Hex Inverter Schmitt Trigger

High-Performance Silicon-Gate CMOS

The MC74AC14/74ACT14 contains six logic inverters which accept standard CMOS Input signals (TTL levels for MC74ACT14) and provide standard CMOS output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter–free output signals. In addition, they have a greater noise margin then conventional inverters.

The MC74AC14/74ACT14 has hysteresis between the positive–going and negative–going input thresholds (typically 1.0 V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

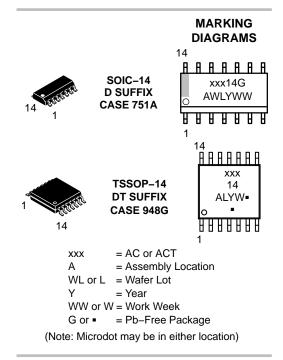
Features

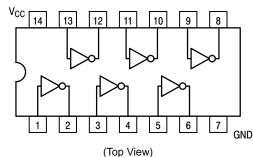
- Schmitt Trigger Inputs
- Outputs Source/Sink 24 mA
- MC74ACT14 Has TTL Compatible Inputs
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant



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(Top View)

Figure 1. Pinout: 14–Lead Packages Conductors

Input	Output
Α	0
L H	H L

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V _{CC}	DC Supply Voltage		-0.5 to +7.0	V
VI	DC Input Voltage		$-0.5 \leq V_I \leq V_{CC} + 0.5$	V
Vo	DC Output Voltage	(Note 1)	$-0.5 \leq V_O \leq V_{CC} + 0.5$	V
I _{IK}	DC Input Diode Current		±20	mA
I _{OK}	DC Output Diode Current		±50	mA
I _O	DC Output Sink/Source Current		±50	mA
I _{CC}	DC Supply Current per Output Pin		±50	mA
I _{GND}	DC Ground Current per Output Pin		±50	mA
T _{STG}	Storage Temperature Range		-65 to +150	°C
TL	Lead temperature, 1 mm from Case for 10 Seco	nds	260	°C
TJ	Junction temperature under Bias		+ 150	°C
θ_{JA}	Thermal Resistance (Note 2)	SOIC TSSOP	125 170	°C/W
P _D	Power Dissipation in Still Air at 85°C	SOIC TSSOP	125 170	mW
MSL	Moisture Sensitivity		Level 1	
F _R	Flammability Rating Oxy	gen Index: 30% – 35%	UL 94 V-0 @ 0.125 in	
V _{ESD}	Ň	n Body Model (Note 3) Iachine Model (Note 4) Device Model (Note 5)	> 2000 > 200 > 1000	V
I _{Latch-Up}	Latch–Up Performance Above V _{CC} and Below	GND at 85°C (Note 6)	±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. I_O absolute maximum rating must be observed.

2. The package thermal impedance is calculated in accordance with JESD51–7.

3. Tested to EIA/JESD22-A114-A.

Tested to EIA/JESD22–A115–A.
Tested to JESD22–C101–A.

6. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter			Тур	Max	Unit
	Quarter Matterna	'AC	2.0	5.0	6.0	
V _{CC}	Supply Voltage	′ACT	4.5	5.0	5.5	V
V _{in} , V _{out}	DC Input Voltage, Output Voltage (Ref. to GND)		0	-	V _{CC}	V
	t _r , t _f Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V _{CC} @ 3.0 V	-	150	-	
t _r , t _f		V _{CC} @ 4.5 V	-	40	-	ns/V
	AC Devices except Schmitt inputs	V _{CC} @ 5.5 V	-	25	-	
	Input Rise and Fall Time (Note 2)	V _{CC} @ 4.5 V	-	10	-	
t _r , t _f	'ACT Devices except Schmitt Inputs	V _{CC} @ 5.5 V	-	8.0	-	ns/V
ТJ	Junction Temperature (PDIP)	·	-	-	140	°C
T _A	Operating Ambient Temperature Range	-40	25	85	°C	
I _{OH}	Output Current – High	_	_	-24	mA	
I _{OL}	Output Current – Low	-	-	24	mA	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

1. V_{in} from 30% to 70% V_{CC} ; see individual Data Sheets for devices that differ from the typical input rise and fall times. 2. V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

DC CHARACTERISTICS

	N		74AC				
Symbol					$T_A = -40^{\circ}C$ to +85°C	Unit	Conditions
		(•)	Тур	G	uaranteed Limits		
V _{OH}	Minimum High Level Output Voltage	3.0 4.5 5.5	2.99 4.49 5.49	2.9 4.4 5.4	2.9 4.4 5.4	V	I _{OUT} = -50 μA
		3.0 4.5 5.5	- - -	2.56 3.86 4.86	2.46 3.76 4.76	V	*V _{IN} = V _{IL} or V _{IH} -12 mA I _{OH} -24 mA -24 mA
V _{OL}	Maximum Low Level Output Voltage	3.0 4.5 5.5	0.002 0.001 0.001	0.1 0.1 0.1	0.1 0.1 0.1	V	I _{OUT} = 50 μA
		3.0 4.5 5.5	- - -	0.36 0.36 0.36	0.44 0.44 0.44	V	*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μΑ	$V_{I} = V_{CC}, GND$
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V _{OLD} = 1.65 V Max
I _{OHD}		5.5	-	-	-75	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	-	4.0	40	μΑ	$V_{IN} = V_{CC}$ or GND

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions. *All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

NOTE: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

AC CHARACTERISTICS

	Parameter			74AC		74	AC		
Symbol		V _{CC} * (V)	T _A = +25°C C _L = 50 pF			T _A = -4 +85°C C _I	40°C to _ = 50 pF	Unit	Figure No.
			Min	Тур	Max	Min	Max		
t _{PLH}	Propagation Delay	3.3 5.0	1.5 1.5	9.5 7.0	13.5 10.0	1.5 1.5	15.0 11.0	ns	3–5
		3.3	1.5	7.5	11.5	1.5	13.0		
t _{PHL} Propagation I	Propagation Delay	5.0	1.5	6.0	8.5	1.5	9.5	ns	3–5

*Voltage Range 3.3 V is 3.3 V \pm 0.3 V. Voltage Range 5.0 V is 5.0 V \pm 0.5 V.

INPUT CHARACTERISTICS (unless otherwise specified)

Symbol	Parameter	V _{CC} (V)	74AC	74ACT		Test Conditions	
V _{t+}	Maximum Positive Threshold	3.0 4.5 5.5	2.2 3.2 3.9	- 2.0 2.0	V	T _A = Worst Case	
V _{t –}	Minimum Negative Threshold	3.0 4.5 5.5	0.5 0.9 1.1	- 0.8 0.8	V	T _A = Worst Case	
V _{h(max)}	Maximum Hysteresis	3.0 4.5 5.5	1.2 1.4 1.6	- 1.2 1.2	V	T _A = Worst Case	
V _{h(min)}	Minimum Hysteresis	3.0 4.5 5.5	0.3 0.4 0.5	- 0.4 0.4	V	T _A = Worst Case	

DC CHARACTERISTICS

	Parameter		74ACT T _A = +25°C		74ACT		
Symbol		V _{CC} (V)			$T_A = -40^{\circ}C$ to +85°C	Unit	Conditions
		(•)	Тур	G	uaranteed Limits		
V _{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	I _{OUT} = -50 μA
		4.5 5.5		3.86 4.86	3.76 4.76	V	$V_{IN} = V_{IL} \text{ or } V_{IH}$ $I_{OH} -24 \text{ mA}$ -24 mA
V _{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	I _{OUT} = 50 μA
		4.5 5.5		0.36 0.36	0.44 0.44	V	$V_{IN} = V_{IL} \text{ or } V_{IH}$ 24 mA I_{OL} 24 mA
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μΑ	$V_{I} = V_{CC}, GND$
ΔI_{CCT}	Additional Max. I _{CC} /Input	5.5	0.6	-	1.5	mA	$V_{I} = V_{CC} - 2.1 V$
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V _{OLD} = 1.65 V Max
I _{OHD}		5.5	-	-	-75	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	-	4.0	40	μA	$V_{IN} = V_{CC}$ or GND

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions. *All outputs loaded; thresholds on input associated with output under test.

*All outputs loaded; thresholds on input associated with output un *Maximum test duration 2.0 ms, one output loaded at a time.

AC CHARACTERISTICS

	Parameter			74ACT		74 <i>A</i>	СТ		
Symbol		V _{CC} * (V)	T _A = +25°C C _L = 50 pF			T _A = −4 +85°C C _I	40°C to _ = 50 pF	Unit	Figure No.
			Min	Тур	Max	Min	Max		
t _{PLH}	Propagation Delay	5.0	1.5	-	11.5	1.0	12.5	ns	3–5
t _{PHL}	Propagation Delay	5.0	1.5	-	10.0	1.0	11.0	ns	3–5

*Voltage Range 5.0 V is 5.0 V \pm 0.5 V.

CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	25	pF	$V_{CC} = 5.0 V$

ORDERING INFORMATION

Device	Package	Shipping [†]		
MC74AC14DG		55 Units / Rail		
MC74AC14DR2G	SOIC-14 (Pb-Free)	2500 / Tape & Reel		
NLV74AC14DR2G*	(. 2	2500 / Tape & Reel		
MC74AC14DTR2G	TSSOP-14 (Pb-Free)	2500 / Tape & Reel		
MC74ACT14DG	SOIC-14	55 Units / Rail		
MC74ACT14DR2G	(Pb-Free)	2500 / Tape & Reel		
MC74ACT14DTR2G	TSSOP-14 (Pb-Free)	2500 / Tape & Reel		

+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP Capable.





*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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