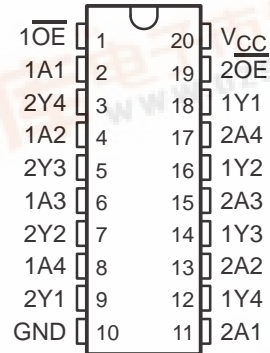# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A
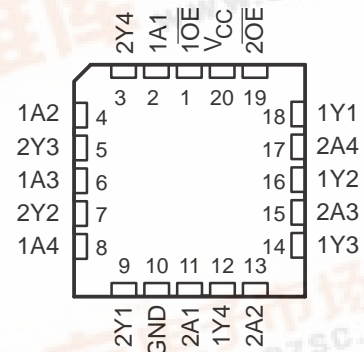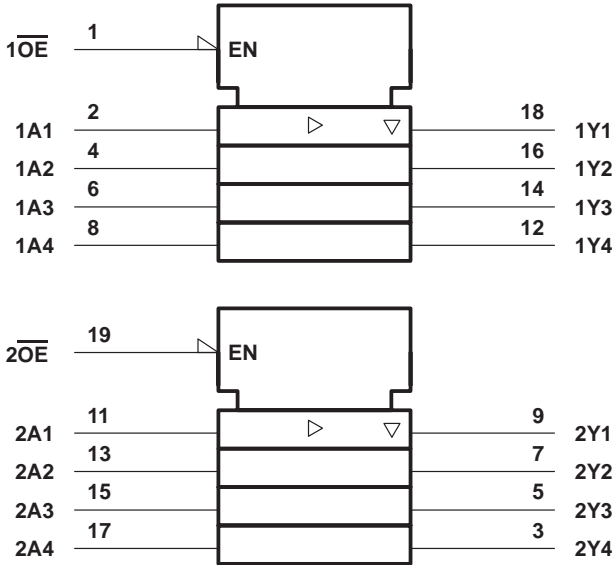## OCTAL BUFFERS AND LINE DRIVERS
WITH 3-STATE OUTPUTS

SDAS142C – JULY 1987 – REVISED AUGUST 1995

- **3-State Outputs Drive Bus Lines or Buffer Memory Address Registers**
- **pnp Inputs Reduce dc Loading**
- **Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs**

description

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. With the ′ALS240A, ′ALS241C, ′AS240A, and ′AS241A, these devices provide the choice of selected combinations of inverting outputs, symmetrical active-low output-enable ($\overline{OE}$) inputs, and complementary OE and $\overline{OE}$ inputs.

The -1 version of SN74ALS244C is identical to the standard version, except that the recommended maximum I_{OL} for the -1 version is 48 mA. There is no -1 version of the SN54ALS244C.

The SN54ALS244C and SN54AS244A are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS244C and SN74AS244A are characterized for operation from 0°C to 70°C.

SN54ALS244C, SN54AS244A . . . J PACKAGE
SN74ALS244C, SN74AS244A . . . DW OR N PACKAGE
(TOP VIEW)

1$\overline{OE}$	1	20	V_{CC}
1A1	2	19	2$\overline{OE}$
2Y4	3	18	1Y1
1A2	4	17	2A4
2Y3	5	16	1Y2
1A3	6	15	2A3
2Y2	7	14	1Y3
1A4	8	13	2A2
2Y1	9	12	1Y4
GND	10	11	2A1

SN54ALS244C, SN54AS244A . . . FK PACKAGE
(TOP VIEW)

Top pins: 2Y4, 1A1, 1$\overline{OE}$, V_{CC}, 2$\overline{OE}$
(3, 2, 1, 20, 19)

1A2 [4	18] 1Y1
2Y3 [5	17] 2A4
1A3 [6	16] 1Y2
2Y2 [7	15] 2A3
1A4 [8	14] 1Y3

Bottom pins: 2Y1, GND, 2A1, 1Y4, 2A2
(9, 10, 11, 12, 13)

FUNCTION TABLE
(each buffer)

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

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TEXAS INSTRUMENTS

logic symbol†

† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)
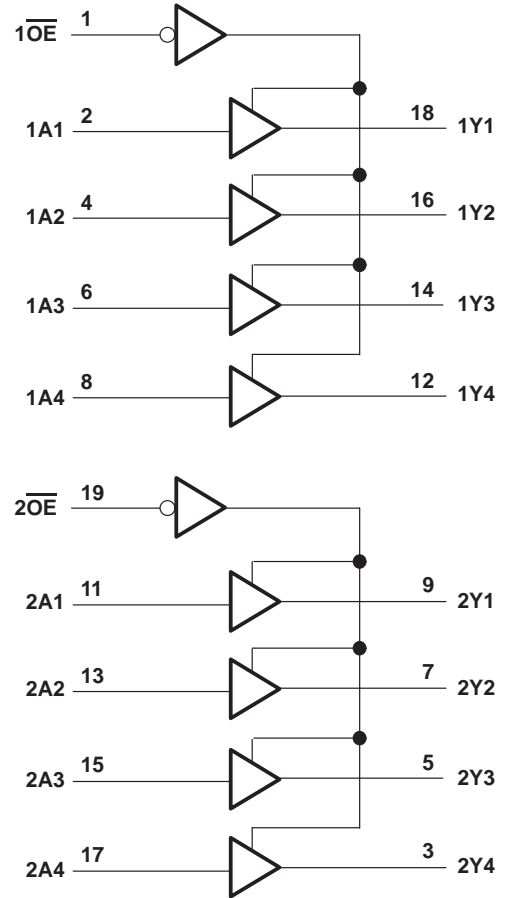
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage, V_{CC} .... 7 V
Input voltage, V_I .... 7 V
Voltage applied to a disabled 3-state output .... 5.5 V
Operating free-air temperature range, T_A: SN54ALS244C .... −55°C to 125°C
                                           SN74ALS244C .... 0°C to 70°C
Storage temperature range .... −65°C to 150°C

‡ 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.

recommended operating conditions

		SN54ALS244C			SN74ALS244C			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8†			0.8	V
				0.7‡				
I_{OH}	High-level output current			−12			−15	mA
I_{OL}	Low-level output current			12			24	mA
							48§	
T_A	Operating free-air temperature	−55		125	0		70	°C

† Applies over temperature range −55°C to 70°C
‡ Applies over temperature range 70°C to 125°C
§ Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V

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

PARAMETER	TEST CONDITIONS		SN54ALS244C			SN74ALS244C			UNIT
			MIN	TYP¶	MAX	MIN	TYP¶	MAX	
V_{IK}	V_{CC} = 4.5 V,	I_I = −18 mA			−1.5			−1.5	V
V_{OH}	V_{CC} = 4.5 V to 5.5 V	I_{OH} = −0.4 mA	V_{CC} −2			V_{CC} −2			V
		I_{OH} = −3 mA	2.4	3.2		2.4	3.2		
	V_{CC} = 4.5 V	I_{OH} = −12 mA	2						
		I_{OH} = −15 mA				2			
V_{OL}	V_{CC} = 4.5 V	I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
		I_{OL} = 24 mA					0.35	0.5	
		I_{OL} = 48 mA (-1 version)					0.35	0.5	
I_{OZH}	V_{CC} = 5.5 V,	V_O = 2.7 V			20			20	µA
I_{OZL}	V_{CC} = 5.5 V,	V_O = 0.4 V			−20			−20	µA
I_I	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
I_{IH}	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
I_{IL}	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.1			−0.1	mA
I_O#	V_{CC} = 5.5 V,	V_O = 2.25 V	−20		−112	−30		−112	mA
I_{CC}	V_{CC} = 5.5 V	Outputs high		9	18		9	17	mA
		Outputs low		15	25		15	24	
		Outputs disabled		17	29		17	27	

¶ All typical values are at V_{CC} = 5 V, T_A = 25°C.
# The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

TEXAS
INSTRUMENTS

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†				UNIT
			SN54ALS244C		SN74ALS244C		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	1	16	2	10	ns
t_{PHL}			3	12	3	10	
t_{PZH}	$\overline{OE}$	Y	1	26	3	20	ns
t_{PZL}			1	24	3	20	
t_{PHZ}	$\overline{OE}$	Y	2	10	2	10	ns
t_{PLZ}			1	26	1	13	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage, V_{CC} . . . . 7 V
Input voltage, V_I . . . . 7 V
Voltage applied to a disabled 3-state output . . . . 5.5 V
Operating free-air temperature range, T_A: SN54AS244A . . . . −55°C to 125°C
SN74AS244A . . . . 0°C to 70°C
Storage temperature range . . . . −65°C to 150°C

‡ 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.

recommended operating conditions

		SN54AS244A			SN74AS244A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−12			−15	mA
I_{OL}	Low-level output current			48			64	mA
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN54AS244A			SN74AS244A			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		$V_{CC} = 4.5$ V,	$I_I = -18$ mA			-1.2			-1.2	V
V_{OH}		$V_{CC} = 4.5$ V to 5.5 V,	$I_{OH} = -2$ mA	$V_{CC} - 2$			$V_{CC} - 2$			V
		$V_{CC} = 4.5$ V	$I_{OH} = -3$ mA	2.4	3.4		2.4	3.4		
			$I_{OH} = -12$ mA	2.4						
			$I_{OH} = -15$ mA				2.4			
V_{OL}		$V_{CC} = 4.5$ V	$I_{OL} = 48$ mA			0.55				V
			$I_{OL} = 64$ mA						0.55	
I_{OZH}		$V_{CC} = 5.5$ V,	$V_O = 2.7$ V			50			50	µA
I_{OZL}		$V_{CC} = 5.5$ V,	$V_O = 0.4$ V			-50			-50	µA
I_I		$V_{CC} = 5.5$ V,	$V_I = 7$ V			0.1			0.1	mA
I_{IH}		$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			20			20	µA
I_{IL}	$\overline{OE}$	$V_{CC} = 5.5$ V,	$V_I = 0.4$ V			-0.5			-0.5	mA
	A					-1			-1	
I_O‡		$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	-50		-150	-50		-150	mA
I_{CC}		$V_{CC} = 5.5$ V	Outputs high		22	34		22	34	mA
			Outputs low		60	90		60	90	
			Outputs disabled		34	54		34	54	

† All typical values are at $V_{CC} = 5$ V, $T_A = 25°C$.
‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.
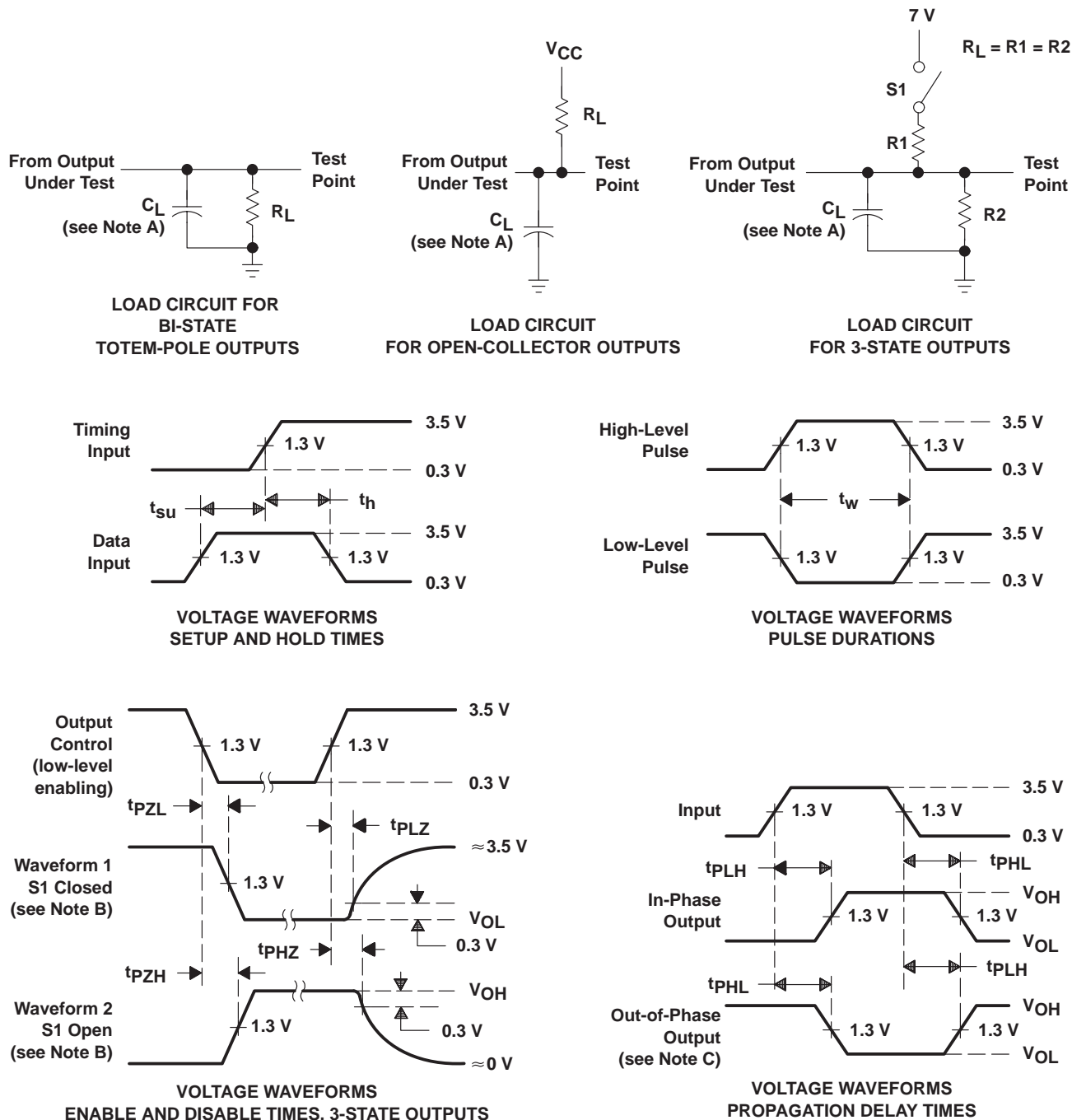
switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5$ V to 5.5 V, $C_L = 50$ pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX§				UNIT
			SN54AS244A		SN74AS244A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	2	9	2	6.2	ns
t_{PHL}			1	7	1	6.2	
t_{PZH}	$\overline{OE}$	Y	1	10	1	9	ns
t_{PZL}			2	8	2	7.5	
t_{PHZ}	$\overline{OE}$	Y	1	6.5	1	6	ns
t_{PLZ}			1	10.5	1	9	

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES

LOAD CIRCUIT FOR
BI-STATE
TOTEM-POLE OUTPUTS

LOAD CIRCUIT
FOR OPEN-COLLECTOR OUTPUTS

LOAD CIRCUIT
FOR 3-STATE OUTPUTS

VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES

VOLTAGE WAVEFORMS
PULSE DURATIONS

VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

NOTES: 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. When measuring propagation delay items of 3-state outputs, switch S1 is open.
   D. All input pulses have the following characteristics: PRR ≤ 1 MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
   E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
5962-86839012A	ACTIVE	LCCC	FK	20	1	None	Call TI	Level-NC-NC-NC
5962-8683901RA	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
5962-8683901SA	ACTIVE	CFP	W	20	1	None	Call TI	Level-NC-NC-NC
5962-9755901Q2A	ACTIVE	LCCC	FK	20	1	None	Call TI	Level-NC-NC-NC
5962-9755901QRA	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
5962-9755901QSA	ACTIVE	CFP	W	20	1	None	Call TI	Level-NC-NC-NC
JM38510/38303B2A	ACTIVE	LCCC	FK	20	1	None	Call TI	Level-NC-NC-NC
JM38510/38303BRA	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
SN54ALS244CJ	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
SN54AS244AJ	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
SN74ALS244C-1DW	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/Level-1-235C-UNLIM
SN74ALS244C-1DWR	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/Level-1-235C-UNLIM
SN74ALS244C-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74ALS244C-1NSR	ACTIVE	SO	NS	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/Level-1-235C-UNLIM
SN74ALS244CDBLE	OBSOLETE	SSOP	DB	20		None	Call TI	Call TI
SN74ALS244CDBR	ACTIVE	SSOP	DB	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/Level-1-235C-UNLIM
SN74ALS244CDW	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/Level-1-235C-UNLIM
SN74ALS244CDWR	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/Level-1-235C-UNLIM
SN74ALS244CN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74ALS244CNSR	ACTIVE	SO	NS	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/Level-1-235C-UNLIM
SN74AS244ADW	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/Level-1-235C-UNLIM
SN74AS244ADWR	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/Level-1-235C-UNLIM
SN74AS244AN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74AS244ANSR	ACTIVE	SO	NS	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/Level-1-235C-UNLIM
SNJ54ALS244CFK	ACTIVE	LCCC	FK	20	1	None	Call TI	Level-NC-NC-NC
SNJ54ALS244CJ	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
SNJ54ALS244CW	ACTIVE	CFP	W	20	1	None	Call TI	Level-NC-NC-NC
SNJ54AS244AFK	ACTIVE	LCCC	FK	20	1	None	Call TI	Level-NC-NC-NC
SNJ54AS244AJ	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
SNJ54AS244AW	ACTIVE	CFP	W	20	1	None	Call TI	Level-NC-NC-NC

[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) Eco Plan - May not be currently available - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
None: Not yet available Lead (Pb-Free).
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDECindustry standard classifications, and peak solder temperature.

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Mailing Address: Texas Instruments
                     Post Office Box 655303 Dallas, Texas 75265