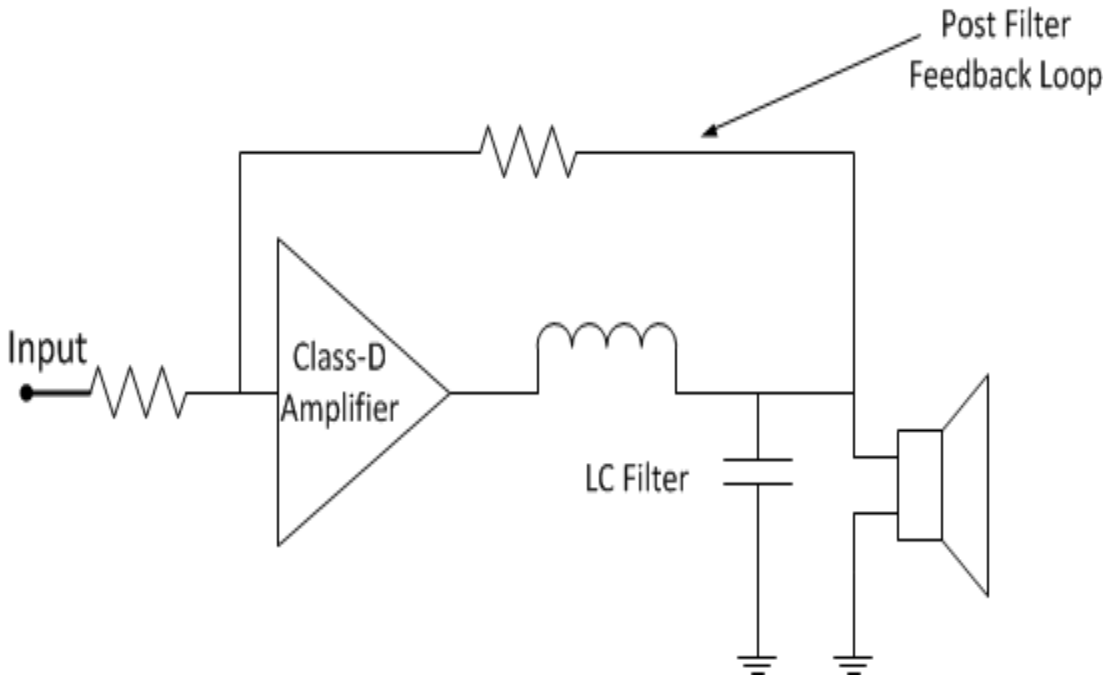
Post Filter Feedback (PFFB)

PFFB– What is it?

- PFFB is a secondary external feedback loop that feeds back a portion of the output signal after the LC filter to the input of the amplifier.

Improves system performance!

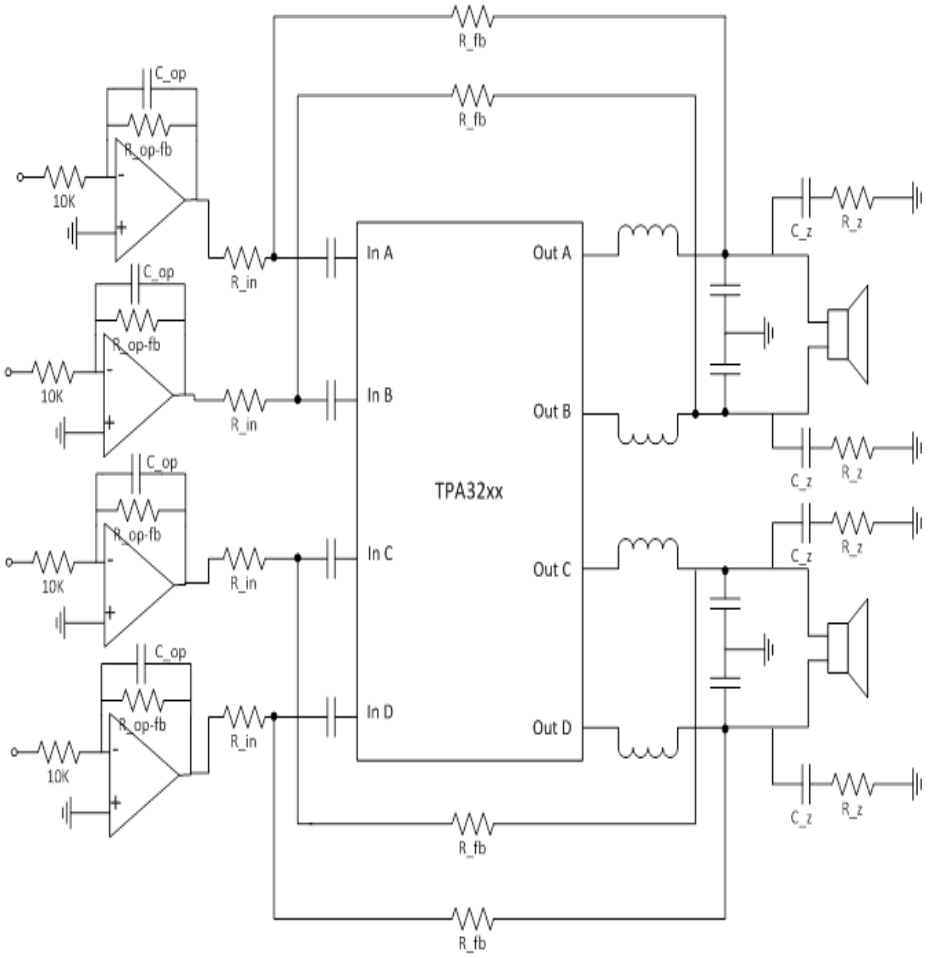


PFFB– TPA32xx EVM Implementation

TPA32xx EVM family has component pads to implement PFFB.

- R_fb: Feedback resistor
- R_in: Input summing junction resistor
- C_z: Zobel capacitor
- R_z: Zobel Resistor
- C_op: Op-Amp feedback capacitor
- R_op-fb: Op-Amp feedback resistor

PFFB Designator	EVM Schematic Location/Designator	TPA3251 (PVDD=36V Fpwm=600KHz)	TPA3255 (PVDD=51V Fpwm=450KHz)
R_fb	R47 R49 R50 R51	18K	20K
R_in	R4 R12 R44 R46	2.7K	2.7K
C_z	C77 C78 C79 C80	1uF	1uF//.33uF
R_z	R54 R55 R56 R57	2.7R	3.3R
C_op	C18 C23 C57 C65	330pF	330pF
R_op-fb	R8 R41 R21 R25	10K	10K



PFFB– Calculating PFFB Gain

$$A_f = \frac{A_0}{(1 + A_0\beta)}$$ Closed Loop Gain

$A_0 = 20dB = 10$ Standard Gain of TPA3251

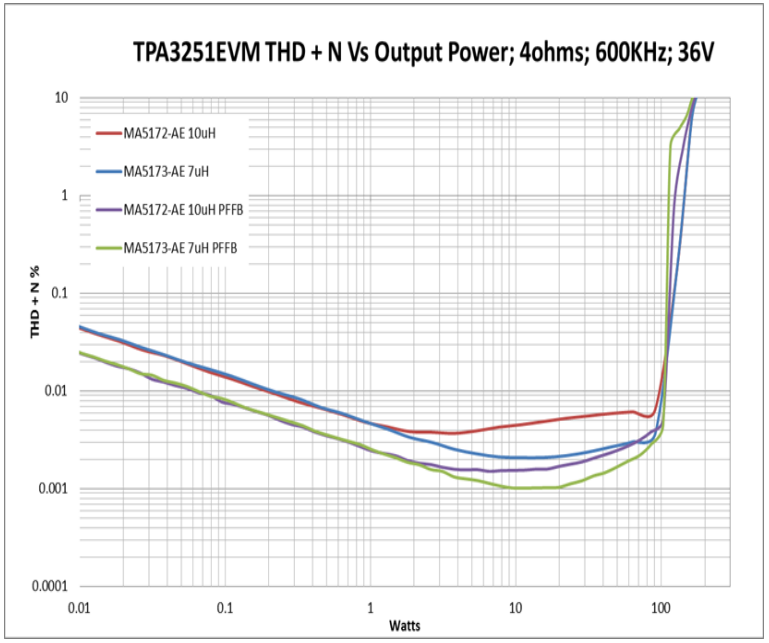
$\beta = \frac{2.7K}{(2.7K+18K)} = 0.13$ Feedback factor for TPA3251
(Based on R_fb and R_in resistor values)

Feedback Parameters	TPA3251 (PVDD=36V Fpwm=600KHz)	TPA3255 (PVDD=51V Fpwm=450KHz)
Gain Ao (dB)	20	21.5
Feedback Factor β	0.13	0.119
PFFB Gain Af (dB)	12.8	13.8
Negative Feedback (dB)	7.2	7.7

$$A_f = \frac{10}{(1 + (10\ x\ 0.13)} = 4.35 = 12.8dB$$ PFFB Gain for TPA3251

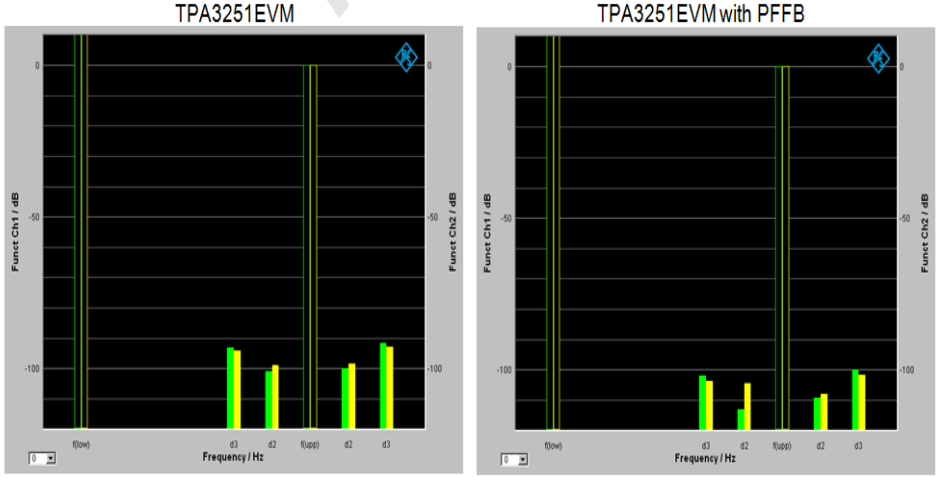
PFFB– Benefits

- Lower Inductor distortion



- Lower Intermodulation distortion

Test: SMPTE (60Hz + 7KHz, Ratio 4:1) 1W 8Ω

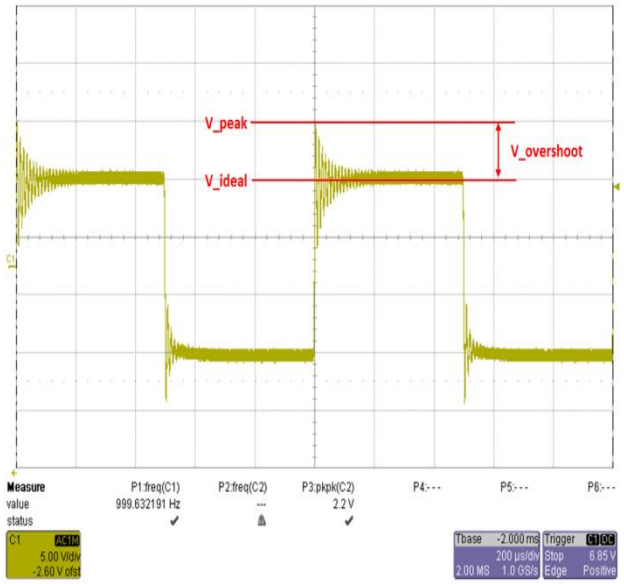


Noise (uV) A-Weighted		
EVM Configuration	TPA3251 (PVDD=36V Fpwm=600KHz)	TPA3255 (PVDD=51V Fpwm=450KHz)
Standard	60uV	86uV
PFFB	35uV	40uV

PFFB– Assessing Stability

Since the TPA32xx family are internally closed loop devices without access to internal loop, **time domain transient response** analysis is used to assess stability.

Frequency domain gain and phase bode plots **Do Not** give accurate results**.**



$$Overshoot(\%) = \left(\frac{(V\_peak) - V\_ideal}{V\_ideal}\right) \times 100$$