

# SN54ABT652A, SN74ABT652A OCTAL REGISTERED TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS072F – JANUARY 1991 – REVISED MAY 1997

- State-of-the-Art *EPIC-II<sup>TM</sup>* BiCMOS Design Significantly Reduces Power Dissipation
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical  $V_{OLP}$  (Output Ground Bounce) < 1 V at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$
- High-Drive Outputs (–32-mA  $I_{OH}$ , 64-mA  $I_{OL}$ )
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Ceramic Flat (W) Package, and Plastic (NT) and Ceramic (JT) DIPs

## description

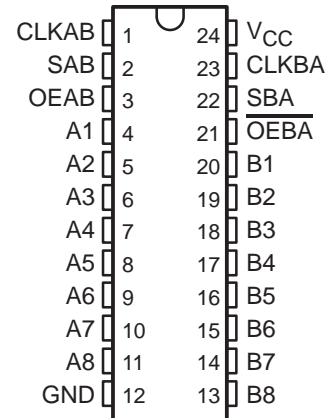
These devices consist of bus-transceiver circuits, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the data bus or from the internal storage registers.

Output-enable (OEAB and  $\overline{OEBA}$ ) inputs are provided to control the transceiver functions. Select-control (SAB and SBA) inputs are provided to select either real-time or stored data for transfer. The circuitry used for select control eliminates the typical decoding glitch that occurs in a multiplexer during the transition between stored and real-time data. A low input selects real-time data, and a high input selects stored data. Figure 1 illustrates the four fundamental bus-management functions that can be performed with the 'ABT652A.

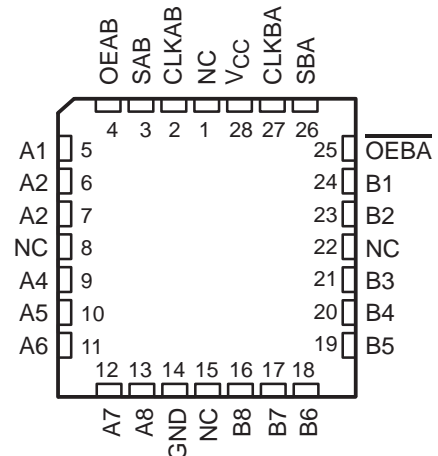
Data on the A- or B-data bus, or both, can be stored in the internal D-type flip-flops by low-to-high transitions at the appropriate clock (CLKAB or CLKBA) inputs, regardless of the select- or enable-control inputs. When SAB and SBA are in the real-time transfer mode, it is possible to store data without using the internal D-type flip-flops by simultaneously enabling OEAB and  $\overline{OEBA}$ . In this configuration, each output reinforces its input. When all other data sources to the two sets of bus lines are at high impedance, each set of bus lines remains at its last state.

To ensure the high-impedance state during power up or power down,  $\overline{OEBA}$  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 (B to A). OEAB should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver (A to B).

SN54ABT652A . . . JT OR W PACKAGE  
SN74ABT652A . . . DB, DW, NT, OR PW PACKAGE  
(TOP VIEW)



SN54ABT652A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



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## description (continued)

The SN54ABT652A is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .  
The SN74ABT652A is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE

INPUTS						DATA I/O†		OPERATION OR FUNCTION
OEAB	OEBA	CLKAB	CLKBA	SAB	SBA	A1–A8	B1–B8	
L	H	H or L	H or L	X	X	Input	Input	Isolation
L	H	↑	↑	X	X	Input	Input	Store A and B data
X	H	↑	H or L	X	X	Input	Unspecified‡	Store A, hold B
H	H	↑	↑	X‡	X	Input	Output	Store A in both registers
L	X	H or L	↑	X	X	Unspecified‡	Input	Hold A, store B
L	L	↑	↑	X	X‡	Output	Input	Store B in both registers
L	L	X	X	X	L	Output	Input	Real-time B data to A bus
L	L	X	H or L	X	H	Output	Input	Stored B data to A bus
H	H	X	X	L	X	Input	Output	Real-time A data to B bus
H	H	H or L	X	H	X	Input	Output	Stored A data to B bus
H	L	H or L	H or L	H	H	Output	Output	Stored A data to B bus and stored B data to A bus

† The data-output functions may be enabled or disabled by a variety of level combinations at OEAB or OEBA. Data-input functions are always enabled; i.e., data at the bus terminals is stored on every low-to-high transition of the clock inputs.

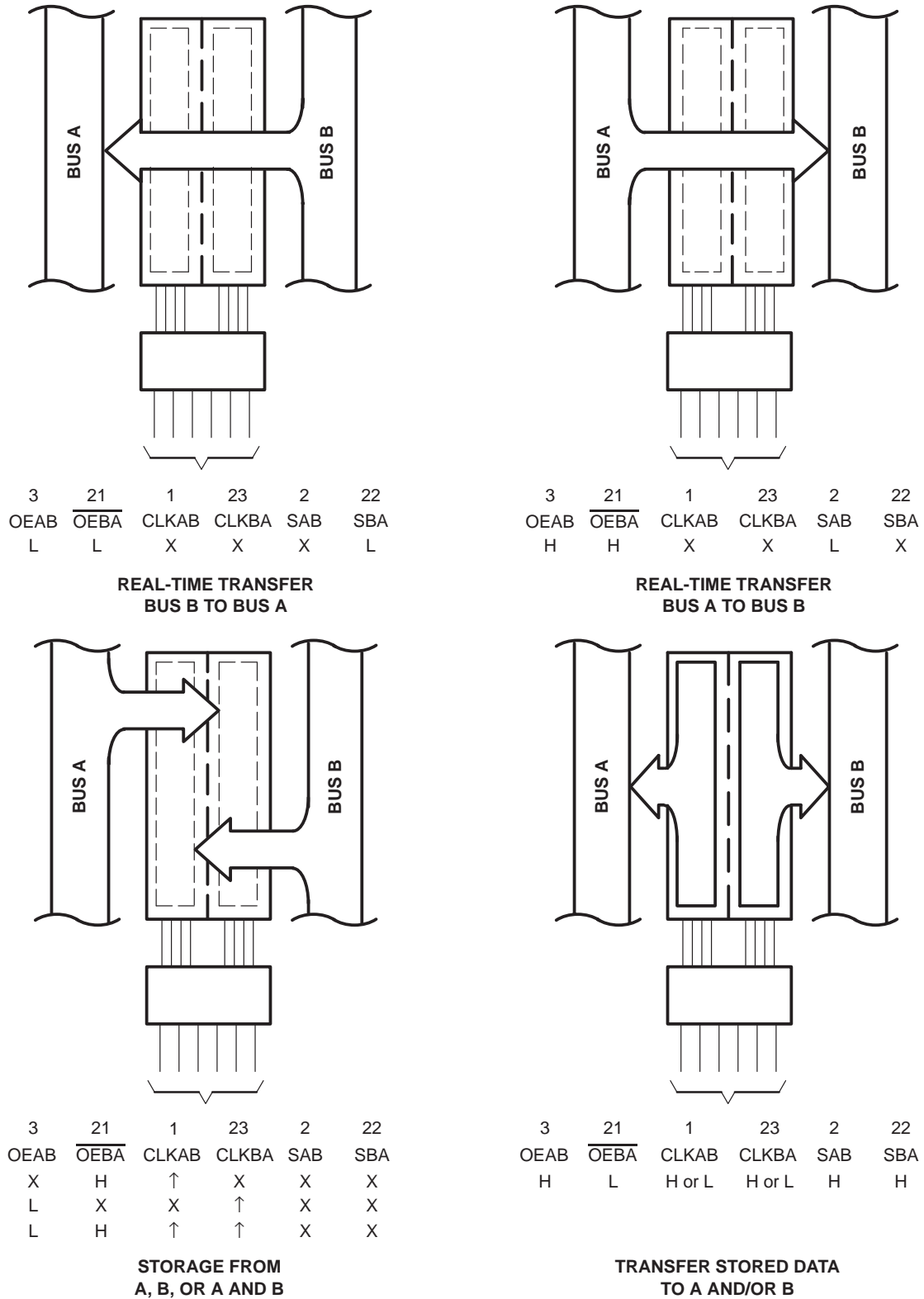
‡ Select control = L; clocks can occur simultaneously.

Select control = H; clocks must be staggered to load both registers.



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Pin numbers shown are for the DB, DW, JT, NT, PW, and W packages.

Figure 1. Bus-Management Functions

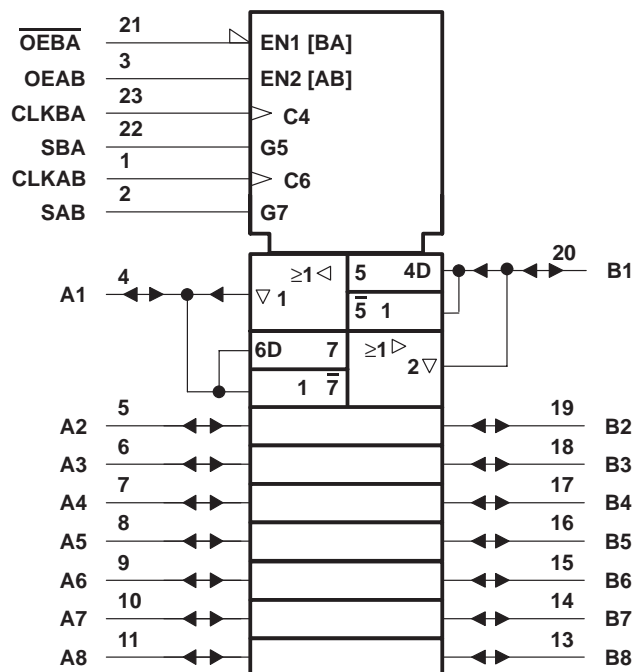
# SN54ABT652A, SN74ABT652A

## OCTAL REGISTERED TRANSCEIVERS

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logic symbol†



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

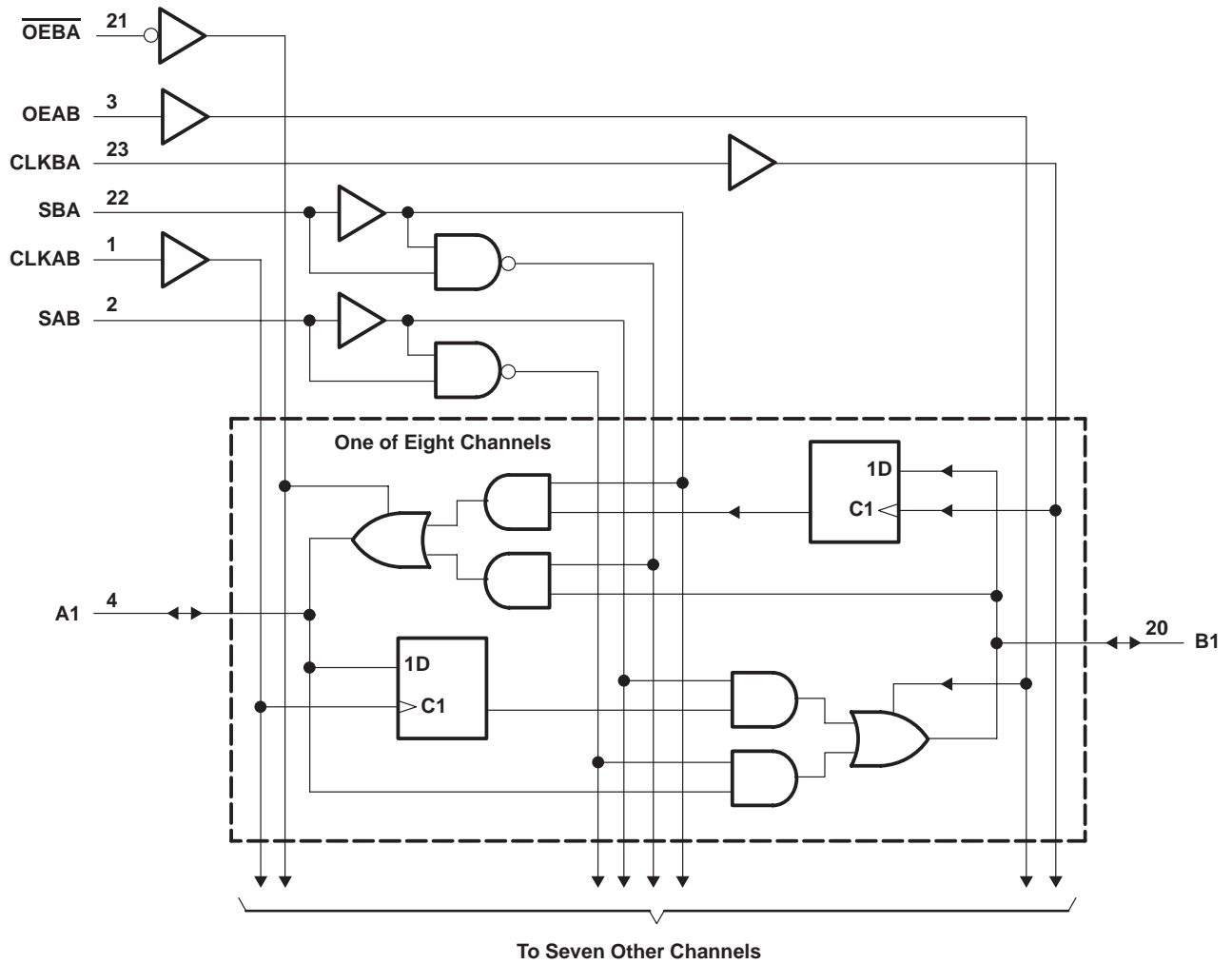


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logic diagram (positive logic)



Pin numbers shown are for the DB, DW, JT, NT, PW, and W packages.

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## OCTAL REGISTERED TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input voltage range, $V_I$ (except I/O ports) (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, $I_O$ : SN54ABT652A	96 mA
SN74ABT652A	128 mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ )	–18 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ )	–50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DB package	104°C/W
DW package	81°C/W
NT package	67°C/W
PW package	120°C/W
Storage temperature range, $T_{stg}$	–65°C to 150°C

<sup>†</sup> 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, except for through-hole packages, which use a trace length of zero.

#### recommended operating conditions (see Note 3)

		SN54ABT652A		SN74ABT652A		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		–24		–32	mA
$I_{OL}$	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled			5	ns/V
$T_A$	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused pins (input or I/O) must be held high or low to prevent them from floating.

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

PARAMETER	TEST CONDITIONS	T <sub>A</sub> = 25°C			SN54ABT652A		SN74ABT652A		UNIT
		MIN	TYP†	MAX	MIN	MAX	MIN	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = –18 mA			–1.2		–1.2		–1.2	V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = –3 mA	2.5			2.5		2.5		V
	V <sub>CC</sub> = 5 V, I <sub>OH</sub> = –3 mA	3			3		3		
	V <sub>CC</sub> = 4.5 V			2		2			
				2*			2		
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V			0.55		0.55			V
				0.55*			0.55		
V <sub>hys</sub>			100						mV
I <sub>I</sub>	Control inputs	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND				±1	±1	±1	μA
	A or B ports					±100	±100	±100	
I <sub>OZH</sub> ‡	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V			50**		10		50	μA
I <sub>OZL</sub> ‡	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.5 V			–50**		–10		–50	μA
I <sub>off</sub>	V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V			±100				±100	μA
I <sub>CEX</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V			50		50		50	μA
I <sub>O</sub> §	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V	–50	–100	–180	–50	–180	–50	–180	mA
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND	Outputs high			250		250		μA
		Outputs low			30		30		mA
		Outputs disabled			250		250		μA
ΔI <sub>CC</sub> ¶	V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND			1.5		1.5		1.5	mA
C <sub>i</sub>	Control inputs	V <sub>I</sub> = 2.5 V or 0.5 V			7				pF
C <sub>io</sub>	A or B ports	V <sub>O</sub> = 2.5 V or 0.5 V			12				pF

\* On products compliant to MIL-PRF-38535, this parameter does not apply.

\*\* These limits apply only to the SN74ABT652A.

† All typical values are at V<sub>CC</sub> = 5 V.

‡ The parameters I<sub>OZH</sub> and I<sub>OZL</sub> include the input leakage current.

§ 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<sub>CC</sub> or GND.

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**timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 2)**

		SN54ABT652A				UNIT
		V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C		MIN	MAX	
		MIN	MAX			
f <sub>clock</sub>	Clock frequency	0	125	0	125	MHz
t <sub>w</sub>	Pulse duration, CLK high or low	4		4		ns
t <sub>su</sub>	Setup time, A or B before CLKAB↑ or CLKBA↑	3		3.5		ns
t <sub>h</sub>	Hold time, A or B after CLKAB↑ or CLKBA↑	1.5		1.5		ns

**timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 2)**

		SN74ABT652A				UNIT
		$V_{CC} = 5\text{ V},$ $T_A = 25^{\circ}\text{C}$		MIN	MAX	
		MIN	MAX			
$f_{\text{clock}}$	Clock frequency	0	125	0	125	MHz
$t_W$	Pulse duration, CLK high or low	4		4		ns
$t_{\text{su}}$	Setup time, A or B before CLKAB↑ or CLKBA↑	3		3		ns
$t_h$	Hold time, A or B after CLKAB↑ or CLKBA↑	0		0		ns



# SN54ABT652A, SN74ABT652A OCTAL REGISTERED TRANSCEIVERS WITH 3-STATE OUTPUTS

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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 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54ABT652A					UNIT
			V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C			MIN	MAX	
			MIN	TYP	MAX			
f <sub>max</sub>			125	200		125		MHz
t <sub>PLH</sub>	CLK	B or A	2.2	4	5.1	1.7	5.9	ns
t <sub>PHL</sub>			1.7	4	5.1	1.7	5.9	
t <sub>PLH</sub>	A or B	B or A	1.5	3	4.8	1	5	ns
t <sub>PHL</sub>			1.5	3.3	4.6	1	5.6	
t <sub>PLH</sub>	SAB or SBA†	B or A	1.5	4	5.5	1.5	6.8	ns
t <sub>PHL</sub>			1.5	3.6	4.9	1.5	6.2	
t <sub>PZH</sub>	$\overline{\text{OEBA}}$	A	2	3.6	5.4	2	6.8	ns
t <sub>PZL</sub>			3	5.7	7.7	3	9.2	
t <sub>PHZ</sub>	$\overline{\text{OEBA}}$	A	1.5	3.2	5.8	1	7.5	ns
t <sub>PLZ</sub>			1.5	3	4.3	1	4.6	
t <sub>PZH</sub>	OEAB	B	2	4.3	6.1	2	7.8	ns
t <sub>PZL</sub>			3	5.5	7.4	3	8.9	
t <sub>PHZ</sub>	OEAB	B	1.5	3.3	6	1	8	ns
t <sub>PLZ</sub>			1.5	3.4	5	1.5	6.8	

† These parameters are measured with the internal output state of the storage register opposite that of the bus input.

switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50$  pF (unless otherwise noted) (see Figure 2)

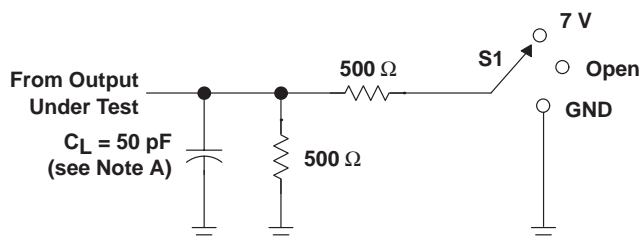
PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT652A					UNIT
			V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C			MIN	MAX	
			MIN	TYP	MAX			
f <sub>max</sub>			125	200		125		MHz
t <sub>PLH</sub>	CLK	B or A	2.2	4	5.1	2.2	5.6	ns
t <sub>PHL</sub>			1.7	4	5.1	1.7	5.6	
t <sub>PLH</sub>	A or B	B or A	1.5	3	4.3	1.5	4.8	ns
t <sub>PHL</sub>			1.5	3.3	4.6	1.5	5.4	
t <sub>PLH</sub>	SAB or SBA†	B or A	1.5	4	5.1	1.5	6.5	ns
t <sub>PHL</sub>			1.5	3.6	4.9	1.5	5.9	
t <sub>PZH</sub>	OEBA	A	2	3.6	4.6	2	5.8	ns
t <sub>PZL</sub>			3	5.7	6.8	3	8.5	
t <sub>PHZ</sub>	OEBA	A	1.5	3.2	4.5	1.5	5	ns
t <sub>PLZ</sub>			1.5	3	3.8	1.5	4.1	
t <sub>PZH</sub>	OEAB	B	2	4.3	6.1	2	6.5	ns
t <sub>PZL</sub>			3	5.5	6.5	3	7.4	
t <sub>PHZ</sub>	OEAB	B	1.5	3.3	4.5	1.5	5.5	ns
t <sub>PLZ</sub>			1.5	3.4	4.4	1.5	5.1	

† These parameters are measured with the internal output state of the storage register opposite that of the bus input.

# SN54ABT652A, SN74ABT652A OCTAL REGISTERED TRANSCEIVERS WITH 3-STATE OUTPUTS

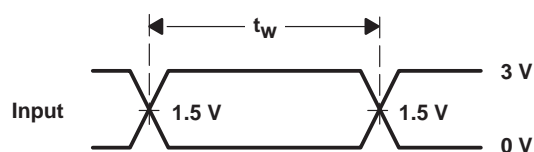
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## PARAMETER MEASUREMENT INFORMATION

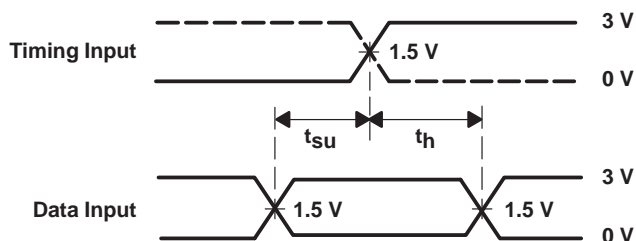


LOAD CIRCUIT

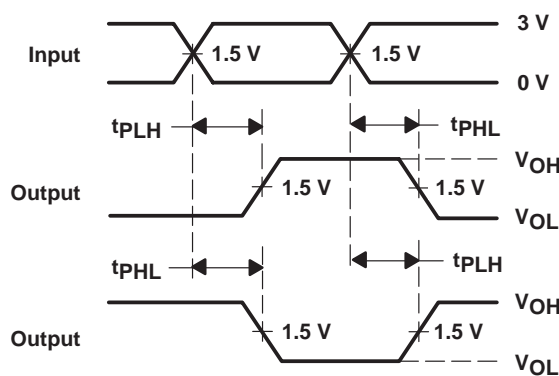
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



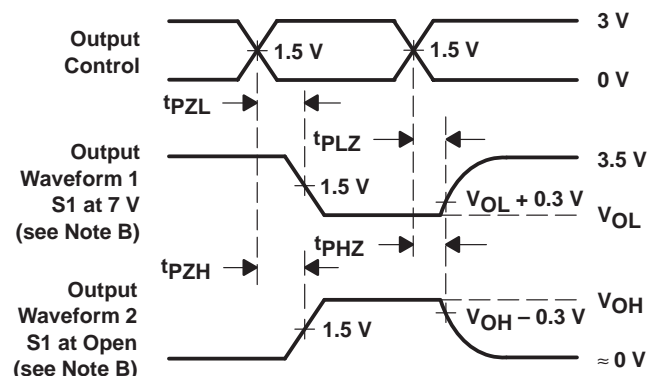
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
  - The outputs are measured one at a time with one transition per measurement.

Figure 2. Load Circuit 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>
5962-9324202Q3A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9324202QKA	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type
5962-9324202QLA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type
SN74ABT652ADBLE	OBSOLETE	SSOP	DB	24		TBD	Call TI	Call TI
SN74ABT652ADBR	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADBRE4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADBRG4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ADWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT652ANT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74ABT652ANTE4	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SNJ54ABT652AFK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54ABT652AJT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type
SNJ54ABT652AW	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type

<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.

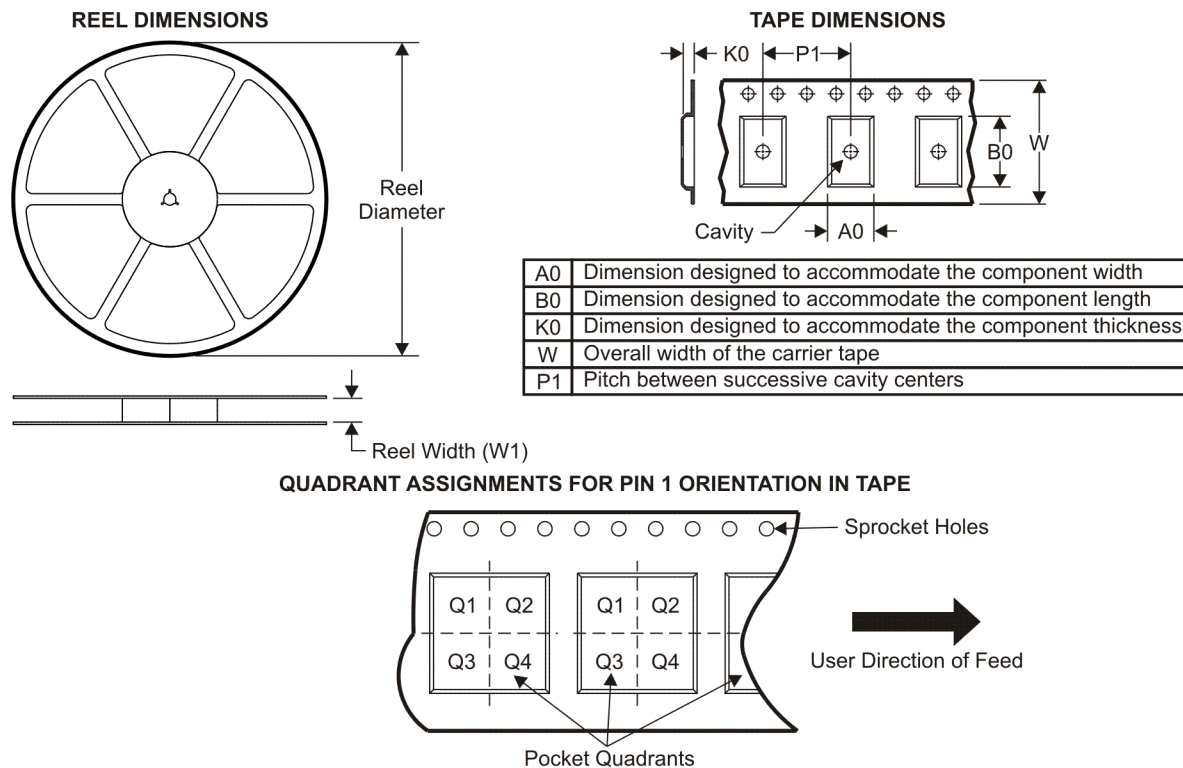
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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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**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
SN74ABT652ADBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
SN74ABT652ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

## TAPE AND REEL BOX DIMENSIONS



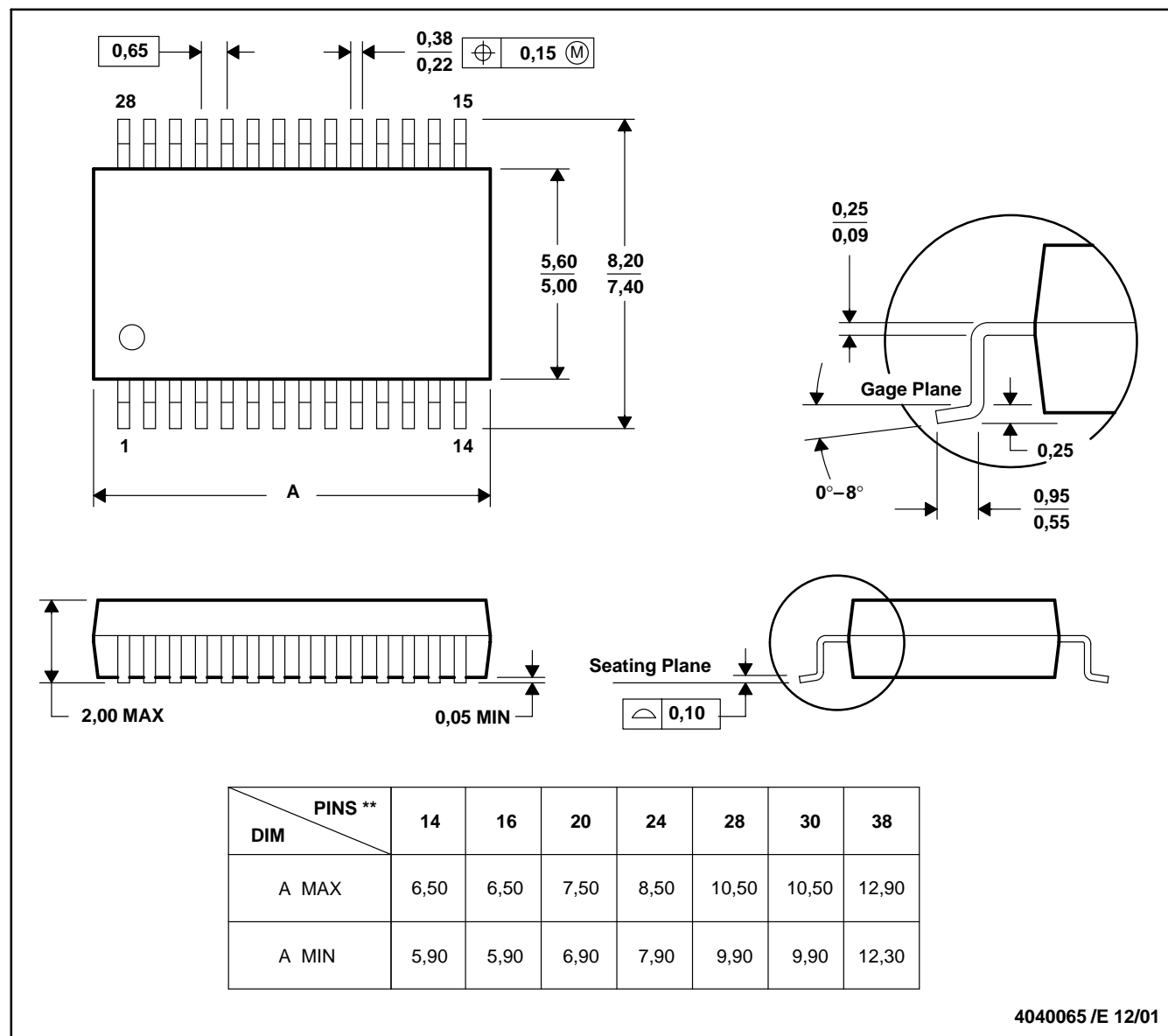
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT652ADBR	SSOP	DB	24	2000	346.0	346.0	33.0
SN74ABT652ADWR	SOIC	DW	24	2000	346.0	346.0	41.0

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

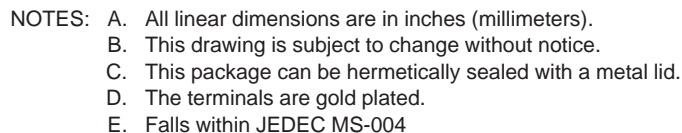
## PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0,15.
  - Falls within JEDEC MO-150

## 28 TERMINAL SHOWN



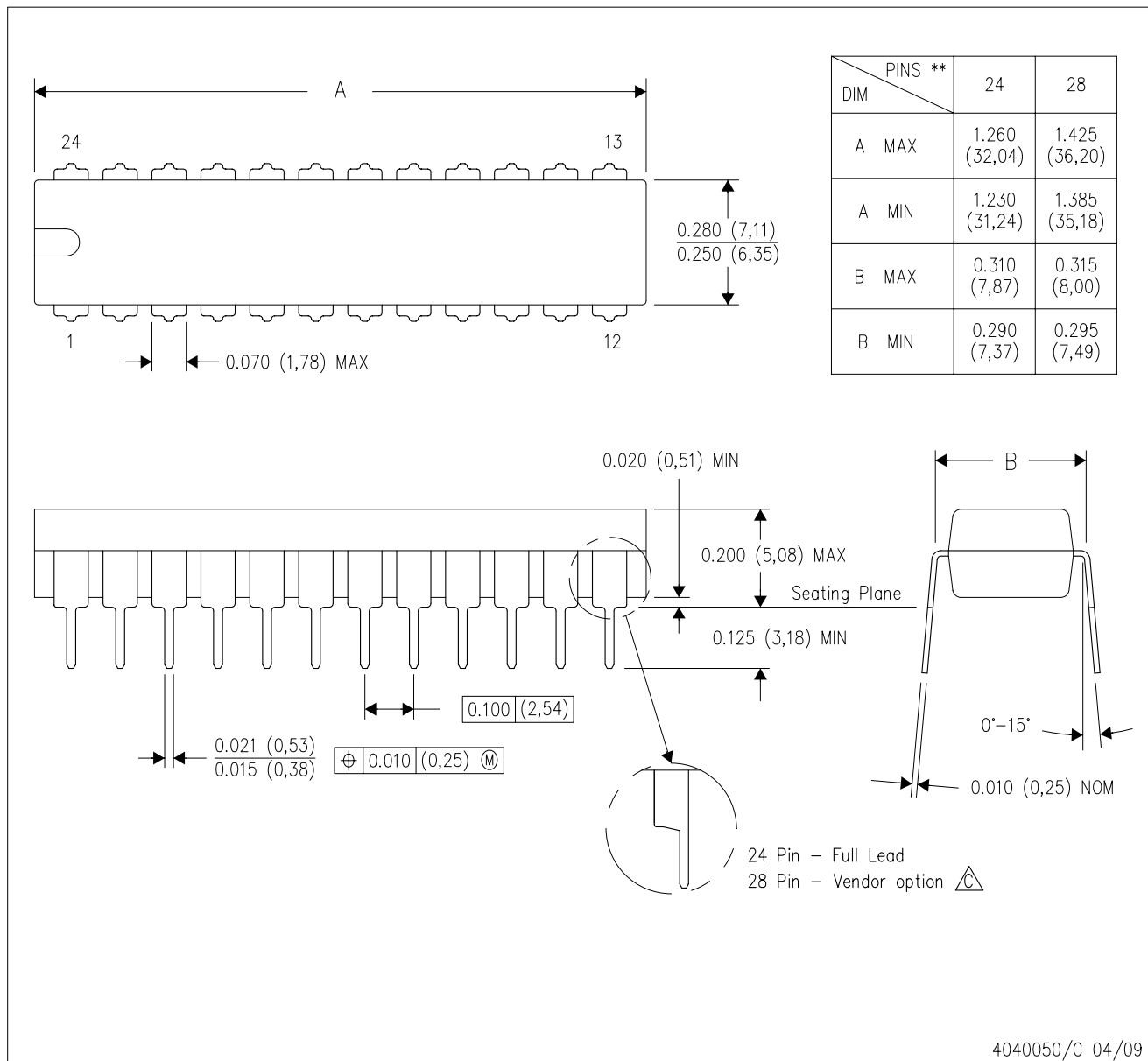


# MECHANICAL DATA

NT (R-PDIP-T\*\*)

24 PINS SHOWN

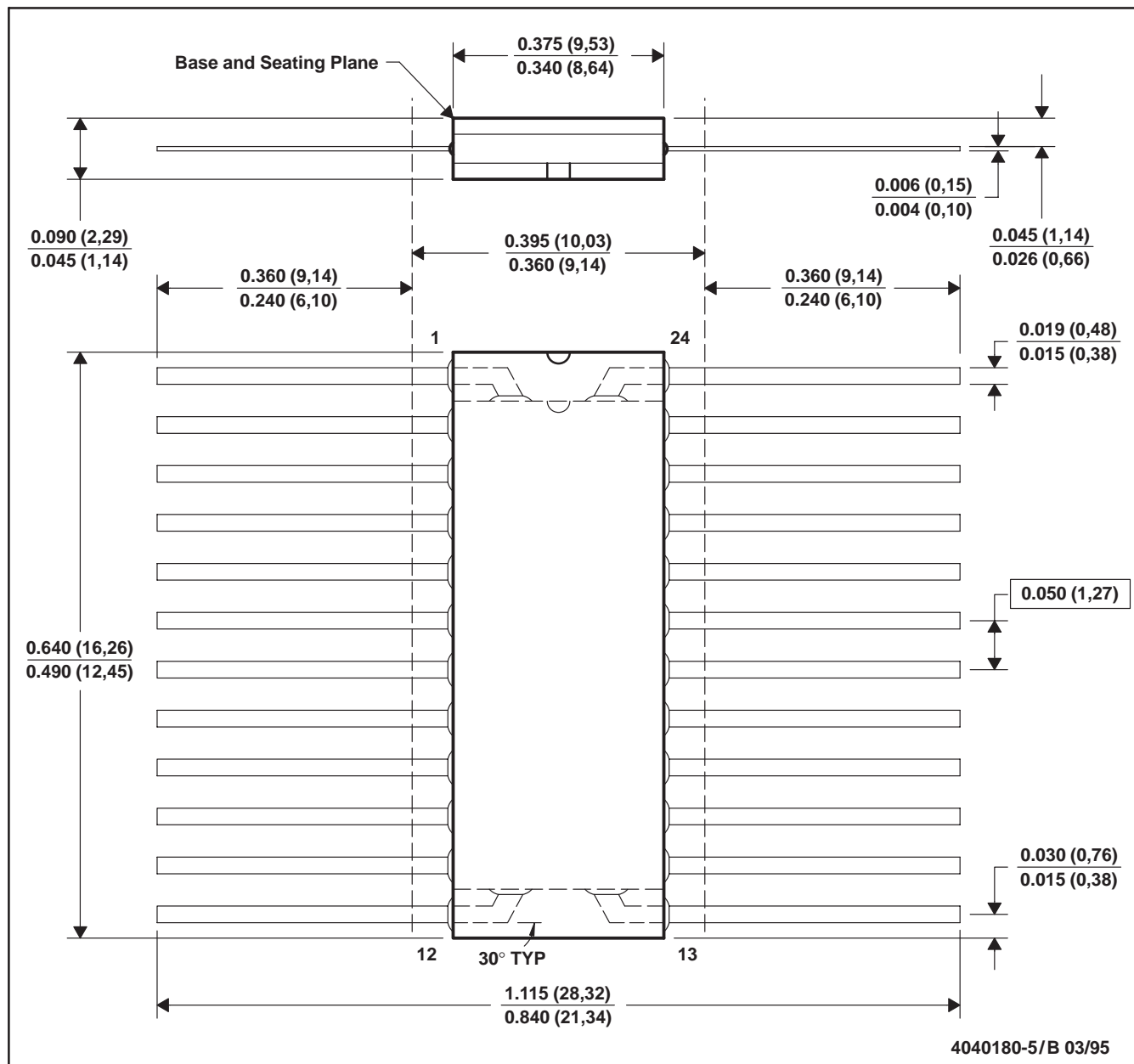
PLASTIC DUAL-IN-LINE PACKAGE



- 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.
  - The 28 pin end lead shoulder width is a vendor option, either half or full width.

W (R-GDFP-F24)

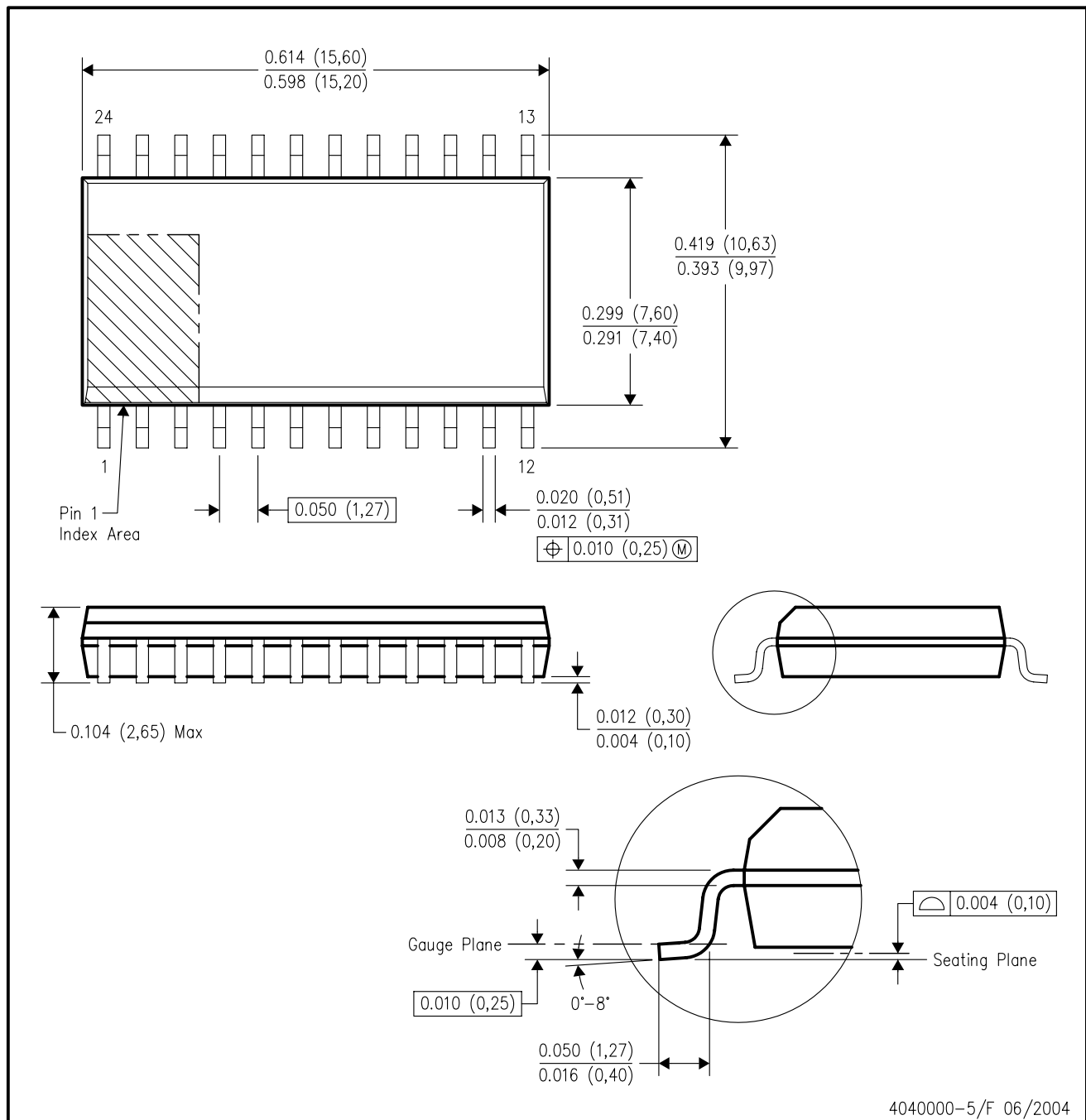
CERAMIC DUAL FLATPACK



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

## DW (R-PDSO-G24)

## PLASTIC SMALL-OUTLINE PACKAGE

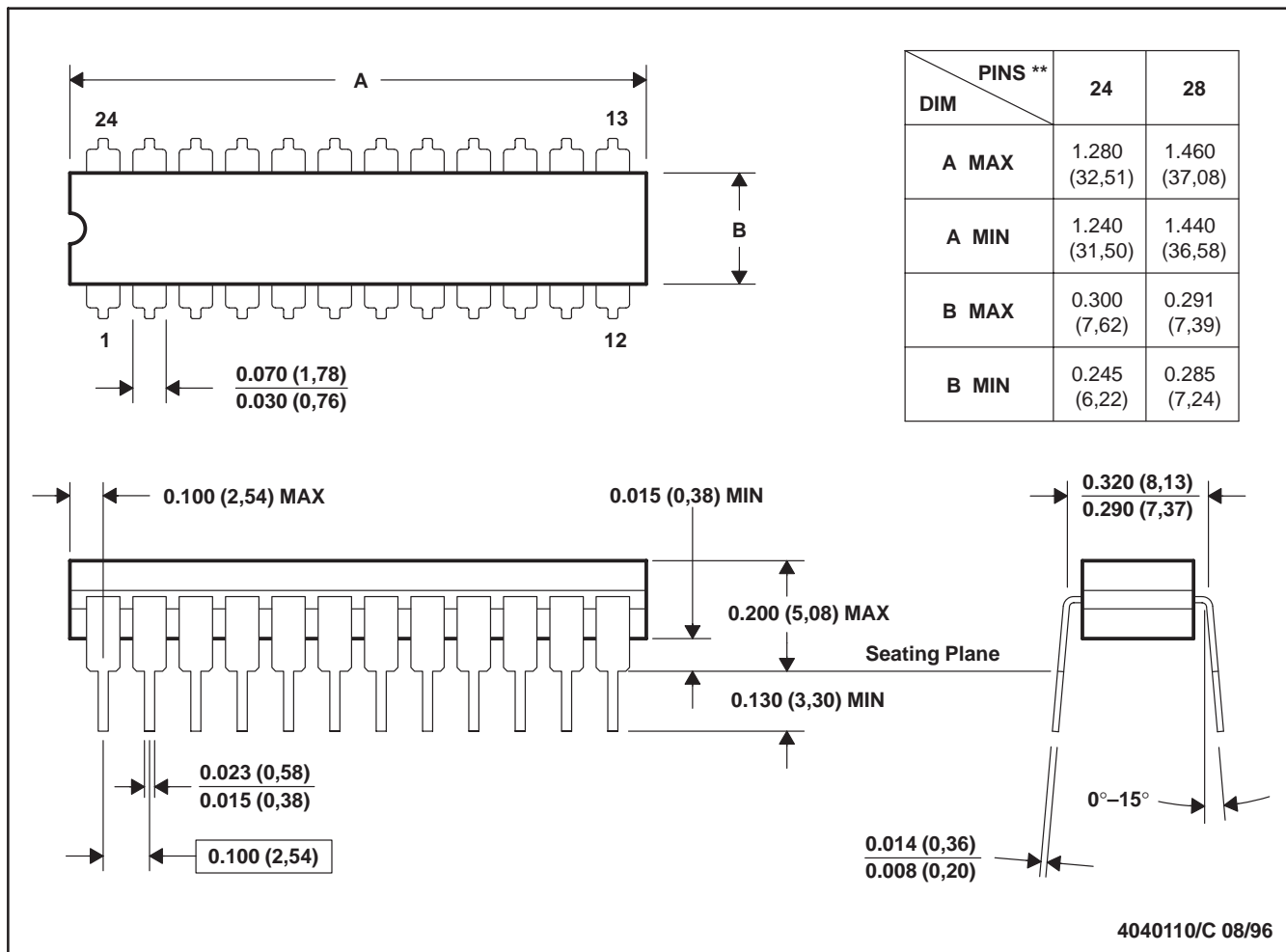


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AD.

## JT (R-GDIP-T\*\*)

## CERAMIC DUAL-IN-LINE

24 LEADS 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 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

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