带 VR13.HC SVID 和 PMBus™ 接口的双通道（N + M ≤ 8 相）、降压、D-CAP+™ 数字多相控制器

1 特性

- 输入电压范围：4.5V 至 18V
- 输出电压范围：0.25V 至 5.5V
- 符合 Intel® VR13.HC SVID 标准
- 支持 M+N 相位配置的双路输出：（N + M ≤ 8，M ≤ 4）
- 增强型 D-CAP+™ 控制可提供卓越的瞬态性能和出色的动态电流共享
- 可编程环路补偿
- 可编程的相位触发顺序
- 单独的相电流校准和报告
- 可通过可编程电流阈值实现动态切相，从而提高轻负载和重负载下的效率
- 快速添相以减弱下冲 (USR)
- 无驱动器配置，有助于实现高效的高频开关
- 与 TI NextFET™ 功率级完全兼容，可实现高密度解决方案
- 精确可调电压定位 (AVP)
- 获得专利的 AutoBalance™ 相位平衡
- 逐周期每相位电流限制
- PMBus™ 系统接口，用于遥测电压、电流、功率、温度和故障条件
- 针对过压故障的新软关断选项
- 5 mm x 5 mm 40 引脚 QFN 封装

2 应用

- 数据中心和企业计算 机架式服务器
- 硬件加速器
- 网络接口卡 (NIC)
- ASIC 和 高性能客户端

3 说明

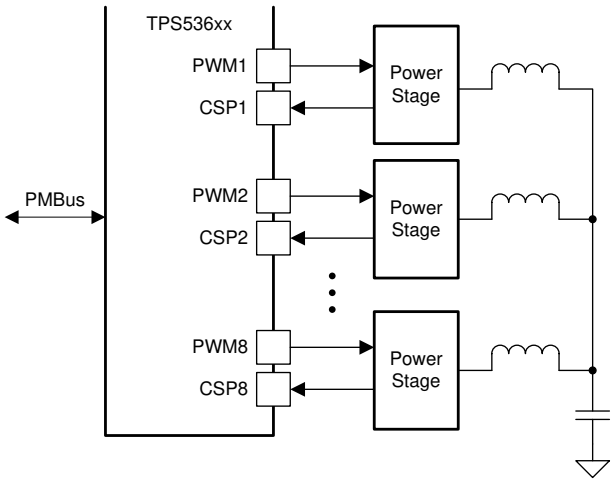
TPS53688A 是一款完全符合 VR13.HC SVID 标准的降压控制器，具有双通道、内置非易失性存储器 (NVM) 及 PMBus 接口，而且与 TI NexFET 智能功率级完全兼容。带下冲衰减 (USR) 功能的 DCAP+ 架构等高级控制特性可提供快速瞬态响应、低输出电容和良好的电流共享。该器件还提供全新的相位交错策略和动态切相功能，可提升不同负载条件下的效率。V_{CORE} 转换率和电压定位的可调节控制完善了 VR13.HC SVID 特性。此外，该器件还支持 PMBus 通信接口，可向系统报告电压、电流、功率、温度和故障状况的遥测数据。所有可编程参数均可通过 PMBus 接口进行配置，并可作为新的默认值存储在 NVM 中，以尽可能减少外部元件数量。

TPS53688A 器件采用热增强型 40 引脚 QFN 封装，额定工作温度为 –40°C 至 125°C。

封装信息

器件型号	封装(1)	封装尺寸（标称值）
TPS53688A	QFN (40)	5mm × 5mm

(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

本资源的原文使用英文撰写。 为方便起见，TI 提供了译文；由于翻译过程中可能使用了自动化工具，TI 不保证译文的准确性。 为确认准确性，请务必访问 ti.com 参考最新的英文版本（控制文档）。

4 器件和文档支持

4.1 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*通知* 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。

4.2 支持资源

TI E2E™ 中文支持论坛是工程师的重要参考资料，可直接从专家处获得快速、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，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。

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4.4 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。

4.5 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。

5 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	注释
August 2025	*	初始发行版

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可用的最新数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。有关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 part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TPS53688ARSBR	Active	Production	WQFN (RSB) | 40	3000 | LARGE T&R	Yes	Call TI | Nipdauag	Level-2-260C-1 YEAR	-	TPS 53688A

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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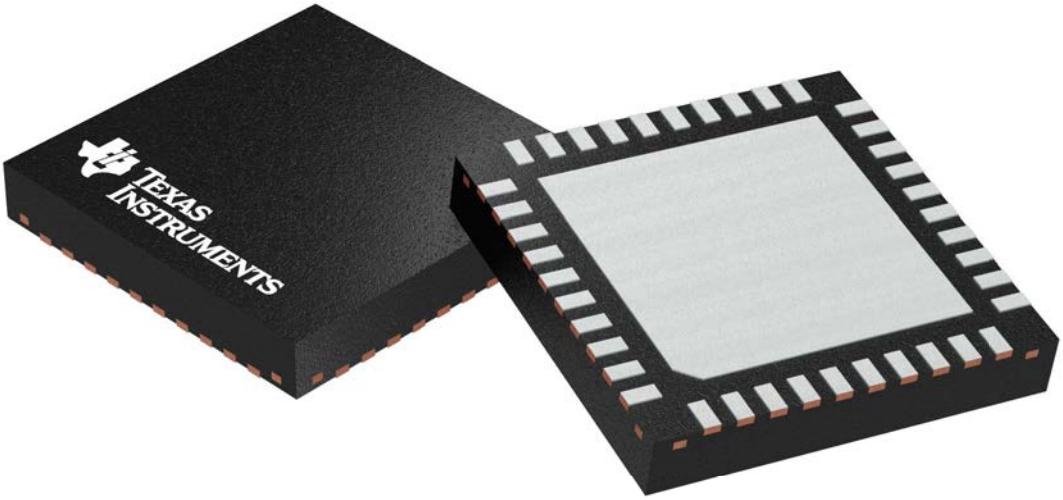
RSB 40

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD

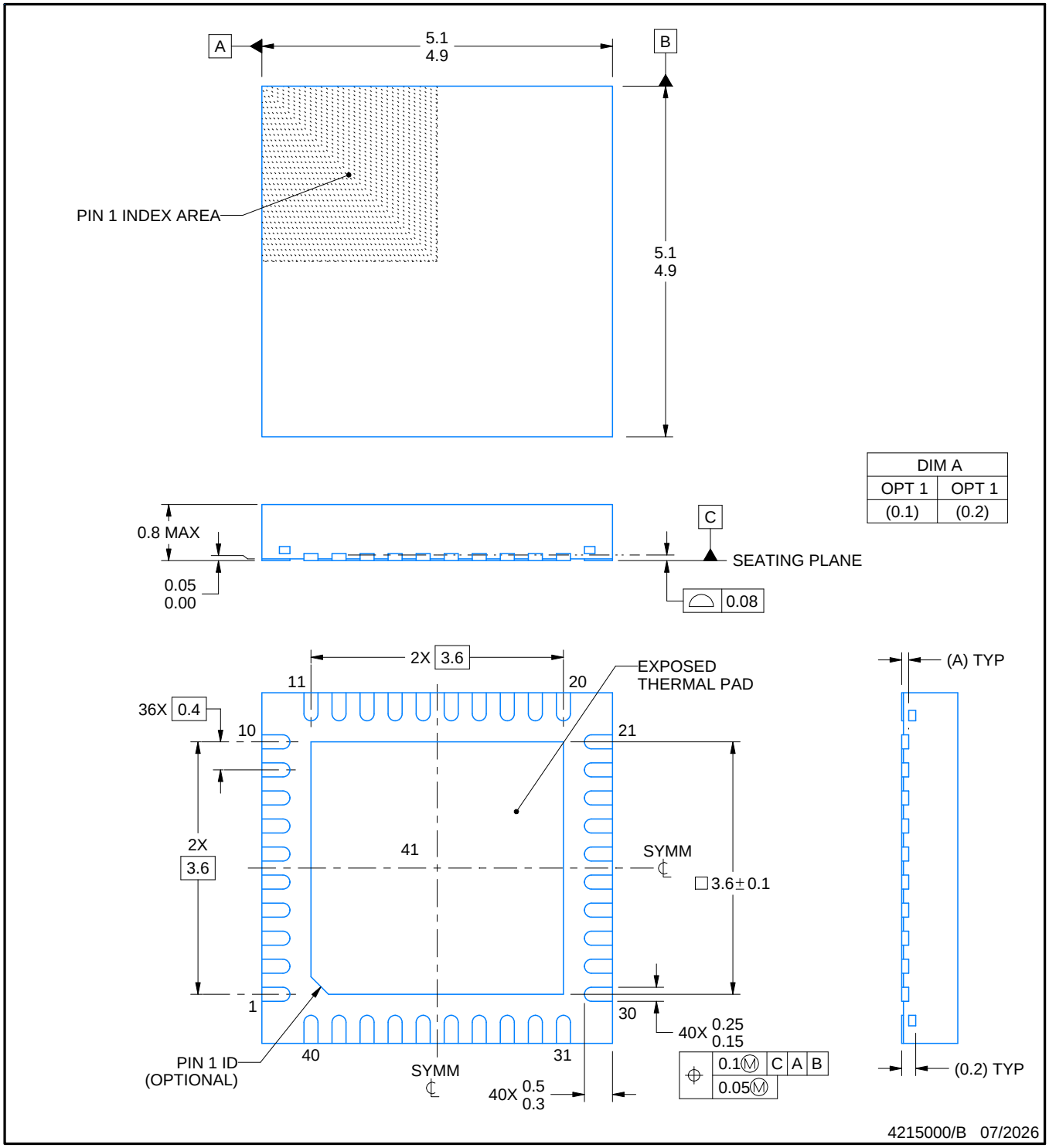
5 x 5 mm, 0.4 mm pitch



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

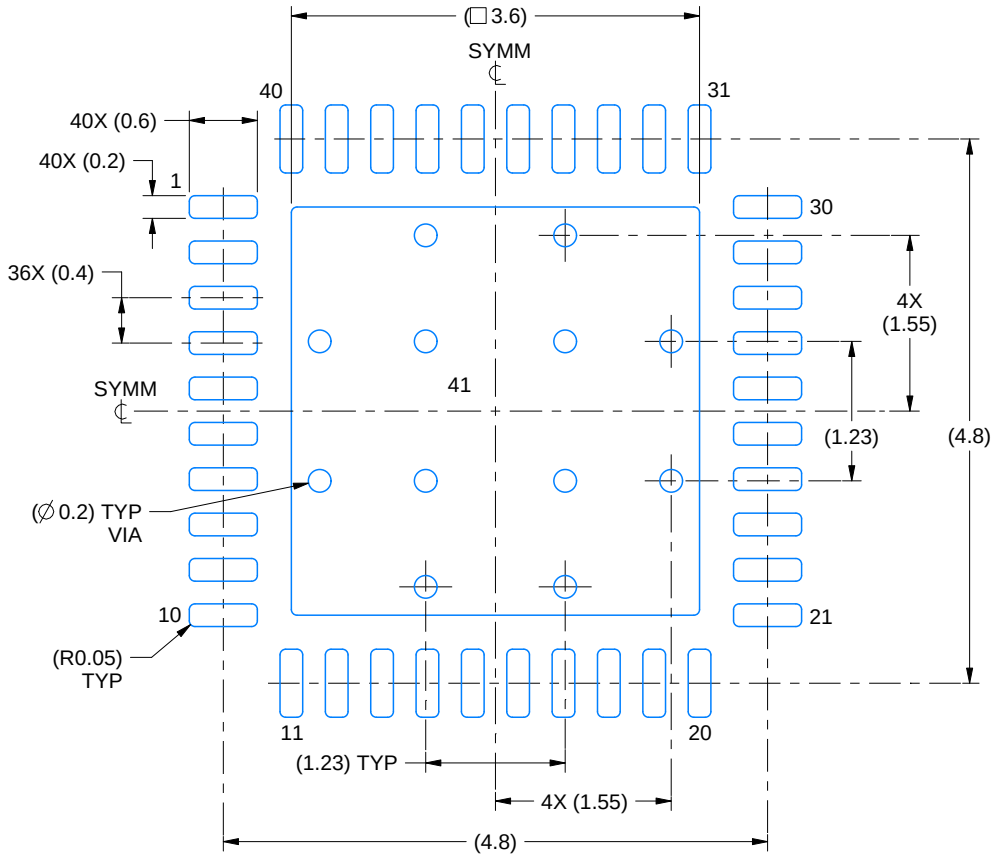
TEXAS INSTRUMENTS

PLASTIC QUAD FLATPACK - NO LEAD

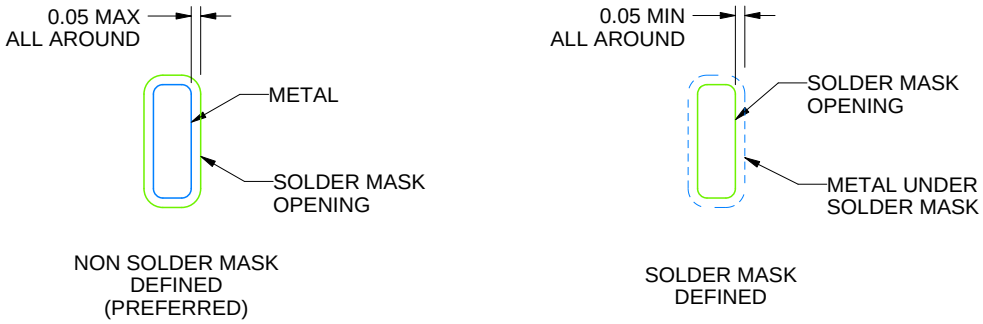


NOTES:

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.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.



LAND PATTERN EXAMPLE
SCALE:15X



SOLDER MASK DETAILS

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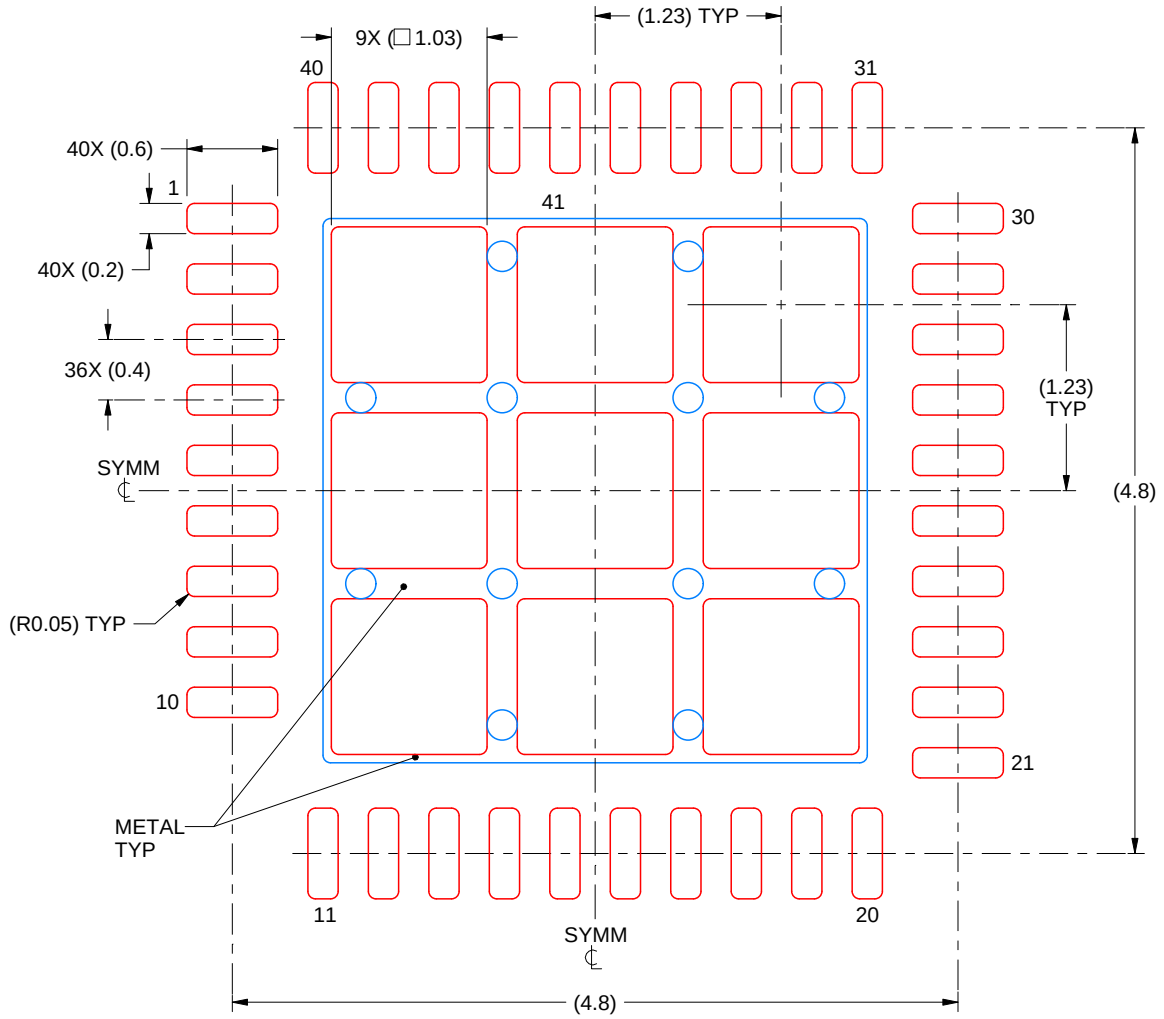
NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. 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.



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL

EXPOSED PAD 41
73.7% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE:20X

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NOTES: (continued)

6. 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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