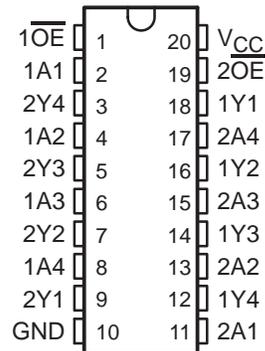


# SN54LVT244, SN74LVT244 3.3-V ABT OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

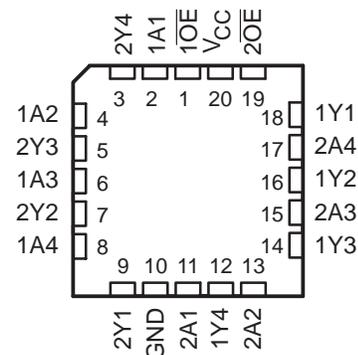
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- State-of-the-Art Advanced BiCMOS Technology (ABT) Design for 3.3-V Operation and Low Static Power Dissipation
- Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V  $V_{CC}$ )
- Support Unregulated Battery Operation Down to 2.7 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  $< 0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model ( $C = 200$  pF,  $R = 0$ )
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Bus-Hold Data Inputs Eliminate the Need for External Pullup Resistors
- Supports Live Insertion
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Ceramic Flatpacks (W), and Ceramic DIPS (J)

SN54LVT244 . . . J OR W PACKAGE  
SN74LVT244 . . . DB, DW, OR PW PACKAGE  
(TOP VIEW)



SN54LVT244 . . . FK PACKAGE  
(TOP VIEW)



## description

These octal buffers and line drivers are designed specifically for low-voltage (3.3-V)  $V_{CC}$  operation, but with the capability to provide a TTL interface to a 5-V system environment.

The 'LVT244 is organized as two 4-bit line drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN74LVT244 is packaged in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN54LVT244 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74LVT244 is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

FUNCTION TABLE  
(each buffer)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	H
L	L	L
H	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.

 **TEXAS  
INSTRUMENTS**

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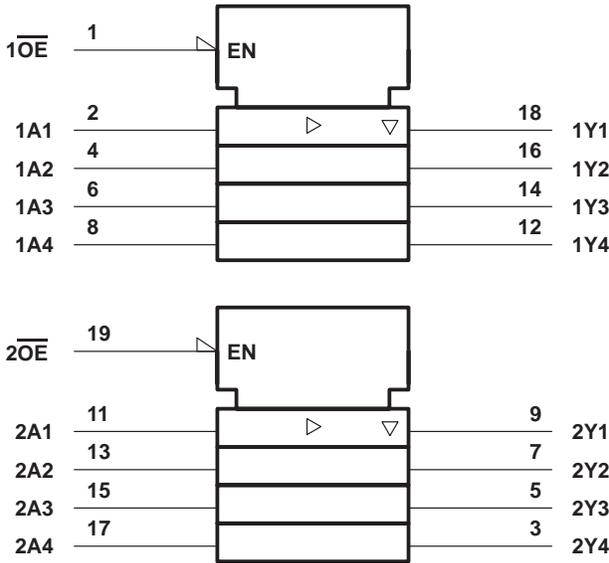
# SN54LVT244, SN74LVT244

## 3.3-V ABT OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

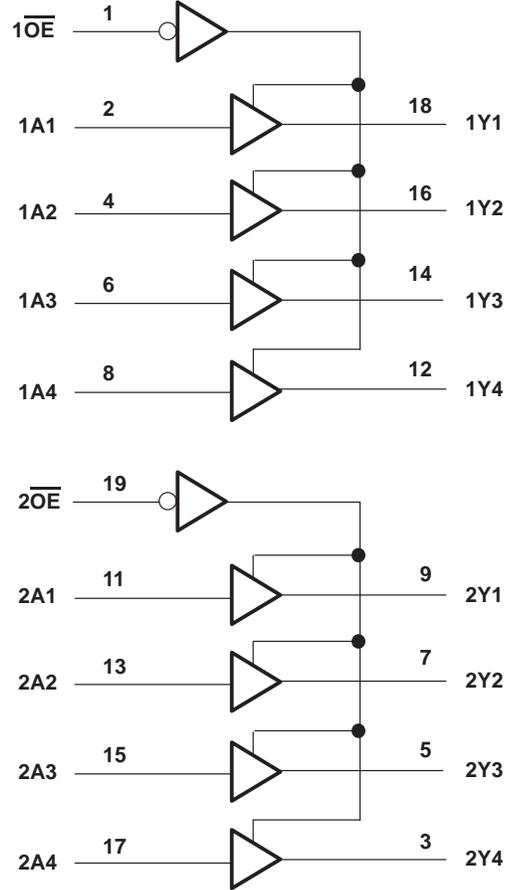
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#### logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

#### 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 4.6 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 V to 7 V
Voltage range applied to any output in the high state or power-off state, $V_O$ (see Note 1) .....	-0.5 V to 7 V
Current into any output in the low state, $I_O$ : SN54LVT244 .....	96 mA
SN74LVT244 .....	128 mA
Current into any output in the high state, $I_O$ (see Note 2): SN54LVT244 .....	48 mA
SN74LVT244 .....	64 mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-50 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	-50 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 3): DB package .....	0.6 W
DW package .....	1.6 W
PW package .....	0.7 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.

- NOTES:
1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
  2. This current will only flow when the output is in the high state and  $V_O > V_{CC}$ .
  3. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils. For more information, refer to the *Package Thermal Considerations* application note.

**SN54LVT244, SN74LVT244**  
**3.3-V ABT OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SCBS135B – AUGUST 1992 – REVISED MARCH 1994

**recommended operating conditions (see Note 4)**

		SN54LVT244		SN74LVT244		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	2.7	3.6	2.7	3.6	V
$V_{IH}$	High-level input voltage	2		2		V
$V_{IL}$	Low-level input voltage		0.8		0.8	V
$V_I$	Input voltage		5.5		5.5	V
$I_{OH}$	High-level output current		-24		-32	mA
$I_{OL}$	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10	10	ns/V
$T_A$	Operating free-air temperature	-55	125	-40	85	°C

NOTE 4: Unused or floating control inputs must be held high or low.



**SN54LVT244, SN74LVT244**  
**3.3-V ABT OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SCBS135B – AUGUST 1992 – REVISED MARCH 1994

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

PARAMETER	TEST CONDITIONS		SN54LVT244		SN74LVT244		UNIT
			MIN	TYP†	MAX	MIN	
$V_{IK}$	$V_{CC} = 2.7\text{ V}$ , $I_I = -18\text{ mA}$		-1.2		-1.2		V
$V_{OH}$	$V_{CC} = \text{MIN to MAX}^\ddagger$ , $I_{OH} = -100\ \mu\text{A}$		$V_{CC} - 0.2$		$V_{CC} - 0.2$		V
	$V_{CC} = 2.7\text{ V}$ , $I_{OH} = -8\text{ mA}$		2.4		2.4		
	$V_{CC} = 3\text{ V}$ , $I_{OH} = -24\text{ mA}$		2				
	$V_{CC} = 3\text{ V}$ , $I_{OH} = -32\text{ mA}$				2		
$V_{OL}$	$V_{CC} = 2.7\text{ V}$ , $I_{OL} = 100\ \mu\text{A}$				0.2		V
	$V_{CC} = 2.7\text{ V}$ , $I_{OL} = 24\text{ mA}$				0.5		
	$V_{CC} = 3\text{ V}$ , $I_{OL} = 16\text{ mA}$				0.4		
	$V_{CC} = 3\text{ V}$ , $I_{OL} = 32\text{ mA}$				0.5		
	$V_{CC} = 3\text{ V}$ , $I_{OL} = 48\text{ mA}$				0.55		
	$V_{CC} = 3\text{ V}$ , $I_{OL} = 64\text{ mA}$				0.55		
$I_I$	$V_{CC} = 0\text{ or MAX}^\ddagger$ , $V_I = 5.5\text{ V}$				50		$\mu\text{A}$
	$V_{CC} = 3.6\text{ V}$ , $V_I = V_{CC}\text{ or GND}$		Control pins		$\pm 1$		
	$V_{CC} = 3.6\text{ V}$ , $V_I = V_{CC}$		Data pins		1		
	$V_{CC} = 3.6\text{ V}$ , $V_I = 0$				-5		
$I_{off}$	$V_{CC} = 0$ , $V_I\text{ or }V_O = 0\text{ to }4.5\text{ V}$				$\pm 100$		$\mu\text{A}$
$I_I(\text{hold})$	$V_{CC} = 3\text{ V}$ , $V_I = 0.8\text{ V}$		A inputs		75		$\mu\text{A}$
	$V_{CC} = 3\text{ V}$ , $V_I = 2\text{ V}$				-75		
$I_{OZH}$	$V_{CC} = 3.6\text{ V}$ , $V_O = 3\text{ V}$				1		$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 3.6\text{ V}$ , $V_O = 0.5\text{ V}$				-1		$\mu\text{A}$
$I_{CC}$	$V_{CC} = 3.6\text{ V}$ , $I_O = 0$ , $V_I = V_{CC}\text{ or GND}$		Outputs high		0.12 0.39		mA
			Outputs low		8.6 14		
			Outputs disabled		0.12 0.39		
$\Delta I_{CC}^\S$	$V_{CC} = 3\text{ V to }3.6\text{ V}$ , One input at $V_{CC} - 0.6\text{ V}$ , Other inputs at $V_{CC}\text{ or GND}$				0.3		mA
$C_i$	$V_I = 3\text{ V or }0$				4		pF
$C_o$	$V_O = 3\text{ V or }0$				8		pF

† All typical values are at  $V_{CC} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

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

§ This is the increase in supply current for each input that is at the specified TTL voltage level rather than  $V_{CC}$  or GND.

**SN54LVT244, SN74LVT244**  
**3.3-V ABT OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SCBS135B – AUGUST 1992 – REVISED MARCH 1994

switching characteristics over recommended operating free-air temperature range,  $C_L = 50 \text{ pF}$   
(unless otherwise noted) (see Note 5)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVT244				SN74LVT244				UNIT	
			$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		$V_{CC} = 2.7 \text{ V}$		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$			$V_{CC} = 2.7 \text{ V}$		
			MIN	MAX	MIN	MAX	MIN	TYP	MAX	MIN		MAX
$t_{PLH}$	A	Y	0.5	4.7	5.2		1	2.5	4.3	5		ns
$t_{PHL}$			0.5	4.4	5.4		1	2.5	4.2	5.2		
$t_{PZH}$	$\overline{OE}$	Y	0.8	5.4	6.5		1	2.7	5.2	6.3		ns
$t_{PZL}$			0.8	5.4	7.6		1.1	3.1	5.2	6.7		
$t_{PHZ}$	$\overline{OE}$	Y	1.5	6.2	6.9		2.1	3.9	5.6	6.3		ns
$t_{PLZ}$			1.2	5.5	6		1.8	3.2	5.1	5.6		

NOTE 5: Load circuit and voltage waveforms are shown in Section 1.

**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>
SN74LVT244DBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI
SN74LVT244DW	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74LVT244DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74LVT244PWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI
SNJ54LVT244FK	OBSOLETE	LCCC	FK	20		TBD	Call TI	Call TI
SNJ54LVT244J	OBSOLETE	CDIP	J	20		TBD	Call TI	Call TI
SNJ54LVT244W	OBSOLETE	CFP	W	20		TBD	Call TI	Call TI

<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.

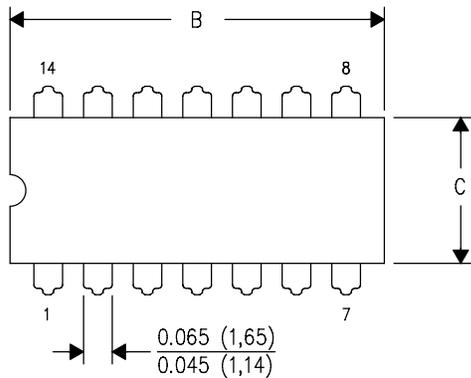
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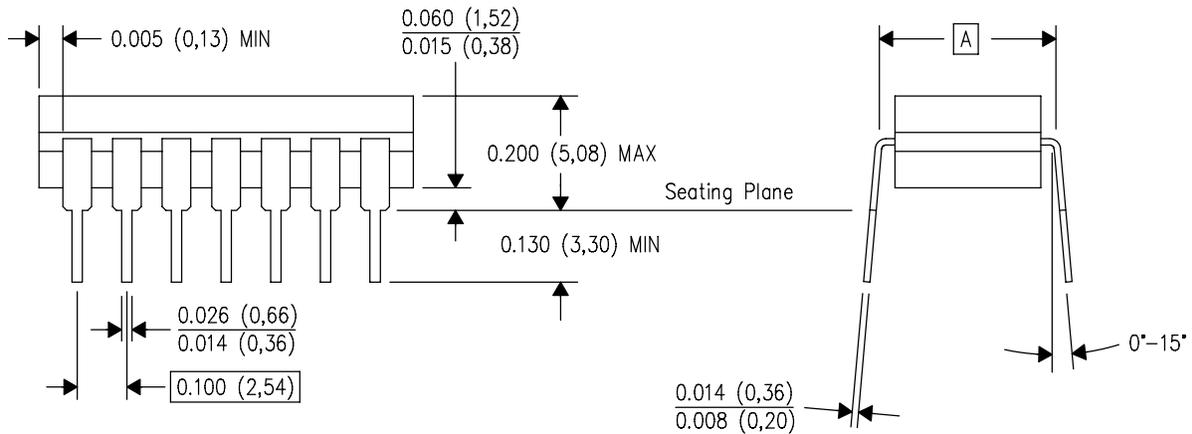
J (R-GDIP-T\*\*)

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)

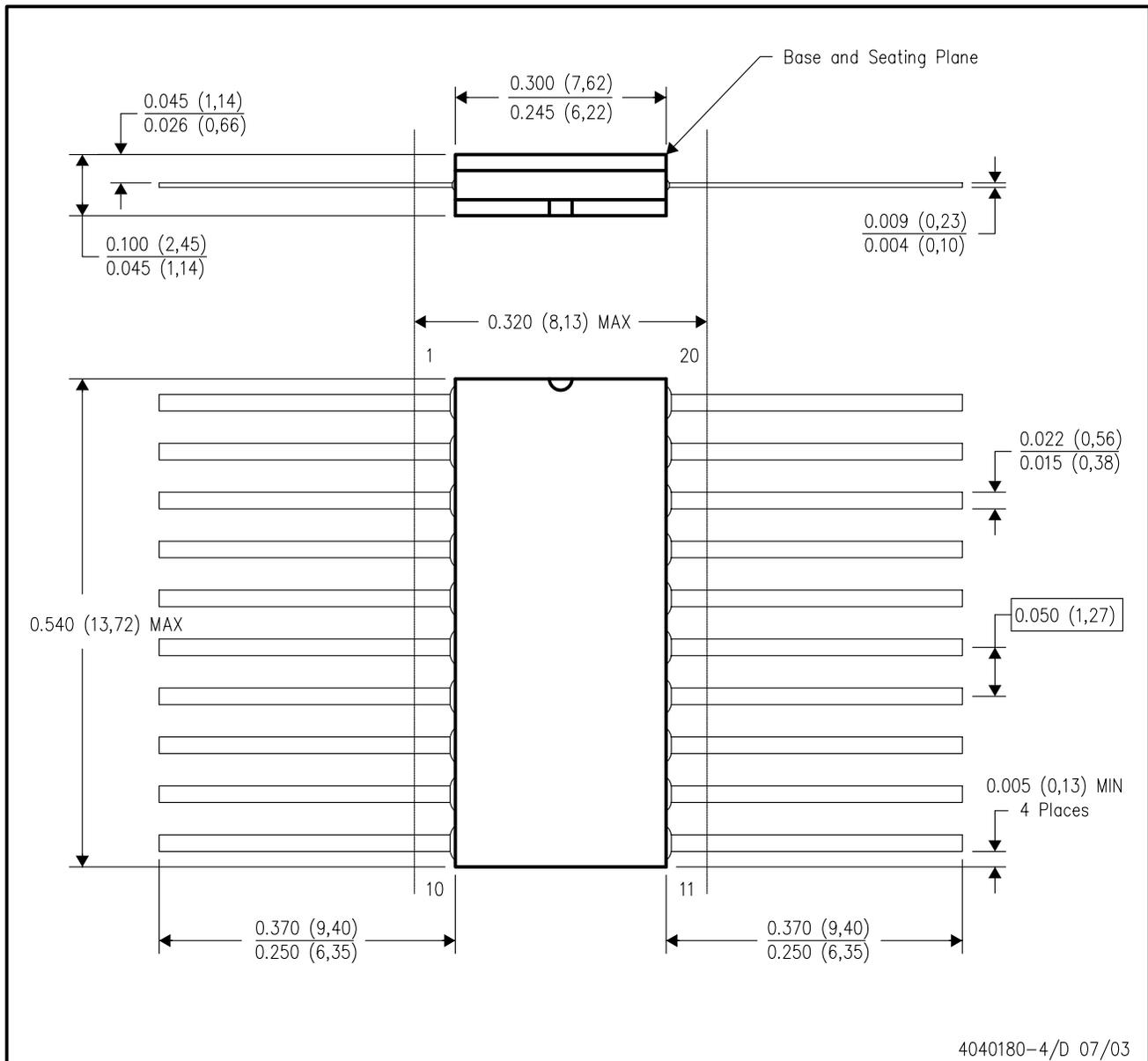


4040083/F 03/03

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

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK

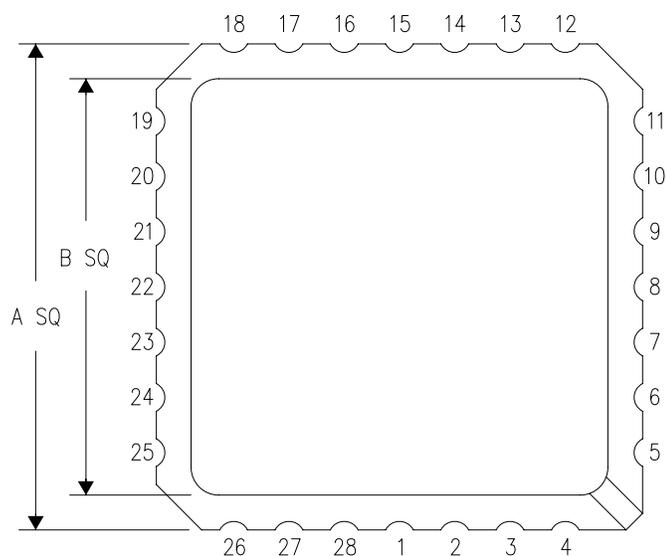


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within Mil-Std 1835 GDFP2-F20

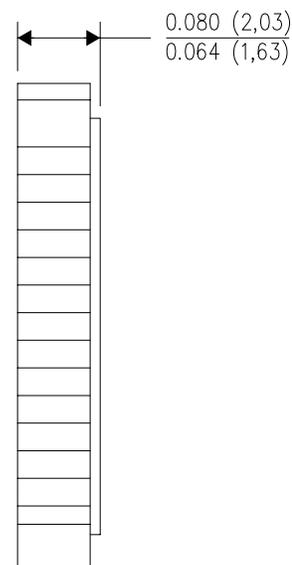
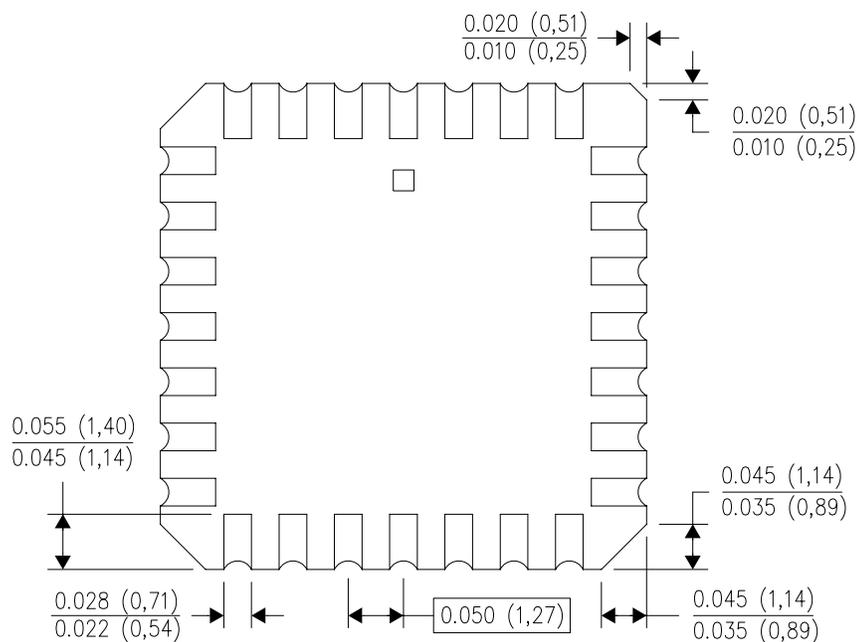
FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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	0.740 (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)

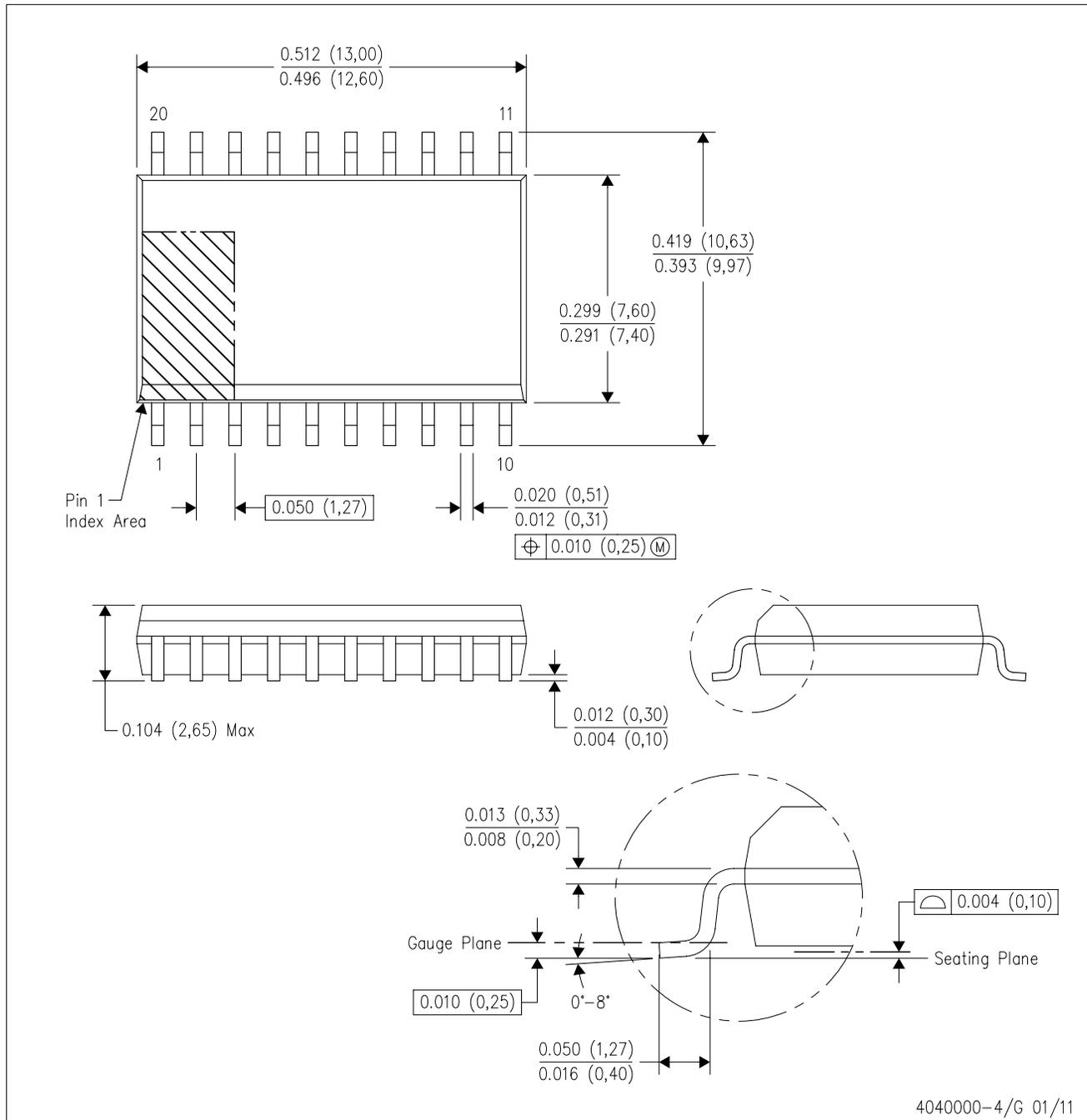


4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

DW (R-PDSO-G20)

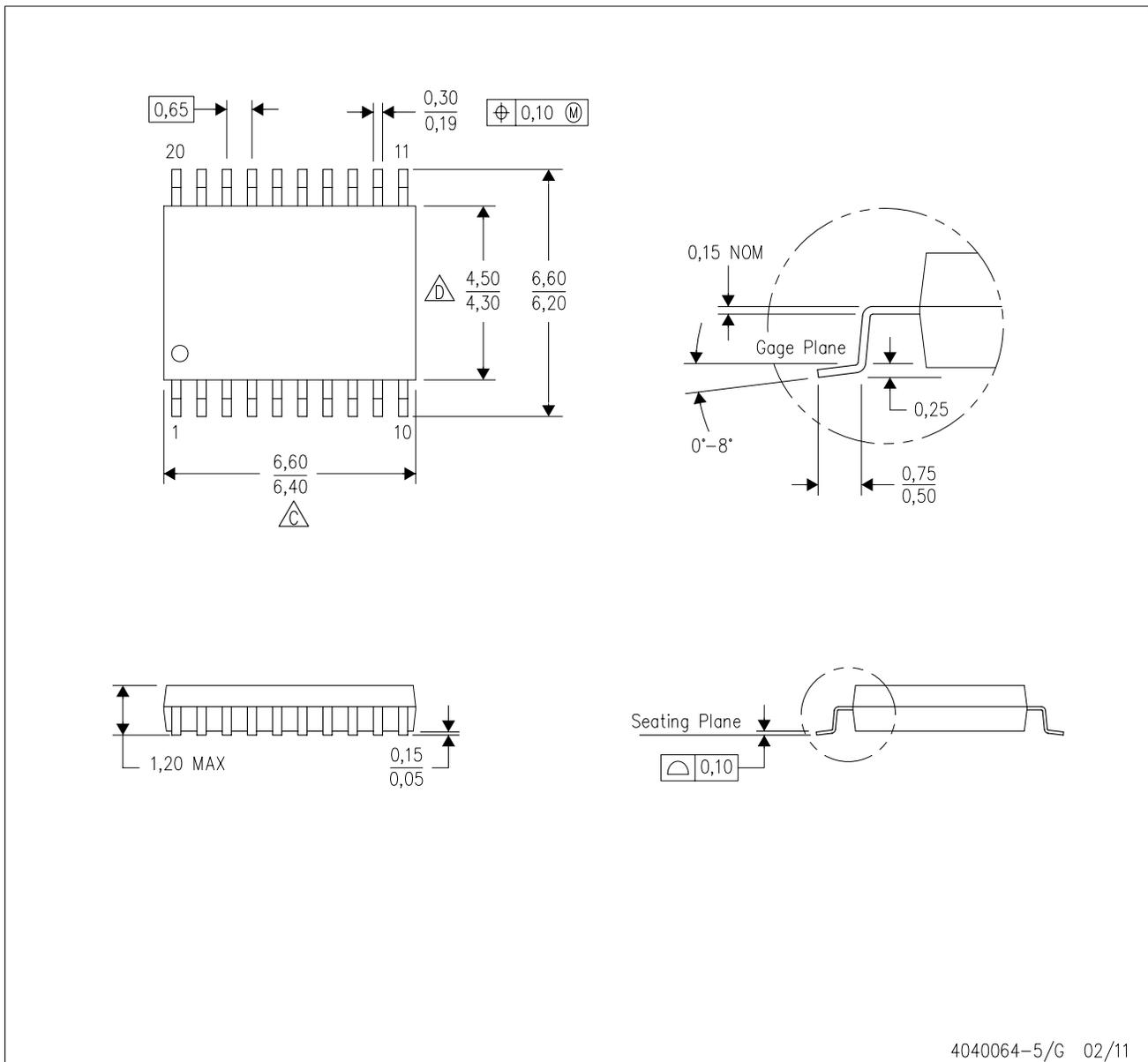
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - 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 AC.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



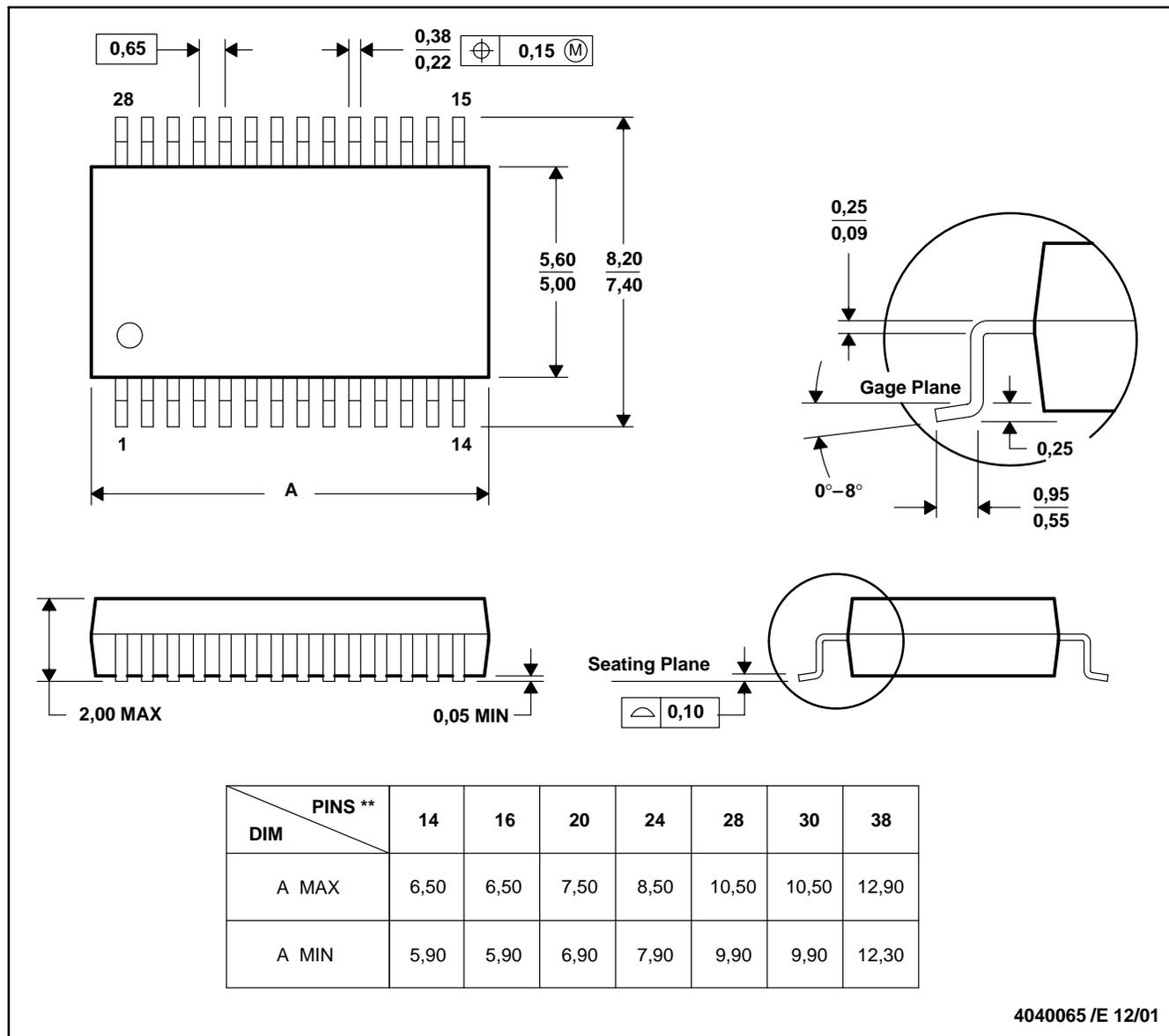
4040064-5/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

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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