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 Ω 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, 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

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.

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

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<thead>
<tr>
<th>Date</th>
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<tbody>
<tr>
<td>05-Oct-2018</td>
<td>1</td>
<td>Initial release.</td>
</tr>
<tr>
<td>07-May-2019</td>
<td>2</td>
<td>Updated document title.</td>
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<tr>
<td></td>
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<td>Minor changes to cover page Features and Description.</td>
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<tr>
<td>14-Jun-2019</td>
<td>3</td>
<td>Updated cover page Features and Description.</td>
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