

SN54ABT573, SN74ABT573A OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCBS190C – JANUARY 1991 – REVISED JANUARY 1997

- State-of-the-Art **EPIC-II^B**™ BiCMOS Design Significantly Reduces Power Dissipation
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- High-Drive Outputs (–32-mA I_{OH} , 64-mA I_{OL})
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Plastic (N) and Ceramic (J) DIPs, and Ceramic Flat (W) Packages

description

These 8-bit latches feature 3-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 of the SN54ABT573 and SN74ABT573A are transparent D-type latches. While the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs. When LE is taken low, the Q outputs are latched at the logic levels set up at the D inputs.

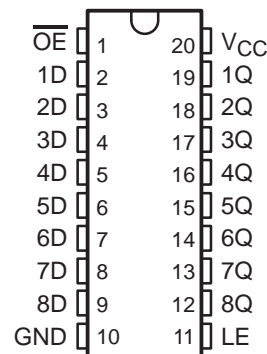
A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased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

\overline{OE} does not affect the internal operations of the latches. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

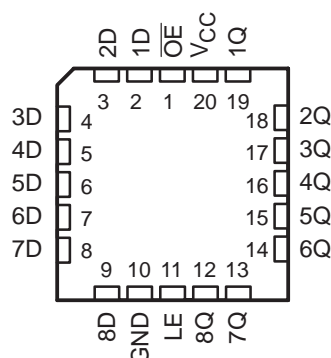
To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT573 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT573A is characterized for operation from -40°C to 85°C .

SN54ABT573 . . . J OR W PACKAGE
SN74ABT573A . . . DB, DW, N, OR PW PACKAGE
(TOP VIEW)



SN54ABT573 . . . FK PACKAGE
(TOP VIEW)



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PRODUCTION DATA information is 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.

**TEXAS
INSTRUMENTS**

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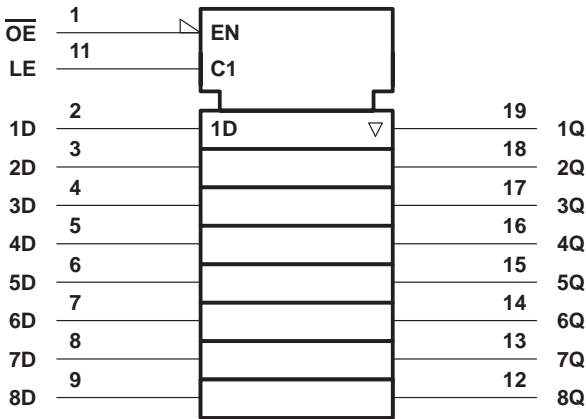
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FUNCTION TABLE
(each latch)

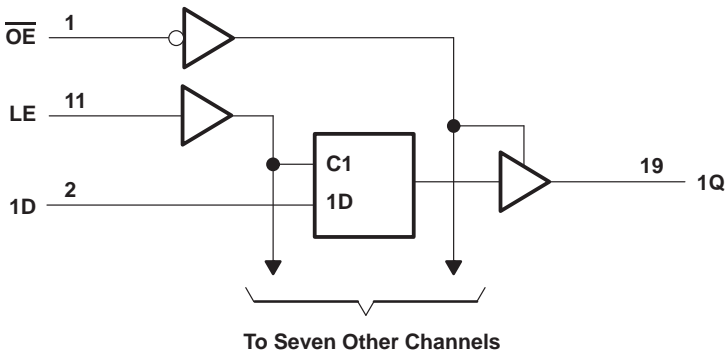
INPUTS			OUTPUT Q
$\overline{\text{OE}}$	LE	D	
L	H	H	H
L	H	L	L
L	L	X	Q_0
H	X	X	Z

logic symbol†



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

logic diagram (positive logic)



SN54ABT573, SN74ABT573A

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WITH 3-STATE OUTPUTS

SCBS190C – JANUARY 1991 – REVISED JANUARY 1997

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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high or power-off state, V_O	–0.5 V to 5.5 V
Current into any output in the low state, I_O : SN54ABT573	96 mA
SN74ABT573A	128 mA
Input clamp current, I_{IK} ($V_I < 0$)	–18 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Package thermal impedance, θ_{JA} (see Note 2): DB package	115°C/W
DW package	97°C/W
N package	67°C/W
PW package	128°C/W
Storage temperature range, T_{stg}	–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.

- NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions (see Note 3)

		SN54ABT573		SN74ABT573A		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	V
V_{IH}	High-level input voltage	2		2		V
V_{IL}	Low-level input voltage		0.8		0.8	V
V_I	Input voltage	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current		–24		–32	mA
I_{OL}	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		5	5	ns/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

SN54ABT573, SN74ABT573A

OCTAL TRANSPARENT D-TYPE LATCHES

WITH 3-STATE OUTPUTS

SCBS190C – JANUARY 1991 – REVISED JANUARY 1997

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

PARAMETER	TEST CONDITIONS	T _A = 25°C			SN54ABT573		SN74ABT573A		UNIT
		MIN	TYP†	MAX	MIN	MAX	MIN	MAX	
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA			-1.2		-1.2		-1.2	V
V _{OH}	V _{CC} = 4.5 V, I _{OH} = -3 mA	2.5			2.5		2.5		V
	V _{CC} = 5 V, I _{OH} = -3 mA	3			3		3		
	V _{CC} = 4.5 V	I _{OH} = -24 mA	2		2				
		I _{OH} = -32 mA	2*				2		
V _{OL}	V _{CC} = 4.5 V	I _{OL} = 48 mA		0.55	0.55				V
		I _{OL} = 64 mA		0.55*			0.55		
V _{hys}			100						mV
I _I	V _{CC} = 5.5 V, V _I = V _{CC} or GND			±1		±1		±1	μA
I _{OZH}	V _{CC} = 5.5 V, V _O = 2.7 V			10‡		10‡		10‡	μA
I _{OZL}	V _{CC} = 5.5 V, V _O = 0.5 V			-10‡		-10‡		-10‡	μA
I _{off}	V _{CC} = 0, V _I or V _O ≤ 4.5 V			±100				±100	μA
I _{CEX}	V _{CC} = 5.5 V, V _O = 5.5 V			50		50		50	μA
I _{O§}	V _{CC} = 5.5 V, V _O = 2.5 V	-50	-100	-180	-50	-180	-50	-180	mA
I _{CC}	V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND	Outputs high		1 250	250		250		μA
		Outputs low		24 30	30		30		mA
		Outputs disabled		0.5 250	250		250		μA
ΔI _{CC¶}	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND			1.5		1.5		1.5	mA
C _i	V _I = 2.5 V or 0.5 V			3.5					pF
C _o	V _O = 2.5 V or 0.5 V			6.5					pF

* On products compliant to MIL-PRF-38535, this parameter does not apply.

† All typical values are at V_{CC} = 5 V.

‡ This data sheet limit may vary among suppliers.

§ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

¶ This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

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

			SN54ABT573		UNIT		
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX
			MIN	MAX			
t _w	Pulse duration, LE high		3.3	3.3	ns		
t _{su}	Setup time, data before LE↓	High	1.9	2.5	ns		
		Low	1.5	2.5			
t _h	Hold time, data after LE↓		1	2.5	ns		



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SN54ABT573, SN74ABT573A

OCTAL TRANSPARENT D-TYPE LATCHES

WITH 3-STATE OUTPUTS

SCBS190C – JANUARY 1991 – REVISED JANUARY 1997

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

			SN74ABT573A		UNIT		
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX
			MIN	MAX			
t _w	Pulse duration, LE high		3.3	3.3	ns		
t _{su}	Setup time, data before LE↓	High	1.9	1.9	ns		
		Low	1.5	1.5			
t _h	Hold time, data after LE↓		1.8†	1.8†	ns		

† This data sheet limit may vary among suppliers.

switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50\text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54ABT573				UNIT	
			V _{CC} = 5 V, T _A = 25°C			MIN		MAX
			MIN	TYP	MAX			
t _{PLH}	D	Q	1.9	3.2	5.4	1.4	6.4	ns
t _{PHL}			2.2	4.2	5.7	1.6	6.7	
t _{PLH}	LE	Q	2.2	4	6.1	2	7.1	ns
t _{PHL}			3.2	5.2	6.7	2.8	7.5	
t _{PZH}	\overline{OE}	Q	1.2	3.2	4.7	0.8	6.2	ns
t _{PZL}			2.7	4.7	6.2	2	7.2	
t _{PHZ}	\overline{OE}	Q	2.5	4.9	6.4	2.2	7.7	ns
t _{PLZ}			2	4.2	6	1.4	7	

switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50\text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT573A					UNIT
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX	
			MIN	TYP	MAX			
t _{PLH}	D	Q	1.9	3.2	5.4	1.9	5.9	ns
t _{PHL}			2.2	4.2	5.7	2.2	6.2	
t _{PLH}	LE	Q	2.2	4	6.1	2.2	6.6	ns
t _{PHL}			3.2	5.2	6.7	3.2	7.2	
t _{PZH}	\overline{OE}	Q	1.2	3.2	4.7	1.2	5.2	ns
t _{PZL}			2.5†	4.7	6.2	2.5†	6.7	
t _{PHZ}	\overline{OE}	Q	2.5	4.9	6.4	2.5	7.1†	ns
t _{PLZ}			2	4.2	6	2	6.5	

† This data sheet limit may vary among suppliers.

SN54ABT573, SN74ABT573A

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WITH 3-STATE OUTPUTS

SCBS190C – JANUARY 1991 – REVISED JANUARY 1997

PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



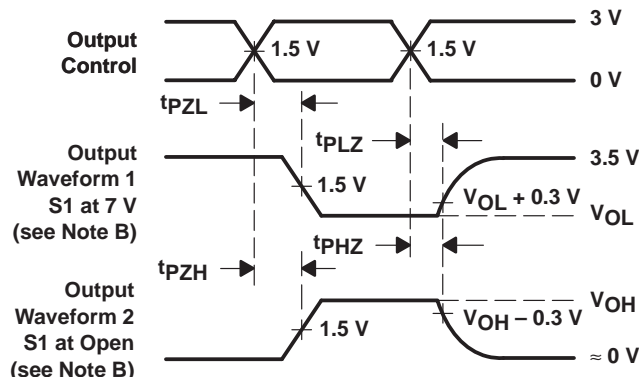
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- 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: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
- 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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