Nitrogen D2
16-Bit Stereo USB Audio Controller
(Dolby Digital Live and DTS Interactive Software Technology Bundle)

Datasheet
Version 1.02

C-MEDIA ELECTRONICS INC.
TEL: 886-2-8773-1100 FAX: 886-2-8773-2211
6F, 100, Sec. 4, Civil Boulevard, Taipei, Taiwan 106, R.O.C.
For detailed product information, please contact TUsales@cmedia.com.twUT

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1. DESCRIPTIONS AND OVERVIEW

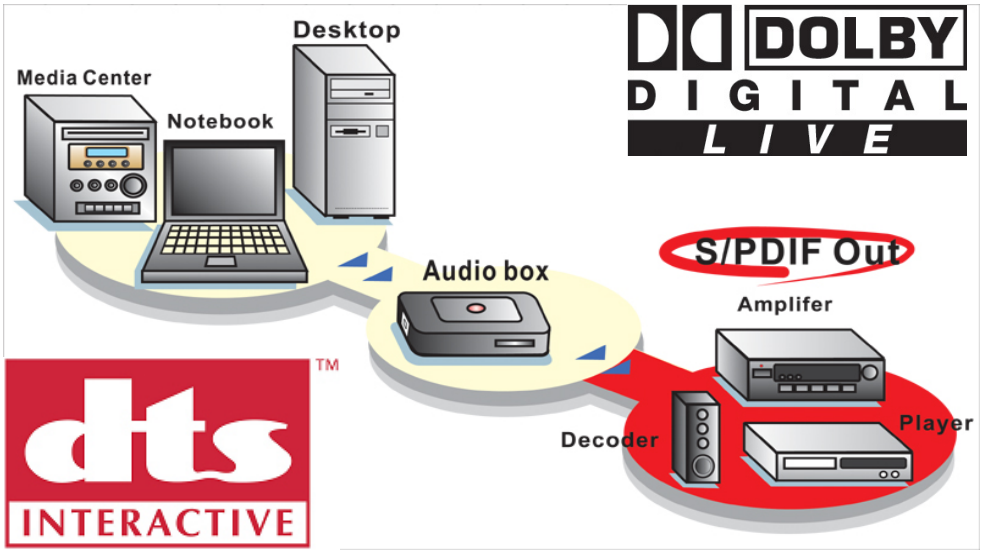
Nitrogen D2 is the world first USB audio chip that with Dolby Digital Live and dts Interactive sounds technology supporting. This new chip design can provided more efficiency features and high quality sound for portable USB audio products application. It is a highly integrated single chip for USB stereo audio and SPDIF output application. Minimum external components are needed for building an USB audio system, which makes Nitrogen D2 a simple and very cost-effective solution.

Nitrogen D2 is design for all kind of PC base USB personal multi-media device products. It is USB 2.0 full speed compatible and utilizes USB bus power for plug-and-play feature. Via C-Media Xear 3D Sound USB audio driver, users can avail themselves of a much better virtual 7.1 CH environment capable. For high-end multi-media application, this light and portable personal audio device can easy to processing any sound source to Dolby Digital AC-3 and dts raw data by real-time encoding function. The world first innovation software function to grade up every PC system and output high quality digital sound effects for link up with high-end home theater equipments like amplifier, DVD player or decoder etc.

This special feature is Dolby Digital Live function modules. As we know, Dolby Digital and dts (Digital Theater System) are the world well-known sound technology brands and generality using on consumer electronics. Therefore, if PC products need to be home theater equipment or media center this would be key feature and selling point for product development. These functions not only provide easy bridge to connect PCs and consumer electronics but also adding value and upgrade sound quality to PC products. In the future, PCs can put on Dolby Digital and dts logo on it and provide advanced sound quality to end-user. All of modules were implemented by C-Media in software technology and anyone can request these features by license from Dolby Lab. and DTS Corporate. through C-Media.

Moreover, the innovation technology DRC feature was integrated on Nitrogen D2. This Dynamic Range Control function can support high efficiency volume output to get loudness sound effect similar D class amplifier capability. Vender can just using single chip to saving external amplifier component and getting a better listen experience when listen to a music source with wide dynamic range.

For vender specific requests, customers can use an EEPROM to create vendor specific VID / PID / Product String, and even special hardware configuration. More flexible and customized design is possible with GPIO pin, which is accessible by USB vendor specific request. Volume control VR input pin; a traditional speaker front panel design can be built. Nitrogen D2 support USB standard HID Interface which provide Volume _up / Volume _down / Playback mute Buttons and Rotary Encoder for pure digital volume control.



2. FEATURES

- USB 2.0 Full Speed Compatible and USB IF certification
- USB Audio Devices Class Specification Ver1.0 Compatible
- USB Bus Powered 500mA, without External Power Supply
- High performance 16-Bit Stereo, 48 / 44.1 KHz Sampling Rate for Audio Playback
- S/PDIF Output Interface
- Embedded USB Transceiver
- Embedded High Performance 16-Bit Audio DAC
- Embedded Digital Control Power Amplifier for Speaker Driving
- Support Power Amplifier Enable / Disable Control Pin

- Support Dynamic Range Control (DRC) Feature to Provide a Better Listen Experience
- Embedded Power-On-Reset Block
- Embedded 5V to 3.3V Regulator with Voltage Level Detector for Single 5V External Power Supply
- Embedded Temperature Protection Circuit
- Embedded X2 Modulation for Higher Audio Quality
- Embedded Anti-Pop Circuit with Internal Feedback Structure
- Single 12MHz Crystal Input with Embedded PLL
- Isochronous Transfer using Adaptive Synchronization with Internal PLL
- External EEPROM Interface for Vendor Specific VID / PID / Product String
- EEPROM Read / Write Function via Vendor Specific Request for Mass Production Convenience
- Analog Volume Control Input with Simple External VR Circuit
- Digital Volume Control Input with Digital Rotary Encoder or Vol_up / Vol_dn / Play_mute Bottoms
- Vol_up / Vol_dn / Play_mute Pins and Digital Rotary Encoder Interface Support USB HID Devices Class Ver1.11 for Host Volume Control Synchronization
- 3.3V I/O with 5V Tolerance
- Dolby® Digital Audio Streaming via S/PDIF Output
- Supports USB Suspend / Resume Mode and Remote Wakeup with Digital Volume Control Pins
- LED Indicator Pin During Playback
- 1 GPIO pin for Application Specific Usage
- Dolby Digital Live Software Sound Technology Bundle
- Digital Theater System (DTS Interactive) Software Sound Technology Bundle
- USB Software Driver Compatible with Win 98SE / Win ME / Win 2000 / Win XP

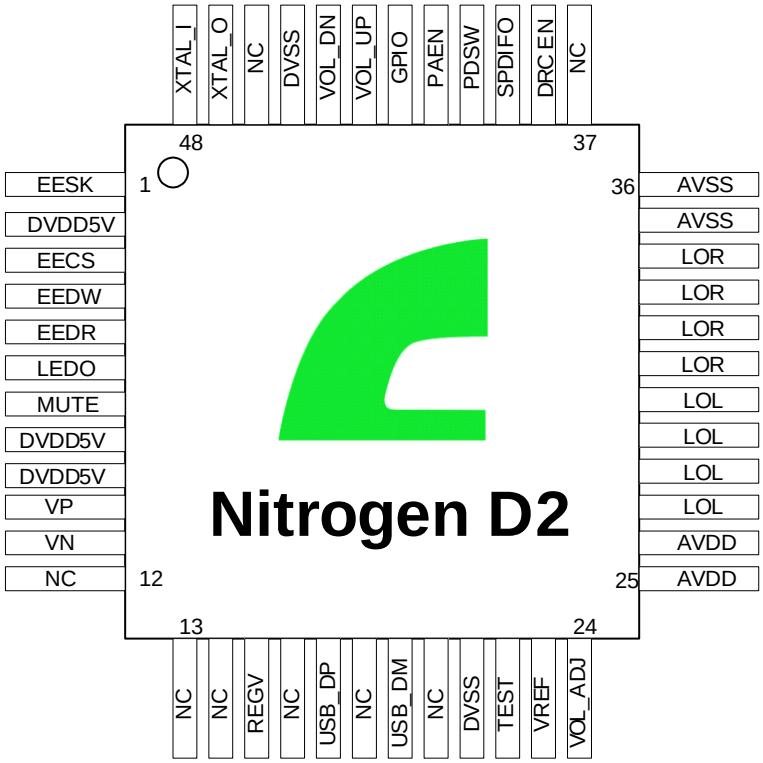
3. PIN DESCRIPTIONS

3.1 PIN ASSIGNMENT BY PIN NUMBER

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
1	EESK	13	NC	25	AVDD	37	NC
2	DVDD5V	14	NC	26	AVDD	38	DRCEN
3	EECS	15	REGV	27	LOL	39	SPDIFO
4	EEDW	16	NC	28	LOL	40	PDSW
5	EEDR	17	USB_DP	29	LOL	41	PAEN
6	LEDO	18	NC	30	LOL	42	GPIO
7	MUTE	19	USB_DM	31	LOR	43	VOL_UP
8	DVDD5V	20	NC	32	LOR	44	VOL_DN
9	DVDD5V	21	DVSS	33	LOR	45	DVSS
10	VP	22	TEST	34	LOR	46	NC
11	VN	23	VREF	35	AVSS	47	XTAL_O
12	NC	24	VOLADJ	36	AVSS	48	XTAL_I

*__Note__: -NC- means No-Connect

3.2 PIN-OUT DIAGRAM



3.3 PIN SIGNAL DESCRIPTIONS

Pin #	Symbol	Type	Description
1	EESK	DO, 8mA, SR	EEPROM Interface Clock
2	DVDD5V	P	5V Power Supply for Digital Circuit
3	EECS	DO, 8mA, SR	EEPROM Interface Chip Select
4	EEDW	DO, 8mA, SR	EEPROM Interface Write to EEPROM
5	EEDR	DI, ST, PD, 5VT	EEPROM Interface Read from EEPROM
6	LEDO	DO, 8mA, SR	LED Indicator for Playback
7	MUTE	DI, ST, PU	Mute Pin (HID Standard)
8	DVDD5V	P	5V Power Supply
9	DVDD5V	P	5V Power Supply
10	VP	DI, ST, PU	Digital Rotary Encoder Interface Pin A
11	VN	DI, ST, PU	Digital Rotary Encoder Interface Pin B
12	NC	-	No Connect
13	NC	-	No Connect
14	NC	-	No Connect
15	REGV	AO	Regulator output 3.3V
16	NC	-	No Connect
17	USB_DP	AIO	USB Data D+
18	NC	-	No Connect
19	USB_DM	AIO	USB Data D-
20	NC	-	No Connect
21	DVSS	P	Digital Ground
22	TEST	DI, ST, PD	Test Mode Select Pin, Pull-Down in normal Operation
23	VREF	AO	Connecting to External Decoupling Capacitor for Embedded Band-gap Circuit; 2.25V Output

24	VOLADJ	AI	Analog Volume Control Input from external VR circuit. 0 ~ 2.25V:+3dB / mute 3.5 ~ 5V: 0dB
25	AVDD	P	5V Power Supply for Analog Circuit
26	AVDD	P	5V Power Supply for Analog Circuit
27	LOL	AO	Line Out Left Channel
28	LOL	AO	Line Out Left Channel
29	LOL	AO	Line Out Left Channel
30	LOL	AO	Line Out Left Channel
31	LOR	AO	Line Out Right Channel
32	LOR	AO	Line Out Right Channel
33	LOR	AO	Line Out Right Channel
34	LOR	AO	Line Out Right Channel
35	AVSS	P	Analog Ground
36	AVSS	P	Analog Ground
37	NC	-	No Connect
38	DRCEN	DI	1:DRC ON (default) 0:DRC Off
39	SPDIFO	DO, 8mA, SR	S/PDIF Data Output
40	PDSW	DO, 8mA, SR	Power Down Switch Control Signal Output 1: Normal Mode 0: Power Down Mode (Suspend Mode)
41	PAEN	DI, ST	Power Amplifier Control Input, Connect to a Switch or Pull-High in Normal Operation. H: Enable Power Amplifier (Normal Mode) L: Disable Power Amplifier

42	GPIO	DIO, 8mA, ST, SR, PD	GPIO Pin, Controlled via Vender Specific Command
43	VOL_UP	DI, ST, PU	Volume Up Pin (HID Standard)
44	VOL_DN	DI, ST, PU	Volume Down Pin (HID Standard)
45	DVSS	P	Digital Ground
46	NC	-	No Connect
47	XTAL_O	AO	Output Pin for 12MHz Oscillator
48	XTAL_I	AI	Input Pin for 12MHz Oscillator

***Note**:**DI / DO / DIO** – Digital Input / Output / Bi-Directional Pad

AI / AO / AIO – Analog Input / Output / Bi-Directional Pad

P – Power Pin

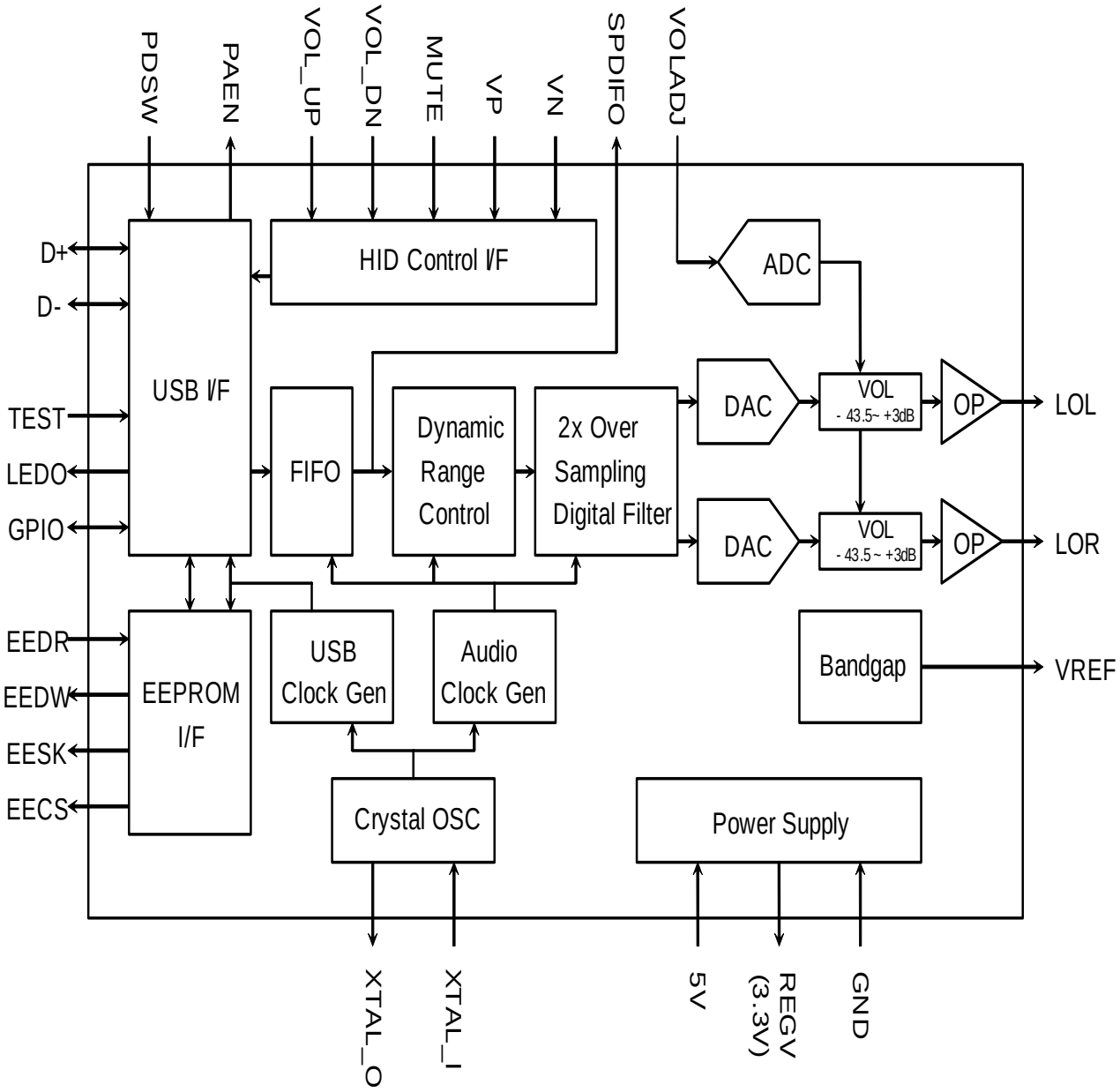
SR – Slew Rate Control

ST – Schmitt Trigger

PD / PU – Pull Down / Pull Up

5VT – 5 Volt Tolerant (3.3V Pad)

4. BLOCK DIAGRAM

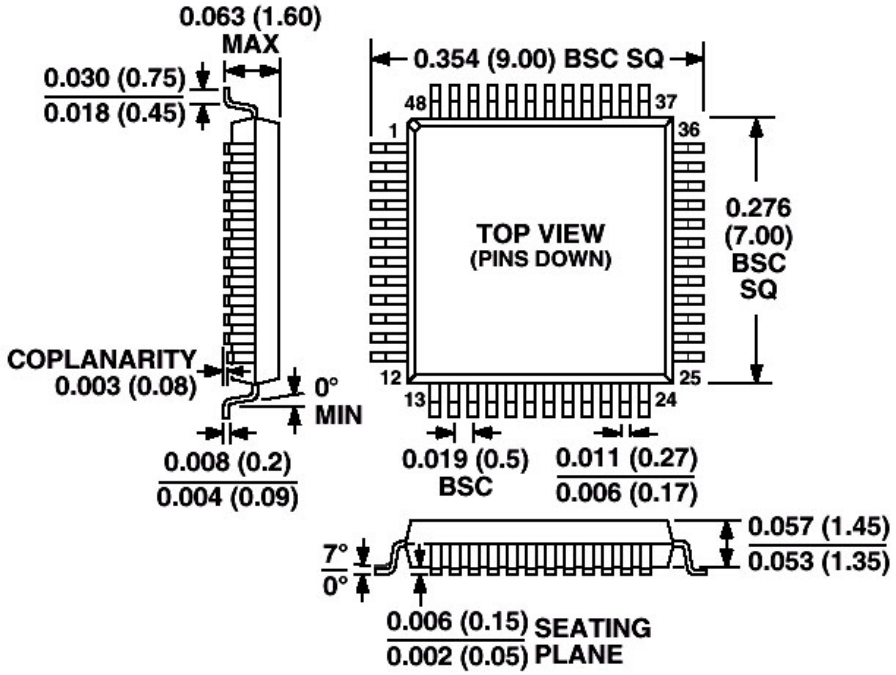


Block Diagram Of Nitrogen D2

5. ORDERING INFORMATION

Model Number	Package	Operating Ambient Temperature	Supply Range
Nitrogen D2	48-Pin LQFP 7mm×7mm×1.4mm (Plastic)	0°C to +70°C	DVdd = 5V, AVdd = 5V

48-Lead Thin Plastic Quad Flatpack (LQFP)



Outline Dimensions *Dimensions shown in inches and (mm)

6. FUNCTION DESCRIPTIONS

6.1 USB INTERFACE

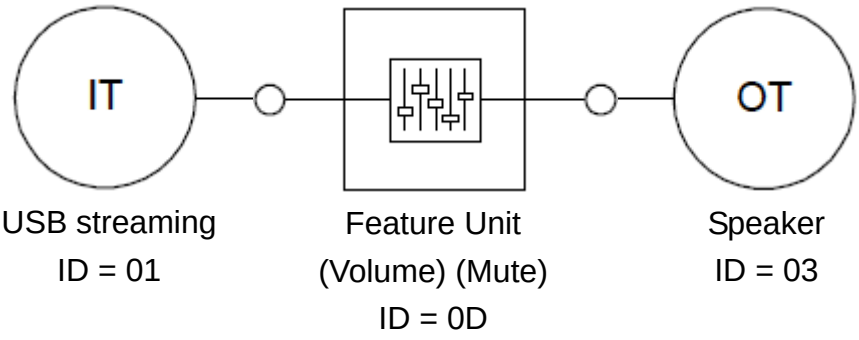
6.1.1 DEVICE DESCRIPTOR

Offset	Field	Size	Value (Hex)	Description
0	bLength	1	12	Total 18 Bytes
1	bDescriptorType	1	01	Device Descriptor
2	bcdUSB	2	0110	USB 1.1 compliant.
4	bDeviceClass	1	00	
5	bDeviceSubClass	1	00	
6	bDeviceProtocol	1	00	
7	bMaxPacketSize0	1	08	Endpoint Zero Size = 8 bytes
8	idVendor	2	0D8C	Vendor ID
10	idProduct	2	0104	Product ID
12	bcdDevice	2	0010	Device Release Number
14	iManufacturer	1	01	Index of string descriptor describing manufacturer -> “*C-Media INC.*”
15	iProduct	1	02	Index of string descriptor describing product -> "*C-Media USB Audio* "
16	iSerialNumber	1	00	Index of string descriptor describing the device’s serial number
17	bNumConfigurations	1	01	Configurations number = 1

6.1.2 CONFIGURATION DESCRIPTOR

Offset	Field	Size	Value (Hex)	Description
0	bLength	1	09	Total 9 Bytes
1	bDescriptorType	1	02	Configuration Descriptor
2	wTotalLength	2	008D	Total length of data returned for this configuration.
4	bNumInterfaces	1	03	Number of interfaces supported by this Configuration.
5	bConfigurationValue	1	01	
6	iConfiguration	1	00	
7	bmAttributes	1	80	Self-powered without Remote Wakeup
8	bMaxPower	2	FA	Maximum power consumption of the USB. 0xFA=500 mA

6.1.3 USB AUDIO TOPOLOGY DIAGRAM



6.2 EEPROM (93C46) CONTENT FORMAT

Nitrogen D2 supports four-wire serial EEPROM interface. When an external serial EEPROM is detected, Vendor ID, Product ID, and Product String reported within Device Descriptor will be derived from the content of serial EEPROM. The setting values of serial EEPROM is shown below:

Address	Contents
00	0x434D (*Note1)
01	Vender ID
02	Product ID
03	String1, String0
04	String3, String2
05	String5, String4
06	String7, String6
07	String9, String8
08	String11, String10
09	String13, String12
10	String15, String14
11	String17, String16
12	String19, String18
13	String21, String20
14	String23, String22
15	Bit 0: DRC Enable / Disable
16~63	--

***Note:** The first word of the EEPROM is a magic code. Only when it matches, the IC will regard the serial EEPROM valid.

6.3 HID FEATURE

Nitrogen D2 provides HID feature with user setting to Volume-Up, Volume-Down, Playback-Mute button pin, and the Digital-Rotary-Encoder for Volume Control is reported to the host to synchronize host side setting.

6.3.1 WHAT'S HID

USB protocols can configure devices at startup or when they are plugged in at run time. These devices are broken into various device classes. Each device class defines the common behavior and protocols for devices that serve similar functions. The HID (Human Interface Device) class is one of the device classes.

The HID class consists primarily of devices that are used by humans to control the operation of computer systems. Typical examples of HID class devices include:

- Keyboards and pointing devices, for example: mouse, trackballs, and joysticks.
- Front-panel controls, for example: knobs, switches, buttons, and sliders.
- Controls that might be found on devices such as VCR remote controls, games or simulation devices, for example: data gloves, throttles, and steering wheels.
- Devices that may not require human interaction but provide data in a similar format to HID class devices, for example: bar-code readers, thermometers, or voltmeters.

6.3.2 HID DESCRIPTOR

HID Interface Descriptor

Offset	Field	Size	Value (Hex)	Description
0	bLength	1	09	Size of this descriptor: 9 byte
1	bDescriptorType	1	04	INTERFACE descriptor type
2	bInterfaceNumber	1	02	Number of Interface
3	bAlternateSetting	1	00	alternate 0

Offset	Field	Size	Value (Hex)	Description
4	bNumEndpoints	1	01	Number of endpoints used by this Interface: 1
5	bInterfaceClass	1	03	HID Interface Class
6	bInterfaceSubClass	1	00	No Subclass
7	bInterfaceProtocol	1	00	Must be set to 0
8	iInterface	1	00	Index of a string descriptor that describes this interface.

HID Descriptor

Offset	Field	Size	Value (Hex)	Description
0	bLength	1	09	Total 9 Bytes
1	bDescriptorType	1	21	HID Descriptor Type
2	bcdHID	2	0100	HID class version 1.00
4	bCountryCode	1	00	
5	bNumDescriptors	1	01	
6	bDescriptorType	1	22	Report Descriptor
7	wDescriptorLength	2	002A	Numeric expression that is the total size of the optional descriptor

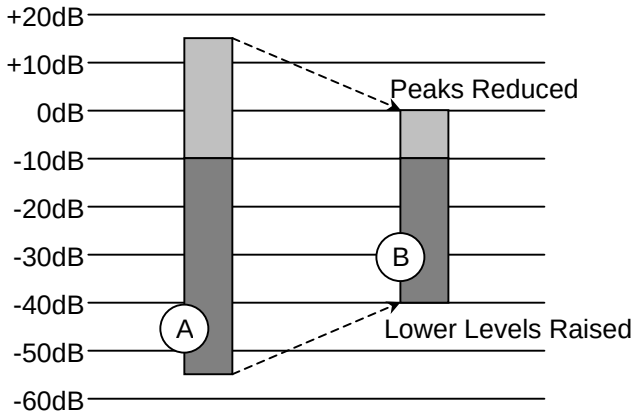
Interrupt IN Endpoint Descriptor

Offset	Field	Size	Value (Hex)	Description
0	bLength	1	07	Total 7 Bytes
1	bDescriptorType	1	05	ENDPOINT Descriptor Type
2	bEndpointAddress	1	81	IN Endpoint Endpoint number = 3
3	bmAttributes	1	03	Interrupt endpoint type
4	wMaxPacketSize	2	0003	Maximum packet size: 4 bytes
6	bInterval	1	04	Interrupt Interval: 4ms

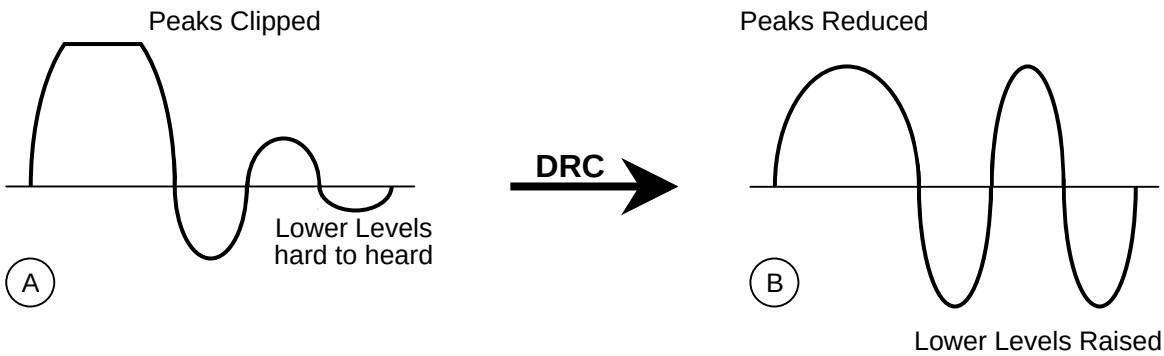
6.4 DYNAMIC RANGE CONTROL (DRC)

Nitrogen D2 include a new feature called Dynamic Range Control (DRC), and with a default ON setting (Users can still turn it off within the Windows audio advance control panel)

Dynamic range is defined as the difference, in decibels (dB), between the loudest and quietest sounds in any particular piece of audio content. Classical music is a good example, with ranges from piano (soft) to forte to FFF (for extremely loud). Movies also typically have a wide dynamic range, which may cause you to have to turn the volume up and down as scenes change. For example, when watching a movie at home, you may be forced to turn up volume to hear the dialog in a quiet scene, and then quickly turn it down again during a car chase scene that follows. In this way, there may be times in a home theater environment when it would be useful to be able to control the dynamic range.



With Dynamic Range Control enabled, the full dynamic range (A) of the program is reduced (B).



6.5 DOLBY DIGITAL AND DTS SOUND TECHNOLOGY

6.5.1 DOLBY DIGITAL LIVE TECHNOLOGY

C-Media Xear 3D™ Sound Solution provides another state-of-the-art high quality audio function--Dolby digital AC-3 encoder module. With this real-time software encoder, the existing and future customers who are using C-Media USB audio solution and devices can obtain this digital quality audio output by S/PDIF format much easier than before. This function can output various 3D and environmental sound effects by high quality AC-3 encoding; in the meantime, it exhibits supreme efficiency—it takes only 7% of CPU consumption from a Pentium 4 Processor.

DOLBY DIGITAL LIVE	A technology that can encode all the digital audio content on PC into Dolby Digital stream in real-time. It can then be sent to external decoder for playback. All path are digital and wiring is simple.

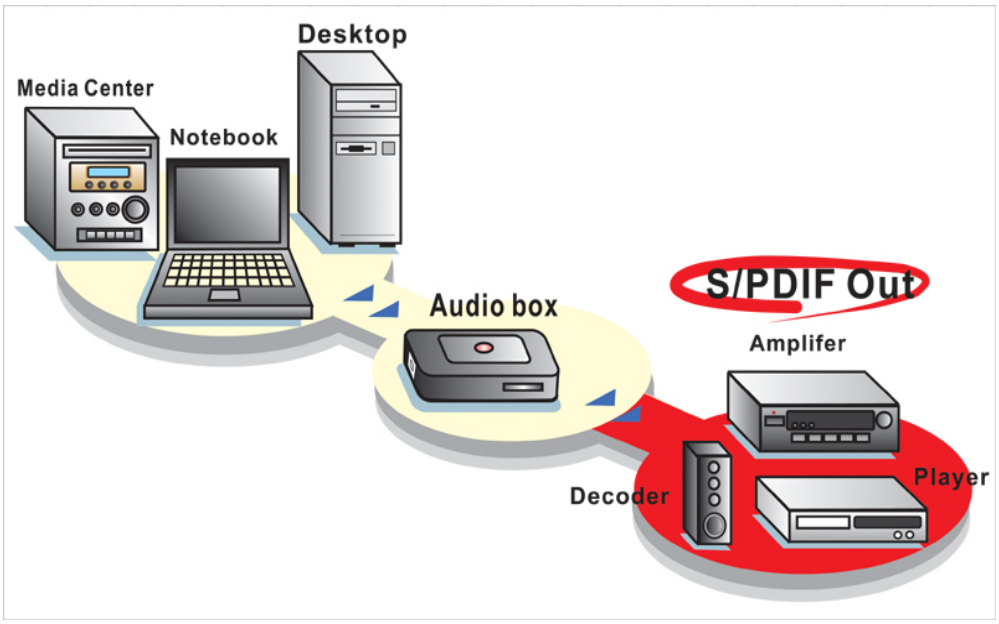
6.5.2 DIGITAL THEATER SYSTEM (DTS interactive)

Besides Dolby, C-Media was also the world first PC audio provider whom can integrate whole DTS Digital DSP technology in software module. Everyone knows that, DTS is the famous of the world sound technology which guarantee high quality and performance. DTS Interactive can take any content (WMA, MP3, CD, and more!) to transfer 5.1 multi-chances with real-time whenever play on line game, listen music, and watch VCD.

dts™ INTERACTIVE	A real-time DTS encoder which takes any LPMC (2 channel or more) and encodes it into DTS bit stream. The data transfer format is 48 KHz at 1.5 mb/sec. Just using a single cable connection to your DTS enabled surround sound system such as, powered PC speakers, an A/V receiver or any other DTS compatible surround sound system.

Better yet, the pure digital signal not only prevents the audio signal from distortion, but also reduces the number of wires connected between PC and a HI-FI audio system. That is to say, this breakthrough real-time AC-3 or DTS encoder can digitally transmit data from PC to HI-FI system via a single RCA cable, instead of three pairs in an analog signal case in the past.

6.6 BENEFITS AND ADVANTAGES



- **Uses a single digital connection**
- **Transforms all PC audio signals into a Dolby and DTS Digital signal**
- **Optimized for low-latency interactive applications**
- **Provides realistic 5.1-channel surround sound effects during interactive video game play**

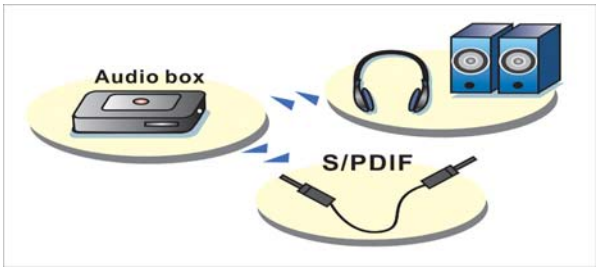
Advantages of this feature：

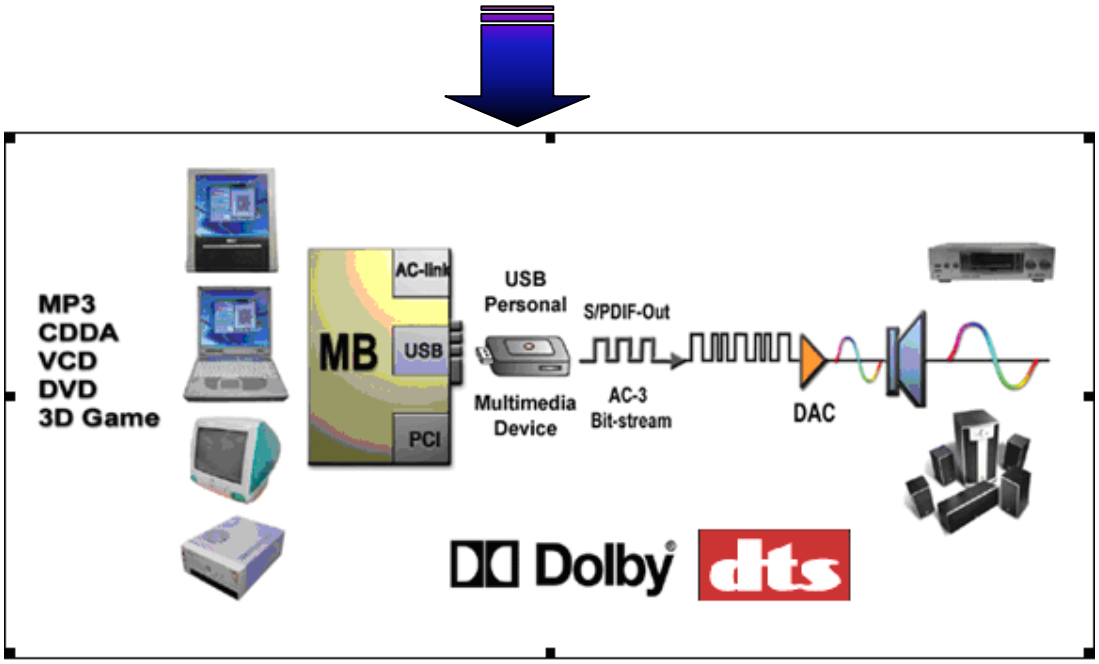
1.Getting higher quality audio signal output compared with any other SPDIF-Out solutions. C-Media Xear 3D™ Plus DDL or DTS INTERACTIVE encoder sound solution can directly process and transmit any PC sound source to digital AC-3 or DTS signal. Digital-transmitted data processed by software driver can absolutely rule out the characteristics influence of DAC quality. Therefore, users are able to get the best sound quality.

2.General PC audio SPDIF-Out solution can only provide 2CH PCM data to external amplifier. If users want to output high quality digital AC-3 or DTS INTERACTIVE bit-stream, they have to rely on software DVD player, from which only DVD playback is achievable. In that case, it will limit and impair the high quality multi-channel sound

enjoyment. C-Media DDL or DTS INTERACTIVE encoder solution not only retains the above functions, but also provides other possible applications on PC audio. Xear 3D™ plus AC-3 or DTS encoder sound solution can process any type of sound sources, and people are able to obtain 7.1CH output by using virtual SPEAKER SHIFTER™ to create optimized personal listening environment.

3.In terms of 3D gaming, C-Media Xear 3D™ sound engine for Dolby Digital Live or DTS INTERACTIVE encoder are far better than Window DirectX 3D sound emulator, in that it is powered by sophisticated HRTF (Head Related Transfer Function) library, supporting environmental effects (EAX 1.0 & 2.0 compatible) to create highly immersive 3D gaming experience. All interactive sound effects of 3D game can real-time encoding to AC-3 or DTS INTERACTIVE bit-stream and getting high quality digital signal to external decoder and speakers for enjoyment.





7. ELECTRICAL CHARACTERISTICS

7.1 ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
Dvmin	Min Digital Supply Voltage	– 0.3	V
Dvmax	Max Digital Supply Voltage	+ 6	V
Avmin	Min Analog Supply Voltage	– 0.3	V
Avmax	Max Analog Supply Voltage	+ 6	V
Dvinout	Voltage on any Digital Input or Output Pin	–0.3 to +5.5	V
Avinout	Voltage on any Analog Input or Output Pin	–0.3 to +5.5	V
T_{stg}	Storage Temperature Range	-40 to +125	^{0}C
ESD (HBM)	ESD Human Body Mode	2000	V
ESD (MM)	ESD Machine Mode	200	V
Latchup	Latch Up Test	200	mA

7.2 OPERATION CONDITIONS

	Min	Typ	Max	Unit
Analog Supply Voltage	4.5	5.0	5.5	V
Digital Supply Voltage	4.5	5.0	5.5	V
Total Power Consumption	-	-	500	mA
Suspend Mode Power Consumption	-	-	320	uA
Operating ambient temperature	0	-	70	^{0}C

7.3 SPERKER IMPEDANCE VS. OUTPUT POWER (PER CHANNEL)

Loading (Ohm) **Items**	**4 Ohm**	**8 Ohm**	**32 Ohm**	**10K Ohm**
Vpp	3.14	3.4	3.635	3.722
Vrms	1.11	1.202	1.285	1.316
W(rms/sin wave)	308 mW	181 mW	52 mW	0.17 mW
W(rms/square wave)	616 mW	361 mW	103 mW	0.35 mW
W(PMPO)	2460 mW	1450 mW	410 mW	1 mW

***Note1:** Test Condition @ 25^{o}C, 5 Volt +- 10%, 1KHz Sin Wave

***Note2:** Typical Output with THD+N < 1%; Maximal Output with THD+N < 10%

7.4 AUDIO PERFORMANCE

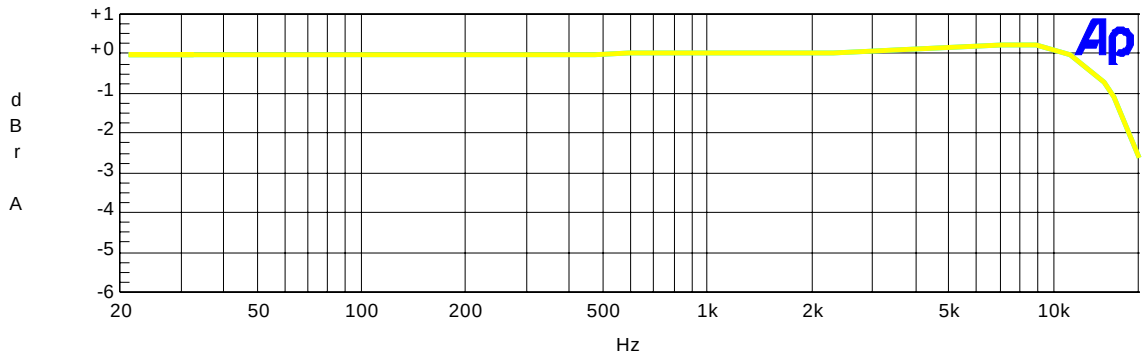
	Min	Typ	Max	Unit
Resolution	--	16	--	Bits
Frequency response @ 48KHz	20	--	20K	Hz
Frequency Response @ 44.1KHz	20	--	20K	Hz
Passband Ripple @ 48 KHz	40	--	9.6K	Hz
Passband Ripple @ 44.1 KHz	40	--	8.8K	Hz
DAC (10K Ohm Loading)				
SNR	--	97.75	--	dB
Dynamic Range	--	96.27	--	dB
THD + N	--	-67.97	--	dB
Output Voltage (rms)	-	1.316	-	Vrms
DAC (32 Ohm Loading)				
SNR	--	97.68	--	dB
Dynamic Range	--	95.99	--	dB
THD + N	--	-57.82	--	dB
Output Voltage (rms)	-	1.285	-	Vrms
DAC (8 Ohm Loading)				
SNR	--	97.67	--	dB
Dynamic Range	--	96.03	--	dB
THD + N	--	-53.28	--	dB
Output Voltage (rms)	-	1.202	-	Vrms
DAC (4 Ohm Loading)				
SNR	--	97.45	--	dB
Dynamic Range	--	95.89	--	dB
THD + N	--	-52.76	--	dB
Output Voltage (rms)	-	1.11	-	Vrms

8. AUDIO PERFORMANCE CURVES

8.1 FREQUENCY RESPONSE (10K OHM LOADING)

8.1.1 FREQUENCY RESPONSE @ 44.1 KS/SEC

C-MEDIA Digital Playback (PC-D-A) for Line Output Frequency Response 05/31/05 14:10:33

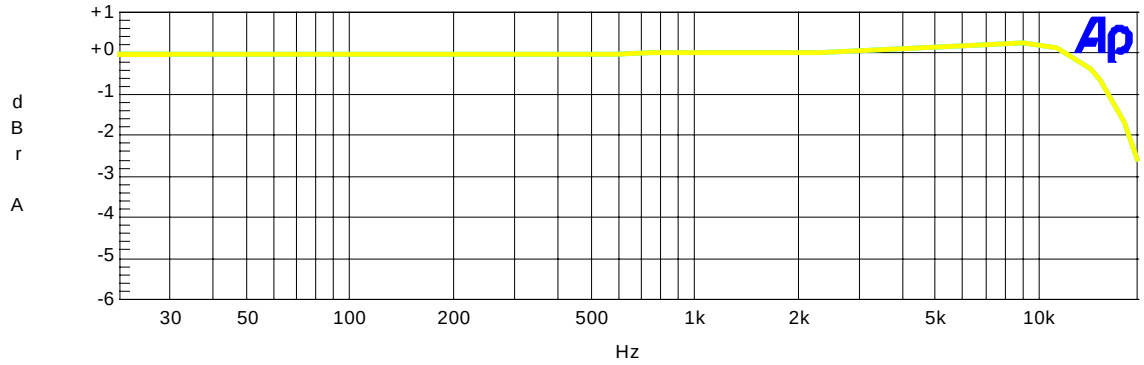


Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Cyan	Solid	3	Fasttest.Ch.1 Ampl!Normalize	Left	
1	2	Yellow	Solid	3	Fasttest.Ch.2 Ampl!Normalize	Left	

WL-Multitone-44k.at2c

8.1.2 FREQUENCY RESPONSE @ 48 KS/SEC

C-MEDIA Digital Playback (PC-D-A) for Line Output Frequency Response 05/31/05 14:07:22



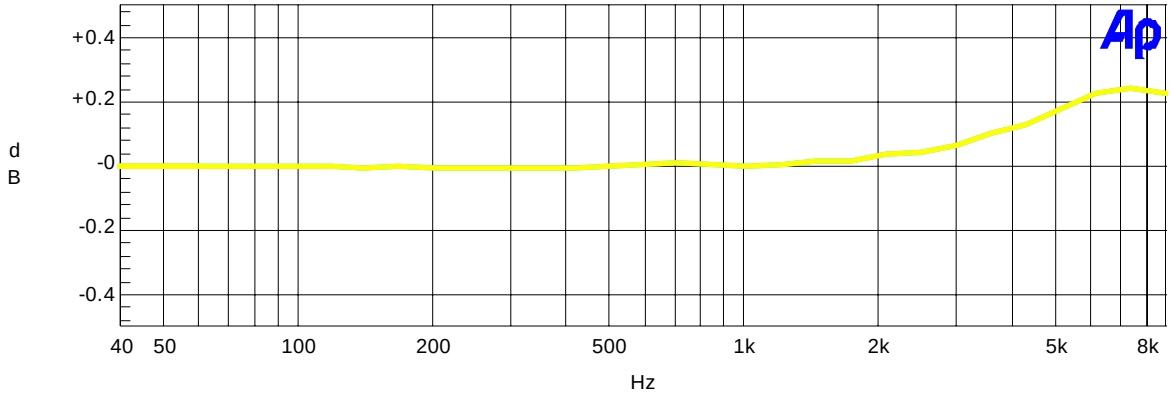
Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Cyan	Solid	3	Fasttest.Ch.1 Ampl!Normalize	Left	
1	2	Yellow	Solid	3	Fasttest.Ch.2 Ampl!Normalize	Left	

WL-Multitone-48k.at2c

8.2 PASSBAND RIPPLE (10K OHM LOADING)

8.2.1 PASSBAND RIPPLE @ 44.1 KS/SEC

C-MEDIA Digital Playback (PC-D-A) for Line Output Passband Ripple @44.1ks/sec 05/31/05 14:11:07

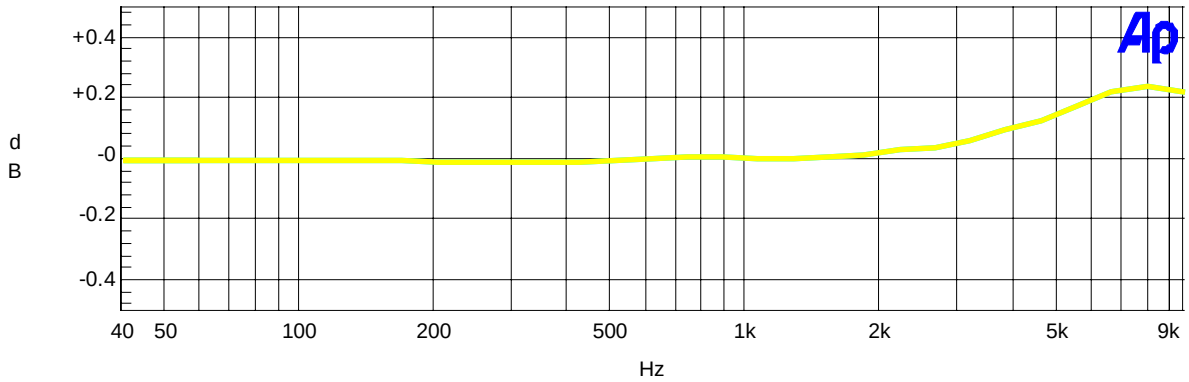


Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Cyan	Solid	3	Fasttest.Ch.1 Ampl!Normalize	Left	
1	2	Yellow	Solid	3	Fasttest.Ch.2 Ampl!Normalize	Left	

WL-PassbandRipple-M44k.at2c

8.2.2 PASSBAND RIPPLE @ 48 KS/SEC

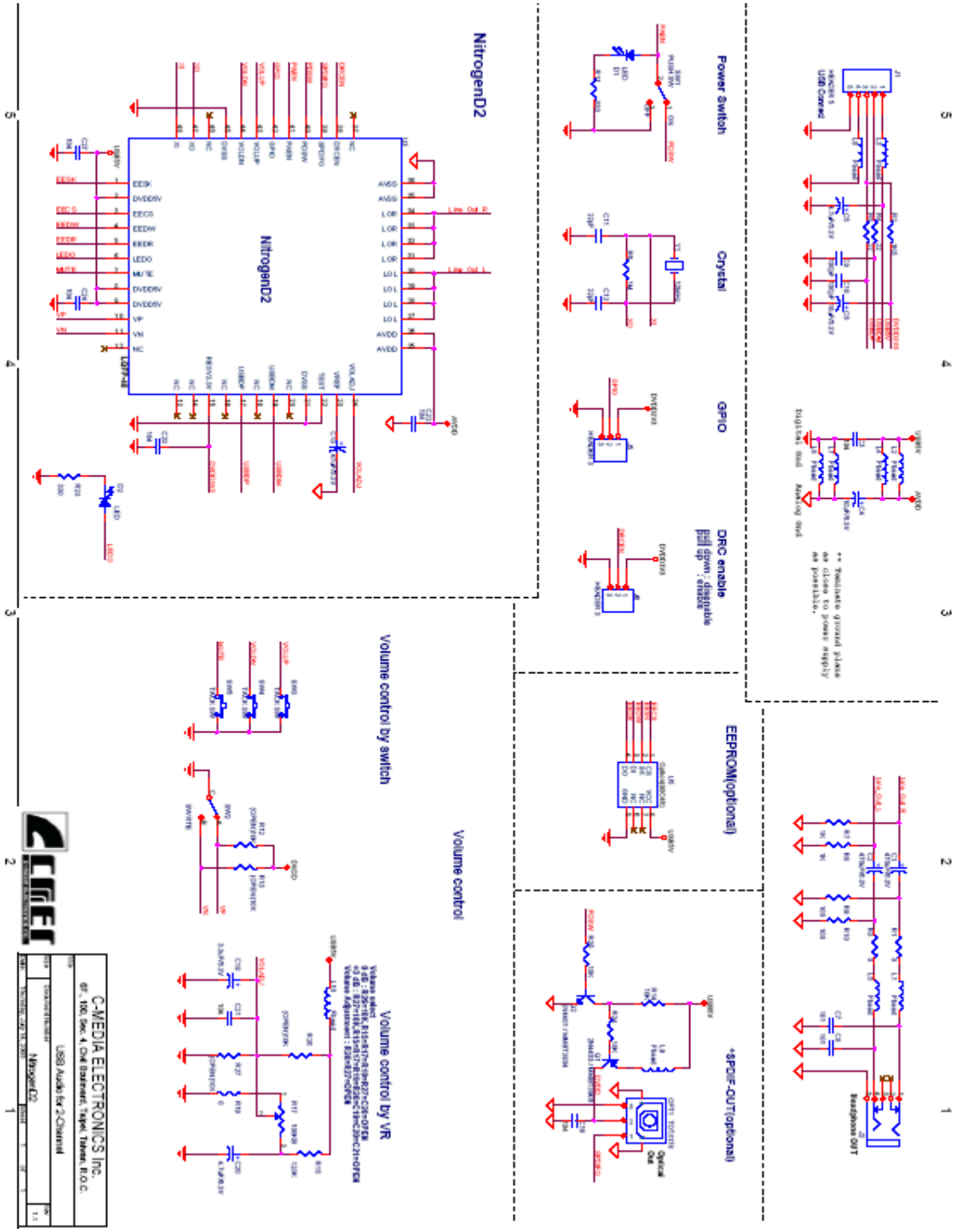
C-MEDIA Digital Playback (PC-D-A) for Line Output Passband Ripple @48ks/sec 05/31/05 14:09:08



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Cyan	Solid	3	Fasttest.Ch.1 Ampl!Normalize	Left	
1	2	Yellow	Solid	3	Fasttest.Ch.2 Ampl!Normalize	Left	

WL-PassbandRipple-M48k.at2c

9. REFERENCE APPLICATION CIRCUIT



10. Reference

- Universal Serial Bus Specification, Version 2.0
- Universal Serial Bus Device Class Definition for Audio Devices, Version 1.0.
- Universal Serial Bus Device Class Definition for Human Interface Devices (HID), Version 1.11
- Dolby Digital Live and dts Interactive function specification

—End of Specifications—

C-MEDIA ELECTRONICS INC.
6F., 100, Sec. 4, Civil Boulevard, Taipei, Taiwan 106 R.O.C.
TEL:886-2-8773-1100
FAX:886-2-8773-2211
E-mail：sales@cmedia.com.tw URL：http://www.cmedia.com.tw