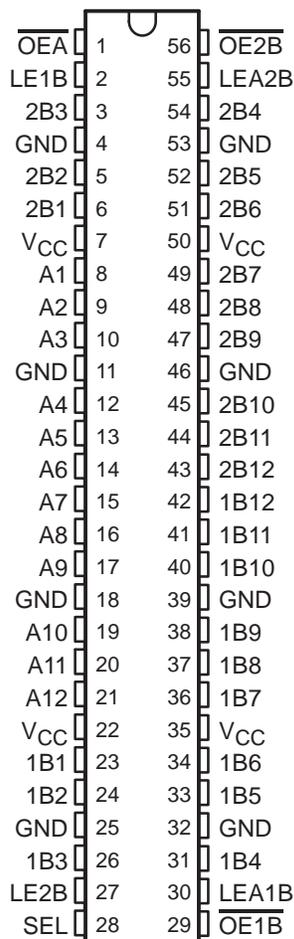


# SN54ABTH162260, SN74ABTH162260 12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCHES WITH SERIES-DAMPING RESISTORS AND 3-STATE OUTPUTS

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- **Members of the Texas Instruments Widebus™ Family**
- **B-Port Outputs Have Equivalent 25-Ω Series Resistors, So No External Resistors Are Required**
- **State-of-the-Art EPIC-II B™ BiCMOS Design Significantly Reduces Power Dissipation**
- **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 500 mA Per JEDEC Standard JESD-17**
- **Typical V<sub>OLP</sub> (Output Ground Bounce) < 1 V at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C**
- **High-Impedance State During Power Up and Power Down**
- **Distributed V<sub>CC</sub> and GND Pin Configuration Minimizes High-Speed Switching Noise**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors**
- **Package Options Include Plastic 300-mil Shrink Small-Outline (DL) Package and 380-mil Fine-Pitch Ceramic Flat (WD) Package Using 25-mil Center-to-Center Spacings**

SN54ABTH162260 . . . WD PACKAGE  
SN74ABTH162260 . . . DL PACKAGE  
(TOP VIEW)



## description

The 'ABTH162260 are 12-bit to 24-bit multiplexed D-type latches used in applications where two separate data paths must be multiplexed onto, or demultiplexed from, a single data path. Typical applications include multiplexing and/or demultiplexing of address and data information in microprocessor or bus-interface applications. These devices are also 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  $\overline{OEA}$ ) 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-port outputs, which are designed to sink up to 12 mA, include equivalent 25-Ω series resistors to reduce overshoot and undershoot.



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 **TEXAS  
INSTRUMENTS**

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**SN54ABTH162260, SN74ABTH162260**  
**12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCHES**  
**WITH SERIES-DAMPING RESISTORS AND 3-STATE OUTPUTS**

SCBS240D – JUNE 1992 – REVISED MAY 1997

**description (continued)**

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

When  $V_{CC}$  is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 V,  $\overline{OE}$  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.

The SN54ABTH162260 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ABTH162260 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

**Function Tables**

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

INPUTS						OUTPUT
1B	2B	SEL	LE1B	LE2B	$\overline{OEA}$	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 ( $\overline{OEA} = \text{H}$ )**

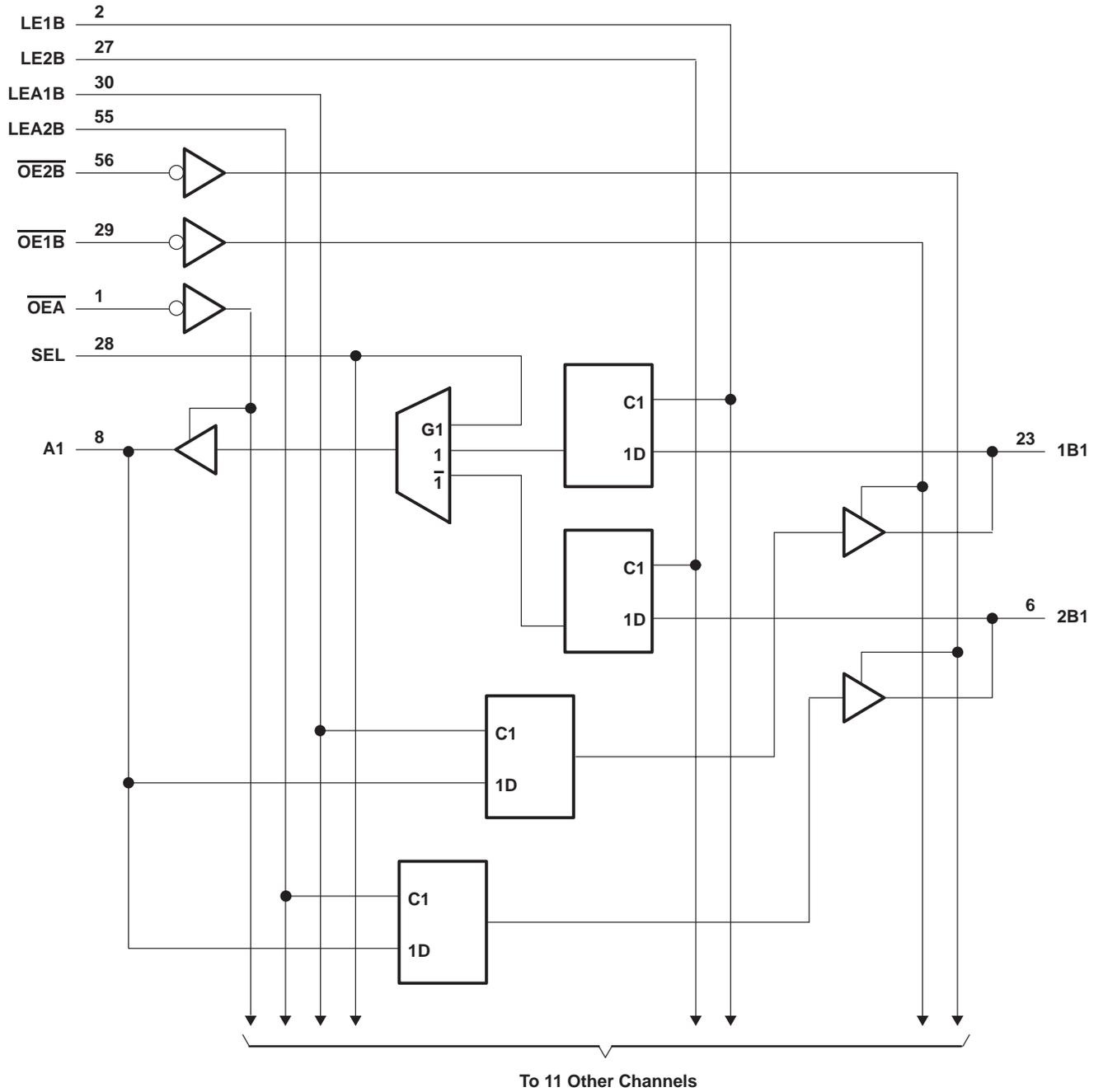
INPUTS					OUTPUTS	
A	LEA1B	LEA2B	$\overline{OE1B}$	$\overline{OE2B}$	1B	2B
H	H	H	L	L	H	H
L	H	H	L	L	L	L
H	H	L	L	L	H	2B <sub>0</sub>
L	H	L	L	L	L	2B <sub>0</sub>
H	L	H	L	L	1B <sub>0</sub>	H
L	L	H	L	L	1B <sub>0</sub>	L
X	L	L	L	L	1B <sub>0</sub>	2B <sub>0</sub>
X	X	X	H	H	Z	Z
X	X	X	L	H	Active	Z
X	X	X	H	L	Z	Active
X	X	X	L	L	Active	Active



**SN54ABTH162260, SN74ABTH162260**  
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SCBS240D – JUNE 1992 – REVISED MAY 1997

**logic diagram (positive logic)**



# SN54ABTH162260, SN74ABTH162260

## 12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCHES

### WITH SERIES-DAMPING RESISTORS AND 3-STATE OUTPUTS

SCBS240D – JUNE 1992 – REVISED MAY 1997

#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, $V_{CC}$	.....	-0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1)	.....	-0.5 V to 7 V
Voltage range applied to any output in the high or power-off state, $V_O$	.....	-0.5 V to 5.5 V
Current into any output in the low state, $I_O$ : SN54ABTH162260 (A port)	.....	96 mA
SN74ABTH162260 (A port)	.....	128 mA
B port	.....	30 mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ )	.....	-18 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ )	.....	-50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DL package	.....	74°C/W
Storage temperature range, $T_{stg}$	.....	-65°C to 150°C

† 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.

- NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
 2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51.

#### recommended operating conditions (see Note 3)

		SN54ABTH162260		SN74ABTH162260		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	4.5	5.5	4.5	5.5	V
$V_{IH}$	High-level input voltage	2		2		V
$V_{IL}$	Low-level input voltage		0.8		0.8	V
$V_I$	Input voltage	0	$V_{CC}$	0	$V_{CC}$	V
$I_{OH}$	High-level output current		-24		-32	mA
$I_{OL}$	Low-level output current	A port	48		64	mA
		B port	12		12	
$\Delta t/\Delta v$	Input transition rise or fall rate		10		10	ns/V
$\Delta t/\Delta V_{CC}$	Power-up ramp rate	200		200		$\mu$ s/V
$T_A$	Operating free-air temperature	-55	125	-40	85	°C

NOTE 3: Unused control inputs must be held high or low to prevent them from floating.

**SN54ABTH162260, SN74ABTH162260**  
**12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCHES**  
**WITH SERIES-DAMPING RESISTORS AND 3-STATE OUTPUTS**

SCBS240D – JUNE 1992 – REVISED MAY 1997

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

PARAMETER		TEST CONDITIONS	T <sub>A</sub> = 25°C			SN54ABTH162260		SN74ABTH162260		UNIT	
			MIN	TYP†	MAX	MIN	MAX	MIN	MAX		
V <sub>IK</sub>		V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2		-1.2		-1.2	V	
V <sub>OH</sub>		V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -3 mA			2.5		2.5		2.5	V	
		V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -3 mA			3		3		3		
		V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = -24 mA			2		2			2
V <sub>OL</sub>		V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 48 mA						0.55	V	
			I <sub>OL</sub> = 64 mA						0.55*		
			I <sub>OL</sub> = 12 mA						0.8		0.8
V <sub>hys</sub>					100					mV	
I <sub>I</sub>		Control inputs	V <sub>CC</sub> = 0 to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±1		±1		±1	μA
		A or B ports	V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±20		±20		±20	
I <sub>I</sub> (hold)		A or B ports	V <sub>CC</sub> = 4.5 V	V <sub>I</sub> = 0.8 V					100	μA	
				V <sub>I</sub> = 2 V					-100		
I <sub>OZPU</sub> ‡		V <sub>CC</sub> = 0 to 2.1 V, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	μA	
I <sub>OZPD</sub> ‡		V <sub>CC</sub> = 2.1 V to 0, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	μA	
I <sub>OZH</sub> §		V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 2.7 V, $\overline{OE} \geq 2$ V			10		10		10	μA	
I <sub>OZL</sub> §		V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 0.5 V, $\overline{OE} \geq 2$ V			-10		-10		-10	μA	
I <sub>off</sub>		V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V			±100				±100	μA	
I <sub>CEX</sub>	Outputs high	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V			50		50		50	μA	
I <sub>O</sub> ¶		V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V	-50	-100	-225		-50	-225	-50	-225	mA
I <sub>CC</sub>		V <sub>CC</sub> = 5.5 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND	Outputs high			1.5		1.5		1.5	mA
			Outputs low			63		63		63	
			Outputs disabled			1		1		1	
ΔI <sub>CC</sub> #		V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND			1		1.5		1	mA	
C <sub>i</sub>		V <sub>I</sub> = 2.5 V or 0.5 V			3					pF	
C <sub>o</sub>		V <sub>O</sub> = 2.5 V or 0.5 V			11.5					pF	

\* On products compliant to MIL-PRF-38535, this parameter does not apply.

† All typical values are at V<sub>CC</sub> = 5 V.

‡ This parameter is characterized but not tested.

§ The parameters I<sub>OZH</sub> and I<sub>OZL</sub> include the input leakage current.

¶ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

# This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.

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**SN54ABTH162260, SN74ABTH162260**  
**12-BIT TO 24-BIT MULTIPLEXED D-TYPE LATCHES**  
**WITH SERIES-DAMPING RESISTORS AND 3-STATE OUTPUTS**

SCBS240D – JUNE 1992 – REVISED MAY 1997

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

		V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C		SN54ABTH162260		SN74ABTH162260		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration, LE1B, LE2B, LEA1B, or LEA2B high	3.3		3.3		3.3		ns
t <sub>su</sub>	Setup time, data before LE1B, LE2B, LEA1B, or LEA2B↓	1.5		1.5		1.5		ns
t <sub>h</sub>	Hold time, data after LE1B, LE2B, LEA1B, or LEA2B↓	1		1		1		ns

switching characteristics over recommended ranges of supply voltage and operating free-air temperature, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C			SN54ABTH162260		SN74ABTH162260		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	1.4	3.6	5.2	1.4	6.3	1.4	6.1	ns
t <sub>PHL</sub>			2.7	4.8	6.4	2.7	7.4	2.7	7.1	
t <sub>PLH</sub>	B	A	1.6	3.6	5.2	1.6	6.4	1.6	6	ns
t <sub>PHL</sub>			1.7	3.8	5.5	1.7	6.5	1.7	6.2	
t <sub>PLH</sub>	LE	A	1.8	3.9	5.3	1.8	6.6	1.8	6.3	ns
t <sub>PHL</sub>			2.3	4.1	5.4	2.3	6.1	2.3	5.8	
t <sub>PLH</sub>	LE	B	1.6	3.7	5.4	1.6	6.4	1.6	6.1	ns
t <sub>PHL</sub>			2.8	4.9	6.4	2.8	7.5	2.8	7.1	
t <sub>PLH</sub>	SEL (1B)	A	1.5	3.6	5	1.5	5.9	1.5	5.6	ns
t <sub>PHL</sub>			1.8	3.5	4.8	1.8	5.2	1.8	5	
t <sub>PLH</sub>	SEL (2B)	A	1.2	3.6	5.1	1.2	6.5	1.2	6.3	ns
t <sub>PHL</sub>			1.7	4	5.5	1.7	6.5	1.7	6.2	
t <sub>PZH</sub>	$\overline{OE}$	A	1.1	3.5	5.2	1.1	6.5	1.1	6.3	ns
t <sub>PZL</sub>			2.1	4.2	5.7	2.1	6.6	2.1	6.5	
t <sub>PZH</sub>	$\overline{OE}$	B	1	3.4	4.9	1	6.4	1	6.3	ns
t <sub>PZL</sub>			2.9	5.5	6.8	2.9	8.3	2.9	8.2	
t <sub>PHZ</sub>	$\overline{OE}$	A	2.5	4.5	5.9	2.5	6.9	2.5	6.7	ns
t <sub>PLZ</sub>			1.8	3.4	4.8	1.8	5.6	1.8	5.2	
t <sub>PHZ</sub>	$\overline{OE}$	B	2.1	4.4	5.7	2.1	7.7	2.1	7.5	ns
t <sub>PLZ</sub>			1.7	3.9	5.4	1.7	6.3	1.7	6.2	

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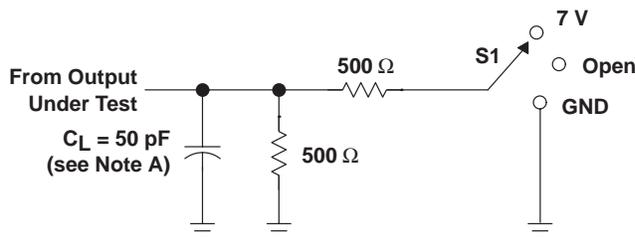


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**SN54ABTH162260, SN74ABTH162260**  
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**WITH SERIES-DAMPING RESISTORS AND 3-STATE OUTPUTS**

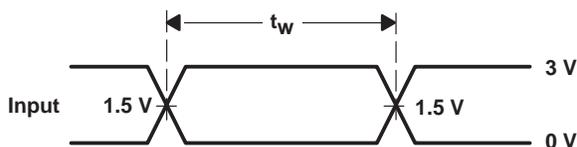
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**PARAMETER MEASUREMENT INFORMATION**

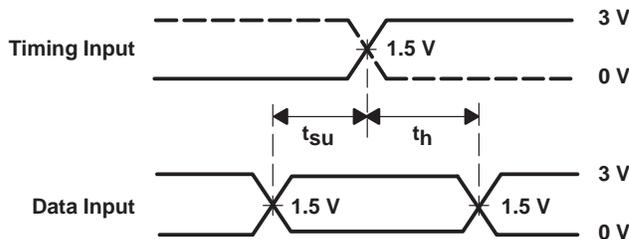


**LOAD CIRCUIT**

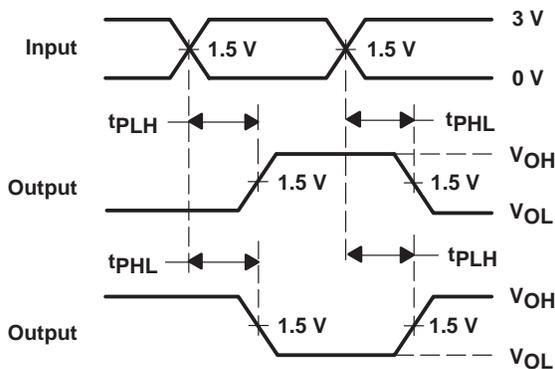
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



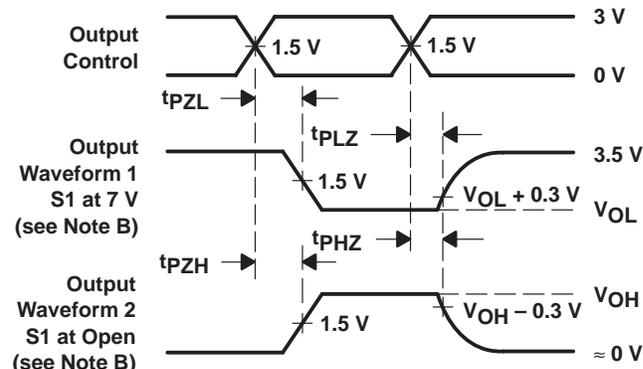
**VOLTAGE WAVEFORMS**  
**PULSE DURATION**



**VOLTAGE WAVEFORMS**  
**SETUP AND HOLD TIMES**



**VOLTAGE WAVEFORMS**  
**PROPAGATION DELAY TIMES**  
**INVERTING AND NONINVERTING OUTPUTS**



**VOLTAGE WAVEFORMS**  
**ENABLE AND DISABLE TIMES**  
**LOW- AND HIGH-LEVEL ENABLING**

- 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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .  
 D. The outputs are measured one at a time with one transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
74ABTH162260DLG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74ABTH162260DLRG4	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABTH162260DL	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABTH162260DLR	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

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

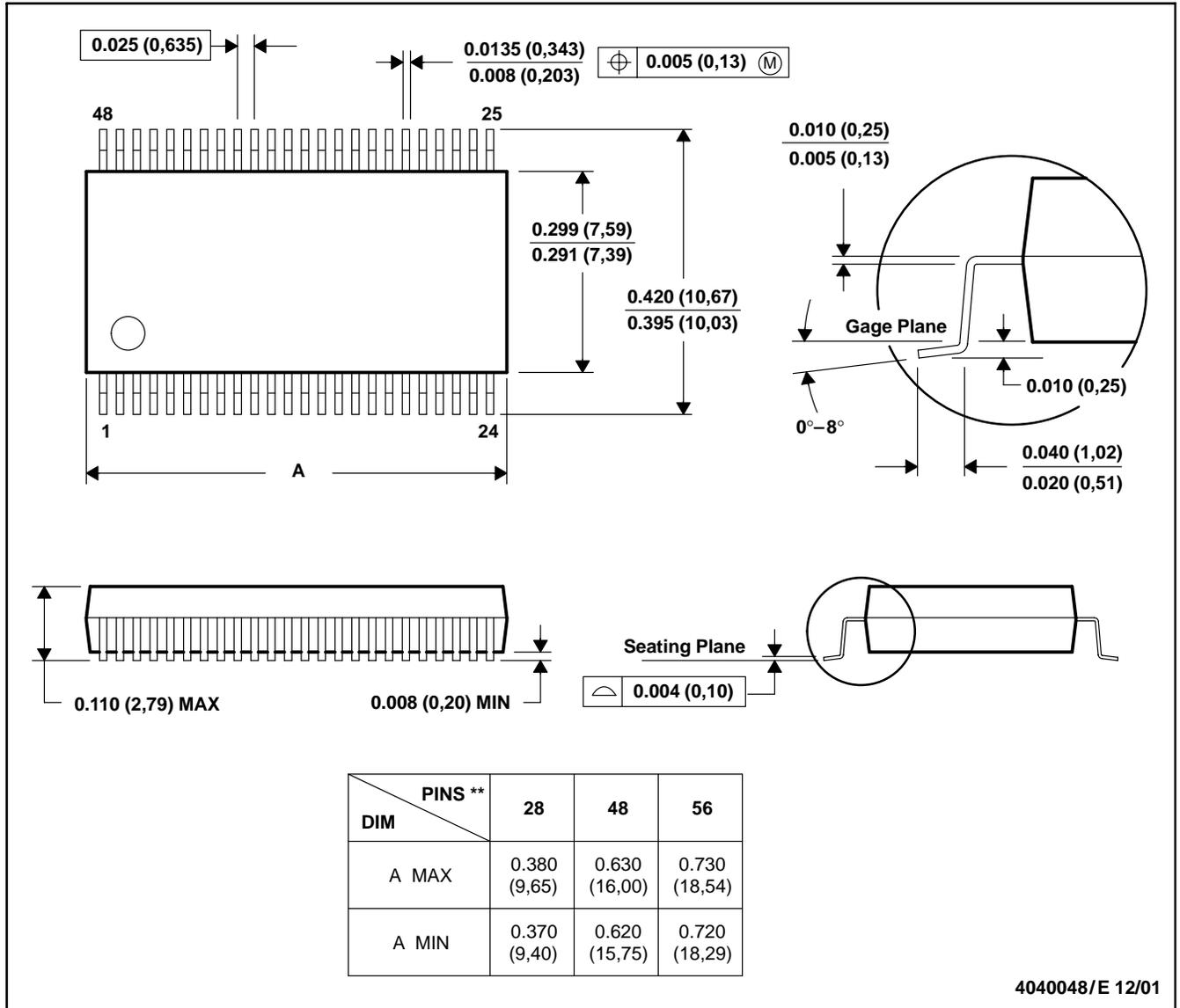
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DL (R-PDSO-G\*\*)

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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Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265

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