

FEATURES

- Member of the Texas Instruments Widebus™ Family
- EPIC™ (Enhanced-Performance Implanted CMOS) Submicron Process
- B-Port Outputs Have Equivalent 26-Ω Series Resistors, So No External Resistors Are Required
- 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 Thin-Shrink Small-Outline (DGG) and Plastic Shrink Small-Outline (DL) Packages

NOTE: For tape-and-reel order entry: The DGGR package is abbreviated to GR.

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 SN74ALVCH162260 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.

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

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 SN74ALVCH162260 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	$\overline{OE1B}$



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SN74ALVCH162260
12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCH
WITH 3-STATE OUTPUTS

SCAS570I—MARCH 1996—REVISED AUGUST 2004

FUNCTION TABLES

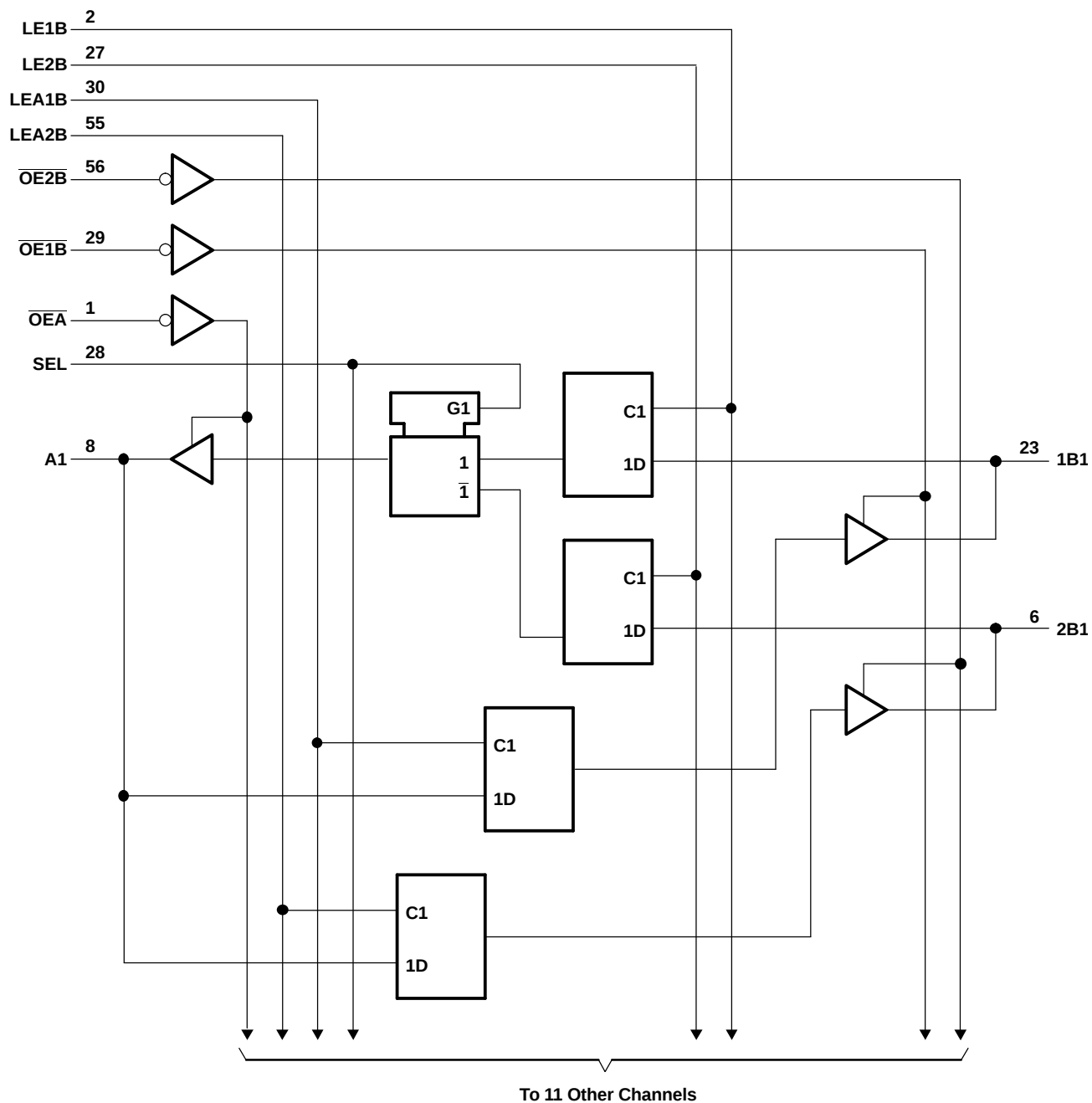
B TO A
($\overline{OE}B = H$)

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

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

INPUTS					OUTPUTS	
A	LEA1B	LEA2B	$\overline{OE}1B$	$\overline{OE}2B$	1B	2B
H	H	H	L	L	H	H
L	H	H	L	L	L	L
H	H	L	L	L	H	2B ₀
L	H	L	L	L	L	2B ₀
H	L	H	L	L	1B ₀	H
L	L	H	L	L	1B ₀	L
X	L	L	L	L	1B ₀	2B ₀
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)



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12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCH

WITH 3-STATE OUTPUTS

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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	
V _I	Input voltage range	Except I/O ports ⁽²⁾	-0.5	4.6	V	
		I/O ports ⁽²⁾⁽³⁾	-0.5	V _{CC} + 0.5		
V _O	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
I _O	Continuous output current				±50	mA
Continuous current through each V _{CC} or GND					±100	mA
θ _{JA}	Package thermal impedance ⁽⁴⁾	DGG package			81	°C/W
		DGV package			86	
		DL package			74	
T _{stg}	Storage temperature		-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⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage		1.65	3.6	V
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	1.7		
		V _{CC} = 2.7 V to 3.6 V	2		
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.35 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	0.7		
		V _{CC} = 2.7 V to 3.6 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 (A port)	V _{CC} = 1.65 V	-4		mA
		V _{CC} = 2.3 V	-12		
		V _{CC} = 2.7 V	-12		
		V _{CC} = 3 V	-24		
	High-level output current (B port)	V _{CC} = 1.65 V	-2		
		V _{CC} = 2.3 V	-6		
		V _{CC} = 2.7 V	-8		
		V _{CC} = 3 V	-12		
I _{OL}	Low-level output current (A port)	V _{CC} = 1.65 V	4		mA
		V _{CC} = 2.3 V	12		
		V _{CC} = 2.7 V	12		
		V _{CC} = 3 V	24		
	Low-level output current (B port)	V _{CC} = 1.65 V	2		
		V _{CC} = 2.3 V	6		
		V _{CC} = 2.7 V	8		
		V _{CC} = 3 V	12		
Δt/Δv	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.

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12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCH

WITH 3-STATE OUTPUTS

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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
V _{OH}	A port	I _{OH} = -100 µA	1.65 V to 3.6 V	V _{CC} - 0.2			V
		I _{OH} = -4 mA	1.65 V	1.2			
		I _{OH} = -6 mA	2.3 V	2			
		I _{OH} = -12 mA	2.3 V	1.7			
			2.7 V	2.2			
			3 V	2.4			
		I _{OH} = -24 mA	3 V	2			
	B port	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			
		I _{OH} = -6 mA	2.3 V	1.7			
			3 V	2.4			
		I _{OH} = -8 mA	2.7 V	2			
		I _{OH} = -12 mA	3 V	2			
V _{OL}	A port	I _{OL} = 100 µA	1.65 V to 3.6 V			0.2	V
		I _{OL} = 4 mA	1.65 V			0.45	
		I _{OL} = 6 mA	2.3 V			0.4	
		I _{OL} = 12 mA	2.3 V			0.7	
			2.7 V			0.4	
		I _{OL} = 24 mA	3 V			0.55	
	B port	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	
		I _{OL} = 6 mA	2.3 V			0.55	
			3 V			0.55	
		I _{OL} = 8 mA	2.7 V			0.6	
		I _{OL} = 12 mA	3 V			0.8	
I _I		V _I = V _{CC} or GND	3.6 V			±5	µA
I _{I(hold)}		V _I = 0.58 V	1.65 V	25			µA
		V _I = 1.07 V		-25			
		V _I = 0.7 V	2.3 V	45			
		V _I = 1.7 V		-45			
		V _I = 0.8 V	3 V	75			
		V _I = 2 V		-75			
		V _I = 0 to 3.6 V ⁽²⁾	3.6 V			±500	
I _{OZ} ⁽³⁾		V _O = V _{CC} or GND	3.6 V			±10	µA
I _{CC}		V _I = V _{CC} or GND, I _O = 0	3.6 V			40	µA
ΔI _{CC}		One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND	3 V to 3.6 V			750	µA
C _i	Control inputs	V _I = V _{CC} or GND	3.3 V			3.5	pF
C _{io}	A or B ports	V _O = V _{CC} or GND	3.3 V			4.5	pF

(1) All typical values are at V_{CC} = 3.3 V, T_A = 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_{OZ} includes the input leakage current.

TIMING REQUIREMENTS

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1 through Figure 3)

		$V_{CC} = 1.8\text{ V}$		$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f_{clock}	Clock frequency	(1)		150		150		150		MHz
t_w	Pulse duration, LE1B, LE2B, LEA1B, or LEA2B high	(1)		3.3		3.3		3.3		ns
t_{su}	Setup time, data before LE1B, LE2B, LEA1B, or LEA2B high or low	(1)		1.4		1.1		1.1		ns
t_h	Hold time, data after LE1B, LE2B, LEA1B, or LEA2B high or low	(1)		1.6		1.9		1.5		ns

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

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1 through Figure 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8\text{ V}$		$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		UNIT
			MIN	TYP	MIN	MAX	MIN	MAX	MIN	MAX	
f_{max}			(1)		150		150		150		MHz
t_{pd}	A	B	(1)		1	5.9	5.8		1.2	4.9	ns
	B	A	(1)		1	5.7	5.1		1.2	4.3	
	LE	A	(1)		1	5.6	5.2		1	4.4	
		B	(1)		1	6.1	5.9		1	5	
	SEL	A	(1)		1	6.9	6.6		1.1	5.6	
t_{en}	$\overline{\text{OE}}$	A	(1)		1	6.7	6.4		1	5.4	ns
		B	(1)		1	7.2	7.1		1	6	
t_{dis}	$\overline{\text{OE}}$	A	(1)		1	5.7	5		1.3	4.6	ns
		B	(1)		1	6.2	5.5		1.3	5.1	

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

OPERATING CHARACTERISTICS

$T_A = 25^\circ\text{C}$

PARAMETER			TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	UNIT
				TYP	TYP	TYP	
C_{pd}	Power dissipation capacitance	All outputs enabled	$C_L = 50\text{ pF}, f = 10\text{ MHz}$	(1)	37	41	pF
		All outputs disabled		(1)	4	7	

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

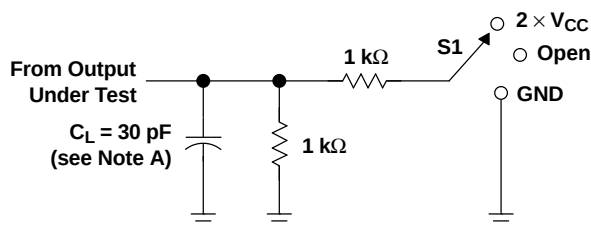
SN74ALVCH162260

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

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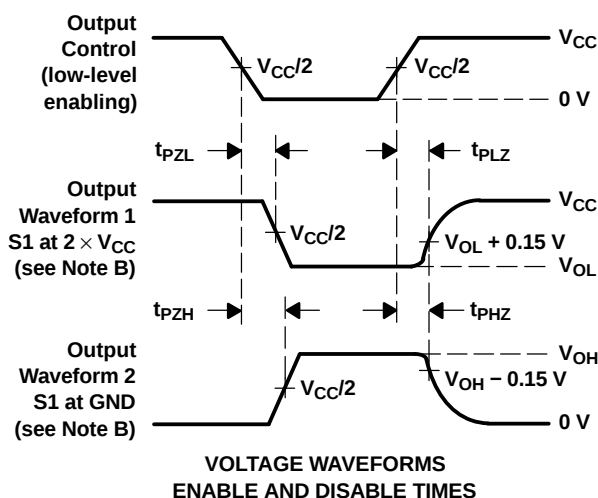
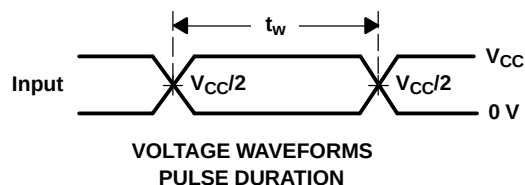
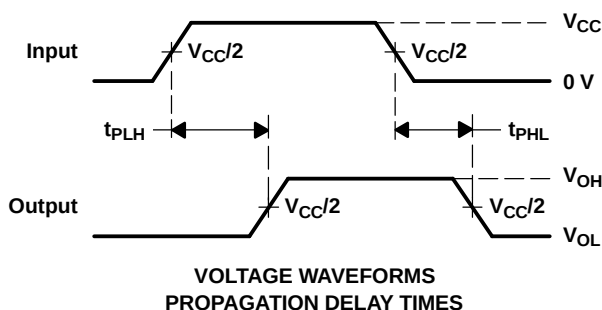
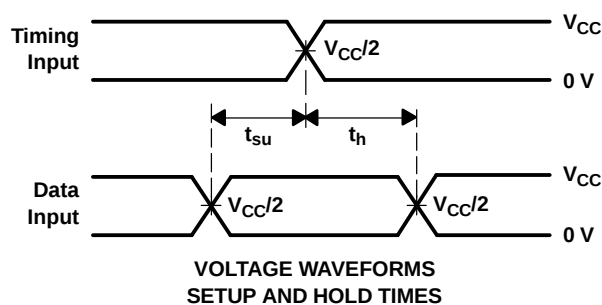
PARAMETER MEASUREMENT INFORMATION

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



LOAD CIRCUIT

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

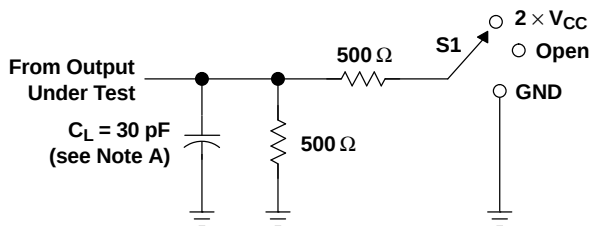


- NOTES:
- C_L includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - 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

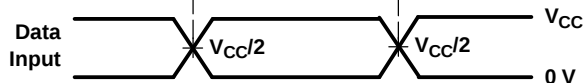
PARAMETER MEASUREMENT INFORMATION

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

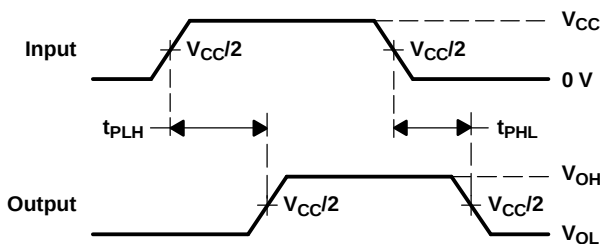


LOAD CIRCUIT

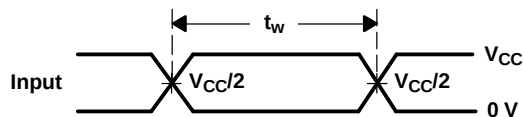
TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	2 $\times V_{CC}$
t_{PHZ}/t_{PZH}	GND



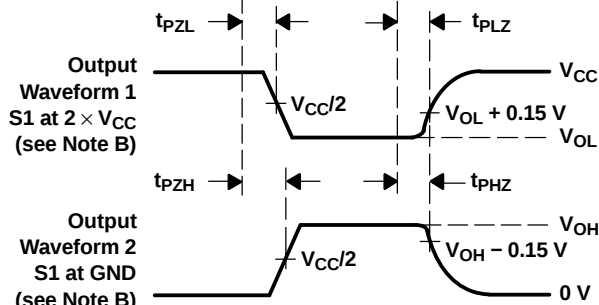
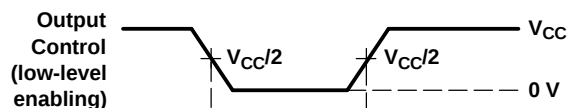
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

- NOTES: A. C_L includes probe and jig capacitance.
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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 2. Load Circuit and Voltage Waveforms

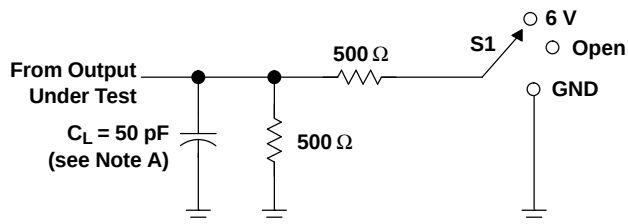
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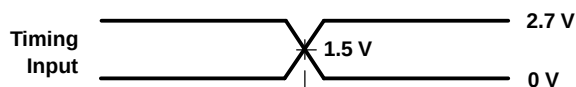
PARAMETER MEASUREMENT INFORMATION

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

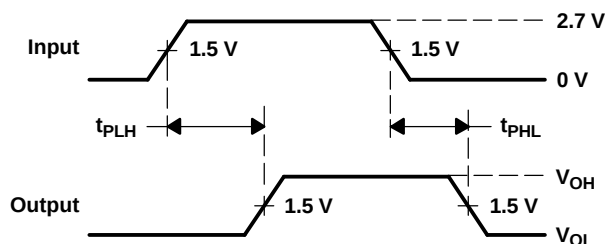


LOAD CIRCUIT

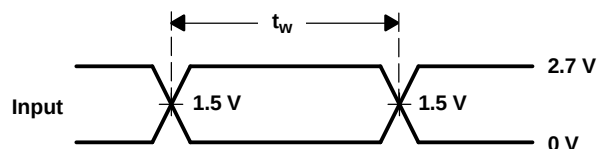
TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	6 V
t_{PHZ}/t_{PZH}	GND



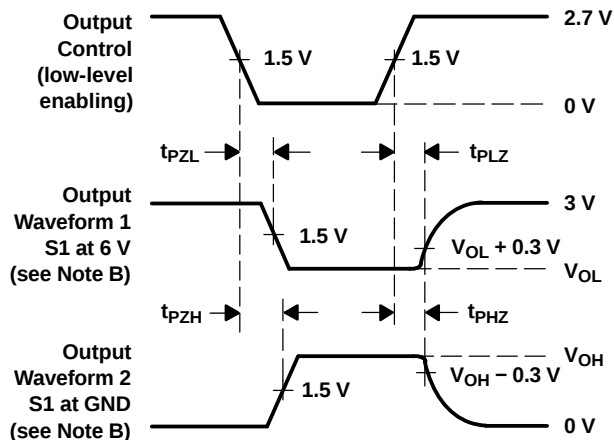
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

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: $PRR \leq 10\text{ MHz}$, $Z_O = 50\text{ }\Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.

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 3. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74ALVCH162260DLG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74ALVCH162260DLRG4	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74ALVCH162260GRE4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74ALVCH162260GRG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALVCH162260DGGR	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI
SN74ALVCH162260DL	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALVCH162260DLR	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALVCH162260GR	ACTIVE	TSSOP	DGG	56	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.

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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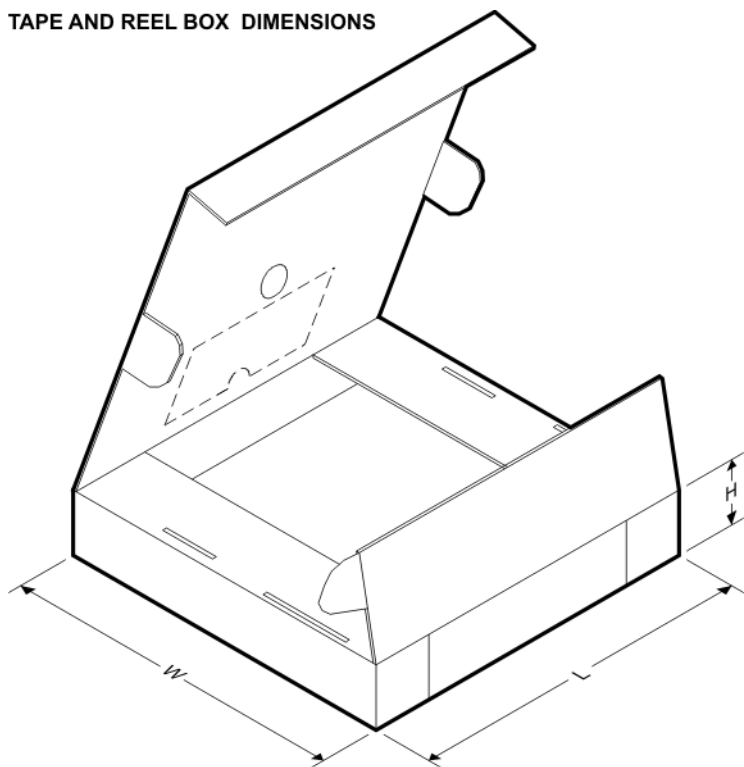
TAPE AND REEL INFORMATION



*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
SN74ALVCH162260DLR	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
SN74ALVCH162260GR	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	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)
SN74ALVCH162260DLR	SSOP	DL	56	1000	346.0	346.0	49.0
SN74ALVCH162260GR	TSSOP	DGG	56	2000	346.0	346.0	41.0

DGG (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

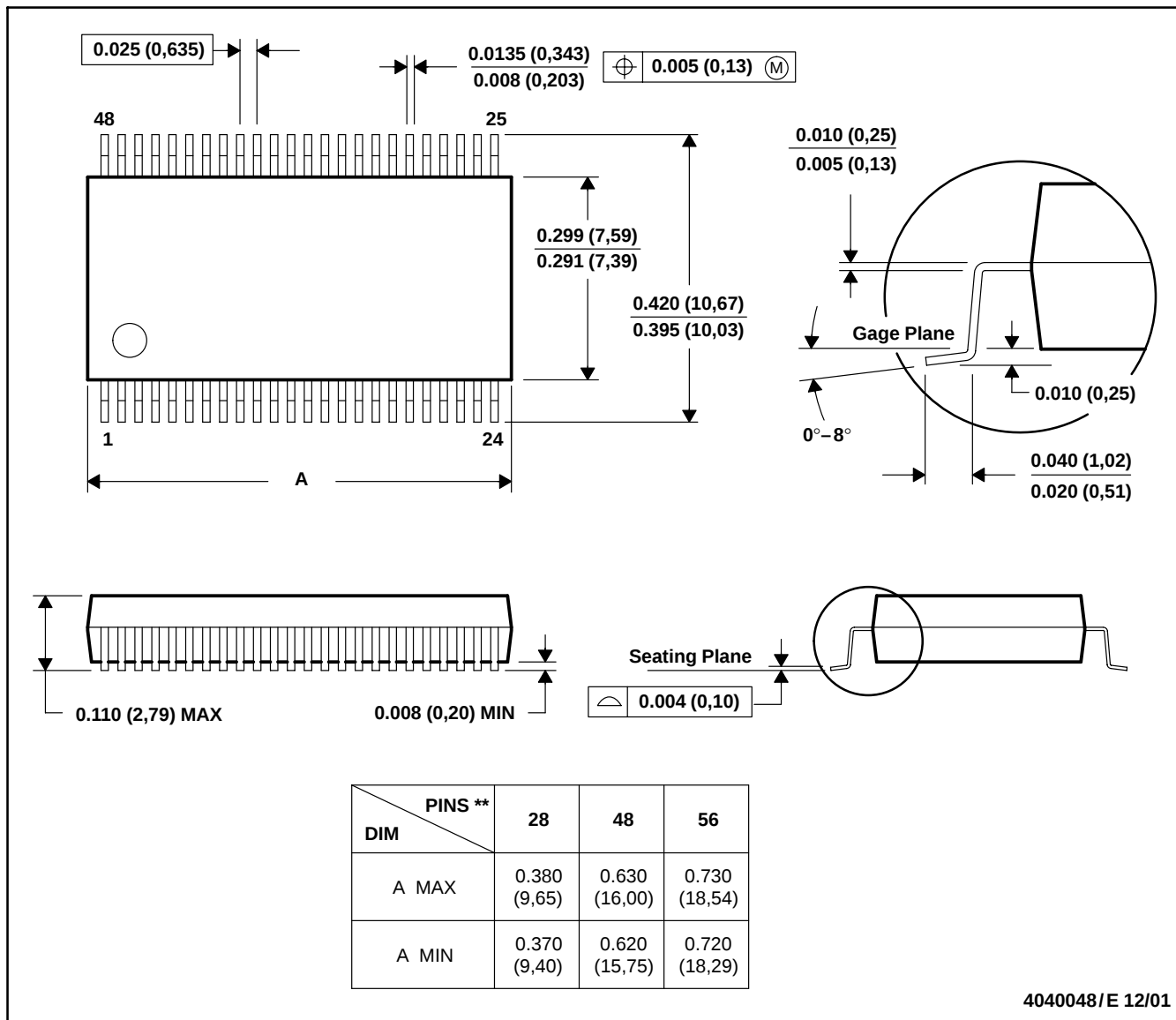


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

DL (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



- 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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