



# MC3487

## Quad Line Driver with Three-State Outputs

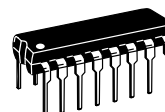
Motorola's Quad EIA-422 Driver features four independent driver chains which comply with EIA Standards for the Electrical Characteristics of Balanced Voltage Digital Interface Circuits. The outputs are three-state structures which are forced to a high impedance state when the appropriate output control pin reaches a logic zero condition. All input pins are PNP buffered to minimize input loading for either logic one or logic zero inputs. In addition, internal circuitry assures a high impedance output state during the transition between power up and power down. A summary of MC3487 features include:

- Four Independent Driver Chains
- Three-State Outputs
- PNP High Impedance Inputs (PIA Compatible)
- Fast Propagation Times (Typical 15 ns)
- TTL Compatible
- Single 5.0 V Supply Voltage
- Output Rise and Fall Times Less Than 20 ns
- DS 3487 Provides Second Source

### QUAD EIA-422 LINE DRIVER WITH THREE-STATE OUTPUTS

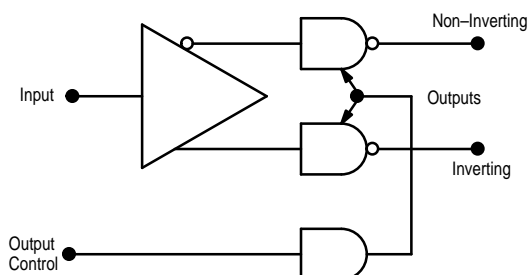
#### SEMICONDUCTOR TECHNICAL DATA

**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751B  
(SO-16)



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 648

#### Driver Block Diagram

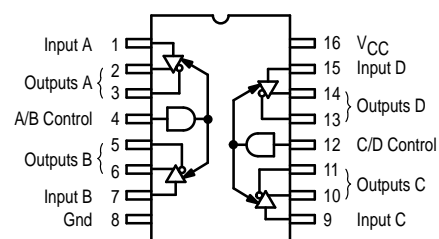


#### TRUTH TABLE

| Input | Control Input | Non-Inverting Output | Inverting Output |
|-------|---------------|----------------------|------------------|
| H     | H             | H                    | L                |
| L     | H             | L                    | H                |
| X     | L             | Z                    | Z                |

L = Low Logic State  
H = High Logic State  
X = Irrelevant  
Z = Third-State (High Impedance)

#### PIN CONNECTIONS



#### ORDERING INFORMATION

| Device  | Operating Temperature Range             | Package     |
|---------|---|-------------|
| MC3487P | $T_A = 0 \text{ to } +70^\circ\text{C}$ | Plastic DIP |
| MC3487D |   | SO-16       |

## MAXIMUM RATINGS

| Rating                               | Symbol    | Value       | Unit |
|--------------------------------------|-----------|-------------|------|
| Power Supply Voltage                 | $V_{CC}$  | 8.0         | Vdc  |
| Input Voltage                        | $V_I$     | 5.5         | Vdc  |
| Operating Ambient Temperature Range  | $T_A$     | 0 to +70    | °C   |
| Operating Junction Temperature Range | $T_J$     | 150         | °C   |
| Storage Temperature Range            | $T_{stg}$ | –65 to +150 | °C   |

**ELECTRICAL CHARACTERISTICS** (Unless otherwise noted, specifications apply  $4.75\text{ V} \leq V_{CC} \leq 5.25\text{ V}$  and  $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ . Typical values measured at  $V_{CC} = 5.0\text{ V}$ , and  $T_A = 25^\circ\text{C}$ .)

| Characteristic  | Symbol                | Min    | Typ    | Max                    | Unit          |
|---|-----------------------|--------|--------|------------------------|---------------|
| Input Voltage – Low Logic State   | $V_{IL}$              | –      | –      | 0.8                    | Vdc           |
| Input Voltage – High Logic State  | $V_{IH}$              | 2.0    | –      | –                      | Vdc           |
| Input Current – Low Logic State<br>( $V_{IL} = 0.5\text{ V}$ )  | $I_{IL}$              | –      | –      | – 400                  | $\mu\text{A}$ |
| Input Current – High Logic State<br>( $V_{IH} = 2.7\text{ V}$ )<br>( $V_{IH} = 5.5\text{ V}$ )  | $I_{IH}$              | –<br>– | –<br>– | + 50<br>+ 100          | $\mu\text{A}$ |
| Input Clamp Voltage<br>( $I_{IK} = -18\text{ mA}$ )   | $V_{IK}$              | –      | –      | – 1.5                  | V             |
| Output Voltage – Low Logic State<br>( $I_{OL} = 48\text{ mA}$ )   | $V_{OL}$              | –      | –      | 0.5                    | V             |
| Output Voltage – High Logic State<br>( $I_{OH} = -20\text{ mA}$ )   | $V_{OH}$              | 2.5    | –      | –                      | V             |
| Output Short-Circuit Current<br>( $V_{IH} = 2.0\text{ V}$ , Note 1)   | $I_{OS}$              | – 40   | –      | – 140                  | mA            |
| Output Leakage Current – Hi-Z State<br>( $V_{IL} = 0.5\text{ V}$ , $V_{IL(Z)} = 0.8\text{ V}$ )<br>( $V_{IH} = 2.7\text{ V}$ , $V_{IL(Z)} = 0.8\text{ V}$ ) | $I_{OL(Z)}$           | –<br>– | –<br>– | $\pm 100$<br>$\pm 100$ | $\mu\text{A}$ |
| Output Leakage Current – Power OFF<br>( $V_{OH} = 6.0\text{ V}$ , $V_{CC} = 0\text{ V}$ )<br>( $V_{OL} = -0.25\text{ V}$ , $V_{CC} = 0\text{ V}$ )          | $I_{OL(off)}$         | –<br>– | –<br>– | + 100<br>– 100         | $\mu\text{A}$ |
| Output Offset Voltage Difference (Note 2)   | $V_{OS} - V_{OS}$     | –      | –      | $\pm 0.4$              | V             |
| Output Differential Voltage (Note 2)  | $V_{OD}$              | 2.0    | –      | –                      | V             |
| Output Differential Voltage Difference (Note 2)   | $ \Delta V_{OD} $     | –      | –      | $\pm 0.4$              | V             |
| Power Supply Current<br>(Control Pins = Gnd, Note 3)<br>(Control Pins = 2.0 V)  | $I_{CCX}$<br>$I_{CC}$ | –<br>– | –<br>– | 105<br>85              | mA            |

**NOTES:** 1. Only one output may be shorted at a time.  
2. See EIA Specification EIA-422 for exact test conditions.  
3. Circuit in three-state condition.

SWITCHING CHARACTERISTICS ( $V_{CC} = 5.0\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

| Characteristic   | Symbol   | Min              | Typ              | Max                  | Unit |
|--|--|------------------|------------------|----------------------|------|
| Propagation Delay Times<br>High to Low Output<br>Low to High Output  | $t_{PHL}$<br>$t_{PLH}$                                       | –<br>–           | –<br>–           | 20<br>20             | ns   |
| Output Transition Times – Differential<br>High to Low Output<br>Low to High Output   | $t_{THL}$<br>$t_{TLH}$                                       | –<br>–           | –<br>–           | 20<br>20             | ns   |
| Propagation Delay – Control to Output<br>( $R_L = 200\ \Omega$ , $C_L = 50\text{ pF}$ )<br>( $R_L = 200\ \Omega$ , $C_L = 50\text{ pF}$ )<br>( $R_L = \infty$ , $C_L = 50\text{ pF}$ )<br>( $R_L = 200\ \Omega$ , $C_L = 50\text{ pF}$ ) | $t_{PHZ(E)}$<br>$t_{PLZ(E)}$<br>$t_{PZH(E)}$<br>$t_{PZL(E)}$ | –<br>–<br>–<br>– | –<br>–<br>–<br>– | 25<br>25<br>30<br>30 | ns   |

Figure 1. Three-State Enable Test Circuit and Waveforms

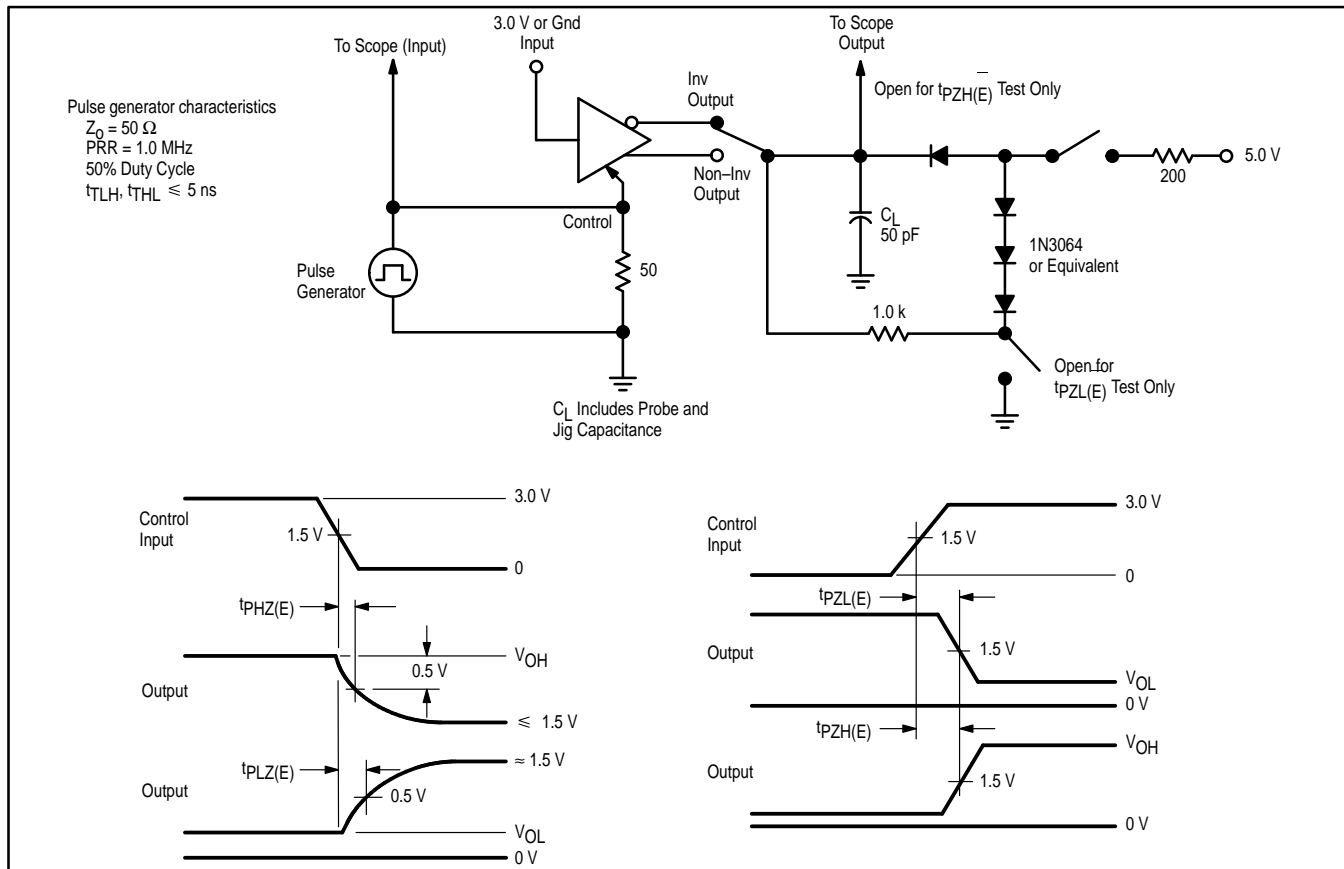


Figure 2. Propagation Delay Times Input to Output Waveforms and Test Circuit

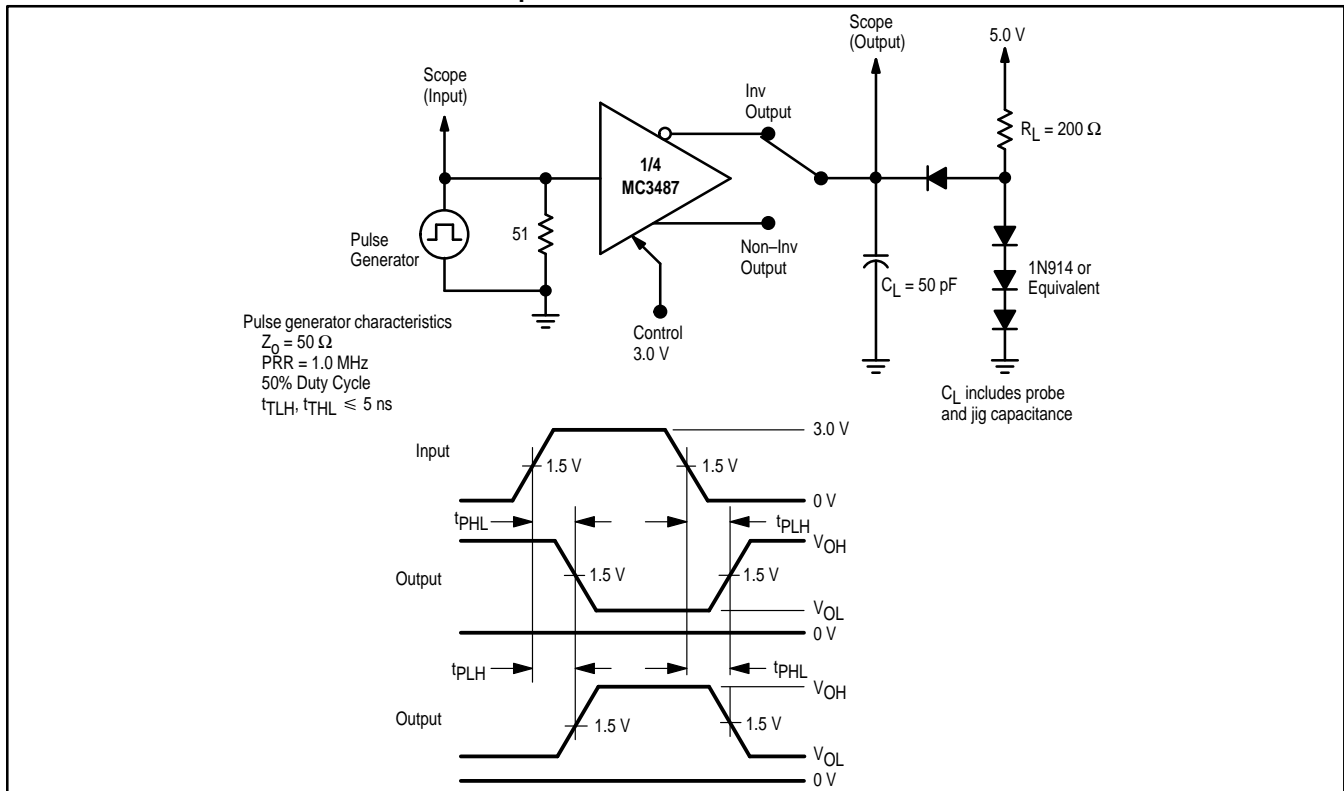


Figure 3. Output Transition Times Test Circuit and Waveforms

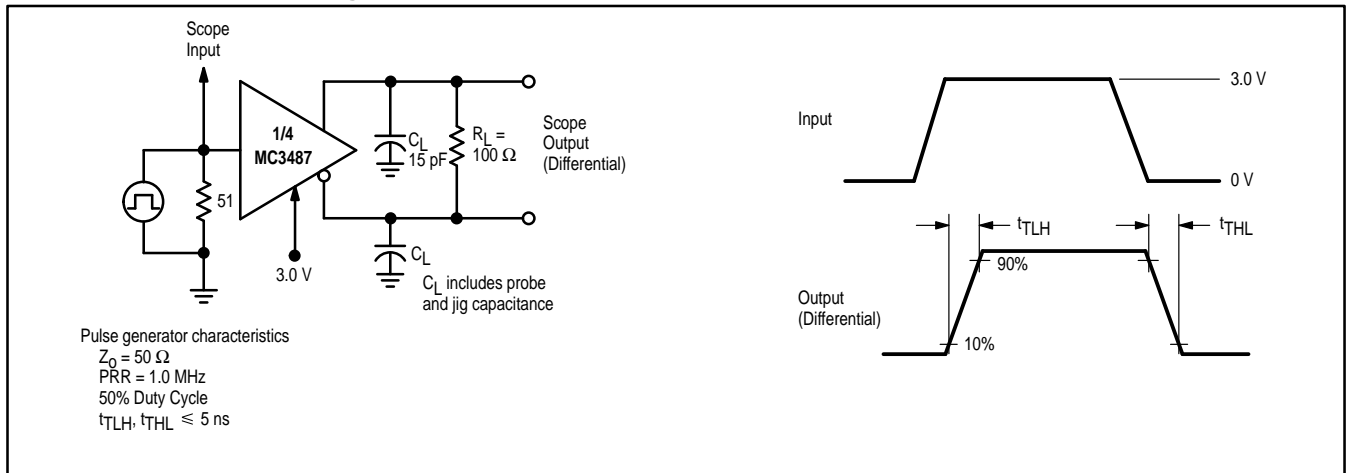


Figure 4. Output Current versus Output Voltage

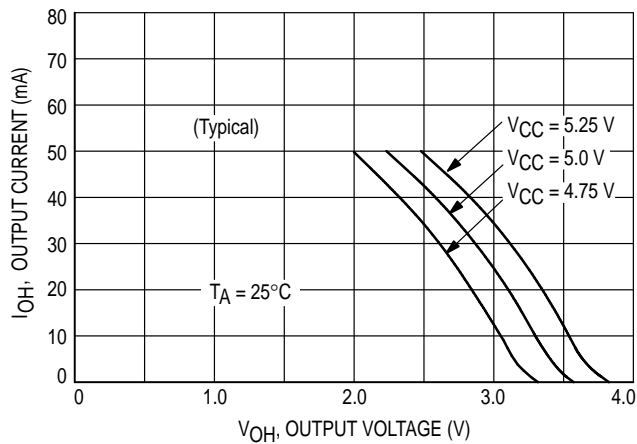
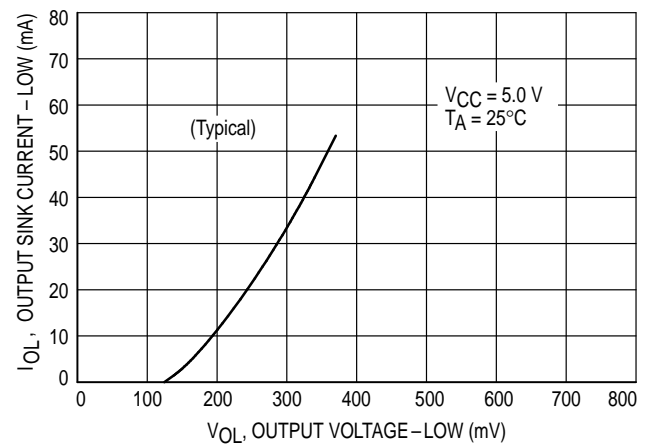
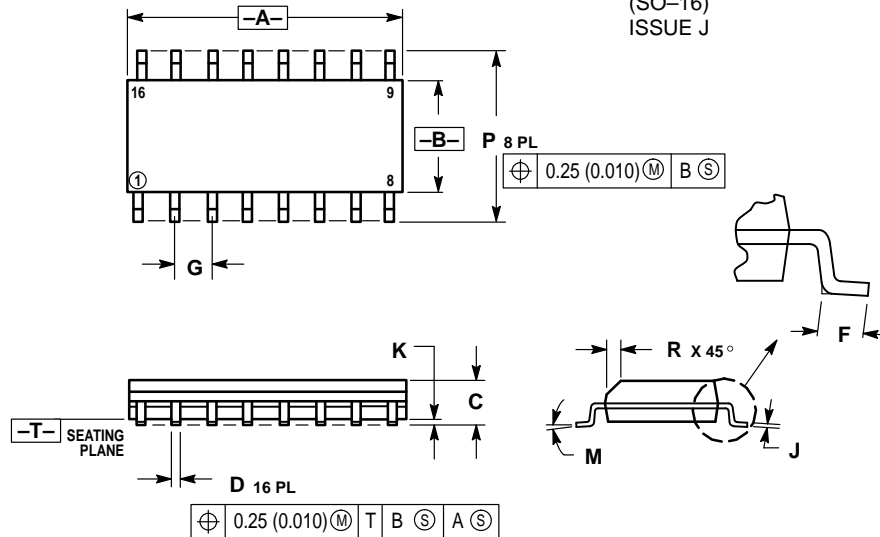


Figure 5. Output Sink Current versus Output Voltage



## OUTLINE DIMENSIONS

**D SUFFIX**  
 PLASTIC PACKAGE  
 CASE 751B-05  
 (SO-16)  
 ISSUE J

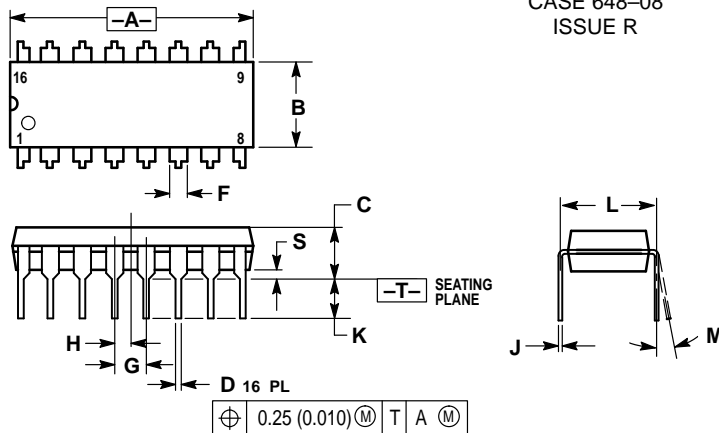


## NOTES:

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   | 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 |


**P SUFFIX**  
 PLASTIC PACKAGE  
 CASE 648-08  
 ISSUE R



## 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   | 0.740     | 0.770 | 18.80       | 19.55 |
| B   | 0.250     | 0.270 | 6.35        | 6.85  |
| C   | 0.145     | 0.175 | 3.69        | 4.44  |
| D   | 0.015     | 0.021 | 0.39        | 0.53  |
| F   | 0.040     | 0.70  | 1.02        | 1.77  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.050 BSC |       | 1.27 BSC    |       |
| J   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.110     | 0.130 | 2.80        | 3.30  |
| L   | 0.295     | 0.305 | 7.50        | 7.74  |
| M   | 0°        | 10°   | 0°          | 10°   |
| S   | 0.020     | 0.040 | 0.51        | 1.01  |

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