

# SN54AC244, SN74AC244 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCAS514E – JUNE 1995 – REVISED OCTOBER 2003

- 2-V to 6-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 6 V
- Max  $t_{pd}$  of 7.5 ns at 5 V

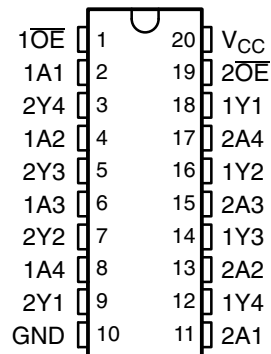
## description/ordering information

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.

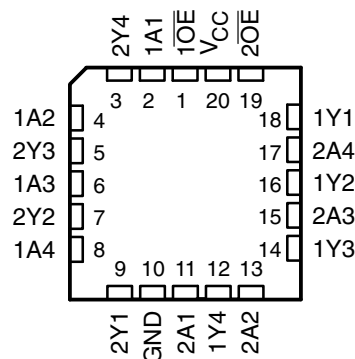
The 'AC244 devices are organized as two 4-bit buffers/drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes noninverted data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

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

## SN54AC244 . . . J OR W PACKAGE SN74AC244 . . . DB, DW, N, NS, OR PW PACKAGE (TOP VIEW)



## SN54AC244 . . . FK PACKAGE (TOP VIEW)



## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	PDIP – N	Tube	SN74AC244N	SN74AC244N
	SOIC – DW	Tube	SN74AC244DW	AC244
		Tape and reel	SN74AC244DWR	
	SOP – NS	Tape and reel	SN74AC244NSR	AC244
	SSOP – DB	Tape and reel	SN74AC244DBR	AC244
	TSSOP – PW	Tube	SN74AC244PW	AC244
Tape and reel		SN74AC244PWR		
–55°C to 125°C	CDIP – J	Tube	SNJ54AC244J	SNJ54AC244J
	CFP – W	Tube	SNJ54AC244W	SNJ54AC244W
	LCCC – FK	Tube	SNJ54AC244FK	SNJ54AC244FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

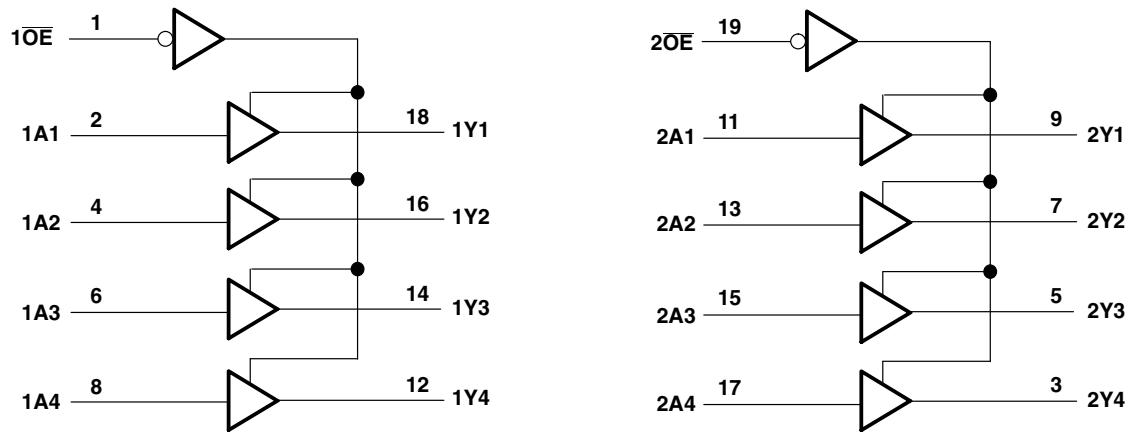
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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

FUNCTION TABLE  
(each buffer)

INPUTS		OUTPUT
OE	A	Y
L	H	H
L	L	L
H	X	Z

logic diagram (positive logic)



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

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ )	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND	$\pm 200$ 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	83°C/W
Storage temperature range, $T_{stg}$	–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.

# SN54AC244, SN74AC244 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCAS514E – JUNE 1995 – REVISED OCTOBER 2003

## recommended operating conditions (see Note 3)

			SN54AC244		SN74AC244		UNIT
			MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage		2	6	2	6	V
$V_{IH}$	High-level input voltage	$V_{CC} = 3\text{ V}$	2.1		2.1		V
		$V_{CC} = 4.5\text{ V}$	3.15		3.15		
		$V_{CC} = 5.5\text{ V}$	3.85		3.85		
$V_{IL}$	Low-level input voltage	$V_{CC} = 3\text{ V}$		0.9		0.9	V
		$V_{CC} = 4.5\text{ V}$		1.35		1.35	
		$V_{CC} = 5.5\text{ V}$		1.65		1.65	
$V_I$	Input voltage		0	$V_{CC}$	0	$V_{CC}$	V
$V_O$	Output voltage		0	$V_{CC}$	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 3\text{ V}$		–12		–12	mA
		$V_{CC} = 4.5\text{ V}$		–24		–24	
		$V_{CC} = 5.5\text{ V}$		–24		–24	
$I_{OL}$	Low-level output current	$V_{CC} = 3\text{ V}$		12		12	mA
		$V_{CC} = 4.5\text{ V}$		24		24	
		$V_{CC} = 5.5\text{ V}$		24		24	
$\Delta t/\Delta v$	Input transition rise or fall rate			8		8	ns/V
$T_A$	Operating free-air temperature		–55	125	–40	85	°C

NOTE 3: 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.

# SN54AC244, SN74AC244

## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

SCAS514E – JUNE 1995 – REVISED OCTOBER 2003

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54AC244		SN74AC244		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = –50 µA	3 V	2.9			2.9		2.9		V
		4.5 V	4.4			4.4		4.4		
		5.5 V	5.4			5.4		5.4		
	I <sub>OH</sub> = –12 mA	3 V	2.56			2.4		2.46		
	I <sub>OH</sub> = –24 mA	4.5 V	3.86			3.7		3.76		
		5.5 V	4.86			4.7		4.76		
	I <sub>OH</sub> = –50 mA <sup>†</sup>	5.5 V				3.85				
V <sub>OL</sub>	I <sub>OL</sub> = 50 µA	3 V			0.1		0.1		0.1	V
		4.5 V			0.1		0.1		0.1	
		5.5 V			0.1		0.1		0.1	
	I <sub>OL</sub> = 12 mA	3 V			0.36		0.5		0.44	
	I <sub>OL</sub> = 24 mA	4.5 V			0.36		0.5		0.44	
		5.5 V			0.36		0.5		0.44	
	I <sub>OL</sub> = 50 mA <sup>†</sup>	5.5 V				1.65				
I <sub>I</sub>	Data inputs	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	µA
	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND, V <sub>I(OE)</sub> = V <sub>IL</sub> or V <sub>IH</sub>	5.5 V			±0.25		±5		±2.5	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			4		80		40	µA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		2.5						pF

<sup>†</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T <sub>A</sub> = 25°C			SN54AC244		SN74AC244		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	2	6.5	9	1	12.5	1.5	10	ns
t <sub>PHL</sub>			2	6.5	9	1	12	2	10	
t <sub>PZH</sub>	OE	Y	2	6	10.5	1	11.5	1.5	11	ns
t <sub>PZL</sub>			2.5	7.5	10	1	13	2	11	
t <sub>PHZ</sub>	OE	Y	3	7	10	1	12.5	1.5	10.5	ns
t <sub>PLZ</sub>			2.5	7.5	10.5	1	13	2.5	11.5	

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SCAS514E – JUNE 1995 – REVISED OCTOBER 2003

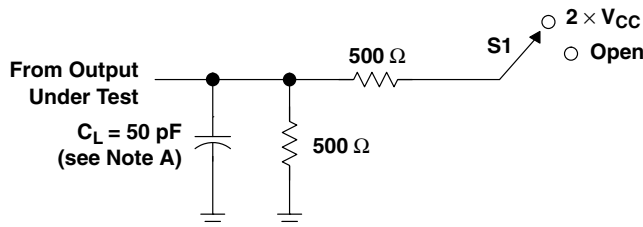
switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			SN54AC244		SN74AC244		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	1.5	5	7	1	9.5	1	7.5	ns
$t_{PHL}$			1.5	5	7	1	9	1	7.5	
$t_{PZH}$	$\overline{\text{OE}}$	Y	1.5	5	7	1	9	1.5	8	ns
$t_{PZL}$			1.5	5.5	8	1	10.5	1.5	8.5	
$t_{PHZ}$	$\overline{\text{OE}}$	Y	2.5	6.5	9	1	10.5	1	9.5	ns
$t_{PLZ}$			2	6.5	9	1	11	2	9.5	

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

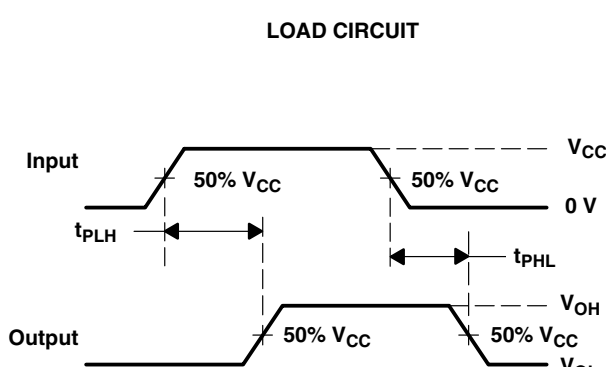
PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per buffer/driver	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	45	pF

## PARAMETER MEASUREMENT INFORMATION

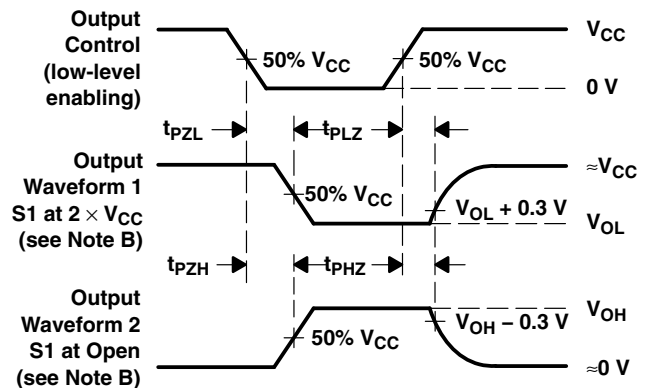


LOAD CIRCUIT

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



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

- NOTES:
- $C_L$  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:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\text{ }\Omega$ ,  $t_r \leq 2.5\text{ ns}$ ,  $t_f \leq 2.5\text{ ns}$ .
  - The outputs are measured one at a time with one input transition per measurement.

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
5962-87552012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 87552012A SNJ54AC 244FK	<a href="#">Samples</a>
5962-8755201RA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8755201RA SNJ54AC244J	<a href="#">Samples</a>
5962-8755201SA	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8755201SA SNJ54AC244W	<a href="#">Samples</a>
5962-8755201VRA	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8755201VR A SNV54AC244J	<a href="#">Samples</a>
5962-8755201VSA	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8755201VS A SNV54AC244W	<a href="#">Samples</a>
SN74AC244DBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AC244	<a href="#">Samples</a>
SN74AC244DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AC244	<a href="#">Samples</a>
SN74AC244DWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AC244	<a href="#">Samples</a>
SN74AC244N	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74AC244N	<a href="#">Samples</a>
SN74AC244NE4	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74AC244N	<a href="#">Samples</a>
SN74AC244NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AC244	<a href="#">Samples</a>
SN74AC244PW	ACTIVE	TSSOP	PW	20	70	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AC244	<a href="#">Samples</a>
SN74AC244PWE4	ACTIVE	TSSOP	PW	20	70	TBD	Call TI	Call TI	-40 to 85		<a href="#">Samples</a>
SN74AC244PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AC244	<a href="#">Samples</a>
SN74AC244PWRE4	ACTIVE	TSSOP	PW	20	2000	TBD	Call TI	Call TI	-40 to 85		<a href="#">Samples</a>
SNJ54AC244FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 87552012A SNJ54AC	<a href="#">Samples</a>

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
										244FK	
SNJ54AC244J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8755201RA SNJ54AC244J	<a href="#">Samples</a>
SNJ54AC244W	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8755201SA SNJ54AC244W	<a href="#">Samples</a>

(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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**OTHER QUALIFIED VERSIONS OF SN54AC244, SN54AC244-SP, SN74AC244 :**

- Catalog : [SN74AC244](#), [SN54AC244](#)
- Enhanced Product : [SN74AC244-EP](#), [SN74AC244-EP](#)
- Military : [SN54AC244](#)
- Space : [SN54AC244-SP](#)

**NOTE: Qualified Version Definitions:**

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application



## 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
SN74AC244DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74AC244DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74AC244NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74AC244PWR	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)
SN74AC244DBR	SSOP	DB	20	2000	356.0	356.0	35.0
SN74AC244DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74AC244NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74AC244PWR	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)
5962-87552012A	FK	LCCC	20	1	506.98	12.06	2030	NA
5962-8755201SA	W	CFP	20	1	506.98	26.16	6220	NA
5962-8755201VSA	W	CFP	20	1	506.98	26.16	6220	NA
SN74AC244DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74AC244N	N	PDIP	20	20	506	13.97	11230	4.32
SN74AC244NE4	N	PDIP	20	20	506	13.97	11230	4.32
SN74AC244PW	PW	TSSOP	20	70	530	10.2	3600	3.5
SNJ54AC244FK	FK	LCCC	20	1	506.98	12.06	2030	NA
SNJ54AC244W	W	CFP	20	1	506.98	26.16	6220	NA

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



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



## TSSOP - 1.2 mm max height

## SMALL OUTLINE PACKAGE



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



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.



FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004



# EXAMPLE BOARD LAYOUT

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

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\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



PINS **	14	16	18	20
DIM				
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - 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

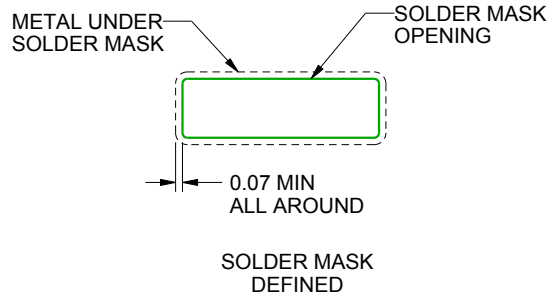
DW0020A

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.

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

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