

MC74HC1G02

Single 2-Input NOR Gate

The MC74HC1G02 is a high speed CMOS 2-input NOR 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 MC74HC1G02 output drive current is 1/2 compared to MC74HC series.

Features

- High Speed: $t_{PD} = 7$ ns (Typ) at $V_{CC} = 5$ 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 ($I_{OH} = I_{OL} = 2$ 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

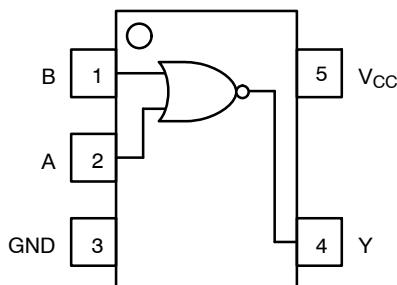


Figure 1. Pinout

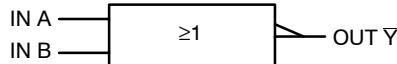


Figure 2. Logic Symbol

PIN ASSIGNMENT	
1	B
2	A
3	GND
4	Y
5	VCC



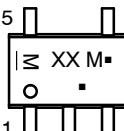
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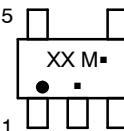
MARKING DIAGRAMS



SC-88A
DF SUFFIX
CASE 419A



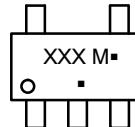
TSOP-5
DT SUFFIX
CASE 483



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.

5
1
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

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

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 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
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 _{TSG}	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) SC70-5/SC-88A/SOT-353 SOT23-5/TSOP-5/SC59-5 SC-74A	659 555 555	°C/W
P _D	Power Dissipation in Still Air at 85°C SC70-5/SC-88A/SOT-353 SOT23-5/TSOP-5/SC59-5 SC-74A	190 225 225	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), SOT-23 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.
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 SC-88A (NLV), TSOP-5 $V_{CC} = 2.0\text{ V}$ $V_{CC} = 3.0\text{ V}$ $V_{CC} = 4.5\text{ V}$ $V_{CC} = 6.0\text{ V}$	0 0 0 0	1000 600 500 400	ns/V
	Input Rise and Fall Time SC-88A, SC-74A $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ $V_{CC} = 4.5\text{ V to }6.0\text{ V}$	0 0 0 0	20 20 10 5	

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)	$T_A = 25^\circ\text{C}$			$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$		$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
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} $I_{OH} = -20\text{ }\mu\text{A}$		2.0 3.0 4.5 6.0	1.9 2.9 4.4 5.9	2.0 3.0 4.5 6.0	— — — —	1.9 2.9 4.4 5.9	— — — —	1.9 2.9 4.4 5.9	— — — —	V
	$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -2\text{ mA}$ $I_{OH} = -2.6\text{ mA}$		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} $I_{OL} = 20\text{ }\mu\text{A}$		2.0 3.0 4.5 6.0	— — — —	0.0 0.0 0.0 0.0	0.1 0.1 0.1 0.1	— — — —	0.1 0.1 0.1 0.1	— — — —	0.1 0.1 0.1 0.1	V
	$V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 2\text{ mA}$ $I_{OL} = 2.6\text{ mA}$		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	$V_{IN} = 6.0\text{ V or GND}$	6.0	—	—	$\pm 0.1\text{ }\mu\text{A}$	—	± 1.0	—	± 1.0	μA
I_{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	6.0	—	—	1.0	—	10	—	40	μA

*Guaranteed by design.

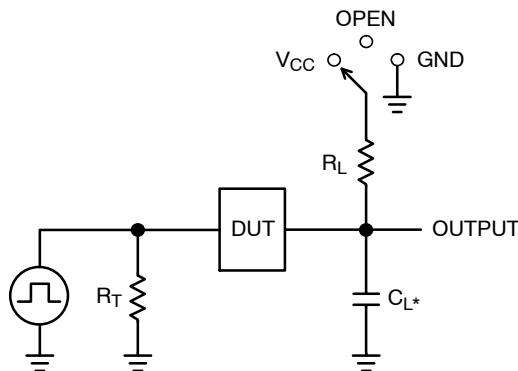
MC74HC1G02

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 6.0$ ns)

Symbol	Parameter	Test Conditions	$T_A = 25^\circ\text{C}$			$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$		$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_{PLH} , t_{PHL}	Propagation Delay, Input A or B to \bar{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	–	20	100	–	125	–	155	
		$V_{CC} = 3.0$ V	–	11	27	–	35	–	90	
		$V_{CC} = 4.5$ V	–	8	20	–	25	–	35	
		$V_{CC} = 6.0$ V	–	7	17	–	21	–	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	–	25	125	–	155	–	200	
		$V_{CC} = 3.0$ V	–	16	35	–	45	–	60	
		$V_{CC} = 4.5$ V	–	11	25	–	31	–	38	
		$V_{CC} = 6.0$ V	–	9	21	–	26	–	32	
C_{IN}	Input Capacitance		–	5	10	–	10	–	10	pF

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

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: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. C_{PD} is used to determine the no-load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.



* 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

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

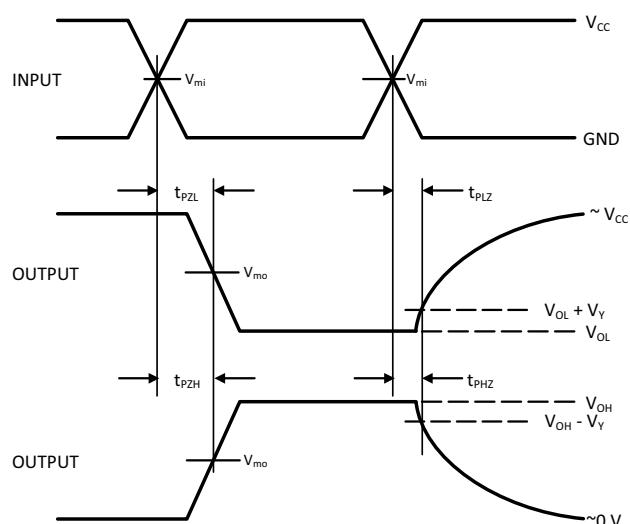
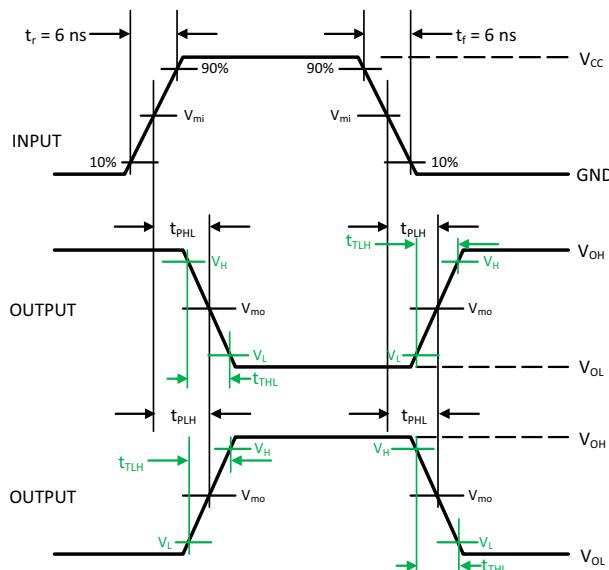


Figure 4. Switching Waveforms

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

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ORDERING INFORMATION

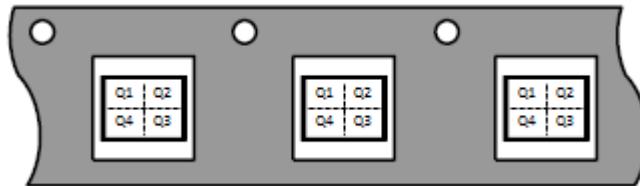
Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping [†]
MC74HC1G02DFT2G	SC-88A	H3	Q4	3000 / Tape & Reel
NLVHC1G02DFT2G*	SC-88A	H3	Q4	3000 / Tape & Reel
MC74HC1G02DTT1G	TSOP-5	H3	Q4	3000 / Tape & Reel
MC74HC1G02DBVT1G (In Development)	SC-74A	TBD	Q4	3000 / Tape & Reel

[†]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.

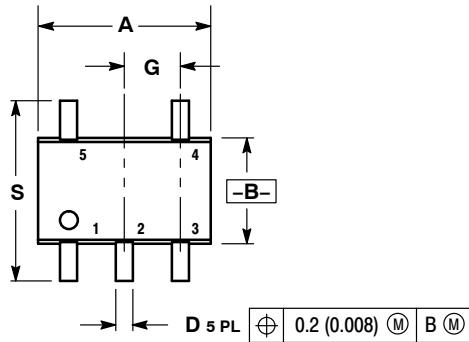
*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

Pin 1 Orientation in Tape and Reel

Direction of Feed

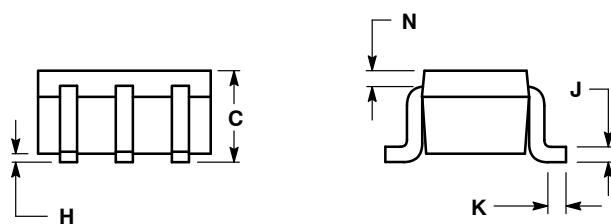


PACKAGE DIMENSIONS

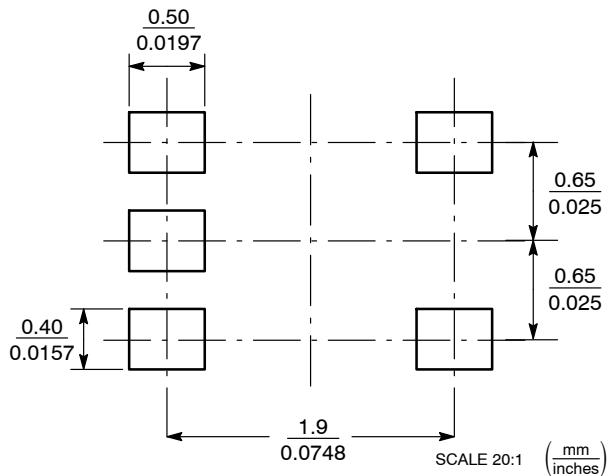
SC-88A (SC-70-5/SOT-353)
CASE 419A-02
ISSUE L

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.

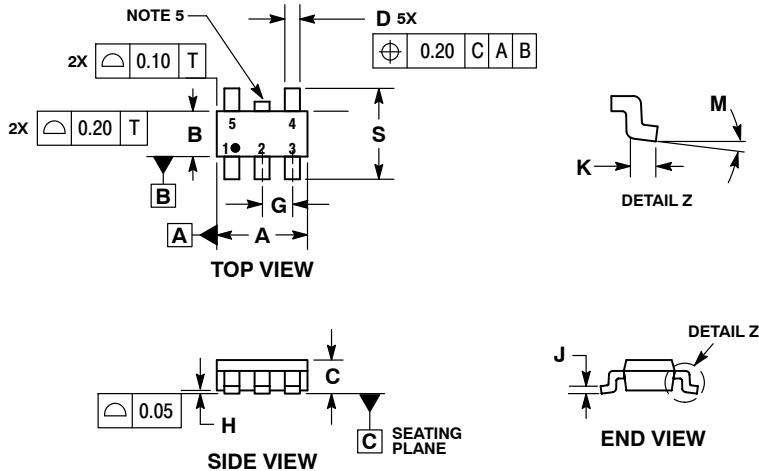
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026	BSC	0.65	BSC
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008	REF	0.20	REF
S	0.079	0.087	2.00	2.20



SOLDER FOOTPRINT



PACKAGE DIMENSIONS

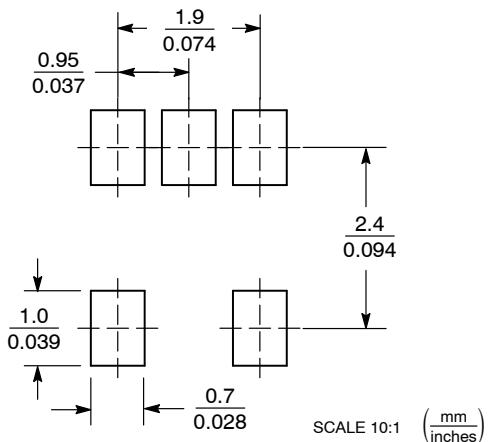
TSOP-5
CASE 483
ISSUE M

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

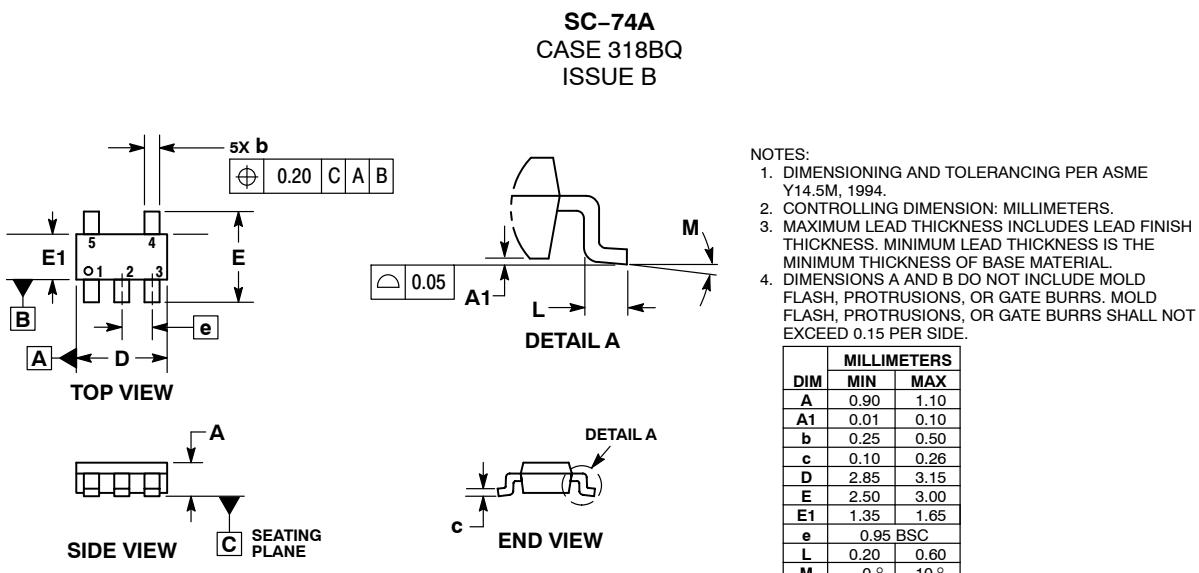
SOLDERING FOOTPRINT*



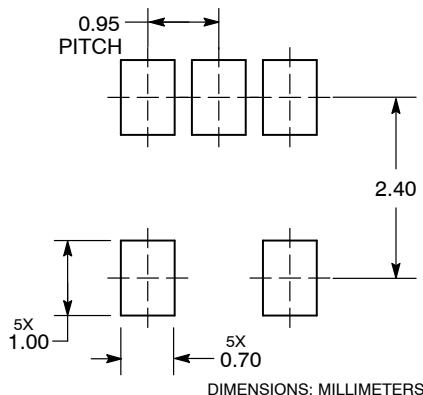
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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PACKAGE DIMENSIONS



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