National Semiconductor

September 1995

CGS74CT2524
1 to 4 Minimum Skew (300 ps) Clock Driver

General Description

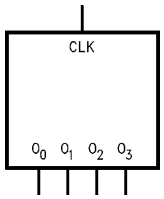
These minimum skew clock drivers are designed for Clock Generation and Support (CGS) applications operating at high frequencies. This device guarantees minimum output skew across the outputs of a given device.

Skew parameters are also provided as a means to measure duty cycle requirements as those found in high speed clocking systems. The CGS74CT2524 is a minimum skew clock driver with one input driving four outputs, specifically designed for signal generation and clock distribution applications.

Features

- Guaranteed 300 ps pin-to-pin skew (t_{OSHL} and t_{OSLH})
- Implemented on National's FACT™ family process
- 1 input to 4 outputs low skew clock distribution
- Symmetric output current drive: 24 mA I_{OH}/I_{OL}
- Industrial temperature of −40°C to +85°C
- 8-pin SOIC package
- Low dynamic power consumption above 20 MHz
- Guaranteed 2 kV ESD protection

Logic Symbol



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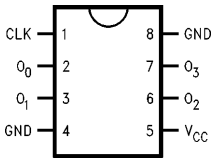
The output pins act as a single entity and will follow the state of the CLK when the clock distribution chip is selected.

Connection Diagrams

Pin Assignment
SOIC (M)



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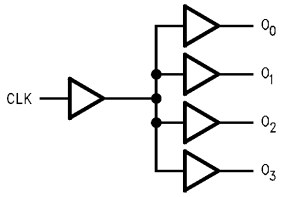

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Pin Description

Pin Names	Descripton
CLK	Clock Input
O_0–O_3	Outputs

Truth Table

Inputs	Outputs
CLK	O_0–O_3
L	L
H	H

L = Low Logic Level
H = High Logic Level

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Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC})			−0.5 to 7.0V
DC Input Voltage Diode Current (I_{IK})			
$V = -0.5V$			−20 mA
$V = V_{CC} + 0.5V$			+20 mA
DC Input Voltage (V_I)			−0.5V to (V_{CC} +0.5V)
DC Output Diode (Current) (I_O)			
$V = -0.5V$			−20 mA
$V = V_{CC} + 0.5V$			+20 mA
DC Output Voltage (V_O)			−0.5V to (V_{CC} +0.5V)
DC Output Source or Sink Current (I_O)			±50 mA
DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND})			±50 mA
Storage Temperature (T_{STG})			−65°C to +150°C
Junction Temperature (θ_{JA})	0	225	500 LFM
M	167	132	117°C/W
N	115	79	62 °C/W

Recommended Operating Conditions

Supply Voltage (V_{CC})	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0 to V_{CC}
Operating Temperature (T_A)	−40°C to +85°C
Input Rise and Fall Times (0.8V to 2.0V)	9.6 ns max

NOTE: *The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the DC and AC Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The Recommended Operating Conditions will define the conditions for actual device operation.*

DC Electrical Characteristics

Over recommended operating conditions unless specified otherwise.

Symbol	Parameter	V_{CC} (V)	CGS74CT2524			Units	Conditions
			$T_A = +25°C$	$T_A = -40°C$ to $+85°C$			
			Typ	Guaranteed Limits			
V_{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
V_{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
V_{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	$V_{IN} = V_{IH}$ $I_{OUT} = -50\ \mu A$
		4.5 5.5		3.86 4.86	3.76 4.76	V	$V_{IN} = V_{IH}$ $I_{OH} = -24$ mA
V_{OL}	Minimum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	$V_{IN} = V_{IL}$ $I_{OUT} = 50\ \mu A$
		4.5 5.5		0.36 0.36	0.44 0.44	V	$V_{IN} = V_{IL}$ $I_{OL} = 24$ mA
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	mA	$V_I = V_{CC}$, GND
I_{CCT}	Maximum I_{CC}/Input	5.5	0.6		1.5	mA	$V_I = V_{CC} - 2.1V$
I_{OLD}	Minimum Dynamic Output Current	5.5			75	mA	$V_{OLD} = 1.65V$ Max
I_{OHD}		5.5			−75	mA	$V_{OHD} = 3.85V$ Min
I_{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	μA	$V_{IN} = V_{CC}$ or GND

AC Electrical Characteristics

Over recommended operating conditions unless specified otherwise. All typical values are measured at $V_{CC} = 5V$, $T_A = 25°C$.

Symbol	Parameter	CGS74CT2524 $V_{CC} = 4.5V$ to $5.5V$, $T_A = -40°C$ to $+85°C$, $C_L = 50$ pF, $R_L = 500\Omega$			Units
		Min	Typ	Max	
t_{PLH}	Low-to-High Propagation Delay CLK to O_n	3.5		9.0	ns
t_{PHL}	High-to-Low Propagation Delay CLK to O_n	3.5		9.0	ns

Extended AC Electrical Characteristics

Over recommended operating conditions unless specified otherwise. All typical values are measured at $V_{CC} = 5V$, $T_A = 25°C$.

Symbol	Parameter	CGS74CT2524 $V_{CC} = 4.5V$ to $5.5V$, $T_A = -40°C$ to $+85°C$, $C_L = 50$ pF, $R_L = 500\Omega$				Units
		Package	Min	Typ	Max	
F_{max}	Maximum Operating Frequency			100		MHz
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation (Note 1)	M M (Note 2) N			300 450 500	ps
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation (Note 1)	M M (Note 2) N			300 450 500	ps
t_{PS}	Maximum Skew Pin (Signal) Transition Variation (Note 3)				1.0	ns
t_{rise} t_{fall}	Rise Time/Fall Time (from 0.8V to 2.0V/2.0V to 0.8V)				1.5	ns
T_{High}	Time High	4				ns
T_{Low}	Time Low	4				ns

Note 1: Output-to-Output Skew is defined as the absolute value of the difference between the actual propagation delay from any outputs within the same packaged device. The specifications apply to any outputs switching in the same direction either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}) or in opposite directions both HL and LH (t_{OST}). t_{OSHL} and t_{OSLH} are characterized and guaranteed by design @1 MHz.

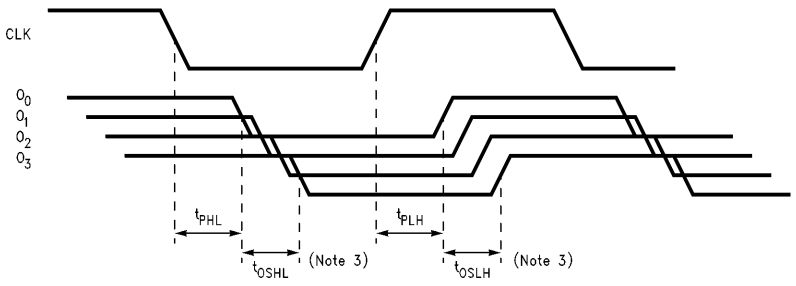
Note 2: Characterized at 66 MHz. Parameter guaranteed by design.

Note 3: Pin transition skew is the absolute difference between High-to-Low and Low-to-High propagation delay measure at a given output pin.

Note 4: Load capacitance includes the test jig.

Timing Diagrams

1 to 4 Min-Skew Clock Driver



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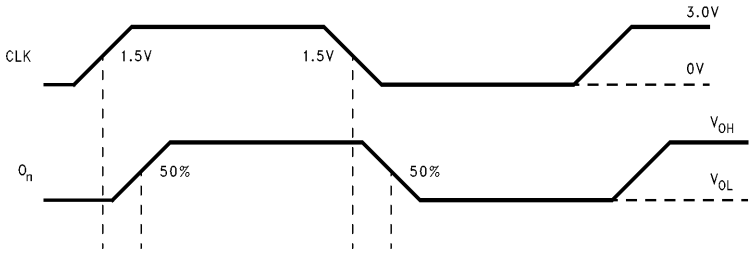

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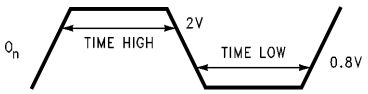

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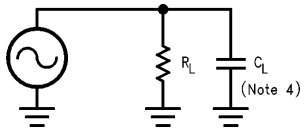
Time high is measured with outputs above 2V.
Time low is measured with outputs below 0.8V.

Test Circuit



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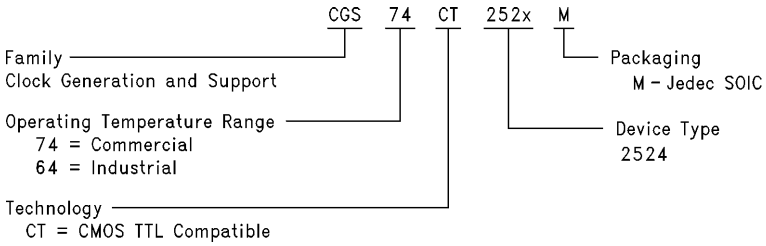
R_L is 500Ω
C_L is 50 pF for all prop delays and skew measurements.

Ordering Information

Contact NSC Marketing for specific data of availability



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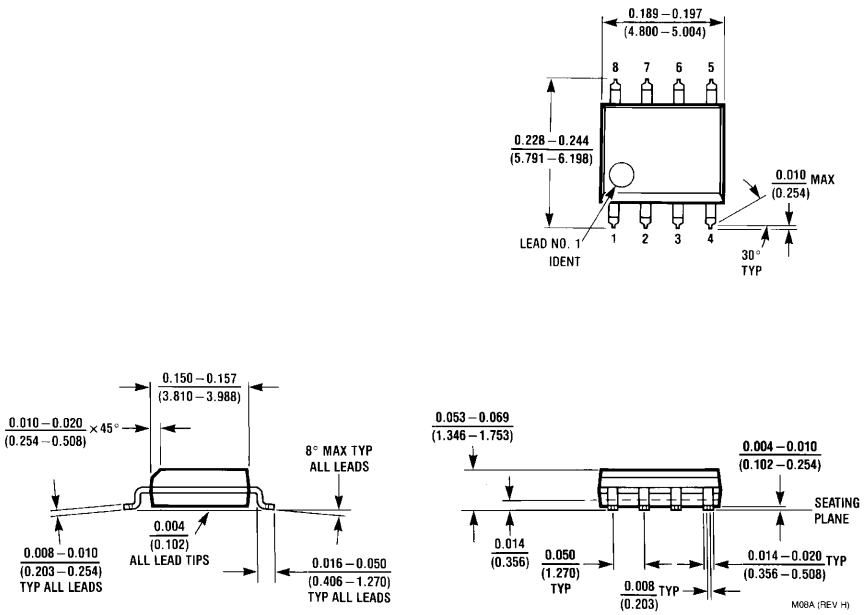
Physical Dimensions inches (millimeters)



8 Lead (0.150″ Wide) Molded Small Outline Package (M)
NS Package Number M08A

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