

SN54ALS873B, SN54AS873A, SN74ALS873B, SN74AS873A DUAL 4-BIT D-TYPE LATCHES WITH 3-STATE OUTPUTS

SDAS036D – APRIL 1982 – REVISED AUGUST 1995

- 3-State Buffer-Type Outputs Drive Bus Lines Directly
- Bus-Structured Pinout
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Plastic (NT) and Ceramic (JT) DIPs

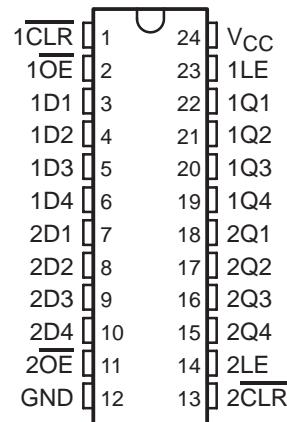
description

These dual 4-bit latches feature 3-state outputs designed specifically for bus driving. These devices are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

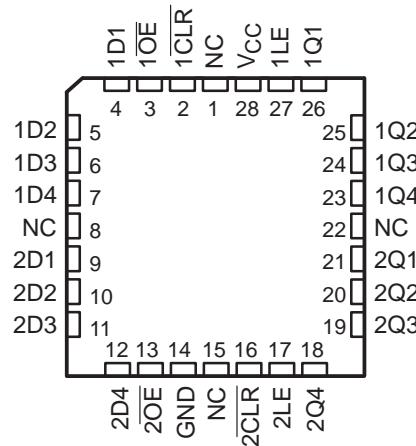
The dual 4-bit latches are transparent D-type latches. While the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs in true form, according to the function table. When LE is low, the outputs are latched. When the clear (CLR) input goes low, the Q outputs go low independently of LE. The outputs are in the high-impedance state when the output-enable (\overline{OE}) input is at a high logic level.

The SN54ALS873B and SN54AS873A are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS873B and SN74AS873A are characterized for operation from 0°C to 70°C .

SN54ALS873B, SN54AS873A . . . JT PACKAGE
SN74ALS873B, SN74AS873A . . . DW OR NT PACKAGE
(TOP VIEW)



SN54ALS873B, SN54AS873A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE
(each latch)

INPUTS				OUTPUT Q
\overline{OE}	\overline{CLR}	LE	D	Q
L	L	X	X	L
L	H	H	H	H
L	H	H	L	L
L	H	L	X	Q_0
H	X	X	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.

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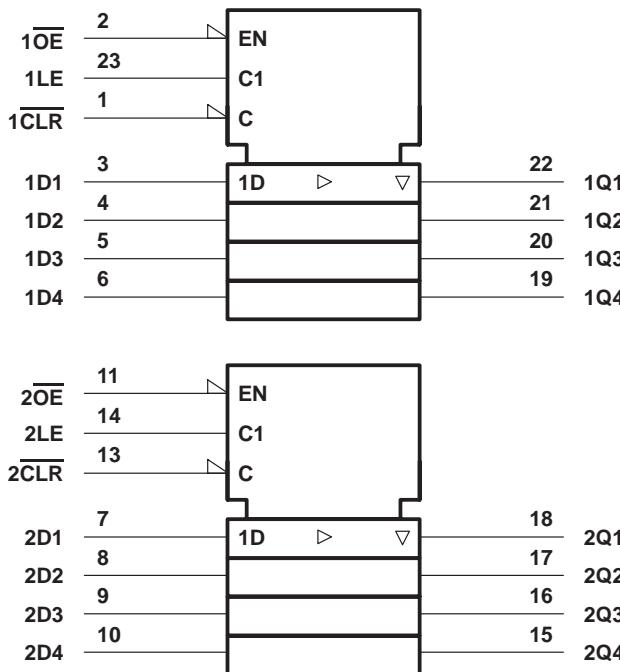
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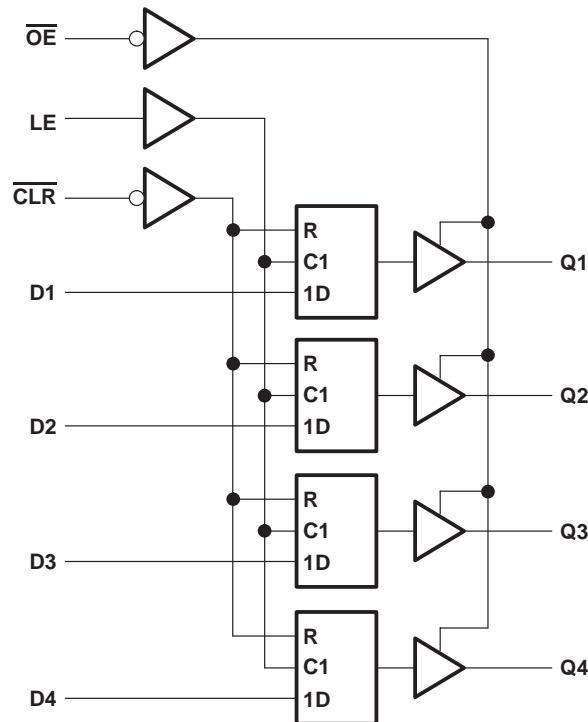
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DUAL 4-BIT D-TYPE LATCHES
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logic symbol†



logic diagram (each quad latch, positive logic)



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

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

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage, V_{CC}	.....	7 V
Input voltage, V_I	.....	7 V
Voltage applied to a disabled 3-state output	.....	5.5 V
Operating free-air temperature range, T_A : SN54ALS873B	.....	-55°C to 125°C
SN74ALS873B	.....	0°C to 70°C
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.

recommended operating conditions

		SN54ALS873B			SN74ALS873B			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.7			0.8	V
I_{OH}	High-level output current			-1			-2.6	mA
I_{OL}	Low-level output current			12			24	mA
T_A	Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54ALS873B			SN74ALS873B			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}	$V_{CC} = 4.5 \text{ V}$, $I_I = -18 \text{ mA}$			-1.2			-1.2	V
V_{OH}	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$, $I_{OH} = -0.4 \text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5 \text{ V}$	$I_{OH} = -1 \text{ mA}$	2.4	3.3				
		$I_{OH} = -2.6 \text{ mA}$			2.4	3.2		
V_{OL}	$V_{CC} = 4.5 \text{ V}$	$I_{OL} = 12 \text{ mA}$	0.25	0.4	0.25	0.4		V
		$I_{OL} = 24 \text{ mA}$			0.35	0.5		
I_{OZH}	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.7 \text{ V}$			20			20	μA
I_{OZL}	$V_{CC} = 5.5 \text{ V}$, $V_O = 0.4 \text{ V}$			-20			-20	μA
I_I	$V_{CC} = 5.5 \text{ V}$, $V_I = 7 \text{ V}$			0.1			0.1	mA
I_{IH}	$V_{CC} = 5.5 \text{ V}$, $V_I = 2.7 \text{ V}$			20			20	μA
I_{IL}	$V_{CC} = 5.5 \text{ V}$, $V_I = 0.4 \text{ V}$			-0.2			-0.2	mA
I_O^{\ddagger}	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.25 \text{ V}$	-20	-112	-30	-112			mA
I_{CC}	$V_{CC} = 5.5 \text{ V}$	Outputs high	11	21	11	21		mA
		Outputs low	16	29	16	29		
		Outputs disabled	20	31	20	31		

† All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

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

		SN54ALS873B		SN74ALS873B		UNIT
		MIN	MAX	MIN	MAX	
t_w	Pulse duration	CLR low	15	15		ns
		LE high	10	10		
t_{su}	Setup time, data before LE↓		10	10		ns
t_h	Hold time, data after LE↓		7	7		ns

SN54ALS873B, SN54AS873A, SN74ALS873B, SN74AS873A DUAL 4-BIT D-TYPE LATCHES WITH 3-STATE OUTPUTS

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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$, $C_L = 50 \text{ pF}$, $R1 = 500 \Omega$, $R2 = 500 \Omega$, $T_A = \text{MIN to MAX}^\dagger$				UNIT	
			SN54ALS873B		SN74ALS873B			
			MIN	MAX	MIN	MAX		
t_{PLH}	D	Q	2	23	2	14	ns	
t_{PHL}			2	17	2	14		
t_{PLH}	LE	Q	8	31	8	22	ns	
t_{PHL}			8	26	8	21		
t_{PHL}	CLR	Q	6	27	6	20	ns	
t_{PZH}	\overline{OE}	Q	4	24	4	18	ns	
t_{PZL}			4	23	4	18		
t_{PHZ}	\overline{OE}	Q	2	12	2	10	ns	
t_{PLZ}			2	30	2	15		

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

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

‡ 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.

recommended operating conditions

		SN54AS873A			SN74AS873A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V _{IH}	High-level input voltage		2		2			V
V _{IL}	Low-level input voltage			0.8			0.8	V
I _{OH}	High-level output current			-12			-15	mA
I _{OL}	Low-level output current			32			48	mA
T _A	Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54AS873A			SN74AS873A			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}	$V_{CC} = 4.5 \text{ V}$, $I_I = -18 \text{ mA}$			-1.2			-1.2	V
V_{OH}	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$, $I_{OH} = -2 \text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5 \text{ V}$	$I_{OH} = -12 \text{ mA}$	2.4	3.2				
		$I_{OH} = -15 \text{ mA}$			2.4	3.3		
V_{OL}	$V_{CC} = 4.5 \text{ V}$	$I_{OL} = 32 \text{ mA}$	0.25	0.5				V
		$I_{OL} = 48 \text{ mA}$			0.35	0.5		
I_{OZH}	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.7 \text{ V}$			50			50	μA
I_{OZL}	$V_{CC} = 5.5 \text{ V}$, $V_O = 0.4 \text{ V}$			-50			-50	μA
I_I	$V_{CC} = 5.5 \text{ V}$, $V_I = 7 \text{ V}$			0.1			0.1	mA
I_{IH}	$V_{CC} = 5.5 \text{ V}$, $V_I = 2.7 \text{ V}$			20			20	μA
I_{IL}	$V_{CC} = 5.5 \text{ V}$, $V_I = 0.4 \text{ V}$			-0.5			-0.5	mA
I_O^{\ddagger}	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.25 \text{ V}$	-30	-112	-30	-112			mA
I_{CC}	$V_{CC} = 5.5 \text{ V}$	Outputs high	68	110	68	110		mA
		Outputs low	67	109	67	109		
		Outputs disabled	80	129	80	129		

† All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

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

		SN54AS873A		SN74AS873A		UNIT
		MIN	MAX	MIN	MAX	
t_w^*	Pulse duration	CLR low	5	5		ns
		LE high	6	5		
t_{su}^*	Setup time, data before LE↓		2	2		ns
t_h^*	Hold time, data after LE↓		4.5	4.5		ns

* On products compliant to MIL-STD-883, Class B, this parameter is based on characterization data but is not production tested.

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switching characteristics (see Figure 1)

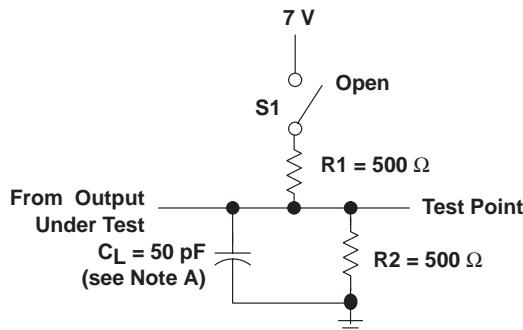
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $C_L = 50\text{ pF}$, $R1 = 500\text{ }\Omega$, $R2 = 500\text{ }\Omega$, $T_A = \text{MIN to MAX}^\dagger$				UNIT	
			SN54AS873A		SN74AS873A			
			MIN	MAX	MIN	MAX		
t_{PLH}	D	Q	3	12.5	3	9.5	ns	
t_{PHL}			3	8.5	3	7.5		
t_{PLH}	LE	Q	6	15.5	6	13	ns	
t_{PHL}			4	9	4	7.5		
t_{PHL}	$\overline{\text{CLR}}$	Q	3	10.5	3	9	ns	
t_{PZH}	$\overline{\text{OE}}$	Q	2	8	2	6.5	ns	
t_{PZL}			4	11	4	10.5		
t_{PHZ}	$\overline{\text{OE}}$	Q	2	8	2	7.5	ns	
t_{PLZ}			2	8.5	2	7.5		

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



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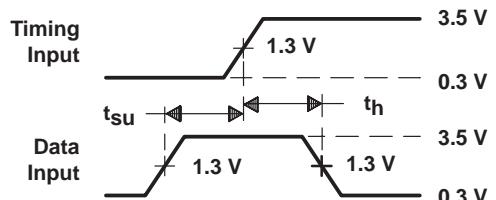
PARAMETER MEASUREMENT INFORMATION



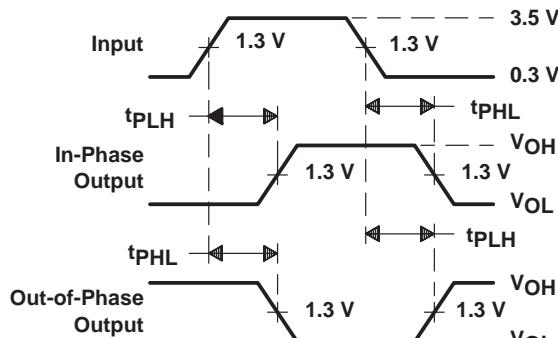
SWITCH POSITION TABLE

TEST	S1
tPLH	Open
tPHL	Open
tPZH	Open
tPZL	Closed
tPHZ	Open
tPLZ	Closed

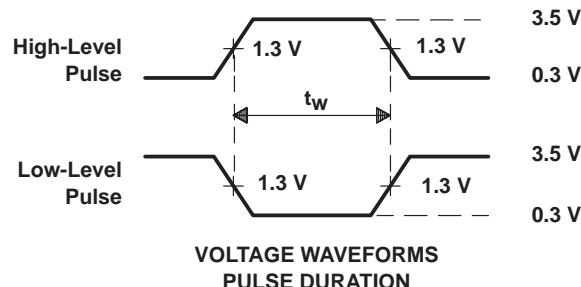
LOAD CIRCUIT FOR 3-STATE OUTPUTS



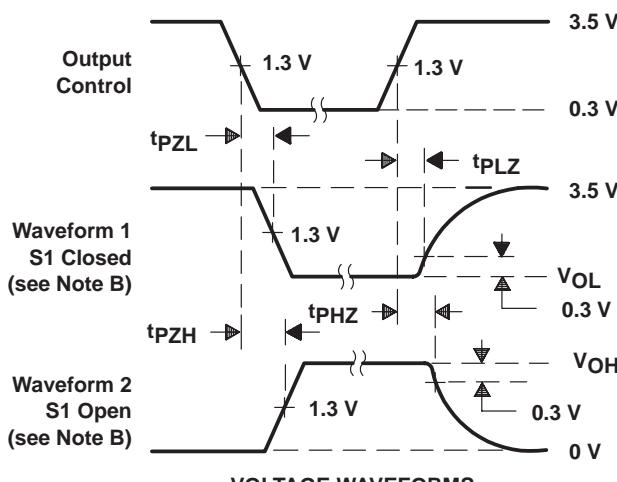
VOLTAGE WAVEFORMS
 SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
 PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
 PULSE DURATION



VOLTAGE WAVEFORMS
 ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

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 1 MHz, $Z_O = 50 \Omega$, $t_r \leq 2$ ns, $t_f \leq 2$ 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	MSL Peak Temp ⁽³⁾
84032013A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type
8403201KA	OBsolete	CFP	W	24		TBD	Call TI	Call TI
8403201LA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type
SN74ALS873BDW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS873BDWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS873BDWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS873BDWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS873BDWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS873BDWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS873BNT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74ALS873BNT3	OBsolete	PDIP	NT	24		TBD	Call TI	Call TI
SN74ALS873BNTE4	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AS873ADW	OBsolete	SOIC	DW	24		TBD	Call TI	Call TI
SN74AS873ADWR	OBsolete	SOIC	DW	24		TBD	Call TI	Call TI
SN74AS873ANT	OBsolete	PDIP	NT	24		TBD	Call TI	Call TI
SNJ54ALS873BFK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54ALS873BJT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type
SNJ54AS873AFK	OBsolete	LCCC	FK	28		TBD	Call TI	Call TI
SNJ54AS873AJT	OBsolete	CDIP	JT	24		TBD	Call TI	Call TI
SNJ54AS873AW	OBsolete	CFP	W	24		TBD	Call TI	Call TI

⁽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.

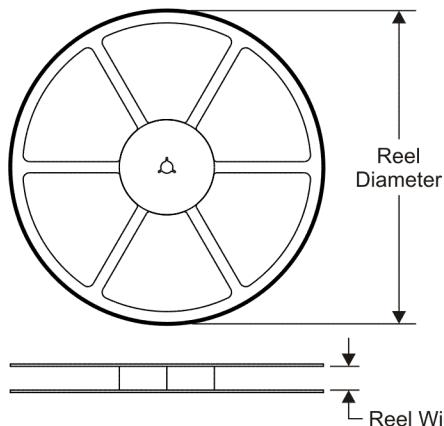
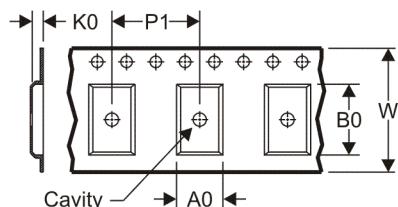
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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)

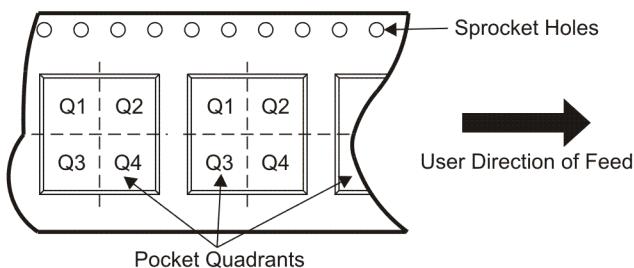
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


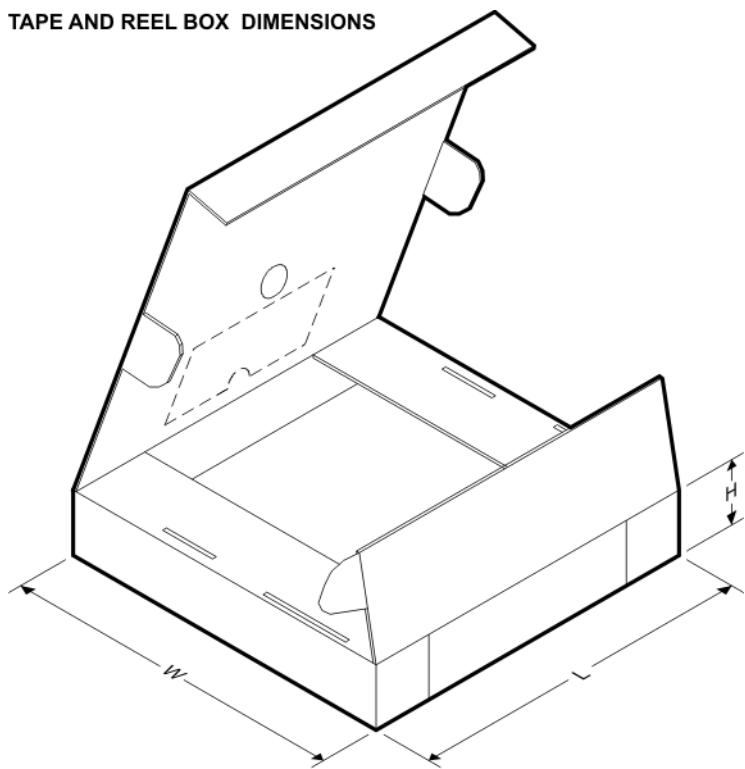
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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
SN74ALS873BDWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



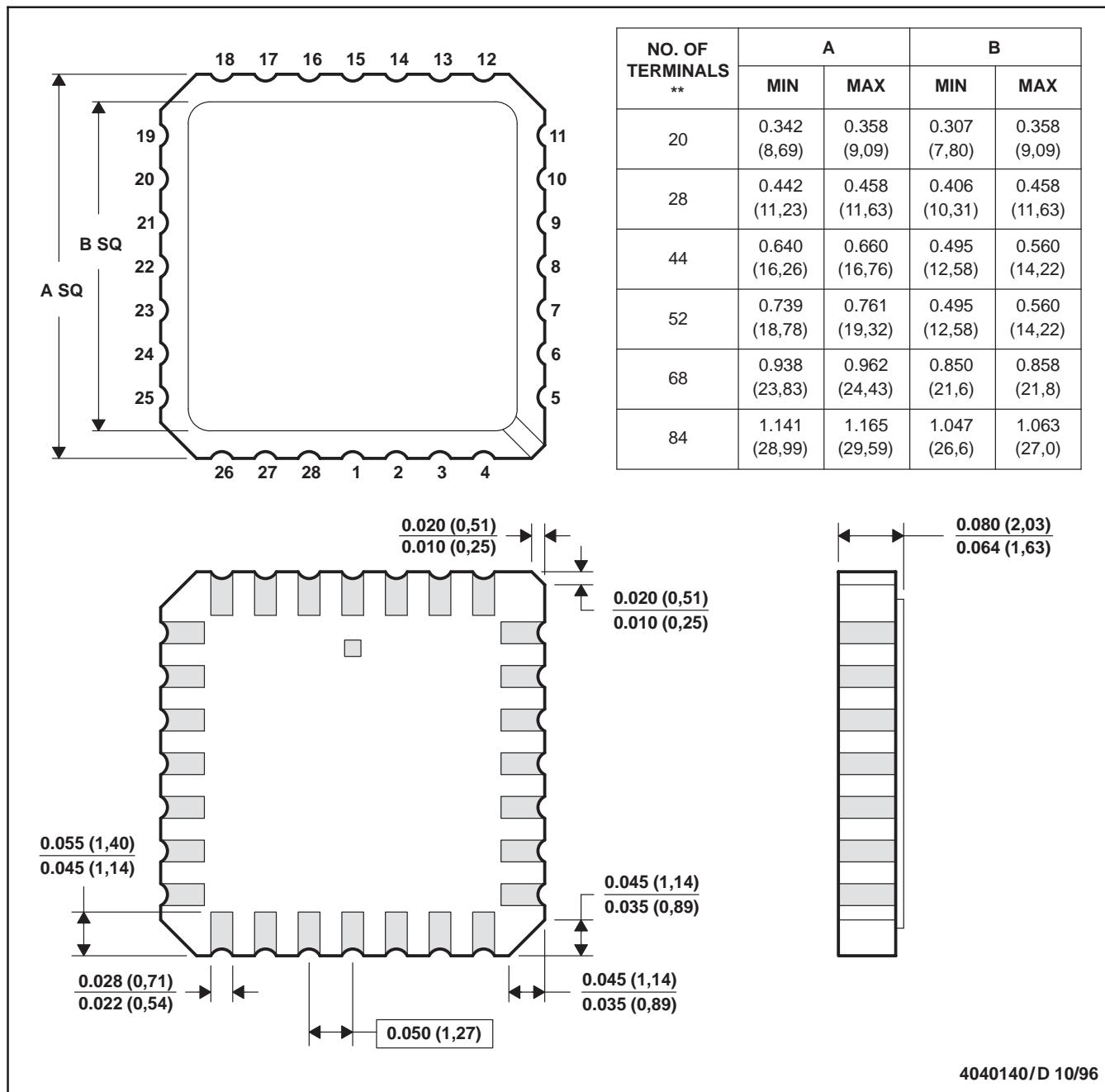
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALS873BDWR	SOIC	DW	24	2000	346.0	346.0	41.0

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL 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 metal lid.
- The terminals are gold plated.
- Falls within JEDEC MS-004

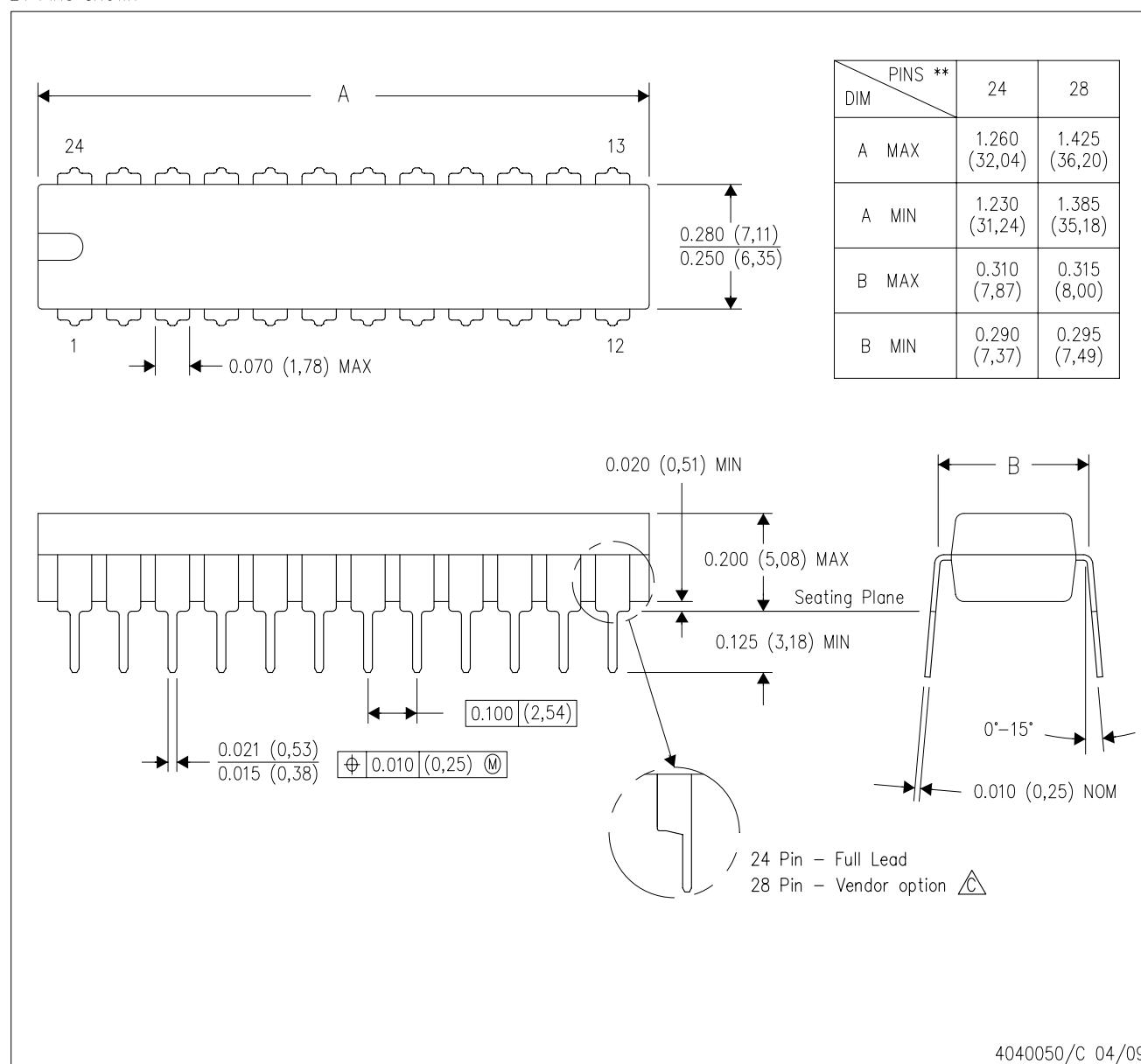
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MECHANICAL DATA

NT (R-PDIP-T**)

24 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



4040050/C 04/09

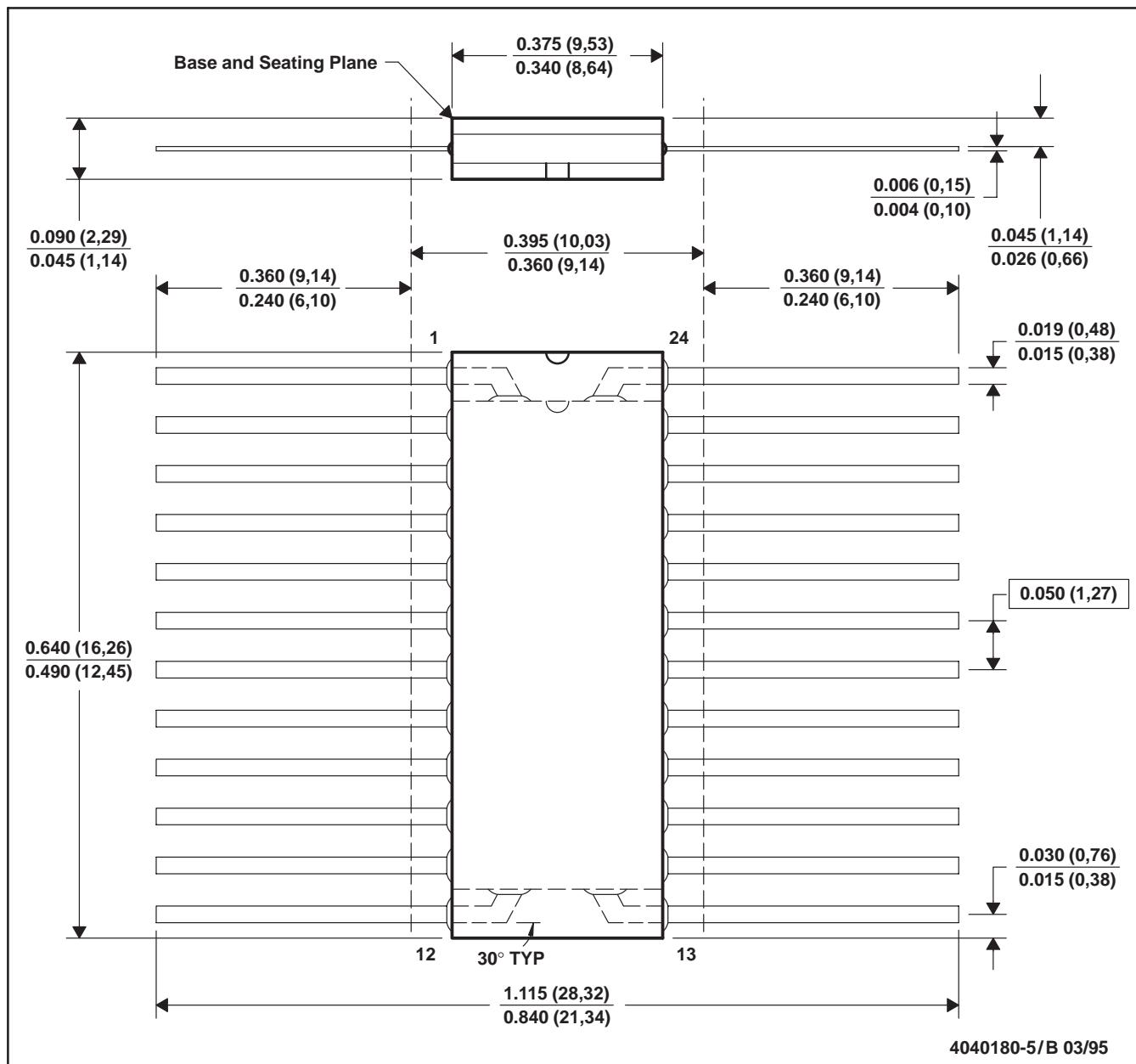
NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.

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

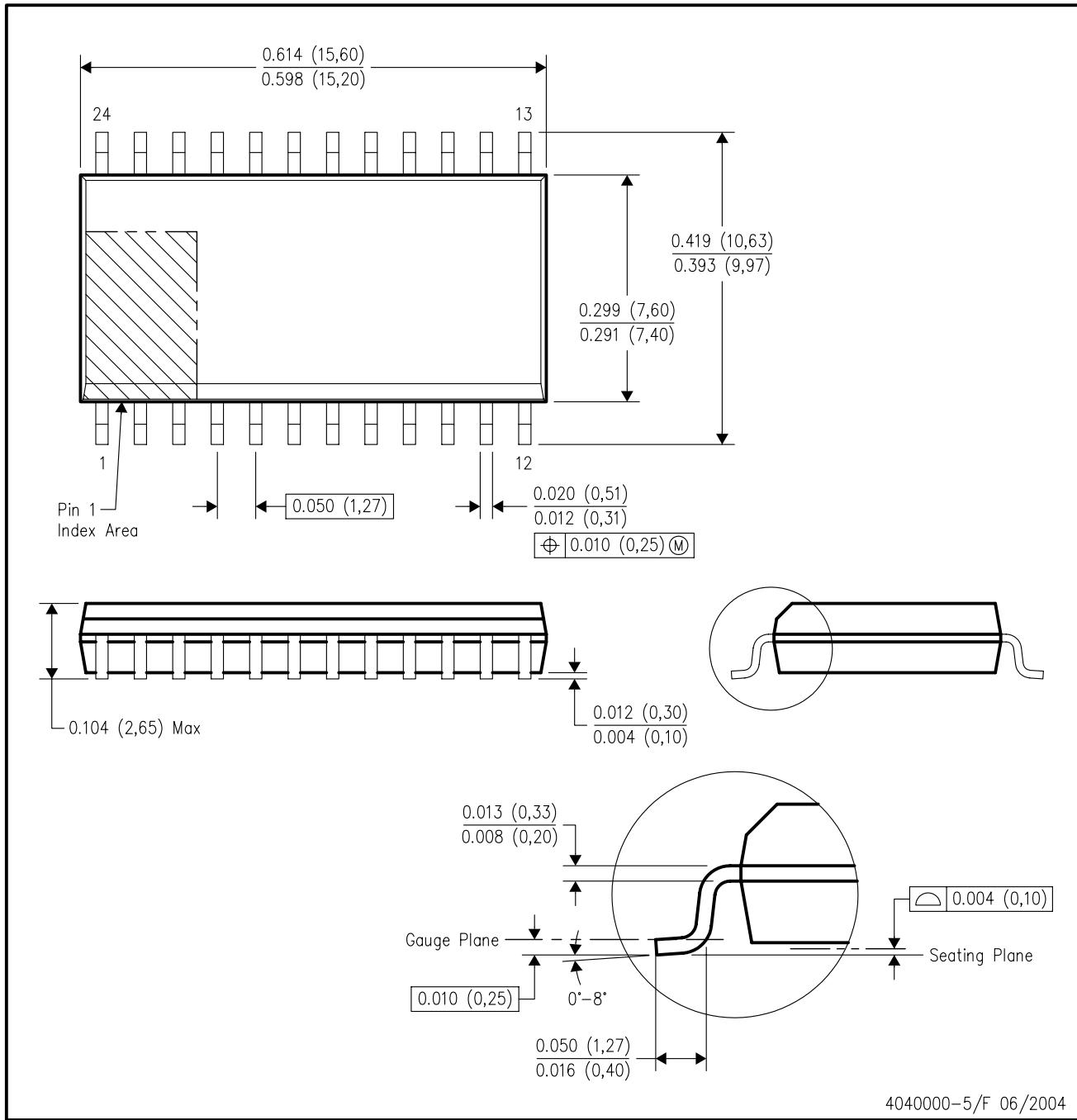


NOTES:

- 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. Falls within MIL-STD-1835 GDFP2-F24 and JEDEC MO-070AD
- E. Index point is provided on cap for terminal identification only.

DW (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



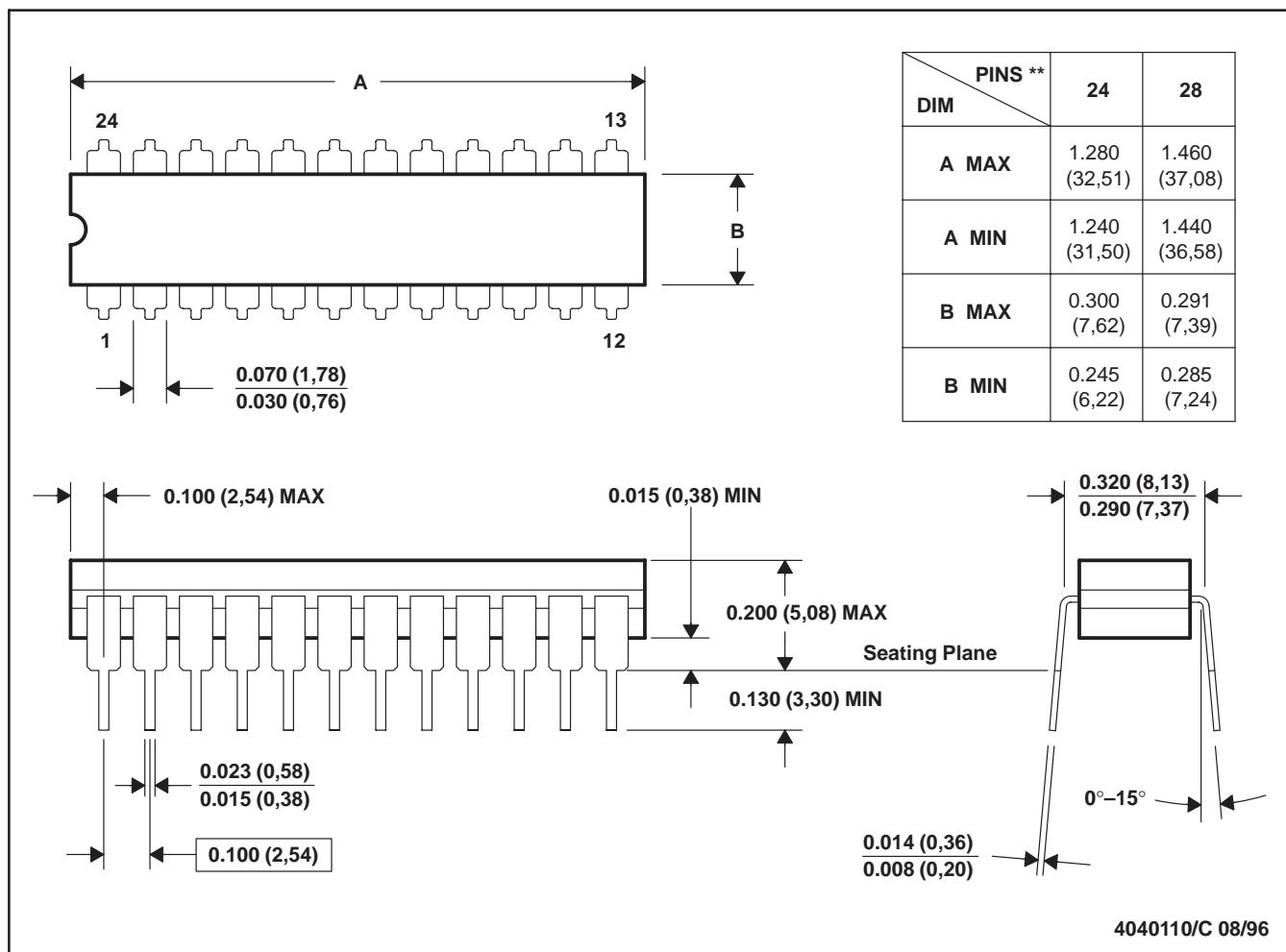
NOTES:

- 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**)

24 LEADS SHOWN

CERAMIC DUAL-IN-LINE



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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