

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

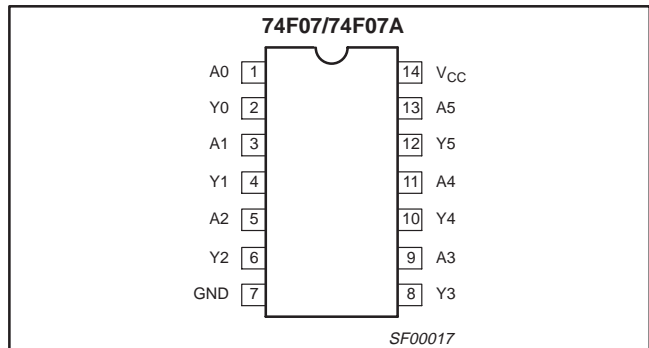
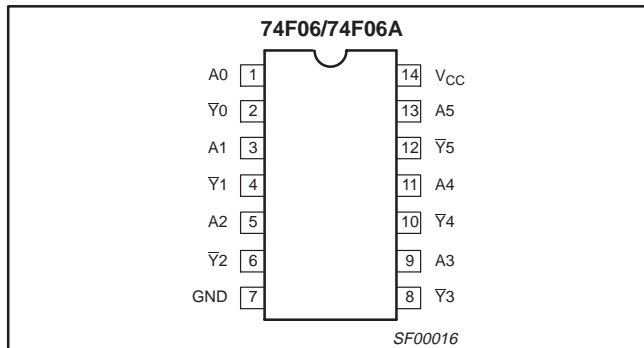
- Open Collector output drive 48mA
- High speed
- 30V output termination voltage
- Replaces 74F06 and 74F07
- Improved performance upgrade for 74F06 and 74F07
- Reduced I_{OH} leakage @ 30V

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

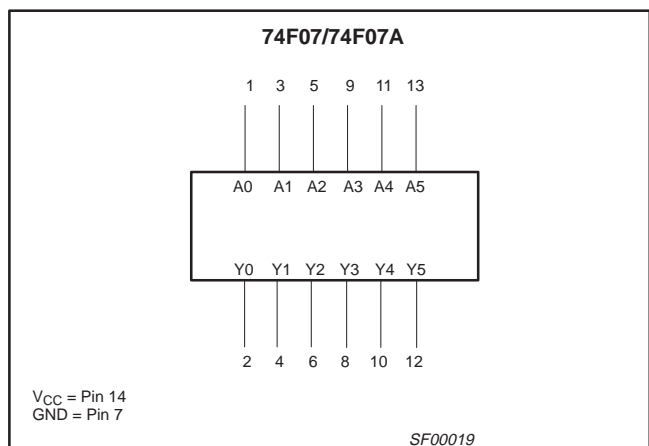
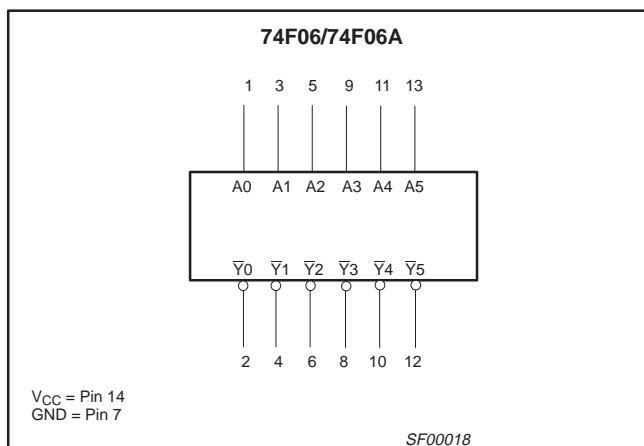
ORDERING INFORMATION

| DESCRIPTION | COMMERCIAL RANGE V _{CC} = 5V ±10%, T _{amb} = 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



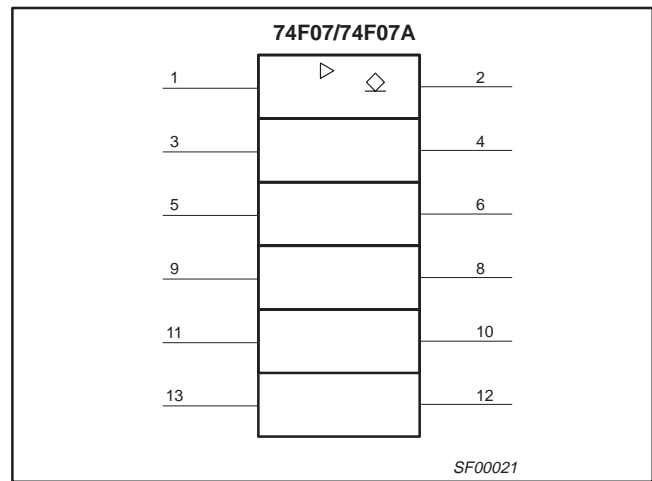
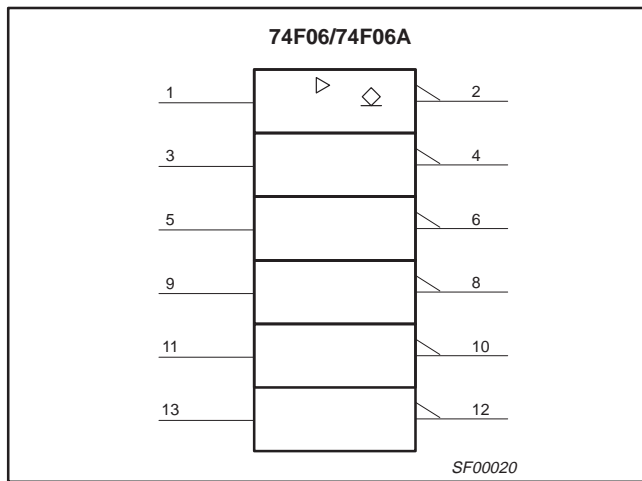
LOGIC SYMBOLS



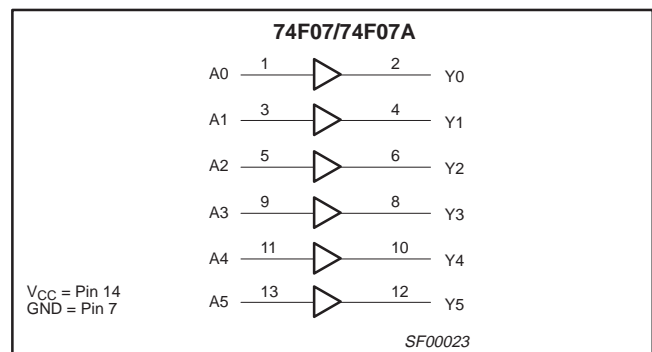
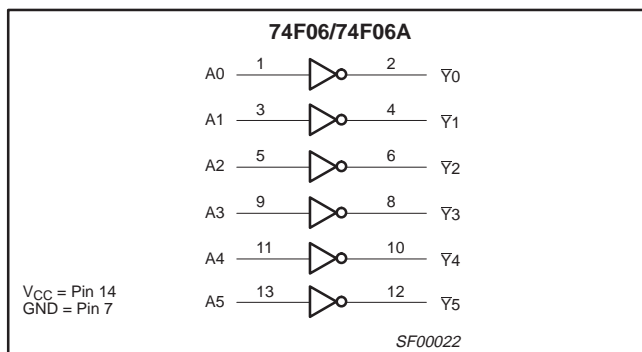
Hex inverter/buffer drivers (open-collector)

74F06, 74F06A,
74F07, 74F07A

IEC/IEEE SYMBOLS



LOGIC DIAGRAMS



INPUT AND OUTPUT LOADING AND FAN OUT TABLE

| PINS | DESCRIPTION | 74F (U.L.) HIGH/LOW | LOAD VALUE 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 | Yn | 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 ¹ | | | LIMITS | | | UNIT |
|-----------------|--|------------------|---|-----------------------|----------------------|--------|------------------|-----|------|
| | | | | | | MIN | TYP ² | MAX | |
| I _{OH} | High-level output current | 'F06, 'F07 | V _{CC} = MIN, V _{IL} = MAX, V _{OH} = MAX, V _{IH} = MIN | | | | | 250 | μA |
| | | 'F06A, 'F07A | | | | | | 100 | |
| V _{OL} | Low-level output voltage | | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = MAX | ±10% V _{CC} | 0.30 | 0.50 | V | |
| | | | | | ±5% V _{CC} | | | | |
| V _{IK} | Input clamp voltage | | V _{CC} = MIN, I _I = I _{IK} | | | -0.73 | -1.2 | V | |
| I _I | Input current at maximum input voltage | | V _{CC} = MAX, V _I = 7.0V | | | | 100 | μA | |
| I _{IH} | High-level input current | | V _{CC} = MAX, V _I = 2.7V | | | | 20 | μA | |
| I _{IL} | Low-level input current | 'F06, 'F07 | V _{CC} = MAX, V _I = 0.5V | | | | -0.6 | mA | |
| | | 'F06A, 'F07A | | | | | -0.4 | | |
| I _{CC} | Supply current (total) | 74F06, 74F06A | I _{CC} H | V _{CC} = MAX | | | 5.0 | 8.0 | mA |
| | | | I _{CC} L | | | | 30 | 43 | |
| | | 74F07, 74F07A | I _{CC} H | | | | 10 | 14 | mA |
| | | | I _{CC} L | | | | 32 | 45 | |

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_{CC} = 5V, T_{amb} = 25°C.
- Not more than one output should be shorted at a time. For testing I_{OS}, 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_{OS} tests should be performed last.

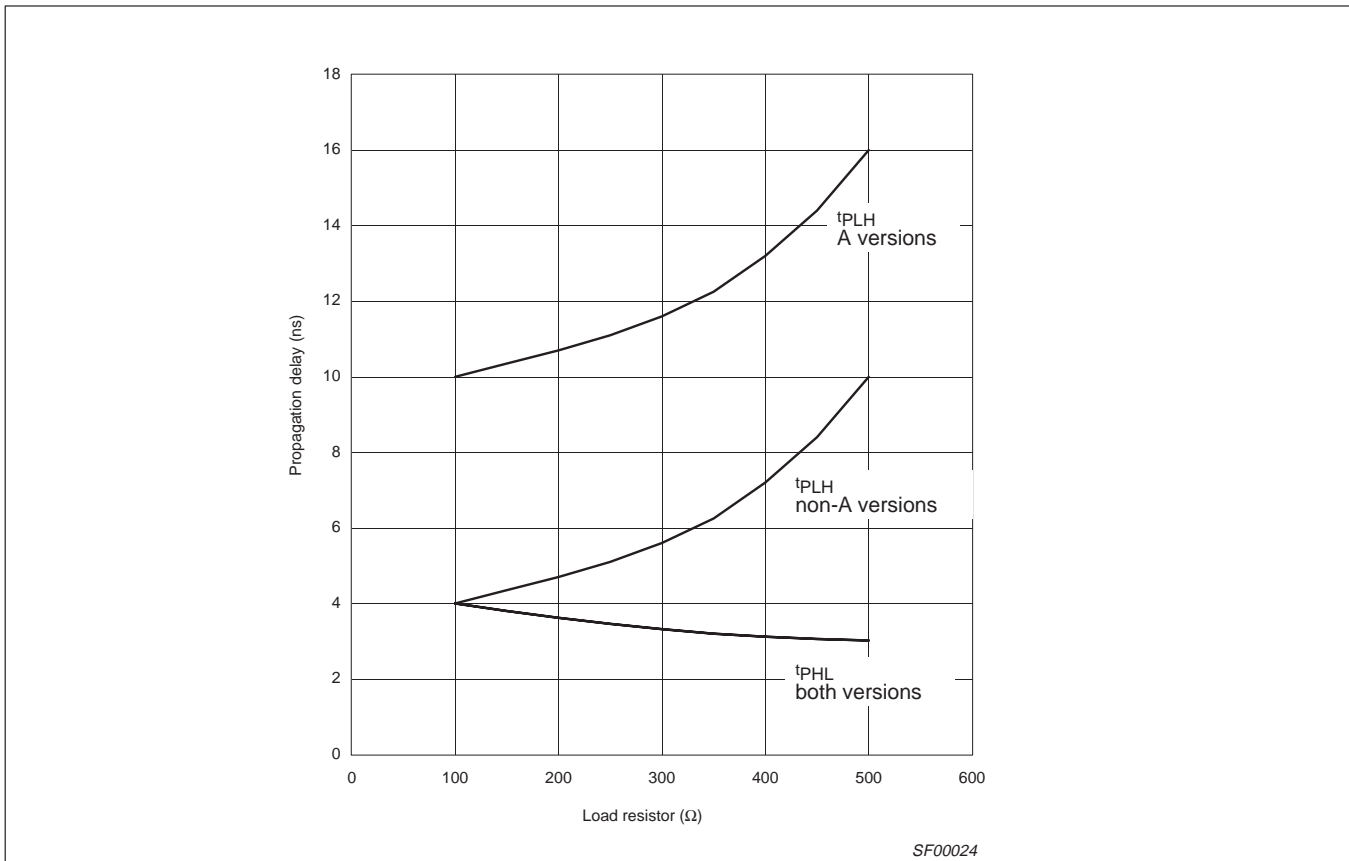
AC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | | TEST CONDITION | LIMITS | | | | | UNIT |
|--------------------------------------|-------------------------------|-------|----------------|---|------|------|--|------|------|
| | | | | V _{CC} = +5.0V T _{amb} = +25°C C _L = 50pF, R _L = 100Ω | | | V _{CC} = +5.0V ± 10% T _{amb} = 0°C to +70°C C _L = 50pF, R _L = 100Ω | | |
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation delay An to Yn | 'F06 | Waveform 1 | 2.0 | 3.5 | 6.0 | 1.5 | 6.5 | ns |
| | | 'F06A | | 5.0 | 9.0 | 11.0 | 4.0 | 15.0 | |
| t _{PLH} t _{PHL} | Propagation delay An to Yn | 'F07 | Waveform 2 | 2.0 | 4.0 | 6.0 | 2.0 | 6.5 | ns |
| | | 'F07A | | 6.0 | 10.5 | 13.0 | 5.0 | 17.0 | |
| | | | | 5.0 | 7.5 | 10.0 | 4.0 | 13.0 | |

Hex inverter/buffer drivers (open-collector)

74F06, 74F06A,
74F07, 74F07A

TYPICAL PROPAGATION DELAYS VERSUS LOAD FOR OPEN COLLECTOR OUTPUTS



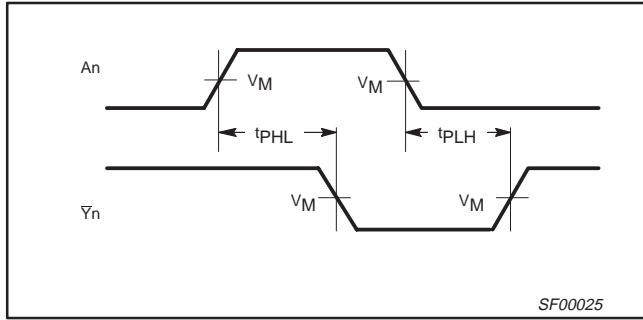
NOTE:

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.

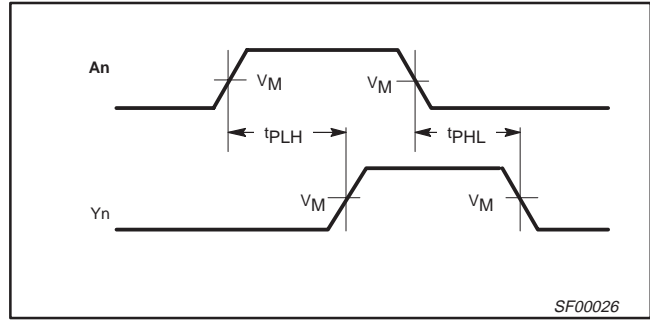
Hex inverter/buffer drivers (open-collector)

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74F07, 74F07A

AC WAVEFORMS



Waveform 1. Propagation delay for inverting outputs

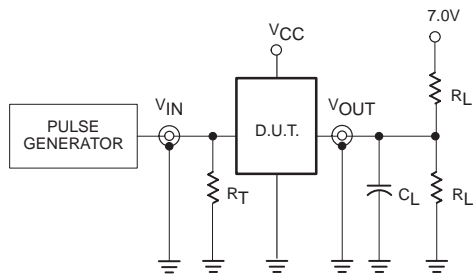


Waveform 2. Propagation delay for non-inverting outputs

NOTE:

For all waveforms, $V_M = 1.5V$.

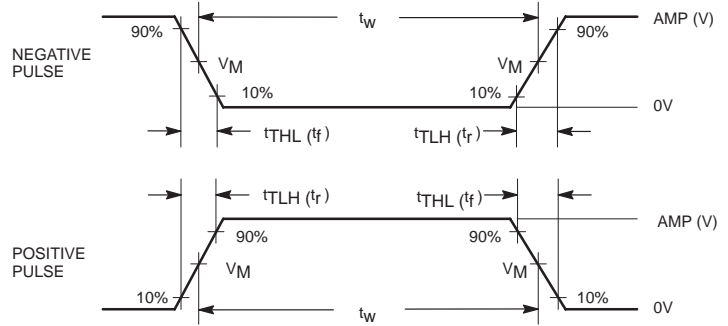
TEST CIRCUIT AND WAVEFORMS



Test Circuit for Open Collector Outputs

DEFINITIONS:

- R_L = Load resistor; see AC electrical characteristics for value.
- C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.
- R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.



Input Pulse Definition

| family | INPUT PULSE REQUIREMENTS | | | | | |
|--------|--------------------------|-------|-----------|-------|-----------|-----------|
| | amplitude | V_M | rep. rate | t_w | t_{TLH} | t_{THL} |
| 74F | 3.0V | 1.5V | 1MHz | 500ns | 2.5ns | 2.5ns |

SF00027

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 max. | A ₁ min. | A ₂ max. | b | b ₁ | c | D ⁽¹⁾ | E ⁽¹⁾ | e | e ₁ | L | M _E | M _H | w | Z ⁽¹⁾ max. |
|--------|--------|---------------------|---------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|-----------------------|
| mm | 4.2 | 0.51 | 3.2 | 1.73 1.13 | 0.53 0.38 | 0.36 0.23 | 19.50 18.55 | 6.48 6.20 | 2.54 | 7.62 | 3.60 3.05 | 8.25 7.80 | 10.0 8.3 | 0.254 | 2.2 |
| inches | 0.17 | 0.020 | 0.13 | 0.068 0.044 | 0.021 0.015 | 0.014 0.009 | 0.77 0.73 | 0.26 0.24 | 0.10 | 0.30 | 0.14 0.12 | 0.32 0.31 | 0.39 0.33 | 0.01 | 0.087 |

Note

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

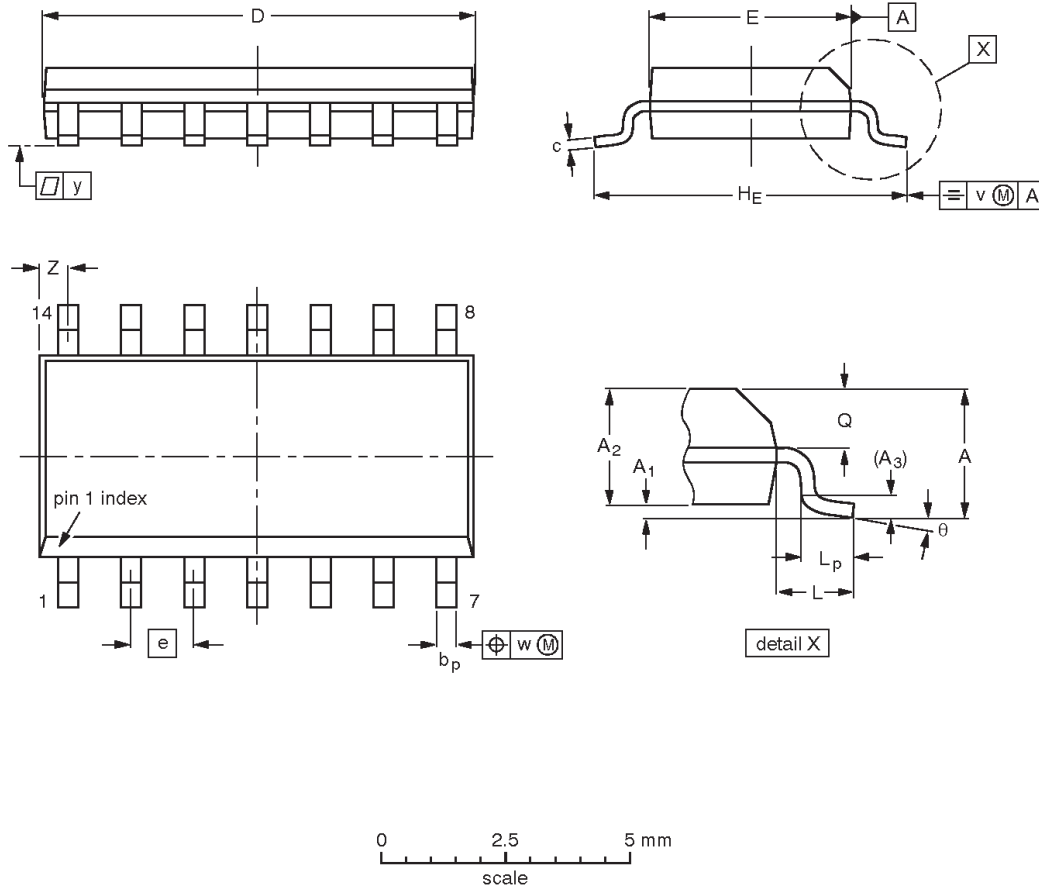
| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | |
| SOT27-1 | 050G04 | MO-001AA | | | 92-11-17 95-03-11 |

Inverter/buffer drivers

74F06, 74F06A,
74F07, 74F07A

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

SOT108-1



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

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 1.75 | 0.25 0.10 | 1.45 1.25 | 0.25 | 0.49 0.36 | 0.25 0.19 | 8.75 8.55 | 4.0 3.8 | 1.27 | 6.2 5.8 | 1.05 | 1.0 0.4 | 0.7 0.6 | 0.25 | 0.25 | 0.1 | 0.7 0.3 | 8° 0° |
| inches | 0.069 | 0.010 0.004 | 0.057 0.049 | 0.01 | 0.019 0.014 | 0.0100 0.0075 | 0.35 0.34 | 0.16 0.15 | 0.050 | 0.244 0.228 | 0.041 | 0.039 0.016 | 0.028 0.024 | 0.01 | 0.01 | 0.004 | 0.028 0.012 | |

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT108-1 | 076E06S | MS-012AB | | | | 95-01-23 97-05-22 |

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

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