

# DATA SHEET

**74F240**

Octal inverting buffer (3-state)

Product data  
Supersedes data of 2002 Mar 18

2004 Feb 25

# Octal inverting buffer

74F240

## FEATURES

- Octal bus interface
- 3-state buffer outputs sink 64 mA
- 15 mA source current

## DESCRIPTION

The 74F240 is an octal inverting buffer that is ideal for driving bus lines of buffer memory address registers. The outputs are all capable of sinking 64 mA and sourcing up to 15 mA. The device features two output enables, each controlling four of the 3-state outputs.

| TYPE   | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|--------|---------------------------|--------------------------------|
| 74F240 | 4.3 ns                    | 37 mA                          |

## ORDERING INFORMATION

| DESCRIPTION            | ORDER CODE                                                                                                                 | PKG DWG # |
|------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------|
|                        | COMMERCIAL RANGE<br>$V_{CC} = 5\text{ V} \pm 10\%$ , $T_{amb} = 0\text{ }^{\circ}\text{C to } +70\text{ }^{\circ}\text{C}$ |           |
| 20-pin plastic DIP     | N74F240N                                                                                                                   | SOT146-1  |
| 20-pin plastic SOL     | N74F240D                                                                                                                   | SOT163-1  |
| 20-pin plastic SSOP II | N74F240DB                                                                                                                  | SOT339-1  |

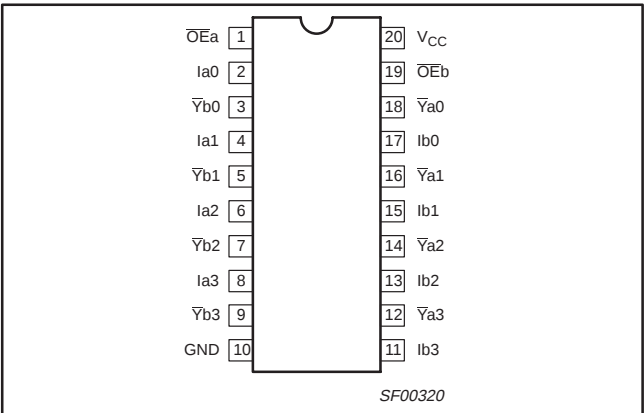
## INPUT AND OUTPUT LOADING AND FAN OUT TABLE

| PINS                                 | DESCRIPTION                       | 74F (U.L.)<br>HIGH/LOW | LOAD VALUE<br>HIGH/LOW |
|--------------------------------------|-----------------------------------|------------------------|------------------------|
| Ian, Ibn                             | Data inputs                       | 1.0/1.67               | 20 $\mu$ A/1.0 mA      |
| $\overline{OE}a$ , $\overline{OE}b$  | Output enable inputs (Active-LOW) | 1.0/0.33               | 20 $\mu$ A/0.2 mA      |
| $\overline{Y}a$ n, $\overline{Y}b$ n | Data outputs                      | 750/106.7              | 15 mA/64 mA            |

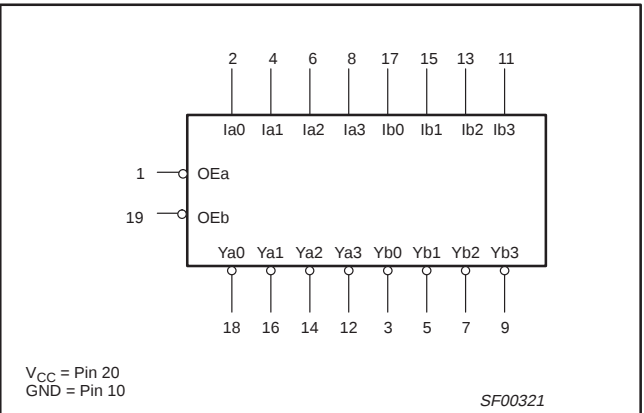
### Note to input and output loading and fan out table

One (1.0) FAST unit load is defined as: 20  $\mu$ A in the HIGH state and 0.6 mA in the LOW state.

## PIN CONFIGURATION



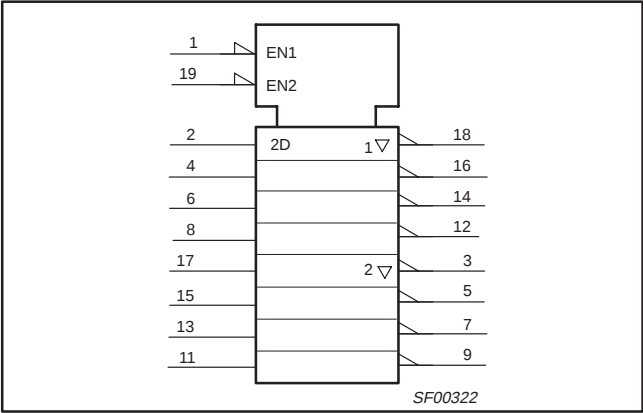
## LOGIC SYMBOL



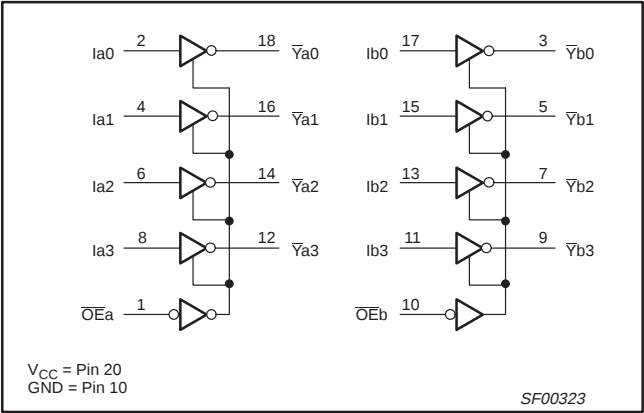
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IEC/IEEE SYMBOL



LOGIC DIAGRAM



FUNCTION TABLE

| INPUTS           |    |                  |    | OUTPUTS         |                 |
|------------------|----|------------------|----|-----------------|-----------------|
| $\overline{OE}a$ | Ia | $\overline{OE}b$ | Ib | $\overline{Y}a$ | $\overline{Y}b$ |
| L                | L  | L                | L  | H               | H               |
| L                | H  | L                | H  | L               | L               |
| H                | X  | H                | X  | Z               | Z               |

NOTES:

- H = High voltage level  
L = Low voltage level  
X = Don't care  
Z = High impedance "off" state

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  | 128              | 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            |        |     | -15 | mA   |
| $I_{OL}$  | Low-level output current             |        |     | 64  | mA   |
| $T_{amb}$ | Operating free air temperature range | 0      |     | +70 | °C   |

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## 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 <sub>OH</sub>  | High-level output voltage                            |                  | V <sub>CC</sub> = MIN; V <sub>IL</sub> = MAX; V <sub>IH</sub> = MIN | I <sub>OH</sub> = −3 mA  | ±10%V <sub>CC</sub> | 2.4              |      | V    |
|                  |                                                      |                  |                                                                     |                          | ±5%V <sub>CC</sub>  | 2.7              | 3.4  | V    |
|                  |                                                      |                  |                                                                     | I <sub>OH</sub> = −15 mA | ±10%V <sub>CC</sub> | 2.0              |      | V    |
|                  |                                                      |                  |                                                                     |                          | ±5%V <sub>CC</sub>  | 2.0              |      | V    |
| V <sub>OL</sub>  | Low-level output voltage                             |                  | V <sub>CC</sub> = MIN; V <sub>IL</sub> = MAX; V <sub>IH</sub> = MIN | I <sub>OL</sub> = MAX    | ±10%V <sub>CC</sub> |                  | 0.50 | V    |
|                  |                                                      |                  |                                                                     |                          | ±5%V <sub>CC</sub>  |                  | 0.42 | 0.50 |
| 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> = 7.0 V                       |                          |                     |                  | 100  | μA   |
| I <sub>IH</sub>  | High-level input current                             |                  | V <sub>CC</sub> = MAX; V <sub>I</sub> = 2.7 V                       |                          |                     |                  | 20   | μA   |
| I <sub>IL</sub>  | Low-level input current                              |                  | V <sub>CC</sub> = MAX; V <sub>I</sub> = 0.5 V                       |                          |                     |                  | −1.0 | mA   |
| I <sub>OZH</sub> | Off-state output current, high-level voltage applied |                  | V <sub>CC</sub> = MAX, V <sub>O</sub> = 2.7 V                       |                          |                     |                  | 50   | μA   |
| I <sub>OZL</sub> | Off-state output current, low-level voltage applied  |                  | V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.5 V                       |                          |                     |                  | −50  | μA   |
| I <sub>OS</sub>  | Short-circuit output current <sup>3</sup>            |                  | V <sub>CC</sub> = MAX                                               |                          | −100                |                  | −225 | mA   |
| I <sub>CC</sub>  | Supply current (total)                               | I <sub>CCH</sub> | V <sub>CC</sub> = MAX                                               |                          |                     | 12               | 18   | mA   |
|                  |                                                      | I <sub>CCL</sub> |                                                                     |                          |                     | 50               | 70   | mA   |
|                  |                                                      | I <sub>CCZ</sub> |                                                                     |                          |                     | 35               | 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  $V_{CC} = 5 \text{ V}$ ,  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ .
- 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.

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## AC ELECTRICAL CHARACTERISTICS

| SYMBOL                               | PARAMETER                                                             | TEST<br>CONDITION | LIMITS                                                                                                  |            |            |                                                                                                                       |             | UNIT |
|--------------------------------------|-----------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------|------------|------------|-----------------------------------------------------------------------------------------------------------------------|-------------|------|
|                                      |                                                                       |                   | T <sub>amb</sub> = +25 °C<br>V <sub>CC</sub> = +5.0 V<br>C <sub>L</sub> = 50 pF; R <sub>L</sub> = 500 Ω |            |            | T <sub>amb</sub> = 0 °C to +70 °C<br>V <sub>CC</sub> = +5.0 V ± 10%<br>C <sub>L</sub> = 50 pF; R <sub>L</sub> = 500 Ω |             |      |
|                                      |                                                                       |                   | MIN                                                                                                     | TYP        | MAX        | MIN                                                                                                                   | MAX         |      |
|                                      |                                                                       |                   | MIN                                                                                                     | TYP        | MAX        | MIN                                                                                                                   | MAX         |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>I <sub>an</sub> , I <sub>bn</sub> to $\bar{Y}_n$ | Waveform 1        | 3.0<br>2.0                                                                                              | 4.5<br>3.0 | 6.5<br>4.5 | 3.0<br>2.0                                                                                                            | 7.5<br>5.0  | ns   |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output enable time<br>to high or low level                            | Waveform 2 & 3    | 3.0<br>4.5                                                                                              | 5.0<br>6.5 | 7.5<br>8.5 | 3.0<br>4.0                                                                                                            | 9.0<br>10.0 | ns   |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output disable time<br>from high or low level                         | Waveform 2 & 3    | 3.0<br>3.0                                                                                              | 5.5<br>5.0 | 7.0<br>7.0 | 3.0<br>3.0                                                                                                            | 7.5<br>7.5  | ns   |

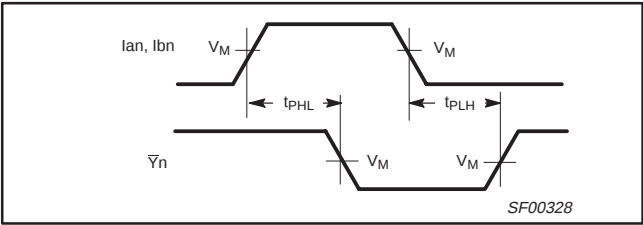
## NOTES:

1.  $|t_{pN} \text{ actual} - t_{pM} \text{ actual}|$  for any output compared to any other output where N and M are either LH or HL.

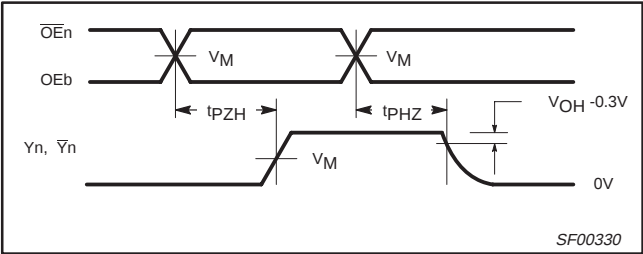
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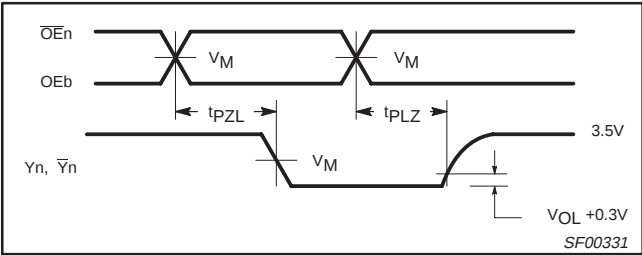
AC WAVEFORMS



Waveform 1. Propagation delay for inverting outputs



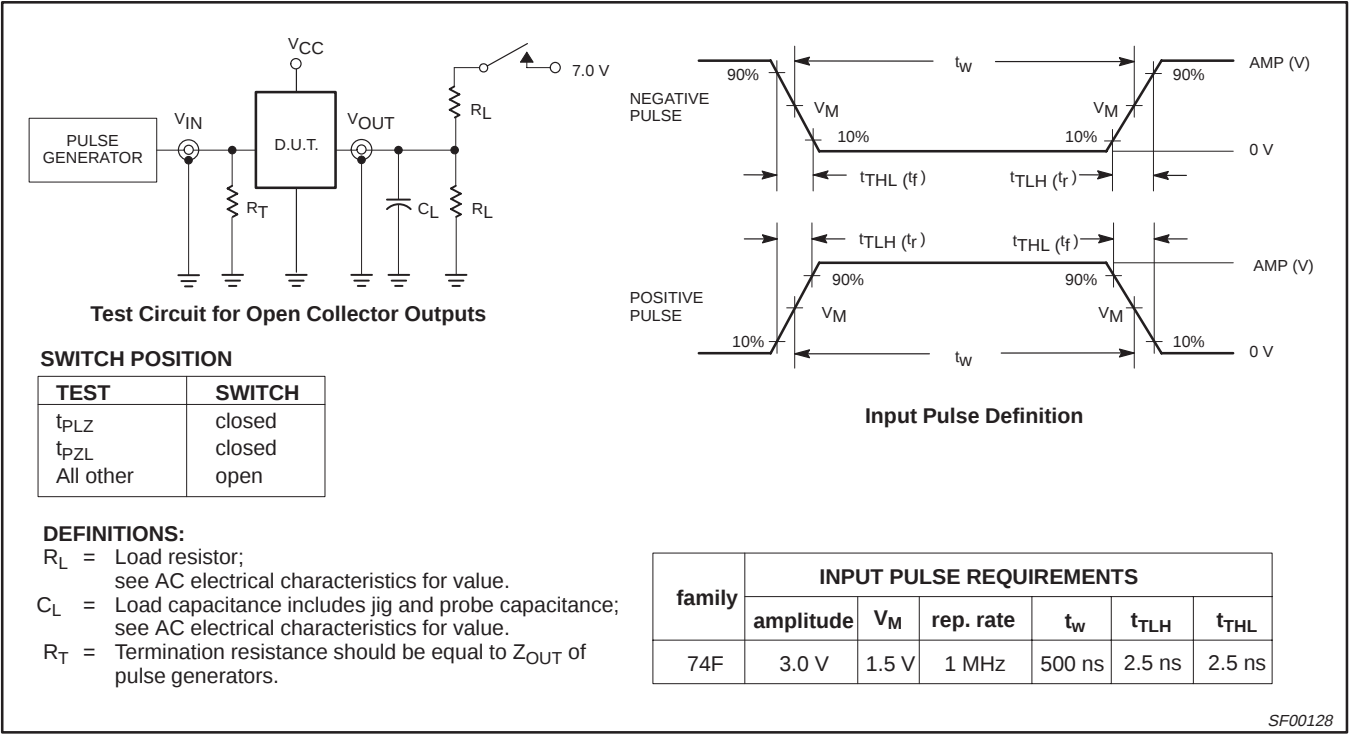
Waveform 2. 3-state output enable time to high level and output disable time from high level



Waveform 3. 3-state output enable time to low level and output disable time from low level

Notes to AC waveforms  
1. For all waveforms,  $V_M = 1.5\text{ V}$ .

TEST CIRCUIT AND WAVEFORMS

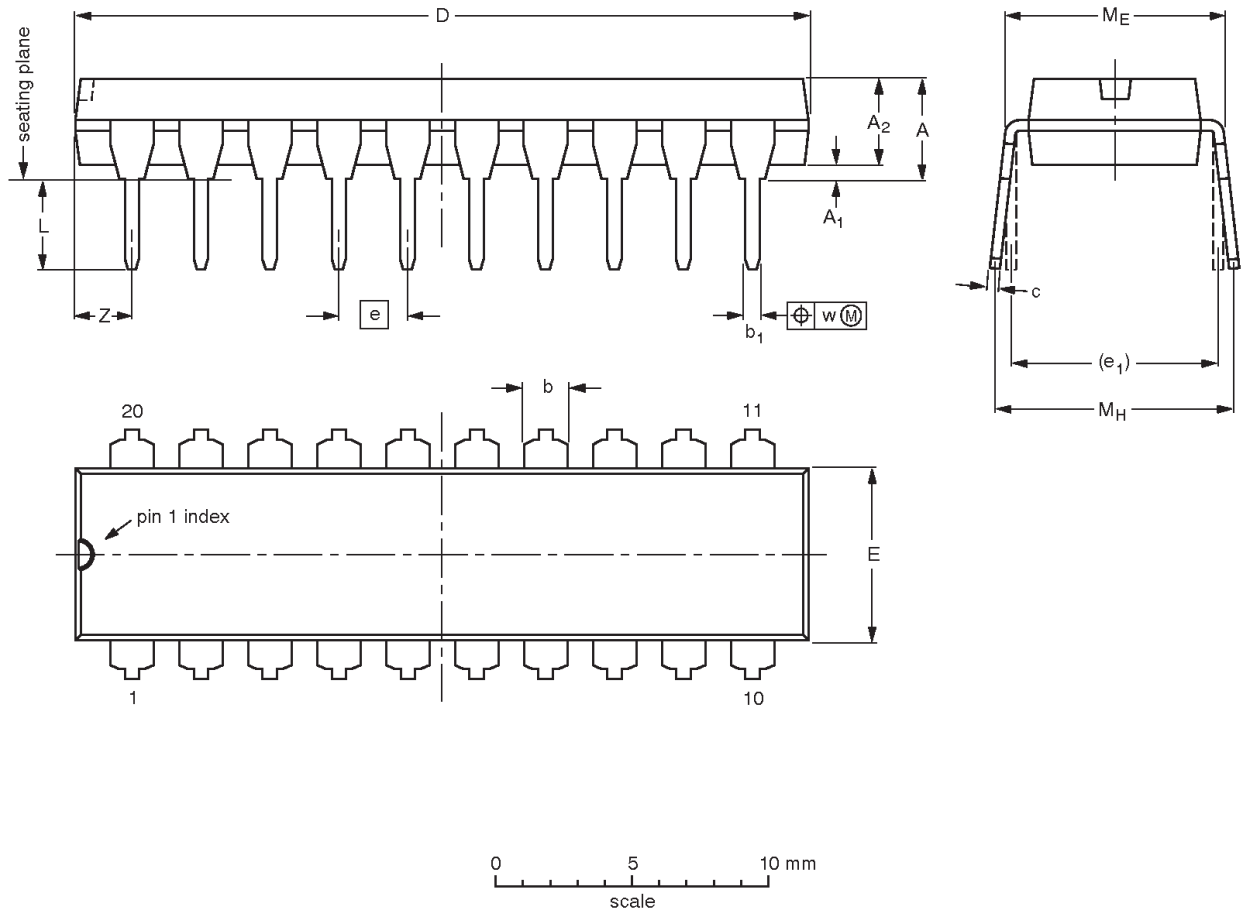


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DIP20: plastic dual in-line package; 20 leads (300 mil)

SOT146-1



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>1.30   | 0.53<br>0.38   | 0.36<br>0.23   | 26.92<br>26.54   | 6.40<br>6.22     | 2.54 | 7.62           | 3.60<br>3.05 | 8.25<br>7.80   | 10.0<br>8.3    | 0.254 | 2                        |
| inches | 0.17      | 0.02                   | 0.13                   | 0.068<br>0.051 | 0.021<br>0.015 | 0.014<br>0.009 | 1.060<br>1.045   | 0.25<br>0.24     | 0.1  | 0.3            | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.078                    |

Note

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

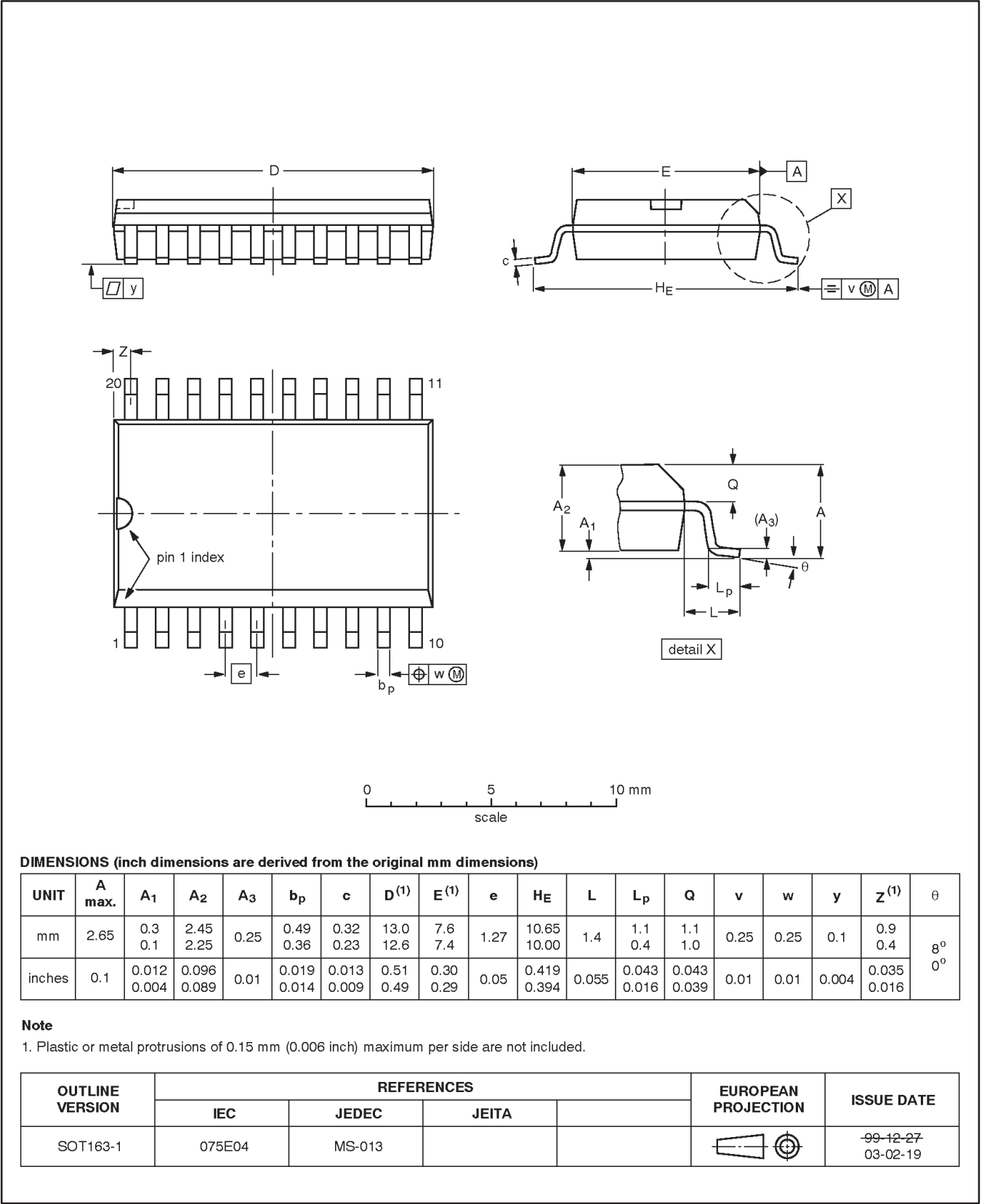
| OUTLINE<br>VERSION | REFERENCES |        |        |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|--------|--------|--|---------------------------------------------------------------------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA  |  |                                                                                       |                      |
| SOT146-1           |            | MS-001 | SC-603 |  |  | 99-12-27<br>03-02-13 |

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SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1

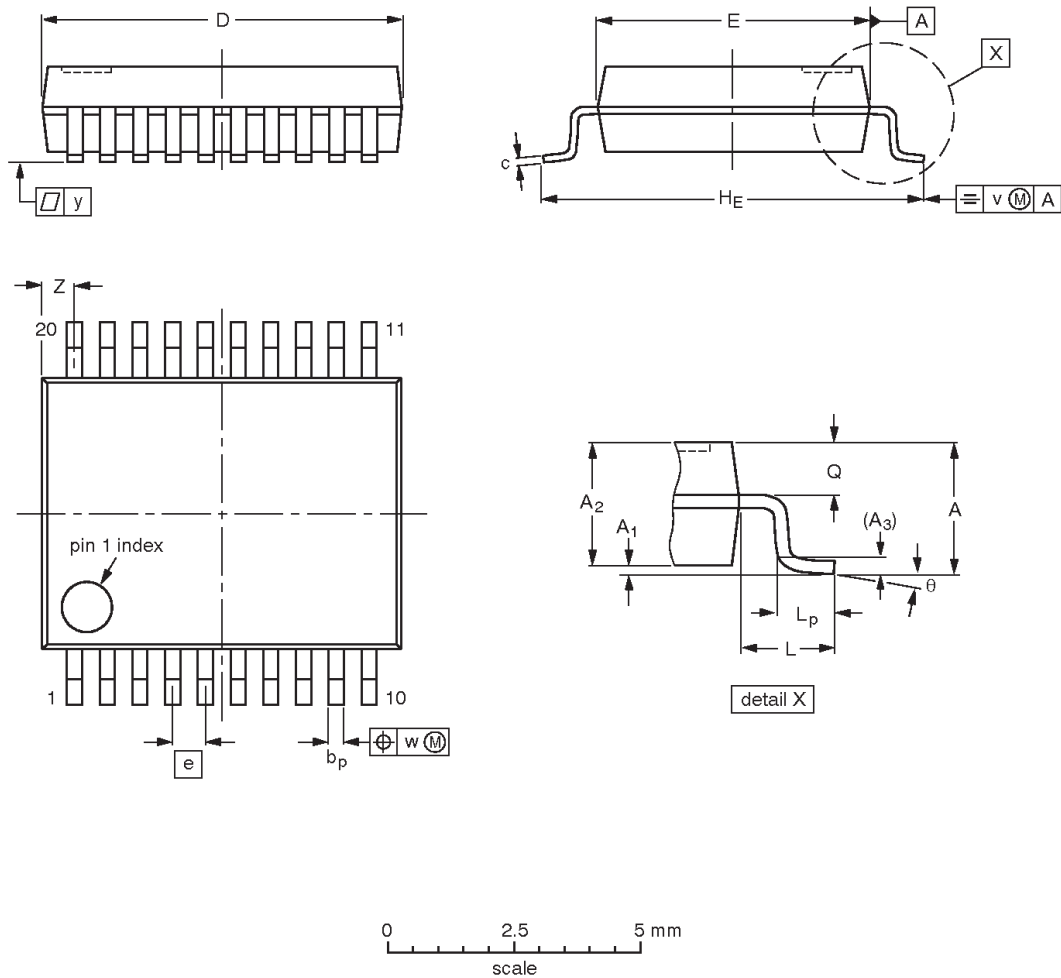


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SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



DIMENSIONS (mm are the original 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   | 2         | 0.21<br>0.05   | 1.80<br>1.65   | 0.25           | 0.38<br>0.25   | 0.20<br>0.09 | 7.4<br>7.0       | 5.4<br>5.2       | 0.65 | 7.9<br>7.6     | 1.25 | 1.03<br>0.63   | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 0.9<br>0.5       | 8°<br>0° |

Note

1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|--------|-------|--|------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |                      |
| SOT339-1           |            | MO-150 |       |  |                        | 99-12-27<br>03-02-19 |

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## REVISION HISTORY

| Rev | Date     | Description                                                                                                                                                                                                                                                                                                   |
|-----|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _4  | 20040225 | <b>Product data (9397 750 12941); supersedes data sheet 74F240_241_241A_3 of 2002 Mar 18 (9397 750 09571).</b><br>Modifications: <ul style="list-style-type: none"><li>• Delete all references to 74F241A (product discontinued).</li><li>• Separate 74F240 and 74F241 into standalone data sheets.</li></ul> |
| _3  | 20020318 | <b>Product data (9397 750 09571); supersedes previous version.</b>                                                                                                                                                                                                                                            |

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## Data sheet status

| Level | Data sheet status <sup>[1]</sup> | Product status <sup>[2] [3]</sup> | Definitions                                                                                                                                                                                                                                                                                    |
|-------|----------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I     | Objective data                   | Development                       | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.                                                                                                    |
| II    | Preliminary data                 | Qualification                     | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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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<http://www.semiconductors.philips.com>. Fax: +31 40 27 24825

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Date of release: 02-04

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Document order number:

9397 750 12941

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