

# DATA SHEET

**74F245**

Octal transceiver (3-State)

Product specification

1994 Nov 15

IC15 Data Handbook

**Philips Semiconductors**



**PHILIPS**

# Octal transceiver (3-State)

# 74F245

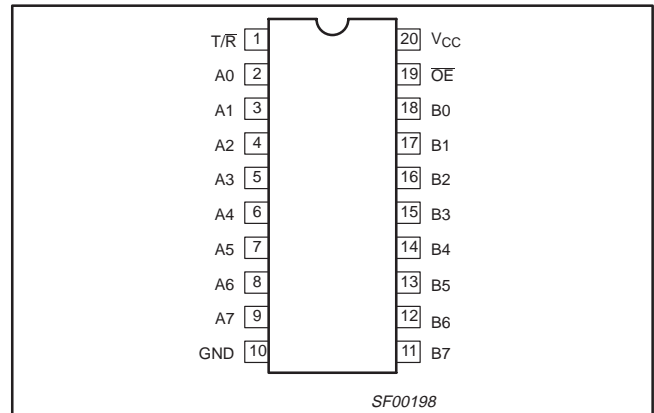
## FEATURES

- Octal bidirectional bus interface
- 3-State buffer outputs sink 64mA
- 15mA source current
- Outputs are placed in high impedance state during power-off conditions

## DESCRIPTION

The 74F245 is an octal transceiver featuring non-inverting 3-State bus compatible outputs in both transmit and receive directions. The B port outputs are capable of sinking 64mA and sourcing 15mA, producing very good capacitive drive characteristics. The device features an Output Enable ( $\overline{OE}$ ) input for easy cascading and Transmit/Receive (T/R) input for direction control. The 3-State outputs, B0–B7, have been designed to prevent output bus loading if the power is removed from the device.

## PIN CONFIGURATION



| TYPE   | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|--------|---------------------------|--------------------------------|
| 74F245 | 4.0ns                     | 70mA                           |

## ORDERING INFORMATION

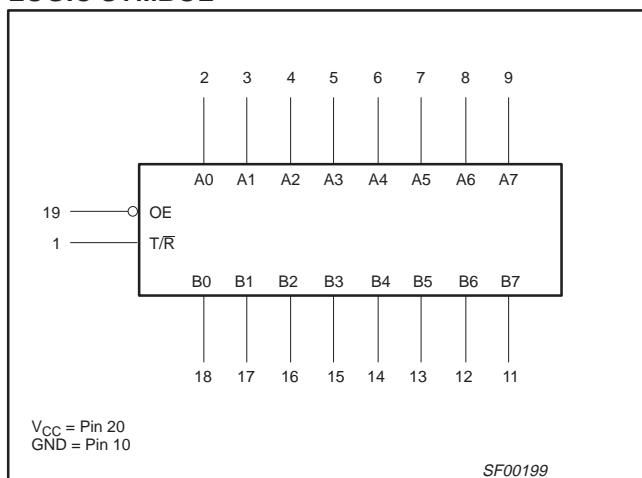
| DESCRIPTION                 | COMMERCIAL RANGE<br>$V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$ | DRAWING NUMBER |
|-----------------------------|---|----------------|
| 20-Pin Plastic DIP          | N74F245N  | SOT146-1       |
| 20-Pin Plastic SO           | N74F245D  | SOT163-1       |
| 20-Pin Plastic SSOP Type II | N74F245DB   | SOT339-1       |

## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

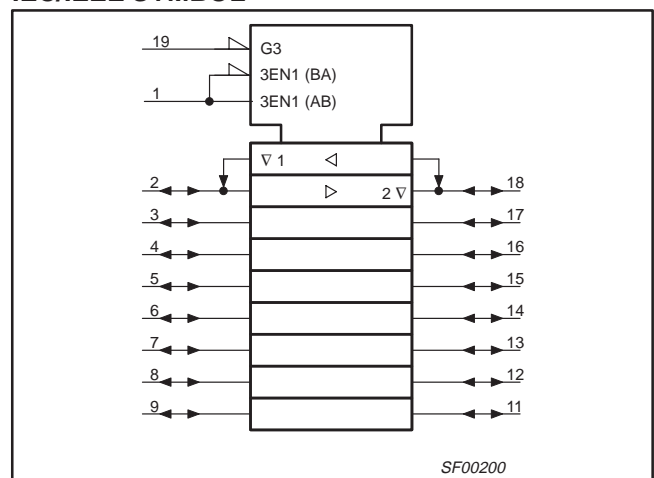
| PINS            | DESCRIPTION                      | 74F (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|-----------------|----------------------------------|---------------------|---------------------|
| A0–A7, B0–B7    | Data inputs                      | 3.5/1.0             | 70 $\mu$ A/0.6mA    |
| $\overline{OE}$ | Output Enable input (active Low) | 1.0/2.0             | 20 $\mu$ A/1.2mA    |
| T/R             | Transmit/Receive input           | 1.0/2.0             | 20 $\mu$ A/1.2mA    |
| A0–A7           | A port outputs                   | 150/40              | 3.0mA/24mA          |
| B0–B7           | B port outputs                   | 750/106.7           | 15mA/64mA           |

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

## LOGIC SYMBOL



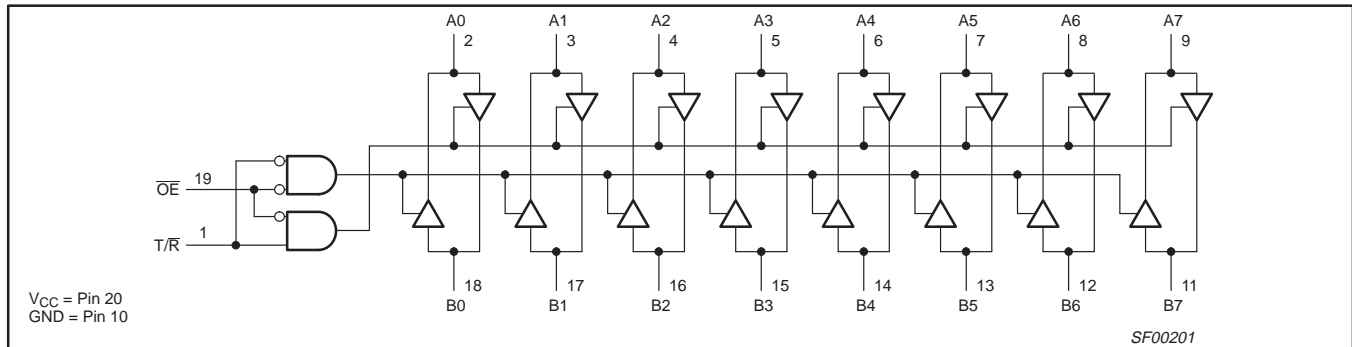
## IEC/IEEE SYMBOL



# Octal transceiver (3-State)

74F245

## LOGIC DIAGRAM



## FUNCTION TABLE

| INPUTS          |     | OUTPUTS             |
|-----------------|-----|---------------------|
| $\overline{OE}$ | T/R |                     |
| L               | L   | Bus B data to Bus A |
| L               | H   | Bus A data to Bus B |
| H               | X   | Z                   |

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

## ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits 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 <sub>CC</sub>  | Supply voltage                                 | -0.5 to +7.0 | V    |
| V <sub>IN</sub>  | Input voltage                                  | -0.5 to +7.0 | V    |
| I <sub>IN</sub>  | Input current                                  | -30 to +5    | mA   |
| V <sub>OUT</sub> | Voltage applied to output in High output state | -0.5 to +5.5 | V    |
| I <sub>OUT</sub> | Current applied to output in Low output state  | A0-A7        | 48   |
|                  |  | B0-B7        | 128  |
| T <sub>amb</sub> | Operating free-air temperature range           | 0 to +70     | °C   |
| T <sub>stg</sub> | Storage temperature range                      | -65 to +150  | °C   |

## RECOMMENDED OPERATING CONDITIONS

| SYMBOL           | PARAMETER                            | LIMITS |     |     | UNIT |
|------------------|--------------------------------------|--------|-----|-----|------|
|                  |                                      | MIN    | NOM | MAX |      |
| V <sub>CC</sub>  | Supply voltage                       | 4.5    | 5.0 | 5.5 | V    |
| V <sub>IH</sub>  | High-level input voltage             | 2.0    |     |     | V    |
| V <sub>IL</sub>  | Low-level input voltage              |        |     | 0.8 | V    |
| I <sub>IK</sub>  | Input clamp current                  |        |     | -18 | mA   |
| I <sub>OH</sub>  | High-level output current            | A0-A7  |     | -3  | mA   |
|                  |                                      | B0-B7  |     | -15 | mA   |
| I <sub>OL</sub>  | Low-level output current             | A0-A7  |     | 24  | mA   |
|                  |                                      | B0-B7  |     | 64  | mA   |
| T <sub>amb</sub> | Operating free-air temperature range | 0      |     | +70 | °C   |

## Octal transceiver (3-State)

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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                              | A0–A7, B0–B7     | V <sub>CC</sub> = MIN,<br>V <sub>IL</sub> = MAX,<br>V <sub>IH</sub> = MIN | I <sub>OH</sub> = –3mA  | ±10% V <sub>CC</sub> | 2.4    |                  |      | V    |
|                                   |  |                  |   |                         | ±5% V <sub>CC</sub>  | 2.7    | 3.4              |      | V    |
|                                   |  | B0–B7            |   | I <sub>OH</sub> = –15mA | ±10% V <sub>CC</sub> | 2.0    |                  |      | V    |
|                                   |  |                  |   |                         | ±5% V <sub>CC</sub>  | 2.0    |                  |      | V    |
| V <sub>OL</sub>                   | Low-level output voltage                               | A0–A7            | V <sub>CC</sub> = MIN,<br>V <sub>IL</sub> = MAX,<br>V <sub>IH</sub> = MIN | I <sub>OL</sub> = 20mA  | ±10% V <sub>CC</sub> |        | 0.30             | 0.50 | V    |
|                                   |  |                  |   | I <sub>OL</sub> = 24mA  | ±5% V <sub>CC</sub>  |        | 0.35             | 0.50 | V    |
|                                   |  | B0–B7            |   | I <sub>OL</sub> = MAX   | ±10% V <sub>CC</sub> |        |                  | 0.55 | V    |
| V <sub>OL</sub>                   | Low-level output voltage                               | B0–B7            | V <sub>CC</sub> = MIN,<br>V <sub>IL</sub> = MAX,<br>V <sub>IH</sub> = MIN | I <sub>OL</sub> = MAX   | ±5% V <sub>CC</sub>  |        | 0.42             | 0.55 | 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                 | OE, T/R          | V <sub>CC</sub> = 5.5V, V <sub>I</sub> = 7.0V                             |                         |                      |        |                  | 100  | μA   |
|                                   |  | A0–A7, B0–B7     | V <sub>CC</sub> = 5.5V, V <sub>I</sub> = 5.5V                             |                         |                      |        |                  | 1    | mA   |
| I <sub>IH</sub>                   | High-level input current                               | OE, T/R only     | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V                              |                         |                      |        |                  | 20   | μA   |
| I <sub>IL</sub>                   | Low-level input current                                | OE, T/R only     | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5V                              |                         |                      |        |                  | –1.2 | mA   |
| I <sub>IH</sub> +I <sub>OZH</sub> | Off-state output current<br>High level voltage applied |                  | V <sub>CC</sub> = MAX, V <sub>O</sub> = 2.7V                              |                         |                      |        |                  | 70   | μA   |
| I <sub>IL</sub> +I <sub>OZL</sub> | Off-state output current<br>Low level voltage applied  |                  | V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.5V                              |                         |                      |        |                  | –600 | μA   |
| I <sub>OS</sub>                   | Short-circuit output current <sup>3</sup>              | A0–A7            | V <sub>CC</sub> = MAX   |                         |                      | –60    |                  | –150 | mA   |
|                                   |  | B0–B7            |   |                         |                      | –100   |                  | –225 | mA   |
| I <sub>CC</sub>                   | Supply current (total)                                 | I <sub>CCH</sub> | V <sub>CC</sub> = MAX   |                         |                      |        | 60               | 87   | mA   |
|                                   |  | I <sub>CCL</sub> |   |                         |                      |        | 70               | 100  | mA   |
|                                   |  | I <sub>CCZ</sub> |   |                         |                      |        | 75               | 110  | 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

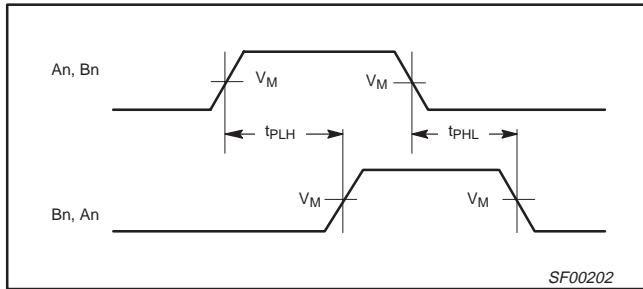
| SYMBOL                               | PARAMETER                                     | TEST CONDITION           | LIMITS  |            |            |  |            | UNIT |
|--------------------------------------|---|--------------------------|---|------------|------------|--|------------|------|
|                                      |   |                          | 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>An to Bn, Bn to An       | Waveform 1               | 2.5<br>2.5  | 3.5<br>4.0 | 6.0<br>6.0 | 2.5<br>2.5   | 7.0<br>7.0 | ns   |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable time<br>to High or Low level    | Waveform 2<br>Waveform 3 | 2.0<br>3.5  | 4.5<br>5.5 | 7.0<br>8.0 | 2.0<br>3.5   | 8.0<br>9.0 | ns   |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable time<br>from High or Low level | Waveform 2<br>Waveform 3 | 2.5<br>1.0  | 5.0<br>3.5 | 6.5<br>6.0 | 2.0<br>1.0   | 7.5<br>7.0 | ns   |

# Octal transceiver (3-State)

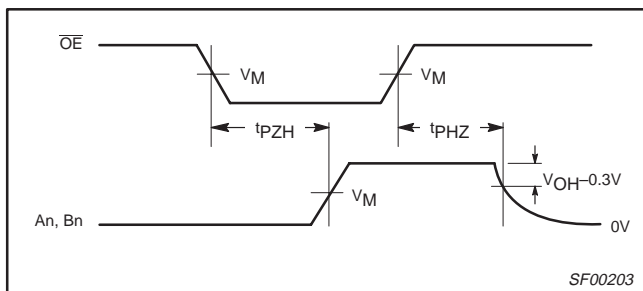
74F245

## AC WAVEFORMS

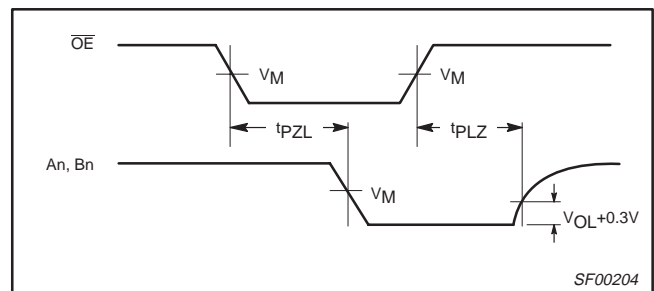
For all waveforms,  $V_M = 1.5V$ .



Waveform 1. Propagation Delay for Non-Inverting Output



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

## TEST CIRCUIT AND WAVEFORMS

**Test Circuit for Open Collector Outputs**

| SWITCH POSITION |        |
|-----------------|--------|
| TEST            | SWITCH |
| $t_{PLZ}$       | closed |
| $t_{PZL}$       | closed |
| All other       | open   |

**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     |

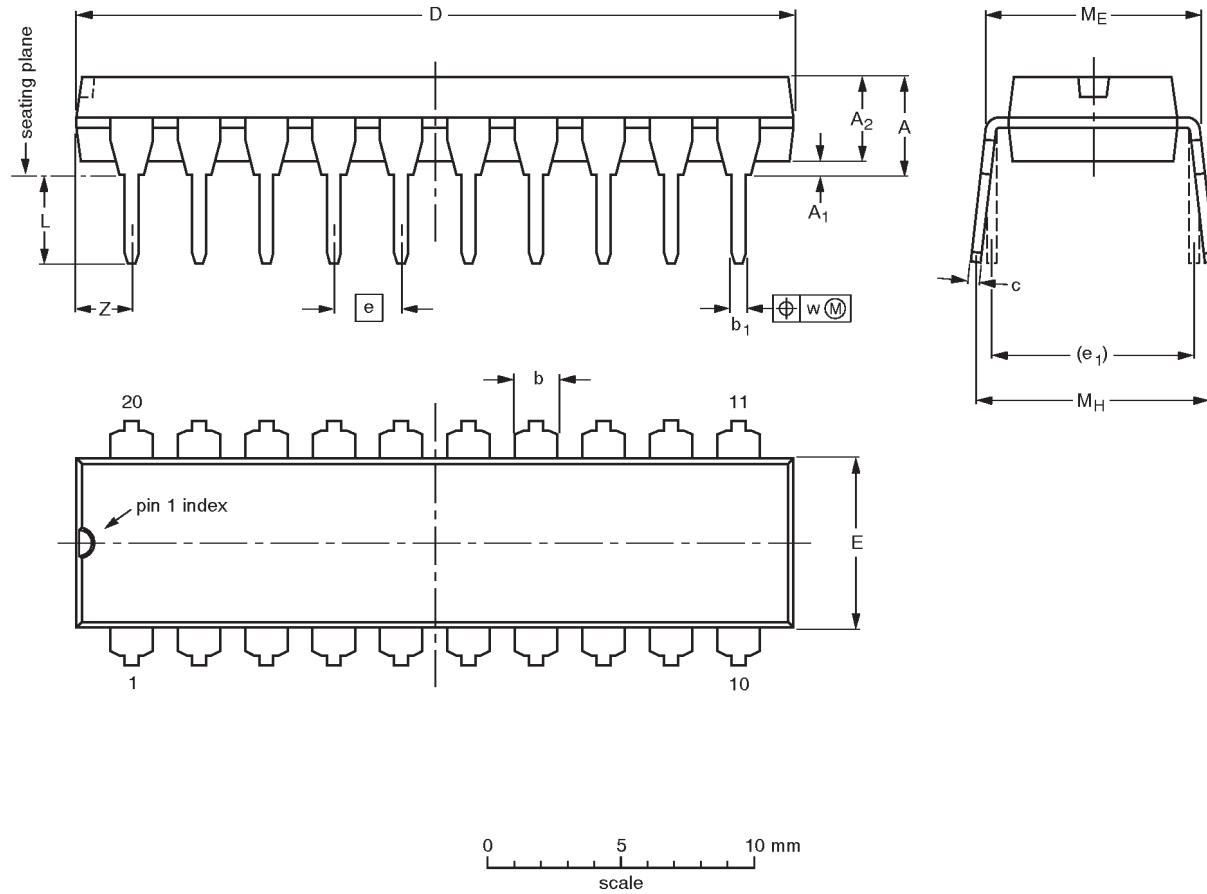
SF00128

# Octal transceiver (3-State)

# 74F245

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

**SOT146-1**



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

| UNIT   | A max. | A <sub>1</sub> min. | A <sub>2</sub> 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> 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 | 2.0                   |
| inches | 0.17   | 0.020               | 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     | 0.10 | 0.30           | 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 maximum per side are not included.

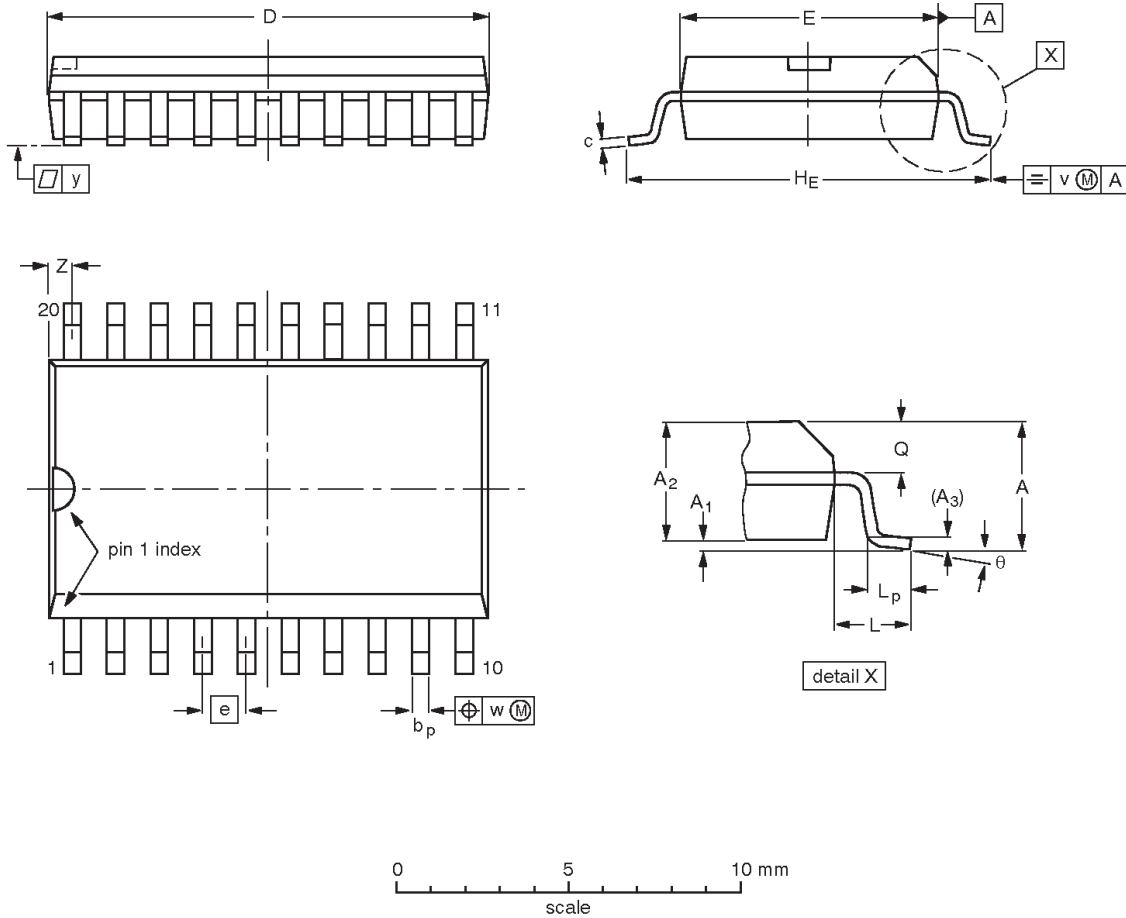
| OUTLINE VERSION | REFERENCES |       |       |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|-------|-------|--|---------------------|----------------------|
|                 | IEC        | JEDEC | EIAJ  |  |                     |                      |
| SOT146-1        |            |       | SC603 |  |                     | 92-11-17<br>95-05-24 |

# Octal transceiver (3-State)

# 74F245

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

**SOT163-1**



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

| UNIT   | A 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     | 2.65   | 0.30<br>0.10   | 2.45<br>2.25   | 0.25           | 0.49<br>0.36   | 0.32<br>0.23   | 13.0<br>12.6     | 7.6<br>7.4       | 1.27  | 10.65<br>10.00 | 1.4   | 1.1<br>0.4     | 1.1<br>1.0     | 0.25 | 0.25 | 0.1   | 0.9<br>0.4       | 8°<br>0° |
| inches | 0.10   | 0.012<br>0.004 | 0.096<br>0.089 | 0.01           | 0.019<br>0.014 | 0.013<br>0.009 | 0.51<br>0.49     | 0.30<br>0.29     | 0.050 | 0.419<br>0.394 | 0.055 | 0.043<br>0.016 | 0.043<br>0.039 | 0.01 | 0.01 | 0.004 | 0.035<br>0.016   |          |

**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 |  |                     |                      |
| SOT163-1        | 075E04     | MS-013AC |      |  |                     | 95-01-24<br>97-05-22 |

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Octal transceiver (3-State)

74F245

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**NOTES**

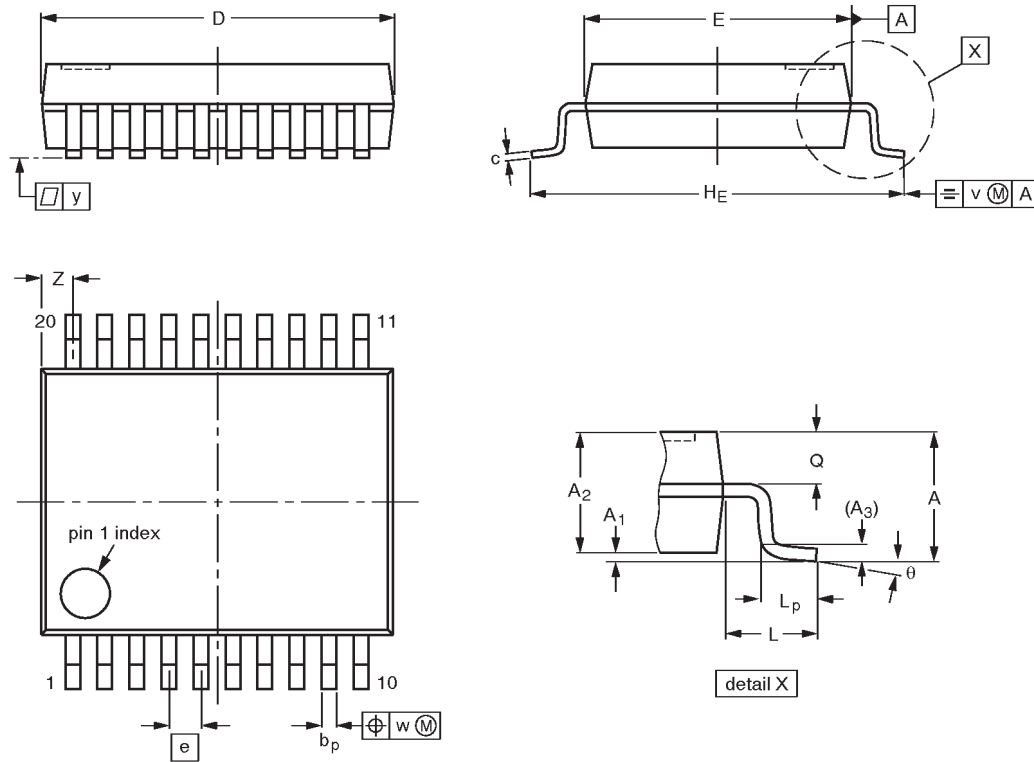


# Octal transceiver (3-State)

# 74F245

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

**SOT339-1**



**DIMENSIONS (mm are the original dimensions)**

| UNIT | A 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    | 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 0.20 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT339-1        |            | MO-150AE |      |  |                     | 93-09-08<br>95-02-04 |

## Octal transceiver (3-State)

74F245

## DEFINITIONS

| Data Sheet Identification        | Product Status                | Definition   |
|----------------------------------|-------------------------------|--|
| <i>Objective Specification</i>   | <b>Formative or in Design</b> | This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.   |
| <i>Preliminary Specification</i> | <b>Preproduction Product</b>  | 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. |
| <i>Product Specification</i>     | <b>Full Production</b>        | 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.  |

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