

# SN5414, SN54LS14, SN7414, SN74LS14

## HEX SCHMITT-TRIGGER INVERTERS

SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

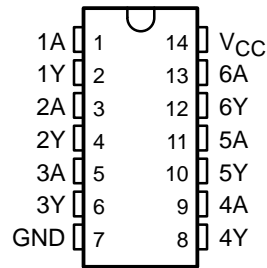
- Operation From Very Slow Edges
- Improved Line-Receiving Characteristics
- High Noise Immunity

### description

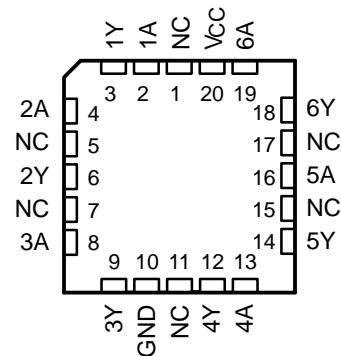
Each circuit functions as an inverter, but because of the Schmitt action, it has different input threshold levels for positive-going ( $V_{T+}$ ) and negative-going ( $V_{T-}$ ) signals.

These circuits are temperature compensated and can be triggered from the slowest of input ramps and still give clean, jitter-free output signals.

SN5414, SN54LS14 . . . J OR W PACKAGE  
SN7414 . . . D, N, OR NS PACKAGE  
SN74LS14 . . . D, DB, OR N PACKAGE  
(TOP VIEW)



SN54LS14 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

### ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN7414N	SN7414N
		Tube	SN74LS14N	SN74LS14N
	SOIC – D	Tube	SN7414D	7414
		Tape and reel	SN7414DR	
		Tube	SN74LS14D	LS14
	Tape and reel	SN74LS14DR		
SOP – NS	Tape and reel	SN7414NSR	SN7414	
SSOP – DB	Tape and reel	SN74LS14DBR	LS14	
–55°C to 125°C	CDIP – J	Tube	SN5414J	SN5414J
		Tube	SNJ5414J	SNJ5414J
		Tube	SN54LS14J	SN54LS14J
		Tube	SNJ54LS14J	SNJ54LS14J
	CFP – W	Tube	SNJ5414W	SNJ5414W
		Tube	SNJ54LS14W	SNJ54LS14W
LCCC – FK	Tube	SNJ54LS14FK	SNJ54LS14FK	

† 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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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.



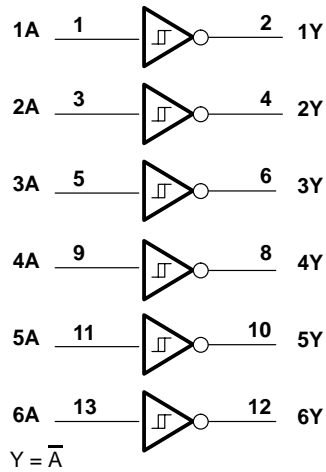
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SN7414, SN74LS14  
HEX SCHMITT-TRIGGER INVERTERS**  
SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

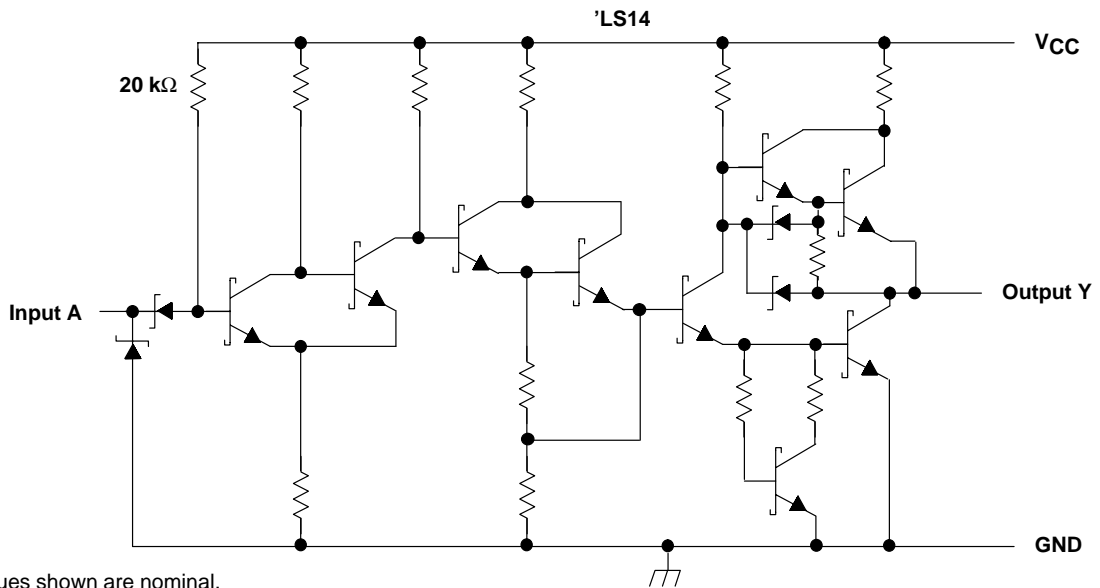
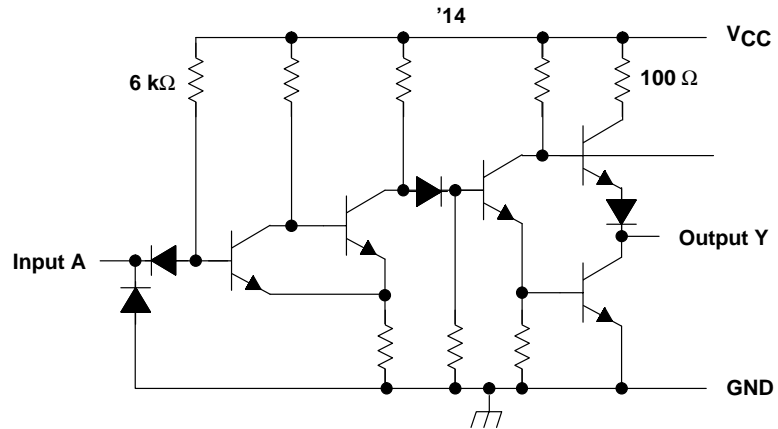
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**logic diagram (positive logic)**



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

schematic



Resistor values shown are nominal.

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SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

**absolute maximum ratings over operating free-air temperature (unless otherwise noted)†**

Supply voltage, $V_{CC}$ (see Note 1) .....	7 V
Input voltage: '14 .....	5.5 V
'LS14 .....	7 V
Package thermal impedance, $\theta_{JA}$ (see Note 2): D package .....	86°C/W
DB package .....	96°C/W
N package .....	80°C/W
NS package .....	76°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.

- NOTES: 1. Voltage values are with respect to network ground terminal.  
2. The package thermal impedance is calculated in accordance with JESD 51-7

**recommended operating conditions**

	SN5414			SN7414			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$ Supply voltage	4.5	5	5.5	4.75	5	5.25	V
$I_{OH}$ High-level output current			-0.8			-0.8	mA
$I_{OL}$ Low-level output current			16			16	mA
$T_A$ Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS‡	SN5414 SN7414			UNIT
		MIN	TYP§	MAX	
$V_{T+}$	$V_{CC} = 5 V$	1.5	1.7	2	V
$V_{T-}$	$V_{CC} = 5 V$	0.6	0.9	1.1	V
Hysteresis ( $V_{T+} - V_{T-}$ )	$V_{CC} = 5 V$	0.4	0.8		V
$V_{IK}$	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-1.5	V
$V_{OH}$	$V_{CC} = \text{MIN}, V_I = 0.6 V, I_{OH} = -0.8 \text{ mA}$	2.4	3.4		V
$V_{OL}$	$V_{CC} = \text{MIN}, V_I = 2 V, I_{OL} = 16 \text{ mA}$		0.2	0.4	V
$I_{T+}$	$V_{CC} = 5 V, V_I = V_{T+}$		-0.43		mA
$I_{T-}$	$V_{CC} = 5 V, V_I = V_{T-}$		-0.56		mA
$I_I$	$V_{CC} = \text{MAX}, V_I = 5.5 V$			1	mA
$I_{IH}$	$V_{CC} = \text{MAX}, V_{IH} = 2.4 V$			40	µA
$I_{IL}$	$V_{CC} = \text{MAX}, V_{IL} = 0.4 V$		-0.8	-1.2	mA
$I_{OS}¶$	$V_{CC} = \text{MAX}$	-18		-55	mA
$I_{CCH}$	$V_{CC} = \text{MAX}$		22	36	mA
$I_{CCL}$	$V_{CC} = \text{MAX}$		39	60	mA

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

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

¶ Not more than one output should be shorted at a time.



**switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	SN5414 SN7414			UNIT
				MIN	TYP	MAX	
$t_{PLH}$	A	Y	$R_L = 400\ \Omega$ , $C_L = 15\ \text{pF}$		15	22	ns
$t_{PHL}$					15	22	

**recommended operating conditions**

	SN54LS14			SN74LS14			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$ Supply voltage	4.5	5	5.5	4.75	5	5.25	V
$I_{OH}$ High-level output current			-0.4			-0.4	mA
$I_{OL}$ Low-level output current			4			8	mA
$T_A$ Operating free-air temperature	-55		125	0		70	$^\circ\text{C}$

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

PARAMETER	TEST CONDITIONS†	SN54LS14			SN74LS14			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{T+}$	$V_{CC} = 5\text{ V}$	1.4	1.6	1.9	1.4	1.6	1.9	V
$V_{T-}$	$V_{CC} = 5\text{ V}$	0.5	0.8	1	0.5	0.8	1	V
Hysteresis ( $V_{T+} - V_{T-}$ )	$V_{CC} = 5\text{ V}$	0.4	0.8		0.4	0.8		V
$V_{IK}$	$V_{CC} = \text{MIN}$ , $I_I = -18\text{ mA}$			-1.5			-1.5	V
$V_{OH}$	$V_{CC} = \text{MIN}$ , $V_I = 0.5\text{ V}$ , $I_{OH} = -0.4\text{ mA}$	2.5	3.4		2.7	3.4		V
$V_{OL}$	$V_{CC} = \text{MIN}$ , $V_I = -1.9\text{ V}$	$I_{OL} = 4\text{ mA}$		0.25	0.4	$I_{OL} = 4\text{ mA}$		V
		$I_{OL} = 8\text{ mA}$				$I_{OL} = 8\text{ mA}$		
$I_{T+}$	$V_{CC} = 5\text{ V}$ , $V_I = V_{T+}$		-0.14			-0.14		mA
$I_{T-}$	$V_{CC} = 5\text{ V}$ , $V_I = V_{T-}$		-0.18			-0.18		mA
$I_I$	$V_{CC} = \text{MAX}$ , $V_I = 7\text{ V}$			0.1			0.1	mA
$I_{IH}$	$V_{CC} = \text{MAX}$ , $V_{IH} = 2.7\text{ V}$			20			20	$\mu\text{A}$
$I_{IL}$	$V_{CC} = \text{MAX}$ , $V_{IL} = 0.4\text{ V}$			-0.4			-0.4	mA
$I_{OS}^{\S}$	$V_{CC} = \text{MAX}$	-20		-100	-20		-100	mA
$I_{CCH}$	$V_{CC} = \text{MAX}$		8.6	16		8.6	16	mA
$I_{CCL}$	$V_{CC} = \text{MAX}$		12	21		12	21	mA

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

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

§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

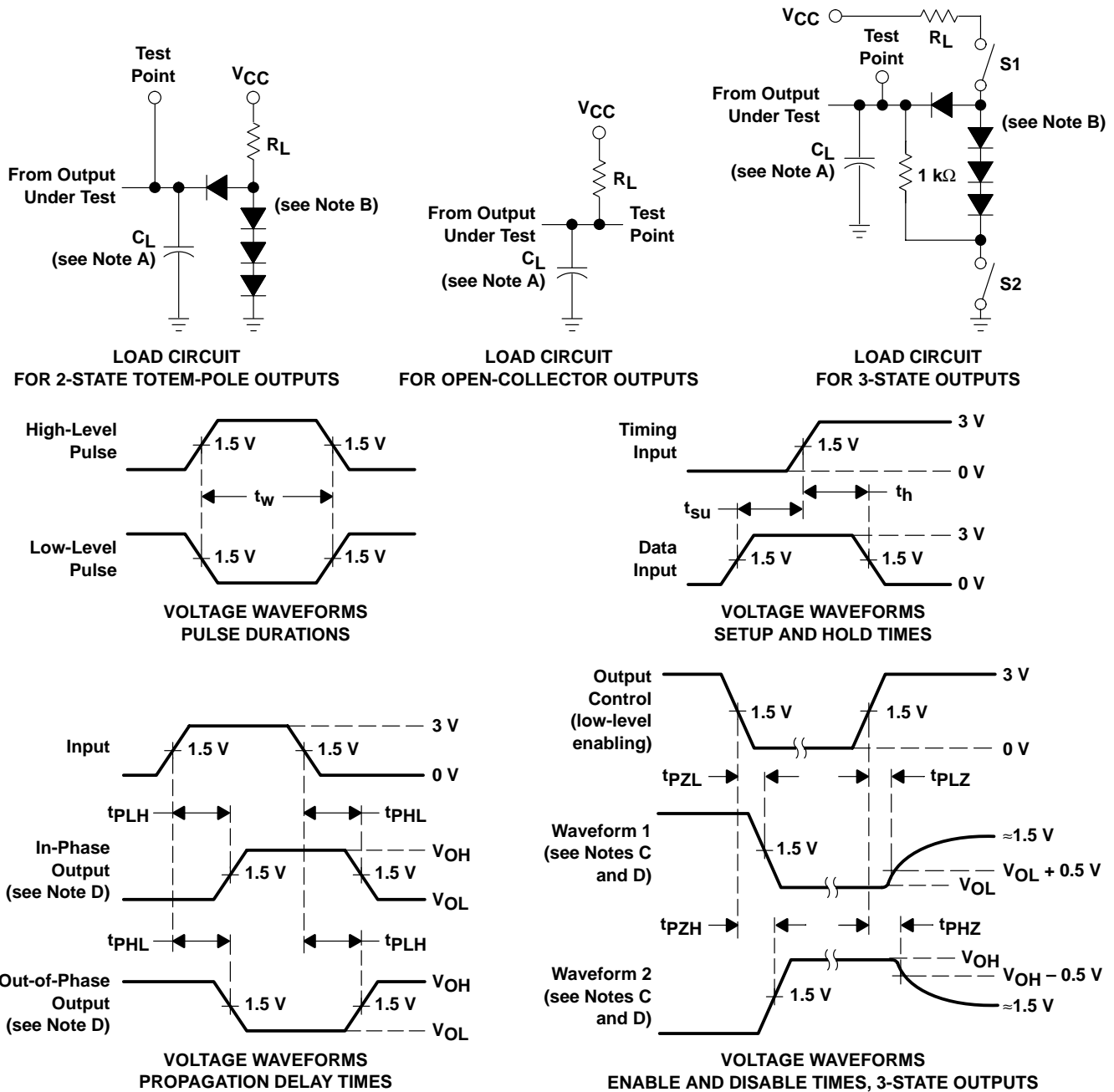
**switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 2)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$	A	Y	$R_L = 2\ \text{k}\Omega$ , $C_L = 15\ \text{pF}$		15	22	ns
$t_{PHL}$					15	22	

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SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

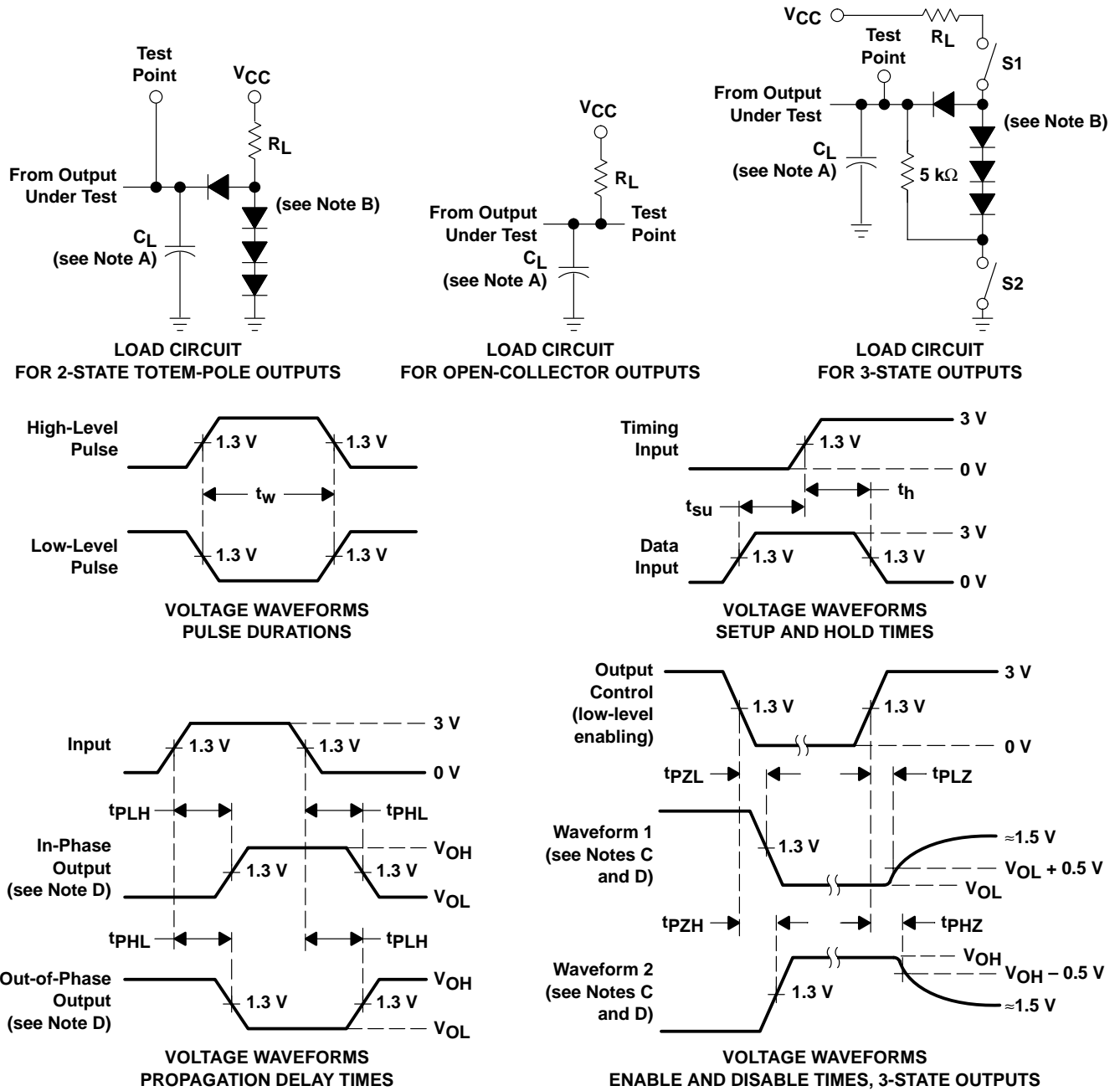
**PARAMETER MEASUREMENT INFORMATION  
SERIES 54/74 DEVICES**



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All diodes are 1N3064 or equivalent.  
 C. 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.  
 D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PLZ}$ ; S1 is open and S2 is closed for  $t_{PZH}$ ; S1 is closed and S2 is open for  $t_{PZL}$ .  
 E. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O \approx 50 \Omega$ ;  $t_r$  and  $t_f \leq 7$  ns for Series 54/74 devices and  $t_r$  and  $t_f \leq 2.5$  ns for Series 54S/74S devices.  
 F. The outputs are measured one at a time with one input transition per measurement.

**Figure 1. Load Circuits and Voltage Waveforms**

**PARAMETER MEASUREMENT INFORMATION**  
**SERIES 54LS/74LS DEVICES**



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All diodes are 1N3064 or equivalent.  
 C. 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.  
 D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PLZ}$ ; S1 is open and S2 is closed for  $t_{PZH}$ ; S1 is closed and S2 is open for  $t_{PZL}$ .  
 E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.  
 F. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O \approx 50 \Omega$ ,  $t_r \leq 1.5$  ns,  $t_f \leq 2.6$  ns.  
 G. The outputs are measured one at a time with one input transition per measurement.

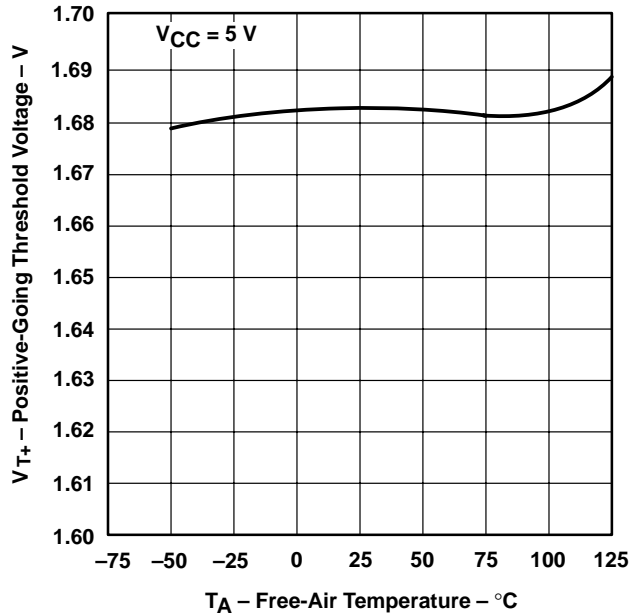
**Figure 2. Load Circuits and Voltage Waveforms**

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SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

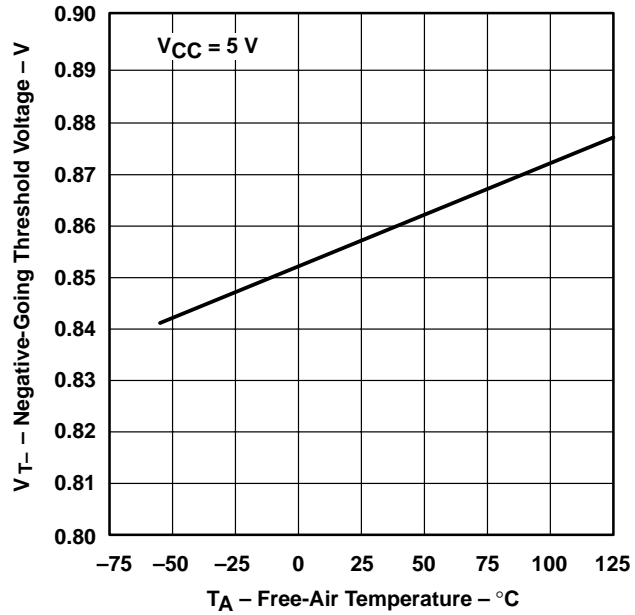
**TYPICAL CHARACTERISTICS OF '14 CIRCUITS†**

**POSITIVE-GOING THRESHOLD VOLTAGE  
vs  
FREE-AIR TEMPERATURE**



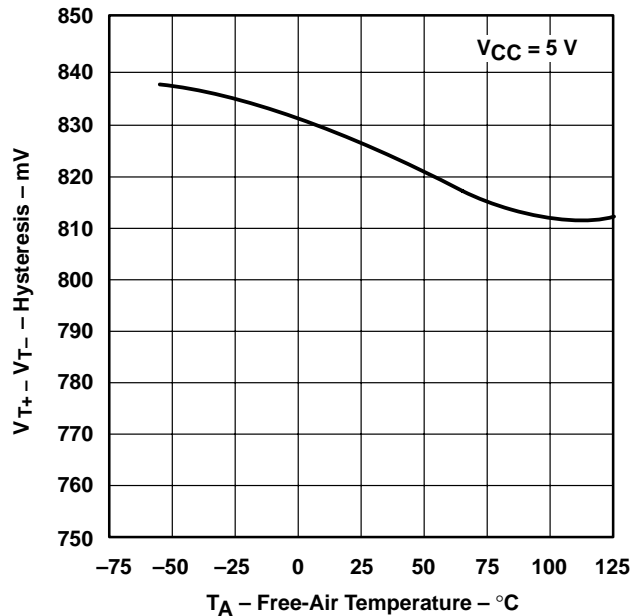
**Figure 3**

**NEGATIVE-GOING THRESHOLD VOLTAGE  
vs  
FREE-AIR TEMPERATURE**



**Figure 4**

**HYSTERESIS  
vs  
FREE-AIR TEMPERATURE**

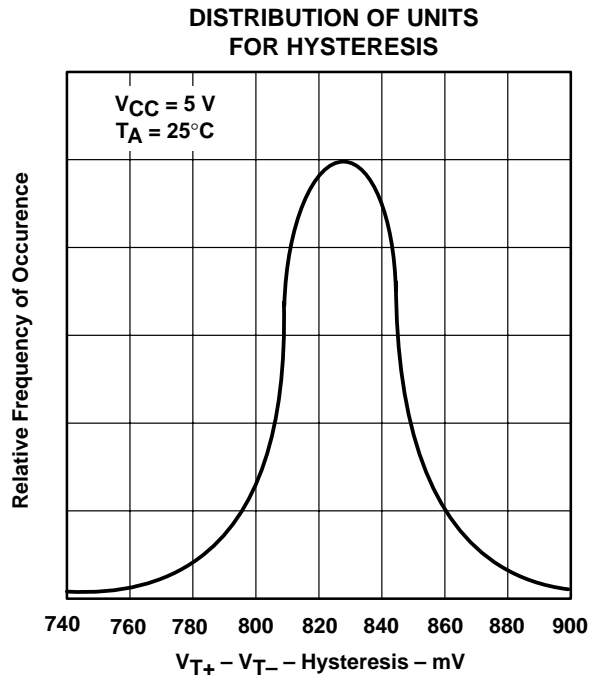


**Figure 5**

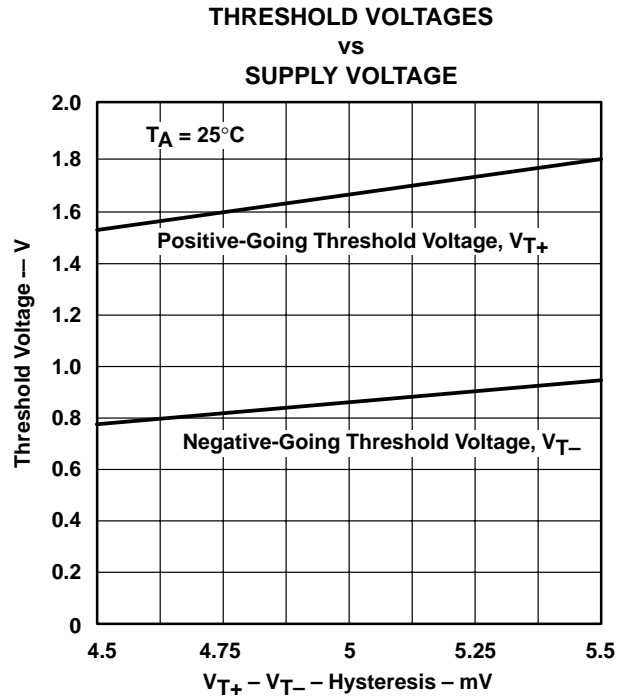
† Data for temperatures below 0°C and above 70°C and supply voltage below 4.75 V and above 5.25 V are applicable for SN5414 only.



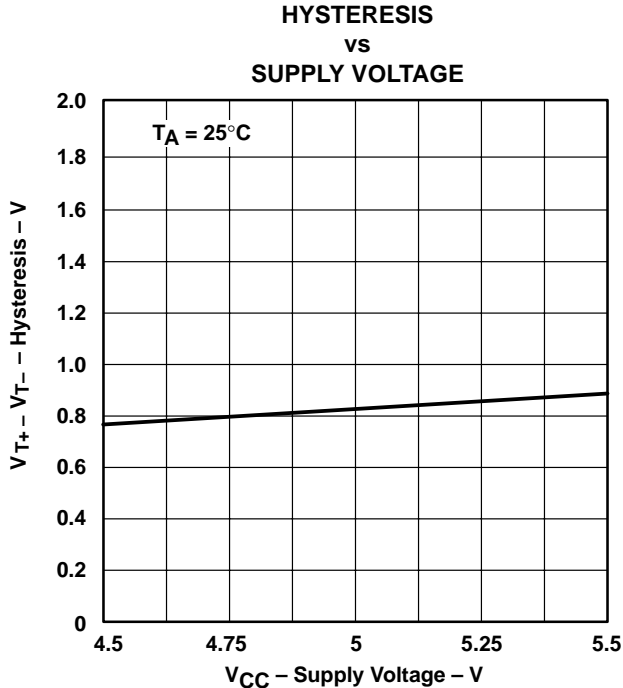
**TYPICAL CHARACTERISTICS OF '14 CIRCUIT†**



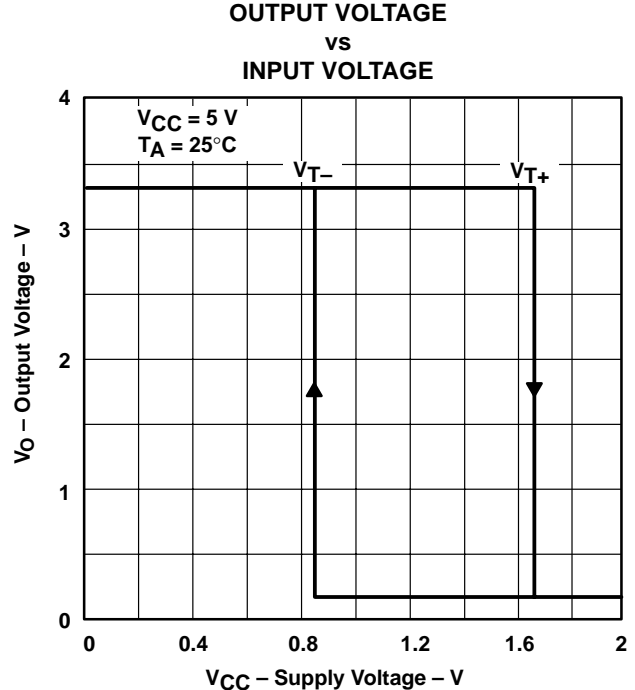
**Figure 6**



**Figure 7**



**Figure 8**



**Figure 9**

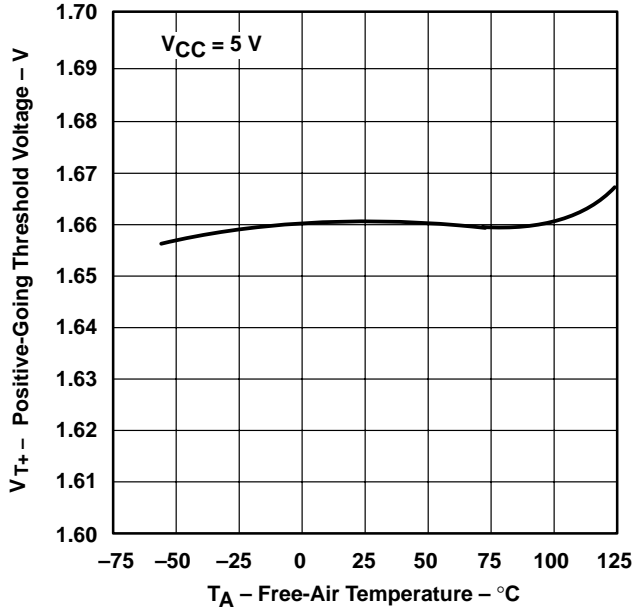
† Data for temperatures below  $0^\circ\text{C}$  and above  $70^\circ\text{C}$  and supply voltage below 4.75 V and above 5.25 V are applicable for SN5414 only.

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SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

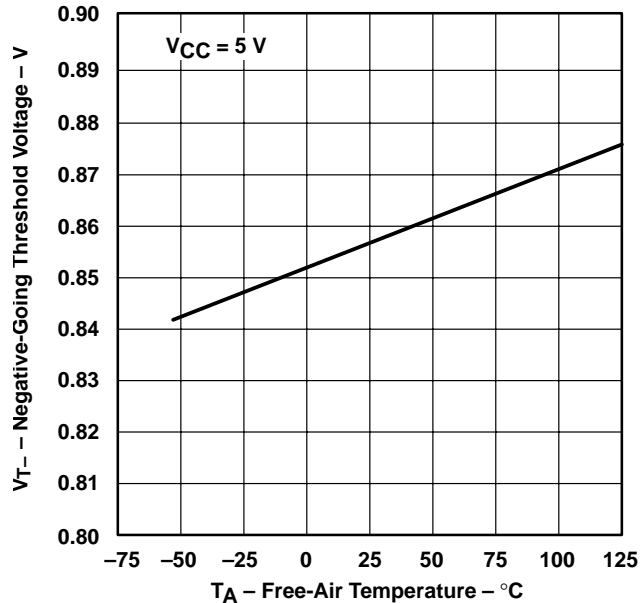
**TYPICAL CHARACTERISTICS OF 'LS14 CIRCUITS†**

**POSITIVE-GOING THRESHOLD VOLTAGE  
vs  
FREE-AIR TEMPERATURE**



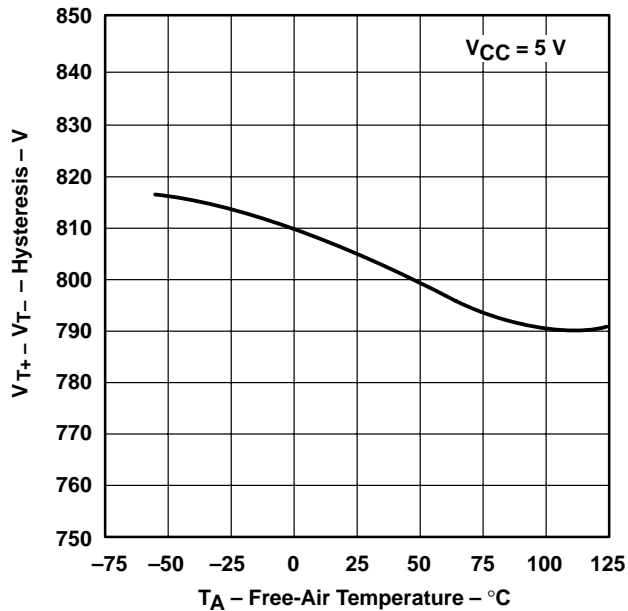
**Figure 10**

**NEGATIVE-GOING THRESHOLD VOLTAGE  
vs  
FREE-AIR TEMPERATURE**



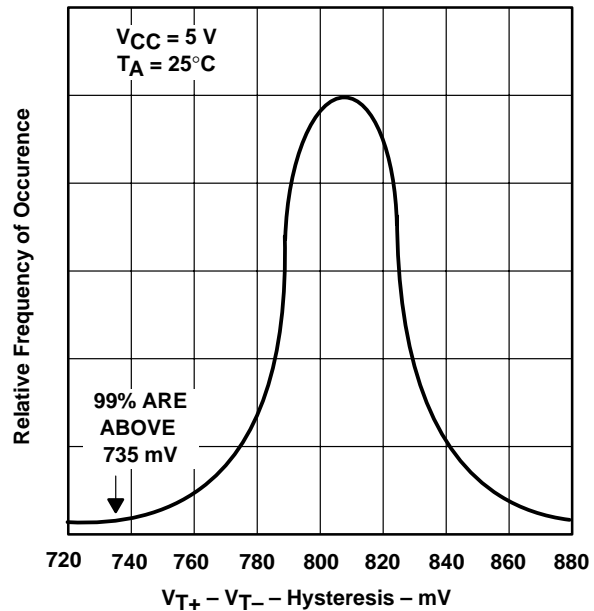
**Figure 11**

**HYSTERESIS  
vs  
FREE-AIR TEMPERATURE**



**Figure 12**

**DISTRIBUTION OF UNITS  
FOR HYSTERESIS**



**Figure 13**

† Data for temperatures below 0°C and above 70°C and supply voltage below 4.75 V and above 5.25 V are applicable for SN5414 only.



**TYPICAL CHARACTERISTICS OF 'LS14 CIRCUITS†**

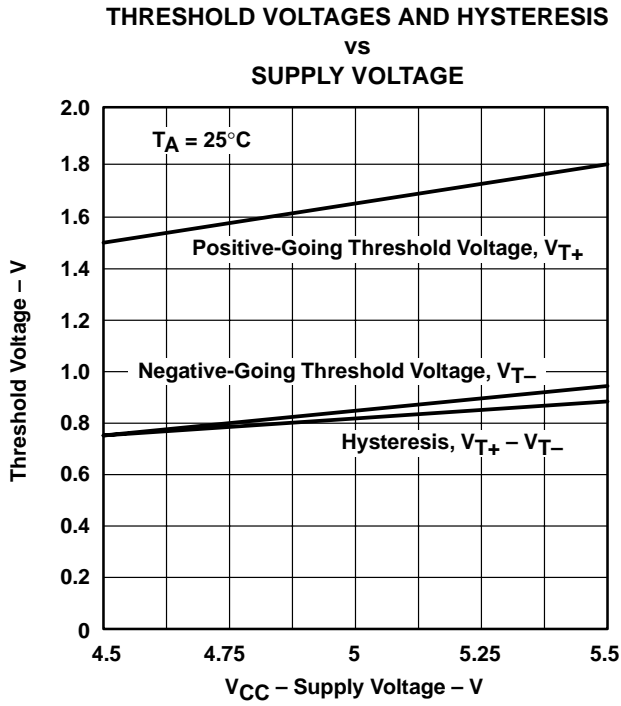


Figure 14

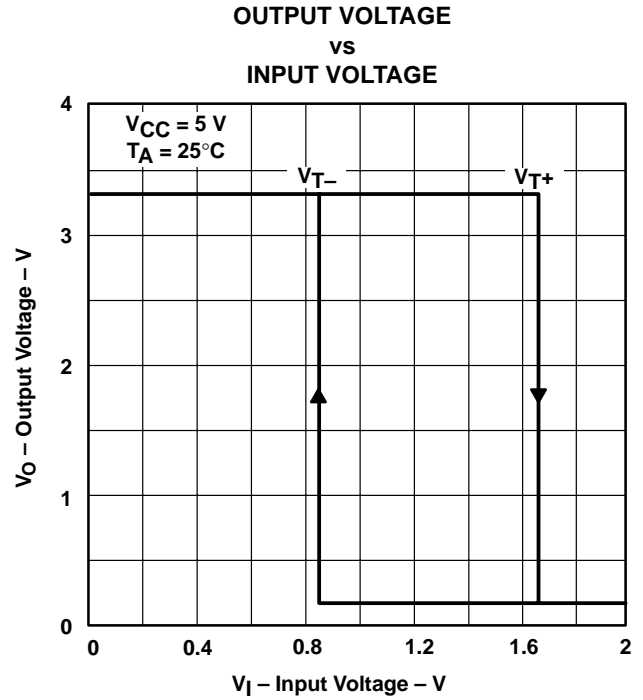


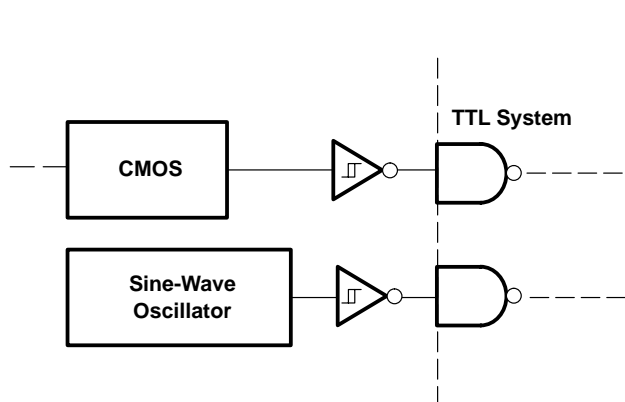
Figure 15

† Data for temperatures below  $0^\circ\text{C}$  and above  $70^\circ\text{C}$  and supply voltage below 4.75 V and above 5.25 V are applicable for SN5414 only.

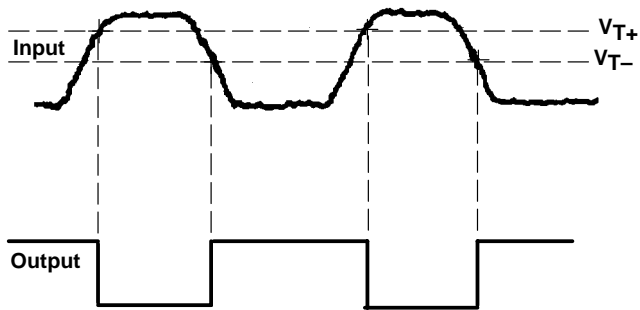
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SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

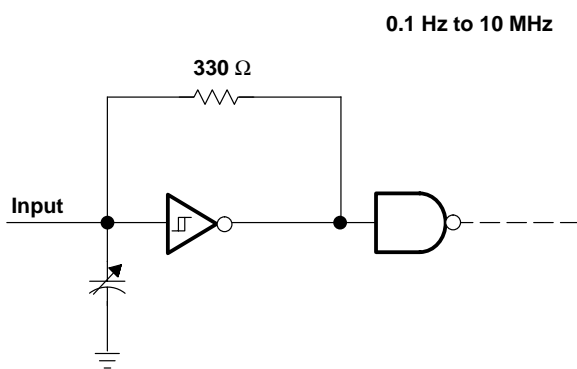
**TYPICAL APPLICATION DATA**



**TTL System Interface  
for Slow Input Waveforms**

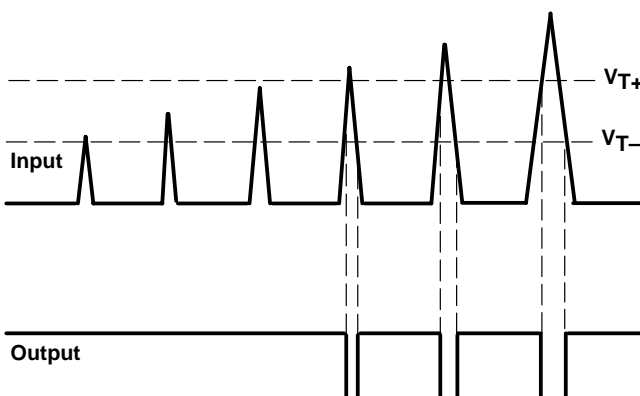


**Pulse Shaper**

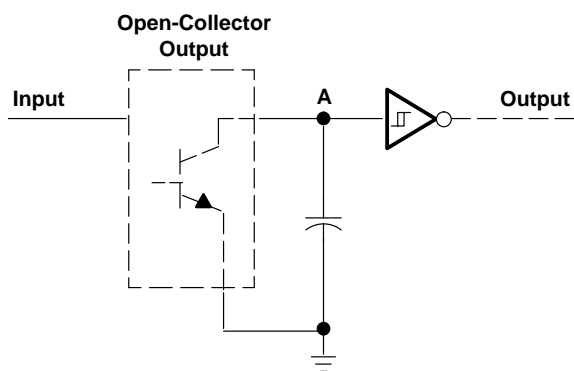


**Multivibrator**

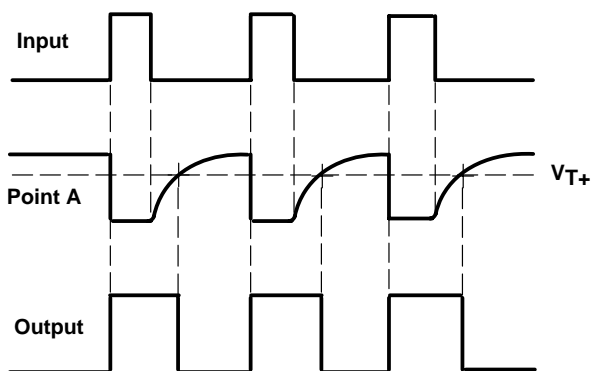
0.1 Hz to 10 MHz



**Threshold Detector**



**Pulse Stretcher**



**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9665801Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9665801Q2A SNJ54LS 14FK	<a href="#">Samples</a>
5962-9665801QCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9665801QC A SNJ54LS14J	<a href="#">Samples</a>
5962-9665801QDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9665801QD A SNJ54LS14W	<a href="#">Samples</a>
5962-9665801VCA	ACTIVE	CDIP	J	14	25	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9665801VC A SNV54LS14J	<a href="#">Samples</a>
5962-9665801VDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9665801VD A SNV54LS14W	<a href="#">Samples</a>
JM38510/31302BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 31302BCA	<a href="#">Samples</a>
M38510/31302BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 31302BCA	<a href="#">Samples</a>
SN5414J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN5414J	<a href="#">Samples</a>
SN54LS14J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54LS14J	<a href="#">Samples</a>
SN7414D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	7414	<a href="#">Samples</a>
SN7414DE4	ACTIVE	SOIC	D	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>
SN7414DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	7414	<a href="#">Samples</a>
SN7414DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	7414	<a href="#">Samples</a>
SN7414DRE4	ACTIVE	SOIC	D	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>
SN7414DRG4	ACTIVE	SOIC	D	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN7414N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN7414N	<a href="#">Samples</a>
SN7414N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI	0 to 70		
SN7414NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN7414N	<a href="#">Samples</a>
SN7414NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	SN7414	<a href="#">Samples</a>
SN7414NSRE4	ACTIVE	SO	NS	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>
SN7414NSRG4	ACTIVE	SO	NS	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>
SN74LS14D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14DBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14DBRE4	ACTIVE	SSOP	DB	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>
SN74LS14DBRG4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS14	<a href="#">Samples</a>
SN74LS14N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS14N	<a href="#">Samples</a>
SN74LS14N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI	0 to 70		
SN74LS14NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS14N	<a href="#">Samples</a>
SN74LS14NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS14	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LS14NSRE4	ACTIVE	SO	NS	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>
SN74LS14NSRG4	ACTIVE	SO	NS	14		TBD	Call TI	Call TI	0 to 70		<a href="#">Samples</a>
SNJ5414J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ5414J	<a href="#">Samples</a>
SNJ5414W	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ5414W	<a href="#">Samples</a>
SNJ54LS14FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962-9665801Q2A SNJ54LS14FK	<a href="#">Samples</a>
SNJ54LS14J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9665801QC A SNJ54LS14J	<a href="#">Samples</a>
SNJ54LS14W	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9665801QD A SNJ54LS14W	<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.

**OBSELETE:** 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.

(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.

**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 SN5414, SN54LS14, SN54LS14-SP, SN7414, SN74LS14 :**

- Catalog: [SN7414](#), [SN74LS14](#), [SN54LS14](#)
  
- Military: [SN5414](#), [SN54LS14](#)
  
- Space: [SN54LS14-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
  
- Military - QML certified for Military and Defense Applications
  
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application



**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


A0	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

**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
SN7414DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN7414NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74LS14DBR	SSOP	DB	14	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74LS14DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LS14NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN7414DR	SOIC	D	14	2500	367.0	367.0	38.0
SN7414NSR	SO	NS	14	2000	367.0	367.0	38.0
SN74LS14DBR	SSOP	DB	14	2000	367.0	367.0	38.0
SN74LS14DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74LS14NSR	SO	NS	14	2000	367.0	367.0	38.0

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.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



4040180-2/F 04/14

- 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 GDFP1-F14

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

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.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- 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



- NOTES:
- 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\*\*)

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.

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