sub>LKG</sub>	HIGH Level Output Leakage	5.50	$V_{IN}=V_{IL}, V_{OUT}=V_{CC} \text{ or } GND$			±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			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	5.50	V <sub>IN</sub> =5.5V, GND			±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	
I <sub>CC</sub>	Quiescent Supply Current	5.50	V <sub>IN</sub> =5.5V, GND			2		20	μA	

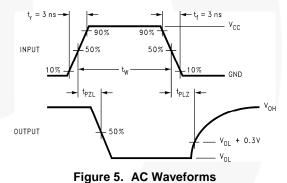
NC7SZ38
80 
UHS
HS 2-Input NAND Gate, (
It NA
ND G
ate, C
Open
Drain
<b>Open Drain Output</b>

Symbol Parameter			T,	T <sub>A</sub> =+25°C		T <sub>A</sub> =-40 to +85°C				
	V <sub>cc</sub>	Conditions	Min.	Тур.	Max.	Min.	Max.	Units	Figure	
		1.65		1.5	6.5	12.7	1.5	13.2		
		1.80	$C_L=50pF$ ,	1.5	5.4	10.5	1.5	11.0		
t <sub>PZL</sub>	$-2$ $1250 \pm 020$	RU=500Ω, RD-500Ω,	0.8	3.5	7.0	0.8	7.5			
		3.30 ± 0.30	V <sub>IN</sub> =2•V <sub>CC</sub>	0.8	2.8	5.0	0.8	5.2	- ns	Figure 4 Figure 5
	Dress existing Delays	5.00 ± 0.50		0.5	2.2	4.3	0.5	4.5		
	Propagation Delay	1.65	C <sub>L</sub> =50pF, RU=500Ω, RD-500Ω,	1.5	5.5	12.7	1.5	13.2		
		1.80		1.5	4.6	10.5	1.5	11.0		
t <sub>PLZ</sub>		2.50 ± 0.20		0.8	3.0	7.0	0.8	7.5		
		3.30 ± 0.30	$V_{IN}=2 \cdot V_{CC}$	0.8	2.1	6.0	0.8	5.2		
	5.00 ± 0.50		0.5	1.3	4.3	0.5	4.5			
C <sub>IN</sub>	Input Capacitance	0.00			4.0				pF	
C <sub>OUT</sub>	Output Capacitance	0.00			5.0				pF	
C <sub>PD</sub> Powe Capa	Power Dissipation	3.30			5.1				ъĘ	Figuro
	Capacitance <sup>(2)</sup>	5.00			7.3				pF	Figure 6

#### Note:

2. CPD 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 loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression:  $I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}static)$ .

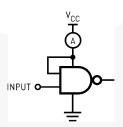




#### Note:

3. C<sub>L</sub> includes load and stray capacitance. Input PRR=10MHz tw=500ns.

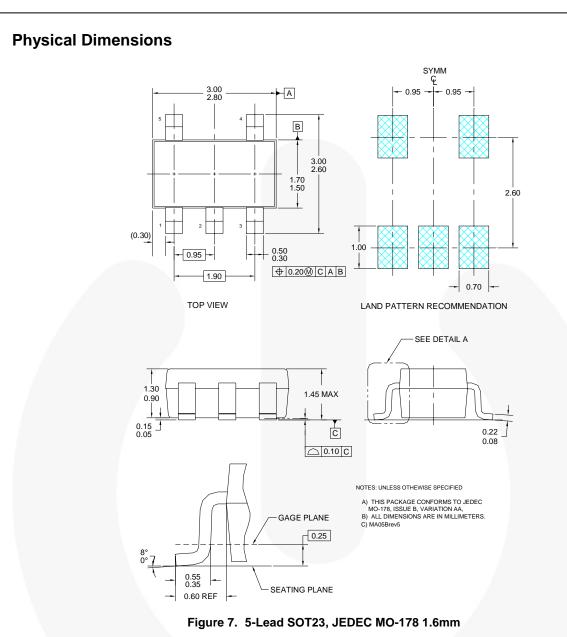
Figure 4. AC Test Circuit



#### Note:

4. Input=AC Waveform; t<sub>r</sub>=t<sub>f</sub>=1.8ns; PRR=10MHz; Duty Cycle=50%.

Figure 6. Test Circuit



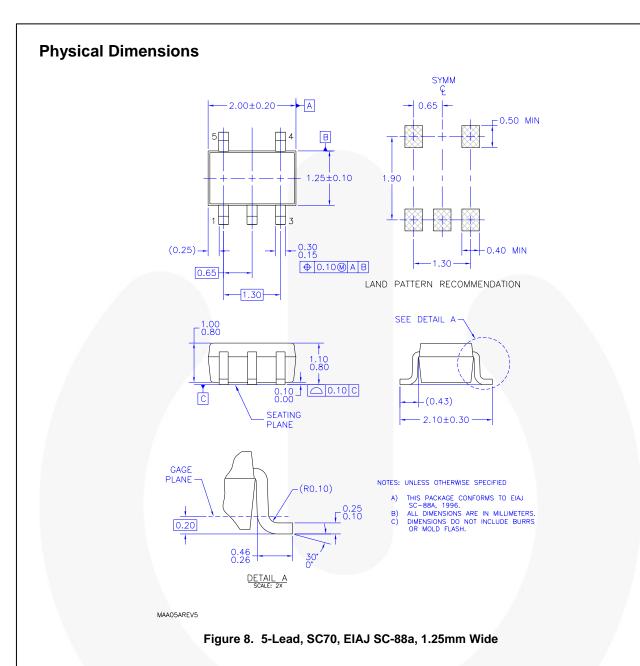
Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings: <u>http://www.fairchildsemi.com/packaging/</u>.

### **Tape and Reel Specifications**

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: <u>http://www.fairchildsemi.com/packaging/SOT23-5L\_tr.pdf</u>.

Package Designator	Tape Section	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



Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings: http://www.fairchildsemi.com/packaging/.

#### **Tape and Reel Specifications**

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: <u>http://www.fairchildsemi.com/products/analog/pdf/sc70-5\_tr.pdf</u>.

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



(1)

(0.30)

6X

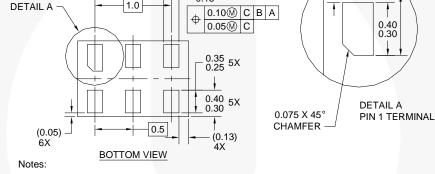
RECOMMENED LAND PATTERN

0.10 6X

(0.75)

0.45 0.35

#### **Physical Dimensions** 2X □ 0.05 C 1.45 В 2X △ 0.05 C (0.49 1.00 5X T. (0.52) А TOP VIEW 1X | 0.55MAX PIN 1 // 0.05 C 0.05 □ 0.05 C С 0.25 0.15 6X



1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD

2. DIMENSIONS ARE IN MILLIMETERS

3. DRAWING CONFORMS TO ASME Y14.5M-1994

1.0

MAC06AREVC

#### Figure 9. 6-Lead, MicroPak<sup>™</sup>, 1.0mm Wide

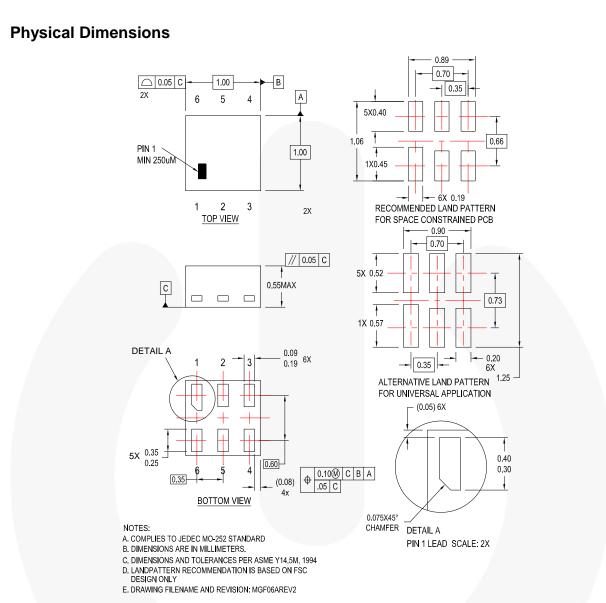
Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings: http://www.fairchildsemi.com/packaging/

### **Tape and Reel Specifications**

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: http://www.fairchildsemi.com/products/logic/pdf/micropak\_tr.pdf.

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

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

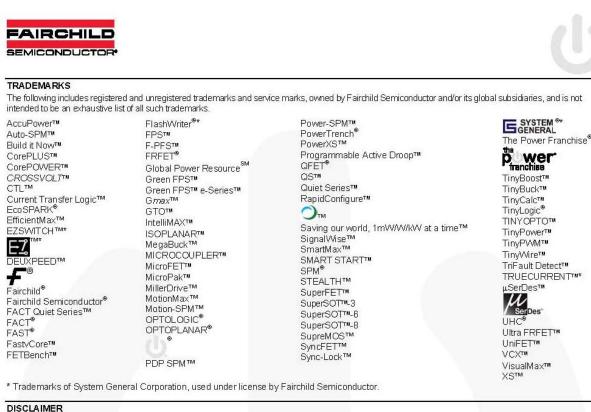
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings: http://www.fairchildsemi.com/packaging/.

#### **Tape and Reel Specifications**

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: <u>http://www.fairchildsemi.com/packaging/MicroPAK2\_6L\_tr.pdf</u>.

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

NC7SZ38 — UHS 2-Input NAND Gate, Open Drain Output



FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR RELIABLITT, FONCTION, OR DESIGN, FAIRCHILD DOES NOT ASSOME ANT LABILITT ARISING OUT OF THE AFFLICATION ONSE OF ANT FRODUCT CIRCUIT DESCRIBED HEREIN, NEITHER DOES IT CONVEY ANY LICENSE UNDERTITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS, THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS

#### LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION

#### As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, 1. and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
- 2 A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness

#### ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors

#### PRODUCT STATUS DEFINITIONS

#### Definition of Terms

Datasheet Identification Product Status		Definition		
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.		
Preliminary	First Production	t Production Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.		
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.		
Obsolete Not In Production		Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.		

Rev. 143

NC7SZ38 — UHS 2-Input NAND Gate, Open Drain Output

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at <u>www.onsemi.com/site/pdf/Patent-Marking.pdf</u>. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor haves against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death a

#### PUBLICATION ORDERING INFORMATION

#### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor 19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada Email: orderlit@onsemi.com N. American Technical Support: 800–282–9855 Toll Free USA/Canada Europe, Middle East and Africa Technical Support: Phone: 421 33 790 2910

Japan Customer Focus Center Phone: 81-3-5817-1050 ON Semiconductor Website: www.onsemi.com

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

© Semiconductor Components Industries, LLC

单击下面可查看定价,库存,交付和生命周期等信息

>>ON Semiconductor(安森美)