TPS92667-Q1 具有高级诊断功能的汽车类低噪声 16 通道 LED 矩阵管理器

1 特性

- 符合面向汽车应用的 AEC-Q100 标准
  - 1 级：–40°C 至 +125°C 环境温度
  - 器件 HBM 分类等级 H1C
  - 器件 CDM 分类等级 C5
- 功能安全型
  - 可提供用于功能安全系统设计的文档
- 16 个集成旁路开关
  - 可编程 10 位 PWM 调光
  - 可编程压摆率控制
  - LED 开路检测和保护
- UART 串行通信
  - 用于外部系统时钟的 LVDS 时钟接收器
  - 兼容上一代 LMM
  - 兼容 CAN 收发器

2 应用

- 汽车前照灯系统
- ADB 或无眩光远光灯
- 连续转向、动画日间行车灯

3 说明

TPS92667 LED 矩阵管理器器件通过提供单个像素级 LED 控制来实现完全动态的自适应照明解决方案。该器件的 4 个串联集成开关各有 4 个子灯串，可绕过单个 LED。各个子灯串允许器件接受单个或多个电流源。

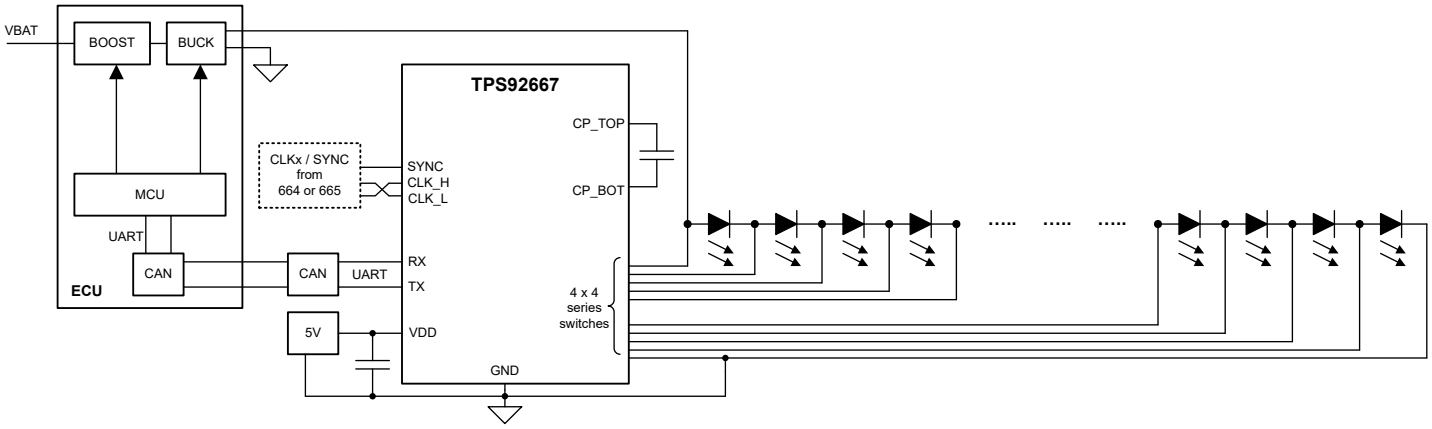
TPS92667 具有内部低噪声 LVDS 接收器输入，用于由 TPS92664 或 TPS92665 器件提供的系统时钟。多点通用异步接收器发送器 (UART) 串行接口与 TPS92664、TPS92665、TPS92662x 和 TPS92663x 器件兼容。

TPS92667 包含寄存器，可用于对灯串中单个 LED 的相移和脉冲宽度进行编程以及报告 LED 开路、短路故障和功能参数。

封装信息

器件型号	封装 (1)	封装尺寸（标称值）
TPS92667-Q1	PHP（HTQFP、48）	7.00mm × 7.00mm

(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。



简化版应用

内容

4 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

日期	修订版本	说明
December 2022	*	初始发行版

5 Device and Documentation Support

5.1 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。

5.2 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》。

5.3 Trademarks

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

5.4 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.

5.5 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.

6.1 封装选项附录

封装信息

可订购器件	状态 (1)	封装类型	封装图	引脚	包装数量	环保计划 (2)	铅/焊球镀层(4)	MSL 峰值温度 (3)	工作温度 (°C)	器件标识(5) (6)
TPS92667QPHPRQ1	ACTIVE	HTQFP	PHP	48	1000	环保（符合 RoHS 标准，无锑/溴）	Cu NiPdAu	LEVEL3-260C-168 HR	-40 至 125	TPS92667Q

(1) 销售状态值定义如下：
正在供货：建议用于新设计的产品器件。
限期购买：TI 已宣布器件即将停产，但仍在购买期限内。
NRND：不建议用于新设计。为支持现有客户，器件仍在生产，但 TI 不建议在新设计中使用此器件。
PRE_PROD：未发布的器件，尚未投产，未向大众市场供货，也未在网络上供应，样片不可用 。
预发布：器件已发布，但未投产。可能提供样片，也可能无法提供样片。
已停产: TI 已停止生产该器件。

(2) 环保计划 - 规划的环保分级包括：无铅 (RoHS)，无铅（RoHS 豁免）或绿色（RoHS，无锑/溴）- 如需了解最新供货信息及更多产品内容详情，请访问 http://www.ti.com/productcontent。
待定：无铅/绿色转换计划尚未确定。
无铅 (RoHS)：TI 所说的“无铅”或“无 Pb”是指半导体产品符合针对所有 6 种物质的现行 RoHS 要求，包括要求铅的重量不超过同质材料总重量的 0.1%。因在设计时就考虑到了高温焊接要求，因此 TI 的无铅产品适用于指定的无铅作业。
无铅（RoHS 豁免）：该元件在以下两种情况下可享受 RoHS 豁免：1) 芯片和封装之间使用铅基倒装芯片焊接凸点；2) 芯片和引线框之间使用铅基芯片粘合剂。否则，元件将根据上述规定视为无铅（符合 RoHS）。
绿色（RoHS，无锑/溴）：TI 将“绿色”定义为无铅（符合 RoHS 标准）、无溴 (Br) 和无锑 (Sb) 基阻燃剂（Br 或 Sb 在同质材料中的质量不超过总质量的 0.1%）

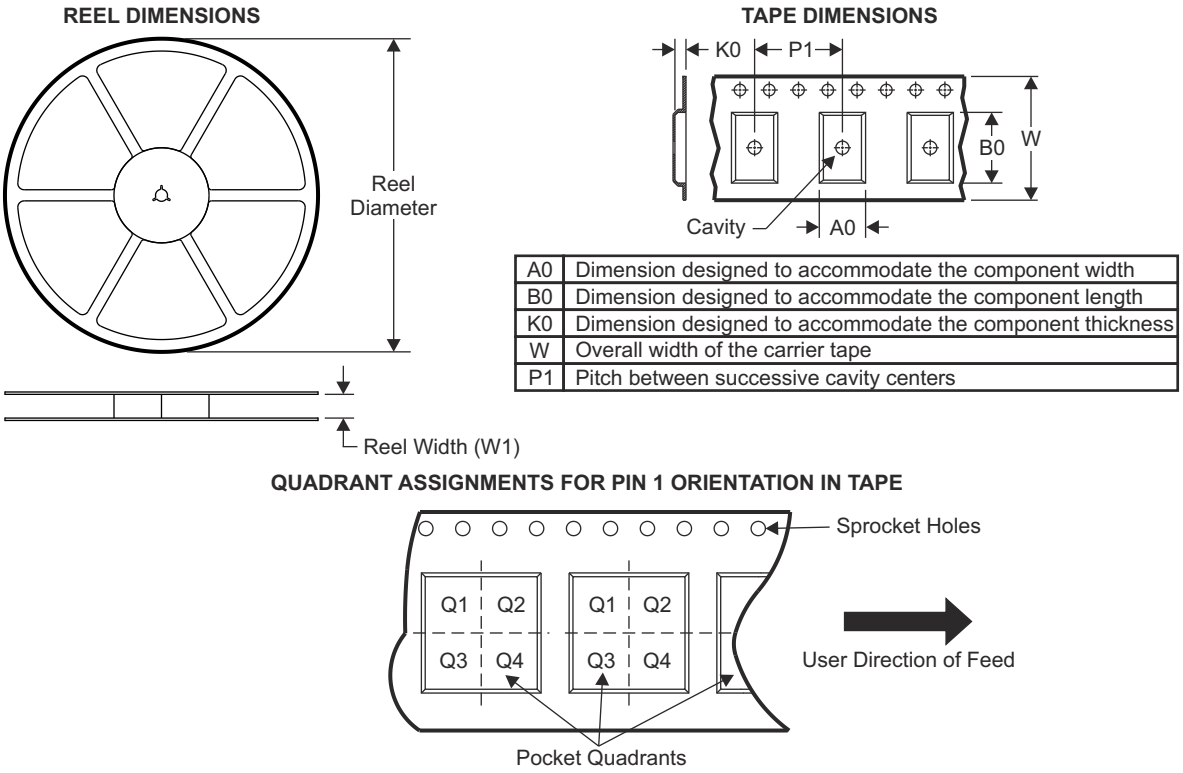
(3) MSL，峰值温度-- 湿敏等级额定值（符合 JEDEC 工业标准分级）和峰值焊接温度。

(4) 铅/焊球镀层 - 可订购器件可能有多种镀层材料选项。各镀层选项用垂直线隔开。 如果铅/焊球镀层值超出最大列宽，则会折为两行。

(5) 器件上可能还有与标识、批次跟踪代码或环境分级相关的标记。

(6) 括号内将包含多个器件标识。不过，器件上仅显示括号中以“~”隔开的其中一个器件标志。如果某一行缩进，说明该行续接上一行，这两行合在一起表示该器件的完整器件标识。

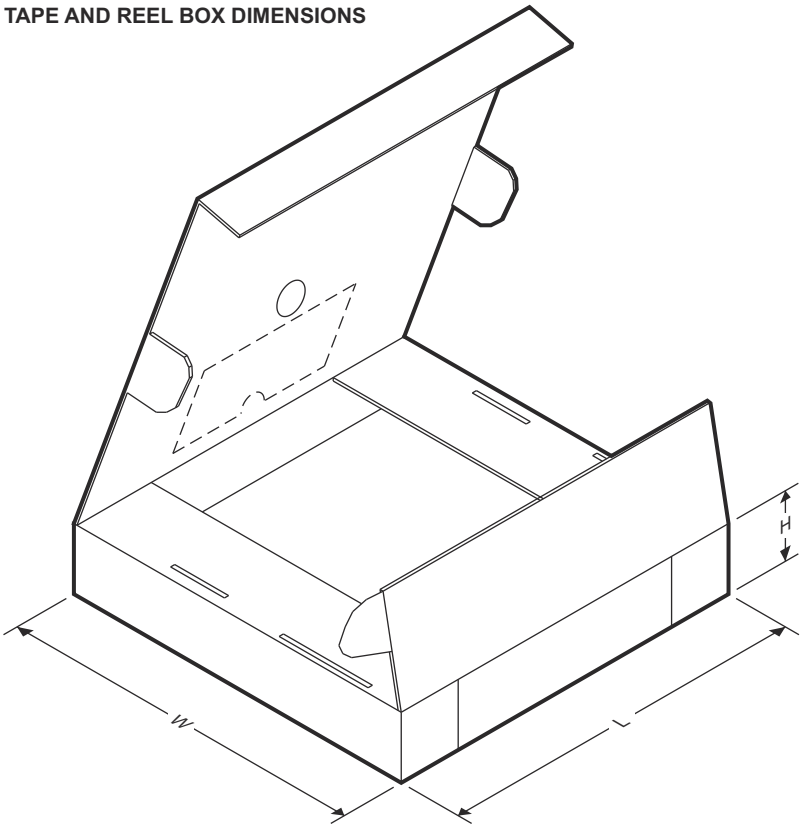
6.2 卷带封装信息



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

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
TPS92667QPHPRQ1	HTQFP	PHP	48	1000	330	16.4	9.6	9.6	1.5	12	16	Q2

TAPE AND REEL BOX DIMENSIONS



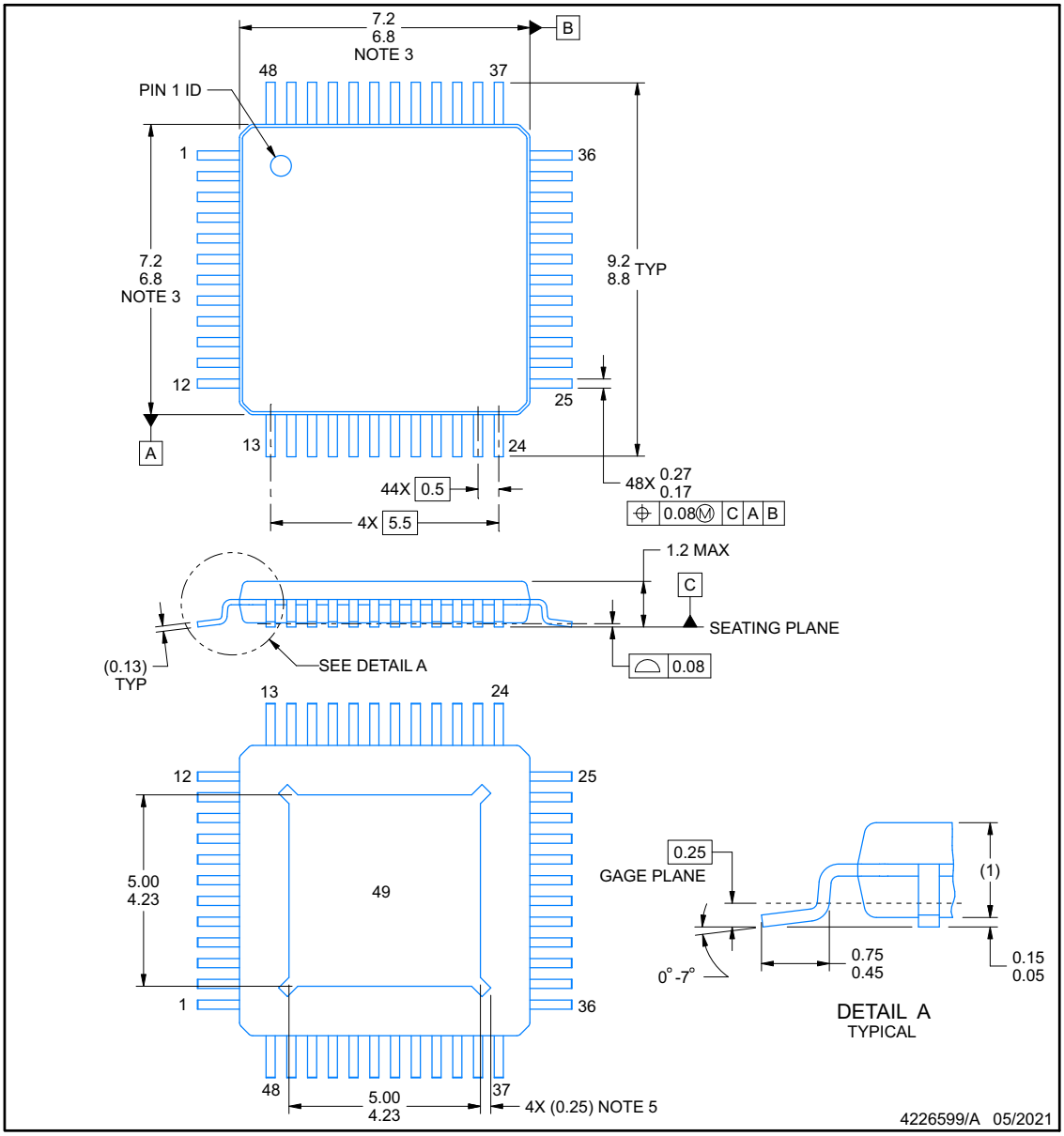
器件	封装类型	封装图	引脚	SPQ	长度（mm）	宽度（mm）	高度（mm）
TPS92667QPHPRQ1	HTQFP	PHP	48	1000	336.6	336.6	31.8

PACKAGE OUTLINE

PHP0048L

PowerPAD™ HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



PowerPAD is a trademark of Texas Instruments.

NOTES:

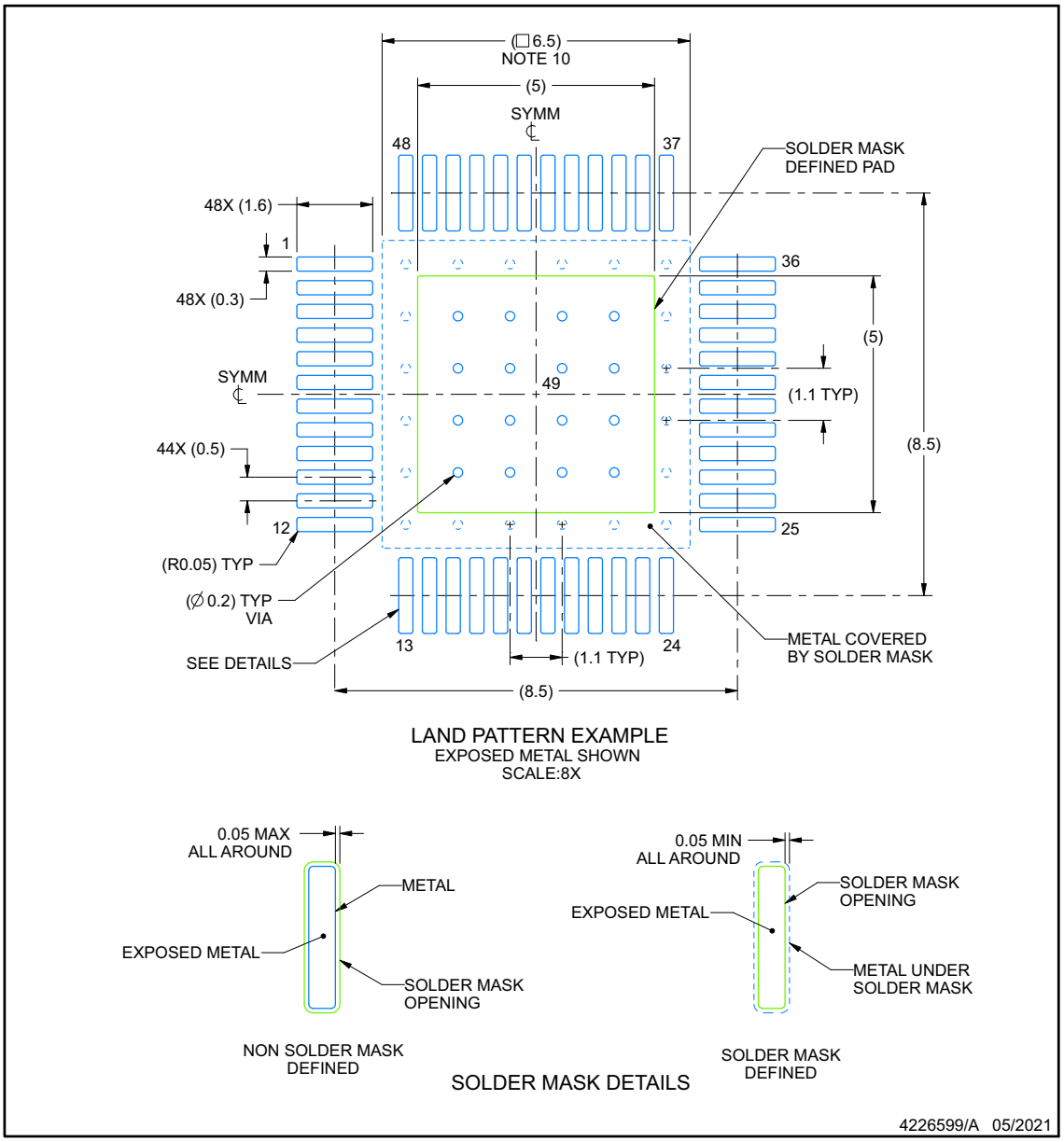
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MS-026.
5. Feature may not be present.

EXAMPLE BOARD LAYOUT

PHP0048L

PowerPAD™ HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



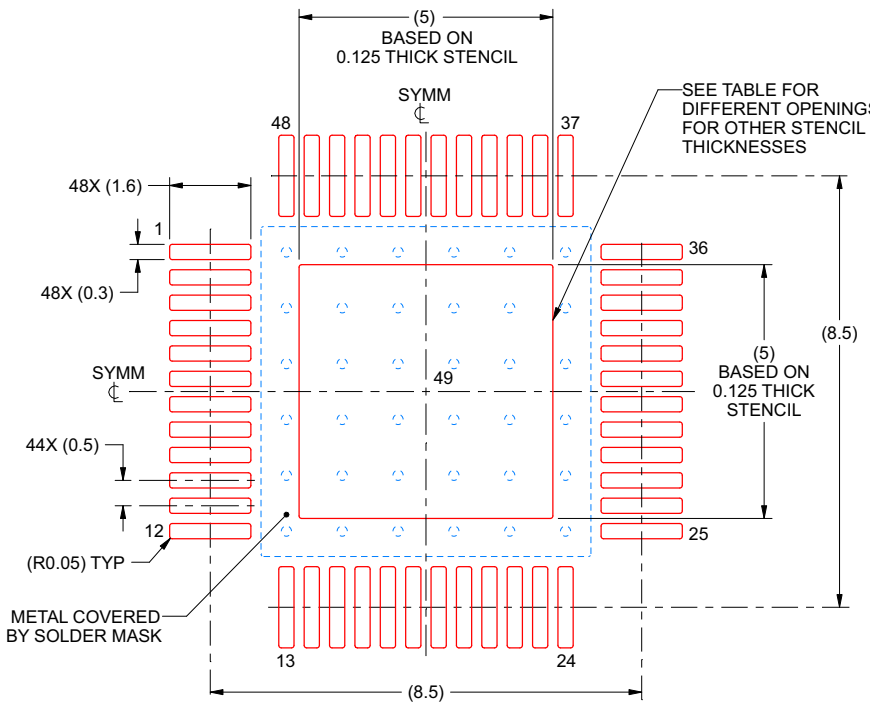
NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
8. This package is designed to be soldered to a thermal pad on the board. See technical brief, Powerpad thermally enhanced package, Texas Instruments Literature No. SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004).
9. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.
10. Size of metal pad may vary due to creepage requirement.

EXAMPLE STENCIL DESIGN

PHP0048L — **PowerPAD™ HTQFP - 1.2 mm max height**

PLASTIC QUAD FLATPACK



SOLDER PASTE EXAMPLE
EXPOSED PAD
100% PRINTED SOLDER COVERAGE BY AREA
SCALE:8X

STENCIL THICKNESS	SOLDER STENCIL OPENING
0.1	5.59 X 5.59
0.125	5.00 X 5.00 (SHOWN)
0.150	4.56 X 4.56
0.175	4.23 X 4.23

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NOTES: (continued)

11. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
12. Board assembly site may have different recommendations for stencil design.

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
TPS92667QPHPRQ1	ACTIVE	HTQFP	PHP	48	1000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	TPS92667Q	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.

GENERIC PACKAGE VIEW

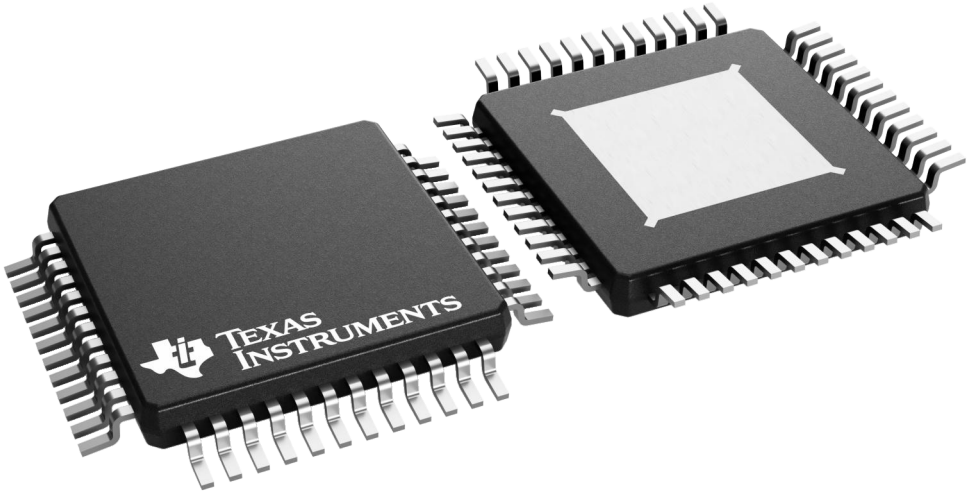
PHP 48

TQFP - 1.2 mm max height

7 x 7, 0.5 mm pitch

QUAD FLATPACK

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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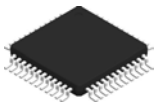
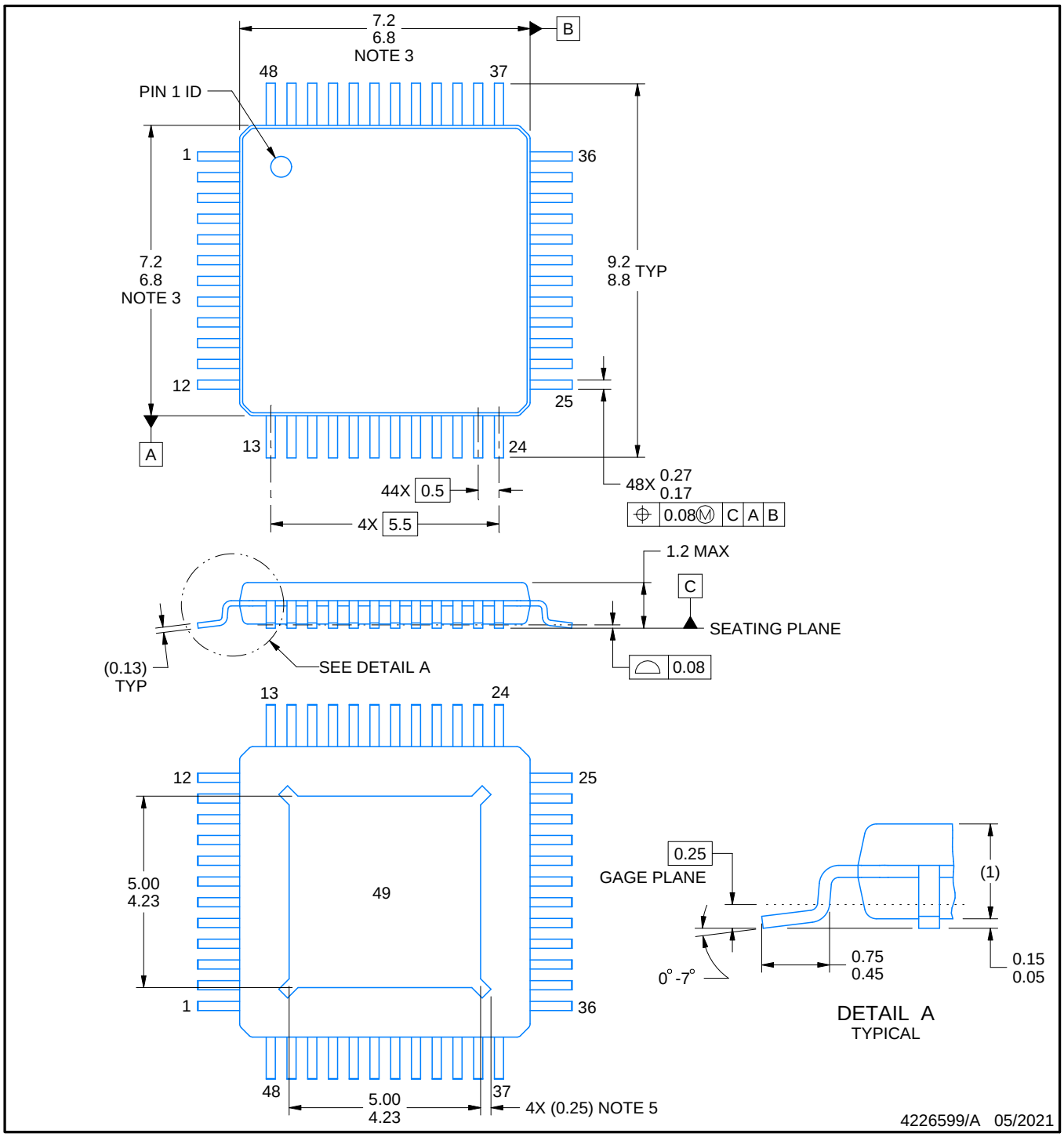


PACKAGE OUTLINE

PHP0048L

PowerPAD™ HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



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NOTES:

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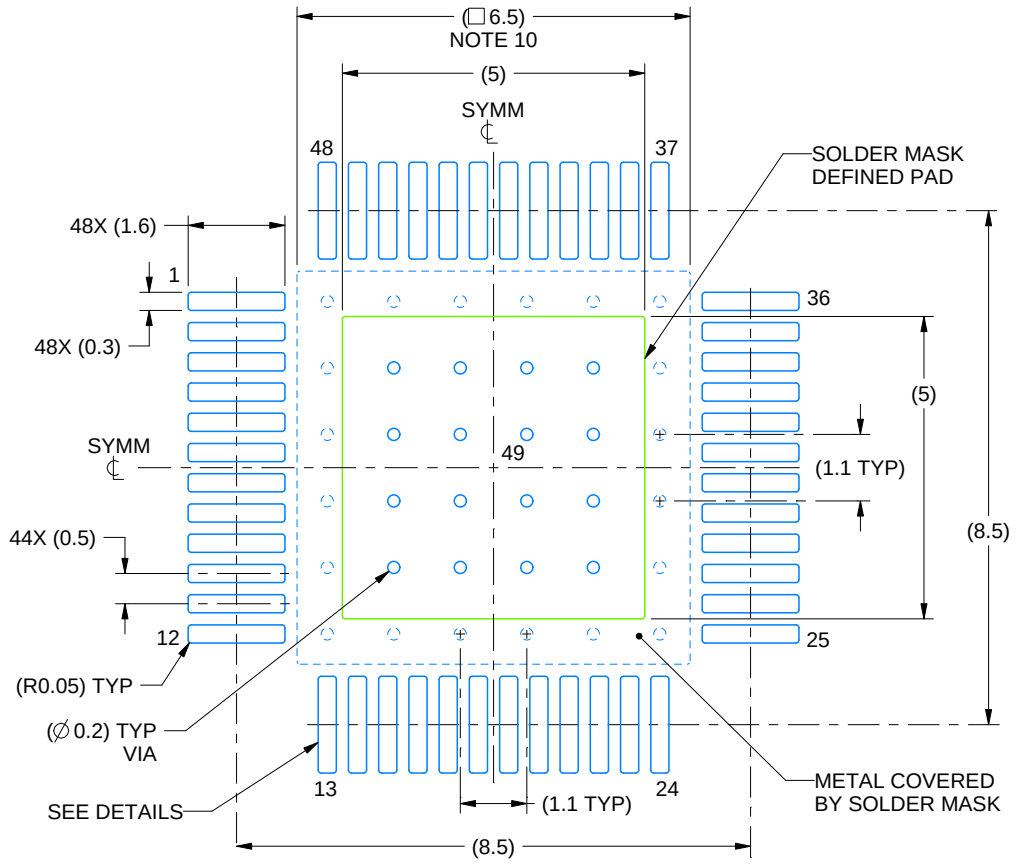
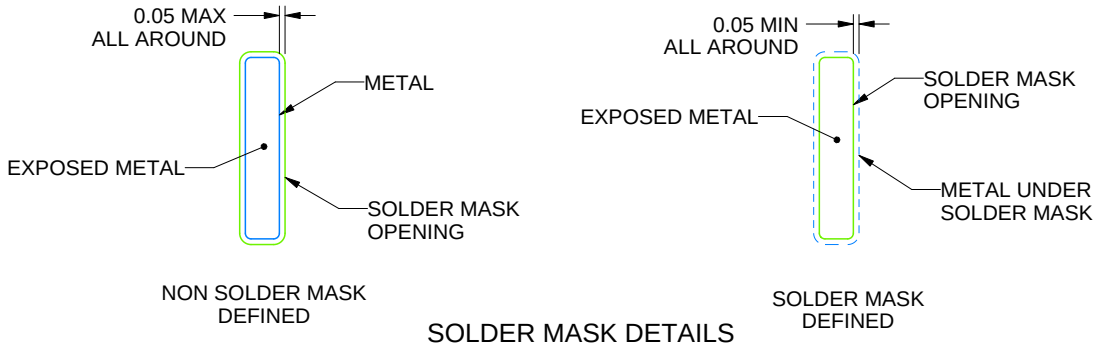
4. Reference JEDEC registration MS-026.
5. Feature may not be present.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
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8. This package is designed to be soldered to a thermal pad on the board. See technical brief, Powerpad thermally enhanced package, Texas Instruments Literature No. SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004).
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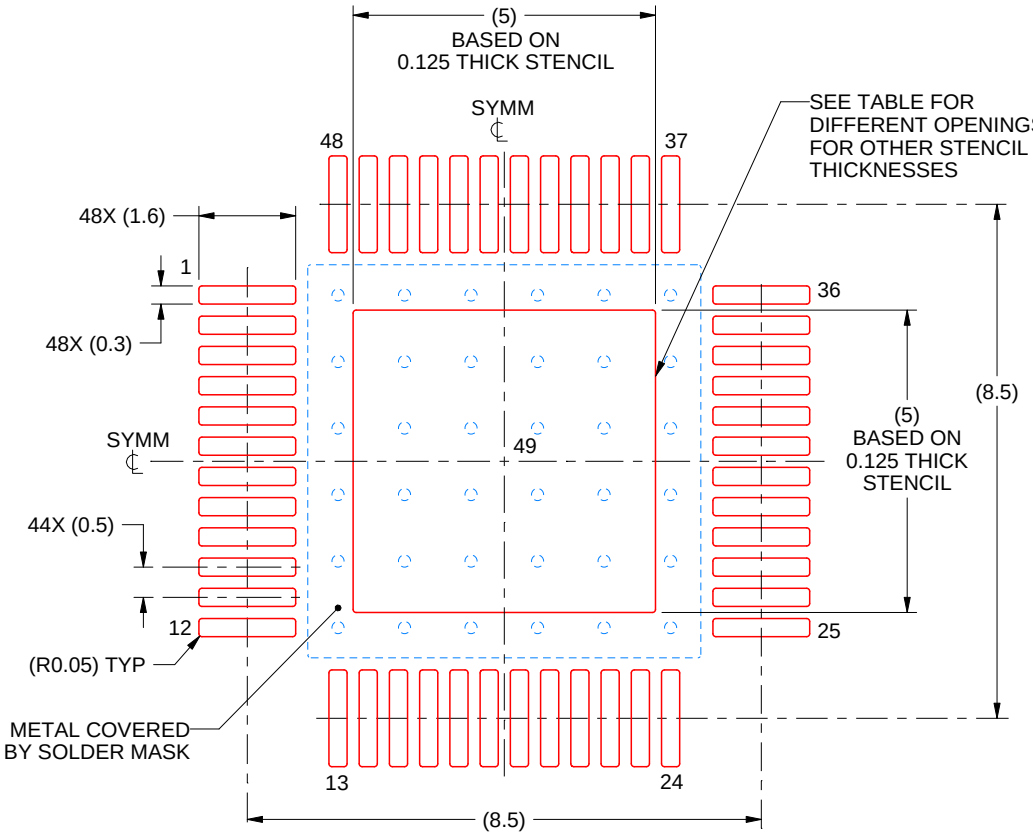

SOLDER PASTE EXAMPLE
EXPOSED PAD
100% PRINTED SOLDER COVERAGE BY AREA
SCALE:8X

STENCIL THICKNESS	SOLDER STENCIL OPENING
0.1	5.59 X 5.59
0.125	5.00 X 5.00 (SHOWN)
0.150	4.56 X 4.56
0.175	4.23 X 4.23

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NOTES: (continued)

11. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
12. Board assembly site may have different recommendations for stencil design.

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