

# CSD95420RCB Synchronous Buck NexFET™ Smart Power Stage

## 1 Features

- 50-A peak continuous current
- Over 94% system efficiency at 15-A
- High-frequency operation (up to 1.75 MHz)
- Diode emulation function
- Temperature compensated bi-directional current sense
- Analog temperature output
- Fault monitoring
- 3.3-V and 5-V PWM signal compatible
- Tri-state PWM input
- Integrated bootstrap switch
- Optimized deadtime for shoot-through protection
- QFN package
  - High-density
  - 4 mm × 5 mm
  - Ultra-low-inductance
  - System-optimized PCB footprint
  - Thermally enhanced tooling
  - RoHS compliant
  - Lead-free terminal plating
  - Halogen Free

## 2 Applications

- Multiphase synchronous buck converters
  - High-frequency applications
  - High-current, low-duty cycle applications
- Point-of-load DC-DC converters
- Memory and graphic cards
- Desktop and server VR13.x / VR14.x V-Core synchronous buck converters

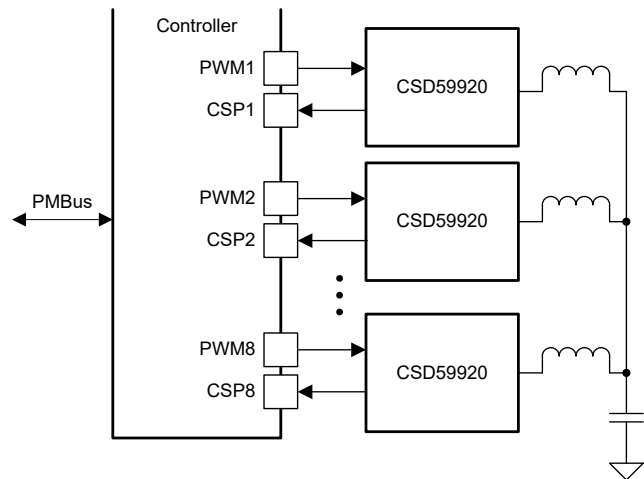
## 3 Description

The CSD95420RCB NexFET™ power stage is highly optimized for high-power, high-density synchronous buck converters. This product integrates the driver device and power MOSFETs to complete the power stage switching function. This combination produces high-current, high-efficiency, and high-speed switching capability in a small 4 mm × 5 mm outline package. The device integrates the accurate current sensing and temperature sensing functionality to simplify system design and improve accuracy. The optimized PCB footprint helps reduce design time and simplifies the completion of the overall system design.

### Device Information

| DEVICE <sup>(1)</sup> | MEDIUM       | QTY  | PACKAGE                  | SHIP          |
|-----------------------|--------------|------|--------------------------|---------------|
| CSD95420RCBRCB        | 13-inch reel | 2500 | QFN<br>4.00 mm × 5.00 mm | Tape and reel |

(1) For all available packages, see the orderable addendum at the end of the data sheet.



**Figure 3-1. Simplified Application**



## Table of Contents

|  |          |   |           |
|--|----------|---|-----------|
| <b>1 Features</b> .....                                  | <b>1</b> | 5.6 Glossary.....   | <b>3</b>  |
| <b>2 Applications</b> .....                              | <b>1</b> | <b>6 Mechanical, Packaging, and Orderable Information</b> ...       | <b>3</b>  |
| <b>3 Description</b> .....                               | <b>1</b> | 6.1 Package Option Addendum.....                                    | <b>4</b>  |
| <b>4 Revision History</b> .....                          | <b>2</b> | 6.2 Mechanical Drawing.....   | <b>6</b>  |
| <b>5 Device and Documentation Support</b> .....          | <b>3</b> | 6.3 Recommended PCB Land Pattern.....                               | <b>7</b>  |
| 5.1 Documentation Support.....                           | <b>3</b> | 6.4 Recommended Stencil Opening.....                                | <b>8</b>  |
| 5.2 Receiving Notification of Documentation Updates..... | <b>3</b> | 6.5 Alternate Industry Standard Compatible PCB<br>Land Pattern..... | <b>9</b>  |
| 5.3 Support Resources.....                               | <b>3</b> | 6.6 Alternate Industry Standard Compatible Stencil<br>Opening.....  | <b>10</b> |
| 5.4 Trademarks.....                                      | <b>3</b> |   |           |
| 5.5 Electrostatic Discharge Caution.....                 | <b>3</b> |   |           |

## 4 Revision History

| DATE          | REVISION | NOTES            |
|---------------|----------|------------------|
| November 2020 | *        | Initial release. |

## 5 Device and Documentation Support

### 5.1 Documentation Support

### 5.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 5.3 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is 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](#).

### 5.4 Trademarks

NexFET™ and TI E2E™ are trademarks of Texas Instruments.  
All trademarks are the property of their respective owners.

### 5.5 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.

### 5.6 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 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.

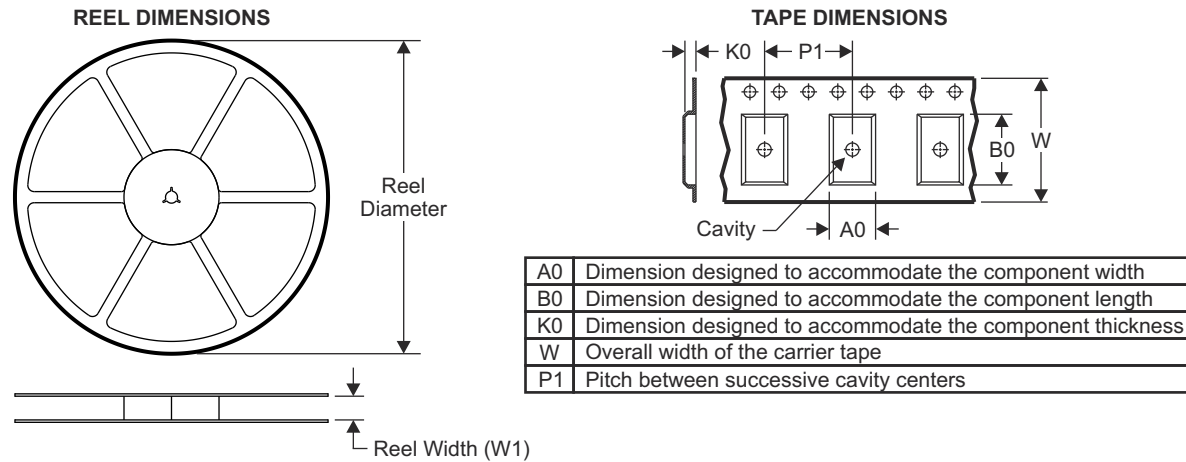
## 6.1 Package Option Addendum

### 6.1.1 Packaging Information

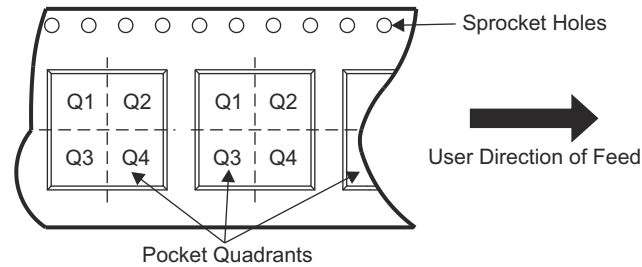
| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> | Op Temp (°C) | Device Marking <sup>(4) (5)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|--------------|-----------------------------------|
| CSD95420RCBRCB   | Active                | QFN          | RCB             | 27   | 2500        | PB-Free (RoHS Exempt)   | CU NIPDAU        | Level-2-260CUNLIM            | -55 to 150   | 59920RB                           |

- (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) 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 on 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.  
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### 6.1.2 Tape and Reel Information

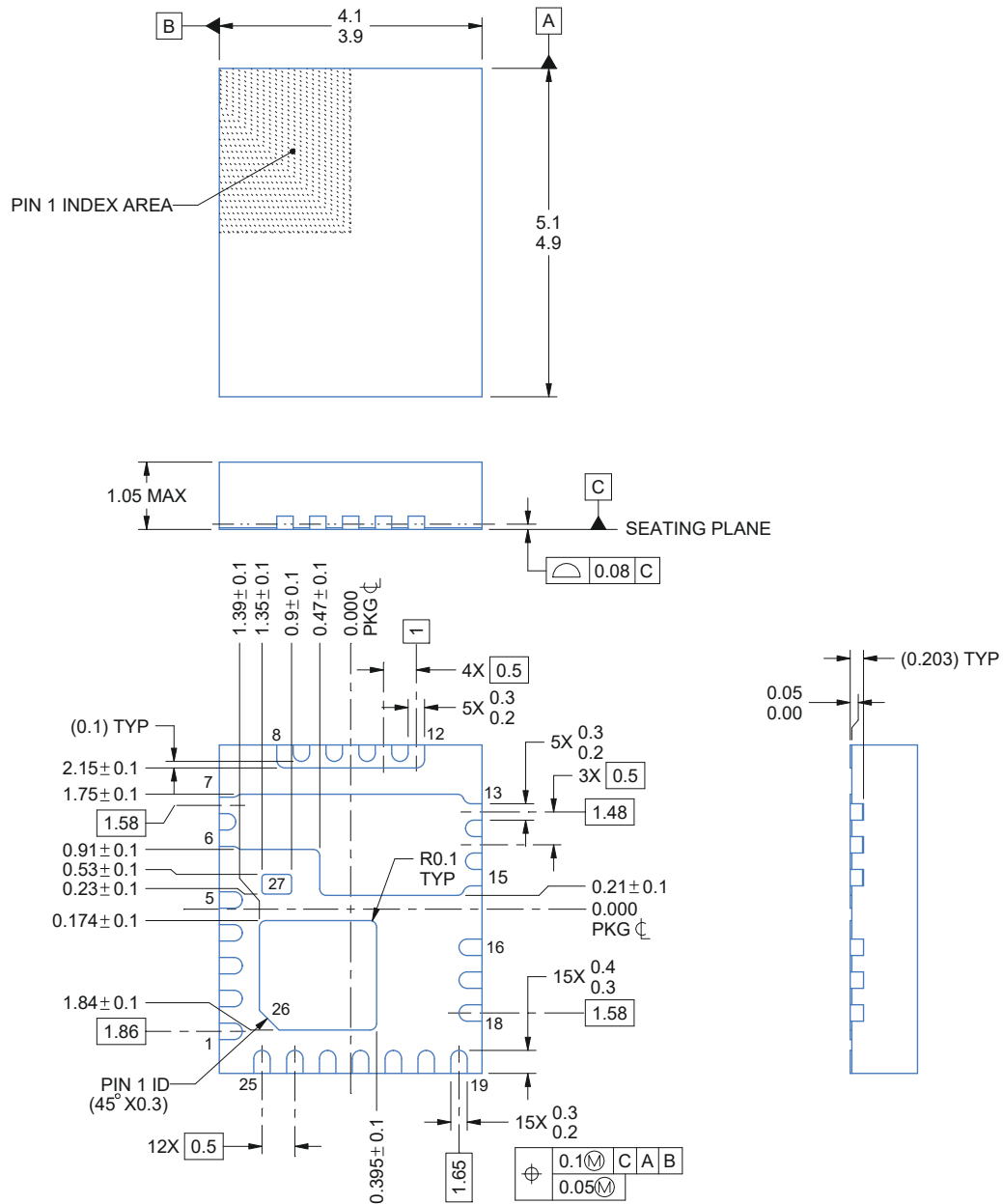


#### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



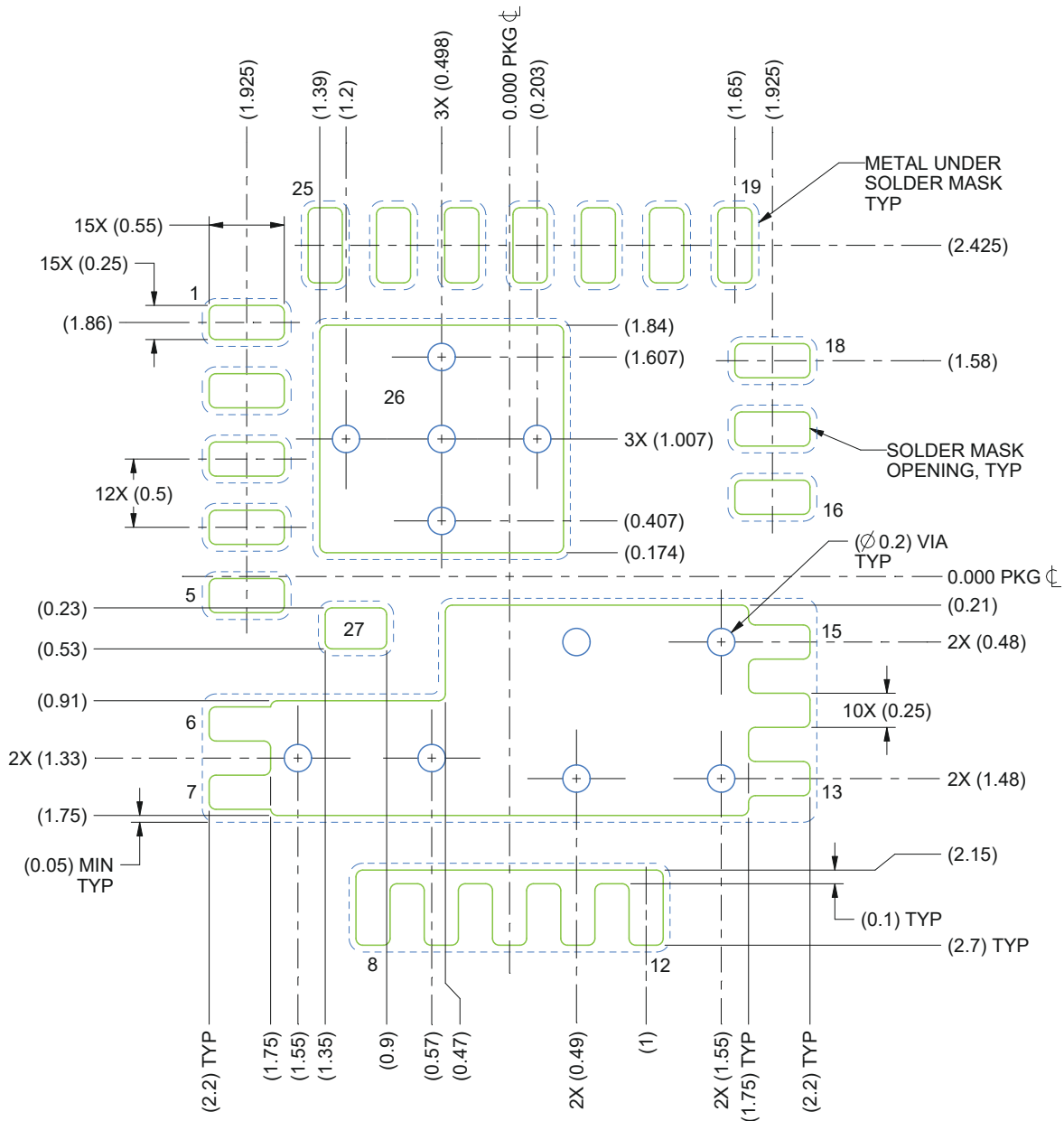
| Device       | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CSD95420RCB  | VQFN-CLIP    | RCB             | 27   | 2500 | 330                | 12.4               | 4.30    | 5.30    | 1.30    | 8.00    | 12.00  | Q1            |
| CSD95420RCBT | VQFN-CLIP    | RCB             | 27   | 250  | 330                | 12.4               | 4.30    | 5.30    | 1.30    | 8.00    | 12.00  | Q1            |

## 6.2 Mechanical Drawing



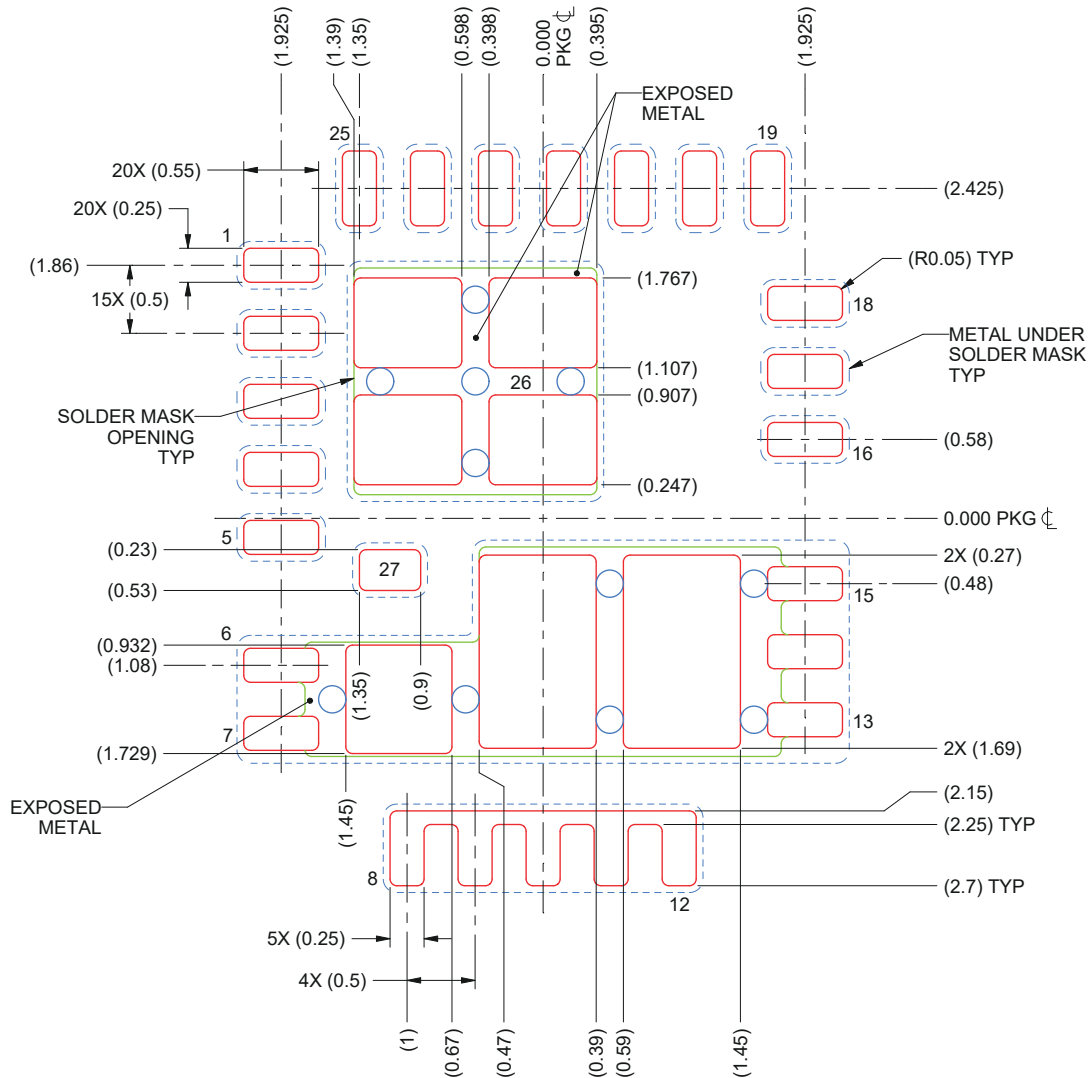
- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- The package thermal pads must be soldered to the printed circuit board for optimal thermal and mechanical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

### 6.3 Recommended PCB Land Pattern



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

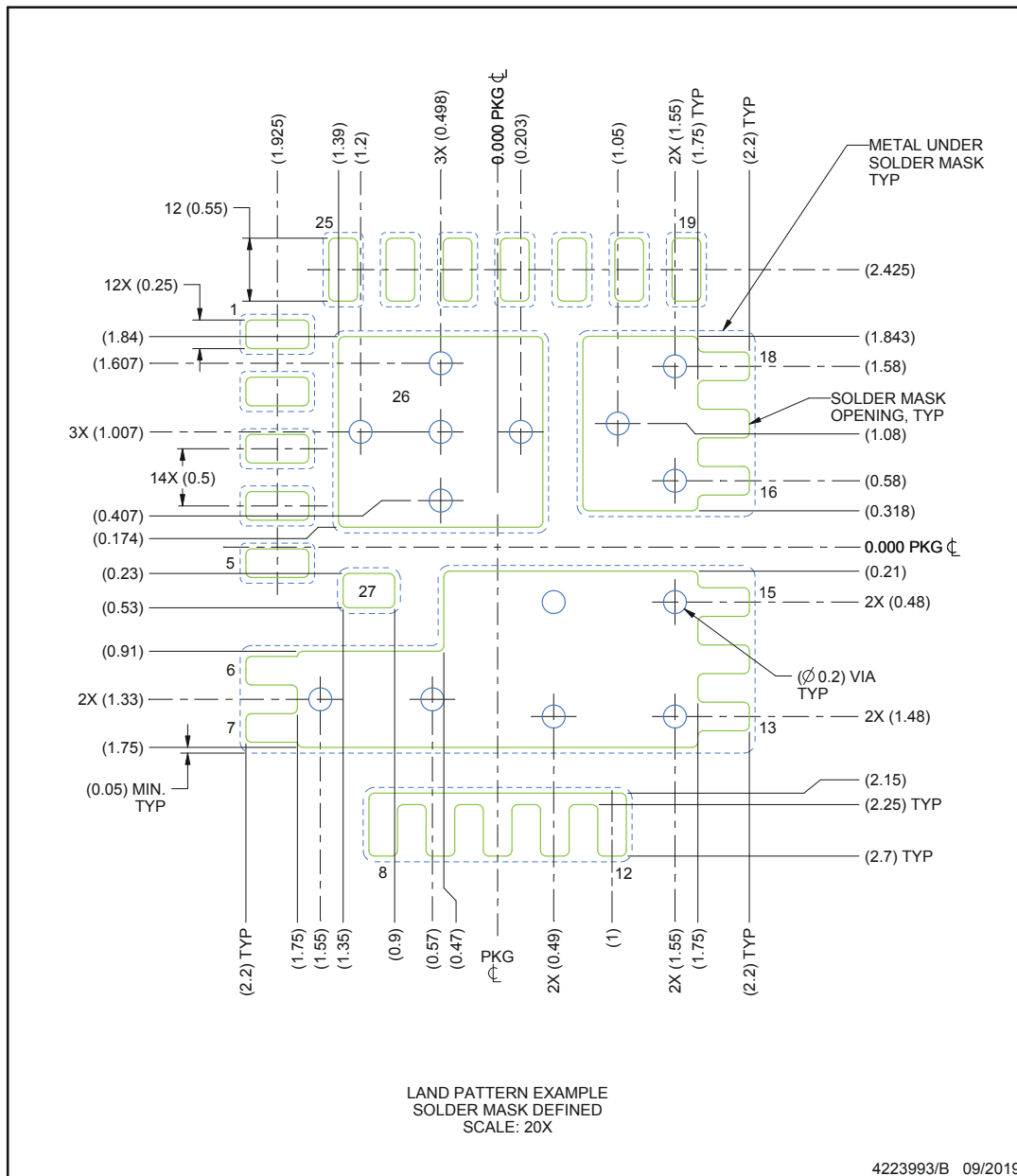
## 6.4 Recommended Stencil Opening



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

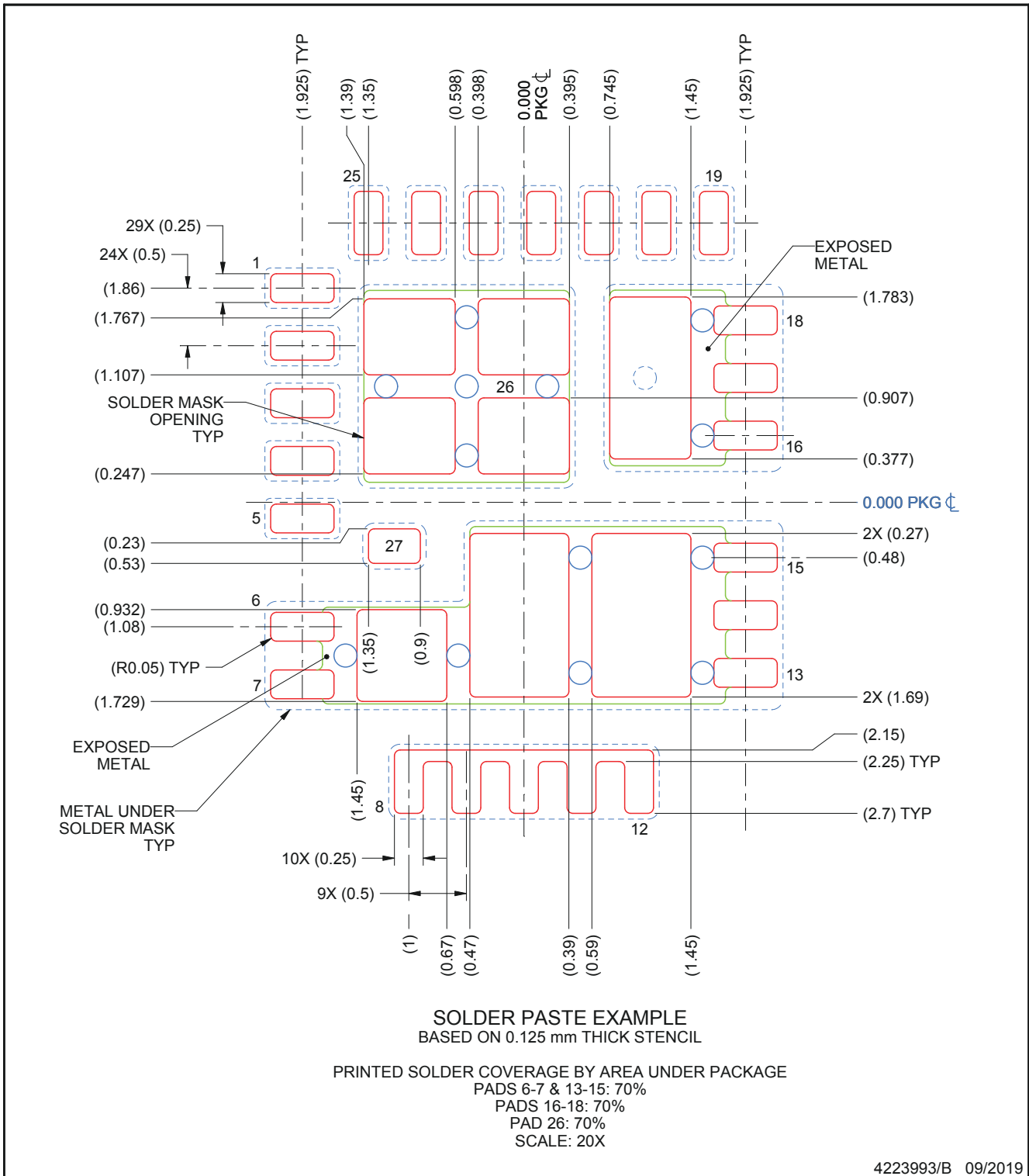


## 6.5 Alternate Industry Standard Compatible PCB Land Pattern



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 pads must be soldered to the printed circuit board for optimal thermal and mechanical performance.
4. This package is designed to be soldered to thermal pads on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

### 6.6 Alternate Industry Standard Compatible Stencil Opening



**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)        | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| CSD95420RCB      | ACTIVE        | VQFN-CLIP    | RCB             | 27   | 2500        | RoHS-Exempt<br>& Green | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 125   | 95420RB                 | <a href="#">Samples</a> |
| CSD95420RCBT     | ACTIVE        | VQFN-CLIP    | RCB             | 27   | 250         | RoHS-Exempt<br>& Green | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 125   | 95420RB                 | <a href="#">Samples</a> |

(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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**TAPE AND REEL INFORMATION**

**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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CSD95420RCB  | VQFN-CLIP    | RCB             | 27   | 2500 | 330.0              | 12.4               | 4.3     | 5.3     | 1.3     | 8.0     | 12.0   | Q1            |
| CSD95420RCBT | VQFN-CLIP    | RCB             | 27   | 250  | 180.0              | 12.4               | 4.3     | 5.3     | 1.3     | 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) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CSD95420RCB  | VQFN-CLIP    | RCB             | 27   | 2500 | 367.0       | 367.0      | 38.0        |
| CSD95420RCBT | VQFN-CLIP    | RCB             | 27   | 250  | 213.0       | 191.0      | 35.0        |

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