1 General

1.1 Purpose

This test report is to provide the detailed data for evaluating and verifying the PMP40294 which performs a battery powered bi-directional system. It employs a bidirectional Buck-Boost Controller ---- BQ25703A with a user command switch. It can support any adaptor input within 5V-20V. And the system can also output multiple output options including 5/9/12/14.5/15/16/19/20V. the max output power is designed as 45W and valid battery voltage is from 9V to 13.2V.

1.2 Reference Documentation

Schematic: PMP40294_Sch.pdf
Gerber: PMP40294_GerberNCdrills.zip
Layer Plot: PMP40294_PCBlayers.pdf
Assembly Drawing: PMP40294_Assy.pdf
CAD File: PMP40294_CAD.zip
BOM: PMP40294_BOM.pdf

1.3 Test Equipment

Multi-meter (current): Fluke 287C
Multi-meter (voltage): Fluke 287C
DC Source: Chroma 62006P-100-25
E-Load: Chroma 63105A module
Oscilloscope: Tektronix DPO3054
Electrical Thermography: Fluke Ti9
2 Performance Data and Waveform

2.1 Efficiency

2.1.1 5V Input in Forward Mode

<table>
<thead>
<tr>
<th>$V_{IN}(V)$</th>
<th>$I_{IN}(A)$</th>
<th>$V_{BAT}(V)$</th>
<th>$I_{BAT}(A)$</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.077</td>
<td>0.409</td>
<td>9.294</td>
<td>0.194</td>
<td>86.83%</td>
</tr>
<tr>
<td>5.057</td>
<td>0.878</td>
<td>9.294</td>
<td>0.436</td>
<td>91.24%</td>
</tr>
<tr>
<td>5.016</td>
<td>1.842</td>
<td>9.294</td>
<td>0.938</td>
<td>94.39%</td>
</tr>
<tr>
<td>4.975</td>
<td>2.823</td>
<td>9.294</td>
<td>1.403</td>
<td>92.81%</td>
</tr>
<tr>
<td>5.073</td>
<td>0.496</td>
<td>11.095</td>
<td>0.194</td>
<td>85.59%</td>
</tr>
<tr>
<td>5.050</td>
<td>1.056</td>
<td>11.095</td>
<td>0.436</td>
<td>90.70%</td>
</tr>
<tr>
<td>5.001</td>
<td>2.205</td>
<td>11.096</td>
<td>0.931</td>
<td>93.67%</td>
</tr>
<tr>
<td>4.970</td>
<td>2.938</td>
<td>11.096</td>
<td>1.209</td>
<td>91.90%</td>
</tr>
<tr>
<td>5.070</td>
<td>0.565</td>
<td>12.523</td>
<td>0.194</td>
<td>84.86%</td>
</tr>
<tr>
<td>5.044</td>
<td>1.196</td>
<td>12.523</td>
<td>0.434</td>
<td>90.12%</td>
</tr>
<tr>
<td>4.989</td>
<td>2.486</td>
<td>12.523</td>
<td>0.923</td>
<td>93.23%</td>
</tr>
<tr>
<td>4.970</td>
<td>2.938</td>
<td>12.523</td>
<td>1.063</td>
<td>91.17%</td>
</tr>
</tbody>
</table>

2.1.2 9V Input in Forward Mode

<table>
<thead>
<tr>
<th>$V_{IN}(V)$</th>
<th>$I_{IN}(A)$</th>
<th>$V_{BAT}(V)$</th>
<th>$I_{BAT}(A)$</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.091</td>
<td>0.226</td>
<td>9.294</td>
<td>0.193</td>
<td>87.35%</td>
</tr>
<tr>
<td>9.079</td>
<td>0.510</td>
<td>9.294</td>
<td>0.462</td>
<td>92.77%</td>
</tr>
<tr>
<td>V IN(V)</td>
<td>I IN(A)</td>
<td>V BAT(V)</td>
<td>I BAT(A)</td>
<td>Efficiency</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>----------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>12.095</td>
<td>0.174</td>
<td>9.294</td>
<td>0.200</td>
<td>88.19%</td>
</tr>
<tr>
<td>12.085</td>
<td>0.392</td>
<td>9.294</td>
<td>0.457</td>
<td>89.58%</td>
</tr>
<tr>
<td>12.068</td>
<td>0.803</td>
<td>9.294</td>
<td>0.985</td>
<td>94.50%</td>
</tr>
<tr>
<td>12.051</td>
<td>1.223</td>
<td>9.294</td>
<td>1.500</td>
<td>94.59%</td>
</tr>
</tbody>
</table>
### 2.1.4 15V Input in Forward Mode

<table>
<thead>
<tr>
<th>$V_{IN}$(V)</th>
<th>$I_{IN}$(A)</th>
<th>$V_{BAT}$(V)</th>
<th>$I_{BAT}$(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.093</td>
<td>0.144</td>
<td>9.294</td>
<td>0.201</td>
<td>85.78%</td>
</tr>
<tr>
<td>15.086</td>
<td>0.321</td>
<td>9.294</td>
<td>0.456</td>
<td>87.44%</td>
</tr>
<tr>
<td>15.073</td>
<td>0.645</td>
<td>9.294</td>
<td>0.977</td>
<td>93.39%</td>
</tr>
</tbody>
</table>
15.058 | 0.991 | 9.294 | 1.499 | 93.36%
15.044 | 1.315 | 9.294 | 2.017 | 94.74%
15.030 | 1.642 | 9.294 | 2.520 | 94.90%
15.018 | 1.928 | 9.294 | 2.975 | 95.48%

| 15.093 | 0.169 | 11.095 | 0.201 | 87.26%
| 15.084 | 0.375 | 11.095 | 0.456 | 89.36%
| 15.068 | 0.759 | 11.096 | 0.977 | 94.78%
| 15.050 | 1.174 | 11.095 | 1.500 | 94.19%
| 15.033 | 1.559 | 11.096 | 2.018 | 95.52%
| 15.018 | 1.947 | 11.096 | 2.521 | 95.66%
| 15.002 | 2.286 | 11.096 | 2.977 | 96.31%

| 15.092 | 0.187 | 12.524 | 0.201 | 89.02%
| 15.082 | 0.418 | 12.524 | 0.457 | 90.71%
| 15.064 | 0.850 | 12.524 | 0.977 | 95.55%
| 15.044 | 1.318 | 12.523 | 1.500 | 94.74%
| 15.026 | 1.751 | 12.524 | 2.019 | 96.12%
| 15.007 | 2.188 | 12.524 | 2.522 | 96.19%
| 14.991 | 2.568 | 12.524 | 2.977 | 96.84%

---

2.1.5 20V Input in Forward Mode

<table>
<thead>
<tr>
<th>$V_{IN}(V)$</th>
<th>$I_{IN}(A)$</th>
<th>$V_{BAT}(V)$</th>
<th>$I_{BAT}(A)$</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.037</td>
<td>0.116</td>
<td>9.294</td>
<td>0.201</td>
<td>80.21%</td>
</tr>
</tbody>
</table>

---

**15V Input@Forward Mode**

![Graph showing efficiency vs. battery current for different battery currents and voltages]
20V Input@Forward Mode

<table>
<thead>
<tr>
<th>Battery Current(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>55%</td>
</tr>
<tr>
<td>0.5</td>
<td>60%</td>
</tr>
<tr>
<td>1.0</td>
<td>65%</td>
</tr>
<tr>
<td>1.5</td>
<td>70%</td>
</tr>
<tr>
<td>2.0</td>
<td>75%</td>
</tr>
<tr>
<td>2.5</td>
<td>80%</td>
</tr>
<tr>
<td>3.0</td>
<td>85%</td>
</tr>
<tr>
<td>3.5</td>
<td>90%</td>
</tr>
<tr>
<td>4.0</td>
<td>95%</td>
</tr>
<tr>
<td>4.5</td>
<td>100%</td>
</tr>
</tbody>
</table>

2.1.6 5V Output in Reverse Mode

<table>
<thead>
<tr>
<th>V_{BAT}(V)</th>
<th>I_{BAT}(A)</th>
<th>V_o(V)</th>
<th>I_o(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.292</td>
<td>0.305</td>
<td>5.033</td>
<td>0.498</td>
<td>88.40%</td>
</tr>
</tbody>
</table>
### 5V Output in Reverse Mode

<table>
<thead>
<tr>
<th>BAT(V)</th>
<th>I(BAT) (A)</th>
<th>Vout(V)</th>
<th>Iout(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.283</td>
<td>0.582</td>
<td>5.028</td>
<td>0.993</td>
<td>92.39%</td>
</tr>
<tr>
<td>9.274</td>
<td>0.868</td>
<td>5.021</td>
<td>1.502</td>
<td>93.69%</td>
</tr>
<tr>
<td>9.264</td>
<td>1.149</td>
<td>5.015</td>
<td>1.996</td>
<td>94.04%</td>
</tr>
<tr>
<td>9.255</td>
<td>1.432</td>
<td>5.009</td>
<td>2.490</td>
<td>94.11%</td>
</tr>
<tr>
<td>9.245</td>
<td>1.727</td>
<td>5.003</td>
<td>2.999</td>
<td>93.97%</td>
</tr>
<tr>
<td>11.093</td>
<td>0.262</td>
<td>5.030</td>
<td>0.497</td>
<td>86.00%</td>
</tr>
<tr>
<td>11.085</td>
<td>0.496</td>
<td>5.025</td>
<td>0.992</td>
<td>90.65%</td>
</tr>
<tr>
<td>11.077</td>
<td>0.736</td>
<td>5.019</td>
<td>1.501</td>
<td>92.40%</td>
</tr>
<tr>
<td>11.069</td>
<td>0.971</td>
<td>5.013</td>
<td>1.995</td>
<td>93.04%</td>
</tr>
<tr>
<td>11.061</td>
<td>1.208</td>
<td>5.005</td>
<td>2.490</td>
<td>93.27%</td>
</tr>
<tr>
<td>11.053</td>
<td>1.454</td>
<td>5.000</td>
<td>2.999</td>
<td>93.31%</td>
</tr>
<tr>
<td>12.593</td>
<td>0.236</td>
<td>5.030</td>
<td>0.497</td>
<td>84.10%</td>
</tr>
<tr>
<td>12.587</td>
<td>0.443</td>
<td>5.025</td>
<td>0.992</td>
<td>89.39%</td>
</tr>
<tr>
<td>12.580</td>
<td>0.655</td>
<td>5.019</td>
<td>1.501</td>
<td>91.42%</td>
</tr>
<tr>
<td>12.573</td>
<td>0.862</td>
<td>5.013</td>
<td>1.995</td>
<td>92.27%</td>
</tr>
<tr>
<td>12.566</td>
<td>1.071</td>
<td>5.005</td>
<td>2.490</td>
<td>92.60%</td>
</tr>
<tr>
<td>12.559</td>
<td>1.287</td>
<td>4.999</td>
<td>2.999</td>
<td>92.75%</td>
</tr>
</tbody>
</table>

#### 2.1.7 9V Output in Reverse Mode

<table>
<thead>
<tr>
<th>BAT(V)</th>
<th>I(BAT) (A)</th>
<th>Vout(V)</th>
<th>Iout(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.285</td>
<td>0.521</td>
<td>9.104</td>
<td>0.496</td>
<td>93.32%</td>
</tr>
<tr>
<td>9.268</td>
<td>1.013</td>
<td>9.099</td>
<td>0.992</td>
<td>96.18%</td>
</tr>
<tr>
<td>9.251</td>
<td>1.526</td>
<td>9.088</td>
<td>1.500</td>
<td>96.56%</td>
</tr>
<tr>
<td>9.235</td>
<td>2.030</td>
<td>9.079</td>
<td>1.994</td>
<td>96.57%</td>
</tr>
</tbody>
</table>
### 9V Output@Reverse Mode

![Graph showing efficiency vs. output current for 9V output in reverse mode]

### 2.1.8 12V Output in Reverse Mode

<table>
<thead>
<tr>
<th>$V_{BAT}(V)$</th>
<th>$I_{BAT}(A)$</th>
<th>$V_o(V)$</th>
<th>$I_o(A)$</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.278</td>
<td>0.705</td>
<td>12.231</td>
<td>0.496</td>
<td>92.73%</td>
</tr>
<tr>
<td>9.256</td>
<td>1.373</td>
<td>12.218</td>
<td>0.990</td>
<td>95.18%</td>
</tr>
<tr>
<td>9.233</td>
<td>2.072</td>
<td>12.205</td>
<td>1.498</td>
<td>95.58%</td>
</tr>
<tr>
<td>9.211</td>
<td>2.756</td>
<td>12.194</td>
<td>1.992</td>
<td>95.70%</td>
</tr>
<tr>
<td>9.187</td>
<td>3.452</td>
<td>12.185</td>
<td>2.486</td>
<td>95.53%</td>
</tr>
<tr>
<td>9.163</td>
<td>4.177</td>
<td>12.173</td>
<td>2.996</td>
<td>95.30%</td>
</tr>
<tr>
<td>VBAT(V)</td>
<td>IBAT(A)</td>
<td>V_o(V)</td>
<td>I_o(A)</td>
<td>Efficiency</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>--------</td>
<td>--------</td>
<td>--------------</td>
</tr>
<tr>
<td>9.272</td>
<td>0.885</td>
<td>15.213</td>
<td>0.495</td>
<td>91.77%</td>
</tr>
<tr>
<td>9.244</td>
<td>1.727</td>
<td>15.205</td>
<td>0.989</td>
<td>94.21%</td>
</tr>
<tr>
<td>9.215</td>
<td>2.607</td>
<td>15.193</td>
<td>1.497</td>
<td>94.69%</td>
</tr>
<tr>
<td>9.187</td>
<td>3.473</td>
<td>15.181</td>
<td>1.991</td>
<td>94.75%</td>
</tr>
<tr>
<td>9.158</td>
<td>4.356</td>
<td>15.165</td>
<td>2.486</td>
<td>94.52%</td>
</tr>
<tr>
<td>9.127</td>
<td>5.279</td>
<td>15.146</td>
<td>2.994</td>
<td>94.13%</td>
</tr>
</tbody>
</table>

2.1.9 15V Output in Reverse Mode

<table>
<thead>
<tr>
<th>VBAT(V)</th>
<th>IBAT(A)</th>
<th>V_o(V)</th>
<th>I_o(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.077</td>
<td>0.737</td>
<td>15.210</td>
<td>0.494</td>
<td>92.06%</td>
</tr>
<tr>
<td>11.053</td>
<td>1.435</td>
<td>15.201</td>
<td>0.988</td>
<td>94.70%</td>
</tr>
<tr>
<td>11.029</td>
<td>2.162</td>
<td>15.191</td>
<td>1.497</td>
<td>95.38%</td>
</tr>
</tbody>
</table>
11.006 | 2.874 | 15.180 | 1.991 | 95.56%
10.982 | 3.594 | 15.169 | 2.485 | 95.52%
10.957 | 4.344 | 15.153 | 2.994 | 95.33%
12.580 | 0.647 | 15.211 | 0.495 | 92.51%
12.559 | 1.259 | 15.203 | 0.989 | 95.10%
12.538 | 1.893 | 15.194 | 1.497 | 95.85%
12.518 | 2.513 | 15.184 | 1.992 | 96.16%
12.497 | 3.140 | 15.170 | 2.485 | 96.08%
12.475 | 3.789 | 15.159 | 2.995 | 96.06%

15V Output@Reverse Mode

2.1.9 20V Output in Reverse Mode

<table>
<thead>
<tr>
<th>$V_{BAT}$(V)</th>
<th>$I_{BAT}$(A)</th>
<th>$V_o$(V)</th>
<th>$I_o$(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.262</td>
<td>1.200</td>
<td>20.235</td>
<td>0.495</td>
<td>90.12%</td>
</tr>
<tr>
<td>9.224</td>
<td>2.338</td>
<td>20.224</td>
<td>0.988</td>
<td>92.66%</td>
</tr>
<tr>
<td>9.184</td>
<td>3.536</td>
<td>20.206</td>
<td>1.496</td>
<td>93.10%</td>
</tr>
<tr>
<td>9.145</td>
<td>4.723</td>
<td>20.188</td>
<td>1.990</td>
<td>93.03%</td>
</tr>
<tr>
<td>9.125</td>
<td>5.349</td>
<td>20.174</td>
<td>2.243</td>
<td>92.69%</td>
</tr>
<tr>
<td>11.068</td>
<td>0.999</td>
<td>20.235</td>
<td>0.495</td>
<td>90.59%</td>
</tr>
<tr>
<td>11.037</td>
<td>1.941</td>
<td>20.224</td>
<td>0.983</td>
<td>92.81%</td>
</tr>
<tr>
<td>11.005</td>
<td>2.925</td>
<td>20.211</td>
<td>1.497</td>
<td>94.01%</td>
</tr>
<tr>
<td>10.973</td>
<td>3.892</td>
<td>20.195</td>
<td>1.991</td>
<td>94.16%</td>
</tr>
<tr>
<td>10.956</td>
<td>4.396</td>
<td>20.186</td>
<td>2.244</td>
<td>94.07%</td>
</tr>
<tr>
<td>12.573</td>
<td>0.875</td>
<td>20.235</td>
<td>0.495</td>
<td>91.05%</td>
</tr>
</tbody>
</table>
2.1.11 USB Type A

<table>
<thead>
<tr>
<th>$V_{BAT}$(V)</th>
<th>$I_{BAT}$(A)</th>
<th>$V_{BUS}$(V)</th>
<th>$I_{BUS}$(A)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.304</td>
<td>0.063</td>
<td>5.140</td>
<td>0.092</td>
<td>80.89%</td>
</tr>
<tr>
<td>9.299</td>
<td>0.297</td>
<td>5.108</td>
<td>0.495</td>
<td>91.48%</td>
</tr>
<tr>
<td>9.293</td>
<td>0.586</td>
<td>5.070</td>
<td>0.990</td>
<td>92.17%</td>
</tr>
<tr>
<td>9.286</td>
<td>0.894</td>
<td>5.028</td>
<td>1.498</td>
<td>90.72%</td>
</tr>
<tr>
<td>9.279</td>
<td>1.203</td>
<td>4.988</td>
<td>1.991</td>
<td>88.97%</td>
</tr>
<tr>
<td>9.278</td>
<td>1.271</td>
<td>4.978</td>
<td>2.096</td>
<td>88.51%</td>
</tr>
<tr>
<td>11.103</td>
<td>0.054</td>
<td>5.143</td>
<td>0.090</td>
<td>77.19%</td>
</tr>
<tr>
<td>11.099</td>
<td>0.255</td>
<td>5.108</td>
<td>0.495</td>
<td>89.50%</td>
</tr>
<tr>
<td>11.094</td>
<td>0.497</td>
<td>5.068</td>
<td>0.988</td>
<td>90.81%</td>
</tr>
<tr>
<td>11.088</td>
<td>0.756</td>
<td>5.028</td>
<td>1.498</td>
<td>89.85%</td>
</tr>
<tr>
<td>11.083</td>
<td>1.015</td>
<td>4.985</td>
<td>1.991</td>
<td>88.28%</td>
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<tr>
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<td>1.072</td>
<td>4.978</td>
<td>2.096</td>
<td>87.84%</td>
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<tr>
<td>12.603</td>
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<td>5.140</td>
<td>0.092</td>
<td>79.66%</td>
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<tr>
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<td>0.226</td>
<td>5.108</td>
<td>0.495</td>
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<td>5.068</td>
<td>0.990</td>
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<td>5.028</td>
<td>1.498</td>
<td>89.42%</td>
</tr>
<tr>
<td>12.585</td>
<td>0.898</td>
<td>4.985</td>
<td>1.991</td>
<td>87.80%</td>
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2.2 Standby Current

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<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
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<td>I_{STD}</td>
<td>Standby current</td>
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<td></td>
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<td>V_{BAT}=9.3V, Connectors Unattached</td>
<td>100</td>
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<td>V_{BAT}=11.1V, Connectors Unattached</td>
<td>102</td>
<td></td>
<td></td>
<td>uA</td>
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<tr>
<td></td>
<td>V_{BAT}=12.6V, Connectors Unattached</td>
<td>103</td>
<td></td>
<td></td>
<td>uA</td>
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</tbody>
</table>

2.3 Start up

2.3.1 Forward Mode

5V Input
CH2: Vin 5V/Div
CH4: Input Current 1A/Div

9V Input
CH2: Vin 5V/Div
CH4: Input Current 1A/Div
12V Input
CH2: Vin 5V/Div
CH4: Input Current 1A/Div

15V Input
CH2: Vin 5V/Div
CH4: Input Current 1A/Div

20V Input
CH2: Vin 5V/Div
CH4: Input Current 1A/Div

2.3.2 Reverse Mode

5V Output
CH2: Vo 5V/Div

9V Output
CH2: Vo 5V/Div
2.4 Output Voltage Ripple in Reverse Mode

2.4.1 Output Voltage: 5V
2.4.2 Output Voltage: 9V
2.4.3 Output Voltage: 12V
2.4.4 Output Voltage: 14.5V
2.4.5 Output Voltage: 15V
V_{BAT}=9.3\text{V} \text{ and No Load}\n\text{CH2: } V_o (AC Coupled) 20mV/Div

V_{BAT}=9.3\text{V} \text{ and Full Load}\n\text{CH1: } V_o (AC Coupled) 50mV/Div

V_{BAT}=11.1\text{V} \text{ and No Load}\n\text{CH1: } V_o (AC Coupled) 20mV/Div

V_{BAT}=11.1\text{V} \text{ and Full Load}\n\text{CH1: } V_o (AC Coupled) 50mV/Div

V_{BAT}=12.6\text{V} \text{ and No Load}\n\text{CH1: } V_o (AC Coupled) 50mV/Div

V_{BAT}=12.6\text{V} \text{ and Full Load}\n\text{CH1: } V_o (AC Coupled) 50mV/Div

2.4.6 Output Voltage: 16V
2.4.7 Output Voltage: 19V
Lit Number

PMP40294 Test Results

2.4.8 Output Voltage: 20V
2.5 Dynamic Performance

2.5.1 Output Voltage Transition in Reverse Mode
2.5.2 Output Current Transition in Reverse Mode

Vo=5V & 100mA/us Current slew rate

V_{BAT}=9.3V and 0 to 25% load
CH2: Vo (AC Coupled) 50mV/Div

V_{BAT}=9.3V and 25% to 0 load
CH2: Vo (AC Coupled) 50mV/Div
PMP40294 Test Results

**V_{BAT} = 11.1V and 0 to 25% load**
CH2: V_o (AC Coupled) 50mV/Div

**V_{BAT} = 12.6V and 0 to 25% load**
CH2: V_o (AC Coupled) 50mV/Div

**V_{BAT} = 9.3V and 25% to 50% load**
CH2: V_o (AC Coupled) 100mV/Div

**V_{BAT} = 11.1V and 25% to 0 load**
CH2: V_o (AC Coupled) 50mV/Div

**V_{BAT} = 12.6V and 25% to 0 load**
CH2: V_o (AC Coupled) 50mV/Div

**V_{BAT} = 9.3V and 50% to 25% load**
CH2: V_o (AC Coupled) 100mV/Div

**V_{BAT} = 11.1V and 50% to 25% load**
CH2: V_o (AC Coupled) 100mV/Div
V_{BAT} = 12.6\,\text{V} \quad \text{and} \quad 25\% \text{ to } 50\% \text{ load}

CH2: V_o (AC Coupled) 100\text{mV/Div}

V_{BAT} = 9.3\,\text{V} \quad \text{and} \quad 50\% \text{ to } 75\% \text{ load}

CH2: V_o (AC Coupled) 100\text{mV/Div}

V_{BAT} = 11.1\,\text{V} \quad \text{and} \quad 50\% \text{ to } 75\% \text{ load}

CH2: V_o (AC Coupled) 100\text{mV/Div}

V_{BAT} = 12.6\,\text{V} \quad \text{and} \quad 50\% \text{ to } 75\% \text{ load}

CH2: V_o (AC Coupled) 100\text{mV/Div}
V\text{BAT} = 9.3V \text{ and 75% to 100% load}

CH2: V\text{o (AC Coupled) 100mV/Div}

V\text{BAT} = 11.1V \text{ and 75% to 100% load}

CH2: V\text{o (AC Coupled) 100mV/Div}

V\text{BAT} = 12.6V \text{ and 75% to 100% load}

CH2: V\text{o (AC Coupled) 100mV/Div}

\text{Vo} = 9V \text{ & 100mA/us Current slew rate}
$V_{BAT} = 9.3\, V$ and 0 to 25% load

CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT} = 9.3\, V$ and 25% to 0 load

CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT} = 11.1\, V$ and 0 to 25% load

CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT} = 11.1\, V$ and 25% to 0 load

CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT} = 12.6\, V$ and 0 to 25% load

CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT} = 12.6\, V$ and 25% to 0 load

CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT} = 9.3\, V$ and 25% to 50% load

CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT} = 9.3\, V$ and 50% to 25% load

CH2: $V_o$ (AC Coupled) 100mV/Div
\textbf{PMP40294 Test Results}

\begin{align*}
\text{VBAT} &= 11.1\text{V and 25\% to 50\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 12.6\text{V and 25\% to 50\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 9.3\text{V and 50\% to 75\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 11.1\text{V and 50\% to 75\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 11.1\text{V and 75\% to 50\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 11.1\text{V and 50\% to 25\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 12.6\text{V and 50\% to 25\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 9.3\text{V and 75\% to 50\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div} \\
\text{VBAT} &= 11.1\text{V and 75\% to 50\% load} \\
\text{CH2: Vo (AC Coupled) 100mV/Div}
\end{align*}
VBAT=12.6V and 50% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT=12.6V and 75% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT=9.3V and 75% to 100% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT=9.3V and 100% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT=11.1V and 75% to 100% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT=11.1V and 100% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT=12.6V and 75% to 100% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT=12.6V and 100% to 75% load
CH2: Vo (AC Coupled) 100mV/Div
Vo=12V & 100mA/us Current slew rate

V_{BAT}=9.3V and 0 to 25% load
CH2: Vo (AC Coupled) 100mV/Div

V_{BAT}=9.3V and 25% to 0 load
CH2: Vo (AC Coupled) 100mV/Div

V_{BAT}=11.1V and 0 to 25% load
CH2: Vo (AC Coupled) 100mV/Div

V_{BAT}=11.1V and 25% to 0 load
CH2: Vo (AC Coupled) 100mV/Div

V_{BAT}=12.6V and 0 to 25% load
CH2: Vo (AC Coupled) 100mV/Div

V_{BAT}=12.6V and 25% to 0 load
CH2: Vo (AC Coupled) 100mV/Div

V_{BAT}=9.3V and 25% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

V_{BAT}=9.3V and 50% to 25% load
CH2: Vo (AC Coupled) 100mV/Div
PMP40294 Test Results

**VBAT = 11.1V and 25% to 50% load**

- **CH2: Vo (AC Coupled) 100mV/Div**

**VBAT = 12.6V and 25% to 50% load**

- **CH2: Vo (AC Coupled) 100mV/Div**

**VBAT = 9.3V and 50% to 75% load**

- **CH2: Vo (AC Coupled) 100mV/Div**

**VBAT = 11.1V and 50% to 75% load**

- **CH2: Vo (AC Coupled) 100mV/Div**

**VBAT = 11.1V and 50% to 25% load**

- **CH2: Vo (AC Coupled) 100mV/Div**

**VBAT = 12.6V and 50% to 25% load**

- **CH2: Vo (AC Coupled) 100mV/Div**

**VBAT = 9.3V and 75% to 50% load**

- **CH2: Vo (AC Coupled) 100mV/Div**

**VBAT = 11.1V and 75% to 50% load**

- **CH2: Vo (AC Coupled) 100mV/Div**
VBAT = 12.6V and 50% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 12.6V and 75% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 9.3V and 75% to 100% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 9.3V and 100% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 11.1V and 75% to 100% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 11.1V and 100% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 12.6V and 75% to 100% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 12.6V and 100% to 75% load
CH2: Vo (AC Coupled) 100mV/Div
$V_o=15V \& 100mA/us$ Current slew rate

$V_{BAT}=9.3V$ and 0 to 25% load
CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT}=9.3V$ and 25% to 0 load
CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT}=11.1V$ and 0 to 25% load
CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT}=11.1V$ and 25% to 0 load
CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT}=12.6V$ and 0 to 25% load
CH2: $V_o$ (AC Coupled) 100mV/Div

$V_{BAT}=12.6V$ and 25% to 0 load
CH2: $V_o$ (AC Coupled) 100mV/Div
**PMP40294 Test Results**

**VBAT** = 9.3V and 25% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 9.3V and 50% to 25% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 11.1V and 25% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 11.1V and 50% to 25% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 12.6V and 25% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 12.6V and 50% to 25% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 9.3V and 50% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 9.3V and 75% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

**VBAT** = 11.1V and 50% to 75% load

**VBAT** = 11.1V and 75% to 50% load
V BAT = 12.6V and 50% to 75% load

CH2: Vo (AC Coupled) 100mV/Div

V BAT = 12.6V and 75% to 50% load

CH2: Vo (AC Coupled) 100mV/Div

V BAT = 9.3V and 75% to 100% load

CH2: Vo (AC Coupled) 100mV/Div

V BAT = 9.3V and 100% to 75% load

CH2: Vo (AC Coupled) 100mV/Div

V BAT = 11.1V and 75% to 100% load

CH2: Vo (AC Coupled) 100mV/Div

V BAT = 11.1V and 100% to 75% load

CH2: Vo (AC Coupled) 100mV/Div

V BAT = 12.6V and 75% to 100% load

CH2: Vo (AC Coupled) 100mV/Div

V BAT = 12.6V and 100% to 75% load

CH2: Vo (AC Coupled) 100mV/Div
Vo=20V & 100mA/us Current slew rate

$V_{BAT}=9.3\,V$ and 0 to 25% load
CH2: Vo (AC Coupled) 100mV/Div

$V_{BAT}=9.3\,V$ and 25% to 0 load
CH2: Vo (AC Coupled) 100mV/Div

$V_{BAT}=11.1\,V$ and 0 to 25% load
CH2: Vo (AC Coupled) 100mV/Div

$V_{BAT}=11.1\,V$ and 25% to 0 load
CH2: Vo (AC Coupled) 100mV/Div

$V_{BAT}=12.6\,V$ and 0 to 25% load
CH2: Vo (AC Coupled) 100mV/Div

$V_{BAT}=12.6\,V$ and 25% to 0 load
CH2: Vo (AC Coupled) 100mV/Div
PMP40294 Test Results

VBAT = 9.3V and 25% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 11.1V and 25% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 12.6V and 25% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 9.3V and 50% to 25% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 11.1V and 50% to 25% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 12.6V and 50% to 25% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 9.3V and 50% to 75% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 11.1V and 50% to 75% load

VBAT = 9.3V and 75% to 50% load
CH2: Vo (AC Coupled) 100mV/Div

VBAT = 11.1V and 75% to 50% load
V_{BAT} = 12.6\,V and 50\% to 75\% load
CH2: V_{o} (AC Coupled) 100\,V/Div

V_{BAT} = 12.6\,V and 75\% to 50\% load
CH2: V_{o} (AC Coupled) 100\,V/Div

V_{BAT} = 9.3\,V and 75\% to 100\% load
CH2: V_{o} (AC Coupled) 100\,V/Div

V_{BAT} = 9.3\,V and 100\% to 75\% load
CH2: V_{o} (AC Coupled) 100\,V/Div

V_{BAT} = 11.1\,V and 75\% to 100\% load
CH2: V_{o} (AC Coupled) 100\,V/Div

V_{BAT} = 11.1\,V and 100\% to 75\% load
CH2: V_{o} (AC Coupled) 100\,V/Div

V_{BAT} = 12.6\,V and 75\% to 100\% load
CH2: V_{o} (AC Coupled) 100\,V/Div

V_{BAT} = 12.6\,V and 100\% to 75\% load
CH2: V_{o} (AC Coupled) 100\,V/Div
2.6 Thermal Performance

The board is applied a 9.3V battery pack and output 20V/2.25A load at the connector. Run about 10min for warming up.
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