National Semiconductor

January 2000

CGS74LCT2524
1 to 4 Minimum Skew (300 ps) 3V Clock Driver

General Description

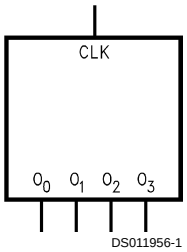
This minimum skew clock driver is a 3V option of the current CGS74CT2524 Minimum Skew Clock Driver and is designed for Clock Generation and Support (CGS) applications operating at low voltage, high frequencies. This device guarantees minimum output skew across the outputs of a given device.

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

Features

- Ideal for low power/low noise high speed applications
- 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: 12 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.

Pin Description

Pin Names	Description
CLK	Clock Input
O_0–O_3	Outputs

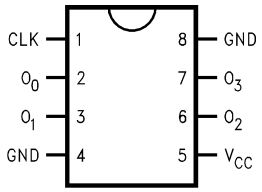
Truth Table

Inputs CLK	Outputs O_0–O_3
L	L
H	H

L = Low Logic Level
H = High Logic Level

Connection Diagrams

Pin Assignment SOIC (MO)



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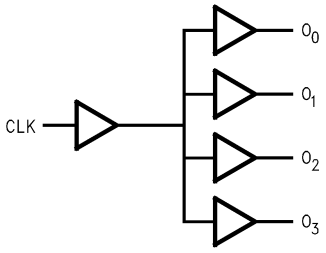

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See NS Package Number M08A

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Absolute Maximum Ratings (Note 1)

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

Supply Voltage (V_{CC})	−0.5V 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})

Airflow	0	225	500 LFM
M	167	132	117 ˚C/W

Recommended Operating Conditions

Supply Voltage (V_{CC})	3.0V to 3.6V
Input Voltage (V_{IN})	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
Industrial	−40˚C to +85˚C
Commercial	0˚C to +70˚C
Input Rise and Fall Times (0.8V to 2.0V)	9.6 ns max

Note 1: *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	Conditions	V_{CC} (V)	CGS74LCT2524			Units
				T_A = +25˚C	T_A = −40˚C to +85˚C		
				Typ	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage	V_{OUT} = 0.1V or V_{CC} − 0.1V	3.3	1.5	2.0	2.0	V
V_{IL}	Maximum Low Level Input Voltage	V_{OUT} = 0.1V or V_{CC} − 0.1V	3.3	1.5	0.8	0.8	V
V_{OH}	Minimum High Level Output Voltage	V_{IN} = V_{IL} or V_{IH}, I_{OUT} = −50 µA	3.3		2.9	2.9	V
		V_{IN} = V_{IL} or V_{IH}, I_{OH} = −12 mA	3.3		2.5	2.4	V
V_{OL}	Minimum Low Level Output Voltage	V_{IN} = V_{IL} or V_{IH}, I_{OUT} = 50 µA	3.3		0.1	0.1	V
		V_{IN} = V_{IL} or V_{IH}, I_{OL} = −12 mA	3.3		0.3	0.4	V
I_{IN}	Maximum Input Leakage Current	V_{IN} = V_{CC}, GND	3.6		±0.1	±1.0	µA
I_{CCT}	Maximum I_{CC}/Input	V_{IN} = 2.4V	3.6			100	µA
I_{OLD}	Minimum Dynamic Output Current	V_{OLD} = 0.8V (max)	3.6			36	mA
I_{OHD}		V_{OHD} = 2.0V (min)	3.6			−25	mA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND	3.6		2.5	10	µA

AC Electrical Characteristics

Over recommended operating conditions unless specified otherwise. All typical values are measured at V_{CC} = 3.3V, T_A = 25˚C

Symbol	Parameter	LCT2524 V_{CC} = 3.0V to 3.6V, T_A = −40˚C to +85˚C, C_L = 50 pF, R_L = 500Ω			Units
		Min	Typ	Max	
t_{PLH}	Low-to-High Propagation Delay CLK to O_n	6		15.0	ns
t_{PHL}	High-to-Low Propagation Delay CLK to O_n	6		15.0	ns

Extended AC Electrical Characteristics

Over recommended operating conditions unless specified otherwise. All typical values are measured at V_{CC} = 3.3V, T_A = 25˚C

Symbol	Parameter	LCT2524 V_{CC} = 3.0V to 3.6V, T_A = −40˚C to +85˚C, C_L = 50 pF, R_L = 500Ω			Units
		Min	Typ	Max	
f_{max}	Maximum Operating Frequency		75		MHz
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation (Note 2)			300	ps
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation (Note 2)			300	ps
t_{PS}	Maximum Skew Pin (Signal) Transition Variation (Note 3)			2.5	ns
t_{RISE} t_{FALL}	Rise Time/Fall Time (from 0.8V to 2.0V/2.0V to 0.8V)			1.75	ns
T_{HIGH}	Time High	4			ns
T_{LOW}	Time Low	4			ns

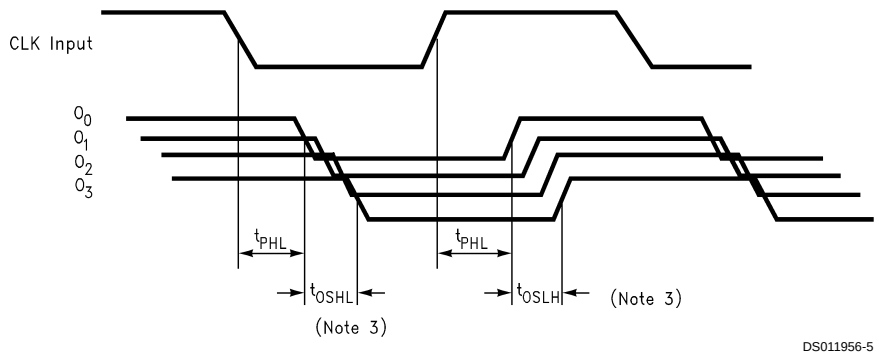
Note 2: Output-to-Output Skew is defined as the absolute value of the difference between the actual propagation delay for any outputs within the same packaged device. The specifications apply to any outputs switching in the same direction either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}) or in opposite directions both HL and LH (t_{OST}). Limits are characterized and guaranteed by design @ 66 MHz.

Note 3: Pin transition skew is the absolute difference between HIGH-to-LOW and LOW-to-HIGH propagation delay, measured at a given output pin.

Note 4: Refer to Minimum Skew Parameters Measurement Information Chart for definitions of each skew specification.

Note 5: Load capacitance includes the test jig.

Timing Diagrams



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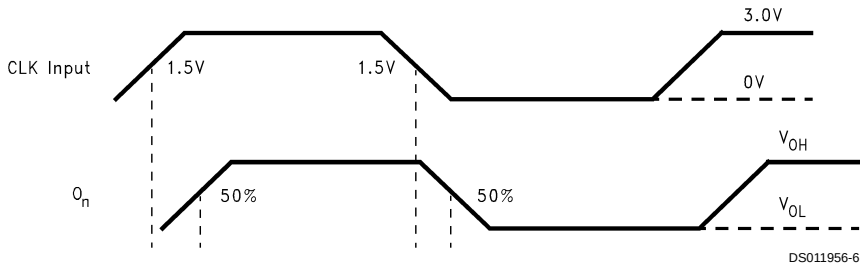
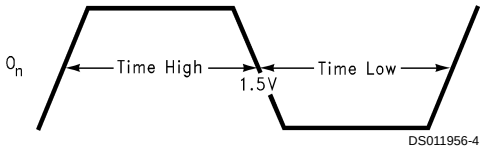
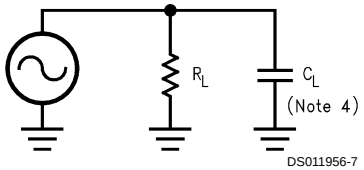
Timing Diagrams (Continued)



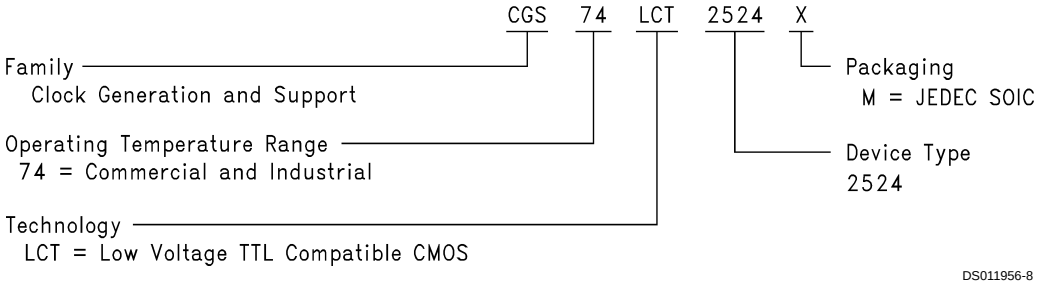


Test Circuit

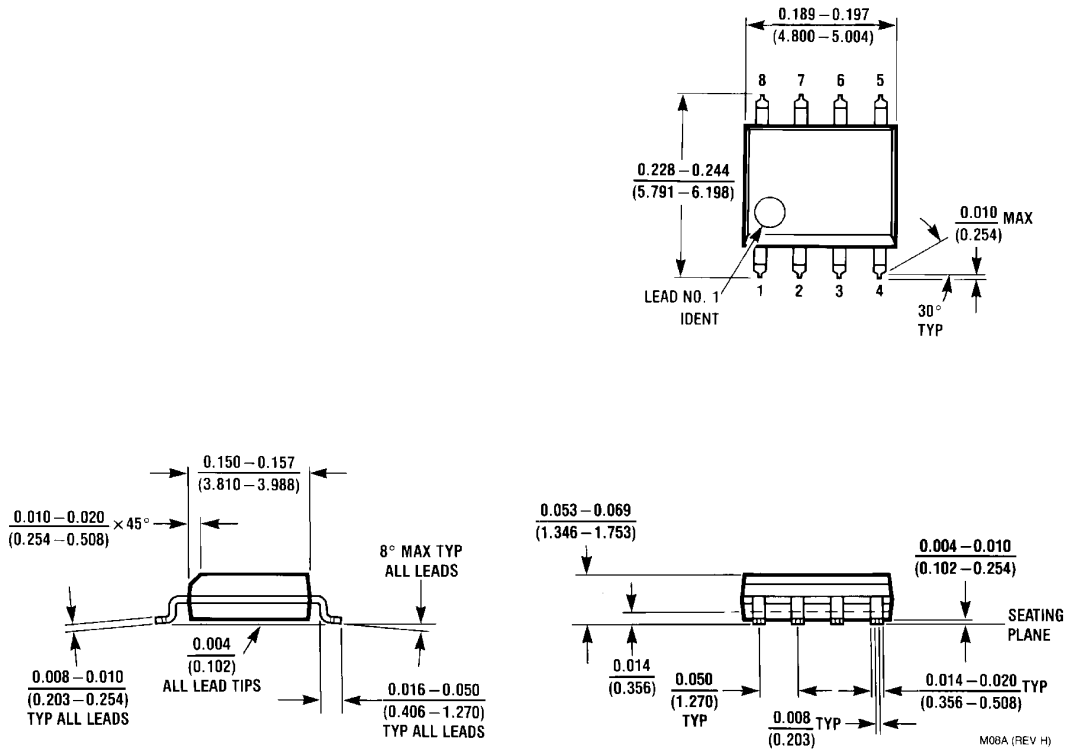


R_L is 500Ω
C_L is 50 pF for all propagation delays and skew measurements.

Ordering Information (Contact NSC Marketing for specific date of availability)



Physical Dimensions inches (millimeters) unless otherwise noted



8-Lead (0.150" Wide) Molded Small Outline Package, JEDEC
Order Number CGS74LCT2524M
NS Package Number M08A

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