Multimeter RF Power Add-On

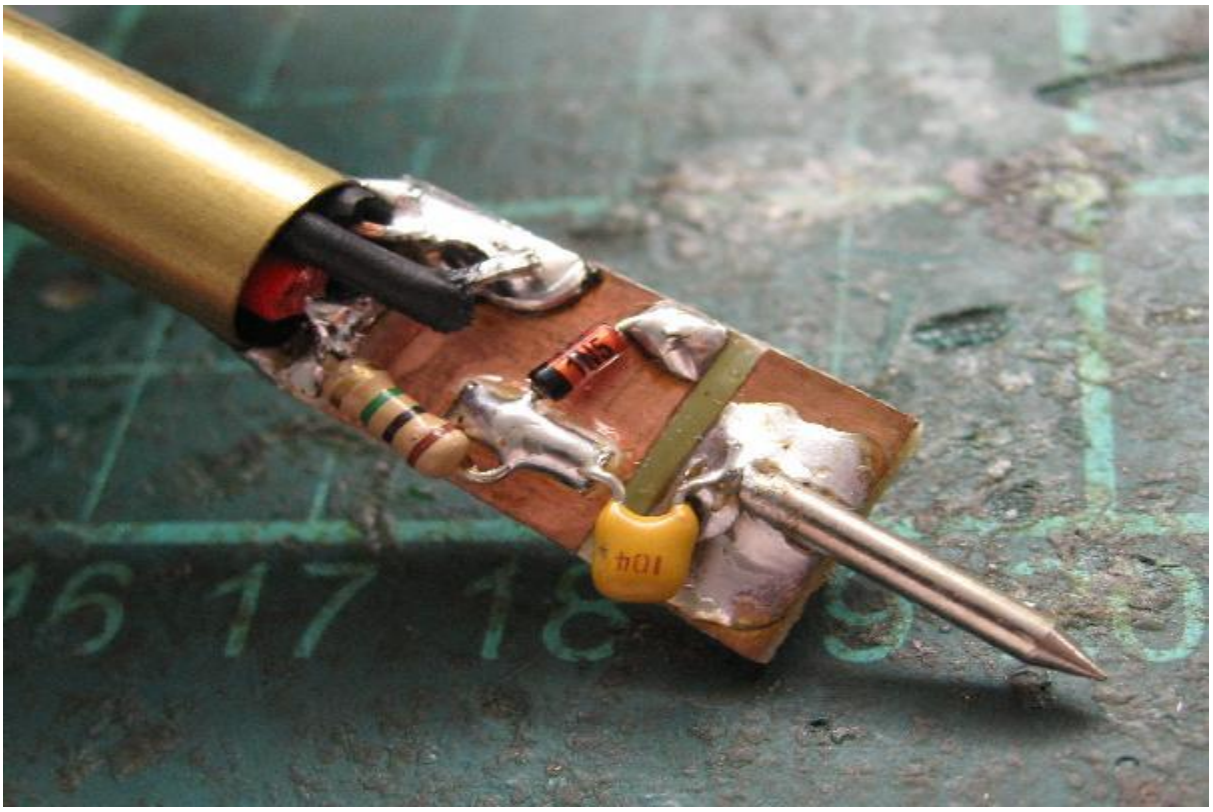
Being able to quickly measure RF power from -10 dBm to + 30dBm is extremely useful. This simple 50 Ohm load with inbuilt diode peak voltage detector fits the bill. Unfortunately it must be calibrated carefully and isn't direct-reading, but a simple table of Voltage or Current measured to delivered dBm can be constructed and kept near the unit.

I wrote a short program to generate a table of the Voltages, RMS, Peak and Peak-to-Peak that represent -20 dBm to +30 dBm. The formulae might be simple, but the table is useful for ball-parking, and was used to calibrate the meter at DC.

Calibration at DC isn't perfect, RF will read slightly differently as the dynamic properties of the diode vary. However it is extremely easy to just dial up DC voltages on your bench PSU and write down the corresponding reading on the multimeter.

If you use 75 Ohms more than you use 50 you might build and calibrate yours for that impedance. The load resistors will tend to dominate the frequency response, but the detector itself does affect the high-frequency return loss. The resistors and layout I used are only really suitable to low VHF, but for my immediate uses that is sufficient.

Build yourself a diode probe too (there is a 470p chip capacitor hidden under the wires).



Unlike the power meter the diode probe is designed to only load the circuit very lightly, measuring the peak RF voltage at the point under test. As the impedance of the particular point in question will vary it can only use used for relative measurements so there is little point calibrating it.

Notes

The diode is a 1N5711.

The 10 nF capacitor directly across the meter plugs is to prevent RF from upsetting the meter (smaller values using ceramic or chip caps might be more appropriate at higher frequencies). The budget meter show is actually very resistant to RF interference compared to some of my other multimeters, my old DSE Q-1418 did not like the RF at all once more than a few dBm was delivered. (Meter show is a Jaycar QM-1500, about $8 AUD. For the price you may as well just dedicate one to this service.)

The 1 KΩ resistor in series is to limit short-circuit currents to something that won't zap the diode. It is small enough to be effectively ignored when looking at the peak voltage with the high input resistance of a modern multimeter. It also allows you to use a current measurement instead, either with a mechanical VOM or bare meter movement, or with the multimeter. Your multimeter might work better in this mode. It can't hurt to produce a calibration for current too, so you can compare the measurement of voltage and current if something looks weird. (i.e. If you have your doubts about RF upsetting the meter due to an unexpected resonance.)

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