

SN54ABT2952A, SN74ABT2952A OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS203D – AUGUST 1992 – REVISED JANUARY 1998

- State-of-the-Art *EPIC-II*[™] BiCMOS Design Significantly Reduces Power Dissipation
- Two 8-Bit Back-to-Back Registers Store Data Flowing in Both Directions
- Noninverting Outputs
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Latch-Up Performance Exceeds 500 mA Per JESD 17
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model ($C = 200$ pF, $R = 0$)
- 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

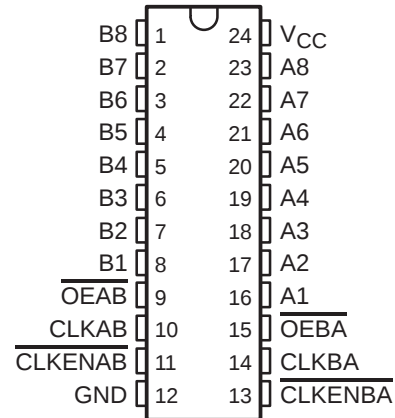
description

The 'ABT2952A transceivers consist of two 8-bit back-to-back registers that store data flowing in both directions between two bidirectional buses. Data on the A or B bus is stored in the registers on the low-to-high transition of the clock (CLKAB or CLKBA) input provided that the clock-enable (CLKENAB or CLKENBA) input is low. Taking the output-enable ($\overline{\text{OEAB}}$ or $\overline{\text{OEBA}}$) input low accesses the data on either port.

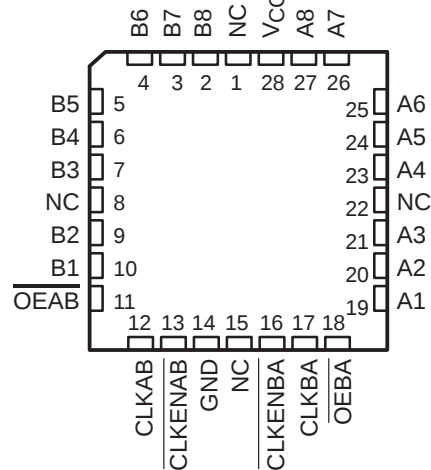
To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT2952A is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT2952A is characterized for operation from -40°C to 85°C .

SN54ABT2952A . . . JT OR W PACKAGE
SN74ABT2952A . . . DB, DW, PW, OR NT PACKAGE
(TOP VIEW)



SN54ABT2952A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection



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SN54ABT2952A, SN74ABT2952A
OCTAL BUS TRANSCEIVERS AND REGISTERS
WITH 3-STATE OUTPUTS

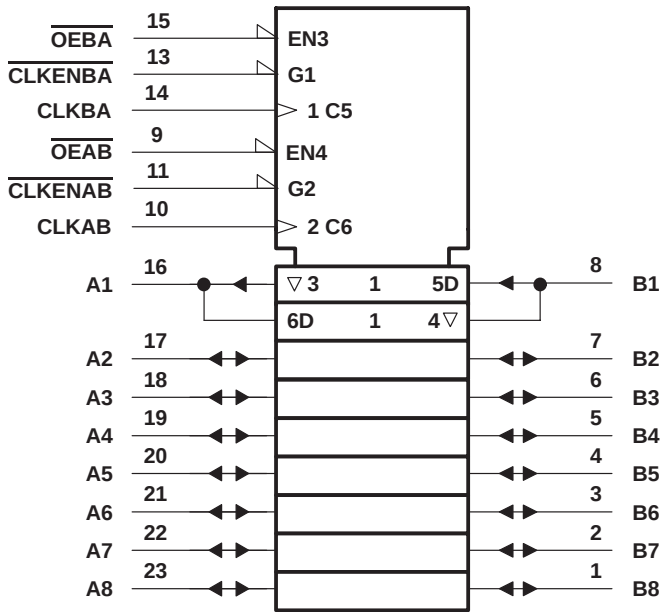
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FUNCTION TABLE†				
INPUTS				OUTPUT B
CLKENAB	CLKAB	OEAB	A	
H	X	L	X	B ₀ ‡
X	H or L	L	X	B ₀ ‡
L	↑	L	L	L
L	↑	L	H	H
X	X	H	X	Z

† A-to-B data flow is shown; B-to-A data flow is similar, but uses $\overline{\text{CLKENBA}}$, CLKBA , and $\overline{\text{OEBA}}$.

‡ Level of B before the indicated steady-state input conditions were established

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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The diagram illustrates the internal logic of a 16-channel multiplexer. It features several input lines at the top: $\overline{\text{CLKENAB}}$ (11), CLKAB (10), $\overline{\text{OEAB}}$ (9), $\overline{\text{CLKENBA}}$ (13), CLKBA (14), $\overline{\text{OEBA}}$ (15), and A1 (16). The bottom right shows output lines B1 (8) and a bracketed area labeled "To Seven Other Channels".

The logic consists of two identical channel selection blocks. Each block takes $\overline{\text{CLKENAB}}$ and CLKAB as inputs to a first AND gate, and $\overline{\text{CLKENBA}}$ and CLKBA as inputs to a second AND gate. The outputs of these AND gates are combined via OR gates and then AND gates to produce control signals for two D-type flip-flops, labeled "C1" and "1D". The $\overline{\text{OEAB}}$ and $\overline{\text{OEBA}}$ signals are inverted and connected to the outputs of the flip-flops. The A1 signal is connected to the data input of the flip-flops. The outputs of the flip-flops are connected to the "To Seven Other Channels" output.

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

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OCTAL BUS TRANSCEIVERS AND REGISTERS

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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 (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 : SN54ABT2952A	96 mA
SN74ABT2952A	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, θ_{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

[†] 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, except for through-hole packages, which use a trace length of zero.

recommended operating conditions (see Note 3)

		SN54ABT2952A		SN74ABT2952A		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			10	ns/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: All unused 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.



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OCTAL BUS TRANSCEIVERS AND REGISTERS

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

PARAMETER		TEST CONDITIONS		T _A = 25°C			SN54ABT2952A		SN74ABT2952A		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} = –3 mA		2.5			2.5		2.5		V
		V _{CC} = 5 V, I _{OH} = –3 mA		3			3		3		
		V _{CC} = 4.5 V	I _{OH} = –24 mA	2			2				
			I _{OH} = –32 mA	2*					2		
V _{OL}		V _{CC} = 4.5 V	I _{OL} = 48 mA	0.55			0.55				V
			I _{OL} = 64 mA	0.55*					0.55		
V _{hys}				100							mV
I _I	Control inputs	V _{CC} = 5.5 V, V _I = V _{CC} or GND		±1			±1		±1		μA
	A or B ports			±100			±100		±100		
I _{OZH} [‡]		V _{CC} = 5.5 V, V _O = 2.7 V		50*			10		50		μA
I _{OZL} [‡]		V _{CC} = 5.5 V, V _O = 0.5 V		–50*			–10		–50		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		–50	–100	–180	–50	–180	–50	–180	mA
I _{CC}	A or B ports	V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND	Outputs high	1	250	250		250		μA	
			Outputs low	24	35	35		35		mA	
			Outputs disabled	0.5	250	250		250		μA	
ΔI _{CC} [¶]		V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND		1.5			1.5		1.5		mA
C _i	Control inputs	V _I = 2.5 V or 0.5 V		3.5							pF
C _{i0}	A or B ports	V _O = 2.5 V or 0.5 V		7.5							pF

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

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

‡ The parameters I_{OZH} and I_{OZL} 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_{CC} or GND.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

				V _{CC} = 5 V, T _A = 25°C		SN54ABT2952A		SN74ABT2952A		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency			0	150	0	150	0	150	MHz
t _w	Pulse duration, CLK high or low			3.3		3.3		3.3		ns
t _{su}	Setup time before CLK↑	A or B	High or low	2.5		3		2.5		ns
		CLKEN		3		3		3		
t _h	Hold time after CLK↑	A or B		1.5		1.5		1.5		ns
		CLKEN		2		2		2		

SN54ABT2952A, SN74ABT2952A

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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)

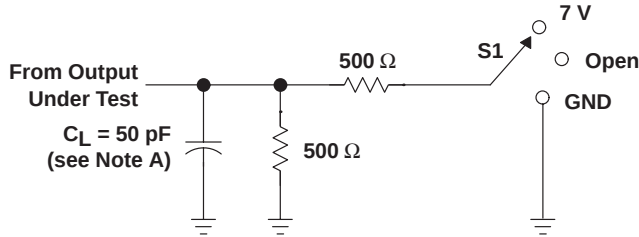
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$			SN54ABT2952A		SN74ABT2952A		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{\max}$			150			150		150		MHz
t_{PLH}	CLKAB or CLKBA	B or A	2	3.3	5.2	2	6.3	2	5.9	ns
t_{PHL}			2.5	4	6.1	2.5	6.8	2.5	6.3	
t_{PZH}	$\overline{OEBA}$ or $\overline{OEAB}$	A or B	1.5	3.2	4.7	1.5	5.7	1.5	5.6	ns
t_{PZL}			2	3.7	5.7	2	6.7	2	6.6	
t_{PHZ}	$\overline{OEBA}$ or $\overline{OEAB}$	A or B	1.5	3.5	5.1	1.5	6.5	1.5	6.4	ns
t_{PLZ}			1.5	3.4	5.9	1.5	6.7	1.5	6.2	



SN54ABT2952A, SN74ABT2952A OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

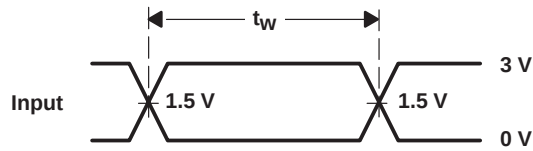
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PARAMETER MEASUREMENT INFORMATION

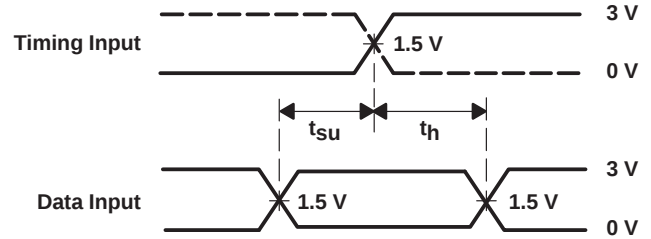


LOAD CIRCUIT

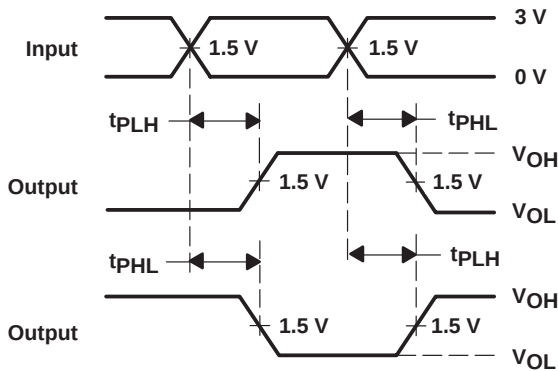
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



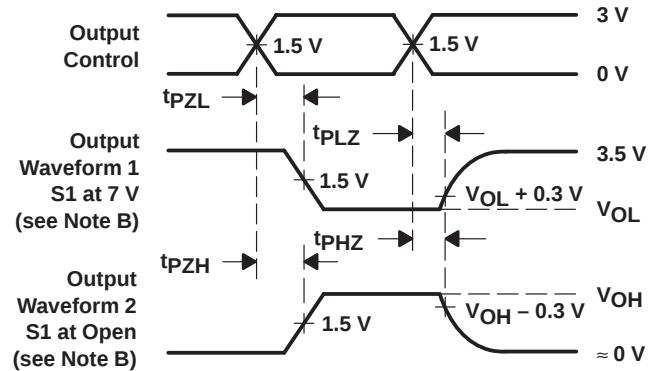
VOLTAGE WAVEFORMS
PULSE DURATION



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: 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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9308602Q3A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9308602Q3A SNJ54ABT 2952AFK	Samples
5962-9308602QKA	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9308602QK A SNJ54ABT2952AW	Samples
5962-9308602QLA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9308602QL A SNJ54ABT2952AJ T	Samples
SN74ABT2952ADBLE	OBSOLETE	SSOP	DB	24		TBD	Call TI	Call TI	-40 to 85		
SN74ABT2952ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT2952A	Samples
SN74ABT2952ADWE4	ACTIVE	SOIC	DW	24		TBD	Call TI	Call TI	-40 to 85		Samples
SN74ABT2952ADWG4	ACTIVE	SOIC	DW	24		TBD	Call TI	Call TI	-40 to 85		Samples
SN74ABT2952ADWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT2952A	Samples
SN74ABT2952ADWRE4	ACTIVE	SOIC	DW	24		TBD	Call TI	Call TI	-40 to 85		Samples
SN74ABT2952ADWRG4	ACTIVE	SOIC	DW	24		TBD	Call TI	Call TI	-40 to 85		Samples
SN74ABT2952ANT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74ABT2952ANT	Samples
SN74ABT2952ANTE4	ACTIVE	PDIP	NT	24		TBD	Call TI	Call TI	-40 to 85		Samples
SNJ54ABT2952AFK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9308602Q3A SNJ54ABT 2952AFK	Samples
SNJ54ABT2952AJT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9308602QL A SNJ54ABT2952AJ T	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54ABT2952AW	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9308602QK A SNJ54ABT2952AW	Samples

⁽¹⁾ 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.

⁽²⁾ 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)

⁽³⁾ MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN54ABT2952A, SN74ABT2952A :

- Catalog: [SN74ABT2952A](#)
- Military: [SN54ABT2952A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

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
SN74ABT2952ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



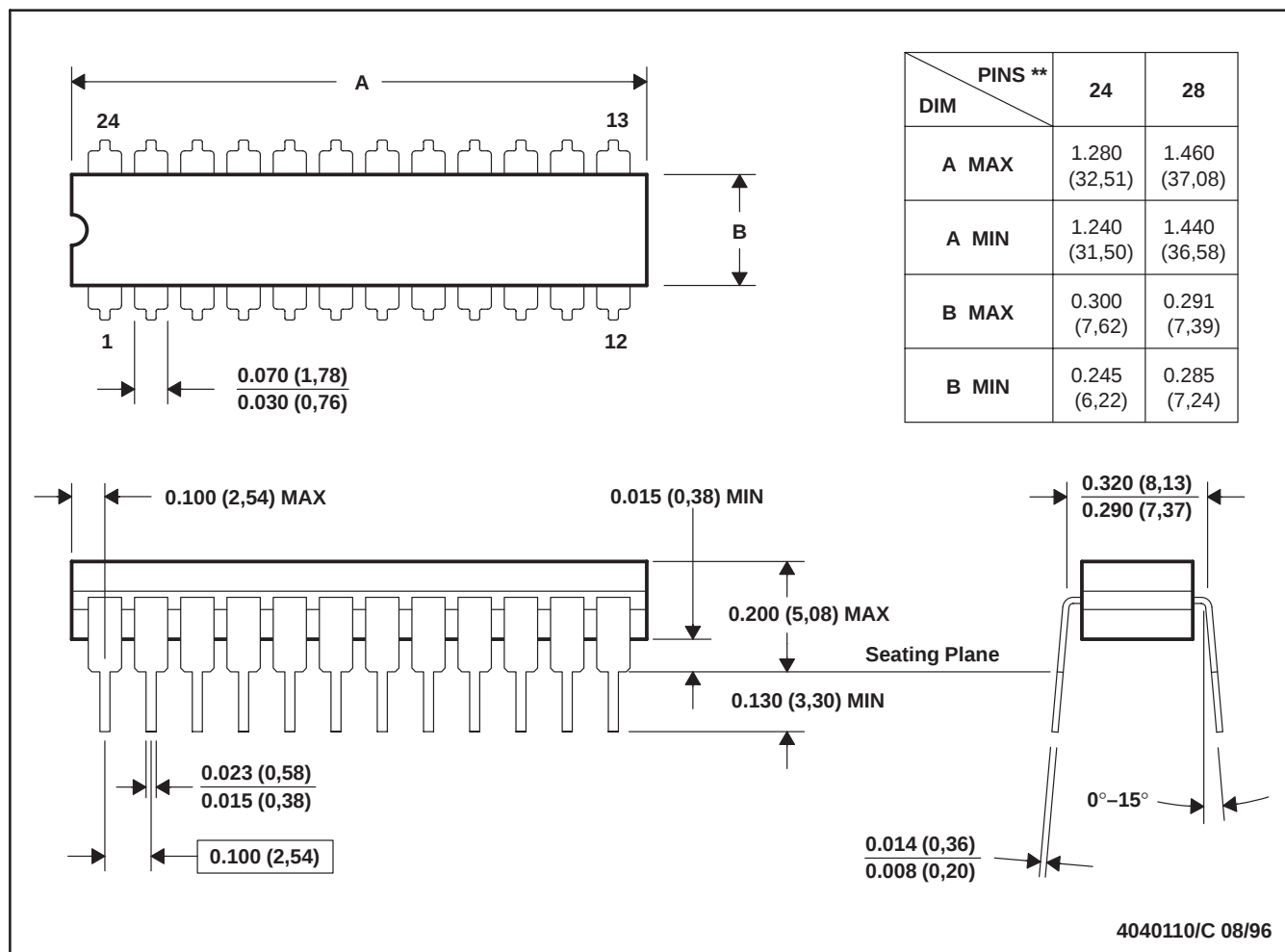
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT2952ADWR	SOIC	DW	24	2000	367.0	367.0	45.0

JT (R-GDIP-T**)

CERAMIC DUAL-IN-LINE

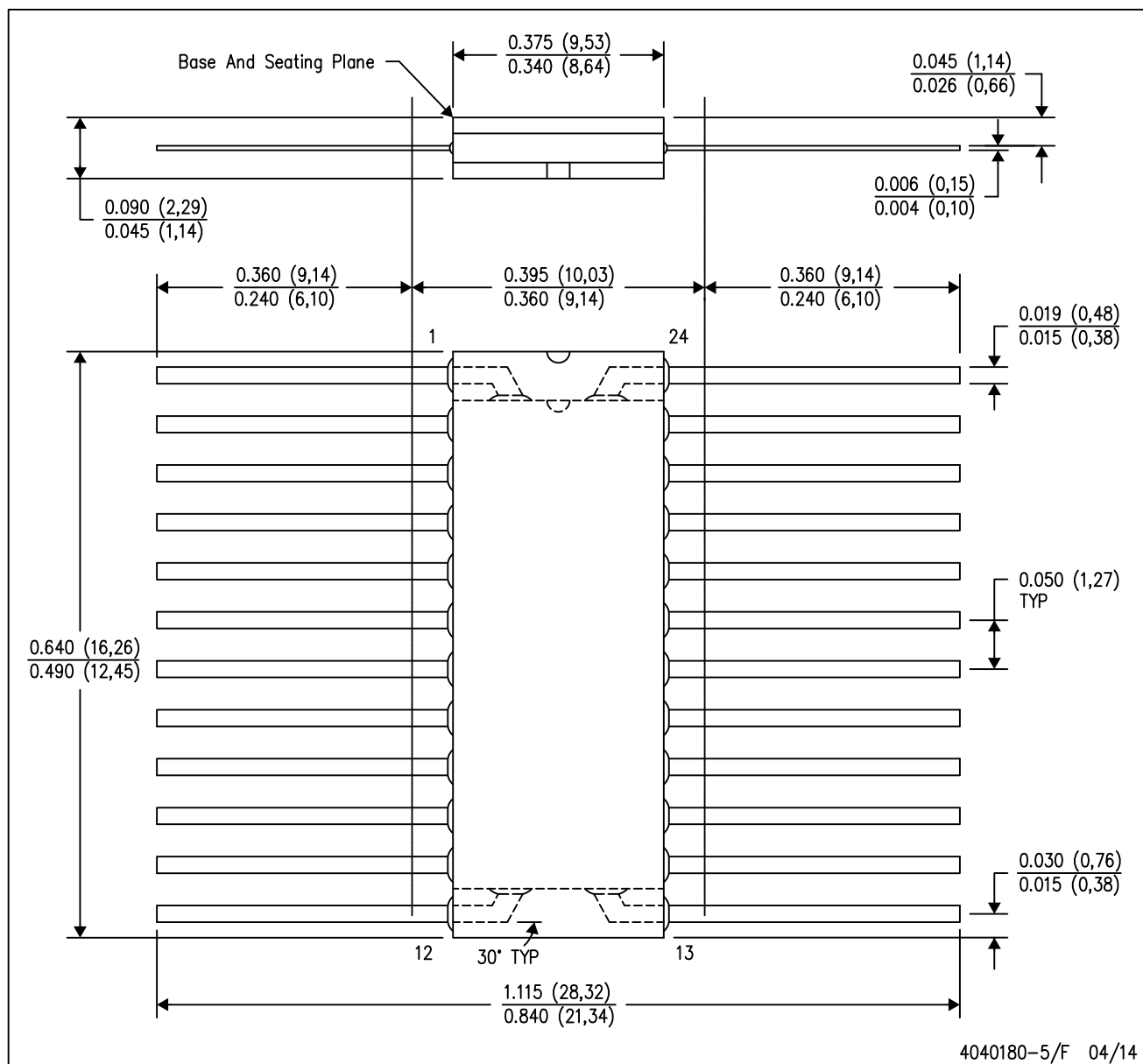
24 LEADS SHOWN



- 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.
 - Index point is provided on cap for terminal identification.
 - Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

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.
- Index point is provided on cap for terminal identification only.
- 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

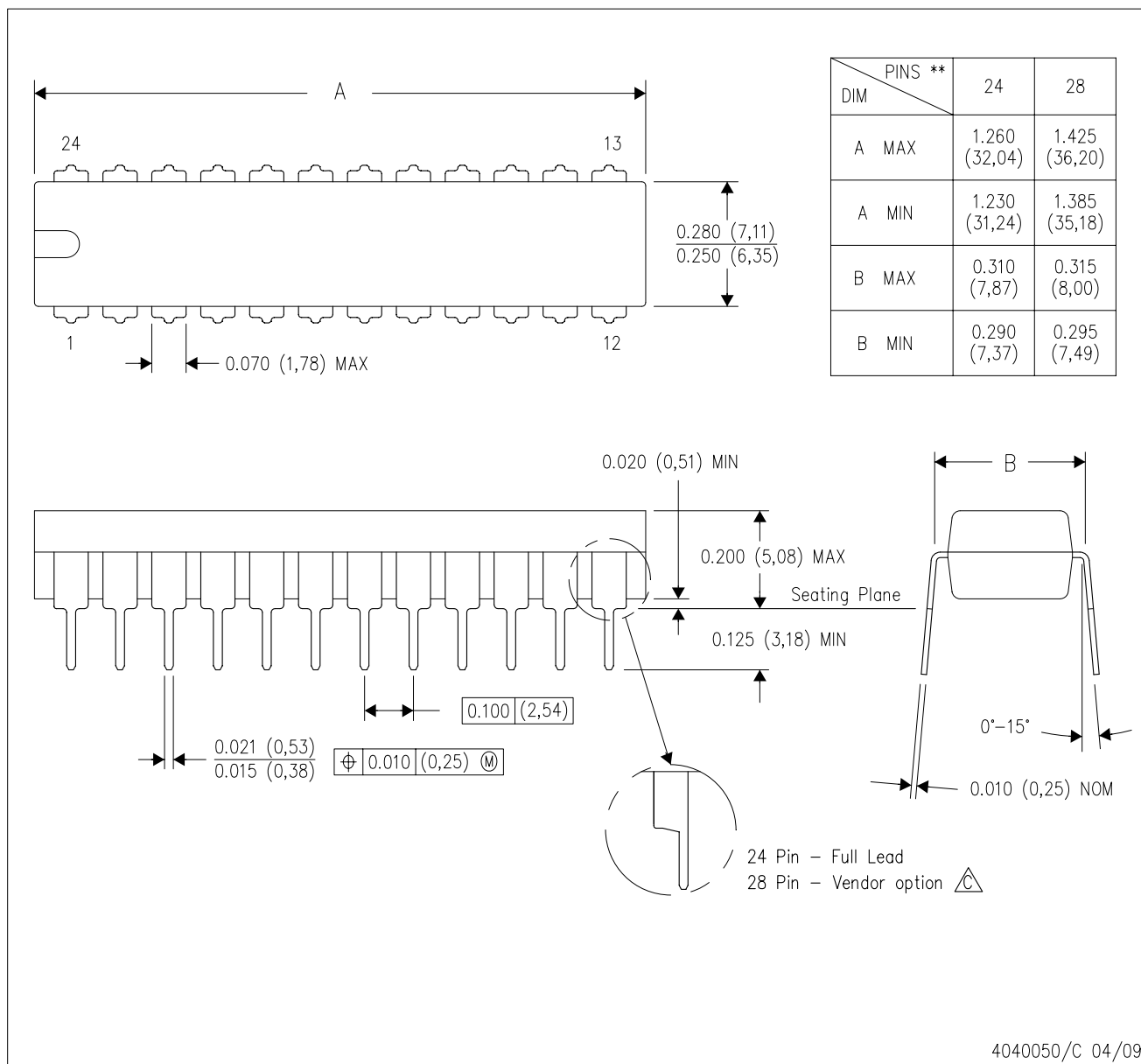
- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - Falls within JEDEC MS-004

MECHANICAL DATA

NT (R-PDIP-T**)

24 PINS SHOWN

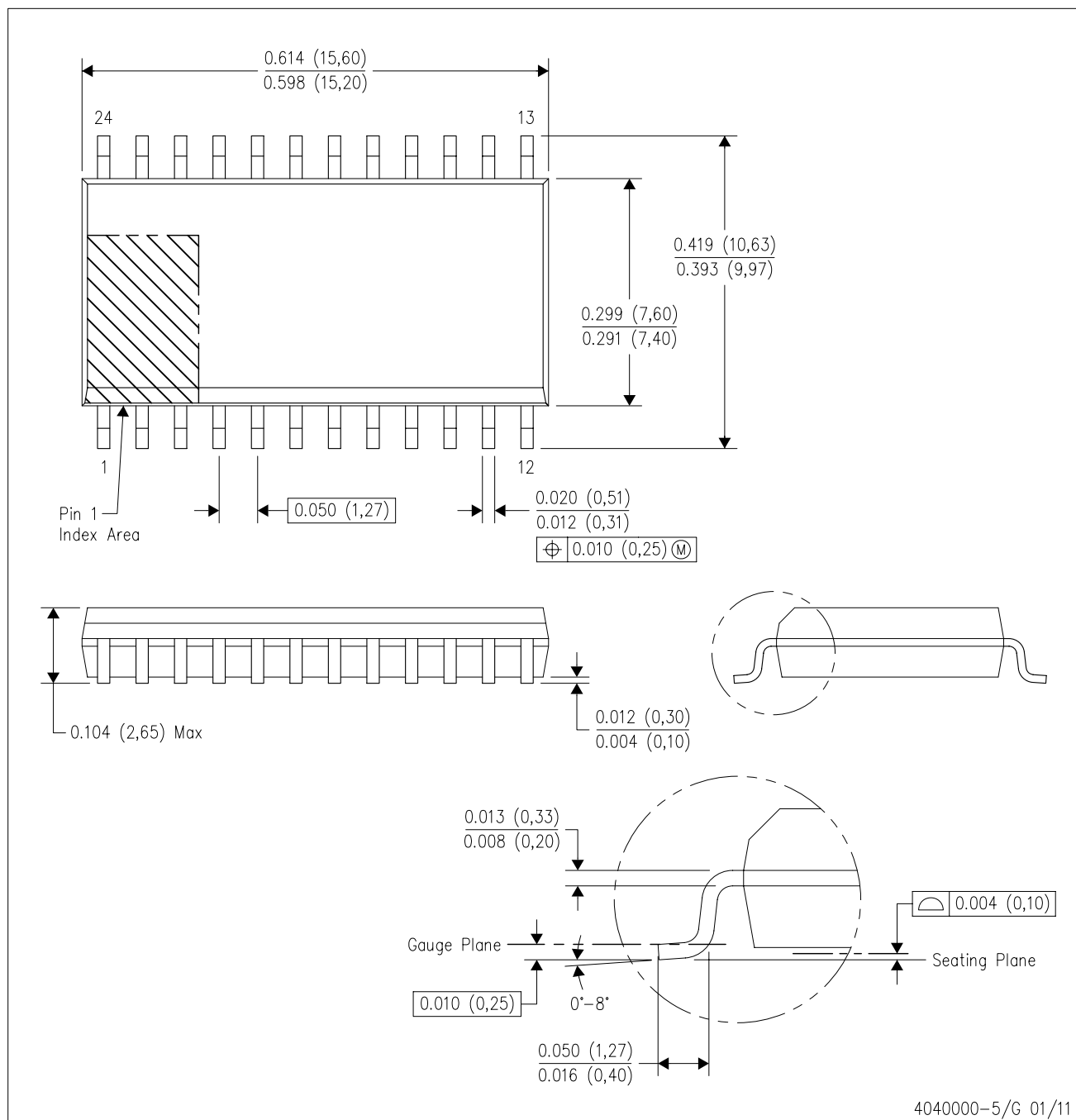
PLASTIC DUAL-IN-LINE PACKAGE



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

DW (R-PDSO-G24)

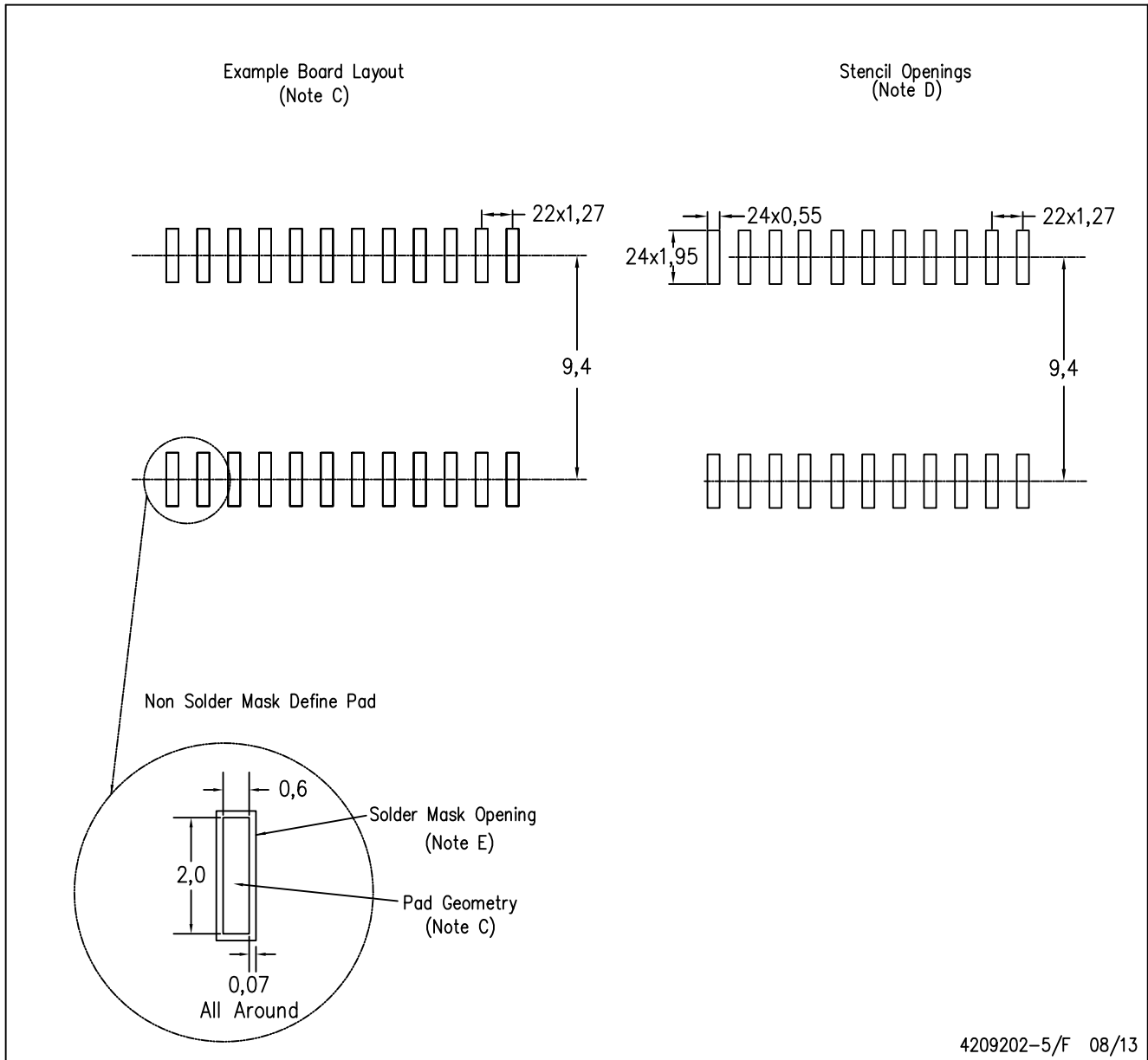
PLASTIC SMALL OUTLINE



- 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 AD.

DW (R-PDSO-G24)

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.

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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