

# Single 2-Input AND Gate MC74HC1G08

The MC74HC1G08 is a high speed CMOS 2-input AND gate 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 MC74HC1G08 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

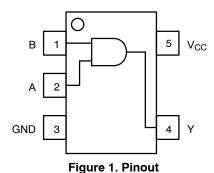
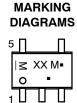


Figure 2. Logic Symbol

PIN ASSIGNMENT				
1	В			
2	А			
3	GND			
4	Y			
5	V <sub>CC</sub>			







TSOP-5 DT SUFFIX CASE 483





XX = Device Code M = Date Code\*

A = Assembly Location

Y = Year W = Work Week • = Pb-Free Package

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





XXX = Specific Device Code

M = Date Code ■ = Pb-Free Package

(Note: Microdot may be in either location)

#### **FUNCTION TABLE**

Inp	uts	Output
Α	В	Υ
L	L	L
L	Н	L
Н	L	L
Н	Н	н

#### **ORDERING INFORMATION**

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet

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#### **MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit	
V <sub>CC</sub>	DC Supply Voltage	SC-88A (NLV), TSOP-5 SC-88A, SC-74A	-0.5 to +7.0 -0.5 to +6.5	V
V <sub>IN</sub>	DC Input Voltage		$-0.5$ to $V_{CC}$ $+0.5$	V
V <sub>OUT</sub>	DC Output Voltage		$-0.5$ to $V_{CC} + 0.5$	V
I <sub>IK</sub>	DC Input Diode Current		±20	mA
l <sub>ok</sub>	DC Output Diode Current		±20	mA
l <sub>OUT</sub>	DC Output Source/Sink Current		± 12.5	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC Supply Current per Supply Pin or Ground Pin		±25	mA
T <sub>STG</sub>	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 <sub>R</sub>	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage (Note 2)	Human Body Model Charged Device Model	2000 1000	V
I <sub>LATCHUP</sub>	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.

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.
 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.

<sup>3.</sup> Tested to EIA/JESD78 Class II.

#### **RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	DC Supply Voltage	2.0	6.0	V
V <sub>IN</sub>	DC Input Voltage	0.0	V <sub>CC</sub>	V
V <sub>OUT</sub>	DC Output Voltage	0.0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature Range	- 55	+ 125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time $ \begin{array}{c} SC-88A \ (NLV), \ TSOP-1000000000000000000000000000000000000$	0 0 0	1000 600 500 400	ns
	Input Rise and Fall Time  SC-88A, SC-74  V <sub>CC</sub> = 2.0 V  V <sub>CC</sub> = 2.3 V to 2.7 V  V <sub>CC</sub> = 3.0 V to 3.6 V  V <sub>CC</sub> = 4.5 V to 6.0 V	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

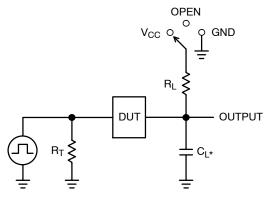
			v <sub>cc</sub>	Т	A = 25°	С	-40°C ≤ 1	Γ <sub>A</sub> ≤ 85°C	-55°C ≤ T	<sub>A</sub> ≤ 125°C	
Symbol	Parameter	Test Conditions	(V)	Min	Тур	Max	Min	Max	Min	Max	Unit
V <sub>IH</sub>	High-Level Input Voltage		2.0 3.0 4.5 6.0	1.5 2.1 3.15 4.20	- - -	1 1 1 1	1.5 2.1 3.15 4.20	- - -	1.5 2.1 3.15 4.20	- - -	V
V <sub>IL</sub>	Low-Level Input Voltage		2.0 3.0 4.5 6.0	- - -	- - -	0.5 0.9 1.35 1.80	1 1 1 1	0.5 0.9 1.35 1.80	- - -	0.5 0.9 1.35 1.80	V
V <sub>OH</sub>	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	- - -	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	1 1	4.13 5.63	1 1	4.08 5.58	1 1	
V <sub>OL</sub>	Low-Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 20 \mu A$	2.0 3.0 4.5 6.0	- - -	0.0 0.0 0.0 0.0	0.1 0.1 0.1 0.1		0.1 0.1 0.1 0.1	- - -	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	1 1	0.33 0.33	- -	0.40 0.40	
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 6.0 V or GND	6.0	_	-	±0.1	-	±1.0	-	±1.0	μΑ
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0	_	_	1.0	-	10	-	40	μΑ

#### **AC ELECTRICAL CHARACTERISTICS**

			T <sub>A</sub> = 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 <sub>PLH</sub> ,	Propagation Delay,	V <sub>CC</sub> = 5.0 V C <sub>L</sub> = 15 pF	_	3.5	15	-	20	_	25	ns
t <sub>PHL</sub>	(A or B) to Y	$\begin{array}{lll} V_{CC} = 2.0 \text{ V} & C_L = 50 \text{ pF} \\ V_{CC} = 3.0 \text{ V} \\ V_{CC} = 4.5 \text{ V} \\ V_{CC} = 6.0 \text{ V} \end{array}$	- - -	20 11 8 7	100 27 20 17	- - -	125 35 25 21	- - - -	155 90 35 26	
t <sub>TLH</sub> , t <sub>THL</sub>	Output Transition Time	$V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ $V_{CC} = 2.0 \text{ V}$ $C_L = 50 \text{ pF}$ $V_{CC} = 3.0 \text{ V}$		3 25 16	10 125 35 25	- - -	15 155 45 31	- - -	20 200 60 38	ns
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 4.5 V V <sub>CC</sub> = 6.0 V	- -	11 9 5	25 21 10	- -	26	- -	38 32 10	pF

		Typical @ 25°C, V <sub>CC</sub> = 5.0 V	
$C_{PD}$	Power Dissipation Capacitance (Note 4)	10	pF

<sup>4.</sup> C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no–load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.



Test	Switch Position	C <sub>L</sub> , pF	R <sub>L</sub> , Ω
t <sub>PLH</sub> / t <sub>PHL</sub>	Open		X
t <sub>TLH</sub> / t <sub>THL</sub> (Note 5)	Open	See AC Characteristics Table	Х
t <sub>PLZ</sub> / t <sub>PZL</sub>	V <sub>CC</sub>	lable	1 k
t <sub>PHZ</sub> / t <sub>PZH</sub>	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

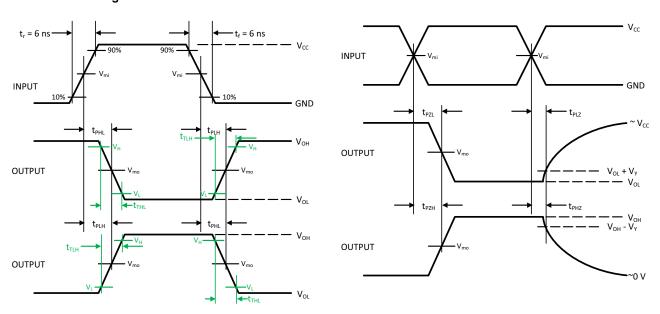


Figure 4. Switching Waveforms

		V <sub>mo</sub> , V				
V <sub>CC</sub> , V	$V_{mi}$ , $V$	t <sub>PLH</sub> , t <sub>PHL</sub>	$t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}$	$V_L,V$	V <sub>H</sub> , V	V <sub>Y</sub> , V
3.0 to 3.6	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>OL</sub> + 0.1 (V <sub>OH</sub> – V <sub>OL</sub> )	V <sub>OL</sub> + 0.9 (V <sub>OH</sub> – V <sub>OL</sub> )	0.3
4.5 to 5.5	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>OL</sub> + 0.1 (V <sub>OH</sub> – V <sub>OL</sub> )	V <sub>OL</sub> + 0.9 (V <sub>OH</sub> – V <sub>OL</sub> )	0.3

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

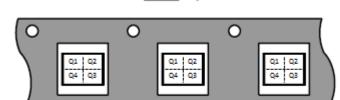
#### **ORDERING INFORMATION**

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping <sup>†</sup>
MC74HC1G08DFT1G	SC-88A	H2	Q2	3000 / Tape & Reel
NLVHC1G08DFT1G*	SC-88A	H2	Q2	3000 / Tape & Reel
MC74HC1G08DFT2G	SC-88A	H2	Q4	3000 / Tape & Reel
MC74HC1G08DFT2G-L22038**	SC-88A	H2	Q4	3000 / Tape & Reel
NLVHC1G08DFT2G*	SC-88A	H2	Q4	3000 / Tape & Reel
MC74HC1G08DTT1G**	TSOP-5	H2	Q4	3000 / Tape & Reel
NLVHC1G08DTT1G*	TSOP-5	H2	Q4	3000 / Tape & Reel
MC74HC1G08DBVT1G	SC-74A	H2	Q4	3000 / Tape & Reel

<sup>†</sup>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.

# Pin 1 Orientation in Tape and Reel

#### Direction of Feed

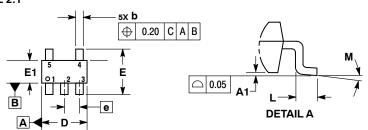


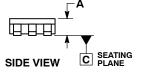
<sup>\*</sup>NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

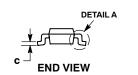
<sup>\*\*</sup>Please refer to NLV specifications for this device.



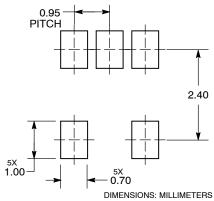
**DATE 18 JAN 2018** 







### **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 R DO NOT INCLUDE MOLD.
- 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				
M	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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DESCRIPTION:	SC-74A		PAGE 1 OF 1	

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

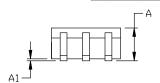
**DATE 11 APR 2023** 

#### NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETERS
- 419A-01 DBSDLETE. NEW STANDARD 419A-02
- 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.

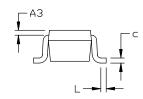
DIM	MILLIMETERS			
	MIN.	N□M.	MAX.	
А	0.80	0.95	1.10	
A1			0.10	
А3	0.20 REF			
b	0.10	0.20	0.30	
С	0.10		0.25	
D	1.80	2.00	2,20	
Е	2.00	2.10	2.20	
E1	1.15	1.25	1.35	
е	0.65 BSC			
L	0.10	0.15	0.30	

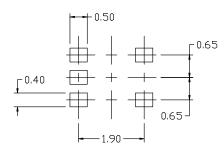
# e Ε1 0



5X b

◆ 0.2 M B M





#### RECOMMENDED MOUNTING FOOTPRINT

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

#### **GENERIC MARKING DIAGRAM\***



\*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.

XXX = Specific Device Code

= Date Code

= Pb-Free Package

(Note: Microdot may be in either location)

STYLE 9:

PIN 1. EMITTER 2

2. BASE 2

3. EMITTER 1

4. COLLECTOR

STYLE 6:

STYLE 2: PIN 1. ANODE 2. EMITTER 3. BASE 4. COLLECTOR CATHODE

2. EMITTER

4. COLLECTOR

5. COLLECTOR

3. BASE

STYLE 3: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. CATHODE 1 STYLE 8:

PIN 1. CATHODE 2. COLLECTOR 3. N/C

5. EMITTER

4. BASE

STYLE 4: PIN 1. SOURCE 1 2. DRAIN 1/2 3 SOURCE 1 4. GATE 1 5. GATE 2

PIN 1. ANODE 2. CATHODE

3. ANODE 4. ANODE

ANODE
 ANODE

STYLE 5: PIN 1. CATHODE 2. COMMON ANODE 3. CATHODE 2 4. CATHODE 3 5. CATHODE 4

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.

# 5. COLLECTOR 2/BASE 1 **DOCUMENT NUMBER:**

98ASB42984B

PIN 1. BASE

STYLE 7:

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**DESCRIPTION:** 

SC-88A (SC-70-5/SOT-353)

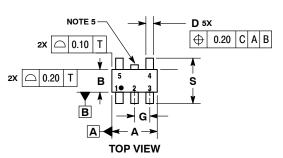
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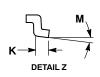
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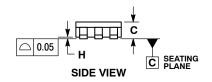


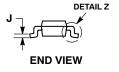
TSOP-5 **CASE 483 ISSUE N** 

**DATE 12 AUG 2020** 









#### NOTES:

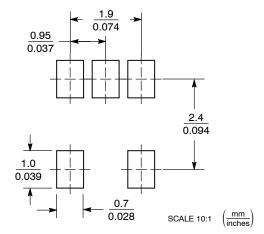
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  MINIMUM THICKNESS OF BASE MATERIAL.
- MINIMUM I HICKNESS OF BASE MAI EHIAL.

  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.

  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	
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\***



<sup>\*</sup>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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