

## Low-Skew Quad Clock Driver

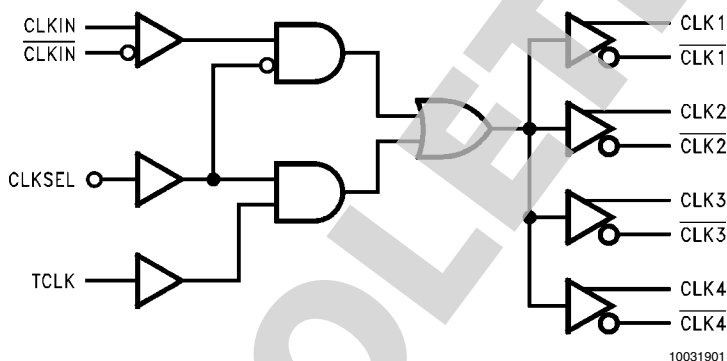
### General Description

The 100315 contains four low skew differential drivers, designed for generation of multiple, minimum skew differential clocks from a single differential input. This device also has the capability to select a secondary single-ended clock source for use in lower frequency system level testing. The 100315 is a 300 Series redesign of the 100115 clock driver.

### Features

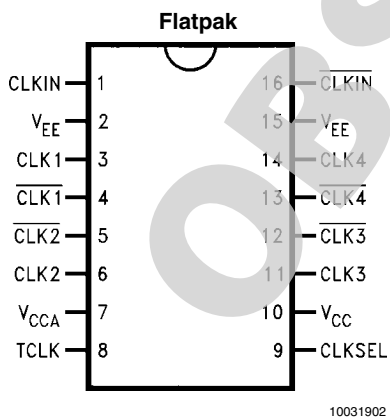
- Low output to output skew ( $\leq 50$  ps)
- Differential inputs and outputs
- Secondary clock available for system level testing
- 2000V ESD protection
- Voltage compensated operating range:  $-4.2V$  to  $-5.7V$
- Standard Microcircuit Drawing (SMD) 5962-9469601

### Logic Diagram



10031901

### Connection Diagram



10031902

Pin Names	Description
CLKIN, $\overline{CLKIN}$	Differential Clock Inputs
CLK <sub>1-4</sub> , $\overline{CLK}_{1-4}$	Differential Clock Outputs
TCLK	Test Clock Input ( <i>Note 1</i> )
CLKSEL	Clock Input Select ( <i>Note 1</i> )

**Note 1:** TCLK and CLKSEL are single-ended inputs, with internal 50 k $\Omega$  pulldown resistors.

### Truth Table

CLKSEL	CLKIN	$\overline{CLKIN}$	TCL K	CLK <sub>N</sub>	$\overline{CLK}_N$
L	L	H	X	L	H
L	H	L	X	H	L
H	X	X	L	L	H
H	X	X	H	H	L

L = Low Voltage Level  
H = High Voltage Level  
X = Don't Care

## Absolute Maximum Ratings *(Note 2)*

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

Above which the useful life may be impaired

Storage Temperature	-65°C to +150°C
Maximum Junction Temperature (T <sub>J</sub> )	
Ceramic	+175°C
Case Temperature under Bias (T <sub>C</sub> )	-55°C to +125°C
V <sub>EE</sub> Pin Potential to Ground Pin	-7.0V to +0.5V
Input Voltage (DC)	V <sub>CC</sub> to +0.5V
Output Current (DC Output HIGH)	-50 mA
Operating Range (Note 2)	-5.7V to -4.2V
ESD <i>(Note 3)</i>	≥2000V

## Military Version DC Electrical Characteristics

V<sub>EE</sub> = -4.2V to -5.7V, V<sub>CC</sub> = V<sub>CCA</sub> = GND *(Note 6)*

Symbol	Parameter	Min	Typ	Max	Units	T <sub>C</sub>	Conditions	Notes	
V <sub>OH</sub>	Output HIGH Voltage	-1025		-870	mV	0°C to +125°C	V <sub>IN</sub> = V <sub>IH(Max)</sub> or V <sub>IL(Min)</sub>	Loading with 50Ω to -2.0V	<i>(Note 4, Note 5, Note 6)</i>
		-1085		-870	mV	-55°C			
V <sub>OL</sub>	Output LOW Voltage	-1830		-1620	mV	0°C to +125°C	V <sub>IN</sub> = V <sub>IH(Min)</sub> or V <sub>IL(Max)</sub>	Loading with 50Ω to -2.0V	<i>(Note 4, Note 5, Note 6)</i>
		-1830		-1555	mV	-55°C			
V <sub>OHC</sub>	Output HIGH Voltage	-1035			mV	0°C to +125°C	V <sub>IN</sub> = V <sub>IH(Min)</sub> or V <sub>IL(Max)</sub>	Loading with 50Ω to -2.0V	<i>(Note 4, Note 5, Note 6)</i>
		-1085			mV	-55°C			
V <sub>OLC</sub>	Output LOW Voltage			-1610	mV	0°C to +125°C	V <sub>IN</sub> = V <sub>IH(Min)</sub> or V <sub>IL(Max)</sub>	Loading with 50Ω to -2.0V	<i>(Note 4, Note 5, Note 6)</i>
				-1555	mV	-55°C			

## Recommended Operating Conditions

Case Temperature (T<sub>C</sub>)

Military

-55°C to +125°C

Supply Voltage (V<sub>EE</sub>)

-5.7V to -4.2V

**Note 2:** Absolute maximum ratings are those values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 3:** ESD testing conforms to MIL-STD-883, Method 3015.

## DC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$  (Note 6)

Symbol	Parameter	Min	Typ	Max	Units	$T_C$	Conditions	Notes
$V_{DIFF}$	Input Voltage Differential	150			mV	$-55^{\circ}C$ to $+125^{\circ}C$	Required for Full Output Swing	(Note 4, Note 5, Note 6)
$V_{CM}$	Common Mode Voltage	$V_{CC} - 2.0$		$V_{CC} - 0.5$	V	$-55^{\circ}C$ to $+125^{\circ}C$		(Note 4, Note 5, Note 6)
$V_{IH}$	Single-Ended Input High Voltage	-1165		-870	mV	$-55^{\circ}C$ to $+125^{\circ}C$	Guaranteed HIGH Signal for All Inputs	(Note 4, Note 5, Note 6, Note 7)
$V_{IL}$	Single-Ended Input Low Voltage	-1830		-1475	mV	$-55^{\circ}C$ to $+125^{\circ}C$	Guaranteed LOW Signal for All Inputs	(Note 4, Note 5, Note 6, Note 7)
$I_{IH}$	Input HIGH Current CLKIN, $\overline{CLKIN}$			150	$\mu A$	$-55^{\circ}C$ to $+125^{\circ}C$	$V_{IN} = V_{IH(Max)}$	(Note 4, Note 5, Note 6)
	TCLK			450	$\mu A$			
	CLKSEL			380	$\mu A$			
$I_{CBO}$	Input Leakage Current	-10			$\mu A$	$-55^{\circ}C$ to $+125^{\circ}C$	$V_{IN} = V_{EE}$	(Note 4, Note 5, Note 6)
$I_{EE}$	Power Supply Current, Normal	-80		-25	mA	$-55^{\circ}C$ to $+125^{\circ}C$		(Note 4, Note 5, Note 6)

**Note 4:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals  $-55^{\circ}C$ ), then testing immediately without allowing for the junction temperature to stabilize due to heat dissipation after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 5:** Screen tested 100% on each device at  $-55^{\circ}C$ ,  $+25^{\circ}C$ , and  $+125^{\circ}C$ , Subgroups 1, 2, 3, 7, and 8.

**Note 6:** Sample tested (Method 5005, Table I) on each manufactured lot at  $-55^{\circ}C$ ,  $+25^{\circ}C$ , and  $+125^{\circ}C$ , Subgroups A1, 2, 3, 7, and 8.

**Note 7:** Guaranteed by applying specified input condition and testing  $V_{OH}/V_{OL}$ .

## AC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$

Symbol	Parameter	$T_C = -55^{\circ}C$		$T_C = +25^{\circ}C$		$T_C = +125^{\circ}C$		Units	Conditions	Notes
		Min	Max	Min	Max	Min	Max			
$t_{PLH}$	Propagation Delay CLKIN, $\overline{CLKIN}$ to $CLK_{(1-4)}$ , $\overline{CLK}_{(1-4)}$	0.58	0.88	0.63	0.88	0.72	1.02	ns	Figures 1, 2	(Note 8, Note 9, Note 10)
$t_{PHL}$										
$t_{PLH}$	Propagation Delay, TCLK to $CLK_{(1-4)}$ , $\overline{CLK}_{(1-4)}$	0.30	1.60	0.30	1.50	0.40	1.70	ns		
$t_{PHL}$										
$t_{S-G-G}$	Skew Gate to Gate (Note 12)		120		100		120	ps		(Note 10)
$t_{TLH}$	Transition Time 20% to 80%, 80% to 20%	0.30	0.90	0.25	0.85	0.20	0.85	ns		
$t_{THL}$										

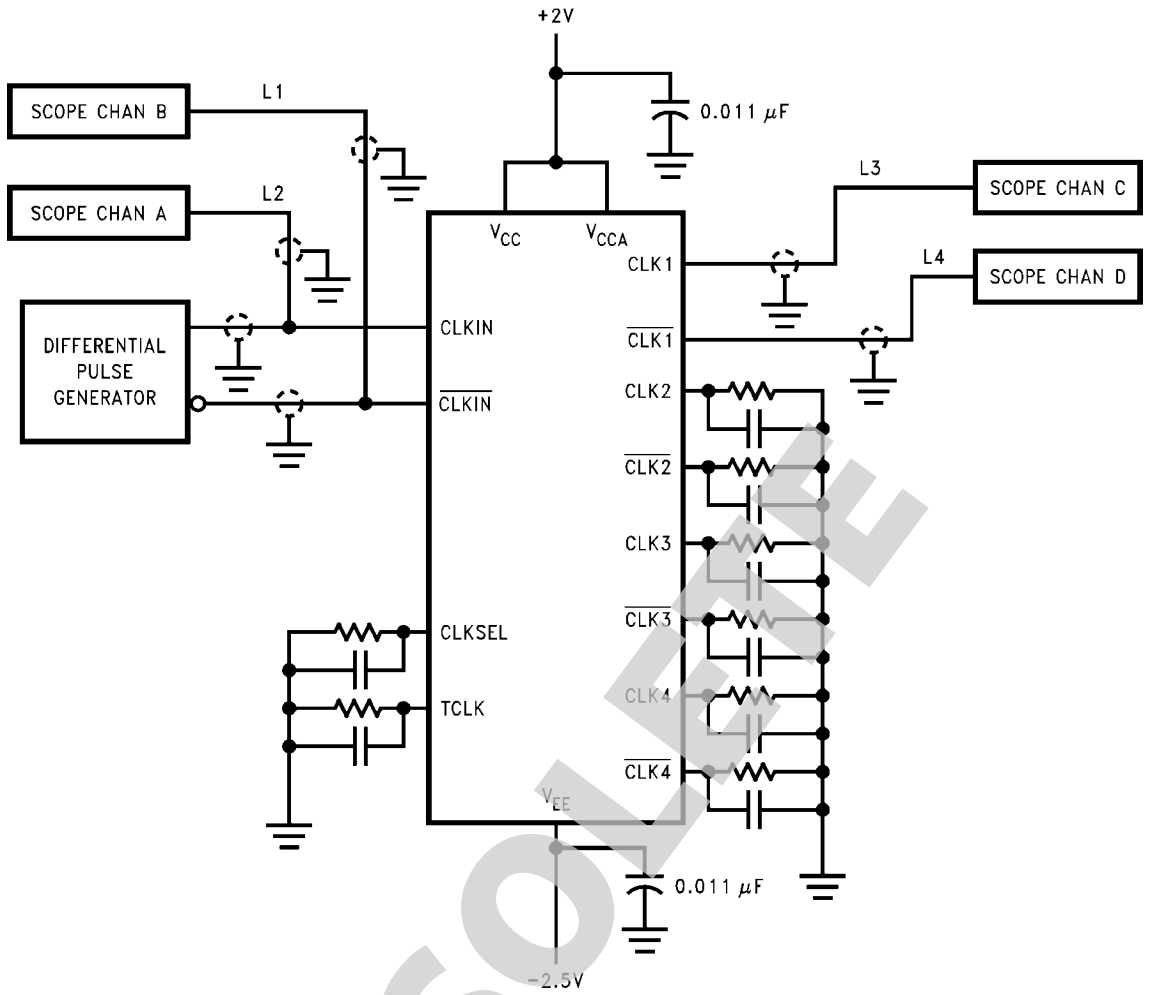
**Note 8:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals  $-55^{\circ}C$ ), then testing immediately after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 9:** Screen tested 100% on each device at  $+25^{\circ}C$  temperature only, Subgroup A9.

**Note 10:** Sample tested (Method 5005, Table I) on each manufactured lot at  $+25^{\circ}C$ , Subgroup A9, and at  $+125^{\circ}C$  and  $-55^{\circ}C$  temperatures, Subgroups A10 and A11.

**Note 11:** Not tested at  $+25^{\circ}C$ ,  $+125^{\circ}C$  and  $-55^{\circ}C$  temperature (design characterization data).

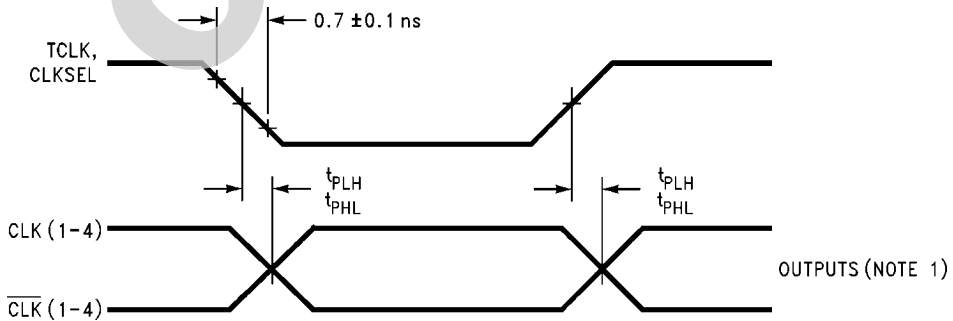
**Note 12:** Maximum output skew for any one device.



- Note 13:** Shown for testing CLKIN to CLK1 in the differential mode.
- Note 14:** L1, L2, L3 and L4 = equal length 50Ω impedance lines.
- Note 15:** All unused inputs and outputs are loaded with 50Ω in parallel with  $\leq 3$  pF to GND.
- Note 16:** Scope should have 50Ω input terminator internally.

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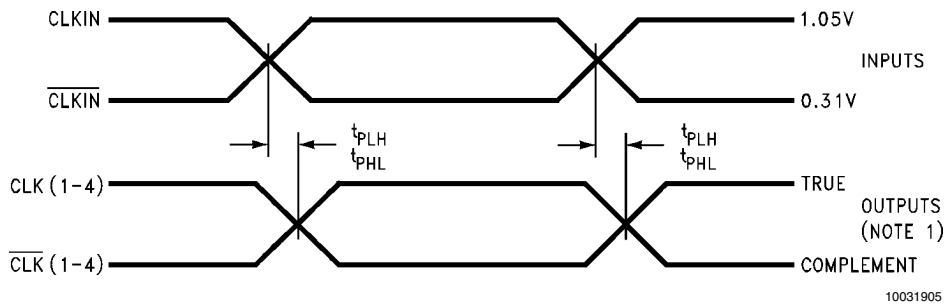
**FIGURE 1. AC Test Circuit**



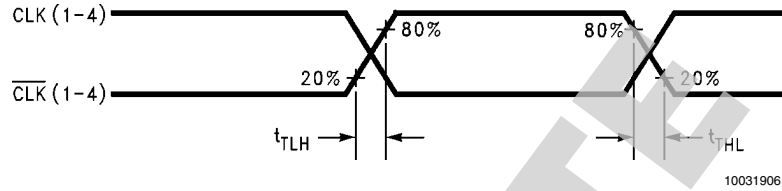
OUTPUTS (NOTE 1)

10031904

**FIGURE 2. Propagation Delay, TCLK, CLKSEL to Outputs**



**FIGURE 3. Propagation Delay, CLKIN/ $\overline{\text{CLKIN}}$  to Outputs**

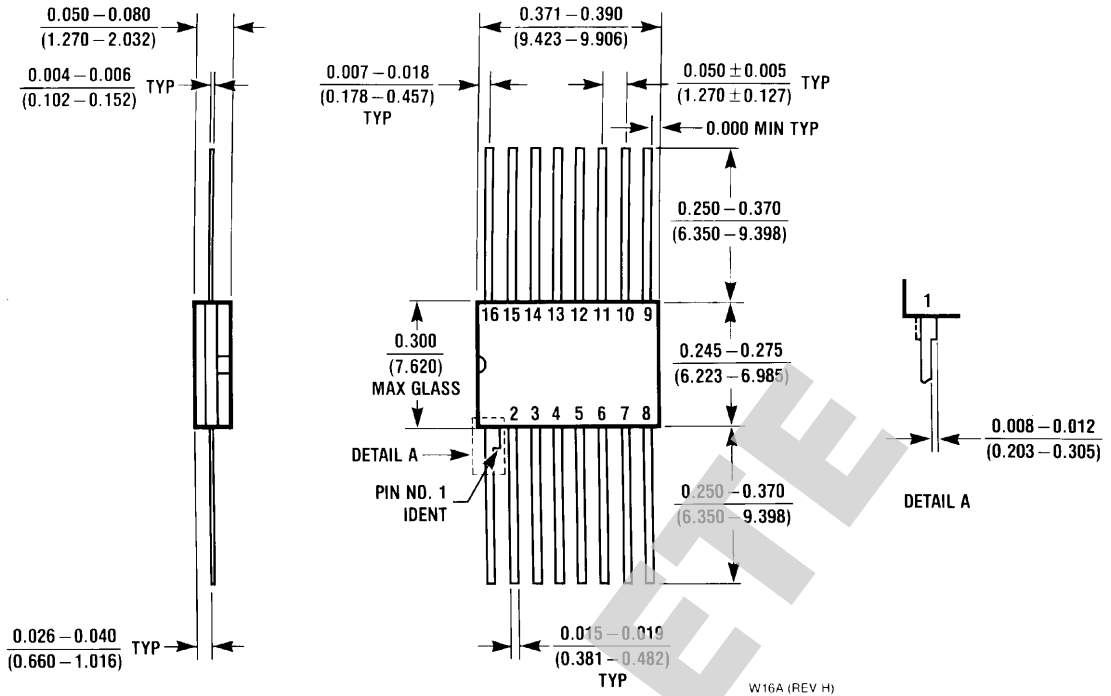


**Note 17:** The output to output skew, which is defined as the difference in the propagation delays between each of the four outputs on any one 100115 shall not exceed 75 ps.

**FIGURE 4. Transition Times**

OBSOLETE

**Physical Dimensions** inches (millimeters) unless otherwise noted



**16 Lead Ceramic Flatpak (F)  
NS Package Number W16A**

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# Notes

100315

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## Notes

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Power Management	<a href="http://www.national.com/power">www.national.com/power</a>	Green Compliance	<a href="http://www.national.com/quality/green">www.national.com/quality/green</a>
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LDOs	<a href="http://www.national.com/ldo">www.national.com/ldo</a>	Quality and Reliability	<a href="http://www.national.com/quality">www.national.com/quality</a>
LED Lighting	<a href="http://www.national.com/led">www.national.com/led</a>	Feedback/Support	<a href="http://www.national.com/feedback">www.national.com/feedback</a>
Voltage Reference	<a href="http://www.national.com/vref">www.national.com/vref</a>	Design Made Easy	<a href="http://www.national.com/easy">www.national.com/easy</a>
PowerWise® Solutions	<a href="http://www.national.com/powerwise">www.national.com/powerwise</a>	Solutions	<a href="http://www.national.com/solutions">www.national.com/solutions</a>
Serial Digital Interface (SDI)	<a href="http://www.national.com/sdi">www.national.com/sdi</a>	Mil/Aero	<a href="http://www.national.com/milaero">www.national.com/milaero</a>
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