

DATA SHEET

74F245

Octal transceiver (3-State)

Product specification

1994 Nov 15

IC15 Data Handbook

Philips Semiconductors



PHILIPS

Octal transceiver (3-State)

74F245

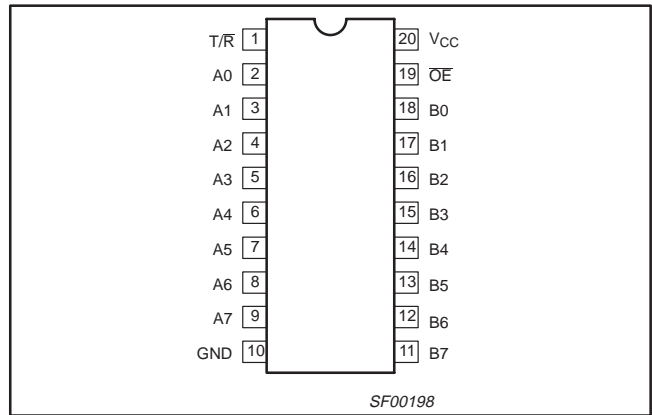
FEATURES

- 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

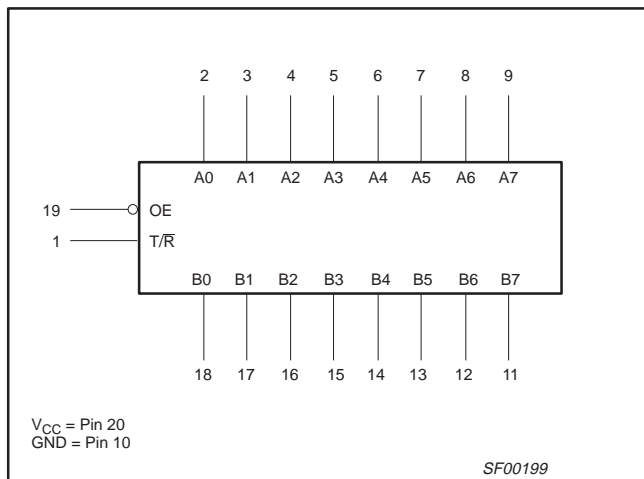
| DESCRIPTION | COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$ | DRAWING NUMBER |
|-----------------------------|---------------------------------------------------------------------------------------|----------------|
| 20-Pin Plastic DIP | N74F245N | SOT146-1 |
|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

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

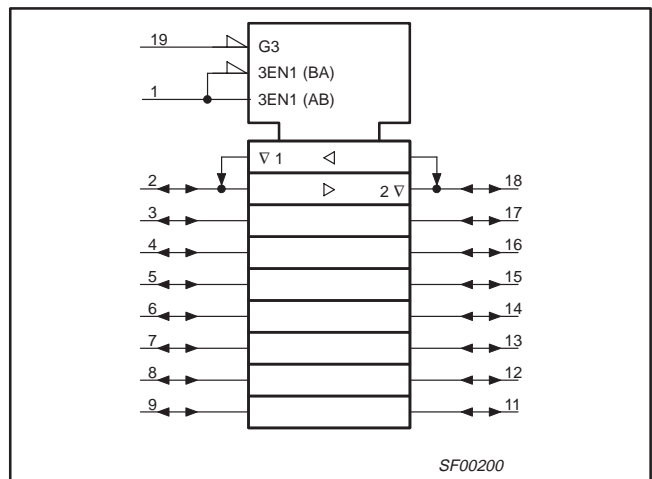
| PINS | DESCRIPTION | 74F (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|-----------------|----------------------------------|---------------------|---------------------|
| A0–A7, B0–B7 | Data inputs | 3.5/1.0 | 70 μ A/0.6mA |
| \overline{OE} | Output Enable input (active Low) | 1.0/2.0 | 20 μ A/1.2mA |
| T/R | Transmit/Receive input | 1.0/2.0 | 20 μ 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 μ A in the High state and 0.6mA in the Low state.

LOGIC SYMBOL



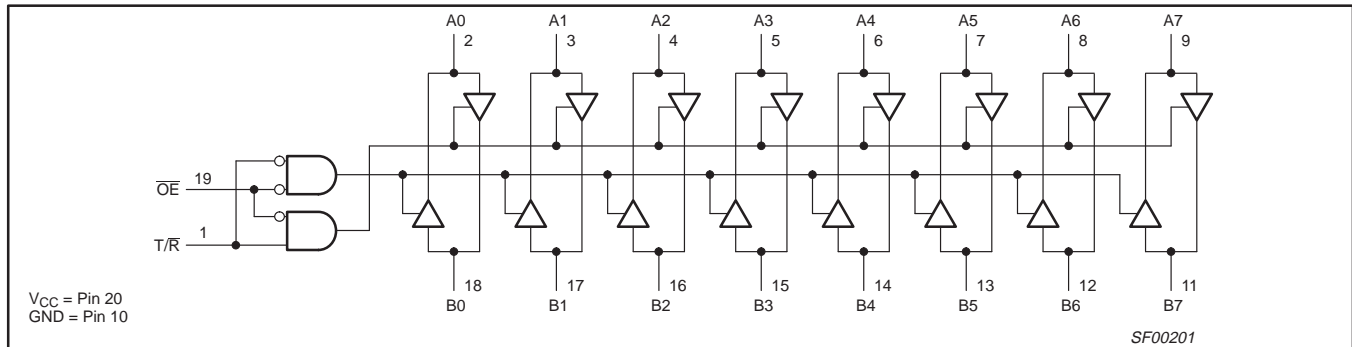
IEC/IEEE SYMBOL



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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_{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 +5.5 | V |
| I_{OUT} | Current applied to output in Low output state | A0-A7 | 48 |
| | | B0-B7 | 128 |
| 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 | A0-A7 | | -3 | mA |
| | | B0-B7 | | -15 | mA |
| I_{OL} | Low-level output current | A0-A7 | | 24 | mA |
| | | B0-B7 | | 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 ¹ | | | LIMITS | | | UNIT | |
|-----------------------------------|--------------------------------------------------------|-------------------|---------------------------------------------------------------------------|-------------------------|----------------------|--------|------------------|------|------|----|
| | | | | | | MIN | TYP ² | MAX | | |
| V _{OH} | High-level output voltage | A0–A7, B0–B7 | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OH} = –3mA | ±10% V _{CC} | 2.4 | | | V | |
| | | | | | ±5% V _{CC} | 2.7 | 3.4 | | V | |
| | | B0–B7 | | I _{OH} = –15mA | ±10% V _{CC} | 2.0 | | | V | |
| | | | | | ±5% V _{CC} | 2.0 | | | V | |
| V _{OL} | Low-level output voltage | A0–A7 | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = 20mA | ±10% V _{CC} | | 0.30 | 0.50 | V | |
| | | | | I _{OL} = 24mA | ±5% V _{CC} | | 0.35 | 0.50 | V | |
| | | B0–B7 | | I _{OL} = MAX | ±10% V _{CC} | | | 0.55 | V | |
| V _{OL} | Low-level output voltage | B0–B7 | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = MAX | ±5% V _{CC} | | 0.42 | 0.55 | V | |
| 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 | OE, T/R | V _{CC} = 5.5V, V _I = 7.0V | | | | | 100 | μA | |
| | | A0–A7, B0–B7 | V _{CC} = 5.5V, V _I = 5.5V | | | | | 1 | mA | |
| I _{IH} | High-level input current | OE, T/R only | V _{CC} = MAX, V _I = 2.7V | | | | | 20 | μA | |
| I _{IL} | Low-level input current | OE, T/R only | V _{CC} = MAX, V _I = 0.5V | | | | | –1.2 | mA | |
| I _{IH} +I _{OZH} | Off-state output current High level voltage applied | | V _{CC} = MAX, V _O = 2.7V | | | | | 70 | μA | |
| I _{IL} +I _{OZL} | Off-state output current Low level voltage applied | | V _{CC} = MAX, V _O = 0.5V | | | | | –600 | μA | |
| I _{OS} | Short-circuit output current ³ | A0–A7 | V _{CC} = MAX | | | | –60 | | –150 | mA |
| | | B0–B7 | | | | | –100 | | –225 | mA |
| I _{CC} | Supply current (total) | I _{CC} H | V _{CC} = MAX | | | | 60 | 87 | mA | |
| | | I _{CC} L | | | | | 70 | 100 | mA | |
| | | I _{CC} Z | | | | | 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_{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

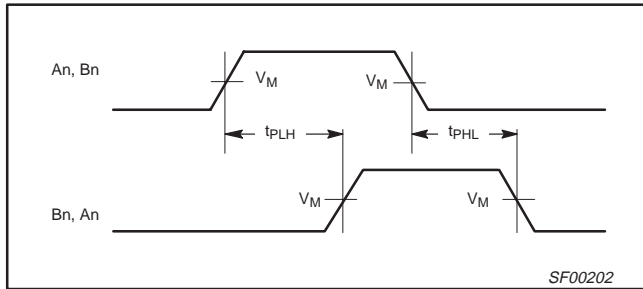
| SYMBOL | PARAMETER | TEST CONDITION | LIMITS | | | | | UNIT |
|--------------------------------------|-----------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------|------------|------------|------------------------------------------------------------------------------------------------------------------|------------|------|
| | | | V _{CC} = +5.0V T _{amb} = +25°C C _L = 50pF, R _L = 500Ω | | | V _{CC} = +5.0V ± 10% T _{amb} = 0°C to +70°C C _L = 50pF, R _L = 500Ω | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| t _{PLH} t _{PHL} | Propagation delay An to Bn, Bn to An | Waveform 1 | 2.5 2.5 | 3.5 4.0 | 6.0 6.0 | 2.5 2.5 | 7.0 7.0 | ns |
| t _{PZH} t _{PZL} | Output Enable time to High or Low level | Waveform 2 Waveform 3 | 2.0 3.5 | 4.5 5.5 | 7.0 8.0 | 2.0 3.5 | 8.0 9.0 | ns |
| t _{PHZ} t _{PLZ} | Output Disable time from High or Low level | Waveform 2 Waveform 3 | 2.5 1.0 | 5.0 3.5 | 6.5 6.0 | 2.0 1.0 | 7.5 7.0 | ns |

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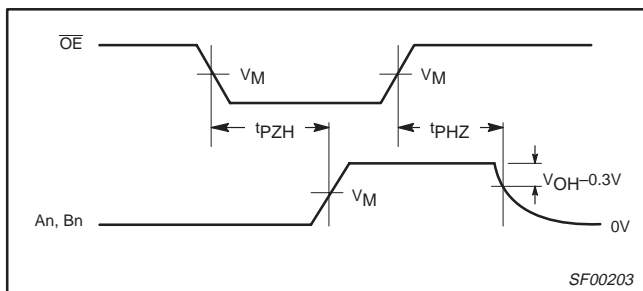
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AC WAVEFORMS

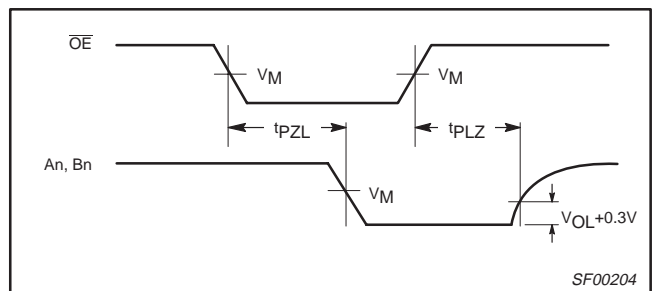
For all waveforms, $V_M = 1.5V$.



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 |

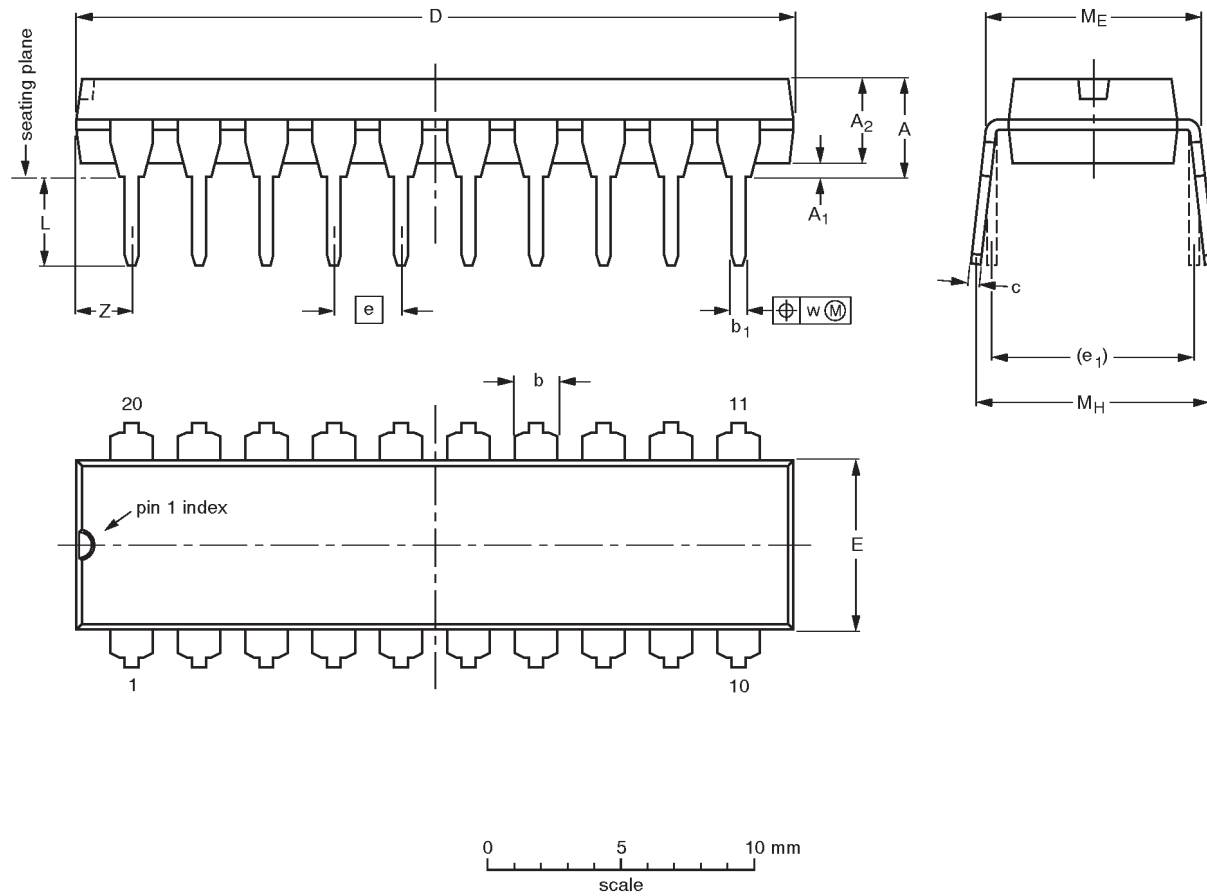
SF00128

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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 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 1.30 | 0.53 0.38 | 0.36 0.23 | 26.92 26.54 | 6.40 6.22 | 2.54 | 7.62 | 3.60 3.05 | 8.25 7.80 | 10.0 8.3 | 0.254 | 2.0 |
| inches | 0.17 | 0.020 | 0.13 | 0.068 0.051 | 0.021 0.015 | 0.014 0.009 | 1.060 1.045 | 0.25 0.24 | 0.10 | 0.30 | 0.14 0.12 | 0.32 0.31 | 0.39 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 95-05-24 |

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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 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 | 2.65 | 0.30 0.10 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 13.0 12.6 | 7.6 7.4 | 1.27 | 10.65 10.00 | 1.4 | 1.1 0.4 | 1.1 1.0 | 0.25 | 0.25 | 0.1 | 0.9 0.4 | 8° 0° |
| inches | 0.10 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.51 0.49 | 0.30 0.29 | 0.050 | 0.419 0.394 | 0.055 | 0.043 0.016 | 0.043 0.039 | 0.01 | 0.01 | 0.004 | 0.035 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 97-05-22 |

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NOTES

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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 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 | 2.0 | 0.21 0.05 | 1.80 1.65 | 0.25 | 0.38 0.25 | 0.20 0.09 | 7.4 7.0 | 5.4 5.2 | 0.65 | 7.9 7.6 | 1.25 | 1.03 0.63 | 0.9 0.7 | 0.2 | 0.13 | 0.1 | 0.9 0.5 | 8° 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 95-02-04 |

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DEFINITIONS

| Data Sheet Identification | Product Status | Definition |
|----------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Objective Specification</i> | Formative or in Design | 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> | Preproduction Product | 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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