
PART NUMBER**74ALS993NT-ROCV**

**Rochester Electronics
Manufactured Components**

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All re-creations are done with the approval of the Original Component Manufacturer. (OCM)

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-38535
 - Class Q Military
 - Class V Space Level

Qualified Suppliers List of Distributors (QSLD)

- Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OCM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

PART NUMBER**74ALS878ADW**

**Rochester Electronics
Manufactured Components**

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All re-creations are done with the approval of the Original Component Manufacturer. (OCM)

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-38535
 - Class Q Military
 - Class V Space Level

Qualified Suppliers List of Distributors (QSLD)

- Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OCM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

SN54ALS878A, SN54ALS879A, SN54AS878, SN54AS879 SN74ALS878A, SN74ALS879A, SN74AS878, SN74AS879 DUAL 4-BIT D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS062A – D2661, APRIL 1982 – REVISED MAY 1986

- 3-State Bus Driving Outputs
- Full Parallel-Access for Loading
- Buffered Control Inputs
- Choice of True or Inverting Logic
'ALS878A, 'AS878 True Outputs
'ALS879A, 'AS879 Inverting Outputs
- Synchronous Clear
- 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

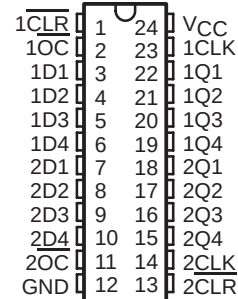
description

These dual 4-bit registers feature 3-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.

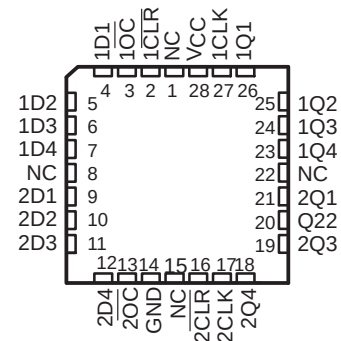
The dual 4-bit edge-triggered flip-flops enter data on the low-to-high transition of the clock (1CLK and 2CLK). All types have individual synchronous clear inputs and output control pins for each group of 4-bit registers.

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 .

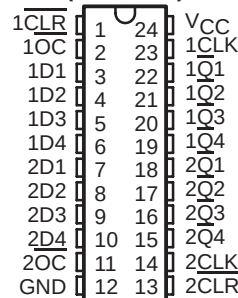
SN54ALS878A, SN54AS878 . . . JT PACKAGE
SN74ALS878A, SN74AS878 . . . DW OR NT PACKAGE
(TOP VIEW)



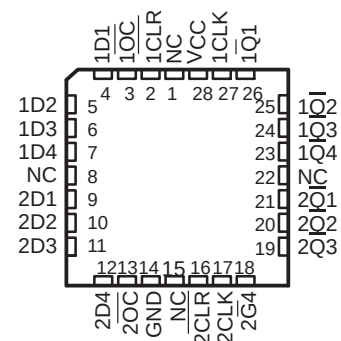
SN54ALS878A, SN54AS878 . . . FK PACKAGE
SN74ALS878A, SN74AS878 . . . FN PACKAGE
(TOP VIEW)



SN54ALS879A, SN54AS879 . . . JT PACKAGE
SN74ALS879A, SN74AS879 . . . DW OR NT PACKAGE
(TOP VIEW)



SN54ALS879A, SN54AS879 . . . FK PACKAGE
SN74ALS879A, SN74AS879 . . . FN PACKAGE
(TOP VIEW)



NC – No internal connection

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.

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INSTRUMENTS**

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SN54ALS878A, SN54ALS879A, SN54AS878, SN54AS879 SN74ALS878A, SN74ALS879A, SN74AS878, SN74AS879 DUAL 4-BIT D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS062A – D2661, APRIL 1982 – REVISED MAY 1986

FUNCTION TABLES

'ALS878A, 'AS878
(each flip-flop)

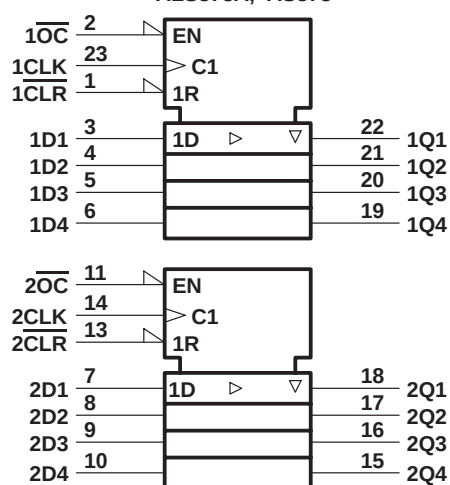
INPUTS				OUTPUT
$\overline{OC}$	$\overline{CLR}$	CLK	D	Q
L	L	$\uparrow$	X	L
L	H	$\uparrow$	H	H
L	H	$\uparrow$	L	L
L	H	L	X	Q_0
H	X	X	X	Z

'ALS879A, 'AS879
(each flip-flop)

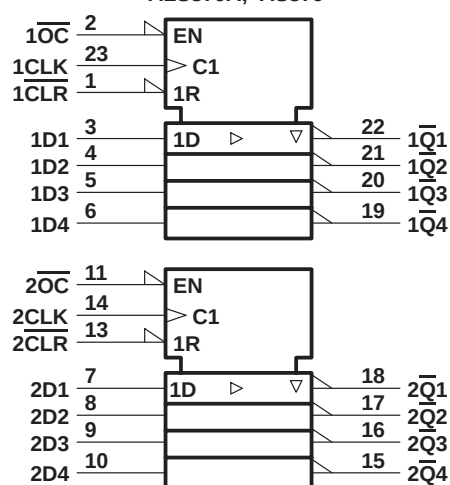
INPUTS				OUTPUT
$\overline{OC}$	$\overline{CLR}$	CLK	D	$\overline{Q}$
L	L	$\uparrow$	X	H
L	H	$\uparrow$	H	L
L	H	$\uparrow$	L	H
L	H	L	X	Q_0
H	X	X	X	Z

logic symbols †

'ALS878A, 'AS878



'ALS879A, 'AS879



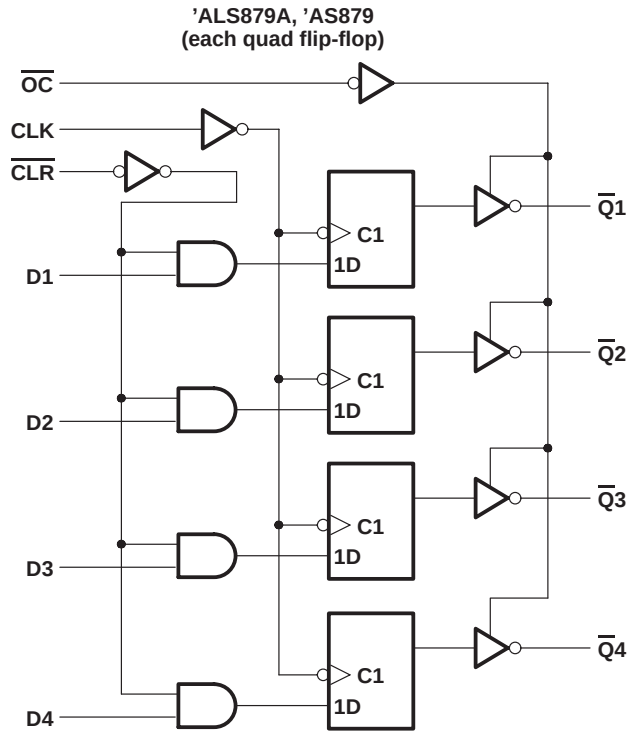
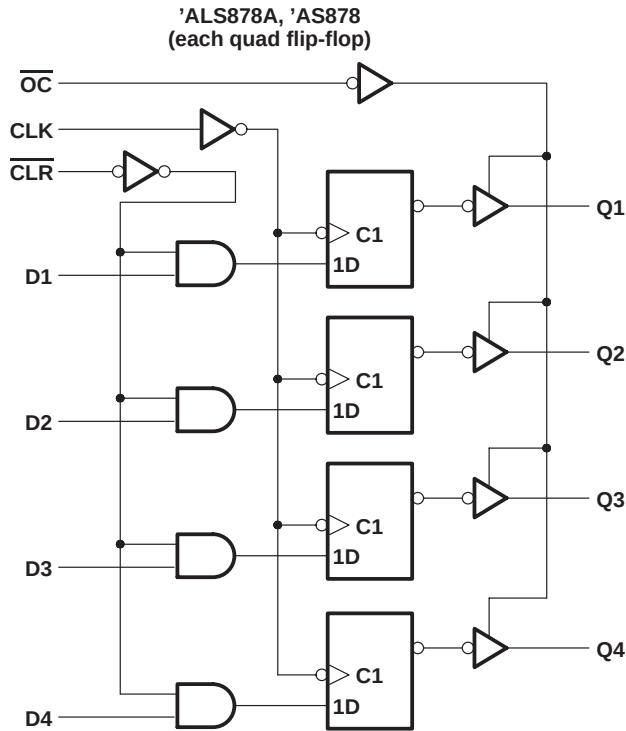
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, JT, and NT packages.

SN54ALS878A, SN54ALS879A
SN74ALS878A, SN74ALS879A

DUAL 4-BIT D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS062A - D2661, APRIL 1982 - REVISED MAY 1986

logic diagrams (positive logic)



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

SN54ALS878A, SN54ALS879A**SN74ALS878A, SN74ALS879A****DUAL 4-BIT D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS**

SDAS062A – D2661, APRIL 1982 – REVISED MAY 1986

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: SN54ALS878A, SN54ALS879A	–55°C to 125°C
SN74ALS878A, SN74ALS879A	0°C to 70°C
Storage temperature range	–65°C to 150°C

recommended operating conditions

			SN54ALS878A SN54ALS879A			SN74ALS878A SN74ALS879A			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	'ALS878A	0			25			MHz
		'ALS879A	0			20			
t _w	Pulse duration	'ALS878A CLK high or low	20			16.5			ns
		'ALS879A CLK high or low	25			20			
t _{su}	Setup time before CLK↑	Data	15			15			ns
		CLR	20			20			
t _h	Hold time after CLK↑	Data	4			4			ns
		CLR	0			0			
T _A	Operating free-air temperature		−55			125			°C

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

PARAMETER	TEST CONDITIONS		SN54ALS878A SN54ALS879A			SN74ALS878A SN74ALS879A			UNIT
			MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	
V_{IK}	$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$				–1.2			–1.2	V
V_{OH}	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $I_{OH} = -0.4\text{ mA}$		$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -1\text{ mA}$		2.4	3.3					
	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -2.6\text{ mA}$					2.4	3.2		
V_{OL}	$V_{CC} = 4.5\text{ V}$, $I_{OL} = 12\text{ mA}$		0.25	0.4		0.25	0.4		V
	$V_{CC} = 4.5\text{ V}$, $I_{OL} = 24\text{ mA}$					0.35	0.5		
I_{OZH}	$V_{CC} = 5.5\text{ V}$, $V_O = 2.7\text{ V}$			20			20		μA
I_{OZL}	$V_{CC} = 5.5\text{ V}$, $V_O = 0.4\text{ V}$			–20			–20		μA
I_I	$V_{CC} = 5.5\text{ V}$, $V_I = 7\text{ V}$			0.1			0.1		mA
I_{IH}	$V_{CC} = 5.5\text{ V}$, $V_O = 2.7\text{ V}$			20			20		μA
I_{IL}	$V_{CC} = 5.5\text{ V}$, $V_I = 0.4\text{ V}$			–0.2			–0.2		mA
$I_O^{\ddagger}$	$V_{CC} = 5.5\text{ V}$, $V_O = 2.25\text{ V}$		–30		–112	–30		–112	mA
I_{CC}	$V_{CC} = 5.5\text{ V}$	Outputs high		14	23		14	23	mA
		Outputs low		18	31		18	31	
		Outputs disabled		20	33		20	33	

[†] All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.[‡] The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

SN54ALS878A, SN54ALS879A
SN74ALS878A, SN74ALS879A

DUAL 4-BIT D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS062A – D2661, APRIL 1982 – REVISED MAY 1986

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
			'ALS878A 'ALS879A			SN54ALS878A SN54ALS879A		SN74ALS878A SN74ALS879A		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}	'ALS878A		40	50		25		30		MHz
	'ALS879A		40	50		20		25		
t _{PLH}	CLK	Q or $\overline{Q}$		8	10	4	15	4	14	ns
t _{PHL}				9	13	4	17	4	16	
t _{PZH}	$\overline{OC}$	Q or $\overline{Q}$		9	13	4	22	4	20	ns
t _{PZL}				11	15	4	22	4	20	
t _{PHZ}	$\overline{OC}$	Q or $\overline{Q}$		6	8	2	12	2	10	ns
t _{PLZ}				7	10	3	18	3	15	

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



SN54AS878, SN54AS879

SN74AS878, SN74AS879

DUAL 4-BIT D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS062A – D2661, APRIL 1982 – REVISED MAY 1986

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: SN54AS878, SN54AS879 -55°C to 125°C
SN74AS878, SN74AS879 0°C to 70°C
Storage temperature range -65°C to 150°C

recommended operating conditions

			SN54AS878 SN54AS879			SN74AS878 SN74AS879			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 low	4			2			ns
		CLK high	5			4			
t _{su}	Setup time before CLK↑	Data	3			2			ns
		CLR	6.5			5.5			
t _h	Hold time after CLK↑	Data	3			2			ns
		CLR	0			0			
T _A	Operating free-air temperature		−55	125		0	70°		°C

SN54AS878, SN54AS879
SN74AS878, SN74AS879

DUAL 4-BIT D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS062A – D2661, APRIL 1982 – REVISED MAY 1986

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

PARAMETER		TEST CONDITIONS		SN54AS878 SN54AS879			SN74AS878 SN74AS879			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					0.33 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	V _{CC} = 5.5 V, V _I = 0.4 V		−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}	'AS878	V _{CC} = 5.5 V, See Note 2	Outputs high	82 132		82 132		mA		
			Outputs low	96 155		96 155				
			Outputs disabled	100 160		100 160				
	'AS879		Outputs high	88 142		88 142				
			Outputs low	94 150		94 150				
			Outputs disabled	100 160		100 160				

[†] All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

[‡] The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

NOTE 2: I_{CC} is measured with CLR and all D inputs grounded, and CLK and OC at 4.5 V.

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
			SN54AS878 SN54AS879		SN74AS878 SN74AS879		
			MIN	MAX	MIN	MAX	
t _{max}			100		125		MHz
t _{PLH}	CLK	Q or $\overline{Q}$	3	11.5	3	8.5	ns
t _{PHL}			4	12.5	4	10.5	
t _{PZH}	$\overline{OC}$	Q or $\overline{Q}$	2	8	2	7	ns
t _{PZL}			3	11.5	3	10.5	
t _{PHZ}	$\overline{OC}$	Q or $\overline{Q}$	2	7	2	6	ns
t _{PLZ}			2	7	2	6	

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



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