SN54ACT241, SN74ACT241 **OCTAL BUFFERS/DRIVERS** WITH 3-STATE OUTPUTS SCAS516C - JUNE 1995 - REVISED OCTOBER 2002 4.5-V to 5.5-V V<sub>CC</sub> Operation Max t<sub>pd</sub> of 8.5 ns at 5 V Inputs Accept Voltages to 5.5 V Inputs Are TTL Compatible SN54ACT241 ... FK PACKAGE SN54ACT241 ... J OR W PACKAGE SN74ACT241 ... DB, DW, N, NS, OR PW PACKAGE (TOP VIEW) (TOP VIEW) 24 1A1 V<sub>CC</sub> 20E 1<del>0E</del> 20 Vcc 1A1 🛛 19 20E 2 2 1 20 19 18 1A2 1Y1 2Y4 3 18 1Y1 2Y3 17 2A4 1A2 4 17 2A4 1A3 6 16 1Y2 2Y3 5 16 1Y2 2Y2 Π7 15 2A3 1A3 🛛 6 15 2A3 Π8 14 1Y3 1A4 2Y2 **[**7 14 1Y3 9 10 11 12 13 1A4 🛛 8 13 2A2 2Y1 GND 2A1 1Y4 2A2 2Y1 9 12 1Y4

#### description/ordering information

GND

10

11 2A1

These octal buffers and line drivers are designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

The 'ACT241 devices are organized as two 4-bit buffers/drivers with separate complementary output-enable (10E and 20E) inputs. When 10E is low or 20E is high, the device passes noninverted data from the A inputs to the Y outputs. When  $1\overline{OE}$  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<sub>CC</sub> 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.

T <sub>A</sub>	PACKAGI	Et	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube	SN74ACT241N	SN74ACT241N
1000 4- 0500		Tube	SN74ACT241DW	107044
	SOIC – DW	Tape and reel	SN74ACT241DWR	ACT241
–40°C to 85°C	SOP – NS	Tape and reel	SN74ACT241NSR	ACT241
	SSOP – DB	Tape and reel	SN74ACT241DBR	AD241
	TSSOP – PW	Tape and reel	SN74ACT241PWR	AD241
	CDIP – J	Tube	SNJ54ACT241J	SNJ54ACT241J
–55°C to 125°C	CFP – W	Tube	SNJ54ACT241W	SNJ54ACT241W
	LCCC – FK	Tube	SNJ54ACT241FK	SNJ54ACT241FK

#### **ORDERING INFORMATION**

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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### SN54ACT241, SN74ACT241 **OCTAL BUFFERS/DRIVERS** WITH 3-STATE OUTPUTS

SCAS516C - JUNE 1995 - REVISED OCTOBER 2002

FUN	FUNCTION TABLES										
INPU	JTS	OUTPUT									
10E	1 <b>A</b>	1Y									
L	Н	Н									
L	L	L									
н	Х	Z									
INPU	JTS	OUTPUT									
20E	2A	2Y									
Н	Н	Н									

L

Х

L

7

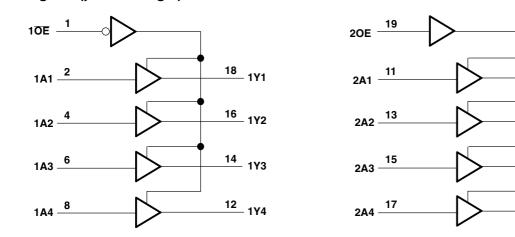
9 \_\_\_\_\_ 2Y1

7 \_\_\_\_ 2Y2

5 2Y3

3 \_\_\_\_\_2Y4

#### logic diagram (positive logic)



Н

L

#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Input voltage range, V <sub>I</sub> (see Note 1) Output voltage range, V <sub>O</sub> (see Note 1)	-0.5 V to 7 V -0.5 V to V <sub>CC</sub> + 0.5 V -0.5 V to V <sub>CC</sub> + 0.5 V -0.5 V to V <sub>CC</sub> + 0.5 V ±20 mA
	±20 mA
	±50 mA
Continuous current through V <sub>CC</sub> or GND	±200 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2):	DB package 70°C/W
	DW package 58°C/W
	N package 69°C/W
	NS package 60°C/W
	PW package
Storage temperature range, T <sub>stg</sub>	–65°C to 150°C

<sup>†</sup> 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. The package thermal impedance is calculated in accordance with JESD 51-7.



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#### recommended operating conditions (see Note 3)

		SN54ACT2		SN74A	CT241	
		MIN	MAX	MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	4.5	5.5	4.5	5.5	V
V <sub>IH</sub>	High-level input voltage	2		2		V
V <sub>IL</sub>	Low-level input voltage		0.8		0.8	V
VI	Input voltage	0	$V_{CC}$	0	$V_{CC}$	V
Vo	Output voltage	0	$V_{CC}$	0	$V_{CC}$	V
I <sub>OH</sub>	High-level output current		-24		-24	mA
I <sub>OL</sub>	Low-level output current		24		24	mA
$\Delta t / \Delta v$	Input transition rise or fall rate		8		8	ns/V
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	85	°C

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

			Ţ	a = 25°C	;	SN54A	CT241	SN74A	CT241	
PARAMETER	TEST CONDITIONS	v <sub>cc</sub>	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
		4.5 V	4.4	4.49		4.4		4.4		
	I <sub>OH</sub> = -50 μA	5.5 V	5.4	5.49		5.4		5.4		
N/		4.5 V	3.86			3.7		3.76		v
V <sub>OH</sub>	I <sub>OH</sub> = -24 mA	5.5 V	4.86			4.7		4.76		V
	$I_{OH} = -50 \text{ mA}^{\dagger}$	5.5 V				3.85				
	$I_{OH} = -75 \text{ mA}^{\dagger}$	5.5 V						3.85		
	1 50	4.5 V		0.001	0.1		0.1		0.1	v
	I <sub>OL</sub> = 50 μA	5.5 V		0.001	0.1		0.1		0.1	
V	$1 - 24 m \Lambda$	4.5 V			0.36		0.5		0.44	
V <sub>OL</sub>	I <sub>OL</sub> = 24 mA	5.5 V			0.36		0.5		0.44	
	$I_{OL} = 50 \text{ mA}^{\dagger}$	5.5 V					1.65			
	$I_{OL} = 75 \text{ mA}^{\dagger}$	5.5 V							1.65	
I <sub>OZ</sub>	$V_{O} = V_{CC}$ or GND	5.5 V			±0.25		±5		±2.5	μA
I <sub>I</sub>	$V_{I} = V_{CC}$ or GND	5.5 V			±0.1		±1		±1	μA
I <sub>CC</sub>	$V_{I} = V_{CC} \text{ or } GND, \qquad I_{O} = 0$	5.5 V			4		80		40	μA
$\Delta I_{CC}^{\ddagger}$	One input at 3.4 V, Other inputs at GND or V <sub>CC</sub>	5.5 V		0.6			1.6		1.5	mA
Ci	$V_{I} = V_{CC}$ or GND	5 V		2.5						pF
Co	$V_{I} = V_{CC}$ or GND	5 V		8						pF

<sup>†</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed 2 ms.

<sup>‡</sup> This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V<sub>CC</sub>.



### SN54ACT241, SN74ACT241 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

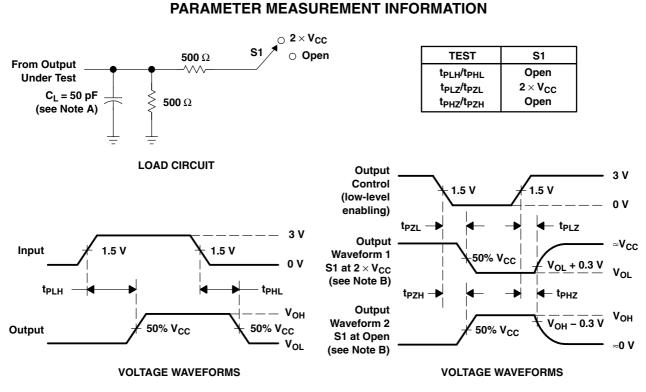
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switching characteristics over recommended operating free-air temperature range,  $V_{CC}$  = 5 V  $\pm$  0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM	TO (OUTPUT)	T <sub>A</sub> = 25°C			SN54A	CT241	SN74A	UNIT	
PANAMETEN	(INPUT)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
t <sub>PLH</sub>	A	Y	1.5	6	8.5	1	9.5	1.5	9.5	
t <sub>PHL</sub>			1.5	5.5	7.5	1	9	1.5	8.5	ns
t <sub>PZH</sub>	OE or OE	Y	1.5	7	8.5	1	10	1	9.5	ns
t <sub>PZL</sub>			2	7	9.5	1	11.5	1.5	10.5	
t <sub>PHZ</sub>	OE or OE	Y	2	8	9.5	1	11	2	10.5	
t <sub>PLZ</sub>			2.5	6.5	10	1	11.5	2	10.5	ns

#### operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = $25^{\circ}C$

	PARAMETER	TEST CO	TYP	UNIT	
C <sub>pd</sub>	Power dissipation capacitance per buffer/driver	C <sub>L</sub> = 50 pF,	f = 1 MHz	45	pF



NOTES: A. CL 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 MHz, Z<sub>O</sub> = 50  $\Omega$ , t<sub>f</sub>  $\leq$  2.5 ns, t<sub>f</sub>  $\leq$  2.5 ns.

 ${\sf D}. \ \ {\sf The outputs are measured one at a time with one input transition per measurement.}$ 

Figure 1. Load Circuit and Voltage Waveforms





#### **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
5962-89847012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 89847012A SNJ54ACT 241FK	Samples
5962-8984701RA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8984701RA SNJ54ACT241J	Samples
5962-8984701SA	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8984701SA SNJ54ACT241W	Samples
SN74ACT241DBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AD241	Samples
SN74ACT241DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ACT241	Samples
SN74ACT241DWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ACT241	Samples
SN74ACT241N	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74ACT241N	Samples
SN74ACT241NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ACT241	Samples
SN74ACT241PW	ACTIVE	TSSOP	PW	20	70	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AD241	Samples
SN74ACT241PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AD241	Samples
SNJ54ACT241FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 89847012A SNJ54ACT 241FK	Samples
SNJ54ACT241J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8984701RA SNJ54ACT241J	Samples
SNJ54ACT241W	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8984701SA SNJ54ACT241W	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.



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### PACKAGE OPTION ADDENDUM

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

<sup>(3)</sup> MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> 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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#### OTHER QUALIFIED VERSIONS OF SN54ACT241, SN74ACT241 :

Catalog : SN74ACT241

• Military : SN54ACT241

NOTE: Qualified Version Definitions:

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

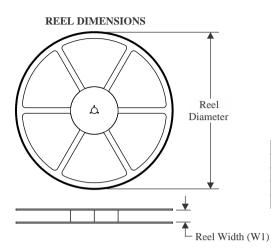


Texas

\*All dimensions are nominal

STRUMENTS

#### TAPE AND REEL INFORMATION





#### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ACT241DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74ACT241DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ACT241NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ACT241PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1



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## PACKAGE MATERIALS INFORMATION

9-Aug-2022



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ACT241DBR	SSOP	DB	20	2000	356.0	356.0	35.0
SN74ACT241DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ACT241NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74ACT241PWR	TSSOP	PW	20	2000	356.0	356.0	35.0

#### TEXAS INSTRUMENTS

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#### TUBE



#### - B - Alignment groove width

#### \*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	Τ (μm)	B (mm)
5962-89847012A	FK	LCCC	20	1	506.98	12.06	2030	NA
5962-8984701SA	W	CFP	20	1	506.98	26.16	6220	NA
SN74ACT241DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74ACT241N	N	PDIP	20	20	506	13.97	11230	4.32
SN74ACT241PW	PW	TSSOP	20	70	530	10.2	3600	3.5
SNJ54ACT241FK	FK	LCCC	20	1	506.98	12.06	2030	NA
SNJ54ACT241W	W	CFP	20	1	506.98	26.16	6220	NA

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- NOTES: A. All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice. В.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
    D. Index point is provided on cap for terminal identification only.
    E. Falls within Mil-Std 1835 GDFP2-F20



# **PW0020A**



## **PACKAGE OUTLINE**

### TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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.



## PW0020A

# **EXAMPLE BOARD LAYOUT**

### TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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.



## PW0020A

# **EXAMPLE STENCIL DESIGN**

### TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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.



### LAND PATTERN DATA



NOTES: Α. 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



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-150.



# DB0020A

# **EXAMPLE BOARD LAYOUT**

### SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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.



# DB0020A

# **EXAMPLE STENCIL DESIGN**

### SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

#### PLASTIC SMALL-OUTLINE PACKAGE

#### 0,51 0,35 ⊕0,25⊛ 1,27 8 14 0,15 NOM 5,60 8,20 5,00 7,40 $\bigcirc$ Gage Plane ₽ 0,25 7 1 1,05 0,55 0-10 Δ 0,15 0,05 Seating Plane — 2,00 MAX 0,10PINS \*\* 14 16 20 24 DIM 10,50 10,50 12,90 15,30 A MAX A MIN 9,90 9,90 12,30 14,70 4040062/C 03/03

NOTES: A. All linear dimensions are in millimeters.

NS (R-PDSO-G\*\*)

**14-PINS SHOWN** 

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



J (R-GDIP-T\*\*) 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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.

## FK 20

#### 8.89 x 8.89, 1.27 mm pitch

## **GENERIC PACKAGE VIEW**

### LCCC - 2.03 mm max height

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.





### 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).
- $\triangle$  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



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.



# DW0020A

# **EXAMPLE BOARD LAYOUT**

### SOIC - 2.65 mm max height

SOIC



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.



## DW0020A

# **EXAMPLE STENCIL DESIGN**

### SOIC - 2.65 mm max height

SOIC



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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