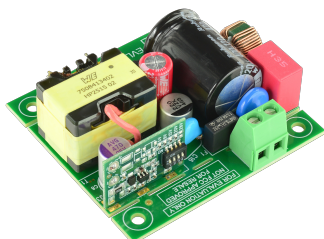


STACF01 non-complementary Active Clamp Flyback controller demonstration board



Features

- Universal AC input voltage: 90~264 VAC, 47~63 Hz
- Maximum output power: 65 W
- Selectable output voltage: 5-9-15-20 VDC
- Peak efficiency: 93% full load @90 VAC
- Stand-by power consumption:
 - 60 mW@115V AC, 5 Vout
 - 68 mW@230 VAC, , 5 Vout
- Compact design: 60 x 35 x 22 mm (L,W,H). Power density: 23 W/in³

Application

- AC-DC adapters for smartphones, laptops, and other handheld devices
- Offline SMPS

Description

The EVLACF01UC65 is a compact 65 W Active Clamp Flyback (ACF) converter designed to evaluate the STACF01A, ACF controller. The board can receive a universal AC input voltage and provides a selectable output voltage based on the USB Power Delivery specifications, from 5 V to 20 V.

At the primary side, the STACF01A is paired with MasterGaN1L, a 600 V half-bridge enhancement mode GaN HEMT with high-voltage drivers.

The STACF01A integrates a buck boost that allows to achieve low stand-by power consumption with a single transformer's auxiliary winding.

A synchronous rectification based on the SRK1004D is employed at the secondary side to enhance the efficiency.

The STACF01A integrates a 800 V rated high-voltage startup, and offers a full set of protections and features, such as AC-Brownout, X-CAP discharge, overload and short-circuit protection, output overvoltage protection.

Product summary	
EVLACF01UC65	65 W ACF converter
STACF01A	ACF controller
MASTERGAN1L	600 V half-bridge enhancement mode GaN HEMT with high-voltage driver
SRK1004D	Synchronous rectifier controller for ACF

1 Schematic

Figure 1. EVLSTACF01UC65 motherboard schematic

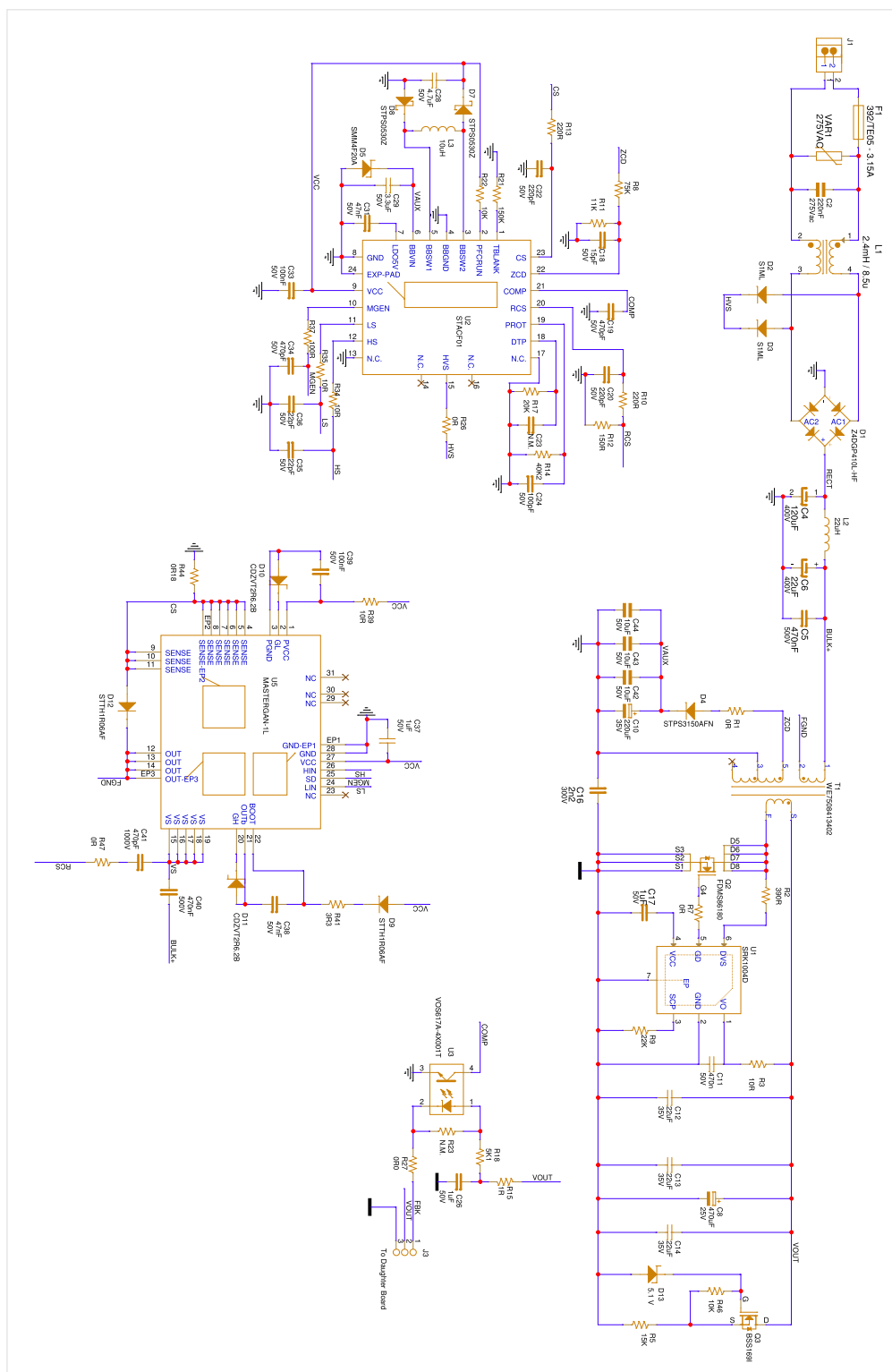
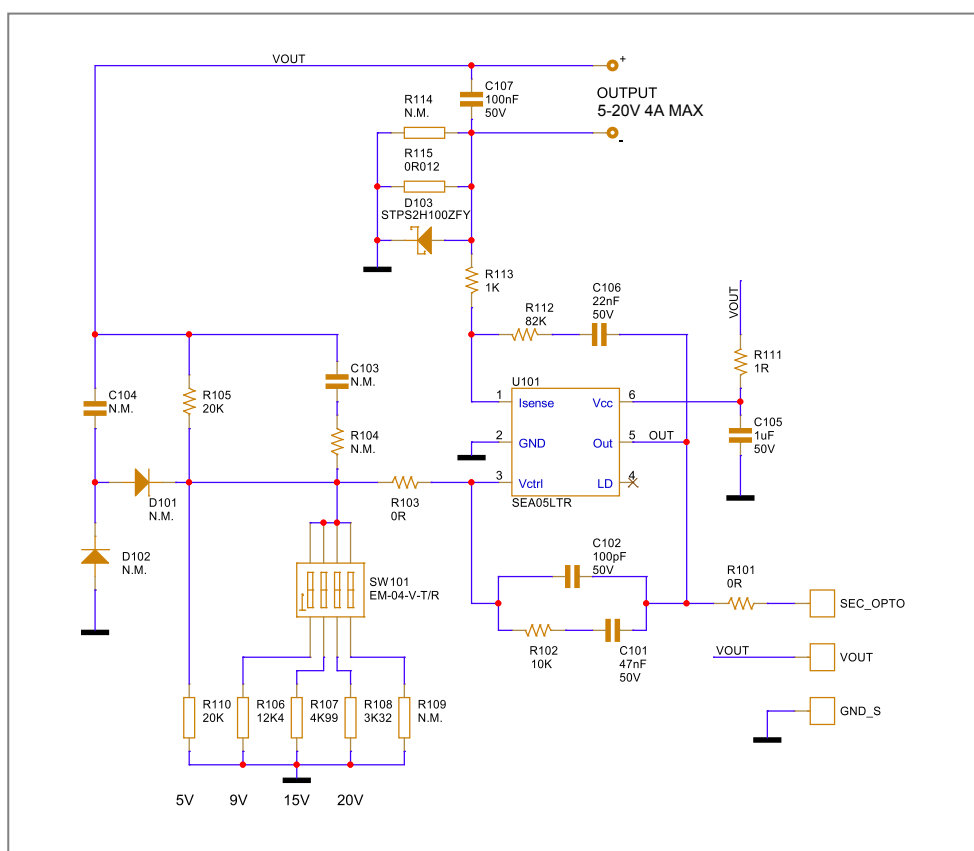


Figure 2. EVLSTACF01UC65 daughterboard schematic



2 PCB Layout

Figure 3. EVLSTACF01UC65- motherboard PCB layout

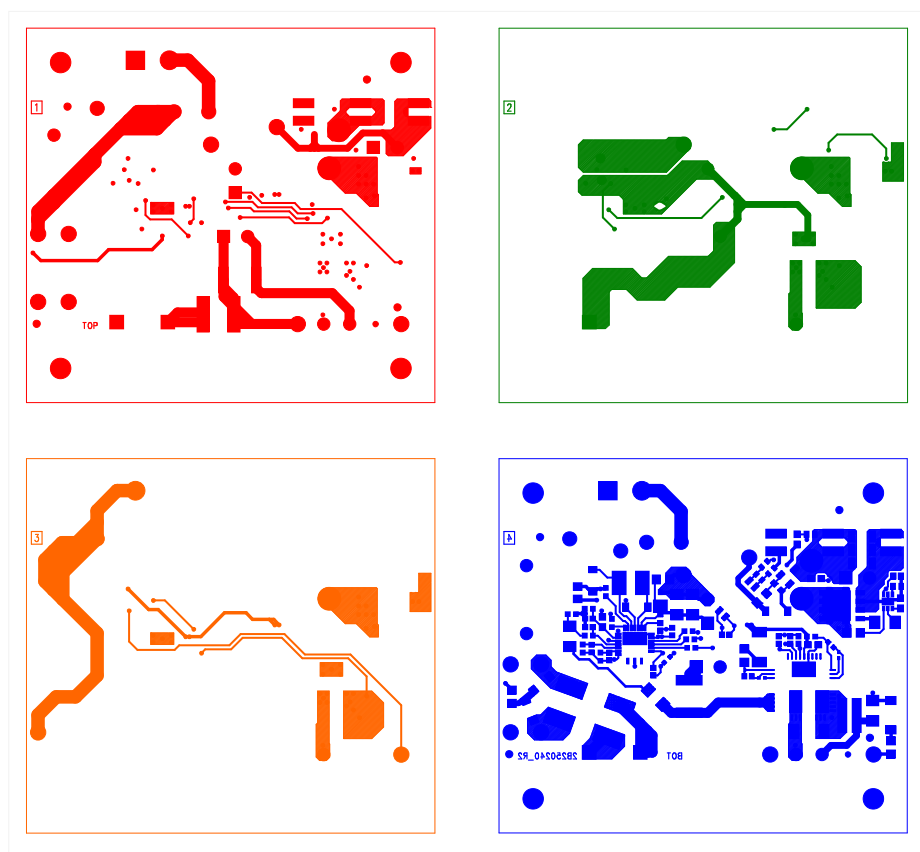
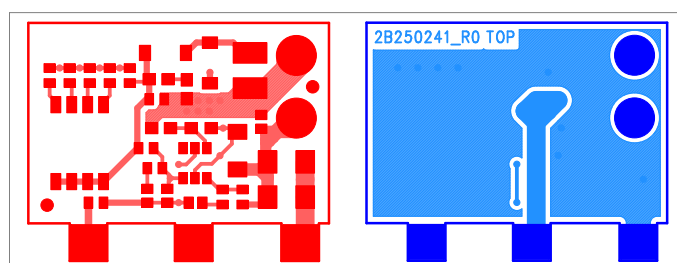


Figure 4. EVLSTACF01UC65- daughterboard PCB layout



3 Bill of materials

Table 1. EVLSTACF01UC65 - mother board bill of materials

Ref	Value	Description	Package	Manufacturer
C2	220nF	275V 10% X2 - FILM CAP - 890324023028	18 x 7mm - PITCH 15mm	Würth Elektronik
C4	120µF	400V 10% - ALUMINUM ELCAP - 400HXW120MEFR18X25	Dia 18 x 30 HOR. - 7.5mm PITCH	RUBYCON
C5	470nF	500V 10% X7R MLCC -885382211003	1812	Würth Elektronik
C6	22µF	400V 10% aluminum electrolytic capacitors - 860021374027	Dia 8 x 16 - 3.5mm PITCH	Würth Elektronik
C8	470µF	25V +/-20% conductive polymer hybrid aluminum electrolytic capacitor - 477AVG025MFBJ	Dia 8 x 12 - 3.5mm PITCH	ILLINOIS CAPACITOR
C10	220µF	35V +/-20% conductive polymer hybrid aluminum electrolytic capacitor - EEHAZKV221UB	Radial	PANASONIC
C11	470n	50V 10% 50V X7R 10% MLCC	0402	
C12	22µF	35V 10% 35V X5R 10% MLCC	1206	
C13	22µF	35V 10% 35V X5R 10% MLCC	1206	
C14	22µF	35V 10% 35V X5R 10% MLCC	1206	
C16	2n2	300VAC 20% Y1 - SAFETY CAP. DE1E3KX222MN4AP01F	5 x 13mm - PITCH 10MM	MURATA
C17	1µF	50V 10% 50V CERCAP - X7R - 10%	0603	
C18	15pF	50V 10% 50V X7R 10% MLCC	0402	
C19	470pF	50V 10% 50V X7R 10% MLCC	0402	
C20	220pF	50V 10% 50V X7R 10% MLCC	0402	
C22	220pF	50V 10% 50V X7R 10% MLCC	0402	
C23	N.M.		0402	
C24	100pF	50V 10% 50V X7R 10% MLCC	0402	
C25	22nF	50V 10% 50V X7R 10% MLCC	0402	
C26	1µF	50V 10% 50V X7R 10% MLCC	0603	
C28	4.7µF	50V 10% 50V X6S 10% MLCC 105°C	0805	
C29	3.3µF	50V 10% 50V X7R 10% MLCC 105°C	0805	
C31	47nF	50V 10% 50V X7R 10% MLCC	0402	
C33	100nF	50V 10% 50V X7R 10% MLCC	0402	
C34	470pF	50V 10% 50V X7R 10% MLCC	0402	
C35	22pF	50V 10% 50V X7R 10% MLCC	0402	
C36	22pF	50V 10% 50V X7R 10% MLCC	0402	
C37	1µF	50V 10% 50V X7R 10% MLCC	0603	
C38	47nF	50V 10% 50V X7R 10% MLCC	0402	
C39	100nF	50V 10% 50V X7R 10% MLCC	0402	
C40	470nF	500V 10% - 885382211003	1812	Würth Elektronik

Ref	Value	Description	Package	Manufacturer
C41	470pF	1000V 10% MLCC - 1KV - X7R - 10% - 202R18W471KV4E	1206	JOHANSON
C42	10µF	50V 10% 50V X5R 10% MLCC	1206	
C43	10µF	50V 10% 50V X5R 10% MLCC	1206	
C44	10µF	50V 10% 50V X5R 10% MLCC	1206	
D1	Z4DGP410L-HF	1kV bridge rect. single phase standard SMD- Z4DGP410L-HF		COMCHIP
D2	S1ML	High voltage rectifier	Sub SMA	TAIWAN SEMICONDUCTOR
D3	S1ML	High voltage rectifier	Sub SMA	TAIWAN SEMICONDUCTOR
D4	STPS3150AFN	150V small signal diode, Single, 250V, 200mA, 1V, 50ns, 625mA	SMA	STMicroelectronics
D5	SMM4F20A	22V SMD unidirectional transil diode	DO-222AA	STMicroelectronics
D7	STPS0530Z	30V SMD Schottky rectifier	SOD-123	STMicroelectronics
D8	STPS0530Z	30V SMD Schottky rectifier	SOD-123	STMicroelectronics
D9	STTH1R06AF	600V fast / ultrafast diode, 600V, 1A, Single, 1.7V, 25ns, 20A	SMA-low profile	STMicroelectronics
D10	CDZVT2R6.2B	6.2V +/-5% SMD low-current zener diode	SOD-923-2	ROHM
D11	CDZVT2R6.2B	6.2V +/-5% SMD low-current zener diode	SOD-923-2	ROHM
D12	STTH1R06AF	600V fast / ultrafast diode, 600V, 1A, Single, 1.7V, 25ns, 20A	SMA-low profile	STMicroelectronics
D13	MMSZ5V1T1G	5.1V +/-5% SMD zener diode	SOD-123	onsemi
F1	392/TE05 - 3.15A	250V FUSE T3.15A - TIME DELAY - 39213150000	P5.08/L8.5/W4.0/H8.0	LITTELFUSE
J1	MKDS 1,5/2-5,08	Screw Conn. Term., single row, 5.08 pitch, 9.8 depth, 13.8 height, AWG 14-30, 15A		PHOENIX
J3	STRIP 1x3	PCB receptacle for protocol DB		
L1	2.4mH/8.5µ	Choke, Common mode, Power line, 2.4mH, 2.4A - CM13090CT-242		BOURNS
L2	22µH	Power inductors - SMD FIXED IND 22UH - 2.1A - 74404064220	6x6 H4,5mm	Würth Elektronik
L3	10µH	Power inductors - SMD FIXED IND 10UH - 1.6A - 74406042100	4.8x4.8 H1.8mm	Würth Elektronik
Q2	FDMS86180	100V SMD N-ch power MOSFET	PowerFLAT	onsemi
Q3	BSS169I	SMD N-ch MOSFET	SOT-23	Infineon Technologies
R1	0R	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0805	
R2	390R	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0805	
R3	10R	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0603	
R5	15K	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0805	
R7	0R	SMD STANDARD FILM RES - 1/4W - 1% - 100ppm/°C	1206	

Ref	Value	Description	Package	Manufacturer
R8	75K	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0603	
R9	22K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R10	220R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R11	11K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R12	150R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R13	220R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R14	40.2K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R15	1R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R17	20K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R18	5K1	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R21	150K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R22	10K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R23	N.M.	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R27	0R0	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R34	10R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R35	10R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R37	100R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R39	10R	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R41	3R3	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0805	
R44	0R18	SMD Current Sense FILM RES - 1W - 1% - 100ppm/°C	1020	
R46	10K	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0603	
R47	0R0	SMD STANDARD FILM RES - 1/4W - 1% - 100ppm/°C	1206	
T1	WE7508413402	ACF flyback transformer		Würth Elektronik
U1	SRK1004D	Synchronous rectifier controller for non-complementary active clamp flyback converter	DFN6	STMicroelectronics
U2	STACF01A	Active clamp flyback controller	QFN 5X5	STMicroelectronics
U3	VOS617A-4X001T	OPTOCOUPLER	SSOP-4	VISHAY
U4	SEA05LTR	SMD Driver	SOT23-6	STMicroelectronics

Ref	Value	Description	Package	Manufacturer
U5	MASTERGAN1L	High-density power driver, H.V. e-mode GaN half bridge	MQFN 9x9	STMicroelectronics
VAR1	Varistor	275VAC - B72210S0271K101	12 x 5mm - 7.5mm PITCH	TDK

Table 2. EVLSTACF01UC65 -daughter board bill of materials

Ref	Value	Description	Package	Manufacturer
C101	47nF	50V 10% 50V X7R 10% MLCC	0402	
C102	100pF	50V 10% 50V X7R 10% MLCC	0402	
C103	N.M.		0603	
C104	N.M.		0603	
C105	1µF	50V 10% 50V X7R 10% MLCC	0603	
C106	22nF	50V 10% 50V X7R 10% MLCC	0402	
C107	100nF	50V 10% 50V X7R 10% MLCC	0402	
D101	N.M.		SOD-123	
D102	N.M.		SOD-123	
D103	STPS2H100ZFY	SMD automotive power Schottky rectifier	SOD-123FL	STMicroelectronics
R101	0R0	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R102	10K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R103	0R0	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R104	N.M.		0603	
R105	20K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R106	12.4K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R107	4.99K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R108	3.32K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R109	N.M.		0603	
R110	20K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	

Ref	Value	Description	Package	Manufacturer
R111	1R0	SMD STANDARD FILM RES - 1/8W - 1% - 100ppm/°C	0603	
R112	82K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R113	1K	SMD STANDARD FILM RES - 1/16W - 1% - 100ppm/°C	0402	
R114	N.M.		1206	
R115	0R012	SMD STANDARD FILM RES - 1/4W - 1% - 100ppm/°C	1206	
SW101	EM-04-V-T/R	24V DIP switches end stackable 24V - 50mA - SMD - A6H-4102		OMRON
U101	SEA05LTR	Advanced constant voltage and constant current controller	SOT23-6	STMicroelectronics

4 Board connection and performance

Figure 8. EVLACF01UC65 basic connection

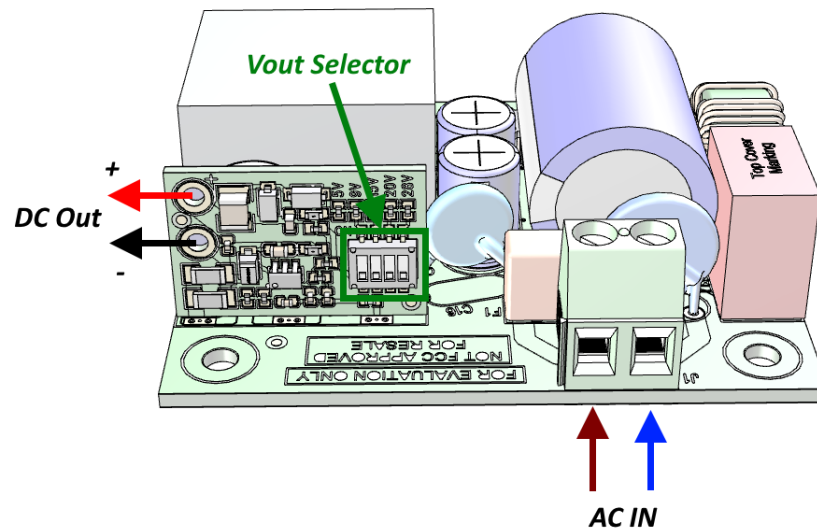


Figure 9. Full load efficiency

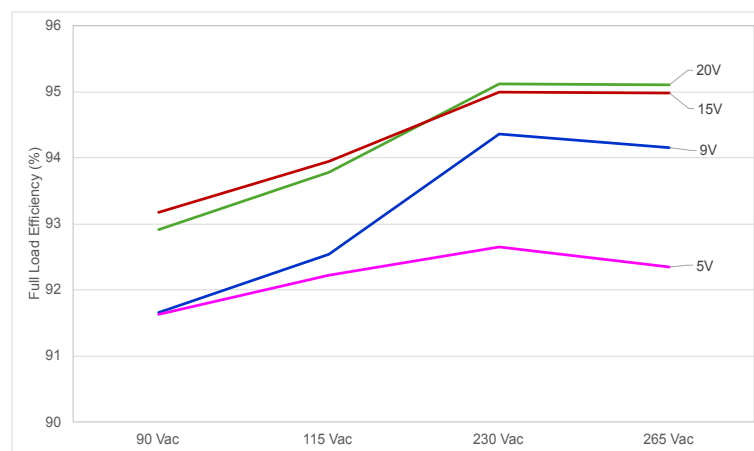
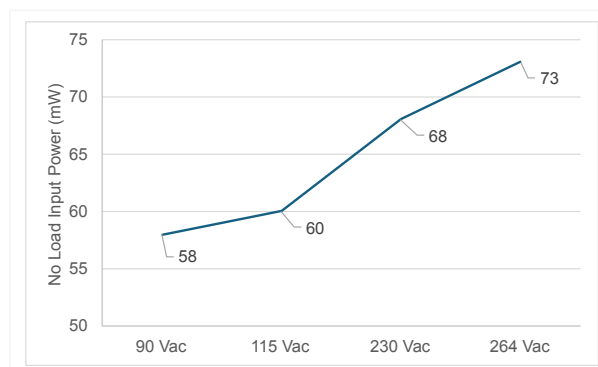


Figure 10. No load power consumption



5 Waste and recycling

The evaluation board is not to be disposed as an urban waste. At the end of its life cycle, differentiated waste collection must be followed. Consult the local authorities for more information on proper disposal channels and recycling centers. It is mandatory to collect the evaluation board separately and make sure it is delivered to the appropriate waste management and recycling centers. As of 15 August 2018, in all countries belonging to the European Union, the evaluation board is subject to the requirements of WEEE Directive 2012/19/EU, and therefore it is forbidden to dispose the evaluation board as undifferentiated waste or with other domestic waste. Incorrect disposal of the evaluation board may cause damage to the environment and may incur fines based on specific countries' rules, regulations, and laws.

Revision history

Table 3. Document revision history

Date	Version	Changes
31-Oct-2025	1	Initial release.

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