

## 74ALVC86

### Low Voltage Quad 2-Input Exclusive-OR Gate with 3.6V Tolerant Inputs and Outputs

#### General Description

The ALVC86 contains four 2-input exclusive OR gates. This product is designed for low voltage (1.65V to 3.6V)  $V_{CC}$  applications with I/O compatibility up to 3.6V

The 74ALVC86 is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

#### Features

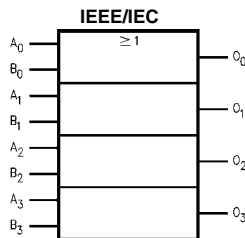
- 1.65V to 3.6V  $V_{CC}$  supply operation
- 3.6V tolerant inputs and outputs
- $t_{PD}$ 
  - 3.5 ns max for 3.0V to 3.6V  $V_{CC}$
  - 4.4 ns max for 2.3V to 2.7V  $V_{CC}$
  - 7.8 ns max for 1.65V to 1.95V  $V_{CC}$
- Power-off high impedance inputs and outputs
- Uses patented Quiet Series™ noise/EMI reduction circuitry
- Latchup conforms to JEDEC JED78
- ESD performance:
  - Human body model > 2000V
  - Machine model > 250V

#### Ordering Code:

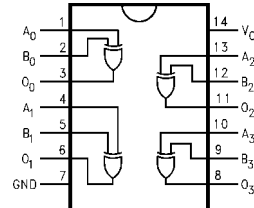
| Order Number | Package Number | Package Description  |
|--------------|----------------|--|
| 74ALVC86M    | M14A           | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| 74ALVC86MTC  | MTC14          | 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 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 |
|------------|-------------|
| $A_n, B_n$ | Inputs      |
| $O_n$      | Outputs     |

Quiet Series™ is a trademark of Fairchild Semiconductor Corporation

**Absolute Maximum Ratings** (Note 1)

|  |                          |
|--|--------------------------|
| Supply Voltage ( $V_{CC}$ )                                  | -0.5V to +4.6V           |
| DC Input Voltage ( $V_I$ )                                   | -0.5V to 4.6V            |
| Output Voltage ( $V_O$ ) (Note 2)                            | -0.5V to $V_{CC} + 0.5V$ |
| DC Input Diode Current ( $I_{IK}$ )                          |                          |
| $V_I < 0V$   | -50 mA                   |
| DC Output Diode Current ( $I_{OK}$ )                         |                          |
| $V_O < 0V$   | -50 mA                   |
| DC Output Source/Sink Current ( $I_{OH}/I_{OL}$ )            | ±50 mA                   |
| DC $V_{CC}$ or GND Current per Supply Pin ( $I_{CC}$ or GND) | ±100 mA                  |
| Storage Temperature Range ( $T_{STG}$ )                      | -65°C to +150°C          |

**Recommended Operating Conditions** (Note 3)

|   |                |
|---|----------------|
| Power Supply                                    |                |
| Operating                                       | 1.65V to 3.6V  |
| Input Voltage ( $V_I$ )                         | 0V to $V_{CC}$ |
| Output Voltage ( $V_O$ )                        | 0V to $V_{CC}$ |
| Free Air Operating Temperature ( $T_A$ )        | -40°C to +85°C |
| Minimum Input Edge Rate ( $\Delta t/\Delta V$ ) |                |
| $V_{IN} = 0.8V$ to 2.0V, $V_{CC} = 3.0V$        | 10 ns/V        |

**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.

**Note 2:**  $I_O$  Absolute Maximum Rating must be observed.

**Note 3:** Floating or unused inputs must be held HIGH or LOW.

**DC Electrical Characteristics**

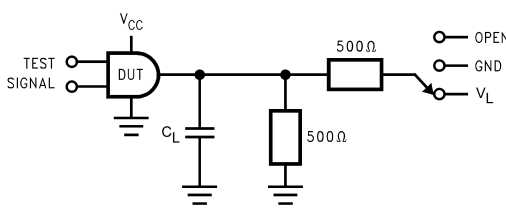
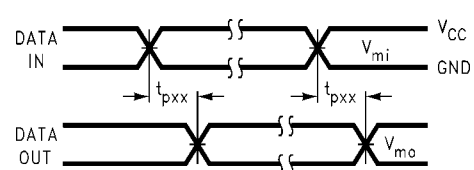
| Symbol          | Parameter                      | Conditions  | $V_{CC}$<br>(V)                                | Min   | Max                                      | Units |
|-----------------|--------------------------------|---|--|---|--|-------|
| $V_{IH}$        | HIGH Level Input Voltage       |   | 1.65 - 1.95<br>2.3 - 2.7<br>2.7 - 3.6          | $0.65 \times V_{CC}$<br>1.7<br>2.0              |  | V     |
| $V_{IL}$        | LOW Level Input Voltage        |   | 1.65 - 1.95<br>2.3 - 2.7<br>2.7 - 3.6          |   | $0.35 \times V_{CC}$<br>0.7<br>0.8       | V     |
| $V_{OH}$        | HIGH Level Output Voltage      | $I_{OH} = -100 \mu A$<br>$I_{OH} = -4 \text{ mA}$<br>$I_{OH} = -6 \text{ mA}$<br>$I_{OH} = -12 \text{ mA}$<br><br>$I_{OH} = -24 \text{ mA}$ | 1.65 - 3.6<br>1.65<br>2.3<br>2.7<br>3.0<br>3.0 | $V_{CC} - 0.2$<br>1.2<br>2<br>1.7<br>2.2<br>2.4 |  | V     |
| $V_{OL}$        | LOW Level Output Voltage       | $I_{OL} = 100 \mu A$<br>$I_{OL} = 4 \text{ mA}$<br>$I_{OL} = 6 \text{ mA}$<br>$I_{OL} = 12 \text{ mA}$<br><br>$I_{OL} = 24 \text{ mA}$      | 1.65 - 3.6<br>1.65<br>2.3<br>2.3<br>2.7<br>3   |   | 0.2<br>0.45<br>0.4<br>0.7<br>0.4<br>0.55 | V     |
| $I_I$           | Input Leakage Current          | $0 \leq V_I \leq 3.6V$  | 3.6  |   | ±5.0                                     | μA    |
| $I_{OZ}$        | 3-STATE Output Leakage         | $0 \leq V_O \leq 3.6V$  | 3.6  |   | ±10                                      | μA    |
| $I_{CC}$        | Quiescent Supply Current       | $V_I = V_{CC}$ or GND, $I_O = 0$  | 3.6  |   | 40                                       | μA    |
| $\Delta I_{CC}$ | Increase in $I_{CC}$ per Input | $V_{IH} = V_{CC} - 0.6V$  | 3 - 3.6  |   | 750                                      | μA    |

| <b>AC Electrical Characteristics</b> |                                 |  |     |                        |     |                               |     |                                |     |       |
|--------------------------------------|---------------------------------|--|-----|------------------------|-----|-------------------------------|-----|--------------------------------|-----|-------|
| Symbol                               | Parameter                       | T <sub>A</sub> = -40°C to +85°C, R <sub>L</sub> = 500Ω |     |                        |     |                               |     |                                |     | Units |
|                                      |                                 | C <sub>L</sub> = 50 pF                                 |     |                        |     | C <sub>L</sub> = 30 pF        |     |                                |     |       |
|                                      |                                 | V <sub>CC</sub> = 3.3V ± 0.3V                          |     | V <sub>CC</sub> = 2.7V |     | V <sub>CC</sub> = 2.5V ± 0.2V |     | V <sub>CC</sub> = 1.8V ± 0.15V |     |       |
|                                      |                                 | Min  | Max | Min                    | Max | Min                           | Max | Min                            | Max |       |
| t <sub>PHL</sub> , t <sub>PLH</sub>  | Propagation Delay<br>Bus to Bus | 1.1  | 3.5 | 1.3                    | 4.4 | 0.8                           | 3.9 | 1.0                            | 7.8 | ns    |

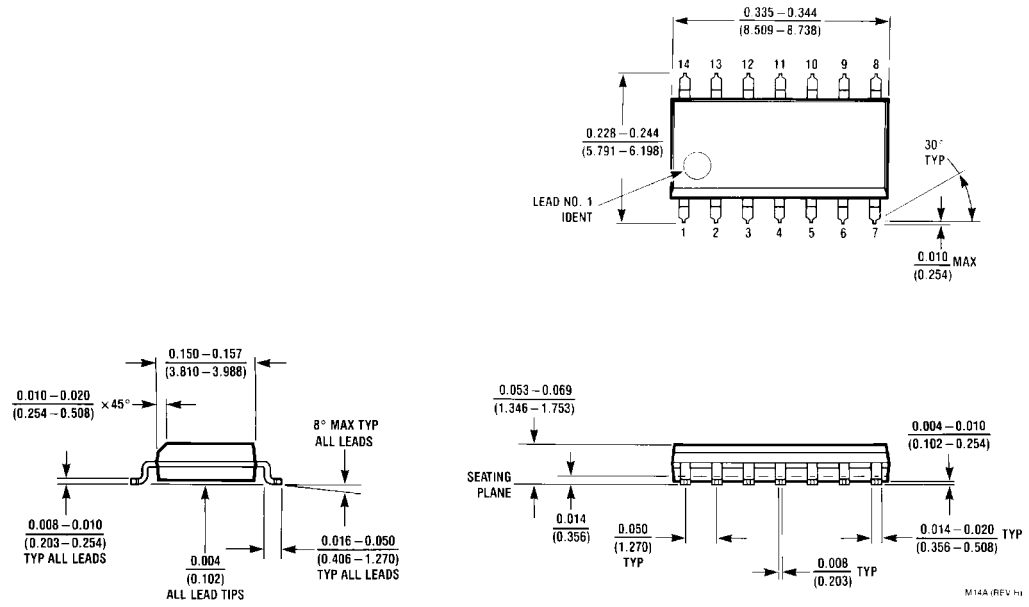
  

| <b>Capacitance</b> |                               |  |                                    |         |       |
|--------------------|-------------------------------|--|------------------------------------|---------|-------|
| Symbol             | Parameter                     | Conditions                             | T <sub>A</sub> = +25°C             |         | Units |
|                    |                               |  | V <sub>CC</sub>                    | Typical |       |
| C <sub>IN</sub>    | Input Capacitance             | V <sub>I</sub> = 0V or V <sub>CC</sub> | 3.3                                | 6       | pF    |
| C <sub>OUT</sub>   | Output Capacitance            | V <sub>I</sub> = 0V or V <sub>CC</sub> | 3.3                                | 7       | pF    |
| C <sub>PD</sub>    | Power Dissipation Capacitance | Outputs Enabled                        | f = 10 MHz, C <sub>L</sub> = 50 pF | 3.3     | 20    |
|                    |                               |  |                                    | 2.5     | 20    |

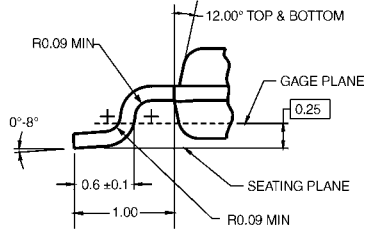
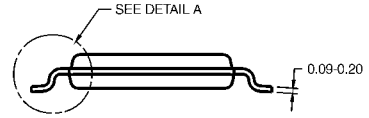
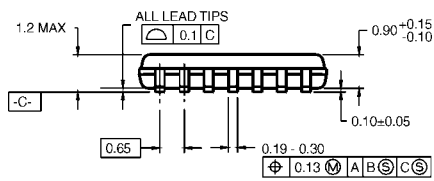
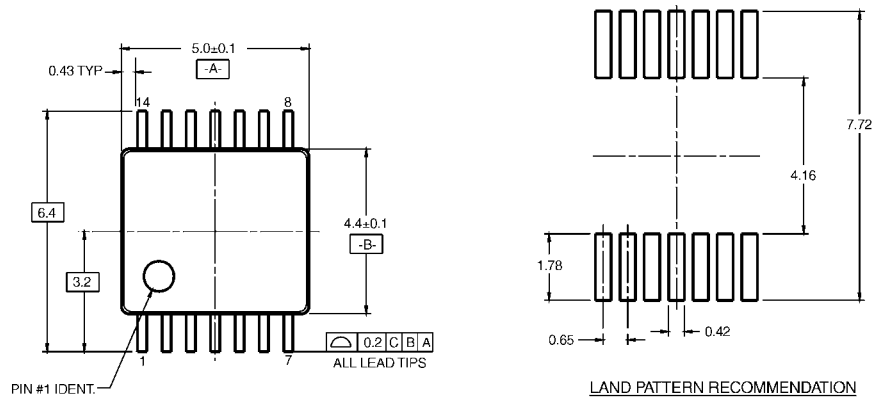
| <b>AC Loading and Waveforms</b>   |   |        |                    |                                     |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
|---|---|--------|--------------------|-------------------------------------|------|--|-------------|------|-------------|--------------|-----------------|------|------|--------------------|--------------------|-----------------|------|------|--------------------|--------------------|
|  <p style="text-align: center; font-size: small;">FIGURE 1. AC Test Circuit</p>   | <p style="text-align: center; font-size: x-small;">TABLE 1. Values for Figure 1</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th style="width: 50%;">TEST</th> <th style="width: 50%;">SWITCH</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">t<sub>PLH</sub>, t<sub>PHL</sub></td> <td style="text-align: center;">Open</td> </tr> </tbody> </table> | TEST   | SWITCH             | t <sub>PLH</sub> , t <sub>PHL</sub> | Open |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
| TEST  | SWITCH  |        |                    |                                     |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
| t <sub>PLH</sub> , t <sub>PHL</sub>   | Open  |        |                    |                                     |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
| <p style="font-size: x-small;">TABLE 2. Variable Matrix<br/>(Input Characteristics: f = 1MHz; t<sub>r</sub> = t<sub>f</sub> = 2ns; Z<sub>0</sub> = 50Ω)</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th rowspan="2" style="width: 15%;">Symbol</th> <th colspan="4" style="text-align: center;">V<sub>CC</sub></th> </tr> <tr> <th style="text-align: center;">3.3V ± 0.3V</th> <th style="text-align: center;">2.7V</th> <th style="text-align: center;">2.5V ± 0.2V</th> <th style="text-align: center;">1.8V ± 0.15V</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">V<sub>mi</sub></td> <td style="text-align: center;">1.5V</td> <td style="text-align: center;">1.5V</td> <td style="text-align: center;">V<sub>CC</sub>/2</td> <td style="text-align: center;">V<sub>CC</sub>/2</td> </tr> <tr> <td style="text-align: center;">V<sub>mo</sub></td> <td style="text-align: center;">1.5V</td> <td style="text-align: center;">1.5V</td> <td style="text-align: center;">V<sub>CC</sub>/2</td> <td style="text-align: center;">V<sub>CC</sub>/2</td> </tr> </tbody> </table> |   | Symbol | V <sub>CC</sub>    |                                     |      |  | 3.3V ± 0.3V | 2.7V | 2.5V ± 0.2V | 1.8V ± 0.15V | V <sub>mi</sub> | 1.5V | 1.5V | V <sub>CC</sub> /2 | V <sub>CC</sub> /2 | V <sub>mo</sub> | 1.5V | 1.5V | V <sub>CC</sub> /2 | V <sub>CC</sub> /2 |
| Symbol  | V <sub>CC</sub>   |        |                    |                                     |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
|   | 3.3V ± 0.3V   | 2.7V   | 2.5V ± 0.2V        | 1.8V ± 0.15V                        |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
| V <sub>mi</sub>   | 1.5V  | 1.5V   | V <sub>CC</sub> /2 | V <sub>CC</sub> /2                  |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
| V <sub>mo</sub>   | 1.5V  | 1.5V   | V <sub>CC</sub> /2 | V <sub>CC</sub> /2                  |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |
|  <p style="text-align: center; font-size: small;">FIGURE 2. Waveform for Inverting and Non-inverting Functions</p>  |   |        |                    |                                     |      |  |             |      |             |              |                 |      |      |                    |                    |                 |      |      |                    |                    |

**Physical Dimensions** inches (millimeters) unless otherwise noted



**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Package Number M14A**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



- NOTES:  
 A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6, DATE 7/93.  
 B. DIMENSIONS ARE IN MILLIMETERS.  
 C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.  
 D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC14RevC3

**14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC14**

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