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.

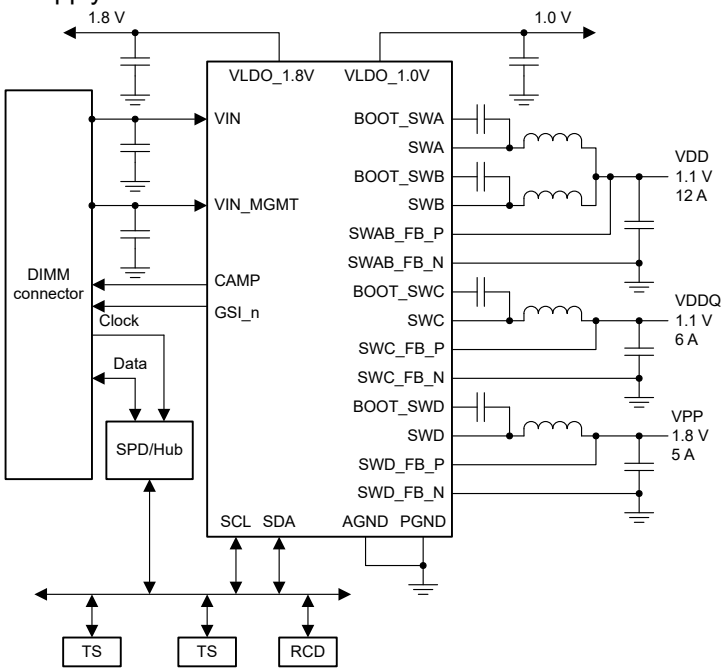


Figure 3-1. Simplified Application

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

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.

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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.

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5.3 Trademarks

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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.

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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.

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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
TPS53830RWZR	ACTIVE	VQFN-HR	RWZ	35	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 53830	Samples
TPS53830RWZT	ACTIVE	VQFN-HR	RWZ	35	250	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 105	TPS 53830	Samples

(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.

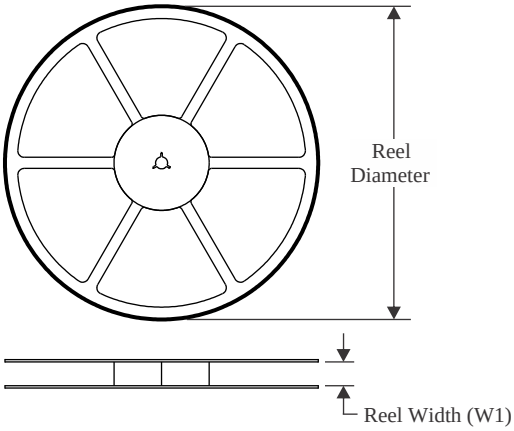
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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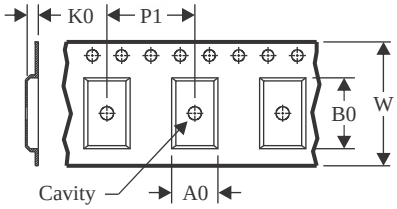
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TAPE AND REEL INFORMATION

REEL DIMENSIONS

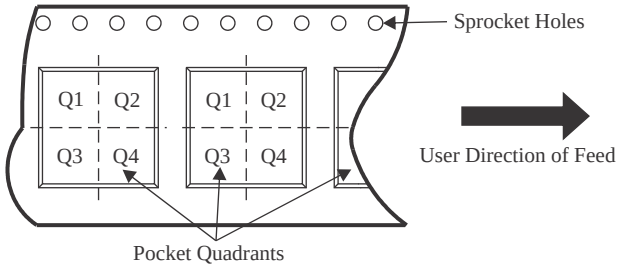


TAPE DIMENSIONS



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

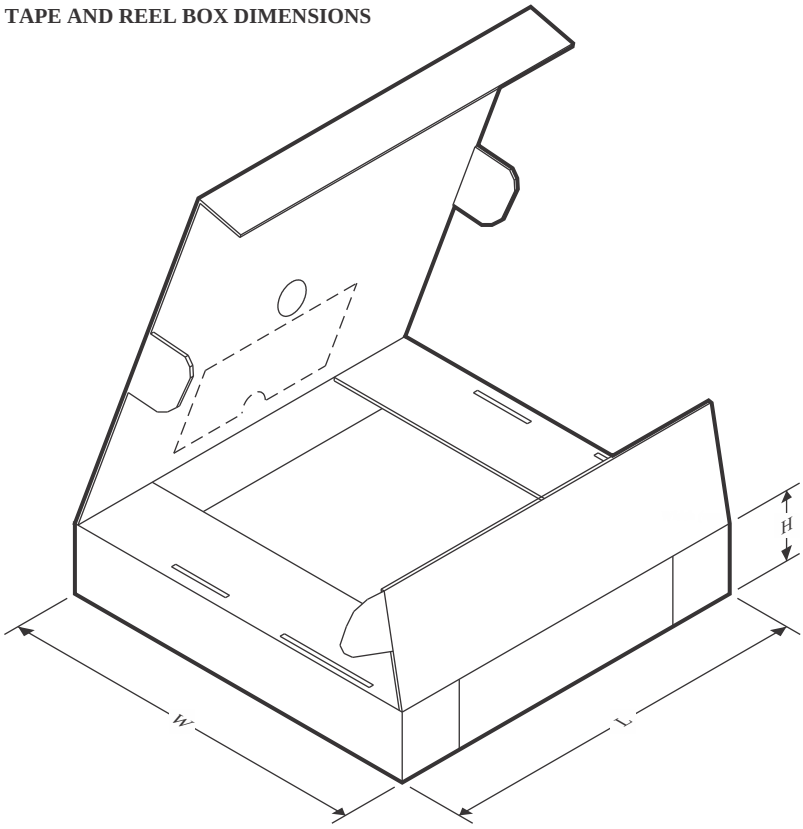
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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	367.0	367.0	35.0
TPS53830RWZT	VQFN-HR	RWZ	35	250	210.0	185.0	35.0

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