SN74ALVCH162832 1-BIT TO 4-BIT ADDRESS REGISTER/DRIVER WITH 3-STATE OUTPUTS

SCAS588I-MAY 1997-REVISED SEPTEMBER 2004

FEATURES

- Member of the Texas Instruments Widebus™
 Family
- Output Ports Have Equivalent 26-Ω Series Resistors, So No External Resistors Are Required
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)

DESCRIPTION/ORDERING INFORMATION

This 1-bit to 4-bit address register/driver is designed for 1.65-V to 3.6-V V_{CC} operation.

This device is ideal for use in applications in which a single address bus is driving four separate memory locations. The SN74ALVCH162832 can be used as a buffer or a register, depending on the logic level of the select (SEL) input.

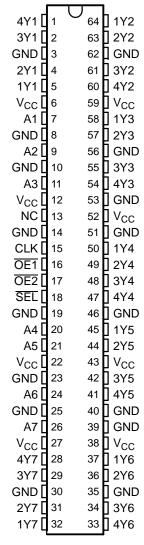
When SEL is a logic high, the device is in the buffer mode. The outputs follow the inputs and are controlled by the two output-enable (OE) inputs. Each OE controls two groups of seven outputs.

When SEL is a logic low, the device is in the register mode. The register is an edge-triggered D-type flip-flop. On the positive transition of the clock (CLK) input, data at the A inputs is stored in the internal registers. OE controls operate the same as in the buffer mode.

When \overline{OE} is a logic low, the outputs are in a normal logic state (high or low logic level). When \overline{OE} is a logic high, the outputs are in the high-impedance state.

Neither SEL nor OE 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.

DGG PACKAGE (TOP VIEW)



NC - No internal connection

ORDERING INFORMATION

T _A	PAC	KAGE ⁽¹⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING	
-40°C to 85°C	TSSOP - DGG	Tape and reel	SN74ALVCH162832GR	ALVCH162832	

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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DESCRIPTION/ORDERING INFORMATION (CONTINUED)

The outputs, which are designed to sink up to 12 mA, include equivalent $26-\Omega$ resistors to reduce overshoot and undershoot.

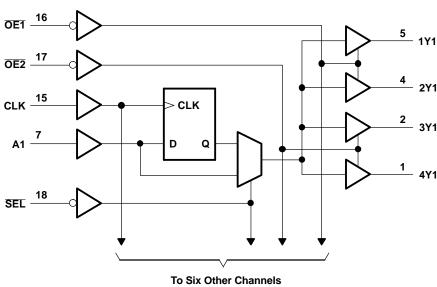
To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

Active bus-hold circuitry holds unused or undriven inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

FUNCTION TABLE

	INPUTS							
ŌĒ	SEL	CLK	Α	Y				
Н	Х	X	Х	Z				
L	Н	X	L	L				
L	Н	X	Н	Н				
L	L	\uparrow	L	L				
L	L	\uparrow	Н	Н				

LOGIC DIAGRAM (POSITIVE LOGIC)





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ABSOLUTE MAXIMUM RATINGS(1)

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

					MIN	MAX	UNIT
V_{CC}	Supply voltage range				-0.5	4.6	V
VI	Input voltage range ⁽²⁾				-0.5	4.6	V
Vo	Output voltage range ⁽²⁾⁽³⁾				-0.5	V _{CC} + 0.5	V
I _{IK}	Input clamp current	V _I < 0				-50	mA
I _{OK}	Output clamp current	V _O < 0				-50	mA
Io	Continuous output current					±50	mA
	Continuous current through each V _{CC} or GND					±100	mA
θ_{JA}	Package thermal impedance ⁽⁴⁾					55	°C/W
T _{stg}	Storage temperature range				-65	150	°C

⁽¹⁾ 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.

(2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

			MIN	MAX	UNIT	
V _{CC}	Supply voltage		1.65	3.6	V	
		V _{CC} = 1.65 V to 1.95 V	$0.65 \times V_{CC}$			
V_{IH}	High-level input voltage	V _{CC} = 2.3 V to 2.7 V	1.7		V	
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2			
		V _{CC} = 1.65 V to 1.95 V		$0.35 \times V_{CC}$		
V_{IL}	Low-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.7	V	
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$		0.8		
V _I	Input voltage		0	V_{CC}	V	
Vo	Output voltage		0	V _{CC}	V	
		V _{CC} = 1.65 V		-2		
	High-level output current	V _{CC} = 2.3 V		-6	mA	
I _{OH}		V _{CC} = 2.7 V		-8		
		V _{CC} = 3 V		-12		
		V _{CC} = 1.65 V		2		
	Low level output ourrent	V _{CC} = 2.3 V		6	A	
l _{OL}	Low-level output current	V _{CC} = 2.7 V		8	mA .	
		V _{CC} = 3 V		12		
Δt/Δν	Input transition rise or fall rate			10	ns/V	
T _A	Operating free-air temperature		-40	85	°C	

⁽¹⁾ All unused control inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.

³⁾ This value is limited to 4.6 V maximum.

⁽⁴⁾ The package thermal impedance is calculated in accordance with JESD 51-7.

SN74ALVCH162832 1-BIT TO 4-BIT ADDRESS REGISTER/DRIVER WITH 3-STATE OUTPUTS





ELECTRICAL CHARACTERISTICS

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

P	ARAMETER	TEST CONDITIONS	V _{cc}	MIN	TYP ⁽¹⁾ MAX	UNIT
		I _{OH} = -100 μA	1.65 V to 3.6 V	V _{CC} - 0.2		
		I _{OH} = -2 mA	1.65 V	1.2		
		I _{OH} = -4 mA	2.3 V	1.9		
V_{OH}			2.3 V	1.7		V
		$I_{OH} = -6 \text{ mA}$	3 V	2.4		
		I _{OH} = -8 mA	2.7 V	2		
		I _{OH} = -12 mA	3 V	2		
		I _{OL} = 100 μA	1.65 V to 3.6 V		0.2	
		I _{OL} = 2 mA	1.65 V		0.45	
		I _{OL} = 4 mA	2.3 V		0.4	
V_{OL}			2.3 V		0.55	V
		I _{OL} = 6 mA	3 V		0.55	
		I _{OL} = 8 mA	2.7 V		0.6	
		I _{OL} = 12 mA	3 V		0.8	
I		$V_I = V_{CC}$ or GND	3.6 V		±5	μΑ
		V _I = 0.58 V	1.65 V	25		
		V _I = 1.07 V	1.65 V	-25		
		V _I = 0.7 V	2.3 V	45		
I _{I(hold)}		V _I = 1.7 V	2.3 V	-45		μΑ
		V _I = 0.8 V	3 V	75		
		V _I = 2 V	3 V	-75		
		V _I = 0 to 3.6 V ⁽²⁾	3.6 V		±500	
I _{OZ}		$V_O = V_{CC}$ or GND	3.6 V		±10	μΑ
I_{CC}		$V_I = V_{CC}$ or GND, $I_O = 0$	3.6 V		40	μΑ
ΔI_{CC}		One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND	3 V to 3.6 V		750	μΑ
_	Control inputs	V V or CND	221/		4.5	~F
Ci	Data inputs	$V_I = V_{CC}$ or GND	3.3 V		5	pF
Co	Outputs	$V_O = V_{CC}$ or GND	3.3 V		7.5	pF

TIMING REQUIREMENTS

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

		V _{CC} = 1.8 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 2.7 V		V_{CC} = 3.3 V \pm 0.3 V		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency		(1)		150		150		150	MHz
t _w	Pulse duration, CLK high or low	(1)		3.3		3.3		3.3		ns
t _{su}	Setup time, A data before CLK↑	(1)		2		2		1.6		ns
t _h	Hold time, A data after CLK↑	(1)		0.7		0.5		1.1		ns

⁽¹⁾ This information was not available at the time of publication.

⁽¹⁾ All typical values are at $V_{CC} = 3.3 \text{ V}$, $T_A = 25^{\circ}\text{C}$. (2) This is the bus-hold maximum dynamic current. It is the minimum overdrive current required to switch the input from one state to another.



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SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM	TO (OUTPUT)	V _{CC} =	1.8 V	V _{CC} = ± 0.2	2.5 V 2 V	V _{CC} = 2	2.7 V	V _{CC} = ± 0.	3.3 V 3 V	UNIT
	(INPUT)	(OUTPUT)	MIN	TYP	MIN	MAX	MIN	MAX	MIN	MAX	
f _{max}			(1)		150		150		150		MHz
	Α			(1)	1.1	4.7		4.8	1.5	4.3	
t _{pd}	CLK	Y		(1)	1	5.3		5.3	1.4	4.7	ns
	SEL			(1)	1.1	6		6.2	1.5	4.8	•
t _{en}	ŌĒ	Y		(1)	1	5.9		5.9	1.1	5.1	ns
t _{dis}	ŌĒ	Y		(1)	1.4	6.3		5.4	1.6	5.1	ns

⁽¹⁾ This information was not available at the time of publication.

OPERATING CHARACTERISTICS

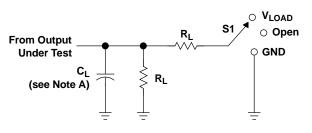
 $T_A = 25^{\circ}C$

	PARAMETER		TEST	TEST CONDITIONS		V _{CC} = 2.5 V TYP	V _{CC} = 3.3 V TYP	UNIT
	Power dissipation	All outputs enabled	_		(1)	119	132	
	C _{pd} capacitance per bit (four outputs switching)	All outputs disabled	$C_L = 0,$	f = 10 MHz	(1)	22	25	pF

⁽¹⁾ This information was not available at the time of publication.



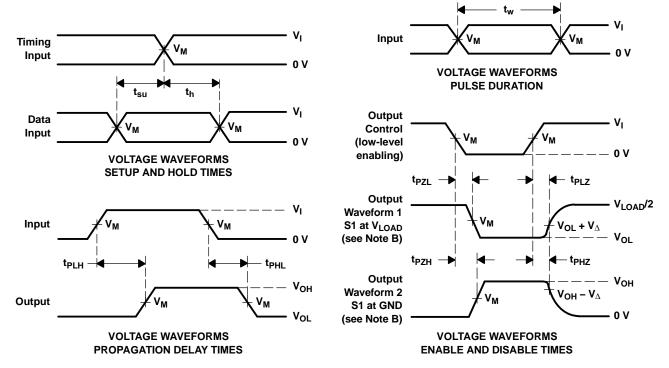
PARAMETER MEASUREMENT INFORMATION



TEST	S 1
t _{pd} t _{PLZ} /t _{PZL} t _{PHZ} /t _{PZH}	Open V _{LOAD} GND

LOAD CIRCUIT

v	IN	PUT	V	· ·	•	ь	v	
V _{CC}	VI	t _r /t _f	V _M	V _{LOAD}	CL	R _L	\mathbf{V}_{Δ}	
1.8 V	V _{CC}	≤2 ns	V _{CC} /2	2×V _{CC}	30 pF	1 k Ω	0.15 V	
2.5 V \pm 0.2 V	V _{CC}	≤2 ns	V _{CC} /2	2×V _{CC}	30 pF	500 Ω	0.15 V	
2.7 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V	
3.3 V \pm 0.3 V	2.7 V	≤ 2. 5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V	



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, $Z_{\Omega} = 50 \Omega$.
- D. The outputs are measured one at a time, with one transition per measurement.
- E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- F. t_{PZL} and t_{PZH} are the same as t_{en} .
- G. t_{PLH} and t_{PHL} are the same as t_{pd} .
- H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms



PACKAGE OPTION ADDENDUM

28-Aug-2010

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
SN74ALVCH162832DGGR	OBSOLETE	TSSOP	DGG	64		TBD	Call TI	Call TI	

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DGG (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold protrusion not to exceed 0,15.

D. Falls within JEDEC MO-153

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