

CD4508B Types

CMOS Dual 4-Bit Latch

High-Voltage Types (20-Volt Rating)

■ CD4508B dual 4-bit latch contains two identical 4-bit latches with separate STROBE, RESET, and OUTPUT DISABLE controls. With the STROBE line in the high state, the data on the "D" inputs appear at the corresponding "Q" outputs provided the DISABLE line is in the low state. Changing the STROBE line to the low state locks the data into the latch. A high on the reset line forces the outputs to a low level regardless of the state of the STROBE input. The outputs are forced to the high-impedance state for bus line applications by a high level on the DISABLE input.

The CD4508B types are supplied in 24-lead hermetic dual-in-line ceramic packages (F3A suffix), 24-lead dual-in-line plastic packages (E suffix), 24-lead small-outline packages (M, M96, and NSR suffixes), and 24-lead thin shrink small-outline packages (PW and PWR suffixes).

The CD4508B is similar to industry type MC14508.

Features:

- Two independent 4-bit latches
- Individual master reset for each 4-bit latch
- 3-state outputs with high-impedance state for bus line applications
- Medium-speed operation: $t_{PHL} = t_{PLH} = 70$ ns (typ.) at $V_{DD} = 10$ V and $C_L = 50$ pF
- 100% tested for quiescent current at 20 V
- 5-V, 10-V, and 15-V parametric ratings
- Standardized, symmetrical output characteristics
- Maximum input current of $1 \mu A$ at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (full package-temperature range) =
 - 1 V at $V_{DD} = 5$ V
 - 2 V at $V_{DD} = 10$ V
 - 2.5 V at $V_{DD} = 15$ V
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

Applications:

- Buffer storage
- Holding registers
- Data storage and multiplexing

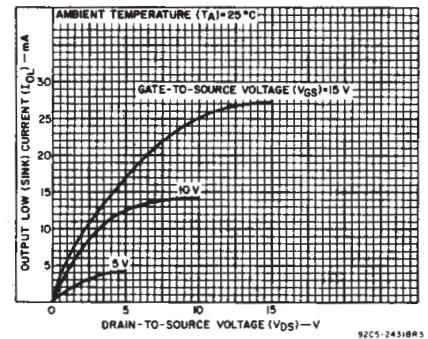
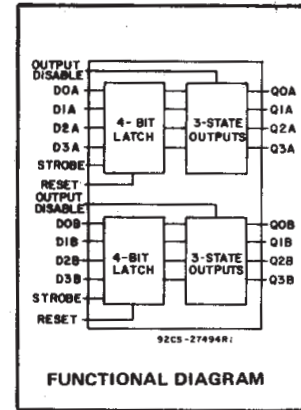


Fig. 2 – Typical output low (sink) current characteristics.

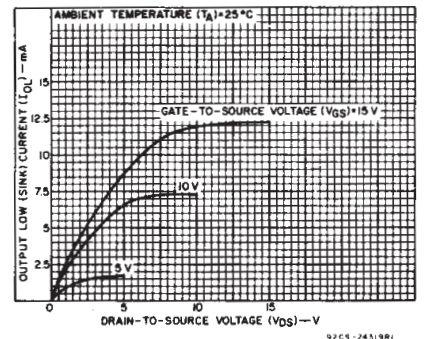


Fig. 3 – Minimum output low (sink) current characteristics.

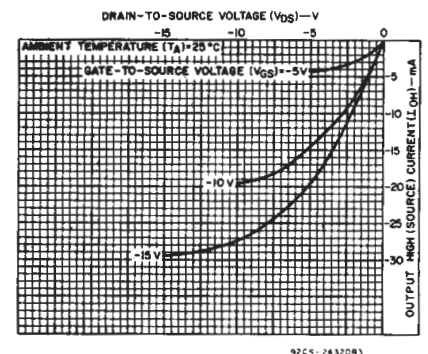


Fig. 4 – Typical output high (source) current characteristics.

MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE RANGE, (V_{DD})	-0.5V to +20V
INPUT VOLTAGE RANGE, ALL INPUTS	-0.5V to $V_{DD} + 0.5V$
DC INPUT CURRENT, ANY ONE INPUT	± 10 mA
POWER DISSIPATION PER PACKAGE (P_D):	
For $T_A = -55^\circ C$ to $+100^\circ C$	500 mW
For $T_A = +100^\circ C$ to $+125^\circ C$	Derate Linearity at 12 mW/ $^\circ C$ to 200 mW
DEVICE DISSIPATION PER OUTPUT TRANSISTOR	
FOR $T_A =$ FULL PACKAGE-TEMPERATURE RANGE (All Package Types)	100 mW
OPERATING-TEMPERATURE RANGE (T_A)	$-55^\circ C$ to $+125^\circ C$
STORAGE TEMPERATURE RANGE (T_{stg})	$-65^\circ C$ to $+150^\circ C$
LEAD TEMPERATURE (DURING SOLDERING):	
At distance 1/16 \pm 1/32 inch (1.59 \pm 0.79 mm) from case for 10s max	$+265^\circ C$

RECOMMENDED OPERATING CONDITIONS at $T_A = 25^\circ C$, Except as Noted. For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

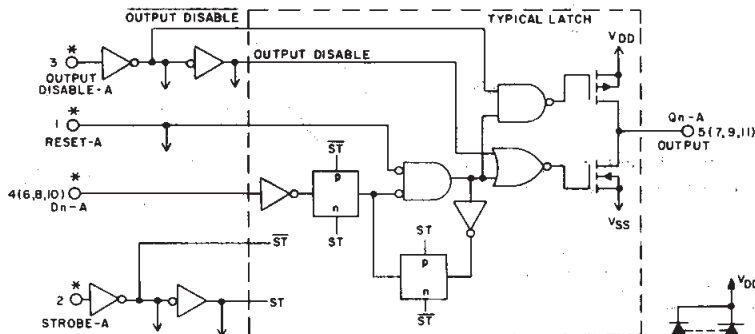
CHARACTERISTIC	V_{DD} (V)	LIMITS		UNITS
		Min.	Max.	
Supply-Voltage Range (For $T_A =$ Full Package-Temperature Range)		3	18	V
Reset Pulse Width, t_{WR}	5	200	—	ns
	10	140	—	
	15	100	—	
Strobe Pulse Width, $t_{W(st)}$	5	140	—	ns
	10	80	—	
	15	70	—	
Setup Time, t_{SU}	5	50	—	ns
	10	30	—	
	15	20	—	
Hold Time, t_H	5	0	—	ns
	10	0	—	
	15	0	—	

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STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
	V _O (V)	V _{IN} (V)	V _{DD} (V)	-55	-40	+85	+125	+25			
								Min.	Typ.	Max.	
Quiescent Device Current, I _{DD} Max.	-	0,5	5	5	5	150	150	-	0.04	5	μA
	-	0,10	10	10	10	300	300	-	0.04	10	
	-	0,15	15	20	20	600	600	-	0.04	20	
	-	0,20	20	100	100	3000	3000	-	0.08	100	
Output Low (Sink) Current I _{OL} Min.	0.4	0,5	5	0.64	0.61	0.42	0.36	0.51	1	-	mA
	0.5	0,10	10	1.6	1.5	1.1	0.9	1.3	2.6	-	
	1.5	0,15	15	4.2	4	2.8	2.4	3.4	6.8	-	
Output High (Source) Current, I _{OH} Min.	4.6	0,5	5	-0.64	-0.61	-0.42	-0.36	-0.51	-1	-	mA
	2.5	0,5	5	-2	-1.8	-1.3	-1.15	-1.6	-3.2	-	
	9.5	0,10	10	-1.6	-1.5	-1.1	-0.9	-1.3	-2.6	-	
	13.5	0,15	15	-4.2	-4	-2.8	-2.4	-3.4	-6.8	-	
Output Voltage: Low-Level, V _{OL} Max.	-	0,5	5	0.05				-	0	0.05	V
	-	0,10	10	0.05				-	0	0.05	
	-	0,15	15	0.05				-	0	0.05	
Output Voltage: High-Level, V _{OH} Min.	-	0,5	5	4.95				4.95	5	-	V
	-	0,10	10	9.95				9.95	10	-	
	-	0,15	15	14.95				14.95	15	-	
Input Low Voltage, V _{IL} Max.	0.5, 4.5	-	5	1.5				-	-	1.5	V
	1, 9	-	10	3				-	-	3	
	1.5, 13.5	-	15	4				-	-	4	
Input High Voltage, V _{IH} Min.	0.5, 4.5	-	5	3.5				3.5	-	-	V
	1, 9	-	10	7				7	-	-	
	1.5, 13.5	-	15	11				11	-	-	
Input Current I _{IN} Max.	-	0,18	18	±0.1	±0.1	±1	±1	-	±10 ⁻⁵	±0.1	μA
3-State Output Leakage Current I _{OUT} Max.	0,18	0,18	18	±0.4	±0.4	±12	±12	-	±10 ⁻⁴	±0.4	μA



TRUTH TABLE

RESET	DISABLE	STROBE	D INPUT	Q OUTPUT
0	0	1	1	1
0	0	1	0	0
0	0	0	X	LATCHED
1	0	X	X	0
X	1	X	X	Z

1 = HIGH LEVEL X = DON'T CARE
0 = LOW LEVEL Z = HIGH IMPEDANCE

Fig. 7 - Logic diagram (A-Section), 1 of 4 identical latches with common output disable, reset, and strobe.

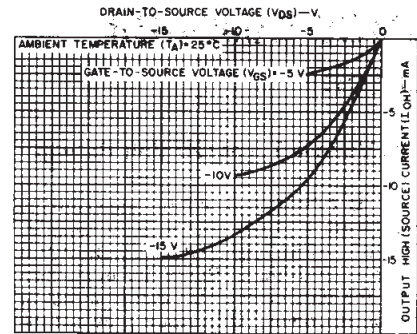


Fig. 4 - Minimum output high (source) current characteristics.

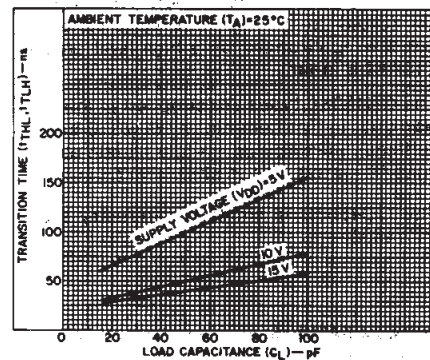


Fig. 5 - Typical transition time as a function of load capacitance.

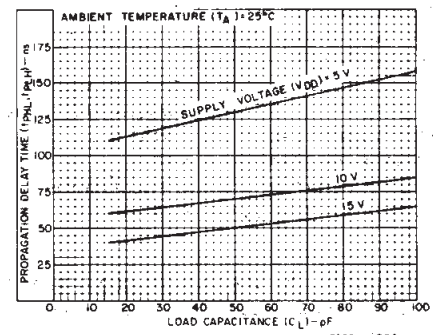


Fig. 6 - Typical propagation delay time as a function of load capacitance (strobe to data out).

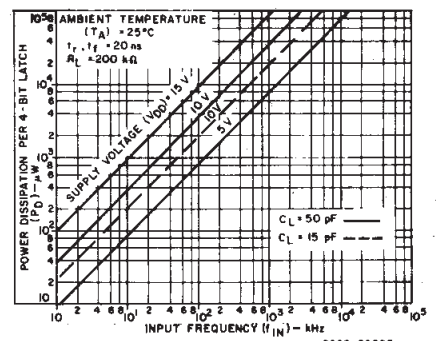


Fig. 8 - Typical power dissipation as a function of frequency.

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DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$; Input $t_r, t_f = 20 \text{ ns}$, $C_L = 50 \text{ pF}$, $R_L = 200 \text{ k}\Omega$, unless otherwise specified.

CHARACTERISTIC	TEST CONDITIONS	LIMITS			UNITS
		VDD	Typ.	Max.	
Transition Time, t_{THL}, t_{TLH}		5	100	200	ns
		10	50	100	
		15	40	80	
Minimum Reset Pulse Width, $t_{W(R)}$		5	100	200	ns
		10	70	140	
		15	50	100	
Minimum Strobe Pulse Width, $t_{W(st)}$		5	70	140	ns
		10	40	80	
		15	35	70	
Minimum Setup Time, t_{SU}		5	25	50	ns
		10	15	30	
		15	10	20	
Minimum Hold Time, t_H		5	0	0	ns
		10	0	0	
		15	0	0	
Propagation Delay Times: t_{pHL}, t_{pLH} Strobe to Data Out		5	130	260	ns
		10	70	140	
		15	50	100	
Data In to Data Out		5	105	210	ns
		10	60	120	
		15	45	90	
Reset to Data Out		5	90	180	ns
		10	50	100	
		15	40	80	
3-State Propagation Delay Times: Output High to High Impedance, t_{pHZ}		5	90	180	ns
		10	50	100	
		15	35	70	
High Impedance to Output High, t_{pZH}		5	90	180	ns
		10	50	100	
		15	35	70	
Output Low to High Impedance, t_{pLZ}		5	90	180	ns
		10	50	100	
		15	35	70	
High Impedance to Output Low, t_{pZL}		5	90	180	ns
		10	50	100	
		15	35	70	
Input Capacitance, C_{IN}	Any Input	—	5	7.5	pF

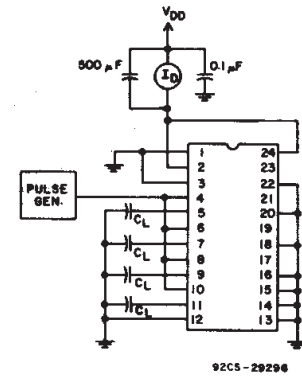


Fig.9 — Power dissipation test circuit.

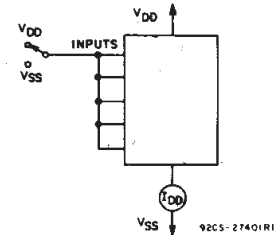


Fig.10 — Quiescent device current test circuit.

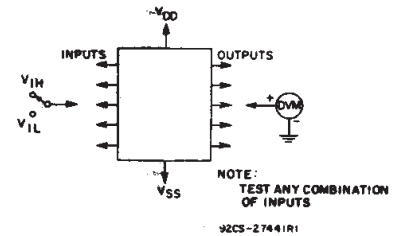


Fig.11 — Input voltage test circuit.

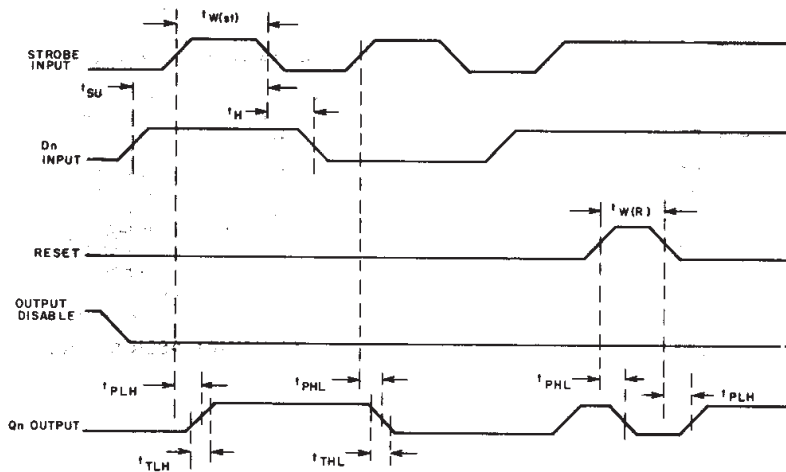


Fig.12 — Test waveforms.

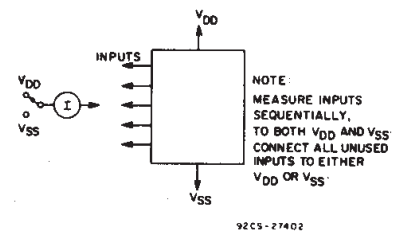
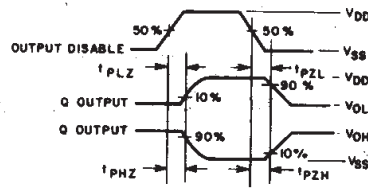
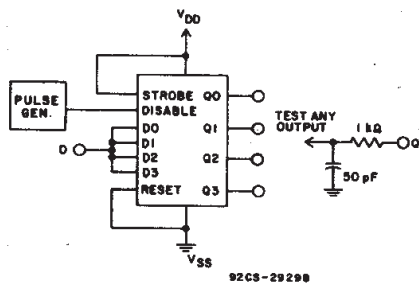


Fig.13 — Input current test circuit.

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CHAR.	TEST VOLT.	AT D	AT Q
t_{PHZ}	VDD	VSS	
t_{PLZ}	VSS	VDD	
t_{PZL}	VSS	VDD	
t_{PZH}	VDD	VSS	

Fig. 14 - Output disable test circuit and waveforms.

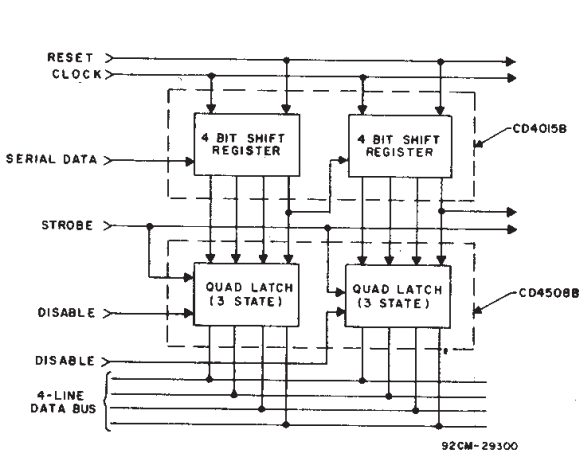


Fig. 15 - Bus register.

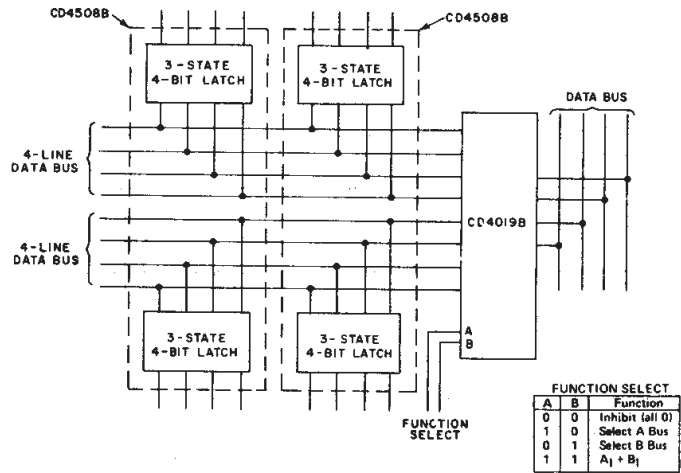
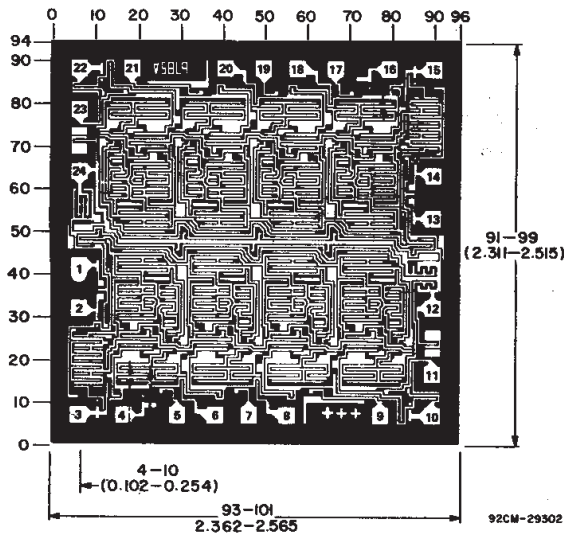
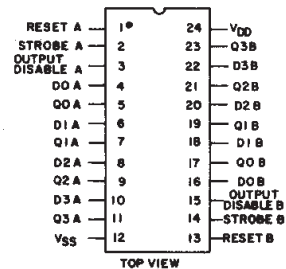


Fig. 16 - Dual multiplexed bus register with function select.



Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10^{-3} inch).

Chip dimensions and pad layout for CD4508B.



TERMINAL ASSIGNMENT

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
CD4508BD3	ACTIVE	CDIP SB	JD	24	1	None	Call TI	Level-NC-NC-NC
CD4508BE	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD4508BF3A	ACTIVE	CDIP	J	24	1	None	Call TI	Level-NC-NC-NC
CD4508BM	ACTIVE	SOIC	DW	24	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
CD4508BM96	ACTIVE	SOIC	DW	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
CD4508BNSR	ACTIVE	SO	NS	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
CD4508BPW	ACTIVE	TSSOP	PW	24	60	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
CD4508BPWR	ACTIVE	TSSOP	PW	24	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM

⁽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 - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

None: Not yet available Lead (Pb-Free).

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.

Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

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

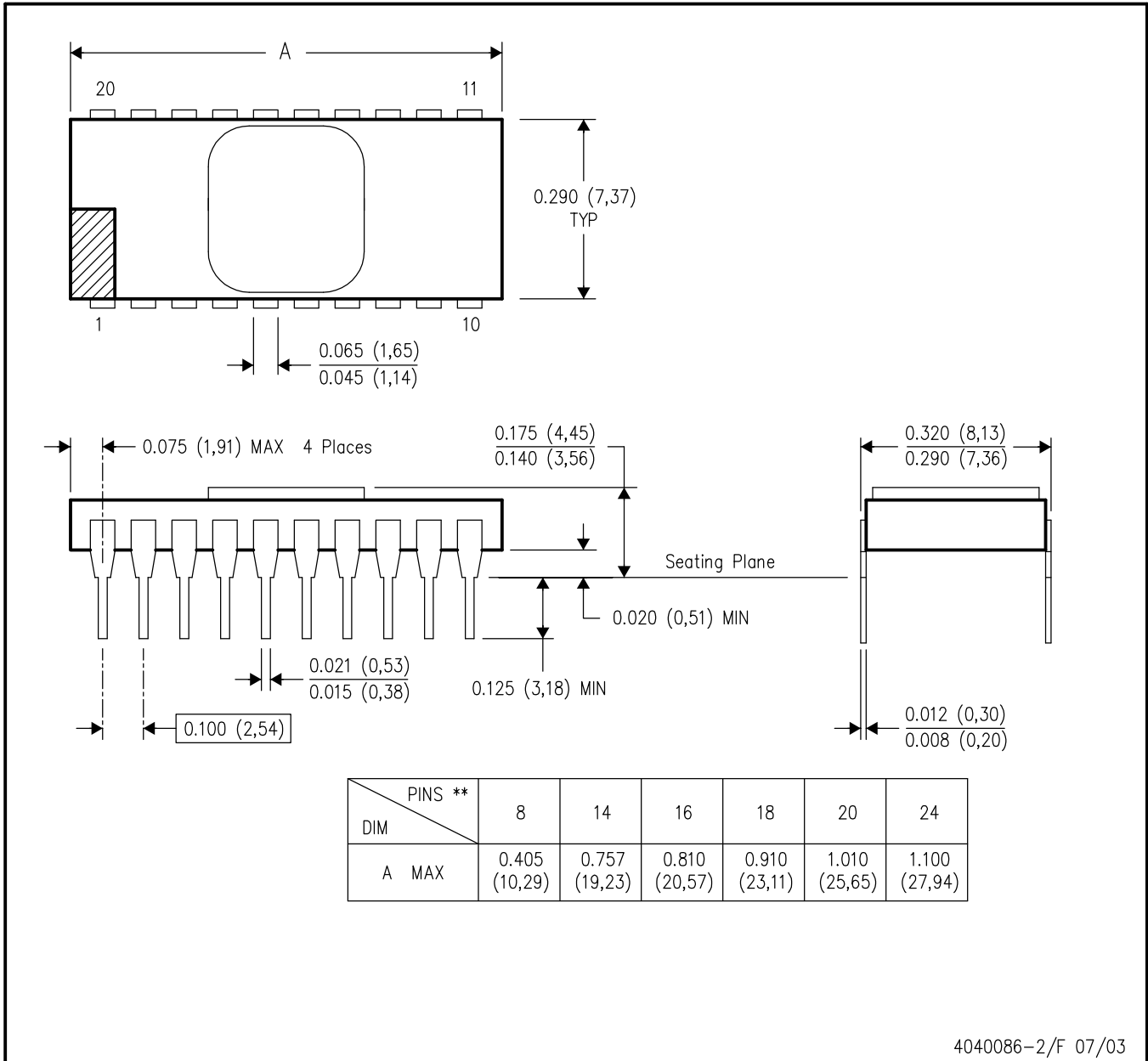
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JD (R-CDIP-T**)

CERAMIC SIDE-BRAZE DUAL-IN-LINE PACKAGE

20 PINS SHOWN



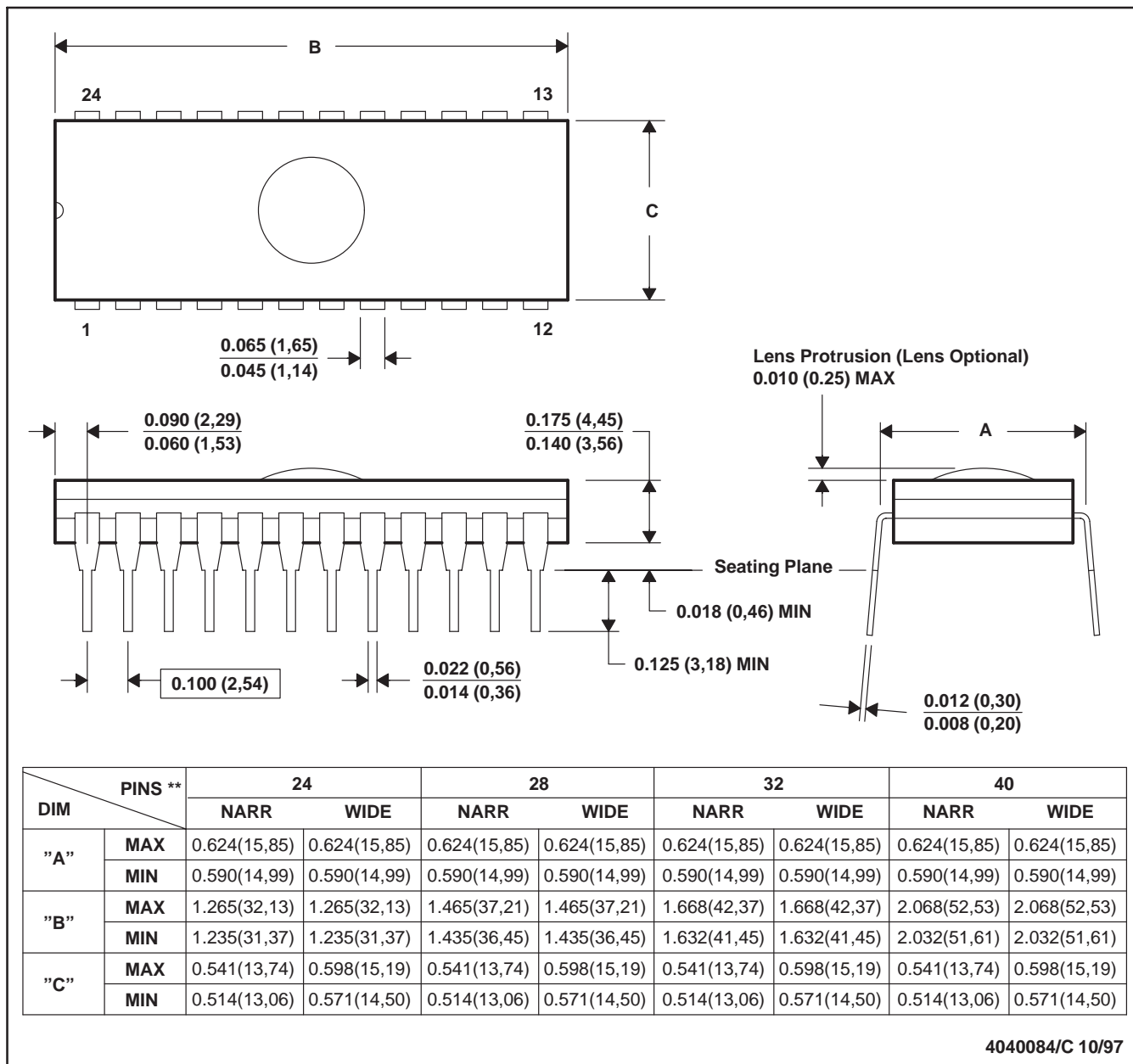
4040086-2/F 07/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package is hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within MIL STD 1835 CDIP2 - T8, T14, T16, T18, T20 and T24 respectively.

J (R-GDIP-T**)

CERAMIC DUAL-IN-LINE PACKAGE

24 PINS SHOWN

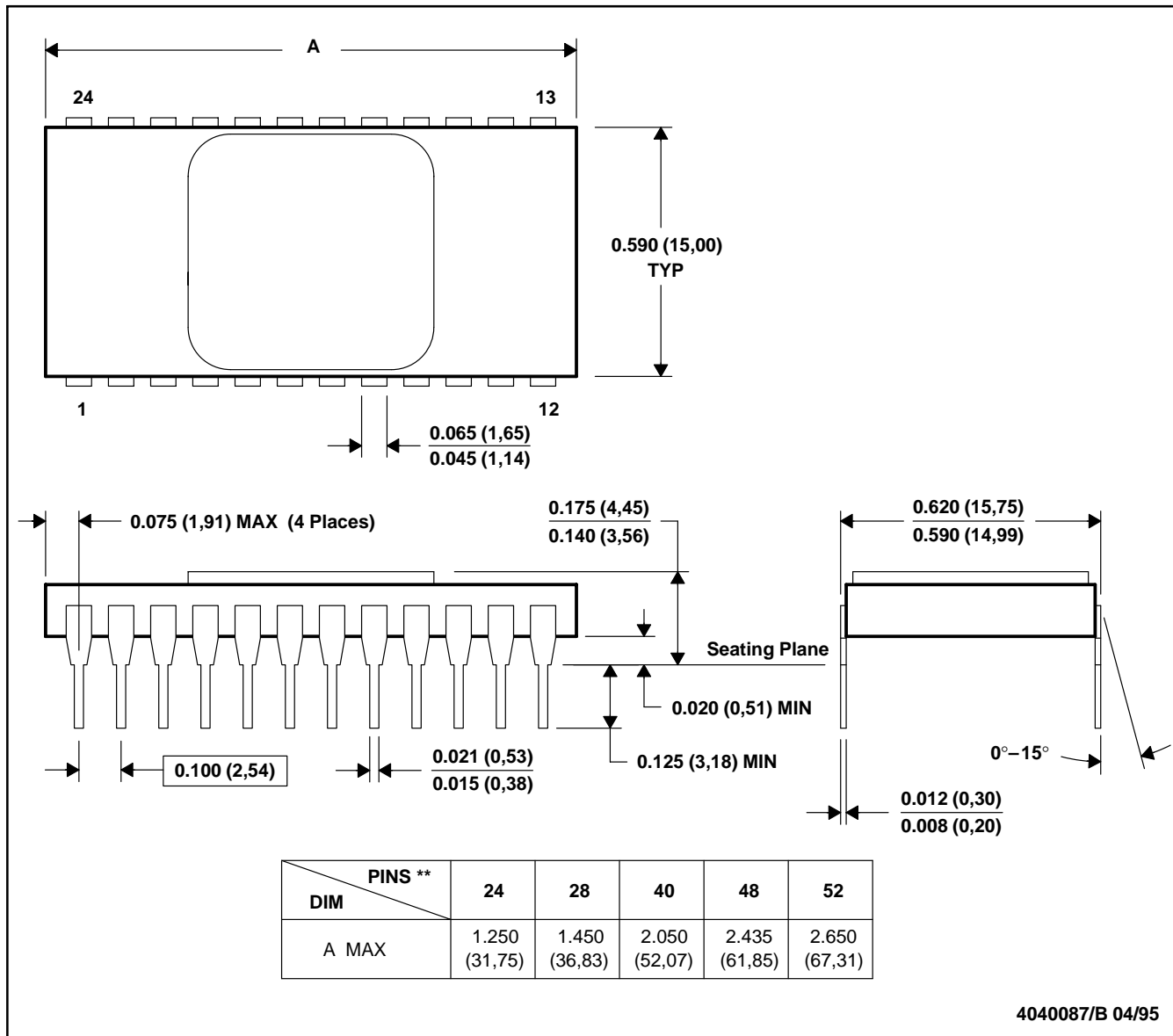


- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Window (lens) added to this group of packages (24-, 28-, 32-, 40-pin).
 D. This package can be hermetically sealed with a ceramic lid using glass frit.
 E. Index point is provided on cap for terminal identification.

JD (R-CDIP-T**)

CERAMIC SIDE-BRAZE DUAL-IN-LINE PACKAGE

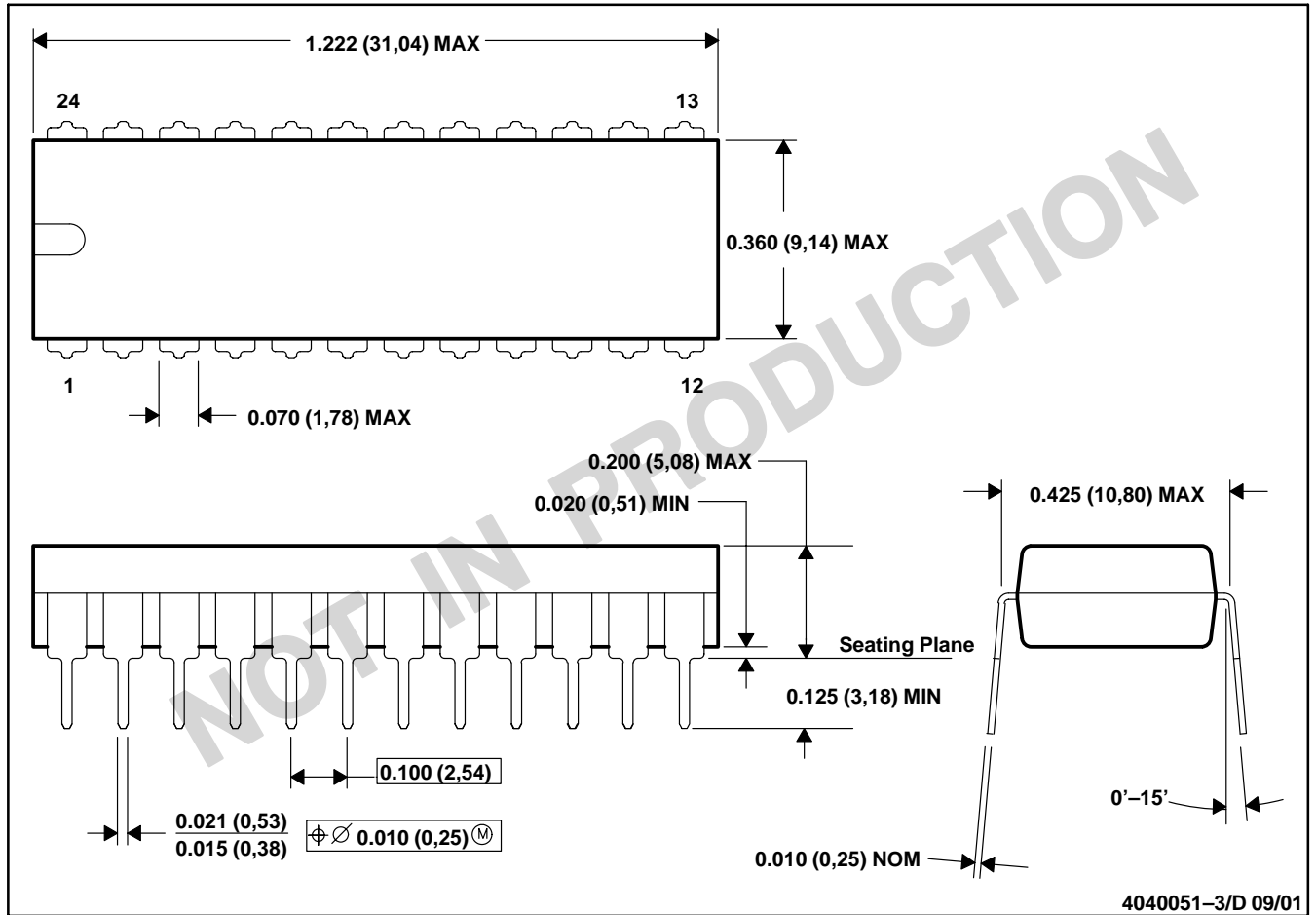
24 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package is hermetically sealed with a metal lid.
 D. The terminals are gold-plated.

N (R-PDIP-T24)

PLASTIC DUAL-IN-LINE

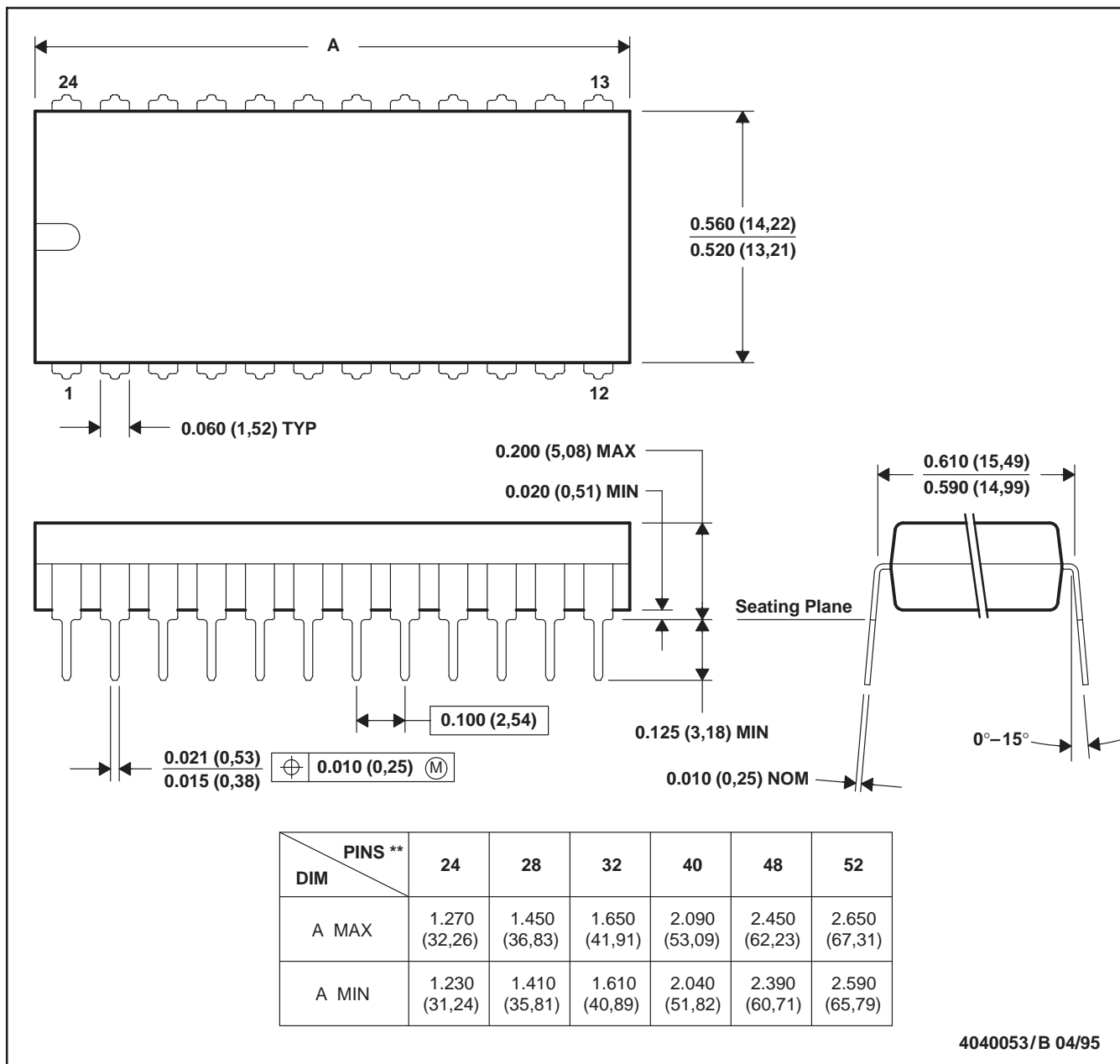


- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-010

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

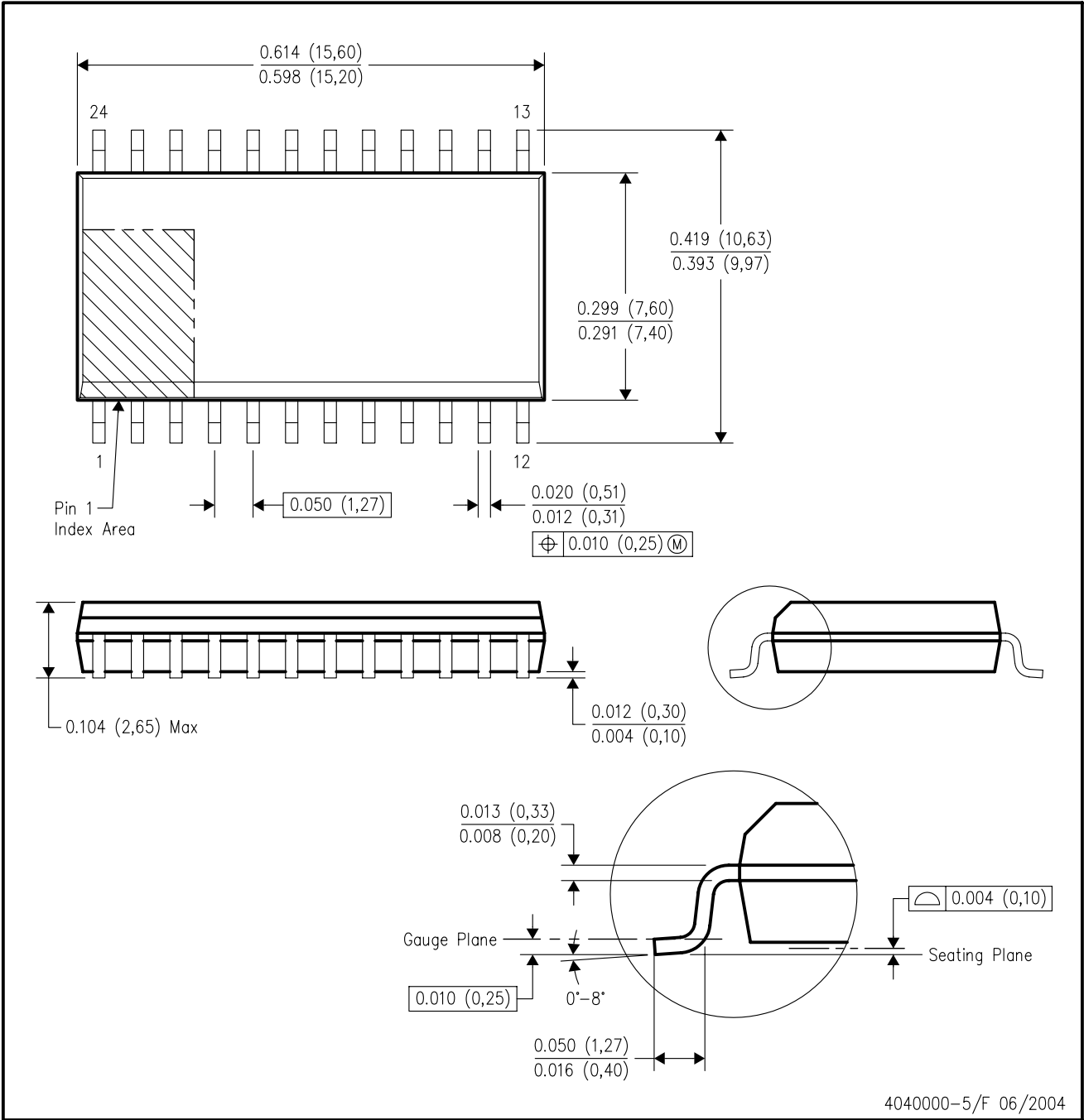
24 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-011
 D. Falls within JEDEC MS-015 (32 pin only)

DW (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



- 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.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



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

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