The PMP30276 is a tampering protected power supply for smart meters. Therefore this board was tested under an external magnet field. A magnet (Neodym, N35, Br=1.21T, 50mm x 12.5mm x 50mm) was placed on the top of the transformer. The distance D between transformer and magnet was <5mm. The magnet generates a magnetic field of about 200mT for D=5mm.

1 Startup

1.1 No external magnet field

Input voltage = 156VAC
Load current = 1.0A
1.2 **External magnet field = 200mT**

Input voltage  = 156VAC  
Load current  = 1.0A
2 Shutdown

2.1 No external magnet field

Input voltage = 156VAC
Load current = 1.0A

Input voltage = 273VAC
Load current = 1.0A
2.2 External magnet field = 200mT

Input voltage  = 156VAC
Load current   = 1.0A

- Input voltage  = 273VAC
- Load current   = 1.0A
3 Efficiency and Load regulation

**PMP30276_RevB Efficiency**

- **Vin=230VAC without external magnet**
- **Vin=230VAC with magnet 200mT**

**PMP30276_RevB Load Regulation**

- **Vin=230VAC without external magnet**
- **Vin=230VAC with magnet 200mT**
4 Switch Node

4.1 No external magnet field
Input voltage = 325VDC
Load current = 1.0A

Input voltage = 622VDC
Load current = 1.0A
4.2 **External magnet field = 200mT**

Input voltage = 325VDC  
Load current = 1.0A
5 Output Ripple

5.1 No external magnet field
Input voltage  = 230VAC
Load current  = 1.0A

5.2 External magnet field = 200mT
Input voltage  = 230VAC
Load current  = 1.0A
6 Control Loop Frequency Response

6.1 No external magnet field

Output Load = 1.0A
Input voltage = 156VAC
Phase margin = 61°
Bandwidth = 3.4kHz

Output Load = 1.0A
Input voltage = 230VAC
Phase margin = 62°
Bandwidth = 3.3kHz

Output Load = 1.0A
Input voltage = 273VAC
Phase margin = 65°
Bandwidth = 3.1kHz
6.2 External magnet field = 200mT

Output Load = 1.0A
Input voltage = 156VAC
Phase margin = 92°
Bandwidth = 0.59kHz

Output Load = 1.0A
Input voltage = 230VAC
Phase margin = 89°
Bandwidth = 0.71kHz

Output Load = 1.0A
Input voltage = 273VAC
Phase margin = 82°
Bandwidth = 0.87kHz
7 Load step

7.1 No external magnet field

Input voltage = 230VAC
Load current = 0.5A – 1A

7.2 External magnet field = 200mT

Input voltage = 230VAC
Load current = 0.5A – 1A
8 Thermal Analysis

8.1 No external magnet field

The images below show the infrared images taken from the FlexCam after 15min at 0.5A output power.

Input voltage = 230VAC
Load current = 0.5A
Ambient temperature = 25°C
No heatsink, no airflow

<table>
<thead>
<tr>
<th>Name</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer T1</td>
<td>88.3°C</td>
</tr>
<tr>
<td>Mosfet Q1</td>
<td>54.3°C</td>
</tr>
<tr>
<td>Diode D3</td>
<td>58.1°C</td>
</tr>
</tbody>
</table>

Top Vin=230VAC Iload=500mA.is2

The images below show the infrared images taken from the FlexCam after 15min at full output power.

Input voltage = 230VAC
Load current = 1.0A
Ambient temperature = 25°C
No heatsink, no airflow

<table>
<thead>
<tr>
<th>Name</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer T1</td>
<td>118.9°C</td>
</tr>
<tr>
<td>Mosfet Q1</td>
<td>67.1°C</td>
</tr>
<tr>
<td>Diode D3</td>
<td>78.4°C</td>
</tr>
</tbody>
</table>

Top Vin=230VAC full load_1143.is2
<table>
<thead>
<tr>
<th>Name</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snubber D2</td>
<td>66.1°C</td>
</tr>
</tbody>
</table>

Bottom Vin=230VAC full load_1144.is2
9  EMI Measurement

The graph below shows the conducted emission EMI noise and the EN55022 Class-B Quasi-Peak limits (measurement from the worst case line). The measurement is not certified. The board was connected to a LISN and an isolation transformer; the load was a power resistor. The receiver was set to Quasi-peak detector, 10 KHz bandwidth. The negative terminal of the converter has been connected to the ground of the LISN.

9.1  No external magnet field

Input voltage  = 230VAC
Load current   = 1A

![Graph showing EMI measurement results](image_url)
9.2 External magnet field = 200mT

Input voltage = 230VAC
Load current = 1A

[Graph and table data]

Date: 1 JAN 1997 2:01:53
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