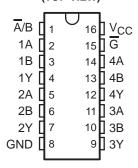
# SN54HC158, SN74HC158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

SCLS296D - JANUARY 1996 - REVISED OCTOBER 2003

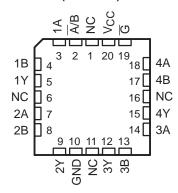
- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up To 15 LSTTL Loads
- Low Power Consumption, 80-μA Max I<sub>CC</sub>

SN54HC158 . . . J OR W PACKAGE SN74HC158 . . . D, N, NS, OR PW PACKAGE (TOP VIEW)



- Typical t<sub>pd</sub> = 11 ns
- ±6-mA Output Drive at 5 V
- Low Input Current of 1 μA Max

SN54HC158...FK PACKAGE (TOP VIEW)



NC - No internal connection

#### description/ordering information

These data selectors/multiplexers contain inverters and drivers that supply full data selection to the four output gates. A separate strobe  $(\overline{G})$  input is provided. A 4-bit word is selected from one of two sources and is routed to the four outputs. The 'HC158 devices' outputs provide inverted data.

#### **ORDERING INFORMATION**

TA	PACKA	GE <sup>†</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube of 25	SN74HC158N	SN74HC158N
		Tube of 40	SN74HC158D	
	SOIC - D	Reel of 2500	SN74HC158DR	HC158
4000 4 0500		Reel of 250	SN74HC158DT	
-40°C to 85°C	SOP - NS	Reel of 2000	SN74HC158NSR	HC158
		Tube of 90	SN74HC158PW	
	TSSOP - PW	Reel of 2000	SN74HC158PWR	HC158
		Reel of 250	SN74HC158PWT	
	CDIP – J	Tube of 25	SNJ54HC158J	SNJ54HC158J
-55°C to 125°C	CFP – W	Tube of 150	SNJ54HC158W	SNJ54HC158W
	LCCC – FK	Tube of 55	SNJ54HC158FK	SNJ54HC158FK

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

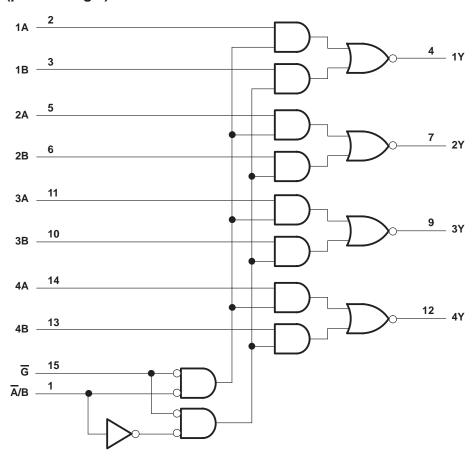


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#### **FUNCTION TABLE**

	INPUTS									
IG	SELECT	DA	TA	OUTPUT						
9	A/B	Α	В	·						
Н	Х	Х	Х	Н						
L	L	L	X	Н						
L	L	Н	X	L						
L	Н	Χ	L	Н						
L	Н	Χ	Н	L						

### logic diagram (positive logic)



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

# SN54HC158, SN74HC158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

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

Supply voltage range, V <sub>CC</sub>		0.5	V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see	ee Note 1)		±20 mA
Output clamp current, I <sub>OK</sub> (V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CO</sub>	C) (see Note 1)		±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	-		±35 mA
Continuous current through V <sub>CC</sub> or GND			±70 mA
Package thermal impedance, θ <sub>JA</sub> (see Note 2)	: D package		73°C/W
	N package		67°C/W
	NS package		64°C/W
	PW package	1	08°C/W
Storage temperature range, T <sub>sta</sub>		. −65°C to	o 150°C

<sup>†</sup> 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 "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

#### recommended operating conditions (see Note 3)

			SN	I54HC15	8	SN	174HC15	8	
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Vcc	Supply voltage		2	5	6	2	5	6	V
		V <sub>CC</sub> = 2 V	1.5			1.5			
VIH	High-level input voltage	V <sub>CC</sub> = 4.5 V	3.15		7	3.15			V
		VCC = 6 V	4.2		\C.V.	4.2			
		V <sub>CC</sub> = 2 V		PAL	0.5			0.5	
VIL	Low-level input voltage	V <sub>CC</sub> = 4.5 V		2	1.35			1.35	V
		V <sub>CC</sub> = 6 V		Ç,	1.8			1.8	
VI	Input voltage		0		VCC	0		VCC	V
VO	Output voltage		0		VCC	0		VCC	V
		V <sub>CC</sub> = 2 V			1000			1000	
Δt/Δν	Input transition rise/fall time	V <sub>CC</sub> = 4.5 V			500			500	ns
		V <sub>CC</sub> = 6 V			400			400	
TA	Operating free-air temperature		-55		125	-40		85	°C

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

<sup>2.</sup> The package thermal impedance is calculated in accordance with JESD 51-7.

## SN54HC158, SN74HC158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

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

				Т	A = 25°C	;	SN54H	C158	SN74H	IC158	
PARAMETER	TEST CO	ONDITIONS	vcc	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
			2 V	1.9	1.998		1.9		1.9		
		$I_{OH} = -20  \mu A$	4.5 V	4.4	4.499		4.4		4.4		
Voн	$V_{OH}$ $V_{I} = V_{IH} \text{ or } V_{IL}$		6 V	5.9	5.999		5.9		5.9		V
		$I_{OH} = -6 \text{ mA}$	4.5 V	3.98	4.3		3.7	TEL	3.84		
		$I_{OH} = -7.8 \text{ mA}$	6 V	5.48	5.8		5.2	Jel.	5.34		
			2 V		0.002	0.1		0.1		0.1	
		$I_{OL} = 20  \mu A$	4.5 V		0.001	0.1	Ö	0.1		0.1	
VOL	VI = VIH or VIL		6 V		0.001	0.1	9	0.1		0.1	V
		I <sub>OL</sub> = 6 mA	4.5 V		0.17	0.26	Q.	0.4		0.33	
		$I_{OL} = 7.8 \text{ mA}$	6 V		0.15	0.26		0.4		0.33	
lį	$V_I = V_{CC}$ or 0		6 V		±0.1	±100		±1000		±1000	nA
Icc	$V_I = V_{CC}$ or 0,	IO = 0	6 V			8		160		80	μΑ
Ci			2 V to 6 V		3	10		10		10	pF

# switching characteristics over recommended operating free-air temperature range, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

DADAMETED	FROM	то	\ \	T,	ղ = 25°C	;	SN54HC158	SN74HC158	LINUT		
PARAMETER	(INPUT)	(OUTPUT)	vcc	MIN	TYP	MAX	MIN MAX	MIN MAX	UNIT		
			2 V		63	125	190	160			
A or B	A or B	Υ	Υ	Υ	4.5 V		13	25	38	32	
			6 V		11	21	32	27			
			2 V		67	125	190	160			
t <sub>pd</sub>	Ā/B	Y	4.5 V		18	25	38	31	ns		
			6 V		14	21	32	27			
		Y	2 V		59	115	170	145			
	G		4.5 V		16	23	34	29			
			6 V		13	20	29	25			
			2 V		28	60	90	75			
t <sub>t</sub>		Υ	4.5 V		8	12	18	15	ns		
			6 V		6	10	15	13			

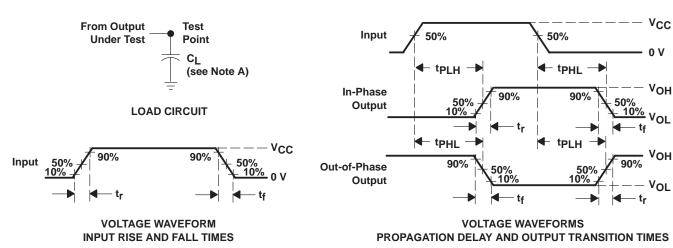
#### switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 150 pF (unless otherwise noted) (see Figure 1)

212115	FROM	то	.,	T,	4 = 25°C	;	SN54H	C158	SN74H	C158																								
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT																							
		Y	2 V		81	190		290		235																								
A or B	A or B		4.5 V		23	38		58		47																								
			6 V		18	33		49		41																								
			2 V		81	210		320		260																								
t <sub>pd</sub>	Ā/B	Y	4.5 V		23	42	70	64		52	ns																							
·			6 V		18	36	4	54		45																								
			2 V		91	190	37	290		235																								
	G	Y	4.5 V		24	38	0	58		47																								
			6 V		18	33	ď	49		41																								
			2 V		45	210		315		265																								
t <sub>t</sub>		Υ	Y	Υ	Υ	Y	Υ	Y	Y	Y	Y	Y	Υ	Y	Y	Y	Y	Y	Y	Y	Υ	Y	Y	Y	Y	4.5 V		17	42		63		53	ns
			6 V		13	36		53		45																								

#### operating characteristics, T<sub>A</sub> = 25°C

	PARAMETER	TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub> Power	dissipation capacitance	No load	40	pF

#### PARAMETER MEASUREMENT INFORMATION



NOTES: A. C<sub>L</sub> includes probe and test-fixture capacitance.

- B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  1 MHz,  $Z_0 = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.
- C. The outputs are measured one at a time with one input transition per measurement.
- D. tpLH and tpHL are the same as tpd.

Figure 1. Load Circuit and Voltage Waveforms









#### **PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN74HC158D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DT	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DTE4	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158DTG4	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HC158NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HC158NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158NSRG4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWT	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWTE4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC158PWTG4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

(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.



#### PACKAGE OPTION ADDENDUM

18-Sep-2008

**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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), 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.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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)

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

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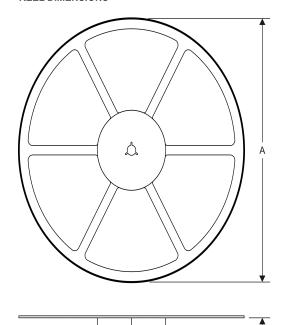
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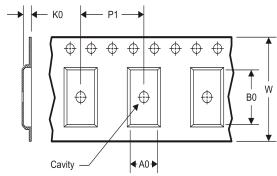
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#### TAPE AND REEL INFORMATION

#### **REEL DIMENSIONS**







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

#### TAPE AND REEL INFORMATION

#### \*All dimensions are nominal

All dimensions are nominal												
Device	_	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HC158DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC158NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74HC158PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC158PWT	TSSOP	PW	16	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

**PACKAGE MATERIALS INFORMATION** 

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\*All dimensions are nominal

7 till difficilities die fremman							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC158DR	SOIC	D	16	2500	333.2	345.9	28.6
SN74HC158NSR	SO	NS	16	2000	367.0	367.0	38.0
SN74HC158PWR	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74HC158PWT	TSSOP	PW	16	250	367.0	367.0	35.0

## 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.



## 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.



## D (R-PDSO-G16)

## PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



PW (R-PDSO-G16)

#### PLASTIC SMALL OUTLINE

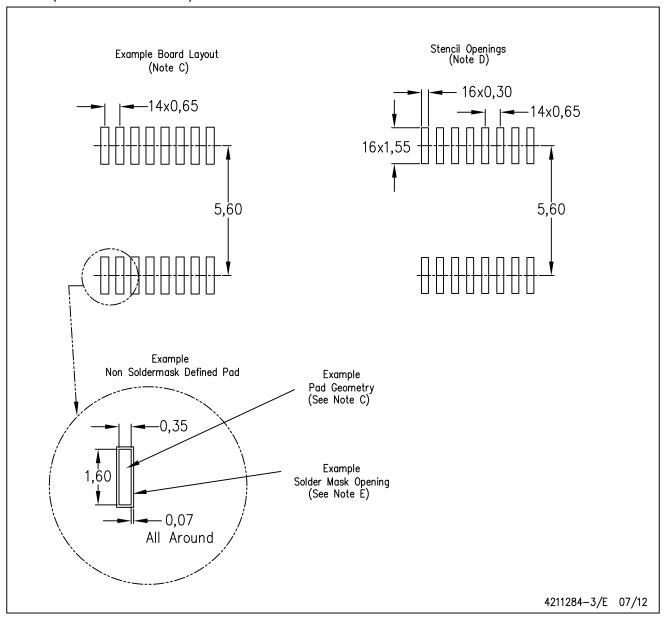


- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153



## PW (R-PDSO-G16)

## PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



#### **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.



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