SHORT CIRCUIT DETECTOR

With the increase in the assembly of printed circuit boards, using surface mount components, there is a need for a short circuit detector that will not damage sensitive low voltage semiconductors. It was decided to construct a tester with a maximum voltage of 50 mV and a current of 1 mA. This could be changed easily by altering the two input potential dividers R1, R2 and R3, R4. Integrated circuit 1a is configured as a voltage comparator so that when the probes are shorted together the output on pin 1 will go high thus switching on the square wave generator I.C.1b which is set to a frequency of 4 KHz by C1 and R8. The output drives a ceramic transducer with a resonance of about 4KHz. This is available from Maplin for less than £2. The potential divider resistor values are chosen so that the resistance of the “short circuit” has to be less than about 25 ohms to activate the tone. This is so that low resistance board components will not cause a false detection. The tolerance errors in resistor values and the variation in the input offset voltage of the comparator can be corrected by changing the value of R3. A value between 82K and 470K gives a 20 mV shift in the reference voltage on pin 3 which should be more than enough. The red LED has been added to indicate when the unit is switched on. If this is not required it can be omitted but R1 should be changed to 8K2. For the perfectionist a 470K resistor can be connected between pins 1 and 3 of the CA 3240 to eliminate indecision at the point of switching. The probes are constructed from ball point pens. The ink refills are removed and replaced with pins soldered to flexible cables.

If a self-oscillating transducer can be found then the 4 KHz oscillator section around IC1b can be omitted and IC1a can be changed to the CA3140. Note that the pin numbers will change. The resistor R5 in series with the transducer should not be less than 1K.

Peter Smith G4JNU

Dec 2014