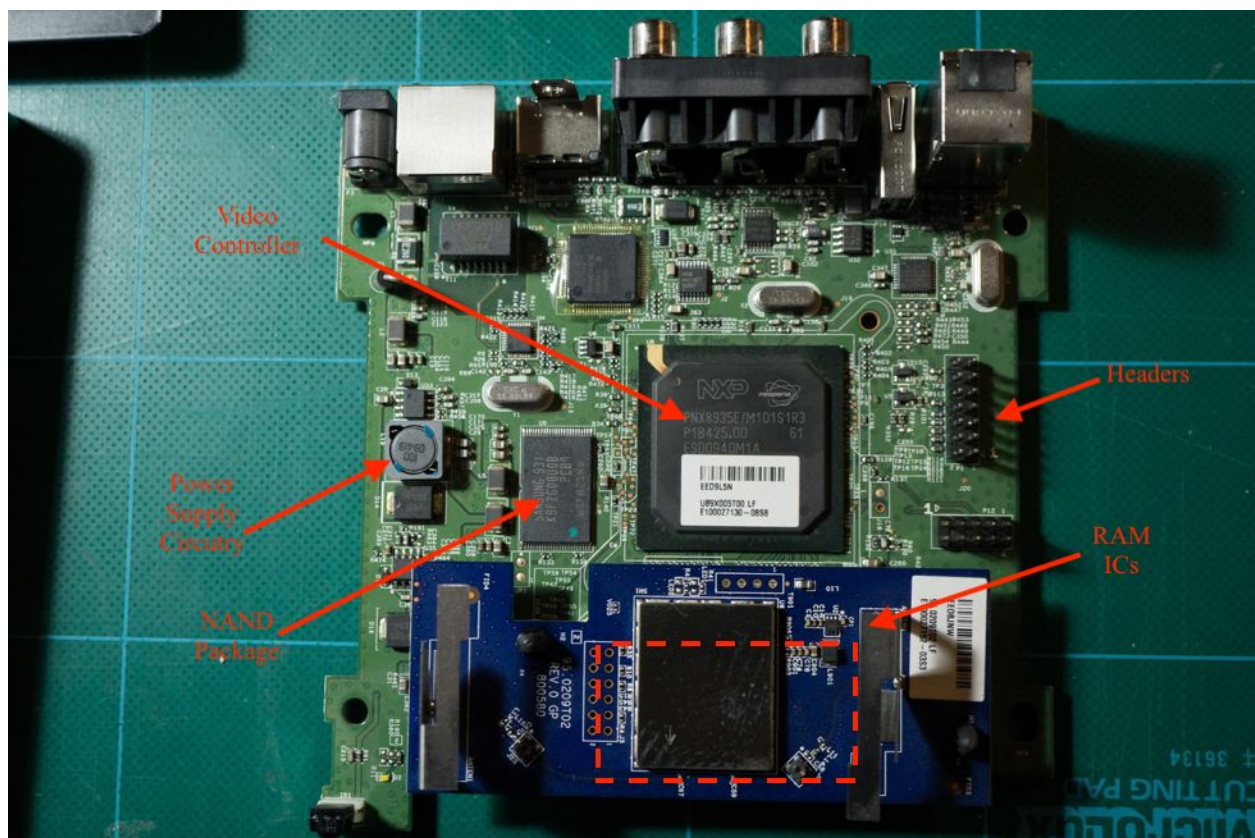TI Electronics Online Challenge
Team 3946 W

        I have selected a Roku 1 ethernet media player because I think it will be full of fascinating digital circuitry. The device is sure to contain a CPU of some kind that runs the operating system, some control ICs for the output stage, and other supporting circuitry. After inspection of the device, I found a video controller that doubles as a CPU for the operating system. The controller is accompanied by some NAND flash for permanent file storage, and 4 RAM ICs. The other major systems include an HDMI controller, a USB controller, and an Ethernet controller. The only TI component that I could find was a protection IC, most likely for the USB or Analog outputs.
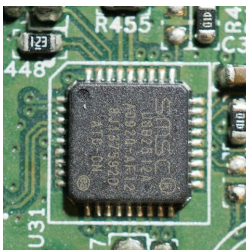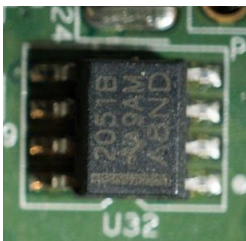

        As can be seen in the image above, the NXP video controller dominates the PCB. It is certainly the largest package on the Roku. To its left can be seen one NAND flash package. Underneath the blue daughter board can be found the four RAM ICs. Interestingly, there are two sets of broken out 0.1" headers to the right of the NXP package. These could potentially be for programming the controller, or they are just test points to ensure that the device is working as intended. To the far left of the PCB one can find the power supply circuitry. Among these components are a protection diode, and some quite large capacitors.

        There is also a daughter board attached to the main PCB. it seems to contain wireless interface circuitry, as it has two antennas attached to the surface. I was unable to inspect the

ICs in control of this board, however, due to an EMF shield that is soldered in place. It is attached to the main PCB with a 6 pin serial interface, so I assume that there is much going on behind the scenes on the wireless daughter board.

Deeper consideration of the structural components of this system defied my previous expectations because I was expecting to find a video controller and a microprocessor, but instead I found one IC that performed both of these functions. The board seems to be designed around this package, as it is placed centrally, and the datasheet for this part lists almost all of the functionality that this media player offers.

Component Image	Part Number	Function	Manufacturer
	PNX8935	The PNX8935 is a video controller. The IC also contains a CPU which runs a linux OS. The IC also has an ethernet controller.	NXP
	K9F2G08	This non-volatile flash memory is presumably responsible for storing media files and the operating system.	Samsung
	K4H5108	The PCB contains 4 of these 512 Mb DDR SDRAM packages.These serve as the RAM for the NXP video controller.	Samsung

	TDA9981	This IC is an HDMI controller. It is directly connected to the output of the NXP video controller and the HDMI output	NXP
	USB2512A	USB controller for the single usb 2.0 port onboard.	SMSC
	LAN8710A	Ethernet transceiver for the single ethernet port onboard.	SMSC
	TPS2051B	This device is a power distribution switch. It is probably involved with io protection of the device.	TI