National Semiconductor

September 1995

CGS64/74B2528 450 ps 1 to 10 Minimum Skew Clock Driver

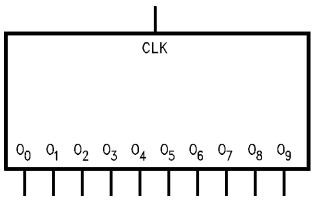
General Description

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
- 450 ps pin-to-pin output skew for the PLCC package
- Specification for transition skew to meet duty cycle requirements
- 28-pin centered V_{CC} and GND configuration for 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

Logic Symbol



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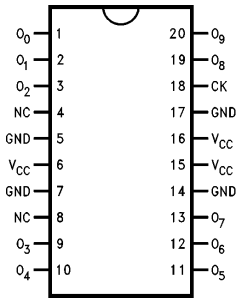
Connection Diagrams

Pin Assignment for DIP and SOIC



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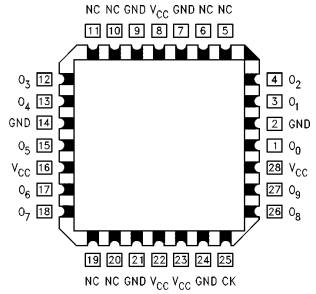
Pin Assignment for PLCC



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RRD-B30M115/Printed in U. S. A.

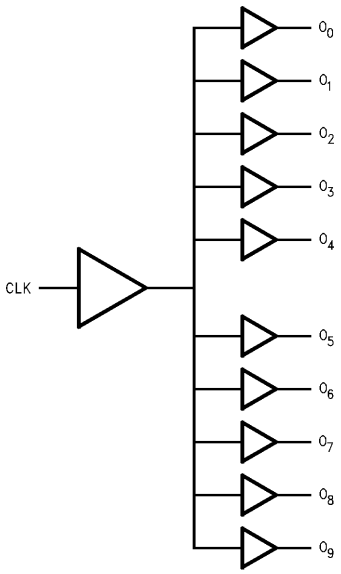
Pin Description

Pin Names	Description
CLK	Clock Input
O_0–O_9	Outputs

Truth Tables

Inputs	Outputs
CLK	**O_0–O_9**
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})		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
Input Rise and Fall Times (0.8V to 2.0V)	9.6 ns max
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 conditions unless specified otherwise. 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_{IH}	Minimum Input High Level Voltage			2.0			V
V_{IL}	Maximum Input Low Level Voltage					0.8	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 conditions unless specified otherwise. 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 $R_L = 500\Omega$			Units
		Min	Typ	Max	
f_{MAX}	Frequency Maximum		80		MHz
t_{PLH}	Low-to-High Propagation Delay CLK to O_n M, N Pkg.	3.0	4.5	7.0	ns
	Low-to-High Propagation Delay CLK to O_n V Pkg.	2.5	4.5	6.5	
t_{PHL}	High-to-Low Propagation Delay CLK to O_n M, N Pkg.	3.0	4.5	7.0	ns
	High-to-Low Propagation Delay CLK to O_n V Pkg.	2.5	4.5	6.5	

Extended AC Electrical Characteristics

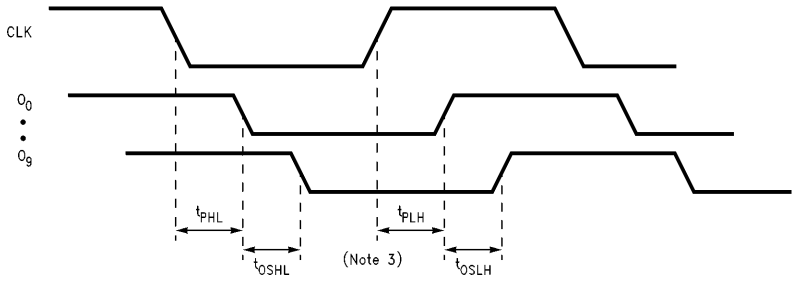
Over recommended operating conditions unless specified otherwise. All typical values are measured at $V_{CC} = 5V$, $T_A = 25°C$.

Symbol	Parameter		$V_{CC} = 4.5V$ to $5.5V$ $C_L = 50$ pF $R_L = 500\Omega$			Units
		Package	Min	Typ	Max	
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation (Note 1)	N M V (Note 2)			700 450 450 550	ps
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation (Note 1)	N M V (Note 2)			700 450 450 550	ps
t_{PS}	Maximum Skew Pin (Signal) Transition Variation	N M V			750 750 850	ps
t_{rise}, t_{fall}	Rise/Fall Time (from 0.8V/2.0V to 2.0V/0.8V)	CGS74			1.5	ns
		CGS64			1.75	

Note 1: t_{OSHL} and t_{OSLH} characterized and guaranteed by design @ 1 MHz.

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

Timing Diagrams



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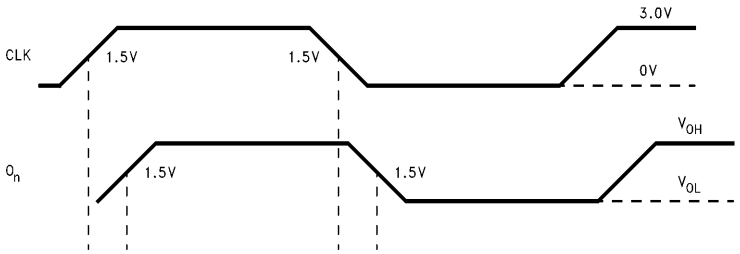

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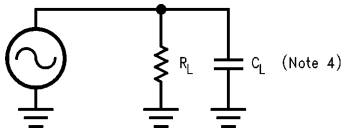
Test Circuit



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R_L is 500Ω

C_L is 50 pF for all prop delays and skew measurements

Note 3: Refer to Test Philosophy and Definitions section for skew specifications.

Note 4: Load capacitance includes the test jig.

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

CGS 74 B 252X WM

Family
Clock Generation & Support

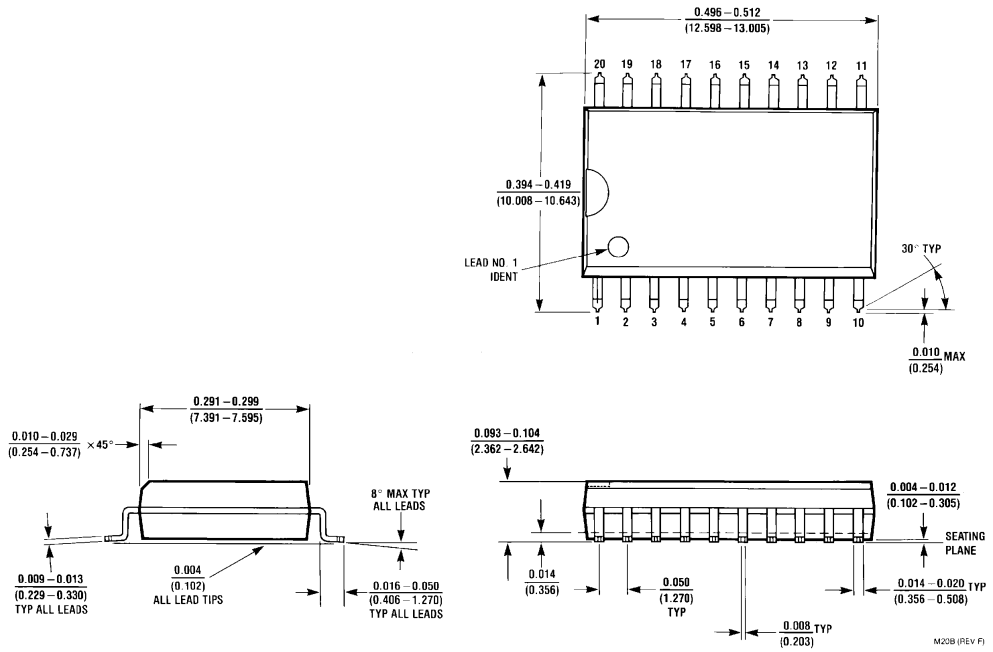
Operating Temperature Range
74 = Commercial
64 = Industrial

Technology
B = Bipolar

Device Type
2528

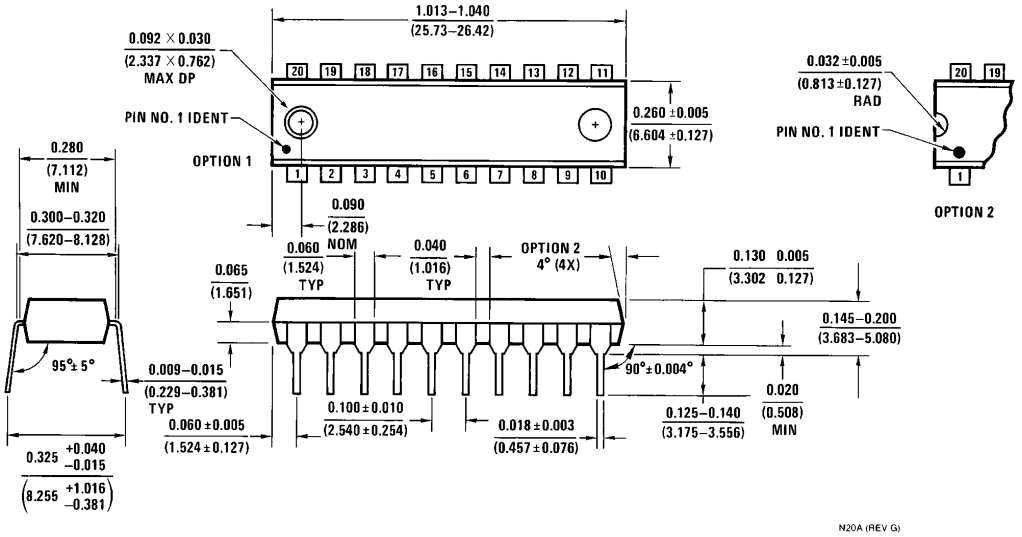
Packaging
WM = JEDEC SOIC
V = PLCC
N = Plastic DIP
DWF = Die Wafer Form

Physical Dimensions inches (millimeters)



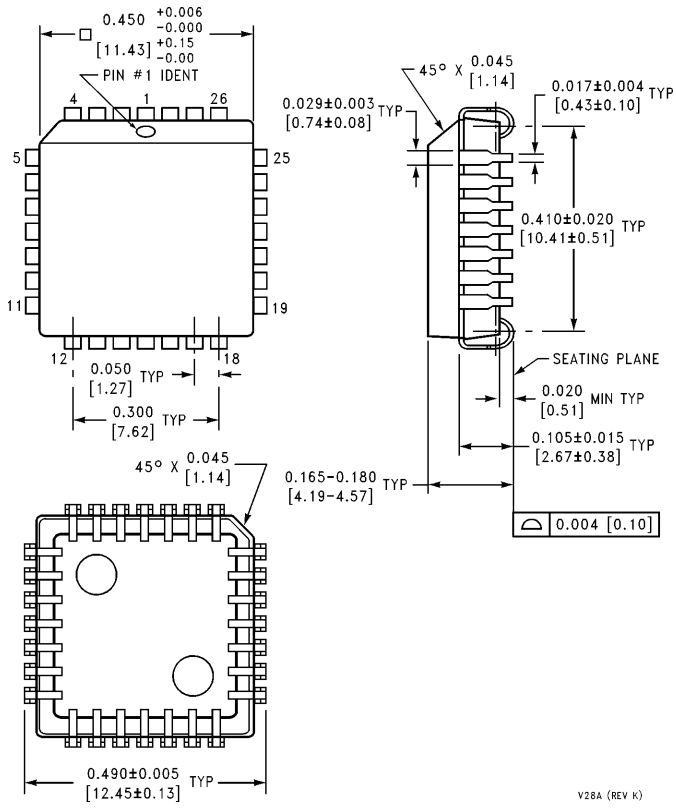
20-Lead Molded Package
(Small Outline 0.300 Wide) (WM)
NS Package Number M20B

Physical Dimensions inches (millimeters) (Continued)



20-Lead Molded Dual-On-Line Package (N)
NS Package Number N20A

Physical Dimensions inches (millimeters) (Continued)



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

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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