具有同步和电源正常指示功能的 TPS40195 4.5V 至 20V 同步降压控制器

1 特性

- 输入工作电压范围：4.5V 至 20V
- 输出电压低至 0.591V ±0.5%
- 180° 双向异相同步功能
- 内部 5V 稳压器
- 高侧和低侧过流检测 MOSFET
- 100kHz 至 600kHz 开关频率
- 使能引脚和电源正常指示功能
- 可编程 UVLO 与迟滞功能
- 150°C 时进行热关断
- 可选软启动
- 预偏置输出安全保护

2 应用

- 数字电视
- 入门级和中端服务器
- 网络设备
- 非隔离式直流/直流模块

3 说明

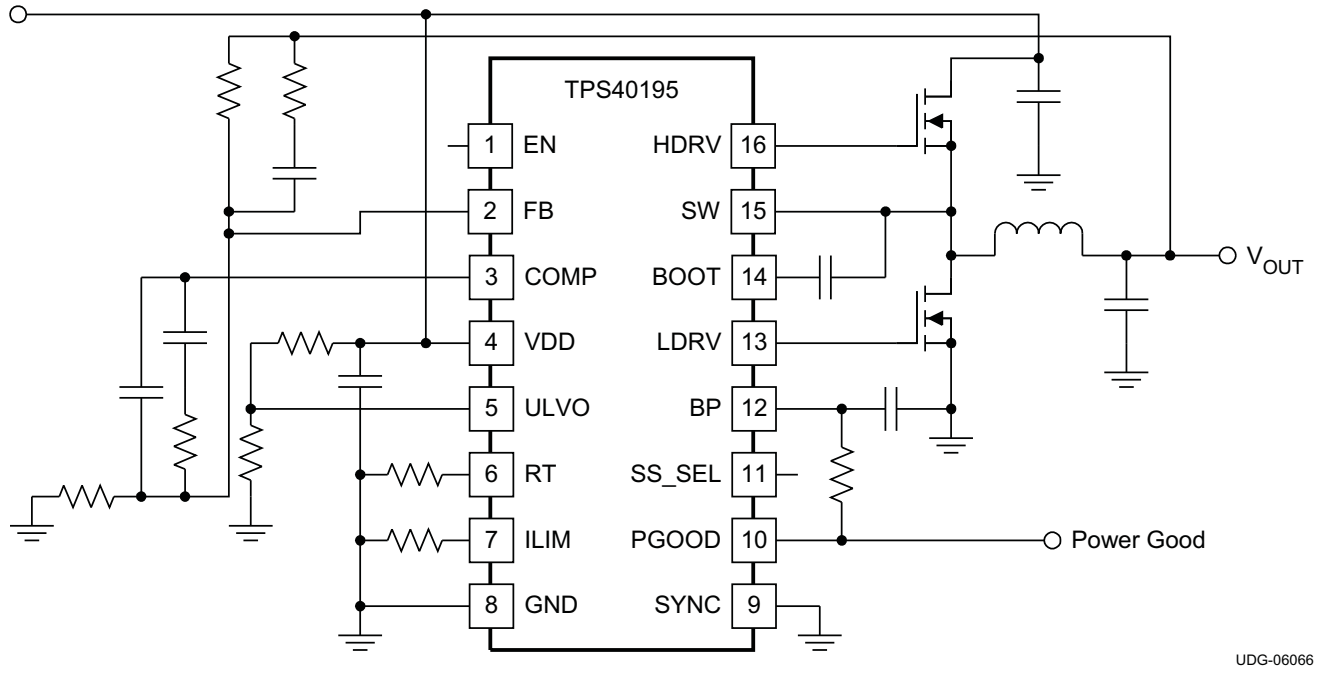
TPS40195 是一款灵活的同步降压控制器，可在额定 4.5V 至 20V 的电源下工作。此控制器通过在 100kHz 至 600kHz 范围内可调的开关频率来实施电压模式控制。此器件的灵活 功能 包括可选软启动时间、可编程短路限制、可编程欠压锁定 (UVLO) 和同步功能。自适应反跨导方案可用于防止功率 FET 中产生击穿电流。通过检测低侧 MOSFET（打开时）上的压降并将其与用户编程的阈值进行比较，来实现过流检测。

器件信息(1)

器件型号	封装	封装尺寸（标称值）
TPS40195	TSSOP (16)	5.00mm × 4.40mm
	VQFN (16)	4.00mm × 3.50mm

(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。

简化应用示意图



目录

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 Revision E (July 2012) to Revision F **Page**

- 仅有编辑更改；无技术性修订 1
- 添加了 *ESD 额定值* 表、*特性* *说明* 部分、*器件功能模式*、*应用和实施* 部分、*电源建议* 部分、*布局* 部分、*器件和文档支持* 部分以及*机械、封装和可订购信息* 部分。 1
- 删除了*可订购信息* 表 1

Changes from Revision D (November 2008) to Revision E **Page**

5 说明 （续）

该阈值可通过从 ILIM 连接到 GND 的单个外部电阻器进行设置。通过检测高侧 MOSFET（通电时）上的电压并在压降上升超过 550mV 固定阀值时终止周期来提供逐脉冲限流功能（以防止电流失控）。如果控制器检测到输出短路，则会关闭两个 MOSFET，并在达到超时时间后尝试重启。这能在持续故障情况下实现有限的功率耗散。此器件上的同步功能是双向的。器件可 180° 异相同步至选定主器件 TPS40195（在固定频率 250kHz 或 500kHz 上运行），也可以同步至外部时钟源（100kHz 至 600kHz 范围内的任意频率）。

6 器件和文档支持

6.1 器件支持

6.1.1 第三方产品免责声明

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6.2 器件支持

6.2.1 相关器件

以下器件具有与 TPS40195 相似的特性，您可能对此感兴趣。

表 **1.** 相关器件

器件	说明
TPS40100	中端输入同步控制器，具有高级排序功能和输出裕量
TPS40075	具有电压前馈功能的宽输入同步控制器
TPS40190	低引脚数同步降压控制器
TPS40192/3	具有电源正常指示功能的 4.5V 至 18V 输入、低引脚数同步降压控制器

6.3 文档支持

6.3.1 相关文档

如需查看这些参考资料，请访问 www.power.ti.com 网站的“技术文档”页面。此外还有众多设计工具和其他参考（包括设计软件），其链接位于 www.power.ti.com

- *《低电压直流/直流转换器内幕揭秘》*，SEM 1500 Topdevice 5，2002 年系列研讨会
- *《了解开关模式电源中的降压功率级》*，SLVA057，1999 年 3 月
- *《高速 MOSFET 栅极驱动电路的设计和应用指南》*，SEM 1400，2001 年系列研讨会
- *《设计稳定控制环路》*，SEM 1400，2001 年系列研讨会
- 有关 PowerPAD™ 的更多信息，请参阅《 应用 简介》SLMA002 和 SLMA004
- 《QFN/SON PCB 连接》，德州仪器 (TI) 文献编号 SLUA271，2002 年 6 月

6.4 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。

6.5 社区资源

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support ***TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

6.6 商标

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6.7 静电放电警告

这些装置包含有限的内置 ESD 保护。 存储或装卸时，应将导线一起截短或将装置放置于导电泡棉中，以防止 MOS 门极遭受静电损伤。

6.8 Glossary

SLYZ022 — *TI Glossary*.

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

7 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。如需获取此数据表的浏览器版本，请查阅左侧的导航栏。

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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
TPS40195PW	ACTIVE	TSSOP	PW	16	90	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	40195	Samples
TPS40195PWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	40195	Samples
TPS40195RGYR	ACTIVE	VQFN	RGY	16	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	40195	Samples
TPS40195RGYT	ACTIVE	VQFN	RGY	16	250	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	40195	Samples
TPS40195RGYTG4	ACTIVE	VQFN	RGY	16	250	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	40195	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.

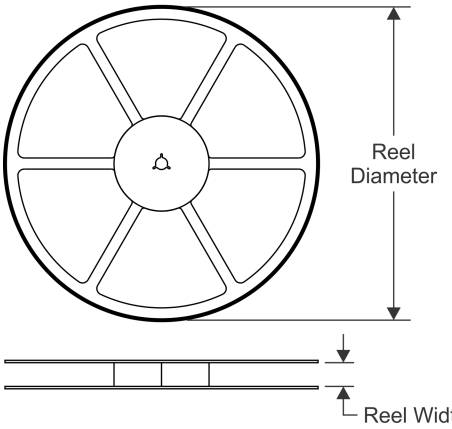
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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.

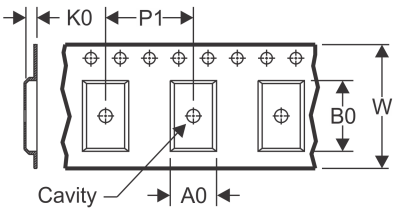
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

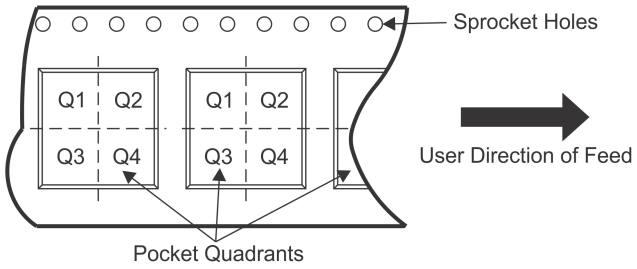


TAPE DIMENSIONS



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

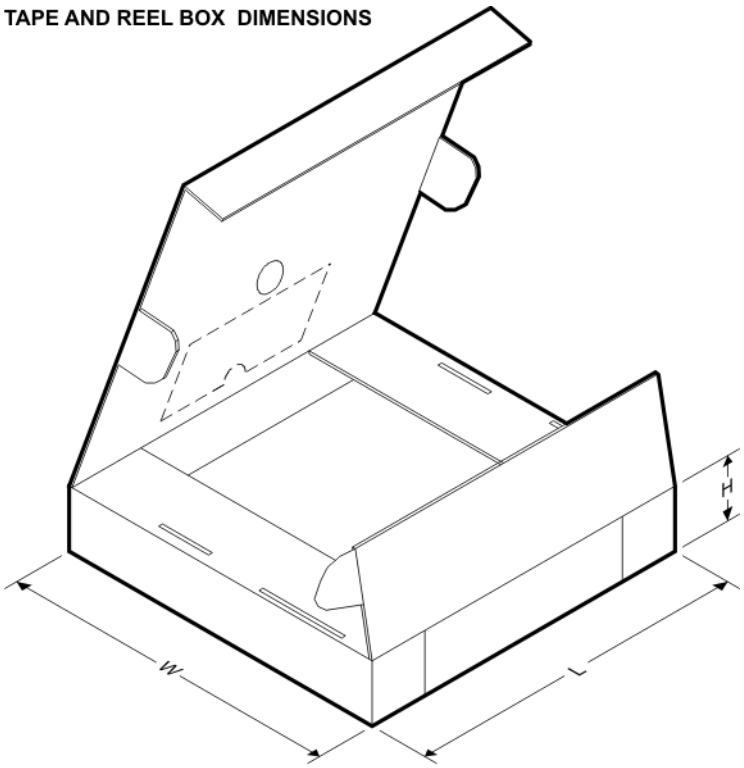
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TPS40195PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
TPS40195RGYR	VQFN	RGY	16	3000	330.0	12.4	3.71	4.21	1.11	8.0	12.0	Q1
TPS40195RGYT	VQFN	RGY	16	250	180.0	12.5	3.71	4.21	1.11	8.0	12.0	Q1

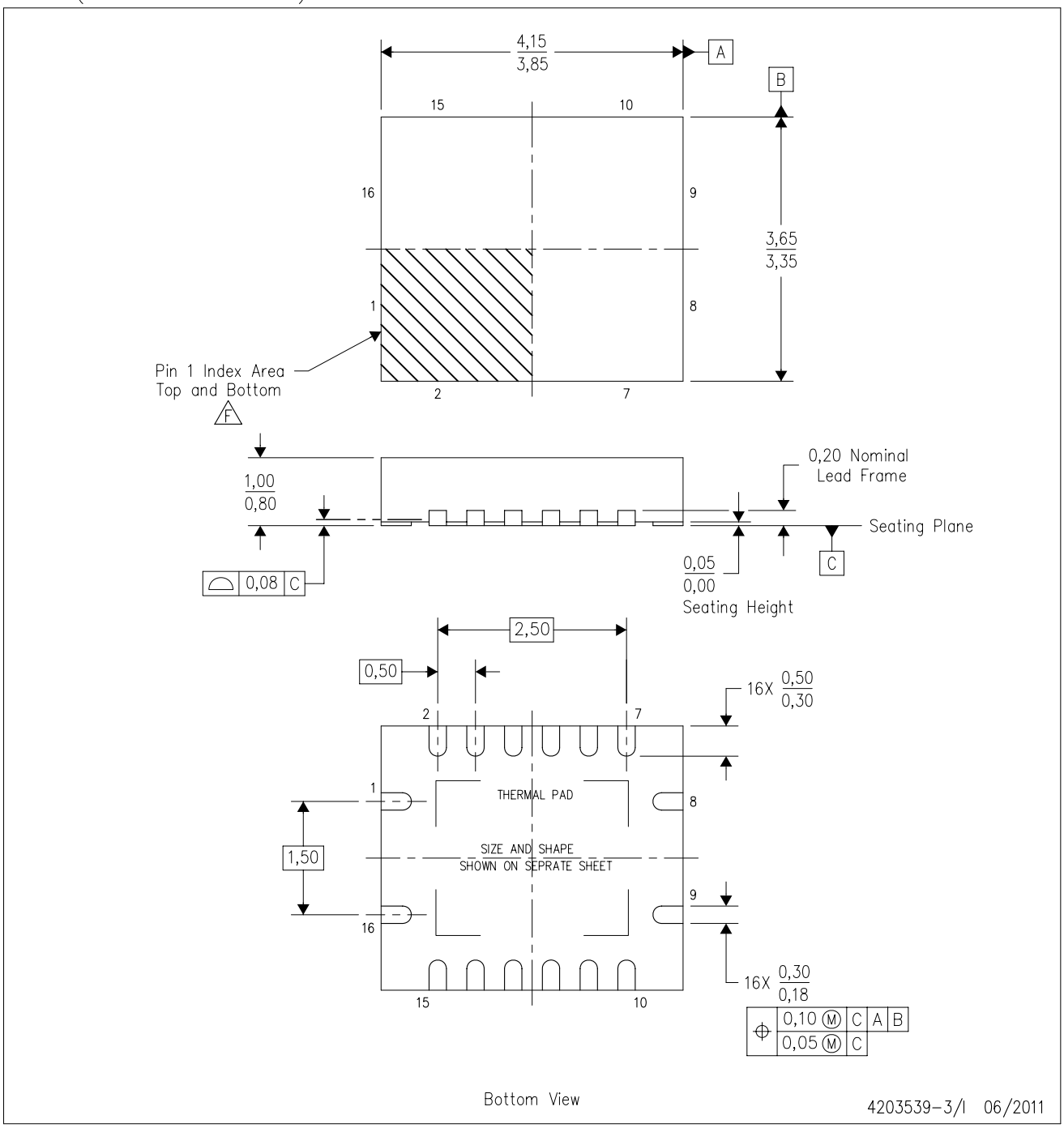
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS40195PWR	TSSOP	PW	16	2000	853.0	449.0	35.0
TPS40195RGYR	VQFN	RGY	16	3000	338.0	355.0	50.0
TPS40195RGYT	VQFN	RGY	16	250	338.0	355.0	50.0

RGY (R–PVQFN–N16) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. QFN (Quad Flatpack No–Lead) package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
F. Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
G. Package complies to JEDEC MO–241 variation BA.

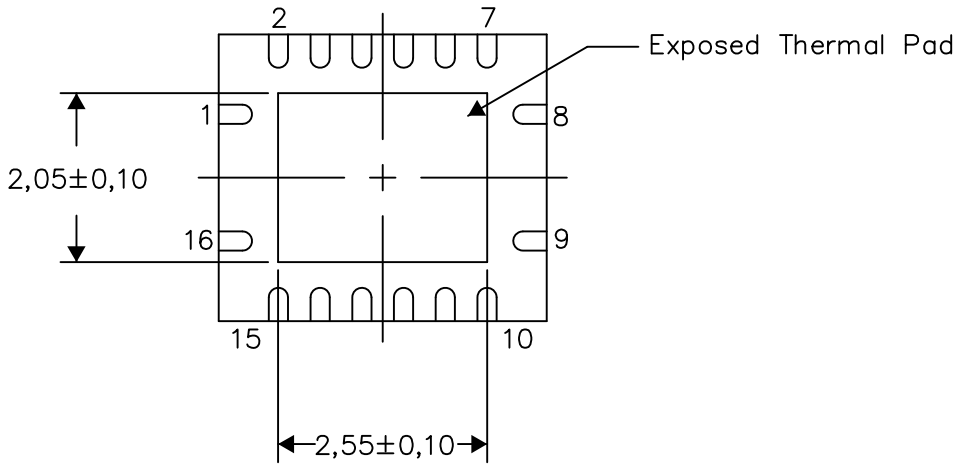
RGY (R–PVQFN–N16) PLASTIC QUAD FLATPACK NO–LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



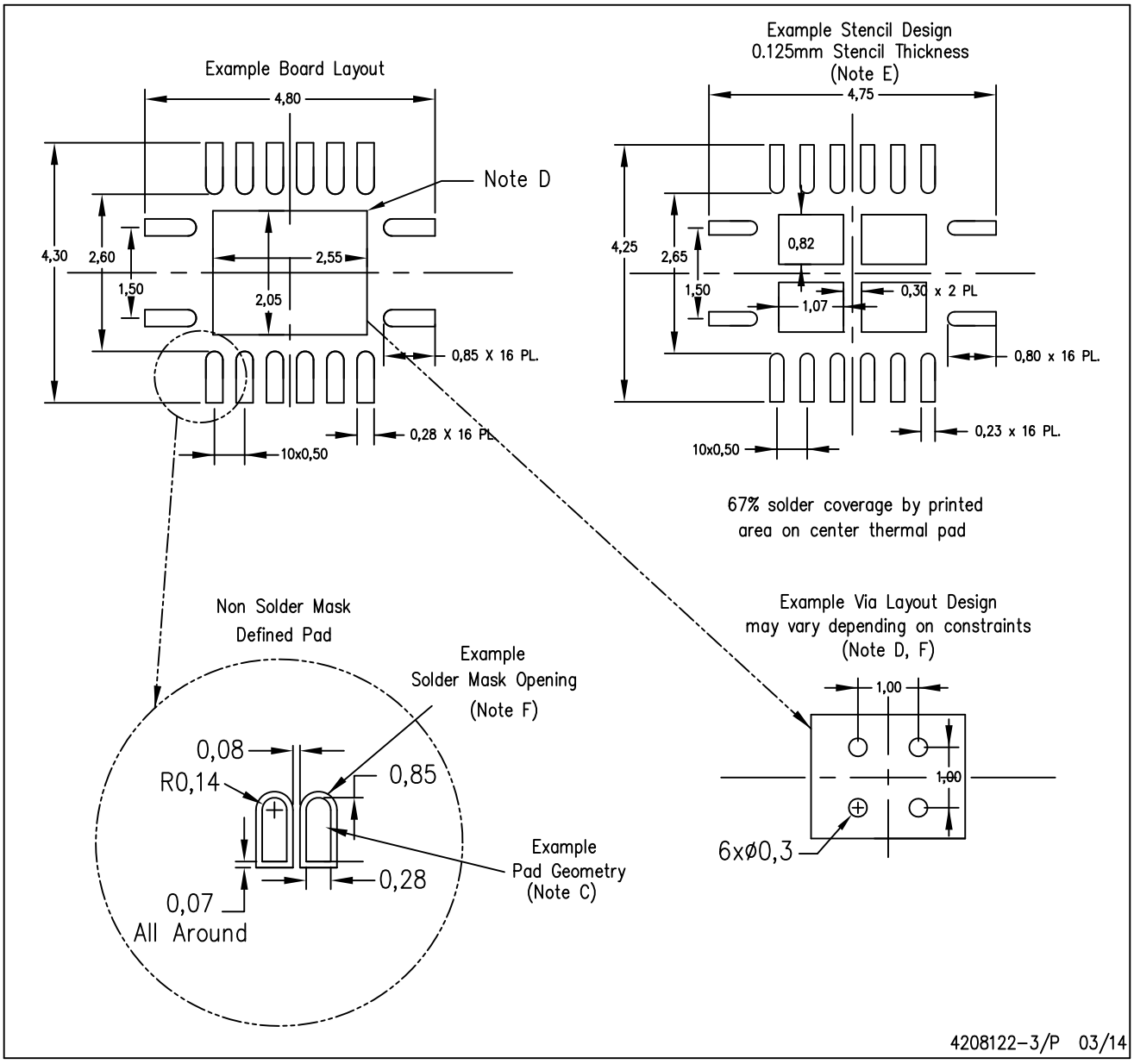
Bottom View

Exposed Thermal Pad Dimensions

4206353–3/P 03/14

NOTE: All linear dimensions are in millimeters

RGY (R–PVQFN–N16) PLASTIC QUAD FLATPACK NO–LEAD



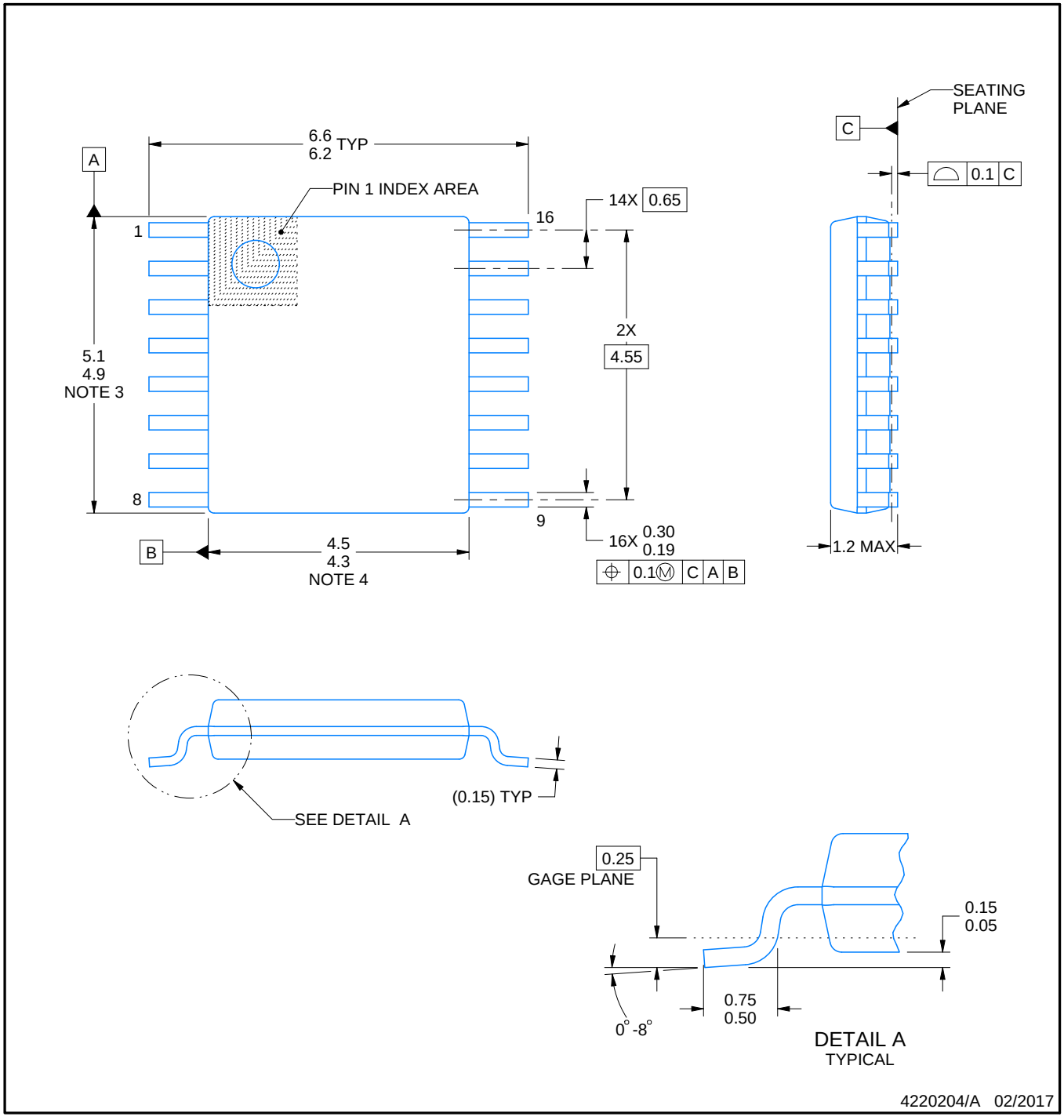
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat–Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http: //www.ti.com>.
E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

PACKAGE OUTLINE

PW0016A

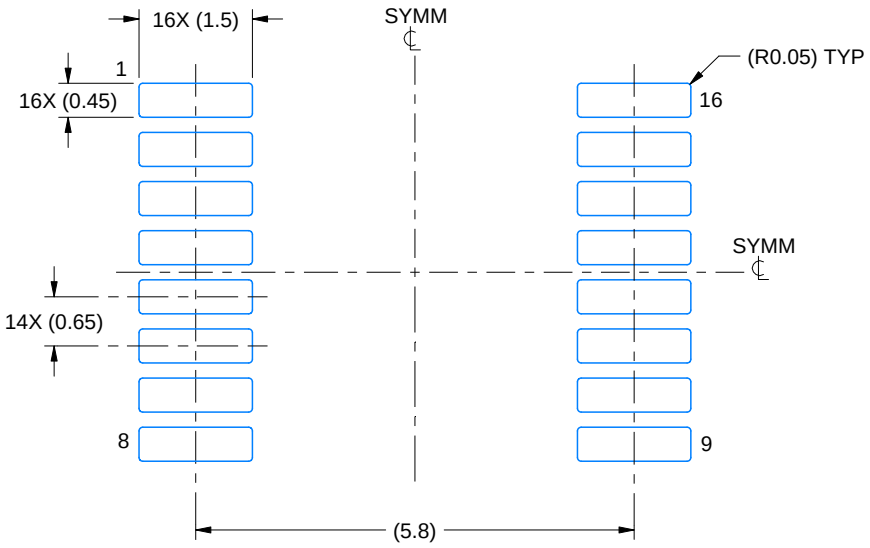
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

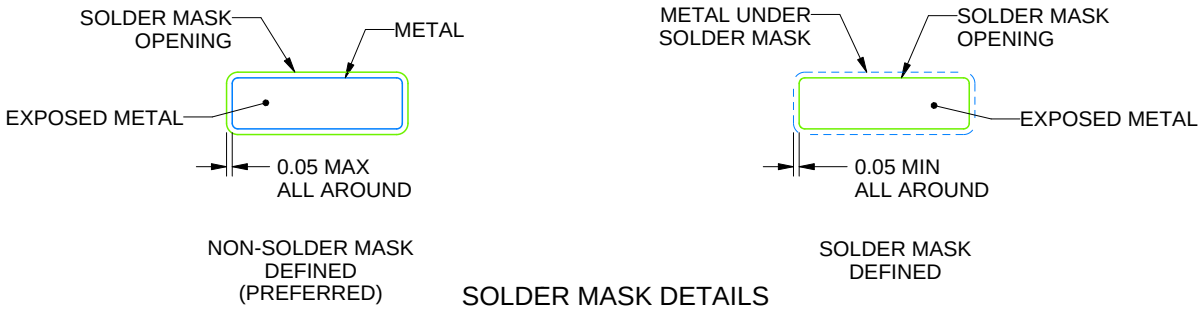


NOTES:

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. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

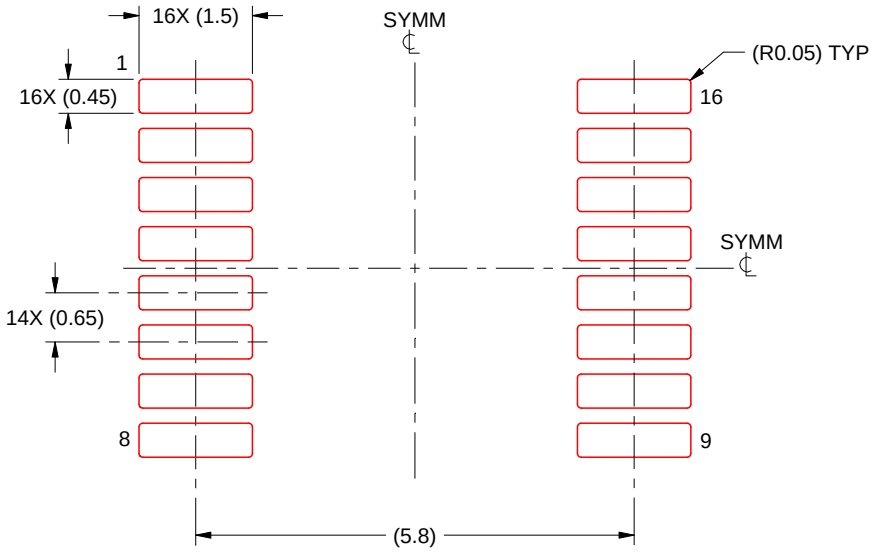


SOLDER MASK DETAILS

4220204/A 02/2017

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.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220204/A 02/2017

NOTES: (continued)

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

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