

## 12V/8A, active clamp forward converter, Power Over Ethernet (PoE) IEEE 802.3bt compliant reference design



### Features

- Features of the [PM8805](#) PoE-PD interface:
  - System in package integrating a double active bridge, a hot-swap MOSFET and a PoE-PD
  - Supports legacy high power, 4-pair applications
  - 100 V N-ch MOSFETs with 0.2  $\Omega$  total path resistance for each active bridge
  - Identifies which kind of PSE (standard or legacy) is connected to, and provides successful IEEE802.3 af /at /bt classification indication as combination of the T0, T1 and T2 signals (open drain)
  - Smart operational mode selection through the STBY, FAUX and RAUX control signals
  - QFN 56 8x8mm package with 43 pins and 6 exposed pads
- Features of the [PM8804](#) PWM controller:
  - PWM peak current mode controller
  - Input operating voltage up to 75 V
  - Internal high voltage start up regulator with 20 mA capability
  - Programmable fixed frequency up to 1 Mhz
  - Soft start up with adjustable time
  - Soft turn off (optionally disabled)
  - Dual 1 A<sub>PK</sub>, low side complementary gate drivers
  - GATE2 optionally turned off for reduced consumption
  - 80% maximum duty cycle with internal slope compensation
  - QFN 16 3x3mm package with exposed pad

Product summary	
High power PoE PD, 12 V up to 8 A active clamp forward evaluation board	<a href="#">STEVAL-POE005V1</a>
PWM peak current mode controller for PoE and telecom systems	<a href="#">PM8804</a>
IEEE802.3bt PoE-PD interface with integrated dual-active bridge	<a href="#">PM8805</a>

### Description

This reference design represents a 12 V, 8 A converter solution ideal for various applications including building safety and security or surveillance, with a PoE-PD interface and a DC-DC active clamp forward converter.

The PoE-PD interface is based on the [PM8805](#) system in package device with two active bridges and an IEEE 802.3bt compliant Powered Device (PD) interface. It can be used in all medium-to-high power 2P and 4P high efficiency PoE and PoE+ applications.

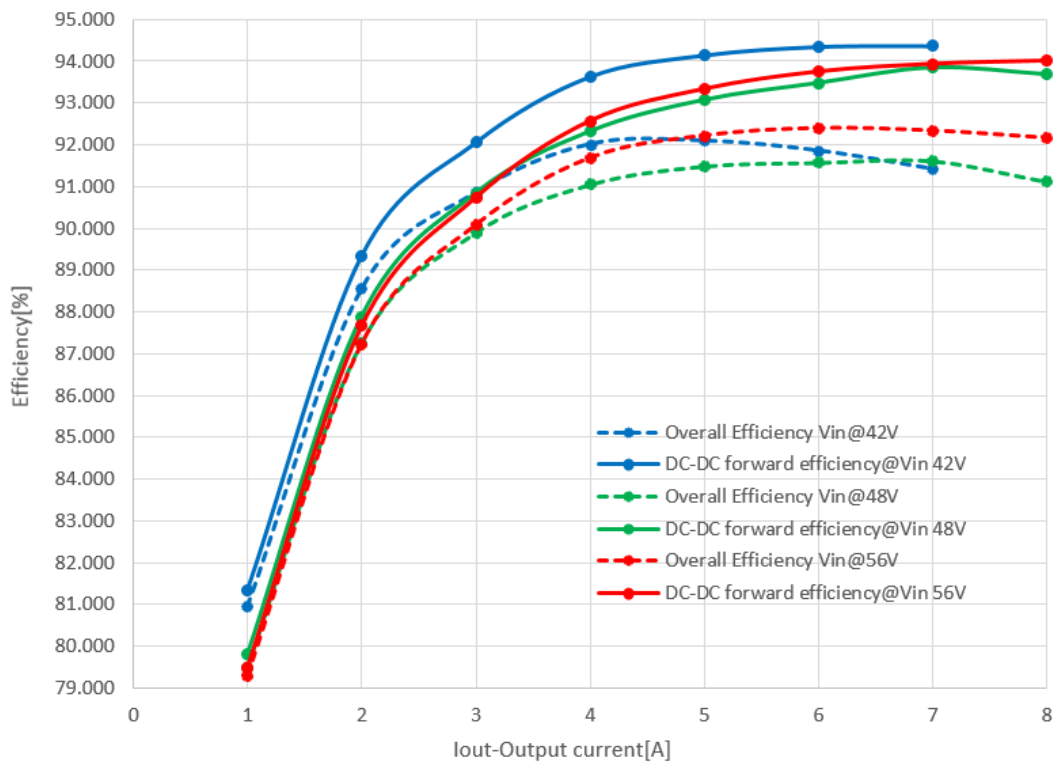
The DC-DC active clamp forward converter is designed around the [PM8804](#) PWM controller, which is an integrated solution for smart and efficient 48 V converters, featuring a programmable oscillator for the switching frequency, adjustable slope compensation, dual complementary low-side drivers with programmable dead time, programmable soft start, soft turn off and a programmable current sense blanking time.

# 1 Efficiency

The **STEVAL-POE005V1** reference design consists of a PoE interface compliant with the IEEE 802.3bt standard and a forward active clamp DC-DC converter that receives DC voltage from the PoE interface.

The figure below shows the efficiency of a single forward converter and the overall efficiency including the PoE interface power losses.

**Figure 1. STEVAL-POE005V1 overall and DC-DC forward efficiency**



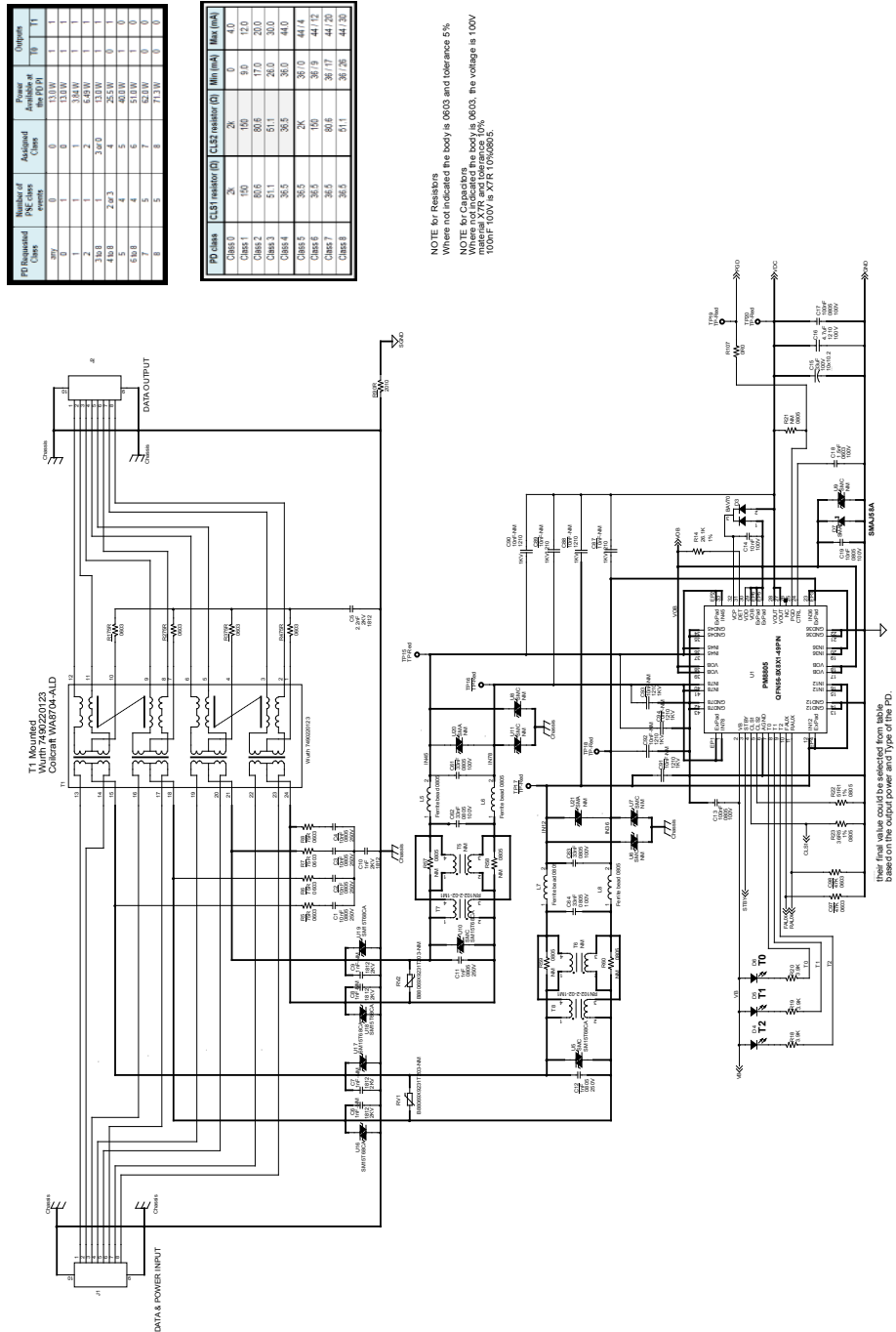
The dotted lines indicate the **STEVAL-POE005V1** efficiency at different DC input voltages applied to RJ45 connector J1. The continuous line indicates the DC-DC forward efficiency, which does not include the following losses associated with the PoE interface section:

- RJ45 connector J1
- PoE data transformer T1
- common chokes T7 and T8 placed on the two power supply pairs
- **PM8805** interface that integrates the dual power MOS bridges and a hot swap MOSFET
- Forward converter input filter

This efficiency is measured between output test points TP8/TP9 and input test points TP5/TP6 of the forward converter.

## 2 STEVAL-POE005V1 schematic diagrams

Figure 2. STEVAL-POE005V1 circuit schematic (1 of 3)



PD Requested Class	Number of PSE class events	Assigned Class	Power Available at the PDP1	Output
0	1	0	13.0W	1
1	1	1	3.84W	1
2	1	2	6.69W	1
3	1	3	10.5W	1
4	2	4	25.5W	0
5	4	5	40.0W	1
6	4	6	51.0W	0
7	5	7	61.0W	0
8	5	8	71.3W	0

PD class	CLZ1 resistor (R)	CLZ2 resistor (R)	Min (mA)	Max (mA)
Class 0	2k	0	0	4.0
Class 1	150	150	9.0	12.0
Class 2	606	606	17.0	20.0
Class 3	511	511	26.0	30.0
Class 4	363	363	36.0	40.0
Class 5	363	363	47.0	47.0
Class 6	363	363	58.0	58.0
Class 7	363	363	69.0	69.0
Class 8	363	363	80.0	80.0

NOTE for Resistors  
Where not indicated the body is 0603 and tolerance 5%  
NOTE for Capacitors  
Where not indicated the body is 0603, the voltage is 100V  
material X7R and tolerance 10%  
1000µF 100V is X7R1000005.

their final value could be selected from table based on the output power and type of the PD.

Figure 3. STEVAL-POE005V1 circuit schematic (2 of 3)

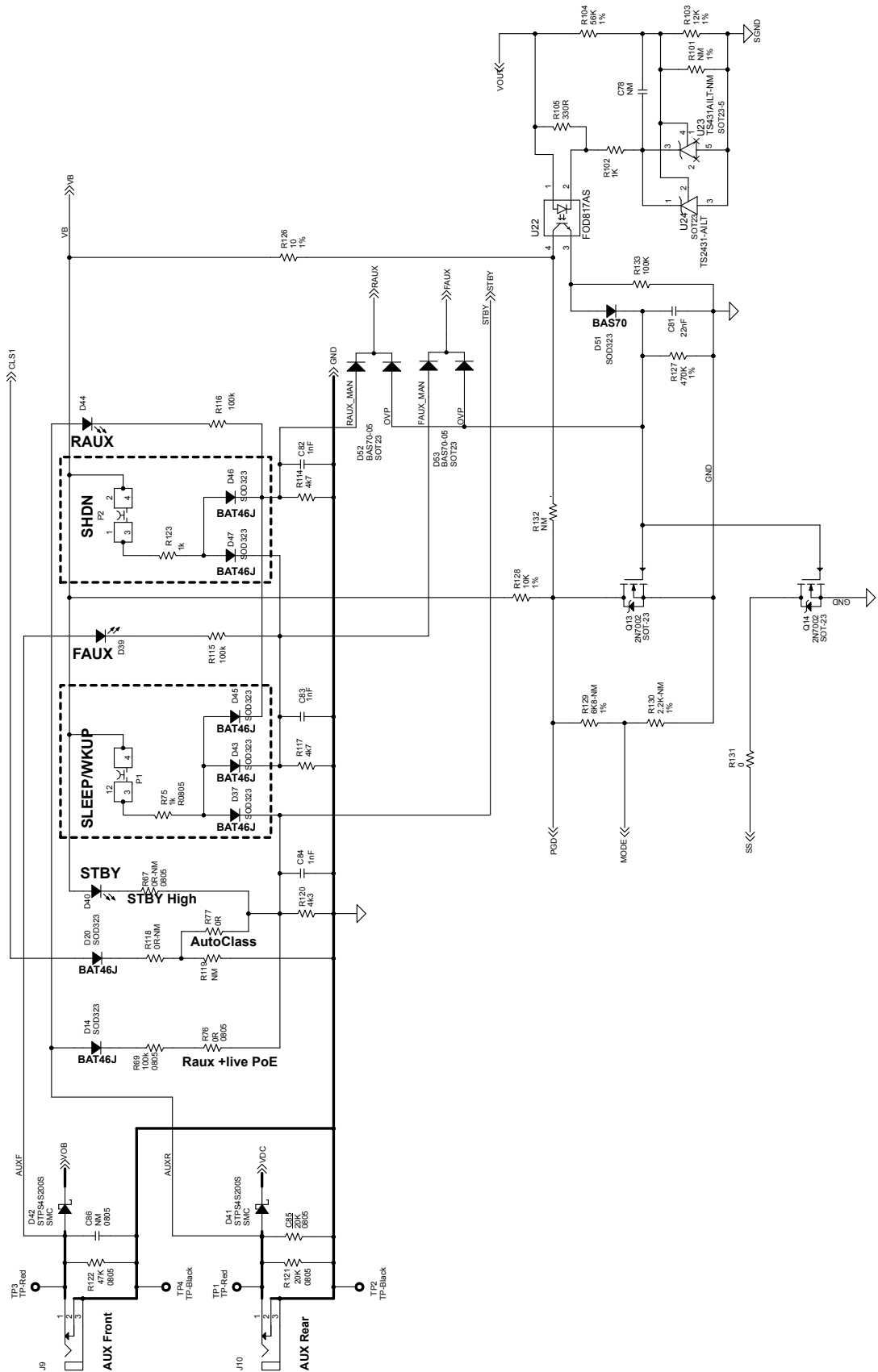
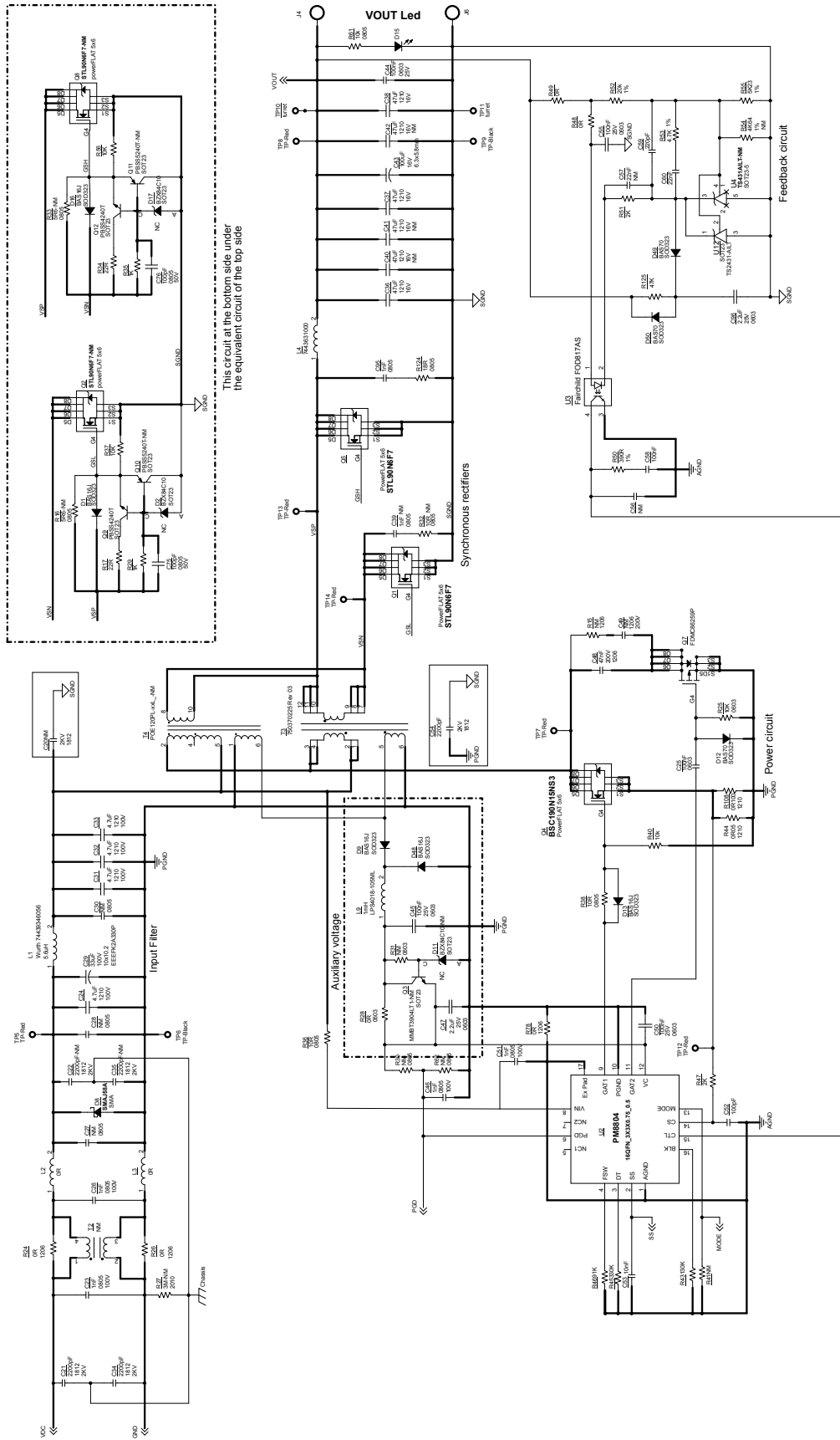


Figure 4. STEVAL-POE005V1 circuit schematic (3 of 3)



## Revision history

**Table 1. Document revision history**

Date	Version	Changes
05-Oct-2018	1	Initial release.
07-May-2019	2	Updated document title. Minor changes to cover page Features and Description.
14-Jun-2019	3	Updated cover page <a href="#">Features</a> and <a href="#">Description</a> .

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