



STEVAL-ISA111V1

Wide-range single-output demonstration board based on the VIPER26HN

Data brief

Features

- Universal input mains range:
 - input voltage 90 - 264 V_{AC}
 - frequency 45 - 65 Hz
- Single-output voltage: 12 V at 1 A continuous operation
- Standby mains consumption: < 30 mW at 230 V_{AC}
- Average efficiency: > 80%
- Fully protected against faults (overload, feedback disconnection and overheating)
- EMI: according to EN55022-Class-B
- RoHS compliant



Description

The STEVAL-ISA111V1 demonstration board is a 12 V, 1 A power supply set in non-isolated flyback topology using the VIPER26HN, the new offline high voltage converter by STMicroelectronics.

The features include an 800 V avalanche rugged power section, PWM operation at 115 kHz with frequency jittering for lower EMI, current limiting with adjustable set point, onboard soft-start, a safe auto-restart after a fault condition and a low standby power. The protections include thermal shutdown with hysteresis, delayed overload protection, and open loop failure protection.

1 Adapter features

Table 1. Electrical specifications

Symbol	Parameter	Value
V_{IN}	Input voltage range	[90 V _{AC} - 265 V _{AC}]
V_{OUT}	Output voltage	12 V
I_{OUT}	Max. output current	1 A
ΔV_{OUT_LF}	Precision of output regulation	± 5%
ΔV_{OUT_HF}	High frequency output voltage ripple	50 mV
T_{AMB}	Max. ambient operating temperature	60 °C

2 Circuit description

Figure 1. Application schematic - simplified for $V_{OUT} \geq 12\text{ V}$

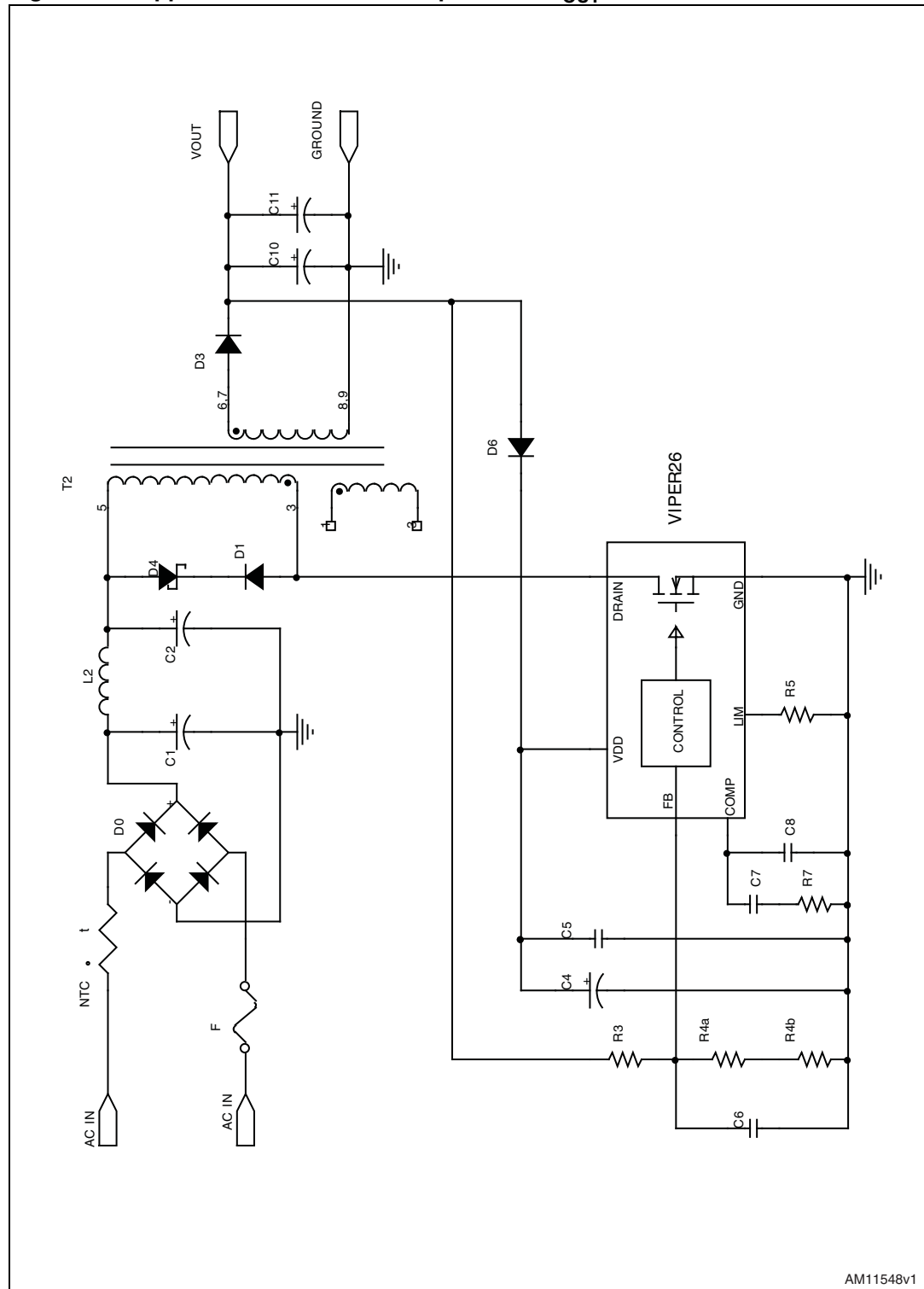


Table 2. Bill of material

Reference	Part	Description	Manufacturer
NTC	2.2 NTC	Thermistor, S236 series	Epcos
F	T2A 250 V	2 A, 250 Vac fuse, TR5 series	Wickmann
C1		10 μ F, 400 V NHG series electrolytic capacitor	Panasonic
C2		22 μ F, 35 V SMG series electrolytic capacitor	Panasonic
C4		2.2 μ F, 63 V electrolytic capacitor	
C5, C7		100 nF, 50 V ceramic capacitor	
C6		2.2 nF, 50 V ceramic capacitor	
C8		2.2 nF, 50 V ceramic capacitor	
C10		1000 F, 16 V ultra low ESR electrolytic capacitor ZL series	Rubycon
C11		680 F, 16 V ultra low ESR electrolytic capacitor ZL series	Rubycon
D0	DF06M	1 A - 600 V diode bridge	Vishay
D1	STTH1L06	1 A - 600 V ultrafast diode	ST
D3	STPS3150	3 A - 150 V power Schottky (output diode)	ST
D4	1.5KE300A	Transil	ST
D6	1N4148	Small signal diode	Fairchild
R3		47 k 1% 1/4 W resistor	
R4a		15 k 1% 1/4 W resistor	
R4b		2.7 k 1% 1/4 W resistor	
R5		27 k 1/4 W resistor	
R7		33 k 1/4 W resistor	
L2	RFB0807-102	Input filter inductor (L = 1 mH, I_{SAT} = 0.3 A; DCRmax = 3.4 Ω)	Coilcraft
T2	1335.0089	115 Hz switch mode transformer	Magnetica
IC1	VIPER26HN	High voltage 115 kHz PWM	ST

3 Measurements

Figure 2. Line regulation

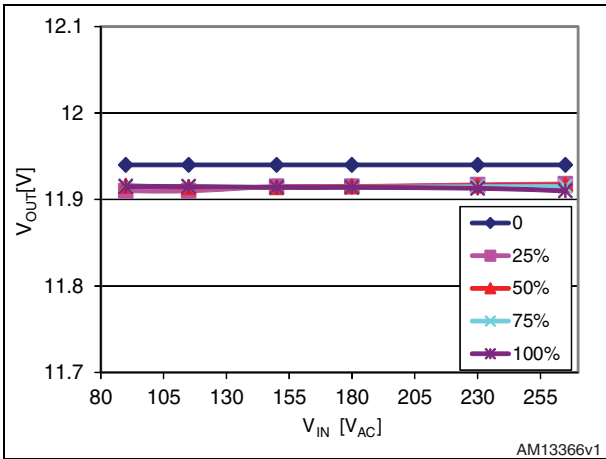


Figure 3. Load regulation

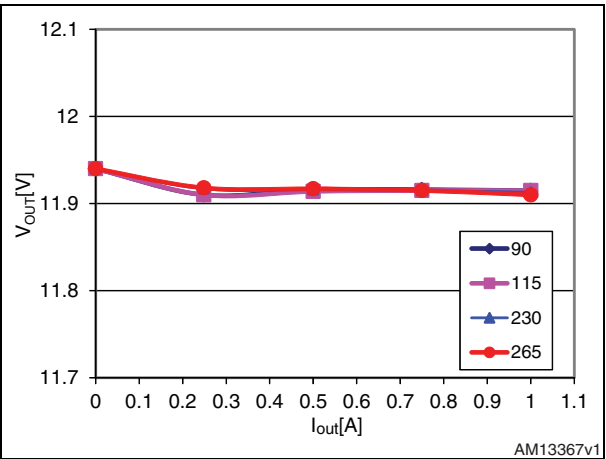


Figure 4. Efficiency vs. V_{IN}

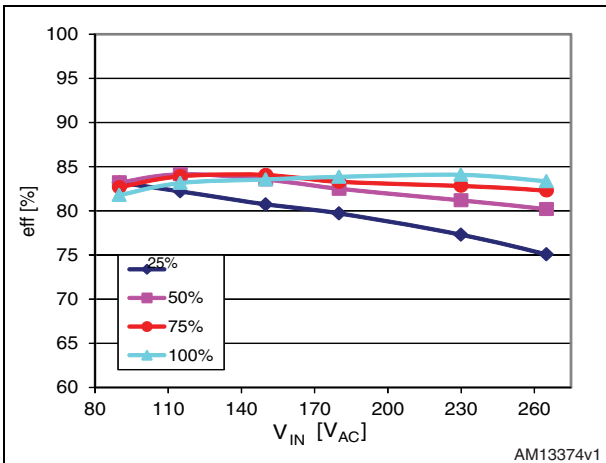


Figure 5. Efficiency vs. load

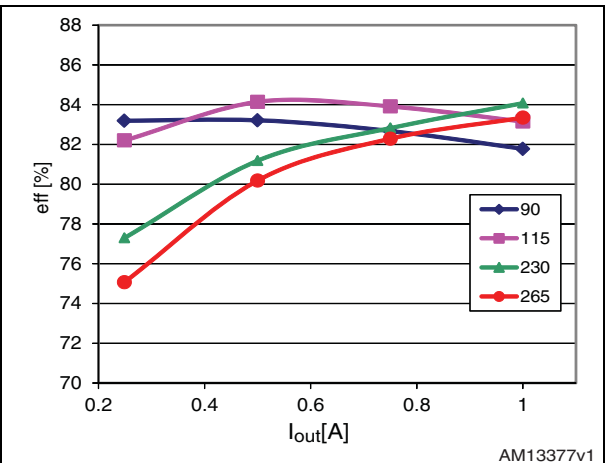


Figure 6. Active mode efficiency vs. V_{IN}

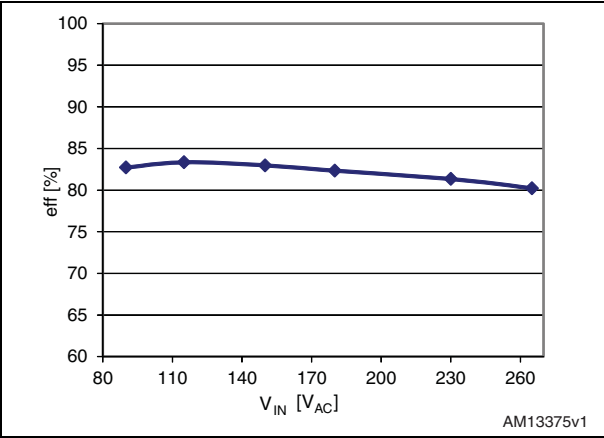


Figure 7. Input voltage averaged efficiency vs. load

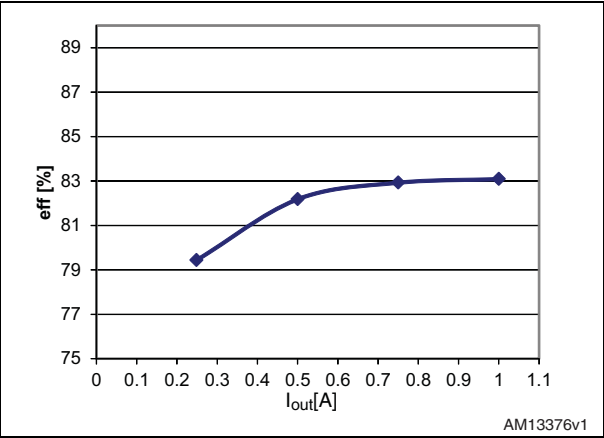


Figure 8. P_{IN} vs. V_{IN} at no load and light load

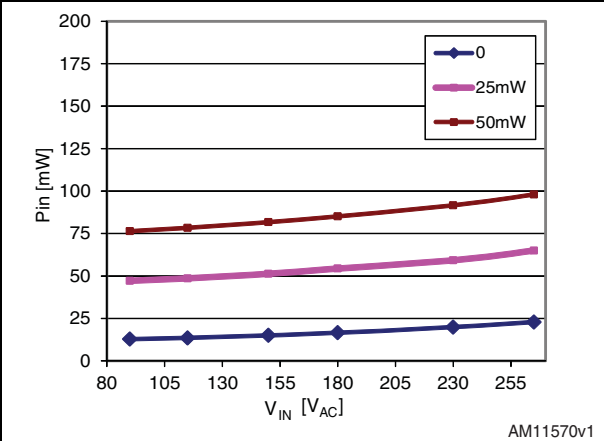
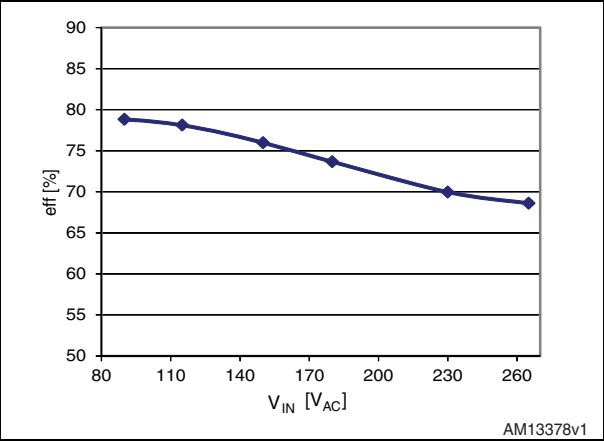
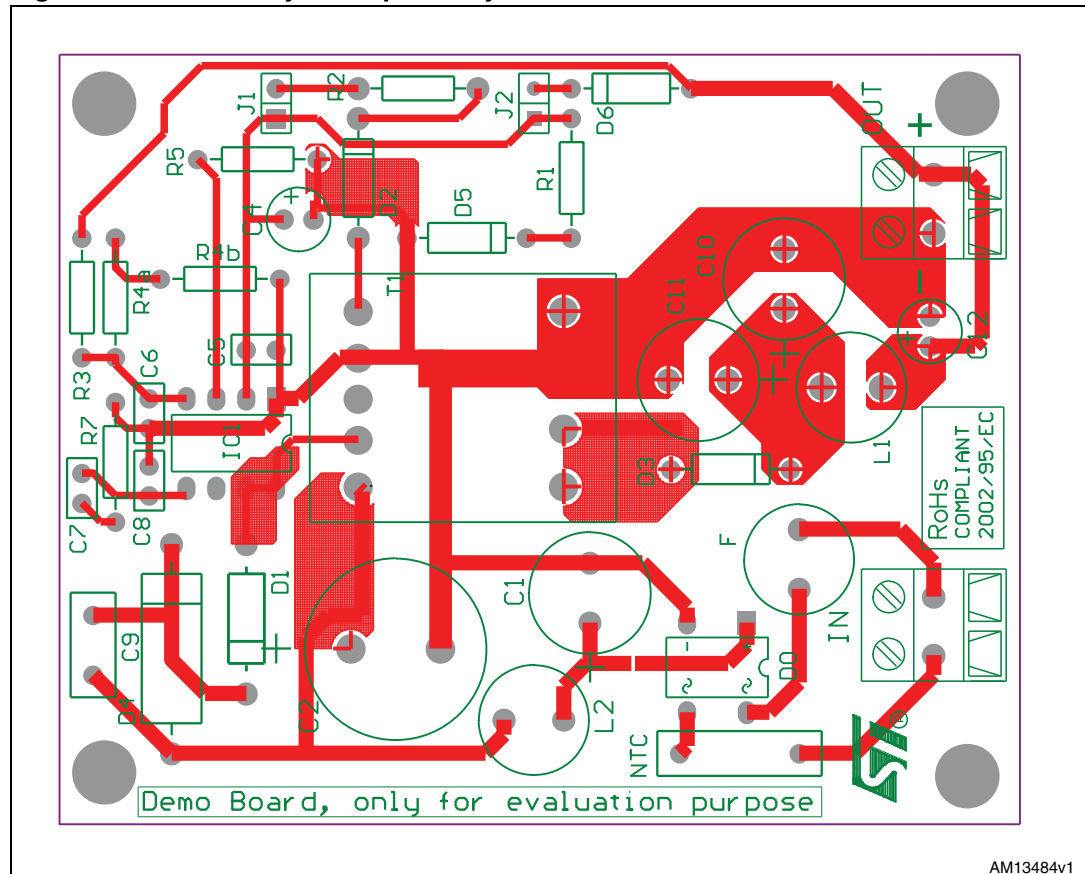


Figure 9. Efficiency vs. V_{IN} at $P_{IN} = 1$ W



4 Board layout

Figure 10. Bottom layer & top overlay



5 Revision history

Table 3. Document revision history

Date	Revision	Changes
10-Dec-2012	1	Initial release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2012 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

