OCTAL D-TYPE TRANSPARENT LATCHES WITH 3-STATE OUTPUTS

D2661, DECEMBER 1982 - REVISED SEPTEMBER 1989

- **3-State Buffer-Type Outputs Drive Bus-Lines Directly**
- **Bus-Structured Pinout**
- **Choice of True or Inverting Logic**

  'ALS573, 'AS573A True Outputs
  'ALS580, 'AS580 Inverting Outputs
- **Package Options Include Ceramic Chip Carriers in Addition to Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

description

These 8-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.

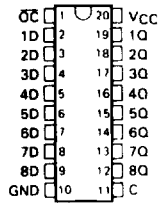
The eight latches are transparent D-type latches. While the enable (C) is high the outputs (Q or Q) will respond to the data (D) inputs. When the enable is taken low the outputs will be latched to retain the data that was set up.

A buffered output-control input can be used to place the eight outputs in either a normal logic state (high or low logic 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.

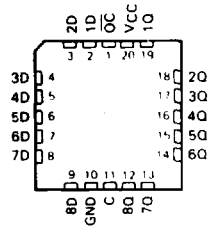
The output control (OC) does not affect the internal operation of the latches. Old data can be retained or new data can be entered while the outputs are at high impedance.

The SN54ALS' and SN54AS' devices are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS' and SN74AS' devices are characterized for operation from 0°C to 70°C.

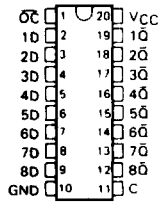
SN54ALS573B, SN54AS573A . . . J PACKAGE
SN74ALS573C, SN74AS573 . . . DW OR N PACKAGE
(TOP VIEW)



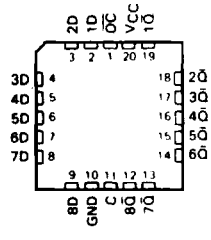
SN54ALS573B, SN54AS573A . . . FK PACKAGE
(TOP VIEW)



SN54ALS580A . . . J PACKAGE
SN74ALS580B, SN74AS580 . . . DW OR N PACKAGE
(TOP VIEW)



SN54ALS580A . . . FK PACKAGE
(TOP VIEW)



TEXAS INSTRUMENTS

FUNCTION TABLES

'ALS573, 'AS573A
(EACH LATCH)

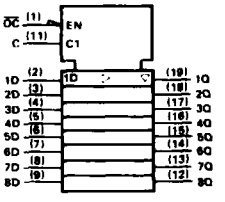
INPUTS			OUTPUT
ENABLE			
$\overline{OC}$	C	D	Q
L	H	H	H
L	H	L	L
L	L	X	Q_0
H	X	X	Z

'ALS580, 'AS580
(EACH LATCH)

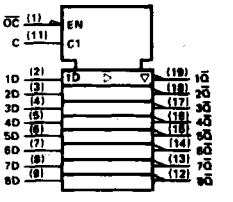
INPUTS			OUTPUT
ENABLE			
$\overline{OC}$	C	D	$\overline{Q}$
L	H	H	L
L	H	L	H
L	L	X	$\overline{Q}_0$
H	X	X	Z

logic symbols†

'ALS573, 'AS573A



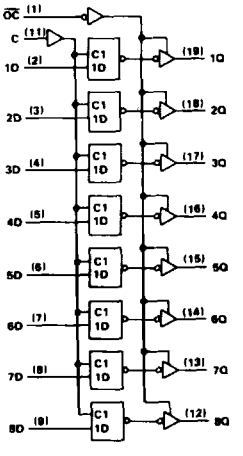
'ALS580, 'AS580



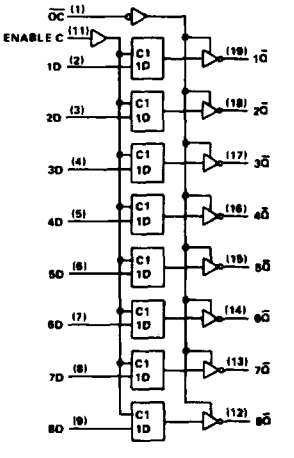
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)

'ALS573, 'AS573A



'ALS580, 'AS580



Pin numbers shown are for DW, J, and N packages.

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; SN54ALS573B, SN54ALS580A . . . . . −55°C to 125°C
SN74ALS573C, SN74ALS580B . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

			SN54ALS573B SN54ALS580A			SN74ALS573C SN74ALS580B			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, enable C high	'ALS573	10			10			ns
		'ALS580	15			15			
t_{su}	Setup time, data before enable C↓		10			10			ns
t_h	Hold time, data after enable C↓	'ALS573	7			7			ns
		'ALS580	10			10			
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		SN54ALS573B SN54ALS580A			SN74ALS573C SN74ALS580B			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			−0.1			−0.1	mA
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}	'ALS573	V_{CC} = 5.5 V	Outputs high		10	17		10	17	mA
			Outputs low		15	24		15	24	
			Outputs disabled		16	27		16	27	
	'ALS580		Outputs high		10	17		10	17	
			Outputs low		16	26		16	26	
			Outputs disabled		17	29		17	29	

† 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}

'ALS573 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
			'ALS573	SN54ALS573B		SN74ALS573C		
			TYP	MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	7	2	15	2	14	ns
t_{PHL}			7	2	15	2	14	
t_{PLH}	C	Q	12	8	25	6	20	ns
t_{PHL}			12	8	20	6	19	
t_{PZH}	$\overline{OC}$	Q	9	4	21	3	18	ns
t_{PZL}			11	4	21	4	18	
t_{PHZ}	$\overline{OC}$	Q	5	2	12	1	10	ns
t_{PLZ}			7	3	18	1	15	

'ALS580 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
			'ALS580	SN54ALS580A		SN74ALS580B		
			TYP	MIN	MAX	MIN	MAX	
t_{PLH}	D	$\overline{Q}$	10	3	21	3	18	ns
t_{PHL}			8	3	15	3	14	
t_{PLH}	C	$\overline{Q}$	8	8	29	6	22	ns
t_{PHL}			14	8	22	6	21	
t_{PZH}	$\overline{OC}$	$\overline{Q}$	8	4	21	3	18	ns
t_{PZL}			10	4	21	4	18	
t_{PHZ}	$\overline{OC}$	$\overline{Q}$	5	2	12	1	10	ns
t_{PLZ}			7	3	18	1	15	

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

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: SN54AS573A . . . . . −55°C to 125°C
SN74AS573A, SN74AS580 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

			SN54AS573A			SN74AS573A SN74AS580			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, enable C high	'AS573A	5.5			4.5			ns
		'AS580				2			
t_{su}	Setup time, data before enable C↓		2			2			ns
t_h	Hold time, data after enable C↓		3			3			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		SN54AS573A			SN74AS573A SN74AS580			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} = −2.6 mA				2.4	3.3		
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 32 mA		0.28	0.5				V
		V_{CC} = 4.5 V,	I_{OL} = 48 mA					0.33	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}	'AS573A	V_{CC} = 5.5 V	Outputs high		56	93		56	93	mA
			Outputs low		55	90		55	90	
			Outputs disabled		65	106		65	106	
	'AS580		Outputs high					62	100	
			Outputs low					65	106	
			Outputs disabled					71	115	

†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}.

'AS573A 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
			SN54AS573A		SN74AS573A		
			MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	3	11	3	8	ns
t_{PHL}			3	8	3	7	
t_{PLH}	C	Q	6	16.5	6	13	ns
t_{PHL}			4	9	4	7.5	
t_{PZH}	$\overline{OC}$	Q	2	8	2	6.5	ns
t_{PZL}			4	11	4	9.5	
t_{PHZ}	$\overline{OC}$	Q	2	8	2	6.5	ns
t_{PLZ}			2	8	2	7	

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

'AS580 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
			SN74AS580		
			MIN	MAX	
t_{PLH}	D	$\overline{Q}$	3	7.5	ns
t_{PHL}			3	7	
t_{PLH}	C	$\overline{Q}$	5	9	ns
t_{PHL}			4	8	
t_{PZH}	$\overline{OC}$	$\overline{Q}$	2	6.5	ns
t_{PZL}			4	9.5	
t_{PHZ}	$\overline{OC}$	$\overline{Q}$	2	6.5	ns
t_{PLZ}			2	7	

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