

# TPS6288x-Q1 2.8V to 6V Input, 12A, 20A, 24A, and 30A Automotive, Fast Transient, Stackable, Dual-Phase Step-Down Converter With I<sup>2</sup>C Interface

## 1 Features

- AEC-Q100 qualified for automotive applications
  - Temperature grade 1: –40°C to 125°C T<sub>A</sub>
  - –40°C to 150°C junction temperature range
- **Functional Safety-Compliant**
  - Developed for functional safety applications
  - Documentation available to aid ISO 26262 system design up to ASIL D (SEooC)
- Input voltage range: 2.8V to 6V
- Selectable output voltage ranges for AVS / DVS
  - Three ranges; V<sub>out</sub> from 0.4V to 1.2V
- Output voltage accuracy: ±0.5%
- 7mΩ and 4.5mΩ internal power MOSFETs
- External compensation
- Switching frequency options of 1.5MHz, 2.25MHz, 2.5MHz, or 3MHz
- Forced PWM or power save mode operation
- 3.4MHz I<sup>2</sup>C-compatible interface with CRC
- Output voltage selection by I<sup>2</sup>C i/f or VSELx pins
- Optional stacked operation
- Differential remote sense
- Input and output overvoltage protection
- Thermal pre-warning and thermal shutdown
- Output discharge
- Optional spread spectrum clocking
- Power-good output with window comparator with adjustable thresholds
- Package with wettable flanks

## 2 Applications

- ADAS camera, [ADAS sensor fusion](#)
- [Surround view ECU](#)
- [Hybrid and reconfigurable cluster](#)
- [Head unit, Telematics control unit](#)

## 3 Description

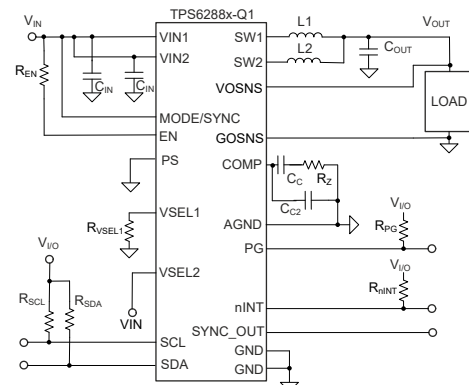
The TPS62880-Q1, TPS62881-Q1, TPS62882-Q1, and TPS62883-Q1 are a family of pin-to-pin 12A, 20A, 24A, and 30A synchronous, dual-phase, step-down DC/DC converters. The TPS6288x-Q1 implement an enhanced DCS-Control scheme that combines fast transient response with fixed frequency operation. Dual-phase operation reduces the input and output voltage ripple and also enables the use of smaller inductors per phase. At medium to heavy loads, the devices operate in Pulse Width Modulation (PWM) mode and automatically enter discontinuous conduction mode at light load to maintain high efficiency over the entire load

current range. The devices can also be forced into PWM mode operation for smallest output voltage ripple. The devices provide 0.5% DC output voltage accuracy across the recommended input voltage and temperature range. Differential remote sense allows for accurate voltage control directly at the load. The I<sup>2</sup>C compatible interface is operational as long as the supply voltage is above the UVLO threshold. The interface offers several control, monitoring, and warning features, such as voltage monitoring and temperature warnings. Dynamic voltage scaling allows the load power consumption to adapt to the performance needs of the application. The default start-up voltage is selectable by the VSELx pins. The switching frequency is factory programmed to 2.25MHz with options for 1.5MHz, 2.5MHz, or 3MHz. The TPS6288x-Q1 can be synchronized to an external clock. Stacking allows to operate up to five devices in parallel to support a total output current of up to 150A. The PS pin along with the SYNC\_OUT pin define a device as a primary or secondary device. The phase shift of the secondary devices is defined by the VSEL1 and VSEL2 pins to either 30°, 60°, 90°, or 120°. See the [Device Options](#) table for details.

### Device Information

PART NUMBER	CURRENT RATING <sup>(1)</sup>	BODY SIZE (NOM)
TPS62880-Q1	12A	4mm × 5mm
TPS62881-Q1	20A	
TPS62882-Q1	24A	
TPS62883-Q1	30A	

(1) See the [Device Options](#) table.



**Simplified Schematic**



## Table of Contents

<b>1 Features</b> .....	<b>1</b>	5.2 Support Resources.....	<b>5</b>
<b>2 Applications</b> .....	<b>1</b>	5.3 Trademarks.....	<b>5</b>
<b>3 Description</b> .....	<b>1</b>	5.4 Electrostatic Discharge Caution.....	<b>5</b>
<b>4 Device Options</b> .....	<b>3</b>	5.5 Glossary.....	<b>5</b>
<b>5 Device and Documentation Support</b> .....	<b>5</b>	<b>6 Revision History</b> .....	<b>5</b>
5.1 Receiving Notification of Documentation Updates.....	<b>5</b>	<b>7 Mechanical, Packaging, and Orderable Information</b> ....	<b>6</b>

## 4 Device Options

DEVICE NUMBER	OUTPUT CURRENT	START-UP VOLTAGE and I <sup>2</sup> C DEVICE ADDRESS FOR PRIMARY DEVICE	I <sup>2</sup> C DEVICE ADDRESS / PHASE SHIFT FOR SECONDARY DEVICE(S)	SOFT-START TIME / DEFAULT SWITCHING FREQUENCY AND OTHER CONFIGURATION SETTINGS
TPS62880QFWRADRQ1	12A	Vo1 = 0.850V; I2C1 = 0x38 Vo2 = 0.750V; I2C2 = 0x39 Vo3 = 0.875V; I2C3 = 0x3A Vo4 = 0.800V; I2C4 = 0x3B	I2C1 = 0x3C / 30° I2C2 = 0x3D / 60° I2C3 = 0x3E / 90° I2C4 = 0x3F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±5% REG_CRC_EN = 1
TPS6288001QFWRADRQ1 <sup>(1)</sup>	12A	Vo1 = 0.750V; I2C1 = 0x18 Vo2 = 0.800V; I2C2 = 0x19 Vo3 = 1.050V; I2C3 = 0x1A Vo4 = 0.800V; I2C4 = 0x1B	I2C1 = 0x1C / 30° I2C2 = 0x1D / 60° I2C3 = 0x1E / 90° I2C4 = 0x1F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±5% REG_CRC_EN = 1
TPS62881QFWRADRQ1	20A	Vo1 = 0.850V; I2C1 = 0x38 Vo2 = 0.750V; I2C2 = 0x39 Vo3 = 0.875V; I2C3 = 0x3A Vo4 = 0.800V; I2C4 = 0x3B	I2C1 = 0x3C / 30° I2C2 = 0x3D / 60° I2C3 = 0x3E / 90° I2C4 = 0x3F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±5% REG_CRC_EN = 1
TPS6288101QFWRADRQ1 <sup>(1)</sup>	20A	Vo1 = 0.750V; I2C1 = 0x18 Vo2 = 0.800V; I2C2 = 0x19 Vo3 = 1.050V; I2C3 = 0x1A Vo4 = 0.800V; I2C4 = 0x1B	I2C1 = 0x1C / 30° I2C2 = 0x1D / 60° I2C3 = 0x1E / 90° I2C4 = 0x1F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±5% REG_CRC_EN = 1
TPS62882QFWRADRQ1	24A	Vo1 = 0.850V; I2C1 = 0x38 Vo2 = 0.750V; I2C2 = 0x39 Vo3 = 0.875V; I2C3 = 0x3A Vo4 = 0.800V; I2C4 = 0x3B	I2C1 = 0x3C / 30° I2C2 = 0x3D / 60° I2C3 = 0x3E / 90° I2C4 = 0x3F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±5% REG_CRC_EN = 1
TPS6288280QFWRADRQ1	24A	Vo1 = 0.850V; I2C1 = 0x38 Vo2 = 0.750V; I2C2 = 0x39 Vo3 = 0.875V; I2C3 = 0x3A Vo4 = 0.800V; I2C4 = 0x3B	I2C1 = 0x3C / 30° I2C2 = 0x3D / 60° I2C3 = 0x3E / 90° I2C4 = 0x3F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±8% REG_CRC_EN = 1
TPS62883QFWRADRQ1	30A	Vo1 = 0.850V; I2C1 = 0x38 Vo2 = 0.750V; I2C2 = 0x39 Vo3 = 0.875V; I2C3 = 0x3A Vo4 = 0.800V; I2C4 = 0x3B	I2C1 = 0x3C / 30° I2C2 = 0x3D / 60° I2C3 = 0x3E / 90° I2C4 = 0x3F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±5% REG_CRC_EN = 1
TPS6288301QFWRADRQ1 <sup>(1)</sup>	30A	Vo1 = 0.750V; I2C1 = 0x18 Vo2 = 0.800V; I2C2 = 0x19 Vo3 = 1.050V; I2C3 = 0x1A Vo4 = 0.800V; I2C4 = 0x1B	I2C1 = 0x1C / 30° I2C2 = 0x1D / 60° I2C3 = 0x1E / 90° I2C4 = 0x1F / 120°	td(Ramp) = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±5% REG_CRC_EN = 1

DEVICE NUMBER	OUTPUT CURRENT	START-UP VOLTAGE and I <sup>2</sup> C DEVICE ADDRESS FOR PRIMARY DEVICE	I <sup>2</sup> C DEVICE ADDRESS / PHASE SHIFT FOR SECONDARY DEVICE(S)	SOFT-START TIME / DEFAULT SWITCHING FREQUENCY AND OTHER CONFIGURATION SETTINGS
TPS6288380QFWRADRQ1	30A	Vo1 = 0.850V; I2C1 = 0x38 Vo2 = 0.750V; I2C2 = 0x39 Vo3 = 0.875V; I2C3 = 0x3A Vo4 = 0.800V; I2C4 = 0x3B	I2C1 = 0x3C / 30° I2C2 = 0x3D / 60° I2C3 = 0x3E / 90° I2C4 = 0x3F / 120°	td <sub>(Ramp)</sub> = 1ms f <sub>SW</sub> = 2.25MHz SOFT_STOP_EN = 1 DROOPEN = 0 DROOPRESISTANCE = 00b PGTH = ±8% REG_CRC_EN = 1

(1) Preview information (not Production Data)

## 5 Device and Documentation Support

### 5.1 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 *Notifications* 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.

### 5.2 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](#).

### 5.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 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 Glossary

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

## 6 Revision History

<b>Changes from Revision A (December 2025) to Revision B (January 2026)</b>	<b>Page</b>
<ul style="list-style-type: none"> <li>Deleted preview label for TPS62880QFWRADRQ1, TPS62881QFWRADRQ1, TPS62882QFWRADRQ1, TPS6288280QFWRADRQ1 and TPS6288380QFWRADRQ1 in the <i>Device Options</i> table.....</li> </ul>	<b>3</b>
<hr/>	
<b>Changes from Revision * (October 2024) to Revision A (December 2025)</b>	<b>Page</b>
<ul style="list-style-type: none"> <li>Changed document status from Advance Information to Production Data.....</li> <li>Added new device spins to Device Options table.....</li> </ul>	<b>1</b> <b>3</b>

## 7 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.

## 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)
<a href="#">TPS62883QFWRADRQ1</a>	Active	Production	VQFN-HR (RAD)   25	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	TPS6288 3-Q1
XTPS62883QFWRADRQ1.A	Active	Preproduction	VQFN-HR (RAD)   25	3000   LARGE T&R	-	Call TI	Call TI	-40 to 125	

(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.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## TAPE AND REEL INFORMATION

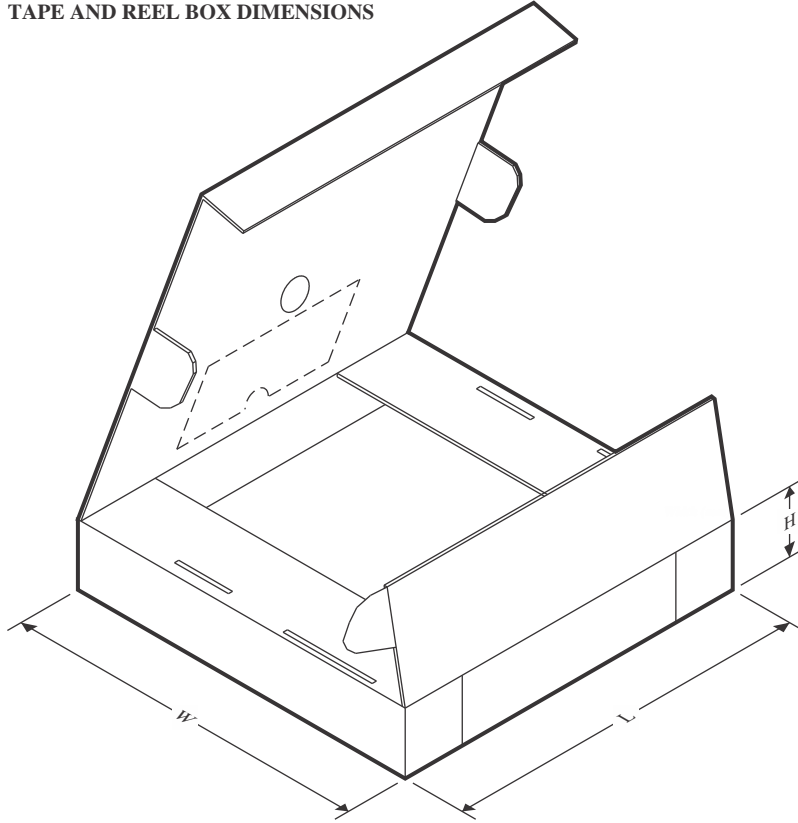


\*All dimensions are nominal

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
TPS62883QFWRADRQ1	VQFN-HR	RAD	25	3000	330.0	12.4	4.3	5.3	1.3	8.0	12.0	Q1

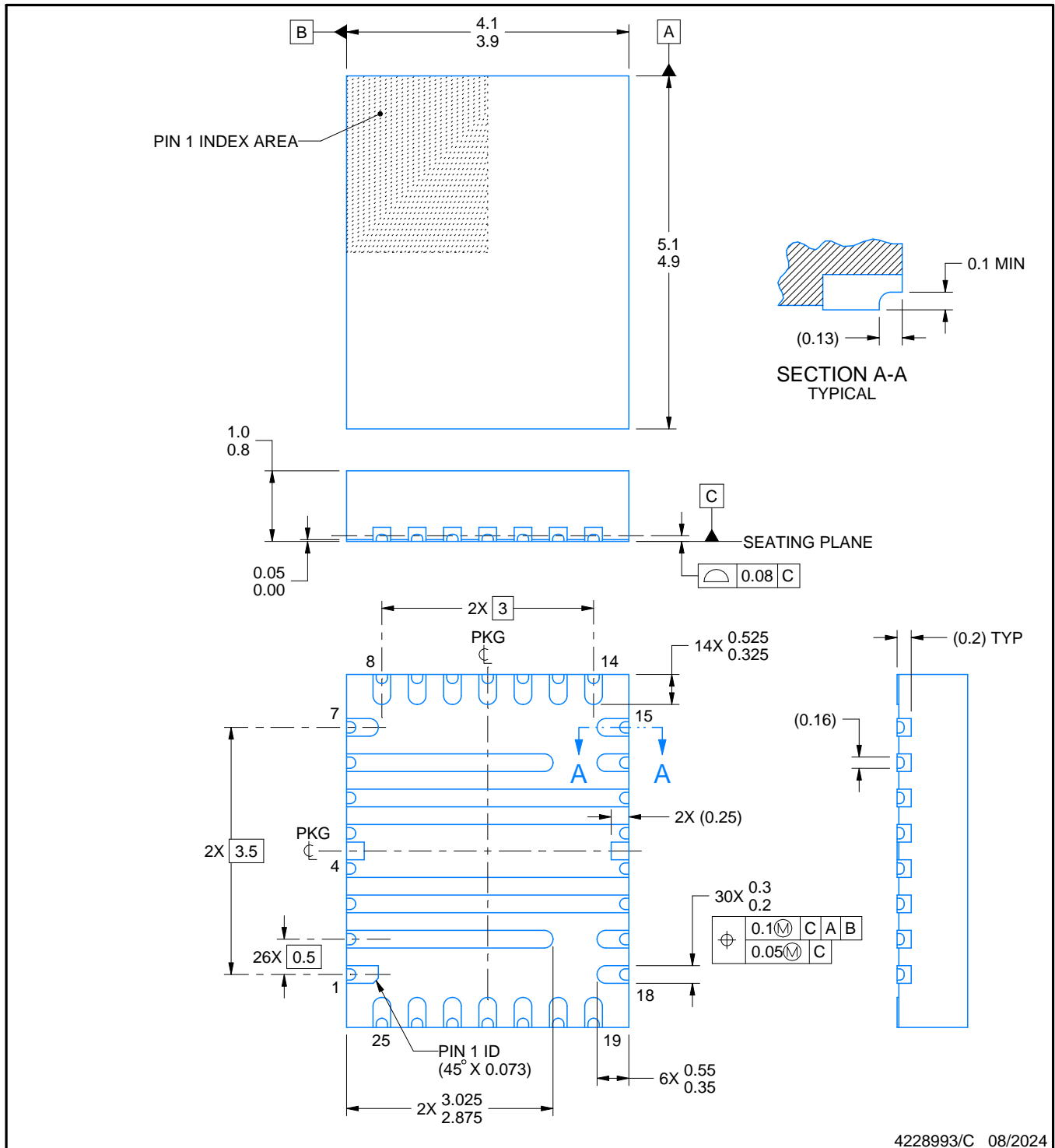


## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS62883QFWRADRQ1	VQFN-HR	RAD	25	3000	367.0	367.0	35.0



4228993/C 08/2024

**NOTES:**

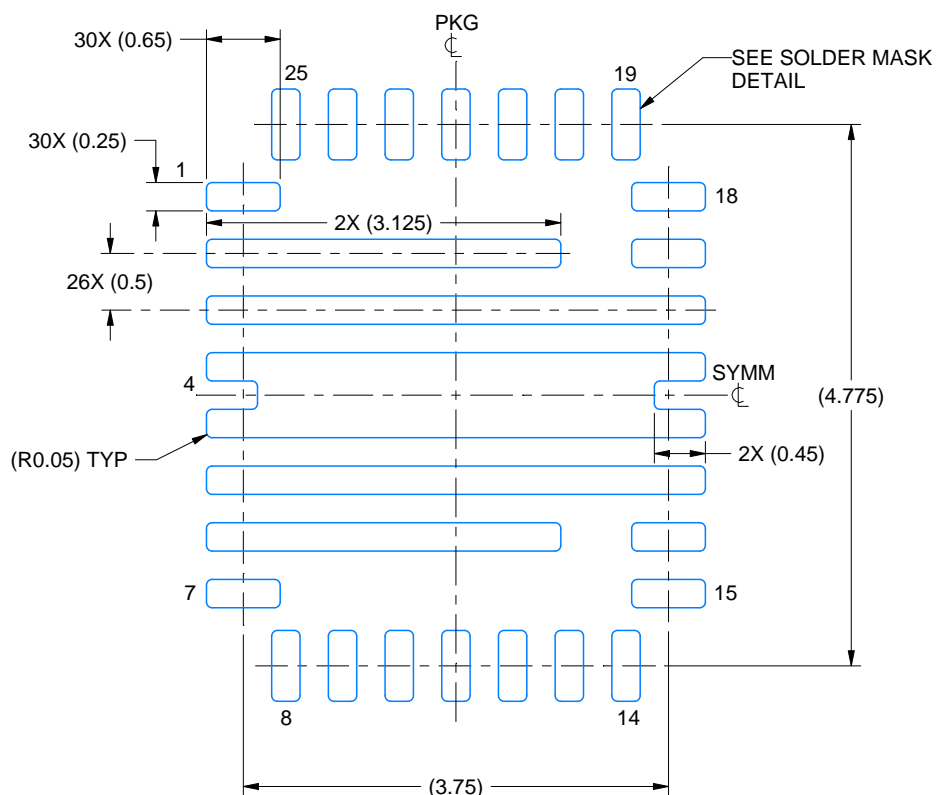
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

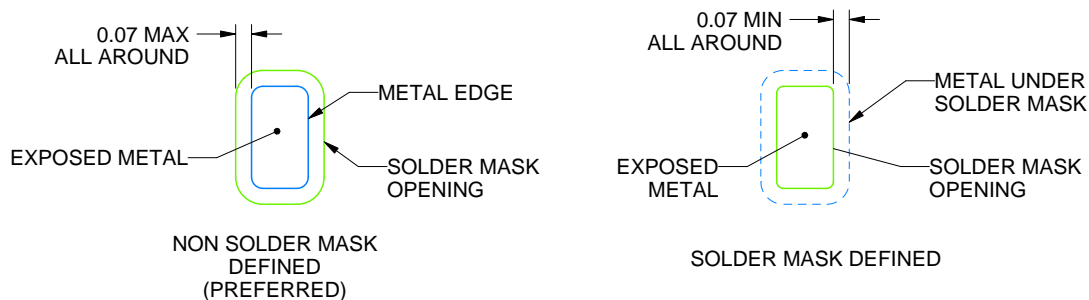
RAD0025A

VQFN-HR - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 15X



SOLDER MASK DETAILS

4228993/C 08/2024

NOTES: (continued)

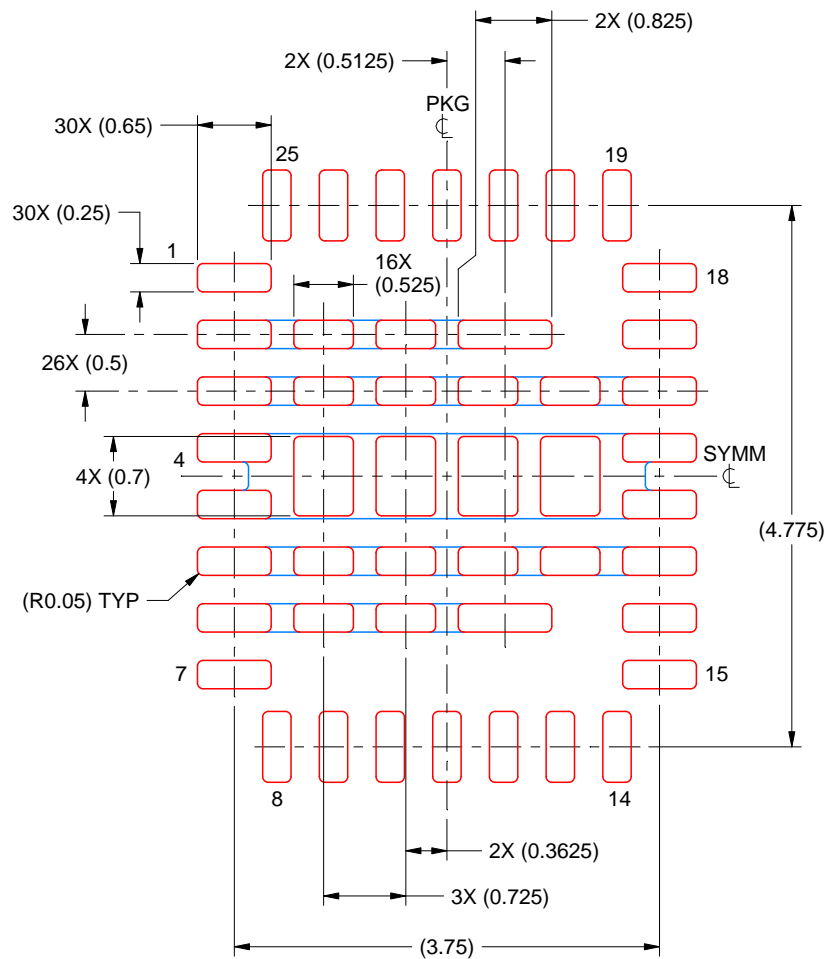
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

RAD0025A

VQFN-HR - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



**SOLDER PASTE EXAMPLE**  
BASED ON 0.125 MM THICK STENCIL  
SCALE: 15X

PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE  
PADS 2 & 6: 80%  
PADS 3 & 5: 77%  
PAD 4: 69%

4228993/C 08/2024

NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on [ti.com](#) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025