TPS53830 Integrated Step-Down Digital Converter for DDR5 On-DIMM Power Supply

1 Features

- Single silicon design to support DDR5 applications
- 3 Outputs to supply VDD (1.1V), VDDQ (1.1V) and VPP (1.8V), with optional 4th Output (VDD2)
- For 3 outputs, 12 A for VDD(SWA dual phase), 6 A for VDDQ(SWC) and 5 A for VPP(SWD) with 3 outputs
- For 4 outputs, 6 A for VDD1(SWA), 6 A for VDD2(SWB), 6 A for VDDQ(SWC), and 5 A for VPP(SWD)
- Differential remote sense: VDD, VDDQ, and VPP
- D-CAP+™ control for fast transient response
- Wide input voltage: 4.5 V to 15 V
- Programmable internal loop compensation
- Per-phase cycle-by-cycle current limit
- Programmable frequency: 500 kHz to 1.375 MHz
- Support I^2C and I3C Bus interface for telemetry of voltage, current, power, temperature, and fault conditions
- Overcurrent, overvoltage, over-temperature protections
- Persistent register (black box) feature
- Low quiescent current
- 5 mm × 5 mm, 35-Pin, QFN PowerPad™ package

2 Applications

- DDR5 On-DIMM Power Supply for Server

3 Description

The TPS53830 is D-CAP+™ mode integrated step-down converter for DDR5 on-DIMM power supply. It provides VDD, VDDQ and VPP voltages to the DRAM chips on the DIMM module with configurable current capability. The high-current rail can be configured to 2-phase or 2 outputs to supply up to 12 A (or 6A + 6 A) current with D-CAP+™ mode control. The converter also employs internal compensation for ease of use and reduce external components.

The converter provides a full set of telemetry, including input voltage, output voltage, and output current. overvoltage, undervoltage, overcurrent limit, and over-temperature protections are provided as well.

The TPS53830 is packaged in a thermally-enhanced 35-pin QFN and operates from -40°C to +125°C.

Device Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
TPS53830	RWZ	5.00 mm x 5.00 mm

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

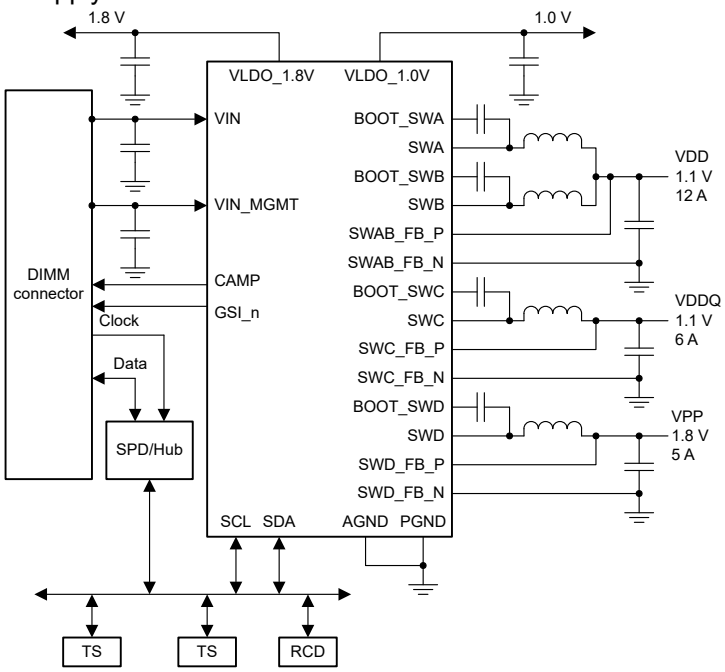


Figure 3-1. Simplified Application

4 Revision History

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

DATE	REVISION	NOTES
September 2021	*	Initial release.

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. 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.

5.2 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

D-CAP+™, PowerPad™, TI E2E™ are trademarks 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 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)
TPS53830RWZR	Active	Production	VQFN-HR (RWZ) | 35	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 53830
TPS53830RWZR.A	Active	Production	VQFN-HR (RWZ) | 35	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 53830
TPS53830RWZT	Active	Production	VQFN-HR (RWZ) | 35	250 | SMALL T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 53830
TPS53830RWZT.A	Active	Production	VQFN-HR (RWZ) | 35	250 | SMALL T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 53830

(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.

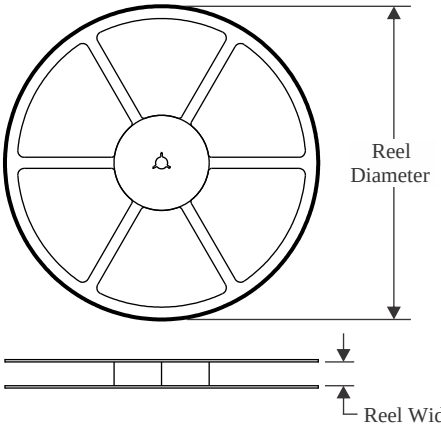
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will 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.

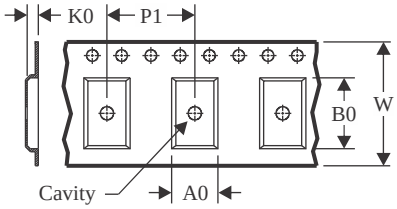
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

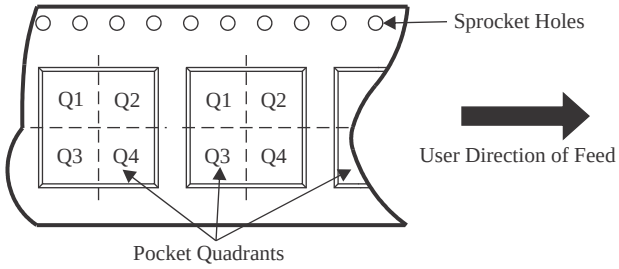


TAPE DIMENSIONS



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

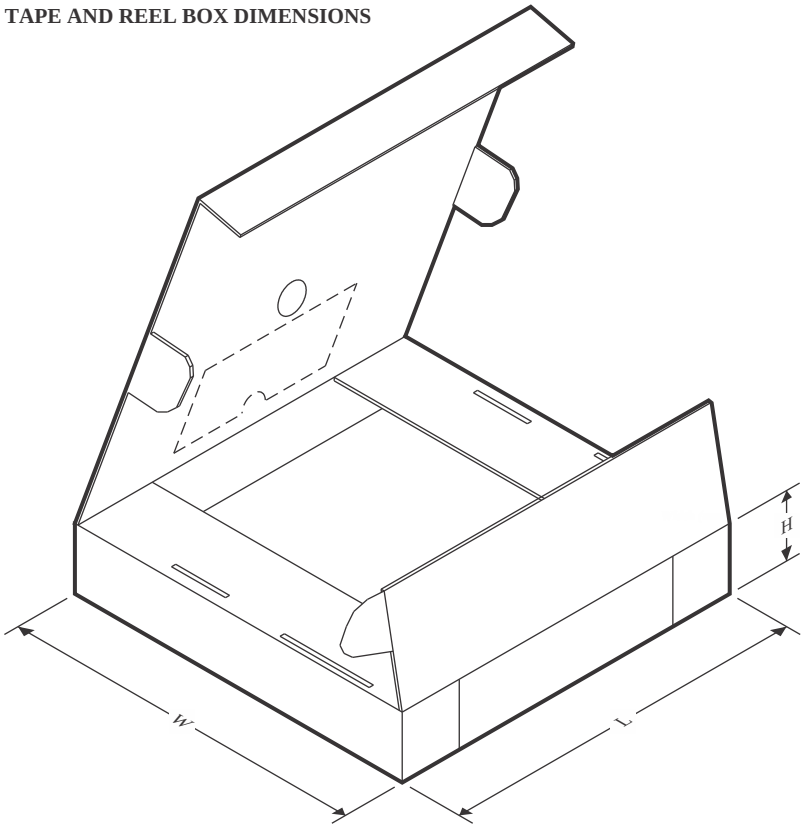
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TPS53830RWZR	VQFN-HR	RWZ	35	3000	330.0	12.4	5.3	5.3	1.1	8.0	12.0	Q1
TPS53830RWZT	VQFN-HR	RWZ	35	250	180.0	12.4	5.3	5.3	1.1	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)
TPS53830RWZR	VQFN-HR	RWZ	35	3000	360.0	360.0	36.0
TPS53830RWZT	VQFN-HR	RWZ	35	250	210.0	185.0	35.0

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.

Last updated 10/2025