

# SN54BCT543, SN74BCT543 OCTAL REGISTERED TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS026C – NOVEMBER 1988 – REVISED APRIL 1994

- State-of-the-Art BiCMOS Design  
Significantly Reduces  $I_{CCZ}$
- 3-State True Outputs
- Back-to-Back Registers for Storage
- ESD Protection Exceeds 2000 V  
Per MIL-STD-883C, Method 3015
- Package Options Include Plastic  
Small-Outline Packages (DW), Ceramic  
Chip Carriers (FK) and Flatpacks (W), and  
Plastic and Ceramic 300-mil DIPs (JT, NT)

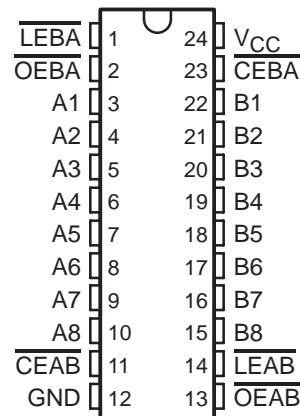
## description

The 'BCT543 octal transceiver contains two sets of D-type latches for temporary storage of data flowing in either direction. Separate latch-enable (LEAB or LEBA) and output-enable (OEAB or OEBA) inputs are provided for each register to permit independent control in either direction of data flow.

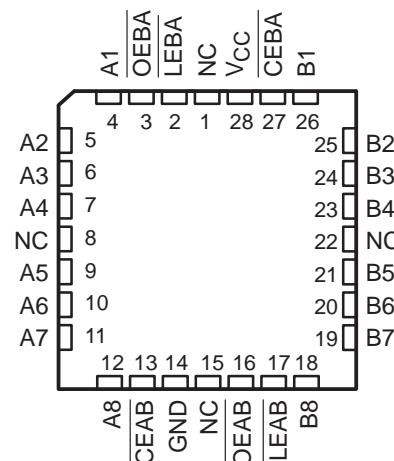
The A-to-B enable (CEAB) input must be low in order to enter data from A or to output data from B. If CEAB is low and LEAB is low, the A-to-B latches are transparent; a subsequent low-to-high transition of LEAB puts the A latches in the storage mode. With CEAB and OEAB both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar but requires using the CEBA, LEBA, and OEBA inputs.

The SN54BCT543 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74BCT543 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54BCT543 . . . JT OR W PACKAGE  
SN74BCT543 . . . DW OR NT PACKAGE  
(TOP VIEW)



SN54BCT543 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE†

INPUTS				OUTPUT B
CEAB	LEAB	OEAB	A	
H	X	X	X	Z
X	X	H	X	Z
L	H	L	X	$B_0^{\ddagger}$
L	L	L	L	L
L	L	L	H	H

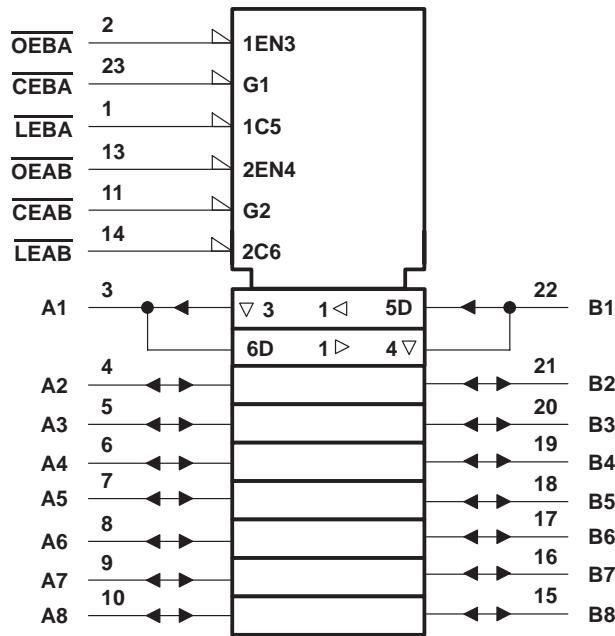
† A-to-B data flow is shown; B-to-A flow control is the same except that it uses CEBA, LEBA, and OEBA.

‡ Output level before the indicated steady-state input conditions were established.

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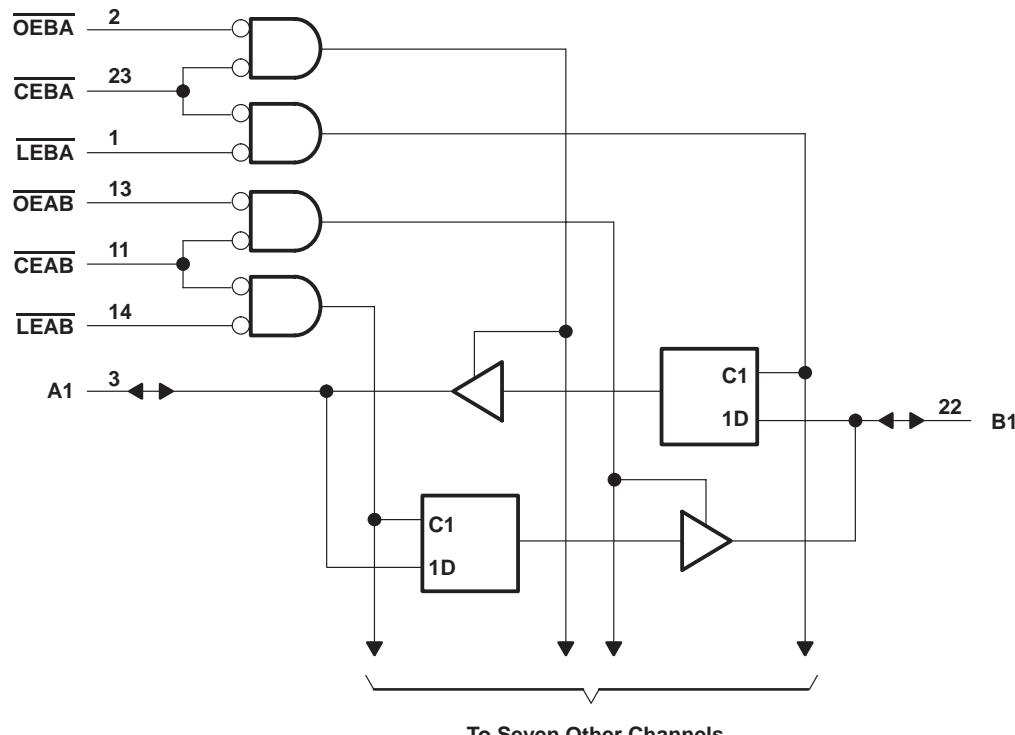
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**logic symbol†**



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

**logic diagram (positive logic)**



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

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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: Control inputs (see Note 1) .....	– 0.5 V to 7 V
I/O ports (see Note 1) .....	– 0.5 V to 5.5 V
Voltage range applied to any output in the disabled or power-off state, $V_O$ .....	– 0.5 V to 7 V
Voltage range applied to any output in the high state, $V_O$ .....	– 0.5 V to $V_{CC}$
Input clamp current, $I_{IK}$ .....	–30 mA
Current into any output in the low state: SN54BCT543 .....	96 mA
SN74BCT543 .....	128 mA
Operating free-air temperature range: SN54BCT543 .....	– 55°C to 125°C
SN74BCT543 .....	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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

**recommended operating conditions**

		SN54BCT543			SN74BCT543			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
$I_{IK}$	Input clamp current			–18			–18	mA
$I_{OH}$	High-level output current			–12			–15	mA
$I_{OL}$	Low-level output current			48			64	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	SN54BCT543			SN74BCT543			UNIT
		MIN	TYPT <sup>†</sup>	MAX	MIN	TYPT <sup>†</sup>	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2			-1.2	V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = -3 mA	2.4	3.3	2.4	3.3		V
		I <sub>OH</sub> = -12 mA	2	3.2				
		I <sub>OH</sub> = -15 mA			2	3.1		
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 48 mA	0.38	0.55				V
		I <sub>OL</sub> = 64 mA					0.42 0.55	
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 5.5 V			0.4			0.4	mA
I <sub>IH</sub> <sup>‡</sup>	A or B port Control input	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V		70			70	μA
				20			20	
I <sub>IL</sub> <sup>‡</sup>	A or B port Control input	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.5 V		-0.65			-0.65	mA
				-0.6			-0.6	
I <sub>OS</sub> <sup>§</sup>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0		-100	-225	-100	-225		mA
I <sub>CCL</sub>	A or B port	V <sub>CC</sub> = 5.5 V		45	71		45 71	mA
I <sub>CCH</sub>	A or B port	V <sub>CC</sub> = 5.5 V		5	8		5 8	mA
I <sub>CCZ</sub>	A or B port	V <sub>CC</sub> = 5.5 V		9	15		9 15	mA
C <sub>i</sub>	Control input	V <sub>CC</sub> = 5 V, V <sub>I</sub> = 2.5 V or 0.5 V		6			6	pF
C <sub>io</sub>	A or B port	V <sub>CC</sub> = 5 V, V <sub>O</sub> = 2.5 V or 0.5 V		16			16	pF

<sup>†</sup> All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

<sup>‡</sup> For I/O ports, the parameters I<sub>IH</sub> and I<sub>IL</sub> include the off-state output current.

<sup>§</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

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

		V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C	SN54BCT543		SN74BCT543		UNIT	
			MIN	MAX	MIN	MAX		
t <sub>w</sub>	Pulse duration, LEAB or LEBA low		7		8		7	ns
t <sub>su</sub>	Setup time, data before LEAB or LEBA↑	High or low	4.5		5.5		4.5	ns
t <sub>h</sub>	Hold time, data after LEAB or LEBA↑	High or low	1.5		1.5		1.5	ns



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**switching characteristics (see Note 2)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = 25°C			V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = MIN to MAX†			UNIT	
			'BCT543			SN54BCT543		SN74BCT543		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	2	5.7	7.5	2	9.9	2	8.8	ns
t <sub>PHL</sub>			2	6.3	8.2	2	9.7	2	9.6	
t <sub>PLH</sub>	$\overline{LE}$	A or B	2	8.2	10.3	2	13.9	2	12.9	ns
t <sub>PHL</sub>			2	8.5	10.6	2	13.2	2	12.7	
t <sub>PZH</sub>	$\overline{OE}$	A or B	1	6.8	8.6	1	11.4	1	10.7	ns
t <sub>PZL</sub>			1	8.7	10.8	1	12.8	1	12.3	
t <sub>PHZ</sub>	$\overline{OE}$	A or B	1	5.5	7.2	1	8.8	1	8.1	ns
t <sub>PLZ</sub>			1	4.7	6.4	1	8.1	1	7.2	
t <sub>PZH</sub>	$\overline{CE}$	A or B	1	7.6	9.8	1	12.8	1	12	ns
t <sub>PZL</sub>			1	9.5	11.6	1	13.8	1	13.5	
t <sub>PHZ</sub>	$\overline{CE}$	A or B	1	5.8	7.5	1	9.3	1	8.5	ns
t <sub>PLZ</sub>			1	4.8	6.7	1	8.4	1	7.6	

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

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

**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
5962-9087001M3A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962-9087001M3A SNJ54BCT543FK	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9087001MKA	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9087001MK A SNJ54BCT543W	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
5962-9087001MLA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9087001ML A SNJ54BCT543JT	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74BCT543DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT543	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SN74BCT543NT	ACTIVE	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74BCT543NT	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54BCT543FK	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962-9087001M3A SNJ54BCT543FK	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54BCT543JT	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9087001ML A SNJ54BCT543JT	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
SNJ54BCT543W	ACTIVE	CFP	W	24	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9087001MK A SNJ54BCT543W	<span style="background-color: red; color: white; padding: 2px;">Samples</span>

(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 SN54BCT543, SN74BCT543 :**

- Catalog: [SN74BCT543](#)
- Military: [SN54BCT543](#)

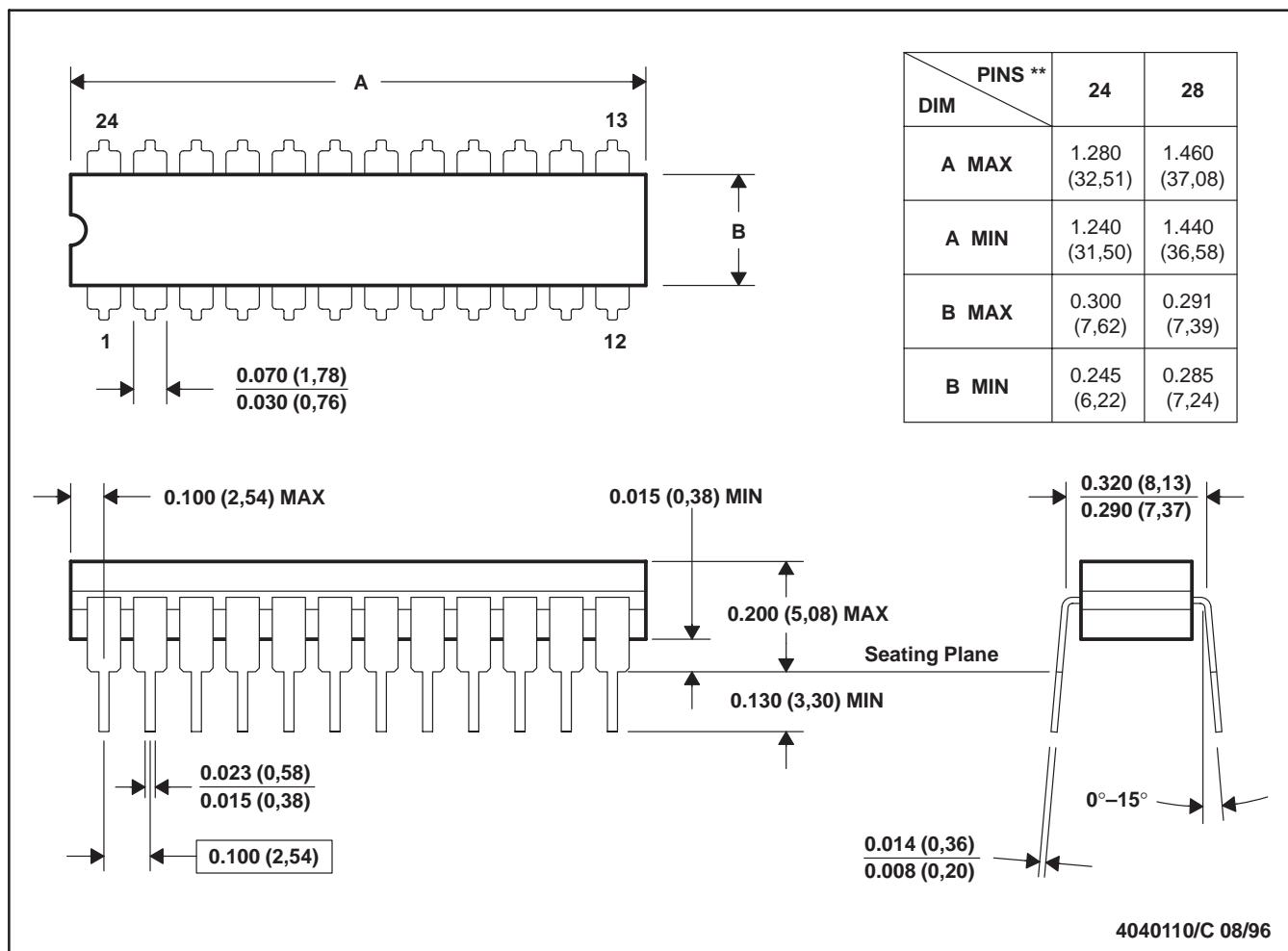
NOTE: Qualified Version Definitions:

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

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

24 LEADS SHOWN

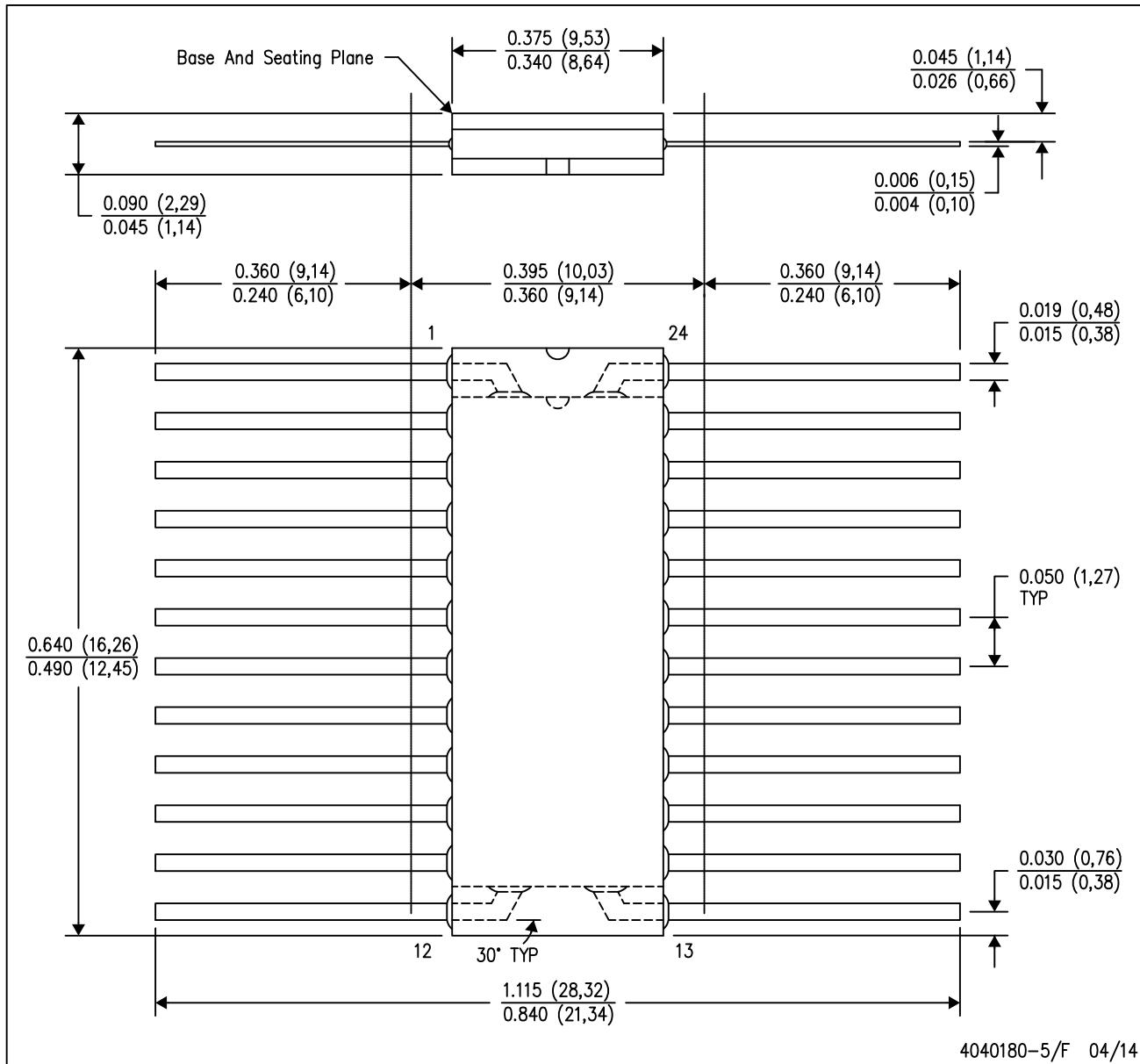
## CERAMIC DUAL-IN-LINE



- 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

W (R-GDFP-F24)

CERAMIC DUAL FLATPACK

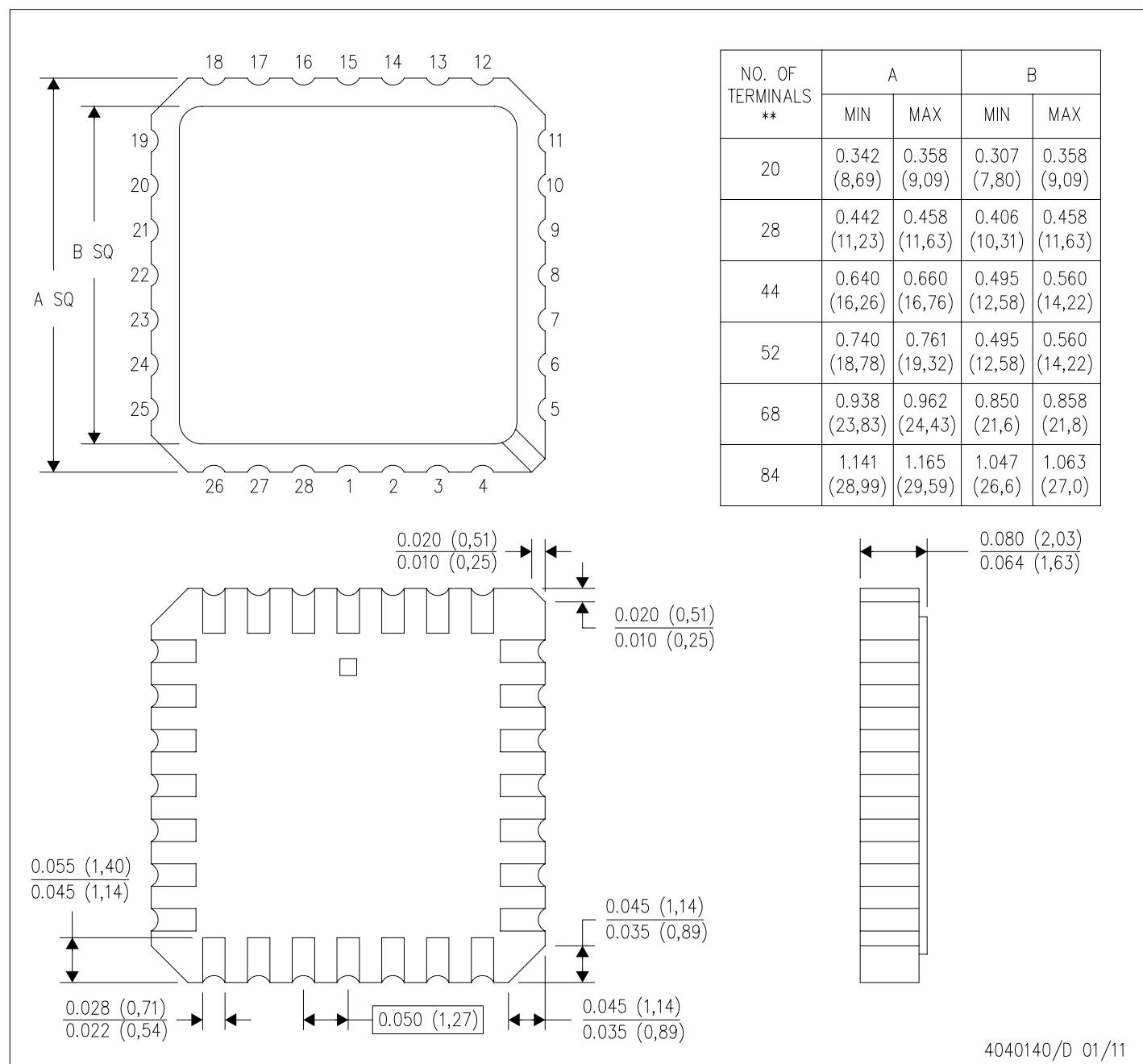


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within Mil-Std 1835 GDFP2-F20

FK (S-CQCC-N\*\*)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



- 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 metal lid.
  - D. Falls within JEDEC MS-004

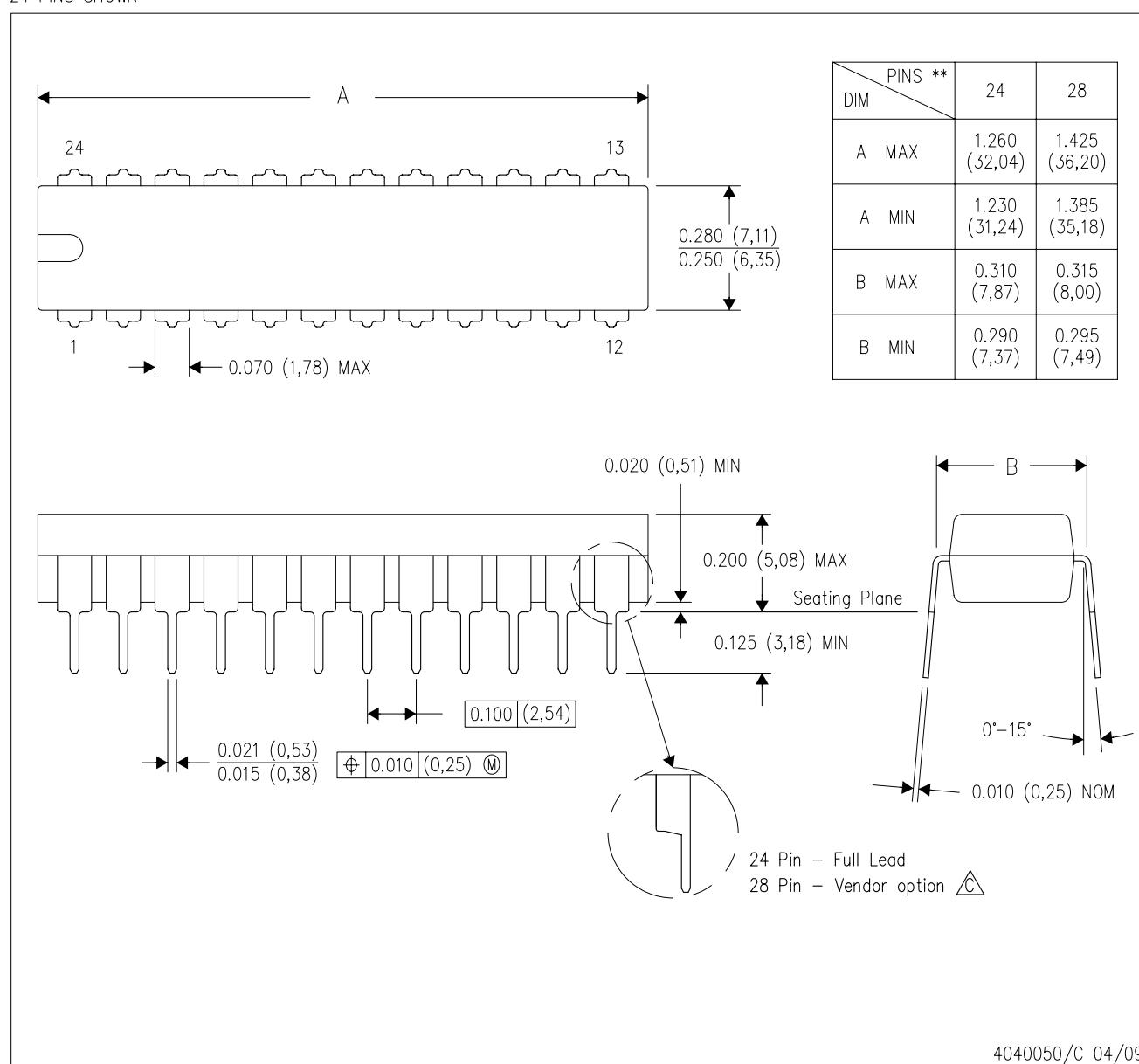
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## MECHANICAL DATA

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

24 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



4040050/C 04/09

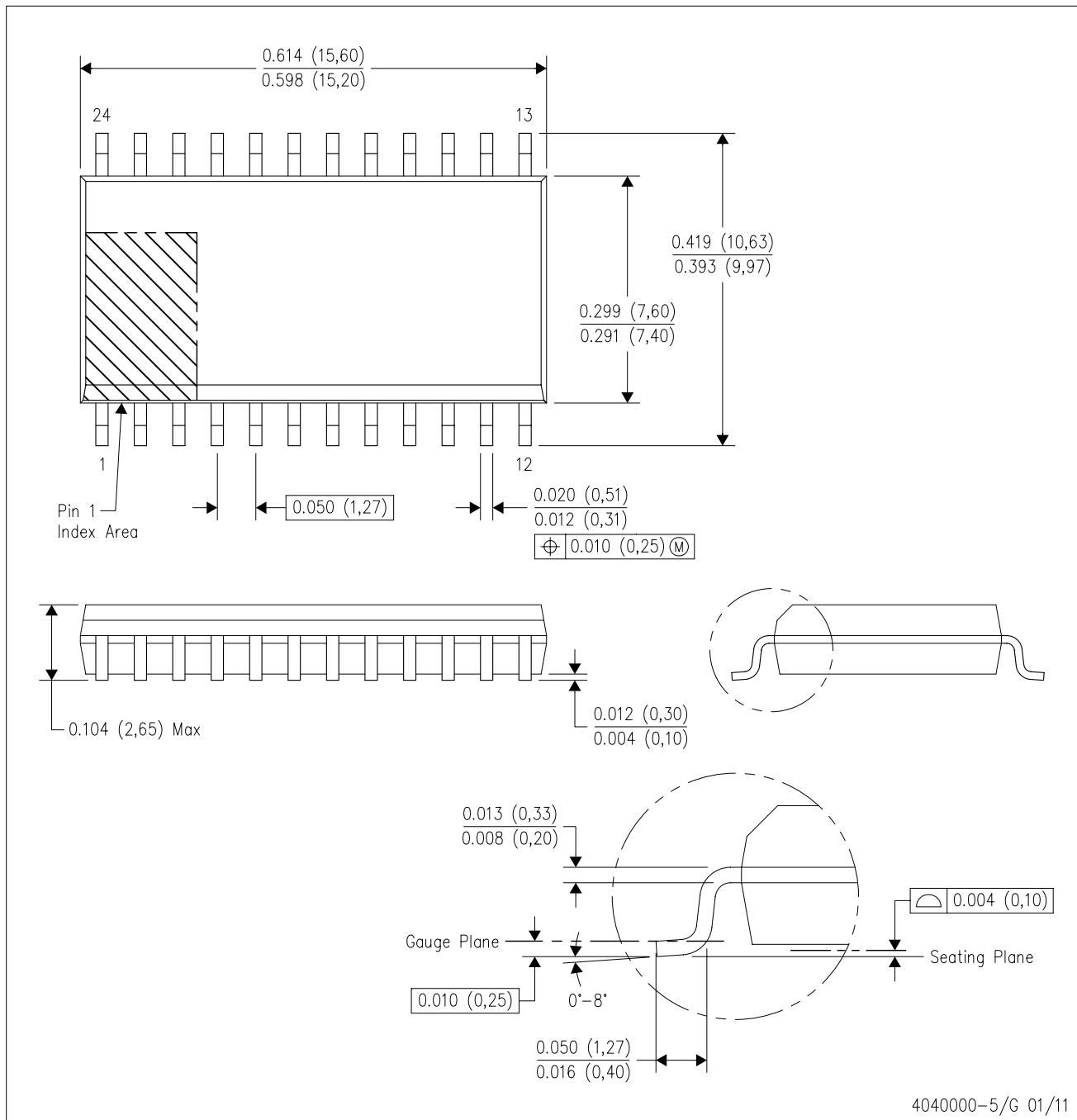
NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.

B. This drawing is subject to change without notice.

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

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



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

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Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>
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