

MC74HC132A

Quad 2-Input NAND Gate with Schmitt-Trigger Inputs

High-Performance Silicon-Gate CMOS

The MC74HC132A is identical in pinout to the LS132. The device inputs are compatible with standard CMOS outputs; with pull-up resistors, they are compatible with LSTTL outputs.

The HC132A can be used to enhance noise immunity or to square up slowly changing waveforms.

Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0 μ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements as Defined by JEDEC Standard No. 7A
- Chip Complexity: 72 FETs or 18 Equivalent Gates
- 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

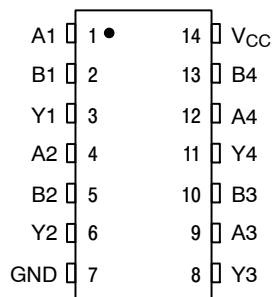


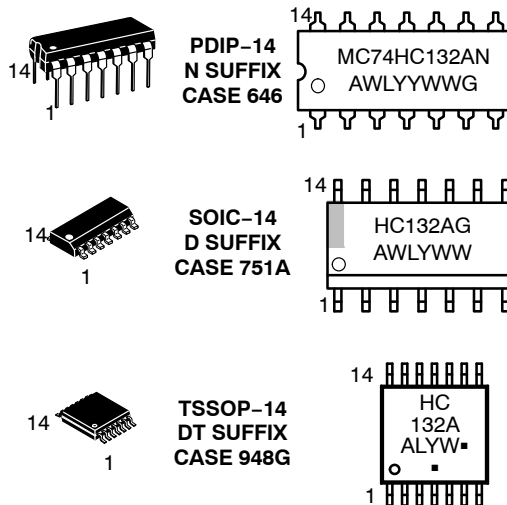
Figure 1. Pin Assignment



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MARKING DIAGRAMS



A = Assembly Location
 L, WL = Wafer Lot
 Y, YY = Year
 W, WW = Work Week
 G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

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

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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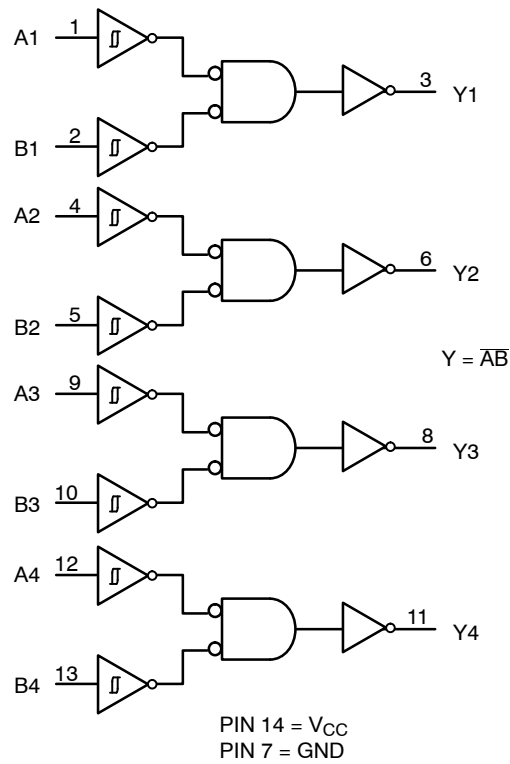


Figure 2. Logic Diagram

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74HC132ANG	PDIP-14 (Pb-Free)	25 / Tape & Ammo Box
MC74HC132ADG	SOIC-14 (Pb-Free)	55 Units / Rail
MC74HC132ADR2G	SOIC-14 (Pb-Free)	2500 / Tape & Reel
MC74HC132ADTG	TSSOP-14 (Pb-Free)	96 Units / Rail
MC74HC132ADTR2G	TSSOP-14 (Pb-Free)	2500 / Tape & Reel
NLV74HC132ADG*	SOIC-14 (Pb-Free)	55 Units / Rail
NLV74HC132ADR2G*	SOIC-14 (Pb-Free)	2500 / Tape & Reel
NLV74HC132ADTG*	TSSOP-14 (Pb-Free)	96 Units / Rail
NLV74HC132ADTR2G*	TSSOP-14 (Pb-Free)	2500 / Tape & Reel
NLV74HC132ANG*	PDIP-14 (Pb-Free)	25 Units / Rail

[†]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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MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Positive DC Supply Voltage	- 0.5 to + 7.0	V
V_{IN}	Digital Input Voltage	- 0.5 to + 7.0	V
V_{OUT}	DC Output Voltage Output in 3-State High or Low State	- 0.5 to + 7.0 - 0.5 to V_{CC} + 0.5	V
I_{IK}	Input Diode Current	- 20	mA
I_{OK}	Output Diode Current	± 20	mA
I_{OUT}	DC Output Current, per Pin	± 25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
I_{GND}	DC Ground Current per Ground Pin	± 75	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	14-PDIP 78 14-SOIC 125 14-TSSOP 170	°C/W
P_D	Power Dissipation in Still Air at 85°C	PDIP 750 SOIC 500 TSSOP 450	mW
MSL	Moisture Sensitivity	Level 1	
F_R	Flammability Rating	Oxygen Index: 30% - 35% UL 94 V0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage	Human Body Model (Note 1) > 2000 Machine Model (Note 2) > 100 Charged Device Model (Note 3) > 500	V
$I_{Latch-Up}$	Latch-Up Performance	Above V_{CC} and Below GND at 85°C (Note 4)	± 300 mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Tested to EIA/JESD22-A114-A.
2. Tested to EIA/JESD22-A115-A.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V_{IN}, V_{OUT}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature, All Package Types	- 55	+ 125	°C
t_r, t_f	Input Rise and Fall Time (Figure 3)	-	No Limit (Note 5)	ns

5. When $V_{IN} \sim 0.5 V_{CC}$, $I_{CC} \gg$ quiescent current.
6. Unused inputs may not be left open. All inputs must be tied to a high-logic voltage level or a low-logic input voltage level.

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DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				-55°C to 25°C	≤ 85°C	≤ 125°C	
V _{T+} max	Maximum Positive-Going Input Threshold Voltage (Figure 5)	V _{OUT} = 0.1 V I _{OUT} ≤ 20 μA	2.0	1.5	1.5	1.5	V
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V _{T+} min	Minimum Positive-Going Input Threshold Voltage (Figure 5)	V _{OUT} = 0.1 V I _{OUT} ≤ 20 μA	2.0	1.0	0.95	0.95	V
			4.5	2.3	2.25	2.25	
			6.0	3.0	2.95	2.95	
V _{T-} max	Maximum Negative-Going Input Threshold Voltage (Figure 5)	V _{OUT} = V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	0.9	0.95	0.95	V
			4.5	2.0	2.05	2.05	
			6.0	2.6	2.65	2.65	
V _{T-} min	Minimum Negative-Going Input Threshold Voltage (Figure 5)	V _{OUT} = V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	0.3	0.3	0.3	V
			4.5	0.9	0.9	0.9	
			6.0	1.2	1.2	1.2	
V _H max (Note 7)	Maximum Hysteresis Voltage (Figure 5)	V _{OUT} = 0.1 V or V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	1.2	1.2	1.2	V
			4.5	2.25	2.25	2.25	
			6.0	3.0	3.0	3.0	
V _H min (Note 7)	Minimum Hysteresis Voltage (Figure 5)	V _{OUT} = 0.1 V or V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	0.2	0.2	0.2	V
			4.5	0.4	0.4	0.4	
			6.0	0.5	0.5	0.5	
V _{OH}	Minimum High-Level Output Voltage	V _{IN} ≤ V _{T-} min or V _{T+} max I _{OUT} ≤ 20 μA	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
		6.0	5.9	5.9	5.9		
		V _{IN} ≤ -V _{T-} min or V _{T+} max I _{OUT} ≤ 4.0 mA I _{OUT} ≤ 5.2 mA	4.5	3.98	3.84	3.7	
6.0	5.48		5.34	5.2			
V _{OL}	Maximum Low-Level Output Voltage	V _{IN} ≥ V _{T+} max I _{OUT} ≤ 20 μA	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
		6.0	0.1	0.1	0.1		
		V _{IN} ≥ V _{T+} max I _{OUT} ≤ 4.0 mA I _{OUT} ≤ 5.2 mA	4.5	0.26	0.33	0.4	
6.0	0.26		0.33	0.4			
I _{IN}	Maximum Input Leakage Current	V _{IN} = V _{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{IN} = V _{CC} or GND I _{OUT} = 0 μA	6.0	1.0	10	40	μA

7. V_Hmin > (V_{T+}min) - (V_{T-}max); V_Hmax = (V_{T+}max) + (V_{T-}min).

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AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6.0 \text{ ns}$)

Symbol	Parameter	V_{CC} V	Guaranteed Limit			Unit
			-55°C to 25°C	$\leq 85^\circ\text{C}$	$\leq 125^\circ\text{C}$	
t_{PLH} , t_{PHL}	Maximum Propagation Delay, Input A or B to Output Y (Figures 3 and 4)	2.0 4.5 6.0	125 25 21	155 31 26	190 38 32	ns
t_{TLH} , t_{THL}	Maximum Output Transition Time, Any Output (Figures 3 and 4)	2.0 4.5 6.0	75 15 13	95 19 16	110 22 19	ns
C_{in}	Maximum Input Capacitance	—	10	10	10	pF
C_{PD}	Power Dissipation Capacitance (per Gate) (Note 8)	Typical @ 25°C , $V_{CC} = 5.0 \text{ V}$			pF	
		24				

8. Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$.

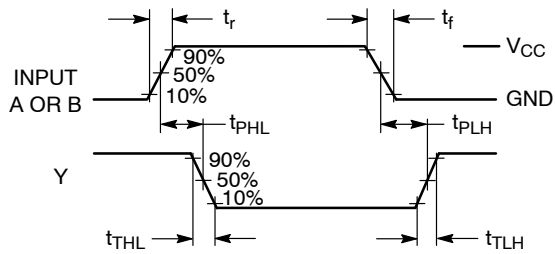
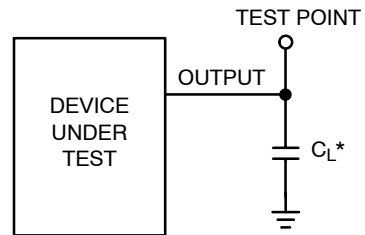


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

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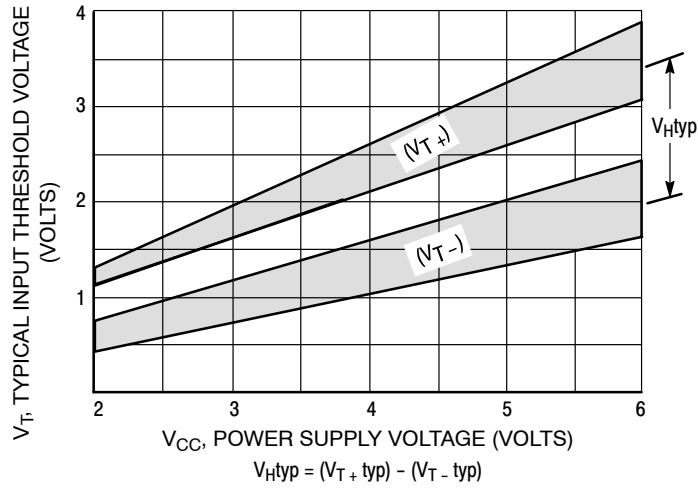


Figure 5. Typical Input Threshold, V_{T+} , V_{T-} Versus Power Supply Voltage

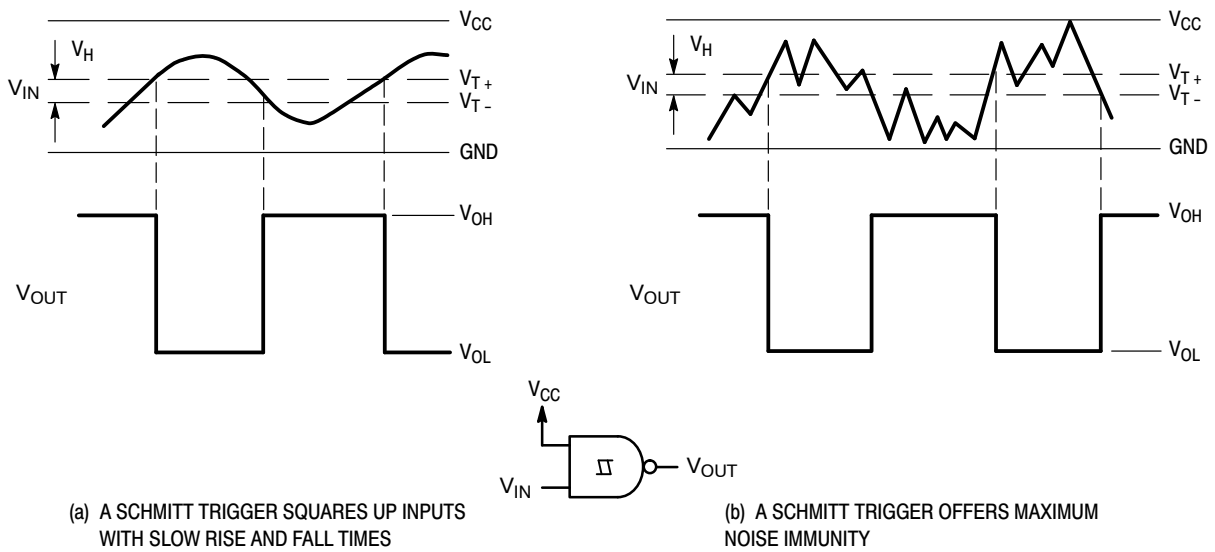
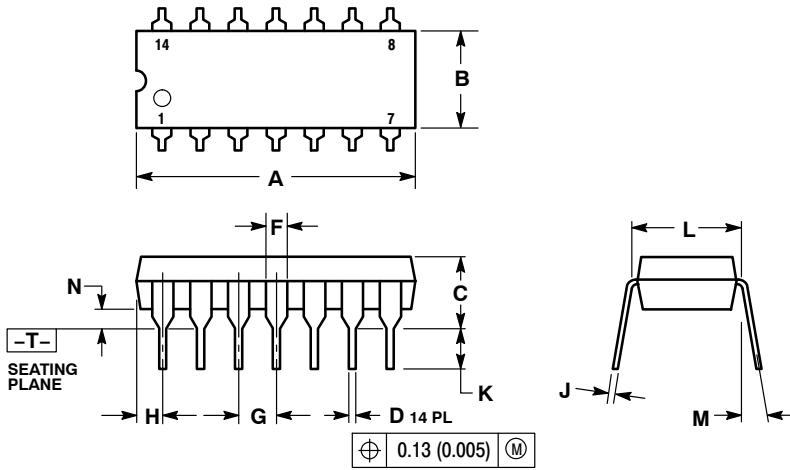


Figure 6. Typical Schmitt-Trigger Applications

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PACKAGE DIMENSIONS

PDIP-14
N SUFFIX
CASE 646-06
ISSUE P



NOTES:

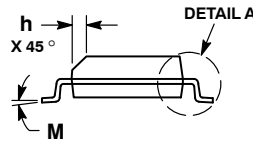
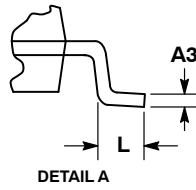
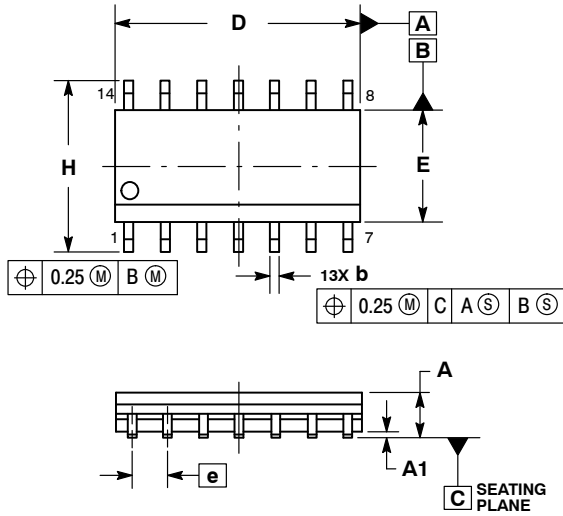
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	---	10°	---	10°
N	0.015	0.039	0.38	1.01

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PACKAGE DIMENSIONS

SOIC-14 NB
CASE 751A-03
ISSUE K

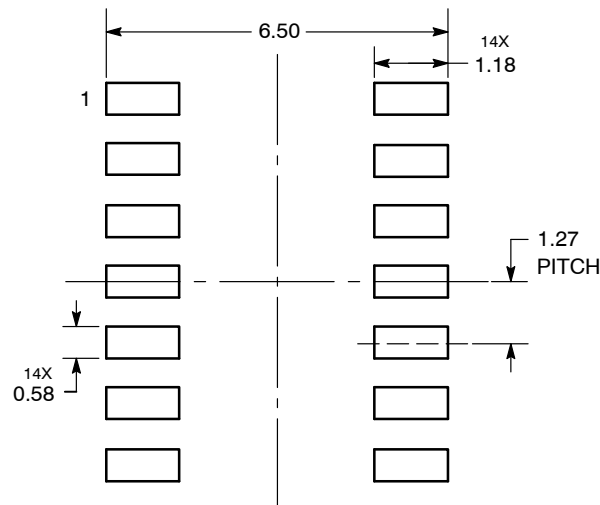


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

SOLDERING FOOTPRINT*



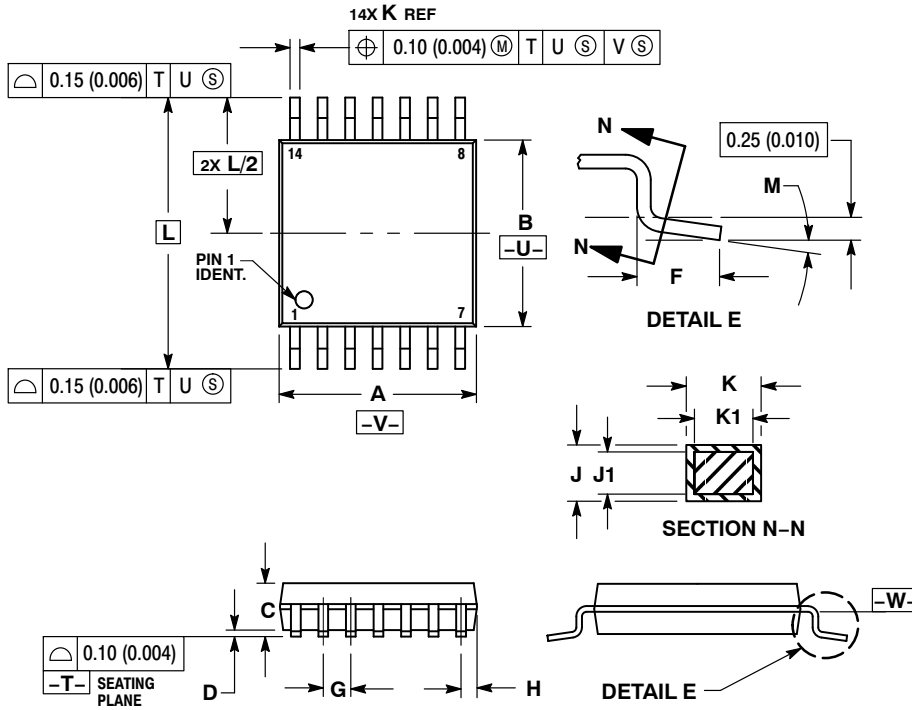
DIMENSIONS: MILLIMETERS

*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

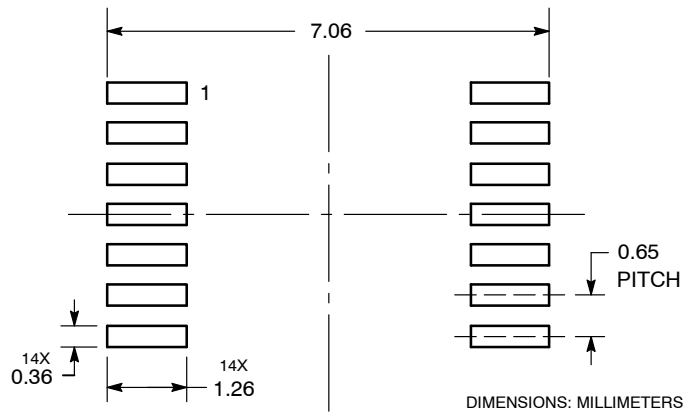
TSSOP-14
DT SUFFIX
CASE 948G-01
ISSUE B



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

SOLDERING FOOTPRINT*



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