

SN54ABT5402A, SN74ABT5402A 12-BIT LINE/MEMORY DRIVERS WITH 3-STATE OUTPUTS

SCBS660B – FEBRUARY 1996 – REVISED MAY 1997

- Output Ports Have Equivalent 25- Ω Series Resistors, So No External Resistors Are Required
- State-of-the-Art *EPIC-II B*[™] BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OLV} (Output Undershoot) < 0.5 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Package Options Include Plastic Small-Outline (DW) Package and Ceramic Chip Carriers (FK) and DIPs (JT)

description

These 12-bit buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

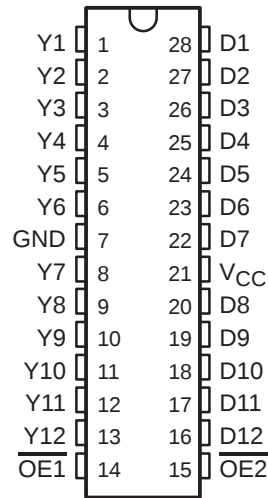
The 3-state control gate is a 2-input AND gate with active-low inputs so that if either output-enable ($\overline{OE1}$ or $\overline{OE2}$) input is high, all 12 outputs are in the high-impedance state.

The outputs, which are designed to source or sink up to 12 mA, include equivalent 25- Ω series resistors to reduce overshoot and undershoot.

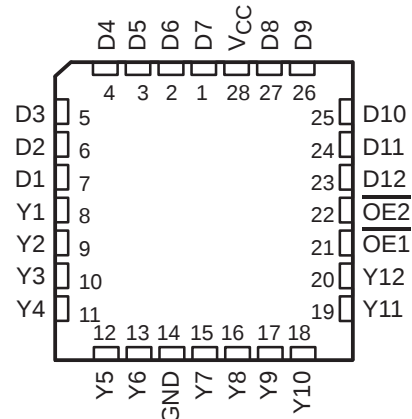
To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT5402A is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT5402A is characterized for operation from -40°C to 85°C .

SN54ABT5402A . . . JT PACKAGE
SN74ABT5402A . . . DW PACKAGE
(TOP VIEW)



SN54ABT5402A . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE

INPUTS			OUTPUT Y
$\overline{OE1}$	$\overline{OE2}$	D	
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z



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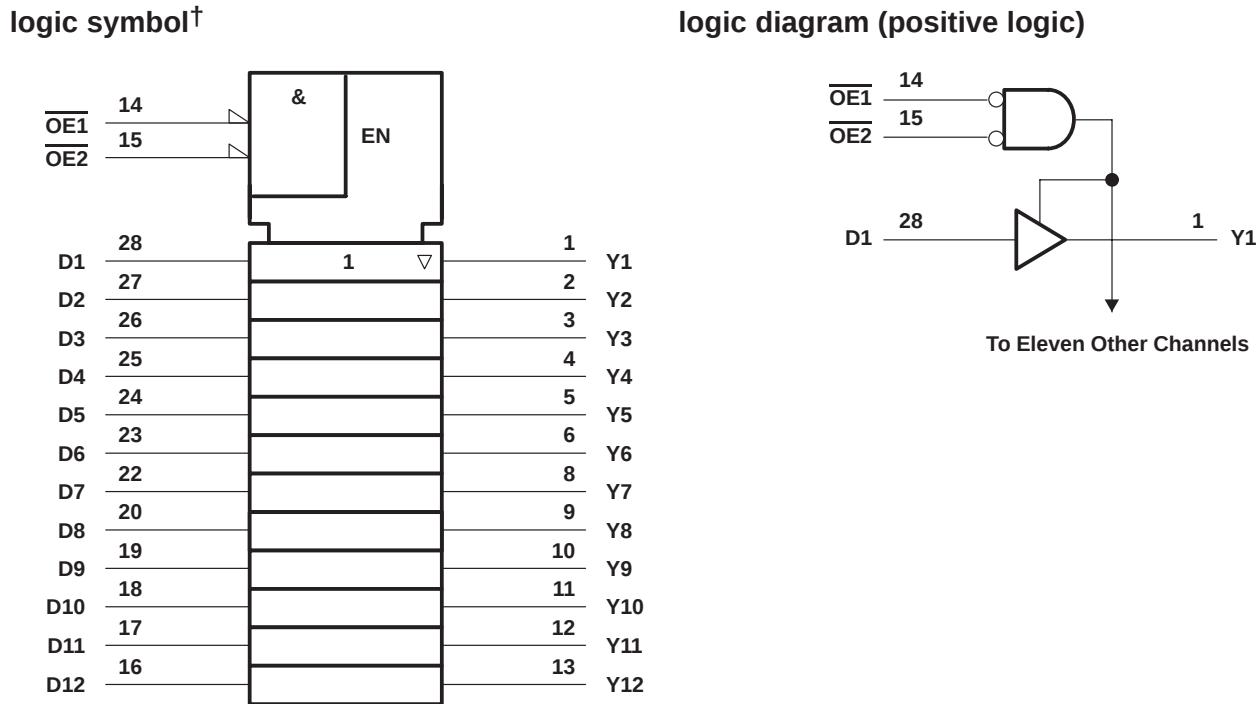
**TEXAS
INSTRUMENTS**

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SN54ABT5402A, SN74ABT5402A
 12-BIT LINE/MEMORY DRIVERS
 WITH 3-STATE OUTPUTS

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† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
 Pin numbers shown are for the DW and JT packages.

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
Voltage range applied to any output in the high or power-off state, V_O	–0.5 V to 5.5 V
Current into any output in the low state, I_O	30 mA
Input clamp current, I_{IK} ($V_I < 0$)	–18 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Package thermal impedance, θ_{JA} (see Note 2): DW package	78°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 EIA/JEDEC Std JESD51.

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SCBS660B – FEBRUARY 1996 – REVISED MAY 1997

recommended operating conditions (see Note 3)

			SN54ABT5402A		SN74ABT5402A		UNIT
			MIN	MAX	MIN	MAX	
V _{CC}	Supply voltage		4.5	5.5	4.5	5.5	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		0	V _{CC}	0	V _{CC}	V
I _{OH}	High-level output current			–12		–12	mA
I _{OL}	Low-level output current			12		12	mA
Δt/Δv	Input transition rise or fall rate	Outputs enabled		10		10	ns/V
T _A	Operating free-air temperature		–55	125	–40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

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

PARAMETER		TEST CONDITIONS	T _A = 25°C			SN54ABT5402A		SN74ABT5402A		UNIT
			MIN	TYP†	MAX	MIN	MAX	MIN	MAX	
V _{IK}		V _{CC} = 4.5 V, I _I = –18 mA			–1.2		–1.2		–1.2	V
V _{OH}		V _{CC} = 4.5 V, I _{OH} = –1 mA	3.35	3.7		3.3		3.35		V
		V _{CC} = 5 V, I _{OH} = –1 mA	3.85	4.2		3.8		3.85		
		V _{CC} = 4.5 V, I _{OH} = –3 mA				3		3.1		
		V _{CC} = 4.5 V, I _{OH} = –12 mA	2.6					2.6		
V _{OL}		V _{CC} = 4.5 V, I _{OL} = 8 mA				0.8		0.65		V
		V _{CC} = 4.5 V, I _{OL} = 12 mA						0.8		
V _{hys}				100						mV
I _I		V _{CC} = 5.5 V, V _I = V _{CC} or GND			±1		±1		±1	μA
I _{OZH}		V _{CC} = 5.5 V, V _O = 2.7 V			10	10		10		μA
I _{OZL}		V _{CC} = 5.5 V, V _O = 0.5 V			–10	–10		–10		μA
I _{off}		V _{CC} = 0, V _I or V _O ≤ 4.5 V			±100			±100		μA
I _{CEX}		V _{CC} = 5.5 V, V _O = 5.5 V, Outputs high			50	50		50		μA
I _O		V _{CC} = 5.5 V, V _O = 2.5 V	–25	–45	–100	–25	–100	–25	–100	mA
I _{OS} ‡		V _{CC} = 5.5 V, V _O = 0	–50		–200	–50	–200	–50	–200	mA
I _{CC}		V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND, Outputs high		5	50	50		50		μA
		V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND, Outputs low		39	48	48		48		mA
		V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND, Outputs disabled		1	50	50		50		μA
ΔI _{CC} §	Data inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND, Outputs enabled		1.5		1.5		1.5		mA
	Data inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND, Outputs disabled		0.05		0.05		0.05		
	Control inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND		1.5		1.5		1.5		
C _i		V _I = 2.5 V or 0.5 V		3						pF
C _O		V _O = 2.5 V or 0.5 V		8						pF

† All typical values are at V_{CC} = 5 V.

‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

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

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SN54ABT5402A, SN74ABT5402A

12-BIT LINE/MEMORY DRIVERS

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switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

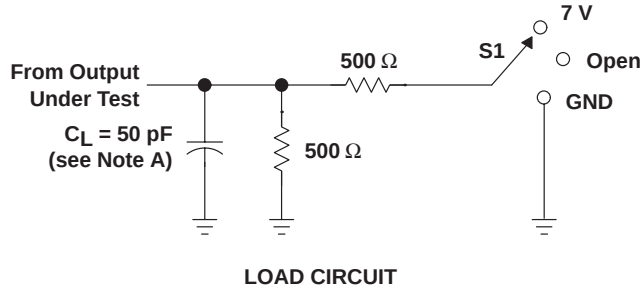
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$			SN54ABT5402A		SN74ABT5402A		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	D	Y	2	4.5	5.2	2	6.3	2	6.2	ns
t_{PHL}			1.5	3.7	5	1.5	5.7	1.5	5.6	
t_{PZH}	$\overline{OE}$	Y	2.5	5.7	7.6	2.5	8.8	2.5	8.7	ns
t_{PZL}			2	4.4	6.3	2	7.6	2	7.5	
t_{PHZ}	$\overline{OE}$	Y	1.5	3.6	4.4	1.5	5.5	1.5	5.2	ns
t_{PLZ}			1.5	4.2	5.4	1.5	7.4	1.5	6.9	

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.

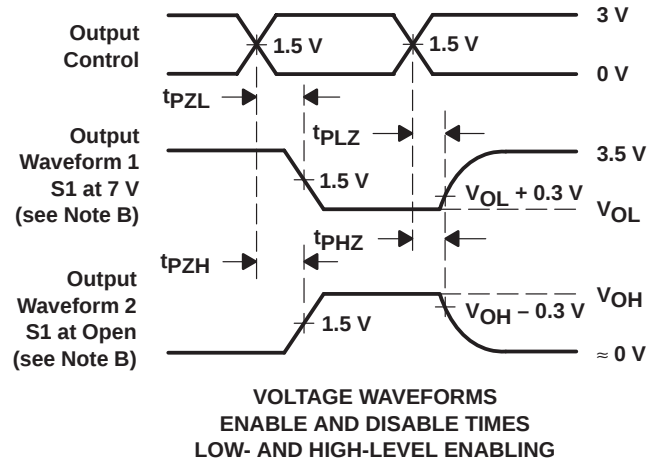
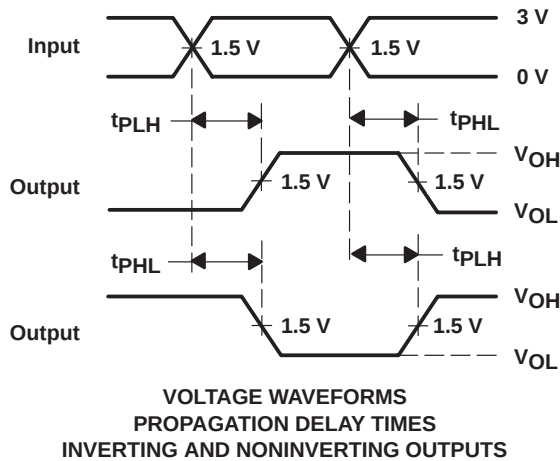
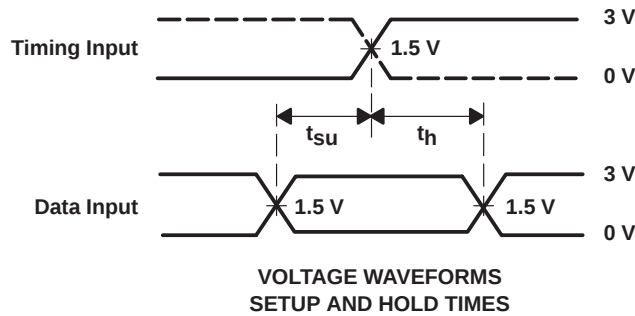


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PARAMETER MEASUREMENT INFORMATION



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



- 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: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74ABT5402ADW	Active	Production	SOIC (DW) 28	20 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT5402A
SN74ABT5402ADW.B	Active	Production	SOIC (DW) 28	20 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT5402A
SN74ABT5402ADWR	Active	Production	SOIC (DW) 28	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT5402A
SN74ABT5402ADWR.B	Active	Production	SOIC (DW) 28	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT5402A

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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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
SN74ABT5402ADWR	SOIC	DW	28	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1

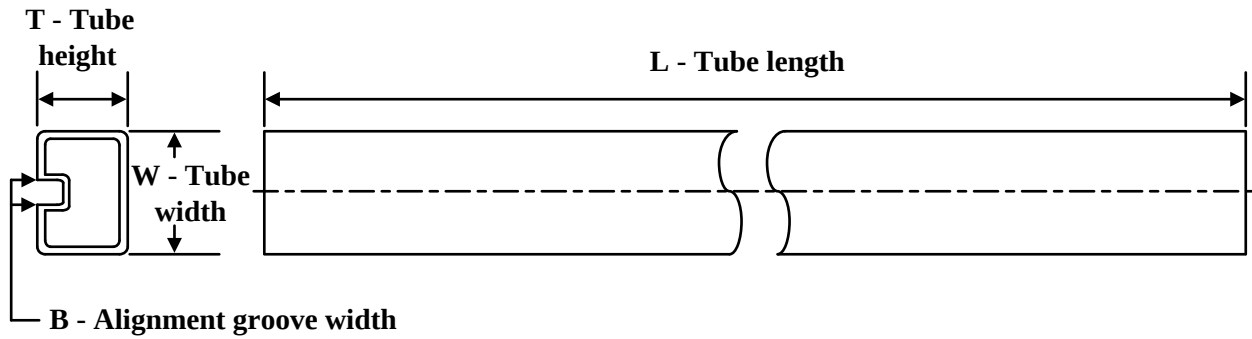
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT5402ADWR	SOIC	DW	28	1000	350.0	350.0	66.0

TUBE

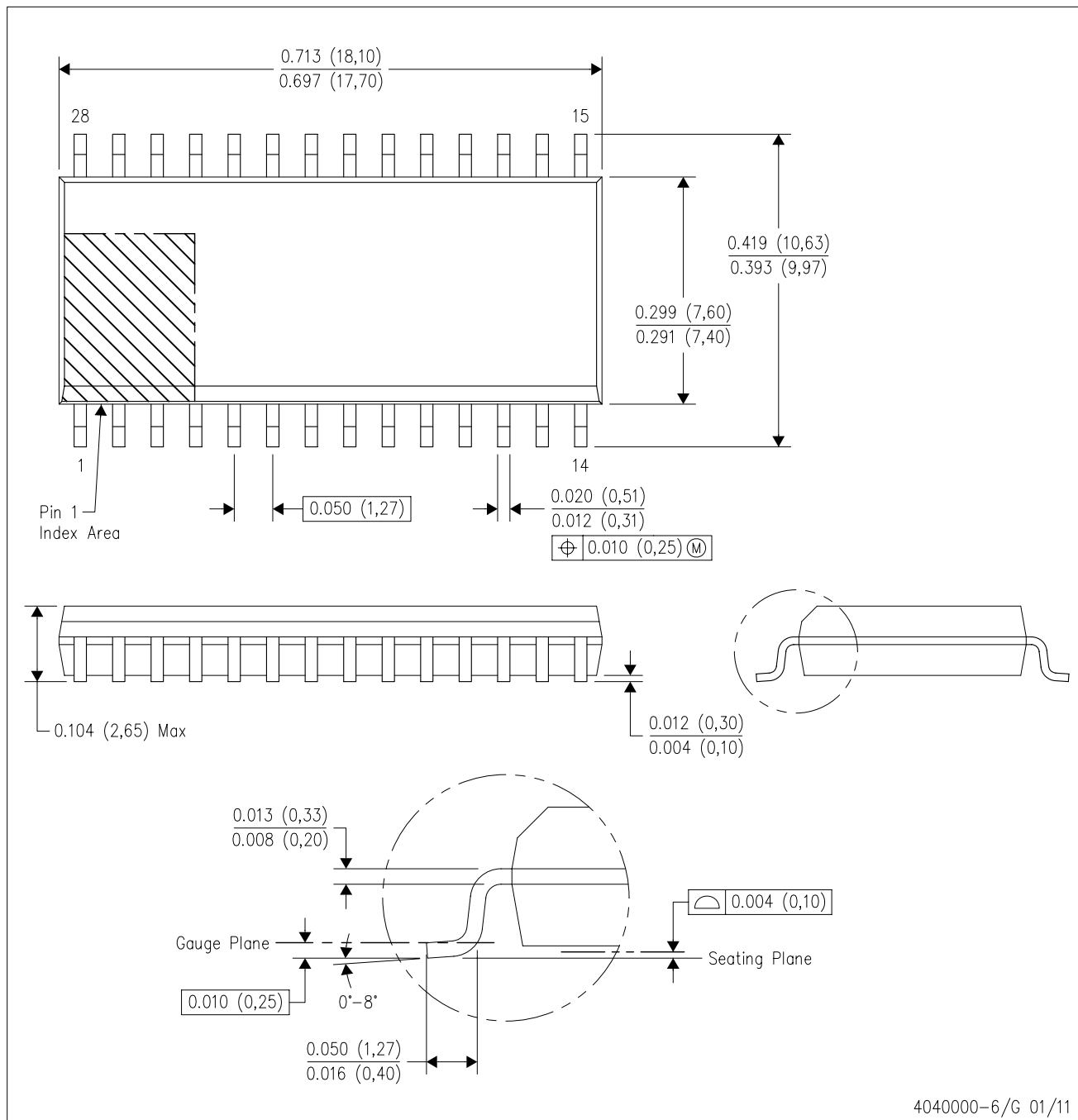


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ABT5402ADW	DW	SOIC	28	20	506.98	12.7	4826	6.6
SN74ABT5402ADW.B	DW	SOIC	28	20	506.98	12.7	4826	6.6

DW (R-PDSO-G28)

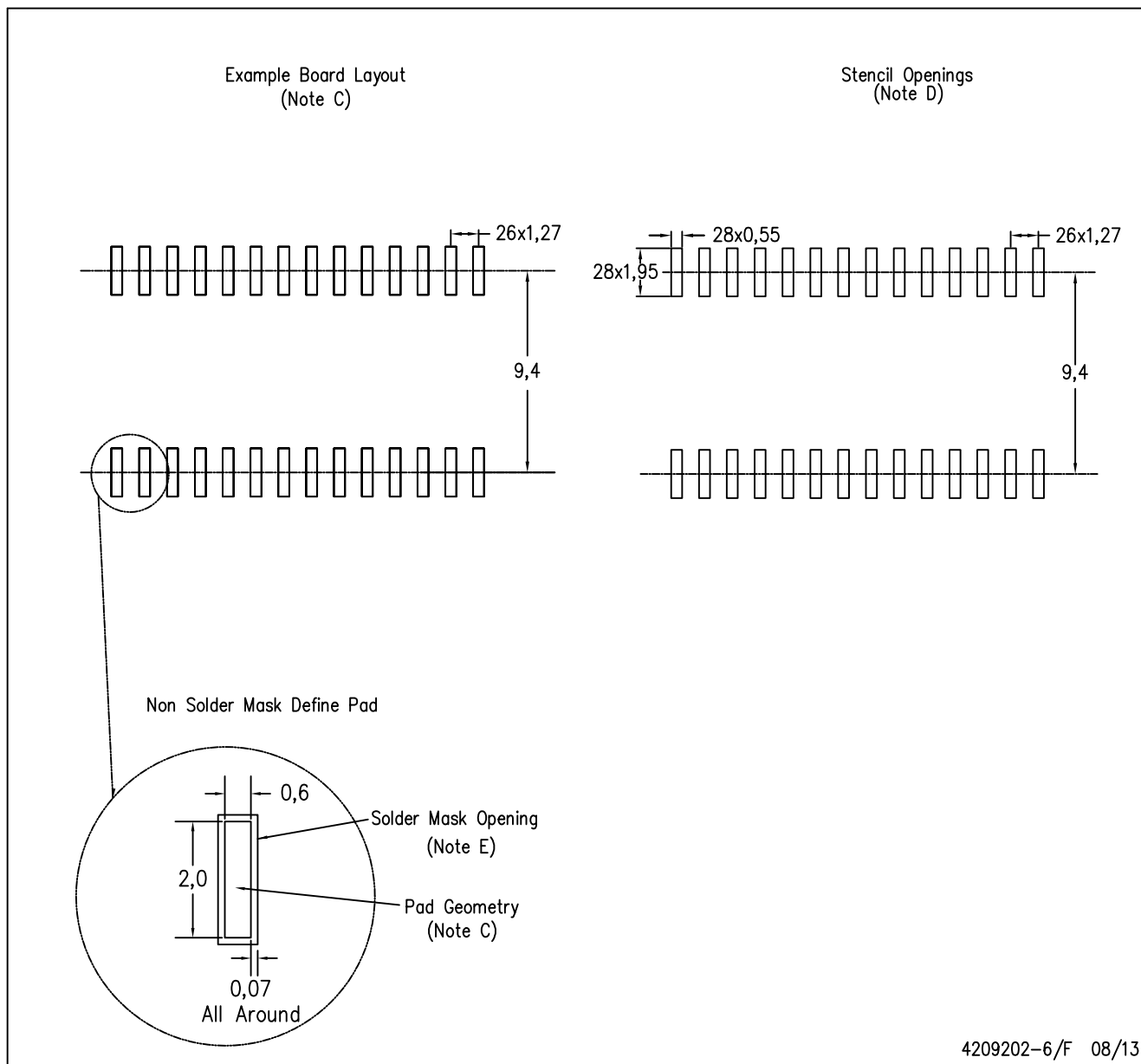
PLASTIC SMALL OUTLINE



- 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 AE.

DW (R-PDSO-G28)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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