

DS90UB971-Q1 具有 CSI-2 接口且适用于 8MP+ 摄像头、雷达和其他传感器的 FPD-Link IV 7.55Gbps 串行器

1 特性

- 符合面向汽车应用的 AEC-Q100 标准：
 - 器件温度：指定了 -40°C 至 115°C 的环境工作温度范围以提高电气性能
- 7.55Gbps (6Gbps 视频有效载荷) 支持高速传感器 (包括 8MP+ 成像仪)
- 同轴电缆供电 (PoC) 兼容收发器
- 具有 4 个通道的单个 MIPI D-PHY 端口
 - 符合 MIPI D-PHY v2.1 标准
 - 1 个时钟通道和 1、2 或 4 个可配置数据通道
 - 每个通道不超过 1.5Gbps，每个端口不超过 6Gbps
 - 支持极性引脚反转 (p/n)
 - 16 个虚拟通道
- 单端口 MIPI CSI-2 接收器
 - 符合 MIPI CSI-2 v2.1 标准
 - 支持多种数据类型和多次曝光
- 高级数据保护与诊断 (包括：CRC 数据保护、传感器数据完整性检查、I2C 写保护、电压与温度测量、可编程警报以及线路故障检测)
- 灵活的可编程输出时钟发生器
- 支持单端同轴或屏蔽双绞线 (STP) 电缆
- 超低延迟双向 I2C 与 GPIO 控制通道，支持通过 ECU 进行 ISP 控制
- 单个 1.8 V 电源
- 兼容 DS90UB9702-Q1、DS90UB954-Q1、DS90UB936-Q1、DS90UB960-Q1、DS90UB962-Q1 解串器
- 与 DS90UB953-Q1、DS90UB953A-Q1、DS90UB935-Q1、DS90UB951-Q1 串行器引脚相兼容
- 小型 5mm × 5mm VQFN 封装与解决方案尺寸，适合紧凑型传感器模块设计
- 功能安全合规型**
 - 专为功能安全应用开发
 - 可提供辅助达到 ASIL B 级别的 ISO 26262 系统设计的文档

2 应用

- 汽车驾驶员辅助系统 (ADAS)
 - 环视系统 (SVS)
 - 摄像头监控系统 (CMS)
 - 前视摄像头 (FC)
 - 驾驶员监控系统 (DMS)
 - 后视摄像头 (RVC)
 - 汽车卫星雷达与激光雷达模块
 - 飞行时间 (ToF) 传感器
- 安防与监控摄像头
- 工业与医疗成像

3 说明

DS90UB971-Q1 串行器是第一代 FPD-Link IV 串行器，旨在支持包括 8MP+ 成像仪、卫星雷达、激光雷达和飞行时间 (ToF) 传感器在内的超高速原始数据传感器。该芯片能够提供 7.55Gbps 正向通道与超低延迟 47.1875Mbps 双向控制通道，并且支持通过单根同轴 (PoC) 或 STP 电缆供电。DS90UB971-Q1 具有先进的数据保护和诊断功能，可支持 ADAS 和汽车功能安全。DS90UB971-Q1 与配套的解串器一起提供精确的多摄像头传感器时钟和传感器同步。

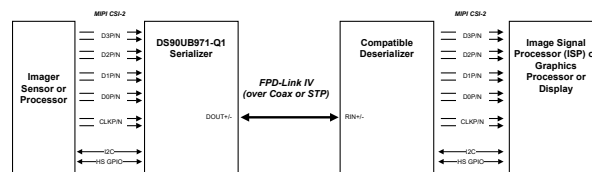
DS90UB971-Q1 完全符合 AEC-Q100 标准，以及 -40°C 至 115°C。该串行器采用 5mm × 5mm 小型 VQFN 封装，适用于空间受限型传感器应用。

器件信息

器件型号	封装 (1)	本体尺寸 (标称值) (2)
DS90UB971-Q1	VQFN (32)	5.00mm × 5.00mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。

(2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。



典型应用



4 器件和文档支持

4.1 相关文档

如需获取安全文档，请联系 TI。

请参阅以下相关文档：

- [通过支持双向控制通道的 FPD-Link III 进行 I2C 通信](#)
- [I2C 总线上拉电阻器计算](#)

4.2 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。

4.3 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](#)。

4.4 商标

TI E2E™ is a trademark of Texas Instruments.

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4.5 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。

4.6 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 修订历史记录

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision * (December 2023) to Revision A (January 2025)	Page
• 新增了“安全相关认证”要点.....	1

6 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。

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
DS90UB971RHRQ1	ACTIVE	VQFN	RHB	32	3000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 115	UB971Q	Samples
DS90UB971RHBTQ1	ACTIVE	VQFN	RHB	32	250	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 115	UB971Q	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.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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
DS90UB971RHBRQ1	VQFN	RHB	32	3000	330.0	12.4	5.3	5.3	1.1	8.0	12.0	Q2
DS90UB971RHBTQ1	VQFN	RHB	32	250	180.0	12.4	5.3	5.3	1.1	8.0	12.0	Q2

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DS90UB971RHBRQ1	VQFN	RHB	32	3000	367.0	367.0	35.0
DS90UB971RHBTQ1	VQFN	RHB	32	250	210.0	185.0	35.0

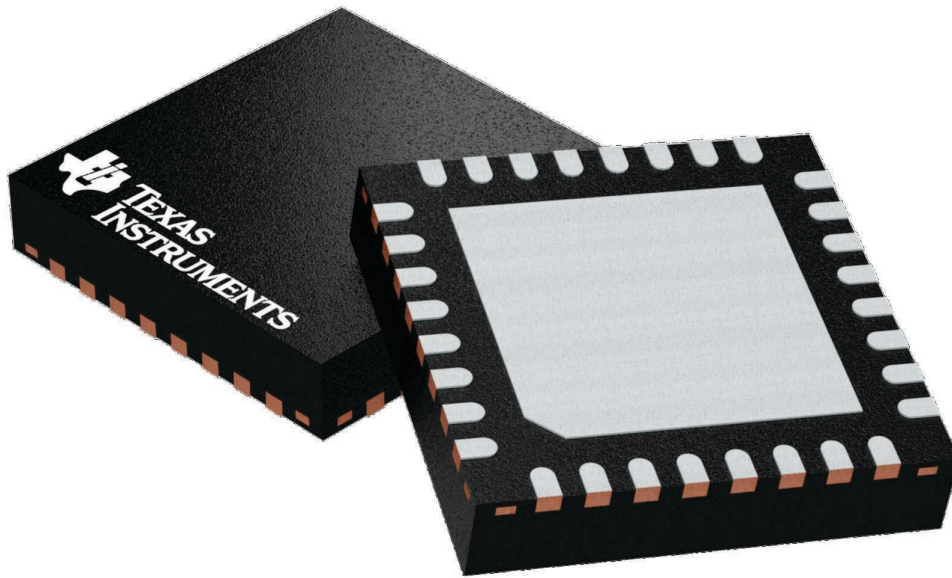
GENERIC PACKAGE VIEW

RHB 32

VQFN - 1 mm max height

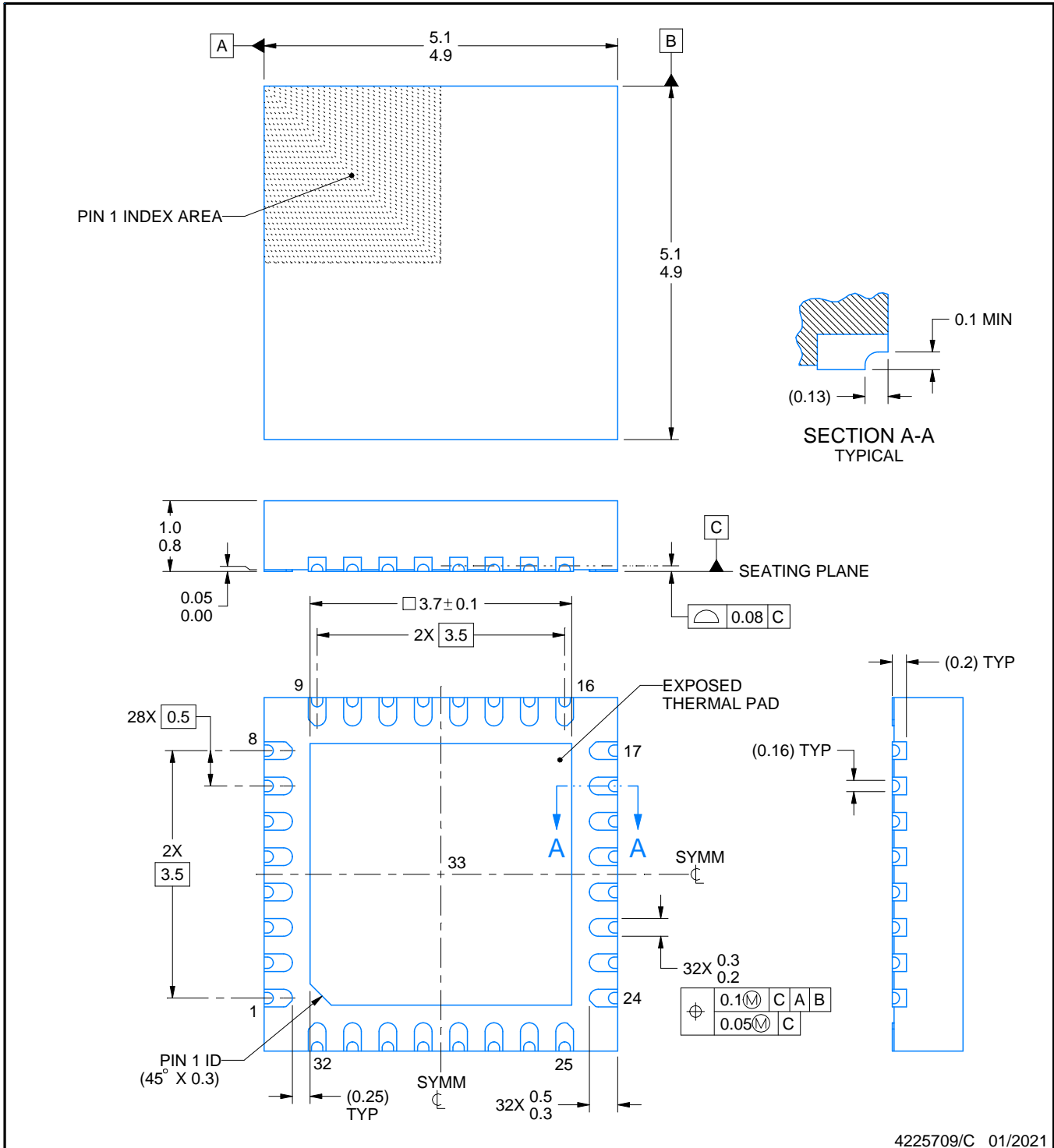
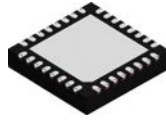
5 x 5, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

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NOTES:

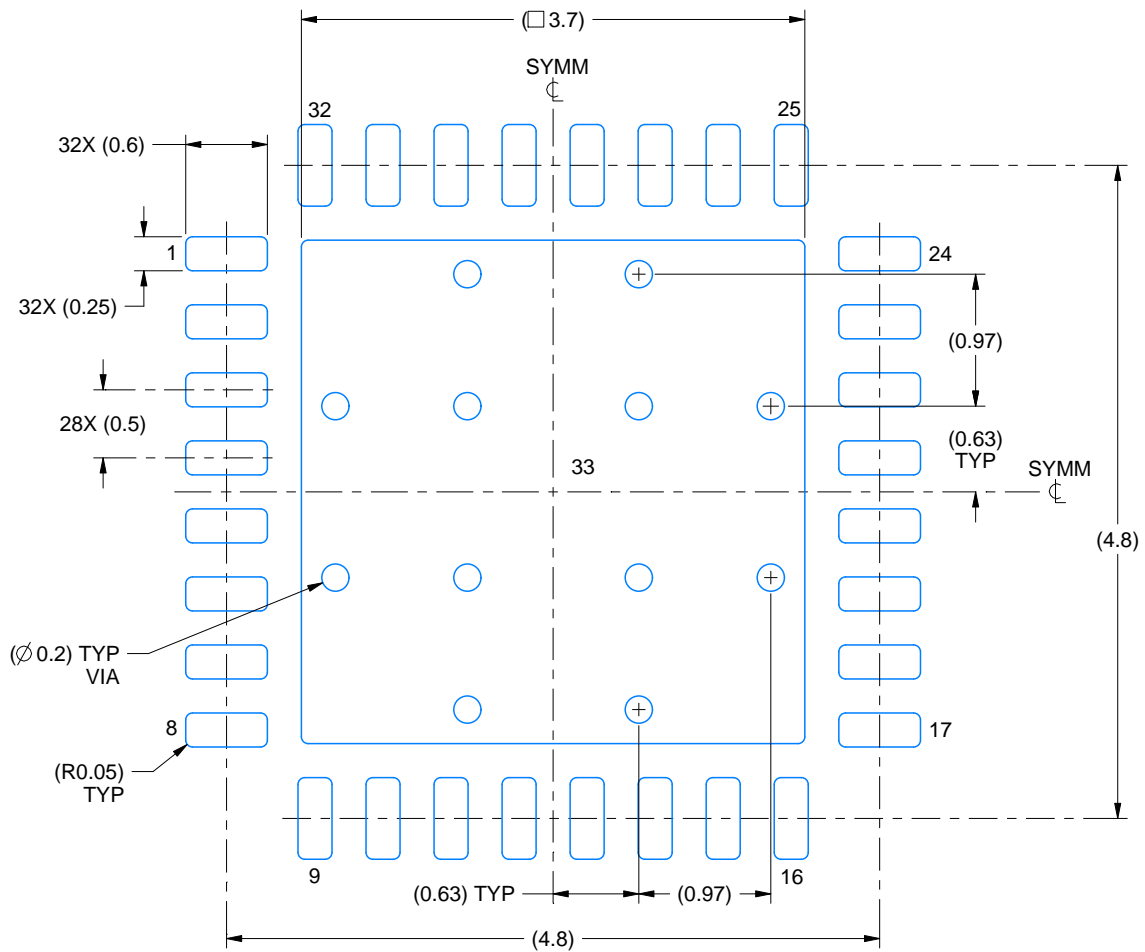
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

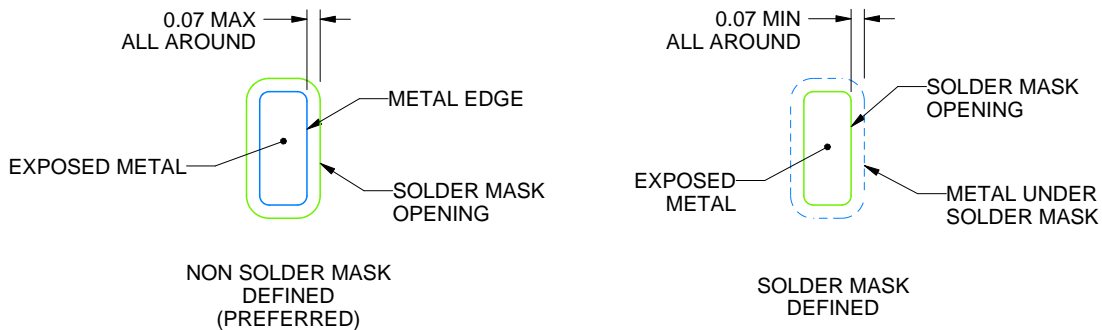
RHB0032U

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X



SOLDER MASK DETAILS

4225709/C 01/2021

NOTES: (continued)

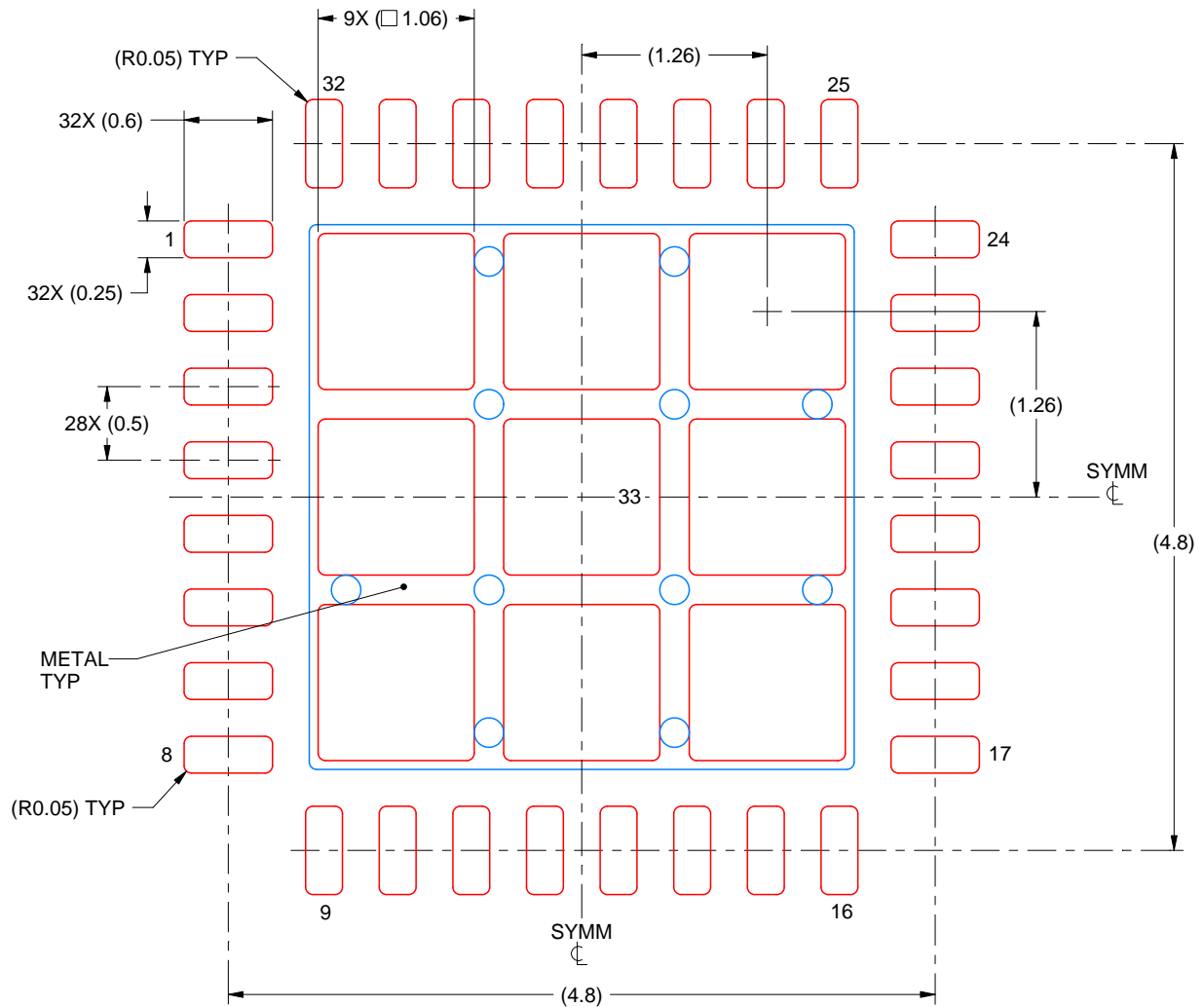
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
- Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

RHB0032U

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD 33:
74% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE:20X

4225709/C 01/2021

NOTES: (continued)

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

重要通知和免责声明

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