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ESR METER: Equivalent Serie Resistance Tester for capacitors



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The project came from an italian magazine (Nuova Elettronica N212); it's very simple but interesting; I've built it and tested some capacitors, so I think it's very useful: build it;

It measures the ESR (Equivalent Serie Resistance) of capacitor (electrolytic and not); practically you can see if a capacitor is good or not.

It's a bridge circuit that work at 100Khz;
there're the following possibilities::

- 1) The electrolytic capacitor is good: (low ESR) the bridge will stay balanced and the meter will indicate the maximun current.
- 2) The electrolytic capacitor is not good: (high ESR) the bridge will be unbalanced and that will cause the meter to indicate less current; as less the meter will indicate as higher will be the ESR;
After few measure you'll be able to decide if a capacitor is good or not.
- 3) There is a short circuit in the electrolytic capacitor:
the meter will indicate the maximum current and the red LED will lamp; capacitor is not good.
- 4) The electrolytic capacitor is broken:
the meter will not move. Capacitor is not good.



I've closed the circuit in a small plastic box inside which there is the battery, the meter and a ON/OFF switch;
 the meter will be 500 microA F.S. but I've used a 1 milliA one adding a small NPN transistor as amplifier;

You will notice some interesting thing about capacitor using this meter; for example low value capacitor (1-10 microF) have often higher ESR than high value one.

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Components:

R1=1K5

R2,R3,R4,R5=10K

R6=68K

R7=4K7

R8=12K

R9,R11=1K-1%

R10,R12=22-1%

R13,R14=1K

R15,R16,R17=47K

R18=15K

R19=680

R20=2K2

R21=20K TRIMMER

C1,C2=1 microF electrolytic

C3=1NF POLY

C4=100NF POLY

C5,C6=1microF POLY

DS1,DS2=1N4007

DS3=1N4148

DL1=LED

TR1,TR3=BC547

TR2=BC557

IC1=TL084

S1=SWITCH

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