

# SN74ALS666, SN74ALS667 8-BIT D-TYPE TRANSPARENT READ-BACK LATCHES WITH 3-STATE OUTPUTS

SDAS227A – JUNE 1984 – REVISED JANUARY 1995

- 3-State I/O-Type Read-Back Inputs
- Bus-Structured Pinout
- Choice of True or Inverting Logic
  - SN74ALS666 . . . True Outputs
  - SN74ALS667 . . . Inverted Outputs
- Preset and Clear Inputs
- Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (NT) 300-mil DIPs

## description

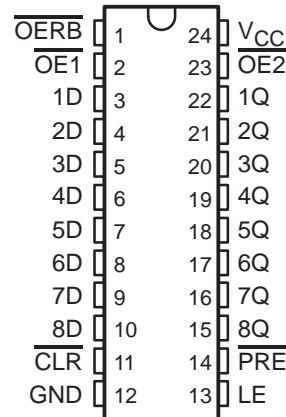
These 8-bit D-type transparent latches are designed specifically for storing the contents of the input data bus, plus reading back the stored data onto the input data bus. In addition, they provide a 3-state buffer-type output and are easily utilized in bus-structured applications.

While the latch enable (LE) is high, the Q outputs of the SN74ALS666 follow the data (D) inputs. The  $\overline{Q}$  outputs of the SN74ALS667 provide the inverse of the data applied to its D inputs. The Q or  $\overline{Q}$  output of both devices is in the high-impedance state if either output-enable ( $\overline{OE1}$  or  $\overline{OE2}$ ) input is at a high logic level.

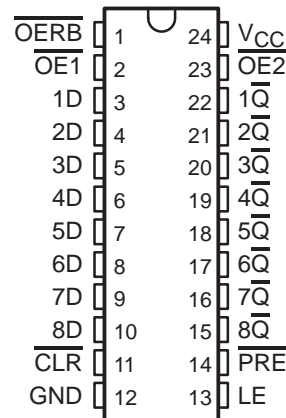
Read back is provided through the read-back control ( $\overline{OERB}$ ) input. When  $\overline{OERB}$  is taken low, the data present at the output of the data latches passes back onto the input data bus. When  $\overline{OERB}$  is taken high, the output of the data latches is isolated from the D inputs.  $\overline{OERB}$  does not affect the internal operation of the latches; however, caution should be exercised to avoid a bus conflict.

The SN74ALS666 and SN74ALS667 are characterized for operation from 0°C to 70°C.

SN74ALS666 . . . DW OR NT PACKAGE  
(TOP VIEW)



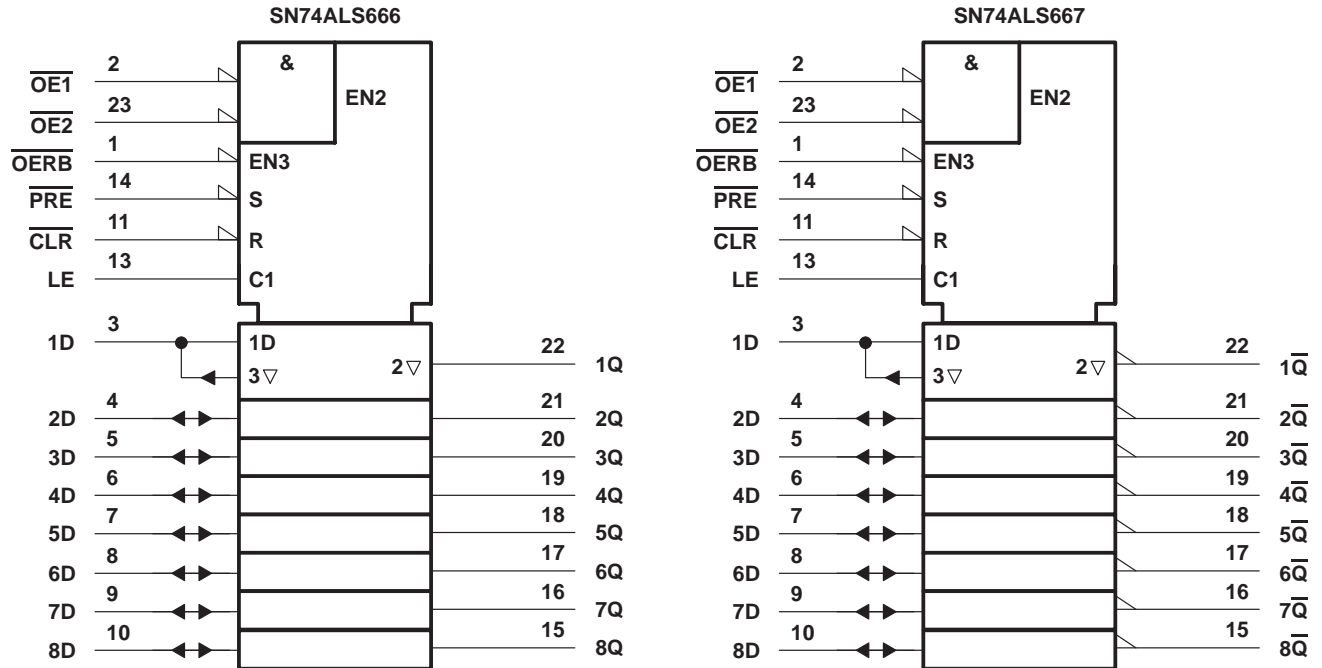
SN74ALS667 . . . DW OR NT PACKAGE  
(TOP VIEW)



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## logic symbols†

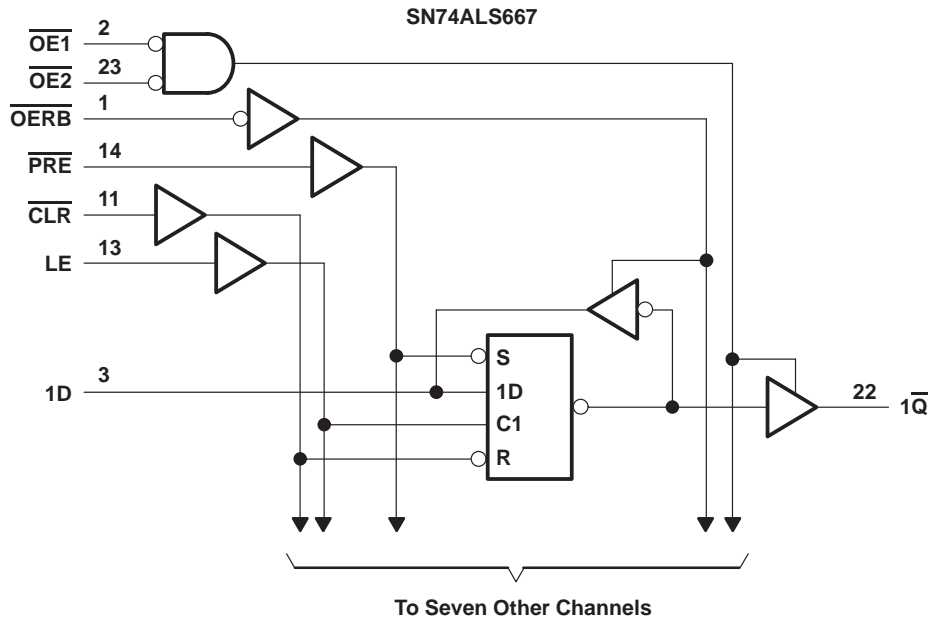
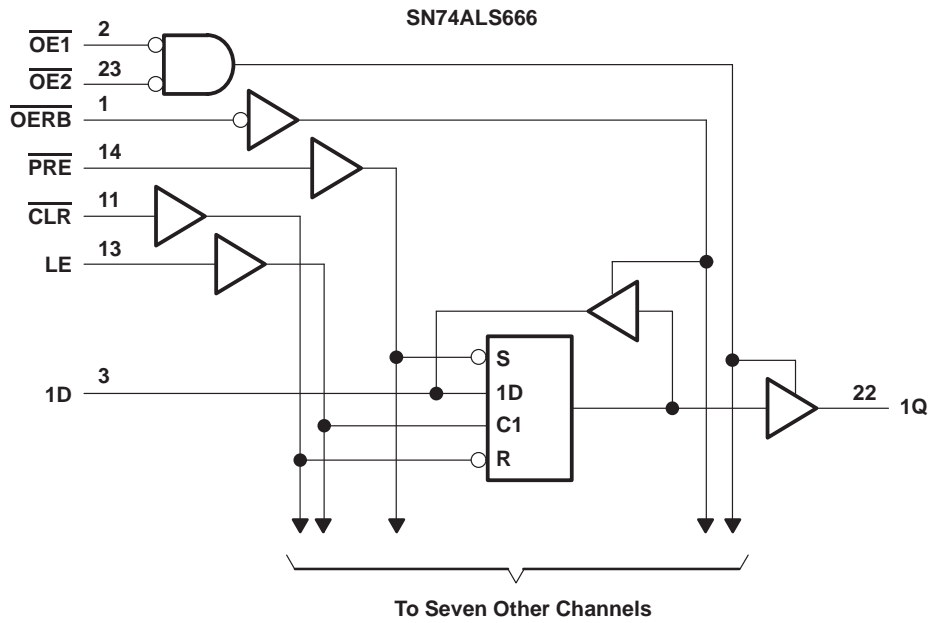


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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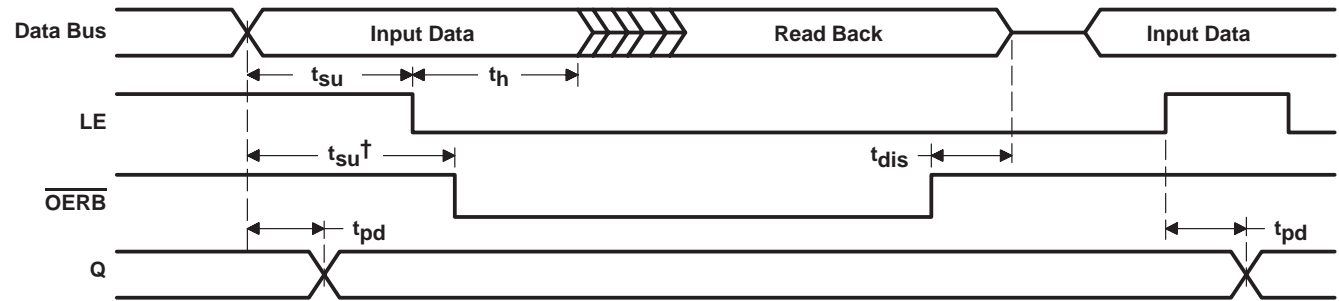
## logic diagrams (positive logic)



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## timing diagram



$\overline{CLR} = H, \overline{PRE} = H, \overline{OE1} = L, \overline{OE2} = L.$

† This setup time ensures the read-back circuit does not create a conflict on the input data bus.

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

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$ (all inputs except D inputs)	7 V
Voltage applied to D inputs and to disabled 3-state outputs	5.5 V
Operating free-air temperature range, $T_A$ : SN74ALS666, SN74ALS667	0°C to 70°C
Storage temperature range	-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.

## recommended operating conditions

		SN74ALS666 SN74ALS667			UNIT	
		MIN	NOM	MAX		
$V_{CC}$	Supply voltage	4.5	5	5.5	V	
$V_{IH}$	High-level input voltage	2			V	
$V_{IL}$	Low-level input voltage			0.8	V	
$I_{OH}$	High-level output current			-2.6	mA	
				-0.4		
$I_{OL}$	Low-level output current			24	mA	
				8		
$t_w$	Pulse duration	LE high		10	ns	
		$\overline{CLR}$ low		10		
		$\overline{PRE}$ low		10		
$t_{su}$	Setup time	Data before LE↓		10	ns	
		Data before OERB↓		10		
$t_h$	Hold time, data after LE↓			5	ns	
$T_A$	Operating free-air temperature			0	70	°C



# SN74ALS666, SN74ALS667 8-BIT D-TYPE TRANSPARENT READ-BACK LATCHES WITH 3-STATE OUTPUTS

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

PARAMETER		TEST CONDITIONS		SN74ALS666 SN74ALS667			UNIT
				MIN	TYP†	MAX	
V <sub>IK</sub>		V <sub>CC</sub> = 4.5 V,	I <sub>I</sub> = -18 mA			-1.2	V
V <sub>OH</sub>	All outputs	V <sub>CC</sub> = 4.5 V to 5.5 V,	I <sub>OH</sub> = -0.4 mA	V <sub>CC</sub> - 2			V
	Q or $\bar{Q}$	V <sub>CC</sub> = 4.5 V,	I <sub>OH</sub> = -2.6 mA	2.4	3.2		
V <sub>OL</sub>	D inputs	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 4 mA	0.25	0.4	V	
			I <sub>OL</sub> = 8 mA	0.35	0.5		
	Q or $\bar{Q}$	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 12 mA	0.25	0.4		
			I <sub>OL</sub> = 24 mA	0.35	0.5		
I <sub>OZH</sub>	Q or $\bar{Q}$	V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 2.7 V			20	μA
I <sub>OZL</sub>	Q or $\bar{Q}$	V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 0.4 V			-20	μA
I <sub>I</sub>	D inputs	V <sub>CC</sub> = 5.5 V	V <sub>I</sub> = 5.5 V			0.1	mA
	All others		V <sub>I</sub> = 7 V			0.1	
I <sub>IH</sub>	D inputs‡	V <sub>CC</sub> = 5.5 V,	V <sub>I</sub> = 2.7 V			20	μA
	All others					20	
I <sub>IL</sub>	D inputs‡	V <sub>CC</sub> = 5.5 V,	V <sub>I</sub> = 0.4 V			-0.1	mA
	All others					-0.1	
I <sub>OS</sub> §		V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 2.25 V	-30	-112		mA
I <sub>CC</sub>	SN74ALS666	$\frac{V_{CC} = 5.5 V,}{OERB \text{ high}}$	Q outputs high	25	50	mA	
			Q outputs low	40	73		
			Q outputs disabled	30	55		
	$\bar{Q}$ outputs high		25	50			
	$\bar{Q}$ outputs low		45	79			
	$\bar{Q}$ outputs disabled		30	60			
		V <sub>CC</sub> = 5.5 V,	OERB high				
		V <sub>CC</sub> = 5.5 V,	OERB high				

† All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

‡ For I/O ports (Q<sub>A</sub> through Q<sub>H</sub>), the parameters I<sub>IH</sub> and I<sub>IL</sub> include the off-state output current.

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.

# SN74ALS666, SN74ALS667

## 8-BIT D-TYPE TRANSPARENT READ-BACK LATCHES WITH 3-STATE OUTPUTS

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### switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, T <sub>A</sub> = MIN to MAX†		UNIT
			SN74ALS666		
			MIN	MAX	
t <sub>PLH</sub>	D	Q	3	14	ns
t <sub>PHL</sub>			4	18	
t <sub>PLH</sub>	LE	Q	6	21	ns
t <sub>PHL</sub>			8	27	
t <sub>PHL</sub>	$\overline{\text{CLR}}$	Q	9	29	ns
		D	11	32	
t <sub>PLH</sub>	$\overline{\text{PRE}}$	Q	7	22	ns
		D	9	28	
t <sub>en</sub> ‡	$\overline{\text{OERB}}$	D	4	21	ns
	$\overline{\text{OE1}}, \overline{\text{OE2}}$	Q	4	21	
t <sub>dis</sub> §	$\overline{\text{OERB}}$	D	1	14	ns
	$\overline{\text{OE1}}, \overline{\text{OE2}}$	Q	1	14	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ t<sub>en</sub> = t<sub>PZH</sub> or t<sub>PZL</sub>

§ t<sub>dis</sub> = t<sub>PHZ</sub> or t<sub>PLZ</sub>

### switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, T <sub>A</sub> = MIN to MAX†		UNIT
			SN74ALS667		
			MIN	MAX	
t <sub>PLH</sub>	D	$\overline{\text{Q}}$	6	20	ns
t <sub>PHL</sub>			4	15	
t <sub>PLH</sub>	LE	$\overline{\text{Q}}$	9	28	ns
t <sub>PHL</sub>			7	22	
t <sub>PHL</sub>	$\overline{\text{CLR}}$	$\overline{\text{Q}}$	7	24	ns
		D	8	26	
t <sub>PLH</sub>	$\overline{\text{PRE}}$	$\overline{\text{Q}}$	8	25	ns
		D	9	28	
t <sub>en</sub> ‡	$\overline{\text{OERB}}$	D	4	21	ns
	$\overline{\text{OE1}}, \overline{\text{OE2}}$	$\overline{\text{Q}}$	4	21	
t <sub>dis</sub> §	$\overline{\text{OERB}}$	D	1	14	ns
	$\overline{\text{OE1}}, \overline{\text{OE2}}$	$\overline{\text{Q}}$	1	14	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

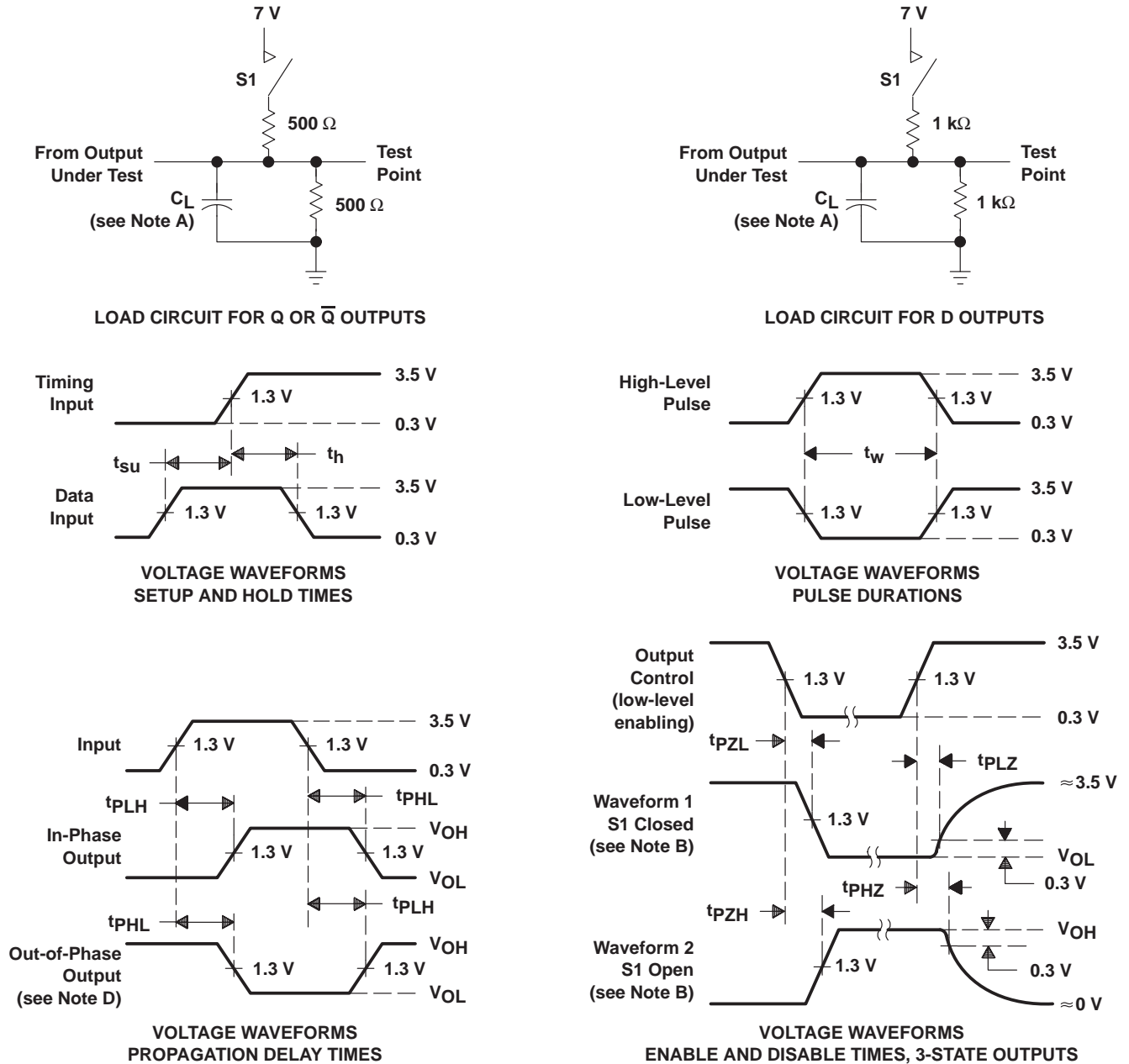
‡ t<sub>en</sub> = t<sub>PZH</sub> or t<sub>PZL</sub>

§ t<sub>dis</sub> = t<sub>PHZ</sub> or t<sub>PLZ</sub>

# SN74ALS666, SN74ALS667 8-BIT D-TYPE TRANSPARENT READ-BACK LATCHES WITH 3-STATE OUTPUTS

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## PARAMETER MEASUREMENT INFORMATION



- 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 have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.
  - D. When measuring propagation delay times of 3-state outputs, switch S1 is open.

**Figure 1. Load Circuits 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>
SN74ALS666DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666DWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666DWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666DWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666NSR	ACTIVE	SO	NS	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666NSRE4	ACTIVE	SO	NS	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666NSRG4	ACTIVE	SO	NS	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS666NT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74ALS666NTE4	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74ALS667DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667DWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667DWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667DWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667NSR	ACTIVE	SO	NS	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667NSRE4	ACTIVE	SO	NS	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667NSRG4	ACTIVE	SO	NS	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS667NT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74ALS667NT3	OBSOLETE	PDIP	NT	24		TBD	Call TI	Call TI
SN74ALS667NTE4	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type

<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



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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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**TAPE AND REEL INFORMATION**



**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*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
SN74ALS666DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74ALS666NSR	SO	NS	24	2000	330.0	24.4	8.2	15.4	2.5	12.0	24.0	Q1
SN74ALS667DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74ALS667NSR	SO	NS	24	2000	330.0	24.4	8.2	15.4	2.5	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)
SN74ALS666DWR	SOIC	DW	24	2000	346.0	346.0	41.0
SN74ALS666NSR	SO	NS	24	2000	346.0	346.0	41.0
SN74ALS667DWR	SOIC	DW	24	2000	346.0	346.0	41.0
SN74ALS667NSR	SO	NS	24	2000	346.0	346.0	41.0

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

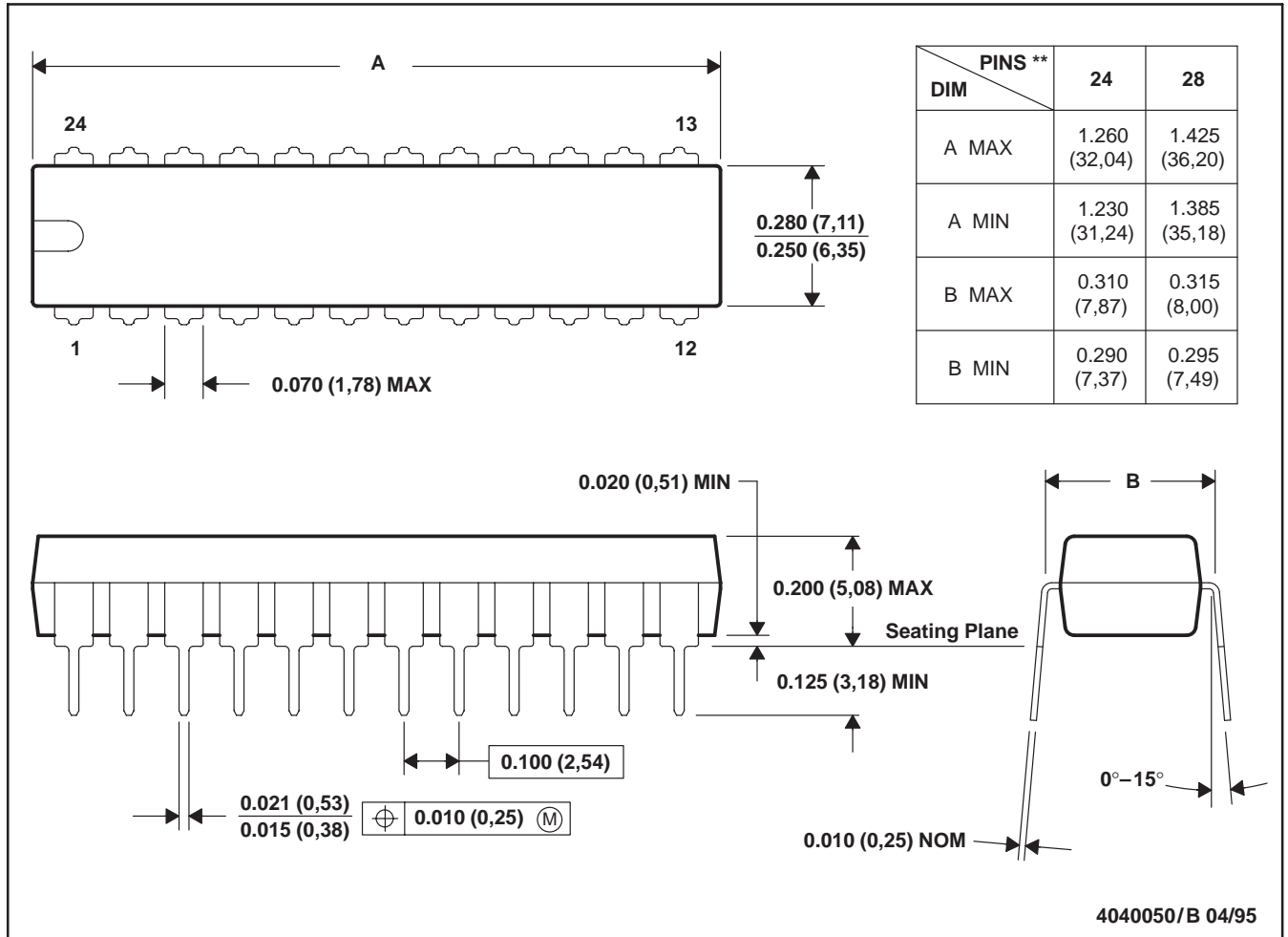


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

NT (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

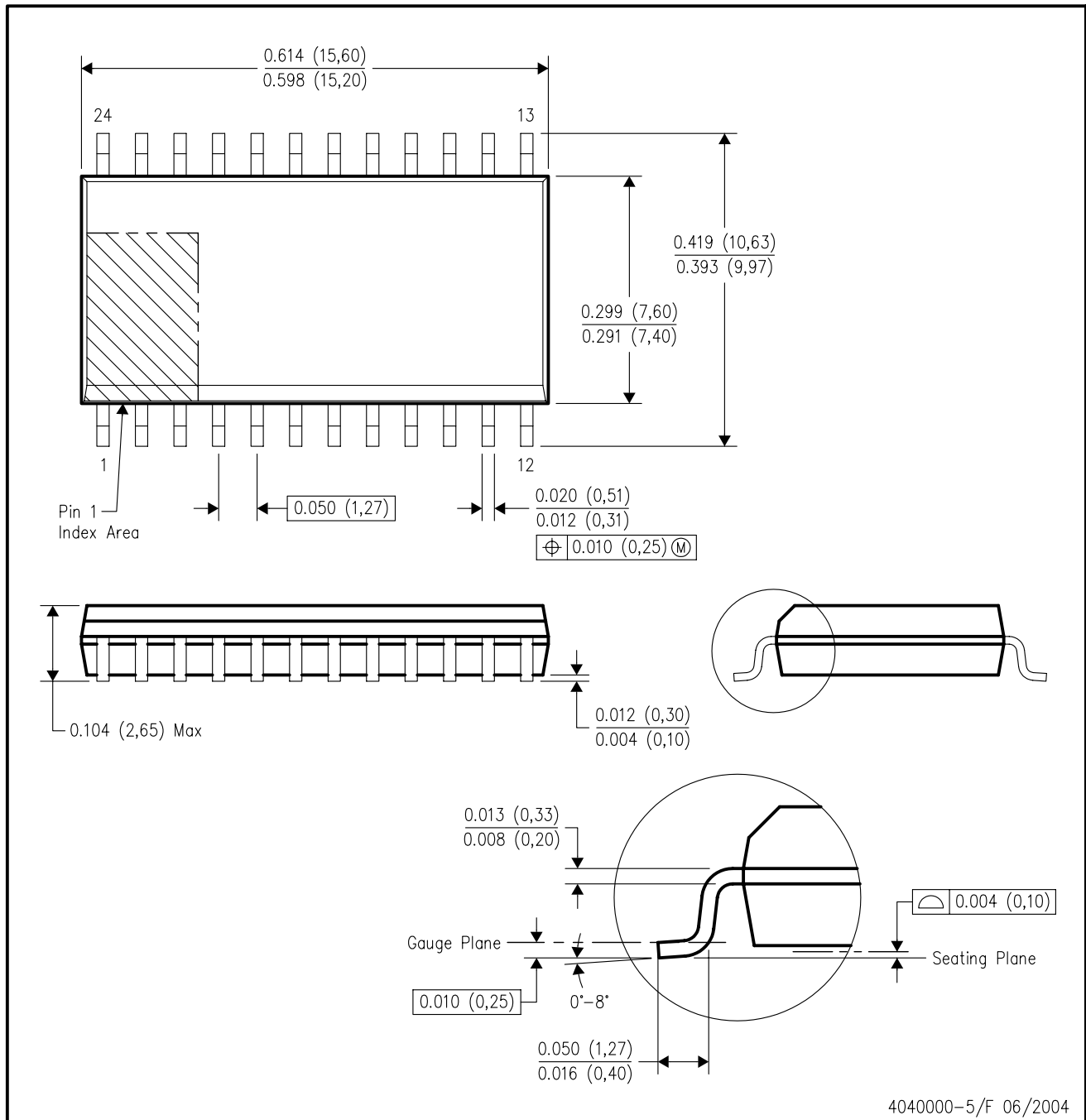
24 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.

DW (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



4040000-5/F 06/2004

- 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 MS-013 variation AD.

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Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>

### Applications

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
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