

# MC74HC32A

## Quad 2-Input OR Gate

### High-Performance Silicon-Gate CMOS

The MC74HC32A is identical in pinout to the LS32. The device inputs are compatible with Standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

#### Features

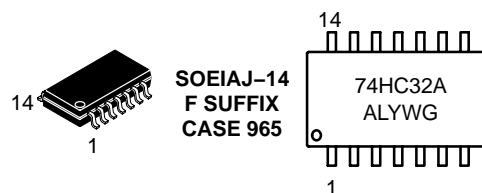
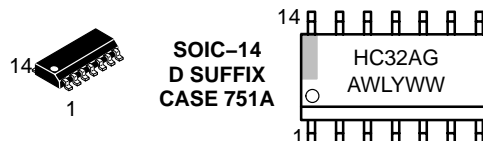
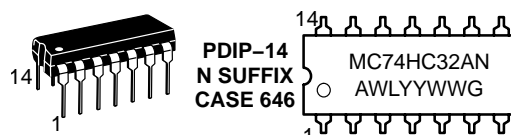
- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1 $\mu$ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 48 FETs or 12 Equivalent Gates
- Pb-Free Packages are Available\*



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#### MARKING DIAGRAMS



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

(Note: Microdot may be in either location)

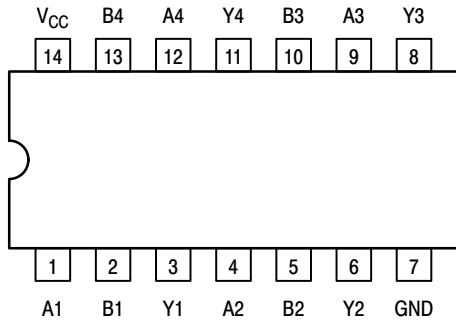
#### ORDERING INFORMATION

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

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

# MC74HC32A

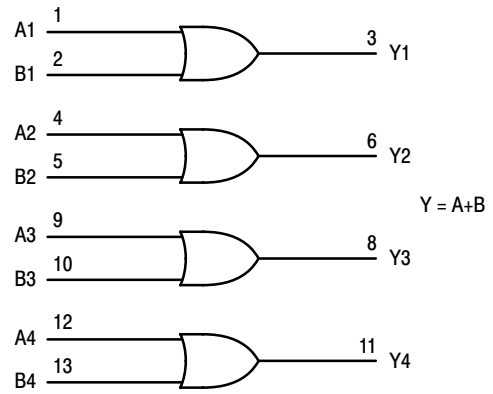
## Pinout: 14-Lead Packages (Top View)



## FUNCTION TABLE

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

## LOGIC DIAGRAM



PIN 14 = V<sub>CC</sub>  
PIN 7 = GND

## ORDERING INFORMATION

Device	Package	Shipping†
MC74HC32AN	PDIP-14	500 Units / Rail
MC74HC32ANG	PDIP-14 (Pb-Free)	500 Units / Rail
MC74HC32AD	SOIC-14	55 Units / Rail
MC74HC32ADG	SOIC-14 (Pb-Free)	55 Units / Rail
MC74HC32ADR2	SOIC-14	2500 Units / Reel
MC74HC32ADR2G	SOIC-14 (Pb-Free)	2500 Units / Reel
MC74HC32ADTR2	TSSOP-14*	2500 Units / Reel
MC74HC32ADTR2G	TSSOP-14*	2500 Units / Reel
MC74HC32AFEL	SOEIAJ-14	2000 Units / Reel
MC74HC32AFELG	SOEIAJ-14 (Pb-Free)	2000 Units / 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.

\*This package is inherently Pb-Free.

# MC74HC32A

## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply Voltage (Referenced to GND)	- 0.5 to + 7.0	V
$V_{in}$	DC Input Voltage (Referenced to GND)	- 0.5 to $V_{CC} + 0.5$	V
$V_{out}$	DC Output Voltage (Referenced to GND)	- 0.5 to $V_{CC} + 0.5$	V
$I_{in}$	DC Input Current, per Pin	$\pm 20$	mA
$I_{out}$	DC Output Current, per Pin	$\pm 25$	mA
$I_{CC}$	DC Supply Current, $V_{CC}$ and GND Pins	$\pm 50$	mA
$P_D$	Power Dissipation in Still Air, Plastic DIP† SOIC Package† TSSOP Package†	750 500 450	mW
$T_{stg}$	Storage Temperature	- 65 to + 150	°C
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds Plastic DIP, SOIC or TSSOP 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,  $V_{in}$  and  $V_{out}$  should be constrained to the range  $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$ . Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or  $V_{CC}$ ). Unused outputs must be left open.

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

†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 ON Semiconductor High-Speed CMOS Data Book (DL129/D).

## 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 1)			ns
	$V_{CC} = 2.0 \text{ V}$	0	1000	
	$V_{CC} = 4.5 \text{ V}$	0	500	
	$V_{CC} = 6.0 \text{ V}$	0	400	

# MC74HC32A

## DC CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Condition	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> = 0.1V or V <sub>CC</sub> - 0.1V  I <sub>out</sub>   ≤ 20μA	2.0	1.50	1.50	1.50	V
			3.0	2.10	2.10	2.10	
			4.5	3.15	3.15	3.15	
			6.0	4.20	4.20	4.20	
V <sub>IL</sub>	Maximum Low-Level Input Voltage	V <sub>out</sub> = 0.1V or V <sub>CC</sub> - 0.1V  I <sub>out</sub>   ≤ 20μA	2.0	0.50	0.50	0.50	V
			3.0	0.90	0.90	0.90	
			4.5	1.35	1.35	1.35	
			6.0	1.80	1.80	1.80	
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>   ≤ 20μA	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>   ≤ 2.4mA  I <sub>out</sub>   ≤ 4.0mA  I <sub>out</sub>   ≤ 5.2mA	3.0	2.48	2.34	2.20	
			4.5	3.98	3.84	3.70	
			6.0	5.48	5.34	5.20	
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 20μA	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>   ≤ 2.4mA  I <sub>out</sub>   ≤ 4.0mA  I <sub>out</sub>   ≤ 5.2mA	3.0	0.26	0.33	0.40	
			4.5	0.26	0.33	0.40	
			6.0	0.26	0.33	0.40	
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>CC</sub>	Maximum Quiescent Supply Current (per Package)	V <sub>in</sub> = V <sub>CC</sub> or GND I <sub>out</sub> = 0μA	6.0	1.0	10	40	μA

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

## AC CHARACTERISTICS (C<sub>L</sub> = 50pF, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)

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 A or B to Output Y (Figures 1 and 2)	2.0	75	95	110	ns
		3.0	30	40	55	
		4.5	15	19	22	
		6.0	13	16	19	
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, Any Output (Figures 1 and 2)	2.0	75	95	110	ns
		3.0	27	32	36	
		4.5	15	19	22	
		6.0	13	16	19	
C <sub>in</sub>	Maximum Input Capacitance		10	10	10	pF

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

C <sub>PD</sub>	Power Dissipation Capacitance (Per Buffer)*	Typical @ 25°C, V <sub>CC</sub> = 5.0 V, V <sub>EE</sub> = 0 V		pF
		20		

\* 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 ON Semiconductor High-Speed CMOS Data Book (DL129/D).

# MC74HC32A

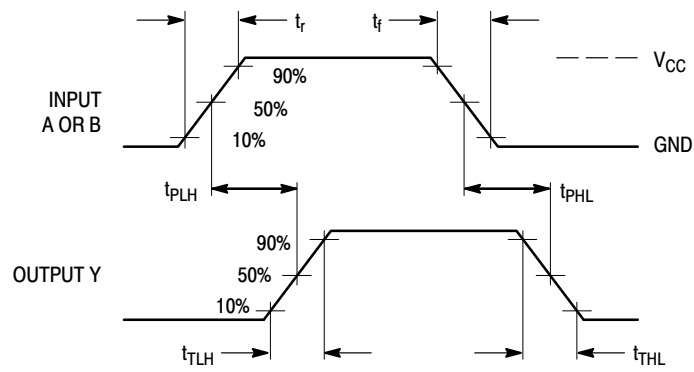
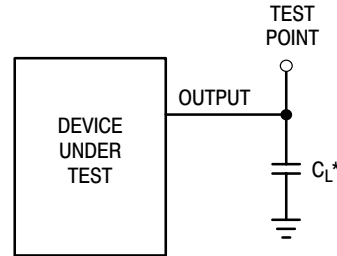


Figure 1. Switching Waveforms



\*Includes all probe and jig capacitance

Figure 2. Test Circuit

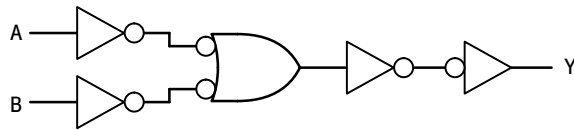
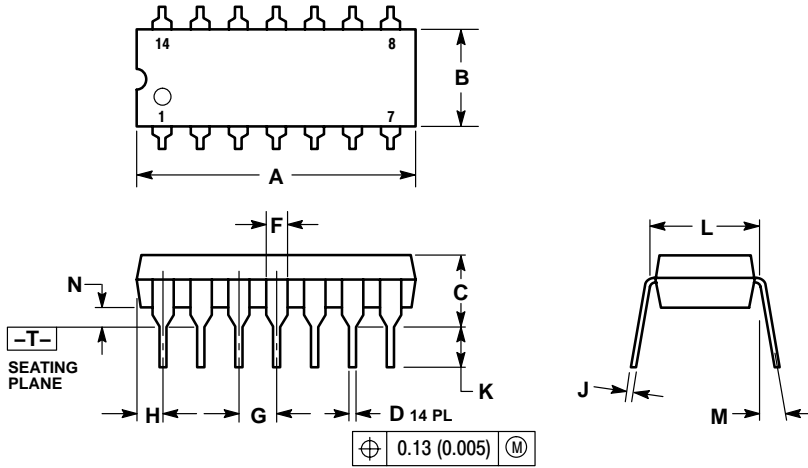


Figure 3. Expanded Logic Diagram  
(1/4 of the Device)

# MC74HC32A

## PACKAGE DIMENSIONS

PDIP-14  
N SUFFIX  
CASE 646-06  
ISSUE N

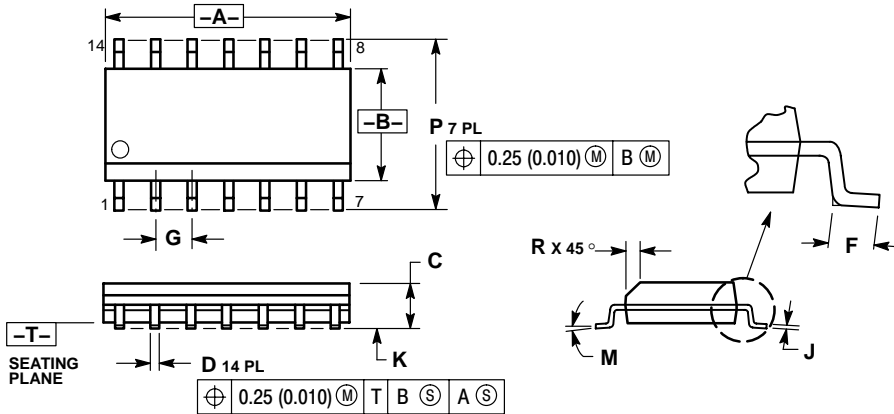


NOTES:

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	18.80
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

SOIC-14  
D SUFFIX  
CASE 751A-03  
ISSUE G



NOTES:

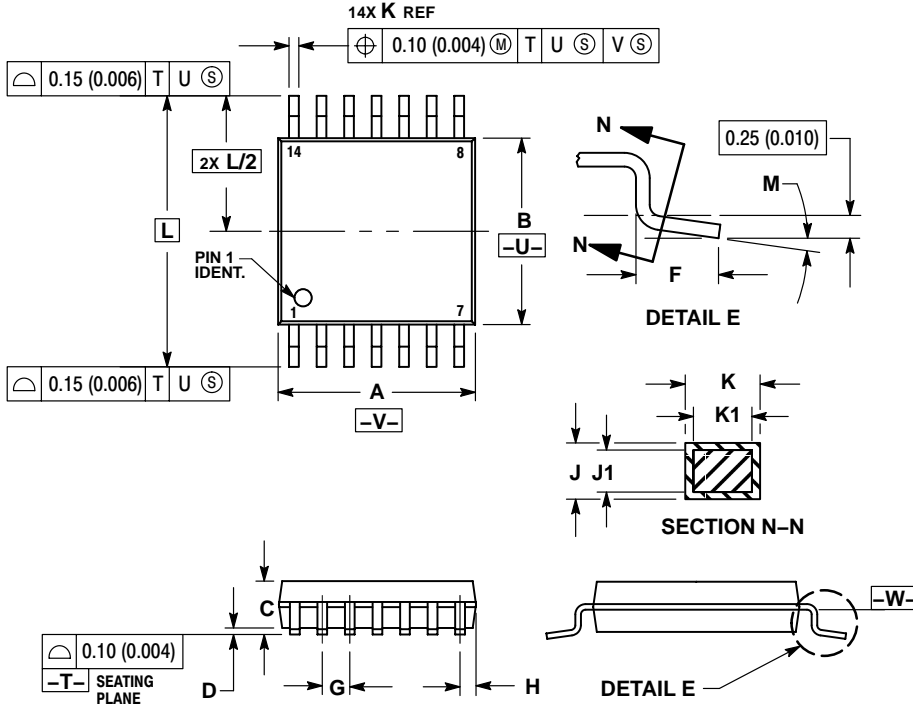
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

# MC74HC32A

## PACKAGE DIMENSIONS

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



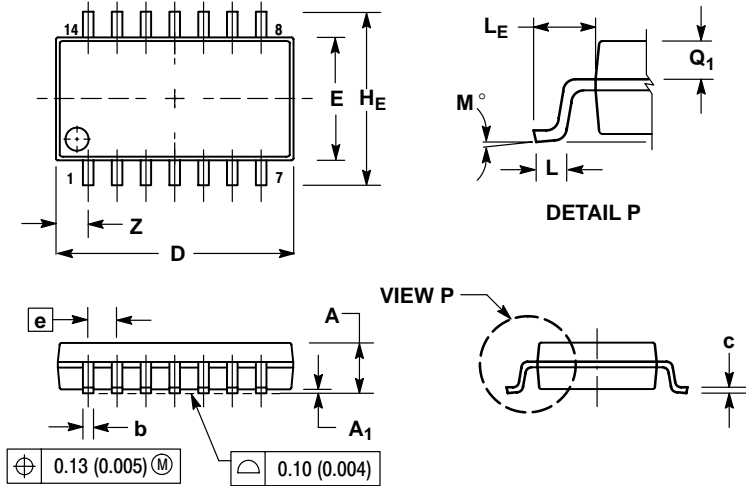
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. 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 -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°

# MC74HC32A

## PACKAGE DIMENSIONS

SOEIAJ-14  
F SUFFIX  
CASE 965-01  
ISSUE O



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A <sub>1</sub>	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H <sub>E</sub>	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L <sub>E</sub>	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q <sub>1</sub>	0.70	0.90	0.028	0.035
Z	---	1.42	---	0.056

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