

100 W USB Type-C power delivery reference design based on VIPERGAN100



Features

- Input voltage range: Universal AC from 90 to 264 VAC with 47 Hz to 63 Hz frequency
- Maximum output power: 100 W
- Output voltage: Single Type-C output 5 VDC±20 VDC
- Five fixed PDOs: 5 V@3 A, 9 V@3 A, 12 V@3 A, 15 V@3 A, 20 V@5 A
- Peak efficiency > 92.6%
- Power density (unboxed): > 24 W/in³
- Support for USB Power Delivery protocol

Application

- AC-DC smart chargers for smartphones, tablets, laptops, and other handheld equipment



Description

The **EVLVIPGAN100PD** is a 100 W USB Type-C® power delivery 3.0 adapter reference design. It is an isolated power supply with a standalone USB PD controller. The evaluation board implements, at the primary side, a quasi-resonant flyback converter based on STMicroelectronics' VIPerGaN® high-voltage converter VIPERGAN100 with optocoupler feedback for voltage regulation. This controller combines a high performance low-voltage PWM controller chip with a 650 V startup cell in the same package. The advanced power management with the low quiescent helps to achieve low standby consumptions.

To reduce the input mains current distortion, thus providing IDE range mains operation with an extremely low THD, a PFC based on the L6564 is used.

At the secondary side, to increase the system efficiency, the rectification is based on the SRK1001 adaptive synchronous rectification controller.

Always on the secondary side the CC/CV regulation loop to drive the power regulation stage and the USB Type-C® PD interface is based on the STUSB4761 controller. This controller offers the benefits of a full hardware USB PD stack allowing robust, deterministic, and safe negotiation in line with USB PD standards.

The evaluation board implements a robust adapter protected for output overvoltage, output undervoltage, output overpower, and output short-circuit. This reference design helps designers to develop adapters with a short bill of materials in order to obtain a cost-effective and fast design.

Product summary	
100W USB Power delivery reference design	EVLVIPGAN100PD
High-voltage GaN converter	VIPERGAN100
Type-C and USB PD controller, programmable VBUS voltage and current protections, high-side current sensing, integrated CC/CV regulation	STUSB4761
Secondary side synchronous rectification controller optimized for flyback converter, operating frequency up to 300 kHz	SRK1001
Current mode PFC controller operating in transition mode	L6564

1 Schematics

Figure 1. Input stage schematic

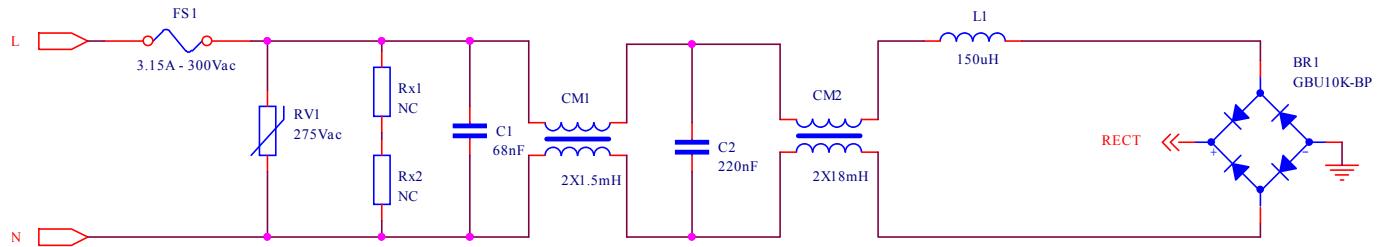


Figure 2. PFC stage schematic

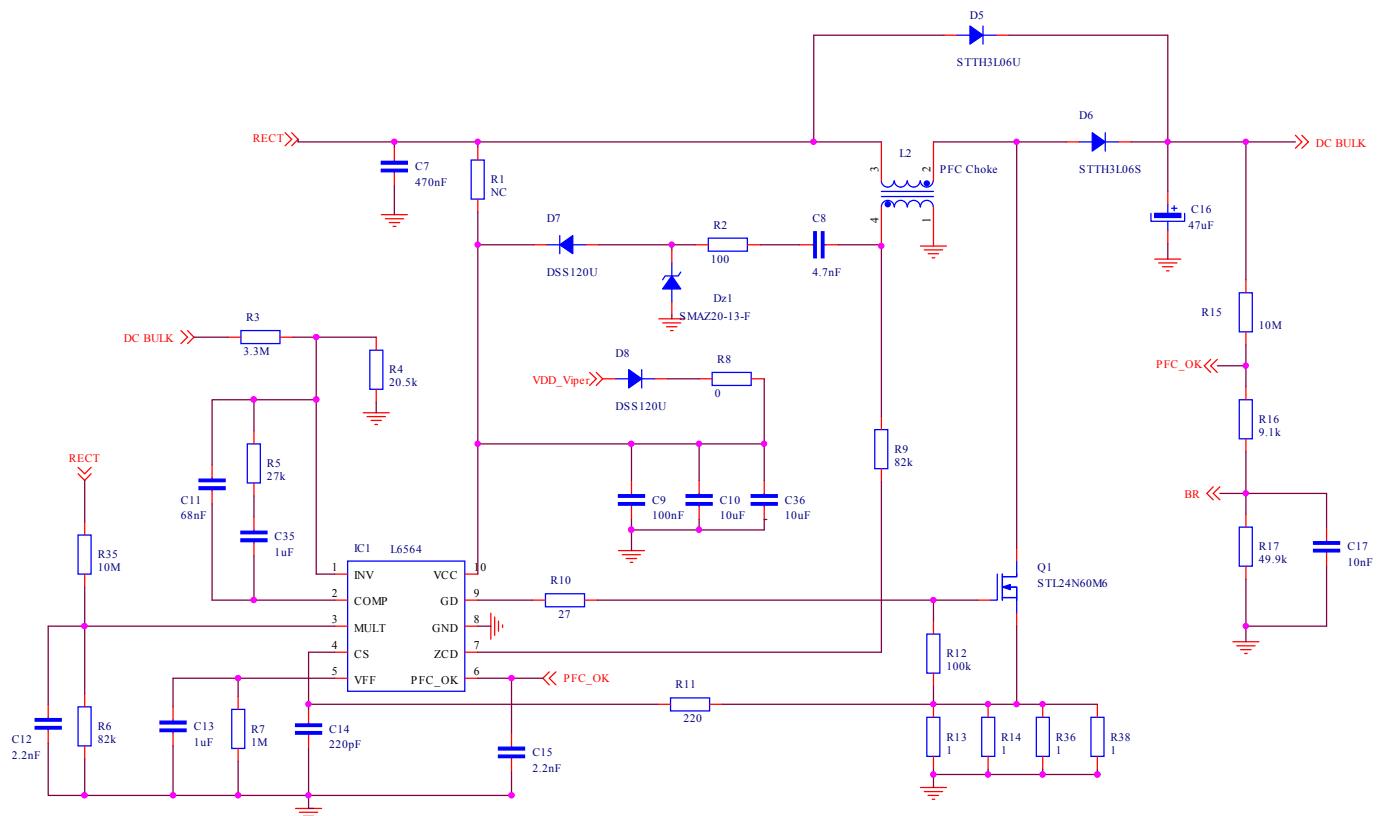
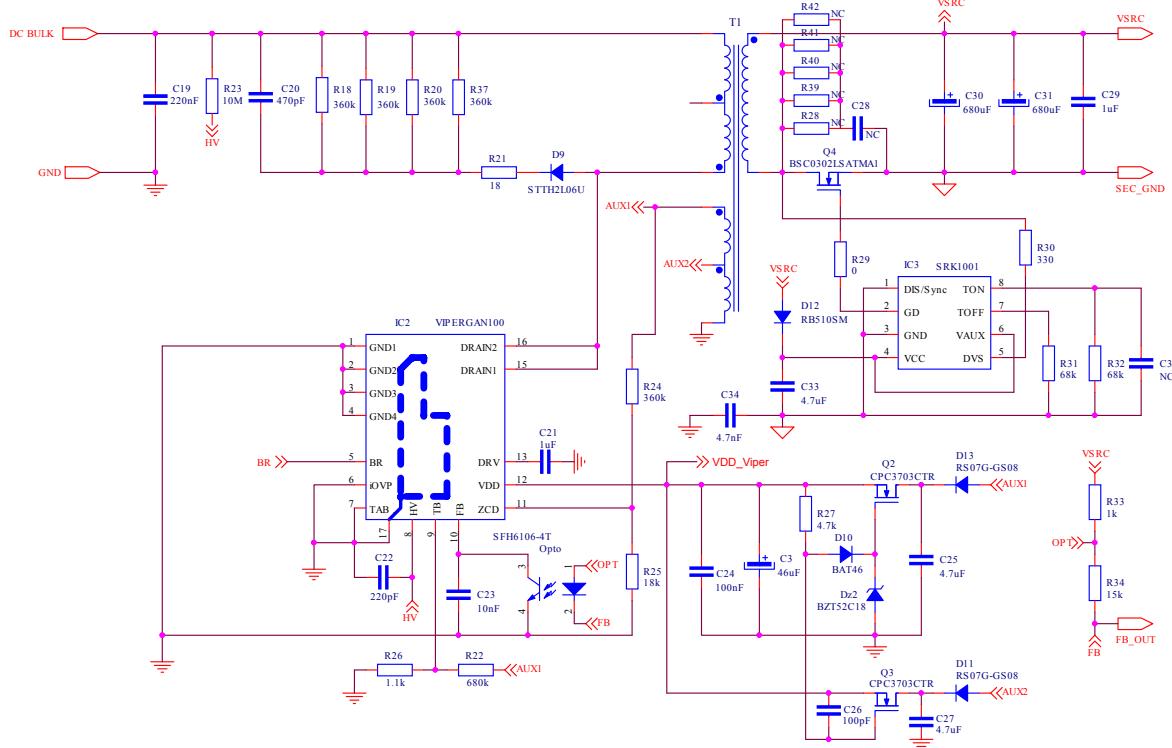
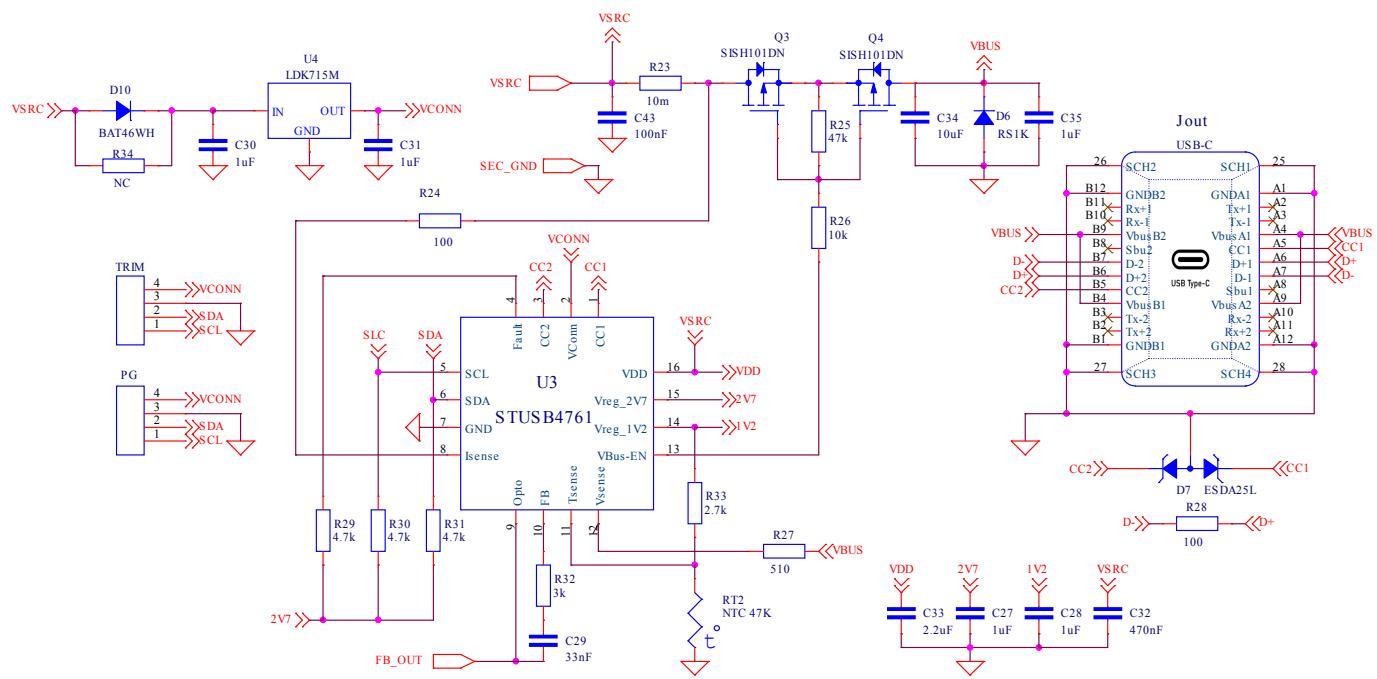


Figure 3. Flyback stage schematic

Figure 4. Daughterboard schematic


2 Efficiency

Figure 5. Efficiency at 115 Vac

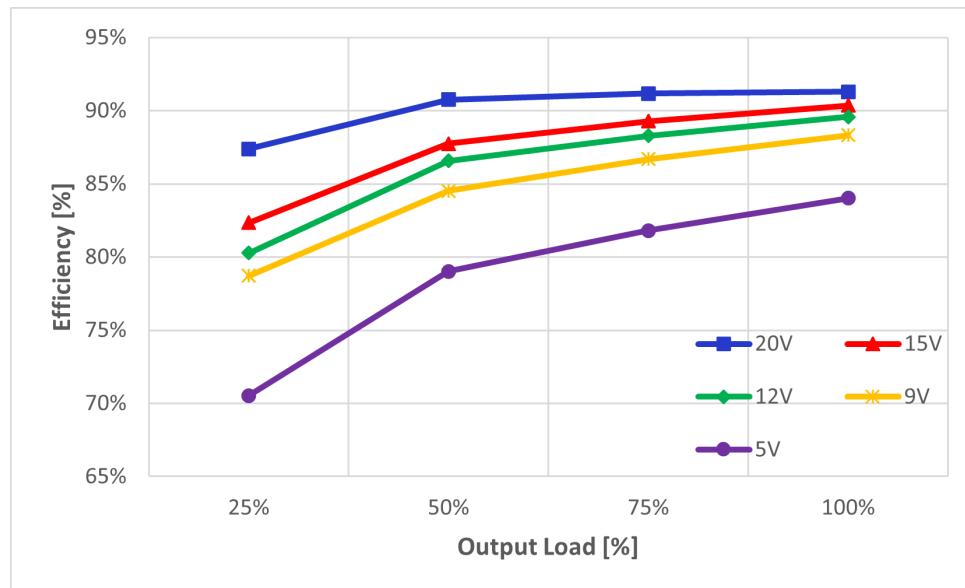
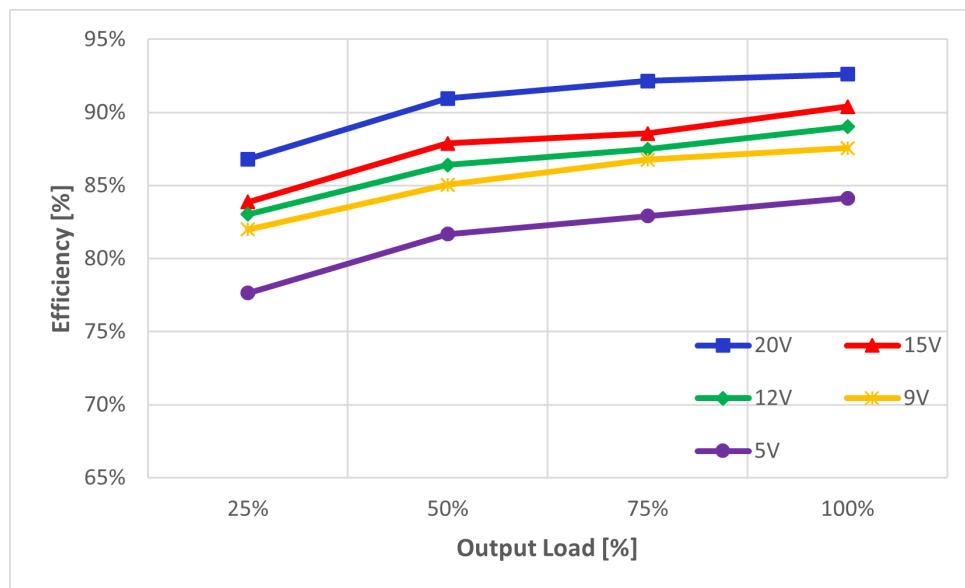


Figure 6. Efficiency at 230 Vac



Revision history

Table 1. Document revision history

Date	Version	Changes
30-May-2023	1	Initial release.
03-Aug-2023	2	Updated Figure 3. Flyback stage schematic ; updated ; some typo removed in Description .

Contents

1	Schematics	2
2	Efficiency	4
	Revision history	5
	List of tables	7
	List of figures	8

List of tables

Table 1. Document revision history	5
--	---

List of figures

Figure 1.	Input stage schematic	2
Figure 2.	PFC stage schematic	2
Figure 3.	Flyback stage schematic	3
Figure 4.	Daughterboard schematic	3
Figure 5.	Efficiency at 115 Vac	4
Figure 6.	Efficiency at 230 Vac	4

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2023 STMicroelectronics – All rights reserved