HARRIS SEMICONDUCTOR

CD74HC132, CD74HCT132

High Speed CMOS Logic Quad 2-Input NAND Schmitt Trigger

August 1997

Features

- Unlimited Input Rise and Fall Times
- Exceptionally High Noise Immunity
- Typical Propagation Delay: 10ns at V_{CC} = 5V, C_L = 15pF, T_A = 25°C
- Fanout (Over Temperature Range)
  - Standard Outputs . . . . . 10 LSTTL Loads
  - Bus Driver Outputs . . . . . 15 LSTTL Loads
- Wide Operating Temperature Range . . . -55°C to 125°C
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- HC Types
  - 2V to 6V Operation
  - High Noise Immunity: N_{IL} = 37%, N_{IH} = 51% of V_{CC} at V_{CC} = 5V
- HCT Types
  - 4.5V to 5.5V Operation
  - Direct LSTTL Input Logic Compatibility, V_{IL}= 0.8V (Max), V_{IH} = 2V (Min)
  - CMOS Input Compatibility, $I_I \leq 1\mu A$ at V_{OL}, V_{OH}
- Related Literature
  - CD54HC132F3A and CD54HCT132F3A Military Data Sheet, Document Number 3778

Description

The Harris CD74HC132, CD74HCT132 each contain four 2-input NAND Schmitt Triggers in one package. This logic device utilizes silicon gate CMOS technology to achieve operating speeds similar to LSTTL gates with the low power consumption of standard CMOS integrated circuits. All devices have the ability to drive 10 LSTTL loads. The 74HCT logic family is functionally pin compatible with the standard 74LS logic family.

Ordering Information

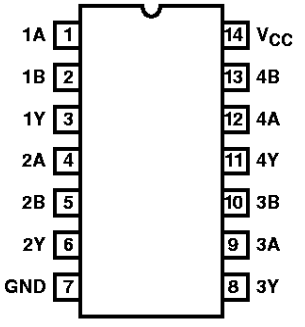
PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
CD74HC132E	-55 to 125	14 Ld PDIP	E14.3
CD74HCT132E	-55 to 125	14 Ld PDIP	E14.3
CD74HC132M	-55 to 125	14 Ld SOIC	M14.15
CD74HCT132M	-55 to 125	14 Ld SOIC	M14.15

NOTE:

1. When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.
2. Die for this part number is available which meets all electrical specifications. Please contact your local sales office or Harris customer service for ordering information.

Pinout

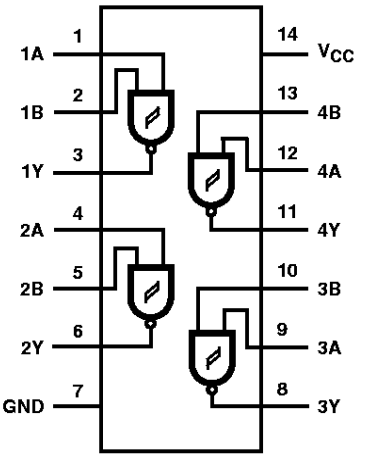
CD74HC132, CD74HCT132
(PDIP, SOIC)
TOP VIEW



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper IC Handling Procedures.

File Number **1649.1**

Functional Diagram

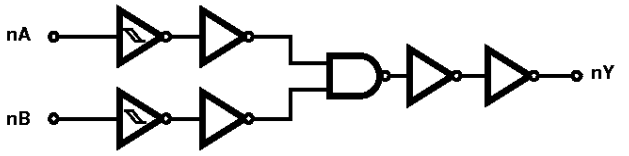


TRUTH TABLE

INPUTS		OUTPUT
nA	nB	nY
L	L	H
L	H	H
H	L	H
H	H	L

NOTE: H = High Voltage Level, L = Low Voltage Level

Logic Symbol



Absolute Maximum Ratings

DC Supply Voltage, V_{CC} . . . . . -0.5V to 7V
DC Input Diode Current, I_{IK}
For V_I < -0.5V or V_I > V_{CC} + 0.5V . . . . . ±20mA
DC Output Diode Current, I_{OK}
For V_O < -0.5V or V_O > V_{CC} + 0.5V . . . . . ±20mA
DC Output Source or Sink Current per Output Pin, I_O
For V_O > -0.5V or V_O < V_{CC} + 0.5V . . . . . ±25mA
DC V_{CC} or Ground Current, I_{CC} or I_{GND} . . . . . ±50mA

Operating Conditions

Temperature Range (T_A) . . . . . -55°C to 125°C
Supply Voltage Range, V_{CC}
HC Types . . . . . 2V to 6V
HCT Types . . . . . 4.5V to 5.5V
DC Input or Output Voltage, V_I, V_O . . . . . 0V to V_{CC}
Input Rise and Fall Time
2V . . . . . 100ms (Max)
4.5V. . . . . 100ms (Max)
6V . . . . . 100ms (Max)

Thermal Information

Thermal Resistance (Typical, Note 3)	θ_{JA} (°C/W)
PDIP Package	90
SOIC Package	175

Maximum Junction Temperature . . . . . 150°C
Maximum Storage Temperature Range . . . . . -65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . . 300°C
(SOIC - Lead Tips Only)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

3. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS		V_{CC} (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V_I (V)	I_O (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES												
Input Switch Points (Note 6)	V_{T+}	-	-	2	0.7	-	1.5	0.7	1.5	0.7	1.5	V
				4.5	1.7	-	3.15	1.7	3.15	1.7	3.15	V
				6	2.1	-	4.2	2.1	4.2	2.1	4.2	V
	V_{T-}	-	-	2	0.3	-	1	0.3	1	0.3	1	V
				4.5	0.9	-	2.2	0.9	2.2	0.9	2.2	V
				6	1.2	-	3	1.2	3	1.2	3	V
	V_H			2	0.2	-	1	0.2	1	0.2	1	V
				4.5	0.4	-	1.4	0.4	1.4	0.4	1.4	V
				6	0.6	-	1.6	0.6	1.6	0.6	1.6	V
High Level Output Voltage CMOS Loads	V_{OH}	V_{T+} or V_{T-}	-0.02	2	1.9	-	-	1.9	-	1.9	-	V
			-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
			-0.02	6	5.9	-	-	5.9	-	5.9	-	V
High Level Output Voltage TTL Loads			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
			-5.2	6	5.48	-	-	5.34	-	5.2	-	V

DC Electrical Specifications (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS		V_{CC} (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V_I (V)	I_O (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
Low Level Output Voltage CMOS Loads	V_{OL}	V_{T+} or V_{T-}	0.02	2	-	-	0.1	-	0.1	-	0.1	V
			0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
			0.02	6	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			4	4.5	-	-	0.26	-	0.33	-	0.4	V
			5.2	6	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	I_I	V_{CC} or GND	-	6	-	-	±0.1	-	±1	-	±1	µA
Quiescent Device Current	I_{CC}	V_{CC} or GND	0	6	-	-	2	-	20	-	40	µA
HCT TYPES												
Input Switch Points (Note 6)	V_{T+}	-	-	4.5	1.2	-	1.9	1.2	1.9	1.2	1.9	V
				5.5	1.4	-	2.1	1.4	2.1	1.4	2.1	V
	V_{T-}	-	-	4.5	0.5	-	1.2	0.5	1.2	0.5	1.2	V
				5.5	0.6	-	1.4	0.6	1.4	0.6	1.4	V
	V_H	-	-	4.5	0.4	-	1.4	0.4	1.4	0.4	1.4	V
				5.5	0.4	-	1.5	0.4	1.5	0.4	1.5	V
High Level Output Voltage CMOS Loads	-	V_{T+} or V_{T-}	-	4.5	4.4	-	-	4.4	-	4.4	-	V
High Level Output Voltage TTL Loads			-	4.5	3.98	-	-	3.84	-	3.7	-	V
Low Level Output Voltage CMOS Loads	V_{OL}	V_{T+} or V_{T-}	-4	4.5	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			0.02	4.5	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	I_I	V_{CC} and GND	4	5.5	-	-	±0.1	-	±1	-	±1	µA
Quiescent Device Current	I_{CC}	V_{CC} or GND	0	5.5	-	-	2	-	20	-	40	µA
Additional Quiescent Device Current Per Input Pin: 1 Unit Load (Note 4)	ΔI_{CC}	V_{CC} - 2.1	-	4.5 to 5.5	-	100	360	-	450	-	490	µA

NOTE:

4. For dual-supply systems theorectical worst case (V_I = 2.4V, V_{CC} = 5.5V) specification is 1.8mA.
5. Die for this part number is available which meets all electrical specifications.
6. Hysteresis definition, characteristic and test setup see Test Circuits and Waveforms:

HCT Input Loading Table

INPUT	UNIT LOADS
nA, nB	0.6

NOTE: Unit Load is ΔI_{CC} limit specified in DC Electrical Specifications table, e.g. 360µA max at 25°C.

Switching Specifications Input t_r, t_f = 6ns

PARAMETER	SYMBOL	TEST CONDITIONS	V_{CC} (V)	25°C			-40°C to 85°C		-55°C to 125°C		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES											
Propagation Delay A, B to Y (Figure 1)	t_{PLH}, t_{PHL}	C_L = 50pF	2	-	-	125	-	156	-	188	ns
			4.5	-	-	25	-	31	-	38	ns
			6	-	-	21	-	27	-	32	ns
Propagation Delay A, B to Y	t_{TLH}, t_{THL}	C_L = 15pF	5	-	10	-	-	-	-	-	pF
Transition Times (Figure 1)	t_{TLH}, t_{THL}	C_L = 50pF	2	-	-	75	-	95	-	110	ns
			4.5	-	-	15	-	19	-	22	ns
			6	-	-	13	-	16	-	19	ns
Input Capacitance	C_I	-	-	-	-	10	-	10	-	10	pF
Power Dissipation Capacitance (Notes 7, 8)	C_{PD}	-	5	-	30	-	-	-	-	-	pF
HCT TYPES											
Propagation Delay A, B to Y (Figure 2)	t_{PHL}, t_{PHL}	C_L = 50pF	4.5	-	-	33	-	41	-	50	ns
Propagation Delay A, B to Y	t_{PLH}, t_{PHL}	C_L = 15pF	5	-	13	-	-	-	-	-	pF
Transition Times (Figure 2)	t_{TLH}, t_{THL}	C_L = 50pF	4.5	-	-	15	-	19	-	22	ns
Input Capacitance	C_I	-	-	-	-	10	-	10	-	10	pF
Power Dissipation Capacitance (Notes 7, 8)	C_{PD}	-	5	-	30	-	-	-	-	-	pF

NOTES:

7. C_{PD} is used to determine the dynamic power consumption, per gate.
8. $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$ where f_i = input frequency, C_L = output load capacitance, V_{CC} = supply voltage.

Test Circuits and Waveforms

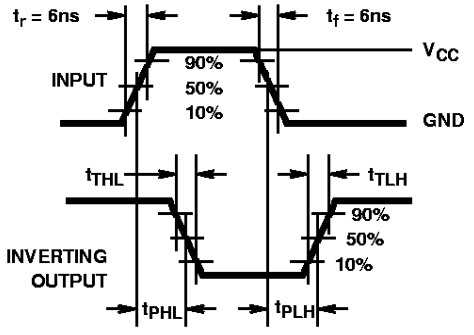


FIGURE 1. HC AND HCU TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

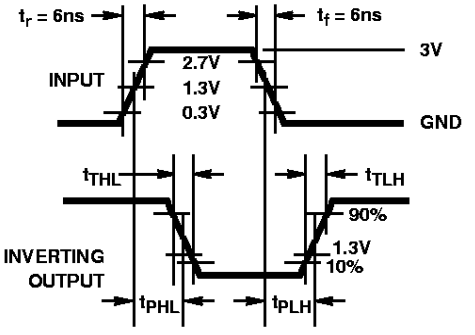


FIGURE 2. HCT TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

Test Circuits and Waveforms

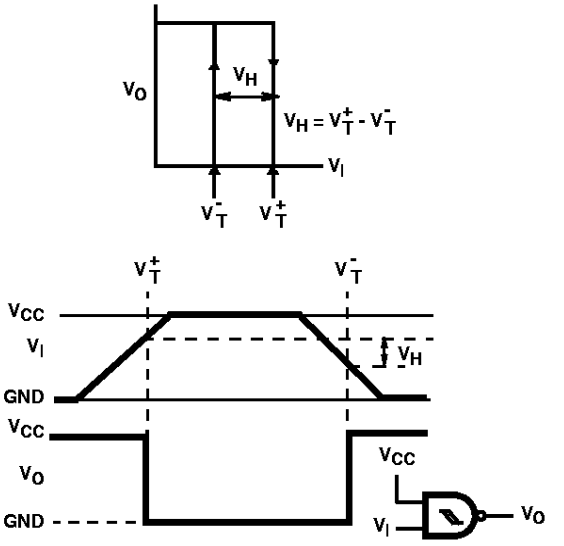


FIGURE 3. HYSTERESIS DEFINITION, CHARACTERISTIC, AND TEST SET-UP

All Harris Semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

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