HEX Inverter

The TC74LVQ04 is a high speed CMOS HEX INVERTER fabricated with silicon gate and double-layer metal wiring C²MOS technology.

Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation. The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

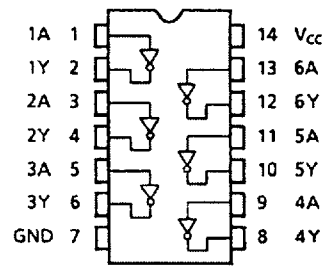
Features

- High Speed: t_{pd} = 4.1ns (Typ.) at V_{CC} = 3.3V
- Low Power Dissipation: I_{CC} = 2.5μA (Max.) at Ta = 25°C
- Input Voltage Level:
  - V_{IL} = 0.8V (Max.) at V_{CC} = 3V
  - V_{IH} = 2.0V (Min.) at V_{CC} = 3V
- Symmetrical Output Impedance: $|I_{OH}| = I_{OL}$ = 12mA (Min.)
- Balanced Propagation Delays: $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74HC04

F (SOP14-P-300)
Weight : 0.18g (TYP.)

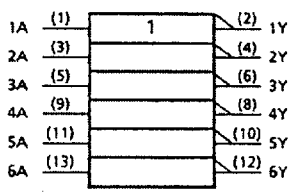
FN (SOL14-P-150)
Weight : 0.12g (TYP.)

FS (SSOP14-P-225)
Weight : 0.07g (TYP.)



(TOP VIEW)

Pin Assignment



IEC Logic Symbol

Truth Table

Inputs	Outputs
A	Y
L	H
H	L

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage Range	V_{CC}	-0.5 ~ 7.0	V
DC Input Voltage	V_{IN}	-0.5 ~ V_{CC} + 0.5	V
DC Output Voltage	V_{OUT}	-0.5 ~ V_{CC} + 0.5	V
Input Diode Current	I_{IK}	±20	mA
Output Diode Current	I_{OK}	±50	mA
DC Output Current	I_{OUT}	±50	mA
DC V_{CC}/Ground Current	I_{CC}	±150	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	-65 ~ 150	°C
Lead Temperature 10sec	T_L	300	°C

Recommended Operating Conditions

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	2.0 ~ 3.6	V
Input Voltage	V_{IN}	0 ~ V_{CC}	V
Output Voltage	V_{OUT}	0 ~ V_{CC}	V
Operating Temperature	T_{opr}	-40 ~ 85	°C
Input Rise and Fall Time	dt/dv	0 ~ 100	ns/V

DC Electrical Characteristics

Parameter	Symbol	Test Condition		Ta = 25°C			Ta = -40 ~ 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max.	Min.	Max.	
High-Level Input Voltage	V_{IH}	–	3.0	2.0	–	–	2.0	–	
Low-Level Input Voltage	V_{IL}	–	3.0	–	–	0.8	–	0.8	
High-Level Output Voltage	V_{OH}	V_{IN} = V_{IL} / I_{OH} = -50μA	3.0	2.9	3.0	–	2.9	–	
		V_{IN} = V_{IL} / I_{OH} = -12mA	3.0	2.58	–	–	2.48	–	
Low-Level Output Voltage	V_{OL}	V_{IN} = V_{IH} / I_{OL} = 50μA	3.0	–	0.0	0.1	–	0.1	
		V_{IN} = V_{IH} / I_{OL} = 12mA	3.0	–	–	0.36	–	0.44	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND	3.6	–	–	±0.1	–	±1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND	3.6	–	–	2.5	–	25.0	

AC Electrical Characteristics (Input $t_r = t_f = 3ns$, $C_L = 50pF$, $R_L = 500\Omega$)

Parameter	Symbol	Test Condition		Ta = 25°C			Ta = -40 ~ 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max.	Min.	Max.	
Propagation Delay Time	t_{pLH} t_{pHL}		2.7 3.3±0.3	– –	6.0 5.0	12.7 9.0	1.0 1.0	15.0 10.0	ns
Output to Output Skew	t_{osLH} t_{osHL}	(Note 1)	2.7 3.3±0.3	– –	– –	1.5 1.5	– –	1.5 1.5	ns
Input Capacitance	C_{IN}	(Note 2)		–	5	10	–	10	pF
Power Dissipation Capacitance	C_{PD}	(Note 3)		–	20	–	–	–	pF

Note (1) Parameter guaranteed by design. $t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

Note (2) Parameter guaranteed by design.

Note (3) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption. Average operating current can be obtained by the equation:

$I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/6$ (per Gate)

Noise Characteristics (Input $t_r = t_f = 3ns$, $C_L = 50pF$, $R_L = 500\Omega$)

Parameter	Symbol	Test Condition	Ta = 25°C		Unit
		V_{CC}	Typ.	Max.	
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	3.3	0.5	0.8	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}	3.3	-0.5	-0.8	V
Minimum High Level Dynamic Input Voltage	V_{IHD}	3.3	–	2.0	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}	3.3	–	0.8	V