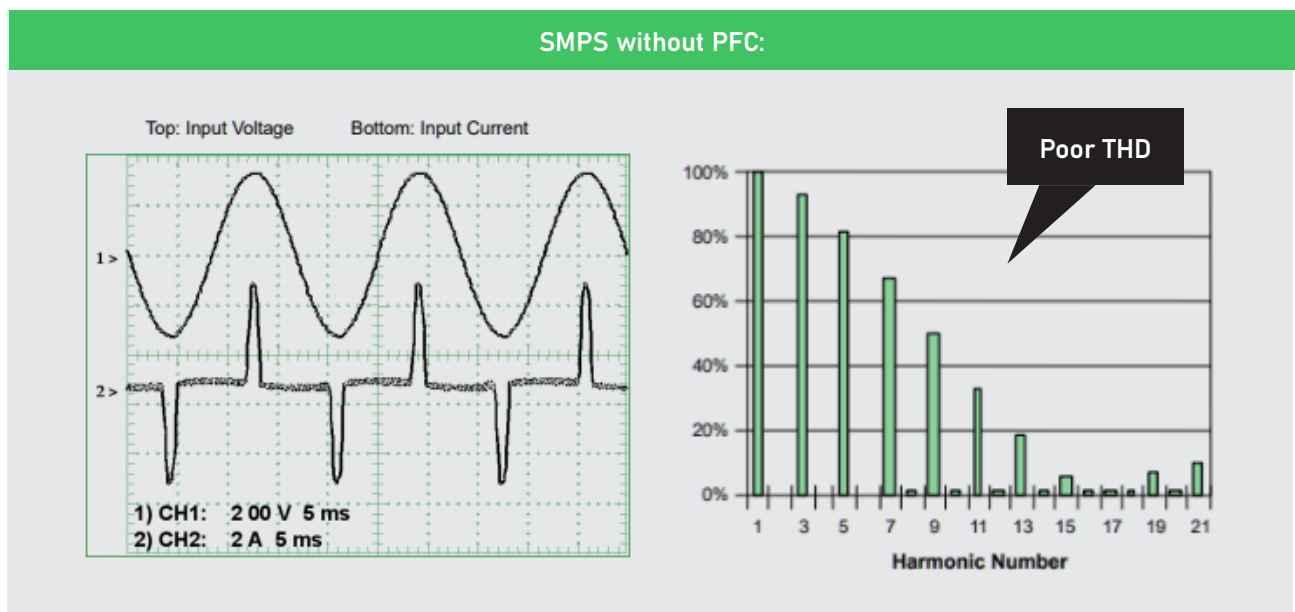


POWER FACTOR CORRECTION – BRIDGELESS TOTEM POLE TOPOLOGY VS STANDARD BOOST

IT IS COMMON TO FACE FOLLOWING PROBLEM WHEN WORKING ON A SMPS DESIGN:

PROBLEM:

When the power factor (load dependent) is not equal to 1, the current waveform does not follow the voltage waveform. This results not only in power losses but may also cause harmonics that travel down the neutral line and disrupt other devices connected to the line. The closer the power factor is to 1, the closer the current harmonics will be to zero since all the power is contained in the fundamental frequency.

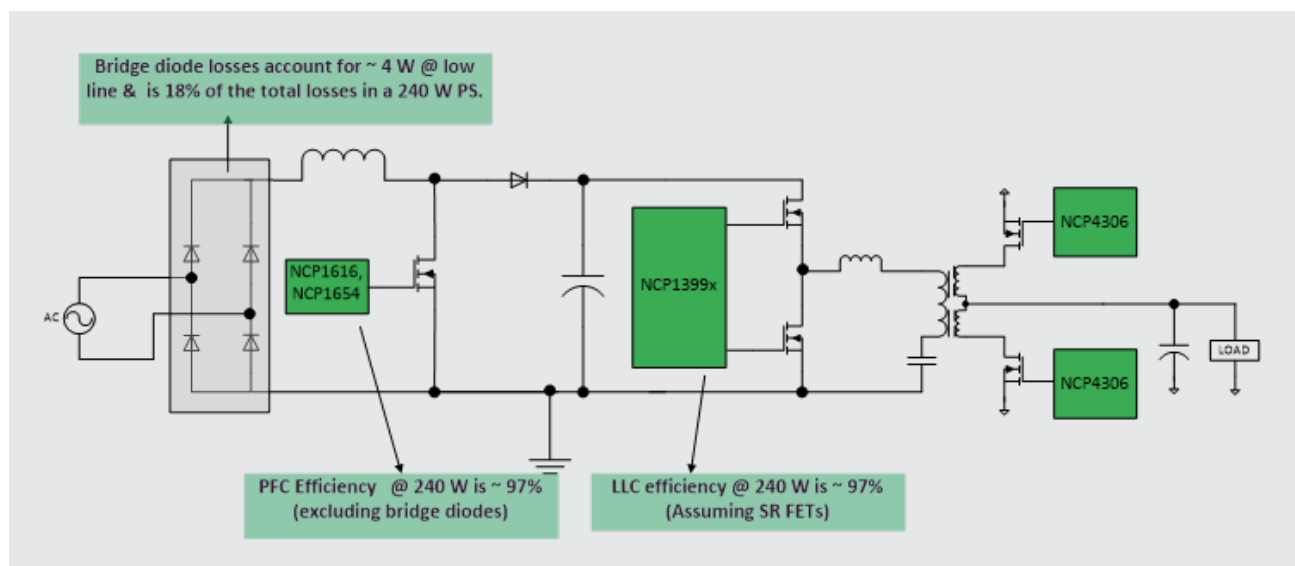


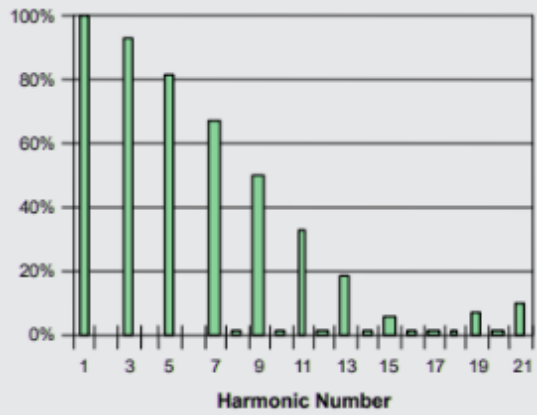
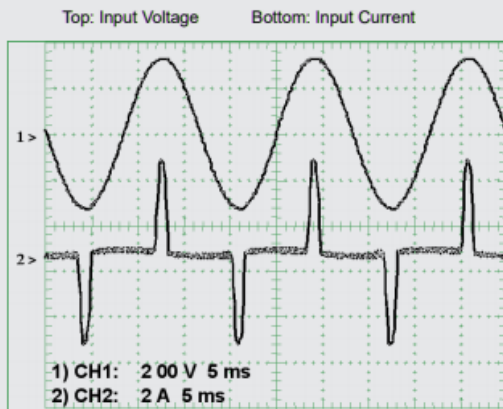
SOLUTION:

Shape the input current to match the input voltage waveform.

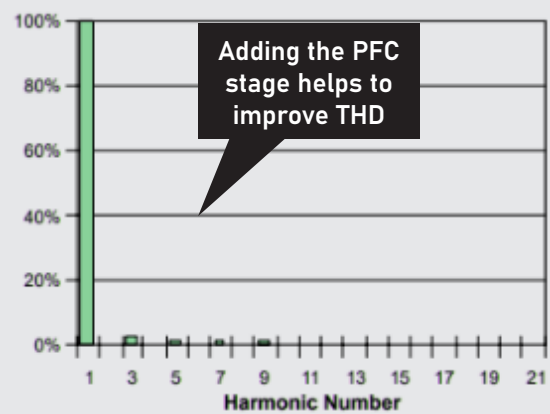
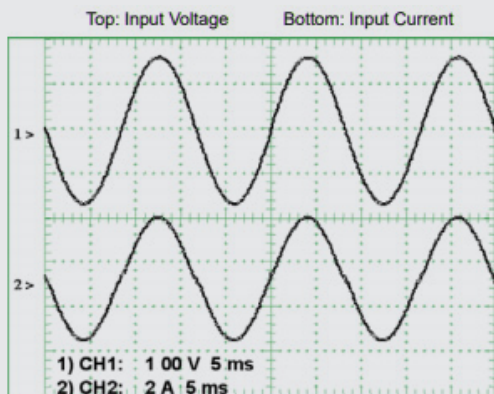
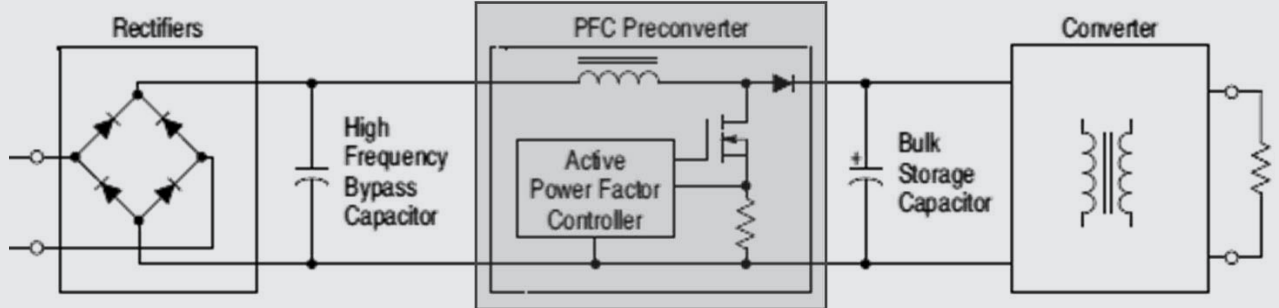
IMPLEMENTATION:

Insert a switched mode boost converter stage between rectifier and bulk storage cap.





Boost Converter:



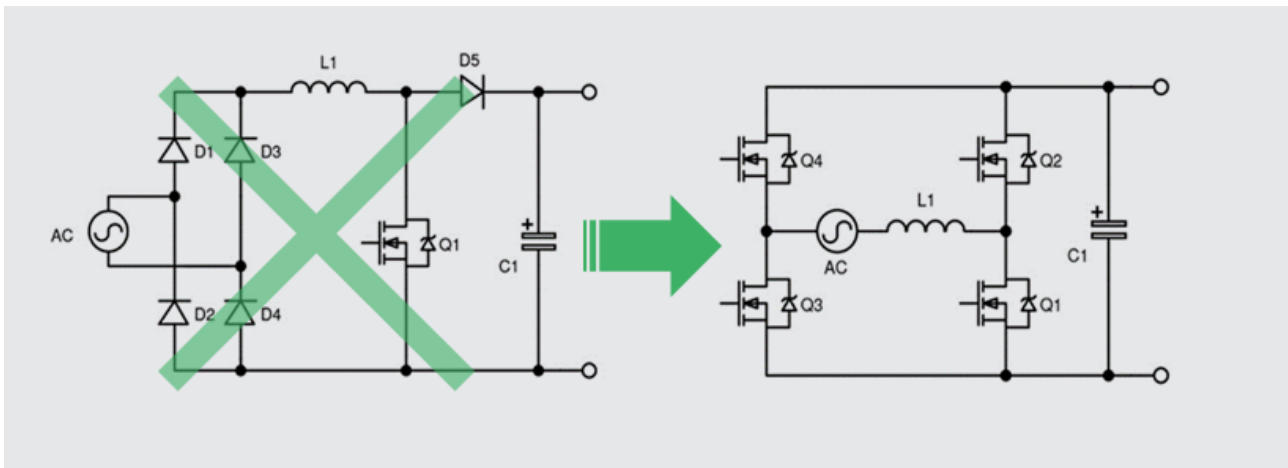
WHY BRIDGELESS TOTEM POLE PFC?

Efficiency of the PFC boost stage & LLC stage have plateaued: bridge diodes are the major source of power loss!

BRIDGELESS TOTEM POLE PFC

Input diodes are replaced with 4 FETs, configured as 2 Half bridge legs: one "slow" and one "fast". The slow one is performing the AC rectification while the fast is doing the proper PWM boost commutation at high frequency.

BRIDGELESS TOTEM POLE is an elegant 4 switches boost solution that reduces the number of components in the current path and therefore increasing the overall efficiency of the PFC stage as well as the entire power converter.



FINAL CONSIDERATION

ONSEMI NCP1680 and NCP1681 are Analog Mixed Signal Bridgeless Totem Pole PFC controllers which are differentiating with the vast majority of the market that proposes MCU/DSP based solutions. This type of approach makes the Totem Pole PFC design much easier as the devices are ready to use and they don't need firmware to be written or tuned. On top of this important advantage, the current sensors needed by NCP1680 and NCP1681 are cheaper shunt R-sense or Current Transformers instead of much expensive hall effect sensor needed with the MCU approach.

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