

Single 2-Input AND Gate

MC74VHC1G08E

The MC74VHC1G08E is an advanced 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 MC74VHC1G08E input structure provides protection when voltages up to 5.5 V are applied, regardless of the supply voltage. This allows the MC74VHC1G08E to be used to interface 5.0 V circuits to 3.0 V circuits.

Features

- High Speed: $t_{PD} = 3.5$ ns (Typ) at $V_{CC} = 5.0$ V
- Low Power Dissipation: $I_{CC} = 1.0$ μ A (Max) at $T_A = 25^\circ$ C
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Chip Complexity: FETs = 62
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

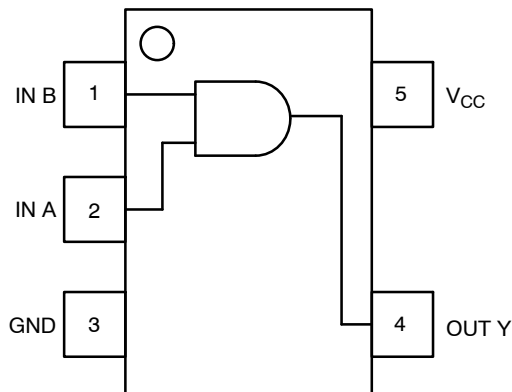


Figure 1. Pinout (Top View)

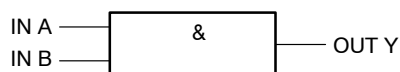
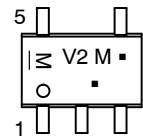


Figure 2. Logic Symbol



SC-88A / SOT-353 / SC-70
 DF SUFFIX
 CASE 419A

MARKING DIAGRAMS



V2 = 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.

PIN ASSIGNMENT

Pin	Function
1	IN B
2	IN A
3	GND
4	OUT Y
5	V _{CC}

FUNCTION TABLE

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

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

MC74VHC1G08E

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	− 0.5 to +6.5	V
V_{IN}	DC Input Voltage	−0.5 to +6.5	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 Sink Current	± 12.5	mA
I_{CC}	DC Supply Current per Supply 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	SC70-5/SC-88A (Note 1)	°C/W
P_D	Power Dissipation in Still Air at 85°C	SC70-5/SC-88A	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	Human Body Model (Note 2) Charged Device Model (Note 3)	> 4000 > 1000
$I_{LATCHUP}$	Latchup Performance	Above V_{CC} and Below GND at 125°C (Note 4)	± 100

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, 2-ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics	Min	Max	Unit
V_{CC}	DC Supply Voltage	2.0	5.5	V
V_{IN}	DC Input Voltage	0.0	5.5	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	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ $V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	0 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.

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = 25°C			T _A ≤ 85°C		–55°C to 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	Minimum High-Level Input Voltage		2.0 3.0 4.5 5.5	1.5 2.1 3.15 3.85	– – – –	– – – –	1.5 2.1 3.15 3.85	– – – –	1.5 2.1 3.15 3.85	– – – –	V
V _{IL}	Maximum Low-Level Input Voltage		2.0 3.0 4.5 5.5	– – – –	– – – –	0.5 0.9 1.35 1.65	– – – –	0.5 0.9 1.35 1.65	– – – –	0.5 0.9 1.35 1.65	V
V _{OH}	Minimum High-Level Output Voltage V _{IN} = V _{IH} or V _{IL}	V _{IN} = V _{IH} or V _{IL} I _{OH} = –50 μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	– – –	1.9 2.9 4.4	– – –	1.9 2.9 4.4	– – –	V
		V _{IN} = V _{IH} or V _{IL} I _{OH} = –4 mA I _{OH} = –8 mA	3.0 4.5	2.58 3.94	– –	– –	2.48 3.80	– –	2.34 3.66	– –	
V _{OL}	Maximum Low-Level Output Voltage V _{IN} = V _{IH} or V _{IL}	V _{IN} = V _{IH} or V _{IL} I _{OL} = 50 μA	2.0 3.0 4.5	– – –	0.0 0.0 0.0	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} = 4 mA I _{OL} = 8 mA	3.0 4.5	– –	– –	0.36 0.36	– –	0.44 0.44	– –	0.52 0.52	
I _{IN}	Maximum Input Leakage Current	V _{IN} = 5.5 V or GND	0 to 5.5	–	–	±0.1	–	±1.0	–	±1.0	μA
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5	–	–	1.0	–	10	–	40	μA

AC ELECTRICAL CHARACTERISTICS Input t_r = t_f = 3.0 ns

Symbol	Parameter	Test Conditions	T _A = 25°C			T _A ≤ 85°C		–55 ≤ T _A ≤ 125°C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A or B to Y	V _{CC} = 3.3 ± 0.3 V C _L = 15 pF	–	4.1	8.8	–	10.5	–	12.5	ns
		C _L = 50 pF	–	5.9	12.3	–	14.0	–	16.5	
		V _{CC} = 5.0 ± 0.5 V C _L = 15 pF	–	3.5	5.9	–	7.0	–	9.0	
		C _L = 50 pF	–	4.2	7.9	–	9.0	–	11.0	
C _{IN}	Maximum Input Capacitance		–	5.5	10	–	10	–	10	pF

C _{PD}	Power Dissipation Capacitance (Note 5)	Typical @ 25°C, V _{CC} = 5.0 V	pF
		11	

5. 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}.

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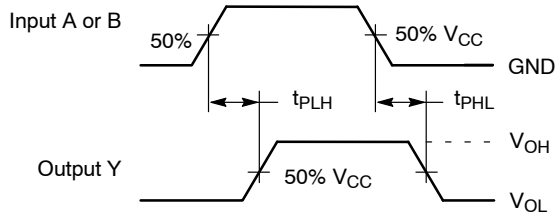
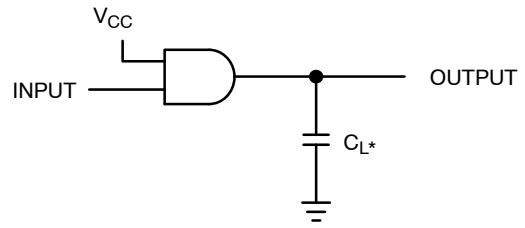


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance.
A 1-MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

DEVICE ORDERING INFORMATION

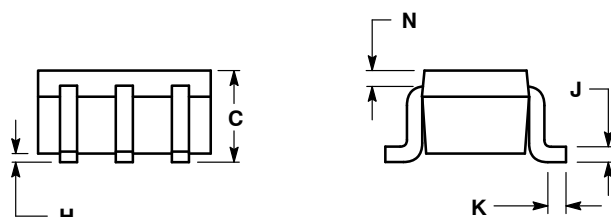
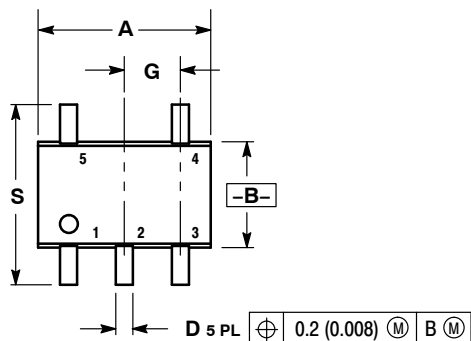
Device	Package	Shipping [†]
MC74VHC1G08EDFT2G	SC70-5/SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel

[†]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.

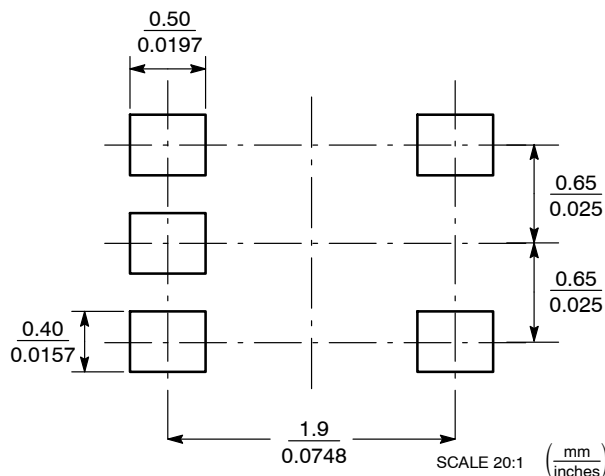
MC74VHC1G08E

PACKAGE DIMENSIONS

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



SOLDER FOOTPRINT



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	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

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