MC74AC14, MC74ACT14

Hex Inverter Schmitt Trigger

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.

- Schmitt Trigger Inputs
- Outputs Source/Sink 24 mA
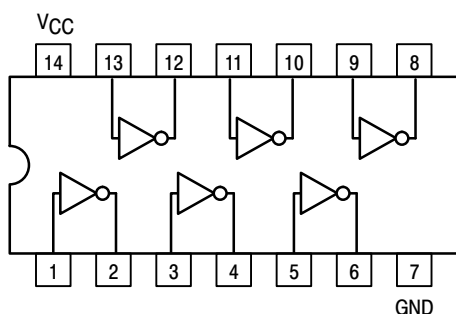- ′ACT14 Has TTL Compatible Inputs

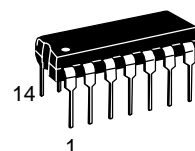**Figure 1. Pinout; 14–Lead Packages Conductors**
(Top View)

FUNCTION TABLE

Input	Output
A	**O**
L	H
H	L

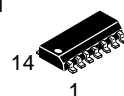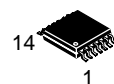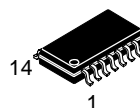**ON Semiconductor™**

http://onsemi.com

PDIP–14
N SUFFIX
CASE 646

SO–14
D SUFFIX
CASE 751A

TSSOP–14
DT SUFFIX
CASE 948G

EIAJ–14
M SUFFIX
CASE 965

ORDERING INFORMATION

Device	Package	Shipping
MC74AC14N	PDIP–14	25 Units/Rail
MC74ACT14N	PDIP–14	25 Units/Rail
MC74AC14D	SOIC–14	55 Units/Rail
MC74AC14DR2	SOIC–14	2500 Tape & Reel
MC74ACT14D	SOIC–14	55 Units/Rail
MC74ACT14DR2	SOIC–14	2500 Tape & Reel
MC74AC14DT	TSSOP–14	96 Units/Rail
MC74AC14DTR2	TSSOP–14	2500 Tape & Reel
MC74ACT14DT	TSSOP–14	96 Units/Rail
MC74ACT14DTR2	TSSOP–14	2500 Tape & Reel
MC74AC14M	EIAJ–14	50 Units/Rail
MC74AC14MEL	EIAJ–14	2000 Tape & Reel
MC74ACT14M	EIAJ–14	50 Units/Rail
MC74ACT14MEL	EIAJ–14	2000 Tape & Reel

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 5 of this data sheet.

MC74AC14, MC74ACT14

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	−0.5 to +7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	−0.5 to V_{CC} +0.5	V
V_{out}	DC Output Voltage (Referenced to GND)	−0.5 to V_{CC} +0.5	V
I_{in}	DC Input Current, per Pin	±20	mA
I_{out}	DC Output Sink/Source Current, per Pin	±50	mA
I_{CC}	DC V_{CC} or GND Current per Output Pin	±50	mA
T_{stg}	Storage Temperature	−65 to +150	°C

*Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
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	–	ns/V
		V_{CC} @ 4.5 V	–	40	–	
		V_{CC} @ 5.5 V	–	25	–	
t_r, t_f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V_{CC} @ 4.5 V	–	10	–	ns/V
		V_{CC} @ 5.5 V	–	8.0	–	
T_J	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

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.

MC74AC14, MC74ACT14

DC CHARACTERISTICS

Symbol	Parameter	V$_{CC}$ (V)	74AC T$_A$ = +25°C		74AC T$_A$ = −40°C to +85°C	Unit	Conditions
			Typ	Guaranteed 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	μA	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	μA	V$_{IN}$ = V$_{CC}$ or GND

*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 (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

Symbol	Parameter	V$_{CC}$* (V)	74AC T$_A$ = +25°C C$_L$ = 50 pF			74AC T$_A$ = −40°C to +85°C C$_L$ = 50 pF		Unit	Fig. No.
			Min	Typ	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
t$_{PHL}$	Propagation Delay	3.3 5.0	1.5 1.5	7.5 6.0	11.5 8.5	1.5 1.5	13.0 9.5	ns	3–5

*Voltage Range 3.3 V is 3.3 V ±0.3 V.
 Voltage Range 5.0 V is 5.0 V ±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	V	T_A = Worst Case
V_{t-}	Minimum Negative Threshold	3.0 4.5 5.5	0.5 0.9 1.1	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	V	T_A = Worst Case
$V_{h(min)}$	Minimum Hysteresis	3.0 4.5 5.5	0.3 0.4 0.5	0.4	V	T_A = Worst Case

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74ACT T_A = +25°C		74ACT T_A = −40°C to +85°C	Unit	Conditions
			Typ	Guaranteed 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} or V_{IH} I_{OH} −24 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} or V_{IH} I_{OL} 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	−	±0.1	±1.0	μA	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

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

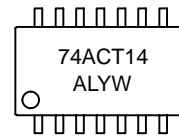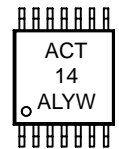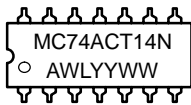**AC CHARACTERISTICS** (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)
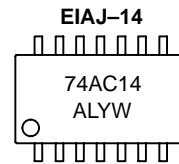
Symbol	Parameter	V_{CC}* (V)	74ACT $T_A = +25°C$ $C_L = 50\ pF$			74ACT $T_A = -40°C$ to +85°C $C_L = 50\ pF$		Unit	Fig. No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay	5.0	1.5	–	11.5	1.0	12.5	ns	3–5
t_{PHL}	Propagation Delay	5.0	1.5	–	10.0	1.0	11.0	ns	3–5

*Voltage Range 5.0 V is 5.0 V ±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	$V_{CC} = 5.0\ V$

MARKING DIAGRAMS

PDIP–14

MC74AC14N
AWLYYWW

MC74ACT14N
AWLYYWW

SO–14

AC14
AWLYWW

ACT14
AWLYWW

TSSOP–14

AC
14
ALYW

ACT
14
ALYW

EIAJ–14

74AC14
ALYW
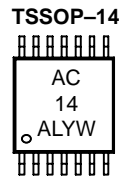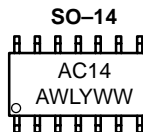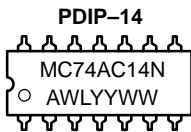
74ACT14
ALYW

A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week

PACKAGE DIMENSIONS

PDIP–14
N SUFFIX
14 PIN PLASTIC DIP PACKAGE
CASE 646–06
ISSUE M
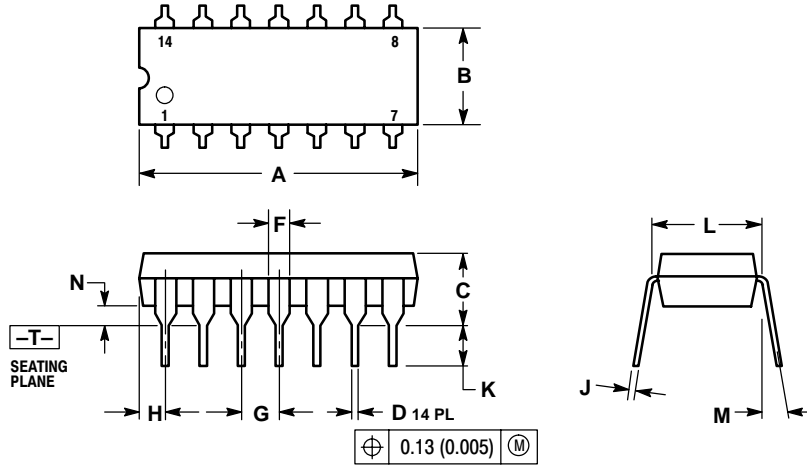
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	18.80
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	---	10°	---	10°
N	0.015	0.039	0.38	1.01

0.13 (0.005) Ⓜ

SO–14
D SUFFIX
14 PIN PLASTIC SOIC PACKAGE
CASE 751A–03
ISSUE F
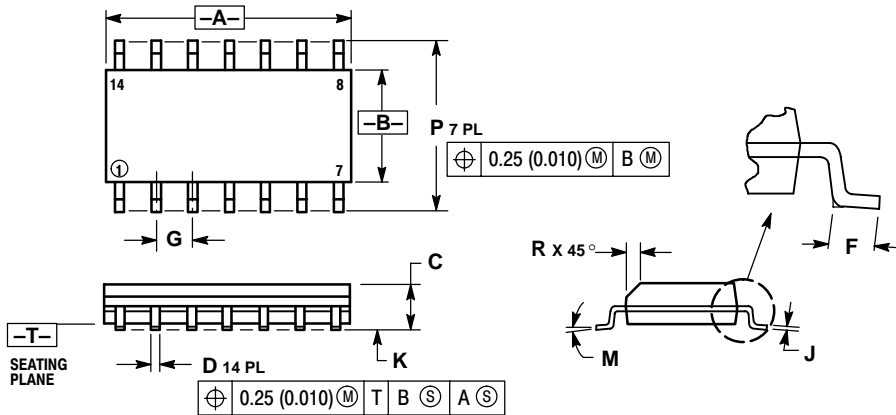
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

P 7 PL
0.25 (0.010) Ⓜ B Ⓜ

0.25 (0.010) Ⓜ T B Ⓢ A Ⓢ

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

R x 45°

PACKAGE DIMENSIONS

TSSOP–14
DT SUFFIX
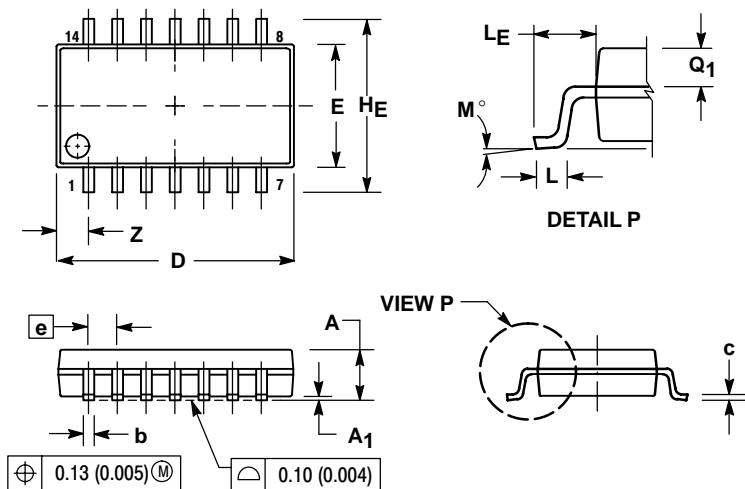14 PIN PLASTIC TSSOP PACKAGE
CASE 948G–01
ISSUE O
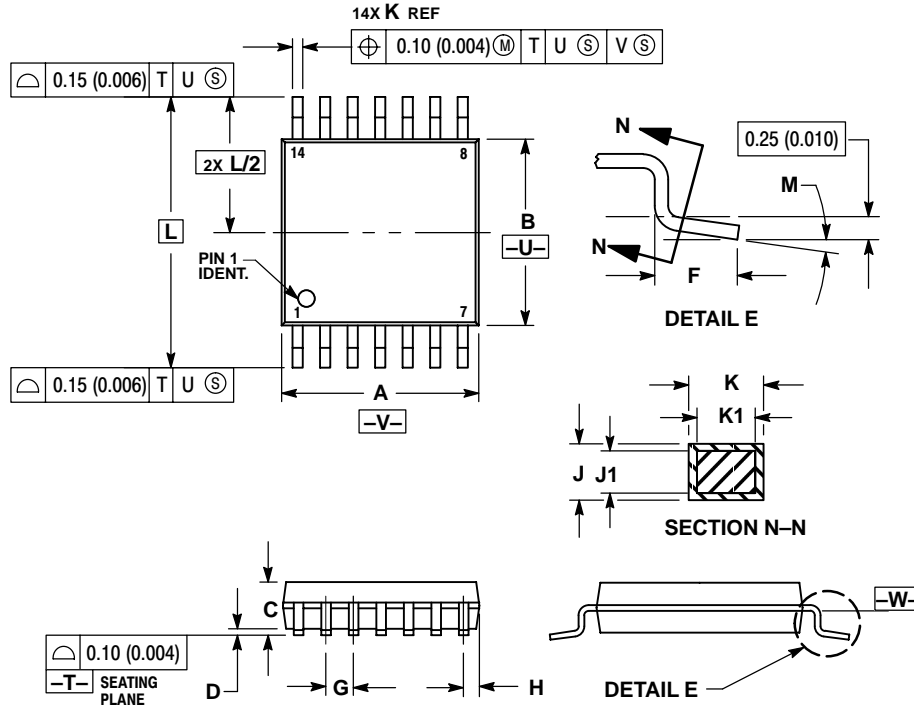
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

DIM	MILLIMETERS		INCHES	
---	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0 °	8 °	0 °	8 °

EIAJ–14
M SUFFIX
14 PIN PLASTIC EIAJ PACKAGE
CASE 965–01
ISSUE O

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
---	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A1	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
HE	7.40	8.20	0.291	0.323
0.50	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0 °	10 °	0 °	10 °
Q1	0.70	0.90	0.028	0.035
Z	---	1.42	---	0.056

MC74AC14, MC74ACT14

PUBLICATION ORDERING INFORMATION