

## QUAD EXCLUSIVE-OR GATE

- MEDIUM SPEED OPERATION -  $t_{pHL} = t_{pLH} = 65\text{ns}$  (TYP.) at  $C_L = 50\text{pF}$  and  $V_{DD}-V_{SS} = 10\text{V}$
- LOW OUTPUT IMPEDANCE :  $500\ \Omega$  (TYP.) at  $V_{DD}-V_{SS} = 10\text{V}$
- QUIESCENT CURRENT SPECIFIED UP TO  $20\text{V}$
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT  
 $I_I = 100\text{nA}$  (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"



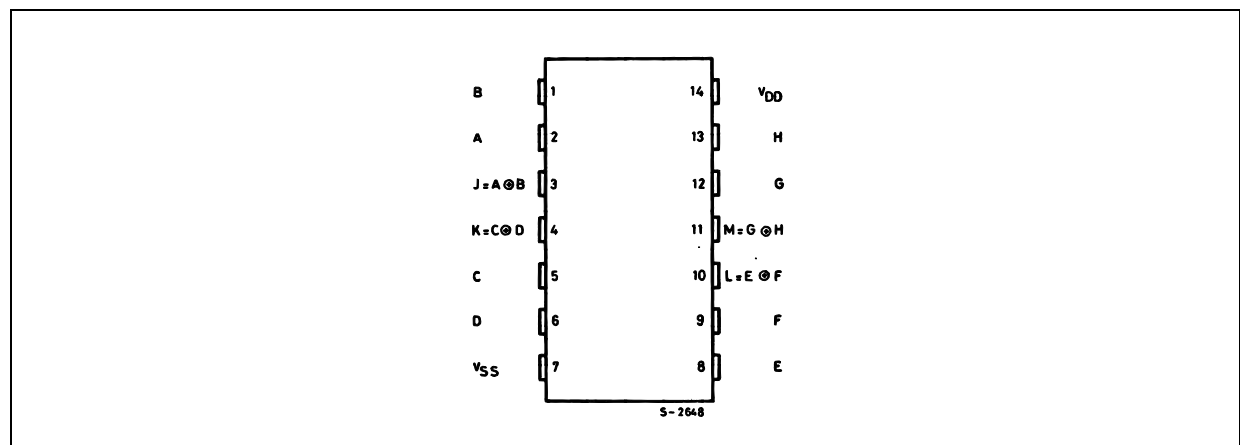
### ORDER CODES

| PACKAGE | TUBE       | T & R         |
|---------|------------|---------------|
| DIP     | HCF4030BEY |               |
| SOP     | HCF4030BM1 | HCF4030M013TR |

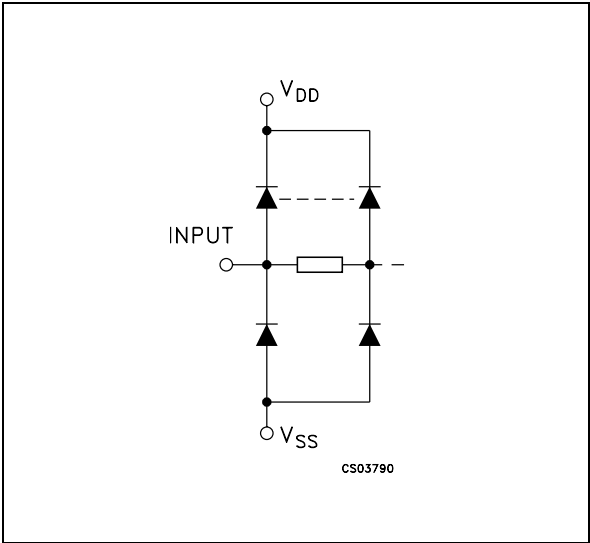
### DESCRIPTION

HCF4030B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. HCF4030B types consist of four independent exclusive-OR gates integrated on a single monolithic silicon chip. Each exclusive-OR gate consists of four n-channel and four p-channel enhancement-type transistors. All inputs and outputs are protected against electrostatic effects.

### PIN CONNECTION



INPUT EQUIVALENT CIRCUIT



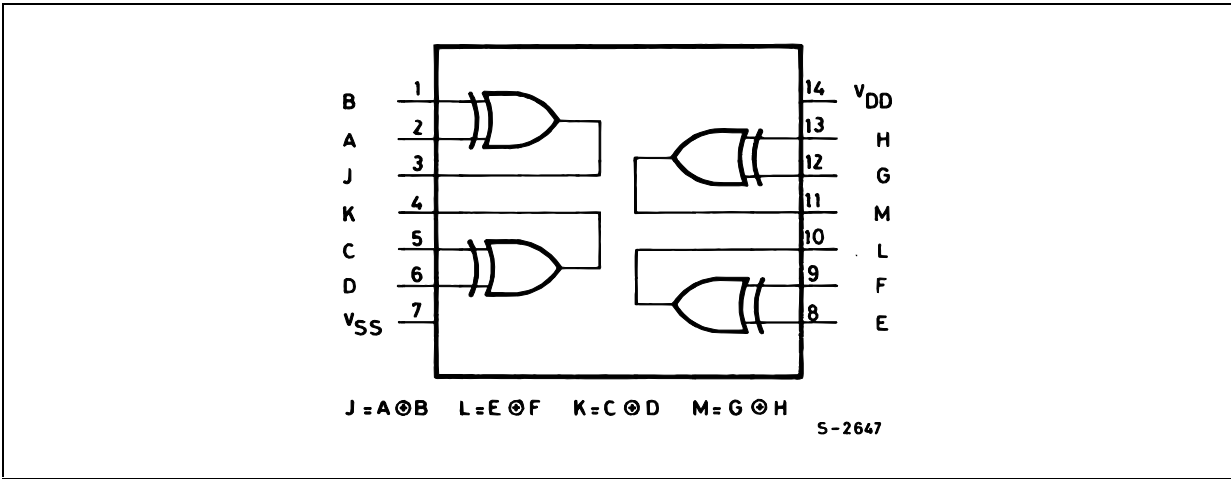
PIN DESCRIPTION

| PIN No                   | SYMBOL                 | NAME AND FUNCTION       |
|--------------------------|------------------------|-------------------------|
| 2, 1, 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 <sub>SS</sub>        | Negative Supply Voltage |
| 14                       | V <sub>DD</sub>        | Positive Supply Voltage |

TRUTH TABLE

| IN1 | IN2 | OUT |
|-----|-----|-----|
| L   | L   | L   |
| L   | H   | H   |
| H   | L   | H   |
| H   | H   | L   |

FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter                               | Value                         | Unit |
|------------------|-----------------------------------------|-------------------------------|------|
| V <sub>DD</sub>  | Supply Voltage                          | -0.5 to +22                   | V    |
| V <sub>I</sub>   | DC Input Voltage                        | -0.5 to V <sub>DD</sub> + 0.5 | V    |
| I <sub>I</sub>   | DC Input Current                        | ± 10                          | mA   |
| P <sub>D</sub>   | Power Dissipation per Package           | 200                           | mW   |
|                  | Power Dissipation per Output Transistor | 100                           | mW   |
| T <sub>op</sub>  | Operating Temperature                   | -55 to +125                   | °C   |
| T <sub>stg</sub> | 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<sub>SS</sub> 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

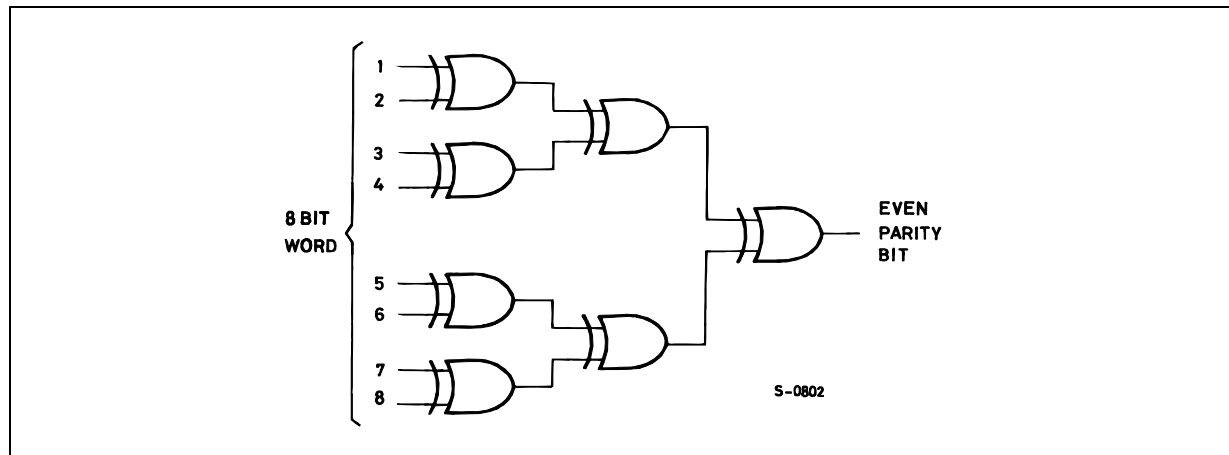
| Symbol          | Parameter             | Test Condition        |                       |                          |                        | Value                 |                   |      |             |      |              |      | Unit |
|-----------------|-----------------------|-----------------------|-----------------------|--------------------------|------------------------|-----------------------|-------------------|------|-------------|------|--------------|------|------|
|                 |                       | V <sub>I</sub><br>(V) | V <sub>O</sub><br>(V) | I <sub>O</sub>  <br>(μA) | V <sub>DD</sub><br>(V) | T <sub>A</sub> = 25°C |                   |      | -40 to 85°C |      | -55 to 125°C |      |      |
|                 |                       |                       |                       |                          |                        | Min.                  | Typ.              | Max. | Min.        | Max. | Min.         | Max. |      |
| I <sub>L</sub>  | Quiescent Current     | 0/5                   |                       |                          | 5                      |                       | 0.02              | 4    |             | 4    |              | 30   | μA   |
|                 |                       | 0/10                  |                       |                          | 10                     |                       | 0.02              | 8    |             | 8    |              | 60   |      |
|                 |                       | 0/15                  |                       |                          | 15                     |                       | 0.02              | 16   |             | 16   |              | 120  |      |
|                 |                       | 0/20                  |                       |                          | 20                     |                       | 0.04              | 20   |             | 20   |              | 600  |      |
| V <sub>OH</sub> | Output High 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 <sub>OL</sub> | Output Low 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 <sub>IH</sub> | Input High 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 <sub>IL</sub> | Input Low 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 <sub>OH</sub> | 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 <sub>OL</sub> | 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 <sub>I</sub>  | Input Leakage Current | 0/18                  | Any Input             |                          | 18                     |                       | ±10 <sup>-5</sup> | ±0.1 |             | ±1   |              | ±1   | μA   |
| C <sub>I</sub>  | 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  $V_{DD}=15V$

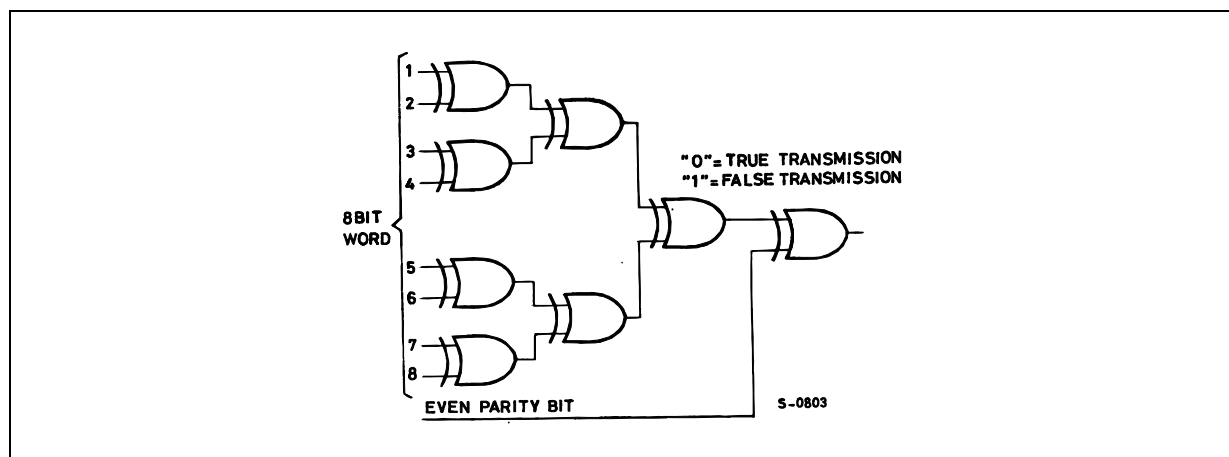
DYNAMIC ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25^\circ C$ ,  $C_L = 50pF$ ,  $R_L = 200K\Omega$ ,  $t_r = t_f = 20 ns$ )

| Symbol              | Parameter              | Test Condition |  | Value (*) |      |      | Unit |
|---------------------|------------------------|----------------|--|-----------|------|------|------|
|                     |                        | $V_{DD}$ (V)   |  | Min.      | Typ. | Max. |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time | 5              |  |           | 140  | 280  | ns   |
|                     |                        | 10             |  |           | 65   | 130  |      |
|                     |                        | 15             |  |           | 50   | 100  |      |
| $t_{TLH}$ $t_{THL}$ | Output Transition Time | 5              |  |           | 100  | 200  | ns   |
|                     |                        | 10             |  |           | 50   | 100  |      |
|                     |                        | 15             |  |           | 40   | 80   |      |

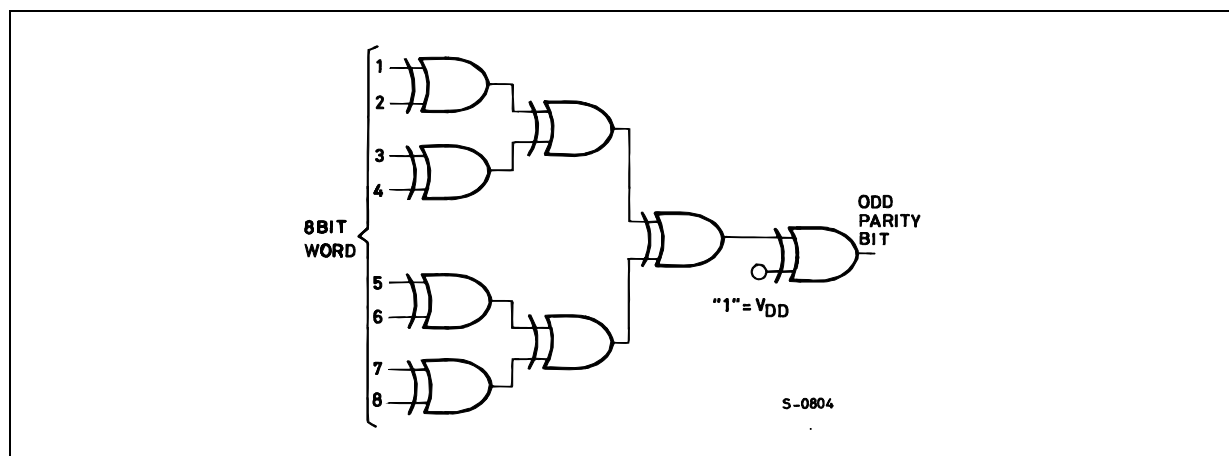
## TYPICAL APPLICATION : EVEN PARITY-BIT GENERATOR



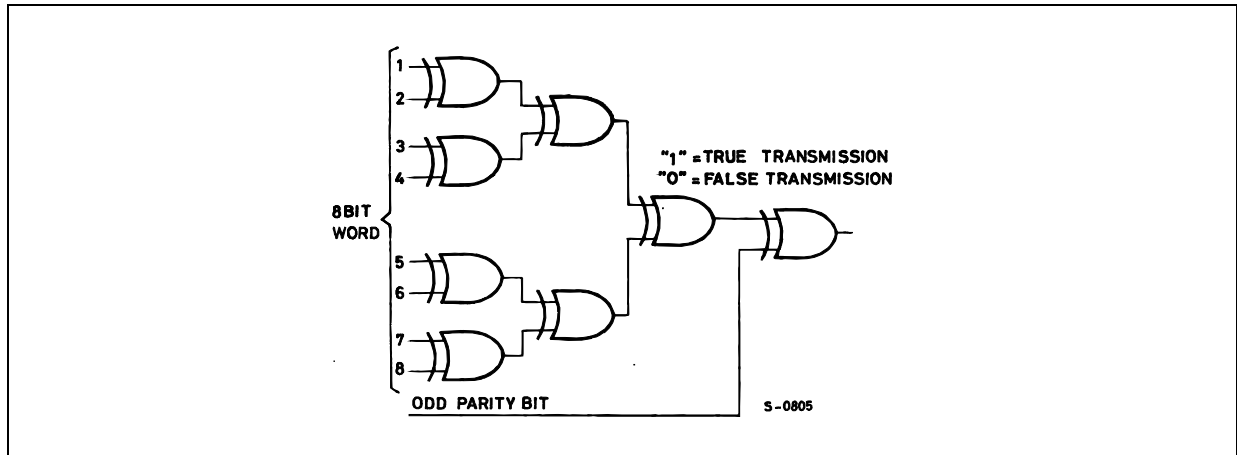
## TYPICAL APPLICATION : EVEN PARITY-CHECKER



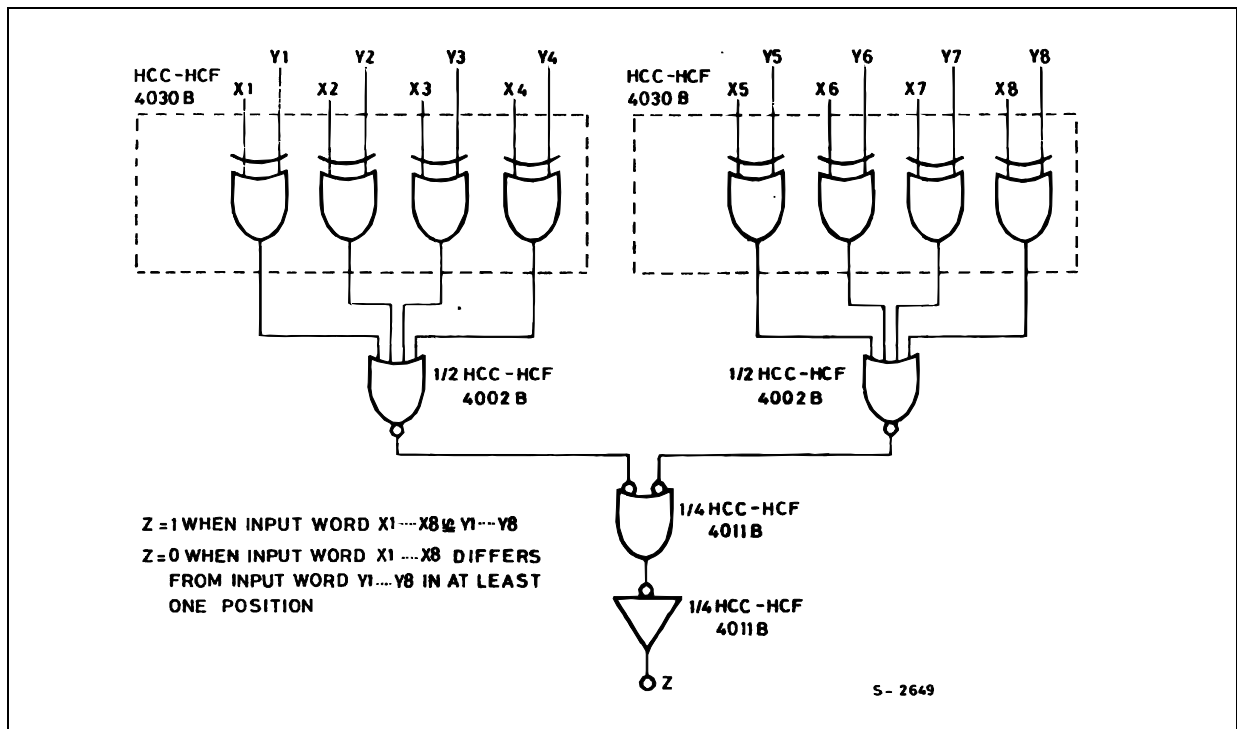
## TYPICAL APPLICATION : ODD-PARITY-BIT GENERATOR



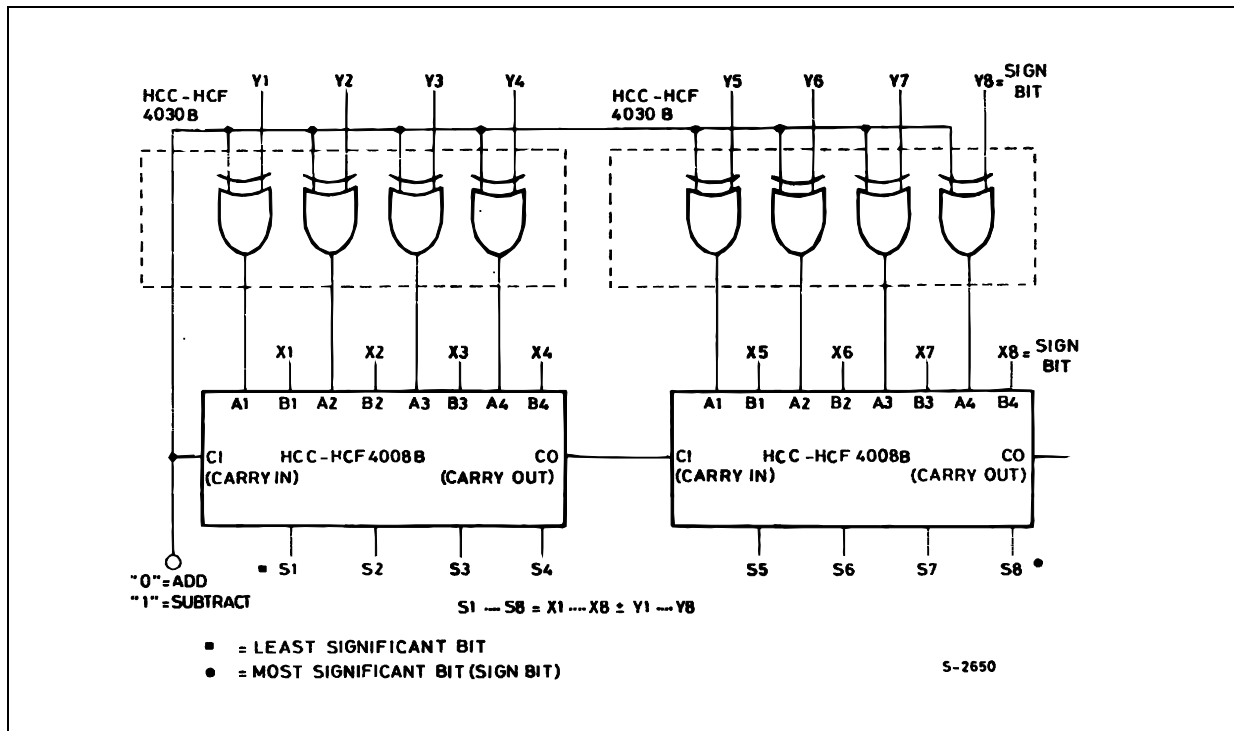
## TYPICAL APPLICATION : ODD-PARITY-CHECKER



## TYPICAL APPLICATION : 8-BIT COMPARATOR

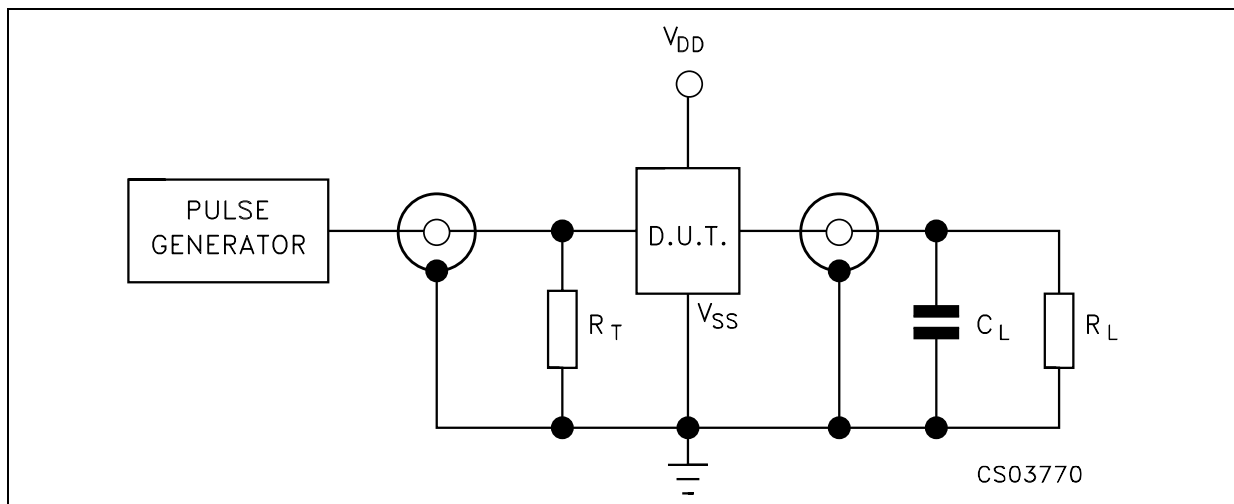


## TYPICAL APPLICATION : 8-BIT TWO'S COMPLEMENT ADDER-SUBTRACTOR

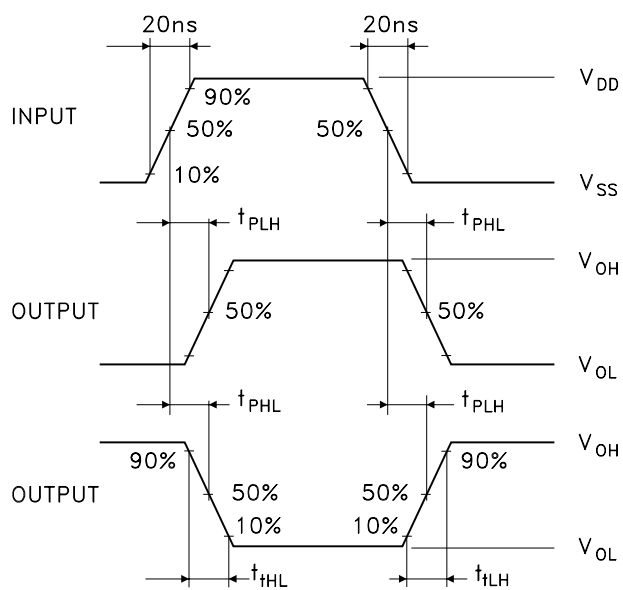


(\*) Typical temperature coefficient for all  $V_{DD}$  value is 0.3 %/°C.

## TEST CIRCUIT



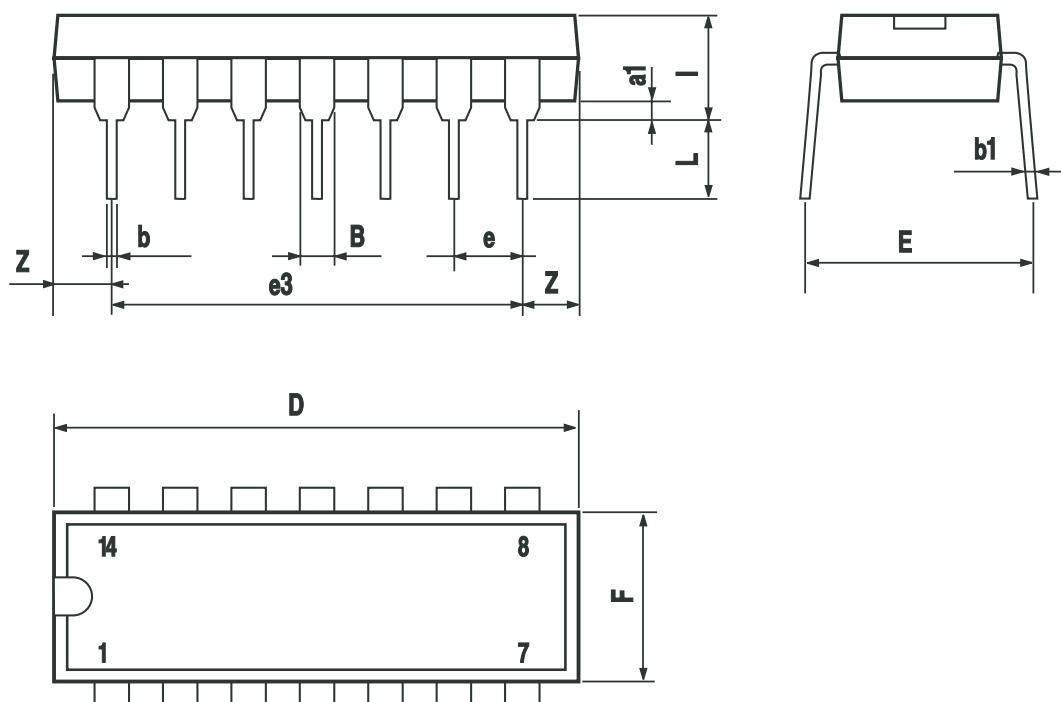
$C_L$  = 50pF or equivalent (includes jig and probe capacitance)  
 $R_L$  = 200K $\Omega$   
 $R_T$  =  $Z_{OUT}$  of pulse generator (typically 50 $\Omega$ )

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

CS08770

## Plastic DIP-14 MECHANICAL DATA

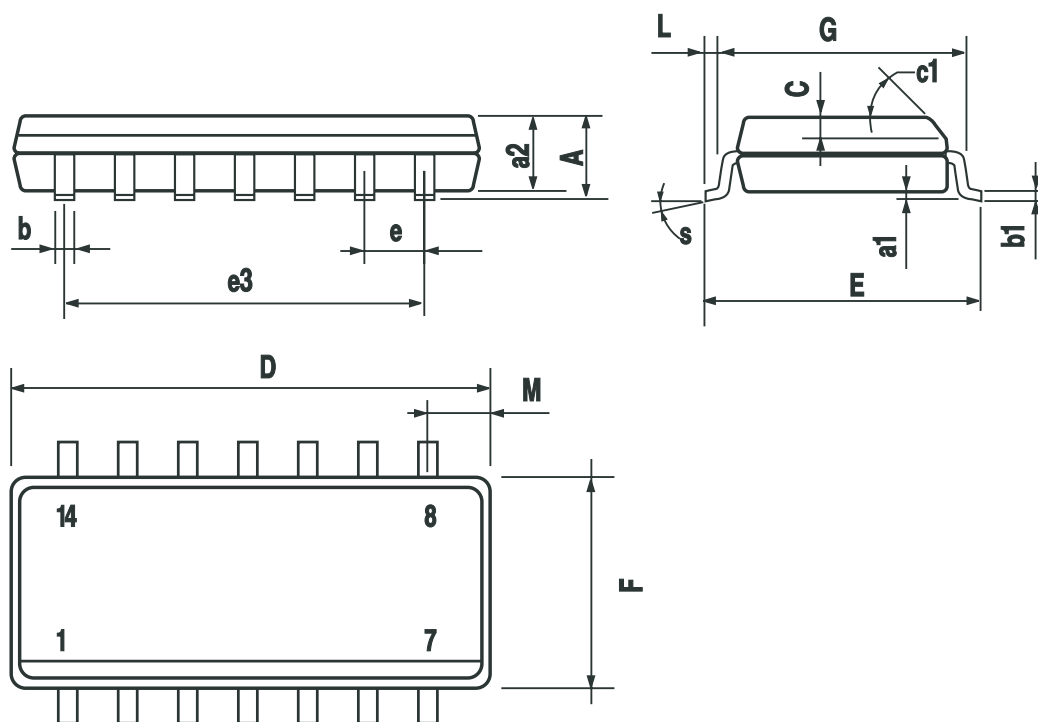
| DIM. | mm.  |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP   | MAX. | MIN.  | TYP.  | MAX.  |
| a1   | 0.51 |       |      | 0.020 |       |       |
| B    | 1.39 |       | 1.65 | 0.055 |       | 0.065 |
| b    |      | 0.5   |      |       | 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 |



P001A

## 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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