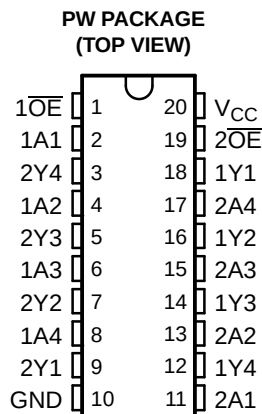


FEATURES

- **Controlled Baseline**
 - One Assembly/Test Site, One Fabrication Site
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree⁽¹⁾**
- **Operates From 1.65-V to 3.6-V V_{CC}**
- **Max t_{pd} of 2.8 ns at 3.3-V V_{CC}**
- **± 24 -mA Output Drive at 3.3-V V_{CC}**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **ESD Protection Exceeds JESD 22**
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

⁽¹⁾ Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.



DESCRIPTION/ORDERING INFORMATION

This octal buffer/line driver is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74ALVC244 is organized as two 4-bit line drivers with separate output-enable ($\overline{OE}$) inputs. When $\overline{OE}$ is low, the device passes 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, $\overline{OE}$ shall 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.

ORDERING INFORMATION

T_A	PACKAGE ⁽¹⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	TSSOP - PW	Tape and reel	SN74ALVC244IPWREP	VA244IEP

⁽¹⁾ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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SN74ALVC244-EP

OCTAL BUFFER/DRIVER

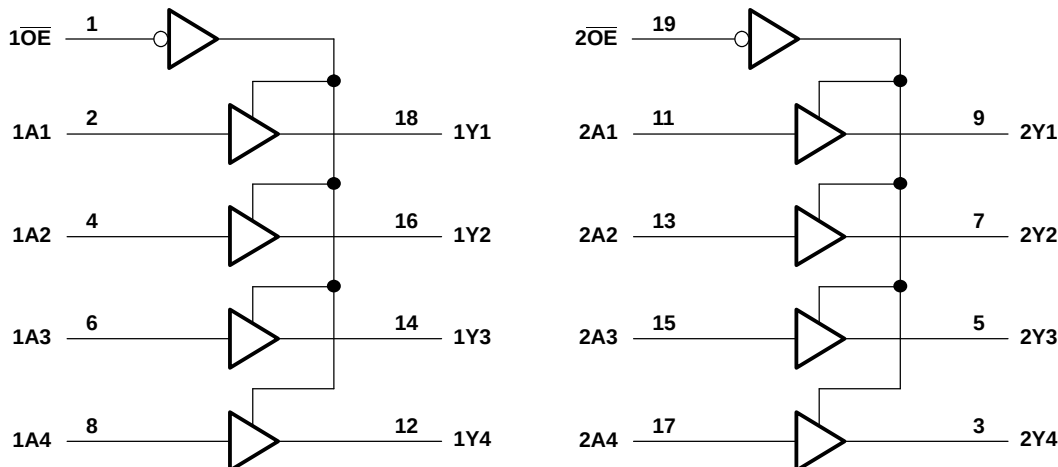
WITH 3-STATE OUTPUTS

SCES600A–AUGUST 2004–REVISED OCTOBER 2004

FUNCTION TABLE
(each buffer)

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

LOGIC DIAGRAM (POSITIVE LOGIC)



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

		MIN	MAX	UNIT
V_{CC}	Supply voltage range	-0.5	4.6	V
V_I	Input voltage range ⁽²⁾	-0.5	4.6	V
V_O	Output voltage range ⁽²⁾⁽³⁾	-0.5	$V_{CC} + 0.5$	V
I_{IK}	Input clamp current	$V_I < 0$		-50 mA
I_{OK}	Output clamp current	$V_O < 0$		-50 mA
I_O	Continuous output current			± 50 mA
	Continuous current through V_{CC} or GND			± 100 mA
θ_{JA}	Package thermal impedance ⁽⁴⁾			83 °C/W
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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 4.6 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage		1.65	3.6	V
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	1.7		
		V _{CC} = 2.7 V to 3.6 V	2		
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.35 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	0.7		
		V _{CC} = 2.7 V to 3.6 V	0.8		
V _I	Input voltage		0	3.6	V
V _O	Output voltage		0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 1.65 V		-4	mA
		V _{CC} = 2.3 V		-12	
		V _{CC} = 2.7 V		-12	
		V _{CC} = 3 V		-24	
I _{OL}	Low-level output current	V _{CC} = 1.65 V		4	mA
		V _{CC} = 2.3 V		12	
		V _{CC} = 2.7 V		12	
		V _{CC} = 3 V		24	
Δt/Δv	Input transition rise or fall rate			5	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.

ELECTRICAL CHARACTERISTICS

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

PARAMETER		TEST CONDITIONS	V _{CC}	MIN TYP ⁽¹⁾ MAX	UNIT
V _{OH}		I _{OH} = -100 μA	1.65 V to 3.6 V	V _{CC} - 0.2	V
		I _{OH} = -4 mA	1.65 V	1.2	
		I _{OH} = -6 mA	2.3 V	2	
		I _{OH} = -12 mA	2.3 V	1.7	
			2.7 V	2.2	
			3 V	2.4	
		I _{OH} = -24 mA	3 V	2	
V _{OL}		I _{OL} = 100 μA	1.65 V to 3.6 V	0.2	V
		I _{OL} = 4 mA	1.65 V	0.45	
		I _{OL} = 6 mA	2.3 V	0.4	
		I _{OL} = 12 mA	2.3 V	0.7	
			2.7 V	0.4	
		I _{OL} = 24 mA	3 V	0.55	
I _I		V _I = V _{CC} or GND	3.6 V	±5	μA
I _{OZ}		V _O = V _{CC} or GND	3.6 V	±10	μA
I _{CC}		V _I = V _{CC} or GND, I _O = 0	3.6 V	10	μA
ΔI _{CC}		One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND	3 V to 3.6 V	750	μA
C _i	Control inputs	V _I = V _{CC} or GND	3.3 V	4.5	pF
	Data inputs			4.5	
C _o	Outputs	V _O = V _{CC} or GND	3.3 V	7.5	pF

(1) All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

SN74ALVC244-EP

OCTAL BUFFER/DRIVER

WITH 3-STATE OUTPUTS

SCES600A–AUGUST 2004–REVISED OCTOBER 2004

SWITCHING CHARACTERISTICS

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

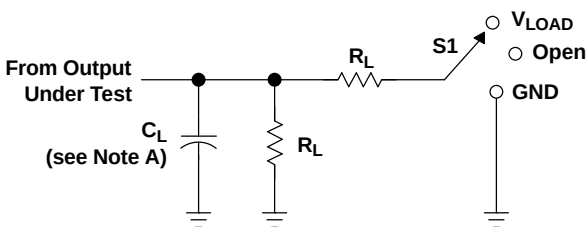
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8\text{ V}$ $\pm 0.15\text{ V}$		$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 2.7\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	1	4.4	1	3.1	3.1		1.1	2.8	ns
t_{en}	$\overline{OE}$	Y	1.8	6.9	1.5	5.4	5.3		1.5	4.5	ns
t_{dis}	$\overline{OE}$	Y	1.8	5.9	1	4.1	4.4		1.7	4.2	ns

OPERATING CHARACTERISTICS

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

PARAMETER			TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	UNIT
				TYP	TYP	TYP	
C_{pd} Power dissipation capacitance per buffer/driver	Outputs enabled	$C_L = 0, f = 10\text{ MHz}$		22	23	26	pF
	Outputs disabled			1	1	1	

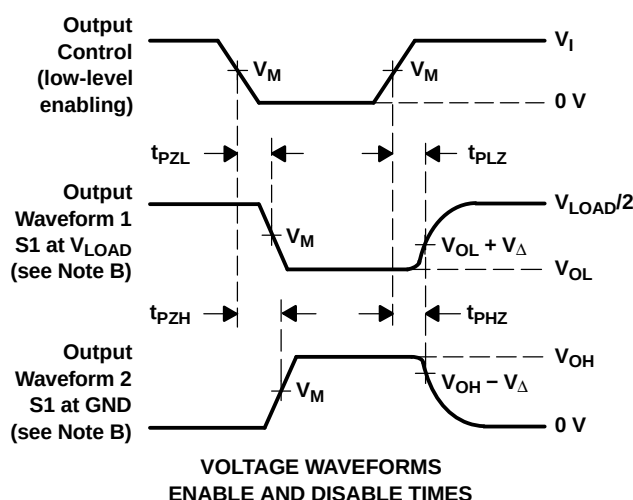
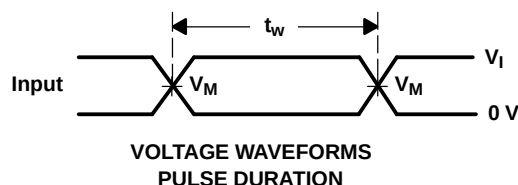
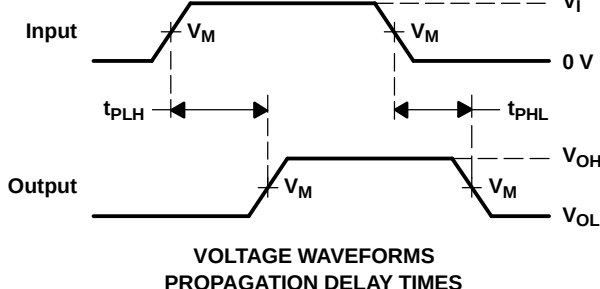
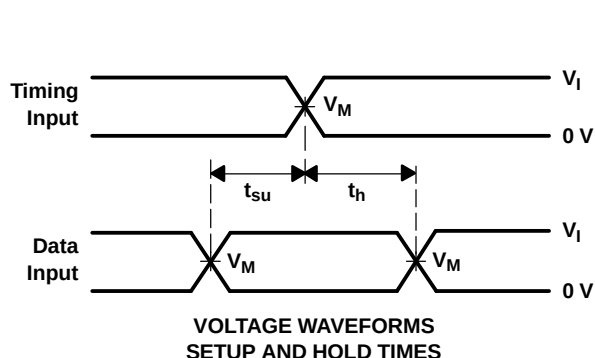
PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

V_{CC}	INPUT		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V
$3.3\text{ V} \pm 0.3\text{ V}$	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V



- 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: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .
 - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74ALVC244IPWREP	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	VA244IEP
V62/04762-01XE	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	VA244IEP

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

⁽²⁾ **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.

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

⁽⁴⁾ **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.

⁽⁵⁾ **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.

⁽⁶⁾ **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.

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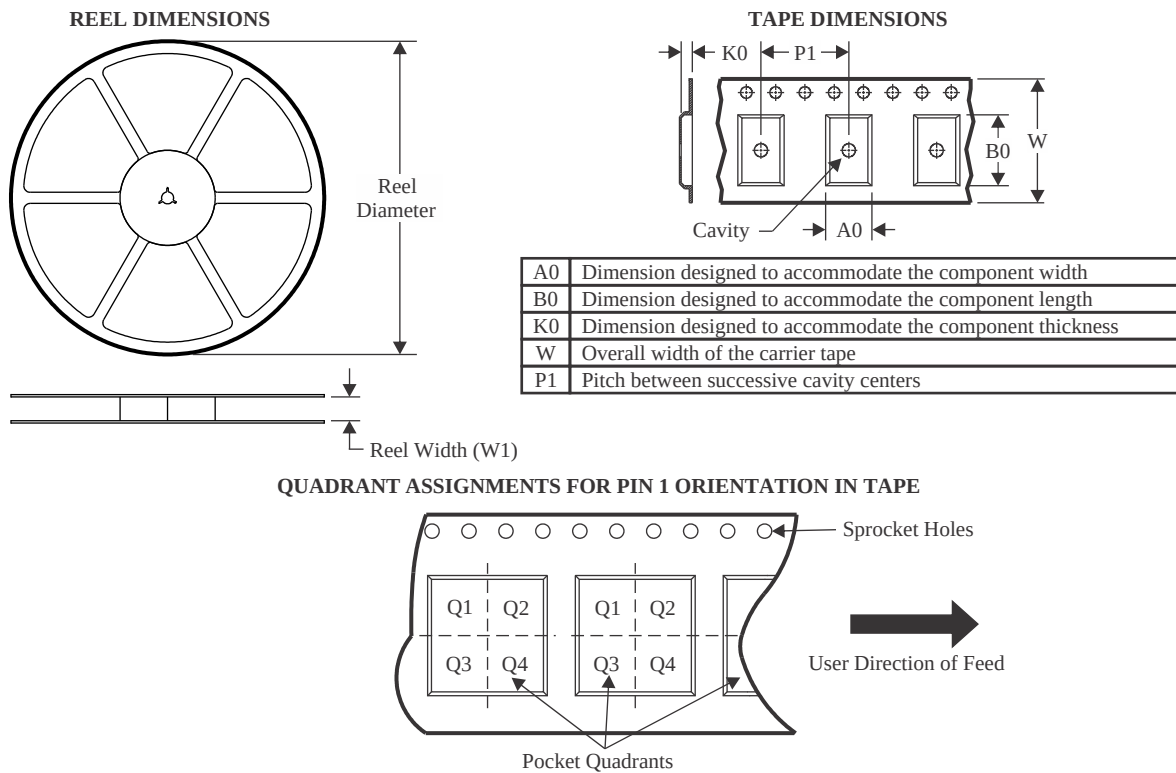
OTHER QUALIFIED VERSIONS OF SN74ALVC244-EP :

- Catalog : [SN74ALVC244](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION



*All dimensions are nominal

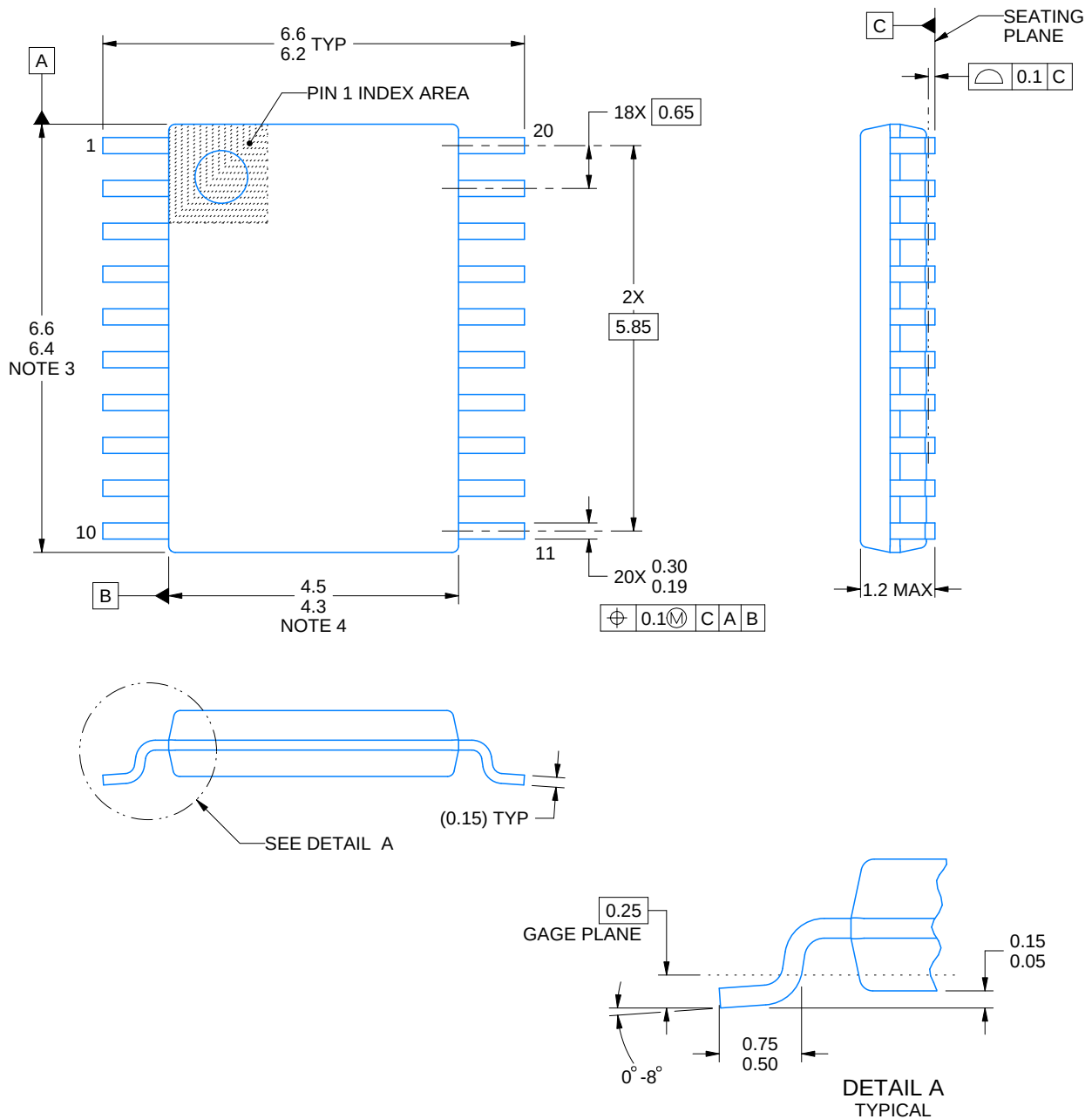
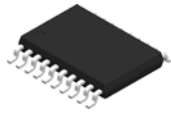
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ALVC244IPWREP	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALVC244IPWREP	TSSOP	PW	20	2000	353.0	353.0	32.0



4220206/A 02/2017

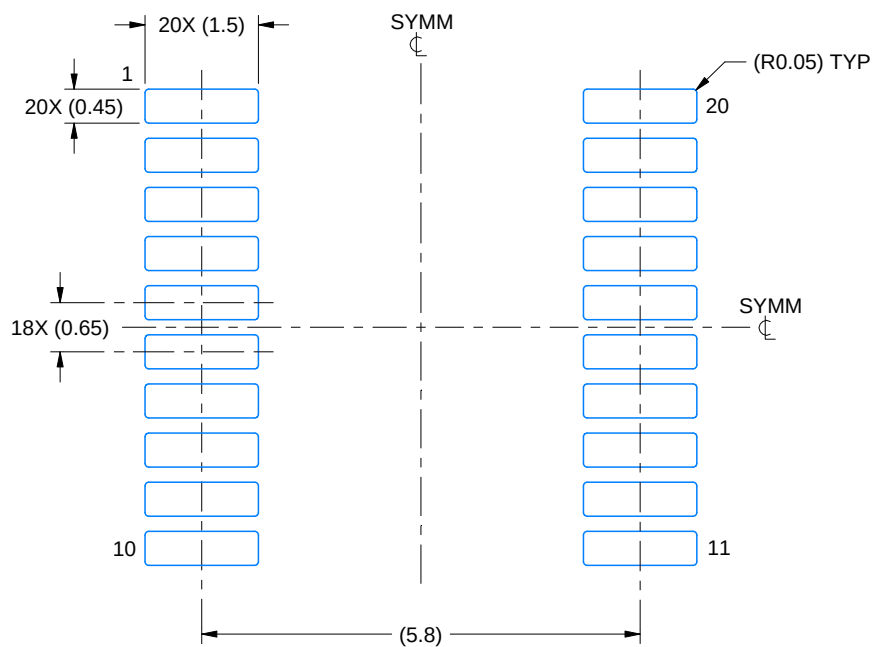
NOTES:

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.

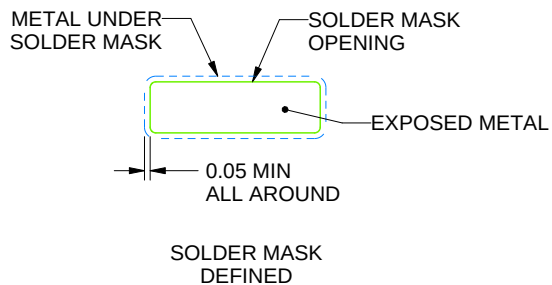
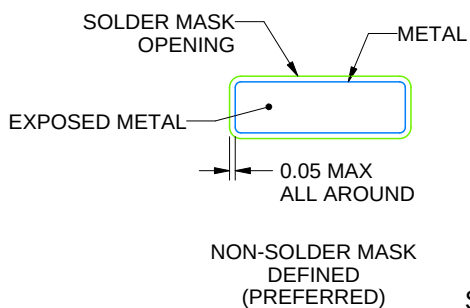
PW0020A

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)

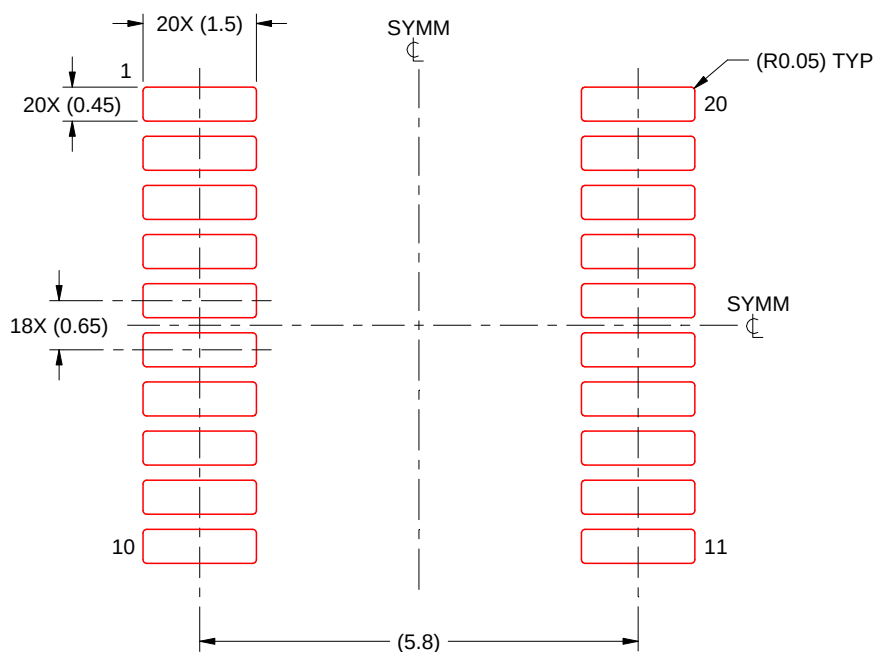
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

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