Analysis of the Drivers in a 1998 Mustang Cobra CRAJ0 (AOL3) PCM

V1.0

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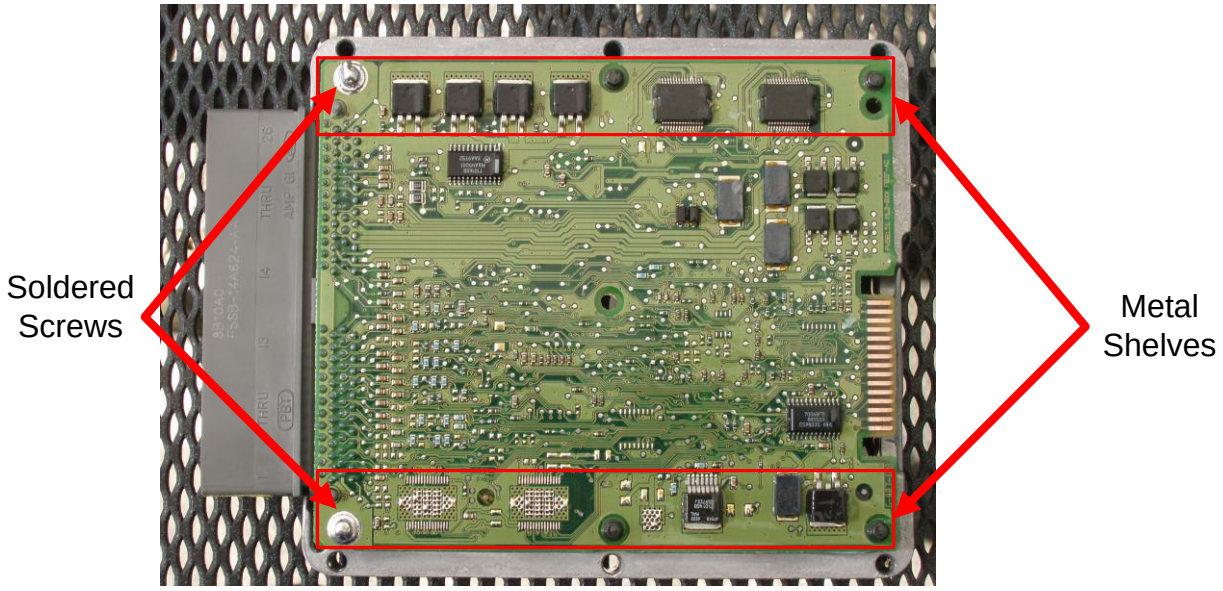
Thanks go to Guido in Da Cobra, who put the project together, and Mustang Matt, who loaned me a spare 98 Cobra PCM.

The specific purpose of this project is to try to determine if the coil drivers in a PCM from a 98 Mustang Cobra will handle both a COP conversion and a Kenne Bell Boost-A-Spark at the same time.

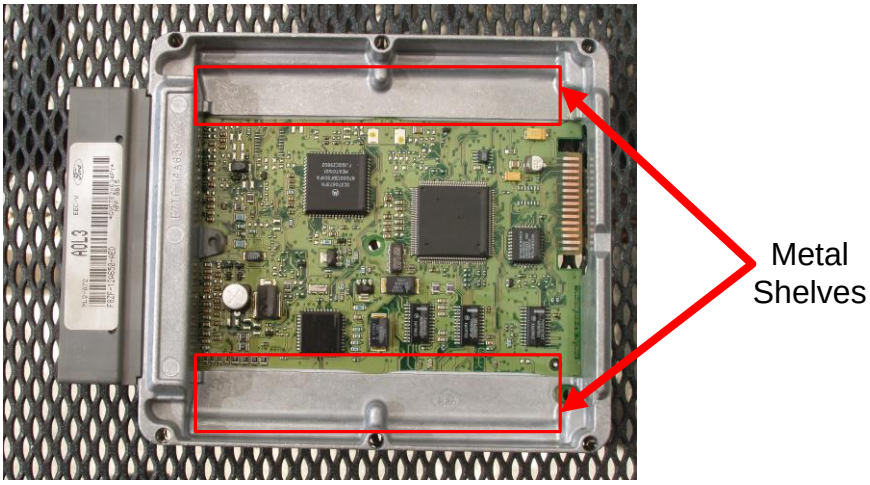
In addition to the specific purpose, I will be documenting what I learn of other drivers on the PCM PCB.

Here is a photo of the PCM. It is housed in a sturdy aluminum frame, held together with 6 hex-head machine screws. The screws are removed with a 5.5mm nut driver.

Here is a photo of one side of the PCB. The PCB is screwed to the middle section of the PCM case, laying on top of two metal shelves at the top and bottom sides of the photo. Under the chips and transistors along the top and bottom. Notice that the two left-most screws that hold the PCB to the case are soldered into place ensuring a great chassis ground.



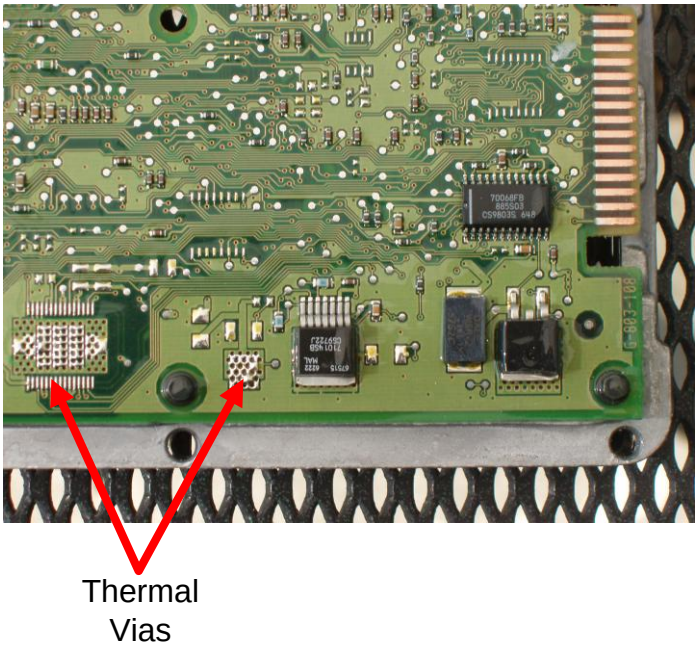
Here is a picture of the metal shelves from the other side of the PCBP



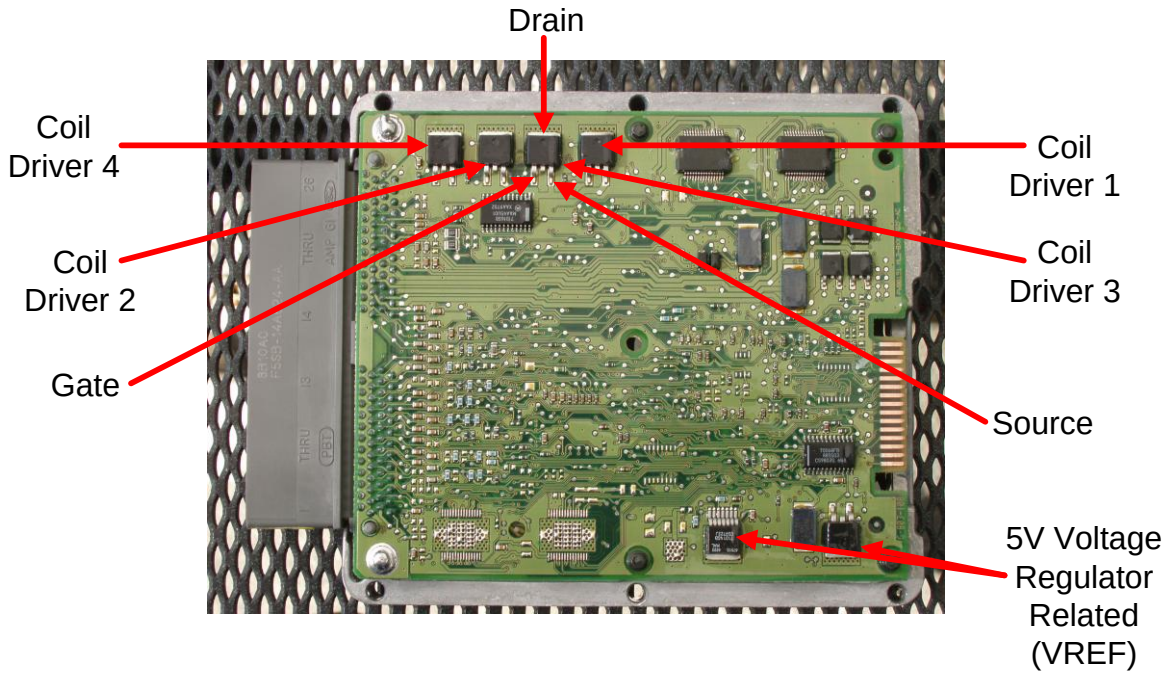
The metal shelves act as support for the PCB as well as a heat sink to the outside of the case. You can see the heat sink compound squeezing out from between the PCB and the shelves.

The entire PCB and middle section of the frame (except for the connector pins) are coated with a heavy coat of silicone conformal coating in order to fight corrosion. All of the components are surface mounted, and it appears that the PCB was flow-soldered. The PCB appears to be a 4 layer board.

Returning to the front side of the board, you can see on two unpopulated component locations, the large number of thermal vias that transfer heat from the component soldered to the board to the board itself and through that, to the metal by way of the shelves of the case.



The coil drivers are 4 individual heat-sunk transistors in a TO-263 (D2PAK) package. Each is marked “4501DM”. Below that, it has "R804" next to a Motorola logo. Based on the era and the packaging technology, I strongly suspect that these devices are N-channel MOSFET Power transistors. Here are the four coil driver transistors labeled with the coil they drive:



N-channel MOSFET transistors provide low-side control of their loads. The load (coil) is connected to the Drain and the Source is connected to power ground. The Gate controls the operation of the transistor. When the Gate is low (near 0V), not current flows through the transistor and the load. When the Gate is high, current flows through the transistor, energizing the coil. It is not clear where control of the Gate comes from. I have also marked the Gate, Source and Drain pins of the transistors in the photo above.

I have powered up the coil drivers on my bench, and I maxed out my bench power supply at 4.5A, and the transistor was still cool to the touch. Based on this analysis, I do not believe that 96-98 PCMs would have any problem driving two COPs in a waste-spark arrangement, even if driven by a Kenne Bell Boost-A-Spark.

There is a similarly packaged (TO-263) unit labeled “5104DP” on the opposite corner of the PCB. It appears to be a 5V voltage regulator and is connected to the VREF pin as is the integrated circuit near it.

There are two integrated circuits next to the coil drivers along the heat sink shelf. Those two circuits are each a 30-pin quad fuel injector driver. Each integrated circuit is Motorola logo'd and labeled "1034SE0017". I have marked which injectors are controlled by which integrated circuit below.

There are 4 smaller transistors in SOT428 (DPAK) packages, just off the heat sink shelf near the injector driver integrated circuits. They are marked "5103DE" and have a Harris logo. These transistors are the O2 sensor heater drivers. It is interesting to note that these drivers don't require heat sinks more than probable thermal vias to the inner planes of the PCB.