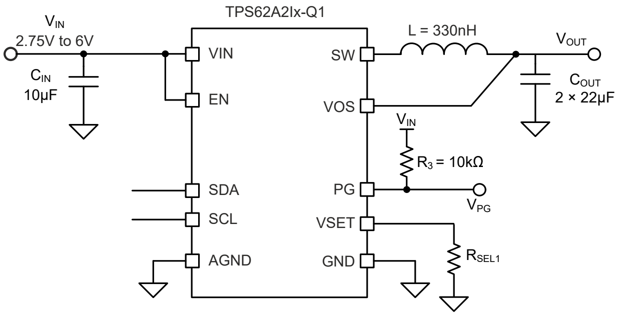
TPS62A2Ix-Q1：2.75V 至 6V 输入，1A、2A、3A、4A 汽车类快速瞬态同步降压转换器，配备 I^2C 接口

1 特性

- 符合面向汽车应用的 AEC-Q100 标准
  - 温度等级 1：–40°C 至 +125°C T_A
- 功能安全型
  - 可提供用于功能安全系统设计的文档
- 1A、2A、3A 和 4A 系列器件
- 输入电压范围：2.75V 至 6V
- 输出电压范围为 0.4V 至 3.6V
- 开关频率范围为 1.5MHz 至 4MHz
- 通过 COT 控制方式，实现快速瞬态响应
  - 稳态运行期间的准固定开关频率
  - 16 项内部补偿设置，可降低输出电容
- 低 $R_{DS(on)}$ MOSFETS：23mΩ 和 15mΩ
- V_{IN} = 5V 时的最短导通时间为 30ns（最大值）
- 可通过 I^2C 选择强制 PWM 模式
- 可编程展频时钟
- 可调软启动、软停止时序
- 具有窗口比较器的电源正常输出
- 有源输出放电
  - 支持可编程软停止功能
- 与 I^2C 兼容的接口频率高达 1MHz
- 具有可润湿侧翼的 2.1mm × 2.1mm WQFN 封装

2 应用

- ADAS 域控制器
- 数字驾驶舱处理单元
- 驾驶员监控
- 前置摄像头



TPS62A2Ix-Q1 简化原理图

3 说明

TPS62A2Ix-Q1 系列是引脚对引脚兼容的高效同步降压直流/直流转换器系列，能够提供 1A、2A、3A 和 4A 的连续输出电流。通过使用恒定导通时间 (COT) 控制拓扑，这些器件可提供快速瞬态响应，同时在稳态条件下保持准固定开关频率运行。

为了增强环路性能，这些器件有 16 项可选的内部补偿设置，可获得更高的带宽并降低输出电容。集成的低 RDS (on) MOSFET 即使在高温环境下也支持高达 4A 的持续输出。

开关频率可在 1.5MHz 至 4MHz 之间调节，也可与外部时钟同步。在 PFM/PWM 模式下，该器件会在轻负载情况下自动进入省电模式，从而在整个负载范围内维持高效率。该器件在 PWM 模式下将输出电压精度保持在 ±0.8% 以内且 V_{OUT} ⩾ 0.5V。软启动功能可实现受控上电，并限制浪涌电流，而软停止功能则能实现协调的断电时序控制。

器件信息

器件型号	输出电流	封装(1)	封装尺寸(2)
TPS62A2I1-Q1(3)	1A	RZX (UQFN-FCRLF，13)	2.1mm × 2.1mm
TPS62A2I2-Q1(3)	2A		
TPS62A2I3-Q1(3)	3A		
TPS62A2I4-Q1	4A		

(1) 有关更多信息，请参阅 节 5。
(2) 封装尺寸（长 × 宽）为标称值，并包括引脚（如适用）。
(3) 预发布信息（非预告信息）。

4 器件和文档支持

4.1 器件支持

4.1.1 第三方产品免责声明

TI 发布的与第三方产品或服务有关的信息，不能构成与此类产品或服务或保修的适用性有关的认可，不能构成此类产品或服务单独或与任何 TI 产品或服务一起的表示或认可。

4.2 文档支持

4.2.1 相关文档

欲查看相关文件，请参阅以下内容：

4.3 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击*通知*进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

4.4 支持资源

TI E2E™ 中文支持论坛是工程师的重要参考资料，可直接从专家处获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题，获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的使用条款。

4.5 商标

TI E2E™ is a trademark of Texas Instruments.
所有商标均为其各自所有者的财产。

4.6 静电放电警告

静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

4.7 术语表

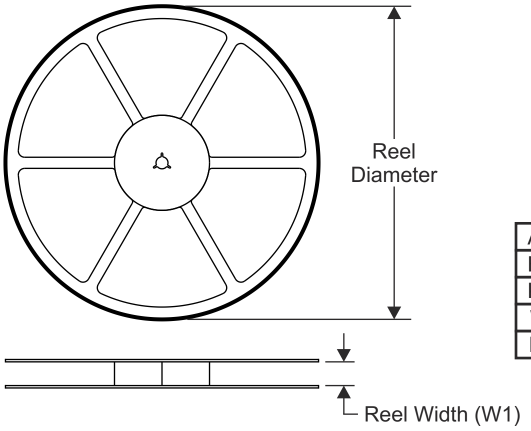
TI 术语表	本术语表列出并解释了术语、首字母缩略词和定义。

5 机械、封装和可订购信息

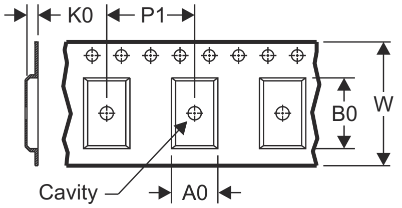
以下页面包含机械、封装和可订购信息。这些信息是指定器件可用的最新数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。有关此数据表的浏览器版本，请查阅左侧的导航栏。

5.1 卷带包装信息

REEL DIMENSIONS

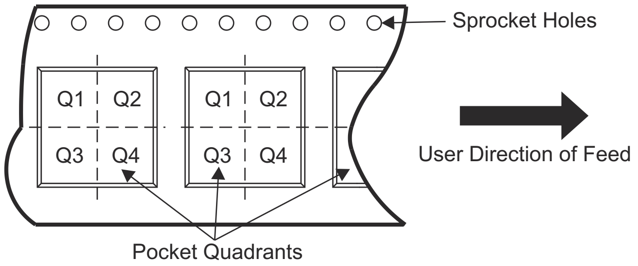


TAPE DIMENSIONS



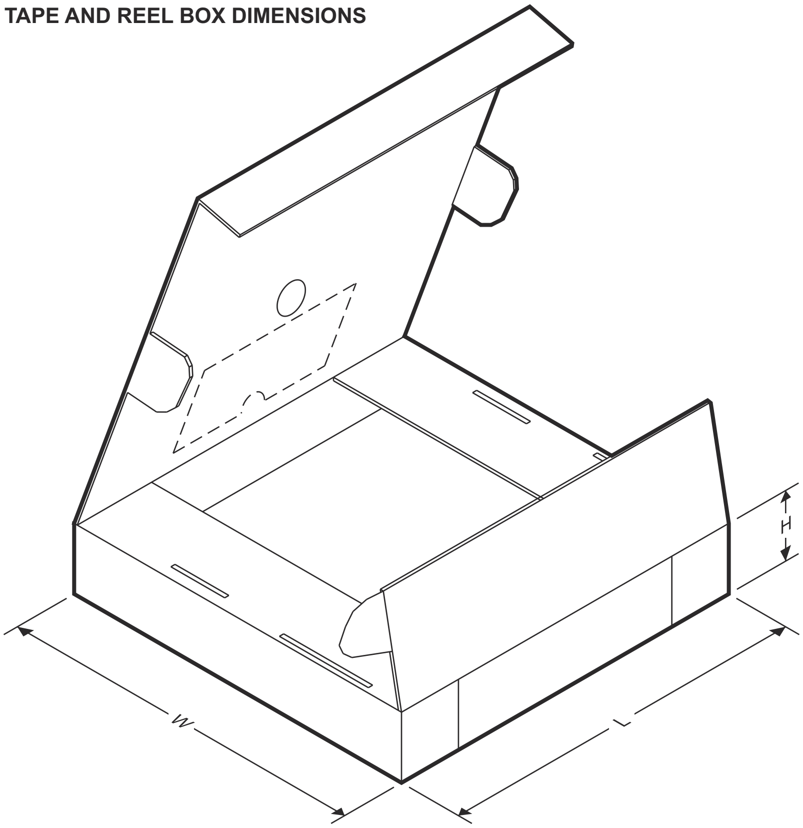
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



器件	封装类型	封装图	引脚	SPQ	卷带直径 (mm)	卷带宽度 W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 象限
TPS62A2I4AQWRZXRQ1	UQFN-FCRLF	RZX	13	3000	180	8.4	2.3	2.3	0.9	4	8	Q2

TAPE AND REEL BOX DIMENSIONS



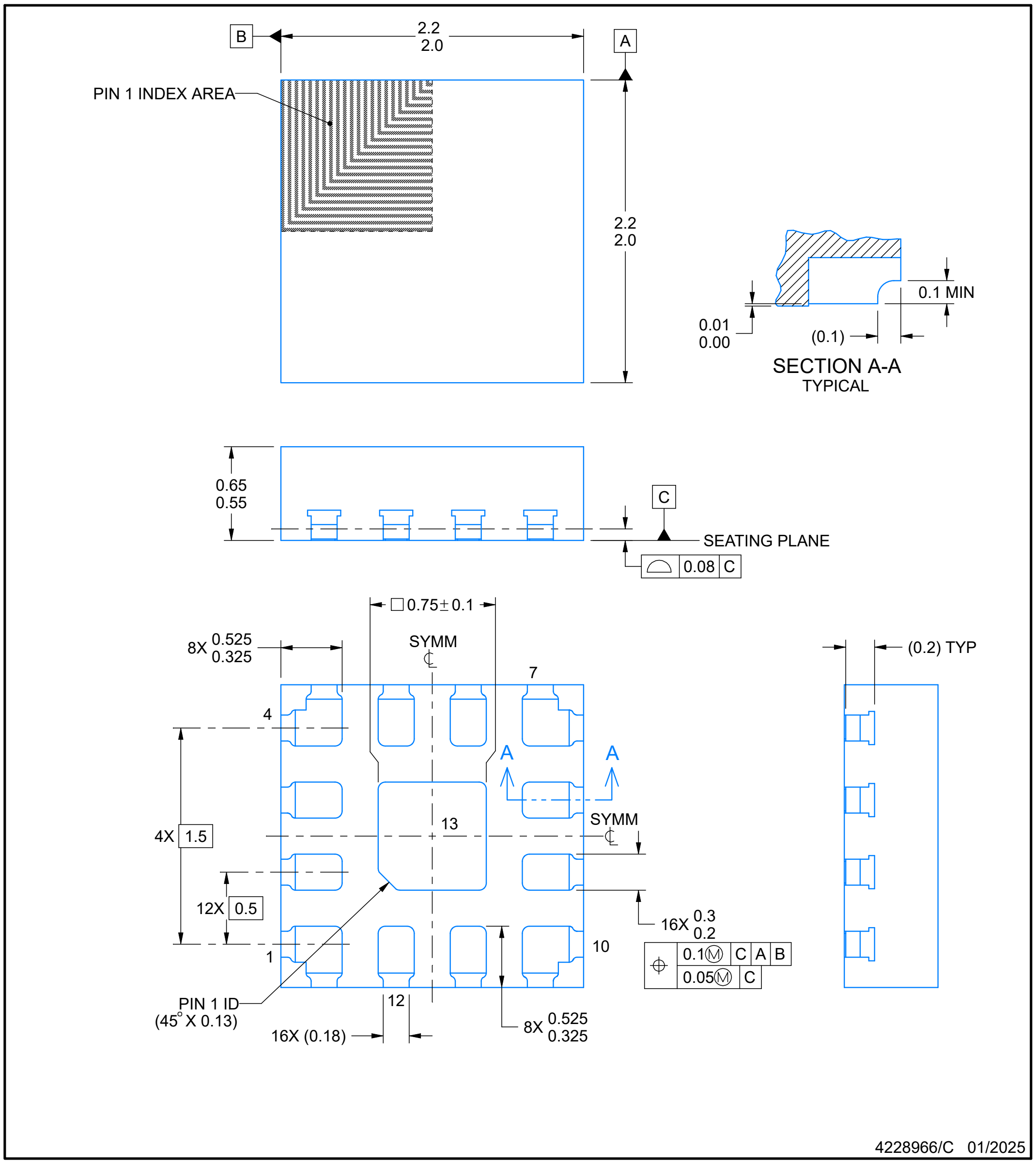
器件	封装类型	封装图	引脚	**SPQ**	长度 (mm)	宽度 (mm)	高度 (mm)
TPS62A2I4AQ WRZXRQ1	UQFN-FCRLF	RZX	13	3000	210	185	35

PACKAGE OUTLINE

RZX0013A

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

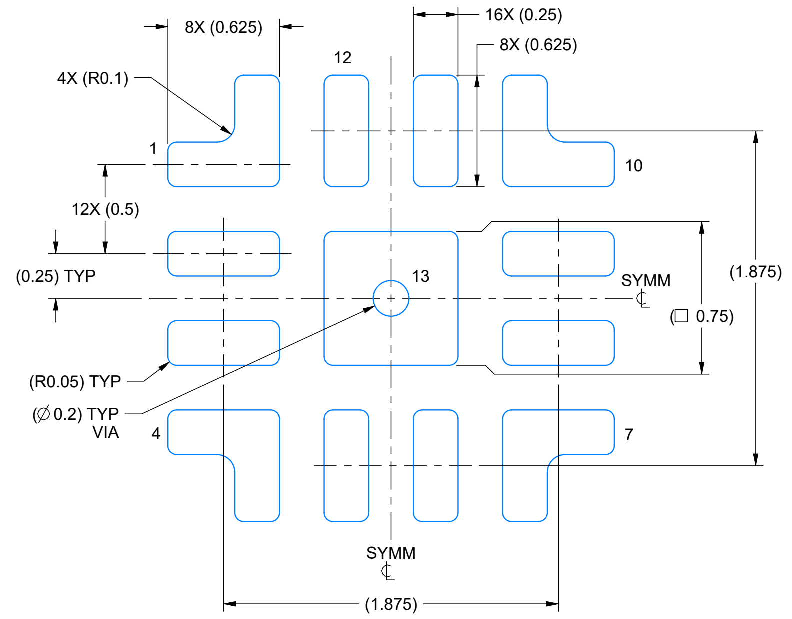
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

www.ti.com

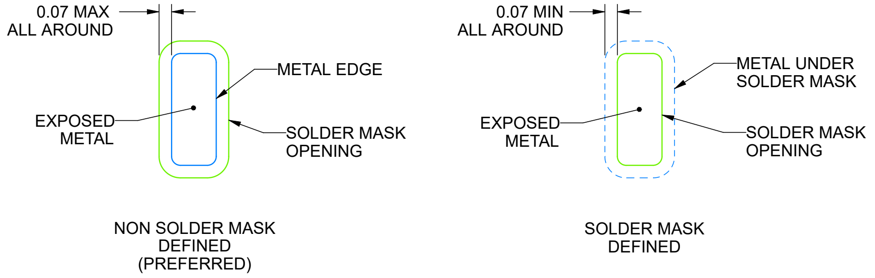
EXAMPLE BOARD LAYOUT

RZX0013A **UQFN-FCRLF - 0.65 mm max height**

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 30X



SOLDER MASK DETAILS

4228966/C 01/2025

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/slua271).
5. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.

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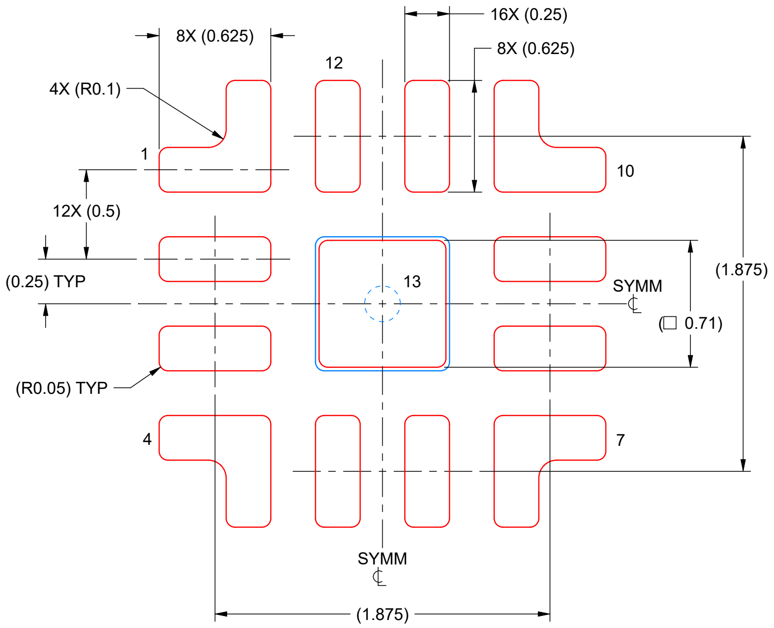
EXAMPLE STENCIL DESIGN

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.

ADVANCE INFORMATION

PACKAGE OPTION ADDENDUM

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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

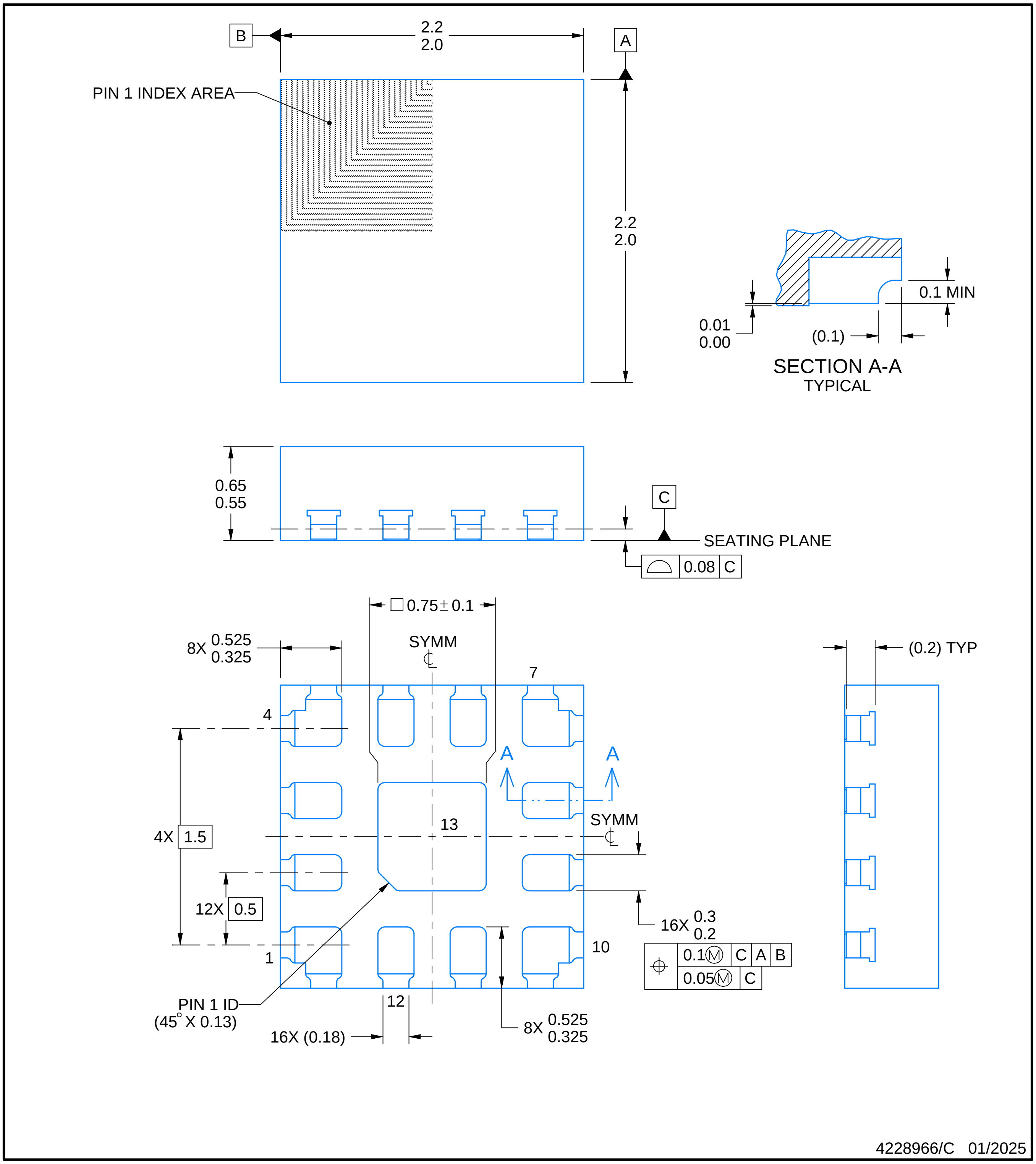
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

PACKAGE OUTLINE

RZX0013A

UQFN-FCRLF - 0.65 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



4228966/C 01/2025

NOTES:

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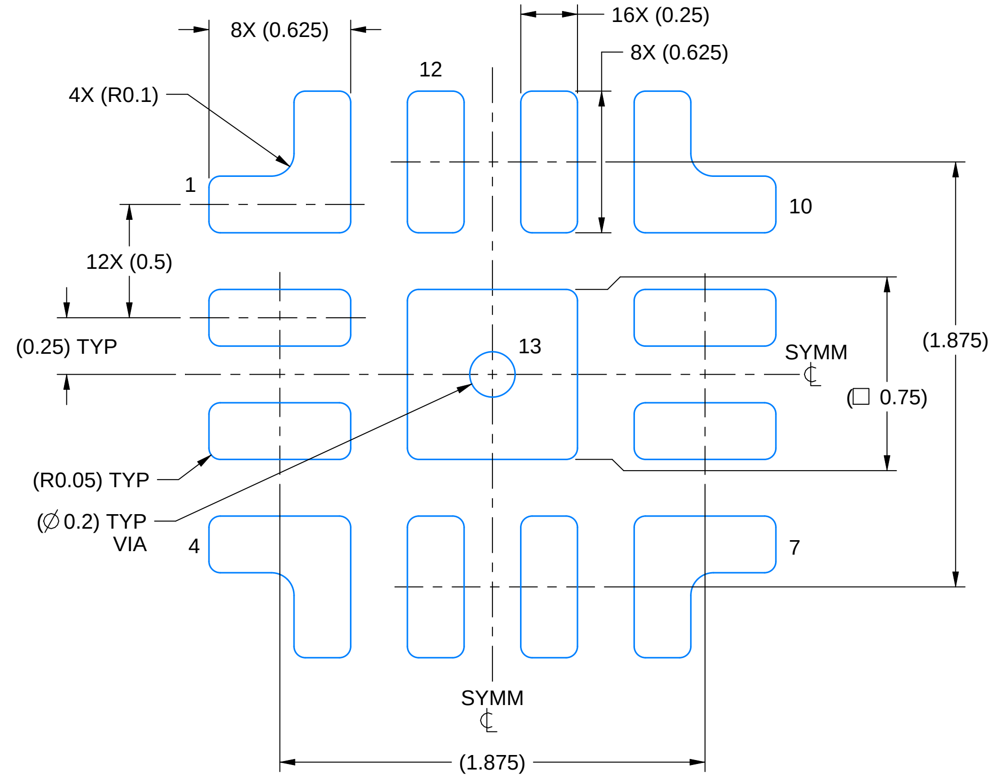
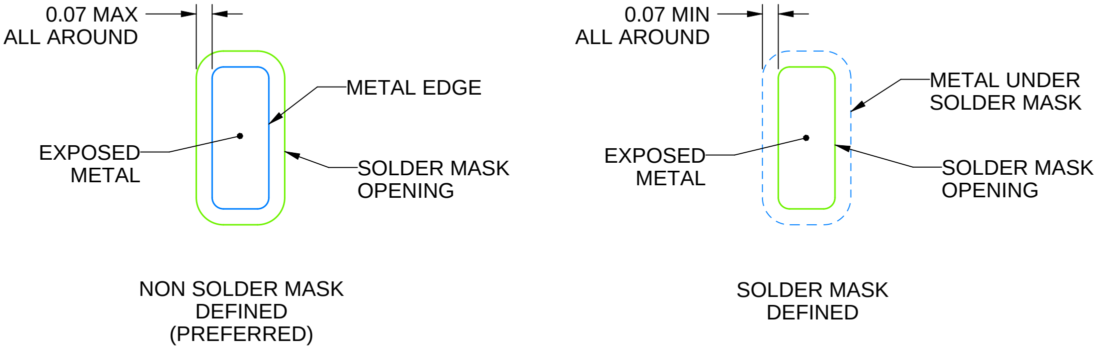


LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 30X



SOLDER MASK DETAILS

4228966/C 01/2025

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/slua271).
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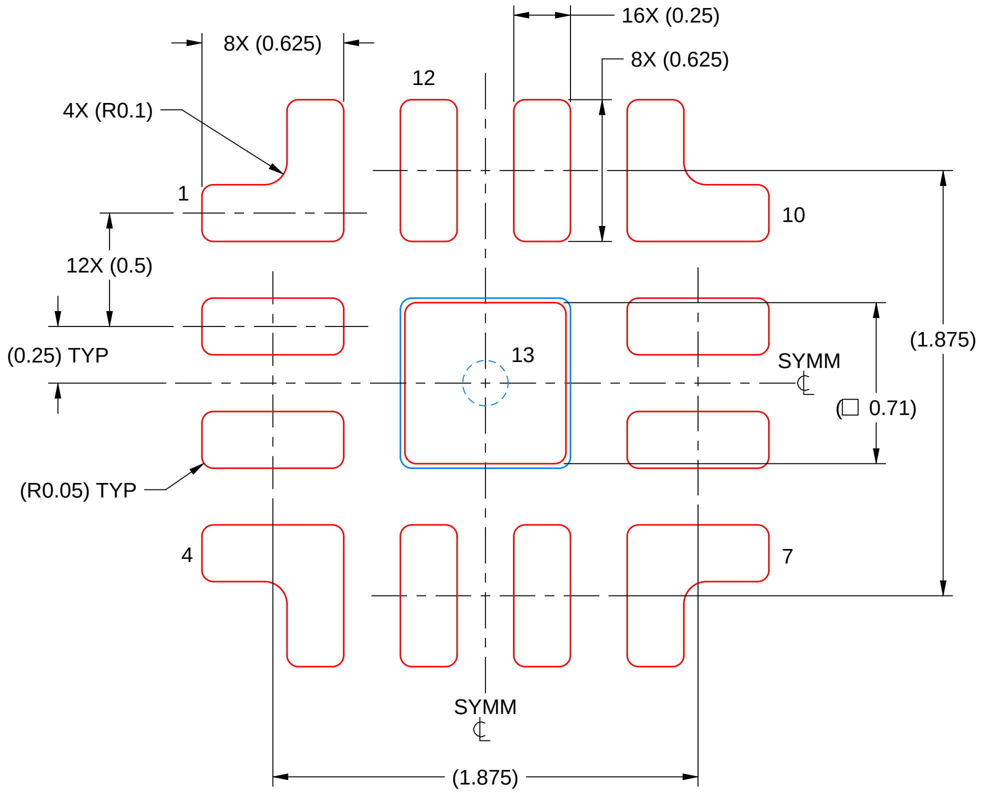

SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 30X

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

NOTES: (continued)

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