Test Report: PMP40347
3 phase AC input, 12W output reference design for smart meter

Description
- The reference design was designed for the 3phase smart meter application. It uses the UCC28600 quasi-resonant flyback controller to generate three isolated 12W rails from an extremely wide input from 110VAC to 420VAC. The design has good line and load regulation, and perfect protection feature.

1 Test Prerequisites

1.1 Voltage and Current Requirements

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage range</td>
<td>110Vac-420Vac</td>
</tr>
<tr>
<td>Output voltage VO1</td>
<td>12V</td>
</tr>
<tr>
<td>Output current IO1</td>
<td>0.2A</td>
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<table>
<thead>
<tr>
<th>Output voltage VO2</th>
<th>12V</th>
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<tr>
<td>Output current IO2</td>
<td>0.7A</td>
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<tr>
<td>Output voltage VO3</td>
<td>5V</td>
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<tr>
<td>Output current IO3</td>
<td>0.2A</td>
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</tbody>
</table>

1.2 Required Equipment

- Chroma programmable AC source 61503
- Tektronix digital phosphor oscilloscope DPO3054
- Chroma Programmable DC power supply model 62012P-600-8
- Chroma DC electronic load 6314A

2 Testing and Results

2.1 Efficiency Graphs

![PMP40347 Efficiency VS input voltage](image)

2.2 Efficiency Data

<table>
<thead>
<tr>
<th>Vin (Vdc)</th>
<th>Pin (W)</th>
<th>V1 (V)</th>
<th>Io_V1 (A)</th>
<th>V2 (V)</th>
<th>Io_V2 (A)</th>
<th>V3 (V)</th>
<th>Io_V3 (A)</th>
<th>Effi (%)</th>
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<tbody>
<tr>
<td>150</td>
<td>0.099</td>
<td>14.910</td>
<td>11.953</td>
<td>0.198</td>
<td>12.003</td>
<td>0.692</td>
<td>4.969</td>
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<td>14.800</td>
<td>11.953</td>
<td>0.198</td>
<td>12.003</td>
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<td>0.691</td>
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<td>0.198</td>
</tr>
<tr>
<td>Vin (Vdc)</td>
<td>Iin (A)</td>
<td>Pin (W)</td>
<td>V1 (V)</td>
<td>Io_V1 (A)</td>
<td>V2 (V)</td>
<td>Io_V2 (A)</td>
<td>V3 (V)</td>
<td>Io_V3 (A)</td>
</tr>
<tr>
<td>----------</td>
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<td>12.000</td>
<td>0.346</td>
<td>4.969</td>
<td>0.099</td>
</tr>
</tbody>
</table>

2.3 Thermal Images

Top View
Vin: 530V DC
Io_V1=0.2A, Io_V2=0.7A, Io_V3=0.1A

Bottom View
Vin: 530V DC
Io_V1=0.2A, Io_V2=0.7A, Io_V3=0.1A

2.4 Dimensions
3 Waveforms

3.1 Switching

Vin: 530V DC
Io1=0.2A, Io2=0.7A, I3=0.2A

3.2 Output Voltage Ripple

Vin: 150V DC, V1 no load, V2 V3 full load
Ch1: V1 ripple

Vin: 150V DC, V1 V2 V3 full load
Ch1: V1 ripple

Vin: 530V DC, V1 no load, V2 V3 full load
Ch1: V1 ripple

Vin: 530V DC, V1 V2 V3 full load
Ch1: V1 ripple
Vin: 590 V DC, V1 no load, V2 V3 full load
Ch1: V1 ripple

Vin: 590 V DC, V1 V2 V3 full load
Ch1: V1 ripple

Vin: 150 V DC, V2 no load, V1 V3 full load
Ch1: V2 ripple

Vin: 150 V DC, V1 V2 V3 full load
Ch1: V2 ripple

Vin: 530 V DC, V2 no load, V1 V3 full load
Ch1: V2 ripple

Vin: 530 V DC, V1 V2 V3 full load
Ch1: V2 ripple

Vin: 590 V DC, V2 no load, V1 V3 full load
Ch1: V2 ripple

Vin: 590 V DC, V1 V2 V3 full load
Ch1: V2 ripple
Vin: 150V DC, V3 no load, V1 V2 full load
Ch1: V3 ripple

Vin: 530V DC, V3 no load, V1 V2 full load
Ch1: V3 ripple

Vin: 590V DC, V3 no load, V1 V2 full load
Ch1: V3 ripple
3.3 Start-up Sequence

Vin: 150V DC, V1 V2 V3 full load start up
Ch1: V1 voltage
Ch2: V2 voltage
Ch3: V3 voltage

Vin: 530V DC, V1 V2 V3 full load start up
Ch1: V1 voltage
Ch2: V2 voltage
Ch3: V3 voltage

Vin: 150V DC, V1 V2 V3 full load start up
Ch1: V1 voltage, with 2200uF cap load
Ch2: V2 voltage
Ch3: V3 voltage

Vin: 530V DC, V1 V2 V3 full load start up
Ch1: V1 voltage, with 2200uF cap load
Ch2: V2 voltage
Ch3: V3 voltage

Vin: 150V DC, V1 V2 V3 full load start up
Ch1: V1 voltage
Ch2: V2 voltage, with 3300uF cap load
Ch3: V3 voltage

Vin: 530V DC, V1 V2 V3 full load start up
Ch1: V1 voltage
Ch2: V2 voltage, with 3300uF cap load
Ch3: V3 voltage
Vin: 150V DC, V1 V2 V3 full load start up
Ch1: V1 voltage
Ch2: V2 voltage
Ch3: V3 voltage, with 470uF cap load

Vin: 530V DC, V1 V2 V3 full load start up
Ch1: V1 voltage
Ch2: V2 voltage
Ch3: V3 voltage, with 470uF cap load
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