

# SN54AS250A, SN74AS250A 1-OF-16 DATA GENERATORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDAS137A – DECEMBER 1983 – REVISED DECEMBER 1994

- 4-Line to 1-Line Multiplexers That Can Select 1-of-16 Data Inputs
- Applications:
  - Boolean Function Generator
  - Parallel-to-Serial Converter
  - Data Source Selector
- Buffered 3-State Bus Driver Inputs Permit Multiplexing From n Lines to One Line
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (NT) and Ceramic (JT) 300-mil DIPs

## description

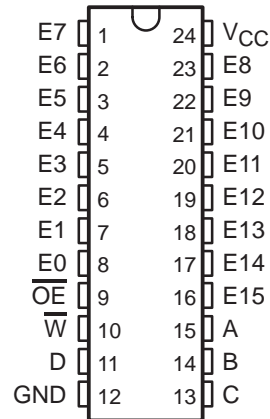
The 'AS250A devices provide full binary decoding to select 1-of-16 data inputs or use sources as an input with an inverting  $\overline{W}$  output. The selected sources are buffered with symmetrical propagation delay times. This reduces the possibility of transients occurring at the output.

A buffered output-enable ( $\overline{OE}$ ) input can be used for n-line to 1-line cascading. Taking  $\overline{OE}$  high places the output in the high-impedance state. In the high-impedance state, the output neither loads nor drives the bus lines significantly.

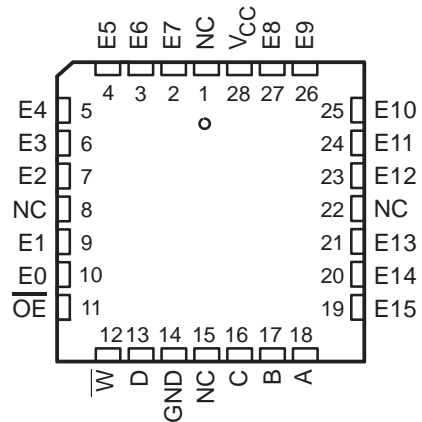
$\overline{OE}$  does not affect the internal operations of the data selector/multiplexer. New data can be set up while the outputs are disabled.

The SN54AS250A is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74AS250A is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54AS250A . . . JT PACKAGE  
SN74AS250A . . . DW OR NT PACKAGE  
(TOP VIEW)



SN54AS250A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

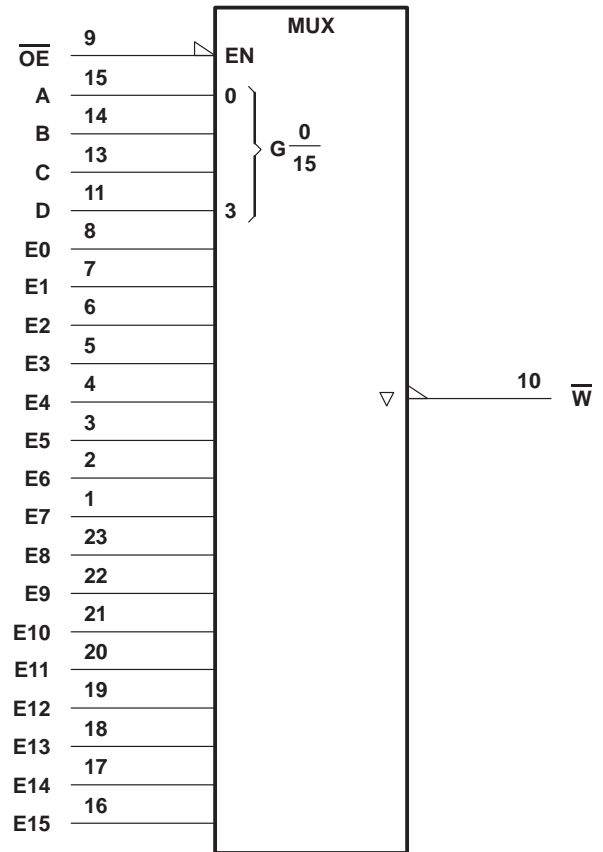
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FUNCTION TABLE

INPUTS						OUTPUT $\overline{W}$
$\overline{OE}$	A	B	C	D	Ei	
L	L	L	L	L	E0	$\overline{E0}$
L	H	L	L	L	E1	$\overline{E1}$
L	L	H	L	L	E2	$\overline{E2}$
L	H	H	L	L	E3	$\overline{E3}$
L	L	L	H	L	E4	$\overline{E4}$
L	H	L	H	L	E5	$\overline{E5}$
L	L	H	H	L	E6	$\overline{E6}$
L	H	H	H	L	E7	$\overline{E7}$
L	L	L	L	H	E8	$\overline{E8}$
L	H	L	L	H	E9	$\overline{E9}$
L	L	H	L	H	E10	$\overline{E10}$
L	H	H	L	H	E11	$\overline{E11}$
L	L	L	H	H	E12	$\overline{E12}$
L	H	L	H	H	E13	$\overline{E13}$
L	L	H	H	H	E14	$\overline{E14}$
L	H	H	H	H	E15	$\overline{E15}$
H	X	X	X	X	X	Z

logic symbol†

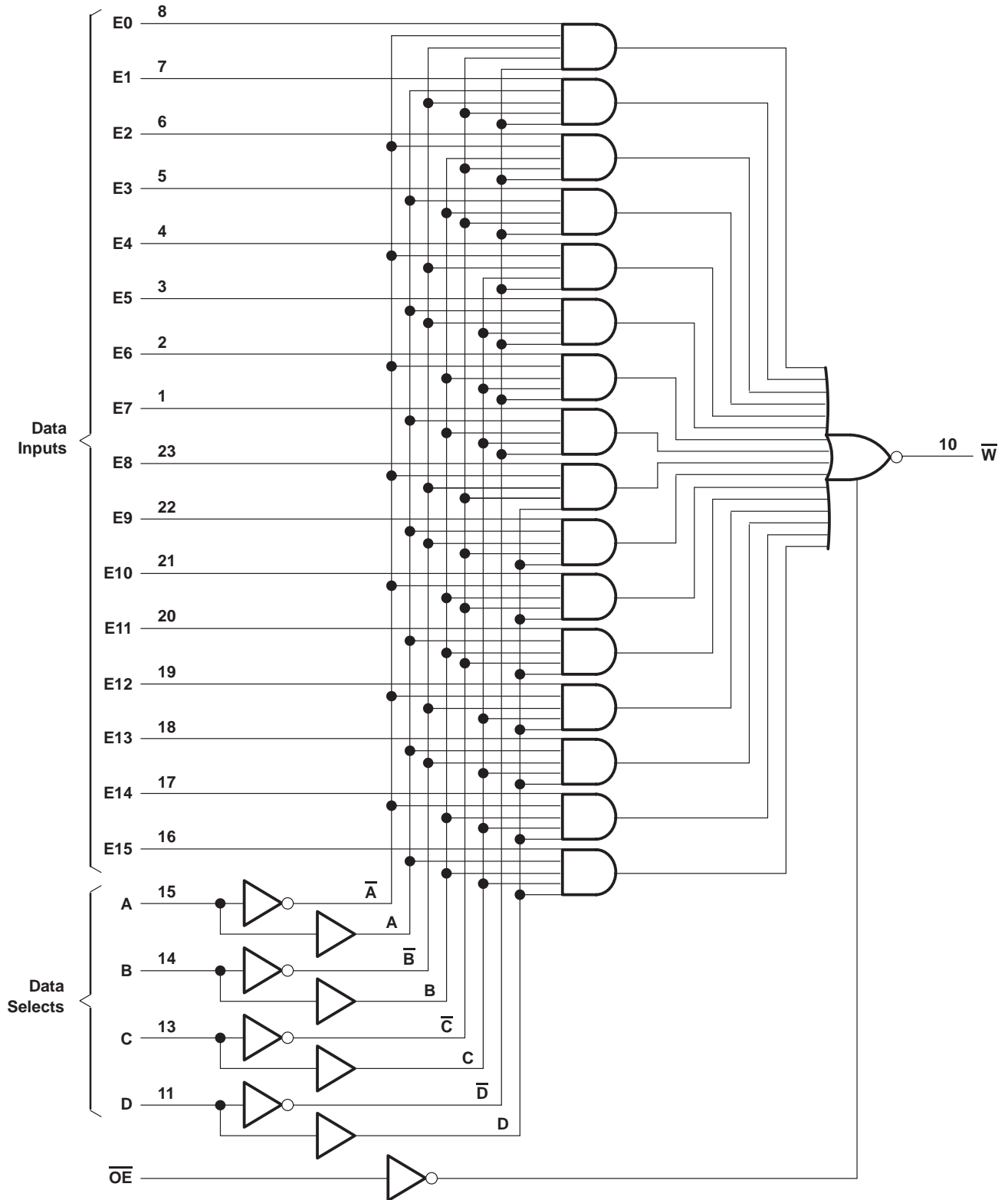


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for the DW, JT, and NT packages.

SN54AS250A, SN74AS250A  
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SDAS137A - DECEMBER 1983 - REVISED DECEMBER 1994

logic diagram (positive logic)



Pin numbers shown are for the DW, JT, and NT packages.

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SDAS137A – DECEMBER 1983 – REVISED DECEMBER 1994

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

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$	7 V
Operating free-air temperature range, $T_A$ : SN54AS250A	-55°C to 125°C
SN74AS250A	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

		SN54AS250A			SN74AS250A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.8			0.8	V
$I_{OH}$	High-level output current			-12			-15	mA
$I_{OL}$	Low-level output current			32			48	mA
$T_A$	Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54AS250A			SN74AS250A			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $I_{OH} = -2\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5\text{ V}$		2.4	3.3		2.4	3.3	
$V_{OL}$	$V_{CC} = 4.5\text{ V}$		0.35	0.5				V
		$I_{OL} = 32\text{ mA}$				0.35	0.5	
	$I_{OL} = 48\text{ mA}$							
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.7\text{ V}$			50			50	μA
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 0.4\text{ V}$			-50			-50	μA
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$			20			20	μA
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$			-0.5			-0.5	mA
$I_O^§$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	-30		-112	-30		-112	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$	Outputs high	26	42	26	42	mA	
		Outputs low	31	50	31	50		
		Outputs disabled	30	48	30	48		

‡ All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .



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SDAS137A – DECEMBER 1983 – REVISED DECEMBER 1994

## switching characteristics (see Figure 1)

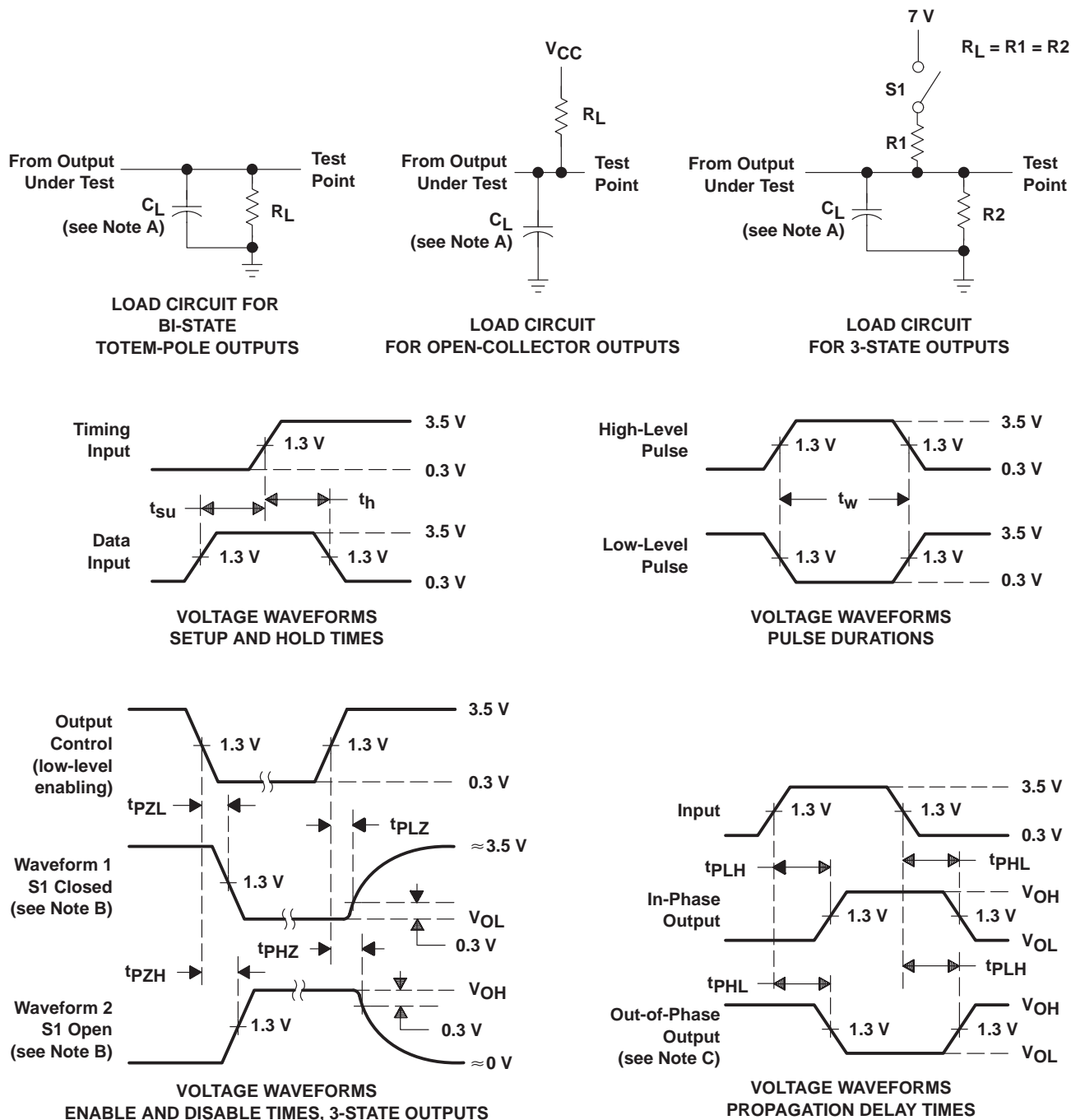
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V},$ $C_L = 50\text{ pF},$ $R_1 = 500\ \Omega,$ $R_2 = 500\ \Omega,$ $T_A = \text{MIN to MAX}^\dagger$				UNIT
			SN54AS250A		SN74AS250A		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	Data	$\overline{W}$	2	9.5	2	8	ns
$t_{PHL}$			2	8.5	2	7	
$t_{PLH}$	A, B, C, D	$\overline{W}$	4	15.5	4	13	ns
$t_{PHL}$			4	12	4	10.5	
$t_{PZH}$	$\overline{OE}$	$\overline{W}$	2	7.5	2	7	ns
$t_{PZL}$			2	10	2	9	
$t_{PHZ}$	$\overline{OE}$	$\overline{W}$	1.5	6.5	1.5	6	ns
$t_{PLZ}$			2	8.5	2	6.5	

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

# SN54AS250A, SN74AS250A 1-OF-16 DATA GENERATORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDAS137A – DECEMBER 1983 – REVISED DECEMBER 1994

## PARAMETER MEASUREMENT INFORMATION SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- 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. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
 D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
 E. The outputs are measured one at a time with one transition per measurement.

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>
5962-9056201LA	ACTIVE	CDIP	JT	24	1	TBD	A42 SNPB	N / A for Pkg Type
SN74AS250ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS250ADWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS250ADWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS250ADWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS250ADWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS250ADWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS250ANT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AS250ANT3	OBSOLETE	PDIP	NT	24		TBD	Call TI	Call TI
SN74AS250ANTE4	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SNJ54AS250AJT	ACTIVE	CDIP	JT	24	1	TBD	A42 SNPB	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 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
SN74AS250ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1



**TAPE AND REEL BOX DIMENSIONS**



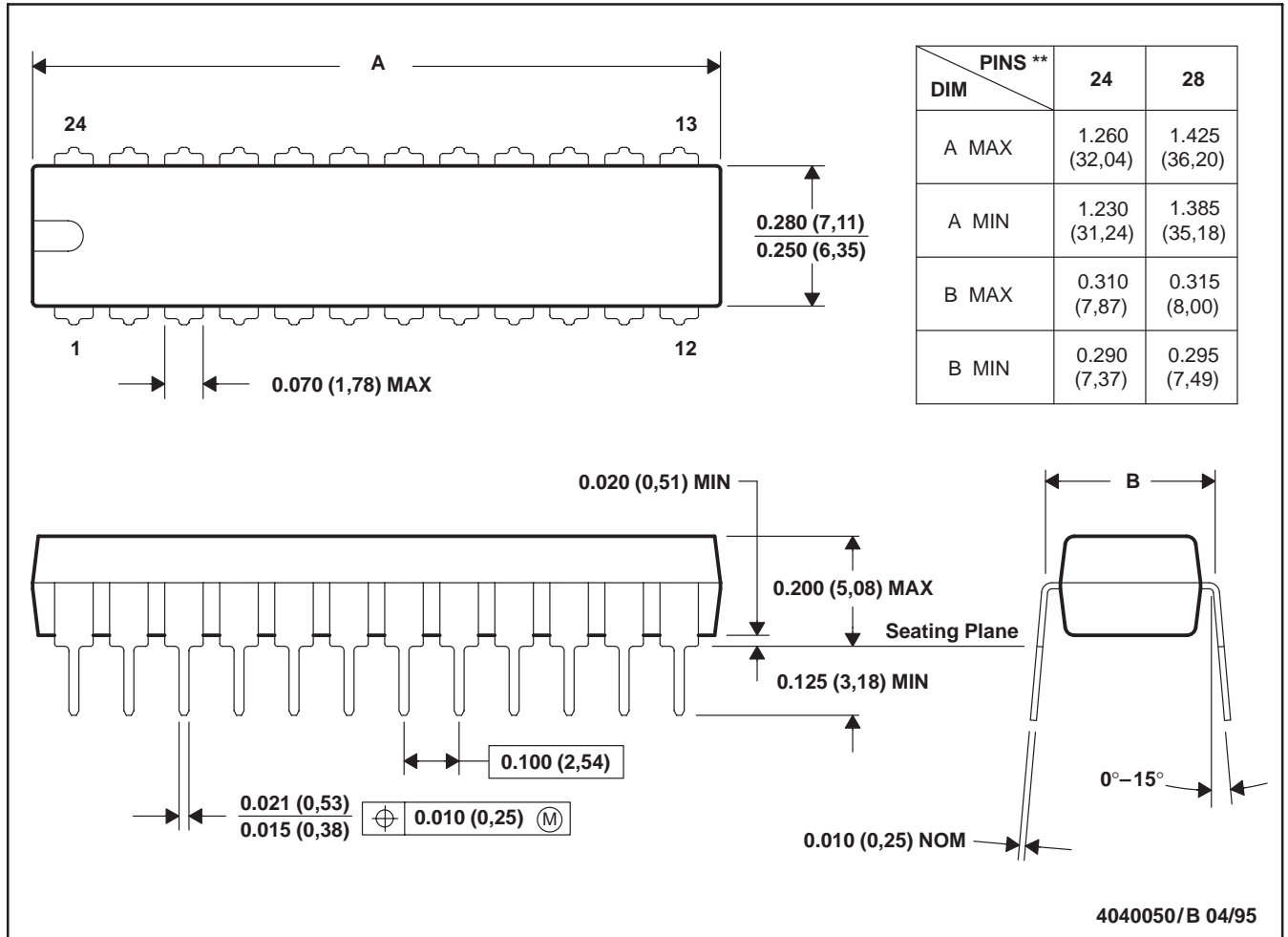
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AS250ADWR	SOIC	DW	24	2000	346.0	346.0	41.0

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

PLASTIC DUAL-IN-LINE PACKAGE

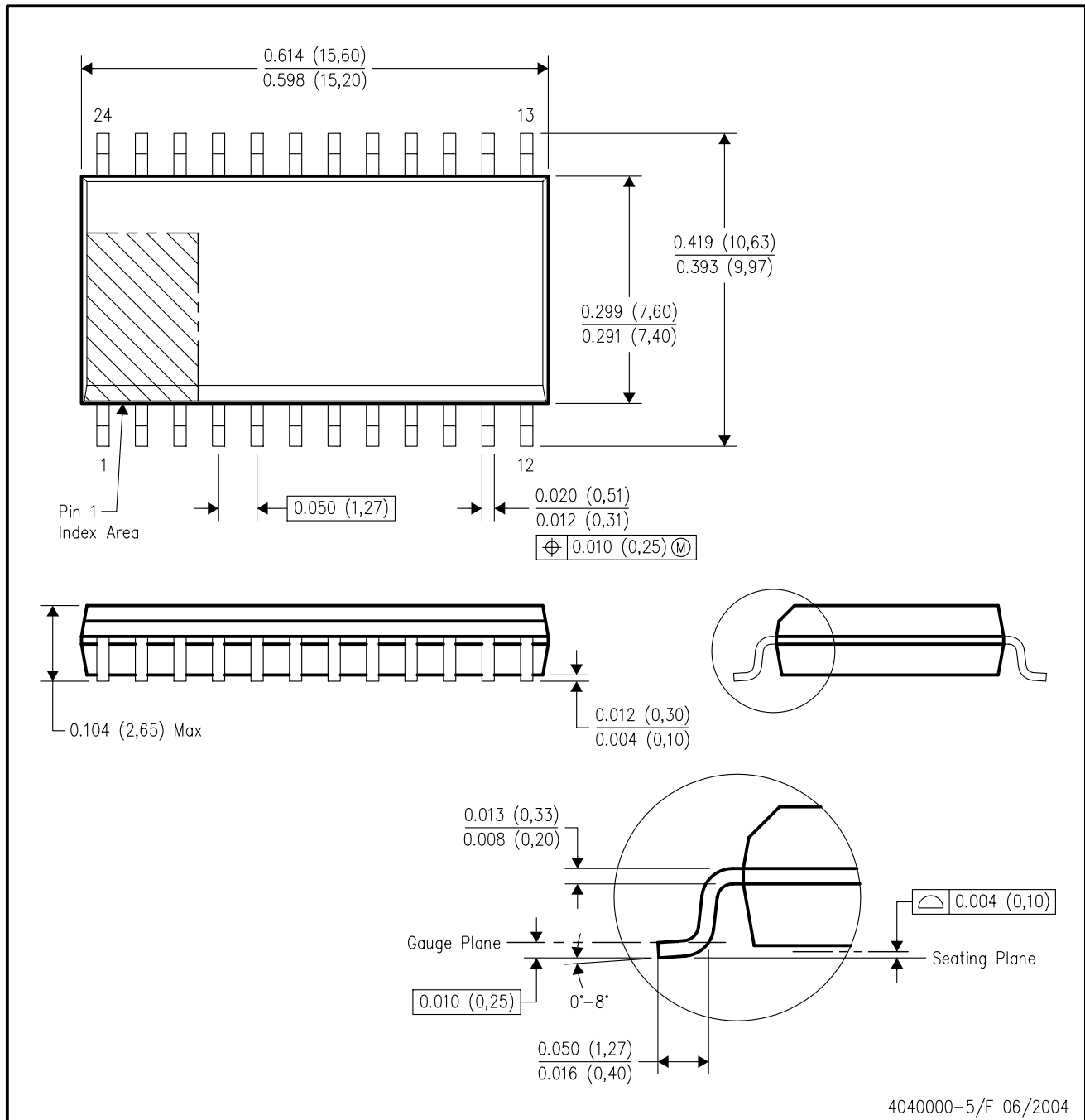
24 PINS SHOWN



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



- 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.

JT (R-GDIP-T\*\*)

CERAMIC DUAL-IN-LINE

24 LEADS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. This package can be hermetically sealed with a ceramic lid using glass frit.  
 D. Index point is provided on cap for terminal identification.  
 E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

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