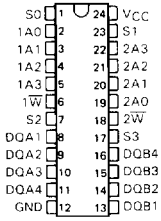
- 'ALS870 and 'AS870 in 24-Pin Small Outline, 300-mil DIP and Both Plastic and Ceramic 28-Pin Chip Carriers
- 'ALS871 and 'AS871 in 28-Pin 600-mil DIP and Both Plastic and Ceramic Chip Carriers
- 3-State Buffer-Type Outputs Drive Bus Lines Directly
- Typical Access Time:
  'ALS is 16 ns
  'AS is 11 ns
- Each Register File Has Individual Write Enable Controls and Address Lines
- Designed Specifically for Multibus Architecture and Overlapping File Operations
- Prioritized B Input Port Prevents Write Conflicts During Dual Input Mode
- Dependable Texas Instruments Quality and Reliability

description

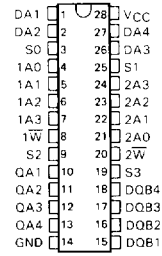
These devices feature two 16-word by 4-bit register files. Each register file has individual write-enable controls and address lines. The 'AS870 has two 4-bit data I/O ports (DQA1-DQA4 and DQB1-DQB4). The 'AS871 has one 4-bit data I/O port (DQB1-DQB4) with the other data port having individual data inputs (DA1-DA4) and data outputs (QA1-QA4). The data I/O ports can output to Bus A and Bus B, receive input from Bus A and Bus B, receive input from Bus A and output to Bus B, or output to Bus A and receive input from Bus B. To prevent writing conflicts in the dual-input mode, the B input port takes priority. Two select lines, S0 and S1, control which port has access to which register. S2 determines whether the A ports are in the input or the output modes and S3 does likewise for the B ports. The address lines (1A0-1A3 or 2A0-2A3) are decoded by an internal 1-of-16 decoder to select which register word is to be accessed. All outputs are 3-state buffer-type outputs designed specifically to drive bus lines directly.

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

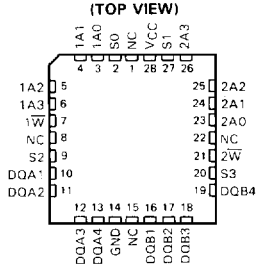
SN54ALS870, SN54AS870 . . . JT PACKAGE
SN74ALS870, SN74AS870 . . . DW OR NT PACKAGE
(TOP VIEW)



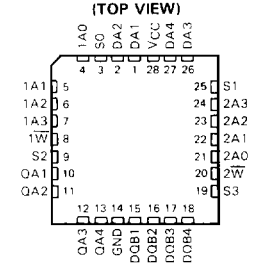
SN54ALS871, SN54AS871 . . . JD PACKAGE
SN74ALS871, SN74AS871 . . . N PACKAGE
(TOP VIEW)



SN54ALS870, SN54AS870 . . . FK PACKAGE
SN74ALS870, SN74AS870 . . . FN PACKAGE
(TOP VIEW)



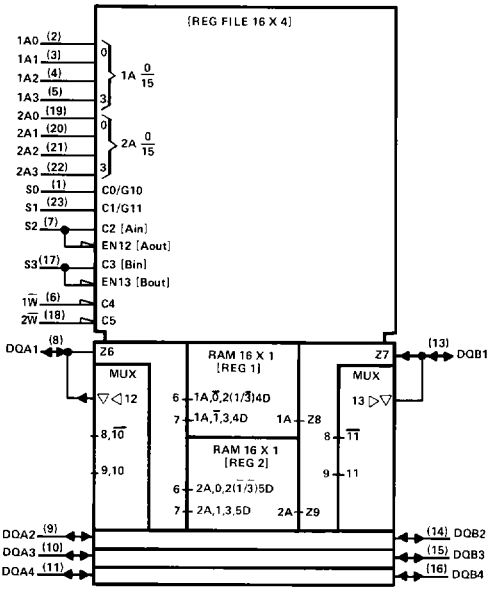
SN54ALS871, SN54AS871 . . . FK PACKAGE
SN74ALS871, SN74AS871 . . . FN PACKAGE
(TOP VIEW)



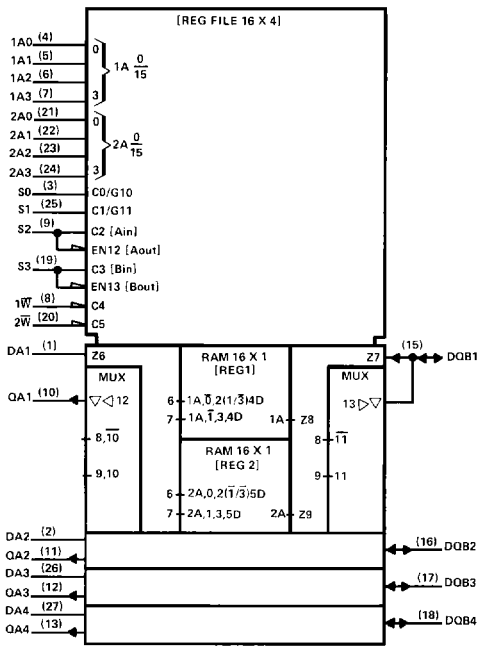
NC No internal connection

logic symbols†

'ALS870, 'AS870

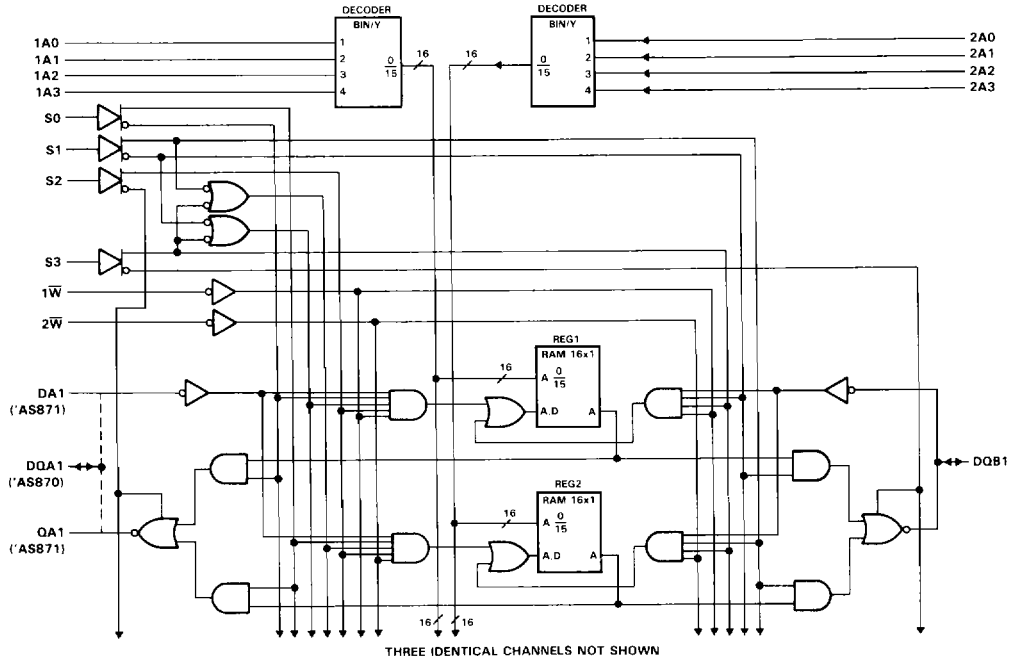


'ALS871, 'AS871



†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.

logic diagram (positive logic)



FUNCTION TABLE

FILE SELECT			INPUT/OUTPUT		
S0	S1	FILE SEL	S2	S3	I/O SEL
L	L	1R TO A, 1R TO B	L	L	A OUT, B OUT
H	L	2R TO A, 1R TO B			
L	H	1R TO A, 2R TO B			
H	H	2R TO A, 2R TO B			
L	L	A TO 1R, 1R TO B	H	L	A IN, B OUT
H	L	A TO 2R, 1R TO B			
L	H	A TO 1R, 2R TO B			
H	H	A TO 2R, 2R TO B			
L	L	1R TO A, B TO 1R	L	H	A OUT, B IN
H	L	2R TO A, B TO 1R			
L	H	1R TO A, B TO 2R			
H	H	2R TO A, B TO 2R			
L	L	B TO 1R	H	H	A IN, B IN
H	L	A TO 2R, B TO 1R			
L	H	A TO 1R, B TO 2R			
H	H	B TO 2R			

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage: All inputs . . . . . 7 V
I/O ports . . . . . 5.5 V
Voltage applied to a disabled 3-state output . . . . . 5.5 V
Operating free-air temperature range: SN54ALS870, SN54ALS871 . . . . . −55°C to 125°C
SN74ALS870, SN74ALS871 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

			SN54ALS870 SN54ALS871			SN74ALS870 SN74ALS871			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	Duration of write pulse			10			10		ns
t_{su}	Setup times	Address before write↑		2			2		ns
		Data before write↑		4			4		
		Select before write↓		3.5			3.5		
t_h	Hold times	Address after write↑		0			0		ns
		Data after write↑		0			0		
		Select after write↑		0			0		
T_A	Operating free-air temperature		−55		125	0		70	°C

'ALS870 electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		SN54ALS870			SN74ALS870			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	3.2					
		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	0.5				V
		V_{CC} = 4.5 V,	I_{OL} = 24 mA					0.35	0.5	
I_I	Control inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
	DQA and DQB ports	V_{CC} = 5.5 V,	V_I = 5.5 V			0.2			0.2	
I_{IH}	$1\overline{W}$ and $2\overline{W}$	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
	Other control inputs					40			40	
	DQA and DQB ports‡					50			50	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.2			−0.2	mA
	DQA and DQB ports‡					−0.2			−0.2	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}		V_{CC} = 5.5 V			70.5			70.5		mA

'ALS871 electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		SN54ALS871			SN74ALS871			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	3.2					
		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	0.5				V
		V_{CC} = 4.5 V,	I_{OL} = 24 mA					0.35	0.5	
I_{OZH}	QA outputs	V_{CC} = 5.5 V,	V_O = 2.7 V			20			20	µA
I_{OZL}	QA outputs	V_{CC} = 5.5 V,	V_O = 0.4 V			−20			−20	µA
I_I	Control and DA inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
	DQB ports	V_{CC} = 5.5 V,	V_I = 5.5 V			0.2			0.2	
I_{IH}	$1\overline{W}$, $2\overline{W}$, and DA inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
	Other control inputs					40			40	
	DQB ports‡					50			50	
I_{IL}	Control and DA inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.2			−0.2	mA
	DQB ports‡					−0.2			−0.2	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}		V_{CC} = 5.5 V			70.5			70.5		mA

†All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.
§The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit current, I_{OS}.

'ALS870 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 500 pF, R_1 = 500 Ω, R_2 = 500 Ω, T_A = MIN to MAX						UNIT
			SN54ALS870			SN74ALS870			
			MIN	TYP†	MAX	MIN	TYP†	MAX	
$t_{a(A)}$	Any A	Any DQ		11.5			11.5		ns
$t_{a(S)}$	S0	Any DQA		16			16		ns
	S1	Any DQB		16			16		
t_{dis}	S2	Any DQA		9.5			9.5		ns
	S3	Any DQB		9.5			9.5		
t_{en}	S2	Any DQA		7.5			7.5		ns
	S3	Any DQB		7.5			7.5		
t_{pd}	$\overline{W}$	Any DQ		12.5			12.5		ns
	DQA	DQB		16.5			16.5		
	DQB	DQA		16.5			16.5		

'ALS871 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 500 pF, R_1 = 500 Ω, R_2 = 500 Ω, T_A = MIN to MAX						UNIT
			SN54ALS871			SN74ALS871			
			MIN	TYP†	MAX	MIN	TYP†	MAX	
$t_{a(A)}$	Any A	Any QA or DQB		11.5			11.5		ns
$t_{a(S)}$	S0	Any QA		16			16		ns
	S1	Any DQB		16			16		
t_{dis}	S2	Any QA		9.5			9.5		ns
	S3	Any DQB		9.5			9.5		
t_{en}	S2	Any QA		7.5			7.5		ns
	S3	Any DQB		7.5			7.5		
t_{pd}	$\overline{W}$	Any QA or DQB		12.5			12.5		ns
	DA	DQB		16.5			16.5		
	DQB	QA		16.5			16.5		

†All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage: All inputs . . . . . 7 V
I/O ports . . . . . 5.5 V
Voltage applied to a disabled 3-state output . . . . . 5.5 V
Operating free-air temperature range: SN54AS870, SN54AS871 . . . . . −55°C to 125°C
SN74AS870, SN74AS871 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

			SN54AS870 SN54AS871			SN74AS870 SN74AS871			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	Duration of write pulse		12			12			ns
t_{su}	Setup times	Address before write↓	5			5			ns
		Data before write↑	15			15			
		Select before write↓	12			12			
t_h	Hold times	Address after write↑	0			0			ns
		Data after write↑	0			0			
		Select after write↑	12			12			
T_A	Operating free-air temperature		−55		125	0		70	°C

'AS870 electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		SN54AS870			SN74AS870			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	3.2		
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 32 mA		0.25	0.5				V
		V_{CC} = 4.5 V,	I_{OL} = 48 mA					0.35	0.5	
I_I	Control inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
	DQA and DQB ports	V_{CC} = 5.5 V,	V_I = 5.5 V			0.2			0.2	
I_{IH}	$1\overline{W}$ and $2\overline{W}$	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
	Other control inputs					40			40	
	DQA and DQB ports‡					50			50	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−2			−2	mA
	DQA and DQB ports‡					−2			−2	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}		V_{CC} = 5.5 V			120	190		120	190	mA

'AS871 electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		SN54AS871			SN74AS871			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	3.2		
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 32 mA		0.25	0.5				V
		V_{CC} = 4.5 V,	I_{OL} = 48 mA					0.35	0.5	
I_{OZH}	QA outputs	V_{CC} = 5.5 V,	V_O = 2.7 V			50			50	µA
I_{OZL}	QA outputs	V_{CC} = 5.5 V,	V_O = 0.4 V			−50			−50	µA
I_I	Control and DA inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
	DQB ports	V_{CC} = 5.5 V,	V_I = 5.5 V			0.2			0.2	
I_{IH}	$1\overline{W}$, $2\overline{W}$, and DA inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
	Other control inputs					40			40	
	DQB ports‡					50			50	
I_{IL}	Control and DA inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−2			−2	mA
	DQB ports‡					−2			−2	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	30		112	mA
I_{CC}		V_{CC} = 5.5 V			120	190		120	190	mA

†All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.
§The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit current, I_{OS}.

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'AS870 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS870		SN74AS870		
			MIN	MAX	MIN	MAX	
$t_{a(A)}$	Any A	Any DQ	5	20	5	15	ns
$t_{a(S)}$	S0	Any DQA	3	15	3	13	ns
	S1	Any DQB	3	15	3	13	
t_{dis}	S2	Any DQA	3	12	3	11	ns
	S3	Any DQB	3	12	3	11	
t_{en}	S2	Any DQA	3	15	3	12	ns
	S3	Any DQB	3	15	3	12	
t_{pd}	$\overline{W}$	Any DQ	5	23	5	19	
	DQA	DQB	5	25	5	22	ns
	DQB	DQA	5	25	5	22	

'AS871 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS871		SN74AS871		
			MIN	MAX	MIN	MAX	
$t_{a(A)}$	Any A	Any QA or DQB	5	20	5	16	ns
$t_{a(S)}$	S0	Any QA	3	15	3	13	ns
	S1	Any DQB	3	15	3	13	
t_{dis}	S2	Any QA	3	12	3	11	ns
	S3	Any DQB	3	12	3	11	
t_{en}	S2	Any QA	3	15	3	12	ns
	S3	Any DQB	3	15	3	12	
t_{pd}	$\overline{W}$	Any QA or DQB	5	23	5	19	
	DA	DQB	5	26	5	23	ns
	DQB	QA	5	26	5	23	

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