

**SN5414, SN54LS14,
SN7414, SN74LS14**
HEX SCHMITT-TRIGGER INVERTERS
SDLS049B – DECEMBER 1983 – REVISED FEBRUARY 2002

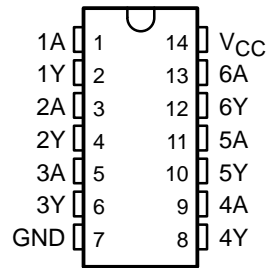
- Operation From Very Slow Edges
- Improved Line-Receiving Characteristics
- High Noise Immunity

description

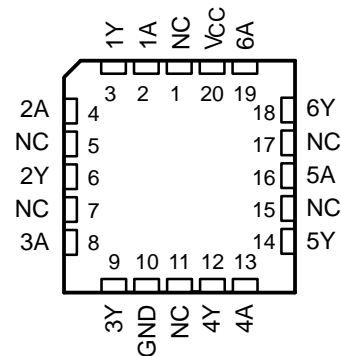
Each circuit functions as an inverter, but because of the Schmitt action, it has different input threshold levels for positive-going (V_{T+}) and negative-going (V_{T-}) signals.

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.



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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.



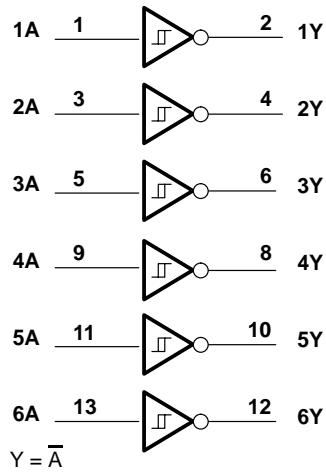
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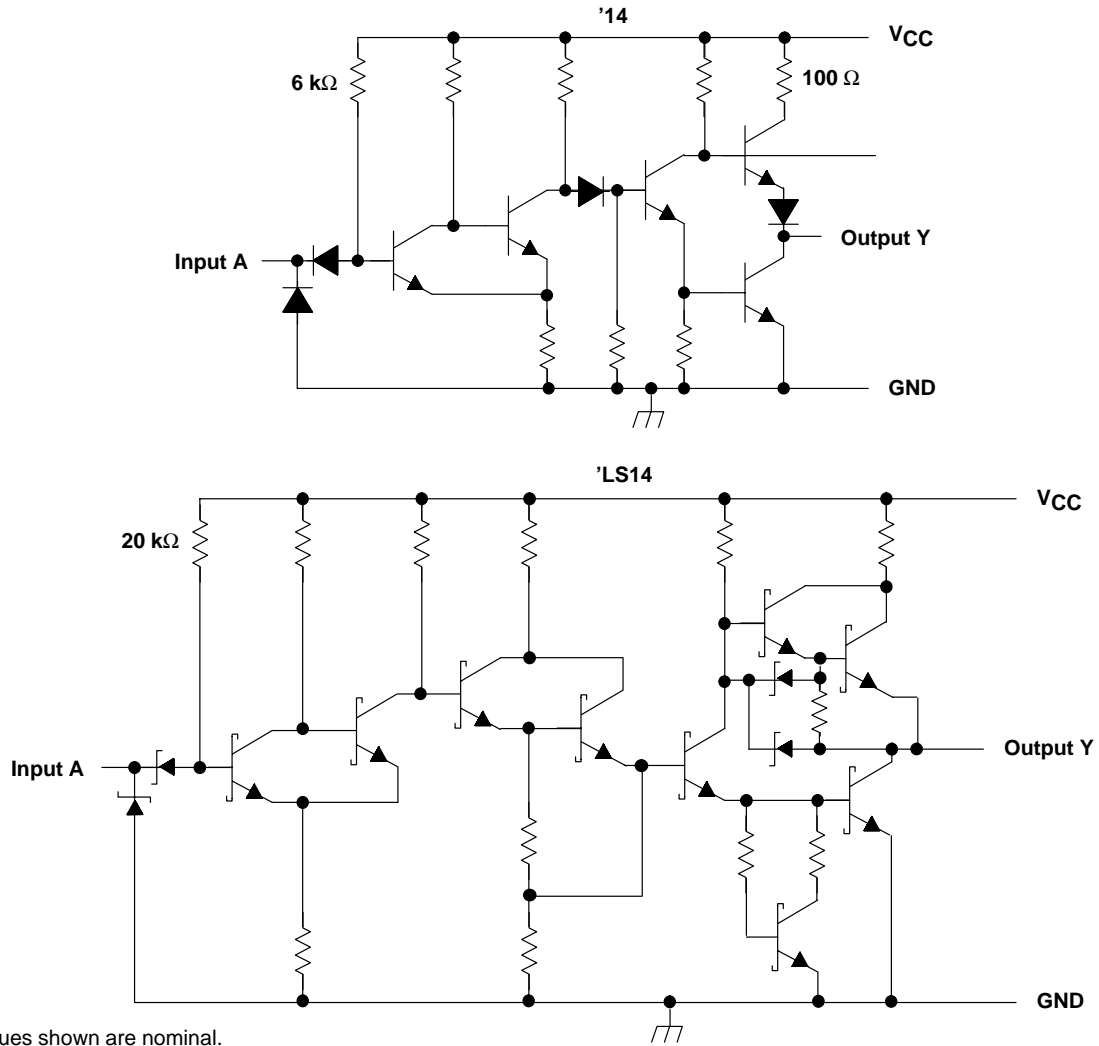
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logic diagram (positive logic)



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

schematic



Resistor values shown are nominal.

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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, θ_{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 | μA |
| 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.

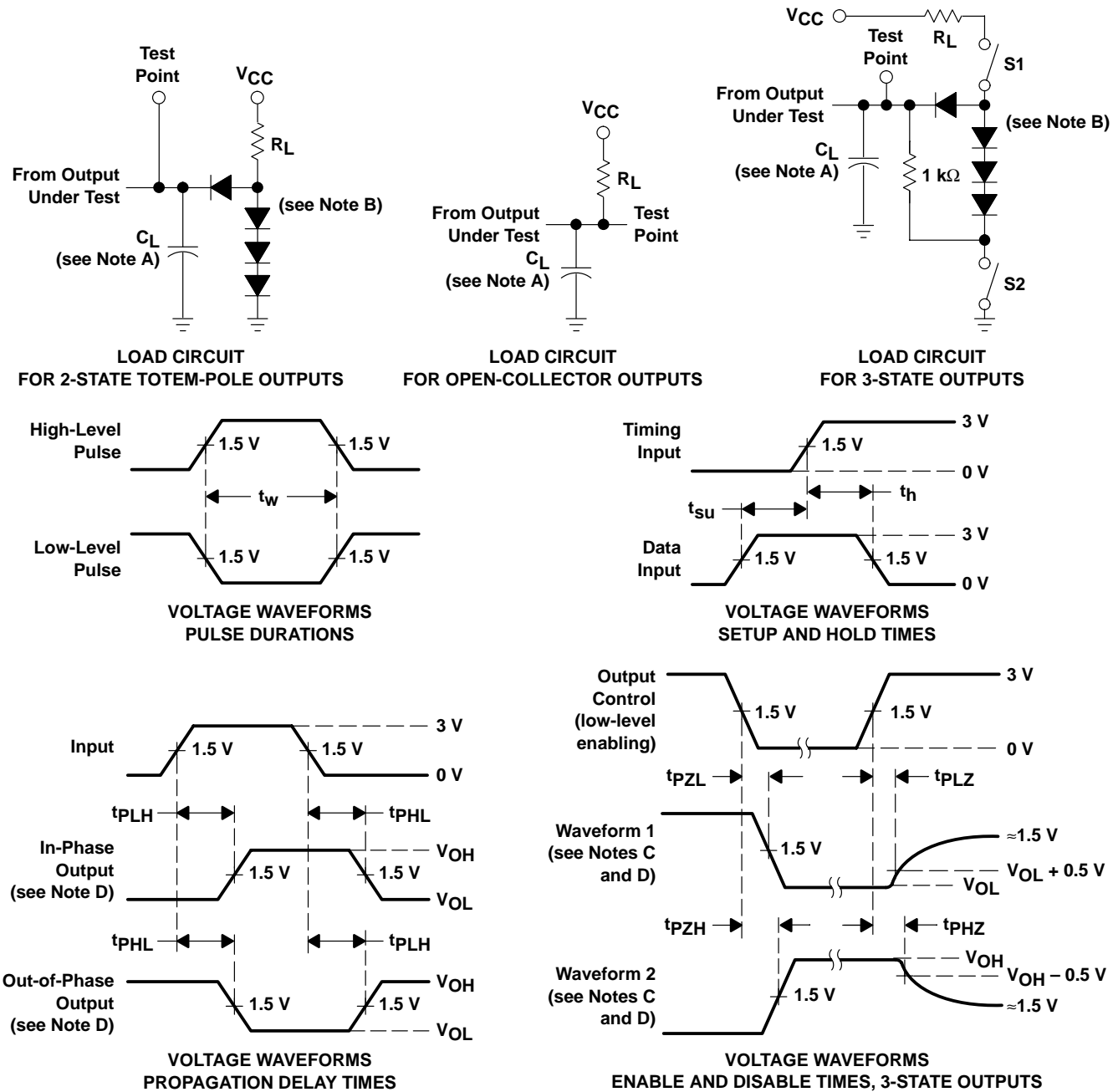
switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$ (see Figure 2)

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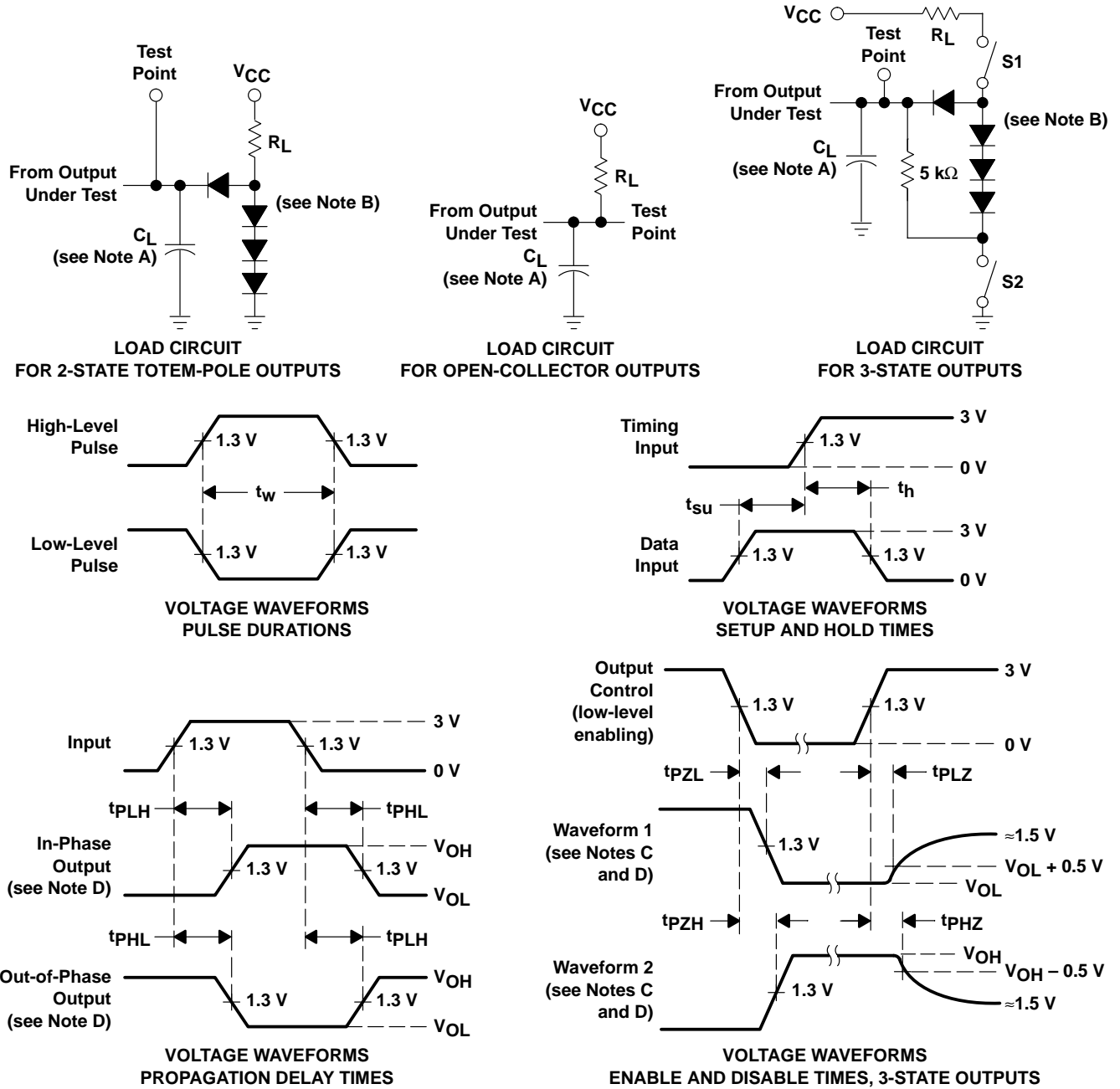
**PARAMETER MEASUREMENT INFORMATION
SERIES 54/74 DEVICES**



- 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

TYPICAL CHARACTERISTICS OF '14 CIRCUITS†

POSITIVE-GOING THRESHOLD VOLTAGE
 vs
 FREE-AIR TEMPERATURE

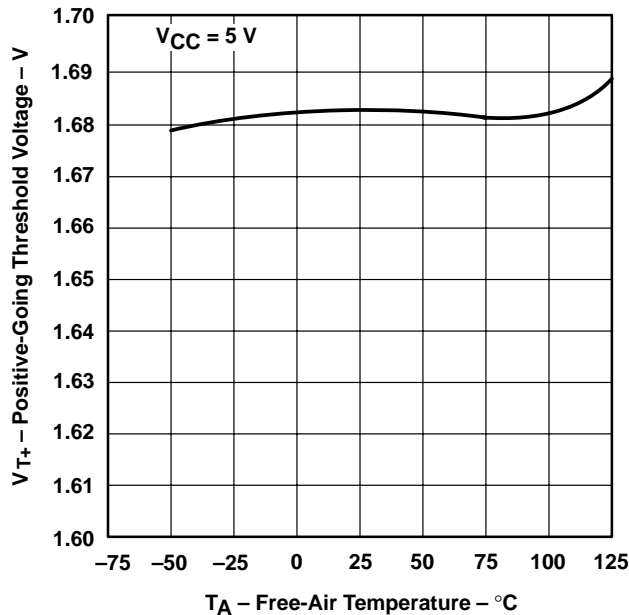


Figure 3

NEGATIVE-GOING THRESHOLD VOLTAGE
 vs
 FREE-AIR TEMPERATURE

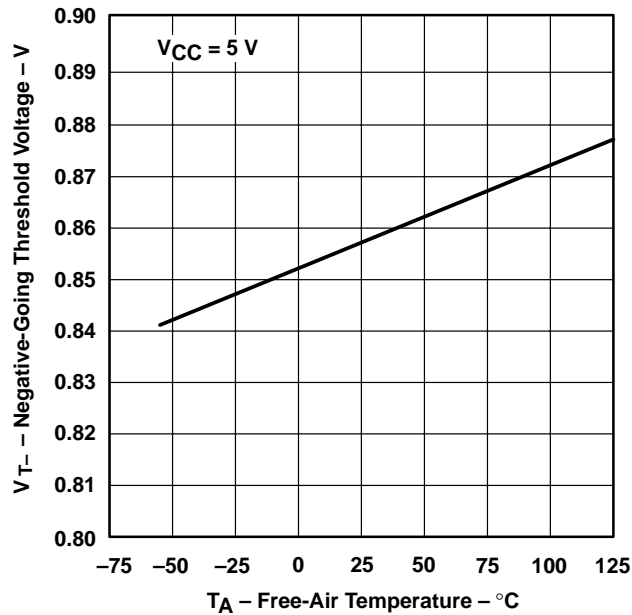


Figure 4

HYSTERESIS
 vs
 FREE-AIR TEMPERATURE

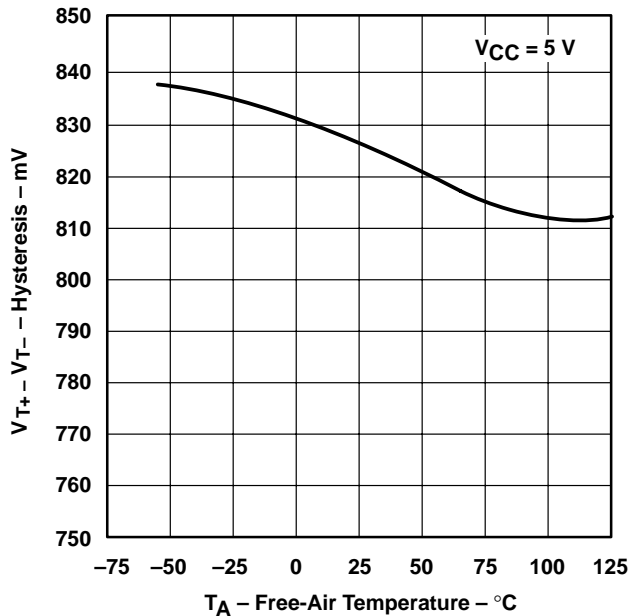


Figure 5

† 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†

**DISTRIBUTION OF UNITS
 FOR HYSTERESIS**

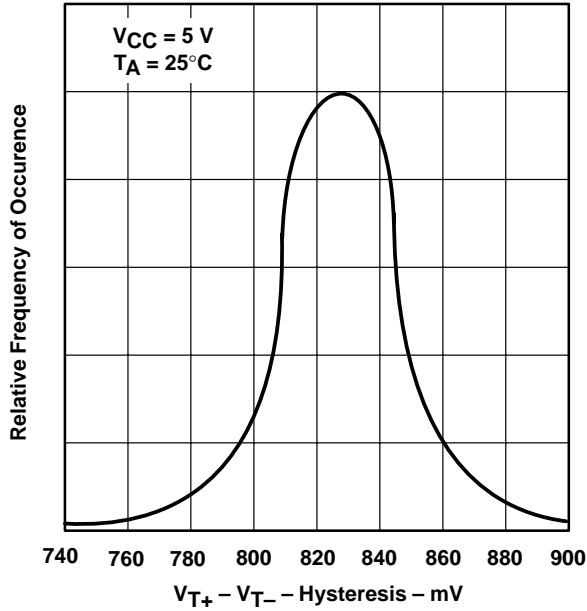


Figure 6

**THRESHOLD VOLTAGES
 vs
 SUPPLY VOLTAGE**

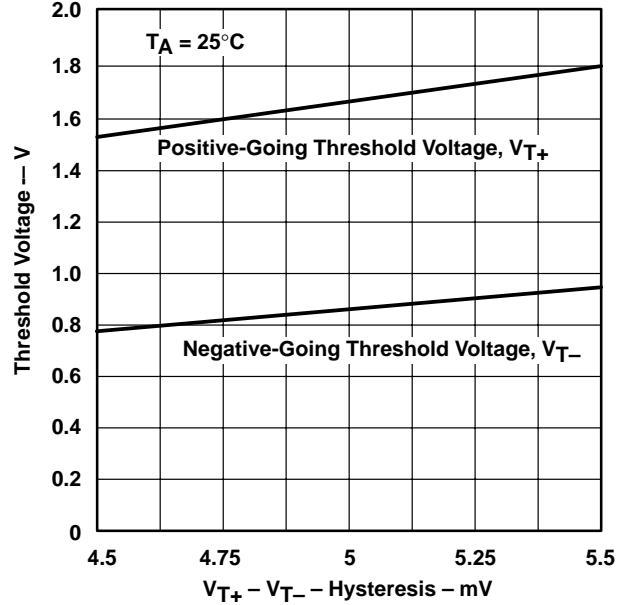


Figure 7

**HYSTERESIS
 vs
 SUPPLY VOLTAGE**

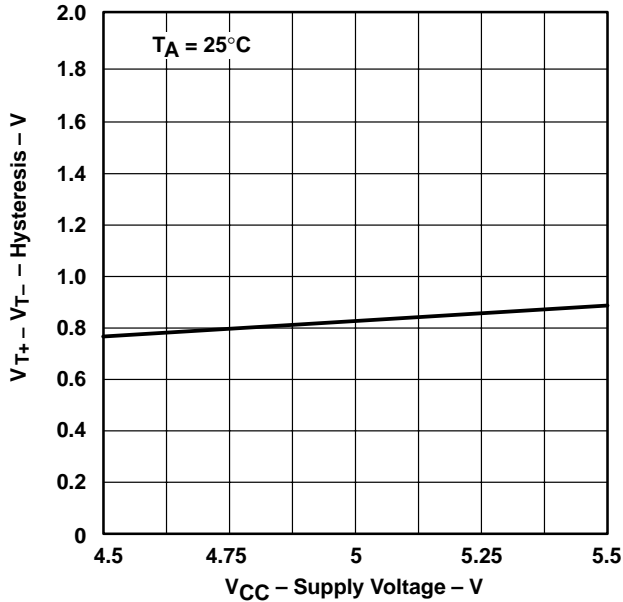


Figure 8

**OUTPUT VOLTAGE
 vs
 INPUT VOLTAGE**

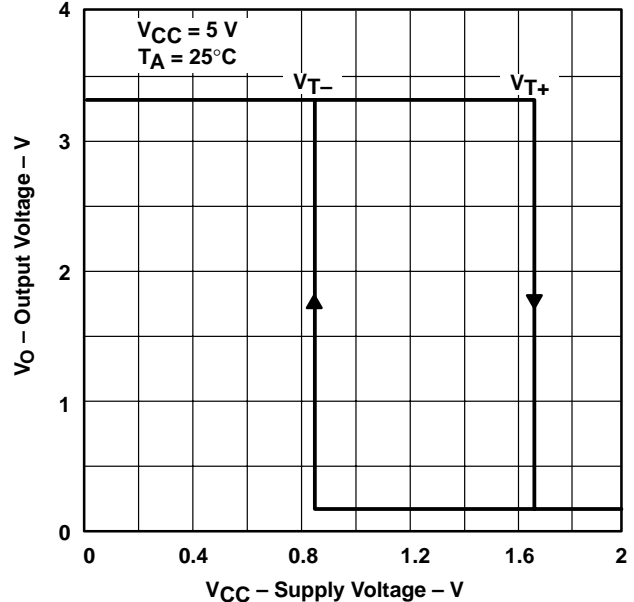


Figure 9

† 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†

POSITIVE-GOING THRESHOLD VOLTAGE
 vs
 FREE-AIR TEMPERATURE

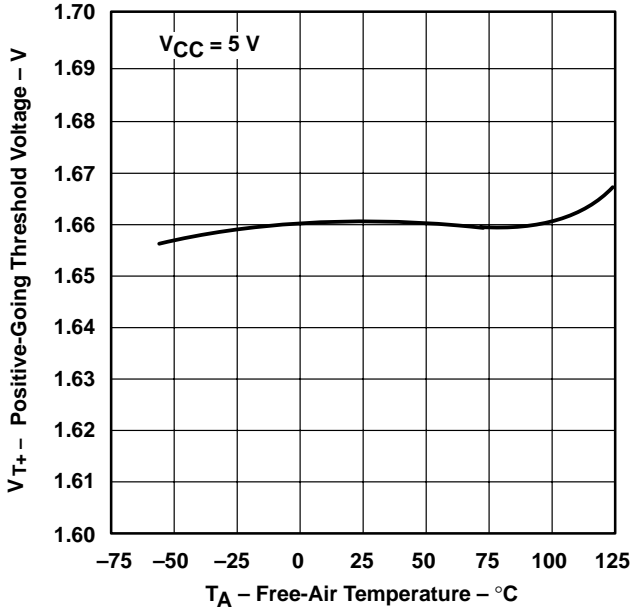


Figure 10

NEGATIVE-GOING THRESHOLD VOLTAGE
 vs
 FREE-AIR TEMPERATURE

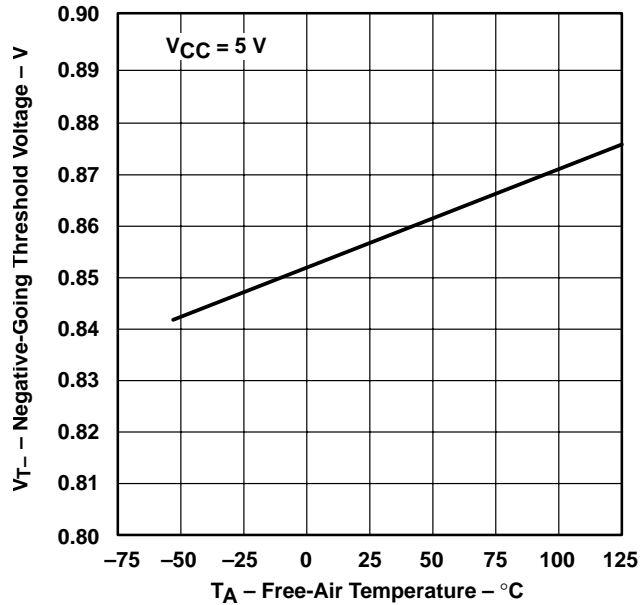


Figure 11

HYSTERESIS
 vs
 FREE-AIR TEMPERATURE

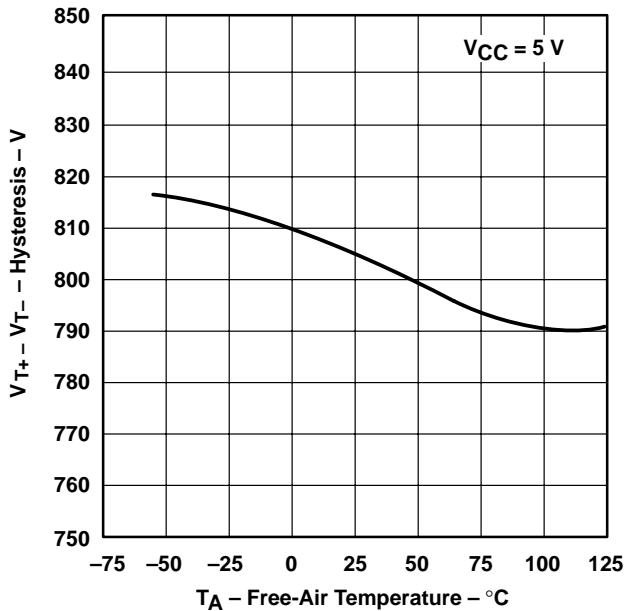


Figure 12

DISTRIBUTION OF UNITS
 FOR HYSTERESIS

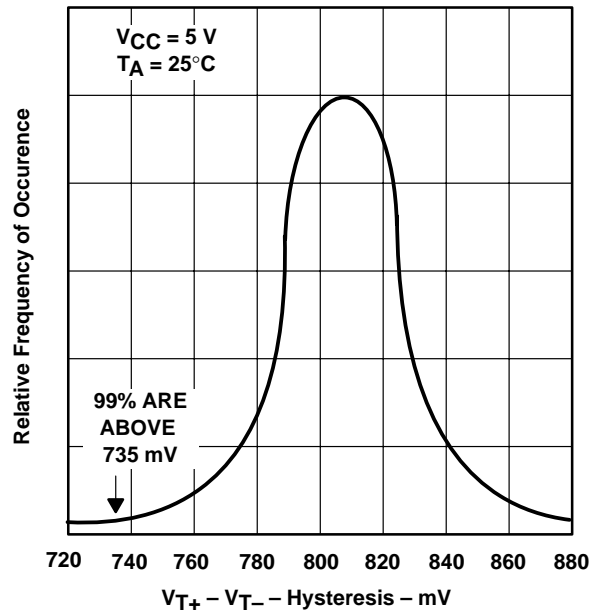


Figure 13

† 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†

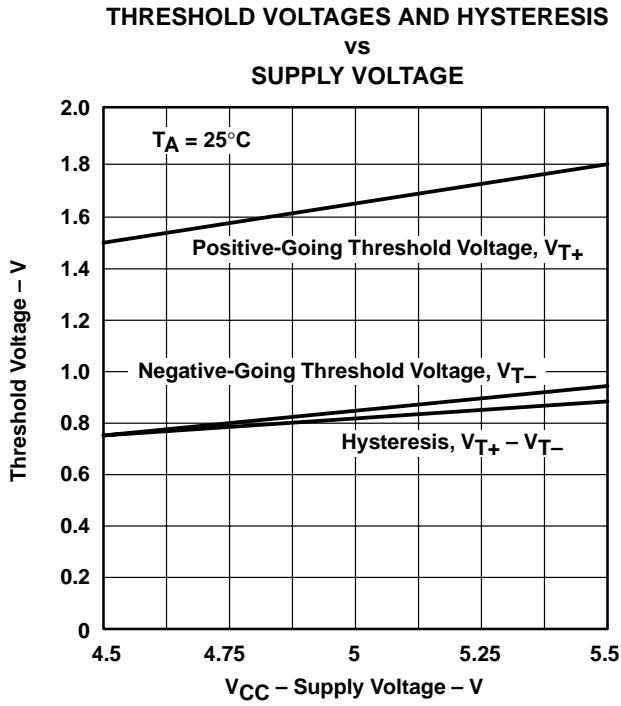


Figure 14

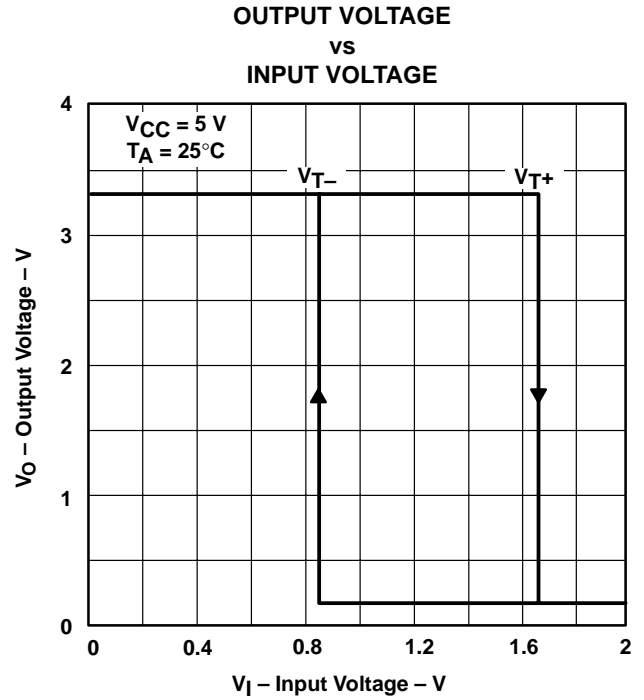


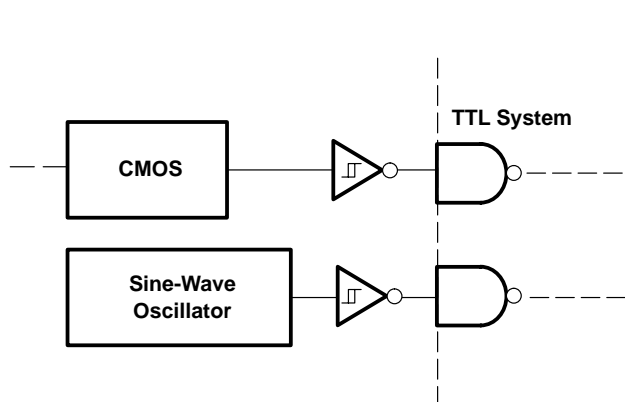
Figure 15

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

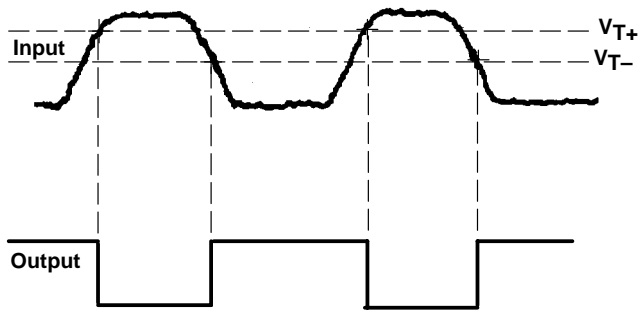
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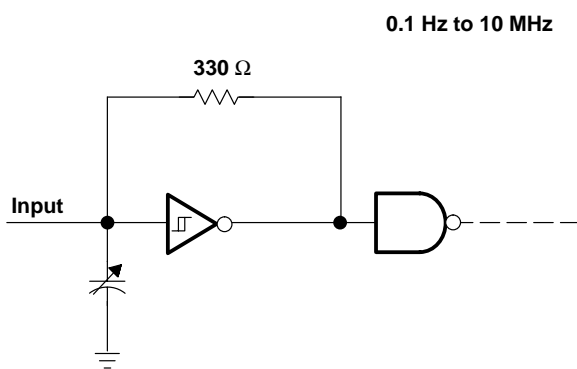
TYPICAL APPLICATION DATA



**TTL System Interface
for Slow Input Waveforms**

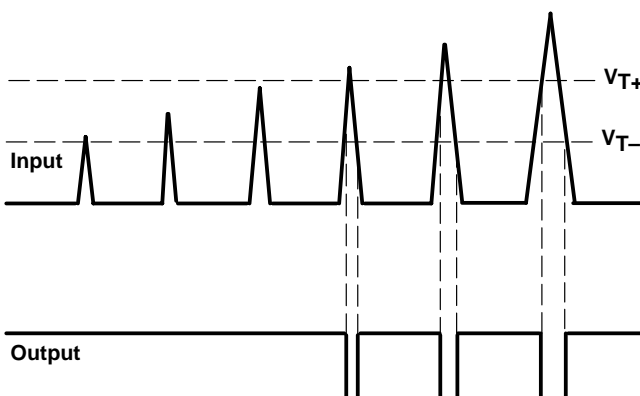


Pulse Shaper

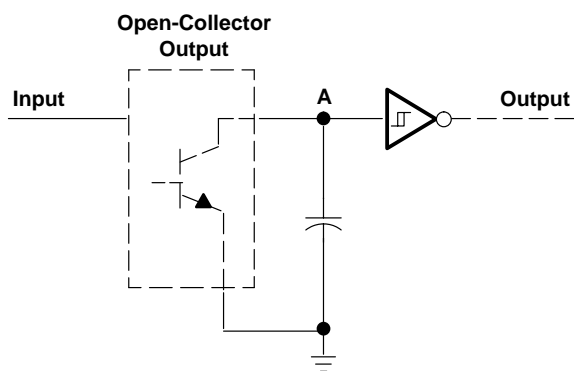


Multivibrator

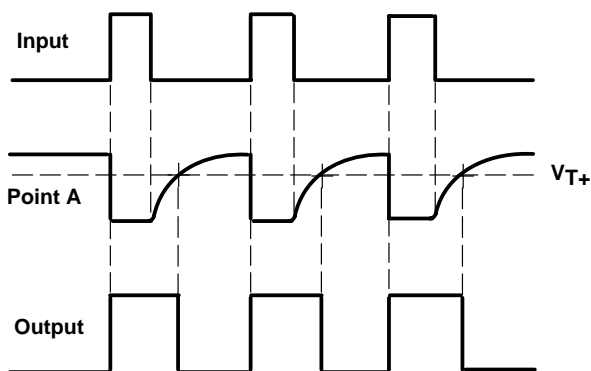
0.1 Hz to 10 MHz



Threshold Detector



Pulse Stretcher



PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-9665801Q2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 5962-9665801QCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| 5962-9665801QDA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| 5962-9665801VCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| 5962-9665801VDA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| JM38510/31302BCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SN5414J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SN54LS14J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SN7414D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414N | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN7414N3 | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI |
| SN7414NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN7414NSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414NSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN7414NSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DBR | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DBRE4 | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DBRG4 | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| | | | | | | no Sb/Br) | | |
| SN74LS14N | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74LS14N3 | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI |
| SN74LS14NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74LS14NSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14NSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS14NSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SNJ5414J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ5414W | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54LS14FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54LS14J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54LS14W | ACTIVE | CFP | W | 14 | 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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TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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

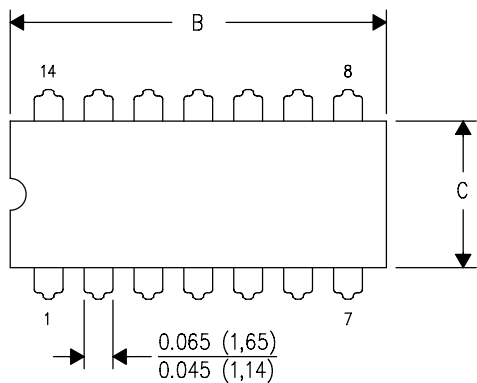


*All dimensions are nominal

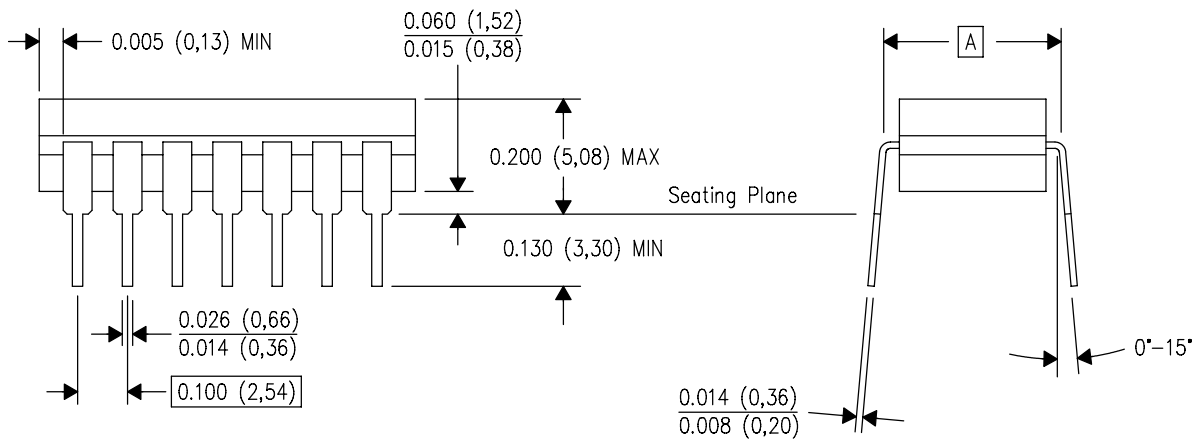
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN7414DR | SOIC | D | 14 | 2500 | 346.0 | 346.0 | 33.0 |
| SN7414NSR | SO | NS | 14 | 2000 | 346.0 | 346.0 | 33.0 |
| SN74LS14DBR | SSOP | DB | 14 | 2000 | 346.0 | 346.0 | 33.0 |
| SN74LS14DR | SOIC | D | 14 | 2500 | 346.0 | 346.0 | 33.0 |
| SN74LS14NSR | SO | NS | 14 | 2000 | 346.0 | 346.0 | 33.0 |

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) |

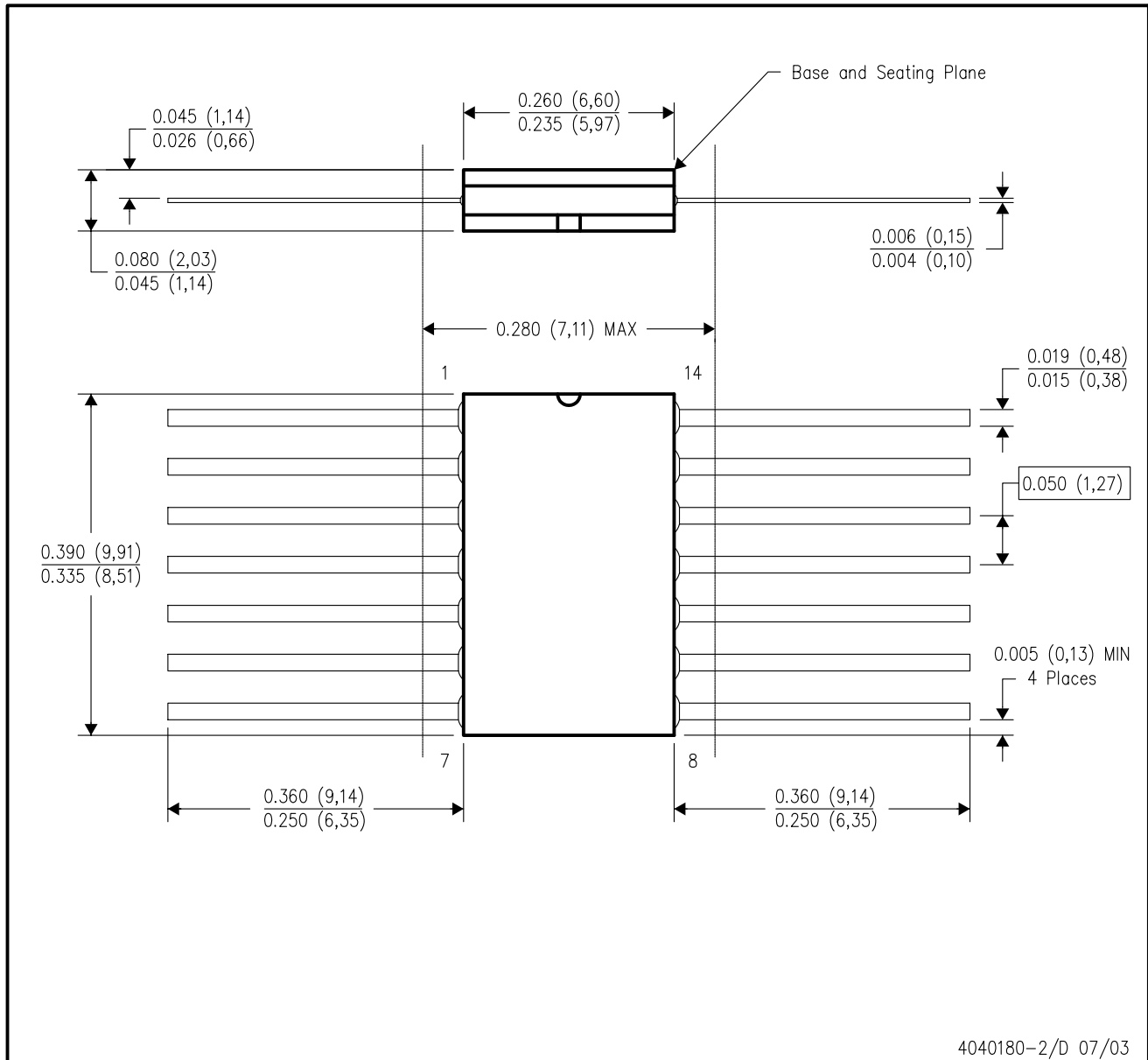


4040083/F 03/03

- 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



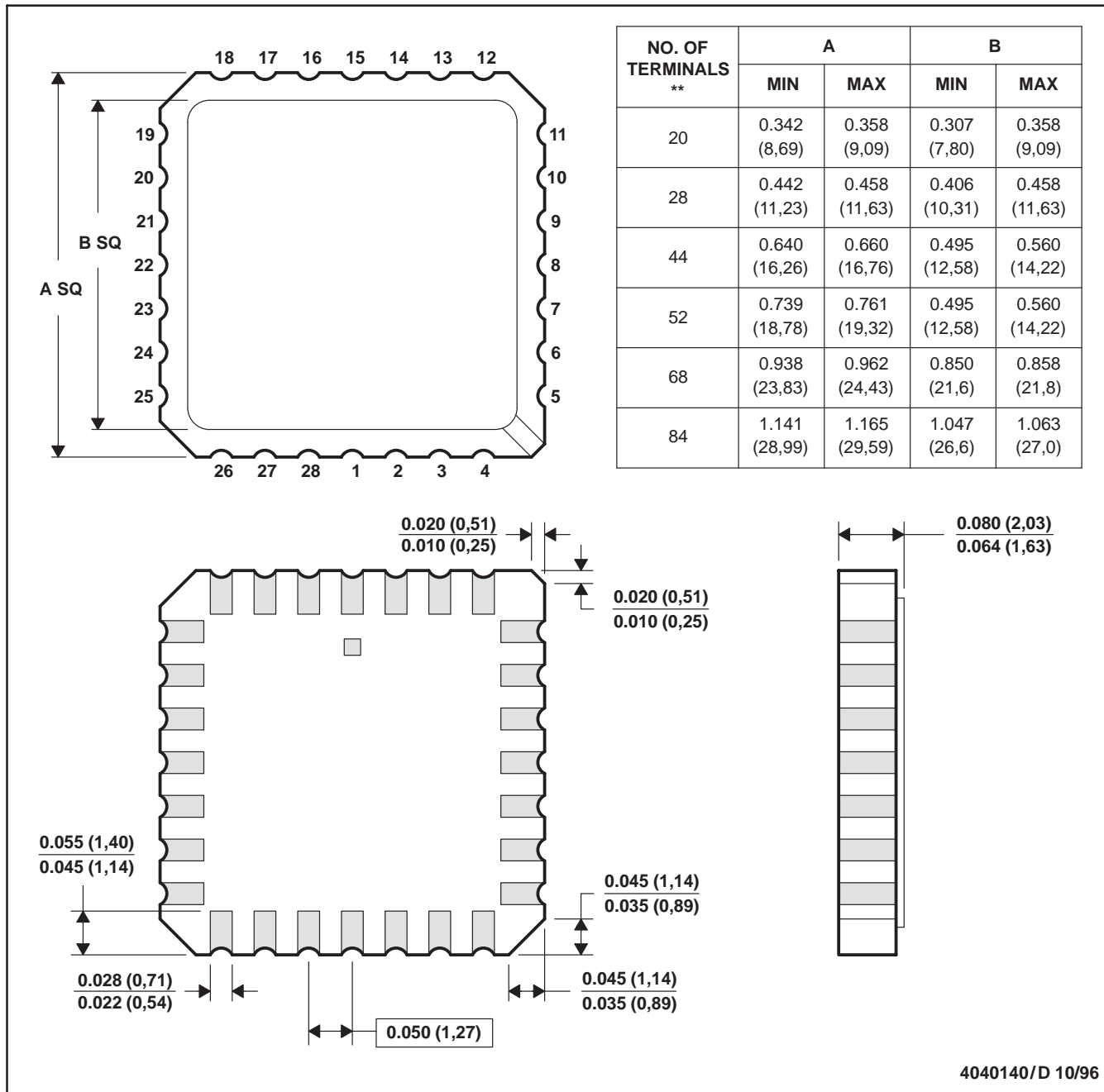
4040180-2/D 07/03

- 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 and JEDEC MO-092AB

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

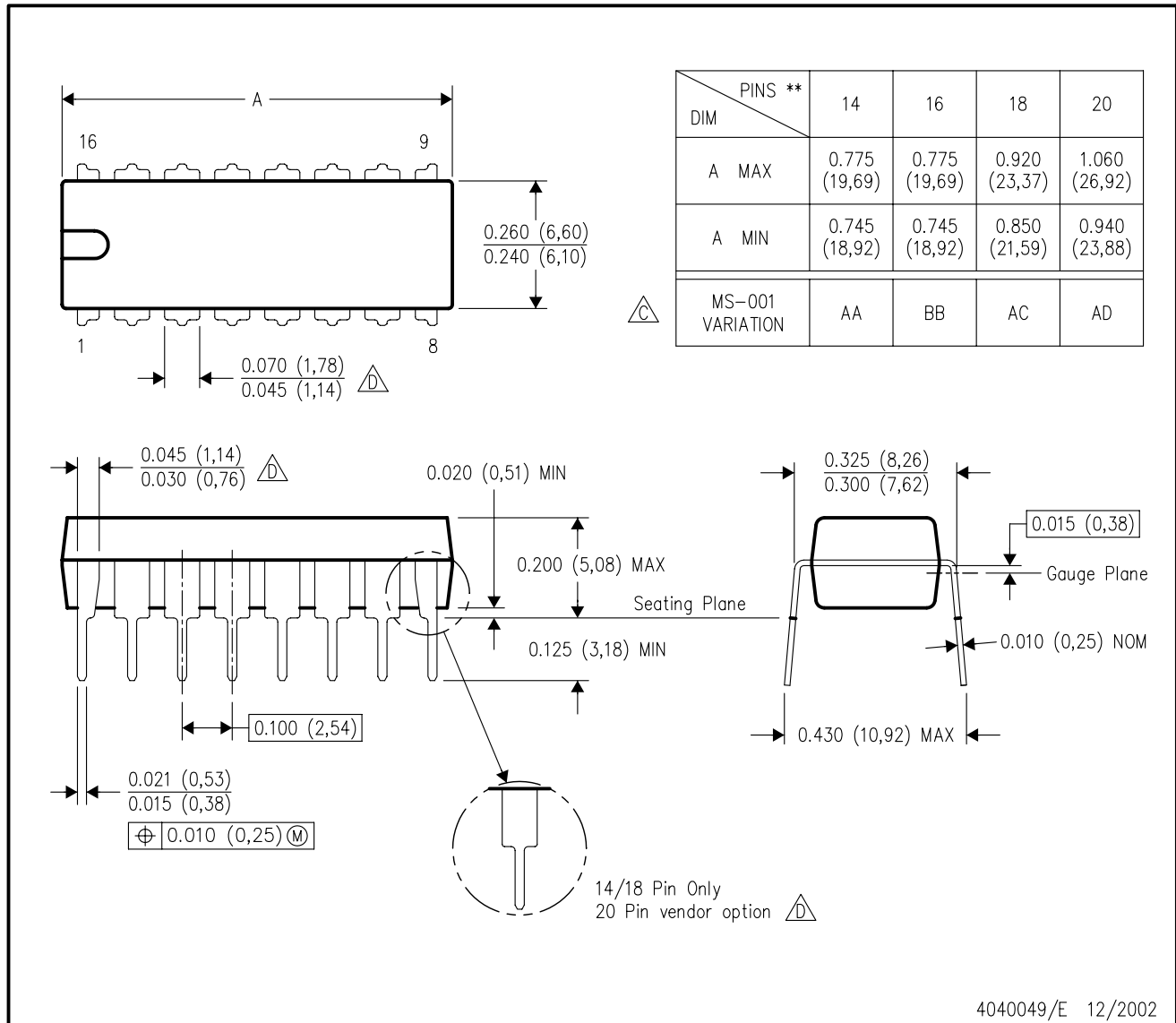


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

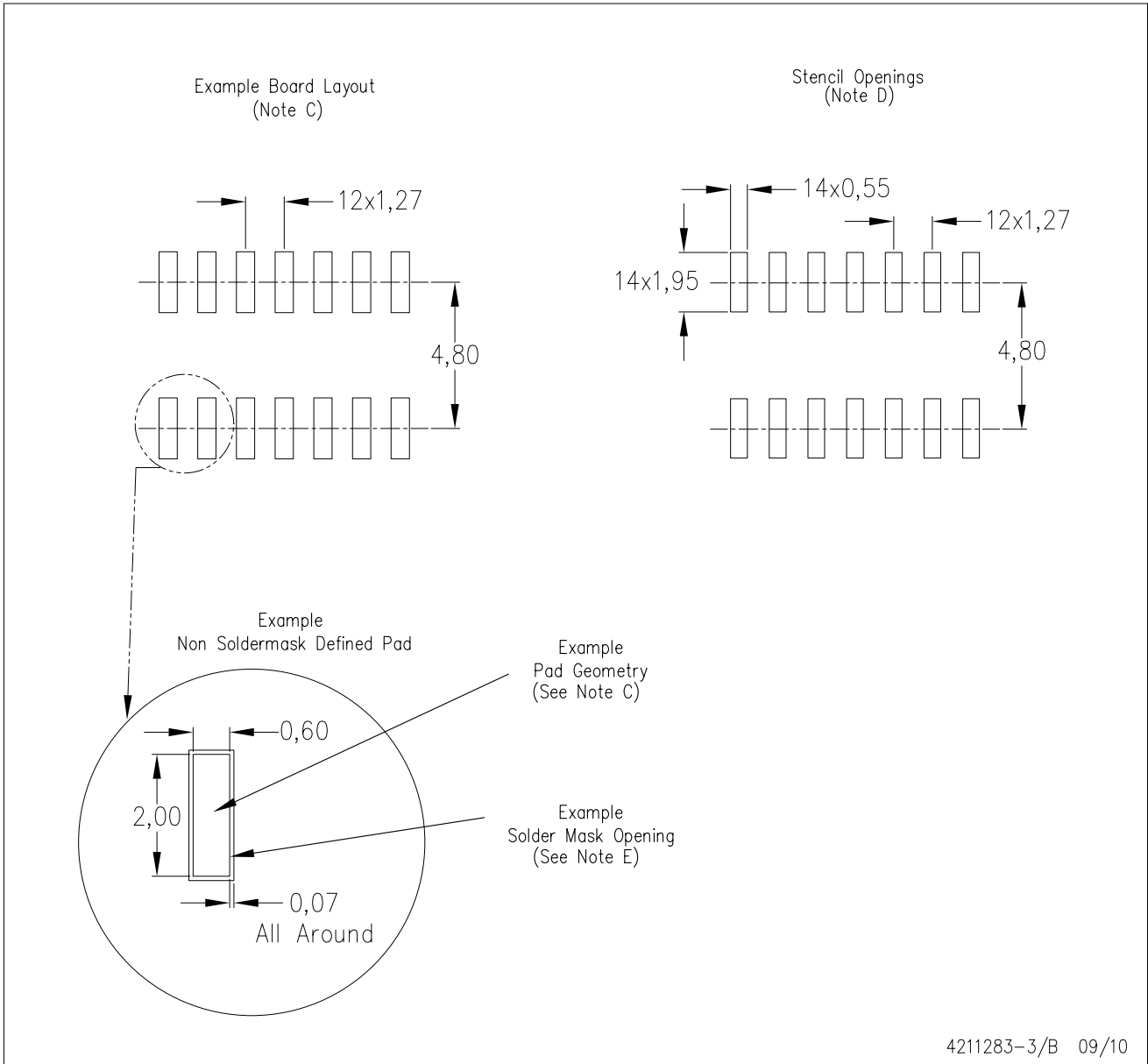
16 PINS SHOWN



- 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



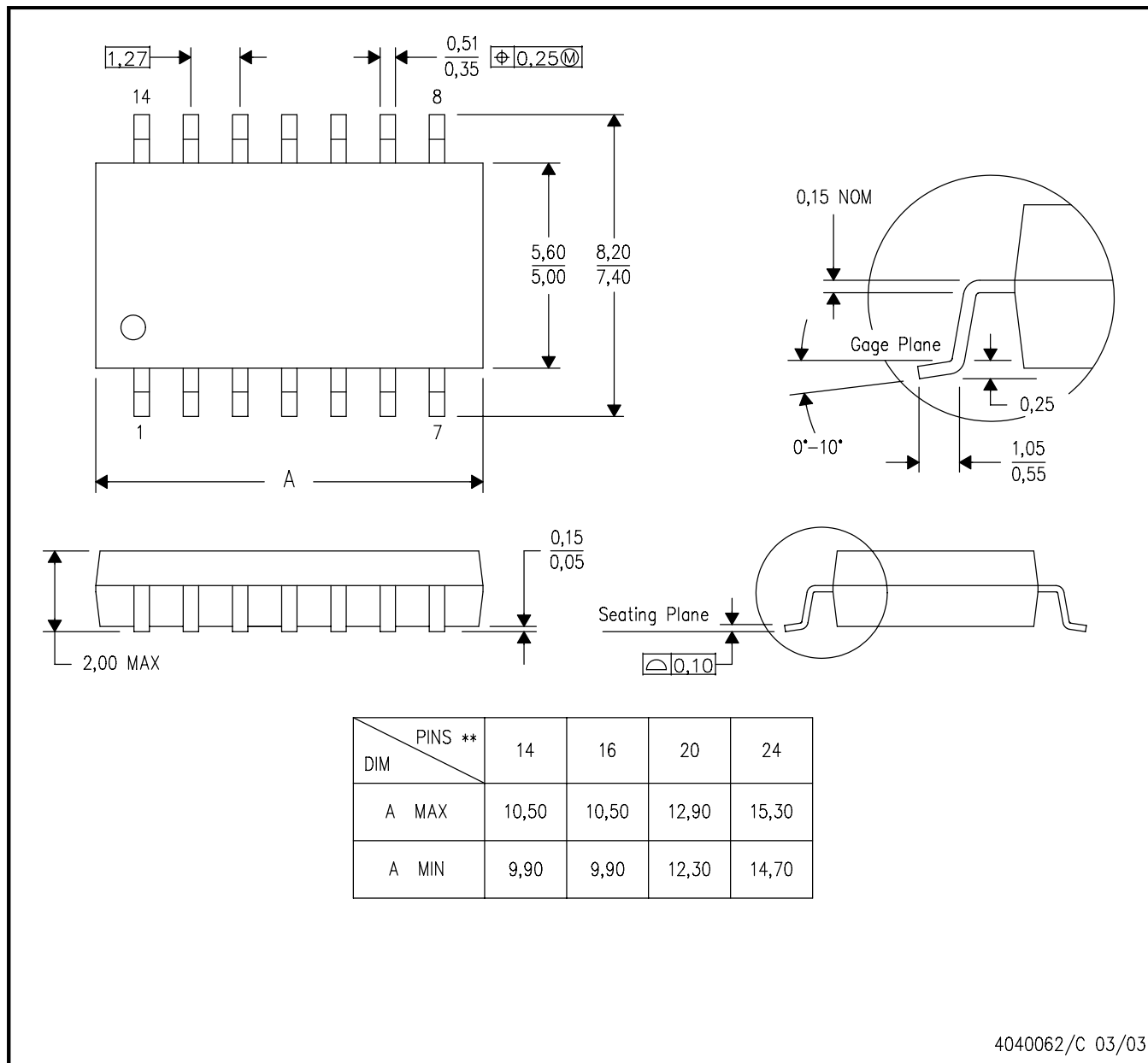
- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should 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

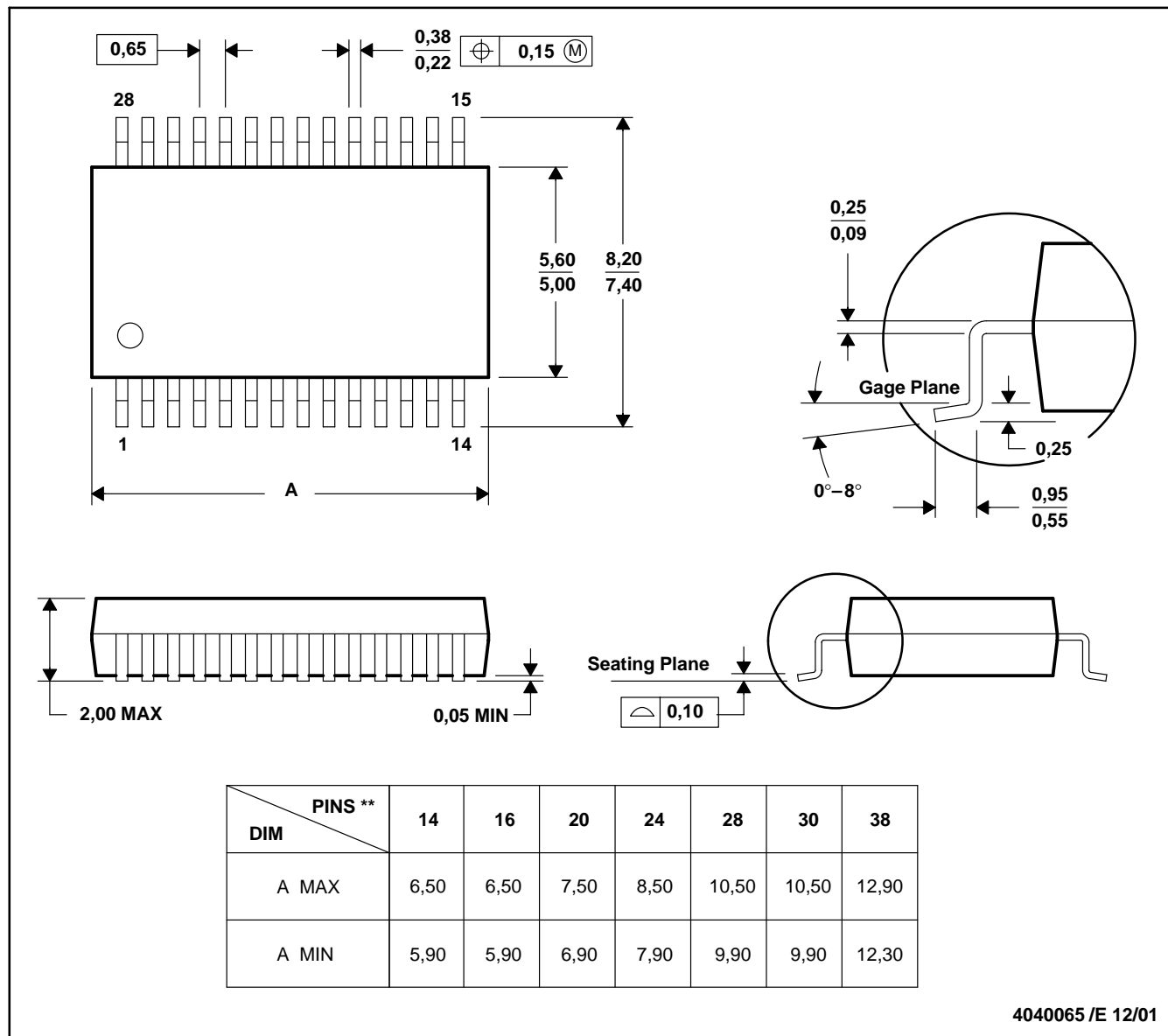


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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

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