

4.2 W off-line LED driver with primary side regulation

Data brief

Features

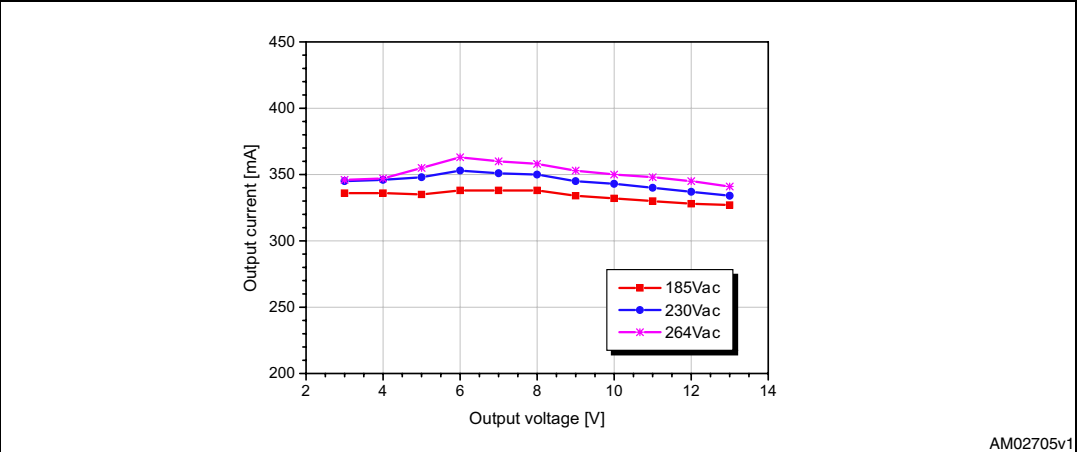
- Input voltage range (V_{IN}): 185 - 265 V_{AC}
- Main frequency (f_L): 50 - 60 Hz
- Maximum (rated) output power: 4.2 W
- Output: $I_{OUT} = 350 \text{ mA} \pm 5\%$
 - Over voltage = 12 V max
 - Current ripple < 10% I_{OUT}
- Minimum switching frequency in normal mode: 70 kHz
- Target average efficiency (from 1 to 3 LEDs) > 70 %
- Maximum input power in no-load < 100 mW



Description

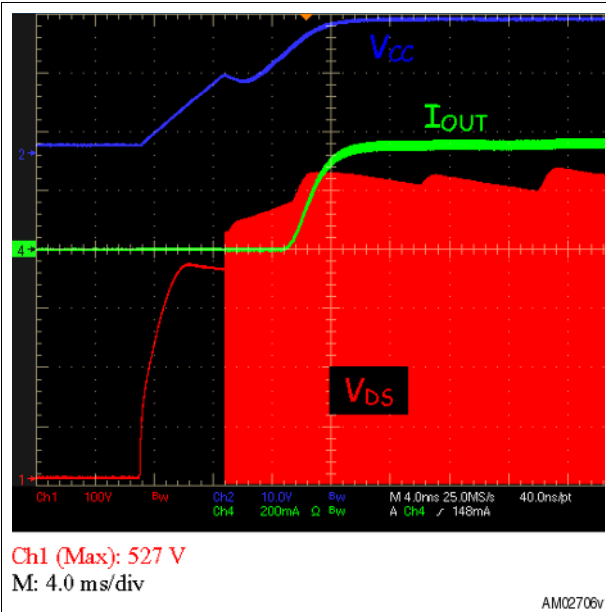
The EVALHVLED805 is a demonstration board equipped with the new HVLED805 PWM current mode LED driver and is designed for European mains. It can control, with very good accuracy, from 1 to 3 LEDs having a nominal current of 350 mA. The HVLED805 has integrated high voltage startup and an 800 V power MOSFET. The high MOSFET's breakdown voltage allows very robust and reliable applications and reduces the size of the snubber and the relative power dissipation. Its accurate primary-current control eliminates the need of the optocoupler which impacts the cost, the compactness and the lifetime of the application while still maintaining a very good LED accuracy (below 5 %). Moreover, this converter, specifically designed for quasi-resonant (QR) flyback converters, enables very low turn-on losses and EMI emissions.

Figure 3. Output current characteristics



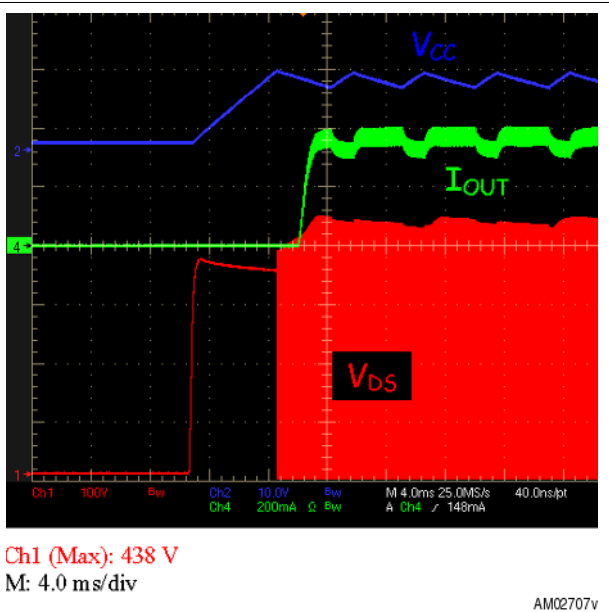
AM02705v1

Figure 4. Start up at 230 VAC, 3 LEDs



AM02706v

Figure 5. Start up at 230 VAC, 1LEDs



AM02707v

Figure 6. Normal operation at 230 VAC, 3 LEDs

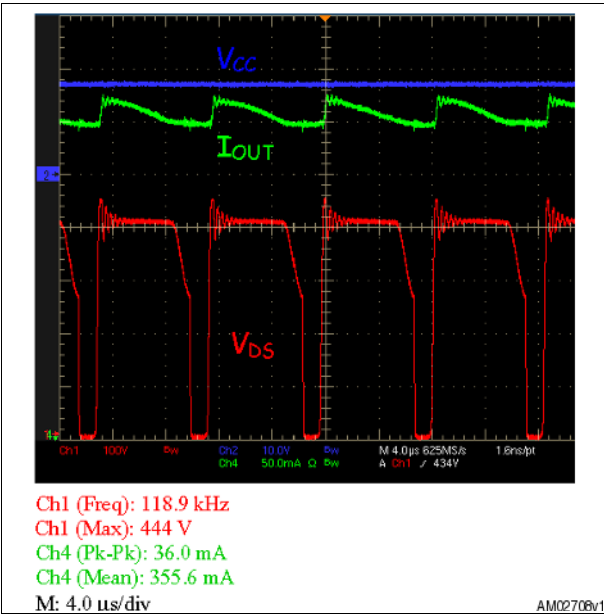


Figure 7. Normal operation at 230 VAC, 2 LEDs

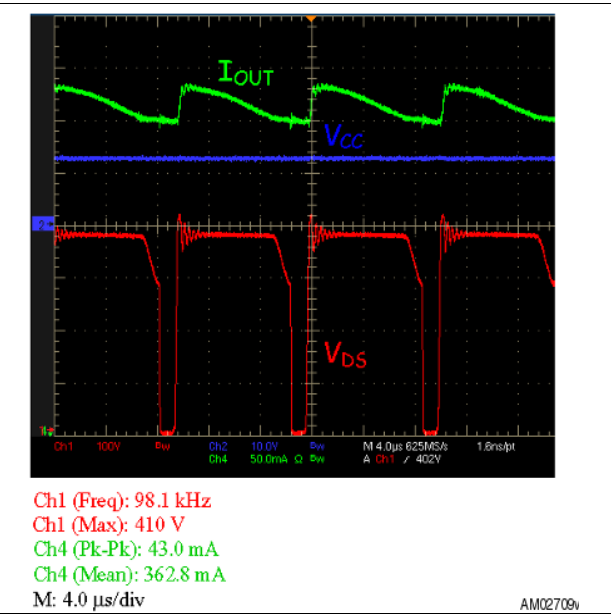


Figure 8. Normal operation at 230 VAC: 1 LEDs

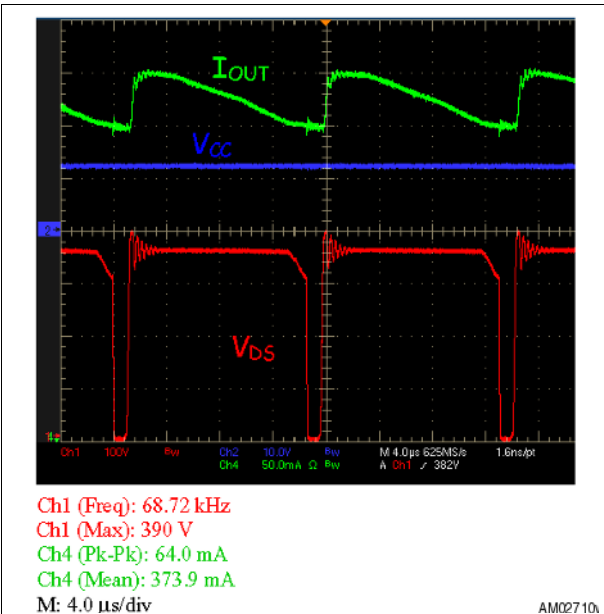


Figure 9. PCB top side and through hole components (not in scale)

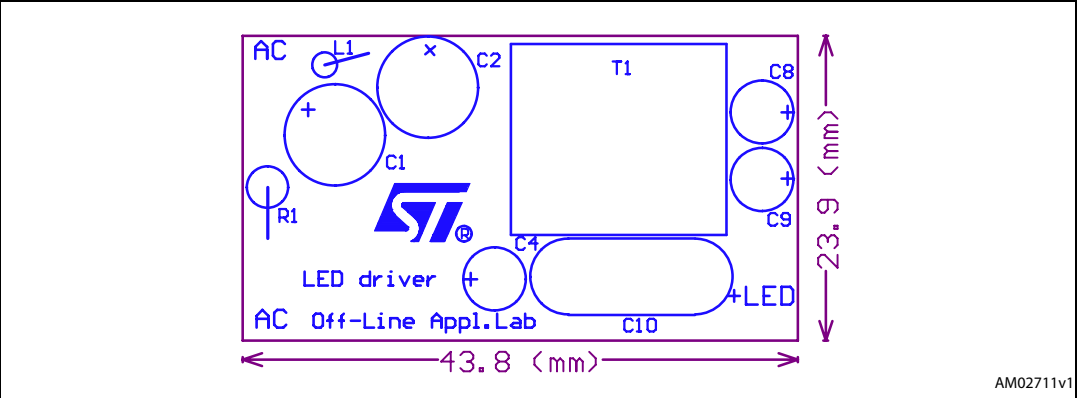


Figure 10. PCB: bottom side and SMD components (not in scale)

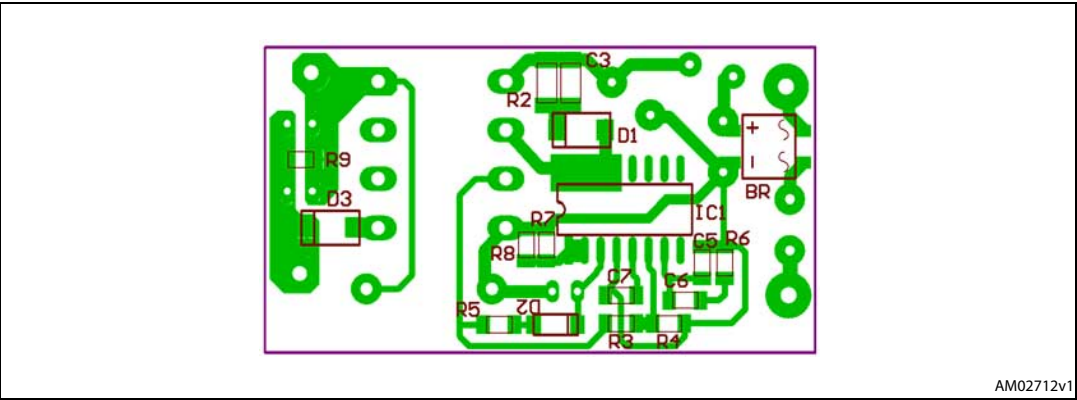


Table 1. Bill of material

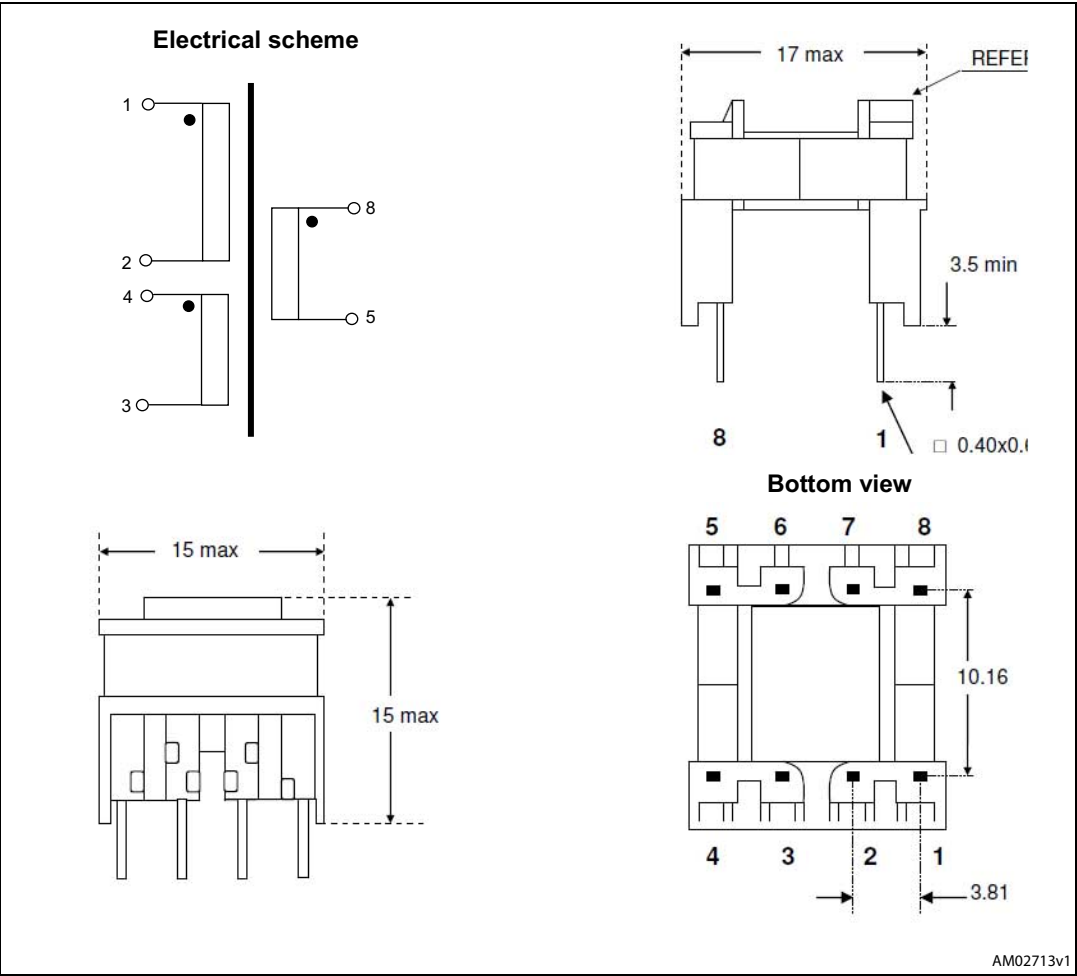
Reference	Part	Description	Note
R1		22 Ω	1 W - Axial flame proof
R2		120 k Ω	
R3		33 k Ω	
R4		5.6 k Ω	
R5		10 Ω	
R6		10 k Ω	
R7		3.3 k Ω	1% tolerance
R8		10 Ω	1% tolerance
R9		100 k Ω	
C1, C2		2.2 μ F	400 V electrolytic
C3		1 nF	500 V - XR7
C4		2.2 μ F	35 V electrolytic
C5		1 nF	25 V
C6		470 nF	25 V
C7		4.7 nF	25 V
C8, C9	B41889A3108M	100 μ F	16V electrolytic Rubycon ZLH
C10	Y1- Capacitor	2.2 nF	230V
D1	STTH1L06A	Ultra-fast high voltage diode	STMicroelectronics
D2	LL4148	Small signal diode	
D3	STPS1H100A	Power schottky diode	STMicroelectronics
L1	B78108S1474J	470 μ H	axial inductor Epcos
BR	MB6S RC	Input bridge rectifier	
TF	1921.0013 Rev04	Flyback transformer	Magnetics
IC	HVLED805	Primary switching regulator	STMicroelectronics

Note: If not otherwise specified, all resistors are 5%, ¼ W

Table 2. Transformer characteristics

Manufacturer	Magnetica
Part number	1921.0013 Rev. 04
Core	E13 – N87 (or equivalent)
Primary inductance	2.6mH ± 15%
Air gap	~ 70 µm
Leakage inductance	1.42% nom
Primary to secondary turn ratio	7.68 ± 5% 123:16
Primary to auxiliary turn ratio	5.59 ± 5% 123:22
Primary saturation current	0.21A _P max (B _{SAT} =0.35 T)
Insulation primary-secondary	4 kV

Figure 11. Transformer electrical scheme and dimensions



2 Revision history

Table 3. Document revision history

Date	Revision	Changes
09-Feb-2011	1	First release
16-Nov-2011	2	Updated Figure 1 , Table 1 , Table 2 , Figure 9 , Figure 11

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