Induction cooktop repair

R. S., of Moruya, NSW, has become something of an expert on the workings of induction cookers after performing several repairs on these finicky devices. But he seems to have figured out how to solve the reliability problems he's encountered, as explained below...

Induction cookers work by converting 50Hz mains power to a higher frequency, typically 20-40kHz, and applying that to a flat coil of heavy wire which sits under the glass "hotplate" of the cooktop.

The ferromagnetic pan (only this type will work) then acts as the secondary of a transformer, being heated by the combination of eddy currents and magnetic hysteresis losses.

Current to the coil and thus heat is controlled by an IGBT (insulated gate bipolar transistor). The IGBT control circuitry incorporates a timer function and temperature control and also prevents operation if there is no suitable pan on the cooktop. An excellent description of the operation of this type of circuit is at: **siliconchip.com.au/link/ab13**

I bought my first portable induction cooktop in early 2016 but it failed dramatically and noisily when first switched on, taking out the switchboard circuit breaker. I returned it for a refund.

Later in 2016, I was given a Baumatic BHI100 portable cooktop which worked very well for nearly a year before failing in a similar manner to the other one. I claimed a replacement under warranty and this was duly supplied but the replacement then failed after a few weeks. I claimed another refund under warranty, but heard nothing back.

As I seemed to have little to lose, I disassembled one cooktop, which seemed to be well made, and hence possibly worth repairing. I identified a blown 12A fuse and a short-circuit IGBT, type H201353, rated at 1350V and 20A.

My experience is that the failure of a main power supply component often causes failure of several other components but as the new IGBT and fuse were inexpensive, I decided to try replacing both and see what happened. I decided to up-rate the IGBT using an IHW30N135R3, rated at 1350V and 30A. Somewhat to my surprise, this fixed the fault entirely.

Heartened by this success, I then disassembled the other failed cooker and found a blown 12A fuse, a faulty IGBT and a short-circuit bridge rectifier. I replaced the bridge rectifier with a higher rated unit, a GBJ2510 rated at 1000V, 25A. The fuse and IGBT were also replaced, as before, and again this fixed the fault.

I had three subsequent failures but new IGBTs fixed these faults. For the latest replacement, I used the highest rated TO-247 "TrenchStop N-Channel" IGBT that I could find, an Infineon IHW30N160R2, rated at 1600V, 60A. Touch wood, but they have not failed since.

In the Baumatic unit, the bridge rectifier and IGBT are mounted on a heatsink on the main circuit board. The unit is easily disassembled; plugs and sockets interconnect the individual boards. Replacing the rectifier and IGBT only required basic soldering and de-soldering skills but of course, as with any mains-powered device, caution is needed.

As an IGBT failure does not seem to take out other components, and the devices are not that expensive, it is generally worthwhile for reasonably experienced and cautious people to have a go at fixing similar units.

The designers could perhaps have used more robust semiconductors. It is asking a lot of a relatively small TO-247 component, even in so-called "resonant switching mode", to deliver 2000W. There may be other faults in the design. This model of Baumatic portable cooktop does not seem to be available now, except as a clearance item. SC