

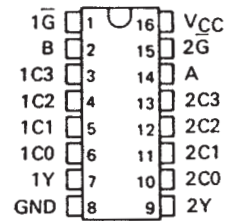
# SN54LS253, SN54S253, SN74LS253, SN74S253 DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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

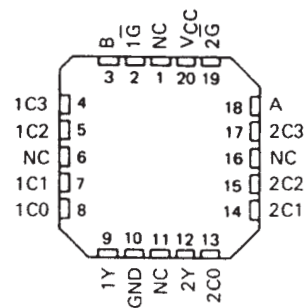
SN54LS253, SN54S253 . . . J OR W PACKAGE  
SN74LS253, SN74S253 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS253, SN54S253 . . . FK PACKAGE

(TOP VIEW)



NC-No internal connection

## 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.

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 <sub>CC</sub> (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.



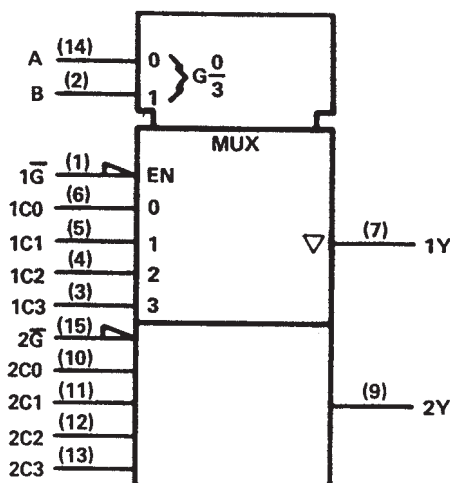
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# SN54LS253, SN54S253, SN74LS253, SN74S253 DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

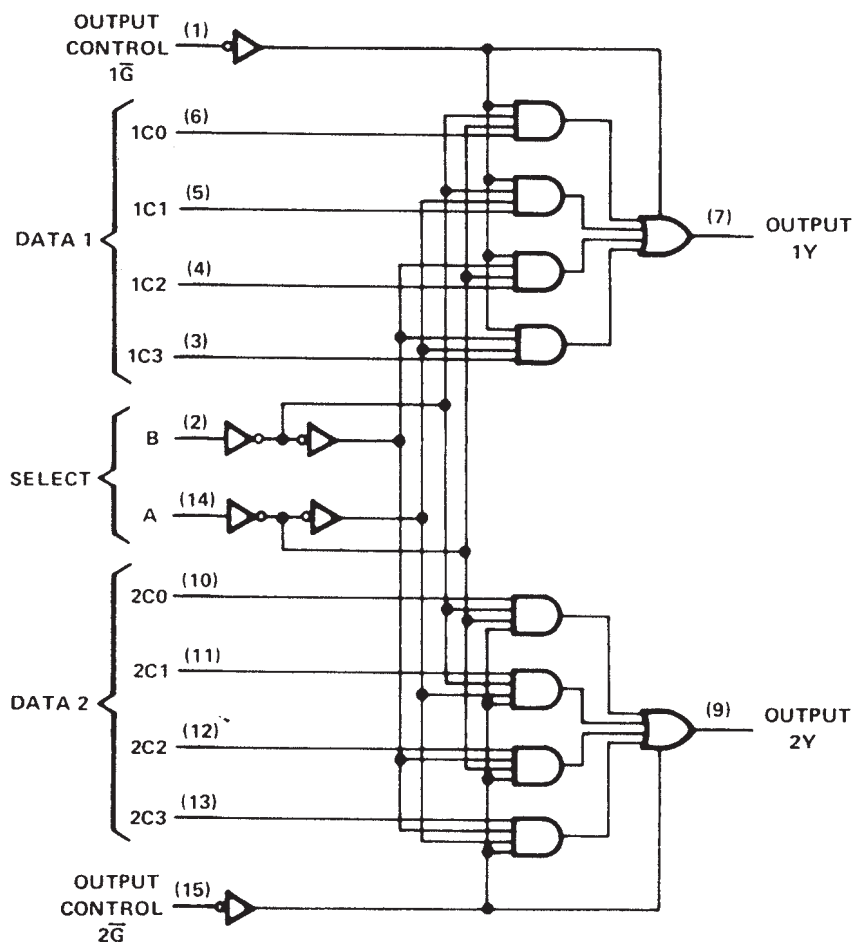
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## logic symbol†



† 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 D, J, N, and W packages.

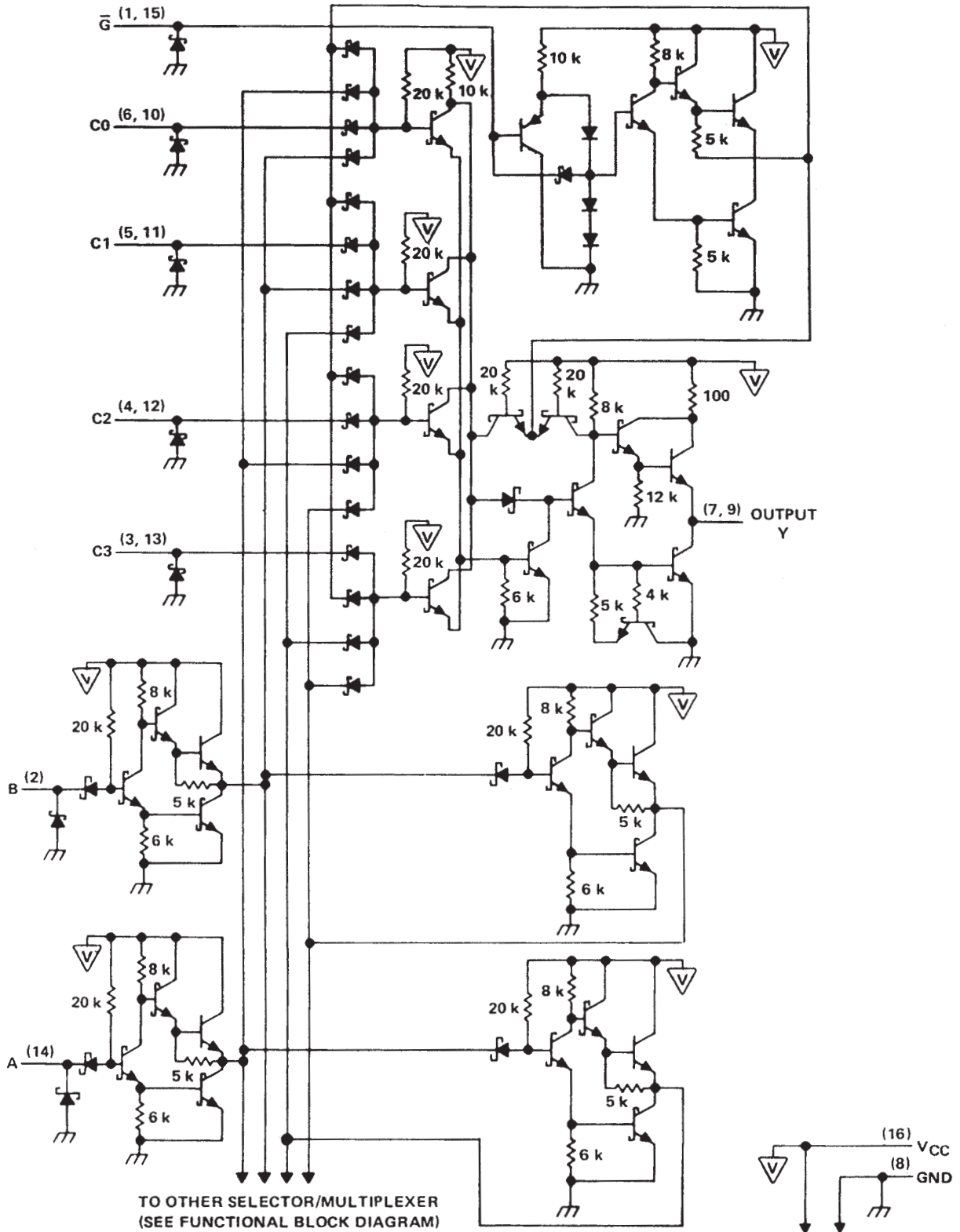


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# SN54LS253, SN54S253, SN74LS253, SN74S253 DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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



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



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# 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 <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	0.7			0.8			V
I <sub>OH</sub> High-level output current	-1			-2.6			mA
I <sub>OL</sub> Low-level output current	4			8			mA
T <sub>A</sub> Operating free-air temperature	-55			125			°C

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

PARAMETER	TEST CONDITIONS†	SN54LS253		SN74LS253		UNIT
		MIN	TYP‡	MAX	MIN	
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	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		μA
		V <sub>O</sub> = 0.4 V		-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	G̅		-0.2		mA
		All other		-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	mA
		Condition B		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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<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	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ, See Note 3	17	25	ns	
t <sub>PHL</sub>				13	20		
t <sub>PLH</sub>	Select	Y		30	45	ns	
t <sub>PHL</sub>				21	32		
t <sub>PZH</sub>	Output	Y		15	28	ns	
t <sub>PZL</sub>	Control			15	23		
t <sub>PHZ</sub>	Output	Y	C <sub>L</sub> = 5 pF, R <sub>L</sub> = 2 kΩ, See Note 3	27	41	ns	
t <sub>PLZ</sub>				Control	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			°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	$\bar{G}$ = 0.8 V	-2		mA
		$\bar{G}$ = 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
JM38510/30908BFA	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30908BFA	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)



4040083/F 03/03

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



W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



4040180-3/D 07/03

- 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 GDFP1-F16 and JEDEC MO-092AC

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



4040140/D 10/96

- 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. The terminals are gold plated.
  - E. Falls within JEDEC MS-004

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-012 variation AC.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- 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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