

DATA SHEET

74LVC1284

**3.3V Parallel printer interface
transceiver/buffer**

Product specification

1995 Nov 10

IC24 Low Voltage Handbook

3.3V Parallel printer interface transceiver/buffer

74LVC1284

FEATURES

- Asynchronous operation
- 4-Bit transceivers
- 3 additional buffer/driver lines
- TTL compatible inputs
- ESD protection exceeds 1000V per MIL STD 883 Method 3015 and 200V per Machine Model
- Input Hysteresis
- Low Noise Operation
- Center Pin V_{CC} & GND
- IEEE 1284 Compliant Level 1 & 2
- Overvoltage Protection on B side

DESCRIPTION

The 74LVC1284 parallel interface chip is designed to provide an asynchronous, 4-bit, bi-directional, parallel printer interface for personal computers. Three additional lines are included to provide handshaking signals between the host and the peripheral. The part is designed to match IEEE 1284 standard.

The 4 transceiver pins (A/B 1-4) allow data transmission from the A bus to the B bus, or from the B bus to the A bus, depending on the state of the direction pin DIR.

The B bus and the Y5-Y7 lines have totem pole or open drain style outputs depending on the state of the high drive enable pin HD. The A bus only has totem pole style outputs. All inputs are TTL compatible with at least 300mV of input hysteresis at $V_{CC} = 3.3V$.

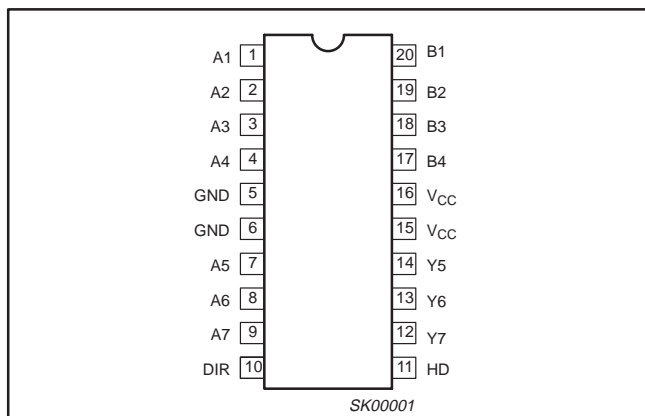
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{amb} = 25^{\circ}C$; GND = 0V | TYPICAL | UNIT |
|----------------------------|---|---|-----------|----------|
| R_D | B/Y Side output resistance | $V_{CC} = 3.3V$; $V_O = 1.65V \pm 0.2V$ (See Figure 2) | 45 | Ω |
| SR | B/Y Side slew rate | $R_L = 62\Omega$; $C_L = 50pF$ (See Waveform 4) | 0.2 | V/ns |
| I_{CC} | Total static current | $V_I = V_{CC}/GND$; $I_O = 0$ | 5 | μA |
| V_{HYS} | Input hysteresis | $V_{CC} = 3.3V$ | 0.4 | V |
| t_{PLH}/t_{PHL} A-B/Y | Propagation delay to the B/Y side outputs | $V_{CC} = 3.3V$ | 12.6/12.4 | ns |

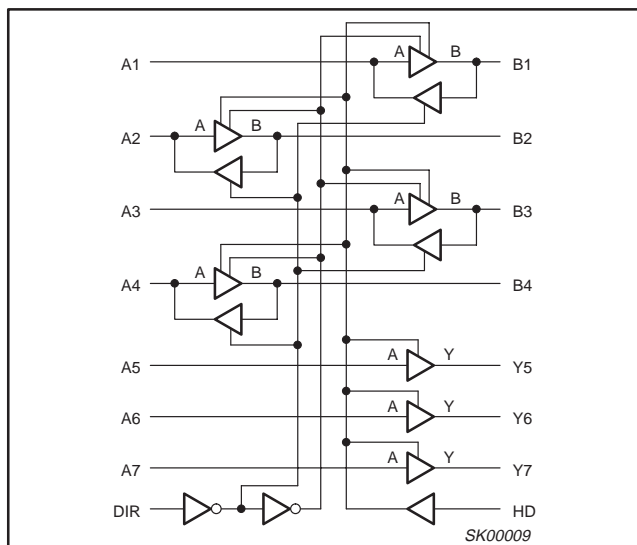
ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | ORDER CODE | DRAWING NUMBER |
|-----------------------------|-------------------|--------------|----------------|
| 20-pin plastic SO | 0°C to +70°C | 7LVC1284 D | SOT163-1 |
| 20-pin plastic SSOP Type II | 0°C to +70°C | 74LVC1284 DB | SOT339-1 |
| 20-pin plastic TSSOP Type I | 0°C to +70°C | 74LVC1284 PW | SOT360-1 |

PIN CONFIGURATION



LOGIC SYMBOL



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PIN DESCRIPTION

| PIN NUMBER | SYMBOL | FUNCTION |
|-------------|-----------------|------------------------------------|
| 1,2,3,4 | A1 - A4 | Data inputs/outputs |
| 20,19,18,17 | B1 - B4 | IEEE 1284 Std. outputs/inputs |
| 7,8,9 | A5 - A7 | Data inputs |
| 14,13,12 | Y5 - Y7 | IEEE 1284 Std. outputs |
| 10 | DIR | Direction selection |
| 11 | HD | B/Y-side high drive enable/disable |
| 5,6 | GND | Ground (0V) |
| 15,16 | V _{CC} | Positive supply voltage |

FUNCTION TABLE

| INPUTS | | | OUTPUTS | INPUTS/OUTPUTS | |
|--------|----|------|---------|----------------|-------------|
| DIR | HD | A5-7 | Y5-7 | A1-4 | B1-4 |
| L | L | L | L | A = B | Inputs |
| L | L | H | Z | A = B | Inputs |
| L | H | L | L | A = B | Inputs |
| L | H | H | H | A = B | Inputs |
| H | L | L | L | Inputs Low | Outputs Low |
| H | L | H | Z | Inputs High | Outputs Z |
| H | H | L | L | Inputs | B = A |
| H | H | H | H | Inputs | B = A |

H = High Voltage

L = Low Voltage

Z = High Impedance, Off-State

ABSOLUTE MAXIMUM RATINGS^{1, 2}

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|-----------------------------------|---|------------------------------|-------------------------------|------|
| | ESD Immunity, per Mil Std 883C method 3015 | | ± 2 | kV |
| V _{CC} | DC supply voltage | | -0.5 to +4.6 | V |
| I _{IK} | DC input diode current | V _I < 0 | ± 20 | mA |
| I _{OK} | DC output diode current | V _O < 0 | ± 50 | mA |
| V _{IN} | DC input voltage ³ | | -0.5 to +5.5 | V |
| V _{OUT B/YDC} | DC output voltage on B/Y side ³ | | -0.5 to +5.5 | V |
| V _{OUT B/Y (tr)} | Transient output voltage on B/Y side ⁴ | 40ns transient | -2 to +7 | V |
| V _{OUT A side} | DC output voltage on A side | | -0.5 to V _{CC} + 0.5 | V |
| I _O | DC output current | Outputs in High or Low state | ± 50 | mA |
| T _{stg} | Storage temperature range | | -60 to +150 | °C |
| I _{CC} /I _{GND} | Continuous current through V _{CC} or GND | | ± 200 | mA |

NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- V_{OUT B/Y (tr)} guarantees only that this part will not be damaged by reflections in application so long as the voltage levels remain in the specified range.

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | UNIT |
|------------------|--------------------------------------|--------|-----------------|------|
| | | MIN | MAX | |
| V _{CC} | DC supply voltage | 3.0 | 3.6 | V |
| V _I | Input voltage | 0 | V _{CC} | V |
| V _{OUT} | B/Y output voltage | -0.5 | 5.5 | V |
| V _{OUT} | A side output voltage | 0 | V _{CC} | V |
| I _{OH} | B/Y side output current High | | -14 | mA |
| I _{OL} | B/Y side output current Low | | 14 | mA |
| T _{amb} | Operating free-air temperature range | 0 | +70 | °C |

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DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | | TEST CONDITIONS | LIMITS | | | | | UNIT |
|------------------------------------|---------------------------------------|----------|--|-------------------------|-----------------|------|---------------------------------|------|------|
| | | | | T _{amb} = 25°C | | | T _{amb} = 0°C to +70°C | | |
| | | | | MIN | TYP | MAX | MIN | MAX | |
| V _{OH} | High-level output voltage | An | V _{CC} = Min to Max; I _{OH} = -50μA | V _{CC} -0.2 | V _{CC} | | V _{CC} -0.2 | | V |
| | | Bn or Yn | V _{CC} = 3.0V; I _{OH} = -4mA | 2.4 | | | 2.4 | | V |
| | | | V _{CC} = 3.0V; I _{OH} = 14mA | 2.2 | 2.4 | | 2.1 | | V |
| V _{OL} | Low-level output voltage | An | V _{CC} = Min to Max; I _{OL} = 50μA; V _I = V _{IL} or V _{IH} | | | 0.2 | | 0.2 | V |
| | | | V _{CC} = 3.0V; I _{OL} = 4mA; V _I = V _{IL} or V _{IH} | | | 0.4 | | 0.4 | V |
| | | Bn or Yn | V _{CC} = 3.0V; I _{OL} = -14mA; V _I = V _{IL} or V _{IH} | | | 0.8 | | 0.9 | V |
| V _{IH} | High-level input voltage | | V _{CC} = Min to Max | | | 0.8 | | 0.8 | |
| V _{IL} | Low-level input voltage | | V _{CC} = Min to Max | 2.0 | | | 2.0 | | |
| V _{HYS} | Input Hysteresis | | V _{CC} = 3.3V | | 0.4 | | 0.3 | | V |
| R _D | B/Y side Output Impedance | | See Figure 2 | 38 | 45 | 53 | 35 | 55 | Ω |
| I _I | Input leakage current (A5-A7 DIR, HD) | | V _{CC} = 3.6V; V _O = V _{CC} or GND; Not for I/O pins | | | ±1.0 | | ±5.0 | μA |
| I _{IHZ} /I _{ILZ} | Input current for common I/O pins | | V _{CC} = 3.6V; V _I = 5.5V or GND | | ±0.1 | ±15 | | | μA |
| I _{OFF} | B/Y Side Power-off leakage current | | V _{CC} = 0.0V; V _O = 0 to 5.5V | | | ±10 | | ±100 | μA |
| I _{OZH} | 3-State output High current Yn | | V _{CC} = 3.6V; V _O = V _{CC} ; V _I = V _{IL} or V _{IH} | | | 5 | | 20 | μA |
| I _{OZL} | 3-State output Low current Yn | | V _{CC} = 3.6V; V _O = GND; V _I = V _{IL} or V _{IH} | | | -5 | | -20 | μA |
| I _{IH} +I _{OZH} | current (A1 - A4, Bn) | | V _{CC} = 3.6V; V _{I/O} = V _{CC} | | | 5 | | 25 | μA |
| I _{IL} +I _{OZL} | current (A1 - A4, Bn) | | V _{CC} = 3.6V; V _{I/O} = GND | | | -5 | | -25 | μA |
| I _{CC} | Quiescent Supply Current | | V _{CC} = 3.6V; I _O = 0; V _I = GND or V _{CC} | | 5 | 10 | | 50 | μA |

AC CHARACTERISTICS

GND = 0V, t_r = t_f = 3.0ns, C_L = 50pF, R_L = 500Ω

| SYMBOL | PARAMETER | | WAVEFORM | LIMITS | | | | | UNIT |
|--------------------------------------|---|--|----------|---|------|------|---|------|------|
| | | | | T _{amb} = 25°C V _{CC} = 3.3V | | | T _{amb} = 0 to +70°C V _{CC} = Min to Max | | |
| | | | | MIN | TYP | MAX | MIN | MAX | |
| SR | B-Side Slew Rate | | 4 | 0.05 | 0.2 | 0.35 | 0.05 | 0.4 | V/ns |
| t _{PLH} t _{PHL} | Propagation delay A to Y or A to B | | 5 | 6.0 | 12.6 | 18.0 | 5.0 | 19.5 | ns |
| | | | | 6.0 | 12.4 | 18.0 | 5.0 | 20.0 | |
| t _{PLH} t _{PHL} | Propagation delay B to A | | 1 | 1.5 | 5.5 | 7.9 | 1.5 | 9.5 | ns |
| | | | | 1.5 | 5.6 | 7.6 | 1.5 | 9.0 | |
| t _{PZH} t _{PHZ} | Output enable/disable time to/from High level HD to Y or HD to B | | 2 | 4.0 | 12.0 | 16.0 | 4.0 | 20.0 | ns |
| | | | | 2.0 | 6.5 | 9.1 | 2.0 | 11.0 | |
| t _{PZL} t _{PLZ} | Output enable/disable time to/from Low level A to Y or A to B | | 2 | 5.0 | 12.7 | 16.3 | 5.0 | 20.0 | ns |
| | | | | 1.5 | 5.0 | 7.1 | 1.5 | 9.0 | |
| t _{PZH} t _{PZL} | Output enable time from DIR to B | | 2 | 8.0 | 12.3 | 18.0 | 4.0 | 20.0 | ns |
| | | | | 8.0 | 12.7 | 18.0 | 4.0 | 20.0 | |
| t _{PHZ} t _{PLZ} | Output disable time from DIR to B | | 2 | 5.0 | 8.9 | 12.5 | 2.0 | 14.5 | ns |
| | | | | 6.0 | 9.1 | 12.0 | 2.0 | 14.0 | |
| t _{PZH} t _{PZL} | Output enable time from DIR to A | | 2 | 3.5 | 6.9 | 13.0 | 3.0 | 14.5 | ns |
| | | | | 4.0 | 8.6 | 14.0 | 3.0 | 16.0 | |
| t _{PHZ} t _{PLZ} | Output disable from DIR to A | | 2 | 2.5 | 3.7 | 5.5 | 2.0 | 6.0 | ns |
| | | | | 2.5 | 3.7 | 5.0 | 2.0 | 5.5 | |

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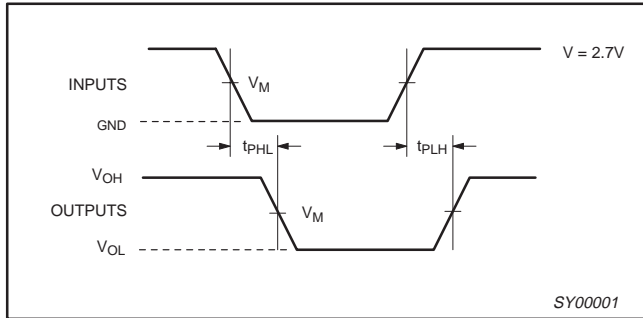
AC WAVEFORMS

$V_M = 1.5V$

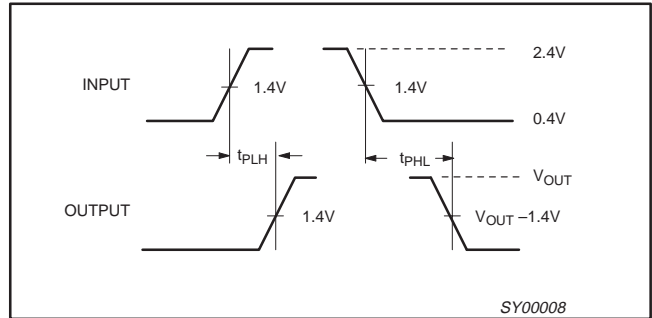
$V_X = V_{OL} \pm 0.3V$

$V_Y = V_{OH} - 0.3V$

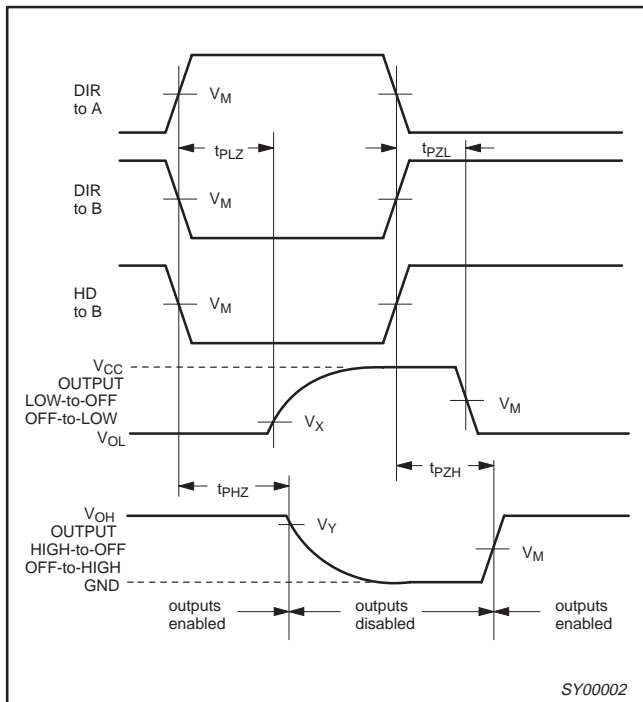
V_{OL} and V_{OH} are the typical output voltage drops that occur with the output load. (V_{CC} never goes below 3.0V).



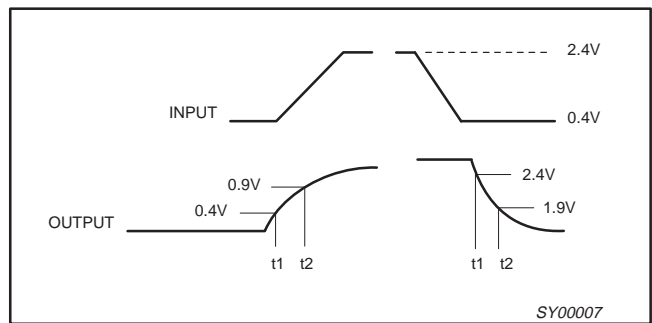
Waveform 1. Input Bn to output An propagation delays



Waveform 3. Voltage Waveforms Propagation Delay Times (A To B) Measured at Output Pin



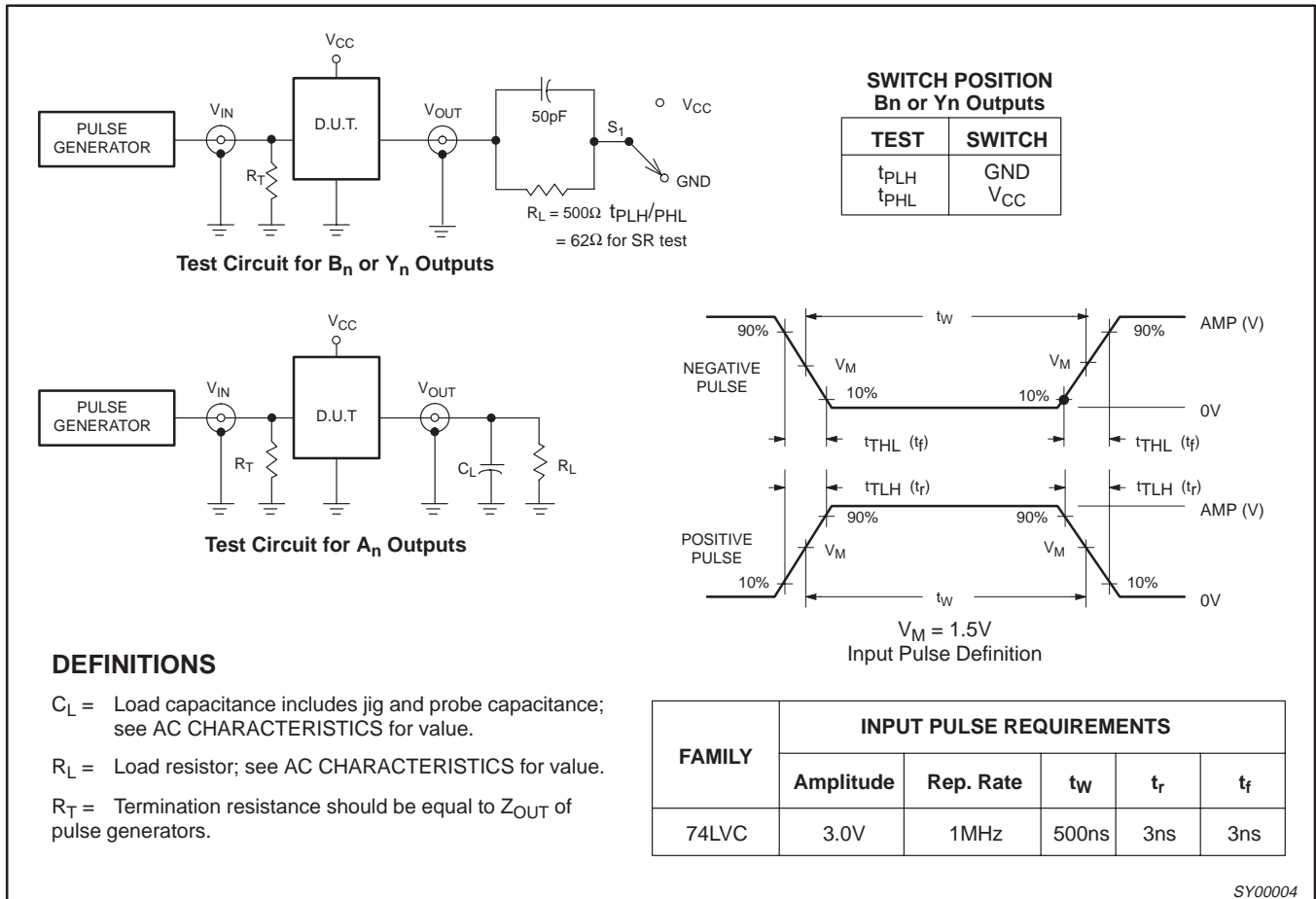
Waveform 2. 3-State enable and disable times



Waveform 4. Slew Rate Waveforms Voltage Waveforms
 (Input pulse rise and fall time are 3ns, $150ns < \text{pulse width} < 10 \mu s$, for both a Low to High and a High to Low transition.)
 Slew Rate measured between 0.4V and 0.9V - rising.
 Slew Rate measured between 2.4V and 1.9V - falling.
 Slew Rate measured at TP1.

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SY00004

Waveform 5.

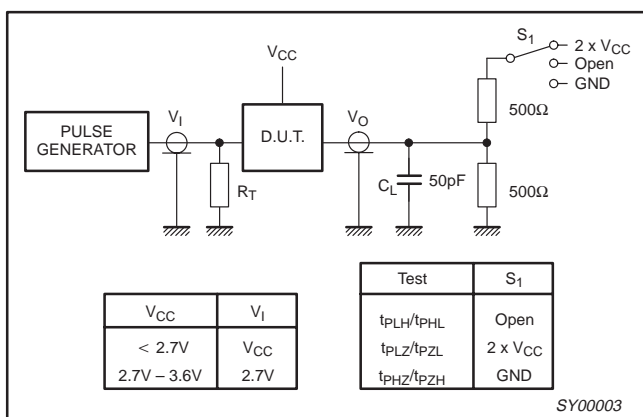


Figure 1. Load Circuitry for B_n to A_n Switching Times

TEST CIRCUIT

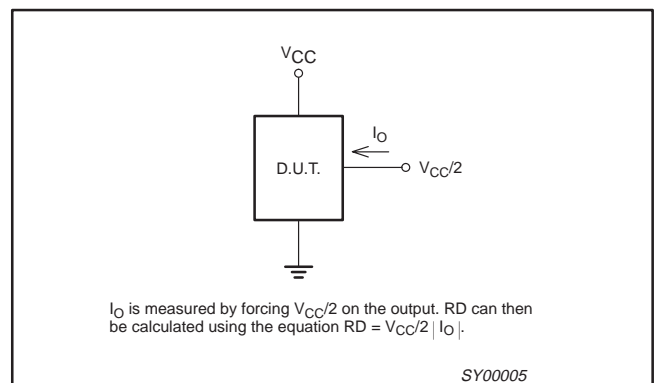


Figure 2. Output Impedance R_D

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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 | 0.42 0.39 | 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 | | | | 92-11-17 95-01-24 |

3.3V Parallel printer interface transceiver/buffer

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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 |

3.3V Parallel printer interface transceiver/buffer

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TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|-----|----------------|------------|-----|------|-----|------------------|----------|
| mm | 1.10 | 0.15 0.05 | 0.95 0.80 | 0.25 | 0.30 0.19 | 0.2 0.1 | 6.6 6.4 | 4.5 4.3 | 0.65 | 6.6 6.2 | 1.0 | 0.75 0.50 | 0.4 0.3 | 0.2 | 0.13 | 0.1 | 0.5 0.2 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|------------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT360-1 | | MO-153AC | | | | -93-06-16- 95-02-04 |

3.3V Parallel printer interface transceiver/buffer

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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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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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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Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

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