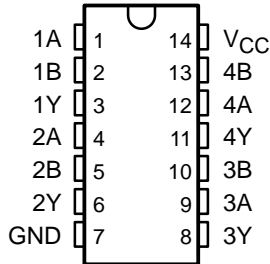


SN54AHC86, SN74AHC86 QUADRUPL 2-INPUT EXCLUSIVE-OR GATES

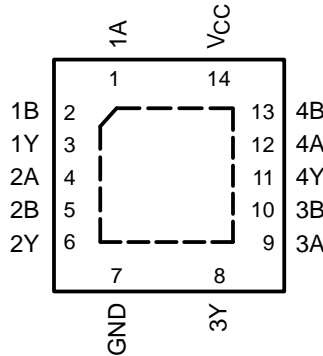
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- Operating Range 2-V to 5.5-V V_{CC}
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

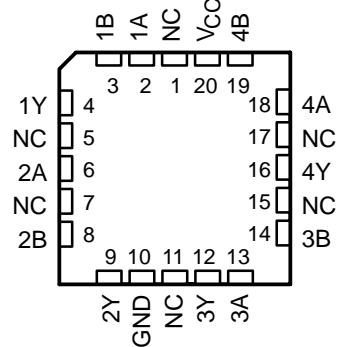
SN54AHC86 . . . J OR W PACKAGE
SN74AHC86 . . . D, DB, DGV, N, NS,
OR PW PACKAGE
(TOP VIEW)



SN74AHC86 . . . RGY PACKAGE
(TOP VIEW)



SN54AHC86 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

The 'AHC86 devices are quadruple 2-input exclusive-OR gates. These devices perform the Boolean function $Y = A \oplus B$ or $Y = \overline{A}B + A\overline{B}$ in positive logic.

A common application is as a true/complement element. If one of the inputs is low, the other input is reproduced in true form at the output. If one of the inputs is high, the signal on the other input is reproduced inverted at the output.

ORDERING INFORMATION

| T_A | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------|---------------|-----------------------|------------------|
| –40°C to 85°C | QFN – RGY | Tape and reel | SN74AHC86RGYR | HA86 |
| | PDIP – N | Tube | SN74AHC86N | SN74AHC86N |
| | SOIC – D | Tube | SN74AHC86D | AHC86 |
| | | Tape and reel | SN74AHC86DR | |
| | SOP – NS | Tape and reel | SN74AHC86NSR | AHC86 |
| | SSOP – DB | Tape and reel | SN74AHC86DBR | HA86 |
| | TSSOP – PW | Tube | SN74AHC86PW | HA86 |
| | | Tape and reel | SN74AHC86PWR | |
| | TVSOP – DGV | Tape and reel | SN74AHC86DGV | HA86 |
| –55°C to 125°C | CDIP – J | Tube | SNJ54AHC86J | SNJ54AHC86J |
| | CFP – W | Tube | SNJ54AHC86W | SNJ54AHC86W |
| | LCCC – FK | Tube | SNJ54AHC86FK | SNJ54AHC86FK |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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.

**TEXAS
INSTRUMENTS**

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SN54AHC86, SN74AHC86
QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

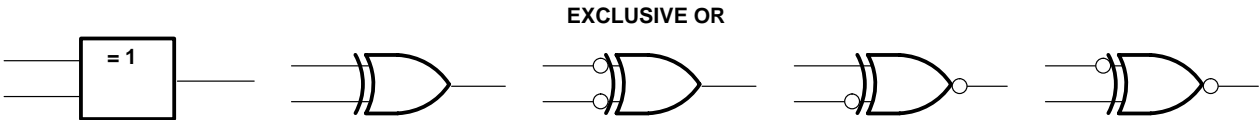
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FUNCTION TABLE
(each gate)

| INPUTS | | OUTPUT Y |
|--------|---|-------------|
| A | B | |
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | L |

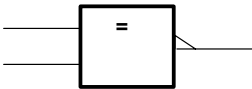
exclusive-OR logic

An exclusive-OR gate has many applications, some of which can be represented better by alternative logic symbols.



These are five equivalent exclusive-OR symbols valid for an SN74AHC86 gate in positive logic; negation may be shown at any two ports.

LOGIC-IDENTITY ELEMENT



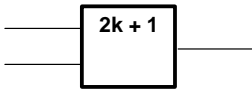
The output is active (low) if all inputs stand at the same logic level (i.e., $A = B$).

EVEN-PARITY ELEMENT



The output is active (low) if an even number of inputs (i.e., 0 or 2) are active.

ODD-PARITY ELEMENT



The output is active (high) if an odd number of inputs (i.e., only 1 of the 2) are active.

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

| | |
|--|----------------------------|
| Supply voltage range, V_{CC} | –0.5 V to 7 V |
| Input voltage range, V_I (see Note 1) | –0.5 V to 7 V |
| Output voltage range, V_O (see Note 1) | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$) | –20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ±20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ±25 mA |
| Continuous current through V_{CC} or GND | ±50 mA |
| Package thermal impedance, θ_{JA} (see Note 2): D package | 86°C/W |
| (see Note 2): DB package | 96°C/W |
| (see Note 2): DGV package | 127°C/W |
| (see Note 2): N package | 80°C/W |
| (see Note 2): NS package | 76°C/W |
| (see Note 2): PW package | 113°C/W |
| (see Note 3): RGY package | 47°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. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.
3. The package thermal impedance is calculated in accordance with JESD 51-5.

SN54AHC86, SN74AHC86 QUADRUPL 2-INPUT EXCLUSIVE-OR GATES

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recommended operating conditions (see Note 4)

| | | | SN54AHC86 | | SN74AHC86 | | UNIT |
|-----------------|------------------------------------|---------------------------------|-----------|-----------------|-----------|-----------------|------|
| | | | MIN | MAX | MIN | MAX | |
| V _{CC} | Supply voltage | | 2 | 5.5 | 2 | 5.5 | V |
| V _{IH} | High-level input voltage | V _{CC} = 2 V | 1.5 | | 1.5 | | V |
| | | V _{CC} = 3 V | 2.1 | | 2.1 | | |
| | | V _{CC} = 5.5 V | 3.85 | | 3.85 | | |
| V _{IL} | Low-level input voltage | V _{CC} = 2 V | | 0.5 | | 0.5 | V |
| | | V _{CC} = 3 V | | 0.9 | | 0.9 | |
| | | V _{CC} = 5.5 V | | 1.65 | | 1.65 | |
| V _I | Input voltage | | 0 | 5.5 | 0 | 5.5 | V |
| V _O | Output voltage | | 0 | V _{CC} | 0 | V _{CC} | V |
| I _{OH} | High-level output current | V _{CC} = 2 V | | –50 | | –50 | μA |
| | | V _{CC} = 3.3 V ± 0.3 V | | –4 | | –4 | mA |
| | | V _{CC} = 5 V ± 0.5 V | | –8 | | –8 | |
| I _{OL} | Low-level output current | V _{CC} = 2 V | | 50 | | 50 | μA |
| | | V _{CC} = 3.3 V ± 0.3 V | | 4 | | 4 | mA |
| | | V _{CC} = 5 V ± 0.5 V | | 8 | | 8 | |
| Δt/Δv | Input transition rise or fall rate | V _{CC} = 3.3 V ± 0.3 V | | 100 | | 100 | ns/V |
| | | V _{CC} = 5 V ± 0.5 V | | 20 | | 20 | |
| T _A | Operating free-air temperature | | –55 | 125 | –40 | 85 | °C |

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | SN54AHC86 | | SN74AHC86 | | UNIT |
|-----------------|---|-----------------|-----------------------|-----|------|-----------|-----|-----------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | I _{OH} = –50 μA | 2 V | 1.9 | 2 | | 1.9 | | 1.9 | | V |
| | | 3 V | 2.9 | 3 | | 2.9 | | 2.9 | | |
| | | 4.5 V | 4.4 | 4.5 | | 4.4 | | 4.4 | | |
| | I _{OH} = –4 mA | 3 V | 2.58 | | | 2.48 | | 2.48 | | |
| | I _{OH} = –8 mA | 4.5 V | 3.94 | | | 3.8 | | 3.8 | | |
| V _{OL} | I _{OL} = 50 μA | 2 V | | | 0.1 | | 0.1 | | 0.1 | V |
| | | 3 V | | | 0.1 | | 0.1 | | 0.1 | |
| | | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | |
| | I _{OL} = 4 mA | 3 V | | | 0.36 | | 0.5 | | 0.44 | |
| | I _{OL} = 8 mA | 4.5 V | | | 0.36 | | 0.5 | | 0.44 | |
| I _I | V _I = 5.5 V or GND | 0 V to 5.5 V | | | ±0.1 | | ±1* | | ±1 | μA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 2 | | 20 | | 20 | μA |
| C _i | V _I = V _{CC} or GND | 5 V | | 4 | 10 | | | | 10 | pF |

* On products compliant to MIL-PRF-38535, this parameter is not production tested at V_{CC} = 0 V.



SN54AHC86, SN74AHC86

QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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**switching characteristics over recommended operating free-air temperature range,
V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | T _A = 25°C | | | SN54AHC86 | | SN74AHC86 | | UNIT |
|------------------|-----------------|----------------|------------------------|-----------------------|-----|------|-----------|------|-----------|------|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{PLH} | A or B | Y | C _L = 15 pF | | 7* | 11* | 1* | 13* | 1 | 13 | ns |
| t _{PHL} | | | | | 7* | 11* | 1* | 13* | 1 | 13 | |
| t _{PLH} | A or B | Y | C _L = 50 pF | | 9.5 | 14.5 | 1 | 16.5 | 1 | 16.5 | ns |
| t _{PHL} | | | | | 9.5 | 14.5 | 1 | 16.5 | 1 | 16.5 | |

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

**switching characteristics over recommended operating free-air temperature range,
V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | T _A = 25°C | | | SN54AHC86 | | SN74AHC86 | | UNIT |
|------------------|-----------------|----------------|------------------------|-----------------------|------|------|-----------|-----|-----------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{PLH} | A or B | Y | C _L = 15 pF | | 4.8* | 6.8* | 1* | 8* | 1 | 8 | ns |
| t _{PHL} | | | | | 4.8* | 6.8* | 1* | 8* | 1 | 8 | |
| t _{PLH} | A or B | Y | C _L = 50 pF | | 6.3 | 8.8 | 1 | 10 | 1 | 10 | ns |
| t _{PHL} | | | | | 6.3 | 8.8 | 1 | 10 | 1 | 10 | |

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

noise characteristics, V_{CC} = 5 V, C_L = 50 pF, T_A = 25°C (see Note 5)

| PARAMETER | | SN74AHC86 | | | UNIT |
|--------------------|---|-----------|------|------|------|
| | | MIN | TYP | MAX | |
| V _{OL(P)} | Quiet output, maximum dynamic V _{OL} | | 0.3 | 0.8 | V |
| V _{OL(V)} | Quiet output, minimum dynamic V _{OL} | | −0.3 | −0.8 | V |
| V _{OH(V)} | Quiet output, minimum dynamic V _{OH} | | 4.4 | | V |
| V _{IH(D)} | High-level dynamic input voltage | | 3.5 | | V |
| V _{IL(D)} | Low-level dynamic input voltage | | | 1.5 | V |

NOTE 5: Characteristics are for surface-mount packages only.

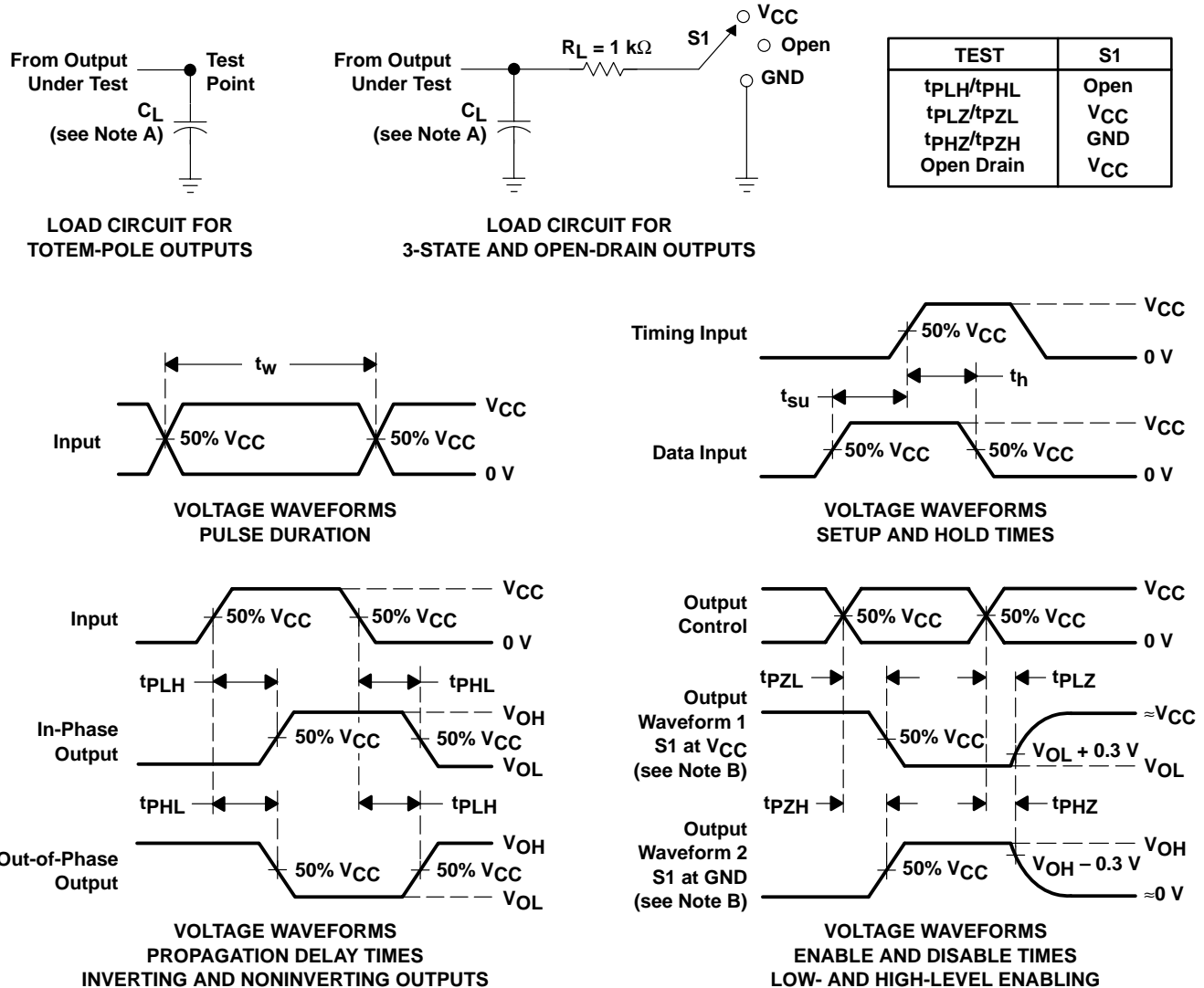
operating characteristics, V_{CC} = 5 V, T_A = 25°C

| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|-----------------|-------------------------------|--------------------|-----|------|
| C _{pd} | Power dissipation capacitance | No load, f = 1 MHz | 18 | pF |



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PARAMETER MEASUREMENT INFORMATION



- 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. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\text{ }\Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
- D. The outputs are measured one at a time with one input transition per measurement.
- E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

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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⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-9681601Q2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 5962-9681601QCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| 5962-9681601QDA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SN74AHC86D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DBLE | OBSOLETE | SSOP | DB | 14 | | TBD | Call TI | Call TI |
| SN74AHC86DBR | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DBRE4 | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DBRG4 | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DGVR | ACTIVE | TVSOP | DGV | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DGVRE4 | ACTIVE | TVSOP | DGV | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DGVRG4 | ACTIVE | TVSOP | DGV | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86N | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74AHC86NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74AHC86NSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86NSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86NSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86PW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86PWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86PWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86PWLE | OBSOLETE | TSSOP | PW | 14 | | TBD | Call TI | Call TI |
| SN74AHC86PWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86PWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | 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⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74AHC86PWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHC86RGYR | ACTIVE | VQFN | RGY | 14 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| SN74AHC86RGYRG4 | ACTIVE | VQFN | RGY | 14 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| SNJ54AHC86FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54AHC86J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54AHC86W | 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.

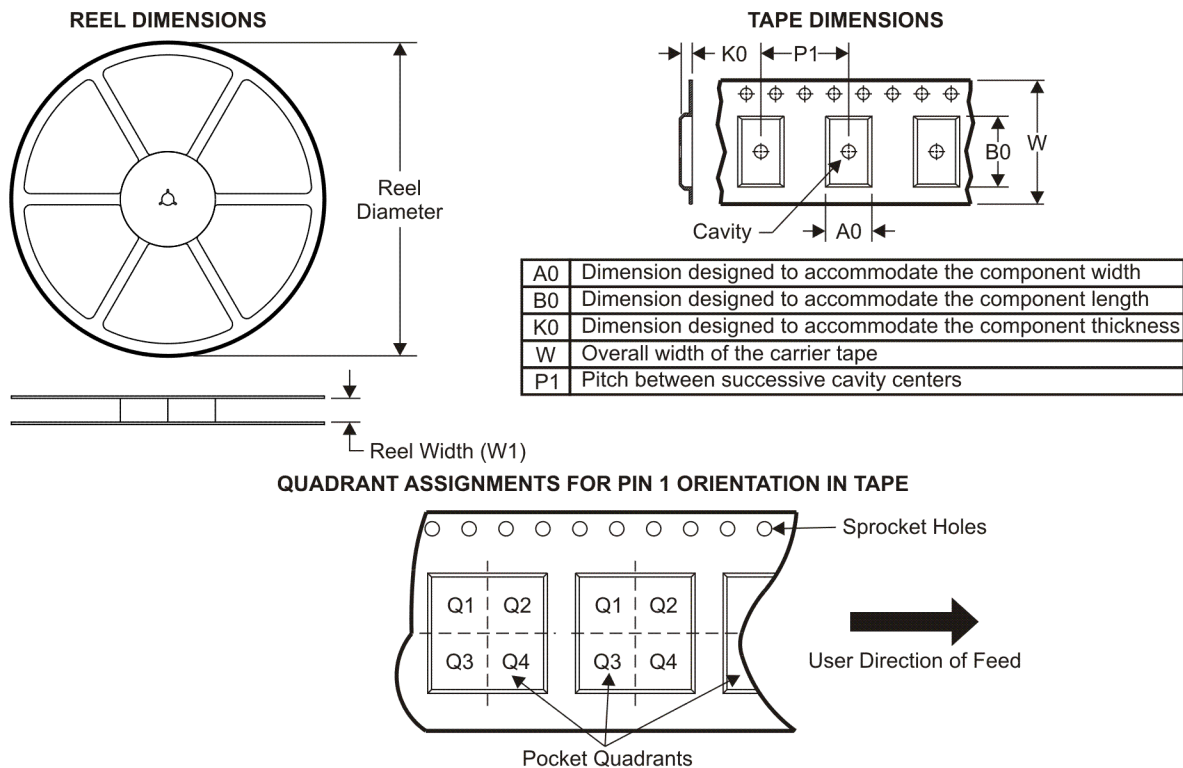
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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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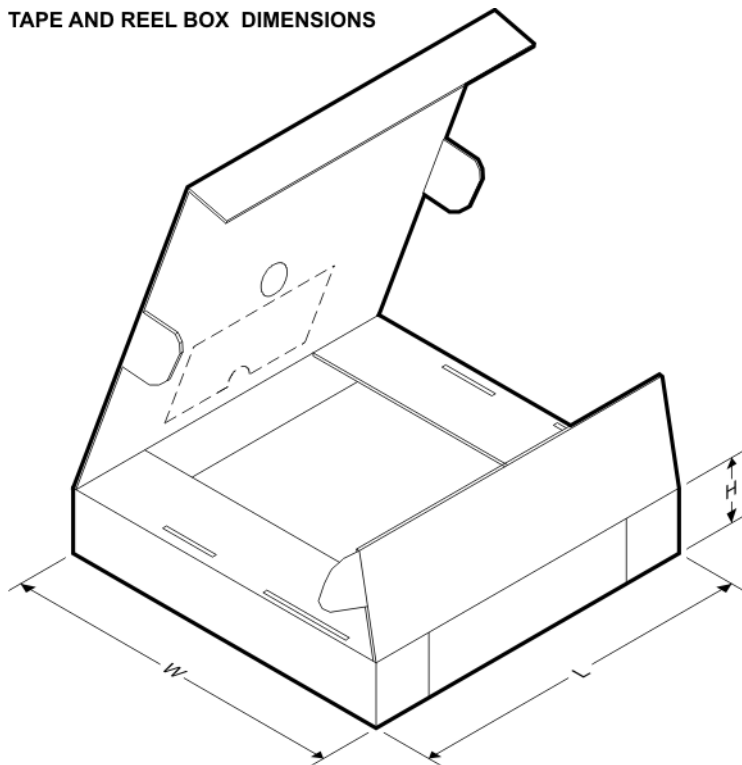
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TAPE AND REEL INFORMATION


*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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHC86DBR | SSOP | DB | 14 | 2000 | 330.0 | 16.4 | 8.2 | 6.6 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74AHC86DGVR | TVSOP | DGV | 14 | 2000 | 330.0 | 12.4 | 6.8 | 4.0 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74AHC86DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74AHC86NSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74AHC86PWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 7.0 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74AHC86RGYR | VQFN | RGY | 14 | 3000 | 180.0 | 12.4 | 3.75 | 3.75 | 1.15 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



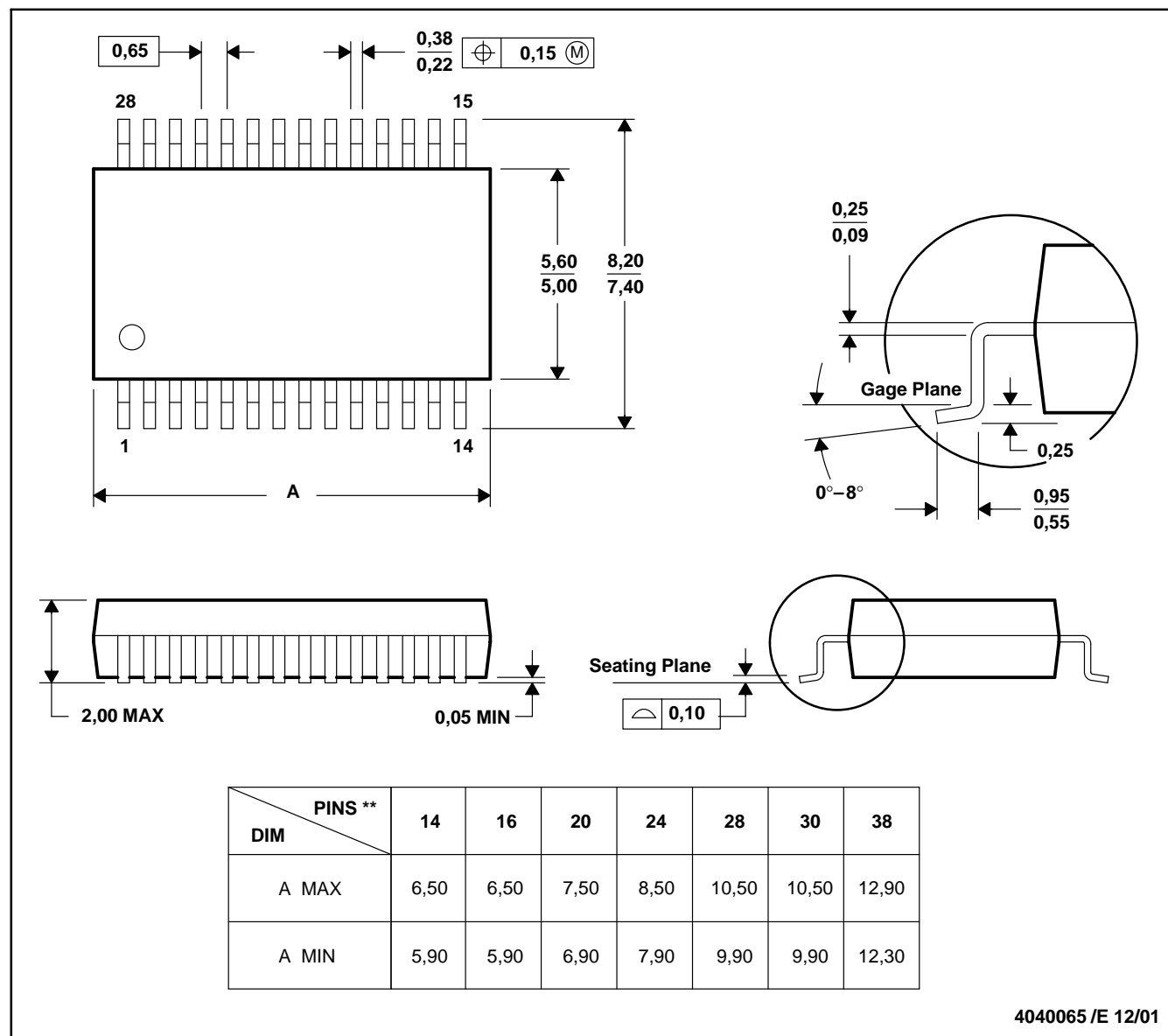
*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHC86DBR | SSOP | DB | 14 | 2000 | 346.0 | 346.0 | 33.0 |
| SN74AHC86DGVR | TVSOP | DGV | 14 | 2000 | 346.0 | 346.0 | 29.0 |
| SN74AHC86DR | SOIC | D | 14 | 2500 | 346.0 | 346.0 | 33.0 |
| SN74AHC86NSR | SO | NS | 14 | 2000 | 346.0 | 346.0 | 33.0 |
| SN74AHC86PWR | TSSOP | PW | 14 | 2000 | 346.0 | 346.0 | 29.0 |
| SN74AHC86RGYR | VQFN | RGY | 14 | 3000 | 190.5 | 212.7 | 31.8 |

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN

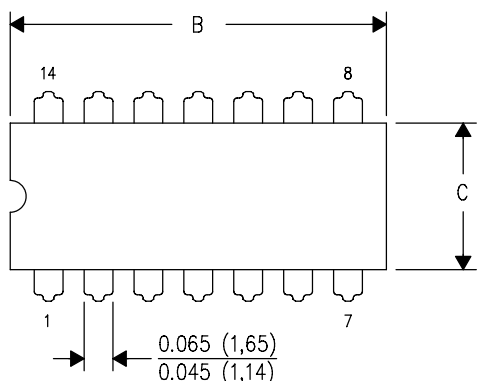


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-150

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| PINS ** DIM | 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:
- 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**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



| DIM \ PINS ** | 14 | 16 | 20 | 24 |
|---------------|-------|-------|-------|-------|
| A MAX | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN | 9,90 | 9,90 | 12,30 | 14,70 |

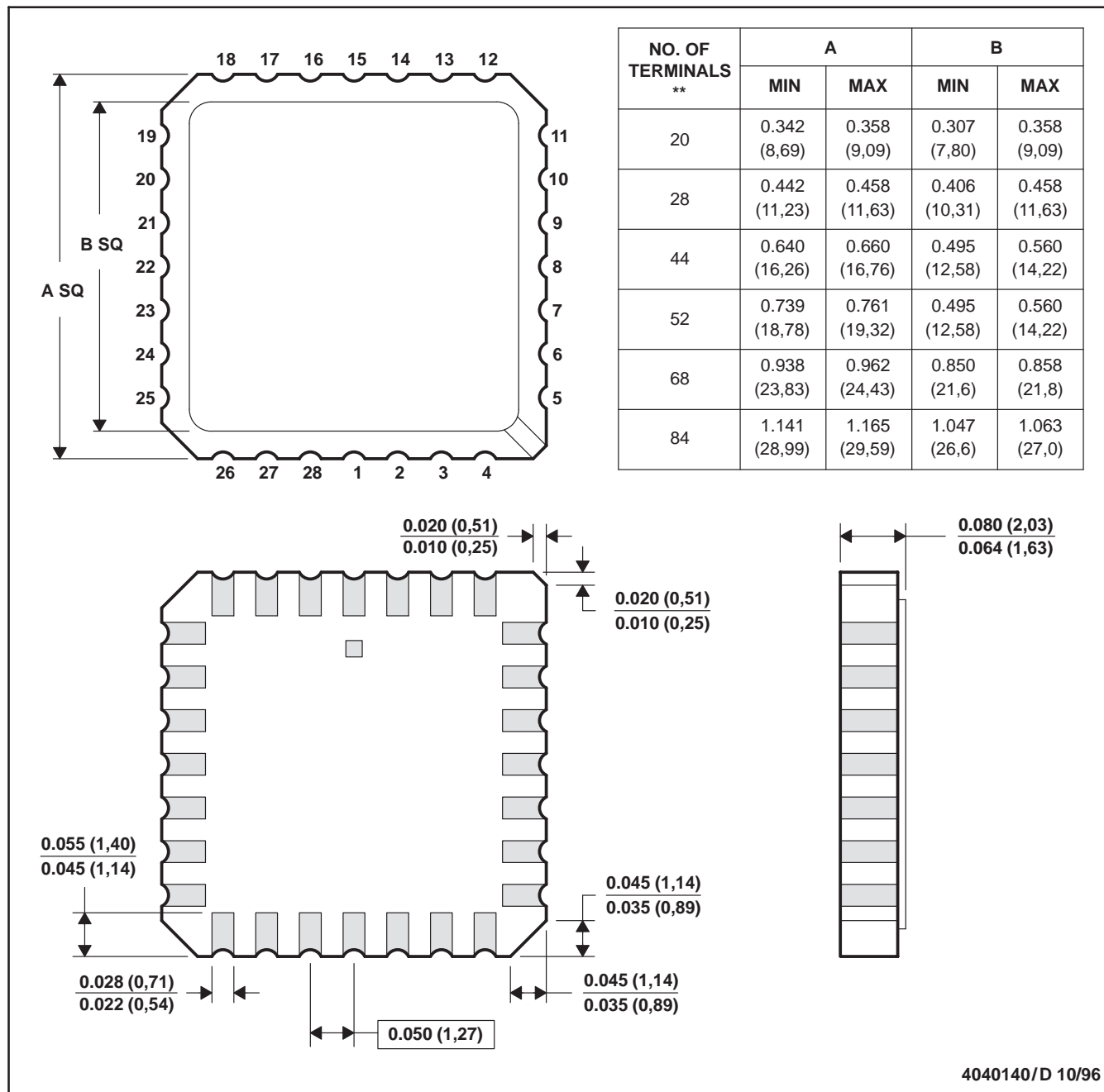
4040062/C 03/03

- 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.

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

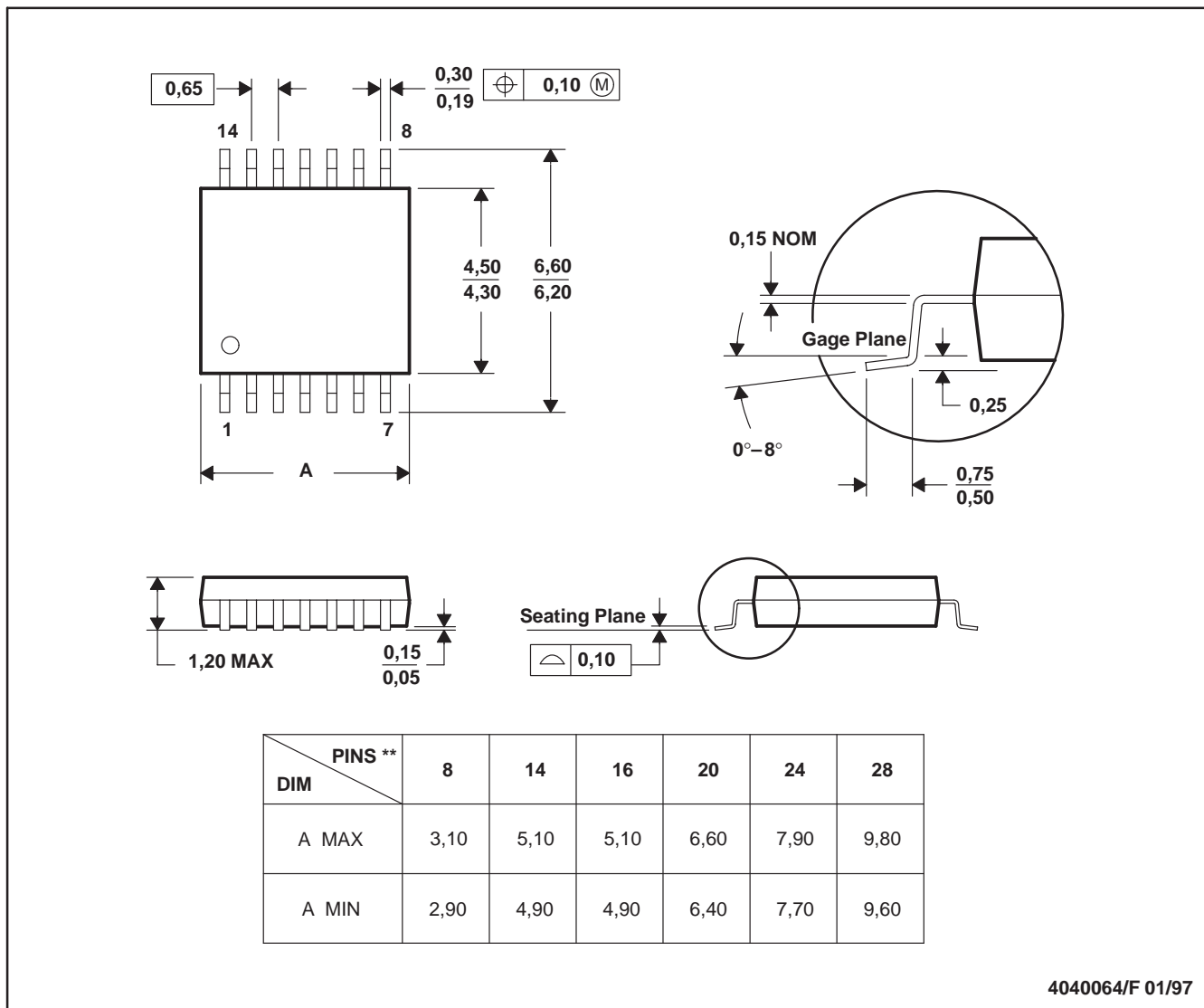


- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - The terminals are gold plated.
 - Falls within JEDEC MS-004

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN

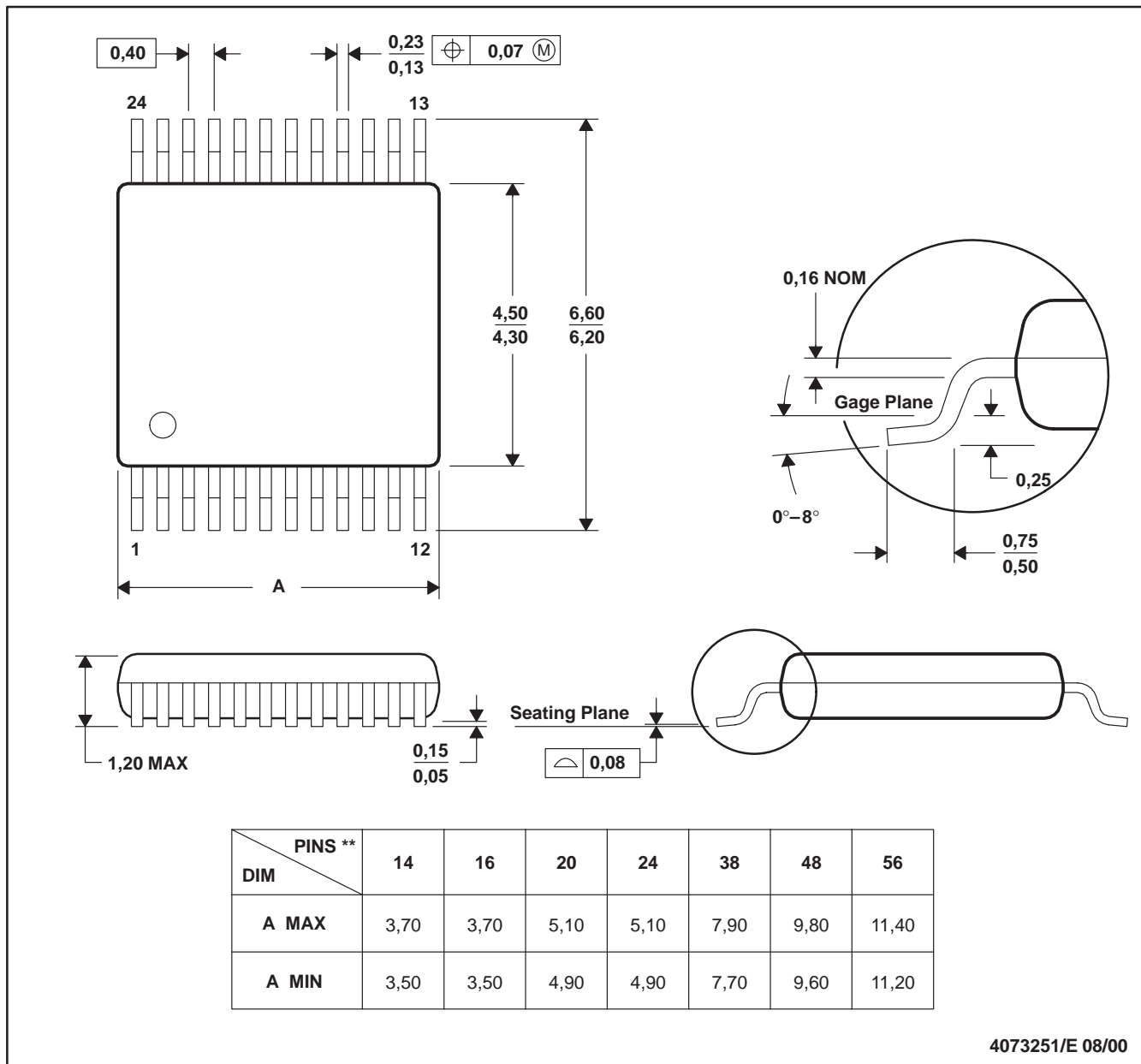


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

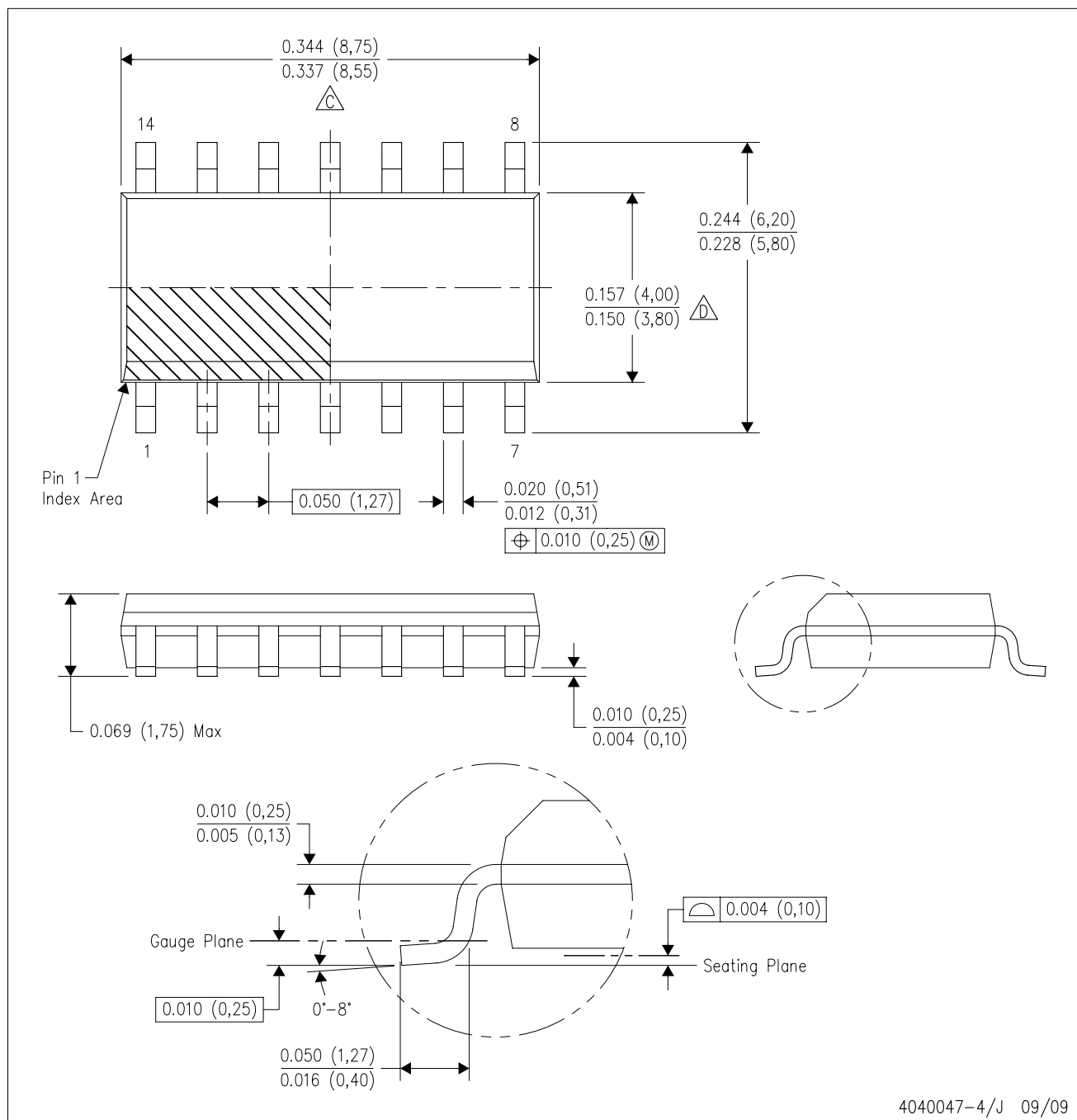
24 PINS SHOWN



- 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 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE

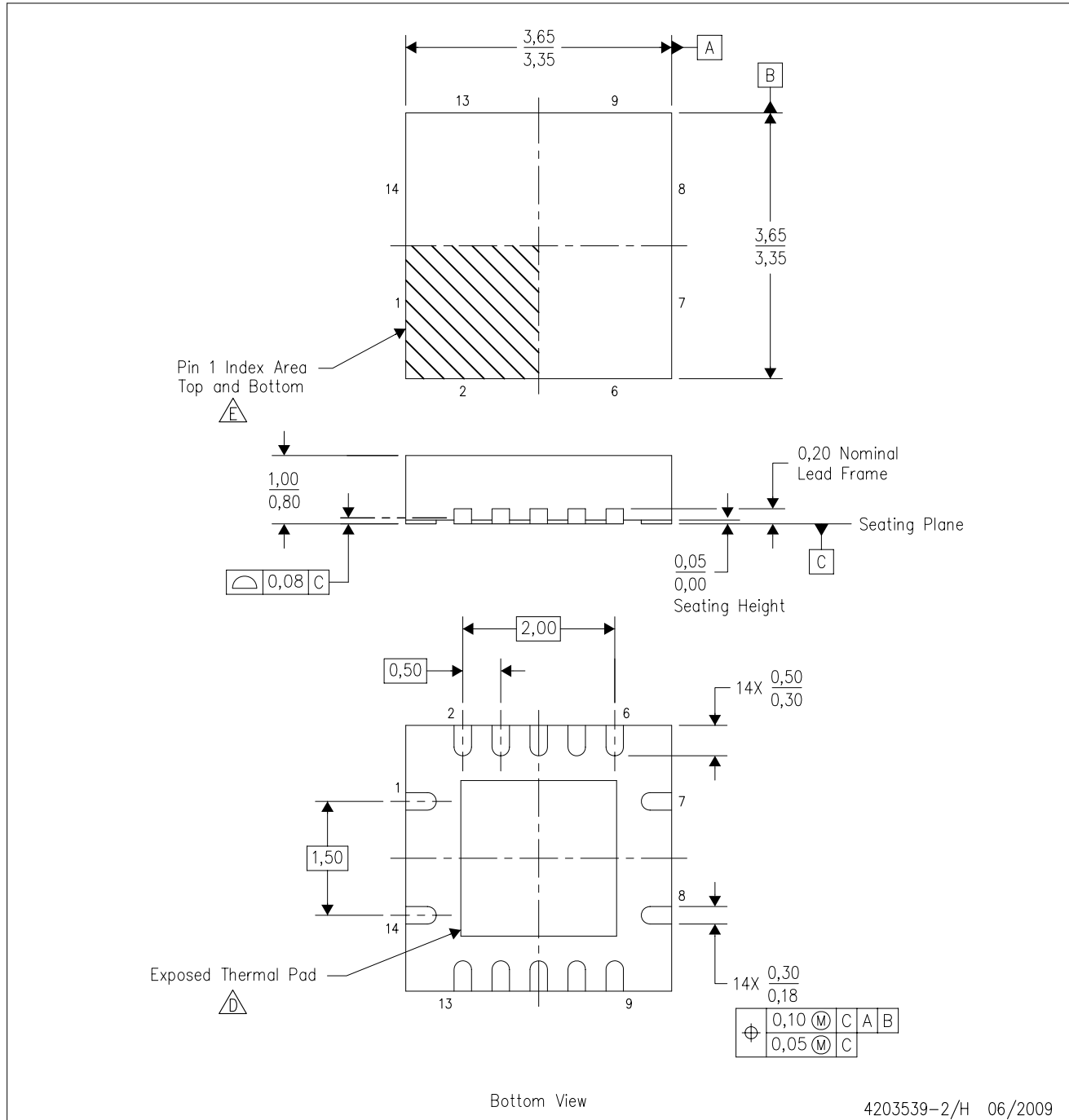


NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. 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.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AB.

RGY (S-PVQFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD



4203539-2/H 06/2009

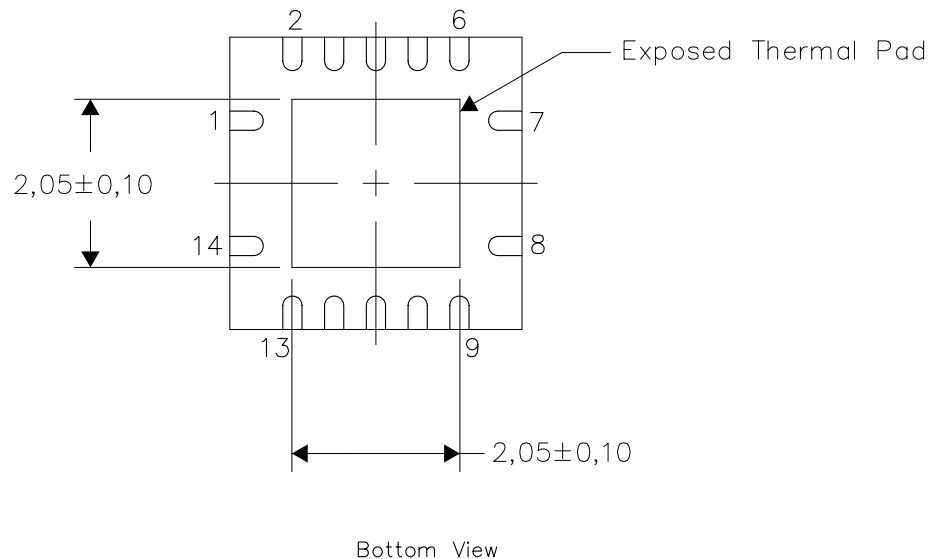
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 - The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.
 - Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
 - F. Package complies to JEDEC MO-241 variation BA.

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

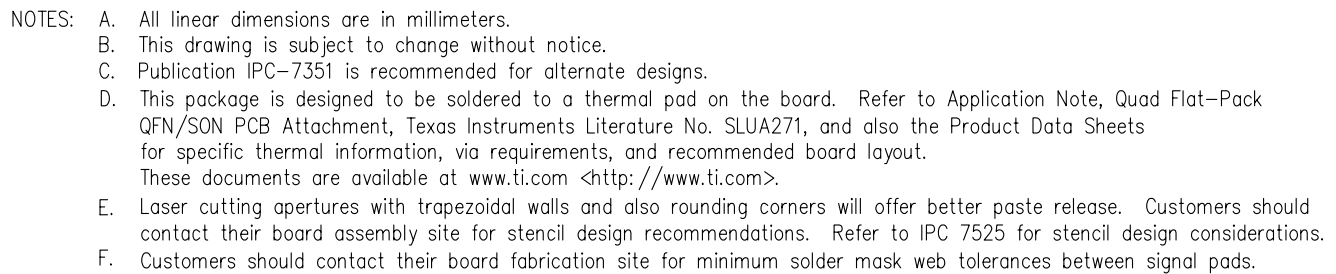
For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



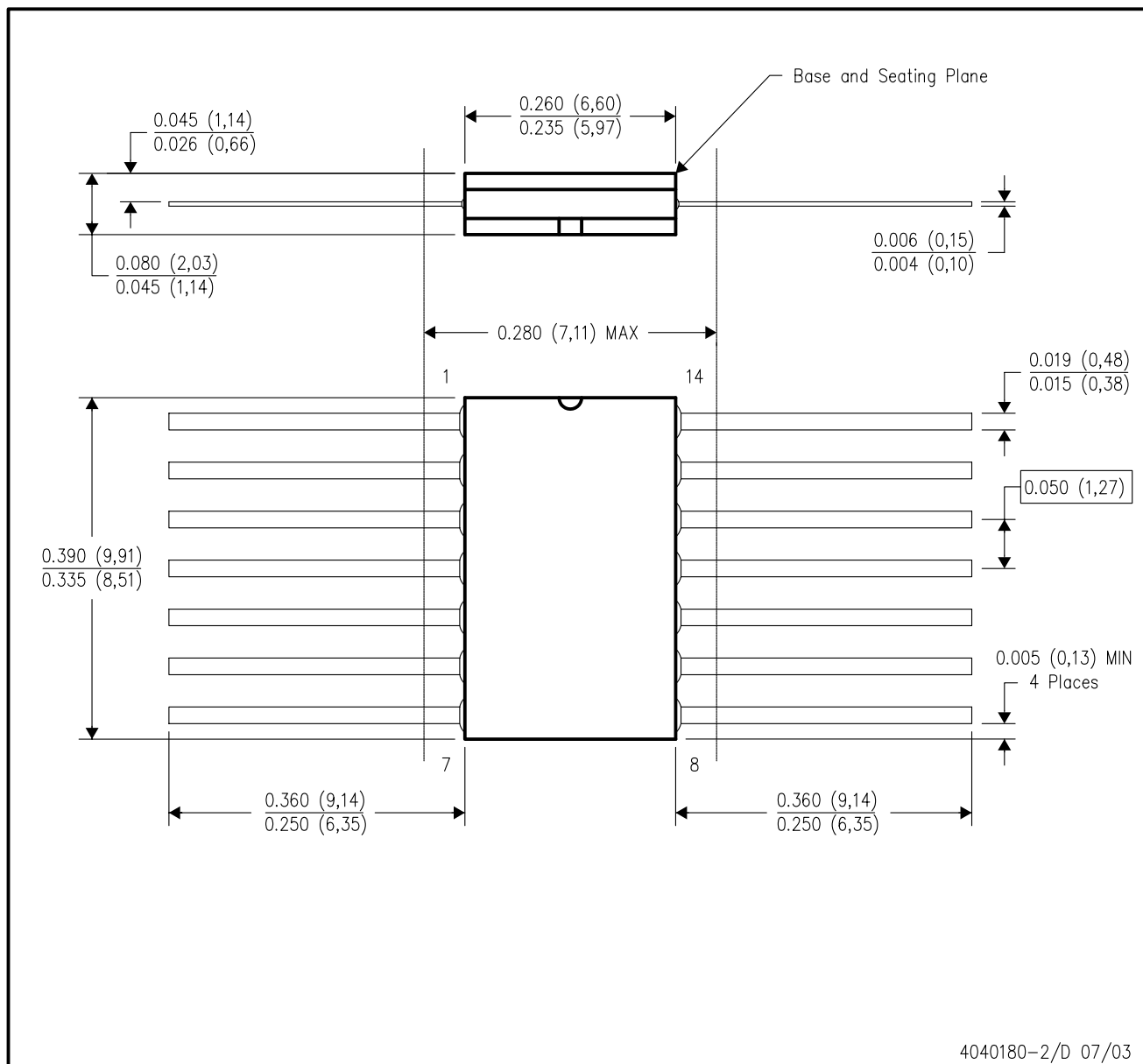
NOTES: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions



W (R-GDFP-F14)

CERAMIC DUAL FLATPACK

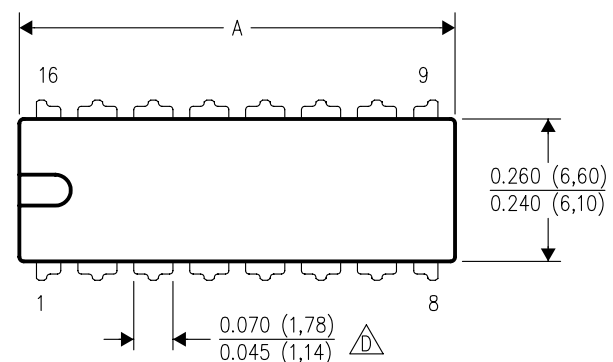


- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only.
 - Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

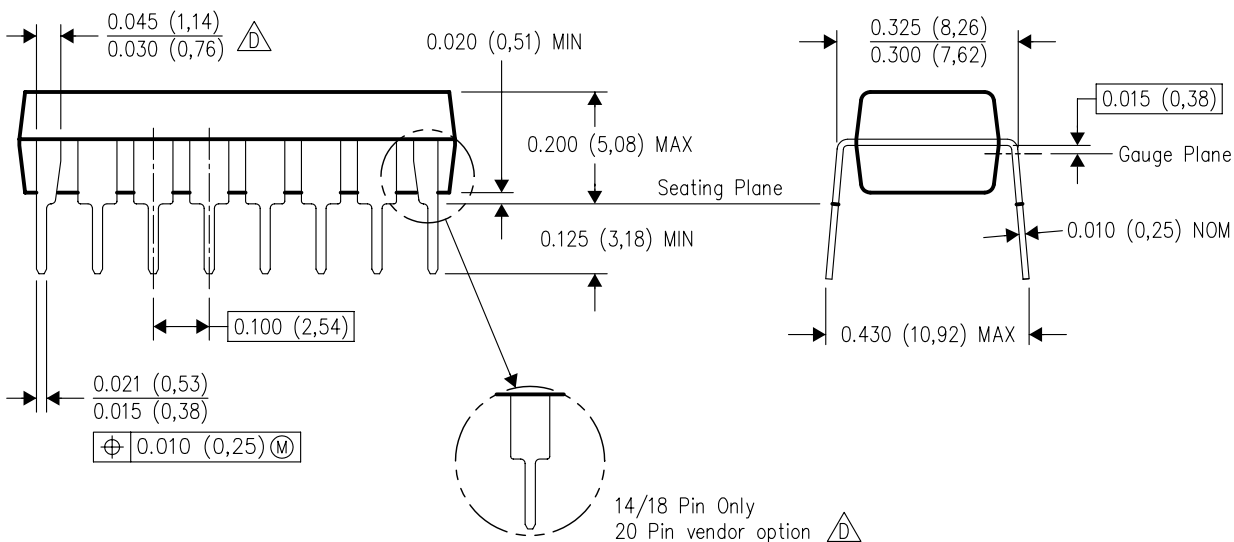
N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE





| PINS ** DIM | 14 | 16 | 18 | 20 |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS-001 VARIATION | AA | BB | AC | AD |



4040049/E 12/2002

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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