FAIRCHILD SEMICONDUCTOR™

February 1989
Revised November 1999

74AC520 • 74ACT520
8-Bit Identity Comparator

General Description

The AC/ACT520 are expandable 8-bit comparators. They compare two words of up to eight bits each and provide a LOW output when the two words match bit for bit. The expansion input $\overline{I}_{A=B}$ also serves as an active LOW enable input.

Features

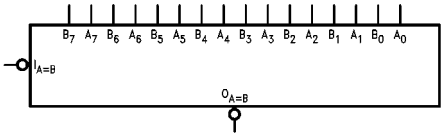
- Compares two 8-bit words in 6.5 ns typ
- Expandable to any word length
- 20-pin package
- Outputs source/sink 24 mA
- ACT520 has TTL-compatible inputs

Ordering Code:

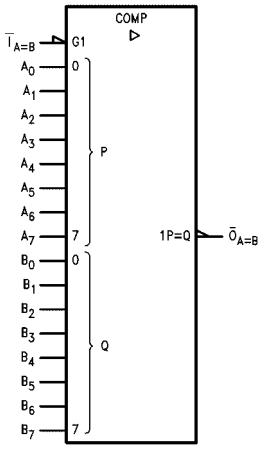
Order Number	Package Number	Package Description
74AC520SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74AC520PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74ACT520SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74ACT520SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT520PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

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

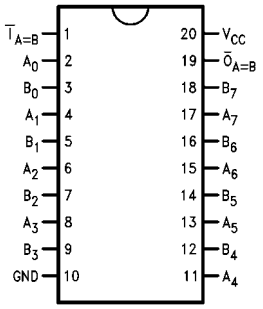
Logic Symbols



IEEE/IEC



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
$\overline{O}_{A=B}$	Identity Output

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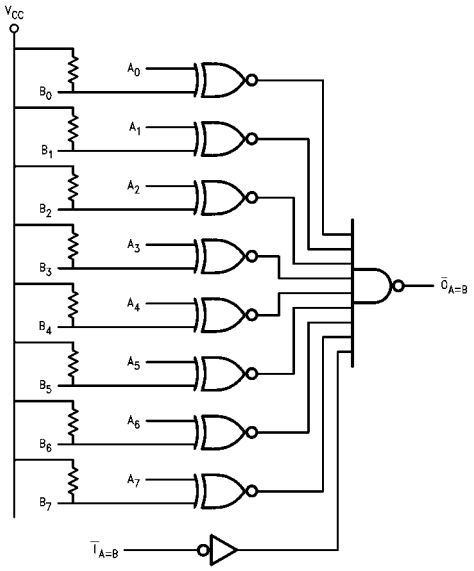
Truth Table

Inputs		Outputs
$\overline{I}_{A=B}$	A, B	$\overline{O}_{A=B}$
L	A = B (Note 1)	L
L	A ≠ B	H
H	A = B (Note 1)	H
H	A ≠ B	H

H = HIGH Voltage Level
L = LOW Voltage Level

Note 1: *$A_0 = B_0$, $A_1 = B_1$, $A_2 = B_2$, etc.

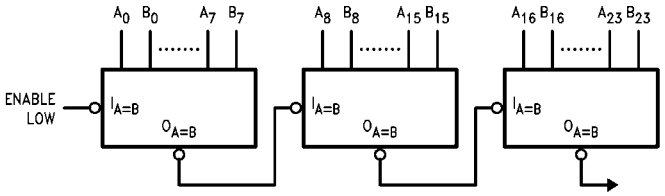
Logic Diagram



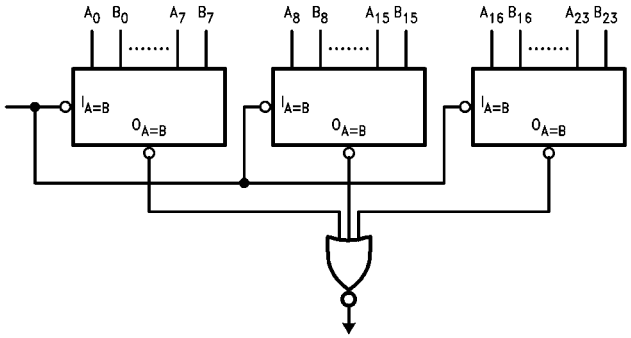
Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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 (ΔV/Δt)	
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 (ΔV/Δt)	
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, and 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°C Typ	T_A = –40°C to +85°C Guaranteed Limits		Units	Conditions
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 μA
		4.5	4.49	4.4	4.4		
		5.5	5.49	5.4	5.4		
							V_{IN} = V_{IL} or V_{IH}
		3.0		2.56	2.46	V	I_{OH} = –12 mA
		4.5		3.86	3.76		I_{OH} = –24 mA
		5.5		4.86	4.76		I_{OH} = –24 mA (Note 3)
V_{OL}	Maximum LOW Level Output Voltage	3.0	0.002	0.1	0.1	V	I_{OUT} = 50 μA
		4.5	0.001	0.1	0.1		
		5.5	0.001	0.1	0.1		
							V_{IN} = V_{IL} or V_{IH}
		3.0		0.36	0.44	V	I_{OL} = 12 mA
		4.5		0.36	0.44		I_{OL} = 24 mA
		5.5		0.36	0.44		I_{OL} = 24 mA (Note 3)
I_{IN} (Note 5)	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V_I = V_{CC}, GND, A Inputs Only
I_{IH}	Maximum Input HIGH Leakage Current	5.5		10.0	10.0	μA	V_I = V_{CC}, B Inputs Only
I_{IL}	Maximum Input LOW Leakage Current	5.5	–0.3	–0.6	–1.0	mA	V_I = V_{CC}, B Inputs Only
I_{OLD}	Minimum Dynamic Output Current (Note 4)	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}
I_{CC} (Note 5)	Maximum Quiescent Supply Current	5.5	2.3	4.8	8.0	mA	V_{IN} = 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
		5.5		4.86	4.76		I_{OH} = −24 mA (Note 6)
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
		5.5		0.36	0.44		I_{OL} = 24 mA (Note 6)
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	µA	$V_I = V_{CC}$, GND
I_{IH}	Maximum Input HIGH Leakage Current	5.5		10.0	10.0	µA	$V_I = V_{CC}$ B Inputs Only
I_{IL}	Maximum Input LOW Leakage Current	5.5	−0.3	−0.6	−1.0	mA	$V_I = V_{CC}$ B Inputs Only
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 (Note 7)	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
I_{CC}	Maximum Quiescent Supply Current	5.5	2.3	4.8	8.0	mA	V_{IN} = 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	4.0	7.5	11.5	3.0	13.0	ns
		5.0	2.5	5.5	8.5	2.0	9.5	
t_{PHL}	Propagation Delay A_n or B_n to $\overline{O}_{A=B}$	3.3	4.5	8.0	12.0	3.5	13.5	ns
		5.0	3.0	5.5	9.0	2.5	10.0	
t_{PLH}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	3.3	3.5	5.5	8.5	2.5	9.5	ns
		5.0	2.5	4.5	6.5	2.0	7.0	
t_{PHL}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	3.3	3.5	5.5	8.5	2.5	9.5	ns
		5.0	2.5	4.5	6.5	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

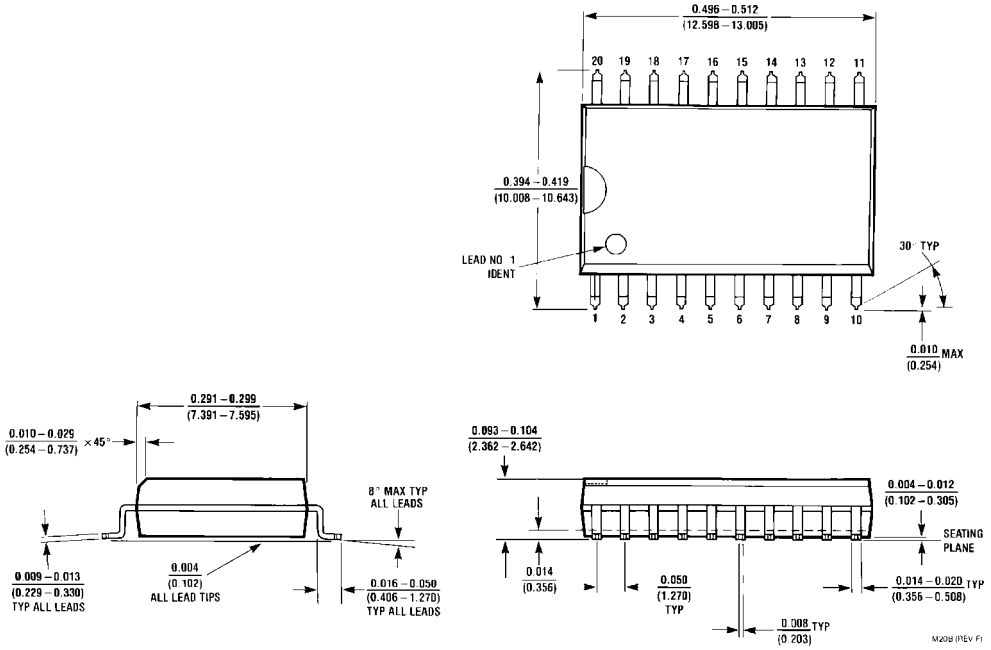
Symbol	Parameter	V_{CC} (V) (Note 9)	$T_A = +25°C$, $C_L = 50$ pF			$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF		Units
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay A_n or B_n to $\overline{O}_{A=B}$	5.0	3.0	5.5	8.5	2.5	9.5	ns
t_{PHL}	Propagation Delay A_n or B_n to $\overline{O}_{A=B}$	5.0	3.0	6.0	10.0	2.5	11.5	ns
t_{PLH}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	5.0	2.0	4.0	6.0	2.0	6.5	ns
t_{PHL}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	5.0	2.5	5.0	7.5	2.0	8.5	ns

Note 9: Voltage Range 5.0 is 5.0V ± 0.5V

Capacitance

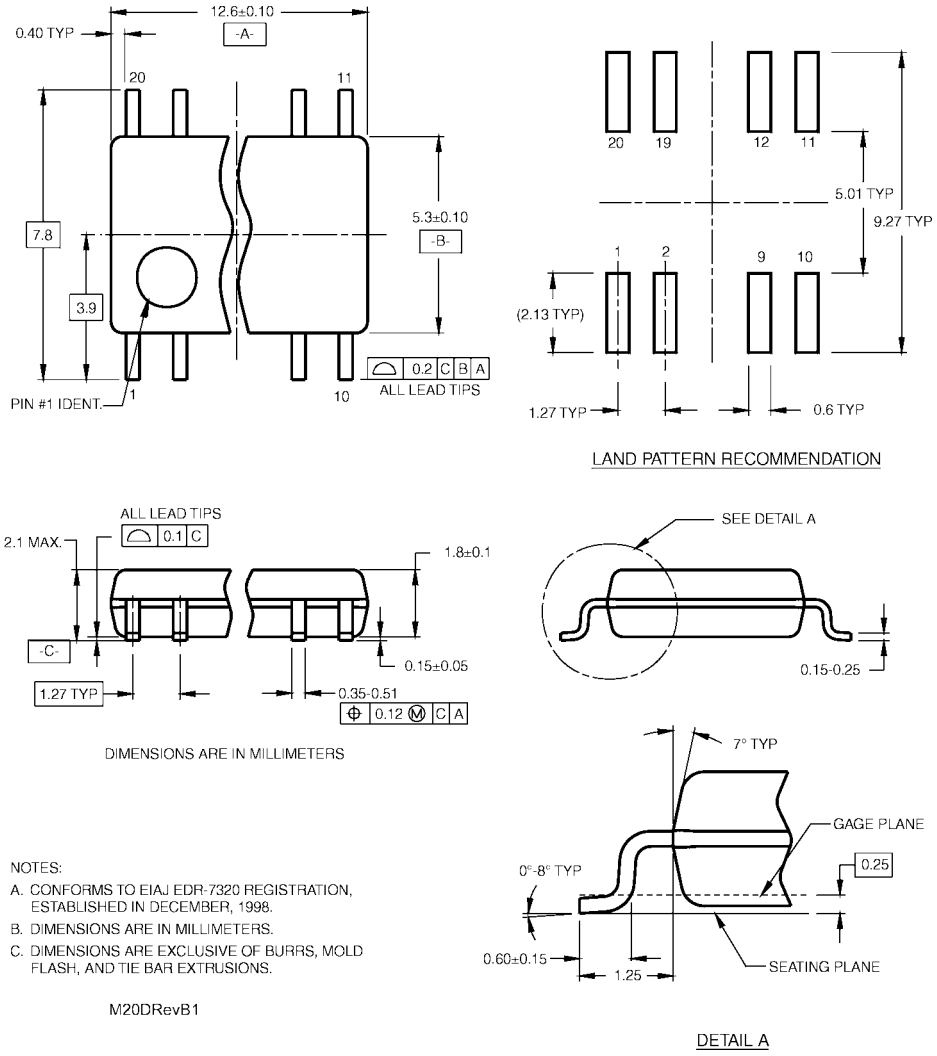
Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	40	pF	V_{CC} = 5.0V

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)



NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

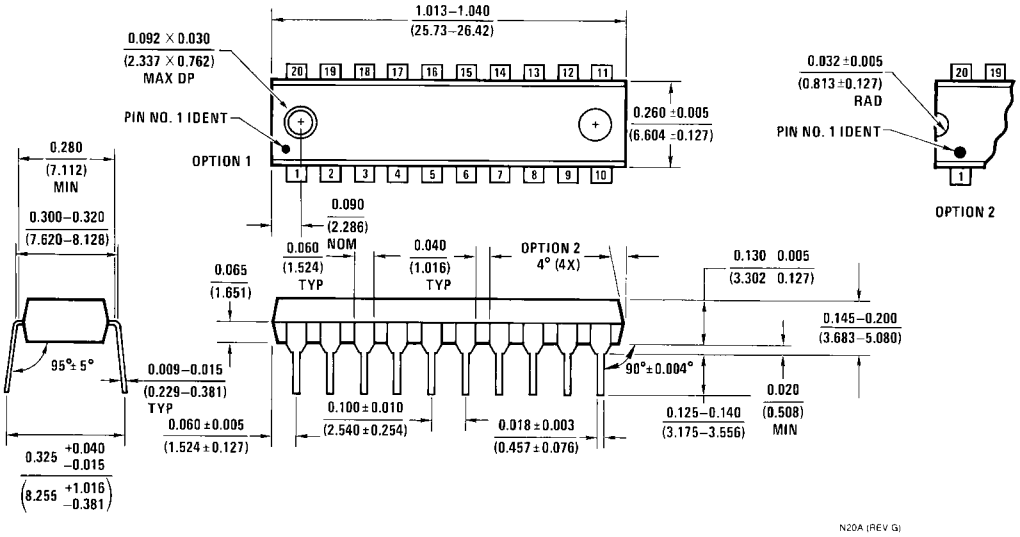
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

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