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MPEG1 DECODER LSI FOR VIDEO CD
µPD61012

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Introduction

The market of video CDs using an MPEG1 decoder has rapidly expanded, particularly in Asian countries such as China and Korea. Recently, demand for video CD players in China has grown because of their falling price, and high-cost-performance video CD systems with an MPEG1 decoder and peripheral functions are in high demand.

The µPD61012 is ideal for the type of video CD systems required in the Chinese market because it provides the peripheral functions necessary for video CD systems on a single chip.

Outline

The µPD61012 is Japan's first MPEG1 decoder LSI for video CD that integrates an MPEG1 decoder, video encoder, video DAC, CD-ROM decoder, and on-screen display (OSD) on a single chip.

In addition, equipped with OSD characters supporting Chinese, a code input control function for damaged discs, reduced screen playback function, and a playback control memory, the µPD61012 offers an ideal configuration for the Chinese video CD system market.

Function

Table 1 lists the functions of the µPD61012. The major functions are described below.

1. MPEG1 decoder

The µPD61012 can decode motion picture data of a video CD (352 x 240 x 30 frames: NTSC format, or 352 x 288 x 25 frames: PAL format) and High Resolution still picture data

Parameter	Function
MPEG1 video decode	352 pixels x 240 lines x 30 frames 352 pixels x 288 lines x 25 frames 704 pixels x 480 lines (High Resolution still picture) 704 pixels x 578 lines (High Resolution still picture)
MPEG1 audio decoding	Supports MPEG1 audio layers 1, 2 Sampling frequency: 44.1 kHz Bit rate: All bit rates except free format Mode: Monaural, stereo, joint stereo, dual channel
CD-ROM data format	Mode1 Mode2Form1 Mode2Form2?(double-speed input supported)
OSD function	Character size: 12 x 18 dots Character type: 224 fixed characters 31 user-defined characters Color: Character color and background color can be specified in screen units. Function: Framing, with/without background color, blinking, expansion (1 to 4 times)
Video output	Composite output, Y/C separate output, RGB output (analog output) Supports PAL and NTSC TV systems
Host interface	Serial interface: 2-wire, 3-wire Parallel interface: 8-bit separate mode, 8-bit multiplexed mode
Others	Reduced screen function Supports auto pause 8 KB sector buffer Can be decoded with 60-ns 4M DRAM Operating voltage: 3.0 to 3.6 V 100-pin QFP

Table 1 Function List

(704 x 488 pixels, or 704 x 576 pixels).

To automatically recognize and decode image size, it can implement frame format conversion according to the output monitor. In other words, the µPD61012 can output disc data recorded in the NTSC format to a PAL monitor, and disc data recorded in the PAL format to an NTSC monitor.

Errors due to erroneous MPEG1 data are corrected by image skipping and muting.

2. CD-ROM decoder

The internal CD-ROM decoder of the µPD61012 supports the MODE1, MODE2form1, and MODE2form2 data formats. The data of MODE2form2 of MPEG1 data can be input at double speed. The CD-ROM decoder can control code
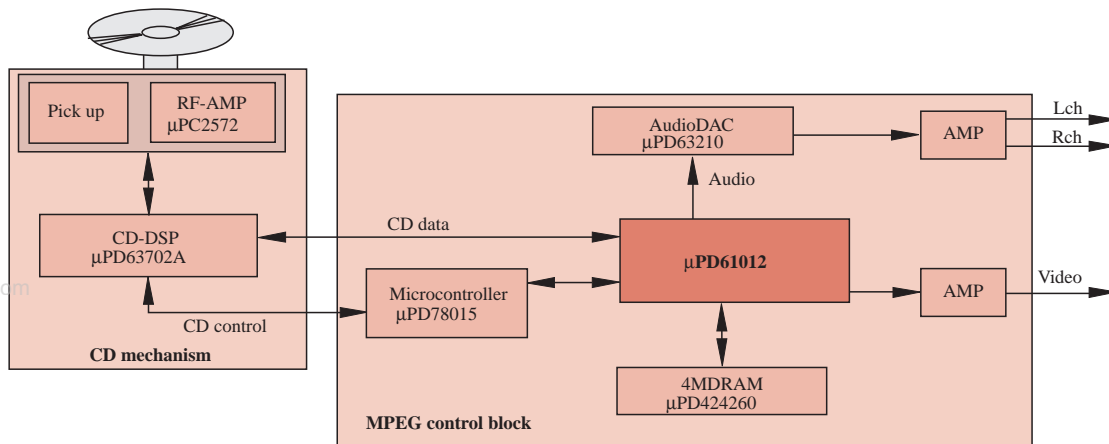
Fig. 1 Example of Video CD System Configuration

input in association with the decoding operation of MPEG1. If code input is stopped, code input control by the CD-ROM decoder block can be mitigated by automatically setting the next input address to an internal register.

The μPD61012 recognizes the data input to the CD-ROM decoder in real time. If the CD-ROM data is illegal, this data is discarded before a code is transferred to the MPEG1 decoder block, so that noise on image and sound can be prevented by not decoding the illegal data.

The μPD61012 can specify an LR clock, whether data is transferred starting from the MSB or LSB, a data length, and a bit clock by using registers, so that it can be connected to the CD player of each manufacturer. It also supports the I²S interface used in Phillips' CD players.

3. OSD function

The OSD of the μPD61012 can display 224 fixed characters and 31 user-defined characters. To support video CDs in the Chinese market, 77 Chinese characters are included as the fixed characters. If the user-defined character display function is used under control of a microcontroller, any characters including 31 Chinese characters can be displayed. The user-defined characters can be rewritten at any time, except while MPEG1 data is decoded.

4. Video output

The μPD61012 can output composite signals supporting PAL/NTSC output, Y/C separated signals, and RGB signals.

When displaying a code in the NTSC format on a PAL monitor, images are not displayed on the upper and lower 24 lines with the conventional method because of problem of image size. The μPD61012 has a function to output an NTSC sync signal by using a PAL subcarrier. PAL60 displays full-screen images on PAL monitors, using 480 lines.

5. Reduced screen function

The μPD61012 halves the I picture of a motion picture (image compressed in a screen) or standard still picture (352 x 240 pixels or 352 x 288 pixels) vertically and horizontally to display the picture as a High Resolution still picture (704 x 480 pixels or 704 x 576 pixels). It can therefore reduce the display screen to 1/4 vertically and horizontally.

Reduced screens can be displayed at any position, thus enabling multi-screen display. By displaying the first image of a track on the reduced screen, dummy menu playback can be realized for video CDs without playback function.

System Configuration

The μPD61012 configures a video CD system when it is connected with an external microcontroller for system control, audio DAC, and 4M-bit DRAM for decoding. Figure 1 shows an example of a video CD system configuration using the μPD61012.

Conclusion

The μPD61012 introduced here integrates an OSD, CD-ROM decoder, video encoder, and video DAC, with an eye for the Chinese video CD market. NEC plans to develop new products to satisfy demand in the video CD market, which is predicted to continue expanding.