

Quadruple 2-Line to 1-Line Data Select RS/Multiplexers With 3-State Outputs

1 Features

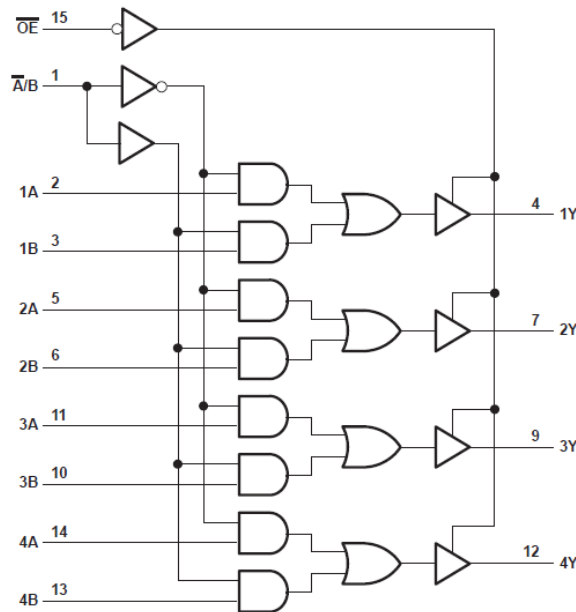
- Operating voltage range of 4.5 V to 5.5 V
- High-current 3-state outputs interface directly with system bus
- Typical $t_{pd} = 17$ ns
- Low power consumption, 80- μ A max I_{CC}
- ± 6 -mA output drive at 5 V
- Low input current of 1 μ A max
- Inputs are TTL-voltage compatible
- Provide bus interface from multiple sources in high-performance systems
- Buffered inputs and outputs

2 Description

The 'HCT257 devices are designed to multiplex signals from 4-bit data sources to 4-output data lines in bus-organized systems.

Device Information

ORDERABLE PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74HCT257	N (PDIP, 16)	19.31 mm × 6.35 mm
	D (SOIC, 16)	9.90 mm × 3.90 mm
SNJ54HCT257	J (CDIP, 16)	24.38 mm × 6.92 mm



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

Logic Diagram (Positive Logic)

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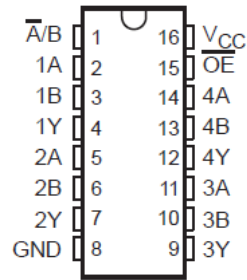
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3 Revision History

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

Changes from Revision D (September 2003) to Revision E (July 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



**Figure 4-1. J, N and D Package
16-Pin CDIP, PDIP or SOIC
Top View**

Pin Functions

PIN		I/O ⁽¹⁾	DESCRIPTION
SOIC or TSSOP NO.	NAME		
1	\bar{A}/B	I	Address select
2	1A	I	Channel 1, data input A
3	1B	I	Channel 1, data input B
4	1Y	I	Channel 1, data output
5	2A	O	Channel 2, data input A
6	2B	O	Channel 2, data input B
7	2Y	I	Channel 2, data output
8	GND	—	Ground
9	3Y	I	Channel 3, data output
10	3B	I	Channel 3, data input B
11	3A	I	Channel 3, data input A
12	4Y	I	Channel 4, data output
13	4B	I	Channel 4, data input B
14	4A	I	Channel 4, data input A
15	\bar{G}	I	Output strobe, active low
16	V _{CC}	—	Positive supply

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 range	-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 “recommended operating conditions” 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⁾

		SN54HCT257			SN74HCT257			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V _{IH}	High-level input voltage	V _{CC} = 4.5 V to 5.5 V		2	2			V
V _{IL}	Low-level input voltage	V _{CC} = 4.5 V to 5.5 V		0.8	0.8			V
V _I	Input voltage	0	V _{CC}		0	V _{CC}		V
V _O	Output voltage	0	V _{CC}		0	V _{CC}		V
t _t	Input transition (rise and fall) time			500	500			ns
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		D (SOIC)	N (PDIP)	UNIT
		16 PINS	16 PINS	
R _{θJA}	Package thermal impedance	73	67	°C/W

5.4 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS		V _{CC}	T _A = 25°C			SN54HCT257		SN74HCT257		UNIT
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	High level output voltage	V _I = V _{IH} or V _{IL}	I _{OH} = -20 μA	4.5 V	4.4	4.499		4.4		4.4	V	
					3.98	4.3		3.7		3.84		
V _{OL}	L Low level output voltage	V _I = V _{IH} or V _{IL}	I _{OL} = 20 μA	4.5 V	0.001	0.1		0.1		0.1	V	
					0.17	0.26		0.4		0.33		

5.4 Electrical Characteristics (continued)

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54HCT257		SN74HCT257		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
I _I	Input leakage current	V _I = V _{CC} or 0	5.5 V	±0.1	±100		±1000	±1000	nA	
I _{oz}	Off-State (High-Impedance State) Output Current	V _O = V _{CC} or 0, V _I = V _{IH} or V _{IL}	5.5 V	±0.01	±0.5		±10	±5	μA	
I _{CC}	Supply current	V _I = V _{CC} or 0, I _O = 0	5.5 V		8		160	80	μA	
ΔI _{CC} ⁽²⁾	Supply-Current Change	One input at 0.5 V or 2.4 V, Other inputs at 0 or V _{CC}	5.5 V	1.4	2.4		3	2.9	mA	
C _i	Input Capacitance		4.5 V to 5.5 V	3	10		10 ⁽¹⁾	10	pF	

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested.

(2) This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

5.5 Switching Characteristics

over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			SN54HCT257		SN74HCT257		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A or B	Y	4.5 V		20	30		45		38	ns
			5.5 V		17	27		40		34	
	A̅/B	Y	4.5 V		20	30		45		38	
			5.5 V		17	27		40		34	
t _{en}	OE̅	Y	4.5 V		20	30		45		38	ns
			5.5 V		17	27		40		34	
t _{dis}	OE̅	Y	4.5 V		20	30		45		38	ns
			5.5 V		17	27		40		34	
t _t		Any	4.5 V		8	15		22		19	ns
			5.5 V		7	14		21		17	

5.6 Switching Characteristics

over recommended operating free-air temperature range, C_L = 150 pF (unless otherwise noted) (see [Figure 6-1](#))

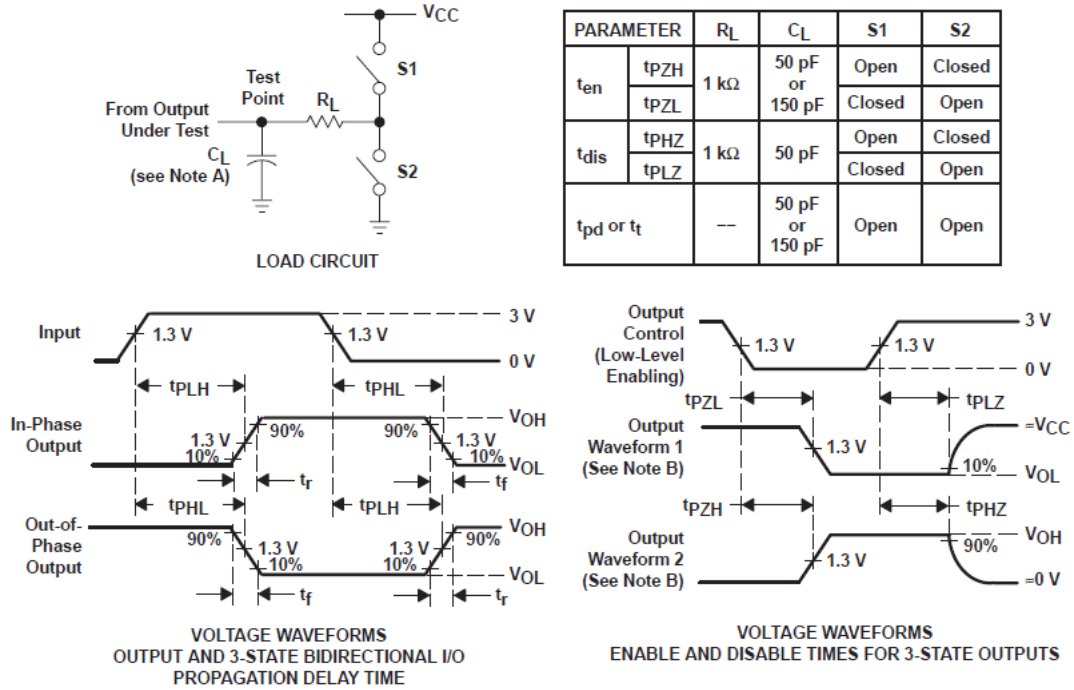
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _C	T _A = 25°C			SN54HCT257		SN74HCT257		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A or B	Y	4.5 V		22	38		57		48	ns
			5.5 V		19	35		53		44	
	A̅/B	Y	4.5 V		22	38		57		48	
			5.5 V		19	35		53		44	
t _{en}	OE̅	Y	4.5 V		23	40		60		50	ns
			5.5 V		20	38		57		48	
t _t		Any	4.5 V		17	42		63		53	ns
			5.5 V		14	38		57		48	

5.7 Operating Characteristics

 T_A 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	No load	13	pF

6 Parameter Measurement Information



- C_L includes probe and test-fixture capacitance.
- Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
- The outputs are measured one at a time with one input transition per measurement.
- t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- t_{PZL} and t_{PZH} are the same as t_{en} .
- t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 6-1. Load Circuit and Voltage Waveforms

7 Detailed Description

7.1 Overview

The 'HCT257 devices are designed to multiplex signals from 4-bit data sources to 4-output data lines in bus-organized systems. The 3-state outputs do not load the data lines when the output-enable (\overline{OE}) input is at the high logic level.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

7.2 Functional Block Diagram

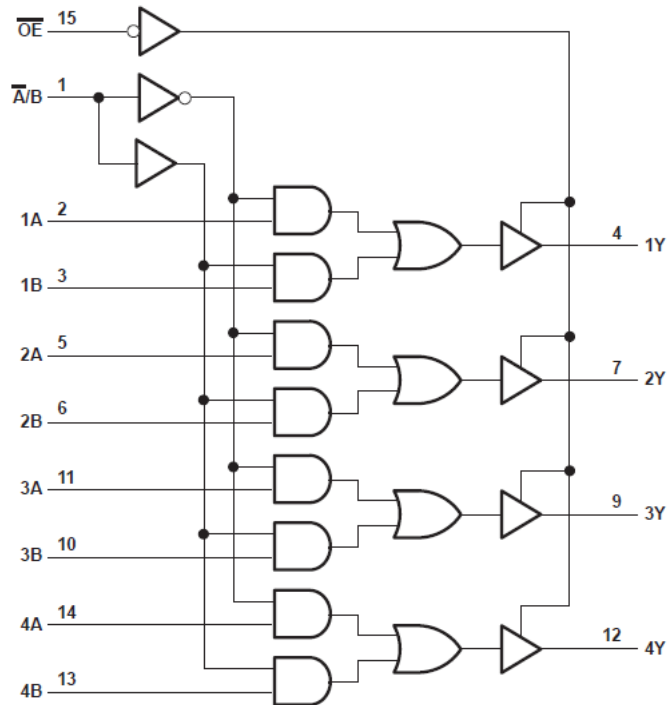


Figure 7-1. Function Diagram

8 Device Functional Modes

Table 8-1. Function Table

INPUTS ⁽¹⁾				OUTPUT ⁽²⁾ Y
OE	SELECT A/B	DATA		
		A	B	
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

- (1) H = High Voltage Level, L = Low Voltage Level, X = Don't Care
 (2) H = Driving High, L = Driving Low, Z = High Impedance State

9 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.

10 Layout

10.1 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.

11 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.

11.1 Documentation Support

11.1.1 Related Documentation

11.2 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.

11.3 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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11.4 Trademarks

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11.5 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.

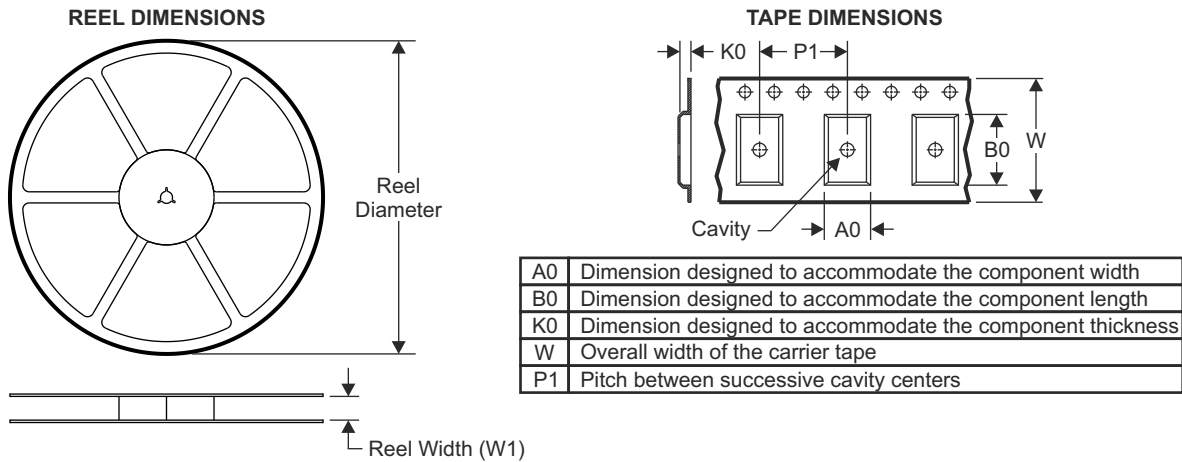
11.6 Glossary

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

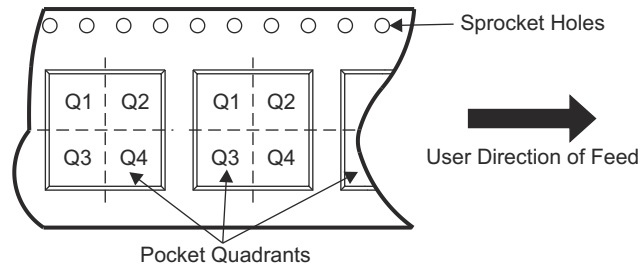
12 Mechanical, Packaging, and Orderable Information

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.

12.1 Tape and Reel Information

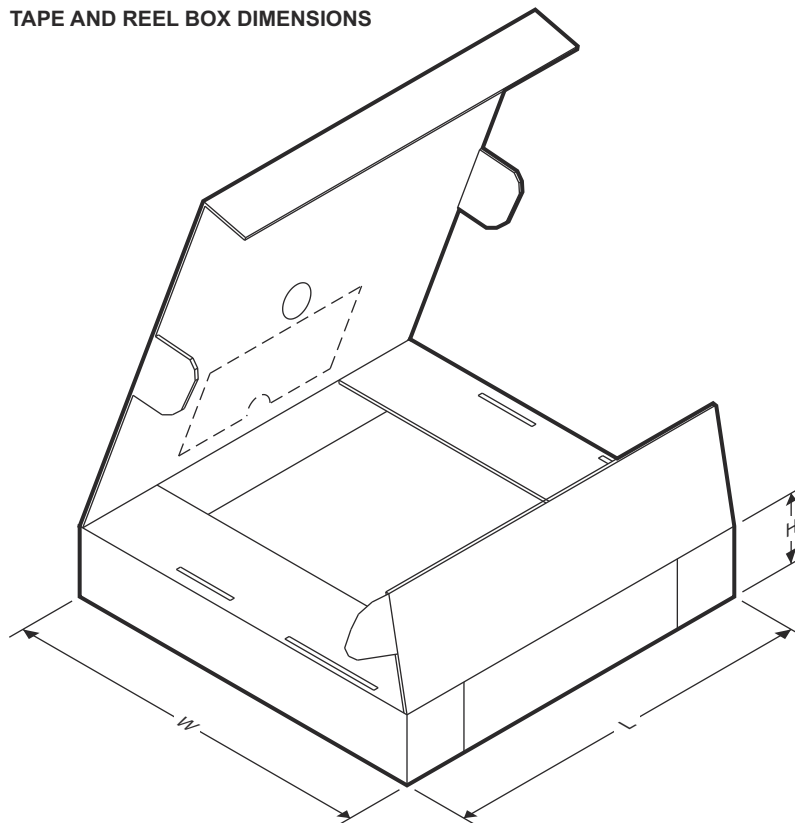


QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



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

TAPE AND REEL BOX DIMENSIONS



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
--------	--------------	-----------------	------	-----	-------------	------------	-------------

12.2 Mechanical Data

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74HCT257D	Obsolete	Production	SOIC (D) 16	-	-	Call TI	Call TI	-40 to 85	HCT257
SN74HCT257DR	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HCT257
SN74HCT257N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HCT257N

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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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
SN74HCT257DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT257DR	SOIC	D	16	2500	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)
SN74HCT257N	N	PDIP	16	25	506	13.97	11230	4.32
SN74HCT257N	N	PDIP	16	25	506	13.97	11230	4.32

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



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

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