



# MC10EL11, MC100EL11

## ATTRIBUTES

| Characteristics                                               | Value                |
|---------------------------------------------------------------|----------------------|
| Internal Input Pulldown Resistor                              | 75 K $\Omega$        |
| Internal Input Pullup Resistor                                | N/A                  |
| ESD Protection Human Body Model<br>Machine Model              | > 1 KV<br>> 100 V    |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) | Level 1              |
| Flammability Rating Oxygen Index: 28 to 34                    | UL 94 V-0 @ 0.125 in |
| Transistor Count                                              | 44                   |
| Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test        |                      |

1. For additional information, see Application Note AND8003/D.

## MAXIMUM RATINGS (Note 2)

| Symbol           | Parameter                                          | Condition 1                                    | Condition 2                                                          | Rating        | Units        |
|------------------|----------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------|---------------|--------------|
| V <sub>CC</sub>  | PECL Mode Power Supply                             | V <sub>EE</sub> = 0 V                          |                                                                      | 8             | V            |
| V <sub>EE</sub>  | NECL Mode Power Supply                             | V <sub>CC</sub> = 0 V                          |                                                                      | -8            | V            |
| V <sub>I</sub>   | PECL Mode Input Voltage<br>NECL Mode Input Voltage | V <sub>EE</sub> = 0 V<br>V <sub>CC</sub> = 0 V | V <sub>I</sub> ≤ V <sub>CC</sub><br>V <sub>I</sub> ≥ V <sub>EE</sub> | 6<br>-6       | V<br>V       |
| I <sub>out</sub> | Output Current                                     | Continuous<br>Surge                            |                                                                      | 50<br>100     | mA<br>mA     |
| T <sub>A</sub>   | Operating Temperature Range                        |                                                |                                                                      | -40 to +85    | °C           |
| T <sub>stg</sub> | Storage Temperature Range                          |                                                |                                                                      | -65 to +150   | °C           |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient)           | 0 LFPM<br>500 LFPM                             | SO-8<br>SO-8                                                         | 190<br>130    | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | SO-8                                                                 | 41 to 44      | °C/W         |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient)           | 0 LFPM<br>500 LFPM                             | TSSOP-8<br>TSSOP-8                                                   | 185<br>140    | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | TSSOP-8                                                              | 41 to 44 ± 5% | °C/W         |
| T <sub>sol</sub> | Wave Solder                                        | <2 to 3 sec @ 248°C                            |                                                                      | 265           | °C           |

2. Maximum Ratings are those values beyond which device damage may occur.

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## 10EL SERIES PECL DC CHARACTERISTICS $V_{CC} = 5.0 \text{ V}$ ; $V_{EE} = 0.0 \text{ V}$ (Note 3)

|             |                                                              | -40 °C |      |      | 25 °C |      |      | 85 °C |      |      |               |
|-------------|--------------------------------------------------------------|--------|------|------|-------|------|------|-------|------|------|---------------|
| Symbol      | Characteristic                                               | Min    | Typ  | Max  | Min   | Typ  | Max  | Min   | Typ  | Max  | Unit          |
| $I_{EE}$    | Power Supply Current                                         |        | 26   | 31   |       | 26   | 31   |       | 26   | 31   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 4)                                 | 3920   | 4010 | 4110 | 4020  | 4105 | 4190 | 4090  | 4185 | 4280 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 4)                                  | 3050   | 3200 | 3350 | 3050  | 3210 | 3370 | 3050  | 3227 | 3405 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                            | 3770   |      | 4110 | 3870  |      | 4190 | 3940  |      | 4280 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                             | 3050   |      | 3500 | 3050  |      | 3520 | 3050  |      | 3555 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 5) | 2.5    |      | 4.6  | 2.5   |      | 4.6  | 2.5   |      | 4.6  | V             |
| $I_{IH}$    | Input HIGH Current                                           |        |      | 150  |       |      | 150  |       |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                            | 0.5    |      |      | 0.5   |      |      | 0.3   |      |      | $\mu\text{A}$ |

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

3. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.25 V / -0.5 V.

4. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC}$  - 2 volts.

5.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{ppmin}$  and 1 V.

## 10EL SERIES NECL DC CHARACTERISTICS $V_{CC} = 0.0 \text{ V}$ ; $V_{EE} = -5.0 \text{ V}$ (Note 6)

|             |                                                              | -40 °C |       |       | 25 °C |       |       | 85 °C |       |       |               |
|-------------|--------------------------------------------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| Symbol      | Characteristic                                               | Min    | Typ   | Max   | Min   | Typ   | Max   | Min   | Typ   | Max   | Unit          |
| $I_{EE}$    | Power Supply Current                                         |        | 26    | 31    |       | 26    | 31    |       | 26    | 31    | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 7)                                 | -1080  | -990  | -890  | -980  | -895  | -810  | -910  | -815  | -720  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 7)                                  | -1950  | -1800 | -1650 | -1950 | -1790 | -1630 | -1950 | -1773 | -1595 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                            | -1230  |       | -890  | -1130 |       | -810  | -1060 |       | -720  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                             | -1950  |       | -1500 | -1950 |       | -1480 | -1950 |       | -1445 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 8) | -2.5   |       | -0.4  | -2.5  |       | -0.4  | -2.5  |       | -0.4  | V             |
| $I_{IH}$    | Input HIGH Current                                           |        |       | 150   |       |       | 150   |       |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                            | 0.5    |       |       | 0.5   |       |       | 0.3   |       |       | $\mu\text{A}$ |

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

6. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.25 V / -0.5 V.

7. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC}$  - 2 volts.

8.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{ppmin}$  and 1 V.

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## 100EL SERIES PECL DC CHARACTERISTICS $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0.0\text{ V}$ (Note 9)

|             |                                                               | -40 °C |      |      | 25 °C |      |      | 85 °C |      |      |               |
|-------------|---------------------------------------------------------------|--------|------|------|-------|------|------|-------|------|------|---------------|
| Symbol      | Characteristic                                                | Min    | Typ  | Max  | Min   | Typ  | Max  | Min   | Typ  | Max  | Unit          |
| $I_{EE}$    | Power Supply Current                                          |        | 26   | 31   |       | 26   | 31   |       | 30   | 36   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 10)                                 | 3915   | 3995 | 4120 | 3975  | 4045 | 4120 | 3975  | 4050 | 4120 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 10)                                  | 3170   | 3305 | 3445 | 3190  | 3295 | 3380 | 3190  | 3295 | 3380 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                             | 3835   |      | 4120 | 3835  |      | 4120 | 3835  |      | 4120 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                              | 3190   |      | 3525 | 3190  |      | 3525 | 3190  |      | 3525 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 11) | 2.5    |      | 4.6  | 2.5   |      | 4.6  | 2.5   |      | 4.6  | V             |
| $I_{IH}$    | Input HIGH Current                                            |        |      | 150  |       |      | 150  |       |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                             | 0.5    |      |      | 0.5   |      |      | 0.5   |      |      | $\mu\text{A}$ |

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

9. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.8 V / -0.5 V.

10. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC}$  - 2 volts.

11.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{ppmin}$  and 1 V.

## 100EL SERIES NECL DC CHARACTERISTICS $V_{CC} = 0.0\text{ V}$ ; $V_{EE} = -5.0\text{ V}$ (Note 12)

|             |                                                               | -40 °C |       |       | 25 °C |       |       | 85 °C |       |       |               |
|-------------|---------------------------------------------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| Symbol      | Characteristic                                                | Min    | Typ   | Max   | Min   | Typ   | Max   | Min   | Typ   | Max   | Unit          |
| $I_{EE}$    | Power Supply Current                                          |        | 26    | 31    |       | 26    | 31    |       | 30    | 36    | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 13)                                 | -1085  | -1005 | -880  | -1025 | -955  | -880  | -1025 | -955  | -880  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 13)                                  | -1830  | -1695 | -1555 | -1810 | -1705 | -1620 | -1810 | -1705 | -1620 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                             | -1165  |       | -880  | -1165 |       | -880  | -1165 |       | -880  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                              | -1810  |       | -1475 | -1810 |       | -1475 | -1810 |       | -1475 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 14) | -2.5   |       | -0.4  | -2.5  |       | -0.4  | -2.5  |       | -0.4  | V             |
| $I_{IH}$    | Input HIGH Current                                            |        |       | 150   |       |       | 150   |       |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                             | 0.5    |       |       | 0.5   |       |       | 0.5   |       |       | $\mu\text{A}$ |

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

12. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.8 V / -0.5 V.

13. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC}$  - 2 volts.

14.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{ppmin}$  and 1 V.

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**AC CHARACTERISTICS**  $V_{CC} = 5.0\text{ V}$ ;  $V_{EE} = 0.0\text{ V}$  or  $V_{CC} = 0.0\text{ V}$ ;  $V_{EE} = -5.0\text{ V}$  (Note 15)

| Symbol                 | Characteristic                                            | -40 °C |        |      | 25 °C |        |          | 85 °C |        |          | Unit |
|------------------------|-----------------------------------------------------------|--------|--------|------|-------|--------|----------|-------|--------|----------|------|
|                        |                                                           | Min    | Typ    | Max  | Min   | Typ    | Max      | Min   | Typ    | Max      |      |
| $f_{\max}$             | Maximum Toggle Frequency                                  |        |        |      |       | 1.5    |          |       |        |          | GHz  |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay to Output                               | 135    | 260    | 385  | 190   | 265    | 340      | 215   | 29*0   | 365      | ps   |
| $t_{SKEW}$             | Within-Device Skew (Note 16)<br>Duty Cycle Skew (Note 17) |        | 5<br>5 |      |       | 5<br>5 | 20<br>20 |       | 5<br>5 | 20<br>20 | ps   |
| $t_{JITTER}$           | Random Clock Jitter (RMS)                                 |        |        |      |       | 0.6    |          |       |        |          | ps   |
| $V_{PP}$               | Input Swing (Note 18)                                     | 150    |        | 1000 | 150   |        | 1000     | 150   |        | 1000     | mV   |
| $t_r$<br>$t_f$         | Output Rise/Fall Times Q<br>(20% - 80%)                   | 100    | 225    | 350  | 100   | 225    | 350      | 100   | 225    | 350      | ps   |

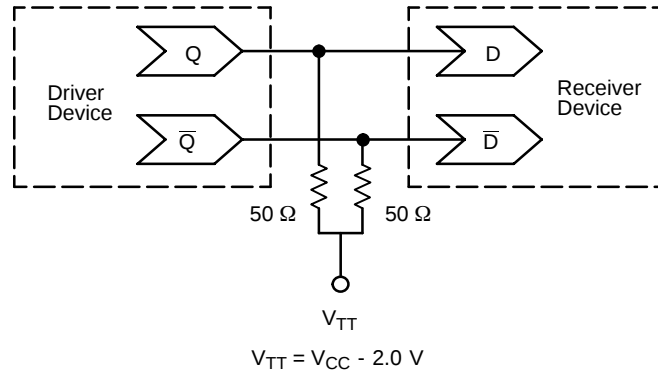
15.10 Series:  $V_{EE}$  can vary  $+0.25\text{ V}$  /  $-0.5\text{ V}$ .

100 Series:  $V_{EE}$  can vary  $+0.8\text{ V}$  /  $-0.5\text{ V}$ .

16. Within-device skew defined as identical transitions on similar paths through a device.

17. Duty cycle skew is the difference between a  $t_{PLH}$  and  $t_{PHL}$  propagation delay through a device.

18.  $V_{PP}(\min)$  is minimum input swing for which AC parameters guaranteed. The device has a DC gain of  $\approx 40$ .



**Figure 2. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note AND8020 - Termination of ECL Logic Devices.)

## MC10EL11, MC100EL11

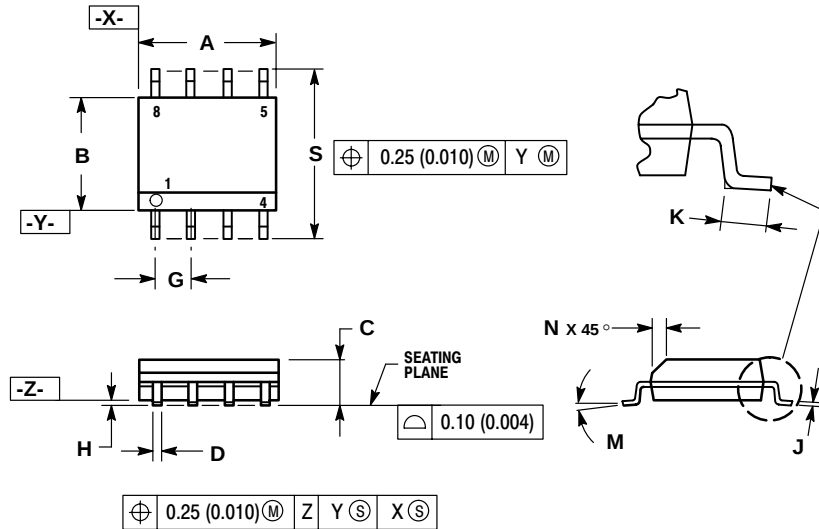
### Resource Reference of Application Notes

|                |                                                               |
|----------------|---------------------------------------------------------------|
| <b>AN1404</b>  | - ECLinPS Circuit Performance at Non-Standard $V_{IH}$ Levels |
| <b>AN1405</b>  | - ECL Clock Distribution Techniques                           |
| <b>AN1406</b>  | - Designing with PECL (ECL at +5.0 V)                         |
| <b>AN1503</b>  | - ECLinPS I/O SPICE Modeling Kit                              |
| <b>AN1504</b>  | - Metastability and the ECLinPS Family                        |
| <b>AN1560</b>  | - Low Voltage ECLinPS SPICE Modeling Kit                      |
| <b>AN1568</b>  | - Interfacing Between LVDS and ECL                            |
| <b>AN1596</b>  | - ECLinPS Lite Translator ELT Family SPICE I/O Model Kit      |
| <b>AN1650</b>  | - Using Wire-OR Ties in ECLinPS Designs                       |
| <b>AN1672</b>  | - The ECL Translator Guide                                    |
| <b>AND8001</b> | - Odd Number Counters Design                                  |
| <b>AND8002</b> | - Marking and Date Codes                                      |
| <b>AND8020</b> | - Termination of ECL Logic Devices                            |
| <b>AND8090</b> | - AC Characteristics of ECL Devices                           |

# MC10EL11, MC100EL11

## PACKAGE DIMENSIONS

### SO-8 D SUFFIX PLASTIC SOIC PACKAGE CASE 751-07 ISSUE AA



#### NOTES:

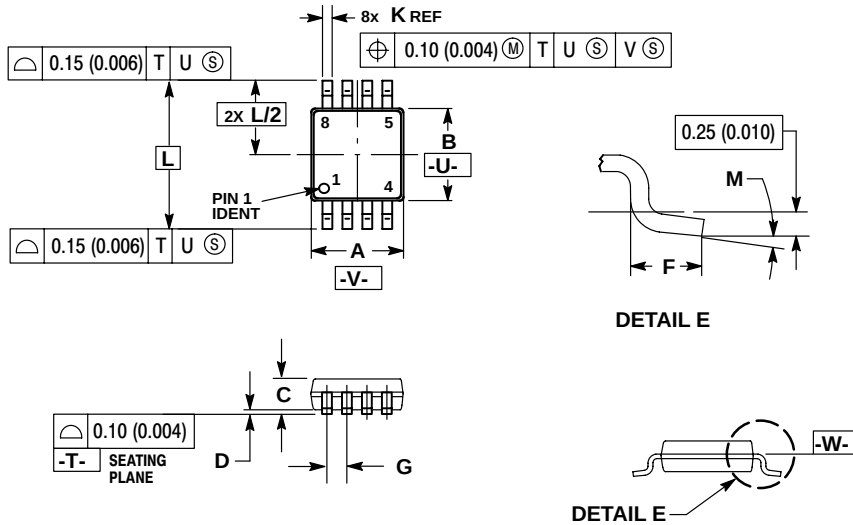
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 0.10        | 0.25 | 0.004     | 0.010 |
| J   | 0.19        | 0.25 | 0.007     | 0.010 |
| K   | 0.40        | 1.27 | 0.016     | 0.050 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

# MC10EL11, MC100EL11

## PACKAGE DIMENSIONS

TSSOP-8  
DT SUFFIX  
PLASTIC TSSOP PACKAGE  
CASE 948R-02  
ISSUE A



### NOTES:

1. DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
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. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -V-.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 2.90        | 3.10 | 0.114     | 0.122 |
| B   | 2.90        | 3.10 | 0.114     | 0.122 |
| C   | 0.80        | 1.10 | 0.031     | 0.043 |
| D   | 0.05        | 0.15 | 0.002     | 0.006 |
| F   | 0.40        | 0.70 | 0.016     | 0.028 |
| G   | 0.65 BSC    |      | 0.026 BSC |       |
| K   | 0.25        | 0.40 | 0.010     | 0.016 |
| L   | 4.90 BSC    |      | 0.193 BSC |       |
| M   | 0°          | 6°   | 0°        | 6°    |

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