SDAS063B - APRIL 1982 - REVISED DECEMBER 1994

 Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

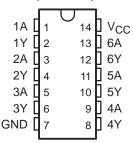
These devices contain six independent hex inverters. They perform the Boolean function $Y = \overline{A}$.

The SN54ALS04B and SN54AS04 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN74ALS04B and SN74AS04 are characterized for operation from 0°C to 70°C.

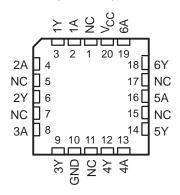
FUNCTION TABLE (each inverter)

INPUT A	OUTPUT Y
Н	L
L	I н

SN54ALS04B, SN54AS04...J PACKAGE SN74ALS04B, SN74AS04...D OR N PACKAGE (TOP VIEW)



SN54ALS04B, SN54AS04 . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

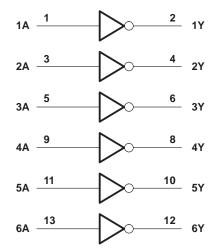
logic symbol†

1A	1	1	2	1Y
	3	'	4	
2A	5		6	2Y
3A	9		8	3Y
4A	11		10	4Y
5A	13		12	5Y
6A				6Y

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

Pin numbers shown are for the D, J, and N packages.

logic diagram (positive logic)



SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04 HEX INVERTERS

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage, V _{CC}		 	7 V
Input voltage, V _I		 	7 V
Operating free-air temperature range, T _A : S			
	SN74ALS04B	 	0°C to 70°C
Storage temperature range		 	-65°C to 150°C

recommended operating conditions

		SN	54ALS0	4B	SN	74ALS0	4B	
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Vcc	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
VIH	High-level input voltage	2			2			V
.,	Law Israel Sanat welliams			0.8‡			0.8	
V_{IL}	Low-level input voltage			0.7§				V
ЮН	High-level output current			-0.4			-0.4	mA
loL	Low-level output current			4			8	mA
TA	Operating free-air temperature	-55		125	0		70	°C

[‡] Applies over –55°C to 70°C temperature range

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

242445752		TEST CONDITIONS				SN	74ALS04	4B	UNIT
PARAMETER	TEST C	MIN	TYP¶	MAX	MIN	TYP¶	MAX	UNIT	
VIK	$V_{CC} = 4.5 V,$	$I_{I} = -18 \text{ mA}$			-1.2			-1.2	V
Voн	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V},$	$I_{OH} = -0.4 \text{ mA}$	V _{CC} -2			V _{CC} -2	2		V
V	\\ 45\\	$I_{OL} = 4 \text{ mA}$		0.25	0.4		0.25	0.4	
V _{OL}	V _{CC} = 4.5 V	$I_{OL} = 8 \text{ mA}$					0.35	0.5	V
lį	$V_{CC} = 5.5 V$,	$V_I = 7 V$			0.1			0.1	mA
lін	$V_{CC} = 5.5 V$,	V _I = 2.7 V			20			20	μΑ
I _I L	$V_{CC} = 5.5 V$,	V _I = 0.4 V			-0.1			-0.1	mA
IO [#]	V _{CC} = 5.5 V,	V _O = 2.25 V	-20		-112	-30		-112	mA
ICCH	V _{CC} = 5.5 V,	V _I = 0		0.65	1.1		0.65	1.1	mA
ICCL	V _{CC} = 5.5 V,	V _I = 4.5 V		2.9	4.4		2.9	4.2	mA

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



[†] 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.

[§] Applies over 70°C to 125°C temperature range

[#] The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, IOS.

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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	C _L R _L T _A	= 50 pF = 500 £ = MIN t	o MAX†		UNIT
			SN54AI		SN74AI		
			MIN	MAX	MIN	MAX	
^t PLH	^	_	3	17	3	11	ns
t _{PHL}	А	'	2	13	2	8	115

[†] 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}	
Input voltage, V _I	
	4AS04 –55°C to 125°C
SN74	4AS04 0°C to 70°C
Storage temperature range	

[‡] 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

		SN54AS04 SN74AS04			4	LINUT		
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
VIH	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
lOH	High-level output current			-2			-2	mA
loL	Low-level output current			20			20	mA
TA	Operating free-air temperature	-55		125	0		70	°C

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

242445752		TEST CONDITIONS					N74AS04	4	UNIT
PARAMETER	TEST Co	ONDITIONS	MIN	TYP§	MAX	MIN	TYP§	MAX	UNII
VIK	V _{CC} = 4.5 V,	I _I = -18 mA			-1.2			-1.2	V
Voн	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V},$	$I_{OH} = -2 \text{ mA}$	V _{CC} -2			V _{CC} -2	!		V
VOL	$V_{CC} = 4.5 \text{ V},$	$I_{OL} = 20 \text{ mA}$		0.35	0.5		0.35	0.5	V
lį	$V_{CC} = 5.5 \text{ V},$	V _I = 7 V			0.1			0.1	mA
lіН	$V_{CC} = 5.5 \text{ V},$	V _I = 2.7 V			20			20	μΑ
I _{IL}	$V_{CC} = 5.5 V,$	V _I = 0.4 V			-0.5			-0.5	mA
IO¶	V _{CC} = 5.5 V,	V _O = 2.25 V	-30		-112	-30		-112	mA
Іссн	$V_{CC} = 5.5 V,$	V _I = 0		3	4.8		3	4.8	mA
ICCL	$V_{CC} = 5.5 V,$	V _I = 4.5 V		14	26.3		14	26.3	mA

[§] 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, IOS.

SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04 HEX INVERTERS

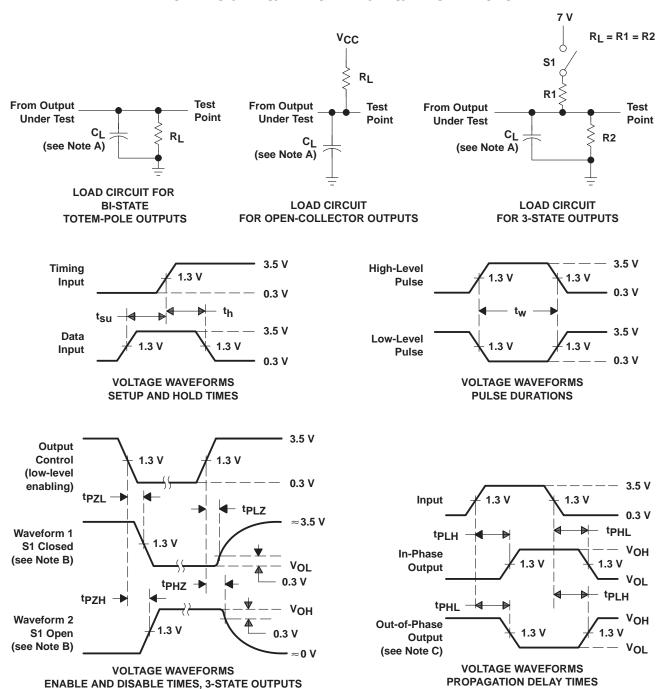
SDAS063B - APRIL 1982 - REVISED DECEMBER 1994

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _C C _L R _L T _A	V, AS04	UNIT		
			MIN	MAX	MIN	MAX	
t _{PLH}	٨	V	1	6	1	5	20
^t PHL	А	ſ	1	4.5	1	4	ns

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

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, $t_{\Gamma} = t_{f} = 2$ 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







10-Jun-2014

PACKAGING INFORMATION

Orderable Device	Status	Package Type	_	Pins	_	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
5962-86843012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 86843012A SNJ54ALS 04BFK	Samples
5962-8684301DA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8684301DA SNJ54ALS04BW	Samples
JM38510/37006B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 37006B2A	Samples
JM38510/37006BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 37006BCA	Samples
M38510/37006B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 37006B2A	Samples
M38510/37006BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 37006BCA	Samples
SN54ALS04BJ	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54ALS04BJ	Samples
SN54AS04J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54AS04J	Samples
SN74ALS04BD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BDBLE	OBSOLETI	E SSOP	DB	14		TBD	Call TI	Call TI	0 to 70		
SN74ALS04BDBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	G04B	Samples
SN74ALS04BDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS04BN	Samples





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Orderable Device	Status	Package Type	_	Pins	_	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
SN74ALS04BN3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI	0 to 70		
SN74ALS04BNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS04BN	Samples
SN74ALS04BNSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BNSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74ALS04BNSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS04B	Samples
SN74AS04D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	AS04	Samples
SN74AS04DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	AS04	Samples
SN74AS04DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	AS04	Samples
SN74AS04DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	AS04	Samples
SN74AS04N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74AS04N	Samples
SN74AS04NSR	ACTIVE	so	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	74AS04	Samples
SNJ54ALS04BFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 86843012A SNJ54ALS 04BFK	Samples
SNJ54ALS04BJ	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54ALS04BJ	Samples
SNJ54ALS04BW	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8684301DA SNJ54ALS04BW	Samples
SNJ54AS04FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	SNJ54AS 04FK	Samples
SNJ54AS04J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54AS04J	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.

PACKAGE OPTION ADDENDUM



10-Jun-2014

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 - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): Tl'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, Tl Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

- (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/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04:

Catalog: SN74ALS04B, SN74AS04

Military: SN54ALS04B, SN54AS04

NOTE: Qualified Version Definitions:

Catalog - TI's standard catalog product



PACKAGE OPTION ADDENDUM



10-Jun-2014

• Military - QML certified for Military and Defense Applications

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ALS04BDBR	SSOP	DB	14	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74ALS04BDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74ALS04BDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74ALS04BNSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74AS04DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74AS04NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

www.ti.com 26-Jan-2013



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)	
SN74ALS04BDBR	SSOP	DB	14	2000	367.0	367.0	38.0	
SN74ALS04BDR	SOIC	D	14	2500	333.2	345.9	28.6	
SN74ALS04BDR	SOIC	D	14	2500	367.0	367.0	38.0	
SN74ALS04BNSR	SO	NS	14	2000	367.0	367.0	38.0	
SN74AS04DR	SOIC	D	14	2500	367.0	367.0	38.0	
SN74AS04NSR	SO	NS	14	2000	367.0	367.0	38.0	

14 LEADS SHOWN



- 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.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- 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 GDFP1-F14



FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- 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



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AB.



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- 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.



DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 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.

D. Falls within JEDEC MO-150

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