

# 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

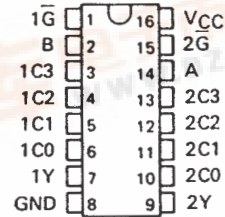
## description

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.

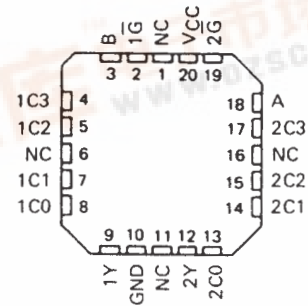
SN54LS253, SN54S253 . . . J OR W PACKAGE  
SN74LS253, SN74S253 . . . D OR N PACKAGE

(TOP VIEW)



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	$\bar{G}$	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)

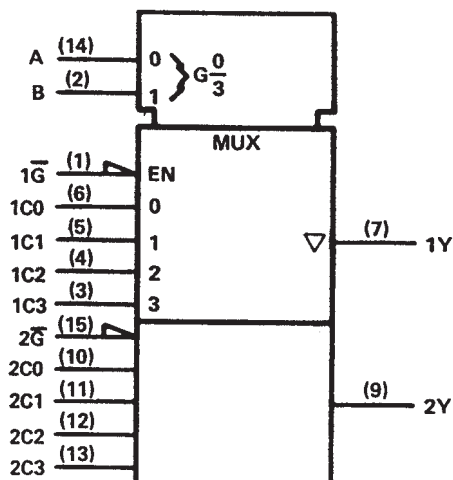
Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage: 'LS253	7 V
'S253	5.5 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS253, SN54S253	– 55°C to 125°C
SN74LS253, SN74S253	0°C to 70°C
Storage temperature range	– 65°C to 150°C

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

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

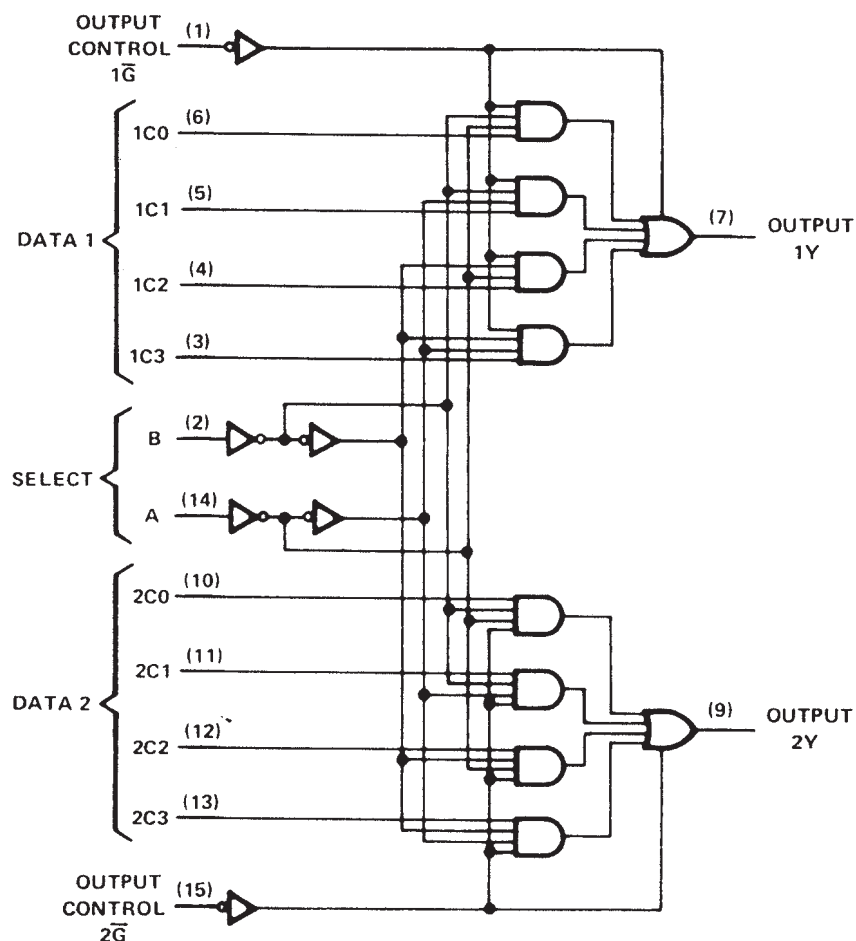
SDLS147 – SEPTEMBER 1972 – REVISED MARCH 1988

logic symbol†



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

logic diagram (positive logic)

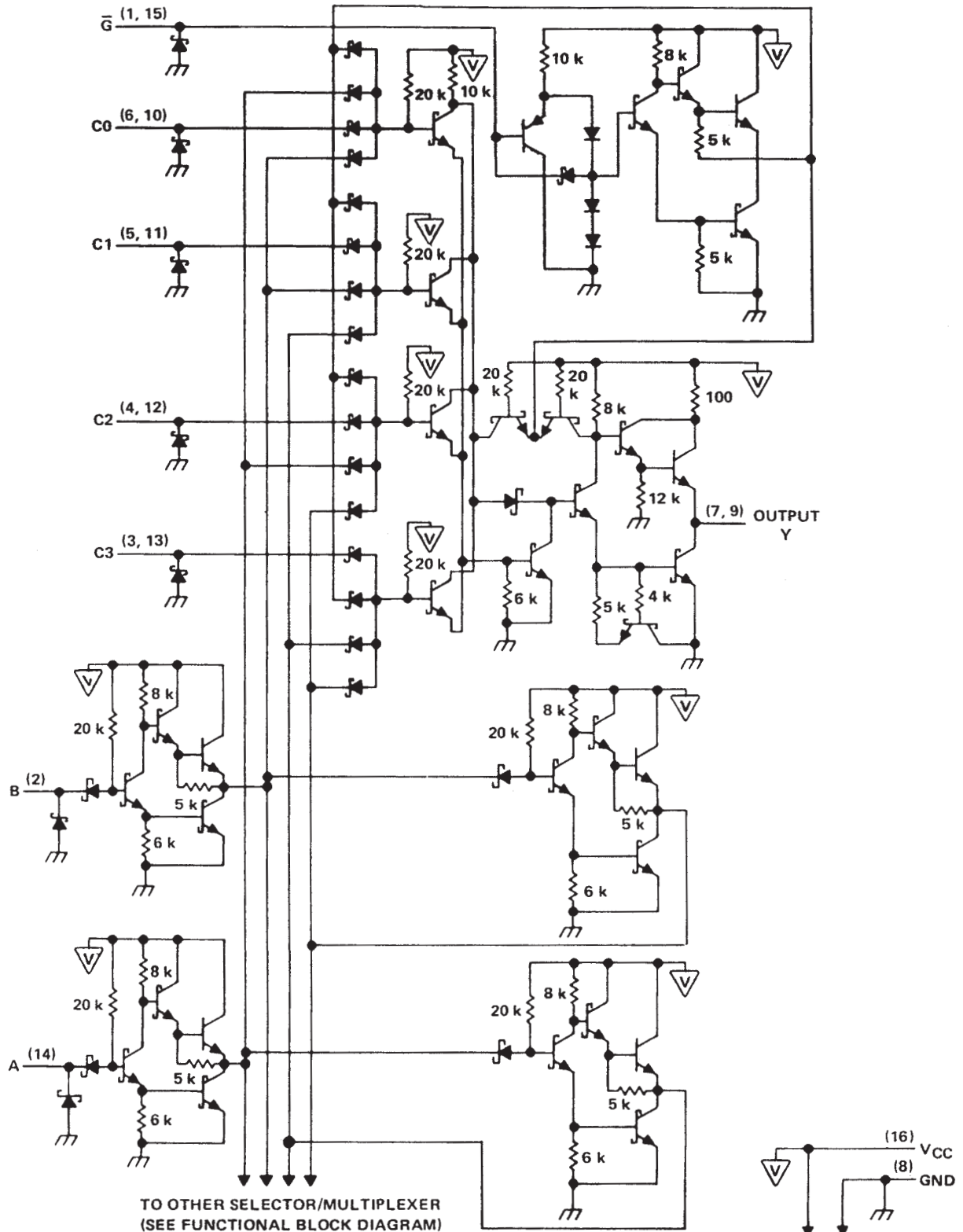


Pin numbers shown are for D, J, N, and W packages.

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

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schematic (each selector/multiplexer, and the common select section)



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

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#### 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	TYP‡ MAX	
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = − 18 mA		− 1.5		− 1.5		V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, I <sub>OH</sub> = MAX		2.4	3.4	2.4	3.1	V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX	I <sub>OL</sub> = 4 mA	0.25 0.4		0.25 0.4		V
		I <sub>OL</sub> = 8 mA			0.25 0.5		
I <sub>OZ</sub>	V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V	V <sub>O</sub> = 2.7 V	20		20		μA
		V <sub>O</sub> = 0.4 V	− 20		− 20		
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.1		0.1		mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		20		20		μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V	$\overline{G}$	− 0.2		− 0.2		mA
		All other	− 0.4		− 0.4		
I <sub>OS</sub> §	V <sub>CC</sub> = MAX		− 30	− 130	− 30	− 130	mA
I <sub>CC</sub>	V <sub>CC</sub> = 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  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

§ 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, $V_{CC} = 5 \text{ V}$ , $T_A = 25^\circ\text{C}$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	Data	Y	CL = 15 pF,      RL = 2 kΩ, See Note 3	17	25		ns
tPHL				13	20		
tPLH	Select	Y		30	45		ns
tPHL				21	32		
tPZH	Output Control	Y		15	28		ns
tPZL				15	23		
tPHZ	Output Control	Y	CL = 5 pF,      RL = 2 kΩ, See Note 3	27	41		ns
tPLZ				18	27		

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

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

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## recommended operating conditions

	SN54S253			SN74S253			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage			0.8			0.8	V
I <sub>OH</sub> High-level output current			– 2			– 6.5	mA
I <sub>OL</sub> Low-level output current			20			20	mA
T <sub>A</sub> 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 <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = – 18 mA				– 1.2	V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = MAX	Series 54S	2.5	3.4		V
		Series 74S	2.7	3.4		
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OL</sub> = 20 mA				0.5	V
I <sub>OZ</sub>	V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V	V <sub>O</sub> = 2.4 V			50	μA
		V <sub>O</sub> = 0.5 V			– 50	
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V				1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V				50	μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5 V	$\overline{G}$ = 0.8 V			– 2	mA
		$\overline{G}$ = 2 V			– 0.25	
I <sub>OS</sub> §	V <sub>CC</sub> = MAX		– 40		– 100	mA
I <sub>CC</sub>	V <sub>CC</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

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

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

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
76017012A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
7601701EA	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
7601701EA	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
7601701FA	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC
7601701FA	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30908B2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30908B2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30908BEA	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30908BEA	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30908BFBA	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30908BFBA	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC
SN54LS253J	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
SN54LS253J	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
SN74LS253D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SN74LS253J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SN74LS253N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS253N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS253N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74LS253N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74LS253NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS253NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS253NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS253NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM



Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
no Sb/Br)								
SN74LS253NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74S253N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74S253N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SNJ54LS253FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS253FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS253J	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS253J	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS253W	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS253W	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

**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)

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

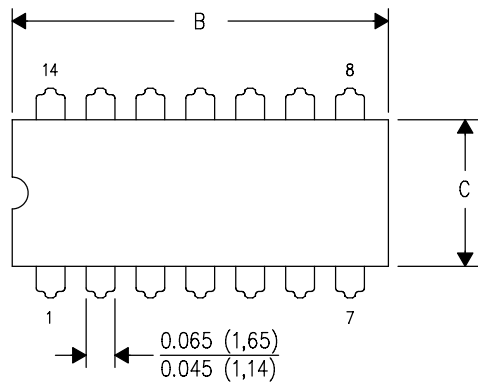
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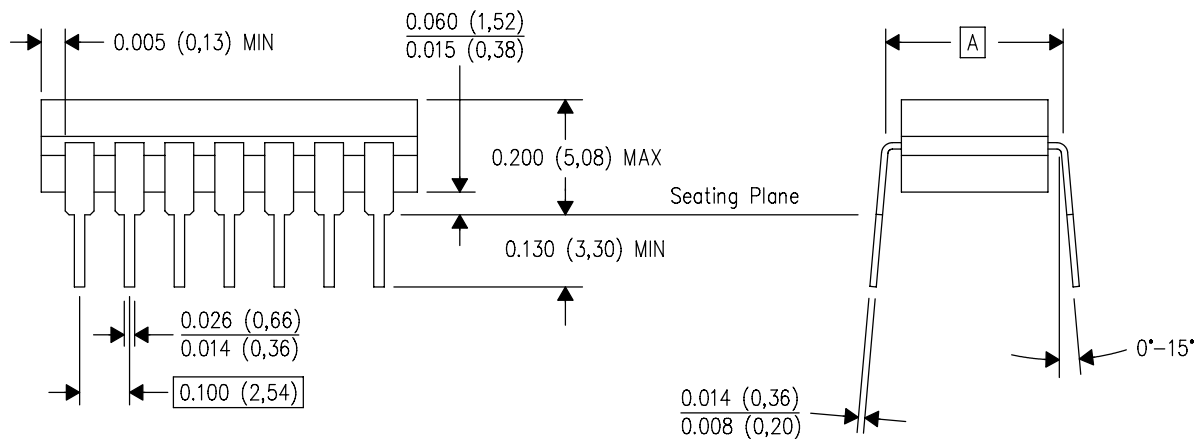
J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	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)



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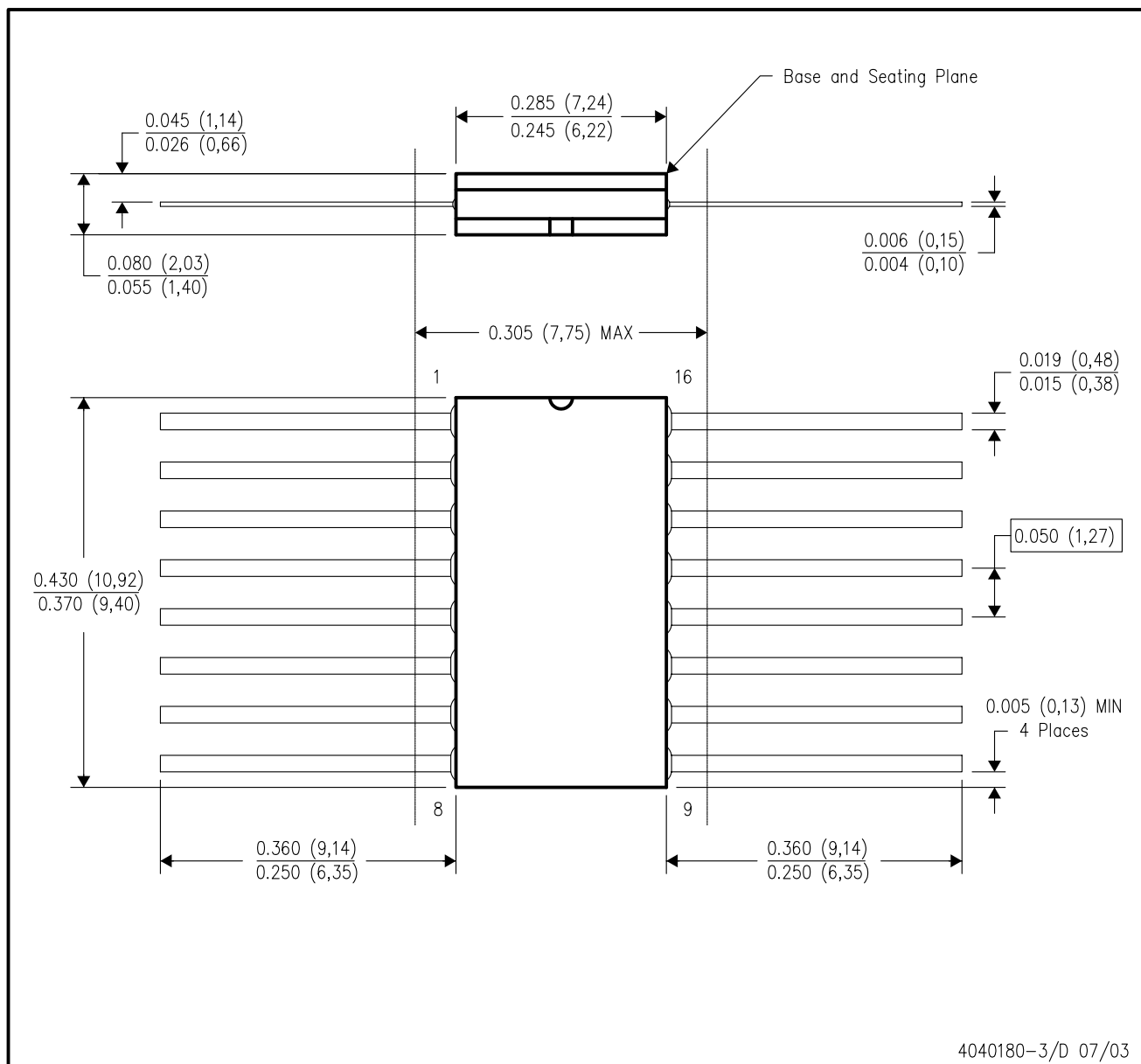
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.



## MECHANICAL DATA

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



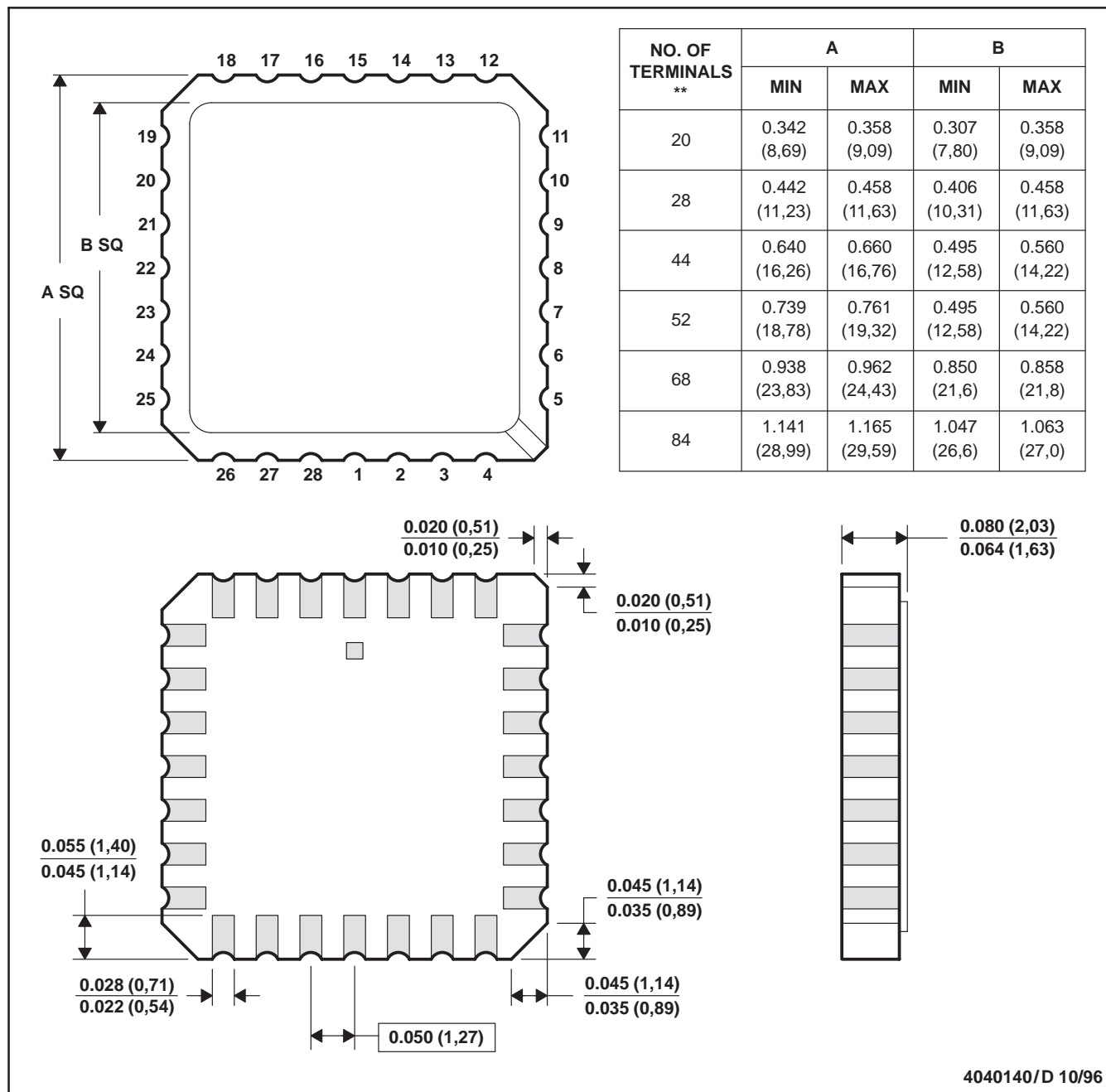
# MECHANICAL DATA

MLCC006B – OCTOBER 1996

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



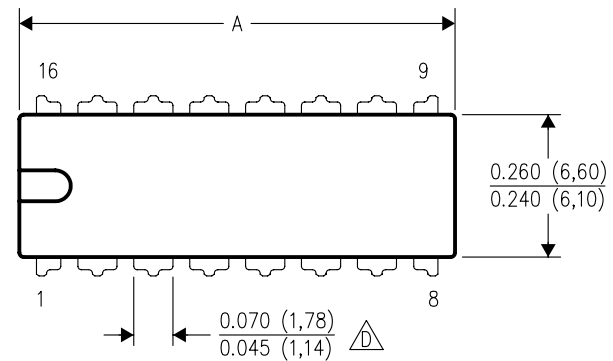
- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - The terminals are gold plated.
  - Falls within JEDEC MS-004

## MECHANICAL DATA

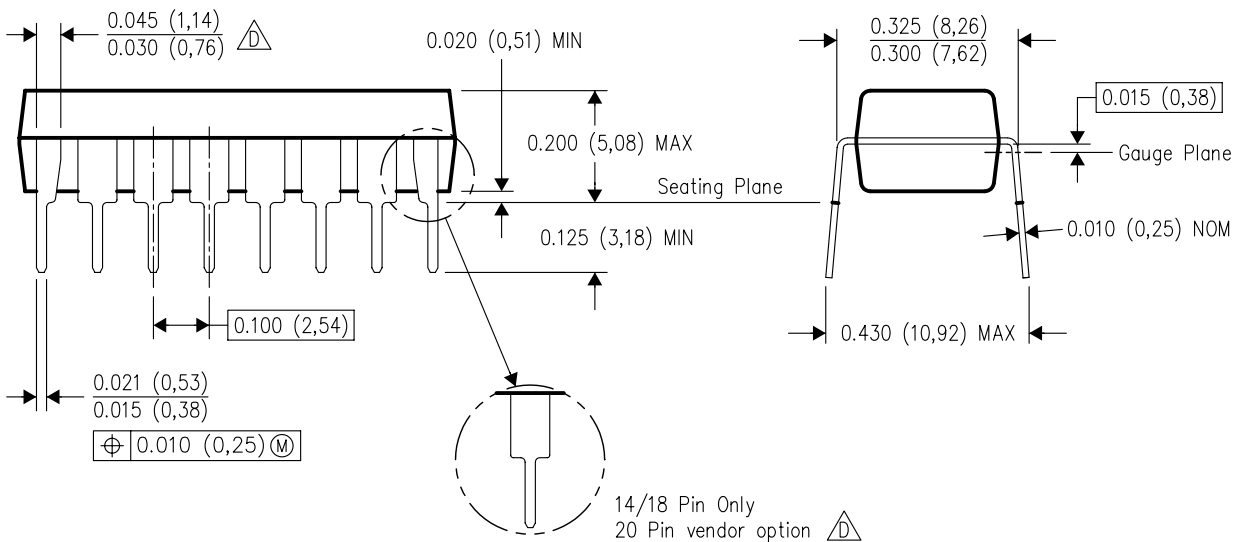
N (R-PDIP-T\*\*)

16 PINS SHOWN

# PLASTIC DUAL-IN-LINE PACKAGE





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

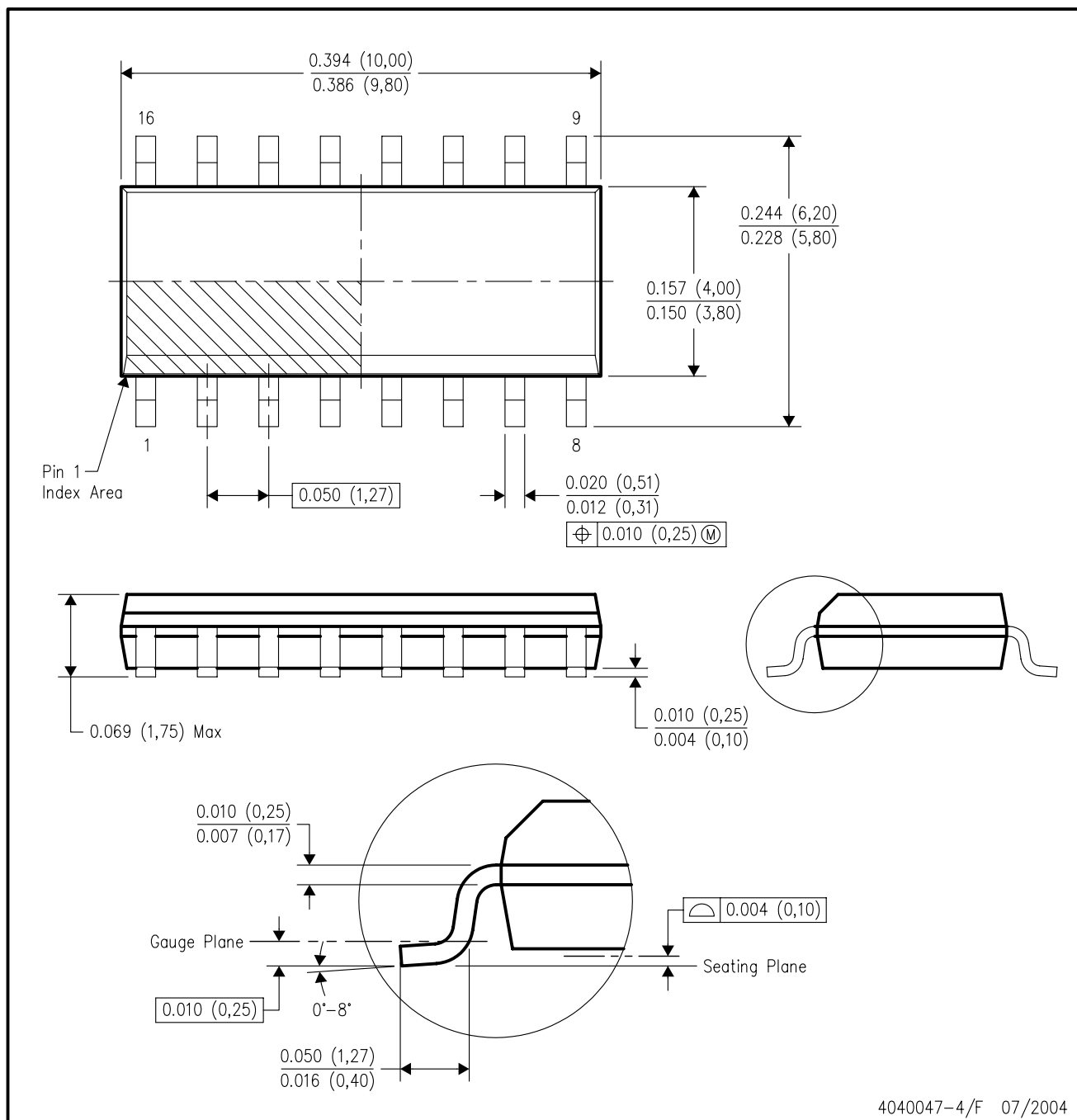
NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
-  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.

# MECHANICAL DATA

## D (R-PDSO-G16)

## PLASTIC SMALL-OUTLINE PACKAGE



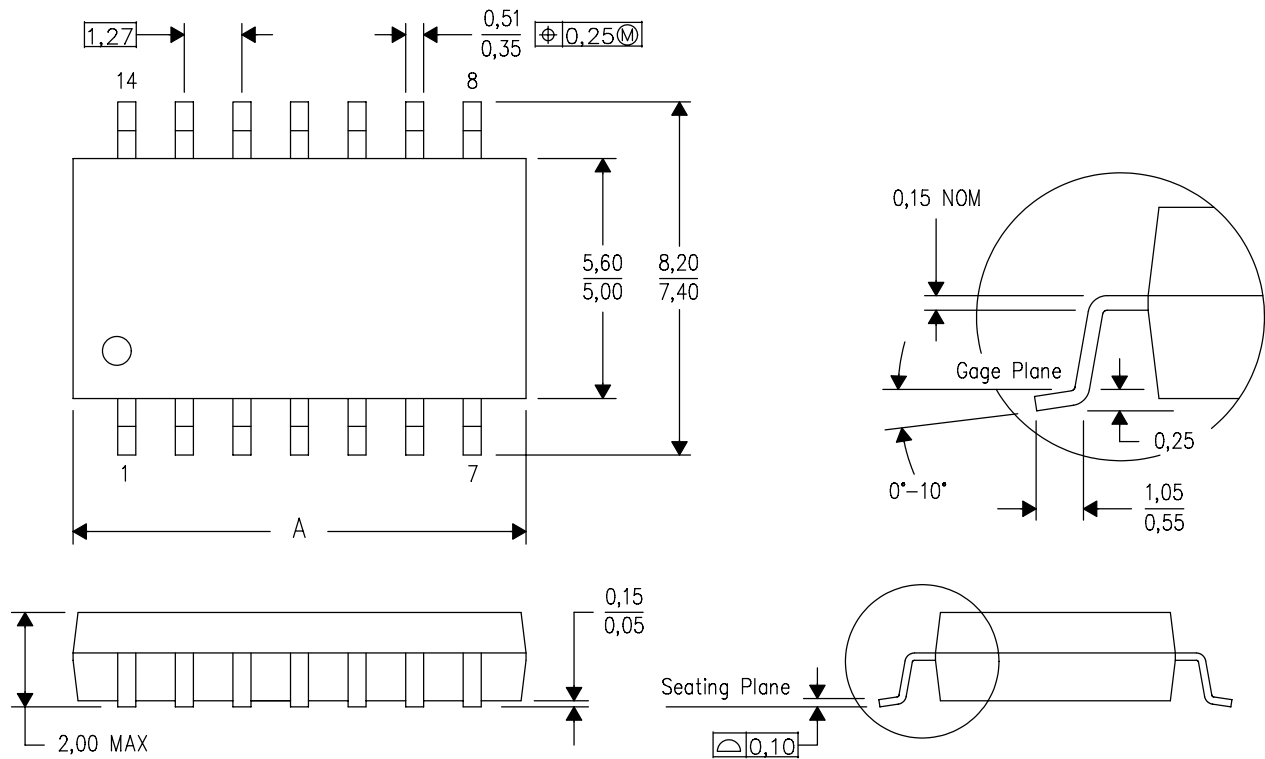
4040047-4/F 07/2004

## MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	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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