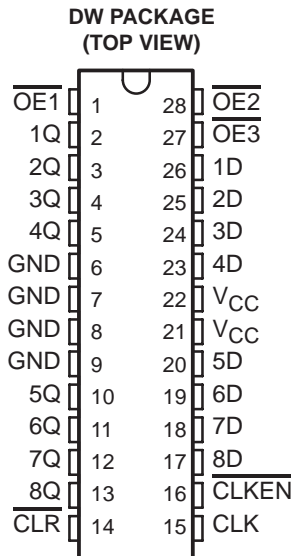


# 74ACT11825 8-BIT BUS-INTERFACE FLIP-FLOP WITH 3-STATE OUTPUTS

SCAS154A – D3715, NOVEMBER 1990 – REVISED APRIL 1993

- Inputs Are TTL-Voltage Compatible
- Multiple Output Enables Allow Multiuser Control of the Interface
- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin  $V_{CC}$  and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process
- 500-mA Typical Latch-Up Immunity at 125°C



## description

This device contains eight flip-flops that feature 3-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 ( $\overline{\text{CLKEN}}$ ) input low, the eight edge-triggered D-type flip-flops enter data on the low-to-high transition of the clock. Taking  $\overline{\text{CLKEN}}$  high disables the clock buffer, thus latching the outputs. The 74ACT11825 has noninverting data (D) inputs. Taking the clear ( $\overline{\text{CLR}}$ ) input low causes the eight Q outputs to go low independently of the clock.

Multiuser buffered output-enable ( $\overline{\text{OE1}}$ ,  $\overline{\text{OE2}}$ , and  $\overline{\text{OE3}}$ ) inputs can be used to place the eight outputs in either a normal logic state (high or low logic level) or a high-impedance state. 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 bus lines without need for interface or pullup components. The output enable ( $\overline{\text{OE}}$ ) 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 74ACT11825 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE

INPUTS					OUTPUT
$\overline{\text{OE}}^{\dagger}$	$\overline{\text{CLR}}$	$\overline{\text{CLKEN}}$	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

$\dagger \overline{\text{OE}} = \text{H}$  if any of  $\overline{\text{OE1}}$ ,  $\overline{\text{OE2}}$ , or  $\overline{\text{OE3}}$  are high.  
 $\overline{\text{OE}} = \text{L}$  if all of  $\overline{\text{OE1}}$ ,  $\overline{\text{OE2}}$ , or  $\overline{\text{OE3}}$  are low.

EPIC is a trademark of Texas Instruments Incorporated.

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.



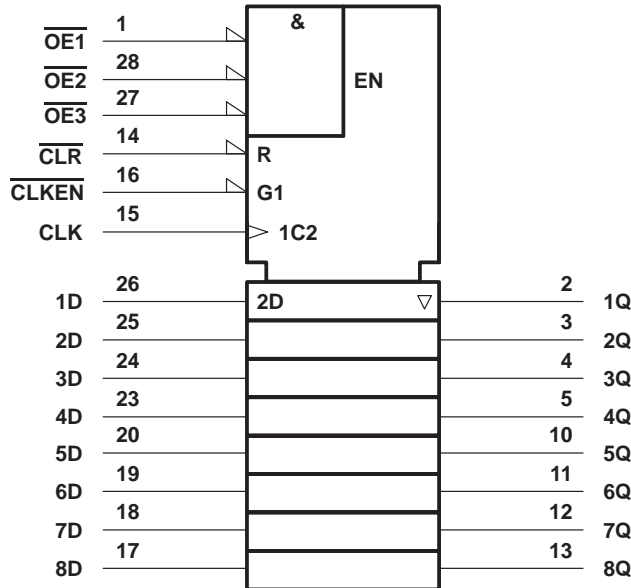
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265  
 POST OFFICE BOX 1443 • HOUSTON, TEXAS 77001

Copyright © 1993, Texas Instruments Incorporated

# 74ACT11825 8-BIT BUS-INTERFACE FLIP-FLOP WITH 3-STATE OUTPUTS

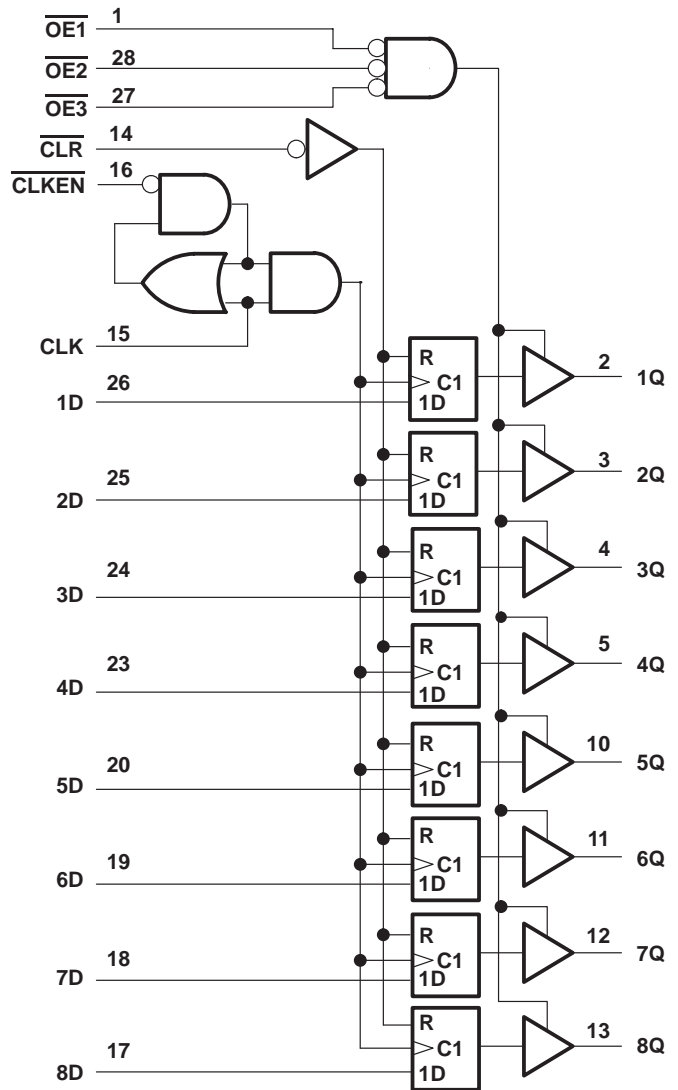
SCAS154A – D3715, NOVEMBER 1990 – REVISED APRIL 1993

## 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 range, $V_{CC}$ .....	-0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 V to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1) .....	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 50$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 200$ mA
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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.



**74ACT11825**  
**8-BIT BUS-INTERFACE FLIP-FLOP**  
**WITH 3-STATE OUTPUTS**

SCAS154A – D3715, NOVEMBER 1990 – REVISED APRIL 1993

**recommended operating conditions (see Note 2)**

		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
$V_I$	Input voltage	0	$V_{CC}$		V
$V_O$	Output voltage	0	$V_{CC}$		V
$I_{OH}$	High-level output current			-24	mA
$I_{OL}$	Low-level output current			24	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0		10	ns/V
$T_A$	Operating free-air temperature	-40		85	°C

NOTE 2: Unused or floating inputs must be held high or low.

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
$V_{OH}$	$I_{OH} = -50 \mu\text{A}$	4.5 V	4.4			4.4	V	
		5.5 V	5.4			5.4		
	$I_{OH} = -24 \text{ mA}$	4.5 V	3.94			3.8		
		5.5 V	4.94			4.8		
	$I_{OH} = -75 \text{ mA}^\dagger$	5.5 V				3.85		
$V_{OL}$	$I_{OL} = 50 \mu\text{A}$	4.5 V			0.1	0.1	V	
		5.5 V			0.1	0.1		
	$I_{OL} = 24 \text{ mA}$	4.5 V			0.36	0.44		
		5.5 V			0.36	0.44		
	$I_{OL} = 75 \text{ mA}^\dagger$	5.5 V				1.65		
$I_I$	$V_I = V_{CC}$ or GND	5.5 V			$\pm 0.1$	$\pm 1$	$\mu\text{A}$	
$I_{OZ}$	$V_O = V_{CC}$ or GND	5.5 V			$\pm 0.5$	$\pm 5$	$\mu\text{A}$	
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			8	80	$\mu\text{A}$	
$\Delta I_{CC}^\ddagger$	One input at 3.4 V, Other inputs at $V_{CC}$ or GND	5.5 V			0.9	1	mA	
$C_i$	$V_I = V_{CC}$ or GND	5 V		4.5			pF	
$C_o$	$V_O = V_{CC}$ or GND	5 V		12			pF	

<sup>†</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

<sup>‡</sup> This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or  $V_{CC}$ .



# 74ACT11825

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

SCAS154A – D3715, NOVEMBER 1990 – REVISED APRIL 1993

timing requirements over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

		$T_A = 25^\circ\text{C}$		MIN	MAX	UNIT
		MIN	MAX			
$f_{\text{clock}}$	Clock frequency	0	122	0	122	MHz
$t_w$	Pulse duration	$\overline{\text{CLR}}$ low	4	4		ns
		CLK high or low	4.5	4.5		
$t_{\text{su}}$	Setup time before $\text{CLK}\uparrow$	$\overline{\text{CLR}}$ inactive	3	3		ns
		Data	3	3		
		CLKEN high or low	3	3		
$t_h$	Hold time after $\text{CLK}\uparrow$	Data	1.5	1.5		ns
		CLKEN high or low	2	2		

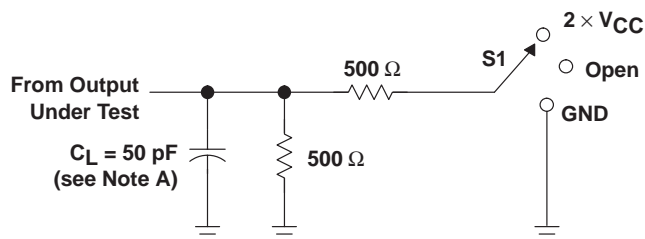
switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
$f_{\text{max}}$			122			122		MHz
$t_{\text{PLH}}$	CLK	Q	4.6	7.7	10.2	4.6	11.6	ns
$t_{\text{PHL}}$			5.1	8.4	10.9	5.1	12.3	
$t_{\text{PHL}}$	$\overline{\text{CLR}}$	Q	4.5	8.5	11.9	4.5	13.2	ns
$t_{\text{PZH}}$	$\overline{\text{OE}}$	Q	3.3	6.4	9.2	3.3	10.4	ns
$t_{\text{PZL}}$			4.2	7.9	11.5	4.2	13	
$t_{\text{PHZ}}$	$\overline{\text{OE}}$	Q	6.1	8.5	10.7	6.1	12	ns
$t_{\text{PLZ}}$			5.5	7.9	10	5.5	11.2	

operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

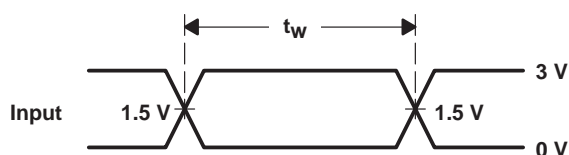
PARAMETER		TEST CONDITIONS	TYP	UNIT
$C_{\text{pd}}$	Power dissipation capacitance	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	47	pF
			34	

PARAMETER MEASUREMENT INFORMATION

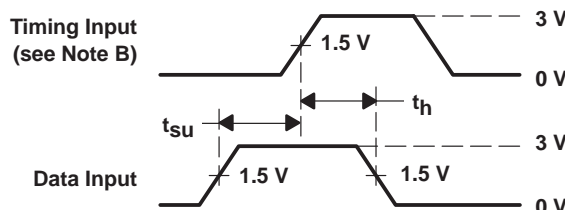


LOAD CIRCUIT

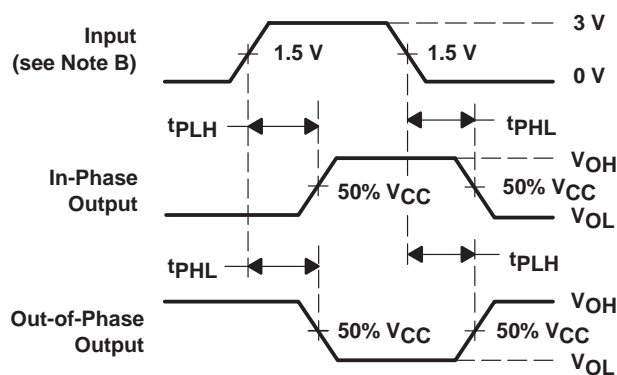
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



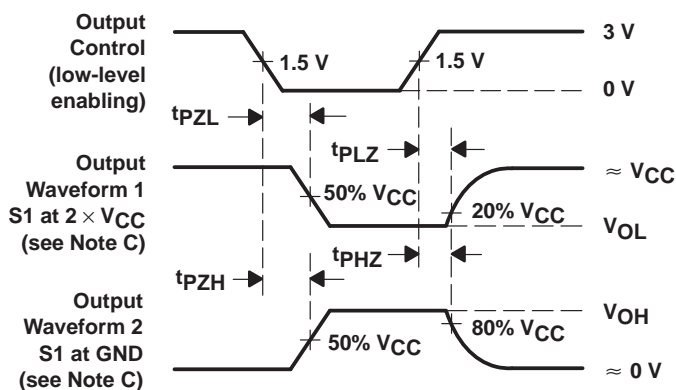
VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

NOTES: A.  $C_L$  includes probe and jig capacitance.

B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 3$  ns,  $t_f = 3$  ns.

C. 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.

D. The outputs are measured one at a time with one input transition per measurement.

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>
DLP® Products	<a href="http://www.dlp.com">www.dlp.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 © 2009, Texas Instruments Incorporated