

## FEATURES

- Member of the Texas Instruments Widebus™ Family
- EPIC™ (Enhanced-Performance Implanted CMOS) Submicron Process
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Package Options Include Plastic Shrink Small-Outline (DL) and Thin Shrink Small-Outline (DGG) Packages

## DESCRIPTION

This 12-bit to 24-bit multiplexed D-type latch is designed for 1.65-V to 3.6-V  $V_{CC}$  operation.

The SN74ALVCH16260 is used in applications in which two separate data paths must be multiplexed onto, or demultiplexed from, a single data path. Typical applications include multiplexing and/or demultiplexing address and data information in microprocessor or bus-interface applications. This device also is useful in memory-interleaving applications.

Three 12-bit I/O ports (A1-A12, 1B1-1B12, and 2B1-2B12) are available for address and/or data transfer. The output-enable ( $\overline{OE1B}$ ,  $\overline{OE2B}$ , and  $\overline{OE A}$ ) inputs control the bus transceiver functions. The  $\overline{OE1B}$  and  $\overline{OE2B}$  control signals also allow bank control in the A-to-B direction.

Address and/or data information can be stored using the internal storage latches. The latch-enable (LE1B, LE2B, LEA1B, and LEA2B) inputs are used to control data storage. When the latch-enable input is high, the latch is transparent. When the latch-enable input goes low, the data present at the inputs is latched and remains latched until the latch-enable input is returned high.

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

The SN74ALVCH16260 is characterized for operation from -40°C to 85°C.

**DGG OR DL PACKAGE  
(TOP VIEW)**

$\overline{OE A}$	1	56	$\overline{OE2B}$
LE1B	2	55	LEA2B
2B3	3	54	2B4
GND	4	53	GND
2B2	5	52	2B5
2B1	6	51	2B6
$V_{CC}$	7	50	$V_{CC}$
A1	8	49	2B7
A2	9	48	2B8
A3	10	47	2B9
GND	11	46	GND
A4	12	45	2B10
A5	13	44	2B11
A6	14	43	2B12
A7	15	42	1B12
A8	16	41	1B11
A9	17	40	1B10
GND	18	39	GND
A10	19	38	1B9
A11	20	37	1B8
A12	21	36	1B7
$V_{CC}$	22	35	$V_{CC}$
1B1	23	34	1B6
1B2	24	33	1B5
GND	25	32	GND
1B3	26	31	1B4
LE2B	27	30	LEA1B
SEL	28	29	$\overline{OE1B}$



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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**SN74ALVCH16260**  
**12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCH**  
**WITH 3-STATE OUTPUTS**

SCES046G—JULY 1995—REVISED OCTOBER 2004

**FUNCTION TABLES**

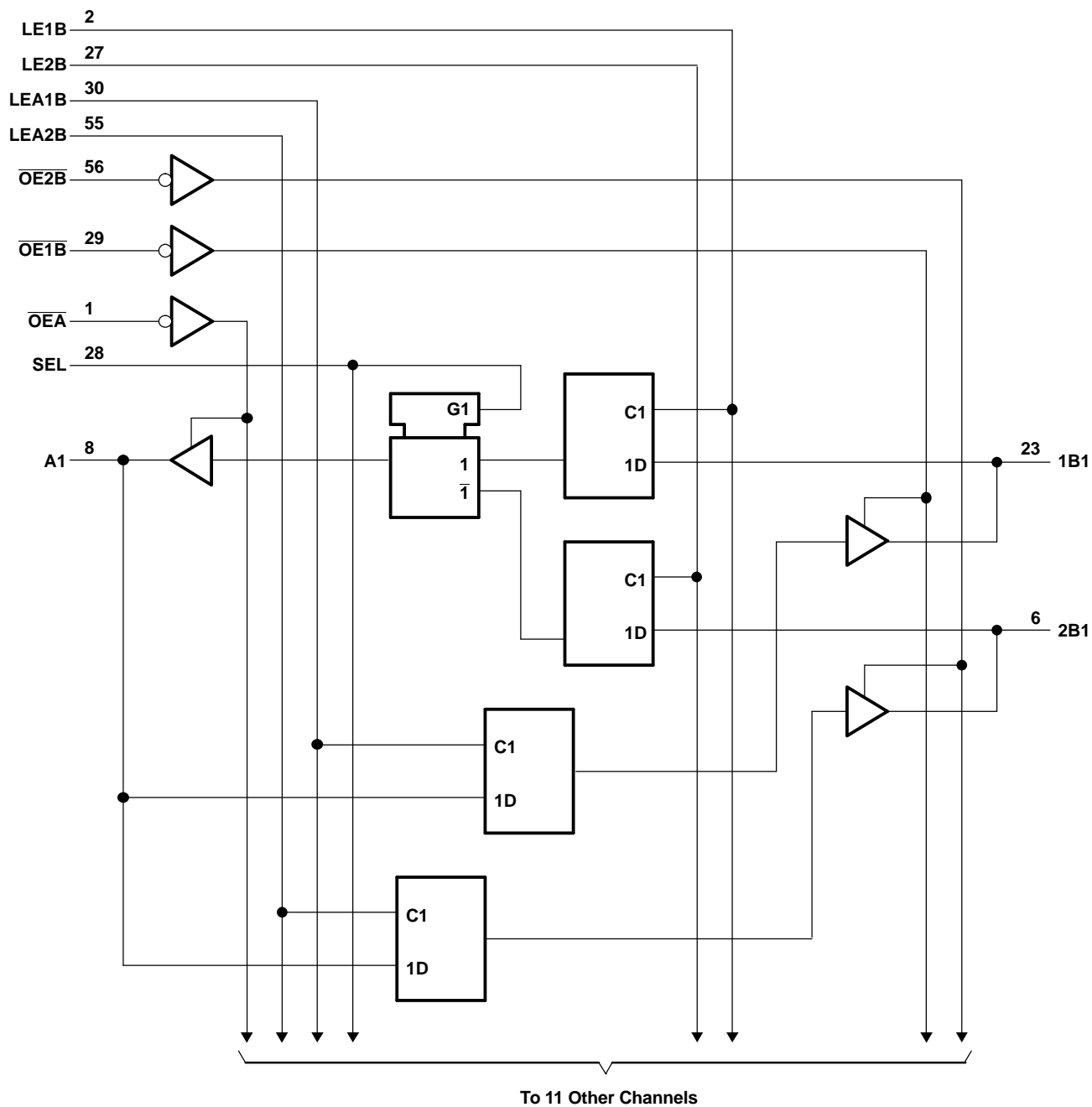
**B TO A ( $\overline{OE\overline{B}} = H$ )**

INPUTS						OUTPUT A
1B	2B	SEL	LE1B	LE2B	$\overline{OE\overline{A}}$	
H	X	H	H	X	L	H
L	X	H	H	X	L	L
X	X	H	L	X	L	A <sub>0</sub>
X	H	L	X	H	L	H
X	L	L	X	H	L	L
X	X	L	X	L	L	A <sub>0</sub>
X	X	X	X	X	H	Z

**A TO B ( $\overline{OE\overline{A}} = H$ )**

INPUTS					OUTPUTS	
A	LEA1B	LEA2B	$\overline{OE1\overline{B}}$	$\overline{OE2\overline{B}}$	1B	2B
H	H	H	L	L	H	H
L	H	H	L	L	L	L
H	H	L	L	L	H	2B <sub>0</sub>
L	H	L	L	L	L	2B <sub>0</sub>
H	L	H	L	L	1B <sub>0</sub>	H
L	L	H	L	L	1B <sub>0</sub>	L
X	L	L	L	L	1B <sub>0</sub>	2B <sub>0</sub>
X	X	X	H	H	Z	Z
X	X	X	L	H	Active	Z
X	X	X	H	L	Z	Active
X	X	X	L	L	Active	Active

**LOGIC DIAGRAM (POSITIVE LOGIC)**



# SN74ALVCH16260

## 12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCH WITH 3-STATE OUTPUTS

SCES046G–JULY 1995–REVISED OCTOBER 2004

### ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

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

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range		-0.5	4.6	V
V <sub>I</sub>	Input voltage range	Except I/O ports <sup>(2)</sup>	-0.5	4.6	V
		I/O ports <sup>(2)(3)</sup>	-0.5	V <sub>CC</sub> + 0.5	
V <sub>O</sub>	Output voltage range <sup>(2)(3)</sup>		-0.5	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
Continuous current through each V <sub>CC</sub> or GND			±100		mA
θ <sub>JA</sub>	Package thermal impedance <sup>(4)</sup>	DGG package	81		°C/W
		DL package	74		
T <sub>stg</sub>	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.

### RECOMMENDED OPERATING CONDITIONS<sup>(1)</sup>

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage		1.65	3.6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7		
		V <sub>CC</sub> = 2.7 V to 3.6 V	2		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.35 × V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.7		
		V <sub>CC</sub> = 2.7 V to 3.6 V	0.8		
V <sub>I</sub>	Input voltage		0	V <sub>CC</sub>	V
V <sub>O</sub>	Output voltage		0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 1.65 V	-4		mA
		V <sub>CC</sub> = 2.3 V	-12		
		V <sub>CC</sub> = 2.7 V	-12		
		V <sub>CC</sub> = 3 V	-24		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 1.65 V	4		mA
		V <sub>CC</sub> = 2.3 V	12		
		V <sub>CC</sub> = 2.7 V	12		
		V <sub>CC</sub> = 3 V	24		
Δt/Δv	Input transition rise or fall rate			10	ns/V
T <sub>A</sub>	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.

## ELECTRICAL CHARACTERISTICS

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

PARAMETER		TEST CONDITIONS	V <sub>CC</sub>	MIN	TYP <sup>(1)</sup>	MAX	UNIT
V <sub>OH</sub>		I <sub>OH</sub> = -100 μA	1.65 V to 3.6 V	V <sub>CC</sub> - 0.2			V
		I <sub>OH</sub> = -4 mA	1.65 V	1.2			
		I <sub>OH</sub> = -6 mA	2.3 V	2			
		I <sub>OH</sub> = -12 mA	2.3 V	1.7			
			2.7 V	2.2			
			3 V	2.4			
		I <sub>OH</sub> = -24 mA	3 V	2			
V <sub>OL</sub>		I <sub>OL</sub> = 100 μA	1.65 V to 3.6 V	0.2		V	
		I <sub>OL</sub> = 4 mA	1.65 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> = 0.58 V	1.65 V	25		μA	
		V <sub>I</sub> = 1.07 V	1.65 V	-25			
		V <sub>I</sub> = 0.7 V	2.3 V	45			
		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> <sup>(3)</sup>		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	3.5		pF	
C <sub>io</sub>	A or B ports	V <sub>O</sub> = V <sub>CC</sub> or GND	3.3 V	9		pF	

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</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.

(3) For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

## TIMING REQUIREMENTS

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1 through Figure 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	
t <sub>w</sub>	Pulse duration, LE1B, LE2B, LEA1B, or LEA2B high	(1)		3.3		3.3		3.3		ns
t <sub>su</sub>	Setup time, data before LE1B, LE2B, LEA1B, or LEA2B	(1)		1.4		1.1		1.1		ns
t <sub>h</sub>	Hold time, data after LE1B, LE2B, LEA1B, or LEA2B	(1)		1.6		1.9		1.5		ns

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

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## 12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCH WITH 3-STATE OUTPUTS

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### SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1 through Figure 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
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A or B	B or A	(1)	1	5.4		5.1	1.2	4.3	ns
	LE	A or B	(1)	1	5.6		5.2	1	4.4	
	SEL	A	(1)	1	6.9		6.6	1.1	5.6	
t <sub>en</sub>	$\overline{OE}$	A or B	(1)	1	6.7		6.4	1	5.4	ns
t <sub>dis</sub>	$\overline{OE}$	A or B	(1)	1	5.7		5	1.3	4.6	ns

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

### OPERATING CHARACTERISTICS

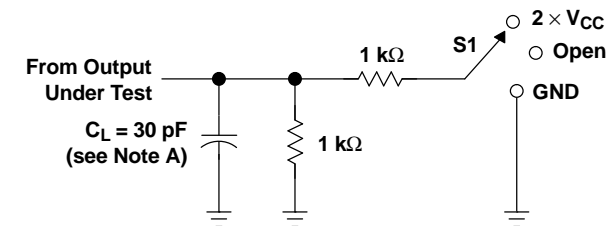
T<sub>A</sub> = 25°C

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	All outputs enabled	C <sub>L</sub> = 50 pF, f = 10 MHz	(1)	37	41	pF
	All outputs disabled		(1)	4	7	

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

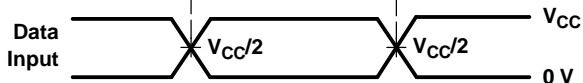
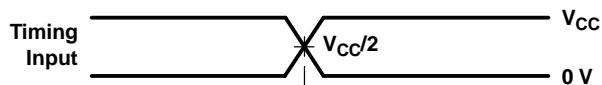
# PARAMETER MEASUREMENT INFORMATION

$V_{CC} = 1.8 \text{ V}$

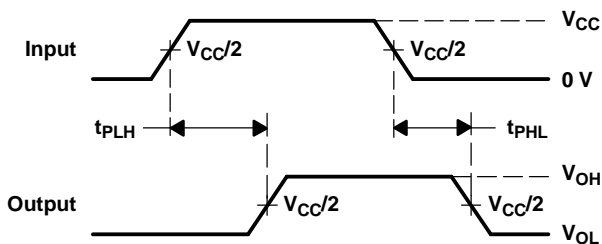


LOAD CIRCUIT

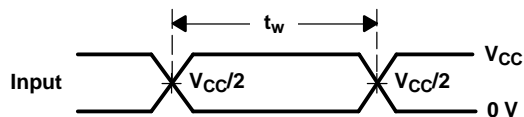
TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



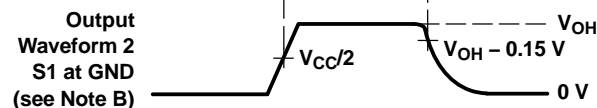
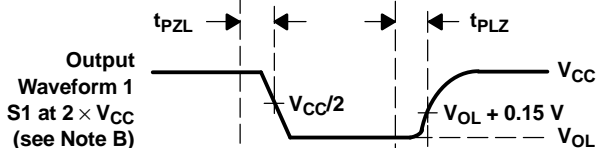
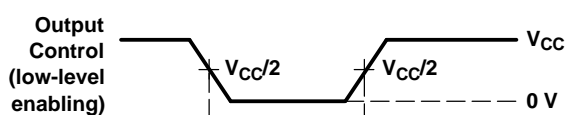
VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2 \text{ ns}$ ,  $t_f \leq 2 \text{ ns}$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

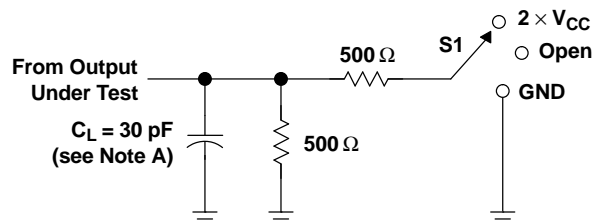
# SN74ALVCH16260

## 12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCH WITH 3-STATE OUTPUTS

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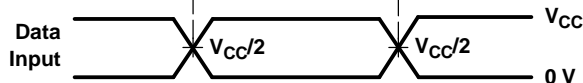
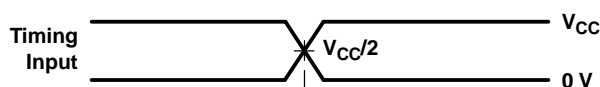
### PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$$

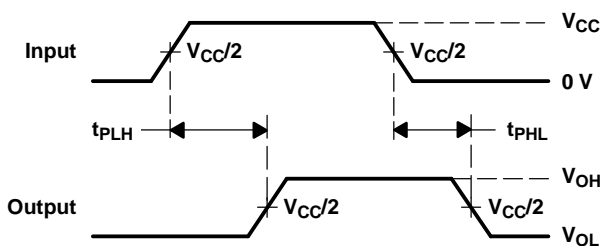


LOAD CIRCUIT

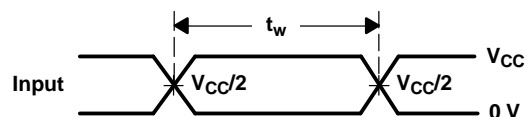
TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	2 $\times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



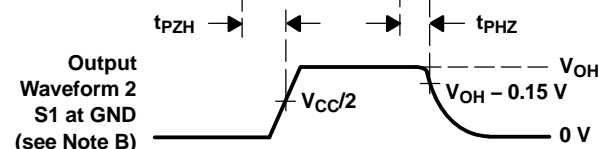
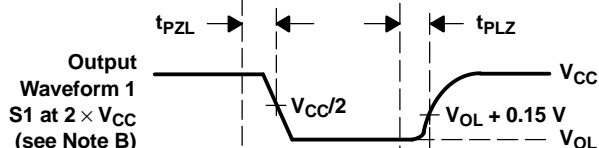
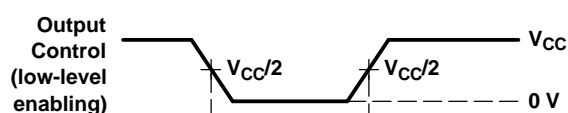
VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES

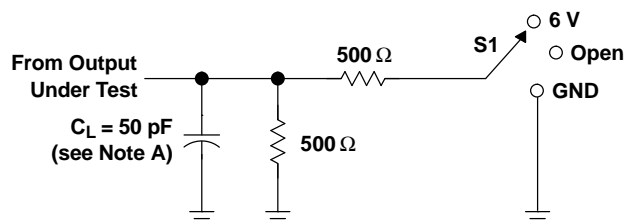
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  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 2. Load Circuit and Voltage Waveforms



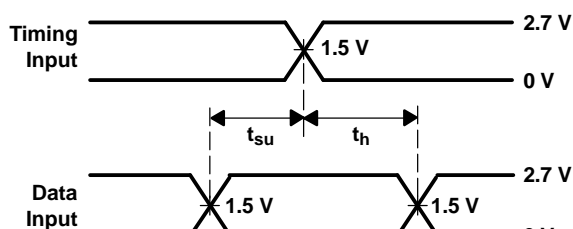
# PARAMETER MEASUREMENT INFORMATION

$V_{CC} = 2.7\text{ V}$  AND  $3.3\text{ V} \pm 0.3\text{ V}$

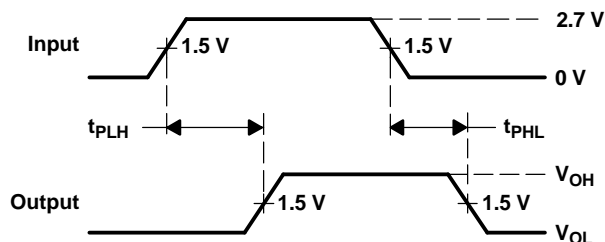


LOAD CIRCUIT

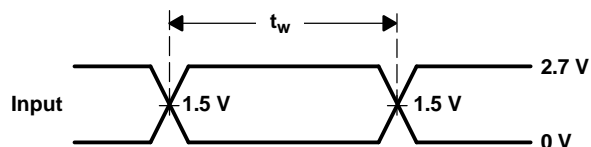
TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	6 V
$t_{PHZ}/t_{PZH}$	GND



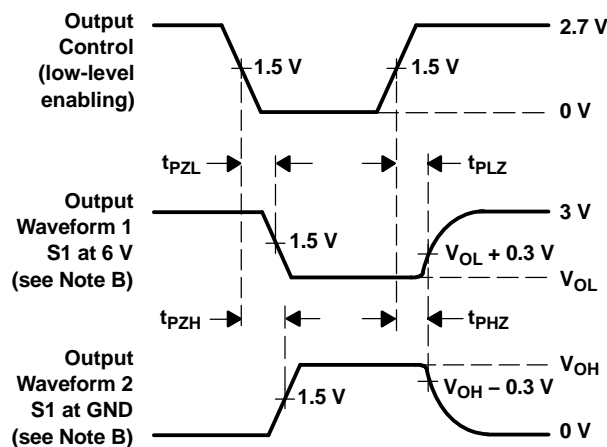
VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



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  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 3. Load Circuit and Voltage Waveforms

## PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">SN74ALVCH16260DGGR</a>	Active	Production	TSSOP (DGG)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVCH16260
SN74ALVCH16260DGGR.B	Active	Production	TSSOP (DGG)   56	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVCH16260
<a href="#">SN74ALVCH16260DL</a>	Active	Production	SSOP (DL)   56	20   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVCH16260
SN74ALVCH16260DL.B	Active	Production	SSOP (DL)   56	20   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVCH16260

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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## TAPE AND REEL INFORMATION



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ALVCH16260DGGR	TSSOP	DGG	56	2000	330.0	24.4	8.9	14.7	1.4	12.0	24.0	Q1

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALVCH16260DGGR	TSSOP	DGG	56	2000	356.0	356.0	45.0

## TUBE

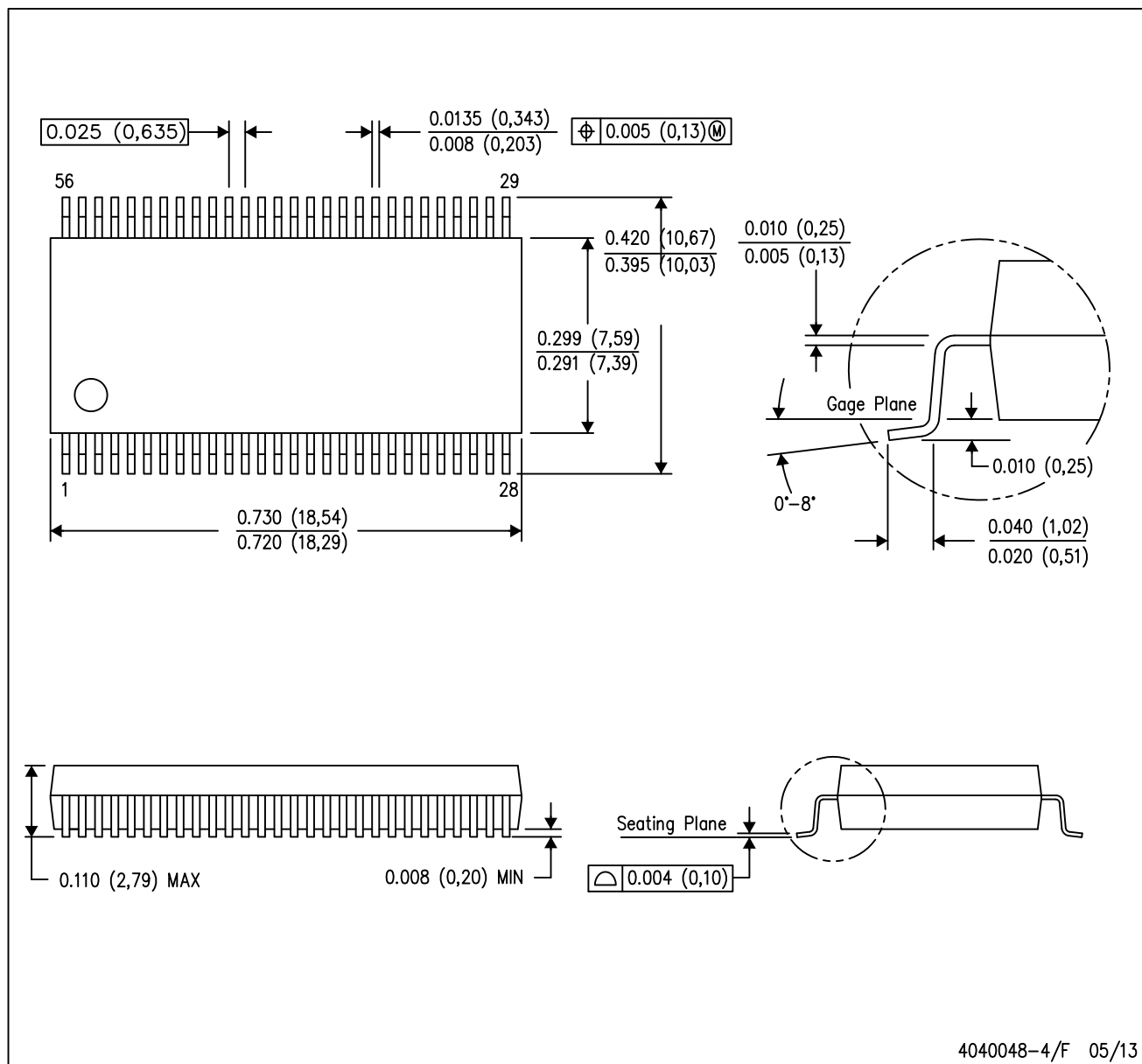


\*All dimensions are nominal

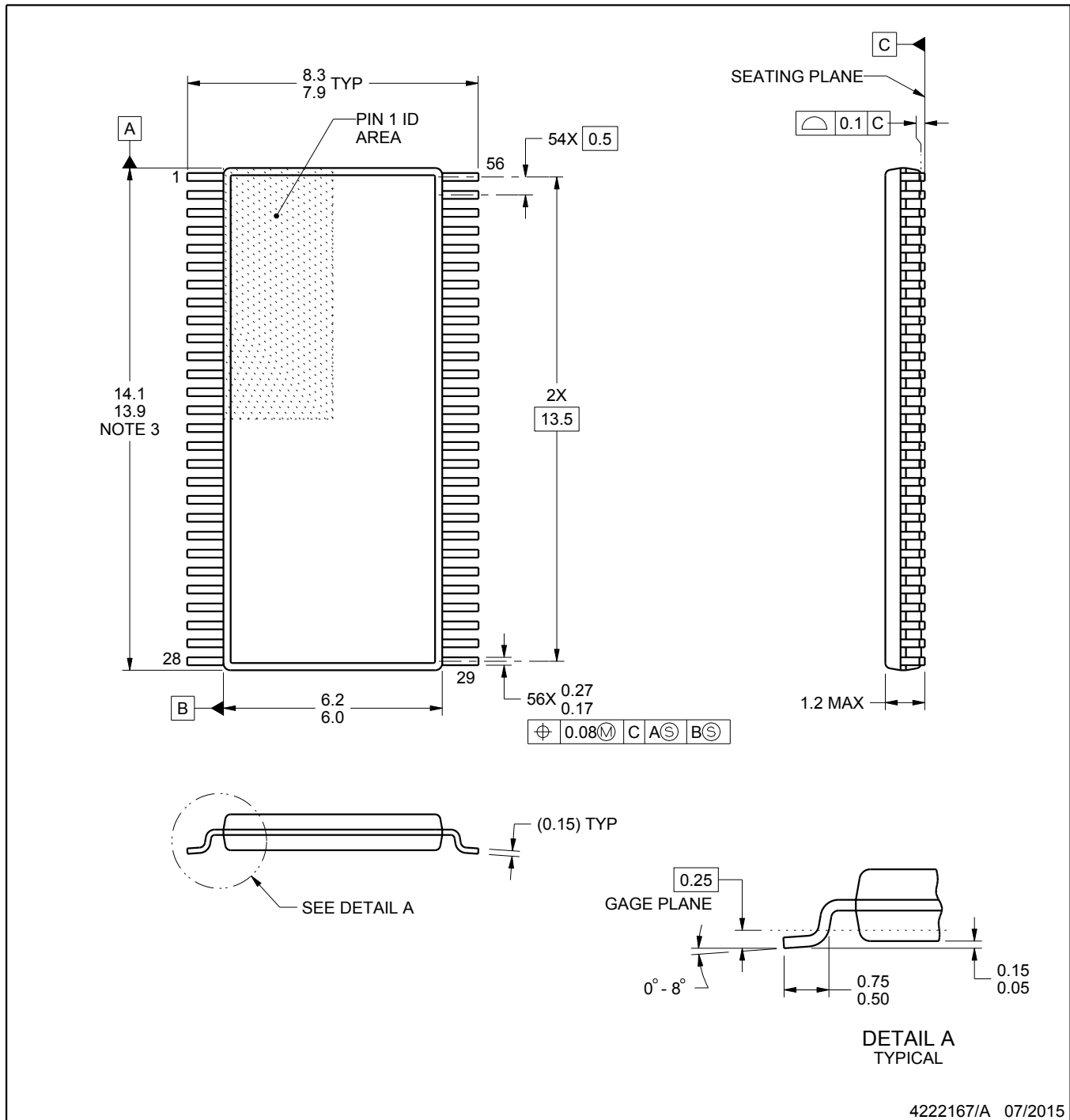
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ALVCH16260DL	DL	SSOP	56	20	473.7	14.24	5110	7.87
SN74ALVCH16260DL.B	DL	SSOP	56	20	473.7	14.24	5110	7.87

DL (R-PDSO-G56)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed  $0.006$  (0,15).
  - D. Falls within JEDEC MO-118



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## NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-153.





## EXAMPLE STENCIL DESIGN

DGG0056A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

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NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

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