SDAS143C - APRIL 1982 - REVISED AUGUST 1995

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

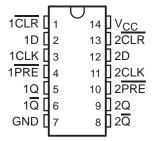
TYPE	TYPICAL MAXIMUM CLOCK FREQUENCY (C _L = 50 pF) (MHz)	TYPICAL POWER DISSIPATION PER FLIP-FLOP (mW)
'ALS74A	50	6
'AS74A	134	26

description

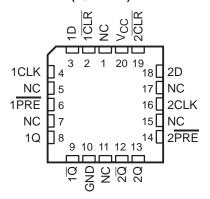
These devices contain two independent positive-edge-triggered D-type flip-flops. A low level at the preset (PRE) or clear (CLR) inputs sets or resets the outputs regardless of the levels of the other inputs. When PRE and CLR are inactive (high), data at the data (D) input meeting the setup-time requirements are transferred to the outputs on the positive-going edge of the clock (CLK) pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of CLK. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

The SN54ALS74A and SN54AS74A are characterized for operation over the full military temperature range of -55°C to 125°C. The SN74ALS74A and SN74AS74A are characterized for operation from 0°C to 70°C.

SN54ALS74A, SN54AS74A...J PACKAGE SN74ALS74A, SN74AS74A...D OR N PACKAGE (TOP VIEW)



SN54ALS74A, SN54AS74A . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

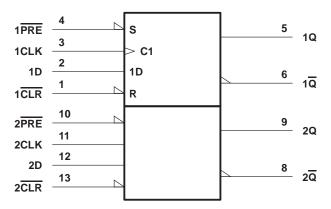
FUNCTION TABLE

	INP	UTS		OUTI	PUTS
PRE	CLR	CLK	D	Q	Q
L	Н	Х	Х	Н	L
Н	L	X	Χ	L	Н
L	L	X	Χ	н†	H [†]
Н	Н	\uparrow	Н	Н	L
Н	Н	\uparrow	L	L	Н
Н	Н	L	Χ	Q_0	\overline{Q}_0

[†] The output levels in this configuration are not specified to meet the minimum levels for V_{OH} if the lows at PRE and CLR are near V_{IL} maximum. Furthermore, this configuration is nonstable; that is, it does not persist when PRE or CLR returns to its inactive (high) level.

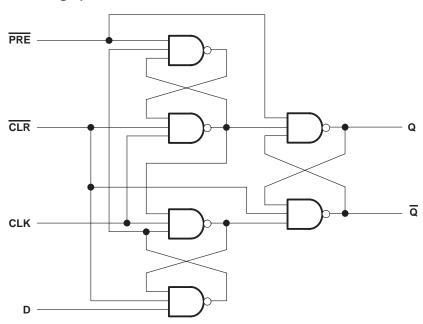
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logic symbol†



 $[\]dagger$ 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)



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 : SN54ALS74A	-55°C to 125°C
SN74ALS74A	0°C to 70°C
Storage temperature range	-65°C to 150°C

[‡] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.



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recommended operating conditions

			SN	54ALS7	4A	SN	74ALS7	4A	
			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
VIL	Low-level input voltage				0.7			8.0	V
lOH	High-level output current				-0.4			-0.4	mA
l _{OL}	Low-level output current				4			8	mA
fclock	Clock frequency		0		25	0		34	MHz
		PRE or CLR low	15			15			
t _w	Pulse duration	CLK high	17.5			14.5			ns
		CLK low	17.5			14.5			
	0	Data	16			15			
tsu	Setup time before CLK↑	PRE or CLR inactive	10			10			ns
th	Hold time after CLK↑	Data	2			0			ns
TA	Operating free-air temperature		-55		125	0		70	°C

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

PARAMETER			TEST CONDITIONS			4A	SN	74ALS7	1A	
		TEST COI				MAX	MIN	TYP†	MAX	UNIT
٧ıK		$V_{CC} = 4.5 \text{ V},$	I _I = -18 mA			-1.5			-1.5	V
Vон		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V},$	$I_{OH} = -2 \text{ mA}$	V _{CC} -2			V _{CC} -2			V
.,		V 45V	$I_{OL} = 4 \text{ mA}$		0.25	0.4		0.25	0.4	.,
VOL		V _{CC} = 4.5 V	$I_{OL} = 8 \text{ mA}$					0.35	0.5	V
	CLK or D	V 45V				0.1			0.1	4
I _I	PRE or CLR	$V_{CC} = 4.5 \text{ V},$	$V_I = 7 V$			0.2			0.2	mA
	CLK or D	V 45V	V 07V			20			20	٨
ΙΗ	PRE or CLR	$V_{CC} = 4.5 \text{ V},$	$V_{I} = 2.7 \text{ V}$			40			40	μΑ
	CLK or D					-0.2			-0.2	
IIL	PRE or CLR	$V_{CC} = 4.5 \text{ V},$	$V_{I} = 0.4 V$			-0.4			-0.4	mA
1 ₀ ‡		V _{CC} = 5.5 V,	V _O = 2.25 V	-20		-112	-30		-112	mA
ICC		V _{CC} = 5.5 V,	See Note 1		2.4	4		2.4	4	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. NOTE 1: ICC is measured with D, CLK, and PRE grounded, then with D, CLK, and CLR grounded.

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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T = MINI to MAYT					
	, ,	SN54ALS74A SN74ALS74						
			MIN	MAX	MIN	MAX		
f _{max}			25		34		MHz	
t _{PLH}	PRE or CLR	Q or Q	3	18	3	13	20	
^t PHL	PRE OF CLR	Q or Q	5	17	5	15	ns	
t _{PLH}	CLK	Q or Q	5	23	5	16	ns	
^t PHL	OLK	Q 01 Q	5	20	5	18	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}	7 V
Input voltage, V _I	7 V
	S74A –55°C to 125°C
SN74A	S74A 0°C to 70°C
Storage temperature range	–65°C to 150°C

[‡] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

			SI	N54AS74	A	SN	174AS74	·A	
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Vсс	Supply voltage		4.5	5	5.5	4.5	5	5.5	V
VIH	High-level input voltage	2			2			V	
VIL	Low-level input voltage	Low-level input voltage						8.0	V
lOH	High-level output current			-2			-2	mA	
loL	Low-level output current			20			20	mA	
fclock*	Clock frequency		0		90	0		105	MHz
		PRE or CLR low	4			4			
t _w *	Pulse duration	CLK high	4			4			ns
		CLK low	5.5			5.5			
		Data	4.5			4.5			
t _{su} *	Setup time before CLK↑	PRE or CLR inactive	2			2			ns
t _h *	Hold time after CLK↑	Data	0			0			ns
TA	Operating free-air temperature		-55		125	0		70	°C

^{*} On products compliant to MIL-STD-833, Class B, this parameter is based on characterization data but is not production tested.

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

				SN	154AS74	Α	SN	74AS74	Α	LINUT
1	PARAMETER	TEST COI	TEST CONDITIONS			MAX	MIN	TYP†	MAX	UNIT
VIK		V _{CC} = 4.5 V,	I _I = -18 mA			-1.2			-1.2	V
Vон		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V},$	$I_{OH} = -2 \text{ mA}$	V _{CC} -2			V _{CC} -2			V
VOL		$V_{CC} = 4.5 \text{ V},$	$I_{OL} = 20 \text{ mA}$		0.25	0.5		0.25	0.5	V
l _l		V _{CC} = 5.5 V,	V _I = 7 V			0.1			0.1	mA
	CLK or D	., 551	V 07V			20			20	•
lн	PRE or CLR	V _{CC} = 5.5 V,	V _I = 2.7 V			40			40	μΑ
	CLK or D	., 551	V 0.4V			-0.5			-0.5	4
I L	PRE or CLR	V _{CC} = 5.5 V,	$V_{I} = 0.4 V$			-1.8			-1.8	mA
IO [‡]	•	V _{CC} = 5.5 V,	V _O = 2.25 V	-30		-112	-30		-112	mA
Icc		V _{CC} = 5.5 V,	See Note 1		10.5	16		10.5	16	mA

[†] All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _C C _L R _L T _A	UNIT				
		SN54AS74A SN74AS74A						
			MIN	MAX	MIN	MAX		
fmax*			90		105		MHz	
t _{PLH}	PRE or CLR	Q or Q	2	9	2	7.5	20	
^t PHL	PRE OF CLR	Q or Q	2.5	11.5	2.5	10.5	ns	
t _{PLH}	CLK	Q or Q	2.5	10	3	8	nc	
t _{PHL}	OLK	300	3.5	10.5	3	9	ns	

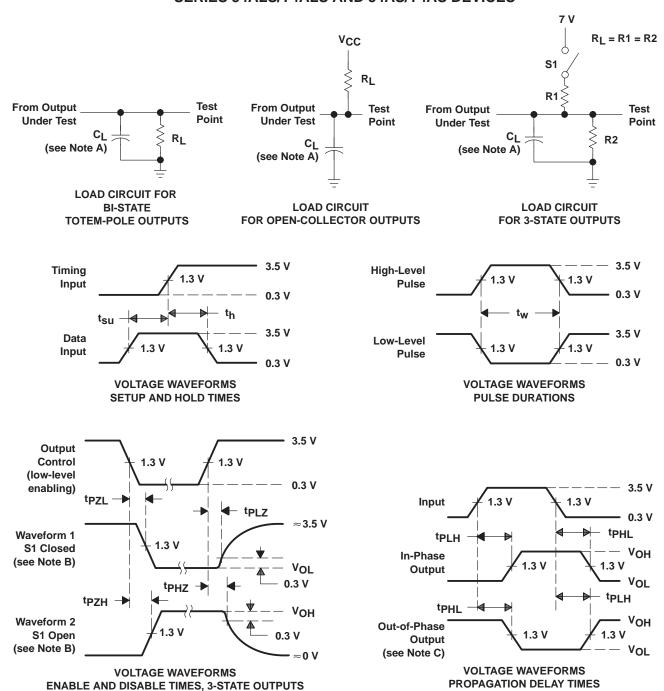
^{*} On products compliant to MIL-STD-833, Class B, this parameter is based on characterization data but is not production tested.

[‡] The output conditions have been chosen to <u>produ</u>ce a current that closely approximates one half of the true short-circuit output current, I_{OS}. NOTE 1: I_{CC} is measured with D, CLK, and PRE grounded, then with D, CLK, and CLR grounded.

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

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



- 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, $t_f = t_f = 2$ ns, duty cycle = 50%.
 - E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms





PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
5962-9862701Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9862701QCA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
84011012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
8401101CA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
8401101DA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
JM38510/37101B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
JM38510/37101BCA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SN54ALS74AJ	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SN54AS74AJ	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SN74ALS74AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74ADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74ADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74AJ	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN74ALS74AN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74ALS74AN3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74ALS74ANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74ALS74ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74ANSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ALS74ANSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74ADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74ADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74AN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type



PACKAGE OPTION ADDENDUM

9-Oct-2007

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp (3)
SN74AS74ANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AS74ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74ANSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AS74ANSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SNJ54ALS74AFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54ALS74AJ	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SNJ54ALS74AW	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type
SNJ54AS74AFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54AS74AJ	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - 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): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

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)

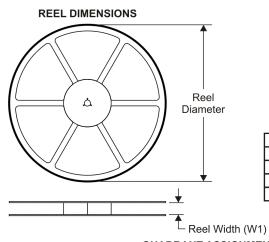
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
B0	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
SN74ALS74ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74ALS74ANSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74AS74ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74AS74ANSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1





*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALS74ADR	SOIC	D	14	2500	346.0	346.0	33.0
SN74ALS74ANSR	SO	NS	14	2000	346.0	346.0	33.0
SN74AS74ADR	SOIC	D	14	2500	346.0	346.0	33.0
SN74AS74ANSR	SO	NS	14	2000	346.0	346.0	33.0

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.

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.



FK (S-CQCC-N**)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



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. The terminals are gold plated.
- E. Falls within JEDEC MS-004



D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- 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 .006 (0,15) per end.
- Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AB.



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 and JEDEC MO-092AB



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.



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