Single Inverter

NLV74HC1G04

The NLV4HC1G04 is a high speed CMOS inverter fabricated with silicon gate CMOS technology.

The internal circuit is composed of multiple stages, including a buffer output which provides high noise immunity and stable output.

The NLV74HC1G04 output drive current is 1/2 compared to NLV74HC series.

Features

- High Speed: t_{PD} = 7 ns (Typ) at V_{CC} = 5 V
- Low Power Dissipation: I_{CC} = 1 μA (Max) at T_A = 25°C
- High Noise Immunity
- Balanced Propagation Delays ($t_{pLH} = t_{pHL}$)
- Symmetrical Output Impedance ($I_{OH} = I_{OL}$ = 2 mA)
- Chip Complexity: < 100 FETs
- 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

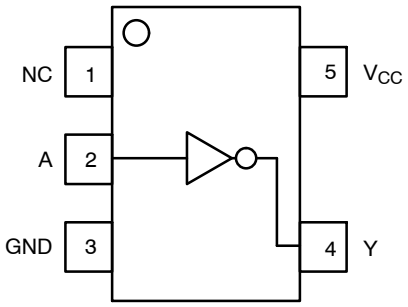


Figure 1. Pinout

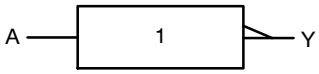
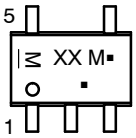
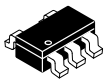


Figure 2. Logic Symbol

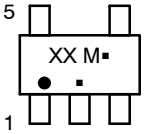
PIN ASSIGNMENT	
1	NC
2	A
3	GND
4	Y
5	V_{CC}

SC−88A
DF SUFFIX
CASE 419A





TSOP−5
DT SUFFIX
CASE 483



MARKING DIAGRAMS

XX = Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)
*Date Code orientation and/or position may vary depending upon manufacturing location.

FUNCTION TABLE

Input A	Output Y
L	H
H	L

ORDERING INFORMATION

See detailed ordering, marking 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
V_{IN}	DC Input Voltage		−0.5 to V_{CC} +0.5	V
V_{OUT}	DC Output Voltage		−0.5 to V_{CC} +0.5	V
I_{IK}	DC Input Diode Current		±20	mA
I_{OK}	DC Output Diode Current		±20	mA
I_{OUT}	DC Output Source/Sink Current		±12.5	mA
I_{CC} or I_{GND}	DC Supply Current per Supply Pin or Ground Pin		±25	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 1)	SC−88A TSOP−5	377 320	°C/W
P_D	Power Dissipation in Still Air at 85°C	SC−88A TSOP−5	332 390	mW
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage (Note 2)	Human Body Model Charged Device Model	2000 1000	V
$I_{LATCHUP}$	Latchup Performance (Note 3)		±500	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. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 20 ounce copper trace with no air flow per JESD51−7.
2. HBM tested to ANSI/ESDA/JEDEC JS−001−2017. CDM tested to JESD22−C101−F. JEDEC recommends that ESD qualification to EIA/JESD22−A115A (Machine Model) be discontinued per JEDEC/JEP172A.
3. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage		2.0	6.0	V
V_{IN}	DC Input Voltage		0.0	V_{CC}	V
V_{OUT}	DC Output Voltage		0.0	V_{CC}	V
T_A	Operating Temperature Range		−55	+125	°C
t_r , t_f	Input Rise and Fall Time	V_{CC} = 2.0 V V_{CC} = 3.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	0 0 0 0	1000 600 500 400	ns

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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} (V)	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	−40°C ≤ T_A ≤ 85°C Min	−40°C ≤ T_A ≤ 85°C Max	−55°C ≤ T_A ≤ 125°C Min	−55°C ≤ T_A ≤ 125°C Max	Unit
V_{IH}	High−Level Input Voltage		2.0 3.0 4.5 6.0	1.5 2.1 3.15 4.20	– – – –	– – – –	1.5 2.1 3.15 4.20	– – – –	1.5 2.1 3.15 4.20	– – – –	V
V_{IL}	Low−Level Input Voltage		2.0 3.0 4.5 6.0	– – – –	– – – –	0.5 0.9 1.35 1.80	– – – –	0.5 0.9 1.35 1.80	– – – –	0.5 0.9 1.35 1.80	V
V_{OH}	High−Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_{OH} = −20 μA	2.0 3.0 4.5 6.0	1.9 2.9 4.4 5.9	2.0 3.0 4.5 6.0	– – – –	1.9 2.9 4.4 5.9	– – – –	1.9 2.9 4.4 5.9	– – – –	V
		V_{IN} = V_{IH} or V_{IL} I_{OH} = −2 mA I_{OH} = −2.6 mA	4.5 6.0	4.18 5.68	4.31 5.80	– –	4.13 5.63	– –	4.08 5.58	– –	
V_{OL}	Low−Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_{OL} = 20 μA	2.0 3.0 4.5 6.0	– – – –	0.0 0.0 0.0 0.0	0.1 0.1 0.1 0.1	– – – –	0.1 0.1 0.1 0.1	– – – –	0.1 0.1 0.1 0.1	V
		V_{IN} = V_{IH} or V_{IL} I_{OL} = 2 mA I_{OL} = 2.6 mA	4.5 6.0	– –	0.17 0.18	0.26 0.26	– –	0.33 0.33	– –	0.40 0.40	
I_{IN}	Input Leakage Current	V_{IN} = 6.0 V or GND	6.0	–	–	±0.1	–	±1.0	–	±1.0	μA
I_{CC}	Quiescent Supply Current	V_{IN} = V_{CC} or GND	6.0	–	–	1.0	–	10	–	40	μA

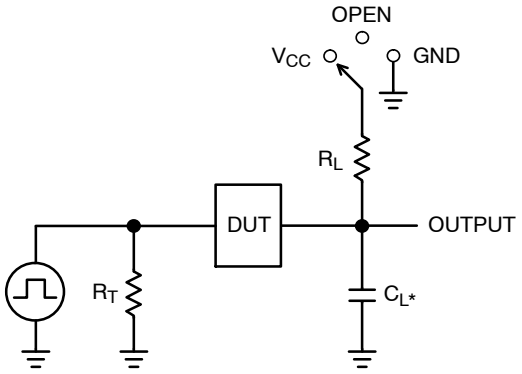
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	−40°C ≤ T_A ≤ 85°C Min	−40°C ≤ T_A ≤ 85°C Max	−55°C ≤ T_A ≤ 125°C Min	−55°C ≤ T_A ≤ 125°C Max	Unit
t_{PLH}, t_{PHL}	Propagation Delay, A to Y	V_{CC} = 5.0 V C_L = 15 pF	–	3.5	15	–	20	–	25	ns
		V_{CC} = 2.0 V C_L = 50 pF V_{CC} = 3.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	– – – –	20 11 8 7	100 27 20 17	– – – –	125 35 25 21	– – – –	155 90 35 26	
t_{TLH}, t_{THL}	Output Transition Time	V_{CC} = 5.0 V C_L = 15 pF	–	3	10	–	15	–	20	ns
		V_{CC} = 2.0 V C_L = 50 pF V_{CC} = 3.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	– – – –	25 16 11 9	125 35 25 21	– – – –	155 45 31 26	– – – –	200 60 38 32	
C_{IN}	Input Capacitance		–	5	10	–	10	–	10	pF

		Typical @ 25°C, V_{CC} = 5.0 V	
C_{PD}	Power Dissipation Capacitance (Note 4)	10	pF

4. 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}. C_{PD} is used to determine the no−load dynamic power consumption; P_D = C_{PD} • V_{CC}^2 • f_{in} + I_{CC} • V_{CC}.



Test	Switch Position	C_L, pF	R_L, Ω
t_{PLH} / t_{PHL}	Open	See AC Characteristics Table	X
t_{TLH} / t_{THL} (Note 5)	Open		X
t_{PLZ} / t_{PZL}	V_{CC}		1 k
t_{PHZ} / t_{PZH}	GND		1 k

X – Don't Care

*C_L includes probe and jig capacitance
R_T is Z_{OUT} of pulse generator (typically 50 W)
f = 1 MHz

Figure 3. Test Circuit

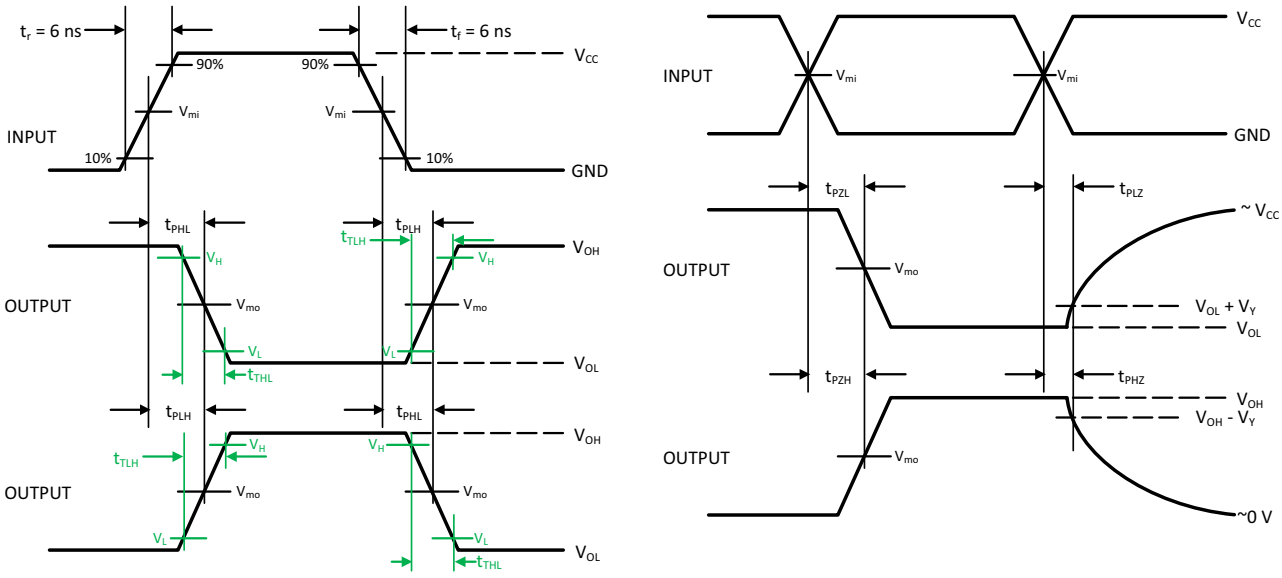


Figure 4. Switching Waveforms

V_{CC}, V	V_{mi}, V	V_{mo}, V		V_L, V	V_H, V	V_Y, V
		t_{PLH}, t_{PHL}	t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}			
3.0 to 3.6	V_{CC}/2	V_{CC}/2	V_{CC}/2	V_{OL} + 0.1 (V_{OH} – V_{OL})	V_{OL} + 0.9 (V_{OH} – V_{OL})	0.3
4.5 to 5.5	V_{CC}/2	V_{CC}/2	V_{CC}/2	V_{OL} + 0.1 (V_{OH} – V_{OL})	V_{OL} + 0.9 (V_{OH} – V_{OL})	0.3

5. t_{TLH} and t_{THL} are measured from 10% to 90% of (V_{OH} – V_{OL}), and 90% to 10% of (V_{OH} – V_{OL}), respectively.

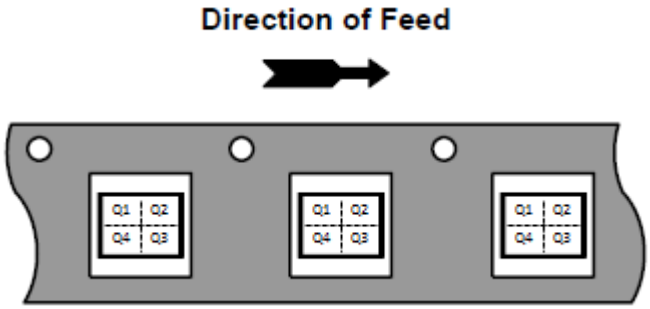
ORDERING INFORMATION

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping†
MC74HC1G04DFT1G−L22038	SC−88A	H5	Q2	3000 / Tape & Reel
NLVHC1G04DFT1G*	SC−88A	H5	Q2	3000 / Tape & Reel
MC74HC1G04DFT2G−L22038	SC−88A	H5	Q4	3000 / Tape & Reel
NLVHC1G04DFT2G*	SC−88A	H5	Q4	3000 / Tape & Reel
MC74HC1G04DTT1G	TSOP−5	H5	Q4	3000 / Tape & Reel

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

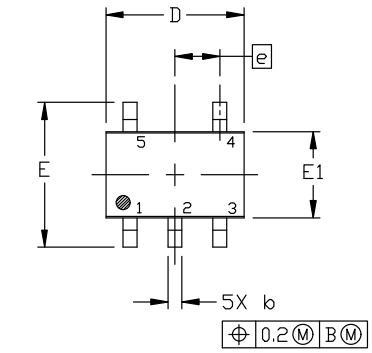
*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

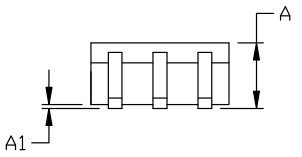
Pin 1 Orientation in Tape and Reel

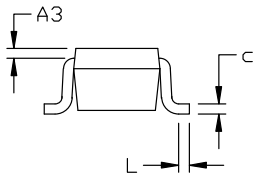


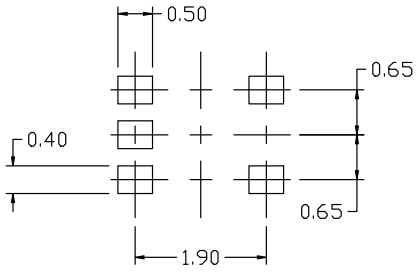
PACKAGE DIMENSIONS

SC−88A (SC−70−5/SOT−353)
CASE 419A−02
ISSUE M









RECOMMENDED
MOUNTING FOOTPRINT

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

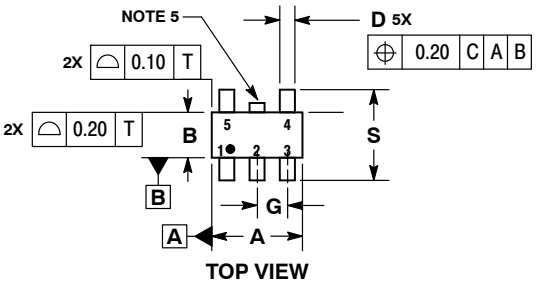
NOTES:

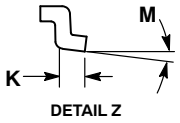
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

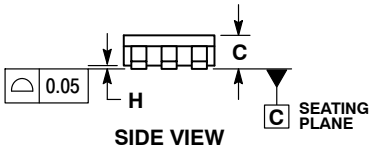
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.95	1.10
A1	---	---	0.10
A3	0.20 REF		
b	0.10	0.20	0.30
c	0.10	---	0.25
D	1.80	2.00	2.20
E	2.00	2.10	2.20
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.10	0.15	0.30

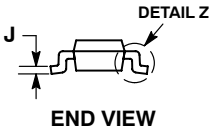
PACKAGE DIMENSIONS

TSOP−5
CASE 483
ISSUE N





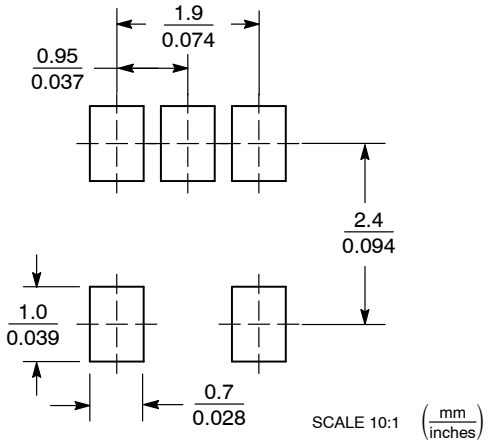




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSION A.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

	MILLIMETERS	
DIM	MIN	MAX
A	2.85	3.15
B	1.35	1.65
C	0.90	1.10
D	0.25	0.50
G	0.95 BSC	
H	0.01	0.10
J	0.10	0.26
K	0.20	0.60
M	0 °	10 °
S	2.50	3.00

SOLDERING FOOTPRINT*



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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

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