MC74AC00, MC74ACT00

Quad 2-Input NAND Gate

High−Performance Silicon−Gate CMOS

ON Semiconductor®

www.onsemi.com

Features

- Output Drive Capability: ±24 mA
- Operating Voltage Range: 2 to 6 V AC00; 4.5 to 5.5 ACT00
- Low Input Current: 1.0 μA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 32 FETs
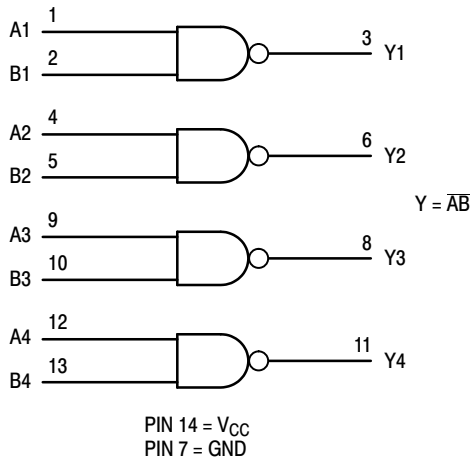- These are Pb−Free Devices

PIN 14 = V_{CC}
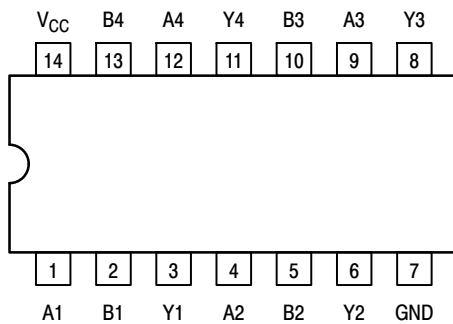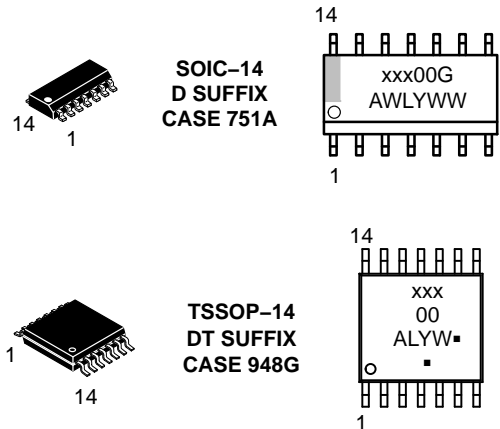PIN 7 = GND

Figure 1. Logic Diagram

$Y = \overline{AB}$

Figure 2. Pinout: 14−Lead Packages (Top View)

MARKING DIAGRAMS

SOIC−14
D SUFFIX
CASE 751A

TSSOP−14
DT SUFFIX
CASE 948G

xxx	= AC or ACT
A	= Assembly Location
WL or L	= Wafer Lot
Y	= Year
WW or W	= Work Week
G or ▪	= Pb−Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

Inputs		Output
A	**B**	**Y**
L	L	H
L	H	H
H	L	H
H	H	L

ORDERING INFORMATION

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

January, 2015 − Rev. 10

1

Publication Order Number:
MC74AC00/D

MC74AC00, MC74ACT00

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		-0.5 to $+7.0$	V
V_I	DC Input Voltage		$-0.5 \leq V_I \leq V_{CC} + 0.5$	V
V_O	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
T_L	Lead temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	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	Oxygen Index: 30% – 35%	UL 94 V–0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage	Human Body Model (Note 3) Machine Model (Note 4) Charged 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.
4. Tested to EIA/JESD22–A115–A.
5. Tested to JESD22–C101–A.
6. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	MC74AC00 MC74ACT00	2.0 4.5	5.0 5.0	6.0 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 7) MC74AC00	V_{CC} @ 3.0 V V_{CC} @ 4.5 V V_{CC} @ 5.5 V	– – –	150 40 25	– – –	ns/V
t_r, t_f	Input Rise and Fall Time (Note 8) MC74ACT00	V_{CC} @ 4.5 V V_{CC} @ 5.5 V	– –	10 8.0	– –	ns/V
T_J	Junction Temperature		–	–	150	°C
T_A	Operating Ambient Temperature Range		–55	25	125	°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.
7. V_{in} from 30% to 70% V_{CC}.
8. V_{in} from 0.8 V to 2.0 V.

MC74AC00, MC74ACT00

DC CHARACTERISTICS

Symbol	Parameter	V_CC (V)	MC74AC00 T_A = +25°C Typ	T_A = +25°C Guaranteed Limits	T_A = −40°C to +85°C Guaranteed Limits	T_A = −55°C + 125°C Guaranteed Limits	Unit	Conditions
V_{IH}	Minimum High Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	2.1 3.15 3.85	2.1 3.15 3.85	2.1 3.15 3.85	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
V_{IL}	Maximum Low Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	0.9 1.35 1.65	0.9 1.35 1.65	0.9 1.35 1.65	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
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	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	2.4 3.7 4.7	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} −12 mA −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	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	0.5 0.5 0.5	V	*V_{IN} = V_{IL} or V_{IH} I_{OL} 12 mA 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	−	±0.1	±1.0	±1.0	μA	V_I = V_{CC}, GND
I_{OLD}	†Minimum Dynamic Output Current	5.5	−	−	75	50	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5	−	−	−75	−50	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	−	4.0	40	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.
†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 (t_r = t_f = 3.0 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

Symbol	Parameter	V_CC* (V)	MC74AC00 T_A = +25°C Min	Typ	Max	T_A = −40°C to +85°C Min	Max	T_A = −55°C to + 125°C Min	Max	Unit
t_{PLH}	Propagation Delay	3.3 5.0	2.0 1.5	7.0 6.0	9.5 8.0	2.0 1.5	10.0 8.5	1.0 1.0	11.0 8.5	ns
t_{PHL}	Propagation Delay	3.3 5.0	1.5 1.5	5.5 4.5	8.0 6.5	1.0 1.0	8.5 7.0	1.0 1.0	9.0 7.0	ns

*Voltage Range 3.3 V is 3.3 V ± 0.3 V.
  Voltage Range 5.0 V is 5.0 V ± 0.5 V.

MC74AC00, MC74ACT00

DC CHARACTERISTICS

Symbol	Parameter	V_CC (V)	MC74ACT00 T_A = +25°C Typ	T_A = +25°C Guaranteed Limits	T_A = −40°C to +85°C Guaranteed Limits	T_A = −55°C to + 125°C Guaranteed Limits	Unit	Conditions
V_{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	2.0 2.0	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
V_{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	0.8 0.8	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
V_{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	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	3.7 4.7	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	0.1 0.1	V	I_{OUT} = 50 μA
		4.5 5.5	– –	0.36 0.36	0.44 0.44	0.5 0.5	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	± 1.0	μA	V_I = V_{CC}, GND
ΔI_{CCT}	Additional Max. I_{CC}/Input	5.5	0.6	–	1.5	1.6	mA	V_I = V_{CC} − 2.1 V
I_{OLD}	†Minimum Dynamic Output Current	5.5	–	–	75	50	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5	–	–	−75	−50	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	–	4.0	40	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.
†Maximum test duration 2.0 ms, one output loaded at a time.

AC CHARACTERISTICS (t_r = t_f = 3.0 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

Symbol	Parameter	V_CC* (V)	MC74ACT00 T_A = +25°C Min	T_A = +25°C Typ	T_A = +25°C Max	T_A = −40°C to +85°C Min	T_A = −40°C to +85°C Max	T_A = −55°C to +125°C Min	T_A = −55°C to +125°C Max	Unit
t_{PLH}	Propagation Delay	5.0	1.5	5.5	9.0	1.0	9.5	1.0	9.5	ns
t_{PHL}	Propagation Delay	5.0	1.5	4.0	7.0	1.0	8.0	1.0	8.0	ns

*Voltage Range 5.0 V is 5.0 V ± 0.5 V.

CAPACITANCE

Symbol	Parameter	Value Typ	Test Conditions	Unit
C_{IN}	Input Capacitance	4.5	V_{CC} = 5.0 V	pF
C_{PD}	Power Dissipation Capacitance	30	V_{CC} = 5.0 V	pF

Figure 3. Switching Waveforms

V_{mi} = 50% for MC74AC00
= 1.5 V for MC74ACT00
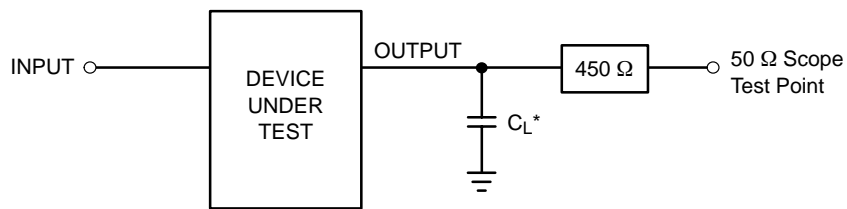
*Includes all probe and jig capacitance

Figure 4. Test Circuit

ORDER INFORMATION

Device	Package	Shipping†
MC74AC00DG	SOIC−14 (Pb−Free)	55 Units / Rail
MC74AC00DR2G	SOIC−14 (Pb−Free)	2500 / Tape and Reel
MC74AC00DTR2G	TSSOP−14 (Pb−Free)	
MC74ACT00DG	SOIC−14 (Pb−Free)	55 Units / Rail
MC74ACT00DR2G	SOIC−14 (Pb−Free)	2500 / Tape and Reel
MC74ACT00DTR2G	TSSOP−14 (Pb−Free)	

†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.

SOIC−14 NB
CASE 751A−03
ISSUE L

SCALE 1:1

DATE 03 FEB 2016

14

1

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DETAIL A

DETAIL A

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0 °	7 °	0 °	7 °

13X b

⊕ 0.25 Ⓜ B Ⓜ

⊕ 0.25 Ⓜ C A Ⓢ B Ⓢ

△ 0.10

SEATING PLANE

X 45 °

SOLDERING FOOTPRINT*

6.50

14X 1.18

1.27 PITCH

14X 0.58

DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*

14

XXXXXXXXXG
AWLYWW

1

XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present.

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

STYLES ON PAGE 2

DOCUMENT NUMBER:	98ASB42565B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	SOIC−14 NB		PAGE 1 OF 2

STYLE 1:
PIN 1. COMMON CATHODE
    2. ANODE/CATHODE
    3. ANODE/CATHODE
    4. NO CONNECTION
    5. ANODE/CATHODE
    6. NO CONNECTION
    7. ANODE/CATHODE
    8. ANODE/CATHODE
    9. ANODE/CATHODE
    10. NO CONNECTION
    11. ANODE/CATHODE
    12. ANODE/CATHODE
    13. NO CONNECTION
    14. COMMON ANODE

STYLE 2:
            CANCELLED

STYLE 3:
PIN 1. NO CONNECTION
    2. ANODE
    3. ANODE
    4. NO CONNECTION
    5. ANODE
    6. NO CONNECTION
    7. ANODE
    8. ANODE
    9. ANODE
    10. NO CONNECTION
    11. ANODE
    12. ANODE
    13. NO CONNECTION
    14. COMMON CATHODE

STYLE 4:
PIN 1. NO CONNECTION
    2. CATHODE
    3. CATHODE
    4. NO CONNECTION
    5. CATHODE
    6. NO CONNECTION
    7. CATHODE
    8. CATHODE
    9. CATHODE
    10. NO CONNECTION
    11. CATHODE
    12. CATHODE
    13. NO CONNECTION
    14. COMMON ANODE

STYLE 5:
PIN 1. COMMON CATHODE
    2. ANODE/CATHODE
    3. ANODE/CATHODE
    4. ANODE/CATHODE
    5. ANODE/CATHODE
    6. NO CONNECTION
    7. COMMON ANODE
    8. COMMON CATHODE
    9. ANODE/CATHODE
    10. ANODE/CATHODE
    11. ANODE/CATHODE
    12. ANODE/CATHODE
    13. NO CONNECTION
    14. COMMON ANODE

STYLE 6:
PIN 1. CATHODE
    2. CATHODE
    3. CATHODE
    4. CATHODE
    5. CATHODE
    6. CATHODE
    7. CATHODE
    8. ANODE
    9. ANODE
    10. ANODE
    11. ANODE
    12. ANODE
    13. ANODE
    14. ANODE

STYLE 7:
PIN 1. ANODE/CATHODE
    2. COMMON ANODE
    3. COMMON CATHODE
    4. ANODE/CATHODE
    5. ANODE/CATHODE
    6. ANODE/CATHODE
    7. ANODE/CATHODE
    8. ANODE/CATHODE
    9. ANODE/CATHODE
    10. ANODE/CATHODE
    11. COMMON CATHODE
    12. COMMON ANODE
    13. ANODE/CATHODE
    14. ANODE/CATHODE

STYLE 8:
PIN 1. COMMON CATHODE
    2. ANODE/CATHODE
    3. ANODE/CATHODE
    4. NO CONNECTION
    5. ANODE/CATHODE
    6. ANODE/CATHODE
    7. COMMON ANODE
    8. COMMON ANODE
    9. ANODE/CATHODE
    10. ANODE/CATHODE
    11. NO CONNECTION
    12. ANODE/CATHODE
    13. ANODE/CATHODE
    14. COMMON CATHODE

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DESCRIPTION:	SOIC−14 NB		PAGE 2 OF 2

TSSOP−14 WB
CASE 948G
ISSUE C

DATE 17 FEB 2016

SCALE 2:1

14

1

14X **K** REF

⊕ | 0.10 (0.004) Ⓜ | T | U Ⓢ | V Ⓢ

◁ | 0.15 (0.006) | T | U Ⓢ

2X **L/2**

L

PIN 1 IDENT.

14   8

1   7

B
−U−

◁ | 0.15 (0.006) | T | U Ⓢ

A
−V−

DETAIL E

N

N

0.25 (0.010)

M

F

K

K1

J **J1**

SECTION N−N

C

◁ | 0.10 (0.004)
−T− SEATING PLANE

D   **G**   **H**

DETAIL E

−W−

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 °

GENERIC MARKING DIAGRAM*

14
XXXX
XXXX
ALYW▪
1

A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot " ▪", may or may not be present.

SOLDERING FOOTPRINT

7.06

1

0.65
PITCH

14X
0.36

14X
1.26

DIMENSIONS: MILLIMETERS

DOCUMENT NUMBER:	98ASH70246A	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	**TSSOP−14 WB**		**PAGE 1 OF 1**

PUBLICATION ORDERING INFORMATION

◊

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Other Similar products are found below :

74HC85N NLU1G32AMUTCG CD4068BE NL17SG32P5T5G NL17SG86DFT2G NLV14001UBDR2G NLX1G11AMUTCG

NLX1G97MUTCG 74LS38 74LVC32ADTR2G MC74HCT20ADTR2G NLV17SZ00DFT2G NLV17SZ02DFT2G NLV74HC02ADR2G

74HC32S14-13 74LS133 74LVC1G32Z-7 M38510/30402BDA 74LVC1G86Z-7 74LVC2G08RA3-7 NLV74HC08ADTR2G

NLV74HC14ADR2G NLV74HC20ADR2G NLX2G86MUTCG 5962-8973601DA 74LVC2G02HD4-7 NLU1G00AMUTCG

74LVC2G32RA3-7 74LVC2G00HD4-7 NL17SG02P5T5G 74LVC2G00HK3-7 74LVC2G86HK3-7 NLX1G99DMUTWG

NLVVHC1G00DFT2G NLVHC1G08DFT2G NLV7SZ57DFT2G NLV74VHC04DTR2G NLV27WZ86USG NLV27WZ00USG

NLU1G86CMUTCG NLU1G08CMUTCG NL17SZ32P5T5G NL17SZ00P5T5G NL17SH02P5T5G 74AUP2G00RA3-7

NLV74HC02ADTR2G NLX1G332CMUTCG NL17SG86P5T5G NL17SZ05P5T5G NLV74VHC00DTR2G