

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

SDAS214E – DECEMBER 1982 – REVISED AUGUST 2002

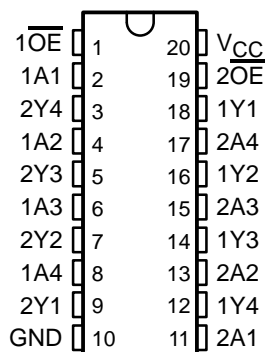
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- pnp Inputs Reduce dc Loading

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

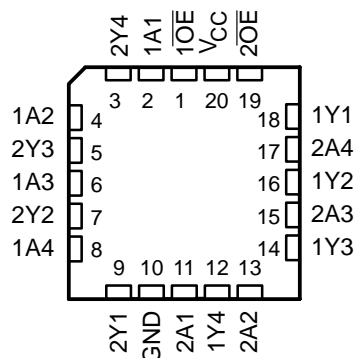
## description/ordering information

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](http://www.ti.com/sc/package).



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 **TEXAS  
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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.

**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](http://www.ti.com/sc/package).

**FUNCTION TABLE**  
**(each buffer)**

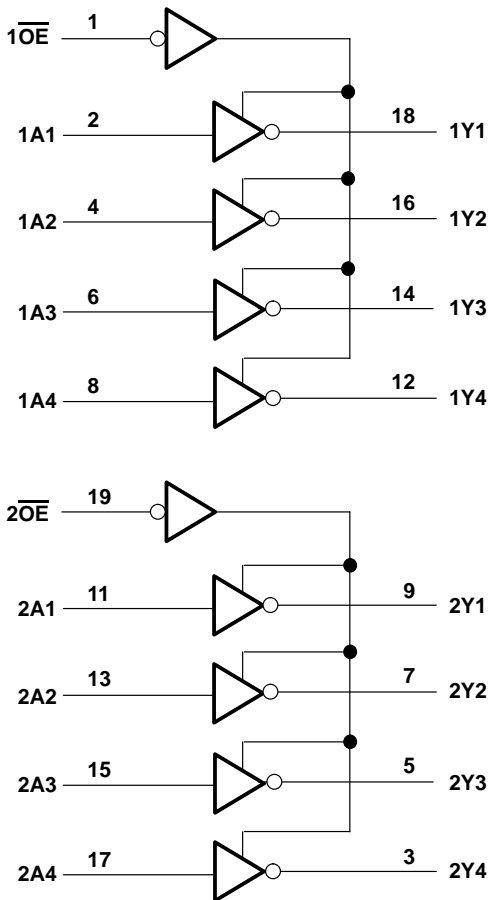
INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	L
L	L	H
H	X	Z



# 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, $\theta_{JA}$ (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 <sub>CC</sub>	Supply voltage	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			V
V <sub>IL</sub>	Low-level input voltage	SN54ALS240A		0.7	V
		SN74ALS240A, 'AS240A		0.8	
I <sub>OH</sub>	High-level output current	SN54ALS240A, SN54AS240A		-12	mA
		SN74ALS240A, SN74AS240A		-15	
I <sub>OL</sub>	Low-level output current	SN54ALS240A		12	mA
		SN74ALS240A		24	
				48†	
				64	
T <sub>A</sub>	Operating free-air temperature	SN54ALS240A, SN54AS240A		-55	°C
		SN74ALS240A, SN74AS240A		0	

† Applies only to the -1 version and only if V<sub>CC</sub> 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 <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2		V		
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = -0.4 mA	V <sub>CC</sub> - 2		V <sub>CC</sub> - 2		V		
	V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = -3 mA	2.4	3.2	2.4		3.2	
		I <sub>OH</sub> = -12 mA	2					
		I <sub>OH</sub> = -15 mA			2			
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 12 mA	0.25	0.4	0.25	0.4	V	
		I <sub>OL</sub> = 24 mA			0.35	0.5		
		I <sub>OL</sub> = 48 mA†			0.35	0.5		
I <sub>OZH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V			20		μA		
I <sub>OZL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.4 V			-20		μA		
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V			0.1		mA		
I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V			20		μA		
I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V			-0.1		mA		
I <sub>O§</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V	-20		-112	-30	-112	mA	
I <sub>CC</sub>	V <sub>CC</sub> = 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<sub>CC</sub> is between 4.75 V and 5.25 V

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>OS</sub>.



# 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		$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0.4\text{ V}$	-50		-50		$\mu\text{A}$
$I_I$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 7\text{ V}$	0.1		0.1		mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$	20		20		$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.4\text{ V}$	-1		-1		mA
			-0.5		-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 <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54AS240A		SN74AS240A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	1	7	1	6.5	ns
t <sub>PHL</sub>			1.2	6.5	1.2	6.5	
t <sub>PZH</sub>	$\overline{OE}$	Y	1	7	1	6.4	ns
t <sub>PZL</sub>			1.1	9.5	1.1	9	
t <sub>PHZ</sub>	$\overline{OE}$	Y	1.2	5.5	1.2	5	ns
t <sub>PLZ</sub>			1.5	12.5	1.5	9.5	

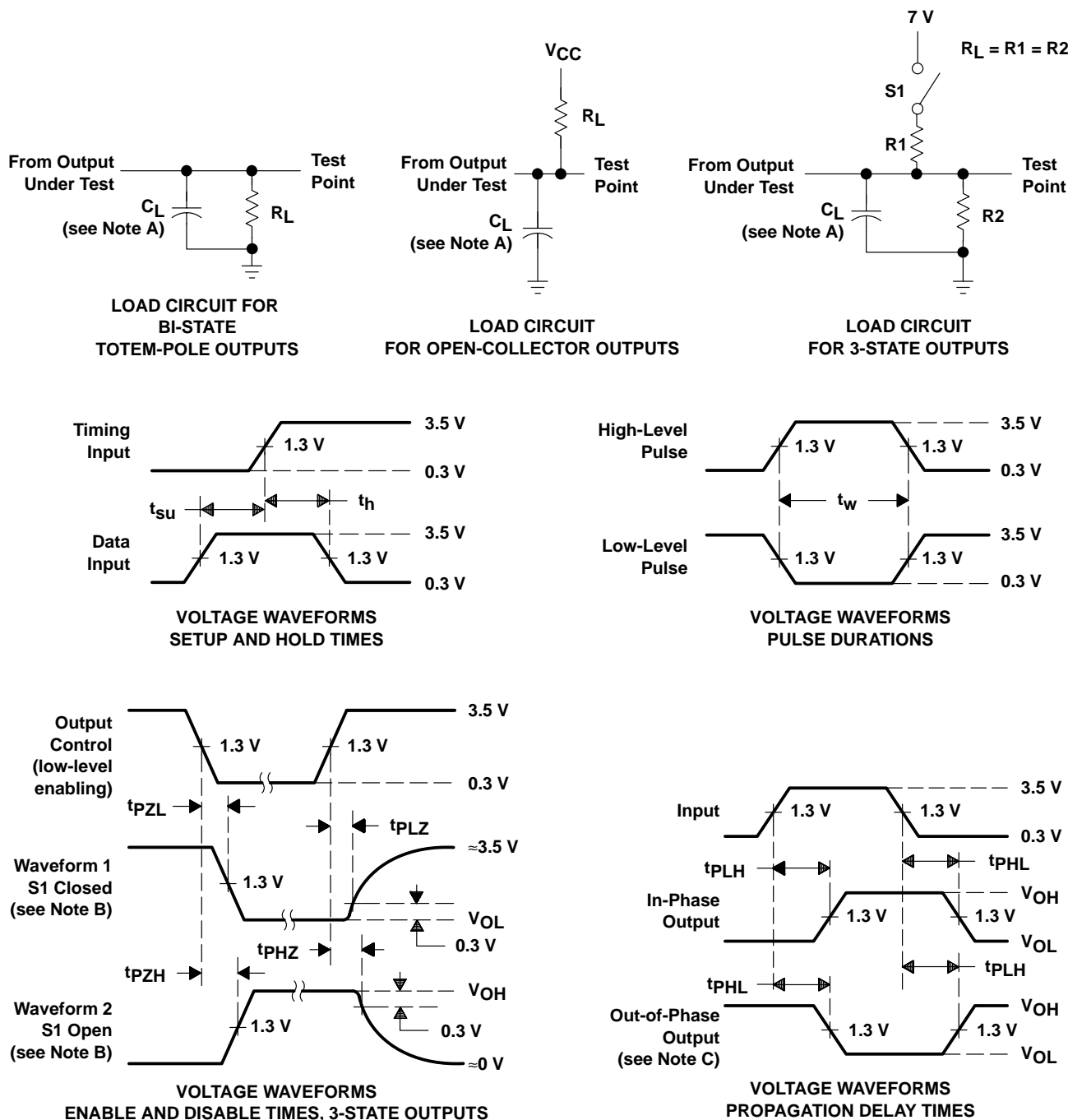
† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



# 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	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8859101SA SNJ54ALS240AW	<a href="#">Samples</a>
JM38510/38301B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301B2A	<a href="#">Samples</a>
JM38510/38301BRA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301BRA	<a href="#">Samples</a>
M38510/38301B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301B2A	<a href="#">Samples</a>
M38510/38301BRA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 38301BRA	<a href="#">Samples</a>
SN54ALS240AJ	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54ALS240AJ	<a href="#">Samples</a>
SN74ALS240A-1DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A-1	<a href="#">Samples</a>
SN74ALS240A-1N	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS240A-1N	<a href="#">Samples</a>
SN74ALS240A-1NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A-1	<a href="#">Samples</a>
SN74ALS240ADBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM		G240A	<a href="#">Samples</a>
SN74ALS240ADW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A	<a href="#">Samples</a>
SN74ALS240ADWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A	<a href="#">Samples</a>
SN74ALS240AN	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS240AN	<a href="#">Samples</a>
SN74ALS240ANSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS240A	<a href="#">Samples</a>
SN74AS240ADW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	AS240A	<a href="#">Samples</a>
SN74AS240AN	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74AS240AN	<a href="#">Samples</a>
SN74AS240ANSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74AS240A	<a href="#">Samples</a>
SNJ54ALS240AFK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54ALS 240AFK	<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
SNJ54ALS240AJ	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54ALS240AJ	<a href="#">Samples</a>
SNJ54ALS240AW	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8859101SA SNJ54ALS240AW	<a href="#">Samples</a>
SNJ54AS240AJ	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54AS240AJ	<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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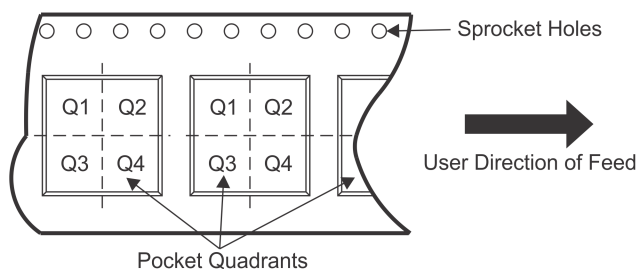
**OTHER QUALIFIED VERSIONS OF SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A :**

- 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**


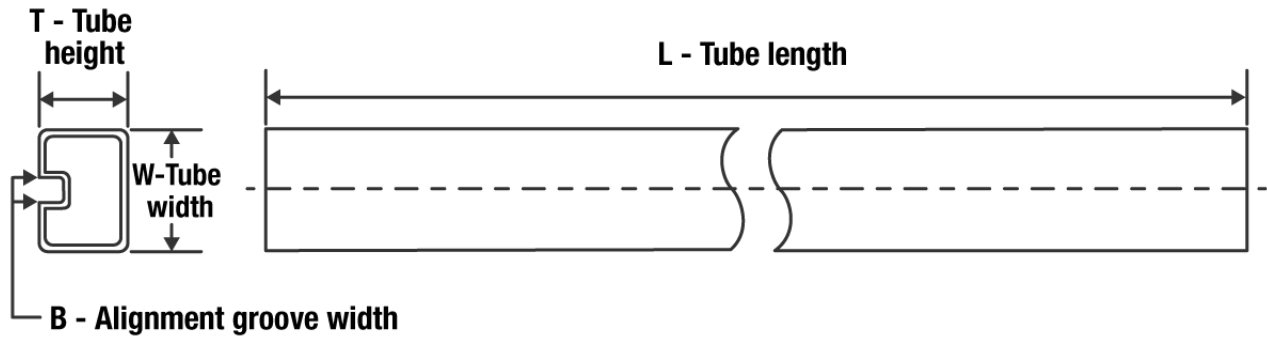
\*All dimensions are nominal

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	853.0	449.0	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**


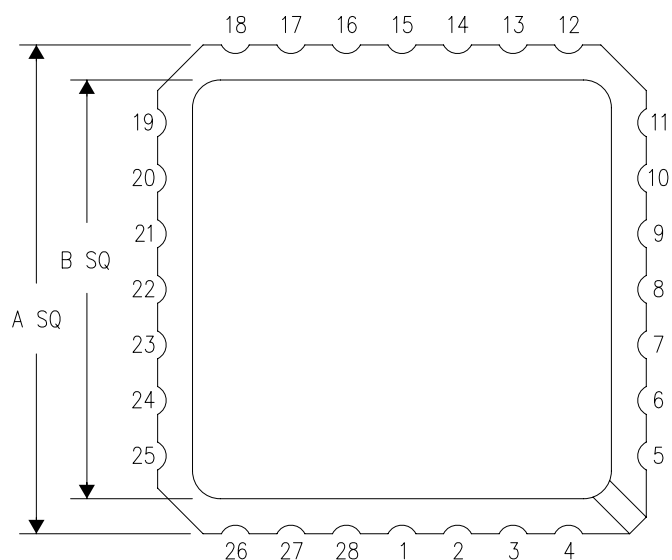
\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
JM38510/38301B2A	FK	LCCC	20	1	506.98	12.06	2030	NA
M38510/38301B2A	FK	LCCC	20	1	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	1	506.98	12.06	2030	NA

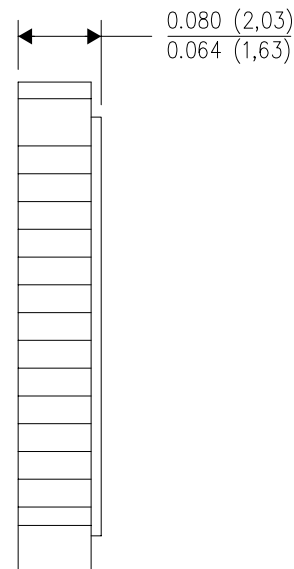
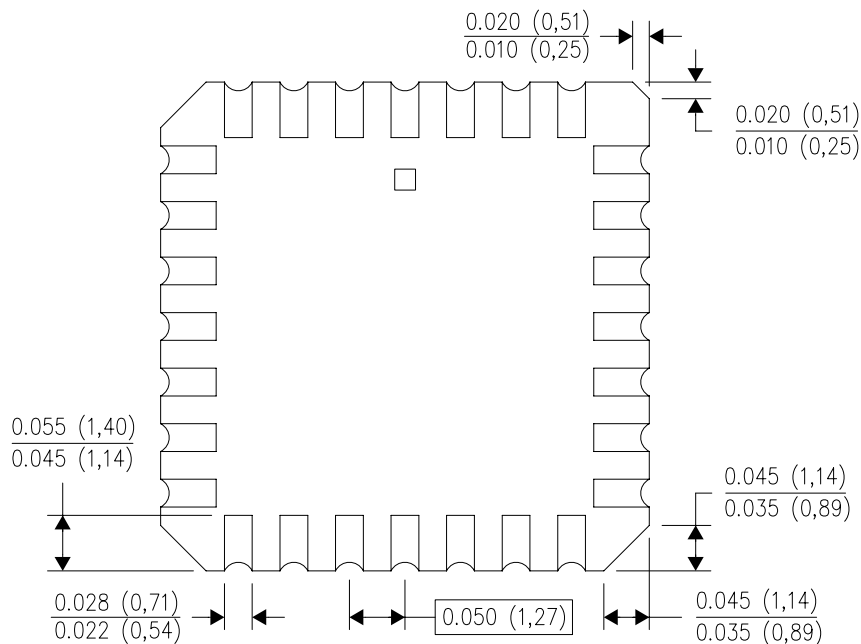
FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



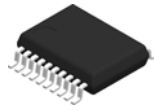
NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	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:
- 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 metal lid.
  - D. Falls within JEDEC MS-004

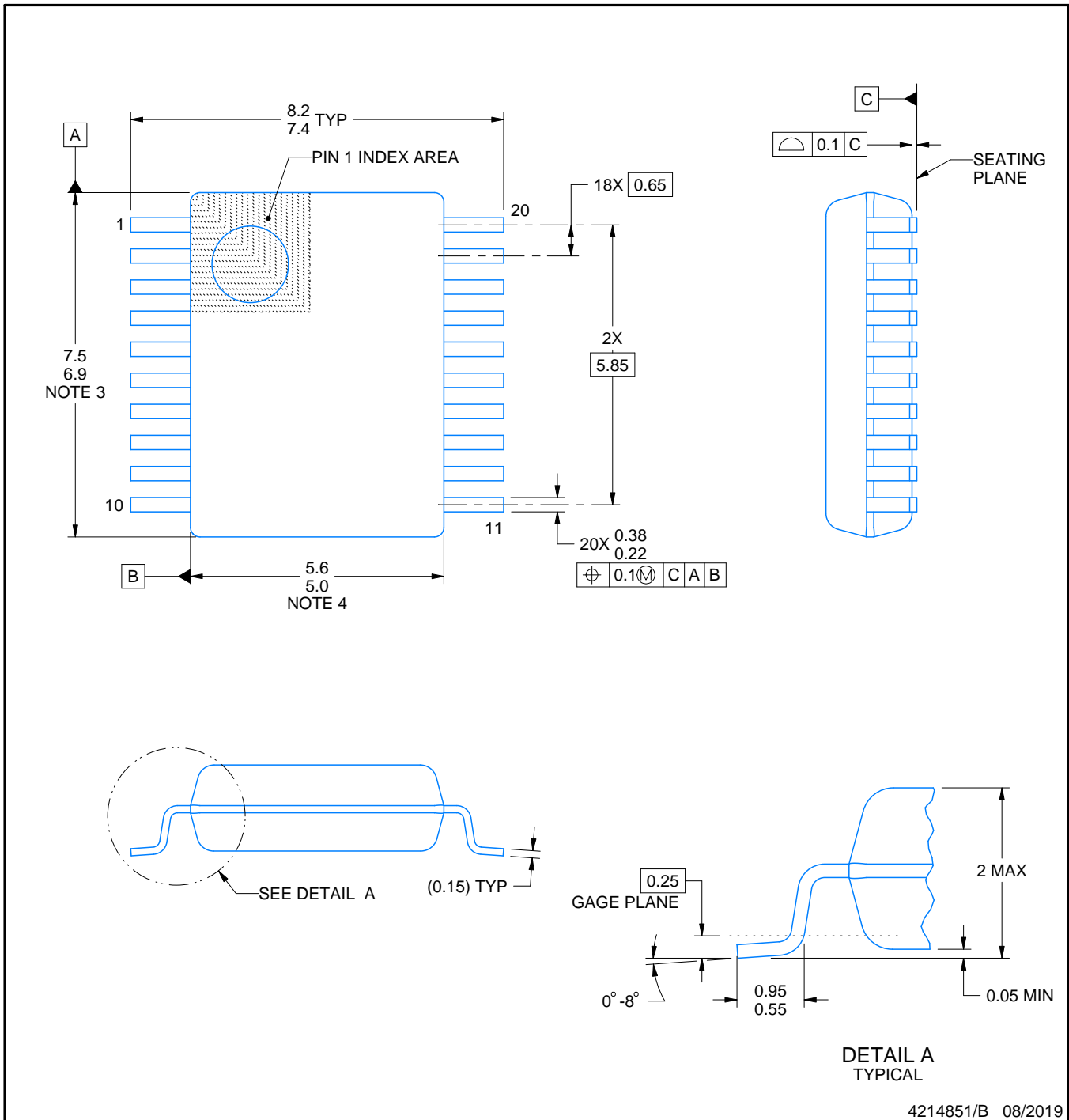
# DB0020A



# PACKAGE OUTLINE

## SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4214851/B 08/2019

### NOTES:

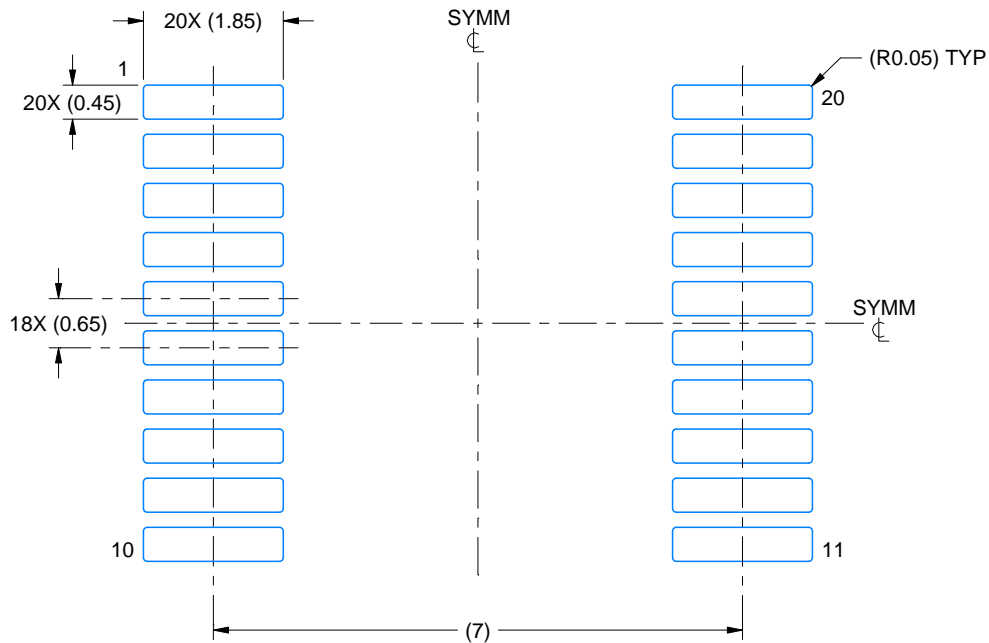
- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
- This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

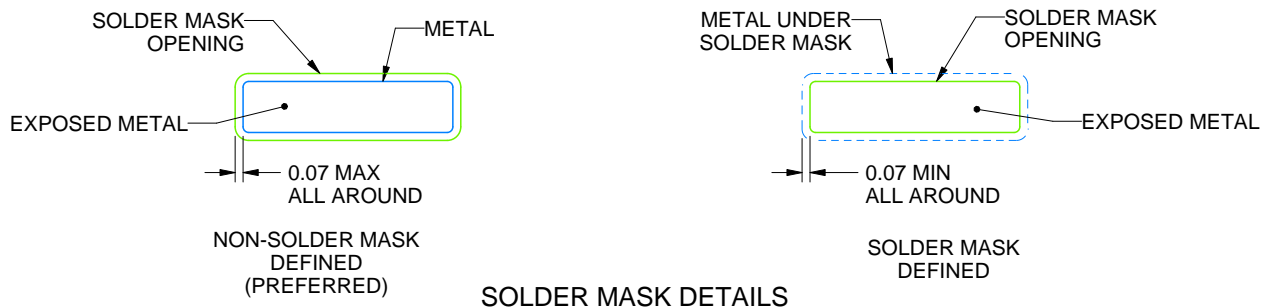
DB0020A

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.

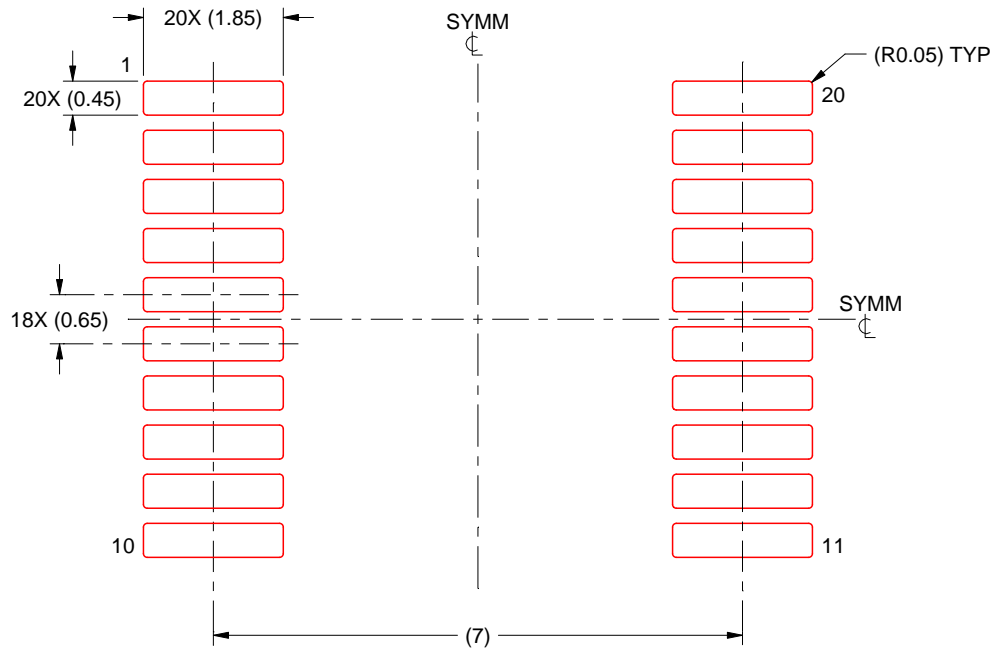


# EXAMPLE STENCIL DESIGN

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.

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.

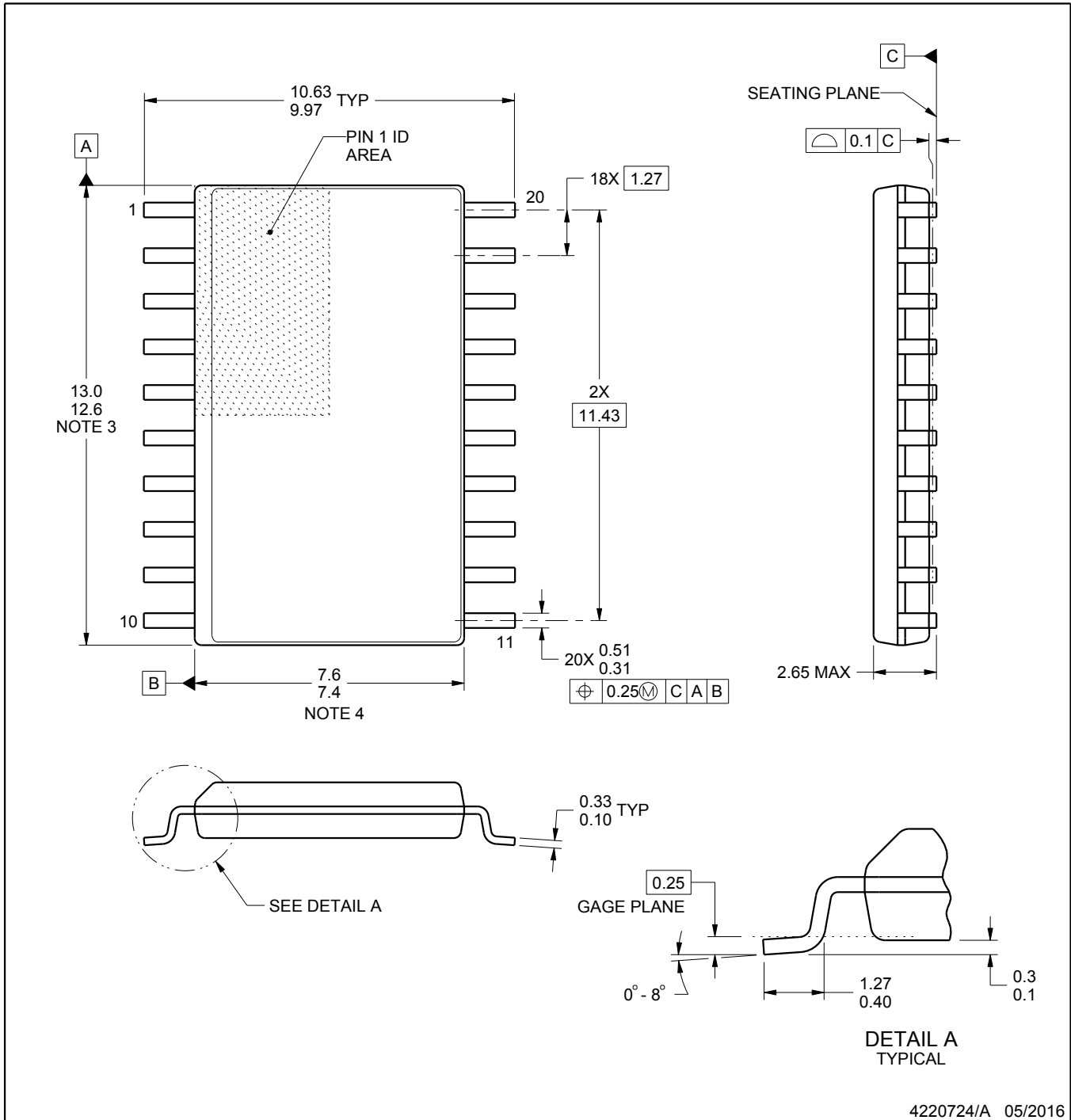
# DW0020A



# 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)

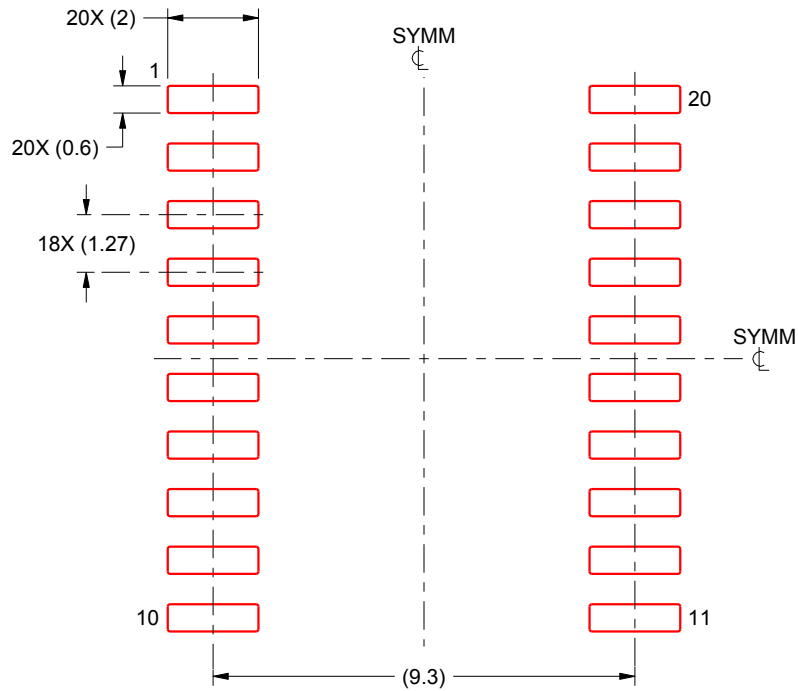
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

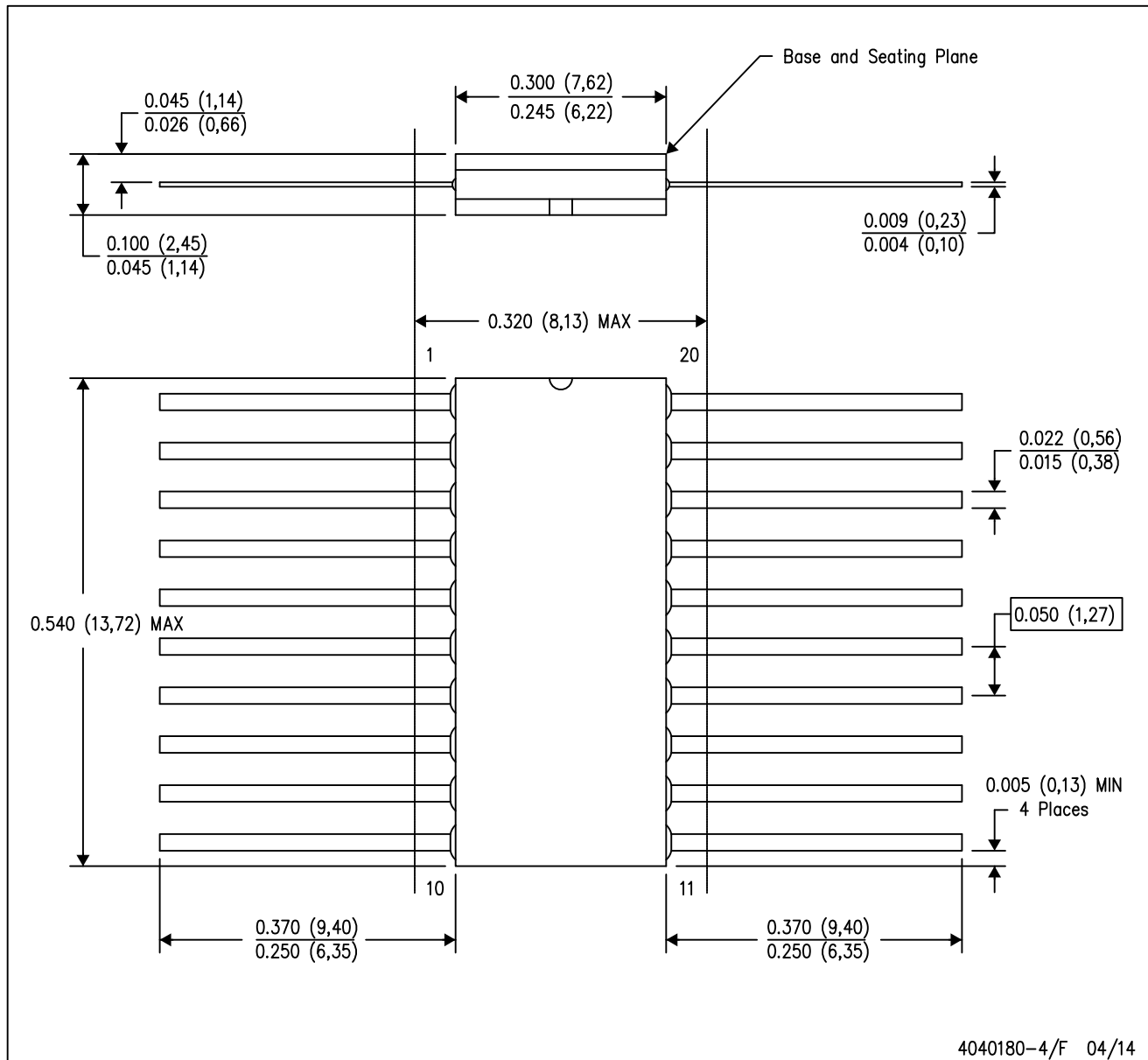
4220724/A 05/2016

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.

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



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