

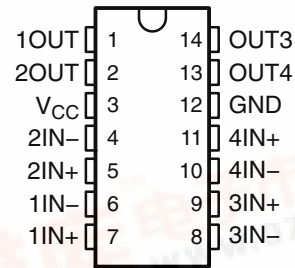
LM2901-Q1, LM2901AV-Q1, LM2901V-Q1 QUADRUPLE DIFFERENTIAL COMPARATOR

查询"LM2901-Q1"供应商

SLCS142D – DECEMBER 2003 – REVISED APRIL 2008

- Qualified for Automotive Applications
- Single Supply or Dual Supplies
- Low Supply-Current Drain Independent of Supply Voltage . . . 0.8 mA Typ
- Low Input Bias Current . . . 25 nA Typ
- Low Input Offset Current . . . 2 nA Typ
- Low Input Offset Voltage . . . 2 mV Typ
- Common-Mode Input Voltage Range Includes Ground
- Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . ± 36 V
- Low Output Saturation Voltage
- Output Compatible With TTL, MOS, and CMOS
- For Single Version in SOT23-5, See TL331

D OR PW PACKAGE
(TOP VIEW)



description/ordering information

This device consists of four independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies is possible, as long as the difference between the two supplies is 2 V to 36 V, and V_{CC} is at least 1.5 V more positive than the input common-mode voltage. Current drain is independent of the supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

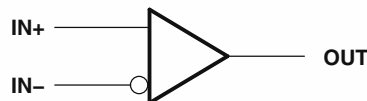
ORDERING INFORMATION†

| T_A | V_{IOmax} AT 25°C | MAX V_{CC} | PACKAGE‡ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------------------|-----------------|------------|--------------|--------------------------|---------------------|
| -40°C to 125°C | 7 mV | 30 V | SOIC (D) | Reel of 2500 | LM2901QDRQ1 | 2901Q1 |
| | | | TSSOP (PW) | Reel of 2000 | LM2901QPWRQ1 | 2901Q1 |
| -40°C to 125°C | 7 mV | 32 V | SOIC (D) | Reel of 2500 | LM2901VQDRQ1 | 2901VQ1 |
| | | | TSSOP (PW) | Reel of 2000 | LM2901VQPWRQ1 | 2901VQ1 |
| -40°C to 125°C | 2 mV | 32 V | SOIC (D) | Reel of 2500 | LM2901AVQDRQ1 | 2901AVQ |
| | | | TSSOP (PW) | Reel of 2000 | LM2901AVQPWRQ1 | 2901AVQ |

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at <http://www.ti.com>.

‡ Package drawings, thermal data, and symbolization are available at <http://www.ti.com/packaging>.

symbol (each comparator)



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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.

 **TEXAS
INSTRUMENTS**

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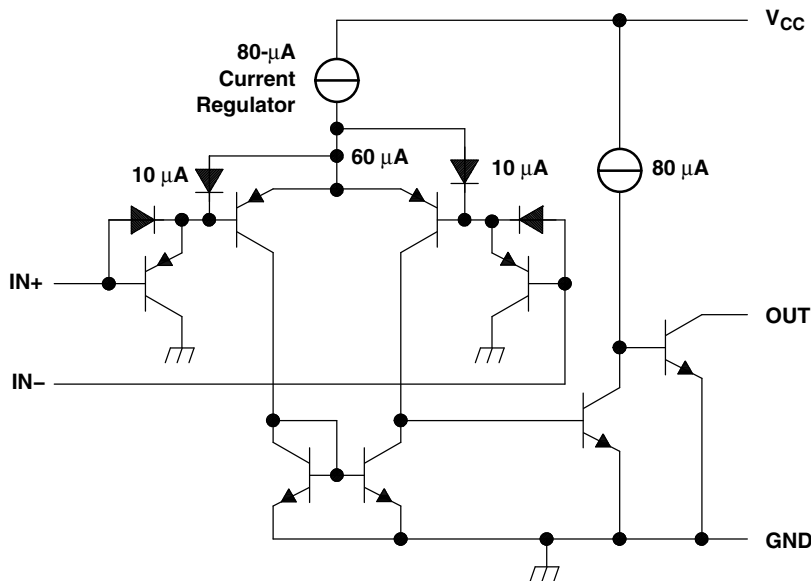
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LM2901-Q1, LM2901AV-Q1, LM2901V-Q1 QUADRUPLE DIFFERENTIAL COMPARATOR

SLCS221G "REVISED" DECEMBER 2003 "REVISED" APRIL 2008

schematic (each comparator)



All current values shown are nominal.

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

| | |
|---|----------------|
| Supply voltage, V_{CC} (see Note 1) | 36 V |
| Differential input voltage, V_{ID} (see Note 2) | ± 36 V |
| Input voltage range, V_I (either input) | -0.3 V to 36 V |
| Output voltage, V_O | 36 V |
| Output current, I_O | 20 mA |
| Duration of output short circuit to ground (see Note 3) | Unlimited |
| Package thermal impedance, θ_{JA} (see Notes 4 and 5): | |
| D package | 86°C/W |
| PW package | 113°C/W |
| Operating virtual junction temperature, T_J | 150°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds | 260°C |
| 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:
- All voltage values, except differential voltages, are with respect to network ground.
 - Differential voltages are at IN+ with respect to IN-.
 - Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.
 - Maximum power dissipation is a function of $T_J(\max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 - The package thermal impedance is calculated in accordance with JESD 51-7.

LM2901-Q1, LM2901AV-Q1, LM2901V-Q1 QUADRUPLE DIFFERENTIAL COMPARATOR

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electrical characteristics at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | T_A ‡ | MIN | TYP | MAX | UNIT | |
|-----------|---|--|------------------|-----------------------------------|------------|----------------------------|-----------------|------|---------------|
| V_{IO} | Input offset voltage | $V_{IC} = V_{ICR}(\text{min})$, $V_O = 1.4\text{ V}$, $V_{CC} = 5\text{ V to MAX}^{\S}$ | Non-A devices | 25°C | | 2 | 7 | mV | |
| | | | | Full range | | | 15 | | |
| | | | A-suffix devices | 25°C | | 1 | 2 | | |
| | | | | Full range | | | 4 | | |
| I_{IO} | Input offset current | $V_O = 1.4\text{ V}$ | | 25°C | | 5 | 50 | nA | |
| | | | | Full range | | | 200 | | |
| I_{IB} | Input bias current | $V_O = 1.4\text{ V}$ | | 25°C | | -25 | -250 | nA | |
| | | | | Full range | | | -500 | | |
| V_{ICR} | Common-mode input-voltage range | | | 25°C | | 0 to $V_{CC}-1.5$ | | V | |
| | | | | Full range | | | 0 to $V_{CC}-2$ | | |
| A_{VD} | Large-signal differential-voltage amplification | $V_{CC} = 15\text{ V}$, $V_O = 1.4\text{ V to }11.4\text{ V}$, $R_L \geq 15\text{ k}\Omega\text{ to }V_{CC}$ | | 25°C | | 25 | 100 | V/mV | |
| I_{OH} | High-level output current | $V_{ID} = 1\text{ V}$ | | $V_{OH} = 5\text{ V}$ | 25°C | | 0.1 | 50 | nA |
| | | | | $V_{OH} = V_{CC}\text{ MAX}^{\S}$ | Full range | | | 1 | μA |
| V_{OL} | Low-level output voltage | $V_{ID} = -1\text{ V}$, $I_{OL} = 4\text{ mA}$ | | 25°C | | 150 | 400 | mV | |
| | | | | Full range | | | 700 | | |
| I_{OL} | Low-level output current | $V_{ID} = -1\text{ V}$, $V_{OL} = 1.5\text{ V}$ | | 25°C | | 6 | 16 | mA | |
| I_{CC} | Supply current (four comparators) | $V_O = 2.5\text{ V}$, No load | | 25°C | | $V_{CC} = 5\text{ V}$ | 0.8 | 2 | mA |
| | | | | | | $V_{CC} = \text{MAX}^{\S}$ | 1 | 2.5 | |

† All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

‡ Full range (MIN to MAX) for LM2901 is -40°C to 125°C . All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

§ $V_{CC}\text{ MAX} = 30\text{ V}$ for non-V devices and 32 V for V-suffix devices.

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---------------|--|---------------------------------------|-----|-----|-----|---------------|
| Response time | R_L connected to 5 V through $5.1\text{ k}\Omega$, $C_L = 15\text{ pF}$ †, See Note 6 | 100-mV input step with 5-mV overdrive | | 1.3 | | μs |
| | | TTL-level input step | | 0.3 | | |

† C_L includes probe and jig capacitance.

NOTE 6: The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V .





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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 |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--------------|
| LM2901AVQDRG4Q1 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901AVQDRQ1 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901AVQPWRG4Q1 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901AVQPWRQ1 | ACTIVE | TSSOP | PW | 14 | 2000 | Pb-Free (RoHS) | CU NIPDAU | Level-1-2500 |
| LM2901QDRG4Q1 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901QDRQ1 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901QPWRG4Q1 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901QPWRQ1 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901VQDRG4Q1 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901VQDRQ1 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901VQPWRG4Q1 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-2600 |
| LM2901VQPWRQ1 | ACTIVE | TSSOP | PW | 14 | 2000 | TBD | CU NIPDAU | Level-1-2500 |

⁽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> for more 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 RoHS materials, with the exception of 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



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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, 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 (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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OTHER QUALIFIED VERSIONS OF LM2901-Q1, LM2901AV-Q1, LM2901V-Q1 :

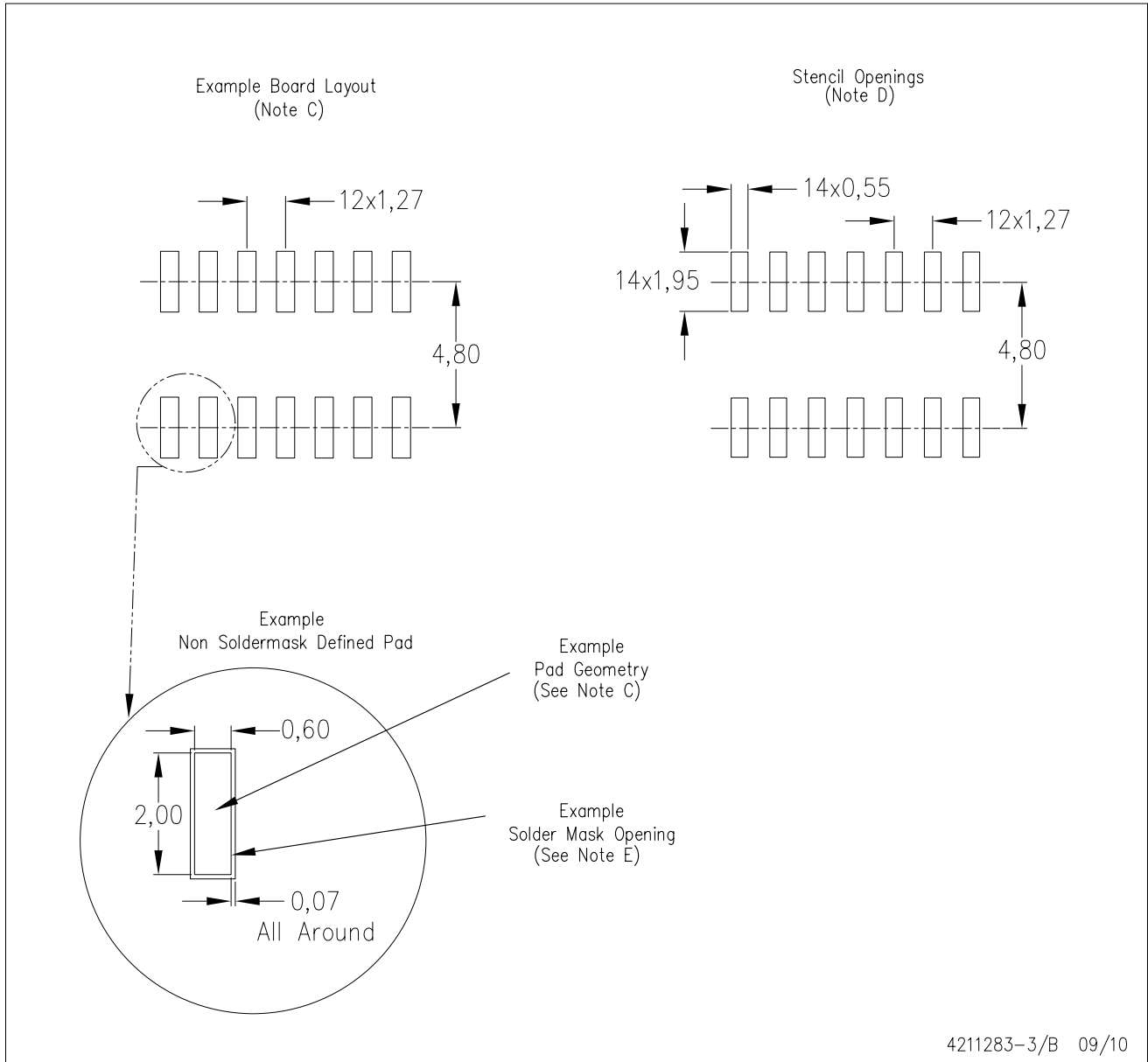
- Catalog: [LM2901](#), [LM2901AV](#), [LM2901V](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE

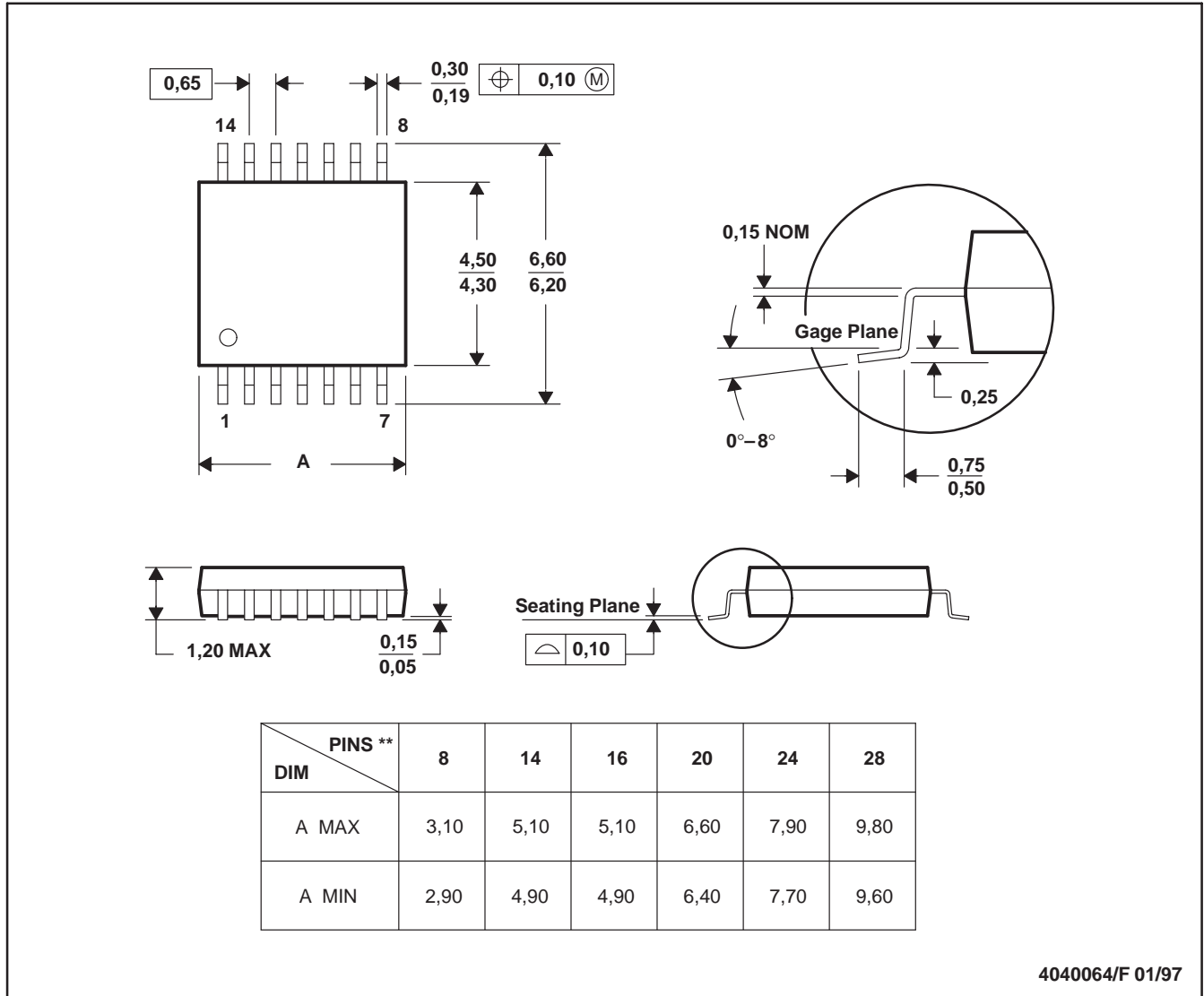


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should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

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

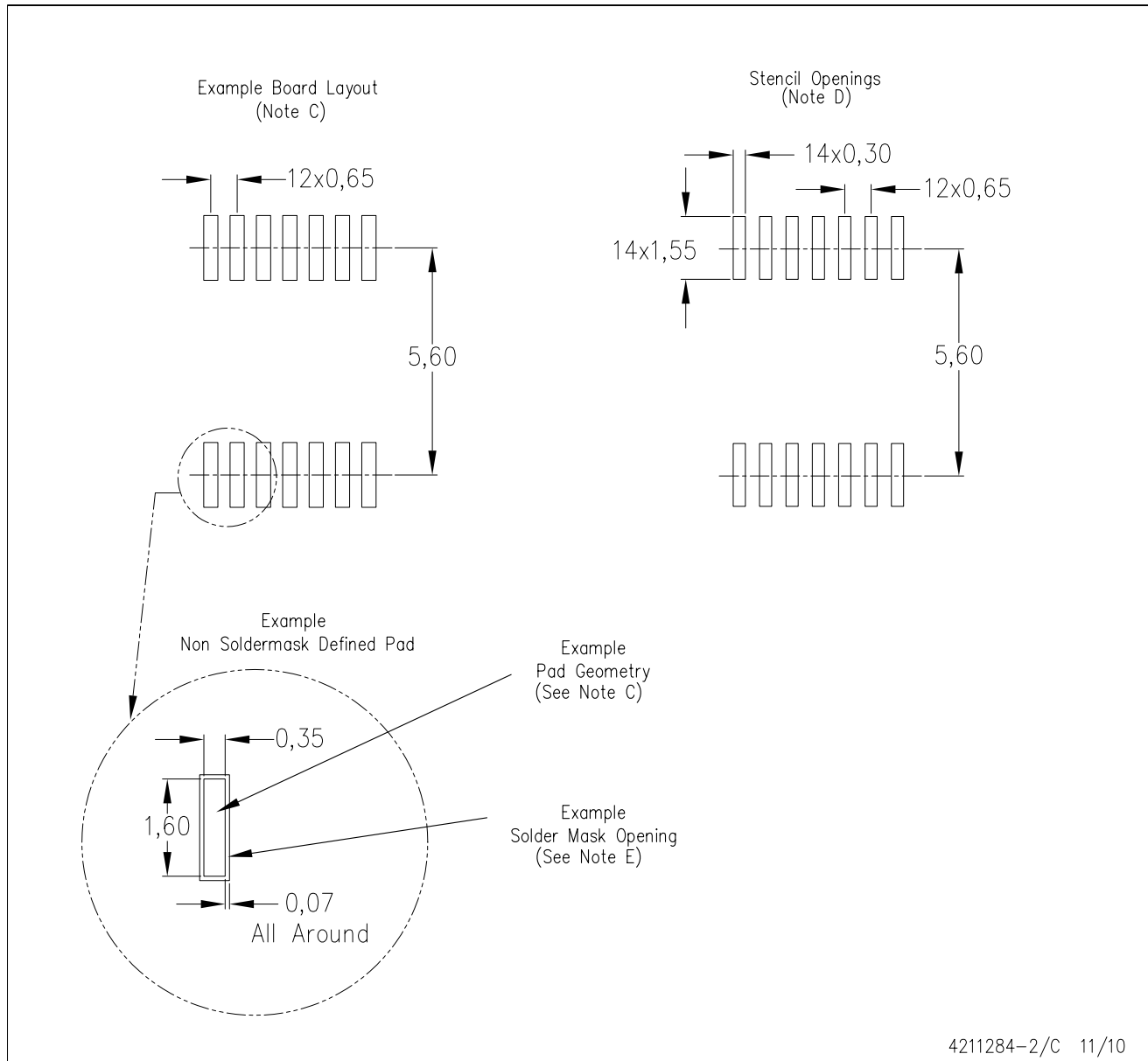
14 PINS SHOWN



- 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

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - 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.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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