Operating Capacitors Well Below Rated Voltage

I have a question regarding electrolytic capacitor voltage ratings. Nearly 50 years ago when I worked in the black and white television service industry, we experienced a spate of electrolytic capacitor failures, typically in the cathode bypass role in areas like the vertical output stage. The capacitors were generally 100µF and rated at 25V (working) or thereabouts.

A number of service technicians started replacing these capacitors with 100µF 250V units, which were very common in this sort of TV set. However, it wasn't long before the 250V capacitors were failing at a greater rate than the 25V ones.

Investigations with capacitor manufacturers led to the theory that an electrolytic capacitor needed to have a voltage applied to it within reach of its rated voltage in order for the electrolyte to form properly. If this was not done, premature failure would result. I don't know if this theory was correct but reverting to the specified voltage ratings seemed to cure the problem.

My question is, therefore, do you know if this theory of capacitor electrolyte formation is correct and if so does it still apply today? In other words, am I risking premature failure if I discard my 16V electrolytic capacitor stock in favour of, say, 50V capacitors which would greatly reduce the number of components I keep on hand? (B. D., Hope Valle, SA.)

- We can't think of any reason why a 250V capacitor would have a higher failure rate than a 25V-rated unit, when operated at a voltage below 25V. Besides the possibility that the 250V capacitors were simply inferior in some way (eg, a different electrolyte formula or concentration), the only possible explanation might be that the AC currents being bypassed by the capacitor were much higher than its ripple current rating. This could possibly happen in the cathode circuit of a TV's vertical output stage, given that it would be handling the relatively high 50Hz currents applied to the deflection coils of the yoke.

As for the necessity to "form" the oxide dielectric layer of an electrolytic capacitor, there is some truth in that but the chemistry of the electrolyte in today's electrolytics is much improved on those from 50 years ago so it is not such an issue. Furthermore, the capacitors do not deteriorate to such a great extent when left for years without use.

So if you really do want to cull your stock of capacitors, you can toss the lower-rated ones. Bear in mind though that some 50V capacitors will be larger than their 16V equivalents and that might present a problem in some tightly packed PCBs. Also consider that if the 50V rated capacitors are a similar size to the 16V types, they may have inferior specifications such as rated temperature, ripple current rating, ESR or lifespan.

checked all my solder joints, both visually and with my meter, as well as reheating the joints to make sure.

I have replaced all the diodes, capacitors and both the Mosfets. I did not replace the resistors as they still measure OK. I bought a new regulator but the replacement Jaycar sent is a different part number and I could not adjust the output to 5V, so I reinstalled the original. Jaycar would not sell me a replacment programmed microcontroller (IC2) so I could not try that.

Given all this, I can only guess that one of the ICs is the problem. I would appreciate any ideas that you might have. (R. A., Crestmead, Qld).

- It sounds like the 5V supply is OK. You could check the drive to the Mosfet gates by removing the fuse and powering up. You should be able to measure a DC voltage at the gates of the Mosfets with respect to ground.

The voltage should go above 0V and since the DC voltage will be an average of the pulses, it will settle at about 2V. That's not the best test but gives an idea if the Mosfets are being switched. An oscilloscope will show whether the Mosfets are being correctly driven in anti-phase.

One problem that can cause a blown fuse is if the large low-ESR electrolytic capacitor is faulty. Another is if one of the IC pins is bent up under the socket for IC2 and so not making contact. A much less likely cause is a faulty PIC12F675 or programming error.

You can get a replacement programmed PIC for the unit by contacting **kits@jaycar.com.au**

Charging gel cell batteries

It may be a silly question but I've forgotten if it's OK to use a lead-acid battery charger designed for car batteries (Thunderbird Battery Charger) on a 12V gel cell. I do have the gel cell charger that SILICON CHIP designed a long time ago but it's buried in my lock-up storage shed. I'd like to avoid digging for it, if I can. (P. V., Hazelbrook, NSW).

- Provided your Thunderbird Charger is adjusted to provide a maximum output of 13.6V when set to charge 12V batteries, it should be fine to charge 12V SLA (gel cell) batteries.

Horizontal trimpots for MPPT Solar Charger

I am purchasing components to build the Solar MPPT Charger & Lighting Controller from the February & March 2016 issues of SILICON CHIP. Can you give me a little more detail on the type/brand of mini horizontal trimpots in your parts list on page 36 of the February edition? I'm not sure whether they are of the open carbon type, Cermet 1-turn type or Piher style. Your photo on page 37 suggests Cermet types. (R. C., Freshwater, NSW.)

- We use the Piher-style trimpots with 5mm (5.08mm) pin spacings, eg, Jaycar RT4360 (10kΩ) and RT4362 (20kΩ), Altronics R2480B (10kΩ) and R2481B (20kΩ). Cermet 3386F types can also be used, such as Altronics R2597 and R2598.

Programming the Spacewriter

I have been given an old Spacewriter kit originally sold by Jaycar Electronics. I would like to build it but note that the TMS6264L is programmed via a parallel printer port. As I have a laptop with USB and no printer port, is there a way I can program the device using a USB cable? I don't want to proceed if I cannot program it. (R. B., NZ).

- Technology has certainly changed