

# SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS153E – DECEMBER 1982 – REVISED AUGUST 1995

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- pnp Inputs Reduce dc Loading
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

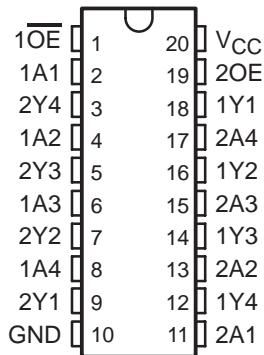
## description

These octal buffers/drivers are designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The designer has a choice of selected combinations of inverting and noninverting outputs, symmetrical active-low output-enable ( $\overline{OE}$ ) inputs, and complementary OE and  $\overline{OE}$  inputs. These devices feature high fan-out and improved fan-in.

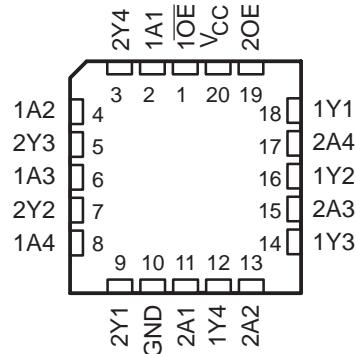
The -1 version of SN74ALS241C is identical to the standard version, except that the recommended maximum  $I_{OL}$  of the -1 version is 48 mA. There is no -1 version of the SN54ALS241C.

The SN54ALS241C and SN54AS241A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS241C and SN74AS241A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS241C, SN54AS241A... J PACKAGE  
SN74ALS241C, SN74AS241A... DW OR N PACKAGE  
(TOP VIEW)



SN54ALS241C, SN54AS241A... FK PACKAGE  
(TOP VIEW)



## FUNCTION TABLES

INPUTS		OUTPUT 1Y
1OE	1A	
L	H	H
L	L	L
H	X	Z

INPUTS		OUTPUT 2Y
2OE	2A	
H	H	H
H	L	L
L	X	Z

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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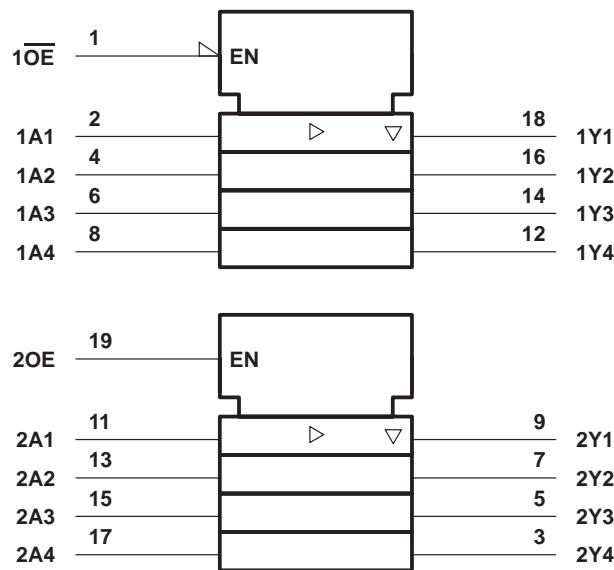
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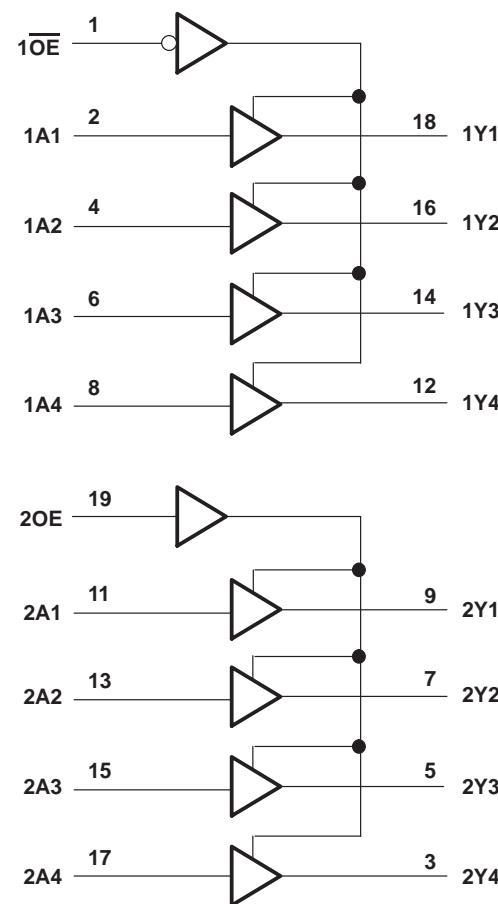
# **SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS**

SDAS153E – DECEMBER 1982 – REVISED AUGUST 1995

## logic symbol



## logic diagram (positive logic)



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

‡ 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.

**SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A**  
**OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SDAS153E – DECEMBER 1982 – REVISED AUGUST 1995

**recommended operating conditions**

		SN54ALS241C			SN74ALS241C			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			2			V
V <sub>IL</sub>	Low-level input voltage			0.7			0.8	V
I <sub>OH</sub>	High-level output current			-12			-15	mA
I <sub>OL</sub>	Low-level output current			12			24	mA
							48 <sup>†</sup>	
T <sub>A</sub>	Operating free-air temperature	-55		125	0		70	°C

<sup>†</sup> Applies only to the -1 version and only if V<sub>CC</sub> is between 4.75 V and 5.25 V

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

PARAMETER	TEST CONDITIONS	SN54ALS241C			SN74ALS241C			UNIT
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2			-1.2	V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = -0.4 mA	V <sub>CC</sub> - 2			V <sub>CC</sub> - 2			V
	V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = -3 mA	2.4	3.2	2.4	3.2		
		I <sub>OH</sub> = -12 mA	2					
		I <sub>OH</sub> = -15 mA				2		
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 12 mA	0.25	0.4	0.25	0.4		V
		I <sub>OL</sub> = 24 mA			0.35	0.5		
		I <sub>OL</sub> = 48 mA (-1 version)			0.35	0.5		
I <sub>OZH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V			20			20	µA
I <sub>OZL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.4 V			-20			-20	µA
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V			0.1			0.1	mA
I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V			20			20	µA
I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V			-0.1			-0.1	mA
I <sub>O\$</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V	-20	-112	-30	-112			mA
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V	Outputs high	9	17	9	18		mA
		Outputs low	15	28	15	26		
		Outputs disabled	17	32	17	30		

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

<sup>§</sup> 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>.

# **SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS**

SDAS153E – DECEMBER 1982 – REVISED AUGUST 1995

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V},$ $C_L = 50\text{ pF},$ $R1 = 500\text{ }\Omega,$ $R2 = 500\text{ }\Omega,$ $T_A = \text{MIN to MAX}^\dagger$				UNIT	
			SN54ALS241C		SN74ALS241C			
			MIN	MAX	MIN	MAX		
$t_{PLH}$	A	Y	3	31	2	11	ns	
$t_{PHL}$			1	17	3	10		
$t_{PZH}$	$\overline{1OE}$	Y	3	33	3	21	ns	
$t_{PZL}$			3	27	4	21		
$t_{PHZ}$	$\overline{1OE}$	Y	2	17	1	10	ns	
$t_{PLZ}$			2	32	2	15		
$t_{PZH}$	2OE	Y	3	38	4	21	ns	
$t_{PZL}$			3	30	5	21		
$t_{PHZ}$	2OE	Y	2	17	2	10	ns	
$t_{PLZ}$			3	35	3	15		

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

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

‡ 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**

		SN54AS241A			SN74AS241A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage		2			2		V
V <sub>IL</sub>	Low-level input voltage			0.8			0.8	V
I <sub>OH</sub>	High-level output current			-12			-15	mA
I <sub>OL</sub>	Low-level output current			48			64	mA
T <sub>A</sub>	Operating free-air temperature	-55		125	0		70	°C

**SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A**  
**OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SDAS153E – DECEMBER 1982 – REVISED AUGUST 1995

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

PARAMETER	TEST CONDITIONS	SN54AS241A			SN74AS241A			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
$V_{OH}$	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $I_{OH} = -2 \text{ mA}$ $V_{CC} = 4.5 \text{ V}$	$V_{CC} - 2$			$V_{CC} - 2$			V
		$I_{OH} = -3 \text{ mA}$	2.4	3.4	2.4	3.4		
		$I_{OH} = -12 \text{ mA}$	2.4				2.4	
		$I_{OH} = -15 \text{ mA}$					2.4	
$V_{OL}$	$V_{CC} = 4.5 \text{ V}$	$I_{OL} = 48 \text{ mA}$	0.27	0.55				V
		$I_{OL} = 64 \text{ mA}$			0.31	0.55		
$I_{OZH}$	$V_{CC} = 5.5 \text{ V}$ , $V_O = 2.7 \text{ V}$		50		50		$\mu\text{A}$	
$I_{OZL}$	$V_{CC} = 5.5 \text{ V}$ , $V_O = 0.4 \text{ V}$		-50		-50		$\mu\text{A}$	
$I_I$	$V_{CC} = 5.5 \text{ V}$ , $V_I = 7 \text{ V}$		0.1		0.1		mA	
$I_{IH}$	$V_{CC} = 5.5 \text{ V}$ , $V_I = 2.7 \text{ V}$		20		20		$\mu\text{A}$	
$I_{IL}$	$V_{CC} = 5.5 \text{ V}$ , $V_I = 0.4 \text{ V}$		-1		-1		mA	
$I_O^{\ddagger}$	$V_{CC} = 5.5 \text{ V}$ , $V_O = 2.25 \text{ V}$	-50	-150	-50	-150		mA	
$I_{CC}$	$V_{CC} = 5.5 \text{ V}$	Outputs high	22	35	22	35		mA
		Outputs low	61	90	61	90		
		Outputs disabled	35	56	35	56		

† 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,  $I_{OS}$ .

**switching characteristics (see Figure 1)**

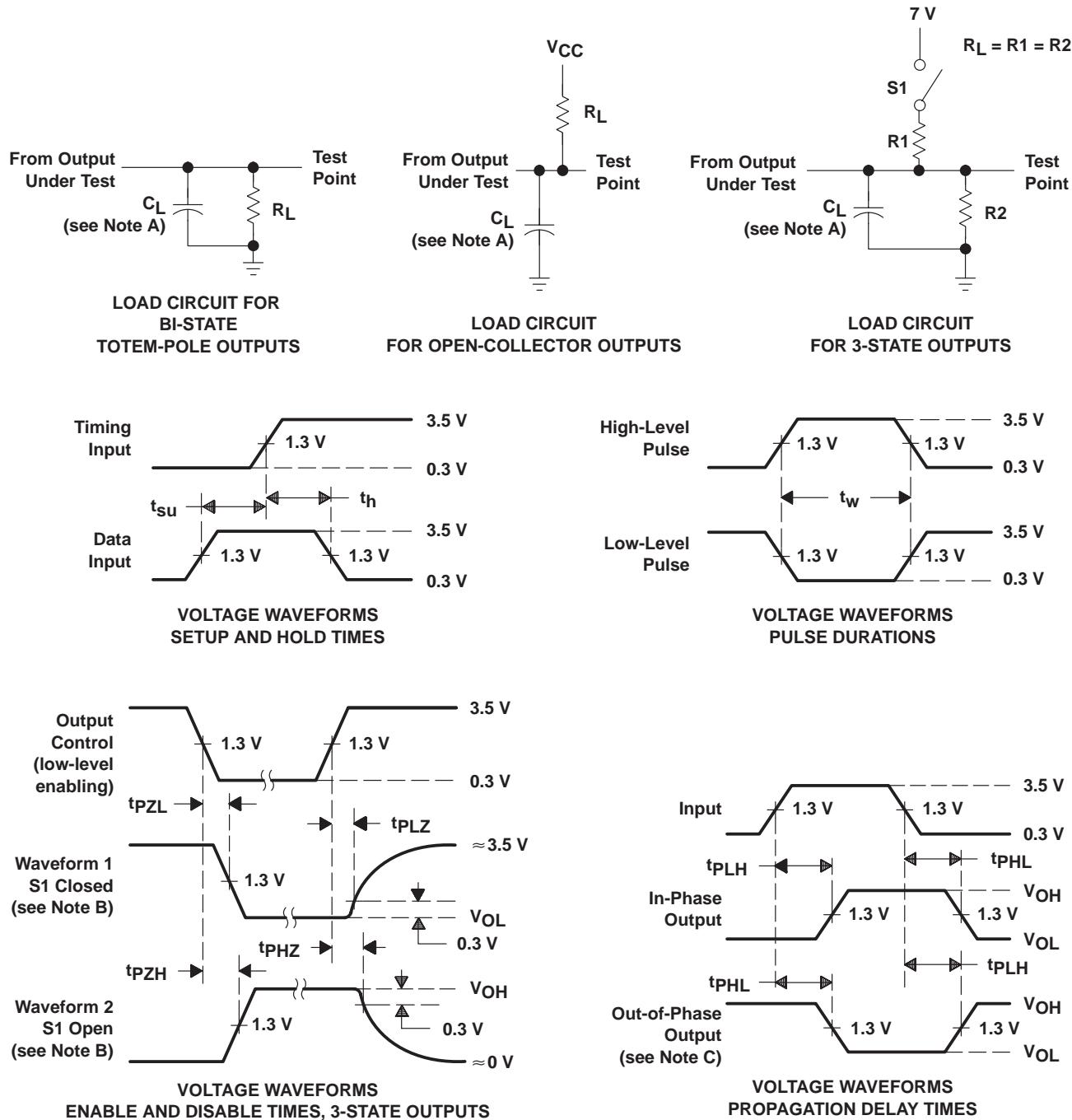
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $C_L = 50 \text{ pF}$ , $R1 = 500 \Omega$ , $R2 = 500 \Omega$ , $T_A = \text{MIN to MAX}^{\$}$				UNIT	
			SN54AS241A		SN74AS241A			
			MIN	MAX	MIN	MAX		
$t_{PLH}$	A	Y	2	9	2	6.2	ns	
			1	7	1	6.2		
$t_{PHL}$	$\overline{1OE}$	Y	1	10	1	9	ns	
			2	8	2	7.5		
$t_{PZH}$	$\overline{1OE}$	Y	1	6.5	1	6	ns	
			1	10.5	1	9		
$t_{PLZ}$	$2OE$	Y	2	11	2	10.5	ns	
			3	9.5	3	8.5		
$t_{PHZ}$	$2OE$	Y	1	7	1	7	ns	
			2	12	2	12		

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

**SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A**  
**OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SDAS153E – DECEMBER 1982 – REVISED AUGUST 1995

**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:  $PRR \leq 1 \text{ MHz}$ ,  $t_r = t_f = 2 \text{ ns}$ , 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 (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8859602SA	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8859602SA SNJ54ALS241CW	Samples
JM38510/38302B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 38302B2A	Samples
JM38510/38302BRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 38302BRA	Samples
M38510/38302B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 38302B2A	Samples
M38510/38302BRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 38302BRA	Samples
SN54ALS241CJ	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54ALS241CJ	Samples
SN54AS241AJ	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54AS241AJ	Samples
SN74ALS241C-1DW	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	0 to 70		
SN74ALS241C-1DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	0 to 70		
SN74ALS241C-1N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI	0 to 70		
SN74ALS241CDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS241C	Samples
SN74ALS241CDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS241C	Samples
SN74ALS241CDWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS241C	Samples
SN74ALS241CN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS241CN	Samples
SN74ALS241CNSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS241C	Samples
SN74AS241AN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74AS241AN	Samples
SNJ54ALS241CFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	SNJ54 ALS241CFK	Samples
SNJ54ALS241CJ	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54ALS241CJ	Samples
SNJ54ALS241CW	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8859602SA SNJ54ALS241CW	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54AS241AFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	SNJ54AS241AFK	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54AS241AJ	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54AS241AJ	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54AS241AW	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54AS241AW	<span style="background-color: red; color: white; padding: 2px;">Samples</span>

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**OTHER QUALIFIED VERSIONS OF SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A :**

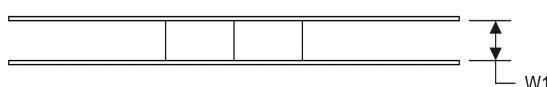
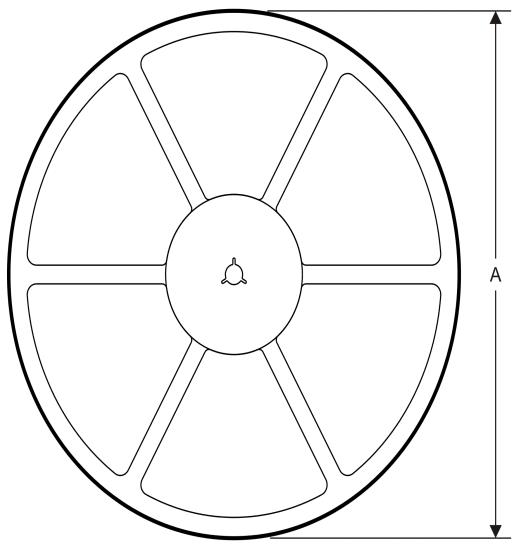
- Catalog: [SN74ALS241C](#), [SN74AS241A](#)
- Military: [SN54ALS241C](#), [SN54AS241A](#)

NOTE: Qualified Version Definitions:

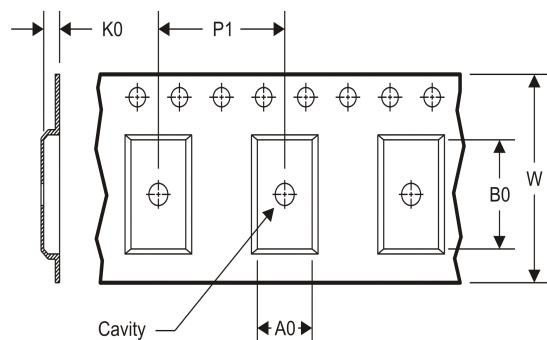
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

### 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
SN74ALS241CDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74ALS241CNSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	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)
SN74ALS241CDWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ALS241CNSR	SO	NS	20	2000	367.0	367.0	45.0

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

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

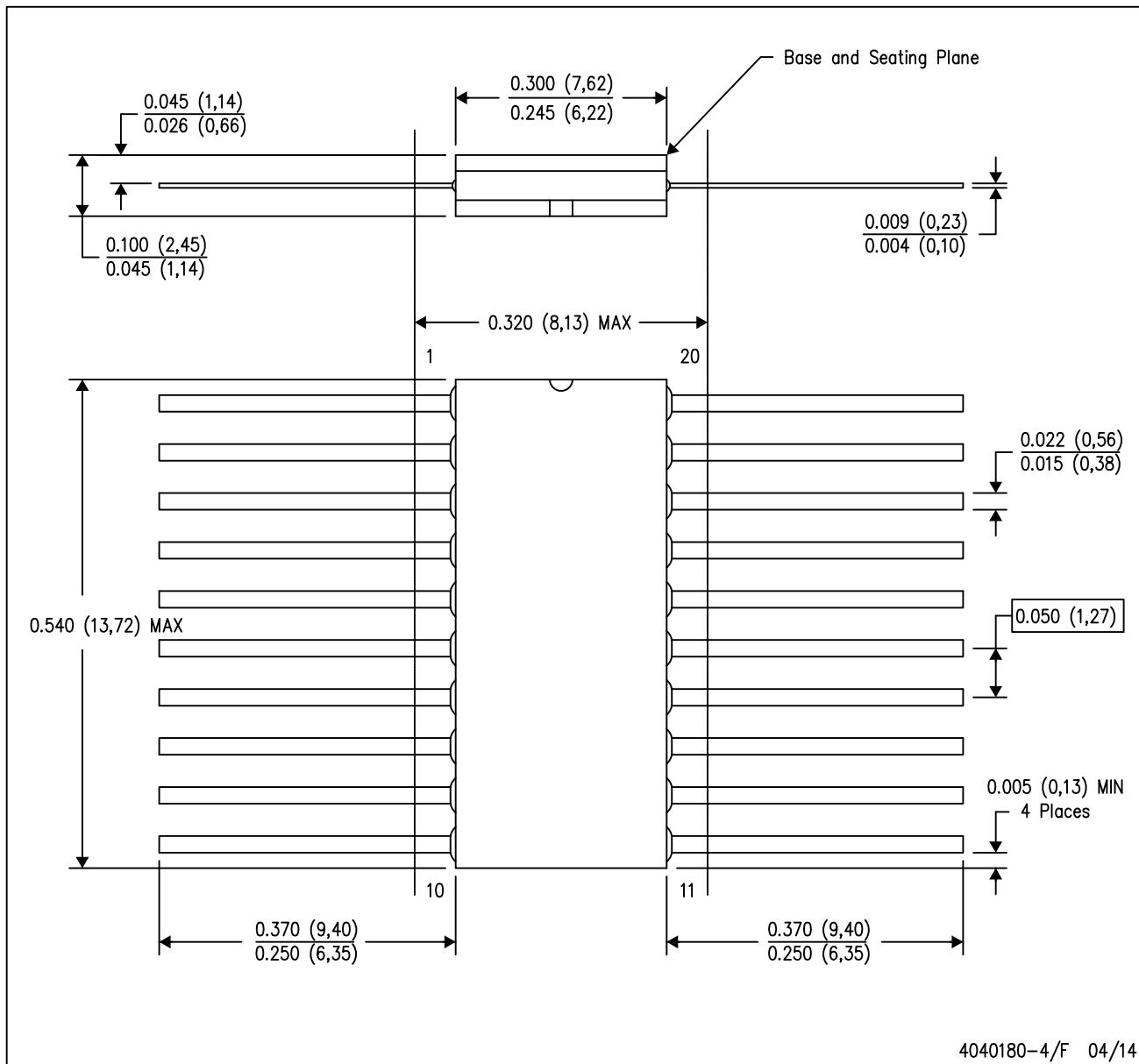


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NOTES: A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.  
C. This package is hermetically sealed with a ceramic lid using glass frit.  
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.  
E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



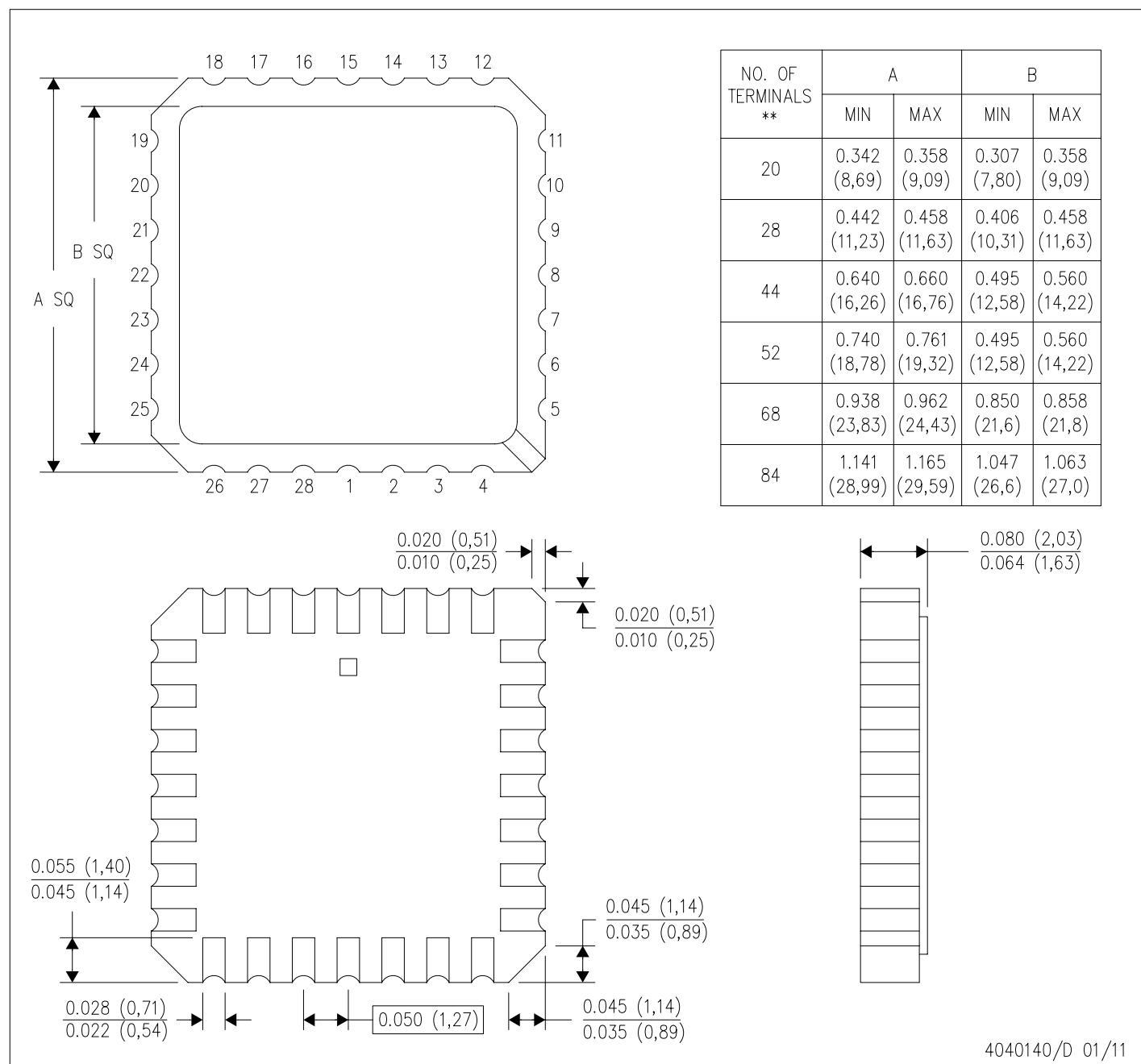
NOTES:

- 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 only.
- E. Falls within Mil-Std 1835 GDFP2-F20

FK (S-CQCC-N\*\*)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



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 metal lid.  
 D. Falls within JEDEC MS-004

4040140/D 01/11

## N (R-PDIP-T\*\*)

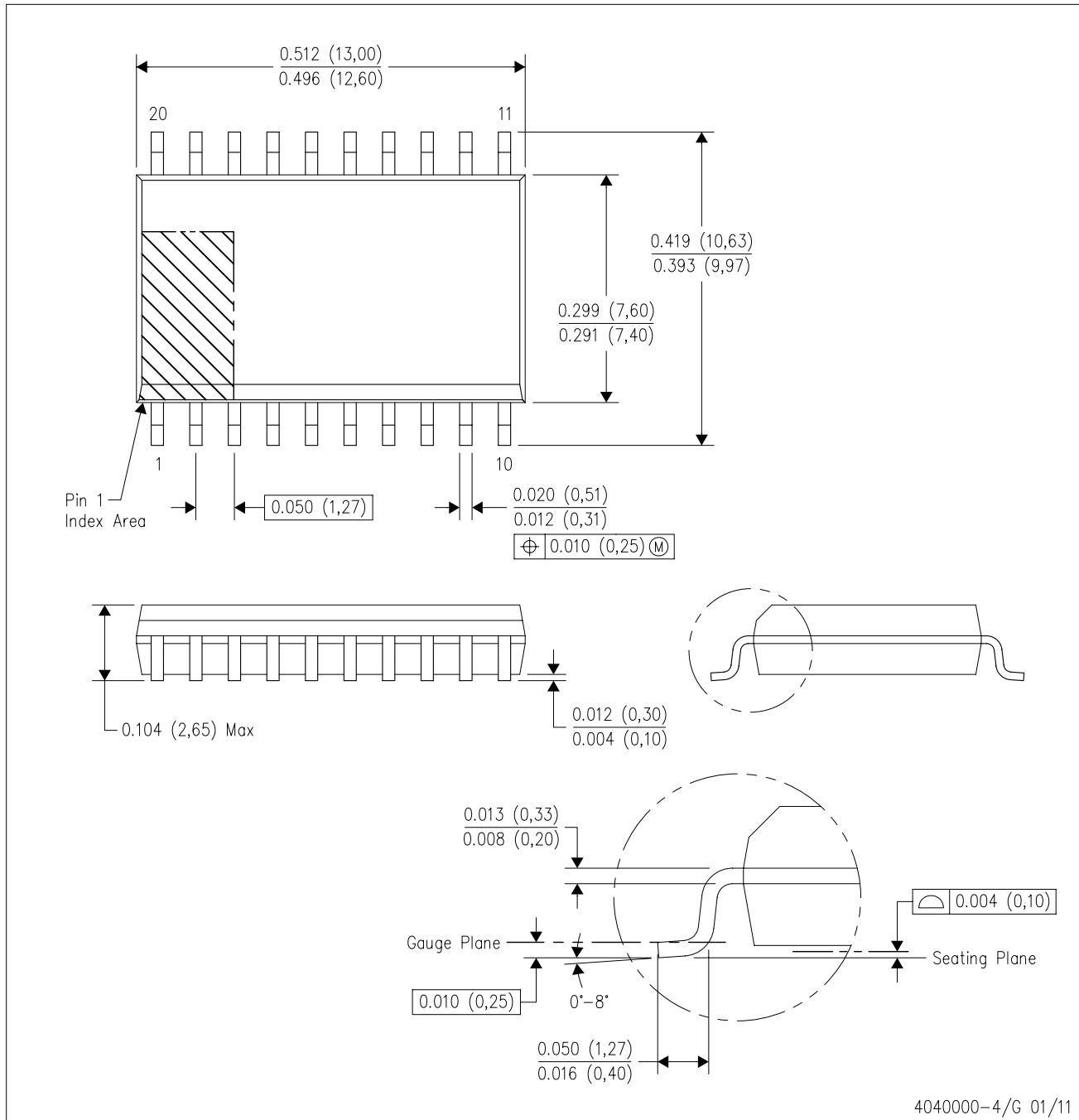
16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



NOTES:

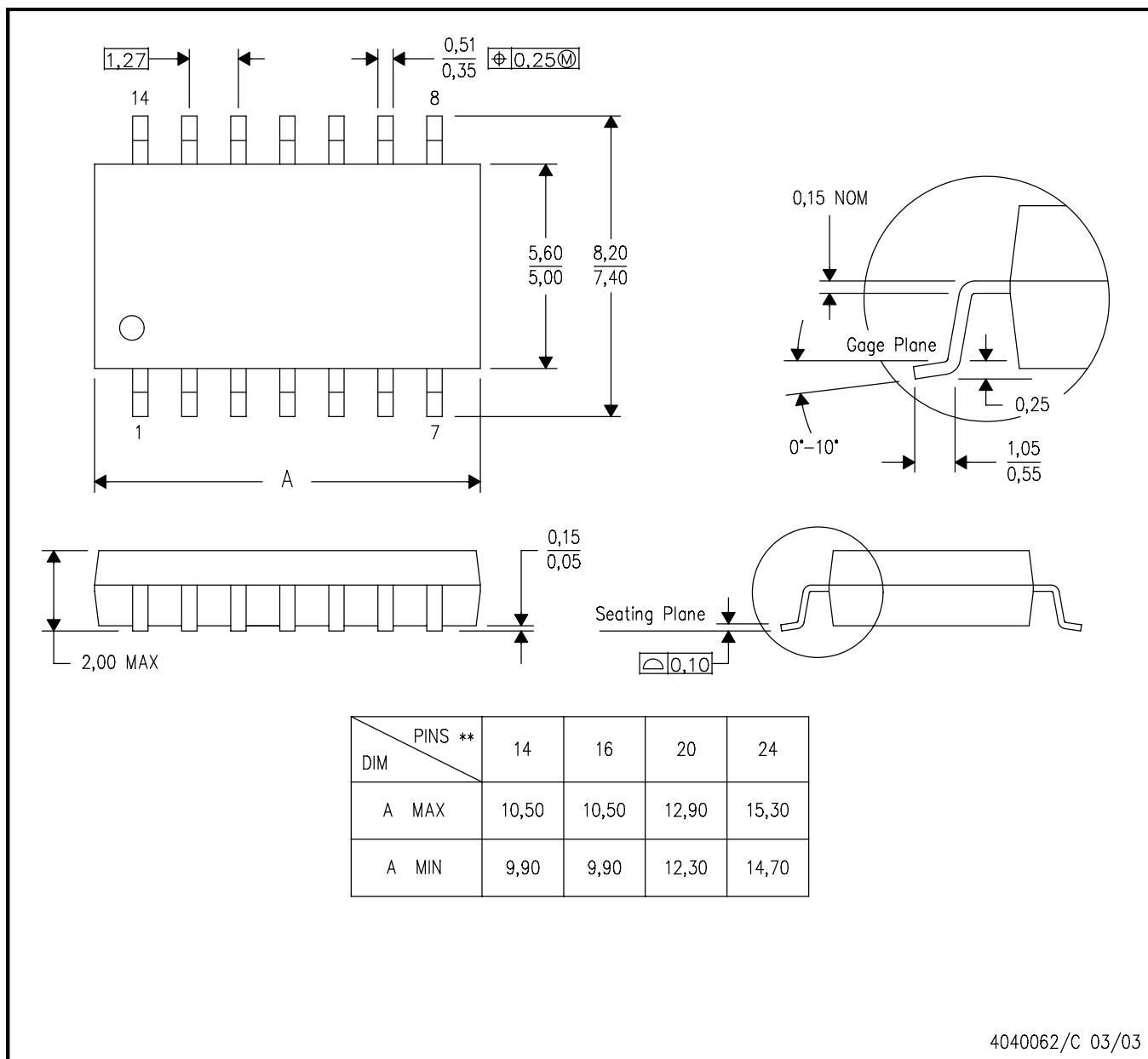
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
- This drawing is subject to change without notice.
- Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0.15).
- Falls within JEDEC MS-013 variation AC.

## MECHANICAL DATA

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

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



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.

4040062/C 03/03

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DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
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