80++ CM6802A/B

80+ CM6800/A

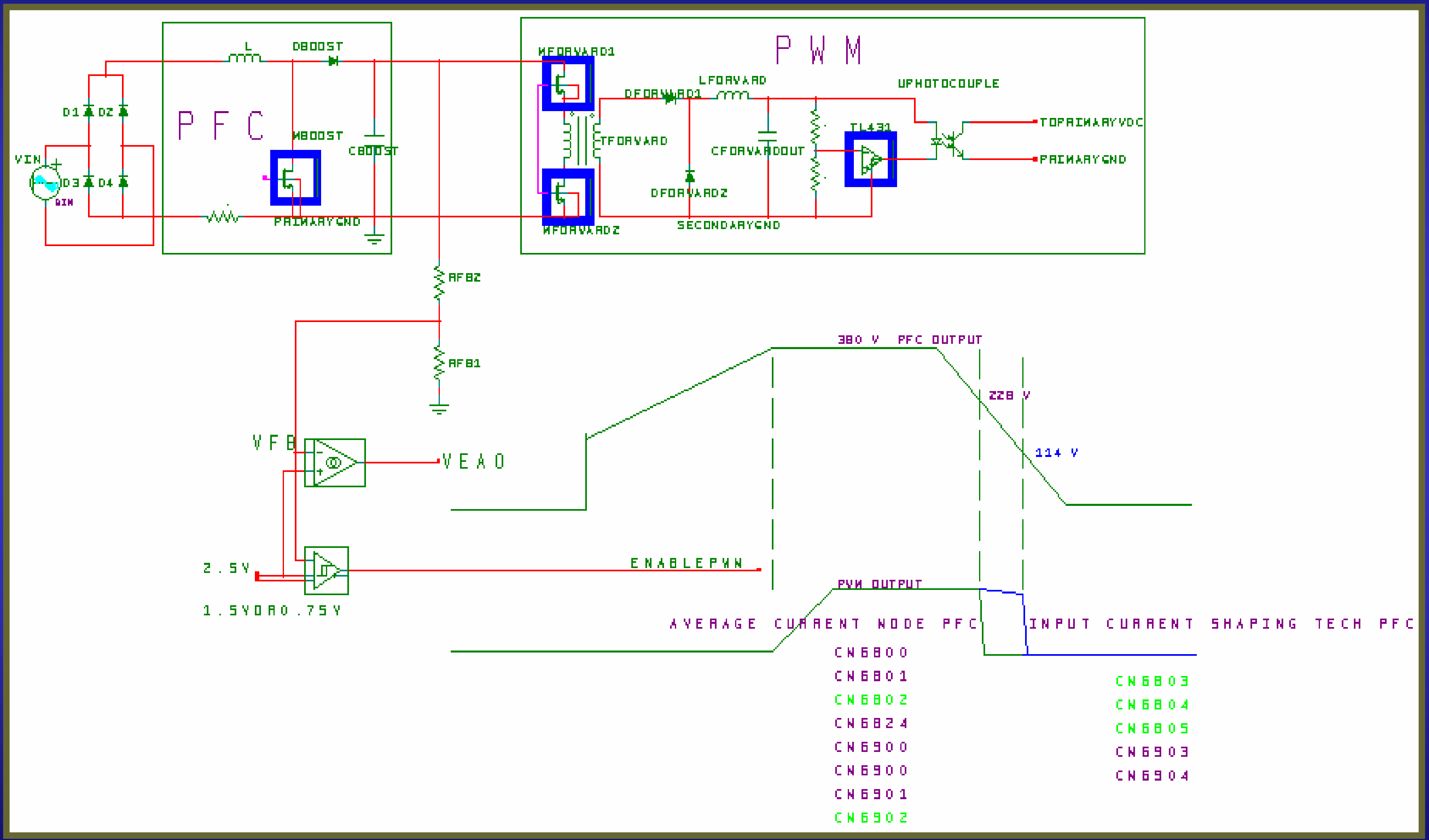
Low Cost CM6805A/B

Champion
PFC-PWM Combo
Key Features
in all combo

80++ CM6802A/B

80+ CM6800/A

Low Cost CM6805A/B

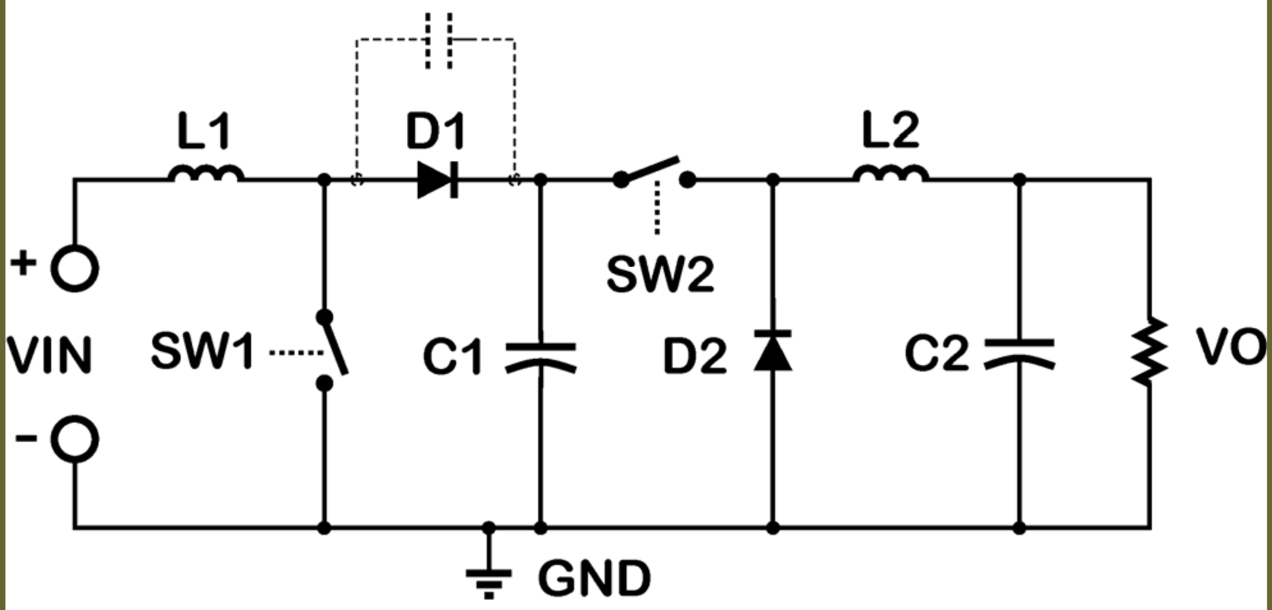


PFC Start Up then PWM Start Up

System Start UP

Reduce the 450V Boost Capacitor

Reduce the 450V Boost Capacitor



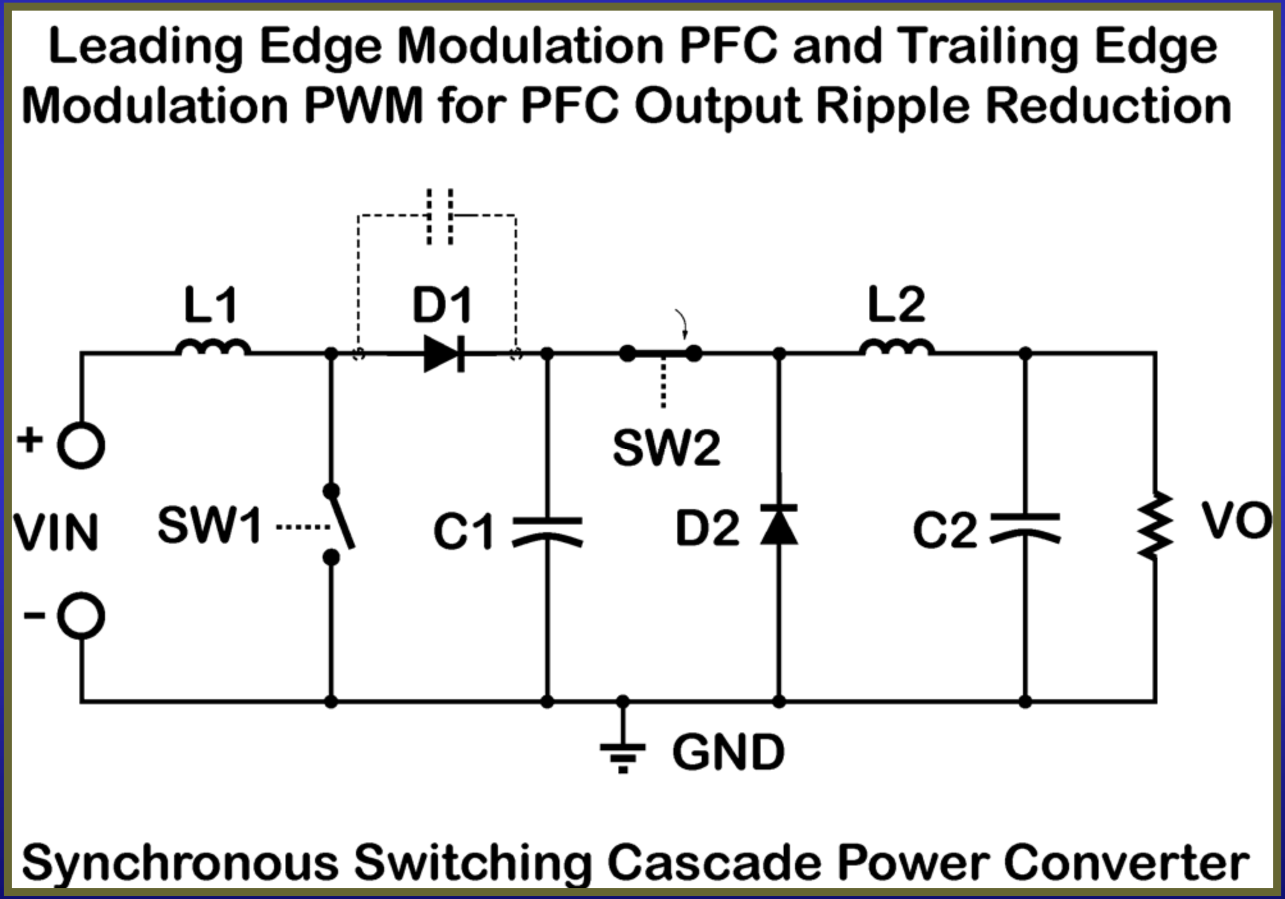
A Cascade Boost-Buck Power Converter Without Synchronous Switching

Reduce the 450V Boost Capacitor

Leading Edge Modulation PFC
+
Trailing Edge Modulation PWM

- to reduce the 450V Boost Capacitor value by 20%
- Bandwidth increases
- Higher Efficiency (Free 0.5% Efficiency Gain)
- Better reliability

Reduce the 450V Boost Capacitor



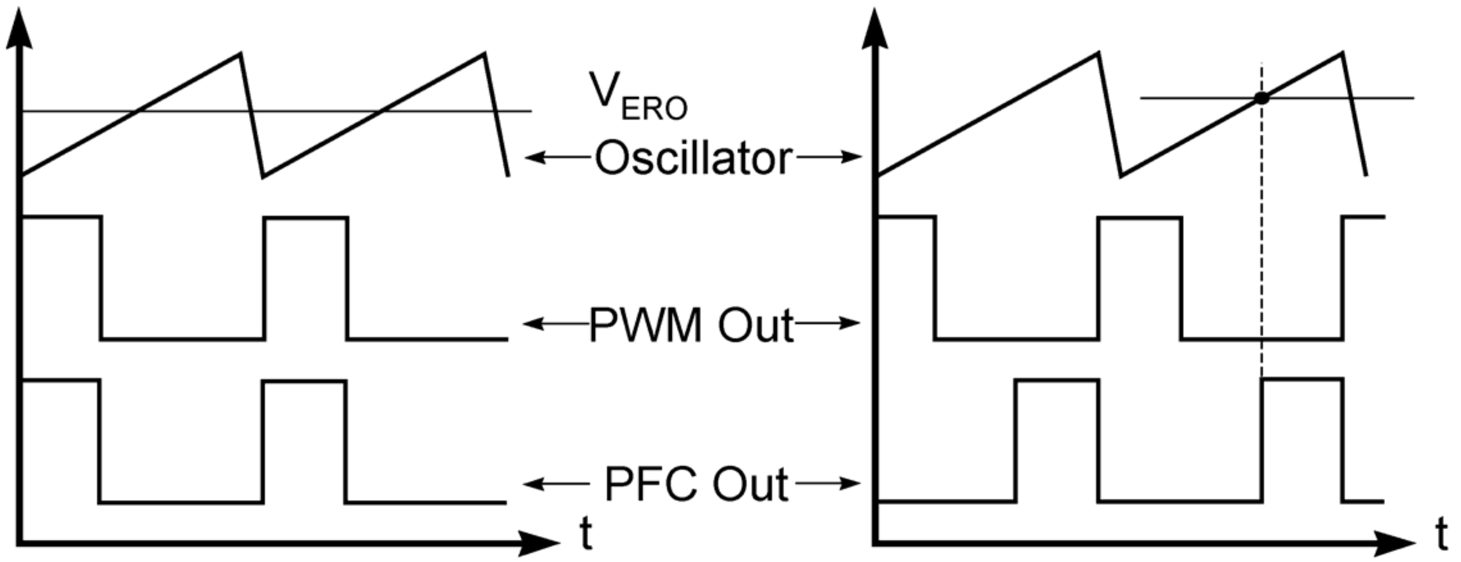
80++ CM6802A/B

80+ CM6800/A

Low Cost CM6805A/B

Reduce the 450V Boost Capacitor

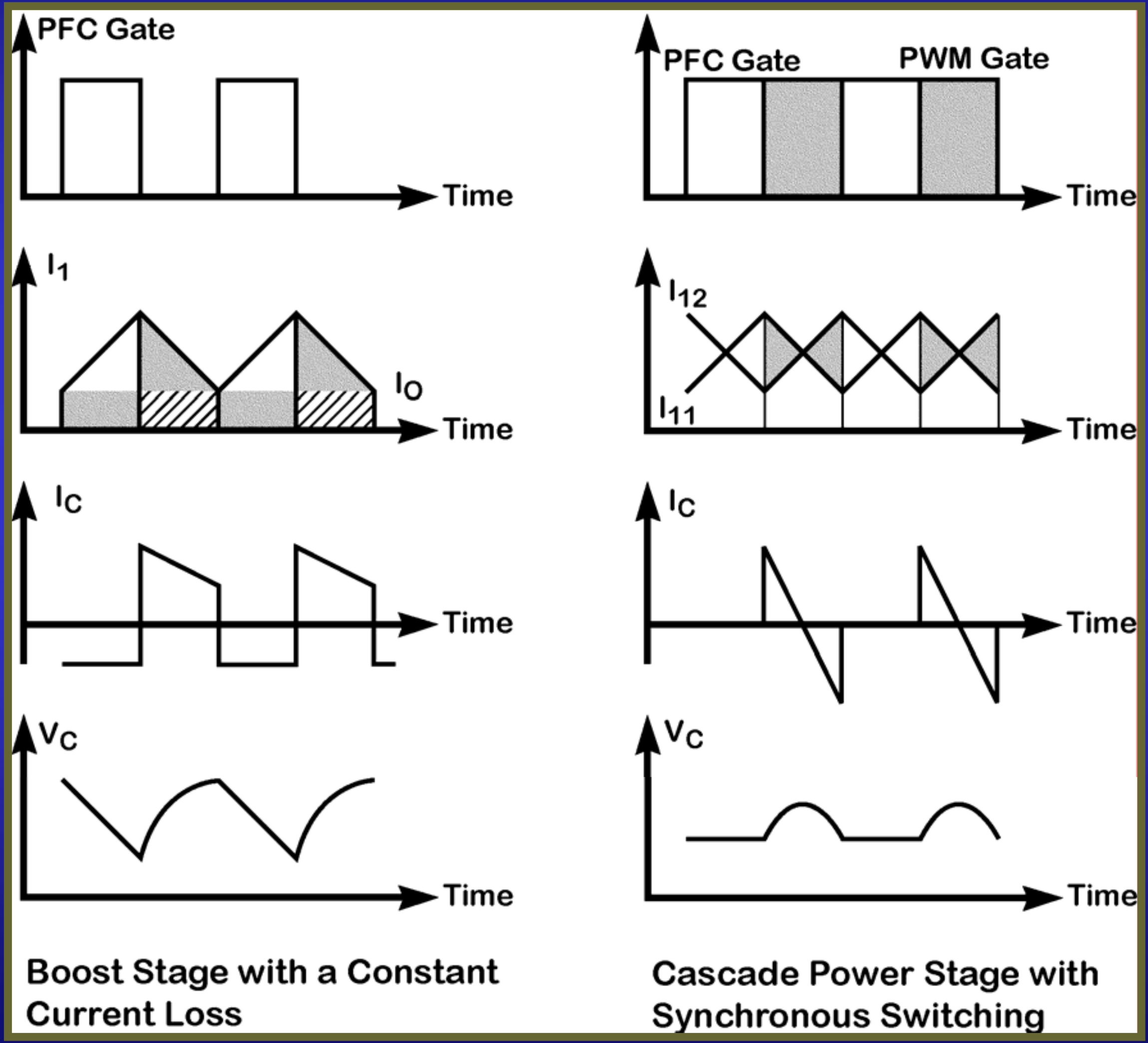
The CM68XX vs "Other" Combo Controllers



Conventional Combos use Trailing/ Trailing Edge Modulation Scheme.

The CM68XX uses Trailing Edge PWM and Leading Edge PFC for Optimum PFC to PWM Inductor Charge Transfer.

Reduce the 450V Boost Capacitor



Champion Microelectronic

80++ CM6802A/B

80+ CM6800/A

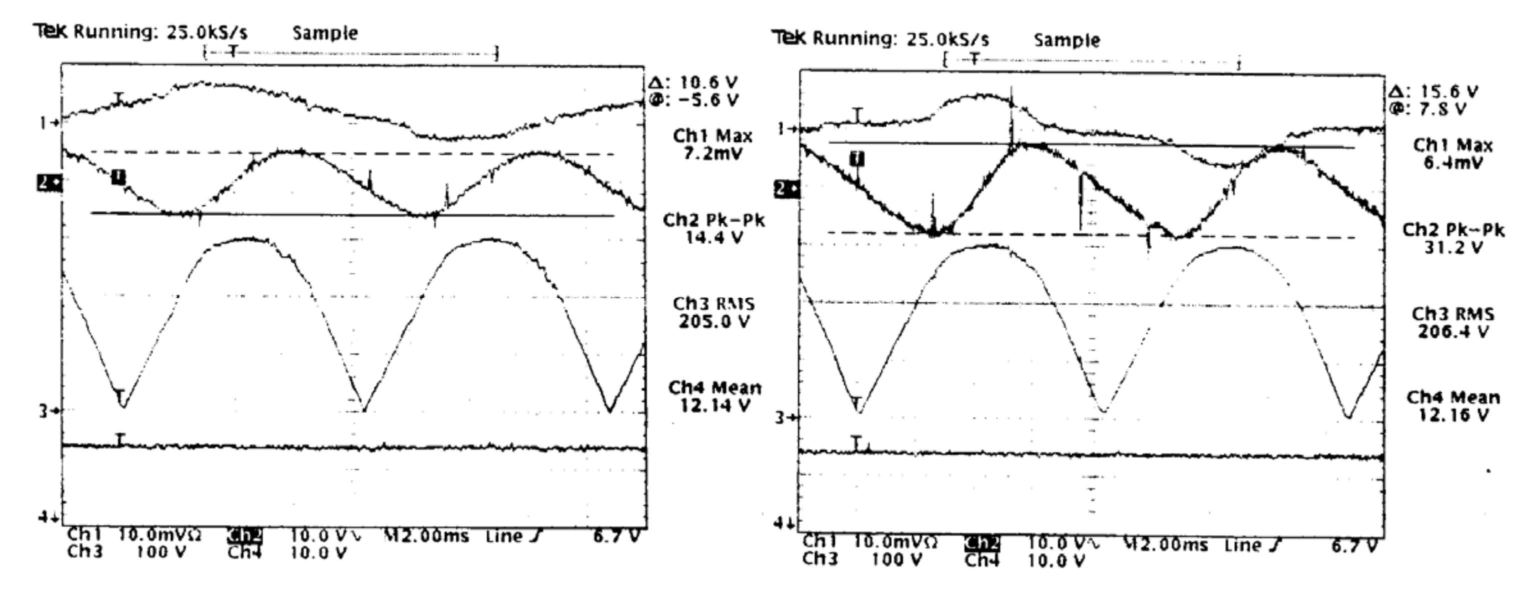
Low Cost CM6805A/B

Reduce the 450V Boost Capacitor

CM68XX vs. ML4819 EXPERIMENTAL RESULTS

Test Conditions: V_{IN} = 220VAC, P_{IN} = 75W,
f_{PFC} = 80kHz, C_{PFC} = 50μF, L_{PFC} = 1.5mH

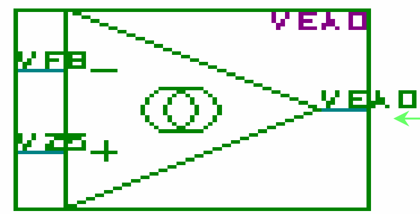
CM68XX TEST RESULTS | ML4819 TEST RESULTS



Speed up
the PFC Voltage Loop 3X

Error Amplifier
Transconductance Amp, GM
vs.
Operational Amp, OP

Transconductance Amp, GM vs. Operational Amp, OP



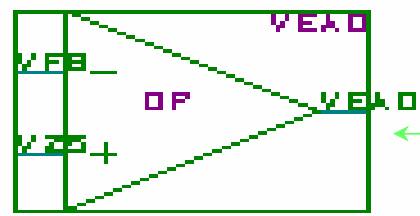
Input Impedance Z_{in}?

Z_{in} ~ High

Output Impedance, Z_{out} ?

Z_{out} ~ High

Transconductance Amp, GM



Input Impedance Z_{in} ?

Z_{in} ~ High

Output Impedance, Z_{out} ?

Z_{out} ~ Low

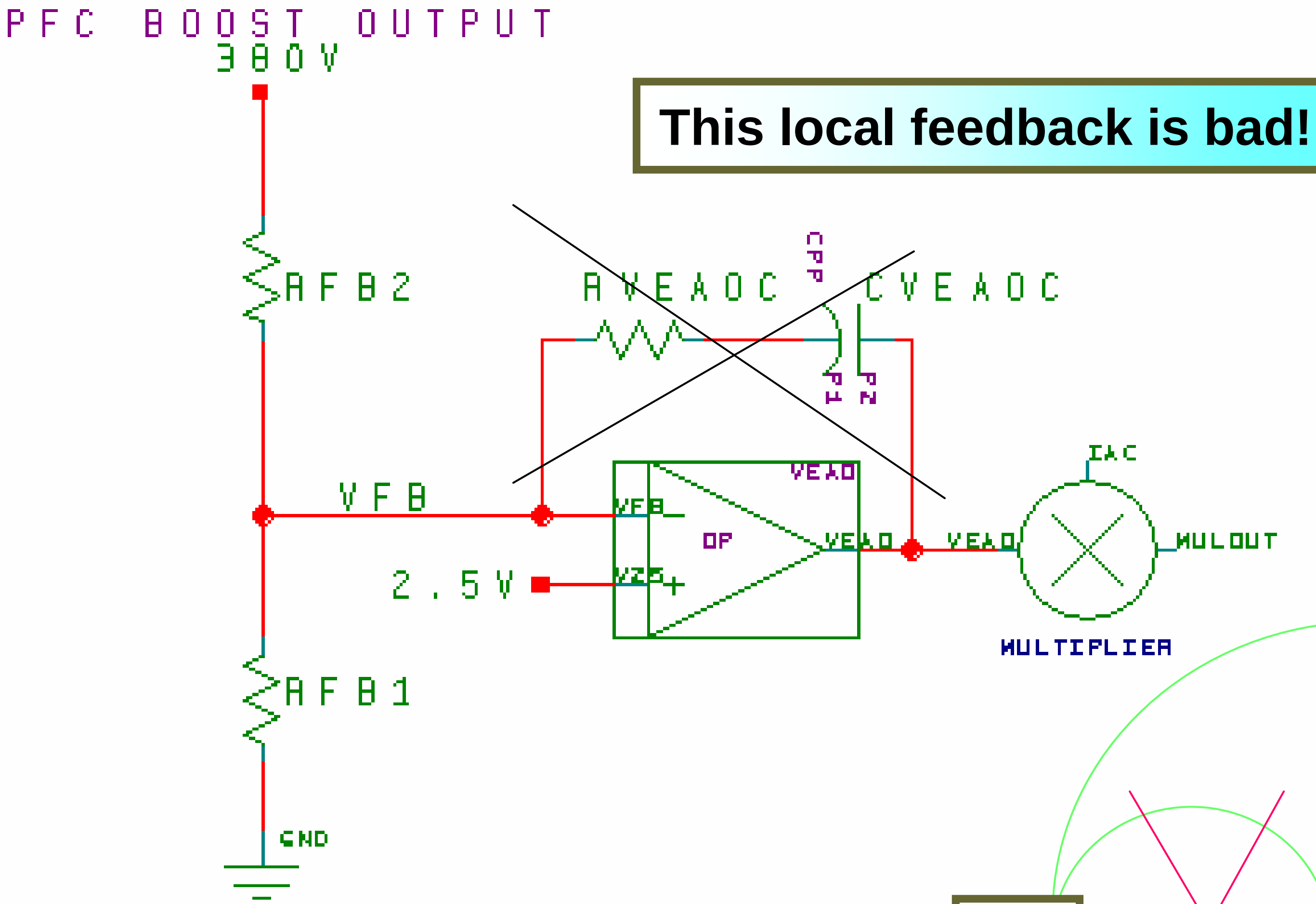
Operational Amp, OP

2 Main Purposes of the Error Amp

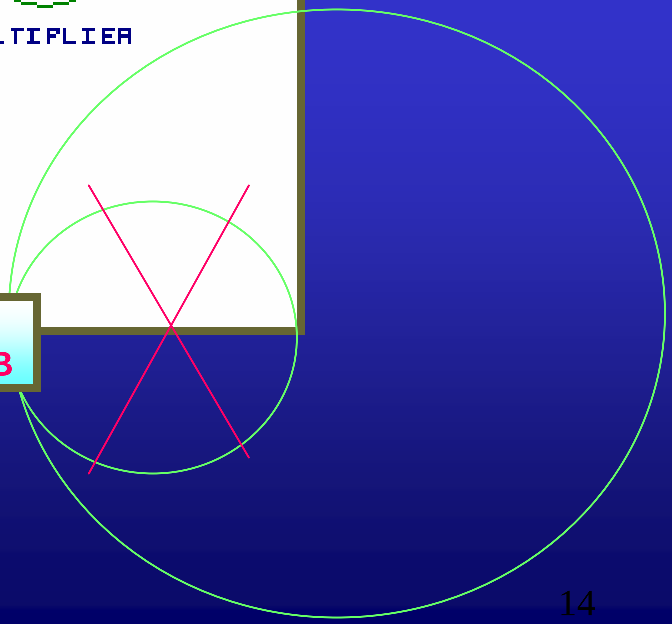
1. Force $V_+ = V_-$ and it means $V_{fb} = 2.5V$
2. Compensation: It needs the R_c and C_c

OP Integrator

80++ CM6802A/B
80+ CM6800/A
Low Cost CM6805A/B



This local feedback is bad!



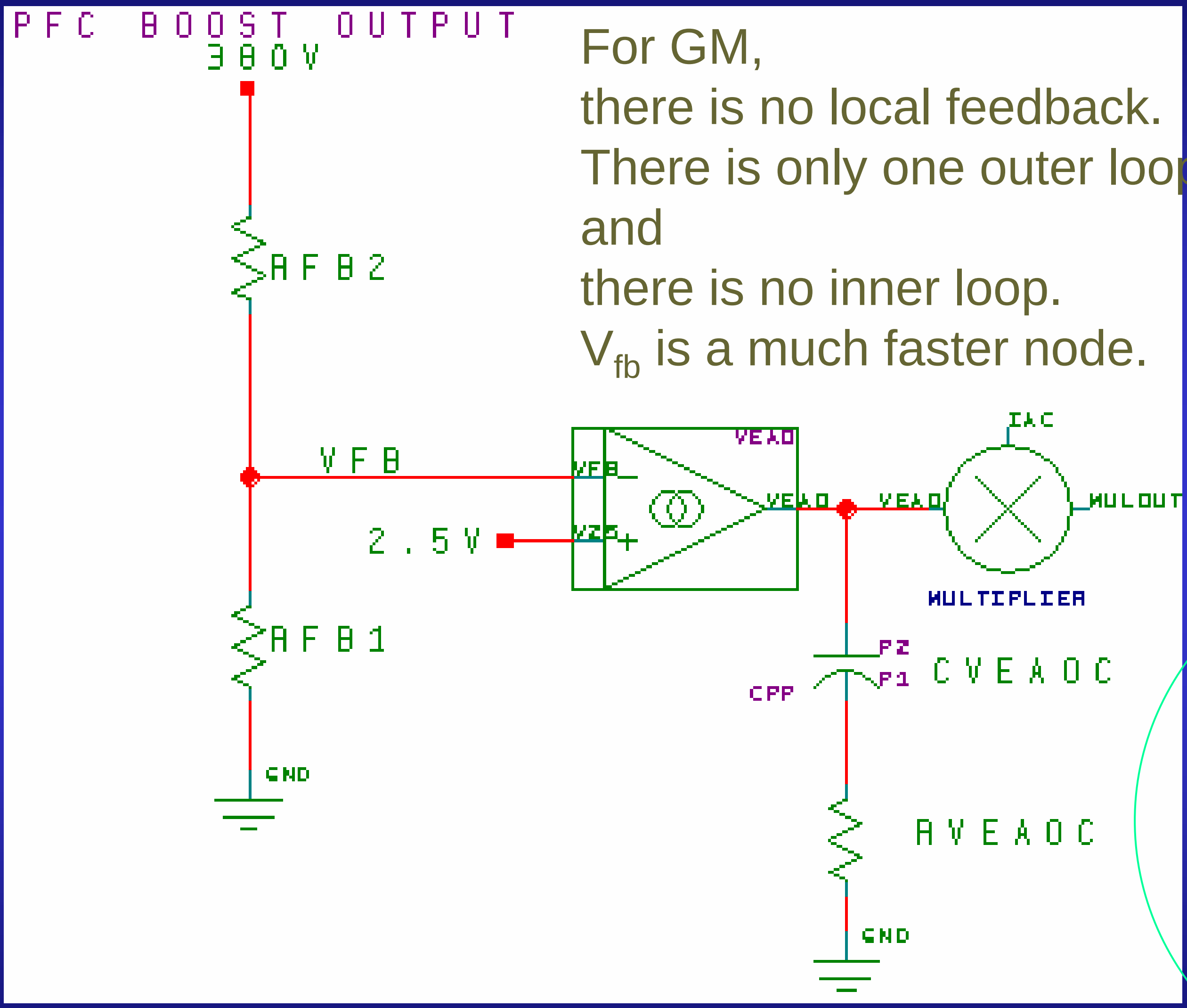
V_{FB}

The Miller Effect slows down the V_{fb} node.
Also, PFC Voltage Loop is very slow.
The consequence: V_{fb} becomes very slow.

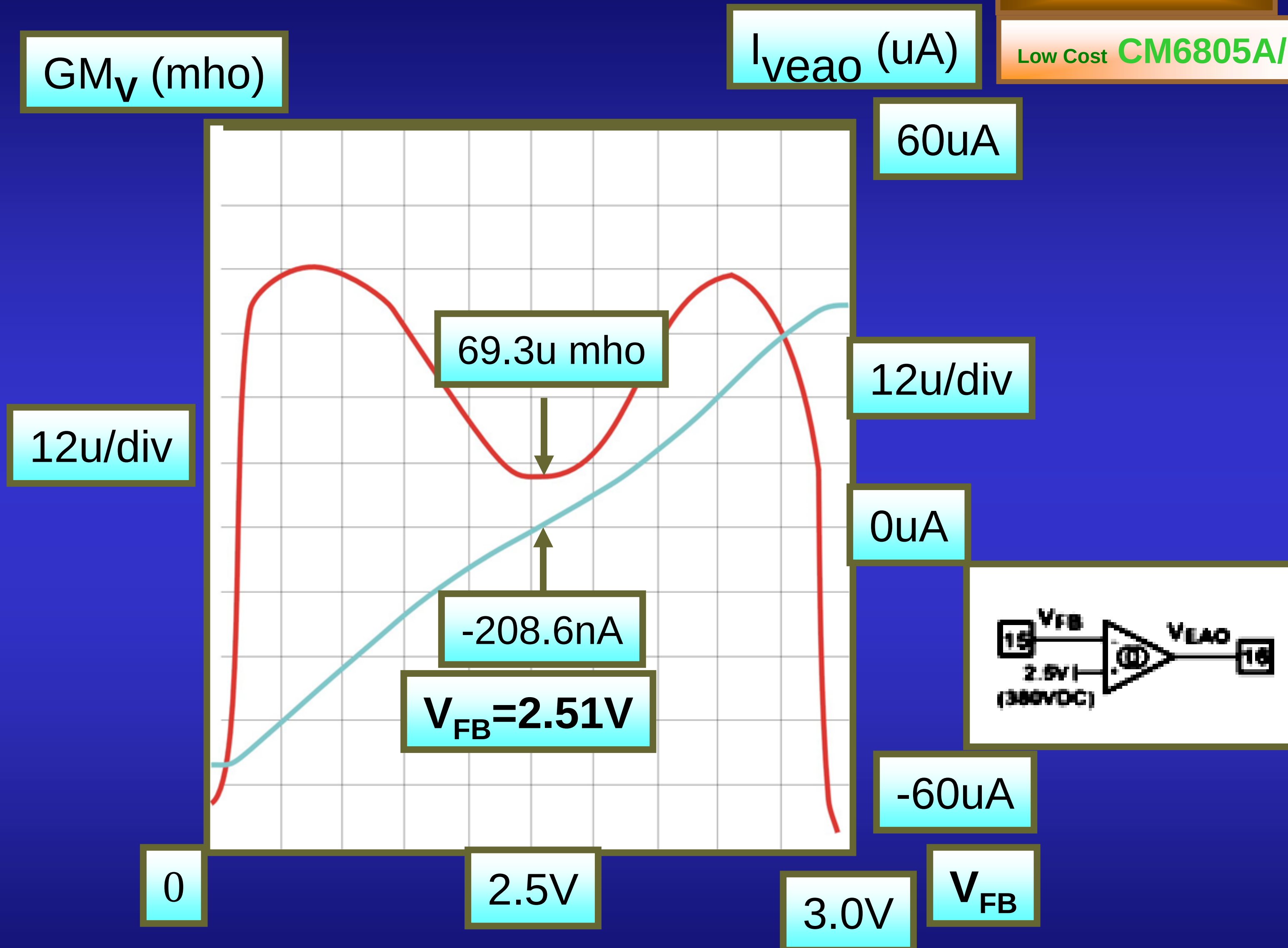
Speed up the PFC Voltage Loop 3X

GM Integrator

For GM,
there is no local feedback.
There is only one outer loop and
there is no inner loop.
V_{fb} is a much faster node.



Speed up the PFC Voltage Loop 3X



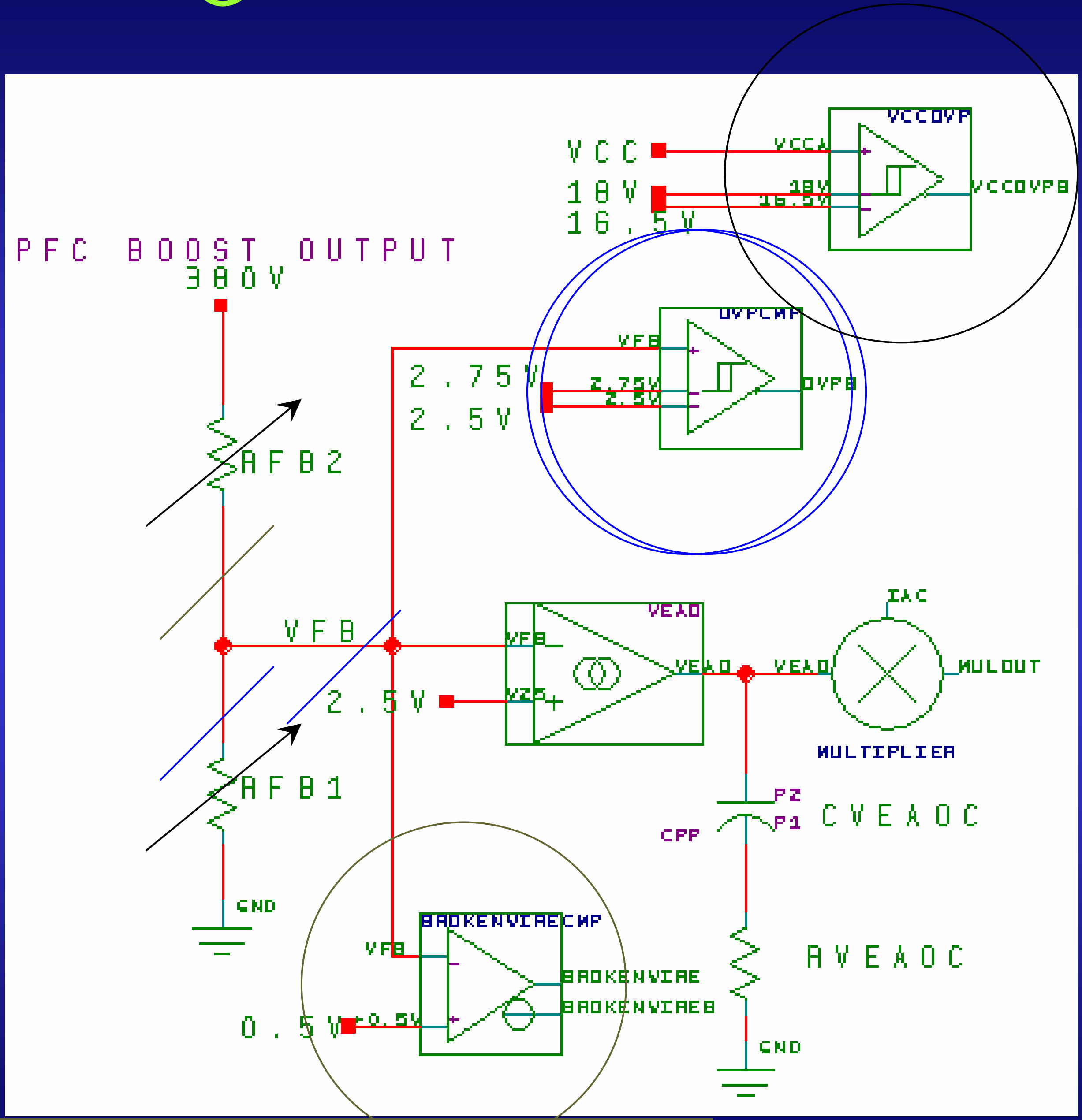
Speed up the PFC Voltage Loop 3X

$$GM_V = \Delta I_{VEAO} / \Delta V_{FB}$$

80++ CM6802A/B

80+ CM6800/A

Low Cost CM6805A/B



Easy to meet UL1950

Speed up the PFC Voltage Loop 3X

CM6802A/B

Dynamic Soft PFC

+

Dual Switch Forward

A ZVS-Like Controller

like a ZVS without any extra ZVS circuit

for

EPA/80++ Power

80++ CM6802A/B

Efficiency goes up

1.5% to 2% higher!

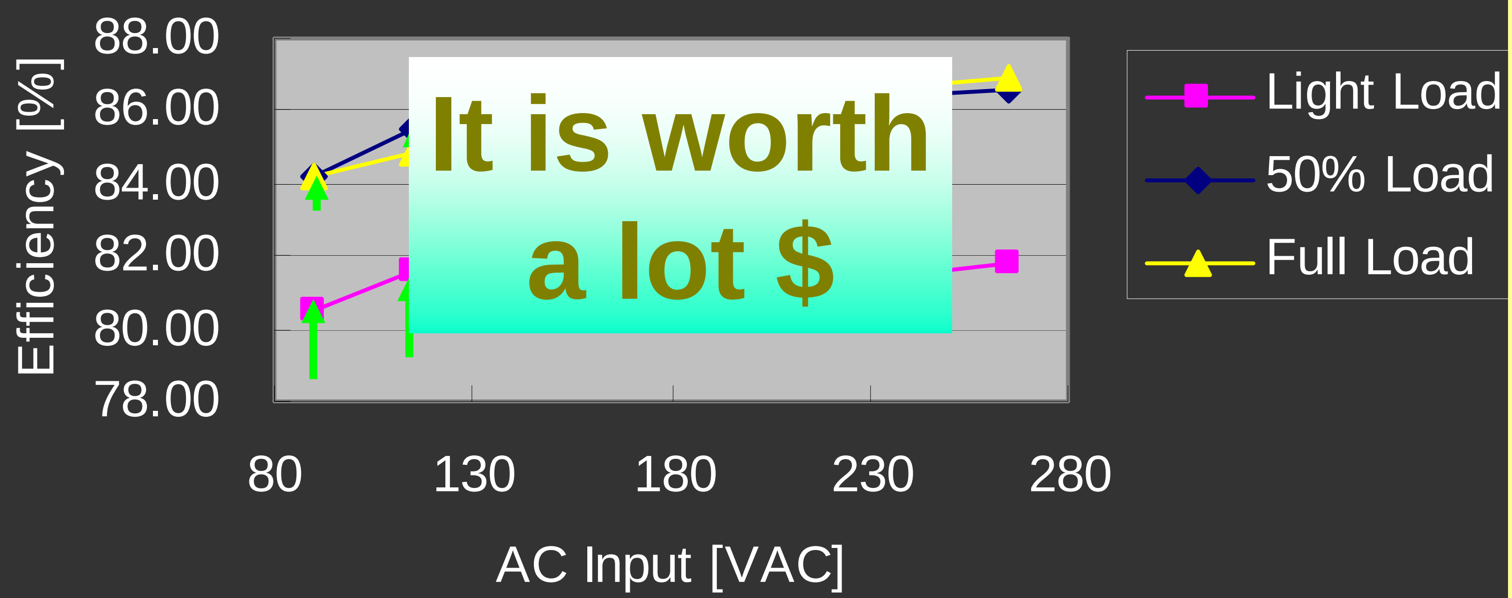
(CM6802A/B vs. CM6800A)

80++ CM6802A/B
80+ CM6800/A
Low Cost CM6805A/B

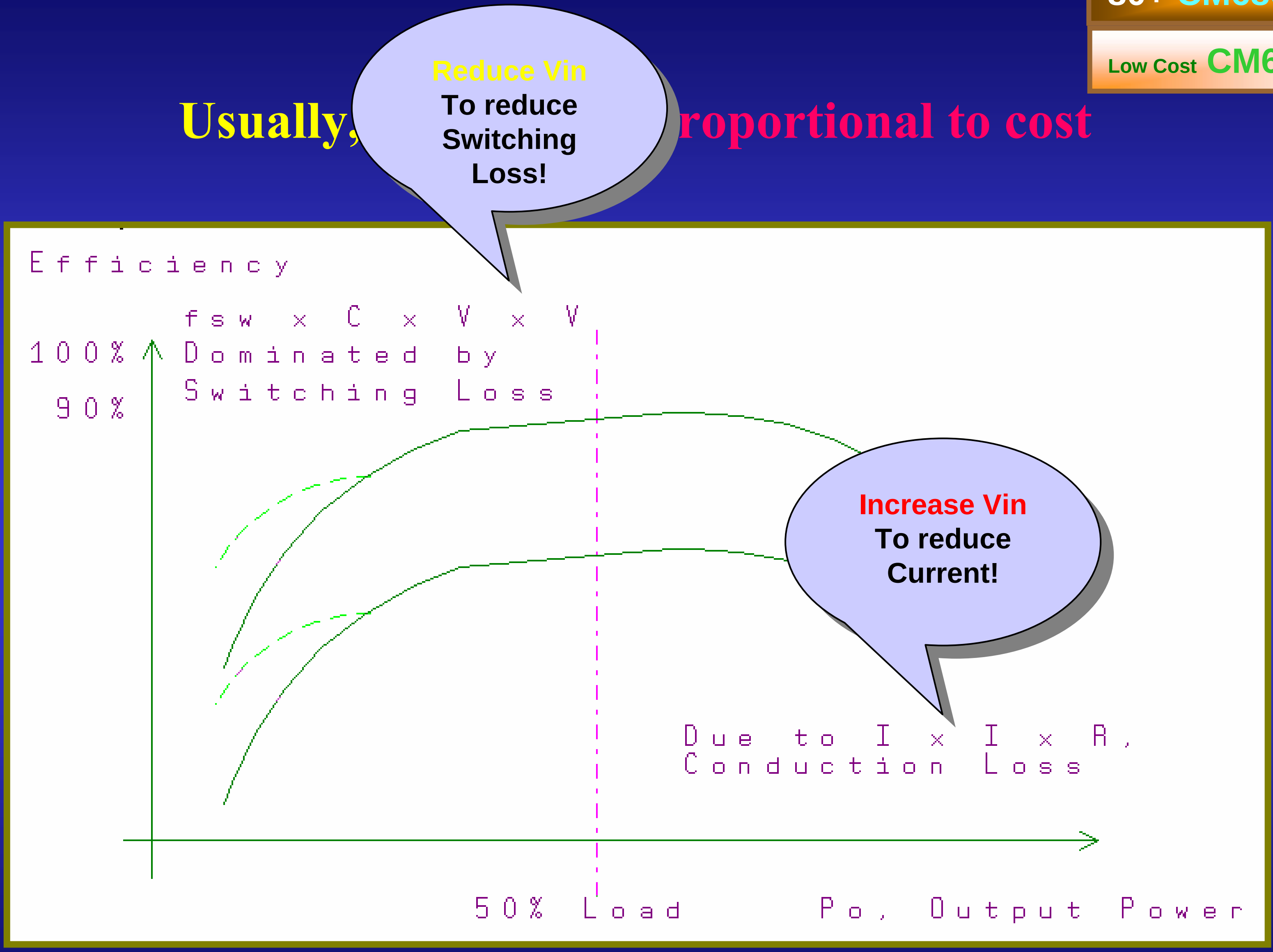
80++

CM6802A/B

300W Fanless ATX Power Supply
Without SR and without other tricks
Efficiency vs. AC Input



Usually, ... roportional to cost



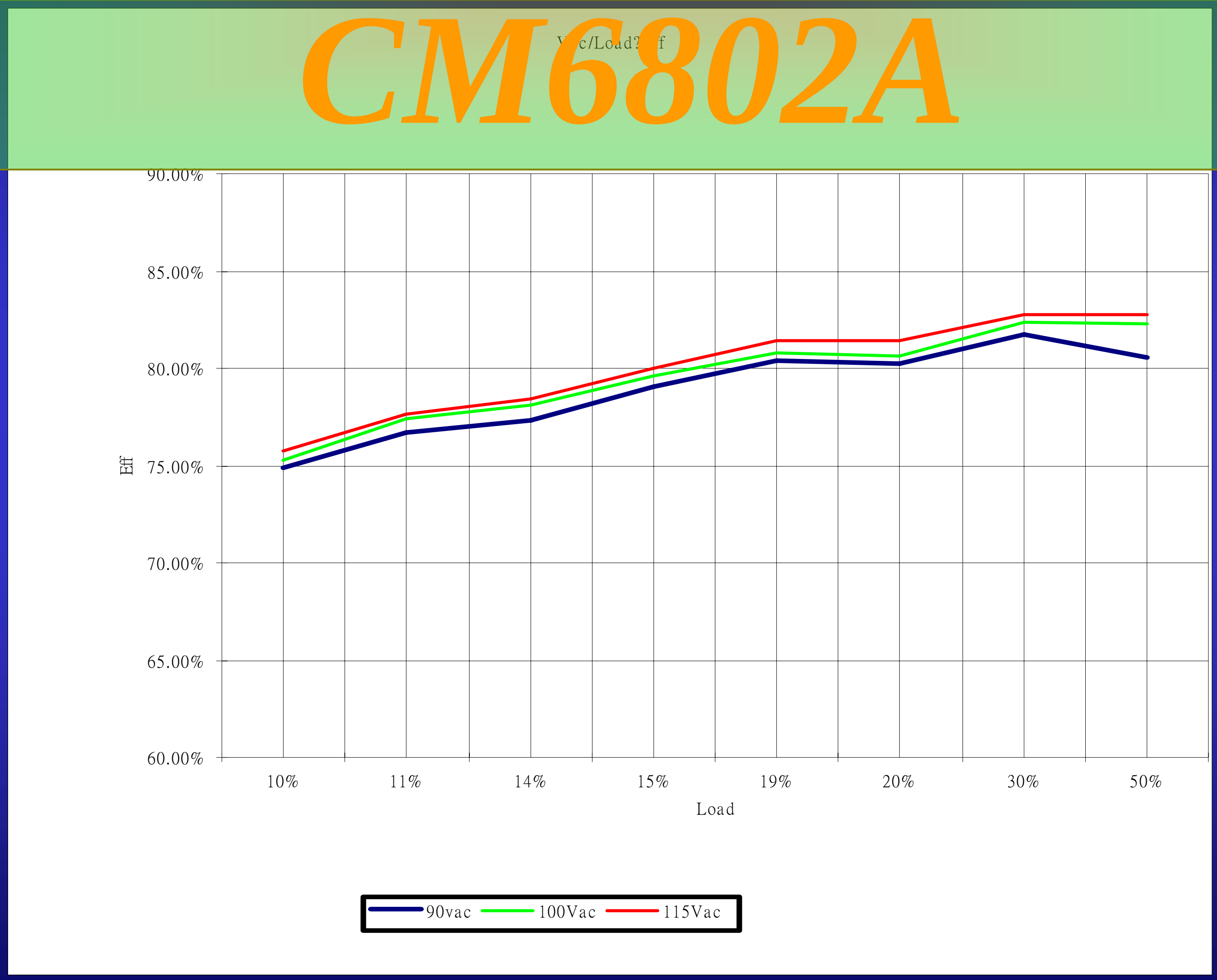
80++ CM6802A/B

80+ CM6800/A

Low Cost CM6805A/B

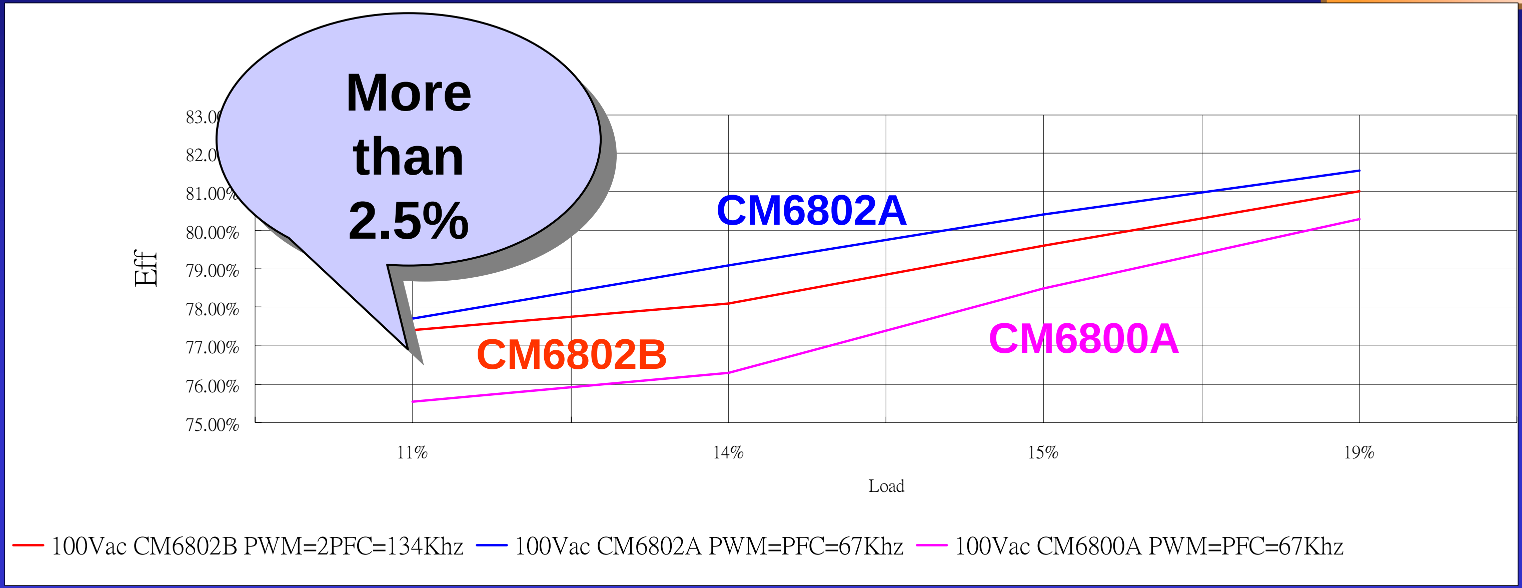
80++

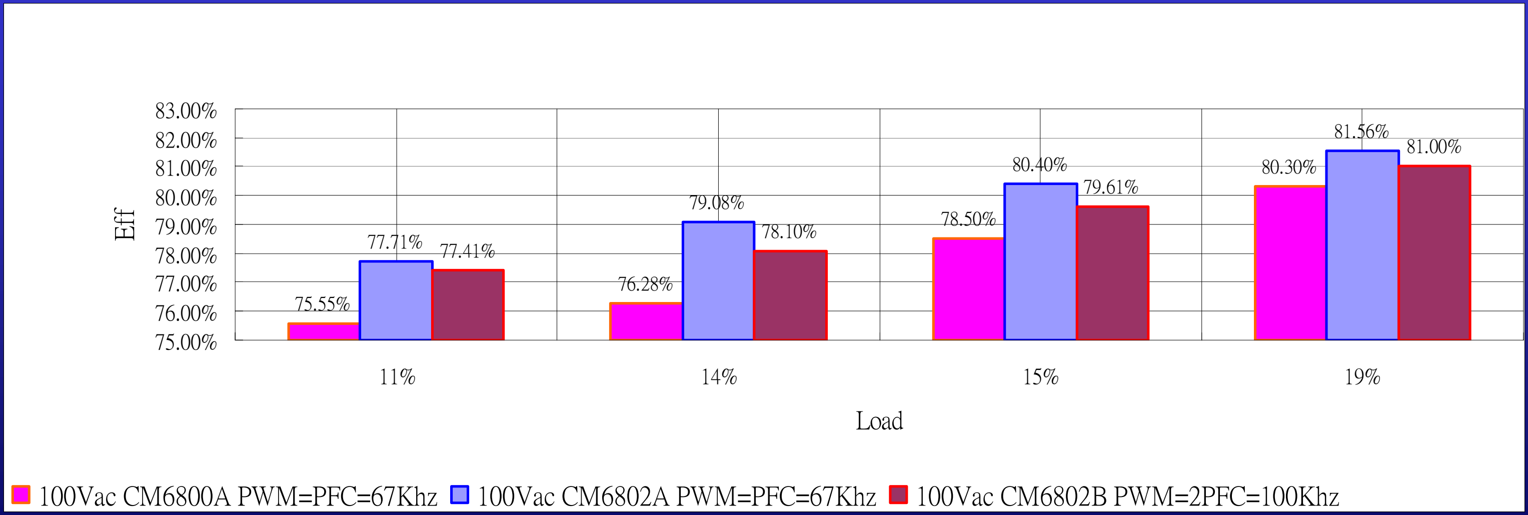
CM6802A



80++ CM6802A/B
80+ CM6800/A
Low Cost CM6805A/B

CM6800A, CM6802A and CM6802B at light load





80++ CM6802A/B

80+ CM6800/A

Low Cost CM6805A/B

80++ CM6802A/B

Dynamic Soft PFC

Reduce PFC Power Device Stress

It is like ZVS without any additional component at fixed switching frequency

Ease EMI filter

- AC Dynamic Brown out
- PWM Brown out
- PFC boost to 380V and 300V
- Ease Monotonic Power Sequence
- Dynamic (Fixed) Switching Frequency

80++
CM6802A/B

Hold-Up Time goes up

3mS to 5mS longer!

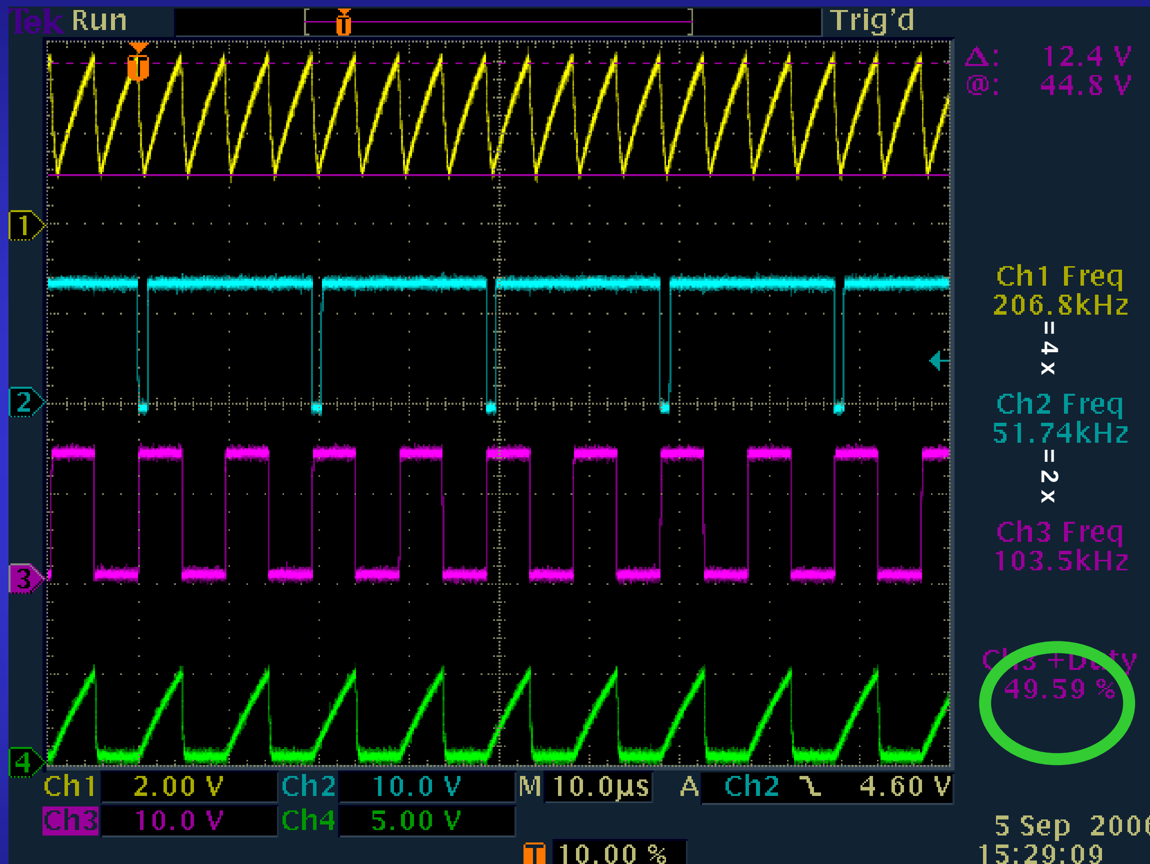
Digitized PWM Maximum Duty Cycle, Dmax

f_{rtct} (pin7)

f_{pfc} (pin12)

f_{pwm} (pin11)

f_{ramp2} (pin8)



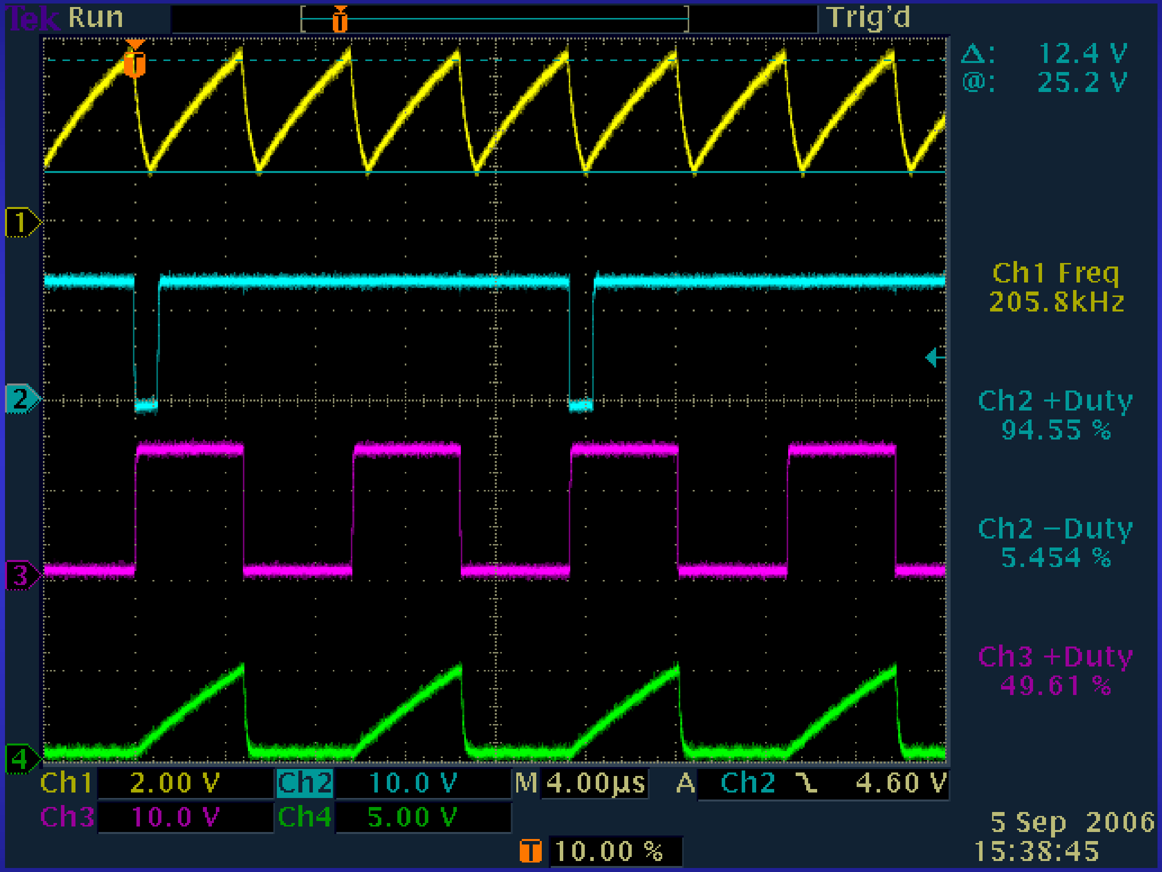
CM6802B Timing Diagram

f_{rtct} (pin7)

f_{pfc} (pin12)

f_{pwm} (pin11)

f_{ramp2} (pin8)



CM6802B Timing Diagram

Champion Microelectronic

Dynamic Soft PFC

80+ CM6800/A

Low Cost CM6805A/B

f_{rtct} (pi

f_{pfc} (pi

f_{pwm} (pi

f_{ramp2} (pin8)

Digitized PWM Dmax = 50%

saving ~ $0.35

for

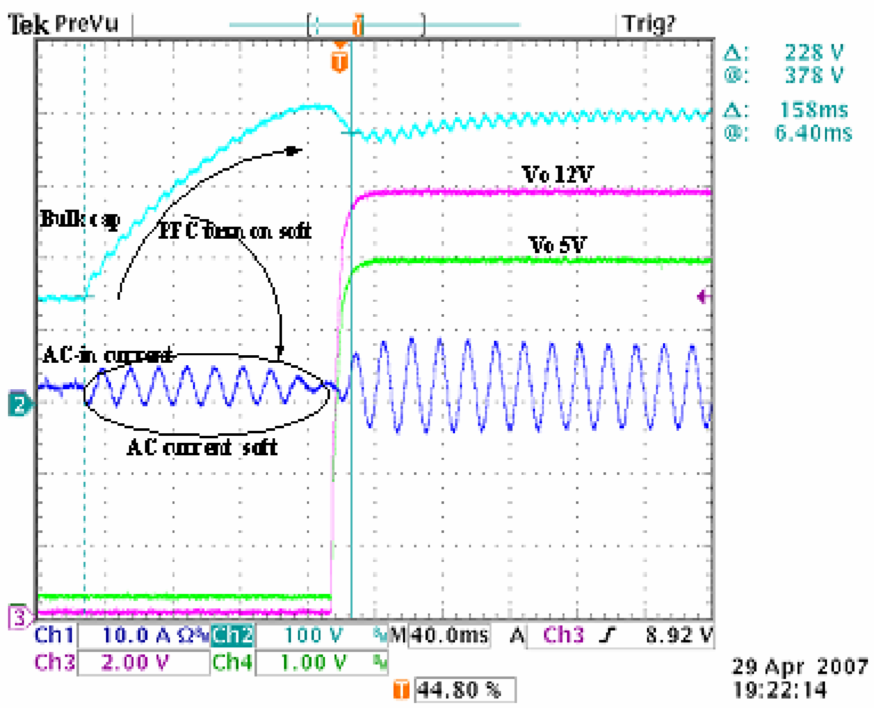
the Hold-Up time

Bulk 450V Cap

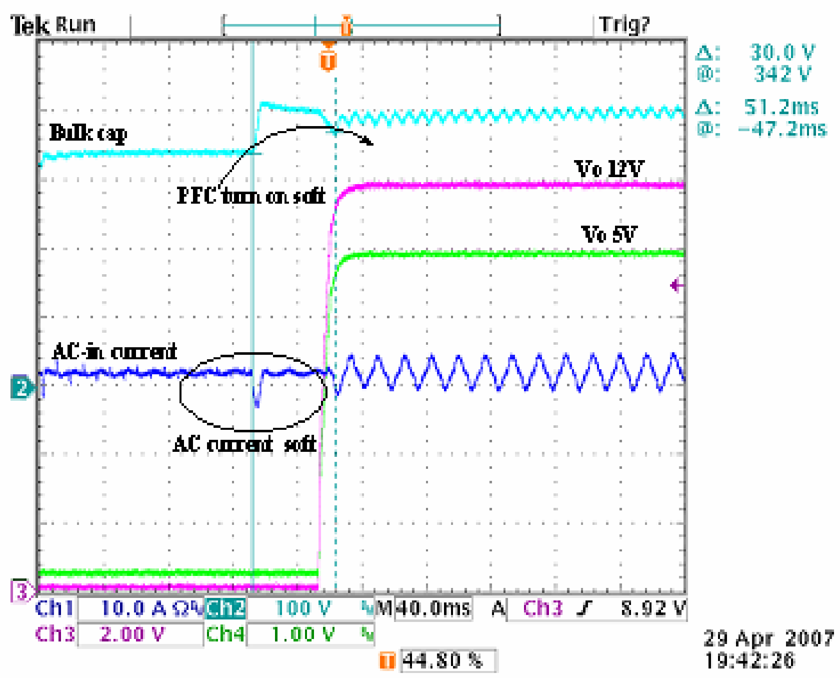
CM6802B Timing Diagram

PFC Soft Start @ full load

PFC soft start 90VAC @ full load (280W)



PFC soft start 230VAC @ full load (280W)

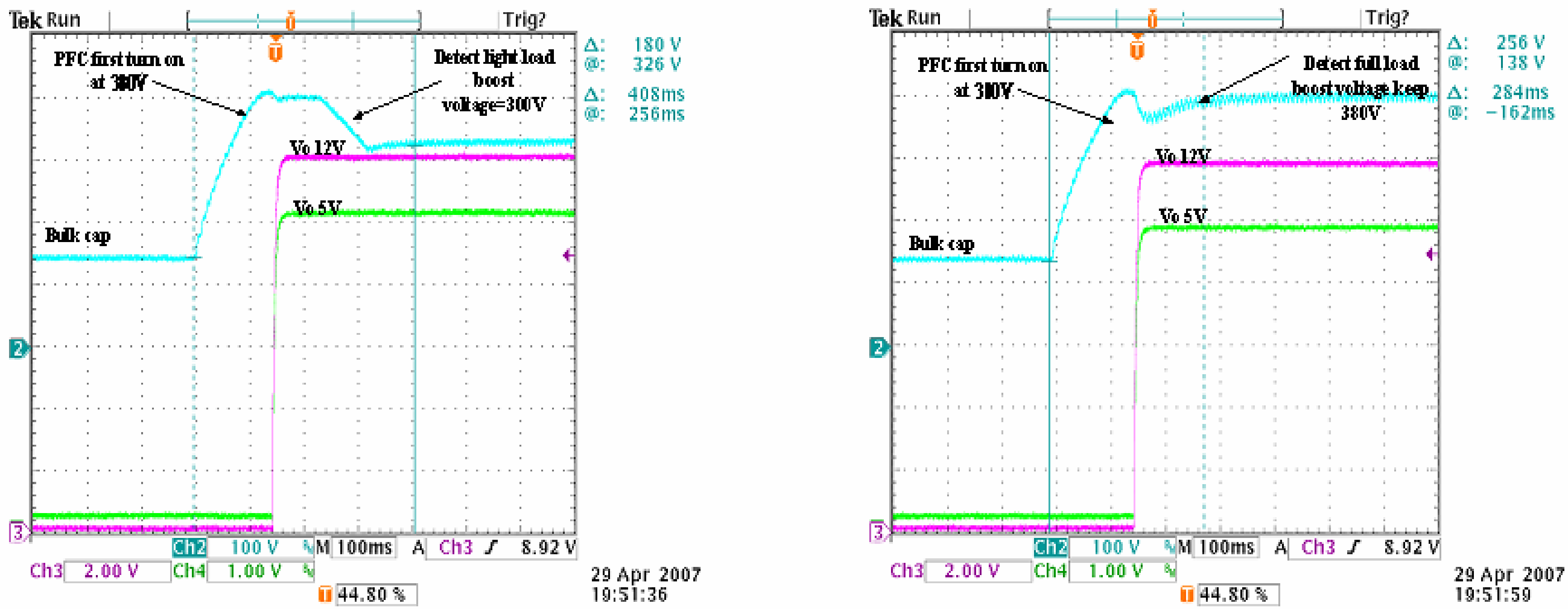


PFC Soft Start @ Vin = 90Vac

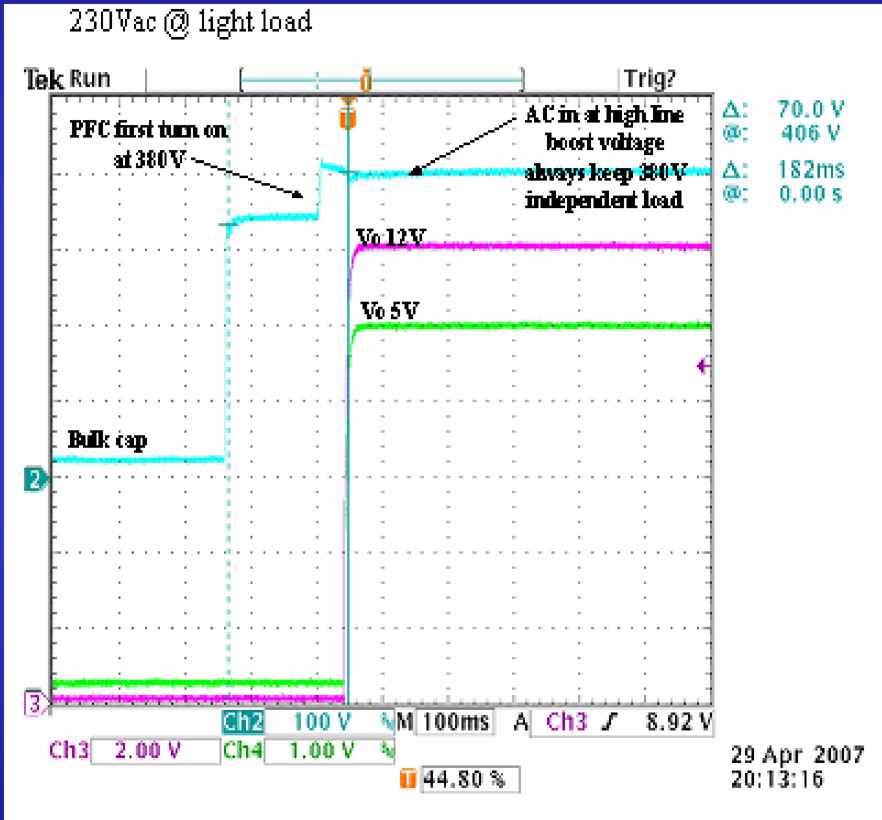
380V to 304V function (light load improve efficiency, full load keep hold up time)

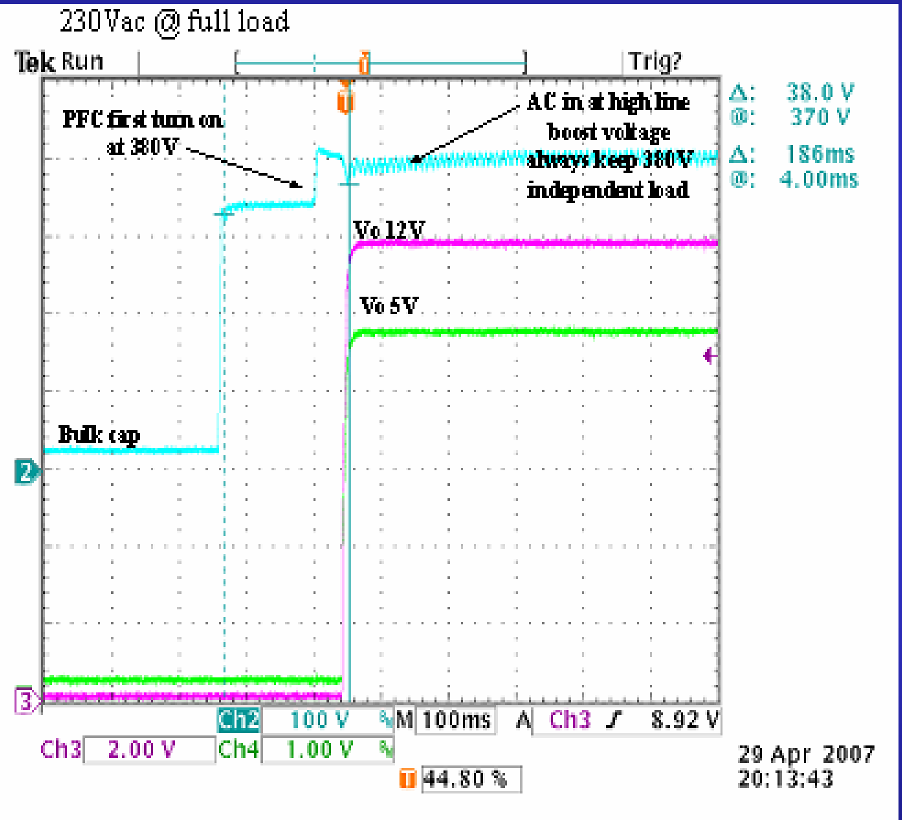
90Vac @ light load

90Vac @ full load



PFC Soft Start @ Vin = 230Vac





80++ CM6802A/B

Change all High Voltage

R > 5 Mega Ohm

No Load Consumption Drops

~ 289mW

@ Vin = 264 Vac

Low Cost
PC Power

Passive to Active PFC M6805A/B and CM6806

- PFC + Dual Switch Forward
- fixed switching frequency (55Khz, 67.5Khz and 90Khz)
  - CM6805A/B: 10 pin SOIC fpfc = fpwm = 67Khz or greater than 90Khz
  - CM6806: 10 pin SOIC fpfc = 55Khz and fpwm = 110Khz

Low Cost
CM6805 family

Low Cost CM6805A/B

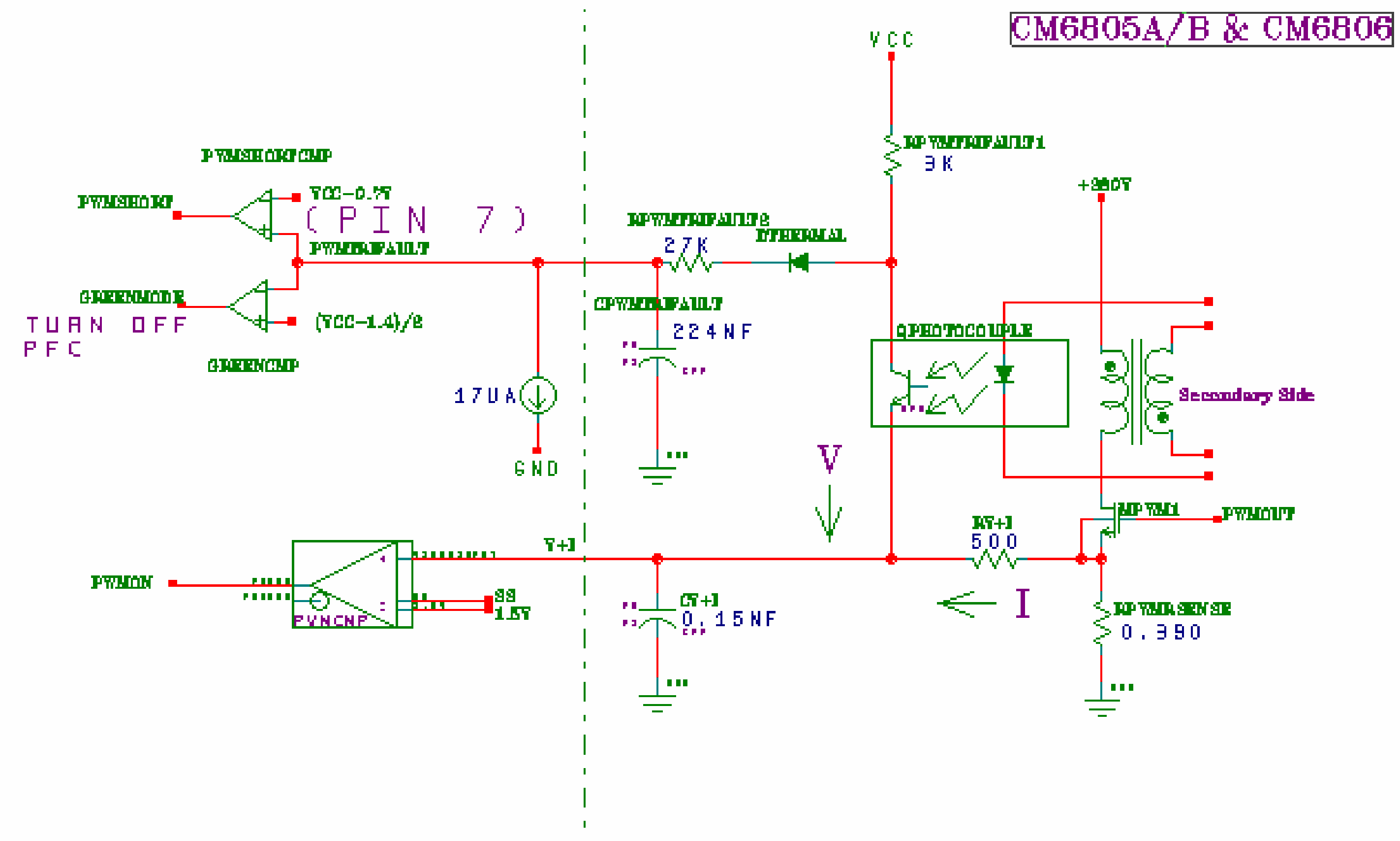
Why with CM6805A/B CM6806 PFC/Dual Switch Forward?

Passive PFC to Active PFC is not for 80+/EPA
CM6805 family could drive BOM 20% lower than 6800A 80+

$ 10 pin SOIC PFC/PWM combo allows Less external components (about 14 components less)
$ PFC + Dual Switch Forward → PWM Mosfet can be 500V
$ Leading Edge PFC/Trailing Edge PWM → 450V Bulk Cap can be reduced
$ Digitized PWM maximum duty, 50% → 450V Bulk Cap can be further reduced
$ CM6805 specialized feature with Powder Iron PFC core
$ Single Range Power reduces PFC Mosfet vs. 80+/EPA
$ Passive PFC has the higher cost in shipping
- PFCtrifault and PWMtrifault →UL1950 (Passive PFC cannot meet it)
- No load consumption spec. cannot be met by Passive PFC; Easy for CM6805 family
- Smooth On/Off which single PFC with single PWM is difficult

$ As results, the BOM cost is lower than Passive PFC

V+I, (pin 6) and PWMtrifault, (pin 7)
For FlyBack Converter



APPLICATION CIRCUIT FOR PWMTRIFAULT PIN