

X31 (RU)

service manual

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Chapter One About Maintenance

1.1 Safety precautions

1.1.1 Precautions for antistatic

Movement and friction will both bring static electricity which causes serious damages to integrated IC. Though static charge is little, when a limited quantity of electric charge is added to large-scale integrated IC, as the capacitance is very small in the meantime, now the integrated IC is very much easy to be struck through by static electricity or the performance will decrease. Thus static electricity prevention is of extraordinary importance. The following are several measures to prevent static electricity:

1. Use a piece of electric conduction metal with the length of about 2 metres to insert into the earth, and Fetch the lead wire from the top of the surplus metal and connect to the required static electricity device. The length and depth of the metal embedded under the earth should be determined according to the wettability of the local soil. For humid places, it may be shorter, and longer and deeper for dry places. If possible, it can be distributed and layed in terms of “#” shape.

2. On operating table-board, the antistatic table cushion should be covered and grounded.

3. All devices and equipments should be placed on the antistatic table cushion and grounded.

4. Maintenance personnel should wear antistatic wrist ring which should be grounded.

5. Places around the operating position should also be covered with electric conduction cushion or Painted with antistatic paint.

1.1.2 About placement position

1. Audio power amplifier cannot be installed in places with high temperature and humidity.

2. Positions for placement should be stable and secure.

1.2 Maintenance method

1.2.1 Visualized method

Directly view whether abnormalities of collision, lack of element, joint welding, shedding welding, rosin joint, copper foil turning up, lead wire disconnection and elements burning up among pins of

Elements appear. Check power supply of the machine and then use hands to touch the casing of part of elements and check whether they are hot to judge the trouble spot. You should pay more attention when using this method to check in high voltage parts.

1.2.2 Electric resistance method

Set the multimeter in resistance position and test whether the numerical value of resistance of each point in the circuit has difference from the normal value to judge the trouble spot. But in the circuit the tested numerical value of resistance is not accurate, and the tested numerical value of integrated IC's pins can only be used for reference, so the elements should be broken down for test.

1.2.3 Voltage method

Voltage method is relatively convenient, quick and accurate. Set the multimeter in voltage position and test power supply voltage of the player and voltage of a certain point to judge the trouble spot according to the tested voltage variation.

1.2.4 Current method

Set the multimeter in current position and test current of the player of a certain point to judge the trouble spot. But when testing in current method, the multimeter should be series connected in the circuit, which makes this method too trivial and troublesome, so it is less frequently used in reality.

1.2.5 Cutting method

Cutting method should be combined with electric resistance method and voltage method to use. This method is mainly used in phenomena of short circuit and current leakage of the circuit. When cutting the input terminal voltage of a certain level, if voltage of the player rises again, it means that the trouble lies in this level.

1.2.6 Element substitution method

When some elements cannot be judged good or bad, substitution method may be adopted directly.

1.2.7 Comparison method

A same good PC board is usually used to test the correct voltage and waveform. Compared these data with those tested through fault PC board, the cause of troubles may be found.

Through the above maintenance method, theoretical knowledge and maintenance experience, all difficulties and troubles will be readily solved.

1.3 Required device for maintenance

- ◆ Audio Generator
- ◆ Digital oscillograph ($\geq 100\text{MHE}$)
- ◆ SMD rework station
- ◆ Multimeter
- ◆ Soldering iron
- ◆ Pointed-month pincers
- ◆ Cutting nippers
- ◆ Forceps
- ◆ Electric screw driver
- ◆ Terminals connecting cord
- ◆ Headphone
- ◆ Microphone

Chapter Two

Functions and Operation Instructions

2.1 USAGE INTRODUCTION

2.1.1 FUNCTIONS AND FEATURES

#Philips PNX0102 audio decode chip

Adopt famous Philips PNX0102 audio decode chip, special for Hi-Fi Mp3 player, forcefully making up audio signal loss when compressing Mp3 to revert audio signal better.

#Play MP3/WMA/WAV files

Support 16kbps~320kbps Mp3 file and 8kbps~192kb0s WMA file.

#Mobile storage function

Capable of downloading files form Windows resource manager.

#FM tuning

Full-auto, automanual and manual scanning function may listen to FM radio station program more easily.

#Voice recording function

May be used to record in class, meeting and interview.

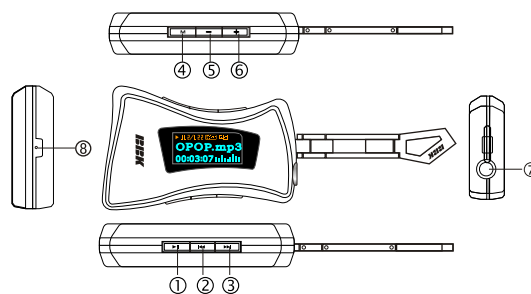
#USB 2.0 transmission(high speed)

USB 2.0 high speed data transmission.

#Support firmware upgrading function

Support upgrading function. You may add new function to the built-in program of this player conveniently.

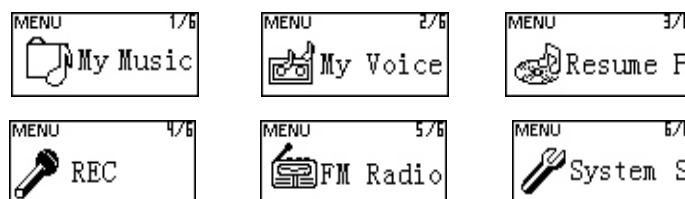
2.1.2 BUTTONS AND JACKS ILLUSTRATION



- ① #Press in power off mode → power on
- #Press for long in power on mode → power off
- #Press in playback interface → switch in pause/play
- #Press when recording → pause recording
- #press when tuning → mute
- #press in tuning SCAN mode → save radio station and switch mode to PRESET
- #press when operating in menu → enter selected item or confirm setup
- ② ③ #Press in playback interface → the previous/next track
- #Press for long in playback interface → fast backward/forward

- #Press in tuning PRESET mode → select channel
 - #Press for long in tuning PRESET mode → full auto scanning
 - #Press in tuning SCAN mode → manual scanning
 - #Press for long in tuning SCAN mode → automanual scanning
 - #When operating in menu → move cursor or set item
 - #Press or for long in "My EQ" → select the frequency point you want to set
- ④ **M** #Press for long in any mode → enter main menu
- #Press when tuning → switch in PRESET and SCAN mode
 - #Press for long when recording → quit recording
 - #Press when operating in menu → not save the setup and return to the previous menu
 - #Press when playing → Set A-B reread
- ⑤ **=** ⑥ **+** #Press in playback interface or when tuning → adjust volume
- #Press in "My EQ" → adjust dB value
 - #Press "-" button when browsing file → enter cancelling file dialogue box
 - #Press "+" button for long when tuning → enter FM recording
- ⑦ USB/headphone jack
- ⑧ MIC:microphone

2.1.3 MAIN MENU ILLUSTRATION



#My music

Memorize music file.

#My Voice

Memorize microphone recording file, such as meeting, classroom and interview recording, etc.

#Resume Play

Select "Resume Play" and the player begins to play from the position that music stopped playing last time.

#REC

Select "REC" to enter recording mode.

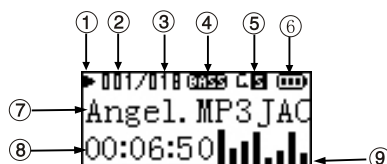
#FM Radio

Select "FM Radio" to enter radio set mode.

#System Setup

Select "System Setup" to set system items.

2.1.4 PLAYING INTERFACE ILLUSTRATION



① Playback state

② Serial number of the current track

③ Number of all tracks

④ Sound effect mode

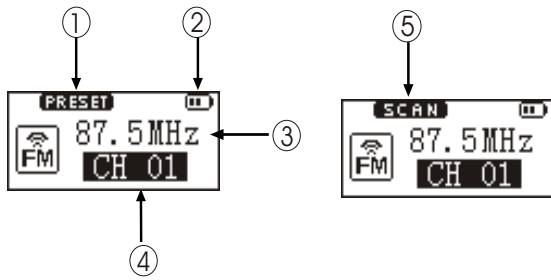
⑤ Playback mode

⑥ Battery capacity

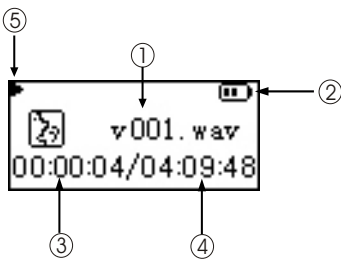
⑦ Id3 information/singer/lyrics display

⑧ Time that has been played of the current track

⑨ Spectrum of the current track



- ① PRESET mode (normal receiving)
- ② Battery capacity
- ③ Frequency of the current radio station
- ④ PRESET channel display
- ⑤ SCAN mode (scanning)



- ① Name of recorded file
- ② Battery capacity
- ③ Time that has been recorded
- ④ The left recordable time
- ⑤ Recording state

As for the name of recorded file "V001.WAV":
001 is serial number of the current recorded track and arranged according to sequence; WAV is file format after recording

2.2 BASIC OPERATION

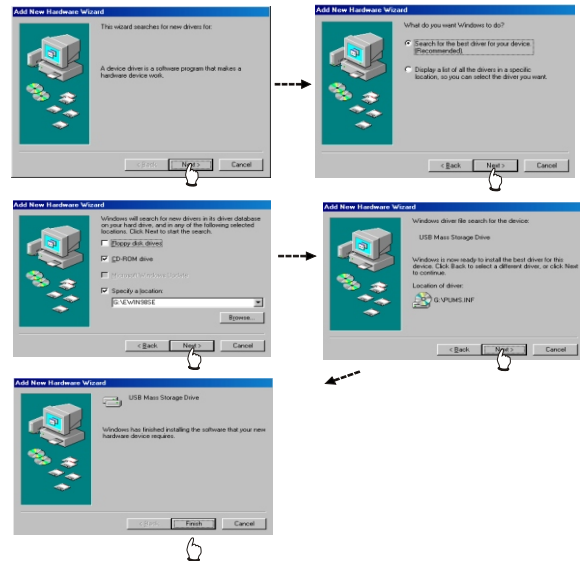
2.2.1 INSTALL USB DRIVE PROGRAM

If your computer is Windows 98, you must install drive program if you want to use the mobile storage function of MP3 player in computer.

1. Place USB drive disc into CD-ROM driver of computer.
2. Connect MP3 player to computer, and the computer will automatically indicate that new firmware device has been found, and run the installation guide, shown as the following figure. You only need to find the drive information file on disc according to prompt information to finish the installation of drive program.
3. After installation finishes, restart the computer and you may use the mobile storage function

normally.

Shown as the following figure:



2.2.2 USE MOBILE STORAGE FUNCTION

This player can be used as mobile storage in Windows ME/2000/XP operating system. In Windows 98SE and Mac operating system, drive program must be installed firstly and then used as mobile storage. Connect MP3 PLAYER and computer with USB transmission line. After the bottom right corner of desktop appears " " symbol, the mobile storage function of Mp3 PLAYER may be used normally.

NOTE:

- #To avoid abnormality of the player appears, you are suggested to power off firstly before connecting MP3 PLAYER with computer, and then use USB transmission line to connect MP3 PLAYER, then connect computer.
- #In Windows 98 system, there is no " " symbol.

2.2.3 DISCONNECT USB SAFELY

After operation finishes, click " " symbol on bottom right corner of Windows desktop with right button of mouse, and disconnect USB safely according to the computer prompt.

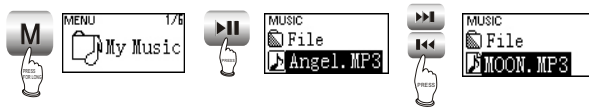


2.2.4 BROWSE/CANCEL FILE

#BROWSE FILE

In any case, press **M** button for long to enter "Main Menu". Music file and recording file are separately saved in the first two items of main menu, "My Music" and "My Voice".

Press **⏪** / **⏩** button to select upward or downward and then press **⏮** button to enter files browsing .



#CANCEL FILE

When browsing files, press **⏮** button and the cancel dialogue box will pop up.

Press **⏪** / **⏩** button to select "YES" and then press **⏮** button to cancel the file. Select "NO" or press **M** button to exit.



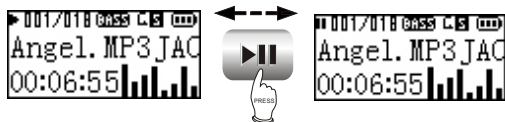
2.2.5 PLAY MUSIC

#PLAY MUSIC

Press **⏪** / **⏩** button to select song In "My Music". Press **⏮** button or select playback in main menu to begin playing music, meanwhile the playback interface displays.

#PAUSE PLAYING MUSIC

When playing, press **⏮** button to switch to pause state. Press **⏮** button again to continue playing.



#NEXT and PREV

When playing, pressing **⏩** button may skip to the next track to play. If playback time of the current track is less than 5 seconds, pressing **⏪** button may skip to the previous track to play, otherwise the current track will be played again if playback time is more than 5 seconds.

#FF and FB

When playing, pressing **⏩** button for long may realize fast forward.



When playing, pressing **⏪** button for long may realize fast backward.



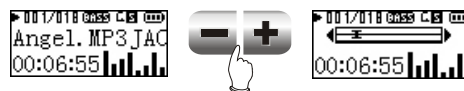
CAUTION:

Fast forward and fast backward operation are only for the current track. After fast backward/forward to the beginning/ending of

track, it switches into normal playback automatically.

#ADJUST VOLUME

When playing or tuning, pressing **-** / **+** button or for long may adjust volume. The display of adjusting volume in music playback interface is shown as follows:



CAUTION:

#Music playback will be paused when browsing file.

#In some operating system (such as complex font Windows), the operation of copying lyrics/song file and changing song's name may probably lead to incorrect display.

When playing WMA songs of VBR, pressing buttons may probably has slow response or has no lyrics display. When playing some non standard songs or songs with special format, noise may probably occur.

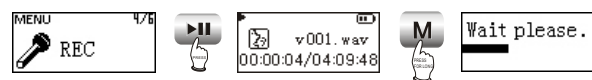
2.2.6 A-B REPEAT FUNCTION

When playing, if you want to listen to a certain segment repeatedly, please use A-B repeat function. Press **M** button for the first time to select the beginning point that you desire to repeat play and screen displays "A"; press it for the second time to select the ending point that you desire to repeat play and screen displays "AB", and system begins to repeat play between A-B segment. Press **M** button for the third time to cancel repeat and continue to play.



2.2.7 RECORDING

When recording, press **⏮** button to pause and press **M** button for long to exit recording and then make files.



#To avoid sudden power-off when recording, you cannot record when in low battery and when disc is fully written. If you are recording, it indicates "FULL DISC" and exits recording.

#When recording with microphone, if you press buttons and the sound of pressing may probably be recorded.

2.2.8 TUNING

#ENTER TUNING MODE

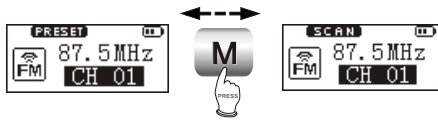
Select "FM Radio" in main menu and press Button to listen to radio.

#EXIT TUNING MODE

When listening to radio, press button for long to return to main menu.

#PRESET/SCAN MODE SWITCH

When listening to radio, press button to switch between PRESET and SCAN mode.



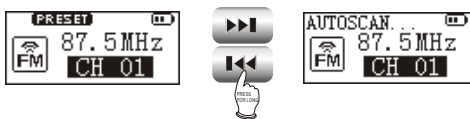
1. PRESET mode

#ADJUST CHANNEL

Press button to enter the next channel, and press button to enter the previous channel.

#FULL AUTO SCANNING

In PRESET mode, press button for long to begin full auto scanning. All scanned radio stations will be saved in PRESET channel automatically.



2. SCAN MODE

#MANUAL/AUTOMANUAL SCANNING

Press button to increase 0.1MHz each time; and press button to decrease 0.1 Mhz each time. Press button to save radio station.

Press button for long to increase frequency continuously and stop until radio station

has been searched. Press button to save radio station.

Press button for long to decrease frequency continuously and stop until radio station has been searched.

Press button to save radio station.

#SAVE RADIO STATION

Select channel in PRESET mode firstly, and then switch to SCAN mode to adjust frequency (manually or auto manually). After scanning desired frequency, press button to save into the current PRESET channel.



#CAUTION:

In the course of full auto/automanual scanning, press or button to stop scanning.

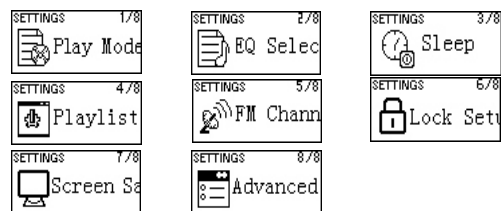
#FM RECORDING

When listening to radio, press button for long to enter FM recording. Press button for long to stop recording and generate into recording file. The generated file of FM recording is wav format.



2.3 SETTINGS

2.3.1 SETTINGS



#Play Mode

- Normal
- Shuffle
- Playlist
- Intro
- REP One
- REP ALL
- REP DIR
- #EQ Select
- Normal
- PURE
- POP
- Clas
- Jazz
- Rock
- Dbass
- Disco
- My EQ

- #Sleep
- Disable~120Min

#Playlist

- Browse
- Edit
- Delete
- #FM Channel
- Auto
- Mono
- #Lock Setup
- Lock Disable
- Lock Enable
- #Screen Save
- Disable~5Min
- #Advanced
- My EQ
- REC Set
- Format
- Load Default
- System Info
- Language

2.3.2 PLAY MODE



The playback symbol displays on playback interface is shown as follows:

- :play according to track sequence.
- :random play any one track.
- :play the track edited in program list.

- : browse play each track for 10 seconds.
- : repeat play single track.
- : repeat play all tracks.
- : repeat play all tracks in this Folder.

CAUTION:

#Play mode is defaulted to "Normal" each time when power on.

#Files in "My Voice" only support sequence playback.

#When playing files in "My Voice", there is no "Play mode" item.

2.3.3 EQ SELECT

Press button to enter "EQ SELECT", and then use / to move cursor, shown as follows:



The corresponding icons of each EQ mode in playback mode are shown as follows:



Select "MY EQ", and correspond with the sound effect that you have preset in "MAIN MENU->SYSTEM SETUP->ADVANCED". If you have not set it, it defaults "MY EQ" to "NORMAL" sound effect.

When the cursor moves to a certain sound effect mode, the sound effect mode played by MP3 player will switch to that in the cursor for the moment to facilitate you to select your desired sound effect mode. Press button to confirm this sound effect mode.

CAUTION:

When playing files in "REC", there is no "EQ SELECT" item.

2.3.4 SLEEP

Press or button to adjust the timing power-off time. After setup finishes, press button to save and then exit, and press button not to save and then exit. If timing power off time is 15 minutes, after 15 minutes, MP3 PLAYER will power off automatically.



CAUTION:

#It is defaulted to be invalid each time when power on.

#Timing power-on time is a rough time, and may have difference.

2.3.5 PLAYLIST

#Browse

Select "Browse", and you may check how many songs have been program-med into playlist. When browsing play list. Pressing button may begin playing.



Note:

Playback will be paused when in "Browse" or "Edit list".

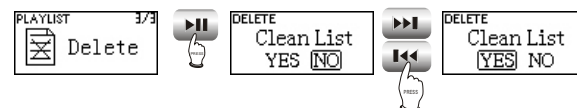
#Edit



As in the above illustration, enter "Edit" and browse files. The icon before songs in the playlist is "P". Select a song not in the playlist and press button to add it into the list. Select a song in the playlist, and press button to cancel it from the playlist. You can add 15 songs into the playlist at most.

#Delete

Select "Delete". After dialogue box pops up, select "YES", and press button to confirm and the playlist is cleared.



NOTE

#If the operation of adding or cancelling music files is detected, MP3 PLAYER will clear the playlist automatically.

#You cannot enter "Edit list" and "Clear list" when in program playback.

2.3.6 FM CHANNEL

You can select the FM channel in settings. When select Auto, it changes the channel automatically. When select Mono, it tunes at Mono channel all the time.



2.3.7 LOCK SETUP

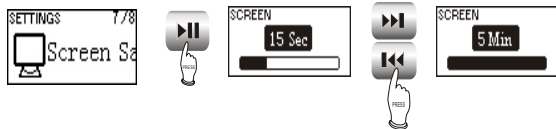
Entering this menu may open or close auto buttons lock function. If "Lock Enable" is selected and not any button is operated during 30 seconds, all button functions will be locked automatically.



CAUTION: Lock is only effective in playback, recording and tuning modes.

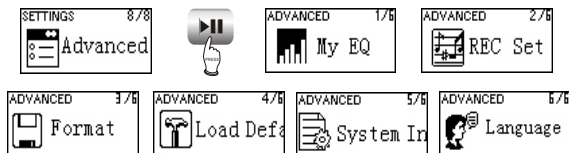
2.3.8 SCREEN SAVE

Press or button to adjust the screen saver time. After setup finishes, press button to save and then exit, and press button not to save and then exit. If the screen saver setup time is 3 minutes and no operation occurs within 3 minutes, MP3 PLAYER will enter screen saver state automatically.



2.3.9 ADVANCED

Advanced items include some other system internal setup, such as user sound effect setup, default setup and system information.

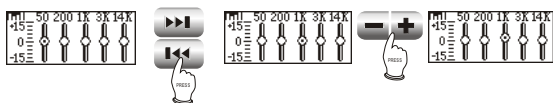


#My EQ

In "My EQ" interface, you may see the decibel (dB) of each frequency.



If you want to adjust the decibel of mediant (1k HZ), operate according to the below illustration.



When adjusting width, take 3dB as a step and the max adjustable range is ± 15 dB. After setup finishes, press button to confirm and exit, and press button to exit with the original setup not being changed.

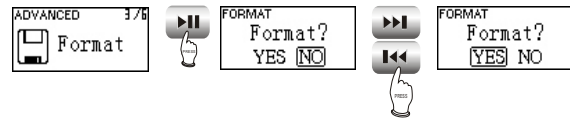
#REC Set

Here to set the recording quality, The recording quality is higher, the sound quality is better and the used space is more. Three kinds of recording quality adopt IMA-ADPCM format coding.

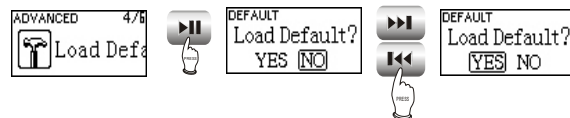


#Formatting

Enter this menu, and you may format hard disk. When dialogue box pops up, press / button to move cursor to "YES", and then press button to confirm to finish formatting operation.



#Default



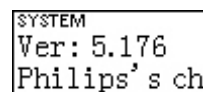
If you want to restore MP3 PLAYER to factory setup state (data and song files cannot be cancelled), you may select "Load Default". After dialogue box pops up, select "YES", press button to confirm and then exit to restore to default state. Select "NO" or press button to cancel.

CAUTION:

Restore to "Default" state is effective only when power on again.

#System Info

You may find information of firmware version, total disc capacity and left disc capacity. In system information menu, press button to return to the previous menu.



CAUTION:

Because firmware will use some space, the displayed content capacity may probably be different from the actual capacity.

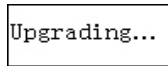
#Languages

Russian and English are supported.



#Upgrade

Download the latest firmware upgrading file from BBK website firstly, such as "BBK_X31RU.ebn" and "X31RU_Resource.bin", copy the two files into MP3 PLAYER at the same time, and then power on again. Find "Upgrade" item in "ADVANCED" of "SETTINGS", and pressing button may start upgrading. After upgrading finishes, MP3 PLAYER will power on again.



NOTE

#Only Mp3 player detects that there is upgrading file in system when this player power on, "Upgrade" menu will appear in "ADVANCED" item.

#Make sure Mp3 PLAYER has enough quantity of electric charge before upgrading.

#To ensure successful firmware upgrading, do not power off during the course of upgrading.

#Upgrading will last for 10 seconds or more, please try your best not to operate other buttons during this course.

#After firmware upgrading finishes, some function or interface may probably be different from user manual, so please take real object as standard.

2.4 SPECIFICATION

Model	X31
Audio decode chip	Philips PNX0102
Lithium battery	3.7V 170mAh
Continuous playback time	The longest time is about 7 hours
Dimensions/weight	57.4mm × 36.5mm × 12.5mm about 23.1g
Audio SNR	≥90dB
Headphone out	9mW+9mW(320hm impedance)
Frequency range	18Hz~20kHz
FM tuning range	87.5MHz~108MHz
Working temperature	0~40°C
Files supported	MPEG 1/2 Layer 3(16kbps~320kbps)、WMA(8kbps~192kbps)、WAV

Chapter Three Servicing and Principle

Section One Principle of the Player

3.1.1 Function introduction

1. Mp3 main decode chip, which adopts professional MP3 decode chip PNX0101 of Philips company, with integrated ARM and DSP core inside. Sound quality is good and power consumption is low.

2. USB jack circuit: USB jack, data exchange.
3. Flash circuit: data storage of the player.
4. OLED circuit: display of working state of the player.
5. MIC circuit: external audio input, record function finishes.

3.1.2 Block diagram of the player

Block diagram of the player is shown in the figure 3.1.2.1:

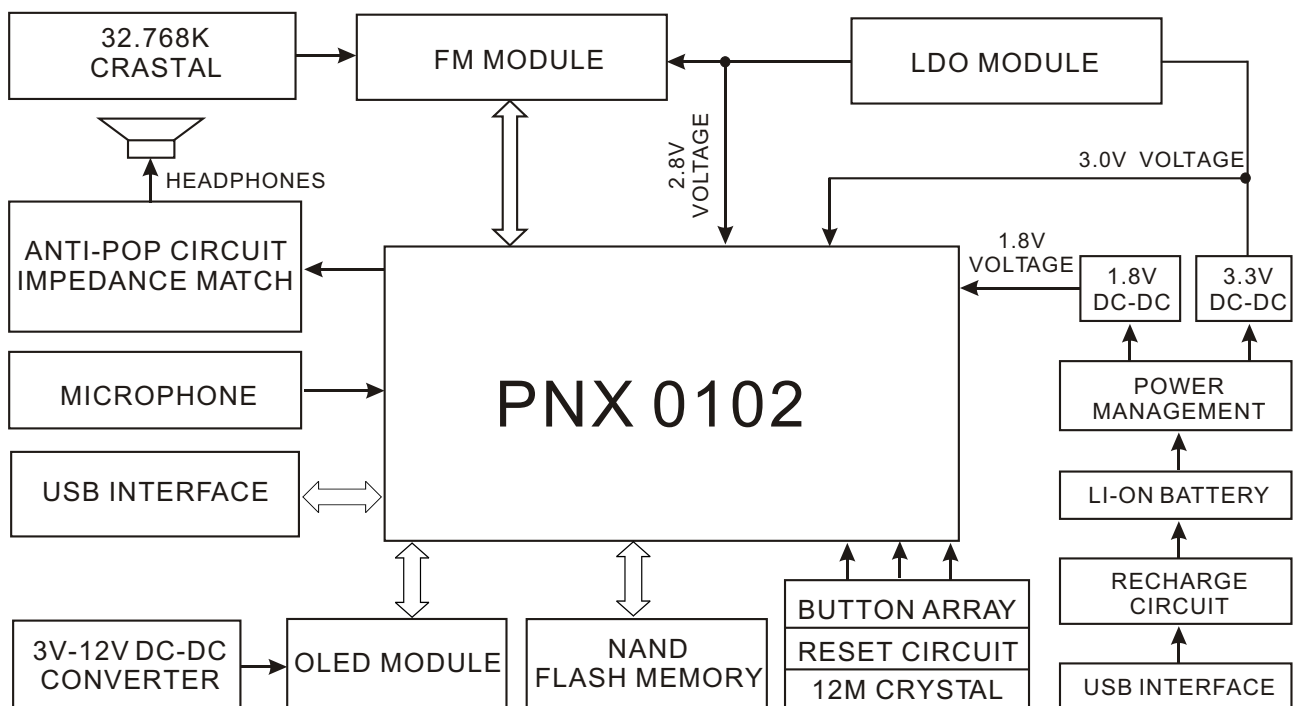


Figure 3.1.2.1 block diagram

3.1.3 Introduction to IC of the player

Introduction to IC of the player is shown as in the following table:

IC model	IC model	Function
TPS79301	U1	Precision voltage stabilizer
G690L263T71	U2	Reset IC
TPS62200	U3	Precision voltage stabilizer
ISL6294IRZ	U4	Charge management
PIC10F200T	U5	Voltage detect
PNX0102AEX	U6	MP3 decode
PQ1X281M2ZP	U7	Precision voltage stabilizer
K9F4G08U0M	U8	Flash
SI1912	U9, U10	Dual MOS tube
LM2703	U11	12V boost
TEA5767HN	FU1	TuningIC

Section Two Unit Circuit Principle

3.2.1 FLASH circuit

1. FLASH circuit schematic diagram is shown in the figure 3.2.1.1:

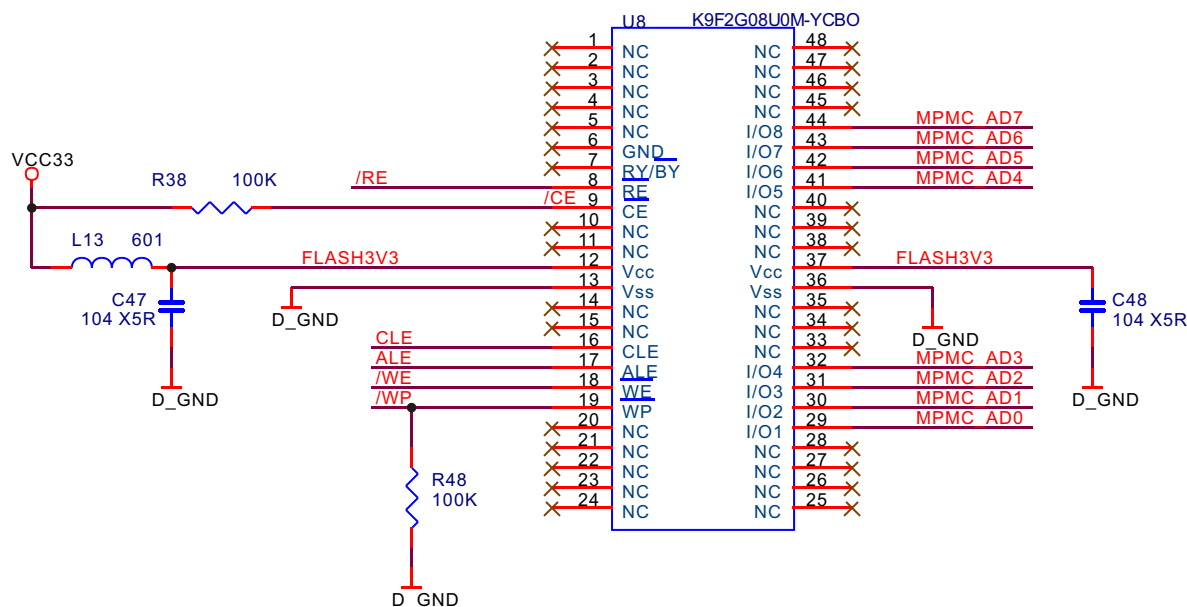


Figure 3.2.1.1 Flash circuit schematic diagram

2. Working principle: Flash Memory is the storage unit of the player, all Mp3 and waveform files should be stored in FLASH. Flash module is composed of FLASH chip K9F2G08U0M and peripheral circuit to finish internal files's working of read, write and delete. 3.3V volatge circuit provides 3.3V voltage for FLASH working. R38 is pull up resistor of /CE, R48 is the pull down resistor of /WP, Vcc is power supply pin of FLASH, /CE is chip selection signal, high level is effective, VCC33 provides 3.3V voltage and FLASH begins to work./RE, /WE are read effective and write effective signal end respectively to control read and write function of FLASH. I/O1 - I/O8 are 8 data lines to complete the exchange of FLASH and external data to realize functions of write, delete and edit of Mp3.

When Mp3 is powered on, 3.3V voltage supplies power for Flash through Vcc, /CE inputs 3.3V high level signal and Flash begins to work effectively. When Mp3 laying music, /RE is high level, Flash performs read operation. When writing files in through data line or recording through microphone, /WE is high level, Flash performs write in operation. Working of read out and write in are performed through I/O1~I/O8 8 data/address lines.

3.2.2 FM tuning circuit

1. FM tuning circuit diagram is shown in the figure 3.2.2.1;

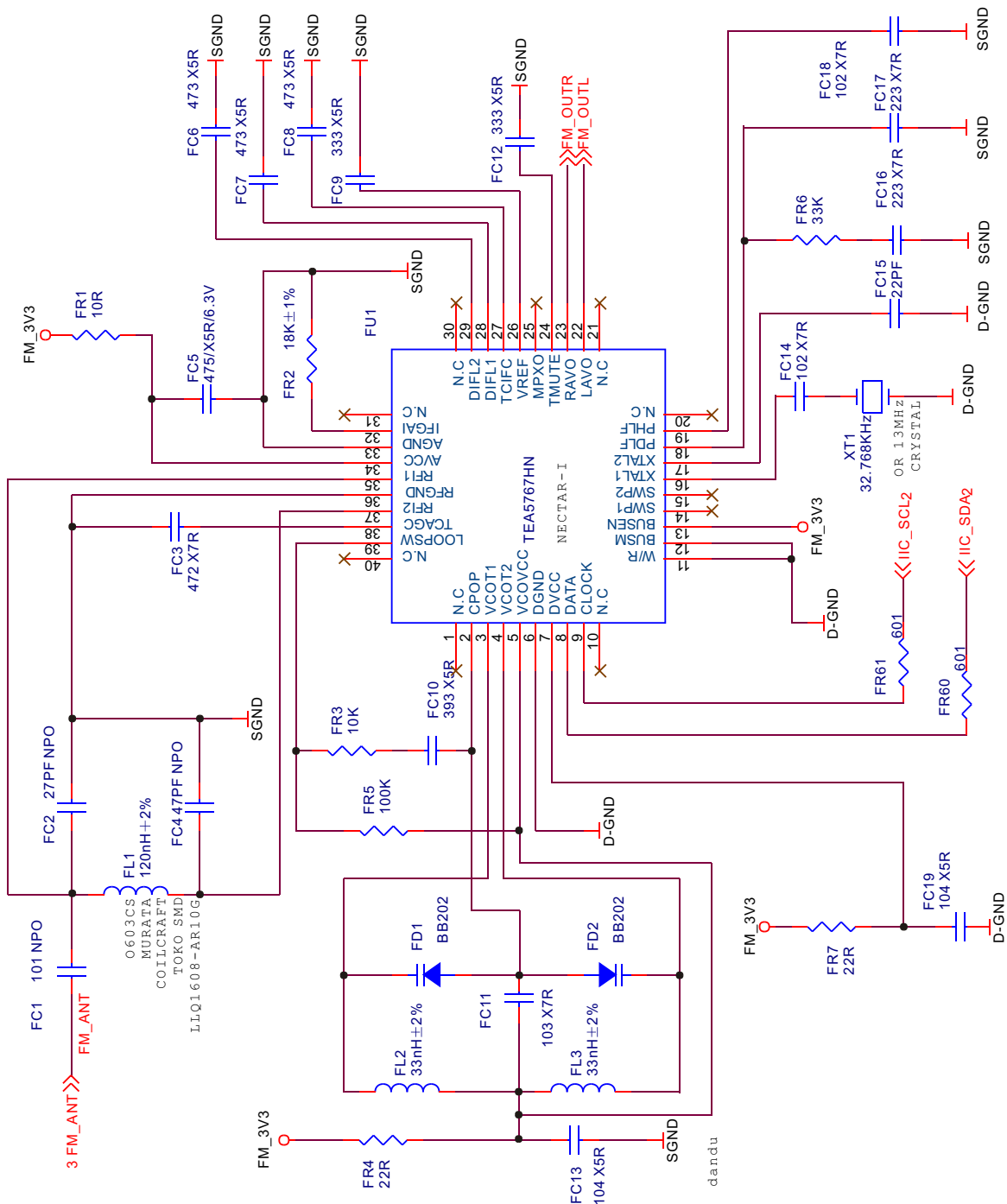


Figure 3.2.2.1 FM tuning circuit diagram

2. Working principle: tuning circuit is composed of micro digital tuning IC TEA5767HN of Philips company and peripheral circuit. Power supply voltage is supplied by PQ1X28 to provide pure voltage with value 2.8V for IC. FC1, FC2, FC3, FC4 and FI1 are antenna input matched circuit of FM module; variable diode Fd1, Fd2 and winding inductor is tuning circuit in FM module. Control of FM adopts IIC bus control means, 8, 9 of TEA5767 are data line and control line.

When MP3 player switches to FM tuning state, pin 13 BUSEN of TEA5767HN receives high level signal, bus control mode is gated, IC begins to work. As antenna, headphone receives FM signals from nature, through antenna input matching circuit, input TEA5767HN, PNX0101 via RF11 and RF12 to control TEA5767HN to perform intermediate frequency and selected frequency control through IIC_SCL and IIC_SDA to transform FM signals to sound simulating signals and then is outputted by FM_OUTR and FM_OUTL to ADC circuit of PNX0101 and then output through headphone after DAC processing.

3.2.3 OLED module circuit

1. OLED module circuit is shown in the figure 3.2.3.1:

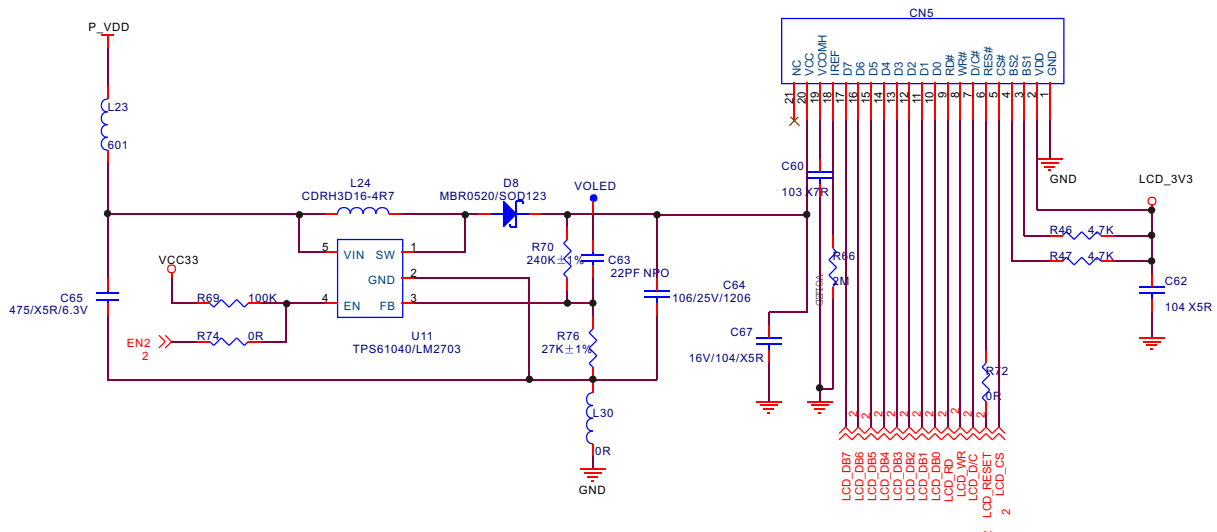


Figure 3.2.3.1 OLED circuit schematic diagram

2. Working principle: 12V high voltage is required to lighten OLED and matching circuit must be matched to finish. The circuit includes two parts: boosted circuit and OLED jack circuit, in which boosted circuit is constituted by boosted DC-DC LM2703 and peripheral circuit, VIN is power input, EN is Lm2703 enable end, high level is effective, SW is high voltage output pin, FB is feedback pin, voltage value VOLED outputted by high voltage is achieved through selecting two voltage partial resistor on two ends of FB, and the following relation is met:

$$\frac{R_1}{R_2} = \frac{VOLED}{1.237} - 1$$

Seen from the above, VOLED is about 12.2V. L25, C62 in circuit are energy storage inductor and output capacitor of boosted circuit.

3.3V voltage inputs LM2703 through Vin, EN receives the high level through current limit by R1 to make LM2703 effective, 3.3V voltage is outputted by SW pin through LM2703 voltage rise, output to pin 20 of OLED through voltage stabilizing pipe D4 to provide lighting voltage for OLED. During the course of working, FB feedback to LM2703 through detecting energy storage capacitor C65, output voltage may be controlled through adjusting resistor R49 and R53.

OLED jack circuit is connected with OLED of PNX0101 directly, through data exchange of LED_DB0~LED_DB7 and PNX0101, character display is controlled by internal program of PNX0101.

Pin 6 of OLED is reset signal and controlled by one MPMC jack of PNX0101. When power on, high level outputs and OLED resets.

3.2.4 Buttons circuit

1. Buttons circuit is shown in the figure 3.2.4.1:

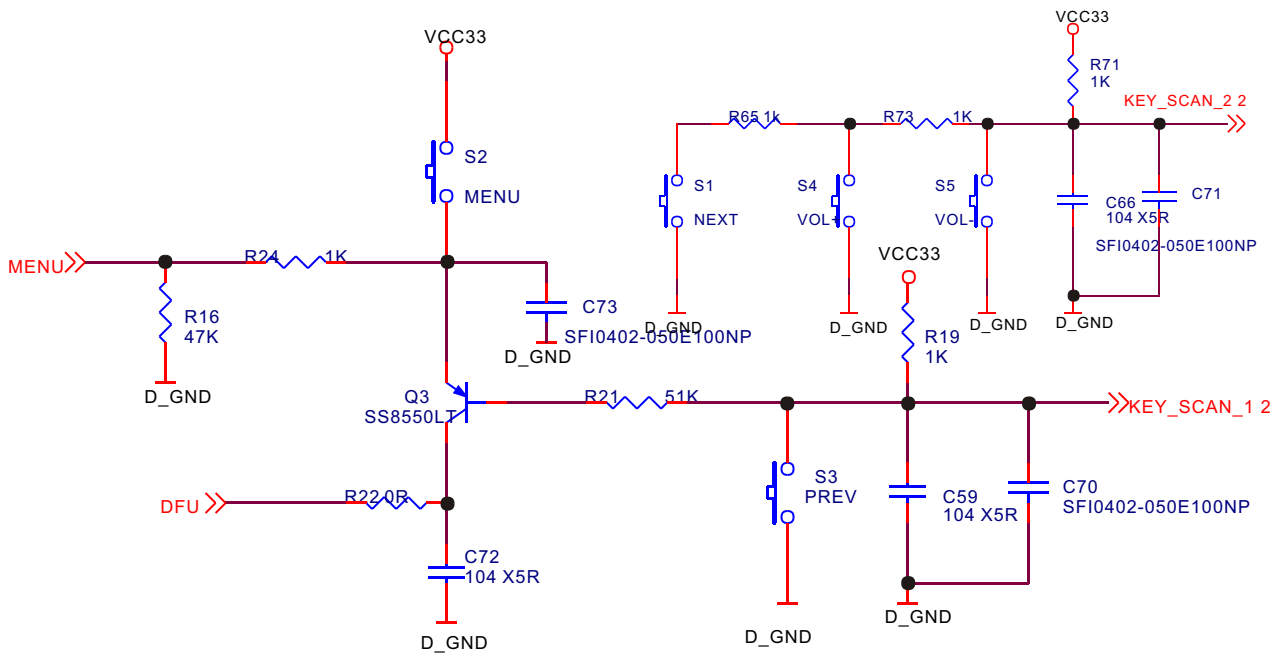


Figure 3.2.4.1 Buttons circuit schematic diagram

2. Working principle: buttons of X23 (RU) are composed of 6 single buttons (one is OPEN/CLOSE and PLAY button, which will be introduced in power on/off circuit). Button detecting uses voltage division mode, which uses ADC circuit of PNX0102, through scanning KEY_SCAN_1_2 and KEY_SCAN_2_1 voltage variation, detects preset voltage value of buttons to decide which button functions; when the relevant button is pressed, the voltage value of the relevant preset point of this button will change; voltage inputs to ADC circuit of PNX0102, and the internal program makes the corresponding response to realize function of each button.

3.2.5 Headphone jack circuit

1. Headphone jack circuit is shown in the figure 3.2.5.1:

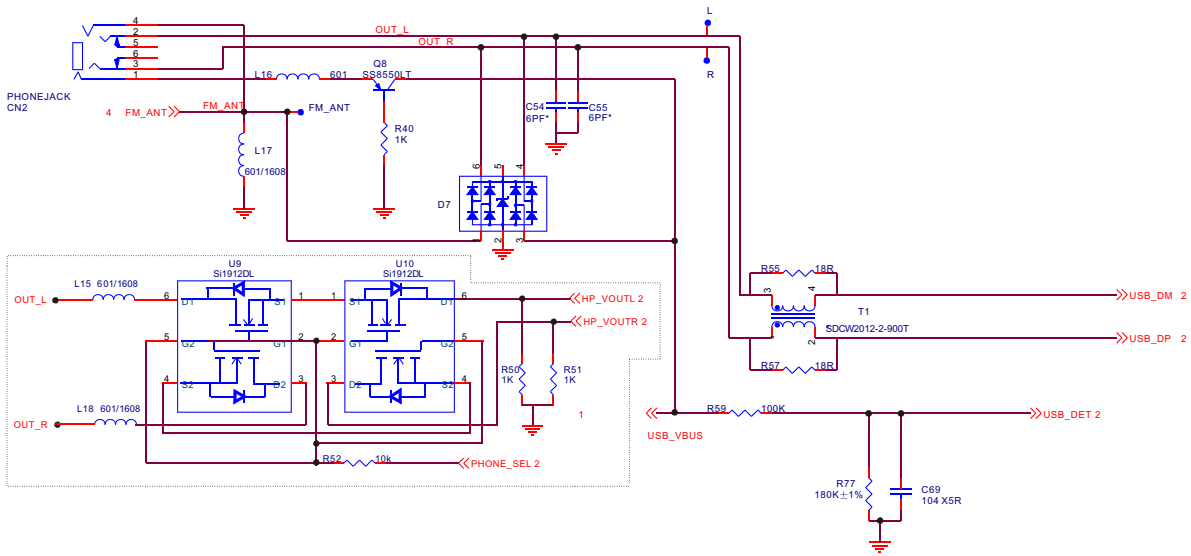


Figure 3.2.5.1 Headphonejack circuit schematic diagram

2. Working principle: headphone audio output jack of X31 (RU), USB jack and charge jack are all integrated on headphone socket, so headphone jack circuit fulfills 3 functions of audio output, USB data change and charge, in addition, ground wire of headphone is also used as antenna input of FM tuning circuit.

Left and right channel audio signals that output from PNX0102 are being coupled by 220uF capacitor (C31, C32) and then output to headphone jack circuit. Headphone jack circuit is composed of the dual MOS tube SI1912DL that controls sound output and the socket Cn2; pin 2 and 5 of SI1912DL are connected with mute circuit; when MUTE button is pressed, dual MOS tube is cut off to cut output of headphone left and right channel; D1 in circuit is TVS diode array used for ESD protection to prevent external static damaging internal circuit through headphone jack.

USB jack line is composed of USB_VBS, USB_DP, USB_DM and GND. PNP triode Q8 in circuit has reverse insert protection function to avoid damaging MP3 internal circuit because of reverse insert. USB jack is directly connected with USB control module of PNX0102; after MP3 is connected with computer, high level of computer USB jack inputs to USB_DET of PNX0101, USB jack is effective; USB connects with PNX0102 through USB_DP and USB_DM and then connects with flash by PNX01021 to fulfill the exchange of Flash internal data and computer internal data.

Meanwhile, USB_VBUS is connected with pin 1 IN of charge management IC ISL6294 to realize the charge to lithium battery. Charge management circuit will be introduced in the next section.

3.2.6 Charge control circuit

1. Charge control circuit fulfills the charge function to lithium-ion battery and circuit diagram is shown in the figure 3.2.6.1:

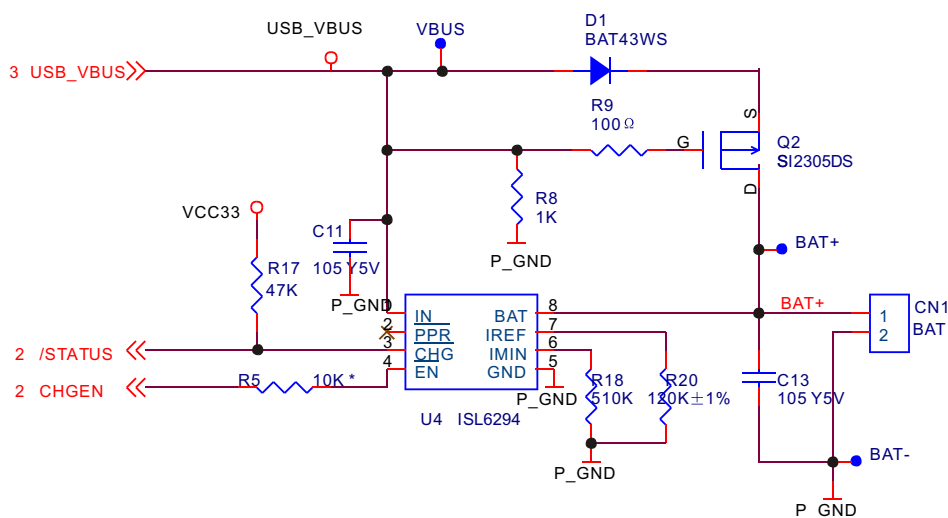


Figure 3.2.6.1 Charge control circuit diagram

2. Working principle: charge circuit is composed of charge control IC ISL6294 and peripheral circuit. Pin IN is ISL6294 power input pin, that is input end of USB 5V power; BAT is output pin of ISL6294, that is input end of lithium-ion battery; /CHG is charge state indication end; when /CHG is low level, it means machine is in charge, or else it means the charge finishes; IMIN is min charge current setup end, that is, when charge current is lower than the current set by this end, charge is terminated. Setup of min charge current is realized through selecting external resistor R18. The relation between min charge current I_{MIN} and R18 is shown as follows:

$$I_{MIN} = \frac{11000}{R20} \text{ (mA)}$$

From the above, we know that min charge current is 20 mA.

IREF is charge current setup end and ISL6294 uses this reference current to charge lithium battery. Relation between charge current I_{REF} and external resistor is shown as follows:

$$I_{REF} = \frac{12089}{R}$$

3.2.7 Battery protection circuit

1. Battery protection circuit board is installed on lithium battery and used to prevent lithium battery from damage of short-circuit, over discharge and over charge. Lithium battery and battery protection circuit board are together called lithium battery core components. Battery protection board circuit diagram is shown in the figure 3.2.7.1:

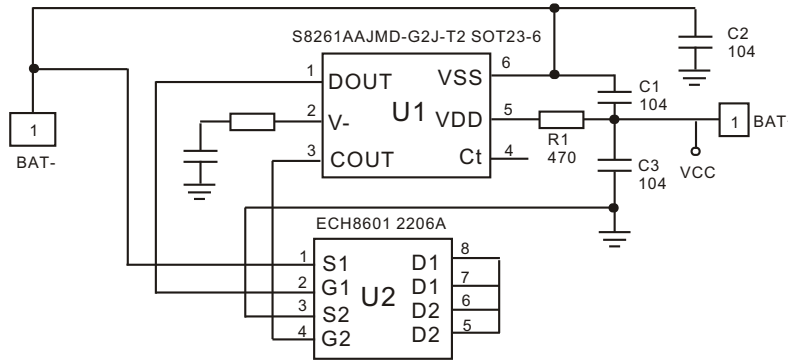


Figure 3.2.7.1 Battery protection circuit diagram

Equivalent circuit diagram of battery protection circuit is shown in the figure 3.2.7.2:

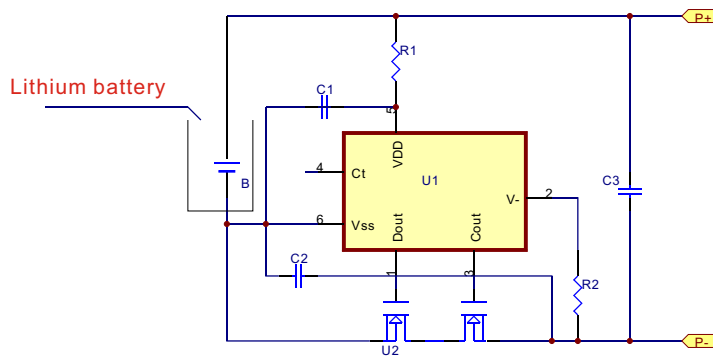


Figure 3.2.7.2 Battery protection circuit equivalent diagram

2. Working principle: battery protection circuit is mainly composed of battery protection IC S8261 and internal dual N groove MOSFET ECH8601. S8261 is the protection IC of the lithium-ion polymer chargeable battery of internal high precision voltage detect circuit and delay circuit. DOUT and COUT pin are over discharge (when lithium battery voltage is lower than 2.4V) protection output end and over charge (when lithium battery voltage is higher than 4.2V) protection output end. The two pins are high level when working normally; MOSFET is on and lithium battery voltage outputs to the player through protection board; when in protection, the two pins output low level to control MOSFET to cut off power. Over current detect (short-circuit protection) is fulfilled through the control of DOUT and COUT output by V- pin when detecting short-circuit state; when battery is in short-circuit, voltage on V- external resistor R1 will have a sudden change, V- detects that voltage on R2 increases immediately and then outputs to control DOUT and COUT and outputs low level at the same time to control MOS tube to cut off battery to protect battery.

3.2.8 Power circuit

1. 3.3V power circuit is shown in the figure 3.2.8.1:

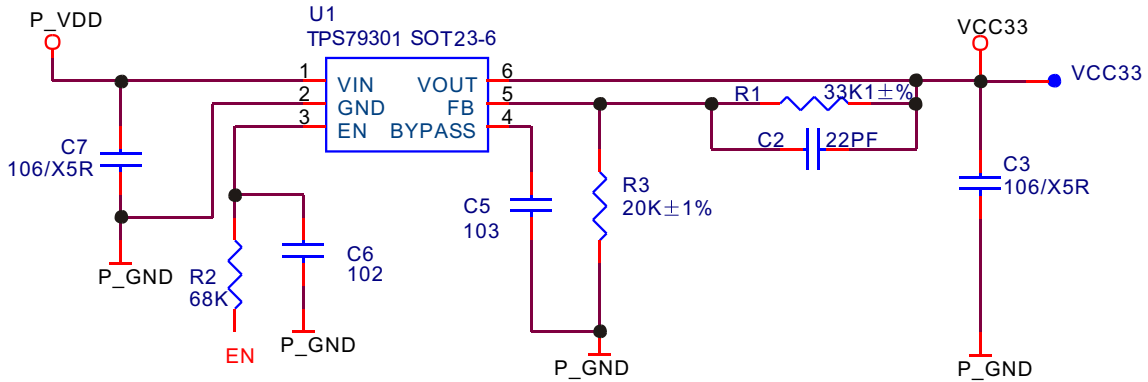


Figure 3.2.8.1 3.3V power circuit

3.3V power is supplied by IC TPS79301 and peripheral circuit. TPS79301 is linear voltage stabilizing module (also called LDO), EN pin is the enable pin that controls normal working and high level is effective; BYPASS has resistor inside and constitutes low-pass filter with external 103 capacitor C5 to decrease output noise; setup of TPS79301 output voltage is decided by two external resistors of FB pin and the relation is shown as follows:

$$VOUT = 1.2246 \times \left(1 + \frac{R_1}{R_2} \right)$$

From the above, we know that $VOUT$ is 3.2V.

2. 2.8V power circuit is shown in the figure 3.2.8.2:

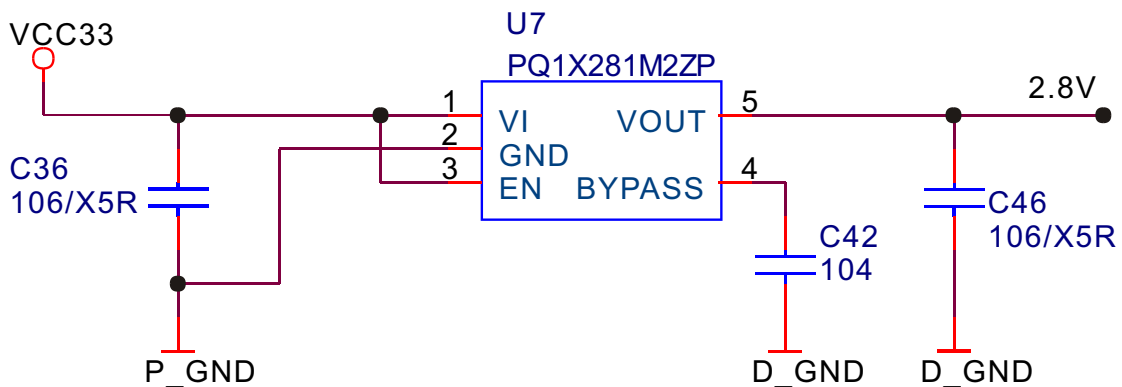


Figure 3.2.8.2 2.8V power circuit diagram

1.8V power is supplied by IC TPS62200 and peripheral circuit. TPS62200 is high efficiency reduce DC-DC converter; EN pin is enable pin and high level is effective; the relation between TPS62200 output voltage and FB pin feedback resistor is :

$$V_{OUT} = 0.5 \times \left(1 + \frac{R_4}{R_5} \right)$$

From the above, we know that output voltage is about 1.75V.

3. 1.8V power circuit is shown in the figure 3.2.8.3:

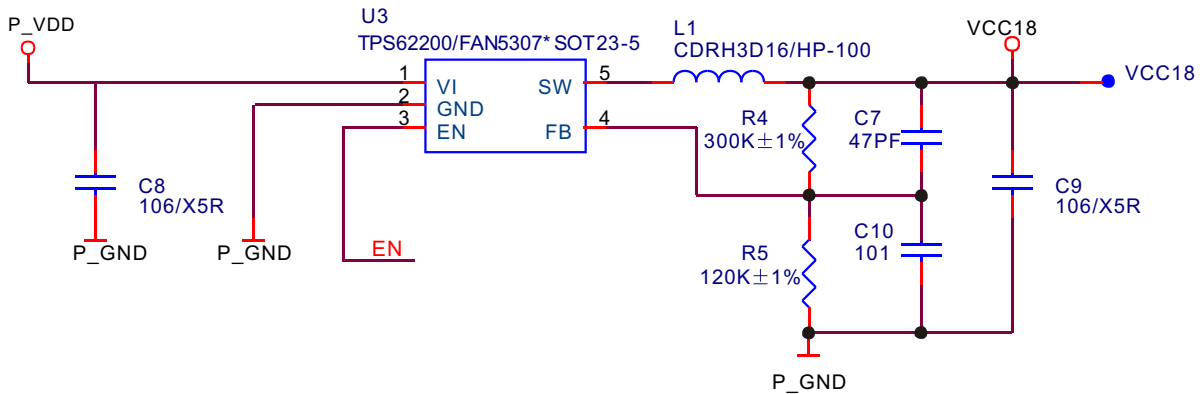


Figure 3.2.8.3 1.8V power circuit diagram

In order to enhance and better sound quality of Mp3, FM tuning and microphone effect, TPS62200 provides 2.8V power with low ripple interference. EN is enable end and high level working.

3.2.9 Reset circuit

1. Reset circuit is shown in the figure 3.2.9.1:

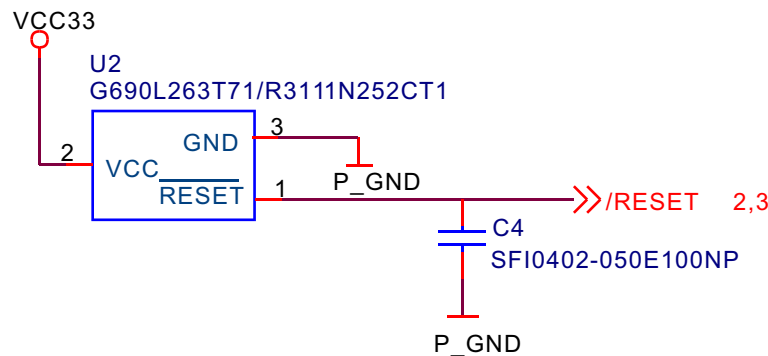


Figure 3.2.9.1 Reset circuit diagram

2. Working principle: reset circuit is composed of reset IC G690L263 (U2). When power on, pin 2 level of G690L263 changes from 0V to 3.3V, pin 3 outputs a low level reset pulse signal with pulse width 140 millisecond which inputs to T14 pin of PNX0101 for the reset of the player; C11 in the circuit is pressure responsive resistor used to protect ESD.

3.2.10 Power on/off circuit

1. Power on/off circuit diagram is shown in the figure 3.2.10.1:

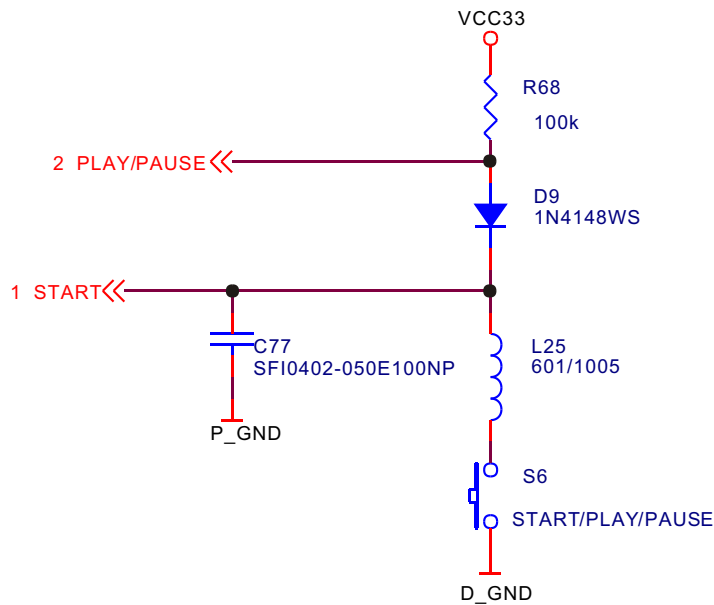


Figure 3.2.10.1 Poweron/off control circuit diagram

2. Working principle: when users are operating “ON/OFF” button S6, the player is powered on; press S6 for long and S6 is connected, voltage in STAT point is pulled down to ground, START sends out low level signal through U5 to PNX0102 and the player starts up. If you want to power off, press S6 button for long, PNX0102 sends out OFF signal and the player stops working.

S6 is also PLAY/PAUSE button; L3 pin of PNX0102 detects voltage on R68 and makes PLAY/PAUSE action when pressing S6 button.

3.2.11 Microphone circuit

1. Microphone circuit is shown in the figure 3.2.11.1:

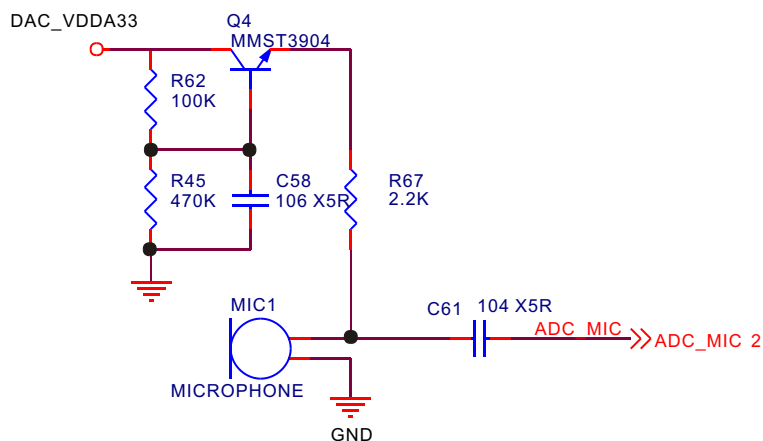


Figure 3.2.11.1 Microphone circuit diagram

2. Working principle: microphone circuit is composed of microphone and microphone power bias circuit. MIC1 switches the recorded external voice signals into electric signals, through C61 coupling, outputs to ADC circuit of PNX0101 to switch analog electric signals into digital signals and forms WAV files through software encoding and saves in FLASH. R62, R45, Q4 and C56 in circuit is triode voltage stabilizing system, which provides microphone with stable power bias, R67 is bias resistor of microphone.

Section Three Servicing Cases

3.3.1 Servicing cases

[Example 1] Symptom: power not on

Description: no OSD and no output

Analysis and troubleshooting: connect with power adapter and check whether charge is available and whether screen has display and result is that there is no display; take down machine and check power supply 3.3V and 1.8V, we find that 3.3V decreases to 0.6V; use power adapter to supply power, input 5V is normal, charge enable end is high level and it is also normal; observe carefully and find that pin 2 of U1 (TPS79301) has false welding; after weld again, trouble is removed.

[Example 2] Symptom: machine cannot be switched on

Description: press ON button, screen has no display and headphone has no output.

Analysis and troubleshooting: firstly make sure whether machine cannot be switched on or power not on; connect with power adapter or computer and check whether screen displays normally; connect with power adapter and charge can display, which means that power and rear stage circuit working is normal; power on/off circuit, through a light touch switch S5, forms loop after closing; a Start signal produces and enters U5 (PIC10F200) pin 1 high level to make pin 4 produce a high level to give power an enable end signal to control whether the whole circuit works; test S5 switch, press SHUT and check whether it is on; when testing, we find that S5 has false welding; after welding again, trouble is removed.

[Example 3] Symptom: noise appears when tuning

Description: noise appears when tuning.

Analysis and troubleshooting: firstly judge whether tuning components or common part has trouble, whether one side of headphone has sound when listening, and the result is normal; then switch to tuning State, search radio station automatically, tuning is normal, which means power supply, data and clock are normal; we remote external interference, receive the nearest local radio station and check whether it is clear, and the result shows noise still exists; circuit that causes noise is high frequency tuning and mixed frequency part; carefully check and find that pin 37 of tuning FU1 (TEA5767HN) is false welding; weld again and trouble is removed.

[Example 4] Symptom: no OSD

Description: screen has no display

Analysis and troubleshooting: firstly confirm whether trouble lies in power or screen itself; power on and listen to the sound and sound is normal, so it is preliminarily judged that power supply 3.3V and 1.8V are both basically normal. Firstly test voltage on two ends of L24 and it is about 4.3V, which is basically normal; then test voltage on two ends of D8 and find that anode has no 13V voltage, take down display screen and there is still no; check input end voltage and enable voltage and they are basically normal, then check FB end voltage of feedback pin and it is obviously low, R74 of EN enable end has false welding, after welding again, trouble is removed.

[Example 5] Symptom: screen has mosaic

Description: display screen has mosaic and display has disorder

Analysis and troubleshooting: this troubleshooting is the same with that of no screen display, with the difference is that power supply is normal; firstly confirm whether the screen itself has trouble or circuit has trouble, change display screen and trouble still exists, then use oscillograph to test the 8-digit number of OLED screen and find that flat cable holder of display screen has false welding, after welding again, trouble is removed.

[Example 6] Symptom: noise when recording

Description: there is noise when playing record files

Analysis and troubleshooting: schematic diagram of record circuit is shown in the figure, it is mainly composed of microphone and microphone power bias circuit, MIC circuit schematic diagram is shown in the figure 3.3.1.2. MIC switches the external voice signals recorded into electric signals, through being coupled by C61, output to ADC circuit of PNX0101 and form WMA files through software coding to save in Flash. When repairing this kind of machine, firstly play files and check whether there is noise and there is no; check recording circuit and power supply is normal; when recording, use oscillograph to test C61 and there is noise interference, after changing MIC, trouble is removed.

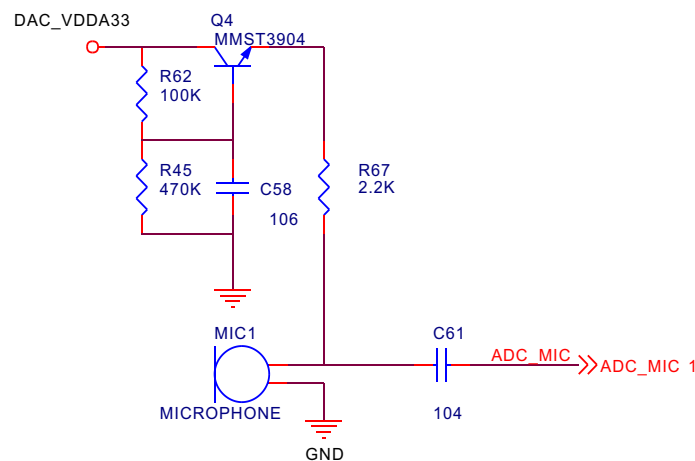


Figure 3.3.1.2 MIC circuit schematic diagram

[Example 7] Symptom: cannot connect with computer

Description: no display after connecting with computer and disk cannot be found

Analysis and troubleshooting: if software program is incorrect or lost, machine may probably not be switched on or machine failure will happen; when this trouble appears, please fresh the software firstly; firstly check whether software upgrading is available and then down load software program; after upgrading software, trouble is removed.

[Example 8] Symptom: cannot charge

Description: charge mode can display but in fact charge function is not available

Analysis and troubleshooting: charge mode and charge can both display but the player cannot be fully charged; after 3 hours, unplug power adapter and power on, low battery charge displays and then power off automatically; you may enter charge mode and there is charge indication, which means there is power input, BAT and CHG are normal, so we should consider charge control pin, check IMIN current control end, when current of this pin is very small, charge stops; R20 has false welding; after welding again, trouble is removed.

[Example 9] Symptom: cannot connect with computer

Description: no response and no OSD after connecting with computer

Analysis and troubleshooting: firstly make sure whether charge and power on are normal and the result is normal; use diode level of multimeter to test the resistance to ground of D+, D- data signals in USB terminal position and it should be close to several hundred ohm, but we find that D+ resistance value is normal, D- resistance value is infinite and USB terminal has false welding; after welding again, trouble is removed.

[Example 10] Symptom: noise appear when playing

Description: headphone output noise when playing

Analysis and troubleshooting: if there is noise when playing, it is BGA that has trouble, for playback and other functions are all normal, only there is noise, so it is necessary to analyse whether decode [art or rear stage causes this trouble, when playing 1KHZ standard signal, there should be sine wave signals and not any noise; test C31, C32 waveform close to BGA, so we judge that it is BGA that has trouble; after changing it, trouble is removed.

3.3.2 Troubleshooting flow chart

1. Troubleshooting process for “No screen display” is shown in the figure 3.2.2.1:

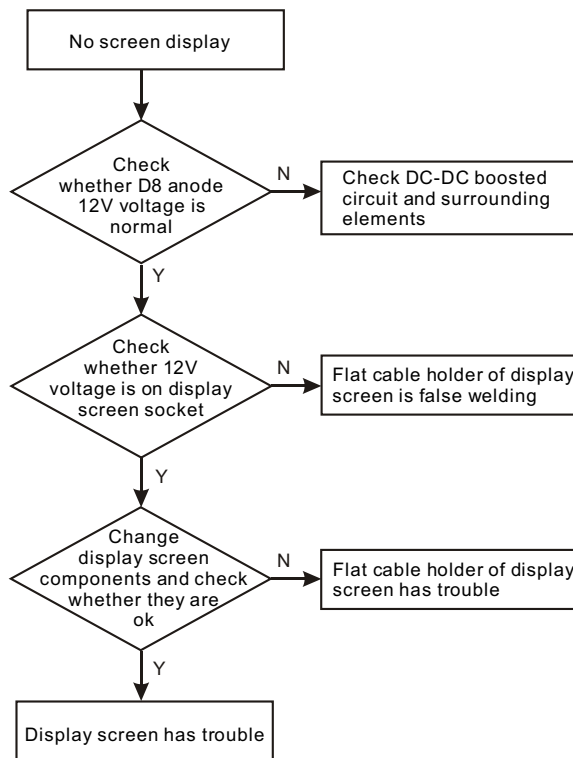


Figure 3.3.2.1 Trouble shooting flow chart for “No screen display”

2. Troubleshooting process for “USB not connected” is shown in the figure 3.2.2.2:

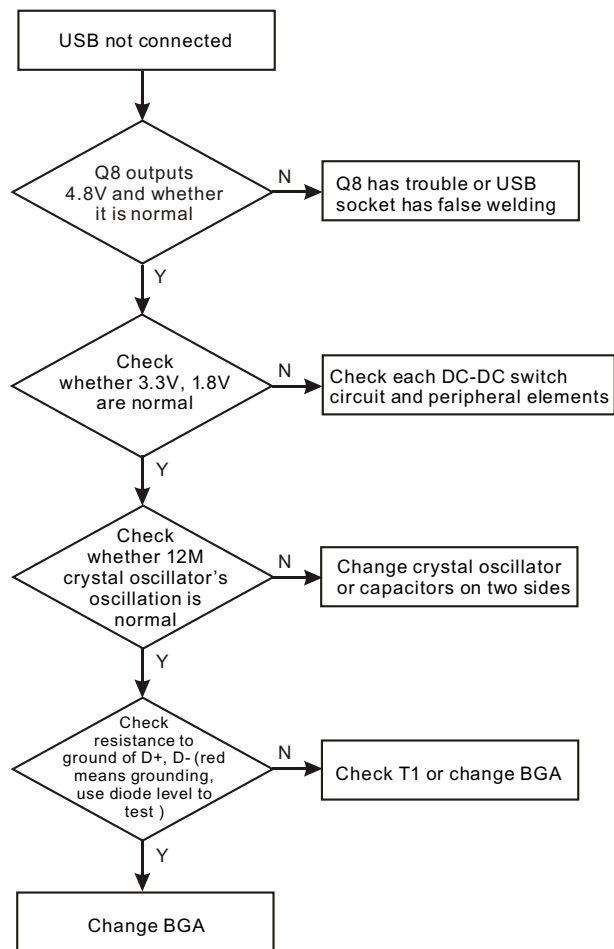


Figure 3.3.2.2 Troubleshooting plow chart for “USB not connected”

3. Troubleshooting process for “Buttons have no function” is shown in the figure 3.2.2.3:

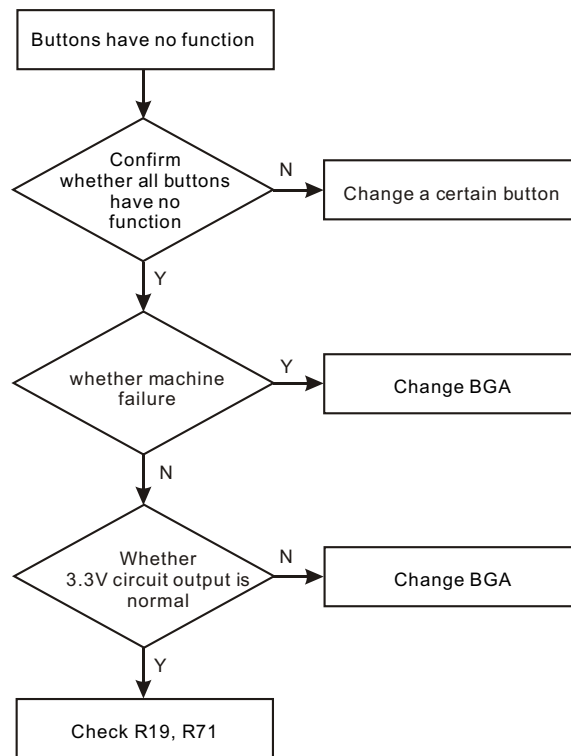


Figure 3.3.2.3 Troubleshooting flow chart for “Buttons have no function”

4. Troubleshooting process for “No tuning function” is shown in the figure 3.2.2.4:

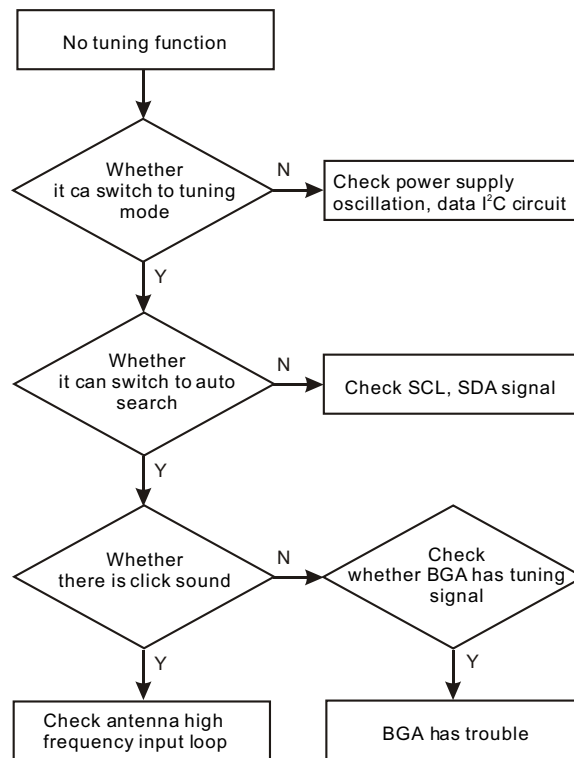


Figure 3.3.2.4 Troubleshooting flow chart for “No tuning function”

5 . Troubleshooting process for “Cannot charge” is shown in the figure 3.2.2.5:

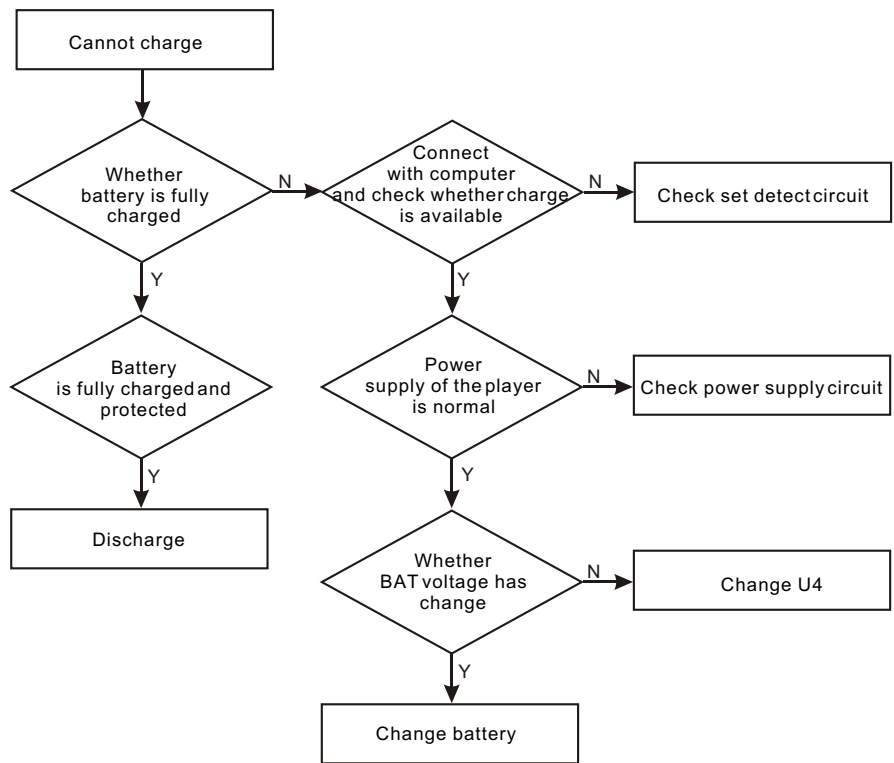
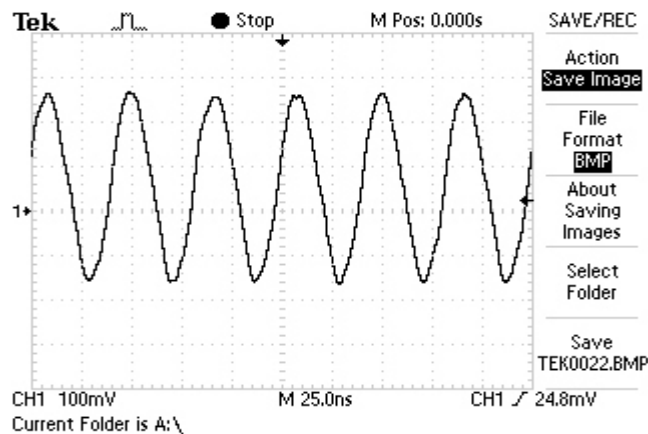


Figure 3.2.2.5 Troubleshooting flow chart for “Cannot charge”

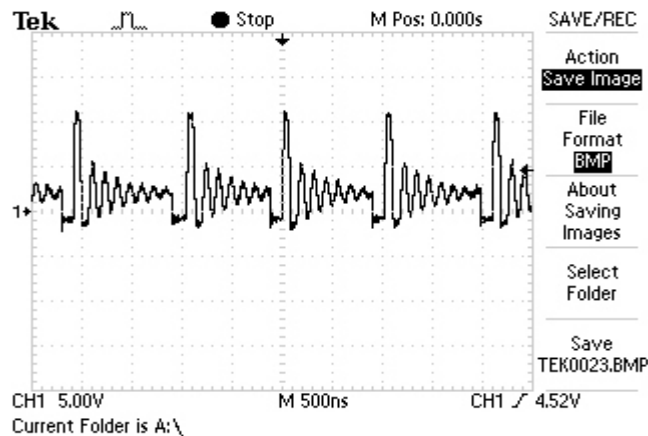
Section Four Waveform diagram

This section collects signal waveform diagram of audio, video and each unit circuit with the purpose to help servicing personnel to judge where trouble lies in accurately and quickly to improve servicing skills. For the difference of oscillograph's type, model and tuner, a certain difference may exist, so the servicing personnel are expected to pay more attention to check in daily operation.

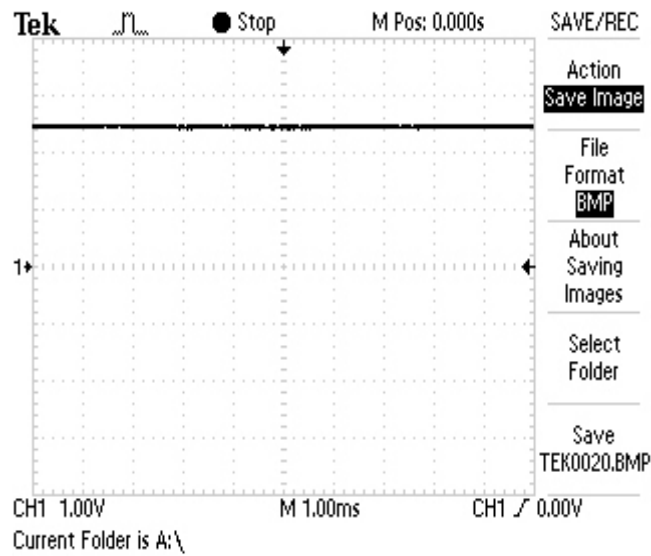
1. 12M crystal oscillator oscillation waveform diagram



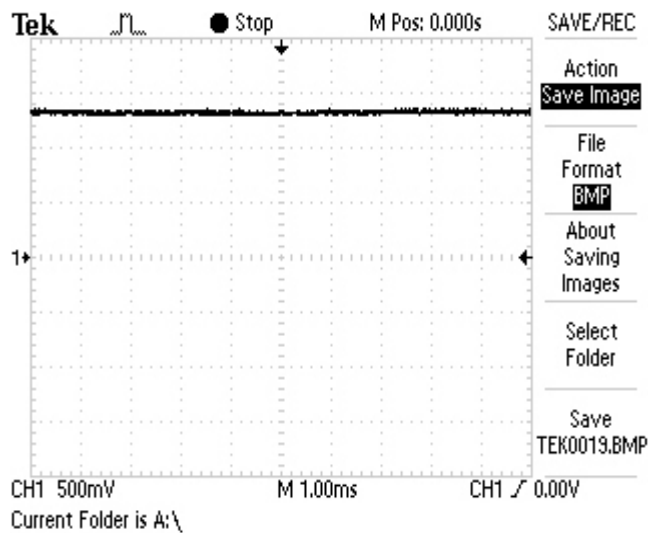
2. L25 boosted energy storage waveform diagram



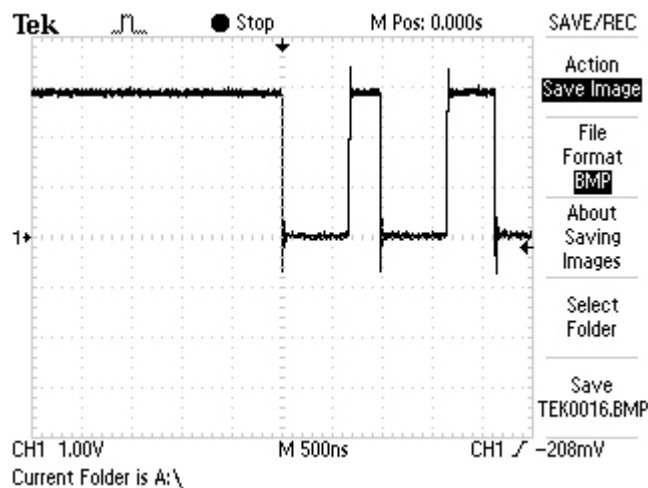
3. Software power supply 3V3 waveform diagram



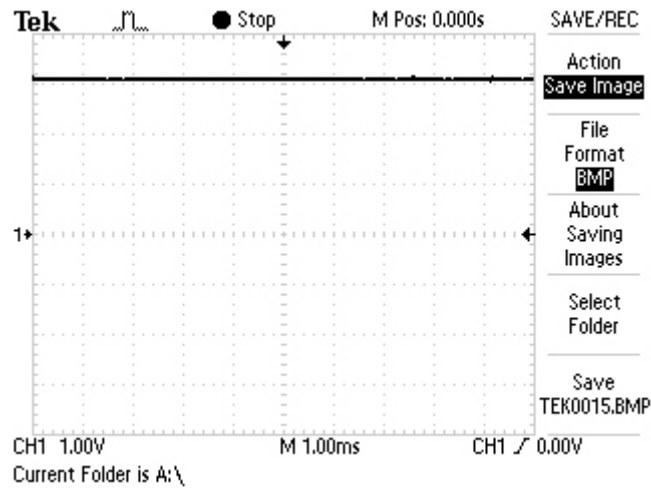
4. LCD_3V3 waveform diagram



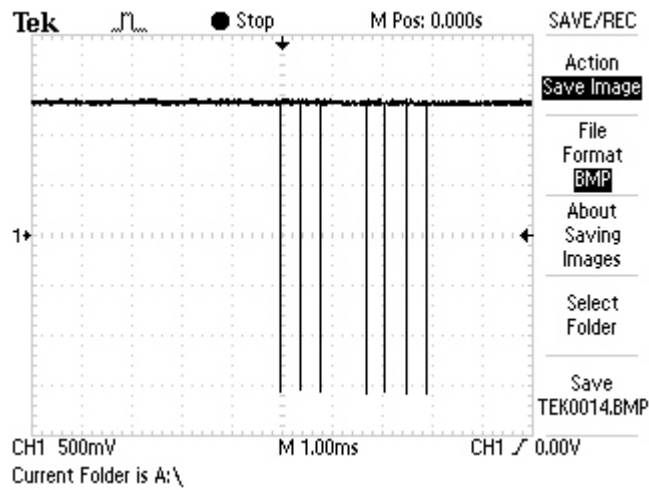
5. LCD_CS waveform diagram



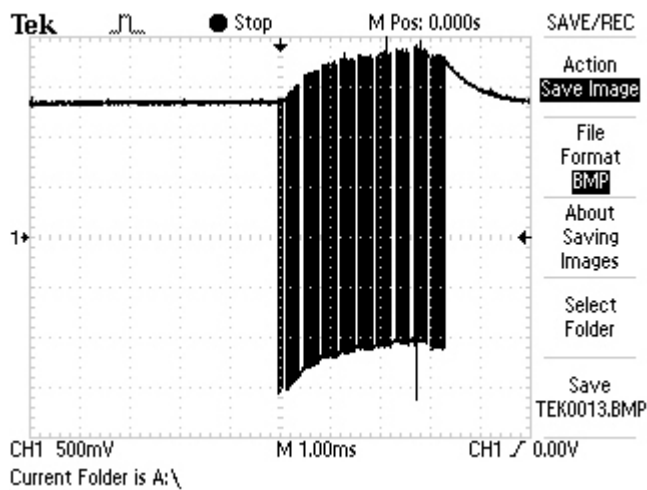
6. LCD_RESET waveform diagram



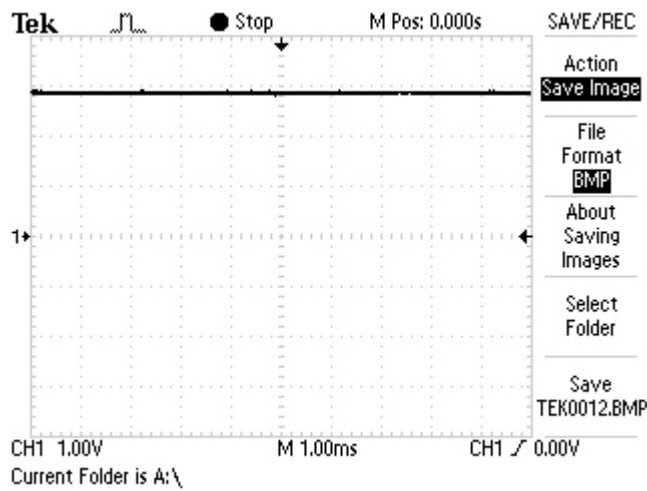
7. LCD_D/C waveform diagram



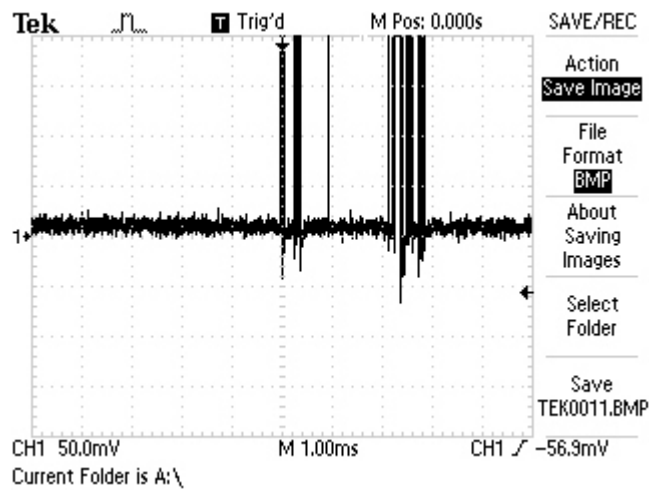
8. LCD_WR waveform diagram



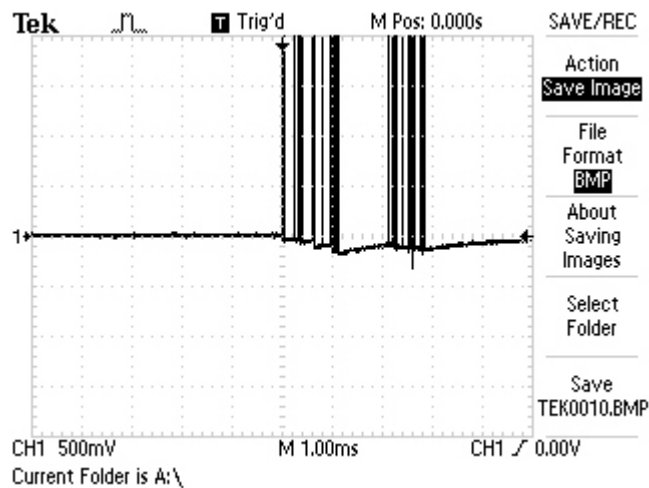
9. LCD_RD waveform diagram



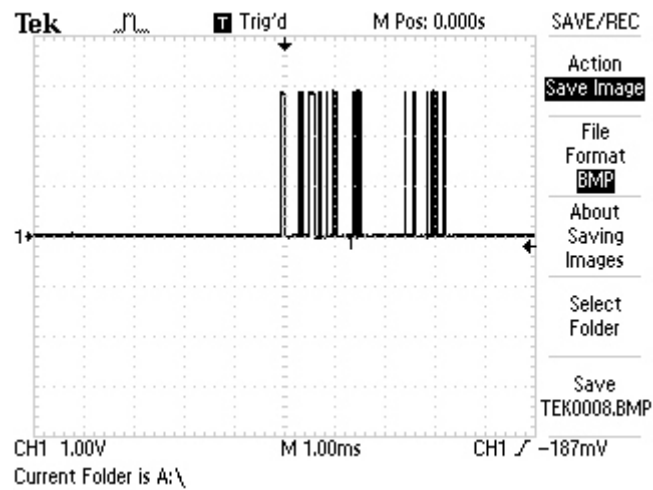
10. LCD_DB0 waveform diagram



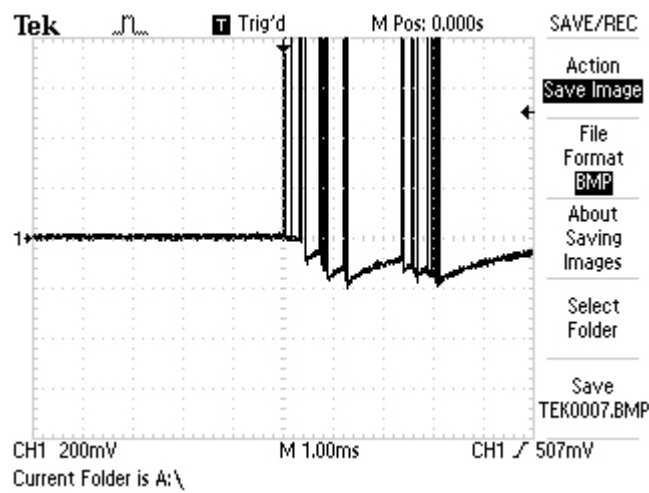
11. LCD_DB1 waveform diagram



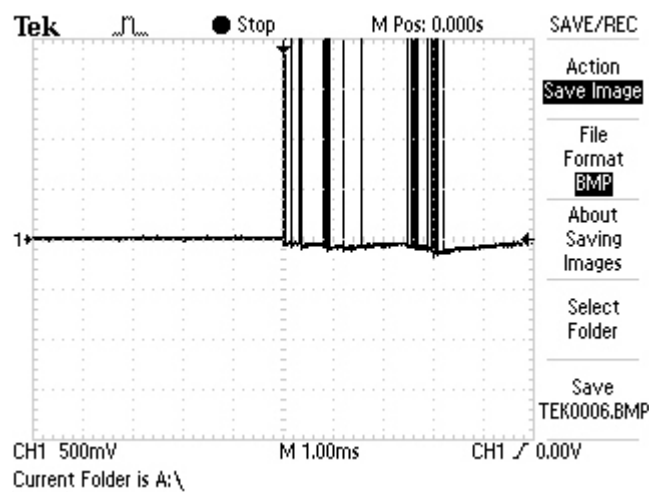
12. LCD_DB2 waveform diagram



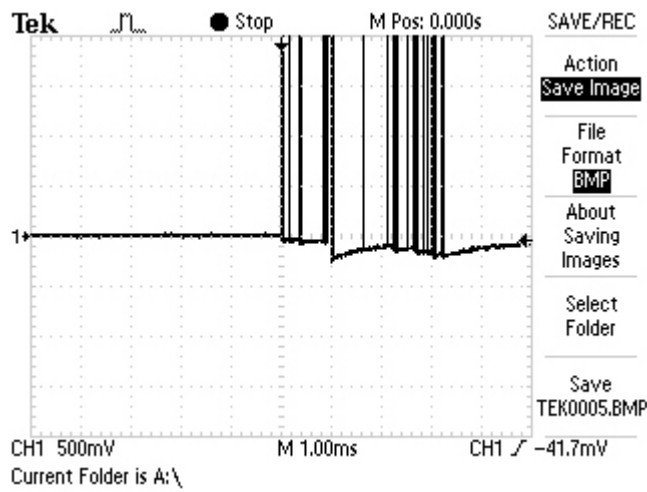
13. LCD_DB3 waveform diagram



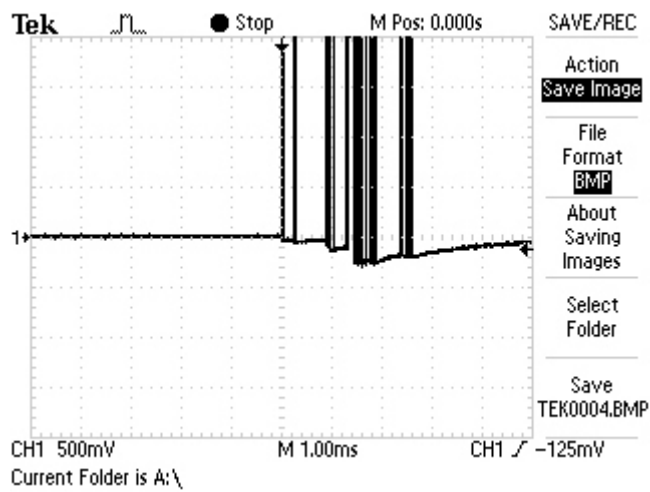
14. LCD_DB4 waveform diagram



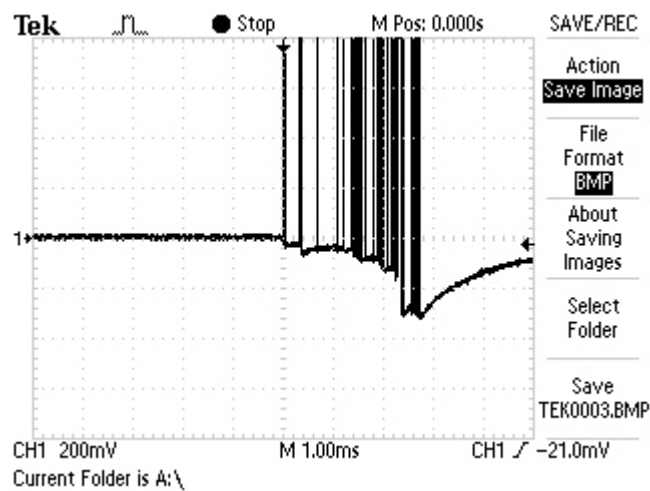
15. LCD_DB5 waveform diagram



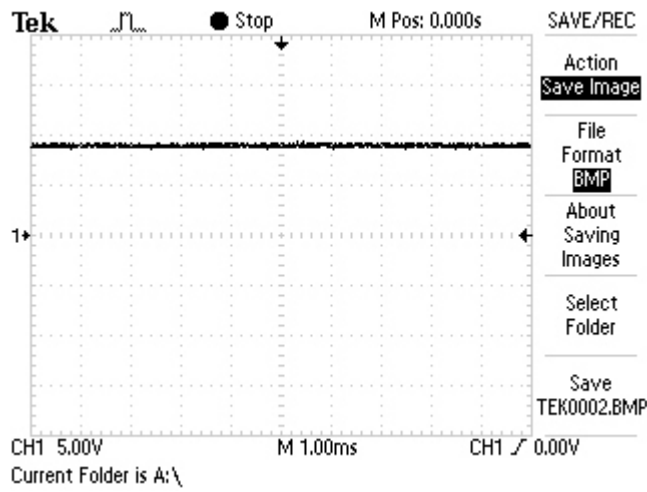
16. LCD_DB6 waveform diagram



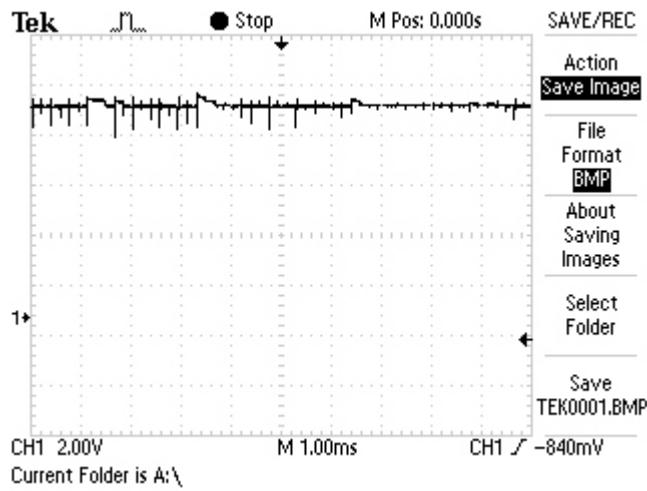
17. LCD_DB7 waveform diagram



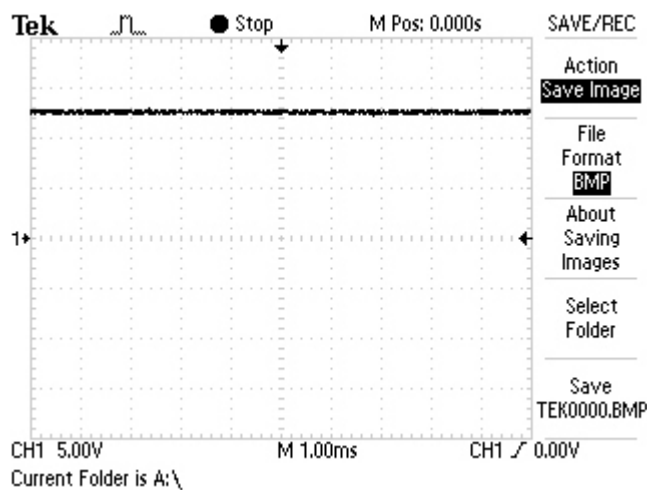
18. IREF waveform diagram



19. VCOMH waveform diagram



20. VOLED waveform diagram



Section Five Function Introduction to IC

3.5.1 Function introduction to PNX0102AEX

1. Description

The PNX0102 (ARM-based Solid State Audio IC) is an IC based on an embedded RISC processor. The device is designed for hand-held Solid State Audio applications like portable MP3 players. The high level of integration, low power consumption and high processor performances make the PNX0102 very suitable for portable hand-held devices.

The PNX0102 is based on the powerful ARM7TDMI CPU core, which is a full 32-bit RISC processor with 8 kbyte dedicated cache.

2. Features

2.1 General Features

- One chip solution for compressed audio players using flash memory
- Programmable architecture enables flexible support of “up-coming” digital music formats
- FM Radio input and control support
- Embedded program flash for easy upgrading and increased program security
- Support for Philips LifeVibes™ audio enhancement algorithms
- Small footprint package TBGA180 10x10mm 0.5pitch

2.2 Hardware Features

- ARM7TDMI + 8kByte cache
- Embedded 64kByte RAM and 32 kByte ROM
- Ultra low power Audio DSP for support of Philips LifeVibes™ audio enhancement algorithms
- Integrated embedded program Flash (8M bit)
- Maximum 4Mbyte of external static memory
- External memory support: Nand Flash/Compact flash/MMC/SMC/SRAM/ROM/SDRAM
- Integrated MCI interface
- Integrated USB 2.0 HS compliant slave interface (for firmware upgrade, data support from/to PC, streaming audio)
- Intelligent Configuration Power Management
- Single battery operated embedded DC/DC converter
- Integrated 6800/8080 compatible LCD interface

General-Purpose IO pins (nearly all pins can be configured as GPIO pins)
 Integrated Master/Slave IIC interface
 Integrated ADC with line input and voice input (with recording possibility)
 Built-in ADC for level measurement & control (5-inputs)
 Integrated DAC with line output, headphone output with short-circuit protection
 Integrated IIS input and output interface
 Integrated SPDIF receiver
 Integrated UART + IRDA
 Integrated Real Time Clock with alarm
 Boundary scan

2.3 Possible software features

MP3 encoding/decoding (*) => Support for MPEG 1 layer 3 and MPEG 2 layer 2.5 and layer 3 audio decoding (MP3)

WMA decoding (*)

AAC decoding (*)

Ogg Vorbis decoding (*)

Voice recording using ADPCM

Intelligent power management software

USB Mass Storage Class

USB Device Firmware Upgrade

Philips LifeVibes™ sound enhancement software including bass/treble/volume control.

(*) Audio decoders/encoders do need appropriate licenses.

3. PIN Description

SYMBOL	BGA BALL	DIGITAL I/O LEVEL	APPL. FUNC	PIN STATE AFTER RESET	CELL TYPE	DESCRIPTION
12 MHz oscillator (fixed: 4 pins)						
XTALH_IN	T10		A	input	apio (ZI)	12 MHz clock input
XTALH_OUT	V9		A	output	apio (IO)	12 MHz clock output
XTALH_VDDA18	U9				vddco	Analog supply Oscillator
XTALH_VSSA	T9				vssco	Analog ground Oscillators
32.768 kHz oscillator (fixed: 4 pins)						
XTALL_IN	V7		A	input	apio (ZI)	32.768 kHz clock input
XTALL_OUT	T8		A	output	apio (ZI)	32.768 kHz clock output
XTALL_VDDA18	U8				vddco	Analog supply Oscillators/PLL's

XTALL_GNDA	V8				vssco	Analog ground Oscillators/PLL's
bitslicer/SPDIF (fixed: 3pins)						
SPDIF_IN	T12		A	input	apio (IO)	SPDIF input
SPDIF_VDDA33	U11				vddco	Analog supply SPDIF input
SPDIF_GNDA	T11				vssco	Analog ground SPDIF input
10-bit ADC (fixed: 7 pins)						
ADC10B_GPA4	U5		A	input	apio (ZI)	Analog General Purpose pins
ADC10B_GPA3	T6		A	input	apio (ZI)	Analog General Purpose pins
ADC10B_GPA2	U6		A	input	apio (ZI)	Analog General Purpose pins
ADC10B_GPA1	T7		A	input	apio (ZI)	Analog General Purpose pins
ADC10B_GPA0	U7		A	input	apio (ZI)	Analog General Purpose pins
ADC10B_VDDA33	V10				vddco	Analog supply 10-bit ADC
ADC10B_GNDA	U10				vssco	Analog ground 10-bit ADC
DAC (fixed: 13 pins)						
DAC_VOUTR	M3		A	output	apio (IO)	SDAC Right Analog Output
DAC_VOUTL	M2		A	output	apio (IO)	SDAC Left Analog Output
DAC_VDDA33	L1				vddco	SDAC Positive Voltage
DAC_VREFP	L2		A	input	apio (IO)	SDAC Positive Reference Voltage
DAC_VREFN	M1		A	input	apio (IO)	SDAC Negative Reference Voltage
HP_OUTR	P3		A	output	apio (IO)	SDAC Right Headphone Output
HP_OUTL	N3		A	output	apio (IO)	SDAC Left Headphone Output
HP_OUTCA	N2		A	output	apio (IO)	Headphone common output reference
HP_OUTCB	N1		A	output	apio (IO)	Headphone common output reference
HP_VDDA33A	R1				vddco	Headphone analog supply
HP_VDDA33B	R2				vddco	Headphone analog supply
HP_GNDAA	P2				vssco	Headphone analog ground
HP_GNDAB	P1				vssco	Headphone analog ground
ADC (fixed: 11 pins)						
ADC_VCOM	T3		A	input	apio (IO)	ADC Common Reference Voltage
ADC_VREFP	U2		A	input	apio (IO)	ADC Positive Reference Voltage
ADC_VREFN	V1		A	input	apio (IO)	ADC Negative Reference Voltage

ADC_VDDA18	V3				vddco	Analog supply ADC
ADC_VDDA33	U3				vddco	Analog supply ADC
ADC_GNDA	V2				vssco	Analog ground ADC
ADC_VREF	U1		A	input	apio (IO)	ADC Reference Voltage
ADC_VINR	T1		A	input	apio (IO)	SADC Right Analog Input
ADC_VINL	T4		A	input	apio (IO)	SADC Left Analog Input
ADC_MIC	R3		A	input	apio (IO)	Microphone input
ADC_MIC_LNA	T2		A	output	apio (IO)	Output of LNA of Microphone input
HP_VCOM				input		HP Common Reference Voltage
LCD Interface (fixed: 12 pins)						
LCD_RW_WR	G2	0-5 VDC tolerant	I/O	output	bpts10tht 5v	6800 read/write select 8080 active 'high' write enable
GPIO_LCD_11						General Purpose IO pin
LCD_E_RD	F2	0-5 VDC tolerant	I/O	output	bpts10tht 5v	6800 enable 8080 active 'high' read enable
GPIO_LCD_10						General Purpose IO pin
LCD_DB_7	E3	0-5 VDC tolerant	I/O	output	bpts10tht 5v	Data input 7/Data output 7/Serial data output/4-bit data 3
GPIO_LCD_9						General Purpos IO pin
LCD_DB_6	E2	0-5 VDC tolerant	I/O	output	bpts10tht 5v	Data input 6/Data output 6/Serial data input/4-bit data 2
GPIO_LCD_8						General Purpose IO pin
LCD_DB_5	D3	0-5 VDC tolerant	I/O	output	bpts10tht 5v	Data input 5/Data output 5/Serial clock output/4-bit data 1
GPIO_LCD_7						General Purpos IO pin
LCD_DB_4	D1	0-5 VDC tolerant	I/O	output	bpts10tht 5v	Data input 4/Data output 4/4-bit data 0
GPIO_LCD_6						General Purpose IO pin
LCD_DB_3	D2	0-5 VDC tolerant	I/O	output	bpts10tht 5v	Data input 3/Data output 3
GPIO_LCD_5						General Purpose IO pin
LCD_DB_2	C3	0-5 VDC tolerant	I/O	output	bpts10tht 5v	Data input 2/Data output 2
GPIO_LCD_4						General Purpose IO pin
LCD_DB_1	C1	0-5 VDC tolerant	I/O	output	bpts10tht 5v	Data input 1/Data output 1
GPIO_LCD_3						General Purpose IO pin

LCD_DB_0	C2	0-5 VDC tolerant	I/O	output	bpts10tht	Data input 0/Data output 0
GPIO_LCD_2					5v	General Purpose IO pin
LCD_CSB	B3	0-5 VDC tolerant	I/O	output	bpts10tht	Chip Select
GPIO_LCD_1					5v	General Purpose IO pin
LCD_RS	F3	0-5 VDC tolerant	I/O	output	bpts10tht	'high' Data register select 'low'
GPIO_LCD_0					5v	instruction register select General Purpose IO pin
Memory Card Interface (fixed: 6 pins)						
MCI_DAT_3	J3	0-5 VDC tolerant	I/O	input	bpts10tht	Data input/Data output
GPIO_MCI_5					5v	General Purpose IO pin
MCI_DAT_2	J1	0-5 VDC tolerant	I/O	input	bpts10tht	Data input/Data output
GPIO_MCI_4					5v	General Purpose IO pin
MCI_DAT_1	J2	0-5 VDC tolerant	I/O	input	bpts10tht	Data input/Data output
GPIO_MCI_3					5v	General Purpose IO pin
MCI_DAT_0	H3	0-5 VDC tolerant	I/O	input	bpts10tht	Data input/Data output
GPIO_MCI_2					5v	General Purpose IO pin
MCI_CLK	G3	0-5 VDC tolerant	I/O	output	bpts10tht	MCI clock output
GPIO_MCI_1					5v	General Purpose IO pin
MCI_CMD	H2	0-5 VDC tolerant	I/O	input	bpts10tht	Command input/Command output
GPIO_MCI_0					5v	General Purpose IO pin
USB Interface (fixed: 4 pins + (8 pins reserved for future use))						
USB_CONNECT_N	T15	0-5 VDC tolerant	I/O	output	bpts10tht	Soft connect output USB 2.0 FS
GPIO_USB_1					5v	General Purpose IO pin
USB_RPU			A		apio (IO)	Reserved for USB 2.0 HS
USB_DP	U17		A	input	usb11	Positive USB data line USB 2.0 FS
USB_DP					apio	Positive USB data line USB 2.0 HS
USB_DM	T17		A	input	usb11	Negative USB data line USB 2.0 FS
USB_DM					apio	Negative USB data line USB 2.0 HS
USB_VBUS	U14	0-5 VDC tolerant	I/O	input	bpts10tht	USB Supply detection line USB 2.0
GPIO_USB_0					5v	FS & USB 2.0 HS General Purpose IO pin
USB_RREF	P16		I/O		bpts10tht 5v	

USB_GNDA	R17				vssco	Reserved for USB 2.0 HS
USB_VSSA_REF	R16				vccso	Reserved for USB 2.0 HS
USB_VSSA_TERM	T16				vssco	Reserved for USB 2.0 HS
USB_VDDA18_PLL	U15				vddco	Reserved for USB 2.0 HS
USB_VDDA18_BG	U16				vddco	Reserved for USB 2.0 HS
USB_VDDA33	U18				vddco	Reserved for USB 2.0 HS
USB_VDDA33_DR V	V18				vddco	Reserved for USB 2.0 HS
DAI Interface (fixed: 3 pins)						
DAI_BCK	H17	0-5 VDC tolerant	I/O	input	bpts10tht	DAI Bitclock
GPIO_DAI_2					5v	General Purpose IO pin
DAI_WS	G17	0-5 VDC tolerant	I/O	input	bpts10tht	DAI Wordselect
GPIO_DAI_1					5v	General Purpose IO pin
DAI_DATA	G16	0-5 VDC tolerant	I/O	input	bpts10tht	DAI Serial data input
GPIO_DAI_0					5v	General Purpose IO pin
DAO Interface (fixed: 4 pins)						
DAO_CLK	F16	0-5 VDC tolerant	I/O	output	bpts10tht 5v	256 fs clock output
DAO_BCK	G18	0-5 VDC tolerant	I/O	output	bpts10tht	DAO Bitclock
GPIO_DAO_2					5v	General Purpose IO pin
DAO_WS	F18	0-5 VDC tolerant	I/O	output	bpts10tht 5v	DAO Wordselect
DAO_DATA	F17	0-5 VDC tolerant	I/O	output	bpts10tht	DAO Serial data output
GPIO_DAO_0					5v	General Purpose IO pin
JTAG (fixed: 6 pins)						
JTAG_TRST_N	T13	0-5 VDC tolerant	I	input	ipthdt5v	JTAG Reset Input (pull-down)
JTAG_TCK	V4	0-5 VDC tolerant	I	input	ipthut5v	JTAG Clock Input (pull-up)
JTAG_TMS	U12	0-5 VDC tolerant	I	input	ipthut5v	JTAG Mode Select Input (external pull-up)
JTAG_TDI	T5	0-5 VDC tolerant	I	input	ipthut5v	JTAG Data Input (pull-up)
JTAG_TDO	U13	0-5 VDC tolerant	I/O	output	bpts10tht 5v	JTAG Data output
JTAG_SEL_ARM	U4	0-5 VDC tolerant	I	input	ipthdt5v	JTAG selection (pull-down)
IIC master/slave Interface (fixed: 2 pins)						

IIC_SCL	H16	0-5 VDC tolerant	I/O	input	iic400kt5 v	Serial clock IIC Slave
IIC_SDA	J17	0-5 VDC tolerant	I/O	input	iic400kt5 v	Serial data IIC Slave
MPMC (fixed: 52 pins)						
MPMC_D_15	B8		I/O	input	bpts10th	MPMC data input/output 15
GPIO_MPMC_50						General Purpose IO pin
MPMC_D_14	C8		I/O	input	bpts10th	MPMC data input/output 14
GPIO_MPMC_49						General Purpose IO pin
MPMC_D_13	B7		I/O	input	bpts10th	MPMC data input/output 13
GPIO_MPMC_48						General Purpose IO pin
MPMC_D_12	C7		I/O	input	bpts10th	MPMC data input/output 12
GPIO_MPMC_47						General Purpose IO pin
MPMC_D_11	B6		I/O	input	bpts10th	MPMC data input/output 11
GPIO_MPMC_46						General Purpose IO pin
MPMC_D_10	C6		I/O	input	bpts10th	MPMC data input/output 10
GPIO_MPMC_45						General Purpose IO pin
MPMC_D_9	C5		I/O	input	bpts10th	MPMC data input/output 9
GPIO_MPMC_44						General Purpose IO pin
MPMC_D_8	C4		I/O	input	bpts10th	MPMC data input/output 8
GPIO_MPMC_43						General Purpose IO pin
MPMC_D_7	B5		I/O	input	bpts10th	MPMC data input/output 7
GPIO_MPMC_42						General Purpose IO pin
MPMC_D_6	A5		I/O	input	bpts10th	MPMC data input/output 6
GPIO_MPMC_41						General Purpose IO pin
MPMC_D_5	B4		I/O	input	bpts10th	MPMC data input/output 5
GPIO_MPMC_40						General Purpose IO pin
MPMC_D_4	A4		I/O	input	bpts10th	MPMC data input/output 4
GPIO_MPMC_39						General Purpose IO pin
MPMC_D_3	A3		I/O	input	bpts10th	MPMC data input/output 3
GPIO_MPMC_38						General Purpose IO pin
MPMC_D_2	B2		I/O	input	bpts10th	MPMC data input/output 2
GPIO_MPMC_37						General Purpose IO pin

MPMC_D_1	A2		I/O	input	bpts10th	MPMC data input/output 1
GPIO_MPMC_36						General Purpose IO pin
MPMC_D_0	A1		I/O	input	bpts10th	MPMC data input/output 0
GPIO_MPMC_35						General Purpose IO pin
MPMC_A_20	C13		I/O	output	bpts10th	MPMC address 20
GPIO_MPMC_34						General Purpose IO pin
MPMC_A_19	B13		I/O	output	bpts10th	MPMC address 19
GPIO_MPMC_33						General Purpose IO pin
MPMC_A_18	A13		I/O	output	bpts10th	MPMC address 18
GPIO_MPMC_32						General Purpose IO pin
MPMC_A_17	C14		I/O	output	bpts10th	MPMC address 17
GPIO_MPMC_31						General Purpose IO pin
MPMC_A_16	B14		I/O	output	bpts10th	MPMC address 16
GPIO_MPMC_30						General Purpose IO pin
MPMC_A_15	A14		I/O	output	bpts10th	MPMC address 15
GPIO_MPMC_29						General Purpose IO pin
MPMC_A_14	C15		I/O	output	bpts10th	MPMC address 14
GPIO_MPMC_28						General Purpose IO pin
MPMC_A_13	B15		I/O	output	bpts10th	MPMC address 13
GPIO_MPMC_27						General Purpose IO pin
MPMC_A_12	C16		I/O	output	bpts10th	MPMC address 12
GPIO_MPMC_26						General Purpose IO pin
MPMC_A_11	B16		I/O	output	bpts10th	MPMC address 11
GPIO_MPMC_25						General Purpose IO pin
MPMC_A_10	C17		I/O	output	bpts10th	MPMC address 10
GPIO_MPMC_24						General Purpose IO pin
MPMC_A_9	B17		I/O	output	bpts10th	MPMC address 9
GPIO_MPMC_23						General Purpose IO pin
MPMC_A_8	C18		I/O	output	bpts10th	MPMC address 8
GPIO_MPMC_22						General Purpose IO pin
MPMC_A_7	B18		I/O	output	bpts10th	MPMC address 7
GPIO_MPMC_21						General Purpose IO pin
MPMC_A_6	A18		I/O	output	bpts10th	MPMC address 6

GPIO_MPMC_20						General Purpose IO pin
MPMC_A_5	D18		I/O	output	bpts10th	MPMC address 5
GPIO_MPMC_19						General Purpose IO pin
MPMC_A_4	D17		I/O	output	bpts10th	MPMC address 4
GPIO_MPMC_18						General Purpose IO pin
MPMC_A_3	D16		I/O	output	bpts10th	MPMC address 3
GPIO_MPMC_17						General Purpose IO pin
MPMC_A_2	E18		I/O	output	bpts10th	MPMC address 2
GPIO_MPMC_16						General Purpose IO pin
MPMC_A_1	E17		I/O	output	bpts10th	MPMC address 1
GPIO_MPMC_15						General Purpose IO pin
MPMC_A_0	E16		I/O	output	bpts10th	MPMC address 0
GPIO_MPMC_14						General Purpose IO pin
MPMC_NSTCS_2	B11		I/O	output	bpts10th	Static memory chip select 2. Default active LOW (reprogrammable).
GPIO_MPMC_13						General Purpose IO pin
MPMC_NSTCS_1	A8		I/O	output	bpts10th	Static memory chip select 1. Default active LOW (reprogrammable).
GPIO_MPMC_12						General Purpose IO pin
MPMC_NSTCS_0	C9		I/O	output	bpts10th	Static memory chip select 0. Default active LOW (reprogrammable).
GPIO_MPMC_11						General Purpose IO pin
MPMC_NDYCS	B9		I/O	output	bpts10th	SDRAM chip select. Active LOW.
GPIO_MPMC_10						General Purpose IO pin
MPMC_CLKOUT	A10		O	output	bpt4mt	Memory clock output. Connect to the clock input of SDRAM and SyncFlash devices.
MPMC_CKE	B10		I/O	output	bpts10th	SDRAM clock enable. Active HIGH.
GPIO_MPMC_9						General Purpose IO pin
MPMC_NWE	C11		I/O	output	bpts10th	Write enable for SDRAM. Active LOW.
GPIO_MPMC_8						General Purpose IO pin

MPMC_NRAS	A9		I/O	output	bpts10th	Row address strobe for SDRAM and SyncFlash devices. Active LOW.
GPIO_MPMC_7		General Purpose IO pin				
MPMC_NCAS	C10		I/O	output	bpts10th	Column address strobe for SDRAM and SyncFlash devices. Active LOW.
GPIO_MPMC_6		General Purpose IO pin				
MPMC_DQM_1	A11		I/O	output	bpts10th	Data mask output to SDRAM. Active HIGH. The signal MPMCDQMOUT[1] mask byte [15:8] on the data bus. Used for SDRAM devices.
GPIO_MPMC_5		General Purpose IO pin				
MPMC_DQM_0	C12		I/O	output	bpts10th	Data mask output to SDRAM. Active HIGH. The signal MPMCDQMOUT[0] mask byte [7:0] on the data bus. Used for SDRAM devices.
GPIO_MPMC_4		General Purpose IO pin				
MPMC_NOE	A17		I/O	output	bpts10th	Output enable for static memories. Active LOW. Used for static memory devices.
GPIO_MPMC_3		General Purpose IO pin				
MPMC_BLOUT1	B12		I/O	output	bpts10th	The signal nMPMCBLSOUT[1] selects byte lane [15:8] on the data bus. Used for static memory devices.
GPIO_MPMC_2		General Purpose IO pin				
MPMC_BLOUT0	A12		I/O	output	bpts10th	The signal nMPMCBLSOUT[0] selects byte lane [7:0] on the data bus. Used for static memory devices.
GPIO_MPMC_1		General Purpose IO pin				

MPMC_RPOUT	B1		I/O	output	bpts10th	Reset power down to SyncFlash memory. Active LOW. Used for static memory devices.
GPIO_MPMC_0						General Purpose IO pin
UART (fixed: 4 pins)						
UART_TXD	L3	0-5 VDC tolerant	I/O	output	bpts10th	Serial output
GPIO_UART_3					5v	General Purpose IO pin
UART_RXD	K3	0-5 VDC tolerant	I/O	input	bpts10th	Serial input
GPIO_UART_2					5v	General Purpose IO pin
UART_NCTS	K2	0-5 VDC tolerant	I/O	input	bpts10th	Clear to send (active low)
GPIO_UART_1					5v	General Purpose IO pin
UART_NRTS	K1	0-5 VDC tolerant	I/O	output	bpts10th	Ready to send
GPIO_UART_0					5v	General Purpose IO pin
Mode selection pins (fixed: 2 pins)						
GPIO_3	J16	0-5 VDC tolerant	I/O	input	bpts10th dt5v	Start up mode pin 2 (pull down) General Purpose IO pin
GPIO_2	K18	0-5 VDC tolerant	I/O	input	bpts10th dt5v	Start up mode pin 1 (pull down) General Purpose IO pin
GPIO (fixed: 2 pins)						
GPIO_1	K17	0-5 VDC tolerant	I/O	input output (Test Mode))	bpts10th 5v	General Purpose IO pin Toggled (Test Mode)
GPIO_0	K16	0-5 VDC tolerant	I/O	input	bpts10th 5v	General Purpose IO pin (stop)
Reset input pin (fixed: 1 pin)						
RSTIN_N	T14	0-5 VDC tolerant	I	input	ipthut5v	System Reset input (active low)
Flash pins (fixed: 1 pins)						
FLASH_VDD_HV	V15				vddco	
Digital supplies (fixed: 6 pins)						
VDDI1	H1				vddco	Core supply (Mem)
VDDI2	V11				vddco	Core supply (Core)
VDDI3	V16				vddi	Core supply (Flash)
VSSI1	G1				vssco	Core ground (Mem)
VSSI2	V12				vssco	Core ground (Core)
VSSI3	V17				vssis	Core ground (Flash)

Peripheral supplies (fixed: 12 pins)						
VDDE1	E1				vdde3v3	Peripheral (I/O) supply (3.3V)
VDDE2	V5				vdde3v3	Peripheral (I/O) supply (3.3V)
VDDE3	V14				vdde3v3	Peripheral (I/O) supply (3.3V)
VDDE4	J18				vdde3v3	Peripheral (I/O) supply (3.3V)
VSSE1	F1				vsse3v3	Peripheral (I/O) ground
VSSE2	V6				vsse3v3	Peripheral (I/O) ground
VSSE3	V13				vsse3v3	Peripheral (I/O) ground
VSSE4	H18				vsse3v3	Peripheral (I/O) ground
VDDE5	A16				vdde3v3	MPMC Peripheral (I/O) supply (1.8V .. 3.3V)
VDDE6	A7				vdde3v3	MPMC Peripheral (I/O) supply (1.8V .. 3.3V)
VSSE5	A15				vsse3v3	MPMC Peripheral (I/O) ground
VSSE6	A6				vsse3v3	MPMC Peripheral (I/O) ground
DC/DC pins (fixed: 13 pins)						
DCDC_PLAY	L17		A		apio	Play button input
DCDC_STOP	L18		A		apio	Stop signal input
DCDC_LX2	N17		A		apio	DC/DC connection to external coil 2
DCDC_LX1	P17		A		apio	DC/DC connection to external coil 1
DCDC_VUSB	T18		A		apio	USB supply voltage
DCDC_VBAT	M17				vddco	Battery supply voltage
DCDC_VOUT33A	R18				vddco	DC/DC 3.3V output voltage
DCDC_VOUT33B	M16				vddco	DC/DC 3.3V input voltage
DCDC_VOUT18	N18				vddco	DC/DC 1.8V output voltage
DCDC_VSS1	P18				vssco	DC/DC ground to N-switch 1
DCDC_VSS2	N16				vssco	DC/DC ground to N-switch 2
DCDC_GND	L16				vssco	Core ground and substrate
DCDC_CLEAN	M18				vssco	Reference circuit ground, not connected to substrate

3.5.2 Function introduction to K9F4G08U0M

1. Description

Offered in 512Mx8bit, the K9F4G08U0M is 4G bit with spare 128M bit capacity. Its NAND cell provides the most cost-effective solution for the solid state mass storage market. A program operation can be performed in typical 200 μ s on the 2112-byte page and an erase operation can be performed in typical 2ms on a 128K-byte block. Data in the data page can be read out at 30ns cycle time per byte. The I/O pins serve as the ports for address and data input/output as well as command input. The on-chip write controller automates all program and erase functions including pulse repetition, where required, and internal verification and margining of data. Even the write-intensive systems can take advantage of the K9K4G08U0M's extended reliability of 100K program/erase cycles by providing ECC(Error Correcting Code) with real time mapping-out algorithm. The K9K4G08U0M is an optimum solution for large nonvolatile storage applications such as solid state file storage and other portable applications requiring non-volatility. An ultra high density solution having two 4Gb stacked with two chip selects is also available in standard TSOP package.

2. Features

Voltage Supply

- 2.7 V ~3.6 V

Organization

- Memory Cell Array
 - (512M + 16,384K)bit x 8bit
- Data Register
 - (2K + 64)bit x8bit
- Cache Register
 - (2K + 64)bit x8bit

Automatic Program and Erase

- Page Program
 - (2K + 64)Byte
- Block Erase
 - (128K + 4K)Byte

Page Read Operation

- Page Size
 - 2K-Byte
- Random Read : 25 μ s(Max.)
- Serial Access : 30ns(Min.)

Fast Write Cycle Time

- Program time : 200 μ s(Typ.)
- Block Erase Time : 2ms(Typ.)

Command/Address/Data Multiplexed I/O Port

Hardware Data Protection

- Program/Erase Lockout During Power Transitions
- Reliable CMOS Floating-Gate Technology
- Endurance : 100K Program/Erase Cycles
- Data Retention : 10 Years
- Command Register Operation
- Cache Program Operation for High Performance Program
- Power-On Auto-Read Operation
- Intelligent Copy-Back Operation
- Unique ID for Copyright Protection
- Package :
- K9K4G08U0M-YCB0/YIB0
48-Pin TSOP I (12 x 20 / 0.5 mm pitch)
- K9W8G08U1M-YCB0/YIB0 : Two K9K4G08U0M stacked.
48-Pin TSOP I (12 x 20 / 0.5 mm pitch)
- K9K4G08U0M-PCB0/PIB0 : Pb-FREE PACKAGE
48-Pin TSOP I (12 x 20 / 0.5 mm pitch)
- K9W8G08U1M-PCB0/PIB0 : Two K9K4G08U0M stacked.
48-Pin TSOP I (12 x 20 / 0.5 mm pitch)

3. PIN Description

PIN No.	Symbol	I/O	Description
29~32, 41~44	I/O0 ~ I/O7	I/O	DATA INPUTS/OUTPUTS
16	CLE	I	COMMAND LATCH ENABLE
17	ALE	I	ADDRESS LATCH ENABLE
9	/CE	I	CHIP ENABLE
8	/RE	I	READ ENABLE
18	/WE	I	WRITE ENABLE
19	/WP	I	WRITE PROTECT
7	R/B	I	READY/BUSY OUTPUT
38	PRE	I	POWER-ON READ ENABLE
37	Vcc	P	POWER
36	Vss	P	GROUND
1~6, 9, 10, 14, 15, 20~24, 25~28, 33~35,	N.C	N	NO CONNECTION

3.5.3 Function introduction to TPS79301

1. Description

The TPS793xx family of low-dropout (LDO) low-power linear voltage regulators features high power supply rejection ratio (PSRR), ultralow noise, fast start-up, and excellent line and load transient responses in NanoStar wafer chip scale and SOT23 packages. NanoStar packaging gives an ultrasmall footprint as well as an ultralow profile and package weight, making it ideal for portable applications such as handsets and PDAs. Each device in the family is stable, with a 2.2- μF ceramic capacitor on the output. The TPS793xx family uses an advanced, proprietary BiCMOS fabrication process to yield extremely low dropout voltages (e.g., 112 mV at 200mA, TPS79330). Each device achieves fast start-up times (approximately 50 μs with a 0.001- μF capacitor) while consuming very low quiescent current (170 μA typical). Moreover, when the device is placed in standby mode, the supply current is reduced to less than 1 μA . The TPS79328 exhibits approximately 32 μVRMS of output voltage noise with a 0.1- μF bypass capacitor. Applications with analog components that are noise sensitive, such as portable RF electronics, benefit from the high PSRR and low-noise features as well as the fast response time.

2. Features

200-mA RF Low-Dropout Regulator With Enable

Available in 1.8-V, 2.5-V, 2.8-V, 2.85-V, 3-V, 3.3-V, 4.75-V, and Adj (1.22 V to 5.5 V)

High PSRR (70 dB at 10 kHz)

Ultralow Noise (32 μV)

Fast Start-Up Time (50 μs)

Stable With a 2.2- μF Ceramic Capacitor

Excellent Load/Line Transient Response

Very Low Dropout Voltage (112 mV at Full exLoad, TPS79330)

5-Pin SOT23 (DBV) and NanoStar Wafer Chip Scale (YEQ) Packages

3. PIN Description

PIN No.	Symbol	I/O	Description
1	IN	I	Unregulated input to the device
2	GND	I	Regulator ground
3	EN	I	Enables or shuts down the device

4	BYPASS	O	further reduce regulator noise
5	FB	O	feedback input voltage for the adjustable device
6	OUT	O	Output of the regulator

3.5.4 Function introduction to G690L263T71

1. Description

The G690/G691 are microprocessor (μ P) supervisory circuits used to monitor the power supplies in μ P and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V- powered circuits.

These circuits perform a single function: they assert a reset signal whenever the VCC supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after VCC has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available.

The G691L has an open-drain output stage, while the G690 have push-pull outputs. The G691L's open-drain RESET output requires a pull-up resistor that can be connected to a voltage higher than VCC. The G690L have an active-low RESET output, while the G690H has an active-high RESET output. The reset comparator is designed to ignore fast transients on VCC, and the outputs are guaranteed to be in the correct logic state for VCC down to 1V.

Low supply current makes the G690/G691 ideal for use in portable equipment. The G690/G691 are available in 3-pin SOT-23 packages.

2. Features

Precision Monitoring of +3V, +3.3V, and +5V

Power-Supply Voltages

Fully Specified Over Temperature

Available in Three Output Configurations

Push-Pull RESET Output (G690L)

140ms min Power-On Reset Pulse Width

10 μ A Supply Current

Guaranteed Reset Valid to VCC = +1V

Power Supply Transient Immunity

No External Components

3-Pin SOT-23 Packages

3. PIN Description

PIN No.	Symbol	I/O	Description
1	/RESET	O	RESET Signal Output
2	GND	I	Ground
3	VCC	P	Power

3.5.5 Function introduction to TPS62200

1. Description

The TPS6220x devices are a family of high-efficiency synchronous step-down converters ideally suited for portable systems powered by 1-cell Li-Ion or 3-cell NiMH/NiCd batteries. The devices are also suitable to operate from a standard 3.3-V or 5-V voltage rail.

With an output voltage range of 6.0 V down to 0.7 V and up to 300 mA output current, the devices are ideal to power low voltage DSPs and processors used in PDAs, pocket PCs, and smart phones. Under nominal load current, the devices operate with a fixed switching frequency of typically 1 MHz. At light load currents, the part enters the power save mode operation; the switching frequency is reduced and the quiescent current is typically only 15 μ A; therefore it achieves the highest efficiency over the entire load current range. The TPS6220x needs only three small external components. Together with the tiny SOT23 package, a minimum system solution size can be achieved. An advanced fast response voltage mode control scheme achieves superior line and load regulation with small ceramic input and output capacitors.

2. Features

- High Efficiency Synchronous Step-Down Converter With up to 95% Efficiency
- 2.5 V to 6.0 V Input Voltage Range
- Adjustable Output Voltage Range From 0.7 V to VI
- Fixed Output Voltage Options Available
- Up to 300 mA Output Current
- 1 MHz Fixed Frequency PWM Operation
- Highest Efficiency Over Wide Load Current Range Due to Power Save Mode
- 15- μ A Typical Quiescent Current
- Soft Start
- 100% Duty Cycle Low-Dropout Operation
- Dynamic Output-Voltage Positioning
- Available in a Tiny 5-Pin SOT23 Package

3. PIN Description

PIN No.	Symbol	I/O	Description
1	VI	I	Supply voltage pin

2	GND		Ground
3	EN	I	The enable pin of the device
4	FB	I	The feedback pin of the device
5	SW	I/O	The switch pin

3.5.6 Function introduction to LM2713

1. Description

The LM2703 is a micropower step-up DC/DC in a small 5-lead SOT-23 package. A current limited, fixed off-time control scheme conserves operating current resulting in high efficiency over a wide range of load conditions. The 21V switch allows for output voltages as high as 20V. The low 400ns off-time permits the use of tiny, low profile inductors and capacitors to minimize footprint and cost in space-conscious portable applications. The LM2703 is ideal for LCD panels requiring low current and high efficiency as well as white LED applications for cellular phone back-lighting. The LM2703 can drive up to 4 white LEDs from a single Li-Ion battery.

2. Features

- 350mA, 0.7W, internal switch
- Uses small surface mount components
- Adjustable output voltage up to 20V
- 2.2V to 7V input range
- Input undervoltage lockout
- 0.01 μ A shutdown current
- Small 5-Lead SOT-23 package

3. PIN Description

PIN No.	Symbol	I/O	Description
1	SW	P	Power Switch input.
2	GND		Ground.
3	FB	O	Output voltage feedback input.
4	SHDN	I	Shutdown control input, active low.
5	VIN	I	Analog and Power input.

3.5.7 Function introduction to TEA5767HN

1. Description

The TEA5767HN is a single-chip electronically tuned FM stereo radio for low-voltage application with fully

integrated IF selectivity and demodulation. The radio is completely adjustment-free and only requires a minimum of small and low cost external components. The radio can be tuned to the European, US and Japanese FM bands.

2. Features

- High sensitivity due to integrated low-noise RF input amplifier
- FM mixer for conversion to IF of the US/Europe (87.5 to 108 MHz) and Japanese (76 to 91MHz) FM band
- Preset tuning to receive Japanese TV audio up to 108 MHz
- RF Automatic Gain Control (AGC) circuit
- LC tuner oscillator operating with low cost fixed chip inductors
- FM IF selectivity performed internally
- No external discriminator needed due to fully integrated FM demodulator
- Crystal reference frequency oscillator; the oscillator operates with a 32.768 kHz clock crystal or with a 13 MHz crystal and with an externally applied 6.5 MHz reference frequency
- PLL synthesizer tuning system
- I2C-bus and 3-wire bus, selectable via pin BUSMODE
- 7-bit IF counter output via the bus
- 4-bit level information output via the bus
- Soft mute
- Signal dependent mono to stereo blend [Stereo Noise Cancelling (SNC)]
- Signal dependent High Cut Control (HCC)
- Soft mute, SNC and HCC can be switched off via the bus
- Adjustment-free stereo decoder
- Autonomous search tuning function
- Standby mode
- Two software programmable ports
- Bus enable line to switch the bus input and output lines into 3-state mode
- Automotive temperature range (at VCCA, VCC(VCO) and VCCD = 5 V).

3. PIN Description

PIN No.	Symbol	I/O	Description
1	n.c.		not connected
2	CPOUT	O	charge pump output of synthesizer PLL
3	VCOTANK1	O	voltage controlled oscillator tuned circuit output 1

4	VCOTANK2	O	voltage controlled oscillator tuned circuit output 2
5	VCC(VCO)	P	voltage controlled oscillator supply voltage
6	DGND		digital ground
7	VCCD	P	digital supply voltage
8	DATA	I/O	bus data line input/output
9	CLOCK	I	bus clock line input
10	n.c.		not connected
11	WRITE/READ	I	write/read control input for the 3-wire bus
12	BUSMODE	I	bus mode select input
13	BUSENABLE	I	bus enable input
14	SWPORT1		software programmable port 1
15	SWPORT2		software programmable port 2
16	XTAL1	I	crystal oscillator input 1
17	XTAL2	I	crystal oscillator input 2
18	PHASEFIL		phase detector loop filter
19	PILFIL		pilot detector low-pass filter
20	n.c.		not connected
21	n.c.		not connected
22	VAFL	O	left audio frequency output voltage
23	VAFR	O	right audio frequency output voltage
24	TMUTE	I	time constant for soft mute
25	MPXO	O	FM demodulator MPX signal output
26	Vref	P	reference voltage
27	TIFC	I	time constant for IF centre adjust
28	LIMDEC1	I	decoupling IF limiter 1
29	LIMDEC2	I	decoupling IF limiter 2
30	n.c.		not connected
31	n.c.		not connected
32	Igain	I	gain control current for IF filter
33	AGND		analog ground
34	VCCA	P	analog supply voltage
35	RFI1	I	RF input 1
36	RFGND		RF ground

37	RFI2	I	RF input 2
38	TAGC		time constant RF AGC
39	LOOPSW		switch output of synthesizer PLL loop filter
40	n.c.		not connected

3.5.8 Function introduction to ISL6294IRZ

1. Description

The ISL6294 is a cost-effective, fully integrated high input voltage single-cell Li-ion battery charger. The charger uses a CC/CV charge profile required by Li-ion batteries. The charger accepts an input voltage up to 28V but is disabled when the input voltage exceeds the OVP threshold, typically 6.8V, to prevent excessive power dissipation. The 28V rating eliminates the overvoltage protection circuit required in a low input voltage charger.

The charge current and the end-of-charge (EOC) current are programmable with external resistors. When the battery voltage is lower than typically 2.55V, the charger preconditions the battery with typically 20% of the programmed charge current. When the charge current reduces to the programmable EOC current level during the CV charge phase, an EOC indication is provided by the CHG pin, which is an open-drain output. An internal thermal foldback function protects the charger from any thermal failure.

Two indication pins (PPR and CHG) allow simple interface to a microprocessor or LEDs. When no adapter is attached or when disabled, the charger draws less than 1µA leakage current from the battery.

2. Features

Complete Charger for Single-Cell Li-ion/Polymer Batteries

Integrated Pass Element and Current Sensor

No External Blocking Diode Required

Low Component Count and Cost

1% Voltage Accuracy

Programmable Charge Current

Programmable End-of-Charge Current

Charge Current Thermal Foldback for Thermal Protection

Trickle Charge for Fully Discharged Batteries

28V Maximum Voltage for the Power Input

Power Presence and Charge Indications

Less Than 1µA Leakage Current off the Battery When No Input Power Attached or Charger Disabled

Ambient Temperature Range: -40°C to 85°C

3. PIN Description

PIN No.	Symbol	I/O	Description
1	VIN	P	Power input
2	PPR	I	Open-drain power presence indication
3	CHG	I	Open-drain charge indication pin
4	EN	I	Enable input
5	BAT	O	Charger output pin
6	IREF	I	Charge-current program and monitoring pin
7	IMIN	I	End-of-charge (EOC) current program pin
8	GND		System ground

3.5.9 Function introduction to PIC10F200T

1. Description

The PIC10F200/202/204/206 devices from Microchip Technology are low-cost, high-performance, 8-bit, fullystatic, Flash-based CMOS microcontrollers. They employ a RISC architecture with only 33 single-word/single-cycle instructions. All instructions are single cycle (1 μ s) except for program branches, which take two cycles. The PIC10F200/202/204/206 devices deliver performance in an order of magnitude higher than their competitors in the same price category. The 12-bit wide instructions are highly symmetrical, resulting in a typical 2:1 code compression over other 8-bit microcontrollers in its class. The easy to use and easy to remember instruction set reduces development time significantly.

2. Features

Only 33 single-word instructions to learn

All single-cycle instructions except for program branches, which are two-cycle

12-bit wide instructions

2-level deep hardware stack

Direct, Indirect and Relative Addressing modes for data and instructions

8-bit wide data path

8 Special Function Hardware registers

Operating speed:

- 4 MHz internal clock

- 1? s instruction cycle

Operating Current:

- < 350 ? A @ 2V, 4 MHz

Standby Current:

- 100 nA @ 2V, typical
- Low-power, high-speed Flash technology:
- 100,000 Flash endurance
- > 40 year retention
- Fully static design
- Wide operating voltage range: 2.0V to 5.5V
- Wide temperature range:
- Industrial: -40° C to +85° C
- Extended: -40° C to +125° C
- 4 I/O pins:
- 3 I/O pins with individual direction control
- 1 input only pin
- High current sink/source for direct LED drive
- Wake-on-change
- Weak pull-ups
- 8-bit real-time clock/counter (TMR0) with 8-bit programmable prescaler

3.5.10 Function introduction to PQ1X281M2ZP

1. Description

The PQ1Xxx1M2ZP Series are Low Output Current, Compact Surface Mount Type Low Power-Loss Voltage Regulators.

2. Features

- Compact surface mount package (2.9 × 1.6 × 1.1mm)
- Low power-loss (Dropout voltage: TYP. 0.11 V/MAX. 0.26V at IO=60mA)
- Also compatible ceramic capacitors because of suppressing oscillation level
- High ripple rejection (TYP. 70dB)
- Low dissipation current (Dissipation current at no load: TYP. 150µA)
- Built-in ON/OFF control function (Dissipation current at OFF-state: MAX. 1µA)
- Built-in overcurrent and overheat protection functions

*It is available for every 0.1V of output voltage (1.3V to 5.0V)

3. PIN Description

PIN No.	Symbol	I/O	Description
1	Vin	I	DC input

2	GND		Ground
3	Vc	I	ON/OFF control terminal
4	Nr	I	Noise reduction
5	Vo	O	DC Output

3.5.11 Function introduction to SI1912

1. Description

The SI1912 is a Dual N-Channel 20-V (D-S) MOSFET.

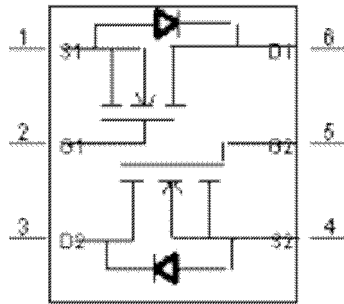
2. Features

TrenchFET Power MOSFETS: 1.8-V Rated

ESD Protected: 2000 V

Thermally Enhanced SC-70 Package

3. PIN Description



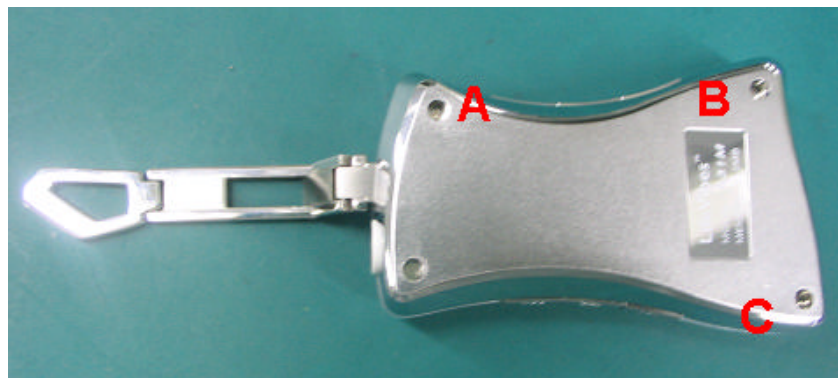
Chapter Four

Assembly and Disassembly Process

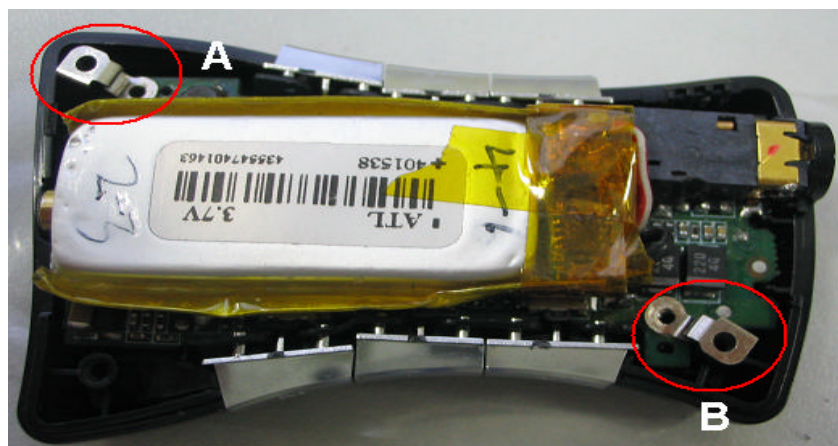
In order to get to know the structure of X31 (RU) more easily and directly, now we use pictures to present each key point of disassembly and assembly process before all users to prevent users from operating blindly and to damage elements, so we hope you can operate according to the instructions strictly.

Note: all operations must be with strict anti-static measures. Operators must wear anti-static gloves or wrist ring; electric screwdriver must be grounded effectively and articles, such as nippers must be removed static before using!

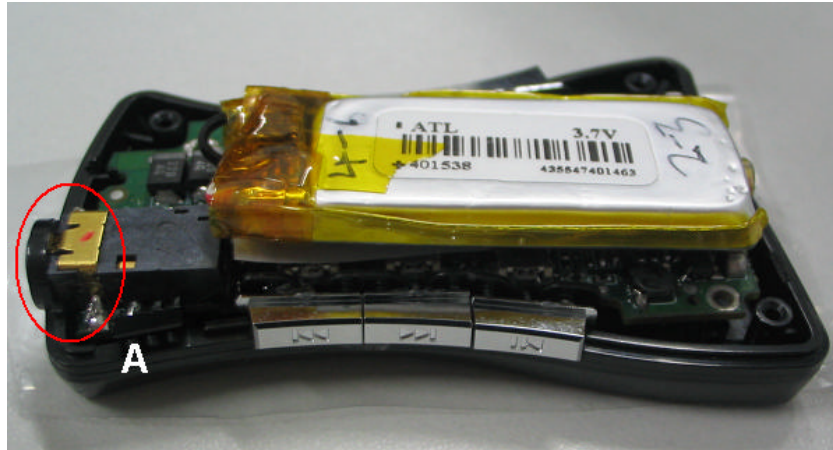
4.1 Disassembly process of the player



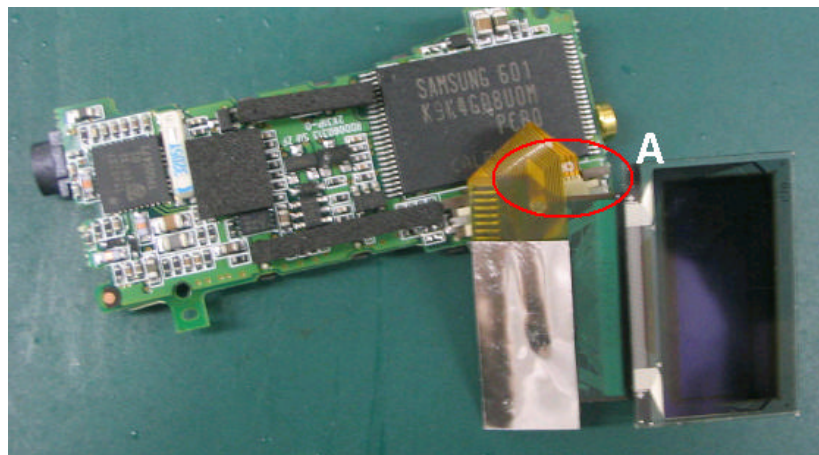
1. Use electric screwdriver or “+”-shaped screwdriver to fix 3 bottom casing screws (A, B, C).



2. Use electric screwdriver or “+”-shaped screwdriver to fix 4 main board screws (A, B).

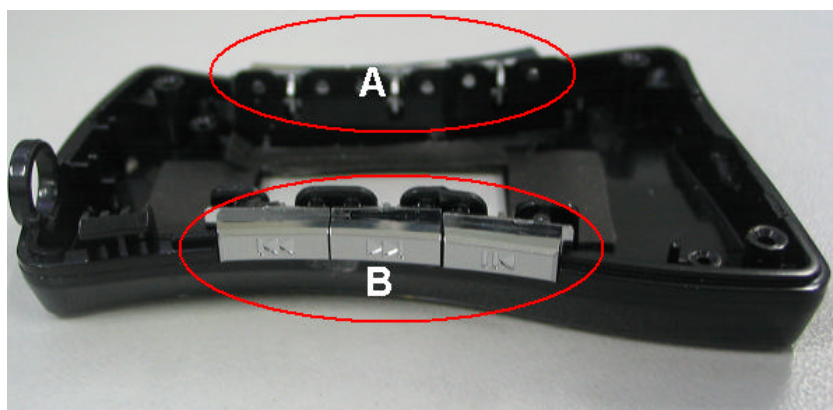


3. Take down main board components and pay attention not to damage headphone jack (A).

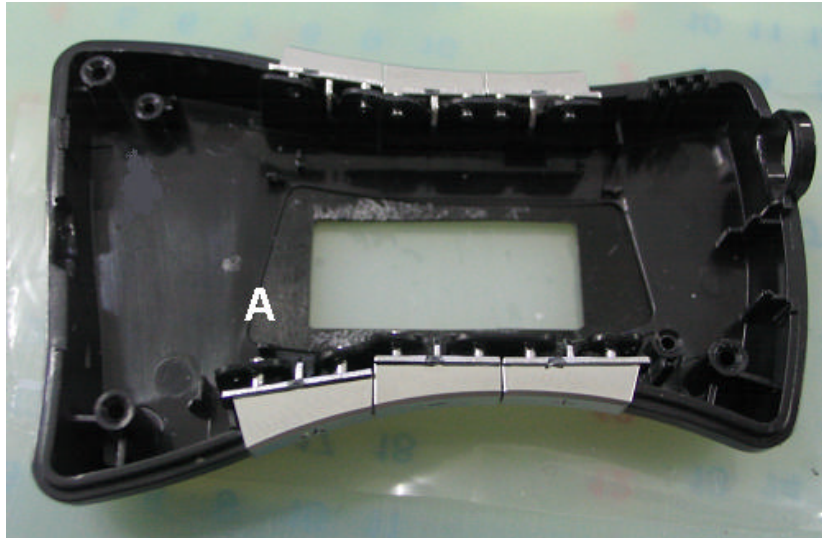


4. Open display screen socket (A) and take down display screen.

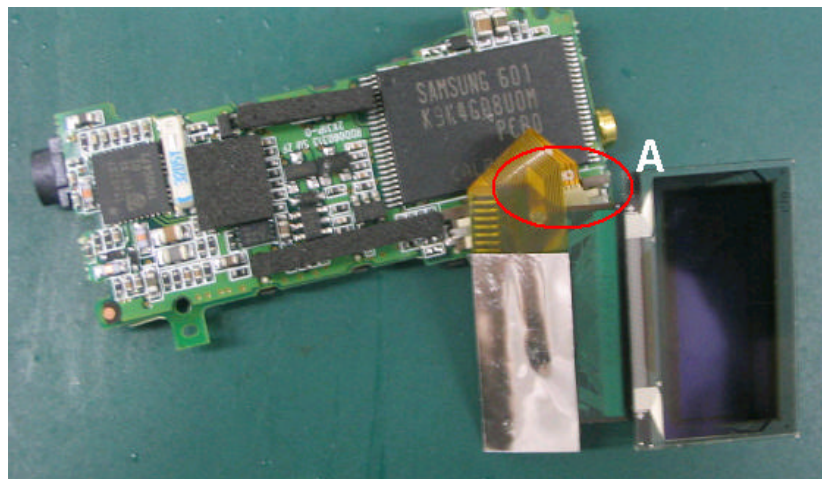
4.2 Assembly process for the player



1. Install 6 buttons (A, B).



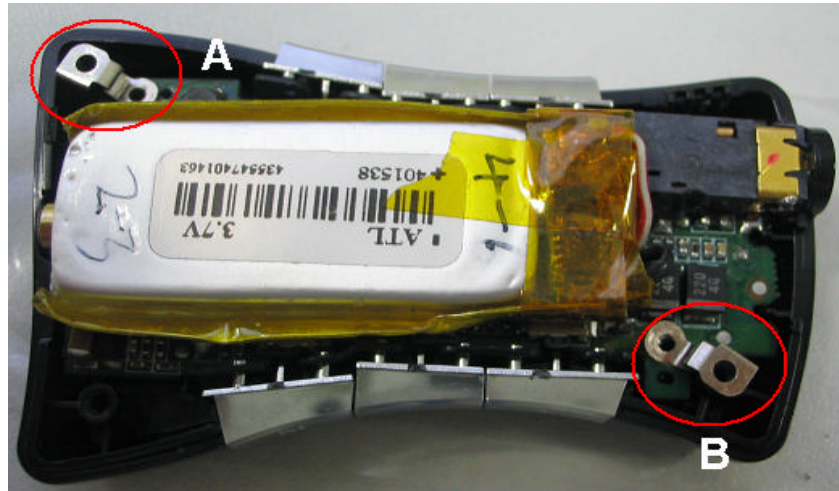
2. Put aluminum decorating plate in position A.



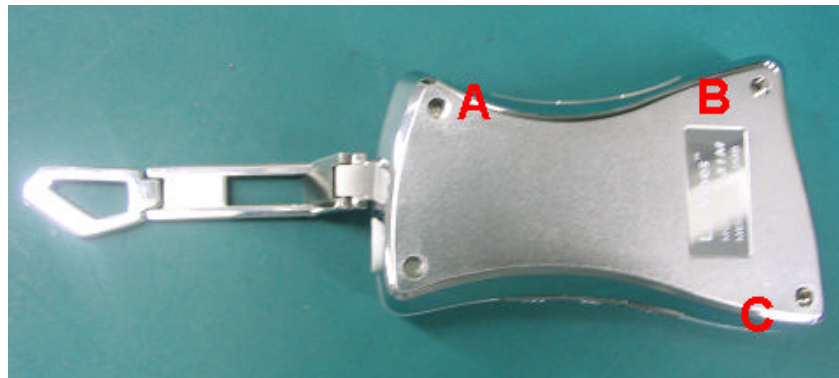
3. Install display screen and press socket (A) tightly.



4. Install main board components into the casing and pay attention not to damage headphone jack.



5. Use electric screwdriver or "+"-shaped screwdriver to fix 4 main board screws (A, B).



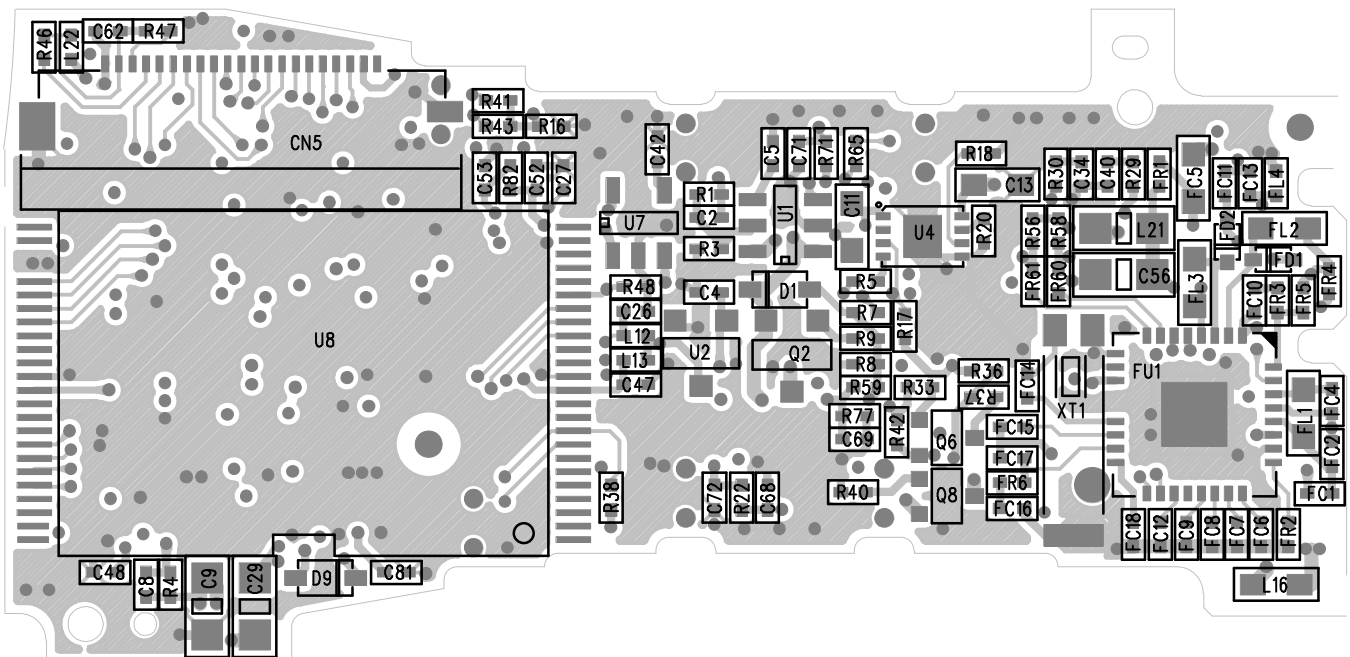
6. Use electric screwdriver or "+"-shaped screwdriver to fix 3 bottom casing screws (A, B, C).

Chapter Cinque

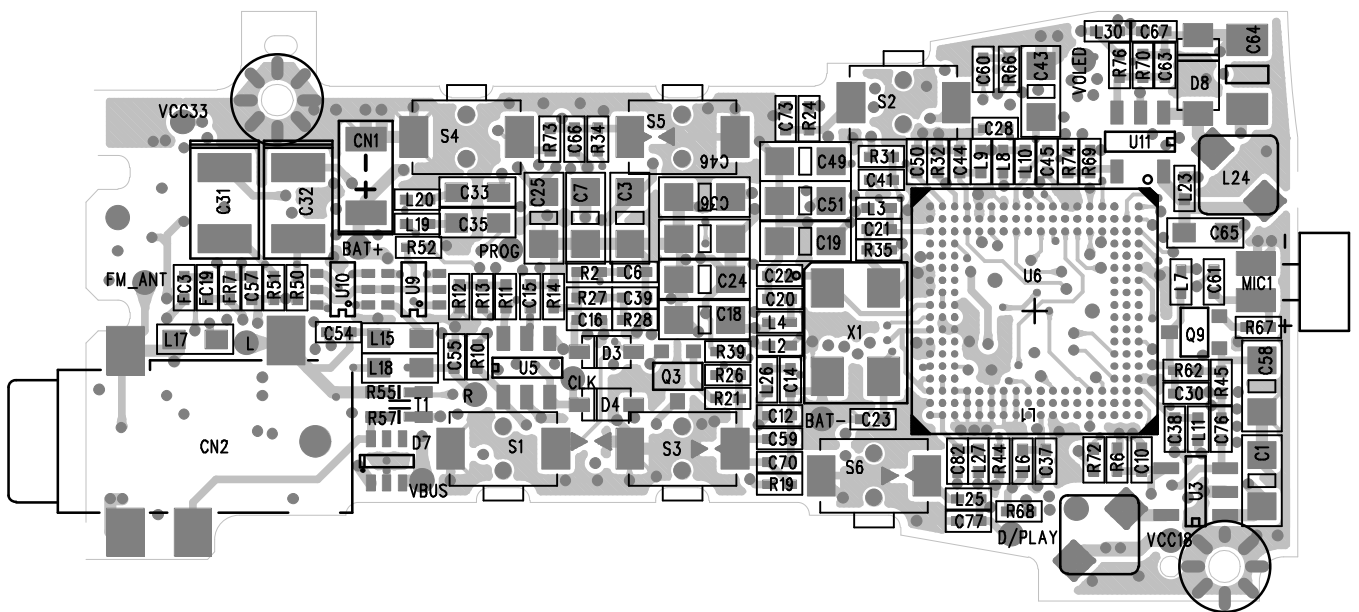
PCB board & Circuit diagram

Section One PCB board

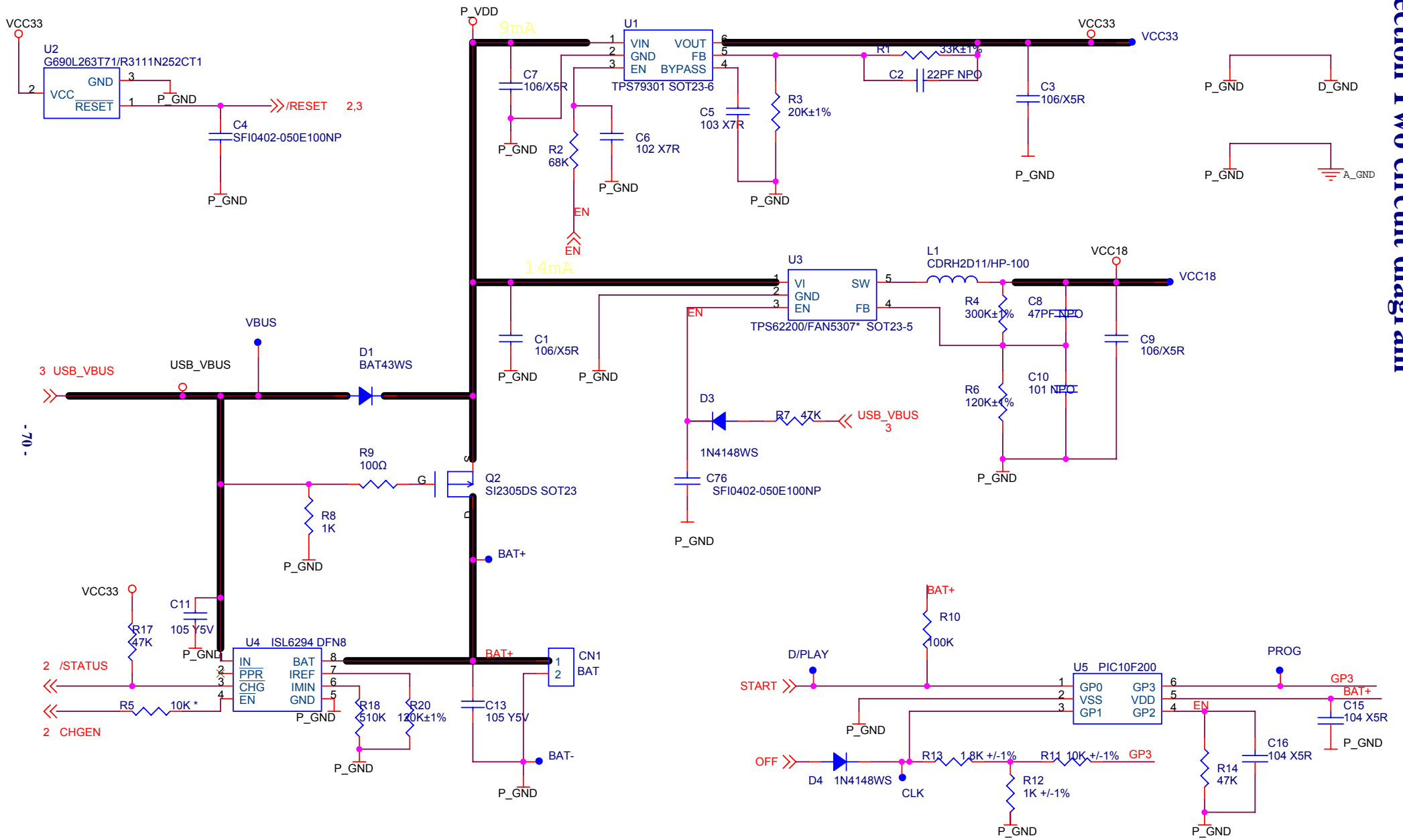
1. Surface layer of PCB Board



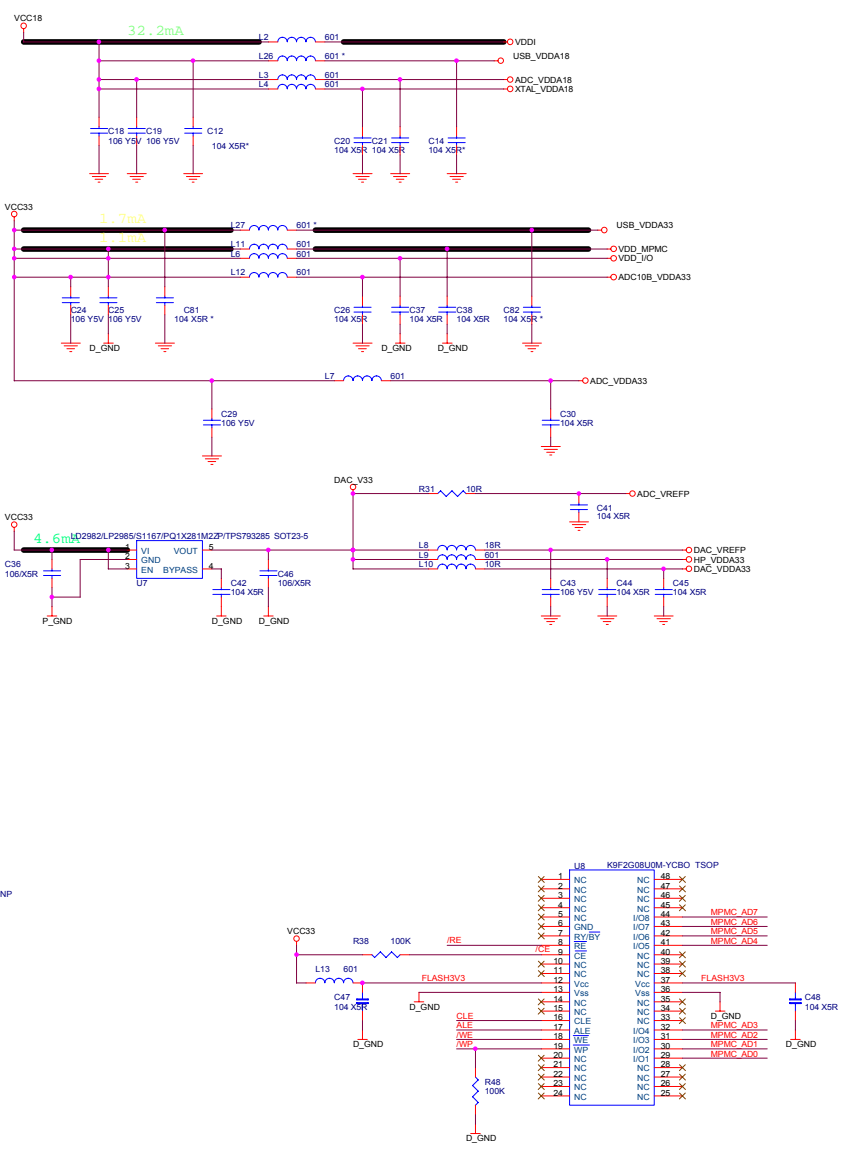
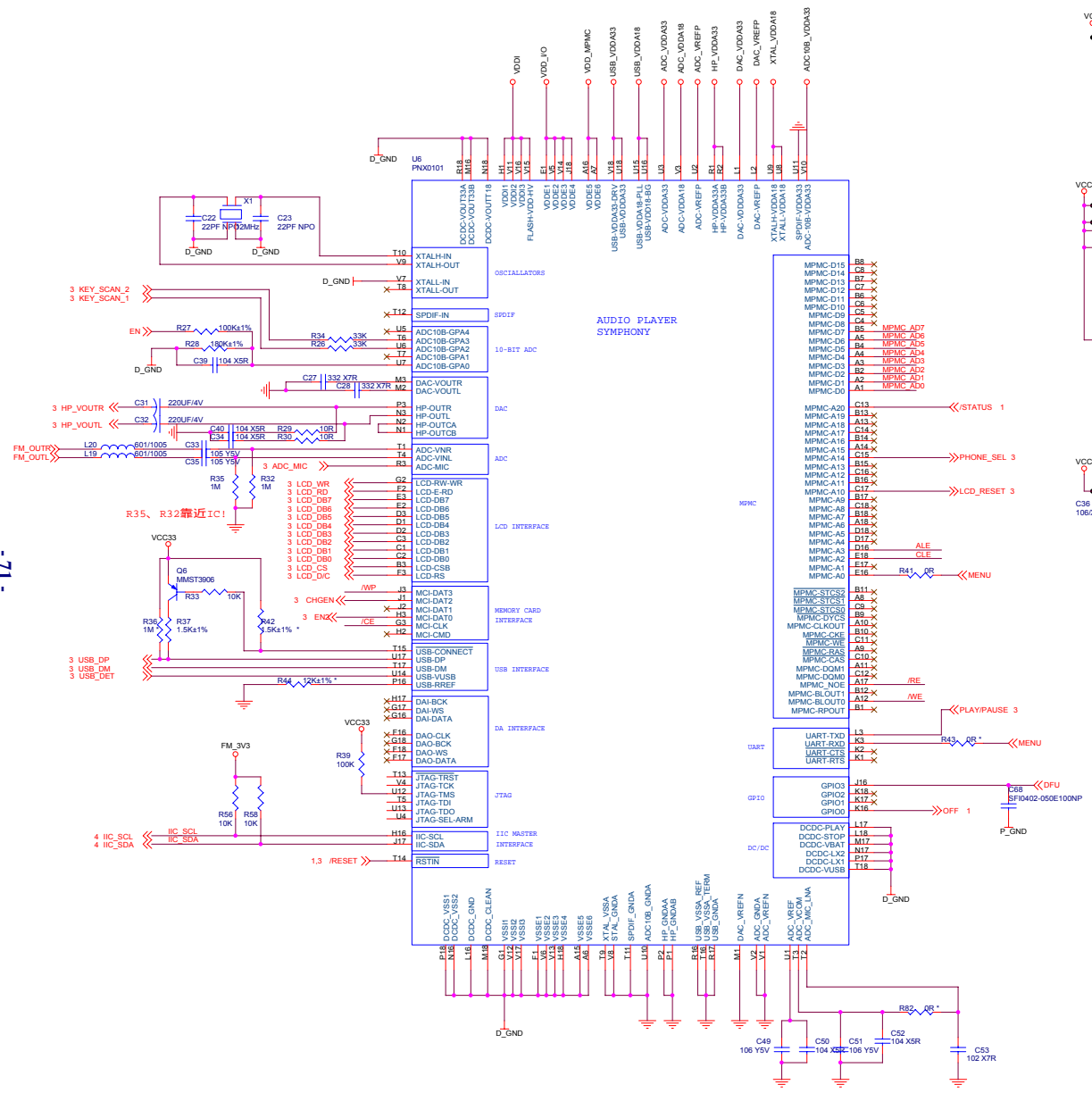
2. Bottom layer of PCB Board



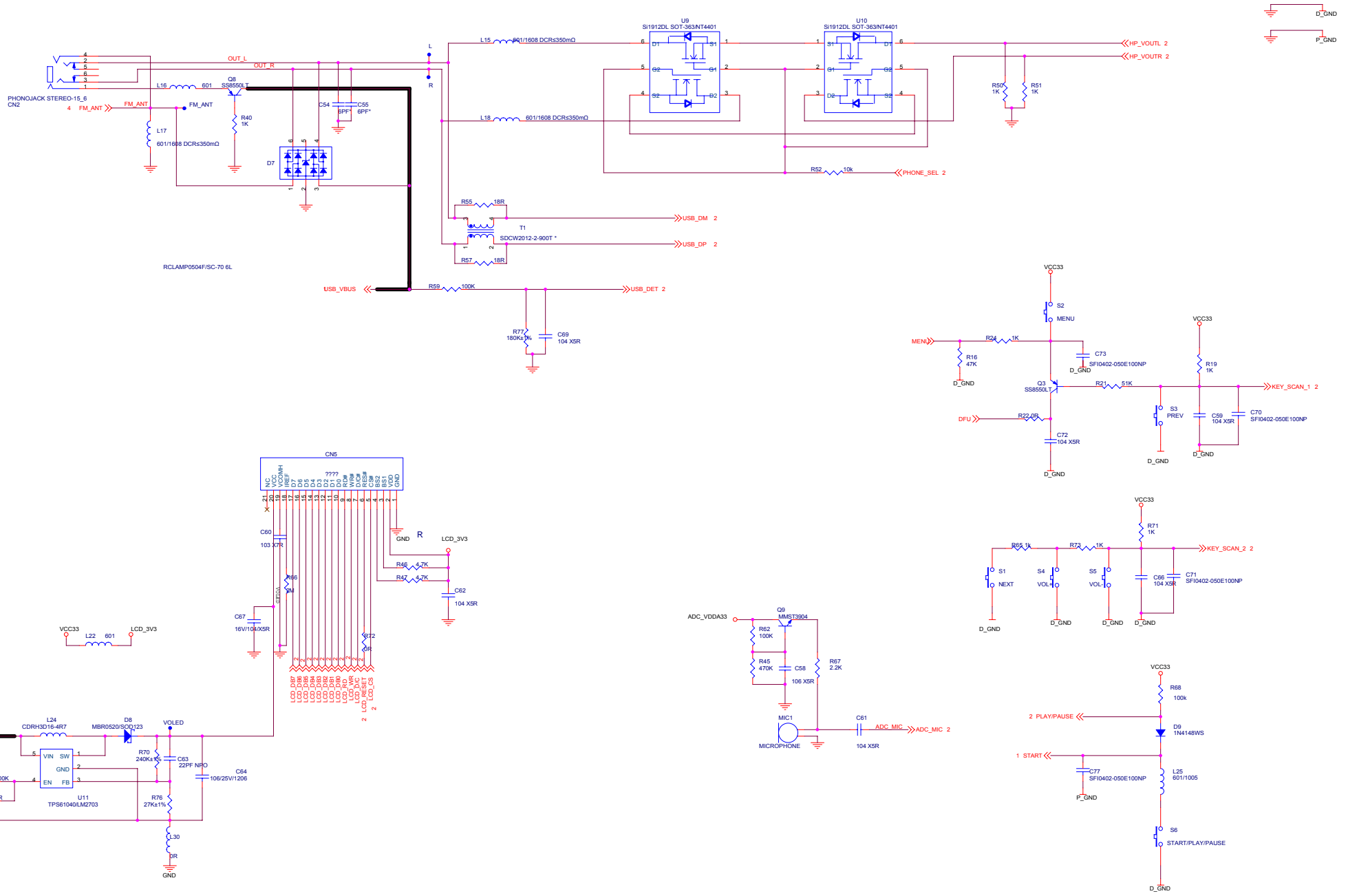
Section Two circuit diagram

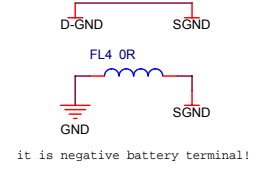
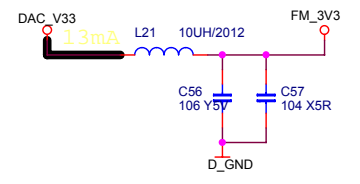
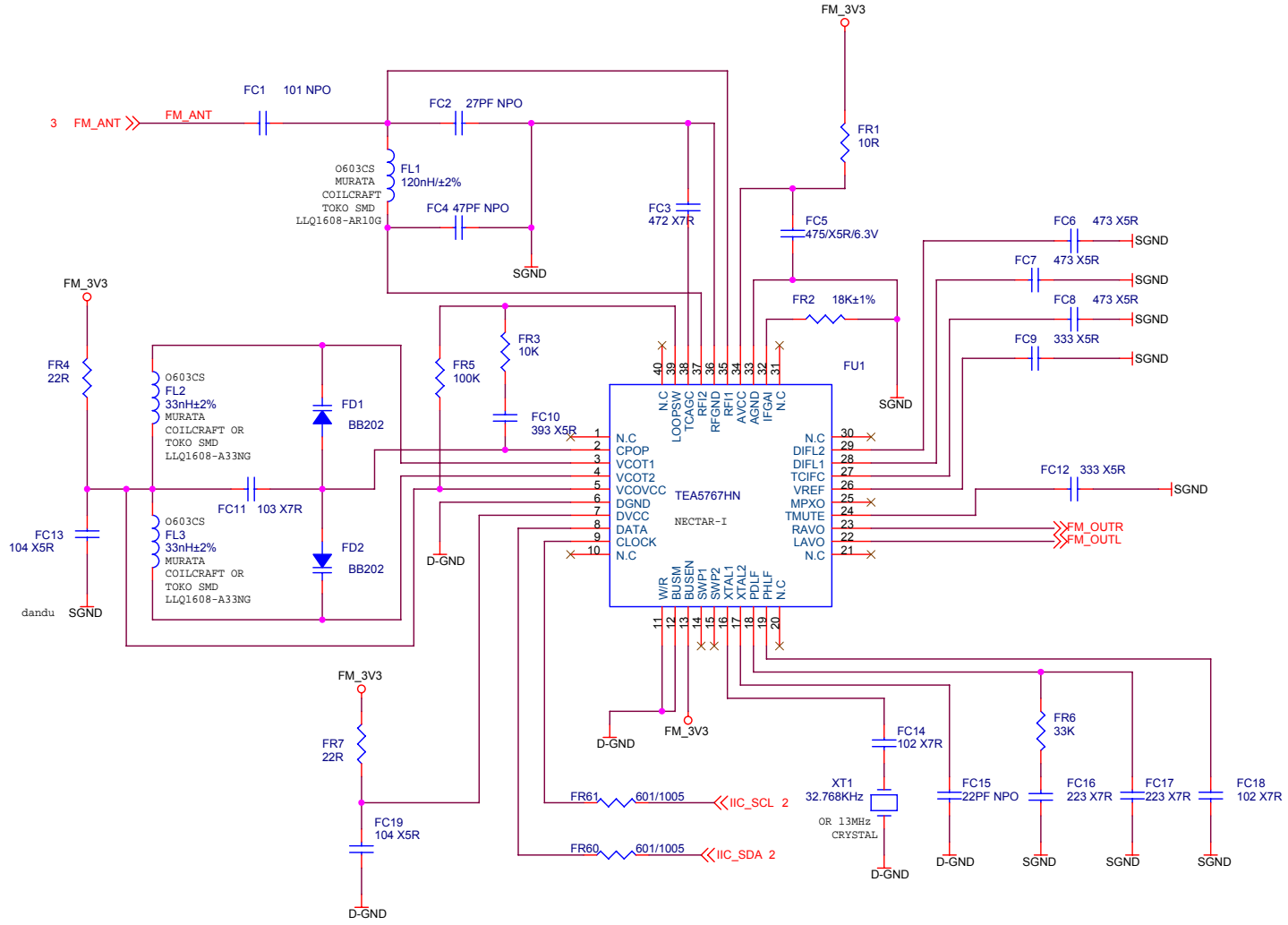


-70-



Pin	Signal	Connection
1	NC	NC
2	NC	NC
3	NC	NC
4	NC	NC
5	NC	NC
6	NC	NC
7	NC	NC
8	NC	NC
9	NC	NC
10	NC	NC
11	NC	NC
12	NC	NC
13	NC	NC
14	NC	NC
15	NC	NC
16	NC	NC
17	NC	NC
18	NC	NC
19	NC	NC
20	NC	NC
21	NC	NC
22	NC	NC
23	NC	NC
24	NC	NC





Chapter six BOM List

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
X31M(RU) BLACK (512M)			
BATTERY PROTECT BOARD		5448351	
0090354	SMD RESISTOR	1/16W 470O±5% 0402	R1
0090368	SMD RESISTOR	1/16W 2K±5% 0402	R2
0310480	SMD CAPACITOR	10V 104±10% X5R 0402	C1,C2,C3
0310790	SMD CAPACITOR	10V 104±20% X5R 0402	C1,C2,C3
0790065	SMD FIELD EFFECT TRANSISTOR	ECH8601 TSSOP	U2
0790090	SMD FIELD EFFECT TRANSISTOR	ECH8601R TSSOP	U2
0882570	IC	S-8261AANMD-G2N-T2 SOT23-6	U1
1633195	PCB	EX31-1	
X31M(RU) BLACK (512M)			
MAIN BOARD		5449000	
0090324	SMD RESISTOR	1/16W 00±5% 0402	FL4,L30,R22,R43,R72,R74,R82
0090326	SMD RESISTOR	1/16W 100±5% 0402	FR1,L10,R29,R30,R31
0090644	SMD RESISTOR	1/16W 180±5% 0402	L8
0090447	SMD RESISTOR	1/16W 220±5% 0402	FR7,FR4
0090339	SMD RESISTOR	1/16W 100O±5% 0402	R9
0090362	SMD RESISTOR	1/16W 1K±5% 0402	R8,R19,R24,R40,R50,R51,R65,R71,R73
0090369	SMD RESISTOR	1/16W 2.2K±5% 0402	R67
0090377	SMD RESISTOR	1/16W 4.7K±5% 0402	R47,R46
0090385	SMD RESISTOR	1/16W 10K±5% 0402	FR3,R52,R56,R58
0090390	SMD RESISTOR	1/16W 18K±5% 0402	FR2
0090396	SMD RESISTOR	1/16W 33K±5% 0402	FR6,R26,R34
0090400	SMD RESISTOR	1/16W 47K±5% 0402	R7,R14,R16,R17
0090401	SMD RESISTOR	1/16W 51K±5% 0402	R21
0090404	SMD RESISTOR	1/16W 68K±5% 0402	R2
0090408	SMD RESISTOR	1/16W 100K±5% 0402	FR5,R10,R38,R39,R48,R59,R62,R68,R69
0090425	SMD RESISTOR	1/16W 470K±5% 0402	R45
0090433	SMD RESISTOR	1/16W 1MO±5% 0402	R35,R32 ,R36
0090436	SMD RESISTOR	1/16W 2MO±5% 0402	R66

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
0090639	PRECISION SMD RESISTOR	1/16W 1.5K±1% 0402	R42
0090652	PRECISION SMD RESISTOR	1/16W 1K±1% 0402	R12
0090740	PRECISION SMD RESISTOR	1/16W 1.8K±1% 0402	R13
0090462	PRECISION SMD RESISTOR	1/16W 10K±1% 0402	R11
0090453	PRECISION SMD RESISTOR	1/16W 12K±1% 0402	R44
0090672	PRECISION SMD RESISTOR	1/16W 20K±1% 0402	R3
0090671	PRECISION SMD RESISTOR	1/16W 33K±1% 0402	R1
0090485	PRECISION SMD RESISTOR	1/16W 27K±1% 0402	R76
0090509	PRECISION SMD RESISTOR	1/16W 100K±1% 0402	R27
0090681	PRECISION SMD RESISTOR	1/16W 120K±1% 0402	R6,R20
0090645	PRECISION SMD RESISTOR	1/16W 180K±1% 0402	R28,R77
0090682	PRECISION SMD RESISTOR	1/16W 300K±1% 0402	R4
0090687	PRECISION SMD RESISTOR	1/16W 240K±1% 0402	R70
0090667	PRECISION SMD RESISTOR	1/16W 510K±1% 0402	R18
1030029	SMD PRESS SENSITIVITY RESISTOR	SFI0402-050E100NP	C4,C68,C70,C71,C73,C76,C77
0310416	SMD CAPACITOR	50V 22P±5% NPO 0402	C2,C22,C23,C63,FC15
0310418	SMD CAPACITOR	50V 27P±5% NPO 0402	FC2
0310424	SMD CAPACITOR	50V 47P±5% NPO 0402	C8,FC4
0310432	SMD CAPACITOR	50V 101±5% NPO 0402	C10,FC1
0310704	SMD CAPACITOR	25V 102±10% X7R 0402	C53,FC14,FC18
0310705	SMD CAPACITOR	25V 332±10% X7R 0402	C27,C28
0310706	SMD CAPACITOR	25V 472±10% X7R 0402	FC3
0310453	SMD CAPACITOR	25V 103±10% X7R 0402	C5,FC11,C6
0310455	SMD CAPACITOR	16V 223±10% X7R 0402	FC16,FC17
0310710	SMD CAPACITOR	16V 333±10% X5R 0402	FC12,FC9
0310711	SMD CAPACITOR	10V 393±10% X5R 0402	FC10
0310712	SMD CAPACITOR	10V 473±10% X5R 0402	FC6,FC7,FC8
0310480	SMD CAPACITOR	10V 104±10% X5R 0402	FC13,C15,C16,FC19,C20,C21,C26,C30,C34,C37,C38,C39,C40,C41,C42,C44,C45,C47,C48,C50,C52,C57,C59,C61,C62,C66,C69,C72,C12
0310790	SMD CAPACITOR	10V 104±20% X5R 0402	FC13,C15,C16,FC19,C20,C21,C26,C30,C34,C37,C38,C39,C40,C41,C42,C44,C45,C47,C48,C50,C52,C57,C59,C61,C62,C66,C69,C72,C12
0310753	SMD CAPACITOR	16V 104±20% X5R 0402	C67,C60

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0310216	SMD CAPACITOR	10V 105 +80%-20% 0603	C11,C13,C33,C35
0310717	SMD CAPACITOR	6.3V 475±20% X5R 0603	C65,FC5
0310486	SMD CAPACITOR	6.3V 106±20% X5R 0805	C1,C3,C7,C9,C36,C46,C58
0310389	SMD CAPACITOR	10V 106 +80%-20% Y5V 0805	C18,C19,C24,C25,C29,C43,C49,C51,C56
0310752	SMD CAPACITOR	25V 106±10% X5R 1206	C64
0310736	SMD TANTALUMCAPACITOR	4V 220uF±20% 3528(B)	C31,C32
0390142	SMD MAGNETIC BEADS	FCM1608-601T02	L15,L17,L18,L16
0390388	SMD MAGNETIC BEADS	600O/100MHZ±25% 1005	L19,L20,L25,FR60,FR61,L2,L3,L4,L6,L7,L9,L11,L12,L13,L22,L23 ,L26,L27
0390044	SMD INDUCTOR	10UH±10% 2012	L21
0390397	SMD CORES INDUCTOR	10uH±20% CDRH2D11/HP	L1
0390221	SMD COIL THREAD INDUCTOR	33nH±2% 1608	FL2,FL3
0390398	SMD COIL THREAD INDUCTOR	120nH±2% 1608	FL1
0390432	SMD CORES INDUCTOR	4.7uH±30% CDRH2D11/HP	L24
1090080	ESD ELEMENT	RCLAMP0504F SC70-6L	D7
1090084	ESD ELEMENT	PLR0504F-P SC70-6L	D7
0700154	SMD TRIODE	1N4148WS SOD-323	D3,D4,D9
0680077	SMD SCHOTTKY DIODE	MBR0520 SOD123	D8
0680074	SMD SCHOTTKY DIODE	BAT43WS SOD-323	D1
0700115	SMD TRANSFIGURATION DIODE	BB202	FD1,FD2
0780298	SMD TRIODE	MMST3904 SOD-323	Q9
0780300	SMD TRIODE	SS8550LT SOD-323	Q8,Q3
0790041	SMD FIELD EFFECT TRANSISTOR	SI2305DS SOT-23	Q2
0790068	SMD FIELD EFFECT TRANSISTOR	SI1912 SOT363	U9,U10
0790070	SMD FIELD EFFECT TRANSISTOR	NTJD4401N SOT363	U9,U10
1000039	COMMON MODE FILTER	SDCW2012-2-900T NT2012	T1
0882475	IC	TPS79301 SOT23-6	U1
0882668	IC	TPS79333DBVR SOT23-5	U1
0882388	IC	TEA5767HN HVQFN	FU1
0882481	IC	G690L263T71 SOT23-3	U2
0882476	IC	TPS62200 SOT23-5	U3
0882851	IC	ISL6294IRZ DFN	U4

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0882853	IC	PIC10F200T-I/OTG SOT-23	U5
0882852	IC	PNX0102AET/N102 TFBGA	U6
0882480	IC	PQ1X281M2ZP SOT23-5	U7
0882629	IC	TPS793285DBVR SOT23-5	U7
0882882	IC	K9F4G08U0M-PCB0 TSOP	U8
0882675	IC	K9K4G08U0M-PCBO TSOP	U8
0882619	IC	K9K4G08U0M-YCBO TSOP	U8
0883070	IC	K9F4G08U0A-YCBO TSOP	U8
0883101	IC	K9K4G08U0A-YCBO TSOP	U8
0882565	IC	LM2703 SOT-23-5	U11
0882999	IC	FAN5331 SOT23-5	U11
1340099	SMD LIGHT TOUCH SWITCH	SKRELGE010	S1,S2,S3,S4,S5,S6
1980074	SMDEARPHONE SOCKET	2SJ-0386-001	CN2
1940282	CABLE SOCKET	21P 0.5mm SMD,SUBMIT MEET WITH CLASP	CN5
1633172	PCB	2X31P-1	
0960279	SMD CMETAL OXIDE FILM RESISTORSTAL OSCILLATOR	32.768KHz±20ppm SSPT6 12.5P	XT1
0960284	SMD CMETAL OXIDE FILM RESISTORSTAL OSCILLATOR	12MHz±30ppm 5032/4 20P	X1