OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

D2661, JUNE 1982 – REVISED MAY 1986

- **3-State Buffer-Type Noninverting Outputs Drive Bus-Lines Directly**
- **Bus-Structured Pinout**
- **Buffered Control Inputs**
- **'ALS575A and 'AS575 Have Synchronous Clear**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil 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 edge-triggered D-type flip-flops enter data on the low-to-high transition of the clock. The 'ALS575A and 'AS575 may be synchronously cleared by taking the $\overline{CLR}$ input low.

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 in the high-impedance state.

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

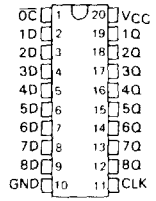
'ALS574A, 'AS574
(EACH FLIP-FLOP)

INPUTS			OUTPUT
$\overline{OC}$	CLK	D	Q
L	↑	H	H
L	↑	L	L
L	L	X	Q_0
H	X	X	Z

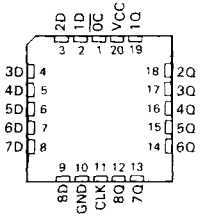
'ALS575A, 'AS575
(EACH FLIP-FLOP)

INPUTS				OUTPUT
$\overline{OC}$	$\overline{CLR}$	CLK	D	Q
L	L	↑	X	L
L	H	↑	H	H
L	H	↑	L	L
L	H	L	X	Q_0
H	X	X	X	Z

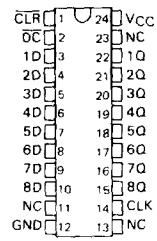
SN54ALS574A, SN54AS574 . . . J PACKAGE
SN74ALS574A, SN74AS574 . . . DW OR N PACKAGE
(TOP VIEW)



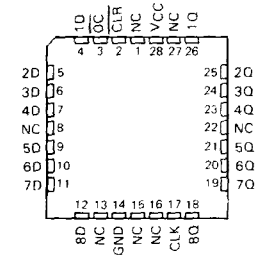
SN54ALS574A, SN54AS574 . . . FK PACKAGE
(TOP VIEW)



SN54ALS575A, SN54AS575 . . . JT PACKAGE
SN74ALS575A, SN74AS575 . . . DW OR NT PACKAGE
(TOP VIEW)



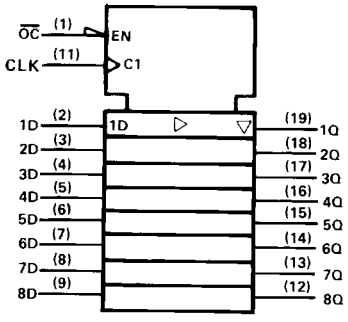
SN54ALS575A, SN54AS575 . . . FK PACKAGE
SN74ALS575A, SN74AS575 . . . FN PACKAGE
(TOP VIEW)



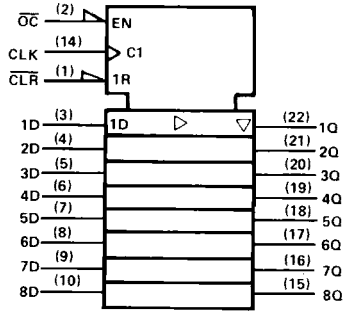
NC – No internal connection

logic symbols†

'ALS574A, 'AS574



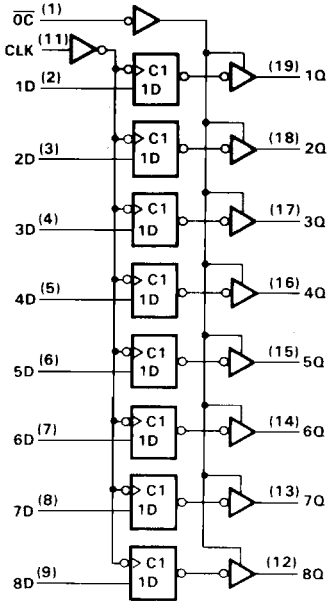
'ALS575A, 'AS575



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

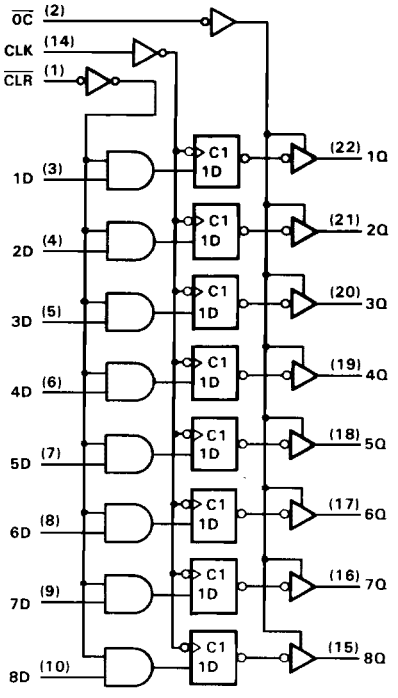
logic diagrams (positive logic)

'ALS574A, 'AS574



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

'ALS575A, 'AS575



Pin numbers shown are for DW, JT, and NT packages.

TEXAS INSTRUMENTS
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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: SN54ALS574A, SN54ALS575A . . . . . −55°C to 125°C
SN74ALS574A, SN74ALS575A . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

			SN54ALS574A SN54ALS575A			SN74ALS574A SN74ALS575A			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
f_{clock}	Clock frequency	'ALS574A	0		28	0		35	MHz
		'ALS575A	0		25	0		30	
t_w	Pulse duration	'ALS574A CLK high or low	16.5			14			ns
		'ALS575A CLK high or low	20			16.5			
t_{su}	Setup time before CLK↑	Data	15			15			ns
		'ALS575A $\overline{CLR}$	15			15			
t_h	Hold time after CLK↑	Data	4			0			ns
		'ALS575A $\overline{CLR}$	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		SN54ALS574A SN54ALS575A			SN74ALS574A SN74ALS575A			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}	'ALS574A	V_{CC} = 5.5 V	Outputs high		11	18		11	18	mA
			Outputs low		17	27		17	27	
			Outputs disabled		17	28		17	28	
	'ALS575A		Outputs high		10	17		10	17	
			Outputs low		15	24		15	24	
			Outputs disabled		16	30		16	30	

†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}.

'ALS574A 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
			'ALS574A	SN54ALS574A		SN74ALS574A		
			TYP	MIN	MAX	MIN	MAX	
f_{max}			50	28		35		MHz
t_{PLH}	CLK	Q	8	4	22	4	14	ns
t_{PHL}			8	4	17	4	14	
t_{PZH}	$\overline{OC}$	Q	9	4	21	4	18	ns
t_{PZL}			12	4	26	4	18	
t_{PHZ}	$\overline{OC}$	Q	5	2	16	2	10	ns
t_{PLZ}			5	2	25	2	12	

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

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'ALS575A 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
			'ALS575A			SN54ALS575A		SN74ALS575A		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{max}			40	50		25		30		MHz
t_{PLH}	CLK	Q		8	11	4	15	4	14	ns
t_{PHL}				9	11.5	4	15	4	14	
t_{PZH}	$\overline{OC}$	Q		11	14	4	21	4	18	ns
t_{PZL}				12	15	4	21	4	18	
t_{PHZ}	$\overline{OC}$	Q		6	8	2	12	2	10	ns
t_{PLZ}				8	11	3	15	3	13	

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: SN54AS574, SN54AS575 . . . . . −55°C to 125°C
SN74AS574, SN74AS575 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

				SN54AS574 SN54AS575			SN74AS574 SN74AS575			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
f_{clock}	Clock frequency			0		100	0		125	MHz
t_w	Pulse duration	CLK high		5			4			ns
		CLK low		4			2			
t_{su}	Setup time before CLK↑	Data		3			2			ns
		'AS575	$\overline{CLR}$ high or low	6.5			5.5			
t_h	Hold time after CLK↑	Data		3			2			ns
		'AS575	$\overline{CLR}$	0			0			
T_A	Operating free-air temperature			−55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN54AS574 SN54AS575			SN74AS574 SN74AS575			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		0.29	0.5				V
		V_{CC} = 4.5 V,	I_{OL} = 48 mA					0.34	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}	$\overline{OC}$, CLK, $\overline{CLR}$	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.5			−0.5	mA
	D					−3			−2	
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}	'AS574	V_{CC} = 5.5 V	Outputs high		73	116		73	116	mA
			Outputs low		85	134		85	134	
			Outputs disabled		84	134		84	134	
	'AS575		Outputs high		78	126		78	126	
			Outputs low		89	142		89	142	
			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}.

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
			SN54AS574 SN54AS575		SN74AS574 SN74AS575		
			MIN	MAX	MIN	MAX	
f_{max}			100		125		MHz
t_{PLH}	CLK	Any Q	3	11	3	8	ns
t_{PHL}			4	11	4	9	
t_{PZH}	$\overline{OC}$	Any Q	2	7	2	6	ns
t_{PZL}			3	11	3	10	
t_{PHZ}	$\overline{OC}$	Any Q	2	7	2	6	ns
t_{PLZ}			2	7	2	6	

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