SN54CBT3383, SN74CBT3383
10-BIT FET BUS-EXCHANGE SWITCHES

SCDS003O – NOVEMBER 1992 – REVISED JULY 2004
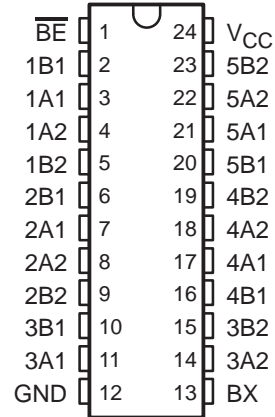
- **5-Ω Switch Connection Between Two Ports**
- **TTL-Compatible Input Levels**

description/ordering information

The 'CBT3383 devices provide ten bits of high-speed TTL-compatible bus switching or exchanging. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The devices operate as a 10-bit bus switch or a 5-bit bus exchanger, which provides swapping of the A and B pairs of signals. The bus-exchange function is selected when BX is high. The switches are connected when $\overline{BE}$ is low.

SN54CBT3383 . . . JT OR W PACKAGE
SN74CBT3383 . . . DB, DBQ, DGV, DW, OR PW PACKAGE
(TOP VIEW)

$\overline{BE}$	1	24	V_{CC}
1B1	2	23	5B2
1A1	3	22	5A2
1A2	4	21	5A1
1B2	5	20	5B1
2B1	6	19	4B2
2A1	7	18	4A2
2A2	8	17	4A1
2B2	9	16	4B1
3B1	10	15	3B2
3A1	11	14	3A2
GND	12	13	BX

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
−40°C to 85°C	SOIC – DW	Tube	SN74CBT3383DW	CBT3383
		Tape and reel	SN74CBT3383DWR	
	SSOP – DB	Tape and reel	SN74CBT3383DBR	CU383
	SSOP (QSOP) – DBQ	Tape and reel	SN74CBT3383DBQR	CBT3383
	TSSOP – PW	Tube	SN74CBT3383PW	CU383
		Tape and reel	SN74CBT3383PWR	
	TVSOP – DGV	Tape and reel	SN74CBT3383DGVR	CU383
−55°C to 125°C	CDIP – JT	Tube	SNJ54CBT3383JT	SNJ54CBT3383JT
	CFP – W	Tube	SNJ54CBT3383W	SNJ54CBT3383W

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

FUNCTION TABLE

INPUTS		INPUTS/OUTPUTS	
$\overline{BE}$	BX	1A1–5A1	1A2–5A2
L	L	1B1–5B1	1B2–5B2
L	H	1B2–5B2	1B1–5B1
H	X	Z	Z

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

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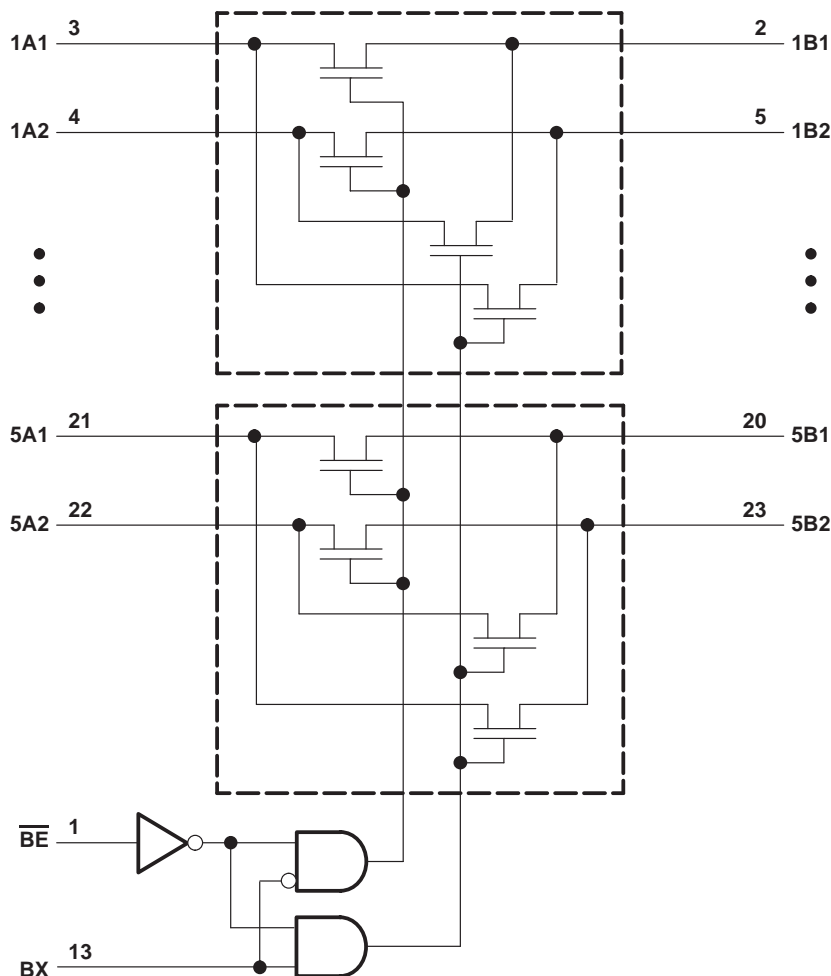
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC} .... –0.5 V to 7 V
Input voltage range, V_I (see Note 1) .... –0.5 V to 7 V
Continuous channel current .... 128 mA
Input clamp current, I_{IK} ($V_{I/O} < 0$) .... –50 mA
Package thermal impedance, θ_{JA} (see Note 2): DB package .... 63°C/W
  DBQ package .... 61°C/W
  DGV package .... 86°C/W
  DW package .... 46°C/W
  PW package .... 88°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.   The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
         2.   The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

		SN54CBT3383		SN74CBT3383		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	V
V_{IH}	High-level control input voltage	2		2		V
V_{IL}	Low-level control input voltage		0.8		0.8	V
T_A	Operating free-air temperature	−55	125	0	70	°C

NOTE 3: All unused control 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			SN54CBT3383			SN74CBT3383			UNIT
					MIN	TYP[†]	MAX	MIN	TYP[†]	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA				−1.2			−1.2	V
I_I		V_{CC} = 5.5 V,	V_I = 5.5 V or GND				±5			±1	µA
I_{CC}		V_{CC} = 5.5 V,	I_O = 0,	V_I = V_{CC} or GND			50			50	µA
ΔI_{CC}[‡]	Control inputs	V_{CC} = 5.5 V, One input at 3.4 V, Other inputs at V_{CC} or GND					2.5			2.5	mA
C_i	Control inputs	V_I = 3 V or 0							3		pF
		V_I = 2.5 V					5				
$C_{io(OFF)}$		V_O = 3 V or 0,	$\overline{BE}$ = V_{CC}						6		pF
		V_O = 2.5 V,	$\overline{BE}$ = V_{CC}				6				
r_{on}[§]		V_{CC} = 4.5 V	V_I = 0	I_I = 64 mA	5		9.2	5		7	Ω
				I_I = 30 mA				5		7	
			V_I = 2.4 V,	I_I = 15 mA	10		17	10		15	

[†] All typical values are at V_{CC} = 5 V, T_A = 25°C.
[‡] This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V_{CC} or GND.
[§] Measured by the voltage drop between the input terminal and the output terminal at the indicated current through the switch. On-state resistance is determined by the lowest voltage of the two (A or B) terminals.

switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54CBT3383		SN74CBT3383		UNIT
			MIN	MAX	MIN	MAX	
t_{pd}[¶]	A or B	B or A		1.5		0.25	ns
t_{pd}	BX	A or B	1	10.2	1	9.2	ns
t_{en}	$\overline{BE}$	A or B	1	10.8	1	8.6	ns
t_{dis}	$\overline{BE}$	A or B	1	8.2	1	7.5	ns

[¶] The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

PARAMETER MEASUREMENT INFORMATION

TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open

LOAD CIRCUIT

VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
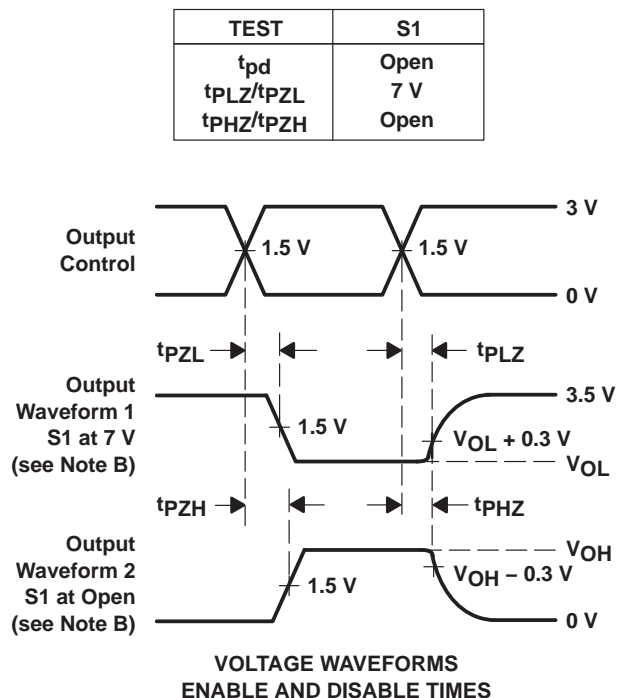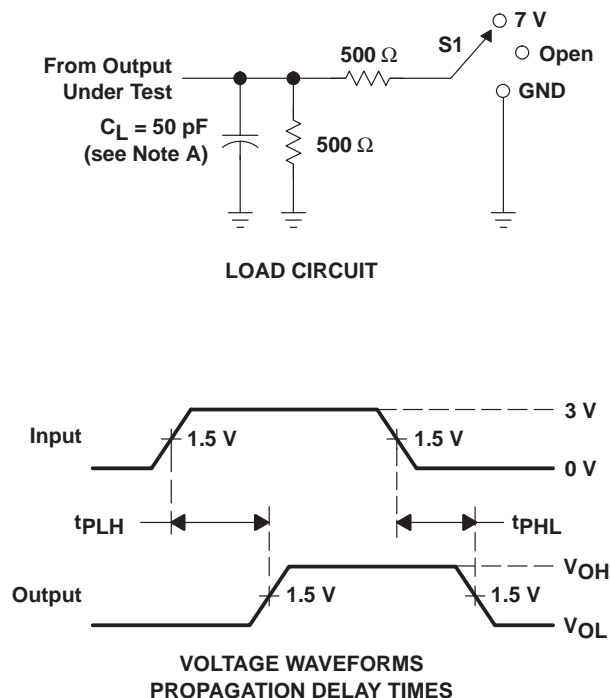
NOTES: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR $\leq$ 10 MHz, Z_O = 50 Ω, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.
D. The outputs are measured one at a time, with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
G. t_{PLH} and t_{PHL} are the same as t_{pd}.

Figure 1. Load Circuit and Voltage Waveforms

TEXAS INSTRUMENTS

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

JT (R-GDIP-T**) **CERAMIC DUAL-IN-LINE**

24 LEADS SHOWN
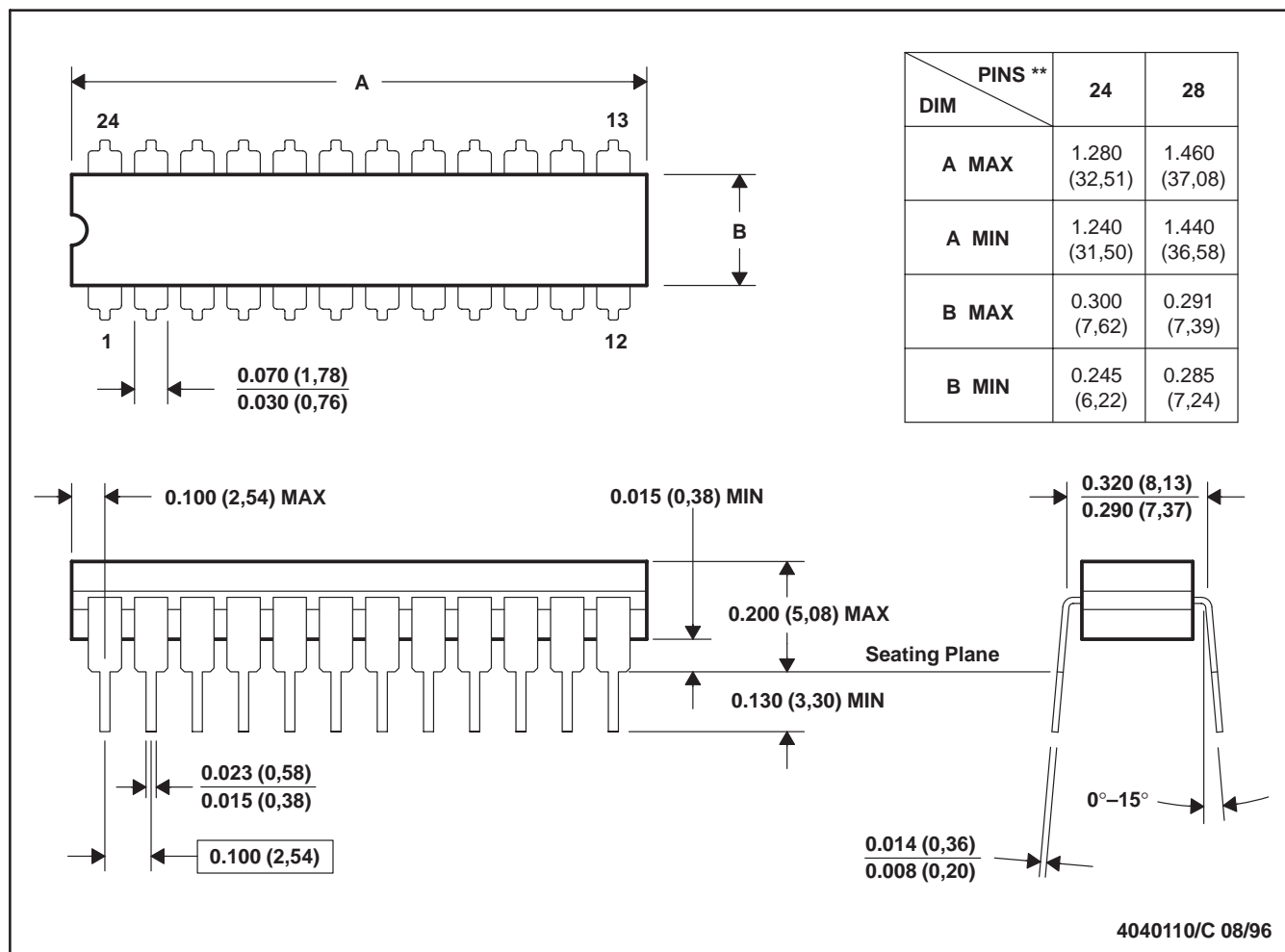
PINS ** DIM	24	28
A MAX	1.280 (32,51)	1.460 (37,08)
A MIN	1.240 (31,50)	1.440 (36,58)
B MAX	0.300 (7,62)	0.291 (7,39)
B MIN	0.245 (6,22)	0.285 (7,24)

A

24   13

B

1   12

0.070 (1,78)
0.030 (0,76)

0.100 (2,54) MAX

0.015 (0,38) MIN

0.320 (8,13)
0.290 (7,37)

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

0.023 (0,58)
0.015 (0,38)

0.100 (2,54)

0°–15°

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

4040110/C 08/96

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 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

TEXAS INSTRUMENTS

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

W (R-GDFP-F24)   **CERAMIC DUAL FLATPACK**

Base and Seating Plane

$\dfrac{0.375\ (9,53)}{0.340\ (8,64)}$

$\dfrac{0.006\ (0,15)}{0.004\ (0,10)}$

$\dfrac{0.090\ (2,29)}{0.045\ (1,14)}$

$\dfrac{0.395\ (10,03)}{0.360\ (9,14)}$

$\dfrac{0.045\ (1,14)}{0.026\ (0,66)}$

$\dfrac{0.360\ (9,14)}{0.240\ (6,10)}$

$\dfrac{0.360\ (9,14)}{0.240\ (6,10)}$

$\dfrac{0.019\ (0,48)}{0.015\ (0,38)}$

1   24

$\dfrac{0.640\ (16,26)}{0.490\ (12,45)}$

0.050 (1,27)

$\dfrac{0.030\ (0,76)}{0.015\ (0,38)}$

12   30° TYP   13

$\dfrac{1.115\ (28,32)}{0.840\ (21,34)}$

4040180-5/B 03/95
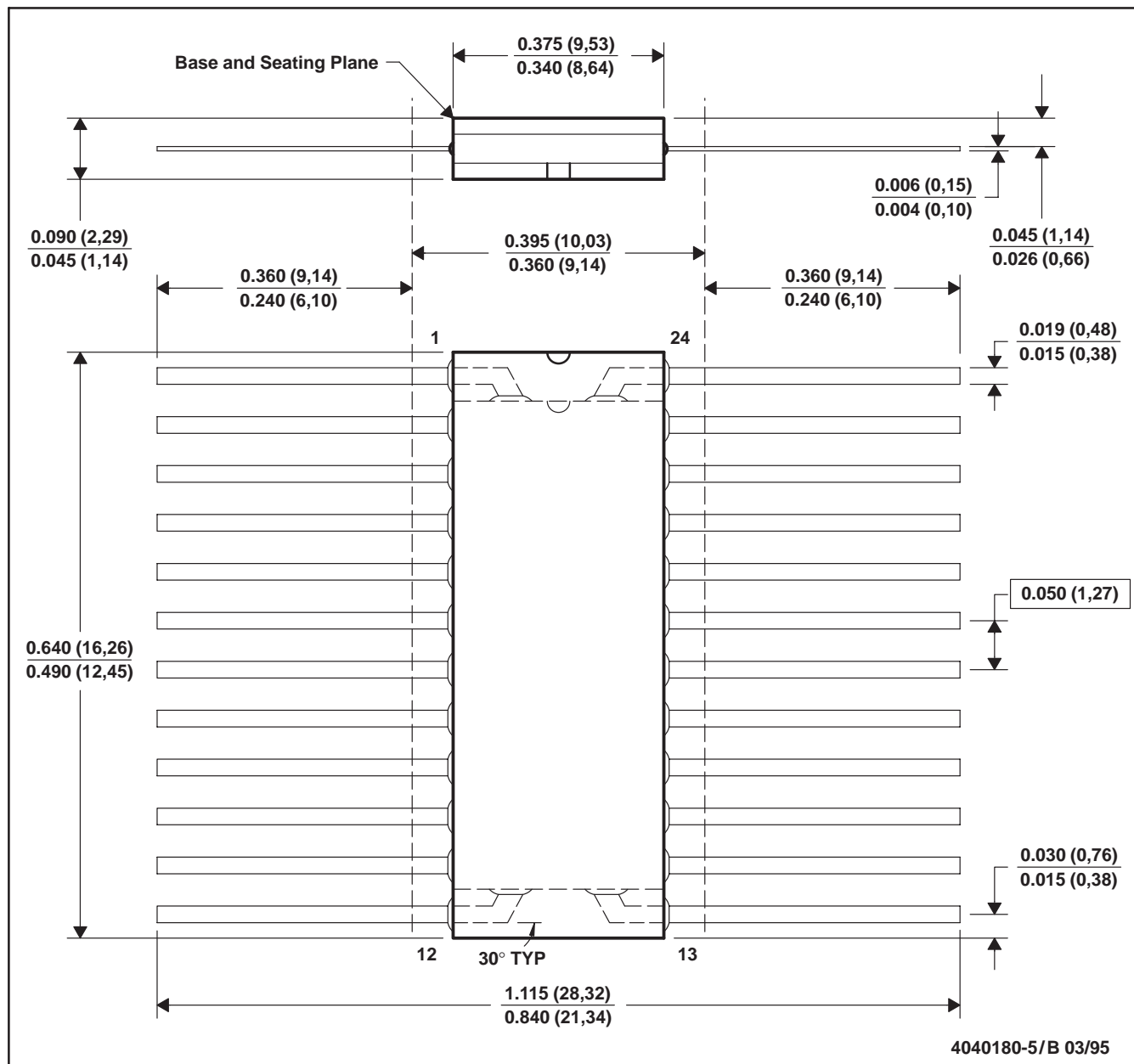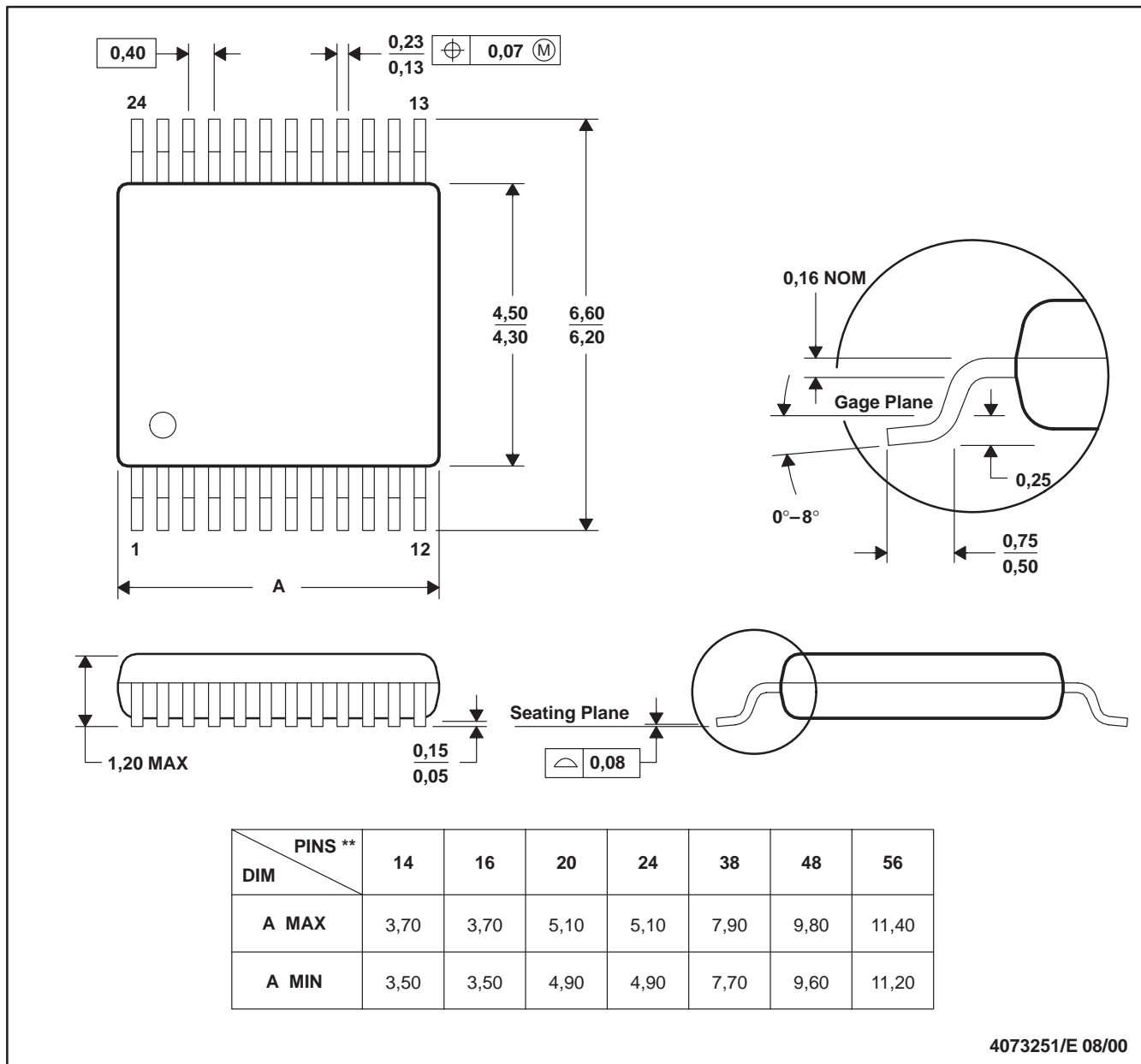
NOTES: A.   All linear dimensions are in inches (millimeters).
         B.   This drawing is subject to change without notice.
         C.   This package can be hermetically sealed with a ceramic lid using glass frit.
         D.   Falls within MIL-STD-1835 GDFP2-F24 and JEDEC MO-070AD
         E.   Index point is provided on cap for terminal identification only.

TEXAS INSTRUMENTS

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

24 PINS SHOWN

PINS ** DIM	14	16	20	24	38	48	56
A MAX	3,70	3,70	5,10	5,10	7,90	9,80	11,40
A MIN	3,50	3,50	4,90	4,90	7,70	9,60	11,20

4073251/E 08/00

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 per side.
D. Falls within JEDEC: 24/48 Pins – MO-153
14/16/20/56 Pins – MO-194

DW (R−PDSO−G24)   PLASTIC SMALL−OUTLINE PACKAGE

0.614 (15,60)
―――――――――
0.598 (15,20)

24   13

0.419 (10,63)
―――――――――
0.393 (9,97)

0.299 (7,60)
―――――――――
0.291 (7,40)

1   12

Pin 1
Index Area

0.050 (1,27)

0.020 (0,51)
―――――――――
0.012 (0,31)

⊕ 0.010 (0,25) Ⓜ

0.104 (2,65) Max

0.012 (0,30)
―――――――――
0.004 (0,10)

0.013 (0,33)
―――――――――
0.008 (0,20)

Gauge Plane

0.004 (0,10)

Seating Plane

0.010 (0,25)   0°−8°

0.050 (1,27)
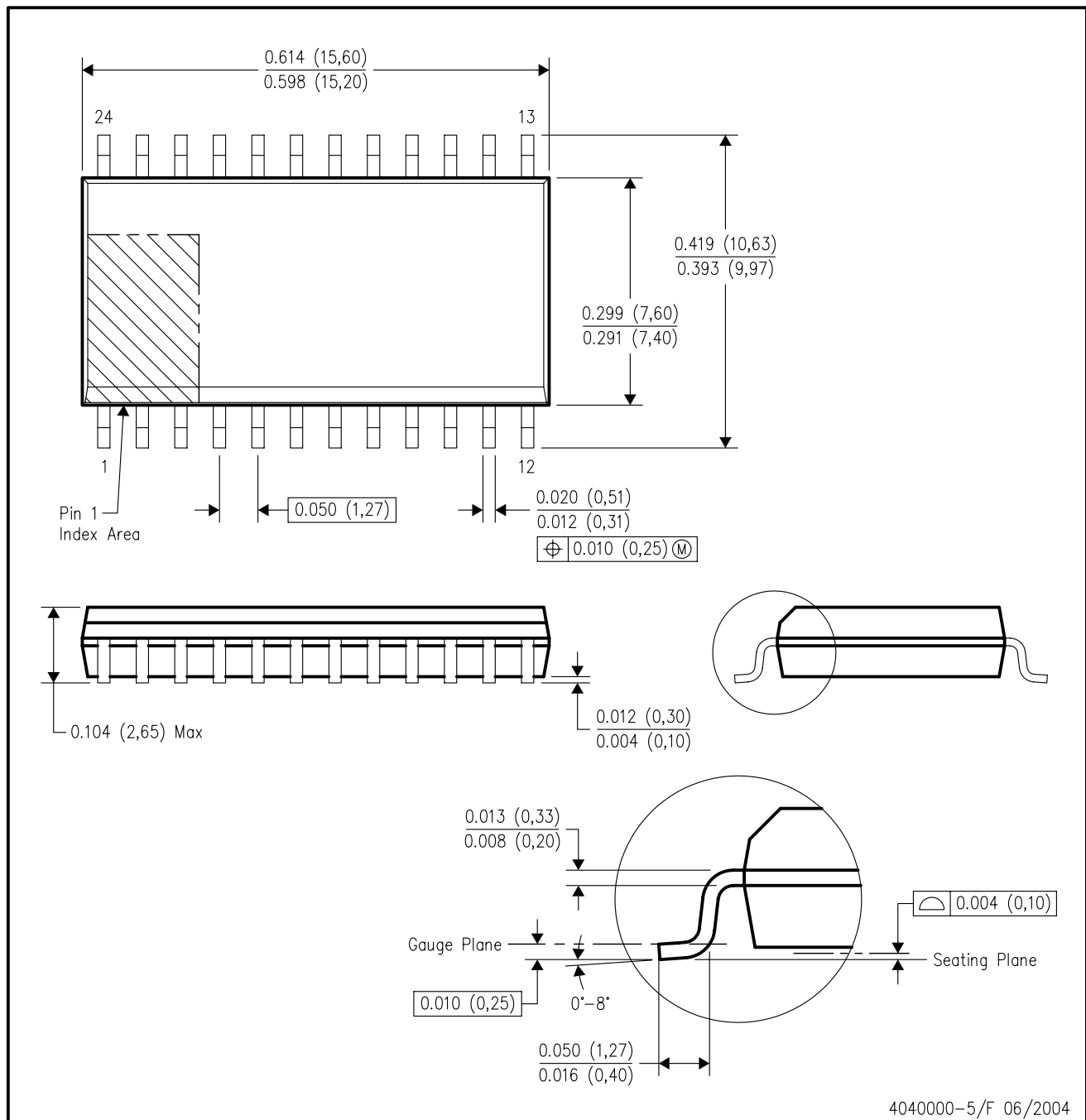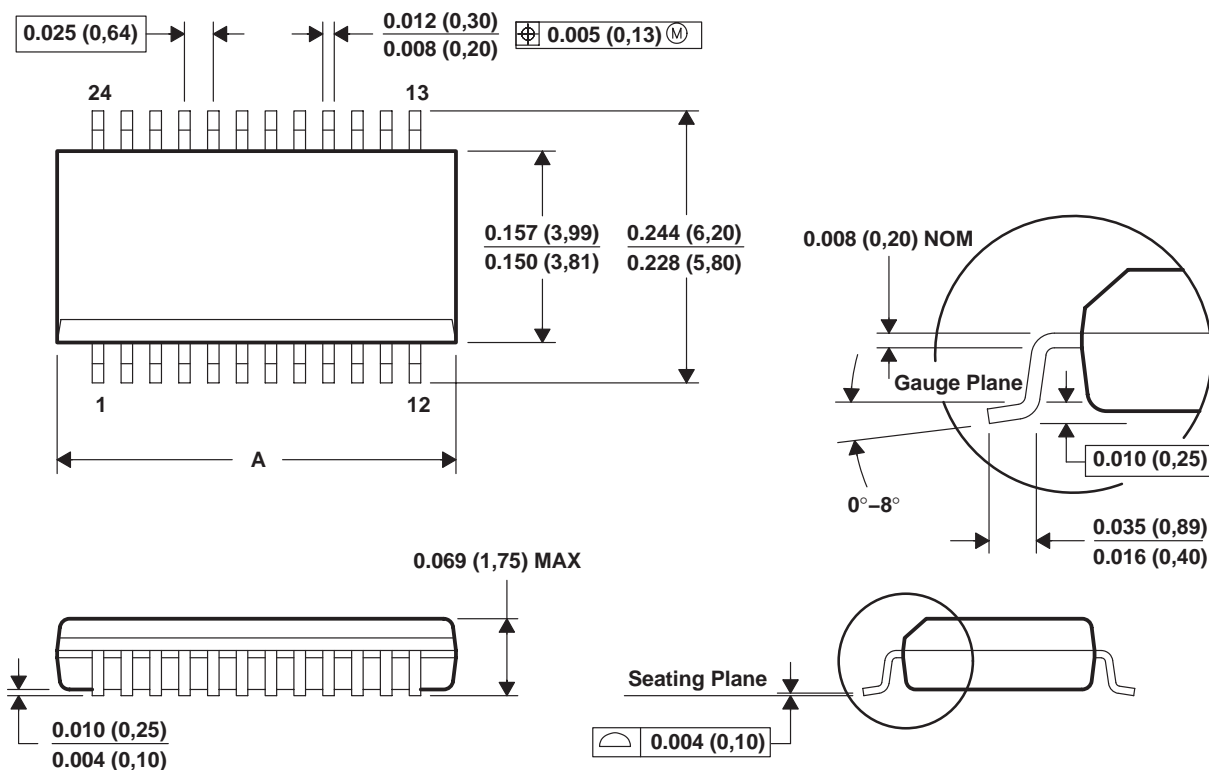―――――――――
0.016 (0,40)

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.

DBQ (R−PDSO−G**)   **PLASTIC SMALL−OUTLINE PACKAGE**

0.025 (0,64)

0.012 (0,30)
0.008 (0,20)

⊕ 0.005 (0,13) Ⓜ

24   13

0.157 (3,99)
0.150 (3,81)

0.244 (6,20)
0.228 (5,80)

0.008 (0,20) NOM

Gauge Plane

1   12

A

0°−8°

0.010 (0,25)

0.035 (0,89)
0.016 (0,40)

0.069 (1,75) MAX

0.010 (0,25)
0.004 (0,10)

Seating Plane

⌓ 0.004 (0,10)

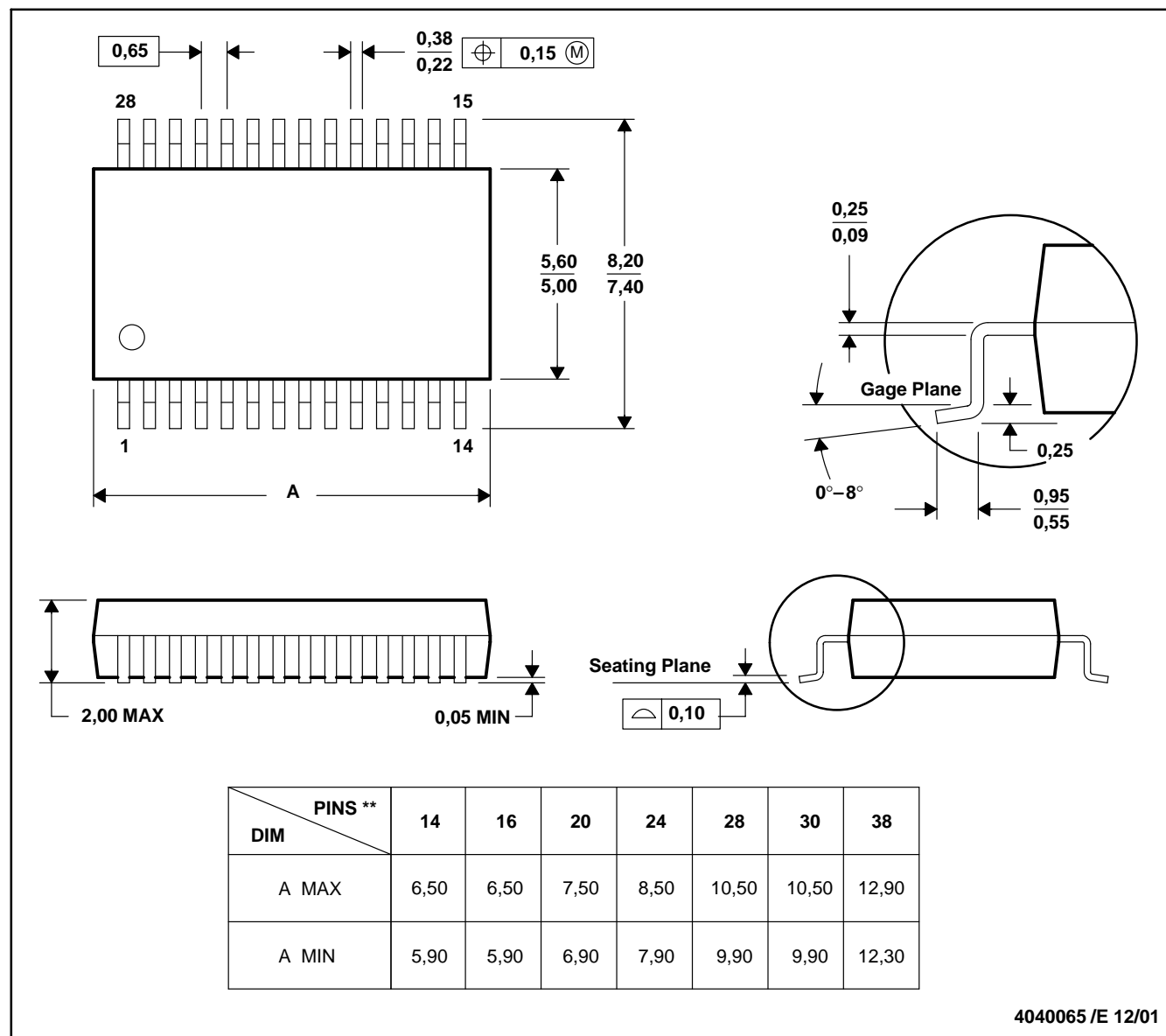| PINS ** DIM	16	20	24	28
A MAX	0.197 (5,00)	0.344 (8,74)	0.344 (8,74)	0.394 (10,01)
A MIN	0.189 (4,80)	0.337 (8,56)	0.337 (8,56)	0.386 (9,80)
⚠D M0−137 VARIATION	AB	AD	AE	AF

4073301/F 02/2002

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 MO−137.

1

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

28 PINS SHOWN

0,65

$\dfrac{0,38}{0,22}$ ⊕   0,15 Ⓜ

28   15

$\dfrac{5,60}{5,00}$ $\dfrac{8,20}{7,40}$

1   14

A

$\dfrac{0,25}{0,09}$

Gage Plane

0,25

0°−8° $\dfrac{0,95}{0,55}$

2,00 MAX   0,05 MIN

Seating Plane

△ 0,10

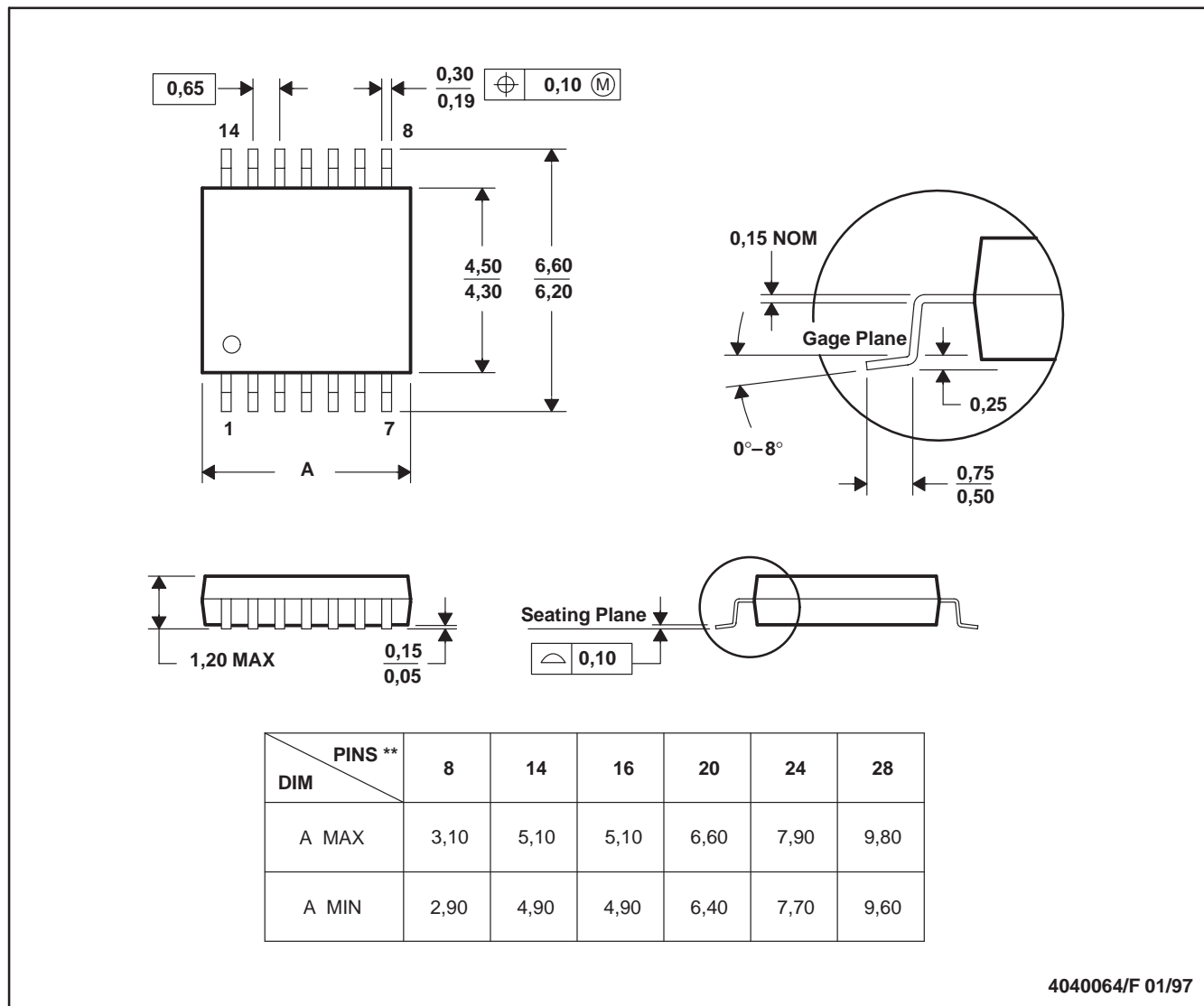| DIM \ PINS **	14	16	20	24	28	30	38
A MAX	6,50	6,50	7,50	8,50	10,50	10,50	12,90
A MIN	5,90	5,90	6,90	7,90	9,90	9,90	12,30

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

MECHANICAL DATA

MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

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

14 PINS SHOWN

0,65

0,30
0,19

⊕ 0,10 Ⓜ

14   8

4,50
4,30

6,60
6,20

1   7

A

0,15 NOM

Gage Plane

0°−8°

0,25

0,75
0,50

1,20 MAX

0,15
0,05

Seating Plane

⌒ 0,10

DIM \ PINS **	8	14	16	20	24	28
A MAX	3,10	5,10	5,10	6,60	7,90	9,80
A MIN	2,90	4,90	4,90	6,40	7,70	9,60

4040064/F 01/97

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-153

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments

Post Office Box 655303 Dallas, Texas 75265