

# HEF4040B

## 12-stage binary ripple counter

Rev. 8 — 17 November 2011

Product data sheet

### 1. General description

The HEF4040B is a 12-stage binary ripple counter with a clock input ( $\overline{CP}$ ), an overriding asynchronous master reset input (MR) and twelve fully buffered outputs (Q0 to Q11). The counter advances on the HIGH-to-LOW transition of  $\overline{CP}$ . A HIGH on MR clears all counter stages and forces all outputs LOW, independent of  $\overline{CP}$ . Each counter stage is a static toggle flip-flop. The clock input is highly tolerant of slow rise and fall times due to its Schmitt trigger action.

It operates over a recommended  $V_{DD}$  power supply range of 3 V to 15 V referenced to  $V_{SS}$  (usually ground). Unused inputs must be connected to  $V_{DD}$ ,  $V_{SS}$ , or another input.

### 2. Features and benefits

- Tolerant of slow clock rise and fall time
- Fully static operation
- 5 V, 10 V, and 15 V parametric ratings
- Standardized symmetrical output characteristics
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$
- Complies with JEDEC standard JESD 13-B

### 3. Applications

- Frequency dividing circuits
- Time delay circuits
- Control counters

### 4. Ordering information

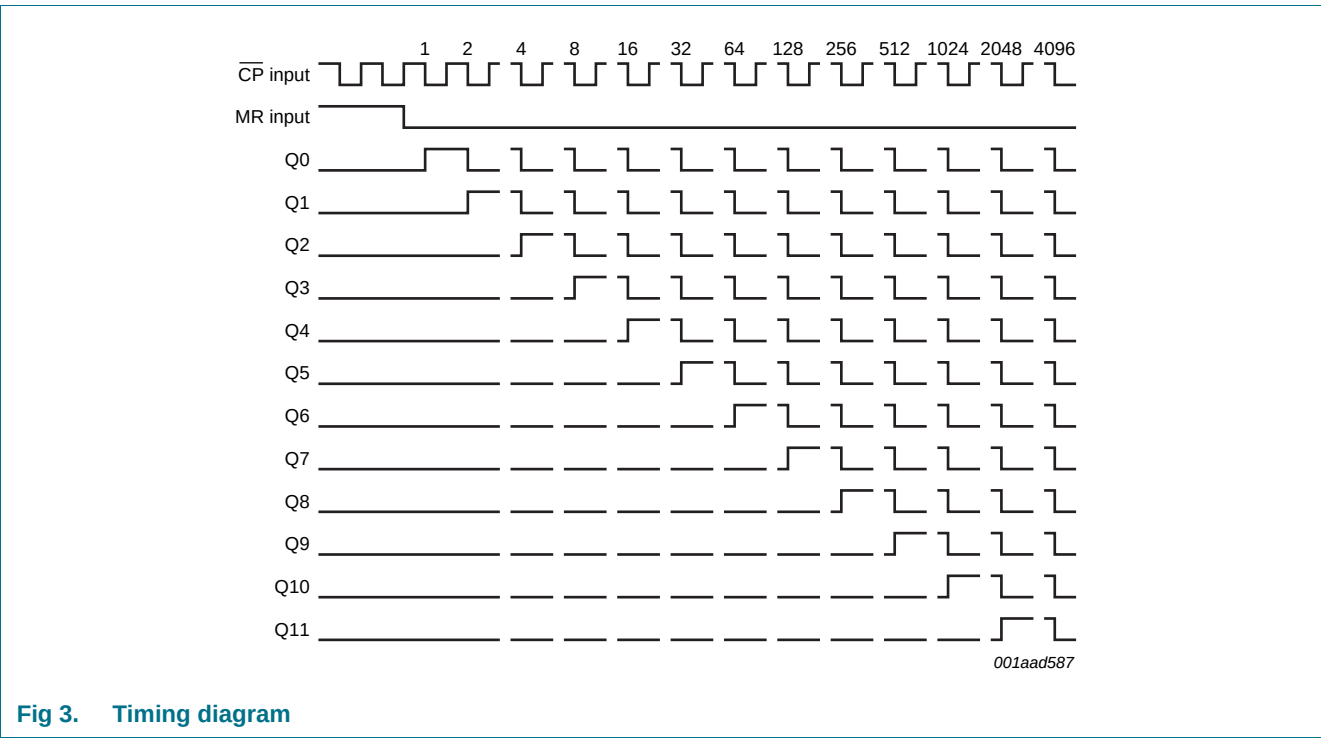
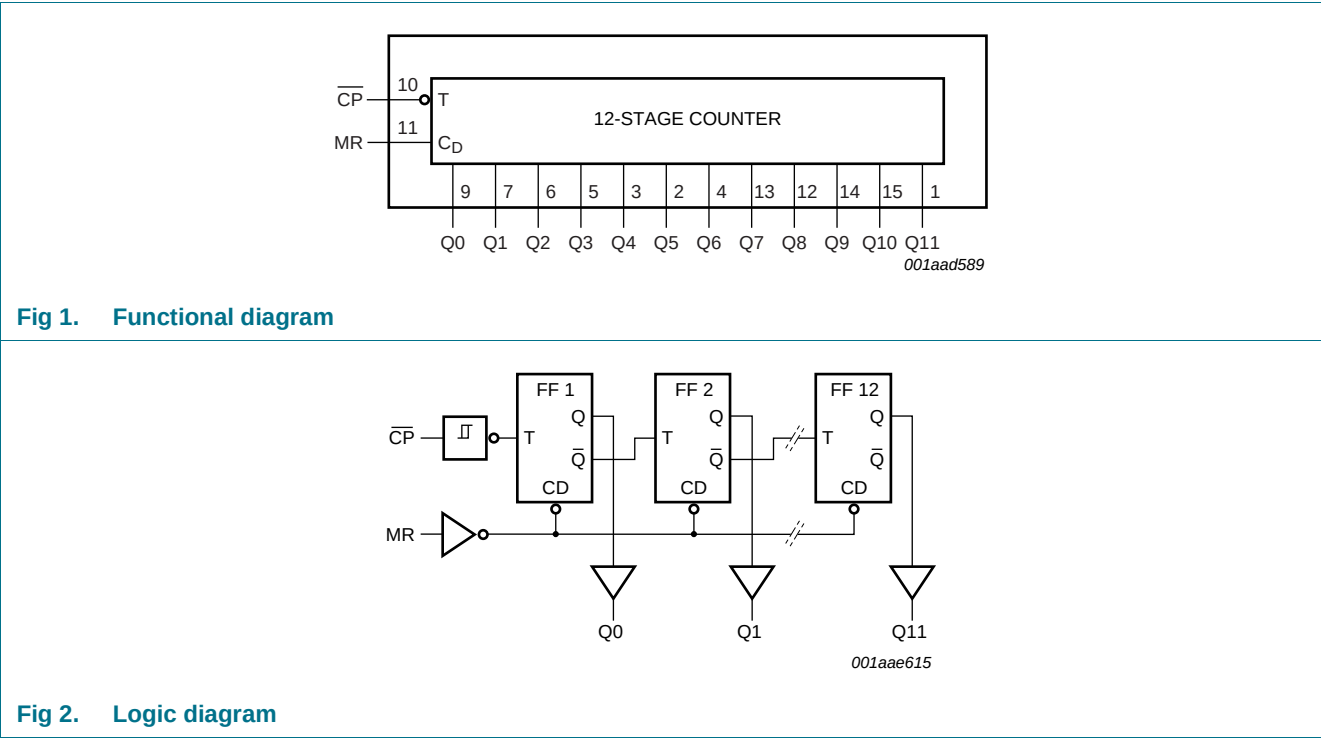
**Table 1.** Ordering information

All types operate from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ .

| Type number | Package |                                                            |          |
|-------------|---------|------------------------------------------------------------|----------|
|             | Name    | Description                                                | Version  |
| HEF4040BP   | DIP16   | plastic dual in-line package; 16 leads (300 mil)           | SOT38-4  |
| HEF4040BT   | SO16    | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |



5. Functional diagram



6. Pinning information

6.1 Pinning

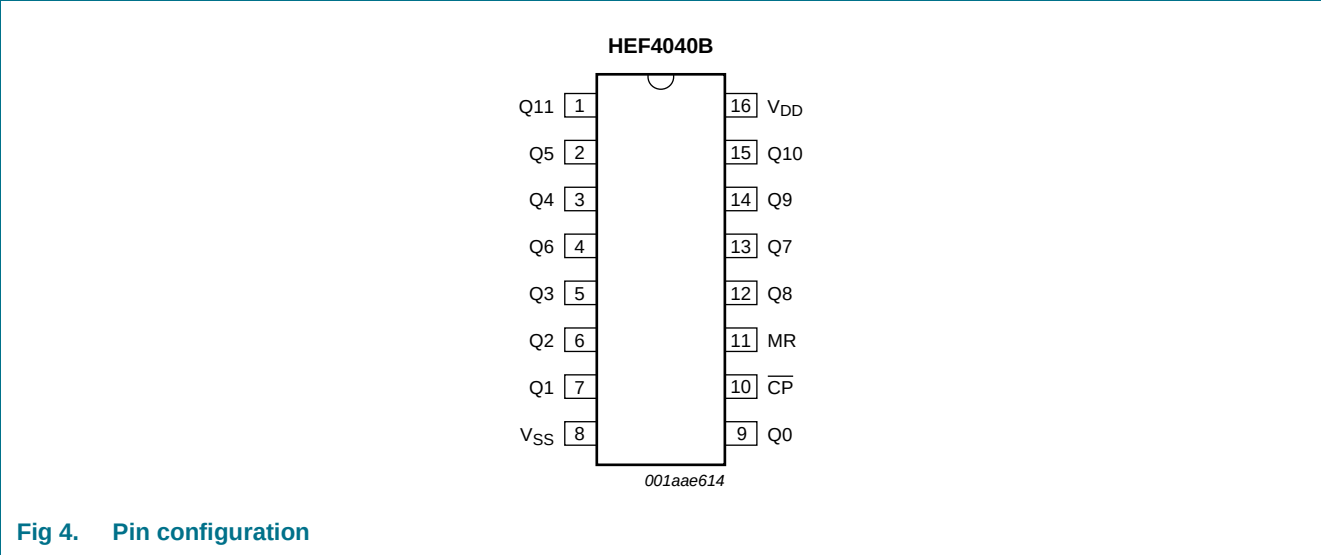


Fig 4. Pin configuration

6.2 Pin description

Table 2. Pin description

| Symbol          | Pin                                    | Description                              |
|-----------------|----------------------------------------|------------------------------------------|
| V <sub>SS</sub> | 8                                      | ground supply voltage                    |
| Q0 to Q11       | 9, 7, 6, 5, 3, 2, 4, 13, 12, 14, 15, 1 | parallel output                          |
| $\overline{CP}$ | 10                                     | clock input (HIGH-to-LOW edge-triggered) |
| MR              | 11                                     | master reset input (active HIGH)         |
| V <sub>DD</sub> | 16                                     | supply voltage                           |

## 7. Limiting values

**Table 3. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol    | Parameter               | Conditions                                             | Min   | Max            | Unit |
|-----------|-------------------------|--------------------------------------------------------|-------|----------------|------|
| $V_{DD}$  | supply voltage          |                                                        | -0.5  | +18            | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{DD} + 0.5\text{ V}$ | -     | $\pm 10$       | mA   |
| $V_I$     | input voltage           |                                                        | -0.5  | $V_{DD} + 0.5$ | V    |
| $I_{OK}$  | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{DD} + 0.5\text{ V}$ | -     | $\pm 10$       | mA   |
| $I_{I/O}$ | input/output current    |                                                        | -     | $\pm 10$       | mA   |
| $I_{DD}$  | supply current          |                                                        | -     | 50             | mA   |
| $T_{stg}$ | storage temperature     |                                                        | -65   | +150           | °C   |
| $T_{amb}$ | ambient temperature     |                                                        | -40   | +85            | °C   |
| $P_{tot}$ | total power dissipation | DIP16 package                                          | [1] - | 750            | mW   |
|           |                         | SO16 package                                           | [2] - | 500            | mW   |
| $P$       | power dissipation       | per output                                             | -     | 100            | mW   |

[1] For DIP16 package:  $P_{tot}$  derates linearly with 12 mW/K above 70 °C.

[2] For SO16 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.

## 8. Recommended operating conditions

**Table 4. Recommended operating conditions**

| Symbol              | Parameter                           | Conditions             | Min | Typ | Max      | Unit |
|---------------------|-------------------------------------|------------------------|-----|-----|----------|------|
| $V_{DD}$            | supply voltage                      |                        | 3   | -   | 15       | V    |
| $V_I$               | input voltage                       |                        | 0   | -   | $V_{DD}$ | V    |
| $T_{amb}$           | ambient temperature                 | in free air            | -40 | -   | +85      | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{DD} = 5\text{ V}$  | -   | -   | 3.75     | ms/V |
|                     |                                     | $V_{DD} = 10\text{ V}$ | -   | -   | 0.5      | ms/V |
|                     |                                     | $V_{DD} = 15\text{ V}$ | -   | -   | 0.08     | ms/V |

## 9. Static characteristics

**Table 5. Static characteristics**

$V_{SS} = 0\text{ V}$ ;  $V_I = V_{SS}$  or  $V_{DD}$ ; unless otherwise specified.

| Symbol   | Parameter                | Conditions                     | $V_{DD}$ | $T_{amb} = -40\text{ °C}$ |     | $T_{amb} = 25\text{ °C}$ |     | $T_{amb} = 85\text{ °C}$ |     | Unit |
|----------|--------------------------|--------------------------------|----------|---------------------------|-----|--------------------------|-----|--------------------------|-----|------|
|          |                          |                                |          | Min                       | Max | Min                      | Max | Min                      | Max |      |
| $V_{IH}$ | HIGH-level input voltage | $ I_O  < 1\text{ }\mu\text{A}$ | 5 V      | 3.5                       | -   | 3.5                      | -   | 3.5                      | -   | V    |
|          |                          |                                | 10 V     | 7.0                       | -   | 7.0                      | -   | 7.0                      | -   | V    |
|          |                          |                                | 15 V     | 11.0                      | -   | 11.0                     | -   | 11.0                     | -   | V    |
| $V_{IL}$ | LOW-level input voltage  | $ I_O  < 1\text{ }\mu\text{A}$ | 5 V      | -                         | 1.5 | -                        | 1.5 | -                        | 1.5 | V    |
|          |                          |                                | 10 V     | -                         | 3.0 | -                        | 3.0 | -                        | 3.0 | V    |
|          |                          |                                | 15 V     | -                         | 4.0 | -                        | 4.0 | -                        | 4.0 | V    |

**Table 5.** Static characteristics ...continued $V_{SS} = 0\text{ V}$ ;  $V_I = V_{SS}$  or  $V_{DD}$ ; unless otherwise specified.

| Symbol   | Parameter                 | Conditions                     | $V_{DD}$ | $T_{amb} = -40\text{ }^{\circ}\text{C}$ |           | $T_{amb} = 25\text{ }^{\circ}\text{C}$ |           | $T_{amb} = 85\text{ }^{\circ}\text{C}$ |           | Unit          |
|----------|---------------------------|--------------------------------|----------|-----------------------------------------|-----------|----------------------------------------|-----------|----------------------------------------|-----------|---------------|
|          |                           |                                |          | Min                                     | Max       | Min                                    | Max       | Min                                    | Max       |               |
| $V_{OH}$ | HIGH-level output voltage | $ I_O  < 1\text{ }\mu\text{A}$ | 5 V      | 4.95                                    | -         | 4.95                                   | -         | 4.95                                   | -         | V             |
|          |                           |                                | 10 V     | 9.95                                    | -         | 9.95                                   | -         | 9.95                                   | -         | V             |
|          |                           |                                | 15 V     | 14.95                                   | -         | 14.95                                  | -         | 14.95                                  | -         | V             |
| $V_{OL}$ | LOW-level output voltage  | $ I_O  < 1\text{ }\mu\text{A}$ | 5 V      | -                                       | 0.05      | -                                      | 0.05      | -                                      | 0.05      | V             |
|          |                           |                                | 10 V     | -                                       | 0.05      | -                                      | 0.05      | -                                      | 0.05      | V             |
|          |                           |                                | 15 V     | -                                       | 0.05      | -                                      | 0.05      | -                                      | 0.05      | V             |
| $I_{OH}$ | HIGH-level output current | $V_O = 2.5\text{ V}$           | 5 V      | -                                       | -1.7      | -                                      | -1.4      | -                                      | -1.1      | mA            |
|          |                           | $V_O = 4.6\text{ V}$           | 5 V      | -                                       | -0.52     | -                                      | -0.44     | -                                      | -0.36     | mA            |
|          |                           | $V_O = 9.5\text{ V}$           | 10 V     | -                                       | -1.3      | -                                      | -1.1      | -                                      | -0.9      | mA            |
|          |                           | $V_O = 13.5\text{ V}$          | 15 V     | -                                       | -3.6      | -                                      | -3.0      | -                                      | -2.4      | mA            |
| $I_{OL}$ | LOW-level output current  | $V_O = 0.4\text{ V}$           | 5 V      | 0.52                                    | -         | 0.44                                   | -         | 0.36                                   | -         | mA            |
|          |                           | $V_O = 0.5\text{ V}$           | 10 V     | 1.3                                     | -         | 1.1                                    | -         | 0.9                                    | -         | mA            |
|          |                           | $V_O = 1.5\text{ V}$           | 15 V     | 3.6                                     | -         | 3.0                                    | -         | 2.4                                    | -         | mA            |
| $I_{LI}$ | input leakage current     |                                | 15 V     | -                                       | $\pm 0.3$ | -                                      | $\pm 0.3$ | -                                      | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{DD}$ | supply current            | $I_O = 0\text{ A}$             | 5 V      | -                                       | 20        | -                                      | 20        | -                                      | 150       | $\mu\text{A}$ |
|          |                           |                                | 10 V     | -                                       | 40        | -                                      | 40        | -                                      | 300       | $\mu\text{A}$ |
|          |                           |                                | 15 V     | -                                       | 80        | -                                      | 80        | -                                      | 600       | $\mu\text{A}$ |
| $C_I$    | input capacitance         |                                | -        | -                                       | -         | -                                      | 7.5       | -                                      | -         | pF            |

## 10. Dynamic characteristics

**Table 6.** Dynamic characteristics $V_{SS} = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified; for test circuit see [Figure 6](#).

| Symbol    | Parameter                     | Conditions                                                     | $V_{DD}$ | Extrapolation formula <sup>[1]</sup>         | Min | Typ | Max | Unit |
|-----------|-------------------------------|----------------------------------------------------------------|----------|----------------------------------------------|-----|-----|-----|------|
| $t_{PHL}$ | HIGH to LOW propagation delay | $\overline{CP} \rightarrow Q0$<br>see <a href="#">Figure 5</a> | 5 V      | $78\text{ ns} + (0.55\text{ ns/pF})C_L$      | -   | 105 | 210 | ns   |
|           |                               |                                                                | 10 V     | $34\text{ ns} + (0.23\text{ ns/pF})C_L$      | -   | 45  | 90  | ns   |
|           |                               |                                                                | 15 V     | $27\text{ ns} + (0.16\text{ ns/pF})C_L$      | -   | 35  | 70  | ns   |
|           |                               | $Qn \rightarrow Qn + 1$                                        | 5 V      | <a href="#">[2]</a> $(0.55\text{ ns/pF})C_L$ | -   | 35  | 70  | ns   |
|           |                               |                                                                | 10 V     | <a href="#">[2]</a> $(0.23\text{ ns/pF})C_L$ | -   | 15  | 30  | ns   |
|           |                               |                                                                | 15 V     | <a href="#">[2]</a> $(0.16\text{ ns/pF})C_L$ | -   | 10  | 20  | ns   |
|           |                               | $MR \rightarrow Qn$<br>see <a href="#">Figure 5</a>            | 5 V      | $63\text{ ns} + (0.55\text{ ns/pF})C_L$      | -   | 90  | 180 | ns   |
|           |                               |                                                                | 10 V     | $29\text{ ns} + (0.23\text{ ns/pF})C_L$      | -   | 40  | 80  | ns   |
|           |                               |                                                                | 15 V     | $22\text{ ns} + (0.16\text{ ns/pF})C_L$      | -   | 30  | 60  | ns   |
| $t_{PLH}$ | LOW to HIGH propagation delay | $\overline{CP} \rightarrow Q0$<br>see <a href="#">Figure 5</a> | 5 V      | $58\text{ ns} + (0.55\text{ ns/pF})C_L$      | -   | 85  | 170 | ns   |
|           |                               |                                                                | 10 V     | $29\text{ ns} + (0.23\text{ ns/pF})C_L$      | -   | 40  | 80  | ns   |
|           |                               |                                                                | 15 V     | $22\text{ ns} + (0.16\text{ ns/pF})C_L$      | -   | 30  | 60  | ns   |
|           |                               | $Qn \rightarrow Qn + 1$                                        | 5 V      | <a href="#">[2]</a> $(0.55\text{ ns/pF})C_L$ | -   | 35  | 70  | ns   |
|           |                               |                                                                | 10 V     | <a href="#">[2]</a> $(0.23\text{ ns/pF})C_L$ | -   | 15  | 30  | ns   |
|           |                               |                                                                | 15 V     | <a href="#">[2]</a> $(0.16\text{ ns/pF})C_L$ | -   | 10  | 20  | ns   |

**Table 6. Dynamic characteristics ...continued**

$V_{SS} = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified; for test circuit see [Figure 6](#).

| Symbol    | Parameter         | Conditions                                                                           | $V_{DD}$ | Extrapolation formula <sup>[1]</sup>                   | Min | Typ | Max | Unit |
|-----------|-------------------|--------------------------------------------------------------------------------------|----------|--------------------------------------------------------|-----|-----|-----|------|
| $t_t$     | transition time   | see <a href="#">Figure 5</a>                                                         | 5 V      | <sup>[3]</sup> $10\text{ ns} + (1.00\text{ ns/pF})C_L$ | -   | 60  | 120 | ns   |
|           |                   |                                                                                      | 10 V     | $9\text{ ns} + (0.42\text{ ns/pF})C_L$                 | -   | 30  | 60  | ns   |
|           |                   |                                                                                      | 15 V     | $6\text{ ns} + (0.28\text{ ns/pF})C_L$                 | -   | 20  | 40  | ns   |
| $t_W$     | pulse width       | $\overline{\text{CP}}$ input HIGH;<br>minimum width;<br>see <a href="#">Figure 5</a> | 5 V      |                                                        | 50  | 25  | -   | ns   |
|           |                   |                                                                                      | 10 V     |                                                        | 30  | 15  | -   | ns   |
|           |                   |                                                                                      | 15 V     |                                                        | 20  | 10  | -   | ns   |
|           |                   | MR input HIGH;<br>minimum width;<br>see <a href="#">Figure 5</a>                     | 5 V      |                                                        | 40  | 20  | -   | ns   |
|           |                   |                                                                                      | 10 V     |                                                        | 30  | 15  | -   | ns   |
|           |                   |                                                                                      | 15 V     |                                                        | 20  | 10  | -   | ns   |
| $t_{rec}$ | recovery time     | MR input;<br>see <a href="#">Figure 5</a>                                            | 5 V      |                                                        | 40  | 20  | -   | ns   |
|           |                   |                                                                                      | 10 V     |                                                        | 30  | 15  | -   | ns   |
|           |                   |                                                                                      | 15 V     |                                                        | 20  | 10  | -   | ns   |
| $f_{max}$ | maximum frequency | $\overline{\text{CP}}$ input;<br>see <a href="#">Figure 5</a>                        | 5 V      |                                                        | 10  | 20  | -   | MHz  |
|           |                   |                                                                                      | 10 V     |                                                        | 15  | 30  | -   | MHz  |
|           |                   |                                                                                      | 15 V     |                                                        | 25  | 50  | -   | MHz  |

[1] The typical values of the propagation delay and transition times are calculated from the extrapolation formulas shown ( $C_L$  in pF).

[2] For loads other than 50 pF at the  $n^{\text{th}}$  output, use the slope given.

[3]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .

**Table 7. Dynamic power dissipation  $P_D$** 

$P_D$  can be calculated from the formulas shown.  $V_{SS} = 0\text{ V}$ ;  $t_r = t_f \leq 20\text{ ns}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

| Symbol | Parameter                 | $V_{DD}$ | Typical formula for $P_D$ ( $\mu\text{W}$ )                      | where:                                                                                                                      |
|--------|---------------------------|----------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| $P_D$  | dynamic power dissipation | 5 V      | $P_D = 400 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$  | $f_i$ = input frequency in MHz,                                                                                             |
|        |                           | 10 V     | $P_D = 2000 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ | $f_o$ = output frequency in MHz,                                                                                            |
|        |                           | 15 V     | $P_D = 5200 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ | $C_L$ = output load capacitance in pF,<br>$V_{DD}$ = supply voltage in V,<br>$\Sigma(f_o \times C_L)$ = sum of the outputs. |

11. Waveforms

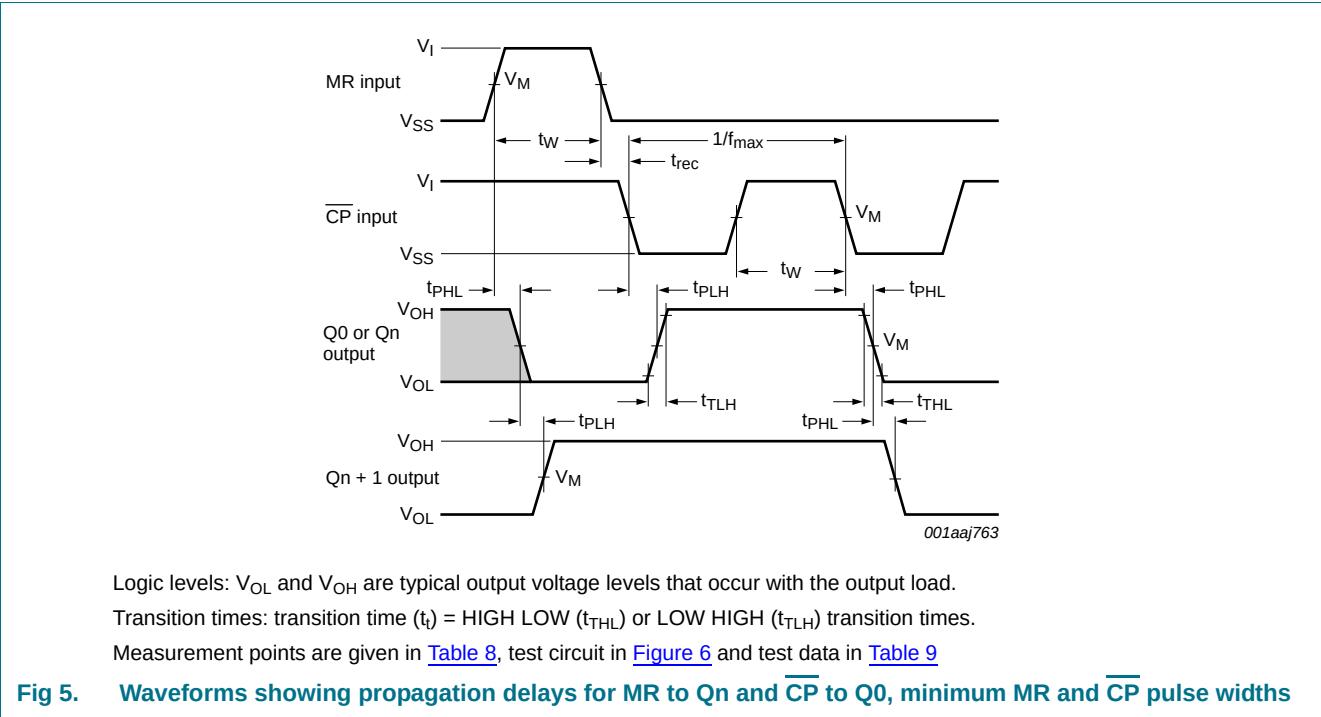
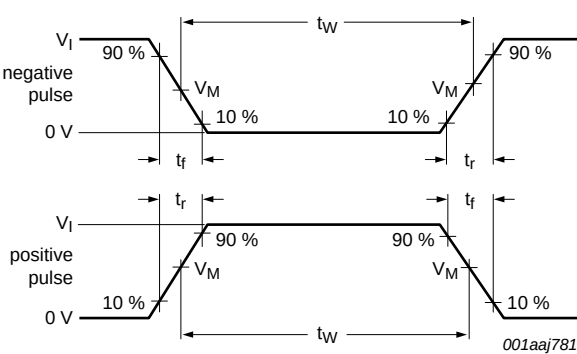
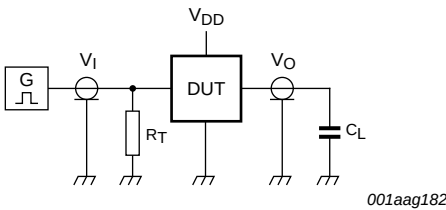


Table 8. Measurement points

| Supply voltage | Input                |             | Output      |
|----------------|----------------------|-------------|-------------|
| $V_{DD}$       | $V_I$                | $V_M$       | $V_M$       |
| 5 V to 15 V    | $V_{DD}$ or $V_{SS}$ | $0.5V_{DD}$ | $0.5V_{DD}$ |



a. Input waveforms



b. Test circuit

Test data is given in [Table 9](#).  
Definitions test circuit:  
DUT = Device Under Test;  
 $C_L$  = load capacitance, including the jig and probe capacitance;  
 $R_L$  = load resistance, which should be equal to the output impedance of the pulse generator.

Fig 6. Test circuit for measuring switching times

Table 9. Test data

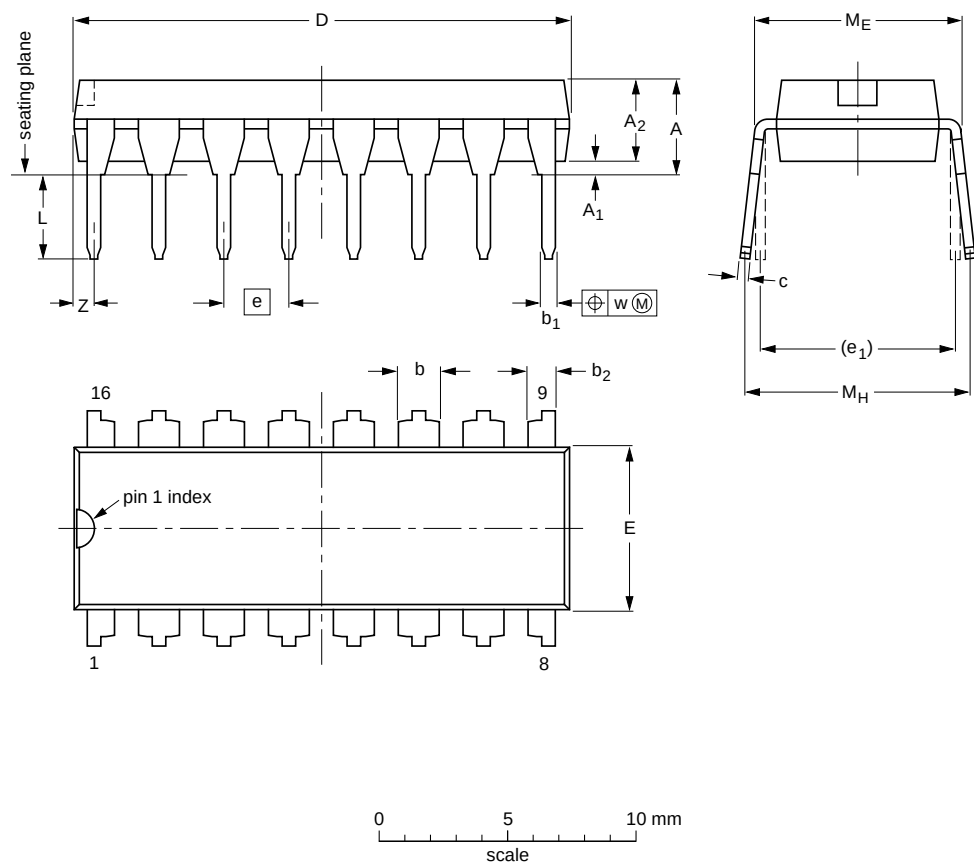
| Supply voltage | Input                |              | Load  |
|----------------|----------------------|--------------|-------|
| $V_{DD}$       | $V_I$                | $t_r, t_f$   | $C_L$ |
| 5 V to 15 V    | $V_{SS}$ or $V_{DD}$ | $\leq 20$ ns | 50 pF |



12. Package outline

DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A<br>max. | A <sub>1</sub><br>min. | A <sub>2</sub><br>max. | b              | b <sub>1</sub> | b <sub>2</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | e <sub>1</sub> | L            | M <sub>E</sub> | M <sub>H</sub> | w     | Z <sup>(1)</sup><br>max. |
|--------|-----------|------------------------|------------------------|----------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|--------------------------|
| mm     | 4.2       | 0.51                   | 3.2                    | 1.73<br>1.30   | 0.53<br>0.38   | 1.25<br>0.85   | 0.36<br>0.23   | 19.50<br>18.55   | 6.48<br>6.20     | 2.54 | 7.62           | 3.60<br>3.05 | 8.25<br>7.80   | 10.0<br>8.3    | 0.254 | 0.76                     |
| inches | 0.17      | 0.02                   | 0.13                   | 0.068<br>0.051 | 0.021<br>0.015 | 0.049<br>0.033 | 0.014<br>0.009 | 0.77<br>0.73     | 0.26<br>0.24     | 0.1  | 0.3            | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.03                     |

**Note**  
1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

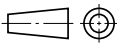
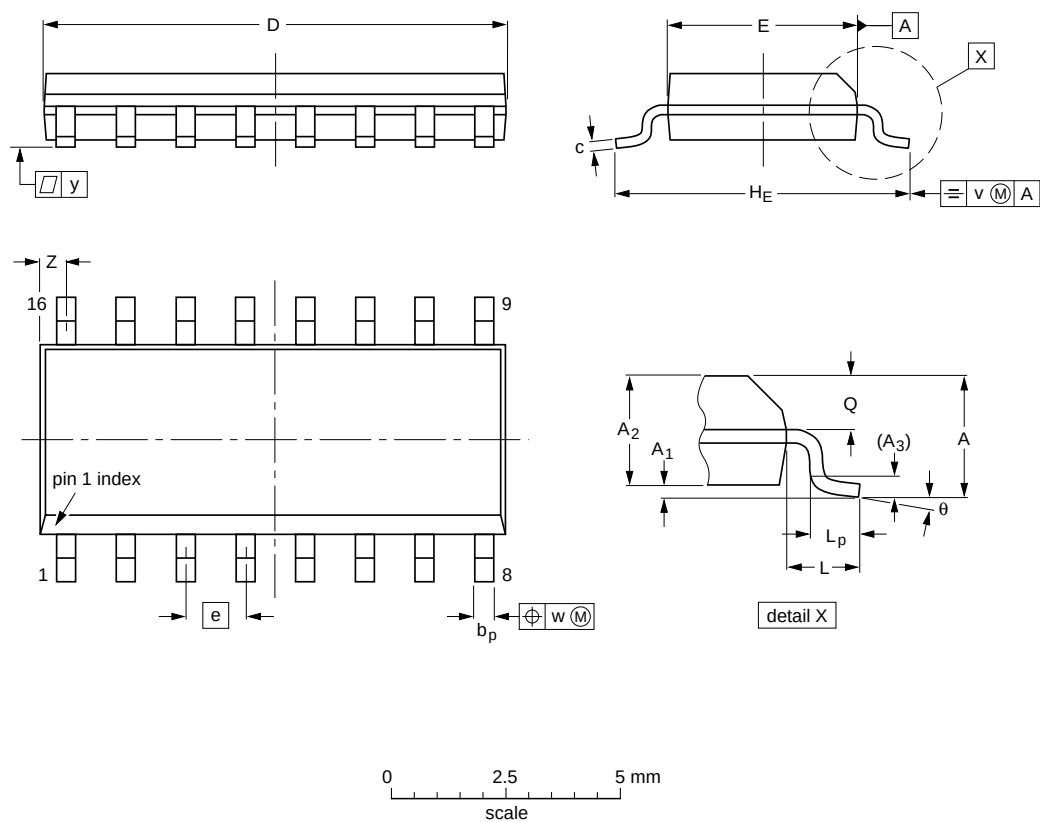
| OUTLINE<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|----------------------|
|                    | IEC        | JEDEC | JEITA |  |                                                                                       |                      |
| SOT38-4            |            |       |       |  |  | 95-01-14<br>03-02-13 |

Fig 7. Package outline SOT38-4 (DIP16)

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A<br>max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c                | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | z <sup>(1)</sup> | θ        |
|--------|-----------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 1.75      | 0.25<br>0.10   | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 10.0<br>9.8      | 4.0<br>3.8       | 1.27 | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069     | 0.010<br>0.004 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.39<br>0.38     | 0.16<br>0.15     | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.020 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012   |          |

**Note**  
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|--------|-------|--|------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |                      |
| SOT109-1           | 076E07     | MS-012 |       |  |                        | 99-12-27<br>03-02-19 |

Fig 8. Package outline SOT109-1 (SO16)

## 13. Revision history

**Table 10. Revision history**

| Document ID      | Release date                                                                                                                                   | Data sheet status     | Change notice | Supersedes       |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|------------------|
| HEF4040B v.8     | 20111117                                                                                                                                       | Product data sheet    | -             | HEF4040B v.7     |
| Modifications:   | <ul style="list-style-type: none"><li>• Legal pages updated.</li><li>• Changes in “General description” and “Features and benefits”.</li></ul> |                       |               |                  |
| HEF4040B v.7     | 20111010                                                                                                                                       | Product data sheet    | -             | HEF4040B v.6     |
| HEF4040B v.6     | 20091125                                                                                                                                       | Product data sheet    | -             | HEF4040B v.5     |
| HEF4040B v.5     | 20090709                                                                                                                                       | Product data sheet    | -             | HEF4040B v.4     |
| HEF4040B v.4     | 20090304                                                                                                                                       | Product data sheet    | -             | HEF4040B_CNV v.3 |
| HEF4040B_CNV v.3 | 19950101                                                                                                                                       | Product specification | -             | HEF4040B_CNV v.2 |
| HEF4040B_CNV v.2 | 19950101                                                                                                                                       | Product specification | -             | -                |

## 14. Legal information

### 14.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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