CDx4HC151、CDx4HCT151 ハイスピード CMOS ロジック、8 入力マルチプレクサ

1 特長

- 相補データ出力
- バッファ付き入力および出力
- ファンアウト (全温度範囲にわたって)
  - 標準出力:10 の LSTTL 負荷
  - バス・ドライバ出力:15 の LSTTL 負荷
- 広い動作電圧範囲:-55℃～125℃
- 平衡な伝搬遅延と遷移時間
- LSTTL ロジック IC に比べて消費電力を大幅削減
- Philips 社 / Signetics 社製品を代替
- HC タイプ
  - 2V～6V で動作
  - 優れたノイズ耐性:N_{IL} = V_{CC} の 30%、N_{IH} = V_{CC} の 30% (V_{CC} = 5V の場合)
- HCT タイプ
  - 4.5V～5.5V で動作
  - LSTTL 入力ロジックと直接互換、V_{IL} = 0.8V (最大値)、V_{IH} = 2V (最小値)
  - CMOS 入力互換、V_{OL}、V_{OH} で $I_I \leq 1\mu A$

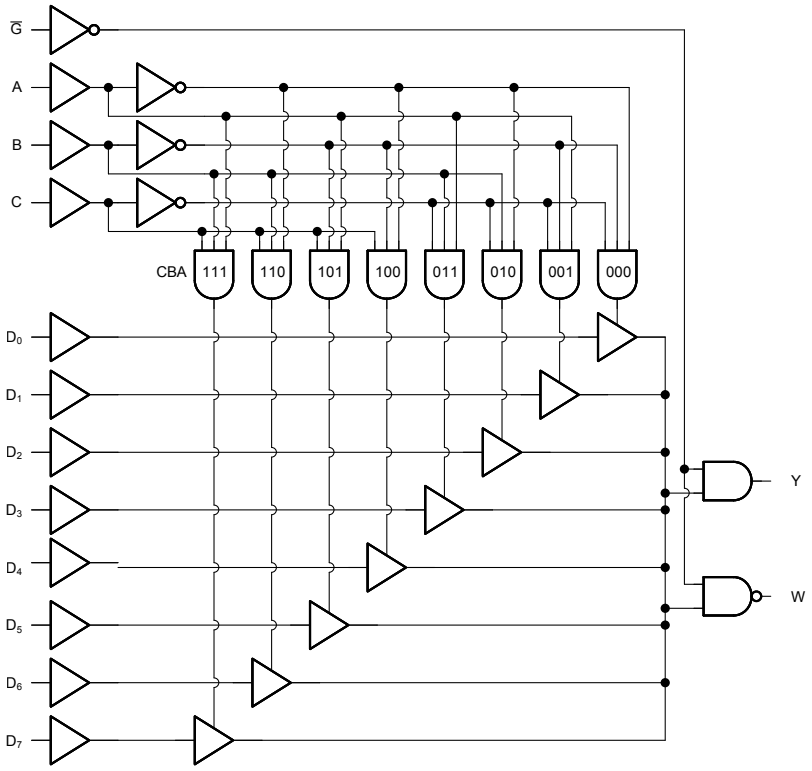
2 概要

'HC151 と 'HCT151 は、3 つのバイナリ制御入力 (A、B、C) と 1 つのアクティブ LOW イネーブル ($\overline{G}$) 入力を備えたシングル 8 チャネル・デジタル・マルチプレクサです。3 つのバイナリ信号を使って 8 つのチャネルのうちの 1 つを選択します。出力には、反転 (W) と非反転 (Y) の両方があります。

製品情報

部品番号	パッケージ(1)	本体サイズ (公称)
CD74HC151M	SOIC (16)	9.90mm × 3.90mm
CD74HC151E	PDIP (16)	19.31mm × 6.35mm
CD54HC151F3A	CDIP (16)	24.38mm × 6.92mm

(1) 利用可能なすべてのパッケージについては、このデータシートの末尾にある注文情報を参照してください。



機能ダイアグラム

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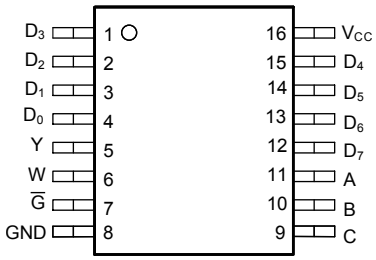
3 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

Changes from Revision C (October 2003) to Revision D (November 2021)	Page
• 最新のデータシート規格を反映するように、文書全体の表、図、相互参照の採番と書式設定を更新	1
• 現行の TI の命名規則に合わせてピン名を以下のように更新。I_3 を D_3、I_2 を D_2、I_1 を D_1、I_0 を D_0、$\overline{Y}$ を W、$\overline{E}$ を $\overline{G}$、S2 を C、S1 を B、S0 を A、I_7 を D_7、I_6 を D_6、I_5 を D_5、I_4 を D_4。	1

4 Pin Configuration and Functions



J, N, or D package
16-Pin CDIP, PDIP, SOIC
Top View

5 Specifications

5.1 Absolute Maximum Ratings[1]

			MIN	MAX	UNIT
V_{CC}	Supply voltage range		-0.5	7	V
I_{IK}	Input diode current	(V_I < -0.5 V or V_I > V_{CC} + 0.5 V)		±20	mA
I_{OK}	Output diode current	(V_O < -0.5 V or V_O > V_{CC} + 0.5 V)		±20	mA
I_O	Continuous output current	(V_O > -0.5 V or V_O < V_{CC} + 0.5 V)		±25	mA
	Continuous current through V_{CC} or GND			±50	mA
T_J	Junction temperature			150	°C
T_{stg}	Storage temperature		-65	150	°C
	Lead Temperature (Soldering 10s)			300	°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.

5.2 Recommended Operating Conditions

			MIN	MAX	UNIT
T_A	Temperature Range		–55	125	℃
V_{CC}	Supply Voltage Range	HC Types	2	6	V
		HCT Types	4.5	5.5	
V_I,V_O	DC Input or Output Voltage		0	V_{CC}	V
t_t	Input Rise and Fall Time	2 V		1000	ns
		4.5 V		500	
		6 V		400	

5.3 Thermal Information

THERMAL METRIC		CD74HC151, CD74HCT151		UNIT
		D (SOIC)	N (PDIP)	
		16 PINS	16 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance[1]	73	67	°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

PARAMETER		TEST CONDITIONS[1]	V_{CC} (V)	25℃			-40℃ to 85℃		-55℃ to 125℃		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES											
V_{IH}	High level input voltage		2	1.5			1.5		1.5		V
			4.5	3.15			3.15		3.15		
			6	4.2			4.2		4.2		
V_{IL}	Low level input voltage		2			0.5		0.5		0.5	V
			4.5			1.35		1.35		1.35	
			6			1.8		1.8		1.8	
V_{OH}	High level output voltage	I_{OH} = – 20 μA	2	1.9			1.9		1.9		V
		I_{OH} = – 20 μA	4.5	4.4			4.4		4.4		
		I_{OH} = – 20 μA	6	5.9			5.9		5.9		
	High level output voltage	I_{OH} = – 4 mA	4.5	3.98			3.84		3.7		
		I_{OH} = – 5.2 mA	6	5.48			5.34		5.2		
V_{OL}	Low level output voltage	I_{OL} = 20 μA	2			0.1		0.1		0.1	V
		I_{OL} = 20 μA	4.5			0.1		0.1		0.1	
		I_{OL} = 20 μA	6			0.1		0.1		0.1	
	Low level output voltage	I_{OL} = 4 mA	4.5			0.26		0.33		0.4	
		I_{OL} = 5.2 mA	6			0.26		0.33		0.4	
I_I	Input leakage current	V_I = V_{CC} or GND	6			±0.1		±1		±1	μA
I_{CC}	Supply current	V_I = V_{CC} or GND	6			8		80		160	μA
HCT TYPES											
V_{IH}	High level input voltage		4.5 to 5.5	2			2		2		V
V_{IL}	Low level input voltage		4.5 to 5.5			0.8		0.8		0.8	V
V_{OH}	High level output voltage	I_{OH} = – 20 μA	4.5	4.4			4.4		4.4		V
	High level output voltage	I_{OH} = – 4 mA	4.5	3.98			3.84		3.7		
V_{OL}	Low level output voltage	I_{OL} = 20 mA	4.5			0.1		0.1		0.1	V
	Low level output voltage	I_{OL} = 4 mA	4.5			0.26		0.33		0.4	
I_I	Input leakage current	V_I = V_{CC} or GND	5.5			± 0.1		±1		± 1	μA
I_{CC}	Supply current	V_I = V_{CC} or GND	5.5			8		80		160	μA
ΔI_{CC} [2]	Additional supply current per input pin	Select inputs held at V_{CC} – 2.1	4.5 to 5.5		100	540		675		735	μA
		Data inputs held at V_{CC} – 2.1	4.5 to 5.5		100	162		202.5		220.5	
		Enable inputs held at V_{CC} – 2.1	4.5 to 5.5		100	108		135		147	

(1) V_I = V_{IH} or V_{IL}, unless otherwise noted.
(2) For dual-supply systems theoretical worst case (V_I = 2.4 V, V_{CC} = 5.5 V) specification is 1.8 mA.

5.5 Switching Characteristics

Input t_t = 6ns. Unless otherwise specified, C_L = 50pF. (See Parameter Measurement Information)

PARAMETER		V_{CC} (V)	25℃			-40℃ to 85℃		-55℃ to 125℃		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES										
t_{pd}	Any Data Input to Y	2			170		215		255	ns
		4.5		14(3)	34		43		51	
		6			29		37		43	
	Any Data Input to W	2			185		230		280	ns
		4.5		15(3)	37		46		56	
		6			31		39		48	
	Any Select to Y	2			185		230		280	ns
		4.5		15(3)	37		46		56	
		6			31		39		48	
	Any Select to W	2			205		255		310	ns
		4.5		17(3)	41		51		62	
		6			35		43		53	
	Enable to Y	2			140		175		210	ns
		4.5		11(3)	28		35		42	
		6			24		30		36	
	Enable to W	2			145		180		220	ns
		4.5		12(3)	29		36		44	
		6			25		31		38	
t_t	Output Transition Time	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(1) (2)	5		59						pF
HCT TYPES										
t_{pd}	Any Data Input to Y	4.5		16(3)	38		48		57	ns
	Any Data Input to W	4.5		15(3)	36		45		54	ns
	Any Select to Y	4.5		17 (3)	41		51		62	ns
	Any Select to W	4.5		18(3)	43		54		65	ns
	Enable to Y	4.5		12(3)	29		36		44	ns
C_L = 50 pF	Enable to W	4.5	15(3)		36		46		54	ns
t_t	Output Transition Time	4.5			15		19		22	ns
C_{IN}	Input Capacitance				10		10		10	pF
C_{PD}	Power Dissipation Capacitance(1) (2)	5		58						pF

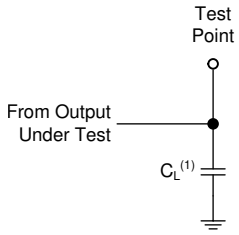
(1) C_{PD} is used to determine the dynamic power consumption, per gate.
(2) $P_D = V_{CC}{}^2 f_i (C_{PD} + C_L)$ where f_i = input frequency, C_L = output load capacitance, V_{CC} = supply voltage.
(3) C_L = 15 pF and V_{CC} = 5 V

6 Parameter Measurement Information

Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_t < 6 ns.

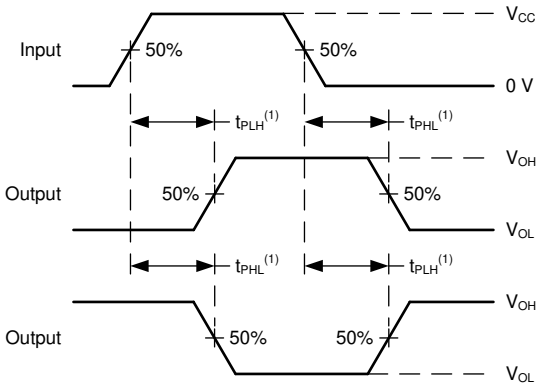
For clock inputs, f_{max} is measured when the input duty cycle is 50%.

The outputs are measured one at a time with one input transition per measurement.



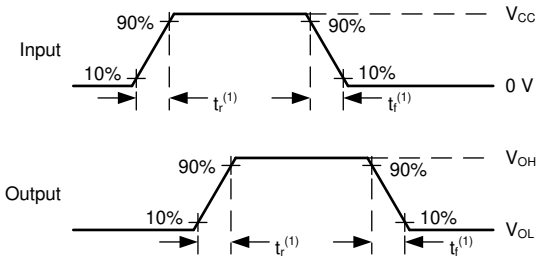
(1) C_L includes probe and test-fixture capacitance.

図 6-1. Load Circuit for Push-Pull Outputs



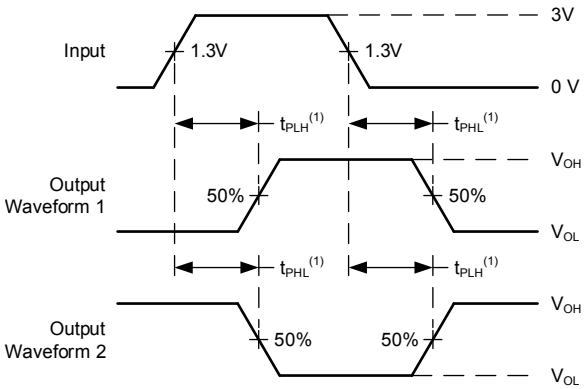
(1) The greater between t_{PLH} and t_{PHL} is the same as t_{pd}.

図 6-2. Voltage Waveforms, Propagation Delays for Standard CMOS Inputs



(1) The greater between t_r and t_f is the same as t_t.

図 6-3. Voltage Waveforms, Input and Output Transition Times for Standard CMOS Inputs



(1) The greater between t_{PLH} and t_{PHL} is the same as t_{pd}.

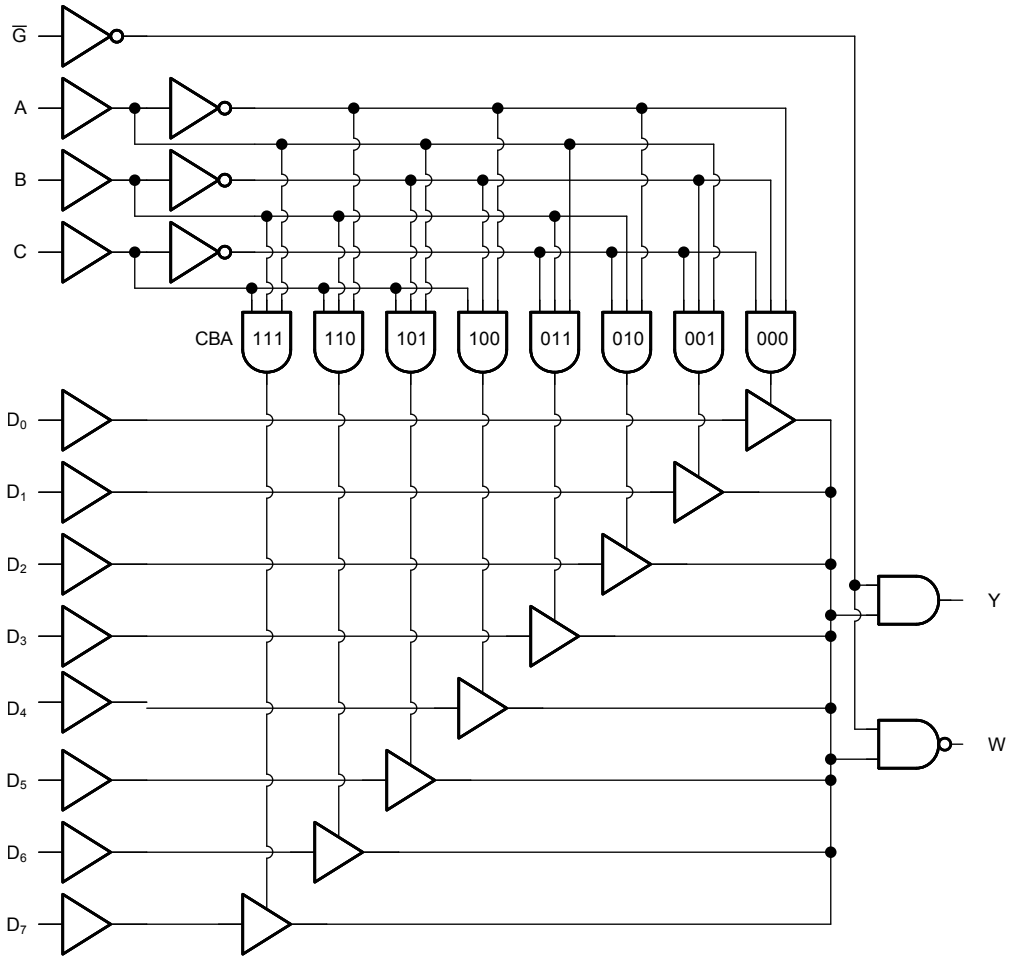
図 6-4. Voltage Waveforms, Propagation Delays for TTL-Compatible Inputs

7 Detailed Description

7.1 Overview

The ’HC151 and ’HCT151 are single 8-channel digital multiplexers having three binary control inputs, A, B and C and an active low enable ($\overline{G}$) input. The three binary signals select 1 of 8 channels. Outputs are both inverting (W) and non-inverting (Y).

7.2 Functional Block Diagram



7.3 Device Functional Modes

SELECT INPUTS(1)			DATA INPUTS								ENABLE	OUTPUT	
C	B	A	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	$\overline{G}$	W	Y
X	X	X	X	X	X	X	X	X	X	X	H	H	L
L	L	L	L	X	X	X	X	X	X	X	L	H	L
L	L	L	H	X	X	X	X	X	X	X	L	L	H
L	L	H	X	L	X	X	X	X	X	X	L	H	L
L	L	H	X	H	X	X	X	X	X	X	L	L	H
L	H	L	X	X	L	X	X	X	X	X	L	H	L
L	H	L	X	X	H	X	X	X	X	X	L	L	H
L	H	H	X	X	X	L	X	X	X	X	L	H	L
L	H	H	X	X	X	H	X	X	X	X	L	L	H
H	L	L	X	X	X	X	L	X	X	X	L	H	L
H	L	L	X	X	X	X	H	X	X	X	L	L	H
H	L	H	X	X	X	X	X	L	X	X	L	H	L
H	L	H	X	X	X	X	X	H	X	X	L	L	H
H	H	L	X	X	X	X	X	X	L	X	L	H	L
H	H	L	X	X	X	X	X	X	H	X	L	L	H
H	H	H	X	X	X	X	X	X	X	L	L	H	L
H	H	H	X	X	X	X	X	X	X	H	L	L	H

(1) H = High Voltage Level, L = Low Voltage Level, X = Don't Care

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 Documentation Support

10.1.1 Related Documentation

10.2 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.

10.3 サポート・リソース

TI E2E™ サポート・フォーラムは、エンジニアが検証済みの回答と設計に関するヒントをエキスパートから迅速かつ直接得ることができる場所です。既存の回答を検索したり、独自の質問をしたりすることで、設計で必要な支援を迅速に得ることができます。

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10.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.
すべての商標は、それぞれの所有者に帰属します。

10.5 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.

10.6 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
5962-9065201MEA	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9065201MEA CD54HCT151F3A	Samples
CD54HC151F3A	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8412801EA CD54HC151F3A	Samples
CD54HCT151F3A	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9065201MEA CD54HCT151F3A	Samples
CD74HC151E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC151E	Samples
CD74HC151EE4	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC151E	Samples
CD74HC151M	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-55 to 125	HC151M	
CD74HC151M96	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU | SN	Level-1-260C-UNLIM	-55 to 125	HC151M	Samples
CD74HC151MT	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-55 to 125	HC151M	
CD74HCT151E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT151E	Samples
CD74HCT151M	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-55 to 125	HCT151M	
CD74HCT151M96	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT151M	Samples
CD74HCT151M96G4	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT151M	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 <=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.

OTHER QUALIFIED VERSIONS OF CD54HC151, CD54HCT151, CD74HC151, CD74HCT151 :

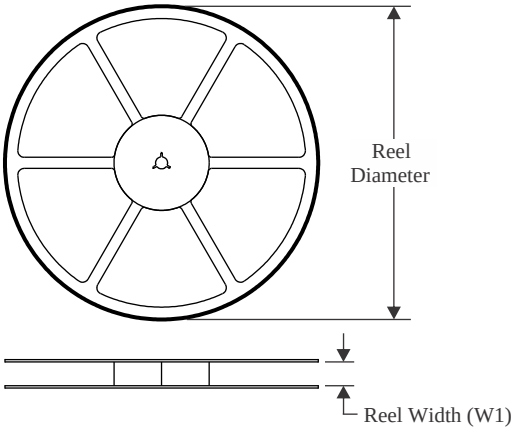
- Catalog : CD74HC151, CD74HCT151
- Military : CD54HC151, CD54HCT151

NOTE: Qualified Version Definitions:

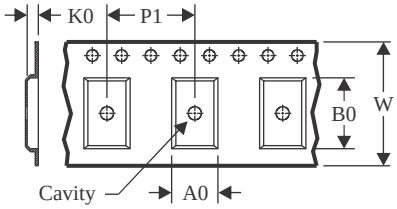
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

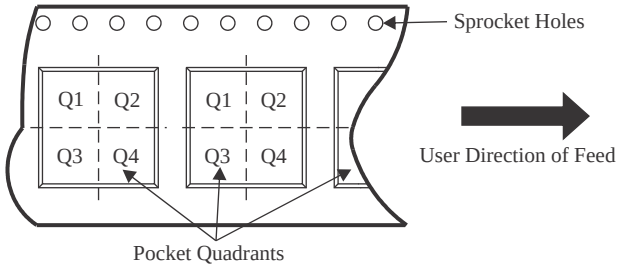


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	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

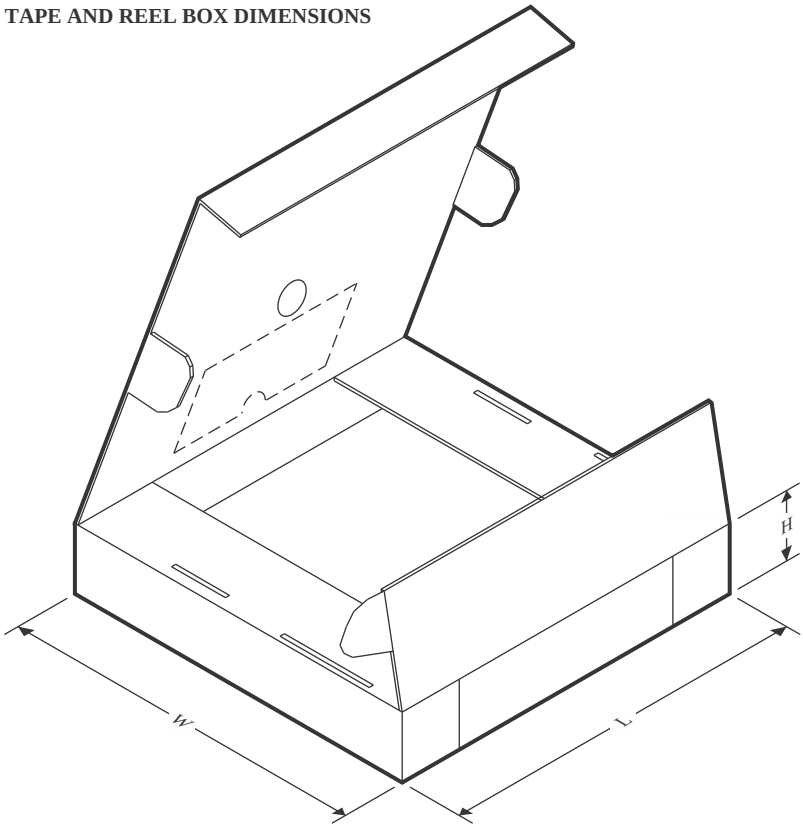
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CD74HC151M96	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
CD74HCT151M96	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

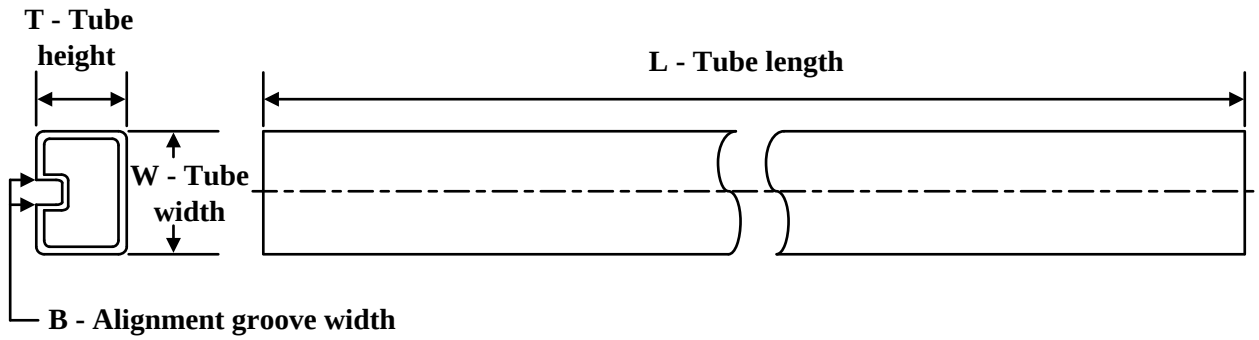
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CD74HC151M96	SOIC	D	16	2500	356.0	356.0	35.0
CD74HCT151M96	SOIC	D	16	2500	340.5	336.1	32.0

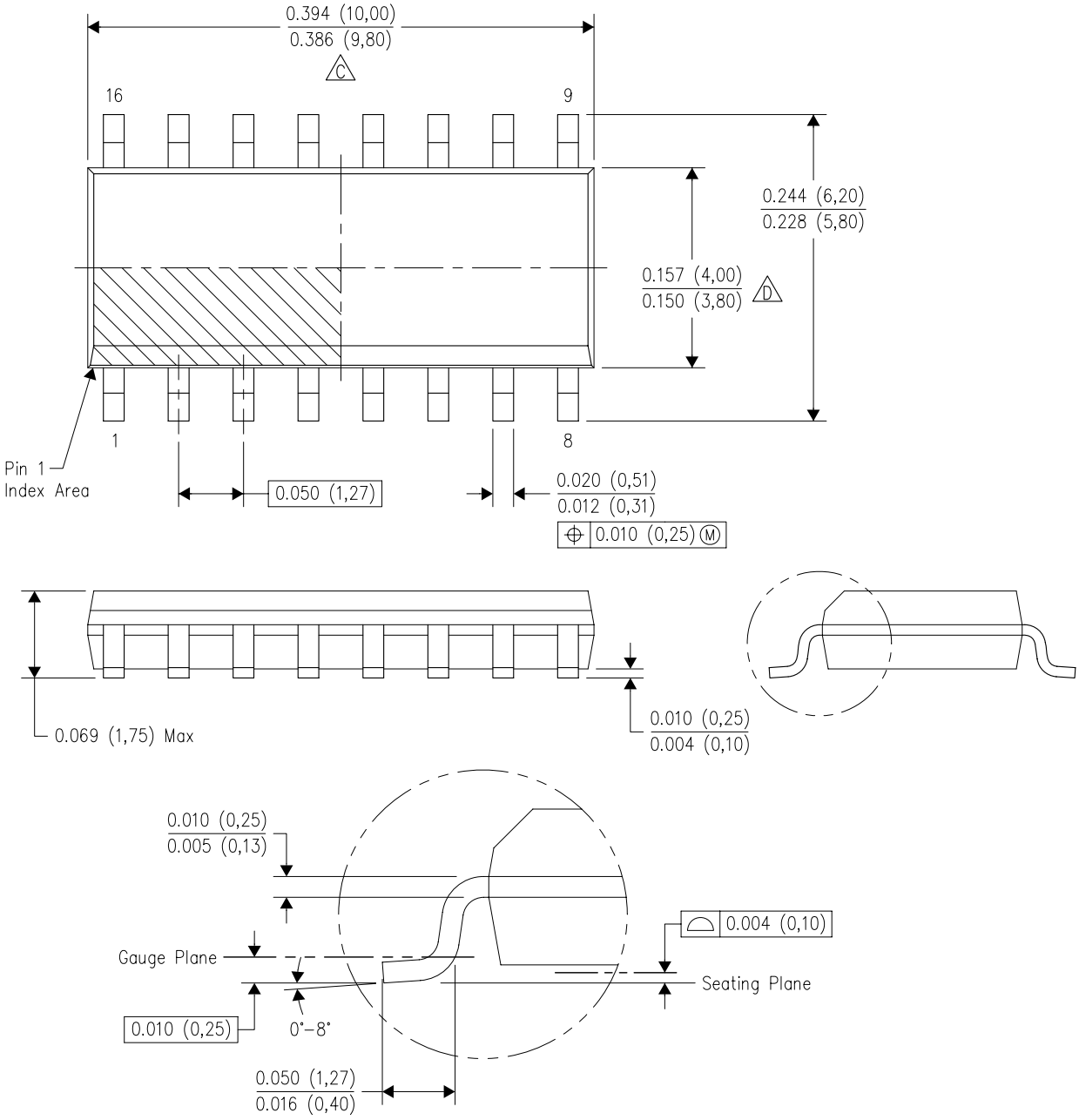
TUBE



*All dimensions are nominal

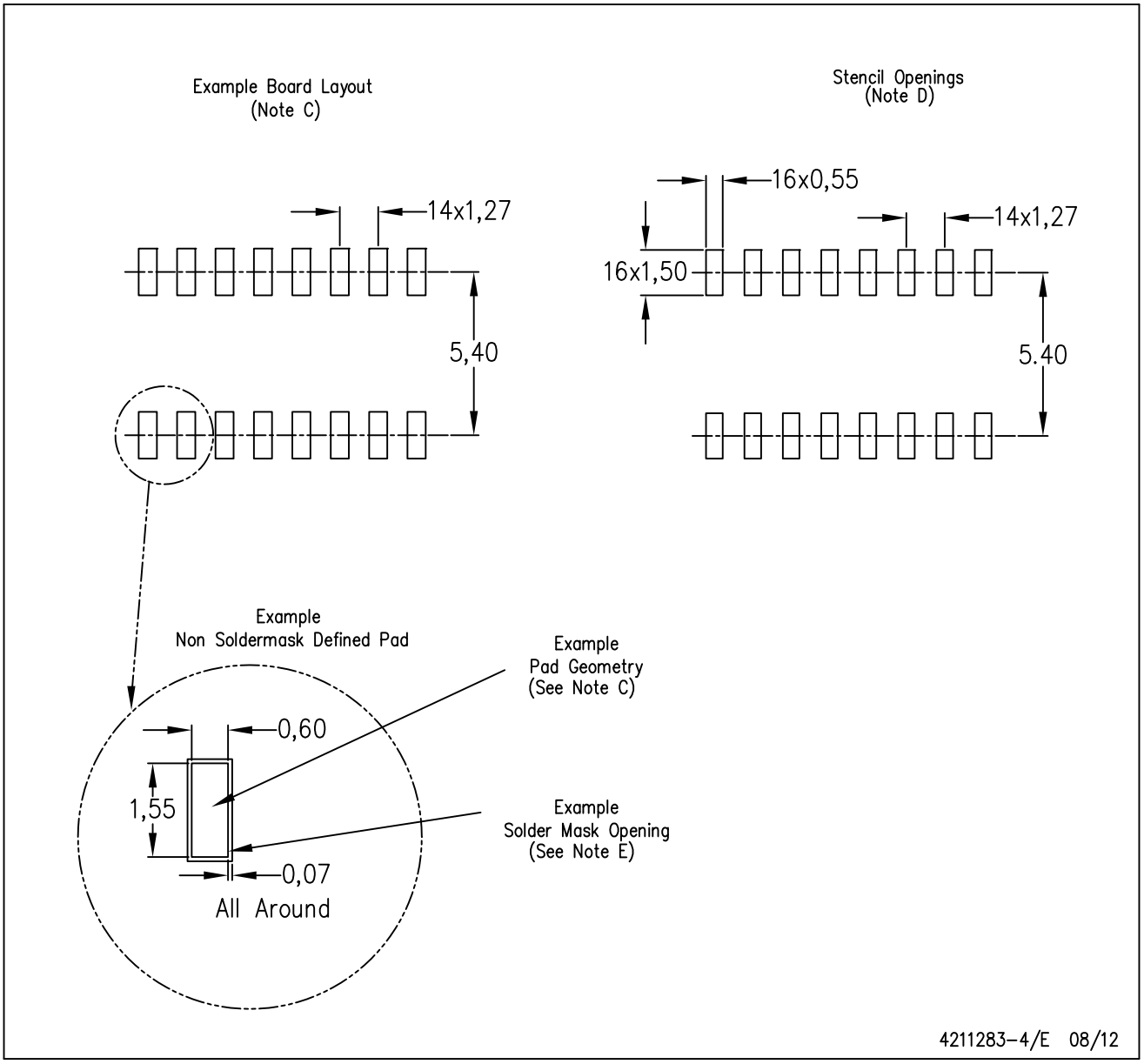
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
CD74HC151E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HC151E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HC151EE4	N	PDIP	16	25	506	13.97	11230	4.32
CD74HC151EE4	N	PDIP	16	25	506	13.97	11230	4.32
CD74HCT151E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HCT151E	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.

D (R–PDSO–G16) PLASTIC SMALL OUTLINE

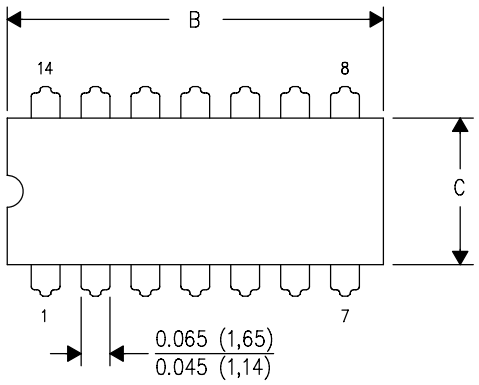


NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact 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.

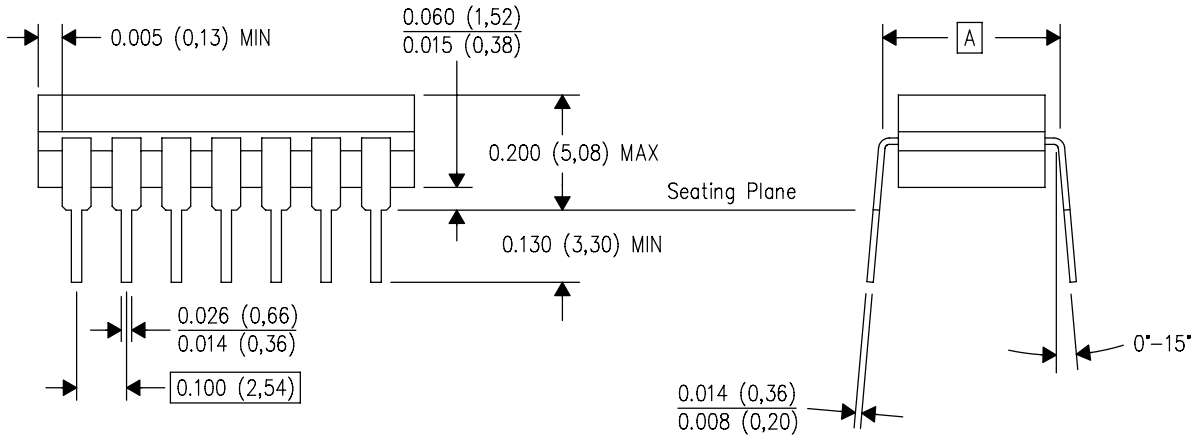
J (R–GDIP–T**)

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)



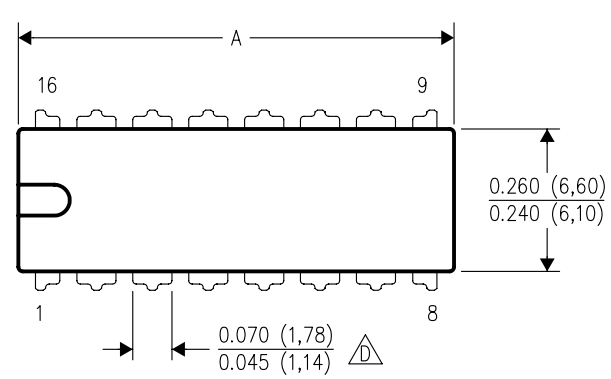
4040083/F 03/03

NOTES:
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.

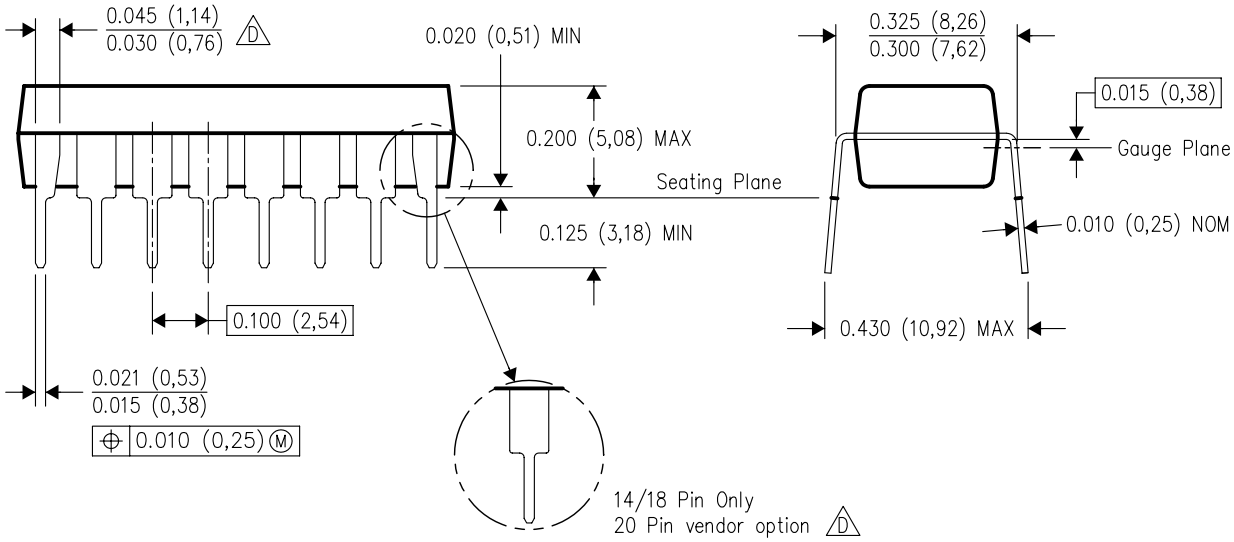
N (R–PDIP–T**)

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)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	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.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

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