

DATA SHEET

For a complete data sheet, please also download:

- The IC06 74HC/HCT/HCU/HCMOS Logic Family Specifications
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Information
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Outlines

74HC/HCT4316 Quad bilateral switches

Product specification
File under Integrated Circuits, IC06

September 1993

Quad bilateral switches

74HC/HCT4316

FEATURES

- Low “ON” resistance:
 160 Ω (typ.) at $V_{CC} - V_{EE} = 4.5\text{ V}$
 120 Ω (typ.) at $V_{CC} - V_{EE} = 6.0\text{ V}$
 80 Ω (typ.) at $V_{CC} - V_{EE} = 9.0\text{ V}$
- Logic level translation:
 to enable 5 V logic to communicate with ± 5 V analog signals
- Typical “break before make” built in
- Output capability: non-standard
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT4316 are high-speed Si-gate CMOS devices. They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT4316 have four independent analog switches. Each switch has two input/output terminals (nY, nZ) and an active HIGH select input (nS). When the enable input (\bar{E}) is HIGH, all four analog switches are turned off.

Current through a switch will not cause additional V_{CC} current provided the voltage at the terminals of the switch is maintained within the supply voltage range; $V_{CC} \gg (V_Y, V_Z) \gg V_{EE}$. Inputs nY and nZ are electrically equivalent terminals.

V_{CC} and GND are the supply voltage pins for the digital control inputs (\bar{E} and nS). The V_{CC} to GND ranges are 2.0 to 10.0 V for HC and 4.5 to 5.5 V for HCT.

The analog inputs/outputs (nY and nZ) can swing between V_{CC} as a positive limit and V_{EE} as a negative limit. $V_{CC} - V_{EE}$ may not exceed 10.0 V.

See the “4016” for the version without logic level translation.

QUICK REFERENCE DATA

$V_{EE} = \text{GND} = 0\text{ V}$; $T_{\text{amb}} = 25\text{ °C}$; $t_r = t_f = 6\text{ ns}$

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | | UNIT |
|-------------------------------------|--|--|---------|-----|------|
| | | | HC | HCT | |
| t _{PZH} | turn “ON” time \bar{E} to V_{OS} nS to V_{OS} | $C_L = 15\text{ pF}$; $R_L = 1\text{ k}\Omega$; $V_{CC} = 5\text{ V}$ | 19 | 19 | ns |
| | | | 16 | 17 | ns |
| t _{PZL} | turn “ON” time \bar{E} to V_{OS} nS to V_{OS} | | 19 | 24 | ns |
| | | | 16 | 21 | ns |
| t _{PHZ} / t _{PLZ} | turn “OFF” time \bar{E} to V_{OS} nS to V_{OS} | | 20 | 21 | ns |
| | | | 16 | 19 | ns |
| C _I | input capacitance | | 3.5 | 3.5 | pF |
| C _{PD} | power dissipation capacitance per switch | notes 1 and 2 | 13 | 14 | pF |
| C _S | max. switch capacitance | | 5 | 5 | pF |

Notes

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

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum \{ (C_L + C_S) \times V_{CC}^2 \times f_o \}$$
 where:
 f_i = input frequency in MHz
 f_o = output frequency in MHz
 $\sum \{ (C_L + C_S) \times V_{CC}^2 \times f_o \}$ = sum of outputs

- C_L = output load capacitance in pF
- C_S = max. switch capacitance in pF
- V_{CC} = supply voltage in V
- 2. For HC the condition is $V_I = \text{GND to } V_{CC}$
 For HCT the condition is $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$

Quad bilateral switches

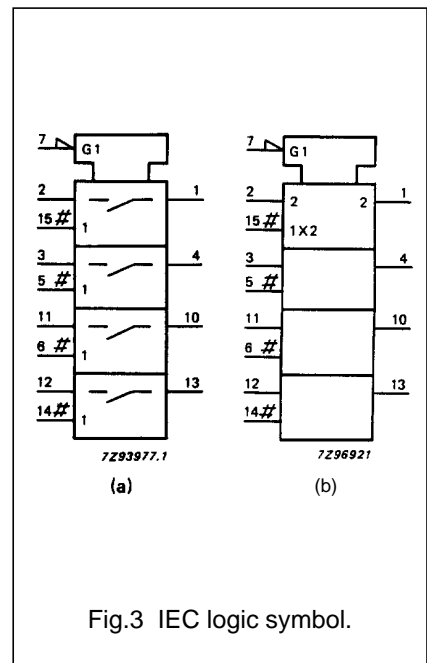
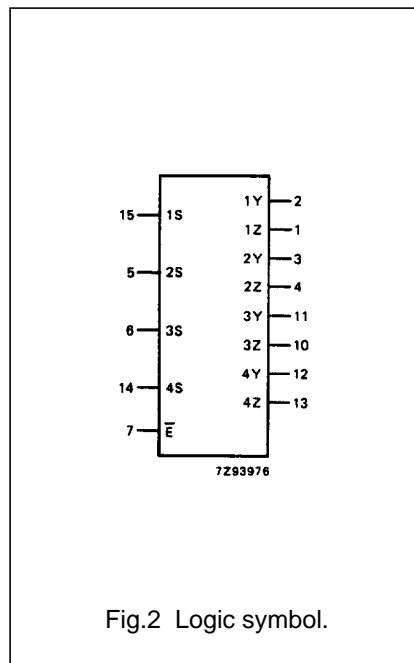
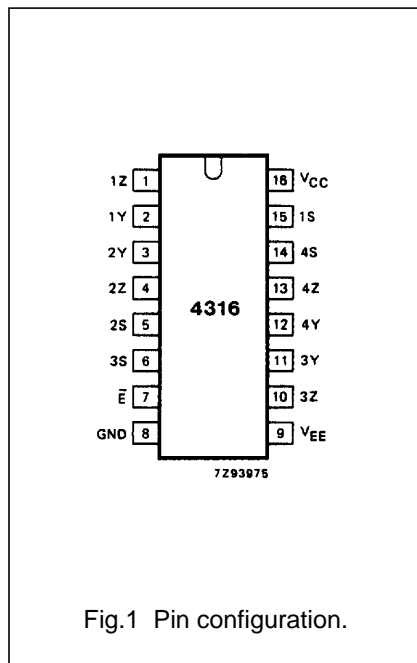
74HC/HCT4316

ORDERING INFORMATION

See "74HC/HCT/HCU/HCMOS Logic Package Information".

PIN DESCRIPTION

| PIN NO. | SYMBOL | NAME AND FUNCTION |
|--------------|-----------|-----------------------------|
| 1, 4, 10, 13 | 1Z to 4Z | independent inputs/outputs |
| 2, 3, 11, 12 | 1Y to 4Y | independent inputs/outputs |
| 7 | \bar{E} | enable input (active LOW) |
| 8 | GND | ground (0 V) |
| 9 | V_{EE} | negative supply voltage |
| 15, 5, 6, 14 | 1S to 4S | select inputs (active HIGH) |
| 16 | V_{CC} | positive supply voltage |



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FUNCTION TABLE

| INPUTS | | SWITCH |
|-----------|----|--------|
| \bar{E} | nS | |
| L | L | off |
| L | H | on |
| H | X | off |

Note

- H = HIGH voltage level
L = LOW voltage level
X = don't care

APPLICATIONS

- Signal gating
- Modulation
- Demodulation
- Chopper

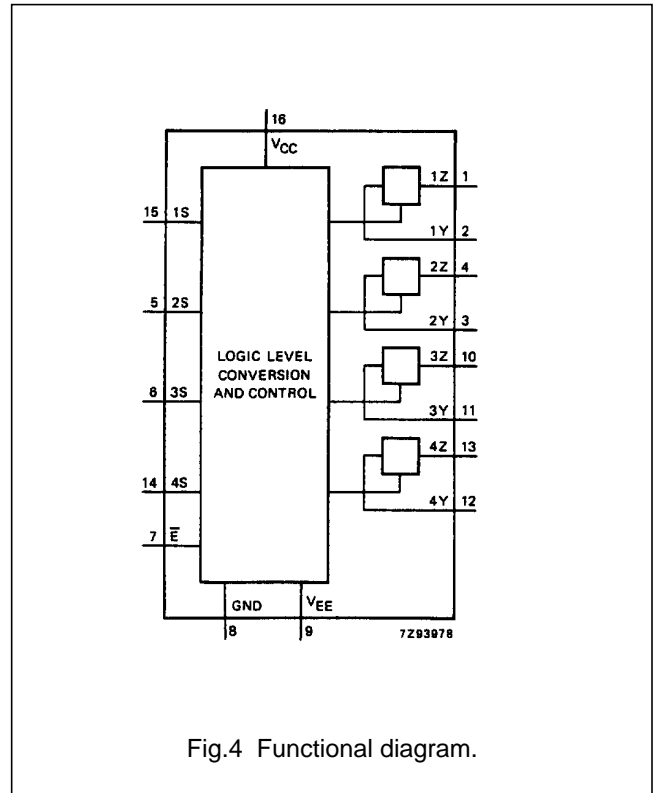


Fig.4 Functional diagram.

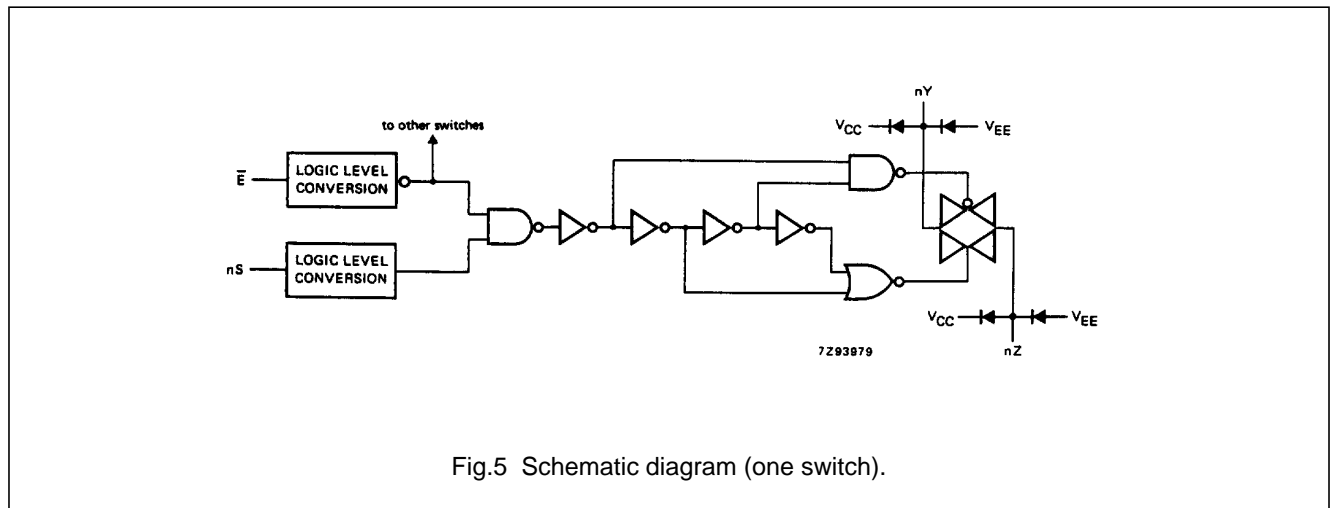


Fig.5 Schematic diagram (one switch).

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RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages are referenced to $V_{EE} = \text{GND}$ (ground = 0 V)

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT | CONDITIONS |
|---------------------------------|--------------------------------|------|-------|------|--|
| V_{CC} | DC supply voltage | -0.5 | +11.0 | V | |
| $\pm I_{IK}$ | DC digital input diode current | | 20 | mA | for $V_I < -0.5 \text{ V}$ or $V_I > V_{CC} + 0.5 \text{ V}$ |
| $\pm I_{SK}$ | DC switch diode current | | 20 | mA | for $V_S < -0.5 \text{ V}$ or $V_S > V_{CC} + 0.5 \text{ V}$ |
| $\pm I_S$ | DC switch current | | 25 | mA | for $-0.5 \text{ V} < V_S < V_{CC} + 0.5 \text{ V}$ |
| $\pm I_{EE}$ | DC V_{EE} current | | 20 | mA | |
| $\pm I_{CC}$; $\pm I_{GND}$ | DC V_{CC} or GND current | | 50 | mA | |
| T_{stg} | storage temperature range | -65 | +150 | °C | |
| P_{tot} | power dissipation per package | | | | for temperature range: -40 to +125 °C 74HC/HCT |
| | plastic DIL | | 750 | mW | above +70 °C: derate linearly with 12 mW/K |
| | plastic mini-pack (SO) | | 500 | mW | above +70 °C: derate linearly with 8 mW/K |
| P_S | power dissipation per switch | | 100 | mW | |

Note to ratings

To avoid drawing V_{CC} current out of terminal Z, when switch current flows in terminals Y_n , the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminals Z, no V_{CC} current will flow out of terminal Y_n . In this case there is no limit for the voltage drop across the switch, but the voltages at Y_n and Z may not exceed V_{CC} or V_{EE} .

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | 74HC | | | 74HCT | | | UNIT | CONDITIONS |
|------------|---------------------------------------|----------|------|---------------------------|----------|------|----------|------|---|
| | | min. | typ. | max. | min. | typ. | max. | | |
| V_{CC} | DC supply voltage $V_{CC}-\text{GND}$ | 2.0 | 5.0 | 10.0 | 4.5 | 5.0 | 5.5 | V | see Figs 6 and 7 |
| V_{CC} | DC supply voltage $V_{CC}-V_{EE}$ | 2.0 | 5.0 | 10.0 | 2.0 | 5.0 | 10.0 | V | see Figs 6 and 7 |
| V_I | DC input voltage range | GND | | V_{CC} | GND | | V_{CC} | V | |
| V_S | DC switch voltage range | V_{EE} | | V_{CC} | V_{EE} | | V_{CC} | V | |
| T_{amb} | operating ambient temperature range | -40 | | +85 | -40 | | +85 | °C | see DC and AC CHARACTERISTICS |
| T_{amb} | operating ambient temperature range | -40 | | +125 | -40 | | +125 | °C | |
| t_r, t_f | input rise and fall times | | 6.0 | 1000 500 400 250 | | 6.0 | 500 | ns | $V_{CC} = 2.0 \text{ V}$ $V_{CC} = 4.5 \text{ V}$ $V_{CC} = 6.0 \text{ V}$ $V_{CC} = 10.0 \text{ V}$ |

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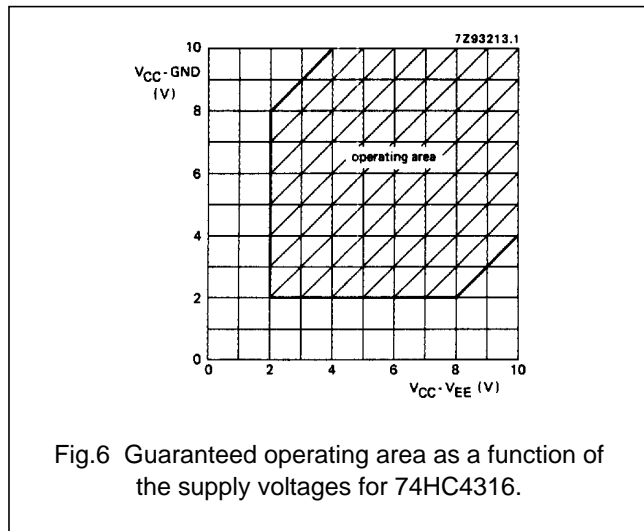


Fig.6 Guaranteed operating area as a function of the supply voltages for 74HC4316.

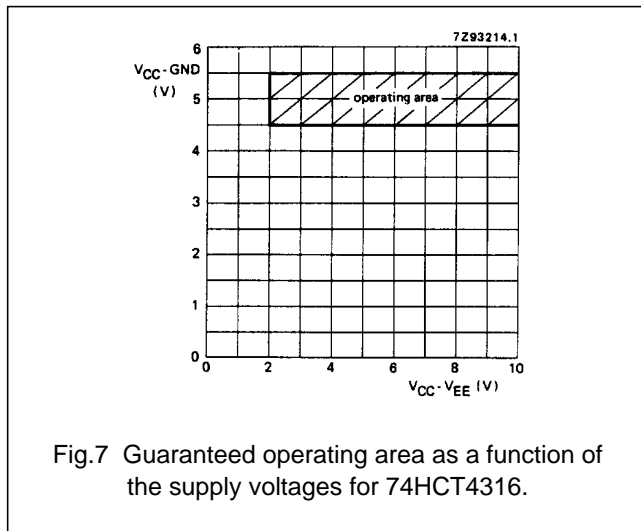


Fig.7 Guaranteed operating area as a function of the supply voltages for 74HCT4316.

DC CHARACTERISTICS FOR 74HC/HCT

For 74HC: $V_{CC} - GND$ or $V_{CC} - V_{EE} = 2.0, 4.5, 6.0$ and 9.0 V

For 74HCT: $V_{CC} - GND = 4.5$ and 5.5 V; $V_{CC} - V_{EE} = 2.0, 4.5, 6.0$ and 9.0 V

| SYMBOL | PARAMETER | T_{amb} (°C) | | | | | | UNIT | TEST CONDITIONS | | | | | |
|-----------------|---|----------------|------|------|------------|------|-------------|------|-----------------|-----------------|----------------------|----------|----------------------------|----------------------------|
| | | 74HC/HCT | | | | | | | V_{CC} (V) | V_{EE} (V) | I_S (μA) | V_{is} | V_i | |
| | | +25 | | | -40 to +85 | | -40 to +125 | | | | | | | |
| | | min. | typ. | max. | min. | max. | min. | | | | | | | max. |
| R_{ON} | ON resistance (peak) | | — | — | | — | | — | Ω | 2.0 | 0 | 100 | V_{CC} to V_{EE} | V_{IH} or V_{IL} |
| | | | 160 | 320 | | 400 | | 480 | Ω | 4.5 | 0 | 1000 | | |
| | | | 120 | 240 | | 300 | | 360 | Ω | 6.0 | 0 | 1000 | | |
| | | | 85 | 170 | | 215 | | 255 | Ω | 4.5 | -4.5 | 1000 | | |
| R_{ON} | ON resistance (rail) | | 160 | — | | — | | — | Ω | 2.0 | 0 | 100 | V_{EE} | V_{IH} or V_{IL} |
| | | | 80 | 160 | | 200 | | 240 | Ω | 4.5 | 0 | 1000 | | |
| | | | 70 | 140 | | 175 | | 210 | Ω | 6.0 | 0 | 1000 | | |
| | | | 60 | 120 | | 150 | | 180 | Ω | 4.5 | -4.5 | 1000 | | |
| R_{ON} | ON resistance (rail) | | 170 | — | | — | | — | Ω | 2.0 | 0 | 100 | V_{CC} | V_{IH} or V_{IL} |
| | | | 90 | 180 | | 225 | | 270 | Ω | 4.5 | 0 | 1000 | | |
| | | | 80 | 160 | | 200 | | 240 | Ω | 6.0 | 0 | 1000 | | |
| | | | 65 | 135 | | 170 | | 205 | Ω | 4.5 | -4.5 | 1000 | | |
| ΔR_{ON} | maximum ΔON resistance between any two channels | | — | | | | | | Ω | 2.0 | 0 | | V_{CC} to V_{EE} | V_H or V_{IL} |
| | | | 16 | | | | | | Ω | 4.5 | 0 | | | |
| | | | 9 | | | | | | Ω | 6.0 | 0 | | | |
| | | | 6 | | | | | | Ω | 4.5 | -4.5 | | | |

Notes

- At supply voltages ($V_{CC} - V_{EE}$) approaching 2.0 V the analog switch ON-resistance becomes extremely non-linear. Therefore it is recommended that these devices are used to transmit digital signals only, when using these supply voltages.
- For test circuit measuring R_{ON} see Fig.8.

Quad bilateral switches

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DC CHARACTERISTICS FOR 74HC

Voltages are referenced to GND (ground = 0 V)

| SYMBOL | PARAMETER | T_{amb} (°C) | | | | | | | UNIT | TEST CONDITIONS | | | |
|-----------|---------------------------------|---------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------|--------------------------|--------------------------|----------------------------|--|-------|
| | | 74HC | | | | | | | | V_{CC} (V) | V_{EE} (V) | V_I | OTHER |
| | | +25 | | | -40 to +85 | | -40 to +125 | | | | | | |
| | | min. | typ. | max. | min. | max. | min. | max. | | | | | |
| V_{IH} | HIGH level input voltage | 1.5 3.15 4.2 6.3 | 1.2 2.4 3.2 4.3 | | 1.5 3.15 4.2 6.3 | | 1.5 3.15 4.2 6.3 | | V | 2.0 4.5 6.0 9.0 | | | |
| V_{IL} | LOW level input voltage | | 0.8 2.1 2.8 4.3 | 0.5 1.35 1.8 2.7 | | 0.5 1.35 1.8 2.7 | 0.5 1.35 1.8 2.7 | V | 2.0 4.5 6.0 9.0 | | | | |
| $\pm I_I$ | input leakage current | | | 0.1 0.2 | | 1.0 2.0 | 1.0 2.0 | μA | 6.0 10.0 | 0 0 | V_{CC} or GND | | |
| $\pm I_S$ | analog switch OFF-state current | | | 0.1 | | 1.0 | 1.0 | μA | 10.0 | 0 | V_{IH} or V_{IL} | $ V_S = V_{CC} - V_{EE}$ (see Fig.10) | |
| $\pm I_S$ | analog switch ON-state current | | | 0.1 | | 1.0 | 1.0 | μA | 10.0 | 0 | V_{IH} or V_{IL} | $ V_S = V_{CC} - V_{EE}$ (see Fig.11) | |
| I_{CC} | quiescent supply current | | | 8.0 16.0 | | 80.0 160.0 | 160.0 320.0 | μA | 6.0 10.0 | 0 0 | V_{CC} or GND | $V_{IS} = V_{EE}$ or V_{CC} ; $V_{OS} = V_{CC}$ or V_{EE} | |

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AC CHARACTERISTICS FOR 74HC

GND = 0 V; $t_r = t_f = 6$ ns; $C_L = 50$ pF

| SYMBOL | PARAMETER | T _{amb} (°C) | | | | | | UNIT | TEST CONDITIONS | | | |
|-------------------------------------|---|-----------------------|------|------|------------|------|-------------|------|------------------------|------------------------|-------|--|
| | | 74HC | | | | | | | V _{CC} (V) | V _{EE} (V) | OTHER | |
| | | +25 | | | -40 to +85 | | -40 to +125 | | | | | |
| | | min. | typ. | max. | min. | max. | min. | | max. | | | |
| t _{PHL} / t _{PLH} | propagation delay V _{is} to V _{os} | | 17 | 60 | | 75 | | 90 | ns | 2.0 | 0 | R _L = ∞; C _L = 50 pF (see Fig.18) |
| | | | 6 | 12 | | 15 | | 18 | | 4.5 | 0 | |
| | | | 5 | 10 | | 13 | | 15 | | 6.0 | 0 | |
| | | | 4 | 8 | | 10 | | 12 | | 4.5 | -4.5 | |
| t _{PZH} / t _{PZL} | turn "ON" time \bar{E} to V _{os} | | 61 | 205 | | 255 | | 310 | ns | 2.0 | 0 | R _L = 1 kΩ; C _L = 50 pF (see Figs 19, 20 and 21) |
| | | | 22 | 41 | | 51 | | 62 | | 4.5 | 0 | |
| | | | 18 | 35 | | 43 | | 53 | | 6.0 | 0 | |
| | | | 19 | 37 | | 47 | | 56 | | 4.5 | -4.5 | |
| t _{PZH} / t _{PZL} | turn "ON" time nS to V _{os} | | 52 | 175 | | 220 | | 265 | ns | 2.0 | 0 | R _L = 1 kΩ; C _L = 50 pF (see Figs 19, 20 and 21) |
| | | | 19 | 35 | | 44 | | 53 | | 4.5 | 0 | |
| | | | 15 | 30 | | 37 | | 45 | | 6.0 | 0 | |
| | | | 17 | 34 | | 43 | | 51 | | 4.5 | -4.5 | |
| t _{PHZ} / t _{PLZ} | turn "OFF" time \bar{E} to V _{os} | | 63 | 220 | | 275 | | 330 | ns | 2.0 | 0 | R _L = 1 kΩ; C _L = 50 pF (see Figs 19, 20 and 21) |
| | | | 23 | 44 | | 55 | | 66 | | 4.5 | 0 | |
| | | | 18 | 37 | | 47 | | 56 | | 6.0 | 0 | |
| | | | 21 | 39 | | 49 | | 59 | | 4.5 | -4.5 | |
| t _{PHZ} / t _{PLZ} | turn "OFF" time nS to V _{os} | | 55 | 175 | | 220 | | 265 | ns | 2.0 | 0 | R _L = 1 kΩ; C _L = 50 pF (see Figs 19, 20 and 21) |
| | | | 20 | 35 | | 44 | | 53 | | 4.5 | 0 | |
| | | | 16 | 30 | | 37 | | 45 | | 6.0 | 0 | |
| | | | 18 | 36 | | 45 | | 54 | | 4.5 | -4.5 | |

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DC CHARACTERISTICS FOR 74HCT

Voltages are referenced to GND (ground = 0)

| SYMBOL | PARAMETER | T_{amb} (°C) | | | | | | | UNIT | TEST CONDITIONS | | | |
|-----------------|---|----------------|------|-------------|------------|---------------|-------------|----------------|---------|-----------------|-----------------|----------------------|---|
| | | 74HCT | | | | | | | | V_{CC} (V) | V_{EE} (V) | V_I | OTHER |
| | | +25 | | | -40 to +85 | | -40 to +125 | | | | | | |
| | | min. | typ. | max. | min. | max. | min. | max. | | | | | |
| V_{IH} | HIGH level input voltage | 2.0 | 1.6 | | 2.0 | | 2.0 | | V | 4.5 to 5.5 | | | |
| V_{IL} | LOW level input voltage | | 1.2 | 0.8 | | 0.8 | | 0.8 | V | 4.5 to 5.5 | | | |
| $\pm I_I$ | input leakage current | | | 0.1 | | 1.0 | | 1.0 | μA | 5.5 | 0 | V_{CC} or GND | |
| $\pm I_S$ | analog switch OFF-state current | | | 0.1 | | 1.0 | | 1.0 | μA | 10.0 | 0 | V_{IH} or V_{IL} | $ V_S = V_{CC} - V_{EE}$ (see Fig.10) |
| $\pm I_S$ | analog switch ON-state current | | | 0.1 | | 1.0 | | 1.0 | μA | 10.0 | 0 | V_{IH} or V_{IL} | $ V_S = V_{CC} - V_{EE}$ (see Fig.11) |
| I_{CC} | quiescent supply current | | | 8.0 16.0 | | 80.0 160.0 | | 160.0 320.0 | μA | 5.5 5.0 | 0 -5.0 | V_{CC} or GND | $V_{is} = V_{EE}$ or V_{CC} ; $V_{OS} = V_{CC}$ or V_{EE} |
| ΔI_{CC} | additional quiescent supply current per input pin for unit load coefficient is 1 (note 1) | | 100 | 360 | | 450 | | 490 | μA | 4.5 to 5.5 | 0 | $V_{CC} - 2.1 V$ | other inputs at V_{CC} or GND |

Note

- The value of additional quiescent supply current (ΔI_{CC}) for a unit load of 1 is given here.
To determine ΔI_{CC} per input, multiply this value by the unit load coefficient shown in the table below.

| INPUT | UNIT LOAD COEFFICIENT |
|-----------|-----------------------|
| nS | 0.50 |
| \bar{E} | 0.50 |

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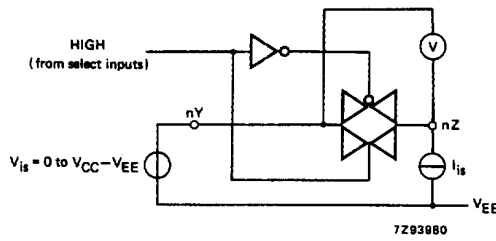


Fig.8 Test circuit for measuring R_{ON} .

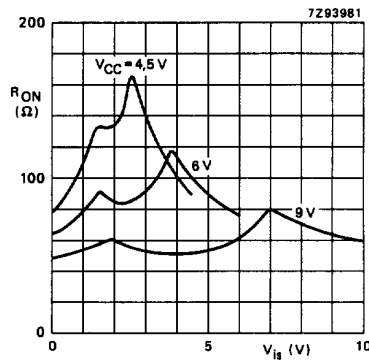


Fig.9 Typical R_{ON} as a function of input voltage V_{is} for $V_{is} = 0$ to $V_{CC} - V_{EE}$.

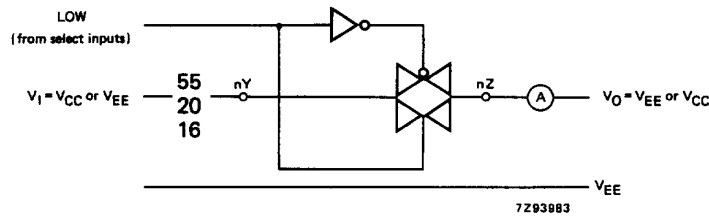


Fig.10 Test circuit for measuring OFF-state current.

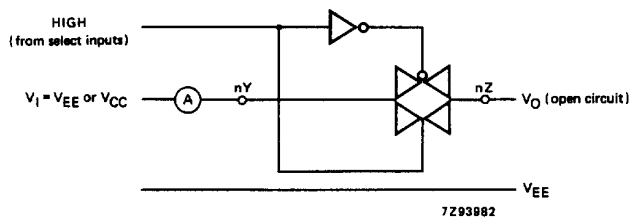


Fig.11 Test circuit for measuring ON-state current.

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AC CHARACTERISTICS FOR 74HCT

GND = 0 V; $t_r = t_f = 6$ ns; $C_L = 50$ pF

| SYMBOL | PARAMETER | T_{amb} (°C) | | | | | | | | UNIT | TEST CONDITIONS | | |
|-------------------|---|----------------|----------|----------|------------|----------|-------------|----------|----|------------|-----------------|--|-------|
| | | 74HCT | | | | | | | | | V_{CC} (V) | V_{EE} (V) | OTHER |
| | | +25 | | | -40 TO +85 | | -40 to +125 | | | | | | |
| | | min. | typ. | max. | min. | max. | min. | max. | | | | | |
| t_{PHL}/t_{PLH} | propagation delay V_{is} to V_{os} | | 6 4 | 12 8 | | 15 10 | | 18 12 | ns | 4.5 4.5 | 0 -4.5 | $R_L = \infty$; $C_L = 50$ pF (see Fig.18) | |
| t_{PZH} | turn "ON" time \bar{E} to V_{os} | | 22 21 | 44 42 | | 55 53 | | 66 63 | ns | 4.5 4.5 | 0 -4.5 | $R_L = 1$ k Ω ; $C_L = 50$ pF (see Figs 19, 20 and 21) | |
| t_{PZL} | turn "ON" time \bar{E} to V_{os} | | 28 21 | 56 42 | | 70 53 | | 84 63 | ns | 4.5 4.5 | 0 -4.5 | (see Figs 19, 20 and 21) | |
| t_{PZH} | turn "ON" time nS to V_{os} | | 20 17 | 40 34 | | 53 43 | | 60 51 | ns | 4.5 4.5 | 0 -4.5 | $R_L = 1$ k Ω ; $C_L = 50$ pF (see Figs 19, 20 and 21) | |
| t_{PZL} | turn "ON" time nS to V_{os} | | 25 17 | 50 34 | | 63 43 | | 75 51 | ns | 4.5 4.5 | 0 -4.5 | (see Figs 19, 20 and 21) | |
| t_{PHZ}/t_{PLZ} | turn "OFF" time \bar{E} to V_{os} | | 25 23 | 50 46 | | 63 58 | | 75 69 | ns | 4.5 4.5 | 0 -4.5 | $R_L = 1$ k Ω ; $C_L = 50$ pF (see Figs 19, 20 and 21) | |
| t_{PHZ}/t_{PLZ} | turn "OFF" time nS to V_{os} | | 22 20 | 44 40 | | 55 50 | | 66 60 | ns | 4.5 4.5 | 0 -4.5 | $R_L = 1$ k Ω ; $C_L = 50$ pF (see Figs 19, 20 and 21) | |

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ADDITIONAL AC CHARACTERISTICS FOR 74HC/HCT

Recommended conditions and typical values

GND = 0 V; T_{amb} = 25 °C

| SYMBOL | PARAMETER | typ. | UNIT | V _{CC} (V) | V _{EE} (V) | V _{is(p-p)} (V) | CONDITIONS |
|--------------------|---|--------------|------------|------------------------|------------------------|-----------------------------|---|
| | sine-wave distortion f = 1 kHz | 0.80 0.40 | % % | 2.25 4.5 | -2.25 -4.5 | 4.0 8.0 | R _L = 10 kΩ; C _L = 50 pF (see Fig.14) |
| | sine-wave distortion f = 10 kHz | 2.40 1.20 | % % | 2.25 4.5 | -2.25 -4.5 | 4.0 8.0 | R _L = 10 kΩ; C _L = 50 pF (see Fig.14) |
| | switch "OFF" signal feed-through | -50 -50 | dB dB | 2.25 4.5 | -2.25 -4.5 | note 1 | R _L = 600 Ω; C _L = 50 pF f = 1 MHz (see Figs 12 and 15) |
| | crosstalk between any two switches | -60 -60 | dB dB | 2.25 4.5 | -2.25 -4.5 | note 1 | R _L = 600 Ω; C _L = 50 pF; f = 1 MHz; (see Fig.16) |
| V _(p-p) | crosstalk voltage between control and any switch (peak-to-peak value) | 110 220 | mV mV | 4.5 4.5 | 0 -4.5 | | R _L = 600 kΩ; C _L = 50 pF; f = 1 MHz (\bar{E} or nS, square-wave between V _{CC} and GND, t _r = t _f = 6 ns) (see Fig.17) |
| f _{max} | minimum frequency response (-3 dB) | 150 160 | MHz MHz | 2.25 4.5 | -2.25 -4.5 | note 2 | R _L = 50 Ω; C _L = 10 pF (see Figs 13 and 14) |
| C _S | maximum switch capacitance | 5 | pF | | | | |

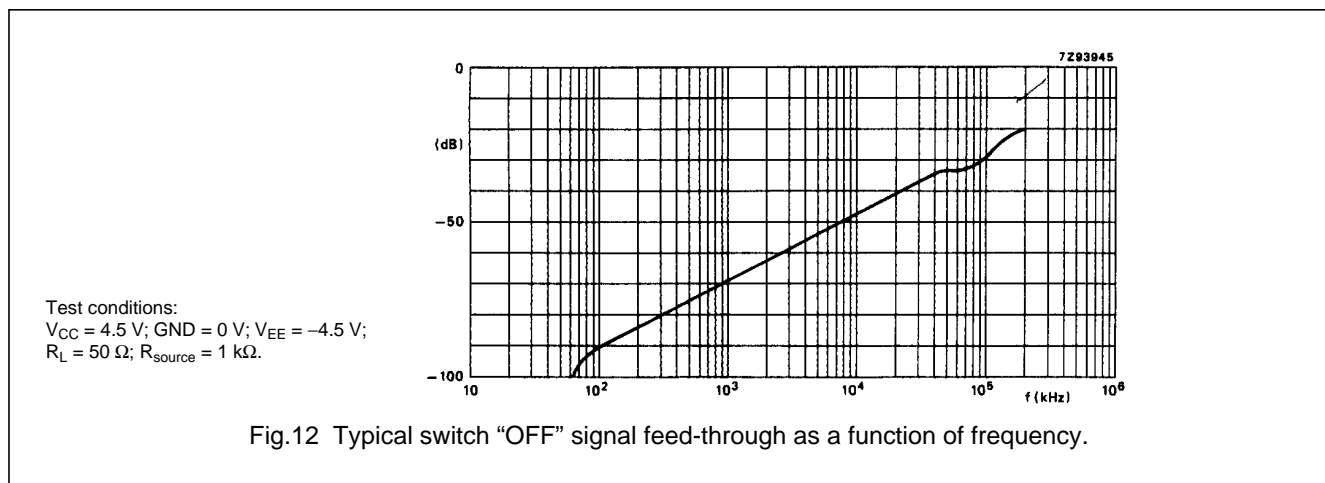
Notes

1. Adjust input voltage V_{is} to 0 dBm level (0 dBm = 1 mW into 600 Ω).
2. Adjust input voltage V_{is} to 0 dBm level at V_{OS} for 1 MHz (0 dBm = 1 mW into 50 Ω).

General note

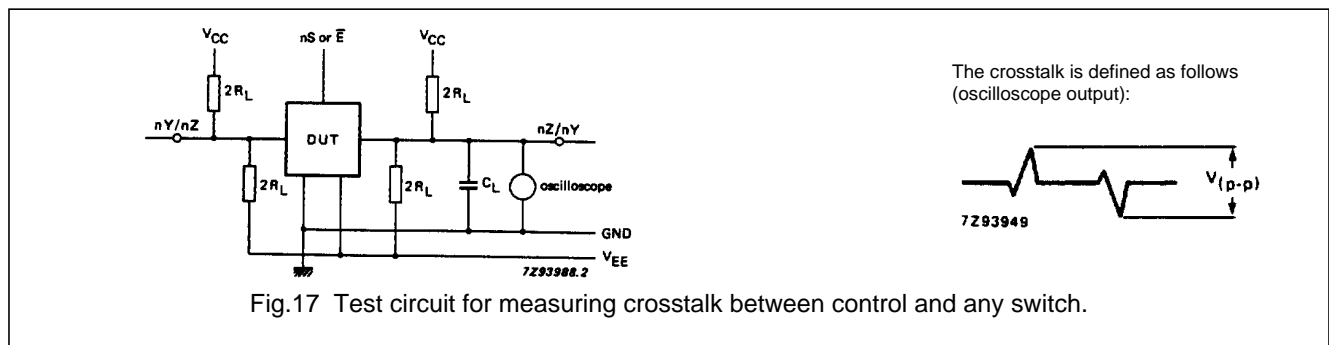
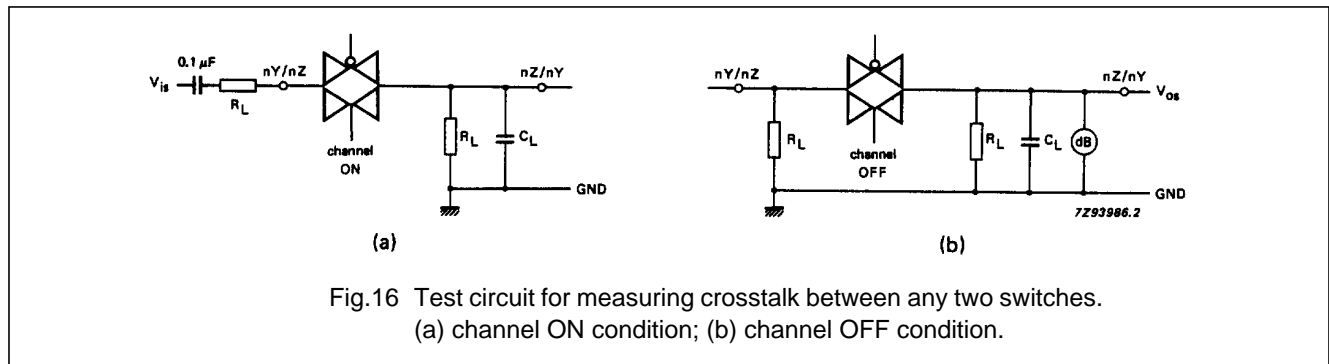
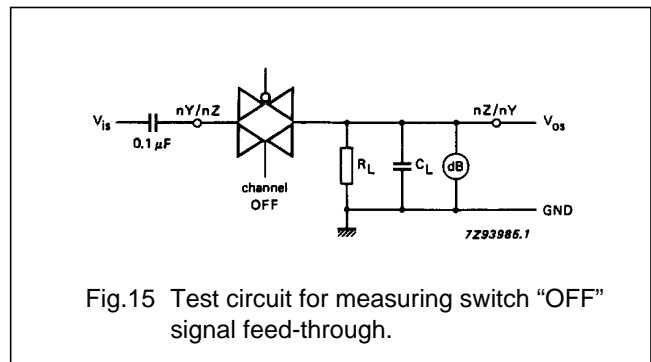
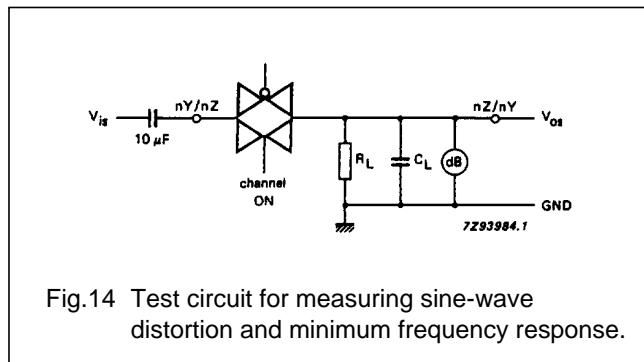
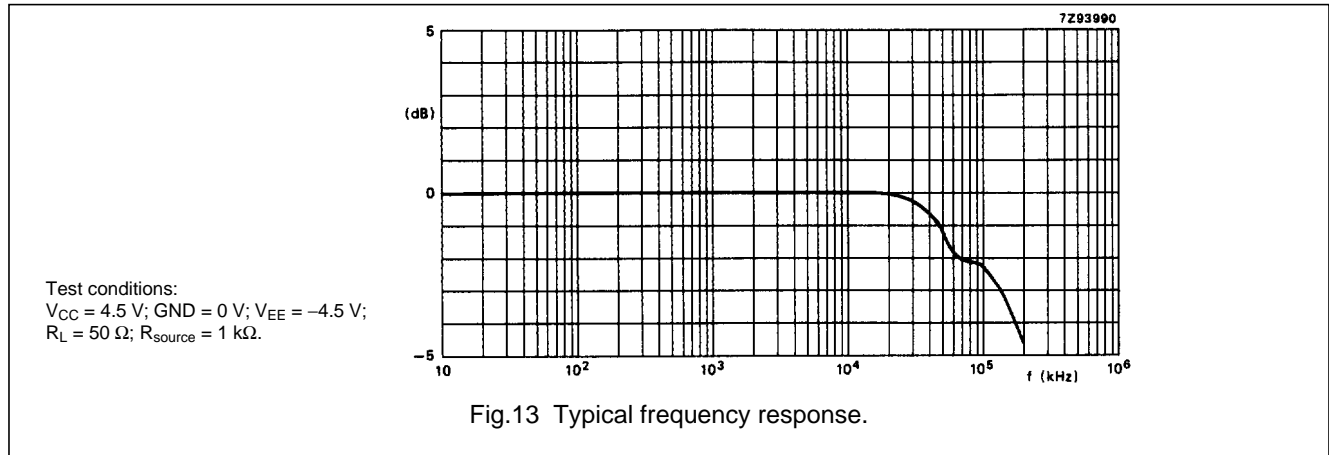
V_{is} is the input voltage at an nY or nZ terminal, whichever is assigned as an input.

V_{OS} is the output voltage at an nY or nZ terminal, whichever is assigned as an output.



Quad bilateral switches

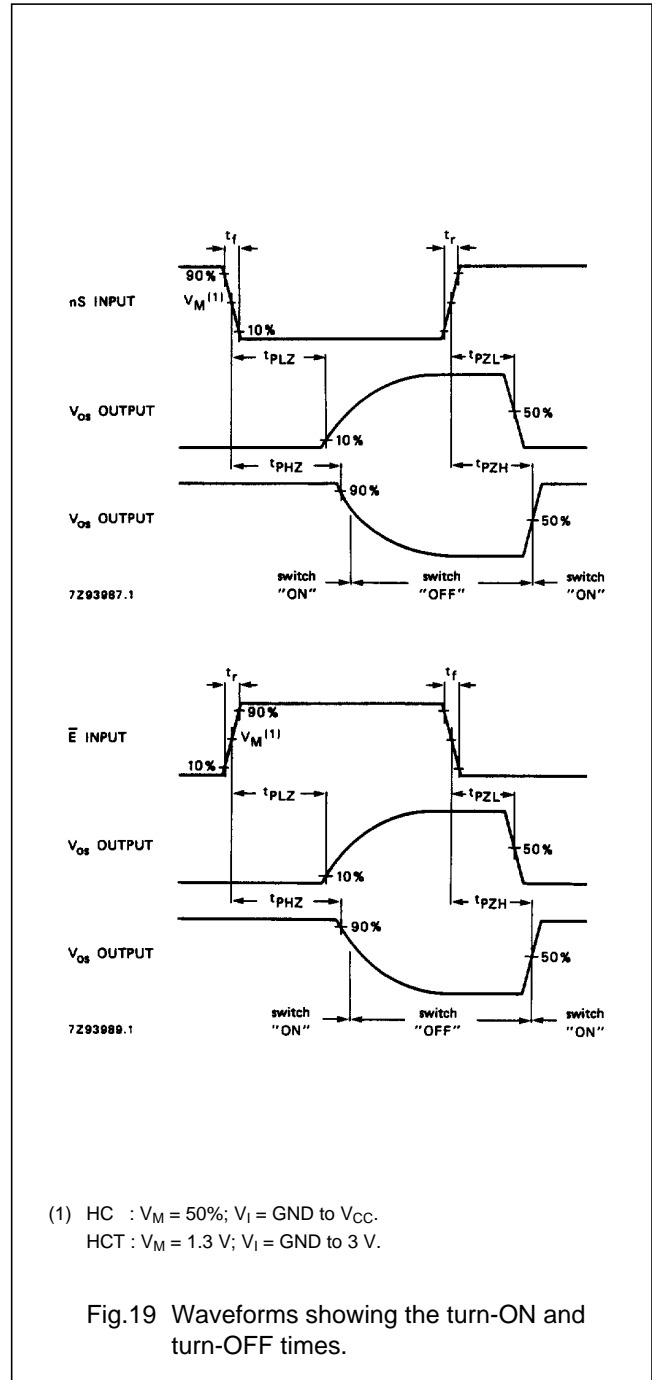
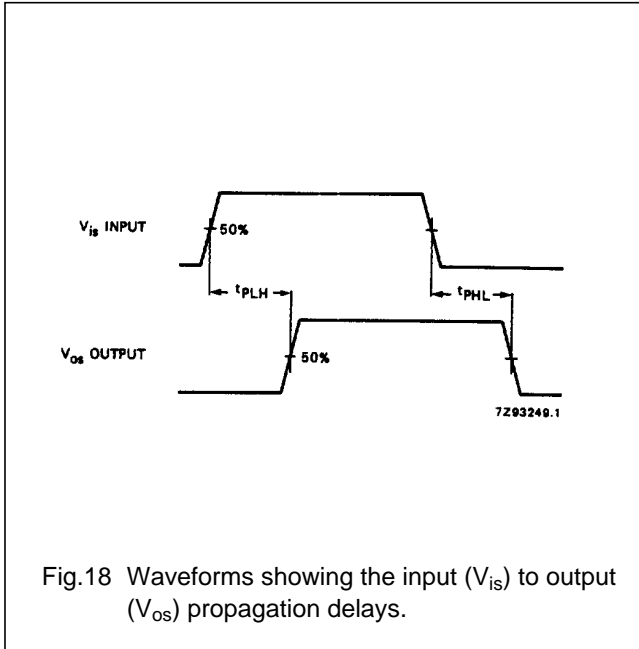
74HC/HCT4316



Quad bilateral switches

74HC/HCT4316

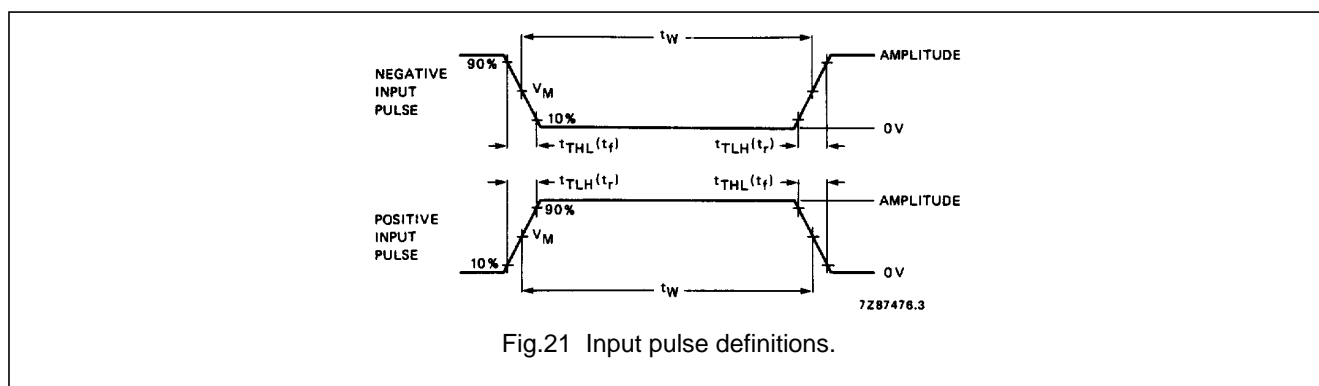
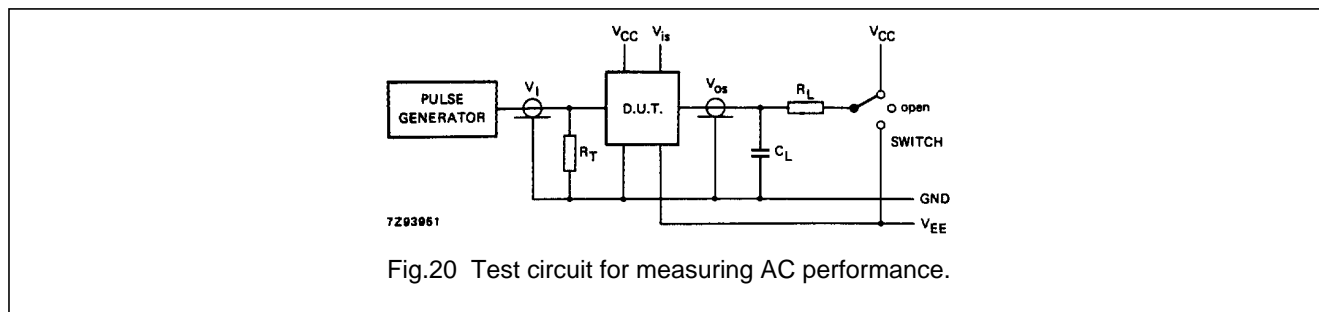
AC WAVEFORMS



Quad bilateral switches

74HC/HCT4316

TEST CIRCUIT AND WAVEFORMS



Conditions

| TEST | SWITCH | V _{iss} |
|------------------|-----------------|------------------|
| t _{PZH} | V _{EE} | V _{CC} |
| t _{PZL} | V _{CC} | V _{EE} |
| t _{PHZ} | V _{EE} | V _{CC} |
| t _{PLZ} | V _{CC} | V _{EE} |
| others | open | pulse |

| FAMILY | AMPLITUDE | V _M | t _r ; t _f | |
|--------|-----------------|----------------|---------------------------------|-------|
| | | | f _{max} ; PULSE WIDTH | OTHER |
| 74HC | V _{CC} | 50% | < 2 ns | 6 ns |
| 74HCT | 3.0 V | 1.3 V | < 2 ns | 6 ns |

Definitions for Figs 20 and 21:

C_L = load capacitance including jig and probe capacitance (see AC CHARACTERISTICS for values).

R_T = termination resistance should be equal to the output impedance Z_O of the pulse generator.

t_r = t_f = 6 ns; when measuring f_{max}, there is no constraint to t_r, t_f with 50% duty factor.

PACKAGE OUTLINES

See "74HC/HCT/HCU/HCMOS Logic Package Outlines".