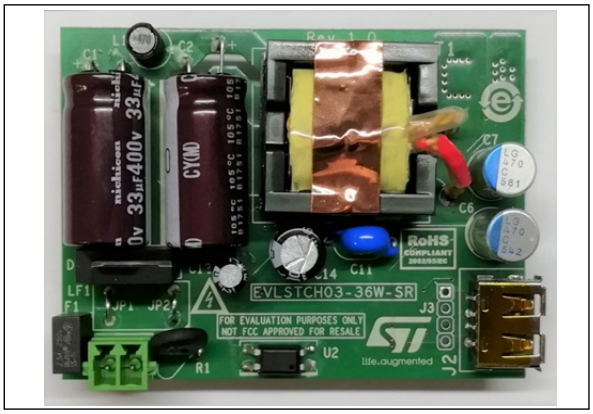
EVLSTCH03-36W-SR

36W USB charger with selectable output voltage (5-9-12 V @3A) based on STCH03L and SRK1000B

Data brief



Features

- Universal AC mains input voltage range: 90 V to 264 V
- Output voltage: 5 - 9 - 12 V selectable @3 A continuous operation
- Constant voltage (CV) regulation with optocoupler and constant current (CC) regulation with primary side sensing
- No-load consumption < 20mW at 230 VAC (with load disconnected from charger)
- 4 points average efficiency and 10% load efficiency in compliance with Eu CoC rev. 5 - Tier 2 (2016)
- Line conducted EMI in compliance with EN55022 - Class B
- Small form factor (73 x 55 x 15 mm)
- RoHS compliant

Description

The EVLSTCH03-36W-SR shown in the image here is a 36 W wide-range mains USB charger demonstration board, with selectable output voltage (5 - 9 - 12 V @ 3 A output current), based on the STCH03L and SRK1000B.

The power circuit is a quasi-resonant (QR) flyback converter, with peak current mode control, based on the STCH03L IC. The circuit operates with secondary side constant voltage (CV) regulation through an optocoupler and is capable of providing constant output current (CC) regulation using primary sensing feedback.

The STCH03L embeds a 650 V, non-dissipative, HV startup cell, which, along with the extremely low quiescent current and burst-mode management, helps minimize residual input consumption, thus achieving less than 20 mW under no-load condition.

At secondary side, the SRK1000B controller implements synchronous rectification to increase system efficiency: it controls the synchronous rectifier MOSFET, driving its gate with minimal turn-on delay and maximizing the turn-off time instant (through an adaptive mechanism) so that the residual conduction of the SR MOSFET body diode after turn-off reduces to the target value of 300 ns.

The charger is designed to meet the most stringent energy saving recommendations (Eu CoC rev. 5 - Tier 2 and EPS of DOE USA) as well as EMI regulation EN55022-Class-B for line conducted noise emissions.

1 Electrical diagram

Figure 1. Electrical diagram

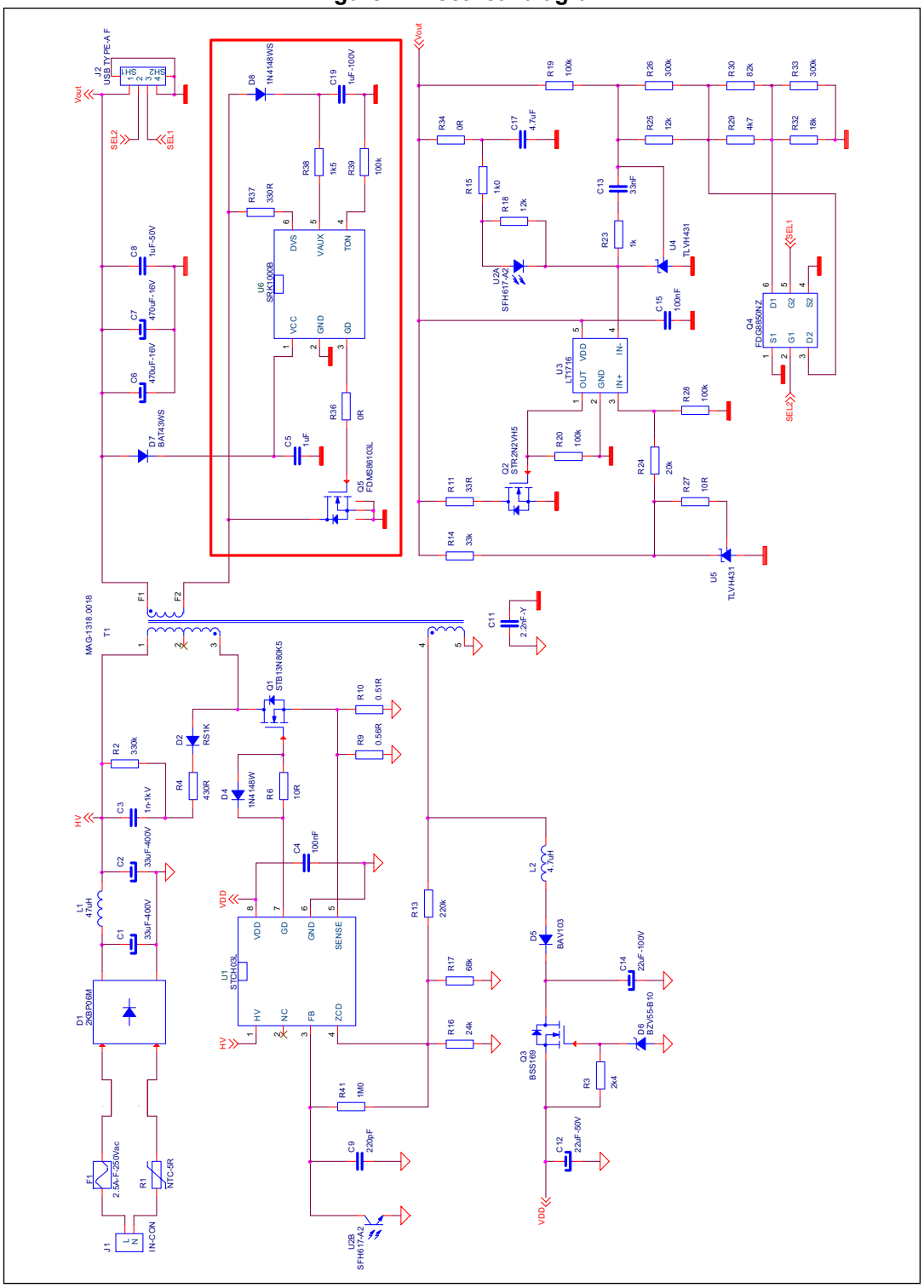


Figure 2. CV-CC regulation @ 12Vout

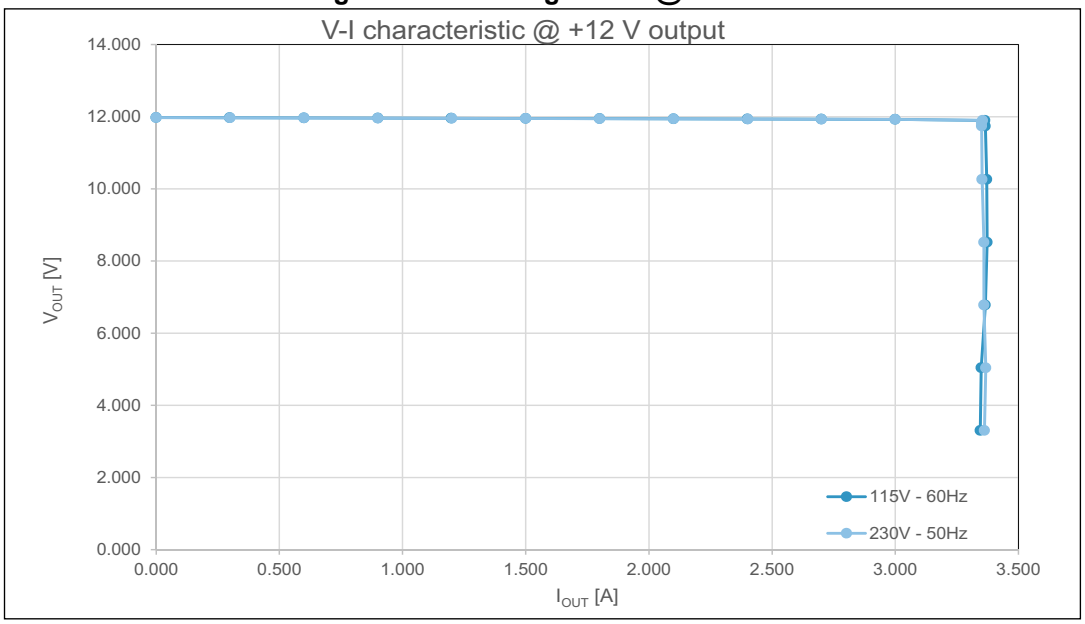


Figure 3. CV-CC regulation @ 9Vout

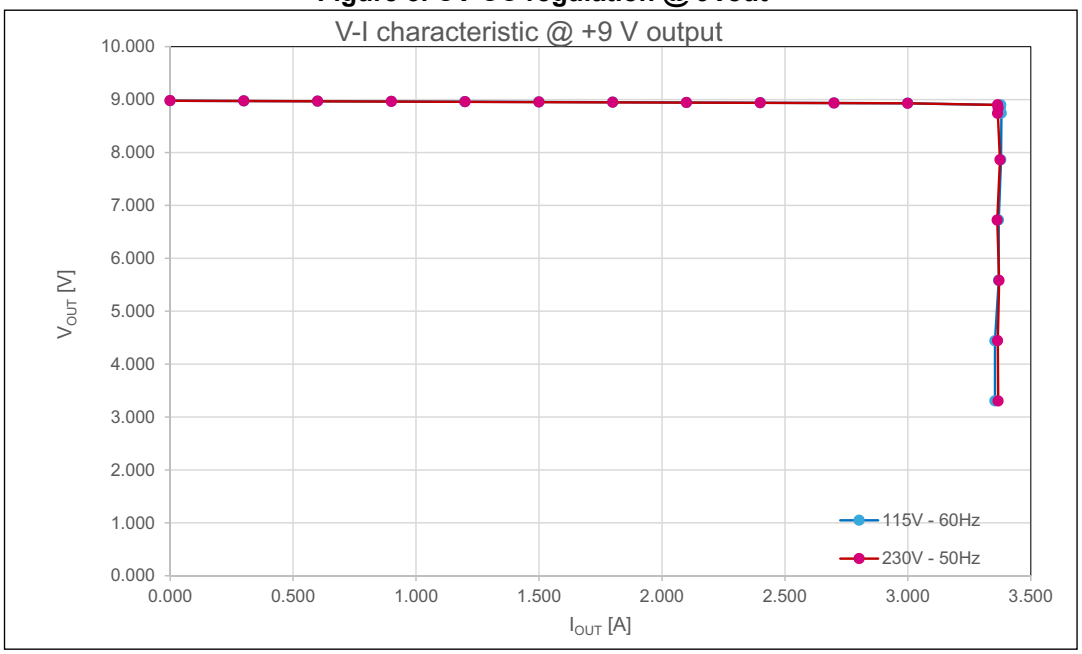


Figure 4. CV-CC regulation @ 5Vout

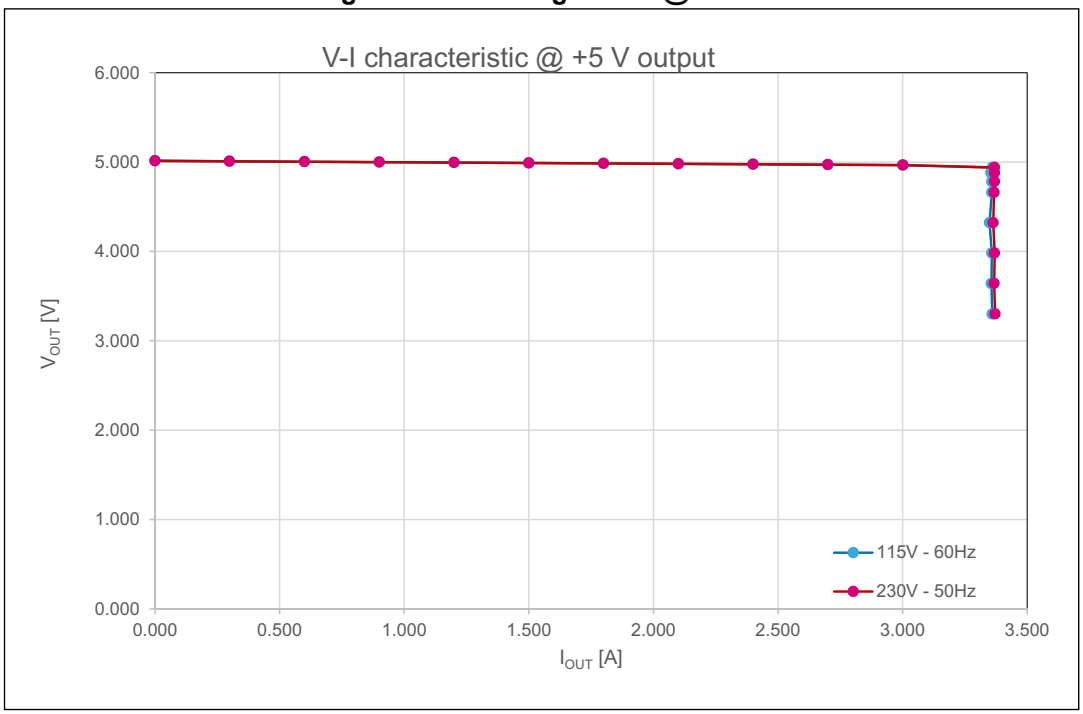


Figure 5. Efficiency plot @ 12 V output

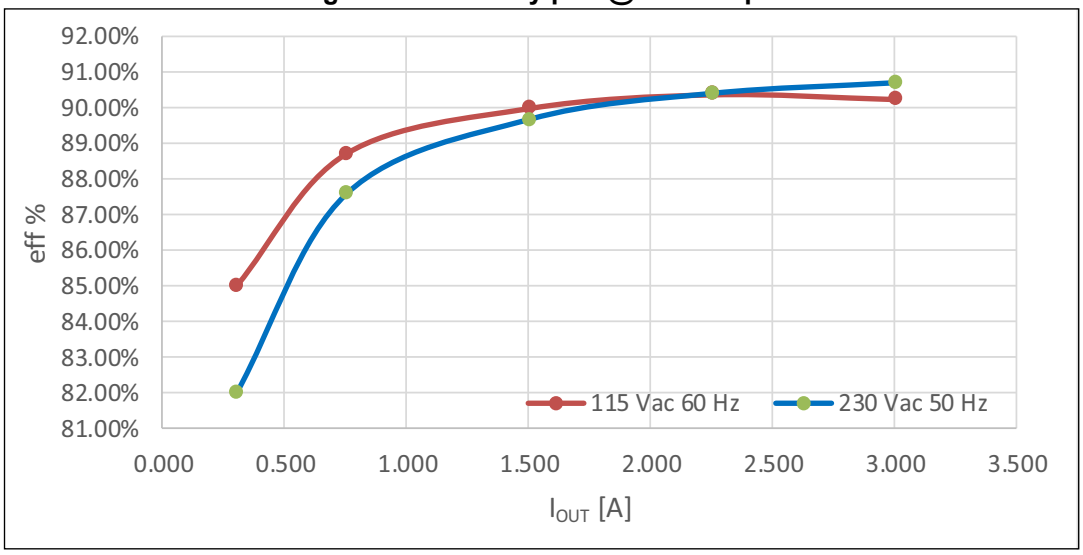


Figure 6. Efficiency plot @ 9 V output

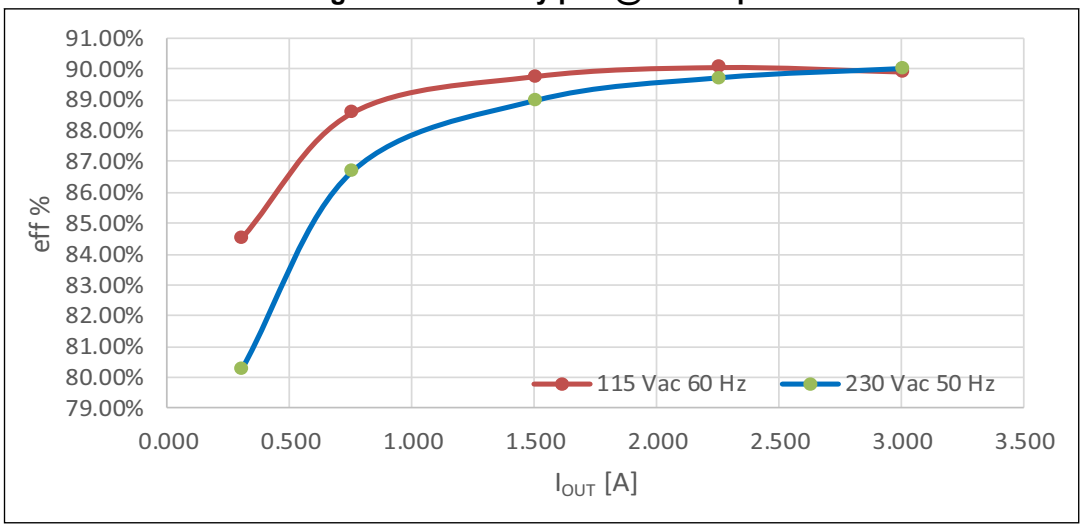
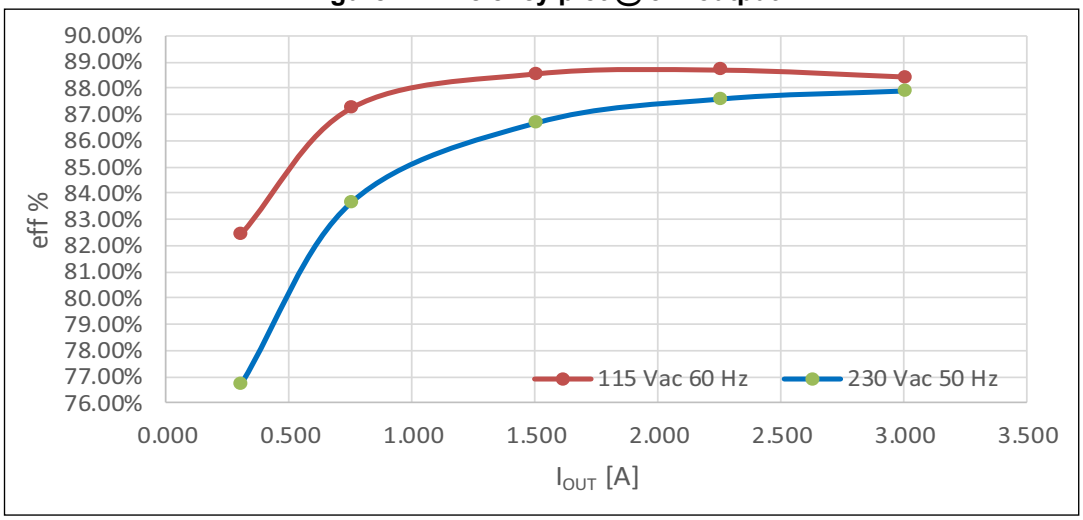


Figure 7. Efficiency plot @ 5 V output



2 Efficiency & no-load consumption data

Table 1. Measurements @ +12 V output

Percent of rated load	Efficiency %	
	115 Vac - 60 Hz	230 Vac - 50 Hz
100%	90.24%	90.68%
75%	90.37%	90.39%
50%	89.99%	89.66%
25%	88.73%	87.58%
avg eff. %	89.83%	89.58%
CoC-2016 - Tier2 requirement:		88.30%
Input voltage	**Efficiency % (@10% Load)**	
115 Vac - 60 Hz	85.03%	
230 Vac - 50 Hz	82.02%	
CoC-2016 - Tier2 requirement:		78.30%

Table 2. Measurements @ +9 V output

Percent of rated load	Efficiency %	
	115 Vac - 60 Hz	230 Vac - 50 Hz
100%	89.91%	90.01%
75%	90.06%	89.71%
50%	89.77%	88.98%
25%	88.58%	86.67%
avg eff. %	89.58%	88.84%
CoC-2016 - Tier2 requirement:		87.30%
Input voltage	**Efficiency % (@10% Load)**	
115 Vac - 60 Hz	84.51%	
230 Vac - 50 Hz	80.29%	
CoC-2016 - Tier2 requirement:		77.30%

Table 3. Measurements @ +5 V output

Percent of rated load	Efficiency %	
	115 Vac - 60 Hz	230 Vac - 50 Hz
100%	88.43%	87.88%
75%	88.70%	87.57%
50%	88.55%	86.66%
25%	87.26%	83.66%
avg eff. %	88.24%	86.44%
CoC-2016 - Tier2 requirement:		81.84%
Input voltage	**Efficiency % (@10% Load)**	
115 Vac - 60 Hz	82.42%	
230 Vac - 50 Hz	76.73%	
CoC-2016 - Tier2 requirement:		72.48%
Input voltage	**no-Load consumption**	
115 Vac - 60 Hz	16.0mW	
230 Vac - 50 Hz	16.7mW	

3 Revision history

Table 4. Revision history

Date	Revision	Changes
23-Feb-2019	1	Initial release

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