

### 1 Photos

The photographs below show the PMP9041 Rev A prototype assembly. This circuit was built on a PMP8940 Rev A PCB.



### 2 Standby Power

With no load attached to the output of the supply, the unit draws 37mW of input power with an 115VAC/60Hz input, and 46mW with a 230VAC/50Hz input.

### 3 Efficiency



### 04/25/2013 PMP9041 Rev A Test Results



115VAC/60Hz								
lout	Vout	Vin	lin	Pin	PF	Pout	Losses	Efficiency
0.000	25.03	115.0	0.0063	0.037		0.00	0.04	0.0%
0.200	23.71	115.0	0.127	5.30	0.36	4.74	0.56	89.5%
0.399	23.69	115.0	0.220	10.55	0.41	9.45	1.10	89.6%
0.599	23.70	115.0	0.305	15.87	0.45	14.20	1.67	89.5%
0.800	23.69	115.0	0.384	21.20	0.48	18.95	2.25	89.4%
1.000	23.68	115.0	0.460	26.58	0.50	23.68	2.90	89.1%
1.199	23.70	115.0	0.534	31.92	0.52	28.42	3.50	89.0%
1.399	23.72	115.0	0.606	37.26	0.54	33.18	4.08	89.1%
1.600	23.74	114.9	0.678	42.65	0.55	37.98	4.67	89.1%
1.699	23.73	114.9	0.712	45.25	0.55	40.32	4.93	89.1%
230VAC/5	0Hz							
230VAC/5 lout	0Hz Vout	Vin	lin	Pin	PF	Pout	Losses	Efficiency
230VAC/50 lout 0.000	0Hz Vout 25.91	Vin 229.8	lin 0.0098	Pin 0.046	PF	Pout 0.00	Losses 0.05	Efficiency 0.0%
230VAC/50 lout 0.000 0.199	0Hz Vout 25.91 23.67	Vin 229.8 230.0	lin 0.0098 0.084	Pin 0.046 5.41	PF 0.28	Pout 0.00 4.71	Losses 0.05 0.70	Efficiency 0.0% 87.1%
230VAC/5 lout 0.000 0.199 0.403	0Hz Vout 25.91 23.67 23.65	Vin 229.8 230.0 230.0	lin 0.0098 0.084 0.150	Pin 0.046 5.41 10.67	PF 0.28 0.31	Pout 0.00 4.71 9.53	Losses 0.05 0.70 1.14	Efficiency 0.0% 87.1% 89.3%
230VAC/5 lout 0.000 0.199 0.403 0.601	0Hz Vout 25.91 23.67 23.65 23.65	Vin 229.8 230.0 230.0 230.0	lin 0.0098 0.084 0.150 0.208	Pin 0.046 5.41 10.67 15.82	PF 0.28 0.31 0.33	Pout 0.00 4.71 9.53 14.21	Losses 0.05 0.70 1.14 1.61	Efficiency 0.0% 87.1% 89.3% 89.8%
230VAC/50 lout 0.000 0.199 0.403 0.601 0.800	0Hz Vout 25.91 23.67 23.65 23.65 23.65	Vin 229.8 230.0 230.0 230.0 230.0	lin 0.0098 0.084 0.150 0.208 0.260	Pin 0.046 5.41 10.67 15.82 21.06	PF 0.28 0.31 0.33 0.35	Pout 0.00 4.71 9.53 14.21 18.94	Losses 0.05 0.70 1.14 1.61 2.12	Efficiency 0.0% 87.1% 89.3% 89.8% 89.8%
230VAC/5 lout 0.000 0.199 0.403 0.601 0.800 1.000	0Hz 25.91 23.67 23.65 23.65 23.65 23.67 23.68	Vin 229.8 230.0 230.0 230.0 230.0 230.0 230.0	lin 0.0098 0.084 0.150 0.208 0.260 0.308	Pin 0.046 5.41 10.67 15.82 21.06 26.34	PF 0.28 0.31 0.33 0.35 0.37	Pout 0.00 4.71 9.53 14.21 18.94 23.68	Losses 0.05 0.70 1.14 1.61 2.12 2.66	Efficiency 0.0% 87.1% 89.3% 89.8% 89.9% 89.9%
230VAC/50 lout 0.000 0.199 0.403 0.601 0.800 1.000 1.198	0Hz 25.91 23.67 23.65 23.65 23.65 23.67 23.68 23.68	Vin 229.8 230.0 230.0 230.0 230.0 230.0 230.0 230.0	lin 0.0098 0.084 0.150 0.208 0.260 0.308 0.353	Pin 0.046 5.41 10.67 15.82 21.06 26.34 31.53	PF 0.28 0.31 0.33 0.35 0.37 0.39	Pout 0.00 4.71 9.53 14.21 18.94 23.68 28.37	Losses 0.05 0.70 1.14 1.61 2.12 2.66 3.16	Efficiency 0.0% 87.1% 89.3% 89.8% 89.9% 89.9% 90.0%
230VAC/5 lout 0.000 0.199 0.403 0.601 0.800 1.000 1.198 1.400	0Hz Vout 25.91 23.67 23.65 23.65 23.65 23.67 23.68 23.68 23.70	Vin 229.8 230.0 230.0 230.0 230.0 230.0 230.0 230.0 230.0	lin 0.0098 0.084 0.150 0.208 0.260 0.308 0.353 0.398	Pin 0.046 5.41 10.67 15.82 21.06 26.34 31.53 36.83	PF 0.28 0.31 0.33 0.35 0.37 0.39 0.40	Pout 0.00 4.71 9.53 14.21 18.94 23.68 28.37 33.18	Losses 0.05 0.70 1.14 1.61 2.12 2.66 3.16 3.65	Efficiency 0.0% 87.1% 89.3% 89.8% 89.9% 89.9% 89.9% 90.0% 90.1%
230VAC/50 lout 0.000 0.199 0.403 0.601 0.800 1.000 1.198 1.400 1.600	0Hz Vout 25.91 23.67 23.65 23.65 23.67 23.68 23.68 23.68 23.70 23.71	Vin 229.8 230.0 230.0 230.0 230.0 230.0 230.0 230.0 230.0 230.0	lin 0.0098 0.084 0.150 0.208 0.260 0.308 0.353 0.398 0.441	Pin 0.046 5.41 10.67 15.82 21.06 26.34 31.53 36.83 42.09	PF 0.28 0.31 0.33 0.35 0.37 0.39 0.40 0.42	Pout 0.00 4.71 9.53 14.21 18.94 23.68 28.37 33.18 37.94	Losses 0.05 0.70 1.14 1.61 2.12 2.66 3.16 3.65 4.15	Efficiency 0.0% 87.1% 89.3% 89.8% 89.9% 89.9% 90.0% 90.1% 90.1%

## 4 Current Limit

A plot of the output voltage versus load current is shown below.





# 5 Thermal Images

The ambient temperature was 25°C. The output was loaded with 1.7A.

#### 5.1 115VAC/60Hz Input







### 5.2 230VAC/50Hz Input





### 6 Startup

Channel 1 shows the AC input voltage. Channel 2 shows the output voltage.

#### 6.1 115VAC/60Hz Startup – 0A Load



### 6.2 115VAC/60Hz Startup – 14Ω Load





### 6.3 230VAC/50Hz Startup – 0A Load



6.4 230VAC/50Hz Startup – 14Ω Load





# 7 Output Ripple Voltage

The output was loaded with 1.7A.

#### 7.1 115VAC/60Hz Input



### 7.2 230VAC/50Hz Input





### 8 Load Transients

### 8.1 0A to 1A Transient – 115VAC/60Hz Input



### 8.2 0A to 1A Transient – 230VAC/50Hz Input





### 8.3 10mA to 1A Transient – 115VAC/60Hz Input



8.4 10mA to 1A Transient – 230VAC/50Hz Input





# 9 Switching Waveforms

The images below show the voltage waveforms on the switching devices within the supply. The input was 265VAC/50Hz. The output was loaded 1.7A.

#### 9.1 Primary Waveforms

The image below shows the drain-to-source voltage on Q1.



#### 9.2 Secondary Waveforms

The image below shows the voltage on the anode of D3.





## **10 Conducted Emissions**



**Average Measurement** 

#### IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (https://www.ti.com/legal/termsofsale.html) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2021, Texas Instruments Incorporated