

## SN74LV32A-Q1 四通道双输入正或门

### 1 特性

- 符合汽车应用要求
- 工作范围为 2V 至 5.5V  $V_{CC}$
- 5V 时  $t_{pd}$  最大值为 6.5ns
- $V_{OLP}$  (输出接地反弹) 典型值小于 0.8V ( $V_{CC} = 3.3V$ 、 $T_A = 25^\circ C$  时)
- $V_{OHV}$  (输出  $V_{OH}$  下冲) 典型值大于 2.3V ( $V_{CC} = 3.3V$ 、 $T_A = 25^\circ C$  时)
- 所有端口上均支持混合模式电压运行
- $I_{off}$  支持局部断电模式运行

### 2 说明

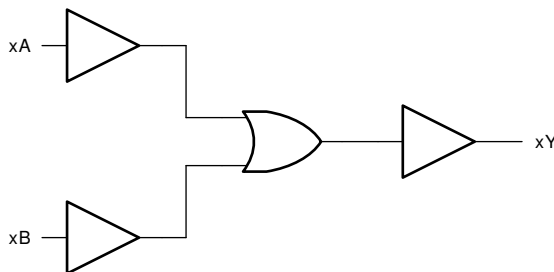
这些四通道双输入正或门可在 2V 至 5.5V  $V_{CC}$  电压下运行。

#### 封装信息

| 器件型号         | 封装 <sup>1</sup> | 封装尺寸 <sup>2</sup> |
|--------------|-----------------|-------------------|
| SN74LV32A-Q1 | PW (TSSOP, 14)  | 5.00 mm x 6.4 mm  |

(1) 如需了解所有可用封装, 请参阅数据表末尾的可订购产品附录。

(2) 封装尺寸 (长 x 宽) 为标称值, 并包括引脚 (如适用)。



逻辑图, 每个逻辑门 (正逻辑)



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## 3 Revision History

| Changes from Revision C (January 2008) to Revision D (August 2023) | Page |
|--------------------------------------------------------------------|------|
| • 添加了封装信息表、引脚功能表、ESD 等级表、热信息表、器件功能模式、器件和文档支持部分以及机械、封装和可订购信息部分..... | 1    |

## 4 Pin Configuration and Functions

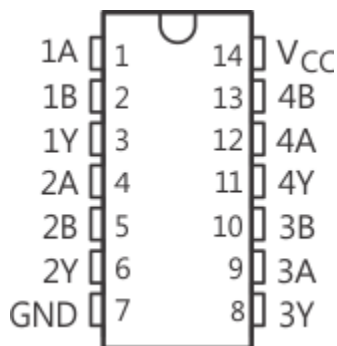


图 4-1. PW Package  
 14-Pin TSSOP  
 Top View

| PIN |                 | TYPE <sup>(1)</sup> | DESCRIPTION     |
|-----|-----------------|---------------------|-----------------|
| NO. | NAME            |                     |                 |
| 1   | 1A              | I                   | 1A input        |
| 2   | 1B              | I                   | 1B              |
| 3   | 1Y              | O                   | 1Y              |
| 4   | 2A              | I                   | 2A              |
| 5   | 2B              | I                   | 2B              |
| 6   | 2Y              | O                   | 2Y              |
| 7   | GND             | —                   | GND             |
| 8   | 3Y              | O                   | 3Y              |
| 9   | 3A              | I                   | 3A              |
| 10  | 3B              | I                   | 3B              |
| 11  | 4Y              | O                   | 4Y              |
| 12  | 4A              | I                   | 4A              |
| 13  | 4B              | I                   | 4B              |
| 14  | V <sub>CC</sub> | —                   | V <sub>CC</sub> |

(1) Signal Types: I = Input, O = Output, I/O = Input or Output

## 5 Specifications

### 5.1 Absolute Maximum Ratings

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

|           |                                                                                     | MIN                   | MAX            | UNIT |
|-----------|-------------------------------------------------------------------------------------|-----------------------|----------------|------|
| $V_{CC}$  | Supply voltage range                                                                | - 0.5                 | 7              | V    |
| $V_I$     | Input voltage range <sup>1</sup>                                                    | - 0.5                 | 7              | V    |
| $V_O$     | Voltage applied to any output in the high-impedance or power-off state <sup>1</sup> | - 0.5                 | 7              | V    |
| $V_O$     | Output voltage range <sup>1 2</sup>                                                 | - 0.5                 | $V_{CC} + 0.5$ | V    |
| $I_{IK}$  | Input clamp current                                                                 | $V_I < 0$             | - 20           | mA   |
| $I_{OK}$  | Output clamp current                                                                | $V_O < 0$             | - 50           | mA   |
| $I_O$     | Continuous output current                                                           | $V_O = 0$ to $V_{CC}$ | $\pm 25$       | mA   |
|           | Continuous current through $V_{CC}$ or GND                                          |                       | $\pm 50$       | mA   |
| $T_{stg}$ | Storage temperature                                                                 | - 65                  | 150            | °C   |

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* 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 Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value is limited to 5.5-V maximum.

### 5.2 ESD Ratings

|             |                                                                                  | VALUE      | UNIT |
|-------------|----------------------------------------------------------------------------------|------------|------|
| $V_{(ESD)}$ | Electrostatic discharge<br>Human body model (HBM), per AEC Q100-002 <sup>1</sup> | $\pm 2000$ | V    |

- (1) AEC Q100-002 indicates that HBM stressing must be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

### 5.3 Recommended Operating Conditions

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

|          |                           | MIN                       | MAX                 | UNIT    |
|----------|---------------------------|---------------------------|---------------------|---------|
| $V_{CC}$ | Supply voltage            | 2                         | 5.5                 | V       |
| $V_{IH}$ | High-level input voltage  | $V_{CC} = 2$ V            | 1.5                 | V       |
|          |                           | $V_{CC} = 2.3$ V to 2.7 V | $V_{CC} \times 0.7$ |         |
|          |                           | $V_{CC} = 3$ V to 3.6 V   | $V_{CC} \times 0.7$ |         |
|          |                           | $V_{CC} = 4.5$ V to 5.5 V | $V_{CC} \times 0.7$ |         |
| $V_{IL}$ | Low-level input voltage   | $V_{CC} = 2$ V            | 0.5                 | V       |
|          |                           | $V_{CC} = 2.3$ V to 2.7 V | $V_{CC} \times 0.3$ |         |
|          |                           | $V_{CC} = 3$ V to 3.6 V   | $V_{CC} \times 0.3$ |         |
|          |                           | $V_{CC} = 4.5$ V to 5.5 V | $V_{CC} \times 0.3$ |         |
| $V_I$    | Input voltage             | 0                         | 5.5                 | V       |
| $V_O$    | Output voltage            | 0                         | $V_{CC}$            | V       |
| $I_{OH}$ | High-level output current | $V_{CC} = 2$ V            | - 50                | $\mu$ A |
|          |                           | $V_{CC} = 2.3$ V to 2.7 V | - 2                 | mA      |
|          |                           | $V_{CC} = 3$ V to 3.6 V   | - 6                 |         |
|          |                           | $V_{CC} = 4.5$ V to 5.5 V | - 12                |         |

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

|                     |                                    | MIN                                     | MAX | UNIT               |
|---------------------|------------------------------------|-----------------------------------------|-----|--------------------|
| $I_{OL}$            | Low-level output current           | $V_{CC} = 2\text{ V}$                   | 50  | $\mu\text{ A}$     |
|                     |                                    | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 2   | mA                 |
|                     |                                    | $V_{CC} = 3\text{ V to }3.6\text{ V}$   | 6   |                    |
|                     |                                    | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | 12  |                    |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 200 | ns/V               |
|                     |                                    | $V_{CC} = 3\text{ V to }3.6\text{ V}$   | 100 |                    |
|                     |                                    | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | 20  |                    |
| $T_A$               | Operating free-air temperature     | - 40                                    | 105 | $^{\circ}\text{C}$ |

(1) All unused inputs of the device must be held at  $V_{CC}$  or GND for proper device operation. See the TI application report, *Implications of Slow or Floating CMOS Inputs*, [SCBA004](#).

## 5.4 Thermal Information

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

| THERMAL METRIC <sup>(1)</sup> |                                        | PW (TSSOP) | UNIT |
|-------------------------------|----------------------------------------|------------|------|
|                               |                                        | 14 PINS    |      |
| R <sub>θJA</sub>              | Junction-to-ambient thermal resistance | 113        | °C/W |

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).

## 5.5 Electrical Characteristics

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

| PARAMETER        | TEST CONDITIONS                        | V <sub>CC</sub>                                             | MIN        | TYP                   | MAX | UNIT |
|------------------|----------------------------------------|-------------------------------------------------------------|------------|-----------------------|-----|------|
| V <sub>OH</sub>  | High level output voltage              | I <sub>OH</sub> = - 50 μ A                                  | 2 to 5.5 V | V <sub>CC</sub> - 0.1 |     | V    |
|                  |                                        | I <sub>OH</sub> = - 2 mA                                    | 2.3 V      | 2                     |     |      |
|                  |                                        | I <sub>OH</sub> = - 6 mA                                    | 3 V        | 2.48                  |     |      |
|                  |                                        | I <sub>OH</sub> = - 12 mA                                   | 4.5 V      | 3.8                   |     |      |
| V <sub>OL</sub>  | Low level output voltage               | I <sub>OL</sub> = 50 μ A                                    | 2 to 5.5 V | 0.1                   |     | V    |
|                  |                                        | I <sub>OL</sub> = 2 mA                                      | 2.3 V      | 0.4                   |     |      |
|                  |                                        | I <sub>OL</sub> = 6 mA                                      | 3 V        | 0.44                  |     |      |
|                  |                                        | I <sub>OL</sub> = 12 mA                                     | 4.5 V      | 0.55                  |     |      |
| I <sub>I</sub>   | Input leakage current                  | V <sub>I</sub> = 5.5 V or GND                               | 0 to 5.5 V | ±1                    |     | μ A  |
| I <sub>CC</sub>  | Supply current                         | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 | 5.5 V      | 20                    |     | μ A  |
| I <sub>off</sub> | Input/Output Power-Off Leakage Current | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V               | 0          | 5                     |     | μ A  |
| C <sub>i</sub>   | Input Capacitance                      | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 3.3 V      | 3.3                   |     | pF   |
|                  |                                        |                                                             | 5 V        | 3.3                   |     |      |

## 5.6 Switching Characteristics, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$

over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^{\circ}\text{C}$ |     |      | MIN | MAX | UNIT |
|-----------|--------------|-------------|----------------------|----------------------------|-----|------|-----|-----|------|
|           |              |             |                      | MIN                        | TYP | MAX  |     |     |      |
| $t_{pd}$  | A or B       | Y           | $C_L = 50\text{ pF}$ |                            | 9.6 | 16.2 | 1   | 20  | ns   |

## 5.7 Switching Characteristics, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^\circ\text{C}$ |     |      | MIN | MAX | UNIT |
|-----------|--------------|-------------|----------------------|--------------------------|-----|------|-----|-----|------|
|           |              |             |                      | MIN                      | TYP | MAX  |     |     |      |
| $t_{pd}$  | A or B       | Y           | $C_L = 50\text{ pF}$ |                          | 6.9 | 11.4 | 1   | 13  | ns   |

## 5.8 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^\circ\text{C}$ |     |     | MIN | MAX | UNIT |
|-----------|--------------|-------------|----------------------|--------------------------|-----|-----|-----|-----|------|
|           |              |             |                      | MIN                      | TYP | MAX |     |     |      |
| $t_{pd}$  | A or B       | Y           | $C_L = 50\text{ pF}$ |                          | 4.9 | 7.5 | 1   | 8.5 | ns   |

## 5.9 Noise Characteristics

$V_{CC} = 3.3\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$ <sup>(1)</sup>

| PARAMETER   |                                        | MIN  | TYP   | MAX   | UNIT |
|-------------|----------------------------------------|------|-------|-------|------|
| $V_{OL(P)}$ | Quiet output, maximum dynamic $V_{OL}$ |      | 0.2   | 0.8   | V    |
| $V_{OL(V)}$ | Quiet output, minimum dynamic $V_{OL}$ |      | - 0.1 | - 0.8 |      |
| $V_{OH(V)}$ | Quiet output, minimum dynamic $V_{OH}$ |      | 3.1   |       |      |
| $V_{IH(D)}$ | High-level dynamic input voltage       | 2.31 |       |       |      |
| $V_{IL(D)}$ | Low-level dynamic input voltage        |      |       | 0.99  |      |

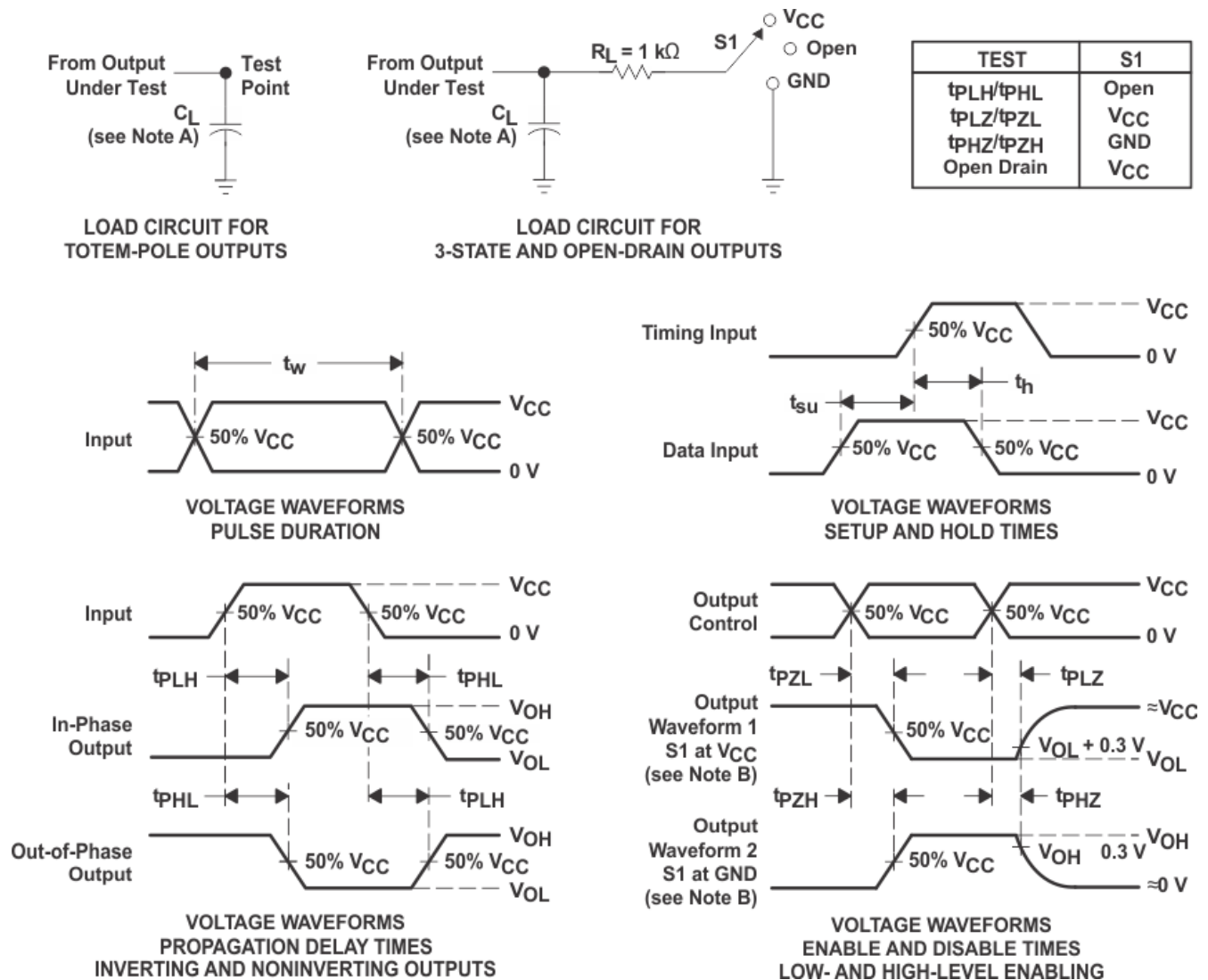
(1) Characteristics are for surface-mount packages only.

## 5.10 Operating Characteristics

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

| PARAMETER |                               | TEST CONDITIONS                            | $V_{CC}$ | TYP  | UNIT |
|-----------|-------------------------------|--------------------------------------------|----------|------|------|
| $C_{pd}$  | Power dissipation capacitance | $C_L = 50\text{ pF}$ , $f = 10\text{ MHz}$ | 3.3 V    | 9.5  | pF   |
|           |                               |                                            | 5 V      | 11.5 |      |

## 6 Parameter Measurement Information



- A.  $C_L$  includes probe and jig capacitance.
- B. 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.
- C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
- D. The outputs are measured one at a time, with one input transition per measurement.
- E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- G.  $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
- H. All parameters and waveforms are not applicable to all devices.

图 6-1. Load Circuit and Voltage Waveforms

## 7 Detailed Description

### 7.1 Overview

These quadruple 2-input positive-OR gates are designed for 2-V to 5.5-V  $V_{CC}$  operation.

The SN74LV32A performs the Boolean function  $Y = A + B$  or  $Y = \overline{A \cdot B}$  in positive logic.

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

### 7.2 Functional Block Diagram

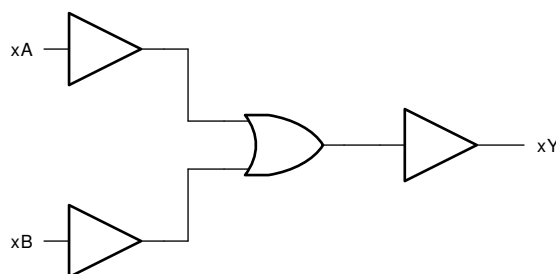


图 7-1. Logic Diagram, Each Gate (Positive Logic)

### 7.3 Device Functional Modes

表 7-1. Function Table

| INPUTS <sup>(1)</sup> |   | OUTPUT <sup>(2)</sup><br>Y |
|-----------------------|---|----------------------------|
| A                     | B |                            |
| H                     | X | H                          |
| X                     | H | H                          |
| L                     | L | L                          |

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

(2) H = Driving High, L = Driving Low, Z = High Impedance State

## 8 Device and Documentation Support

### 8.1 Documentation Support (Analog)

#### 8.1.1 Related Documentation

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

**表 8-1. Related Links**

| PARTS        | PRODUCT FOLDER             | SAMPLE & BUY               | TECHNICAL DOCUMENTS        | TOOLS & SOFTWARE           | SUPPORT & COMMUNITY        |
|--------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| SN74LV32A-Q1 | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> |

### 8.2 接收文档更新通知

要接收文档更新通知，请导航至 [ti.com](http://ti.com) 上的器件产品文件夹。点击 [订阅更新](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

### 8.3 支持资源

[TI E2E™ 支持论坛](#) 是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [《使用条款》](#)。

### 8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

### 8.5 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

### 8.6 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

## 9 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 part number             | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|-----------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">SN74LV32ATPWRG4Q1</a> | Active        | Production           | TSSOP (PW)   14 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 105   | (LV32AT, LV32ATQ)   |
| SN74LV32ATPWRG4Q1.A               | Active        | Production           | TSSOP (PW)   14 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 105   | (LV32AT, LV32ATQ)   |

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

<sup>(2)</sup> **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.

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

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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.

**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 SN74LV32A-Q1 :

- Catalog : [SN74LV32A](#)

- Enhanced Product : [SN74LV32A-EP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

## TAPE AND REEL INFORMATION



\*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 |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LV32ATPWG4Q1 | TSSOP        | PW              | 14   | 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

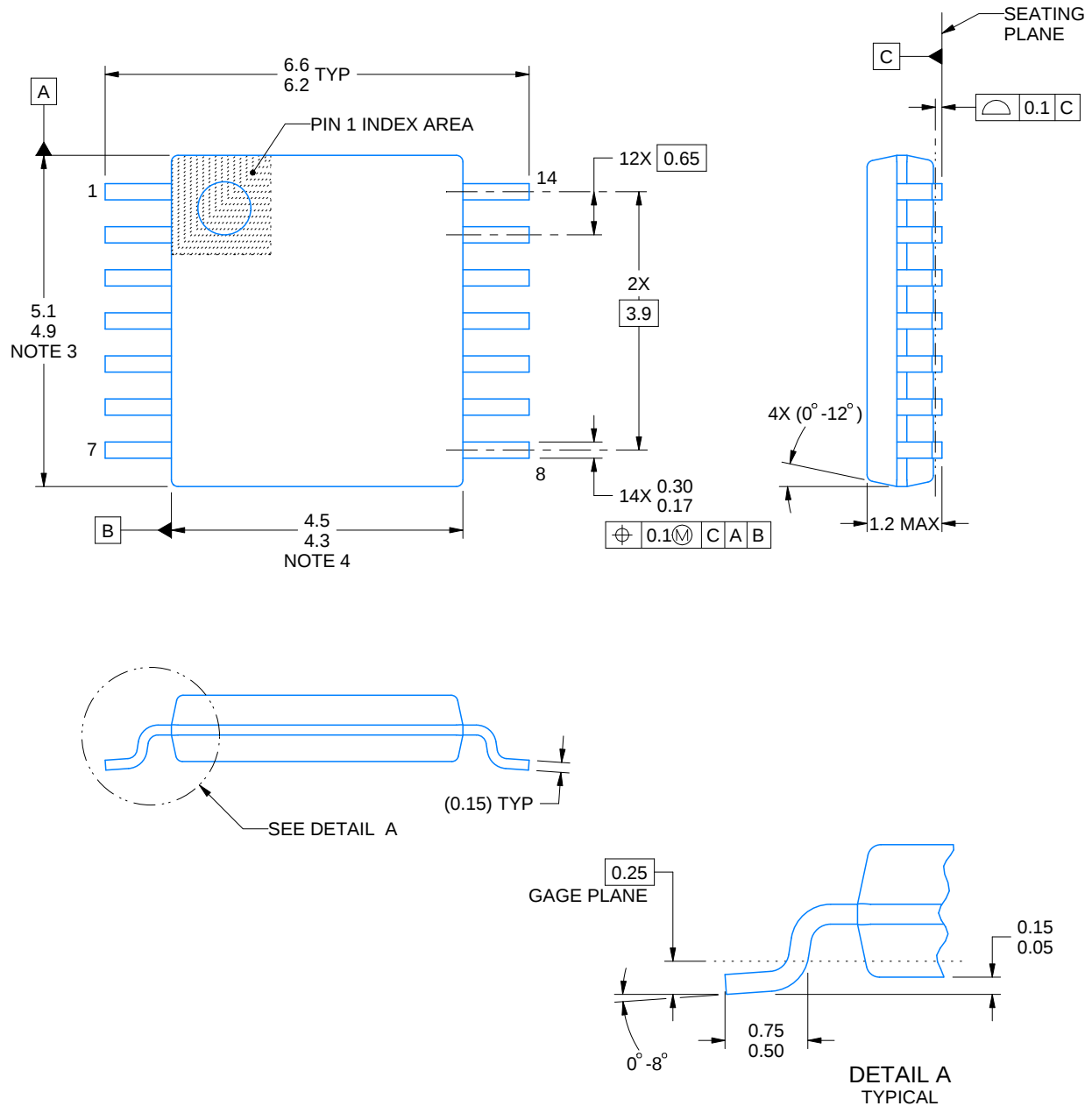
| Device           | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LV32ATPWG4Q1 | TSSOP        | PW              | 14   | 2000 | 353.0       | 353.0      | 32.0        |

**PW0014A**

## PACKAGE OUTLINE

**TSSOP - 1.2 mm max height**

SMALL OUTLINE PACKAGE



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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.

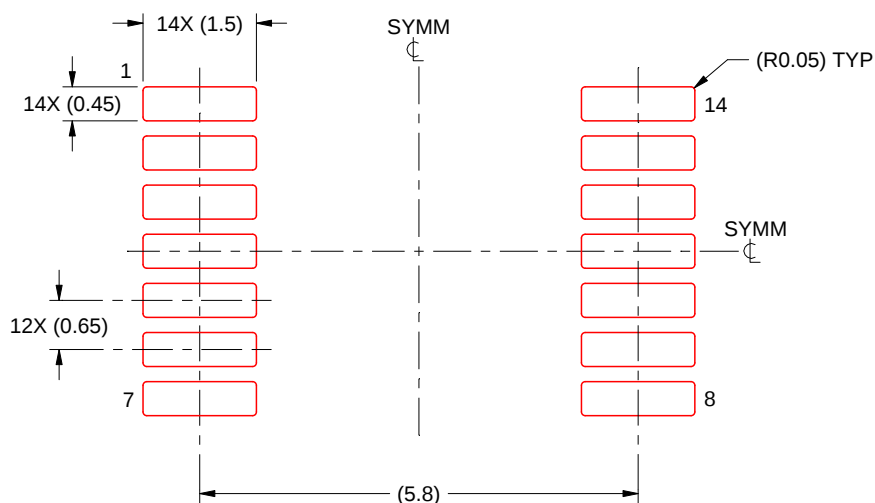


# EXAMPLE STENCIL DESIGN

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

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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.

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