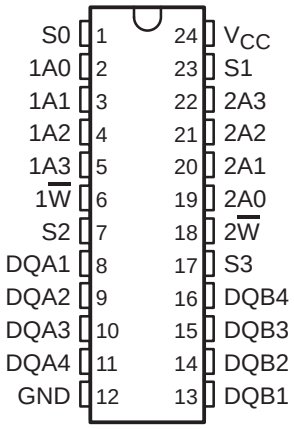
- **3-State Buffer-Type Outputs Drive Bus Lines Directly**
- **Each Register File Has Individual Write-Enable Controls and Address Lines**
- **Designed Specifically for Multibus Architecture and Overlapping File Operations**
- **Prioritized B-Input Port Prevents Write Conflicts During Dual-Input Mode**
- **Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (NT) 300-mil DIPs**

DW OR NT PACKAGE
(TOP VIEW)



description

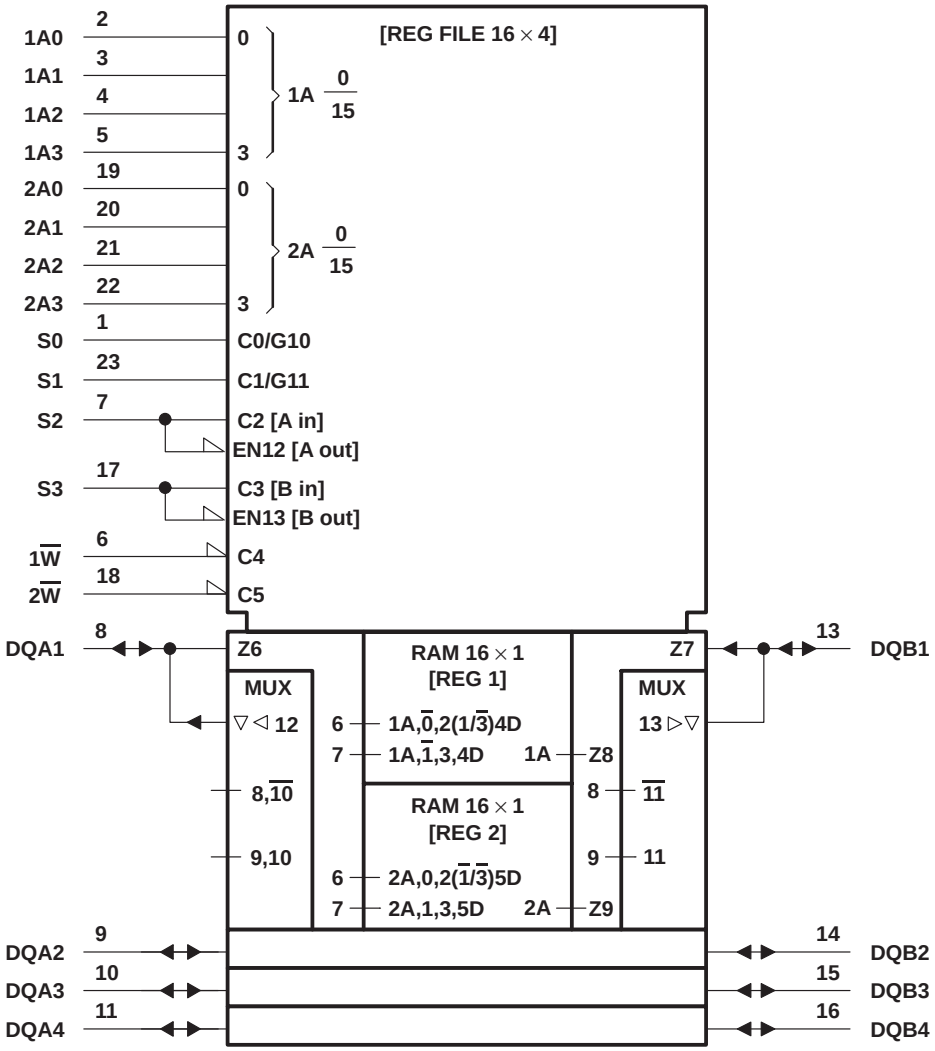
This device features two 16-word by 4-bit register files. Each register file has individual write-enable ($1\overline{W}$, $2\overline{W}$) controls and address lines. This device has two 4-bit data I/O ports (DQA1–DQA4 and DQB1–DQB4). The data I/O ports can output to bus A and bus B, receive input from 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 (S0 and S1) lines 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 SN74ALS870 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE

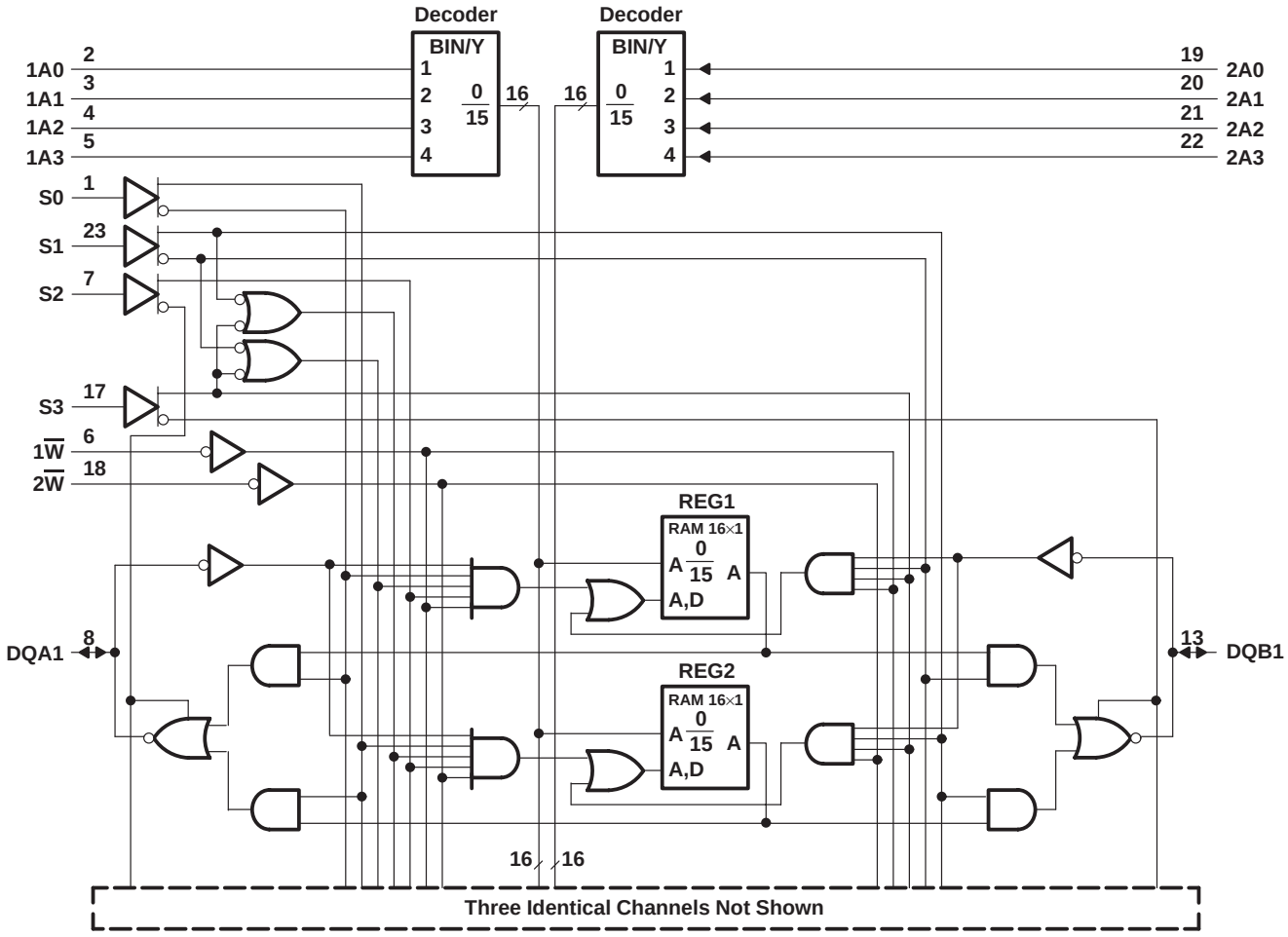
FILE SELECT			INPUT/OUTPUT		
S0	**S1**	**FILE SEL**	**S2**	**S3**	**I/O SEL**
L	L	1R to A, 1R to B	L	L	A out, B out
H	L	2R to A, 1R to B			
L	H	1R to A, 2R to B			
H	H	2R to A, 2R to B			
L	L	A to 1R, 1R to B	H	L	A in, B out
H	L	A to 2R, 1R to B			
L	H	A to 1R, 2R to B			
H	H	A to 2R, 2R to B			
L	L	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			

logic symbol†



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

logic diagram (positive logic)



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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage, V_I: 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, T_A . . . . . 0°C to 70°C
Storage temperature range . . . . . –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.

recommended operating conditions

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		4.5	5	5.5	V
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage				0.8	V
I_{OH}	High-level output current				–2.6	mA
I_{OL}	Low-level output current				24	mA
t_w	Pulse duration, write		12			ns
t_{su}	Setup time	Address before write↓	5			ns
		Data before write↑	15			
		Select before write↓	12			
t_h	Hold time	Address before write↓	0			ns
		Data before write↑	0			
		Select before write↓	12			
T_A	Operating free-air temperature		0		70	°C

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}		V_{CC} = 4.5 V,	I_I = –18 mA			–1.2	V
V_{OH}		V_{CC} = 4.5 V to 5.5 V,	I_{OH} = –0.4 mA	V_{CC} –2			V
		V_{CC} = 4.5 V,	I_{OH} = –2.6 mA	2.4	3.2		
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 24 mA		0.35	0.5	V
I_I	Control inputs	V_{CC} = 5.5 V	V_I = 7 V			0.1	mA
	DQA and DQB ports		V_I = 5.5 V			0.2	
I_{IH}	$1\overline{W}$ and $2\overline{W}$	V_{CC} = 5.5 V,	V_I = 2.7 V			20	µA
	Other control inputs					40	
	DQA and DQB ports‡					50	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			–0.2	mA
	DQA and DQB ports‡					–0.2	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	–30		–112	mA
I_{CC}		V_{CC} = 5.5 V			80	110	mA

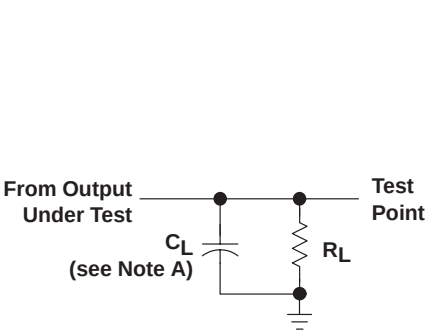
† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.
§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

switching characteristics (see Figure 1)

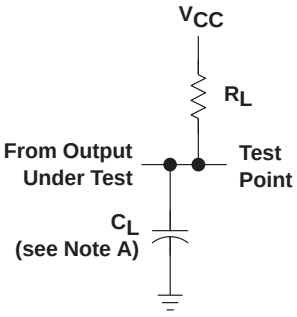
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†		UNIT
			MIN	MAX	
$t_{a(A)}$	Any A	Any DQ	3	19	ns
$t_{a(S)}$	S0	Any DQA	3	15	ns
	S1	Any DQB	3	15	
t_{dis}	S2	Any DQA	3	14	ns
	S3	Any DQB	3	14	
t_{en}	S2	Any DQA	3	17	ns
	S3	Any DQB	3	17	
t_{pd}	$\overline{W}$	Any DQ	5	23	ns
	DQA	DQB	5	26	
	DQB	DQA	5	26	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

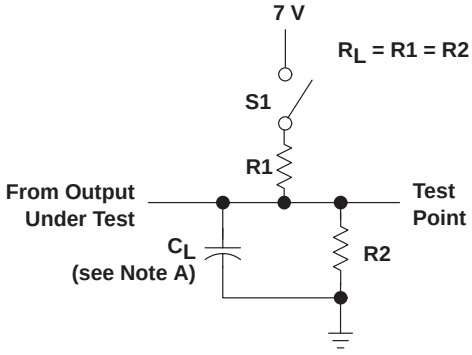
PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



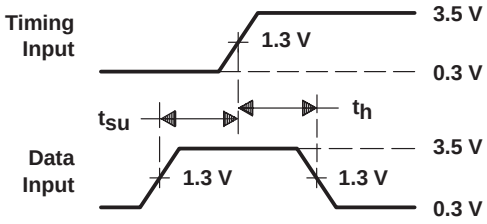
LOAD CIRCUIT FOR
BI-STATE
TOTEM-POLE OUTPUTS



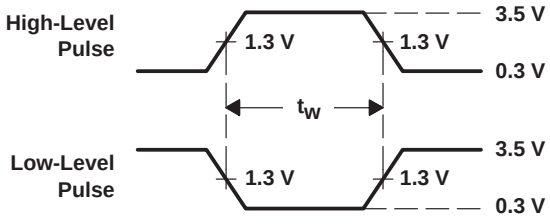
LOAD CIRCUIT
FOR OPEN-COLLECTOR OUTPUTS



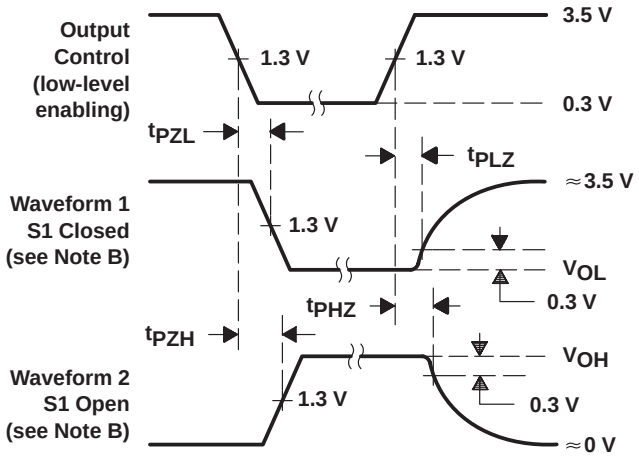
LOAD CIRCUIT
FOR 3-STATE OUTPUTS



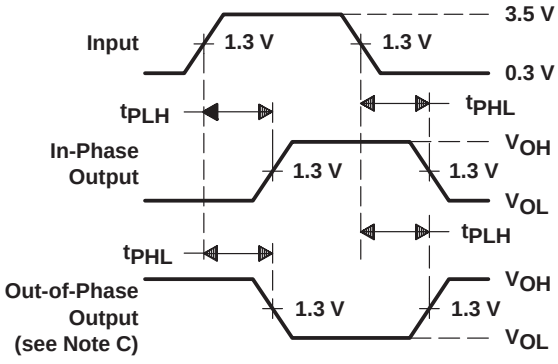
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PULSE DURATIONS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

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. When measuring propagation delay items of 3-state outputs, switch S1 is open.
D. All input pulses have the following characteristics: PRR ≤ 1 MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.