ECE 668 Final Report

Daewoo DVD-5800 DVD Player

1. Introduction

The Daewoo DVD-5800 is a low-end consumer DVD player. It supports NTSC or PAL output and plays DVD, VCD, SVCD, Audio CD, and MP3 formats. It supports reading DVD, CD, CD-R, and CD-RW media.

2. Main Components

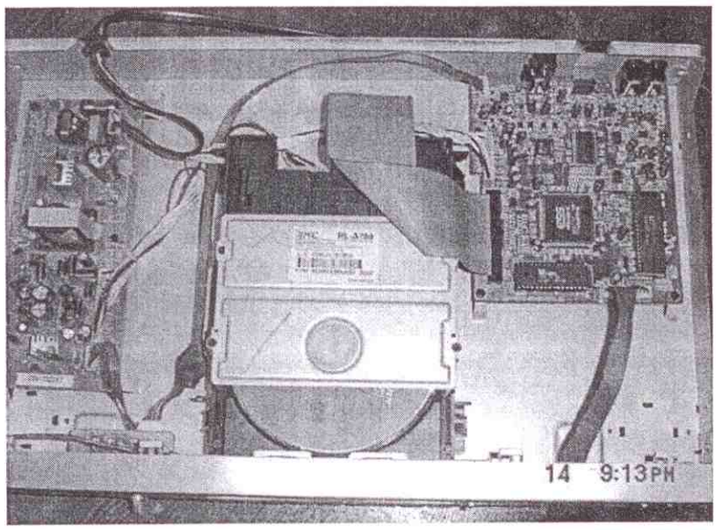

Figure 1 – Player internals

Figure 1 shows the layout of the major components of the DVD player. From left to right are: the power circuitry board, the DVD loader, and the main processing board. On the left side of the front panel is a small board with a headphone jack and volume control, and on the right side is another board with the infrared receiver, VFD display, front-panel buttons, and VFD controller chip.

3. DVD Loader

The DVD loader is the physical drive and related controllers. It contains the motor, laser, and associated electronics to control reading the data from the disk. It uses a standard IDE 40-pin connection. The model used in the Daewoo DVD-5800 is the Raymedia RL-A700. It is using firmware version AC08 and is upgradeable, but no firmware updates are readily available on the internet.

4. Main Processing Board

The main processing board contains all the hardware for decoding and outputting audio and video from supported formats. The primary chip that does all the A/V decoding is the ESS AudioDrive ES4318 chip. This chip provides MPEG video decoding, Dolby Digital/DTS/MPEG audio decoding, Huffman decoding, NTSC/PAL conversion, letterbox conversion, motion zoom and pan, DVD loader interface, SDRAM interface, and its built-in RISC processor can take the place of a separate microcontroller. Figure 2

is a generic block diagram of the interface between the ES4318 and other basic components.

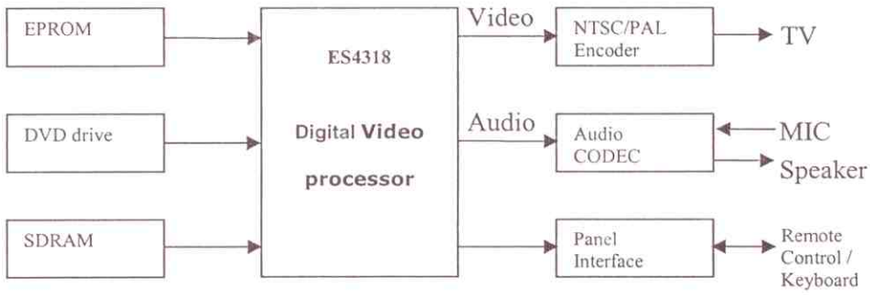

Figure 2 – ES4318 Block Diagram

Also found on the main processing board are the EEPROM, SDRAM, and video and audio codecs. The video output is handled by the Analog Devices ADV7170 chip. This chip converts 8- or 16-bit component video into a standard NTSC or PAL analog video signal. It comes in a 44-pin TQFP package. The audio output is handled by the Cirrus CS4391 stereo audio DAC. It takes up to 24-bit and 192 kHz digital audio data and provides complete digital-to-analog conversion. It comes in a 20-pin TSSOP package and connects using an I^2S bus.

The SDRAM chip is a VT3664164T manufactured by Kreton Corp. It is a 64Mb (8MB) chip with 4 banks of 1M 16-bit words. It is rated for 133MHz operation and comes in a 54-pin TSOP package. The EEPROM chip is an A29040A series Flash ROM chip manufactured by AMIC Technology. It is a 4Mb chip arranged as 512K 8-bit words. It is in a 32-pin DIP package.

This board also contains a PROM of unidentified manufacturer that uses a 40-pin DIP package. An Atmel AT24C02 serial EEPROM stores the user-defined player settings. It is a 2Kb memory arranged as 256 8-bit words and comes in an 8-pin TSSOP package. It communicates with the ES4318 using an I^2C bus.

Figure 3 illustrates the major components and their interconnections.

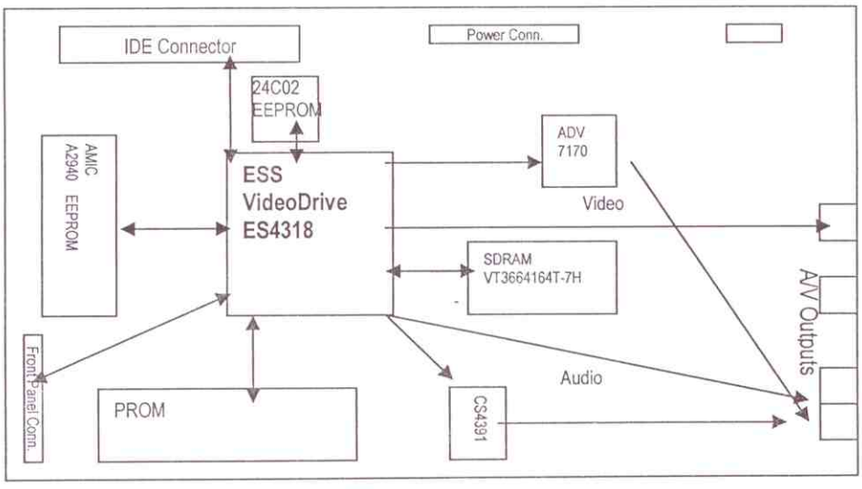

Figure 3 – Main Processor Board

5. Front Panel Interface Board

The front panel interface board contains the IR receiver for the remote control and the VFD (vacuum fluorescent display) panel and its controller. It connects to the main processing board via an 11-pin ribbon cable. The VFD controller chip is a Topro TP6311Q, which provides control for the display panel and uses a 3-pin serial interface (CLK, STB, DATA).

6. Putting It All Together

The ES4318 chip is the heart of the player, providing the A/V decoding and functioning as the controller for the system as a whole. It outputs the component (YUV) video directly to the connectors on the back, as well as the SPDIF digital audio output to the coaxial digital audio connector on the back. The YUV video signal is also processed by the ADV7170 video decoder to support standard analog S-video and RCA composite video outputs. The digital audio stream is also processed by the CS4391 audio DAC to provide standard 2-channel stereo RCA audio outputs.

The unidentified PROM on the main processing board acts similar to a BIOS, providing basic support for updating the system firmware via CD-R. When a disc is inserted containing a firmware image, this PROM supports loading the firmware image into the EEPROM. This 4Mb EEPROM stores the player's firmware.

The firmware contains the code that the ES4318's built-in RISC processor executes. When the DVD player is turned on, the ES4318 reads some configuration data from the firmware and begins executing the main code. This configuration data is frequently modified by hobbyists to disable Macrovision in order to enable copying DVDs to VHS tape. Other configuration data includes such things as region coding and video output format (PAL/NTSC). The firmware also includes the code and images that define the player's on-screen user interface. Other parts of this code are used to process the user input from front panel buttons or the remote control and to change the user-definable settings. Other code is responsible for telling the TP6311Q VFD driver chip what to display on the front panel at the appropriate times (LOAD, PLAY, etc.).

7. Cost

This player costs in the range of $90 to $120.

8. Conclusions

The Daewoo DVD-5800 is a low-cost DVD player that uses several different chips in an embedded computing context. It makes use of A/V codecs and DACs, PROM, EEPROMs, SDRAM, IDE bus, I^2C and I^2S buses, a VFD display panel, and an A/V processor that includes DRAM control, DVD loader control, and microcontroller functionality. Each chip claims to support low power consumption, though as a whole unit it consumes 26W of power. As it does not run on batteries this level of consumption is not very significant.

Bibliography

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