

# DATA SHEET

## **74F06, 74F06A, 74F07, 74F07A** Inverter/buffer drivers

Product specification

1992 Jul 24

IC15 Data Handbook

Hex inverter/buffer drivers (open-collector)

74F06, 74F06A,  
74F07, 74F07A

FEATURES OF 74F06, 74F07

- Open Collector output drive 64mA
- High speed
- 12V output termination voltage
- Symmetrical propagation delays

FEATURES OF 74F06A, 74F07A

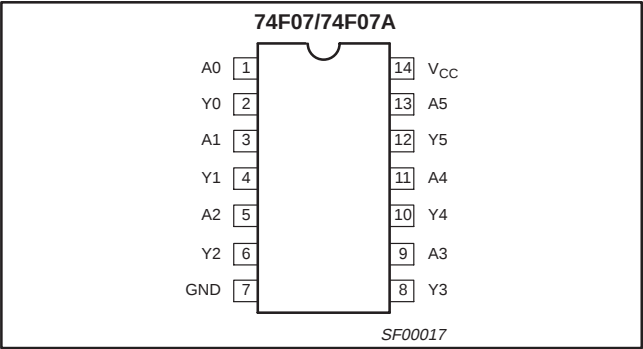
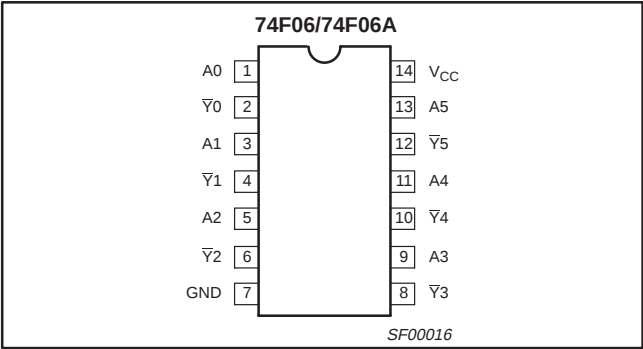
- Open Collector output drive 48mA
- High speed
- 30V output termination voltage
- Replaces 74F06 and 74F07
- Improved performance upgrade for 74F06 and 74F07
- Reduced I<sub>OH</sub> leakage @ 30V

| TYPE   | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|--------|---------------------------|--------------------------------|
| 74F06  | 3.5ns                     | 30mA                           |
| 74F06A | 9.0ns                     | 30mA                           |
| 74F07  | 4.5ns                     | 32mA                           |
| 74F07A | 10.0ns                    | 32mA                           |

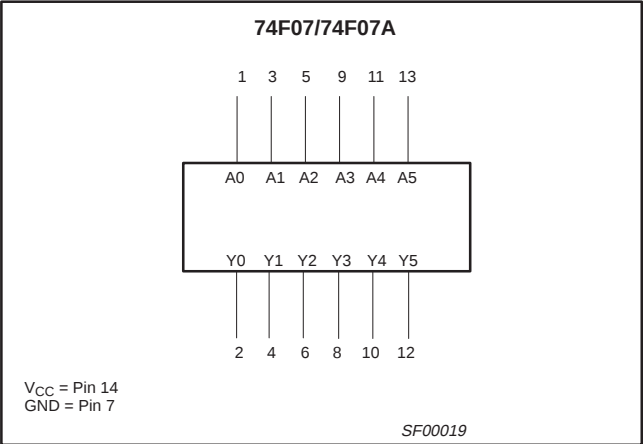
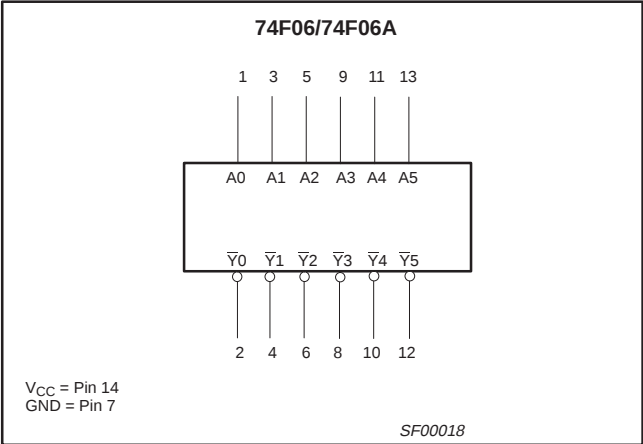
ORDERING INFORMATION

| DESCRIPTION                         | COMMERCIAL RANGE<br>V <sub>CC</sub> = 5V ±10%,<br>T <sub>amb</sub> = 0°C to +70°C | PKG DWG # |
|-------------------------------------|-----------------------------------------------------------------------------------|-----------|
| 14-pin plastic Dual In-line Package | N74F06N, N74F06AN                                                                 | SOT27-1   |
| 14-pin plastic Small Outline        | N74F07D, N74F07AD                                                                 | SOT108-1  |

PIN CONFIGURATIONS



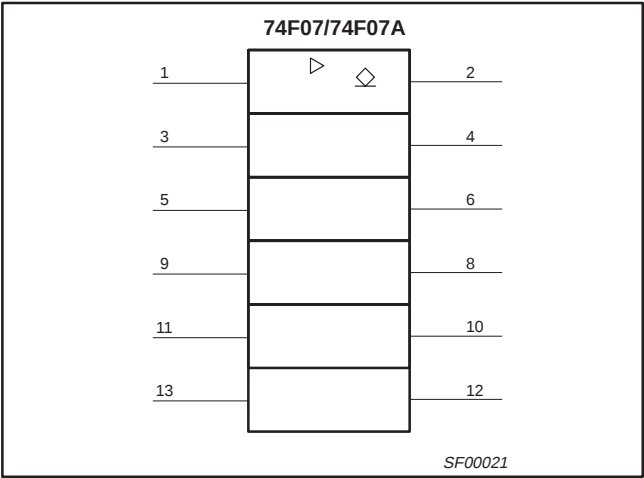
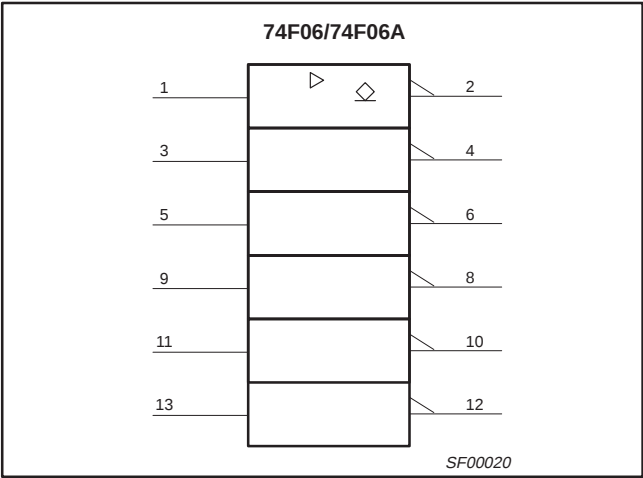
LOGIC SYMBOLS



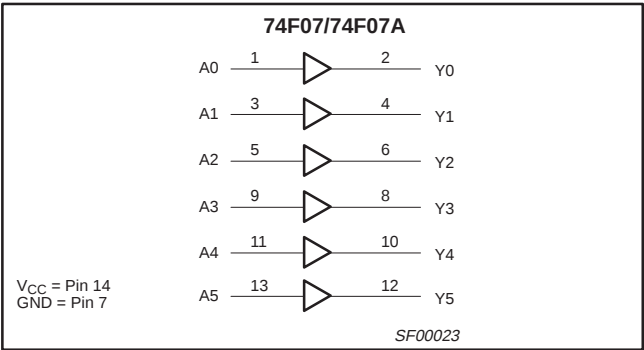
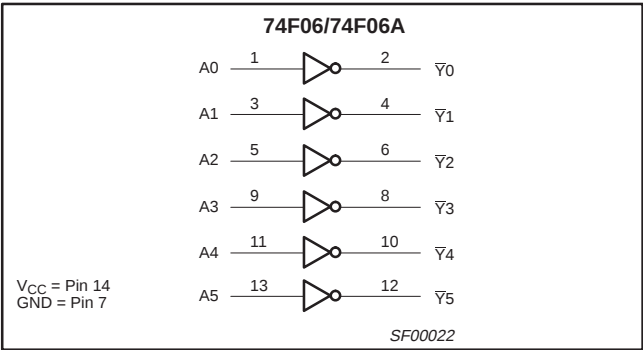
Hex inverter/buffer drivers (open-collector)

74F06, 74F06A,  
74F07, 74F07A

IEC/IEEE SYMBOLS



LOGIC DIAGRAMS



INPUT AND OUTPUT LOADING AND FAN OUT TABLE

| PINS        | DESCRIPTION                | 74F (U.L.)<br>HIGH/LOW | LOAD VALUE<br>HIGH/LOW |
|-------------|----------------------------|------------------------|------------------------|
| An          | Data inputs ('F06, 'F07)   | 1.0/1.0                | 20μA/0.6mA             |
| An          | Data inputs ('F06A, 'F07A) | 1.0/0.7                | 20μA/0.4mA             |
| $\bar{Y}_n$ | Data outputs ('F06)        | OC/106.7               | OC/64mA                |
| $\bar{Y}_n$ | Data outputs ('F06A)       | OC/80                  | OC/48mA                |
| Yn          | Data outputs ('F07)        | OC/106.7               | OC/64mA                |
| Yn          | Data outputs ('F07A)       | OC/80                  | OC/48mA                |

- NOTES:
- One (1.0) FAST unit load is defined as: 20μA in the High state and 0.6mA in the Low state.
  - OC = Open Collector

FUNCTION TABLE

| INPUTS | OUTPUTS     |             |
|--------|-------------|-------------|
|        | 'F06, 'F06A | 'F07, 'F07A |
| An     | $\bar{Y}_n$ | Yn          |
| L      | H           | L           |
| H      | L           | H           |

- NOTES:
- H = High voltage level
  - L = Low voltage level

## Hex inverter/buffer drivers (open-collector)

74F06, 74F06A,  
74F07, 74F07A**ABSOLUTE MAXIMUM RATINGS**

(Operation beyond the limit set forth in this table may impair the useful life of the device.

Unless otherwise noted these limits are over the operating free air temperature range.)

| SYMBOL    | PARAMETER                                      |              | RATING       | UNIT |
|-----------|------------------------------------------------|--------------|--------------|------|
| $V_{CC}$  | Supply voltage                                 |              | −0.5 to +7.0 | V    |
| $V_{IN}$  | Input voltage                                  |              | −0.5 to +7.0 | V    |
| $I_{IN}$  | Input current                                  |              | −30 to +5    | mA   |
| $V_{OUT}$ | Voltage applied to output in High output state | 'F06, 'F07   | −0.5 to 12   | V    |
|           |                                                | 'F06A, 'F07A | −0.5 to 30   | V    |
| $I_{OUT}$ | Current applied to output in Low output state  | 'F06, 'F07   | 128          | mA   |
|           |                                                | 'F06A, 'F07A | 96           | mA   |
| $T_{amb}$ | Operating free air temperature range           |              | 0 to +70     | °C   |
| $T_{stg}$ | Storage temperature range                      |              | −65 to +150  | °C   |

**RECOMMENDED OPERATING CONDITIONS**

| SYMBOL    | PARAMETER                            |              | LIMITS |     |     | UNIT |
|-----------|--------------------------------------|--------------|--------|-----|-----|------|
|           |                                      |              | MIN    | NOM | MAX |      |
| $V_{CC}$  | Supply voltage                       |              | 4.5    | 5.0 | 5.5 | V    |
| $V_{IH}$  | High-level input voltage             |              | 2.0    |     |     | V    |
| $V_{IL}$  | Low-level input voltage              |              |        |     | 0.8 | V    |
| $I_{lk}$  | Input clamp current                  |              |        |     | −18 | mA   |
| $V_{OH}$  | High-level output voltage            | 'F06, 'F07   |        |     | 12  | V    |
|           |                                      | 'F06A, 'F07A |        |     | 30  | V    |
| $I_{OL}$  | Low-level output current             | 'F06, 'F07   |        |     | 64  | mA   |
|           |                                      | 'F06A, 'F07A |        |     | 48  | mA   |
| $T_{amb}$ | Operating free air temperature range |              | 0      |     | +70 | °C   |

## Hex inverter/buffer drivers (open-collector)

74F06, 74F06A,  
74F07, 74F07A

## DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

| SYMBOL          | PARAMETER                              |                  | TEST CONDITIONS <sup>1</sup>                                                                  |                       |                      | LIMITS |                  |      | UNIT |
|-----------------|----------------------------------------|------------------|-----------------------------------------------------------------------------------------------|-----------------------|----------------------|--------|------------------|------|------|
|                 |                                        |                  |                                                                                               |                       |                      | MIN    | TYP <sup>2</sup> | MAX  |      |
| I <sub>OH</sub> | High-level output current              | 'F06, 'F07       | V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX,<br>V <sub>OH</sub> = MAX, V <sub>IH</sub> = MIN |                       |                      |        |                  | 250  | μA   |
|                 |                                        | 'F06A, 'F07A     |                                                                                               |                       |                      |        |                  | 100  | μA   |
| V <sub>OL</sub> | Low-level output voltage               |                  | V <sub>CC</sub> = MIN,<br>V <sub>IL</sub> = MAX,<br>V <sub>IH</sub> = MIN                     | I <sub>OL</sub> = MAX | ±10% V <sub>CC</sub> |        | 0.30             | 0.50 | V    |
|                 |                                        |                  |                                                                                               |                       | ±5% V <sub>CC</sub>  |        | 0.30             | 0.50 | V    |
| V <sub>IK</sub> | Input clamp voltage                    |                  | V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>                                       |                       |                      |        | −0.73            | −1.2 | V    |
| I <sub>I</sub>  | Input current at maximum input voltage |                  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7.0V                                                  |                       |                      |        |                  | 100  | μA   |
| I <sub>IH</sub> | High-level input current               |                  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V                                                  |                       |                      |        |                  | 20   | μA   |
| I <sub>IL</sub> | Low-level input current                | 'F06, 'F07       | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5V                                                  |                       |                      |        |                  | −0.6 | mA   |
|                 |                                        | 'F06A, 'F07A     |                                                                                               |                       |                      |        |                  | −0.4 | mA   |
| I <sub>CC</sub> | Supply current (total)                 | 74F06,<br>74F06A | I <sub>CCH</sub>                                                                              | V <sub>CC</sub> = MAX |                      |        | 5.0              | 8.0  | mA   |
|                 |                                        |                  | I <sub>CCL</sub>                                                                              |                       |                      |        | 30               | 43   | mA   |
|                 |                                        | 74F07,<br>74F07A | I <sub>CCH</sub>                                                                              |                       |                      |        | 10               | 14   | mA   |
|                 |                                        |                  | I <sub>CCL</sub>                                                                              |                       |                      |        | 32               | 45   | mA   |

## NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V<sub>CC</sub> = 5V, T<sub>amb</sub> = 25°C.
- Not more than one output should be shorted at a time. For testing I<sub>OS</sub>, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I<sub>OS</sub> tests should be performed last.

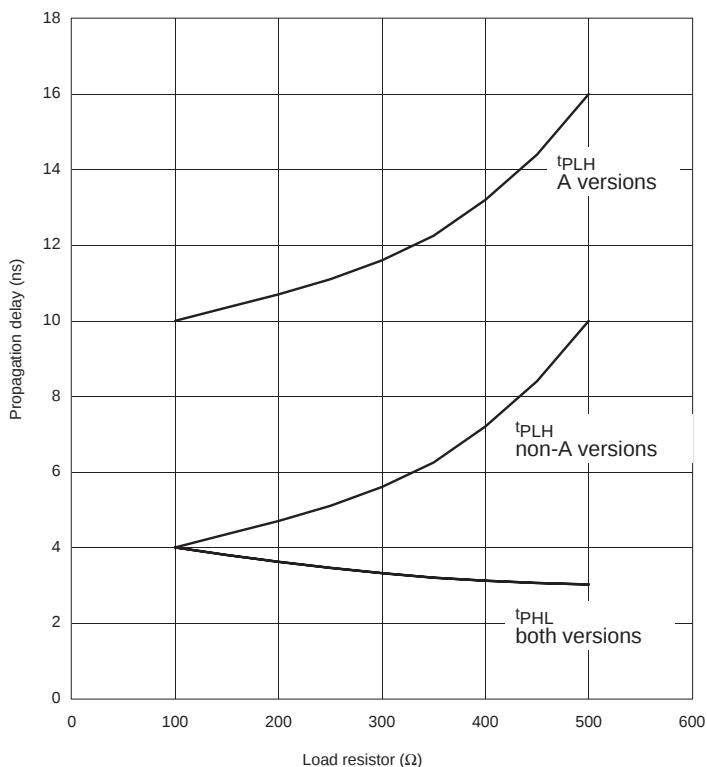
## AC ELECTRICAL CHARACTERISTICS

| SYMBOL                               | PARAMETER                     |       | TEST<br>CONDITION | LIMITS                                                                                              |             |              |                                                                                                                  |              | UNIT |
|--------------------------------------|-------------------------------|-------|-------------------|-----------------------------------------------------------------------------------------------------|-------------|--------------|------------------------------------------------------------------------------------------------------------------|--------------|------|
|                                      |                               |       |                   | V <sub>CC</sub> = +5.0V<br>T <sub>amb</sub> = +25°C<br>C <sub>L</sub> = 50pF, R <sub>L</sub> = 100Ω |             |              | V <sub>CC</sub> = +5.0V ± 10%<br>T <sub>amb</sub> = 0°C to +70°C<br>C <sub>L</sub> = 50pF, R <sub>L</sub> = 100Ω |              |      |
|                                      |                               |       |                   | Min                                                                                                 | Typ         | Max          | Min                                                                                                              | Max          |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>An to Yn | 'F06  | Waveform 1        | 2.0<br>1.5                                                                                          | 3.5<br>3.0  | 6.0<br>5.5   | 1.5<br>1.0                                                                                                       | 6.5<br>6.0   | ns   |
|                                      |                               | 'F06A |                   | 5.0<br>2.0                                                                                          | 9.0<br>4.0  | 11.0<br>6.0  | 4.0<br>2.0                                                                                                       | 15.0<br>8.0  |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>An to Yn | 'F07  | Waveform 2        | 2.0<br>3.0                                                                                          | 4.0<br>5.0  | 6.0<br>7.0   | 2.0<br>2.5                                                                                                       | 6.5<br>7.5   | ns   |
|                                      |                               | 'F07A |                   | 6.0<br>5.0                                                                                          | 10.5<br>7.5 | 13.0<br>10.0 | 5.0<br>4.0                                                                                                       | 17.0<br>13.0 |      |

## Hex inverter/buffer drivers (open-collector)

74F06, 74F06A,  
74F07, 74F07A

## TYPICAL PROPAGATION DELAYS VERSUS LOAD FOR OPEN COLLECTOR OUTPUTS



SF00024

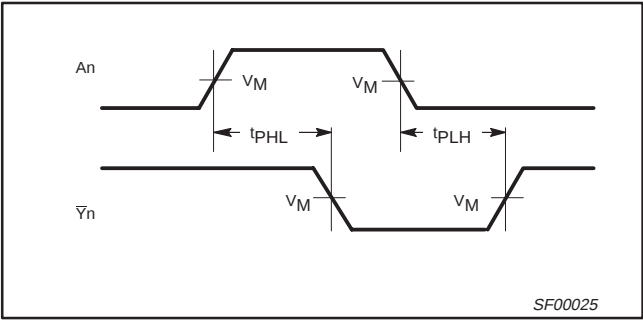
**NOTE:**

When using Open-Collector parts, the value of the pull-up resistor greatly affects the value of the  $t_{PLH}$ . For example, changing the specified pull-up resistor value from 500Ω to 100Ω will improve the  $t_{PLH}$  up to 50% with only a slight increase in the  $t_{PHL}$ . However, if the value of the pull-up resistor is changed, the user must make certain that the total  $I_{OL}$  current through the resistor and the total  $I_{IL}$ 's of the receivers does not exceed the  $I_{OL}$  maximum specification.

Hex inverter/buffer drivers (open-collector)

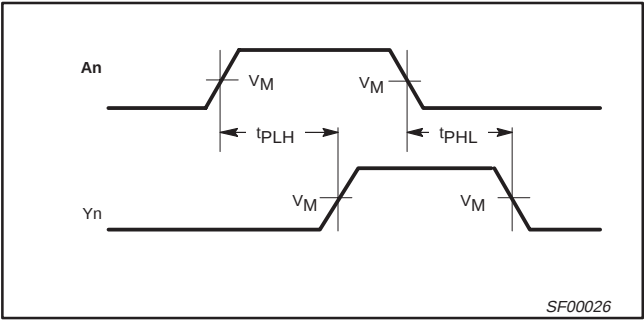
74F06, 74F06A,  
74F07, 74F07A

AC WAVEFORMS



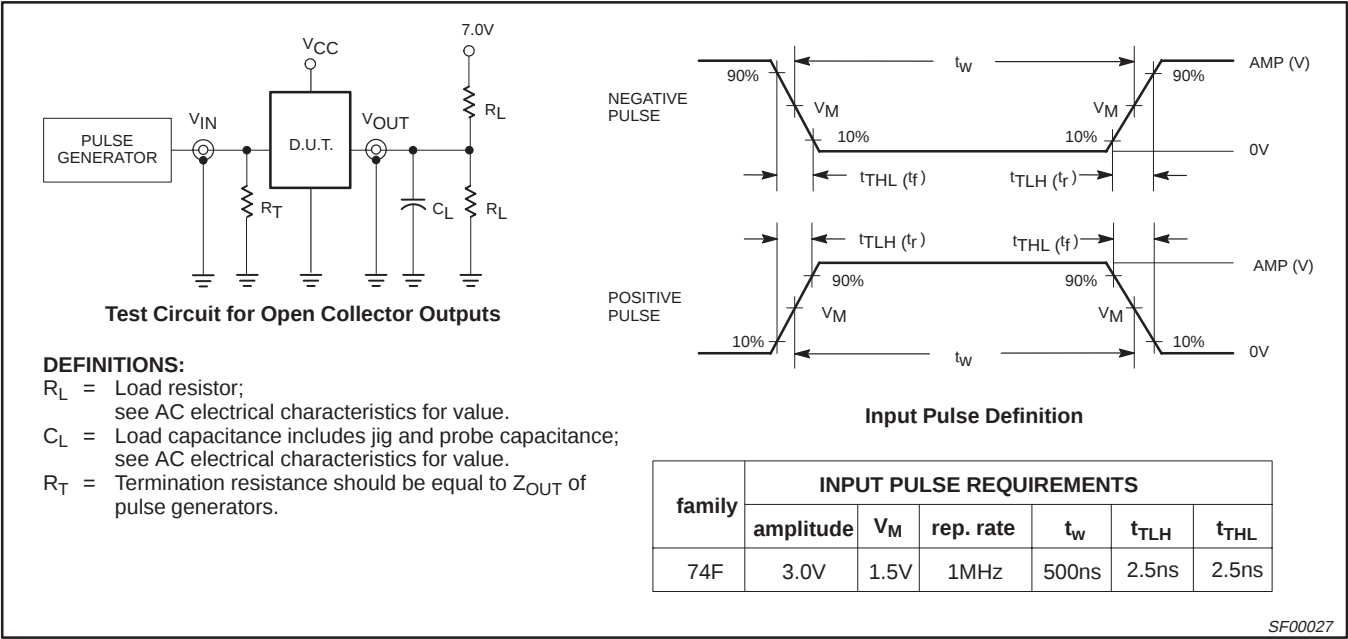
Waveform 1. Propagation delay for inverting outputs

**NOTE:**  
For all waveforms,  $V_M = 1.5V$ .



Waveform 2. Propagation delay for non-inverting outputs

TEST CIRCUIT AND WAVEFORMS

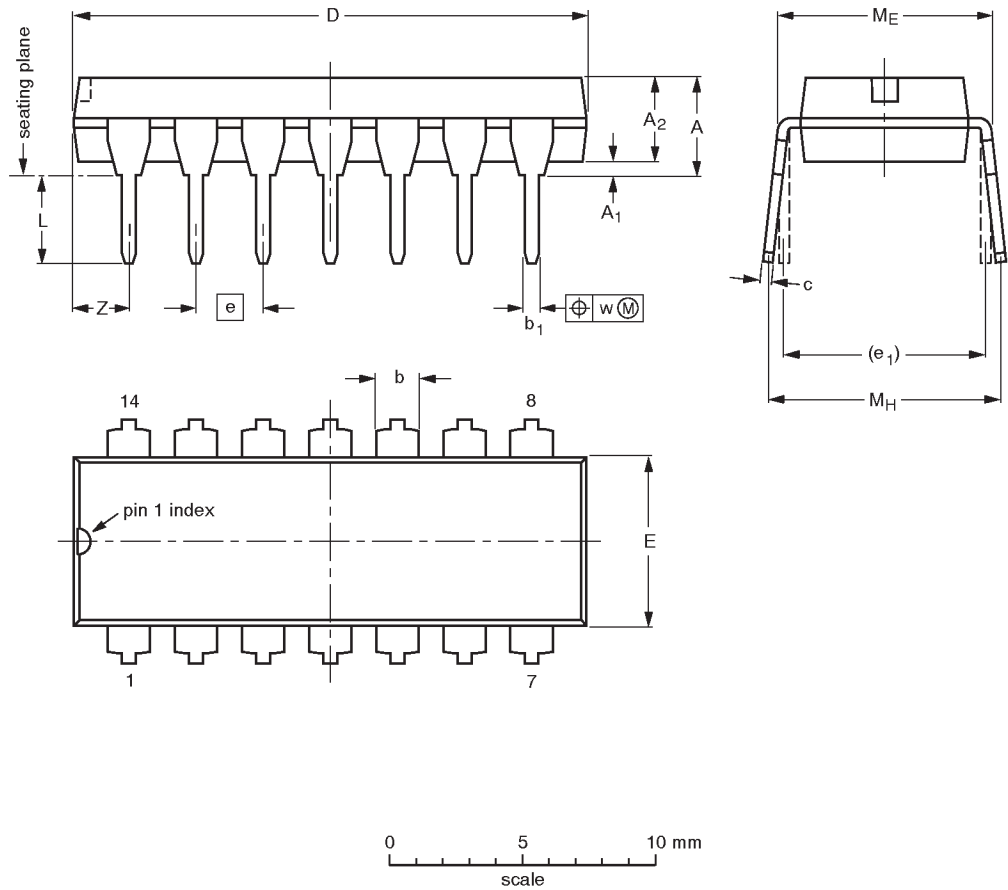


Inverter/buffer drivers

74F06, 74F06A,  
74F07, 74F07A

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



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> | 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>1.13   | 0.53<br>0.38   | 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 | 2.2                      |
| inches | 0.17      | 0.020                  | 0.13                   | 0.068<br>0.044 | 0.021<br>0.015 | 0.014<br>0.009 | 0.77<br>0.73     | 0.26<br>0.24     | 0.10 | 0.30           | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.087                    |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

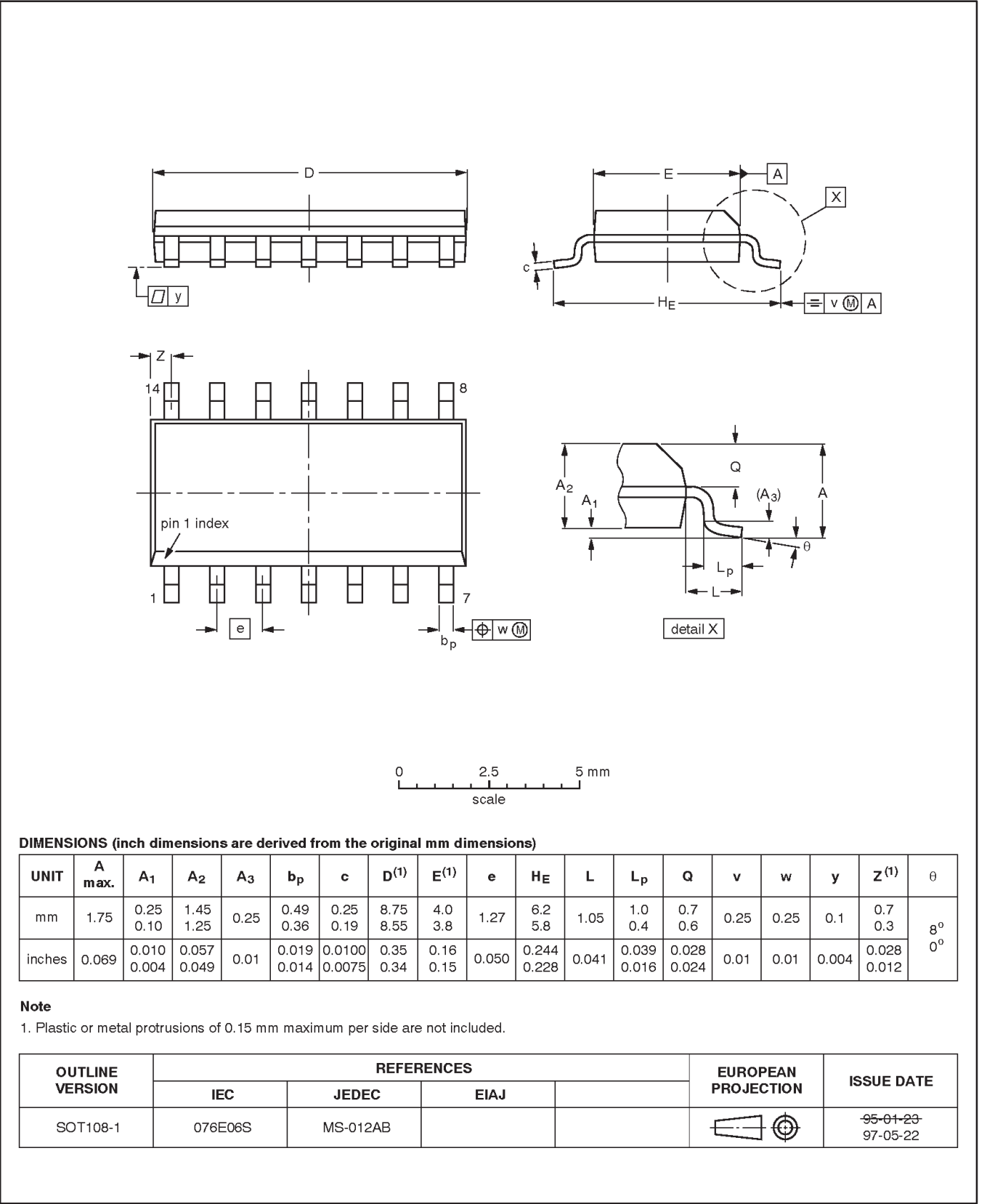
| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|----------|------|--|------------------------|----------------------|
|                    | IEC        | JEDEC    | EIAJ |  |                        |                      |
| SOT27-1            | 050G04     | MO-001AA |      |  |                        | 92-11-17<br>95-03-11 |

Inverter/buffer drivers

74F06, 74F06A,  
74F07, 74F07A

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



## Inverter/buffer drivers

74F06, 74F06A,  
74F07, 74F07A

## Data sheet status

| Data sheet status         | Product status | Definition [1]                                                                                                                                                                                                                                             |
|---------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objective specification   | Development    | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.                                                                                                          |
| Preliminary specification | Qualification  | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| Product specification     | Production     | This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.                                                       |

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

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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