

SN54ALS273, SN74ALS273 OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

SDAS218A – APRIL 1982 – REVISED DECEMBER 1994

- Contain Eight Flip-Flops With Single-Rail Outputs
- Buffered Clock and Direct-Clear Inputs
- Individual Data Input to Each Flip-Flop
- Applications Include:
 - Buffer/Storage Registers
 - Shift Registers
 - Pattern Generators
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

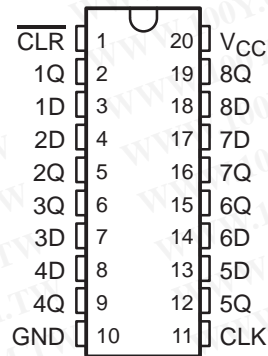
description

These octal positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic with a direct-clear (CLR) input.

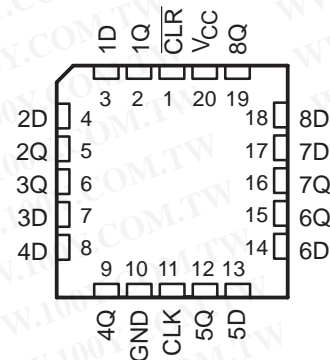
Information at the data (D) inputs meeting the setup-time requirements is transferred to the Q outputs on the positive-going edge of the clock (CLK) pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When CLK is at either the high or low level, the D input signal has no effect at the output.

The SN54ALS273 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS273 is characterized for operation from 0°C to 70°C .

SN54ALS273 . . . J PACKAGE
SN74ALS273 . . . DW OR N PACKAGE
(TOP VIEW)



SN54ALS273 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each flip-flop)

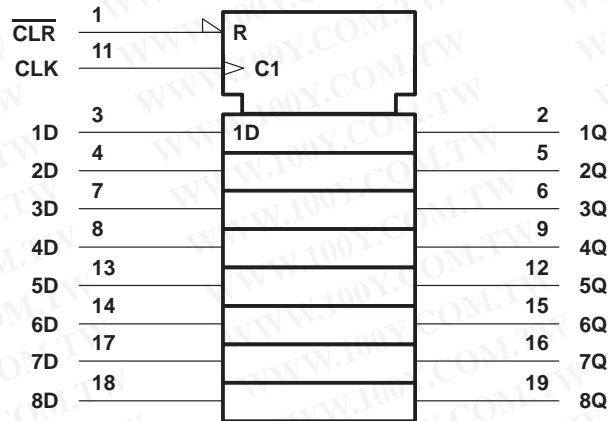
| INPUTS | | | OUTPUT |
|--------|--------|---|----------------|
| CLR | CLK | D | Q |
| L | X | X | L |
| H | ↑ | H | H |
| H | ↑ | L | L |
| H | H or L | X | Q ₀ |

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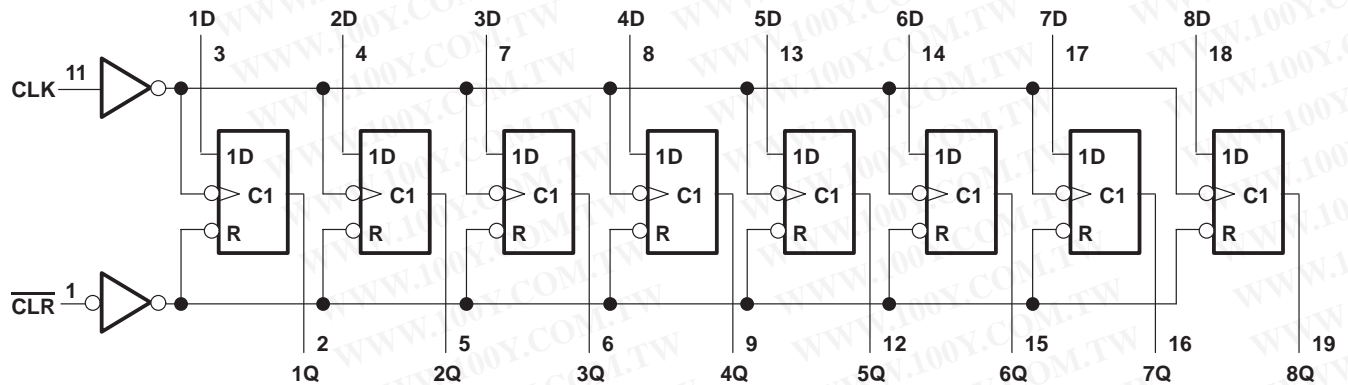
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logic symbol†



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

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 : SN54ALS273 | -55°C to 125°C |
| SN74ALS273 | 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

| | | SN54ALS273 | | | SN74ALS273 | | | 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 | | | -1 | | | -2.6 | mA | | |
| I_{OL} | Low-level output current | | | 12 | | | 24 | mA | | |
| f_{clock} | Clock frequency | 0 | | 30 | 0 | | 35 | MHz | | |
| t_w | Pulse duration | \overline{CLR} low | | 10 | | | 10 | ns | | |
| | | CLK high | | 16.5 | | | 14 | | | |
| | | CLK low | | 16.5 | | | 14 | | | |
| t_{su} | Setup time before CLK \uparrow | Data | | 10 | | | 10 | ns | | |
| | | \overline{CLR} inactive state | | 15 | | | 15 | | | |
| t_h | Hold time, data after CLK \uparrow | | | 0 | | | 0 | ns | | |
| 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 | SN54ALS273 | | | SN74ALS273 | | | UNIT | |
|-----------------|---|-------------------------|---------------|------|--------------|---------------|------|---------------|---|
| | | MIN | TYP \dagger | MAX | MIN | TYP \dagger | MAX | | |
| V_{IK} | $V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$ | | | -1.5 | | | -1.5 | V | |
| V_{OH} | $V_{CC} = 4.5\text{ V to } 5.5\text{ V}$, $I_{OH} = -0.4\text{ mA}$ | $V_{CC} - 2$ | | | $V_{CC} - 2$ | | | V | |
| | $V_{CC} = 4.5\text{ V}$ | | 2.4 | 3.3 | | 2.4 | 3.2 | | |
| V_{OL} | $V_{CC} = 4.5\text{ V}$ | $I_{OL} = 12\text{ mA}$ | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | $I_{OL} = 24\text{ mA}$ | | | | | 0.35 | 0.5 | |
| I_I | $V_{CC} = 5.5\text{ V}$, $V_I = 7\text{ V}$ | | | 0.1 | | | 0.1 | mA | |
| I_{IH} | $V_{CC} = 5.5\text{ V}$, $V_I = 2.7\text{ V}$ | | | 20 | | | 20 | μA | |
| I_{IL} | $V_{CC} = 5.5\text{ V}$, $V_I = 0.4\text{ V}$ | | | -0.2 | | | -0.2 | mA | |
| $I_{O\ddagger}$ | $V_{CC} = 5.5\text{ V}$, $V_O = 2.25\text{ V}$ | -20 | | -112 | -30 | | -112 | mA | |
| I_{CCH} | $V_{CC} = 5.5\text{ V}$ | | 11 | 20 | | 11 | 20 | mA | |
| I_{CCL} | $V_{CC} = 5.5\text{ V}$ | | 19 | 29 | | 19 | 29 | mA | |

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

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

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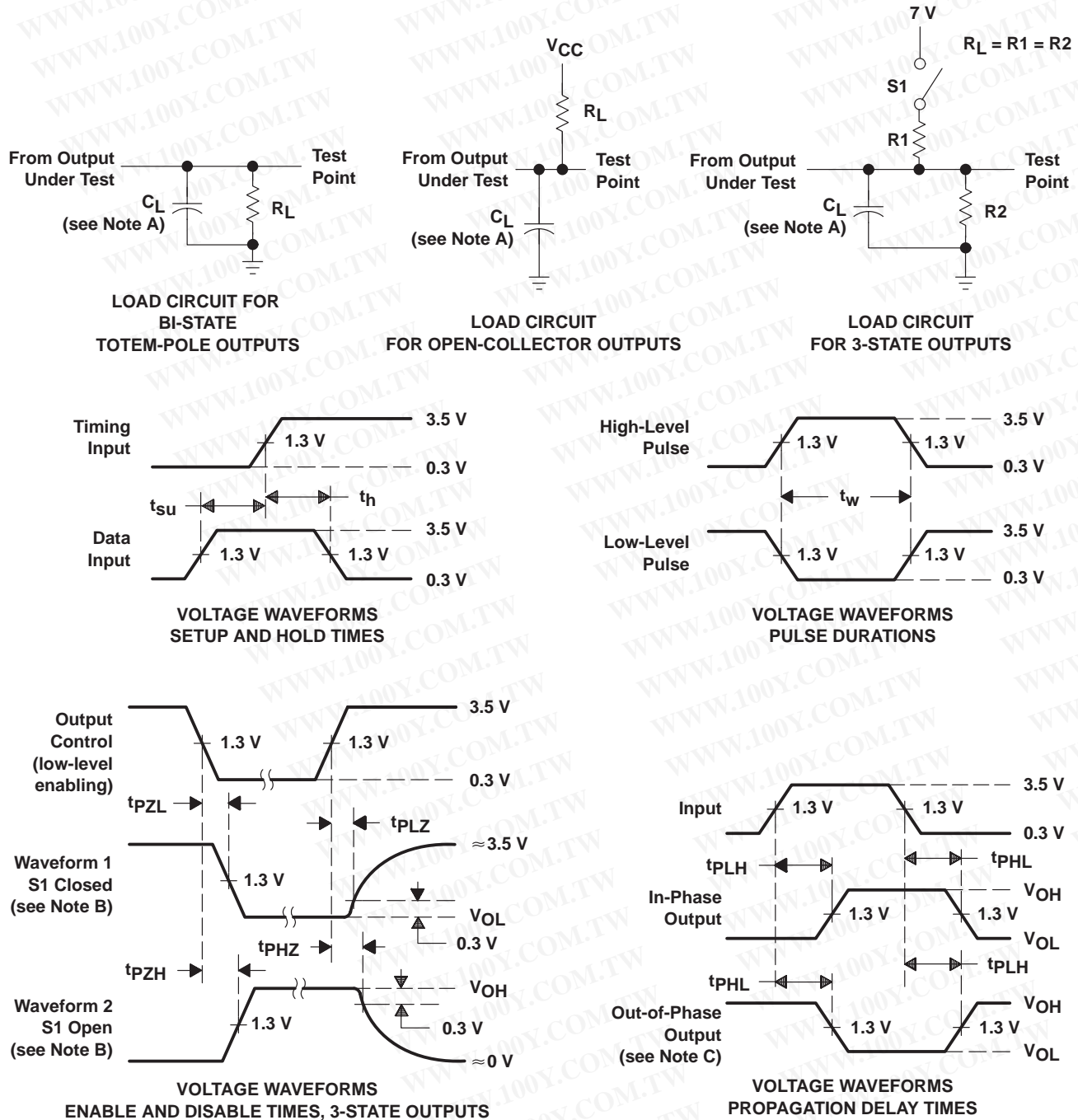
switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX† | | | | UNIT |
|------------------|-----------------|----------------|---|-----|------------|-----|------|
| | | | SN54ALS273 | | SN74ALS273 | | |
| | | | MIN | MAX | MIN | MAX | |
| f _{max} | | | 30 | | 35 | | MHz |
| t _{PHL} | CLR | Any Q | 4 | 24 | 4 | 18 | ns |
| t _{PLH} | CLK | Any Q | 2 | 20 | 2 | 12 | ns |
| t _{PHL} | | | 3 | 17 | 3 | 15 | |

† 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, $t_r = t_f = 2$ 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/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 84136012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 8413601RA | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 8413601SA | ACTIVE | CFP | W | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| SN54ALS273J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SN74ALS273DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS273DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS273DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS273DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS273DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS273DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS273N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS273N3 | OBSOLETE | PDIP | N | 20 | | TBD | Call TI | Call TI |
| SN74ALS273NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS273NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS273NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SNJ54ALS273FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54ALS273J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ54ALS273W | ACTIVE | CFP | W | 20 | 1 | TBD | A42 | 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.

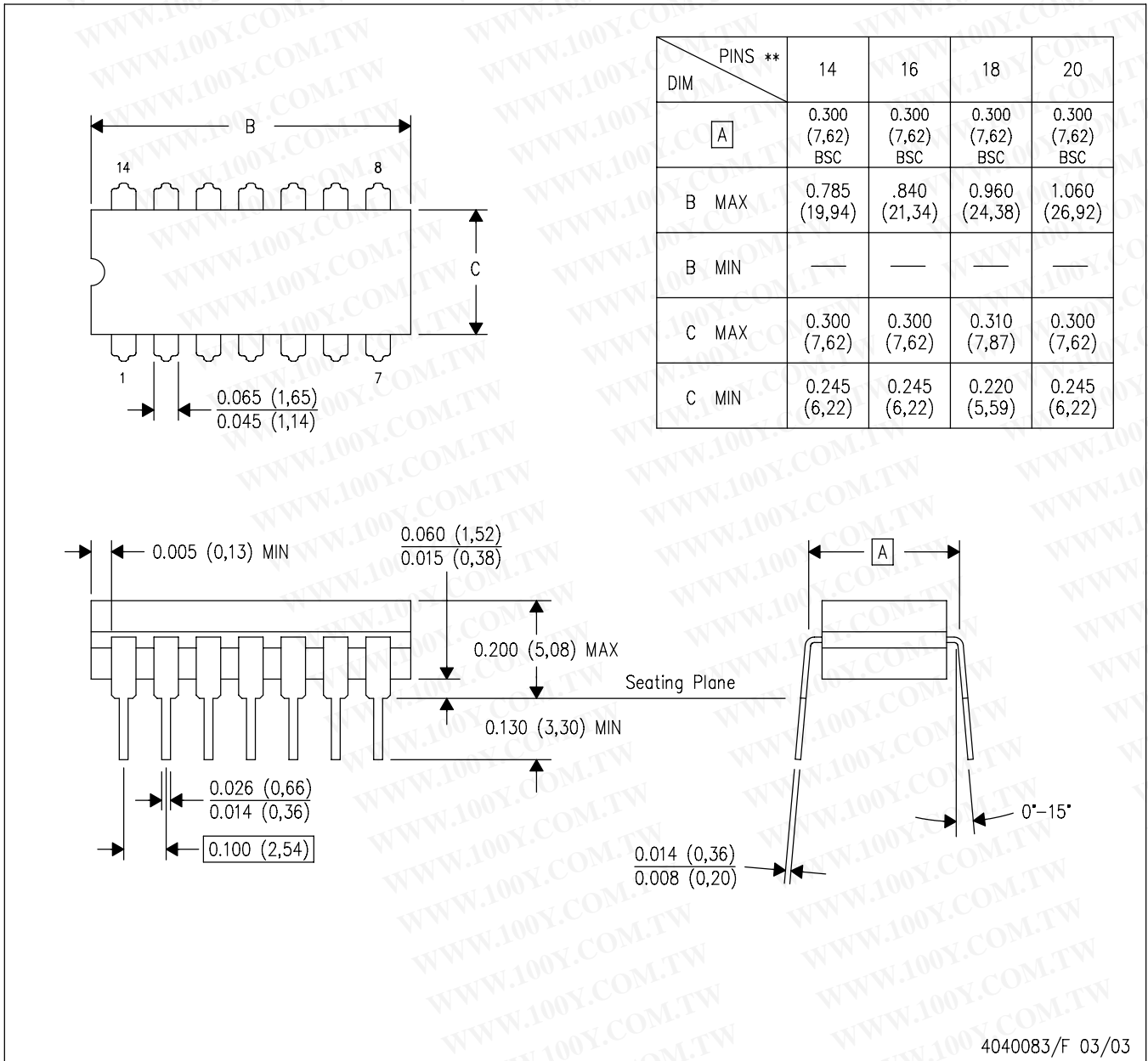
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J (R-GDIP-T**) 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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.

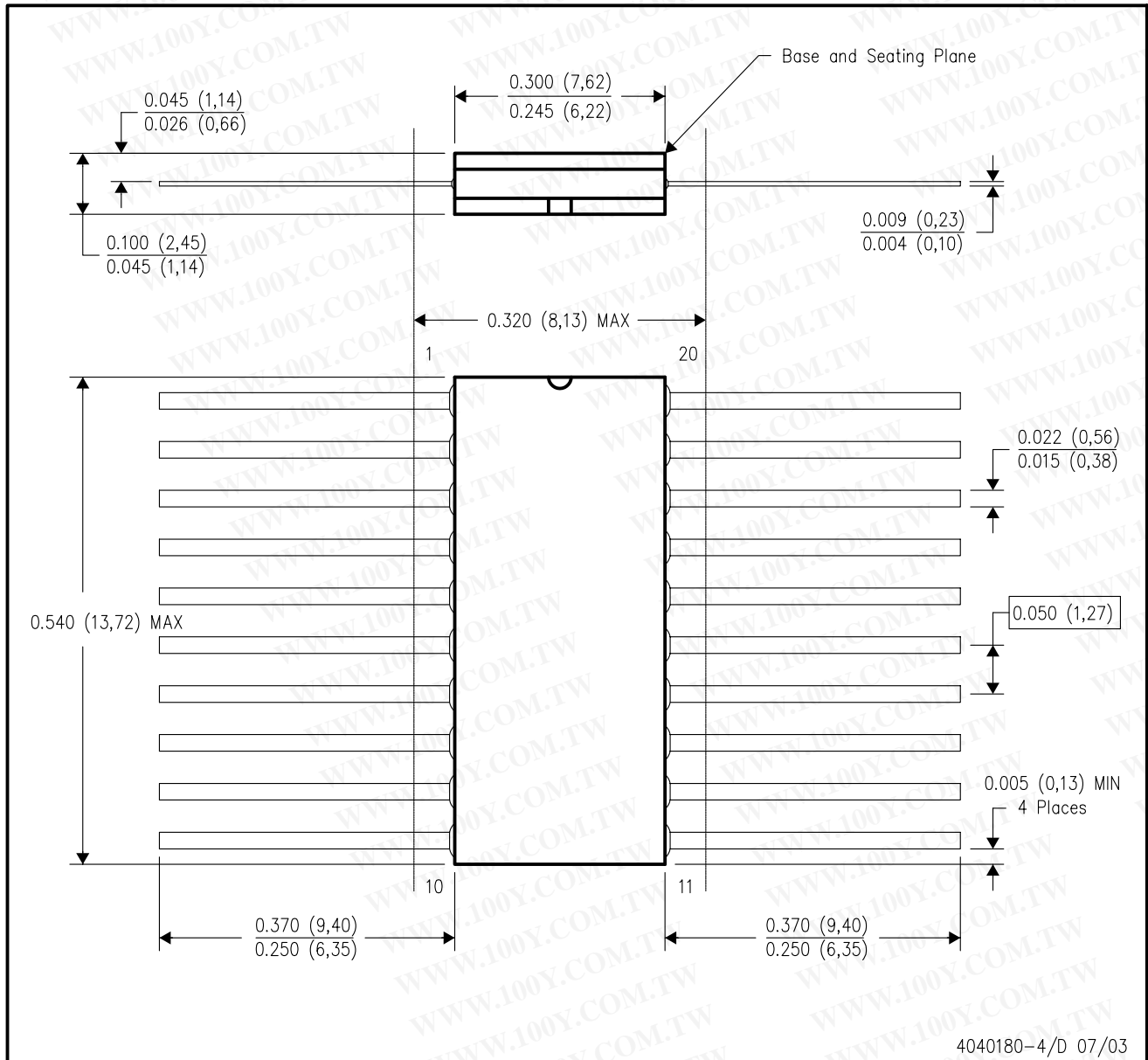
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MECHANICAL DATA

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK

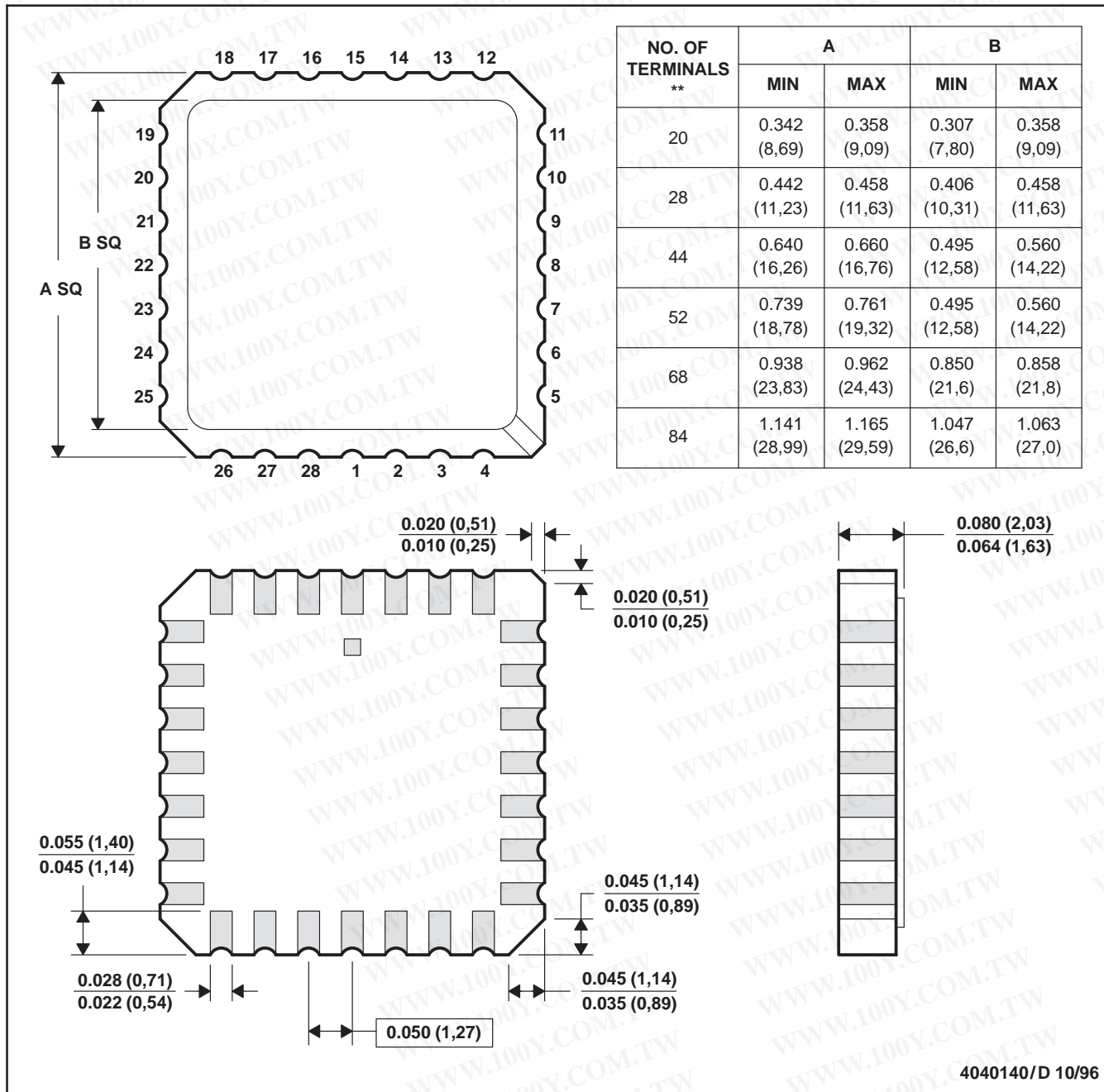


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within Mil-Std 1835 GDFP2-F20

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



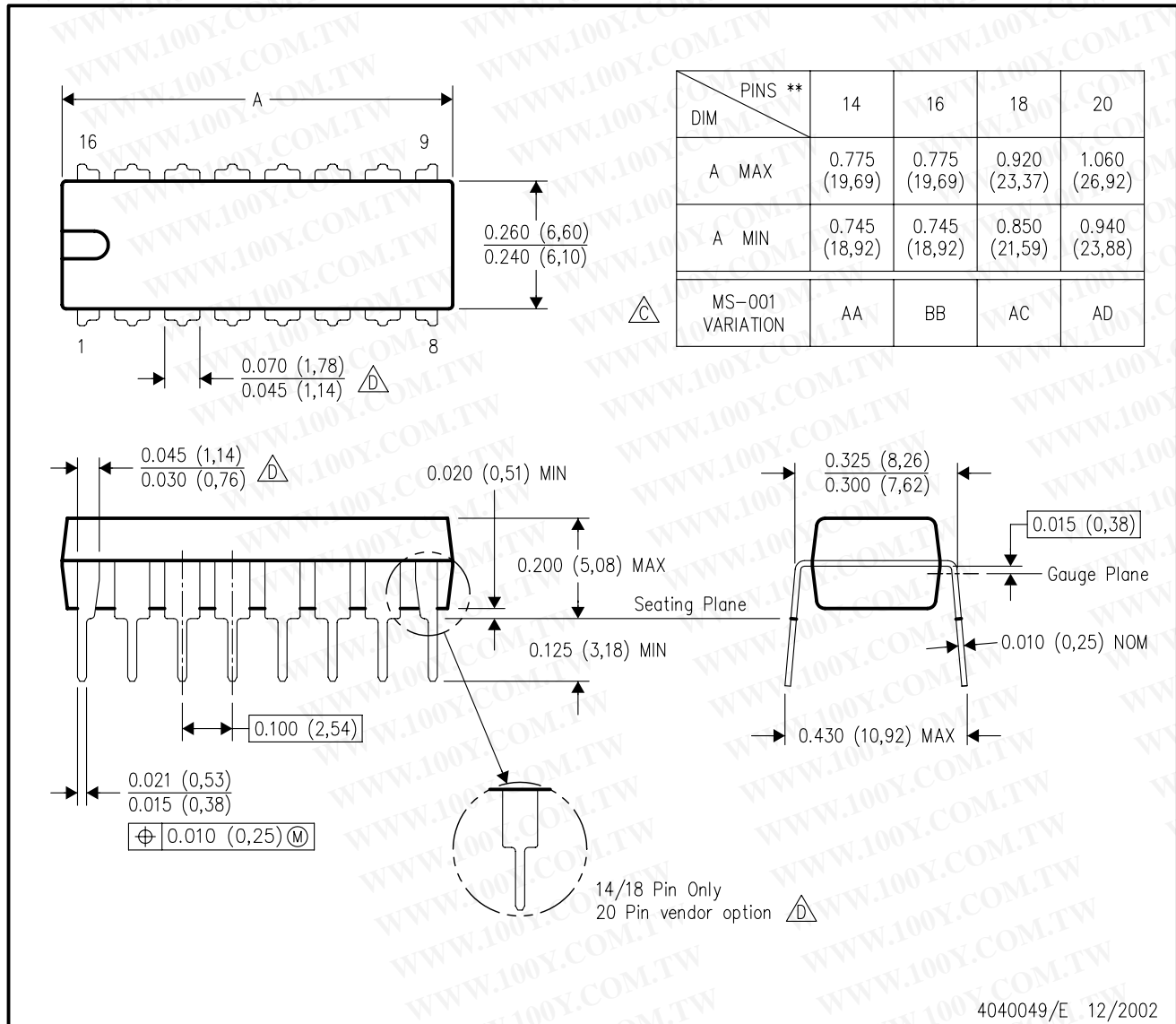
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

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N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

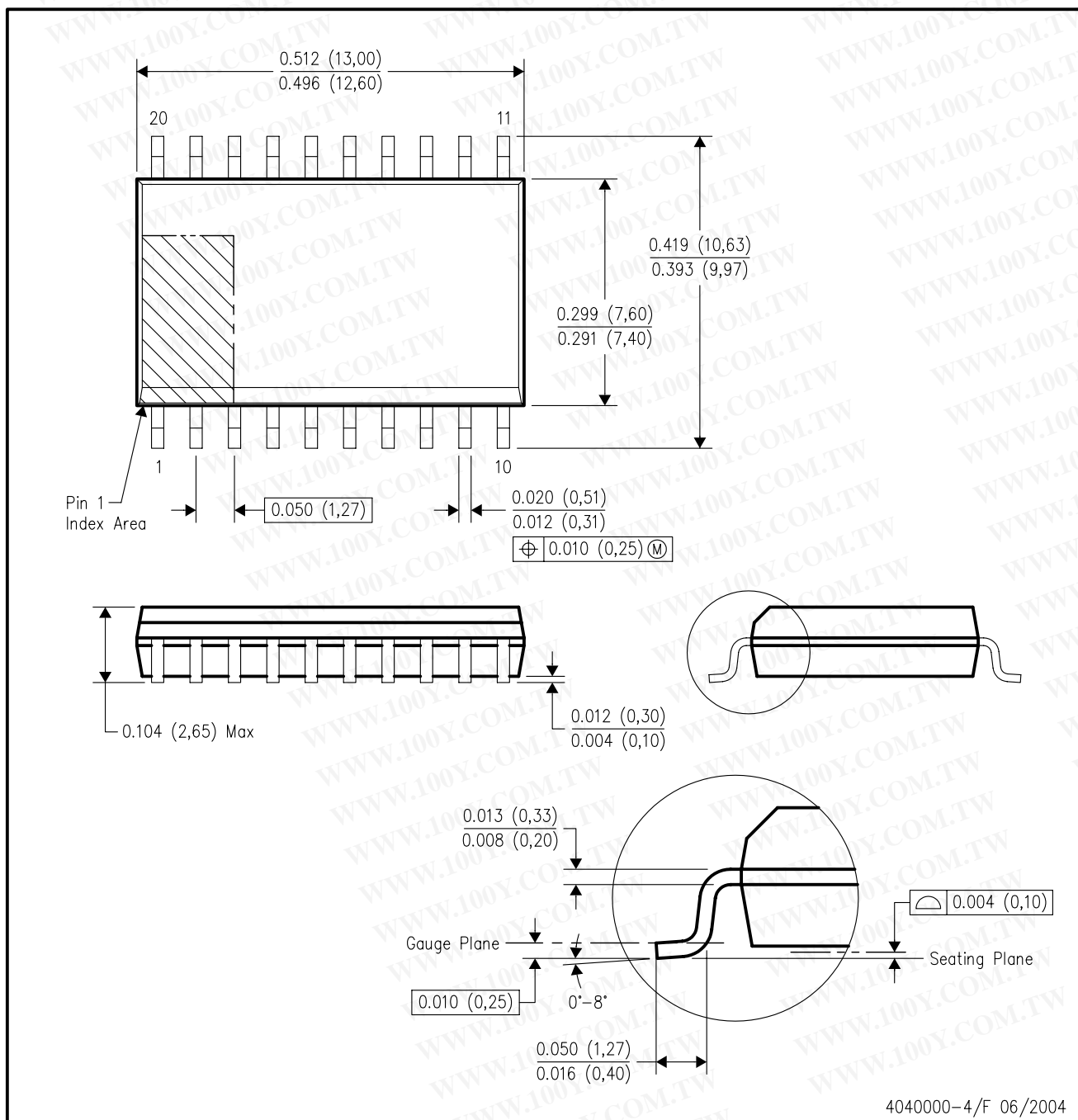


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

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DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



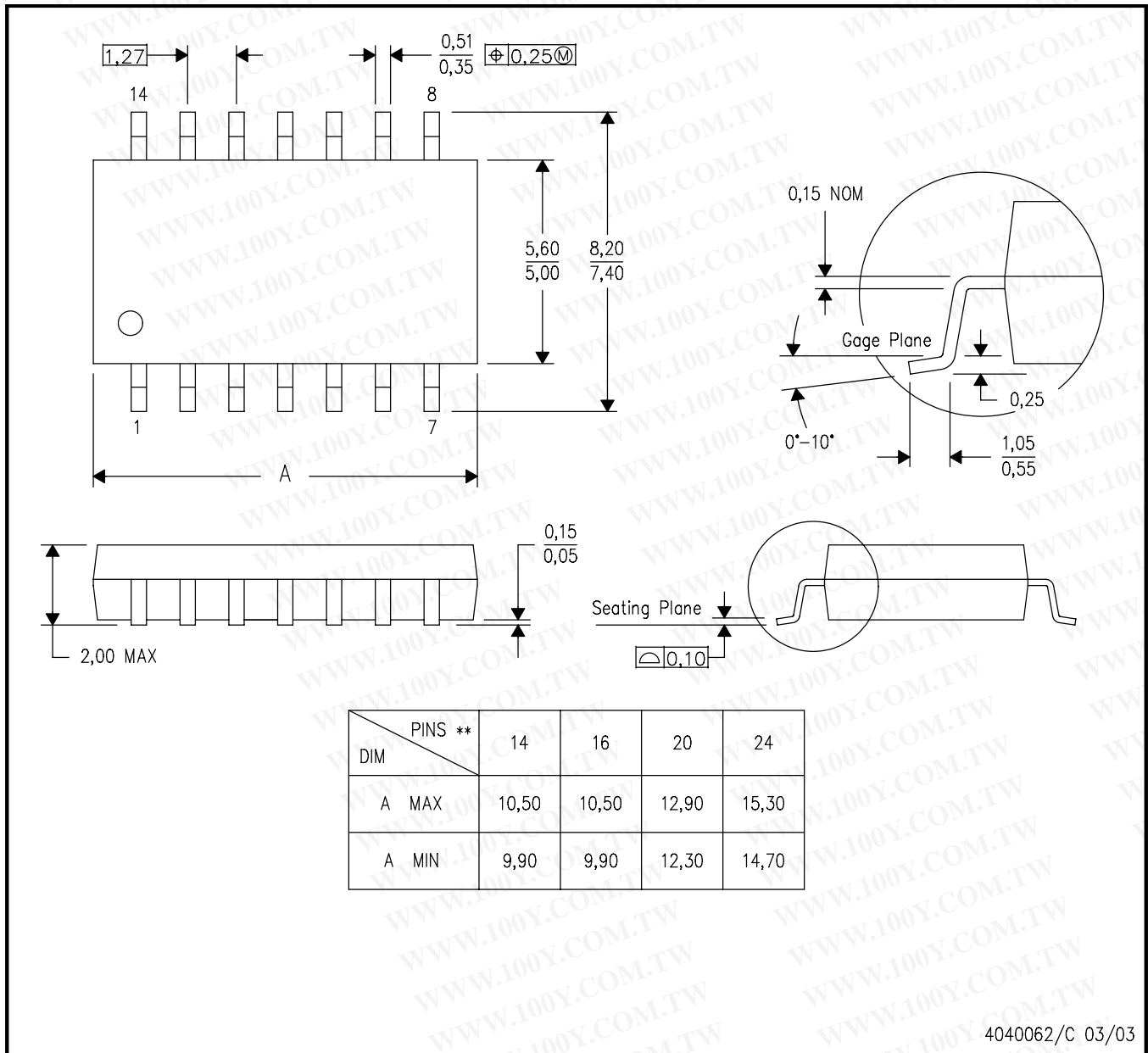
- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-013 variation AC.

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.

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