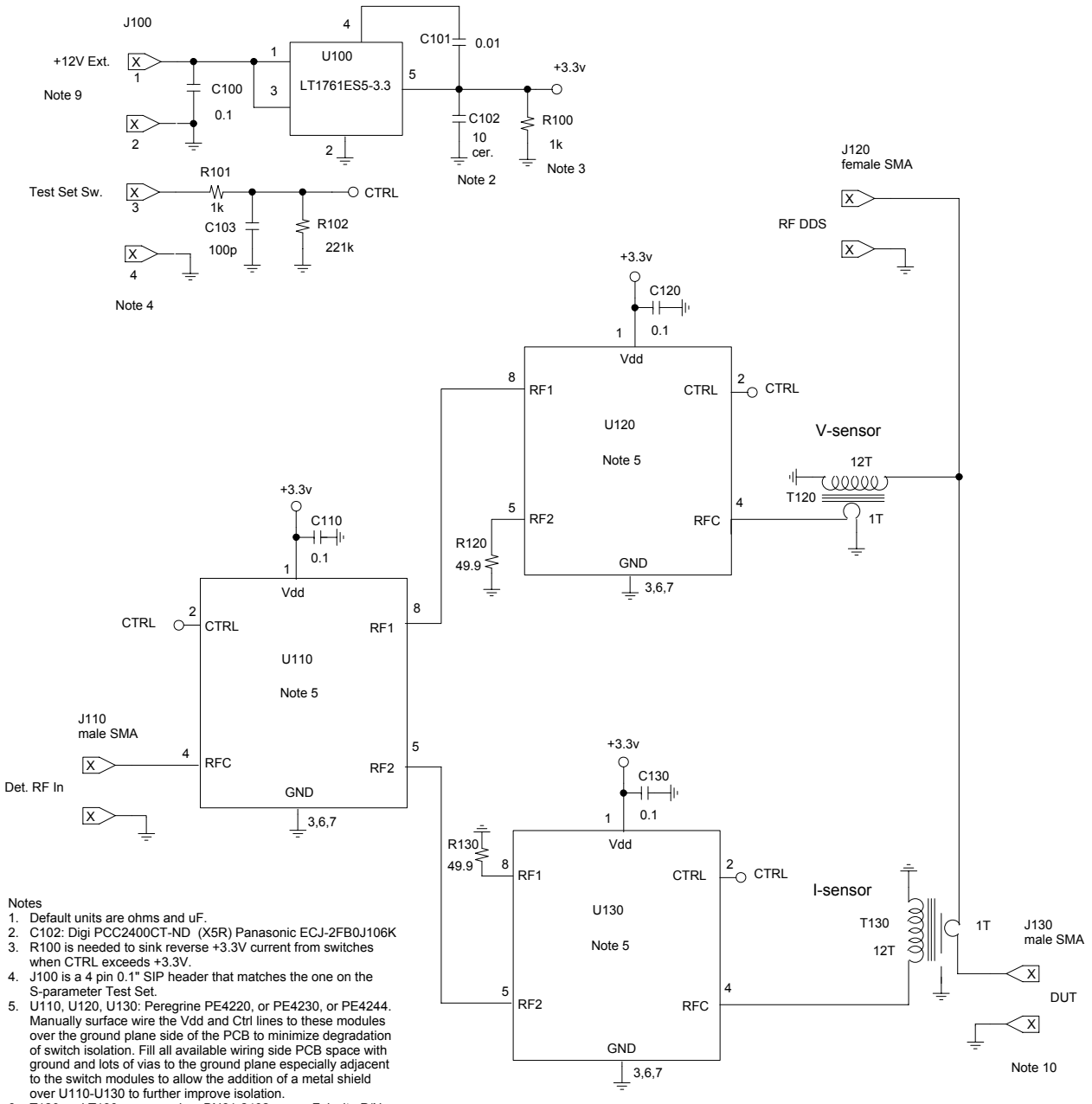
N2PK VNA RF I-V Single Detector Test Head V1c

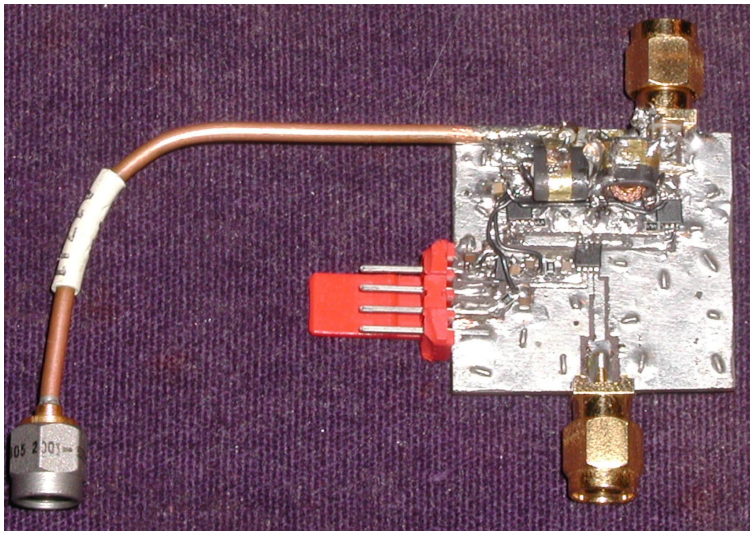
File: RFIV_Single_Detector_Switch_and_Sensors_V1c.pdf N2PK Aug. 30, 2008

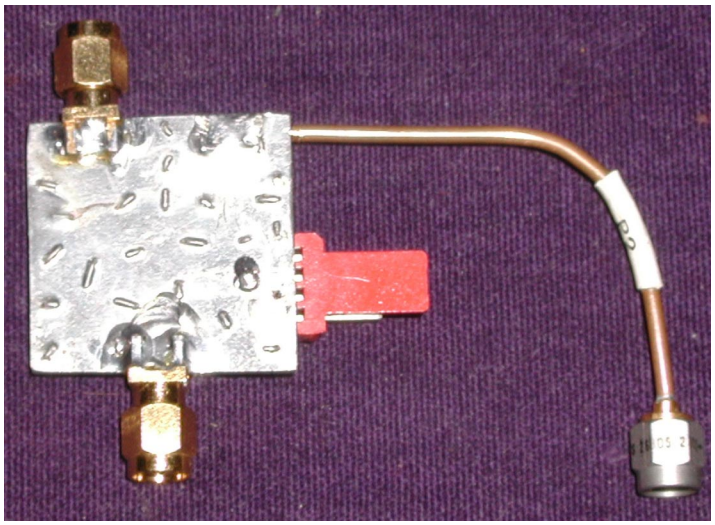


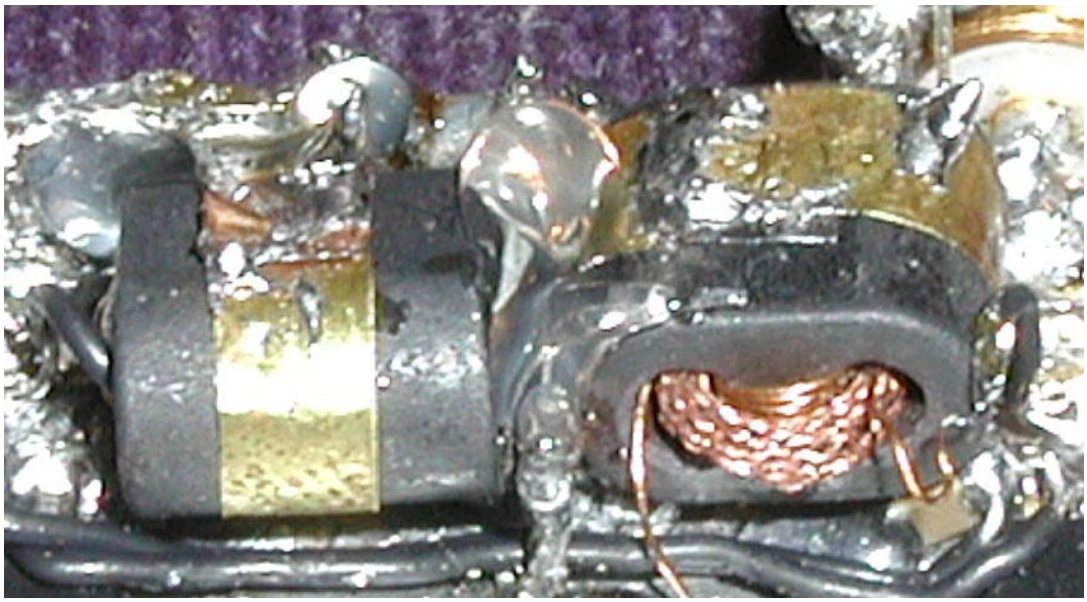
Notes

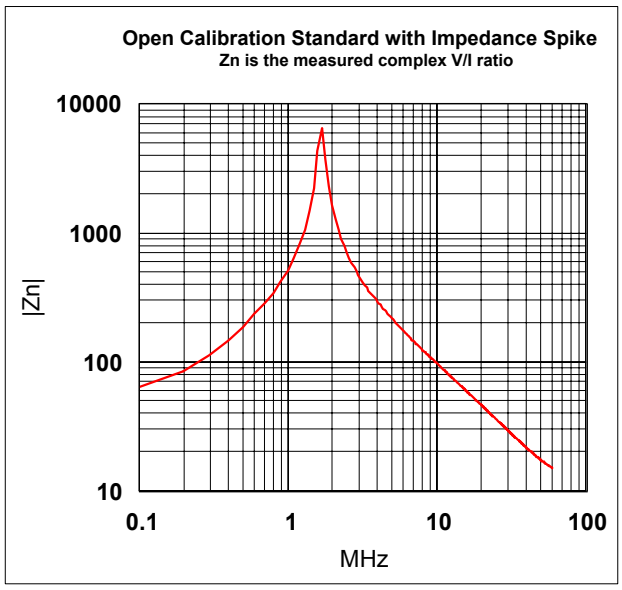
1. Default units are ohms and uF.
2. C102: Digi PCC2400CT-ND (X5R) Panasonic ECJ-2FB0J106K
3. R100 is needed to sink reverse +3.3V current from switches when CTRL exceeds +3.3V.
4. J100 is a 4 pin 0.1" SIP header that matches the one on the S-parameter Test Set.
5. U110, U120, U130: Peregrine PE4220, or PE4230, or PE4244. Manually surface wire the Vdd and Ctrl lines to these modules over the ground plane side of the PCB to minimize degradation of switch isolation. Fill all available wiring side PCB space with ground and lots of vias to the ground plane especially adjacent to the switch modules to allow the addition of a metal shield over U110-U130 to further improve isolation.
6. T120 and T130 are wound on BN61-2402 cores, Fair-rite P/N 2861002402. Each winding turn goes thru BOTH holes of the binocular core. Before winding, either a drill bit should be used to remove the sharp edge from each core hole or use plumber's teflon tape wound thru both holes. The 12 turn winding is AWG #36 enamelled wire wound first and tightly against the (taped) core. The one-turn winding is AWG #30 with teflon insulation. For PCB layout convenience, each winding can exit the core on the same or opposite ends. Also, the wire ends can be selected to ease the PCB layout. Larger wire may be used but possibly at the expense of high-frequency performance. A small braid is placed over the one-turn winding on T130 and grounded at one end to serve as the electrostatic shield.
7. T130 should be located as close as possible to J130 to minimize the land capacitance between these two. T120, in turn, should be located about 0.15 inch away from T130 and perpendicular to T130 to reduce transformer interaction and minimize the land capacitance between these two.
8. A high logic level on "Test Set Sw" will select the V-sensor and a low logic level selects the I-sensor.
9. "+12V Ext." can range from +5V to +16V.
10. For best accuracy high impedance measurement accuracy, the DUT should be as close as possible to the T130 current sensor. The best case would be when the DUT and calibration standards F/SMAs mate directly with the M/SMA at J130. Although not as critical, the connections to the VNA RF DDS and Detector RF In should be as short as possible and use the fewest possible connectors and adapters.

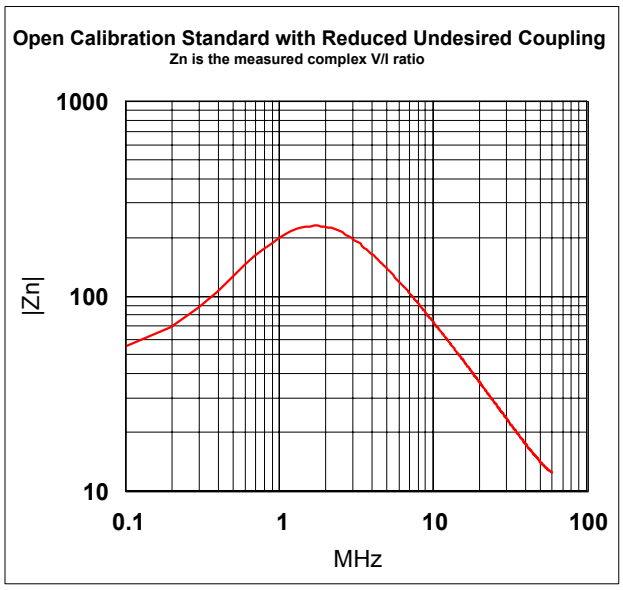
Here is what my first pass single detector RF I-V test head looks like. It is somewhat smaller than desired since it was an adaptation of a previous PCB which was built with one switch. The I-V sensor cores, in particular, should be a bit further apart than shown here. I found that the cores being perpendicular to each other resulted in the least coupling and was essential to avoiding a very undesirable impedance spike with the open calibration standard. For further undesirable coupling reductions, I placed shorted turns around each core and grounded them. I also placed a braid over the 1 turn I-sensor winding which is grounded ONLY at one end. Hot melt wax holds the cores in place. I did not locate the switch Vdd and Ctrl wiring on the ground plane side here as I am now recommending.











Some additional data: