

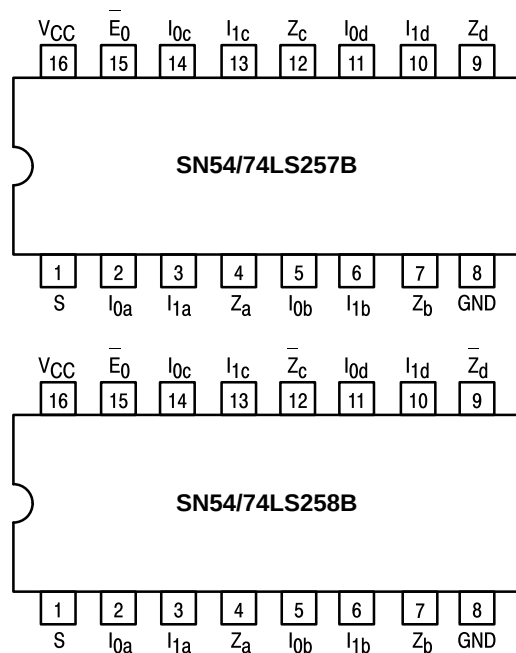


# QUAD 2-INPUT MULTIPLEXER WITH 3-STATE OUTPUTS

The LSTTL/MSI SN54/74LS257B and the SN54/74LS258B are Quad 2-Input Multiplexers with 3-state outputs. Four bits of data from two sources can be selected using a Common Data Select input. The four outputs present the selected data in true (non-inverted) form. The outputs may be switched to a high impedance state with a HIGH on the common Output Enable ( $\bar{E}_O$ ) Input, allowing the outputs to interface directly with bus oriented systems. It is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all Motorola TTL families.

- Schottky Process For High Speed
- Multiplexer Expansion By Tying Outputs Together
- Non-Inverting 3-State Outputs
- Input Clamp Diodes Limit High Speed Termination Effects
- Special Circuitry Ensures Glitch Free Multiplexing
- ESD > 3500 Volts

## CONNECTION DIAGRAM DIP (TOP VIEW)



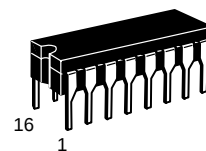
$V_{CC}$  = PIN 16  
GND = PIN 8

NOTE:  
The Flatpak version  
has the same pinouts  
(Connection Diagram) as  
the Dual In-Line Package.

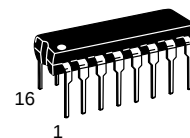
**SN54/74LS257B**  
**SN54/74LS258B**

**QUAD 2-INPUT MULTIPLEXER  
WITH 3-STATE OUTPUTS**

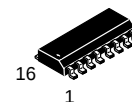
**LOW POWER SCHOTTKY**



**J SUFFIX**  
CERAMIC  
CASE 620-09



**N SUFFIX**  
PLASTIC  
CASE 648-08



**D SUFFIX**  
SOIC  
CASE 751B-03

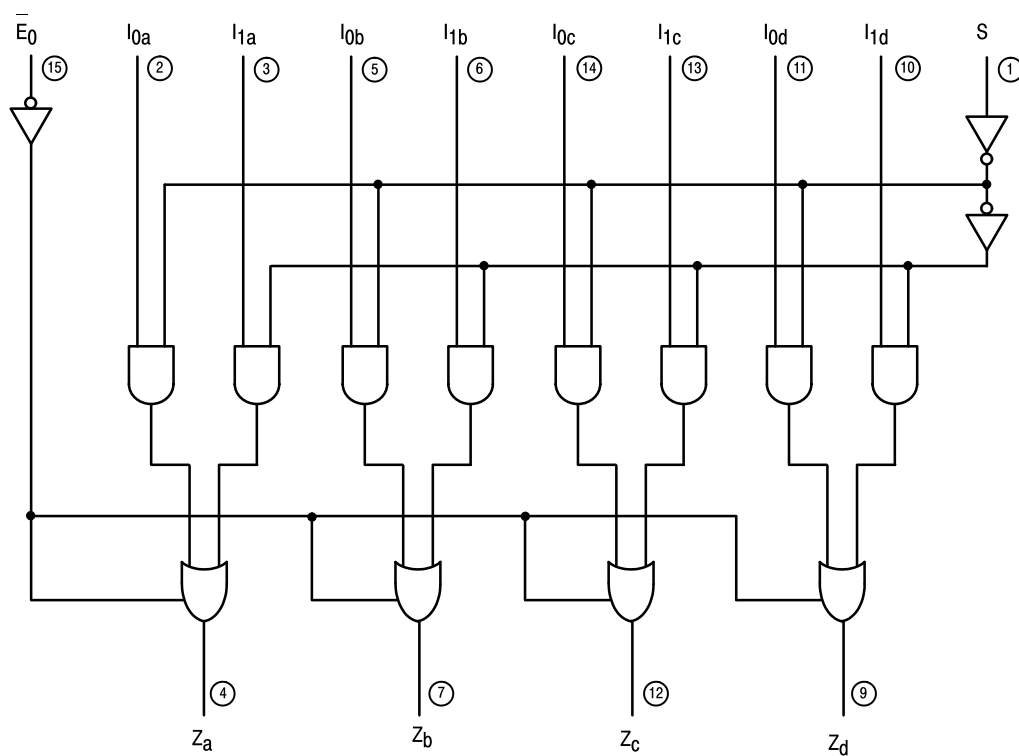
## ORDERING INFORMATION

|            |         |
|------------|---------|
| SN54LSXXXJ | Ceramic |
| SN74LSXXXN | Plastic |
| SN74LSXXXD | SOIC    |

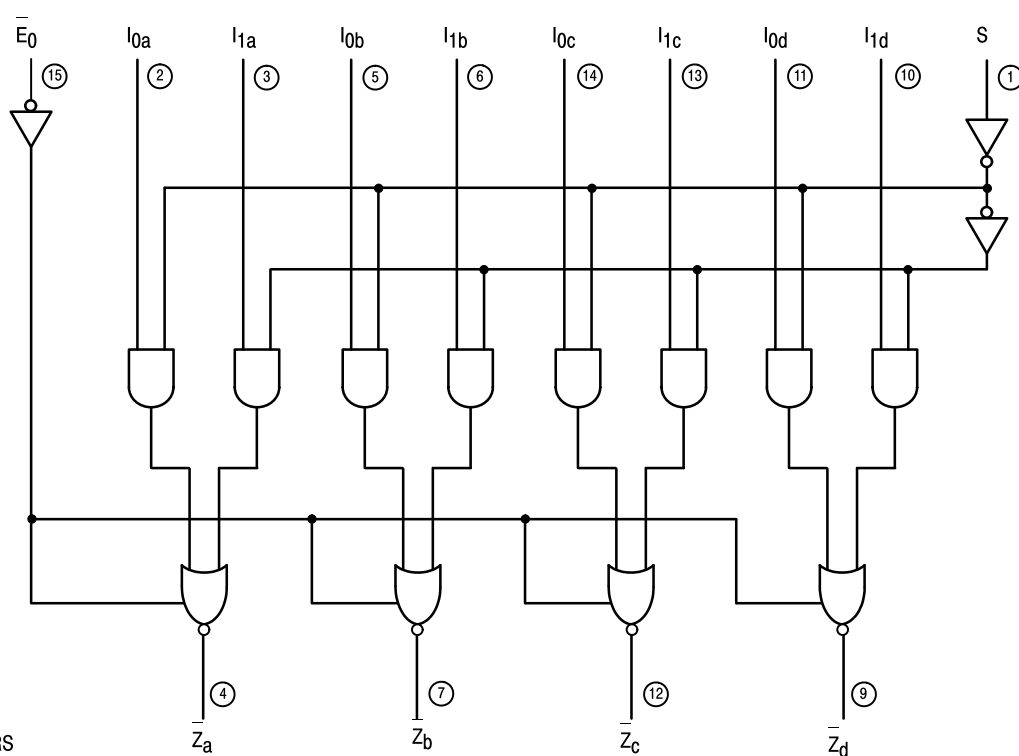
# SN54/74LS257B • SN54/74LS258B

## LOGIC DIAGRAMS

SN54/74LS257B



SN54/74LS258B



$V_{CC}$  = PIN 16  
 GND = PIN 8  
 ○ = PIN NUMBERS

# SN54/74LS257B • SN54/74LS258B

## FUNCTIONAL DESCRIPTION

The LS257B and LS258B are Quad 2-Input Multiplexers with 3-state outputs. They select four bits of data from two sources each under control of a Common Data Select Input. When the Select Input is LOW, the  $I_0$  inputs are selected and when Select is HIGH, the  $I_1$  inputs are selected. The data on the selected inputs appears at the outputs in true (non-inverted) form for the LS257B and in the inverted form for the LS258B.

The LS257B and LS258B are the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select Input. The logic equations for the outputs are shown below:

### LS257B

$$Z_a = \overline{E_0} \cdot (I_{1a} \cdot S + I_{0a} \cdot \overline{S}) \quad Z_b = \overline{E_0} \cdot (I_{1b} \cdot S + I_{0b} \cdot \overline{S})$$

$$Z_c = E_0 \cdot (I_{1c} \cdot S + I_{0c} \cdot \overline{S}) \quad Z_d = E_0 \cdot (I_{1d} \cdot S + I_{0d} \cdot \overline{S})$$

When the Output Enable Input ( $\overline{E_0}$ ) is HIGH, the outputs are forced to a high impedance "off" state. If the outputs are tied together, all but one device must be in the high impedance state to avoid high currents that would exceed the maximum ratings. Designers should ensure that Output Enable signals to 3-state devices whose outputs are tied together are designed so there is no overlap.

### LS258B

$$Z_a = \overline{E_0} \cdot (I_{1a} \cdot S + I_{0a} \cdot \overline{S}) \quad \overline{Z_b} = \overline{E_0} \cdot (I_{1b} \cdot S + I_{0b} \cdot \overline{S})$$

$$Z_c = E_0 \cdot (I_{1c} \cdot S + I_{0c} \cdot \overline{S}) \quad \overline{Z_d} = E_0 \cdot (I_{1d} \cdot S + I_{0d} \cdot \overline{S})$$

TRUTH TABLE

| OUTPUT<br>ENABLE | SELECT<br>INPUT | DATA<br>INPUTS |       | OUTPUTS<br>LS257B | OUTPUTS<br>LS258B |
|------------------|-----------------|----------------|-------|-------------------|-------------------|
| $\overline{E_0}$ | S               | $I_0$          | $I_1$ | Z                 | $\overline{Z}$    |
| H                | X               | X              | X     | (Z)               | (Z)               |
| L                | H               | X              | L     | L                 | H                 |
| L                | H               | X              | H     | H                 | L                 |
| L                | L               | L              | X     | L                 | H                 |
| L                | L               | H              | X     | H                 | L                 |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care  
(Z) = High Impedance (off)

## GUARANTEED OPERATING RANGES

| Symbol          | Parameter                           |          | Min         | Typ        | Max          | Unit |
|-----------------|-------------------------------------|----------|-------------|------------|--------------|------|
| V <sub>CC</sub> | Supply Voltage                      | 54<br>74 | 4.5<br>4.75 | 5.0<br>5.0 | 5.5<br>5.25  | V    |
| T <sub>A</sub>  | Operating Ambient Temperature Range | 54<br>74 | -55<br>0    | 25<br>25   | 125<br>70    | °C   |
| I <sub>OH</sub> | Output Current — High               | 54<br>74 |             |            | -1.0<br>-2.6 | mA   |
| I <sub>OL</sub> | Output Current — Low                | 54<br>74 |             |            | 12<br>24     | mA   |

# SN54/74LS257B • SN54/74LS258B

## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

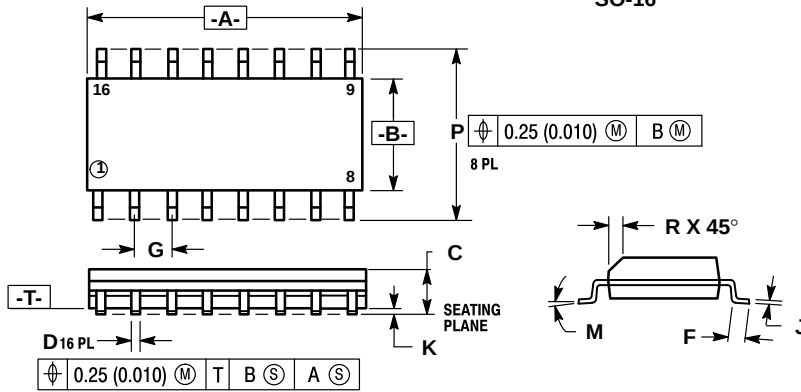
| Symbol           | Parameter                                      |        | Limits |       |            | Unit | Test Conditions                                                                                                    |                                                                                                             |
|------------------|------------------------------------------------|--------|--------|-------|------------|------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
|                  |                                                |        | Min    | Typ   | Max        |      |                                                                                                                    |                                                                                                             |
| V <sub>IH</sub>  | Input HIGH Voltage                             |        | 2.0    |       |            | V    | Guaranteed Input HIGH Voltage for All Inputs                                                                       |                                                                                                             |
| V <sub>IL</sub>  | Input LOW Voltage                              | 54     |        |       | 0.7        | V    | Guaranteed Input LOW Voltage for All Inputs                                                                        |                                                                                                             |
|                  |                                                | 74     |        |       | 0.8        |      |                                                                                                                    |                                                                                                             |
| V <sub>IK</sub>  | Input Clamp Diode Voltage                      |        |        | −0.65 | −1.5       | V    | V <sub>CC</sub> = MIN, I <sub>IN</sub> = −18 mA                                                                    |                                                                                                             |
| V <sub>OH</sub>  | Output HIGH Voltage                            | 54     | 2.4    | 3.4   |            | V    | V <sub>CC</sub> = MIN, I <sub>OH</sub> = MAX, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table |                                                                                                             |
|                  |                                                | 74     | 2.4    | 3.1   |            | V    |                                                                                                                    |                                                                                                             |
| V <sub>OL</sub>  | Output LOW Voltage                             | 54, 74 |        | 0.25  | 0.4        | V    | I <sub>OL</sub> = 12 mA                                                                                            | V <sub>CC</sub> = V <sub>CC</sub> MIN, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> per Truth Table |
|                  |                                                | 74     |        | 0.35  | 0.5        | V    | I <sub>OL</sub> = 24 mA                                                                                            |                                                                                                             |
| I <sub>OZH</sub> | Output Off Current — HIGH                      |        |        |       | 20         | μA   | V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 2.7 V                                                                    |                                                                                                             |
| I <sub>OZL</sub> | Output Off Current — LOW                       |        |        |       | −20        | μA   | V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0.4 V                                                                    |                                                                                                             |
| I <sub>IH</sub>  | Input HIGH Current<br>Other Inputs<br>S Inputs |        |        |       | 20<br>40   | μA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V                                                                     |                                                                                                             |
|                  | Other Inputs<br>S Inputs                       |        |        |       | 0.1<br>0.2 | mA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V                                                                     |                                                                                                             |
| I <sub>IL</sub>  | Input LOW Current<br>All Inputs                |        |        |       | −0.4       | mA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4 V                                                                     |                                                                                                             |
| I <sub>OS</sub>  | Short Circuit Current (Note 1)                 |        | −30    |       | −130       | mA   | V <sub>CC</sub> = MAX                                                                                              |                                                                                                             |
| I <sub>CC</sub>  | Power Supply Current<br>Total, Output HIGH     | LS257B |        |       | 10         | mA   | V <sub>CC</sub> = MAX                                                                                              |                                                                                                             |
|                  |                                                | LS258B |        |       | 9.0        |      |                                                                                                                    |                                                                                                             |
|                  | Total, Output LOW                              | LS257B |        |       | 16         | mA   |                                                                                                                    |                                                                                                             |
|                  |                                                | LS258B |        |       | 14         |      |                                                                                                                    |                                                                                                             |
|                  | Total, Output 3-State                          | LS257B |        |       | 19         | mA   |                                                                                                                    |                                                                                                             |
|                  |                                                | LS258B |        |       | 16         |      |                                                                                                                    |                                                                                                             |

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

## AC CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , $V_{CC} = 5.0 \text{ V}$ ) See SN54LS251 for Waveforms

| Symbol                 | Parameter                           |  | Limits |          |          | Unit | Test Conditions |                                              |
|------------------------|-------------------------------------|--|--------|----------|----------|------|-----------------|----------------------------------------------|
|                        |                                     |  | Min    | Typ      | Max      |      |                 |                                              |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay, Data to Output   |  |        | 10<br>12 | 13<br>15 | ns   | Figures 1 & 2   | $C_L = 45 \text{ pF}$                        |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay, Select to Output |  |        | 14<br>14 | 21<br>21 | ns   | Figures 1 & 2   |                                              |
| $t_{PZH}$              | Output Enable Time to HIGH Level    |  |        | 20       | 25       | ns   | Figures 4 & 5   | $C_L = 45 \text{ pF}$<br>$R_L = 667 \Omega$  |
| $t_{PZL}$              | Output Enable Time to LOW Level     |  |        | 20       | 25       | ns   | Figures 3 & 5   |                                              |
| $t_{PLZ}$              | Output Disable Time to LOW Level    |  |        | 16       | 25       | ns   | Figures 3 & 5   | $C_L = 5.0 \text{ pF}$<br>$R_L = 667 \Omega$ |
| $t_{PHZ}$              | Output Disable Time from HIGH Level |  |        | 18       | 25       | ns   | Figures 4 & 5   |                                              |

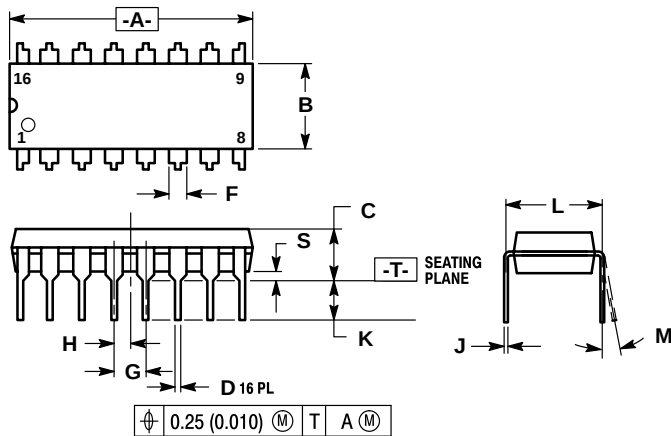
**Case 751B-03 D Suffix**  
**16-Pin Plastic**  
**SO-16**



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
  5. 751B-01 IS OBSOLETE, NEW STANDARD 751B-03.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 9.80        | 10.00 | 0.386     | 0.393 |
| 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  | 0.229     | 0.244 |
| R   | 0.25        | 0.50  | 0.010     | 0.019 |

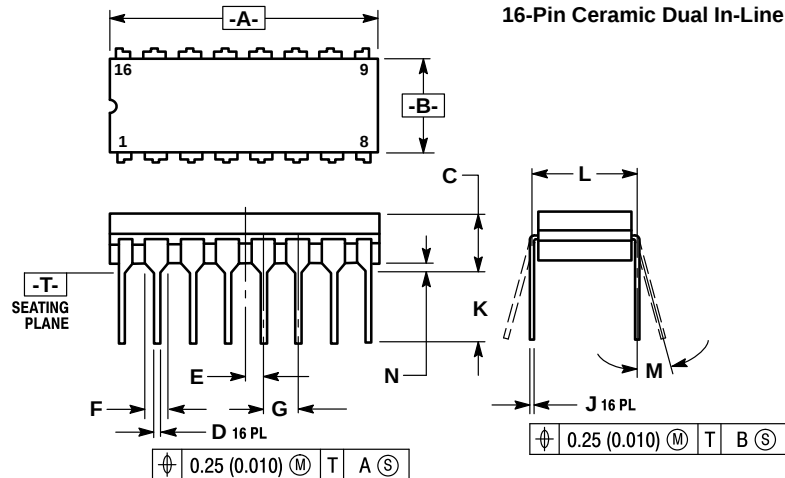
**Case 648-08 N Suffix**  
**16-Pin Plastic**



- 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.
  6. 648-01 THRU -07 OBSOLETE, NEW STANDARD 648-08.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 18.80       | 19.55 | 0.740     | 0.770 |
| B   | 6.35        | 6.85  | 0.250     | 0.270 |
| C   | 3.69        | 4.44  | 0.145     | 0.175 |
| D   | 0.39        | 0.53  | 0.015     | 0.021 |
| F   | 1.02        | 1.77  | 0.040     | 0.070 |
| G   | 2.54 BSC    |       | 0.100 BSC |       |
| H   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.21        | 0.38  | 0.008     | 0.015 |
| K   | 2.80        | 3.30  | 0.110     | 0.130 |
| L   | 7.50        | 7.74  | 0.295     | 0.305 |
| M   | 0°          | 10°   | 0°        | 10°   |
| S   | 0.51        | 1.01  | 0.020     | 0.040 |

**Case 620-09 J Suffix**  
**16-Pin Ceramic Dual In-Line**



- 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. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.
  5. 620-01 THRU -08 OBSOLETE, NEW STANDARD 620-09.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 19.05       | 19.55 | 0.750     | 0.770 |
| B   | 6.10        | 7.36  | 0.240     | 0.290 |
| C   | —           | 4.19  | —         | 0.165 |
| D   | 0.39        | 0.53  | 0.015     | 0.021 |
| E   | 1.27 BSC    |       | 0.050 BSC |       |
| F   | 1.40        | 1.77  | 0.055     | 0.070 |
| G   | 2.54 BSC    |       | 0.100 BSC |       |
| J   | 0.23        | 0.27  | 0.009     | 0.011 |
| K   | —           | 5.08  | —         | 0.200 |
| L   | 7.62 BSC    |       | 0.300 BSC |       |
| M   | 0°          | 15°   | 0°        | 15°   |
| N   | 0.39        | 0.88  | 0.015     | 0.035 |

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