SN54ALS873B, SN54AS873A, SN74ALS873B, SN74AS873A
DUAL 4-BIT D-TYPE LATCHES
WITH 3-STATE OUTPUTS

SDAS036D – APRIL 1982 – REVISED AUGUST 1995

- **3-State Buffer-Type Outputs Drive Bus Lines Directly**
- **Bus-Structured Pinout**
- **Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Plastic (NT) and Ceramic (JT) DIPs**
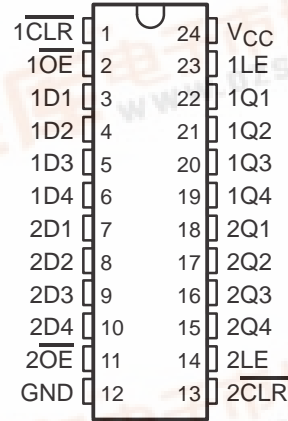
description

These dual 4-bit D-type latches feature 3-state outputs designed specifically for bus driving. These devices are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.
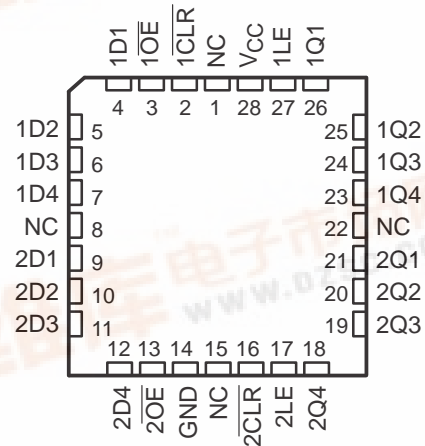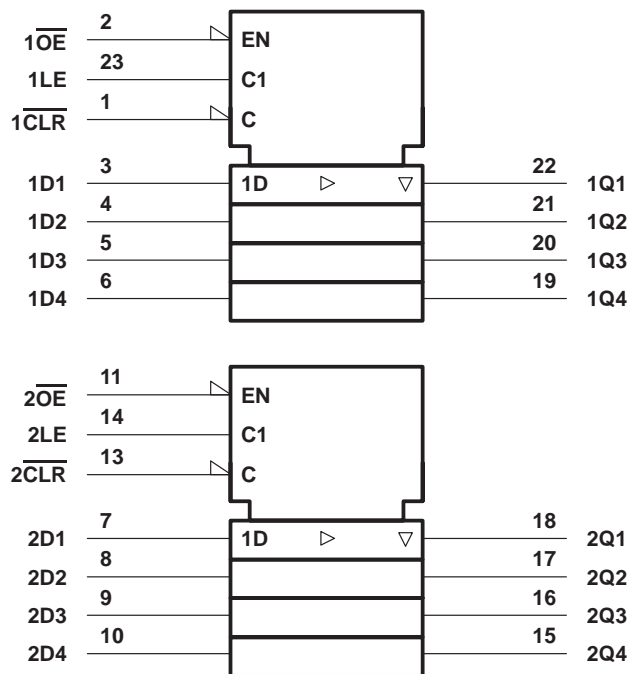
The dual 4-bit latches are transparent D-type latches. While the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs in true form, according to the function table. When LE is low, the outputs are latched. When the clear ($\overline{\text{CLR}}$) input goes low, the Q outputs go low independently of LE. The outputs are in the high-impedance state when the output-enable ($\overline{\text{OE}}$) input is at a high logic level.

The SN54ALS873B and SN54AS873A are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS873B and SN74AS873A are characterized for operation from 0°C to 70°C.

**SN54ALS873B, SN54AS873A . . . JT PACKAGE
SN74ALS873B, SN74AS873A . . . DW OR NT PACKAGE
(TOP VIEW)**

1$\overline{\text{CLR}}$	1	24 V$_{CC}$
1$\overline{\text{OE}}$	2	23 1LE
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 2LE
GND	12	13 2$\overline{\text{CLR}}$

**SN54ALS873B, SN54AS873A . . . FK PACKAGE
(TOP VIEW)**

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

Left	Pin		Pin	Right
1D2	5		25	1Q2
1D3	6		24	1Q3
1D4	7		23	1Q4
NC	8		22	NC
2D1	9		21	2Q1
2D2	10		20	2Q2
2D3	11		19	2Q3

Bottom pins (12 13 14 15 16 17 18): 2D4, 2$\overline{\text{OE}}$, GND, NC, 2$\overline{\text{CLR}}$, 2LE, 2Q4

NC – No internal connection

FUNCTION TABLE
(each latch)

INPUTS				OUTPUT
$\overline{\text{OE}}$	$\overline{\text{CLR}}$	LE	D	Q
L	L	X	X	L
L	H	H	H	H
L	H	H	L	L
L	H	L	X	Q$_0$
H	X	X	X	Z

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logic symbol†

logic diagram (each quad latch, positive logic)
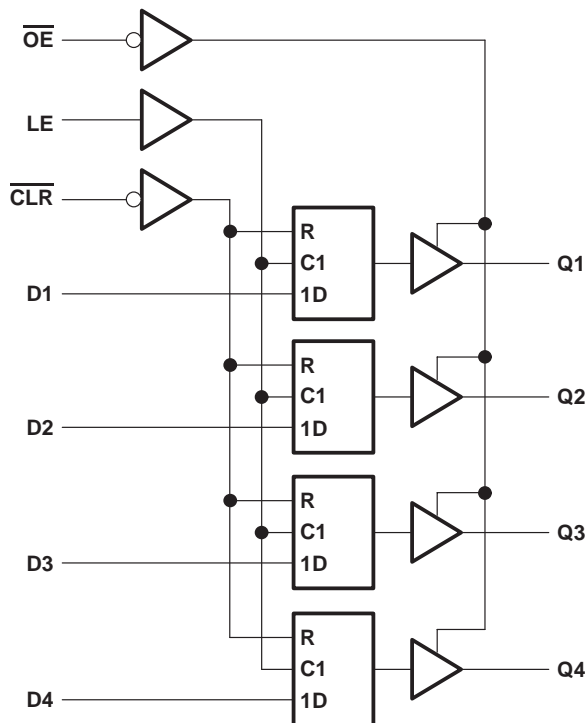
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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: SN54ALS873B .... −55°C to 125°C
                                        SN74ALS873B .... 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

		SN54ALS873B			SN74ALS873B			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		SN54ALS873B			SN74ALS873B			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}	V_{CC} = 5.5 V	Outputs high		11	21		11	21	mA
		Outputs low		16	29		16	29	
		Outputs disabled		20	31		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}.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

			SN54ALS873B		SN74ALS873B		UNIT
			MIN	MAX	MIN	MAX	
t_w	Pulse duration	$\overline{CLR}$ low	15		15		ns
		LE high	10		10		
t_{su}	Setup time, data before LE↓		10		10		ns
t_h	Hold time, data after LE↓		7		7		ns

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
			SN54ALS873B		SN74ALS873B		
			MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	2	23	2	14	ns
t_{PHL}			2	17	2	14	
t_{PLH}	LE	Q	8	31	8	22	ns
t_{PHL}			8	26	8	21	
t_{PHL}	$\overline{CLR}$	Q	6	27	6	20	ns
t_{PZH}	$\overline{OE}$	Q	4	24	4	18	ns
t_{PZL}			4	23	4	18	
t_{PHZ}	$\overline{OE}$	Q	2	12	2	10	ns
t_{PLZ}			2	30	2	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 . . . . 7 V
Voltage applied to a disabled 3-state output . . . . 5.5 V
Operating free-air temperature range, T_A: SN54AS873A . . . . −55°C to 125°C
SN74AS873A . . . . 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

		SN54AS873A			SN74AS873A			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			−12			−15	mA
I_{OL}	Low-level output current			32			48	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		SN54AS873A			SN74AS873A			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} = −2 mA	V_{CC}− 2			V_{CC}− 2			V
	V_{CC} = 4.5 V	I_{OH} = −12 mA	2.4	3.2					
		I_{OH} = −15 mA				2.4	3.3		
V_{OL}	V_{CC} = 4.5 V	I_{OL} = 32 mA		0.25	0.5				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}	V_{CC} = 5.5 V	Outputs high		68	110		68	110	mA
		Outputs low		67	109		67	109	
		Outputs disabled		80	129		80	129	

† 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}.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

			SN54AS873A		SN74AS873A		UNIT
			MIN	MAX	MIN	MAX	
t_w*	Pulse duration	$\overline{CLR}$ low	5		5		ns
		LE high	6		5		
t_{su}*	Setup time, data before LE↓		2		2		ns
t_h*	Hold time, data after LE↓		4.5		4.5		ns

* On products compliant to MIL-STD-883, Class B, this parameter is based on characterization data but is not production tested.

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
			SN54AS873A		SN74AS873A		
			MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	3	12.5	3	9.5	ns
t_{PHL}			3	8.5	3	7.5	
t_{PLH}	LE	Q	6	15.5	6	13	ns
t_{PHL}			4	9	4	7.5	
t_{PHL}	$\overline{CLR}$	Q	3	10.5	3	9	ns
t_{PZH}	$\overline{OE}$	Q	2	8	2	6.5	ns
t_{PZL}			4	11	4	10.5	
t_{PHZ}	$\overline{OE}$	Q	2	8	2	7.5	ns
t_{PLZ}			2	8.5	2	7.5	

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

PARAMETER MEASUREMENT INFORMATION

SWITCH POSITION TABLE

TEST	S1
t_{PLH}	Open
t_{PHL}	Open
t_{PZH}	Open
t_{PZL}	Closed
t_{PHZ}	Open
t_{PLZ}	Closed

LOAD CIRCUIT FOR 3-STATE OUTPUTS
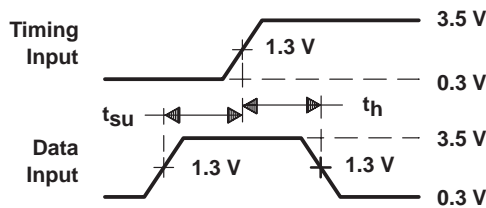
**VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES**

**VOLTAGE WAVEFORMS
PULSE DURATION**
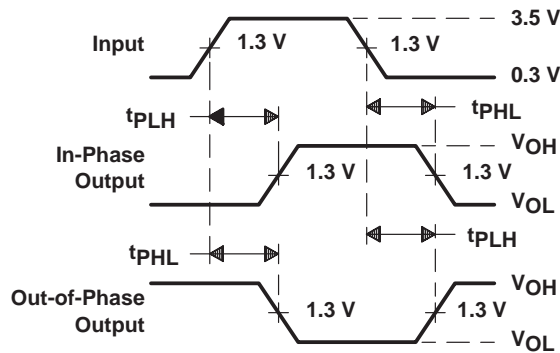
**VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES**
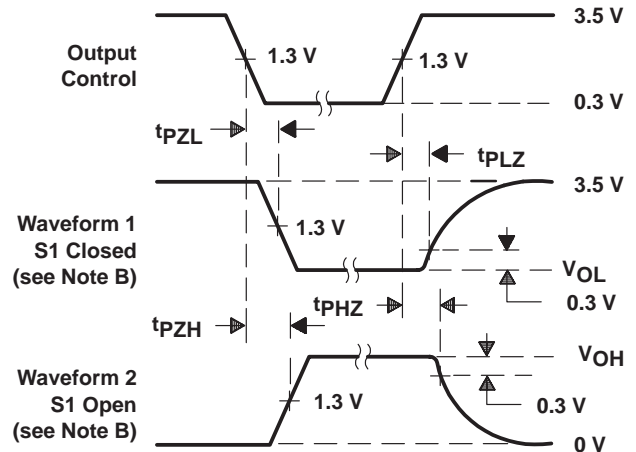
**VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS**

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. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 2 ns, t_f ≤ 2 ns.
   D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
84032013A	ACTIVE	LCCC	FK	28	1	None	Call TI	Level-NC-NC-NC
8403201KA	OBSOLETE	CFP	W	24		None	Call TI	Call TI
8403201LA	ACTIVE	CDIP	JT	24	1	None	Call TI	Level-NC-NC-NC
SN54ALS873BJT	ACTIVE	CDIP	JT	24	1	None	Call TI	Level-NC-NC-NC
SN74ALS873BDW	ACTIVE	SOIC	DW	24	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS873BDWR	ACTIVE	SOIC	DW	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS873BNT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74ALS873BNT3	OBSOLETE	PDIP	NT	24		None	Call TI	Call TI
SN74AS873ADW	OBSOLETE	SOIC	DW	24		None	Call TI	Call TI
SN74AS873ADWR	OBSOLETE	SOIC	DW	24		None	Call TI	Call TI
SN74AS873ANT	OBSOLETE	PDIP	NT	24		None	Call TI	Call TI
SNJ54ALS873BFK	ACTIVE	LCCC	FK	28	1	None	Call TI	Level-NC-NC-NC
SNJ54ALS873BJT	ACTIVE	CDIP	JT	24	1	None	Call TI	Level-NC-NC-NC
SNJ54AS873AFK	OBSOLETE	LCCC	FK	28		None	Call TI	Call TI
SNJ54AS873AJT	OBSOLETE	CDIP	JT	24		None	Call TI	Call TI
SNJ54AS873AW	OBSOLETE	CFP	W	24		None	Call TI	Call TI

[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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