







SN54HC153, SN74HC153 SCLS112E - DECEMBER 1982 - REVISED FEBRUARY 2022

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-µA max I_{CC}
- Typical $t_{pd} = 9 \text{ ns}$
- ±6-mA output drive at 5 V
- Low input current of 1 µA 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)

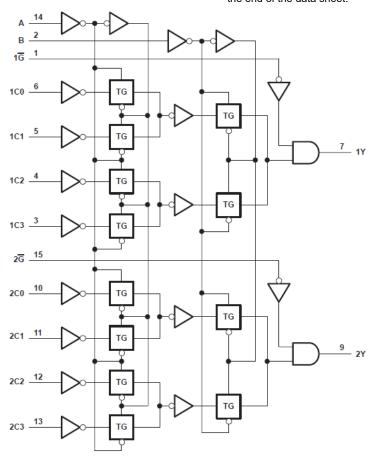
2 Description

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 repective output low.

Device Information

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

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



Table of Contents

1 Features1	7.1 Overview
2 Description1	7.2 Functional Block Diagram
3 Revision History2	7.3 Device Functional Modes
4 Pin Configuration and Functions3	8 Power Supply Recommendations10
5 Specifications4	9 Layout10
5.1 Absolute Maximum Ratings4	9.1 Layout Guidelines10
5.2 Recommended Operating Conditions ⁽¹⁾	10 Device and Documentation Support11
5.3 Thermal Information4	10.1 Receiving Notification of Documentation Updates 11
5.4 Electrical Characteristics5	10.2 Support Resources11
5.5 Switching Characteristics5	10.3 Trademarks11
5.6 Switching Characteristics6	10.4 Electrostatic Discharge Caution11
5.7 Operating Characteristics6	10.5 Glossary11
6 Parameter Measurement Information7	11 Mechanical, Packaging, and Orderable
7 Detailed Description8	Information11

3 Revision History

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

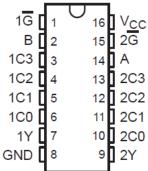
Changes from Revision D (October 2003) to Revision E (February 2022)

Page

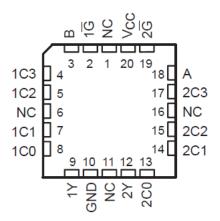
 Updated the numbering, formatting, tables, figures, and cross-references throughout the document to reflect modern data sheet standards......



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)

		<u> </u>	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
Io	Continuous output current	V _O = 0 to V _{CC}		±35	mA
	Continuous current through V _{CC} o	r GND		±70	mA
TJ	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.

5.2 Recommended Operating Conditions⁽¹⁾

			SN54HC153			SN	74HC153		UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage		2	5	6	2	5	6	V
		V _{CC} = 2 V	1.5			1.5			
V_{IH}	High-level input voltage	V _{CC} = 4.5 V	3.15			3.15			V
	V _{CC} = 6 V	4.2			4.2				
	V _{IL} Low-level input voltage	V _{CC} = 2 V			0.5			0.5	
V_{IL}		V _{CC} = 4.5 V			1.35			1.35	V
		V _{CC} = 6 V			1.8			1.8	
V _I	Input voltage		0		V _{CC}	0		V _{CC}	V
Vo	Output voltage		0		V _{CC}	0		V _{CC}	V
		V _{CC} = 2 V			1000			1000	
Δt/Δν	Δt/Δv Input transition rise/fall time	V _{CC} = 4.5 V			500			500	ns
		V _{CC} = 6 V			400			400	
T _A	Operating free-air temperatu	re	-55		125	-40		85	°C

⁽¹⁾ All unused inputs of the device must be held at VCCor 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

		D (SOIC)	N (PDIP)	NS (SO)	PW (TSSOP)	
THERMAL MET	RIC ⁽¹⁾	16 PINS	16 PINS	16 PINS	16 PINS	UNIT
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.

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⁽²⁾ The input and output voltage ratings may be exceeded if the input and output current ratings are observed.



5.4 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS(1)	V _{cc}	Т	A = 25°C		SN54HC	153	SN74HC1	53	UNIT
PARAMETER	1E31 CONDITIONS	(V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	ONII
		2	1.9	1.998		1.9		1.9		
	I _{OH} = -20 μA	4.5	4.4	4.499		4.4		4.4		
V _{OH}		6	5.9	5.999		5.9		5.9		V
	$I_{OH} = -6 \text{ mA}$ $I_{OH} = -7.8 \text{ mA}$	4.5	3.98	4.3		3.7		3.84		
		6	5.48	5.8		5.2		5.34		
		2		0.002	0.1		0.1		0.1	
	I _{OL} = 20 μA	4.5		0.001	0.1		0.1		0.1	
V _{OL}		6		0.001	0.1		0.1		0.1	V
	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	μΑ
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	то	V (V)	T _A	= 25°C		SN54HC153	SN74HC153	UNIT
PARAMETER	(INPUT)	(OUTPUT)	V _{CC} (V)	MIN	TYP	MAX	MIN MAX	MIN MAX	UNIT
			2		90	150	225	190	
	A or B	Y	4.5		21	30	45	38	
			6		17	26	38	32	
	Data		2		73	126	189	158	
t _{pd} Data (Any C)	Y	Υ	4.5		17	28	42	35	ns
	(/)		6		14	23	35	29	
			2		38	95	150	125	
	G	Υ	4.5		11	19	28	24	
			6		9	16	24	20	
			2		20	60	90	75	
t _t		Y	4.5		8	12	18	15	ns
			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	то	V _{CC} (V)	TA	= 25°C		SN54HC153	SN74HC153	UNIT				
FARAIVIETER	(INPUT)	(OUTPUT)	VCC (V)	MIN	TYP	MAX	MIN MAX	MIN MAX	ONII				
			2		105	235	355	295					
	A or B	Y	4.5		27	47	71	59					
			6		21	41	60	51					
	5 .		2		93	220	335	274					
t _{pd}	Data (Any C)				Y	4.5		23	44	67	55	ns	
	(, 0)		6		19	38	57	48					
			2		60	185	280	230					
	G	Y	4.5		17	37	56	46					
	J		J		6		14	32	48	40			
	t _t		2		45	210	315	265					
t _t					Y	4.5		17	42	63	53	ns	
											r	6	

5.7 Operating Characteristics

T_A = 25°C

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



6 Parameter Measurement Information

 t_{pd} is the maximum between t_{PLH} and t_{PHL}

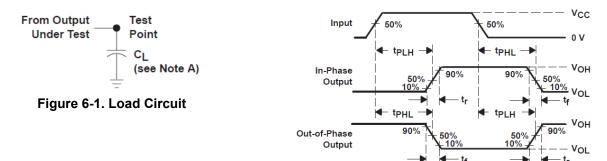


Figure 6-2. Voltage Waveforms
Propagation Delay and Output Transition Times

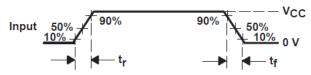


Figure 6-3. Voltage Waveform Input Rise and Fall Times

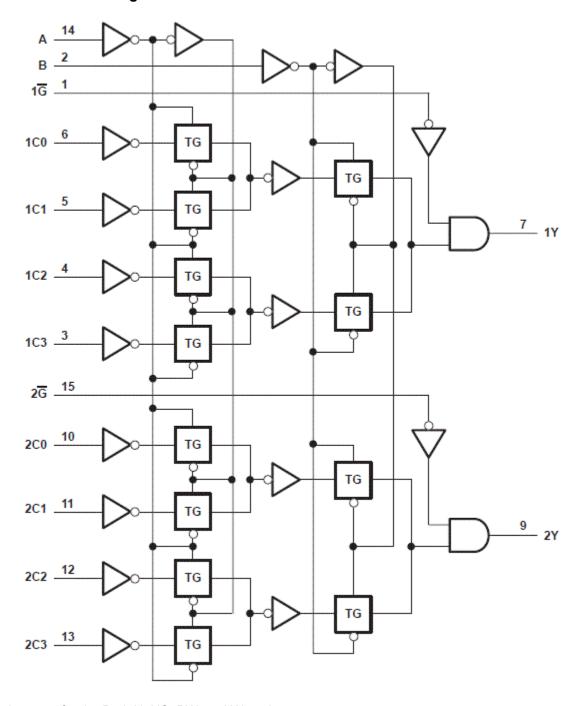
- A. C_I includes probe and jig capacitance.
- B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following charactersitics: PRR \leq 1 MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
- C. The outputs are measured one at a time with one input transition per measurement.

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				
SELE	CT ⁽¹⁾		DA	TA		G	OUTPUT Y
В	Α	C0	C1	C2	C3	G	
Х	Х	Х	Х	Х	Х	Н	L
L	L	L	Х	Х	Х	L	L
L	L	Н	Х	Х	Х	L	Н
L	Н	Х	L	Х	Х	L	L
L	Н	Х	Н	Х	Х	L	Н
Н	L	Х	Х	L	Х	L	L
Н	L	Х	Х	Н	Х	L	Н
Н	Н	Х	Х	Х	L	L	L
Н	Н	Х	Х	Х	Н	L	Н

⁽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- μ F capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- μ F and 1- μ F 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.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

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.

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PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	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	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84093012A SNJ54HC 153FK	Samples
8409301EA	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8409301EA SNJ54HC153J	Samples
SN54HC153J	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54HC153J	Samples
SN74HC153D	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-40 to 85	HC153	
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	SOP	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC153	Samples
SN74HC153PW	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85	HC153	
SN74HC153PWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HC153	Samples
SNJ54HC153FK	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84093012A SNJ54HC 153FK	Samples
SNJ54HC153J	ACTIVE	CDIP	J	16	25	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.



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(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 (CI) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm 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



PACKAGE OPTION ADDENDUM

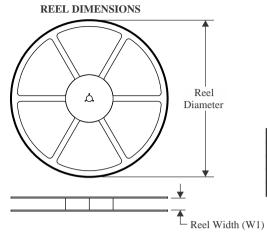
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• Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
В0	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

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		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	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC153NSR	SOP	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	6.9	5.6	1.6	8.0	12.0	Q1



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*All dimensions are nominal

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Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC153DR	SOIC	D	16	2500	356.0	356.0	35.0
SN74HC153NSR	SOP	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	356.0	356.0	35.0

PACKAGE MATERIALS INFORMATION

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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	55	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	55	506.98	12.06	2030	NA

D (R-PDS0-G16)

PLASTIC SMALL OUTLINE



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





SMALL OUTLINE PACKAGE



- 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.



SMALL OUTLINE PACKAGE



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.



SMALL OUTLINE PACKAGE



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**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- 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



- 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.





SOP



- 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.



SOF



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.



SOF



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.



W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



- 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



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.



14 LEADS SHOWN



- 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.

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