

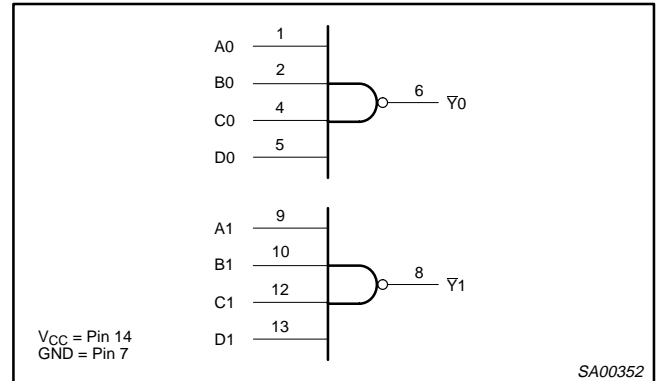
Dual 4-input NAND gate

74ABT20

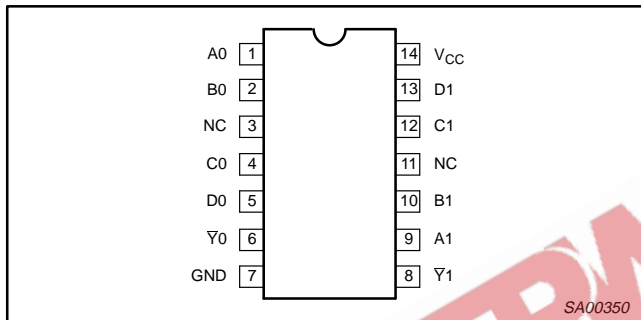
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{amb} = 25^{\circ}\text{C};$ $\text{GND} = 0\text{V}$ | TYPICAL | UNIT |
|--------------------------|-------------------------------------------------------|---------------------------------------------------------------------------|------------|---------------|
| t_{PLH} t_{PHL} | Propagation delay An, Bn, Cn, Dn to \bar{Y}_n | $C_L = 50\text{pF};$ $V_{CC} = 5\text{V}$ | 2.7 2.2 | ns |
| t_{OSLH} t_{OSHL} | Output to Output skew | | 0.3 | ns |
| C_{IN} | Input capacitance | $V_I = 0\text{V}$ or V_{CC} | 3 | pF |
| I_{CC} | Total supply current | Outputs disabled; $V_{CC} = 5.5\text{V}$ | 50 | μA |

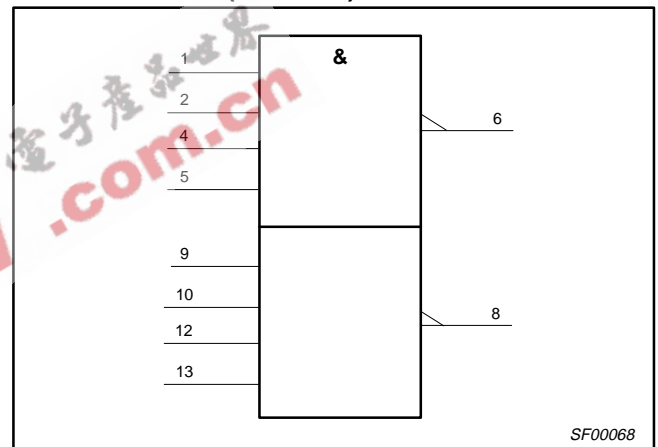
LOGIC DIAGRAM



PIN CONFIGURATION



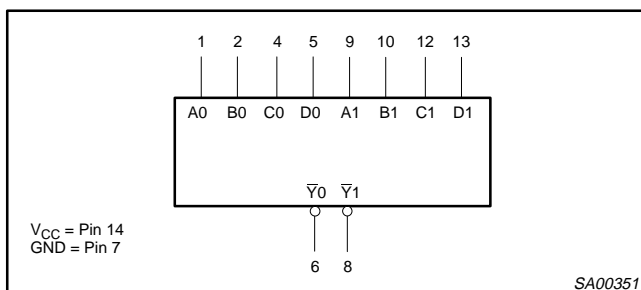
LOGIC SYMBOL (IEEE/IEC)



PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|---------------------------|----------------|-------------------------|
| 1, 2, 4, 5, 9, 10, 12, 13 | An, Bn, Cn, Dn | Data inputs |
| 6, 8 | \bar{Y}_n | Data outputs |
| 7 | GND | Ground (0V) |
| 14 | V_{CC} | Positive supply voltage |

LOGIC SYMBOL



FUNCTION TABLE

| INPUTS | | | | OUTPUT |
|--------|----|----|----|-------------|
| An | Bn | Cn | Dn | \bar{Y}_n |
| L | X | X | X | H |
| X | L | X | X | H |
| X | X | L | X | H |
| X | X | X | L | H |
| H | H | H | H | L |

NOTES:

- H = High voltage level
- L = Low voltage level
- X = Don't care

ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|-----------------------------|-------------------|-----------------------|---------------|------------|
| 14-Pin Plastic DIP | -40°C to +85°C | 74ABT20 N | 74ABT20 N | SOT27-1 |
| 14-Pin plastic SO | -40°C to +85°C | 74ABT20 D | 74ABT20 D | SOT108-1 |
| 14-Pin Plastic SSOP Type II | -40°C to +85°C | 74ABT20 DB | 74ABT20 DB | SOT337-1 |
| 14-Pin Plastic TSSOP Type I | -40°C to +85°C | 74ABT20 PW | 74ABT20PW DH | SOT402-1 |

Dual 4-input NAND gate

74ABT20

ABSOLUTE MAXIMUM RATINGS^{1, 2}

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|-----------|--------------------------------|-----------------------------|--------------|------|
| V_{CC} | DC supply voltage | | -0.5 to +7.0 | V |
| I_{IK} | DC input diode current | $V_I < 0$ | -18 | mA |
| V_I | DC input voltage ³ | | -1.2 to +7.0 | V |
| I_{OK} | DC output diode current | $V_O < 0$ | -50 | mA |
| V_{OUT} | DC output voltage ³ | output in Off or High state | -0.5 to +5.5 | V |
| I_{OUT} | DC output current | output in Low state | 40 | mA |
| T_{stg} | Storage temperature range | | -65 to 150 | °C |

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.

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | UNIT |
|---------------------|--------------------------------------|--------|----------|------|
| | | MIN | MAX | |
| V_{CC} | DC supply voltage | 4.5 | 5.5 | V |
| V_I | Input voltage | 0 | V_{CC} | V |
| V_{IH} | High-level input voltage | 2.0 | | V |
| V_{IL} | Low-level input voltage | | 0.8 | V |
| I_{OH} | High-level output current | | -15 | mA |
| I_{OL} | Low-level output current | | 20 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 0 | 10 | ns/V |
| T_{amb} | Operating free-air temperature range | -40 | +85 | °C |

DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | | | UNIT |
|-----------------|------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------|------------|-----------|---------------------------------------------------------|-----------|---------------|
| | | | $T_{amb} = +25^\circ\text{C}$ | | | $T_{amb} = -40^\circ\text{C}$ to $+85^\circ\text{C}$ | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| V_{IK} | Input clamp voltage | $V_{CC} = 4.5\text{V}; I_{IK} = -18\text{mA}$ | | -0.9 | -1.2 | | -1.2 | V |
| V_{OH} | High-level output voltage | $V_{CC} = 4.5\text{V}; I_{OH} = -15\text{mA}; V_I = V_{IL}$ or V_{IH} | 2.5 | 2.9 | | 2.5 | | V |
| V_{OL} | Low-level output voltage | $V_{CC} = 4.5\text{V}; I_{OL} = 20\text{mA}; V_I = V_{IL}$ or V_{IH} | | 0.35 | 0.5 | | 0.5 | V |
| I_I | Input leakage current | $V_{CC} = 5.5\text{V}; V_I = \text{GND}$ or 5.5V | | ± 0.01 | ± 1.0 | | ± 1.0 | μA |
| I_{OFF} | Power-off leakage current | $V_{CC} = 0.0\text{V}; V_O$ or $V_I \leq 4.5\text{V}$ | | ± 5.0 | ± 100 | | ± 100 | μA |
| I_{CEX} | Output High leakage current | $V_{CC} = 5.5\text{V}; V_O = 5.5\text{V}; V_I = \text{GND}$ or V_{CC} | | 5.0 | 50 | | 50 | μA |
| I_O | Output current ¹ | $V_{CC} = 5.5\text{V}; V_O = 2.5\text{V}$ | -50 | -75 | -180 | -50 | -180 | mA |
| I_{CC} | Quiescent supply current | $V_{CC} = 5.5\text{V}; V_I = \text{GND}$ or V_{CC} | | 2 | 50 | | 50 | μA |
| ΔI_{CC} | Additional supply current per input pin ² | $V_{CC} = 5.5\text{V};$ One data input at 3.4V, other inputs at V_{CC} or GND | | 0.25 | 500 | | 500 | μA |

NOTES:

- Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
- This is the increase in supply current for each input at 3.4V.
- For valid test results, data must not be loaded into the flip-flop or latch after applying the power.

Dual 4-input NAND gate

74ABT20

AC CHARACTERISTICS

GND = 0V; $t_R = t_F = 2.5\text{ns}$; $C_L = 50\text{pF}$, $R_L = 500\Omega$

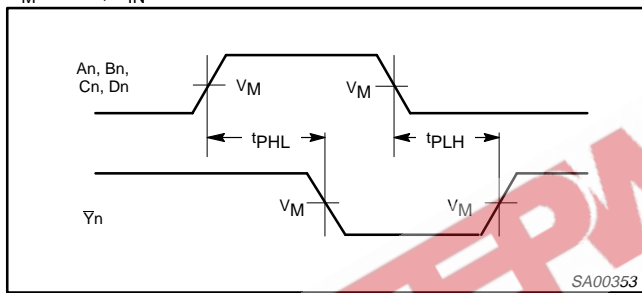
| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | | | UNIT |
|------------------------------------------|----------------------------------------------------|----------|------------------------------------------------------------------------|-----|-----|--------------------------------------------------------------------------------------------------------------|-----|------|
| | | | $T_{\text{amb}} = +25^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V}$ | | | $T_{\text{amb}} = -40^\circ\text{C to } +85^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V} \pm 0.5\text{V}$ | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| t_{PLH} t_{PHL} | Propagation delay An, Bn, Cn, Dn to \bar{Y}_n | 1 | 1.0 | 2.7 | 3.9 | 1.0 | 4.6 | ns |
| t_{OSHL} t_{OSLH}^1 | Output to Output skew An or Bn to \bar{Y}_n | 2 | | 0.3 | 0.5 | | 0.5 | ns |

NOTE:

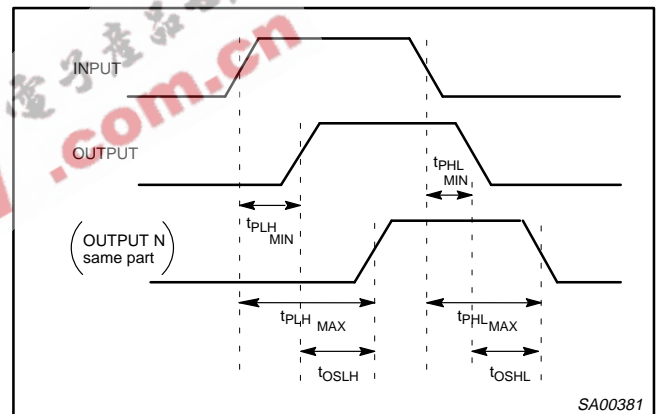
1. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}); parameter guaranteed by design.

AC WAVEFORMS

$V_M = 1.5\text{V}$, $V_{\text{IN}} = \text{GND to } 3.0\text{V}$



Waveform 1. Propagation Delay for Inverting Outputs



Waveform 2. Common edge skew

TEST CIRCUIT AND WAVEFORMS

Test Circuit for Outputs

Input Pulse Definition

$V_M = 1.5\text{V}$

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

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

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|--------|--------------------------|-----------|-------|-------|-------|
| | Amplitude | Rep. Rate | t_w | t_R | t_F |
| 74ABT | 3.0V | 1MHz | 500ns | 2.5ns | 2.5ns |

SH00067