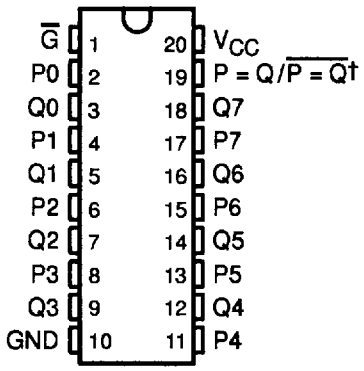
SDAS224B – JUNE 1982 – REVISED NOVEMBER 1995

- **Compare Two 8-Bit Words**
- **Choice of Totem-Pole or Open-Collector Outputs**
- **SN74ALS518 and 'ALS520 Have 20-kΩ Pullup Resistors on Q Inputs**
- **Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs**

TYPE	INPUT PULLUP RESISTOR	OUTPUT FUNCTION AND CONFIGURATION
SN74ALS518	Yes	P = Q open collector
'ALS520	Yes	$\overline{P = Q}$ totem pole
SN74ALS521‡	No	$\overline{P = Q}$ totem pole

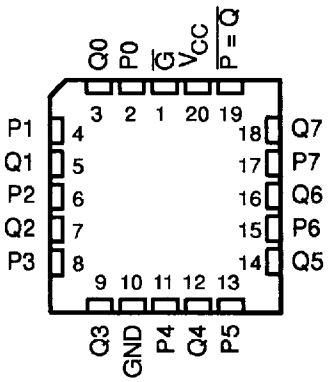
‡ SN74ALS521 is identical to 'ALS688.

SN54ALS520 . . . J PACKAGE
SN74ALS518, SN74ALS520,
SN74ALS521 . . . DW OR N PACKAGE
(TOP VIEW)



† P = Q for SN74ALS518
$\overline{P = Q}$ for 'ALS520 and SN74ALS521

SN54ALS520 . . . FK PACKAGE
(TOP VIEW)



description

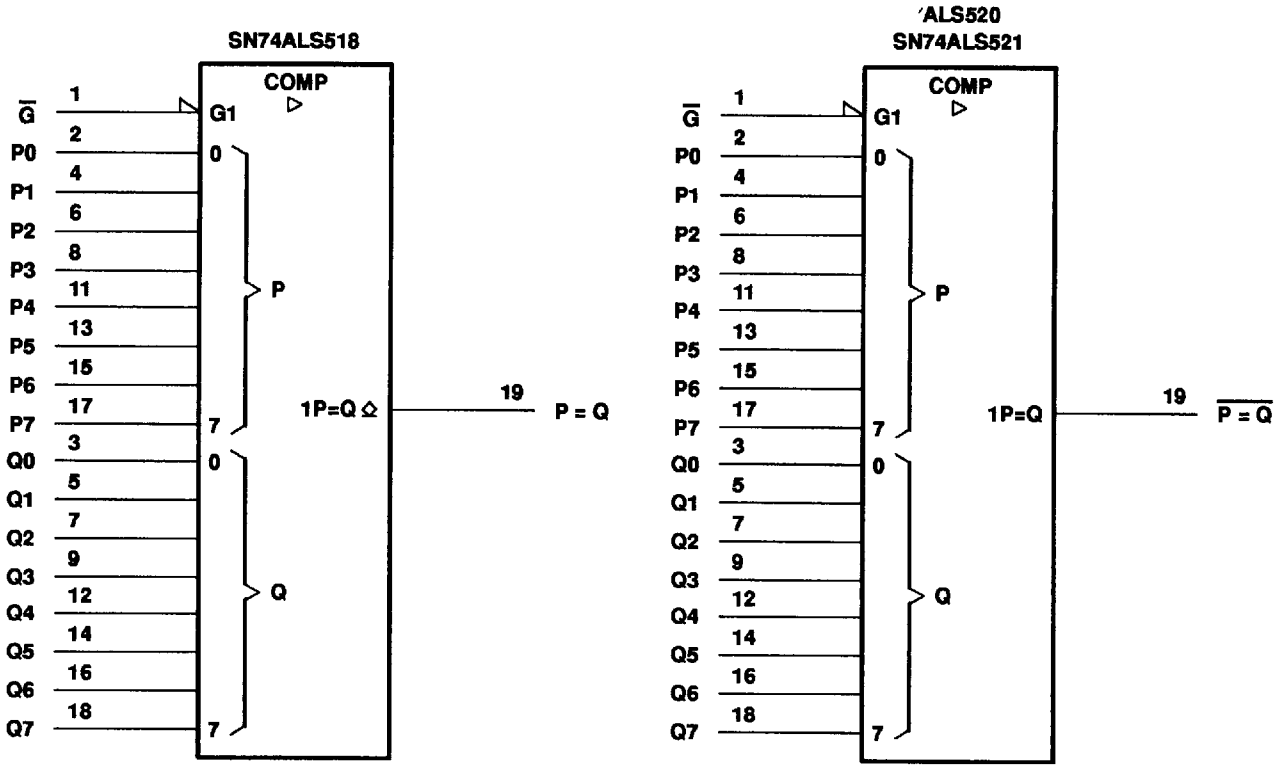
These identity comparators perform comparisons on two 8-bit binary or BCD words. The SN74ALS518 provides P = Q outputs, while the 'ALS520 and SN74ALS521 provide $\overline{P = Q}$ outputs. The SN74ALS518 has an open-collector output. The SN74ALS518 and 'ALS520 feature 20-kΩ pullup resistors on the Q inputs for analog or switch data.

The SN54ALS520 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS518, SN74ALS520, and SN74ALS521 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE

INPUTS		OUTPUTS	
DATA P, Q	ENABLE $\overline{G}$	P = Q	$\overline{P = Q}$
P = Q	L	H	L
P > Q	L	L	H
P < Q	L	L	H
X	H	L	H

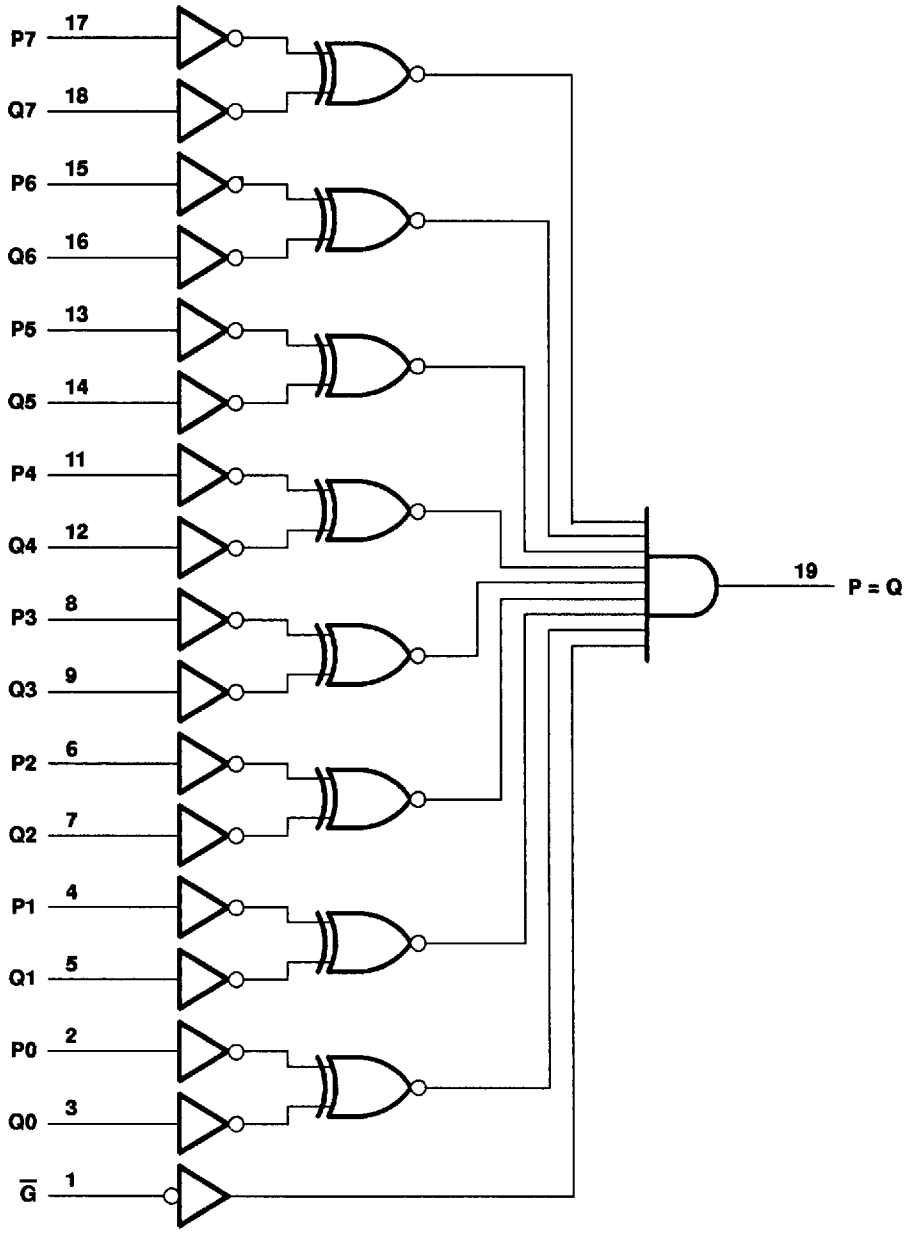
logic symbols†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

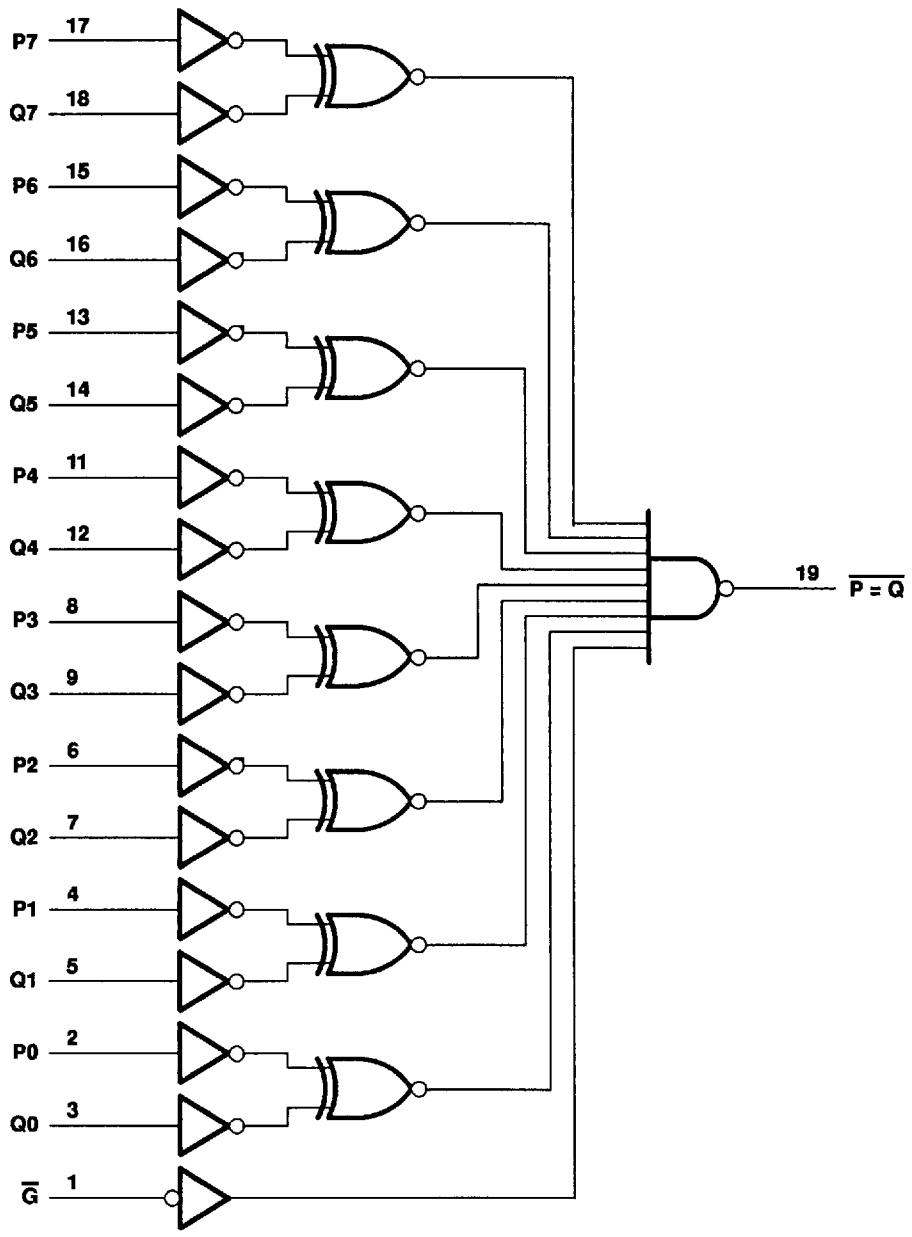
logic diagrams (positive logic)

SN74ALS518



logic diagrams (positive logic) (continued)

'ALS520
SN74ALS521



TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

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

Supply voltage, V_{CC} ..... 7 V
Input voltage, V_I: Q inputs ..... V_{CC} + 0.5 V or 5.5 V, whichever is less
All other inputs ..... 7 V
Off-state output voltage ..... 7 V
Operating free-air temperature range, T_A: SN74ALS518 ..... 0°C to 70°C
Storage temperature range ..... −65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

		SN74ALS518			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
V_{OH}	High-level output voltage			5.5	V
I_{OL}	Low-level output current			24	mA
T_A	Operating free-air temperature	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN74ALS518			UNIT
				MIN	TYP‡	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.5	V
I_{OH}		V_{CC} = 5.5 V,	V_{OH} = 5.5 V			0.1	mA
V_{OL}		V_{CC} = 4.5 V	I_{OL} = 12 mA		0.25	0.4	V
			I_{OL} = 24 mA		0.35	0.5	
I_I	Q inputs	V_{CC} = 5.5 V	V_I = 5.5 V			0.1	mA
	All other inputs		V_I = 7 V			0.1	
I_{IH}	Q inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			−0.2	mA
	All other inputs					20	µA
I_{IL}	Q inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.6	mA
	All other inputs					−0.1	
I_{CC}		V_{CC} = 5.5 V,	See Note 1		11	17	mA

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 1: I_{CC} is measured with $\overline{G}$ grounded, and P and Q at 4.5 V.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 680 Ω, T_A = MIN to MAX†		UNIT
			SN74ALS518		
			MIN	MAX	
t_{PLH}	P or Q	P = Q	15	33	ns
t_{PHL}			3	15	
t_{PLH}	$\overline{G}$	P = Q	15	33	ns
t_{PHL}			3	15	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

Supply voltage, V_{CC} ..... 7 V
Input voltage, V_I: Q inputs of 'ALS520 ..... V_{CC} + 0.5 V or 5.5 V, whichever is less
All other inputs ..... 7 V
Operating free-air temperature range, T_A: SN54ALS520 ..... −55°C to 125°C
SN74ALS520, SN74ALS521 ..... 0°C to 70°C
Storage temperature range ..... −65°C to 150°C

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

		SN54ALS520			SN74ALS520 SN74ALS521			UNIT
		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
I_{OH}	High-level output current			−1			−2.6	mA
I_{OL}	Low-level output current			12			24	mA
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN54ALS520			SN74ALS520 SN74ALS521			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.5			−1.5	V
V_{OH}		V_{CC} = 4.5 V to 5.5 V,	I_{OH} = −0.4 mA	V_{CC} −2			V_{CC} −2			V
		V_{CC} = 4.5 V	I_{OH} = −1 mA	2.4	3.3					
			I_{OH} = −2.6 mA				2.4	3.2		
V_{OL}		V_{CC} = 4.5 V	I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 24 mA					0.35	0.5	
I_I	'ALS520 Q inputs	V_{CC} = 5.5 V	V_I = 5.5 V			0.1			0.1	mA
	All other inputs		V_I = 7 V			0.1			0.1	
I_{IH}	'ALS520 Q inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			−0.2			−0.2	mA
	All other inputs					20			20	µA
I_{IL}	'ALS520 Q inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.6			−0.6	mA
	All other inputs					−0.1			−0.1	
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	−20		−112	−30		−112	mA
I_{CC}	'ALS520	V_{CC} = 5.5 V,	See Note 1		12	19		12	19	mA
	SN74ALS521				12	19		12	19	

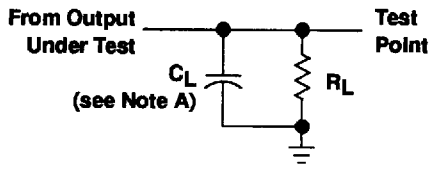
† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.
NOTE 1: I_{CC} is measured with $\overline{G}$ grounded, and P and Q at 4.5 V.

switching characteristics (see Figure 1)

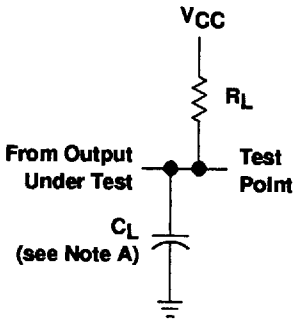
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 500 Ω, T_A = MIN to MAX§				UNIT
			SN54ALS520		SN74ALS520 SN74ALS521		
			MIN	MAX	MIN	MAX	
t_{PLH}	P or Q	P = Q	3	19	3	12	ns
t_{PHL}			3	25	5	20	
t_{PLH}	G	P = Q	2	18	2	12	ns
t_{PHL}			5	23	5	22	

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

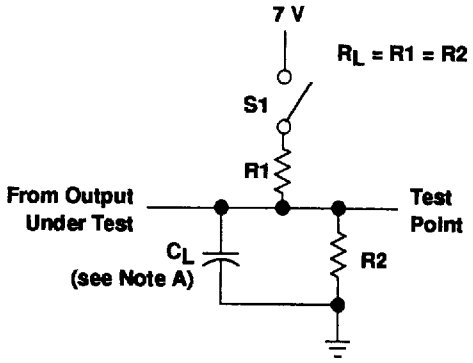
PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



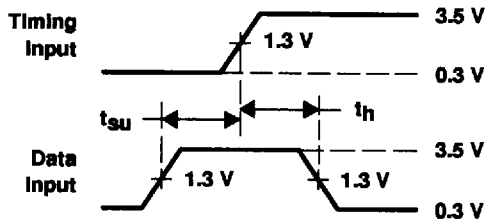
LOAD CIRCUIT FOR BI-STATE TOTEM-POLE OUTPUTS



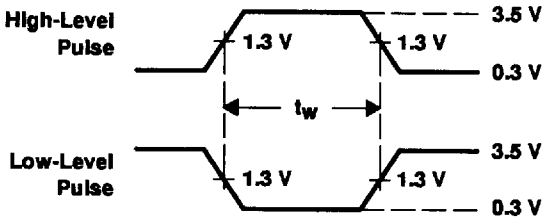
LOAD CIRCUIT FOR OPEN-COLLECTOR OUTPUTS



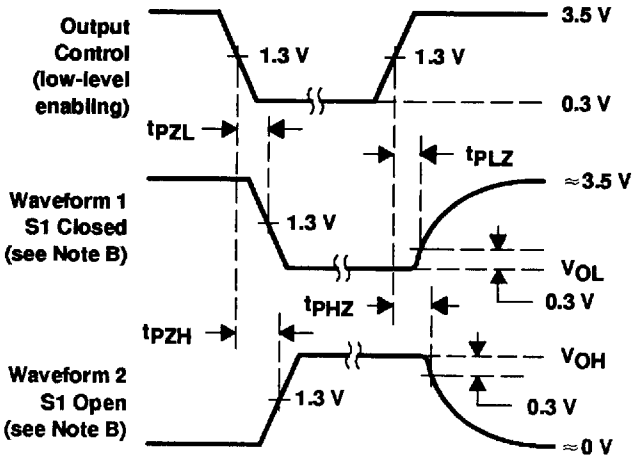
LOAD CIRCUIT FOR 3-STATE OUTPUTS



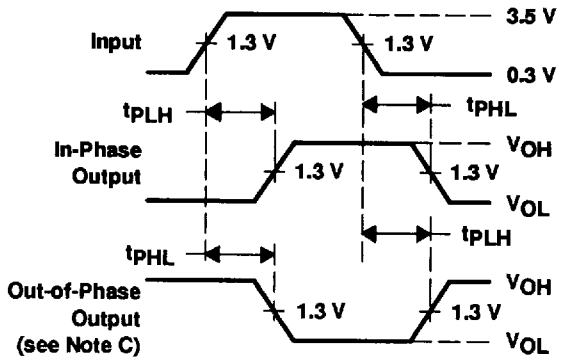
VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS PULSE DURATIONS



VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES

NOTES: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. When measuring propagation delay items of 3-state outputs, switch S1 is open.
D. All input pulses have the following characteristics: PRR ≤ 1 MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms