

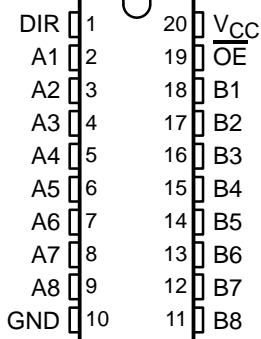
# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SDAS272A – NOVEMBER 1994 – REVISED JANUARY 2003

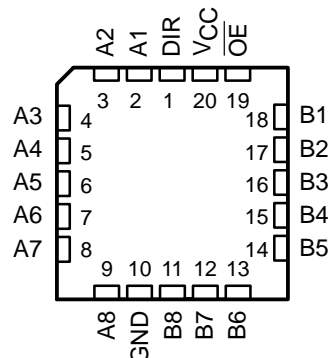
- 4.5-V to 5.5-V  $V_{CC}$  Operation
- Max  $t_{pd}$  of 5.5 ns at 5 V

- 3-State Outputs Drive Bus Lines Directly
- pnp Inputs Reduce dc Loading

SN54ALS245A . . . J OR W PACKAGE  
SN54AS245 . . . J PACKAGE  
SN74ALS245A . . . DB, DW, N, OR NS PACKAGE  
SN74AS245 . . . DW, N, OR NS PACKAGE  
(TOP VIEW)



SN54ALS245A, SN54AS245 . . . FK PACKAGE  
(TOP VIEW)



description/ordering information

## ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74ALS245A-1N	SN74ALS245A-1N
			SN74ALS245AN	SN74ALS245AN
			SN74AS245N	SN74AS245N
	SOIC – DW	Tube	SN74ALS245ADW	ALS245A
		Tape and reel	SN74ALS245ADWR	
		Tube	SN74ALS245A-1DW	ALS245A-1
		Tape and reel	SN74ALS245A-1DWR	
		Tube	SN74AS245DW	AS245
		Tape and reel	SN74AS245DWR	
	SOP – NS	Tape and reel	SN74ALS245ANSR	ALS245A
		Tape and reel	SN74ALS245A-1NSR	ALS245A-1
		Tape and reel	SN74AS245NSR	74AS245
–55°C to 125°C	SSOP – DB	Tape and reel	SN74ALS245ADBR	G245A
	CDIP – J	Tube	SNJ54ALS245AJ	SNJ54ALS245AJ
			SNJ54AS245J	SNJ54AS245J
	CFP – W	Tube	SNJ54ALS245AW	SNJ54ALS245AW
	LCCC – FK	Tube	SNJ54ALS245AFK	SNJ54ALS245AFK
			SNJ54AS245FK	SNJ54AS245FK



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**TEXAS  
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## SDAS272A – NOVEMBER 1994 – REVISED JANUARY 2003

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

The -1 version of the SN74ALS245A is identical to the standard version, except that the recommended maximum  $I_{O1}$  is increased to 48 mA. There is no -1 version of the SN54ALS245A.

INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$ : All inputs	7 V
I/O ports	5.5 V
Package thermal impedance, $\theta_{JA}$ (see Note 1): DB package	70°C/W
DW package	58°C/W
N package	69°C/W
NS package	60°C/W
Storage temperature range	–65°C to 150°C

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

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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#### recommended operating conditions (see Note 2)

		SN54ALS245A			SN74ALS245A			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			0.7			0.8	V
$I_{OH}$	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 only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

NOTE 2: 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		SN54ALS245A			SN74ALS245A			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
		$V_{CC} = 4.5$ 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	
$I_I$	Control inputs	$V_{CC} = 5.5$ V	$V_I = 7$ V			0.1			0.1	mA
	A or B ports		$V_I = 5.5$ V			0.1			0.1	
$I_{IH}$	Control inputs	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			20			20	µA
	A or B ports§					20			20	
$I_{IL}$	Control inputs	$V_{CC} = 5.5$ V,	$V_I = 0.4$ V			-0.1			-0.1	mA
	A or B ports§					-0.1			-0.1	
$I_{O}^{  }$		$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	-20		-112	-30		-112	mA
$I_{CC}$		$V_{CC} = 5.5$ V	Outputs high		30	48		30	45	mA
			Outputs low		36	60		36	55	
			Outputs disabled		38	63		38	58	

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

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

§ For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

|| The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit output current,  $I_{OS}$ .

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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#### 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, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54ALS245A		SN74ALS245A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	1	19	3	10	ns
t <sub>PHL</sub>			1	14	3	10	
t <sub>PZH</sub>	$\overline{\text{OE}}$	A or B	2	30	5	20	ns
t <sub>PZL</sub>			2	29	5	20	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	A or B	2	14	2	10	ns
t <sub>PLZ</sub>			2	30	4	15	

† 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 (SN54AS245, SN74AS245) (unless otherwise noted)‡

Supply voltage, V <sub>CC</sub>	7 V
Input voltage, V <sub>I</sub> : All inputs	7 V
I/O ports	5.5 V
Package thermal impedance, θ <sub>JA</sub> (see Note 1): DW package	58°C/W
N package	69°C/W
NS package	60°C/W
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.

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

#### recommended operating conditions (see Note 2)

		SN54AS245			SN74AS245			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			2			V
V <sub>IL</sub>	Low-level input voltage			0.8			0.8	V
I <sub>OH</sub>	High-level output current			–12			–15	mA
I <sub>OL</sub>	Low-level output current			48			64	mA
T <sub>A</sub>	Operating free-air temperature	–55		125	0		70	°C

NOTE 2: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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

PARAMETER		TEST CONDITIONS		SN54AS245			SN74AS245			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			−1.2			V
V <sub>OH</sub>		V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = −2 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> = 48 mA	0.3	0.55				V	
			I <sub>OL</sub> = 64 mA				0.35	0.55		
I <sub>I</sub>	Control inputs	V <sub>CC</sub> = 5.5 V	V <sub>I</sub> = 7 V	0.1			0.1			mA
	A or B ports		V <sub>I</sub> = 5.5 V	0.1			0.1			
I <sub>IH</sub>	Control inputs	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V		50			20			μA
	A or B ports‡			70			70			
I <sub>IL</sub>	Control inputs	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V		−0.5			−0.5			mA
	A or B ports‡			−0.75			−0.75			
I <sub>O</sub> §		V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V		−50 −150			−50 −150			mA
I <sub>CC</sub>		V <sub>CC</sub> = 5.5 V	Outputs high	62 97		62 97				mA
			Outputs low	95 143		95 143				
			Outputs disabled	79 123		79 123				

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

‡ For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

§ 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 <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†¶				UNIT
			SN54AS245		SN74AS245		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A or B	B or A	2	9.5	2	7.5	ns
t <sub>PHL</sub>			2	9	2	7	
t <sub>PZH</sub>	OE	A or B	2	11	2	9	ns
t <sub>PZL</sub>			2	10.5	2	8.5	
t <sub>PHZ</sub>	OE	A or B	2	7.5	2	5.5	ns
t <sub>PLZ</sub>			2	12	2	9.5	

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

# SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245

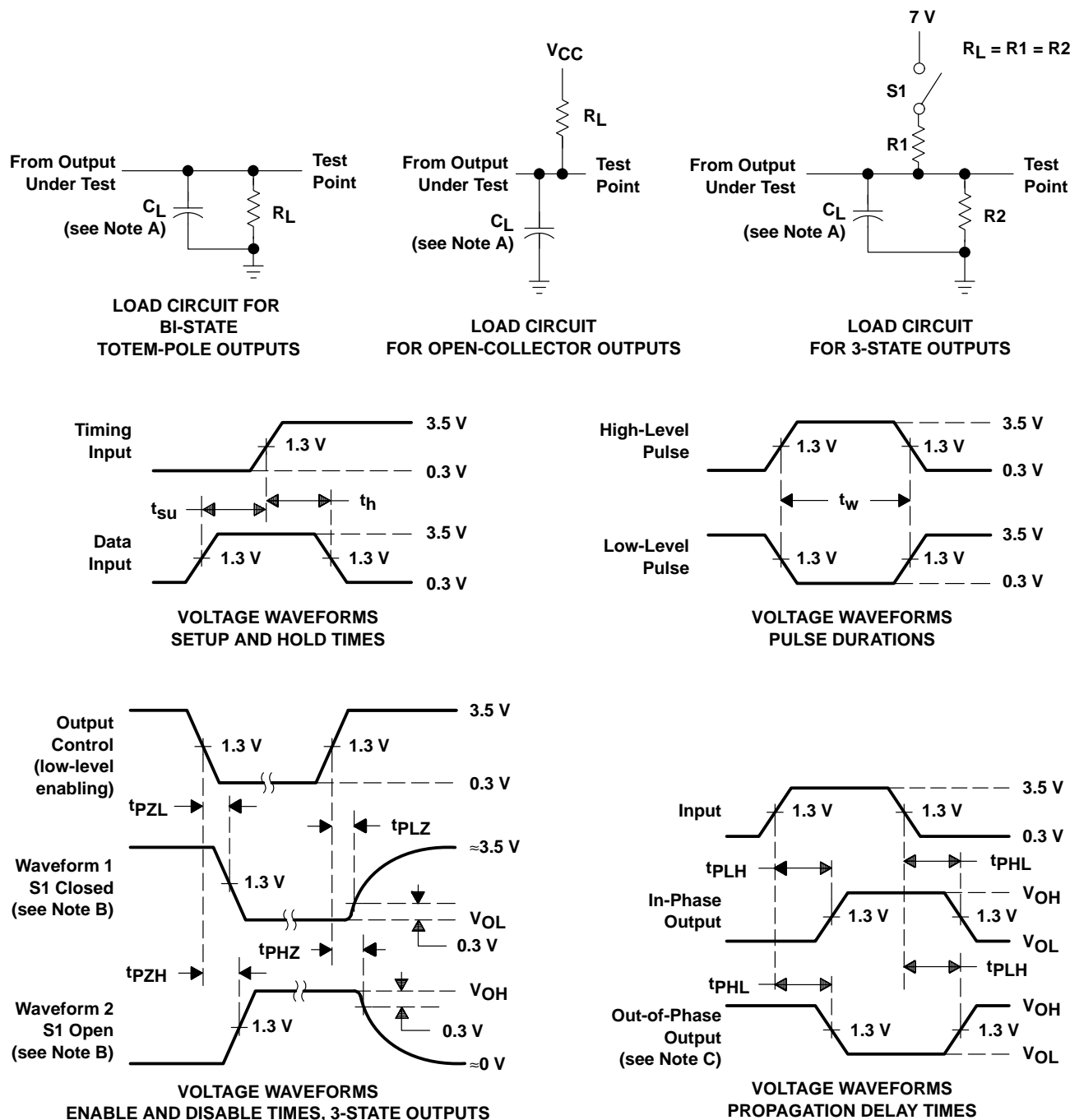
## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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#### 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
84030012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84030012A SNJ54ALS 245AFK	<a href="#">Samples</a>
8403001RA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8403001RA SNJ54ALS245AJ	<a href="#">Samples</a>
8403001SA	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8403001SA SNJ54ALS245AW	<a href="#">Samples</a>
SN54ALS245AJ	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54ALS245AJ	<a href="#">Samples</a>
SN54AS245J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54AS245J	<a href="#">Samples</a>
SN74ALS245A-1DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A-1	<a href="#">Samples</a>
SN74ALS245A-1DWG4	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A-1	<a href="#">Samples</a>
SN74ALS245A-1DWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A-1	<a href="#">Samples</a>
SN74ALS245A-1DWRG4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A-1	<a href="#">Samples</a>
SN74ALS245A-1N	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS245A-1N	<a href="#">Samples</a>
SN74ALS245A-1NE4	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS245A-1N	<a href="#">Samples</a>
SN74ALS245A-1NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A-1	<a href="#">Samples</a>
SN74ALS245ADBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	G245A	<a href="#">Samples</a>
SN74ALS245ADBRG4	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	G245A	<a href="#">Samples</a>
SN74ALS245ADW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A	<a href="#">Samples</a>
SN74ALS245ADWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A	<a href="#">Samples</a>
SN74ALS245ADWRG4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A	<a href="#">Samples</a>
SN74ALS245AN	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS245AN	<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
SN74ALS245ANSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A	<a href="#">Samples</a>
SN74ALS245ANSRG4	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS245A	<a href="#">Samples</a>
SN74AS245DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	AS245	<a href="#">Samples</a>
SN74AS245N	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74AS245N	<a href="#">Samples</a>
SN74AS245NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74AS245	<a href="#">Samples</a>
SNJ54ALS245AFK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84030012A SNJ54ALS 245AFK	<a href="#">Samples</a>
SNJ54ALS245AJ	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8403001RA SNJ54ALS245AJ	<a href="#">Samples</a>
SNJ54ALS245AW	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8403001SA SNJ54ALS245AW	<a href="#">Samples</a>
SNJ54AS245FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54AS 245FK	<a href="#">Samples</a>
SNJ54AS245J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54AS245J	<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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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 SN54ALS245A, SN54AS245, SN74ALS245A, SN74AS245 :**

- Catalog: [SN74ALS245A](#), [SN74AS245](#)
- Military: [SN54ALS245A](#), [SN54AS245](#)

**NOTE: Qualified Version Definitions:**

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

**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
SN74ALS245A-1DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ALS245A-1NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ALS245ADBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74ALS245ADWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ALS245ANSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74AS245NSR	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)
SN74ALS245A-1DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ALS245A-1NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74ALS245ADBR	SSOP	DB	20	2000	853.0	449.0	35.0
SN74ALS245ADWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ALS245ANSR	SO	NS	20	2000	367.0	367.0	45.0
SN74AS245NSR	SO	NS	20	2000	367.0	367.0	45.0

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 GDP2-F20

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

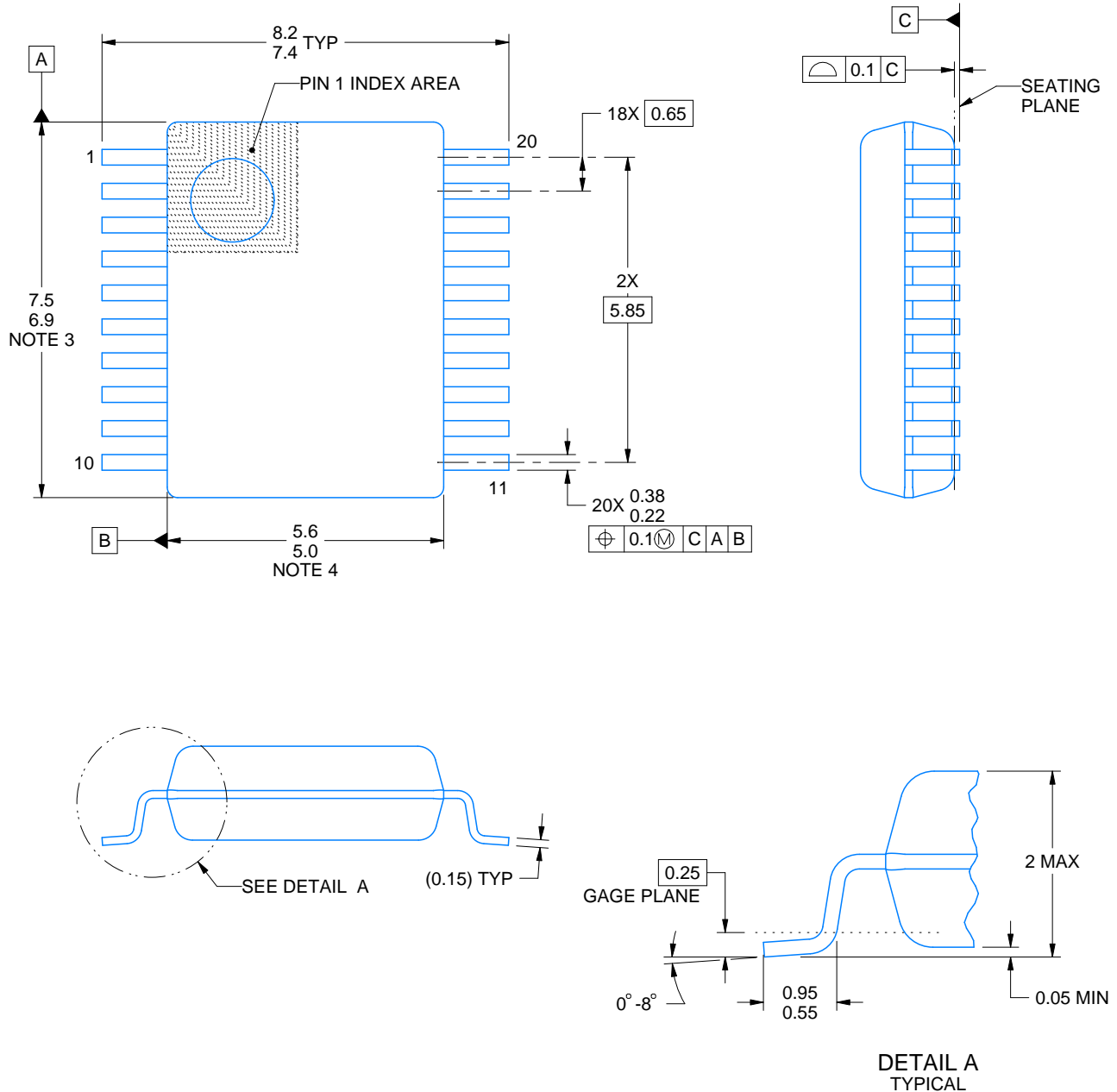


NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)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



4214851/B 08/2019

## 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-150.

# 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:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - 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



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.

## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



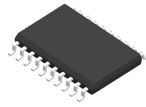
PINS **	14	16	18	20
DIM				
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



14/18 Pin Only  
20 Pin vendor option

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.



## 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.

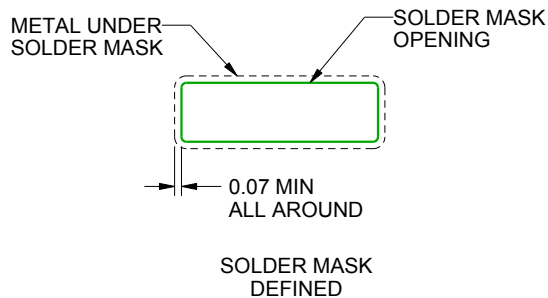
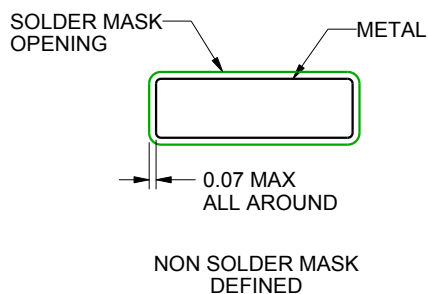
**DW0020A**

### 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.

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