

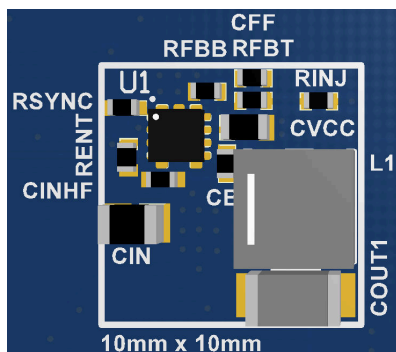
具有 1.5 μ A I_Q 并采用 4mm²HotRod™ QFN 封装的 LMR436x0-Q1 36V、1A/2A 降压转换器

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
- 1mA 下的效率大于 85%
 - 在输入电压为 13.5V、固定输出电压为 3.3V 时具有 1.5 μ A 的 I_Q (开关)
- 微型解决方案尺寸和低组件成本
 - 具有可湿性侧面的 2mm $\times$ 2mm HotRod™ 封装
 - 内部补偿
- 针对超低 EMI 要求进行了优化
 - 扩频可降低峰值发射
 - 轻负载下可通过 MODE/SYNC 引脚使用引脚可选 FPWM 模式提供恒定频率
 - F_{SW} 与 MODE/SYNC 引脚同步
- 专为汽车应用设计
 - 结温范围：-40°C 至 +150°C
 - 支持 42V 的汽车负载突降
 - 提供 3V V_{IN} 用于汽车冷启动
 - 可调范围高达 95% 的 V_{IN} ，提供 3.3V 和 5V 固定 V_{OUT} 选项
- 适用于可扩展电源
 - 可调 F_{SW} ：RT 引脚为 200kHz 至 2.2MHz
 - 与以下器件引脚兼容：
 - LMR36506-Q1 (65V、600mA)
 - LMR36503-Q1 (65V、300mA)

2 应用

- 高级驾驶辅助系统：雷达 ECU
- 信息娱乐系统和仪表组：音响主机、eCall
- 车身电子装置和照明



典型解决方案尺寸

3 说明

LMR436x0-Q1 是业界超小型 36V、2A 和 1A 同步降压直流/直流转换器，采用 2mm $\times$ 2mm HotRod™ 封装。这款易于使用的转换器支持从 3.0V 到 36V 的宽输入电压范围，以及高达 42V 的瞬态电压。

LMR43620-Q1 是专为满足始终运行的汽车类应用的低待机功耗要求而设计的。自动模式可在轻负载运行时进行频率折返，在输入电压为 13.5V 时实现 1.5 μ A 的空载电流消耗和高轻负载效率。PWM 和 PFM 模式之间无缝转换，以及超低的 MOSFET 导通电阻，均确保在整个负载范围内实现卓越的效率。

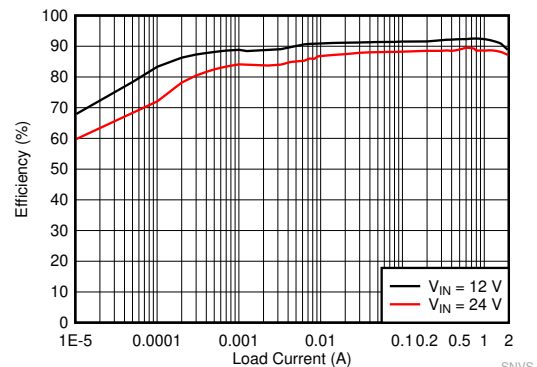
控制架构和功能集经过优化，可实现超小型解决方案尺寸。该器件使用峰值电流模式控制，可更大程度降低输出电容。LMR436x0-Q1 利用假随机扩频、低 EMI HotRod™ 封装和经过优化的引脚排列，更大程度地减小了输入滤波器尺寸。MODE/SYNC 和 RT 引脚型号可用于在 200kHz 至 2.2MHz 范围内设置或同步频率，以避免噪声敏感频带。

LMR436x0-Q1 丰富的功能集旨在简化各种汽车类终端设备的实施。

器件信息

器件型号	封装 ⁽¹⁾	封装尺寸 (标称值)
LMR43620-Q1	VQFN-HR (9)	2.00mm $\times$ 2.00mm
LMR43610-Q1	VQFN-HR (9)	2.00mm $\times$ 2.00mm

- (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。



效率： $V_{OUT} = 3.3V$ (固定值)、2.2MHz



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4 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision * (October 2020) to Revision A (December 2020)	Page
• 向数据表中添加了 LMR43610-Q1.....	1
• 更新了 节 2	1
• 编辑了 节 3	1

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

For related documentation see the following:

- Texas Instruments, [Thermal Design by Insight not Hindsight Application Report](#)
- Texas Instruments, [A Guide to Board Layout for Best Thermal Resistance for Exposed Pad Packages Application Report](#)
- Texas Instruments, [Semiconductor and IC Package Thermal Metrics Application Report](#)
- Texas Instruments, [Thermal Design Made Simple with LM43603 and LM43602 Application Report](#)
- Texas Instruments, [PowerPAD™ Thermally Enhanced Package Application Report](#)
- Texas Instruments, [PowerPAD™ Made Easy Application Report](#)
- Texas Instruments, [Using New Thermal Metrics Application Report](#)
- Texas Instruments, [Layout Guidelines for Switching Power Supplies Application Report](#)
- Texas Instruments, [Simple Switcher PCB Layout Guidelines Application Report](#)
- Texas Instruments, [Construction Your Power Supply- Layout Considerations Seminar](#)
- Texas Instruments, [Low Radiated EMI Layout Made Simple with LM4360x and LM4600x Application Report](#)

5.2 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 [订阅更新](#) 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。

5.3 支持资源

[TI E2E™ 支持论坛](#) 是工程师的重要参考资料，可直接从专家获得快速、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可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》。

5.4 Trademarks

HotRod™, PowerPAD™, and are trademarks of TI.

TI E2E™ is a trademark of Texas Instruments.

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5.5 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。

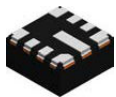
ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

5.6 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。

6 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.

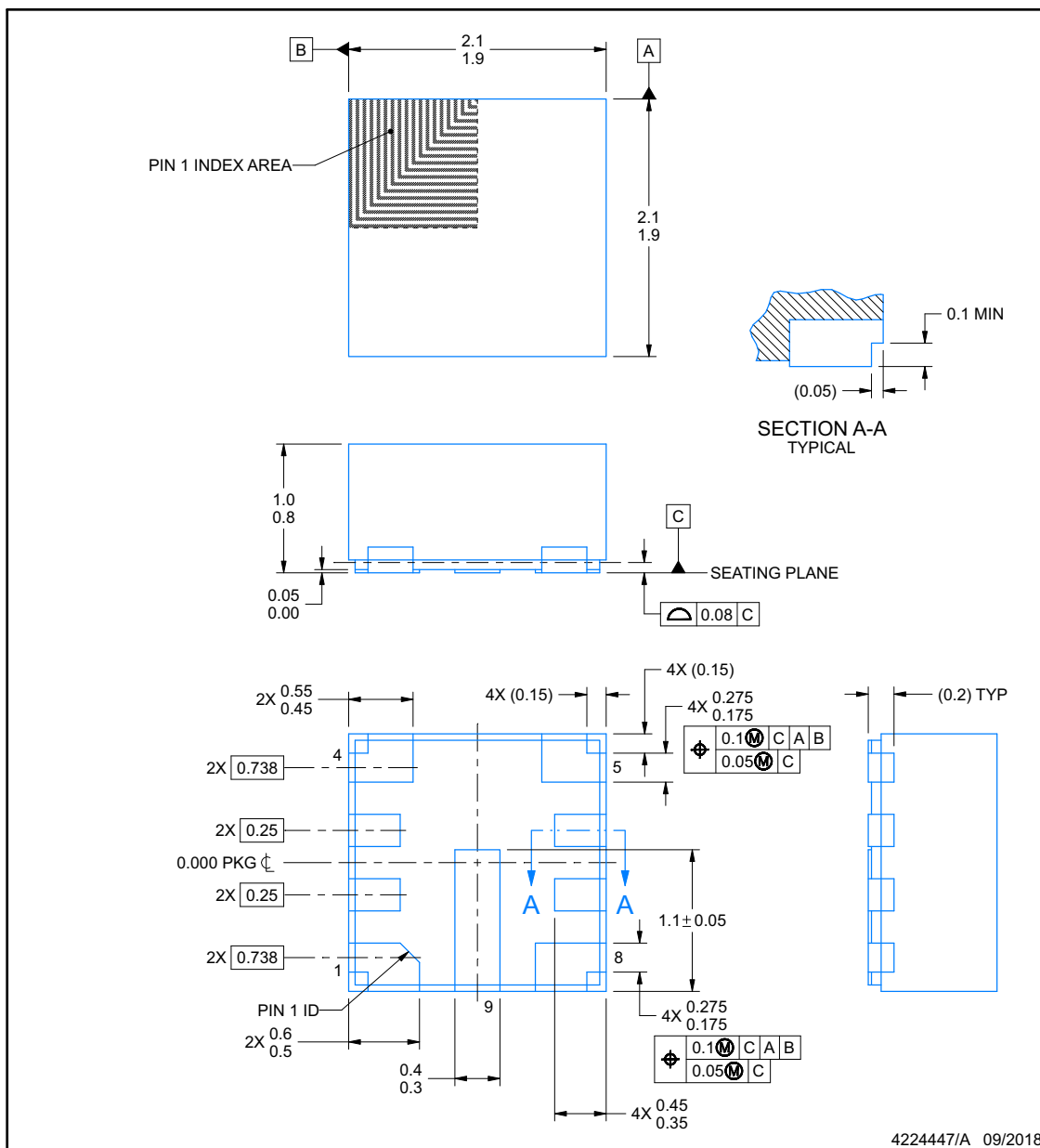


PACKAGE OUTLINE

RPE0009A

VQFN-HR - 1.0 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

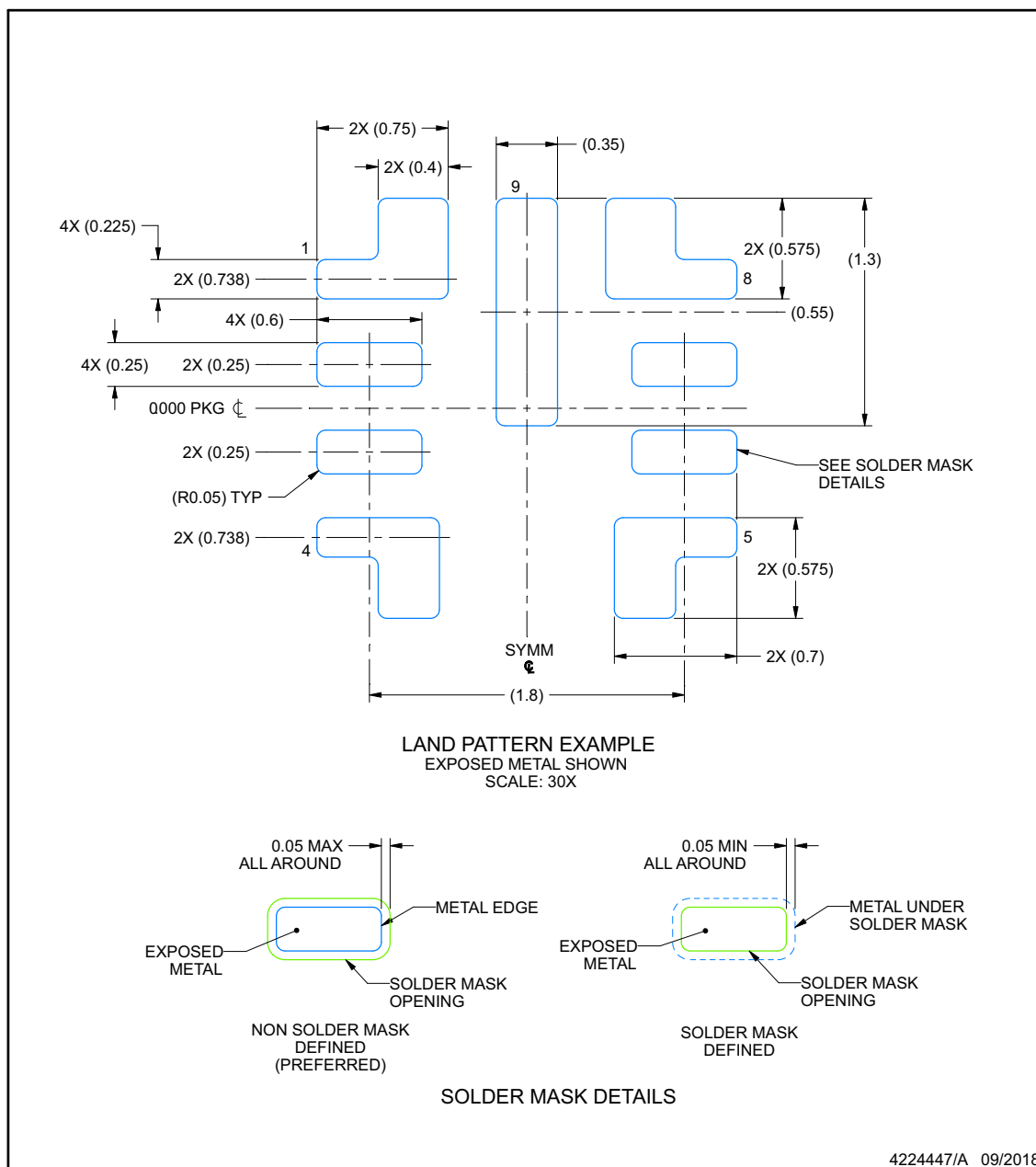
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

RPE0009A

VQFN-HR - 1.0 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

3. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
4. 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.

VQFN-HR - 1.0 mm max height

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

PADS 1 & 8:
 90% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

PAD 9:
 85% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

DWG NO:5/REV:5 MM YYYY:5

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

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
LMR43610MSC3RPERQ1	PREVIEW	VQFN-HR	RPE	9	4500	TBD	Call TI	Call TI	-40 to 150		
LMR43620MSC3RPERQ1	PREVIEW	VQFN-HR	RPE	9	3000	Non-RoHS & Non-Green	Call TI	Call TI	-40 to 150		
PMR43620MSC3RPERQ1	ACTIVE	VQFN-HR	RPE	9	3000	Non-RoHS & Non-Green	Call TI	Call TI	-40 to 150		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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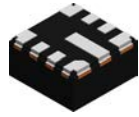
www.ti.com

PACKAGE OPTION ADDENDUM

9-Mar-2021

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.

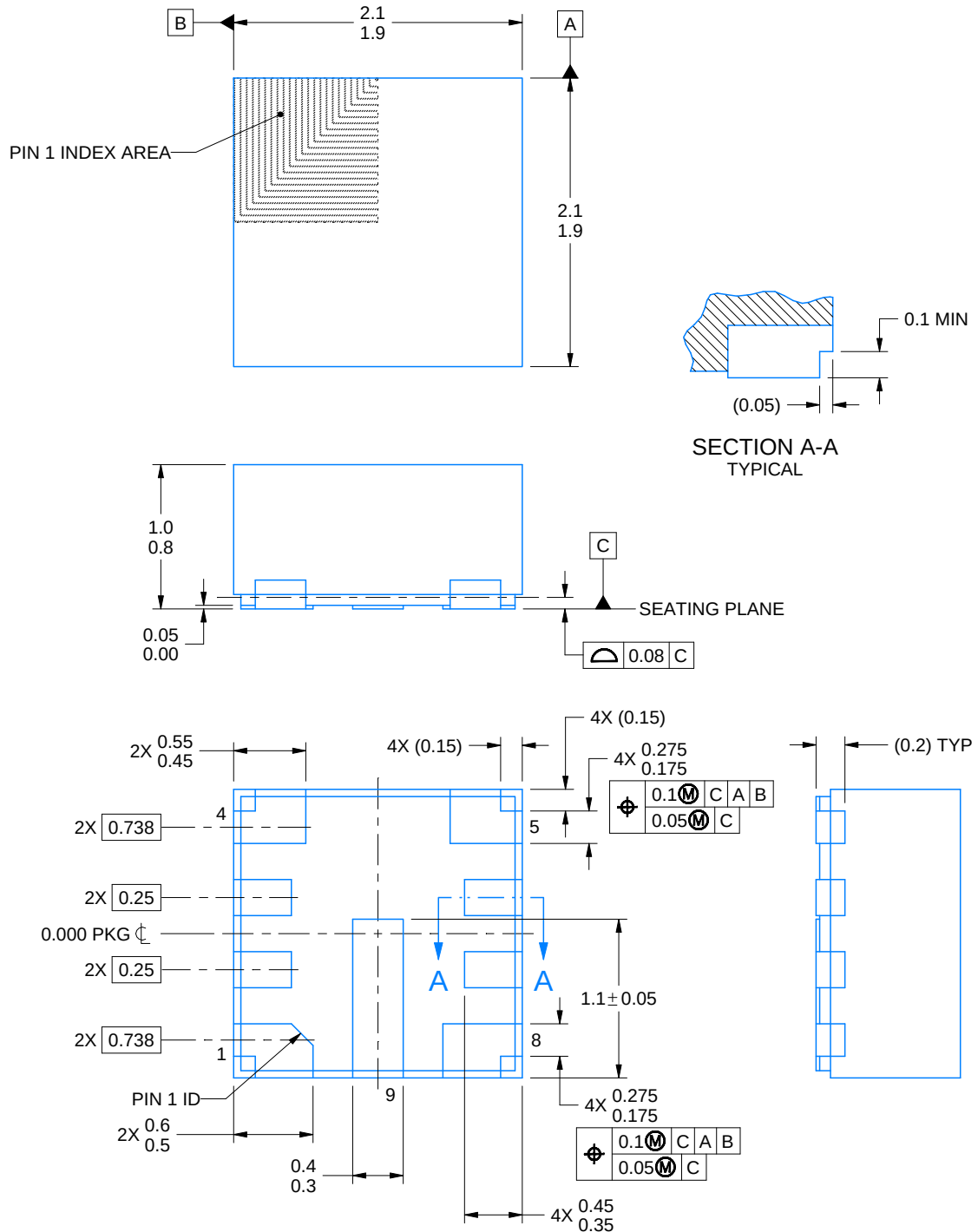
RPE0009A



PACKAGE OUTLINE

VQFN-HR - 1.0 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



4224447/A 09/2018

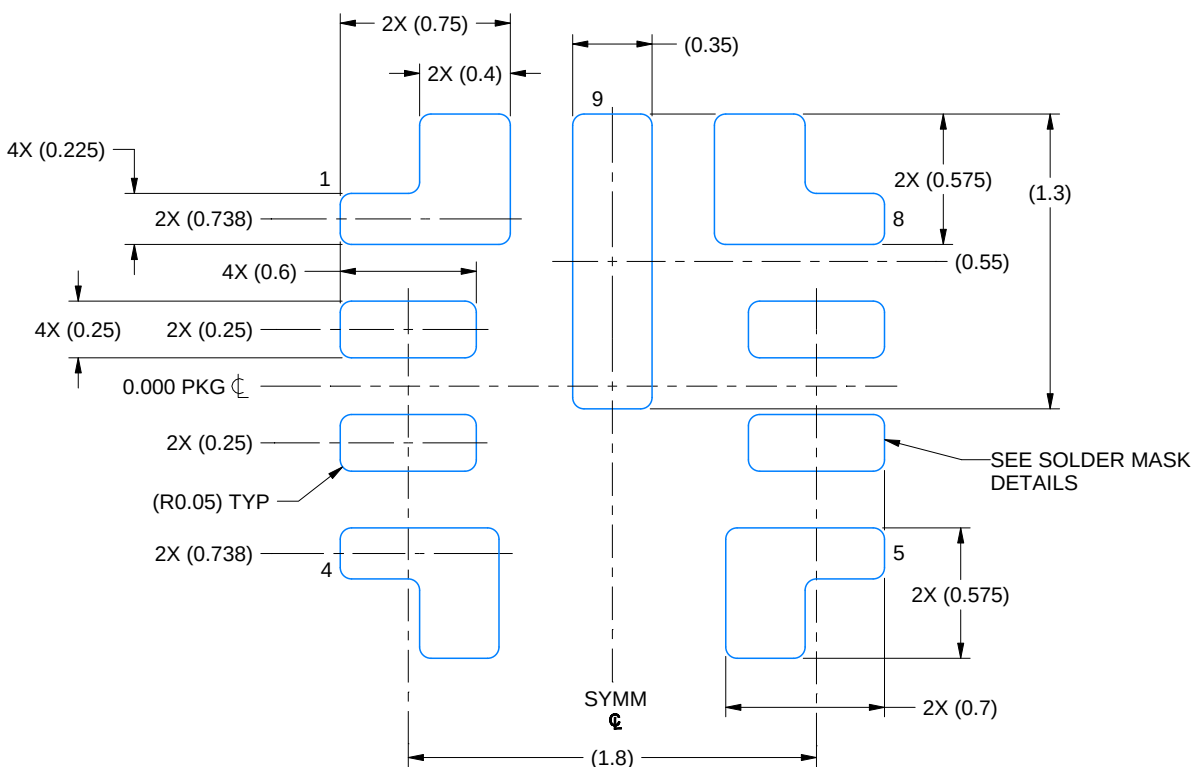
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
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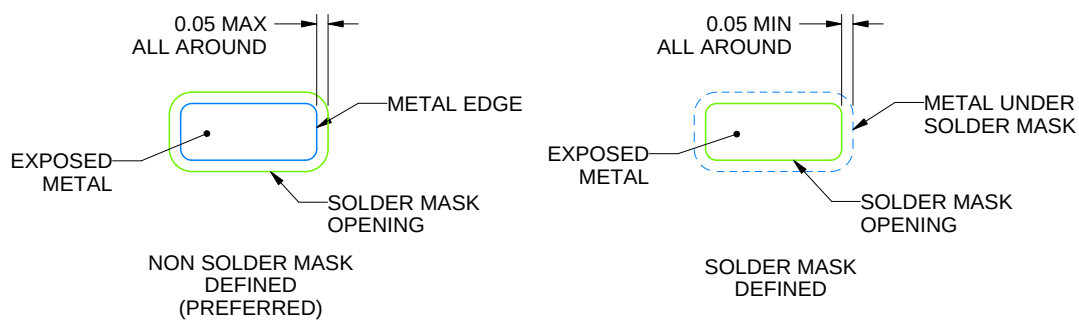
RPE0009A

VQFN-HR - 1.0 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 30X



SOLDER MASK DETAILS

4224447/A 09/2018

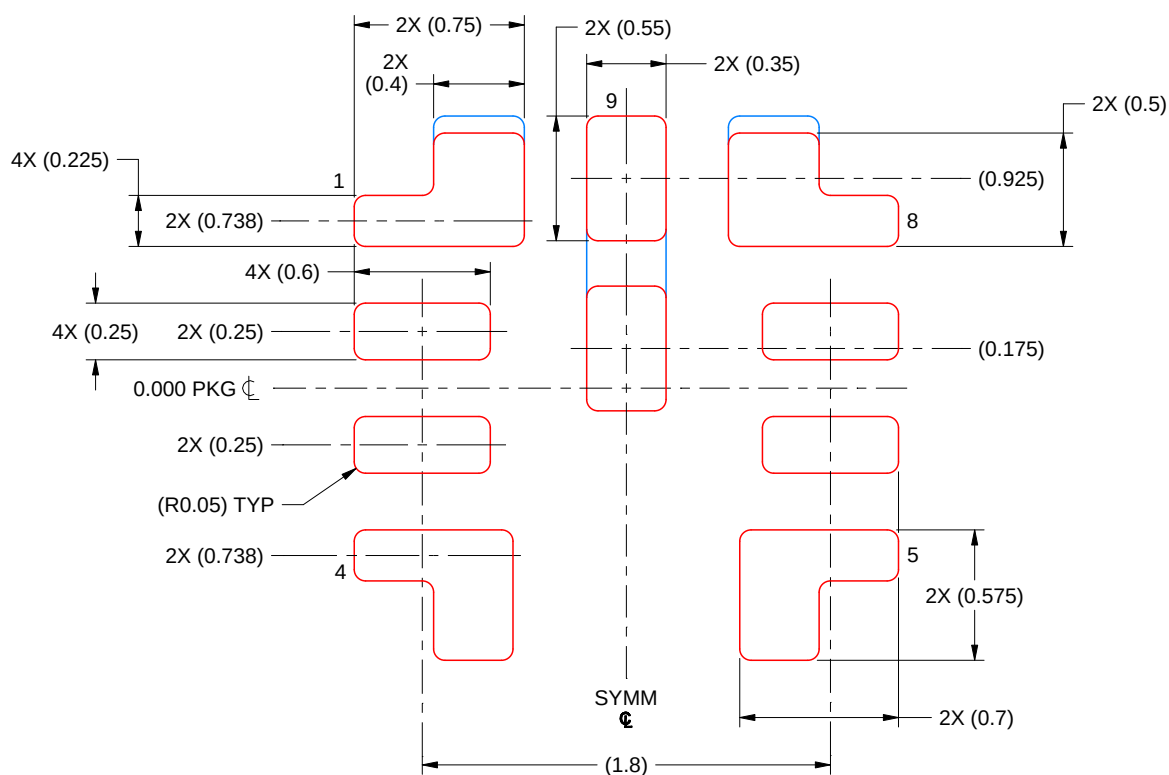
NOTES: (continued)

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RPE0009A

VQFN-HR - 1.0 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



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

PADS 1 & 8:
90% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
PAD 9:
85% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

DWG_NO:5/REV:5 MM_YYYY:5

NOTES: (continued)

5. 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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