Test Data
For PMP9350
2/24/2014
Rev 2
1. Circuit Description

PMP9350 is a Constant On-Time synchronous buck regulator utilizing the LM5017 wide-vin with integrated HS and LS MOSFETs. For industrial/automotive applications. The switching frequency has been set to 575 kHz. This board was developed to fit into space-constrained applications. It also uses an external SS circuit for a reduced start-up time.

<table>
<thead>
<tr>
<th>Vin</th>
<th>20V-100V +/-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vout(s)</td>
<td>12V</td>
</tr>
<tr>
<td>Iout Max</td>
<td>400mA</td>
</tr>
<tr>
<td>FSW</td>
<td>~575kHz</td>
</tr>
</tbody>
</table>
2. Photos

Top Side:

![Top Side Image]

Bottom Side:

![Bottom Side Image]
3. Thermal Images.

Steady State Temp – 20Vin, 12Vout at 400mA. (10min run time)

![Thermal Image 1](image1.png)

The IC is the hottest item. Temp rise is approximately 19.2°C
*Note: Board copper weight is 1oz, 0.5oz, 0.5oz, 1oz. Suggest increasing copper weight for improved thermal performance.*

Steady State Temp – 100Vin, 12Vout at 400mA. (10min run time)

![Thermal Image 2](image2.png)

The IC is the hottest item. Temp rise is approximately 70.2°C
*Note: Board copper weight is 1oz, 0.5oz, 0.5oz, 1oz. Suggest increasing copper weight for improved thermal performance.*
4. Efficiency Data

Efficiency Curve
## Efficiency Curve Data

<table>
<thead>
<tr>
<th>Vol [V]</th>
<th>Is [mA]</th>
<th>Vo2 [V]</th>
<th>Io2 [mA]</th>
<th>P02 [mW]</th>
<th>P02 [%]</th>
<th>ERP [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.00</td>
<td>0.0557</td>
<td>12.046</td>
<td>0.01</td>
<td>0.21</td>
<td>0.13</td>
<td>0.09</td>
</tr>
<tr>
<td>20.00</td>
<td>0.0364</td>
<td>12.024</td>
<td>0.05</td>
<td>0.73</td>
<td>0.60</td>
<td>0.13</td>
</tr>
<tr>
<td>20.00</td>
<td>0.0885</td>
<td>12.021</td>
<td>0.10</td>
<td>1.38</td>
<td>1.20</td>
<td>0.17</td>
</tr>
<tr>
<td>20.00</td>
<td>0.1011</td>
<td>12.019</td>
<td>0.15</td>
<td>2.02</td>
<td>1.80</td>
<td>0.22</td>
</tr>
<tr>
<td>20.00</td>
<td>0.3136</td>
<td>12.016</td>
<td>0.20</td>
<td>2.65</td>
<td>2.40</td>
<td>0.25</td>
</tr>
<tr>
<td>20.00</td>
<td>0.1652</td>
<td>12.014</td>
<td>0.25</td>
<td>3.30</td>
<td>3.00</td>
<td>0.30</td>
</tr>
<tr>
<td>20.00</td>
<td>0.1968</td>
<td>12.011</td>
<td>0.30</td>
<td>3.94</td>
<td>3.60</td>
<td>0.33</td>
</tr>
<tr>
<td>20.00</td>
<td>0.2297</td>
<td>12.009</td>
<td>0.35</td>
<td>4.59</td>
<td>4.20</td>
<td>0.39</td>
</tr>
<tr>
<td>20.00</td>
<td>0.2658</td>
<td>12.007</td>
<td>0.40</td>
<td>5.24</td>
<td>4.80</td>
<td>0.43</td>
</tr>
</tbody>
</table>

| 35.00   | 0.0082  | 12.399  | 0.01     | 0.30     | 0.12    | 0.17    | 41.06%  |
| 35.00   | 0.0233  | 12.385  | 0.05     | 0.80     | 0.61    | 0.19    | 76.35%  |
| 35.00   | 0.0431  | 12.366  | 0.10     | 1.55     | 1.22    | 0.33    | 78.88%  |
| 35.00   | 0.0629  | 12.352  | 0.15     | 2.26     | 1.84    | 0.43    | 81.05%  |
| 35.00   | 0.0818  | 12.331  | 0.20     | 2.94     | 2.45    | 0.50    | 83.07%  |
| 35.00   | 0.1007  | 12.318  | 0.25     | 3.63     | 3.06    | 0.57    | 83.43%  |
| 35.00   | 0.1191  | 12.295  | 0.30     | 4.29     | 3.67    | 0.62    | 85.54%  |
| 35.00   | 0.1382  | 12.272  | 0.35     | 4.98     | 4.28    | 0.70    | 85.08%  |
| 35.00   | 0.1572  | 12.249  | 0.40     | 5.66     | 4.89    | 0.77    | 80.37%  |

| 56.00   | 0.0095  | 12.496  | 0.01     | 0.39     | 0.12    | 0.26    | 32.25%  |
| 56.00   | 0.0162  | 12.477  | 0.05     | 0.91     | 0.63    | 0.29    | 68.38%  |
| 56.00   | 0.0305  | 12.466  | 0.10     | 1.71     | 1.24    | 0.47    | 72.40%  |
| 56.00   | 0.0452  | 12.468  | 0.15     | 2.59     | 1.86    | 0.73    | 71.71%  |
| 56.00   | 0.0591  | 12.466  | 0.20     | 3.31     | 2.47    | 0.84    | 74.71%  |
| 56.00   | 0.0721  | 12.461  | 0.25     | 4.04     | 3.09    | 0.95    | 76.54%  |
| 56.00   | 0.0830  | 12.457  | 0.30     | 4.76     | 3.71    | 1.06    | 77.88%  |
| 56.00   | 0.0977  | 12.454  | 0.35     | 5.47     | 4.12    | 1.15    | 79.03%  |
| 56.00   | 0.1106  | 12.451  | 0.40     | 6.19     | 4.89    | 1.25    | 79.77%  |

| 100.00  | 0.0042  | 12.704  | 0.01     | 0.62     | 0.13    | 0.49    | 20.49%  |
| 100.00  | 0.0121  | 12.631  | 0.05     | 1.21     | 0.63    | 0.58    | 52.19%  |
| 100.00  | 0.0219  | 12.569  | 0.10     | 2.19     | 1.26    | 0.93    | 57.39%  |
| 100.00  | 0.0340  | 12.534  | 0.15     | 3.40     | 1.88    | 1.52    | 55.39%  |
| 100.00  | 0.0448  | 12.560  | 0.20     | 4.48     | 2.51    | 1.97    | 56.07%  |
| 100.00  | 0.0551  | 12.551  | 0.25     | 5.31     | 3.14    | 2.17    | 59.09%  |
| 100.00  | 0.0612  | 12.544  | 0.30     | 6.12     | 3.76    | 2.36    | 61.49%  |
| 100.00  | 0.0951  | 12.537  | 0.35     | 8.91     | 4.19    | 2.52    | 63.50%  |
| 100.00  | 0.0770  | 12.532  | 0.40     | 7.70     | 5.01    | 2.69    | 65.10%  |

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**Texas Instruments**

Test Report PMP9350

2/24/14
5. Waveforms

Switch-Node & Output Ripple Voltage

20Vin, 12Vout @ 400mA load current.

(≈ 28.0mV pk-pk)

24Vin, 12Vout @ 400mA load current.

(≈ 35.0mV pk-pk)

36Vin, 12Vout @ 400mA load current.

(≈ 40.0mV pk-pk)
48Vin, 12Vout @ 400mA load current.

(~ 44.0mV pk-pk)

56Vin, 12Vout @ 400mA load current.

(~ 50.0mV pk-pk)

72Vin, 12Vout @ 400mA load current.

(~ 57.0mV pk-pk)
100Vin, 12Vout @ 400mA load current. 
(~ 75.0mV pk-pk)

Transient Response Test

20Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz, 50% duty cycle, 12V out. Load Step on/off.

24Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz, 50% duty cycle, 12V out. Load Step on/off.
36Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz, 50% duty cycle, 12V out. Load Step on/off.

48Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz, 50% duty cycle, 12V out. Load Step on/off.

56Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz, 50% duty cycle, 12V out. Load Step on/off.
72Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz, 50% duty cycle, 12V out. Load Step on/off.

100Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz, 50% duty cycle, 12V out. Load Step on/off.
Startup Test

20Vin, 12Vout @ no load current.

20Vin, 12Vout @ 27.77Ω Load.

20Vin, 12Vout @ no load current. In-rush zoom.

20Vin, 12Vout @ 27.77Ω Load. In-rush zoom.

24Vin, 12Vout @ no load current.

24Vin, 12Vout @ 27.77Ω Load.
24Vin, 12Vout @ no load current. In-rush zoom.

24Vin, 12Vout @ 27.77Ω Load. In-rush zoom.

36Vin, 12Vout @ no load current.

36Vin, 12Vout @ 27.77Ω Load.

36Vin, 12Vout @ no load current. In-rush zoom.

36Vin, 12Vout @ 27.77Ω Load. In-rush zoom.
48Vin, 12Vout @ no load current.

48Vin, 12Vout @ 27.77Ω Load.

48Vin, 12Vout @ no load current. In-rush zoom.

48Vin, 12Vout @ 27.77Ω Load. In-rush zoom.

56Vin, 12Vout @ no load current.

56Vin, 12Vout @ 27.77Ω Load.
56Vin, 12Vout @ no load current. In-rush zoom.

72Vin, 12Vout @ no load current.

72Vin, 12Vout @ 27.77Ω Load.

72Vin, 12Vout @ 27.77Ω Load. In-rush zoom.
100Vin, 12Vout @ no load current.

100Vin, 12Vout @ 27.77Ω Load.

100Vin, 12Vout @ no load current. In-rush zoom.

100Vin, 12Vout @ 27.77Ω Load. In-rush zoom.
Short-Circuit Test

Applied to board under the following conditions:
20Vin, 12Vout @ no load current.

20Vin, 12Vout @ 400mA Load.

24Vin, 12Vout @ no load current.
24Vin, 12Vout @ 400mA Load.

36Vin, 12Vout @ no load current.

36Vin, 12Vout @ 400mA Load.
48Vin, 12Vout @ no load current.

48Vin, 12Vout @ 400mA Load.

56Vin, 12Vout @ no load current.
56Vin, 12Vout @ 400mA Load.

72Vin, 12Vout @ no load current.

72Vin, 12Vout @ 400mA Load.
100Vin, 12Vout @ no load current.

100Vin, 12Vout @ 400mA Load.

**Short-Circuit Recovery Test**

Applied to board under the following conditions:
20Vin, 12Vout @ no load current.
20Vin, 12Vout @ 400mA Load.

24Vin, 12Vout @ no load current.

24Vin, 12Vout @400mA Load.
36Vin, 12Vout @ no load current.

36Vin, 12Vout @ 400mA Load.

48Vin, 12Vout @ no load current.
48Vin, 12Vout @ 400mA Load.

56Vin, 12Vout @ no load current.

56Vin, 12Vout @ 400mA Load.
72Vin, 12Vout @ no load current.

72Vin, 12Vout @ 400mA Load.

100Vin, 12Vout @ no load current.
100Vin, 12Vout @ 400mA Load.
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