

SN74AC241 具有三态输出的八路缓冲器/驱动器

1 特性

- V_{CC} 工作范围为 2V 至 6V
- 输入电压高达 6 V
- 5V 时 t_{pd} 最大值为 7.5ns

2 说明

这些八路缓冲器和线路驱动器专门设计用于提高三态存储器地址驱动器、时钟驱动器以及总线导向接收器和发送器的性能和密度。

封装信息

| 器件型号 | 封装 ¹ | 封装尺寸 (标称值) |
|-----------|-----------------|------------------|
| SN74AC241 | N (PDIP, 20) | 24.33mm x 6.35mm |
| | DW (SOIC, 20) | 12.8mm x 7.5mm |
| | NS (SOP, 20) | 12.6 mm x 5.3 mm |
| | DB (SSOP, 20) | 7.2 mm x 5.3 mm |
| | PW (TSSOP, 20) | 6.5mm x 4.4mm |

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。

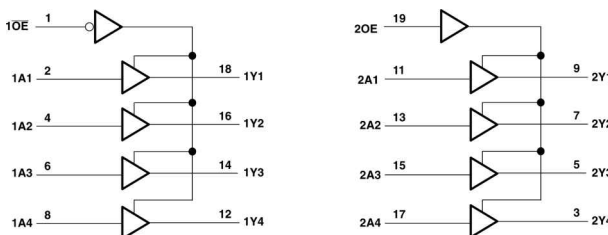


图 2-1. 逻辑图 (正逻辑)



Table of Contents

| | | | |
|--|---|---|---|
| 1 特性 | 1 | 5.5 Switching Characteristics, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ | 5 |
| 2 说明 | 1 | 5.6 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ | 5 |
| 3 Revision History | 2 | 5.7 Operating Characteristics..... | 6 |
| 4 Pin Configuration and Functions | 3 | 6 Parameter Measurement Information | 7 |
| 5 Specifications | 4 | 7 Detailed Description | 8 |
| 5.1 Absolute Maximum Ratings..... | 4 | 7.1 Overview..... | 8 |
| 5.2 Recommended Operating Conditions..... | 4 | 7.2 Functional Block Diagram..... | 8 |
| 5.3 Thermal Information..... | 4 | 7.3 Device Functional Modes..... | 8 |
| 5.4 Electrical Characteristics..... | 5 | | |

3 Revision History

| Changes from Revision E (October 2003) to Revision F (May 2023) | Page |
|---|------|
| • 添加了封装信息表、引脚功能表和热性能信息表..... | 1 |

4 Pin Configuration and Functions

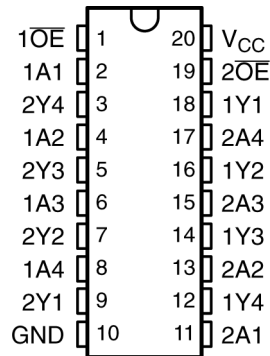


图 4-1. SN54AC241 DB, DW, N, NS, Or PW Package (Top View)

表 4-1. Pin Functions

| NAME ¹ | PIN | TYPE | DESCRIPTION |
|-------------------|-----|------|-----------------|
| 1OE | 1 | I | Output enable 1 |
| 1A1 | 2 | I | 1A1 input |
| 2Y4 | 3 | O | 2Y4 output |
| 1A2 | 4 | I | 1A2 input |
| 2Y3 | 5 | O | 2Y3 output |
| 1A3 | 6 | I | 1A3 input |
| 2Y2 | 7 | O | 2Y2 output |
| 1A4 | 8 | I | 1A4 input |
| 2Y1 | 9 | O | 2Y1 output |
| GND | 10 | — | Ground pin |
| 2A1 | 11 | I | 2A1 input |
| 1Y4 | 12 | O | 1Y4 output |
| 2A2 | 13 | I | 2A2 input |
| 1Y3 | 14 | O | 1Y3 output |
| 2A3 | 15 | I | 2A3 input |
| 1Y2 | 16 | O | 1Y2 output |
| 2A4 | 17 | I | 2A4 input |
| 1Y1 | 18 | O | 1Y1 output |
| 2OE | 19 | I | Output enable 2 |
| VCC | 20 | — | Power pin |

5 Specifications

5.1 Absolute Maximum Ratings

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

| | | MIN | MAX | UNIT |
|-----------------------------|---|------|----------------------|------|
| V _{CC} | Supply voltage range | -0.5 | 7 | V |
| V _I ¹ | Input voltage range | -0.5 | V _{CC} +0.5 | V |
| V _O ¹ | Output voltage range | -0.5 | V _{CC} +0.5 | V |
| I _{IK} | Input clamp current (V _I < 0 or V _I > V _{CC}) | | ±20 | mA |
| I _{OK} | Output clamp current (V _O < 0 or V _O > V _{CC}) | | ±20 | mA |
| I _O | Continuous output current (V _O = 0 or V _{CC}) | | ±50 | mA |
| | Continuous current through V _{CC} or GND | | ±200 | mA |
| T _{stg} | Storage temperature range | -65 | 150 | °C |

- (1) Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 Recommended Operating Conditions

(see [Note 1](#))

| | | | MIN | MAX | UNIT |
|-----------------|------------------------------------|-------------------------|------|-----------------|------|
| V _{CC} | Supply voltage | | 2 | 6 | V |
| V _{IH} | High-level input voltage | V _{cc} = 3 V | 2.1 | | V |
| | | V _{cc} = 4.5 V | 1.15 | | |
| | | V _{cc} = 5.5 V | 1.85 | | |
| V _{IL} | Low-level input voltage | V _{cc} = 3 V | | 0.9 | V |
| | | V _{cc} = 4.5 V | | 1.35 | |
| | | V _{cc} = 5.5 V | | 1.65 | |
| V _I | Input voltage | | 0 | V _{cc} | V |
| V _O | Output voltage | | 0 | V _{cc} | V |
| I _{OH} | High-level output current | V _{cc} = 3 V | | -12 | mA |
| | | V _{cc} = 4.5 V | | -24 | |
| | | V _{cc} = 5.5 V | | -24 | |
| I _{OL} | Low-level output current | V _{cc} = 3 V | | 12 | mA |
| | | V _{cc} = 4.5 V | | 24 | |
| | | V _{cc} = 5.5 V | | 24 | |
| Δt/Δv | Input transition rise or fall rate | | | 8 | ns/V |
| T _a | Operating free-air temperature | | -40 | 85 | °C |

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

5.3 Thermal Information

| THERMAL METRIC ⁽¹⁾ | DB | DW | N | NS | PW | UNIT |
|-------------------------------|---------|----|----|----|----|------|
| | 20 PINS | | | | | |
| R _{θJA} | 70 | 58 | 69 | 60 | 83 | °C/W |

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

5.4 Electrical Characteristics

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | SN74AC241 | | UNIT |
|---|--|---|-----------------------|-----|------|-----------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | |
| V _{OH} | I _{oh} = -50 μA | 3 V | 2.9 | | | 2.9 | V | |
| | | 4.5 V | 4.4 | | | 4.4 | | |
| | | 5.5 V | 5.4 | | | 5.4 | | |
| | I _{oh} = -12 mA | 3 V | 2.56 | | | 2.46 | | |
| | | 4.5 V | 3.86 | | | 3.76 | | |
| | I _{oh} = -24 mA | 5.5 V | 4.86 | | | 4.76 | | |
| | | 5.5 V | | | | | | |
| I _{oh} = -50 mA ⁽¹⁾ | 5.5 V | | | | | | | |
| I _{oh} = -75 mA ⁽¹⁾ | 5.5 V | | | | 3.85 | | | |
| V _{OL} | I _{ol} = 50 μA | 3 V | | | | 0.1 | V | |
| | | 4.5 V | | | | 0.1 | | |
| | | 5.5 V | | | | 0.1 | | |
| | I _{ol} = 12 mA | 3 V | | | | 0.36 | | 0.44 |
| | | 4.5 V | | | | 0.36 | | 0.44 |
| | I _{ol} = 24 mA | 5.5 V | | | | 0.36 | | 0.44 |
| | | 5.5 V | | | | | | |
| I _{ol} = 50 mA ⁽¹⁾ | 5.5 V | | | | | | | |
| I _{ol} = 75 mA ⁽¹⁾ | 5.5 V | | | | | 1.65 | | |
| I _I | Data inputs | V _I = V _{CC} or GND | 5.5 V | | | ±0.1 | ±1 | μA |
| | Control inputs | V _I = V _{CC} or GND | | | | ±0.1 | ±1 | |
| I _{OZ} | V _O = V _{CC} or GND, V _{I(OE)} = V _{IL} or V _{IH} | | 5.5 V | | | ±0.25 | ±2.5 | μA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | | 5.5 V | | | 4 | 40 | μA |
| C _i | V _I = V _{CC} or GND | | 5 V | 2.5 | | | | pF |

(1) Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

5.5 Switching Characteristics, V_{CC} = 3.3 V ± 0.3 V

over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see 图 6-1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | T _A = 25°C | | | SN74AC241 | | UNIT |
|------------------|--------------|-------------|-----------------------|-----|------|-----------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | |
| t _{PLH} | A | Y | 1.5 | 6 | 9 | 1.5 | 10 | ns |
| t _{PHL} | | | 1.5 | 6 | 9 | 1 | 10.5 | |
| t _{PZH} | OE or OE | Y | 1.5 | 6.5 | 12.5 | 1 | 13 | ns |
| t _{PZL} | | | 1.5 | 7 | 12 | 1.5 | 13 | |
| t _{PHZ} | OE or OE | Y | 2 | 8 | 12 | 2 | 12.5 | ns |
| t _{PLZ} | | | 1.5 | 7 | 12.5 | 1 | 13.5 | |

5.6 Switching Characteristics, V_{CC} = 5 V ± 0.5 V

over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see 图 6-1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | T _A = 25°C | | | SN74AC241 | | UNIT |
|------------------|--------------|-------------|-----------------------|-----|-----|-----------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | |
| t _{PLH} | A | Y | 1.5 | 5 | 7 | 1 | 7.5 | ns |
| t _{PHL} | | | 1.5 | 4.5 | 7 | 1 | 7.5 | |
| t _{PZH} | OE or OE | Y | 1.5 | 5.5 | 9 | 1 | 9.5 | ns |
| t _{PZL} | | | 1.5 | 5.5 | 9 | 1 | 9.5 | |

over recommended operating free-air temperature range, $V_{CC} = 5 V \pm 0.5 V$ (unless otherwise noted) (see [Figure 6-1](#))

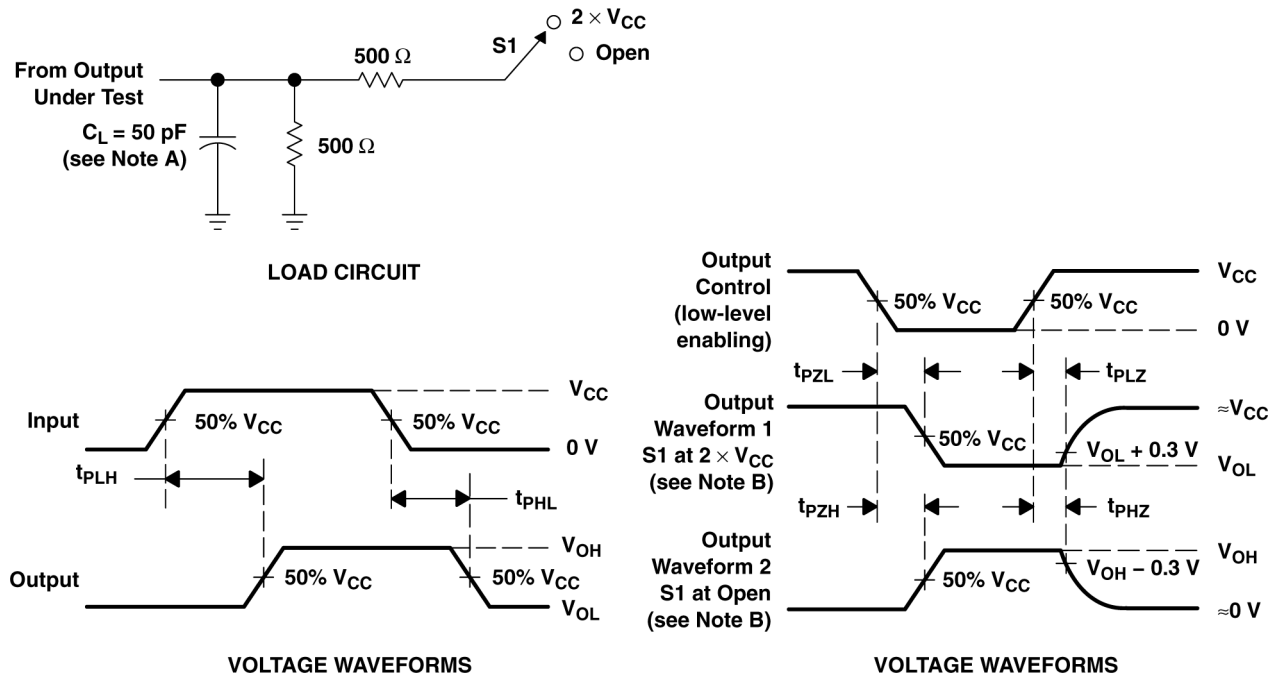
| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A = 25^\circ\text{C}$ | | | SN74AC241 | | UNIT |
|-----------|-----------------------|-------------|--------------------------|-----|-----|-----------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | |
| t_{PHZ} | \overline{OE} or OE | Y | 1.5 | 6.5 | 10 | 1 | 10.5 | ns |
| t_{PLZ} | | | 1.5 | 6 | 10 | 1 | 10.5 | |

5.7 Operating Characteristics

$V_{CC} = 5 V$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|---|-----|------|
| C_{pd} Power dissipation capacitance per buffer/driver | $C_1 = 50 \text{ pF}$, $f = 1 \text{ MHz}$ | 45 | pF |

6 Parameter Measurement Information



- C_L includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
- The outputs are measured one at a time with one input transition per measurement.

图 6-1. Load Circuit and Voltage Waveforms

| TEST | S1 |
|-------------------|-------------------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | $2 \times V_{CC}$ |
| t_{PHZ}/t_{PZH} | Open |

7 Detailed Description

7.1 Overview

The 'AC241 devices are organized as two 4-bit buffers/drivers with separate complementary output-enable ($\overline{1OE}$ and $2OE$) inputs. When $\overline{1OE}$ is low or $2OE$ is high, the device passes noninverted data from the A inputs to the Y outputs. When $\overline{1OE}$ is high or $2OE$ is low, the outputs are in the high-impedance state.

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

7.2 Functional Block Diagram

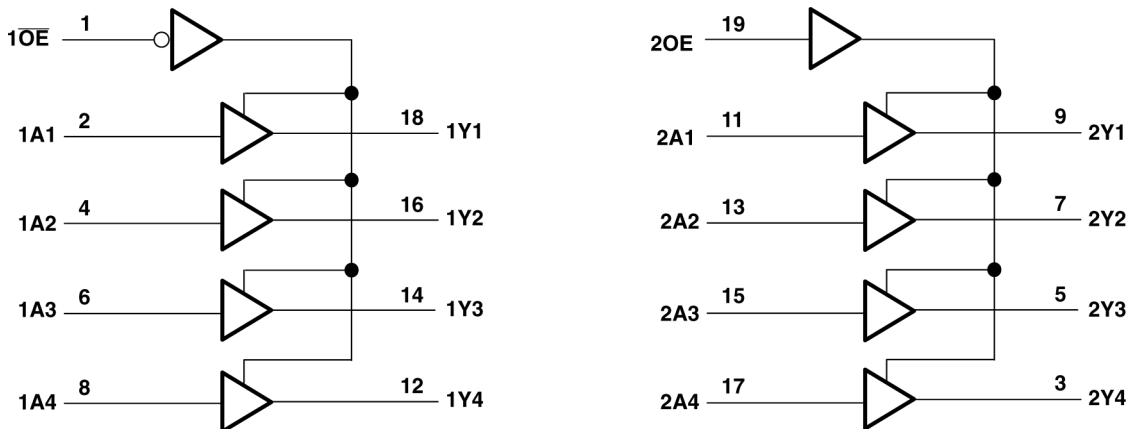


图 7-1. Logic Diagram (Positive Logic)

7.3 Device Functional Modes

表 7-1. Function Tables

| INPUTS | | OUTPUT 1Y |
|------------------|----|-----------|
| $\overline{1OE}$ | 1A | |
| L | H | H |
| L | L | L |
| H | X | Z |

| INPUTS | | OUTPUT 2Y |
|--------|----|-----------|
| $2OE$ | 2A | |
| H | H | H |
| H | L | L |
| L | X | Z |

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 |
|------------------|---------------|--------------|-----------------|------|-------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74AC241DBR | ACTIVE | SSOP | DB | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC241 | Samples |
| SN74AC241DW | ACTIVE | SOIC | DW | 20 | 25 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC241 | Samples |
| SN74AC241DWR | ACTIVE | SOIC | DW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC241 | Samples |
| SN74AC241N | ACTIVE | PDIP | N | 20 | 20 | RoHS & Non-Green | NIPDAU | N / A for Pkg Type | -40 to 85 | SN74AC241N | Samples |
| SN74AC241NSR | ACTIVE | SO | NS | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC241 | Samples |
| SN74AC241PWR | ACTIVE | TSSOP | PW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC241 | 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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AC241DBR | SSOP | DB | 20 | 2000 | 330.0 | 16.4 | 8.2 | 7.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74AC241DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.3 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74AC241NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.4 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74AC241PWR | TSSOP | PW | 20 | 2000 | 330.0 | 16.4 | 6.95 | 7.1 | 1.6 | 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) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AC241DBR | SSOP | DB | 20 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74AC241DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74AC241NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74AC241PWR | TSSOP | PW | 20 | 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) |
|-------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74AC241DW | DW | SOIC | 20 | 25 | 507 | 12.83 | 5080 | 6.6 |
| SN74AC241N | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |

PW0020A



PACKAGE OUTLINE

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220206/A 02/2017

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

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4220206/A 02/2017

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

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220206/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.

PW (R-PDSO-G20)

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 design.
 - 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.

DB0020A



PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4214851/B 08/2019

EXAMPLE BOARD LAYOUT

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4214851/B 08/2019

NOTES: (continued)

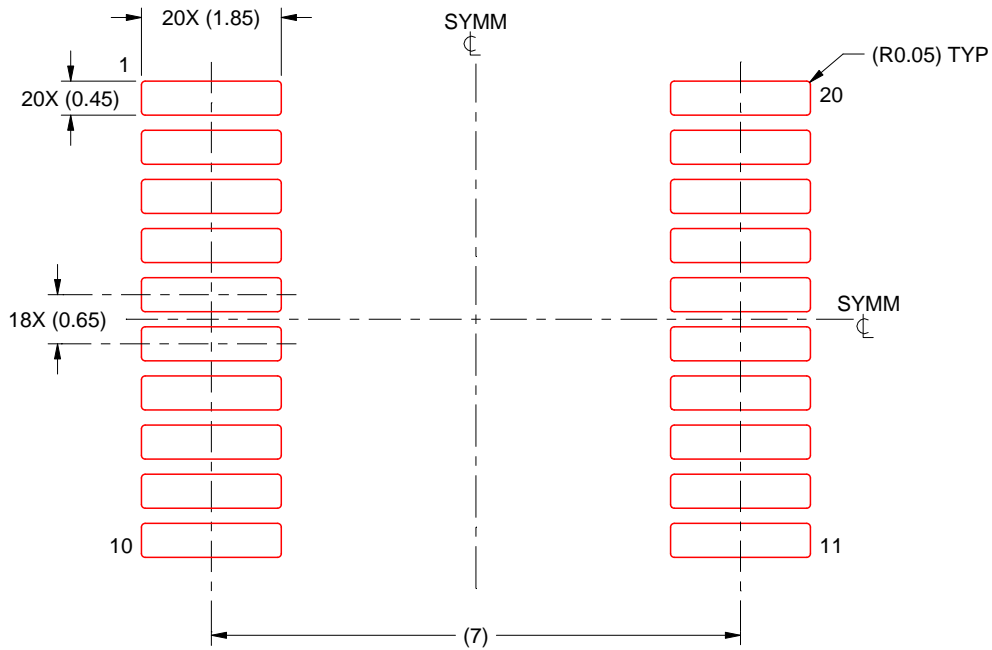
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4214851/B 08/2019

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.

DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

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-013.

EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

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

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

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.

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