

74VHC14 Hex Schmitt Inverter

General Description

The VHC14 is an advanced high speed CMOS Hex Schmitt Inverter fabricated with silicon gate CMOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. Pin configuration and function are the same as the VHC04 but the inputs have hysteresis between the positive-going and negative-going input thresholds, which are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals, thus providing greater noise margin than conventional inverters.

An input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Features

- High Speed: t_{PD} = 5.5 ns (typ) at V_{CC} = 5V
- I Low power dissipation: $I_{CC} = 2 \ \mu A$ (Max) at $T_A = 25^{\circ}C$
- High noise immunity: V_{NIH} = V_{NIL} = 28% V_{CC} (Min)
- Power down protection is provided on all inputs
- Low noise: V_{OLP} = 0.8V (Max)
- Pin and function compatible with 74HC14

Order Number	Package Number	Package Description
74VHC14M (Note 1)	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC14MX_NL (Note 2)	M14A	Pb-Free 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC14SJ (Note 1)	M14D	Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHC14MTC (Note 1)	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC14MTC_NL (Note 3)	MTC14	Pb-Free 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC14MTCX_NL (Note 2)	MTC14	Pb-Free 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC14N (Obsolete)	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Pb-Free package per JEDEC J-STD-020B.

Ordering Code:

Note 1: Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Note 2: "_NL" indicates Pb-Free product (per JEDEC J-STD-020B). Device is available in Tape and Reel only.

Note 3: "_NL" indicates Pb-Free product (per JEDEC J-STD-020B).

Logic Symbol/s

IEEE/IEC



Pin Descriptions

Pin Names	Description
A _n	Inputs
\overline{O}_n	Outputs

Connection Diagram/s



Truth Table/s

А	0
L	Н
Н	L

Absolute Maximum Ratings(Note 4)

Supply Voltage (V _{CC})	-0.5V to +7.0V
DC Input Voltage (V _{IN})	-0.5V to +7.0V
DC Output Voltage (V _{OUT})	$-0.5V$ to $V_{CC} + 0.5V$
Input Diode Current (I _{IK})	–20 mA
Output Diode Current (I _{OK})	±20 mA
DC Output Current (I _{OUT})	±25 mA
DC V _{CC} /GND Current (I _{CC})	±50 mA
Storage Temperature (T _{STG})	-65°C to +150°C
Lead Temperature (T _L)	
Soldering (10 seconds)	260°C

Recommended Operating Conditions (Note 5)

Supply Voltage (V _{CC})	+2.0V to +5.5V
Input Voltage (V _{IN})	0V to +5.5V
Output Voltage (V _{OUT})	0V to V _{CC}
Operating Temperature (T _{OPR})	-40°C to +85°C

Note 4: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. The data book specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside databook specifications.

Note 5: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Cumphiel	Parameter	Vcc		T _A = 25°C		$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$		Units	Conditions	
Symbol	Farameter		Min	Тур Мах		Min Max		Units	Conditions	
VP	Positive Threshold Voltage	3.0			2.20		2.20			
		4.5			3.15		3.15	V		
		5.5			3.85		3.85			
V _N	Negative Threshold Voltage	3.0	0.90			0.90				
		4.5	1.35			1.35		V		
		5.5	1.65			1.65				
V _H	Hysteresis Voltage	3.0	0.30		1.20	0.30	1.20			
		4.5	0.40		1.40	0.40	1.40	V		
		5.5	0.50		1.60	0.50	1.60			
V _{OH}	HIGH Level Output Voltage	2.0	1.9	2.0		1.9			V _{IN} =V _{IL}	
		3.0	2.9	3.0		2.9		V	I _{OH} = -50 μA	
		4.5	4.4	4.5		4.4				
		3.0	2.58			2.48		V	I _{OH} = -4 mA	
		4.5	3.94			3.80		v	$I_{OH} = -8 \text{ mA}$	
V _{OL}	LOW Level Output Voltage	2.0		0.0	0.1		0.1		$V_{IN} = V_{IH}$	
		3.0		0.0	0.1		0.1	V	$I_{OL} = 50 \ \mu A$	
		4.5		0.0	0.1		0.1			
		3.0			0.36		0.44	V	I _{OL} = 4 mA	
		4.5			0.36		0.44	v	I _{OL} = 8 mA	
I _{IN}	Input Leakage Current	0–5.5			±0.1		±1.0	μA	V _{IN} = 5.5V or GND	
I _{CC}	Quiescent Supply Current	5.5			2.0		20.0	μA	V _{IN} = V _{CC} or GND	

Noise Characteristics

Symbol	Parameter	v _{cc}	T _A =	25°C	Units	Conditions	
Symbol	Falanietei	•00	Тур	Limits	Units	Conditions	
V _{OLP} (Note 6)	Quiet Output Maximum Dynamic V _{OL}	5.0	0.4	0.8	V	C _L = 50 pF	
V _{OLV} (Note 6)	Quiet Output Minimum Dynamic V _{OL}	5.0	-0.4	-0.8	V	C _L = 50 pF	
V _{IHD} (Note 6)	Minimum HIGH Level Dynamic Input Voltage	5.0		3.5	V	C _L = 50 pF	
V _{ILD} (Note 6)	Maximum LOW Level Dynamic Input Voltage	5.0		1.5	V	C _L = 50 pF	

Note 6: Parameter guaranteed by design.

AC Electrical Characteristics

Symbol	Parameter	V _{cc}	T _A = 25°C			$T_A = -40^{\circ}$	C to +85°C	Units	Conditions
Symbol		•cc	Min	Тур	Max	Min	Max	Units	contantions
t _{PLH}	Propagation Delay	$\textbf{3.3}\pm\textbf{0.3}$		8.3	12.8	1.0	15.0	ns	C _L = 15 pF
t _{PHL}	Time			10.8	16.3	1.0	18.5		$C_L = 50 \text{ pF}$
		5.0 ± 0.5		5.5	8.6	1.0	10.0	ns	C _L = 15 pF
				7.0	10.6	1.0	12.0		C _L = 50 pF
C _{IN}	Input Capacitance			4	10		10	pF	V _{CC} = Open
C _{PD}	Power Dissipation Capacitance			21				pF	(Note 7)

Note 7: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC} (Opr) = $C_{PD} * V_{CC} * f_{IN} + I_{CC}/6$ (per Gate)







14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC14







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