

54AC/74AC08 • 74ACT08 Quad 2-Input AND Gate

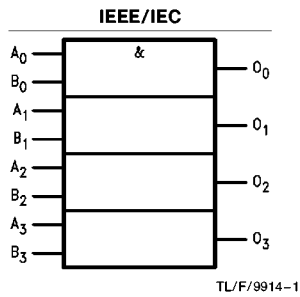
General Description

The 'AC/'ACT08 contains four, 2-input AND gates.

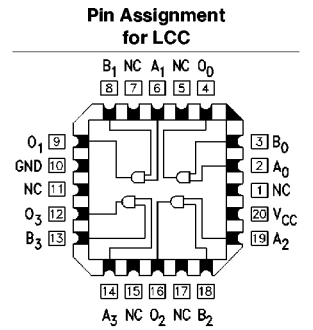
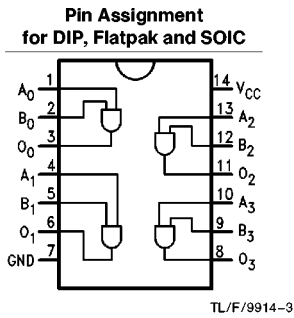
Features

- I_{CC} reduced by 50% on 54AC/74AC only
- Outputs source/sink 24 mA
- 'ACT08 has TTL-compatible inputs
- Standard Military Drawing (SMD)
 - 'AC08: 5962-87615
- For Military 54ACT08 device, see 54ACTQ08

Logic Symbols



Connection Diagrams



| Pin Names | Description |
|------------|-------------|
| A_n, B_n | Inputs |
| O_n | Outputs |

FACT™ is a trademark of National Semiconductor Corporation.

Absolute Maximum Rating (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) | ±50 mA |
| DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND}) | ±50 mA |
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Junction Temperature (T_J) | |
| CDIP | 175°C |
| PDIP | 140°C |

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.

Recommended Operating Conditions

| | | |
|---|--|-----------------|
| Supply Voltage (V_{CC}) | | 2.0V to 6.0V |
| 'AC | | 4.5V to 5.5V |
| 'ACT | | |
| Input Voltage (V_I) | | 0V to V_{CC} |
| Output Voltage (V_O) | | 0V to V_{CC} |
| Operating Temperature (T_A) | | |
| 74AC/ACT | | -40°C to +85°C |
| 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 |
| Minimum Input Edge Rate ($\Delta V/\Delta t$) | | |
| 'ACT Devices | | |
| V_{IN} from 0.8V to 2.0V | | |
| V_{CC} @ 4.5V, 5.5V | | 125 mV/ns |

DC Characteristics for 'AC Family Devices

| Symbol | Parameter | V_{CC} (V) | 74AC | | 54AC | 74AC | Units | Conditions | |
|----------|-----------------------------------|-----------------|---------------------------|-------------------|--|---|-------|--|--|
| | | | $T_A = +25^\circ\text{C}$ | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | | |
| | | | Typ | Guaranteed Limits | | | | | |
| V_{IH} | Minimum High Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | 2.1 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 4.5 | 2.25 | 3.15 | 3.15 | 3.15 | | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | 3.85 | | | |
| V_{IL} | Maximum Low Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | 0.9 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 4.5 | 2.25 | 1.35 | 1.35 | 1.35 | | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | 1.65 | | | |
| V_{OH} | Minimum High Level Output Voltage | 3.0 | 2.99 | 2.9 | 2.9 | 2.9 | V | $I_{OUT} = -50 \mu\text{A}$ | |
| | | 4.5 | 4.49 | 4.4 | 4.4 | 4.4 | | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | 5.4 | | | |
| | | | 3.0 | | 2.56 | 2.4 | 2.46 | V | * $V_{IN} = V_{IL}$ or V_{IH} -12 mA I_{OH} -24 mA -24 mA |
| | | | 4.5 | | 3.86 | 3.7 | 3.76 | | |
| | | | 5.5 | | 4.86 | 4.7 | 4.76 | | |
| V_{OL} | Maximum Low Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | 0.1 | V | $I_{OUT} = 50 \mu\text{A}$ | |
| | | 4.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | | 3.0 | | 0.36 | 0.5 | 0.44 | V | * $V_{IN} = V_{IL}$ or V_{IH} 12 mA I_{OL} 24 mA 24 mA |
| | | | 4.5 | | 0.36 | 0.5 | 0.44 | | |
| | | | 5.5 | | 0.36 | 0.5 | 0.44 | | |
| I_{IN} | Maximum Input Leakage Current | 5.5 | | ±0.1 | ±1.0 | ±1.0 | μA | $V_I = V_{CC}, \text{GND}$ | |

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

DC Characteristics for 'AC Family Devices (Continued)

| Symbol | Parameter | V _{CC} (V) | 74AC | | 54AC | 74AC | | Units | Conditions |
|------------------|----------------------------------|------------------------|------------------------|-------------------|-------------------------------------|------------------------------------|------|-------|---|
| | | | T _A = +25°C | | T _A = -55°C to +125°C | T _A = -40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | | | | | |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | | | 50 | | 75 | mA | V _{OLD} = 1.65V Max |
| I _{OHD} | | 5.5 | | | -50 | | -75 | mA | V _{OHD} = 3.85V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | | 2.0 | 40.0 | | 20.0 | μA | V _{IN} = V _{CC} or GND |

†Maximum test duration 2.0 ms, one output loaded at a time.

Note: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.
I_{CC} for 54AC @ 25°C is identical to 74AC @ 25°C.

DC Characteristics for 'ACT Family Devices

| Symbol | Parameter | V _{CC} (V) | 74ACT | | 74ACT | | Units | Conditions |
|------------------|-----------------------------------|------------------------|------------------------|-------------------|------------------------------------|--|-------|--|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | | | | |
| V _{IH} | Minimum High Level Input Voltage | 4.5 | 1.5 | 2.0 | 2.0 | | V | V _{OUT} = 0.1V or V _{CC} - 0.1V |
| | | 5.5 | 1.5 | 2.0 | 2.0 | | | |
| V _{IL} | Maximum Low Level Input Voltage | 4.5 | 1.5 | 0.8 | 0.8 | | V | V _{OUT} = 0.1V or V _{CC} - 0.1V |
| | | 5.5 | 1.5 | 0.8 | 0.8 | | | |
| V _{OH} | Minimum High Level Output Voltage | 4.5 | 4.49 | 4.4 | 4.4 | | V | I _{OUT} = -50 μA |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | | |
| | | 4.5 | | 3.86 | 3.76 | | | |
| 5.5 | | 4.86 | 4.76 | | | | | |
| V _{OL} | Maximum Low Level Output Voltage | 4.5 | 0.001 | 0.1 | 0.1 | | V | I _{OUT} = 50 μA |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 4.5 | | 0.36 | 0.44 | | | |
| 5.5 | | 0.36 | 0.44 | | | | | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | | ±0.1 | ±1.0 | | μA | V _I = V _{CC} , GND |
| I _{CCT} | Maximum I _{CC} /Input | 5.5 | 0.6 | | 1.5 | | mA | V _I = V _{CC} - 2.1V |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | | | 75 | | mA | V _{OLD} = 1.65V Max |
| I _{OHD} | | 5.5 | | | -75 | | mA | V _{OHD} = 3.85V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | | 4.0 | 40.0 | | μA | V _{IN} = V _{CC} or GND |

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

†Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} * (V) | 74AC | | | 54AC | | 74AC | | Units |
|------------------|-------------------|--------------------------|--|------------|------------|---|-------------|--|-------------|-------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -55°C to +125°C C _L = 50 pF | | T _A = -40°C to +85°C C _L = 50 pF | | |
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 3.3 5.0 | 1.5 1.5 | 7.5 5.5 | 9.5 7.5 | 1.0 1.5 | 12.5 9.0 | 1.0 1.0 | 10.0 8.5 | ns |
| t _{PHL} | Propagation Delay | 3.3 5.0 | 1.5 1.5 | 7.0 5.5 | 8.5 7.0 | 1.0 1.5 | 11.5 8.5 | 1.0 1.0 | 9.0 7.5 | ns |

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

†Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} * (V) | 74ACT | | | 74ACT | | Units |
|------------------|-------------------|--------------------------|--|-----|-----|--|------|-------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | |
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 5.0 | 1.0 | 6.5 | 9.0 | 1.0 | 10.0 | ns |
| t _{PHL} | Propagation Delay | 5.0 | 1.0 | 6.5 | 9.0 | 1.0 | 10.0 | ns |

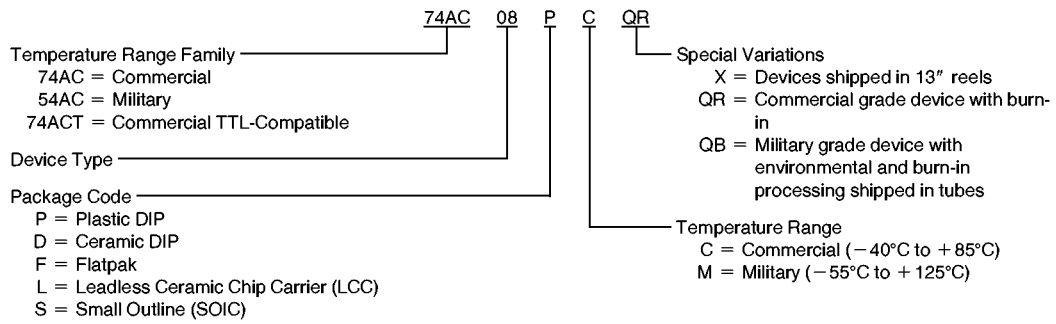
*Voltage Range 5.0 is 5.0V ± 0.5V

Capacitance

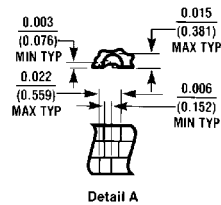
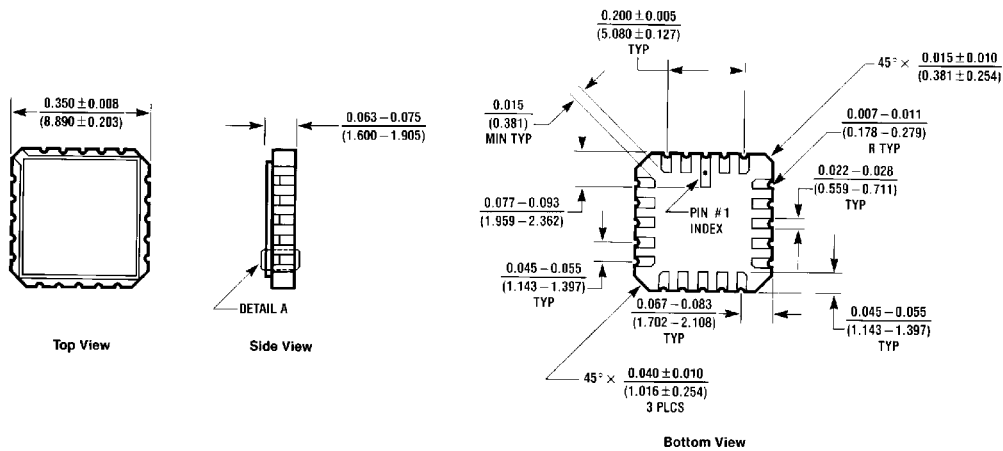
| Symbol | Parameter | Typ | Units | Conditions |
|-----------------|-------------------------------|------|-------|------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = OPEN |
| C _{PD} | Power Dissipation Capacitance | 20.0 | pF | V _{CC} = 5.0V |

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:

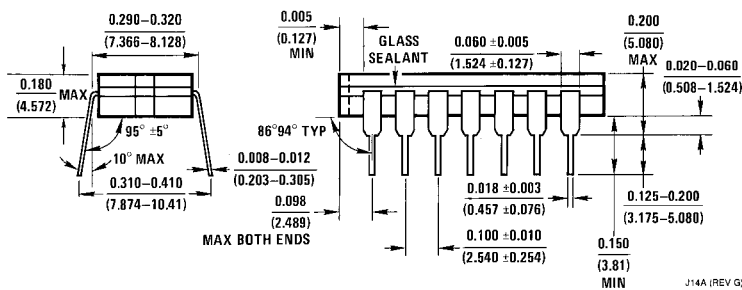
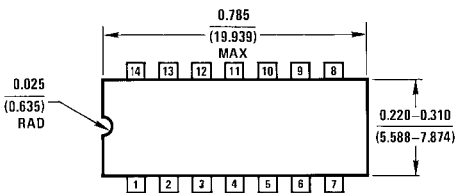


Physical Dimensions inches (millimeters)



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

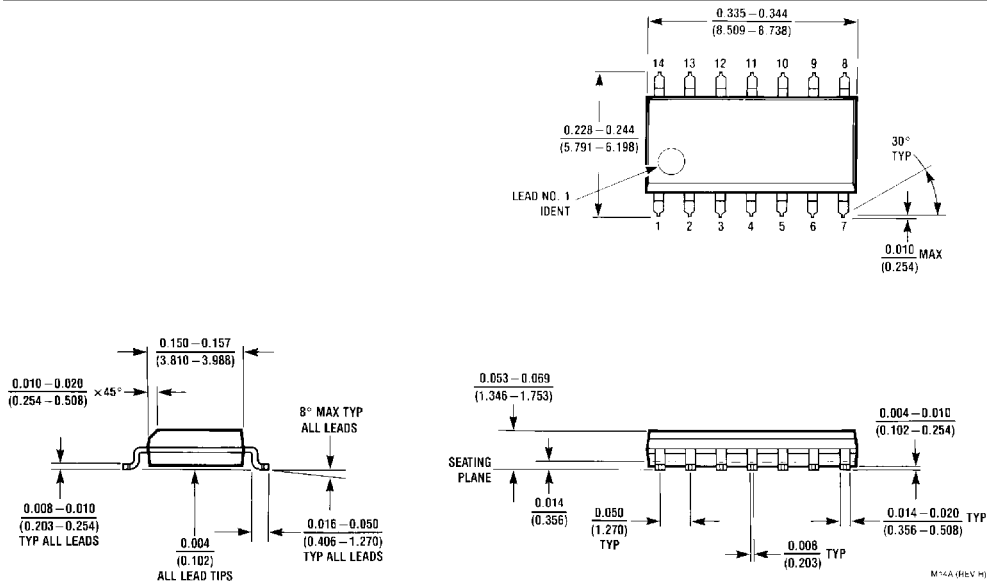
E20A (REV. D)



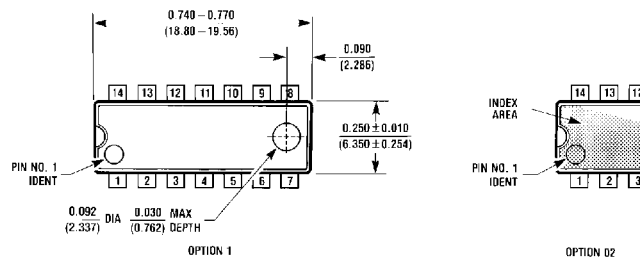
**14-Lead Ceramic Dual-In-Line Package (D)
 NS Package Number J14A**

J14A (REV. G)

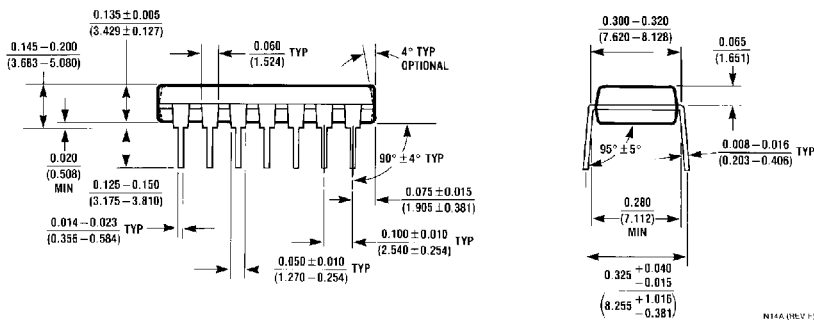
Physical Dimensions inches (millimeters) (Continued)



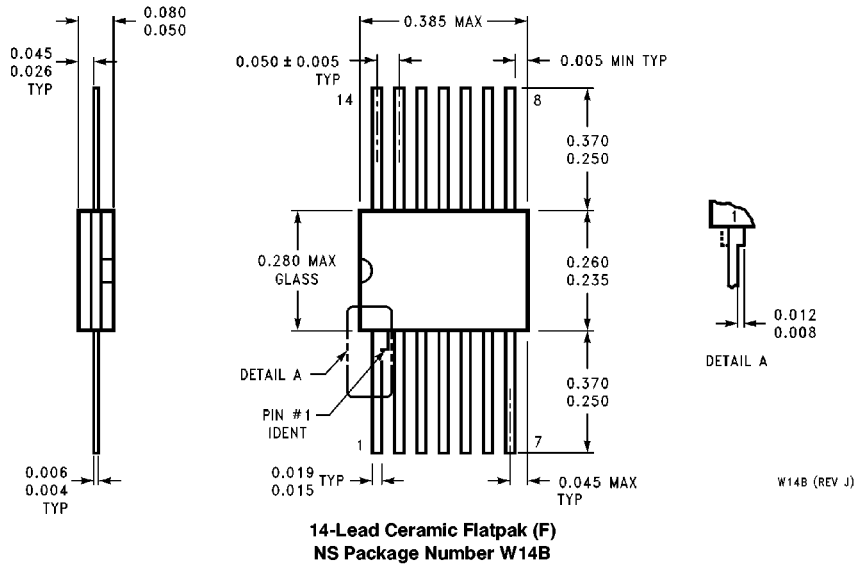
**14-Lead Small Outline Integrated Circuit (S)
NS Package Number M14A**



**14-Lead Plastic Dual-In-Line Package (P)
NS Package Number N14A**



Physical Dimensions inches (millimeters) (Continued)



W14B (REV J)

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National Semiconductor Corporation
2900 Semiconductor Drive
P.O. Box 58090
Santa Clara, CA 95052-8090
Tel: 1(800) 272-9959
TWX: (910) 339-9240

National Semiconductor GmbH
Livy-Gargan-Str. 10
D-82256 Fürstfeldbruck
Germany
Tel: (81-41) 35-0
Telex: 527649
Fax: (81-41) 35-1

National Semiconductor Japan Ltd.
Sumitomo Chemical
Engineering Center
Bldg. 7F
1-7-1, Nakase, Mihama-Ku
Chiba-City,
Chiba Prefecture 261
Tel: (043) 299-2300
Fax: (043) 299-2500

National Semiconductor Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semicondutores Do Brazil Ltda.
Rue Deputado Lacorda Franco
120-3A
Sao Paulo-SP
Brazil 05418-000
Tel: (55-11) 212-5066
Telex: 391-1131931 NSBR BR
Fax: (55-11) 212-1181

National Semiconductor (Australia) Pty. Ltd.
Building 16
Business Park Drive
Monash Business Park
Nottingham, Melbourne
Victoria 3168 Australia
Tel: (3) 558-9999
Fax: (3) 558-9998

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