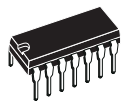
M74HC14

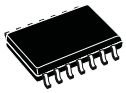
Hex Schmitt inverter

Features

- High speed:
  t_{PD} =12 ns (typ.) at V_{CC} = 6 V
- Low power dissipation:
  I_{CC} = 1 µA (max.) at T_A = 25 °C
- High noise immunity:
  V_H = 1.2 V (typ.) at V_{CC} = 6 V
- Symmetrical output impedance:
  $|I_{OH}| = I_{OL}$ = 4 mA (min.)
- Balanced propagation delays:
  $t_{PLH} \cong t_{PHL}$
- Wide operating voltage range:
  V_{CC} (opr) = 2 to 6 V
- Pin and function compatible with 74 series 14



DIP-14



SO-14

TSSOP14

Description

The M74HC14 is a high speed CMOS hex Schmitt inverter fabricated with silicon gate C^2MOS technology. Pin configuration and functions are the same as those of the M74HC04 but all the inputs have 20% V_{CC} hysteresis level.

This, together with its Schmitt trigger function, allows the device to be used on line receivers with slow rise/fall input signals.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

Table 1. Device summary

Order code	Package	Packaging
M74HC14B1R	DIP-14	Tube
M74HC14RM13TR	SO-14	Tape and reel
M74HC14TTR	TSSOP14	Tape and reel

2 Maximum rating

Stressing the device above the rating listed in the “Absolute maximum ratings” table may cause permanent damage to the device. These are stress ratings only, and operation of the device at these or any other conditions above those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics SURE Program and other relevant quality documents.

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.5 to +7	V
V_I	DC input voltage	-0.5 to V_{CC} + 0.5	V
V_O	DC output voltage	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC input diode current	±20	mA
I_{OK}	DC output diode current	±20	mA
I_O	DC output current	±25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground current	±50	mA
P_D	Power dissipation	500(1)	mW
T_{stg}	Storage temperature	-65 to +150	°C
T_L	Lead temperature (10 sec)	300	°C

1. 500 mW at 65 °C; derate to 300 mW by 10 mW/ °C from 65 °C to 85 °C

2.1 Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	2 to 6	V
V_I	Input voltage	0 to V_{CC}	V
V_O	Output voltage	0 to V_{CC}	V
T_{op}	Operating temperature	-55 to 125	°C

3 Electrical characteristics

Table 6. DC specifications

Symbol	Parameter	Test condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min	Typ	Max	Min	Max	Min	Max	
V_{t+}	High level input voltage	2.0		1.0	1.28	1.5	1.0	1.5	1.0	1.5	V
		4.5		2.3	2.8	3.15	2.3	3.15	2.3	3.15	
		6.0		3.0	3.7	4.2	3.0	4.2	3.0	4.2	
V_{t-}	Low level input voltage	2.0		0.3	0.74	0.9	0.3	0.9	0.3	0.9	V
		4.5		1.13	1.8	2.0	1.13	2.0	1.13	2.0	
		6.0		1.5	2.4	2.6	1.5	2.6	1.5	2.6	
V_H	Hysteresis voltage	2.0		0.3	0.54	1.0	0.3	1.0	0.3	1.0	V
		4.5		0.6	1.0	1.4	0.6	1.4	0.6	1.4	
		6.0		0.8	1.3	1.4	0.8	1.7	0.8	1.7	
V_{OH}	High level output voltage	2.0	I_O = -20 µA	1.9	2.0		1.9		1.9		V
		4.5	I_O = -20 µA	4.4	4.5		4.4		4.4		
		6.0	I_O = -20 µA	5.9	6.0		5.9		5.9		
		4.5	I_O = -4.0 mA	4.18	4.31		4.13		4.10		
		6.0	I_O = -5.2 mA	5.68	5.8		5.63		5.60		
V_{OL}	Low level output voltage	2.0	I_O = -20 µA		0.0	0.1		0.1		0.1	V
		4.5	I_O = -20 µA		0.0	0.1		0.1		0.1	
		6.0	I_O = -20 µA		0.0	0.1		0.1		0.1	
		4.5	I_O = -4.0 mA		0.17	0.26		0.33		0.40	
		6.0	I_O = -5.2 mA		0.18	0.26		0.33		0.40	
I_I	Input leakage current	6.0	V_I = V_{CC} or GND			±0.1		±1		±1	µA
I_{CC}	Quiescent supply current	6.0	V_I = V_{CC} or GND			1		10		20	µA

Table 7. AC electrical characteristics (C_L = 50 pF, Input $t_r = t_f$ = 6 ns)

Symbol	Parameter	Test condition		Value							Unit
		V_{CC} (V)		T_A = 25 °C			-40 to 85 °C		-55 to 125 °C		
				Min	Typ	Max	Min	Max	Min	Max	
t_{TLH} t_{THL}	Output transition time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t_{PLH} t_{PHL}	Propagation delay time	2.0			42	125		155		190	ns
		4.5			14	25		31		38	
		6.0			12	21		16		32	

Table 8. Capacitive characteristics

Symbol	Parameter	Test condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min	Typ	Max	Min	Max	Min	Max	
C_{IN}	Input capacitance	5.0			5	10		10		10	pF
C_{PD}	Power dissipation capacitance(1)	5.0	f_{IN} = 10 MHz		28						pF

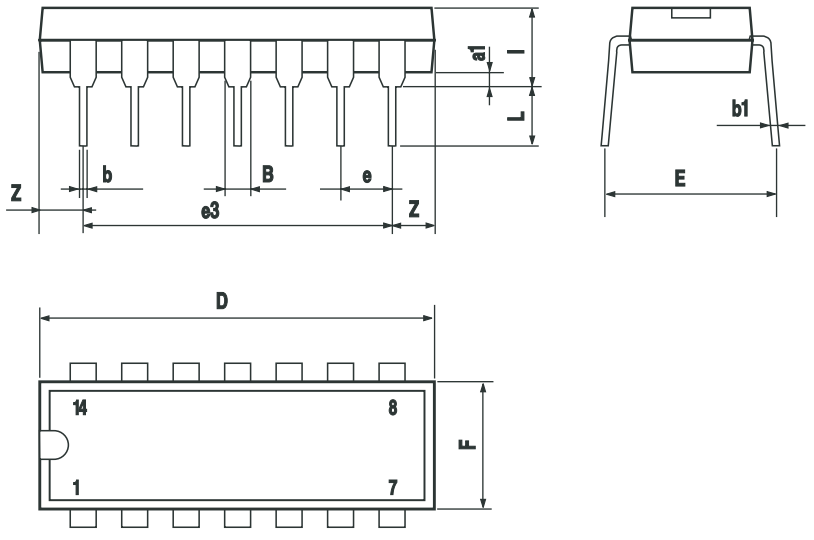
1. C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to test circuit). Average operating current can be obtained by the following equation: $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/6$(per gate).

4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark.

Plastic DIP-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



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