

Integrated Step-Down Converter with SVID Interface for Intel® CPU Power Supply

1 Features

- Single chip to support Intel VR13.HC SVID POL applications
- Two outputs to support VCCANA (5.5 A) and P1V8 (4 A)
- D-CAP+™ Control for Fast Transient Response
- Wide Input Voltage (4.5 V to 15 V)
- Differential Remote Sense
- Programmable Internal Loop Compensation
- Per-Phase Cycle-by-Cycle Current Limit
- Programmable Frequency from 800 kHz to 2 MHz
- I²C System Interface for Telemetry of Voltage, Current, Output Power, Temperature, and Fault Conditions
- Over-Current, Over-Voltage, Over-Temperature protections
- Low Quiescent Current
- 5 mm × 5 mm, 35-Pin QFN, PowerPAD Package

2 Applications

- Low Current SVID Rails for Intel Server Platforms

3 Description

The TPS53820 device is D-CAP+ mode integrated step-down converter for low current SVID rails of Intel CPU power supply. It provides up to two outputs to power the low current SVID rails such as VCCANA (5.5 A) and P1V8 (4 A). The device employs D-CAP+ mode control to provide fast load transient performance. Internal compensation allows ease of use and reduces external components.

The device also provides telemetry, including input voltage, output voltage, output current and temperature reporting. Over voltage, over current and over temperature protections are provided as well.

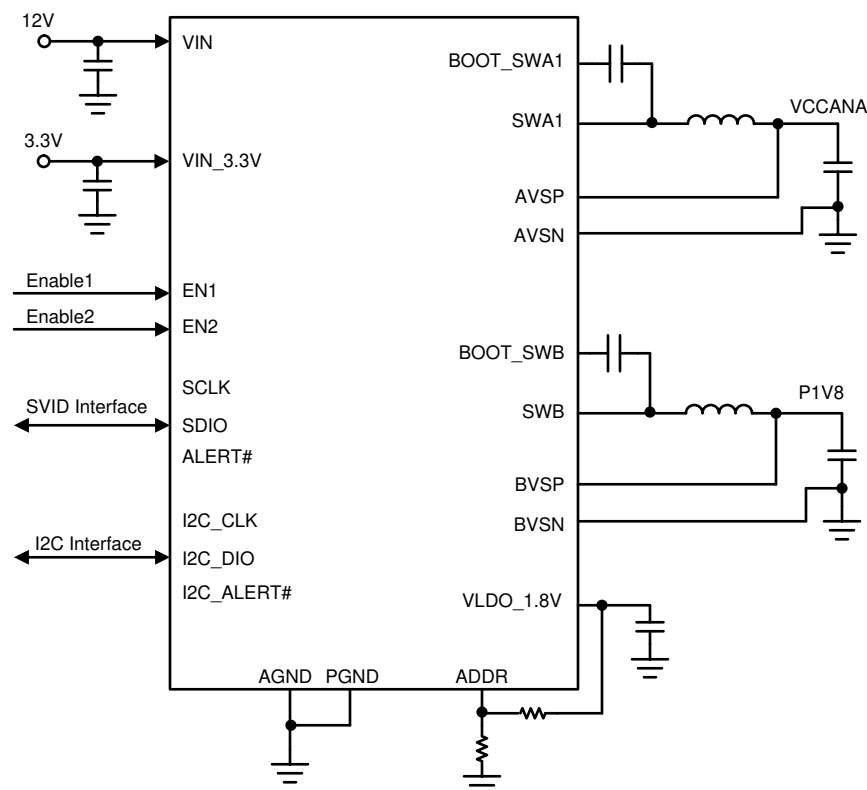
The TPS53820 device is packaged in a thermally enhanced 35-pin QFN and operates between –40°C and 125°C.

Table 1. Device Information⁽¹⁾

| PART NUMBER | PACKAGE | BODY SIZE (NOM) |
|-------------|----------|-----------------|
| TPS53820 | RWZ (35) | 5 mm × 5 mm |

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

Figure 1. Simplified Application



4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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

5 Device and Documentation Support

5.1 Trademarks

D-CAP+ is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

5.2 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.

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

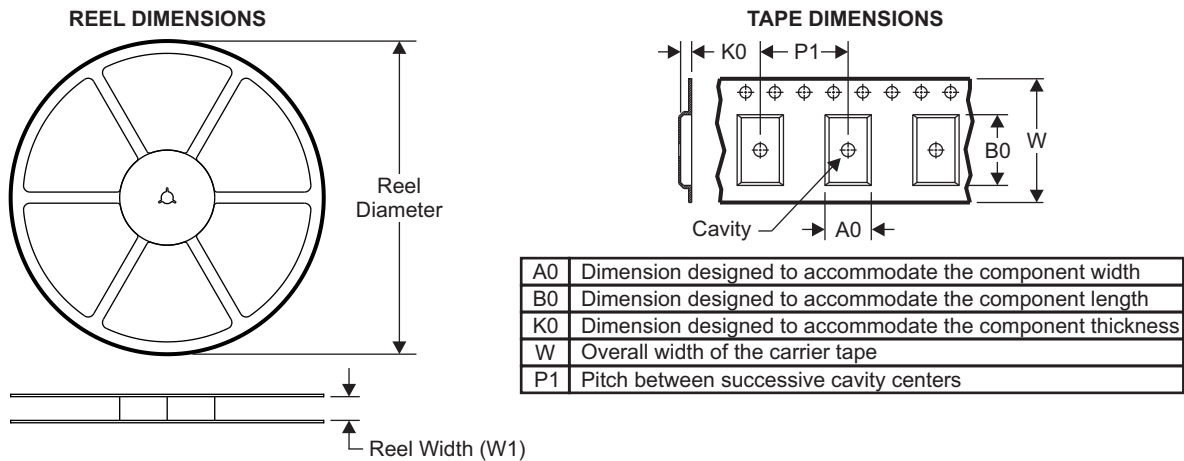
| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish ⁽³⁾ | MSL Peak Temp ⁽⁴⁾ | Op Temp (°C) | Device Marking ⁽⁵⁾⁽⁶⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|---------------------------------|------------------------------|--------------|----------------------------------|
| TPS53820RWZR | ACTIVE | VQFN-HR | RWZ | 35 | 3000 | Green (RoHS & no Sb/Br) | NiPdAu | Level-2-260C-1 YEAR | –40 to 125 | TPS53820 |
| TPS53820RWZT | ACTIVE | VQFN-HR | RWZ | 35 | 250 | Green (RoHS & no Sb/Br) | NiPdAu | Level-2-260C-1 YEAR | –40 to 125 | TPS53820 |

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

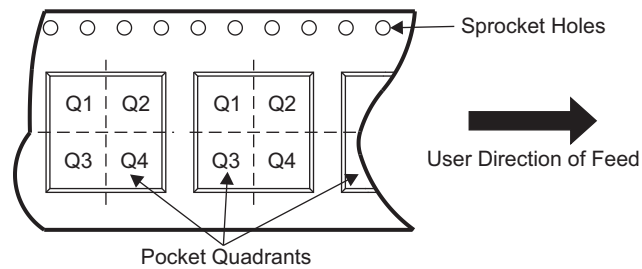
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. 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.

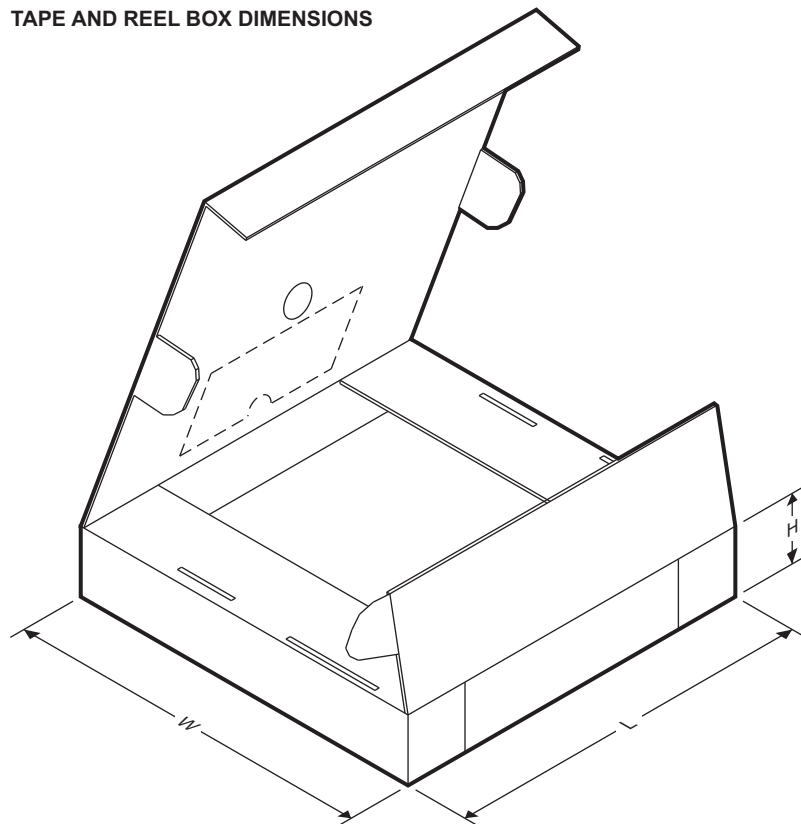
6.1.2 Tape and Reel Information



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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TPS53820RWZR | VQFN-HR | RWZ | 35 | 3000 | 330.0 | 12.4 | 5.3 | 5.3 | 1.1 | 8.0 | 12.0 | Q2 |
| TPS53820RWZT | VQFN-HR | RWZ | 35 | 250 | 180.0 | 12.4 | 5.3 | 5.3 | 1.1 | 8.0 | 12.0 | Q2 |

TAPE AND REEL BOX DIMENSIONS


| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TPS53820RWZR | VQFN-HR | RWZ | 35 | 3000 | 367.0 | 367.0 | 35.0 |
| TPS53820RWZT | VQFN-HR | RWZ | 35 | 250 | 210.0 | 185.0 | 35.0 |

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) |
|------------------------------|---------------|----------------------|--------------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| TPS53820RWZR | Active | Production | VQFN-HR (RWZ) 35 | 3000 LARGE T&R | Yes | SN | Level-2-260C-1 YEAR | -40 to 125 | TPS 53820 |
| TPS53820RWZR.A | Active | Production | VQFN-HR (RWZ) 35 | 3000 LARGE T&R | Yes | SN | Level-2-260C-1 YEAR | -40 to 125 | TPS 53820 |
| TPS53820RWZT | Active | Production | VQFN-HR (RWZ) 35 | 250 SMALL T&R | Yes | SN | Level-2-260C-1 YEAR | -40 to 125 | TPS 53820 |
| TPS53820RWZT.A | Active | Production | VQFN-HR (RWZ) 35 | 250 SMALL T&R | Yes | SN | Level-2-260C-1 YEAR | -40 to 125 | TPS 53820 |

⁽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.

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](https://www.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 © 2025, Texas Instruments Incorporated

Last updated 10/2025