



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://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](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto:Fairchild_questions@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](http://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 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 reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

# NC7SZ74

## TinyLogic® UHS D-Type, Flip-Flop with Preset and Clear

### Features

- Ultra-High Speed:  $t_{PD}$  2.6ns (Typical) into 50pF at 5V  $V_{CC}$
- High Output Drive:  $\pm 24mA$  at 3V  $V_{CC}$
- Broad  $V_{CC}$  Operating Range: 1.65V to 5.5V
- Power Down High-Impedance Inputs/Outputs
- Over-Voltage Tolerance Inputs Facilitate 5V to 3V Translation
- Proprietary Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Package
- Space-Saving US8 Surface Mount Package

### Description

The NC7SZ74 is a single, D-type, CMOS flip-flop with preset and clear 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 of 1.65V to 5.5V  $V_{CC}$ . The inputs and outputs are high impedance when  $V_{CC}$  is 0V. Inputs tolerate voltages up to 7V, independent of  $V_{CC}$  operating voltage.

The signal level applied to the D input is transferred to the Q output during the positive-going transition of the CLK pulse.

### Ordering Information

Part Number	Top Mark	Package	Packing Method
NC7SZ74K8X	SZ74	8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide-	3000 Units on Tape & Reel
NC7SZ74L8X	N9	8-Lead MicroPak, 1.6 mm Wide	5000 Units on Tape & Reel

## Connection Diagrams

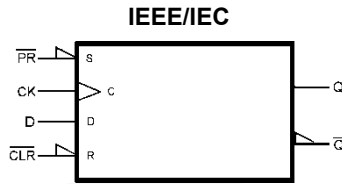


Figure 1. Logic Symbol

## Pin Configurations

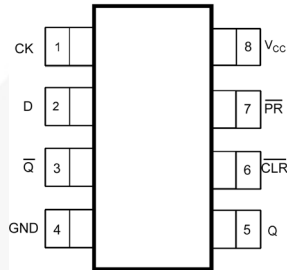


Figure 2. US8 (Top View)

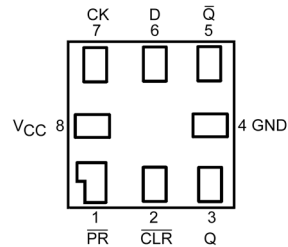


Figure 3. MicroPak™ (Top Through View)

## Pin Definitions

Pin # US8	Pin # MicroPak	Name	Description
1	7	CK	Clock Pulse Input
2	6	D	Data Input
3	5	/Q	Flip-Flop Output
4	4	GND	Ground
5	3	Q	Flip-Flop Output
6	2	/CLR	Direct Clear Input
7	1	/PR	Direct Preset Input
8	8	V <sub>CC</sub>	Supply Voltage

## Function Table

Inputs				Output		Function
/CLR	/PR	D	CK	Q	/Q	
L	H	X	X	L	H	Clear
H	L	X	X	H	L	Preset
L	L	X	X	H	H	
H	H	L	↑	L	H	
H	H	H	↑	H	L	
H	H	X	↓	Q <sub>n</sub>	/Q <sub>n</sub>	No Change

H = HIGH Logic Level

L = LOW Logic Level

Q<sub>n</sub> = No change in data

Z = High Impedance

X = Immaterial

↑ = Rising Edge

↓ = Falling Edge

## 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	$V_{IN} < 0V$	-50	mA
$I_{OK}$	DC Output Diode Current	$V_{OUT} < 0V$	-50	mA
$I_{OUT}$	DC Output Source/Sink 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		250	mW
ESD	Human Body Model, JEDEC:JESD22-A114		5000	V
	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
$V_{CC}$	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	Active State	0	$V_{CC}$	V
		3-State	0	5.5	
$t_r, t_f$	Input Rise and Fall Times	$V_{CC}=1.8V, 2.5V \pm 0.2V$	0	20	ns/V
		$V_{CC}=3.3V \pm 0.3V$	0	10	
		$V_{CC}=5.0V \pm 0.5V$	0	5	
$T_A$	Operating Temperature		-40	+85	°C
$\theta_{JA}$	Thermal Resistance	US8		250	°C/W
		MicroPak™-8		280	

**Note:**

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

### DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
V <sub>IH</sub>	HIGH Level Control Input Voltage	1.65 to 1.95		0.75V <sub>CC</sub>			0.75V <sub>CC</sub>		V
		2.30 to 5.50		0.70V <sub>CC</sub>			0.70V <sub>CC</sub>		
V <sub>IL</sub>	LOW Level Control Input Voltage	1.65 to 1.95				0.25V <sub>CC</sub>		0.25V <sub>CC</sub>	V
		2.30 to 5.50				0.30V <sub>CC</sub>		0.30V <sub>CC</sub>	
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	V <sub>IN</sub> =V <sub>IH</sub> , I <sub>OH</sub> =-100μA	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 <sub>OH</sub> =-4mA	1.29	1.52		1.29		
		2.30	I <sub>OH</sub> =-8mA	1.90	2.15		1.90		
		3.00	I <sub>OH</sub> =-16mA	2.40	2.80		2.40		
		3.00	I <sub>OH</sub> =-24mA	2.30	2.68		2.30		
		4.50	I <sub>OH</sub> =-32mA	3.80	4.20		3.80		
V <sub>OL</sub>	LOW Level Control Output Voltage	1.65	V <sub>IN</sub> =V <sub>IH</sub> , I <sub>OL</sub> =100μA			0.10		0.10	V
		2.30				0.10		0.10	
		3.00				0.10		0.10	
		4.50				0.10		0.10	
		1.65	I <sub>OL</sub> =4mA		0.80	0.24		0.24	
		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 ≤ V <sub>IN</sub> ≤ 5.5V			±0.1		±1.0	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	1.65 to 5.50	V <sub>IN</sub> =5.5V, GND			1		10	μA

### AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C		Units	Figure
				Min.	Typ.	Max.	Min.	Max.		
f <sub>MAX</sub>	Maximum Clock Frequency	1.80 ± 0.15	C <sub>L</sub> =15pF R <sub>D</sub> =1MΩ S <sub>I</sub> =Open	75			75		ns	Figure 4 Figure 8
		2.50 ± 0.20		150			150			
		3.30 ± 0.30		200			200			
		5.00 ± 0.50		250			250			
		3.30 ± 0.50	C <sub>L</sub> =50pF R <sub>D</sub> =500Ω, S <sub>I</sub> =Open	175			175			
		5.00 ± 0.50		200			200			
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay CK to Q, /Q	1.80 ± 0.15	C <sub>L</sub> =15pF, R <sub>D</sub> =1MΩ S <sub>I</sub> =Open	2.5	6.5	12.5	2.5	13.0	ns	Figure 4 Figure 6
		2.50 ± 0.20		1.5	3.8	7.5	1.5	8.0		
		3.30 ± 0.30		1.0	2.8	6.5	1.0	7.0		
		5.00 ± 0.50		0.8	2.2	4.5	0.8	5.0		
		3.30 ± 0.30	C <sub>L</sub> =50pF R <sub>D</sub> =500Ω, S <sub>I</sub> =Open	1.0	3.4	7.0	1.0	7.5		
		5.00 ± 0.50		1.0	2.6	5.0	1.0	5.5		
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay /CLR, /PR to Q, /Q	1.80 ± 0.15	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ S <sub>I</sub> =Open	2.5	6.5	14.0	2.5	14.5	ns	Figure 4 Figure 6
		2.50 ± 0.20		1.5	3.8	9.0	1.5	9.5		
		3.30 ± 0.30		1.0	2.8	6.5	1.0	7.0		
		5.00 ± 0.50		0.8	2.2	5.0	0.8	5.5		
		3.30 ± 0.30	C <sub>L</sub> =50pF, R <sub>D</sub> =500Ω, S <sub>I</sub> =Open	1.0	3.4	7.0	1.0	7.5		
		5.00 ± 0.50		1.0	2.6	5.0	1.0	5.5		
t <sub>S</sub>	Setup Time CK to D	1.80 ± 0.15	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ S <sub>I</sub> =Open	6.5			6.5		ns	Figure 4 Figure 7
		2.50 ± 0.20		3.5			3.5			
		3.30 ± 0.30		2.0			2.0			
		5.00 ± 0.50		1.5			1.5			
		3.30 ± 0.30	C <sub>L</sub> =50pF, R <sub>D</sub> =500Ω, S <sub>I</sub> =Open	2.0			2.0			
		5.00 ± 0.50		1.5			1.5			
t <sub>H</sub>	Hold Time, CK to D	1.80 ± 0.15	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ S <sub>I</sub> =Open	0.5			0.5		ns	Figure 4 Figure 7
		2.50 ± 0.20		0.5			0.5			
		3.30 ± 0.30		0.5			0.5			
		5.00 ± 0.50		0.5			0.5			
		3.30 ± 0.30	C <sub>L</sub> =50pF, R <sub>D</sub> =500Ω, S <sub>I</sub> =Open	0.5			0.5			
		5.00 ± 0.50		0.5			0.5			
t <sub>w</sub>	Pulse Width, CK, /PR, /CLR	1.80 ± 0.15	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ S <sub>I</sub> =Open	6.0			6.0		ns	Figure 4 Figure 8
		2.50 ± 0.20		4.0			4.0			
		3.30 ± 0.30		3.0			3.0			
		5.00 ± 0.50		2.0			2.0			
		3.30 ± 0.30	C <sub>L</sub> =50pF, R <sub>D</sub> =500Ω, S <sub>I</sub> =Open	3.0			3.0			
		5.00 ± 0.50		2.0			2.0			
t <sub>REC</sub>	Recover Time /CLR, /PR to CK	1.80 ± 0.15	C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ S <sub>I</sub> =Open	8.0			8.0		ns	Figure 4 Figure 7
		2.50 ± 0.20		4.5			4.5			
		3.30 ± 0.30		3.0			3.0			
		5.00 ± 0.50		3.0			3.0			
		3.30 ± 0.30	C <sub>L</sub> =50pF, R <sub>D</sub> =500Ω, S <sub>I</sub> =Open	3.0			3.0			
		5.00 ± 0.50		3.0			3.0			

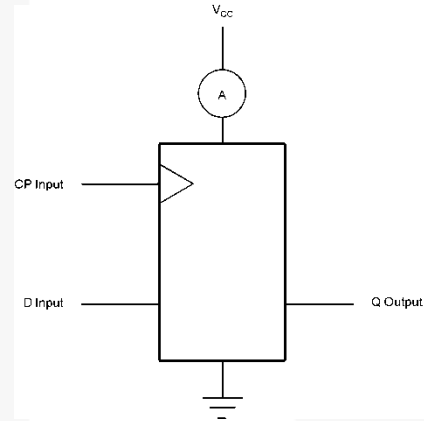
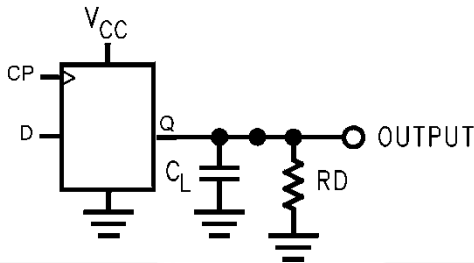
Continued on the following page...

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =+25°C		T <sub>A</sub> =-40 to +85°C			Units	Figure
				Min.	Typ.	Min.	Typ.	Min.		
C <sub>IN</sub>	Input Capacitance	0			3				pF	
C <sub>OUT</sub>	Output Capacitance	0			4				pF	
C <sub>PD</sub>	Power Dissipation Capacitance <sup>(2)</sup>	3.30			10				pF	
		5.00			12					

**Note:**

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



**Note:**

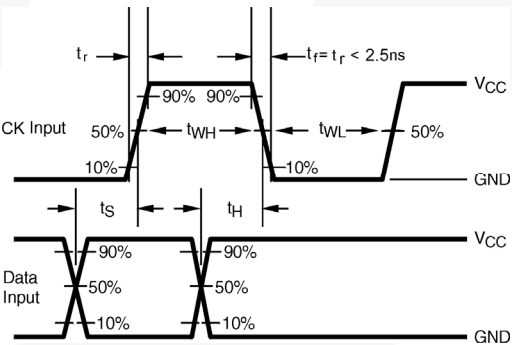
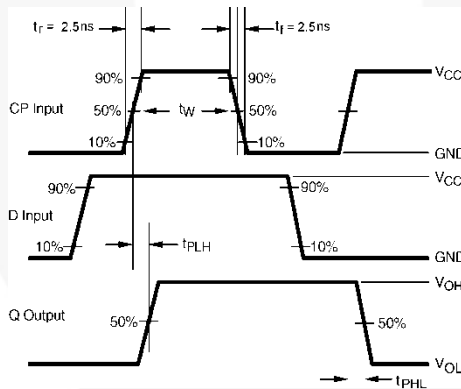
3. C<sub>L</sub> includes load and stray capacitance. Input PRR=1.0MHz t<sub>w</sub>=500ns.

**Notes:**

4. CP input=AC Waveforms t<sub>r</sub>=t<sub>f</sub>=2.5ns.  
 5. CP input PRR=10MHz; Duty Cycle=50%.  
 6. D input PRR=5MHz; Duty Cycle=50%.

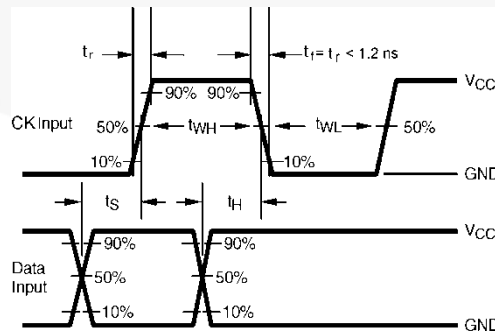
**Figure 4. AC Test Circuit**

**Figure 5. I<sub>CCD</sub> Test Circuit**



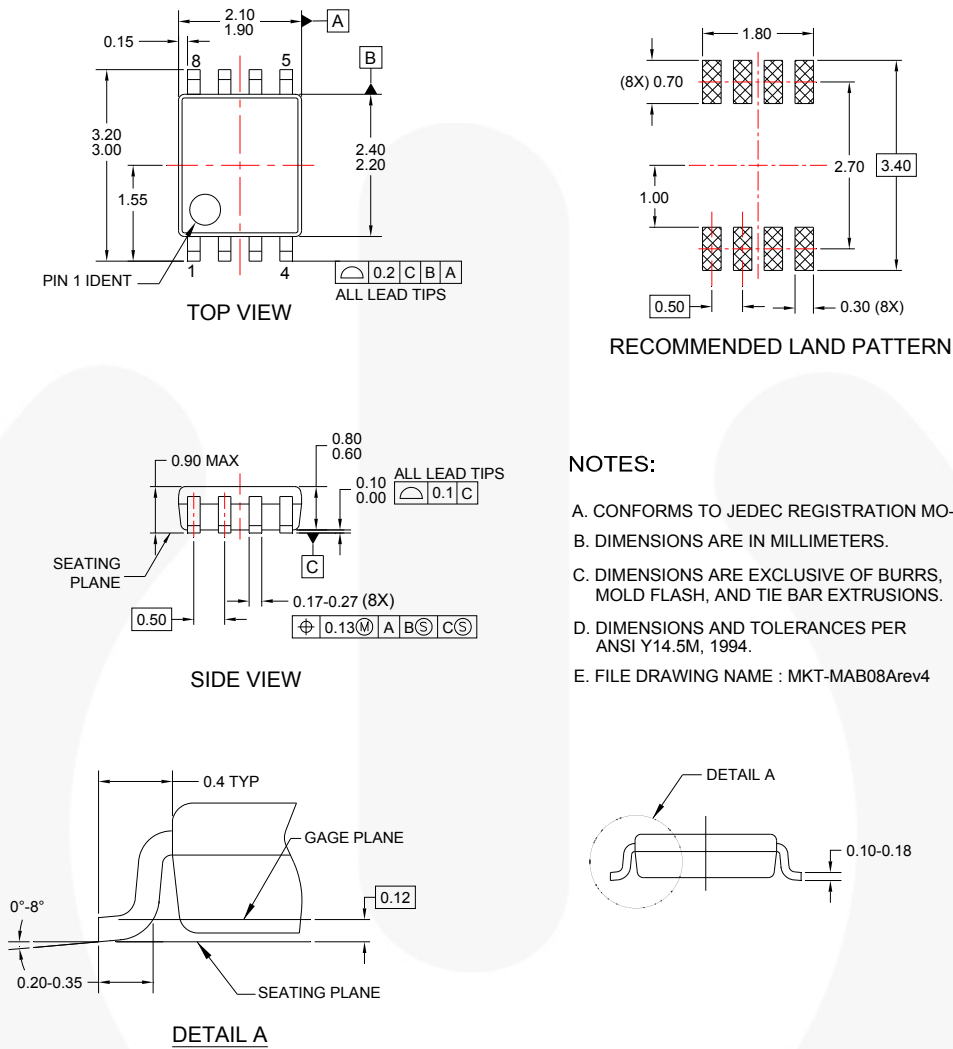
**Figure 6. AC Waveforms**

**Figure 7. AC Waveforms**



**Figure 8. AC Waveforms**

## Physical Dimensions



### NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1994.
- E. FILE DRAWING NAME : MKT-MAB08Arev4

**Figure 9. 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm 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/>.

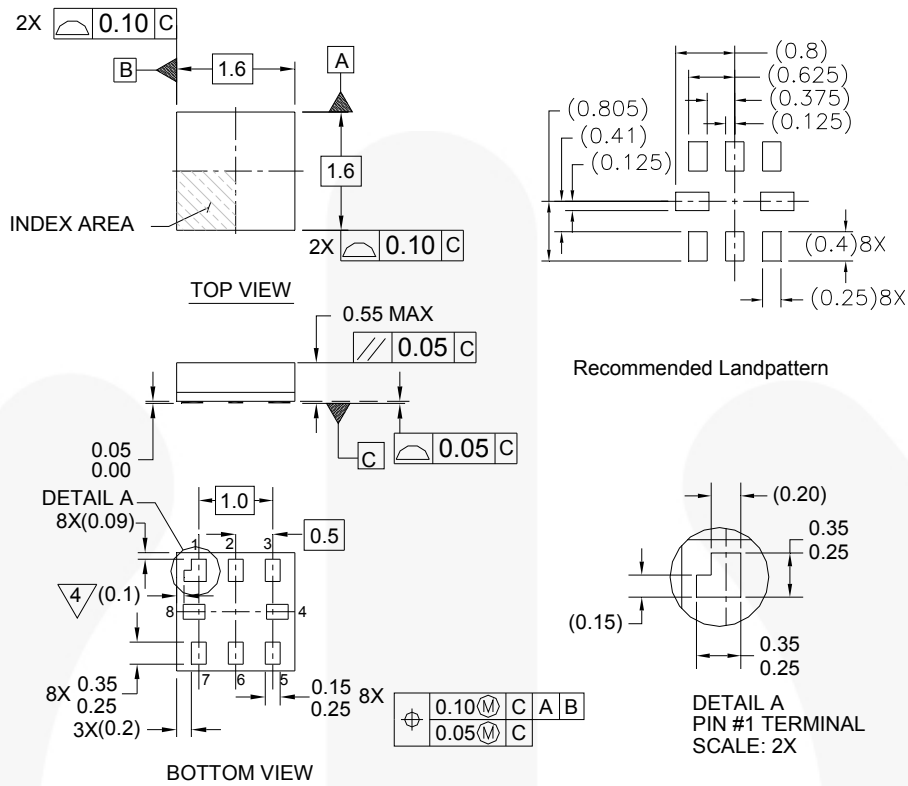
## Tape and Reel Specifications

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](http://www.fairchildsemi.com/products/analog/pdf/sc70-5_tr.pdf).

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
K8X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed



## Physical Dimensions



**Notes:**

1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
4. PIN 1 FLAG, END OF PACKAGE OFFSET
5. DRAWING FILE NAME: MKT-MAC08AREV4

MAC08AREV4

**Figure 10.8-Lead, MicroPak™, 1.6mm 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](http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf)

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
L8X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed



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 [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://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 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 reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## 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](mailto: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](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative