

# DATA SHEET

## **74HC/HCT9323A**

Programmable ripple counter with  
oscillator (3-State)

Objective specification

1995 Oct 27

IC06 Data Handbook

# Programmable ripple counter with oscillator (3-State)

## 74HC/HCT9323A

### FEATURES

- 8-pin space saving package
- Programmable 3-stage ripple counter
- Suitable for over-tone crystal application up to 85MHz ( $V_{CC} = 5V \pm 10\%$ )
- 3-State output buffer
- Two internal capacitors
- Recommended operating range for use with third overtone crystals 3V to 6V
- Oscillator stop function ( $\overline{MR}$ )
- Output capability:  
bus driver  $\rightarrow$  (15 LSTTL)
- $I_{CC}$  category: MSI

### APPLICATIONS

- Control counters
- Timers
- Frequency dividers
- Time-delay circuits
- CIO (Compact Integrated Oscillator)
- Third-overtone crystal operation

### DESCRIPTION

The 74HC/HCT9323A are high-speed Si-gate CMOS devices. They are specified in compliance with JEDEC standard no. 7A.

The HC/HCT 9323A are oscillators designed for quartz crystal combined with a programmable 3-State counter, a 3-State output buffer and an overriding asynchronous master reset ( $\overline{MR}$ ). With the two select inputs S1 and S2 the counter can be switched in the divide-1, 2, 4 or 8 mode. If left floating the clock is divided by 8. The oscillator is designed to operate either in the fundamental or third overtone mode depending on the crystal and external components applied. On-chip capacitors minimize external component count for third overtone crystal applications.

The oscillator may be replaced by an external clock signal at input X1. In this event the other oscillator pin (X2) must be floating. The counter advances on the negative-going transition of X1. A LOW level on  $\overline{MR}$  resets the counter, stops the oscillator and sets the output buffer in the 3-State condition.  $\overline{MR}$  can be left floating since an internal pull-up resistor will make the  $\overline{MR}$  inactive. In the HCT version, the  $\overline{MR}$  input and the two mode select pins S1 and S2 are TTL compatible, but the X1 input has CMOS input switching levels and may be driven by a TTL output using a pull-up resistor connected to  $V_{CC}$ .

### QUICK REFERENCE DATA

GND = 0V;  $T_{amb} = 25^{\circ}\text{C}$ ,  $t_r = t_f = 6\text{ns}$

| SYMBOL                 | PARAMETER                                      | CONDITIONS<br>$T_{amb} = 25^{\circ}\text{C}$ ; GND = 0V | TYPICAL |     | UNIT |
|------------------------|--|---|---------|-----|------|
|                        |  |   | HC      | HCT |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>X1 to OUT (S1 = S2 = LOW) | $C_L = 50\text{pF}$ ; $V_{CC} = 5\text{V}$              | 8       | 8   | ns   |
| $f_{max}$              | Maximum clock frequency                        |   | 150     | 150 | MHz  |
| $C_I$                  | Input capacitance except X1 and X2             |   | 3.5     | 3.5 | pF   |
| $C_{PD}$               | Power dissipation<br>capacitance per package   |   |         |     | pF   |

#### NOTES:

$C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ):

$$P_D = (C_{PD} \times V_{CC}^2 \times f_i) + (C_L + V_{CC}^2 \times f_O) + (I_{pull-up} \times V_{CC})$$

where:

$f_i$  = input frequency in MHz..

$f_O$  = output frequency in MHz.

$V_{CC}$  = Supply voltage in V.

$C_L$  = Output load capacitance in pF.

$I_{pull-up}$  = Pull-up currents in  $\mu\text{A}$ .

For HC and HCT an external clock is applied to X1 with:

$t_r = t_f \leq 6\text{ns}$ ,  $V_I$  is GND to  $V_{CC}$ ,  $\overline{MR} = \text{HIGH}$ .

$I_{pull-up}$  is the summation of  $-I_I$  ( $\mu\text{A}$ ) of S1 and S2 inputs at the LOW state.

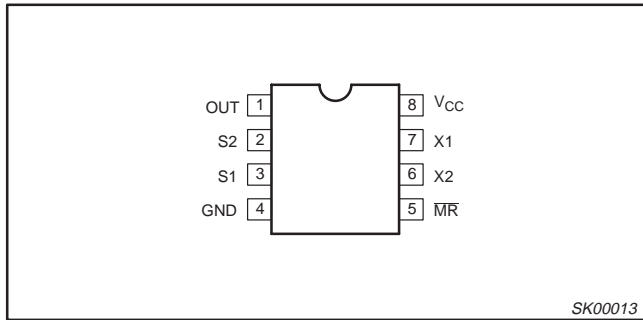
### ORDERING INFORMATION

| PACKAGES         | TEMPERATURE RANGE                            | ORDER NUMBER    | DWG NUMBER |
|------------------|--|-----------------|------------|
| 8-Pin Plastic SO | $0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ | 74HC/HCT9323A D | SOT96-1    |

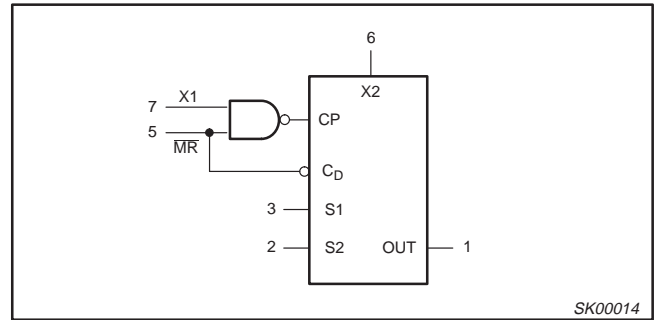
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## PIN CONFIGURATION



## IEC LOGIC SYMBOL



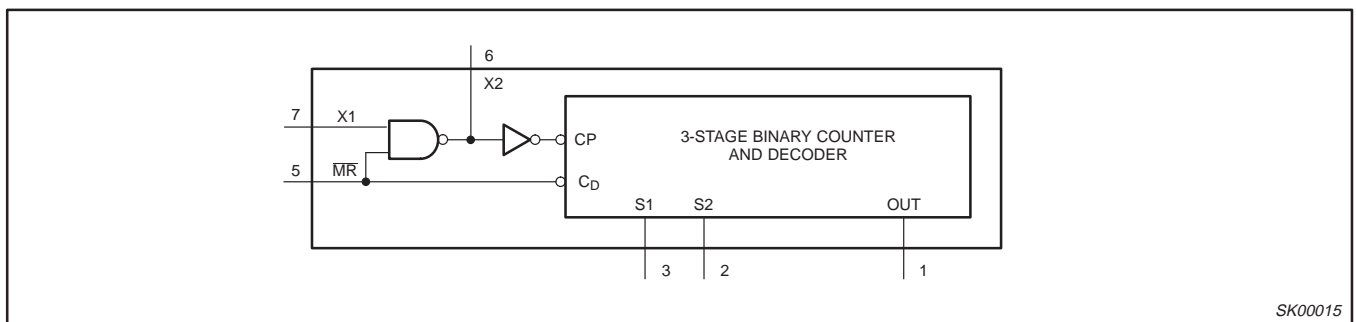
## PIN DESCRIPTION

| PIN NUMBER | SYMBOL          | FUNCTION                                      |
|------------|-----------------|---|
| 1          | OUT             | Counter output                                |
| 3, 2       | S1-S2           | Mode select inputs for divide by 1, 2, 4 or 8 |
| 4          | GND             | Ground (0V)                                   |
| 5          | MR              | Master reset (active LOW)                     |
| 6          | X2              | Oscillator pin                                |
| 7          | X1              | Clock input/oscillator pin                    |
| 8          | V <sub>CC</sub> | Positive supply voltage                       |

## FUNCTION TABLE

| INPUTS |    | OUTPUTS           |
|--------|----|-------------------|
| S1     | S2 | OUT               |
| 0      | 0  | f <sub>i</sub>    |
| 0      | 1  | f <sub>i</sub> /2 |
| 1      | 0  | f <sub>i</sub> /4 |
| 1      | 1  | f <sub>i</sub> /8 |

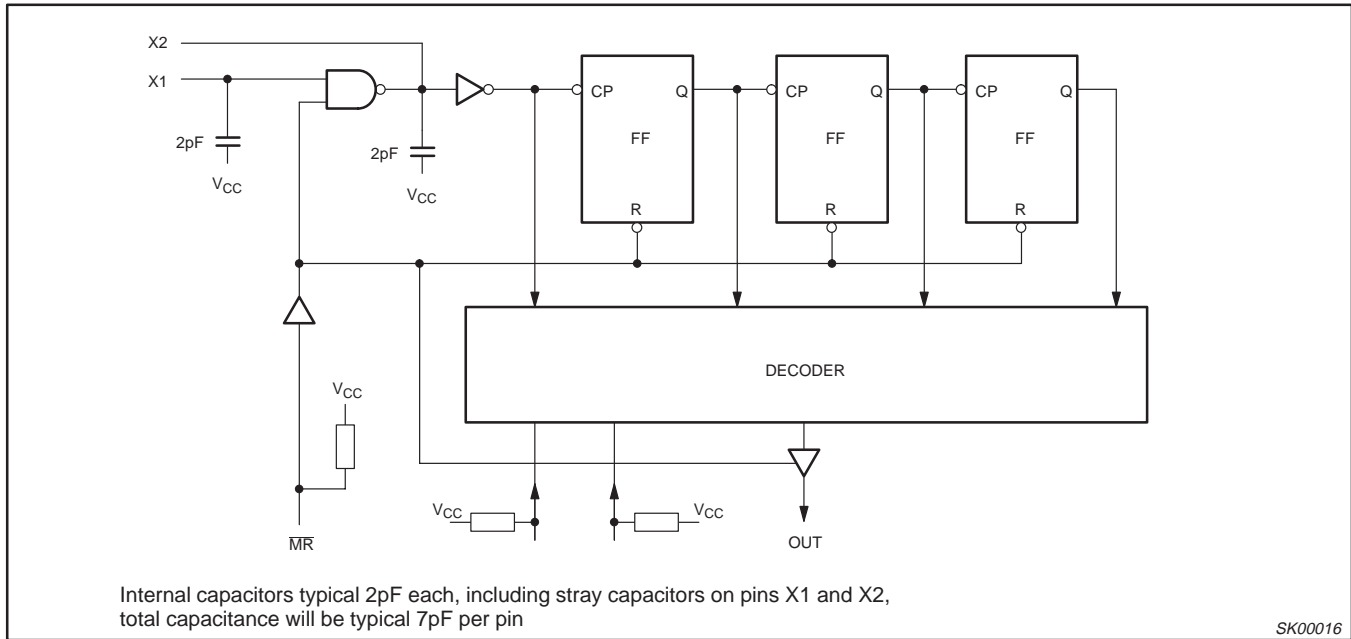
## FUNCTIONAL DIAGRAM



# Programmable ripple counter with oscillator (3-State)

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## LOGIC DIAGRAM

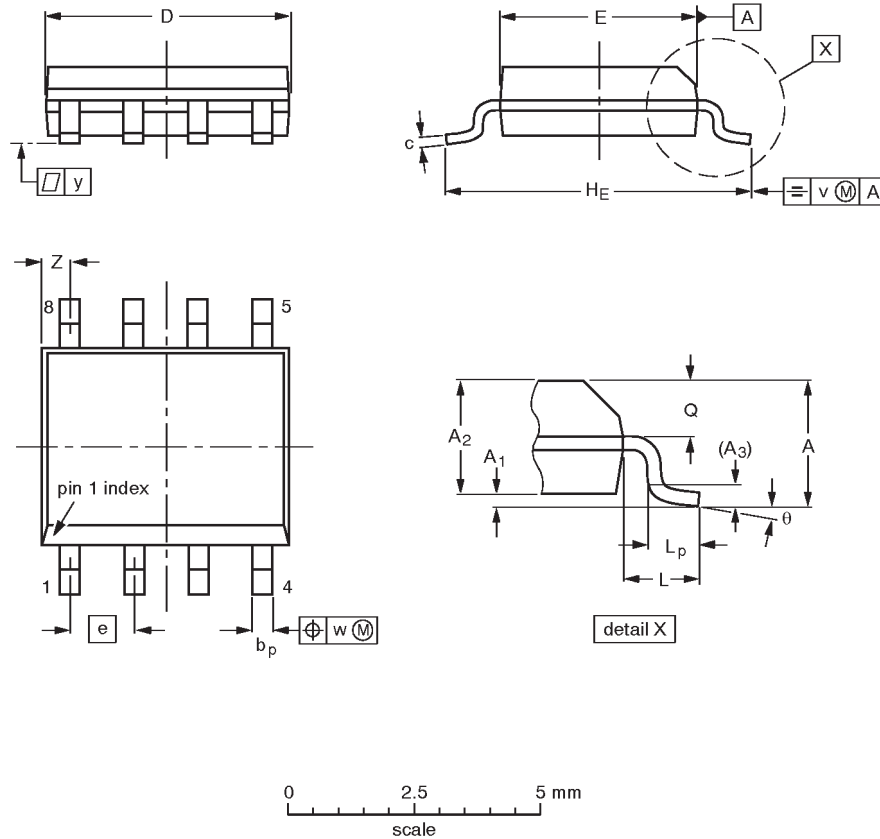


# Programmable ripple counter with oscillator (3-State)

## 74HC/HCT9323A

**SO8: plastic small outline package; 8 leads; body width 3.9mm**

**SOT96-1**



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT   | A max. | A <sub>1</sub>   | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c                | D <sup>(1)</sup> | E <sup>(2)</sup> | e     | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | Z <sup>(1)</sup> | θ        |
|--------|--------|------------------|----------------|----------------|----------------|------------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 1.75   | 0.25<br>0.10     | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 5.0<br>4.8       | 4.0<br>3.8       | 1.27  | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069  | 0.0098<br>0.0039 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0098<br>0.0075 | 0.20<br>0.19     | 0.16<br>0.15     | 0.050 | 0.24<br>0.23   | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012   |          |

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT96-1         | 076E03S    | MS-012AA |      |  |                     | 92-11-17<br>95-02-04 |

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## DEFINITIONS

| Data Sheet Identification        | Product Status                | Definition   |
|----------------------------------|-------------------------------|--|
| <i>Objective Specification</i>   | <b>Formative or in Design</b> | This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.   |
| <i>Preliminary Specification</i> | <b>Preproduction Product</b>  | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
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