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AC11132: Product Specification

ACT11132: Objective Specification

Quad 2-Input NAND Schmitt-trigger

FEATURES

- Output capability: ± 24 mA
- CMOS (AC) and TTL (ACT) voltage level inputs
- 50 Ω incident wave switching
- Center-pin V_{CC} and ground configuration to minimize high-speed switching noise
- I_{CC} category: SSI

DESCRIPTION

The 74AC/ACT11132 high-performance CMOS devices combine very high speed and high output drive comparable to the most advanced TTL families.

The 74AC/ACT11132 provides four separate 2-input NAND gate functions which are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have greater noise margin than conventional NAND gates.

QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{amb} = 25^{\circ}\text{C}; \text{GND} = 0\text{V};$ $V_{CC} = 5.0\text{V}$ | TYPICAL | | UNIT |
|-------------------|--|---|---------|-----|------|
| | | | AC | ACT | |
| t_{PLH}/t_{PHL} | Propagation delay A, B, to \bar{Y} | $C_L = 50\text{pF}$ | 4.2 | 7.9 | ns |
| C_{PD} | Power dissipation capacitance per gate ¹ | $f = 1\text{MHz}; C_L = 50\text{pF}$ | 27 | 30 | pF |
| C_{IN} | Input capacitance | $V_I = 0\text{V}$ or V_{CC} | 3.5 | 3.5 | pF |
| I_{LATCH} | Latch-up current | Per Jeduc JC40.2 Standard 17 | 500 | 500 | mA |

Note:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

$$P_D = C_{PD} \times V_{CC}^2 \times f_I + \sum (C_L \times V_{CC}^2 \times f_O) \text{ where:}$$

f_I = input frequency in MHz, C_L = output load capacitance in pF,

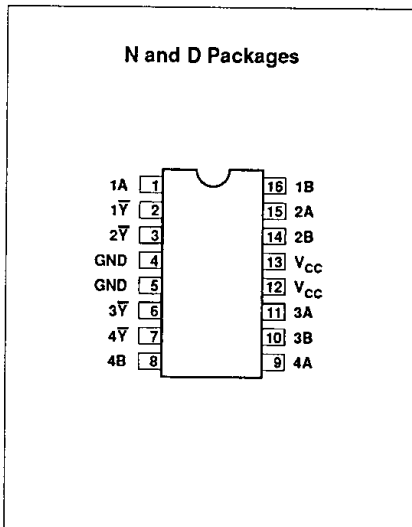
f_O = output frequency in MHz, V_{CC} = supply voltage in V,

$\sum (C_L \times V_{CC}^2 \times f_O)$ = sum of outputs

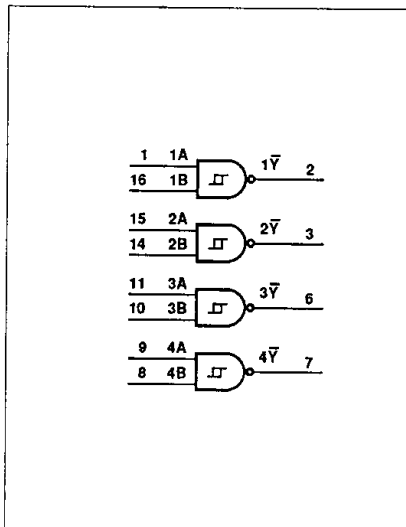
ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | ORDER CODE |
|-------------------------------------|-------------------|---------------------------|
| 16-pin plastic DIP (300mil-wide) | -40°C to +85°C | 74AC11132N 74ACT11132N |
| 16-pin plastic SO (150mil-wide) | -40°C to +85°C | 74AC11132D 74ACT11132D |

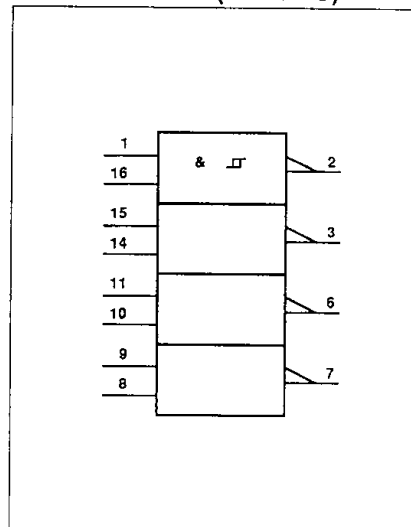
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



Quad 2-Input NAND Schmitt-trigger

74AC/ACT11132

PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|---------------|-----------------|-------------------------|
| 1, 15, 11, 9 | 1A - 4A | Data inputs |
| 16, 14, 10, 8 | 1B - 4B | Data inputs |
| 2, 3, 6, 7 | 1Y - 4Y | Data outputs |
| 4, 5 | GND | Ground (0V) |
| 12, 13 | V _{CC} | Positive supply voltage |

FUNCTION TABLE

| INPUTS | | OUTPUT |
|--------|----|--------|
| nA | nB | nY |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | AC11132 | | | ACT11132 | | | UNIT |
|------------------|--------------------------------------|------------------|-----|-----------------|----------|-----|-----------------|------|
| | | Min | Nom | Max | Min | Nom | Max | |
| V _{CC} | DC supply voltage | 3.0 ¹ | 5.0 | 5.5 | 4.5 | 5.0 | 5.5 | V |
| V _I | Input voltage | 0 | | V _{CC} | 0 | | V _{CC} | V |
| V _O | Output voltage | 0 | | V _{CC} | 0 | | V _{CC} | V |
| ΔV/ΔV | Input transition rise or fall rate | 0 | | 100 | 0 | | 100 | ns/V |
| T _{amb} | Operating free-air temperature range | -40 | | +85 | -40 | | +85 | °C |

NOTE:

1. No electrical or switching characteristics are specified at V_{CC} < 3V. Operation between 2V and 3V is not recommended, but within that range, a device output will maintain a previously established logic state.

ABSOLUTE MAXIMUM RATINGS¹

| SYMBOL | PARAMETER | TEST CONDITIONS | RATING | UNIT |
|---|---|---------------------------------------|-------------------------------|------|
| V _{CC} | DC supply voltage | | -0.5 TO +7.0 | V |
| I _{IK} or V _I | DC input diode current ² | V _I < 0 | -20 | mA |
| | | V _I > V _{CC} | 20 | |
| | DC input voltage | | -0.5 to V _{CC} + 0.5 | V |
| I _{OK} or V _O | DC output diode current ² | V _O < 0 | -50 | mA |
| | | V _O > V _{CC} | 50 | |
| | DC output voltage | | -0.5 to V _{CC} + 0.5 | V |
| I _O | DC output source or sink current per output pin | V _O = 0 to V _{CC} | ±50 | mA |
| I _{CC} or I _{GND} | DC V _{CC} current | | ±100 | mA |
| | DC ground current | | ±100 | |
| T _{STG} | Storage temperature | | -65 to 150 | °C |
| P _{TOT} | Power dissipation per package | Above 70°C; derate linearly by 8mW/K | 500 | mW |
| | Power dissipation per package Plastic surface mount (SO) | Above 70°C; derate linearly by 8mW/K | 400 | |

NOTES:

1. 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.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Quad 2-Input NAND Schmitt-trigger

74AC/ACT11132

DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | | V _{CC} V | 74AC11132 | | | | 74ACT11132 | | | | UNIT |
|------------------|---|--|--------------------------------------|--------------------------|--------------------------|------|--------------------------------------|------|--------------------------|-----|--------------------------------------|------|------|
| | | | | | T _{amb} = +25°C | | T _{amb} = -40°C to +85°C | | T _{amb} = +25°C | | T _{amb} = -40°C to +85°C | | |
| | | | | | Min | Max | Min | Max | Min | Max | Min | Max | |
| V _{T+} | Positive-going threshold | | | 3.0 | | 2.2 | | 2.2 | | | | | V |
| | | | | 4.5 | | 3.2 | | 3.2 | | 2.0 | | 2.0 | |
| | | | | 5.5 | | 3.9 | | 3.9 | | 2.0 | | 2.0 | |
| V _{T-} | Negative-going threshold | | | 3.0 | 0.5 | | 0.5 | | | | | | V |
| | | | | 4.5 | 0.9 | | 0.9 | | | 0.8 | | 0.8 | |
| | | | | 5.5 | 1.1 | | 1.1 | | | 0.8 | | 0.8 | |
| ΔV _T | Hysteresis (V _{T+} - V _{T-}) | | | 3.0 | 0.3 | 1.2 | 0.3 | 1.2 | | | | | V |
| | | | | 4.5 | 0.4 | 1.4 | 0.4 | 1.4 | 0.4 | 1.2 | 0.4 | 1.2 | |
| | | | | 5.5 | 0.5 | 1.6 | 0.5 | 1.6 | 0.4 | 1.2 | 0.4 | 1.2 | |
| V _{IH} | High-level input voltage | | | 3.0 | 2.10 | | 2.10 | | | | | | V |
| | | | | 4.5 | 3.15 | | 3.15 | | 2.0 | | 2.0 | | |
| | | | | 5.5 | 3.85 | | 3.85 | | 2.0 | | 2.0 | | |
| V _{IL} | Low-level input voltage | | | 3.0 | | 0.90 | | 0.90 | | | | | V |
| | | | | 4.5 | | 1.35 | | 1.35 | | 0.8 | | 0.8 | |
| | | | | 5.5 | | 1.65 | | 1.65 | | 0.8 | | 0.8 | |
| V _{OH} | High-level output voltage | V _I = V _{IL} or V _{IH} | I _{OH} = -50μA | 3.0 | 2.9 | | 2.9 | | | | | | V |
| | | | | 4.5 | 4.4 | | 4.4 | | 4.4 | | 4.4 | | |
| | | | | 5.5 | 5.4 | | 5.4 | | 5.4 | | 5.4 | | |
| | | | I _{OH} = -4mA | 3.0 | 2.58 | | 2.48 | | | | | | |
| | | | | 4.5 | 3.94 | | 3.8 | | 3.94 | | 3.8 | | |
| | | | | 5.5 | 4.94 | | 4.8 | | 4.94 | | 4.8 | | |
| | | | I _{OH} = -75mA ¹ | 5.5 | | | 3.85 | | | | 3.85 | | |
| V _{OL} | Low-level output voltage | V _I = V _{IL} or V _{IH} | I _{OL} = 50μA | 3.0 | | 0.1 | | 0.1 | | | | | V |
| | | | | 4.5 | | 0.1 | | 0.1 | | 0.1 | | 0.1 | |
| | | | | 5.5 | | 0.1 | | 0.1 | | 0.1 | | 0.1 | |
| | | | I _{OL} = 12mA | 3.0 | | 3.6 | | 0.44 | | | | | |
| | | | | 4.5 | | 3.6 | | 0.44 | | 3.6 | | 0.44 | |
| | | | | 5.5 | | 3.6 | | 0.44 | | 3.6 | | 0.44 | |
| | | | I _{OL} = 75mA ¹ | 5.5 | | | | 1.65 | | | | 1.65 | |
| I _I | Input leakage current | V _I = V _{CC} or GND | 5.5 | | ±0.1 | | ±0.1 | | ±0.1 | | ±0.1 | μA | |
| I _{CC} | Quiescent supply current | V _I = V _{CC} or GND, I _O = 0mA | 5.5 | | 4.0 | | 4.0 | | 4.0 | | 4.0 | μA | |
| ΔI _{CC} | Supply current, TTL inputs High ² | One input at 3.4V, other inputs at V _{CC} or GND | 5.5 | | | | | | 0.9 | | 1.0 | mA | |

NOTES:

1. Not more than one output should be tested at a time, and the duration of the test should not exceed 10ms.
2. This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0V or V_{CC}.

Quad 2-Input NAND Schmitt-trigger

74AC/ACT11132

AC ELECTRICAL CHARACTERISTICS AT 3.3V $\pm 0.3V$

| SYMBOL | PARAMETER | WAVEFORM | 74AC11132 | | | | | UNIT |
|--------------------------------------|-----------------------------------|----------|--------------------------|------------|------------|-----------------------------------|--------------|------|
| | | | T _{amb} = +25°C | | | T _{amb} = -40°C to +85°C | | |
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation delay nA, nB to nY | 1 | 2.2 2.8 | 6.2 6.8 | 9.2 9.8 | 2.2 2.8 | 10.3 10.5 | ns |

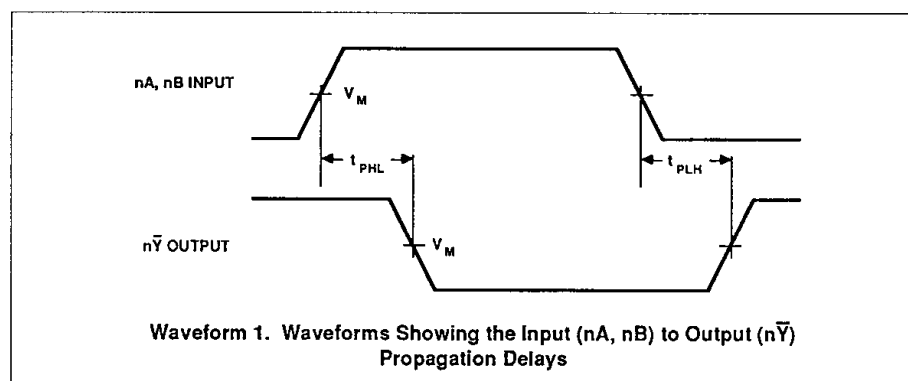
AC ELECTRICAL CHARACTERISTICS AT 5.0V $\pm 0.5V$

| SYMBOL | PARAMETER | WAVEFORM | 74AC11132 | | | | | UNIT |
|--------------------------------------|-----------------------------------|----------|--------------------------|------------|------------|-----------------------------------|------------|------|
| | | | T _{amb} = +25°C | | | T _{amb} = -40°C to +85°C | | |
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation delay nA, nB to nY | 1 | 1.8 2.3 | 4.2 4.8 | 6.9 7.3 | 1.8 2.3 | 7.5 8.0 | ns |

AC ELECTRICAL CHARACTERISTICS AT 5.0V $\pm 0.5V$

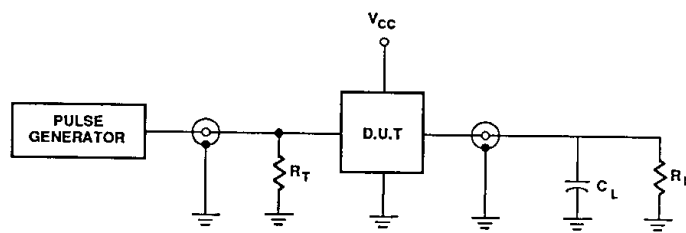
| SYMBOL | PARAMETER | WAVEFORM | 74ACT11132 | | | | | UNIT |
|--------------------------------------|-----------------------------------|----------|--------------------------|-----|-----|-----------------------------------|-----|------|
| | | | T _{amb} = +25°C | | | T _{amb} = -40°C to +85°C | | |
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation delay nA, nB to nY | 1 | 1.5 1.5 | | | 1.5 1.5 | | ns |

AC WAVEFORMS



WAVEFORM CONDITIONS

| | INPUTS | OUTPUTS |
|-----|--|---------------------------------------|
| AC | $V_{IN} = GND \text{ to } V_{CC}$ $V_M = 50\% V_{CC}$ | $V_{OUT} = V_{OL} \text{ to } V_{OH}$ |
| ACT | $V_{IN} = GND \text{ to } 3.0V$ $V_M = 1.5V$ | $V_M = 50\% V_{CC}$ |

Quad 2-Input NAND Schmitt-trigger**74AC/ACT11132****TEST CIRCUIT****Test Circuit****DEFINITIONS**

C_L = Load capacitance, 50pF; includes jig and probe capacitance

R_L = Load resistor, 500 Ω

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators

Input pulses: $PRR \leq 10\text{MHz}$

$t_r = t_f = 3\text{ns}$