

TC74LVQ04F/FN/FS

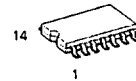
HEX Inverter

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



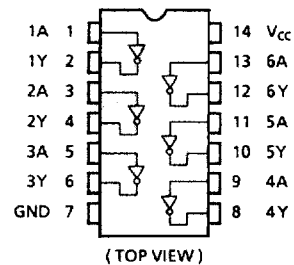
F (SOP14-P-300)
Weight: 0.18g (TYP.)



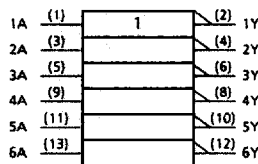
FN (SOL14-P-150)
Weight: 0.12g (TYP.)



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



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	$T_a = 25^\circ\text{C}$				$T_a = -40 \sim 85^\circ\text{C}$		Unit
			V_{CC} (V)	Min	Typ.	Max.	Min.	Max.	
High-Level Input Voltage	V_{IH}	-	3.0	2.0	-	-	2.0	-	V
Low-Level Input Voltage	V_{IL}	-	3.0	-	-	0.8	-	0.8	
High-Level Output Voltage	V_{OH}	$V_{IN} = V_{IL}$ $I_{OH} = -50\mu\text{A}$ $I_{OH} = -12\text{mA}$	3.0	2.9	3.0	-	2.9	-	
			3.0	2.58	-	-	2.48	-	
Low-Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ $I_{OL} = 50\mu\text{A}$ $I_{OL} = 12\text{mA}$	3.0	-	0.0	0.1	-	0.1	
			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	V _{CC} (V)	Ta = 25°C			Ta = -40 ~ 85°C		Unit
				Min	Typ.	Max.	Min.	Max.	
Propagation Delay Time	t _{pLH} t _{pHL}		2.7	–	6.0	12.7	1.0	15.0	ns
			3.3±0.3	–	5.0	9.0	1.0	10.0	
Output to Output Skew	t _{osLH} t _{osHL}	(Note 1)	2.7	–	–	1.5	–	1.5	ns
			3.3±0.3	–	–	1.5	–	1.5	
Input Capacitance	C _{IN}	(Note 2)		–	5	10	–	10	pF
Power Dissipation Capacitance	C _{PC}	(Note 3)		–	20	–	–	–	

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:

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

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

Parameter	Symbol	Test Condition	V _{CC}	Ta = 25°C		Unit
				Typ.	Max.	
Quiet Output Maximum Dynamic V _{OLH}	V _{OLH}		3.3	0.5	0.8	V
Quiet Output Minimum Dynamic V _{OLV}	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



Notes

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