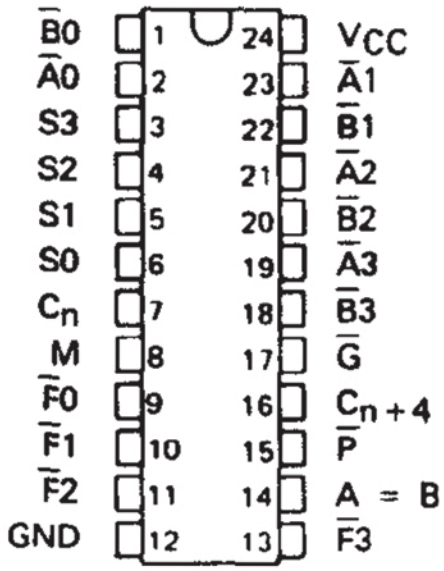
XD74LS181 DIP-24

- Full Look-Ahead for High-Speed Operations on Long Words
- Input Clamping Diodes Minimize Transmission-Line Effects
- Darlington Outputs Reduce Turn-Off Time
- Arithmetic Operating Modes:
  - Addition
  - Subtraction
  - Shift Operand A One Position
  - Magnitude Comparison
  - Plus Twelve Other Arithmetic Operations
- Logic Function Modes:
  - Exclusive-OR
  - Comparator
  - AND, NAND, OR, NOR
  - Plus Ten Other Logic Operations



TYPICAL ADDITION TIMES

NUMBER OF BITS	ADDITION TIMES USING 'LS181	PACKAGE COUNT		CARRY METHOD BETWEEN ALUs
		ARITHMETIC/ LOGIC UNITS	LOOK-AHEAD CARRY GENERATORS	
1 to 4	24 ns	1		NONE
5 to 8	40 ns	2		RIPPLE
9 to 16	44 ns	3 or 4	1	FULL LOOK-AHEAD
17 to 64	68 ns	5 to 16	2 to 5	FULL LOOK-AHEAD

description

The 'LS181 are arithmetic logic units (ALUI/function generators that have a complexity of 75 equivalent gates on a monolithic chip. These circuits perform 16 binary arithmetic operations on two 4-bit words as shown in Tables 1 and 2. These operations are selected by the four function-select lines (SO. S1, S2, S3) and include addition, subtraction, decrement, and straight transfer. When performing arithmetic manipulations, the internal carries must be enabled by applying a low-level voltage to the mode control input (M). A full carry look-ahead scheme Is made available in these devices for fast, simultaneous carry generation by means of two cascade-outputs (pins 15 and 17)

description (continued)

The 'LS181 will accommodate active-high data if the pin designations are interpreted as follows:

PIN NUMBER	2	1	23	22	21	20	19	18	9	10	11	13	7	16	15	17
Active-low data (Table 1)	$\overline{A}_0$	$\overline{B}_0$	$\overline{A}_1$	$\overline{B}_1$	$\overline{A}_2$	$\overline{B}_2$	$\overline{A}_3$	$\overline{B}_3$	$\overline{F}_0$	$\overline{F}_1$	$\overline{F}_2$	$\overline{F}_3$	C_n	C_{n+4}	$\overline{P}$	$\overline{G}$
Active-high data (Table 2)	A_0	B_0	A_1	B_1	A_2	B_2	A_3	B_3	F_0	F_1	F_2	F_3	$\overline{C}_n$	$\overline{C}_{n+4}$	X	Y

Subtraction is accomplished by 1's complement addition where the 1's complement of the subtrahend is generated internally. The resultant output is A—B—1, which requires an end-around or forced carry to provide A—B.

The 'LS181 can also be utilized as a comparator. The A = B output is internally decoded from the function outputs (F0, F1, F2, F3) so that when two words of equal magnitude are applied at the A and B inputs, it will assume a high level to indicate equality (A=B). The ALU must be in the subtract mode with C_n = H when performing this comparison. The A = B output is open-collector so that it can be wire-AND connected to give a comparison for more than four bits. The carry output (C_{n+4}) can also be used to supply relative magnitude information. Again, the ALU must be placed in the subtract mode by placing the function select inputs S3, S2, S1, S0 at L, H, H, L, respectively.

INPUT C_n	OUTPUT C_{n+4}	ACTIVE-LOW DATA (FIGURE 1)	ACTIVE-HIGH DATA (FIGURE 2)
H	H	A ≥ B	A ≤ B
H	L	A < B	A > B
L	H	A > B	A < B
L	L	A ≤ B	A ≥ B

These circuits have been designed to not only incorporate all of the designer's requirements for arithmetic operations, but also to provide 16 possible functions of two Boolean variables without the use of external circuitry. These logic functions are selected by use of the four function-select inputs (S0, S1, S2, S3) with the mode-control input (M) at a high level to disable the internal carry. The 16 logic functions are detailed in Tables 1 and 2 and include exclusive-OR, NAND, AND, NOR, and OR functions.

Series 74LS devices are characterized for operation from 0°C to 70°C.

signal designations

In both Figures 1 and 2, the polarity indicators (◺) indicate that the associated input or output is active-low with respect to the function shown inside the symbol, and the symbols are the same in both figures. The signal designations in Figure 1 agree with the indicated internal functions based on active-low data, and are for use with the logic functions and arithmetic operations shown in Table 1. The signal designations have been changed in Figure 2 to accommodate the logic functions and arithmetic operations for the active-high data given in Table 2. The 'LS181 together with the 'S182, can be used with the signal designation of either Figure 1 or Figure 2.

logic symbols† and signal designations (active-low data)

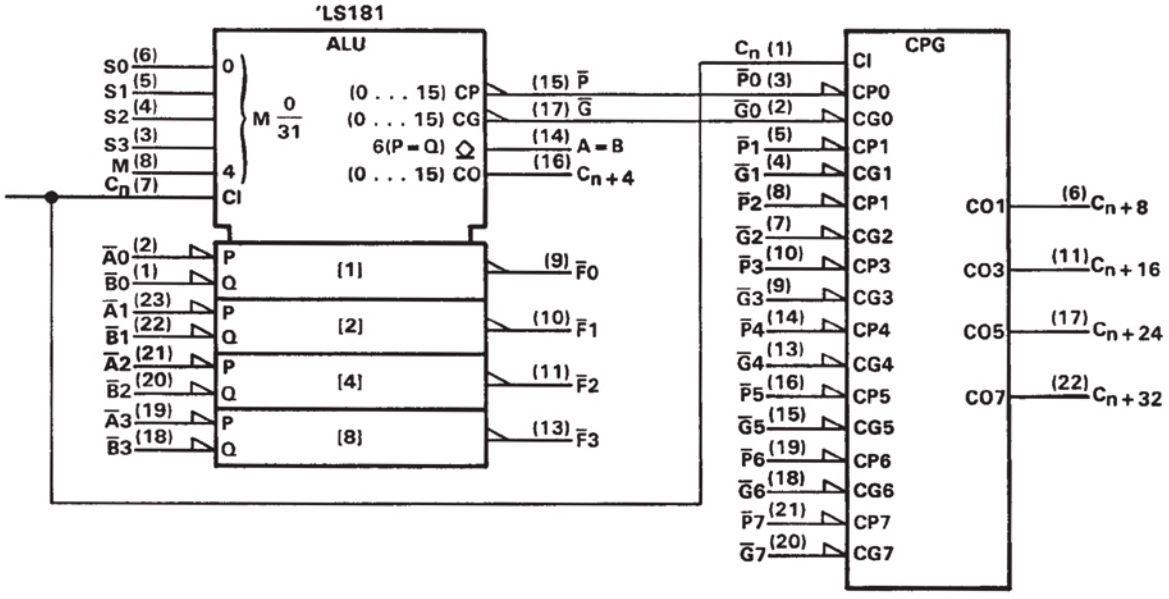


FIGURE 1 (USE WITH TABLE 1)

TABLE 1

SELECTION				ACTIVE-LOW DATA		
				M = H	M = L; ARITHMETIC OPERATIONS	
S3	S2	S1	S0	LOGIC FUNCTIONS	Cn = L (no carry)	Cn = H (with carry)
L	L	L	L	F = $\overline{A}$	F = A MINUS 1	F = A
L	L	L	H	F = $\overline{AB}$	F = AB MINUS 1	F = AB
L	L	H	L	F = $\overline{A}$ + B	F = A$\overline{B}$ MINUS 1	F = A$\overline{B}$
L	L	H	H	F = 1	F = MINUS 1 (2's COMP)	F = ZERO
L	H	L	L	F = $\overline{A + B}$	F = A PLUS (A + $\overline{B}$)	F = A PLUS (A + $\overline{B}$) PLUS 1
L	H	L	H	F = $\overline{B}$	F = AB PLUS (A + $\overline{B}$)	F = AB PLUS (A + $\overline{B}$) PLUS 1
L	H	H	L	F = $\overline{A \oplus B}$	F = A MINUS B MINUS 1	F = A MINUS B
L	H	H	H	F = A + $\overline{B}$	F = A + $\overline{B}$	F = (A + $\overline{B}$) PLUS 1
H	L	L	L	F = $\overline{A}$B	F = A PLUS (A + B)	F = A PLUS (A + B) PLUS 1
H	L	L	H	F = A ⊕ B	F = A PLUS B	F = A PLUS B PLUS 1
H	L	H	L	F = B	F = A$\overline{B}$ PLUS (A + B)	F = A$\overline{B}$ PLUS (A + B) PLUS 1
H	L	H	H	F = A + B	F = (A + B)	F = (A + B) PLUS 1
H	H	L	L	F = 0	F = A PLUS A‡	F = A PLUS A PLUS 1
H	H	L	H	F = A$\overline{B}$	F = AB PLUS A	F = AB PLUS A PLUS 1
H	H	H	L	F = AB	F = A$\overline{B}$ PLUS A	F = A$\overline{B}$ PLUS A PLUS 1
H	H	H	H	F = A	F = A	F = A PLUS 1

‡Each bit is shifted to the next more significant position.

logic symbols† and signal designations (active-high data)

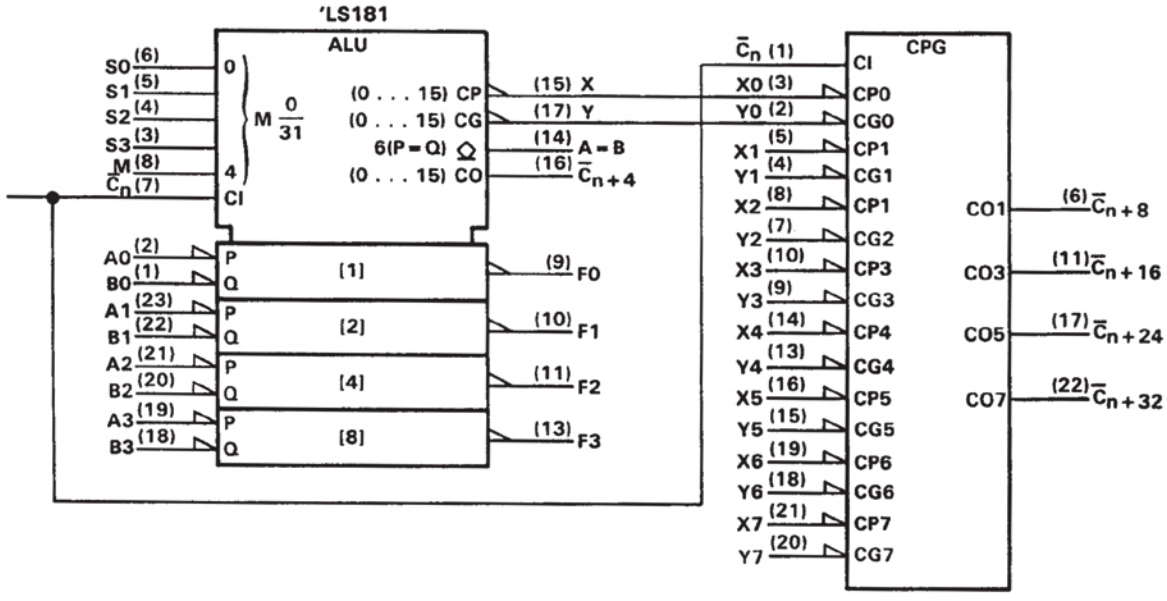


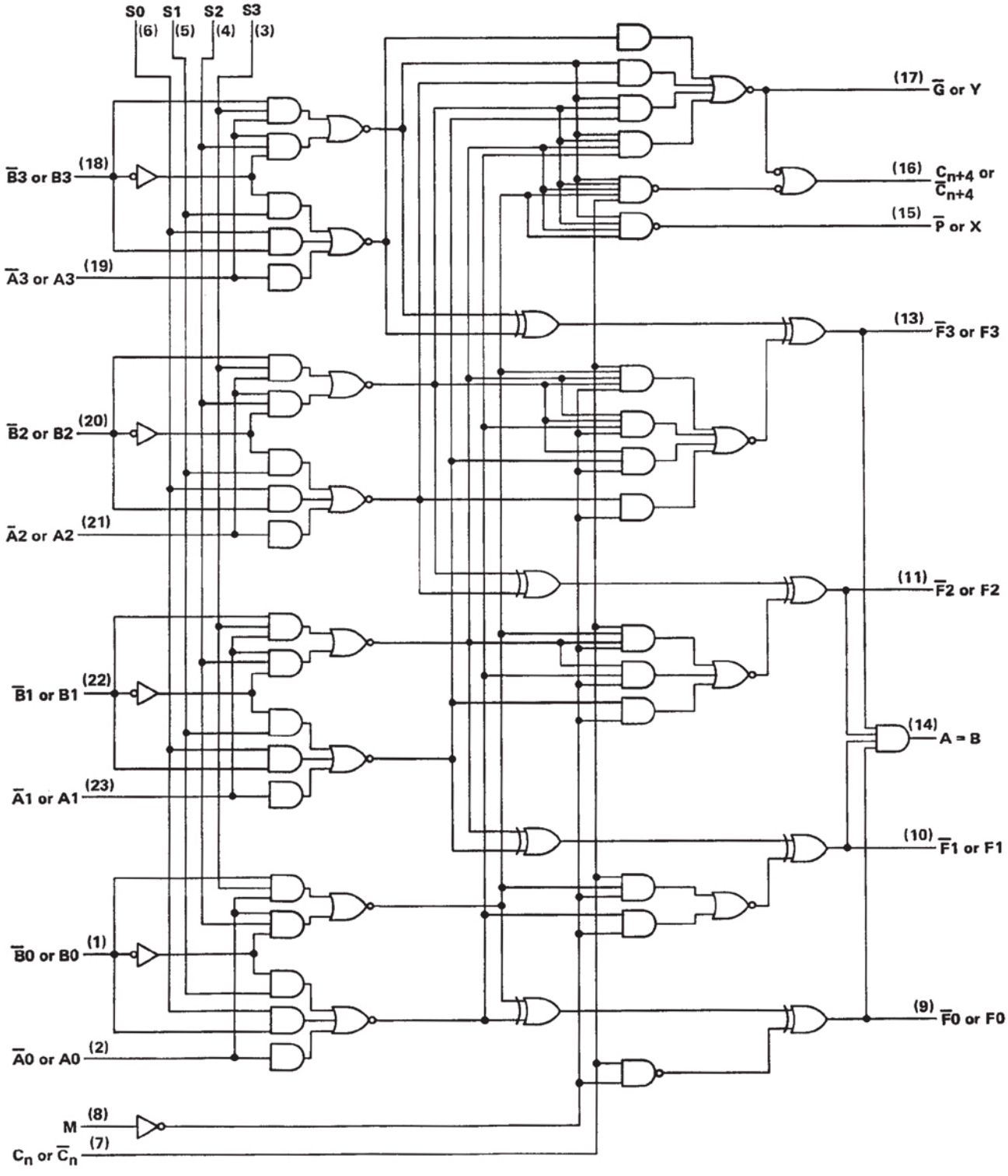
FIGURE 2 (USE WITH TABLE 2)

TABLE 2

SELECTION				ACTIVE-HIGH DATA		
				M = H	M = L; ARITHMETIC OPERATIONS	
S3	S2	S1	S0	LOGIC FUNCTIONS	$\overline{C_n}$ = H (no carry)	$\overline{C_n}$ = L (with carry)
L	L	L	L	F = $\overline{A}$	F = A	F = A PLUS 1
L	L	L	H	F = $\overline{A+B}$	F = A + B	F = (A + B) PLUS 1
L	L	H	L	F = $\overline{A}B$	F = A + $\overline{B}$	F = (A + $\overline{B}$) PLUS 1
L	L	H	H	F = 0	F = MINUS 1 (2's COMPL)	F = ZERO
L	H	L	L	F = $\overline{AB}$	F = A PLUS A$\overline{B}$	F = A PLUS A$\overline{B}$ PLUS 1
L	H	L	H	F = $\overline{B}$	F = (A + B) PLUS A$\overline{B}$	F = (A + B) PLUS A$\overline{B}$ PLUS 1
L	H	H	L	F = A ⊕ B	F = A MINUS B MINUS 1	F = A MINUS B
L	H	H	H	F = A$\overline{B}$	F = A$\overline{B}$ MINUS 1	F = A$\overline{B}$
H	L	L	L	F = $\overline{A}$ + B	F = A PLUS AB	F = A PLUS AB PLUS 1
H	L	L	H	F = $\overline{A \oplus B}$	F = A PLUS B	F = A PLUS B PLUS 1
H	L	H	L	F = B	F = (A + $\overline{B}$) PLUS AB	F = (A + $\overline{B}$) PLUS AB PLUS 1
H	L	H	H	F = AB	F = AB MINUS 1	F = AB
H	H	L	L	F = 1	F = A PLUS A†	F = A PLUS A PLUS 1
H	H	L	H	F = A + $\overline{B}$	F = (A + B) PLUS A	F = (A + B) PLUS A PLUS 1
H	H	H	L	F = A + B	F = (A + $\overline{B}$) PLUS A	F = (A + $\overline{B}$) PLUS A PLUS 1
H	H	H	H	F = A	F = A MINUS 1	F = A

† Each bit is shifted to the next more significant position.

logic diagram (positive logic)



Pin numbers shown are for DW, J, N, and W packages.

absolute maximum ratings over recommended operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage . . . . . 5.5 V
Interemitter voltage (see Note 2) . . . . . 5.5 V
Operating free-air temperature range: XD74LS181 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTES: 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.
2. This is the voltage between two emitters of a multiple-emitter transistor. For this circuit, this rating applies to each $\overline{A}$ input in conjunction with inputs S2 or S3, and to each $\overline{B}$ input in conjunction with inputs S0 or S3.

recommended operating conditions

	XD74LS181			UNIT
	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH} (All outputs except A = B)			−400	μA
Low-level output current, I_{OL}			8	mA
Operating free-air temperature, T_A	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS†		XD74LS181 MIN	XD74LS181 TYP‡	XD74LS181 MAX	UNIT
V_{IH}	High-level input voltage				2			V
V_{IL}	Low-level input voltage						0.8	V
V_{IK}	Input clamp voltage		V_{CC} = MIN, I_I = −18 mA				−1.5	V
V_{OH}	High-level output voltage, any output except A = B		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max, I_{OH} = −400 μA		2.7	3.4		V
I_{OH}	High-level output current, A = B output only		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max, V_{OH} = 5.5 V				100	μA
V_{OL}	Low-level output voltage	All outputs	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max	I_{OL} = 4 mA		0.25	0.4	V
		All outputs		I_{OL} = 8 mA		0.35	0.5	
		Output $\overline{G}$		I_{OL} = 16 mA		0.47	0.7	
		Output $\overline{P}$		I_{OL} = 8 mA		0.35	0.5	
I_I	Input current at max. input voltage	Mode input	V_{CC} = MAX, V_I = 5.5 V				0.1	mA
		Any $\overline{A}$ or $\overline{B}$ input					0.3	
		Any S input					0.4	
		Carry input					0.5	
I_{IH}	High-level input current	Mode input	V_{CC} = MAX, V_I = 2.7 V				20	μA
		Any $\overline{A}$ or $\overline{B}$ input					60	
		Any S input					80	
		Carry input					100	
I_{IL}	Low-level input current	Mode input	V_{CC} = MAX, V_I = 0.4 V				−0.4	mA
		Any $\overline{A}$ or $\overline{B}$ input					−1.2	
		Any S input					−1.6	
		Carry input					−2	
I_{OS}	Short-circuit output current, any output except A = B§		V_{CC} = MAX		−5		−42	mA
I_{CC}	Supply current		V_{CC} = MAX, See Note 3	Condition A		20	34	mA
				Condition B		21	37	

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
§Not more than one output should be shorted at a time.
NOTE 3: With outputs open, I_{CC} is measured for the following conditions:
A. S0 through S3, M, and $\overline{A}$ inputs are at 4.5 V, all other inputs are grounded.
B. S0 through S3 and M are at 4.5 V, all other inputs are grounded.

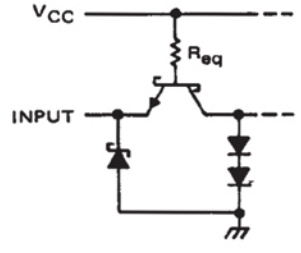
switching characteristics, V_{CC} = 5 V, T_A = 25°C, (C_L = 15 pF, R_L = 2 kΩ, see note 4)

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	C_n	C_{n+4}			18	27	ns
t_{PHL}					13	20	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	C_{n+4}	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V ($\overline{SUM}$ mode)		25	38	ns
t_{PHL}					25	38	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	C_{n+4}	M = 0 V, S0 = S3 = 0 V S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		27	41	ns
t_{PHL}					27	41	
t_{PLH}	C_n	Any $\overline{F}$	M = 0 V ($\overline{SUM}$ or $\overline{DIFF}$ mode)		17	26	ns
t_{PHL}					13	20	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{G}$	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V ($\overline{SUM}$ mode)		19	29	ns
t_{PHL}					15	23	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{G}$	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		21	32	ns
t_{PHL}					21	32	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{P}$	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V, ($\overline{SUM}$ mode)		20	30	ns
t_{PHL}					20	30	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{P}$	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		20	30	ns
t_{PHL}					22	33	
t_{PLH}	$\overline{A}_i$ or $\overline{B}_i$	$\overline{F}_i$	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V ($\overline{SUM}$ mode)		21	32	ns
t_{PHL}					13	20	
t_{PLH}	$\overline{A}_i$ or $\overline{B}_i$	$\overline{F}_i$	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		21	32	ns
t_{PHL}					21	32	
t_{PLH}	$\overline{A}_i$ or $\overline{B}_i$	$\overline{F}_i$	M = 4.5 V (logic mode)		22	33	ns
t_{PHL}					26	38	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	A = B	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		33	50	ns
t_{PHL}					41	62	

†t_{PLH} ≡ propagation delay time, low-to-high-level output
t_{PHL} ≡ propagation delay time, high-to-low-level output
NOTE 4: Load circuits and voltage wveforms are shown in Section 1. Refer to Parameter Measurement Information page for test conditions.

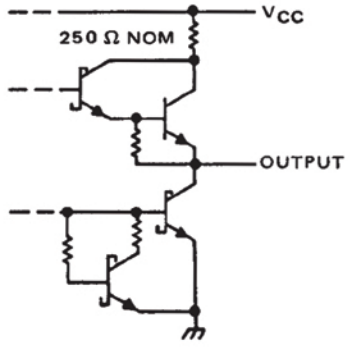
schematics of inputs and outputs

EQUIVALENT OF EACH INPUT

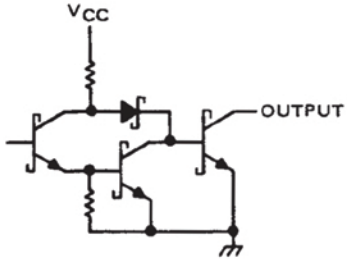


Mode control: R_{eq} = 17 kΩ NOM
Any $\overline{A}$ or $\overline{B}$: R_{eq} = 5.67 kΩ NOM
Any S: R_{eq} = 4.25 kΩ NOM
C_n: R_{eq} = 2.86 kΩ NOM

TYPICAL OF ALL OUTPUTS EXCEPT A = B



A = B OUTPUT



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage . . . . . 5.5 V
Interemitter voltage (see Note 2) . . . . . 5.5 V
Operating free-air temperature: XD74LS181 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTES: 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.
2. This is the voltage between two emitters of a multiple-emitter transistor. For this circuit, this rating applies to each $\overline{A}$ input in conjunction with inputs S2 or S3, and to each $\overline{B}$ input in conjunction with inputs S0 or S3.

recommended operating conditions

	XD74LS181			UNIT
	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH} (All outputs except A = B)			−1	mA
Low-level output current, I_{OL}			20	mA
Operating free-air temperature, T_A	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS†			XD74LS181 MIN	XD74LS181 TYP‡	XD74LS181 MAX	UNIT
V_{IH}	High-level input voltage				2			V
V_{IL}	Low-level input voltage						0.8	V
V_{IK}	Input clamp voltage	V_{CC} = MIN,	I_I = −18 mA				−1.2	V
V_{OH}	High-level output voltage, any output except A = B	V_{CC} = MIN, V_{IL} = 0.8 V,	V_{IH} = 2 V, I_{OH} = −1 mA		2.7	3.4		V
I_{OH}	High-level output current, A = B output only	V_{CC} = MIN, V_{IL} = 0.8 V,	V_{IH} = 2 V, V_{OH} = 5.5 V				250	μA
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IL} = 0.8 V,	V_{IH} = 2 V, I_{OL} = 20 mA				0.5	V
I_I	Input current at maximum input voltage	V_{CC} = MAX,	V_I = 5.5 V				1	mA
I_{IH}	High-level input current: Mode input	V_{CC} = MAX,	V_I = 2.5 V				50	μA
	Any $\overline{A}$ or $\overline{B}$ input						150	
	Any S input						200	
	Carry input						250	
I_{IL}	Low-level input current: Mode input	V_{CC} = MAX,	V_I = 0.5 V				−2	mA
	Any $\overline{A}$ or $\overline{B}$ input						−6	
	Any S input						−8	
	Carry input						−10	
I_{OS}	Short-circuit output current, any output except A = B§	V_{CC} = MAX			−40		−100	mA
I_{CC}	Supply current	V_{CC} = MAX, See Note 3	T_A = 125°C,	W package only				mA
		V_{CC} = MAX,	See Note 3	All packages		120	220	

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
§Not more than one output should be shorted at a time.
NOTE 3: I_{CC} is measured for the following conditions (the typical and maximum values apply to both):
A. S0 through S3, M, and $\overline{A}$ inputs are at 4.5 V, all other inputs are grounded, and all outputs are open.
B. S0 through S3 and M are at 4.5 V, all other inputs grounded, and all outputs are open.

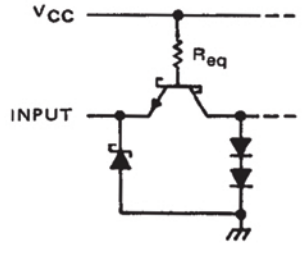
switching characteristics, V_{CC} = 5 V, T_A = 25°C (C_L = 15 pF, R_L = 280 Ω, see note 4)

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	C_n	C_{n+4}			7	10.5	ns
t_{PHL}					7	10.5	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	C_{n+4}	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V ($\overline{SUM}$ mode)		12.5	18.5	ns
t_{PHL}					12.5	18.5	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	C_{n+4}	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		15.5	23	ns
t_{PHL}					15.5	23	
t_{PLH}	C_n	Any $\overline{F}$	M = 0 V ($\overline{SUM}$ or $\overline{DIFF}$ mode)		7	12	ns
t_{PHL}					7	12	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{G}$	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V ($\overline{SUM}$ mode)		8	12	ns
t_{PHL}					7.5	12	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{G}$	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		10.5	15	ns
t_{PHL}					10.5	15	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{P}$	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V ($\overline{SUM}$ mode)		7.5	12	ns
t_{PHL}					7.5	12	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	$\overline{P}$	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		10.5	15	ns
t_{PHL}					10.5	15	
t_{PLH}	$\overline{A}_i$ or $\overline{B}_i$	$\overline{F}_i$	M = 0 V, S0 = S3 = 4.5 V, S1 = S2 = 0 V ($\overline{SUM}$ mode)		11	16.5	ns
t_{PHL}					11	16.5	
t_{PLH}	$\overline{A}_i$ or $\overline{B}_i$	$\overline{F}_i$	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		14	20	ns
t_{PHL}					14	22	
t_{PLH}	$\overline{A}_i$ or $\overline{B}_i$	$\overline{F}_i$	M = 4.5 V (logic mode)		14	20	ns
t_{PHL}					14	22	
t_{PLH}	Any $\overline{A}$ or $\overline{B}$	A = B	M = 0 V, S0 = S3 = 0 V, S1 = S2 = 4.5 V ($\overline{DIFF}$ mode)		15	23	ns
t_{PHL}					20	30	

† t_{PLH} = propagation delay time, low-to-high-level output
t_{PHL} = propagation delay time, high-to-low-level output
NOTE 4: Load circuits and voltage wveforms are shown in Section 1. Refer to Parameter Measurement Information page for test conditions.

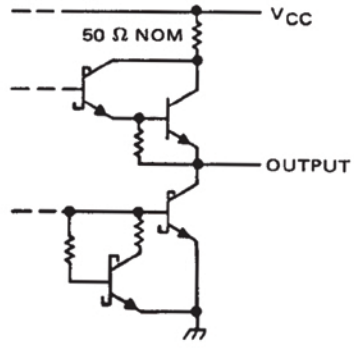
schematics of inputs and outputs

EQUIVALENT OF EACH INPUT

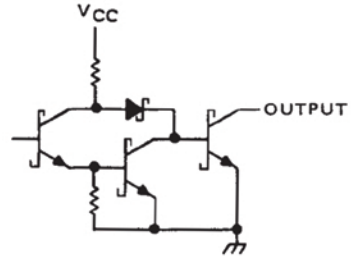


Mode control: R_{eq} = 2.8 kΩ NOM
Any $\overline{A}$ or $\overline{B}$: R_{eq} = 940 Ω NOM
Any S: R_{eq} = 700 Ω NOM
C_n: R_{eq} = 560 Ω NOM

TYPICAL OF ALL OUTPUTS EXCEPT A = B



A = B OUTPUT



PARAMETER MEASUREMENT INFORMATION

$\overline{\text{SUM}}$ MODE TEST TABLE

FUNCTION INPUTS: S0 = S3 = 4.5 V, S1 = S2 = M = 0 V

PARAMETER	INPUT UNDER TEST	OTHER INPUT SAME BIT		OTHER DATA INPUTS		OUTPUT UNDER TEST	OUTPUT WAVEFORM (See Note 4)
		APPLY 4.5 V	APPLY GND	APPLY 4.5 V	APPLY GND		
t_{PLH} / t_{PHL}	$\overline{A}_i$	$\overline{B}_i$	None	Remaining $\overline{A}$ and $\overline{B}$	C_n	$\overline{F}_i$	In-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	$\overline{A}_i$	None	Remaining $\overline{A}$ and $\overline{B}$	C_n	$\overline{F}_i$	In-Phase
t_{PLH} / t_{PHL}	$\overline{A}_i$	$\overline{B}_i$	None	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{P}$	In-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	$\overline{A}_i$	None	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{P}$	In-Phase
t_{PLH} / t_{PHL}	$\overline{A}_i$	None	$\overline{B}_i$	Remaining $\overline{B}$	Remaining $\overline{A}$, C_n	$\overline{G}$	In-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	None	$\overline{A}_i$	Remaining $\overline{B}$	Remaining $\overline{A}$, C_n	$\overline{G}$	In-Phase
t_{PLH} / t_{PHL}	C_n	None	None	All $\overline{A}$	All $\overline{B}$	Any $\overline{F}$ or C_{n+4}	In-Phase
t_{PLH} / t_{PHL}	$\overline{A}_i$	None	$\overline{B}_i$	Remaining $\overline{B}$	Remaining $\overline{A}$, C_n	C_{n+4}	Out-of-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	None	$\overline{A}_i$	Remaining $\overline{B}$	Remaining $\overline{A}$, C_n	C_{n+4}	Out-of-Phase

$\overline{\text{DIFF}}$ MODE TEST TABLE

FUNCTION INPUTS: S1 = S2 = 4.5 V, S0 = S3 = M = 0 V

PARAMETER	INPUT UNDER TEST	OTHER INPUT SAME BIT		OTHER DATA INPUTS		OUTPUT UNDER TEST	OUTPUT WAVEFORM (See Note 4)
		APPLY 4.5 V	APPLY GND	APPLY 4.5 V	APPLY GND		
t_{PLH} / t_{PHL}	$\overline{A}_i$	None	$\overline{B}_i$	Remaining $\overline{A}$	Remaining $\overline{B}$, C_n	$\overline{F}_i$	In-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	$\overline{A}_i$	None	Remaining $\overline{A}$	Remaining $\overline{B}$, C_n	$\overline{F}_i$	Out-of-Phase
t_{PLH} / t_{PHL}	$\overline{A}_i$	None	$\overline{B}_i$	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{P}$	In-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	$\overline{A}_i$	None	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{P}$	Out-of-Phase
t_{PLH} / t_{PHL}	$\overline{A}_i$	$\overline{B}_i$	None	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{G}$	In-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	None	$\overline{A}_i$	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{G}$	Out-of-Phase
t_{PLH} / t_{PHL}	$\overline{A}_i$	None	$\overline{B}_i$	Remaining $\overline{A}$	Remaining $\overline{B}$, C_n	A = B	In-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	$\overline{A}_i$	None	Remaining $\overline{A}$	Remaining $\overline{B}$, C_n	A = B	Out-of Phase
t_{PLH} / t_{PHL}	C_n	None	None	All $\overline{A}$ and $\overline{B}$	None	C_{n+4} or any $\overline{F}$	In-Phase
t_{PLH} / t_{PHL}	$\overline{A}_i$	$\overline{B}_i$	None	None	Remaining $\overline{A}$, $\overline{B}$, C_n	C_{n+4}	Out-of-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	None	$\overline{A}_i$	None	Remaining $\overline{A}$, $\overline{B}$, C_n	C_{n+4}	In -Phase

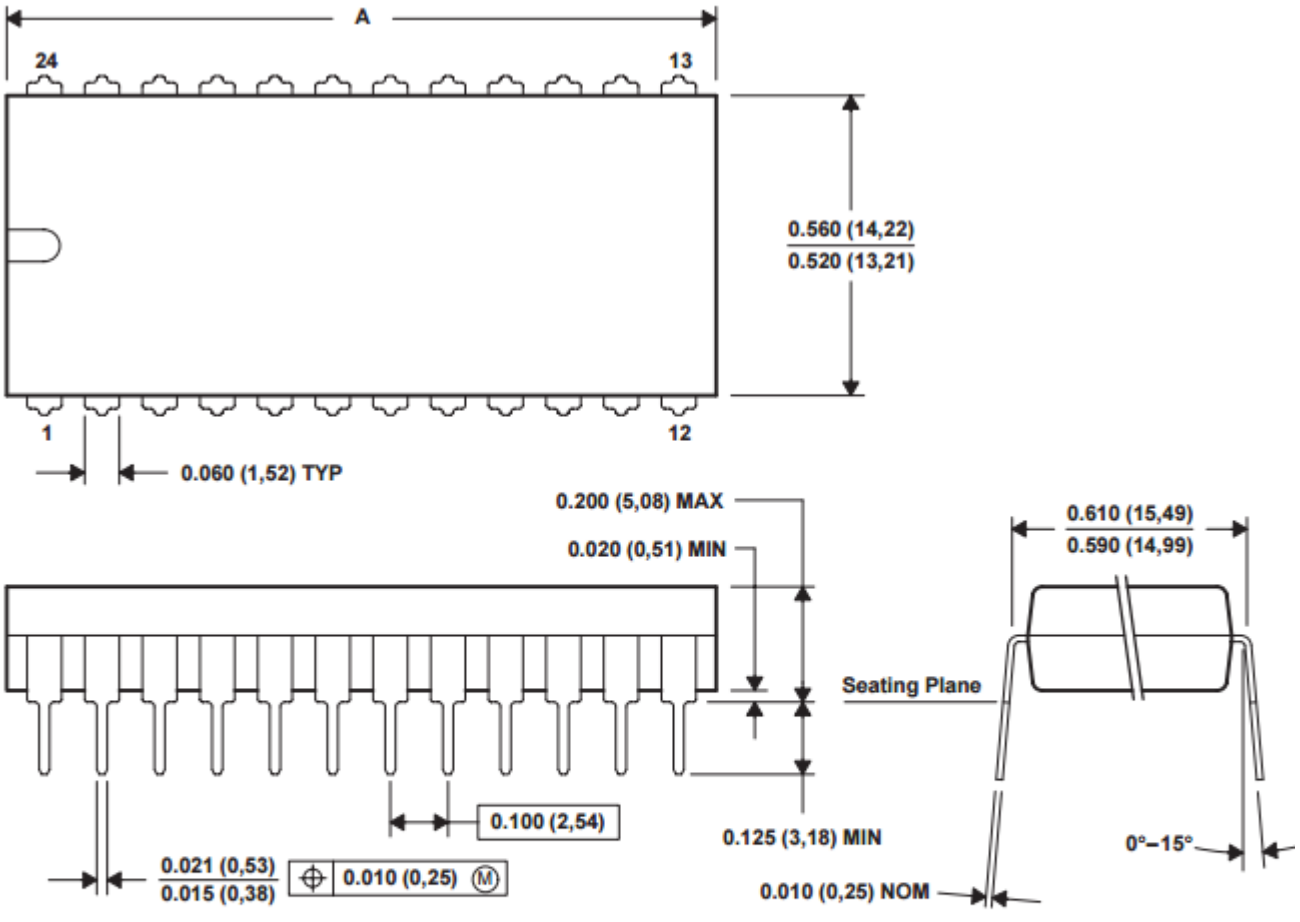
LOGIC MODE TEST TABLE

FUNCTION INPUTS: S1 = S2 = M = 4.5 V, S0 = S3 = 0 V

PARAMETER	INPUT UNDER TEST	OTHER INPUT SAME BIT		OTHER DATA INPUTS		OUTPUT UNDER TEST	OUTPUT WAVEFORM (See Note 4)
		APPLY 4.5 V	APPLY GND	APPLY 4.5 V	APPLY GND		
t_{PLH} / t_{PHL}	$\overline{A}_i$	$\overline{B}_i$	None	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{F}_i$	Out-of-Phase
t_{PLH} / t_{PHL}	$\overline{B}_i$	$\overline{A}_i$	None	None	Remaining $\overline{A}$ and $\overline{B}$, C_n	$\overline{F}_i$	Out-of-Phase

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.

DIP



DIM \ PINS **	24	28	32	40	48	52
A MAX	1.270 (32,26)	1.450 (36,83)	1.650 (41,91)	2.090 (53,09)	2.450 (62,23)	2.650 (67,31)
A MIN	1.230 (31,24)	1.410 (35,81)	1.610 (40,89)	2.040 (51,82)	2.390 (60,71)	2.590 (65,79)

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