National Semiconductor

September 1995

CGS74CT2527
1-to-8 Minimum Skew (300 ps) Clock Driver

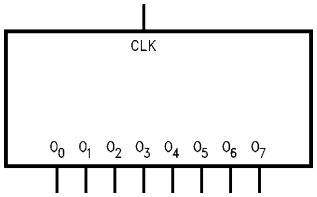
General Description

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. The '2527 is a minimum skew clock driver with one input driving eight outputs, specifically designed for clock distribution applications.

Features

- Guaranteed and tested:
  300 ps Pin-to-pin skew (t_{OSHL} and t_{OSLH})
- High performance version of existing CGS74CT2525
- Implemented on National's FACT™ family process
- 1 input to 8 outputs low skew clock distribution
- Symmetric output current drive: 24 mA I_{OH}/I_{OL}
- Industrial temperature of −40°C to +85°C
- 28 pin PLCC for optimum skew performance
- Guaranteed 2K volts ESD protection

Logic Symbols



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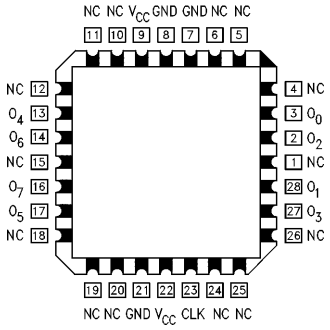
Connection Diagram

Pin Assignment for PLCC



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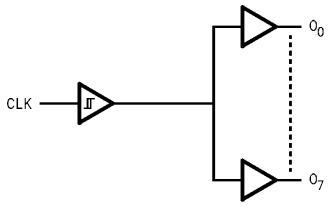
Functional Description

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

Pin Description

Pin Names	Description
CLK	Clock Input
O_0–O_7	Outputs



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Truth Table

Inputs	Outputs
CLK	O_0–O_7
L	L
H	H

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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})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_i = −0.5V	−20 mA
V_i = 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_o = 0.5V	−20 mA
V_o = 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})	
PLCC (0 LFM Air Flow)	71°C/W
PLCC (225 LFM Air Flow)	53°C/W
PLCC (500 LFM Air Flow)	47°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)	0V 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: *Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of CGS circuits outside databook specifications.*

DC Electrical Characteristics for CGS74CT Family Devices

Over recommended operating conditions unless specified otherwise.

Symbol	Parameter	V_{CC} (V)	CGS74CT T_A = +25°C		CGS74CT T_A = −40°C to +85°C	Units	Conditions
			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 (Note 1)	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	V_{IN} = V_{IH} I_{OUT} = −50 μA
		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 (Note 1)	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	V_{IN} = V_{IL} I_{OUT} = 50 μA
		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 (Note 2)	5.5			75	mA	V_{OLD} = 1.65V Max
I_{OHD}		5.5			−75	mA	V_{OHD} = 3.85V Min
I_{CC}	Minimum Quiescent Supply Current	5.5		8.0	80.0	μA	V_{IN} = V_{CC} or GND

Note 1: All outputs loaded; thresholds on input associated with output under test.

Note 2: Maximum test duration 2.0 ms, one output loaded at a time.

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	CGS74CT2527			Units
		$V_{CC} = 4.5V$ to $5.5V$ $T_A = -40°C$ to $+85°C$ $C_L = 50$ pF $R_L = 500\Omega$			
		Min	Typ	Max	
f_{MAX}	Maximum Frequency		100		MHz
t_{PLH}	Low-to-High Propagation Delay CLK to O_n	3.0		10.5	ns
t_{PHL}	High-to-Low Propagation Deay CLK to O_n	3.0		10.5	ns
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation (Note 3)		150	300	ps
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation (Note 3)		150	300	ps
t_{rise}, t_{fall}	Rise/Fall Time (from 0.8V/2.0V to 2.0V/0.8V)			1.5	ns
T_{High}	Time High	4			ns
T_{Low}	Time Low	4			ns

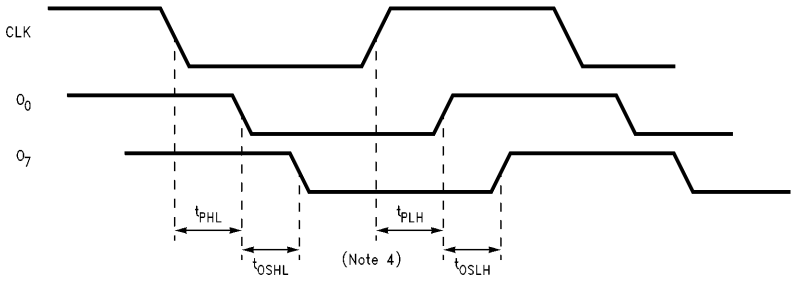
Note 3: Output-to-Output Skew is defined as the absolute value of the difference between the actual propagation delay for any outputs within the same packaged device. The specifications apply to any outputs switching in the same direction either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}) or in opposite directions both HL and LH (t_{OST}). Characterized at 1 MHz and 66 MHz, Parameter guaranteed by design.

Note 4: Refer to Test philopophy and definitions section for skew specifications.

Note 5: Load capacitance includes the test jig.

Timing Diagrams

1 to 8 Min-Skew Clock Driver



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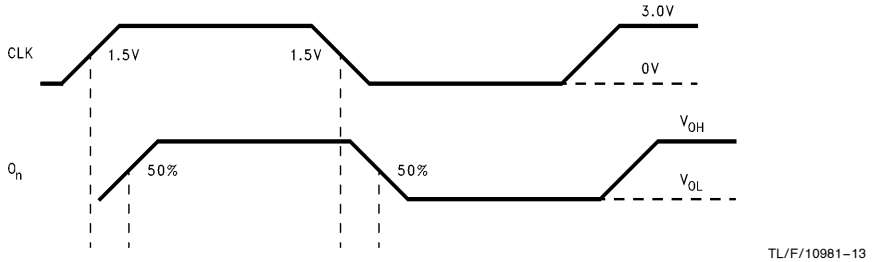

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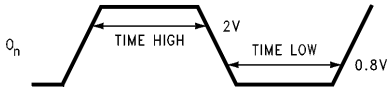

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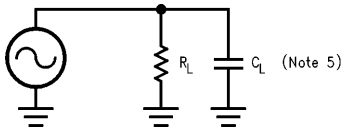
Test Circuit



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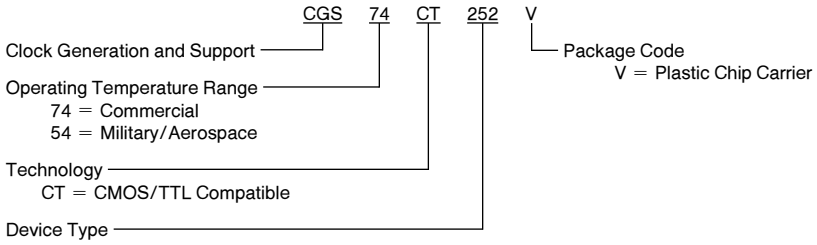
R_L is 500Ω

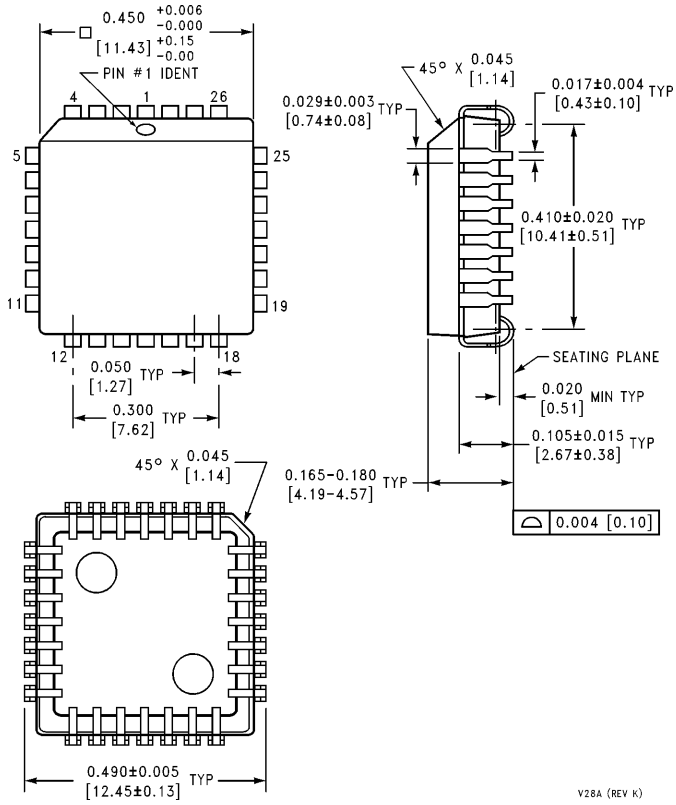
C_L is 50 pF for all prop delays and skew measurements.

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



Physical Dimensions inches (millimeters)



28-Lead Plastic Chip Carrier (PLCC)
NS Package Number V28A

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