

SN54ALS857, SN74ALS857 HEX 2-TO-1 UNIVERSAL MULTIPLEXERS WITH 3-STATE OUTPUTS

SDAS170A – DECEMBER 1982 – REVISED JANUARY 1995

- Select True or Complementary Data
- Perform AND/NAND (Masking) of A or B Operand
- Cascadable to Expand Number of Operands
- Detect Zeros on A or B Operands
- 3-State Outputs Interface Directly With System Bus
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (NT) and Ceramic (JT) 300-mil DIPs

description

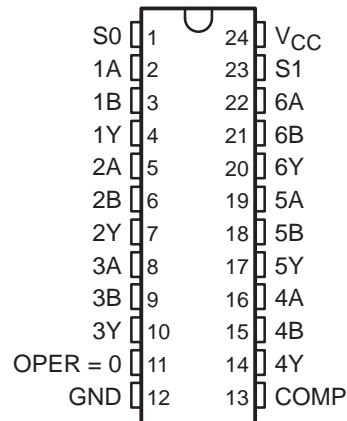
The 'ALS857 are hextuple 2-line to 1-line multiplexers with 3-state outputs. The devices can provide either true (COMP low) or inverted (COMP high) data at the Y outputs. In addition, the 'ALS857 perform the logical AND function ($A \bullet B$) and the clear function as well. The four modes of operation are:

- Select A-data inputs
- Select B-data inputs
- AND A inputs with B inputs
- Clear

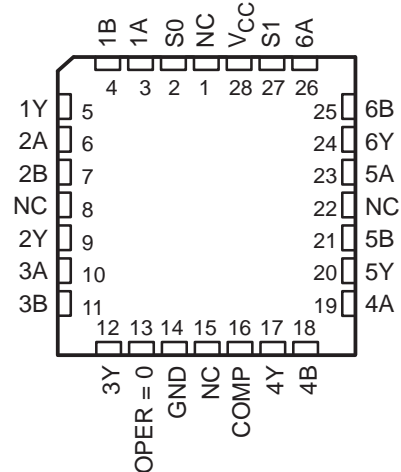
In either of the first two modes, OPER = 0 is high if all the selected A or B inputs are low. The six Y outputs and the OPER = 0 output are all 3-state and rated at 12-mA and 24-mA I_{OL} for the SN54ALS857 and SN74ALS857, respectively. All outputs can be placed in the high-impedance state by applying a high level to the COMP, S0, and S1 inputs simultaneously.

The SN54ALS857 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS857 is characterized for operation from 0°C to 70°C .

SN54ALS857 . . . JT PACKAGE
SN74ALS857 . . . DW OR NT PACKAGE
(TOP VIEW)



SN54ALS857 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

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INPUTS			OUTPUTS	
COMP	S1	S0	Y	OPER = 0
L	L	L	A	H = all A inputs L
L	L	H	B	H = all B inputs L
L	H	L	$A \bullet B$	Z
L	H	H	\overline{L}	L
H	L	L	\overline{A}	H = all A inputs L
H	L	H	\overline{B}	H = all B inputs L
H	H	L	$\overline{A \bullet B}$	Z
H	H	H	Z	Z

The diagram illustrates the internal architecture of the 74181 ALU. It features several key components:

- Comparator:** A 4-bit comparator (N4) that compares the magnitude of two 4-bit numbers. It has inputs for two 4-bit numbers (labeled 0, 1, 2, 3) and outputs for greater than (G), less than (L), and equal (E) conditions. In this diagram, it is used to compare the result of the addition (3) with the constant 1.
- Multiplexer (MUX):** A 4-bit multiplexer that selects between two 4-bit inputs based on a select signal. It is used to select between the result of the addition (3) and the constant 1 based on the output of the comparator (G).
- Adder:** A 4-bit adder that adds two 4-bit numbers. It is used to add the result of the multiplication (3) and the constant 1 to produce the final result (4, 5).
- Control Logic:** The ALU is controlled by a 4-bit function code (S0, S1, S2, S3) and a 4-bit operand code (1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B). The function code determines the operation to be performed (e.g., addition, subtraction, multiplication, division). The operand code determines the operands to be used.

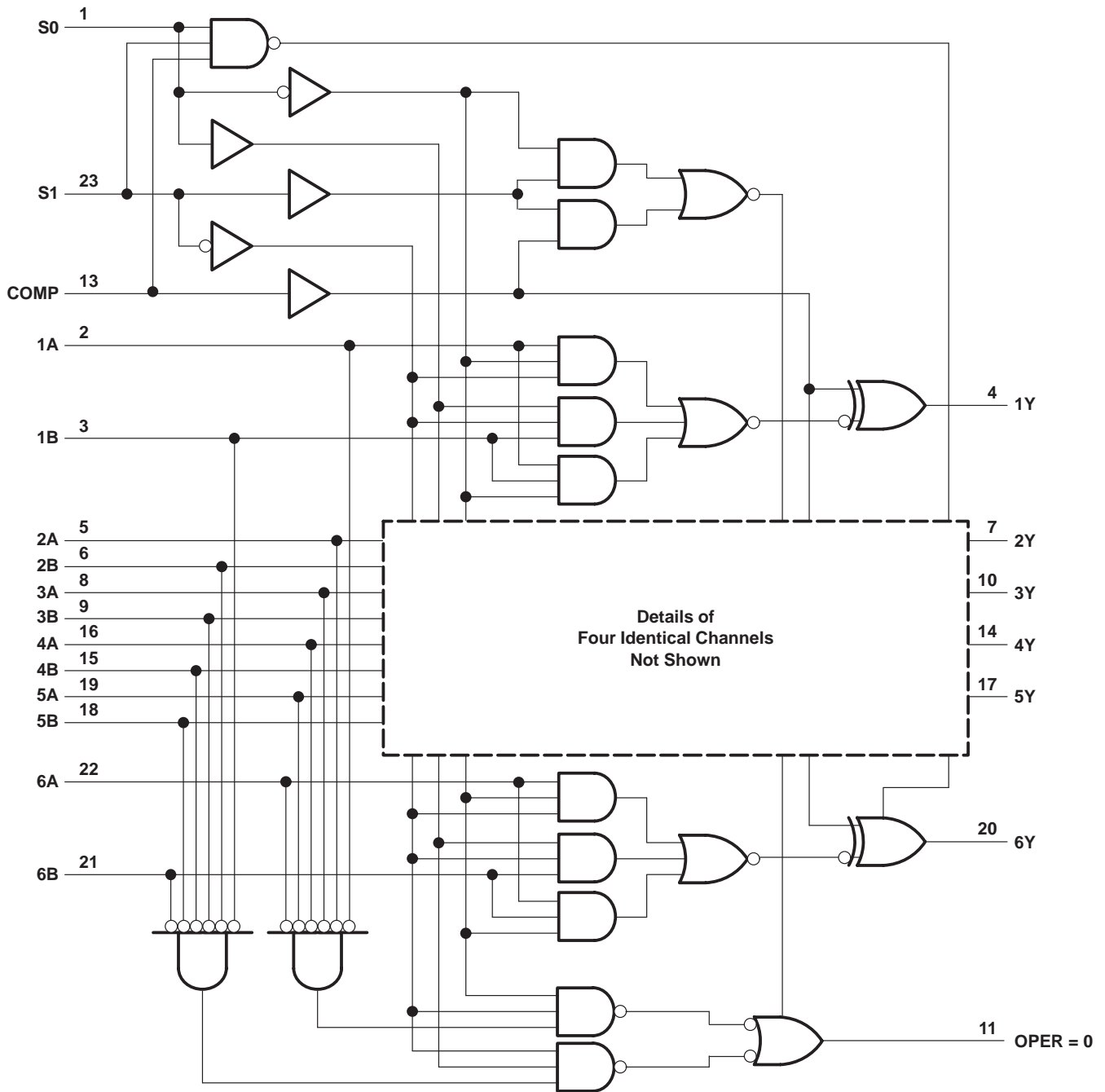


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logic diagram (positive logic)



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

SN54ALS857, SN74ALS857

HEX 2-TO-1 UNIVERSAL MULTIPLEXERS

WITH 3-STATE OUTPUTS

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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 : SN54ALS857	–55°C to 125°C
SN74ALS857	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

		SN54ALS857			SN74ALS857			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

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

PARAMETER	TEST CONDITIONS		SN54ALS857			SN74ALS857			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	$V_{CC} = 4.5$ V,	$I_I = -18$ mA			–1.5			–1.5	V
V_{OH}	$V_{CC} = 4.5$ V to 5.5 V,	$I_{OH} = -0.4$ mA	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5$ V	$I_{OH} = -1$ mA	2.4	3.3					
		$I_{OH} = -2.6$ mA				2.4	3.2		
V_{OL}	$V_{CC} = 4.5$ V	$I_{OL} = 12$ mA		0.25	0.4		0.25	0.4	V
		$I_{OL} = 24$ mA					0.35	0.5	
I_{OZH}	$V_{CC} = 5.5$ V,	$V_O = 2.7$ V			20			20	μA
I_{OZL}	$V_{CC} = 5.5$ V,	$V_O = 0.4$ V			–20			–20	μA
I_I	$V_{CC} = 5.5$ V,	$V_I = 7$ V			0.1			0.1	mA
I_{IH}	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			20			20	μA
I_{IL}	$V_{CC} = 5.5$ V,	$V_I = 0.4$ V			–0.2			–0.2	mA
$I_{O§}$	$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	–15		–70	–15		–70	mA
I_{CC}	$V_{CC} = 5.5$ V, See Note 1	Outputs high		11	24		11	24	mA
		Outputs low		16	33		16	33	
		Outputs disabled		18	36		18	36	

‡ All typical values are at $V_{CC} = 5$ 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} .

NOTE 1: I_{CC} is measured with all possible inputs grounded while achieving the stated output conditions.



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switching characteristics (see Figure 1)

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = MIN to MAX‡				UNIT
			SN54ALS857		SN74ALS857		
			MIN	MAX	MIN	MAX	
t _{pd}	A or B (COMP high)	Y (inverting)	2	35	4	25	ns
	A or B (COMP low)	Y (noninverting)	2	27	4	18	
	S0 or S1	Y	2	37	7	33	
	COMP		2	26	6	18	
	A or B	OPER = 0	2	45	5	37	
	S0 to S1		2	30	5	23	
t _{en}	S0 to S1	Y	2	38	7	35	ns
t _{dis}			2	43	2	23	
t _{en}	COMP	Y	2	37	8	24	ns
t _{dis}			2	45	6	21	
t _{en}	S0	OPER = 0	2	29	6	20	ns
t _{dis}			2	42	11	27	
t _{en}	S1	OPER = 0	2	28	6	25	ns
t _{dis}			2	37	3	19	
t _{en}	COMP	OPER = 0	2	43	9	25	ns
t _{dis}			2	36	6	20	

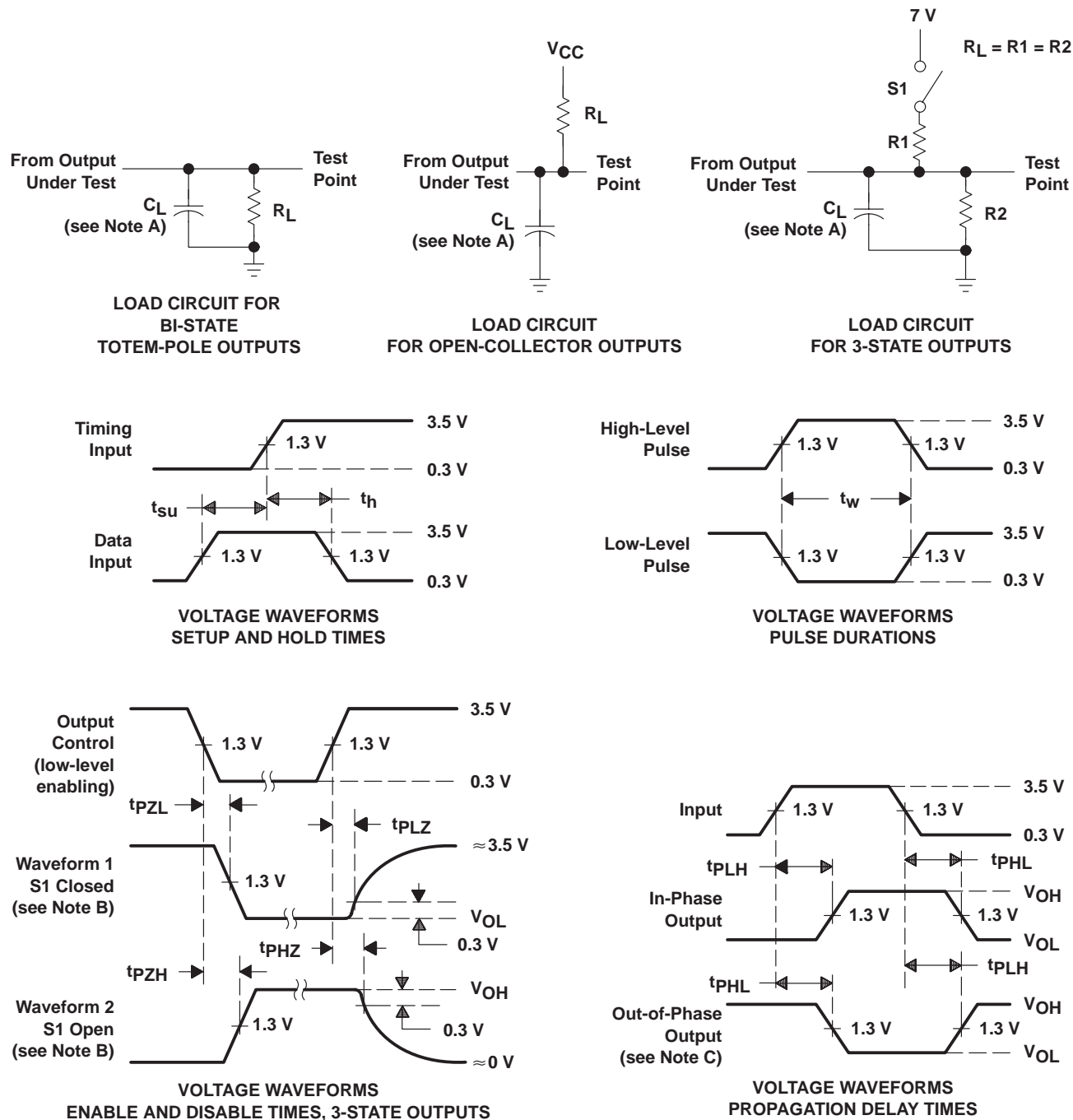
† t_{pd} = t_{PLH} or t_{PHL}, t_{en} = t_{PZH} or t_{PZL}, t_{dis} = t_{PHZ} or t_{PLZ}

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

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PARAMETER MEASUREMENT INFORMATION SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- 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. When measuring propagation delay items of 3-state outputs, switch S1 is open.
 D. All input pulses have the following characteristics: $PRR \leq 1$ MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits 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)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-87533013A	OBSOLETE	LCCC	FK	24		TBD	Call TI	Call TI	-55 to 125		
5962-8753301LA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8753301LA SNJ54ALS857JT	Samples
SN74ALS857NT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS857NT	Samples
SN74ALS857NTE4	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS857NT	Samples
SNJ54ALS857FK	OBSOLETE	LCCC	FK	24		TBD	Call TI	Call TI	-55 to 125		
SNJ54ALS857JT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8753301LA SNJ54ALS857JT	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.

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OTHER QUALIFIED VERSIONS OF SN54ALS857, SN74ALS857 :

- Catalog: [SN74ALS857](#)
- Military: [SN54ALS857](#)

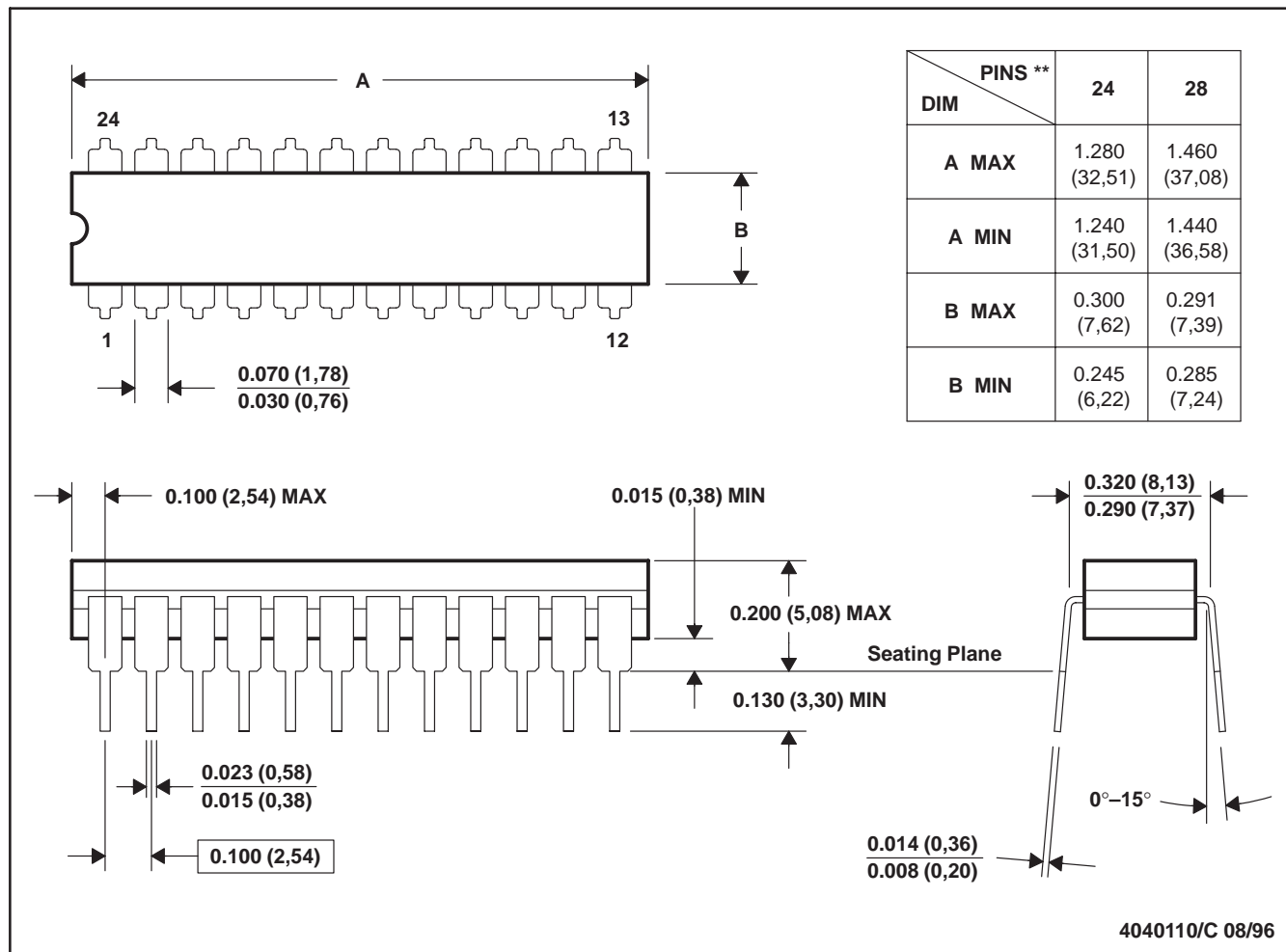
NOTE: Qualified Version Definitions:

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

JT (R-GDIP-T**)

CERAMIC DUAL-IN-LINE

24 LEADS SHOWN



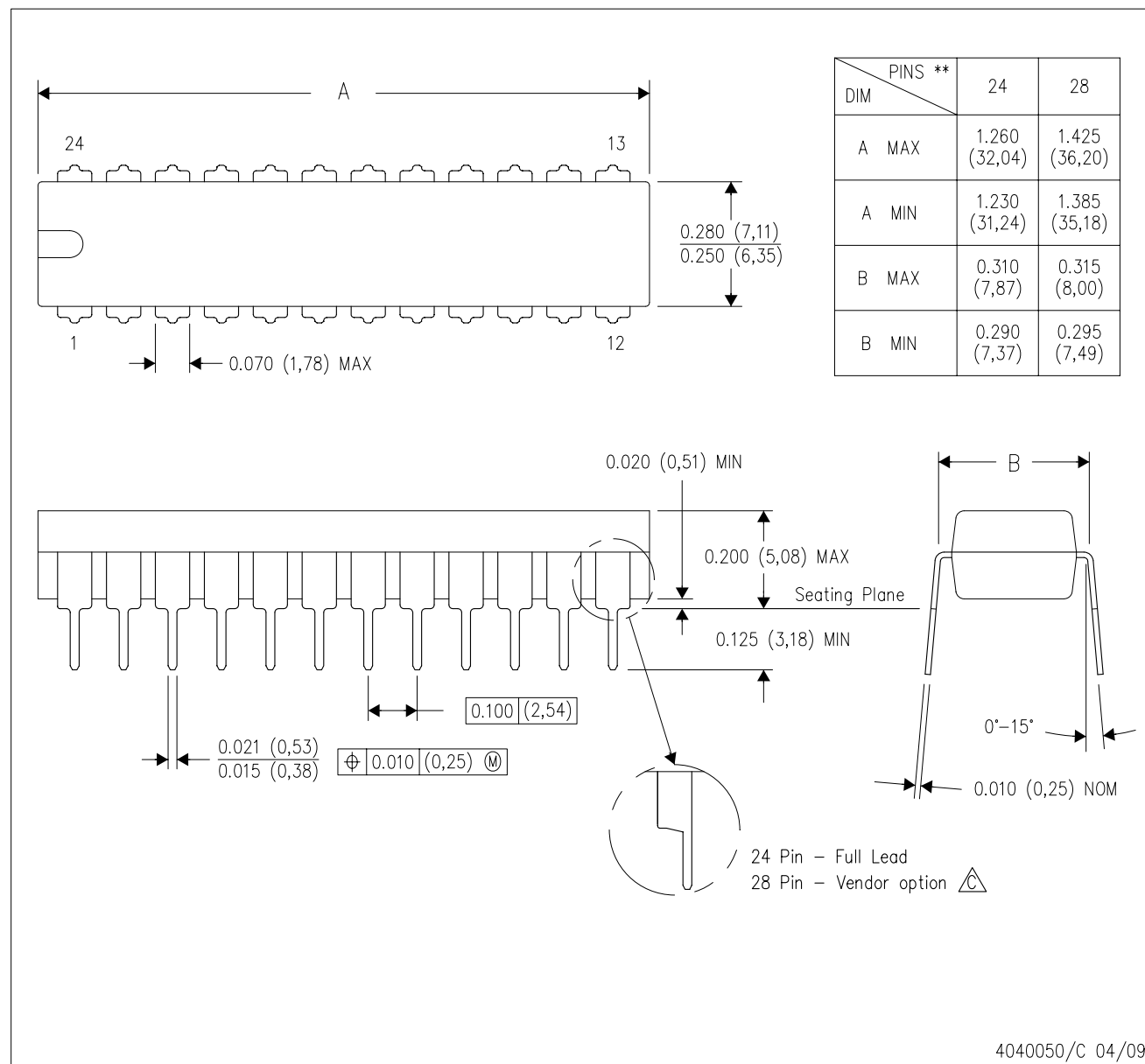
- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification.
 - Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

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.

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