National Semiconductor

CGS64/74B2528 550 ps 1 to 10 Minimum Skew Clock Driver

General Description

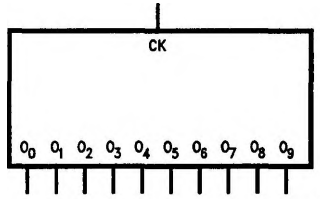
These minimum skew clock drivers are designed for Clock Generation & Support (CGS) applications operating above 50 MHz. This device guarantees minimum output skew across the outputs of a given device. Skew parameters are also provided as a means to measure duty cycle requirements as those found in high speed clocking systems. The '2528 is a minimum skew clock driver with one input driving ten outputs, specifically designed for signal generation and clock distribution applications.

Features

- Clock Generation & Support (CGS) devices ideal for high frequency signal generation or clock distribution applications
- CGS64/74B version features National's Advanced Bipolar FAST® LSI process
- 1-to-10 low skew clock distribution
- 550 ps pin-to-pin output skew for the PCC package
- Specification for transition skew to meet duty cycle requirements
- 28-pin centered V_{CC} and GND configuration or PLCC to minimize high speed switching noise
- Current sourcing 48 mA and current sinking of 64 mA
- Low dynamic power consumption above 20 MHz
- Guaranteed 4K volts ESD protection
- Commercial and Industrial temperature availability

Ordering Code: See Section 5

Logic Symbol



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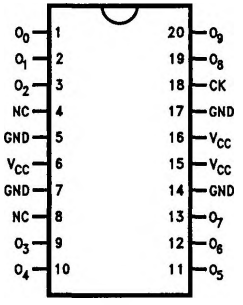
Connection Diagrams

Pin Assignment for DIP and SOIC



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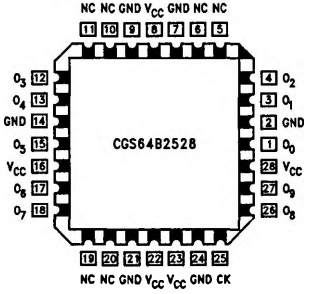
Pin Assignment for LCC



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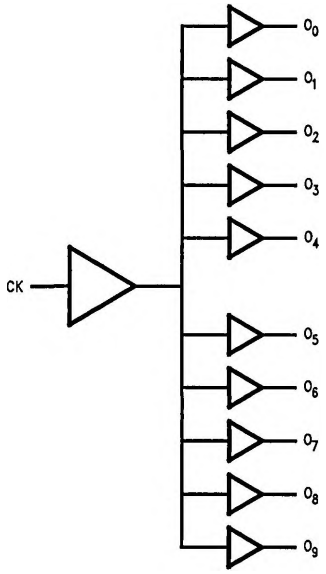
Pin Description

Pin Names	Description
CK	Clock Input ('2528)
O_0–O_9	Outputs

Truth Tables

Inputs	Outputs
CK	**O_0–O_9**
L	L
H	H

L = Low Logic Level
H = High Logic Level
X = Immaterial



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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})		7.0V
Input Voltage (V_I)		7.0V
Operating Temperature	64 Grade	−40°C to +85°C
	74 Grade	0°C to +70°C
Storage Temperature Range		−65°C to +150°C

Typical θ_{JA}	M	N	V	
0 LFM	89	71	64	°C/W
225 LFM	71	57	52	°C/W
500 LFM	63	48	45	°C/W

Recommended Operating Conditions

Supply Voltage (V_{CC})	4.5V to 5.5V
High Level Input Voltage (V_{IH})	2V
Low Level Input Voltage (V_{IL})	0.8V
High Level Output Current (I_{OH})	−48 mA
Low Level Output Current (I_{OL})	64 mA
Free Air Operating Temperature 64 (T_A)	−40°C to +85°C
Free Air Operating Temperature 74 (T_A)	−0°C to +70°C

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 free air temperature range. All typical values are measured at V_{CC} = 5V, T_A = 25°C.

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_{IK}	Input Clamp Voltage	V_{CC} = 4.5V, I_I = −18 mA				−1.2	V
V_{OH}	High Level Output Voltage	I_{OH} = −3 mA, V_{CC} = 4.5V		2.4			V
		I_{OH} = 48 mA, V_{CC} = 4.5V		2.0			
V_{OL}	Low Level Output Voltage	V_{CC} = 4.5V, I_{OL} = 64 mA			0.35	0.5	V
I_I	Input Current @ Max Input Voltage	V_{CC} = 5.5V, V_{IH} = 7V				0.1	mA
I_{IH}	High Level Input Current	V_{CC} = 5.5V, V_{IH} = 2.7V				20	μA
I_{IL}	Low Level Input Current	V_{CC} = 5.5V, V_{IL} = 0.4V			−0.5	−0.75	mA
I_O	Output Drive Current	V_{CC} = 5.5V, V_O = 2.25V		−50		−150	mA
I_{CC}	Supply Current	V_{CC} = 5.5V	Outputs High		24	35	mA
			Outputs Low		45	65	mA
C_{IN}	Input Capacitance	V_{CC} = 5V			5		pF

AC Electrical Characteristics

Over recommended operating free air temperature range. All typical values are measured at V_{CC} = 5V, T_A = 25°C.

Symbol	Parameter	V_{CC} = 4.5V to 5.5V C_L = 50 pF R_L = 500Ω			Units
		Min	Typ	Max	
f_{MAX}	Frequency Maximum		80		MHz
t_{PLH}	Low-to-High Propagation Delay CK to O_n ('2528) M, N	3.0	4.5	7.0	ns
	Low-to-High Propagation Delay CK to O_n ('2528) V	2.5	4.5	6.5	
t_{PHL}	High-to-Low Propagation Delay CK to O_n ('2528) M, N	3.0	4.5	7.0	ns
	High-to-Low Propagation Delay CK to O_n ('2528) V	2.5	4.5	6.5	

Extended AC Electrical Characteristics

Over recommended operating free air temperature range. All typical values are measured at V_{CC} = 5V, T_A = 25°C.

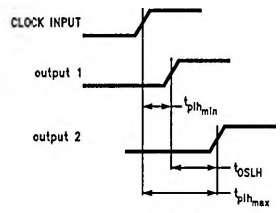
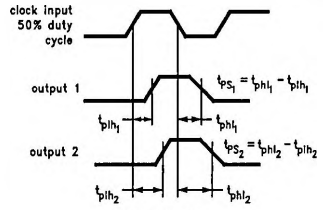
Symbol	Parameter	Package	V_{CC}* (V)	V_{CC} = 4.5V to 5.5V C_L = 50 pF R_L = 500Ω			Units
				Min	Typ	Max	
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation	N M V	5.0		0.15	800 650 550	ps
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation	N M V	5.0		0.15	800 650 550	ps
t_{PS}	Maximum Skew Pin (Signal) Transition Variation	N M V	5.0		0.6	750 750 850	ps
t_{rise}, t_{fall}	Rise/Fall Time (from 0.8V/2.0V to 2.0V/0.8V)	CGS74	5.0			1.5	ns
		CGS64	5.0			1.75	

*Voltage Range 5.0 is 5.0V ±0.5V

Note: t_{OSHL} and t_{OSLH} parameters are being tested and guaranteed at 1 MHz for V package. In addition V package is guaranteed by design at 66 MHz until Oct. 1993, when it will be fully production tested.

Minimum Skew Parameters

Parameter Measurement Information (Preliminary)

Definition	Example	Significance
t_{OSHL}, t_{OSLH} **Common Edge Skew:** Output Skew for HIGH-to-LOW Transitions: $t_{OSHL} = \lvert t_{PHL_{max}} - t_{PHL_{min}} \rvert$ Output Skew for LOW-to-HIGH Transitions: $t_{OSLH} = \lvert t_{PLH_{max}} - t_{PLH_{min}} \rvert$ Propagation delays are measured across the outputs of any given device.	 **FIGURE A**	• t_{OS}, Output Skew or Common Edge Skew • Skew parameter to observe propagation delay differences in applications requiring synchronous data/clock operations.
t_{PS} **Pin Skew or Transition Skew:** $t_{PS} = \lvert t_{PHL_i} - t_{PLH_i} \rvert$ Both HIGH-to-LOW and LOW-to-HIGH propagation delays are measured at each output pin across the given device. T_{PS} is the maximum difference for outputs I = 1 8 to within a device package.	 **FIGURE B**	• t_{PS}, Pin Skew or Transition Skew • Skew parameter to observe duty cycle degradation of any output signal (pin).