

SN74LS19A, SN74LS24A SCHMITT-TRIGGER POSITIVE-NAND GATES AND INVERTERS WITH TOTEM-POLE OUTPUTS

JANUARY 1981 — REVISED MARCH 1988

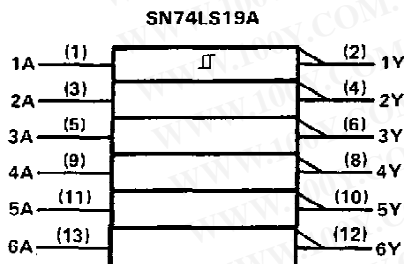
- Functionally and Mechanically Identical to 'LS13, 'LS14, and 'LS132, Respectively
- Improved Line-Receiving Characteristics
- P-N-P Inputs Reduce System Loading
- Excellent Noise Immunity with Typical Hysteresis of 0.8 V

description

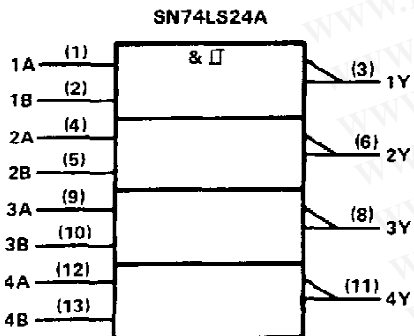
Each circuit functions as a NAND gate or inverter, but because of the Schmitt action, it has different input threshold levels for positive-going (V_{T+}) and for negative-going (V_{T-}) signals. The hysteresis or backlash, which is the difference between the two threshold levels ($V_{T+} - V_{T-}$), is typically 800 millivolts.

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

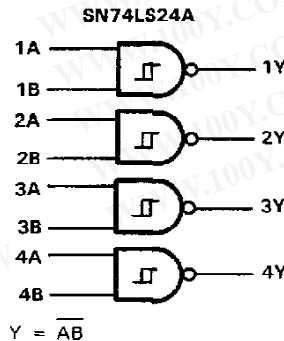
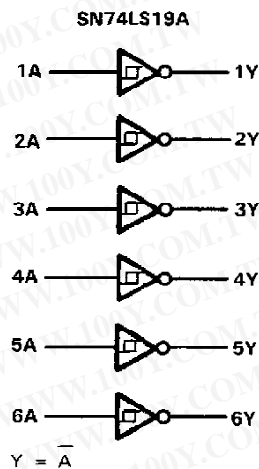
logic symbols †



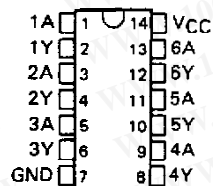
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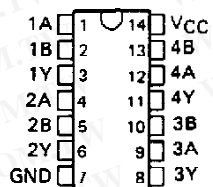
logic diagrams (positive logic)



SN74LS19A . . . D, J, OR N PACKAGE
(TOP VIEW)



SN74LS24A . . . D, J, OR N PACKAGE
(TOP VIEW)



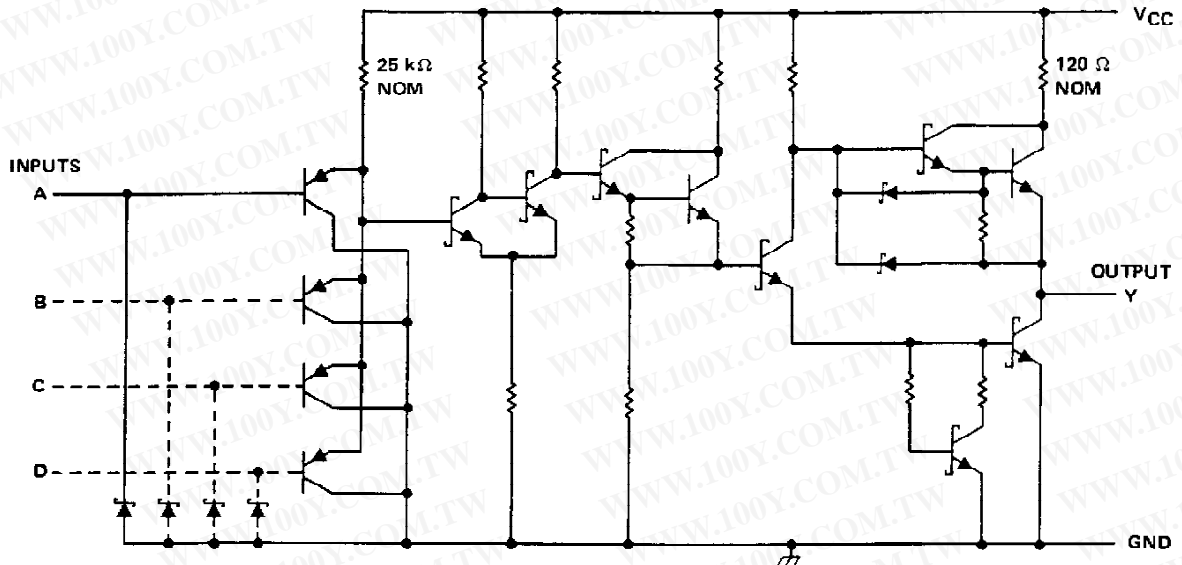
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

PRODUCTION DATA documents contain information 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.



SN74LS19A, SN74LS24A
SCHMITT-TRIGGER POSITIVE-NAND GATES
AND INVERTERS WITH TOTEM-POLE OUTPUTS

schematic (each gate)



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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C

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recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			-400	μ A
Low-level output current, I_{OL}			8	mA
Operating free-air temperature, T_A	0		70	°C

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

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT	
V_{T+}	$V_{CC} = 5\text{ V}$	1.65	1.9	2.15	V	
V_{T-}	$V_{CC} = 5\text{ V}$	0.75	1.0	1.25	V	
Hysteresis ($V_{T+} - V_{T-}$)	$V_{CC} = 5\text{ V}$	0.4	0.9		V	
V_{IK}	$V_{CC} = \text{MIN.}$ $I_I = -18\text{ mA}$		-1.5		V	
V_{OH}	$V_{CC} = \text{MIN.}$ $V_I = V_{T-\text{min}}$ $I_{OH} = -0.4\text{ mA}$	2.7	3.4		V	
V_{OL}	$V_{CC} = \text{MIN.}$ $V_I = V_{T+\text{max}}$	$I_{OL} = 4\text{ mA}$	0.25	0.4	V	
		$I_{OL} = 8\text{ mA}$	0.35	0.5		
I_{T+}	$V_{CC} = 5\text{ V.}$ $V_I = V_{T+}$		-2	-20	μA	
I_{T-}	$V_{CC} = 5\text{ V.}$ $V_I = V_{T-}$		-5	-30	μA	
I_I	$V_{CC} = \text{MAX.}$ $V_I = 7\text{ V}$		0.1		mA	
I_{IH}	$V_{CC} = \text{MAX.}$ $V_I = 2.7\text{ V}$			20	μA	
I_{IL}	$V_{CC} = \text{MAX.}$ $V_I = 0.4\text{ V}$			-50	μA	
I_{OS}^{\S}	$V_{CC} = \text{MAX.}$ $V_I = V_O = 0\text{ V}$		-20	-100	mA	
I_{CCH}	$V_{CC} = \text{MAX.}$ $V_I = 0\text{ V}$	'LS19A		9.9	18	mA
		'LS24A		6.6	12	
I_{CCL}	$V_{CC} = \text{MAX.}$ $V_I = 4.5\text{ V}$	'LS19A		17	30	mA
		'LS24A		11	20	

† 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 the 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 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	SN74LS19A			SN74LS24A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Any	Y	$R_L = 2\text{ k}\Omega,$ $C_L = 15\text{ pF}$		13	20		13	20	ns
t_{PHL}	Any	Y			18	30		25	40	ns

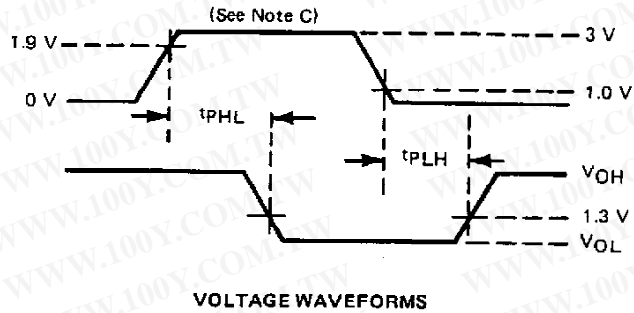
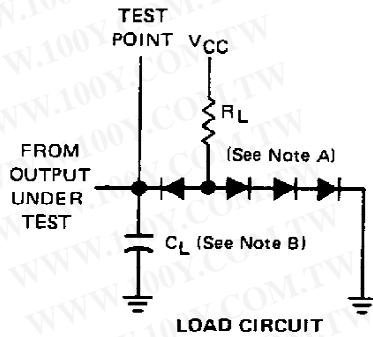
t_{PLH} = Propagation delay time, low-to-high-level output

t_{PHL} = Propagation delay time, high-to-low-level output

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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. All diodes are IN3064 or equivalent.
 B. C_L includes probe and circuit capacitance.
 C. The generator characteristics are: PRR = 1 MHz, t_r = 15 ns, t_p = 6 ns, Z_o = 50 Ω.

FIGURE 1

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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LS19AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS19ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS19ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS19ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS19AN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS19ANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS19ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS19ANSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS24AD	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI
SN74LS24AN	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI

⁽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.

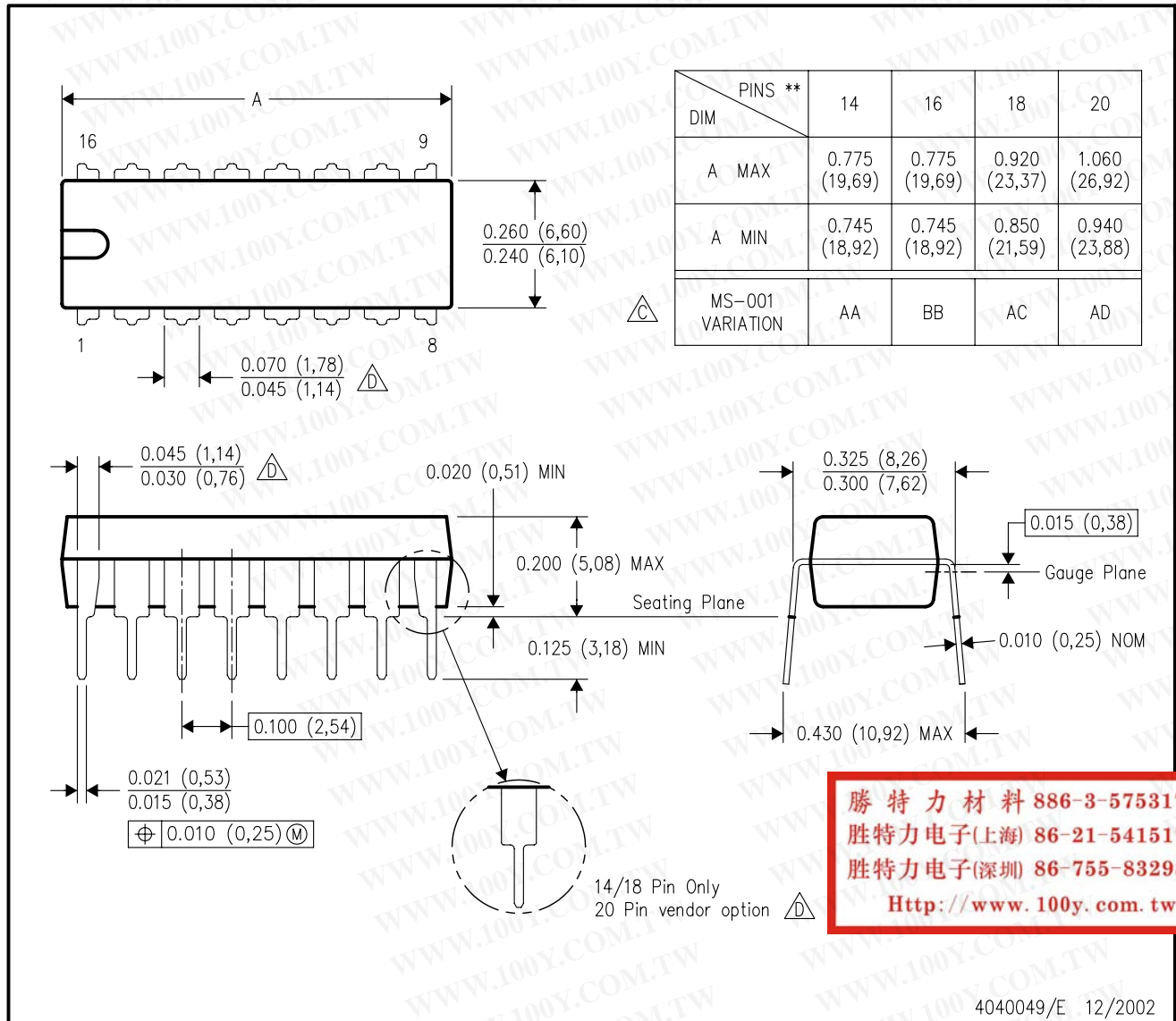
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N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE

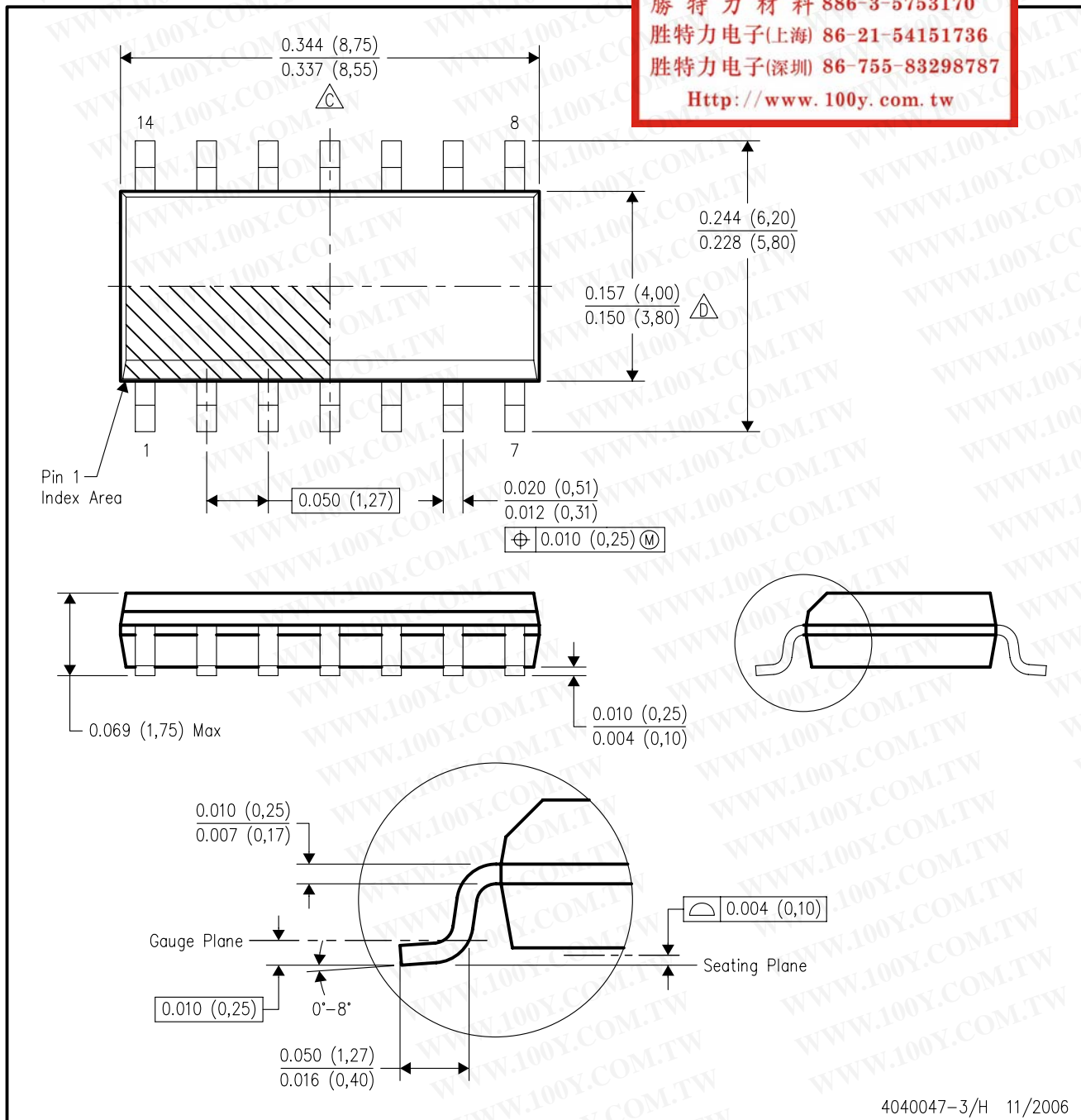


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.



D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE

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4040047-3/H 11/2006

- 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 .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.

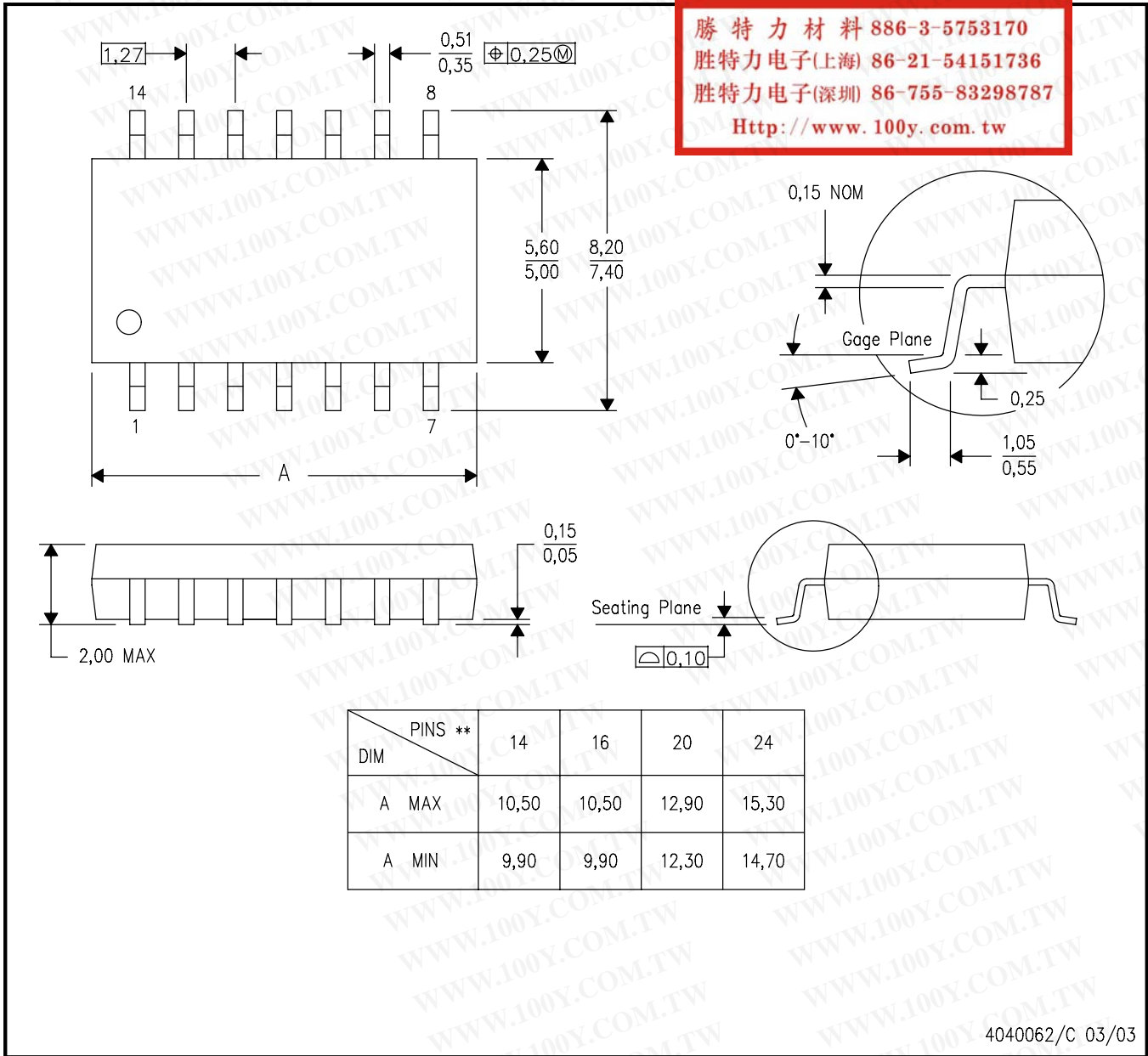
MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

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- 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.