

Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at www.onsemi.com

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 www.onsemi.com. Please email any questions regarding the system integration to Fairchild guestions@onsemi.com.

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 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 nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any EDA 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 officer



October 2009

NC7SZU04 TinyLogic[®] UHS Unbuffered Inverter

Features

- Unbuffered for Crystal Oscillator and Analog Applications
- Balanced Output Drive: ±16mA at 4.5V V_{CC}
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Matches Performance of LCX Operated at 3.3V V_{CC}
- Low Quiescent Power: I_{CC}<2µA, V_{CC}=5.5V, T_A=25°C
- Ultra-Small MicroPak[™] Packages
- Space-Saving SOT23 and SC70 Packages

Description

The NC7SZU04 is a single unbuffered inverter from Fairchild's Ultra-High Speed series of TinyLogic®. The special purpose unbuffered circuit design is primarily intended for crystal oscillator or analog applications. 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 $V_{\rm CC}$ operating range. The device is specified to operate over the 1.65V to 5.5V $V_{\rm CC}$ range.

Ordering Information

Part Number	Top Mark	Eco Status	Package	Packing Method
NC7SZU04M5X	7ZU4	RoHS	5-Lead SOT23, JEDEC MO-178 1.6mm	3000 Units on Tape & Reel
NC7SZU04P5X	ZU4	RoHS	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SZU04L6X	C5	RoHS	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SZU04FHX	C5	Green	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

Por Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Connection Diagrams

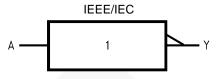


Figure 1. Logic Symbol

Pin Configurations

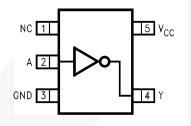


Figure 2. SC70 and SOT23 (Top View)

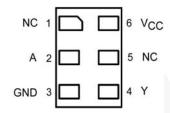


Figure 3. MicroPak (Top Through View)

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 4 Y Output		Output
5	6	Vcc	Supply Voltage

Function Table

Y = /A

Inputs	Output
Α	Y
L	Н
Н	L

H = HIGH Logic Level

L = LOW 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	Para	Min.	Max.	Unit	
V _{CC}	Supply Voltage		-0.5	6.0	V
V _{IN}	DC Input Voltage		-0.5	6.0	V
V _{OUT}	DC Output Voltage		-0.5	6.0	V
	DC Input Diada Current	V _{IN} < -0.5V		-50	A
I _{IK}	DC Input Diode Current	$V_{IN} > V_{CC} + 5.0V$		+20	- mA
ı	DC Output Diada Current	V _{OUT} < -0.5V		-50	A
l _{OK}	DC Output Diode Current	$V_{OUT} > 0.5V$, $V_{CC}=GND$		+50	- mA
I _{OUT}	DC Output Current		±50	mA	
I _{CC} or I _{GND}	DC V _{CC} or Ground Current			±100	mA
T _{STG}	Storage Temperature Range		-65	+150	°C
TJ	Junction Temperature Under B	ias		+150	°C
TL	Junction Lead Temperature (So	oldering, 10 Seconds)		+260	°C
		SOT-23		200	
Б	Davier Dissipation at 1959C	SC70-5		150	\^/
P _D	Power Dissipation at +85°C	MicroPak-6	1	130	mW
		MicroPak2-6		120	
ECD.	Human Body Model, JEDEC:JE	SD22-A114		4000	V
ESD	Charge Device Model, JEDEC:	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	Supply Voltage Operating		1.65	5.50	V
V _{CC}	Supply Voltage Data Retention		1.50	5.50	_ v
V _{IN}	Input Voltage		0	5.5	V
V _{OUT}	Output Voltage		0	Vcc	V
T _A	Operating Temperature		-40	+85	°C
		SOT-23		300	≤ 1
0	Thermal Resistance	SC70-5		425	00/1/1
θ_{JA}		MicroPak-6		500	°C/W
		MicroPak2-6		560	

Note:

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

DC Electrical Characteristics

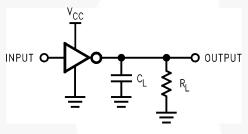
0		.,	Conditions -		$T_A=+25$ °C			T _A =-40 to +85°C		l linita
Symbol	Parameter	V _{CC}			Min.	Тур.	Max.	Min.	Max.	Units
.,	HIGH Level	1.8 to 2.7			0.85V _{CC}			0.85V _{CC}		
V_{IH}	Input Voltage	3.0 to 5.5			0.80V _{CC}			0.80V _{CC}		V
.,	LOW Level Input	1.8 to 2.7					0.15V _{CC}		0.15V _{CC}	.,
V_{IL}	Voltage	3.0 to 5.5	1				0.20V _{CC}		0.20V _{CC}	V
		1.65			1.55	1.65		1.55		
		1.80			1.60	1.80		1.60		
		2.30	V _{IN} =V _{IL,} I _O	_{0H} =-100μA	2.10	2.30		2.10		
		3.00			2.70	3.00		2.70		
.,	HIGH Level	4.50			4.00	4.40		4.00		.,
V_{OH}	Output Voltage	1.65		I _{OH} =-4mA	1.29	1.52		1.29		V
		2.30		I _{OH} =-4mA	1.90	2.14		1.90		
		3.00	V _{IN} =GND	I _{OH} =-8mA	2.40	2.75		2.40		
		3.00		I _{OH} =-12mA	2.30	2.61	A 1	2.30		
		4.50		I _{OH} =-16mA	3.80	4.13		3.80		
	1.65				0.00	0.10		0.10		
		1.80				0.00	0.20		0.20	
	7/4	2.30	V _{IN} =V _{IH} , I _{OL} =100μA			0.00	0.20		0.20	
	//	3.00	,			0.00	0.30	7	0.30	
	LOW Level	4.50				0.00	0.50		0.50	.,
V_{OL}	Output Voltage	1.65		I _{OL} =4mA		0.80	0.24		0.24	V
		2.30		I _{OL} =4mA		0.10	0.30		0.30	
		3.00	V _{IN} =V _{CC}	I _{OL} =8mA		0.17	0.40		0.40	
		3.00		I _{OL} =12mA		0.25	0.55		0.55	
		4.50		I _{OL} =16mA		0.226	0.55		0.55	
I _{IN}	Input Leakage Current	0 to 5.5	V _{IN} =5.5V	GND			±1		±10	μA
I _{CC}	Quiescent Supply Current	1.65 to 5.50	V _{IN} =5.5V, GND				2		20	μA
\	Peak Supply	1.8				2	1			
laner	Current in	2.5	V _{OUT} =Op	en, st for Peak		4				mA
CCPEAK	Analog	3.3	I _{CC} Curre			10				
Operation	5.0	1			30					

AC Electrical Characteristics

Symbol	Parameter	Davamatar V		T _A =+25°C		T _A =-40 to +85°C		Units	Eiguro	
Symbol	Parameter	V _{CC}	Conditions	Min.	Тур.	Max.	Min.	Max.	Ullits	Figure
		1.65		1.0		11.7	1.0	12.1		
		1.80		1.0		8.5	1.0	9.0		
	2.50 ± 0.20	$C_L=15pF$, $R_I=1M\Omega$,	opF, 0.8 6.2 0.8 6.5	6.5						
t _{PLH} ,t _{PHL}	t _{PLH} ,t _{PHL} Propagation Delay	3.30 ± 0.30		0.5		4.5	0.5	4.8	ns	Figure 4 Figure 5
		5.00 ± 0.50		0.5		3.9	0.5	4.1		
		3.30 ± 0.30	C _L =50pF,	1.0		6.0	1.0	6.5		
		5.00 ± 0.50	$R_L=500\Omega$,	0.8		5.0	0.8	5.5		
C _{IN}	Input Capacitance	0.00			4.5				pF	
	Power Dissipation	3.30			6.3				nE.	Figure 6
C _{PD} Cap	Capacitance ⁽²⁾	5.00			9.5				pF	rigule 6

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).



Note:

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

Figure 4. AC Test Circuit

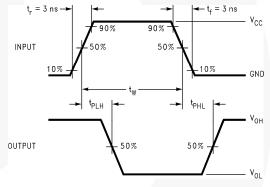
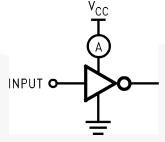


Figure 5. AC Waveforms



Note:

- 5. When operating the NC7SZU04's unbuffered output stage in its linear range, as in oscillator applications, care must be taken to observe maximum power rating for the device and package. The high drive nature of the design of the output stage results in substantial simultaneous conduction currents when the stage is in the linear region. See the I_{CCPEAK} specification in the DC Electrical Characteristics table.
- 6. Input=AC Waveform; t_r=t_f=1.8ns; PRR=variable; Duty Cycle =50%.

Figure 6. Test Circuit

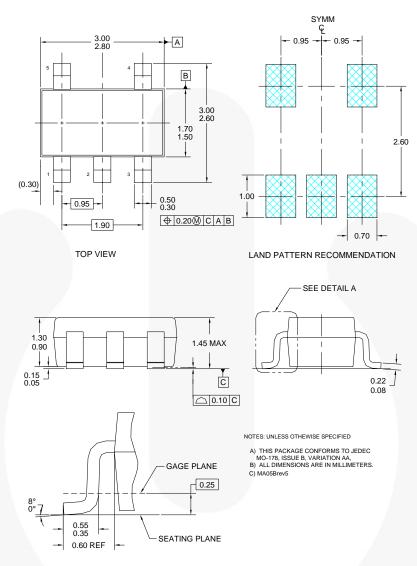


Figure 7. 5-Lead SOT23, JEDEC MO-178 1.6mm

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/packaging/SOT23-5L tr.pdf.

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	

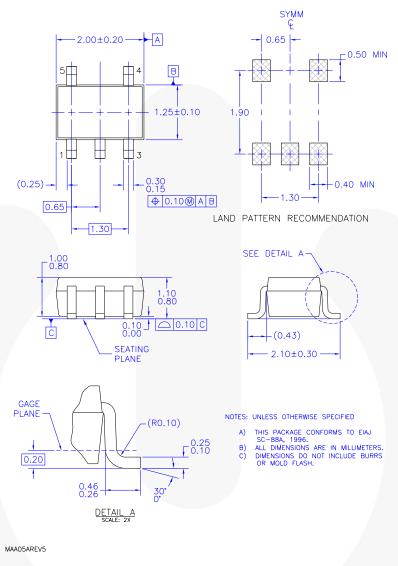


Figure 8. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide

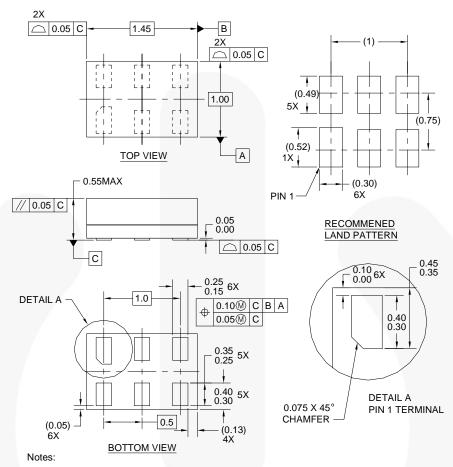
Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications 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/analog/pdf/sc70-5 tr.pdf.

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. 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™, 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	

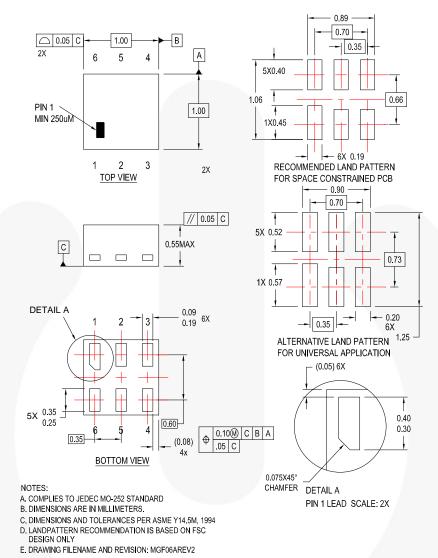


Figure 10.6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch

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: http://www.fairchildsemi.com/packaging/MicroPAK2 6L tr.pdf.

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	





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks

AccuPower™ Auto-SPM™ Build it Now™ CorePLUS™ CorePOWER** CROSSVOLT" **CTL™** Current Transfer Logic™

EcoSPARK⁶ EfficientMa×™ EZSWITCH***

•®

Fairchild® Fairchild Semiconductor® FACT Quiet Series™ FACT® FAST® FastvCore™ FETBench™

FlashWriter®* FPSTM F-PFSTM FRFET®

Global Power Resource Green FPS™ Green FPS™ e-Series™

G*m*ax™ GTO™ IntelliMAX™ ISOPLANAR™ MegaBuck™ MICROCOUPLER™

MicroFET* MicroPak™ MillerDrive™ MotionMax™ Motion-SPM™ OPTOLOGIC® OPTOPLANAR®

PDP SPM™

Power-SPM™ PowerTrench® PowerXS™

Programmable Active Droop™

QFE1 QS™ Quiet Series™ RapidConfigure™

Saving our world, 1mW/W/kW at a time™

SignalWise™ SmartMax™ SMART START™ SPM®

STEALTH™ SuperFET™ SuperSOT™3 SuperSOTM-6 SuperSOT*-8 SupreMOS™ SyncFET™ Sync-Lock™

SYSTEM ®* The Power Franchise⁶ p wer TinyBoost™

TinyBuck™ TinyCalc™ TinyLogic® TINY OPTO TM TinyPower™ TinyPWM™ TinyWire™ TriFault Detect™ TRUECURRENT*** uSerDes™

UHC Ultra FRFET™ UniFET** **VCXTM** VisualMax™ XS™

DISCLAIMER

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 RELIABILITY, FUNCTION, OR DESIGN. PAIRCHILD DOES NOT ASSOME ANY LIABILITY ARISING OUT OF THE APPLICATION OF OSE OF ANY PRODUCT CIRCUIT DESCRIBED HEREIN, NETHER DOES IT CONVEY ANY LICENSE UNDER ITS 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

- 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, 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.
- 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 expenience 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

Permitton 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	Data sheet 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

^{*} Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

ON Semiconductor and in 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/pdt/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor and see any inability 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 nor the 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 ex

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

ON Semiconductor:

NC7SZU04P5 NC7SZU04M5 NC7SZU04L6X NC7SZU04M5X NC7SZU04P5X NC7SZU04FHX