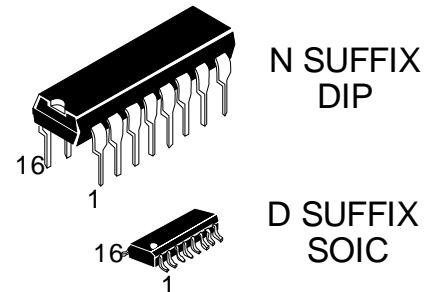


**MICROCIRCUIT HT3232AN, HT3232AR INTERFACE
 TRANSCEIVER OF THE SERIAL DATA OF THE STANDARD RS -232
 (compatible to MAX3232 (MAXIM USA))**

Microcircuits HT3232A is interface transceiver of serial data under RS - 232 standard with single power supply source & bipolar output voltage of transmitter, forming by build-in voltage multiplier on 4 external capacities, 0.1 μ F. HT3232A correspond to EIA/TIA-232E, V.28 standard and is purposed for application in modern high efficient calculating systems with the wide range of supply voltage, fast-operating electronic devices with high level of fidelity of information exchange among distant devices.



IC marking in package
 HT3232AN Plastic DIP
 HT3232AR SOIC
 $T_A =$ from -40 to 85 °C
 For all packages

Functions and structure:

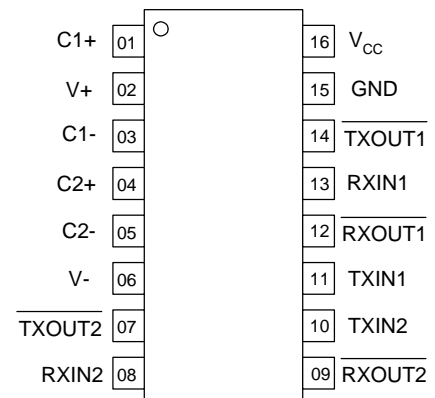
- Microcircuit contains 2 transmitters and 2 receivers of the serial data of the standard RS-232.
- The microcircuit supply voltage range is from 3.0 to 5.5 V.
- The microcircuits is available in 16-pin DIP-package (MS-001BB). 16-pin SO-package (MS-012AC).

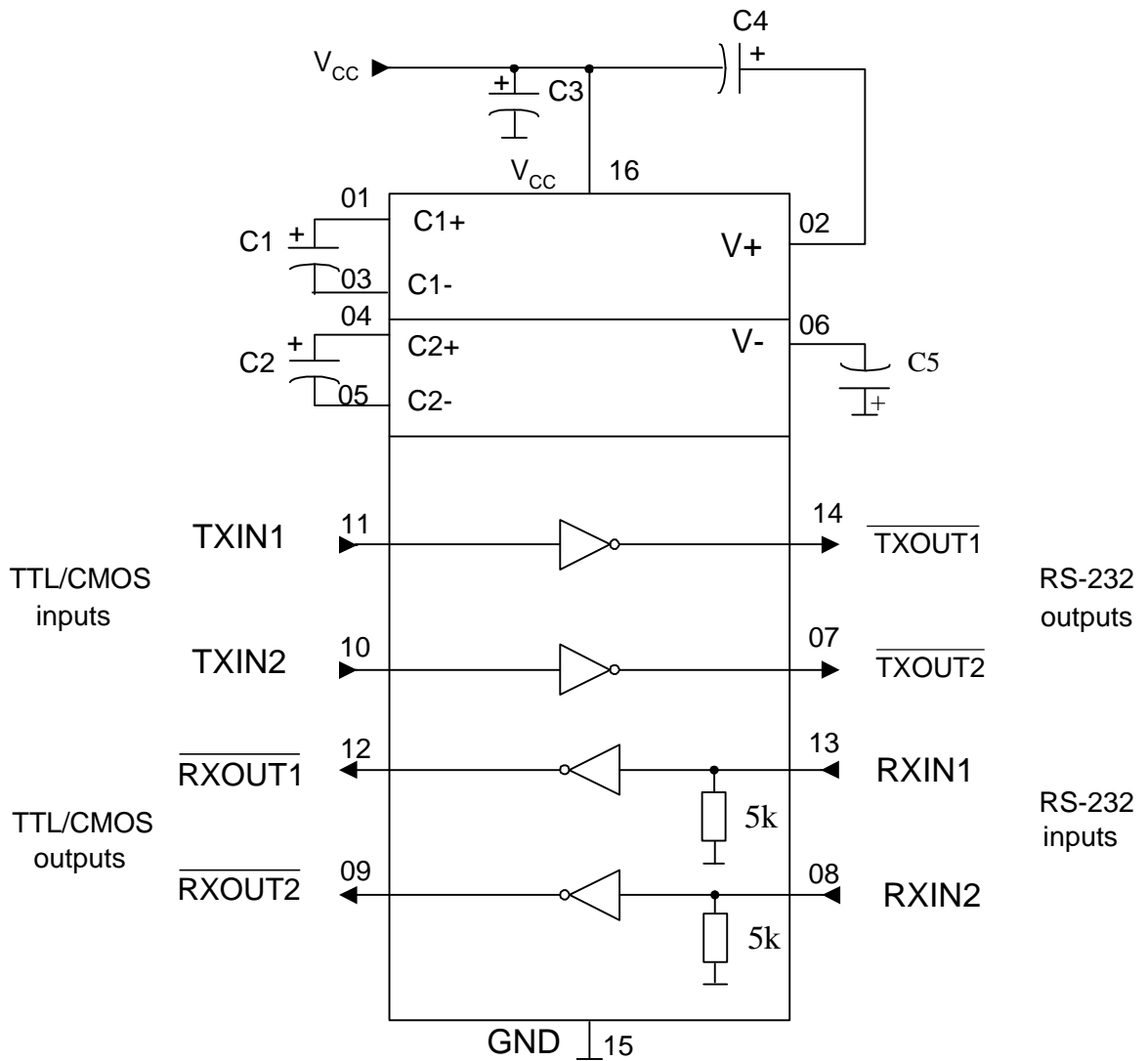
Truth Table

| Input | Output |
|------------|--|
| RXIN, TXIN | $\overline{\text{RXOUT}}, \overline{\text{TXOUT}}$ |
| H | L |
| L | H |

Note –
 L – low voltage level;
 H – high voltage level

Pinning



Functional diagram


C1 – capacitor 0.1 $\mu\text{F} \pm 10\%$ for $U_{\text{CC}} = 3.3 \text{ V} \pm 10\%$ (0.047 $\mu\text{F} \pm 10\%$ for $U_{\text{CC}} = 5.0 \text{ V} \pm 10\%$)

C2, C4, C5– capacitors 0.1 $\mu\text{F} \pm 10\%$ for $U_{\text{CC}} = 3.3 \text{ V} \pm 10\%$ (0.33 $\mu\text{F} \pm 10\%$ for $U_{\text{CC}} = 5.0 \text{ V} \pm 10\%$)

C3 – capacitor 0.1 $\mu\text{F} \pm 10\%$

Pin description table

| Pin number | Pin description | Symbol |
|------------|---|----------------------------|
| 01 | Positive terminal of the voltage multiplier charge-pump capacitor | C1+ |
| 02 | Positive voltage multiplier output | V+ |
| 03 | Negative terminal of the voltage multiplier charge-pump capacitor | C1- |
| 04 | Positive terminal of the voltage multiplier charge-pump capacitor | C2+ |
| 05 | Negative terminal of the voltage multiplier charge-pump capacitor | C2- |
| 06 | Negative voltage multiplier output | V- |
| 07 | Transmitter output (RS-232 levels) | $\overline{\text{TXOUT2}}$ |
| 08 | Receiver input (RS-232 levels) | RXIN2 |
| 09 | Receiver output (TTL/CMOS levels) | $\overline{\text{RXOUT2}}$ |
| 10 | Transmitter input (TTL/CMOS levels) | TXIN2 |
| 11 | Transmitter input (TTL/CMOS levels) | TXIN1 |
| 12 | Receiver output (TTL/CMOS levels) | $\overline{\text{RXOUT1}}$ |
| 13 | Receiver input (RS-232 levels) | RXIN1 |
| 14 | Transmitter output (RS-232 levels) | $\overline{\text{TXOUT1}}$ |
| 15 | Common pin | GND |
| 16 | Supply voltage | V _{CC} |

Maximum Ratings & Recommended Operating Conditions

| Parameter, unit | Symbol | Recommended operating conditions | | Maximum rate | |
|--|---------------------------------|----------------------------------|-----------------|--------------|----------------------|
| | | min | max | min | max |
| Supply voltage, V | U _{CC} | 3.0 | 5.5 | -0.3 | 6.0 |
| Voltage applied to transmitter output, V | U _{OT} | – | – | -13.2 | 13.2 |
| Multiplier positive output voltage, V | U ₊ | 5.0 | – | -0.3 | 7.0 |
| Multiplier negative output voltage, V | U ₋ | -5.0 | – | -7.0 | 0.3 |
| Receiver input voltage, V | U _{IR} | -25 | 25 | -25 | 25 |
| Receiver output voltage, V | U _{OR} | – | – | -0.3 | U _{CC} +0.3 |
| Transmitter low level input voltage, V | U _{IL} | 0 | 0.8 | -0.3 | – |
| Transmitter high level input voltage, V | U _{IH} | 2.0 (U _{CC} =3.3 V) | U _{CC} | – | 6 |
| | | 2.4 (U _{CC} =5.0 V) | | | |
| Multiplier outputs voltages difference, V | U ₊ + U ₋ | – | – | – | 13 |
| Receiver low level threshold input voltage, V | U _{ITL} | 0.6 (U _{CC} =3.3 V) | – | – | – |
| | | 0.8 (U _{CC} =5.0 V) | | | |
| Receiver high level threshold input voltage, V | U _{ITH} | – | 2.4 | – | – |

Electric parameters

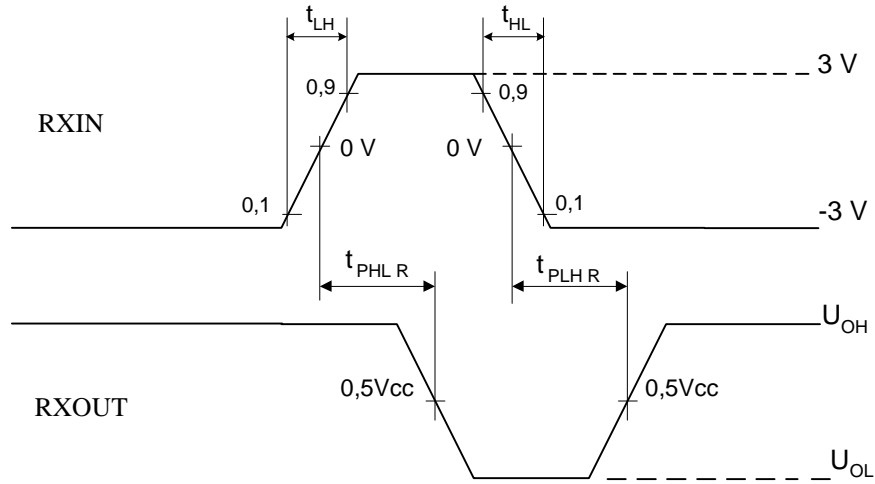
| Parameter, unit | Symbol | Norm | | Mode | T _A , °C |
|--|--|------|---|--|---------------------|
| | | Min | Max | | |
| Supply current, μA | I _{CC1} | - | 1.0 | U _{CC} = 3.3 V; 5.0 V; U _{IL} = 0 V | 25±10 |
| | | | 1.4 | | -40; 85 |
| Receiver | | | | | |
| Low level output voltage, V | U _{OLR} | - | 0.3 | U _{CC} = 3.3V ±10%; U _{ITH} = 2.4V; I _{OL} = 1.6 mA | 25±10 |
| | | | 0.4 | | -40; 85 |
| | | | 0.3 | U _{CC} = 5.0V ±10%; U _{ITH} = 2.4V; I _{OL} = 1.6 mA | 25±10 |
| | | | 0.4 | | -40; 85 |
| High level output voltage, V | U _{OHR1} | 2.5 | - | U _{CC} = 3.3V ±10%; U _{ITL} = 0.6 V; I _{OH} = -1.0 mA | 25±10 |
| | | | | | 2.4 |
| | U _{OHR2} | 4.0 | - | U _{CC} = 5.0V ±10%; U _{ITL} = 0.8 V; I _{OH} = -1.0 mA | 25±10 |
| | | 3.9 | | | -40; 85 |
| Receiver hysteresis, V | U _{hR} | 0.2 | 1.0 | U _{CC} = 3.3 V ± 10%; 5.0 V ± 10% | 25±10 |
| Input resistance, kOhm | R _I | 3 | 7 | - | 25±10 |
| OFF-ON switching propagation delay, ns | t _{PHLR} , t _{PLHR} | - | 1500 | U _{CC} = 5.0V ±10 %; C _L = 150 pF; U _{IL} = 0 V; U _{IH} = 3.0 V; t _{LH} = t _{HL} ≤ 10 ns | 25±10 |
| Propagation delays difference, ns | t _{SKD} | - | 600 | | |
| Transmitter | | | | | |
| Low level output voltage, V | U _{OLT1} | - | -5.07 | U _{CC} = 3.3V ±10%; U _{IH} = 2.0V; R _L = 3 kOhm | 25±10 |
| | | | -5.0 | | -40; 85 |
| | U _{OLT2} | - | -5.07 | U _{CC} = 5.0V ±10%; U _{IH} = 2.4V; R _L = 3 kOhm | 25±10 |
| | | | -5.0 | | -40; 85 |
| High level output voltage, V | U _{OHT} | 5.07 | - | U _{CC} = 3.3V ±10%; U _{IL} = 0.8V; R _L = kOhm | 25±10 |
| | | | 5.0 | | -40; 85 |
| | 5.07 | - | U _{CC} = 5.0V ±10%; U _{IL} = 0.8V; R _L = kOhm | 25±10 | |
| | | | | 5.0 | -40; 85 |
| Transmitter hysteresis, V | U _{hT} | 0.1 | 1.0 | U _{CC} = 3.3 V ± 10%; 5.0 V ± 10% | 25±10 |
| Low level input leakage current, μA | I _{ILL} | - | -0.5 | U _{CC} = 5.5 V; U _{IL} = 0V | 25±10 |
| | | | -1.0 | | -40; 85 |
| High level input leakage current, μA | I _{ILH} | - | 0.5 | U _{CC} = 5.5 V; U _{IH} = 5.5V | 25±10 |
| | | | 1.0 | | -40; 85 |
| Output resistance, Ohm | R _O | 350 | - | U _{CC} = U _{V+} * = U _{V-} * = 0 V; U _O = ±2 V | 25±10 |
| | | 300 | | | -40; 85 |

Electric parameters

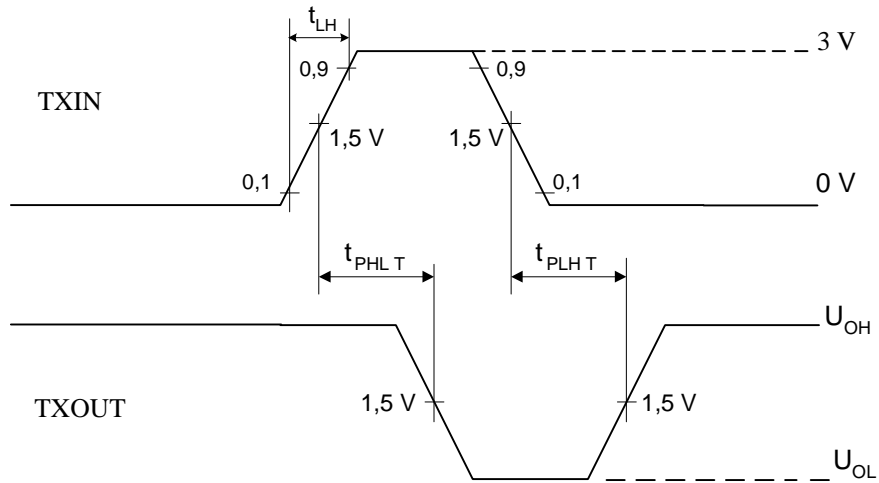
| Parameter, unit | Symbol | Norm | | Mode | T _A , °C |
|---|-------------------|------|-----|---|---------------------|
| | | Min | Max | | |
| Transmitter | | | | | |
| Short circuit current, mA | I _{OS} | - | 53 | U _{CC} = 3.6 V | 25±10 |
| | | | 60 | | -40; 85 |
| | | | -53 | U _{CC} = 3.6 V | 25±10 |
| | | | -60 | | -40; 85 |
| | | | 53 | U _{CC} = 5.5 V | 25±10 |
| | | | 60 | | -40; 85 |
| | | | -53 | U _{CC} = 5.5 V | 25±10 |
| | | | -60 | | -40; 85 |
| Low level output current for OFF-state, µA | I _{OZLT} | - | -10 | U _{CC} = 0V; U _O = -12 V; transmitter output is disabled | 25±10 |
| | | | -25 | | -40; 85 |
| High level output current for OFF-state, µA | I _{OZHT} | - | 10 | U _{CC} = 0V; U _O = 12 V; transmitter output is disabled | 25±10 |
| | | | 25 | | -40; 85 |
| Maximum Data Rate, Kbit/s | ST | 140 | - | R _L = 3 kOhm; C _L = 1000 pF | 25±10 |
| | | 120 | | | -40±85 |
| Transition-Region Slew Rate, V/µs | SR | 6 | 30 | U _{CC} = 3.3 V; R _L = (3-7) kOhm; U _{OT} is from +3 to -3 V or from -3 to +3 V; C _L = (150-1000) pF | 25±10 |
| | | 4 | 30 | | |
| Propagation delays difference, ns | t _{SKEW} | - | 600 | U _{CC} = 5.0V ±10 %; U _{IL} = 0 V; U _{IH} = 3.0 V; t _{LH} = t _{HL} ≤ 10 ns; R _L =3 kOhm; C _L =1000 pF | |

* U_{V+}, U_{V-} - voltages applied to pins 02, 06.

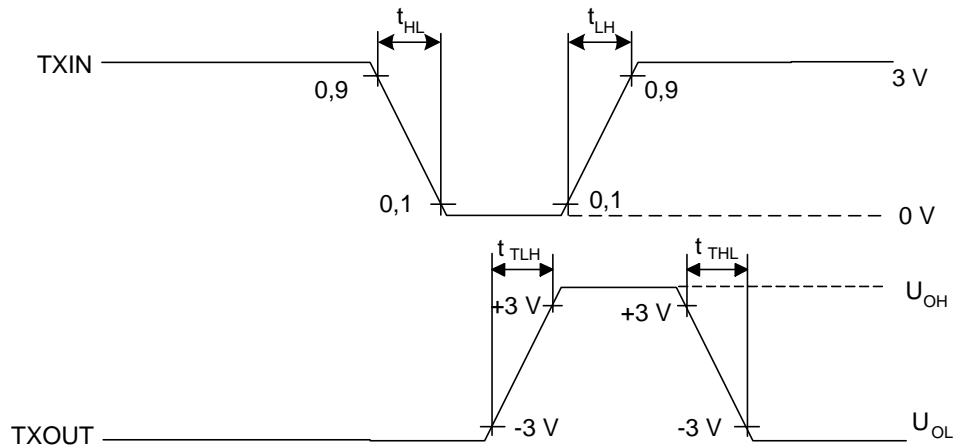
Note – Electric parameters is indicated for C1=0.047 µF, C2-C4 = 0.33 µF & U_{CC} = 5.0 V±10 %
(or C1-C4 = 0.1 µF & U_{CC} = 3.3 V±10 %)



Receiver output & input signals time diagram

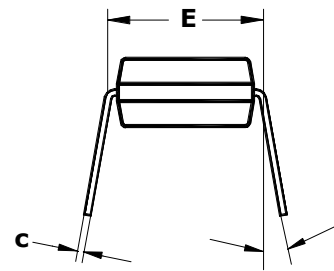
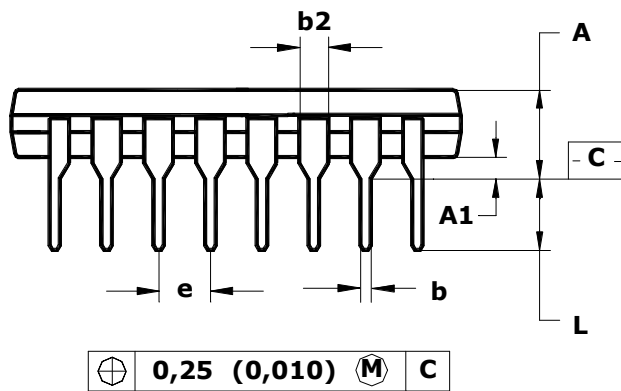
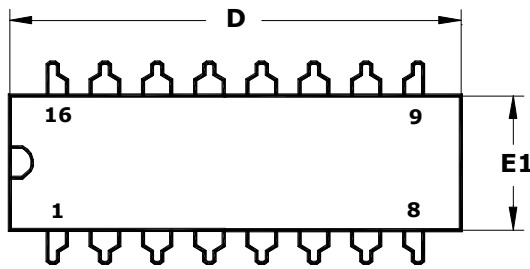


Transmitter output & input signals time diagram



Transmitter output & input signals time diagram

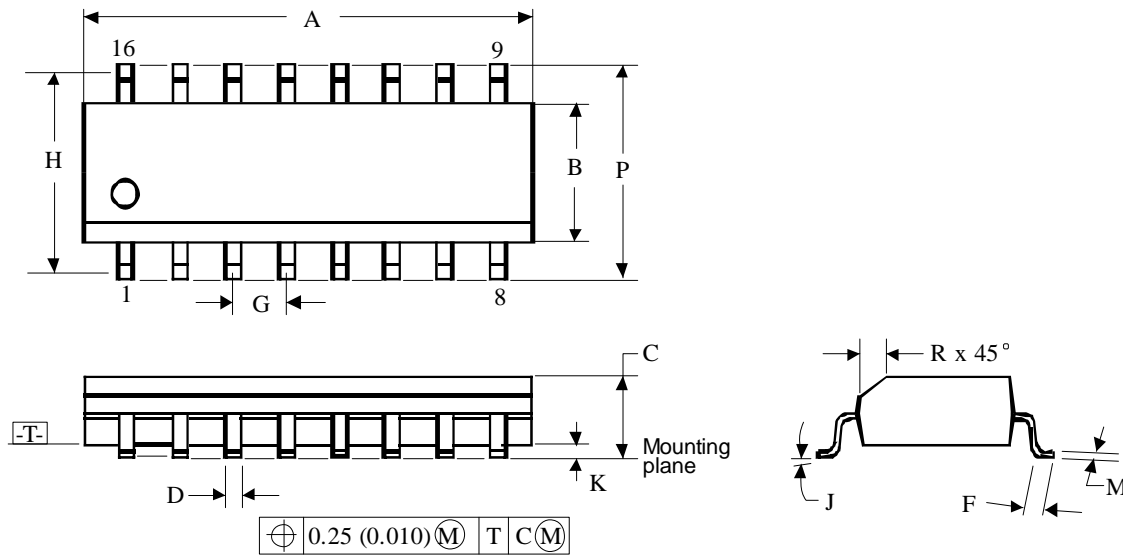
Package Dimensions
DIP-package MS-001BB



α

Note - Dimensions D, E1 do not include the fin value, which should not exceed 0.25 mm (0.010) per side.

| | D | E1 | A | b | b2 | e | α | L | E | c | A1 |
|--------|-------|-------|-------|-------|-------|------|----------|-------|-------|-------|-------|
| mm | | | | | | | | | | | |
| min | 18.93 | 6.07 | — | 0.36 | 1.14 | 2.54 | 0° | 2.93 | 7.62 | 0.20 | 0.38 |
| max | 19.43 | 7.11 | 5.33 | 0.56 | 1.78 | | 15° | 3.81 | 8.26 | 0.36 | — |
| Inches | | | | | | | | | | | |
| min | 0.355 | 0.240 | — | 0.014 | 0.045 | 0.1 | 0° | 0.115 | 0.300 | 0.008 | 0.015 |
| max | 0.400 | 0.280 | 0.210 | 0.022 | 0.070 | | 15° | 0.150 | 0.325 | 0.014 | — |

Package Dimensions
SO-package MS-012AC


| | | | |
|---|-----------------------------|------------------|------------|
| Note: 1. Dimensional sizes A and B are preset without consideration of fin and the metal bulges. 2. Availability of the fin and the metal bulges for A – up to 0.15 mm (0.006) per side; for B – up to 0.25 mm (0.010) per side. | Identifi- cation | Sizes, mm | |
| | | MIN | MAX |
| | A | 9.80 | 10.0 |
| | B | 3.80 | 4.00 |
| | C | 1.35 | 1.75 |
| | D | 0.33 | 0.51 |
| | F | 0.40 | 1.27 |
| | G | 1.27 | |
| | H | 5.72 | |
| | J | 0° | 8° |
| | K | 0.10 | 0.25 |
| | M | 0.19 | 0.25 |
| | P | 5.80 | 6.20 |
| R | 0.25 | 0.50 | |

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