

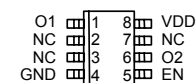
# MONOLITHIC GATED DELAY LINE OSCILLATOR (SERIES 3D3701)



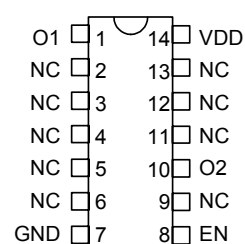
## FEATURES

- All-silicon, low-power CMOS technology
- Vapor phase, IR and wave solderable
- Auto-insertable (DIP pkg.)
- **Frequency range:** 0.3MHz through 100MHz
- **Frequency tolerance:** 0.5% typical
- **Temperature stability:**  $\pm 1.5\%$  typical (-40C to 85C)
- **Vdd stability:**  $\pm 0.5\%$  typical (3.0V to 3.6V)
- 14-pin DIP available as drop-in replacements for hybrid delay line oscillators

## PACKAGES



3D3701Z-xx SOIC-8

3D3701-xx DIP-14  
3D3701K-xx NC pins removed

For mechanical dimensions, click [here](#).  
For package marking details, click [here](#).

## FUNCTIONAL DESCRIPTION

The 3D3701 Delay Line Oscillator product family consists of fixed-frequency CMOS integrated circuit oscillators. Each package contains a single oscillator, which is gated and can therefore be synchronized to an external signal. The device frequency can range from 0.3MHz through 100MHz. The 3D3701 has two outputs that are in phase when the oscillator is running. The 3D3701 is offered in a standard 14-pin auto-insertable DIP and a space saving surface mount 8-pin SOIC package.

## PIN DESCRIPTIONS

EN Oscillator Enable  
O1 Oscillator Output 1  
O2 Oscillator Output 2  
VDD +3.3 Volts  
GND Ground

### TABLE 1: PART NUMBER SPECIFICATIONS

DASH NUMBER	OUTPUT FREQUENCY (MHz)	
	25C Vdd=3.3V	-40C to 85C 3.0V<Vdd<3.6V
-0.3	0.3 $\pm$ 0.002	0.3 $\pm$ 0.008
-0.4	0.4 $\pm$ 0.002	0.4 $\pm$ 0.010
-0.5	0.5 $\pm$ 0.003	0.5 $\pm$ 0.013
-0.75	0.75 $\pm$ 0.004	0.75 $\pm$ 0.019
-1	1.0 $\pm$ 0.005	1.0 $\pm$ 0.025
-2	2.0 $\pm$ 0.010	2.0 $\pm$ 0.050
-2.5	2.5 $\pm$ 0.013	2.5 $\pm$ 0.063
-3	3.0 $\pm$ 0.015	3.0 $\pm$ 0.075
-4	4.0 $\pm$ 0.020	4.0 $\pm$ 0.100
-5	5.0 $\pm$ 0.025	5.0 $\pm$ 0.125
-7.5	7.5 $\pm$ 0.038	7.5 $\pm$ 0.188
-10	10.0 $\pm$ 0.05	10.0 $\pm$ 0.25
-20	20.0 $\pm$ 0.10	20.0 $\pm$ 0.50
-25	25.0 $\pm$ 0.13	25.0 $\pm$ 0.63
-30	30.0 $\pm$ 0.15	30.0 $\pm$ 0.75
-40	40.0 $\pm$ 0.20	40.0 $\pm$ 1.00
-50	50.0 $\pm$ 0.25	50.0 $\pm$ 1.50
-75	75.0 $\pm$ 0.38	75.0 $\pm$ 5.25
-100	100.0 $\pm$ 0.50	100.0 $\pm$ 12.0

NOTE: Any dash number between 0.3 and 100 not shown is also available as standard.

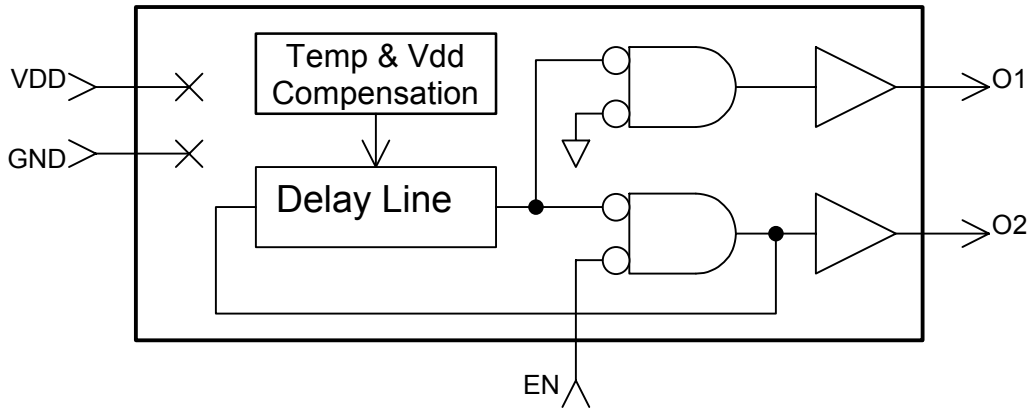
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## APPLICATION NOTES

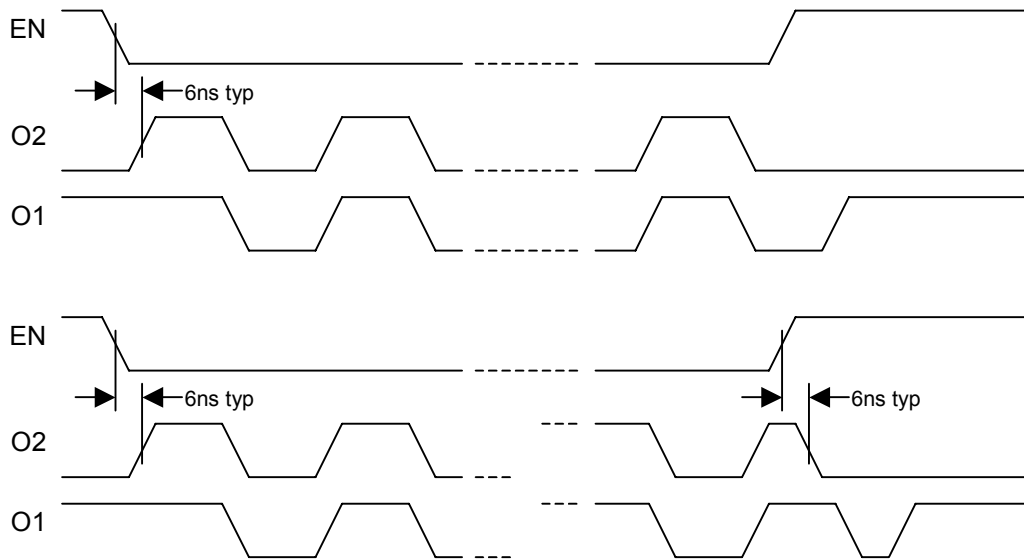
### OPERATIONAL DESCRIPTION

The 3D3701 delay line oscillator architecture is shown in Figure 1. The internal delay line is composed of a number of delay cells connected in series and is compensated for thermal and supply voltage variations. A low-going edge on the EN input starts the oscillator, with the O2 output responding immediately. The O1 output is

delayed by  $\frac{1}{2}$  cycle. The response of the output when the oscillator is disabled depends on the status of O2 when the EN signal goes high, as shown in Figure 2. If O2 is low, it will remain low, and the final pulse on O1 will be  $\frac{1}{2}$  of the period. If O2 is high, it will go low as soon as EN goes high, and the final pulse on both outputs will have a width smaller than  $\frac{1}{2}$  the period.



**Figure 1: 3D3701 Functional Diagram**



**Figure 2: 3D3701 Timing Diagrams**

## APPLICATION NOTES (CONT'D)

### POWER SUPPLY AND TEMPERATURE CONSIDERATIONS

The delay of CMOS integrated circuits is strongly dependent on power supply and temperature. The monolithic 3D3701 oscillator utilizes novel and innovative compensation circuitry to minimize the frequency variations induced by fluctuations in power supply and/or temperature.

The thermal coefficient is reduced to 250 PPM/C, which is equivalent to a variation, over the -40C to 85C operating range, of  $\pm 1.5\%$  from the room-

temperature frequency setting. The power supply coefficient is reduced, over the 3.0V to 3.6V operating range, to  $\pm 0.5\%$  of the frequency setting at the nominal 3.3VDC power supply. These specifications hold for the lower frequencies only. For higher dash numbers, the variations will be slightly greater, as noted in Table 1. **It is essential that the power supply pin be adequately bypassed and filtered. In addition, the power bus should be of as low an impedance construction as possible. Power planes are preferred.**

## DEVICE SPECIFICATIONS

**TABLE 2: ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTES
DC Supply Voltage	$V_{DD}$	-0.3	7.0	V	
Input Pin Voltage	$V_{IN}$	-0.3	$V_{DD}+0.3$	V	
Input Pin Current	$I_{IN}$	-1.0	1.0	mA	25C
Storage Temperature	$T_{STRG}$	-55	150	C	
Lead Temperature	$T_{LEAD}$		300	C	10 sec

**TABLE 3: DC ELECTRICAL CHARACTERISTICS**

(-40C to 85C, 3.0V to 3.6V)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Static Supply Current*	$I_{DD}$		3.5	5.5	mA	
High Level Input Voltage	$V_{IH}$	2.0			V	
Low Level Input Voltage	$V_{IL}$			0.8	V	
High Level Input Current	$I_{IH}$			1.0	$\mu$ A	$V_{IH} = V_{DD}$
Low Level Input Current	$I_{IL}$			1.0	$\mu$ A	$V_{IL} = 0V$
High Level Output Current	$I_{OH}$		-20.0	-4.0	mA	$V_{DD} = 3.0V$ $V_{OH} = 2.4V$
Low Level Output Current	$I_{OL}$	4.0	15.0		mA	$V_{DD} = 3.0V$ $V_{OL} = 0.4V$
Output Rise & Fall Time	$T_R$ & $T_F$		2.0	2.5	ns	$C_{LD} = 5$ pf

\* $I_{DD}(\text{Dynamic}) = 2 * C_{LD} * V_{DD} * F$   
 where:  $C_{LD}$  = Average capacitance load/output (pf)  
 $F$  = Device frequency (GHz)

Input Capacitance = 10 pf typical  
 Output Load Capacitance ( $C_{LD}$ ) = 25 pf max

# SILICON DELAY LINE AUTOMATED TESTING

## TEST CONDITIONS

**INPUT:**

**Ambient Temperature:**  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$   
**Supply Voltage (Vcc):**  $3.3\text{V} \pm 0.1\text{V}$   
**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/Fall Time:** 3.0 ns Max. (measured between 0.6V and 2.4V )

**OUTPUT:**

**R<sub>load</sub>:**  $10\text{K}\Omega \pm 10\%$   
**C<sub>load</sub>:**  $5\text{pf} \pm 10\%$   
**Threshold:** 1.5V (Rising & Falling)



**NOTE:** The above conditions are for test only and do not in any way restrict the operation of the device.

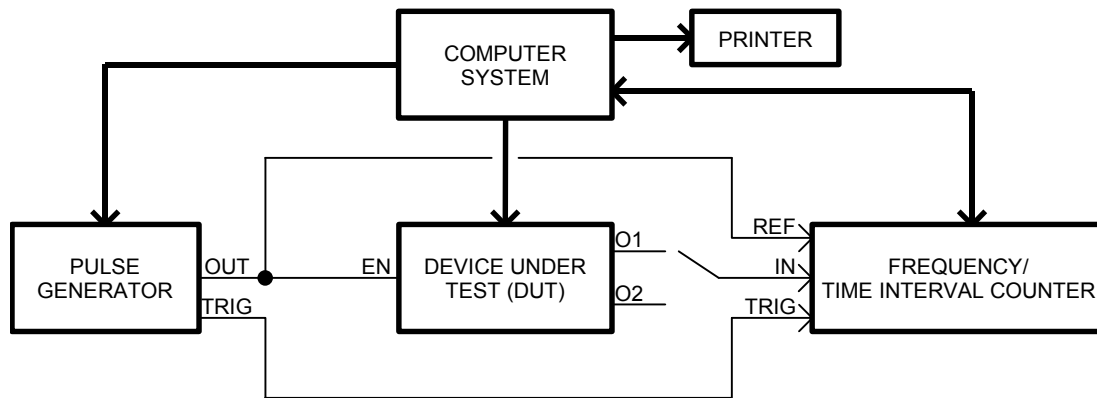


Figure 3: Test Setup

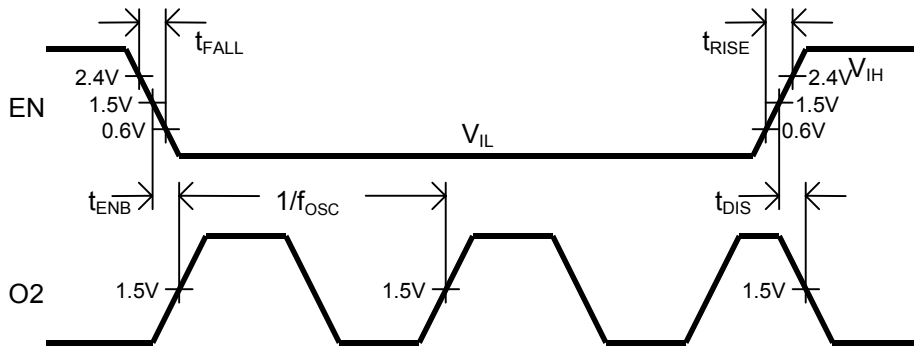


Figure 4: Timing Diagram