

# CDx4HC147, CD74HCT147 High-Speed CMOS Logic 10- to 4-Line Priority Encoder

## 1 Features

- Buffered inputs and outputs
- Typical propagation delay: 13ns at  $V_{CC} = 5V$ ,  $C_L = 15pF$ ,  $T_A = 25^\circ C$
- Fanout (over temperature range)
  - Bus driver outputs: 15 LSTTL loads
- Wide operating temperature range:  $-55^\circ C$  to  $125^\circ C$
- Balanced propagation delay and transition times
- Significant power reduction compared to LSTTL logic ICs
- HC types
  - 2V to 6V Operation
  - High noise immunity:  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$  at  $V_{CC} = 5V$
- HCT types
  - 4.5V to 5.5V Operation
  - Direct LSTTL input logic compatibility,  $V_{IL} = 0.8V$  (Max),  $V_{IH} = 2V$  (Min)
  - CMOS input compatibility,  $I_I \leq 1\mu A$  at  $V_{OL}$ ,  $V_{OH}$

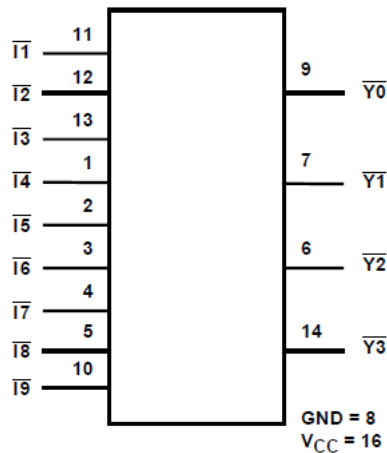
## 2 Description

The CDx4HC147 and CD74HCT147 are 9-input priority encoders. These devices provide the 10-line to 4-line priority encoding function by use of the implied decimal “zero.”

### Device Information

PART NUMBER	PACKAGE <sup>(1)</sup>	BODY SIZE (NOM) <sup>(2)</sup>
CD54HC147	J (CDIP, 16)	21.34mm × 6.92mm
CD74HC147	N (PDIP, 16)	19.31mm × 6.35mm
	D (SOIC, 16)	9.90mm × 3.90mm
	PW (TSSOP, 16)	5.00mm × 4.40mm
CD74HCT147	N (PDIP, 16)	19.31mm × 6.35mm

- (1) For more information, see [Mechanical, Packaging, and Orderable Information](#).
- (2) The body size (length × width) is a nominal value and does not include pins.



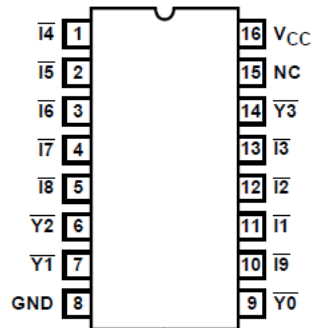
**Functional Block Diagram**



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### 3 Pin Configuration and Functions



**CD54HC147 J Package; CD74HC(T)147 N, D, or PW Package;  
16-Pin CDIP, PDIP, SOIC, or TSSOP  
(Top View)**

**Table 3-1. Pin Functions**

PIN		I/O <sup>1</sup>	DESCRIPTION
NO.	NAME		
1	$\overline{14}$	I	Active low input 4
2	$\overline{15}$	I	Active low input 5
3	$\overline{16}$	I	Active low input 6
4	$\overline{17}$	I	Active low input 7
5	$\overline{18}$	I	Active low input 8
6	$\overline{Y2}$	O	Active low output 2
7	$\overline{Y1}$	O	Active low output 1
8	GND	—	Ground
9	$\overline{10}$	I	Active low input 0
10	$\overline{19}$	I	Active low input 9
11	$\overline{11}$	I	Active low input 1
12	$\overline{12}$	I	Active low input 2
13	$\overline{13}$	I	Active low input 3
14	$\overline{Y3}$	O	Active low output 3
15	NC	N/A	No internal connection
16	V <sub>CC</sub>	—	Positive supply

1. I = input, O = output, P = power, FB = feedback, GND = ground, N/A = not applicable

## 4 Specifications

### 4.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	-0.5	7	V
I <sub>IK</sub>	Input diode current	For V <sub>I</sub> < -0.5V or V <sub>I</sub> > V <sub>CC</sub> + 0.5V		±20 mA
I <sub>OK</sub>	Output diode current	For V <sub>O</sub> < -0.5V or V <sub>O</sub> > V <sub>CC</sub> + 0.5V		±20 mA
I <sub>O</sub>	Output source or sink current per output pin	For V <sub>O</sub> > -0.5V or V <sub>O</sub> < V <sub>CC</sub> + 0.5V		±25 mA
Continuous current through V <sub>CC</sub> or GND				±50 mA

(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.

### 4.2 Recommended Operating Conditions

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

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage range	HC Types	2	6	V
		HCT Types	4.5	5.5	
V <sub>I</sub>	Input voltage	0	V <sub>CC</sub>	V	
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	V	
t <sub>t</sub>	Input rise and fall time	V <sub>CC</sub> = 2V		1000	ns
		V <sub>CC</sub> = 4.5V		500	
		V <sub>CC</sub> = 6V		400	
T <sub>A</sub>	Temperature range	-55	125	°C	

### 4.3 Thermal Information

THERMAL METRIC		N (PDIP)	NS (SOP)	D (SOIC)	PW (TSSOP)	UNIT
		16 PINS	16 PINS	16 PINS	16 PINS	
R <sub>θJA</sub>	Junction-to-ambient thermal resistance <sup>(1)</sup>	67	64	117.2	137.5	°C/W

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report

## 4.4 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS		V <sub>CC</sub> (V)	25°C			-40°C to 85°C		-55°C to 125°C		UNIT
		V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HC TYPES</b>												
V <sub>IH</sub>	High-level input voltage			2	1.5			1.5		1.5		V
				4.5	3.15			3.15		3.15		V
				6	4.2			4.2		4.2		V
V <sub>IL</sub>	Low-level input voltage			2	0.5			0.5		0.5		V
				4.5	1.35			1.35		1.35		V
				6	1.8			1.8		1.8		V
V <sub>OH</sub>	High-level output voltage CMOS loads	V <sub>IH</sub> or V <sub>IL</sub>	-0.02	2	1.9			1.9		1.9		V
			-0.02	4.5	4.4			4.4		4.4		V
			-0.02	6	5.9			5.9		5.9		V
	High-level output voltage TTL loads		-4	4.5	3.98			3.84		3.7		V
			-5.2	6	5.48			5.34		5.2		V
V <sub>OL</sub>	Low-level output voltage CMOS loads	V <sub>IH</sub> or V <sub>IL</sub>	0.02	2	0.1			0.1		0.1		V
			0.02	4.5	0.1			0.1		0.1		V
			0.02	6	0.1			0.1		0.1		V
	Low-level output voltage TTL loads		4	4.5	0.26			0.33		0.4		V
			5.2	6	0.26			0.33		0.4		V
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> or GND		6	±0.1			±1		±1		µA
I <sub>CC</sub>	Quiescent device current	V <sub>CC</sub> or GND	0	6	8			80		160		µA
<b>HCT TYPES</b>												
V <sub>IH</sub>	High-level input voltage			4.5 to 5.5	2			2		2		V
V <sub>IL</sub>	Low-level input voltage			4.5 to 5.5	0.8			0.8		0.8		V
V <sub>OH</sub>	High-level output voltage CMOS loads	V <sub>IH</sub> or V <sub>IL</sub>	-0.02	4.5	4.4			4.4		4.4		V
	High-level output voltage TTL loads		-4	4.5	3.98			3.84		3.7		V
V <sub>OL</sub>	Low-level output voltage CMOS loads	V <sub>IH</sub> or V <sub>IL</sub>	0.02	4.5	0.1			0.1		0.1		V
	Low-level output voltage TTL		4	4.5	0.26			0.33		0.4		V
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> and GND	0	5.5	±0.1			±1		±1		µA
I <sub>CC</sub>	Quiescent device current	V <sub>CC</sub> or GND	0	5.5	8			80		160		µA
ΔI <sub>CC</sub> (1)	Additional quiescent device current per input pin: 1 Unit Load	V <sub>CC</sub> -2.1		4.5 to 5.5	100 360			450		490		µA

(1) V<sub>I</sub> = V<sub>IH</sub> or V<sub>IL</sub>, unless otherwise noted.

## HCT Input Loading Table

### 4.4 Electrical Characteristics

INPUT	UNIT LOADS <sup>(1)</sup>
$\bar{I}_1, \bar{I}_2, \bar{I}_3, \bar{I}_6, \bar{I}_7$	1.1
$\bar{I}_4, \bar{I}_5, \bar{I}_8, \bar{I}_9$	1.5

(1) Unit Load is  $\Delta I_{CC}$  limit specified in DC Electrical Table, e.g., 360 $\mu$ A max at 25°C.

### 4.5 Switching Characteristics

Input  $t_f = 6$ ns. Unless otherwise specified,  $C_L = 50$ pF

PARAMETER		TEST CONDITIONS	$V_{CC}$ (V)	25°C			-40°C to 85°C		-55°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HC TYPES</b>											
$t_{PLH}, t_{PHL}$	Propagation delay, input to output	$C_L = 50$ pF	2		160		200		240	ns	
			4.5		32		40		48		
			5		13						
			6		27		34		41		
$t_{TLH}, t_{THL}$	Transition times	$C_L = 50$ pF	2		75		95		110	ns	
			4.5		15		19		22		
			6		13		16		19		
$C_{IN}$	Input capacitance				10		10		10	pF	
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>		5		32					pF	
<b>HCT TYPES</b>											
$t_{PLH}, t_{PHL}$	Propagation delay, input to output	$C_L = 50$ pF	4.5		35		44		53	ns	
			5		14					ns	
$t_{TLH}, t_{THL}$	Transition times	$C_L = 50$ pF	4.5		15		19		22	ns	
$C_{IN}$	Input capacitance				10		10		10	pF	
$C_{PD}$	Power dissipation capacitance <sup>(1) (2)</sup>		5		42					pF	

(1)  $C_{PD}$  is used to determine the dynamic power consumption, per gate.

(2)  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = Input Frequency,  $C_L$  = Output Load Capacitance,  $V_{CC}$  = Supply Voltage.

## 5 Parameter Measurement Information

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

$t_t$  is the maximum between  $t_{TLH}$  and  $t_{THL}$

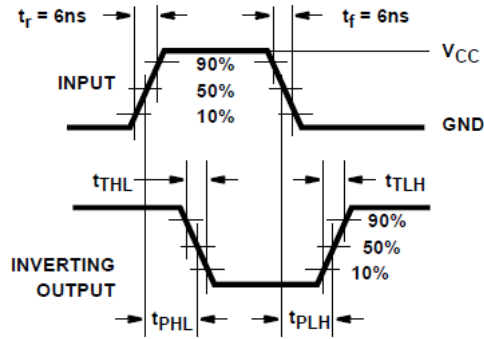


Figure 5-1. HC and HCU transition times and propagation delay times, combination logic

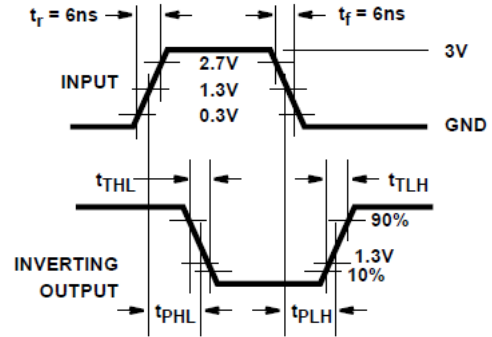


Figure 5-2. HCT transition times and propagation delay times, combination logic

## 6 Detailed Description

### 6.1 Overview

The CDx4HC147 and CD74HCT147 devices are high speed silicon-gate CMOS devices and are pin-compatible with low power Schottky TTL (LSTTL).

The CDx4HC147 and CD74HCT147 9-input priority encoders accept data from nine active LOW inputs ( $\overline{I1}$  to  $\overline{I9}$ ) and provide binary representation on the four active LOW outputs ( $\overline{Y0}$  to  $\overline{Y3}$ ). A priority is assigned to each input so that when two or more inputs are simultaneously active, the input with the highest priority is represented on the output, with input line  $\overline{I9}$  having the highest priority.

These devices provide the 10-line to 4-line priority encoding function by use of the implied decimal “zero”. The “zero” is encoded when all nine data inputs are HIGH, forcing all four outputs HIGH.

### 6.2 Functional Block Diagram

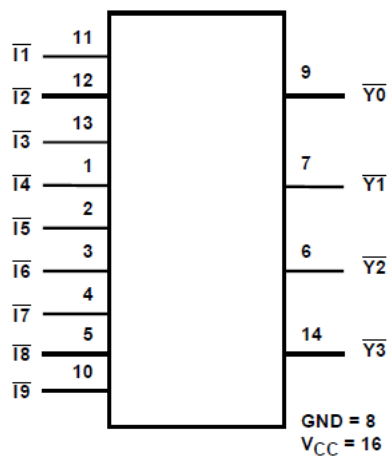


Figure 6-1. Functional Block Diagram

### 6.3 Device Functional Modes

Function Table lists the functional modes of the CDx4HC(T)147.

Table 6-1. Truth Table <sup>(1) (2) (3)</sup>

INPUTS									OUTPUTS			
$\overline{I1}$	$\overline{I2}$	$\overline{I3}$	$\overline{I4}$	$\overline{I5}$	$\overline{I6}$	$\overline{I7}$	$\overline{I8}$	$\overline{I9}$	$\overline{Y3}$	$\overline{Y2}$	$\overline{Y1}$	$\overline{Y0}$
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	L	H	H
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	X	L	H	H	H	H	L	L	H
X	X	X	X	L	H	H	H	H	H	L	H	L
X	X	X	L	H	H	H	H	H	H	H	L	H
X	X	L	H	H	H	H	H	H	H	H	H	L
X	L	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

- (1) H = High logic level
- (2) L = Low logic level
- (3) X = Don't care



## 7 Application and Implementation

### Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

### 7.1 Power Supply Recommendations

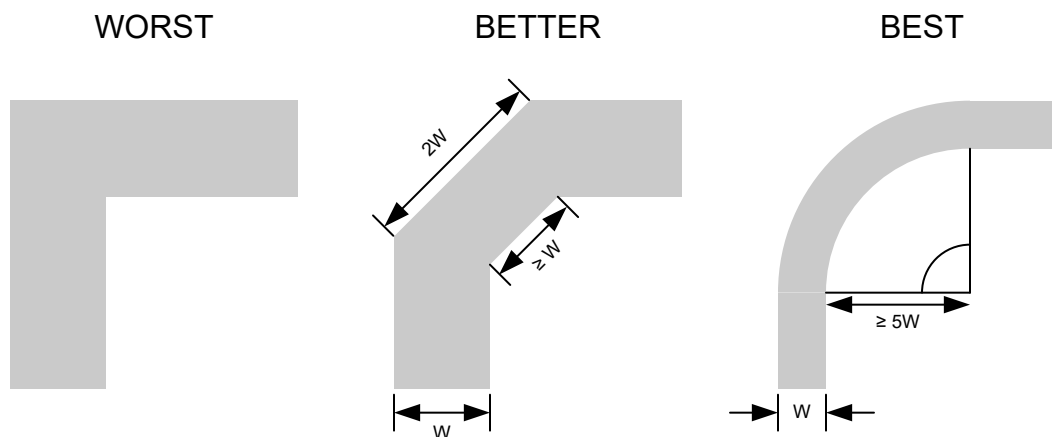
The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. A  $0.1\mu\text{F}$  capacitor is recommended for this device. It is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

### 7.2 Layout

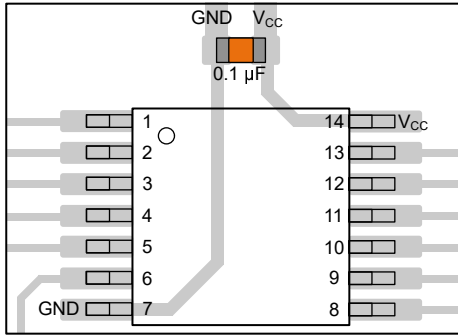
#### 7.2.1 Layout Guidelines

- Bypass capacitor placement
  - Place near the positive supply terminal of the device
  - Provide an electrically short ground return path
  - Use wide traces to minimize impedance
  - Keep the device, capacitors, and traces on the same side of the board whenever possible
- Signal trace geometry
  - 8mil to 12mil trace width
  - Lengths less than 12cm to minimize transmission line effects
  - Avoid  $90^\circ$  corners for signal traces
  - Use an unbroken ground plane below signal traces
  - Flood fill areas around signal traces with ground
  - For traces longer than 12cm
    - Use impedance controlled traces
    - Source-terminate using a series damping resistor near the output
    - Avoid branches; buffer signals that must branch separately

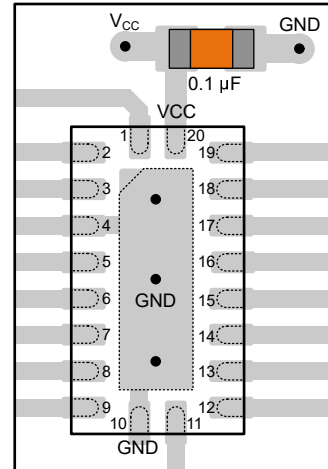
#### 7.2.2 Layout Example



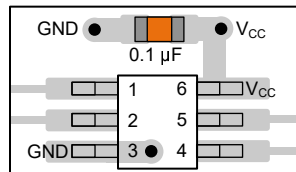
**Figure 7-1. Example Trace Corners for Improved Signal Integrity**



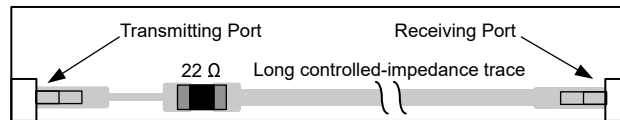
**Figure 7-2. Example Bypass Capacitor Placement for TSSOP and Similar Packages**



**Figure 7-3. Example Bypass Capacitor Placement for WQFN and Similar Packages**



**Figure 7-4. Example Bypass Capacitor Placement for SOT, SC70 and Similar Packages**



**Figure 7-5. Example Damping Resistor Placement for Improved Signal Integrity**

## 8 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.

### 8.1 Documentation Support

#### 8.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [CMOS Power Consumption and  \$C\_{pd}\$  Calculation application report](#)
- Texas Instruments, [Designing With Logic application report](#)
- Texas Instruments, [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices application report](#)

### 8.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://ti.com). Click on *Notifications* 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.

### 8.3 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.

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](#).

### 8.4 Trademarks

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

### 8.5 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.

### 8.6 Glossary

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

## 9 Revision History

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

Changes from Revision F (October 2003) to Revision G (January 2025)	Page
• Updated the numbering, formatting, tables, figures, and cross-references throughout the document to reflect modern data sheet standards.....	1
• Added <i>Device Information</i> table, <i>Pin Functions</i> table, <i>Thermal Information</i> table, <i>Device Functional Modes, Application and Implementation</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section .....	1
• Updated thermal values to reflect current function. D was 73 is now 117.2; PW was 108 is now 137.5.....	4

## 10 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
8406401EA	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8406401EA CD54HC147F3A	<a href="#">Samples</a>
CD54HC147F3A	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8406401EA CD54HC147F3A	<a href="#">Samples</a>
CD74HC147E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC147E	<a href="#">Samples</a>
CD74HC147M	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-55 to 125	HC147M	
CD74HC147M96	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU   SN	Level-1-260C-UNLIM	-55 to 125	HC147M	<a href="#">Samples</a>
CD74HC147MT	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-55 to 125	HC147M	
CD74HC147PW	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-55 to 125	HJ147	
CD74HC147PWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HJ147	<a href="#">Samples</a>
CD74HC147PWT	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-55 to 125	HJ147	
CD74HCT147E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT147E	<a href="#">Samples</a>

(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 <=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.

**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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 CD54HC147, CD74HC147 :**

- Catalog : [CD74HC147](#)
- Military : [CD54HC147](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

**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
CD74HC147M96	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
CD74HC147PWR	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)
CD74HC147M96	SOIC	D	16	2500	356.0	356.0	35.0
CD74HC147PWR	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)
CD74HC147E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HC147E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HCT147E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HCT147E	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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**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



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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.

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)



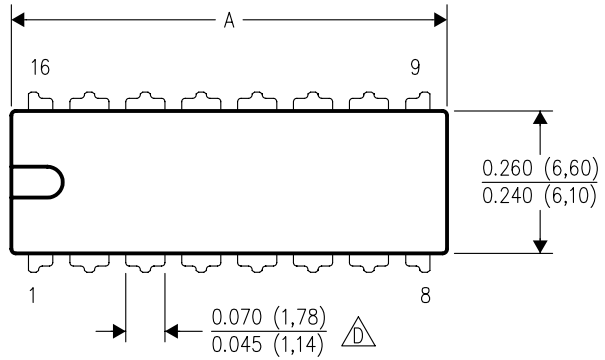
4040083/F 03/03

- 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.

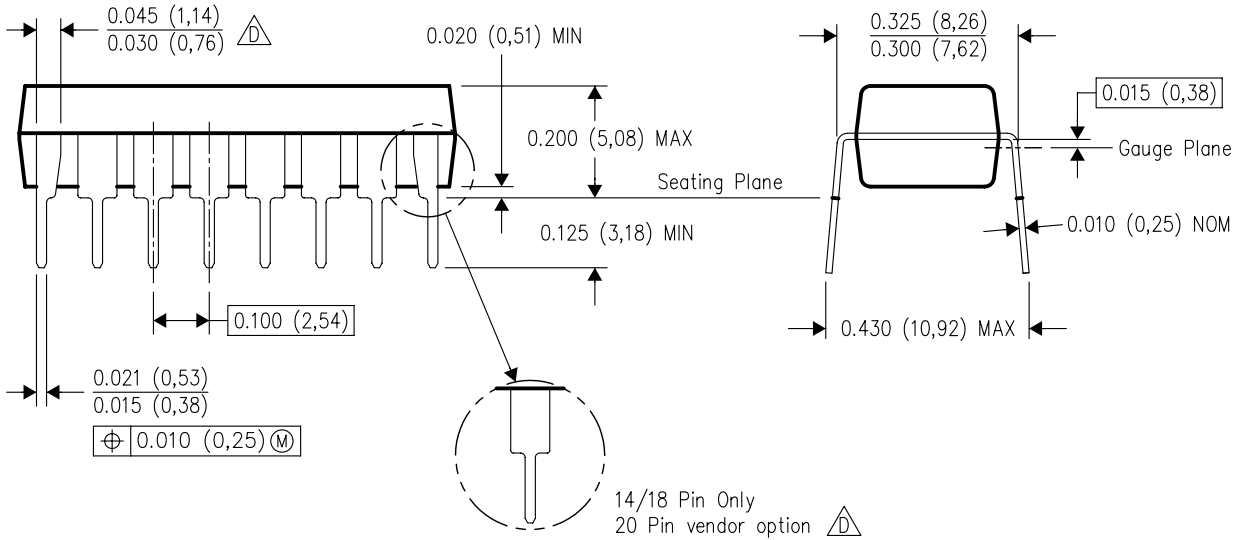
N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE



16 PINS SHOWN



DIM \ PINS **	14	16	18	20
	A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

- 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.

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