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74LCX02

Low Voltage Quad 2-Input NOR Gate with 5V Tolerant Inputs

Features

- 5V tolerant inputs
- 2.3V–3.6V V_{CC} specifications provided
- 5.2ns t_{PD} max. ($V_{CC} = 3.3V$), 10 μ A I_{CC} max.
- Power down high impedance inputs and outputs
- $\pm 24mA$ output drive ($V_{CC} = 3.0V$)
- Implements proprietary noise/EMI reduction circuitry
- Latch-up performance exceeds 500mA
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

General Description


The LCX02 contains four 2-input NOR gates. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The 74LCX02 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

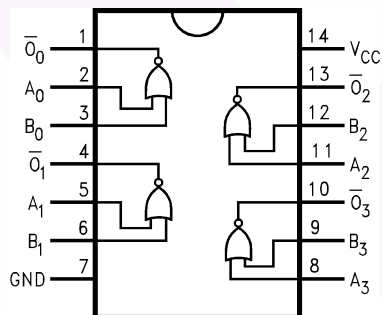
Ordering Information

| Order Number | Package Number | Package Description |
|--------------|----------------|--|
| 74LCX02M | M14A | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| 74LCX02SJ | M14D | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74LCX02MTC | MTC14 | 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

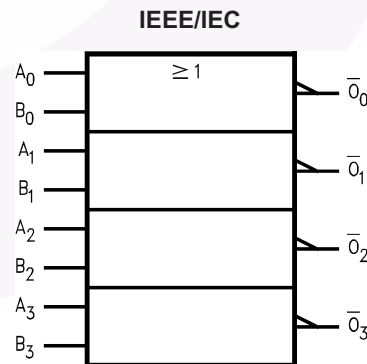
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

 All packages are lead free per JEDEC: J-STD-020B standard.

Connection Diagram



Logic Symbol



Pin Description

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

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | Rating |
|-----------|---|--------------------------|
| V_{CC} | Supply Voltage | -0.5V to +7.0V |
| V_I | DC Input Voltage | -0.5V to +7.0V |
| V_O | DC Output Voltage, Output in HIGH or LOW State ⁽¹⁾ | -0.5V to $V_{CC} + 0.5V$ |
| I_{IK} | DC Input Diode Current, $V_I < GND$ | -50mA |
| I_{OK} | DC Output Diode Current $V_O < GND$ | -50mA |
| | $V_O > V_{CC}$ | +50mA |
| I_O | DC Output Source/Sink Current | $\pm 50mA$ |
| I_{CC} | DC Supply Current per Supply Pin | $\pm 100mA$ |
| I_{GND} | DC Ground Current per Ground Pin | $\pm 100mA$ |
| T_{STG} | Storage Temperature | -65°C to +150°C |

Note:

1. I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions⁽²⁾

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

| 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, HIGH or LOW State | 0 | V_{CC} | V |
| I_{OH} / I_{OL} | Output Current $V_{CC} = 3.0V-3.6V$ | | ± 24 | mA |
| | $V_{CC} = 2.7V-3.0V$ | | ± 12 | |
| | $V_{CC} = 2.3V-2.7V$ | | ± 8 | |
| T_A | Free-Air Operating Temperature | -40 | 85 | °C |
| $\Delta t / \Delta V$ | Input Edge Rate, $V_{IN} = 0.8V-2.0V$, $V_{CC} = 3.0V$ | 0 | 10 | ns/V |

Note:

2. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

| Symbol | Parameter | V _{CC} (V) | Conditions | 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 _{OH} | HIGH Level Output Voltage | 2.3–3.6 | I _{OH} = -100μA | V _{CC} - 0.2 | | V |
| | | 2.3 | I _{OH} = -8mA | 1.8 | | |
| | | 2.7 | I _{OH} = -12mA | 2.2 | | |
| | | 3.0 | I _{OH} = -18mA | 2.4 | | |
| | | | I _{OH} = -24mA | 2.2 | | |
| V _{OL} | LOW Level Output Voltage | 2.3–3.6 | I _{OL} = 100μA | | 0.2 | V |
| | | 2.3 | I _{OL} = 8mA | | 0.6 | |
| | | 2.7 | I _{OL} = 12mA | | 0.4 | |
| | | 3.0 | I _{OL} = 16mA | | 0.4 | |
| | | | I _{OL} = 24mA | | 0.55 | |
| I _I | Input Leakage Current | 2.3–3.6 | 0 ≤ V _I ≤ 5.5V | | ±5.0 | μA |
| I _{OFF} | Power-Off Leakage Current | 0 | V _I or V _O = 5.5V | | 10 | μA |
| I _{CC} | Quiescent Supply Current | 2.3–3.6 | V _I = V _{CC} or GND | | 10 | μA |
| | | | 3.6V ≤ V _I ≤ 5.5V | | ±10 | |
| ΔI _{CC} | Increase in I _{CC} per Input | 2.3–3.6 | V _{IH} = V _{CC} - 0.6V | | 500 | μA |

AC Electrical Characteristics

| Symbol | Parameter | T _A = -40°C to +85°C, R _L = 500Ω | | | | | | Units |
|---------------------------------------|--------------------------------------|---|------|--|------|---|------|-------|
| | | V _{CC} = 3.3V ± 0.3V, C _L = 50pF | | V _{CC} = 2.7V, C _L = 50pF | | V _{CC} = 2.5V ± 0.2V, C _L = 30pF | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{PHL} , t _{PLH} | Propagation Delay | 1.5 | 5.2 | 1.5 | 6.0 | 1.5 | 6.2 | ns |
| t _{OSSL} , t _{OSLH} | Output to Output Skew ⁽³⁾ | | 1.0 | | | | | ns |

Note:

3. 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_{OSSL}) or LOW-to-HIGH (t_{OSLH}).

Dynamic Switching Characteristics

| Symbol | Parameter | V _{CC} (V) | Conditions | T _A = 25°C | |
|------------------|---|---------------------|---|-----------------------|------|
| | | | | Typical | Unit |
| V _{OLP} | Quiet Output Dynamic Peak V _{OL} | 3.3 | C _L = 50pF, V _{IH} = 3.3V, V _{IL} = 0V | 0.8 | V |
| | | 2.5 | C _L = 30pF, V _{IH} = 2.5V, V _{IL} = 0V | 0.6 | |
| V _{OLV} | Quiet Output Dynamic Valley V _{OL} | 3.3 | C _L = 50pF, V _{IH} = 3.3V, V _{IL} = 0V | -0.8 | V |
| | | 2.5 | C _L = 30pF, V _{IH} = 2.5V, V _{IL} = 0V | -0.6 | |

Capacitance

| Symbol | Parameter | Conditions | Typical | Units |
|------------------|-------------------------------|--|---------|-------|
| C _{IN} | Input Capacitance | V _{CC} = Open, V _I = 0V or V _{CC} | 7 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 3.3V, V _I = 0V or V _{CC} | 8 | pF |
| C _{PD} | Power Dissipation Capacitance | V _{CC} = 3.3V, V _I = 0V or V _{CC} , f = 10MHz | 25 | pF |

AC Loading and Waveforms (Generic for LCX Family)

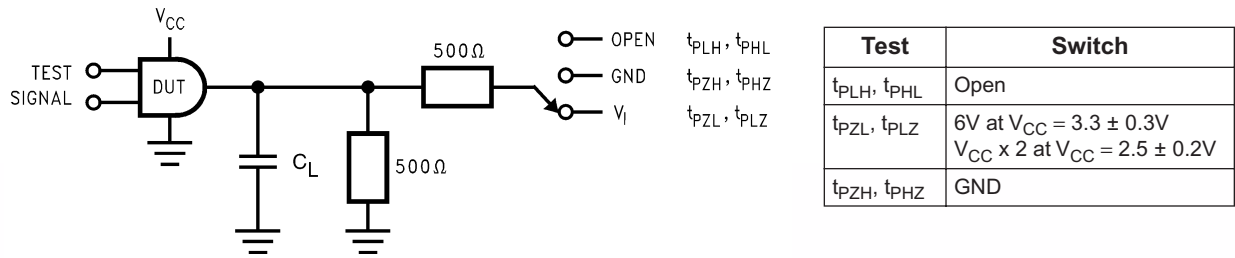
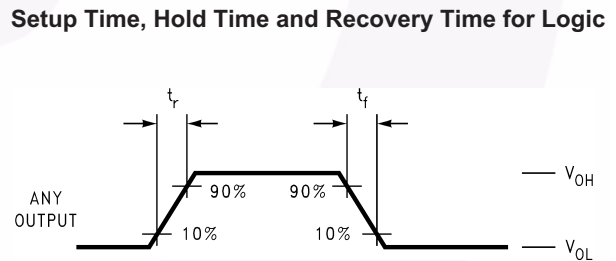
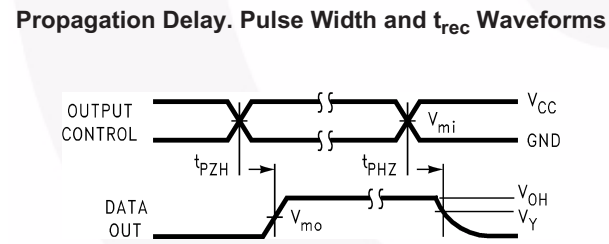
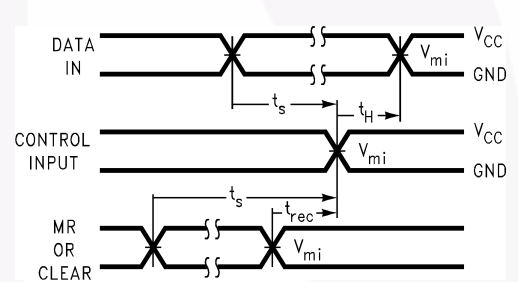
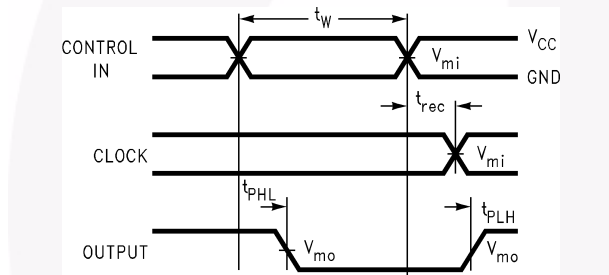
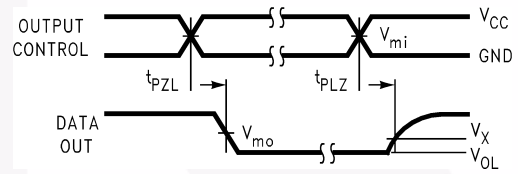
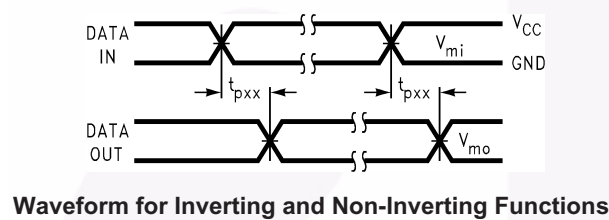


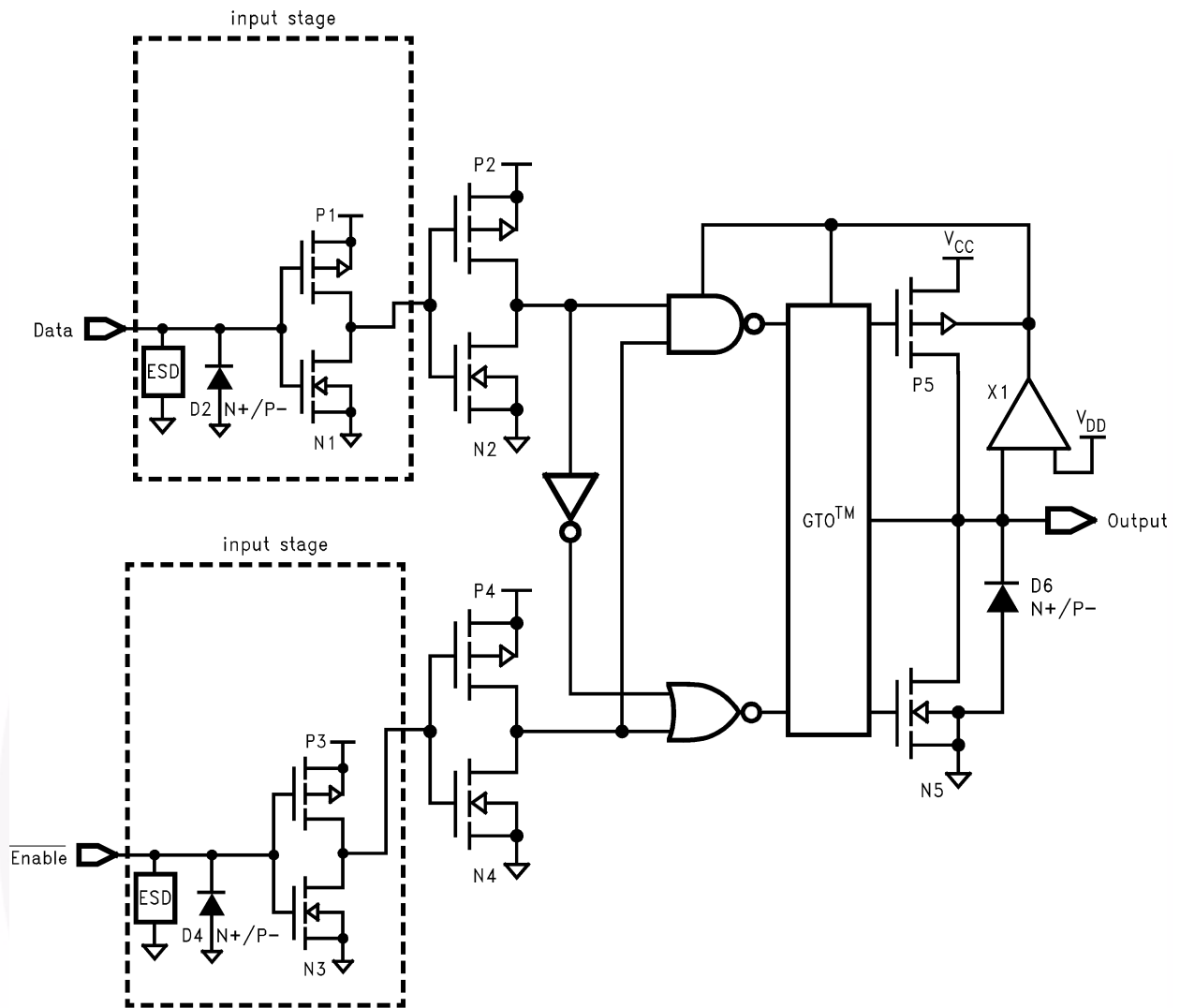
Figure 1. AC Test Circuit (C_L includes probe and jig capacitance)

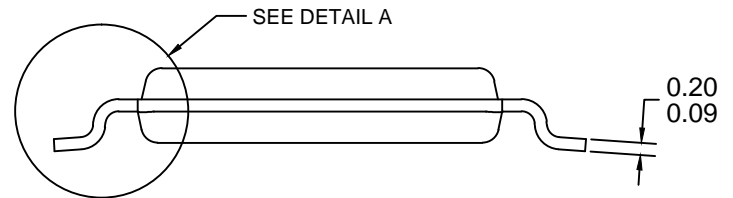


| Symbol | V_{CC} | | |
|----------|-----------------|-----------------|------------------|
| | $3.3V \pm 0.3V$ | 2.7V | $2.5V \pm 0.2V$ |
| V_{mi} | 1.5V | 1.5V | $V_{CC}/2$ |
| V_{mo} | 1.5V | 1.5V | $V_{CC}/2$ |
| V_x | $V_{OL} + 0.3V$ | $V_{OL} + 0.3V$ | $V_{OL} + 0.15V$ |
| V_y | $V_{OH} - 0.3V$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

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

Schematic Diagram (Generic for LCX Family)

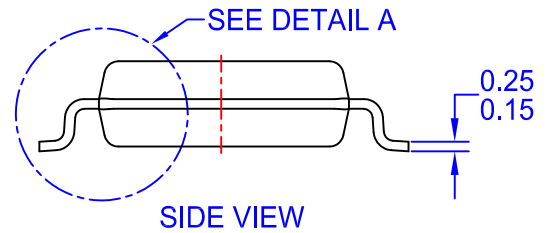
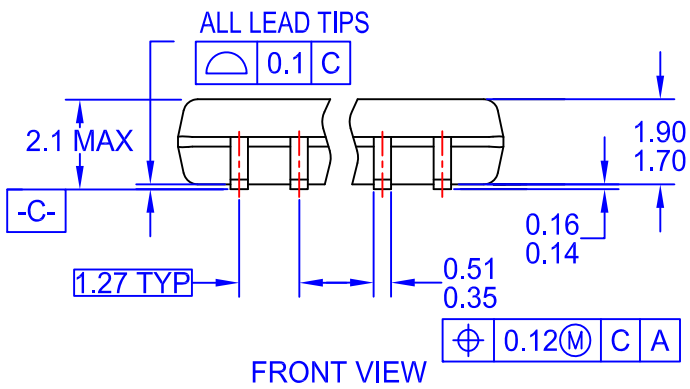
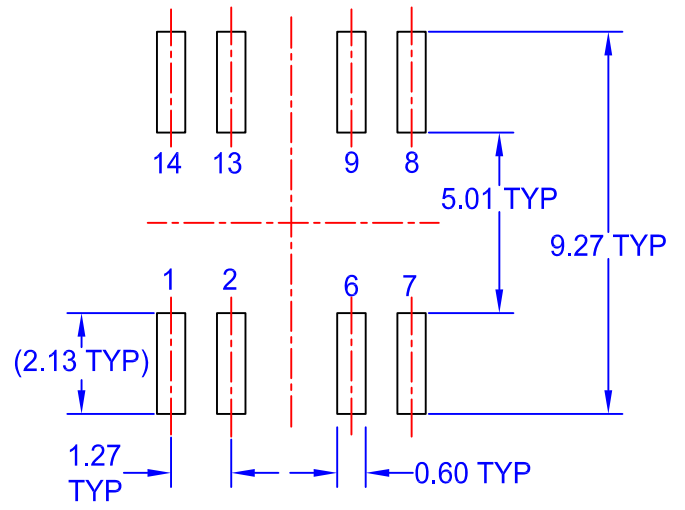
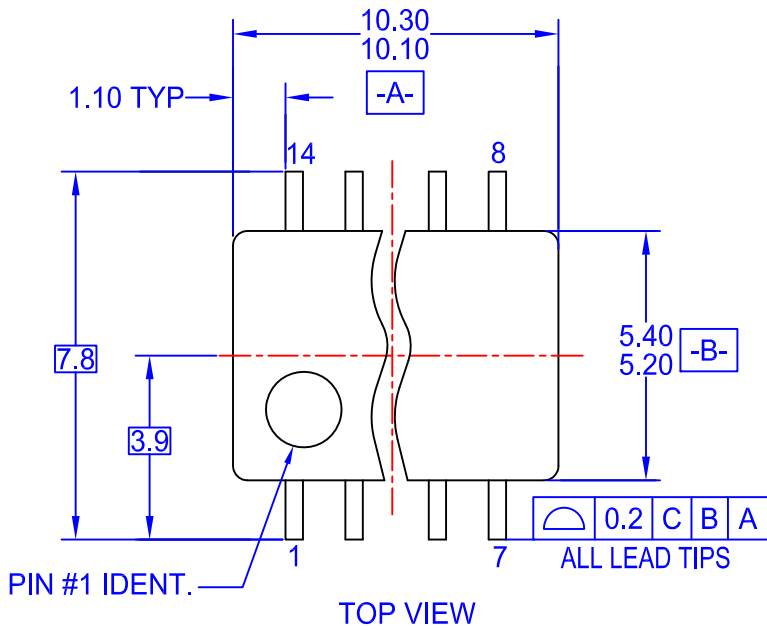




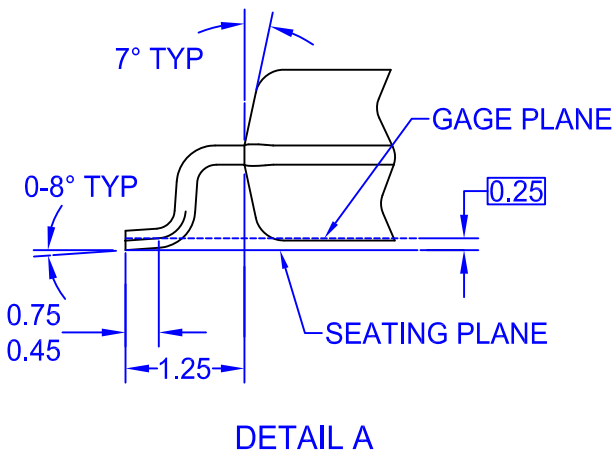
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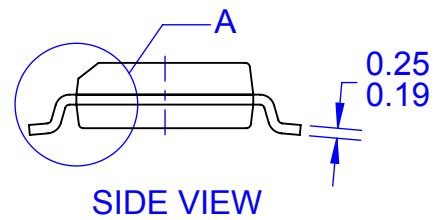
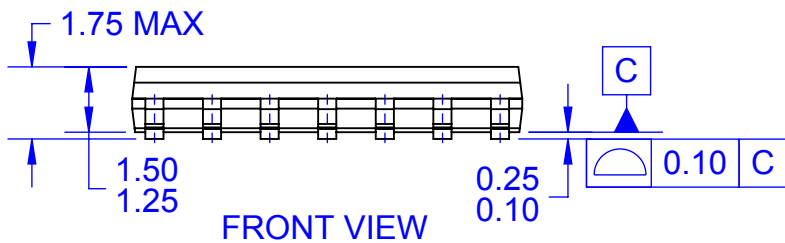
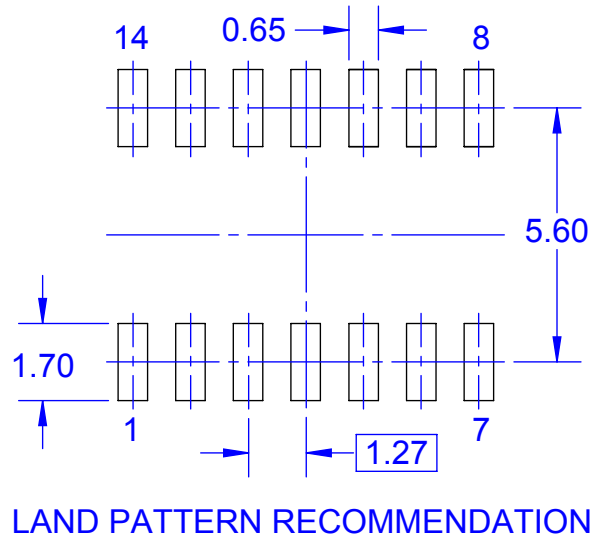
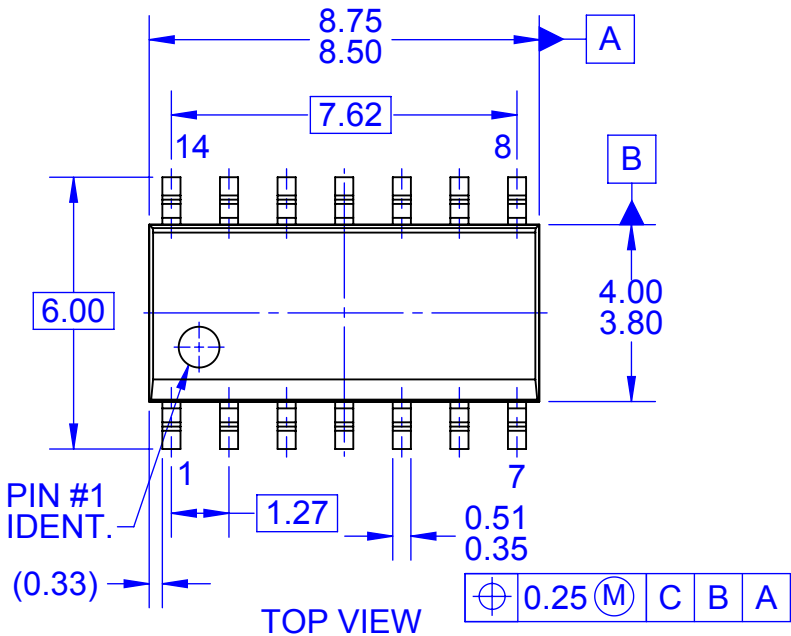
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