

74AC521 • 74ACT521 8-Bit Identity Comparator

General Description

The AC/ACT521 is an expandable 8-bit comparator. It compares two words of up to eight bits each and provides a LOW output when the two words match bit for bit. The expansion input $\bar{T}_{A=B}$ also serves as an active LOW enable input.

Features

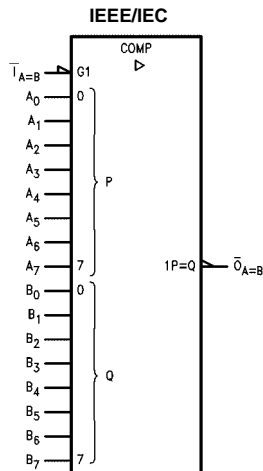
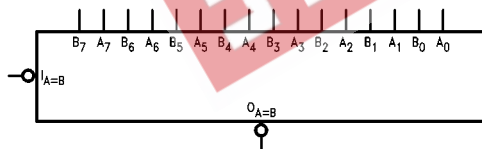
- I_{CC} reduced by 50%
- Compares two 8-bit words in 6.5 ns typ
- Expandable to any word length
- 20-pin package
- Outputs source/sink 24 mA
- ACT521 has TTL-compatible inputs

Ordering Code:

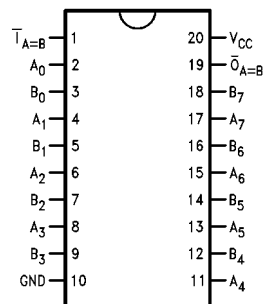
| Order Number | Package Number | Package Description |
|--------------|----------------|---|
| 74AC521SC | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body |
| 74AC521SJ | M20D | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74AC521PC | N20A | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |
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Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering table.

Logic Symbols



Connection Diagram



Pin Descriptions

| Pin Names | Description |
|-----------------|---------------------------|
| A_0 - A_7 | Word A Inputs |
| B_0 - B_7 | Word B Inputs |
| $T_{A=B}$ | Expansion or Enable Input |
| $\bar{O}_{A=B}$ | Identity Output |

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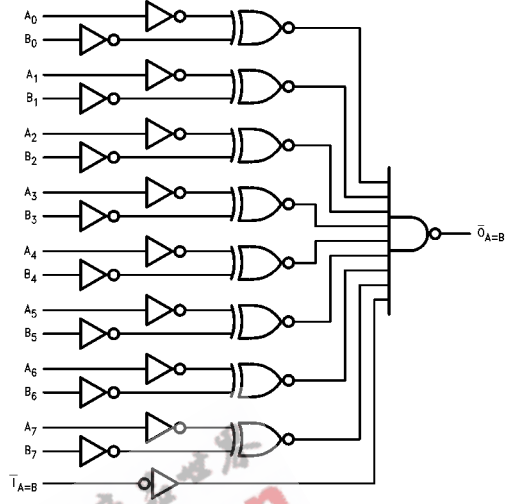
Truth Table

| Inputs | | Outputs |
|-----------------|----------------|-----------------|
| $\bar{I}_{A=B}$ | A, B | $\bar{O}_{A=B}$ |
| L | A = B (Note 1) | L |
| L | A \neq B | H |
| H | A = B (Note 1) | H |
| H | A \neq B | H |

H = HIGH Voltage Level
L = LOW Voltage Level

Note 1: A₀ = B₀, A₁ = B₁, A₂ = B₂, etc.

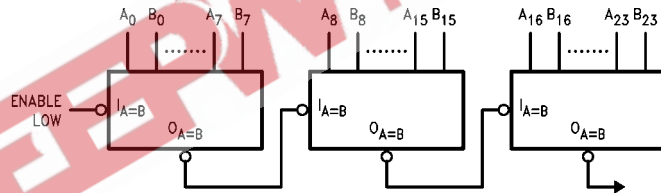
Logic Diagram



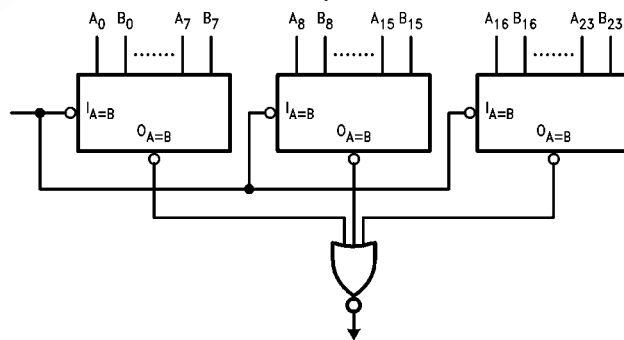
Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Applications

Ripple Expansion



Parallel Expansion



Absolute Maximum Ratings (Note 2)

| | |
|--|--------------------------|
| 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) | |
| PDIP | 140°C |

Recommended Operating Conditions

| | |
|---|----------------|
| Supply Voltage (V_{CC}) | |
| AC | 2.0V to 6.0V |
| ACT | 4.5V to 5.5V |
| Input Voltage (V_I) | 0V to V_{CC} |
| Output Voltage (V_O) | 0V to V_{CC} |
| Operating Temperature (T_A) | -40°C to +85°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 |

Note 2: 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, output/input loading variables. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

DC Electrical Characteristics for AC

| Symbol | Parameter | V_{CC} (V) | $T_A = +25^\circ\text{C}$ | | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Units | Conditions |
|----------------------|--------------------------------------|-----------------|---------------------------|-------------------|---|-------------------|---------------|---|
| | | | Typ | Guaranteed Limits | Guaranteed Limits | Guaranteed Limits | | |
| V_{IH} | Minimum HIGH Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ |
| | | 4.5 | 2.25 | 3.15 | 3.15 | | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | | | |
| V_{IL} | Maximum LOW Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ |
| | | 4.5 | 2.25 | 1.35 | 1.35 | | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | | | |
| V_{OH} | Minimum HIGH Level Output Voltage | 3.0 | 2.99 | 2.9 | 2.9 | | V | $I_{OUT} = -50 \mu\text{A}$ |
| | | 4.5 | 4.49 | 4.4 | 4.4 | | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | | |
| | | 3.0 | | 2.56 | 2.46 | | V | $V_{IN} = V_{IL}$ or V_{IH} $I_{OH} = -12 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ (Note 3) |
| | | 4.5 | | 3.86 | 3.76 | | | |
| | | 5.5 | | 4.86 | 4.76 | | | |
| V_{OL} | Maximum LOW Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | | V | $I_{OUT} = 50 \mu\text{A}$ |
| | | 4.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 3.0 | | 0.36 | 0.44 | | V | $V_{IN} = V_{IL}$ or V_{IH} $I_{OL} = 12 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ (Note 3) |
| | | 4.5 | | 0.36 | 0.44 | | | |
| | | 5.5 | | 0.36 | 0.44 | | | |
| I_{IN} (Note 5) | Maximum Input Leakage Current | 5.5 | | ± 0.1 | ± 1.0 | | μA | $V_I = V_{CC}, \text{GND}$ |
| I_{OLD} | Minimum Dynamic | 5.5 | | | 75 | | mA | $V_{OLD} = 1.65V \text{ Max}$ |
| I_{OHD} | Output Current (Note 4) | 5.5 | | | -75 | | mA | $V_{OHD} = 3.85V \text{ Min}$ |
| I_{CC} (Note 5) | Maximum Quiescent Supply Current | 5.5 | | 4.0 | 40.0 | | μA | $V_{IN} = V_{CC}$ or GND |

Note 3: All outputs loaded; thresholds on input associated with output under test.

Note 4: Maximum test duration 2.0 ms, one output loaded at a time.

Note 5: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC} .

DC Electrical Characteristics for ACT

| Symbol | Parameter | V _{CC} (V) | T _A = +25°C | | T _A = -40°C to +85°C | | Units | Conditions |
|------------------|--------------------------------------|------------------------|------------------------|-------------------|---------------------------------|----|---|------------|
| | | | 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 | V | V _{IN} = V _{IL} or V _{IH} I _{OH} = -24 mA I _{OH} = -24 mA (Note 6) | |
| | | 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 | V | V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA I _{OL} = 24 mA (Note 6) | |
| | | 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 | 5.5 | | | 75 | mA | V _{OLD} = 1.65V Max | |
| I _{OHD} | Output Current (Note 7) | 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 | |

Note 6: All outputs loaded; thresholds on input associated with output under test.

Note 7: Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics for AC

| Symbol | Parameter | V _{CC} (V) (Note 8) | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | Units |
|------------------|---|------------------------------------|--|---|------|---|------|-------|
| | | | Min | Typ | Max | Min | Max | |
| | | | t _{PLH} | Propagation Delay A _n or B _n to $\overline{O}_{A=B}$ | 3.3 | 3.5 | 7.0 | |
| 5.0 | 2.5 | 5.0 | 8.0 | 2.0 | 9.0 | | | |
| t _{PHL} | Propagation Delay A _n or B _n to $\overline{O}_{A=B}$ | 3.3 | 4.5 | 7.5 | 11.5 | 3.5 | 12.5 | ns |
| 5.0 | 3.0 | 5.5 | 8.5 | 2.5 | 9.0 | | | |
| t _{PLH} | Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$ | 3.3 | 3.0 | 5.5 | 8.0 | 2.5 | 9.0 | ns |
| 5.0 | 2.5 | 4.0 | 6.0 | 2.0 | 7.0 | | | |
| t _{PHL} | Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$ | 3.3 | 3.0 | 5.5 | 8.0 | 2.5 | 9.0 | ns |
| 5.0 | 2.0 | 4.0 | 6.0 | 2.0 | 7.0 | | | |

Note 8: Voltage Range 3.3 is 3.3V ± 0.3V

Voltage Range 5.0 is 5.0V ± 0.5V

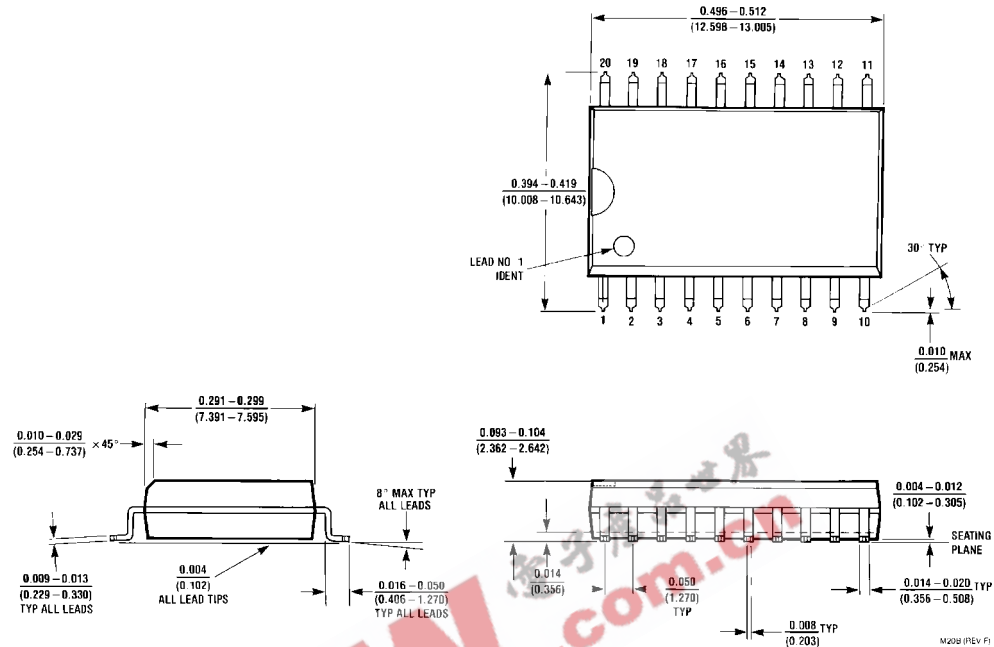
| AC Electrical Characteristics for ACT | | | | | | | | |
|---------------------------------------|---|------------------------------------|--|-----|------|---|------|-------|
| Symbol | Parameter | V _{CC} (V) (Note 9) | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | Units |
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} | Propagation Delay A _n or B _n to $\overline{O}_{A=B}$ | 5.0 | 3.0 | 5.5 | 9.0 | 2.5 | 9.5 | ns |
| t _{PHL} | Propagation Delay A _n or B _n to $\overline{O}_{A=B}$ | 5.0 | 3.0 | 6.0 | 10.0 | 2.5 | 11.0 | ns |
| t _{PLH} | Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$ | 5.0 | 2.0 | 4.0 | 6.5 | 2.0 | 7.0 | ns |
| t _{PHL} | Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$ | 5.0 | 2.5 | 5.0 | 7.5 | 2.0 | 8.0 | ns |

Note 9: 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 | 40 | pF | V _{CC} = 5.0V |

Physical Dimensions inches (millimeters) unless otherwise noted

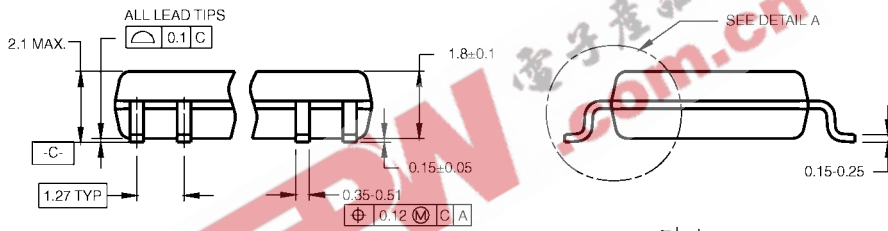


**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
Package Number M20B**

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



LAND PATTERN RECOMMENDATION

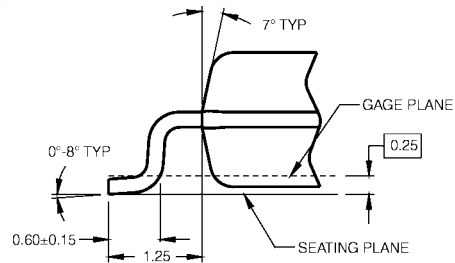


DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

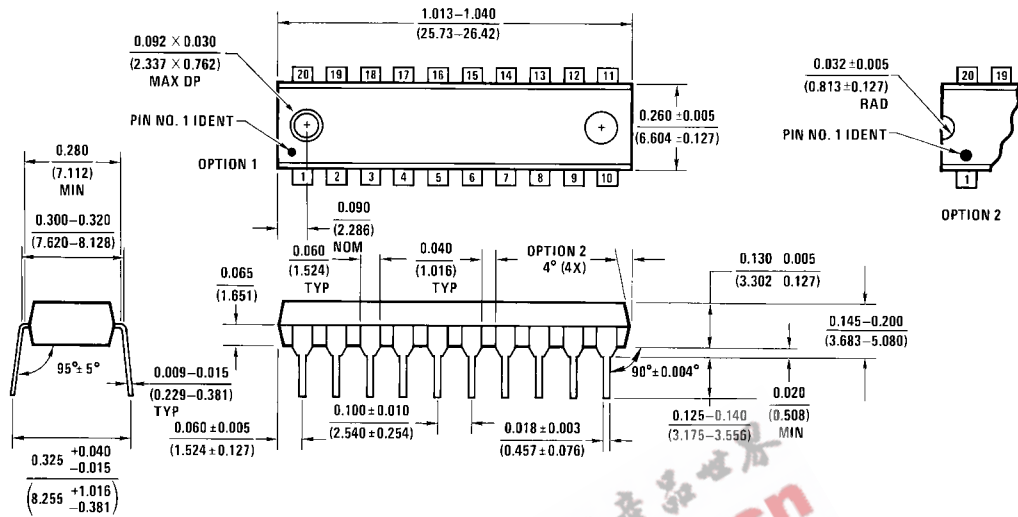
M20DRevB1



DETAIL A

20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide Package Number M20D

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



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N20A

N20A (REV G)

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