

# DATA SHEET

## **74ALVCH16832**

7-bit to 28-bit address register/driver  
with 3-state outputs

Product data

2001 Dec 14

File under Integrated Circuits — ICL03

# 7-bit to 28-bit address register/driver with 3-state outputs

## 74ALVCH16832

### FEATURES

- ESD protection exceeds 2000 V HBM per JESD22-A114, 200 V MM per JESD22-A115 and 1000 V CDM per JESD22-C101
- Latch-up testing is done to JESDEC Standard JESD78 which exceeds 100 mA
- Bus hold on data inputs eliminates the need for external pullup/pulldown resistors

### DESCRIPTION

This 7 channel 1-bit to 4-bit address register/driver is designed for 2.3 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 74ALVCH16832 can be used as a buffer or a register, depending on the logic level of the select (SEL) input.

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

When  $\overline{SEL}$  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 ( $\overline{CLK}$ ) input, data at the A inputs is stored in the internal registers.  $\overline{OE}$  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  $\overline{SEL}$  or  $\overline{OE}$  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.

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.

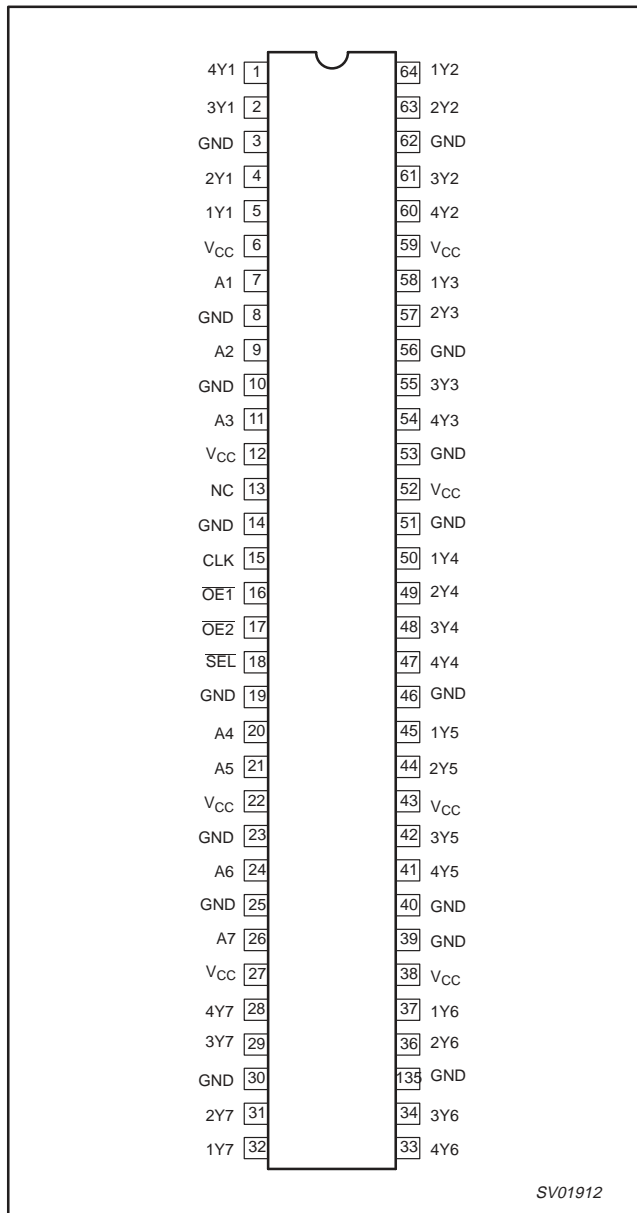
Active buss-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

The 74ALVCH16832 is characterized for operation from  $-40$  to  $+85^\circ\text{C}$ .

### PIN DESCRIPTION

PIN(S)	SYMBOL	FUNCTION
1, 2, 4, 5, 28, 29, 31, 32, 33, 34, 36, 37, 41, 42, 44, 45, 47, 48, 49, 50, 54, 55, 57, 58, 60, 61, 63, 64	1Yn, 2Yn, 3Yn, 4Yn	Outputs
3, 8, 10, 14, 19, 23, 25, 30, 35, 39, 40, 46, 51, 53, 56, 62	GND	Ground
6, 12, 22, 27, 38, 43, 52, 59	$V_{CC}$	Supply voltage
7, 9, 11, 20, 21, 24, 26	A <sub>n</sub>	Inputs
16, 17	$\overline{OE1}$ , $\overline{OE2}$	Output enable
15	CLK	Clock
18	SEL	Select

### PIN CONFIGURATION



SV01912

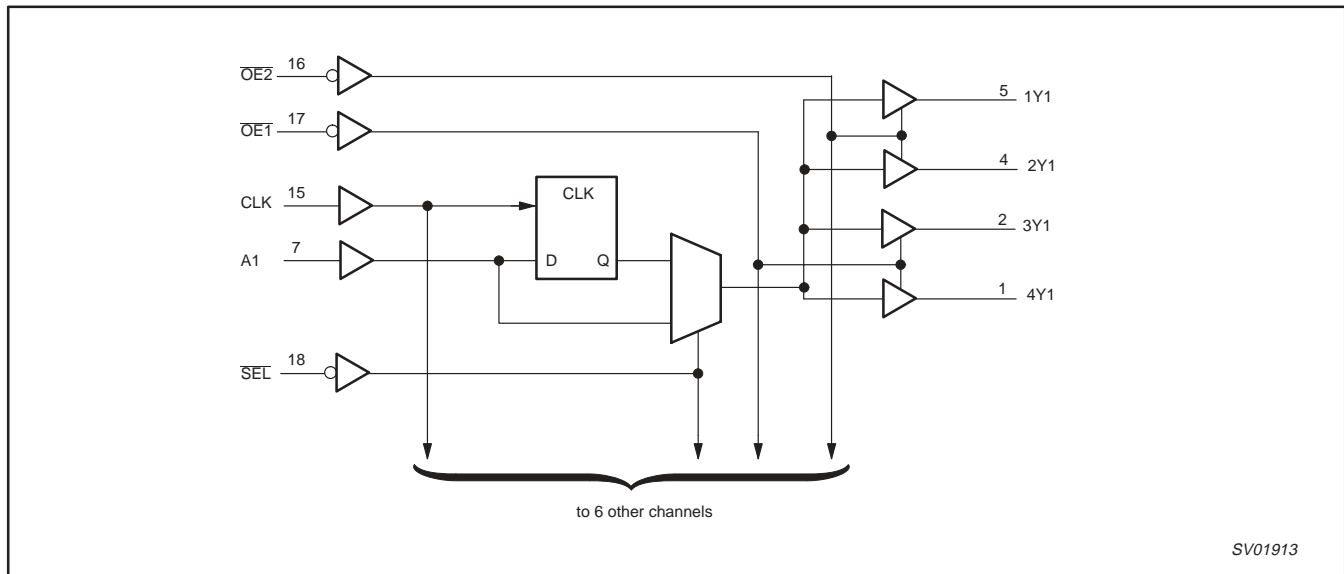
### ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	DWG NUMBER
64-pin Plastic TSSOP	$-40$ to $+85^\circ\text{C}$	74ALVCH16832DGG	SOT646-1

# 7-bit to 28-bit address register/driver with 3-state outputs

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## LOGIC DIAGRAM (POSITIVE LOGIC)



## FUNCTION TABLE

Inputs				Output
OE	SEL	CLK	A	Y
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	↑	L	L
L	L	↑	H	H

## ABSOLUTE MAXIMUM RATINGS

Over recommended operating free-air temperature range (unless otherwise noted).<sup>1</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V <sub>CC</sub>	Supply voltage range		-0.5 to +4.6	V
V <sub>I</sub>	Input voltage range	See Note 2	-0.5 to +4.6	V
V <sub>O</sub>	Output voltage range	See Notes 2 and 3	-0.5 to V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0	-50	mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0	-50	mA
I <sub>O</sub>	Continuous output current		± 50	mA
I <sub>CC</sub> , I <sub>GND</sub>	Continuous current through each V <sub>CC</sub> or GND		± 100	mA
θ <sub>JA</sub>	Package thermal impedance	See Note 4	106	°C/W
T <sub>stg</sub>	Storage temperature range		-65 to +150	°C

## NOTES:

- 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.
- The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- This value is limited to 4.6 V maximum.
- The package thermal impedance is calculated in accordance with JESD 51.

# 7-bit to 28-bit address register/driver with 3-state outputs

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## RECOMMENDED OPERATING CONDITIONS

All unused control inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
$V_{CC}$	Supply voltage		2.3	3.6	V
$V_{IH}$	High-level input voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	—	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	2	—	
$V_{IL}$	Low-level input voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	—	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	—	0.7	
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	—	0.8	
$V_I$	Input voltage		0	$V_{CC}$	V
$V_O$	Output voltage		0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 2.3\text{ V}$	—	-12	mA
		$V_{CC} = 2.7\text{ V}$	—	-12	
		$V_{CC} = 3\text{ V}$	—	-24	
$I_{OL}$	Low-level output current	$V_{CC} = 2.3\text{ V}$		12	mA
		$V_{CC} = 2.7\text{ V}$		12	
		$V_{CC} = 3\text{ V}$		24	
$\Delta t/\Delta v$	Input transition rise or fall rate			10	ns/V
$T_{amb}$	Operating free-air temperature		-40	+85	°C

# 7-bit to 28-bit address register/driver with 3-state outputs

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## ELECTRICAL CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	LIMITS			UNIT
				MIN	TYP <sup>1</sup>	MAX	
V <sub>OH</sub>		I <sub>OH</sub> = -100 μA	2.3 V to 3.6 V	V <sub>CC</sub> -0.2	—	—	V
		I <sub>OH</sub> = -4 mA	2.3 V	1.2	—	—	
		I <sub>OH</sub> = -6 mA	2.3 V	2.0	—	—	
		I <sub>OH</sub> = -12 mA	2.3 V	1.7	—	—	
			2.7 V	2.2	—	—	
		I <sub>OH</sub> = -24 mA	3 V	2.4	—	—	
V <sub>OL</sub>		I <sub>OL</sub> = 100 μA	2.3 V to 3.6 V	—	—	0.2	V
		I <sub>OL</sub> = 4 mA	2.3 V	—	—	0.45	
		I <sub>OL</sub> = 6 mA	2.3 V	—	—	0.4	
		I <sub>OL</sub> = 12 mA	2.3 V	—	—	0.7	
			2.7 V	—	—	0.4	
		I <sub>OL</sub> = 24 mA	3 V	—	—	0.55	
I <sub>I</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND	3.6 V	—	—	±5	μA
I <sub>I(hold)</sub>		V <sub>I</sub> = 0.7 V	2.3 V	45	—	—	μA
		V <sub>I</sub> = 1.7 V	2.3 V	-45	—	—	
		V <sub>I</sub> = 0.8 V	3 V	75	—	—	
		V <sub>I</sub> = 2 V	3 V	-75	—	—	
		V <sub>I</sub> = 0 to 3.6 V <sup>2</sup>	3.6 V	—	—	±500	
I <sub>OZ</sub>		V <sub>O</sub> = V <sub>CC</sub> or GND	3.6 V	—	—	±10	μA
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	3.6 V	—	—	40	μA
ΔI <sub>CC</sub>		One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND	3 V to 3.6 V	—	—	750	μA
C <sub>i</sub>	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V	—	4.5	—	pF
	Data inputs			—	5	—	
C <sub>o</sub>	Outputs	V <sub>O</sub> = V <sub>CC</sub> or GND	3.3 V	—	7.5	—	pF

### NOTES:

1. All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>amb</sub> = 25°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.

# 7-bit to 28-bit address register/driver with 3-state outputs

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## TIMING REQUIREMENTS

Over recommended operating free-air temperature range (unless otherwise noted) (see Figures 1 through 3).

		V <sub>CC</sub> = 1.8 V		V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>CLK</sub>	Clock frequency	—	—	—	150	—	150	—	150	MHz
t <sub>W</sub>	Pulse duration, CLK high or low	—	—	3.3	—	3.3	—	3.3	—	ns
t <sub>SU</sub>	Setup time, A data before CLK ↑	—	—	2	—	2	—	1.6	—	ns
t <sub>h</sub>	Hold time, A data after CLK ↑	—	—	0.7	—	0.5	—	1.1	—	ns

## SWITCHING CHARACTERISTICS

Over recommended operating free-air temperature range (unless otherwise noted) (see Figures 1 through 3).

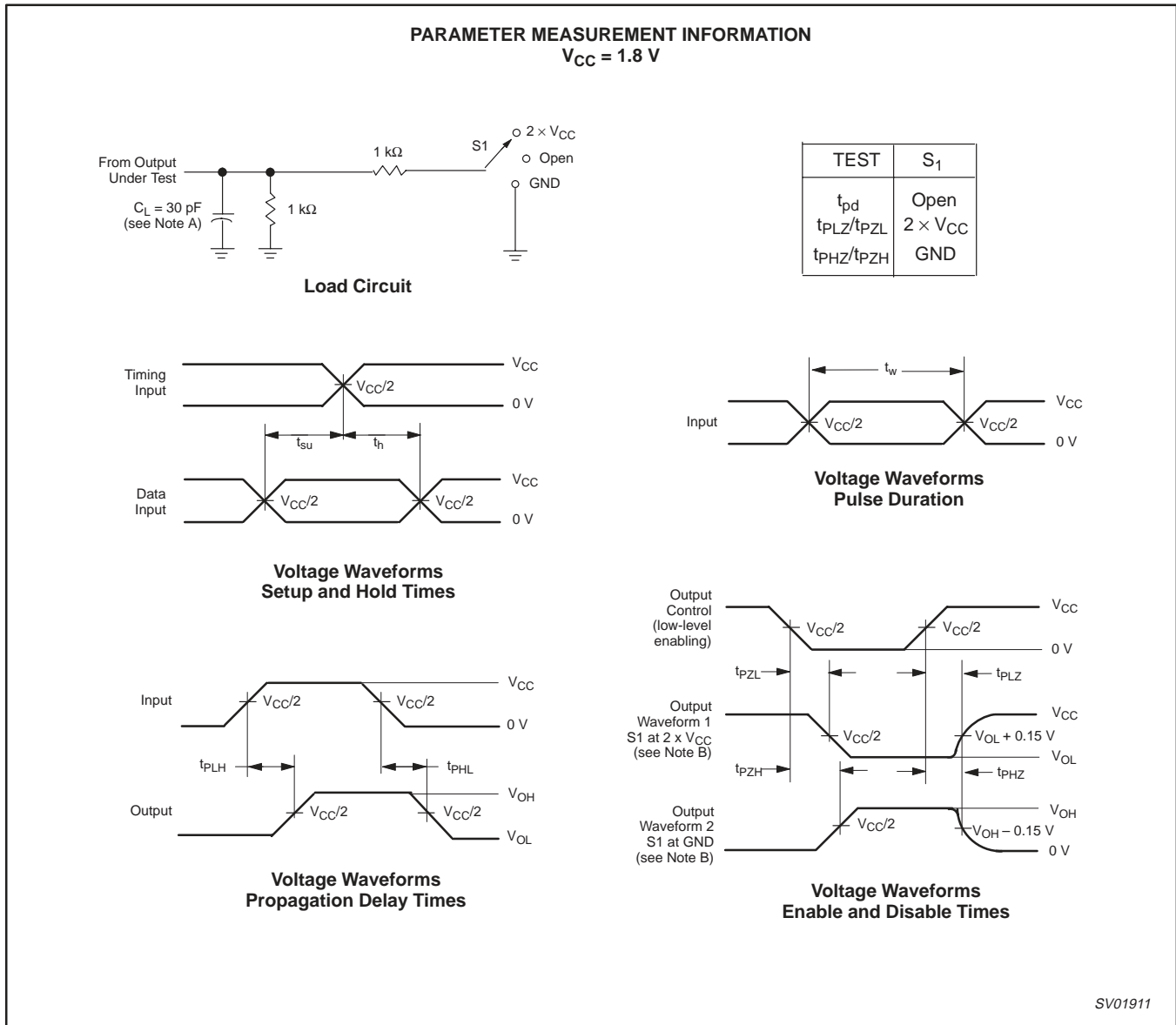
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 1.8 V		V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>MAX</sub>			—	—	150	—	150	—	150	—	MHz
t <sub>pd</sub>	A	Y	—	—	1.2	4	—	4.1	1.6	3.6	ns
	CLK		—	—	1.1	4.5	—	4.4	1.5	3.9	
	SEL		—	—	1.3	5.2	—	5.2	1.7	4.4	
t <sub>en</sub>	OE	Y	—	—	1.1	5.1	—	5	1.2	4.3	ns
t <sub>dis</sub>	OE	Y	—	—	1.4	5.5	—	4.7	1.6	4.5	ns

## OPERATING CHARACTERISTICS, T<sub>amb</sub> = 25 °C

SYMBOL	PARAMETER		TEST CONDITIONS	V <sub>CC</sub> = 1.8 V	V <sub>CC</sub> = 2.5 V	V <sub>CC</sub> = 3.3 V	UNIT
				TYP	TYP	TYP	
C <sub>pd</sub>	Power dissipation capacitance per driver	All outputs enabled	C <sub>L</sub> = 0, f = 10 MHz	—	119	132	pF
		All outputs disabled		—	22	25	

# 7-bit to 28-bit address register/driver with 3-state outputs

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**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:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 2\text{ ns}$ ,  $t_f \leq 2\text{ ns}$ .
- 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  $t_{pd}$ .

**Figure 1. Load circuit and voltage waveforms**

# 7-bit to 28-bit address register/driver with 3-state outputs

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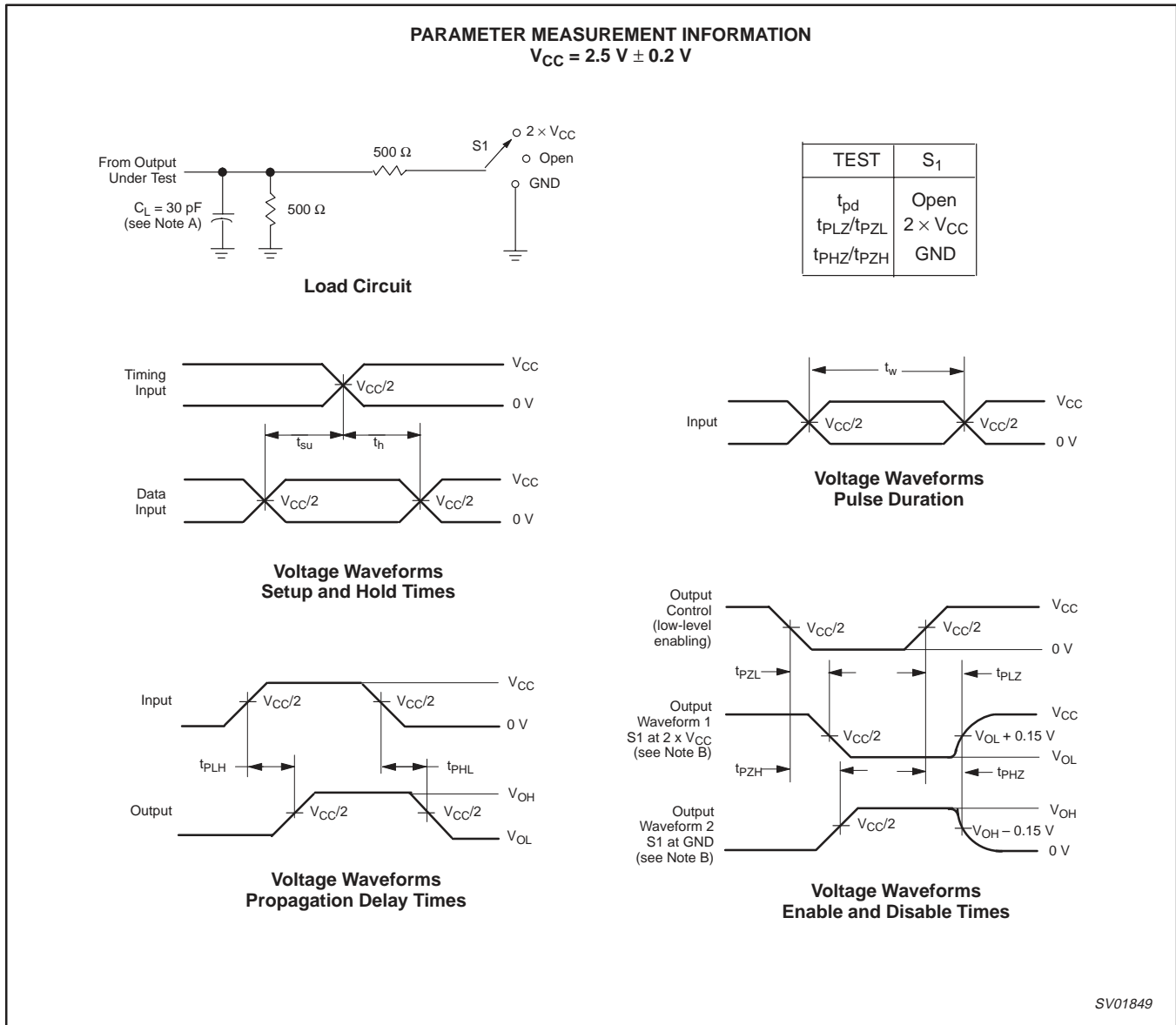


Figure 2. Load circuit and voltage waveforms

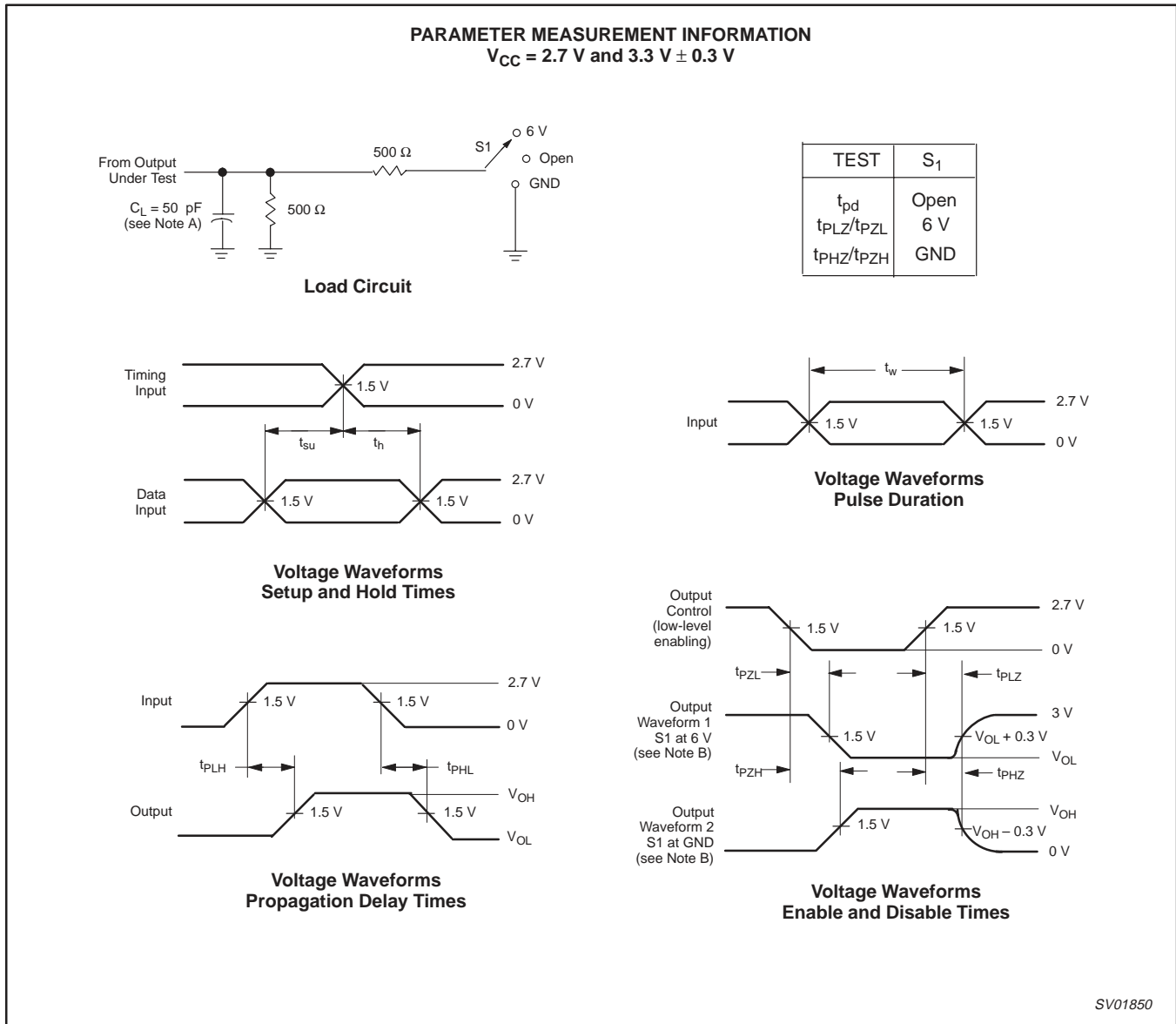
**NOTES:**

- A. C<sub>L</sub> 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<sub>O</sub> = 50 Ω, t<sub>r</sub> ≤ 2 ns, t<sub>f</sub> ≤ 2 ns.
- D. The outputs are measured one at a time with one transition per measurement.
- E. t<sub>P LZ</sub> and t<sub>P HZ</sub> are the same as t<sub>dis</sub>.
- F. t<sub>P ZL</sub> and t<sub>P ZH</sub> are the same as t<sub>en</sub>.
- G. t<sub>P LH</sub> and t<sub>P HL</sub> are the same as t<sub>pd</sub>.



# 7-bit to 28-bit address register/driver with 3-state outputs

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**NOTES:**

- A. C<sub>L</sub> 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<sub>O</sub> = 50 Ω, t<sub>r</sub> ≤ 2.5 ns, t<sub>f</sub> ≤ 2.5 ns.
- D. The outputs are measured one at a time with one transition per measurement.
- E. t<sub>PLZ</sub> and t<sub>PHZ</sub> are the same as t<sub>dis</sub>.
- F. t<sub>PZL</sub> and t<sub>PZH</sub> are the same as t<sub>en</sub>.
- G. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>pd</sub>.

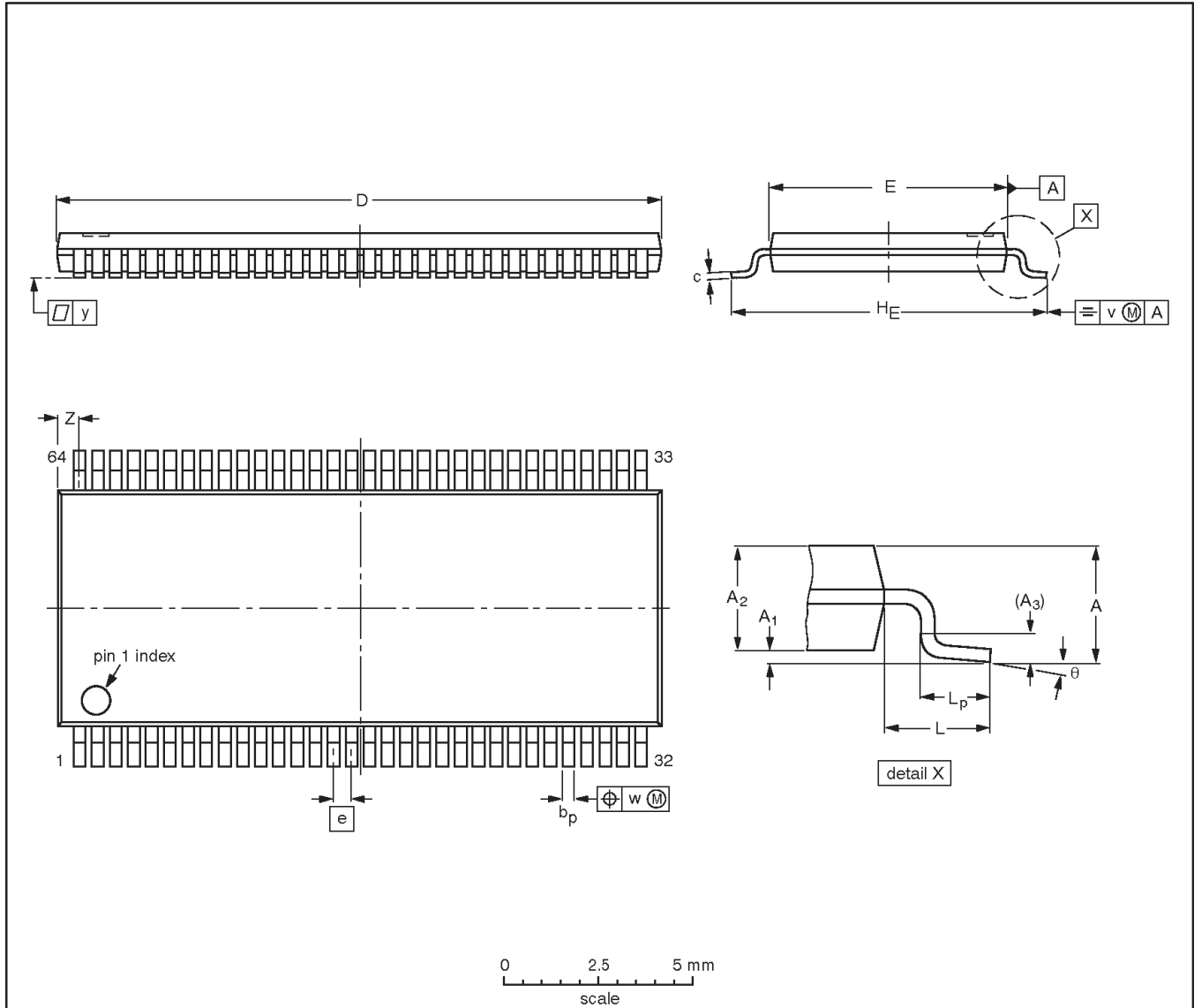
Figure 3. Load circuit and voltage waveforms

# 7-bit to 28-bit address register/driver with 3-state outputs

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**TSSOP64:** plastic thin shrink small outline package; 64 leads; body width 6.1 mm

**SOT646-1**



**DIMENSIONS (mm are the original dimensions).**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	v	w	y	Z	$\theta$
mm	1.2	0.15 0.05	1.05 0.85	0.25	0.27 0.17	0.2 0.1	17.1 16.9	6.2 6.0	0.5	8.3 7.9	1.0	0.75 0.45	0.2	0.08	0.1	0.89 0.61	8° 0°

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT646-1		MO-153				00-08-21

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**NOTES**

# 7-bit to 28-bit address register/driver with 3-state outputs

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## Data sheet status

Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup>	Definitions
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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