

SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- pnp Inputs Reduce dc Loading

SN54ALS240A, SN54AS240A . . . J OR W PACKAGE
SN74ALS240A . . . DB, DW, N, OR NS PACKAGE
SN74AS240A . . . DW OR N PACKAGE
(TOP VIEW)

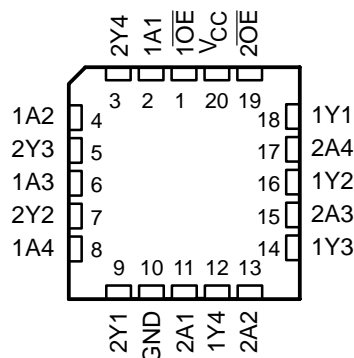
description/ordering information

These octal buffers/drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. When these devices are used with the 'ALS241, 'AS241A, 'ALS244, and 'AS244A devices, the circuit designer has a choice of selected combinations of inverting and noninverting outputs, symmetrical active-low output-enable (\overline{OE}) inputs, and complementary OE and \overline{OE} inputs. These devices feature high fan-out and improved fan-in.

The -1 version of SN74ALS240A 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 SN54ALS240A.



SN54ALS240A, SN54AS240A . . . FK PACKAGE
(TOP VIEW)



ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74ALS240AN	SN74ALS240AN
			SN74ALS240A-1N	SN74ALS240A-1N
			SN74AS240AN	SN74AS240AN
	SOIC – DW	Tube	SN74ALS240ADW	ALS240A
			SN74ALS240ADWR	
		Tape and reel	SN74ALS240A-1DW	ALS240A-1
			SN74ALS240A-1DWR	
		Tube	SN74AS240ADW	AS240A
			SN74AS240ADWR	
	SOP – NS	Tape and reel	SN74ALS240ANSR	ALS240A
			SN74ALS240A-1NSR	ALS240A-1
	SSOP – DB	Tape and reel	SN74ALS240ADBR	G240A
			SN74ALS240A-1DBR	G240A-1

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



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2002, Texas Instruments Incorporated
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.

SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A
OCTAL BUFFERS/DRIVERS
WITH 3-STATE OUTPUTS

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

description/ordering information (continued)

ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-55°C to 125°C	CDIP – J	Tube	SNJ54ALS240AJ	SNJ54ALS240AJ
			SNJ54AS240AJ	SNJ54AS240AJ
	CFP – W	Tube	SNJ54ALS240AW	SNJ54ALS240AW
			SNJ54AS240AW	SNJ54AS240AW
	LCCC – FK	Tube	SNJ54ALS240AFK	SNJ54ALS240AFK
			SNJ54AS240AFK	SNJ54AS240AFK

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

FUNCTION TABLE
(each buffer)

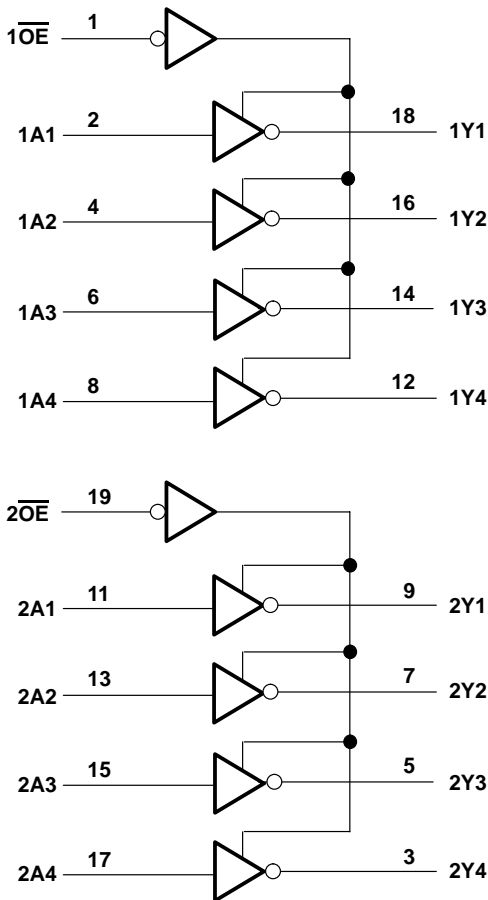
INPUTS		OUTPUT
\overline{OE}	A	Y
L	H	L
L	L	H
H	X	Z



SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

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
Package thermal impedance, θ_{JA} (see Note 1):	
DB package	70°C/W
DW package	58°C/W
N package	70°C/W
NS package	60°C/W
Storage temperature range, T_{Stg}	-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.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

recommended operating conditions

		MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage	4.5	5	5.5	V
V _{IH}	High-level input voltage	2			V
V _{IL}	Low-level input voltage	SN54ALS240A		0.7	V
		SN74ALS240A, 'AS240A		0.8	
I _{OH}	High-level output current	SN54ALS240A, SN54AS240A		-12	mA
		SN74ALS240A, SN74AS240A		-15	
I _{OL}	Low-level output current	SN54ALS240A		12	mA
		SN74ALS240A		24	
				48†	
				64	
T _A	Operating free-air temperature	SN54ALS240A, SN54AS240A		-55	°C
		SN74ALS240A, SN74AS240A		0	

† 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	SN54ALS240A		SN74ALS240A		UNIT		
		MIN	TYP‡	MAX	MIN		TYP‡	MAX
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA			-1.2		V		
V _{OH}	V _{CC} = 4.5 V to 5.5 V, I _{OH} = -0.4 mA	V _{CC} - 2		V _{CC} - 2		V		
	V _{CC} = 4.5 V	I _{OH} = -3 mA	2.4	3.2	2.4		3.2	
		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†			0.35	0.5		
I _{OZH}	V _{CC} = 5.5 V, V _O = 2.7 V			20		μA		
I _{OZL}	V _{CC} = 5.5 V, V _O = 0.4 V			-20		μA		
I _I	V _{CC} = 5.5 V, V _I = 7 V			0.1		mA		
I _{IH}	V _{CC} = 5.5 V, V _I = 2.7 V			20		μA		
I _{IL}	V _{CC} = 5.5 V, V _I = 0.4 V			-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		4	11	4	11	mA
		Outputs low		13	23	13	23	
		Outputs disabled		14	25	14	25	

† Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V

‡ 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}.



SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

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

PARAMETER	TEST CONDITIONS		SN54AS240A		SN74AS240A		UNIT
			MIN	TYP†	MAX	MIN	
V_{IK}	$V_{CC} = 4.5\text{ V}$,	$I_I = -18\text{ mA}$	-1.2		-1.2		V
V_{OH}	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	$I_{OH} = -2\text{ mA}$	$V_{CC} - 2$		$V_{CC} - 2$		V
		$I_{OH} = -3\text{ mA}$	2.4	3.4	2.4	3.4	
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -12\text{ mA}$	2.4				
		$I_{OH} = -15\text{ mA}$			2.4		
V_{OL}	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 48\text{ mA}$	0.27	0.55			V
		$I_{OL} = 64\text{ mA}$			0.31	0.55	
I_{OZH}	$V_{CC} = 5.5\text{ V}$,	$V_O = 2.7\text{ V}$	50		50		μA
I_{OZL}	$V_{CC} = 5.5\text{ V}$,	$V_O = 0.4\text{ V}$	-50		-50		μA
I_I	$V_{CC} = 5.5\text{ V}$,	$V_I = 7\text{ V}$	0.1		0.1		mA
I_{IH}	$V_{CC} = 5.5\text{ V}$,	$V_I = 2.7\text{ V}$	20		20		μA
I_{IL}	A inputs	$V_{CC} = 5.5\text{ V}$,	$V_I = 0.4\text{ V}$		-1		mA
	\overline{OE} inputs				-0.5		
$I_{O\ddagger}$	$V_{CC} = 5.5\text{ V}$,	$V_O = 2.25\text{ V}$	-50	-150	-50	-150	mA
I_{CC}	$V_{CC} = 5.5\text{ V}$	Outputs high	11	17	11	17	mA
		Outputs low	51	75	51	75	
		Outputs disabled	24	38	24	38	

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ 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)	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$, $C_L = 50\text{ pF}$, $R_1 = 500\ \Omega$, $R_2 = 500\ \Omega$, $T_A = \text{MIN to MAX}\S$				UNIT
			SN54ALS240A		SN74ALS240A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	2	22	2	9	ns
t_{PHL}			2	11	2	9	
t_{PZH}	\overline{OE}	Y	4	34	5	13	ns
t_{PZL}			5	26	5	18	
t_{PHZ}	\overline{OE}	Y	1	15	2	10	ns
t_{PLZ}			3	24	3	12	

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



SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A
OCTAL BUFFERS/DRIVERS
WITH 3-STATE OUTPUTS

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

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
			SN54AS240A		SN74AS240A		
			MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	1	7	1	6.5	ns
t _{PHL}			1.2	6.5	1.2	6.5	
t _{PZH}	\overline{OE}	Y	1	7	1	6.4	ns
t _{PZL}			1.1	9.5	1.1	9	
t _{PHZ}	\overline{OE}	Y	1.2	5.5	1.2	5	ns
t _{PLZ}			1.5	12.5	1.5	9.5	

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



SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

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



- 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: $PRR \leq 1$ 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 finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8859101SA	ACTIVE	CFP	W	20	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8859101SA SNJ54ALS240AW	Samples
JM38510/38301B2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301B2A	Samples
JM38510/38301BRA	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301BRA	Samples
M38510/38301B2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301B2A	Samples
M38510/38301BRA	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301BRA	Samples
SN54ALS240AJ	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54ALS240AJ	Samples
SN74ALS240A-1DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A-1	Samples
SN74ALS240A-1N	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS240A-1N	Samples
SN74ALS240A-1NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A-1	Samples
SN74ALS240ADBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM		G240A	Samples
SN74ALS240ADW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A	Samples
SN74ALS240ADWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A	Samples
SN74ALS240AN	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS240AN	Samples
SN74ALS240ANSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A	Samples
SN74AS240ADW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	AS240A	Samples
SN74AS240AN	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74AS240AN	Samples
SN74AS240ANSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74AS240A	Samples
SNJ54ALS240AFK	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54ALS 240AFK	Samples

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
SNJ54ALS240AJ	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54ALS240AJ	Samples
SNJ54ALS240AW	ACTIVE	CFP	W	20	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8859101SA SNJ54ALS240AW	Samples
SNJ54AS240AJ	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54AS240AJ	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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A :

- Catalog : [SN74ALS240A](#), [SN74AS240A](#)
- Military : [SN54ALS240A](#), [SN54AS240A](#)

NOTE: Qualified Version Definitions:

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

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
SN74ALS240A-1NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ALS240ADBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74ALS240ADWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ALS240ANSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74AS240ANSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALS240A-1NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74ALS240ADBR	SSOP	DB	20	2000	356.0	356.0	35.0
SN74ALS240ADWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ALS240ANSR	SO	NS	20	2000	367.0	367.0	45.0
SN74AS240ANSR	SO	NS	20	2000	367.0	367.0	45.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-8859101SA	W	CFP	20	25	506.98	26.16	6220	NA
JM38510/38301B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
M38510/38301B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
SN74ALS240A-1DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74ALS240A-1N	N	PDIP	20	20	506	13.97	11230	4.32
SN74ALS240ADW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74ALS240AN	N	PDIP	20	20	506	13.97	11230	4.32
SN74AS240ADW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74AS240AN	N	PDIP	20	20	506	13.97	11230	4.32
SNJ54ALS240AFK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54ALS240AW	W	CFP	20	25	506.98	26.16	6220	NA

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



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

GENERIC PACKAGE VIEW

FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

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.



4229370VA\

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

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



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.

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.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024, Texas Instruments Incorporated