

SN74HC266 クワッド 2 入力 XNOR ゲート、オープン・ドレイン出力

1 特長

- 広い動作電圧範囲: 2V~6V
- 出力は最大 10 個の LSTTL 負荷を駆動可能
- 低消費電力、最大 I_{CC} 20μA
- 最大 t_{pd} 8ns (5V 時)
- 5V で ±4mA の出力駆動能力
- 低い入力電流: 1μA

2 アプリケーション

- 選択可能なバッファ / インバータ
- クロック位相差検出器

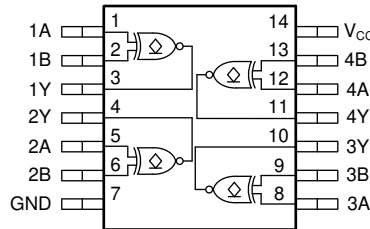
3 概要

このデバイスには、4 つの独立したオープン・ドレイン出力付きの 2 入力 XNOR ゲートが内蔵されています。各ゲートはブール関数 $Y = \overline{A} \oplus B$ を正論理で実行します。

製品情報 (1)

部品番号	パッケージ	本体サイズ (公称)
SN74HC266N	PDIP (14)	19.30mm × 6.40mm
SN74HC266NS	SO (14)	10.20mm × 5.30mm
SN74HC266D	SOIC (14)	8.70mm × 3.90mm

(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。



SN74HC266 の機能的なピン配置

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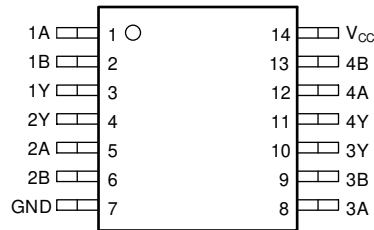
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4 Revision History

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 F (August 2003) to Revision G (April 2021)	Page
• 文書全体にわたって表、図、相互参照の採番方法を更新.....	1
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5 Pin Configuration and Functions



**图 5-1. D, N, or NS Package
 14-Pin SOIC, PDIP, or SO
 Top View**

Pin Functions

PIN		I/O	DESCRIPTION
NAME	NO.		
1A	1	Input	Channel 1, Input A
1B	2	Input	Channel 1, Input B
1Y	3	Output	Channel 1, Output Y
2Y	4	Output	Channel 2, Output Y
2A	5	Input	Channel 2, Input A
2B	6	Input	Channel 2, Input B
GND	7	—	Ground
3A	8	Input	Channel 3, Input A
3B	9	Input	Channel 3, Input B
3Y	10	Output	Channel 3, Output Y
4Y	11	Output	Channel 4, Output Y
4A	12	Input	Channel 4, Input A
4B	13	Input	Channel 4, Input B
V _{CC}	14	—	Positive Supply

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage	-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}		±25 mA
	Continuous current through V _{CC} or GND			±50 mA
T _J	Junction temperature ⁽³⁾			150 °C
T _{stg}	Storage temperature	-65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Rating* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Condition*. 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.

(3) Guaranteed by design.

6.2 Recommended Operating Conditions

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

		MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage	2	5	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5		V
		V _{CC} = 4.5 V	3.15		
		V _{CC} = 6 V	4.2		
V _{IL}	Low-level input voltage	V _{CC} = 2 V		0.5	V
		V _{CC} = 4.5 V		1.35	
		V _{CC} = 6 V		1.8	
V _I	Input voltage	0		V _{CC}	V
V _O	Output voltage	0		V _{CC}	V
t _t	Input transition time	V _{CC} = 2 V		1000	ns
		V _{CC} = 4.5 V		500	
		V _{CC} = 6 V		400	
T _A	Operating free-air temperature	-40		85	°C

6.3 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74HC266			UNIT
		N (PDIP)	D (SOIC)	NS (SOP)	
		14 PINS	14 PINS	14 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	62.5	133.6	122.6	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	42.4	89.0	81.8	°C/W
R _{θJB}	Junction-to-board thermal resistance	50.2	89.5	83.8	°C/W
Ψ _{JT}	Junction-to-top characterization parameter	29.8	45.5	45.4	°C/W
Ψ _{JB}	Junction-to-board characterization parameter	42.0	89.1	83.4	°C/W

THERMAL METRIC ⁽¹⁾		SN74HC266			UNIT
		N (PDIP)	D (SOIC)	NS (SOP)	
		14 PINS	14 PINS	14 PINS	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	°C/W

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

6.4 Electrical Characteristics

over operating free-air temperature range; typical values measured at $T_A = 25^\circ\text{C}$ (unless otherwise noted).

PARAMETER		TEST CONDITIONS		V_{CC}	Operating free-air temperature (T_A)						UNIT
					25°C			-40°C to 85°C			
					MIN	TYP	MAX	MIN	TYP	MAX	
I_{OH}	High-level output current	$V_I = V_{IH}$ or V_{IL}	$V_O = V_{CC}$	6 V		0.01	0.5			5	μA
V_{OL}	Low-level output voltage	$V_I = V_{IH}$ or V_{IL}	$I_{OL} = 20\ \mu\text{A}$	2 V		0.002	0.1			0.1	V
				4.5 V		0.001	0.1		0.1		
			6 V		0.001	0.1		0.1			
			$I_{OL} = 4\ \text{mA}$	4.5 V		0.17	0.26		0.33		
			$I_{OL} = 5.2\ \text{mA}$	6 V		0.15	0.26		0.33		
I_I	Input leakage current	$V_I = V_{CC}$ or 0		6 V		±0.1	±100			±1000	nA
I_{CC}	Supply current	$V_I = V_{CC}$ or 0	$V_I = V_{CC}$ or 0	6 V			2			20	μA
C_i	Input capacitance			2 V to 6 V		3	10			10	pF

6.5 Switching Characteristics

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

PARAMETER		FROM	TO	V_{CC}	Operating free-air temperature (T_A)						UNIT
					25°C			-40°C to 85°C			
					MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Propagation delay (Low to High)	A or B	Y	2 V		60	125			155	ns
				4.5 V		13	25		31		
				6 V		10	23		26		
t_{PHL}	Propagation delay (High to Low)	A or B	Y	2 V		60	100			125	ns
				4.5 V		13	20		25		
				6 V		10	17		21		
t_t	Transition-time		Y	2 V		28	75			95	ns
				4.5 V		8	15		19		
				6 V		6	13		16		

6.6 Operating Characteristics

over operating free-air temperature range; typical values measured at $T_A = 25^\circ\text{C}$ (unless otherwise noted).

PARAMETER		TEST CONDITIONS	V_{CC}	MIN	TYP	MAX	UNIT
C_{pd}	Power dissipation capacitance per gate	No load	2 V to 6 V		35		pF

6.7 Typical Characteristics

$T_A = 25^\circ\text{C}$

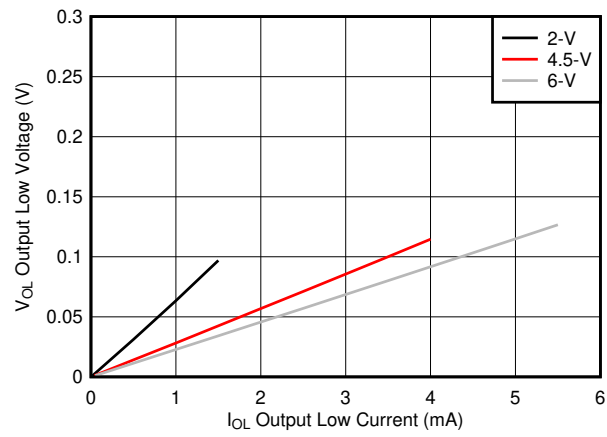
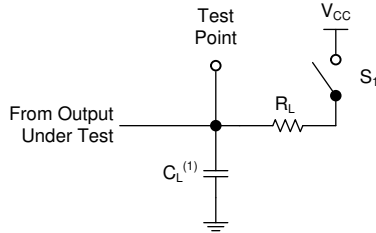


FIG 6-1. Typical output voltage in the low state (V_{OL})

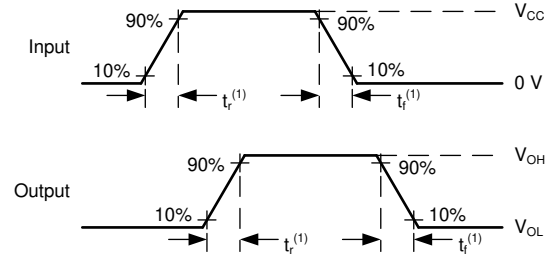
7 Parameter Measurement Information

- Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_t < 6 \text{ ns}$.
- The outputs are measured one at a time, with one input transition per measurement.



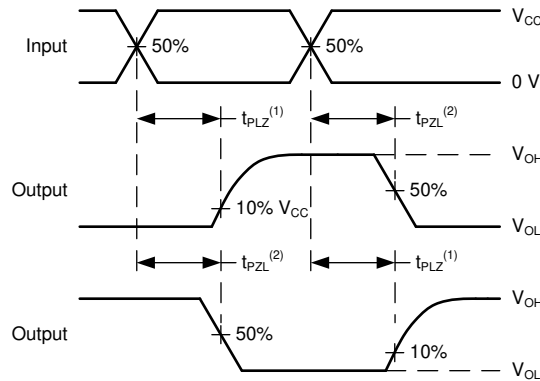
A. $C_L = 50 \text{ pF}$ and includes probe and jig capacitance.

7-1. Load Circuit



A. t_t is the greater of t_r and t_f .

7-2. Voltage Waveforms Transition Times



A. The maximum between t_{PLH} and t_{PHL} is used for t_{pd} .

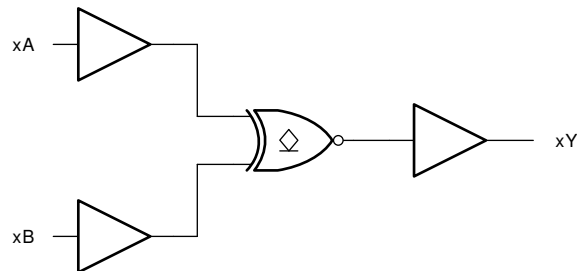
7-3. Voltage Waveforms Propagation Delays

8 Detailed Description

8.1 Overview

This device contains four independent 2-input XNOR gates with open-drain outputs. Each gate performs the Boolean function $Y = \overline{A \oplus B}$ in positive logic.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 CMOS Open-Drain Outputs

The open-drain output allows the device to sink current to GND but not to source current from V_{CC} . When the output is not actively pulling the line low, it will go into a high impedance state. This allows the device to be used for a wide variety of applications, including up-translation and down-translation, as the output voltage can be determined by an external pull-up resistor.

The current drive capability of this device creates fast edges into light loads, so routing and load conditions should be considered to prevent ringing. Additionally, the outputs of this device are capable of driving larger currents than the device can sustain without being damaged. It is important for the power output of the device to be limited to avoid thermal runaway and damage due to over-current. The electrical and thermal limits defined in the [Absolute Maximum Ratings](#) must be followed at all times.

The SN74HC266 can drive a load with a total capacitance less than or equal to the maximum load listed in the [Switching Characteristics](#) connected to a high-impedance CMOS input while still meeting all of the datasheet specifications. Larger capacitive loads can be applied, however it is not recommended to exceed the provided load value. If larger capacitive loads are required, it is recommended to add a series resistor between the output and the capacitor to limit output current to the values given in the [Absolute Maximum Ratings](#).

8.3.2 Standard CMOS Inputs

Standard CMOS inputs are high impedance and are typically modeled as a resistor from the input to ground in parallel with the input capacitance given in the [Electrical Characteristics](#). The worst case resistance is calculated with the maximum input voltage, given in the [Absolute Maximum Ratings](#), and the maximum input leakage current, given in the [Electrical Characteristics](#), using ohm's law ($R = V \div I$).

Signals applied to the inputs need to have fast edge rates, as defined by the input transition time in the [Recommended Operating Conditions](#) to avoid excessive current consumption and oscillations. If a slow or noisy input signal is required, a device with a Schmitt-trigger input should be used to condition the input signal prior to the standard CMOS input.

8.3.3 Clamp Diode Structure

The inputs and outputs to this device have both positive and negative clamping diodes as depicted in 図 8-1.

注意

Voltages beyond the values specified in the セクション 6.1 table can cause damage to the device. The recommended input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

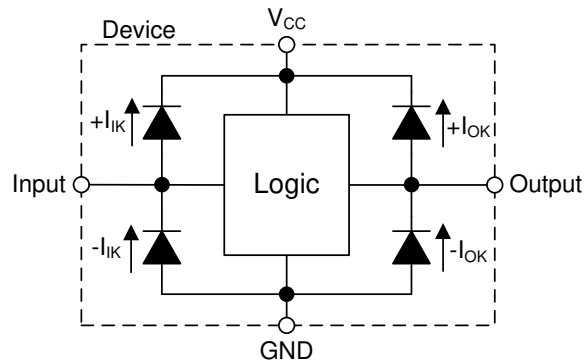


図 8-1. Electrical Placement of Clamping Diodes for Each Input and Output

8.4 Device Functional Modes

表 8-1. Function Table

INPUTS		OUTPUT
A	B	Y
L	L	Z
L	H	L
H	L	L
H	H	Z

9 Application and Implementation

注

以下のアプリケーション情報は、TI の製品仕様に含まれるものではなく、TI ではその正確性または完全性を保証いたしません。個々の目的に対する製品の適合性については、お客様の責任で判断していただくこととなります。また、お客様は自身の設計実装を検証しテストすることで、システムの機能を確認する必要があります。

9.1 Application Information

In this application, one 2-input open-drain XNOR gate is used to create a selectable buffer or inverter as shown in [Figure 9-1](#). This application allows for using a quad XNOR gate to produce any combination of one to four buffers and inverters. Commonly each channel is permanently connected as either an inverter or buffer, however some systems do require the ability to switch between the two. If some channels are unused, the inputs can be grounded and the outputs left open.

9.2 Typical Application

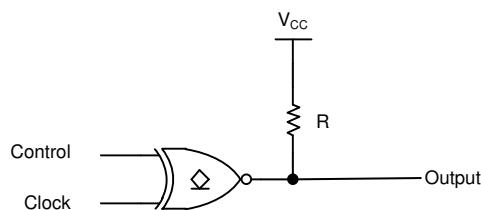


Figure 9-1. Typical application schematic

9.2.1 Design Requirements

9.2.1.1 Power Considerations

Ensure the desired supply voltage is within the range specified in the [Recommended Operating Conditions](#). The supply voltage sets the device's electrical characteristics as described in the [Electrical Characteristics](#).

The ground must be capable of sinking current equal to the total current to be sunk by all outputs of the SN74HC266 plus the maximum supply current, I_{CC} , listed in [Electrical Characteristics](#). The logic device can only sink as much current as is provided by the external pull-up resistor or other supply source. Be sure not to exceed the maximum total current through GND listed in the [Absolute Maximum Ratings](#).

Total power consumption can be calculated using the information provided in [CMOS Power Consumption and \$C_{pd}\$ Calculation](#).

Thermal increase can be calculated using the information provided in [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices](#).

注意

The maximum junction temperature, $T_J(\text{max})$ listed in the [Absolute Maximum Ratings](#), is an *additional limitation* to prevent damage to the device. Do not violate any values listed in the [Absolute Maximum Ratings](#). These limits are provided to prevent damage to the device.

9.2.1.2 Input Considerations

Unused inputs must be terminated to either V_{CC} or ground. These can be directly terminated if the input is completely unused, or they can be connected with a pull-up or pull-down resistor if the input is to be used sometimes, but not always. A pull-up resistor is used for a default state of HIGH, and a pull-down resistor is used for a default state of LOW. The resistor size is limited by drive current of the controller, leakage current into the SN74HC266, as specified in the [Electrical Characteristics](#), and the desired input transition rate. A 10-k Ω resistor value is often used due to these factors.

The SN74HC266 has standard CMOS inputs, so input signal edge rates cannot be slow. Slow input edge rates can cause oscillations and damaging shoot-through current. The recommended rates are defined in the [Recommended Operating Conditions](#).

Refer to [セクション 8.3](#) for additional information regarding the inputs for this device.

9.2.1.3 Output Considerations

The ground voltage is used to produce the output LOW voltage. Sinking current into the output will increase the output voltage as specified by the V_{OL} specification in the [Electrical Characteristics](#). The plot in the [Typical Characteristics](#) provides a typical relationship between output voltage and current for this device.

Open-drain outputs can be directly connected together to produce a wired-AND. This is possible because the outputs cannot source current, and thus can never be in bus-contention.

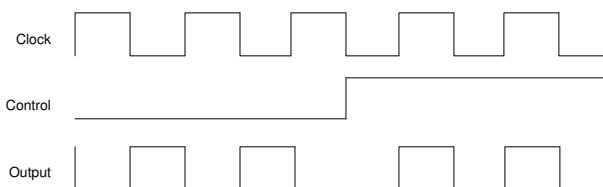
Unused outputs can be left floating. Do not connect outputs directly to V_{CC} or ground.

Refer to [セクション 8.3](#) for additional information regarding the outputs for this device.

9.2.2 Detailed Design Procedure

1. Add a decoupling capacitor from V_{CC} to GND. The capacitor needs to be placed physically close to the device and electrically close to both the V_{CC} and GND pins. An example layout is shown in [セクション 11](#).
2. Ensure the capacitive load at the output is ≤ 70 pF. This is not a hard limit, however it will ensure optimal performance. This can be accomplished by providing short, appropriately sized traces from the SN74HC266 to the receiving device.
3. Ensure the resistive load at the output is larger than $(V_{CC} / I_{O(max)}) \Omega$. This will ensure that the maximum output current from the [Absolute Maximum Ratings](#) is not violated. Most CMOS inputs have a resistive load measured in megaohms; much larger than the minimum calculated above.
4. Thermal issues are rarely a concern for logic gates, however the power consumption and thermal increase can be calculated using the steps provided in the application report, [CMOS Power Consumption and Cpd Calculation](#)

9.2.3 Application Curves



ⓧ 9-2. Typical application timing diagram

10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the [セクション 6.2](#). Each V_{CC} terminal should have a 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, as shown in [図 11-1](#).

11 Layout

11.1 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. 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.

11.2 Layout Example

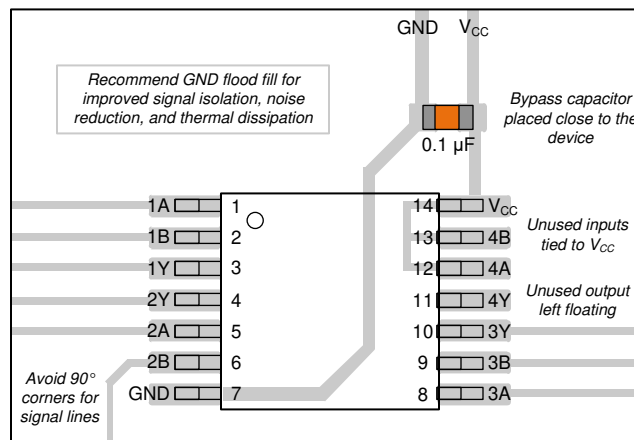


図 11-1. Example layout for the SN74HC266

12 Device and Documentation Support

12.1 Documentation Support

12.1.1 Related Documentation

For related documentation see the following:

- [HCMOS Design Considerations](#)
- [CMOS Power Consumption and CPD Calculation](#)
- [Designing with Logic](#)

12.2 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to order now.

12.3 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、設計に必要な支援を迅速に得ることができます。

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12.4 Trademarks

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12.5 静電気放電に関する注意事項



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12.6 用語集

TI 用語集 この用語集には、用語や略語の一覧および定義が記載されています。

13 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
SN74HC266D	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 85	HC266	
SN74HC266DR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HC266	Samples
SN74HC266DT	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 85	HC266	
SN74HC266N	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC266N	Samples
SN74HC266NSR	ACTIVE	SOP	NS	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC266	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.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

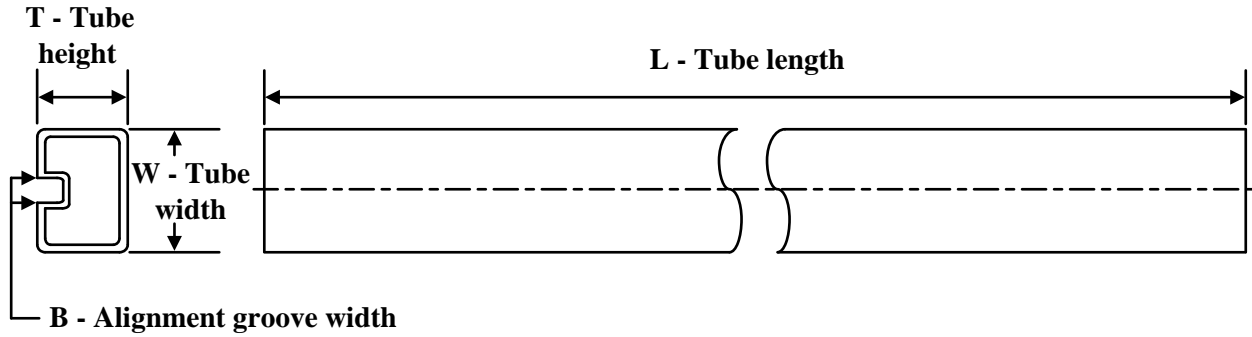
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HC266DR	SOIC	D	14	2500	330.0	16.4	6.6	9.3	2.1	8.0	16.0	Q1
SN74HC266DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HC266NSR	SOP	NS	14	2000	330.0	16.4	8.45	10.55	2.5	12.0	16.2	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC266DR	SOIC	D	14	2500	366.0	364.0	50.0
SN74HC266DR	SOIC	D	14	2500	356.0	356.0	35.0
SN74HC266NSR	SOP	NS	14	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)
SN74HC266N	N	PDIP	14	25	506	13.97	11230	4.32
SN74HC266N	N	PDIP	14	25	506	13.97	11230	4.32

D0014A



PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

NOTES:

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 0.43 mm, per side.
5. Reference JEDEC registration MS-012, variation AB.

EXAMPLE BOARD LAYOUT

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

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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

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:8X

4220718/A 09/2016

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**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- 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



- 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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