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ZMM LTD Windows Telephony and USB Technologies

DA010

USB DSP CODEC DA0xx family

Preliminary specification, September , 1998 version 1.2,

DATA SHEET

TABLE OF CONTENTS

GENERAL DESCRIPTION

The ZMM DA0xx Universal Serial Bus Audio DSP Family is a single chip that implements a full sound card on a chip. A WAVE player and recorder with capabilities to uncompressed MPEG3 and MIDI files with 10 band programmable equalizer with interface to HID with Joystick buttons inputs.
This chip was developed with a core of silicon and different firmware to support a variety of devices. Its cost and feature-optimize USB interface device.
The chip is used in Audio USB-based systems and communicates with high speed I 2 C serial bus. All the necessary firmware WDM and drivers are supplied ready to be evaluated from ZMM. This approach to implementing USB functions allows the designer to choose the optimum USB device from the available DA0xx family.

This flexibility cuts down the development time, risks, and costs by allowing the use of the existing architecture and the firmware investments. This results in the fastest way to develop the most cost-effective USB Audio peripheral solutions. The DA0xx family is ideally suited for telephone, speakers, computer monitors, docking stations, keyboards, and many other applications that use the USB audio with DSP and the I2C architecture.

The DA0xx Family is a USB single chip, integrated mixed signal USB (Universal Serial Bus), Processor 31 with I2C, I2S, PCM, DSP (digital signaling Processor) and stereo 60KHZ 24 bit audio Codec for recording and playing.

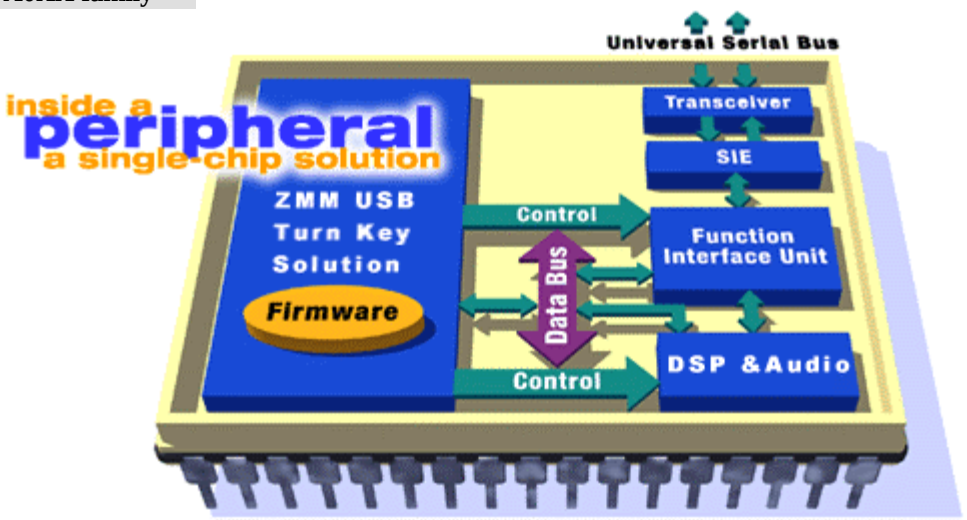
The DA0xx Family supports USB audio class and USB communication class devices.
The stereo channel audio Codec is designed for direct connection of a stereo microphone and stereo speaker with control and expansion using I2C.
The built-in stereo Codec can be connected directly to a DAA. It supports high-speed Soft-Modem protocols. The incorporated 16 to 24 bit analog to digital with digital to analog to converter and the internal DSP interface provides complete control for USB speakers, USB phone and USB monitor.

The additional general purpose I/O pins (using expansion I2C) provides programmable inputs
And / or outputs to any external device.

The DA0xx Family has 31 core, DSP core and Codec input and Output audio data multiplexed.

APPLICATIONS using The DA0xx Family USB chip.
(Schematic, demo PCB, WDM drivers and demo application can be licensed form ZMM)

- USB speakers
- USB monitor
- USB Phone (Analog, ISDN, Digital)
- USB Cellular phone cable
- USB Handset for UnPBX
- USB Headset
- USB extension for PBX
- USB CT server
- USB audio part for USB Video conference.
- USB DBA – Desktop Bussing Audio
- USB port for consumer audio devices.
- USB Toys



Inside the ZMM USB ready Audio Peripheral Controller.

KEY FEATURES

- QFP64 plastic quad flat package; 64 leads (lead length 2.35 mm) body 14 x 20 x 2.8 mm small body SMD package and low external component count result in minimal PCB space requirement.
- Complies with the ACPI, OnNOW, and USB power management requirements
- Automatic USB protocol handling
- Compliant with Audio and Monitor Control Class
- Full-scan design with high fault coverage (>99%) ensures high quality. Every chip is tested before shipping.
- Higher than 8 kV in-circuit ESD protection lowers cost of extra components
- Automatic USB protocol handling
- A 8-bit and 16 bit stereo USB Digital Audio Player with programmable sample rate 5Khz to 60KHz (24 bit internal sample rate),
- AGC Input and output voltage levels, capable of connecting directly to Multimedia speaker and microphone
- Digitally controlled soft mute, Volume in recording and Playing.
- DSP Bass and Treble control
- DSP 10 Band programmable active graphic equalizer
- DSP 3D and surround effect
- DSP Variable playing rates without changing pitch.
- DSP uncompressed MP3, AC3, MIDI
- Support Compress for H323
- DSP Support ZMM multi user Speaker dependent Speech Recognition.
- DSP Support ZMM Text to Speech
- DSP Support low level Microsoft Speaker independent Speech Recognition.
- 31 processor core with transparent I2C read/write to PC over USB
- DSP telecom tone supports: DTMF, Caller ID, direct connection to a DAA (digital access arrangement) including a built-in sidetone suppression circuit with digital 2 to 4.
- Firmware read supply with the chip
- WDM drivers ready supply with the chip
- Application for MP3 player with Audio CD supply with the chip
- Schematic with demo PCB and Windows'98 program can be licensed form ZMM
- Single 3.3V supply with 5V tolerant I/O
- USB stereo audio record and playback system with large buffer with integrated click preventing filtering
- USB-compliant audio/HID device
- Supports 12 Mbits/s 'full speed' serial data transmission
- Fully automatic 'Plug-and-Play' operation
- 5V Self-powered or USB bus-powered and operation

- Supports playing of multiple files in multiple format (MP3 with MIDI with wave) in the same time.
- Supports multiple audio data formats (8, 16 and 24 bits)
- Very low power consumption with efficient power management
- Only one external crystal oscillator is required. On-chip PLL master clock for 31 DSP Codec I2C I2S PCM
- Hi fidelity Digital audio with high linearity, 24 bit Wide dynamic range with superior signal-to-noise ratio and low total harmonic distortion.
- Customer Vendor ID and product ID with name programmable in Mask ROM

Document references (see www.usb.org)
· "USB Common Class Specification".
· "USB Specification"
· "Device Class Definition for Human Interface Devices (HID)"
· "USB HID Usage Table".
· "USB Device Class Definition for Audio Devices"

PINNING

PIN	SYMBOL	FUNCTION
50	ALE	Address Latch enable
27	CLKOUT	CLKOUT 48MHz output
61	DSPC	DSP Clock input
57	DSPD	DSP Digital Data input
59	DSPFS	DSP Frame Select
48	EAN	Enable external EPROM
39	G3.3A	Analog GND
44	G3.3B	Analog GND
55	G3.3C	Analog GND PLL
49	G3.3D	Analog ground
33	G3.3E	Analog GND
10	G3.3G	Digital Ground to DSP
24	G3.3H	Analog GND PLL
11	G5.0	Digital Ground 5V
36	GND1	GND
35	GND2	GND
4	GND3	Digital GND
19	I2C_SCL	I2C CLOCK OUT
21	I2C_SDA	I2C DATA
17	IO0	General purpose input output pin, can be configured as HID
13	IO1	General purpose input output pin, can be configured as HID
63	IO2	General purpose input output pin, can be configured as HID
1	IO3	General purpose input output pin, can be configured as HID
2	IO4	General purpose input output pin, can be configured as HID
15	IO5	General purpose input output pin, can be configured as HID
43	LINE_L_IN	Left Audio input
34	LINE_L_OUT	Left Audio output
47	LINE_R_IN	Right Audio input
37	LINE_R_OUT	Right Audio output
45	N.C.	Not connected
46	N.C.	Not connected
56	P0.0	Address Data AD0

58	P0.1	Address Data AD1
60	P0.2	Address Data AD2
62	P0.3	Address Data AD3
64	P0.4	Address Data AD4
3	P0.5	Address Data AD5
5	P0.6	Address Data AD6
7	P0.7	Address Data AD7
14	P2.0	Address A8 of the EPROM
16	P2.1	Address A9 of the EPROM
18	P2.2	Address A10 of the EPROM
20	P2.3	Address A11 of the EPROM
22	P2.4	Address A12 of the EPROM
23	P2.5	Address A13 of the EPROM
29	P2.6	Address A14 of the EPROM
30	P2.7	Address A15 of the EPROM
31	PSEN	Program Store Enable
40	RESET	Analog V reference and Auto wake up circuit
6	USB_D-	USB Line -
8	USB_D+	USB Line +
38	V3.3A	Analog supply voltage 3.3V
42	V3.3B	Analog supply voltage 3.3V
52	V3.3C	Analog supply voltage 3.3V to Xtal and PLL
51	V3.3D	Analog supply voltage 3.3V
32	V3.3E	Analog supply voltage 3.3V
9	V3.3G	Supply 3.3 to DSP
28	V3.3H	Analog supply voltage 3.3V PLL
12	V5.0	Digital Supply 5V
41	VAD	V reference for Analog to Digital
53	XTAL_1394A	Connect to 18p
54	XTAL_1394B	Connect to 18p
25	XTAL_48MHZ	XTAL_48MHz
26	XTAL_CHOKE	XTAL_CHOKE

IO1, IO2, IO3, IO4, IO5, IO6 can be dynamically configured to support I2S in/out or PCM (E1/T1) by sending commands to the embedded DSP.

Chip set + Firmware ORDERING INFORMATION

DESCRIPTION Chip and Firmware	ORDER CODE	DRAWING NUMBER SOT319-4
USB speakers	**DA010**	QFP64 plastic quad flat
USB monitor	**DA015**	QFP64 plastic quad flat
USB Phone Analog	**DA020**	QFP64 plastic quad flat
USB Phone ISDN	**DA022**	QFP64 plastic quad flat
USB Phone Digital	**DA024**	QFP64 plastic quad flat
USB Cellular phone cable	**DA030**	QFP64 plastic quad flat
USB Handset for UnPBX	**DA040**	QFP64 plastic quad flat
USB Headset	**DA045**	QFP64 plastic quad flat
USB extension for PBX	**DA060**	QFP64 plastic quad flat
USB CT server 4 line analog	**DA070**	QFP64 plastic quad flat
USB CT server T1 24 voice port	**DA072**	QFP64 plastic quad flat
USB CT server E1 30 voice port	**DA073**	QFP64 plastic quad flat
USB audio for USB Video conference	**DA080**	QFP64 plastic quad flat
USB audio for USB Video with DAA	**DA083**	QFP64 plastic quad flat
USB DBA – Desktop Bussing Audio	**DA050**	QFP64 plastic quad flat
USB port for consumer audio devices	**DA090**	QFP64 plastic quad flat
USB Toys	**DA095**	QFP64 plastic quad flat

ORDERING INFORMATION kit

These kits can be Licenses from ZMM.

Kit includes:

- Demo PCB Electronic Schematic diagram: Orcad 7, DXF
- Demo PCB
- Demo WDM Drivers in format: SYS, Object, DLL, Source, C++ and ASM.
- Demo Windows 98 application: EXE, SYS, Object, source in :C++, Pascal, ASM and VCL for Delphi

DESCRIPTION	ORDER CODE
USB speakers	**DA010-S**
USB monitor	**DA015-S**
USB Phone Analog	**DA020-S**
USB Phone ISDN	**DA022-S**
USB Phone Digital	**DA024-S**
USB Cellular phone cable	**DA030-S**
USB Handset for UnPBX	**DA040-S**
USB Headset	**DA045-S**
USB extension for PBX	**DA060-S**
USB CT server 4 line analog	**DA070-S**
USB CT server T1 24 voice port	**DA072-S**
USB CT server E1 30 voice port	**DA073-S**
USB audio for USB Video conference	**DA080-S**
USB audio for USB Video with DAA	**DA083-S**
USB DBA – Desktop Bussing Audio	**DA050-S**
USB port for consumer audio devices	**DA090-S**
USB Toys	**DA095-S**

USB DSP CODEC
DA0XX family

QUICK REFERENCE DATA

V5.0 for IO periphery 5.0 V ± 5%
V3.3 voltage DSP core 3.3V ± 5%
Total supply current 40 mA
Total power dissipation 180 mW
Output resistance at D/A 50
I2C SCL clock frequency 100 kHz
Oscillator frequency 48MHz

Dynamic performance D/A & A/D

(THD + N)/S total harmonic distortion plus noise-to-signal ratio
f_s = 44.1 kHz; R_L =5 kΩ
f_i = 1 kHz (0 dB) – 95 dB – 0.0032 0.01 %
f_i = 1 kHz (–60 dB) – 35 dB – 3.2 10 %
S/N signal-to-noise ratio 95 – dBA
$V_{o(FS)(rms)}$ full-scale output voltage (RMS value) 1V PP

General characteristics

$f_{i(s)}$ audio input sample frequency 5 – 60 kHz
Tamb operating ambient temperature: 0, 24,70 °C

DSP PROGRAMABALE A/D Inputs

- ANALOG TO DIGITAL GAIN
- Using pin 47 and 43 LINE_L_IN or LINE_R_IN Vi (FS) (rms) full-scale input voltage (RMS value)
- DSP gain = -3 dB 1500mV pick to pick
- DSP gain = 0 dB 1000mV pick to pick
- DSP gain = 3 dB 700mV pick to pick
- DSP gain = 9 dB 400mV pick to pick
- DSP gain = 15 dB 150mV pick to pick
- DSP gain = 21 dB 90mV pick to pick
- DSP gain = 27 dB 40mV pick to pick

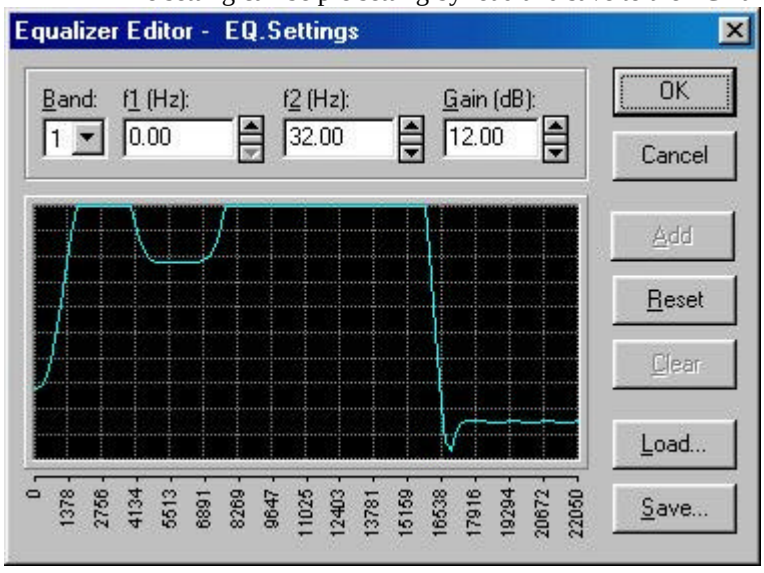
Microsoft Windows WDM Drivers

The Audio in and audio out is support totally by Microsoft WDM drivers.

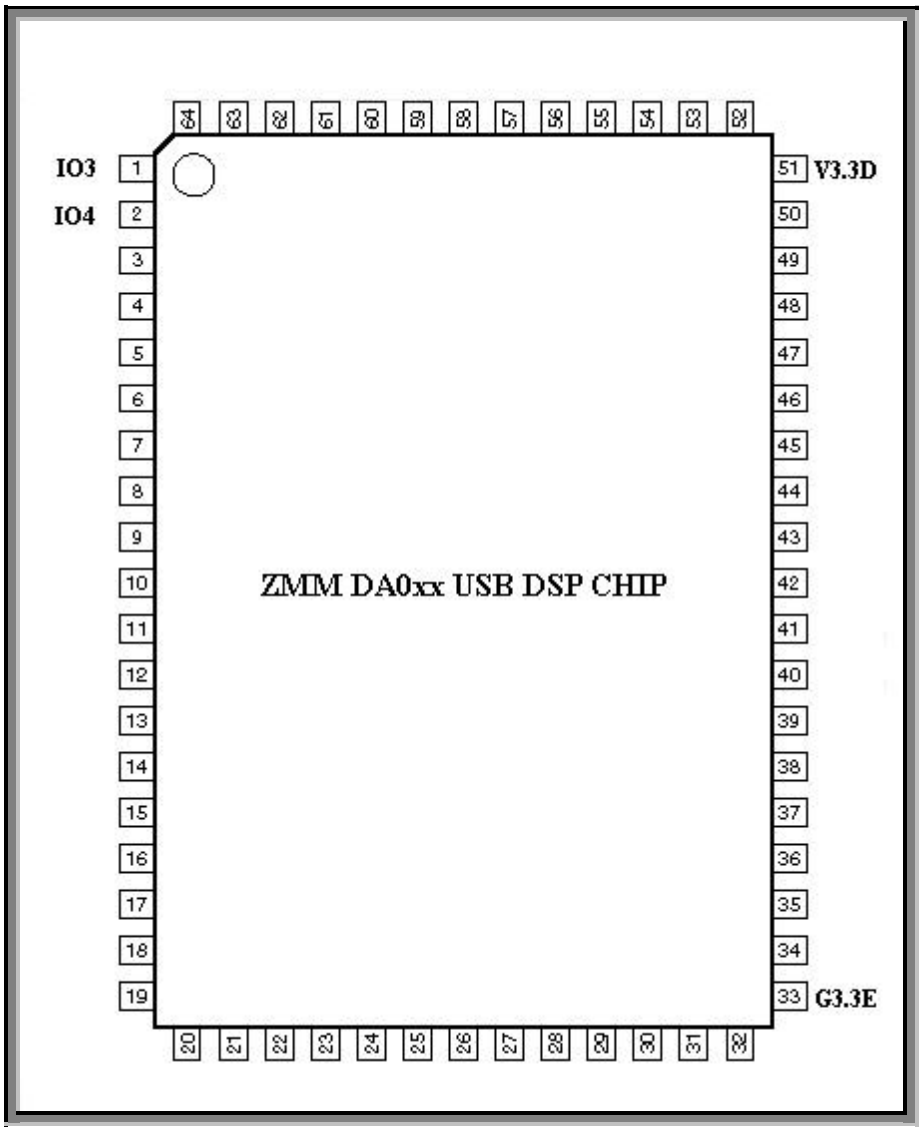
The I2C in/out is support by ZMM WDM drivers

Windows 98 application that supply with the DA0xx family to send an DSP equalizer setting to the USB DSP core and to send MPEG file to play. 10 band graphic equalizer setting and one pre amplifier is supported.

Every band (1 of 10) can be program:
Frequencies low, Frequencies high and the gain to control in every band.
The setting can be pre setting by load and save to the PC hard disk.



The DA0xx Pin out



USB Chip ready
for Audio in/out
Control and interface

Software ready
for many projects.
Applications, WDM drivers,
Windows Telephony
Mapi TAPI Outlook
USB kit, Voice -email

On chip conversion
Phone to USB phone

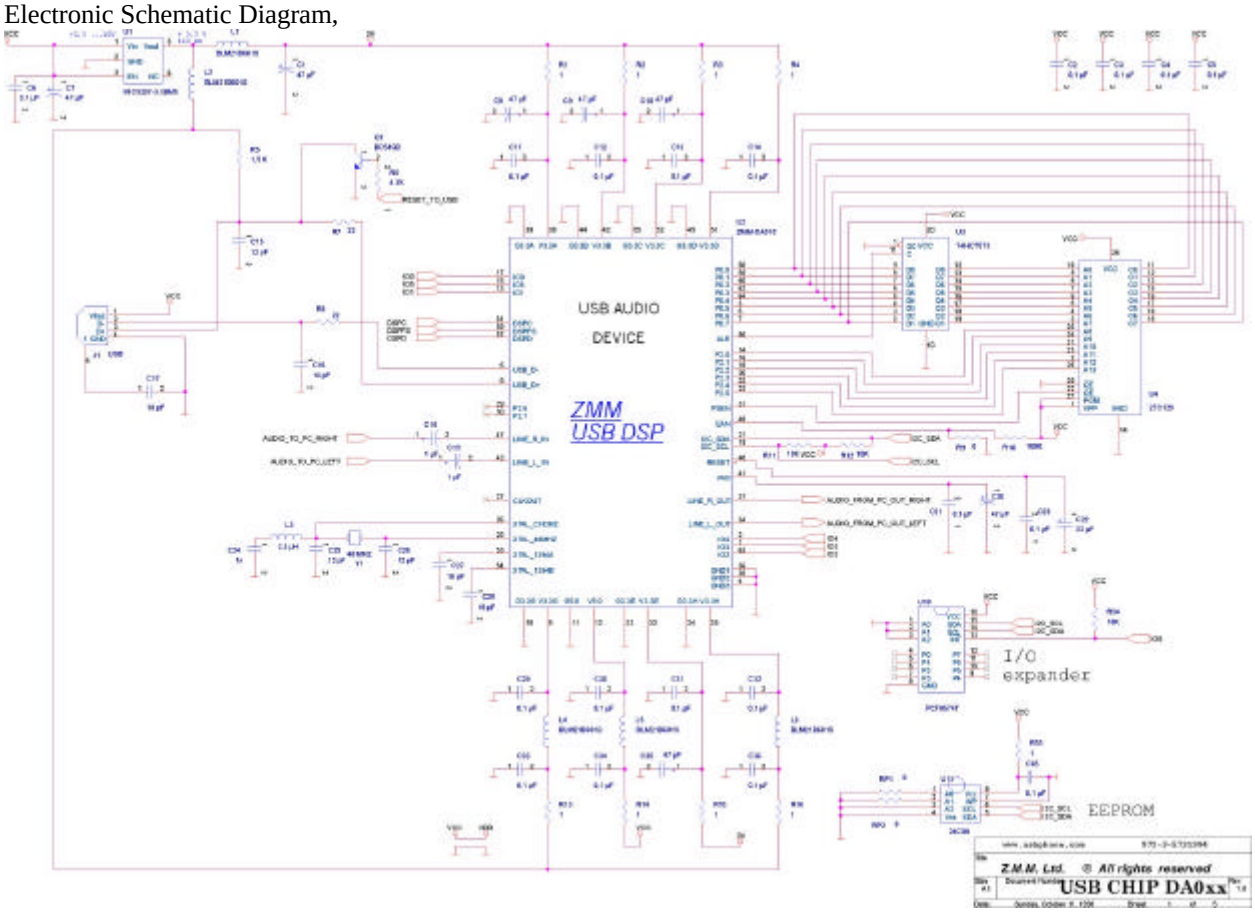
On chip conversion
Speakers to USB Speakers
and Recording

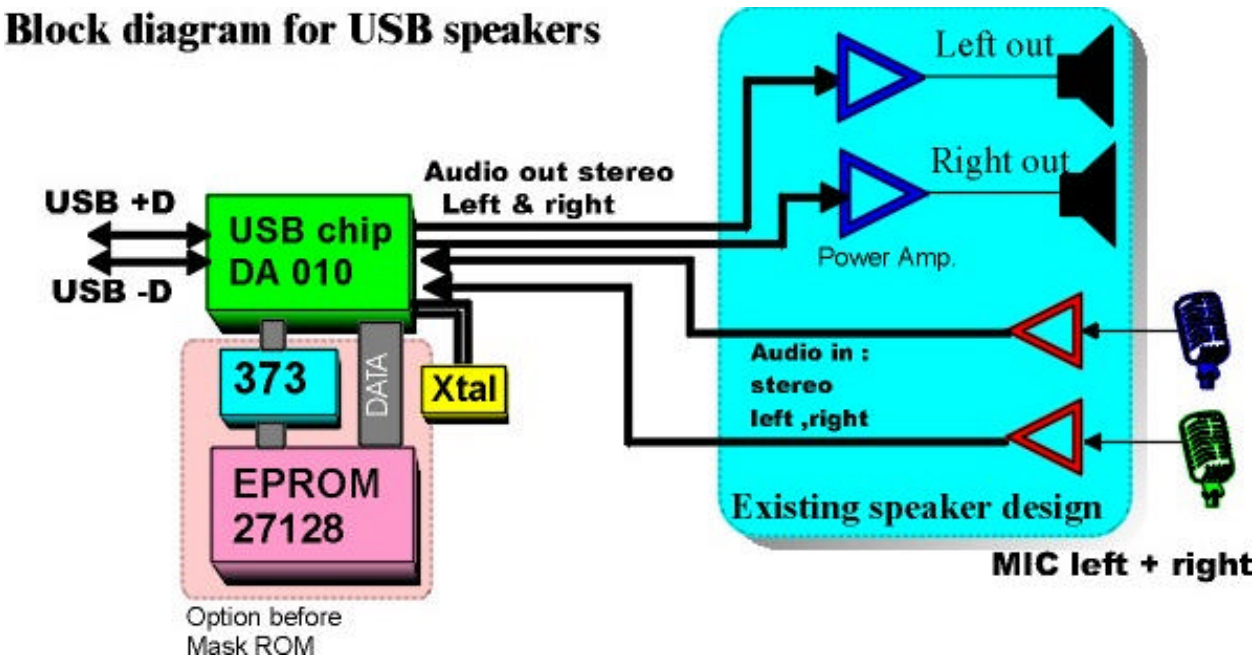
chip conversion
Monitor to USB Monitor

ZMM USB Multimedia player

ZMM Telephony Speech Recognition
Call control

Electronic Schematic Diagram,

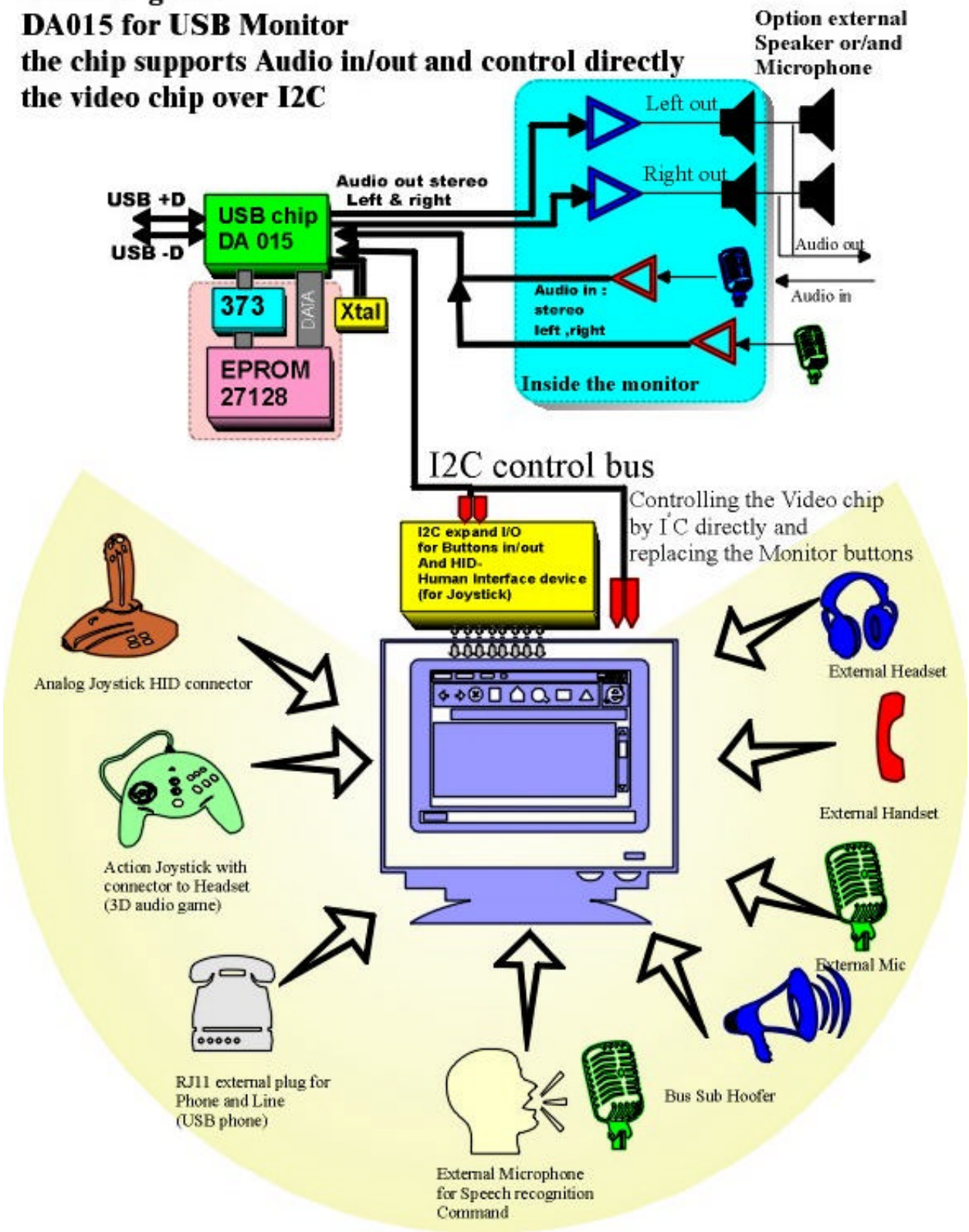




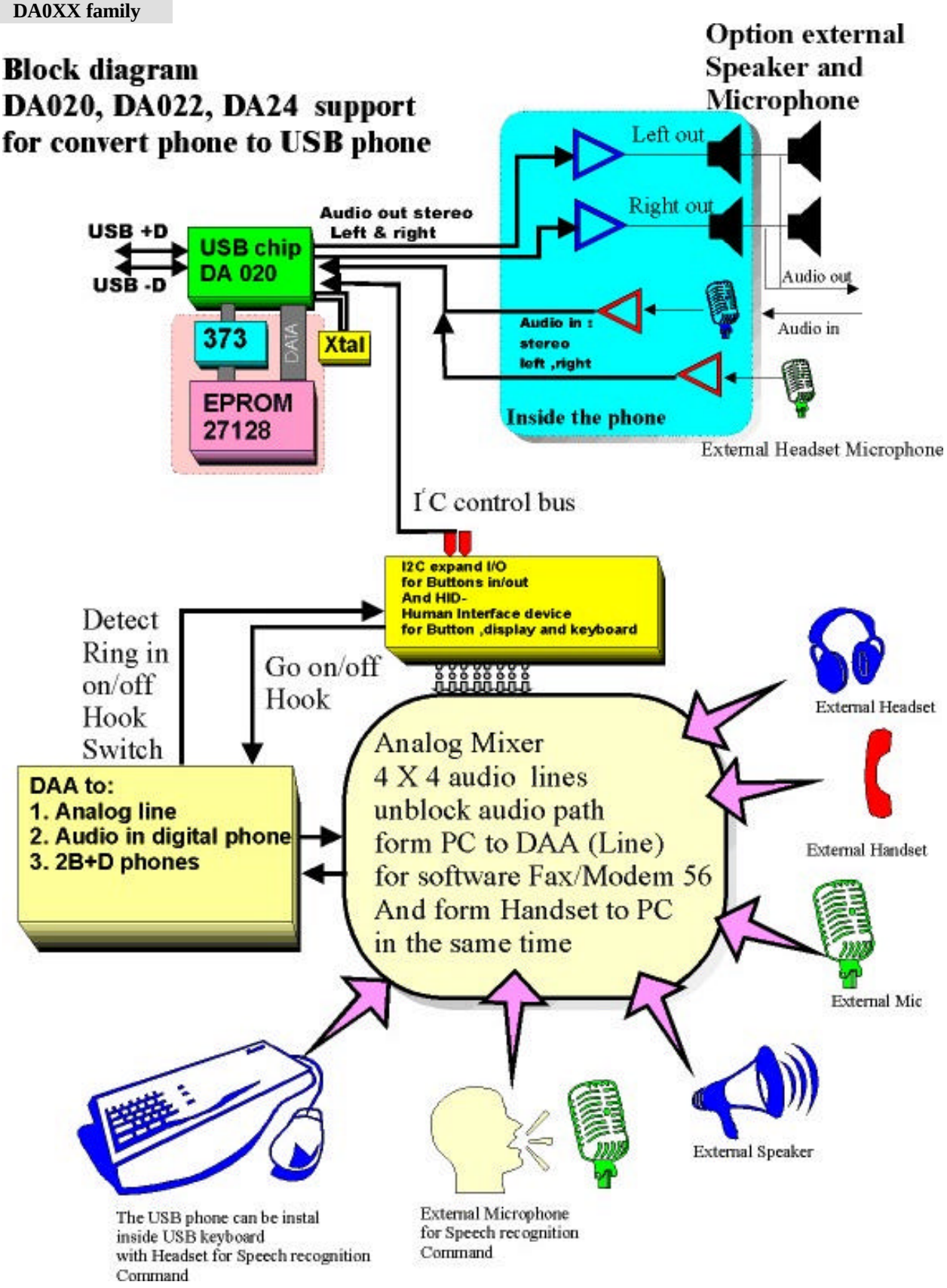
Block diagram

DA015 for USB Monitor

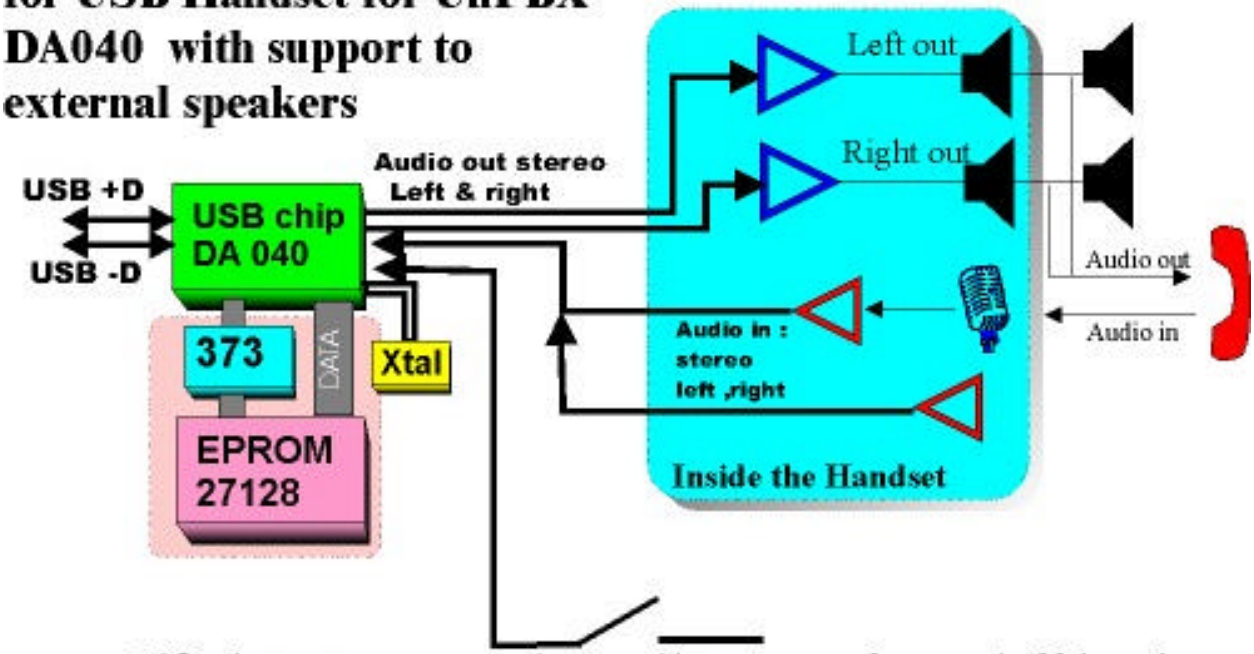
the chip supports Audio in/out and control directly the video chip over I2C



Block diagram
DA020, DA022, DA24 support for convert phone to USB phone



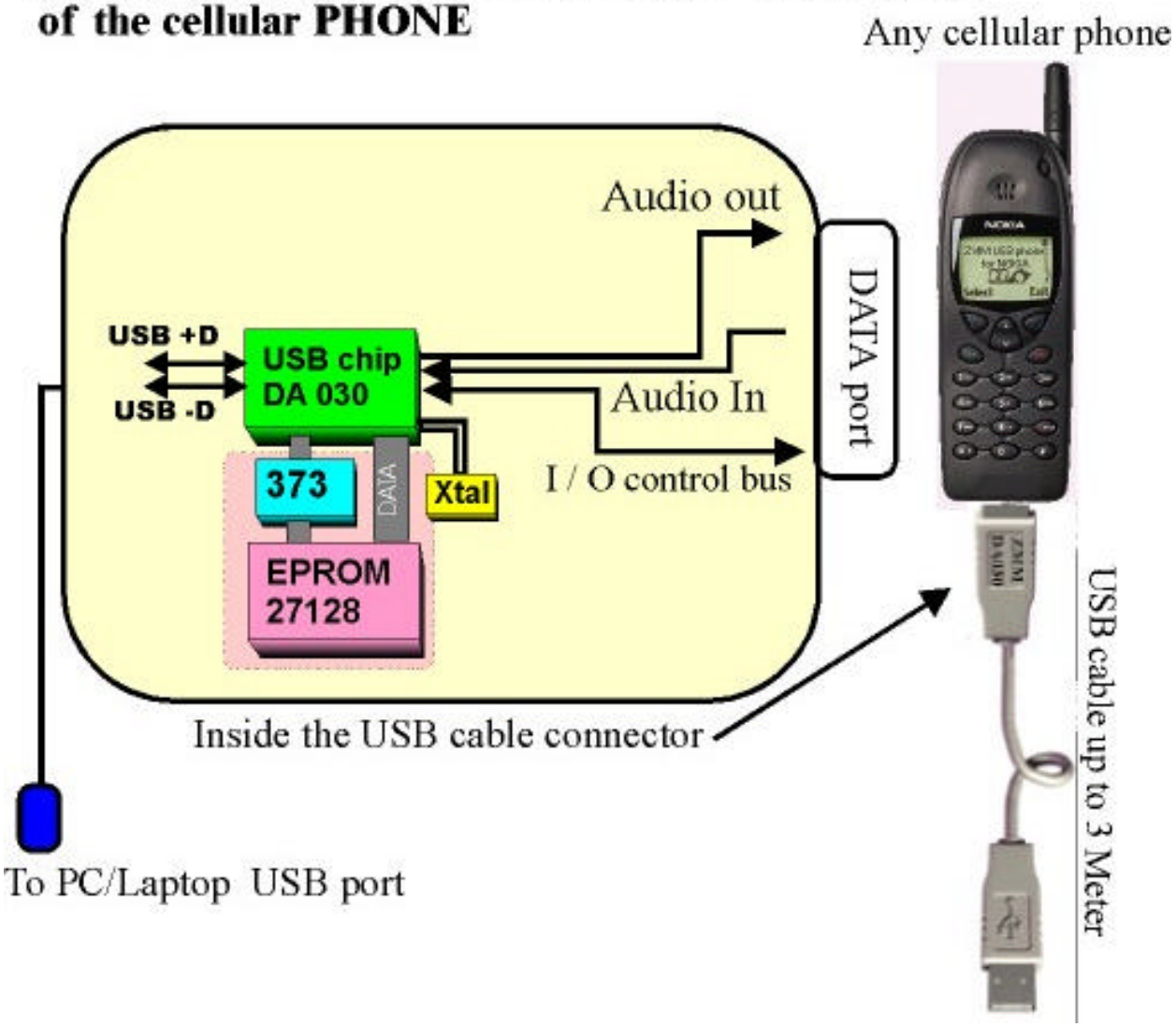
Block diagram for USB Handset for UnPBX DA040 with support to external speakers



I/O detects magnetic or tilt sensor for on/off hook

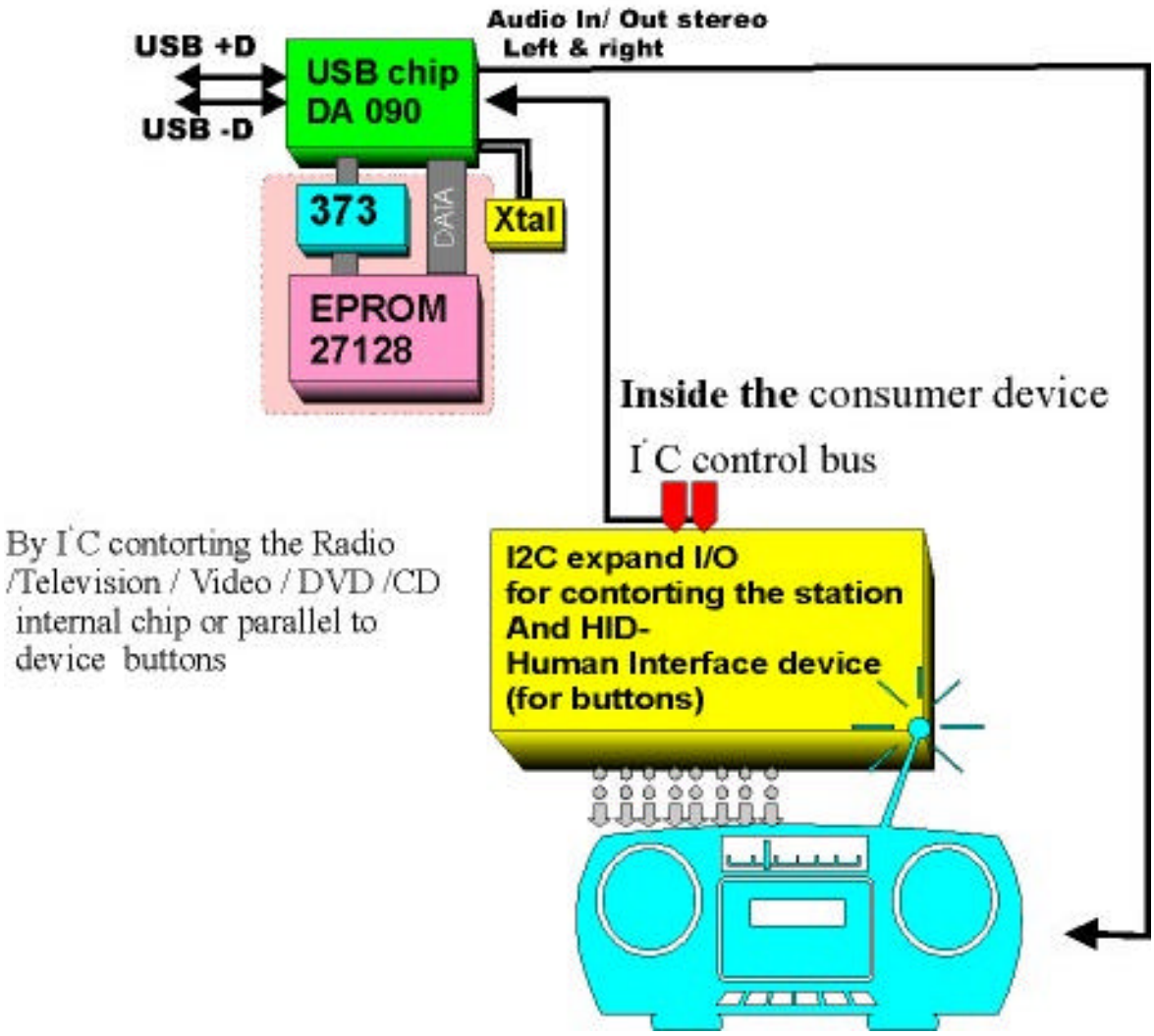
TAPI (Telephone Application Programer Interface) support

Block diagram
for USB cable for cellular phone
DA030 support by using the internal DSP
E-mail reader by text to speech,
speech recognition command and fax / modem
get way to Internet connect directly to the data port
of the cellular PHONE



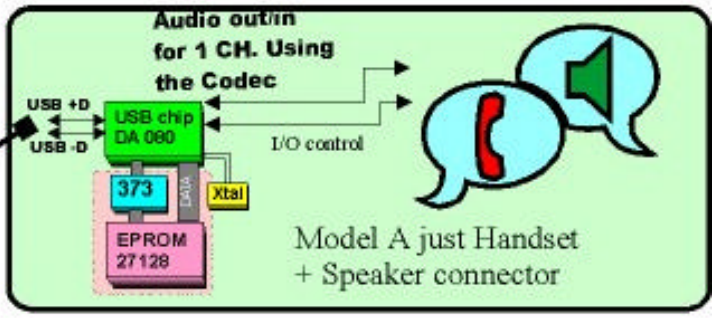
Block diagram

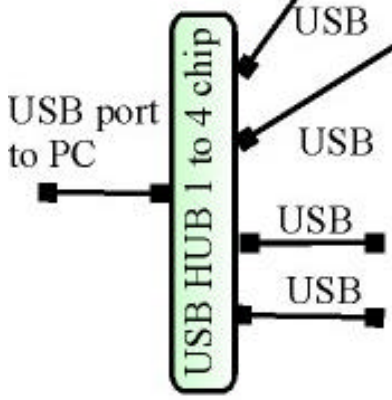
DA090 support for Home consumer audio device the chip add controls recording & Playing from Windows program to the home device (Install directly on the PCB of the consumer audio device)



Block diagram
Audio for
USB Video camera
DA080 Model A just audio
DA083 Model B audio with DAA
and software FAX MODEM 56 K

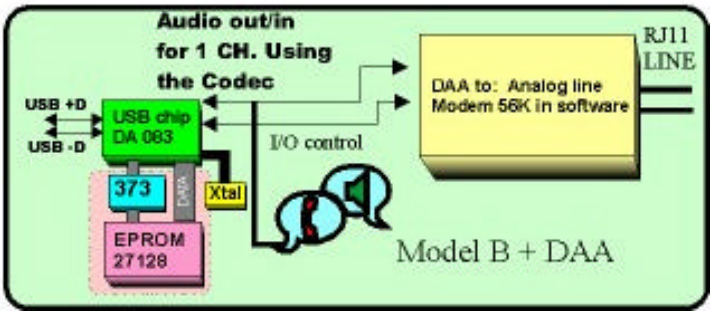
USB Video camera chip
Not supply by ZMM!



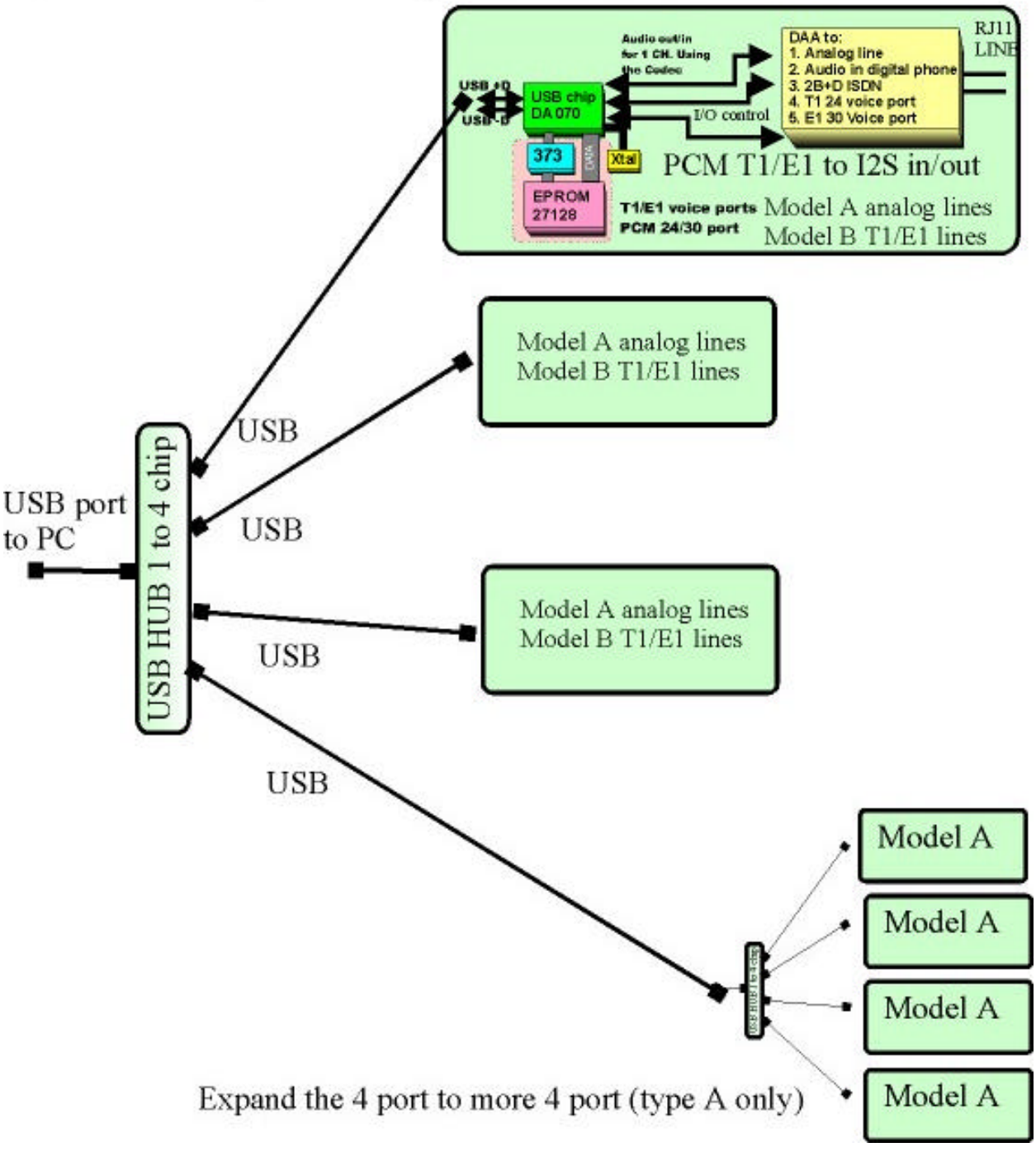


Free USB ports

Option with modem



Block diagram
for USB CT server 4 lines
DA070 Model A Analog line
DA072 DA073 Model B Digital T1/E1 lines



Diminution of the DA chips

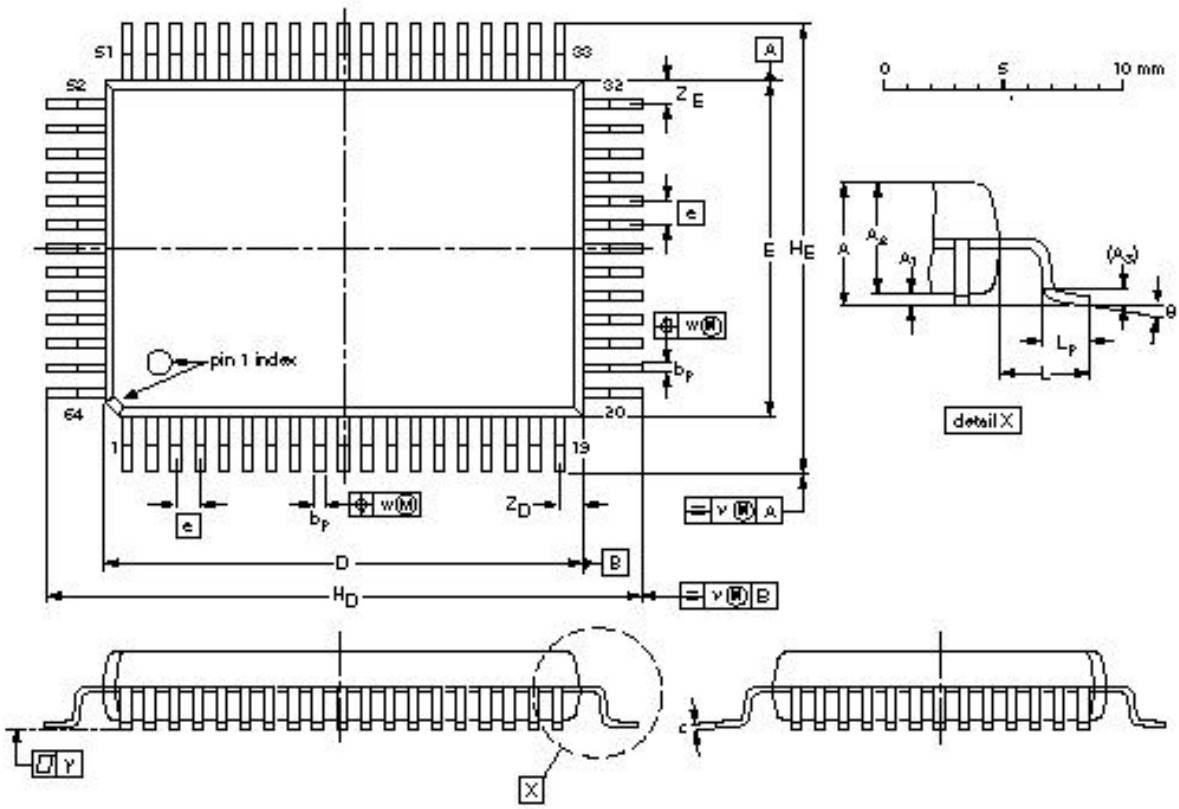
DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_D	H_E	L	L_p	v	w	y	$Z_D^{(1)}$	$Z_E^{(1)}$	θ
mm	3.25	0.30 0.10	2.90 2.65	0.25	0.50 0.35	0.25 0.14	20.1 19.9	14.1 13.9	1	25.0 24.4	19.0 18.4	2.35	1.4 1.0	0.2	0.2	0.1	1.2 0.8	1.2 0.8	7° 0°

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT319-3						~~95-02-04~~ 97-08-01



SOLDERING

CAUTION

Wave soldering is NOT applicable for all QFP packages with a pitch (e) equal or less than 0.5mm.

REFLOW SOLDERING

Reflow soldering techniques are suitable for DA0xx family. The choice of heating method may be influenced by larger plastic QFP packages (44 leads, or more). If infrared or vapour phase heating is used and the large packages are not absolutely dry (less than 0.1% moisture content by weight), vaporization of the small amount of moisture in them can cause cracking of the plastic body. For more information, refer to the Drypack chapter in our "Quality Reference Handbook" (order code 939775000192). Reflow soldering requires solder paste (a suspension of fine solder particles,

flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.
Several methods exist for reflowing; for example, infrared/convection heating in a conveyor type oven. Throughput times (preheating, soldering and cooling) vary between 50and300seconds depending on heating method. Typical reflow peak temperatures range from 215 to 250°C.

WAVESOLDERING
Wave soldering is **not** recommended for QFP packages. This is because of the likelihood of solder bridging due to closely-spaced leads and the possibility of incomplete solder penetration in multi-lead devices.

If wave soldering cannot be avoided, for QFP packages with a pitch (e) larger than 0.5mm, the following conditions must be observed:
·**A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.**
·**The footprint must be at an angle of 45° to the board direction and must incorporate solder thieves downstream and at the side corners.**
During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured. Maximum permissible solder temperature is 260°C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150°C within 6seconds. Typical dwell time is 4seconds at 250°C. A mildly-activated flux will eliminate the need for
removal of corrosive residues in most applications.

REPAIRINGSOLDEREDJOINTS
Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than24V) applied to the flat part of the lead. Contact time must be limited to 10seconds at up to 300°C. When using a dedicated tool, all other leads can be soldered in one operation within 2to5seconds between 270and320°C.

LIFE SUPPORT APPLICATIONS
These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. ZMM customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify ZMM for any damages resulting from such improper use or sale.