

# DATA SHEET

**74F10** Triple 3-input NAND gate

**74F11** Triple 3-input AND gate

Product specification

1989 Sep 20

IC15 Data Handbook

Gates

74F10, 74F11

74F10 Triple 3-input NAND gate  
74F11 Triple 3-input AND gate

| TYPE  | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|-------|---------------------------|--------------------------------|
| 74F10 | 3.5ns                     | 3.3mA                          |
| 74F11 | 4.2ns                     | 5.3mA                          |

ORDERING INFORMATION

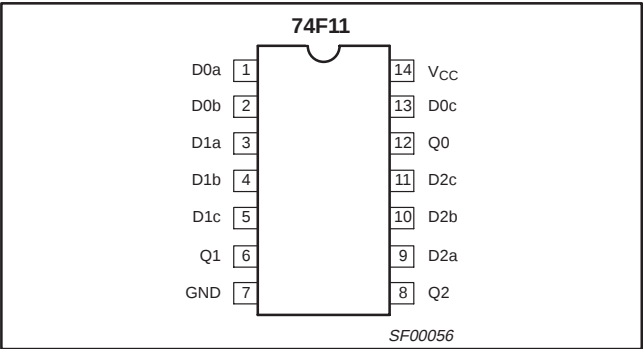
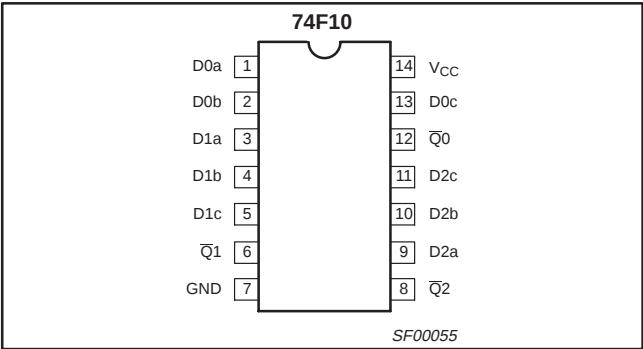
| DESCRIPTION        | COMMERCIAL RANGE<br>$V_{CC} = 5V \pm 10\%$ ,<br>$T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$ | PKG DWG # |
|--------------------|-------------------------------------------------------------------------------------------------|-----------|
| 14-pin plastic DIP | N74F10N, N74F11N                                                                                | SOT27-1   |
| 14-pin plastic SO  | N74F10D, N74F11D                                                                                | SOT108-1  |

INPUT AND OUTPUT LOADING AND FAN OUT TABLE

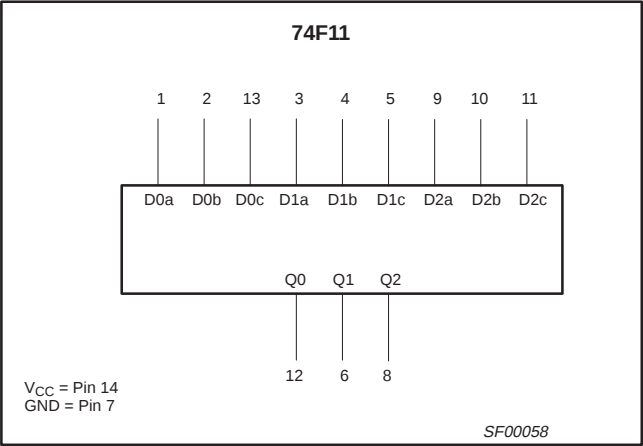
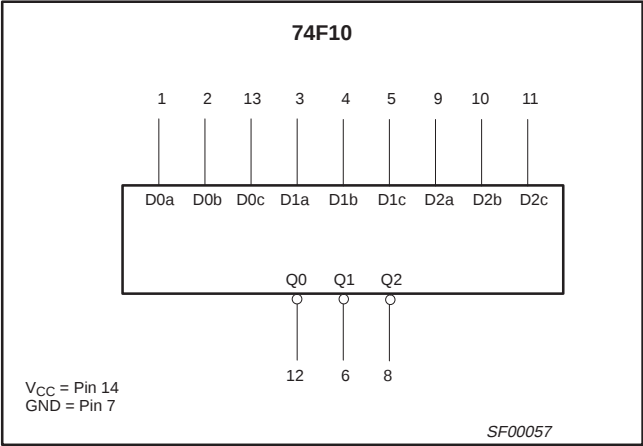
| PINS            | DESCRIPTION         | 74F (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|-----------------|---------------------|---------------------|---------------------|
| Dna, Dnb, Dnc   | Data inputs         | 1.0/1.0             | 20µA/0.6mA          |
| $\overline{Q}n$ | Data output (74F10) | 50/33               | 1.0mA/20mA          |
| Qn              | Data output (74F11) | 50/33               | 1.0mA/20mA          |

NOTE: One (1.0) FAST unit load is defined as: 20µA in the High state and 0.6mA in the Low state.

PIN CONFIGURATIONS



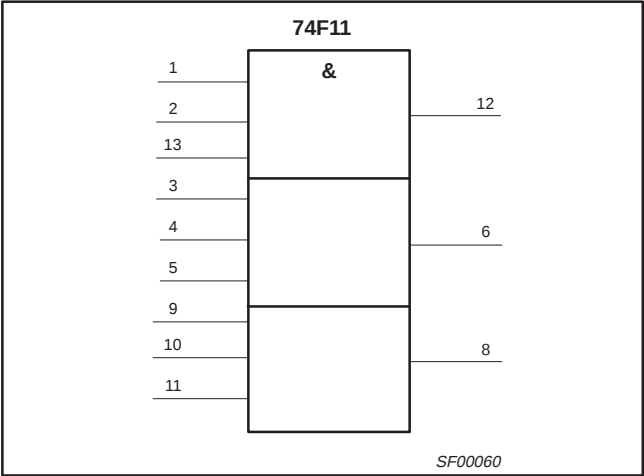
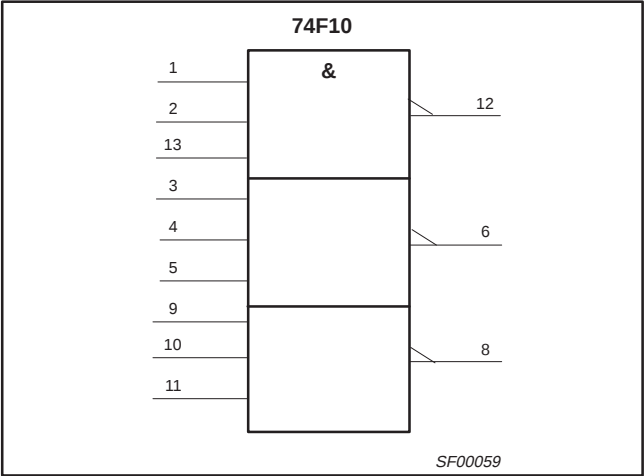
LOGIC SYMBOLS



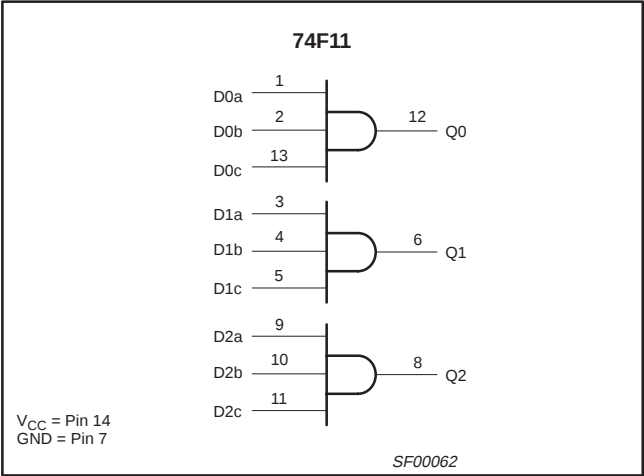
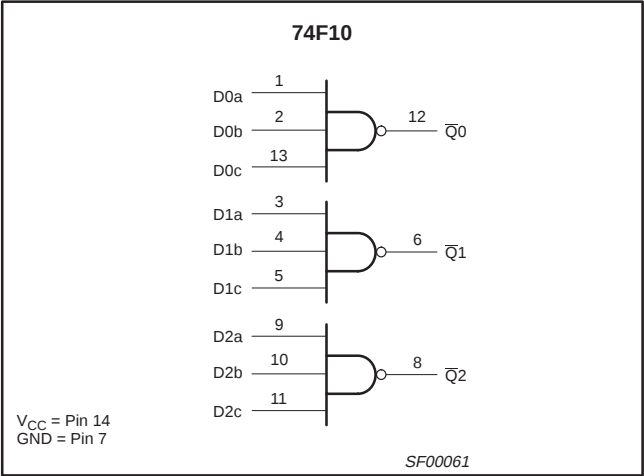
Gates

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IEC/IEEE SYMBOLS



LOGIC DIAGRAMS



FUNCTION TABLE

| INPUTS |     |     | OUTPUTS          |       |
|--------|-----|-----|------------------|-------|
|        |     |     | 74F10            | 74F11 |
| Dna    | Dnb | Dnc | $\overline{Q_n}$ | $Q_n$ |
| L      | L   | L   | H                | L     |
| L      | L   | H   | H                | L     |
| L      | H   | L   | H                | L     |
| L      | H   | H   | H                | L     |
| H      | L   | L   | H                | L     |
| H      | L   | H   | H                | L     |
| H      | H   | L   | H                | L     |
| H      | H   | H   | L                | H     |

- NOTES:
1. H = High voltage level
  2. L = Low voltage level

## Gates

## 74F10, 74F11

## 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 | −0.5 to $V_{CC}$ | V    |
| $I_{OUT}$ | Current applied to output in Low output state  | 40               | 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    |
| $I_{IK}$  | Input clamp current                  |        |     | −18 | mA   |
| $I_{OH}$  | High-level output current            |        |     | −1  | mA   |
| $I_{OL}$  | Low-level output current             |        |     | 20  | mA   |
| $T_{amb}$ | Operating free air temperature range | 0      |     | +70 | °C   |

## 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  |      |
| $V_{OH}$ | High-level output voltage                 |       | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}$ | $\pm 10\%V_{CC}$       | 2.5              |      | V    |
|          |                                           |       | $V_{IH} = \text{MIN}, I_{OH} = \text{MAX}$ | $\pm 5\%V_{CC}$        | 2.7              | 3.4  |      |
| $V_{OL}$ | Low-level output voltage                  |       | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}$ | $\pm 10\%V_{CC}$       |                  | 0.35 | V    |
|          |                                           |       | $V_{IH} = \text{MIN}, I_{OL} = \text{MAX}$ | $\pm 5\%V_{CC}$        |                  | 0.35 |      |
| $V_{IK}$ | Input clamp voltage                       |       | $V_{CC} = \text{MIN}, I_I = I_{IK}$        |                        | −0.73            | −1.2 | V    |
| $I_I$    | Input current at maximum input voltage    |       | $V_{CC} = \text{MAX}, V_I = 7.0\text{V}$   |                        |                  | 100  | μA   |
| $I_{IH}$ | High-level input current                  |       | $V_{CC} = \text{MAX}, V_I = 2.7\text{V}$   |                        |                  | 20   | μA   |
| $I_{IL}$ | Low-level input current                   |       | $V_{CC} = \text{MAX}, V_I = 0.5\text{V}$   |                        |                  | −0.6 | mA   |
| $I_{OS}$ | Short-circuit output current <sup>3</sup> |       | $V_{CC} = \text{MAX}$                      | −60                    |                  | −150 | mA   |
| $I_{CC}$ | Supply current (total)                    | 74F10 | $V_{CC} = \text{MAX}$                      | $V_{IN} = \text{GND}$  | 1.8              | 2.1  | mA   |
|          |                                           |       |                                            | $V_{IN} = 4.5\text{V}$ | 6.0              | 7.7  |      |
|          |                                           | 74F11 | $V_{CC} = \text{MAX}$                      | $V_{IN} = 4.5\text{V}$ | 4.7              | 6.2  | mA   |
|          |                                           |       |                                            | $V_{IN} = \text{GND}$  | 7.2              | 9.7  |      |

## 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  $V_{CC} = 5\text{V}$ ,  $T_{amb} = 25^\circ\text{C}$ .
- 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.

Gates

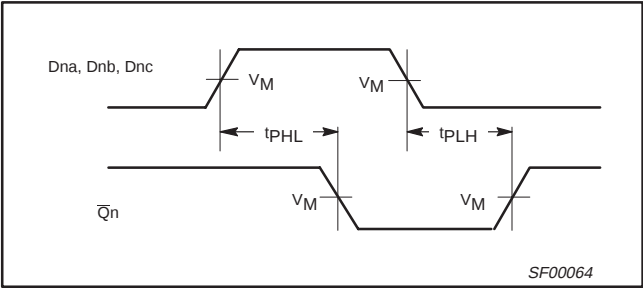
74F10, 74F11

AC ELECTRICAL CHARACTERISTICS

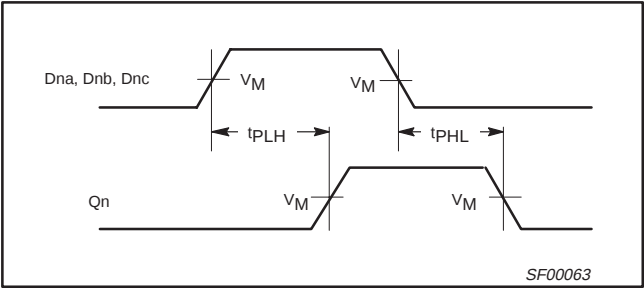
| SYMBOL                               | PARAMETER                                                                                   |       | TEST<br>CONDITION | LIMITS                                                                                              |            |            |                                                                                                                  |            | UNIT |
|--------------------------------------|---------------------------------------------------------------------------------------------|-------|-------------------|-----------------------------------------------------------------------------------------------------|------------|------------|------------------------------------------------------------------------------------------------------------------|------------|------|
|                                      |                                                                                             |       |                   | V <sub>CC</sub> = +5.0V<br>T <sub>amb</sub> = +25°C<br>C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω |            |            | 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> = 500Ω |            |      |
|                                      |                                                                                             |       |                   | MIN                                                                                                 | TYP        | MAX        | MIN                                                                                                              | MAX        |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>D <sub>na</sub> , D <sub>nb</sub> , D <sub>nc</sub> to Q̄ <sub>n</sub> | 74F10 | Waveform 1        | 2.4<br>1.5                                                                                          | 3.7<br>3.2 | 5.0<br>4.3 | 2.4<br>1.5                                                                                                       | 6.0<br>5.3 | ns   |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>D <sub>na</sub> , D <sub>nb</sub> , D <sub>nc</sub> to Q <sub>n</sub>  | 74F11 | Waveform 2        | 3.0<br>2.5                                                                                          | 4.2<br>4.1 | 5.6<br>5.5 | 3.0<br>2.5                                                                                                       | 6.6<br>6.5 | ns   |

AC WAVEFORMS

For all waveforms,  $V_M = 1.5V$ .

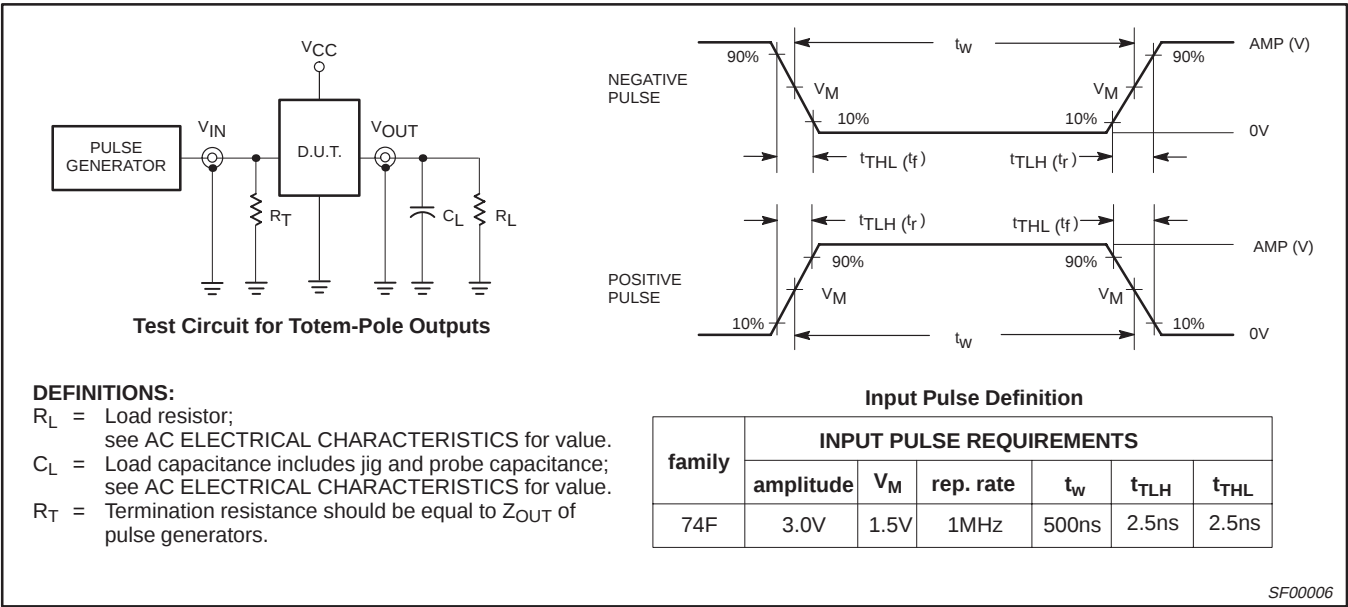


Waveform 1. Propagation Delay for Inverting Outputs (74F10)



Waveform 2. Propagation Delay for Non-Inverting Outputs (74F11)

TEST CIRCUIT AND WAVEFORM

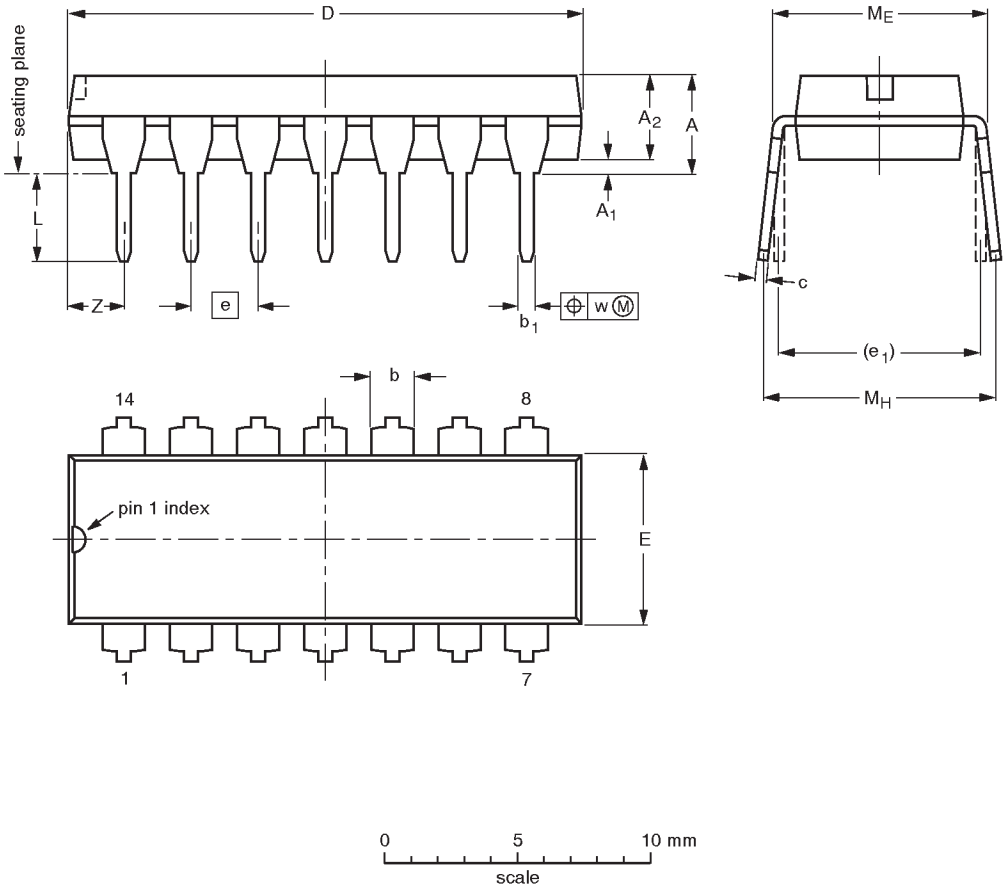


Gates

74F10, 74F11

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.

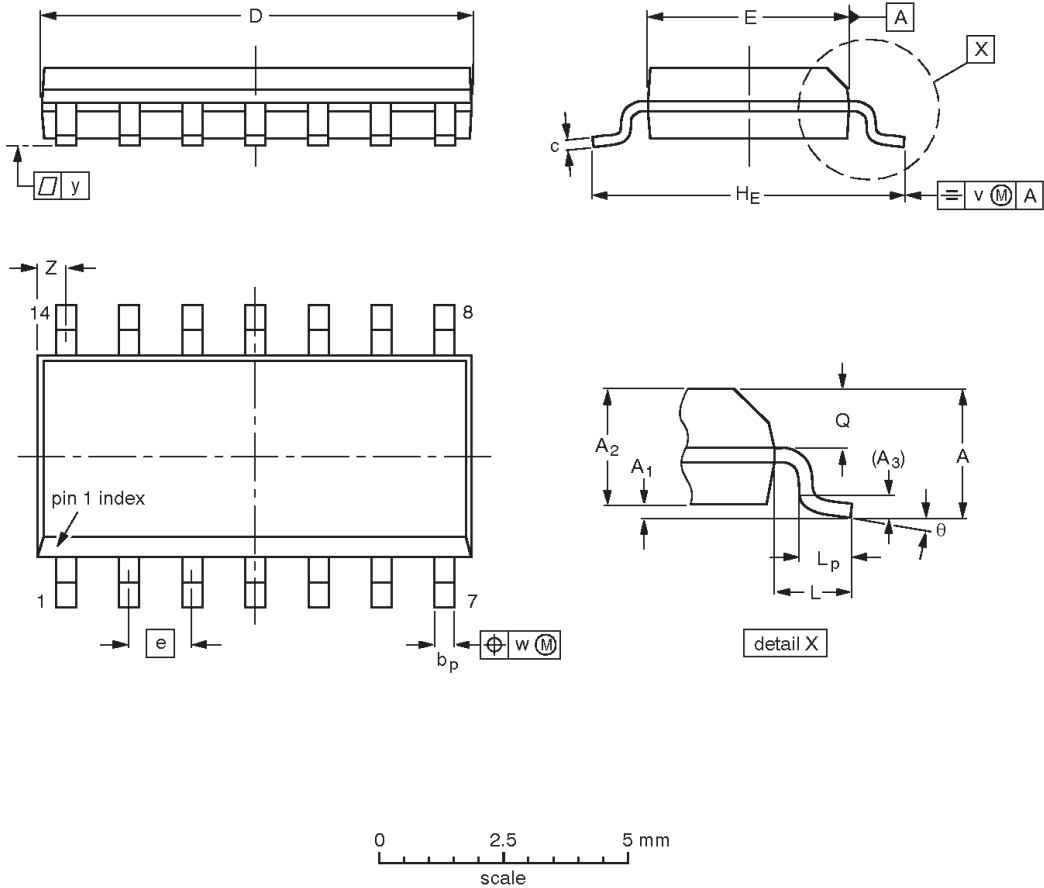
| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|----------|------|--|---------------------------------------------------------------------------------------|----------------------|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

Gates

74F10, 74F11

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<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     | 8.75<br>8.55     | 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 | 0.35<br>0.34     | 0.16<br>0.15     | 0.050 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012   |          |

Note

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

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

## Gates

74F10, 74F11

## 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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