

SNx4HC153 Dual 4-Line To 1-Line Data Selectors/Multiplexers

1 Features

- Wide operating voltage range of 2 V to 6 V
- Outputs can drive up to 15 LSTTL loads
- Low power consumption, 80- μ A max I_{CC}
- Typical $t_{pd} = 9$ ns
- ± 6 -mA output drive at 5 V
- Low input current of 1 μ A max
- Permit multiplexing from n lines to one line
- Perform parallel-to-serial conversion
- Strobe (enable) line provided for cascading (N lines to n lines)

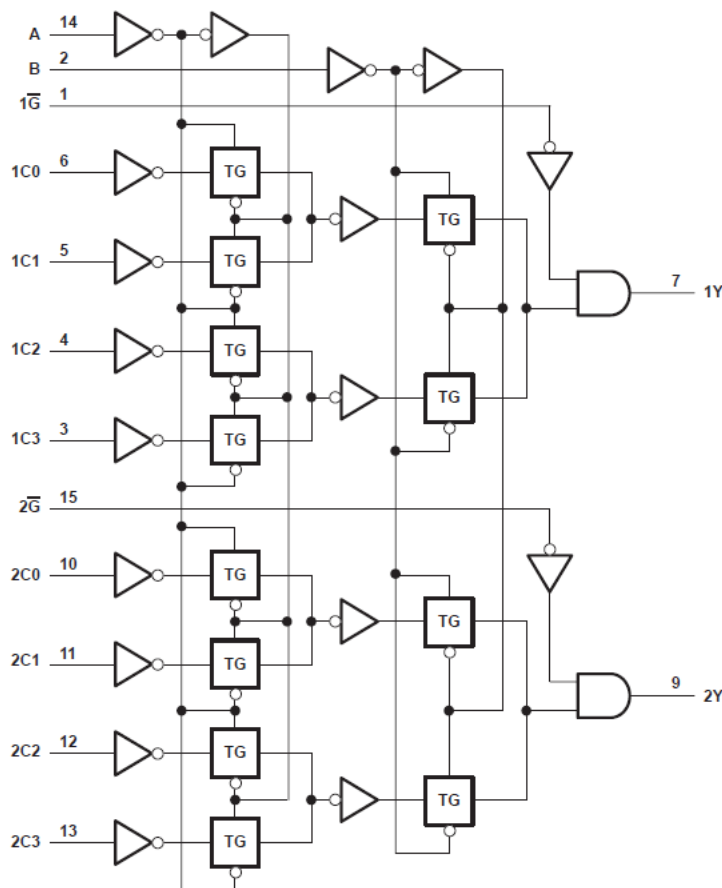
2 Description

The SNx4HC153 is a dual data selector/multiplexer containing full binary decoding to select one of four data sources. Both channels are controlled by the same address select inputs, and each channel includes its own strobe (\overline{G}) input. A high level at the strobe terminal forces the respective output low.

Device Information

PART NUMBER	PACKAGE ⁽¹⁾	BODY SIZE (NOM)
SN74HC153D	SOIC (16)	9.90 mm \times 3.90 mm
SN74HC153N	PDIP (16)	19.31 mm \times 6.35 mm
SN74HC153NS	SO (16)	6.20 mm \times 5.30 mm
SN74HC153PW	TSSOP (16)	5.00 mm \times 4.40 mm
SN54HC153J	CDIP (16)	24.38 mm \times 6.92 mm
SNJ54HC153FK	LCCC (20)	8.89 mm \times 8.45 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Pin numbers are for the D, J, N, NS, PW, and W packages.

Functional Block Diagram



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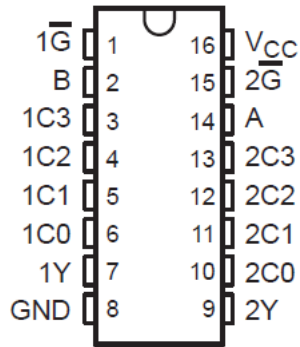
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3 Revision History

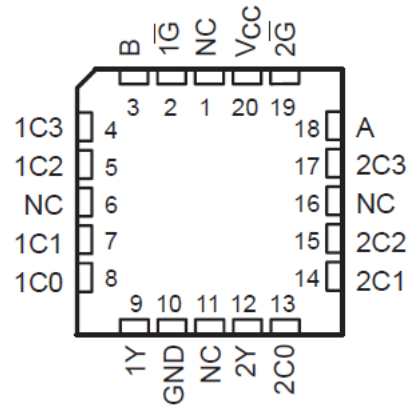
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision D (October 2003) to Revision E (February 2022)	Page
• Updated the numbering, formatting, tables, figures, and cross-references throughout the document to reflect modern data sheet standards.....	1

4 Pin Configuration and Functions



J, W, D, N, NS, or PW Package
16-Pin CDIP, CFP, SOIC, PDIP, SO, or TSSOP
Top View



NC - No internal connection

FK Package
20-Pin LCCC
Top View

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	7	V
I _{IK}	Input clamp current ⁽²⁾	V _I < 0 or V _I > V _{CC}	±20	mA
I _{OK}	Output clamp current ⁽²⁾	V _O < 0 or V _O > V _{CC}	±20	mA
I _O	Continuous output current	V _O = 0 to V _{CC}	±35	mA
	Continuous current through V _{CC} or GND		±70	mA
T _J	Junction temperature		150	°C
T _{stg}	Storage temperature	-65	150	°C

- (1) 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 [Section 5.2](#) is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 Recommended Operating Conditions⁽¹⁾

		SN54HC153			SN74HC153			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	2	5	6	2	5	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5		1.5			V
		V _{CC} = 4.5 V	3.15		3.15			
		V _{CC} = 6 V	4.2		4.2			
V _{IL}	Low-level input voltage	V _{CC} = 2 V		0.5		0.5		V
		V _{CC} = 4.5 V		1.35		1.35		
		V _{CC} = 6 V		1.8		1.8		
V _I	Input voltage	0		V _{CC}	0		V _{CC}	V
V _O	Output voltage	0		V _{CC}	0		V _{CC}	V
Δt/Δv	Input transition rise/fall time	V _{CC} = 2 V		1000		1000		ns
		V _{CC} = 4.5 V		500		500		
		V _{CC} = 6 V		400		400		
T _A	Operating free-air temperature	-55		125	-40		85	°C

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number [SCBA004](#).

5.3 Thermal Information

THERMAL METRIC ⁽¹⁾		D (SOIC)	N (PDIP)	NS (SO)	PW (TSSOP)	UNIT
		16 PINS	16 PINS	16 PINS	16 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	73	67	64	108	°C/W

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC package thermal metrics](#) application report.

5.4 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS ⁽¹⁾	V _{CC} (V)	T _A = 25°C			SN54HC153		SN74HC153		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = -20 μA	2	1.9	1.998		1.9		1.9	V	
		4.5	4.4	4.499		4.4		4.4		
		6	5.9	5.999		5.9		5.9		
	I _{OH} = -6 mA	4.5	3.98	4.3		3.7		3.84		
	I _{OH} = -7.8 mA	6	5.48	5.8		5.2		5.34		
V _{OL}	I _{OL} = 20 μA	2		0.002	0.1		0.1		0.1	
		4.5		0.001	0.1		0.1		0.1	
		6		0.001	0.1		0.1		0.1	
	I _{OL} = 6 mA	4.5		0.17	0.26		0.4		0.33	
	I _{OL} = 7.8 mA	6		0.15	0.26		0.4		0.33	
I _I	V _I = V _{CC} or 0	6		±0.1	±100		±1000		±1000	nA
I _{CC}	V _I = V _{CC} or 0, I _O = 0	6			8		160		80	μA
C _i		2 to 6		3	10		10		10	pF

(1) V_I = V_{IH} or V_{IL}, unless otherwise noted.

5.5 Switching Characteristics

over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see [Figure 6](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} (V)	T _A = 25°C			SN54HC153		SN74HC153		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A or B	Y	2		90	150		225		190	ns
			4.5		21	30		45		38	
			6		17	26		38		32	
	Data (Any C)	Y	2		73	126		189		158	
			4.5		17	28		42		35	
			6		14	23		35		29	
	\bar{C}	Y	2		38	95		150		125	
			4.5		11	19		28		24	
			6		9	16		24		20	
t _t		Y	2		20	60		90		75	ns
			4.5		8	12		18		15	
			6		6	10		15		13	

5.6 Switching Characteristics

over recommended operating free-air temperature range, $C_L = 150$ pF (unless otherwise noted) (see [Figure 6](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} (V)	$T_A = 25^\circ\text{C}$			SN54HC153		SN74HC153		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	Y	2	105	235	355	295	ns			
			4.5	27	47	71	59				
			6	21	41	60	51				
	Data (Any C)	Y	2	93	220	335	274				
			4.5	23	44	67	55				
			6	19	38	57	48				
	\bar{G}	Y	2	60	185	280	230				
			4.5	17	37	56	46				
			6	14	32	48	40				
t_t		Y	2	45	210	315	265	ns			
			4.5	17	42	63	53				
			6	13	36	53	45				

5.7 Operating Characteristics

$T_A = 25^\circ\text{C}$

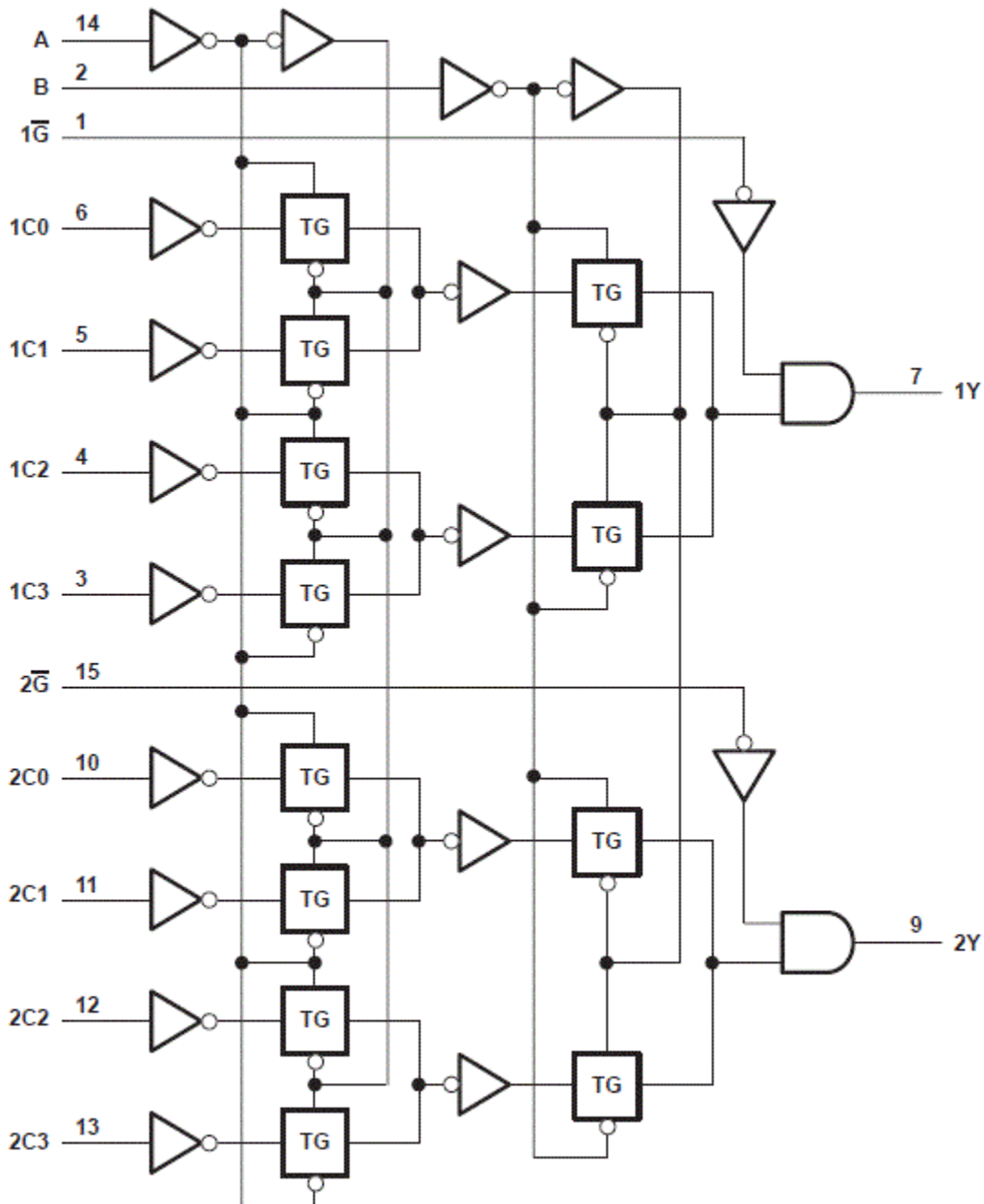
PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per multiplexer	No load	40	pF

7 Detailed Description

7.1 Overview

Each of these data selectors/multiplexers contains inverters and drivers to supply full binary decoding data selection to the AND-OR gates. Separate strobe (\overline{G}) inputs are provided for each of the two 4-line sections.

7.2 Functional Block Diagram



Pin numbers are for the D, J, N, NS, PW, and W packages.

7.3 Device Functional Modes

INPUTS							\bar{G}	OUTPUT Y
SELECT ⁽¹⁾		DATA						
B	A	C0	C1	C2	C3			
X	X	X	X	X	X	H	L	
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	

(1) Select inputs A and B are common to both sections.

8 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- μF capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- μF and 1- μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

9 Layout

9.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or V_{CC} , whichever makes more sense for the logic function or is more convenient.

10 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

10.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

10.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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10.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

10.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

10.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8409301VEA	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8409301VE A SNV54HC153J	Samples
5962-8409301VFA	ACTIVE	CFP	W	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8409301VF A SNV54HC153W	Samples
84093012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84093012A SNJ54HC 153FK	Samples
8409301EA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8409301EA SNJ54HC153J	Samples
SN54HC153J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54HC153J	Samples
SN74HC153DR	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HC153	Samples
SN74HC153N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC153N	Samples
SN74HC153NE4	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC153N	Samples
SN74HC153NSR	ACTIVE	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC153	Samples
SN74HC153PWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HC153	Samples
SNJ54HC153FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84093012A SNJ54HC 153FK	Samples
SNJ54HC153J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8409301EA SNJ54HC153J	Samples

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of ≤ 1000 ppm threshold. Antimony trioxide based flame retardants must also meet the ≤ 1000 ppm threshold requirement.

(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 finish/Ball material - Orderable Devices 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.

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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 SN54HC153, SN54HC153-SP, SN74HC153 :

● Catalog : [SN74HC153](#), [SN54HC153](#)

● Military : [SN54HC153](#)

● Space : [SN54HC153-SP](#)

NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

● Military - QML certified for Military and Defense Applications

- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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
SN74HC153DR	SOIC	D	16	2500	330.0	16.4	6.6	9.3	2.1	8.0	16.0	Q1
SN74HC153DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC153NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74HC153PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC153PWR	TSSOP	PW	16	2000	330.0	12.4	6.85	5.45	1.6	8.0	12.0	Q1
SN74HC153PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC153DR	SOIC	D	16	2500	366.0	364.0	50.0
SN74HC153DR	SOIC	D	16	2500	356.0	356.0	35.0
SN74HC153NSR	SO	NS	16	2000	356.0	356.0	35.0
SN74HC153PWR	TSSOP	PW	16	2000	356.0	356.0	35.0
SN74HC153PWR	TSSOP	PW	16	2000	366.0	364.0	50.0
SN74HC153PWR	TSSOP	PW	16	2000	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-8409301VFA	W	CFP	16	25	506.98	26.16	6220	NA
84093012A	FK	LCCC	20	1	506.98	12.06	2030	NA
SN74HC153N	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC153N	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC153NE4	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC153NE4	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54HC153FK	FK	LCCC	20	1	506.98	12.06	2030	NA

W (R-GDFP-F16)

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-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



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.



PACKAGE OUTLINE

NS0016A

SOP - 2.00 mm max height

SOP



NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

4220735/A 12/2021

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.



4220204/A 02/2017

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220204/A 02/2017

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220204/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



4040049/E 12/2002

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

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