

具有高性能传感、保护和诊断功能的DRV3245Q-Q1三相汽车栅极驱动器单元 (GDU)

1 特性

- 符合面向汽车应用的 AEC-Q100 标准，标准：
 - 器件温度等级 1: -40°C 至 $+125^{\circ}\text{C}$, T_A
- SafeTI™ 半导体组件
 - 根据 ISO 26262 标准的相应要求开发
- 4.5V 至 45V 工作电压范围
- 可编程峰值栅极驱动电流高达 1A
- 支持 100% 占空比的电荷泵栅极驱动器
- 分流放大器和相位比较器
 - A 器件: 3 个分流放大器和三相比较器，具有状态，通过 SPI
 - B 器件: 2 个分流放大器和三相比较器，具有实时监控器，通过数字引脚
- 高达 20kHz 的 3 PWM 或 6 PWM 输入控制
- 能够进行单 PWM 模式换向
- 支持 3.3V 和 5V 数字接口
- 串行外设接口 (SPI)
- 耐热增强型 48 引脚薄型四方扁平封装 (HTQFP)
- 保护特性:
 - 内部稳压器、电池电压监控器
 - SPI CRC
 - 时钟监控器
 - 模拟内置自检
 - 可编程死区时间控制
 - 金属氧化物半导体场效应晶体管 (MOSFET) 击穿保护
 - MOSFET V_{DS} 过流监视器
 - 栅极-源极电压实时监控器

- 过热警告和关断

2 应用

- 12V 汽车电机控制 应用
 - 电动助力转向系统 (EPS, 电动液压助力转向 (EHPS))
 - 全电刹车和刹车辅助
 - 变速箱和泵

3 说明

DRV3245Q-Q1 器件是一款适用于三相电机驱动应用的 FET 栅极驱动器 IC，根据 ISO 26262 标准中有关功能安全应用的相应要求设计而成。该器件具有三个半桥驱动器，每个驱动器都能够驱动高侧和低侧 N 沟道 MOSFET，同时还具有先进的 FET 保护和监控功能。电荷泵驱动器可在冷启动运行期间实现 100% 占空比并支持低电池电压。凭借所集成的分流放大器、相位比较器和基于 SPI 的配置以及外设，该系列驱动器省去了大多数外部和无源组件，从而减少了所需物料并减小了印刷电路板 (PCB) 空间。

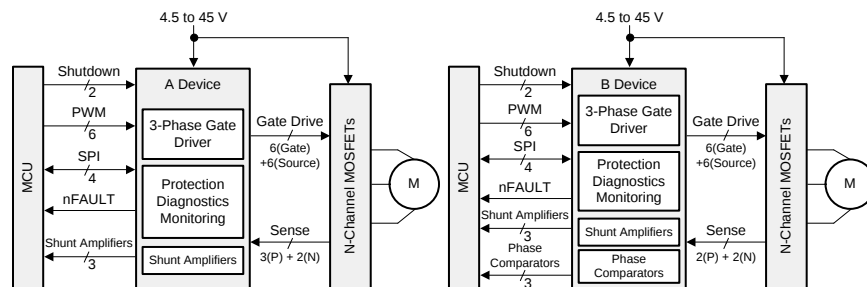
DRV3245Q-Q1 器件还为内部时钟集成了诊断和保护功能，并可提供常用系统诊断检查支持，二者皆可进行实例化并通过 SPI 进行报告。这种集成特性的灵活性使得该器件能够无缝集成到各种安全架构中。

器件信息 (1)

器件型号	封装	封装尺寸 (标称值)
DRV3245Q-Q1	HTQFP (48)	7.00mm × 7.00mm

(1) 如需了解所有可用封装，请参阅产品说明书末尾的可订购产品附录。

简化原理图



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4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

Changes from Original (November 2017) to Revision A	Page
• 将器件状态从 预告信息 更改为 生产数据	1

5 器件和文档支持

5.1 器件支持

5.1.1 器件命名规则

图 1 显示了 DRV3245Q-Q1 器件的完整可订购器件名称的解读图例

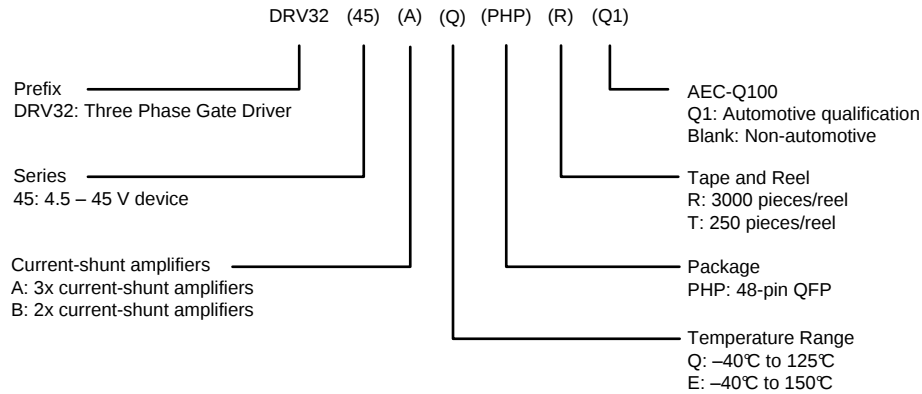


图 1. 器件命名规则

5.2 文档支持

相关文档请参见以下部分：

- 德州仪器 (TI), [《BOOSTXL-DRV3245AQ1 EVM 用户指南》](#)
- 德州仪器 (TI), [《BOOSTXL-DRV3245AQ1 EVM 传感器式软件用户指南》](#)
- 德州仪器 (TI), [《BOOSTXL-DRV3245AQ1 EVM 无传感器软件用户指南》](#)
- 德州仪器 (TI), [《BOOSTXL-DRV3245A-Q1 TRAP-EVM GUI 用户指南》](#)
- 德州仪器 (TI), [《PowerPAD™ 热增强型封装》应用报告](#)
- 德州仪器 (TI), [《PowerPAD™ 速成》应用报告](#)
- 德州仪器 (TI), [《使用 MSP430 的传感器式三相 BLDC 电机控制》应用报告](#)
- 德州仪器 (TI), [《了解 TI 电机栅极驱动器中的 IDRIVE 和 TDRIVE》应用报告](#)

5.3 接收文档更新通知

要接收文档更新通知，请导航至 Ti.com.cn 上的器件产品文件夹。单击右上角的通知我 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。

5.4 社区资源

下列链接提供到 TI 社区资源的连接。链接的内容由各个分销商“按照原样”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》](#)。

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设计支持 TI 参考设计支持 可帮助您快速查找有帮助的 E2E 论坛、设计支持工具以及技术支持的联系信息。

5.5 商标

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5.6 静电放电警告



ESD 可能会损坏该集成电路。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措施和安装程序，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。

5.7 术语表

[SLYZ022](#) — TI 术语表。

这份术语表列出并解释术语、缩写和定义。

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的最新可用数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。如需获取此产品说明书的浏览器版本，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
DRV3245AQPHPRQ1	ACTIVE	HTQFP	PHP	48	1000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	DR3245AQ	Samples
DRV3245BQPHPRQ1	ACTIVE	HTQFP	PHP	48	1000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	DR3245BQ	Samples
DRV3245CQPHPRQ1	ACTIVE	HTQFP	PHP	48	1000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	DR3245CQ	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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PACKAGE OPTION ADDENDUM

10-Dec-2020

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.

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
DRV3245AQPHPRQ1	HTQFP	PHP	48	1000	330.0	16.4	9.6	9.6	1.5	12.0	16.0	Q2
DRV3245BQPHPRQ1	HTQFP	PHP	48	1000	330.0	16.4	9.6	9.6	1.5	12.0	16.0	Q2
DRV3245CQPHPRQ1	HTQFP	PHP	48	1000	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)
DRV3245AQPHPRQ1	HTQFP	PHP	48	1000	350.0	350.0	43.0
DRV3245BQPHPRQ1	HTQFP	PHP	48	1000	350.0	350.0	43.0
DRV3245CQPHPRQ1	HTQFP	PHP	48	1000	350.0	350.0	43.0

GENERIC PACKAGE VIEW

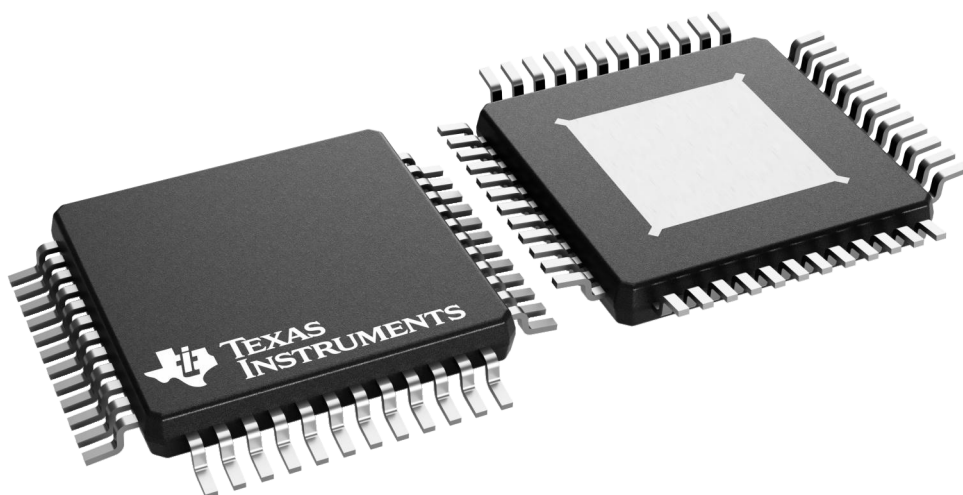
PHP 48

TQFP - 1.2 mm max height

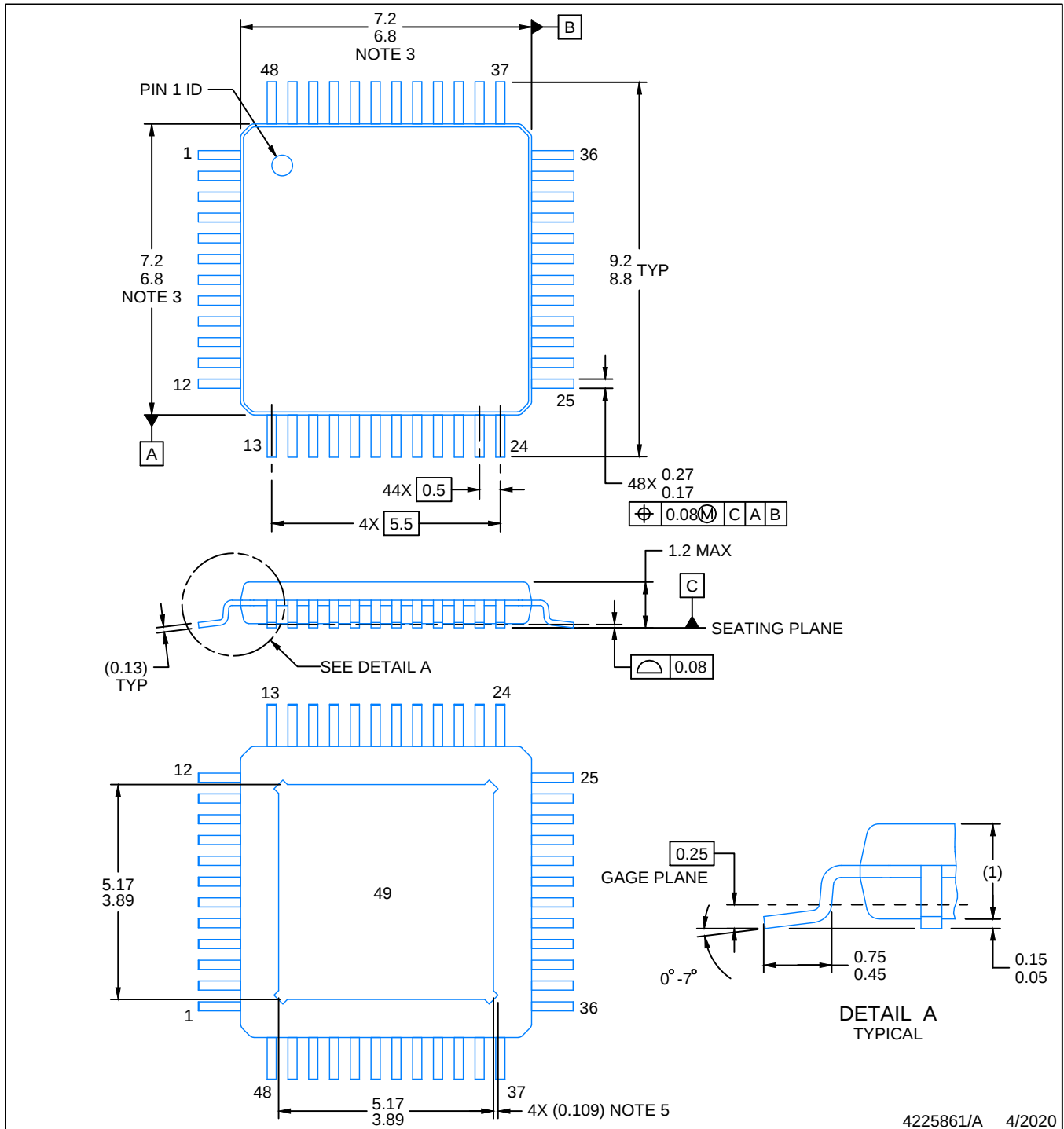
7 x 7, 0.5 mm pitch

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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NOTES:

PowerPAD is a trademark of Texas Instruments.

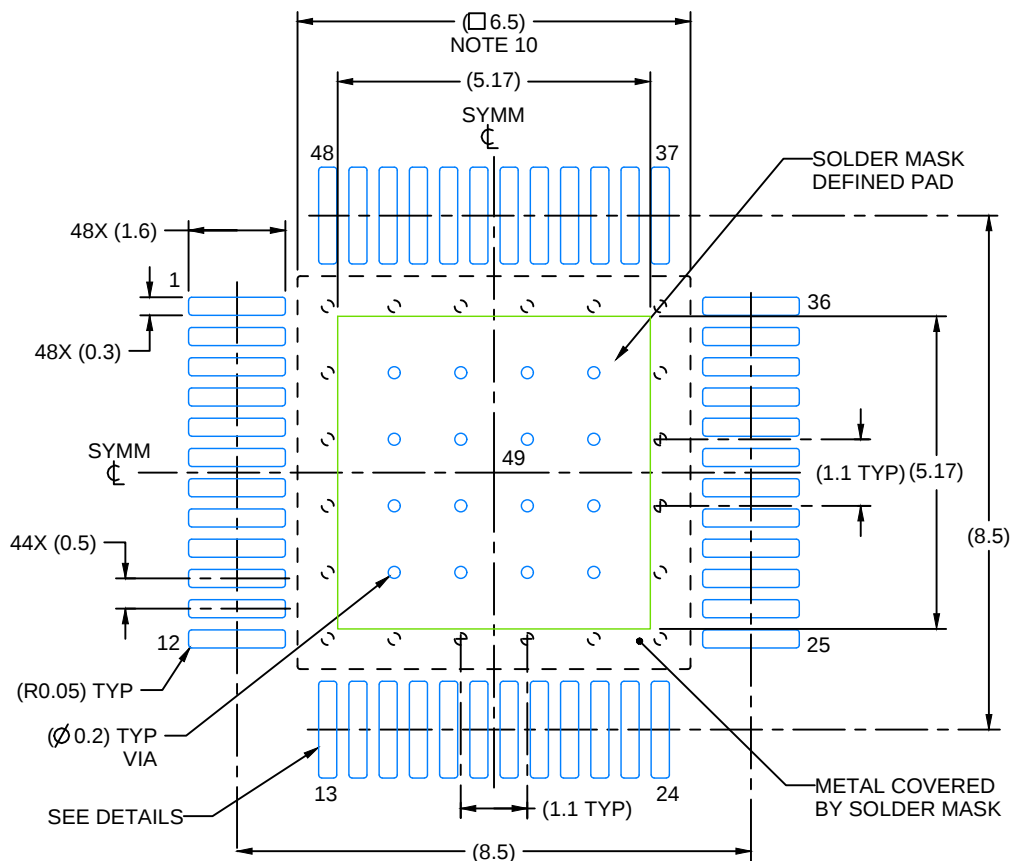
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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

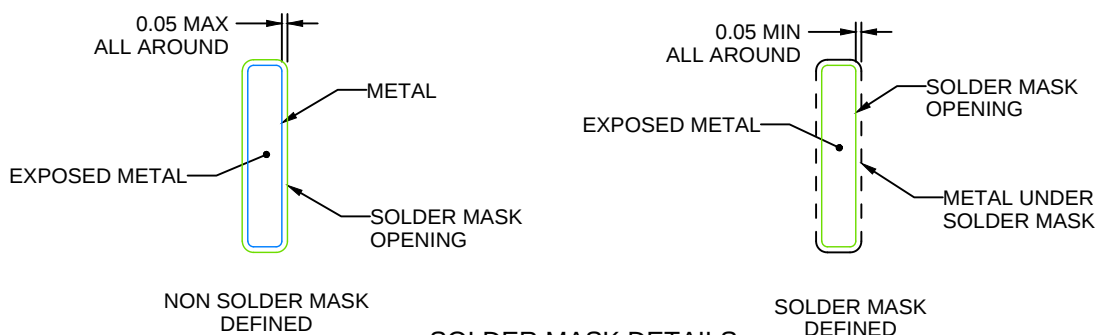
PHP0048G

PowerPAD™ HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

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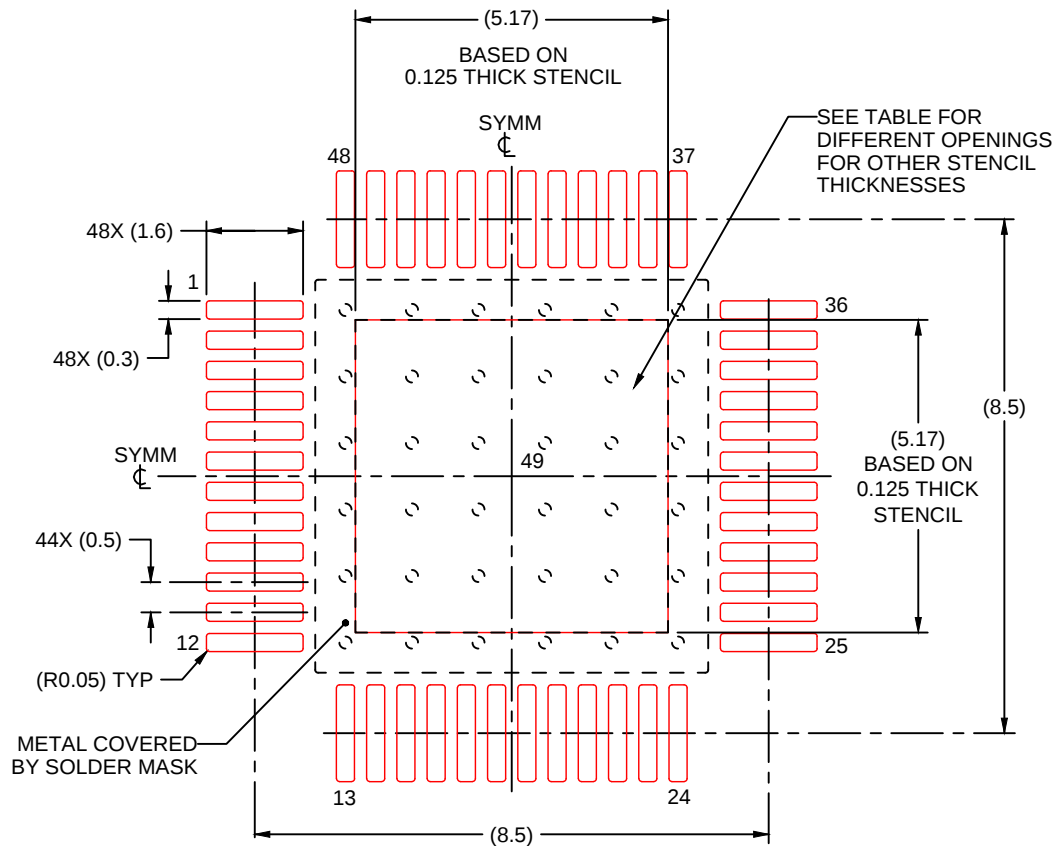
NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
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.

PHP0048G

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	5.78 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.

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