



Best High Integration/Low Cost USB Audio Controller

CM109 USB Audio I/O Controller Technical Brief

Version 1.0

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DESCRIPTION AND OVERVIEW

CM109 is a highly integrated single chip USB audio controller specifically for VoIP (Voice over internet protocol) application. All essential analog modules are embedded in CM109, including dual DAC and earphone driver, ADC, microphone booster, PLL, regulator, and USB transceiver. 8 GPIO pins can constitute a 16 key matrix; together with buzzer output pin a concise single chip VoIP application can be achieved. In addition, audio adjustment can be easily controlled via specific HID compliant volume control pins. Many features are easily set with jumper pins. Customized USB VID, PID, and can product string be used for VoIP software authentication. Moreover, individual unique phone number for each device is possible via serial number stored in external EEPROM.

VoIP applications are becoming increasingly popular as VoIP can provide free or low-cost calling worldwide. To provide a VoIP experience that is the same as using a regular phone and eliminate the poor call quality that results from using the PC audio, C-Media has developed CM109 USB Controller that enables a regular phone, handset, or headset which is interfaced to the USB port on the PC. With the C-Media OEMs can quickly bring to market a family of low cost high quality VoIP products.

2. FEATURES

- Compliant with USB 2.0 Full Speed Operation
- Compliant with USB Audio Device class specification v1.0
- Supports USB Suspend/Resume Mode and remote Wakeup with Volume Control pins
- Single 12MHz Crystal input with on-chip PLL and embedded USB transceiver
- Jumper Pin for Speaker Mode (Playback Only) or Headset Mode (Playback + Recording)
- For Headset Mode, USB audio function topology has 2 Input Terminals, 2 Output Terminals, 1 Mixer Unit, 1 Selector Unit, and 3 Feature Units
- Jumper Pin for Mixer Unit Enable/Disable under Headset Mode



- For Speaker Mode, USB audio function topology has 1 Input Terminal, 1 Output Terminal, and 1 Feature Unit
- Support one Control Endpoint, one Isochronous out Endpoint, one Isochronous in Endpoint, and one Interrupt in Endpoint
- Alternate zero bandwidth setting for releasing playback bandwidth on USB Bus when this device is inactive
- Volume up, volume down, and playback mute support USB HID for Host Control Synchronization
- Record Mute Pin with LED Indicator for Record Mute Status
- External EEPROM Interface for Vendor Specific USB VID, PID, and Serial Number
- EEPROM write function via Vendor Specific request for Mass Production Convenience
- Customized embedded VID, PID, and product string by Customer Request
- 8 GPIO Pins with Read/Write via HID
- Embedded Buzzer Function controlled by Register
- Jumper Pin for Output Voltage Swing (3.5V or 2.5V)
- Jumper Pin for Power Mode Setting
- Isochronous transfer uses Adaptive Mode with Internal PLL for Synchronization
- 48K/44.1KHz Sampling Rate for both Playback and Recording
- Soft Mute Function
- Embedded High Performance 16 bit audio DAC with Earphone Phone Buffer
- Host side data loss noise reduction function
- Embedded 16 bit ADC input with Microphone Boost
- Embedded power on Reset Block
- Embedded 5V to 3.3V regulator for single External 5V Operation
- Compatible with Win98 SE / Win ME / Win 2000 / Win XP and Mac OS9 / OS X without Additional Driver
- 48 Pin LQFP Package

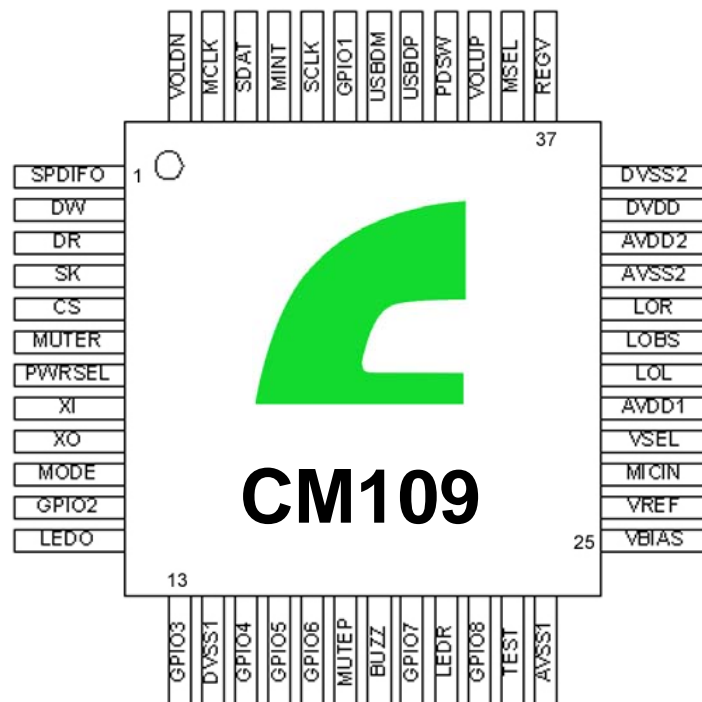


3. PIN DESCRIPTIONS

3.1 PIN ASSIGNMENT BY PIN NUMBER

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
1	SPDIFO	13	GPIO3	25	VBIAS	37	REGV
2	DW	14	DVSS1	26	VREF	38	MSEL
3	DR	15	GPIO4	27	MICIN	39	VOLUP
4	SK	16	GPIO5	28	VSEL	40	PDSW
5	CS	17	GPIO6	29	AVDD1	41	USBDP
6	MUTER	18	MUTEP	30	LOL	42	USBDM
7	PWRSEL	19	BUZZ	31	LOBS	43	GPIO1
8	XI	20	GPIO7	32	LOR	44	SCLK
9	XO	21	LEDR	33	AVSS2	45	MINT
10	MODE	22	GPIO8	34	AVDD2	46	SDAT
11	GPIO2	23	TEST	35	DVDD	47	MCLK
12	LEDO	24	AVSS1	36	DVSS2	48	VOLDN

3.2 PIN-OUT DIAGRAM



Pin Assignments (Top View)



3.3 PIN SIGNAL DESCRIPTIONS

Pin #	Symbol	Type	Description
1	SPDIFO	DO, 8mA, SR	SPDIF Output
2	DW	DIO, 8mA, PD, 5VT	EEPROM Interface Data read from EEPROM
3	DR	DO, 4mA, SR	EEPROM Interface Data write to EEPROM
4	SK	DO, 4mA, SR	EEPROM Interface Clock
5	CS	DO, 4mA, SR	EEPROM Interface Chip Select
6	MUTER	DI, ST, PU	Mute Recording (Edge Trigger with de-Bouncing)
7	PWRSEL	DI, ST	H: Pull Up to 3.3V; L: Pull Down to Ground Speaker Mode H : Self Power with 100mA ; L : Bus Power with 500mA Headset Mode H : Bus Power with 100mA ; L : Bus Power with 500mA
8	XI	DI	Input Pin for 12MHz Oscillator
9	XO	DO	Output Pin for 12MHz Oscillator
10	MODE	DI, ST	H: Pull Up to 3.3V; L: Pull Down to Ground L : Headset Mode: Playback & Recording H : Speaker Mode: Playback Only
11	GPIO2	DIO, 8mA, PD, 5VT	GPIO Pin
12	LEDO	DO, SR, 8mA	LED for Operation; Output H for Power On; Toggling for Data Transmit
13	GPIO3	DIO, 8mA, PD, 5VT	GPIO Pin
14	DVSS1	P	Digital Grounding
15	GPIO4	DIO, 8mA, PD, 5VT	GPIO Pin
16	GPIO5	DIO, 8mA, PD, 5VT	GPIO Pin
17	GPIO6	DIO, 8mA, PD, 5VT	GPIO Pin
18	MUTEP	DI, ST, PU	Mute Playback (Edge Trigger with de-Bouncing)
19	BUZZ	DO, 8mA, SR	Buzzer Output Pin
20	GPIO7	DIO, 8mA, PD, 5VT	GPIO Pin
21	LEDR	DO, SR, 8mA	LED for Mute Recording Indicator; Output H when Recording is Muted
22	GPIO8	DIO, 8mA, PD, 5VT	GPIO Pin



23	TEST	DI, ST, PD	Test Mode Select Pin; Pull Low for Normal Operation
24	AVSS1	P	Analog Ground
25	VBIAS	AO	Microphone Bias Voltage Supply (4.5V)
26	VREF	AO	Connecting to External Decoupling Capacitor for Embedded Bandgap Circuit; 2.25V Output
27	MICIN	AI	Microphone Input
28	VSEL	AI	Line Out Voltage Swing Select H: Pull Up to 5V, L: Pull Down to Ground L: 2.5Vpp Output ; H: 3.5Vpp Output
29	AVDD1	P	5V Analog Power for Analog Circuit
30	LOL	AO	Line Out Left Channel
31	LOBS	AO	DC 2.25V Output for Line Out Bias
32	LOR	AO	Line Out Right Channel
33	AVSS2	P	Analog Ground
34	AVDD2	P	5V Analog Power for Analog Circuit
35	DVDD	P	5V Power Supply to Internal Regulator
36	DVSS2	P	Digital Grounding
37	REGV	AO	3.3V Reference Output for Internal 5V → 3.3V Regulator
38	MSEL	DI, ST	Mixer Enable Select H: Pull Up to 3.3V, L: Pull Down to Ground L: Without Mixer; H: With Mixer (With Default Mute) USB Descriptors are changed accordingly
39	VOLUP	DI, ST, PU	Volume Up (Edge Trigger with de-Bouncing)
40	PDSW	DO, 4mA, OD	Power Down Switch Control (for PMOS Polarity) 0: Normal Mode, 1: Power Down Mode
41	USBDP	AIO	USB Data D+
42	USBDM	AIO	USB Data D-
43	GPIO1	DIO, 8mA, PD, 5VT	GPIO Pin
44	SCLK	DIO, 8mA, PD, 5VT	External MCU Serial Bus Clock Pin
45	MINT	DO, 4mA, SR	External MCU Interrupt Pin When Register Address 4 ~ 7 has new data, MINT is set Low; after MCU read MINT is reset to H
46	SDAT	DIO, 8mA, PD, 5VT	External MCU Serial Bus Data Pin
47	MCLK	DO, 4mA, SR	External MCU Clock Pin, Clock Frequency is Programmable Default is 1.5 MHz (Options Include 12MHz, 6MHz, 3MHz, 1.5MHz)



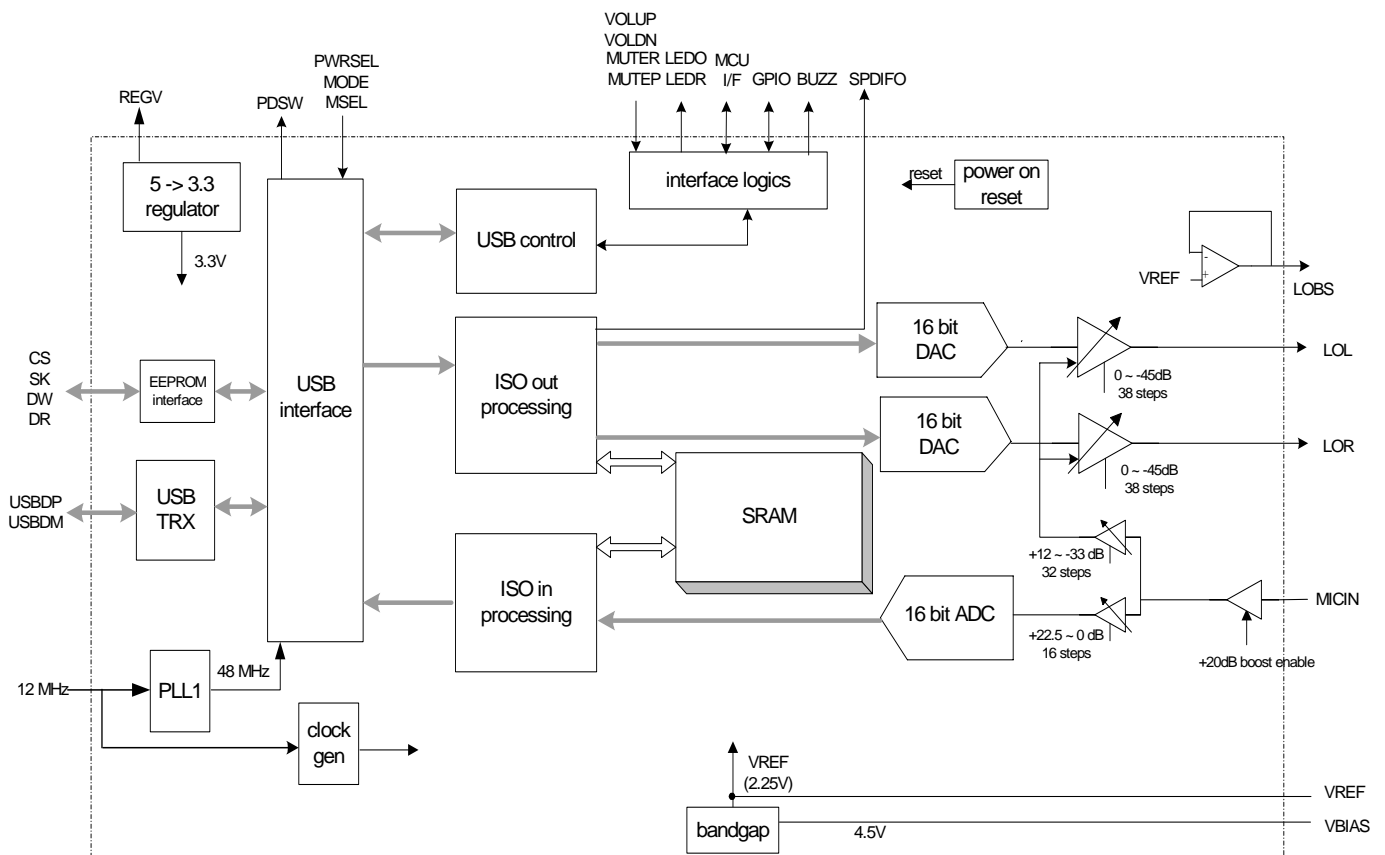
48	VOLDN	DI, ST, PU	Volume Down (Edge Trigger with de-Bouncing)
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Note: DI – Digital Input Pad, DO – Digital Output Pad, DIO – Digital bi-Directional Pad, AI/AO/AIO – Analog Pad, SR Slew Rate Control, ST – Schmitt Trigger, PD/PU – Pull Down or Pull Up, 5VT – 5 Volt Tolerant (3.3V Pad), OD – Open Drain

4. MCU INTERFACE

CM109 provides a serial MCU Interface for external MCU to access internal registers with these registers access. MCU and host side software can have bidirectional communication. This interface can keep flexibility for external module control and integrate, such as LCD panel.

5. BLOCK DIAGRAM of CM109



Block Diagram Of CM109

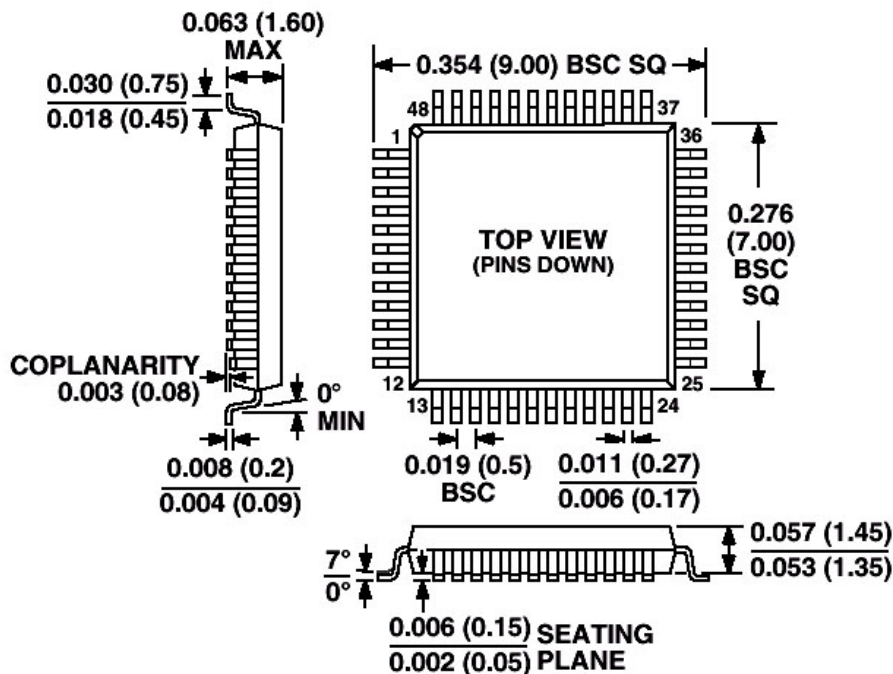


4. ORDERING INFORMATION

Model Number	Package	Operating Ambient Temperature	Supply Range
CM109	48-Pin LQFP 7mm×7mm×1.4mm (Plastic)	0 °C to +70 °C	DVdd = 5V, AVdd = 5V

Outline Dimensions Dimensions shown in inches and (mm)

◆48-Lead Thin Plastic Quad Flatpack (LQFP)



Ordering Information Of CM109

