The SN5405 is obsolete and no longer is supplied.

- **Package Options Include Plastic Small-Outline (D, NS), Shrink Small-Outline (DB), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs**

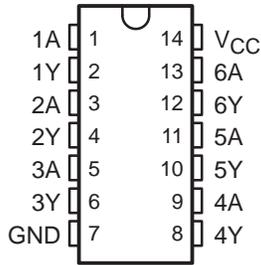- **Dependable Texas Instrument Quality and Reliability**

SN5405, SN54LS05, SN54S05 . . . J PACKAGE
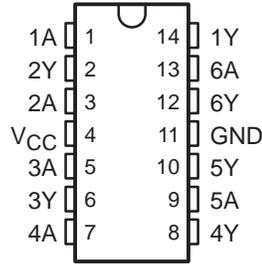SN7405 . . . N PACKAGE
SN74LS05 . . . D, DB, N, OR NS PACKAGE
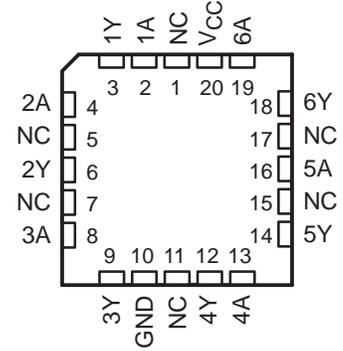SN74S05 . . . D, N, OR NS PACKAGE
(TOP VIEW)

1A	1	14	V_{CC}
1Y	2	13	6A
2A	3	12	6Y
2Y	4	11	5A
3A	5	10	5Y
3Y	6	9	4A
GND	7	8	4Y

SN54LS05, SN54S05 . . . W PACKAGE
(TOP VIEW)

1A	1	14	1Y
2Y	2	13	6A
2A	3	12	6Y
V_{CC}	4	11	GND
3A	5	10	5Y
3Y	6	9	5A
4A	7	8	4Y

SN54LS05, SN54S05 . . . FK PACKAGE
(TOP VIEW)

Pins top: 1Y, 1A, NC, V_{CC}, 6A (3 2 1 20 19)
Left: 2A (4), NC (5), 2Y (6), NC (7), 3A (8)
Right: 6Y (18), NC (17), 5A (16), NC (15), 5Y (14)
Bottom: 3Y, GND, NC, 4Y, 4A (9 10 11 12 13)

NC – No internal connection

description/ordering information

These devices contain six independent inverters. To perform correctly, the open-collector outputs require pullup resistors. These devices may be connected to other open-collector outputs to implement active-low wired-OR or active-high wire-AND functions. Open-collector devices often are used to generate high V_{OH} levels.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN7405N	SN7405N
			SN74LS05N	SN74LS05N
			SN74S05N	SN74S05N
	SOIC – D	Tube	SN74LS05D	LS05
		Tape and reel	SN74LS05DR	
		Tube	SN74S05D	S05
		Tape and reel	SN74S05DR	
	SOP – NS	Tape and reel	SN74LS05NSR	74LS05
			SN74S05NSR	74S05
	SSOP – DB	Tape and reel	SN74LS05DBR	LS05
−55°C to 125°C	CDIP – J	Tube	SNJ54LS05J	SNJ54LS05J
			SNJ54S05J	SNJ54S05J
	CDIP – W	Tube	SNJ54LS05W	SNJ54LS05W
			SNJ54S05W	SNJ54S05W
	LCCC – FK	Tube	SNJ54LS05FK	SNJ54LS05FK
			SNJ54S05FK	SNJ54S05FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

TEXAS INSTRUMENTS

SN54LS05, SN54S05
SN7405, SN74LS05, SN74S05
HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS
SDLS030A – DECEMBER 1983 – REVISED NOVEMBER 2003

The SN5405 is obsolete
and no longer is supplied.

FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

logic diagram (positive logic)

1A	1	2	1Y
2A	3	4	2Y
3A	5	6	3Y
4A	9	8	4Y
5A	11	10	5Y
6A	13	12	6Y

$Y = \overline{A}$
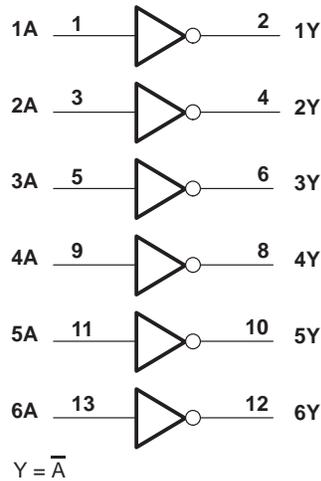
Pin numbers shown are for the D, DB, J, N, and NS packages.

The SN5405 is obsolete and no longer is supplied.

schematic (each inverter)

Resistor values shown are nominal.

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

Supply voltage, V_{CC} (see Note 1): '05, 'LS05, 'S05 .... 7 V
Input voltage, V_I: '05, 'S05 .... 5.5 V
              'LS05 .... 7 V
Off-state output voltage, V_O .... 7 V
Package thermal impedance, θ_{JA} (see Note 2): D package .... 86°C/W
                                DB package .... 96°C/W
                                N package .... 80°C/W
                                NS package .... 76°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. Voltage values are with respect to network ground terminal.
        2. The package thermal impedance is calculated in accordance with JESD 51-7.

SN54LS05, SN54S05
SN7405, SN74LS05, SN74S05
HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS
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The SN5405 is obsolete
and no longer is supplied.

recommended operating conditions

		SN5405			SN7405			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			16			16	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†			SN5405			SN7405			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −12 mA				−1.5			−1.5	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 5.5 V	V_{IL} = 0.8 V						0.25	mA
			V_{IL} = 0.7 V			0.25				
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V,	I_{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I_I	V_{CC} = MAX,	V_I = 5.5 V				1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.4 V				40			40	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.4 V				−1.6			−1.6	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V			6	12		6	12	mA
I_{CCL}	V_{CC} = MAX,	V_I = 4.5 V			18	33		18	33	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A	Y	R_L = 4 kΩ	C_L = 15 pF		40	55	ns
t_{PHL}			R_L = 400 Ω			8	15	

**The SN5405 is obsolete
and no longer is supplied.**

recommended operating conditions

		SN54LS05			SN74LS05			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.7			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			4			8	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†			SN54LS05			SN74LS05			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V_{IK}	V_{CC} = MIN,	I_I = –18 mA				–1.5			–1.5	V
I_{OH}	V_{CC} = MIN,	V_{IL} = MAX, V_{OH} = 5.5 V				0.1			0.1	mA
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 8 mA					0.35	0.5	
I_I	V_{CC} = MAX,	V_I = 7 V				0.1			0.1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V				20			20	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.4 V				–0.4			–0.4	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V			1.2	2.4		1.2	2.4	mA
I_{CCL}	V_{CC} = MAX,	V_I = 4.5 V			3.6	6.6		3.6	6.6	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A	Y	R_L = 2 kΩ, C_L = 15 pF		17	32	ns
t_{PHL}					15	28	

SN54LS05, SN54S05
SN7405, SN74LS05, SN74S05
HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS
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The SN5405 is obsolete
and no longer is supplied.

recommended operating conditions

		SN54S05			SN74S05			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			20			20	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†		SN54S05			SN74S05			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 5.5 V	V_{IL} = 0.8 V						0.25	mA
			V_{IL} = 0.7 V			0.25				
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V, I_{OL} = 20 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			50			50	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−2			−2	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V		9	19.8		9	19.8	mA
I_{CCL}	V_{CC} = MAX,	V_I = 4.5 V		30	54		30	54	mA

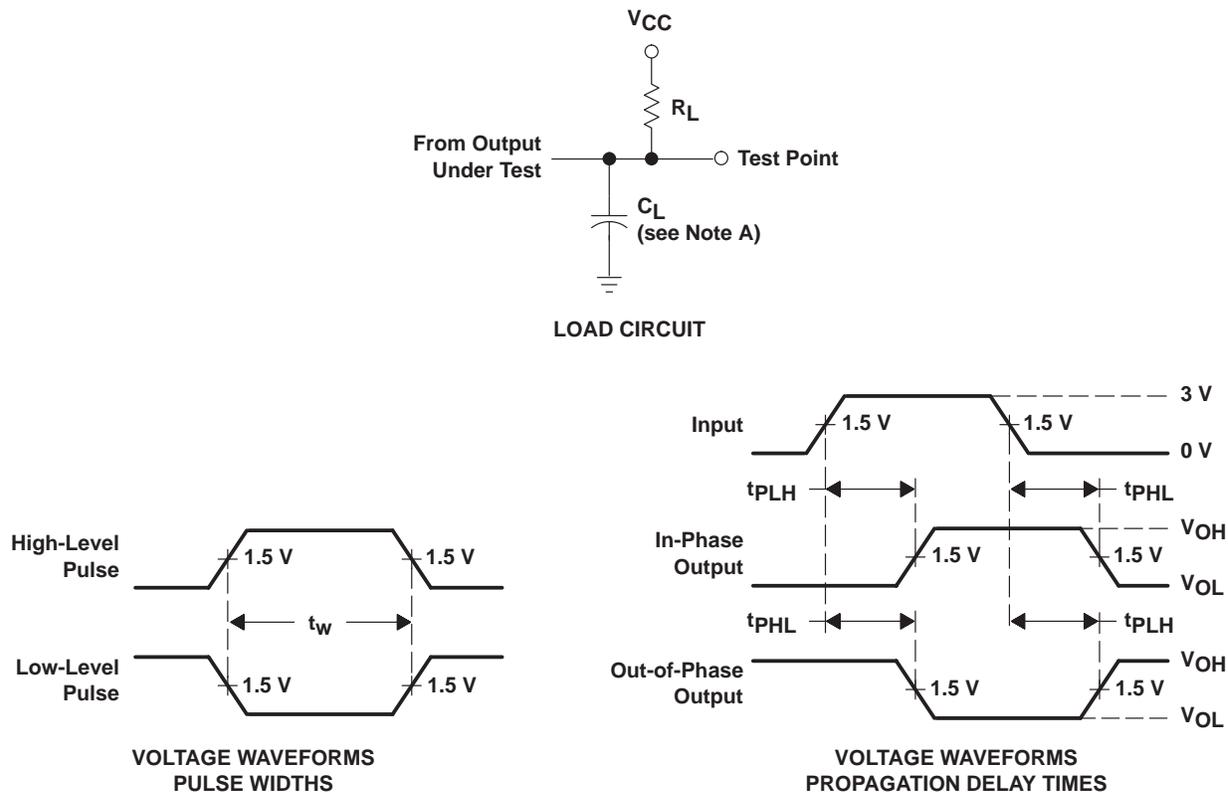† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A	Y	R_L = 280 Ω	C_L = 15 pF	2	5	7.5	ns
t_{PHL}					2	4.5	7	
t_{PLH}				C_L = 50 pF			7.5	ns
t_{PHL}							7	

**The SN5405 is obsolete
and no longer is supplied.**

**SN54LS05, SN54S05
SN7405, SN74LS05, SN74S05
HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS**
SDLS030A – DECEMBER 1983 – REVISED NOVEMBER 2003

PARAMETER MEASUREMENT INFORMATION
SERIES 54/74 AND 54S/74S DEVICES

LOAD CIRCUIT

**VOLTAGE WAVEFORMS
PULSE WIDTHS**

**VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES**

NOTES: A. C_L includes probe and jig capacitance.
B. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, and:
For Series 54/74, t_r ≤ 7 ns, t_f ≤ 7 ns.
For Series 54S/74S, t_r ≤ 2.5 ns, t_f ≤ 2.5 ns.
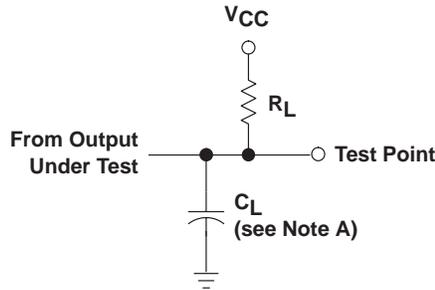D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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SN54LS05, SN54S05
SN7405, SN74LS05, SN74S05
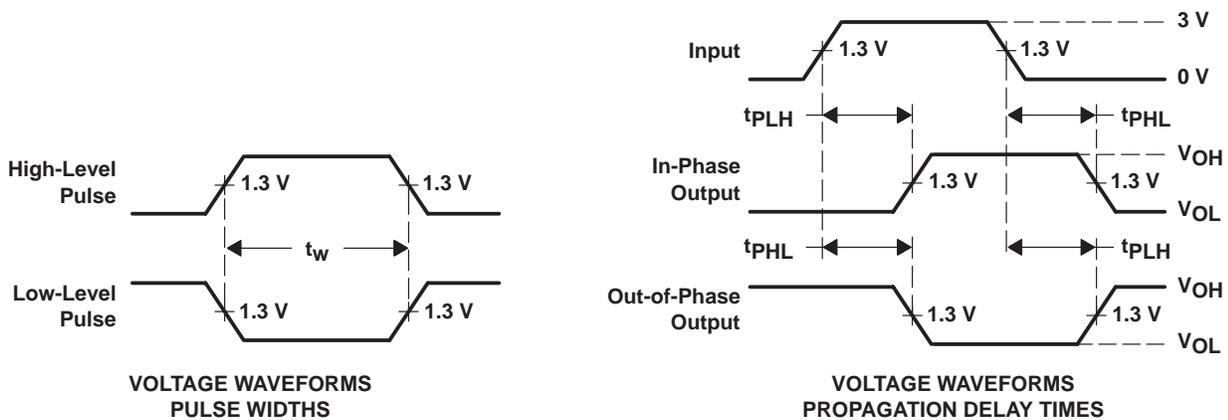**HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS**
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**The SN5405 is obsolete
and no longer is supplied.**

PARAMETER MEASUREMENT INFORMATION
SERIES 54LS/74LS DEVICES

LOAD CIRCUIT

**VOLTAGE WAVEFORMS
PULSE WIDTHS**

**VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES**

NOTES: A. C_L includes probe and jig capacitance.
       B. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
       C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 1.5 ns, t_f ≤ 2.6 ns.
       D. The outputs are measured one at a time with one input transition per measurement.

Figure 2. Load Circuit and Voltage Waveforms
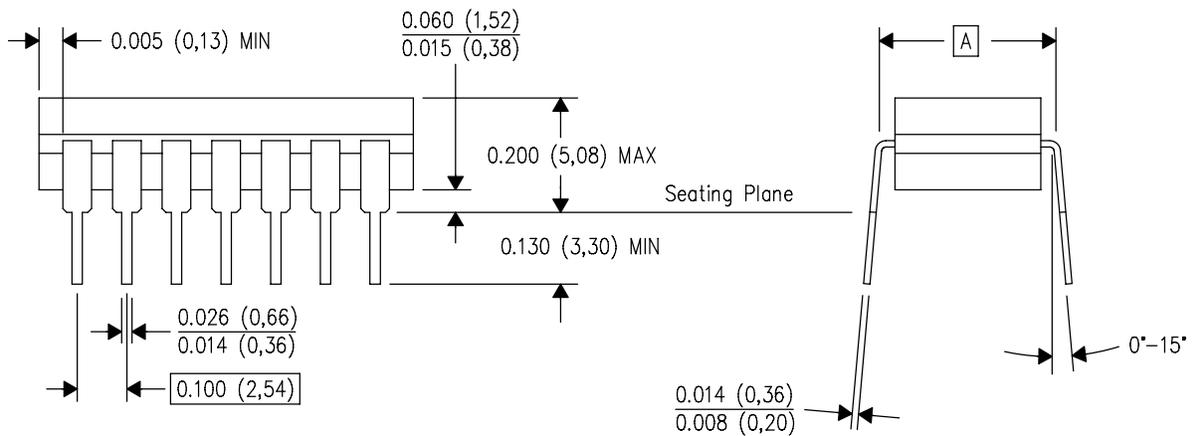
CERAMIC DUAL IN-LINE PACKAGE
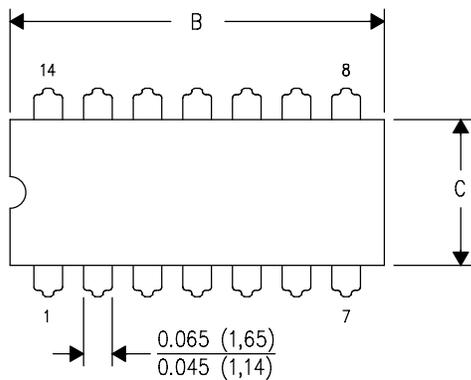
DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	——	——	——	——
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

B

14   8

C

1   7

0.065 (1,65)
0.045 (1,14)

0.005 (0,13) MIN

0.060 (1,52)
0.015 (0,38)

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

0.026 (0,66)
0.014 (0,36)

0.100 (2,54)
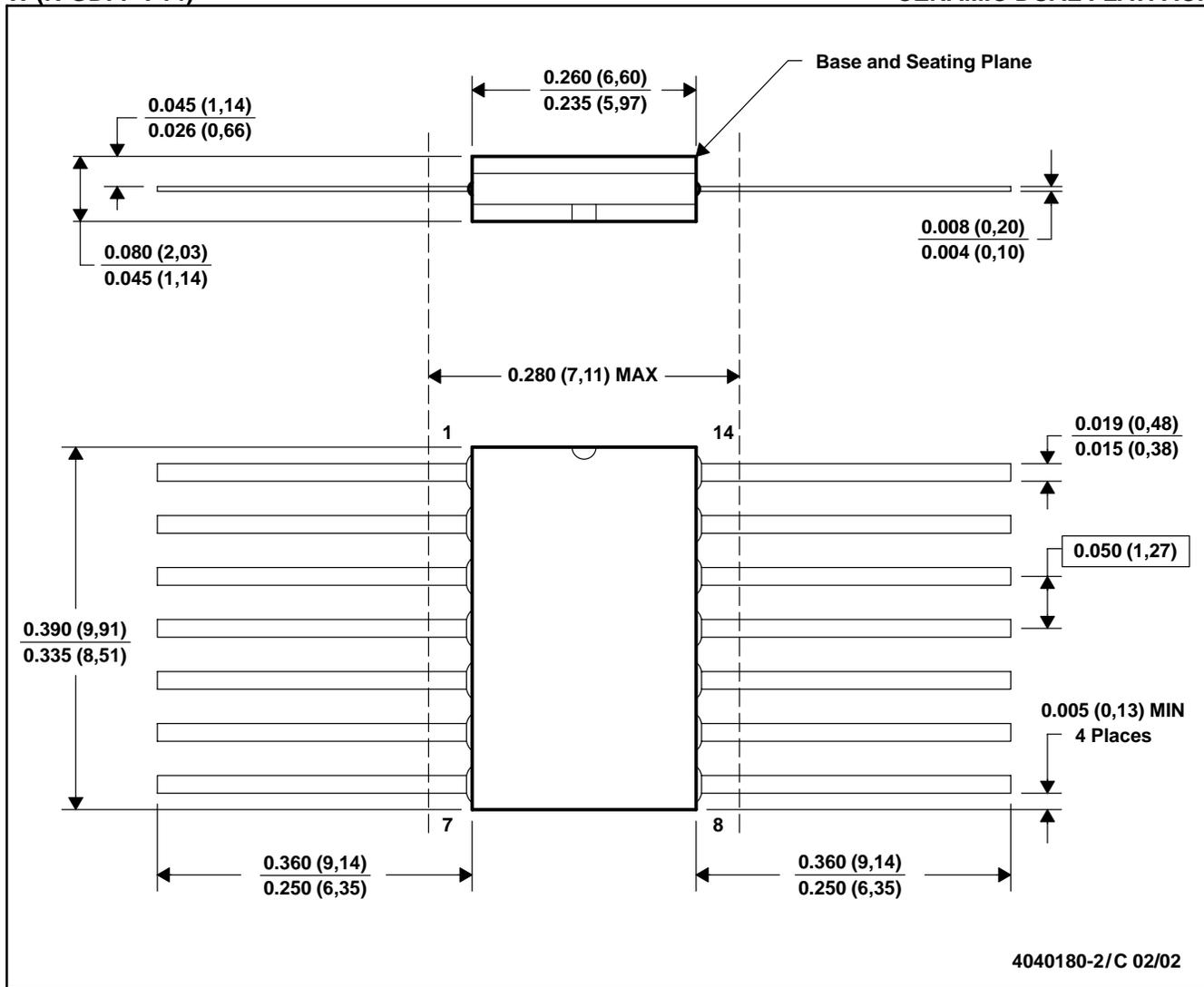
A

0°-15°

0.014 (0,36)
0.008 (0,20)

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.

W (R-GDFP-F14)   **CERAMIC DUAL FLATPACK**

Base and Seating Plane

0.045 (1,14)
0.026 (0,66)

0.260 (6,60)
0.235 (5,97)

0.080 (2,03)
0.045 (1,14)

0.008 (0,20)
0.004 (0,10)

0.280 (7,11) MAX

1   14

0.019 (0,48)
0.015 (0,38)

0.050 (1,27)

0.390 (9,91)
0.335 (8,51)

0.005 (0,13) MIN
4 Places

7   8

0.360 (9,14)
0.250 (6,35)

0.360 (9,14)
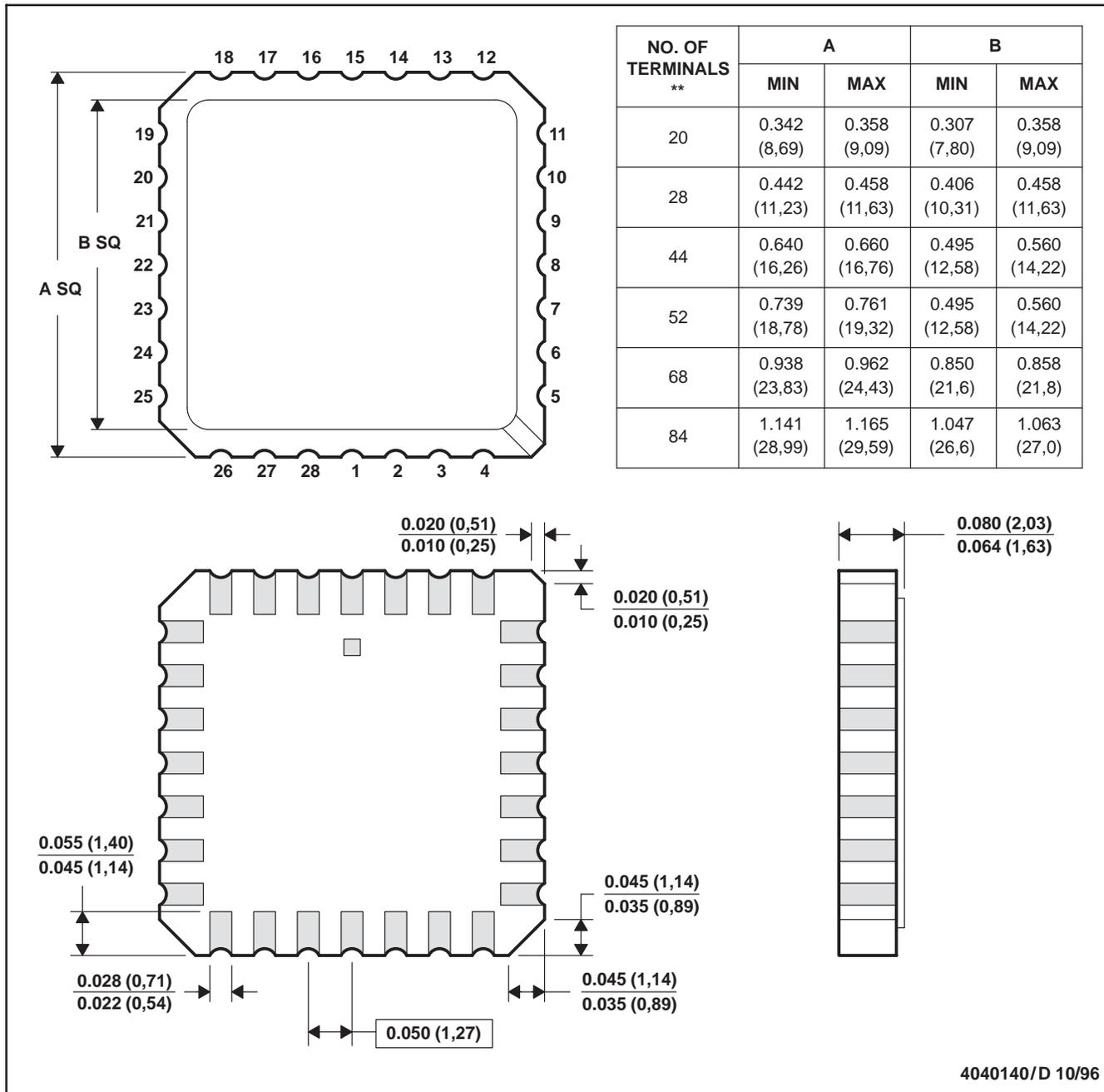0.250 (6,35)

4040180-2 / C 02/02

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 GDFP1-F14 and JEDEC MO-092AB

FK (S-CQCC-N**)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER

NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.739 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)

0.020 (0,51)
0.010 (0,25)

0.020 (0,51)
0.010 (0,25)

0.080 (2,03)
0.064 (1,63)

0.055 (1,40)
0.045 (1,14)

0.045 (1,14)
0.035 (0,89)

0.028 (0,71)
0.022 (0,54)

0.045 (1,14)
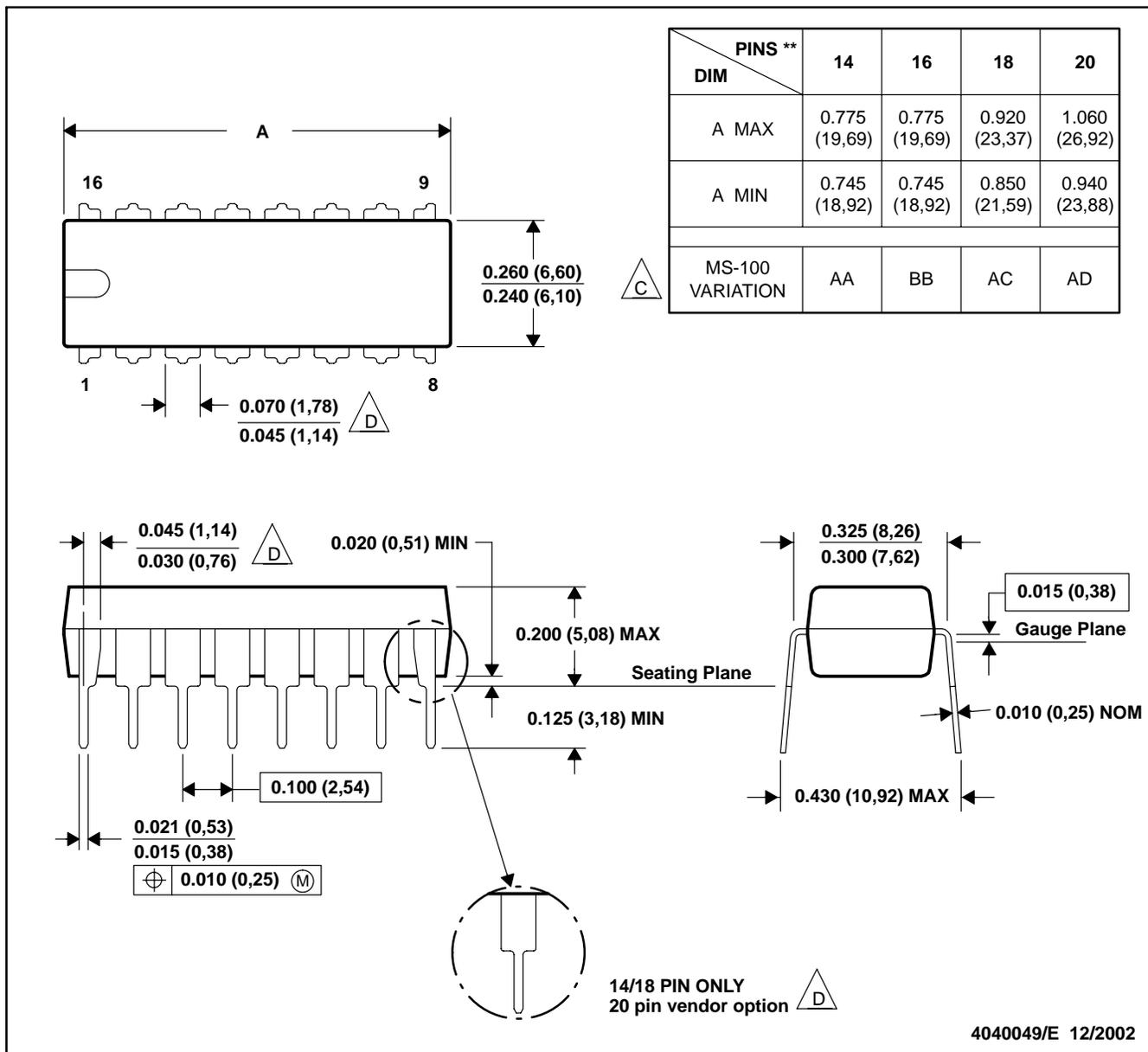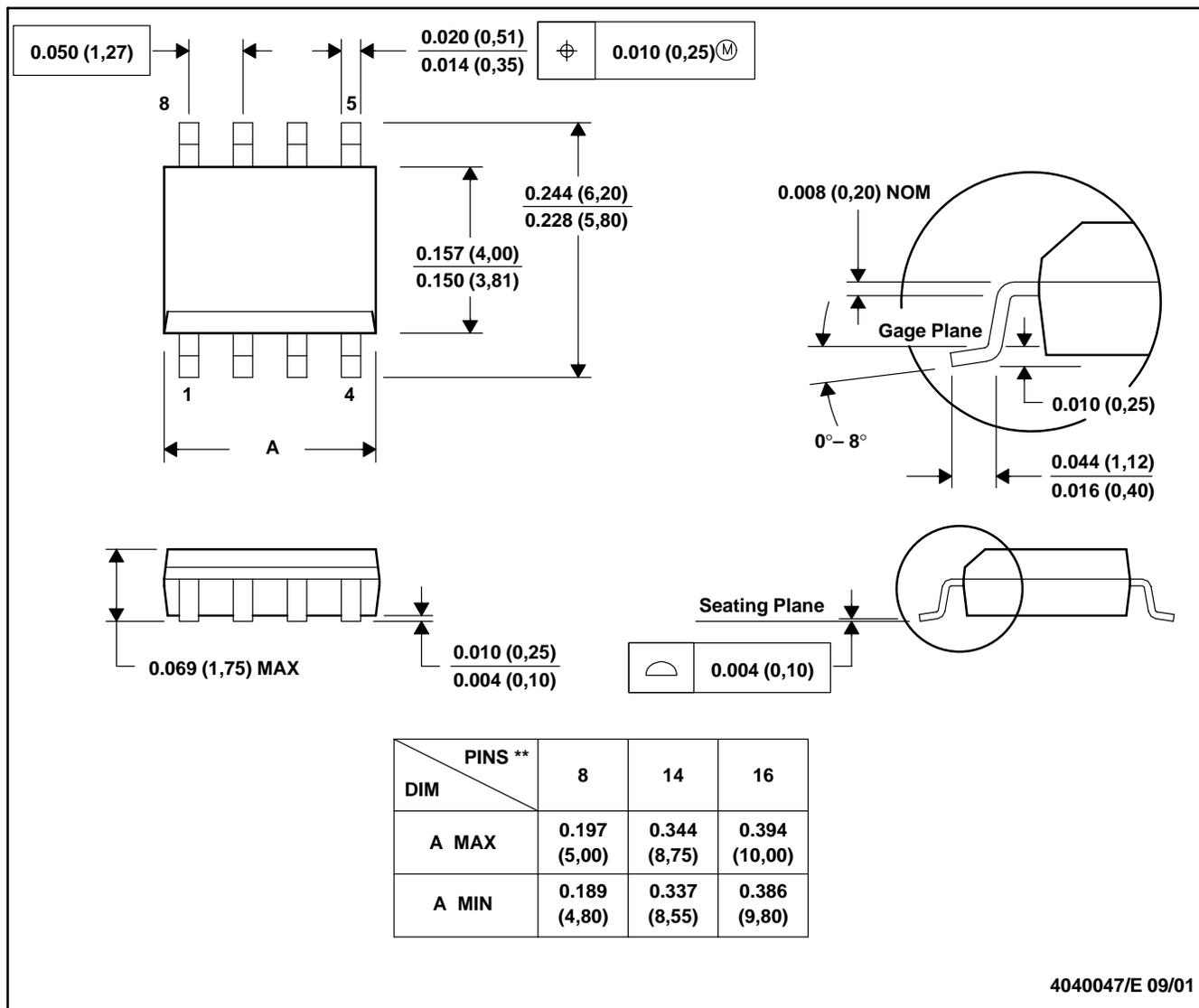0.035 (0,89)

0.050 (1,27)

4040140 / D 10/96

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

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MECHANICAL

N (R-PDIP-T**)   PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-100 VARIATION	AA	BB	AC	AD

A

16   9

0.260 (6,60)
0.240 (6,10)

1   8

0.070 (1,78)
0.045 (1,14) /D\

0.045 (1,14) /D\
0.030 (0,76)

0.020 (0,51) MIN

0.325 (8,26)
0.300 (7,62)

0.015 (0,38)
Gauge Plane

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.010 (0,25) NOM

0.100 (2,54)

0.430 (10,92) MAX

0.021 (0,53)
0.015 (0,38)
⊕ 0.010 (0,25) Ⓜ
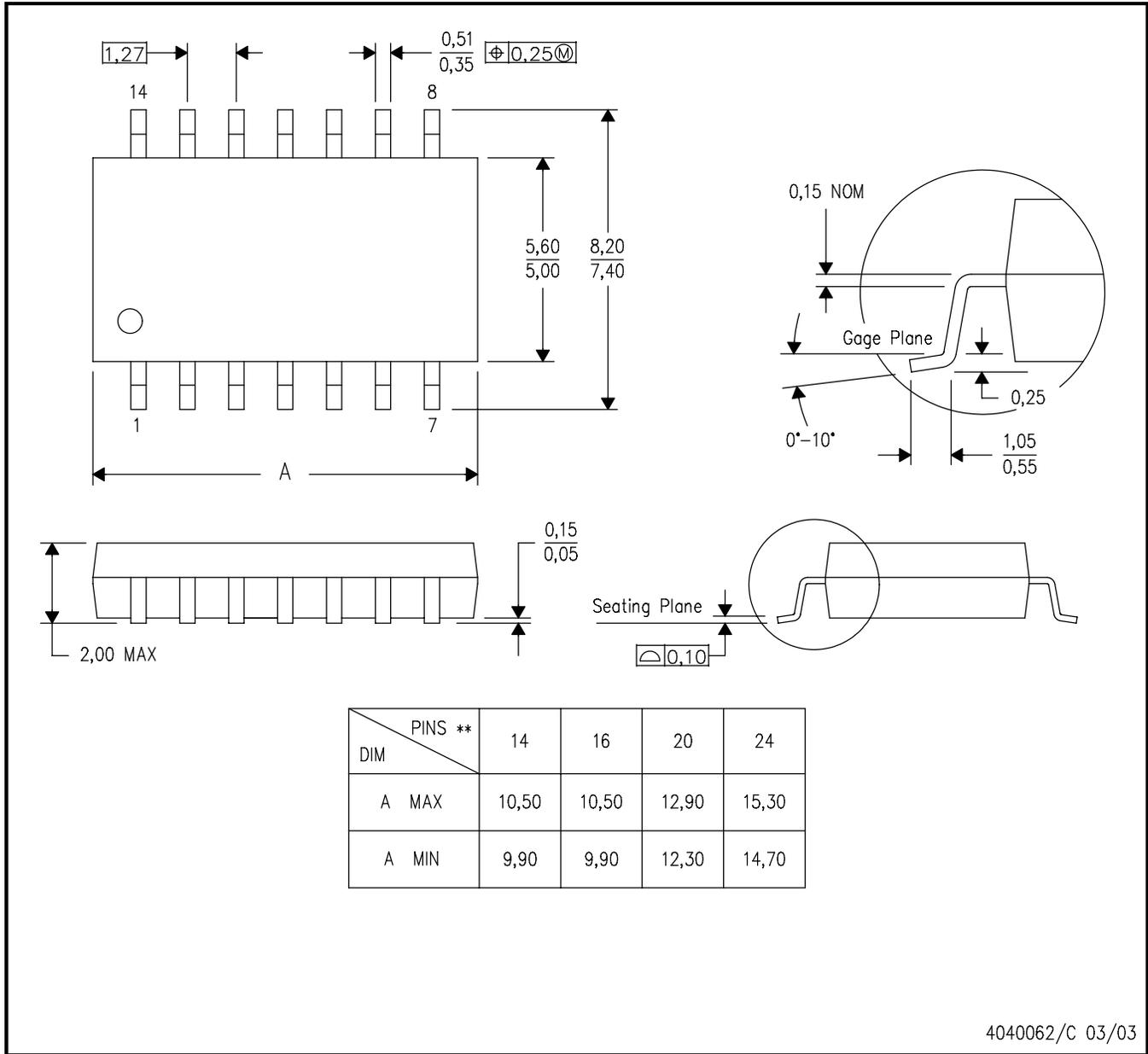
14/18 PIN ONLY
20 pin vendor option /D\

4040049/E 12/2002

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

/C\ Falls within JEDEC MS-001, except 18 and 20 pin minimum body lrngth (Dim A).

/D\ The 20 pin end lead shoulder width is a vendor option, either half or full width.

TEXAS INSTRUMENTS

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

MECHANICAL DATA

D (R-PDSO-G**)   **PLASTIC SMALL-OUTLINE PACKAGE**

8 PINS SHOWN

PINS ** DIM	8	14	16
A MAX	0.197 (5,00)	0.344 (8,75)	0.394 (10,00)
A MIN	0.189 (4,80)	0.337 (8,55)	0.386 (9,80)

4040047/E 09/01

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-012

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

NS (R-PDSO-G)**   **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN

DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

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.

DB (R-PDSO-G**) PLASTIC SMALL-OUTLINE

28 PINS SHOWN
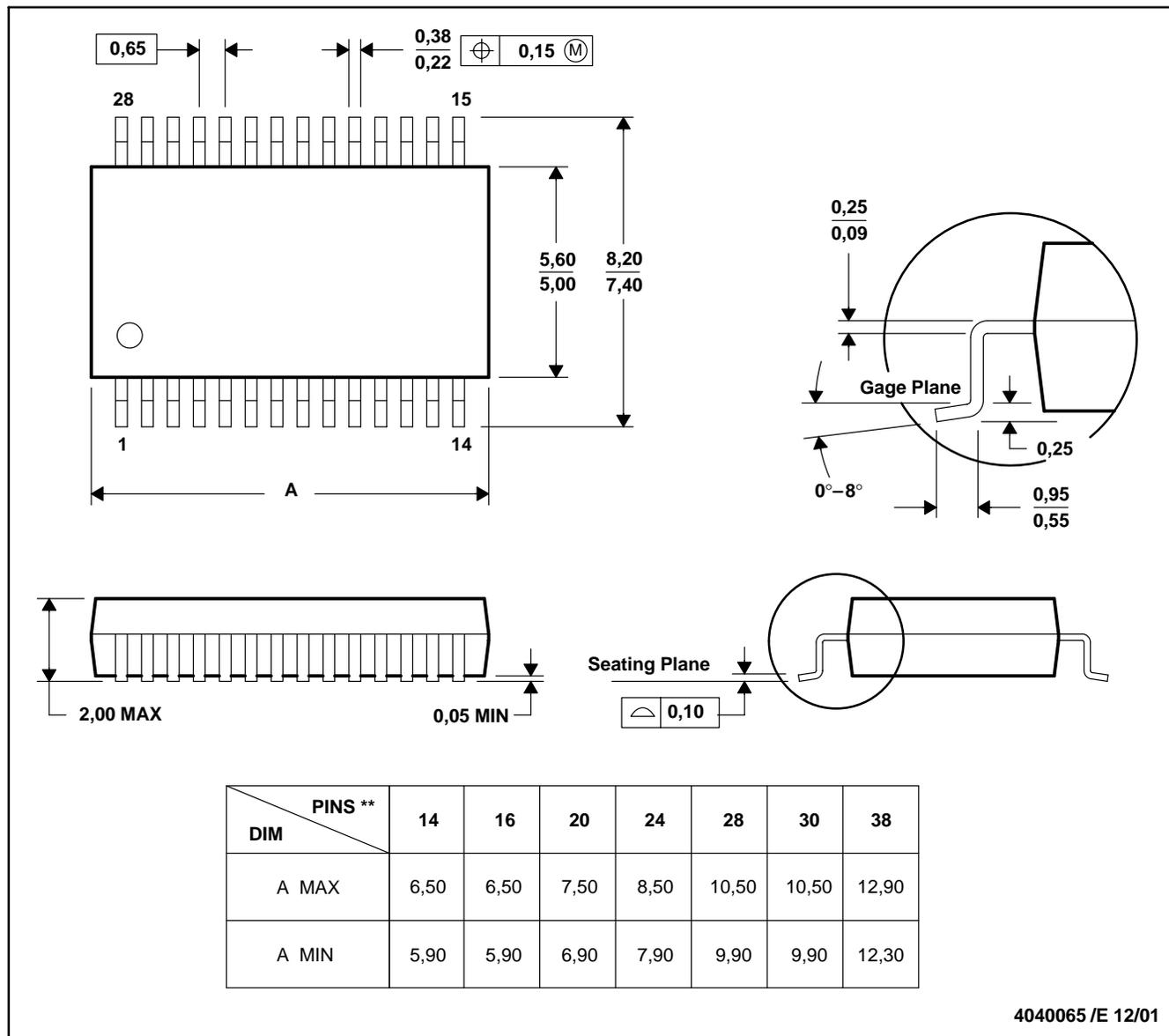
PINS ** DIM	14	16	20	24	28	30	38
A MAX	6,50	6,50	7,50	8,50	10,50	10,50	12,90
A MIN	5,90	5,90	6,90	7,90	9,90	9,90	12,30

4040065 /E 12/01

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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