National Semiconductor

DM54/74ALS518/519/520/521/522 8-Bit Comparator

General Description

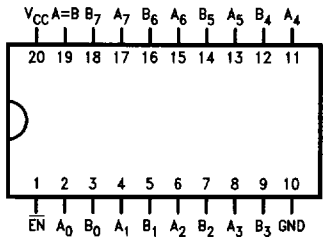
These comparators perform an "equal to" comparison of two eight-bit words with provision for expansion or external enabling. The matching of the two 8-bit input plus a logic LOW on the $\overline{EN}$ input produces the output A = B on the ALS518 and 519 and the output $\overline{A = B}$ on the ALS520, 521 and 522. The ALS520 and 521 have totem pole outputs, while the ALS518, 519 and 522 have open collector outputs for wire AND cascading. Additionally, the ALS518, 520 and 522 are provided with B input pull up termination resistors for analog or switch data.

Features

- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and V_{CC} range
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Functionally and pin for pin compatible with LS family counterpart
- Improved output transient handling capability

Connection Diagrams

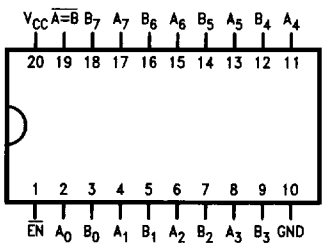
Dual-In-Line Package



TL/F/6114–1

Order Number DM74ALS518WM, DM74ALS519WM, DM74ALS518N or DM74ALS519N
See NS Package Number M20B or N20A

Dual-In-Line Package



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Order Number DM74ALS520WM, DM74ALS521WM, DM74ALS522WM, DM74ALS520N, DM54ALS521J, DM74ALS521N or DM74ALS522N
See NS Package Number J20A, M20B or N20A

Function Tables

ALS518, 519

Inputs		Output
$\overline{EN}$	Data	A = B
L	A = B	H
L	A ≠ B	L
H	X	L

H = High Logic Level; L = Low Logic Level; X = Don't Care

ALS520, 521, 522

Inputs		Output
$\overline{EN}$	Data	$\overline{A = B}$
L	A = B	L
L	A ≠ B	H
H	X	H

H = High Logic Level; L = Low Logic Level; X = Don't Care

Absolute Maximum Ratings

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

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54ALS	−55°C to +125°C
DM74ALS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Typical θ_{JA}	
N Package	62.0°C/W
M Package	82.0°C/W

Note: *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" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter	DM54ALS 521			DM74ALS 518, 519, 520, 521, 522			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High Level Input Voltage	2			2			V
V_{IL}	Low Level Input Voltage			0.7			0.8	V
V_{OH}	High Level Output Voltage (ALS518, 519, 522)			5.5			5.5	V
I_{OH}	High Level Output Current (ALS520, 521)			−1			−2.6	mA
I_{OL}	Low Level Output Current			12			24	mA
T_A	Free Air Operating Temperature	−55		125	0		70	°C

Electrical Characteristics

over recommended operating free air temperature range. All typical values are measured at V_{CC} = 5V, T_A = 25°C.

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_{IK}	Input Clamp Voltage	V_{CC} = 4.5V, I_I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = 4.5V to 5.5V, I_{OH} = −400 μA	ALS520, 521	V_{CC} − 2			V
		V_{CC} = 4.5V, I_{OH} = Max		2.4	3.2		V
I_{OH}	High Level Output Current	V_{CC} = 5.5V, V_{OH} = 5.5V	ALS518, 519, 522			0.1	mA
V_{OL}	Low Level Output Voltage	V_{CC} = 4.5V	54/74ALS I_{OL} = 12 mA		0.25	0.4	V
			74ALS I_{OL} = 24 mA		0.35	0.5	V
I_I	Max High Input Current	V_{CC} = 5.5V	V_{IH} = 5.5V B Input ALS518, 520, 522			0.1	mA
			V_{IH} = 7V, All Others				
I_{IH}	High Level Input Current	V_{CC} = 5.5V, V_{IH} = 2.7V	All Others			20	μA
			B Input ALS518, 520, 522			−200	
I_{IL}	Low Level Input Current	V_{CC} = 5.5V, V_{IL} = 0.4V	B Input ALS518, 520, 522			−0.6	mA
			All Others			−0.1	mA
I_O	Output Drive Current	V_{CC} = 5.5V	V_O = 2.25V ALS520, 521	−30		−112	mA
I_{CC}	Supply Current	V_{CC} = 5.5V (Note 1)	ALS518, 519, 522		11	17	mA
			ALS520, 521		12	19	mA

Note 1: I_{CC} is measured with $\overline{EN}$ grounded, A and B inputs at 4.5V and outputs open.

Switching Characteristics over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From Input	To Output	DM74ALS 518, 519		Units
					Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	V_{CC} = 4.5V to 5.5V C_L = 50 pF R_L = 680Ω	A or B Data	A = B	15	33	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		A or B Data	A = B	3	15	ns
t_{PLH}	Propagation Delay Time Low to High Level Output		$\overline{EN}$	A = B	15	33	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		$\overline{EN}$	A = B	3	15	ns

Switching Characteristics over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From Input	To Output	DM54ALS 521		DM74ALS 520, 521		Units
					Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	V_{CC} = 4.5V to 5.5V C_L = 50 pF R_L = 500Ω	A or B Data	$\overline{A = B}$	3	18	3	12	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		A or B Data	$\overline{A = B}$	5	25	5	20	ns
t_{PLH}	Propagation Delay Time Low to High Level Output		$\overline{EN}$	$\overline{A = B}$	3	15	2	12	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		$\overline{EN}$	$\overline{A = B}$	5	25	5	22	ns

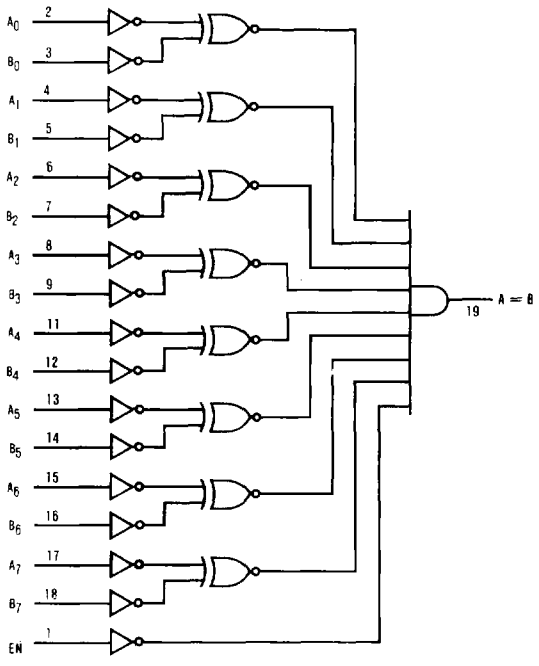
Switching Characteristics over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From Input	To Output	DM74ALS 522		Units
					Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	V_{CC} = 4.5V to 5.5V C_L = 50 pF R_L = 680Ω	A or B Data	$\overline{A = B}$	10	25	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		A or B Data	$\overline{A = B}$	5	23	ns
t_{PLH}	Propagation Delay Time Low to High Level Output		$\overline{EN}$	$\overline{A = B}$	8	25	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		$\overline{EN}$	$\overline{A = B}$	8	23	ns

Note 1: See Section 1 for test waveforms and output load.

Logic Diagrams

ALS518/519



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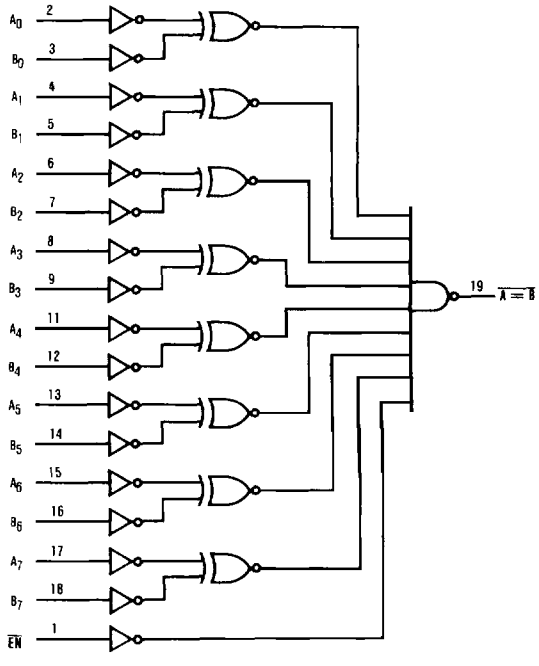
ALS520/521/522



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