

# MC74HC573A

## Octal 3-State Noninverting Transparent Latch High-Performance Silicon-Gate CMOS

The MC74HC573A is identical in pinout to the LS573. The devices are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

These latches appear transparent to data (i.e., the outputs change asynchronously) when Latch Enable is high. When Latch Enable goes low, data meeting the setup and hold time becomes latched.

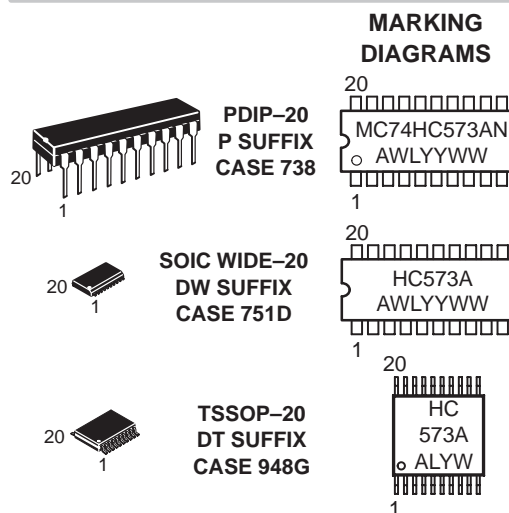
The HC573A is identical in function to the HC373A but has the data inputs on the opposite side of the package from the outputs to facilitate PC board layout.

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0  $\mu$ A
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 218 FETs or 54.5 Equivalent Gates



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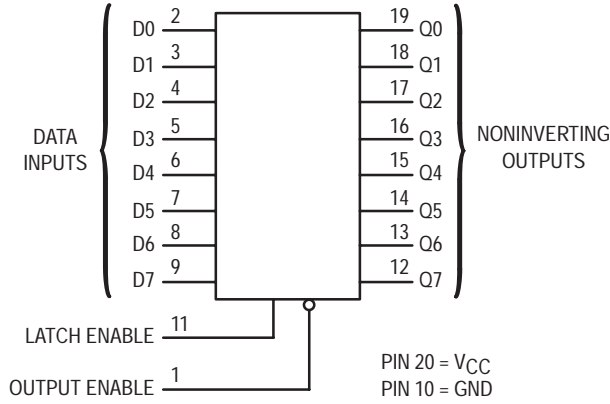
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week

### ORDERING INFORMATION

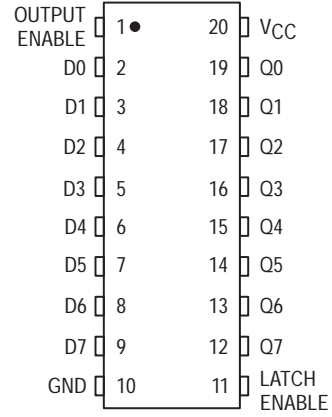
Device	Package	Shipping
MC74HC573AN	PDIP-20	1440 / Box
MC74HC573ADW	SOIC-WIDE	38 / Rail
MC74HC573ADWR2	SOIC-WIDE	1000 / Reel
MC74HC573ADT	TSSOP-20	75 / Rail
MC74HC573ADTR2	TSSOP-20	2500 / Reel

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## LOGIC DIAGRAM



## PIN ASSIGNMENT



## FUNCTION TABLE

Inputs			Output
Output Enable	Latch Enable	D	Q
L	H	H	H
L	H	L	L
L	L	X	No Change
H	X	X	Z

X = Don't Care

Z = High Impedance

Design Criteria	Value	Units
Internal Gate Count*	54.5	ea.
Internal Gate Propagation Delay	1.5	ns
Internal Gate Power Dissipation	5.0	μW
Speed Power Product	0.0075	pJ

\*Equivalent to a two-input NAND gate.

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## MAXIMUM RATINGS\*

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	- 0.5 to + 7.0	V
V <sub>in</sub>	DC Input Voltage (Referenced to GND)	- 0.5 to V <sub>CC</sub> + 0.5	V
V <sub>out</sub>	DC Output Voltage (Referenced to GND)	- 0.5 to V <sub>CC</sub> + 0.5	V
I <sub>in</sub>	DC Input Current, per Pin	± 20	mA
I <sub>out</sub>	DC Output Current, per Pin	± 35	mA
I <sub>CC</sub>	DC Supply Current, V <sub>CC</sub> and GND Pins	± 75	mA
P <sub>D</sub>	Power Dissipation in Still Air, Plastic DIP† SOIC Package† TSSOP Package†	750 500 450	mW
T <sub>stg</sub>	Storage Temperature	- 65 to + 150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP, TSSOP or SOIC Package)	260	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V<sub>in</sub> and V<sub>out</sub> should be constrained to the range GND ≤ (V<sub>in</sub> or V<sub>out</sub>) ≤ V<sub>CC</sub>. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V<sub>CC</sub>). Unused outputs must be left open.

\*Maximum Ratings are those values beyond which damage to the device may occur.

Functional operation should be restricted to the Recommended Operating Conditions.

†Derating — Plastic DIP: -10 mW/°C from 65° to 125°C

SOIC Package: -7 mW/°C from 65° to 125°C

TSSOP Package: -6.1 mW/°C from 65° to 125°C

For high frequency or heavy load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Referenced to GND)	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature, All Package Types	- 55	+ 125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Figure 1)			
	V <sub>CC</sub> = 2.0 V	0	1000	ns
	V <sub>CC</sub> = 4.5 V	0	500	
	V <sub>CC</sub> = 6.0 V	0	400	

## DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	Guaranteed Limit			Unit
				- 55 to 25°C	≤ 85°C	≤ 125°C	
V <sub>IH</sub>	Minimum High-Level Input Voltage	V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V  I <sub>out</sub>   ≤ 20 μA	2.0	1.5	1.5	1.5	V
			3.0	2.1	2.1	2.1	
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V <sub>IL</sub>	Maximum Low-Level Input Voltage	V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V  I <sub>out</sub>   ≤ 20 μA	2.0	0.5	0.5	0.5	V
			3.0	0.9	0.9	0.9	
			4.5	1.35	1.35	1.35	
			6.0	1.8	1.8	1.8	
V <sub>OH</sub>	Minimum High-Level Output Voltage	V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 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 <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 2.4 mA  I <sub>out</sub>   ≤ 6.0 mA  I <sub>out</sub>   ≤ 7.8 mA	3.0	2.48	2.34	2.2	
			4.5	3.98	3.84	3.7	
			6.0	5.48	5.34	5.2	

NOTE: Information on typical parametric values can be found in Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

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## DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	Guaranteed Limit			Unit
				- 55 to 25°C	≤ 85°C	≤ 125°C	
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V  I <sub>out</sub>   ≤ 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 <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 2.4 mA  I <sub>out</sub>   ≤ 6.0 mA  I <sub>out</sub>   ≤ 7.8 mA	3.0	0.26	0.33	0.4	
			4.5	0.26	0.33	0.4	
			6.0	0.26	0.33	0.4	
I <sub>in</sub>	Maximum Input Leakage Current	V <sub>in</sub> = V <sub>CC</sub> or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I <sub>OZ</sub>	Maximum Three-State Leakage Current	Output in High-Impedance State V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub> V <sub>out</sub> = V <sub>CC</sub> or GND	6.0	- 0.5	- 5.0	- 10	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current (per Package)	V <sub>in</sub> = V <sub>CC</sub> or GND  I <sub>out</sub>   = 0 μA	6.0	4.0	40	160	μA

NOTE: Information on typical parametric values can be found in Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

## AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6.0 ns)

Symbol	Parameter	V <sub>CC</sub> V	Guaranteed Limit			Unit
			- 55 to 25°C	≤ 85°C	≤ 125°C	
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Input D to Q (Figures 1 and 5)	2.0	150	190	225	ns
		3.0	100	140	180	
		4.5	30	38	45	
		6.0	26	33	38	
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Latch Enable to Q (Figures 2 and 5)	2.0	160	200	240	ns
		3.0	105	145	190	
		4.5	32	40	48	
		6.0	27	34	41	
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay, Output Enable to Q (Figures 3 and 6)	2.0	150	190	225	ns
		3.0	100	125	150	
		4.5	30	38	45	
		6.0	26	33	38	
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Propagation Delay, Output Enable to Q (Figures 3 and 6)	2.0	150	190	225	ns
		3.0	100	125	150	
		4.5	30	38	45	
		6.0	26	33	38	
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, Any Output (Figures 1 and 5)	2.0	60	75	90	ns
		3.0	27	32	36	
		4.5	12	15	18	
		6.0	10	13	15	
C <sub>in</sub>	Maximum Input Capacitance		10	10	10	pF
C <sub>out</sub>	Maximum Three-State Output Capacitance (Output in High-Impedance State)		15	15	15	pF

NOTE: For propagation delays with loads other than 50 pF, and information on typical parametric values, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

C <sub>PD</sub>	Power Dissipation Capacitance (Per Enabled Output)*	Typical @ 25°C, V <sub>CC</sub> = 5.0 V	
		23	

\* 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 + I<sub>CC</sub> V<sub>CC</sub>. For load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

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**TIMING REQUIREMENTS** ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6.0 \text{ ns}$ )

Symbol	Parameter	Fig.	VCC Volts	Guaranteed Limit						Unit
				- 55 to 25°C		≤ 85°C		≤ 125°C		
				Min	Max	Min	Max	Min	Max	
$t_{su}$	Minimum Setup Time, Input D to Latch Enable	4	2.0	50		65		75		ns
			3.0	40		50		60		
			4.5	10		13		15		
			6.0	9.0		11		13		
$t_h$	Minimum Hold Time, Latch Enable to Input D	4	2.0	5.0		5.0		5.0		ns
			3.0	5.0		5.0		5.0		
			4.5	5.0		5.0		5.0		
			6.0	5.0		5.0		5.0		
$t_w$	Minimum Pulse Width, Latch Enable	2	2.0	75		95		110		ns
			3.0	60		80		90		
			4.5	15		19		22		
			6.0	13		16		19		
$t_r, t_f$	Maximum Input Rise and Fall Times	1	2.0		1000		1000		1000	ns
			3.0		800		800		800	
			4.5		500		500		500	
			6.0		400		400		400	

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## SWITCHING WAVEFORMS

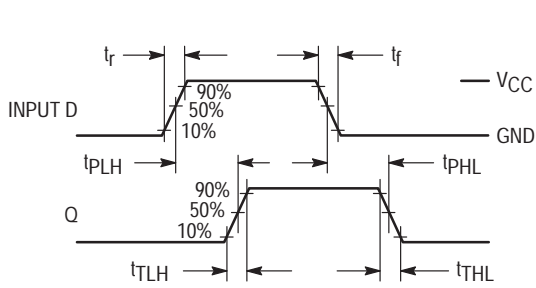


Figure 1.

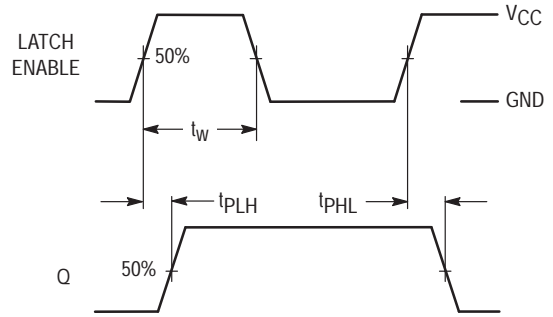


Figure 2.

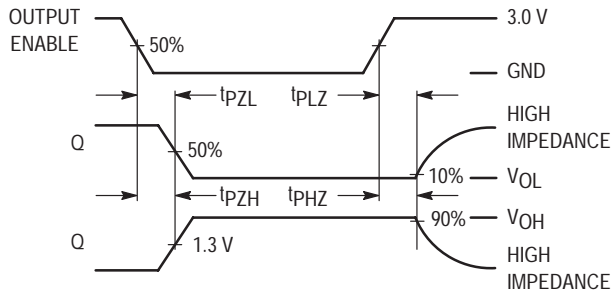


Figure 3.

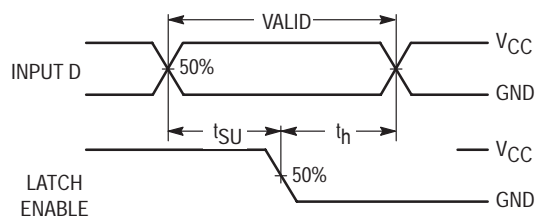
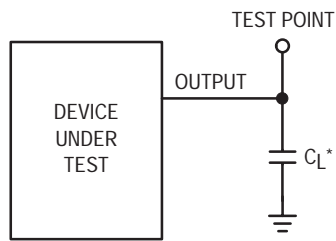
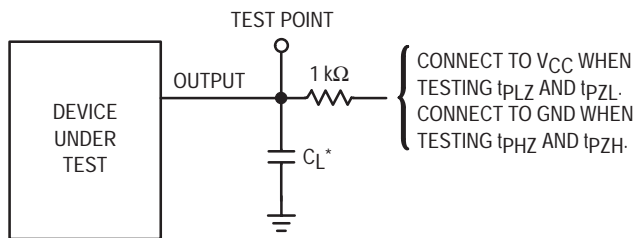


Figure 4.



\*Includes all probe and jig capacitance

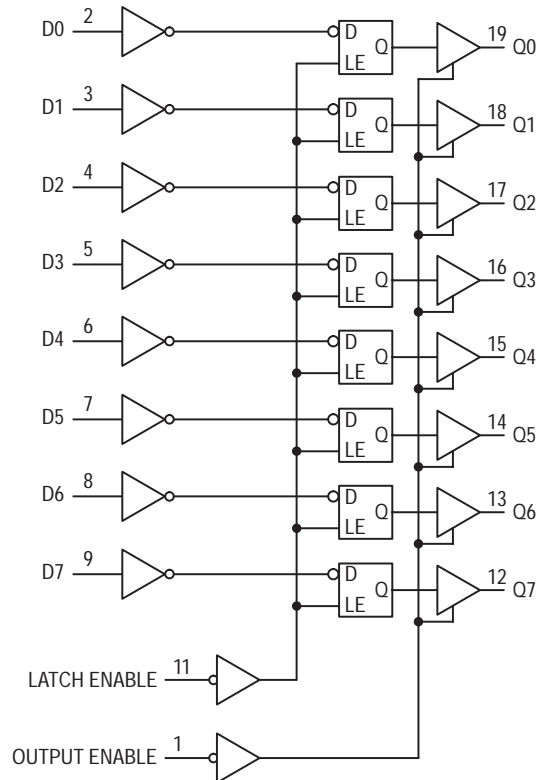
Figure 5. Test Circuit



\*Includes all probe and jig capacitance

Figure 6. Test Circuit

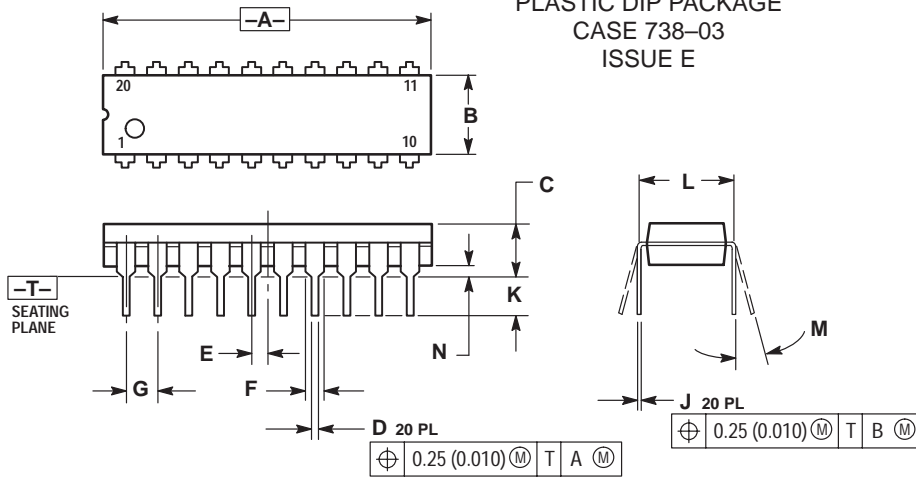
### EXPANDED LOGIC DIAGRAM



# MC74HC573A

## PACKAGE DIMENSIONS

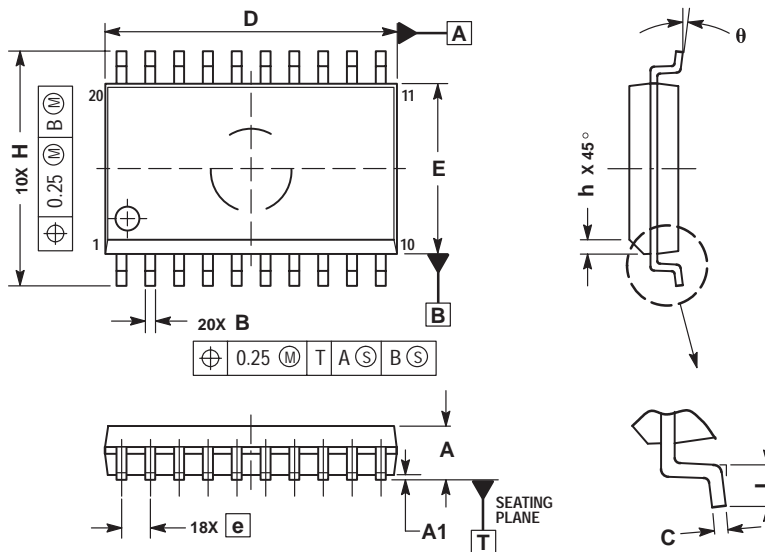
**PDIP-20**  
**N SUFFIX**  
PLASTIC DIP PACKAGE  
CASE 738-03  
ISSUE E



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.010	1.070	25.66	27.17
B	0.240	0.260	6.10	6.60
C	0.150	0.180	3.81	4.57
D	0.015	0.022	0.39	0.55
E	0.050 BSC		1.27 BSC	
F	0.050	0.070	1.27	1.77
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

**SO-20**  
**DW SUFFIX**  
CASE 751D-05  
ISSUE F



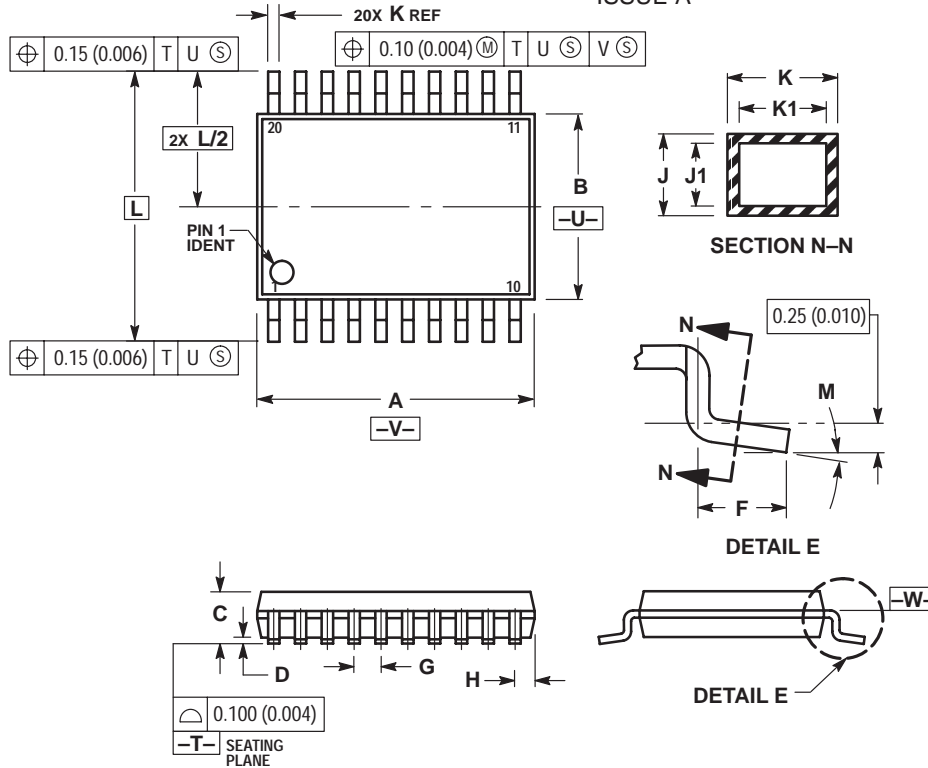
- NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
  2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
  3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
  5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
$\theta$	0°	7°

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## PACKAGE DIMENSIONS

TSSOP-20  
DT SUFFIX  
CASE 948E-02  
ISSUE A



### 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 -V-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
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	0.27	0.37	0.011	0.015
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°

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