

solid state

Capacitor Bypass: Proceed Carefully

By Paul J. Stamler

A closer look at the role of capacitors in power-supply design and bypassing electrolytic caps with small film caps to improve their performance.

It's almost axiomatic among designers of audiophile projects and products that electrolytic capacitors should be bypassed with smaller, high-grade film capacitors. In the course of planning some preamp projects, it occurred to me that, like most people, I wasn't approaching the matter scientifically. Instead, when designing a power supply, I threw in what seemed like the right size electrolytic,

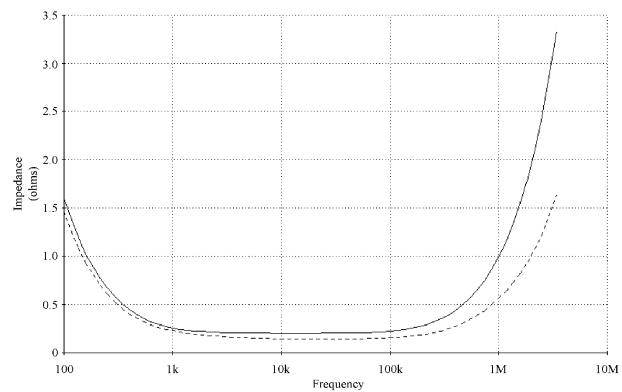
stuck in the biggest bypass caps that would fit the board and budget, and turned my attention elsewhere.

However, after a couple of bad expe-

riences (they mostly involved op amps going ballistically unstable), I decided that electrolytics and the film caps that bypass them deserved a closer look. I was curious how some popular, widely available capacitors actually behaved when tested in the crucible of life itself, to borrow a cliché. How, in particular, did they act at high frequencies? What were the design implications of that behavior?

to p. 57

FIGURE 1: TYPICAL CAPACITOR IMPEDANCE CURVE. THE SOLID LINE IS A SINGLE 1000 μ F 35V NHG-SERIES ELECTROLYTIC, UNBYPASSED. THE DASHED LINE IS THE SAME CAPACITOR, BUT BY-PASSED WITH A 0.1 μ F 400V POLYPROPYLENE AND A 100 μ F 50V NHG-SERIES ELECTROLYTIC.



A-2437-1

TABLE 1A

100 μ F electrolytics

SERIES	VALUE (μ F)	WV	DIGI-KEY PART #	COST (US\$)	DIAM. (IN.)	LENGTH (IN.)	PCM (IN.)	TAN THETA
TSHA	100	450	P10155-ND	4.65	0.90	1.40	0.4	
M	100	50	P5182-ND	0.41	0.30	0.45	0.15	0.12
FC	100	50	P10323-ND	0.76	0.40	0.50	0.2	0.10
TSHA	100	450	P10156-ND	4.56	1.00	1.20	0.4	
FC	100	35	P10294-ND	0.63	0.30	0.45	0.15	0.12
NHG	100	35	P5551-ND	0.40	0.25	0.45	0.1	0.14
M	100	35	P5165-ND	0.35	0.25	0.45	0.1	0.14
NHG	100	50	P5571-ND	0.48	0.30	0.45	0.15	0.12

TEMP (° C)	LIFE (khrs)	FRES (kHz)	ESR (Ω)	L (μ H)
105	3	27.9	0.52	0.325
85	2	28.7	0.362	0.308
105	3	29.1	0.263	0.299
105		30.8	0.458	0.267
105	2	31.2	0.23	0.260
105	2	32.7	0.467	0.237
85	2	34	0.458	0.219
105	2	34	0.49	0.219



DIAMOND GROOVE

- Analogue Productions
- Audio Fidelity
- Cisco Music
- Classic Records
- Mosaic Records
- Simply Vinyl
- Speakers Corner
- Sundazed

Many other non-audiophile labels
Over 1,500 new vinyl titles in stock

www.diamondgroove.com

1-877-DGROOVE

info@diamondgroove.com

the whole sound of vinyl
for Canada and the world