

74LCX06

Low Voltage Hex Inverter/Buffer with Open Drain Outputs

General Description

The LCX06 contains six inverters/buffers. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The outputs of the LCX06 are open drain and can be connected to other open drain outputs to implement active LOW wire AND or active HIGH wire OR functions.

The 74LCX06 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

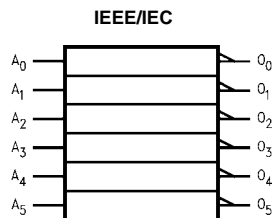
- 5V tolerant inputs
- 2.3V–3.6V V_{CC} specifications provided
- 3.7 ns t_{PD} max ($V_{CC} = 3.3V$), 10 μA I_{CC} max
- Power down high impedance inputs and outputs
- ± 24 mA output drive ($V_{CC} = 3.0V$)
- Implements patented noise/EMI reduction circuitry
- Latch-up performance exceeds 500 mA
- Functionally compatible with 74 series 05
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

Ordering Code:

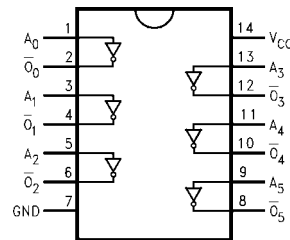
| Order Number | Package Number | Package Description |
|--------------|----------------|------------------------------------------------------------------------------|
| 74LCX06M | M14A | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow |
| 74LCX06SJ | M14D | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74LCX06MTC | MTC14 | 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbol



Connection Diagram



Pin Descriptions

| Pin Names | Description |
|-------------|-------------|
| A_n | Inputs |
| \bar{O}_n | Outputs |

74LCX06 Low Voltage Hex Inverter/Buffer with Open Drain Outputs

| Absolute Maximum Ratings (Note 1) | | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------|--------------------------------------|---------------------------------|------|-------|
| Symbol | Parameter | Value | Conditions | Units | | |
| V _{CC} | Supply Voltage | -0.5 to +7.0 | | V | | |
| V _I | DC Input Voltage | -0.5 to +7.0 | | V | | |
| V _O | DC Output Voltage | -0.5 to V _{CC} + 0.5 | Output in HIGH or LOW State (Note 2) | V | | |
| I _{IK} | DC Input Diode Current | -50 | V _I < GND | mA | | |
| I _{OK} | DC Output Diode Current | -50 | V _O < GND | mA | | |
| | | +50 | V _O > V _{CC} | mA | | |
| I _O | DC Output Source/Sink Current | ±50 | | mA | | |
| I _{CC} | DC Supply Current per Supply Pin | ±100 | | mA | | |
| I _{GND} | DC Ground Current per Ground Pin | ±100 | | mA | | |
| T _{STG} | Storage Temperature | -65 to +150 | | °C | | |
| Recommended Operating Conditions (Note 3) | | | | | | |
| Symbol | Parameter | Min | Max | Units | | |
| V _{CC} | Supply Voltage | Operating | 2.0 | 3.6 | V | |
| | | Data Retention | 1.5 | 3.6 | | |
| V _I | Input Voltage | 0 | 5.5 | V | | |
| V _O | Output Voltage | 0 | V _{CC} | V | | |
| I _{OH} /I _{OL} | Output Current | HIGH or LOW State | | | mA | |
| | | V _{CC} = 3.0V – 3.6V | | ±24 | | |
| | | V _{CC} = 2.7V – 3.0V | | ±12 | | |
| | | V _{CC} = 2.3V – 2.7V | | ±8 | | |
| T _A | Free-Air Operating Temperature | -40 | 85 | °C | | |
| Δt/ΔV | Input Edge Rate, V _{IN} = 0.8V–2.0V, V _{CC} = 3.0V | 0 | 10 | ns/V | | |
| <p>Note 1: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.</p> <p>Note 2: I_O Absolute Maximum Rating must be observed.</p> <p>Note 3: Unused inputs must be held HIGH or LOW. They may not float.</p> | | | | | | |
| DC Electrical Characteristics | | | | | | |
| Symbol | Parameter | Conditions | V _{CC} (V) | T _A = -40°C to +85°C | | Units |
| | | | | Min | Max | |
| V _{IH} | HIGH Level Input Voltage | | 2.3 – 2.7 | 1.7 | | V |
| | | | 2.7 – 3.6 | 2.0 | | |
| V _{IL} | LOW Level Input Voltage | | 2.3 – 2.7 | | 0.7 | V |
| | | | 2.7 – 3.6 | | 0.8 | |
| V _{OL} | LOW Level Output Voltage | I _{OL} = -100 μA | 2.3 – 3.6 | | 0.2 | V |
| | | I _{OL} = 8 mA | 2.3 | | 0.6 | |
| | | I _{OL} = 12 mA | 2.7 | | 0.4 | |
| | | I _{OL} = 16 mA | 3.0 | | 0.4 | |
| | | I _{OL} = 24 mA | 3.0 | | 0.55 | |
| I _I | Input Leakage Current | 0 ≤ V _I ≤ 5.5V | 2.3 – 3.6 | | ±5.0 | μA |
| I _{OFF} | Power-Off Leakage Current | V _I or V _O = 5.5V | 0 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | V _I = V _{CC} or GND | 2.3 – 3.6 | | 10 | μA |
| | | 3.6V ≤ V _I ≤ 5.5V | 2.3 – 3.6 | | ±10 | |
| ΔI _{CC} | Increase in I _{CC} per Input | V _{IH} = V _{CC} - 0.6V | 2.3 – 3.6 | | 500 | μA |

| AC Electrical Characteristics | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------|-----------------|--------------------------|-------|--------------------------|-----|-------|
| Symbol | Parameter | $T_A = -40^\circ\text{C to } +85^\circ\text{C}, R_L = 500\Omega$ | | | | | | Units |
| | | $V_{CC} = 3.3V \pm 0.3V$ | | $V_{CC} = 2.7V$ | | $V_{CC} = 2.5V \pm 0.2V$ | | |
| | | $C_L = 50\text{ pF}$ | | $C_L = 50\text{ pF}$ | | $C_L = 30\text{ pF}$ | | |
| | | Min | Max | Min | Max | Min | Max | |
| t_{PZL} | Propagation Delay Time | 0.8 | 3.7 | 1.0 | 4.1 | 0.8 | 3.5 | ns |
| t_{PLZ} | | 0.8 | 3.7 | 1.0 | 4.1 | 0.8 | 3.5 | |
| Note 4: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}). | | | | | | | | |
| Dynamic Switching Characteristics | | | | | | | | |
| Symbol | Parameter | Conditions | V_{CC} (V) | $T_A = 25^\circ\text{C}$ | Units | | | |
| | | | | Typical | | | | |
| V_{OLP} | Quiet Output Dynamic Peak V_{OL} | $C_L = 50\text{ pF}, V_{IH} = 3.3V, V_{IL} = 0V$ | 3.3 | 0.9 | V | | | |
| | | $C_L = 30\text{ pF}, V_{IH} = 2.5V, V_{IL} = 0V$ | 2.5 | 0.7 | | | | |
| V_{OLV} | Quiet Output Dynamic Valley V_{OL} | $C_L = 50\text{ pF}, V_{IH} = 3.3V, V_{IL} = 0V$ | 3.3 | -0.8 | V | | | |
| | | $C_L = 30\text{ pF}, V_{IH} = 2.5V, V_{IL} = 0V$ | 2.5 | -0.6 | | | | |
| Capacitance | | | | | | | | |
| Symbol | Parameter | Conditions | Typical | Units | | | | |
| C_{IN} | Input Capacitance | $V_{CC} = \text{Open}, V_I = 0V \text{ or } V_{CC}$ | 7 | pF | | | | |
| C_{OUT} | Output Capacitance | $V_{CC} = 3.3V, V_I = 0V \text{ or } V_{CC}$ | 8 | pF | | | | |
| C_{PD} | Power Dissipation Capacitance | $V_{CC} = 3.3V, V_I = 0V \text{ or } V_{CC}, f = 10\text{ MHz}$ | 25 | pF | | | | |

AC Loading and Waveforms Generic for LCX Family

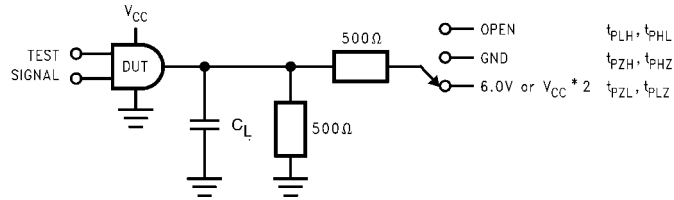


FIGURE 1. AC Test Circuit
(C_L includes probe and jig capacitance)

| Test | Switch |
|--------------------|--------------------------------------------------------------------------|
| t_{PLH}, t_{PHL} | OPEN |
| t_{PZL}, t_{PLZ} | 6V at $V_{CC} = 3.3 \pm 0.3V$ $V_{CC} * 2$ at $V_{CC} = 2.5 \pm 0.2V$ |
| t_{PZH}, t_{PHZ} | GND |

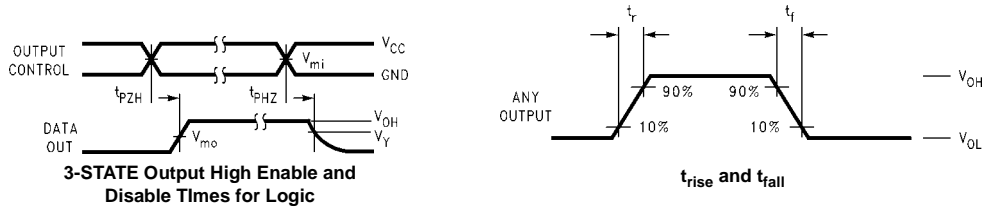
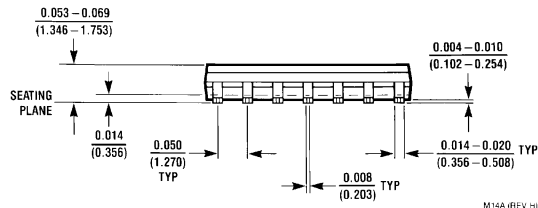
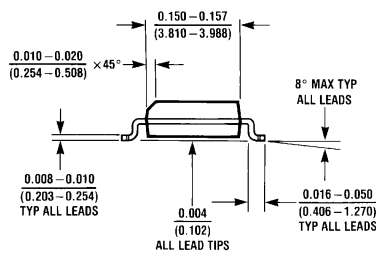
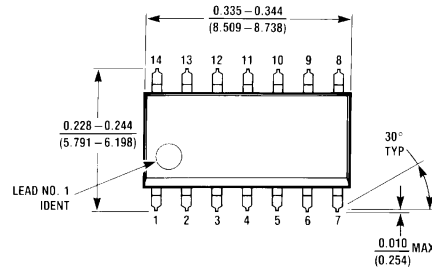


FIGURE 2. Waveforms
(Input Pulse Characteristics; $f = 1MHz, t_r = t_f = 3ns$)

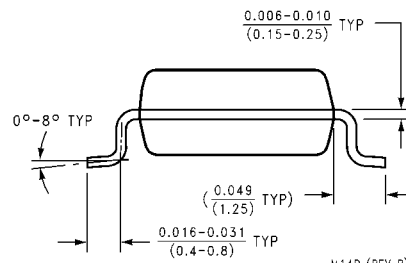
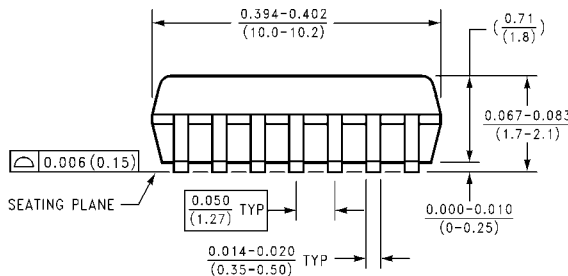
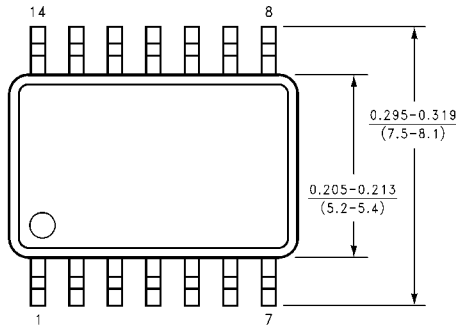
| Symbol | V_{CC} | | |
|----------|-----------------|-----------------|------------------|
| | $3.3V \pm 0.3V$ | 2.7V | $2.5V \pm 0.2V$ |
| V_{mi} | 1.5V | 1.5V | $V_{CC}/2$ |
| V_{mo} | 1.5V | 1.5V | $V_{CC}/2$ |
| V_x | $V_{OL} + 0.3V$ | $V_{OL} + 0.3V$ | $V_{OL} + 0.15V$ |
| V_y | $V_{OH} - 0.3V$ | $V_{OH} - 0.3V$ | $V_{OH} - 0.15V$ |

Physical Dimensions inches (millimeters) unless otherwise noted



M14A (REV H)

14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow Package Number M14A



M14D (REV B)

14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide Package Number M14D

