

**DALLAS**  
**SEMICONDUCTOR**

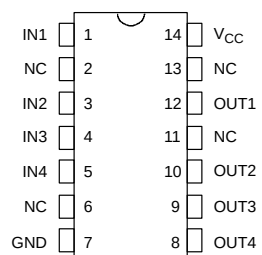
## DS1044

### 4-in-1 High-Speed Silicon Delay Line

#### FEATURES

- All-silicon timing circuit
- Four independent buffered delays
- Initial delay tolerance  $\pm 1.5$  ns
- Stable and precise over temperature and voltage
- Leading and trailing edge precision preserves the input symmetry
- Standard 14-pin DIP, 14-pin SOIC (150 mil)
- Vapor phase, IR and wave solderable
- Available in Tape and Reel

#### PIN ASSIGNMENT



DS1044 14-PIN DIP  
 DS1044R 14-PIN SOIC (150 MIL)  
 See Mech. Drawings  
 Section

#### PIN DESCRIPTION

|                 |                  |
|-----------------|------------------|
| IN1-IN4         | - Input Signals  |
| OUT1-OUT4       | - Output Signals |
| NC              | - No Connection  |
| V <sub>CC</sub> | - +5 Volt Supply |
| GND             | - Ground         |

#### DESCRIPTION

The DS1044 series is a 4-in-1 version of the low-power, +5 Volt, high speed, DS1035.

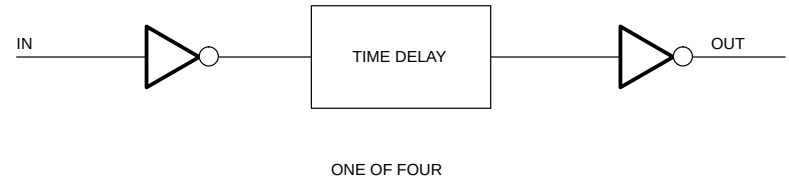
The DS1044 series of delay lines have four independent logic buffered delays in a single package. The device is Dallas Semiconductor's fastest 4-in-1 delay line. It is available in a standard 14-pin DIP and 14-pin SOIC.

The device features precise leading and trailing edge accuracies. It has the inherent reliability of an all-silicon

delay line solution. The DS1044's nominal tolerance is  $\pm 1.5$  ns and an additional tolerance over temperature and voltage of  $\pm 1.0$  ns for the faster delays. Each output is capable of driving up to 10 LS loads.

Standard delay values are indicated in Table 1. Customers may contact Dallas Semiconductor at (972) 371-4348 for further information.

**LOGIC DIAGRAM** Figure 1



**PART NUMBER DELAY TABLE** ( $t_{PLH}$ ,  $t_{PHL}$ ) Table 1

| PART NUMBER | DELAY PER OUTPUT (ns) | INITIAL TOLERANCE | TOLERANCE OVER (temp and voltage) |
|-------------|-----------------------|-------------------|-----------------------------------|
| DS1044-5    | 5                     | $\pm 1.5$ ns      | $\pm 1.0$ ns                      |
| DS1044-6    | 6                     | $\pm 1.5$ ns      | $\pm 1.0$ ns                      |
| DS1044-7    | 7                     | $\pm 1.5$ ns      | $\pm 1.0$ ns                      |
| DS1044-8    | 8                     | $\pm 1.5$ ns      | $\pm 1.0$ ns                      |
| DS1044-10   | 10                    | $\pm 1.5$ ns      | $\pm 1.0$ ns                      |
| DS1044-12   | 12                    | $\pm 1.5$ ns      | $\pm 1.0$ ns                      |
| DS1044-14   | 14                    | $\pm 1.5$ ns      | $\pm 1.5$ ns                      |
| DS1044-18   | 18                    | $\pm 1.5$ ns      | $\pm 1.5$ ns                      |
| DS1044-20   | 20                    | $\pm 1.5$ ns      | $\pm 1.5$ ns                      |
| DS1044-25   | 25                    | $\pm 2.0$ ns      | $\pm 1.5$ ns                      |

**NOTES:**

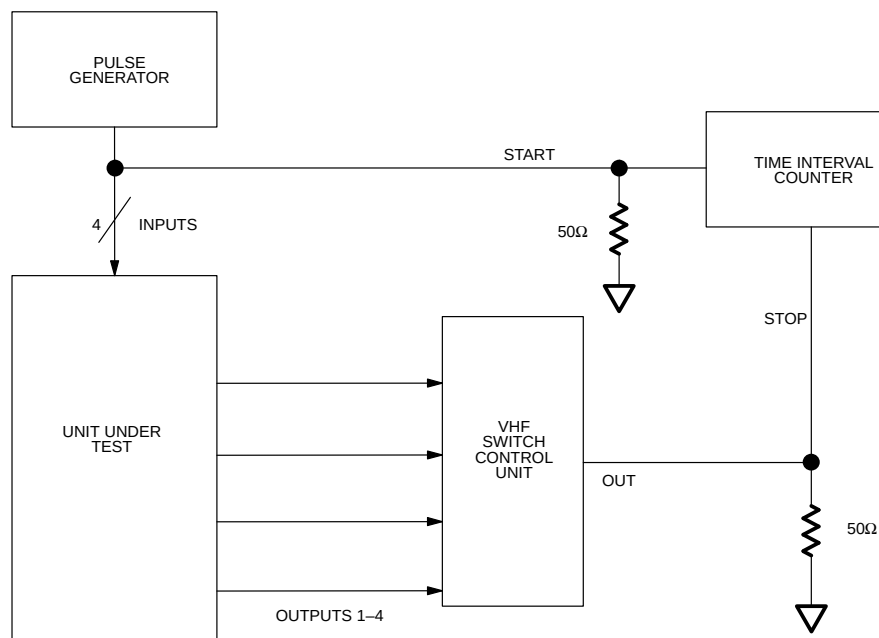
1. Nominal conditions are +25°C and  $V_{CC}=+5.0$  volts.
2. Temperature range of 0°C to 70°C and voltage range of 4.75 volts to 5.25 volts.
3. Delay accuracy are for both leading and trailing edges.

### TEST SETUP DESCRIPTION

Figure 2 illustrates the hardware configuration used for measuring the timing parameters of the DS1044. The input waveform is produced by a precision pulse generator under software control. Time delays are measured by a time interval counter (20 ps resolution) connected

to the output. The DS1044 output taps are selected and connected to the interval counter by a VHF switch control unit. All measurements are fully automated with each instrument controlled by the computer over an IEEE 488 bus.

**DS1044 TEST CIRCUIT** Figure 2



**ABSOLUTE MAXIMUM RATINGS\***

|                                       |                      |
|---------------------------------------|----------------------|
| Voltage on Any Pin Relative to Ground | –1.0V to +7.0V       |
| Operating Temperature                 | 0°C to 70°C          |
| Storage Temperature                   | –55°C to +125°C      |
| Soldering Temperature                 | 260°C for 10 seconds |
| Short Circuit Output Current          | 50 mA for 1 second   |

\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

**DC ELECTRICAL CHARACTERISTICS**(0°C to 70°C;  $V_{CC}=+5V \pm 5\%$ )

| PARAMETER                 | SYMBOL   | TEST CONDITION                     | MIN  | TYP  | MAX          | UNITS   |
|---------------------------|----------|------------------------------------|------|------|--------------|---------|
| Supply Voltage            | $V_{CC}$ |                                    | 4.75 | 5.00 | 5.25         | V       |
| Active Current            | $I_{CC}$ | $V_{CC}=5.25V$<br>Period=1 $\mu s$ |      |      | 45           | mA      |
| High Level Input Voltage  | $V_{IH}$ |                                    | 2.2  |      | $V_{CC}+0.5$ | V       |
| Low Level Input Voltage   | $V_{IL}$ |                                    | –0.5 |      | 0.8          | V       |
| Input Leakage             | $I_L$    | $0V \leq V_I \leq V_{CC}$          | –1.0 |      | 1.0          | $\mu A$ |
| High Level Output Current | $I_{OH}$ | $V_{CC}=4.75V$<br>$V_{OH}=4V$      |      |      | –1.0         | mA      |
| Low Level Output Current  | $I_{OL}$ | $V_{CC}=4.75V$<br>$V_{OL}=0.5V$    | 12   |      |              | mA      |

**AC ELECTRICAL CHARACTERISTICS**(+25°C;  $V_{CC}=5V \pm 5\%$ )

| PARAMETER                 | SYMBOL                | MIN                  | TYP     | MAX | UNITS | NOTES |
|---------------------------|-----------------------|----------------------|---------|-----|-------|-------|
| Period                    | $t_{PERIOD}$          | 2 ( $t_{WI}$ )       |         |     | ns    | 3     |
| Input Pulse Width         | $t_{WI}$              | 100% of<br>Tap Delay |         |     | ns    | 3     |
| Input-to-Tap Output Delay | $t_{PLH}$ , $t_{PHL}$ |                      | Table 1 |     | ns    |       |
| Output Rise or Fall Time  | $t_{OR}$ , $t_{OF}$   |                      | 2.0     | 2.5 | ns    |       |
| Power-up Time             | $t_{PU}$              |                      |         | 100 | ms    |       |

**CAPACITANCE**(t<sub>A</sub>=25°C)

| PARAMETER         | SYMBOL   | MIN | TYP | MAX | UNITS | NOTES |
|-------------------|----------|-----|-----|-----|-------|-------|
| Input Capacitance | $C_{IN}$ |     |     | 10  | pF    |       |

**TEST CONDITIONS**

Ambient Temperature:  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Supply Voltage ( $V_{\text{CC}}$ ):  $5.0\text{V} \pm 0.1\text{V}$

Input Pulse:

High:  $3.0\text{V} \pm 0.1\text{V}$

Low:  $0.0\text{V} \pm 0.1\text{V}$

Source Impedance:  $50\Omega$  Max.

Rise and Fall Time:  $3.0\text{ ns Max.}$  – Measured between  $0.6\text{V}$  and  $2.4\text{V}$ .

Pulse Width:  $500\text{ ns}$

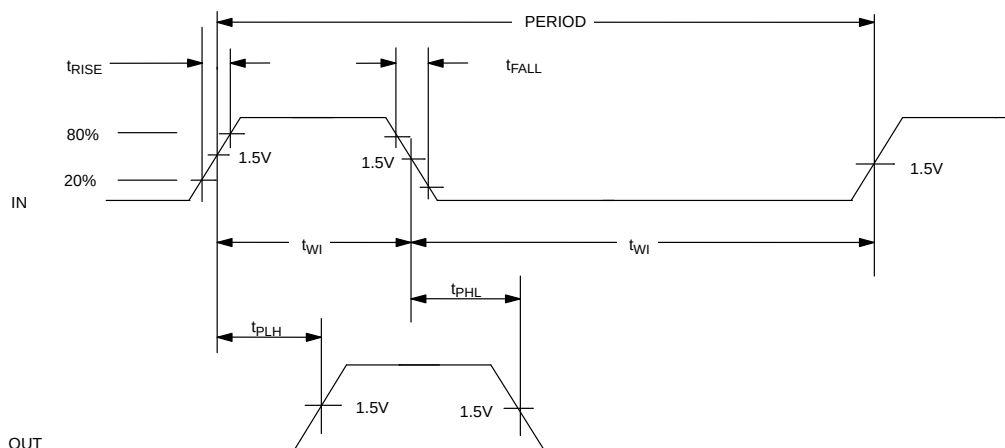
Pulse Period:  $1\text{ }\mu\text{s}$

Output Load Capacitance:  $15\text{ pF}$

Output: Each output is loaded with the equivalent of one 74F04 input gate.

Data is measured at the  $1.5\text{V}$  level on the rising and falling edges.

Note: The above conditions are for test only and do not restrict the devices under other data sheet conditions.

**TIMING DIAGRAM****NOTES:**

1. All voltages are referenced to ground.
2. @  $V_{\text{CC}}=5\text{ volts}$  and  $25^{\circ}\text{C}$ , delay accuracy on both the rising and falling edges within tolerances given in Table 1.
3. Pulse width and duty cycle specifications may be exceeded, however, accuracy will be application sensitive with respect to de-coupling, layout, etc.

**TERMINOLOGY**

**Period:** The time elapsed between the leading edge of the first pulse and the leading edge of the following pulse.

**$t_{WI}$**  (Pulse Width): The elapsed time on the pulse between the 1.5 volt point on the leading edge and the 1.5 volt point on the trailing edge or the 1.5 volt point on the trailing edge and the 1.5 volt point on the leading edge.

**$t_{RISE}$**  (Input Rise Time): The elapsed time between the 20% and the 80% point on the leading edge of the input pulse.

**$t_{FALL}$**  (Input Fall Time): The elapsed time between the 80% and the 20% point on the trailing edge on the input pulse.

**$t_{PLH}$**  (Time Delay, Rising): The elapsed time between the 1.5 volt point on the leading edge of the input pulse and the 1.5 volt point on the leading edge of the output pulse.

**$t_{PHL}$**  (Time Delay, Falling): The elapsed time between the 1.5 volt point on the falling edge of the input pulse and the 1.5 volt point on the falling edge of the output pulse.

