7.1CH Decoder DA32VB User Manual

◆ Features

- ✧ Four digital inputs and one analog input, users can extend analog input on your own.
- ✧ 7.1 analog audio input, built-in third-order low-pass filter amplifier circuit.
- ✧ Adopt CS4926 series audio DSP, CS8415 96KHz digital receiver, 96 KHz/24bit ADC and DAC.
- ✧ Support Dolby digital, Dolby pro-logic, DTS, and so on, with many kinds of listening modes and sound field effect playbacks.
- ✧ Built-in analog input mute, when there is no analog signal, the muting process will automatically go on without stop, and there is no need to connect detection circuit outside.
- ✧ Digital and analog ground wires are independent, which lowers the requirement of motherboard PCB LAYOUT and gets better performance.
- ✧ Provide mute control signal output and directly use hardware to mute.
- ✧ STL212 MCU can upgrade directly program online. Users can get new program on Internet when necessary, which provides convenience for debugging and maintenance.
- ✧ 17 universal output ports, it is okay to use built-in CPU to complete whole machine functions.
- ✧ Use I^2C slave interface to connect user host, and it is okay to use existing I^2C interface without adding additional interface.
- ➢ I^2C interface can be used with another I^2C device in parallel. DA32VB is the same as many I^2C devices such as 24C01 and so on, and it's easy for users to do secondary development.
- ✧ I^2C communication has TNT interrupt output port, user host can read corresponding data when TNT changes, which reduces the holding time of user host communication.
- ✧ Built-in 60 bytes memory space, 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 software development kit SDK source code, it is convenient for users to do secondary development.

◆ Application fields

- ➢ Digital audio decoder or analog audio decoder.
- ➢ Multi-channel multimedia sound box with decoding.
- ➢ Multi-channel AV reception power amplifier.
- ➢ Computer host peripheral audio decoding device.
- ➢ Another advanced audio products.

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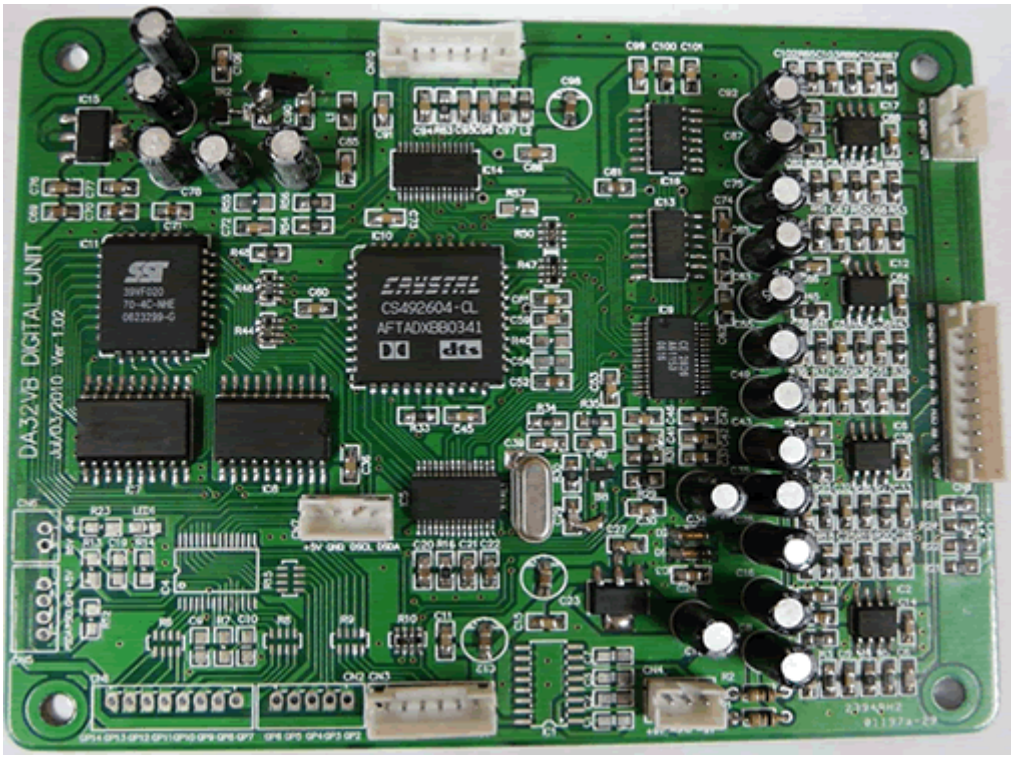
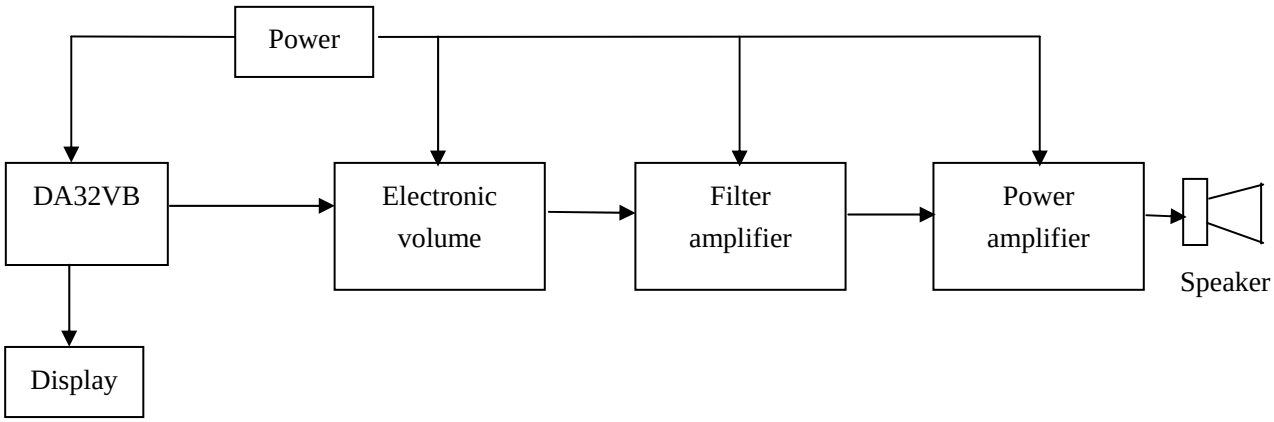


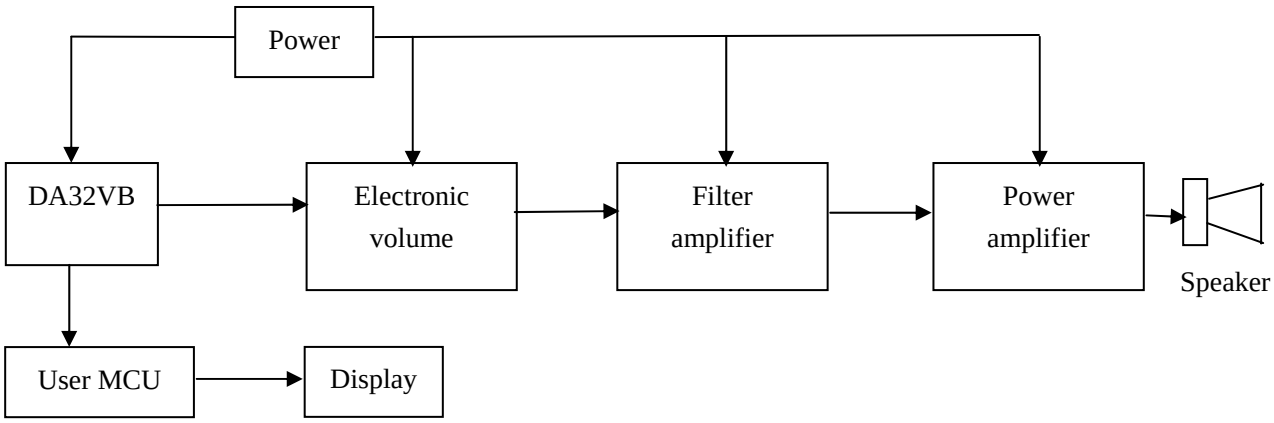
◆ Related technical files

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

◆ Working principle block diagram



Working principle block diagram without communication

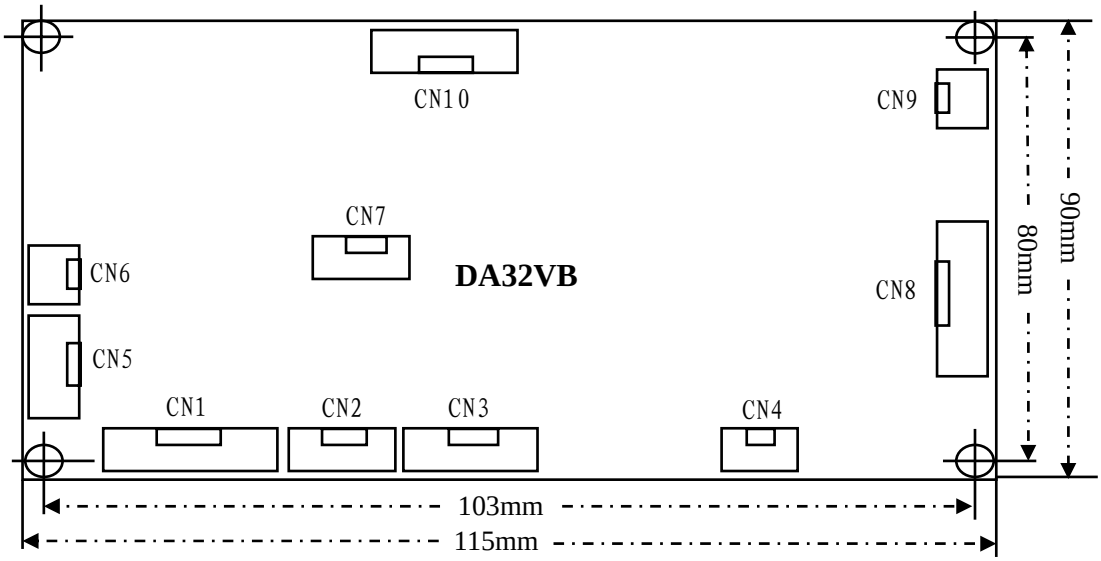


Working principle block diagram with communication

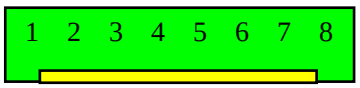
◆ Ground wire instructions

AGND and GND are not connected inside DA32VB, and need to be connected on the user board. If +5V ground wire and analog ground wire are not connected at the power supply, connection point should be close to the DA32VB pins or connecting at power supply is also acceptable, while the position close to DA32VB is preferable for a better effect.

◆ Size and pins instructions



CN1

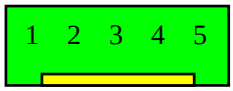


Extended interface.

1. **GP7** Extended MCU I/O port GP7, standard bi-directional port, built-in pull-up resistor
2. **GP8** Extended MCU I/O port GP8, standard bi-directional port, built-in pull-up resistor

3. **GP9** Extended MCU I/O port GP9, standard bi-directional port, built-in pull-up resistor
4. **GP10** Extended MCU I/O port GP10, standard bi-directional port, built-in pull-up resistor
5. **GP11** Extended MCU I/O port GP11, standard bi-directional port, built-in pull-up resistor
6. **GP12** Extended MCU I/O port GP12, standard bi-directional port, built-in pull-up resistor
7. **GP13** Extended MCU I/O port GP13, standard bi-directional port, built-in pull-up resistor
8. **GP14** Extended MCU I/O port GP14, standard bi-directional port, built-in pull-up resistor

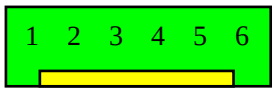
CN2



Extended interface.

1. **GP2** Extended MCU I/O port GP2, standard bi-directional port, built-in pull-up resistor
2. **GP3** Extended MCU I/O port GP3, standard bi-directional port, built-in pull-up resistor
3. **GP4** Extended MCU I/O port GP4, standard bi-directional port, built-in pull-up resistor
4. **GP5** Extended MCU I/O port GP5, standard bi-directional port, built-in pull-up resistor
5. **GP6** Extended MCU I/O port GP6, standard bi-directional port, built-in pull-up resistor

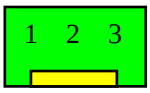
CN3



Extended interface.

1. **+5V** +5V output.
2. **GND** Digital ground wire input/output.
3. **SDA** I^2C communication SDA port.
4. **SCL** I^2C communication SCL port, it is infrared remote control reception input in common application.
5. **GP0** Extended MCU I/O port GP0, standard bi-directional port, built-in pull-up resistor
6. **GP1** Extended MCU I/O port GP1, standard bi-directional port, built-in pull-up resistor

CN4



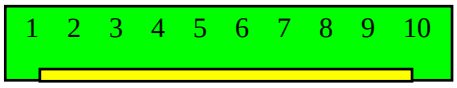
Power input interface.

1. **-9V** -9V input.
2. **AGND** Analog ground wire input/output.
3. **+9V** +9V input.

CN5, CN6, and CN7:

Factory debugging interface, there is no need to pay attention it in general.

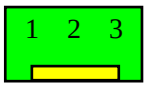
CN8



Audio output interface.

1. **SBR** Surround back right channel signal output.
2. **AGND** Analog ground wire input/output.
3. **SBL** Surround back left channel signal output.
4. **SW** Sub woof channel signal output.
5. **SR** Surround right signal output.
6. **SL** Surround left signal output.
7. **CEN** Central channel signal output.
8. **FR** Front right channel signal output.
9. **FL** Front left channel signal output.
10. **AGND** Analog ground wire input/output.

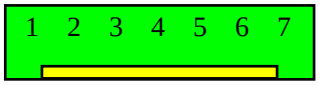
CN9



Analog audio input interface.

1. **RCH** Analog right channel signal input.
2. **AGND** Analog ground wire input/output.
3. **LCH** Analog left channel signal input.

CN10



Digital input interface.

1. **RX1** The first digital input.
2. **+5V** +5V input/output.
3. **RX2** The second digital input.
4. **GND** Digital ground wire input/output.
5. **RX3** The third digital input.
6. **GND** Digital ground wire input/output.
7. **RX4** The fourth digital input.

◆ Electrical specification

Items	Minimum	Typical	Maximum
+5V power supply voltage	+4.6V	+5V	+5.5V
+5V working current (@ HDMI (DTS))	260mA	270mA	350mA
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)	90dB	89dB	95dB
Resolution	-	88dB	-
Level output @0dB	-	1V	-
Analog level input	-	2V	2.2V
Frequency response（20Hz-20KHz）	-	+/-1dB	-

◆ Software development instructions

It is okay for DA32VB 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 DA32VB is 0x32, i.e. 00110010B. I^2C address that user host reads DA32VB 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.

DA32VB write register diagram:

Start	Device address (write)	Register address	Write data 0	Write data X (when multibyte)	End

DA32VB read register diagram:

Start	Device address (write)	Register address waiting for being read	End

Start	Device address (read)	Read data 0	Read data X (when multibyte)	End

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 DA32VB. User host can know if DA32VB 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.

◆ I²C Communication user host instructions set

Address	Name	Description
0x00	INTCLR	Clear interrupt register (write only) Interrupt number: INT0=1, DA32VB initialization, guarantee that user host and DA32VB 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. DA32VB 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.
0x03	POWERON	
0x04	DIGITINFO	Digital signal input format indication (read only) 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; 0x03 means inputting from RX4.

Address	Name	Description
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, 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.
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.
0x0f	VOLCTRL	Volume setup (write only) 0x00 is minimum volume 0dB, 0x3f is maximum volume 63dB.
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