

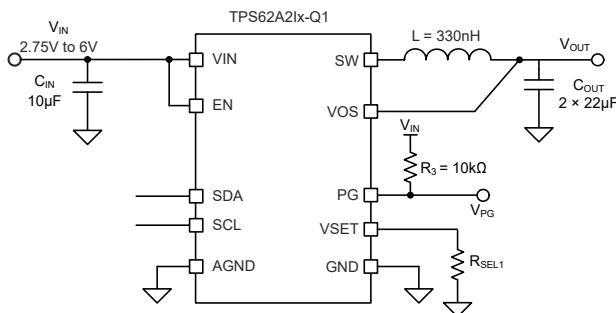
TPS62A21x-Q1: 2.75V to 6V Input, 1A, 2A, 3A, 4A Automotive, Fast Transient, Synchronous Step-Down Converters With I²C Interface

1 Features

- AEC-Q100 qualified for automotive applications
 - Temperature grade 1: -40°C to $+125^{\circ}\text{C}$ T_A
- [Functional Safety-Capable](#)
 - [Documentation available to aid functional safety system design](#)
- Family of 1A, 2A, 3A, and 4A devices
- Input voltage range: 2.75V to 6V
- Output voltage from 0.4V to 3.6V
- Switching frequency from 1.5MHz to 4MHz
- Fast transient response with COT control
 - Quasi-fixed switching frequency during steady-state operation
 - 16 internal compensation settings to reduce output capacitance
- Low R_{DS(on)} MOSFETS: 23mΩ and 15mΩ
- Minimum on-time of 30ns (maximum) at V_{IN} = 5V
- Selectable forced PWM mode through I²C
- Programmable spread spectrum clocking
- Adjustable soft-start, soft-stop timings
- Power-good output with window comparator
- Active output discharge
 - Supports programmable soft-stop feature
- I²C-compatible interface up to 1MHz
- 2.1mm × 2.1mm WQFN package with wettable flanks

2 Applications

- [ADAS domain controller](#)
- [Digital cockpit processing unit](#)
- [Driver monitoring](#)
- [Front camera](#)



Simplified Schematic for TPS62A21x-Q1

3 Description

The TPS62A21x-Q1 series are families of pin-to-pin compatible, high-efficiency, synchronous step-down DC-DC converters capable of delivering continuous output currents of 1A, 2A, 3A, and 4A. Using a constant on-time (COT) control topology, these devices provide fast transient response while maintaining quasi-fixed switching frequency operation during steady-state conditions.

To enhance loop performance, the devices offer 16 selectable internal compensation settings, enabling higher bandwidth and reducing output capacitance. Integrated low R_{DS(on)} MOSFETs support continuous output up to 4A even at high ambient temperatures.

The switching frequency is adjustable from 1.5MHz to 4MHz and supports synchronization to an external clock. In PFM/PWM mode, the device automatically enters power-save mode at light loads to achieve high efficiency across the full load range. The device maintains the output voltage accuracy within $\pm 0.8\%$ in PWM mode for V_{OUT} \geq 0.5V. The soft-start feature provides controlled power-up and limits inrush current, while the soft-stop feature enables coordinated power-down sequencing.

Device Information

PART NUMBER	OUTPUT CURRENT	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾
TPS62A211-Q1 ⁽³⁾	1A	RZX (UQFN-FCRLF, 13)	2.1mm × 2.1mm
TPS62A212-Q1 ⁽³⁾	2A		
TPS62A213-Q1 ⁽³⁾	3A		
TPS62A214-Q1	4A		

- (1) For more information, see [Section 5](#).
- (2) The package size (length × width) is a nominal value and includes pins, where applicable.
- (3) Preview information (not Advance Information).



4 Device and Documentation Support

4.1 Device Support

4.1.1 Third-Party Products Disclaimer

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4.2 Documentation Support

4.2.1 Related Documentation

For related documentation, see the following:

4.3 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* 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.

4.4 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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4.5 Trademarks

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4.6 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

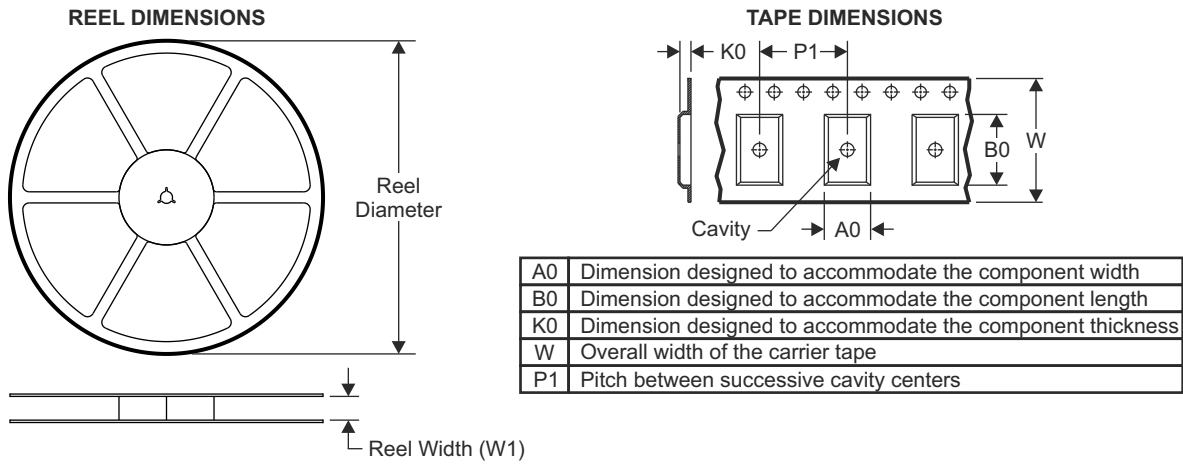
4.7 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

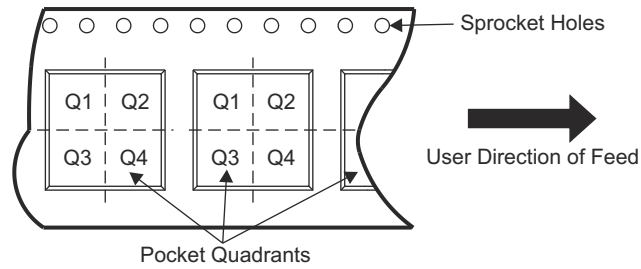
5 Mechanical, Packaging, and Orderable Information

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.

5.1 Tape and Reel Information



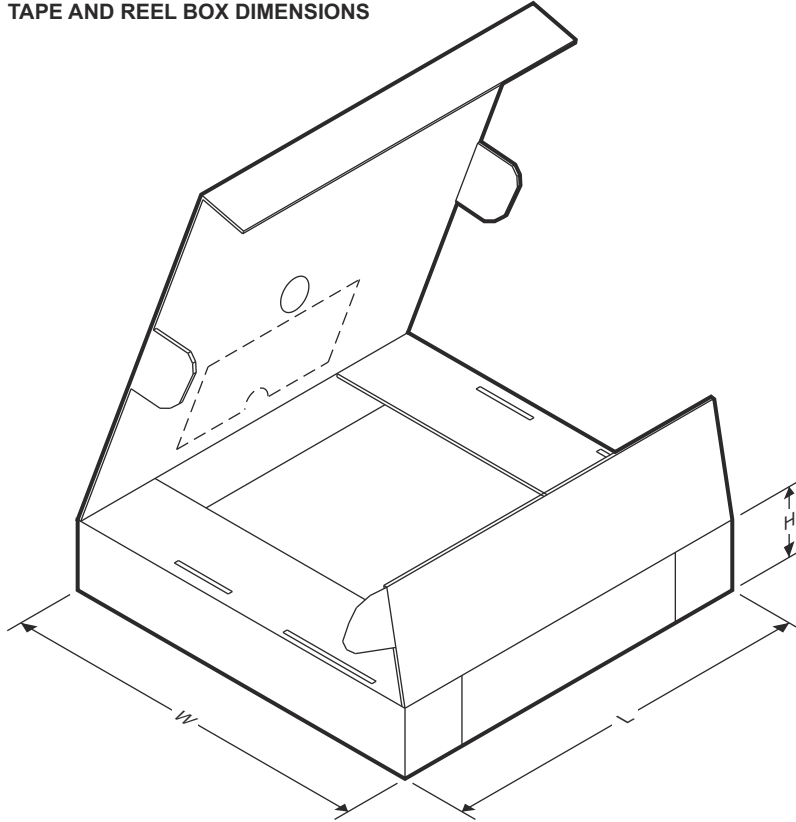
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



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
TPS62A2I4AQ WRZXRQ1	UQFN- FCRLF	RZX	13	3000	180	8.4	2.3	2.3	0.9	4	8	Q2

ADVANCE INFORMATION

TAPE AND REEL BOX DIMENSIONS



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS62A2I4AQ WRZXRQ1	UQFN-FCRLF	RZX	13	3000	210	185	35

ADVANCE INFORMATION

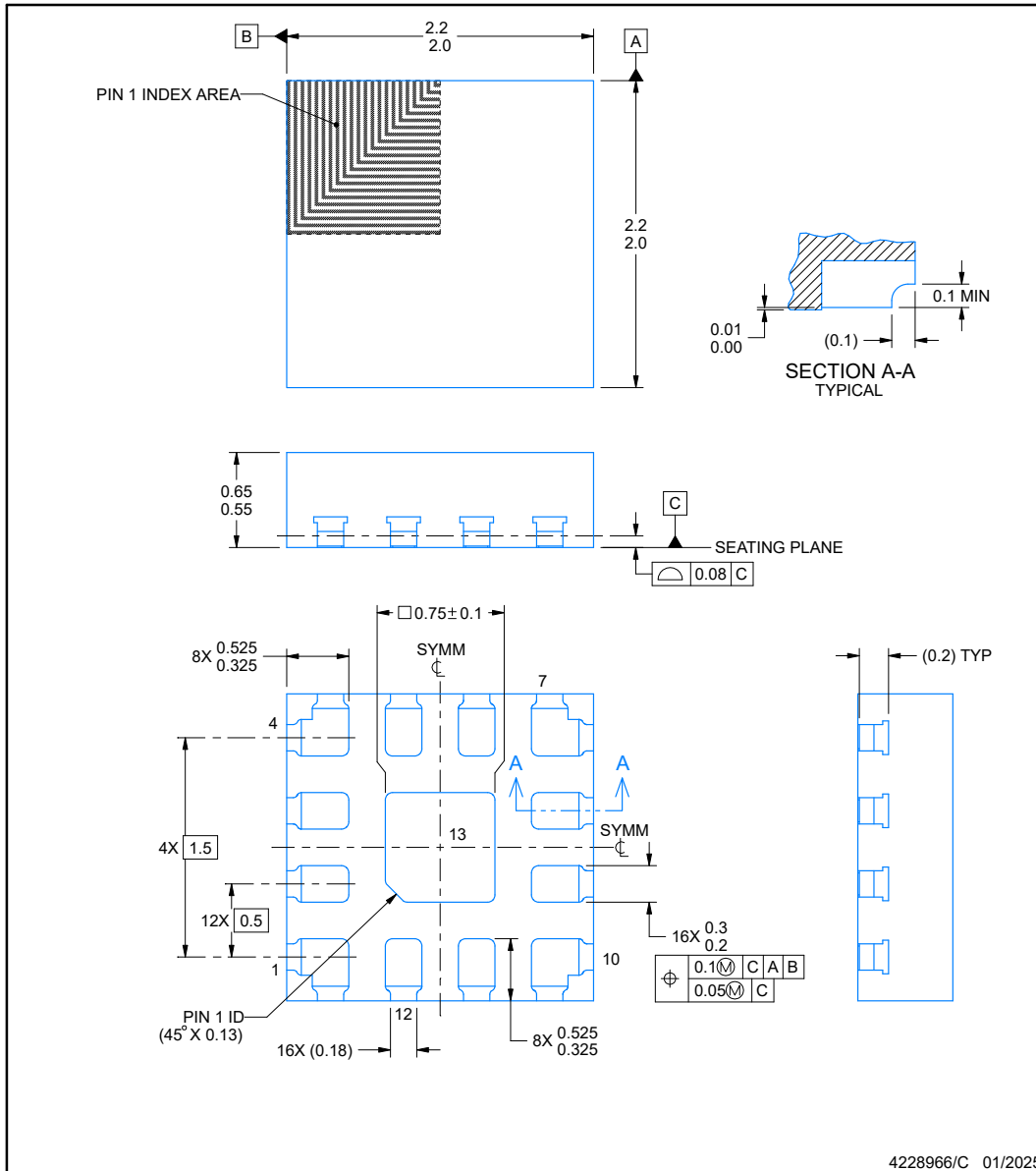


PACKAGE OUTLINE

RZX0013A

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

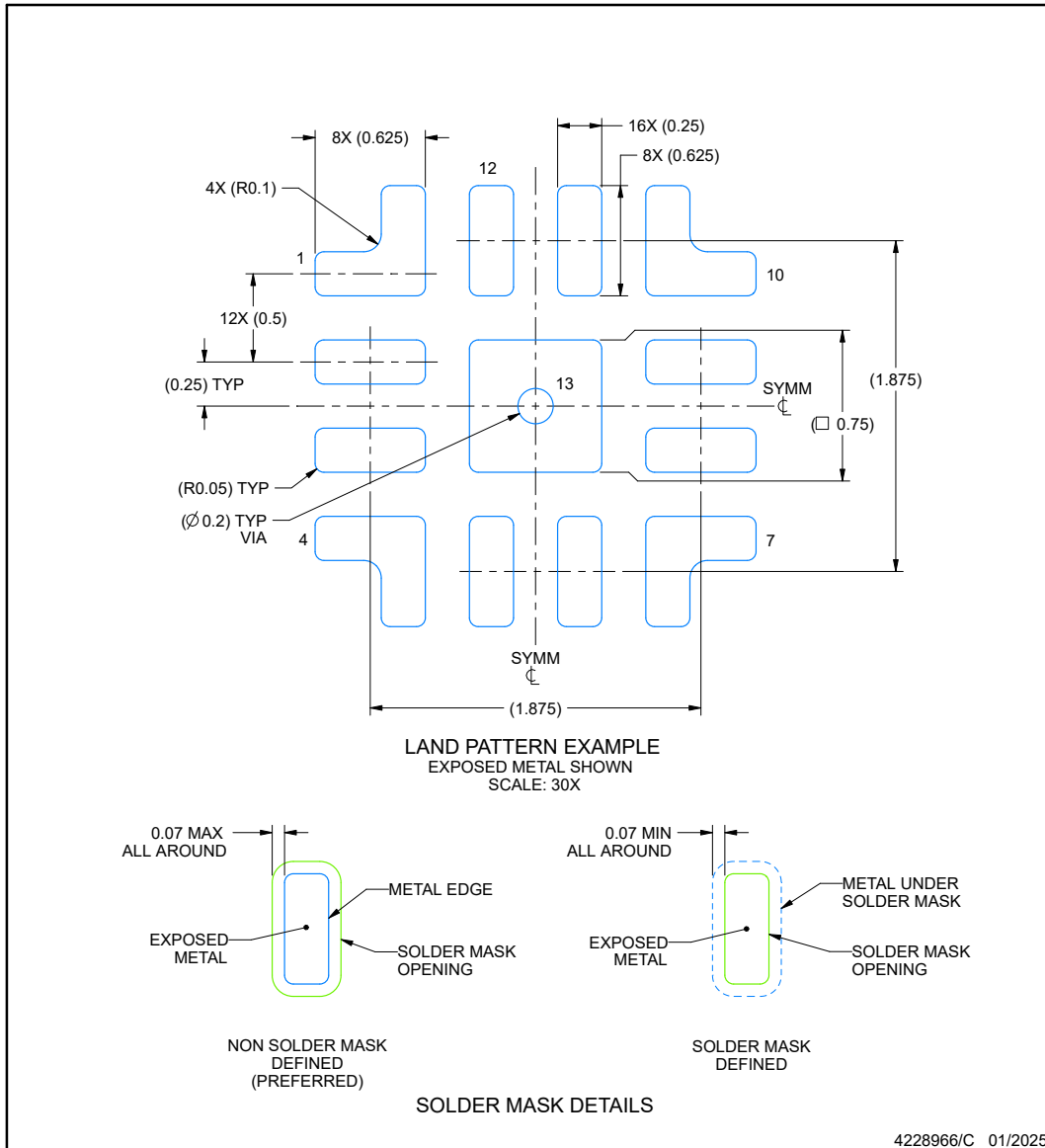
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

RZX0013A

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

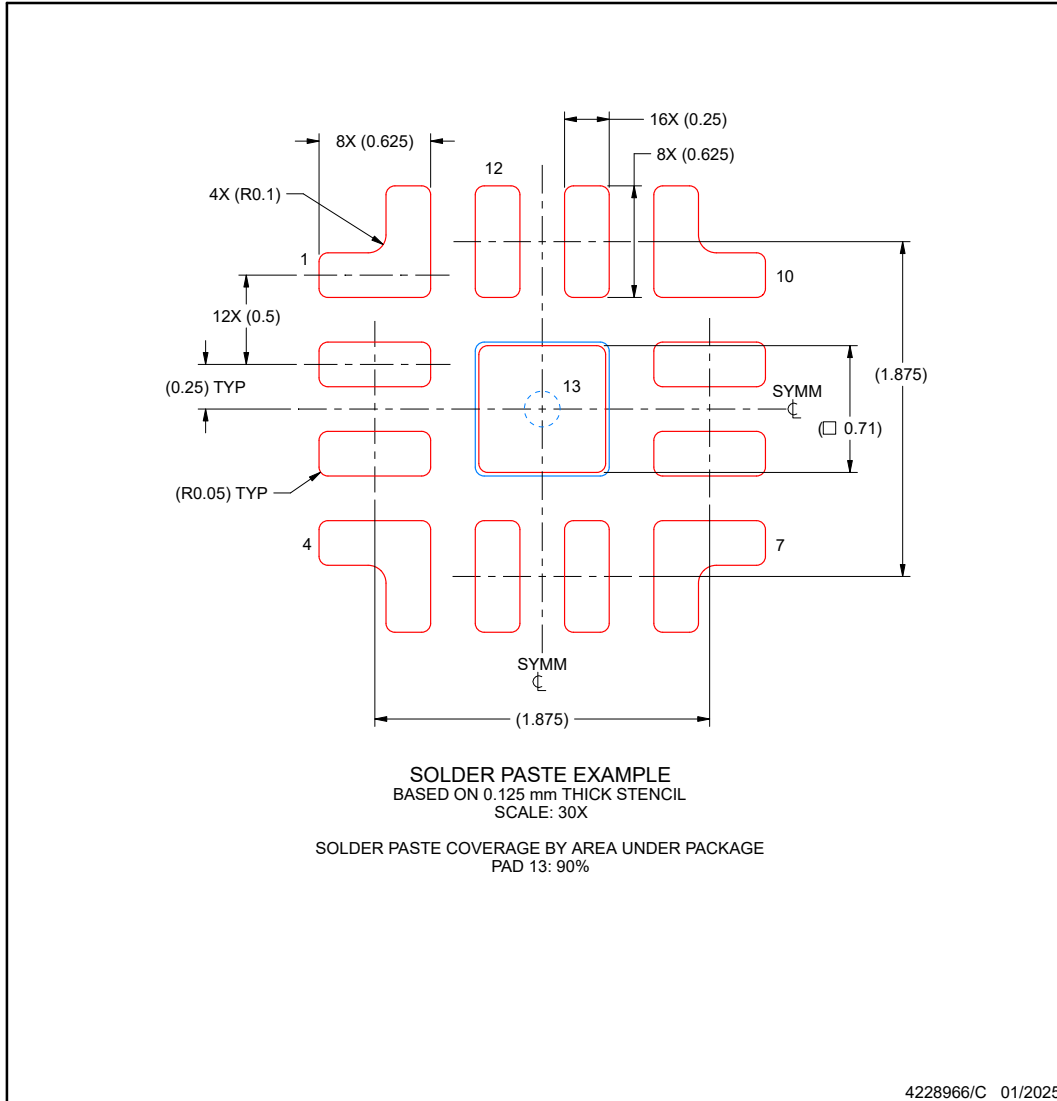
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
- Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.

EXAMPLE STENCIL DESIGN

RZX0013A

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

- 6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

ADVANCE INFORMATION

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)
XPS62A2I4AQWRZXRQ1	Active	Preproduction	UQFN-FCRLF (RZX) 13	3000 LARGE T&R	-	Call TI	Call TI	-40 to 125	

(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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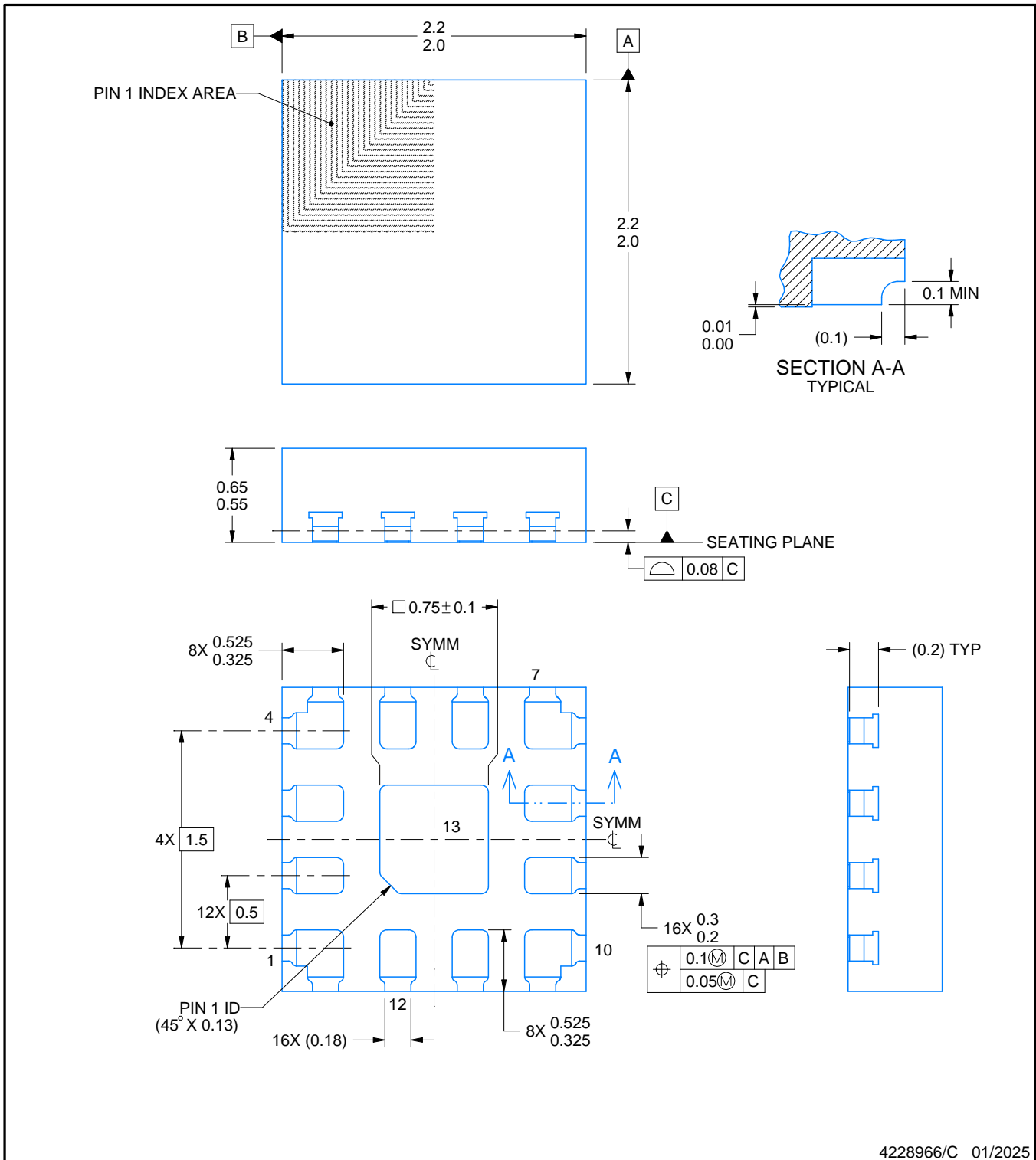
RZX0013A



PACKAGE OUTLINE

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

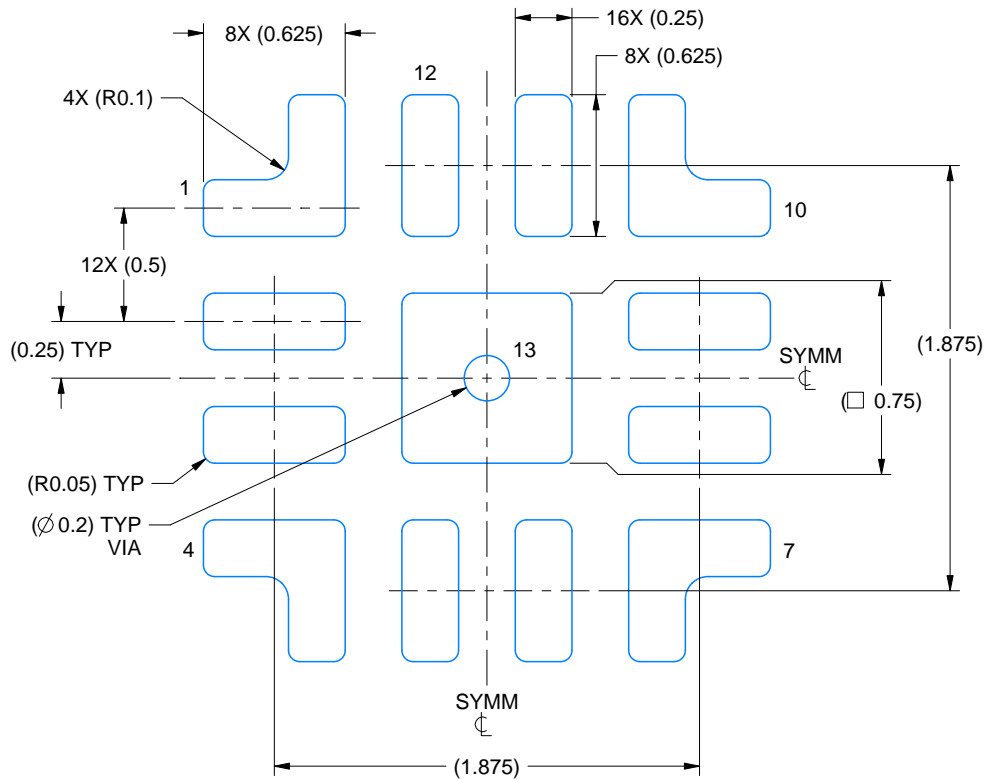
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

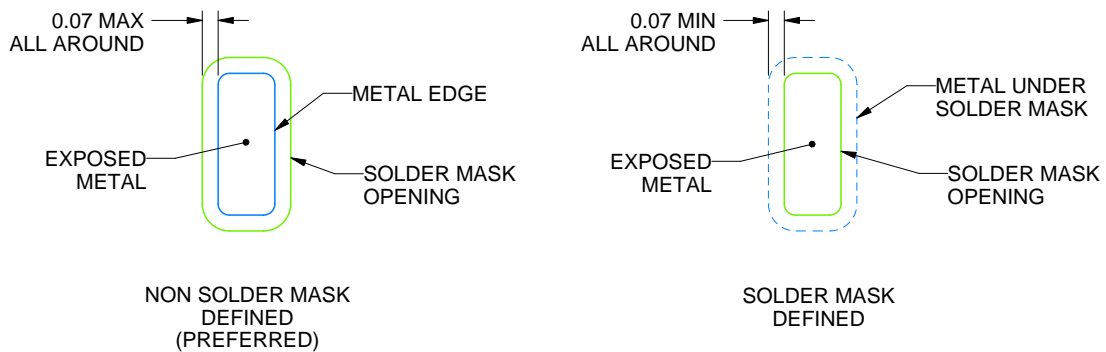
RZX0013A

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 30X



SOLDER MASK DETAILS

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NOTES: (continued)

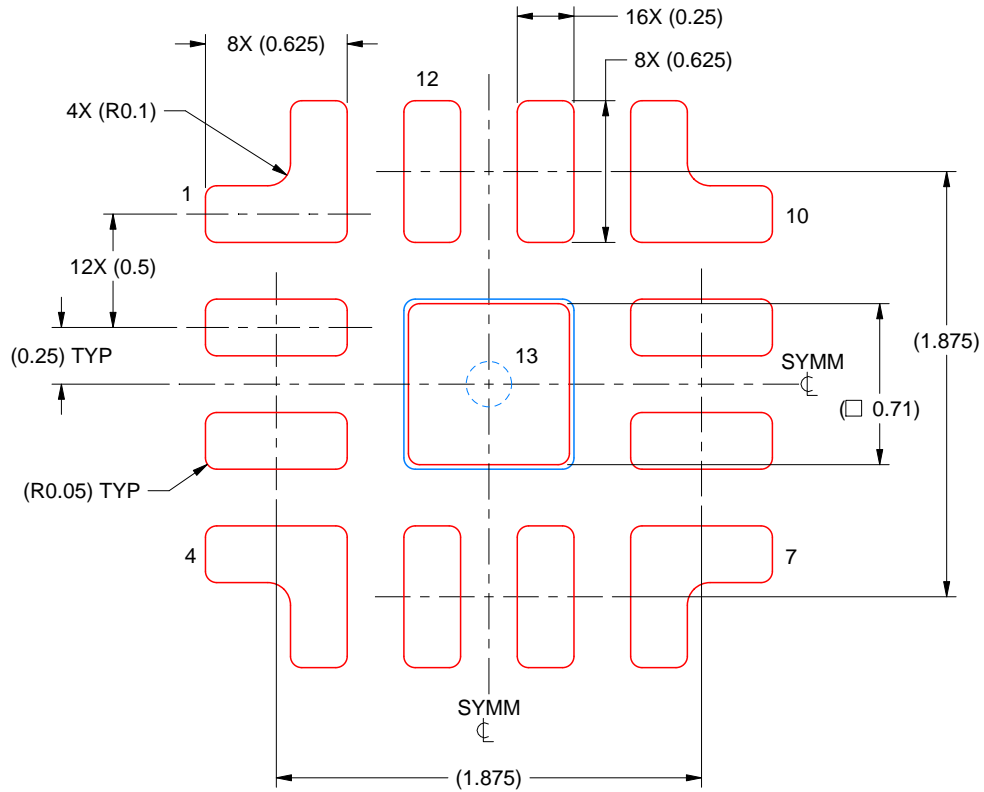
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sluea271).
5. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.

EXAMPLE STENCIL DESIGN

RZX0013A

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 30X

SOLDER PASTE COVERAGE BY AREA UNDER PACKAGE
PAD 13: 90%

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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.

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