



HCF4011B

QUAD 2 INPUT NAND GATE

- PROPAGATION DELAY TIME
 $t_{PD} = 60\text{ns}$ (Typ.) at $V_{DD} = 10\text{V}$
- BUFFERED INPUTS AND OUTPUTS
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT
 $I_1 = 100\text{nA}$ (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"



ORDER CODES

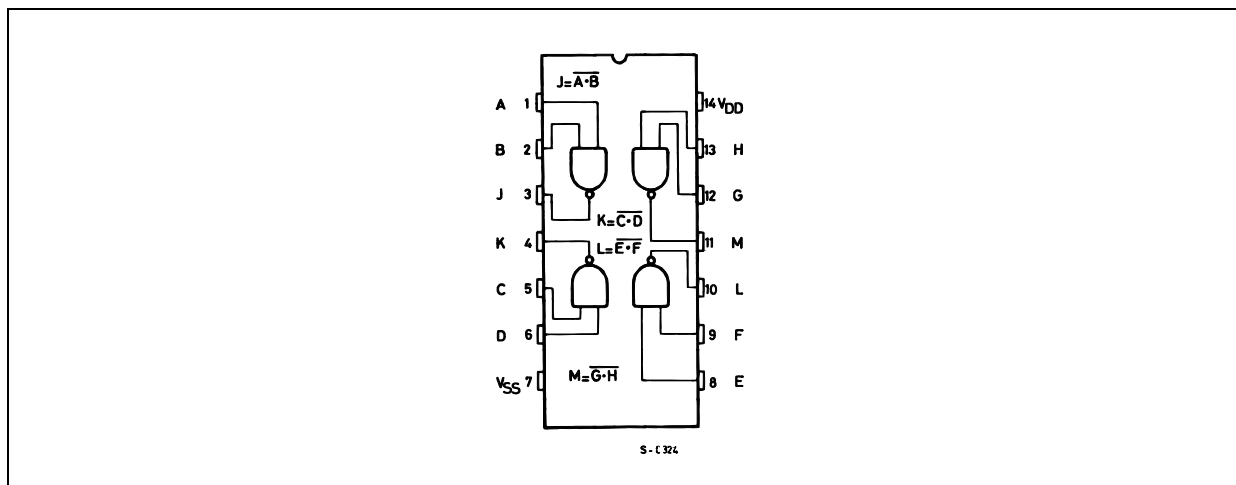
| PACKAGE | TUBE | T & R |
|---------|------------|---------------|
| DIP | HCF4011BEY | |
| SOP | HCF4011BM1 | HCF4011M013TR |

DESCRIPTION

The HCF4011B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. The HCF4011B QUAD 2 INPUT NAND GATE provides the system designer with direct

implementation of the NAND function and supplement the existing family of CMOS gates. All inputs and outputs are buffered.

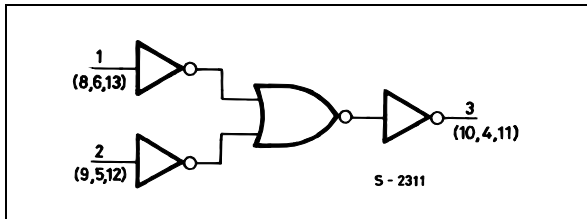
PIN CONNECTION



INPUT EQUIVALENT CIRCUIT



LOGIC DIAGRAM



PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|--------------------------|------------------------|-------------------------|
| 1, 2, 5, 6, 8, 9, 12, 13 | A, B, C, D, E, F, G, H | Data Inputs |
| 3, 4, 10, 11 | J, K, L, M | Data Outputs |
| 7 | V _{SS} | Negative Supply Voltage |
| 14 | V _{DD} | Positive Supply Voltage |

TRUTH TABLE

| INPUTS | | OUTPUTS |
|------------|------------|------------|
| A, C, E, G | B, D, F, H | J, K, L, M |
| L | L | H |
| L | H | H |
| H | L | H |
| 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 | °C |
| T _{stg} | Storage Temperature | -65 to +150 | °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 | °C |

DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | | | Value | | | | | | Unit | |
|-----------------|---------------------------|-----------------------|-----------------------|---------------------------------|------------------------|-----------------------|---------------|-----------|-------------|---------|--------------|---------|---------|
| | | V _I (V) | V _O (V) | I _{OL} (μ A) | V _{DD} (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 | | 0.01 | 0.25 | | 7.5 | | 7.5 | μ A |
| | | 0/10 | | | 10 | | 0.01 | 0.5 | | 15 | | 15 | |
| | | 0/15 | | | 15 | | 0.01 | 1 | | 30 | | 30 | |
| | | 0/20 | | | 20 | | 0.02 | 5 | | 150 | | 150 | |
| 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 | 3.5 | | | 3.5 | | 3.5 | | V |
| | | | 1/9 | <1 | 10 | 7 | | | 7 | | 7 | | |
| | | | 1.5/13.5 | <1 | 15 | 11 | | | 11 | | 11 | | |
| V _{IL} | Low Level Input Voltage | | 4.5/0.5 | <1 | 5 | | | 1.5 | | 1.5 | | 1.5 | V |
| | | | 9/1 | <1 | 10 | | | 3 | | 3 | | 3 | |
| | | | 13.5/1.5 | <1 | 15 | | | 4 | | 4 | | 4 | |
| I _{OH} | Output Drive Current | 0/5 | 2.5 | <1 | 5 | -1.36 | -3.2 | | -1.15 | | -1.1 | | mA |
| | | 0/5 | 4.6 | <1 | 5 | -0.44 | -1 | | -0.36 | | -0.36 | | |
| | | 0/10 | 9.5 | <1 | 10 | -1.1 | -2.6 | | -0.9 | | -0.9 | | |
| | | 0/15 | 13.5 | <1 | 15 | -3.0 | -6.8 | | -2.4 | | -2.4 | | |
| I _{OL} | Output Sink Current | 0/5 | 0.4 | <1 | 5 | 0.44 | 1 | | 0.36 | | 0.36 | | mA |
| | | 0/10 | 0.5 | <1 | 10 | 1.1 | 2.6 | | 0.9 | | 0.9 | | |
| | | 0/15 | 1.5 | <1 | 15 | 3.0 | 6.8 | | 2.4 | | 2.4 | | |
| 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 | | | | 5 | 7.5 | | | | | 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

DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200K Ω , t_r = t_f = 20 ns)

| Symbol | Parameter | Test Condition | | Value (*) | | | Unit |
|-----------------------------------|------------------------|---------------------|--|-----------|------|------|------|
| | | V _{DD} (V) | | Min. | Typ. | Max. | |
| t _{PLH} t _{PHL} | Propagation Delay Time | 5 | | | 125 | 250 | ns |
| | | 10 | | | 60 | 120 | |
| | | 15 | | | 45 | 90 | |
| t _{TLH} t _{THL} | Output Transition Time | 5 | | | 100 | 200 | ns |
| | | 10 | | | 50 | 100 | |
| | | 15 | | | 40 | 80 | |

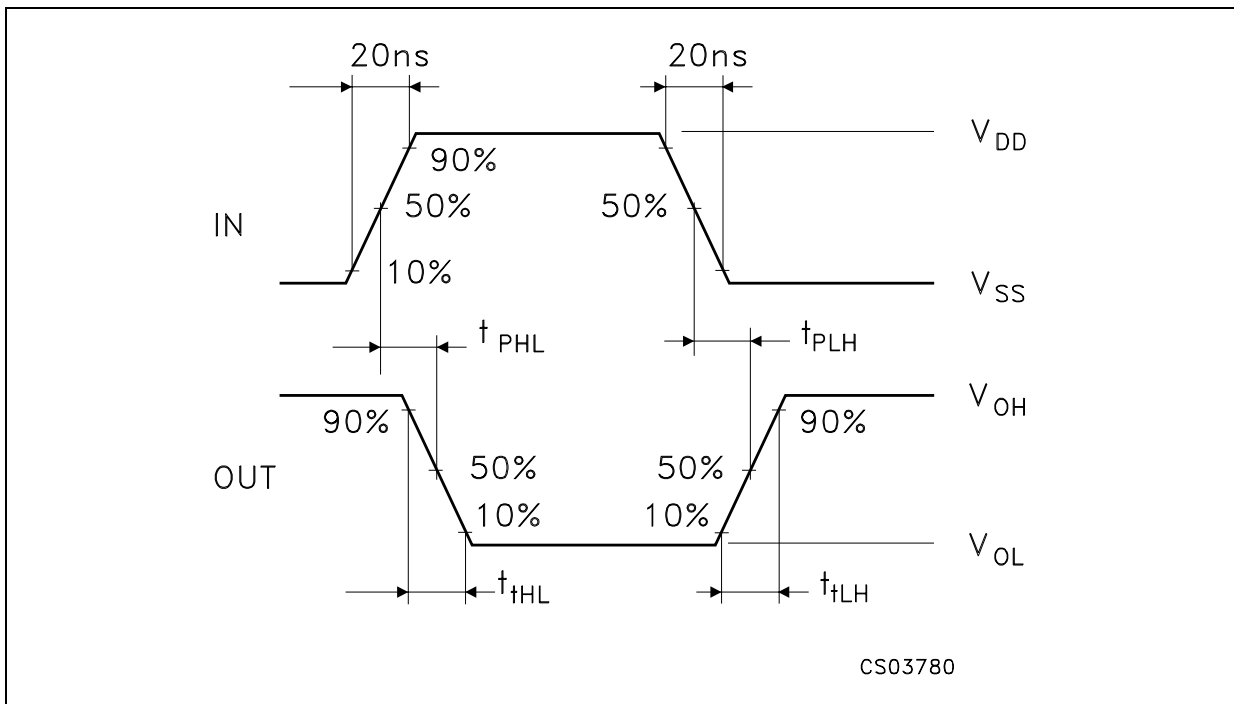
(*) Typical temperature coefficient for all V_{DD} value is 0.3 %/°C.

TEST CIRCUIT



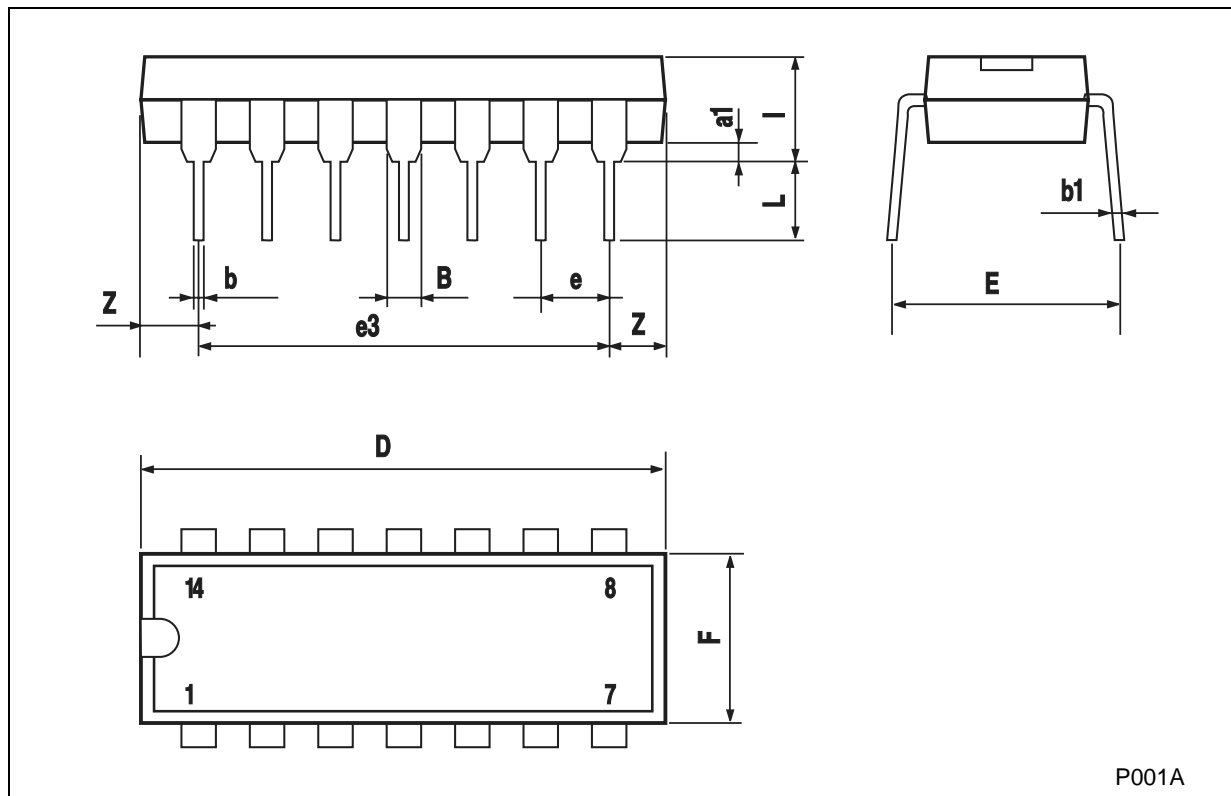
$C_L = 50\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_L = 200\text{k}\Omega$
 $R_T = Z_{\text{OUT}}$ of pulse generator (typically 50Ω)

WAVEFORM : PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)



Plastic DIP-14 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.39 | | 1.65 | 0.055 | | 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 | | 15.24 | | | 0.600 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | 1.27 | | 2.54 | 0.050 | | 0.100 |



SO-14 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 | 8.55 | | 8.75 | 0.336 | | 0.344 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 7.62 | | | 0.300 | |
| 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 | | | 0.68 | | | 0.026 |
| S | 8° (max.) | | | | | |



PO13G

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