

# MC74HC1G14

## Single Inverter with Schmitt-Trigger Input

The MC74HC1G14 is a high speed CMOS inverter with Schmitt-Trigger input 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 MC74HC1G14 output drive current is 1/2 compared to MC74HC series.

- High Speed:  $t_{PD} = 7.0 \text{ ns}$  (Typ) at  $V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation:  $I_{CC} = 1.0 \mu\text{A}$  (Max) at  $T_A = 25^\circ\text{C}$
- High Noise Immunity
- Balanced Propagation Delays ( $t_{PLH} = t_{PHL}$ )
- Symmetrical Output Impedance ( $I_{OH} = I_{OL} = 2.0 \text{ mA}$ )
- Chip Complexity: FET = 101
- 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 and are RoHS Compliant

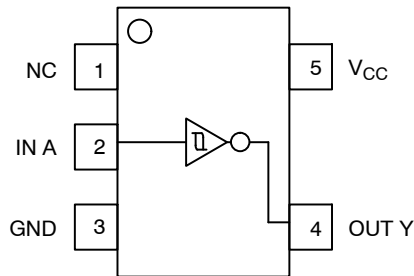


Figure 1. Pinout (Top View)

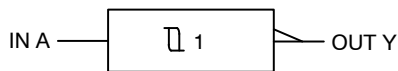


Figure 2. Logic Symbol



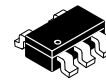
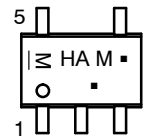
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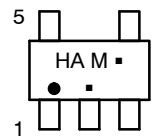
### MARKING DIAGRAMS



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



TSOP-5 / SOT-23 / SC-59  
DT SUFFIX  
CASE 483



HA = 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 ASSIGNMENT	
1	NC
2	IN A
3	GND
4	OUT Y
5	V <sub>CC</sub>

### FUNCTION TABLE

Inputs	Outputs
L	H
H	L

### ORDERING INFORMATION

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

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## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit	
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0	V	
V <sub>IN</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V	
V <sub>OUT</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V	
I <sub>IK</sub>	DC Input Diode Current	±20	mA	
I <sub>OK</sub>	DC Output Diode Current	±20	mA	
I <sub>OUT</sub>	DC Output Sink Current	±12.5	mA	
I <sub>CC</sub>	DC Supply Current per Supply Pin	±25	mA	
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C	
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C	
T <sub>J</sub>	Junction Temperature Under Bias	+150	°C	
θ <sub>JA</sub>	Thermal Resistance	SC70-5/SC-88A/SOT-353 (Note 1) SOT23-5/TSOP-5/SC59-5	350 230	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 85°C	SC70-5/SC-88A/SOT-353 SOT23-5/TSOP-5/SC59-5	150 200	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	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	>2000 >200 N/A	V
I <sub>LATCHUP</sub>	Latchup Performance	Above V <sub>CC</sub> and Below GND at 125°C (Note 5)	±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, 2 ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

## 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	V <sub>CC</sub> = 3.3 V ± 0.3 V V <sub>CC</sub> = 5.0 V ± 0.5 V	No Limit No Limit	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.

## DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES

Junction Temperature °C	Time, Hours	Time, Years
80	1,032,200	117.8
90	419,300	47.9
100	178,700	20.4
110	79,600	9.4
120	37,000	4.2
130	17,800	2.0
140	8,900	1.0

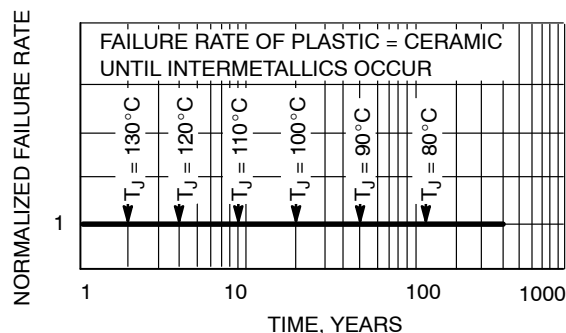


Figure 3. Failure Rate vs. Time Junction Temperature

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			T <sub>A</sub> ≤ 85°C		-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V <sub>T+</sub>	Positive Threshold Voltage		3.0	1.85	2.0	2.20		2.20		2.20	V
			4.5	2.86	3.0	3.15		3.15		3.15	
			5.5	3.50	3.6	3.85		3.85		3.85	
V <sub>T-</sub>	Negative Threshold Voltage		3.0	0.9	1.5	1.65	0.9		0.9		V
			4.5	1.35	2.3	2.46	1.35		1.35		
			5.5	1.65	2.9	3.05	1.65		1.65		
V <sub>H</sub>	Hysteresis Voltage		3.0	0.30	0.57	1.20	0.30	1.20	0.30	1.20	V
			4.5	0.40	0.67	1.40	0.40	1.40	0.40	1.40	
			5.5	0.50	0.74	1.60	0.50	1.60	0.50	1.60	
V <sub>OH</sub>	Minimum High-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -20 μA	2.0	1.9	2.0		1.9		1.9	V	
		3.0	2.9	3.0		2.9		2.9			
		V <sub>IN</sub> ≤ V <sub>T</sub> - Min I <sub>OH</sub> = -2 mA I <sub>OH</sub> = -2.6 mA	4.5	4.4	4.5		4.4		4.4		
			6.0	5.9	6.0		5.9		5.9		
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>IN</sub> ≥ V <sub>T</sub> + Max I <sub>OL</sub> = 20 μA	2.0		0.0	0.1		0.1		0.1	V
		3.0		0.0	0.1		0.1		0.1		
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 2 mA I <sub>OL</sub> = 2.6 mA	4.5		0.17	0.26		0.33		0.40	
			6.0		0.18	0.26		0.33		0.40	
I <sub>IN</sub>	Maximum Input Leakage Current	V <sub>IN</sub> = 6.0 V or GND	6.0			±0.1		±1.0		±1.0	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0			1.0		10		40	μA

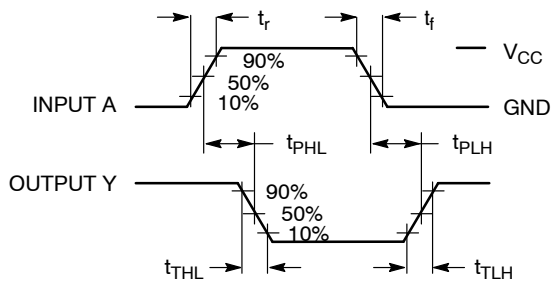
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 6.0 ns)

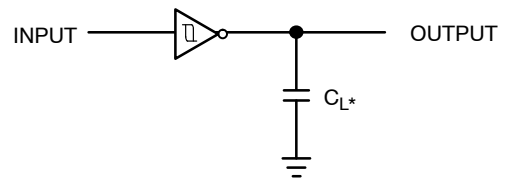
Symbol	Parameter	Test Conditions	T <sub>A</sub> = 25°C			T <sub>A</sub> ≤ 85°C		-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Input A or B to Y	V <sub>CC</sub> = 5.0 V C <sub>L</sub> = 15 pF		3.5	15		20		25	ns
		V <sub>CC</sub> = 2.0 V C <sub>L</sub> = 50 pF		19	100		125		155	
		V <sub>CC</sub> = 3.0 V		10.5	27		35		90	
		V <sub>CC</sub> = 4.5 V		7.5	20		25		35	
		V <sub>CC</sub> = 6.0 V		6.5	17		21		26	
t <sub>TLH</sub> , t <sub>THL</sub>	Output Transition Time	V <sub>CC</sub> = 5.0 V C <sub>L</sub> = 15 pF		3	10		15		20	ns
		V <sub>CC</sub> = 2.0 V C <sub>L</sub> = 50 pF		25	125		155		200	
		V <sub>CC</sub> = 3.0 V		16	35		45		60	
		V <sub>CC</sub> = 4.5 V		11	25		31		38	
		V <sub>CC</sub> = 6.0 V		9	21		26		32	
C <sub>IN</sub>	Maximum Input Capacitance			5	10		10		10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 6)	Typical @ 25°C, V <sub>CC</sub> = 5.0 V								pF
		10								

6. 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>.

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**Figure 4. Switching Waveforms**



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

**Figure 5. Test Circuit**

## ORDERING INFORMATION

Device	Package	Shipping†
MC74HC1G14DFT1G	SC70-5/SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel
NLVHC1G14DFT1G*		
MC74HC1G14DFT2G		
NLVHC1G14DFT2G*		
MC74HC1G14DTT1G	SOT23-5/TSOP-5/SC59-5 (Pb-Free)	
NLV74HC1G14DTT1G*		

†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.

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

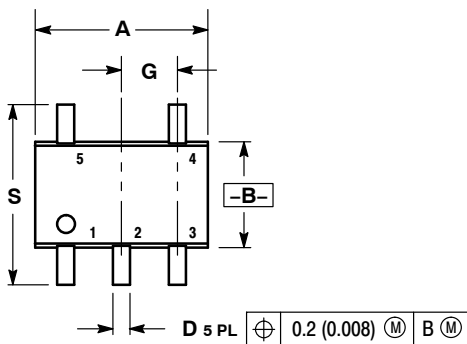
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## PACKAGE DIMENSIONS

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

CASE 419A-02

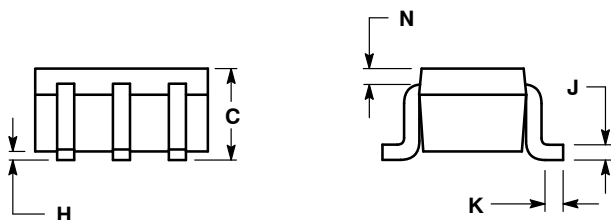
ISSUE L



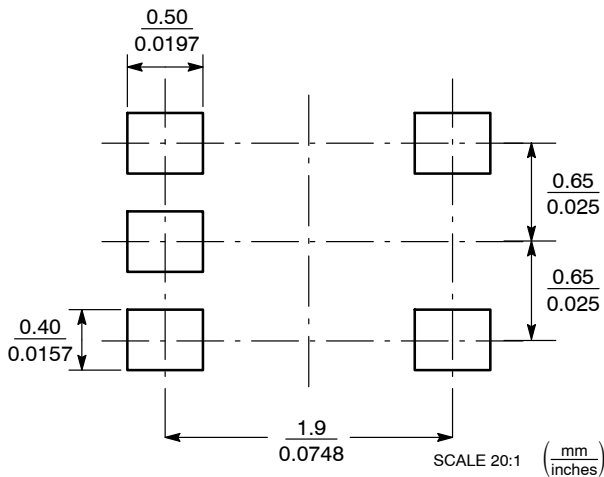
NOTES:

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



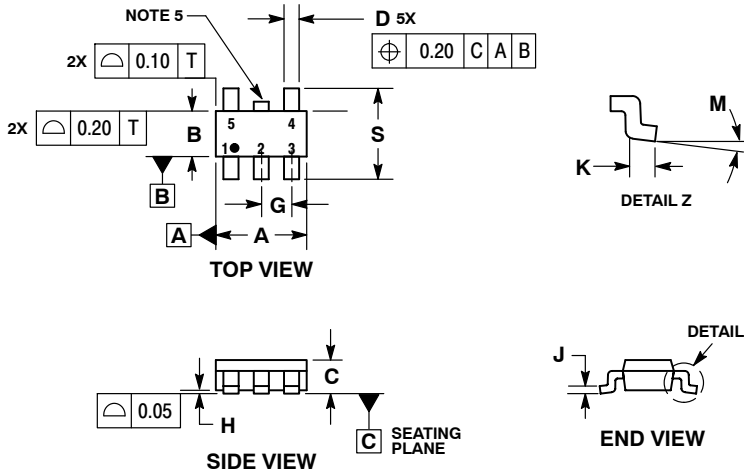
### SOLDER FOOTPRINT



# MC74HC1G14

## PACKAGE DIMENSIONS

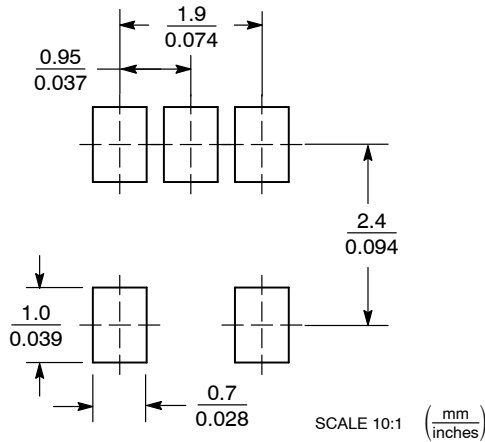
### TSOP-5 CASE 483-02 ISSUE K



#### 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.

#### 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.

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