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June 2014

# NC7SV126
# TinyLogic® ULP-A Buffer with Three-State Output

## Features

- 0.9 V to 3.6 V $V_{CC}$ Supply Operation
- 3.6 V Over-Voltage Tolerant I/O's at $V_{CC}$ from 0.9 V to 3.6 V
- Extremely High Speed $t_{PD}$
  - 1.0 ns: Typical for 2.7 V to 3.6 V $V_{CC}$
  - 1.8 ns: Typical for 2.3 V to 2.7 V $V_{CC}$
  - 3.0 ns: Typical for 1.65 V to 1.95 V $V_{CC}$
  - 3.5 ns: Typical for 1.4 V to 1.6 V $V_{CC}$
  - 6.0 ns: Typical for 1.1 V to 1.3 V $V_{CC}$
  - 13.0 ns:Typical for 0.9 V $V_{CC}$
- Power-Off High-Impedance Inputs and Outputs
- High Static Drive ($I_{OH}/I_{OL}$)
  - ±24 mA at 3.00 V $V_{CC}$
  - ±18 mA at 2.30 V $V_{CC}$
  - ±6 mA at 1.65 V $V_{CC}$
  - ±4 mA at 1.4V $V_{CC}$
  - ±2 mA at 1.1 V $V_{CC}$
  - ±0.1 mA at 0.9 V $V_{CC}$
- Uses Proprietary Quiet Series™ Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Leadfree Package
- Ultra-Low Dynamic Power

## Description

The NC7SV126 is a single buffer with 3-STATE output from Fairchild's Ultra-Low Power-A (ULP-A) Series of TinyLogic®. ULP-A is ideal for applications that require extreme high speed, high drive, and low power. This product is designed for a wide low-voltage operating range (0.9 V to 3.6 V $V_{CC}$) and applications that require more drive and speed than the TinyLogic® ULP series, but still offer best in class low power operation.

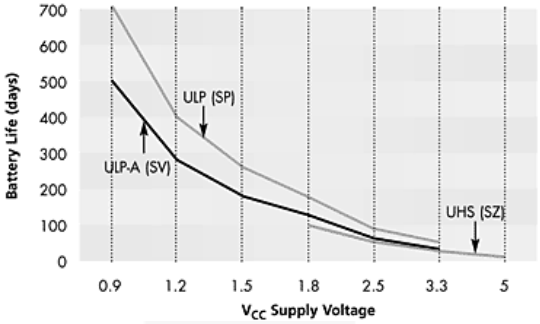
The NC7SV126 is uniquely designed for optimized power and speed, and is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

## Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|---|---|---|---|
| NC7SV126P5X | V26 | 5-Lead SC70, EIAJ SC-88a, 1.25 mm Wide | 3000 Units on Tape & Reel |
| NC7SV126L6X | H7 | 6-Lead MicroPak™, 1.00 mm Wide | 5000 Units on Tape & Reel |

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

## Battery Life




**Notes:**

1. TinyLogic® ULP and ULP-A with up to 50% less power consumption can extend your battery life significantly.
   Battery Life = $(V_{battery} \bullet I_{battery} \bullet .9)/(P_{device})/24hrs/day$
   Where, $P_{device} = (I_{CC} \bullet V_{CC}) + (C_{PD} + C_L) \bullet V_{CC2} \bullet f$.
2. Assumes ideal 3.6 V Lithium Ion battery with current rating of 900 mAH and derated 90% and device frequency at 10 MHz, with $C_L$ = 15 pF load.

**Figure 1. Battery Life vs. $V_{CC}$ Supply Voltage**

## Connection Diagram

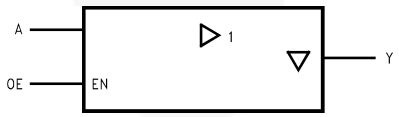



**Figure 2. Logic Symbol**

## Pin Configurations

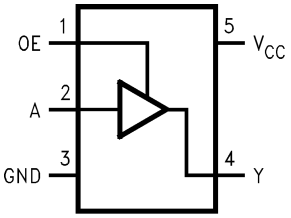



**Figure 3. SC70 (Top View)**

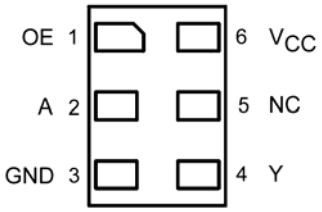



**Figure 4. MicroPak (Top Through View)**

## Pin Definitions

| Pin # SC70 | Pin # MicroPak | Name | Description |
|---|---|---|---|
| 1 | 1 | OE | Input |
| 2 | 2 | A | Input |
| 3 | 3 | GND | Ground |
| 4 | 4 | Y | Output |
| 5 | 6 | $V_{CC}$ | Supply Voltage |
| | 5 | NC | No Connect |

## Function Table

| Inputs | | Output |
|---|---|---|
| **OE** | **A** | **Out Y** |
| H | L | L |
| H | H | H |
| L | X | Z |

H = HIGH Logic Level
L = LOW Logic Level
X = HIGH or LOW Logic Level
Z = HIGH Impedance State

## 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 | 4.6 | V |
| $V_{IN}$ | DC Input Voltage | | -0.5 | 4.6 | V |
| $V_{OUT}$ | DC Output Voltage | HIGH or LOW State[3] | -0.5 | $V_{CC}$ + 0.5 | V |
| | | $V_{CC}$ = 0 V | -0.5 | 4.6 | |
| $I_{IK}$ | DC Input Diode Current | $V_{IN}$ < 0 V | | -50 | mA |
| $I_{OK}$ | DC Output Diode Current | $V_{OUT}$ < 0 V | | -50 | mA |
| | | $V_{OUT}$ > $V_{CC}$ | | +50 | |
| $I_{OH}/I_{OL}$ | DC Output Source/Sink Current | | | ±50 | mA |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current per Supply Pin | | | ±50 | mA |
| $T_{STG}$ | Storage Temperature Range | | -65 | +150 | °C |
| $P_D$ | Power Dissipation at +85°C | SC70-5 | | 150 | mW |
| | | MicroPak-6 | | 130 | |
| ESD | Human Body Model, JEDEC:JESD22-A114 | | | 4000 | V |
| | Charge Device Model, JEDEC:JESD22-C101 | | | 2000 | |

**Note:**

3. IO absolute maximum rating must be observed.

## 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 | | 0.9 | 3.6 | V |
| $V_{IN}$ | Input Voltage | | 0 | 3.6 | V |
| $V_{OUT}$ | Output Voltage | $V_{CC}$ = 0 V | 0 | 3.6 | V |
| | | HIGH or LOW State | 0 | $V_{CC}$ | |
| $I_{OH}/I_{OL}$ | Output Current | $V_{CC}$ = 3.0 V to 3.6 V | | ±24 | mA |
| | | $V_{CC}$ = 2.3 V to 3.6 V | | ±18 | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | ±6 | |
| | | $V_{CC}$ = 1.4 V to 1.6 V | | ±4 | |
| | | $V_{CC}$ = 1.1 V to 1.3 V | | ±2 | |
| | | $V_{CC}$ = 0.9 V | | ±0.1 | |
| $T_A$ | Operating Temperature, Free Air | | -40 | +85 | °C |
| $\Delta t/\Delta V$ | Minimum Input Edge Rate | $V_{IN}$ = 0.8 V to 2.0, $V_{CC}$ = 3.0 V | | 10 | ns/V |
| $\theta_{JA}$ | Thermal Resistance | SC70-5 | | 425 | °C/W |
| | | MicroPak-6 | | 500 | |

**Note:**

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

## DC Electrical Characteristics

| Symbol | Parameter | $V_{CC}$ | Conditions | $T_A$=25°C | | $T_A$=-40 to 85°C | | Units |
|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Max. | Min. | Max. | |
| $V_{IH}$ | HIGH Level Input Voltage | 0.90 | | .65 x $V_{CC}$ | | .65 x $V_{CC}$ | | V |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | | .65 x $V_{CC}$ | | .65 x $V_{CC}$ | | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | | .65 x $V_{CC}$ | | .65 x $V_{CC}$ | | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | | .65 x $V_{CC}$ | | .65 x $V_{CC}$ | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | | 1.6 | | 1.6 | | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | 2.0 | | 2.0 | | |
| $V_{IL}$ | LOW Level Input Voltage | 0.90 | | | .35 x $V_{CC}$ | | .35 x $V_{CC}$ | V |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | | | .35 x $V_{CC}$ | | .35 x $V_{CC}$ | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | | | .35 x $V_{CC}$ | | .35 x $V_{CC}$ | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | | | .35 x $V_{CC}$ | | .35 x $V_{CC}$ | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | | | 0.7 | | 0.7 | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | | 0.8 | | 0.8 | |
| $V_{OH}$ | HIGH Level Output Voltage | 0.90 | $I_{OH}$=-100 µA | $V_{CC}$-0.1 | | $V_{CC}$-0.1 | | V |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | | $V_{CC}$-0.1 | | $V_{CC}$-0.1 | | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | | $V_{CC}$-0.2 | | $V_{CC}$-0.2 | | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | | $V_{CC}$-0.2 | | $V_{CC}$-0.2 | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | | $V_{CC}$-0.2 | | $V_{CC}$-0.2 | | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | $V_{CC}$-0.2 | | $V_{CC}$-0.2 | | |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | $I_{OH}$=-2 mA | .75 x $V_{CC}$ | | .75 x $V_{CC}$ | | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | $I_{OH}$=-4 mA | .75 x $V_{CC}$ | | .75 x $V_{CC}$ | | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | $I_{OH}$=-6 mA | 1.25 | | 1.25 | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | | 2.0 | | 2.0 | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | $I_{OH}$=-12 mA | 1.8 | | 1.8 | | |
| | | 2.70≤ $V_{CC}$ ≤ 3.60 | | 2.2 | | 2.2 | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | $I_{OH}$=-18 mA | 1.7 | | 1.7 | | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | 2.4 | | 2.4 | | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | $I_{OH}$=-24 mA | 2.2 | | 2.2 | | |

*Continued on following page…*

## DC Electrical Characteristics (Continued)

| Symbol | Parameter | $V_{CC}$ | Conditions | $T_A$=25°C | | $T_A$=-40 to 85°C | | Units |
|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Max. | Min. | Max. | |
| $V_{OL}$ | LOW Level Output Voltage | 0.90 | $I_{OL}$=100 µA | | 0.1 | | 0.1 | V |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | | | 0.1 | | 0.1 | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | | | 0.2 | | 0.2 | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | | | 0.2 | | 0.2 | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | | | 0.2 | | 0.2 | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | | 0.2 | | 0.2 | |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | $I_{OL}$=2 mA | | 0.25 x $V_{CC}$ | | 0.25 x $V_{CC}$ | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | $I_{OL}$=4 mA | | 0.25 x $V_{CC}$ | | 0.25 x $V_{CC}$ | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | $I_{OL}$=6 mA | | 0.3 | | 0.3 | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.70 | $I_{OL}$=12 mA | | 0.4 | | 0.4 | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | | 0.4 | | 0.4 | |
| | | 2.30≤ $V_{CC}$ ≤ 2.70 | $I_{OL}$=18 mA | | 0.6 | | 0.6 | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | | 0.4 | | 0.4 | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | $I_{OL}$=24 mA | | 0.55 | | 0.55 | |
| $I_{IN}$ | Input Leakage Current | 0.90 to 3.60 | 0 ≤ $V_{IN}$ ≤ 3.60 | | ±0.1 | | ±0.5 | µA |
| $I_{OZ}$ | 3-STATE Output Leakage | 0.90 to 3.6 | $V_{IN}$=$V_{IH}$ or $V_{IL}$<br>0 ≤ $V_{IN}$ ≤ 3.60 | | ±0.5 | | ±0.5 | µA |
| $I_{OFF}$ | Power Off | 0 | 0 ≤ ($V_{IN,}$ $v_o$)<br>≤ 3.60 | | 0.5 | | 0.5 | µA |
| $I_{CC}$ | Quiescent Supply Current | 0.90 to 3.60 | $V_{IN}$=$V_{CC}$, or GND | | 0.9 | | 0.9 | µA |
| | | | $V_{CC}$ ≤ $V_{IN}$ ≤ 3.6 V | | | | ±0.9 | |

## AC Electrical Characteristics

| Symbol | Parameter | $V_{CC}$ | Conditions | $T_A$=25°C | | | $T_A$=-40 to 85°C | | Units | Figure |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | Min. | Max. | | |
| $t_{PHL}$, $t_{PLH}$ | Propagation Delay | 0.90 | $C_L$=15 pF, $R_L$=1 MΩ | | 13 | | | | ns | Figure 5 Figure 6 |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | $C_L$=15 pF, $R_L$=2 kΩ | 3.0 | 6.0 | 9.8 | 1.9 | 14.9 | | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | | 1.0 | 3.5 | 5.3 | 0.8 | 5.7 | | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | $C_L$=30 pF, $R_L$=500 Ω | 0.9 | 3.0 | 4.3 | 0.8 | 4.6 | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.60 | | 0.8 | 1.8 | 2.8 | 0.7 | 3.0 | | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | 0.5 | 1.0 | 2.6 | 0.3 | 2.8 | | |
| $t_{PZL}$,$t_{PZH}$ | Output Enable Time | 0.90 | $C_L$=30 pF, $R_U$=1 kΩ $R_D$=1 kΩ | | 12 | | | | ns | |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | | 3.0 | 6.0 | 9.7 | 2.0 | 16.4 | ns | Figure 5 Figure 6 |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | | 1.2 | 4.0 | 6.0 | 1.0 | 7.5 | | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | | 1.0 | 3.0 | 4.5 | 0.9 | 5.0 | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.60 | | 0.8 | 2.0 | 3.0 | 0.7 | 3.4 | | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | 0.5 | 1.2 | 2.6 | 0.4 | 2.9 | | |
| $t_{PHZ}$,$t_{PLZ}$ | Output Disable Time | 0.90 | $C_L$=30 pF, $R_U$=1 kΩ $R_D$=1 kΩ | | 14 | | | | ns | Figure 5 Figure 6 |
| | | 1.10 ≤ $V_{CC}$ ≤ 1.30 | | 2.0 | 5.0 | 9.5 | 2.0 | 14.0 | | |
| | | 1.40 ≤ $V_{CC}$ ≤ 1.60 | | 1.2 | 3.0 | 5.5 | 1.1 | 7.0 | | |
| | | 1.65 ≤ $V_{CC}$ ≤ 1.95 | | 1.0 | 2.0 | 5.6 | 0.8 | 5.8 | | |
| | | 2.30 ≤ $V_{CC}$ ≤ 2.60 | | 0.6 | 1.3 | 4.2 | 0.5 | 5.0 | | |
| | | 2.70 ≤ $V_{CC}$ ≤ 3.60 | | 0.5 | 1.0 | 3.9 | 0.4 | 4.2 | | |
| $C_{IN}$ | Input Capacitance | 0.00 | | | 2 | | | | pF | |
| $C_{OUT}$ | Output Capacitance | 0.00 | | | 4.5 | | | | pF | |
| $C_{PD}$ | Power Dissipation Capacitance | 0.90 to 3.60 | $V_I$=0 V or $V_{CC}$, f=10 MHz | | 10 | | | | pF | |

## AC Loadings and Waveforms

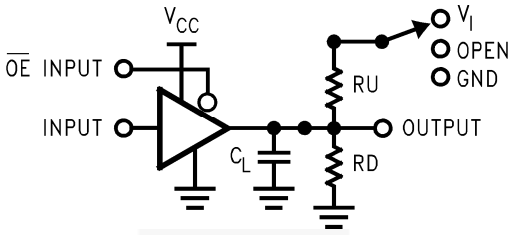



**Figure 5. AC Test Circuit**

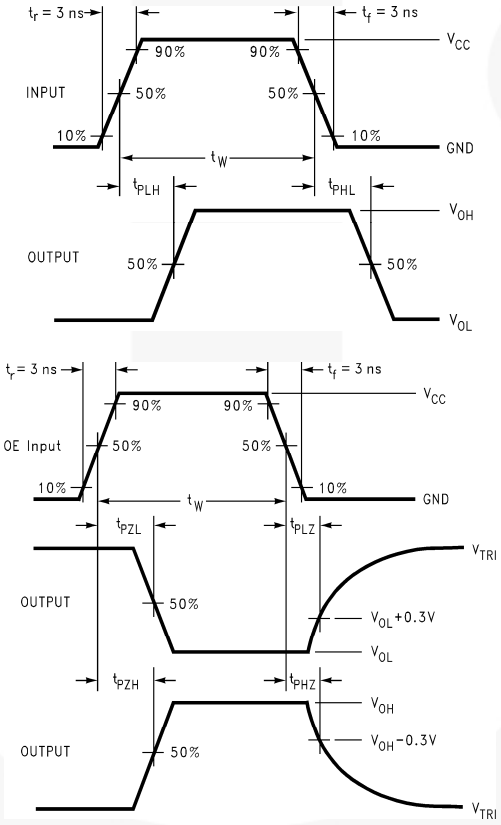



**Figure 6. AC Waveforms**

## Physical Dimensions

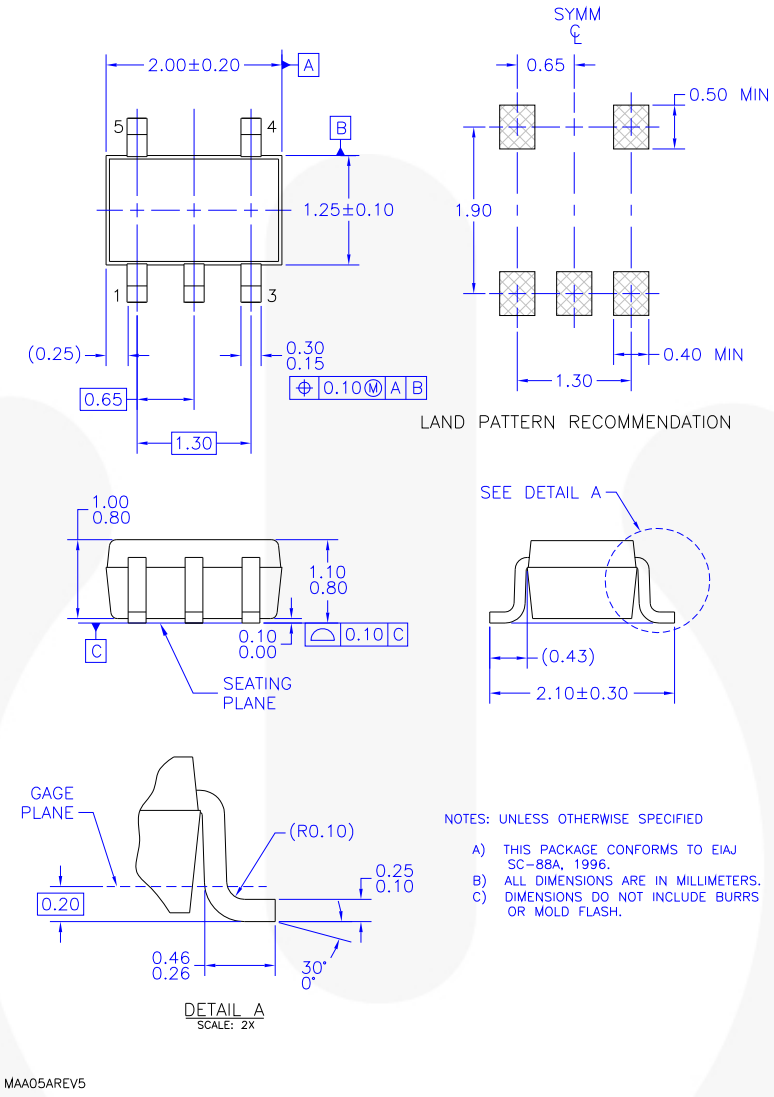



**Figure 7. 5-Lead, SC70, EIAJ SC-88a, 1.25 mm Wide**

*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.*

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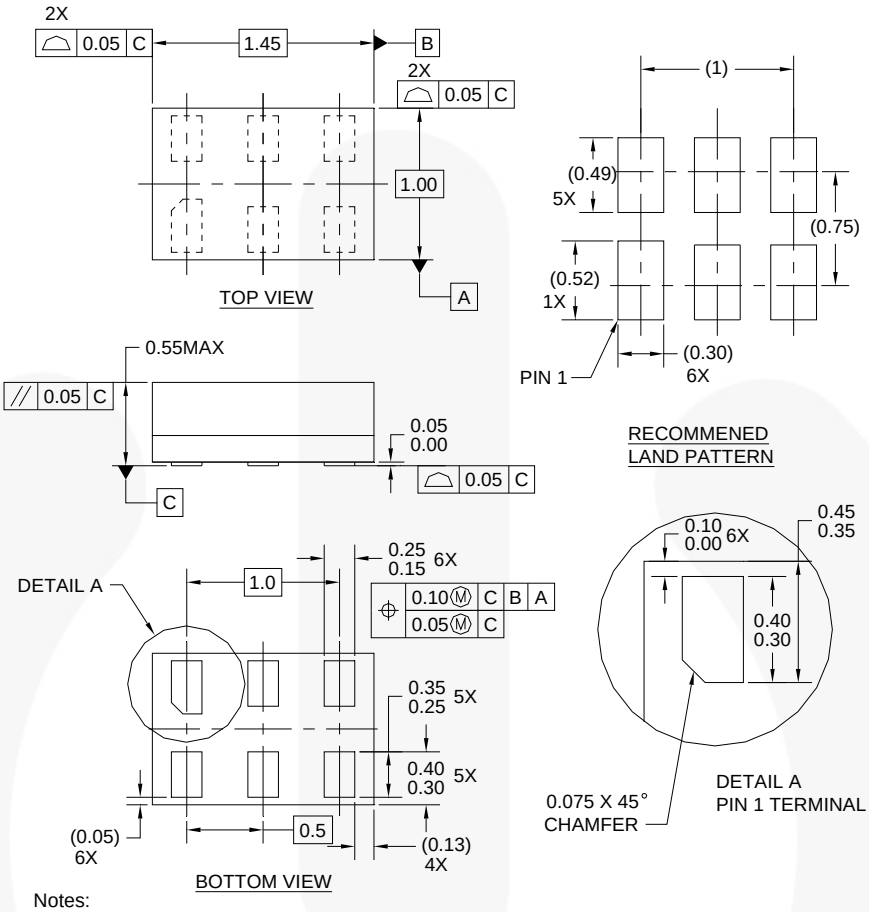
## Tape and Reel Specification

*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 |
|---|---|---|---|---|
| P5X | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |

## Physical Dimensions




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 8. 6-Lead, MicroPak™, 1.0mm Wide**

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## Tape and Reel Specification

*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 |
|---|---|---|---|---|
| L6X | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 5000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |

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TinyPower™
TinyPWM™
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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 | 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. |

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