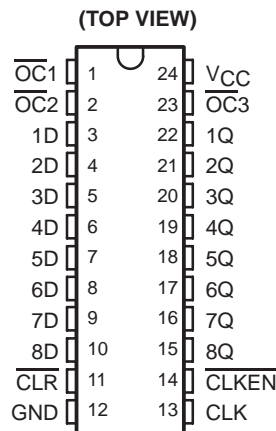


# SN54ALS29825, SN74ALS29825, SN74ALS29826 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS147B — JANUARY 1986 — REVISED MARCH 1990

- Functionally Equivalent to AMD AM29825 and AM29826
- Improved  $I_{OH}$  Specifications
- Multiple Output Enables Allow Multiuser Control of the Interface
- Outputs Have Undershoot Protection Circuitry
- Power-Up High-Impedance State
- Package Options Include Plastic “Small-Outline” Packages and Standard Plastic and Ceramic 300-mil DIPs
- Buffered Control Inputs to Reduce DC Loading Effect

SN54ALS29825 . . . JT PACKAGE  
SN74ALS29825 . . . DW OR NT PACKAGE



## description

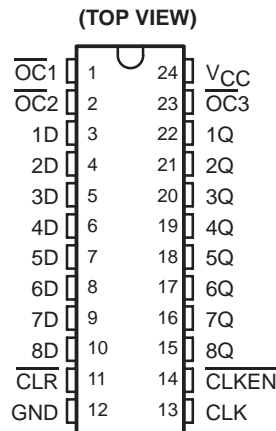
These 8-bit flip-flops feature three-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing multiuser registers, I/O ports, bidirectional bus drivers, and working registers.

With the clock enable ( $\overline{CLKEN}$ ) low, the eight D-type edge-triggered flip-flops enter data on the low-to-high transitions of the clock. Taking  $\overline{CLKEN}$  high will disable the clock buffer, thus latching the outputs. The 'ALS29825 has noninverting D inputs and the 'ALS29826 has inverting  $\overline{D}$  inputs. Taking the  $\overline{CLR}$  input low causes the eight Q outputs to go low independently of the clock.

Multiuser buffered output-control inputs ( $\overline{OC1}$ ,  $\overline{OC2}$ , and  $\overline{OC3}$ ) can be used to place the eight outputs in either a normal logic state (high or low level) or a high-impedance state. The outputs are also in the high-impedance state during power-up and power-down conditions. The outputs remain in the high-impedance state while the device is powered-down. In the high-impedance state the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive the bus lines in a bus-organized system without need for interface or pullup components. The output controls do 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 SN54ALS29825 is characterized over the full military range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS29825 and SN74ALS29826 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN74ALS29826 . . . DW OR NT PACKAGE



# SN54ALS29825, SN74ALS29825

## 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

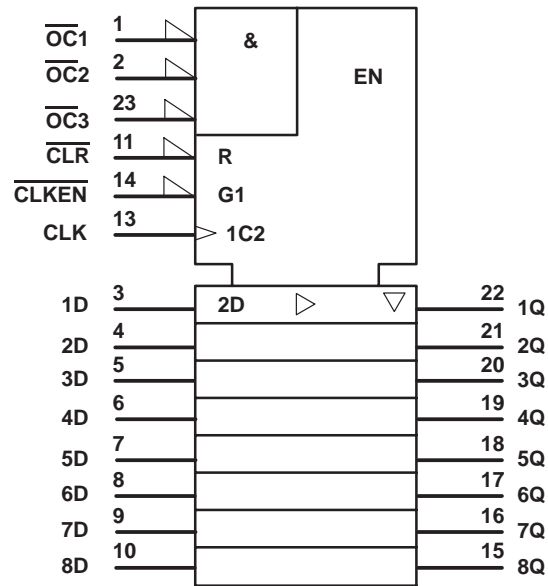
SDAS147B — JANUARY 1986 — REVISED MARCH 1990

FUNCTION TABLE

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

$\overline{OC}^* = H$  if any of  $\overline{OC}1$ ,  $\overline{OC}2$ , or  $\overline{OC}3$  is high.  
 $\overline{OC}^* = L$  if any of  $OC1$ ,  $OC2$ , or  $OC3$  is low.

### logic symbol †



logic diagram (positive logic)

**MISSING ILLUSTRATION**

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

# SN74ALS29826

## 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

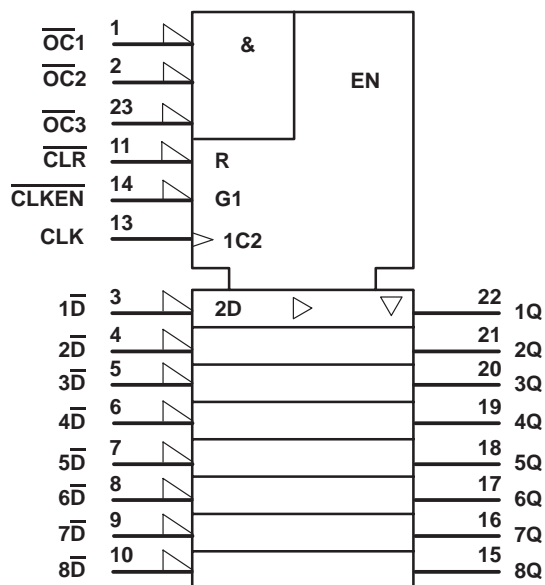
SDAS147B — JANUARY 1986 — REVISED MARCH 1990

FUNCTION TABLE

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

$\overline{OC}^*$  = H if any of  $\overline{OC}1$ ,  $\overline{OC}2$ , or  $\overline{OC}3$  is high.  
 $\overline{OC}^*$  = L if any of  $\overline{OC}1$ ,  $\overline{OC}2$ , or  $\overline{OC}3$  is low.

### logic symbol †



logic diagram (positive logic)

## MISSING ILLUSTRATION

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

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	7 V
Voltage applied to a disabled high-impedance output	5.5 V
Operating free-air temperature range	-55°C to 125°C
Storage temperature range	-65°C to 150°C

† Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions beyond those indicated in the "Recommended Operating Conditions" section of this specification is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values are with respect to GND.

**recommended operating conditions**

		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage		5		4.75	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						-18	mA
$I_{OL}$	Low-level output current						32	mA
$t_w$	Pulse duration	CLR low	7		7			ns
		CLK high	8		8			
		CLK low	8		8			
$t_{su}$	Setup time before CLK ↑	CLR inactive	7		7			ns
		Data	4		4			
		CLKEN high or low	8		8			
$t_h$	Hold time, data after CLK ↑	Data	4		4			ns
		CLKEN	2		2			
$T_A$	Operating free-air temperature		25		-55		125	°C

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

PARAMETER	TEST CONDITIONS ‡		MIN	TYP §	MAX	UNIT
$V_{IK}$	$V_{CC} = \text{MIN}$ ,	$I_I = -18 \text{ mA}$			-1.2	V
$V_{OH}$	$V_{CC} = \text{MIN}$ ,	$I_{OH} = -12 \text{ mA}$	2.4			V
	$V_{CC} = \text{MIN}$ ,	$I_{OH} = -18 \text{ mA}$	2			
$V_{OL}$	$V_{CC} = \text{MIN}$ ,	$I_{OL} = 32 \text{ mA}$		0.35	0.5	V
$I_{OZH}$	$V_{CC} = \text{MAX}$ ,	$V_O = 2.4 \text{ V}$			50	μA
$I_{OZL}$	$V_{CC} = \text{MAX}$ ,	$V_O = 0.4 \text{ V}$			-50	μA
$I_I$	$V_{CC} = \text{MAX}$ ,	$V_I = 5.5 \text{ V}$			0.1	mA
$I_{IH}$	$V_{CC} = \text{MAX}$ ,	$V_I = 2.7 \text{ V}$			20	μA
$I_{IL}$	$V_{CC} = \text{MAX}$ ,	$V_I = 0.4 \text{ V}$			-0.5	mA
$I_{OS} ¶$	$V_{CC} = \text{MAX}$ ,	$V_O = 0 \text{ V}$	-75		-250	mA
$I_{CC}$	$V_{CC} = \text{MAX}$ ,	Outputs open		70	115	mA

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

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

¶ Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

# SN74ALS29825, SN74ALS29826

## 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS147B — JANUARY 1986 — REVISED MARCH 1990

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	7 V
Voltage applied to a disabled high-impedance output	5.5 V
Operating free-air temperature range	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. This is a stress rating only, and functional operation of the device at these or any other conditions beyond those indicated in the "Recommended Operating Conditions" section of this specification is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values are with respect to GND.

### recommended operating conditions

		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage		5		4.75	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						–24	mA
$I_{OL}$	Low-level output current						48	mA
$t_w$	Pulse duration		CLR low	5		7		ns
			CLK high	5		7		
			CLK low	5		7		
$t_{su}$	Setup time before CLK ↑		CLR inactive	5		7		ns
			Data	2		4		
			CLKEN high or low	6		6		
$t_h$	Hold time, data after CLK ↑		Data	2		2		ns
			CLKEN	0		2		
$T_A$	Operating free-air temperature		25		0		70	°C

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

PARAMETER	TEST CONDITIONS ‡	MIN	TYP ‡	MAX	UNIT
$V_{IK}$	$V_{CC} = \text{MIN}$ , $I_I = -18 \text{ mA}$			–1.2	V
$V_{OH}$	$V_{CC} = \text{MIN}$ , $I_{OH} = -15 \text{ mA}$	2.4	3.3		V
	$V_{CC} = \text{MIN}$ , $I_{OH} = -24 \text{ mA}$	2	3.1		
$V_{OL}$	$V_{CC} = \text{MIN}$ , $I_{OL} = 48 \text{ mA}$		0.35	0.5	V
$I_{OZH}$	$V_{CC} = \text{MAX}$ , $V_O = 2.4 \text{ V}$			20	μA
$I_{OZL}$	$V_{CC} = \text{MAX}$ , $V_O = 0.4 \text{ V}$			–20	μA
$I_I$	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$			0.1	mA
$I_{IH}$	$V_{CC} = \text{MAX}$ , $V_I = 2.7 \text{ V}$			20	μA
$I_{IL}$	$V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$			–0.2	mA
$I_{OS} \text{ ¶}$	$V_{CC} = \text{MAX}$ , $V_O = 0 \text{ V}$	–75		–250	mA
$I_{CC}$	$V_{CC} = \text{MAX}$ , Outputs open		70	100	mA

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

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

¶ Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.



# SN54ALS29825

## 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS147B — JANUARY 1986 — REVISED MARCH 1990

### switching characteristics over recommended ranges of supply voltage and free-air temperature

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS (see Figure 1)	V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C			V <sub>CC</sub> = MIN to MAX, † T <sub>A</sub> = MIN to MAX †		UNIT
				MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub>	CLK	Any Q	C <sub>L</sub> = 50 pF	2		8.5	2	14	ns
t <sub>PHL</sub>				2		8.5	2	17.5	
t <sub>PLH</sub>			C <sub>L</sub> = 300 pF	2		14	2	16	
t <sub>PHL</sub>				2		17.5	2	21	
t <sub>PHL</sub>	$\overline{\text{CLR}}$	Any Q	C <sub>L</sub> = 50 pF	1	6	14.5	1	17.5	ns
t <sub>PZH</sub>	$\overline{\text{OC}}$	Any Q	C <sub>L</sub> = 50 pF	1	11.5	14.5	1	17.5	ns
t <sub>PZL</sub>				1	11	13	1	18	
t <sub>PZH</sub>			C <sub>L</sub> = 300 pF	1		18	1	22	
t <sub>PZL</sub>				1		25	1	29.5	
t <sub>PHZ</sub>	$\overline{\text{OC}}$	Any Q	C <sub>L</sub> = 50 pF	1		15	1	19	ns
t <sub>PLZ</sub>				1		10	1	12	
t <sub>PHZ</sub>			C <sub>L</sub> = 5 pF	1	5.2	10	1	14	
t <sub>PLZ</sub>				1	5.2	9	1	11	

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



# SN74ALS29825, SN74ALS29826

## 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3 STATE OUTPUTS

SDAS147B — JANUARY 1986 — REVISED MARCH 1990

### switching characteristics over recommended ranges of supply voltage and free-air temperature

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS (see Figure 1)	V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C			V <sub>CC</sub> = MIN to MAX, † T <sub>A</sub> = MIN to MAX †		UNIT
				MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub>	CLK	Any Q	C <sub>L</sub> = 50 pF	2		8.5	2	10	ns
t <sub>PHL</sub>				2		8.5	2	10	
t <sub>PLH</sub>			C <sub>L</sub> = 300 pF			14		16	
t <sub>PHL</sub>						14		16	
t <sub>PHL</sub>	$\overline{\text{CLR}}$	Any Q	C <sub>L</sub> = 50 pF		6	10		12	ns
t <sub>PZH</sub>	$\overline{\text{OC}}$	Any Q	C <sub>L</sub> = 50 pF		11.5	12		14	ns
t <sub>PZL</sub>					11	12		14	
t <sub>PZH</sub>			C <sub>L</sub> = 300 pF			17		20	
t <sub>PZL</sub>						21		23	
t <sub>PHZ</sub>	$\overline{\text{OC}}$	Any Q	C <sub>L</sub> = 50 pF			11		14	ns
t <sub>PLZ</sub>						9		12	
t <sub>PHZ</sub>			C <sub>L</sub> = 5 pF		5.2	8		9	
t <sub>PLZ</sub>					5.2	8		9	

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



# SN54ALS29825, SN74ALS29825, SN74ALS29826

## 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS147B — JANUARY 1986 — REVISED MARCH 1990

---

### PARAMETER MEASUREMENT INFORMATION

## MISSING ILLUSTRATION

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. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $Z_0 = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns.

**Figure 1. Load Circuit and Voltage Waveforms**

---





## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>

### Applications

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2008, Texas Instruments Incorporated