Re: Where are all the ESR meters?

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2007−07/msg03306.html

- *From*: Winfield <winfieldhill@xxxxxxxxx>
- *Date*: Mon, 23 Jul 2007 05:50:10 −0700

On Jul 23, 6:08 am, Fred Bloggs <nos...@xxxxxxxxxx> wrote:

> John Larkin wrote:
>
> > On Sun, 22 Jul 2007 19:39:36 GMT, Fred Bloggs <nos...@xxxxxxxxxx>
> > wrote:
> >
> > > John Larkin wrote:
> > >
> > > > On Sun, 22 Jul 2007 15:57:37 GMT, Fred
> > > > Bloggs <nos...@xxxxxxxxxx>
> > > > wrote:
> > > >
> > > > > Jim Thompson wrote:
> > > > >
> > > > > > On Sun, 22
> > > > > > Jul 2007
> > > > > > 04:24:21
> > > > > > −0700,
> > > > > > Winfield
> > > > > > <winfieldh...@xxxxxxxxx>
> > > > > > wrote:
> > > > > >
> > > > > > > Jim
> > > > > > > Thompson
> > > > > > > wrote:

Winfield wrote:

> I'll post mine, when I get enough energy to transcribe it from my paper scratchings, calculations and notes. Remember, it must be four terminal, and handle high DC voltages when probing in−circuit storage capacitors.

How high is "high"?

Perhaps a

better
question
is,
how
big
is
big?

Several
designs
we've
been
considering
have
a
pair
of
diodes
to
discharge
the
test
capacitor
and
limit
the
circuit
voltages,
but
I've
heard
these
can
fail
with
large,
charged
capacitors.

I
think
the
issue
isn't
necessarily
how
high

the voltage (tube amplifiers get to hundreds of volts), or how high the current delivered, but how much energy is going to be dissipated in the protection components that discharge the guilty capacitor.

I'd say the answer is, the size of two fists. I think we're talking about

~
100J
of
energy.
Isn't
that
more
than
enough
to
blow
out
a
common
glass
diode
and/or
a
1/4−watt
resistor?

Should be
enough to
crank you
over a few
times ;−)

...Jim
Thompson

WH is stalling... input
protection has little to do
with a basic
measurement architecture. I
had no idea this little project
would be so
difficult for everyone:−)

Interesting that for a proposed "group
design", hardly anybody is
willing to make a first step. The psychology
of group design is
fascinating, and it turns out that an audience

> is a huge inhibition;
> people tend to not expose ideas if they fear
> they are imperfect, and
> might give some nit−picker grounds for
> public criticism.
>
> Brainstorming is delicate because people are
> fragile. At my place, we
> scribble goofy ideas on a whiteboard, do a
> lot of stupid stuff (don't
> distinguish between circuit−as−proposal and
> circuit−as−joke), argue
> and laugh a lot, and sometimes come up with
> brilliance, with no way to
> tell who gets the credit. Some people just
> can't play at this game.
>
> John

Well whatever...the task is straightforward and does not require a great
amount of ingenuity. The ingenuity comes in deciding the functionality
of the meter. In my opinion there is nothing to accomplish by going half
way to an impedance analyzer, there are already plenty of compact and
fully functional products in that niche. The key is to produce the
simplest possible design that measures ESR, if something else comes free
along with that without introducing one iota more of complexity then
fine, but if it requires one speck of dedicated hardware not useful for
determining ESR then it goes. This will require that you discover
something inherent to ESR that allows for a very simple circuit
architecture. That is all the help I am going to give you at this stage:−)

> Thanks for the excellent illustration of my point. You are far more concerned about your ego than you are about the technology. Probably that explains why you don't design electronics.

> I know where you're coming from with that statement and it is not true. I am far enough along to know for sure whether something will work or not. All you have thought of so far is measuring the in−phase component of voltage developed by a current pulse. And your typical white board brainstorming is largely used for the how and not the what. The idea within the original Italian hobby circuit was not too bad, the execution was lacking, and the outputs of interest were sort of compressed, but the idea of a bridge driven by a reasonably *low* impedance current source, resulting in short transient recovery from the ESL and limited peak response, is not bad at all.

A better idea, I think, is to use a proper higher−impedance current source, and drive with a 100kHz sine wave, thereby greatly reducing the ESL problem, which can otherwise be a killer for the 1 to 30 milliohm region. Using a sine wave also means the measured ESR can be compared with laboratory meter readings. Otherwise, how would one compare sets of square−wave readings with accurate lab instrument readings?

I'm thinking of using a 2−volt peak sine wave with a 200−ohm resistor (10mA peak test current) delivered from a rail−to−rail opamp with a slew rate exceeding say 2V/us. I'll break the resistor into three parts and add two sets of protection diodes to the rails. The outermost resistor can be a 100−ohm 10−watt high−thermal−mass part to discharge the capacitors.

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