CMI8770

PCI 8CH Integrated Sound Chip

DESCRIPTION

CMI8770 is the first high performance (SNR~100dB) 8CH PCI integrated sound chip compatible with PCI V.2.2 specification in the world. With 16bit/96K digital/analog playback capability and versatile driver support, CMI8770 is designed delicately for advanced consumer PC sound card/media center/mainboard/desktop/embedded system/server audio applications. Through integrating a full-duplex 8/2 CODEC and S/PDIF transmitter/receiver, CMI8770 consequently saves much BOM cost for customers. CMI8770, bundled with C-Media friendly and high add-on value driver, provides the most economic and ideal audio solution with the best value-price ratio.

Integrated S/PDIF transmitter can deliver 5.1 Dolby® Digital/DTS®, or 6.1/7.1 Dolby® Digital Surround EX/DTS ES DVD soundtracks and up-to-96KHz high-definition audio stream to external receiver

FEATURES

- The global first 8CH single sound chip supporting Dolby® Digital Live 5.1 (AC-3) real-time interactive content encoder
- DTS® Interactive – a real time 5.1 channel encoder that takes 2 or more channels and encodes them into a DTS bit stream
- DTS® NeoPC – an up-mix matrix that turns any 2 channel audio into 7.1 channel surround sound
- Full-duplex 8CH DAC/2CH ADC
- Supports 48K/16bit analog playback and recording
- CE level high-quality Signal-to-Noise Ratio (SNR)~100Db
- Integrated S/PDIF transmitter supports 44.1k/48k/96KHz(96k not available on windows vista) sample-rate and 16bits resolution
- PCI Rev. 2.2 compliant with bus mastering modes

BLOCK DIAGRAM

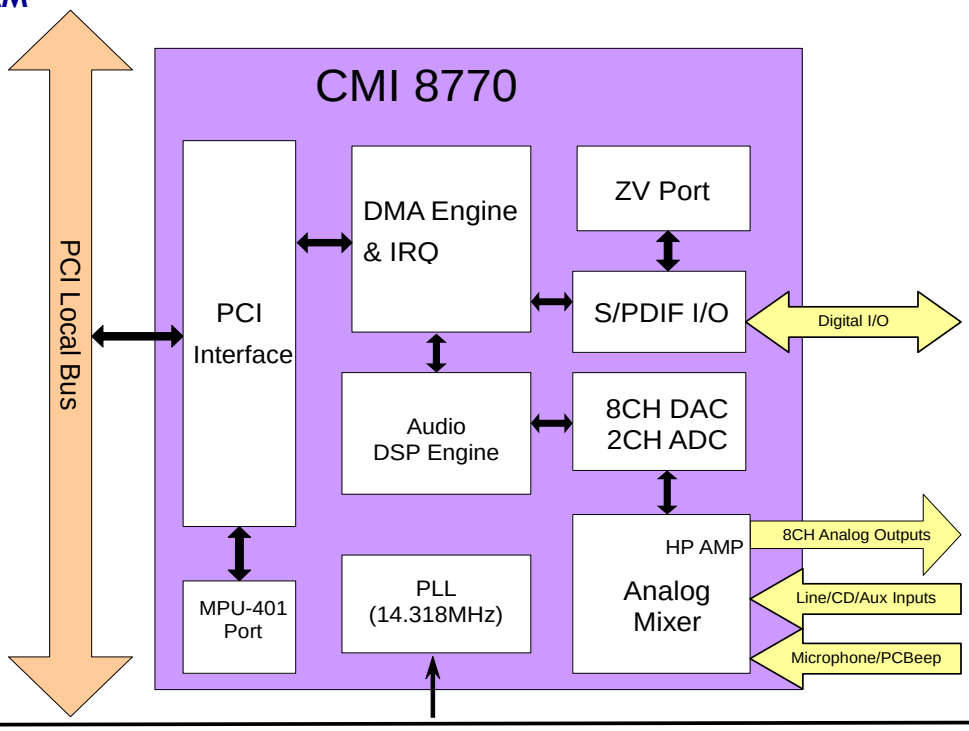


TABLE OF CONTENTS

Revision History

Date	Rev.	Release Note
2007/11/01	Rev. 0.1	Preliminary vision
2007/12/11	Rev. 1.0	Word Correction
2008/4/18	Rev. 1.1	Change the spec of resolution support Highlight the current spec limitations on Microsoft Windows Vista
2008/10/08	Rev. 1.2	Remove Sensaura support
2008/11/19	Rev. 1.3	Add note for spdif out 96k not support on Vista
2010/04/29	Rev. 1.4	Format Modification
2010/05/07	Rev. 1.5	Modify pin71, 72 as input

1. Description and Overview

2. Features

- The global first 8CH single sound chip supporting Dolby® Digital Live 5.1 (AC-3) real-time interactive content encoder
- DTS® Interactive – a real time 5.1 channel encoder that takes 2 or more channels and encodes them into a DTS bit stream
- DTS® NeoPC – an up-mix matrix that turns any 2 channel audio into 7.1 channel surround sound
- Full-duplex 8CH DAC/2CH ADC
- Supports 48K/16bit analog playback and recording
- CE level high-quality Signal-to-Noise Ratio (SNR)~ 100Db
- Integrated S/PDIF transmitter supports 44.1k/48k/96KHz(96k not available on windows vista) sample-rate and 16bits resolution
- PCI Rev. 2.2 compliant with bus mastering modes
- Supports the latest Dolby® Digital EX and DTS® ES 6.1/7.1CH DVD soundtrack playback
- Two S/PDIF inputs for optical and coaxial connectors individually
- Built-in earphone buffer at Front-Out pins (32Ω loading)
- One GPIO (General purpose I/O) support
- External EEPROM Interface for SVID\SSID R/W purpose
- Supports MPU401 MIDI UART port
- DirectSound™ 3D HW acceleration compliant
- Power On/Off anti-pop circuit reference design
- ACPI compliant power down management
- Zoomed Video Port support
- Industrial standard QFP-128 package
- Digital power = 3.3V & 5V, Analog power = 5V
- PCIe sound card reference design provided

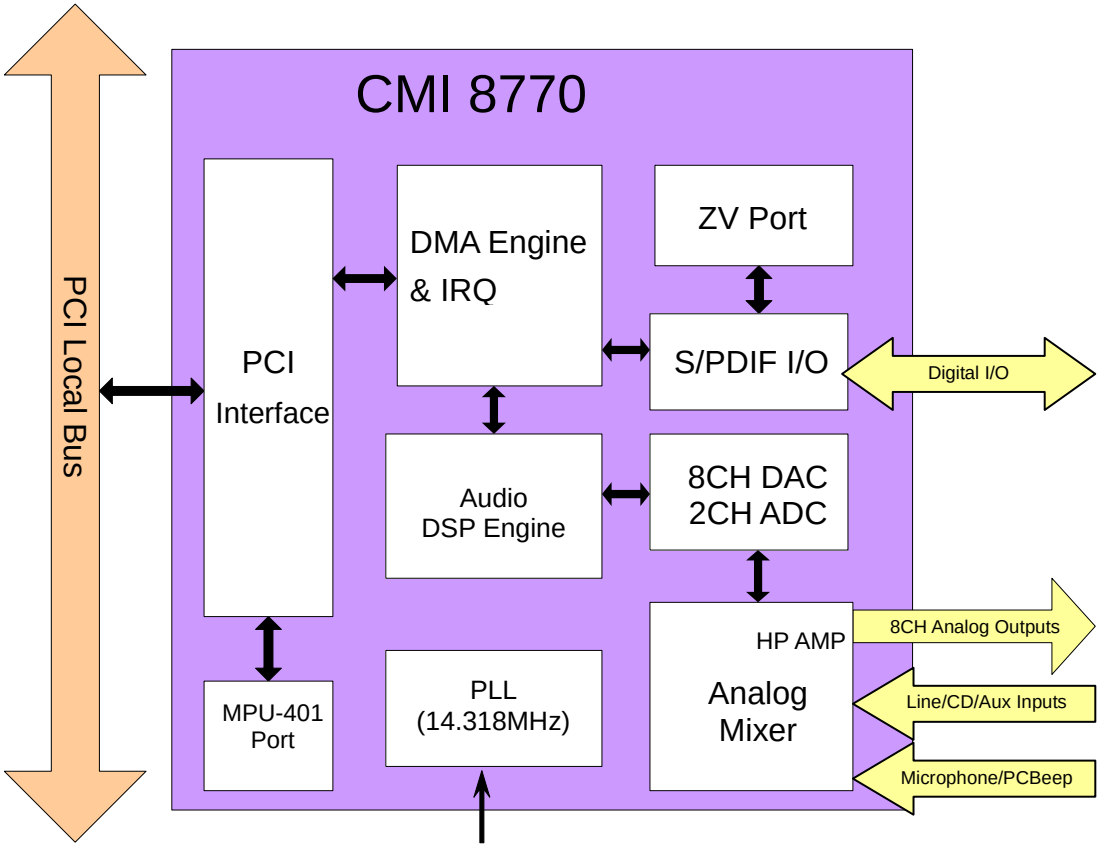
Valuable S/W:

- Dolby® Digital Live 5.1(AC-3) real-time interactive content encoder
- DTS® Interactive 5.1(DTS) real-time interactive content encoder
- DTS® NeoPC upmix 2 channel audio into 7.1 channel surround sound
- C-Media Xear 3D EX™ Gaming support technology
- C-Media Xear 3D™ 7.1 Virtual Speaker SHIFTER technology
- Interesting Magic VoiceTM feature to disguise users' voice tone in all IP phones (Skype, MSN,

Yahoo,…), online games, messenger, and Internet DJ/broadcasting applications

- Unique Karaoke functionality: Mic Echo, Key-shifting, Vocal Cancellation
- Supports most industrial standards of PC 3D sound for gaming, including EAX™ 1.0&2.0, and DirectSound™ 3 SW
- 10-band Equalizer with 12 preset modes; 27 global environment effects
- Support 7.1 CH digital audio playback for Vista , WinXP, Win2000(Microsoft® DirectX V.9.0 above is required)
- WinCE driver and Linux OSS driver available

3. Block Diagram



4. Pin Assignment

5. Pin Description

5.1 Digital I/O

Pin No	Signal Name	Type	Description
1-2, 5-7, 12-16, 19-21, 32-35, 38-41, 43-44, 47-52, 126-128	XA31 – XA0	I/O	PCI bus address and data lines
117	XINTA	O	Interrupt request, active-low
119	XPRST	I	Reset
120	XCLK33	I	PCI bus clock
121	XGNT	I	Bus master grant, active-low.
122	XREQ	O	Bus master request, tri-state output, active-low.
9	XIDSEL	I	ID select, active-high. (only work with A16~31 pin of host controller)
23	XFRAME	I/O	Cycle frame, active-low.
24	XIRDY	I/O	Initiator ready, active-low. The bus master device is ready to transmit or receive data.
25	XTRDY	I/O	Target ready, active-low. The target device is ready to transmit or receive data.
26	XDEVSEL	I/O	Device select, active-low. The target device has decoded the address of the current transaction as its own chip select range.
29	XSTOP	I/O	Stop transaction, active-low. The target device request to the master to stop the current transaction.
30	XPAR	I/O	Parity. The pin indicates even parity across XA31-XA9 and XCBE3-XCBE0 for both address and data phases.
8, 22, 31, 42	XCBE0 – XCBE3	I/O	Multiplexed command / byte enable. These pins indicate cycle type during the address phase of a transaction.
88	XTXD	O	MIDI transmit data
89	XRXD	I	MIDI receive data
55	XIN	I	14.318 MHz crystal input or ext. oscillator input
56	XOUT	O	13.318 MHz crystal output or NC
87	XGBIO0	I/O	General purpose I/O
84	XEECS	O	EEPROM chip select
85	XMBCSZ	I	Audio chip enable select (low:enable)
112	ZVCLK	I	ZV port clock
98	XSPDIFO	O	S/PDIF output (5V)
86	XSPDIFI	I	S/PDIF input 1 / ZV port LR channel clock
113	XSPDIFI2	I	S/PDIF input 2 (TTL 5V) / ZV port data input

5.2 Analog I/O

Pin No	Signal Name	Type	Description
57,58	XSUROUTL-R	O	Back surround out L/R channel
59	EXTBASS	I	External bass input
62	XINTREF	O	Internal reference voltage (for testing purpose)
64,65	XADOUTL-R	O	Front out L/R channel
66,67	XADCFL-R	O	ADC S/H capacitors
68	XCNOUT	O	Center channel output
69	XBSOUT	O	Bass channel output
70	XCDGND	O	CD audio differential ground channel output
71,72	XCDL-R	I	CD audio differential L/R channel input
73,74	XREARL-R	O	Side surround out L/R channel
75,76	XLNL-R	I	Line-In L/R channel
77,78	XAUXL-R	I	Aux input L/R channel
79	XPCSPKIN	I	PC beep or mono input
80	XMIC	I	Microphone input

5.3 Power & Ground

Pin No	Signal Name	Type	Description
4, 10, 18, 27, 37, 45, 100, 124	VDDIO	I	PCI I/O power pin (3.3V)
54, 115	VDDCORE	I	Core logic power pin (3.3V)
83	VDD5V	I	PCI I/O power pin (5V)
3, 11, 17, 28, 36, 46, 53, 82, 99, 116, 125	GND	I	Digital ground
61, 81	AVDD	I	Analog I/O power pin
60, 82	AGND	I	Analog ground

5.4 NC

Pin No	Signal Name
63, 90-97, 101 – 111, 114, 118, 123	NC

6. Electrical Characteristics

6.1 Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Digital power voltage	DVDD	3	3.6	V
Analog power voltage	AVDD	3	5.5	V
Digital Input Voltage	VIND	-0.5	3.6	V
Analog Input Voltage	VINA	-0.5	5.5	V
Operating temperature range	TO	0	70	°C
Storage temperature range	TST	-40	125	°C
Maximum power dissipation	PDMAX		300	MW

6.2 Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Digital Operating Voltage	DVDD	3.135	3.3	3.465	V
Analog Operating voltage	AVDD	4.75	5	5.25	V
Operating Ambient Temperature	TO	0	25	70	°C

6.3 Power Consumption

Parameter	Min.	Typ.	Max.	Unit
Power Supply Current (Normal)				
AVDD (5.0V)	-	35	-	mA
DVDD (3.3V)	-	10	-	mA

6.4 Digital Characteristics

PARAMETER	Symbol	Condition	Min.	Typ.	Max.	Unit
Input high voltage(PCI I/O)	VIH		2.0	-	VDD+0.3	V
Input low voltage (PCI I/O)	VIL		-0.5	-	0.8	V
Output high voltage	VOH	IOH=1.5mA	2.4	-	VDD	V
Output low voltage	VOL	IOL=-0.5mA	0.0	0.2	0.4	V
Input Leakage Current	IIL	0<Vin<VDD	-70	-	70	μ A
Output Leakage Current	IOL		-70	-	70	μ A
SPDIF IN input high voltage	VIH1		2.6	-	-	V
SPDIF IN input low voltage	VIL1		-	-	2.4	V
SPDIF output high voltage	VOH1		-	VDD5V	-	V
SPDIF output low voltage	VOL1		-	GND	-	V
Input Pin Capacitance	Cin		-	-	10	pF
Pin Inductance	Lpin		-	-	20	nH

6.5 AC Characteristics

Parameter	Symbol	Condition	Min.	Max.	Units
High Clamp Current	Ich	Vdd+4>Vin>=Vdd+1	25+(Vin-Vdd-1)/0.015	-	mA
Low Clamp Current	Icl	-3<Vin<=-1	-25+(Vin+1)/0.015	-	mA
Output Rise Slew Rate	SLEWr	0.2Vdd-0.6Vdd load	1	4	V/ns
Output Fall Slew Rate	SLEWf	0.6Vdd-0.2Vdd load	1	4	V/ns

6.6 Analog Performance

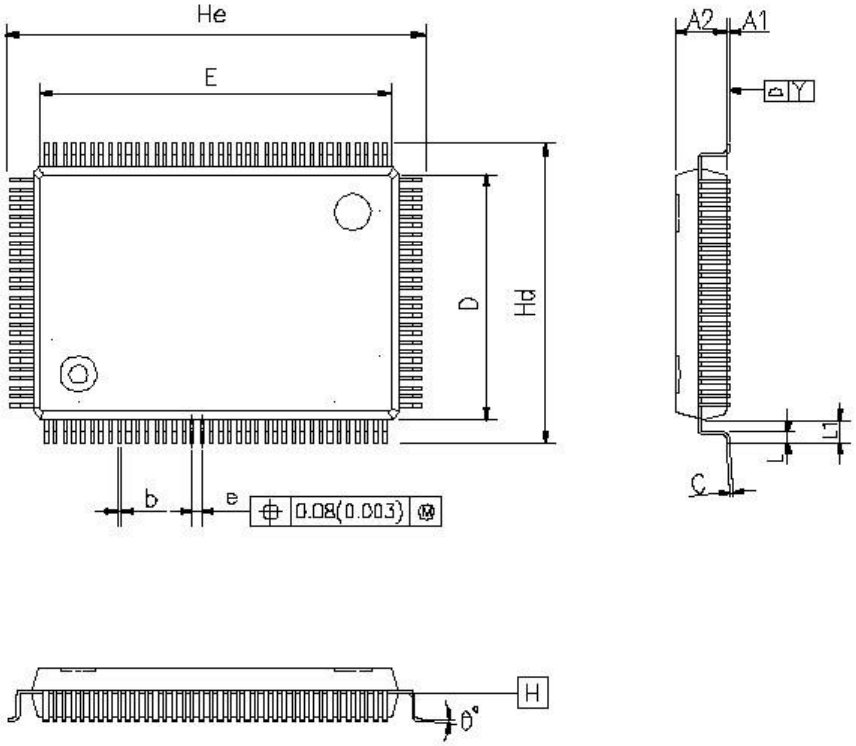
The measurements are performed under the circumstance as:
Tambient = 25℃, AVdd = 5.0V ± 5%, DVdd = 3.3V ± 5%, 10kΩ /50pF external load. Input is 1 kHz sine wave;
Sampling frequency = 48 kHz; Bandwidth = 20 to 20 kHz; 0dB attenuation; All sound effects such as 3D effects are disabled.

Parameter	Minimum	Typical	Maximum	Units
Full Scale Input Voltage:	-	1.1	1.25	Vrms
Line Inputs (Mixer)	-	-	1.25	Vrms
Line Inputs (A/D)	-	0.1	1.25	Vrms
Mic Inputs (20dB boost)				
Full Scale Output Voltage:	-	1.1	-	Vrms
Front_Out	-	1.1	-	Vrms
Side_Surround_Out	-	1.1	-	Vrms
Center / LFE_out	-	1.1	-	Vrms
Back_Surround_Out				
SNR (Idle)	-	100	-	- dB
A/A	-	101	-	dB
D/A	-	86	-	dB
A/D				
Dynamic Range (-60dB)	-	100	-	dB
A/A	-	94	-	dB
D/A	-	85	-	dB
A/D				
THD+N	-	0.005	-	%
A/A	-	0.017	-	%
D/A	-	0.015	-	%
A/D				
Frequency Response	5	-	22,000	Hz
A/A	5	-	22,000	Hz
D/A	10	-	22,000	Hz
A/D				
Cross-talk @ 10KHz (A/A)	-	100	-	dB
Transition Band	19,200		28,800	Hz
Stop Band	28,800		∞	Hz
Stop Band Rejection	-	-70	-	dB
Out-Of-Band Rejection	-	-65	-	dB
Power Supply Rejection Ratio	-	-65	-	dB

Parameter	Minimum	Typical	Maximum	Units
Master Volume Gain (32 steps)				
Step Size	-54	1.5 -	+6	dB dB
Control Range				
Analog Input Gain (16 steps)				
Step Size	-30	2 -	0	dB dB
Control Range				
Mic Input Gain (16 steps)				
Step Size	-22	3 -	+24	dB dB
Control Range				
Mic Boost Gain	-	+20	-	dB
PCSPK Input Gain (4 steps)				
Step Size	-24	8 -	0	dB dB
Control Range				
Recording Gain (16 steps)				
Step Size	0	1.5 -	+22.5	dB dB
Control Range				
Input Impedance	-	60	-	KΩ
Line-In, CD, Aux, PCSPK	-	30	-	KΩ
Mic (w/o Boost)	-	10	-	KΩ
Mic (w/ Boost)				
Output Impedance	-	2	-	Ω
Amplifier Output	-	200	-	Ω
Non-amp Output				
Output Power	-	50	-	mW
Line-Out (Front) @32Ω Load	-	0.16	-	mW
Line-Out (Front) @10KΩ Load				
Vrefout	-	2.25	-	V

7. Mechanical Dimensions

QFP-128



Symbols	Min.	Typ.	Max.	Notes
A1	0.25	0.35	0.45	1. Jedec outline : N/A 2. Datum plane H is located at the bottom of the mold parting line coincident with where the lead exits the body. 3. Dimensions E and D do not include mold protrusion. Allowable protrusion is 0.25 mm per side. Dimensions E and D do include mold mismatch and are determined at datum plane H. 4. Dimension b does not include dambar protrusion.
A2	2.57	2.72	2.87	
b	0.10	0.20	0.30	
C	0.10	0.15	0.20	
D	13.90	14.00	14.10	
E	19.90	20.00	20.10	
e	-	0.50	-	
Hd	17.00	17.20	17.40	
He	23.00	23.20	23.40	
L	0.65	0.80	0.95	
L1	-	1.60	-	
Y	-	-	0.08	
θ °	0	-	12	

Unit : mm

—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