

DGG PACKAGE

SCES098G-MAY 1997-REVISED OCTOBER 2004

FEATURES

- Member of the Texas Instruments Widebus™ Family
- 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 Human-Body Model (A114-
 - 1000-V Charged-Device Model (C101)

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 SN74ALVCH16832 can be used as a buffer or a register, depending on the logic level of the select (SEL) input.

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

When $\overline{\text{SEL}}$ 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. $\overline{\text{OE}}$ operates 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 \overline{SEL} nor \overline{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.

D	(TOF	P VIEW)	
4Y1[1	∪ ₆₄] 1Y2
3Y1[2	63] 2Y2
GND [3	62	GND
2Y1	4	61] 3Y2
1Y1	5	60] 4Y2
V _{CC} [6	59] V _{CC}
A1 [7	58] 1Y3
GND [8	57] 2Y3
A2	9	56] GND
GND [10	55] 3Y3
A3 [11	54] 4Y3
V _{CC}	12	53] GND
NC [13	52] V _{CC}
GND [14	51] GND
CLK [15	50] 1Y4
OE1	16	49] 2Y4
OE2	17	48] 3Y4
SEL [18	47] 4Y4
GND [19	46] GND
A4 [20	45] 1Y5
A5 [21	44] 2Y5
V _{CC} [22	43] V _{CC}
GND [23	42] 3Y5
A6 [24	41] 4Y5
GND [25	40] GND
A7 [26	39] GND
V _{CC}	27	38] V _{CC}
4Y7 [28	37] 1Y6
3Y7 [29	36] 2Y6
GND [30	35] GND
2Y7 [31	34] 3Y6
1Y7 [32	33] 4Y6

NC - No internal connection

ORDERING INFORMATION

ſ	T _A	PACK	AGE ⁽¹⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	-40°C to 85°C	TSSOP - DGG Tape and reel		SN74ALVCH16832DGGR	ALVCH16832

(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)

To ensure the high-impedance state during power up or power down, \overline{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.

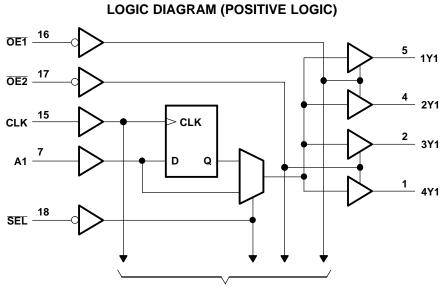
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Active bus-hold circuitry holds unused or undriven inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

	INP	UTS		OUTPUT		
OE	SEL	CLK	Α	Y		
Н	Х	Х	Х	Z		
L	н	Х	L	L		
L	н	Х	Н	н		
L	L	\uparrow	L	L		
L	L	\uparrow	н	н		

FUNCTION TABLE



To Six Other Channels



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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 ₁ <	: 0			-50	mA
I _{OK}	Output clamp voltage	Vo	< 0			-50	mA
I _O	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.

(3) This value is limited to 4.6 V maximum.

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

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	$0.65 imes V_{CC}$			
VIH	High-level input voltage	V_{CC} = 2.3 V to 2.7 V	1.7		V	
		$V_{CC} = 2.7 V \text{ to } 3.6 V$	2			
		V _{CC} = 1.65 V to 1.95 V		$0.35 imes V_{CC}$		
V _{IL}	Low-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.7	V	
		$V_{CC} = 2.7 V \text{ to } 3.6 V$		0.8		
VI	Input voltage		0	V _{CC}	V	
Vo	Output voltage		0	V _{CC}	V	
		V _{CC} = 1.65 V		-4		
	LPak land and an end and an	$V_{CC} = 2.3 V$		-12	~ ^	
I _{OH}	High-level output current	$V_{CC} = 2.7 V$		-12		
		$V_{CC} = 3 V$		-24		
		V _{CC} = 1.65 V		4		
	Low lovel output ourrent	$V_{CC} = 2.3 V$		12	~ ^	
I _{OL}	Low-level output current	V _{CC} = 2.7 V		12	mA	
		$V_{CC} = 3 V$		24		
$\Delta t / \Delta v$	Input transition rise or fall rate	·		10	ns/V	
T _A	Operating free-air temperature		-40	85	°C	

 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.

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ELECTRICAL CHARACTERISTICS

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

PARAMETER	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} = -4 mA	1.65 V	1.2				
	I _{OH} = -6 mA	2.3 V	2				
V _{OH}		2.3 V	1.7		V		
	I _{OH} = -12 mA	2.7 V	2.2				
		3 V	2.4				
	I _{OH} = -24 mA	3 V	2				
	I _{OL} = 100 μA	1.65 V to 3.6 V		0.2			
	I _{OL} = 4 mA	1.65 V		0.45			
V _{OL}	I _{OL} = 6 mA	2.3 V		0.4	V		
	I _{OL} = 12 mA	2.3 V		0.7	v		
	$I_{OL} = 12 \text{ IIIA}$	2.7 V		0.4			
	$I_{OL} = 24 \text{ mA}$	3 V		0.55			
I _I	$V_{I} = V_{CC} \text{ or } GND$	3.6 V		±5	μA		
	V _I = 0.58 V	1.65 V	25				
	V ₁ = 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		μA		
	V _I = 0.8 V	3 V	75				
	V ₁ = 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	μA		
I _{CC}	$V_{I} = V_{CC} \text{ or } GND, \qquad I_{O} = 0$	3.6 V		40	μA		
ΔI _{CC}	One input at V_{CC} - 0.6, Other inputs at V_{CC} or GND	3 V to 3.6 V		750	μA		
Control inputs	V - V or CND	221/	4.5		٦Ē		
C _i Data inputs	$V_{I} = V_{CC} \text{ or } GND$	3.3 V	5		pF		
C _o Outputs	$V_0 = V_{CC}$ or GND	3.3 V	7.5		pF		

IEXAS

TRUMENTS www.ti.com

(1)

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

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 ± 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.



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SWITCHING CHARACTERISTICS

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

PARAMETER	FROM TO (INPUT) (OUTPUT	-	V _{CC} = 1.8 V		V_{CC} = 2.5 V ± 0.2 V		V _{CC} = 2.7 V		V _{CC} = 3.3 V ± 0.3 V		UNIT
	(INFOT)	(001701)	MIN	TYP	MIN	MAX	MIN	MAX	MIN	MAX	
f _{max}			(1)		150		150		150		MHz
	A			(1)	1.2	4		4.1	1.6	3.6	
t _{pd}	CLK	Y		(1)	1.1	4.5		4.4	1.5	3.9	ns
	SEL			(1)	1.3	5.2		5.2	1.7	4.4	
t _{en}	ŌE	Y		(1)	1.1	5.1		5	1.2	4.3	ns
t _{dis}	ŌĒ	Y		(1)	1.4	5.5		4.7	1.6	4.5	ns

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

OPERATING CHARACTERISTICS

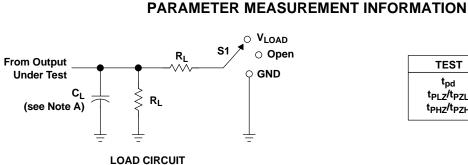
 $T_A = 25^{\circ}C$

	PARAMETER		TEST CONDITIONS		V _{CC} = 1.8 V TYP	V _{CC} = 2.5 V TYP	V _{CC} = 3.3 V TYP	UNIT
	Power dissipation	All outputs enabled		f = 10 MHz	(1)	119	132	pF
C _{pd}	capacitance per bit (four outputs switching)	All outputs disabled	$C_{L} = 0, f = 10 f$		(1)	22	25	

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

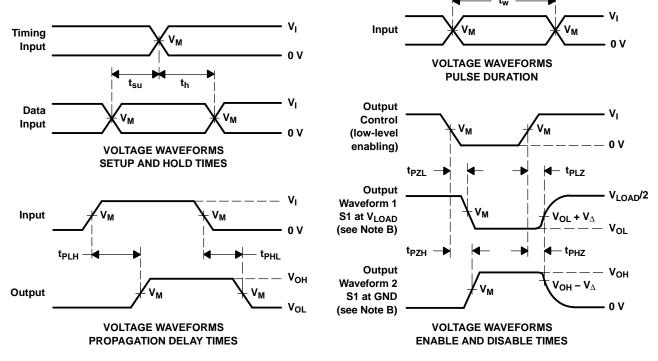


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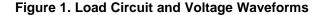
TEST	S1
t _{pd}	Open
t _{PLZ} /t _{PZL}	V _{LOAD}
t _{PHZ} /t _{PZH}	GND

N N	IN	PUT	V	v	<u>^</u>	Р	v
V _{cc}	VI	t _r /t _f	V _M	V _{LOAD}	C∟	RL	V_{Δ}
1.8 V	V _{CC}	≤2 ns	V _{CC} /2	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
2.5 V \pm 0.2 V	V _{CC}	≤2 ns	V _{CC} /2	$2 \times V_{CC}$	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 ≤ 10 MHz, Z_O = 50 Ω.
- 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.



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74ALVCH16832DGGRE4	ACTIVE	TSSOP	DGG	64	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74ALVCH16832DGGRG4	ACTIVE	TSSOP	DGG	64	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALVCH16832DGGR	ACTIVE	TSSOP	DGG	64	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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.

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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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TAPE AND REEL INFORMATION





QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal	
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Device	Package Type	Package Drawing			Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ALVCH16832DGGR	TSSOP	DGG	64	2000	330.0	24.4	8.4	17.3	1.7	12.0	24.0	Q1



PACKAGE MATERIALS INFORMATION

11-Mar-2008



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALVCH16832DGGR	TSSOP	DGG	64	2000	346.0	346.0	41.0

MECHANICAL DATA

MTSS003D - JANUARY 1995 - REVISED JANUARY 1998

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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