Single Inverter

MC74HC1G04

The MC74HC1G04 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 MC74HC1G04 output drive current is 1/2 compared to MC74HC series.

Features

- High Speed: $t_{PD} = 7 \text{ ns (Typ)}$ at $V_{CC} = 5 \text{ V}$
- Low Power Dissipation: $I_{CC} = 1 \mu A$ (Max) at $T_A = 25^{\circ}C$
- High Noise Immunity
- Balanced Propagation Delays $(t_{pLH} = t_{pHL})$
- Symmetrical Output Impedance ($I_{OH} = I_{OL} = 2 \text{ mA}$)
- 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

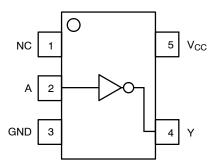


Figure 1. Pinout



Figure 2. Logic Symbol

PIN ASSIGNMENT					
1	NC				
2	А				
3	GND				
4	Y				
5	V _{CC}				



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SC-88A DF SUFFIX CASE 419A



MARKING



TSOP-5 DT SUFFIX CASE 483



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.



SC-74A DBV SUFFIX CASE 318BQ



XXX = Specific Device Code
M = Date Code
Pb-Free Package

(Note: Microdot may be in either 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	SC-88A (NLV), TSOP-5 SC-88A, SC-74A	-0.5 to +7.0 -0.5 to +6.5	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
l _{ok}	DC Output Diode Current		±20	mA
l _{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
TJ	Junction Temperature Under Bias		+150	°C
$\theta_{\sf JA}$	Thermal Resistance (Note 1)	SC-88A SC-74A	377 320	°C/W
P_{D}	Power Dissipation in Still Air at 85°C	SC-88A SC-74A	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)	SC-88A (NLV), TSOP-5 SC-88A, SC-74A	±500 ±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. 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	٧
V _{IN}	DC Input Voltage	0.0	V _{CC}	V
V _{OUT}	DC Output Voltage	0.0	V _{CC}	٧
T _A	Operating Temperature Range	-55	+125	°C
t _r , t _f	Input Rise and Fall Time $SC-88A \ (NLV), TSOP-5$ $V_{CC}=2.0 \ V$ $V_{CC}=3.0 \ V$ $V_{CC}=4.5 \ V$ $V_{CC}=6.0 \ V$	0 0 0 0	1000 600 500 400	ns
	Input Rise and Fall Time $SC-88A, SC-74A \\ V_{CC}=2.0 \text{ V} \\ V_{CC}=2.3 \text{ V to } 2.7 \text{ V} \\ V_{CC}=3.0 \text{ V to } 3.6 \text{ V} \\ V_{CC}=4.5 \text{ V to } 6.0 \text{ V} \\ \end{array}$	0 0 0 0	20 20 10 5	ns/V

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

			V _{CC}	Т	A = 25°	С	-40°C ≤ 1	Γ _A ≤ 85°C	-55°C ≤ T	_A ≤ 125°C	
Symbol	Parameter	Test Conditions	(V)	Min	Тур	Max	Min	Max	Min	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 1 1 1	1.5 2.1 3.15 4.20	- - -	1.5 2.1 3.15 4.20	- - - -	٧
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	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -20 \mu A$	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 1 1 1	1.9 2.9 4.4 5.9	- - -	1.9 2.9 4.4 5.9	- - - -	٧
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -2$ mA $I_{OH} = -2.6$ mA	4.5 6.0	4.18 5.68	4.31 5.80	1 1	4.13 5.63	- -	4.08 5.58	- -	
V _{OL}	Low-Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 20 \mu\text{A}$	2.0 3.0 4.5 6.0	- - -	0.0 0.0 0.0 0.0	0.1 0.1 0.1 0.1	1 1 1 1	0.1 0.1 0.1 0.1	1 1	0.1 0.1 0.1 0.1	V
		$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 2 \text{ mA}$ $I_{OL} = 2.6 \text{ mA}$	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	μΑ
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	6.0	_	_	1.0	-	10	-	40	μΑ

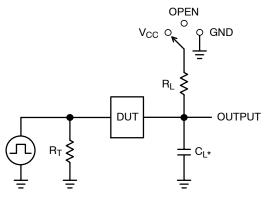
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

AC ELECTRICAL CHARACTERISTICS

			T _A = 25°C		$-40^{\circ}\text{C} \le \text{T}_{\text{A}} \le 85^{\circ}\text{C}$		-55 °C ≤ T_A ≤ 125°C			
Symbol	Parameter	Test Conditions	Min	Тур	Max	Min	Max	Min	Max	Unit
t _{PLH} ,	Propagation Delay,	V _{CC} = 5.0 V C _L = 15 pF	-	3.5	15	-	20	-	25	ns
t _{PHL}	A to Y	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		20 11 8 7	100 27 20 17		125 35 25 21		155 90 35 26	
t _{TLH} , t _{THL}	Output Transition Time	$V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$	-	3	10	-	15	-	20	ns
*IHL		$ \begin{array}{llllllllllllllllllllllllllllllllllll$	- - -	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		Х
t _{TLH} / t _{THL} (Note 5)	Open	See AC Characteristics Table	Х
t _{PLZ} / t _{PZL}	V _{CC}	lable	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

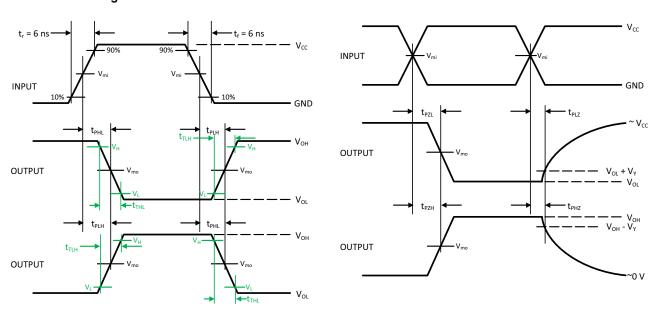


Figure 4. Switching Waveforms

		V _{mo} , V				
V _{CC} , V	V_{mi} , V	t _{PLH} , t _{PHL}	$t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}$	V_L, V	V _H , V	V _Y , V
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.

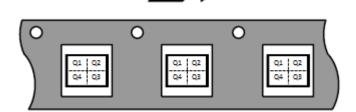
ORDERING INFORMATION

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping [†]
MC74HC1G04DFT1G	SC-88A	H5	Q2	3000 / Tape & Reel
NLVHC1G04DFT1G*	SC-88A	H5	Q2	3000 / Tape & Reel
MC74HC1G04DFT2G	SC-88A	H5	Q4	3000 / Tape & Reel
NLVHC1G04DFT2G*	SC-88A	H5	Q4	3000 / Tape & Reel
MC74HC1G04DTT1G	TSOP-5	H5	Q4	3000 / Tape & Reel
MC74HC1G04DBVT1G	SC-74A	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

Pin 1 Orientation in Tape and Reel

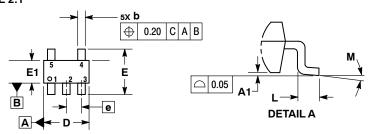
Direction of Feed

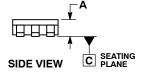


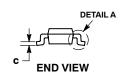
Capable.



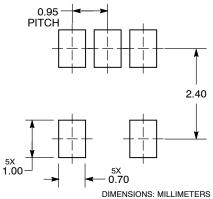
DATE 18 JAN 2018







RECOMMENDED 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.

NOTES:

- DIMENSIONING AND TOLERANCING PER ASME
 Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETERS.
 MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH
 THICKNESS. MINIMUM LEAD THICKNESS IS THE
 MINIMUM THICKNESS OF BASE MATERIAL.
- 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.

	MILLIMETERS				
DIM	MIN	MAX			
Α	0.90	1.10			
A1	0.01	0.10			
b	0.25	0.50			
С	0.10	0.26			
D	2.85	3.15			
E	2.50	3.00			
E1	1.35	1.65			
е	0.95 BSC				
L	0.20	0.60			
М	0 °	10°			

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

Μ = Date Code = 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. Some products may not follow the Generic Marking.

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SC-88A (SC-70-5/SOT-353) CASE 419A-02 **ISSUE L**

DATE 17 JAN 2013



- TES:
 DIMENSIONING AND TOLERANCING
 PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: INCH.
 419A-01 OBSOLETE. NEW STANDARD 3.
- 419A-02.
 DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	0.071	0.087	1.80	2.20
В	0.045	0.053	1.15	1.35
С	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
Н		0.004		0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

GENERIC MARKING DIAGRAM*



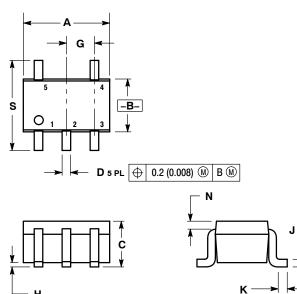
XXX = Specific Device Code

= Date Code

= 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. Some products may not follow the Generic Marking.



0.50 0.0197 0.65 0.025 0.65 0.025 0.40 0.0157 1.9 mm 0.0748 SCALE 20:1

SOLDER FOOTPRINT

STYLE 1: PIN 1. BASE 2. EMITTER 3. BASE 4. COLLECTOR 5. COLLECTOR	STYLE 2: PIN 1. ANODE 2. EMITTER 3. BASE 4. COLLECTOR 5. CATHODE	STYLE 3: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. CATHODE 1	STYLE 4: PIN 1. SOURCE 1 2. DRAIN 1/2 3. SOURCE 1 4. GATE 1 5. GATE 2	STYLE 5: PIN 1. CATHODE 2. COMMON ANODE 3. CATHODE 2 4. CATHODE 3 5. CATHODE 4

5. COLLECTOR	5. CATHODE	5. CATHODE I	5. GATE 2	5. CATHODE 4
STYLE 6: PIN 1. EMITTER 2 2. BASE 2 3. EMITTER 1 4. COLLECTOR 5. COLLECTOR 2/BASE 1	STYLE 7: PIN 1. BASE 2. EMITTER 3. BASE 4. COLLECTOR 5. COLLECTOR	STYLE 8: PIN 1. CATHODE 2. COLLECTOR 3. N/C 4. BASE 5. EMITTER	STYLE 9: PIN 1. ANODE 2. CATHODE 3. ANODE 4. ANODE 5. ANODE	Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

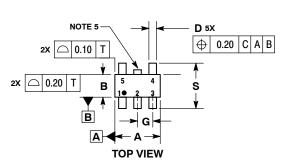
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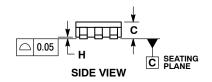


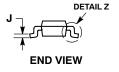
TSOP-5 **CASE 483 ISSUE N**

DATE 12 AUG 2020







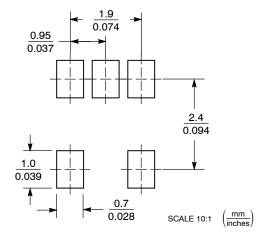


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 THICKNESS. MINIMUM LEAD THICKNESS IS THE
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- TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

	MILLIMETERS		
DIM	MIN	MAX	
Α	2.85	3.15	
В	1.35	1.65	
C	0.90	1.10	
D	0.25	0.50	
G	0.95 BSC		
Н	0.01	0.10	
J	0.10	0.26	
K	0.20	0.60	
М	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.

GENERIC MARKING DIAGRAM*





XXX = Specific Device Code XXX = Specific Device Code

= Assembly Location = Date Code

= Year = Pb-Free Package

= Work Week W

= 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.

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NLU2GU04BMX1TCG NLU2G04CMX1TCG NLV17SZ06DFT2G TC74VHC04FK(EL,K) NLV74HC04ADTR2G NLU1G04AMUTCG
NLX2G04CMUTCG NLX2G04AMUTCG NLU1GU04CMUTCG NLU1GT14AMUTCG NLU1G04CMUTCG NL17SZU04P5T5G
74LVC06ADTR2G 74LVC04ADR2G NLV37WZ04USG NLX3G14FMUTCG NL17SZ04P5T5G NLV17SG14DFT2G 74ACT14SC
BU4069UBF-E2 EMPP008Z NC7WZ14P6X NLV14106BDTR2G NLV74AC14DTR2G SN74HCT04DE4 ODE-3-120023-1F12
74VHCT04AM SV004IE5-1C TC74HC04APF TC7SH04F,LJ(CT TC7W14FK,LF 74VHC14MTCX 74LCX14MTC
SN74LVC1GU04DBVR NLU1G14BMX1TCG NLU2G04AMX1TCG NLU2G14AMX1TCG NLU3G14AMX1TCG NLVVHC1G04DFT2G
NLX2G04CMX1TCG NLX3G14AMX1TCG 74HC14T14-13