Geckodrive G320 vs. Leadshine DB810 Copy

The Leadshine DB810 servo motor drive is a pirated copy of our Geckodrive G320 drive. We received 2 Leadshine drives for analysis to confirm it is indeed a pirated copy of the G320 REV5.

One drive was stripped of all components for printed circuit board artwork analysis; the other will be used for functional testing. This report deals with the stripped drive exclusively.

The drives were unpacked and first inspected for external points of interest.

The first item of note was what appears to be an adhesive label where the positive power supply is located (Fig. 1). The label was peeled back to reveal the original can artwork sREVcreen (Fig. 2). The original artwork says "+18 – 80VDC" while the label reads "+18 – 50VDC". This is an enormous performance de-rating compared to the G320. There must be something very interesting going on inside for that to happen.

Fig. 1

Fig. 2

We'll get back to what that is a little later. The second point of interest is the back of the drive (Fig. 3). All trimpots increase a setting if turned counter-clockwise instead of the intuitive and conventional clockwise rotation. This is just plain sloppy and it is indicative of far more serious mistakes that are made in pirated drives. Pirate companies like Leadshine just don't care.

Fig. 3

It's time to pop the hood on the DB810 and the G320 to see just what is inside. The original is Fig. 4 and the copy is Fig. 5. Look at the locations of the components relative to each other. The copy looks remarkably similar to the original.

Fig. 4

Fig. 5

Let's see just how close the actual similarity is. Photoshop was used to form a 50% transparency of the original G320 and this was overlaid onto the DB810 pirate drive. Perspective correction was used to correct for the geometric distortion evident in the DB810 image (Fig. 5) and the result is a composite image (Fig. 6).

Fig. 6

A poor match would have given a very blurry picture. Note the blurriness of the big blue capacitor, the main connector, the red LED and the yellow and blue ceramic capacitors. They are slightly bent in position or are different (the connectors) and do not match exactly. What does match exactly is everything else.

This is too close; let's see if it's exact. The DB810 board was stripped of all components, lapped to reveal the copper traces (Fig. 7). The G320 REV5 top layer gerber file is next to it (Fig. 8).
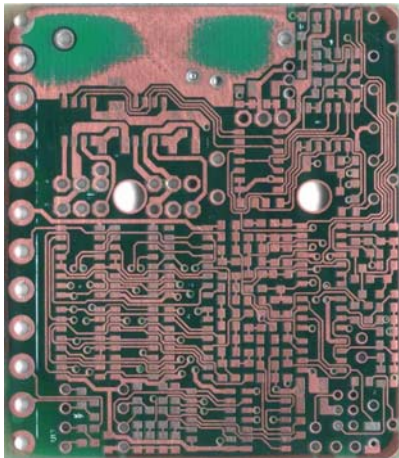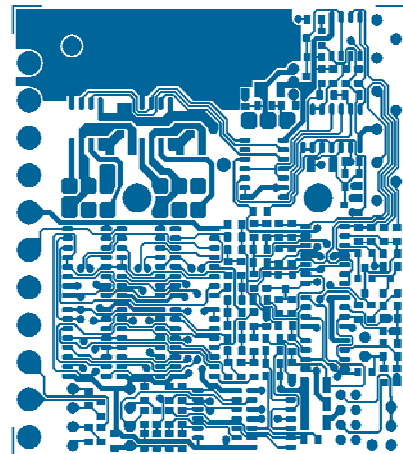

Fig. 7

Fig. 8

Fig. 7 and Fig. 8 really look nearly identical now in the dense area of the printed circuit board artwork. In fact they are. Fig. 9 superimposes these images just like in Fig. 6.
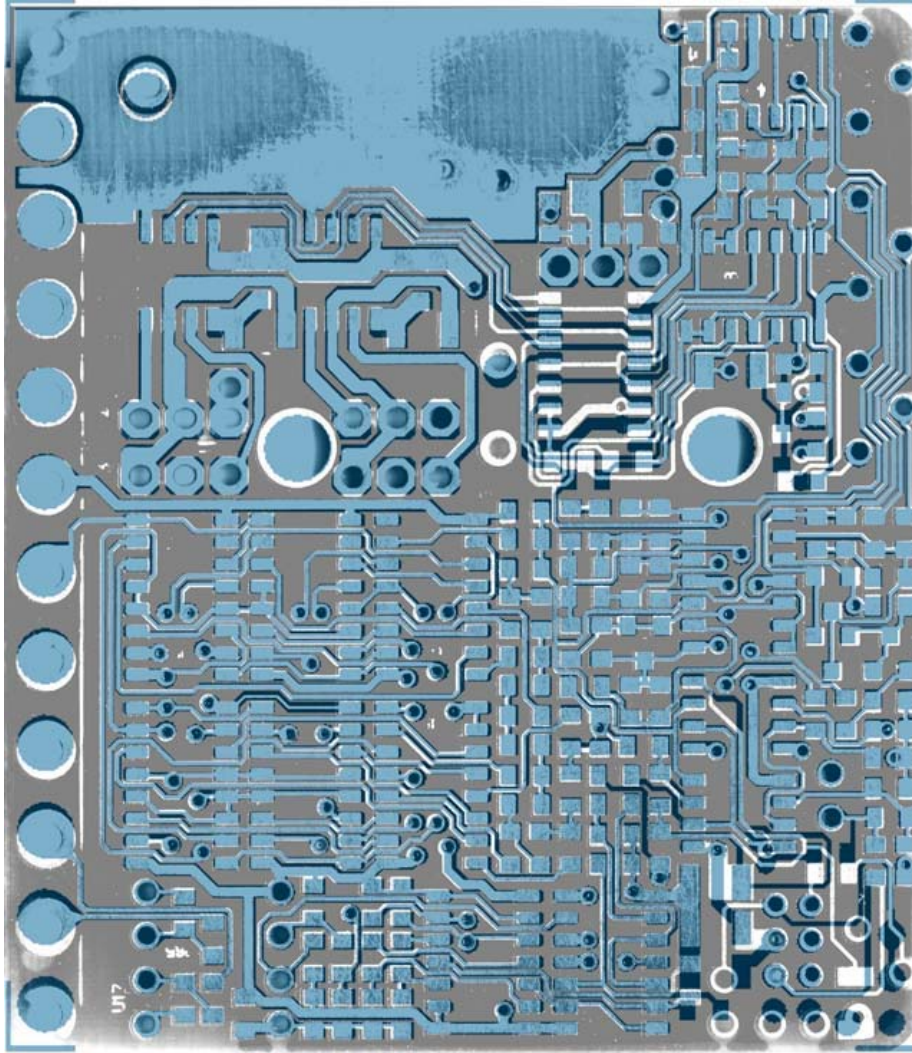

Fig. 9

In Fig. 9 everything that is a perfect match shows as light blue or gray. Everything that does not exactly match shows as dark blue or white. The vast majority matches exactly. In all likelihood the G320 board used for the copy was stripped of components like we stripped the DB810 and it was placed on a flatbed scanner to generate the PCB artwork. This is the work of "Xerox Engineering" at its finest.

There are several mistakes made, some completely inexplicable:

1) The voltage regulator used makes the drive unsafe above 40VDC.
2) The copy generates vast amounts of unnecessary RFI.
3) The MOSFETs are exposed to a known but uncorrected power-on failure mode.
4) The MOSFETs are inadequately heatsinked.
5) Misconnected STEP and DIRECTION mistakes are unrepairable.
6) There are no protected servo tuning test points.

A gentleman by the name of Bill who represented himself as Leadshine's purchasing engineer was kind enough to send the following email to help clarify some but not all of these issues. His gracious email was as follows:

 Hi Mariss,
 I got your message. I'm the purchasing engineer of Leadshine. We make only stepping drivers, and this brushed servo drive DB810 is a labelled product supplied to us by a local small shop. Was it designed by you? We don't quite believe it, because we were told by experts it's a very old-fashioned and poor design. It uses laughable analog circuit, and it uses silly things like the unreliable IC TI783CKC which TI admitted (publicly apologized) to be flawed and disastrous. Several local servo suppliers are sending us fully digital DSP-based brush/brushless servo drives for replacing this brushed analog drive. Anyway, we sold very few pieces of this analog drive. We definitely want to stop selling such old technology, and will switch to DSP-based brushed/brushless technology to catch up with the digital trend. Thank you for reminding us of dumping this product.

Wish you and your company the very best.

---Bill

Despite Bill's assertion to the contrary, the pirate board top silkscreen clearly reads "DB810" and is in keeping with Leadshine's product name convention. That makes it their copy, specifically the G320 revision 5 superceded by a new revision in April of 2003. This dates the approximate time that the copy was made.

Leadshine's engineers evidently did not understand the purpose of the regulator used in the G320 and substituted an LM317 instead. The LM317 datasheet specifies a 40VDC max input / output difference voltage. The regulator fails if more than 40VDC is switched to the drive, not the specified 50VDC on the paste-on label on the cover. We have failed the remaining drive twice already at only 48VDC because of this. This restriction eliminates fully 75% of the motors the G320 reliably drives.

Bill did not address or was not aware of the remaining enumerated problems with Leadshine's G320 copy drive.

On a more humorous note: The integrated circuit part numbers are removed on the DB810 copy (Fig. 4). This means thieves don't like to be stolen from by other thieves. To keep it fair, Fig. 10 shows the removed IC part numbers.

Fig. 10
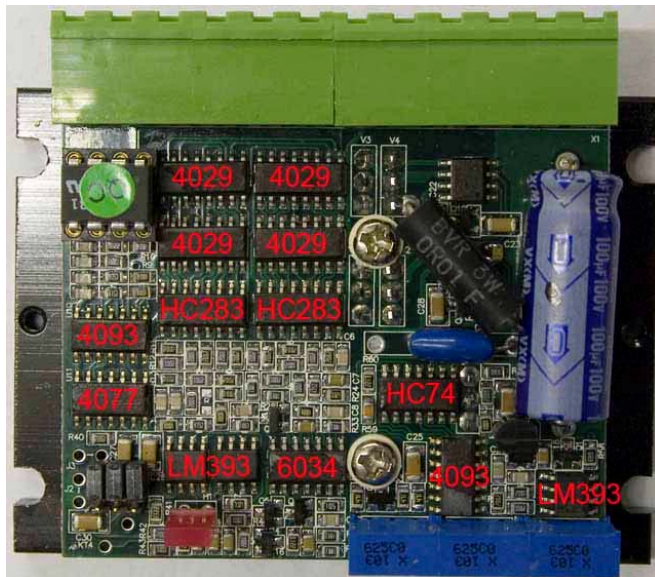
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November 5, 2006