CSD96416 同步降压 NexFET™ 智能功率级

1 特性

- 峰值电流额定值：50A
- 16V V_{IN}，25V 高侧和低侧 FET
- 调整了死区时间修整功能，通过非 TI 控制器改善瞬态响应
- 峰值效率（f_{SW} = 600kHz，L_{OUT} = 150nH）：超过 94%
- 工作频率高（高达 1.75 MHz）
- 温度补偿双向电流感应
- 模拟温度输出
- 故障监控
- 兼容 3.3V 和 5V PWM 信号
- 三态 PWM 输入
- 集成自举开关
- 优化了击穿保护死区时间
- 高密度 5mm × 6mm QFN 封装
- 超低电感封装
- 系统已优化的 PCB 空间占用
- 耐热增强型顶部散热
- 符合 RoHS 标准、无铅端子镀层
- 无卤素

2 应用

- 多相同步降压转换器
  - 高频应用
  - 大电流、低占空比应用
- 负载点 (POL) 直流/直流转换器
- 存储器和显卡
- 台式机和服务器电压内核同步降压转换器

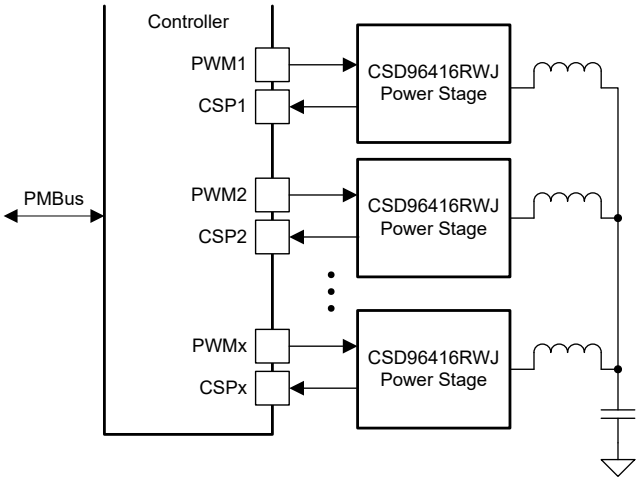


图 3-1. 简化版应用

3 说明

CSD96416 NexFET™ 功率级是一款针对高功率、高密度同步降压转换器进行高度优化的设计。这款产品集成了驱动器和功率 MOSFET 来完善功率级开关功能。该组合采用 5mm × 6mm 封装，可实现高电流、高效率以及高速切换功能。该功率级具有经过调整的死区时间修整功能，可通过非 TI 控制器改善瞬态响应。它还集成了准确电流检测和温度感测功能，以简化系统设计并提高准确度。此外，已对 PCB 封装进行了优化以帮助减少设计时间并简化总体系统设计的完成。

器件信息

器件型号	介质	数量	封装 (1)
CSD96416RWJ	13 英寸卷带	2500	QFN 5.00mm × 6.00mm

(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。

Table of Contents

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
January 2023	*	Initial release

5 器件和文档支持

TI 提供大量的开发工具。下面列出了用于评估器件性能、生成代码和开发解决方案的工具和软件。

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

TI E2E™ is a trademark of Texas Instruments.
所有商标均为其各自所有者的财产。

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

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.

6.1 Package Option Addendum

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish(4)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking(5) (6)
CSD96416RWJ	ACTIVE	VQFN-CLIP	RWJ	41	2500	Green (RoHS-Exempt & no Sb/Br)	NIPDAU	Level-2-260C-1 YEAR	– 55 to 150	96416RWJ

(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.
PRE_PROD Unannounced device, not in production, not available for mass market, nor on the web, samples not available.
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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

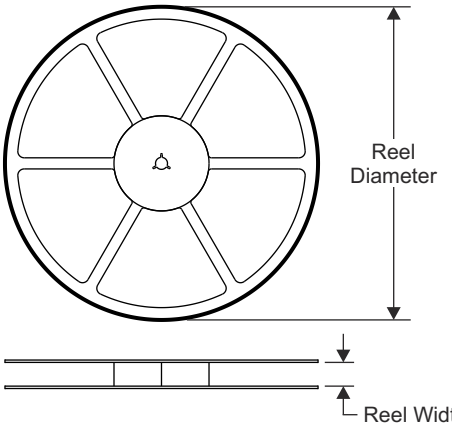
(4) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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

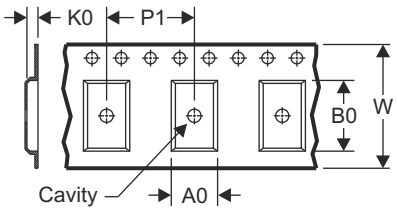
(6) Multiple Device markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

6.2 Tape and Reel Information

REEL DIMENSIONS

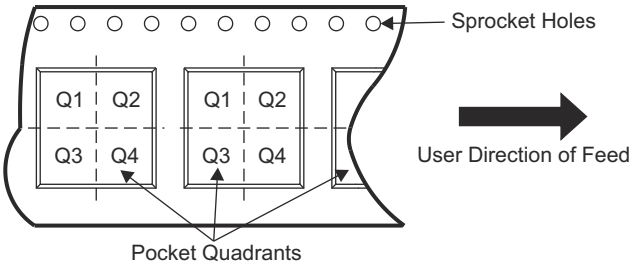


TAPE DIMENSIONS



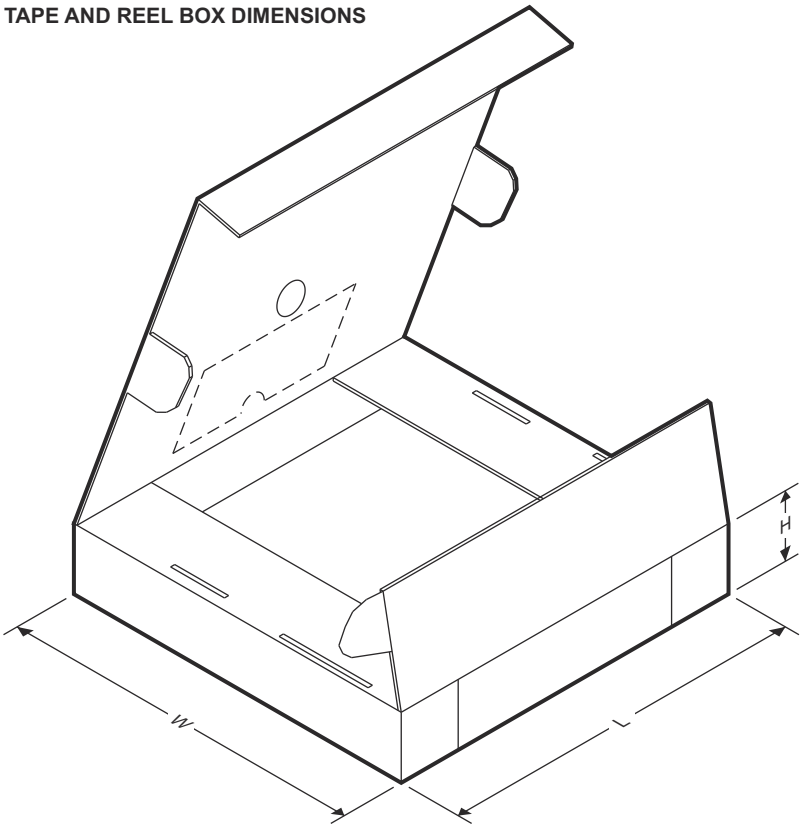
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



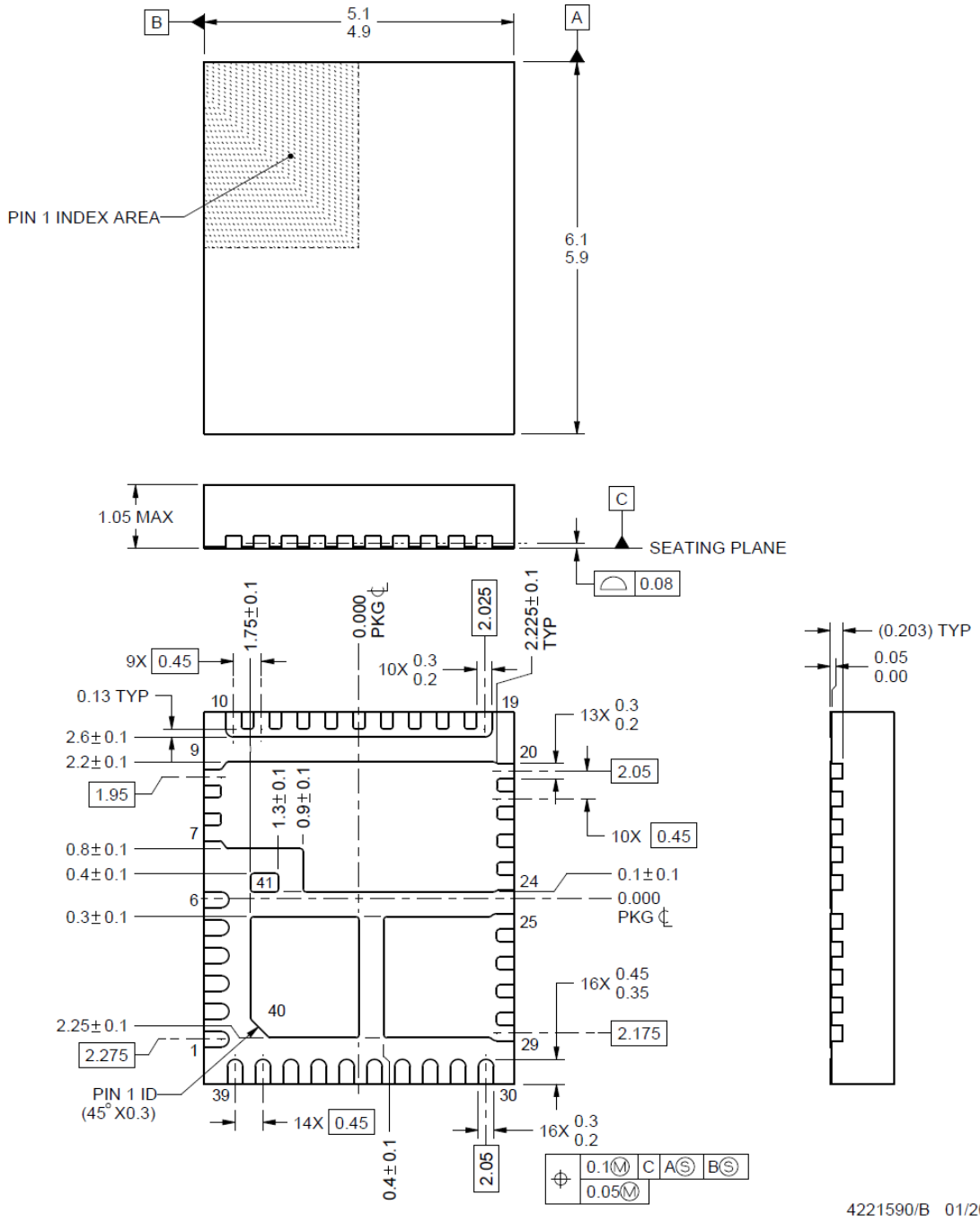
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CSD96416RWJ	VQFN-CLIP	RWJ	41	2500	330	12.4	5.30	6.30	1.20	8.00	12.00	Q1

TAPE AND REEL BOX DIMENSIONS



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD96416RWJ	VQFN-CLIP	RWJ	41	2500	367	367	38

6.3 Mechanical Drawing

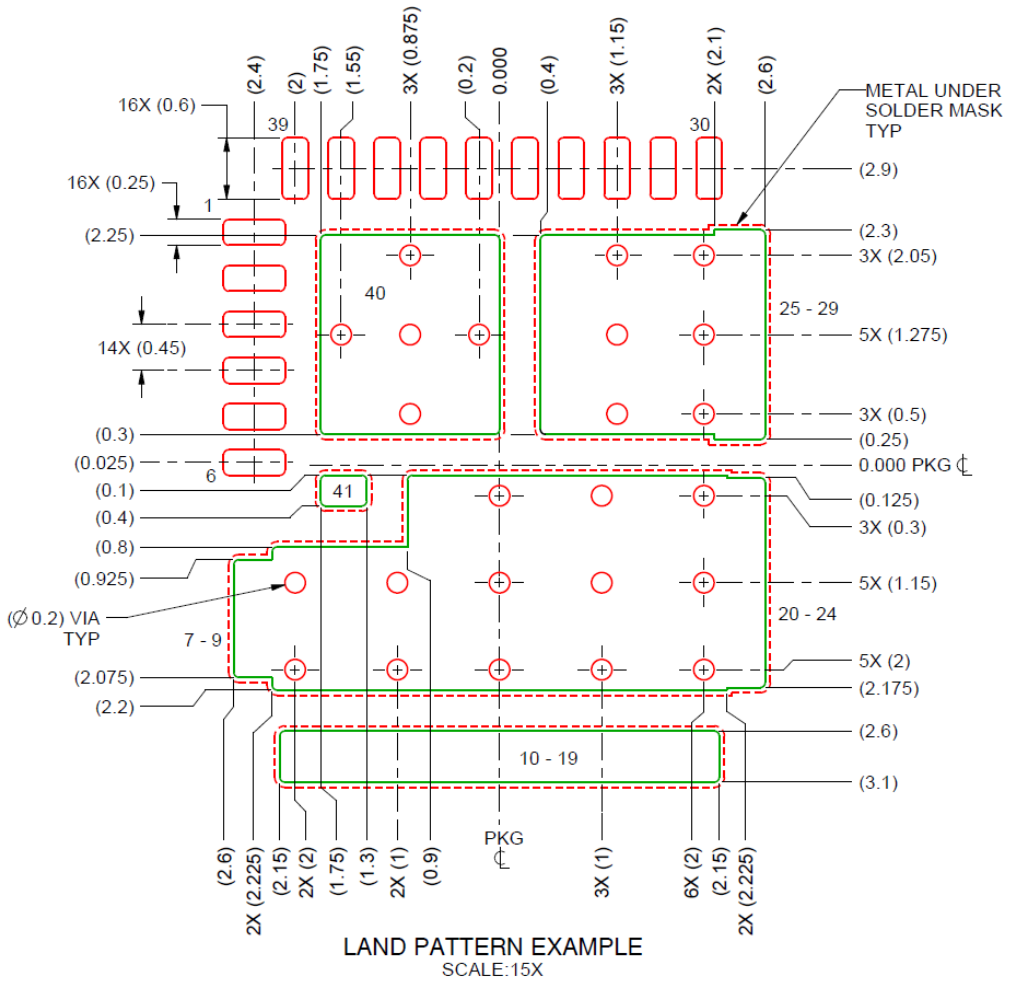


A. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

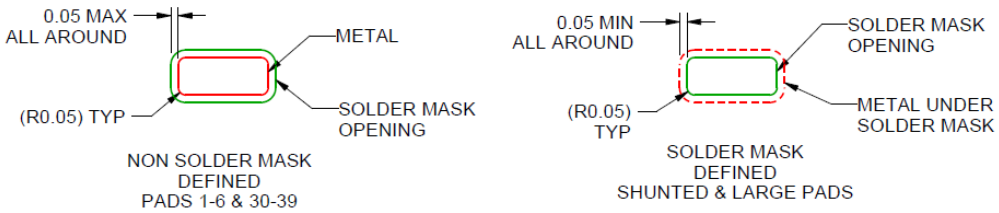
B. This drawing is subject to change without notice.

C. The package thermal pads must be soldered to the printed circuit board for optimal thermal and mechanical performance.

6.4 Recommended PCB Land Pattern



LAND PATTERN EXAMPLE
SCALE:15X

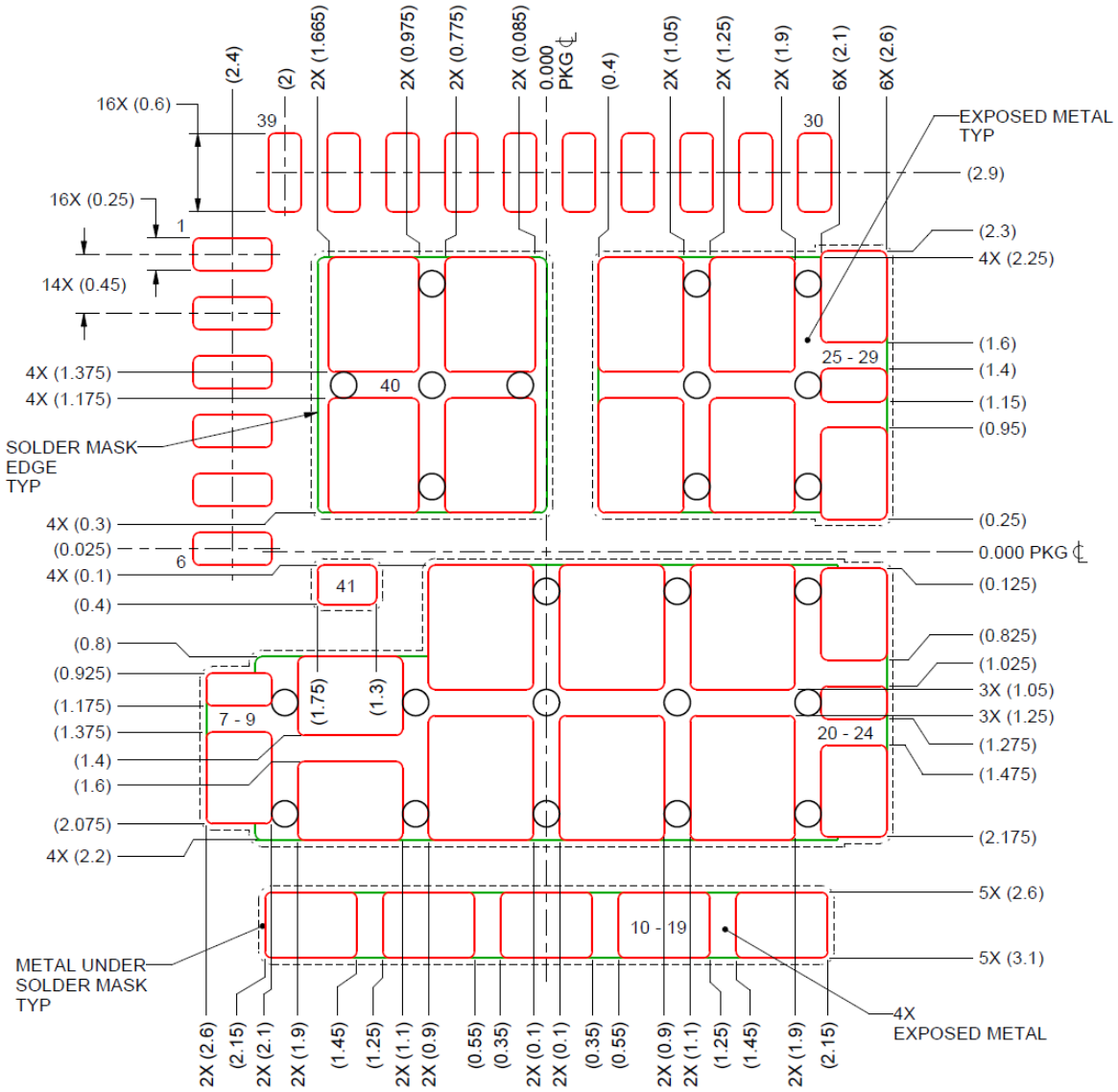


SOLDER MASK DETAILS

4221590/B 01/2015

A. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
B. This drawing is subject to change without notice.
C. This package is designed to be soldered to thermal pads on the board. For more information, see QFN/SON PCB Attachment (SLUA271).

6.5 Recommended Stencil Opening



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL

EXPOSED PAD
71% PRINTED SOLDER COVERAGE BY AREA
SCALE:20X

4221590/B 01/2015

A. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
B. This drawing is subject to change without notice.
C. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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
CSD96416RWJ	ACTIVE	VQFN-CLIP	RWJ	41	2500	RoHS-Exempt & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	96416RWJ	Samples
CSD96416RWJT	ACTIVE	VQFN-CLIP	RWJ	41	250	RoHS-Exempt & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	96416RWJ	Samples

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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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