D2661, DECEMBER 1982 – REVISED MAY 1986

- **3-State Buffer-Type Outputs Drive Bus-Lines Directly**
- **Bus-Structured Pinout**
- **'ALS873B is Alternative Version with Noninverting Outputs**
- **Package Options Include Plastic "Small Outline" Packages, Both Plastic and Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

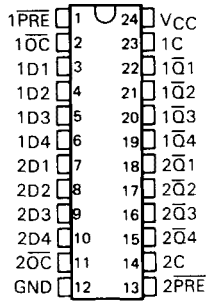
description

These dual 4-bit registers feature three-state outputs designed specifically for bus driving. This makes these devices particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

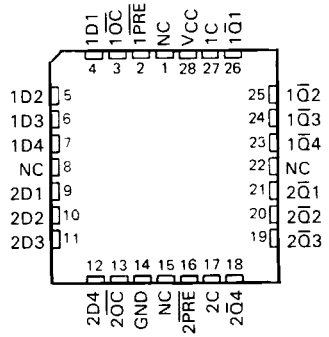
The dual 4-bit latches are transparent D-type. When the latch enable input (1C or 2C) is high, the $\overline{Q}$ outputs will follow the data (D) inputs in inverted form, according to the function table. When the latch enable input is taken low, the outputs will be latched. When $\overline{PRE}$ goes low, the $\overline{Q}$ outputs go low independently of the clock. The outputs are in a high-impedance state when $\overline{OC}$ (output control) is at a high logic level.

The SN54ALS880A and SN54AS880 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS880A and SN74AS880 are characterized for operation from 0°C to 70°C.

SN54ALS880A, SN54AS880 . . . JT PACKAGE
SN74ALS880A, SN74AS880 . . . DW OR NT PACKAGE
(TOP VIEW)



SN54ALS880A, SN54AS880 . . . FK PACKAGE
SN74ALS880A, SN74AS880 . . . FN PACKAGE
(TOP VIEW)

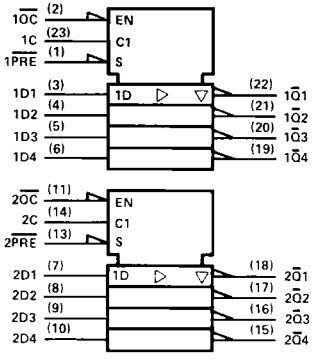


NC – No internal connection

FUNCTION TABLES (EACH LATCH)

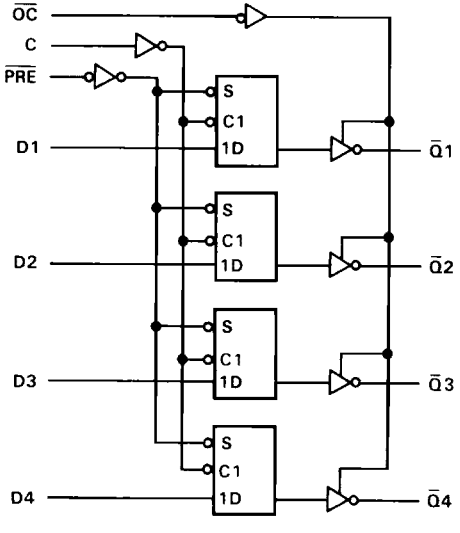
INPUTS				OUTPUT
$\overline{OC}$	$\overline{PRE}$	ENABLE C	D	$\overline{Q}$
L	L	X	X	L
L	H	H	H	L
L	H	H	L	H
L	H	L	X	$\overline{Q}_0$
H	X	X	X	Z

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.

logic diagram (each quad latch, positive logic)



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: SN54ALS880A, SN54AS880 . . . . . −55°C to 125°C
SN74ALS880A, SN74AS880 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

			SN54ALS880A			SN74ALS880A			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_w	Pulse duration	$\overline{PRE}$ low	15			15			ns
		Enable C high	15			15			
t_{su}	Setup time, data before enable C↓		10			10			ns
t_h	Hold time, data after enable C↓		10			10			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		SN54ALS880A			SN74ALS880A			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_{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	−30		−112	−30		−112	mA
I_{CC}	V_{CC} = 5.5 V	Outputs high		14	21		14	21	mA
		Outputs low		19	29		19	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}.

recommended operating conditions

			SN54ALS880A			SN74ALS880A			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_w	Pulse duration	$\overline{PRE}$ low	15			15			ns
		Enable C high	15			15			
t_{su}	Setup time, data before enable C↓		10			10			ns
t_h	Hold time, data after enable C↓		10			10			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		SN54ALS880A			SN74ALS880A			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_{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	−30		−112	−30		−112	mA
I_{CC}	V_{CC} = 5.5 V	Outputs high		14	21		14	21	mA
		Outputs low		19	29		19	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}.

recommended operating conditions

			SN54AS880			SN74AS880			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_w	Pulse duration	$\overline{PRE}$ low	4.5			3.5			ns
		Enable C high	4			2.5			
t_{su}	Setup time, data before enable C↓		2			2			ns
t_h	Hold time, data after enable C↓		1			1			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		SN54AS880			SN74AS880			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					
	V_{CC} = 4.5 V,	I_{OH} = −15 mA				2.4	3.3		
V_{OL}	V_{CC} = 4.5 V,	I_{OL} = 32 mA		0.30	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}	V_{CC} = 5.5 V	Outputs high		73	118		73	118	mA
		Outputs low		76	122		76	122	
		Outputs disabled		86	137		86	137	

† 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 Note 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
			SN54AS880		SN74AS880		
			MIN	MAX	MIN	MAX	
t_{PLH}	D	$\overline{Q}$	4	11	4	9.5	ns
t_{PHL}			4	9	4	8.5	
t_{PLH}	C	$\overline{Q}$	6	14	6	11.5	ns
t_{PHL}			4	10	4	8	
t_{PHL}	$\overline{PRE}$	$\overline{Q}$	4	11.5	4	10	ns
t_{PZH}	$\overline{OC}$	$\overline{Q}$	2	8	2	7.5	ns
t_{PZL}			4	11	4	10	
t_{PHZ}	$\overline{OC}$	$\overline{Q}$	2	8	2	6.5	ns
t_{PLZ}			2	9	2	8	

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