

SN54ALS843, SN54AS843, SN54ALS844, SN54AS844 SN74ALS843, SN74AS843, SN74ALS844, SN74AS844 9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

D2910, DECEMBER 1983—REVISED DECEMBER 1985

- 3-State Buffer-Type Outputs Drive Bus-Lines Directly
- Bus-Structured Pinout
- Provide Extra Bus Driving Latches Necessary for Wider Address/Data Paths or Buses with Parity
- Buffered Control Inputs to Reduce DC Loading
- Power-Up High Impedance
- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

These 9-bit latches feature three-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The nine latches are transparent D-type. The 'ALS843 and 'AS843 have noninverting data (D) inputs. The 'ALS844 and 'AS844 have inverting D inputs.

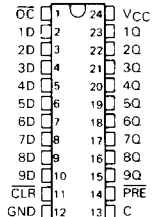
A buffered output control (\overline{OC}) input can be used to place the nine outputs in either a normal logic state (high or low levels) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive the bus lines in a bus-organized system without need for interface or pull-up components.

The output control (\overline{OC}) does not affect the internal operation of the flip-flops. Old data can be retained or new data can be entered while the outputs are off.

The -1 versions of the SN74ALS843 and SN74ALS844 parts are identical to the standard versions except that the recommended maximum IOL is increased to 48 milliamperes. There are no -1 versions of the SN54ALS843 and SN54ALS844.

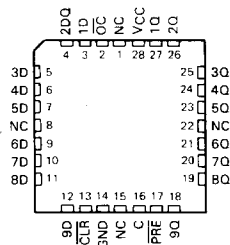
SN54ALS843, SN54AS843 . . . JT PACKAGE
SN74ALS843, SN74AS843 . . . DW OR NT PACKAGE

(TOP VIEW)



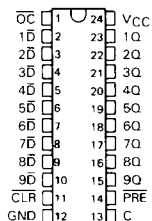
SN54ALS843, SN54AS843 . . . FK PACKAGE
SN74ALS843, SN74AS843 . . . FN PACKAGE

(TOP VIEW)



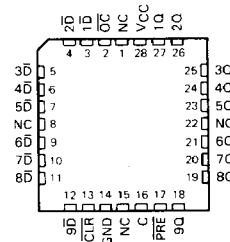
SN54ALS844, SN54AS844 . . . JT PACKAGE
SN74ALS844, SN74AS844 . . . DW OR NT PACKAGE

(TOP VIEW)



SN54ALS844, SN54AS844 . . . FK PACKAGE
SN74ALS844, SN74AS844 . . . FN PACKAGE

(TOP VIEW)



NC—No internal connection

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

Copyright © 1983, Texas Instruments Incorporated

2-173

2

LSI Devices

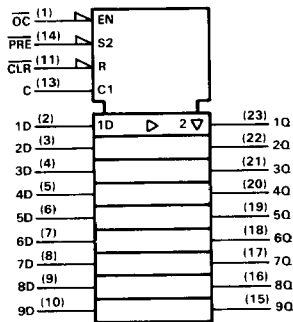
**SN54ALS843, SN54AS843, SN54ALS844, SN54AS844
SN74ALS843, SN74AS843, SN74ALS844, SN74AS844
9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS**

The SN54ALS843, SN54AS843, SN54ALS844, and SN54AS844 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS843, SN74AS843, SN74ALS844, and SN74AS844 are characterized for operation from 0°C to 70°C .

'ALS843, 'AS843 FUNCTION TABLE

INPUTS					OUTPUT
PRE	CLR	OC	C	D	Q
L	X	L	X	X	H
H	L	L	X	X	L
H	H	L	H	L	L
H	H	L	H	H	H
H	H	L	L	X	Q_O
X	X	H	X	X	Z

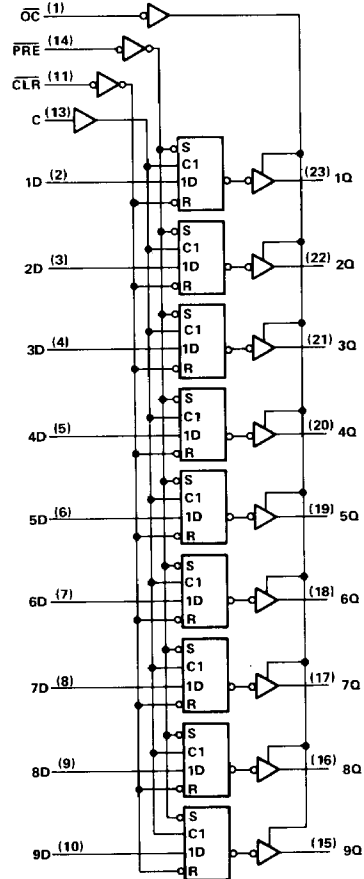
'ALS843, 'AS843 logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for DW, JT, and NT packages.

'ALS843, 'AS843 logic diagram (positive logic)



2

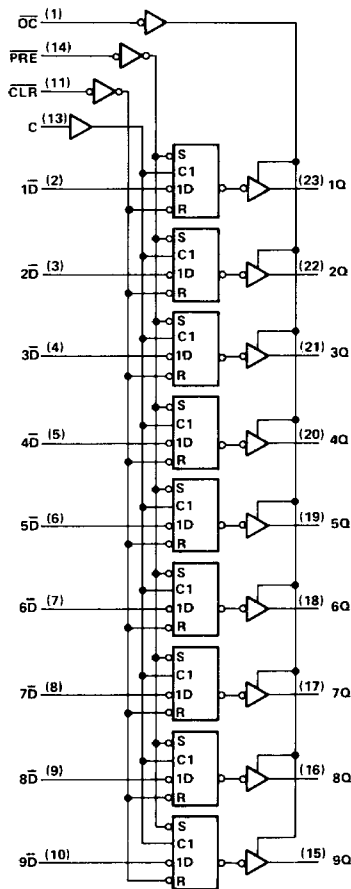
LSI Devices

**SN54ALS843, SN54AS843, SN54ALS844, SN54AS844
SN74ALS843, SN74AS843, SN74ALS844, SN74AS844
9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS**

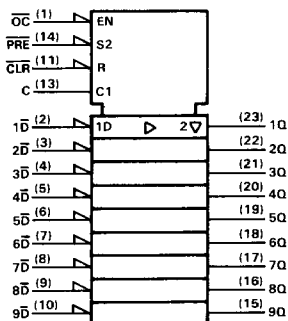
'ALS844, 'AS844 FUNCTION TABLE

INPUTS					OUTPUT
PRE	CLR	OC	C	D	Q
L	X	L	X	X	H
H	L	L	X	X	L
H	H	L	H	L	H
H	H	L	H	H	L
H	H	L	L	X	Q _O
X	X	H	X	X	Z

'ALS844, 'AS844 logic diagram (positive logic)



'ALS844, 'AS844 logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, JT, and NT packages.

2
LSI Devices

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

Supply voltage, V _{CC}	7 V
Input voltage	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range: SN54ALS', SN54AS'	-55 °C to 125 °C
SN74ALS', SN74AS'	0 °C to 70 °C
Storage temperature range	-65 °C to 150 °C

SN54ALS843, SN54ALS844
SN74ALS843, SN74ALS844
9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

recommended operating conditions

		SN54ALS843 SN54ALS844			SN74ALS843 SN74ALS844			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	-1			-2.6			mA	
I _{OL}	Low-level output current	12			24			mA	
					48 [†]				
t _w	Pulse duration	CLR or PRE low			35			ns	
		C high			20				
t _{su}	Setup time, data before enable C↓	16			10			ns	
t _h	Hold time, data after enable C↓	7			5			ns	
T _A	Operating free-air temperature	-55			125			0	°C

[†]The 48-mA limit applies for SN74ALS843-1 and SN74ALS844-1 only and only if V_{CC} is maintained between 4.75 V and 5.25 V.

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

2

LSI Devices

PARAMETER		TEST CONDITIONS	SN54ALS843 SN54ALS844			SN74ALS843 SN74ALS844			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					
		V _{CC} = 4.5 V, 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
		V _{CC} = 4.5 V, I _{OL} = 24 mA				0.35 0.5			
		(I _{OL} = 48 mA for -1 versions)							
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	-0.1			-0.1			mA
I _O [§]		V _{CC} = 5.5 V, V _O = 2.25 V	-30		-112	-30		-112	mA
I _{CC}	'ALS843	V _{CC} = 5.5 V	Outputs high		21	36	21	36	mA
			Outputs low		41	67	41	67	
	Outputs disabled		25	42	25	42			
	'ALS844		Outputs high		21	36	21	36	
			Outputs low		41	72	41	72	
	Outputs disabled		28	48	28	48			

[‡] 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}.

SN54ALS843, SN54ALS844
SN74ALS843, SN74ALS844

9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

'ALS843 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T _A = 25°C			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
			'ALS843			SN54ALS843		SN74ALS843		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	D	Q		7	11	2	15	2	13	ns
t _{PHL}				11	15	4	20	4	18	
t _{PLH}	C	Q		12	18	5	25	5	21	ns
t _{PHL}				16	23	8	30	8	26	
t _{PLH}	PRE	Q		13	19	5	25	5	22	ns
t _{PHL}				19	26	4	35	6	30	
t _{PLH}	CLR	Q		19	26	4	35	6	30	ns
t _{PHL}				14	21	6	27	6	23	
t _{PZH}	OC	Q		7	10	2	14	2	12	ns
t _{PZL}				9	12	4	16	4	14	
t _{PHZ}	OC	Q		6	9	2	12	2	10	ns
t _{PLZ}				7	10	2	14	2	12	

'ALS844 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T _A = 25°C			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
			'ALS844			SN54ALS844		SN74ALS844		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	D	Q		11	16	4	22	4	20	ns
t _{PHL}				9	13	3	17	3	15	
t _{PLH}	C	Q		17	24	8	32	8	29	ns
t _{PHL}				14	19	6	26	6	22	
t _{PLH}	PRE	Q		13	19	5	25	5	22	ns
t _{PHL}				19	26	4	35	6	30	
t _{PLH}	CLR	Q		19	26	4	35	6	30	ns
t _{PHL}				16	23	8	29	8	25	
t _{PZH}	OC	Q		10	15	2	19	4	17	ns
t _{PZL}				12	18	3	22	5	20	
t _{PHZ}	OC	Q		7	10	1	12	1	11	ns
t _{PLZ}				5	9	1	14	1	12	

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

2

LSI Devices

**SN54AS843, SN54AS844
SN74AS843, SN74AS844
9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS**

recommended operating conditions

		SN54AS843 SN54AS844			SN74AS843 SN74AS844			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	-24			-24			mA
I _{OL}	Low-level output current	32			48			mA
t _w	Pulse duration, enable C high	CLR or PRE low		5		4		ns
		C high		5		4		
t _{su}	Setup time, data before enable C↓	3.5			2.5			ns
t _h	Hold time, data after enable C↓	3.5			2.5			ns
t _r	Recovery time	PRE		17		15		ns
		CLR		16		14		
T _A	Operating free-air temperature	-55		125		0		70 °C

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

2

LSI Devices

PARAMETER		TEST CONDITIONS		SN54AS843 SN54AS844		SN74AS843 SN74AS844		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, I _{OH} = -2 mA		V _{CC} -2		V _{CC} -2		V			
		V _{CC} = 4.5 V, I _{OH} = -15 mA		2.4	3.2	2.4	3.2				
		V _{CC} = 4.5 V, I _{OH} = -24 mA		2		2					
V _{OL}		V _{CC} = 4.5 V, I _{OL} = 32 mA		0.25 0.5				V			
		V _{CC} = 4.5 V, I _{OL} = 48 mA				0.35	0.5				
I _{OZH}		V _{CC} = 5.5 V, V _O = 2.7 V		50		50		μA			
I _{OZL}		V _{CC} = 5.5 V, V _O = 0.4 V		-50		-50		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		-0.5		-0.5		mA			
I _O [‡]		V _{CC} = 5.5 V, V _O = 2.25 V		-30	-112	-30	-112	mA			
I _{CC}	'AS843	V _{CC} = 5.5 V.		Outputs high		37	62	37	62	mA	
				Outputs low		56	92	56	92		
	Outputs disabled			56	92	56	92				
	'AS844			Outputs high		39	64	39	64		
				Outputs low		58	95	58	95		
	Outputs disabled			58	95	58	95				

[†]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}.

SN54AS843, SN54AS844
SN74AS843, SN74AS844

9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

AS843 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = \text{MIN to MAX}$				UNIT
			SN54AS843		SN74AS843		
			MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	1	8.5	1	6.5	ns
t_{PHL}			1	10	1	9	
t_{PLH}	C	O	2	13	2	12	ns
t_{PHL}			2	13	2	12	
t_{PLH}	PRE	Q	2	12	2	10	ns
t_{PHL}	CLR	Q	2	14	2	13	ns
t_{PZH}	\overline{OC}	Q	2	13.5	2	10.5	ns
t_{PZL}			2	15	2	13.5	
t_{PHZ}	\overline{OC}	Q	1	10	1	8	ns
t_{PLZ}			1	10	1	8	

AS844 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = \text{MIN to MAX}$				UNIT
			SN54AS844		SN74AS844		
			MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	1	11	1	8.5	ns
t_{PHL}			1	11	1	10	
t_{PLH}	C	O	2	14	2	12.5	ns
t_{PHL}			2	14	2	13	
t_{PLH}	PRE	Q	2	12	2	10	ns
t_{PHL}	CLR	Q	2	14.5	2	13.5	ns
t_{PZH}	\overline{OC}	Q	2	14.5	2	12	ns
t_{PZL}			2	15	2	13.5	
t_{PHZ}	\overline{OC}	Q	1	10	1	8	ns
t_{PLZ}			1	10	1	8	

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

2

LSI Devices

SN54ALS843, SN54AS843, SN54ALS844, SN54AS844
SN74ALS843, SN74AS843, SN74ALS844, SN74AS844
9-BIT BUS INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

D latch signal conventions

It is normal TI practice to name the outputs and other inputs of a D-type latch and to draw its logic symbol based on the assumption of true data (D) inputs. Then outputs that produce data in phase with the data inputs are called Q and those producing complementary data are called \bar{Q} . An input that causes a Q output to go high or a \bar{Q} output to go low is called Preset; an input that causes a \bar{Q} output to go high or a Q output to go low is called Clear. Bars are used over these pin names ($\overline{\text{PRE}}$ and $\overline{\text{CLR}}$) if they are active low. The devices on this data sheet are second-source designs and the pin-name conventions used by the original manufacturer have been retained. That makes it necessary to designate the data inputs and outputs of the inverting circuit \bar{D} and Q.

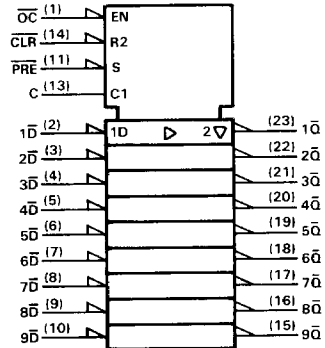
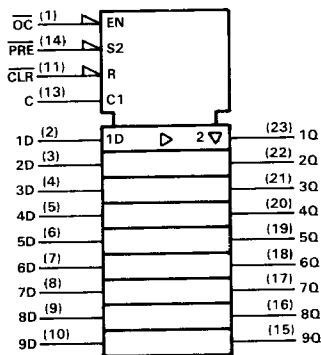
In some applications it may be advantageous to redesignate the inputs and outputs \bar{D} and \bar{Q} for the noninverting circuits or D and \bar{Q} for the inverting circuits. In that case signal names should change as shown below. Also shown are corresponding changes in the logic symbols.

Notice that Q becoming \bar{Q} causes $\overline{\text{PRE}}$ and $\overline{\text{CLR}}$ to exchange their names and their S and R function labels. The presence or absence of polarity indicators (∇) changes at the data inputs and outputs, but not at PRE, CLR, and OC since these inputs are still active-low.

2

LSI Devices

'ALS843, 'AS843



'ALS844, 'AS844

