12-BIT, 21-MSPS, ULTRALOW-POWER CCD SIGNAL PROCESSOR

FEATURES

- **12-Bit, 21-MSPS, Analog-to-Digital Converter**
- **Low Power: 70 mW Minimum Power-Down Mode: 4 mW**
- **Low Input-Referred Noise: 75-dB SNR Typical at 0-dB Gain**
- **Novel Optical-Black (OB) Calibration**
- **Low-Aperture Delay**
- **Single 3-V Supply Operation**
- **DNL: <±0.5 LSB and INL: <±1.5 LSB Typical at 0-dB Gain**
- **Programmable-Gain Range: 0 dB to 36 dB, Gain Resolution of 0.05 dB/Step**
- **48-Pin TQFP Package**

APPLICATIONS

- **Digital Still Camera**
- **Digital Video Camera**

DESCRIPTION

The VSP1221 is a highly-integrated mixed-signal IC used for signal conditioning and analog-to-digital conversion at the output of a CCD array. The IC has a correlated double sampler (CDS) and an analog programmable-gain amplifier (PGA) stage followed by an analog-to-digital converter (ADC) and a digital PGA stage. The CDS is used to sample the CCD signal and is followed by the analog PGA stage. The ADC is a12-bit, 21-MSPS pipelined ADC. The digital PGA provides further amplification.

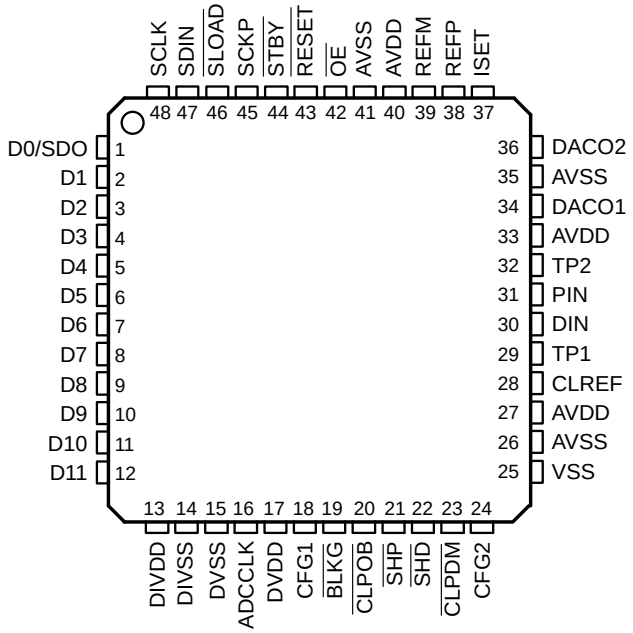
Additionally, there is an offset calibration loop for optical-black correction. The optical-black reference level is user-programmable. The chip also has two 8-bit digital-to-analog converters (DAC) for external analog settings.

The chip has a serial port for configuring internal control registers.

The VSP1221 is available in a 48-pin TQFP package and operates from a single 3-V power supply.

PIN ASSIGNMENTS

PACKAGE (TOP VIEW)



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
VSP1221PFB	ACTIVE	TQFP	PFB	48	250	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	0 to 70	VSP1221	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.

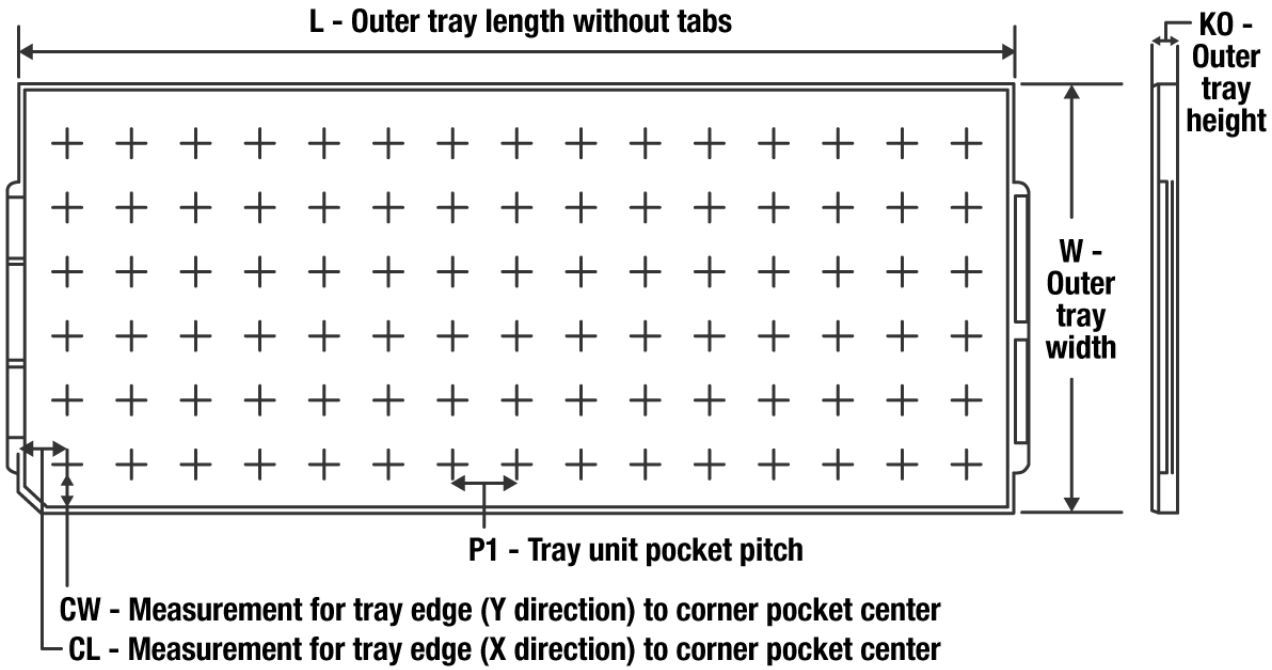
(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(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

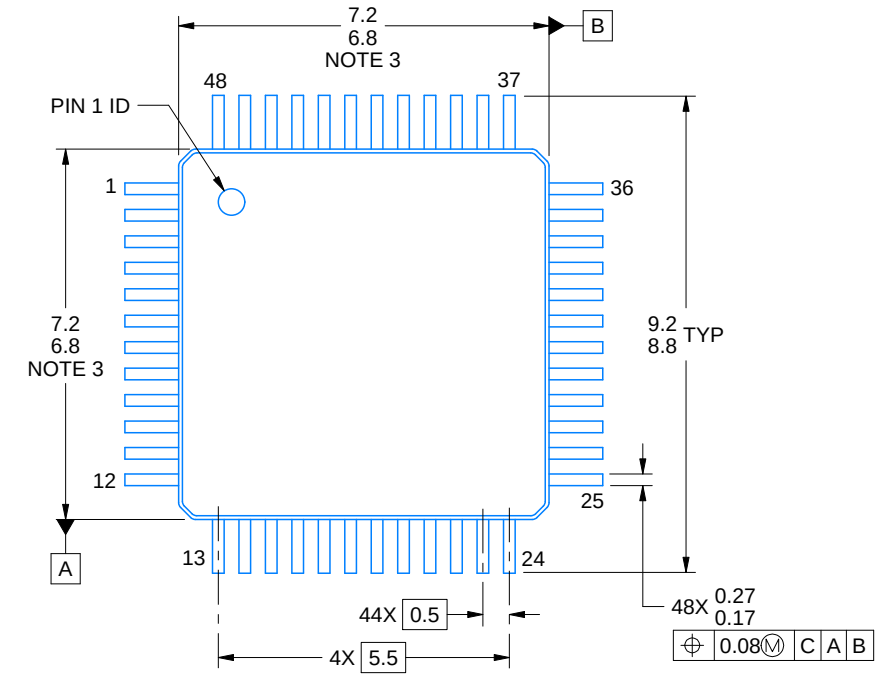
Device	Package Name	Package Type	Pins	SPQ	Unit array matrix	Max temperature (°C)	L (mm)	W (mm)	K0 (µm)	P1 (mm)	CL (mm)	CW (mm)
VSP1221PFB	PFB	TQFP	48	250	10 x 25	150	315	135.9	7620	12.2	11.1	11.25

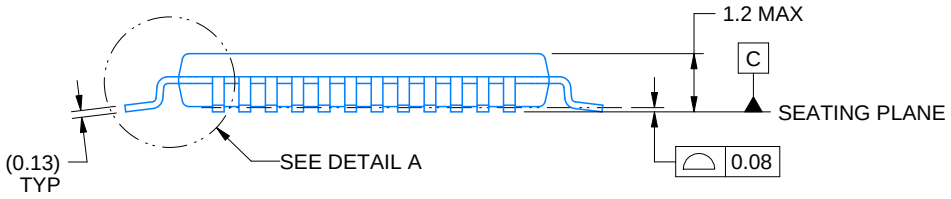
PACKAGE OUTLINE

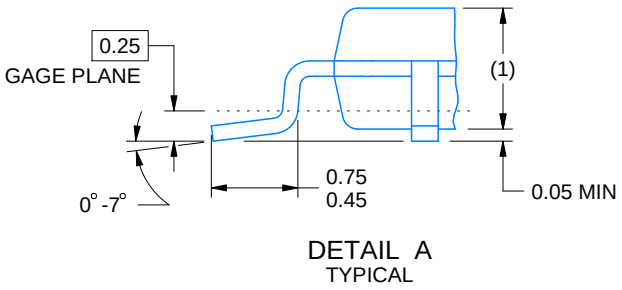
PFB0048A

TQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK







DETAIL A
TYPICAL

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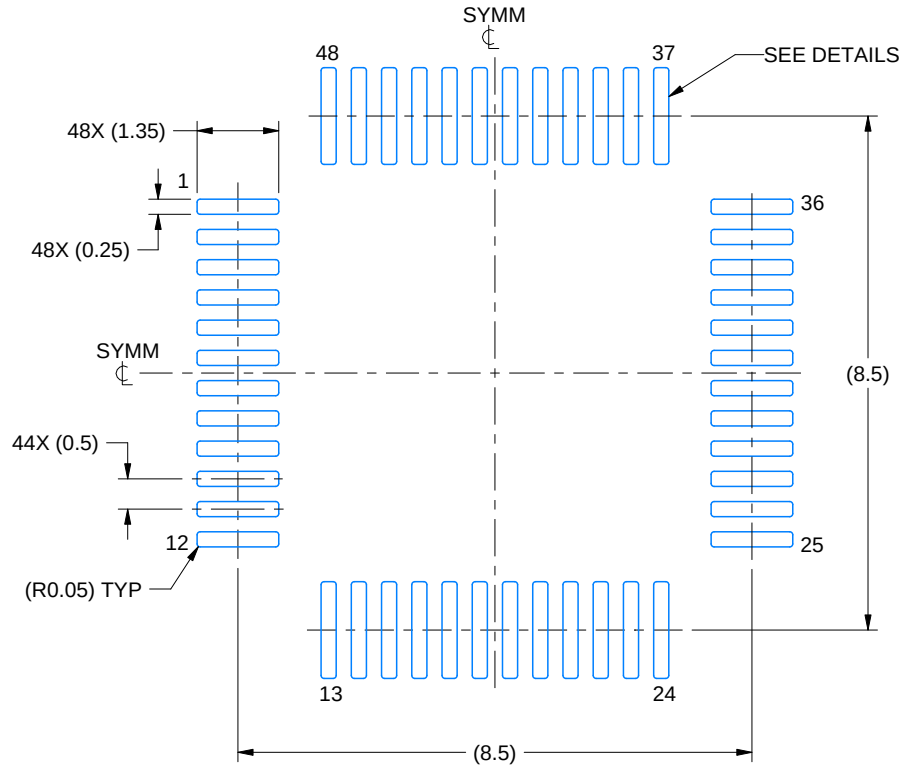
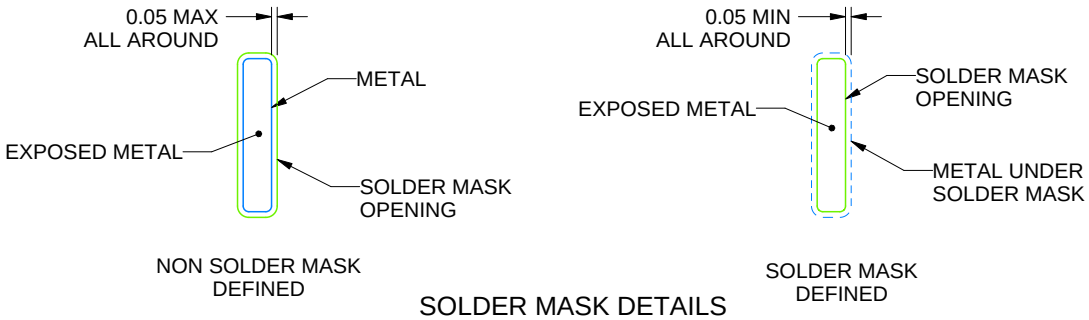
NOTES:

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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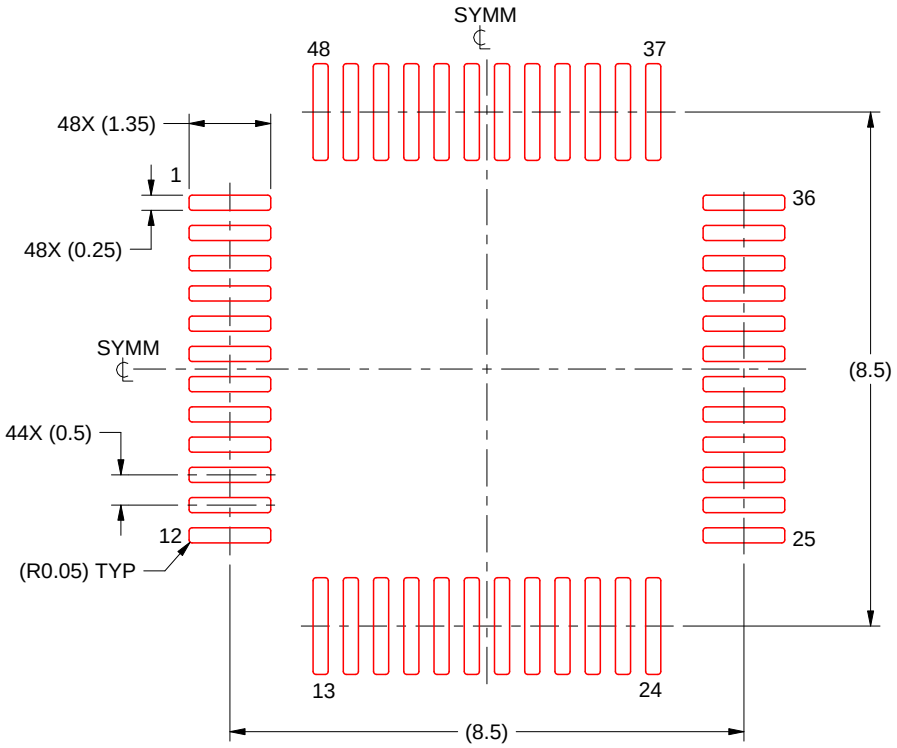
NOTES: (continued)

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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