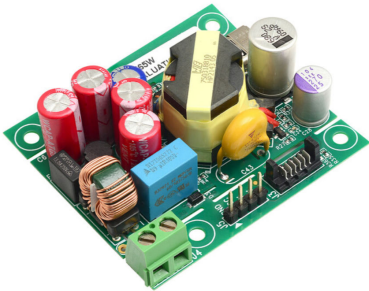


65W USB-PD certified reference design based on ST-ONE



Product status link

[EVLONE65W](#)

Features

- Universal input mains range: 90 Vac to 265 Vac - Frequency 47 ÷ 63 Hz
- Maximum output power: 65 W
- Dimensions: 58x32x20 mm, (L x W x H)
- Power density: 30 W/in³
- Efficiency: > 93 % @ full load
- Constant current output: 3.75 A max
- Output voltage range: 3.3 ÷ 21 Vdc
- PD output:
 - Five fixed PDOs: 5 V@3.75 A, 9 V@3.75 A, 12 V@3.75 A, 15 V@3.75 A, 20 V@3.25 A
 - Two APDOs (PPS): 3.3 V÷16 V@3.75 A, 3.3 V÷21 V@3.25 A
- PPS mode: 20 mV step for CV, 50 mA step for CC
- Certified USB power delivery 3.1.1.2 power brick
- Feedback loops: constant current and constant voltage
- Protections: brown out, over current protection, over temperature protection, over voltage protection, under voltage protection

Description

The **EVLONE65W** is a high power density USB-PD board supporting Programmable Power Supply (PPS). The design supports wide range input voltage and can deliver five fixed PDOs and two APDOs.

This board is based on ST-ONE, the world's first digital controller embedding an Arm® Cortex® M0+ core, an offline programmable controller with synchronous rectification, and USB-PD PHY in a single package.

Such a system is specifically designed to control ZVS non-complementary active clamp flyback converters to create high power density chargers and adapters with USB-PD interface. The device includes an active clamp flyback controller and its HV startup on the primary side, a microcontroller and all the peripherals required to control the conversion and the USB-PD communication on the secondary side. The two sides are connected through an embedded galvanically isolated dual communication channel.

High switching frequency operations in companion with a MasterGaN4 power stage allows use of small size magnetic components while reaching a very high efficiency.

1 Schematic diagram and bill of material

Figure 1. EVLONE65W schematic diagram

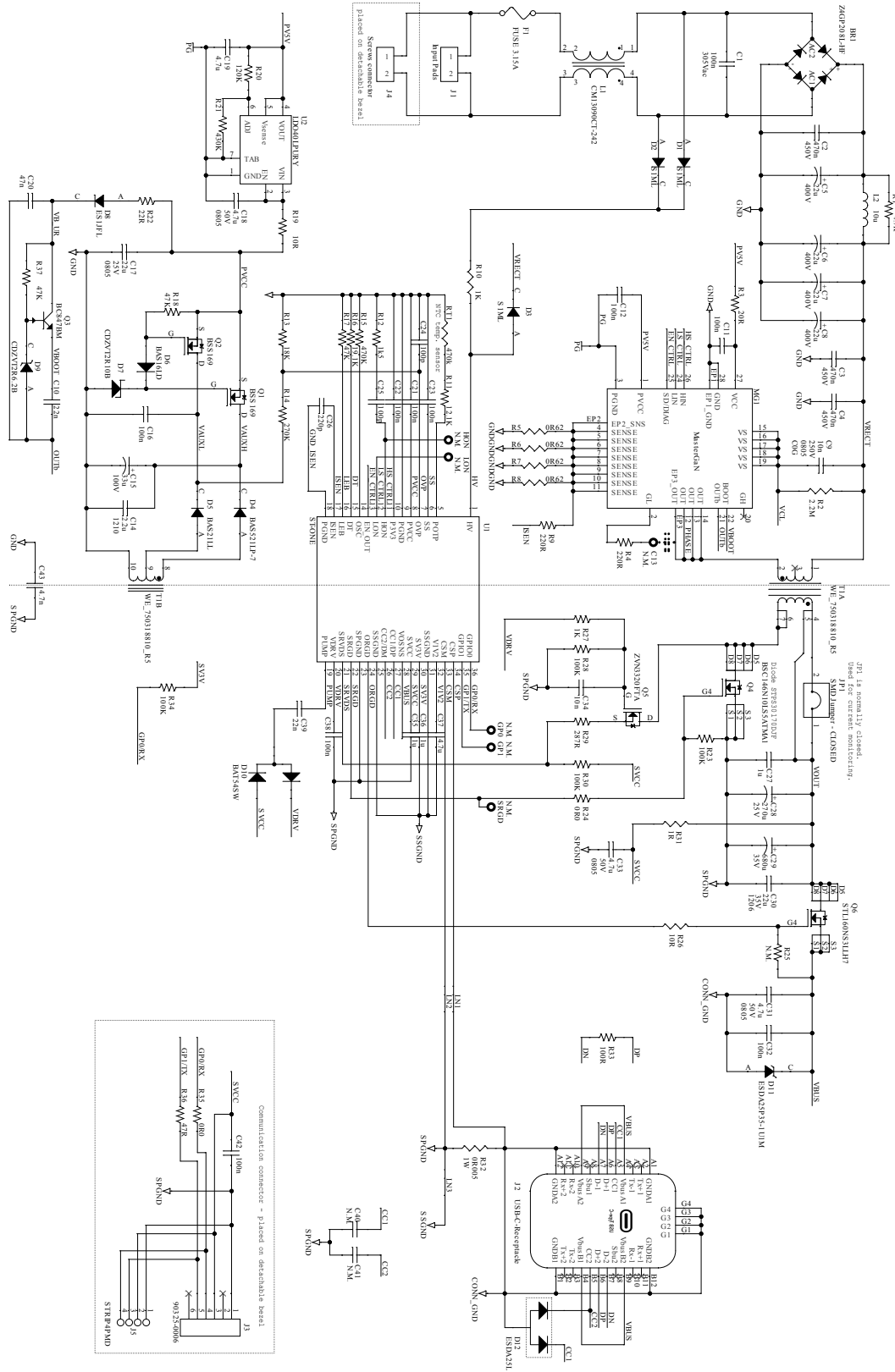


Table 1. EVLONE65W bill of material

Reference	Part Number	Value	Description	Package	Manufacturer
BR1	Z4GP208L-HF		RECT BRIDGE GP 800V 2A Z4	Z4	Comchip
C1	B32921C3104M	100nF	Radial polypropylene film cap.	Plastic radial	TDK
C2, C3, C4	CGA8N4X7T2W474K230K A	470nF	SMD multilayer ceramic cap.	1812	TDK
C5, C6, C7, C8	860021374027	22µF	Aluminum electrolytic capacitor	D8, h16, pitch 3.5 mm	Würth
C9	C2012C0G2E103J125AA	10nF	SMD multilayer ceramic cap.	0805	TDK
C10, C39	885012205052	22nF	SMD multilayer ceramic cap.	0402	Würth
C11, C12, C21, C22, C23, C32, C38, C42	885012205085	100nF	SMD multilayer ceramic cap.	0402	Würth
C13	DNM	N.M.	Not mounted		
C14	885012209071	2.2µF	SMD multilayer ceramic cap.	1210	Würth
C15	ECA2AAM330X	33µF	Aluminum electrolytic capacitor	D8, h11.5, pitch 3.5 mm	Panasonic
C16	885012206120	100nF	SMD multilayer ceramic cap.	0603	Würth
C17	CL21A226MAQNNNE	22µF	SMD multilayer ceramic cap.	0805	Samsung
C18, C31, C33	C2012X7R1H475K	4.7µF	SMD multilayer ceramic cap.	0805	TDK
C19	885012107018	4.7µF	SMD multilayer ceramic cap.	0805	Würth
C20	C1608X7R1H473K080AA	47nF	SMD multilayer ceramic cap.	0603	TDK
C24, C25	885012205055	100pF	SMD multilayer ceramic cap.	0402	Würth
C26	885012005063	220pF	SMD multilayer ceramic cap.	0402	Würth
C27	UMK107AB7105KA-T	1µF	SMD multilayer ceramic cap.	0603	Taiyo Yuden
C28	25SEK270M	270µF	Aluminum polymer capacitor	Radial	Panasonic
C29	EEH-ZS1V681UP	680µF	Aluminum polymer capacitor	10 mm SMD	Panasonic
C30	C3216X5R1V226M160AC	22µF	SMD multilayer ceramic cap.	1206	TDK
C34	885012205050	10nF	SMD multilayer ceramic cap.	0402	Würth
C35	C1005X5R1V105K050BC	1µF	SMD multilayer ceramic cap.	0402	TDK
C36	885012105012	1µF	SMD multilayer ceramic cap.	0402	Würth

Reference	Part Number	Value	Description	Package	Manufacturer
C37	885012105008	4.7µF	SMD multilayer ceramic cap.	0402	Würth
C40, C41		N.M.	SMD multilayer ceramic cap.	0402	
C43	VY1472M51Y5VQ63V0	4.7nF	CAP CER 4700PF 500 VAC Y5 V RADIAL		Vishay
D1, D2, D3	S1ML R3G		SMD diode	DO-219AB	Taiwan Semiconductor
D4	BAS521LP-7		High-voltage switching diode	SOD-882	Nexperia
D5	BAS21LLYL		High-voltage switching diode	SOD-882	Nexperia
D6	BAS16LD		SMD fast switching rectifier	SOD-882	NXP
D7	CDZVT2R10B		SMD Zener diode	SOD-923	ROHM
D8	ES1JFL		SMD diode	SOD-123F	On Semiconductor
D9	CDZVT2R6.2B		SMD Zener diode	SOD-923	ROHM
D10	BAT54SWFILM		SMD Schottky rectifiers array	SOT-323	STMicroelectronics
D11	ESDA25P35-1U1M		TVS diode	QFN-1610	STMicroelectronics
D12	ESDA25L		SMD TVS diode	SOT23	STMicroelectronics
F1	39213150000	FUSE 3.15 A	Radial lead time lag fuse	8.5X4	Littelfuse
HON, LON, SRGD, GP0, GP1		N.M.	Test point pad		
J1		Input pads	Plated holes for cable.		
J2	2012670005		USB-C Receptacle		Molex
J3	90325-0006		Conn flat male 6 pins, straight, pitch 1.27 mm		Molex
J4	282837-2	Screws connector	Screw connector, single row, 5.08 pitch, 13.5 A	5.08 mm	TE Connectivity
J5	M20-9993645		Male strip 4 pins pitch 2.54 180°		Harwin Inc.
JP1		SMD Jumper / CLOSED	Jumper_SMD - CLOSE with solder drop	2 p medium	
L1	CM13090CT-242		Common mode choke		Bourns
L2	744779100	10µH	Radial leaded wire wound inductor	Radial	Würth Elektronik
LN1, LN2, LN3		LINK	PCB link: ignore		
MG1	MASTERGAN4		GaN half-bridge w. driver	31VFQFPN 9 x 9 x 1.0	STMicroelectronics
Q1, Q2	BSS169H6327XTSA1		SMD N-ch MOSFET	SOT23	Infineon
Q3	BC847BM		NPN Transistor general purpose	SOT883	Nexperia
Q4	BSC146N10LS5ATMA1		SMD N-ch power MOSFET	PowerFLAT	Infineon

Reference	Part Number	Value	Description	Package	Manufacturer
Q5	ZVN3320FTA		SMD N-ch MOSFET	SOT23	Diodes Incorporated
Q6	STL160NS3LLH7		SMD N-ch power MOSFET	PowerFLAT	STMicroelectronics
R1		4.7kΩ	SMD resistor	0603	
R2	RC0805FR-072M2L	2.2MΩ	SMD resistor	0805	Yageo
R3	RC0603FR-0720RL	20Ω	SMD resistor	0603	Yageo
R4, R9	RC0402FR-07220RL	220Ω	SMD resistor	0402	Yageo
R5, R6, R7, R8	UCR03EVPFLR620	0.62Ω	SMD current sense resistor	0603	ROHM
R10	RC0603FR-071KL	1kΩ	SMD resistor	0603	Yageo
R11	CRCW04024K70FKEDC	12.1kΩ	SMD resistor	0402	Vishay
R12	RC0402FR-071K5L	1.5kΩ	SMD resistor	0402	Yageo
R13	RC0402FR-0718KL	18kΩ	SMD resistor	0402	Yageo
R14	RC0402FR-07270KL	270kΩ	SMD resistor	0402	Yageo
R15	RC0402FR-07470KL	470kΩ	SMD resistor	0402	Yageo
R16	ERJ-2RKF1912X	19.1kΩ	SMD resistor	0402	Panasonic
R17, R18, R37	RC0402FR-0747KL	47kΩ	SMD resistor	0402	Yageo
R19, R26	CRCW040210R0JNED	10Ω	SMD resistor	0402	Vishay
R20	RC0402FR-07120KL	120kΩ	SMD resistor	0402	Yageo
R21	RC0402FR-07430KL	430kΩ	SMD resistor	0402	Yageo
R22	RC0402FR-0722RL	22Ω	SMD resistor	0402	Yageo
R23, R28, R30	RC0402FR-07100KL	100kΩ	SMD resistor	0402	Yageo
R24, R35	MCR01MZPJ000	0Ω	SMD resistor	0402	ROHM
R25		N.M.	SMD resistor	0402	
R27	RC0402JR-071KL	1kΩ	SMD resistor	0402	Yageo
R29	RC0402FR-07287RL	287Ω	SMD resistor	0402	Yageo
R31	RC0402FR-071RL	1Ω	SMD resistor	0402	Yageo
R32	WSLP08055L000FEA18	5mΩ	SMD very high power, low value resistor	0805	Vishay
R33	RC0402FR-07100RL	100Ω	SMD resistor	0402	Yageo
R34	CRG0603F100K	100kΩ	SMD resistor	0603	TE Connectivity
R36		47Ω	SMD resistor	0402	
RT1	NCP15WM474J03RC	470kΩ	SMD thermistor NTC	0402	Murata
T1	750318810_R5		RM8 extended rail transformer		Würth
U1	ST-ONE		Fully integrated controller for smart chargers	SSOP36	STMicroelectronics
U2	LDO40LPURY		Low drop out regulator	6-DFN	STMicroelectronics

Revision history

Table 2. Document revision history

Date	Version	Changes
23-May-2022	1	Initial release.
06-Mar-2023	2	Title modification.



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