Double HDMI Interface 8-channel Audio Decoder DI35H

◆ Features

- ✧ Two HDMI audio and video inputs, support HDMI 1.3C standard 1080p signal, and two HDMI videos can be switched to HDMI output at will.
- ✧ One HDMI audio and video output and video signal is only chosen in the middle of two HDMI inputs.
- ✧ One optical and two RCA coaxial digital inputs or two optical and one coaxial inputs.
- ✧ One internal stereo analog input, users can extend several analog inputs on your own.
- ✧ Adopt CS4926 series audio DSP, CS8415 96KHz digital receiver, 96 KHz/24bit ADC and DAC.
- ✧ Support Dolby AC3, DTS, DTS-HD, PCM, HDCD, Dolby pro-logic, LPCM 7.1ch, and so on, with many kinds of listening modes and sound field effect playbacks.
- ✧ 8-channel analog audio frequency output, can select different low-pass filter circuits by itself so as to realize different effects.
- ✧ Use AGATE large-scale FPGA AS1E5F1KA as center processing unit, built-in high speed 8051 hard core, process PCM signal in real time.
- ✧ Use FPGA hardware module as audio signal detection, automatically select PCM 2 channel and LPCM 8 channel.
- ✧ Built-in input signal automatic recognition, it can provide control mute signal output when there is no signal, and there is no need to connect detection circuit outside.
- ✧ STL212 MCU can upgrade directly program online. Users can get new program on Internet when necessary, which provides convenience for debugging and maintenance.
- ✧ 12 universal I/O ports, it's okay to complete whole machine functions without external MCU. IO ports support analog input, it is acceptable to add voltage detection, spectrum display, and so on.
- ✧ Use I^2C slave interface to connect user mainframe, and it is okay to use existing I^2C interface without adding additional interface.
- ✧ I^2C communication has TNT interrupt output port, user mainframe can read corresponding data when TNT changes, which reduces the holding time of user mainframe communication.
- ✧ Built in memory space with 60 bytes, its function is the same as 24C01, and there is no need for users to use memory chips such as 24C01, 93C46 and so on any more.
- ✧ Provide SDK kit source code, it is easy for users to do secondary development.

◆ Application fields

- ➢ Blue-ray HDMI high-definition decoding power amplifier.
- ➢ Digital audio decoder or analog audio decoder.
- ➢ Multi-channel multimedia sound box with decoding.
- ➢ Multi-channel AV reception power amplifier.

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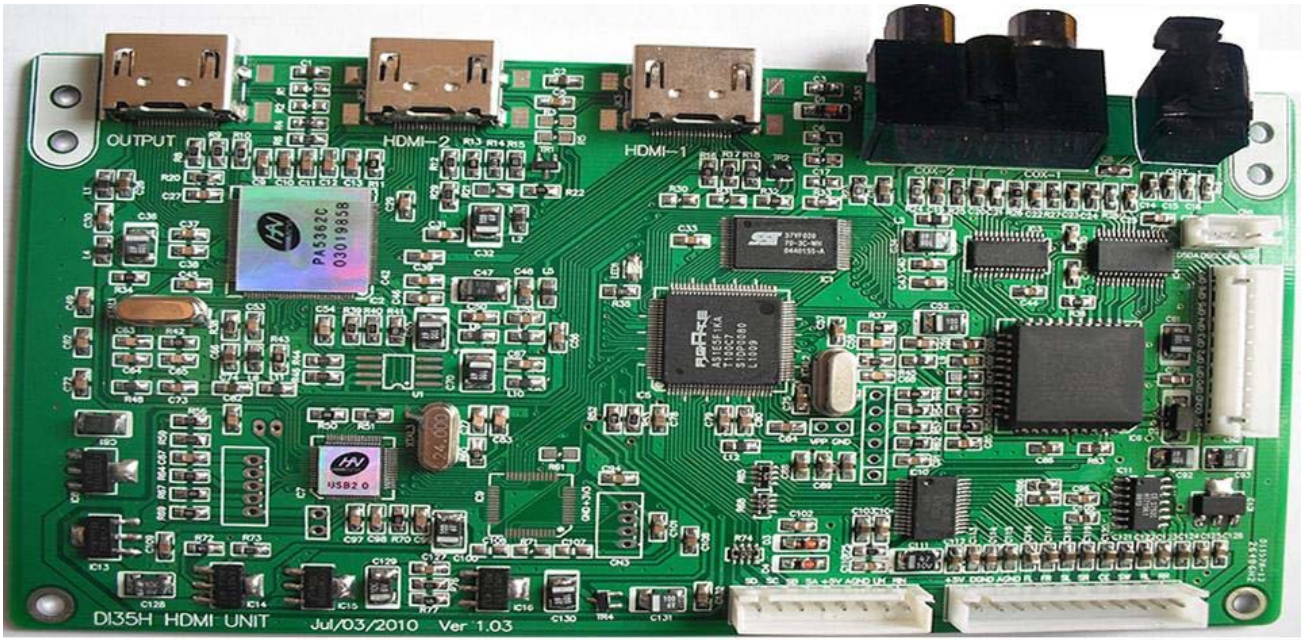
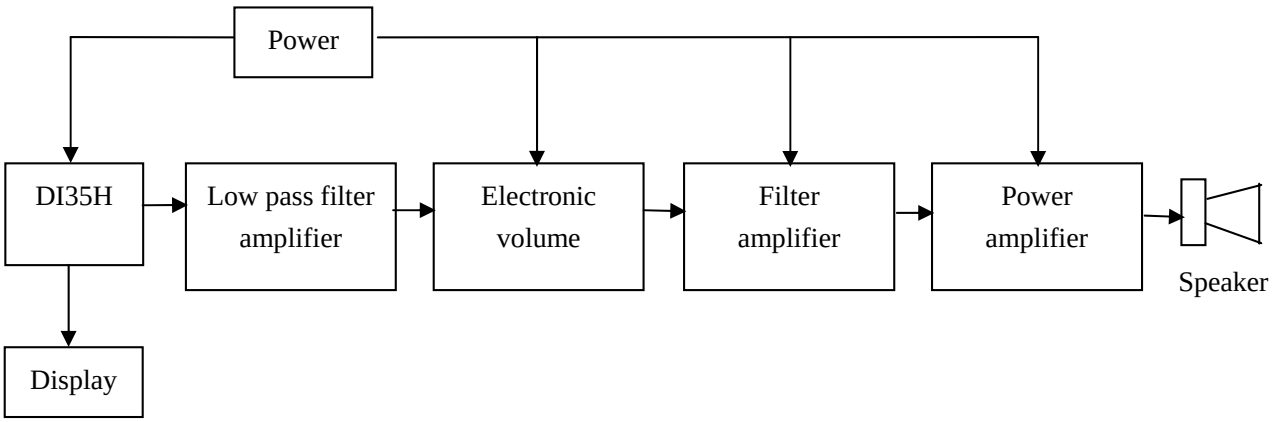
- Matched with PS2/PS3 game device.
- Computer host peripheral audio decoding device.
- All kinds of high-definition audio equipments.



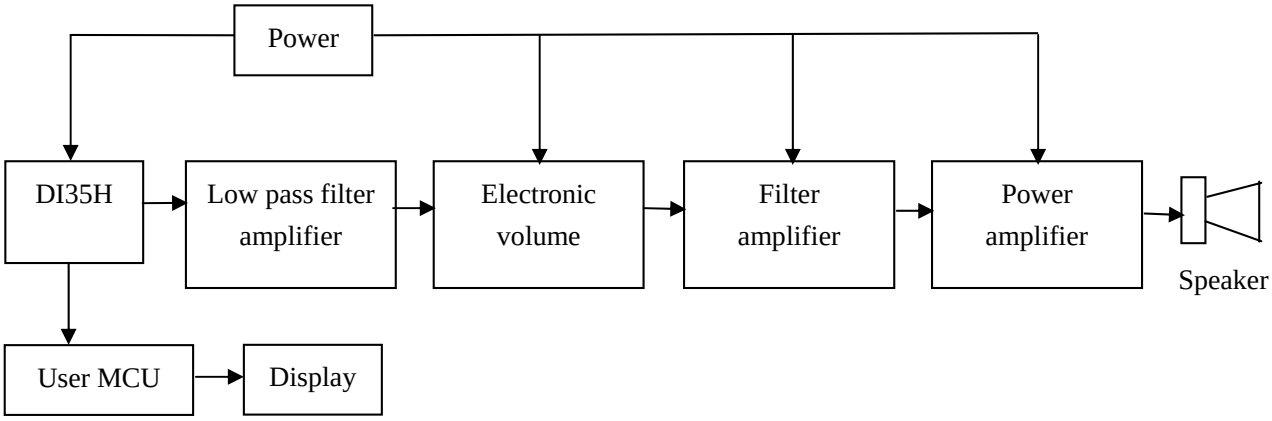
◆ Related technical files

- 《I²C Device Development User Manual》----------hsavd107.pdf
- 《DI35H Software Development Kit User Manual》----------hsavd605.pdf
- 《ST-991AR5 Upgrade Device User Manual》----------hsavd201.pdf
- DA32xSDK Software Development Kit

◆ Working principle block diagram



Working principle block diagram without communication

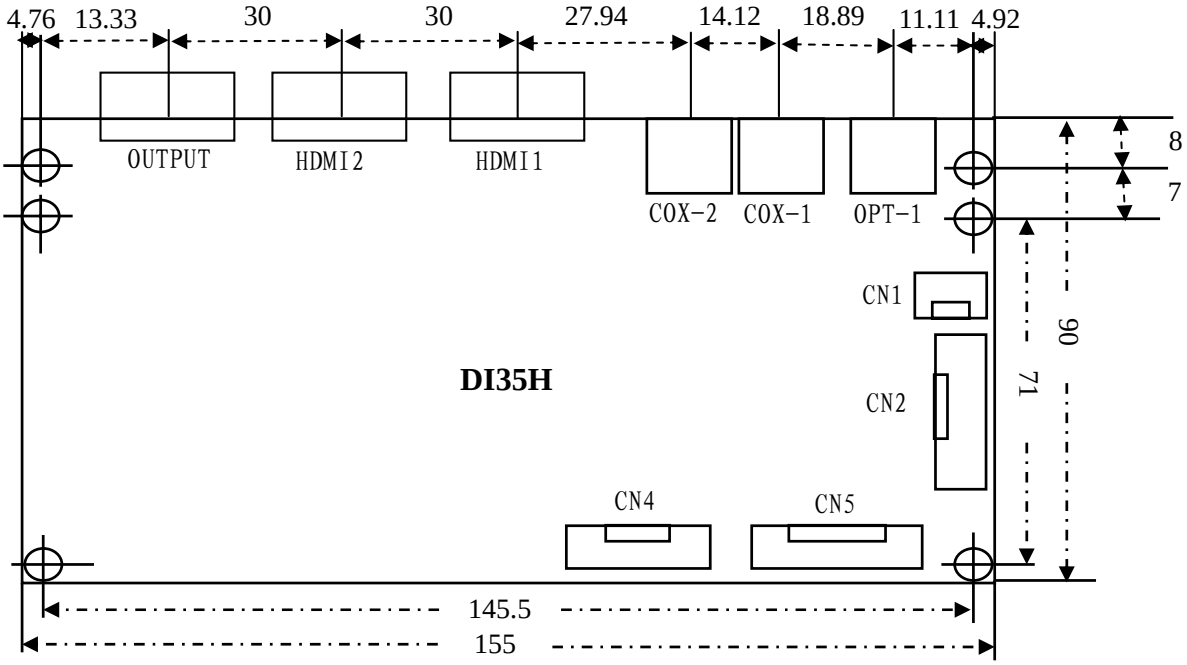


Working principle block diagram with communication

◆ Ground wire instructions

AGND and GND are not connected inside DI35H, and need to be connected on the user board. If +5V ground wire and analog ground wire are not connected at the power supply terminal, connection point should be close to the DI35H pins or connecting at power supply is also acceptable, while the position close to DI35H is preferable for a better effect.

◆ Size and pins instructions (unit: mm)



OUTPUT: HDMI signal audio and video output.

HDMI signal audio and video input1.

HDMI signal audio and video input 2.

COX-1: coaxial digital signal input 1, and it is optional that it can be optical fiber digital signal input 2.

COX-2: coaxial digital signal input 2.

OPT-1: optical fiber digital signal input 1.

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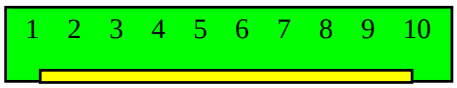

Extended interface.

1. **GP7** Extended MCU I/O port GP7, standard bi-directional port, built-in pull-up resistor; with ADC, can be used as analog detection input.
2. **GP6** Extended MCU I/O port GP6, standard bi-directional port, built-in pull-up resistor; with ADC, can be used as analog detection input.
3. **GP5** Extended MCU I/O port GP5, standard bi-directional port, built-in pull-up resistor; with ADC, can be used as analog detection input.
4. **GP4** Extended MCU I/O port GP4, standard bi-directional port, built-in pull-up resistor.
5. **GP3** Extended MCU I/O port GP3, standard bi-directional port, built-in pull-up resistor.
6. **GP2** Extended MCU I/O GP2, the SCL port of I^2C communication port, ordinary application is infrared remote control reception input.
7. **GP1** Extended MCU I/O GP1, the SDA port of I^2C communication port.
8. **GP0** Extended MCU I/O port GP0, standard bi-directional port, built-in pull-up resistor, also it can be used as ADC input.
9. **DGND** Digital ground wire input/output.
10. **+5V** +5V output.

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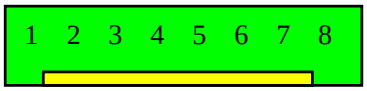

Analog audio input interface.

1. **RIN** Analog right channel signal input.
2. **LIN** Analog left channel signal input.
3. **AGND** Analog ground wire input/output.
4. **+5V** +5V output.
5. **SA** Extended MCU IO input/output CPSA, built-in pull-up resistor, used for analog input on-off switch in general.
6. **SB** Extended MCU IO input/output CPSB, built-in pull-up resistor, used for analog input on-off switch in general.
7. **SC** Extended MCU IO input/output CPSC, built-in pull-up resistor, used for analog input on-off switch in general.
8. **SD** Extended MCU IO input/output CPSD, built-in pull-up resistor, used for analog input on-off switch in general.

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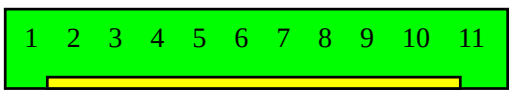


7.1 audio output interface.

1. **RR** Back surround right channel signal output.
2. **RL** Back surround left channel signal output.
3. **SR** Surround right channel signal output.
4. **SL** Surround left channel signal output.
5. **CE** Central channel signal output.
6. **SW** Sub woof channel signal output.
7. **FR** Front right channel signal output.
8. **FL** Front left channel signal output.
9. **AGND** Analog ground wire audio output and power supply input, it does not connect with digital ground, and it is necessary to connect digital ground wire outside.
10. **DGND** Digital ground wire input/output.
11. **+5V** +5V input.

◆ HDMI audio signal formats that are compatible with DI35H

Resolution setting		480I/576I	480P/576P	720P	1080I	1080P	
HDMI	BD	576I 50Hz	576P 50Hz	720P 50Hz	1080I 50Hz	1080P 24Hz	1080P 50Hz
	Others						

◆ Electrical specification

Items	Minimum	Typical	Maximum
+5V power supply voltage	+4.6V	+5V	+5.5V
+5V working current (@ HDMI (DTS))	800mA	900mA	1100mA
Digital RX input	0.1V(P-P)	0.5V(P-P)	1.0V(P-P)
Analog input effective detection level	0.8 Vrms	-	-
Signal-to-noise ratio (CIR)	-	89dB	-
Resolution	-	88dB	-
Level output @0dB	-	1V	-
Analog level input	-	2V	2.2V
Frequency response（20Hz-20KHz）	-	+/-1dB	-

Note; power consumption is big relatively during working, it is recommended to use DC/DC regulator.

◆ Software development instructions

It is okay for DI35H to use I^2C bus to communicate with user MCU and provide SDK (software development kit) software packet, user can directly use source code in the software packet. If user is not familiar with I^2C communication, please refer to ***I^2C device development user manual hsavd107.pdf.***

If two bytes form 16-bit parameter, the first byte is low bit and the second byte is high bit.

If four bytes form 32-bit parameter, the first byte is low bit and the fourth byte is high bit.

0xnn means the described value is uncertain, it may be any values, but its value is within range fixed

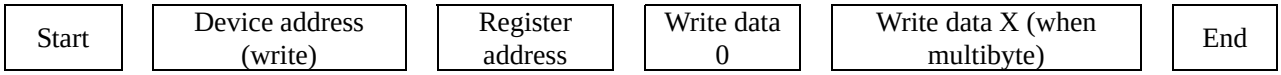
originally, for instance, instruction length is 2 to 137.

B7 means the seventh bit of byte, B6 means the sixth bit of byte, and the rest may be deduced by analogy.

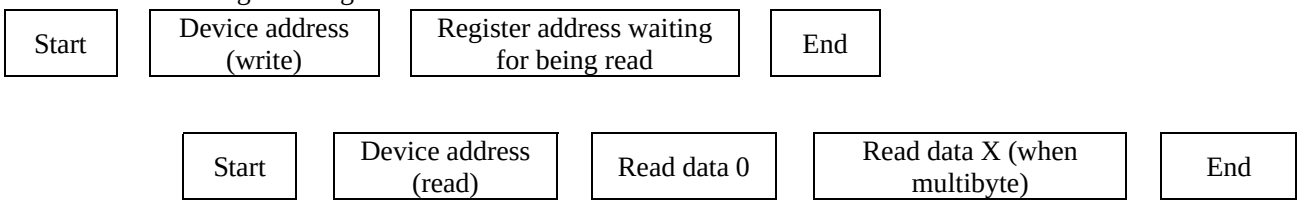
I^2C address that user host writes DI35H is 0x32, i.e. 00110010B. I^2C address that user host reads DI35H is 0x33, i.e. 00110011B.

The length of register is 8 bits in general, and user host only needs one byte for read and write. Another registers that mark byte length need several bytes for read and write, should do multibyte read and write according to need.

DI35H write register diagram:



DI35H read register diagram:



First use the device address of write to write register address waiting for being read, and then use the device address of read to read corresponding data.

Need to receive the ninth ACK bit when write each byte including data and address for I^2C, ACK bit is 0 outputted by DI35H. User host can know if DI35H is working normally according to ACK.

Need to send the ninth ACK bit when read each byte for I^2C, ACK bit is 0 outputted by user host, but the last byte needs to send the ninth NAK bit, NAK bit is 1 outputted by user host.

◆ I^2C Communication user host instructions set

Address	Name	Description
0x00	INTCLR	Clear interrupt register (write only) Interrupt number: INT0=1, DI35H initialization, guarantee that user host and DI35H connect power synchronously. INT1=1, digital signal input format change, interrupt needs to read "DIGIINFO" register. INT2=1, analogue signal input change interrupt, need to read "ANASIGNAL" register. INT3 to INT7, reserved.
0x01	INTRD	Read interrupt register (read only) Interrupt number is the same as clear interrupt register. Attention: please clear corresponding interrupt number after read, or interrupt will go on without stop. Register writes 1 to clear corresponding interrupt.
0x02	INTENA	Interrupt enable register (write only) Set corresponding interrupt enable. DI35H will generate corresponding interrupt and lower INT pin when status changes. User host needs to detect INT pin and read interrupt value and do corresponding treatment. Interrupt number and read/write interrupt register are corresponding. Allow corresponding interrupt when corresponding bit is 1, and forbid

		corresponding interrupt when corresponding bit is 0.
Address	**Name**	**Description**
0x03	POWERON	
0x04	DIGITINFO	Digital signal input format indication (read only) B5 is LPCM digital signal input. B3 is DTS digital signal input. B2 is Dolby digital AC3 signal input. B1 is PCM digital signal input. B0 means that there is no signal input.
0x05	CHINFO	Dolby digital or DTS input channel information (read only) 0x00 is 1+1, 0x10 is 1/0, 0x20 is 2/0, 0x30 is 3/0, 0x40 is 2/1, 0x50 is 3/1, 0x60 is 2/2, 0x70 is 3/2, 0x90 is 4/2, 0xa0 is 3/2+1, 0xb0 is 4/2, 0xc0 is 5/2, 0xd0 is 4/4, and 0xe0 is 5/3.
0x06	ANASIGNAL	Analogue signal input level indication (read only) 0 is analogue signal input level, and more than 6mV. 1 is analogue signal input level, and less than 6mV. Enter into mute state and there is no sound output.
0x07	SFREQFREG	Sampling frequency (red only) **AC-3:** 0x00/48K; 0x01/44.1K; 0x02/32K; **DTS**: 0x0f /Err,0x04/8K,0x05/16K,0x02/32K,0x06/64K,0x07/128K; 0x08/11.025K, 0x09/22.05K, 0x01/44.1K, 0x0a /88.2K, 0x0b /176.4K; 0x0c /12K,0x0d /24K,0x00/48K,0x03/96K,0x0e /192K。
0x0a	INPUTSEL	Input port selection (write only) Select analogue signal input when B7 is 1. Select digital input when B7 is 0. B1 to B0 is to select different digital ports: 0x00 means inputting from RX1; 0x01means inputting from RX2; 0x02 means inputting from RX3. Select HDMI input when B6 is 1. B1 to B0 is to select different digital port: 0x01means inputting from HDMI-1; 0x02 means inputting from HDMI-2; 0x03 means closing HDMI output.
0x0b	LISTMODE	Listening mode selection (write only) Select TEST TONE function When B7 is 1. B3 to B0 is corresponding channel selection, same as sound channel selection codes: 0x00 is left channel, 0x01 is central channel, 0x02 is right channel, 0x03 is right surround channel, 0x04 is left surround channel, 0x05 is sub woof channel, 0x06 is back right channel, 0x07 is back left channel. Sending 2.1 sound channel or 5.1 sound channel or 7.1 sound channel exits from TEST TONE. Select standard listening mode when B7 is 0 and B6 is 0. B2 to B0 is to select different effects: 0x00 is automation mode, if input is Dolby digital AC-3 (2.1sound channel), listening mode is AC-3 (2.1sound channel); if input is Dolby digital AC-3 (5.1sound channel), and listening mode is Dolby digital AC-3 (5.1sound channel). 0x01 is stereo, 0x02 is Dolby Pro Logic mode (5.1CH), and 0x03 is 7.1CH.
0x0c	SPKCONFIG	Speaker setup (write only) Note: big speaker means low, medium, and high bandwidth; small speaker means medium and high bandwidth. It is small speaker when B0 is 0, and it is big speaker when B0 is1.

0x0d	DNYCOMP	Dolby digital dynamic compression (write only) Only when input digital data rate is Dolby digital AC-3, it is effective. 0x00 is normal playback without compression, the rest are dynamic compression playback.
Address	**Name**	**Description**
0x0e	DSPMODE	DSP effect setup (write only) B7 is 0 when PCM digital and analogue input, B2 to B0 is to select different DSP effects: 0x00 is HALL, 0x01 is CHURCH, 0x02 is DISCO, 0x03 is THEATER, 0x04 is LIVE, 0x05 is MOVIE, 0x06 is MUSIC, 0x07 is SIMULATE, and 0x08 is exit.
0x10 to 0x12	DLTIME	Channel delay adjustment (write only) 0x10 is CEDLTME, 0x11 is SLDLTME, and 0x12 is SRDLTIME. Central delay writes 0 to 15, it is 0 to15ms in Dolby digital mode. Surround delay writes 0 to 15, it is 0 to 15ms in DTS and Dolby Digital mode, and it is 15ms to 30ms in Dolby Pro Logic mode. Note: it is effective only when listening mode is digital automation or Dolby Pro Logic mode.
0x80 to 0x7d	MEMORYWR	FLASH memory space with power-failed memory write
0xc0 to 0xdd	MEMORYRD	FLASH memory space with power-failed memory read