PMP20873 – 1kW Totem-Pole PFC EVM Test Report

GaN / Next
Zhong Ye

Start up

High line startup

Low line startup

Note: extra 0.9 second was inserted due to DCP010512 bias long startup time.
The time can be eliminated when using bootstrap circuit.
Step Load Response – High Line (230Vac)

0 to 50% step load

50 to 100% step load
Step Load Response – High Line (230Vac)

100% to 50% step load

50 to 0% step load
Step Load Response – Low Line (115Vac)

0 to 50% step load

50 to 100% step load

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Step Load Response – Low Line (115Vac)

100% to 50% step load

50 to 0% step load
AC voltage transient Test  115V-230V at 0A load
AC voltage transient Test  115V-230V at 1kW load
AC frequency transient Test (45 – 66Hz @ 230V 1kW)
AC drop and recovery test

Pending issues: Current software disables PFC for three AC cycles when AC drop is detected.
A large reverse current occurs at AC dropping edges.
AC Current Waveforms at Full Load

115Vac 100KHz

230Vac 100KHz

115Vac 140KHz

230Vac 140KHz
Efficiency

Note: 1. Eff data were taken after thermal became stable (around 10 minutes).
2. At room temp, the EVM max power at high line is 1.5kW and low line is 1kW.
3. Power level of the measurement was limited by power meter AC current range.

Note: Bias loss not included
Improving Power Factor by Using Higher $f_s$

Higher switching frequency increases current loop bandwidth and improves PF.

Golden unit data
Lead OEM Spec

- 115Vac and 140kHz
- 230Vac and 140kHz
- 115Vac and 100kHz
- 230Vac and 100kHz

Inductor: 480uH

Energy Star-Server (1kW+)
THD

Golden unit data

Inductor: 480uH

- 115Vac and 140kHz
- 230Vac and 140kHz
- 115Vac and 100kHz
- 230Vac and 100kHz

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EMI design modification to improve efficiency

- Change CM inductor from 1.68mH to 1.2mH (DCR decreased from 30mΩ to 20mΩ by using 16 AWG 10 turn instead of 18 AWG wire)
- C103 changed from 1uF to 0.47uF
- C107 changed from 1uF to 2.2uF
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