## 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: <±0.5 LSB Typical**
- **Full-Channel Integral-Nonlinearity Error: <±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°C to 75°C.

**AVAILABLE OPTIONS**

| $T_A$ | PACKAGE TQFP (PFB) |
|---|---|
| −20°C to 75°C | VSP1021PFB |

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.

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VSP1021PFB | ACTIVE | TQFP | PFB | 48 | 250 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | -20 to 75 | VSP1021 | Samples |

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

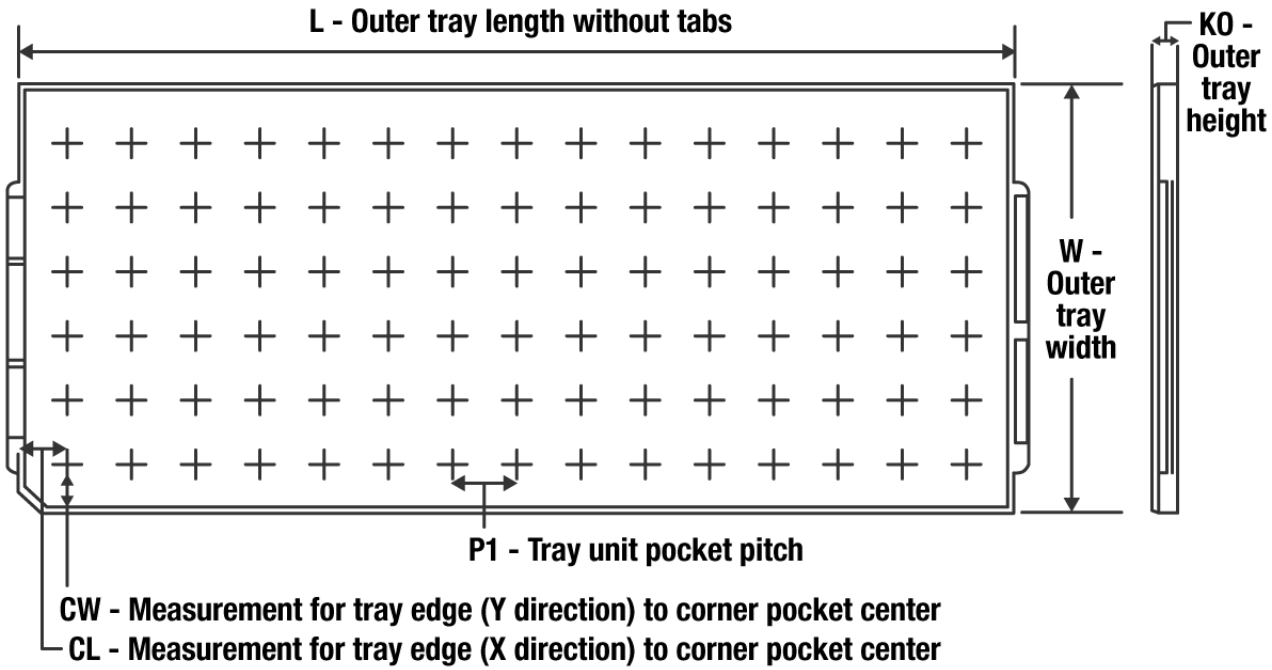
(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

## TRAY




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

*All dimensions are nominal

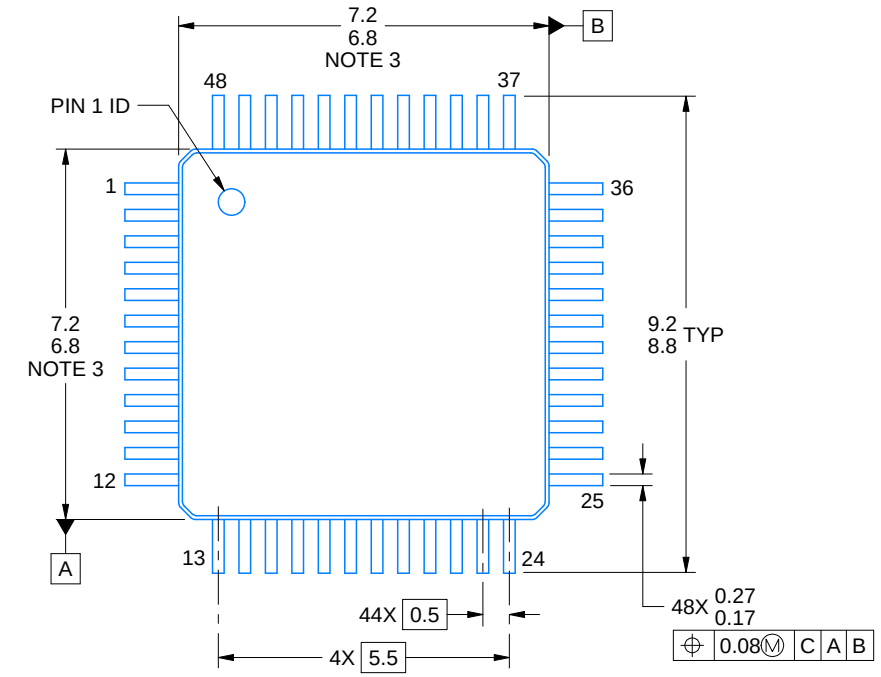
| Device | Package Name | Package Type | Pins | SPQ | Unit array matrix | Max temperature (°C) | L (mm) | W (mm) | K0 (µm) | P1 (mm) | CL (mm) | CW (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VSP1021PFB | PFB | TQFP | 48 | 250 | 10 x 25 | 150 | 315 | 135.9 | 7620 | 12.2 | 11.1 | 11.25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

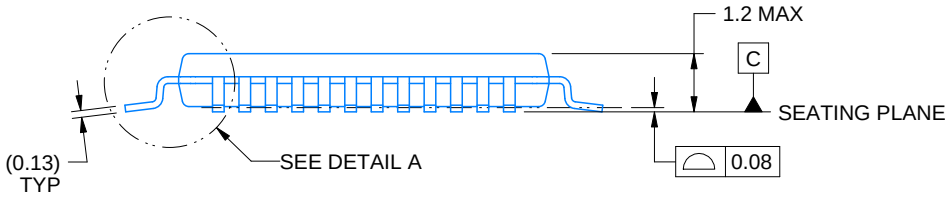
# PACKAGE OUTLINE

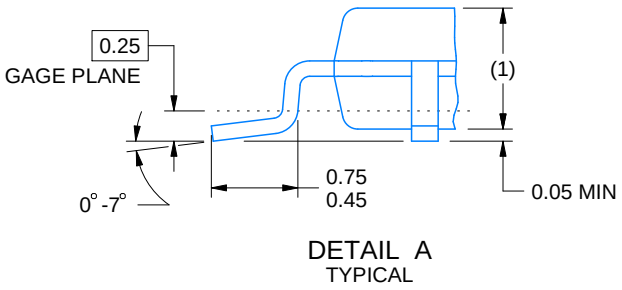
## PFB0048A

## TQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK




DETAIL A
TYPICAL

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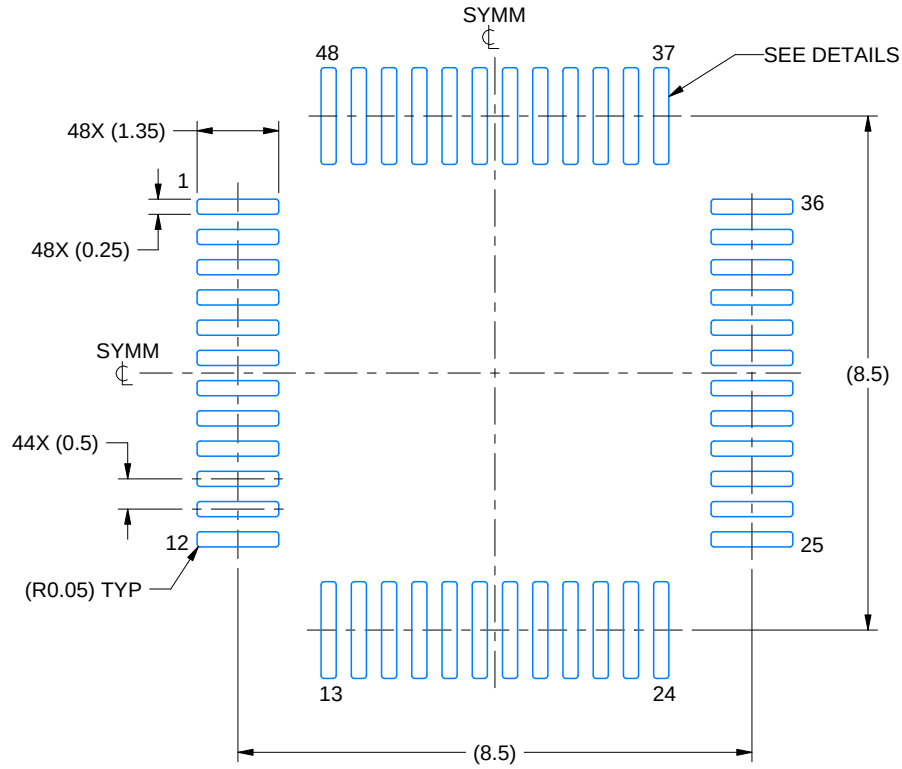
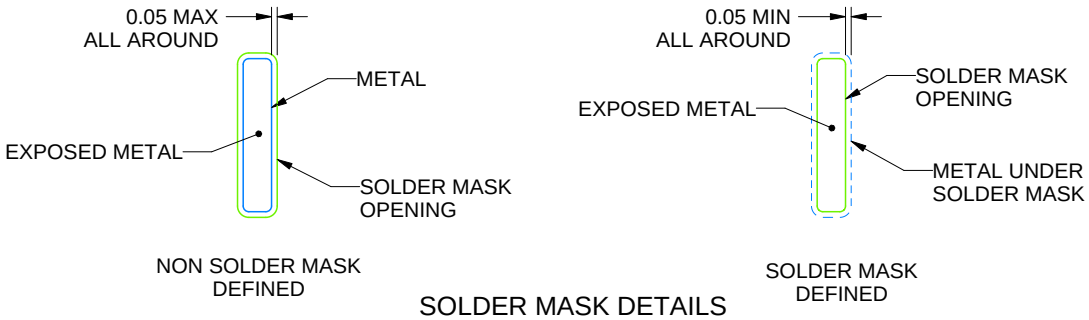
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration MS-026.




LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X




SOLDER MASK DETAILS

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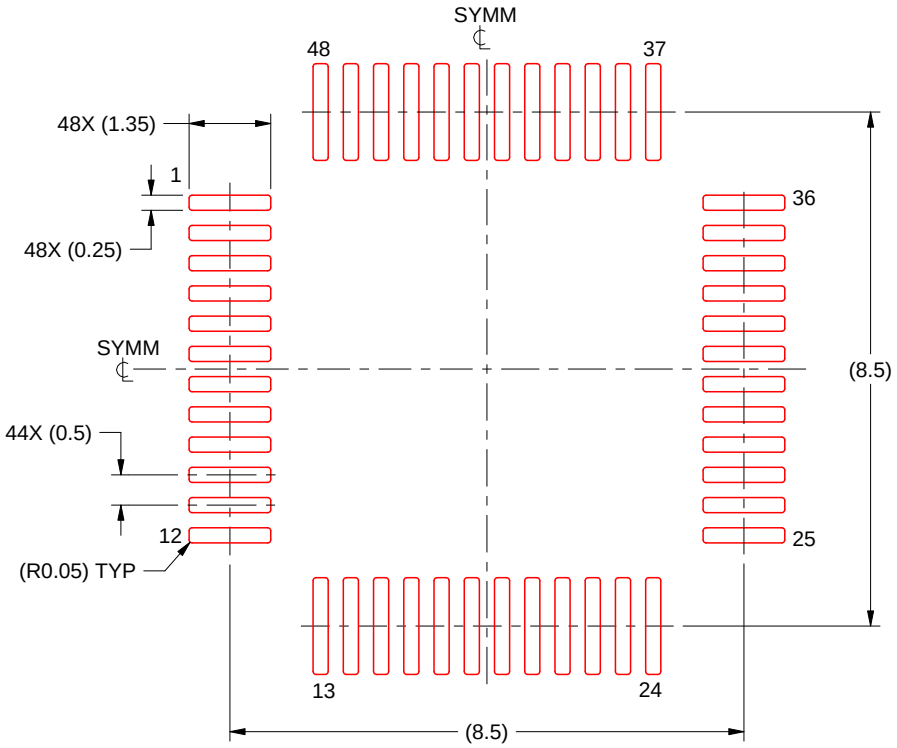
NOTES: (continued)

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




SOLDER PASTE EXAMPLE
SCALE:8X

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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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