



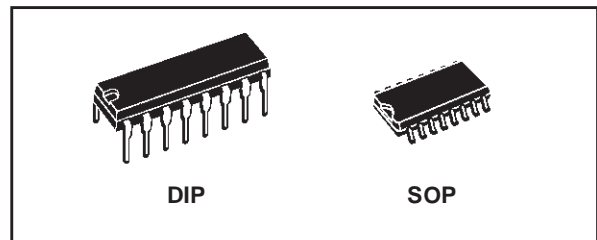
HCF4009UB

HEX BUFFER/CONVERTER (INVERTING)

- PROPAGATION DELAY TIME $t_{pD} = 40\text{ns}$ (Typ.) at $V_{DD} = 10\text{V}$ $C_L = 50\text{pF}$
- HIGH TO LOW LEVEL LOGIC CONVERSION
- MULTIPLEXER: 1 TO 6 OR 6 TO 1
- HIGH "SINK" AND "SOURCE" CURRENT CAPABILITY
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT
 $I_l = 100\text{nA}$ (MAX) AT $V_{DD} = 18\text{V}$ $T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

DESCRIPTION

The HCF4009UB is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages.



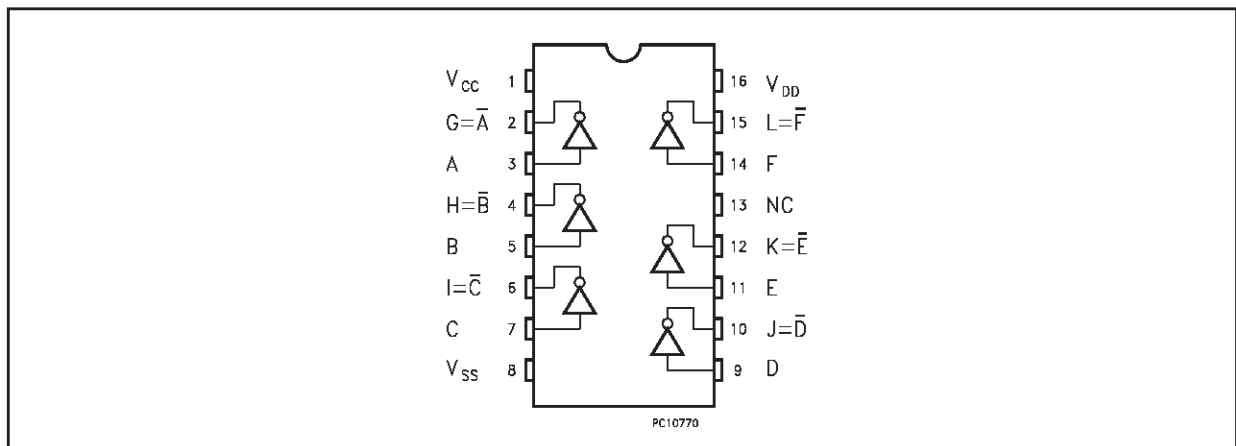
ORDER CODES

| PACKAGE | TUBE | T & R |
|---------|-------------|----------------|
| DIP | HCF4009UBEY | |
| SOP | HCF4009UBM1 | HCF4009UM013TR |

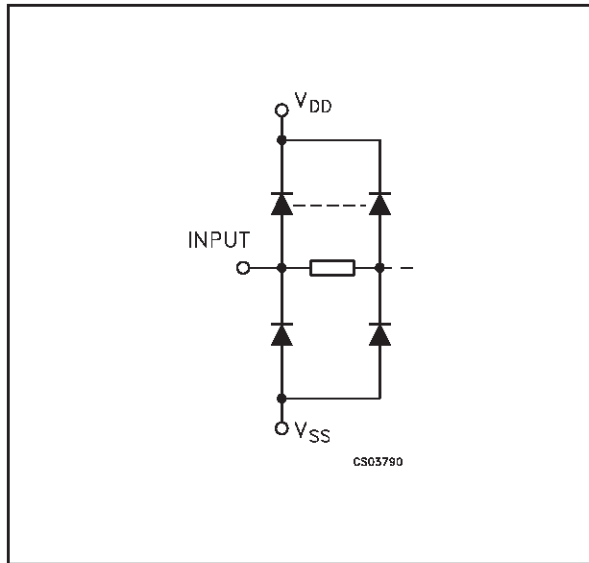
It is an inverting Hex Buffer/Converter and can be used as CMOS to TTL logic level converter as current "sink" or "source" driver or as multiplexer (1 to 6).

It is a preferred replacement of HCF4049UB in buffer applications.

PIN CONNECTION



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|---------------------|------------------|-------------------------|
| 3, 5, 7, 9, 11, 14 | A, B, C, D, E, F | Data Inputs |
| 2, 4, 6, 10, 12, 15 | G, H, I, J, K, L | Data Outputs |
| 13 | NC | Not Connected |
| 1 | V_{CC} | Positive Supply Voltage |
| 8 | V_{SS} | Negative Supply Voltage |
| 16 | V_{DD} | Positive Supply Voltage |

TRUTH TABLE

| INPUTS | OUTPUTS |
|------------------|------------------|
| A, B, C, D, E, F | G, H, I, J, K, L |
| L | H |
| H | L |

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|---|------------------------|-------------|
| V_{DD} | Supply Voltage | -0.5 to +22 | V |
| V_I | DC Input Voltage | -0.5 to $V_{DD} + 0.5$ | V |
| I_I | DC Input Current | ± 10 | mA |
| P_D | Power Dissipation per Package | 200 | mW |
| | Power Dissipation per Output Transistor | 100 | mW |
| T_{op} | Operating Temperature | -55 to +125 | $^{\circ}C$ |
| T_{stg} | Storage Temperature | -65 to +150 | $^{\circ}C$ |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit |
|----------|-----------------------|---------------|-------------|
| V_{DD} | Supply Voltage | 3 to 20 | V |
| V_I | Input Voltage | 0 to V_{DD} | V |
| T_{op} | Operating Temperature | -55 to 125 | $^{\circ}C$ |

DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | | | Value | | | | | | Unit | |
|-----------------|---------------------------|-----------------------|-----------------------|--------------------------------|---|-----------------------|---------------|-----------|-------------|---------|--------------|---------|---------|
| | | V _I (V) | V _O (V) | I _o (μ A) | V _{DD} = V _{CC} (V) | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| I _L | Quiescent Current | 0/5 | | | 5 | | 0.02 | 1 | | 30 | | 30 | μ A |
| | | 0/10 | | | 10 | | 0.02 | 2 | | 60 | | 60 | |
| | | 0/15 | | | 15 | | 0.02 | 4 | | 120 | | 120 | |
| | | 0/20 | | | 20 | | 0.04 | 20 | | 600 | | 600 | |
| V _{OH} | High Level Output Voltage | 0/5 | | <1 | 5 | 4.95 | | | 4.95 | | 4.95 | | V |
| | | 0/10 | | <1 | 10 | 9.95 | | | 9.95 | | 9.95 | | |
| | | 0/15 | | <1 | 15 | 14.95 | | | 14.95 | | 14.95 | | |
| V _{OL} | Low Level Output Voltage | 5/0 | | <1 | 5 | | 0.05 | | | 0.05 | | 0.05 | V |
| | | 10/0 | | <1 | 10 | | 0.05 | | | 0.05 | | 0.05 | |
| | | 15/0 | | <1 | 15 | | 0.05 | | | 0.05 | | 0.05 | |
| V _{IH} | High Level Input Voltage | | 0.5/4.5 | <1 | 5 | 4 | | | 4 | | 4 | | V |
| | | | 1/9 | <1 | 10 | 8 | | | 8 | | 8 | | |
| | | | 1.5/13.5 | <1 | 15 | 12.5 | | | 12.5 | | 12.5 | | |
| V _{IL} | Low Level Input Voltage | | 4.5/0.5 | <1 | 5 | | | 1 | | 1 | | 1 | V |
| | | | 9/1 | <1 | 10 | | | 2 | | 2 | | 2 | |
| | | | 13.5/1.5 | <1 | 15 | | | 2.5 | | 2.5 | | 2.5 | |
| I _{OH} | Output Drive Current | 0/5 | 2.5 | <1 | 5 | -0.8 | -1.6 | | -0.65 | | -0.65 | | mA |
| | | 0/5 | 4.6 | <1 | 5 | -0.2 | -0.4 | | -0.18 | | -0.18 | | |
| | | 0/10 | 9.5 | <1 | 10 | -0.45 | -0.9 | | -0.38 | | -0.38 | | |
| | | 0/15 | 13.5 | <1 | 15 | -1.5 | -3 | | -1.25 | | -1.25 | | |
| I _{OL} | Output Sink Current | 0/5 | 0.4 | <1 | 5 | 3 | 4 | | 2.4 | | 2.4 | | mA |
| | | 0/10 | 0.5 | <1 | 10 | 8 | 10 | | 6.4 | | 6.4 | | |
| | | 0/15 | 1.5 | <1 | 15 | 24 | 36 | | 19 | | 19 | | |
| I _I | Input Leakage Current | 0/18 | Any Input | | 18 | | $\pm 10^{-5}$ | ± 0.1 | | ± 1 | | ± 1 | μ A |
| C _I | Input Capacitance | | Any Input | | | | 15 | 22.6 | | | | | pF |

The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}=5V, 2V min. with V_{DD}=10V, 2.5V min. with V_{DD}=15V

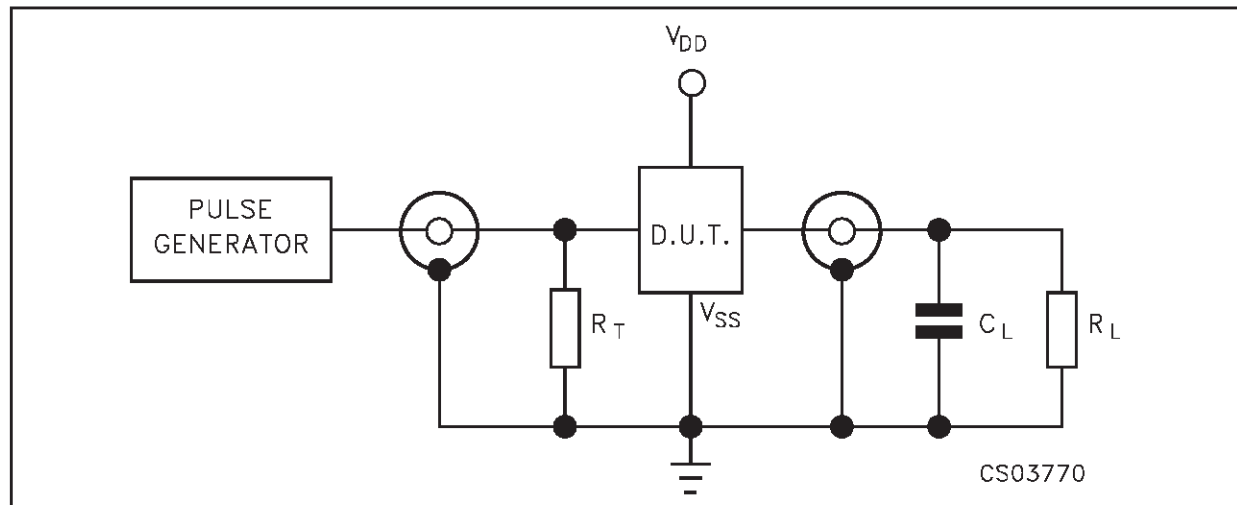
HCF4009UB

DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{K}\Omega$, $t_r = t_f = 20\text{ ns}$)

| Symbol | Parameter | Test Condition | | | | Value (*) | | | Unit |
|-----------|------------------------|----------------|-----------|--------------|--|-----------|------|------|------|
| | | V_{DD} (V) | V_I (V) | V_{CC} (V) | | Min. | Typ. | Max. | |
| t_{TLH} | Output Transition Time | 5 | 5 | 5 | | | 150 | 350 | ns |
| | | 10 | 10 | 10 | | | 75 | 15 | |
| | | 15 | 15 | 15 | | | 55 | 110 | |
| t_{THL} | Output Transition Time | 5 | 5 | 5 | | | 35 | 70 | ns |
| | | 10 | 10 | 10 | | | 20 | 40 | |
| | | 15 | 15 | 15 | | | 15 | 30 | |
| t_{PLH} | Propagation Delay Time | 5 | 5 | 5 | | | 70 | 140 | ns |
| | | 10 | 10 | 10 | | | 40 | 80 | |
| | | 10 | 10 | 5 | | | 35 | 70 | |
| | | 15 | 15 | 15 | | | 30 | 60 | |
| | | 15 | 15 | 5 | | | 30 | 60 | |
| t_{PHL} | Propagation Delay Time | 5 | 5 | 5 | | | 30 | 60 | ns |
| | | 10 | 10 | 10 | | | 20 | 40 | |
| | | 10 | 10 | 5 | | | 15 | 30 | |
| | | 15 | 15 | 15 | | | 15 | 30 | |
| | | 15 | 15 | 5 | | | 10 | 20 | |

(*) Typical temperature coefficient for all V_{DD} value is 0.3 %/°C.

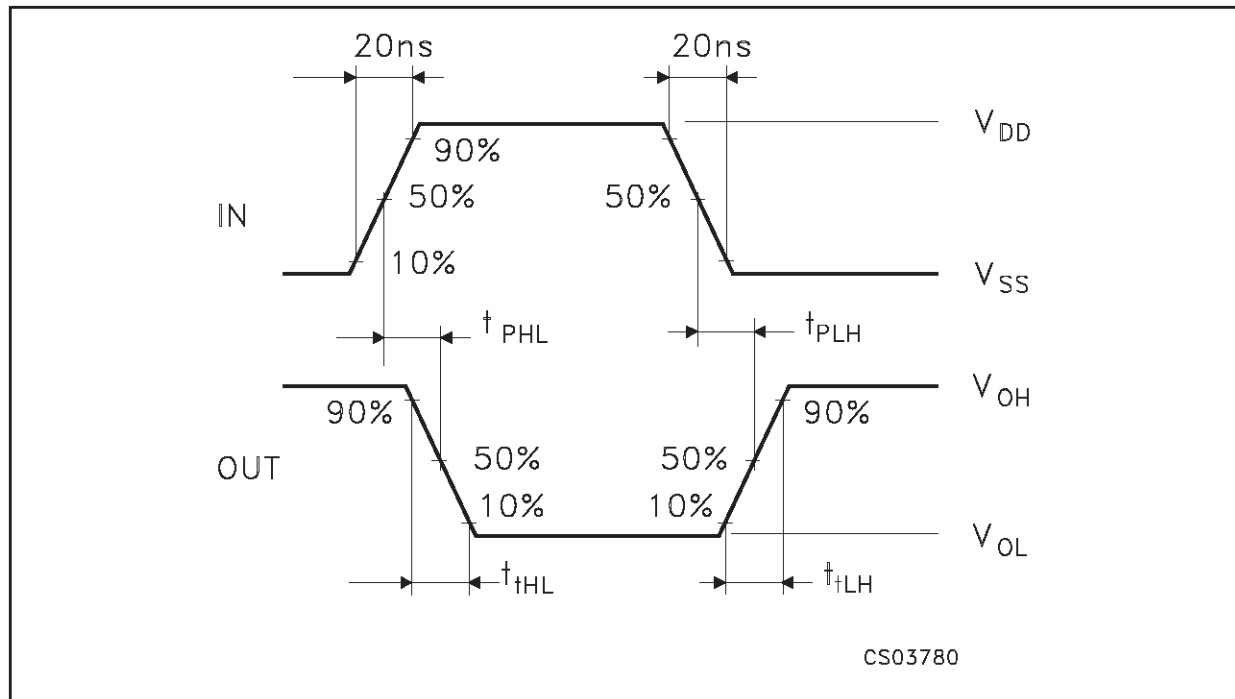
TEST CIRCUIT



$C_L = 50\text{pF}$ or equivalent (includes jig and probe capacitance)

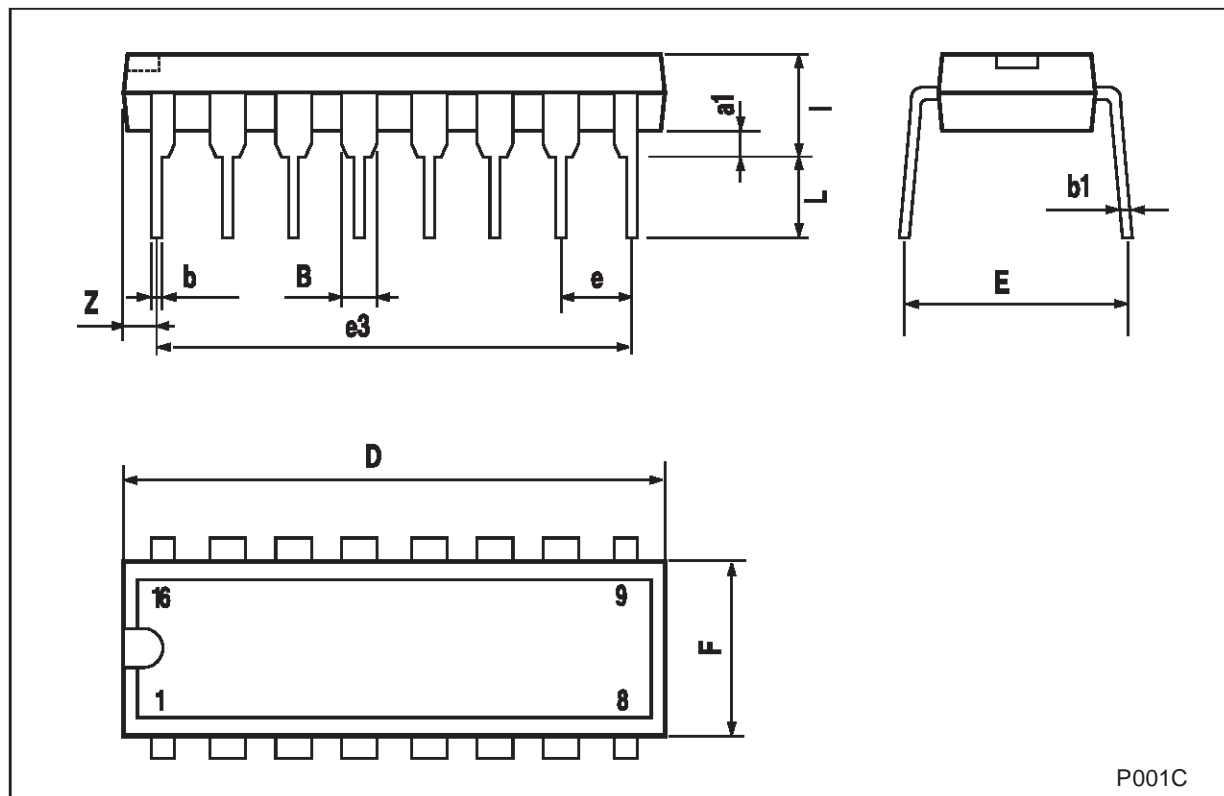
$R_L = 200\text{K}\Omega$

$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

WAVEFORM : PROPAGATION DELAY TIMES ($f=1\text{MHz}$; 50% duty cycle)

Plastic DIP-16 (0.25) MECHANICAL DATA

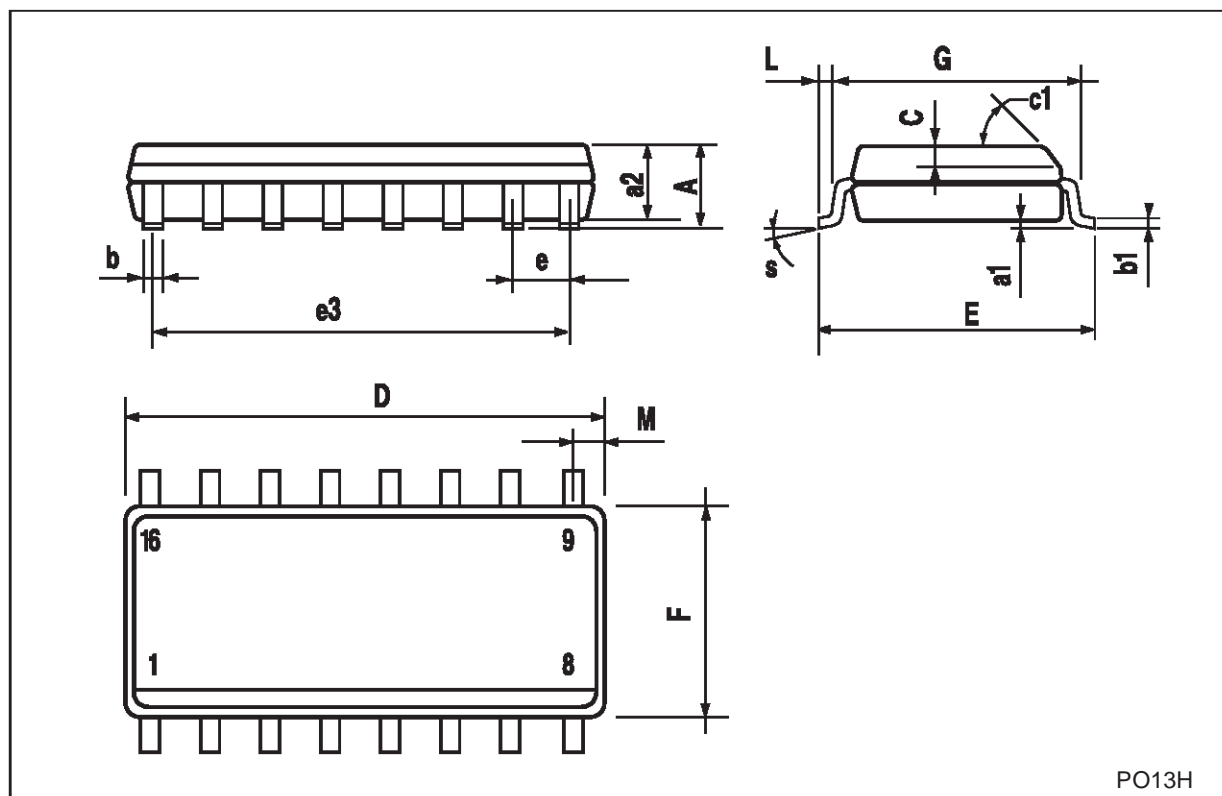
| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.77 | | 1.65 | 0.030 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |



P001C

SO-16 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.003 | | 0.007 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | | 0.5 | | | 0.019 | |
| c1 | 45° (typ.) | | | | | |
| D | 9.8 | | 10 | 0.385 | | 0.393 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 8.89 | | | 0.350 | |
| F | 3.8 | | 4.0 | 0.149 | | 0.157 |
| G | 4.6 | | 5.3 | 0.181 | | 0.208 |
| L | 0.5 | | 1.27 | 0.019 | | 0.050 |
| M | | | 0.62 | | | 0.024 |
| S | 8° (max.) | | | | | |



PO13H

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