

# 54AC86

## Quad 2-Input Exclusive-OR Gate

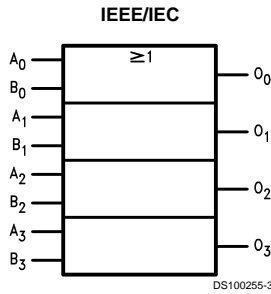
### General Description

The 'AC86 contains four, 2-input exclusive-OR gates.

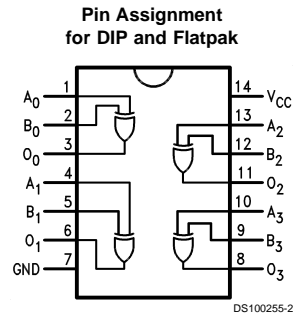
### Features

- $I_{CC}$  reduced by 50%
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
  - 'AC86: 5962-89550

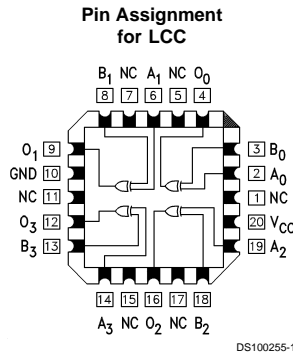
### Logic Symbol



### Connection Diagrams



| Pin Names                      | Description |
|--------------------------------|-------------|
| A <sub>0</sub> -A <sub>3</sub> | Inputs      |
| B <sub>0</sub> -B <sub>3</sub> | Inputs      |
| O <sub>0</sub> -O <sub>3</sub> | Outputs     |



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## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

|  |                          |
|--|--------------------------|
| Supply Voltage ( $V_{CC}$ )                | -0.5V to +7.0V           |
| DC Input Diode Current ( $I_{IK}$ )        |                          |
| $V_I = 0.5V$                               | -20 mA                   |
| $V_I = V_{CC} + 0.5V$                      | +20 mA                   |
| DC Input Voltage ( $V_I$ )                 | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Diode Current ( $I_{OK}$ )       |                          |
| $V_O = -0.5V$                              | -20 mA                   |
| $V_O = V_{CC} + 0.5V$                      | +20 mA                   |
| DC Output Voltage ( $V_O$ )                | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source or Sink Current ( $I_O$ ) | $\pm 50$ mA              |
| DC $V_{CC}$ or Ground Current              |                          |
| Per Output Pin ( $I_{CC}$ or $I_{GND}$ )   | $\pm 50$ mA              |
| Storage Temperature ( $T_{STG}$ )          | -65°C to +150°C          |
| Junction Temperature ( $T_J$ )             |                          |
| CDIP                                       | 175°C                    |

## Recommended Operating Conditions

|   |                                      |                 |
|---|--------------------------------------|-----------------|
| Supply Voltage ( $V_{CC}$ )                     | 'AC                                  | 2.0V to 6.0V    |
| Input Voltage ( $V_I$ )                         |                                      | 0V to $V_{CC}$  |
| Output Voltage ( $V_O$ )                        |                                      | 0V to $V_{CC}$  |
| Operating Temperature ( $T_A$ )                 | 54AC                                 | -55°C to +125°C |
| Minimum Input Edge Rate ( $\Delta V/\Delta t$ ) | 'AC Devices                          |                 |
|   | $V_{IN}$ from 30% to 70% of $V_{CC}$ |                 |
|   | $V_{CC}$ @ 3.3V, 4.5V, 5.5V          | 125 mV/ns       |

**Note 1:** Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

## DC Characteristics for 'AC Family Devices

| Symbol    | Parameter                            | $V_{CC}$<br>(V) | 54AC                       | Units   | Conditions   |
|-----------|--------------------------------------|-----------------|----------------------------|---------|--|
|           |                                      |                 | $T_A =$<br>-55°C to +125°C |         |  |
|           |                                      |                 | Guaranteed Limits          |         |  |
| $V_{IH}$  | Minimum High Level<br>Input Voltage  | 3.0             | 2.1                        | V       | $V_{OUT} = 0.1V$<br>or $V_{CC} - 0.1V$   |
|           |                                      | 4.5             | 3.15                       |         |  |
|           |                                      | 5.5             | 3.85                       |         |  |
| $V_{IL}$  | Maximum Low Level<br>Input Voltage   | 3.0             | 0.9                        | V       | $V_{OUT} = 0.1V$<br>or $V_{CC} - 0.1V$   |
|           |                                      | 4.5             | 1.35                       |         |  |
|           |                                      | 5.5             | 1.65                       |         |  |
| $V_{OH}$  | Minimum High Level<br>Output Voltage | 3.0             | 2.9                        | V       | $I_{OUT} = -50 \mu A$  |
|           |                                      | 4.5             | 4.4                        |         |  |
|           |                                      | 5.5             | 5.4                        |         |  |
| $V_{OL}$  | Maximum Low Level<br>Output Voltage  | 3.0             | 2.4                        | V       | (Note 2)<br>$V_{IN} = V_{IL}$ or $V_{IH}$<br>$I_{OH} = -12$ mA<br>$I_{OH} = -24$ mA<br>$I_{OH} = -24$ mA |
|           |                                      | 4.5             | 3.7                        |         |  |
|           |                                      | 5.5             | 4.7                        |         |  |
| $V_{OL}$  | Maximum Low Level<br>Output Voltage  | 3.0             | 0.1                        | V       | $I_{OUT} = 50 \mu A$   |
|           |                                      | 4.5             | 0.1                        |         |  |
|           |                                      | 5.5             | 0.1                        |         |  |
| $V_{OL}$  | Maximum Low Level<br>Output Voltage  | 3.0             | 0.50                       | V       | (Note 2)<br>$V_{IN} = V_{IL}$ or $V_{IH}$<br>$I_{OL} = 12$ mA<br>$I_{OL} = 24$ mA<br>$I_{OL} = 24$ mA    |
|           |                                      | 4.5             | 0.50                       |         |  |
|           |                                      | 5.5             | 0.50                       |         |  |
| $I_{IN}$  | Maximum Input<br>Leakage Current     | 5.5             | $\pm 1.0$                  | $\mu A$ | $V_I = V_{CC}, GND$  |
| $I_{OZ}$  | Maximum TRI-STATE®                   |                 |                            |         | $V_I (OE) = V_{IL}, V_{IH}$<br>$V_O = V_{CC}, GND$   |
| $I_{OLD}$ | (Note 3) Minimum Dynamic             | 5.5             | 50                         | mA      | $V_{OLD} = 1.65V$ Max  |
| $I_{OHD}$ | Output Current                       | 5.5             | -50                        | mA      | $V_{OHD} = 3.85V$ Min  |

## DC Characteristics for 'AC Family Devices (Continued)

| Symbol          | Parameter                           | V <sub>CC</sub><br>(V) | 54AC                                |  | Units | Conditions                                  |
|-----------------|-------------------------------------|------------------------|-------------------------------------|--|-------|---|
|                 |                                     |                        | T <sub>A</sub> =<br>-55°C to +125°C |  |       |   |
|                 |                                     |                        | Guaranteed Limits                   |  |       |   |
| I <sub>CC</sub> | Maximum Quiescent<br>Supply Current | 5.5                    | 40.0                                |  | μA    | V <sub>IN</sub> = V <sub>CC</sub><br>or GND |

**Note 2:** All outputs loaded; thresholds on input associated with output under test.

**Note 3:** Maximum test duration 20 ms, one output loaded at a time.

**Note 4:** I<sub>IN</sub> and I<sub>CC</sub> @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V<sub>CC</sub>.

I<sub>CC</sub> for 54AC @ 25°C is identical to 74AC @ 25°C.

## AC Electrical Characteristics

| Symbol           | Parameter         | V <sub>CC</sub><br>(V)<br>(Note 5) | 54AC  |      | Units | Fig.<br>No. |
|------------------|-------------------|------------------------------------|---|------|-------|-------------|
|                  |                   |                                    | T <sub>A</sub> = -55°C<br>to +125°C<br>C <sub>L</sub> = 50 pF |      |       |             |
|                  |                   |                                    | Min   | Max  |       |             |
| t <sub>PHL</sub> | Propagation Delay | 3.3                                | 1.0   | 14.0 | ns    |             |
|                  | Inputs to Outputs | 5.0                                | 1.0   | 10.0 |       |             |
| t <sub>PLH</sub> | Propagation Delay | 3.3                                | 1.0   | 14.0 | ns    |             |
|                  | Inputs to Outputs | 5.0                                | 1.0   | 10.0 |       |             |

**Note 5:** Voltage Range 3.3V is 3.3V ±0.3V

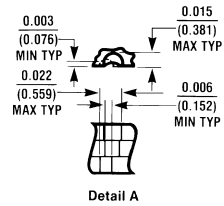
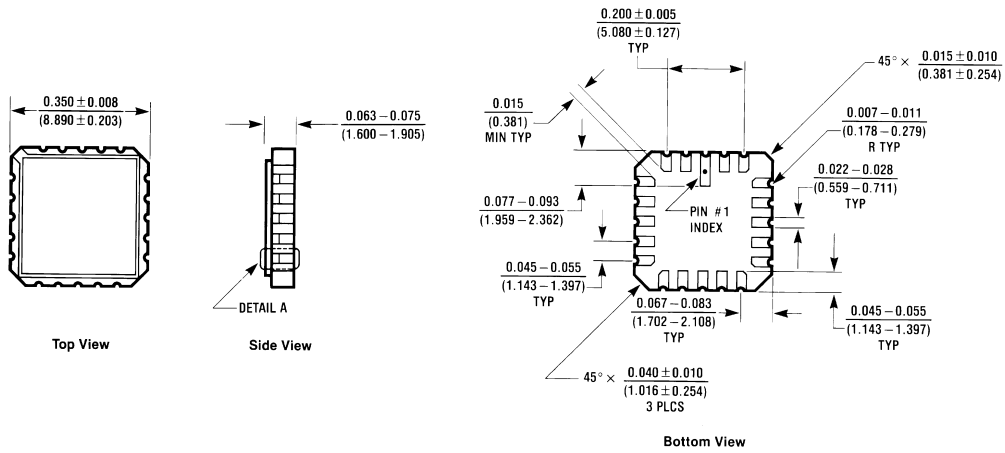
Voltage Range 5.0V is 5.0V ±0.5V

## Capacitance

| Symbol          | Parameter                     | Typ | Units | Conditions             |
|-----------------|-------------------------------|-----|-------|------------------------|
| C <sub>IN</sub> | Input Capacitance             | 4.5 | pF    | V <sub>CC</sub> = Open |
| C <sub>PD</sub> | Power Dissipation Capacitance | 35  | pF    | V <sub>CC</sub> = 5.0V |

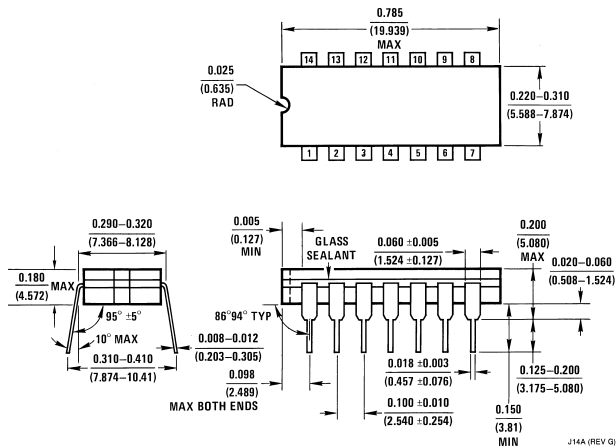


**Physical Dimensions** inches (millimeters) unless otherwise noted



**20-Terminal Ceramic Leadless Chip Carrier (L)**  
 NS Package Number E20A

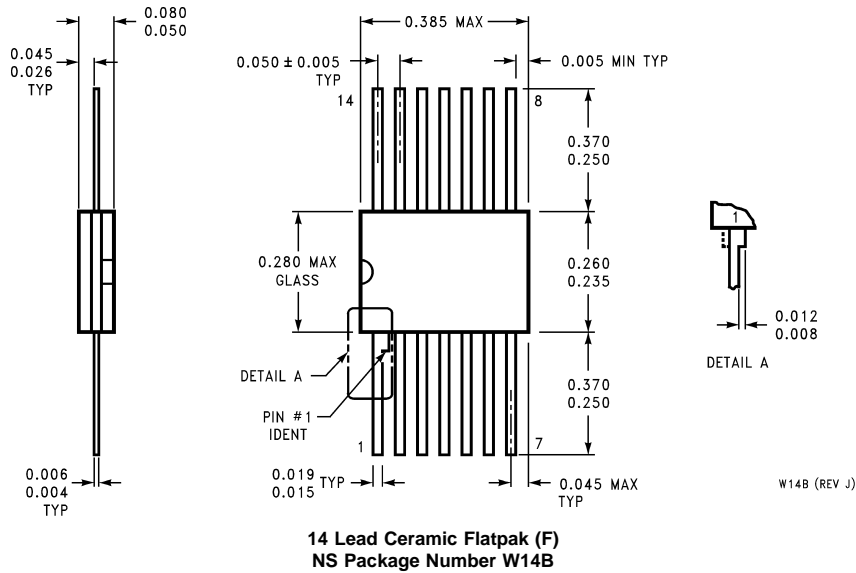
E20A (REV D)



**14 Lead Ceramic Dual-In-Line Package (D)**  
 NS Package Number J14A

J14A (REV G)

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



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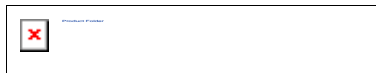
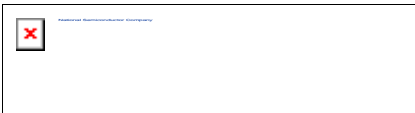
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Email: support@nsc.com

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## 54AC86 Quad 2-input Exclusive-OR Gate

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### General Description

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### Features




- $I_{CC}$  reduced by 50%
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD) -'AC86: 5962-89550

### Datasheet

| Title                                 | Size (in Kbytes) | Date      | <br>View Online | <br>Download | <br>Receive via Email |
|---------------------------------------|------------------|-----------|---|---|--|
| 54AC86 Quad 2-Input Exclusive-OR Gate | 112 Kbytes       | 24-Sep-98 | <a href="#">View Online</a>   | <a href="#">Download</a>  | <a href="#">Receive via Email</a>  |

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## Package Availability, Models, Samples & Pricing

| Part Number     | Package |        | Status          | Models |      | Samples & Electronic Orders  | Budgetary Pricing |           | St<br>Pac<br>Siz |
|-----------------|---------|--------|-----------------|--------|------|--|-------------------|-----------|------------------|
|                 | Type    | # pins |                 | SPICE  | IBIS |  | Quantity          | \$US each |                  |
| 5962-89550012A  | LCC     | 20     | Full production | N/A    | N/A  |  | 50+               | \$6.5000  | tub<br>of<br>50  |
| 5962-8955001CA  | Cerdip  | 14     | Full production | N/A    | N/A  |  | 50+               | \$1.8000  | tub<br>of<br>25  |
| 5962-8955001DA  | Cerpack | 14     | Full production | N/A    | N/A  |  | 50+               | \$5.0000  | tub<br>of<br>19  |
| JM38510R75202BC | Cerdip  | 14     | Full production | N/A    | N/A  | .  | 50+               | \$68.0000 | tub<br>of<br>25  |
| JM38510R75202BD | Cerpack | 14     | Full production | N/A    | N/A  | .  | 50+               | \$69.0000 | tub<br>of<br>19  |
| JM38510/75202B2 | LCC     | 20     | Full production | N/A    | N/A  | .  | 50+               | \$9.0000  | tub<br>of<br>50  |
| JM38510R75202B2 | LCC     | 20     | Full production | N/A    | N/A  | .  | 50+               | \$70.0000 | tub<br>of<br>50  |
| JM38510/75202BC | Cerdip  | 14     | Full production | N/A    | N/A  | .  | 50+               | \$7.0000  | tub<br>of<br>25  |
| JM38510/75202BD | Cerpack | 14     | Full production | N/A    | N/A  | .  | 50+               | \$9.0000  | tub<br>of<br>19  |



|                 |         |    |                 |     |     |   |     |            |           |
|-----------------|---------|----|-----------------|-----|-----|---|-----|------------|-----------|
| JM38510/75202S2 | LCC     | 20 | Full production | N/A | N/A | . | 50+ | \$170.0000 | tub of 50 |
| JM38510R75202S2 | LCC     | 20 | Full production | N/A | N/A | . | 50+ | \$138.0000 | tub of 50 |
| JM38510R75202SC | Cerdip  | 14 | Full production | N/A | N/A | . | 50+ | \$138.0000 | tub of 25 |
| JM38510/75202SD | Cerpack | 14 | Full production | N/A | N/A | . | 50+ | \$170.0000 | tub of 19 |
| JM38510R75202SD | Cerpack | 14 | Full production | N/A | N/A | . | 50+ | \$138.0000 | tub of 19 |
| 54AC86 MW8      | wafer   |    | Full production | N/A | N/A | . |     |            | N/.       |

## Application Notes

| Title   | Size (in Kbytes) | Date     |  View Online |  Download |  Receive via Email |
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