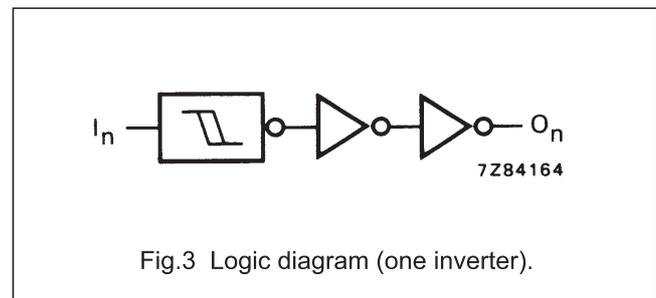# Hex inverting Schmitt trigger

HEF40106B
gates

DESCRIPTION

Each circuit of the HEF40106B functions as an inverter with Schmitt-trigger action. The Schmitt-trigger switches at different points for the positive and negative-going input signals. The difference between the positive-going voltage (V_P) and the negative-going voltage (V_N) is defined as hysteresis voltage (V_H).

This device may be used for enhanced noise immunity or to "square up" slowly changing waveforms.

Fig.1 Functional diagram.

Fig.2 Pinning diagram.
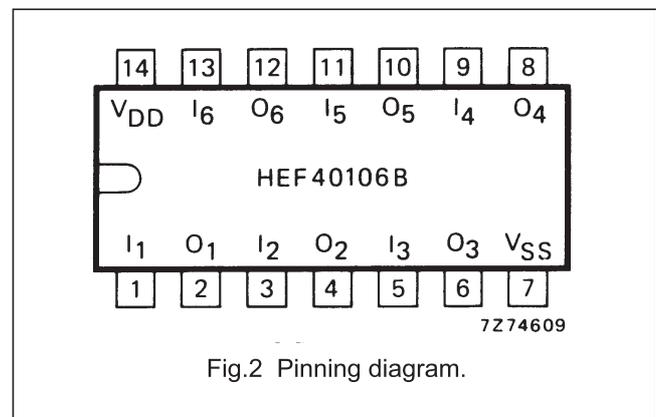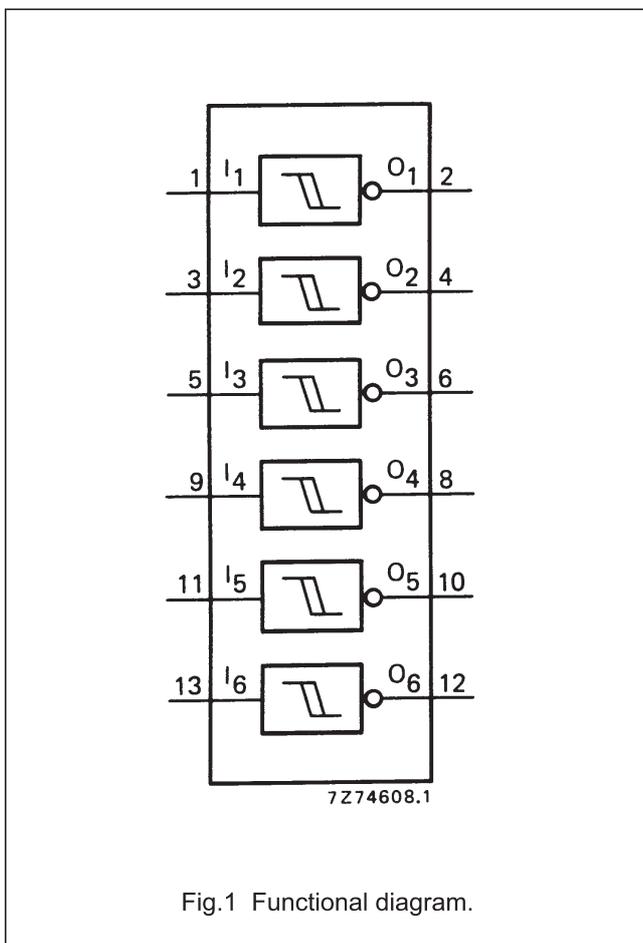
HEF40106BP(N): 14-lead DIL; plastic (SOT27-1)

HEF40106BD(F): 14-lead DIL; ceramic (cerdip) (SOT73)

HEF40106BT(D): 14-lead SO; plastic (SOT108-1)

( ): Package Designator North America

Fig.3 Logic diagram (one inverter).

FAMILY DATA, I_{DD} LIMITS category GATES

See Family Specifications

DC CHARACTERISTICS

$V_{SS} = 0$ V; $T_{amb} = 25\ °C$

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	
Hysteresis	5		0,5	0,8		V
voltage	10	V_H	0,7	1,3		V
	15		0,9	1,8		V
Switching levels	5		2	3,0	3,5	V
positive-going	10	V_P	3,7	5,8	7	V
input voltage	15		4,9	8,3	11	V
negative-going	5		1,5	2,2	3	V
input voltage	10	V_N	3	4,5	6,3	V
	15		4	6,5	10,1	V

Fig.4 Transfer characteristic.

Fig.5 Waveforms showing definition of V_P, V_N and V_H, where V_N and V_P are between limits of 30% and 70%.

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AC CHARACTERISTICS

V_{SS} = 0 V; T_{amb} = 25 °C; C_L = 50 pF; input transition times ≤ 20 ns

	V_{DD} V	SYMBOL	TYP.	MAX.		TYPICAL EXTRAPOLATION FORMULA
Propagation delays						
$I_n \rightarrow O_n$	5		90	180	ns	63 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}	35	70	ns	24 ns + (0,23 ns/pF)
	15		30	60	ns	22 ns + (0,16 ns/pF) C_L
	5		75	150	ns	48 ns + (0,55 ns/pF) C_L
LOW to HIGH	10	t_{PLH}	35	70	ns	24 ns + (0,23 ns/pF) C_L
	15		30	60	ns	22 ns + (0,16 ns/pF) C_L
Output transition times	5		60	120	ns	10 ns + (1,0 ns/pF) C_L
HIGH to LOW	10	t_{THL}	30	60	ns	9 ns + (0,42 ns/pF) C_L
	15		20	40	ns	6 ns + (0,28 ns/pF) C_L
	5		60	120	ns	10 ns + (1,0 ns/pF) C_L
LOW to HIGH	10	t_{TLH}	30	60	ns	9 ns + (0,42 ns/pF) C_L
	15		20	40	ns	6 ns + (0,28 ns/pF) C_L

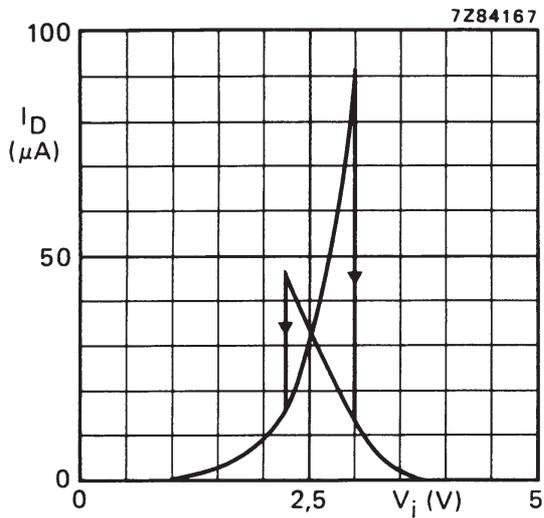|	V_{DD} V	TYPICAL FORMULA FOR P (µW)	
Dynamic power	5	2 300 f_i + Σ ($f_o C_L$) × V_{DD}^2	where
dissipation per	10	9 000 f_i + Σ ($f_o C_L$) × V_{DD}^2	f_i = input freq. (MHz)
package (P)	15	20 000 f_i + Σ ($f_o C_L$) × V_{DD}^2	f_o = output freq. (MHz)
			C_L = load capacitance (pF)
			Σ ($f_o C_L$) = sum of outputs
			V_{DD} = supply voltage (V)

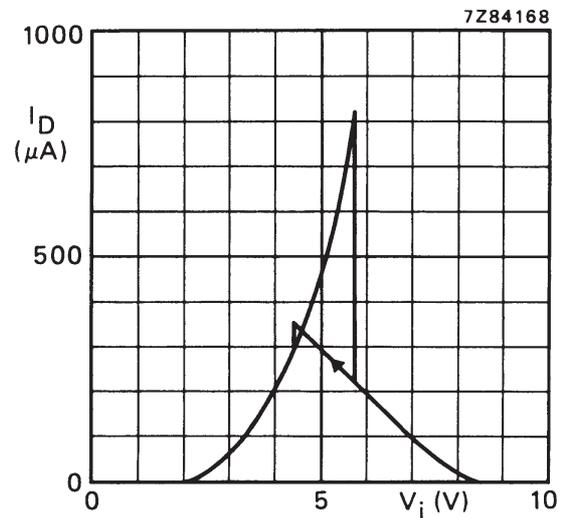Fig.6 Typical drain current as a function of input voltage; V_{DD} = 5 V; T_{amb} = 25 °C.

Fig.7 Typical drain current as a function of input voltage; V_{DD} =10 V; T_{amb} = 25 °C.
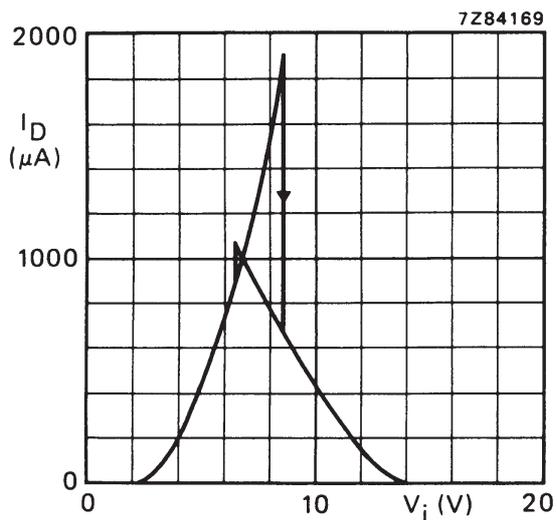
Fig.8 Typical drain current as a function of input voltage; V_{DD} = 15 V; T_{amb} = 25 °C.
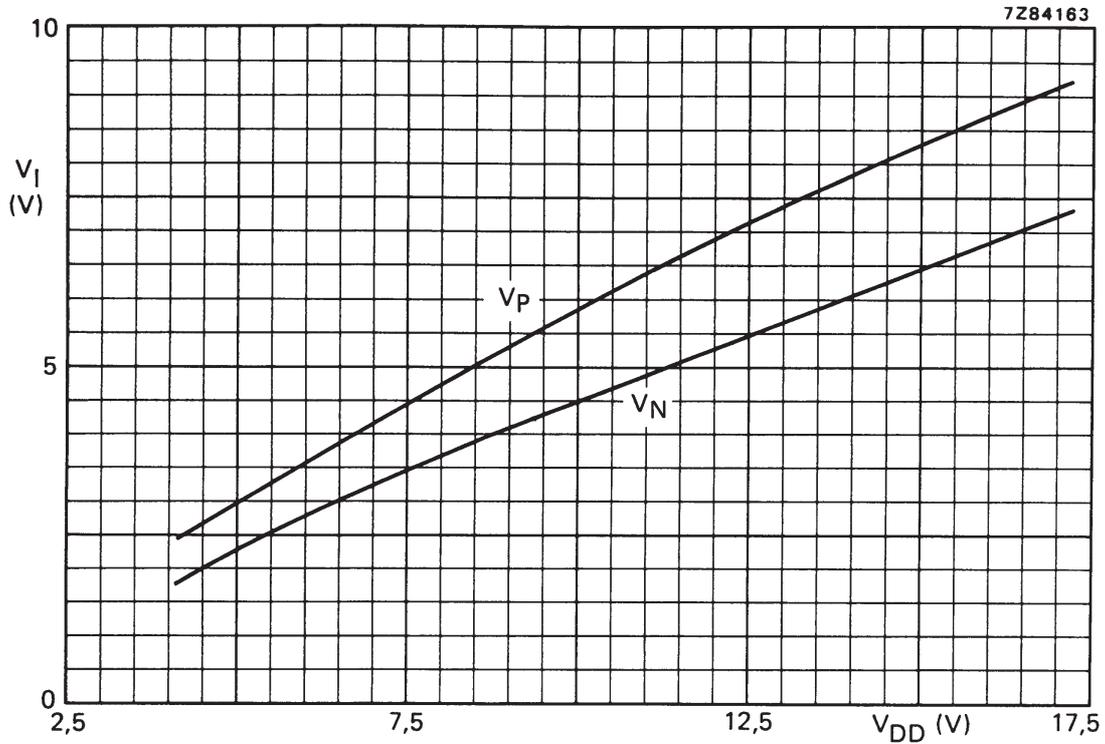
Fig.9 Typical switching levels as a function of supply voltage V_{DD}; T_{amb} = 25 °C.
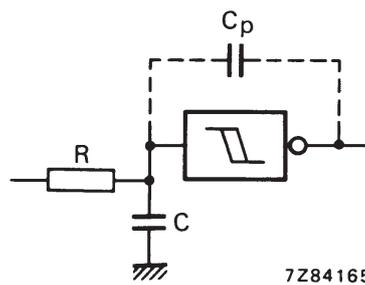

Fig.10 Schmitt trigger driven via a high impedance (R > 1 kΩ).

If a Schmitt trigger is driven via a high impedance (R > 1 kΩ) then it is necessary to incorporate a capacitor C of such value that: $\dfrac{C}{C_p} > \dfrac{V_{DD} - V_{SS}}{V_H}$, otherwise oscillation can occur on the edges of a pulse.

C_p is the external parasitic capacitance between input and output; the value depends on the circuit board layout.

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APPLICATION INFORMATION

Some examples of applications for the HEF40106B are:

- Wave and pulse shapers
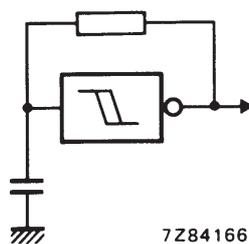- Astable multivibrators
- Monostable multivibrators.

Fig.11 The HEF40106B used as an astable multivibrator.