

TYPES SN54ALS576, SN54ALS577, SN54AS576, SN54AS577 SN74ALS576, SN74ALS577, SN74AS576, SN74AS577 OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

D2661, DECEMBER 1982 - REVISED DECEMBER 1983

- 3-State Buffer-Type Inverting Outputs Drive Bus-Lines Directly
- Bus-Structured Pinout
- Buffered Control Inputs
- 'ALS577 and 'AS577 Have Synchronous Clear
- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

These 8-bit registers feature three-state outputs designed specifically for bus driving. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight-bit edge-triggered D-type flip-flops enter data on the low-to-high transition of the clock.

The output control 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 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 .

FUNCTION TABLES

ALS576, AS576
(Each Flip-Flop)

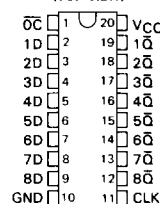
INPUTS			OUTPUT
$\overline{\text{OC}}$	CLK	D	$\overline{\text{Q}}$
L	↑	H	L
L	↑	L	H
L	L	X	$\overline{\text{Q}}_0$
H	X	X	Z

ALS577, AS577
(Each Flip-Flop)

INPUTS				OUTPUT
$\overline{\text{OC}}$	CLR	CLK	D	$\overline{\text{Q}}$
L	L	↑	X	H
L	H	↑	H	L
L	H	↑	L	H
L	H	L	X	$\overline{\text{Q}}_0$
H	X	X	X	Z

SN54ALS576, SN54AS576 . . . J PACKAGE
SN74ALS576, SN74AS576 . . . N PACKAGE

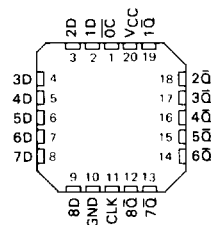
(TOP VIEW)



SN54ALS576, SN54AS576 . . . FH PACKAGE

SN74ALS576, SN74AS576 . . . FN PACKAGE

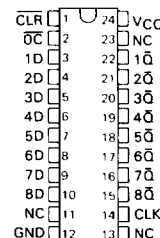
(TOP VIEW)



SN54ALS577, SN54AS577 . . . JT PACKAGE

SN74ALS577, SN74AS577 . . . NT PACKAGE

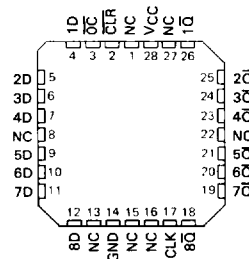
(TOP VIEW)



SN54ALS577, SN54AS577 . . . FH PACKAGE

SN74ALS577, SN74AS577 . . . FN PACKAGE

(TOP VIEW)



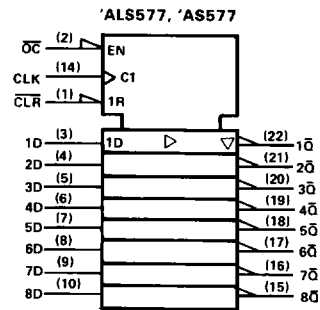
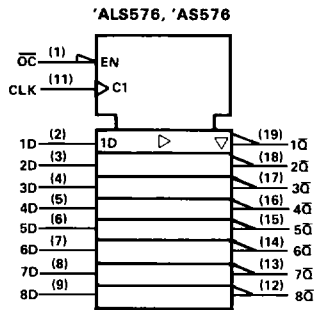
NC — No internal connection

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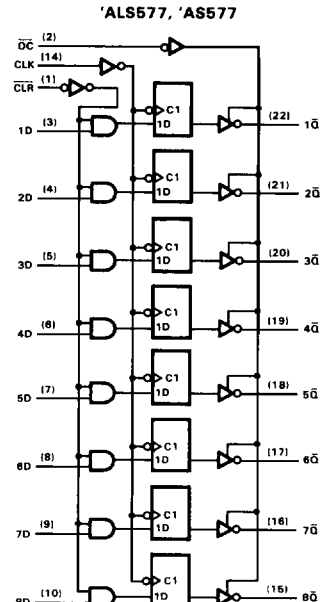
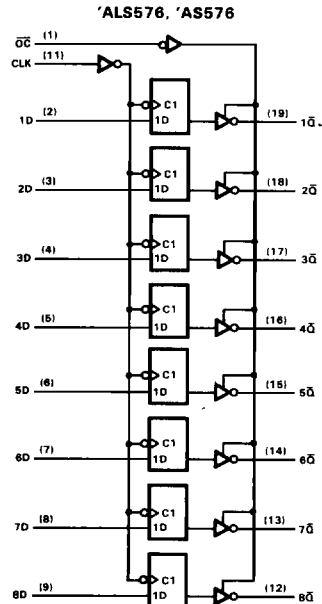
ALS AND AS CIRCUITS

**TYPES SN54ALS576, SN54ALS577, SN54AS576, SN54AS577
SN74ALS576, SN74ALS577, SN74AS576, SN74AS577
OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS**

logic symbols



logic diagrams (positive logic)



Pin numbers shown are for J and N packages.

Pin numbers shown are for JT and NT 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: SN54ALS', SN54AS'	-55 °C to 125 °C
SN74ALS', SN74AS'	0 °C to 70 °C
Storage temperature range	-65 °C to 150 °C

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ALS AND AS CIRCUITS

TYPES SN54ALS576, SN54ALS577, SN74ALS576, SN74ALS577 OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

recommended operating conditions

		SN54ALS576 SN54ALS577			SN74ALS576 SN74ALS577			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
f _{clock}	Clock frequency	'ALS576	0	25	0	30		MHz
		'ALS577	0	25	0	30		
t _w	Pulse duration	CLK high or low 'ALS576	20		16.5			ns
		CLK high or low 'ALS577	20		16.5			
t _{su}	Setup time before CLK †	Data	15		15			ns
		CLR ('ALS577)	15		15			
t _h	Hold time after CLK †	Data	4		0			ns
		CLR ('ALS577)	4		0			
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	SN54ALS576 SN54ALS577			SN74ALS576 SN74ALS577			UNIT
		MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA	-1.5			-1.5			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				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	-15	-70		-15	-70		mA
I _{CC}	V _{CC} = 5.5 V	Outputs high		10	17		mA	
		Outputs low		15	24			
		Outputs disabled		16	27			

[†]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}.

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ALS AND AS CIRCUITS

TYPES SN54ALS576, SN54ALS577, SN74ALS576, SN74ALS577
OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

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
			SN54ALS576 SN54ALS577		SN74ALS576 SN74ALS577		
			MIN	MAX	MIN	MAX	
f_{max}		'ALS576	25		30	MHz	
		'ALS577	25		30		
t_{PLH}	CLK	Any \bar{Q}	4	15	4	14	ns
t_{PHL}			4	15	4	14	
t_{PZH}	\bar{OC}	Any \bar{Q}	4	21	4	18	ns
t_{PZL}			4	21	4	18	
t_{PHZ}	\bar{OC}	Any \bar{Q} ALS576	2	10	2	8	ns
		Any \bar{Q} ALS577	2	12	2	10	
t_{PLZ}		Any \bar{Q}	3	15	3	13	

NOTE 1: For load circuit and voltage waveforms, see page 1-12.

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ALS AND AS CIRCUITS

TYPES SN54AS576, SN54AS577, SN74AS576, SN74AS577
OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

recommended operating conditions

		SN54AS576			SN74AS576			UNIT		
		SN54AS577			SN74AS577					
		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		
f _{clock}	Clock frequency	0		100	0		125	MHz		
t _w	Pulse duration	CLK high		5			4	ns		
		CLK low		3			2			
t _{su}	Setup time before CLK↑	Data		3			2	ns		
		CLR ('AS577)		6.5			5.5			
t _h	Hold time after CLK↑	Data		3			2	ns		
		CLR ('AS577)		0			0			
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	SN54AS576			SN74AS576			UNIT
		SN54AS577			SN74AS577			
		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		0.29	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}	D			-3			-2	mA
	All other			-0.5			-0.5	
I _{O[‡]}	V _{CC} = 5.5 V, V _O = 2.25 V	-30		-112	-30		-112	mA
I _{CC}	'AS576	V _{CC} = 5.5 V	Outputs high	77	125	77	125	mA
			Outputs low	84	135	84	135	
			Outputs disabled	84	135	84	135	
			Outputs high	78	126	78	126	
			Outputs low	76	123	76	123	
			Outputs disabled	88	142	88	142	
I _{CC}	'AS577	V _{CC} = 5.5 V	Outputs high	77	125	77	125	mA
			Outputs low	84	135	84	135	
			Outputs disabled	84	135	84	135	
			Outputs high	78	126	78	126	
			Outputs low	76	123	76	123	
			Outputs disabled	88	142	88	142	

[†]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}.

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ALS AND AS CIRCUITS

TYPES SN54AS576, SN54AS577, SN74AS576, SN74AS577
OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

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
			SN54AS576 SN54AS577		SN74AS576 SN74AS577		
			MIN	MAX	MIN	MAX	
f_{max}			100	125			MHz
t_{PLH}	CLK	Any \bar{Q}	3	11	3	8	ns
t_{PHL}			4	11	4	9	
t_{PZH}	\bar{OC}	Any \bar{Q}	2	7	2	6	ns
t_{PZL}			3	11	3	10	
t_{PHZ}	\bar{OC}	Any \bar{Q}	2	7	2	6	ns
t_{PLZ}			2	7	2	6	

NOTE 1: For load circuit and voltage waveforms, see page 1-12.

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ALS AND AS CIRCUITS