

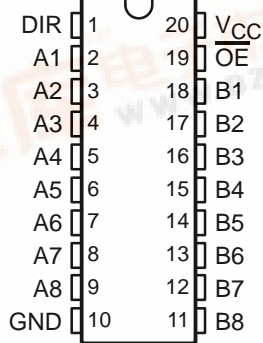
# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SDAS272A – NOVEMBER 1994 – REVISED JANUARY 2003

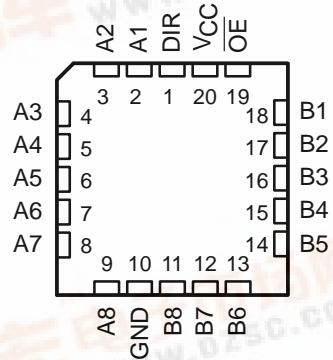
- 4.5-V to 5.5-V  $V_{CC}$  Operation
- Max  $t_{pd}$  of 5.5 ns at 5 V

- 3-State Outputs Drive Bus Lines Directly
- pnp Inputs Reduce dc Loading

SN54ALS245A . . . J OR W PACKAGE  
SN54AS245 . . . J PACKAGE  
SN74ALS245A . . . DB, DW, N, OR NS PACKAGE  
SN74AS245 . . . DW, N, OR NS PACKAGE  
(TOP VIEW)



SN54ALS245A, SN54AS245 . . . FK PACKAGE  
(TOP VIEW)

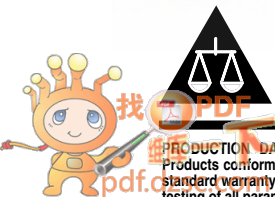


## description/ordering information

### ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74ALS245A-1N	SN74ALS245A-1N
			SN74ALS245AN	SN74ALS245AN
			SN74AS245N	SN74AS245N
	SOIC – DW	Tube	SN74ALS245ADW	ALS245A
			Tape and reel	
		Tube	SN74ALS245A-1DW	ALS245A-1
			Tape and reel	
		Tube	SN74AS245DW	AS245
			Tape and reel	
	SOP – NS	Tape and reel	SN74ALS245ANSR	ALS245A
SN74ALS245A-1NSR			ALS245A-1	
SN74AS245NSR			74AS245	
SSOP – DB	Tape and reel	SN74ALS245ADBR	G245A	
–55°C to 125°C	CDIP – J	Tube	SNJ54ALS245AJ	SNJ54ALS245AJ
			SNJ54AS245J	SNJ54AS245J
	CFP – W	Tube	SNJ54ALS245AW	SNJ54ALS245AW
	LCCC – FK	Tube	SNJ54ALS245AFK	SNJ54ALS245AFK
			SNJ54AS245FK	SNJ54AS245FK

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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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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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## description/ordering information(continued)

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

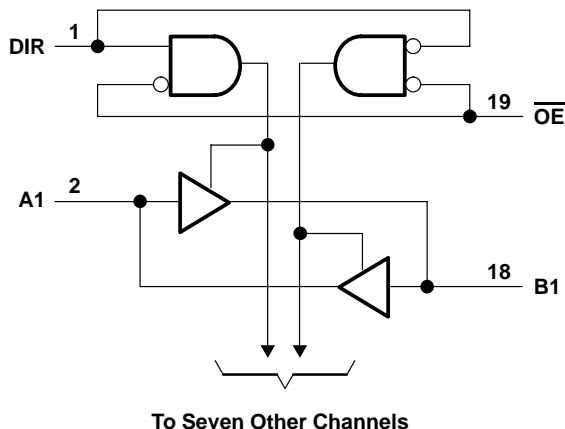
The devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

The -1 version of the SN74ALS245A is identical to the standard version, except that the recommended maximum  $I_{OL}$  is increased to 48 mA. There is no -1 version of the SN54ALS245A.

FUNCTION TABLE

INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

## logic diagram, each gate (positive logic)



## absolute maximum ratings over operating free-air temperature range (SN54ALS245A, SN74ALS245A) (unless otherwise noted)†

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$ : All inputs	7 V
I/O ports	5.5 V
Package thermal impedance, $\theta_{JA}$ (see Note 1): DB package	70°C/W
DW package	58°C/W
N package	69°C/W
NS package	60°C/W
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.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 2)

		SN54ALS245A			SN74ALS245A			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			0.7			0.8	V
$I_{OH}$	High-level output current			-12			-15	mA
$I_{OL}$	Low-level output current			12			24	mA
							48†	
$T_A$	Operating free-air temperature	-55		125	0		70	°C

† Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

NOTE 2: All unused 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.

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

PARAMETER		TEST CONDITIONS	SN54ALS245A			SN74ALS245A			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IK}$		$V_{CC} = 4.5$ V, $I_I = -18$ mA			-1.5			-1.5	V
$V_{OH}$		$V_{CC} = 4.5$ V to 5.5 V, $I_{OH} = -0.4$ mA	$V_{CC} - 2$			$V_{CC} - 2$			V
		$V_{CC} = 4.5$ V, $I_{OH} = -3$ mA	2.4	3.2		2.4	3.2		
		$V_{CC} = 4.5$ V, $I_{OH} = -12$ mA	2						
		$V_{CC} = 4.5$ V, $I_{OH} = -15$ mA				2			
$V_{OL}$		$V_{CC} = 4.5$ V	$I_{OL} = 12$ mA	0.25	0.4	0.25	0.4	V	
			$I_{OL} = 24$ mA				0.35		0.5
			$I_{OL} = 48$ mA†				0.35		0.5
$I_I$	Control inputs	$V_{CC} = 5.5$ V	$V_I = 7$ V			0.1	0.1	mA	
	A or B ports		$V_I = 5.5$ V			0.1	0.1		
$I_{IH}$	Control inputs	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			20	20	µA	
	A or B ports§					20	20		
$I_{IL}$	Control inputs	$V_{CC} = 5.5$ V,	$V_I = 0.4$ V			-0.1	-0.1	mA	
	A or B ports§					-0.1	-0.1		
$I_{O}^{\parallel}$		$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	-20	-112	-30	-112	mA	
$I_{CC}$		$V_{CC} = 5.5$ V	Outputs high	30	48	30	45	mA	
			Outputs low	36	60	36	55		
			Outputs disabled	38	63	38	58		

† Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

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

§ For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  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,  $I_{OS}$ .

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SDAS272A – NOVEMBER 1994 – REVISED JANUARY 2003

## 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, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54ALS245A		SN74ALS245A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	1	19	3	10	ns
t <sub>PHL</sub>			1	14	3	10	
t <sub>PZH</sub>	$\overline{OE}$	A or B	2	30	5	20	ns
t <sub>PZL</sub>			2	29	5	20	
t <sub>PHZ</sub>	$\overline{OE}$	A or B	2	14	2	10	ns
t <sub>PLZ</sub>			2	30	4	15	

† 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 (SN54AS245, SN74AS245) (unless otherwise noted)‡

Supply voltage, V <sub>CC</sub>	7 V
Input voltage, V <sub>I</sub> : All inputs	7 V
I/O ports	5.5 V
Package thermal impedance, θ <sub>JA</sub> (see Note 1): DW package	58°C/W
N package	69°C/W
NS package	60°C/W
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.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

## recommended operating conditions (see Note 2)

		SN54AS245			SN74AS245			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

NOTE 2: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SDAS272A – NOVEMBER 1994 – REVISED JANUARY 2003

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

PARAMETER		TEST CONDITIONS	SN54AS245		SN74AS245		UNIT		
			MIN	TYP†	MAX	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>		V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = -2 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			
		V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -12 mA	2						
		V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -15 mA			2				
V <sub>OL</sub>		V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 48 mA	0.3 0.55				V		
		V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 64 mA			0.35	0.55			
I <sub>I</sub>	Control inputs	V <sub>CC</sub> = 5.5 V	V <sub>I</sub> = 7 V		0.1		mA		
	A or B ports		V <sub>I</sub> = 5.5 V		0.1				
I <sub>IH</sub>	Control inputs	V <sub>CC</sub> = 5.5 V,	V <sub>I</sub> = 2.7 V		50		μA		
	A or B ports‡				70				
I <sub>IL</sub>	Control inputs	V <sub>CC</sub> = 5.5 V,	V <sub>I</sub> = 0.4 V		-0.5		mA		
	A or B ports‡				-0.75				
I <sub>O</sub> §		V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 2.25 V		-50	-150	-50	-150	mA
I <sub>CC</sub>		V <sub>CC</sub> = 5.5 V	Outputs high		62	97	62	97	
			Outputs low		95	143	95	143	
			Outputs disabled		79	123	79	123	

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

‡ For I/O ports, 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>.

## switching characteristics (see Figure 1)

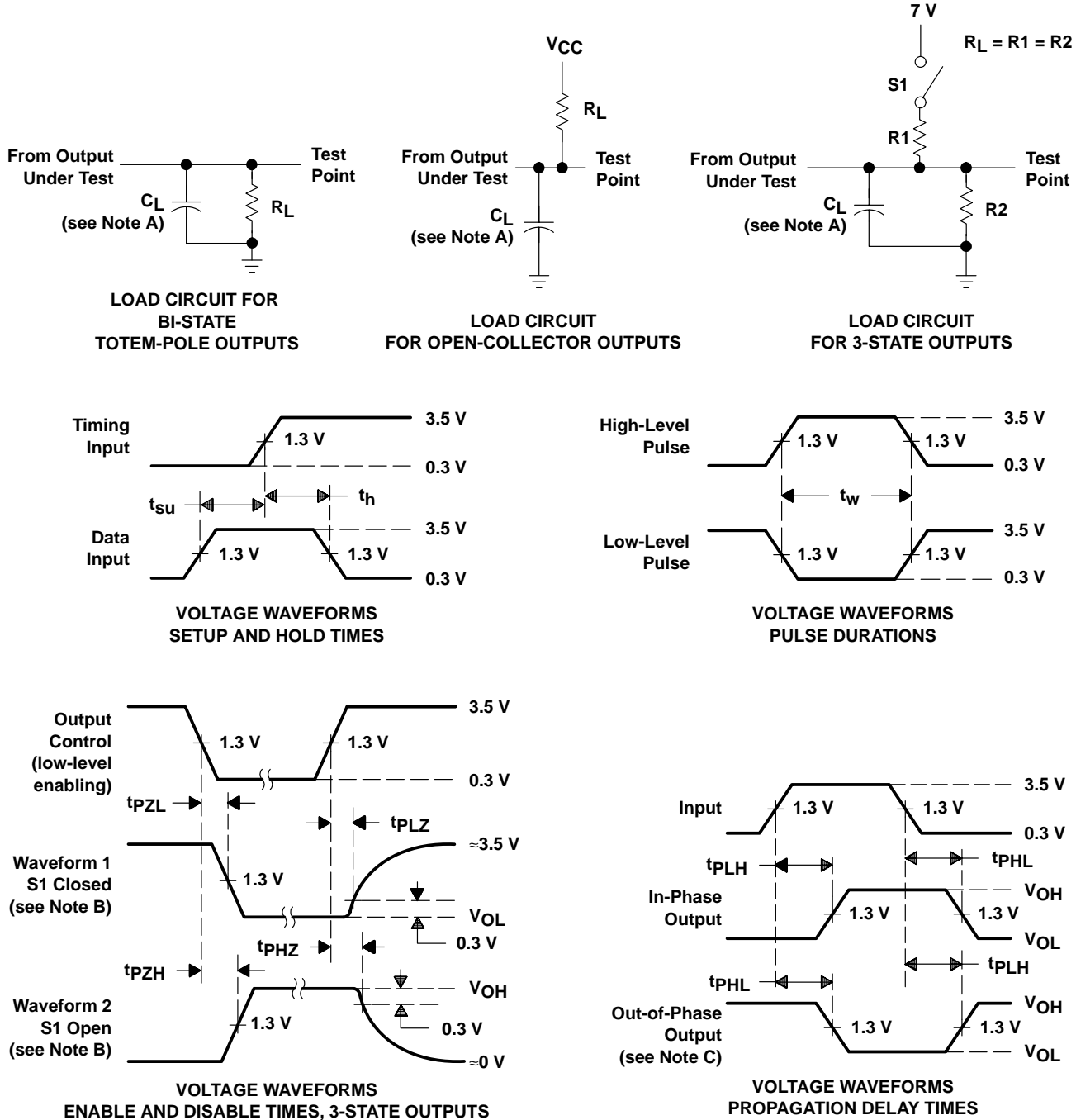
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX††				UNIT
			SN54AS245		SN74AS245		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	2	9.5	2	7.5	ns
t <sub>PHL</sub>			2	9	2	7	
t <sub>PZH</sub>	$\overline{\text{OE}}$	A or B	2	11	2	9	ns
t <sub>PZL</sub>			2	10.5	2	8.5	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	A or B	2	7.5	2	5.5	ns
t <sub>PLZ</sub>			2	12	2	9.5	

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

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SDAS272A – NOVEMBER 1994 – REVISED JANUARY 2003

## 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>
84030012A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
8403001RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	Level-NC-NC-NC
8403001SA	ACTIVE	CFP	W	20	1	TBD	Call TI	Level-NC-NC-NC
SN54ALS245AJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	Level-NC-NC-NC
SN54AS245J	ACTIVE	CDIP	J	20	1	TBD	Call TI	Level-NC-NC-NC
SN74ALS245ADBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI
SN74ALS245ADBR	ACTIVE	SSOP	DB	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS245ADBRE4	ACTIVE	SSOP	DB	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS245ADW	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS245ADWR	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS245ADWRE4	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74ALS245AN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74ALS245AN3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74ALS245ANSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS245ANSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS245ANSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS245DW	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS245DWE4	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS245DWR	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS245DWRE4	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AS245N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74AS245NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS245NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SNJ54ALS245AFK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54ALS245AJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54ALS245AW	ACTIVE	CFP	W	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54AS245FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54AS245J	ACTIVE	CDIP	J	20	1	TBD	Call TI	Level-NC-NC-NC

<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.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

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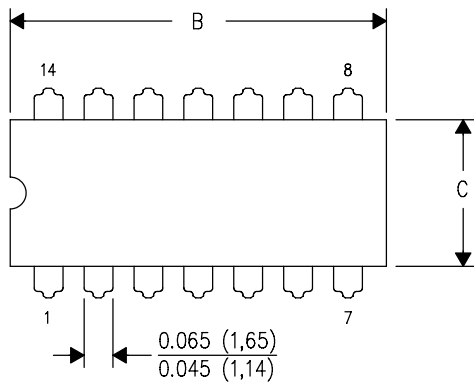
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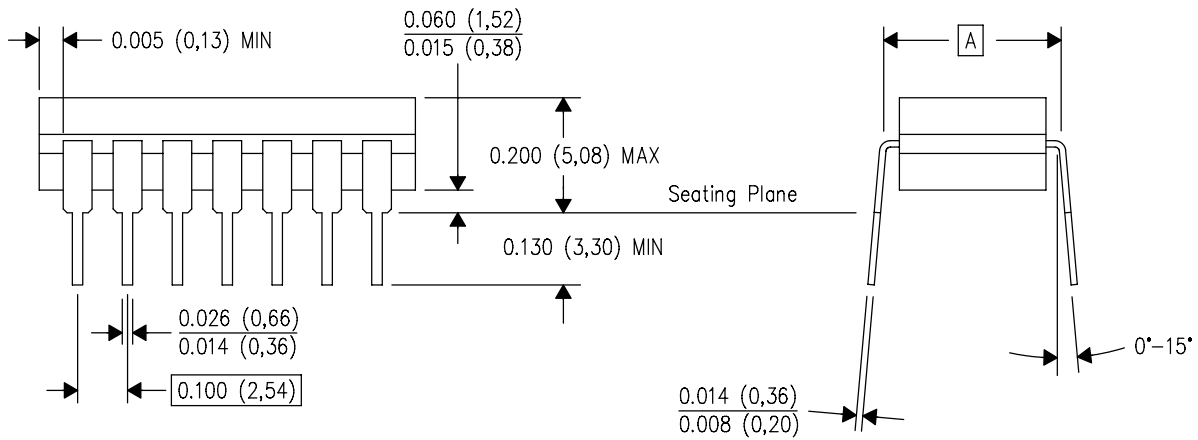
J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	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)



4040083/F 03/03

- 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.



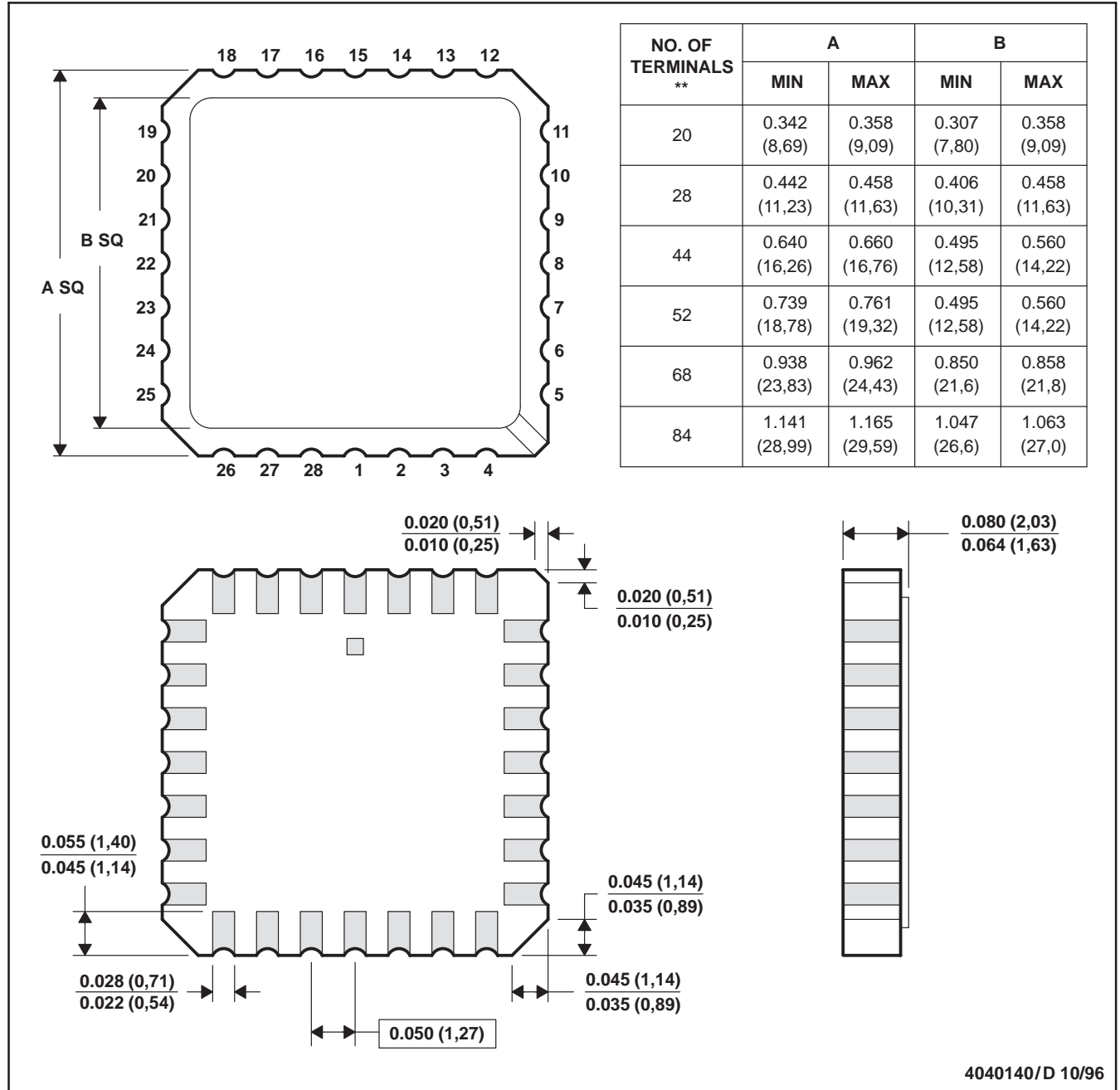
# MECHANICAL DATA

MLCC006B – OCTOBER 1996

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

## LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



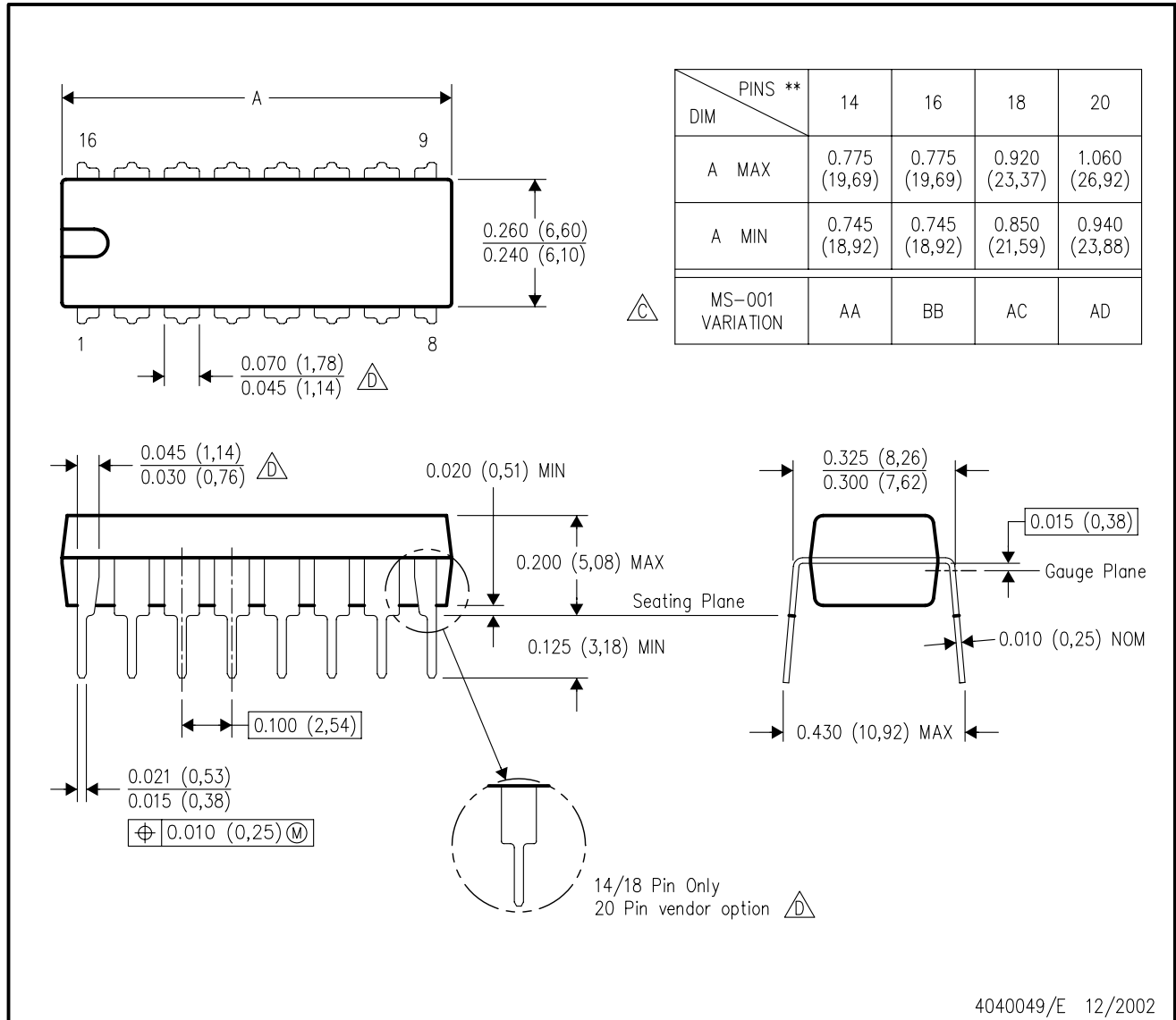
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a metal lid.
  - D. The terminals are gold plated.
  - E. Falls within JEDEC MS-004

# MECHANICAL DATA

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

## PLASTIC DUAL-IN-LINE PACKAGE

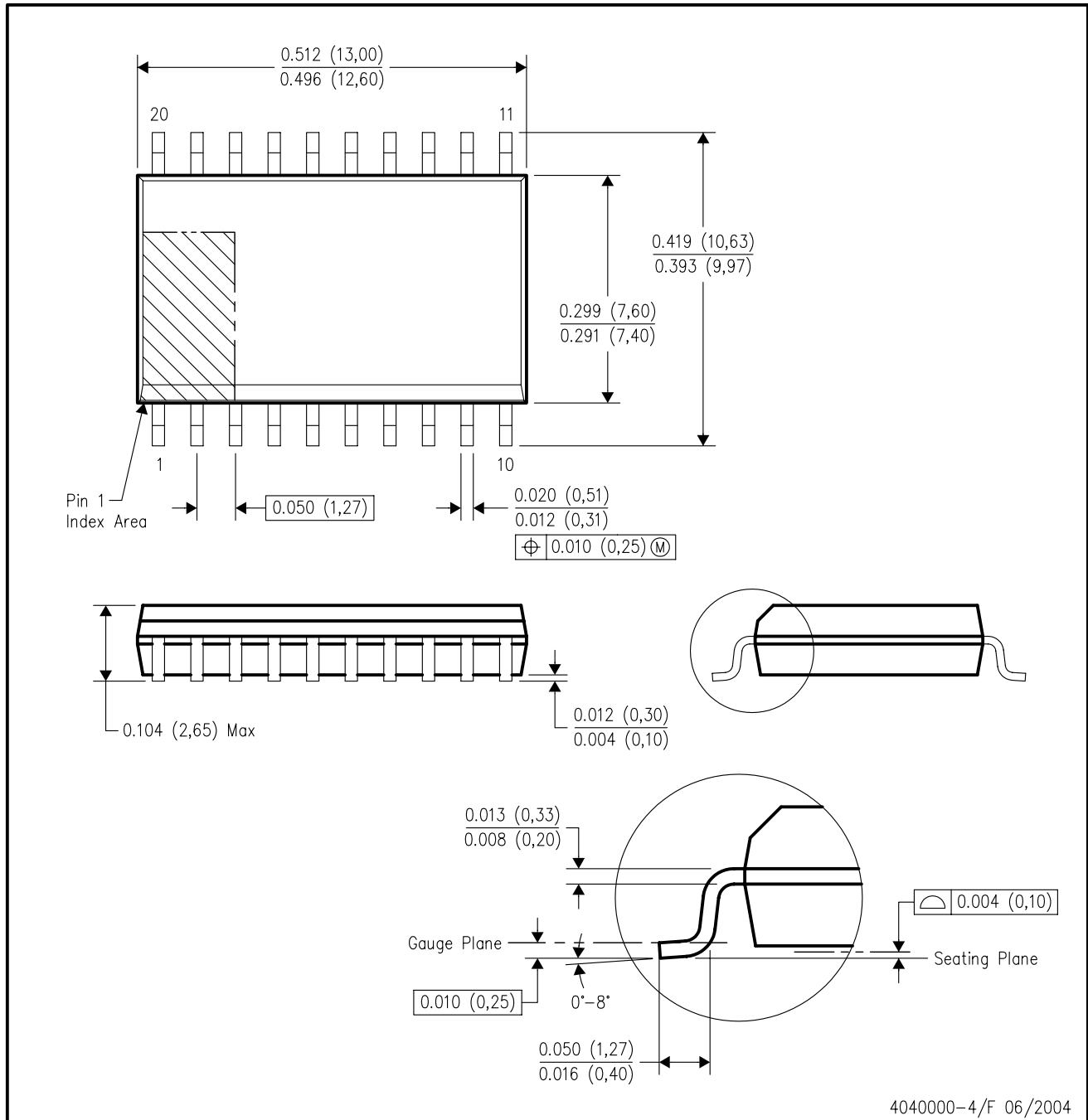
16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



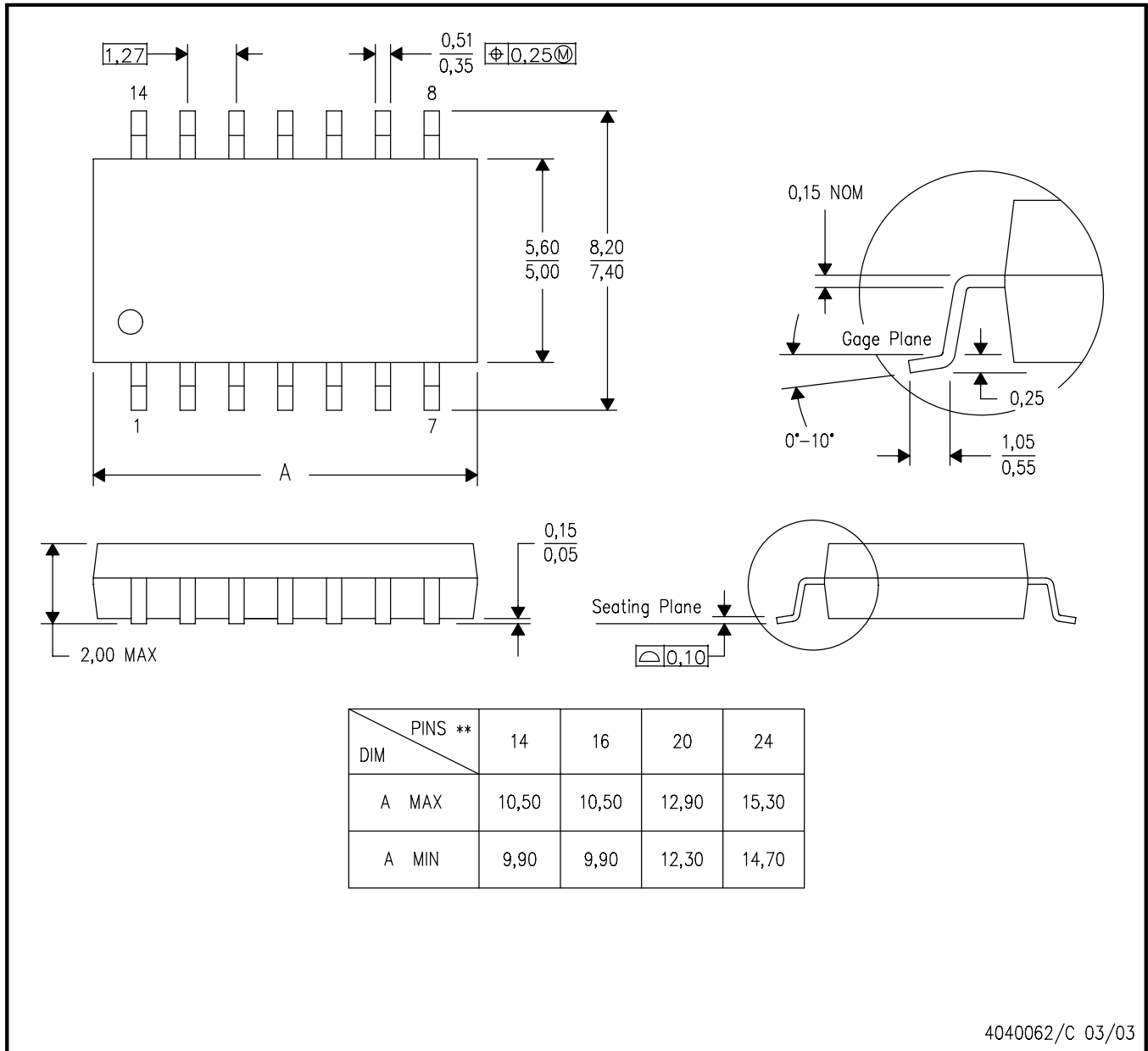
- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AC.

## MECHANICAL DATA

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

**PLASTIC SMALL-OUTLINE PACKAGE**

**14-PINS SHOWN**



4040062/C 03/03

- 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.

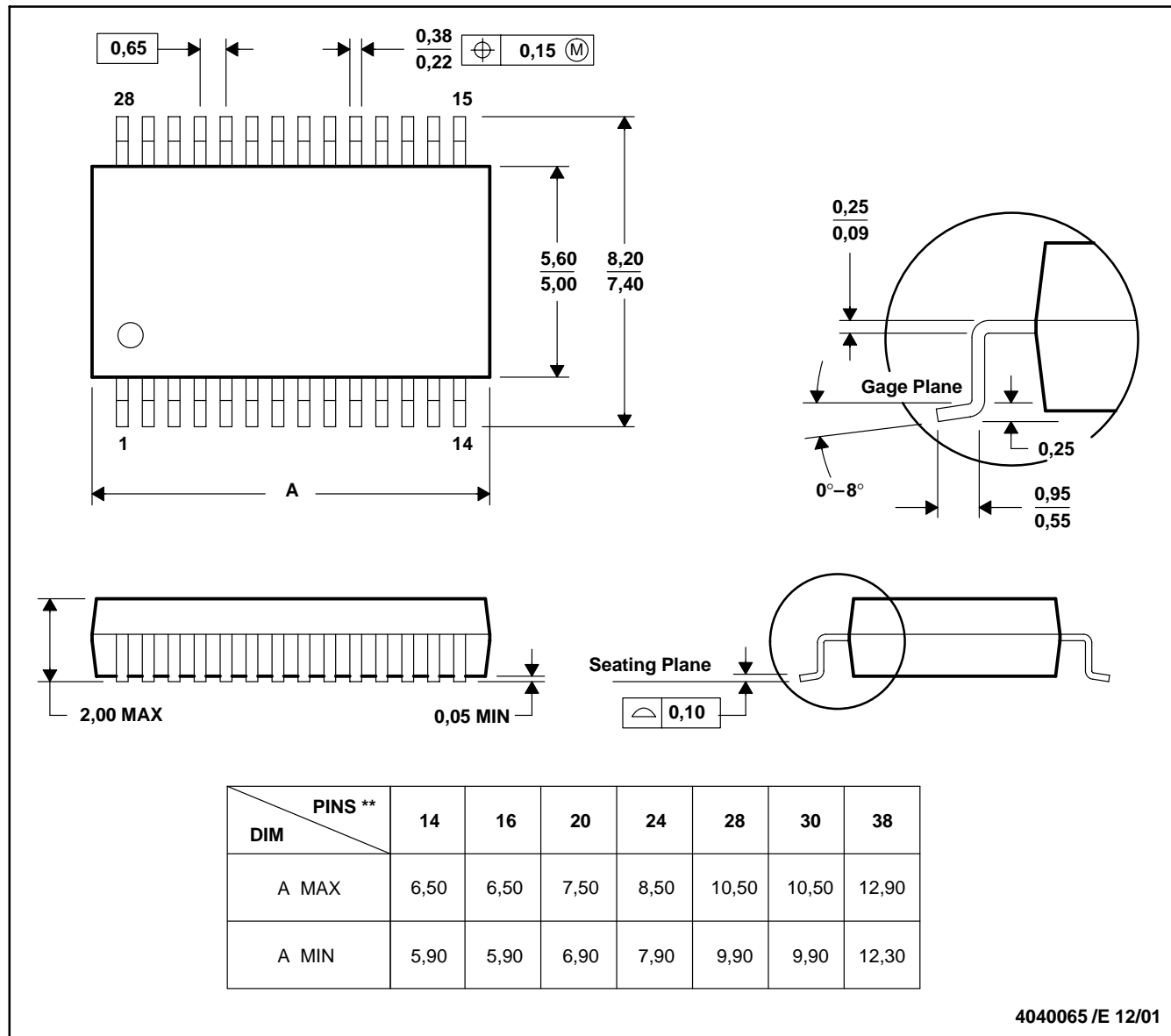
# MECHANICAL DATA

MSS0002E – JANUARY 1995 – REVISED DECEMBER 2001

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 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.  
 D. Falls within JEDEC MO-150

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