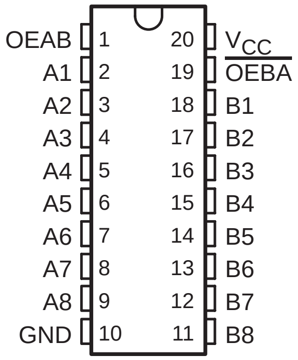
SN54BCT623, SN74BCT623
OCTAL BUS TRANSCEIVERS
WITH 3-STATE OUTPUTS

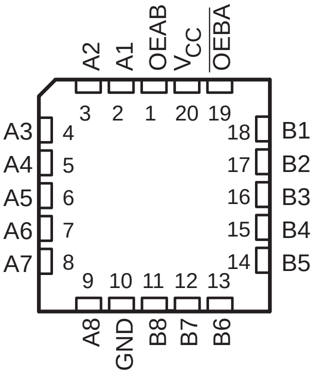
SCBS020A − SEPTEMBER 1988 − REVISED NOVEMBER 1993

- **State-of-the-Art BiCMOS Design Significantly Reduces I_{CCZ}**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015**
- **Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Plastic and Ceramic 300-mil DIPs (J, N)**

SN54BCT623 . . . J OR W PACKAGE
SN74BCT623 . . . DW OR N PACKAGE
(TOP VIEW)



SN54BCT623 . . . FK PACKAGE
(TOP VIEW)



description

The ′BCT623 bus transceiver is designed for asynchronous communication between data buses. The control function implementation allows for maximum flexibility in timing. The ′BCT623 provides true data at its outputs.

This device allows data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic levels at the output-enable (OEAB and $\overline{\text{OEBA}}$) inputs.

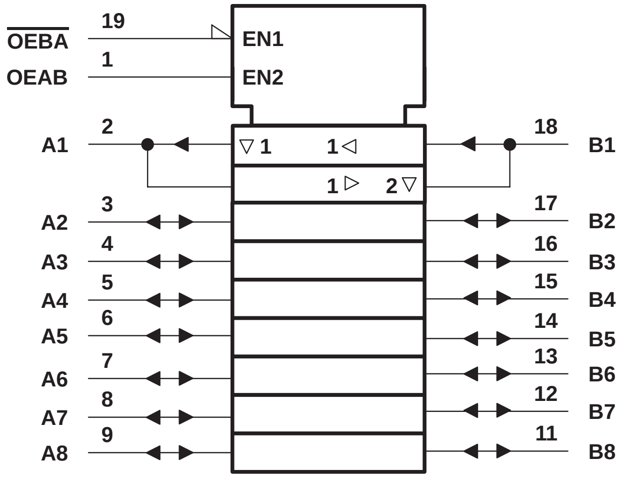
The output-enable inputs can be used to disable the device so that the buses are effectively isolated. The dual-enable configuration gives the transceivers the capability of storing data by simultaneously enabling OEAB and $\overline{\text{OEBA}}$. Each output reinforces its input in this configuration. When both OEAB and $\overline{\text{OEBA}}$ are enabled and all other data sources to the two sets of bus lines are at high impedance, both sets of bus lines (16 in all) will remain at their last states.

The SN54BCT623 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74BCT623 is characterized for operation from 0°C to 70°C.

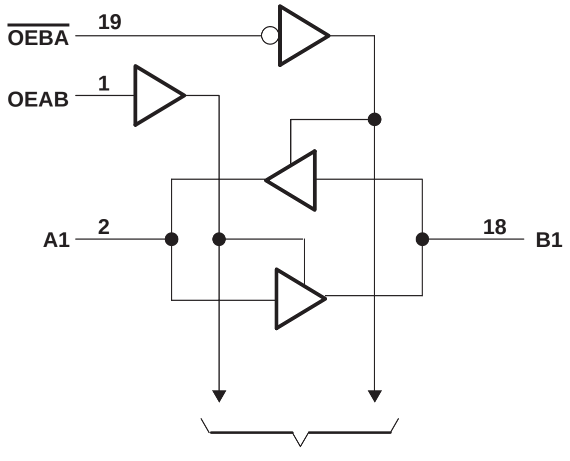
FUNCTION TABLE

INPUTS		OPERATION
$\overline{\text{OEBA}}$	OEAB	
L	L	B data to A bus
L	H	B data to A bus, A data to B bus
H	L	Isolation
H	H	A data to B bus

logic symbol†



logic diagram (positive logic)



To Seven Other Channels

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

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 5.5 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: SN54BCT623 . . . . 96 mA
SN74BCT623 . . . . 128 mA
Operating free-air temperature range: SN54BCT623 . . . . − 55°C to 125°C
SN74BCT623 . . . . 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

			SN54BCT623			SN74BCT623			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	A port			−3			−3	mA
		B port			−12			−15	
I_{OL}	Low-level output current	A port			20			24	mA
		B port			48			64	
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		SN54BCT623			SN74BCT623			UNIT
				MIN	TYP[†]	MAX	MIN	TYP[†]	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	A port	V_{CC} = 4.5 V	I_{OH} = −1 mA	2.5	3.4		2.5	3.4		V
			I_{OH} = −3 mA	2.4	3.3		2.4	3.3		
	B port	V_{CC} = 4.5 V	I_{OH} = −3 mA	2.4	3.3		2.4	3.3		
			I_{OH} = −12 mA	2	3.2					
			I_{OH} = −15 mA				2	3.1		
V_{OL}	A port	V_{CC} = 4.5 V	I_{OL} = 20 mA		0.3	0.5				V
			I_{OL} = 24 mA					0.35	0.5	
	B port	V_{CC} = 4.5 V	I_{OL} = 48 mA		0.38	0.55				
			I_{OL} = 64 mA					0.42	0.55	
I_I	A or B port	V_{CC} = 5.5 V,	V_I = 5.5 V			1			1	mA
	OEAB or $\overline{\text{OEBA}}$					0.1			0.1	
I_{IH}[‡]	A or B port	V_{CC} = 5.5 V,	V_I = 2.7 V			70			70	μA
	OEAB or $\overline{\text{OEBA}}$					20			20	
I_{IL}[‡]	A or B port	V_{CC} = 5.5 V,	V_I = 0.5 V			−0.65			−0.65	mA
	OEAB or $\overline{\text{OEBA}}$					−0.6			−0.6	
I_{OS}[§]	A port	V_{CC} = 5.5 V,	V_O = 0	−60		−150	−60		−150	mA
	B port			−100		−225	−100		−225	
I_{CCL}	A to B	V_{CC} = 5.5 V			58	92		58	92	mA
I_{CCH}	A to B	V_{CC} = 5.5 V			33	53		33	53	mA
I_{CCZ}		V_{CC} = 5.5 V			6	11		6	11	mA
C_i	OEAB or $\overline{\text{OEBA}}$	V_{CC} = 5 V,	V_I = 2.5 V or 0.5 V		5			5		pF
C_{io}	A to B	V_{CC} = 5 V,	V_O = 2.5 V or 0.5 V		9			9		pF
	B to A				12			12		

[†] All typical values are at V_{CC} = 5 V, T_A = 25°C.
[‡] For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.
[§] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

switching characteristics (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = 25°C			V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†				UNIT
			′BCT623			SN54BCT623		SN74BCT623		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	0.5	3.1	4.7	0.5	5.3	0.5	5.2	ns
t_{PHL}			1.7	4.9	6.9	1.7	7.6	1.7	7.4	
t_{PLH}	B	A	0.9	4.1	5.9	0.9	6.8	0.9	6.7	ns
t_{PHL}			1.8	5.3	7.6	1.8	8.3	1.8	8	
t_{PZH}	$\overline{OEBA}$	A	3.1	6.8	9.1	3.1	10.7	3.1	10.6	ns
t_{PZL}			3.3	7.2	9.6	3.3	11.3	3.3	10.7	
t_{PHZ}	$\overline{OEBA}$	A	1.9	6.1	8.3	1.9	10.6	1.9	9.8	ns
t_{PLZ}			1.1	4.6	7	1.1	8.1	1.1	7.8	
t_{PZH}	OEAB	B	2	5	6.8	2	7.8	2	7.6	ns
t_{PZL}			2.7	6.2	8	2.7	9.3	2.7	8.9	
t_{PHZ}	OEAB	B	1.1	4.6	6.5	1.1	8	1.1	7.7	ns
t_{PLZ}			0.3	3.2	6.3	0.3	7.2	0.3	7.1	

† 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	MSL Peak Temp [3]	Samples (Requires Login)
5962-9094001M2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Call TI	
5962-9094001MRA	ACTIVE	CDIP	J	20	1	TBD	Call TI	Call TI	
5962-9094001MSA	ACTIVE	CFP	W	20	1	TBD	Call TI	Call TI	
SN74BCT623N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	
SN74BCT623NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	
SN74BCT623NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74BCT623NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74BCT623NSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SNJ54BCT623FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	
SNJ54BCT623J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	
SNJ54BCT623W	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	

[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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OTHER QUALIFIED VERSIONS OF SN54BCT623, SN74BCT623 :

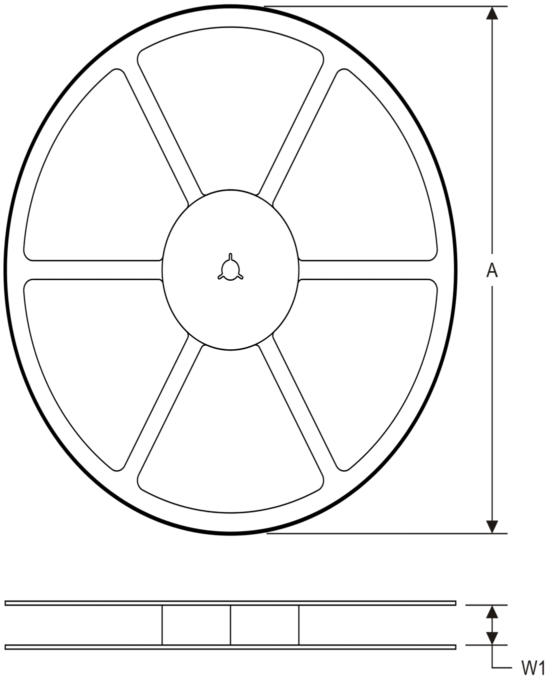
- Catalog: SN74BCT623
- Military: SN54BCT623

NOTE: Qualified Version Definitions:

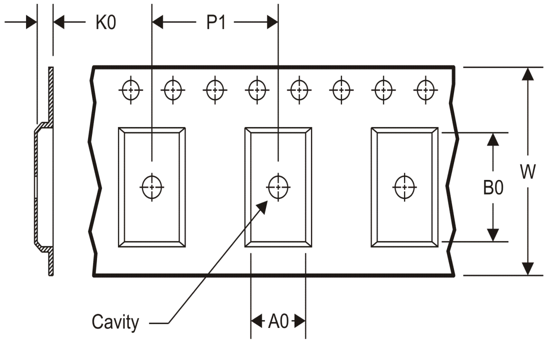
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



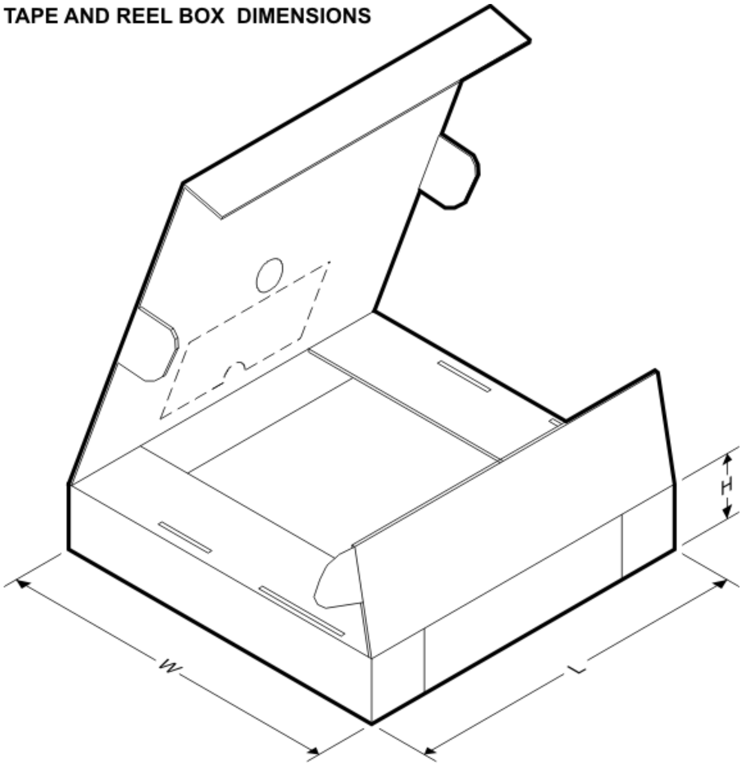
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

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
SN74BCT623NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



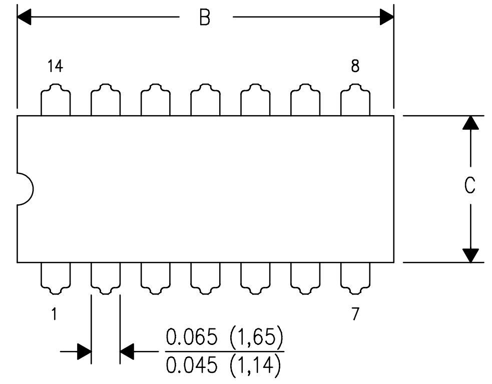
*All dimensions are nominal

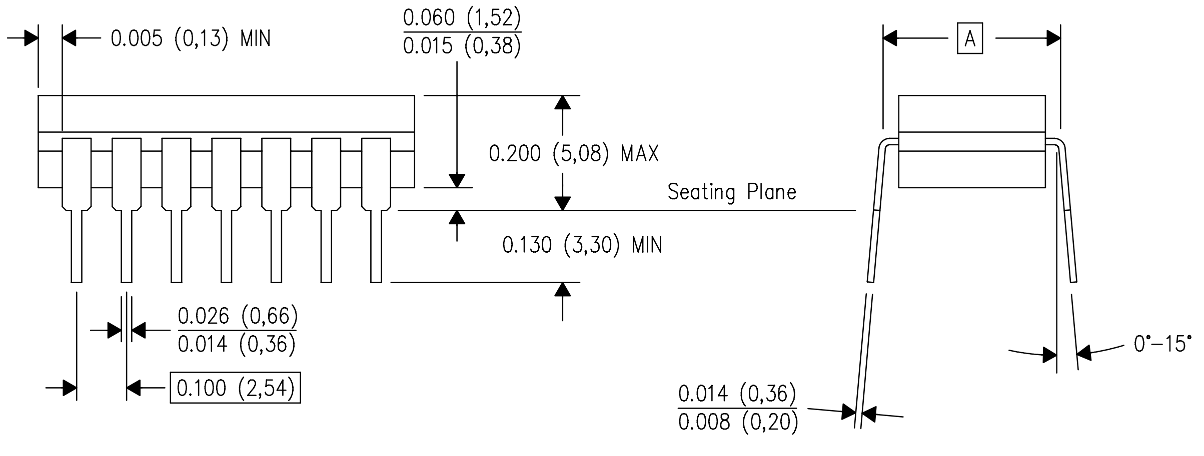
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74BCT623NSR	SO	NS	20	2000	367.0	367.0	45.0

J (R—GDIP—T**) CERAMIC DUAL IN—LINE PACKAGE

14 LEADS SHOWN

PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	——	——	——	——
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

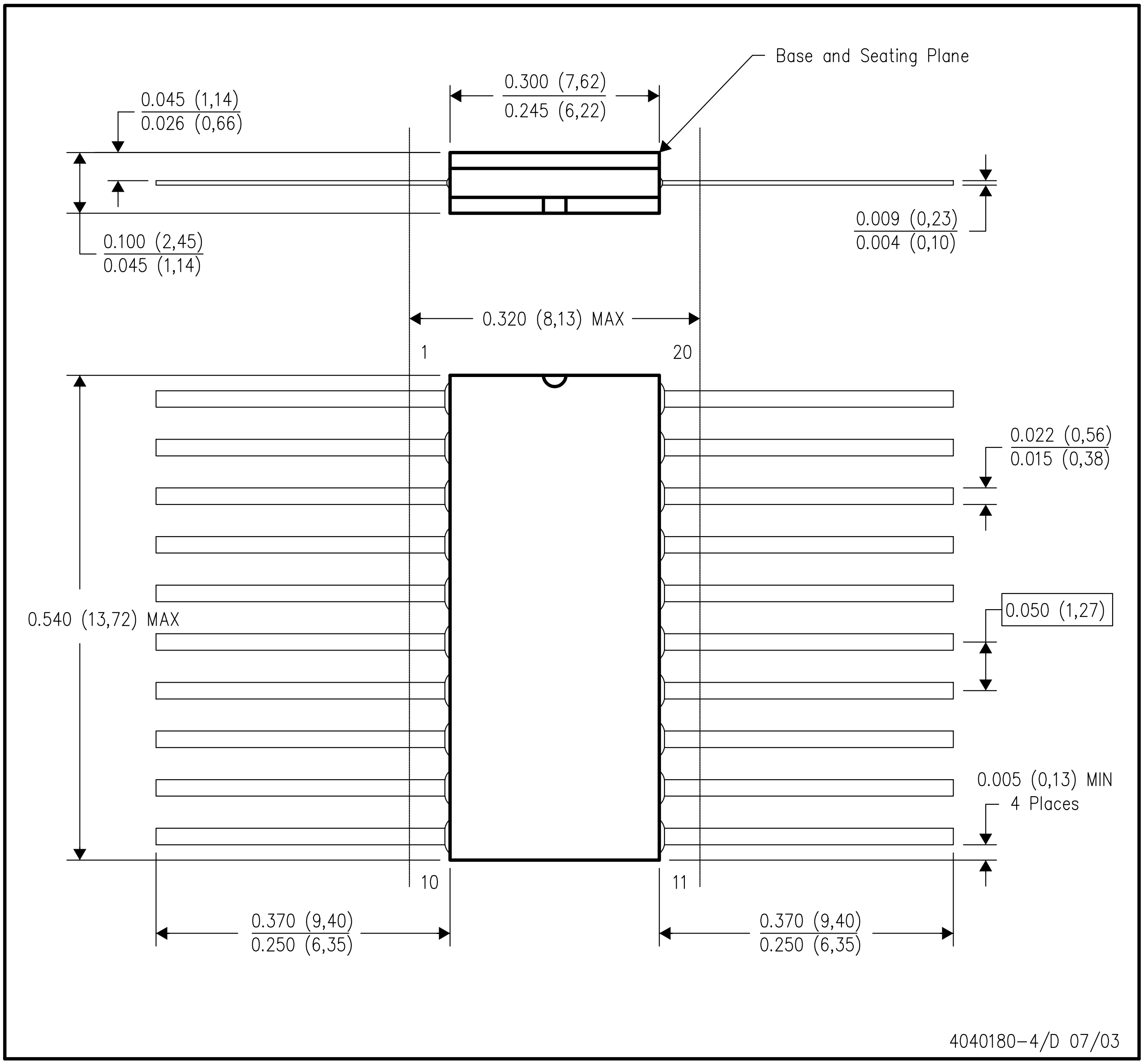




4040083/F 03/03

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 ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1—T14, GDIP1—T16, GDIP1—T18 and GDIP1—T20.

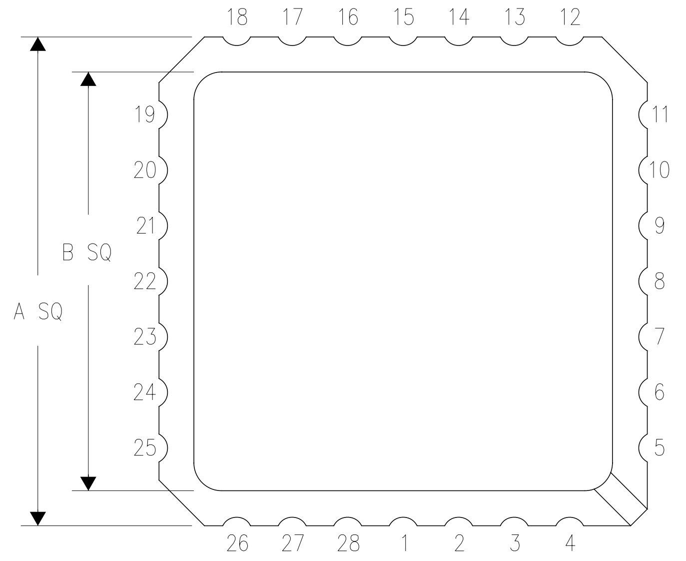
W (R–GDFP–F20)　CERAMIC DUAL FLATPACK



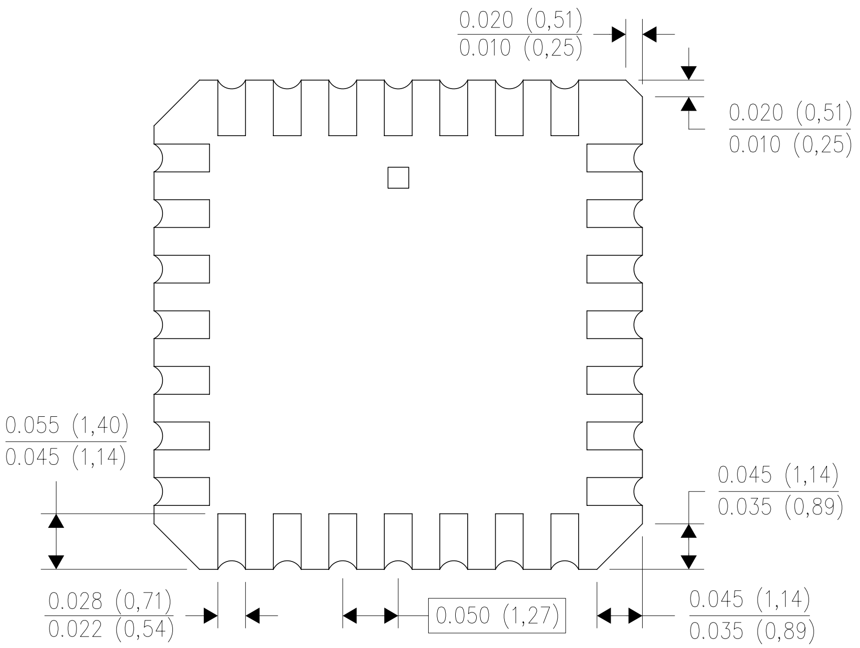
NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within Mil–Std 1835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

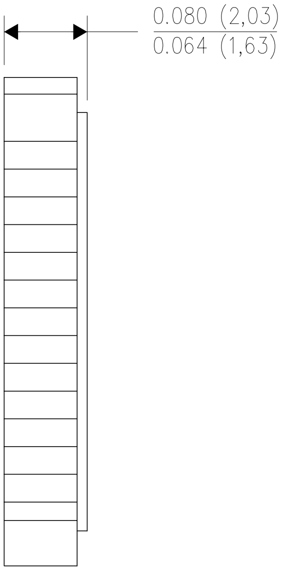
FK (S–CQCC–N**) LEADLESS CERAMIC CHIP CARRIER

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)



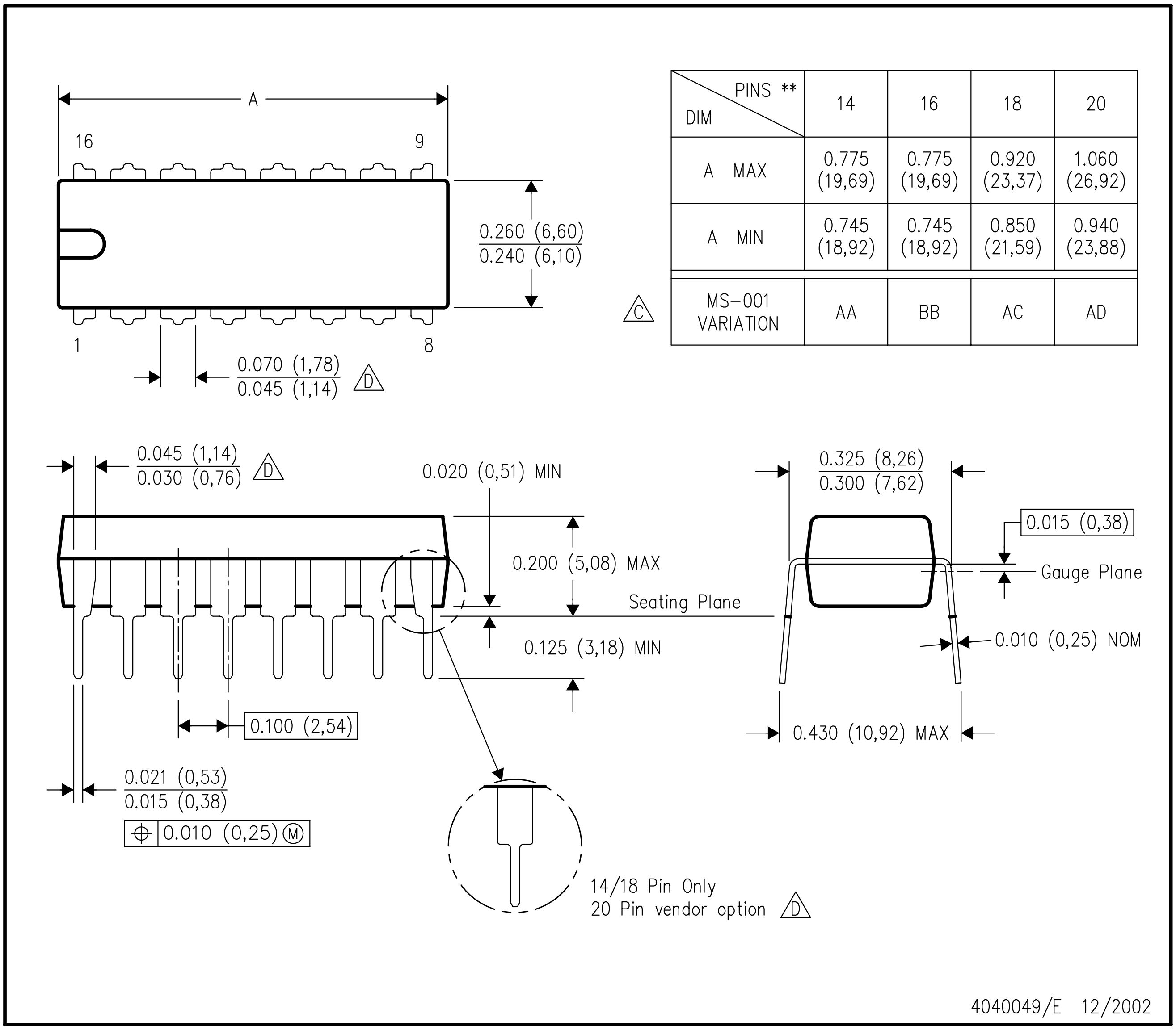


4040140/D 01/11

NOTES:
- 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

N (R–PDIP–T**) PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION	AA	BB	AC	AD

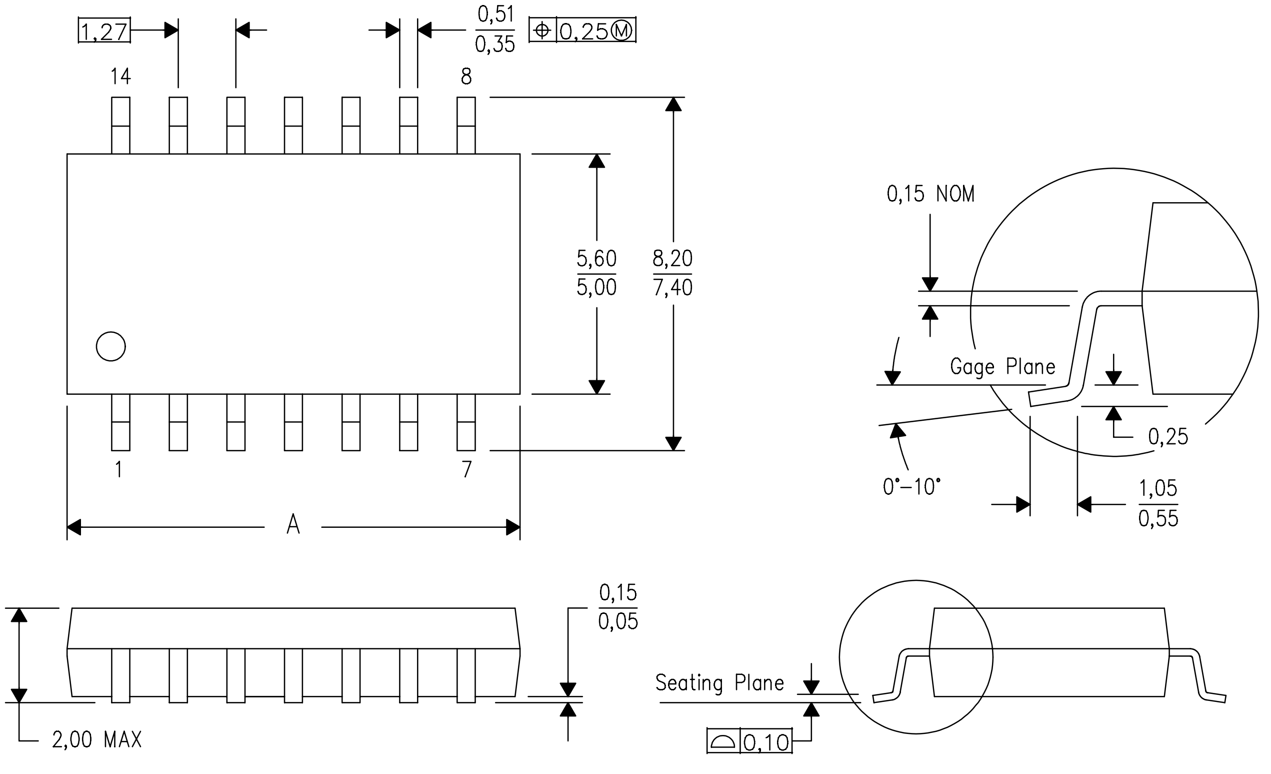
4040049/E 12/2002

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D The 20 pin end lead shoulder width is a vendor option, either half or full width.

MECHANICAL DATA

NS (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN



PINS ** DIM	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

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.

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