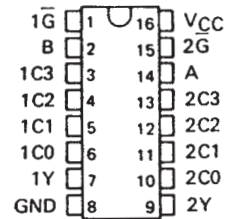


SN54LS253, SN54S253, SN74LS253, SN74S253 DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDLS147 - SEPTEMBER 1972 - REVISED MARCH 1988

- Three-State Version of SN54/74LS153, SN54/74S153
- Schottky-Diode-Clamped Transistors
- Permits Multiplexing from N Lines to 1 Line
- Performs Parallel-to Serial Conversion
- Fully Compatible with Most TTL Circuits
- Low Power Dissipation
'LS253 . . . 35 mW Typical
'S253 . . . 225 mW Typical

SN54LS253, SN54S253 . . . J OR W PACKAGE
SN74LS253, SN74S253 . . . D OR N PACKAGE
(TOP VIEW)

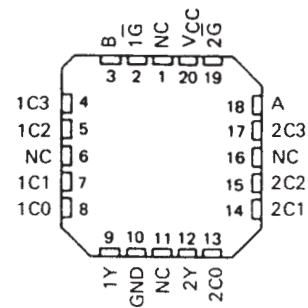


description

Each of these Schottky-clamped data selectors/multiplexers contains inverters and drivers to supply fully complementary, on-chip, binary decoding data selection to the AND-OR gates. Separate output control inputs are provided for each of the two four-line sections.

The three-state outputs can interface with and drive data lines of bus-organized systems. With all but one of the common outputs disabled (at a high-impedance state) the low-impedance of the single enabled output will drive the bus line to a high or low logic level.

SN54LS253, SN54S253 . . . FK PACKAGE
(TOP VIEW)



NC-No internal connection

FUNCTION TABLE

SELECT INPUTS		DATA INPUTS				OUTPUT CONTROL	OUTPUT
B	A	C0	C1	C2	C3	G	Y
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

Address inputs A and B are common to both sections.

H = high level, L = low level, X = irrelevant, Z = high impedance (off)

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: 'LS253	7 V
'S253	5.5 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS253, SN54S253	-55°C to 125°C
SN74LS253, SN74S253	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1988, Texas Instruments Incorporated

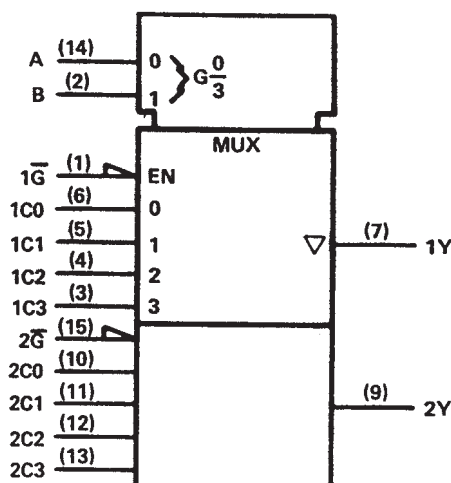
SN54LS253, SN54S253, SN74LS253, SN74S253

DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

WITH 3-STATE OUTPUTS

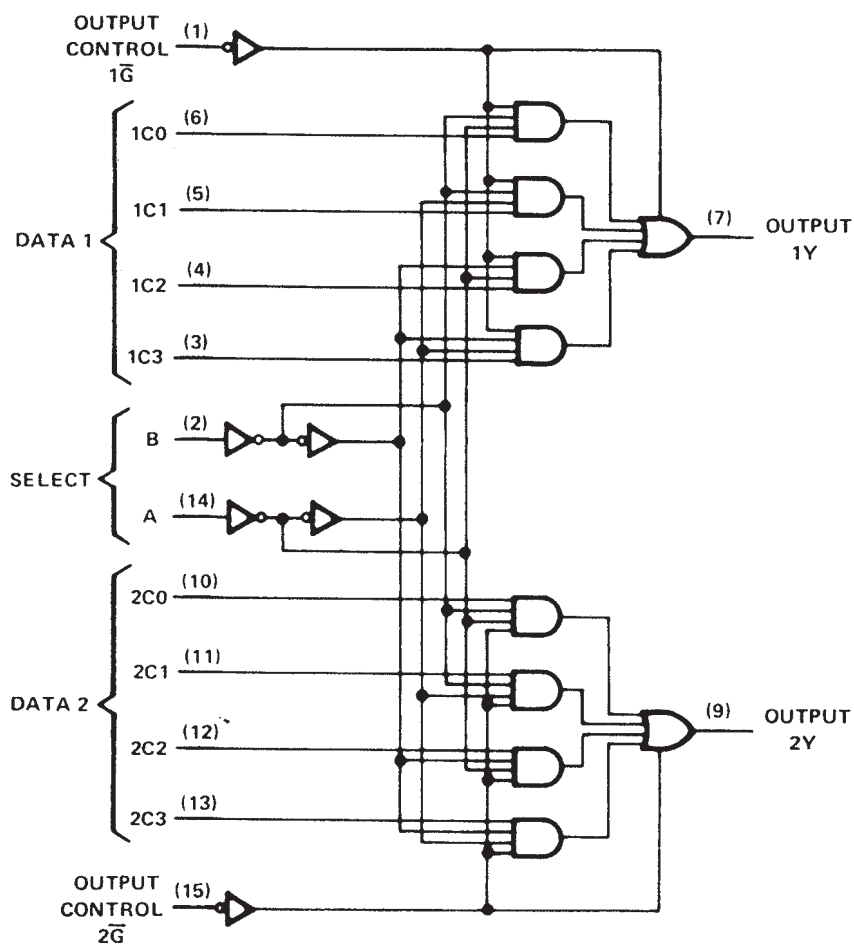
SDLS147 - SEPTEMBER 1972 - REVISED MARCH 1988

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 D, J, N, and W packages.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

SDLS147 – SEPTEMBER 1972 – REVISED MARCH 1988

Pin numbers shown are for D, J, N, and W packages.

SN54LS253, SN54S253, SN74LS253, SN74S253

DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

WITH 3-STATE OUTPUTS

SDLS147 - SEPTEMBER 1972 - REVISED MARCH 1988

recommended operating conditions

	SN54LS253			SN74LS253			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	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			4			8	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†			SN54LS253		SN74LS253		UNIT
				MIN	TYP‡	MAX	MIN	
V _{IK}	V _{CC} = MIN, I _I = - 18 mA			- 1.5		- 1.5		V
V _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX, I _{OH} = MAX			2.4	3.4	2.4	3.1	V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX	I _{OL} = 4 mA		0.25 0.4		0.25 0.4		V
		I _{OL} = 8 mA				0.25 0.5		
I _{OZ}	V _{CC} = MAX, V _{IH} = 2 V	V _O = 2.7 V		20		20		μA
		V _O = 0.4 V		- 20		- 20		
I _I	V _{CC} = MAX, V _I = 7 V			0.1		0.1		mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			20		20		μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V	$\overline{G}$		- 0.2		- 0.2		mA
		All other		- 0.4		- 0.4		
I _{OS} §	V _{CC} = MAX			- 30	- 130	- 30	- 130	mA
I _{CC}	V _{CC} = MAX, See Note 2	Condition A		7	12	7	12	mA
		Condition B		8.5	14	8.5	14	

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

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

§ Not more than one output should be shorted at a time, and duration for the short-circuit should exceed one second.

NOTE 2: I_{CC} is measured with the outputs open under the following conditions:

A. All inputs grounded.

B. Output control at 4.5 V, all inputs grounded.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	Data	Y	C _L = 15 pF, R _L = 2 kΩ, See Note 3	17	25		ns
t _{PHL}				13	20		
t _{PLH}	Select	Y		30	45		ns
t _{PHL}				21	32		
t _{PZH}	Output Control	Y		15	28		ns
t _{PZL}				15	23		
t _{PHZ}	Output Control	Y	C _L = 5 pF, R _L = 2 kΩ, See Note 3	27	41		ns
t _{PLZ}			18	27			

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

SN54LS253, SN54S253, SN74LS253, SN74S253 DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDLS147 – SEPTEMBER 1972 – REVISED MARCH 1988

recommended operating conditions

	SN54S253			SN74S253			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	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			– 2			– 6.5	mA
I _{OL} Low-level output current			20			20	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†		MIN	TYP‡	MAX	UNIT
V _{IK}	V _{CC} = MIN, I _I = – 18 mA				– 1.2	V
V _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = MAX	Series 54S	2.5	3.4		V
		Series 74S	2.7	3.4		
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = 20 mA				0.5	V
I _{OZ}	V _{CC} = MAX, V _{IH} = 2 V	V _O = 2.4 V			50	μA
		V _O = 0.5 V			– 50	
I _I	V _{CC} = MAX, V _I = 5.5 V				1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V				50	μA
I _{IL}	V _{CC} = MAX, V _I = 0.5 V	$\bar{G}$ = 0.8 V			– 2	mA
		$\bar{G}$ = 2 V			– 0.25	
I _{OS§}	V _{CC} = MAX		– 40		– 100	mA
I _{CC}	V _{CC} = MAX, See Note 2	Condition A		45	70	mA
		Condition B		65	85	

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

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

Not more than one output should be shorted at a time and duration of short-circuit should not exceed one second.

NOTE 2: I_{CC} is measured with the outputs open under the following conditions:

A. All inputs grounded.

B. Output control at 4.5 V, all inputs grounded.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	Data	Y	R _L = 280 Ω, See Note 3	C _L = 15 pF		6	9	ns
t _{PHL}						6	9	
t _{PLH}	Select	Y				11.5	18	ns
t _{PHL}						12	18	
t _{PZH}	Output Control	Y				11	16.5	ns
t _{PZL}						12	18	
t _{PHZ}	Output Control	Y	R _L = 280 Ω, See Note 3	C _L = 5 pF		6.5	9.5	ns
t _{PLZ}							10	

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
76017012A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76017012A SNJ54LS 253FK
7601701EA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7601701EA SNJ54LS253J
7601701EA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7601701EA SNJ54LS253J
JM38510/30908BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BEA
JM38510/30908BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BEA
JM38510/30908BEA.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BEA
JM38510/30908BEA.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BEA
JM38510/30908BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BFA
JM38510/30908BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BFA
JM38510/30908BFA.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BFA
JM38510/30908BFA.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BFA
M38510/30908BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BEA
M38510/30908BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BEA
M38510/30908BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BFA
M38510/30908BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 30908BFA
SN54LS253J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS253J
SN54LS253J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS253J

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN54LS253J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS253J
SN54LS253J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS253J
SN74LS253DR	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS253
SN74LS253DR	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS253
SN74LS253DR.A	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS253
SN74LS253DR.A	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS253
SN74LS253N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS253N
SN74LS253N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS253N
SN74LS253N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS253N
SN74LS253N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS253N
SNJ54LS253FK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76017012A SNJ54LS 253FK
SNJ54LS253FK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76017012A SNJ54LS 253FK
SNJ54LS253FK.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76017012A SNJ54LS 253FK
SNJ54LS253FK.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76017012A SNJ54LS 253FK
SNJ54LS253J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7601701EA SNJ54LS253J
SNJ54LS253J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7601701EA SNJ54LS253J
SNJ54LS253J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7601701EA SNJ54LS253J
SNJ54LS253J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7601701EA SNJ54LS253J

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

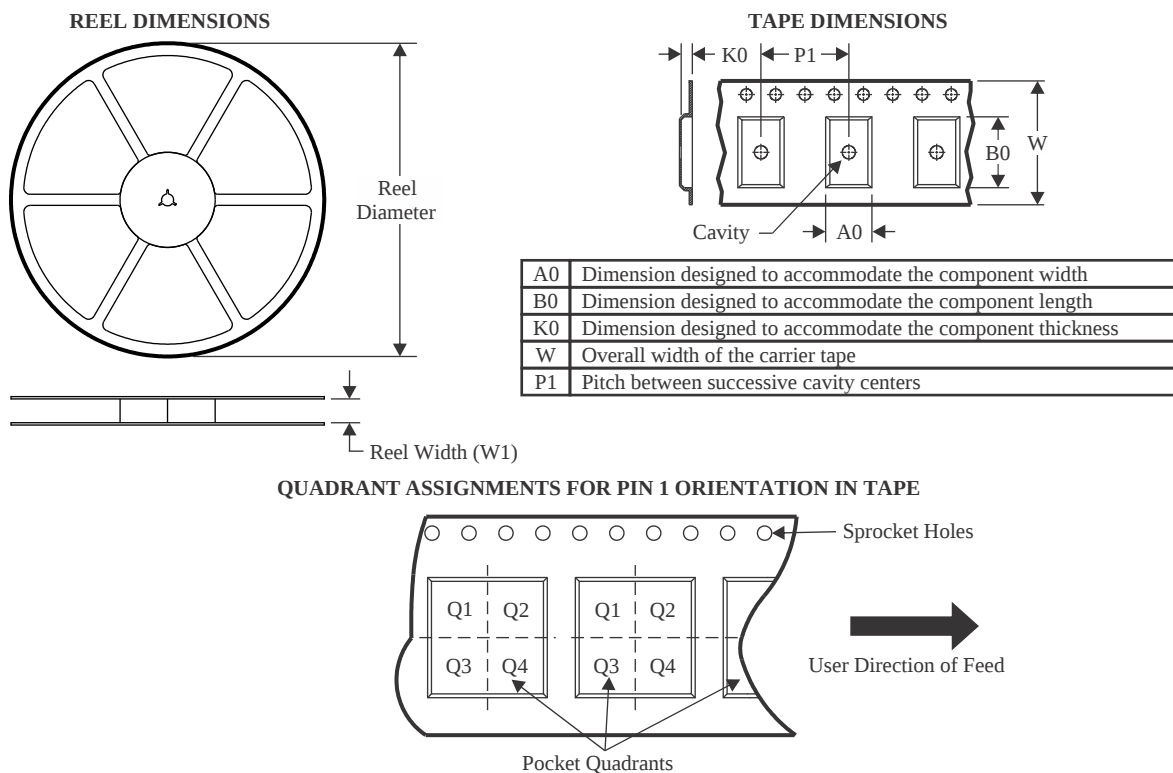
OTHER QUALIFIED VERSIONS OF SN54LS253, SN74LS253 :

- Catalog : [SN74LS253](#)
- Military : [SN54LS253](#)

NOTE: Qualified Version Definitions:

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

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
SN74LS253DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS253DR	SOIC	D	16	2500	340.5	336.1	32.0

TUBE

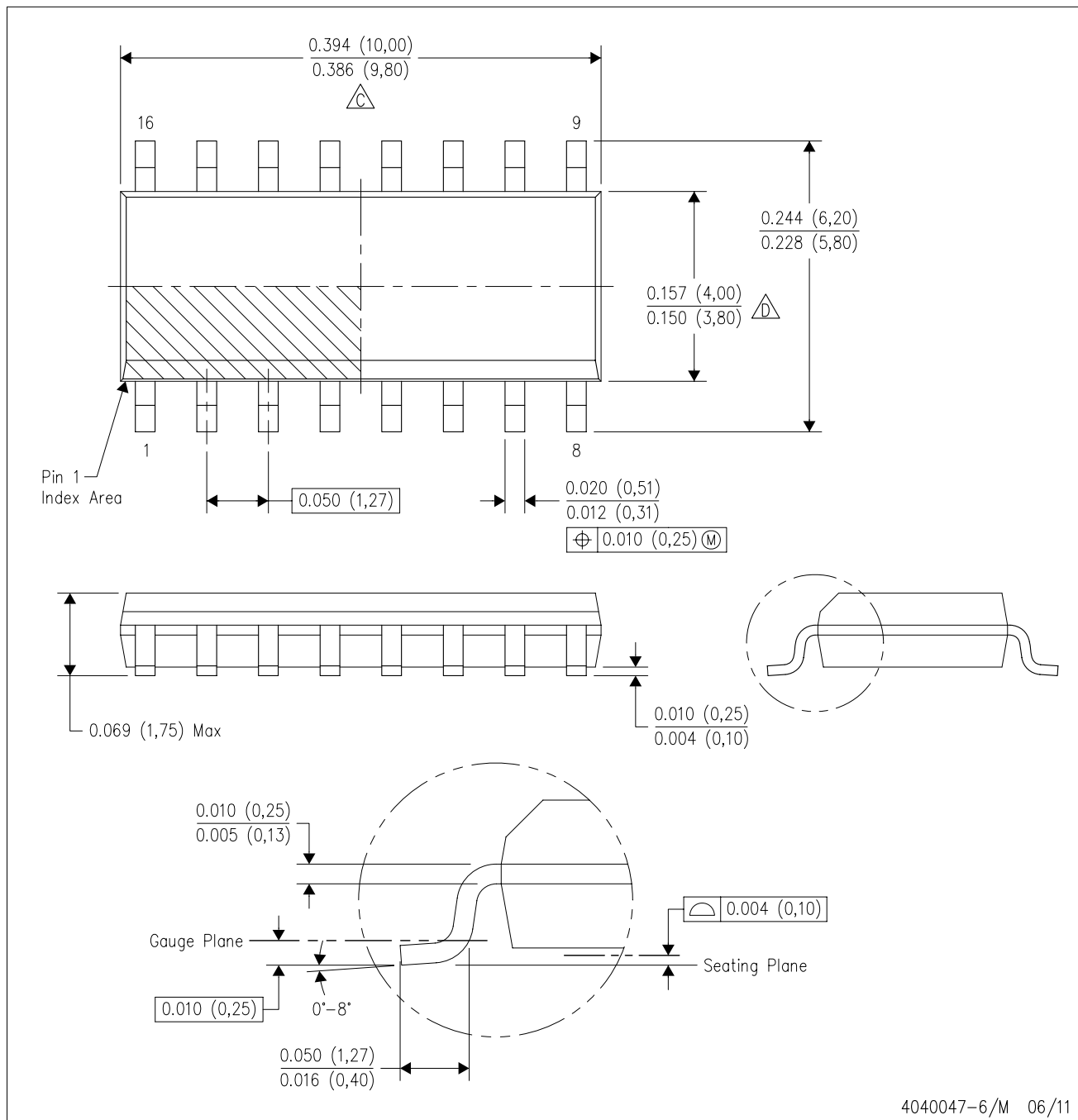


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
76017012A	FK	LCCC	20	55	506.98	12.06	2030	NA
JM38510/30908BFA	W	CFP	16	25	506.98	26.16	6220	NA
JM38510/30908BFA.A	W	CFP	16	25	506.98	26.16	6220	NA
M38510/30908BFA	W	CFP	16	25	506.98	26.16	6220	NA
SN74LS253N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS253N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS253N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS253N.A	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54LS253FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LS253FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA

D (R-PDSO-G16)

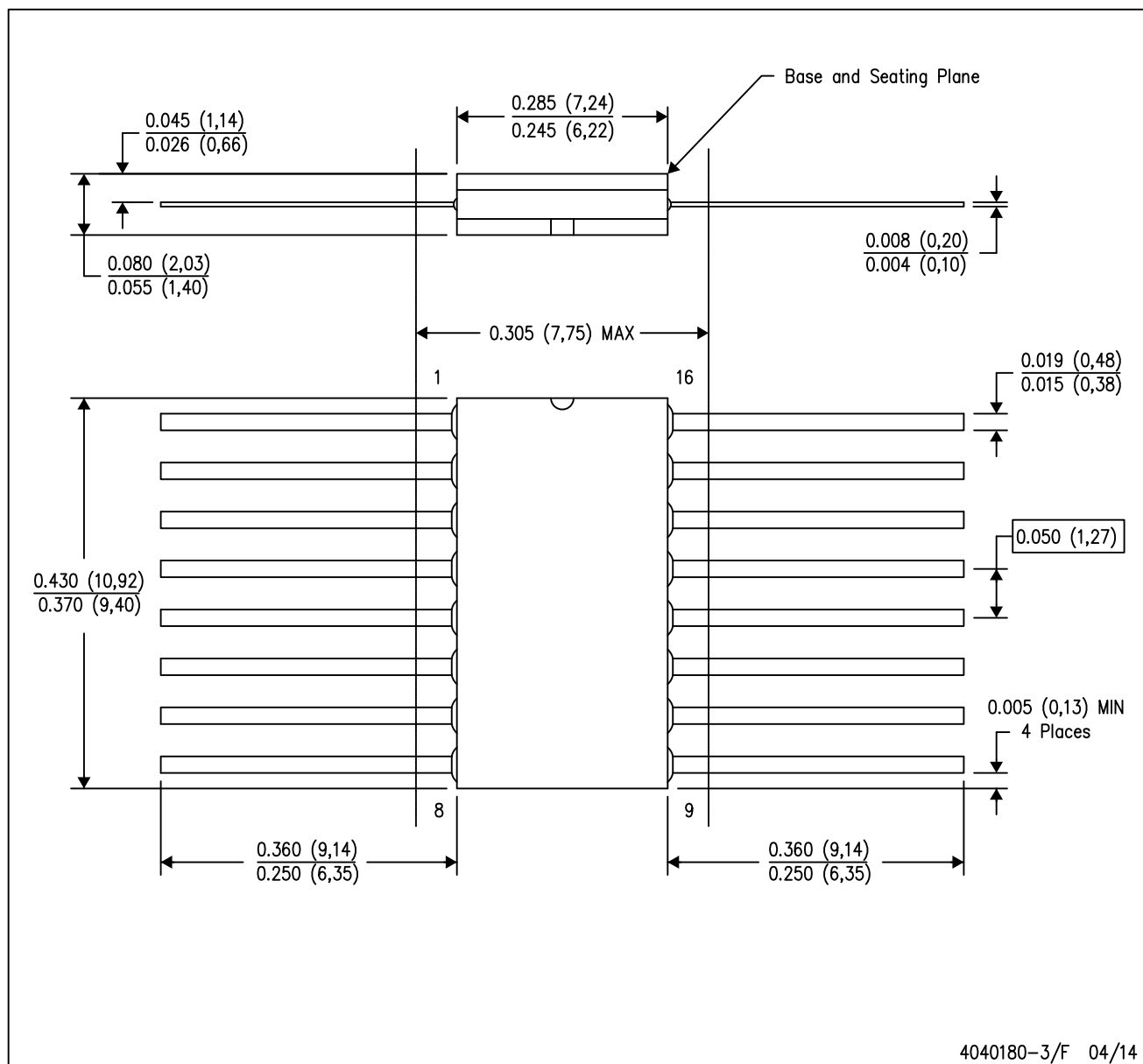
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AC.

W (R-GDFP-F16)

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-F16

GENERIC PACKAGE VIEW

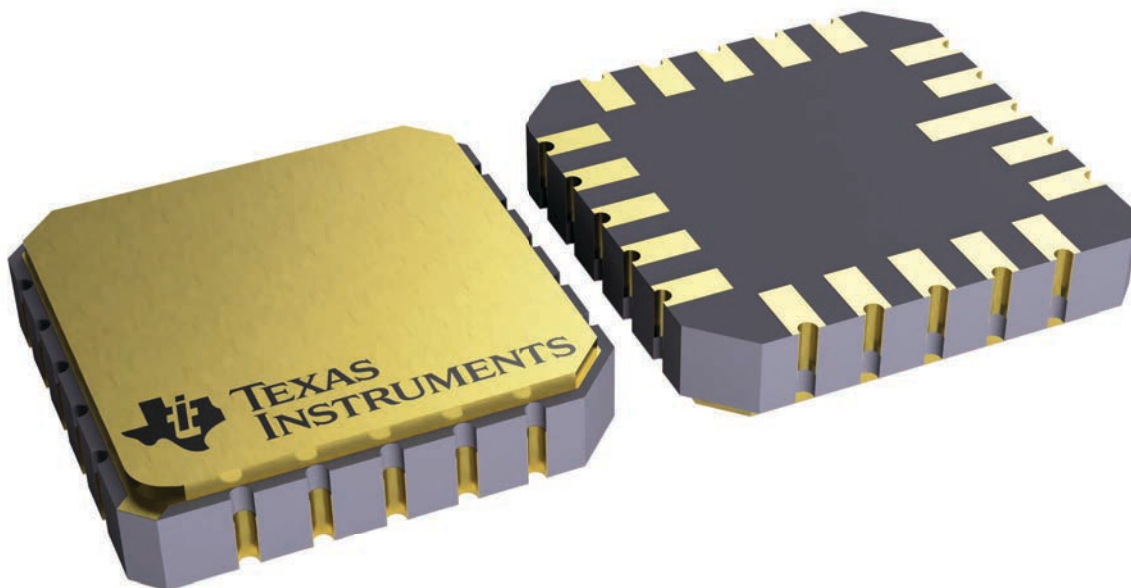
FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

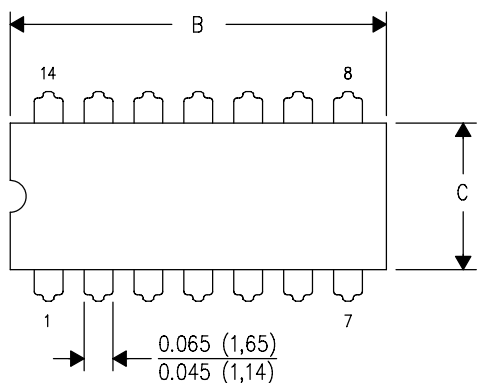


4229370VA\

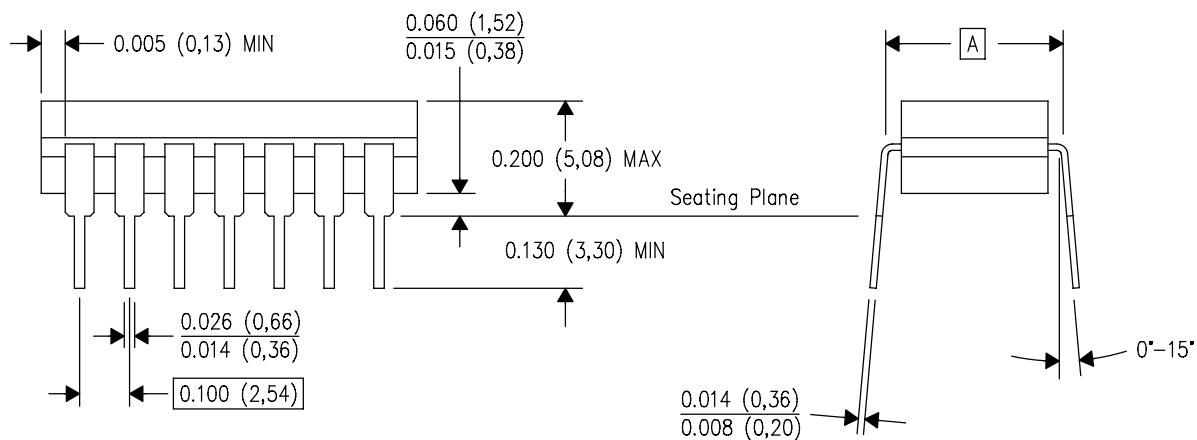
J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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)



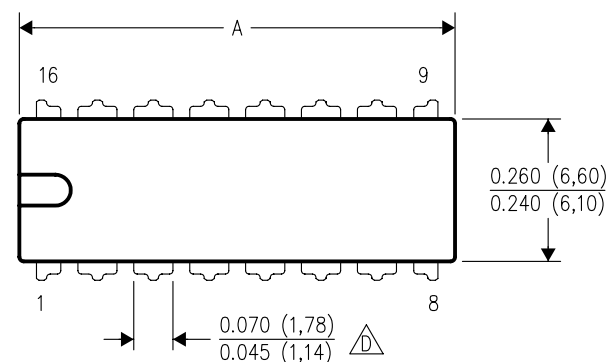
4040083/F 03/03

- 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.

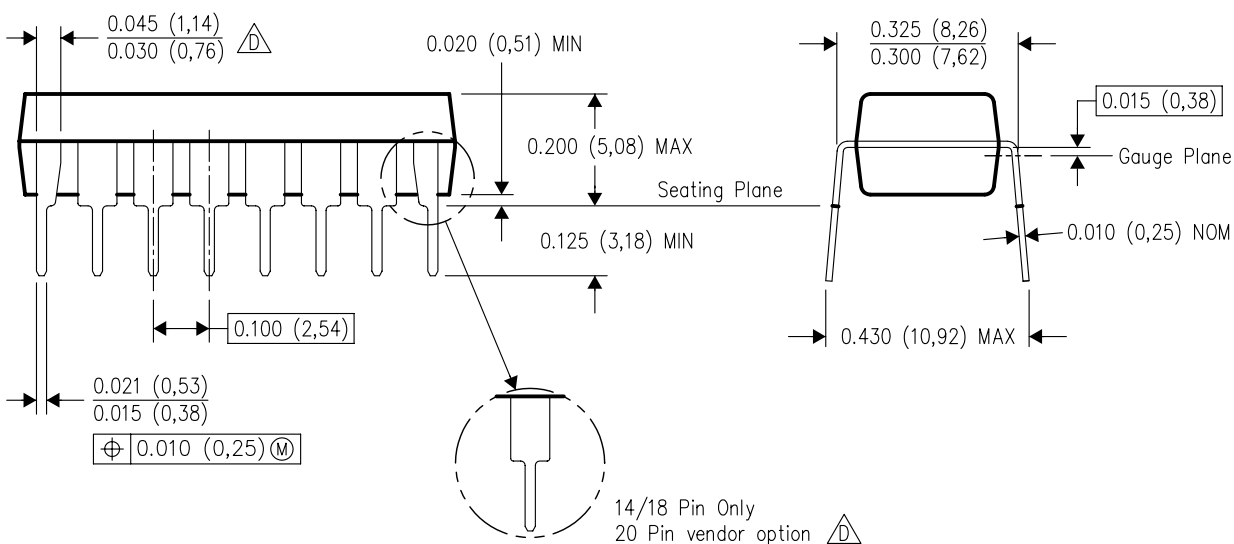
N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	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.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025