TEXAS INSTRUMENTS
TPS92662-Q1
ZHCSGE3B – OCTOBER 2018 – REVISED JULY 2020

TPS92662-Q1 适用于汽车前照灯系统的高亮度 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 的工作环境温度范围
  - 器件 HBM 分类等级 H1C
  - 器件 CDM 分类等级 C5
- 输入电压范围：4.5V 至 60V
- 12 个集成旁路开关
  - 3 个串联开关各有 4 个子灯串
  - 20V 最大跨开关电压
  - 62V 最大开关到接地电压
- 多点 UART 通信接口
  - 多达 31 个可寻址器件
- 与 CAN 物理层兼容
  - 电缆线束中具有最少的导线数
- 具有 2 个多路复用输入的 8 位 ADC
- 晶体振荡器驱动器
- 外部 EEPROM I²C 接口
- 可编程 10 位 PWM 调光
  - 单个相移和脉宽
  - 器件间同步
- LED 开路/短路检测和保护

2 应用

- 汽车前照灯系统
- 高亮度 LED 矩阵系统
- ADB 或无眩光远光灯
- 连续转向和动画日间行车灯

3 说明

TPS92662-Q1 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 3 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。它还允许并联多达 4 个开关，用于绕过高电流 LED。

使用主微控制器通过多点通用异步接收器发送器 (UART) 串行接口来控制和管理 TPS92662-Q1 器件。串行接口支持使用 CAN 收发器，适用于更可靠稳健的物理层。I²C 通信接口用于从存储系统校准数据的外部 EEPROM 读取数据或向其中写入数据。

具有两个多路复用输入的板载 8 位 ADC 可用于系统温度补偿，并用于测量分级值，从而实现 LED 分级和编码。

内部电荷泵轨为 LED 旁路开关提供栅极驱动电压。旁路开关的低电阻 ($R_{DS(on)}$) 可最大程度地减少传导损耗和功率耗散。

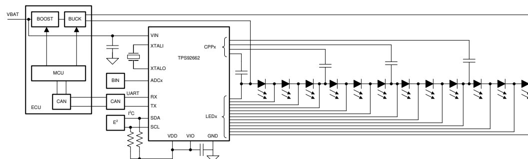
灯串中每个 LED 的相移和脉冲宽度是可编程的。该器件使用内部寄存器来调节 PWM 频率。可以对多个器件进行同步。在 PWM 调光操作过程中，开关转换具有可编程的压摆率，用于缓解 EMI 问题。

该器件具有开路 LED 保护功能（阈值可编程）。串行接口会报告开路 LED 或短路 LED 故障。

器件信息

器件型号	封装(1)	封装尺寸（标称值）
TPS92662-Q1	PHP (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

本文档旨在为方便起见，提供有关 TI 产品中文版本的信息，以确认产品的概要。有关适用的官方英文版本的最新信息，请访问 www.ti.com，其内容始终优先。TI 不保证翻译的准确性和有效性。在实际设计之前，请务必参考最新版本的英文版本。
English Data Sheet: SLUSD15

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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 A (January 2019) to Revision B (July 2020)	Page
• 向*电气特性*添加了 CLK 低电平 (V_{IL-TH}) 和高电平 (V_{IH-TH}) 输入电压阈值	0
• 更新了整个文档中的表格、图和交叉参考的编号格式	1

Changes from Revision * (June 2017) to Revision A (January 2019)	Page
• 更新了*节 3*	1

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5 Device and Documentation Support

5.1 Receiving Notification of Documentation Updates

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

5.2 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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5.3 Trademarks

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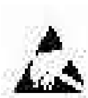
5.4 Electrostatic Discharge Caution



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 Glossary

TI Glossary This glossary lists and explains terms, acronyms, and definitions.

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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.

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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
TPS92662QPHPRQ1	ACTIVE	HTQFP	PHP	48	1000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	92662Q	Samples
TPS92662QPHPTQ1	ACTIVE	HTQFP	PHP	48	250	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	92662Q	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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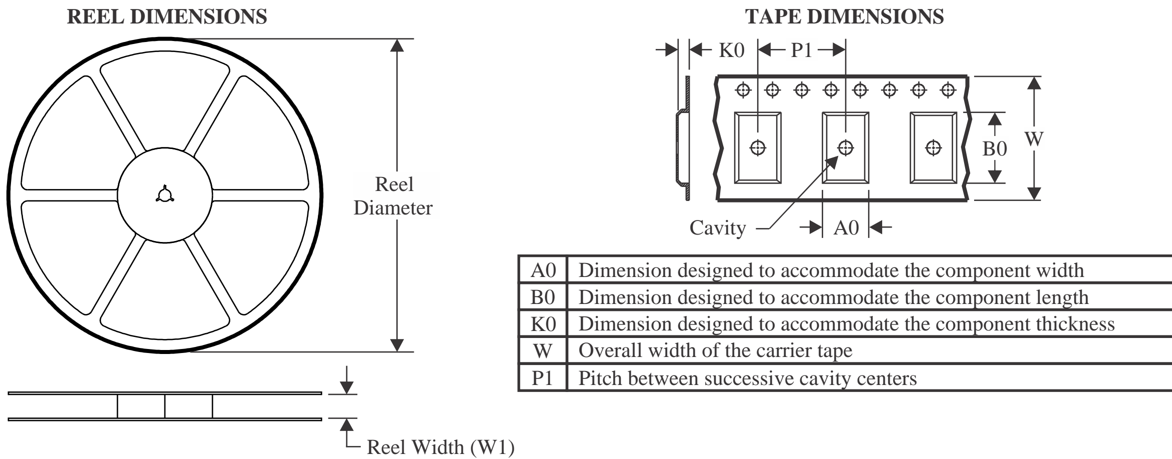
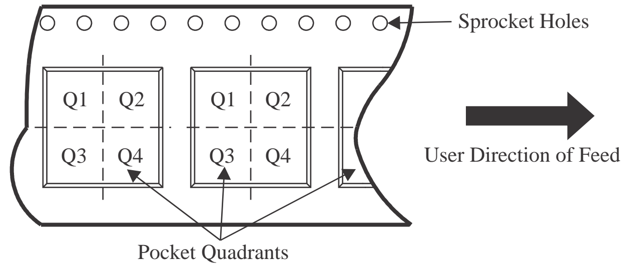
TAPE AND REEL INFORMATION

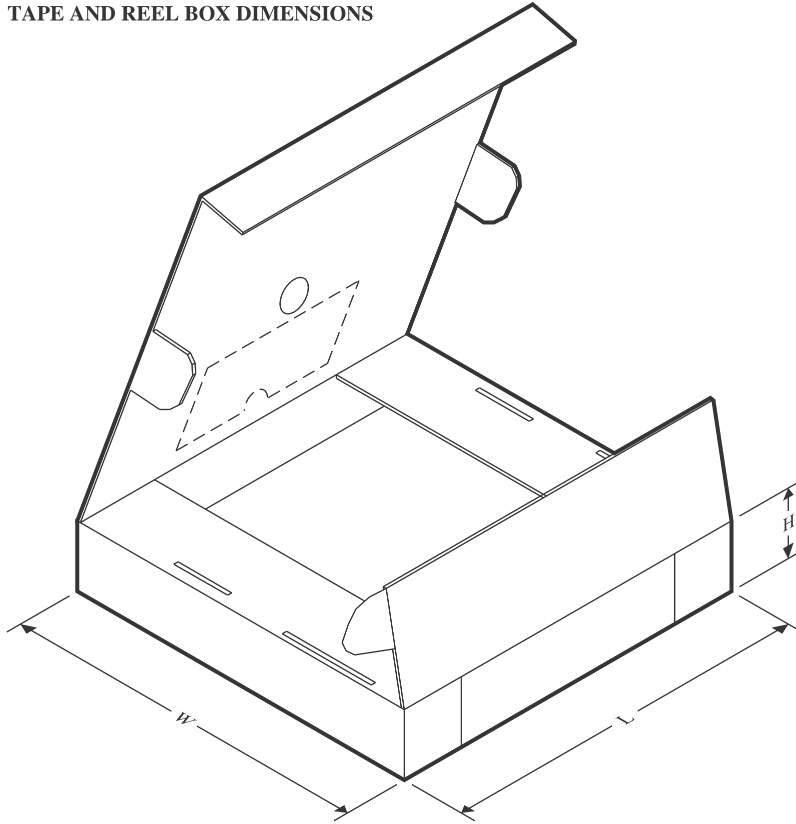




*All dimensions are nominal

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
TPS92662QPHPRQ1	HTQFP	PHP	48	1000	330.0	16.4	9.6	9.6	1.5	12.0	16.0	Q2
TPS92662QPHPTQ1	HTQFP	PHP	48	250	330.0	16.4	9.6	9.6	1.5	12.0	16.0	Q2

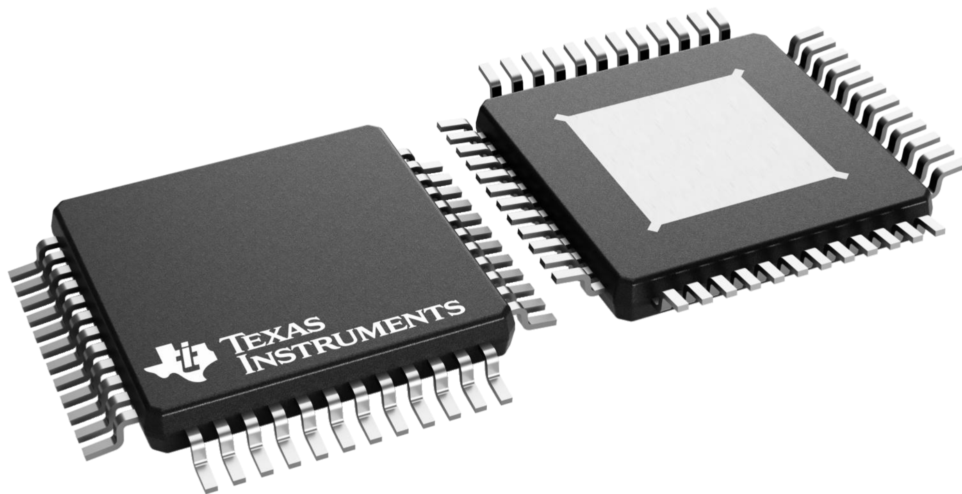
TAPE AND REEL BOX DIMENSIONS

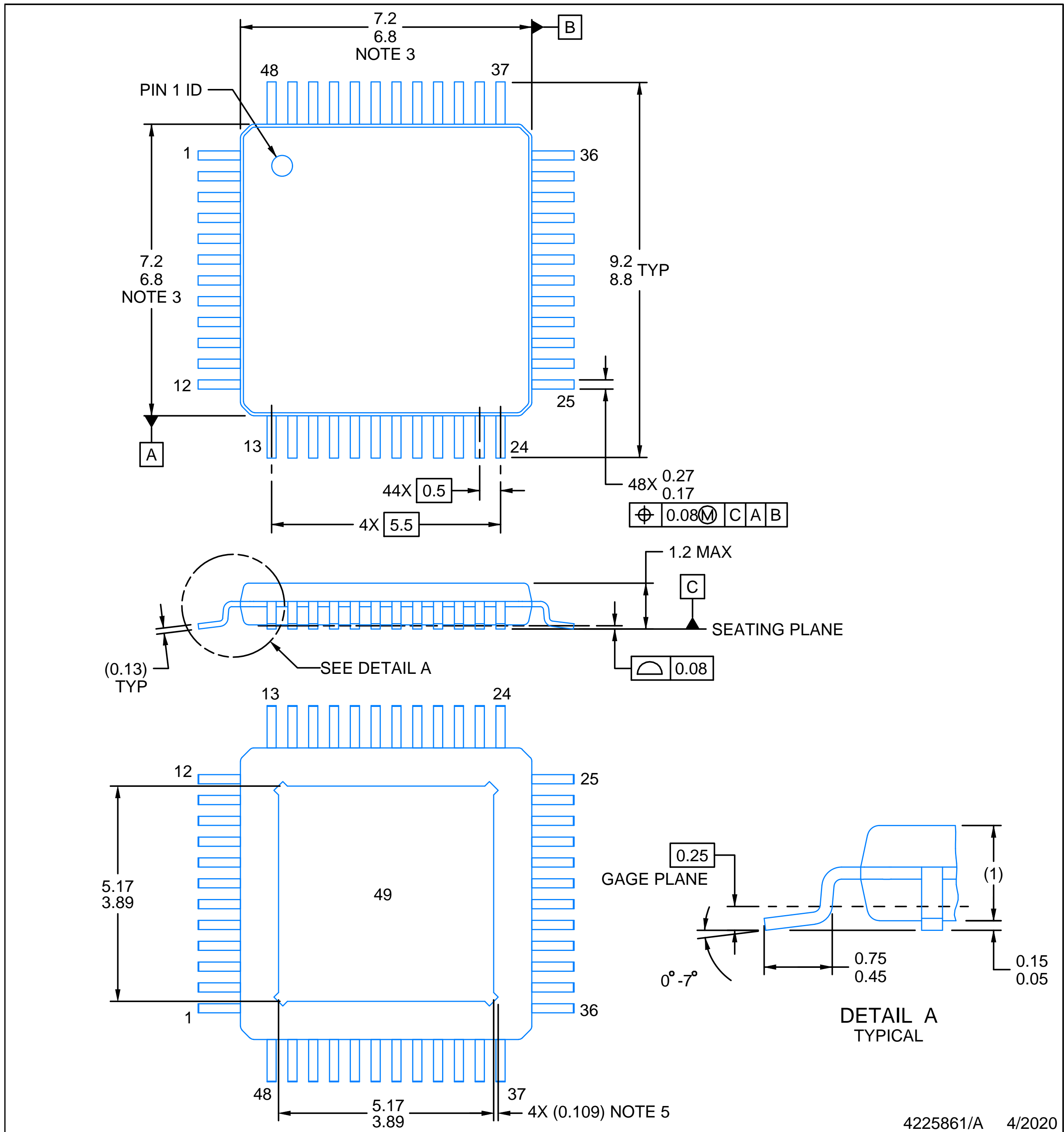


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS92662QPHPRQ1	HTQFP	PHP	48	1000	336.6	336.6	31.8
TPS92662QPHPTQ1	HTQFP	PHP	48	250	336.6	336.6	31.8

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

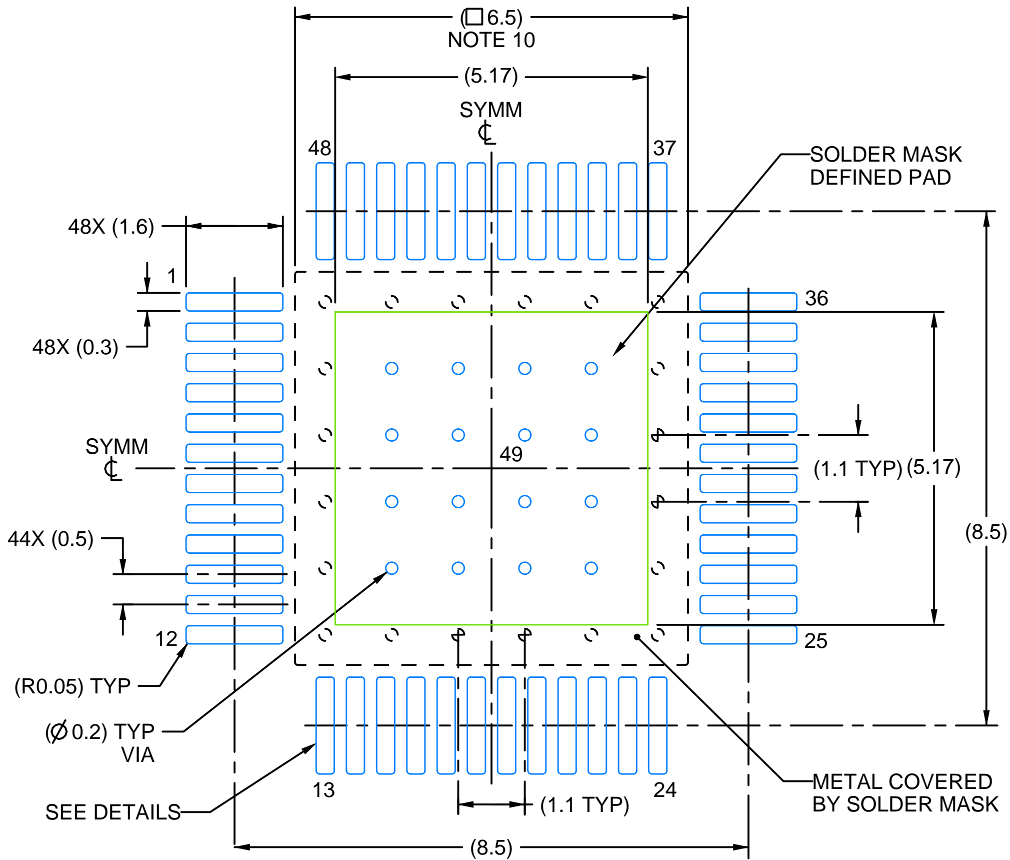




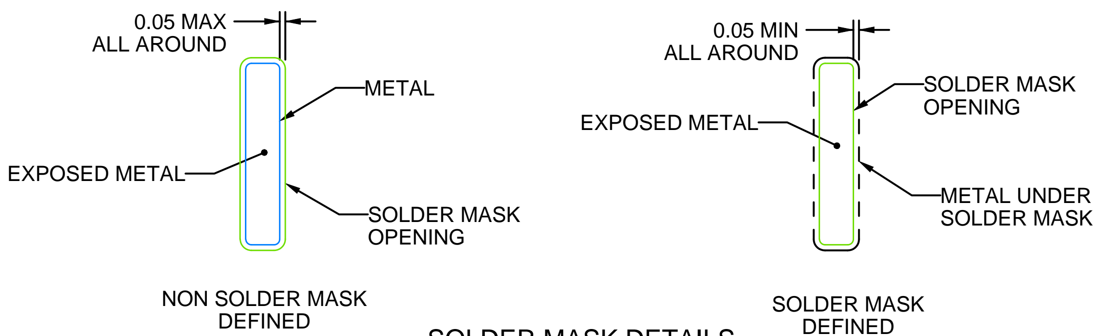
PowerPAD is a trademark of Texas Instruments.

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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X

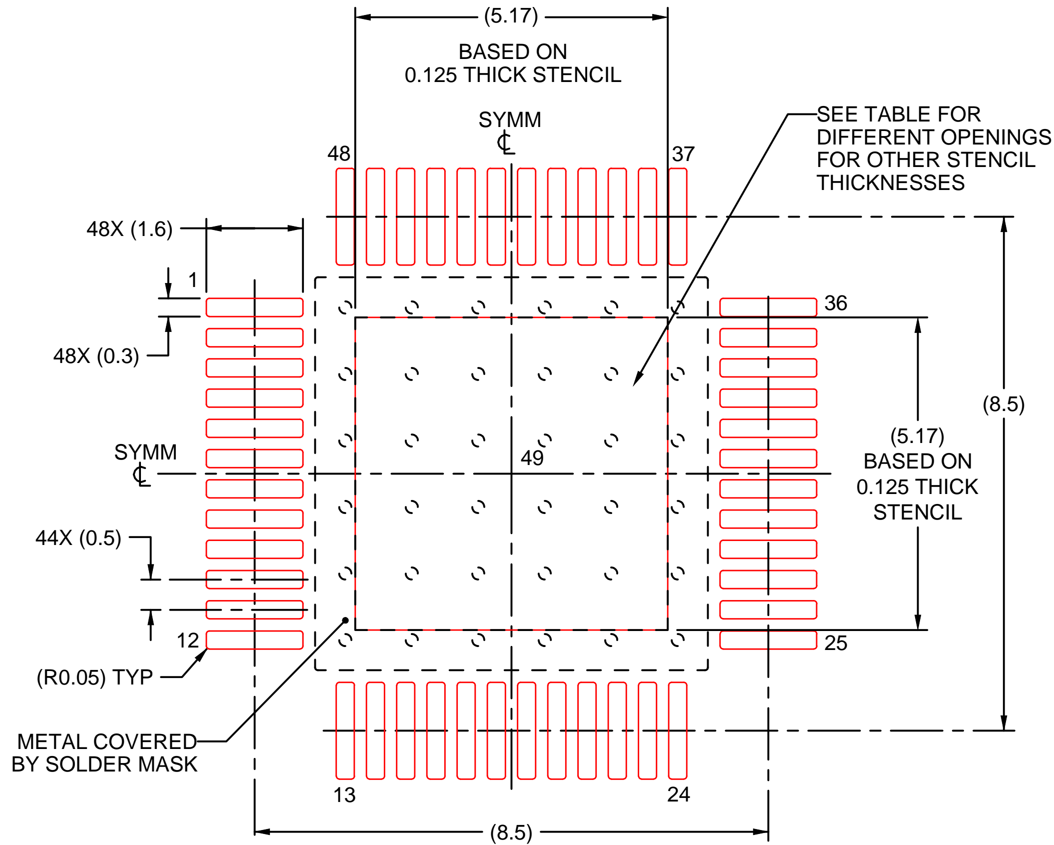


SOLDER MASK DETAILS

4225861/A 4/2020

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.



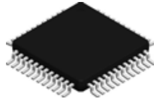
SOLDER PASTE EXAMPLE
EXPOSED PAD
100% PRINTED SOLDER COVERAGE BY AREA
SCALE:8X

STENCIL THICKNESS	SOLDER STENCIL OPENING
0.1	5.78 X 5.78
0.125	5.17 X 5.17 (SHOWN)
0.150	4.72 X 4.72
0.175	4.37 X 4.37

4225861/A 4/2020

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.



PACKAGE OUTLINE

PowerPAD™ HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK

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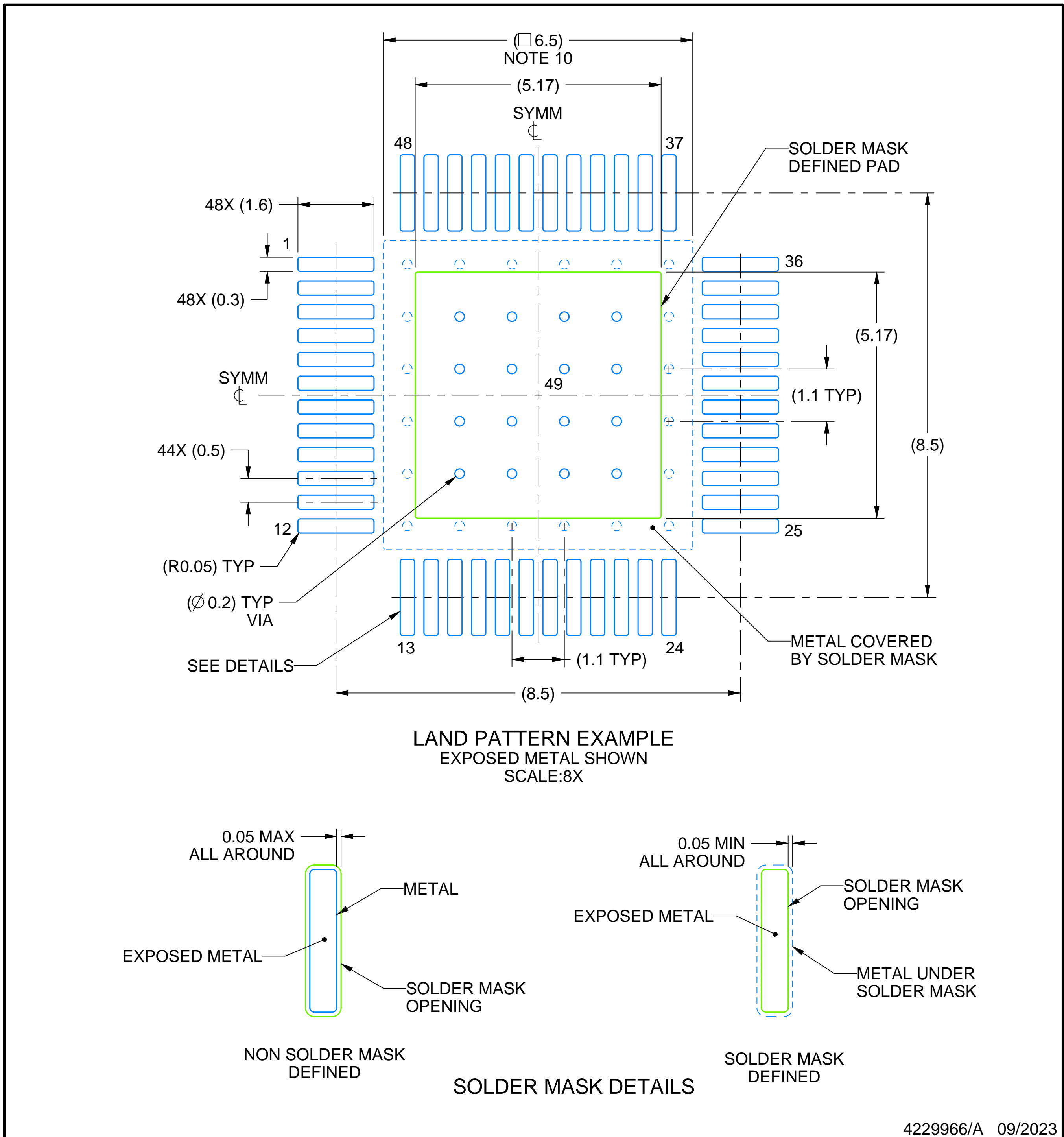

NOTES: (continued)

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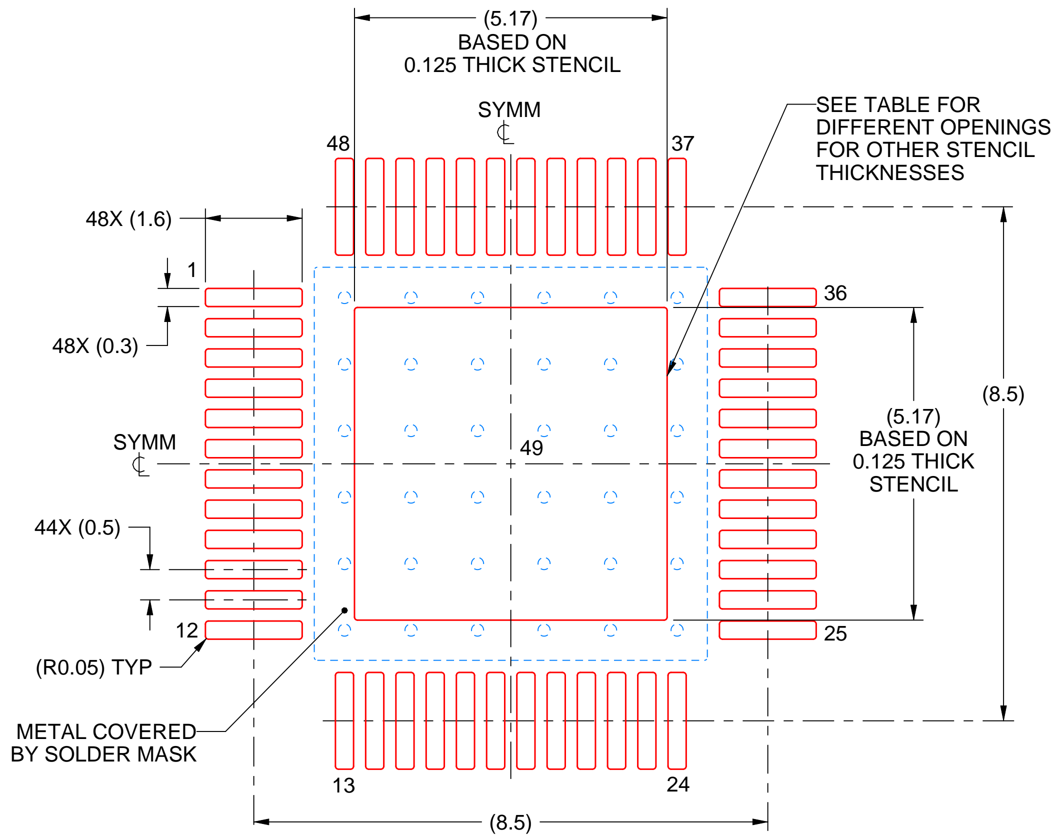

SOLDER PASTE EXAMPLE
EXPOSED PAD
100% PRINTED SOLDER COVERAGE BY AREA
SCALE:8X

STENCIL THICKNESS	SOLDER STENCIL OPENING
0.1	5.78 X 5.78
0.125	5.17 X 5.17 (SHOWN)
0.150	4.72 X 4.72
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4229966/A 09/2023

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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