

## features

- 10-Bit, 25-MSPS, Analog-to-Digital Converter (ADC)
- Single Power Supply Operation, 2.7 V to 3.3 V
- Low Power: 95 mW at 2.7 V, Power-Down Mode: 1 mW
- Full-Channel Differential-Nonlinearity Error:  $<\pm 0.5$  LSB Typical
- Full-Channel Integral-Nonlinearity Error:  $<\pm 1.5$  LSB Typical
- Dual Input Modes: CCD and Video
- Programmable-Gain Amplifier (PGA) With 0-dB to 36-dB Gain Range (0.047 dB/Step) for CCD Mode, 0-dB to 12-dB Gain Range (0.047 dB/Step) for Video Mode
- Serial Interface for Register Configuration
- Programmable Black-Level and Offset Calibration
- Analog Gain Implementation With Specified No Missing Code, Even At High Gains
- Additional Digital-to-Analog Converters (DACs) for External Analog Setting
- Internal Reference Voltages
- Programmable Internal-Timing Signal Delays
- 48-Terminal TQFP Package

## applications

- Digital Still Camera
- Digital Camcorder
- Digital Video Camera

## description

The VSP1021 device is a highly-integrated monolithic analog-signal processor/digitizer designed to interface the area charge-coupled-device (CCD) sensors in digital-camera and camcorder applications. The VSP1021 device performs all the analog processing functions necessary to maximize the dynamic range, corrects various errors associated with the CCD sensor, and then digitizes the results with an on-chip, high-speed ADC. The key components of the VSP1021 device include:

- Input clamp circuitry and a correlated double sampler (CDS)
- Programmable-gain amplifier (PGA) with 0-dB to 36-dB gain range for CCD mode and 0-dB to 12-dB range for video mode
- Two internal DACs for automatic or programmable optical-black-level and offset calibration
- 10-bit, 25-MSPS pipeline ADC for CCD mode and a 28-MSPS ADC for video mode
- Parallel data port for easy microprocessor interface and a serial port for configuring internal control registers
- Two additional DACs for external system control
- Internal reference voltages

The VSP1021 device is designed using advanced CMOS process and operates from a single 3-V power supply with a normal power consumption of just 95 mW, and 1 mW in power-down mode.

High throughput rate, single 3-V operation, very-low-power consumption, and fully-integrated analog-processing circuitry make the VSP1021 device an ideal CCD and video-signal-processing solution for electronic video-camcorder applications.

This device is available in a 48-terminal TQFP package and is specified over an operating temperature range of  $-20^{\circ}\text{C}$  to  $75^{\circ}\text{C}$ .

### AVAILABLE OPTIONS

| T <sub>A</sub>                                | PACKAGE TQFP (PFB) |
|-----------------------------------------------|--------------------|
| $-20^{\circ}\text{C}$ to $75^{\circ}\text{C}$ | VSP1021PFB         |



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 **TEXAS  
INSTRUMENTS**

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PACKAGING INFORMATION

| Orderable part number | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier   | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|-----------------------|---------------|----------------------|-----------------|-------------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| VSP1021PFB            | Active        | Production           | TQFP (PFB)   48 | 250   JEDEC TRAY (10+1) | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -20 to 75    | VSP1021             |
| VSP1021PFB.B          | Active        | Production           | TQFP (PFB)   48 | 250   JEDEC TRAY (10+1) | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -20 to 75    | VSP1021             |

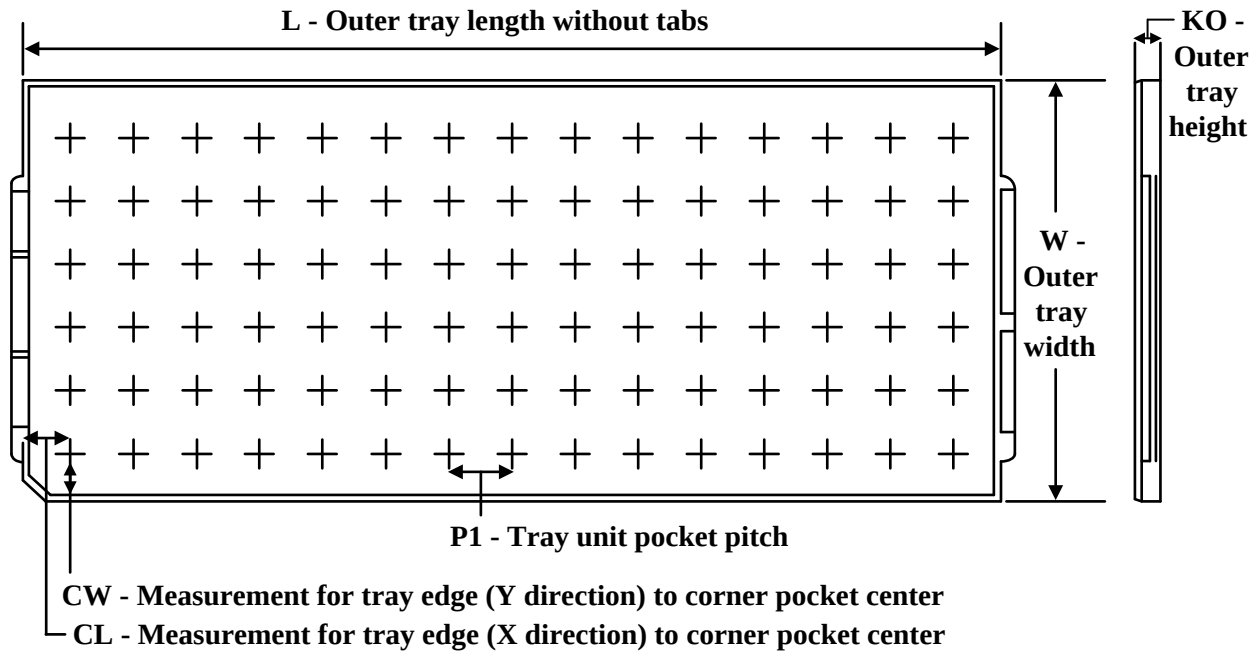
- (1) **Status:** For more details on status, see our [product life cycle](#).
- (2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
- (3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.
- (4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
- (5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
- (6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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## TRAY

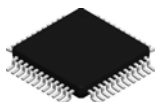


Chamfer on Tray corner indicates Pin 1 orientation of packed units.

\*All dimensions are nominal

| Device       | Package Name | Package Type | Pins | SPQ | Unit array matrix | Max temperature (°C) | L (mm) | W (mm) | K0 (μm) | P1 (mm) | CL (mm) | CW (mm) |
|--------------|--------------|--------------|------|-----|-------------------|----------------------|--------|--------|---------|---------|---------|---------|
| VSP1021PFB   | PFB          | TQFP         | 48   | 250 | 10 x 25           | 150                  | 315    | 135.9  | 7620    | 12.2    | 11.1    | 11.25   |
| VSP1021PFB.B | PFB          | TQFP         | 48   | 250 | 10 x 25           | 150                  | 315    | 135.9  | 7620    | 12.2    | 11.1    | 11.25   |

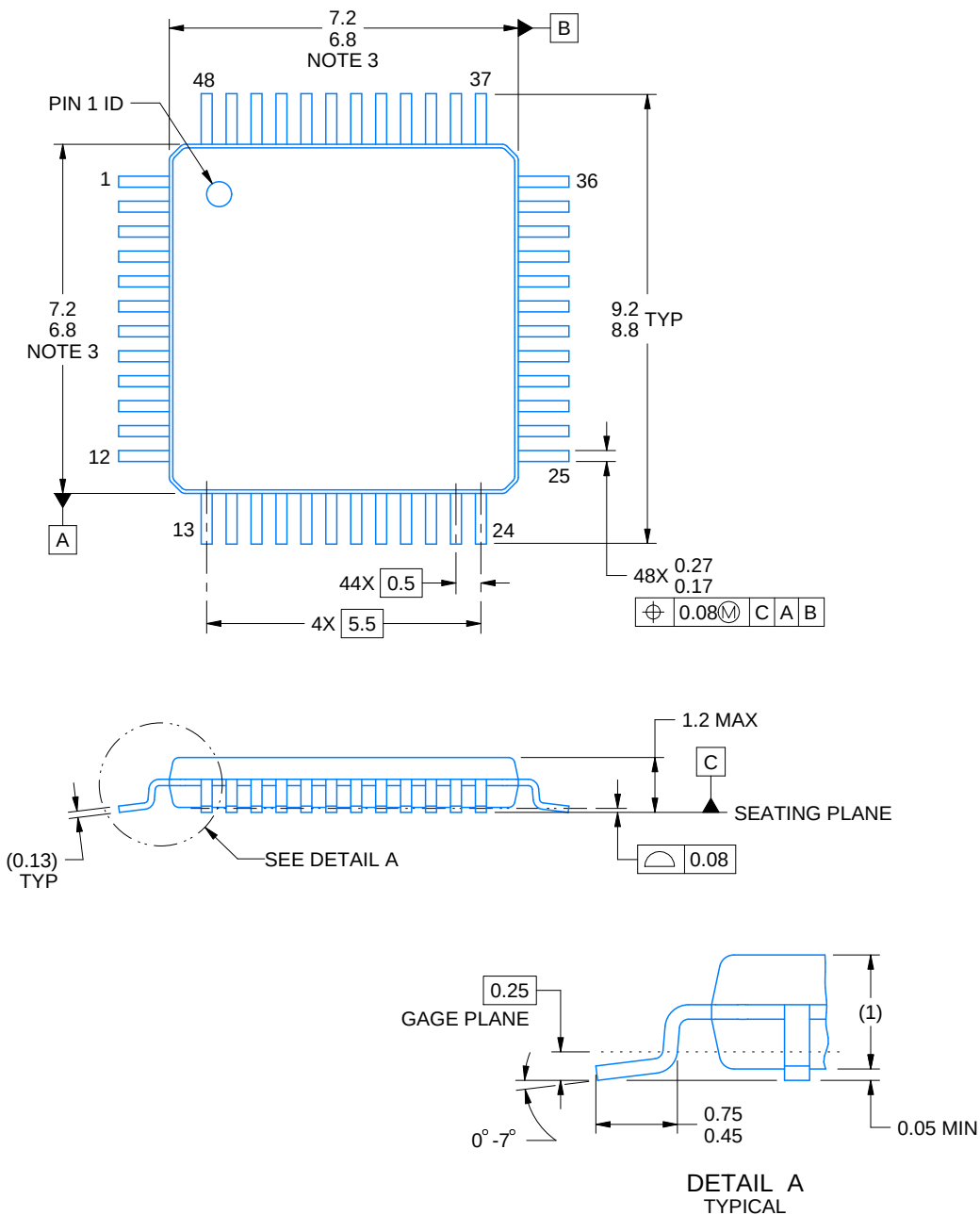
PFB0048A



# PACKAGE OUTLINE

TQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK

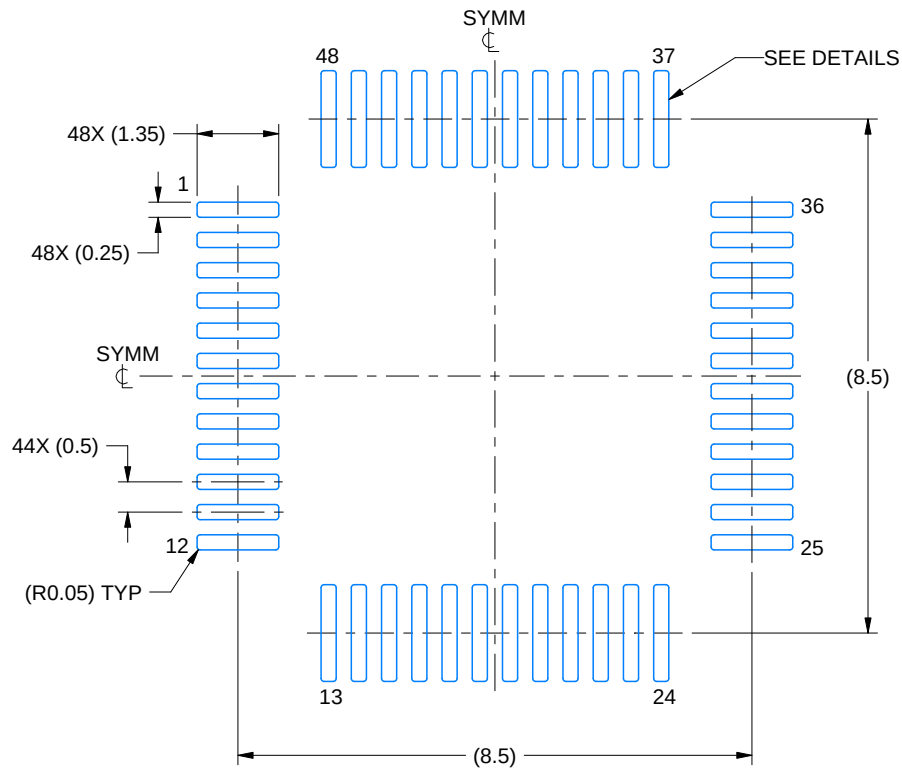


# EXAMPLE BOARD LAYOUT

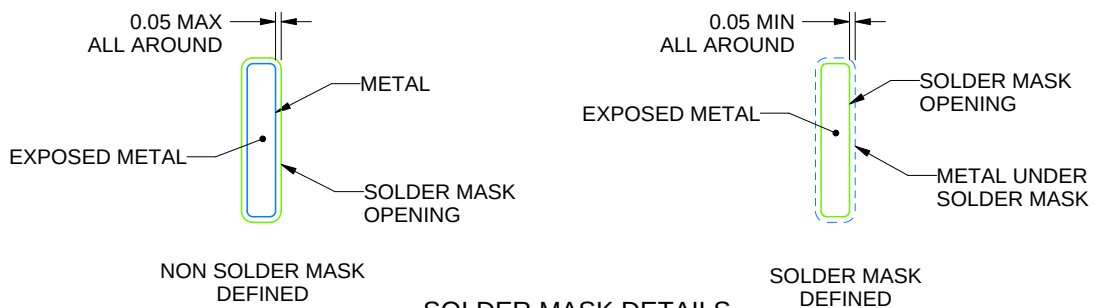
PFB0048A

TQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:8X



SOLDER MASK DETAILS

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NOTES: (continued)

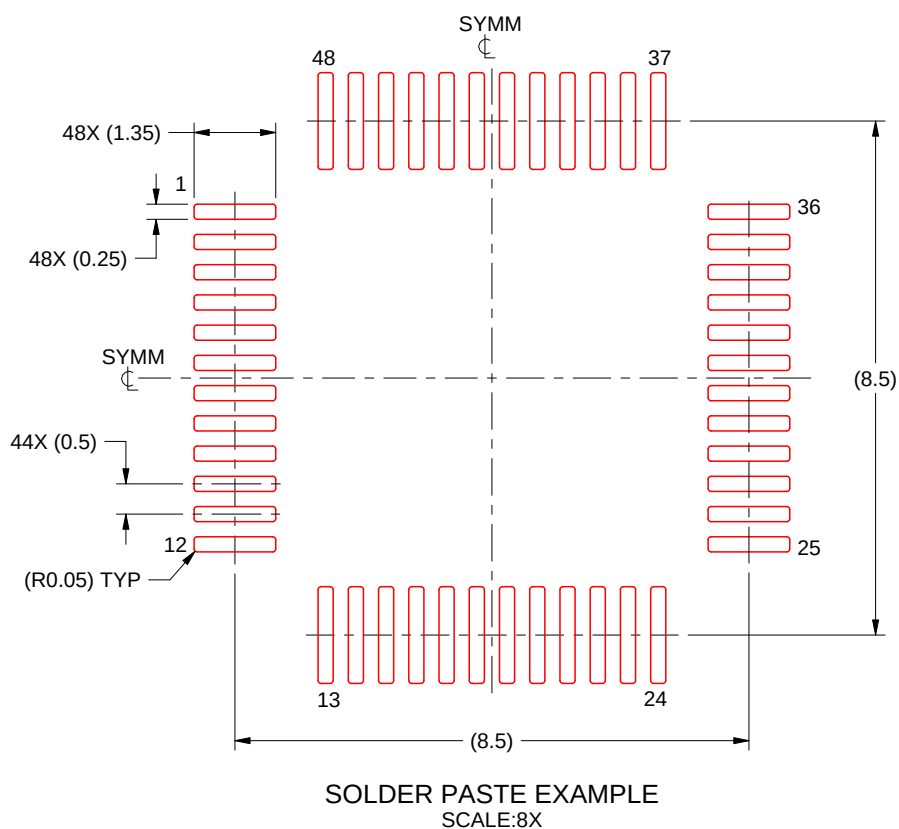
4. Publication IPC-7351 may have alternate designs.
5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PFB0048A

TQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



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NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
7. Board assembly site may have different recommendations for stencil design.

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