Teardown: The Roku 1 media streamer

Brian Dipert - May 02, 2019

A couple of years ago, I mentioned that I'd retired (with subsequent plans to tear down) my longstanding travel companion, a third-generation Roku 1 Model 2710 media streamer. The Roku 1 (later renamed and briefly reintroduced as the Roku SE) was succeeded in my in-use stable by a Roku Streaming Stick Model 3500 (which I've more recently learned I'll eventually need to resign to the teardown heap, too, due to its lack of support for Netflix interactive content ... but I digress ... ). It's taken me more time than I originally forecasted to get around to getting the Roku 1 dissected, but in the spirit of "better late than never," I present it to you now.

Roku's business model is an interesting one; as with game consoles, for example, the initial hardware sale to a consumer is the “razor,” with subsequent content consumption acting as the ongoing-revenue “blades." But unlike with a game console, the foundation content revenue doesn't come straight from the consumer (although in some cases, the company takes a “cut” of each video rental or purchase, for example). Instead, for subscription services such as Netflix (Roku's original owner, ironically), the company takes a percentage of the monthly subscription fee paid by each consumer who accesses the service through Roku's hardware. That all being said, Roku doesn't want its hardware sales to be unprofitable, either, which factors directly into the bill-of-materials and manufacturing costs. Keep this all in mind as the teardown progresses in the coming paragraphs and pictures.

I'll begin, as usual, with some exterior shots of the unit (the first one including a penny for size comparison sake), which has dimensions of 3.7×3.7×1.2 inches:
Here's a closeup of the bottom-side sticker and the recessed reset switch:
And front and side views:
The Roku 1’s composite video/analog audio option (in the middle), therefore its compatibility with legacy TVs in hotel rooms, had been key to its travel-companion appeal. On the left is the power input; on the right is the 1080p-max HDMI output:

Here's an overview shot of the included hardware "extras" (a HDMI cable was not included in the box):
The included paperwork, "wall wart" specs, and a remote control close-up complete the picture:
Time to dive in! The rubberized feet on the unit's underside were an obvious first step, in the belief that underneath them might be accessible heads for screws holding the two halves together. They were removed easily (albeit imperfectly) and underneath them, indeed, four Philips heads appeared:

But that's not all. In the bottom left quadrant were three holes in the chassis, along with four holes in the bottom right corner.
I immediately thought "manufacturing test/programming point access," and I ended up being right ... mostly. Hold that thought. The screws came right out, whereupon the bottom half of the "clamshell" lifted right off, exposing one side's worth of the PCB "guts" (plus front panel) to view:
The front panel slipped right off, too. As did the PCB itself; here's what the inside of the "clamshell" top half looks like:

And here's a "bare" view of the PCB bottom side, with the reset button and a Faraday shield as dominant features of the landscape:
Before I forget, let's revisit the lower left quadrant:

If you compare this and the prior photo, you'll accurately conclude that there's an exact match between test points 3-5 and their chassis hole equivalents.

Turn your attention to the lower right quadrant, however, and the picture's less clear:
Two of the four holes correspond to test points 1 and 2. But in-between them is a hole that seemingly associates with nothing but an empty green span of PCB real estate. And the one at the very top mates up with a corner of the aforementioned Faraday shield (which I’m guessing is used for test jig grounding purposes?). Very strange.

Speaking of that Faraday shield, let's see what's underneath it, shall we?

The answer? Nothing ... that is, unless you're into through-hole solder joints and a smattering of
passives. Again, very strange. There aren’t even unpopulated IC sites here that might suggest the PCB is shared between this and a higher-end product variant (for which the IC sites would be populated). And although (as you’ll soon see) this region on the other side of the PCB is IC-populated, why would the Faraday shield be on this side instead? Reader opinions are welcomed!

Speaking of ICs, before we turn our attention to that other side, let’s not forget about the one dominant IC on this side, which you’ve probably already noticed. It’s a Toshiba TC58NVG1S3HTA00 2 Gbit (256 MByte) SLC (single bit per cell) NAND flash memory.

Ok, time to flip the PCB over:

Ah, good, more to talk about! With the front panel removed, we can now see what’s behind it (at the bottom of this photo): left to right, there’s a bulky LED assembly, the Wi-Fi antenna, and an infrared receiver. Some points on these particular bits: the Roku 1 is a 2.4 GHz-only (albeit supporting 802.11b/g/n) device, and the remote control is IR-only, not handling the no-line-of-sight-required Bluetooth and/or Wi-Fi Direct (lack of support being not an all-bad thing, in retrospect) protocols of its higher-end siblings and successors.

On the left edge of the PCB is a Samsung K4B4G1646B-HYK0 4 Gbit (512 MByte) DDR3 SDRAM. Toward the middle is the system’s "brains," a Broadcom BCM7218 SoC reportedly running at 600 MHz. And in the bottom right quadrant is ... look, another Faraday shield! Let’s hope this one’s more meaningful underneath (I’m betting on it being the Wi-Fi IC):
Yep, I was right. It's Broadcom's (now Cypress Semiconductor's) BCM43143, to be precise.

To quote Porky Pig, that's all, folks! Comments as always are welcomed, especially about that mysterious back-side Faraday shield.

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