

PGA900 Programmable Resistive Sensing Conditioner With Digital and Analog Outputs

1 Features

- High accuracy, low noise, low power, small size resistive sensing signal conditioner
- User-programmable temperature and nonlinearity compensation
- On-chip ARM® Cortex® M0 microprocessor allows users to develop and implement calibration software
- One-wire interface enables the communication through power supply pin without using additional lines
- On-chip power management accepts wide power supply voltage from 3.3 V to 30 V
- Operating temperature range: -40°C to $+150^{\circ}\text{C}$
- Memory:
 - 8-kB software memory
 - 128 bytes EEPROM
 - 1-kB data SRAM
- Accommodates sensor sensitivities from 1 mV/V to 135 mV/V
- Two individual analog-front end (AFE) chains, each including:
 - Low-noise programmable gain amplifier
 - 24-bit sigma-delta analog-to-digital converter
- Built-in internal temperature sensor with option to use external temperature sensor
- 14-bit DAC with programmable gain amplifier
- Output options:
 - Ratiometric and absolute voltage output
 - 4- to 20-mA current loop interface
 - One-wire interface (OWI) over power line
 - PWM output
 - Serial peripheral interface (SPI)
 - Inter-integrated circuit (I²C)
- Depletion MOSFET gate driver
- Diagnostic functions

2 Applications

- Pressure sensor transmitters and transducers
- Liquid level meters and flow meters
- Weight scales, load meters, and strain gauges
- Thermocouples, thermistors, and 2-wire resistance thermometers (RTD)
- Resistive field transmitters

3 Description

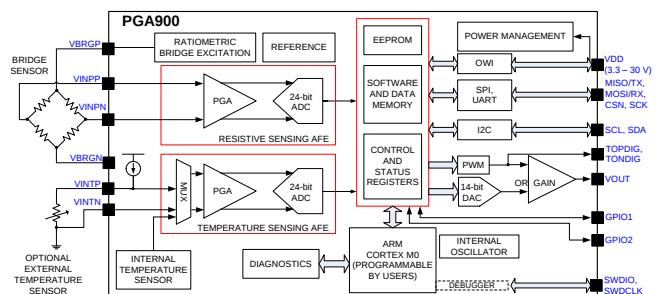
The PGA900 is a signal conditioner for resistive sensing applications. It can accommodate various sensing element types. The PGA900 conditions its input signals by amplification and digitization through two analog front end channels. With the user programmed software in the on-chip ARM Cortex M0 processor, the PGA900 can perform linearization, temperature compensation, and other user defined compensation algorithms. The conditioned signal can be output as ratiometric voltage, absolute voltage, 4- to 20-mA current loop or PWM. The data and configuration registers can also be accessed through SPI, I²C, UART, and two GPIO ports. In addition, the unique OWI allows communication and configuration through the power supply pin without using additional lines. The PGA900 operating voltage is from 3.3 V to 30 V and it can operate in temperatures from -40°C to $+150^{\circ}\text{C}$.

Device Information⁽¹⁾

NUMBER	PACKAGE	BODY SIZE (NOM)
PGA900	VQFN (36)	6.00 mm × 6.00 mm
	DSBGA (36)	3.66 mm × 3.66 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

PGA900 Simplified Block Diagram



4 Device and Documentation Support

4.1 Documentation Support

4.1.1 Related Documentation

For related documentation see the following:

- Texas Instruments, [PGA900 as a Capacitive Load Driver application note](#)
- Texas Instruments, [PGA900 as a 4- to 20-mA Current Loop Transmitter application note](#)
- Texas Instruments, [Understanding Open Loop Gain of the PGA900 DAC Gain Amplifier application note](#)
- Texas Instruments, [Connecting PGA900 Instrumentation Amplifier to Resistive Bridge Sensor application note](#)
- Texas Instruments, [Understanding Open Loop Output Impedance of the PGA900 DAC Gain Amplifier application note](#)
- Texas Instruments, [System Noise Analysis of a Resistive Bridge Pressure Sensor Connected to the PGA900 application note](#)
- Texas Instruments, [PGAxxxEVM-034 user's guide](#)
- Texas Instruments, [PGA900 Software user's guide](#)
- Texas Instruments, [PGA900 Pressure and Temperature Sensor Signal Conditioner user's guide](#)

4.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](#). In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

4.3 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At [e2e.ti.com](#), you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

4.4 Trademarks

E2E is a trademark of Texas Instruments.
ARM, Cortex are registered trademarks of ARM Ltd.
All other trademarks are the property of their respective owners.

4.5 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

4.6 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

5 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
PGA900ARHHR	Active	Production	VQFN (RHH) 36	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 150	PGA900A RHH
PGA900ARHHR.A	Active	Production	VQFN (RHH) 36	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 150	PGA900A RHH
PGA900ARHHRG4	Active	Production	VQFN (RHH) 36	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 150	PGA900A RHH
PGA900ARHHRG4.A	Active	Production	VQFN (RHH) 36	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 150	PGA900A RHH
PGA900ARHHT	Active	Production	VQFN (RHH) 36	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 150	PGA900A RHH
PGA900ARHHT.A	Active	Production	VQFN (RHH) 36	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 150	PGA900A RHH
PGA900AYZSR	Active	Production	DSBGA (YZS) 36	1500 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 150	PGA900A YZS
PGA900AYZSR.A	Active	Production	DSBGA (YZS) 36	1500 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 150	PGA900A YZS
PGA900AYZST	Active	Production	DSBGA (YZS) 36	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 150	PGA900A YZS
PGA900AYZST.A	Active	Production	DSBGA (YZS) 36	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 150	PGA900A YZS

⁽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.

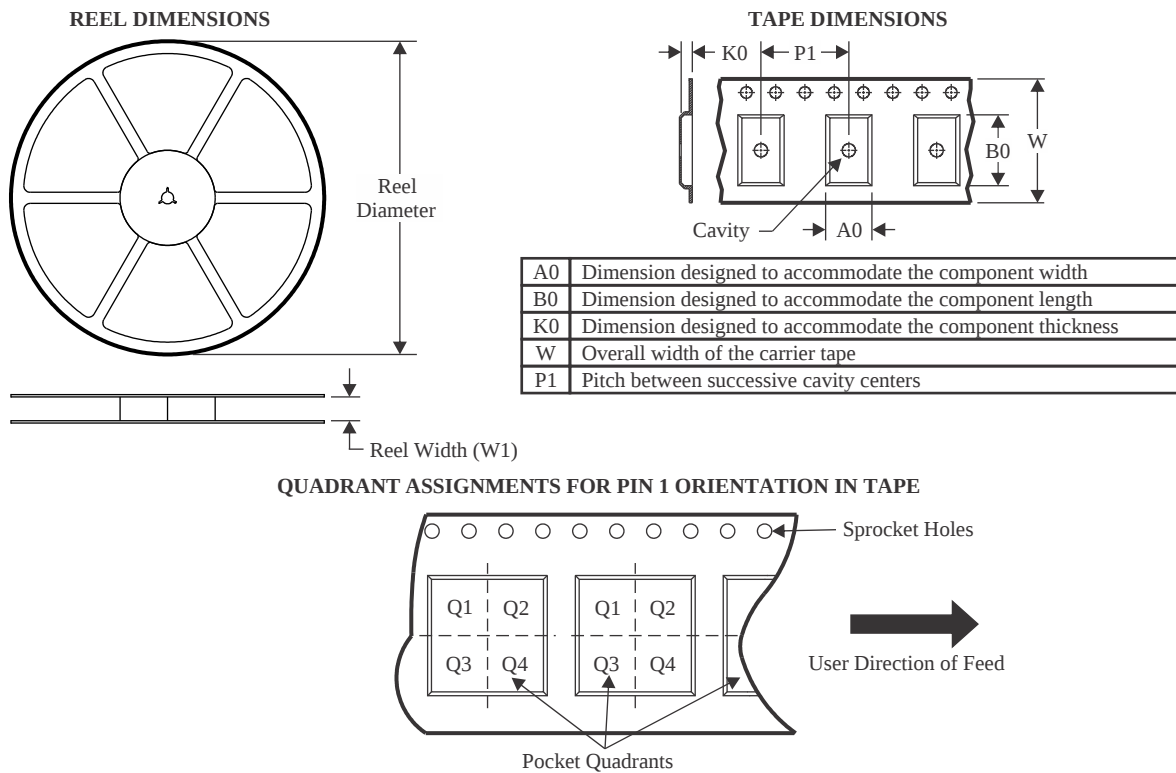
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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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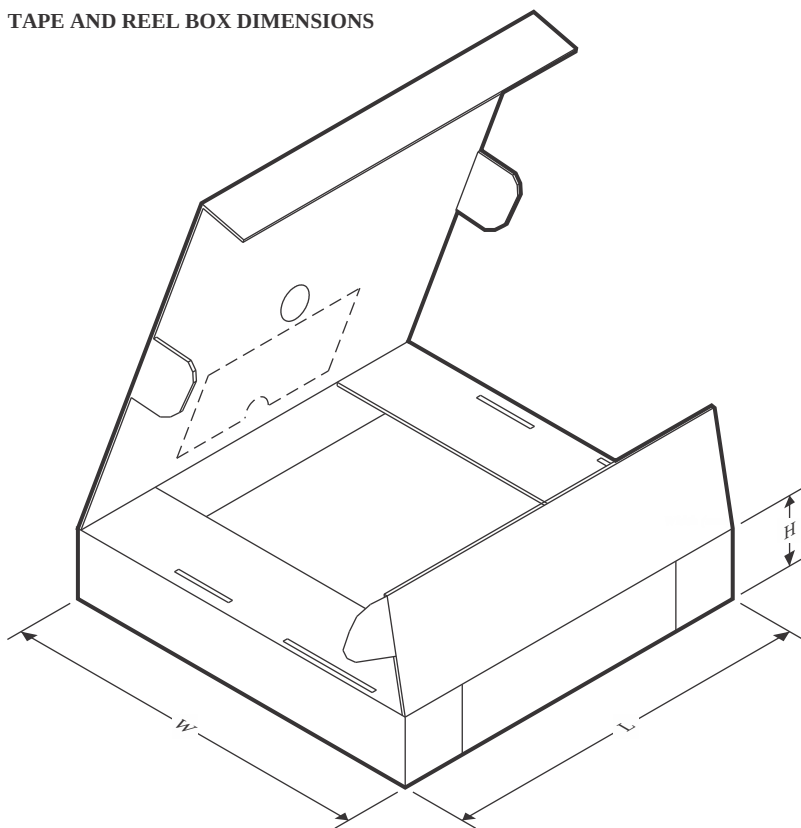
TAPE AND REEL INFORMATION



*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
PGA900ARHHR	VQFN	RHH	36	2500	330.0	16.4	6.3	6.3	1.1	12.0	16.0	Q2
PGA900ARHHRG4	VQFN	RHH	36	2500	330.0	16.4	6.3	6.3	1.1	12.0	16.0	Q2
PGA900ARHHT	VQFN	RHH	36	250	180.0	16.4	6.3	6.3	1.1	12.0	16.0	Q2
PGA900AYZSR	DSBGA	YZS	36	1500	180.0	12.4	3.79	3.79	0.71	8.0	12.0	Q1
PGA900AYZST	DSBGA	YZS	36	250	180.0	12.4	3.79	3.79	0.71	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)
PGA900ARHHR	VQFN	RHH	36	2500	367.0	367.0	38.0
PGA900ARHHRG4	VQFN	RHH	36	2500	367.0	367.0	38.0
PGA900ARHHT	VQFN	RHH	36	250	182.0	182.0	20.0
PGA900AYZSR	DSBGA	YZS	36	1500	182.0	182.0	20.0
PGA900AYZST	DSBGA	YZS	36	250	182.0	182.0	20.0

GENERIC PACKAGE VIEW

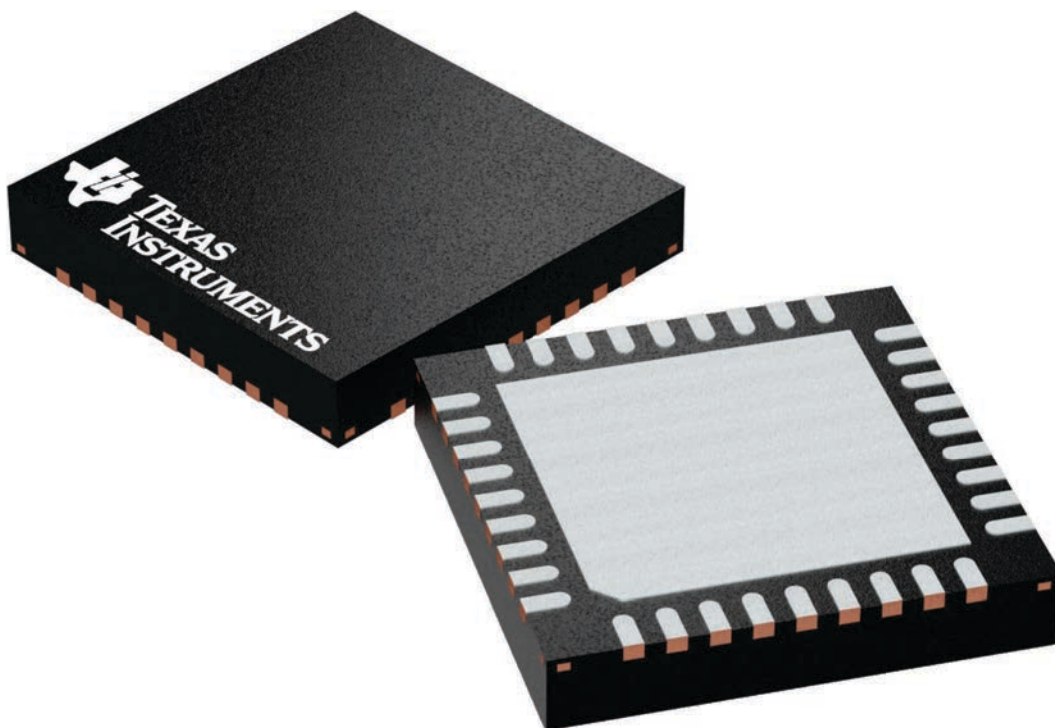
RHH 36

VQFN - 1 mm max height

6 x 6, 0.5 mm pitch

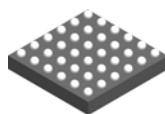
PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



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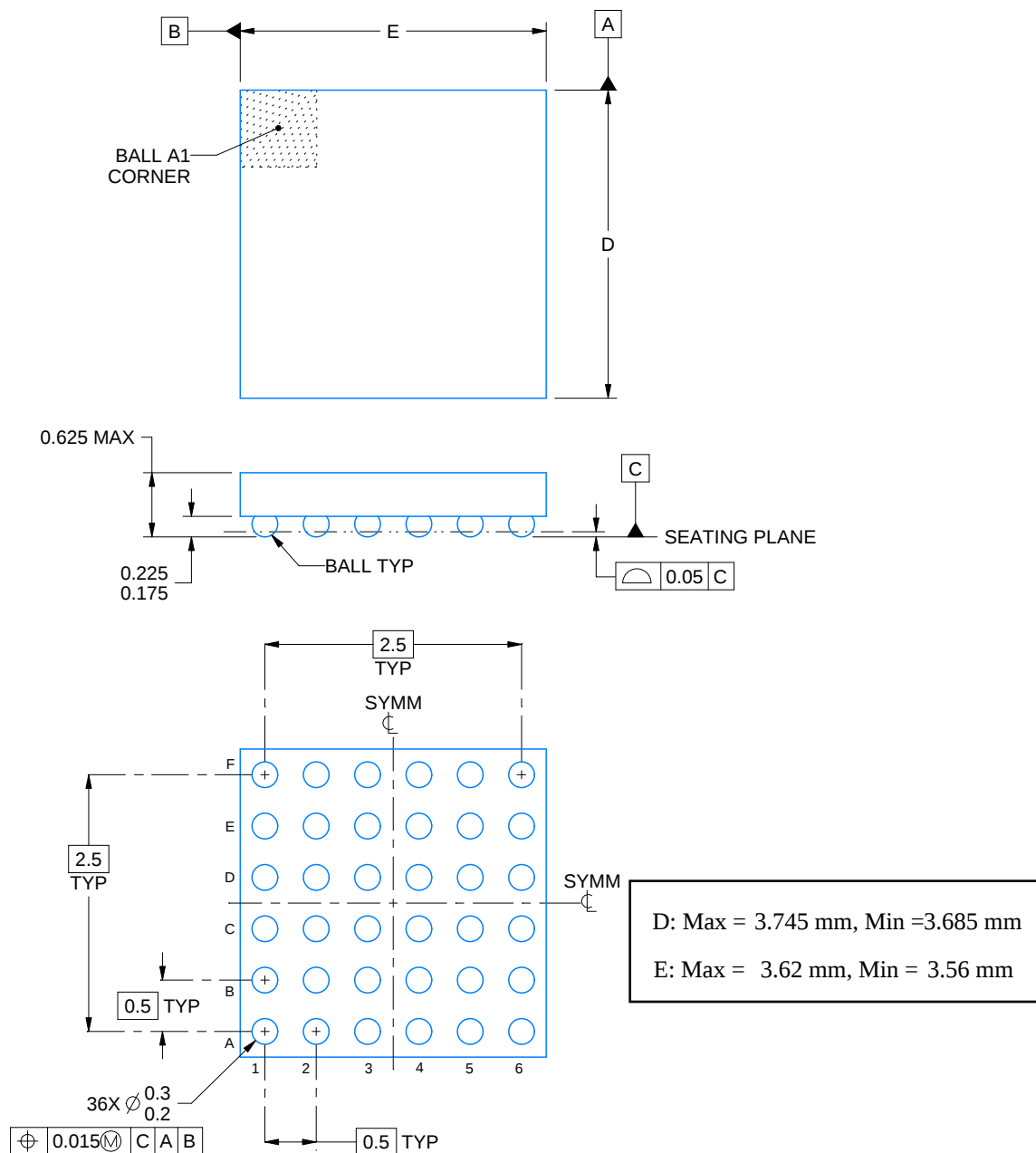
YZS0036



PACKAGE OUTLINE

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



4219444/A 02/2018

NOTES:

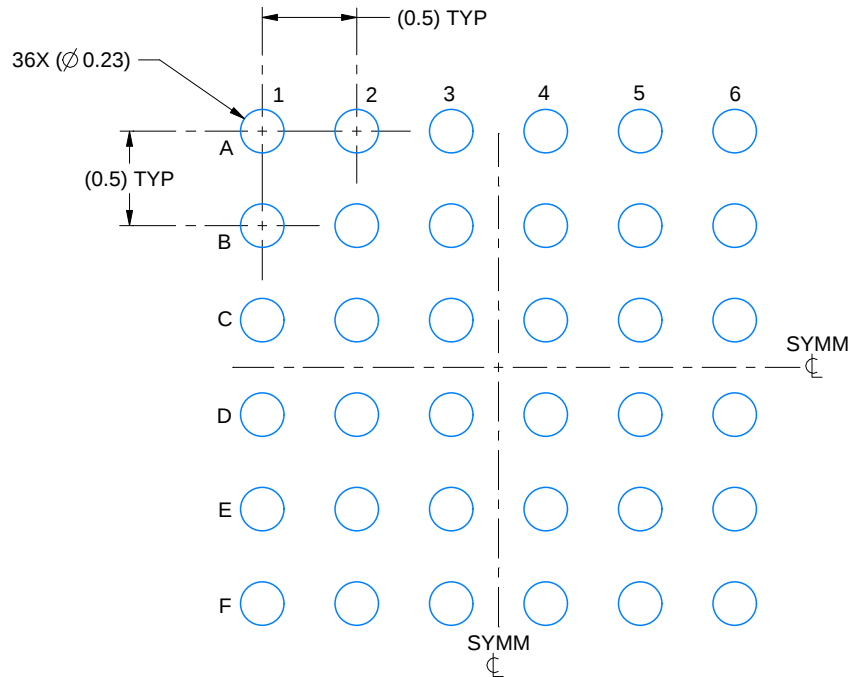
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

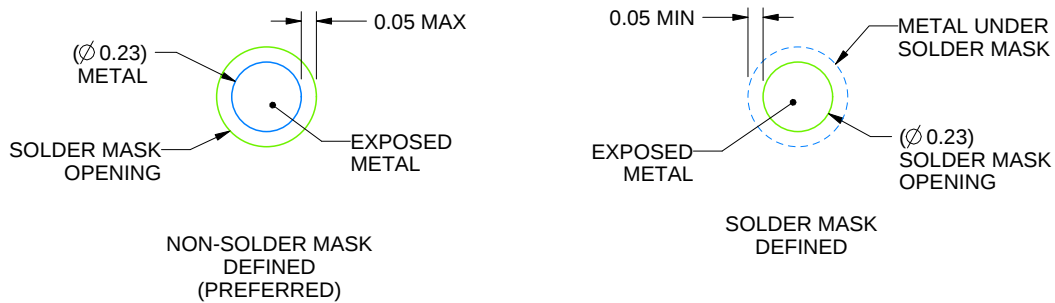
YZS0036

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 25X

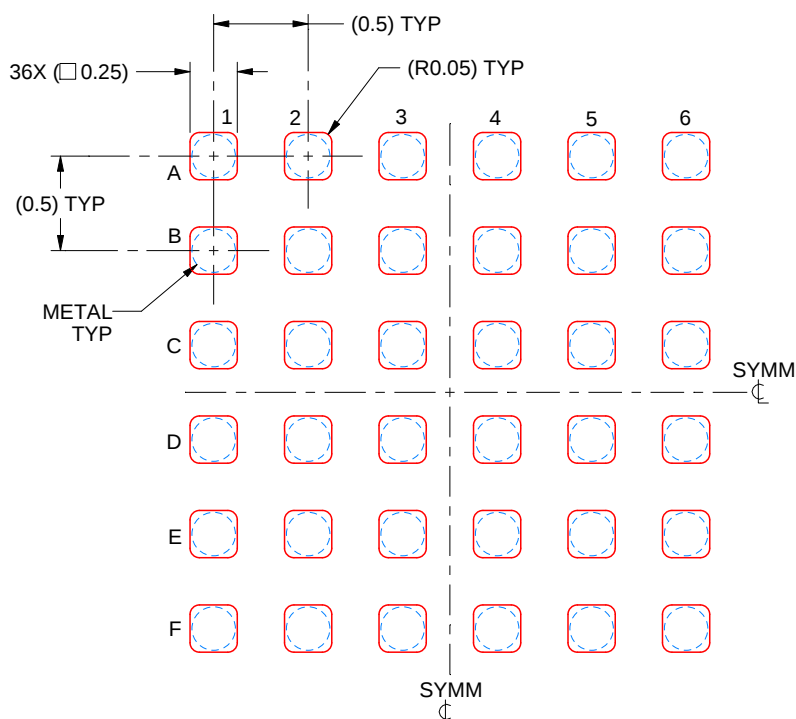


SOLDER MASK DETAILS
NOT TO SCALE

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NOTES: (continued)

- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. See Texas Instruments Literature No. SNVA009 (www.ti.com/lit/snva009).



SOLDER PASTE EXAMPLE
 BASED ON 0.1 mm THICK STENCIL
 SCALE: 25X

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NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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