- **3-State Buffer-Type Outputs Drive Bus Lines Directly**
- **Bus-Structured Pinout**
- **Choice of True or Inverting Logic**
  - **SN54ALS874B, SN74ALS874B, SN74AS874 Have True Outputs**
  - **SN74ALS876A, SN74AS876 Have Inverting Outputs**
- **Asynchronous Clear**
- **Package Options Include Plastic Small-Outline (DW) Packages, Plastic (FN) and Ceramic (FK) Chip Carriers, and Standard Plastic (NT) and Ceramic (JT) 300-mil DIPs**

description

These dual 4-bit D-type edge-triggered flip-flops feature 3-state outputs designed specifically as bus drivers. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The edge-triggered flip-flops enter data on the low-to-high transition of the clock (CLK) input. The SN54ALS874B, SN74ALS874B, and SN74AS874 have clear ($\overline{\text{CLR}}$) inputs and noninverting Q outputs. The SN74ALS876A and SN74AS876 have preset ($\overline{\text{PRE}}$) inputs and inverting $\overline{\text{Q}}$ outputs; taking $\overline{\text{PRE}}$ low causes the four Q or $\overline{\text{Q}}$ outputs to go low independently of the clock.

The SN54ALS874B is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS874B, SN74ALS876A, SN74AS874, and SN74AS876 devices are characterized for operation from 0°C to 70°C.

SN54ALS874B . . . JT PACKAGE
SN74ALS874B, SN74AS874 . . . DW OR NT PACKAGE
(TOP VIEW)

1$\overline{\text{CLR}}$	1	24	V$_{CC}$
1$\overline{\text{OE}}$	2	23	1CLK
1D1	3	22	1Q1
1D2	4	21	1Q2
1D3	5	20	1Q3
1D4	6	19	1Q4
2D1	7	18	2Q1
2D2	8	17	2Q2
2D3	9	16	2Q3
2D4	10	15	2Q4
2$\overline{\text{OE}}$	11	14	2CLK
GND	12	13	2$\overline{\text{CLR}}$
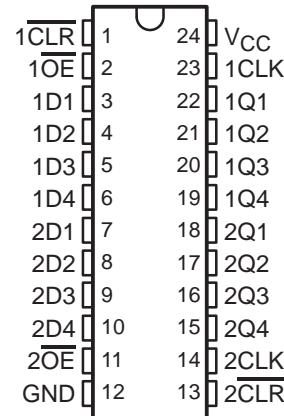
SN54ALS874B . . . FK PACKAGE
(TOP VIEW)

Top pins (left to right): 1D1, 1$\overline{\text{OE}}$, 1$\overline{\text{CLR}}$, NC, V$_{CC}$, 1CLK, 1Q1 — pins 4, 3, 2, 1, 28, 27, 26

Left side: 1D2 (5), 1D3 (6), 1D4 (7), NC (8), 2D1 (9), 2D2 (10), 2D3 (11)

Right side: 1Q2 (25), 1Q3 (24), 1Q4 (23), NC (22), 2Q1 (21), 2Q2 (20), 2Q3 (19)

Bottom pins (left to right): 2D4, 2$\overline{\text{OE}}$, GND, NC, 2$\overline{\text{CLR}}$, 2CLK, 2Q4 — pins 12, 13, 14, 15, 16, 17, 18
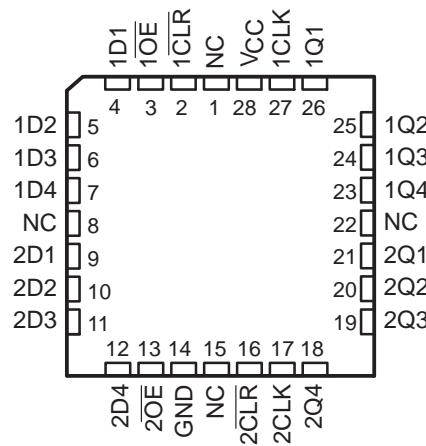
NC – No internal connection

SN74ALS876A, SN74AS876 . . . DW OR NT PACKAGE
(TOP VIEW)

1$\overline{\text{PRE}}$	1	24	V$_{CC}$
1$\overline{\text{OE}}$	2	23	1CLK
1D1	3	22	1$\overline{\text{Q}}$1
1D2	4	21	1$\overline{\text{Q}}$2
1D3	5	20	1$\overline{\text{Q}}$3
1D4	6	19	1$\overline{\text{Q}}$4
2D1	7	18	2$\overline{\text{Q}}$1
2D2	8	17	2$\overline{\text{Q}}$2
2D3	9	16	2$\overline{\text{Q}}$3
2D4	10	15	2$\overline{\text{Q}}$4
2$\overline{\text{OE}}$	11	14	2CLK
GND	12	13	2$\overline{\text{PRE}}$

TEXAS INSTRUMENTS

Function Tables

SN54ALS874B, SN74ALS874B, SN74AS874
(each flip-flop)

INPUTS				OUTPUT
$\overline{OE}$	$\overline{CLR}$	CLK	D	Q
L	L	X	X	L
L	H	↑	H	H
L	H	↑	L	L
L	H	L	X	Q_0
H	X	X	X	Z

SN74ALS876A, SN74AS876
(each flip-flop)

INPUTS				OUTPUT
$\overline{OE}$	$\overline{PRE}$	CLK	D	$\overline{Q}$
L	L	X	X	L
L	H	↑	H	L
L	H	↑	L	H
L	H	L	X	$\overline{Q}_0$
H	X	X	X	Z

logic symbols†

SN54ALS874B, SN74ALS874B, SN74AS874

1$\overline{OE}$	2	EN
1CLK	23	C1
1$\overline{CLR}$	1	R

1D1	3	1D	22	1Q1
1D2	4		21	1Q2
1D3	5		20	1Q3
1D4	6		19	1Q4

2$\overline{OE}$	11	EN
2CLK	14	C1
2$\overline{CLR}$	13	R

2D1	7	1D	18	2Q1
2D2	8		17	2Q2
2D3	9		16	2Q3
2D4	10		15	2Q4

SN74ALS876A, SN74AS876

1$\overline{OE}$	2	EN
1CLK	23	C1
1$\overline{PRE}$	1	S

1D1	3	1D	22	1$\overline{Q}$1
1D2	4		21	1$\overline{Q}$2
1D3	5		20	1$\overline{Q}$3
1D4	6		19	1$\overline{Q}$4

2$\overline{OE}$	11	EN
2CLK	14	C1
2$\overline{PRE}$	13	S

|					
2D1	7	1D	18	2$\overline{Q}$1
2D2	8		17	2$\overline{Q}$2
2D3	9		16	2$\overline{Q}$3
2D4	10		15	2$\overline{Q}$4
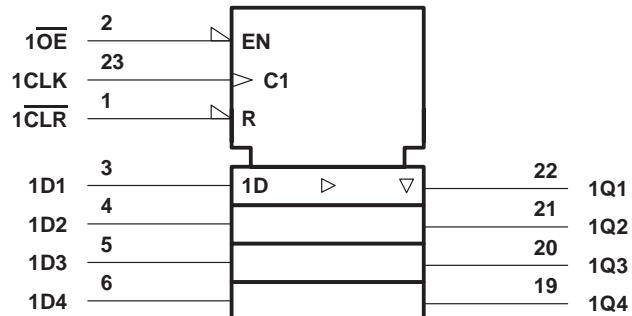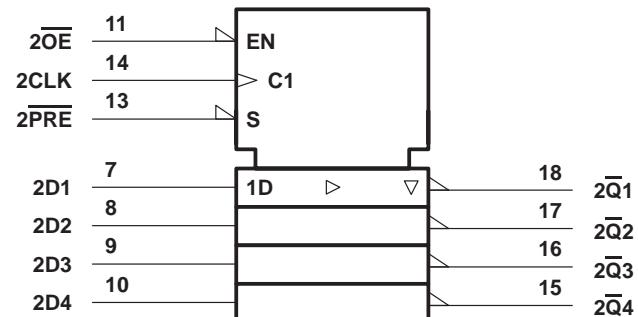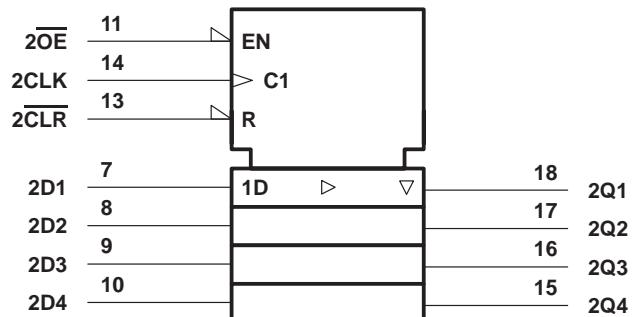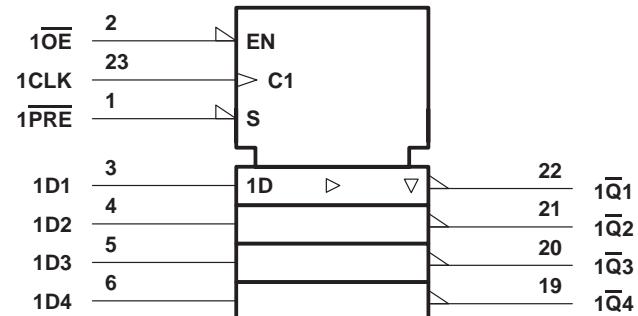
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the DW, JT, and NT packages.

logic diagrams (positive logic)

SN54ALS874B, SN74ALS874B, SN74AS874
(each quad flip-flop)
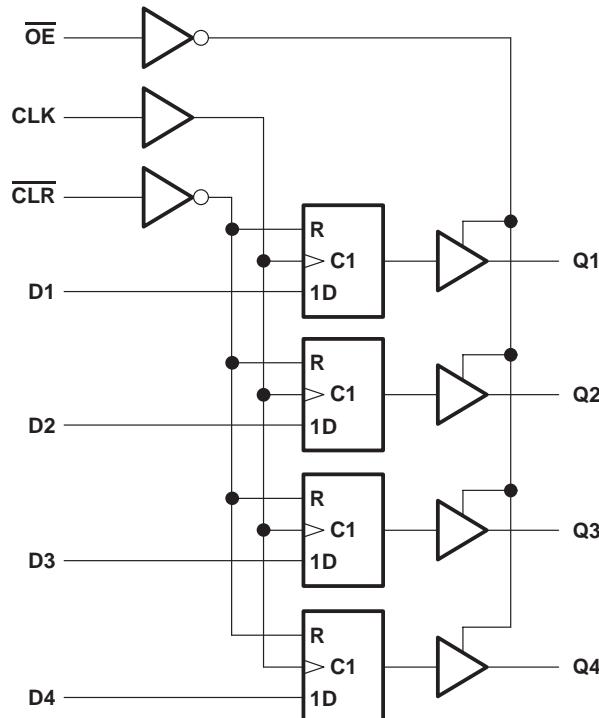
SN74ALS876A, SN74AS876
(each quad flip-flop)
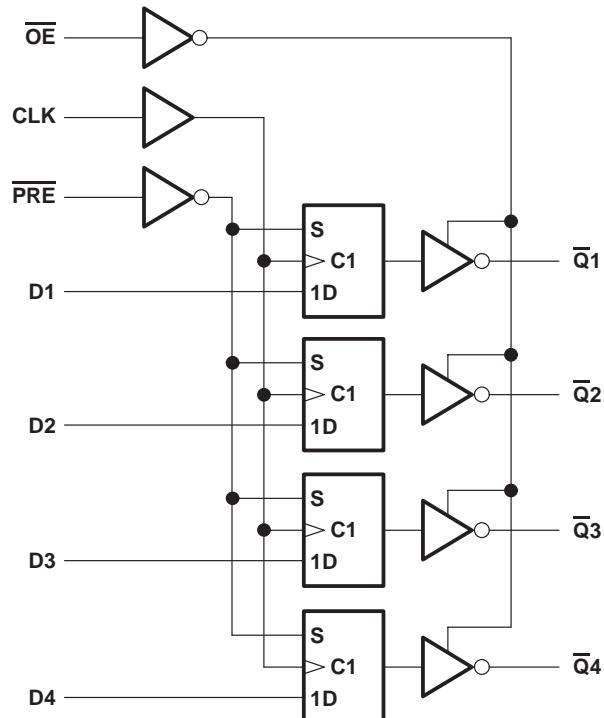
Pin numbers shown are for the DW, JT, and NT packages.

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

Supply voltage, V_{CC} . . . . 7 V
Input voltage, V_I . . . . 7 V
Voltage applied to a disabled 3-state output . . . . 5.5 V
Operating free-air temperature range, T_A: SN54ALS874B . . . . −55°C to 125°C
SN74ALS874B, SN74ALS876A . . . . 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

			SN54ALS874B			SN74ALS874B SN74ALS876A			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
f_{clock}	Clock frequency		0		25	0		30	MHz
t_w	Pulse duration	$\overline{PRE}$ or $\overline{CLR}$ low	15			10			ns
		CLK high	20			16.5			
		CLK low	20			16.5			
t_{su}	Setup time before CLK↑	Data	15			15			ns
		$\overline{PRE}$ or $\overline{CLR}$ inactive	15			10			
t_h	Hold time, data after CLK↑		4			0			ns
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		SN54ALS874B			SN74ALS874B SN74ALS876A			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.2			−1.2	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_{OZH}		V_{CC} = 5.5 V,	V_O = 2.7 V			20			20	µA
I_{OZL}		V_{CC} = 5.5 V,	V_O = 0.4 V			−20			−20	µA
I_I		V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
I_{IH}		V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
I_{IL}		V_{CC} = 5.5 V,	V_I = 0.4 V			−0.2			−0.2	mA
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	−20		−112	−30		−112	mA
I_{CC}	'ALS874B	V_{CC} = 5.5 V	Outputs high		14	21		14	21	mA
			Outputs low		19	30		19	30	
			Outputs disabled		20	32		20	32	
	SN74ALS876A	V_{CC} = 5.5 V	Outputs high					14	21	
			Outputs low					18	29	
			Outputs disabled					20	31	

† 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}.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX[†]				UNIT
			SN54ALS874B		SN74ALS874B		
			MIN	MAX	MIN	MAX	
f_{max}			25		30		MHz
t_{PLH}	CLK	Any Q	4	18	4	14	ns
t_{PHL}			4	16	4	14	
t_{PHL}	$\overline{CLR}$	Any Q	5	23	5	17	ns
t_{PZH}	$\overline{OE}$	Any Q	4	24	4	18	ns
t_{PZL}			4	21	4	18	
t_{PHZ}	$\overline{OE}$	Any Q	2	15	2	10	ns
t_{PLZ}			3	22	3	12	

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

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX[†]		UNIT
			SN74ALS876A		
			MIN	MAX	
f_{max}			30		MHz
t_{PLH}	CLK	Any $\overline{Q}$	4	14	ns
t_{PHL}			4	14	
t_{PHL}	$\overline{PRE}$	Any $\overline{Q}$	6	19	ns
t_{PZH}	$\overline{OE}$	Any $\overline{Q}$	4	18	ns
t_{PZL}			4	18	
t_{PHZ}	$\overline{OE}$	Any $\overline{Q}$	2	10	ns
t_{PLZ}			3	13	

[†] 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 . . . . 7 V
Operating free-air temperature range, T_A: SN74AS874, SN74AS876 . . . . 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

			SN74AS874			SN74AS876			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				0.8			0.8	V
I_{OH}	High-level output current				−15			−15	mA
I_{OL}	Low-level output current				48			48	mA
f_{clock}	Clock frequency		0		125	0		80	MHz
t_w	Pulse duration	$\overline{PRE}$ or $\overline{CLR}$ low	2			4.5			ns
		CLK high	3			6.2			
		CLK low	4			6.2			
t_{su}	Setup time before CLK↑	Data	2			4.5			ns
		$\overline{PRE}$ or $\overline{CLR}$ inactive	4			5			
t_h	Hold time, data after CLK↑		1			2			ns
T_A	Operating free-air temperature		0		70	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN74AS874 SN74AS876			UNIT
				MIN	TYP[†]	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.2	V
V_{OH}		V_{CC} = 4.5 V to 5.5 V,	I_{OH} = −2 mA	V_{CC} −2			V
		V_{CC} = 4.5 V,	I_{OH} = −15 mA	2.4	3.3		
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.35	0.5	V
I_{OZH}		V_{CC} = 5.5 V,	V_O = 2.7 V			50	µA
I_{OZL}		V_{CC} = 5.5 V,	V_O = 0.4 V			−50	µA
I_I		V_{CC} = 5.5 V,	V_I = 7 V			0.1	mA
I_{IH}		V_{CC} = 5.5 V,	V_I = 2.7 V			20	µA
I_{IL}	D	V_{CC} = 5.5 V,	V_I = 0.4 V			−2	mA
	All others					−0.5	
I_O[‡]		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	mA
I_{CC}	SN74AS874	V_{CC} = 5.5 V	Outputs high		82	133	mA
			Outputs low		92	149	
			Outputs disabled		100	160	
	SN74AS876	V_{CC} = 5.5 V	Outputs high		88	142	
			Outputs low		94	150	
			Outputs disabled		100	160	

[†] 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}.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX[†]		UNIT
			SN74AS874		
			MIN	MAX	
f_{max}			125		MHz
t_{PLH}	CLK	Any Q	3	8.5	ns
t_{PHL}	CLK	Any Q	4	10.5	ns
t_{PHL}	$\overline{CLR}$	Any Q	4	9.5	ns
t_{PZH}	$\overline{OE}$	Any Q	2	7	ns
t_{PZL}	$\overline{OE}$	Any Q	3	10.5	ns
t_{PHZ}	$\overline{OE}$	Any Q	2	6	ns
t_{PLZ}	$\overline{OE}$	Any Q	2	7.5	ns

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

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX[†]		UNIT
			SN74AS876		
			MIN	MAX	
f_{max}			80		MHz
t_{PLH}	CLK	Any $\overline{Q}$	3	8.5	ns
t_{PHL}	CLK	Any $\overline{Q}$	4	10.5	ns
t_{PHL}	$\overline{PRE}$	Any $\overline{Q}$	4	9.5	ns
t_{PZH}	$\overline{OE}$	Any $\overline{Q}$	2	7	ns
t_{PZL}	$\overline{OE}$	Any $\overline{Q}$	3	11	ns
t_{PHZ}	$\overline{OE}$	Any $\overline{Q}$	2	7	ns
t_{PLZ}	$\overline{OE}$	Any $\overline{Q}$	2	7	ns

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

TEXAS
INSTRUMENTS
POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

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**
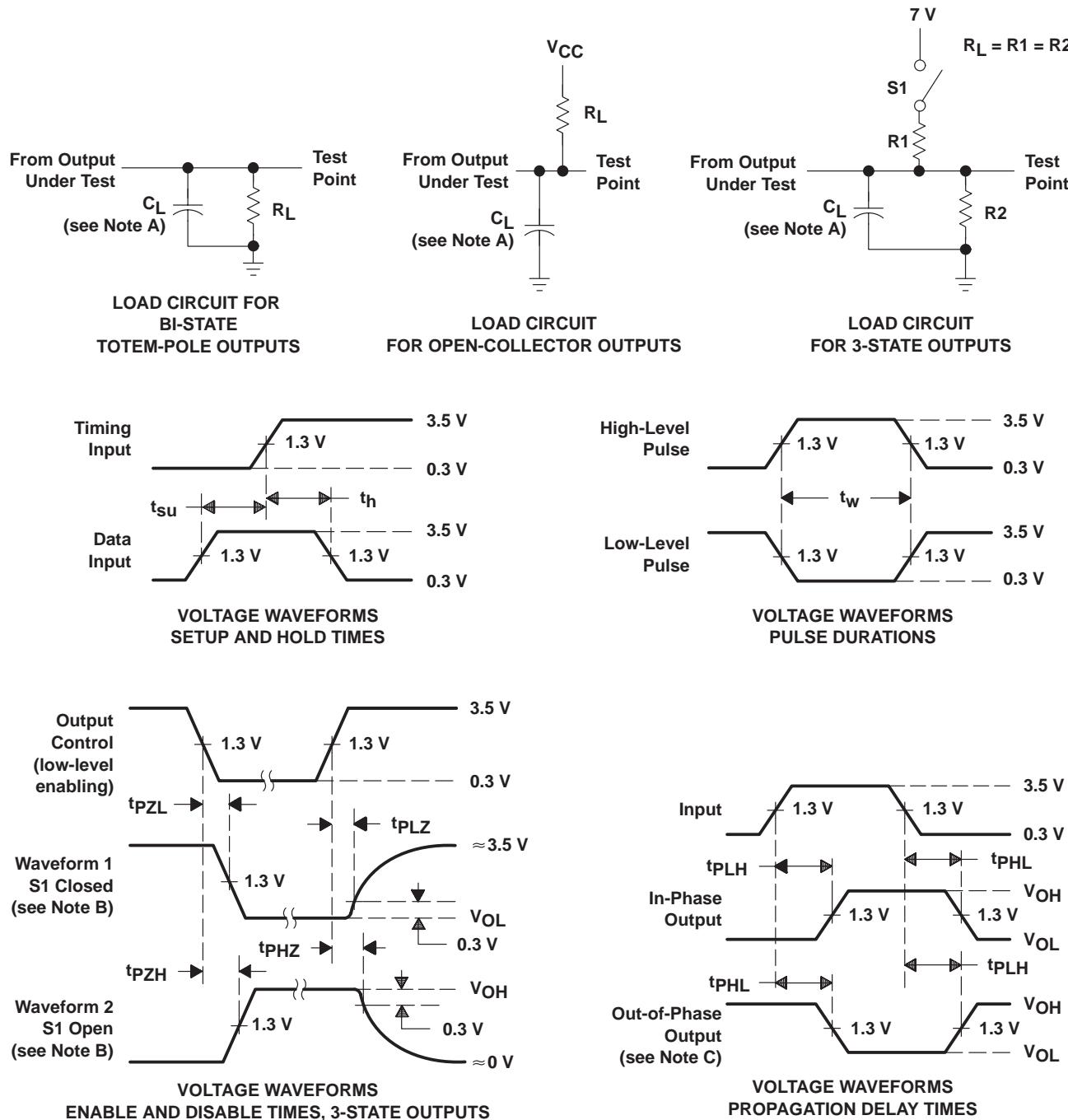
NOTES: A. C_L includes probe and jig capacitance.
        B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
           Waveform 2 is for an output with internal conditions such that the output is high except when disabled by 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

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
84010013A	ACTIVE	LCCC	FK	28	1	None	Call TI	Level-NC-NC-NC
8401001KA	OBSOLETE	CFP	W	24		None	Call TI	Call TI
8401001LA	ACTIVE	CDIP	JT	24	1	None	Call TI	Level-NC-NC-NC
SN54ALS874BJT	ACTIVE	CDIP	JT	24	1	None	Call TI	Level-NC-NC-NC
SN74ALS874BDW	ACTIVE	SOIC	DW	24	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS874BDWR	ACTIVE	SOIC	DW	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS874BNSR	ACTIVE	SO	NS	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS874BNT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74ALS876ADW	ACTIVE	SOIC	DW	24	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS876ADWR	ACTIVE	SOIC	DW	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS876ANT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74AS874DW	ACTIVE	SOIC	DW	24	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS874DWR	ACTIVE	SOIC	DW	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS874NT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74AS876DW	ACTIVE	SOIC	DW	24	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS876DWR	ACTIVE	SOIC	DW	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS876NT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SNJ54ALS874BFK	ACTIVE	LCCC	FK	28	1	None	Call TI	Level-NC-NC-NC
SNJ54ALS874BJT	ACTIVE	CDIP	JT	24	1	None	Call TI	Level-NC-NC-NC

[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

[2] Eco Plan - May not be currently available - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
None: Not yet available Lead (Pb-Free).
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDECindustry standard classifications, and peak solder

temperature.

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