
eKA8562A

USB Audio Controller

**Product
Specification**

Doc. VERSION 0.1

ELAN MICROELECTRONICS CORP.


April 2006



Trademark Acknowledgments:

IBM is a registered trademark and PS/2 is a trademark of IBM.

Windows is a trademark of Microsoft Corporation.

ELAN and ELAN logo  are trademarks of ELAN Microelectronics Corporation.

Copyright © 2006 by ELAN Microelectronics Corporation

All Rights Reserved

Printed in Taiwan

The contents of this specification are subject to change without further notice. ELAN Microelectronics assumes no responsibility concerning the accuracy, adequacy, or completeness of this specification. ELAN Microelectronics makes no commitment to update, or to keep current the information and material contained in this specification. Such information and material may change to conform to each confirmed order.

In no event shall ELAN Microelectronics be made responsible for any claims attributed to errors, omissions, or other inaccuracies in the information or material contained in this specification. ELAN Microelectronics shall not be liable for direct, indirect, special incidental, or consequential damages arising from the use of such information or material.

The software (if any) described in this specification is furnished under a license or nondisclosure agreement, and may be used or copied only in accordance with the terms of such agreement.

ELAN Microelectronics products are not intended for use in life support appliances, devices, or systems. Use of ELAN Microelectronics product in such applications is not supported and is prohibited.

NO PART OF THIS SPECIFICATION MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE EXPRESSED WRITTEN PERMISSION OF ELAN MICROELECTRONICS.



ELAN MICROELECTRONICS CORPORATION

Headquarters:

No. 12, Innovation Road 1
Hsinchu Science Park
Hsinchu, TAIWAN 30077
Tel: +886 3 563-9977
Fax: +886 3 563-9966
<http://www.emc.com.tw>

Hong Kong:

Elan (HK) Microelectronics Corporation, Ltd.
Rm. 1005B, 10/F Empire Centre
68 Mody Road, Tsimshatsui
Kowloon, HONG KONG
Tel: +852 2723-3376
Fax: +852 2723-7780
elanhk@emc.com.hk

USA:

Elan Information Technology Group (U.S.A.)
1821 Saratoga Ave., Suite 250
Saratoga, CA 95070
USA
Tel: +1 408 366-8225
Fax: +1 408 366-8220

Europe:

Elan Microelectronics Corp. (Europe)
Siewerdtstrasse 105
8050 Zurich, SWITZERLAND
Tel: +41 43 299-4060
Fax: +41 43 299-4079
<http://www.elan-europe.com>

Shenzhen:

Elan Microelectronics Shenzhen, Ltd.
SSMEC Bldg., 3F, Gaoxin S. Ave.
Shenzhen Hi-Tech Industrial Park
Shenzhen, Guangdong, CHINA
Tel: +86 755 2601-0565
Fax: +86 755 2601-0500

Shanghai:

Elan Microelectronics Shanghai, Ltd.
23/Bldg. #115 Lane 572, Bibo Road
Zhangjiang Hi-Tech Park
Shanghai, CHINA
Tel: +86 21 5080-3866
Fax: +86 21 5080-4600

Contents

1	General Description	1
2	Features	1
3	Applications.....	2
4	Block Diagram	2
5	Pin Configuration	3
6	Pin Description.....	4
7	Function Description	6
8	Absolute Maximum Rating	6
9	Electrical Characteristic	7
9.1	DC Electrical Characteristic.....	7
9.2	Analog Electrical Characteristic.....	8
10	Application Circuit	9
11	Buzzer Interface Signal.....	11
12	I²S Interface Signal.....	12
13	Package.....	13

Specification Revision History

Doc. Version	Revision Description	Date
0.1	Initial Preliminary Version	2006/04/24

PRELIMINARY



1 General Description

The eKA8562A is a USB audio controller for USB Phone Applications. The device has an integrated USB transceiver, USB core, dual DAC, ADC, and I²S Input/Output. It can handle a high-level USB protocol, and manages user interface via HID I/O pins.

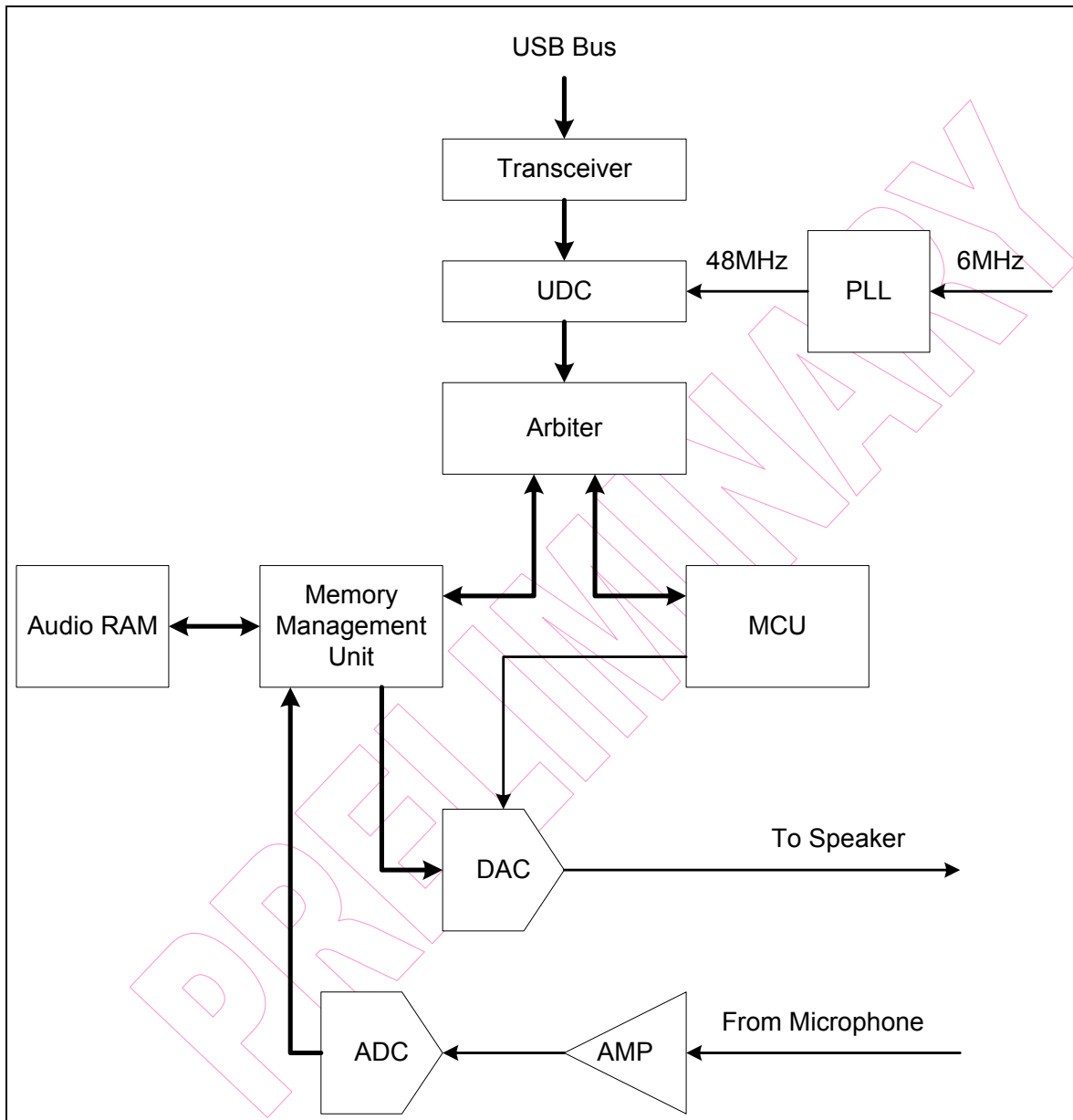
2 Features

- USB Specification v1.1 Compliant
- USB Audio and Human Interface Device (HID) Class v1.1 Compliant
- Supports 12 Mbits/s Full Speed Serial Data Transmission
- Supports 48 kHz, 44.1 kHz, 32 kHz, 8kHz sampling rate
- Single oscillator: 6MHz
- Audio buffer size: 192×16 bits × 2
- Total of four Endpoints : Endpoint 0 for control transfer , Endpoint 1 for audio streaming out , Endpoint 2 for streaming in , Endpoint 3 for HID
- Supports stereo/mono playback
- Built-in 2-channel D/A converter with 10-bit resolution
- Built-in 1-channel A/D converter with 10-bit resolution
- Alternative settings supported by the audio streaming-out interface:
 - ALT-0: (default setting) zero isochronous bandwidth
 - ALT-1: 16-bit PCM 2 channel
- Alternative settings supported by the audio streaming-in interface:
 - ALT-0: (default setting) zero isochronous bandwidth
 - ALT-1: 16-bit PCM stereo
- 32 bytes of general purpose RAM (R20~R3F)
- Supports 1 LED output pin
- Supports 1 Buzzer output pin (2.45 kHz)
- Supports 24 Button control
- RC Oscillator with internal RC
- Package: 48-pin LQFP

3 Application

- USB Skype Phone (including key scan and buzzer output)

4 Block Diagram



5 Pin Configuration

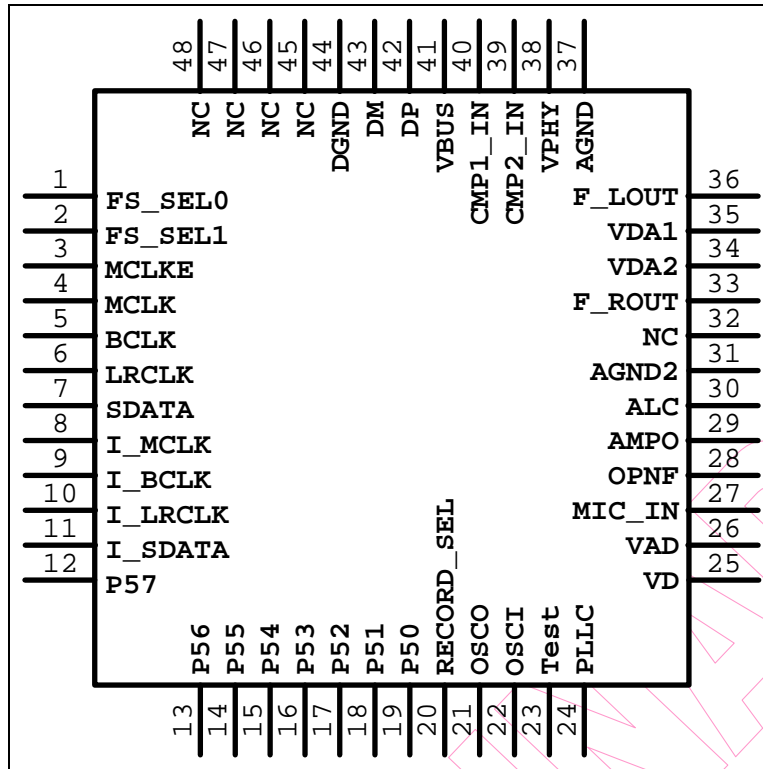


Fig 5-1 48-Pin Configuration of eKA8562A LQFP Type

6 Pin Description

Symbol	Pin No.	I/O	Function															
FS_SEL0 FS_SEL1	1, 2	I	<p>I²S Sample Frequency</p> <table border="1"> <thead> <tr> <th></th> <th>Sample Frequency</th> <th>MCLK</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>32kHz</td> <td>8.192MHz</td> </tr> <tr> <td>01</td> <td>8kHz</td> <td>2.048MHz</td> </tr> <tr> <td>10</td> <td>44.1kHz</td> <td>11.2896MHz</td> </tr> <tr> <td>11</td> <td>48kHz</td> <td>12.288MHz</td> </tr> </tbody> </table> <p>Pull-high resistors are connected to VD.</p>		Sample Frequency	MCLK	00	32kHz	8.192MHz	01	8kHz	2.048MHz	10	44.1kHz	11.2896MHz	11	48kHz	12.288MHz
	Sample Frequency	MCLK																
00	32kHz	8.192MHz																
01	8kHz	2.048MHz																
10	44.1kHz	11.2896MHz																
11	48kHz	12.288MHz																
MCLKE	3	I	<p>External MCLK enable pin. 0 : use external MCLK, and MCLK pin is input pin 1 : use internal MCLK, and MCLK pin is output pin A pull-high resistor is connected to VD.</p>															
MCLK	4	I	Crystal oscillator I/O pin															
BCLK	5	O	BCLK for I ² S interface															
LRCLK	6	O	LRCLK for I ² S interface															
SDATA	7	O	I ² S interface for FL, FR output															
I_MCLK	8	I	MCLK input input pin															
I_BCLK	9	I	BCLK for I ² S interface															
I_LRCLK	10	I	LRCLK for I ² S interface															
I_SDATA	11	I	I ² S interface for FL, FR input															
P57(PlayLED)	12	O	<p>LED output pin Play/Pause: Flash LED Stop: LED On</p>															
P56(Buzzer)	13	O	Buzzer output pin															
P55~P53	14~16	I	Key scan input pin															
P52~P50	17~19	O	Key scan output pin															
RECORD_SEL	20	I	<p>Record select pin 0 : ADC record 1 : I²S record A pull-low resistor is connected to DGND</p>															
OSCO	21	O	Crystal output															
OSCI	22	I	Crystal input															
Test	23	I	<p>Test mode select pin Test =0, enter normal mode Test =1, enter test mode A pull-low resistor is connected to DGND.</p>															
PLLC	24	I	External capacitor for PLL															



Symbol	Pin No.	I/O	Function
VD	25	PWR	5V digital power supply pin
VAD	26	PWR	ADC analog power supply pin
MIC_IN	27	I	Microphone analog input pin
OPNF	28	I	Non-inverting type amplifier. Normally, a feedback resistor connects from AMPO to OPNF and a gain resistor connects to MIC.
AMPO	29	O	Gain amplifier output and negative feedback Terminal for MIC
ALC	30	I	Automatic Level Control adjustment pin for MIC
AGND2	31		Analog Ground pin2
NC	32	-	No connection
F_ROUT	33	O	Front right channel analog audio output pin
VDA2	34	PWR	DAC analog power supply Pin 2
VDA1	35	PWR	DAC analog power supply Pin 1
F_LOUT	36	O	Front left channel analog audio output pin
AGND	37	PWR	Analog ground pin
VPHY	38	PWR	Phy and PLL power supply pin
CMP2_IN	39	I	Comparator 2 Input (FR)
CMP1_IN	40	I	Comparator 1 Input (MIC)
VBUS	41	PWR	USB bus power supply pin
DP	42	I/O	USB plus data line interface
DM	43	I/O	USB minus data line interface
DGND	44	PWR	Digital ground pin
NC	45-48		No connection

7 Function Description

The eKA8562A is a USB Audio Controller that transmits/receives audio data stream to/from the host through its Audio Streaming interface. The Audio Data Format supports 16-bit, 2-channel, and 48kHz PCM. It has three interfaces. Interface 1 supports three sampling frequencies. The sampling rate is changed when "Set Endpoint Control Request" is issued. If user plays other format audio data, the application software transforms it to 48kHz data and then transmit to this device. For Interface 2, this device transmits data at a rate that is locked to frame timing. When user use the recording format (ex. 8kHz) to record speech other than 48kHz stereo format, the application software transforms 48kHz data to 8kHz data. Interface 3 is HID pipe which is used to read button status.

The volume and mute control can be activated via host (audio device class requests) or via I/O pins (HID plus audio device class requests). When this function is activated via host, the host manages the audio PCM data directly. The eKA8562A device just playback the audio data. Otherwise, when it is activated via I/O pins, the eKA8562A sends the controlled feature (Key code) message through HID pipe and signals the host to manage the audio PCM data and control the Skype phone directly.

8 Absolute Maximum Rating

Symbol	Min	Max	Unit
Temperature under bias	0	70	°C
Storage temperature	-65	150	°C
Input voltage	-0.5	6.0	V
Output voltage	-0.5	6.0	V

9 Electrical Characteristic

9.1 DC Electrical Characteristic

Ta=0°C~70°C, VBus=5V, DGND=0V

Symbol	Parameter	Condition	Min	Typ	Max	Unit
I ² L	Input Leakage Current	VIN = VBus, DGND	-	-	±1	μA
VIH	Input High Voltage	-	2.0	-	-	V
VIL	Input Low Voltage	-	-	-	0.8	V
VIHX	Clock Input High Voltage	OSCI	2.5	-	-	V
VILX	Clock Input Low Voltage	OSCI	-	-	1.0	V
VOH	Output High Voltage (I ² S Interface Pin)	IOH = -10.0mA	2.4	-	-	V
VOL1	Output Low Voltage (Port 5, I ² S Interface Pin) (P5 : Normal Mode)	IOL = 10.0mA	-	-	0.4	V
VOL2	Output Low Voltage (P5 : LED driver Mode)	IOL = 10.0mA VBus = 5V	-10%	1.3	+10%	V
IPH	Pull-high Current (Input and Sel_Vref pin)	Pull-high active, input pin at DGND (PH resistor = 25 KΩ)	-20%	-125	+20%	μA
IPL	Pull-low Current (Test pin)	Test pin at VBus (PL resistor = 25 KΩ)	-20%	125	+20%	μA
ISB1	Power Down Current	All input and I/O pin at VBus, Output pin floating, WDT disabled	-	-	50	μA
ISB2	Power Down Current	All input and I/O pin at VBus, Output pin floating, WDT enabled	-	-	100	μA
ICC	Operating Supply Current	Fosc= 6.0 MHz , output pin floating	-	-	10	mA



9.2 Analog Electrical Characteristic

Parameter	Condition	Min	Typ	Max	Unit
ADC					
ADC Resolution	-	-	10	-	Bits
ADC Sampling Frequency	-	-	48	-	kHz
Internal High Reference Voltage for ADC	-	-	2.55	-	V
Internal Low Reference Voltage for ADC	-	-	0.75	-	V
Pre-Amplifier Spec.					
Pre-Amplifier Voltage Gain	-	19.5	20	20.5	dB
Gain Amplifier Spec.					
Voltage Amplifier Gain	-	49	50	51	dB
Output Voltage Swing	-	-	1.6	-	Vp-p
Output Voltage	-	0.85	-	2.45	V
ALC Circuit Spec.					
ALC Detection Level	MIC input = 7.5mV	-40	-	-	dBm
ALC Operating Range	-	36	40	44	dB
LPF Spec					
Pass-Band Ripple	-	-	-	0.5	dB
Pass-Band Cutoff Frequency	-	-	4	-	kHz
Stop-Band Attenuation @ 24kHz	-	70	-	-	dB
Stop-Band Attenuation @ 48kHz	-	90	-	-	dB
DAC					
DAC Resolution	-	-	10	-	Bits
DAC Sampling Frequency	-	-	48	-	kHz
Reference Voltage (Vref)	-	1.45	1.65	1.85	V
Minimum Analog Output Voltage	-	0.99	1.04	1.09	V
Maximum Analog Output Voltage	-	2.15	2.26	2.37	V
Full Scale Voltage Range	VDA=3.3V	-5%	1.2	+5%	V
Analog Output Impedance at Each Output Pin	-	-	-	200	Ω
Analog Output Capacitance at Each Output Pin	-	-	-	20	pF
External Load Impedance	-	-	32	-	Ω
Volume Control Step	-	-	16	-	Step

10 Application Circuit

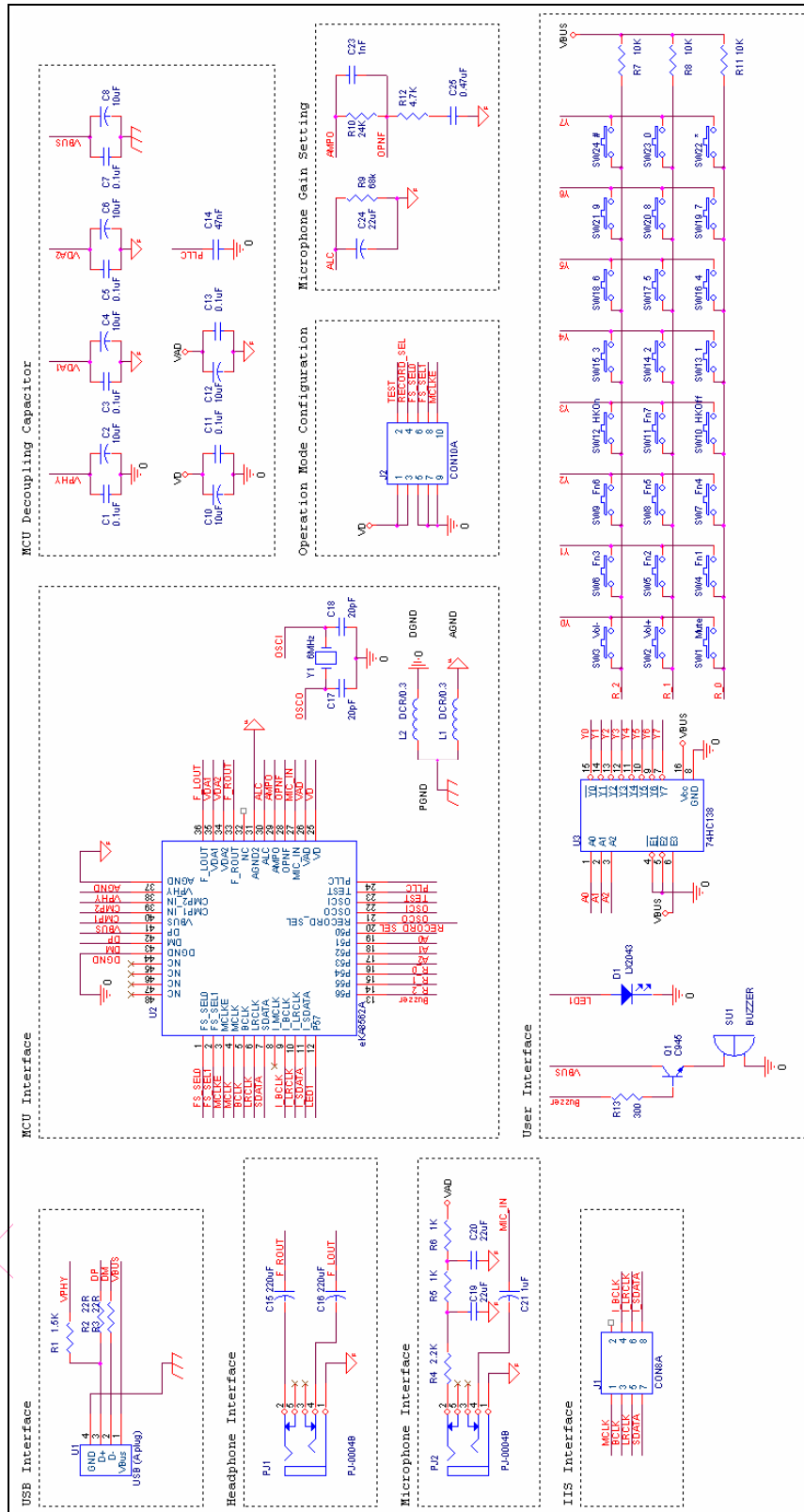


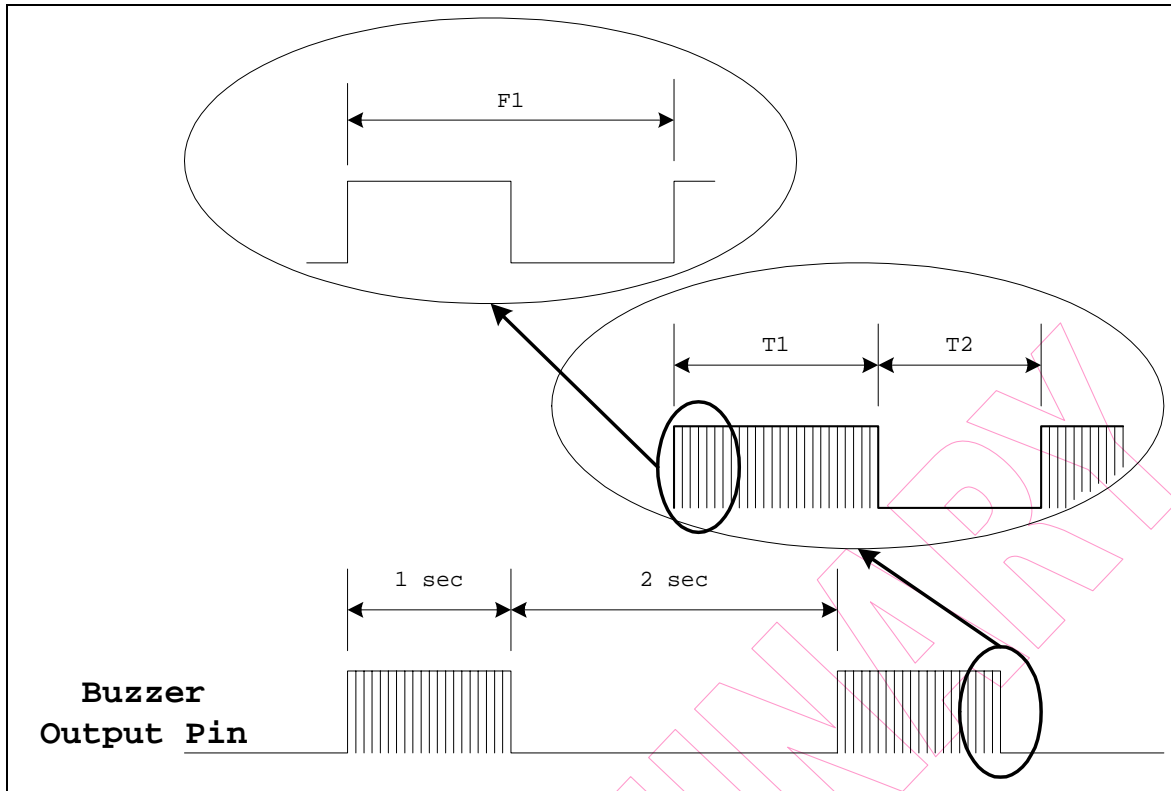
Fig 10-1 eKA8562A 48-pin, ePhone Circuit

Key Map

Button	Function
SW1	Mute
SW2	Vol+
SW3	Vok-
SW4	Fn1
SW5	Fn2
SW6	Fn3
SW7	Fn4
SW8	Fn5
SW9	Fn6
SW10	Hook Off
SW11	Fn7
SW12	Hook On
SW13	1
SW14	2
SW15	3
SW16	4
SW17	5
SW18	6
SW19	7
SW20	8
SW21	9
SW22	*
SW23	0
SW24	#

Fn1~Fn7 can be defined.

11 Buzzer Interface Signal



F1=2.45 kHz

12 I²S Interface Signal

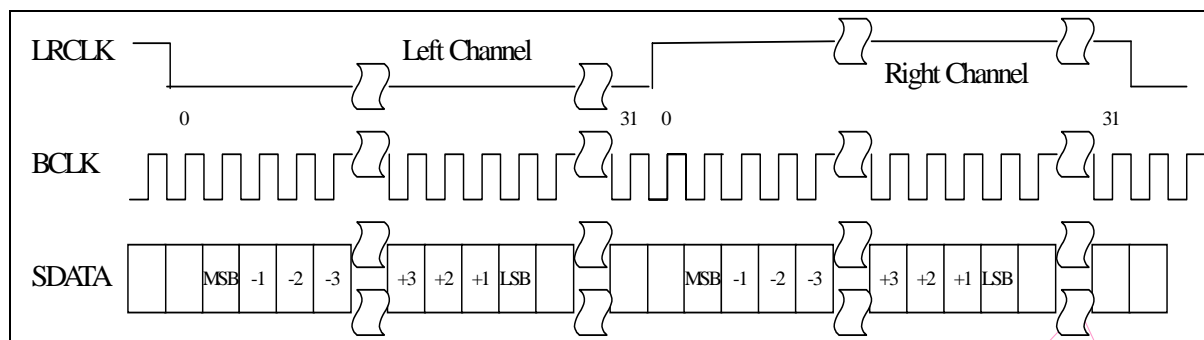


Fig 12-1 I²S Justified Audio Stream Format

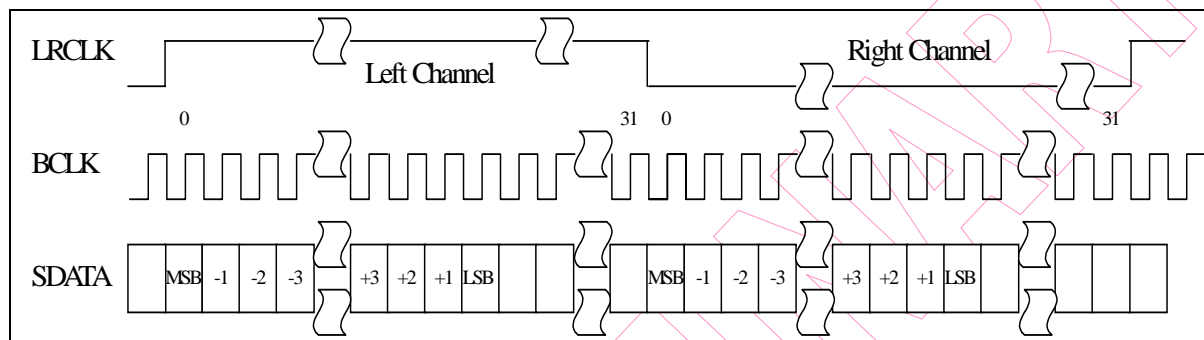


Fig 12-2 Left Justified Audio Stream Format

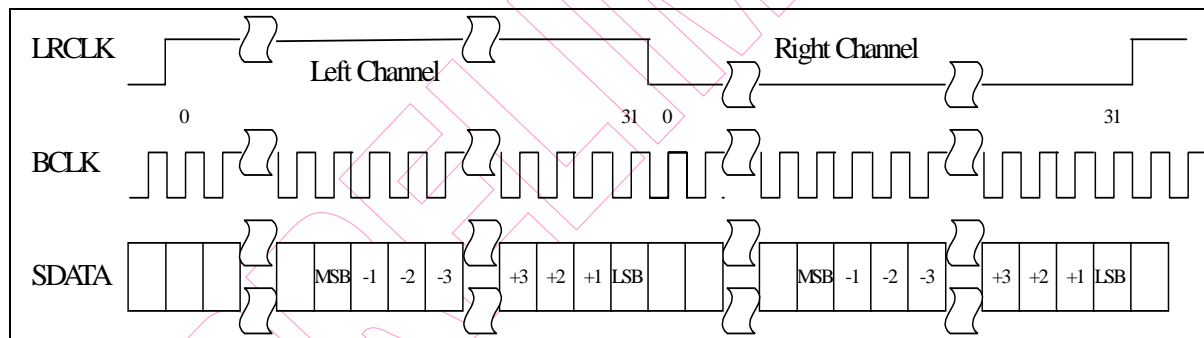


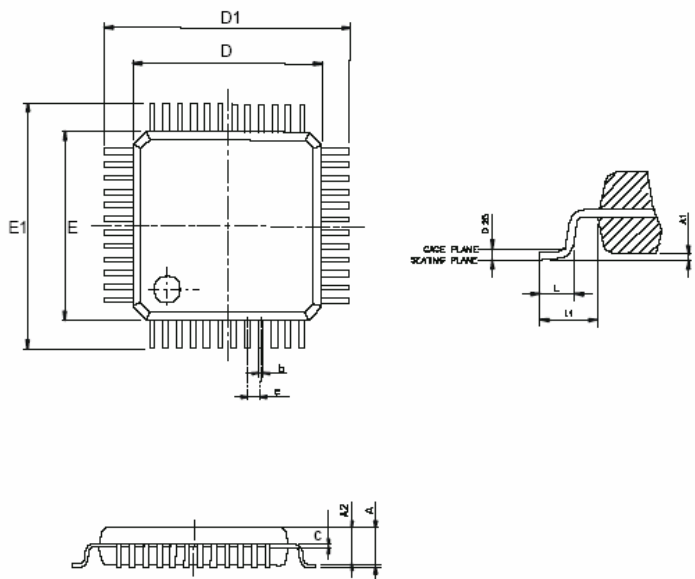
Fig 12-3 Right Justified Audio Stream Format

The LRCLK and BCLK are derived from MCLK.


The frequency ratio is MCLK: LRCLK: BCLK = 256: 1: 64

The frequency of LRCLK equals the sampling rate of 48kHz, 44.1kHz, 32kHz or 8kHz based on FS_SEL0 and FS_SEL1 pins status.

13 Package



Symbol	Min	Normal	Max
A			1.60
A1	0.05		0.15
A2	1.35	1.40	1.45
b	0.17	0.22	0.27
c	0.09		0.20
D1	9.00BCS		
D	7.00BSC		
E1	9.00BSC		
E	7.00BSC		
e	0.50BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
θ	0°	3.5°	7°

義隆電子股份有限公司 ELAN MICROELECTRONICS CORPORATION			TITLE: LQFP48 (8LQ*1) M&D FOOTPRINT 2.0mm PACKAGE OUTLINE DIMENSION	
DWG NO: POD-058			File : LQFP48	Edition: A
	Name	Date		Unit : mm
Draw	鍾玉真	92/10/23		Scale: Free
Check	吳進富	92/10/23		Material:
Approved	蔡建文	92/10/23		Sheet: 1 of 1

PRELIMINARY



PRELIMINARY