

适用于 VR12.6 V_{CPU} 的两相 D-CAP+™ 降压控制器

1 特性

- Intel® VR12.6 PWM 规格符合串行 VID (SVID) 标准
- 单相或两相运行
- 完整的 VR12.6 移动功能集，包括数字电流监控器、PS3 和 PS4 运行
- 输出电压范围为 0.50V 至 2.30V 的 8 位 DAC
- 优化了轻负载和重负载条件下的效率
- 8 级独立的过冲衰减 (OSR) 和下冲衰减 (USR)
- 无驱动器配置，有助于实现高效的高频开关
- 支持分立式、电源块、功率级或 DrMOS MOSFET 实施
- 精确可调电压定位
- 300kHz 至 1.5MHz 的频率选择
- 获得专利的 AutoBalance 相位平衡
- 可选 8 级电流限制
- 4.5V 至 28V 转换电压范围
- 小型 4 × 4 32 引脚 QFN PowerPAD™ 集成电路封装

2 应用

- VR12.6 VCPU 应用，适用于
 - 适配器
 - 电池
 - NVDC
 - 5V 至 12V 电源轨

3 说明

TPS51624 是一款无驱动器、完全符合 SVID 标准的 VR12.6 降压控制器。高级控制特性（例如 D-CAP+ 架构）借助重叠脉冲支持下冲衰减 (USR) 和过冲衰减 (OSR)，可提供快速瞬态响应、最低输出电容和高效率。TPS51624 还支持在 CCM 或 DCM 运行情况下进行单相运行，从而提高轻负载情况下的效率。TPS51624 集成了完整的 VR12.6 I/O 功能，包括 VR_READY (PGOOD)、 $\overline{\text{ALERT}}$ 和 $\overline{\text{VR_HOT}}$ 。SVID 接口地址允许在 0 到 7 的时间范围内进行编程。在 PS4 中，控制器的静态功耗通常为 0.25mW。VCPU 压摆率和电压定位的可调节控制完善了 VR12.6 功能。与新的 TPS51604 FET 栅极驱动器配合使用时，该解决方案可提供超高速度和低开关损耗。TPS51624 与选定的 TI Power Stage™ 产品以及 DrMOS 产品一起使用，可实现出色效率。

TPS51624 器件采用节省空间的热增强型 32 引脚 QFN 封装，可在 -40°C 到 105°C 温度下运行。

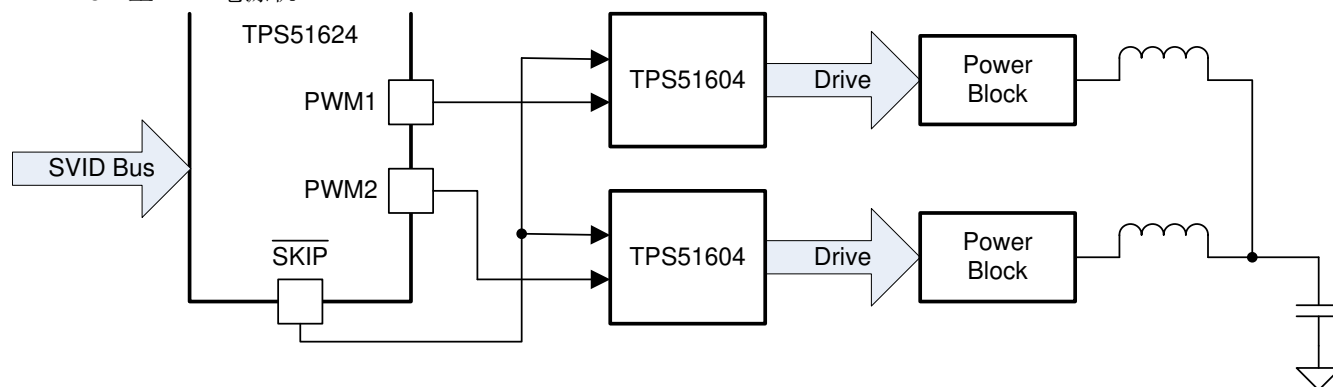


图 3-1. 简化版原理图



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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

DATE	REVISION	NOTES
June 2022	*	Initial Release

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

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TI E2E™ is a trademark of Texas Instruments.

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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 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

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)
TPS51624RSMR	Active	Production	VQFN (RSM) 32	3000 LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 51624
TPS51624RSMR.A	Active	Production	VQFN (RSM) 32	3000 LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 51624
TPS51624RSMT	Active	Production	VQFN (RSM) 32	250 SMALL T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 51624
TPS51624RSMT.A	Active	Production	VQFN (RSM) 32	250 SMALL T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 51624

⁽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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GENERIC PACKAGE VIEW

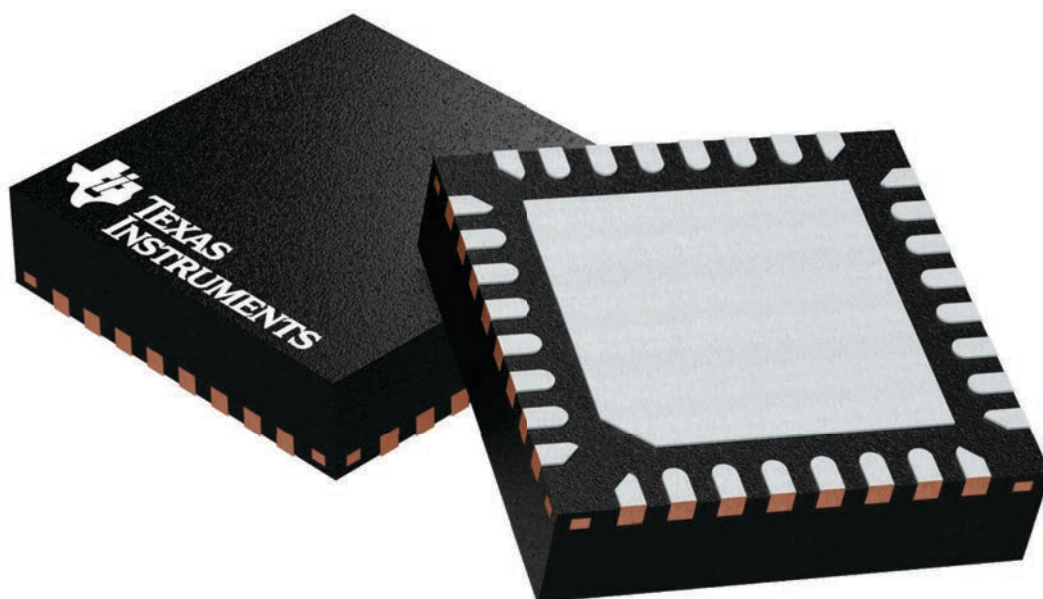
RSM 32

VQFN - 1 mm max height

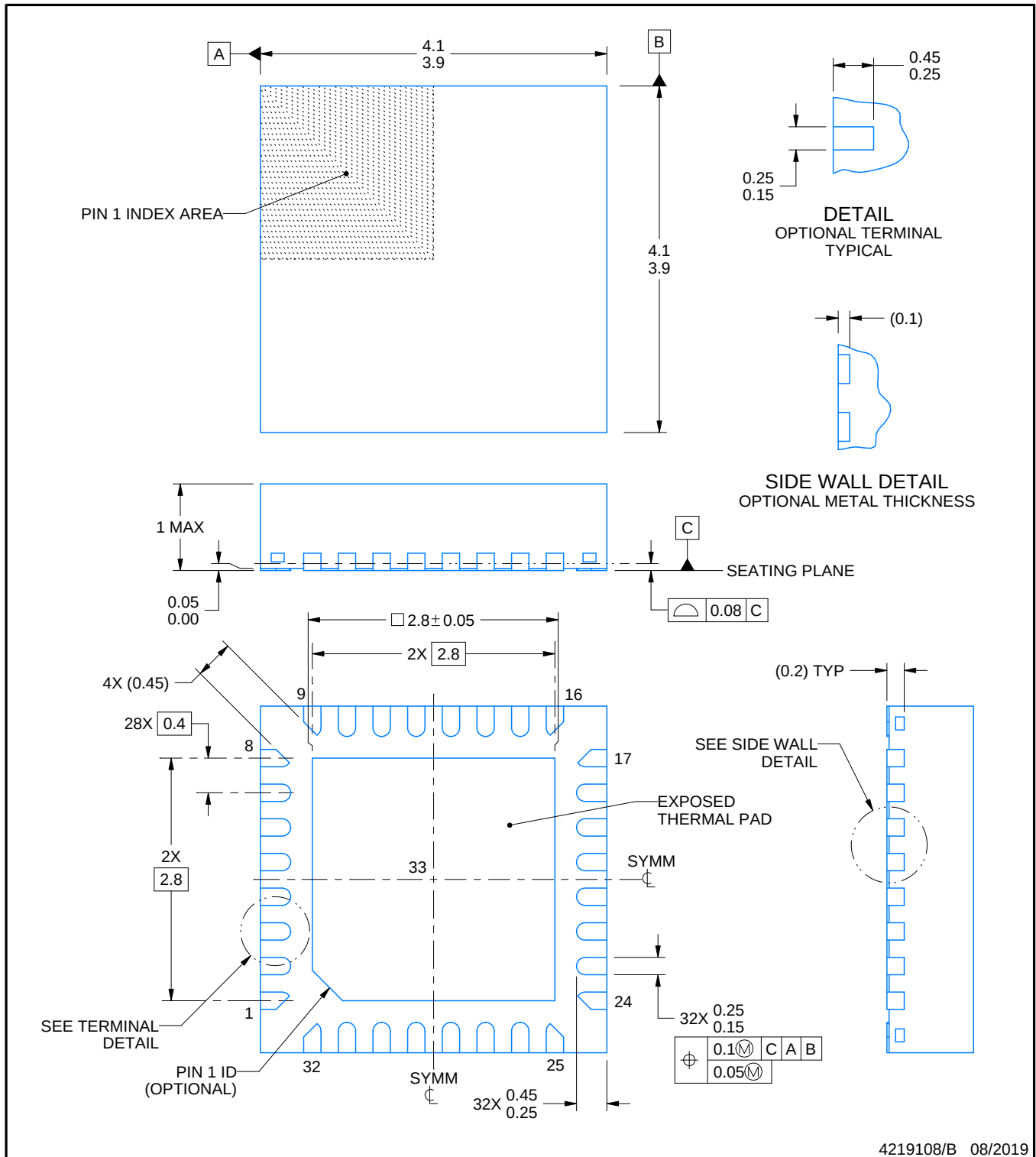
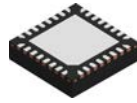
4 x 4, 0.4 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

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



4224982/A



NOTES:

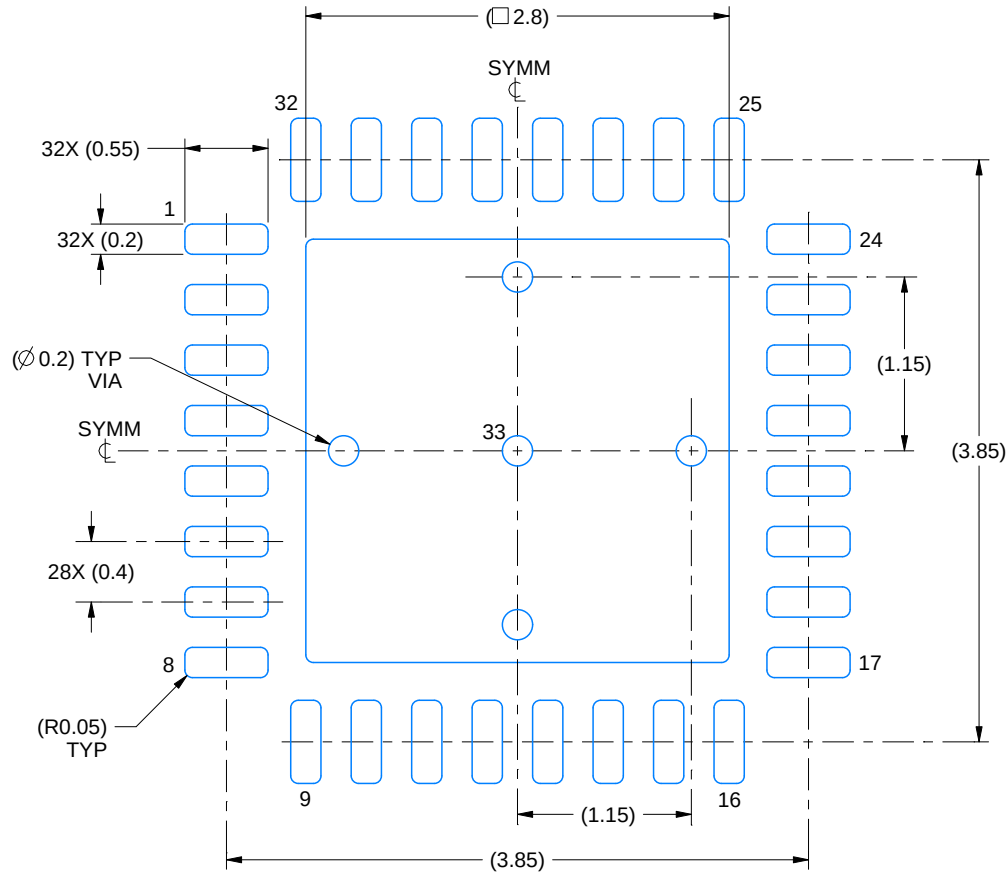
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

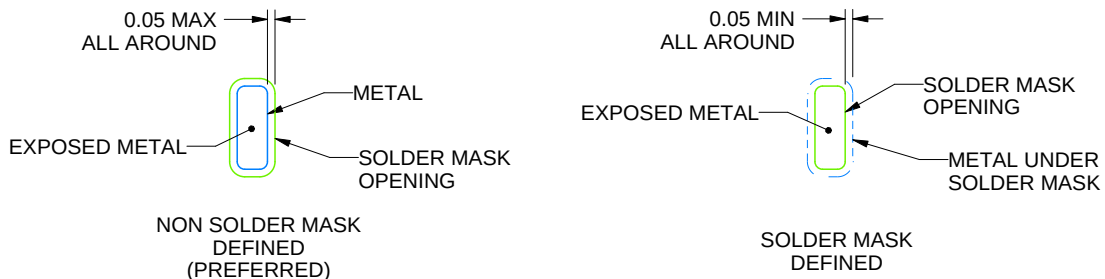
RSM0032B

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:20X



SOLDER MASK DETAILS

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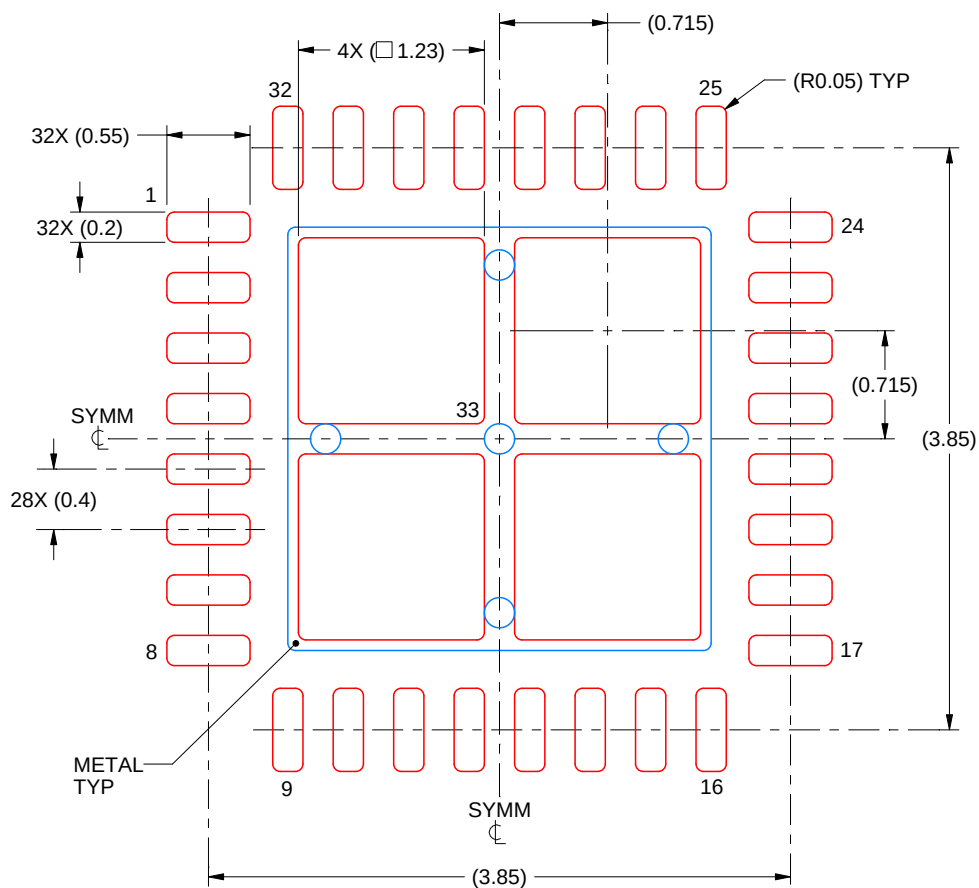
NOTES: (continued)

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/slue271).
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.

RSM0032B

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL

EXPOSED PAD 33:
77% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE:20X

4219108/B 08/2019

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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