

IBK

DL387SI

service manual



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Chapter One About Maintenance

1.1 Safety precautions

1.1.1 Power Safety Warning

Voltage of Portable DVD is safe low voltage, but there is 220V AC high voltage on Power Adapter, it can cause damage to body ! Maintenance personnel should take extra care.

1.1.2 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.

1.1.3 Precautions for display screen

1. Display screen is breakable article, so please protect carefully when carrying and prevent fingers or hard objects striking the screen to damage structure of the screen.

2. When cleaning screen, do not use organic chemicals. You should use cloth and use small amount of special cleaning liquid in places difficult to clean.

1.1.4 Precautions for laser head

1. Do not stare at laser head directly, for laser emission will occur when laser head is working, which will Hurt your eyes!
2. Do not use wiping water or alcohol to clean laser head, and you may use cotton swab.

1.1.5 About placement position

1. Never place TV in positions with high temperature and humidity.
2. Avoid placing near high magnetic fields, such as loudspeaker or magnet.
3. Positions for placement should be stable and secure.

1.2 Maintenance method

1.2.1 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.

1.2.2 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.

1.2.3 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.

1.2.4 Element substitution method

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

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 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.

1.2.7 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 Features

This portable DVD player has a color large-format TFT LCD and the newest decoding processor, and due to this fact enables you to enjoy high-quality picture and sound. The reading discs mechanism has the latest error protection, so it can work in difficult conditions of shaking and vibration.

Compatible Disc Types:

#Digital video playback: DVD-Video, Super VCD, VCD compatibility

#MPEG-4 standard support: compatibility with Divx3.11, Divx4, Divx5, Divx Pro, XviD compressed video files

#Digital audio playback: CD-DA and HDCD compatibility

#Fully compatible with compressed audio files such as Mp3 and WMA

#Digital graphic albums playback: Kodak Picture CD, JPEG compatibility

Video:

#Color TFT LCD

#Composite video output for TV connection

#Composite video inputs for external signal source

Audio:

#Stereo signal input for external signal connection

#Digital decoders, providing Dolby Digital/DTS audio stream playing

#Built-in stereo audio system

#Headphones output

Storage battery

Working time	MP3 playback (closed lid)	DL370SI	DL372SI	DL375SI	DL377SI	DL385SI	DL387SI	DL3103SI
		5h.	5h.	6h.	4h.	6h.	4h.	5h.
	MP3+JPEG playback	2.5h.	2.5h.	3h.	2h.	4h.	2h.	2.5h.
	DVD playback	3h.	3h.	3.5h.	2.5h.	4.5h.	2.5h.	3h.

Others:

#Compatible disc types: CD-R/CD-RW, DVD-R/DVD-RW, DVD+R/DVD+RW

#Russia, CIS and Baltic States adaptation interface and filenames, ID3-tags and CD-Text support simplifies device operation

#"Memory" function enables to save the last point after stop playback

#"Source" function enables to select video signal source

#"Q-Play" function provides direct playback and allows to skip commercial that is not possible to rewind

#"Virtual Keyboard" function provides more convenient DVD playback control

#"Browser" function provides easy access to playback control

#Parental control function to protect children from watching inappropriate discs

#Large capacity battery enables to watch movies outdoors

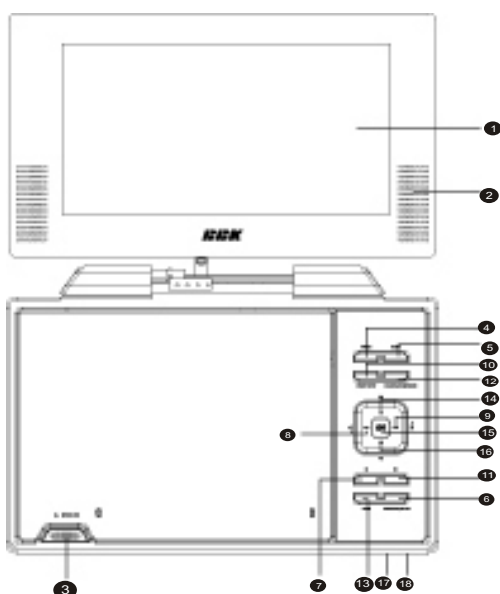
#Electrical connector for external equipment(5V)

#Modern shaking and vibration protection technology

#Good transportation bag

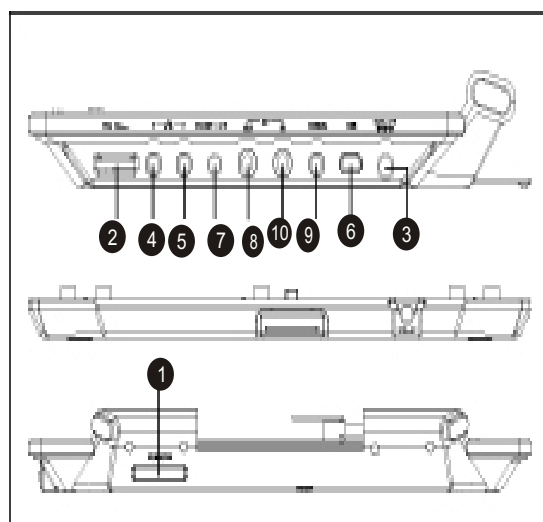
2.2 Set list

Portable DVD player.....	1pcs
Battery	1pcs
Charger/adapter.....	1pcs
Adapter cable.....	1pcs
Auto charger/adapte.....	1pcs
AV cabler	1pcs
Remote control.....	1pcs
Batteries for remote control(AAA size).....	2pcs
Stereo audio cable	1pcs
Cable for composite video signal.....	1pcs
Transportation bag.....	1pcs
Headrest bracket.....	1pcs
Warranty card.....	1pcs
User manual.....	1pcs
Headphones.....	1pcs
USB-Mini-USB adapter.....	1pcs
Screw for headrest bracket.....	4pcs



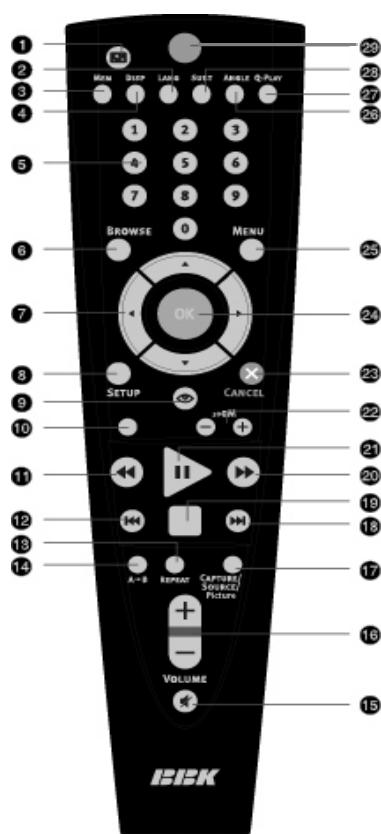
- ① **TFT LCD**
- ② **Built-in loud-speaker**
- ③ **OPEN/CLOSE button**
- ④ **POWER button**
Press to switch power
- ⑤ **SETUP button**
Press to switch setup mode.
- ⑥ **KEYBOARD/SWITCH button**
- ⑦ **REW/DOWN button**
Press to skip reverse/down.

- ⑧ **PREV/LEFT button**
Press to play from previous mark/left.
- ⑨ **NEXT/RIGHT button**
Press to play next/right.
- ⑩ **DVD/AV INPUT button**
Press to switch between DVD/AV Input.
- ⑪ **FWD/UP button**
Press to skip forward/up.
- ⑫ **DVD/USB/CARD READER button**
- ⑬ **MENU button**
Press to switch disc menu.
- ⑭ **STOP/UP button**
- ⑮ **OK button**
- ⑯ **PAUSE/DOWN button**



- ① **SD/MMC/MS**
- ② **VOLUME adjuster**
- ③ **Power socket**
- ④ **Headphones output-1**
- ⑤ **Headphones output-2**
- ⑥ **USB-port**
- ⑦ **External devices socket**
- ⑧ **AV OUT**
- ⑨ **COAXIAL**
- ⑩ **AV IN**

2.3 Remote control general view



CAPTURE button (for DL370SI,DL372SI)

Press to save picture as a screensaver.

SOURCE button(DL375SI,DL385SI,
DL3103SI)

Press to change DVD/USB/CARD READER
mode.

PICTURE button (DL377SI,DL387SI)

Press to change picture mode.

18 Button

Press to skip forward.

19 Button

Press to stop the playback.

20 Button

Press to start forward/forward scanning.

21 Button

Press to normal playback/pause.

22 ZOOM+/- button

Press to zoom in/out.

1 Screensaver button

Activation of screensaver function.

2 LANG button

Press to change language.

3 MEM button

Press to memorize the point where playback
was stopped/playback from the previously
memorized point.

4 DISP button

Press to display the disc information.

5 Numeric buttons

6 BROWSE button

Press to turn on/off the browser function.

7 CURSOR buttons

8 SETUP button

Press to switch to setup mode.

9 Button

Press to turn on/off the virtual control panel.

10 /SOURCE button

Button(for all models except DL387SI)

Press to change image setting.

SOURCE button (for DL387SI)

Press to change DVD/USB/CARD READER
mode.

11 Button

Press to start rewind/rewind scanning.

12 Button

Press to skip backward.

13 REPEAT button

Press to repeat playback.

14 A-B button

Press to repeat the selected portion.

15 Button

Press to turn on/off the sound.

16 VOLUME+/- button

Press to adjust the volume.

17 CAPTURE/SOURCE/PICTURE button

23 CANCEL button

Press to go one level back/cancel current operation.

24 OK button

25 MENU button

DVD disc menu/PBC function.

26 ANGEL button

Press to change the camera angel.

27 Q-PLAY button

Press to turn the Q-Play mode on.

28 SUBT button

Press to change the subtitles language.

29 Button

Button  (for

DL370SI,DL372SI,DL385SI,DL3103SI)

Press to switch into standby.

Button  (for DL375SI,DL387SI)

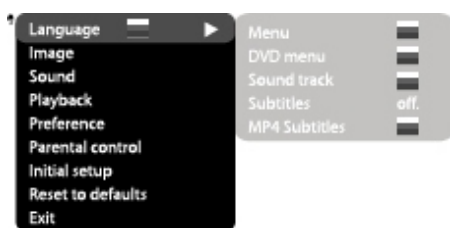
Press to switch the device on.

2.4 FUNCTION SETTINGS

2.4.1 Function selection and change

#Press the SETUP button to show the setup menu. You will see the following image on the screen, as shown on the figure:

#Select the desired menu item using the UP/DOWN buttons; press the OK button for confirmation.



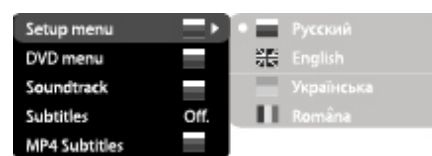
1. For example, if you wish to change the image settings, You have to select the image item and press the OK or RIGHT key.
2. Using the UP/DOWN buttons, select the desired item and press OK or RIGHT button. For example, select the TV format item. Settings will appear on the screen. Then select the desired TV 16:9 and press OK for confirmation.

3. Press LEFT for exit to previous menu level.
4. Press SETUP to exit setup menu.



2.4.2 Language settings

1. Menu: interface language set-up
#Options: Russian, English, Ukrainian, Romanian.
#Default option: Russian.
2. DVD menu: selection of disc menu language
3. Sound: selection of translation language
#Disc menu/translation language options:
Russian, English, Estonian, Lithuanian, Kazakh, Romanian, Belarusian, Ukrainian, Chinese.
#Default menu/translation language option: English.
- #Selection of other languages: select the OTHERS item using the wheel and press OK. Enter the language code using the numeric buttons and press OK.
- #If the language you selected is not recorded on the DVD disc, another available language will be used.



4. 5. DVD/MP4 Subtitles: selection of subtitles language
#Options: Off, Russian, English, Estonian, Lithuanian, Kazakh, Romanian, Belarusian, Ukrainian, and Chinese.
#Default option: Off.
- #Selection of other languages: select the OTHERS item using the wheel and press OK. Enter the language code using numeric buttons and press OK.
- #If the language you selected is not recorded on the DVD/MP4 disc, another available language will be displayed.

2.4.3 Image settings menu

1. TV system: TV system selection
#Options: Auto, PAL, NTSC.
#Default option: Auto.

2. TV Format: image ratio settings

Options: 4:3 pan&scan, 4:3 letterbox and 16:9 TV.

#Default option: 16:9 TV.

#Some discs are recorded with support of only one ratio.

The selected ratio must comply with the TV screen.



2.4.4 Sound settings menu

1. Mixer

a) Configuration: setting of the mode for conversion

Of L+R to L or R.

#Options: L+R, R, L.

#Default option: L+R.

2. Digital output

A) SPDIF format: set-up of digital audio output options.

#Options: RAW, PCM.

#Default options : RAW.

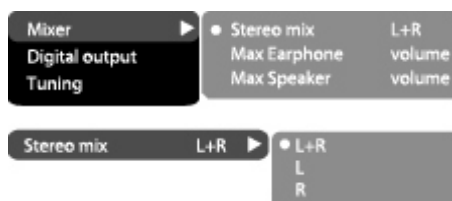
#When you select the RAW option, the not decoded signal is transferred to the DVD player's digital outputs, the decoded signal is transferred to analog outputs. Decoding is performed by the built-in decoder of the DVD player. This feature is meant to ensure that signal decoding at digital outputs is performed by an external device (e.g. an amplifier).

If you select the PCM option, a PCM coded signal will be transferred to the DVD player's digital outputs.

B) LPCM: set-up of digital audio output options to comply with different amplifiers and receivers.

#Options: 48 kHz 16 bit, 96 kHz 24 bit.

#Default option : 48 kHz 16 bit.



3. Tuning

A) Max volume: max volume limiting

#Using the cursor buttons, adjust the max volume level.

#Press the LEFT key to return to sound correction set-up menu.

B) Equalizer: equalizer modes

#Options: Off, rock, pop, live dance, techno, classics, soft.

#Default option: Off.

C) Echo: echo effects

#Options: Off, concert, living room, hall, bathroom, cave, arena, church.

#Default option: Off.

D) Tone balance: adjustment of tone balance level.

#Adjust the tone balance level using the cursor buttons.

#Press the LEFT button to return to sound correction set-up menu.

2.4.5 Playback settings



1. DVD

Advertisement skip: skip the unskippable block while playing a DVD disc.

#Options: Yes, No.

#Default option: No.

2. VCD/SVCD

PBS menu: PBS menu on/off

#Options: On, Off.

#Default option: On.

#If On option is set, while reproducing discs, a menu will appear, in which you can select the order of playing the disc content. If the Off option is set, the reproducing of content is performed in the order, in which it is recorded on the disc.

3. Files: selection of reproduced files on the disc

#Options: Audio, Pictures, Video.

#Default option: A. P. V

4. Repeat: file repeat mode

#Options: Off, Single, All.

#Default option: Off.

5. Load effect: type of transition from one JPEG file to another

#Options: Off, from Top, from Bottom.

#Default option: Off.

2.4.6 Preference settings



1.Equalizer: spectrum analyzer

#Options: On, Off.

#Default option: Off.

2.Screensaver: screen saver on/off

#Options: On, Off.

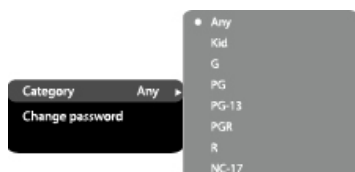
#Default option: On.

2.4.7 Family filter settings

1.Category: set-up of age restrictions to prevent children from seeing undesirable discs.

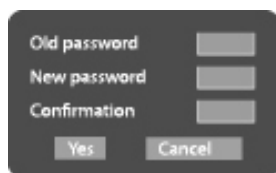
#Options: Any, Kid, G, PG, PG-13, PGR, R, NC-17

#Default option: Any.



2.Change password: set-up of a four-digit password to change the level of age restrictions.

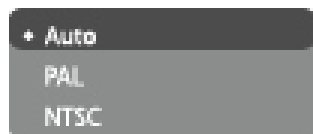
Default option:7890.



2.4.8 Initial settings menu

#Press the RIGHT key to enter the initial settings menu, then select the desired item using the cursor buttons and press OK key for confirmation.

#While being in this menu section, you cannot return to the previous level by pressing the LEFT key.



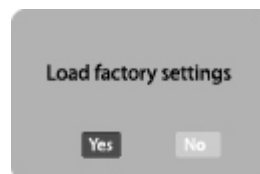
2.5.2 Trouble shooting

Please check probable causes of malfunction before addressing the service center.

Sign of trouble	Cause of trouble	Actions to eliminate the trouble
No sound	1.Poor audio cable connection. 2.Disc dirty or damaged. 3.Sound disabled by the MUTE button.	1.Make proper connection. 2.Clean the disc. 3.Press the MUTE button.
No image	1.Poor video cable connection.	1.Make proper connection.

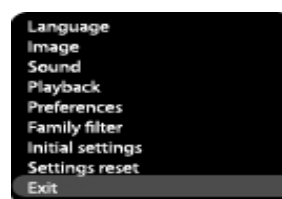
2.4.9 Reset settings to default

#Resetting all settings and restoring default options, except age restrictions level and password.



2.4.10 Exit settings menu

#Select the exit item using the UP/DOWN buttons and press the OK key to exit the menu.



2.5 OTHERS

2.5.1 Useful notes

#To extend the service life of your DVD player make pauses of not less than 30 seconds between switching off and repeatedly switching on the DVD player.

#Disconnect the DVD player from the wall outlet after shutdown.

#Some DVD player's functions may not be applied to some discs.

#Use supply sources of rated voltage, otherwise the DVD player may not function or be damaged.

#In case of the DVD player's occasional stops, please switch the power supply off and then on again.

Black and white image	1.Color level adjusted incorrectly .	1.Readjust the color system.
Discs cannot be read	1.Disc not inserted. 2.Disc inserted incorrectly. 3.Condensate on the DVD player's laser head.	1.Insert the disc. 2.Install the disc with the label side facing up. 3.Switch the DVD player on without disc for an hour.
Remote control does not operate	1.Remote control is incorrectly directed at the DVD player's screen. 2.Distance to the DVD player is in excess of 8 meters . 3.Run out batteries .	1.Use the remote control according to the manual. 2.Decrease the distance to the DVD player. 3.Replace both batteries .
Some functions do not work	1.Disc is recorded incorrectly. 2.Incorrect key sequence. 3.Static voltage on the DVD player's housing.	1.Wait 5-10 seconds and the DVD player will automatically return to normal state. 2.Repeat the operation one more time. 3.Switch the DVD player off for 1-2 minutes and then switch it on again.
Image fault	1.Battery charge is consumed.	1.Charge your battery or connect adapter.
Errors in normal disc playback	1.Defective disc. 2.Wrong button is pressed. 3.Static discharge.	1.Check the disc. 2.Press the right button. 3.Switch off the player for 1-2 minutes .

2.5.3 Technical characteristics

		DL370SI	DL372SI	DL375SI	DL377SI	DL385SI	DL387SI	DL3103SI
Disc types	DVD-Video, DivX3.11, DivX4, DivX5, DivX Pro, XviD, Super VCS, VCD 1.0, 2.0, CD-DA, HDCD, MP3, WMA, Kodak Picture CD, JPEG							
Medium types	CD-R, CD-RW, DVD-R, DVD+R, DVD-RW, DVD+RW							
	SD, MMC, MS Cards	-	-	+	+	+	+	+
Outputs	Headphone output	1	2	2	2	2	2	2
	Analogue stereophonic audio output	-	+	+	+	+	+	+
	Optical digital audio output	-	-	-	-	+	-	-
	Composite video outputs	-	+	+	+	+	+	+
	S-Video output	-	-	-	-	+	-	+
	Coaxial digital audio output	-	-	+	-	-	+	+

Inputs	Stereo audio input	1						
	Composite video input	1						
Video characteristics	Video amplitude	1.0Vp-p(75H)						
	Amplitude of video signal no S-Video output	Y:1.0Vp-p(75H) C:0,286 Vp-p(75H)						
Audio characteristics	Frequency	20-20000 Hz(1 db)						
	Signal-to-noise Ratio	>100 db						
	Total harmonic distortion	< 0.01%						
General Specifications	TFT color display	7"	7"	7"	7"	8"	8"	10"
	Power supply	~100-250; 50/60	~100-250; 50/60	~100-250; 50/60	~100-250; 50/60	~100-250; 50/60	~100-250; 50/60	~100-250; 50/60
	Power consumption,w	12	16	16	13	16	15	37
	Dimensions,mm	205*149*39.5	190*163*38.2	219*151.2*29.6	220*149*41.7	220*166*28	245.5*167.8*30.7	266*183*28
	Mass,kg	0.735	0.835	0.759	0.775	0.877	0.88	1.2
Operating temperature	5-35℃							
Operating Humidity	15-75%(no condensation)							

#Specifications are subject to change without notice.

#We do not guarantee that all discs can be played smoothly due to the disc quality, disc recording quality and recording format.

Chapter Three Principle and Servicing

Section One Principle of the Player

3.1.1 Block diagram of the player

DL387SI is composed of decode circuit, servo circuit, audio circuit, video circuit, MIC circuit and power circuit. Block diagram of the player is shown in the figure 3.1.1.1:

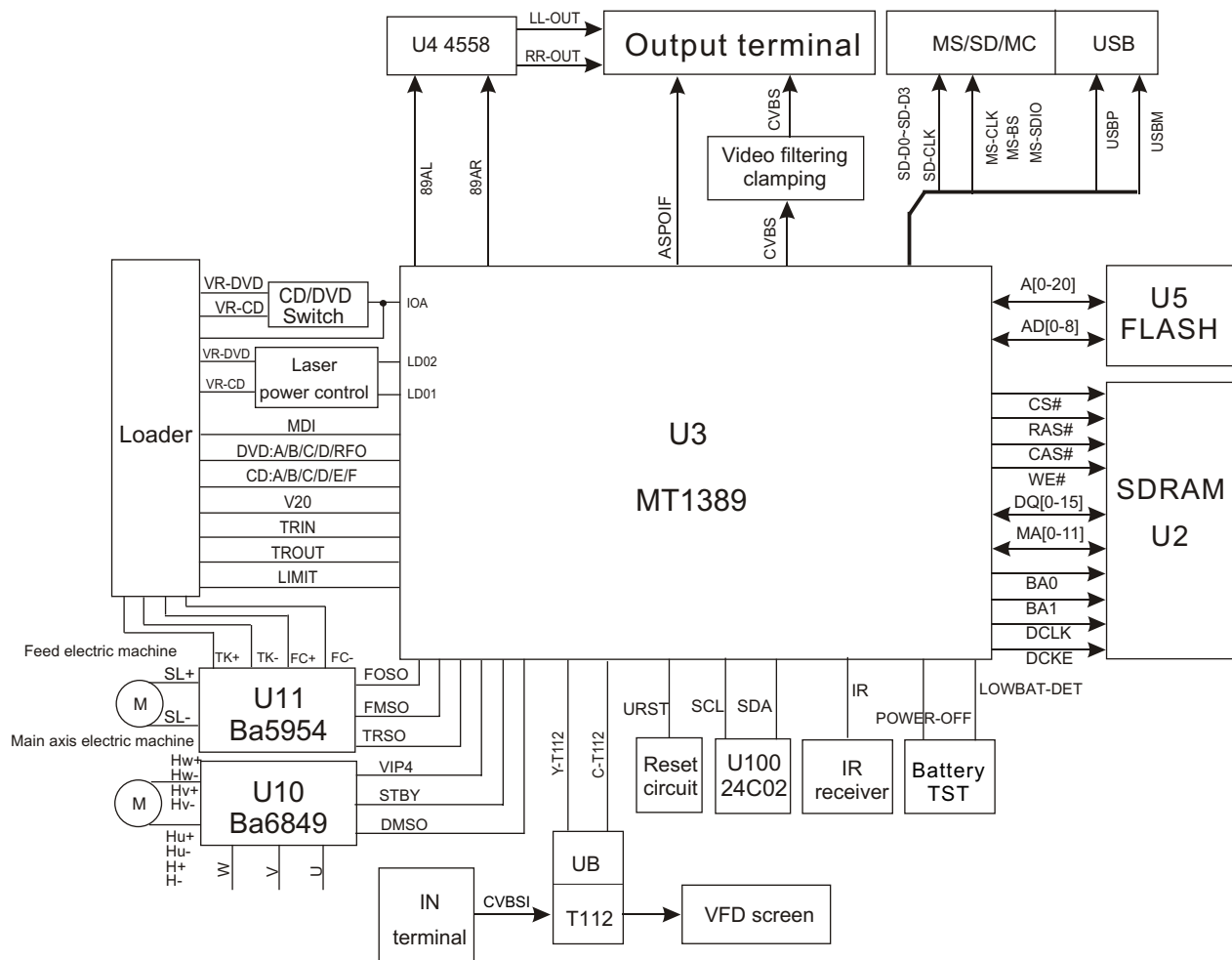


Figure 3.1.1.1 Block diagram of the player

3.1.2 Introduction to IC of the player

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

PCB board	Location	IC model	Function
Decode board	U1	MAX9702	Audio amplifying
	U2	HY57V641620HGT	64M SDRAM
	U3	MT1389FE/HD	Decode chip
	U4	4558	Audio amplifying (operational amplifying)
	U5	29LV160BE	16M FLASH
	U6	MMBD4148SE	Dual diode
	U7	AZ2940	Voltage stabilizing IC
	U8	LM393	Comparator
	U9	AT24C16N	EEPROM
	U10	BA6849FM	Servo drive
	U11	BA5954FM	Servo drive
	U13, U30	LM1117MP	Voltage stabilizing IC
	U14	AO4419	FET
	U15	AS7805	Voltage stabilizing IC
	U16	AZ431-2.5V	Three-end adjustable distribution reference source
	U18	T112	Video encode, LCD drive
	U24	NJM3414	VCOM signal amplifying
	U26, U27	BAT54S	Schottky diode
	U29	AMS1117-3.3	Voltage stabilizing IC
	U31,U32	MP1411	Single-chip step switch converter
Main panel	U7	HS0038B3V	IR sensor
Charge board	U1	S8232	Charge protection
	U2	S3F9454	Charge management single-chip device
	U3	LM358M	operational amplifying
	U4	AZ431AZ-A	Three-end adjustable distribution reference source
	U5	UPA1870	FET
Power adapter	IC1	TOP246Y	Power switch IC
	IC2	HS817	Photoelectric coupler
	IC3	AZ431	Three-end adjustable distribution reference source
Remote controller	U801	PT2222A	Button encode control

Section Two Unit Circuit Principle

3.2.1 Servo processing circuit

1. DL387SI adopts small loader DM-12N loader and MTK decode scheme (MT1389HD+FLASH (16M)+SDRAM (64M)) and its servo circuit is composed of front end signal processing, digital servo processing, digital signal processing IC MT1389HD and drive circuit Ba5954, in which MT1389HD is also the main composed part of decode circuit. Servo processing circuit block diagram is shown in the figure 3.2.1.1:

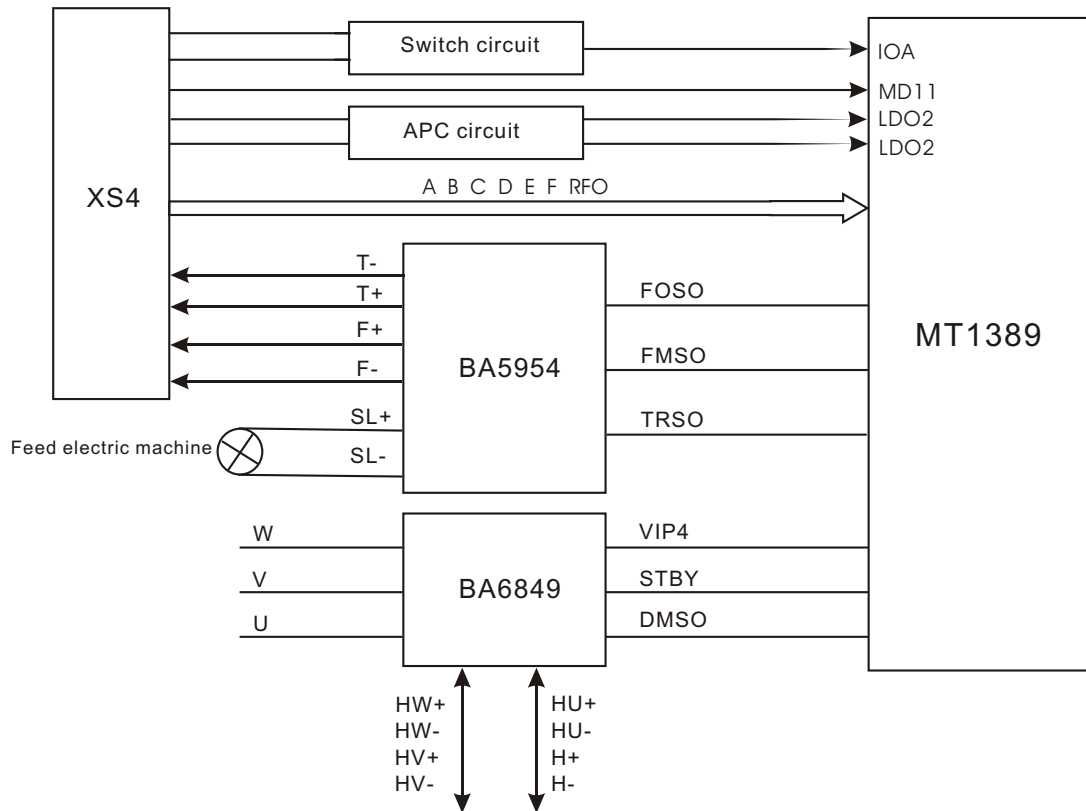


Figure 3.2.2.1 Servo processing circuit block diagram

2. Working principle: after power on or closing door (door detect switch SW1/SW2 on charge board closes), loader pick-up begins to reset, focus and main axis begin to rotate and pick-up begins to identify disc information to judge whether it is CD or DVD disc to make the corresponding control action. Meanwhile MT1389 also adjusts laser output power through laser power control circuit. When loader reads disc information, signals A, B, C, D, E, F form through photoelectric conversion to give to Mt1389

(DVD has signals A, B, C, D only) and also Therefore signal, and then input from pin 2~11, 18, 19 of MT1389, after being processed and amplified by MT1389 internal pre-amplifier, now signals are precessed in two parts inside MT1389: one part forms the corresponding servo control signals after being processed by digital servo signal circuit inside Mt1389 and then outputs FOO, TRO, TRO, DMO and FMO

Digital servo control signal from pin 42, 41, 37 and 38 o MT1389, through the integration circuit composed of capacitor and resistor, become analog servo control signal FOSO, TRSO, FMSO and send to drive circuit BA5954 for drive amplifying, and bring along focus winding, trace winding, feed electric machine and main axis signal (DMSO) after amplifying to send to drive circuit BA6849 for drive amplifying to bring along main axis electric machine, in which focus and trace servo are used to correct objective lens position accurately; feed servo is used to bring along pick-up to make radial and large range movement, which belongs to the preliminary adjustment to pick-up position; main axis servo is used to control main axis electric machine to read signal in the means of constant line speed to bring along disc to rotate. After being amplified by VGA voltage control amplifier inside MT1389 and even frequency compensation, the other part signals switched into digital signal through internal A/D conversion. When loader reads CD/VCD signals, these signals perform EFM demodulating inside MT1389 and then finish CIRC error correction and then output to rear stage for AV decoding; when loader reads DVD signals, these signals perform ESM demodulating inside MT1389 and then finish RSPC error correction and then send to rear stage for decoding. Compared with general DVD players, this machine has no disc trat in/out circuit and manual means is adopted.

3. Loader signals explanation is shown as follows:

Pin	Name	Signal flow direction	DVD disc	CD disc	No disc	Function description
1	F-	Input loader	2.52	2.34	0.46	Focus error signal is added to two sides of pick-up focus coil
2	F+	Input loader	2.49	2.49	0.93	
3	T+	Input loader	2.53	2.51	0.94	Trace error signal is added to two sides of pick-up trace coil
4	T-	Input loader	2.58	2.51	0.93	
5	C	Input MT1389	2.2	2.25	2.04	Disc data signal
6	D	Input MT1389	2.2	3.2	2.04	Disc data signal
7	IOA	Input MT1389	0.01	3.2	3.21	Disc identification signal, CD is 3.3V, DVD is 0V
8	RF	Input MT1389	2.21	2.53	1.28	The sum of disc data signal
9	A	Input MT1389	2.17	2.22	2.04	Disc data signal
10	B	Input MT1389	2.19	2.27	2.04	Disc data signal
11	F	Input MT1389	2.07	2.44	2.03	Supplementary signal used in trace
12	GND	Ground	0.01	0.01	0	Grounding

13	V20	Input loader	2.04	2.06	2.03	Reference voltage
14	Vcc	Input loader	5.04	5.04	5.02	Supply voltage f or loader
15	E	Input MT1389	2.06	2.45	2.03	Disc data signal
16	Blanking	haning in air	0.01	0	0	unused
17	VR-CD	Input loader	0.21	0.01	0	Through the handling inside loader, make sure MD11 is 180mV when reading CD
18	VR-DVD	Input loader	0.01	0.2	0	Through the handling inside loader, make sure MD11 is 180mV when reading DVD
19	LD-CD	Input loader	0.09	2.1	0	CD laser power control signal
20	MDII	Input MT1389	0.21	0.2	0	CD and DVD laser power monitoring signal
21	HFM	Input loader	5.04	5.04	5.02	High frequency overlapping signal produces laser with different wave length inside loader
22	Blanking	unused	0.01	0.1	0	
23	LD-DVD	Input loader	2.21	0.1	0	DVD laser power control signal
24	GND	unused	0.01	0.01	0	Grounding

Note: 1. When reading DVD, there are only A, B, C, D signals.

2. When reading CD, there are A, B, C, D, E, F signals.

3. $RFO=A+B+C+D$.

4. Focus error signal= $(A+C)-(B+D)$ Trace error signal=E-F.

3.2.2 CD/DVD switch circuit

1. CD/DVD switch circuit is shown in the figure 3.2.2.1:

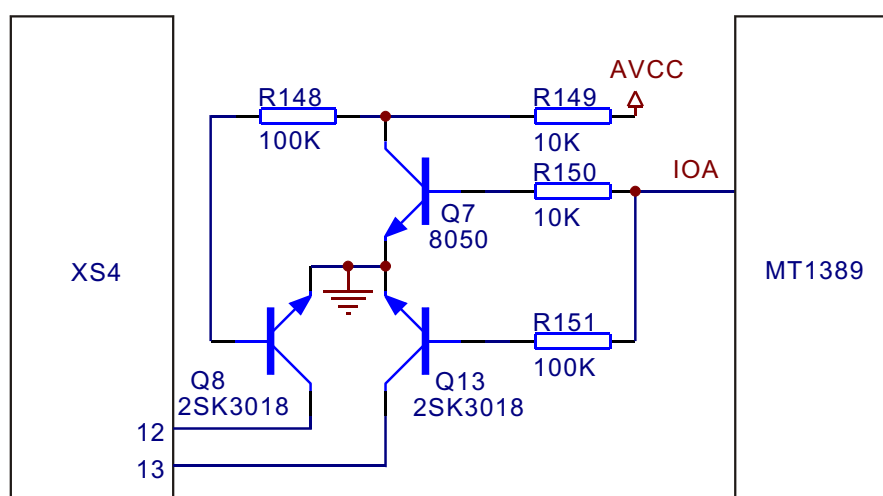


Figure 3.2.2.1 CD/DVD switch circuit

2. Working principle: after loading disc into machine, IOA port of the player defaults high level to make V103 saturated on and forms loop together with CD laser power control circuit, meanwhile IOA also goes to PD IC directly for switch and disc begins to rotate. When servo processing system recognises the disc inside is not CD, IQA pin outputs low level to make Q13 cut off, Q8 is connected and forms loop together with DVD laser power control circuit on loader to perform the action of reading DVD disc. After disc tray ejects out, IOA still maintains the state before opening door. If the machine cannot recognise which disc is, IQA pin will switch continuously until disc is read out or system judges no disc in.

Note: Q13 and Q8 are MOS tube (voltage drop is small when saturated on) .

3.2.3 Laser power control circuit

1. Laser power control circuit is shown in the figure 3.2.3.1:

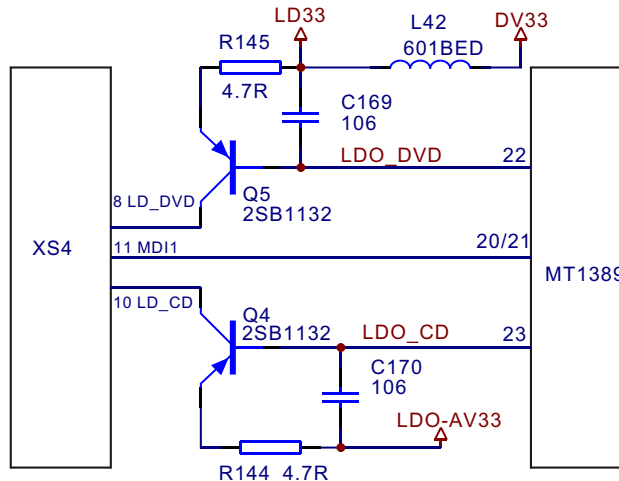


Figure 3.2.3.1 Laser power control circuit diagram

2. Working principle: pin 20/21 of MT1389 is laser power detect signal input pin, pin 21 is DVD laser power detect signal input pin, pin 23 is VCD laser power drive control output pin and pin 22 is DVD laser power drive control output pin.

When reading VCD disc, laser power becomes weak and voltage of MDI pin 1 reduces; MT1389 voltage reduces and XS5 pin 10 voltage increases to reach the purpose of boosting laser power. When laser power is too strong, MDI pin 1 voltage increases to make Mt1389 voltage increase and X5 pin 10 voltage decrease to reach the purpose of reducing laser power to form an auto power control circuit. When reading DVD disc, pin 21 is detect signal input pin, pin 22 is drive control output pin and the working principle is the same with that when playing VCD.

3.2.4 Main axis control circuit

1. Main axis control circuit is shown in the picture 3.2.4.1:

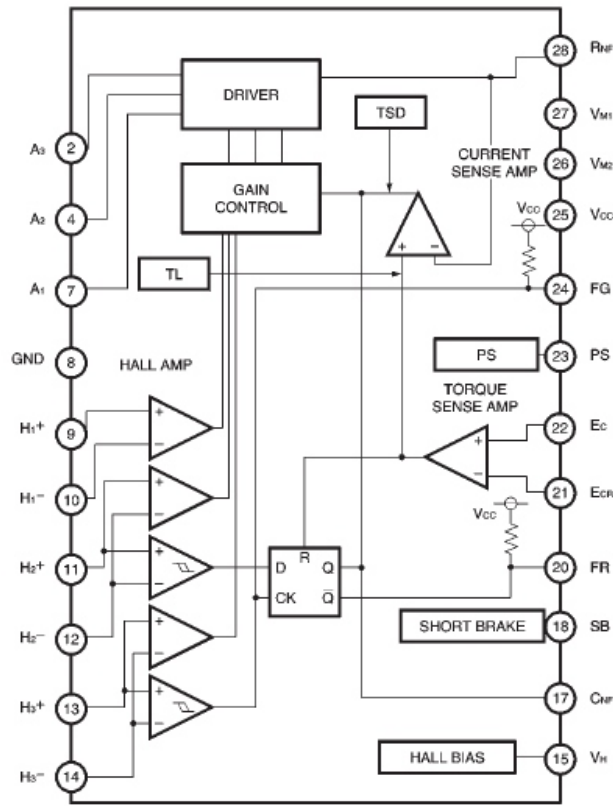


Figure 3.2.4.1 Main axis control circuit diagram

2. Working principle: BA6849 has a built-in comparator composed by operational amplifier. When open disc tray, disc is rotating all the time and a braking signal is required to make main axis electric machine stop rotating immediately and thus disc can be stopped rotating in a short period after opening disc tray. Open disc when playing, main axis braking signal disappears and still in rotation state because of inertia function. Now the induction electromotive force generated by electric machine rotation inputs to Ba6849 through H1+, H1-, H2+, H2-, after amplifying and processing inside, an electric machine reverse braking signal outputs to make main axis electric machine speed down. This player adopts manual opening disc tray means, so disc still rotates after opening disc tray but will stop soon.

3.2.5 DC-DC circuit

1. DC-DC start circuit

As shown in the figure 3.2.5.1, when power switch Sw5 cuts off, triode Q18 cuts off, MOS tube U14 is in cutoff state, DC-DC circuit has no voltage input, DC-DC circuit does not function and machine is in power-off state. After Sw5 closes, Q18 is connected to make U14 connected, +9V voltage begins to supply power for DC-DC circuit and DC-DC circuit begins to work.

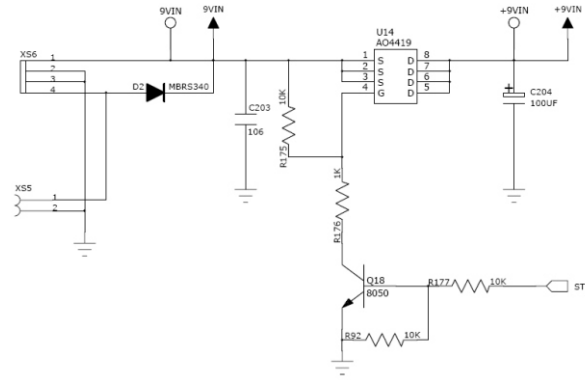


Figure 3.2.5.1 DC-DC start circuit diagram

2. DC-DC circuit

As shown in the picture 3.2.5.2, after +9V power is being connected, Mp1411 (U32) begins to work, Mp1411 control the change of +9VIN. When Mp1411 is connected, +9V power reaches L68 through Mp1411, C339 save energy of inductor and charges capacitor. D16 is freewheeling diode, when Mp1411 cuts off, L68 discharges energy and its inductance electromotive force makes diode connected, and now C339 discharges load and the current direction is unchanged to form a DC-DC circuit.

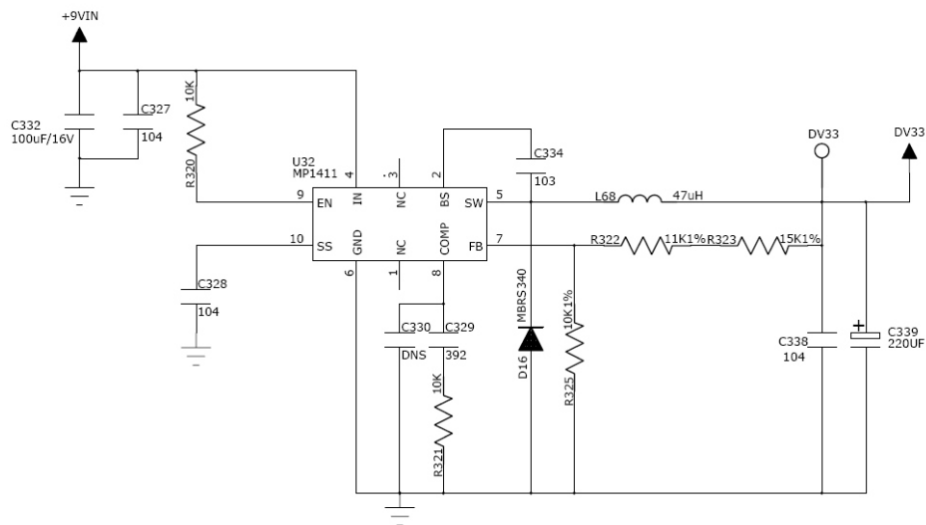


Figure 3.2.5.2 DC-DC circuit diagram

3. DC OUT control circuit

As shown in the figure 3.2.5.3, DC OUT controls circuit. When machine is in DVD state, decode chip I/O_SELECT pin outputs a high level to make servo drive circuit enter working state, and Q20 is saturated on at the same time. Q21 cuts off, Q19 cuts off, DC OUT has no power output. When machine switched in external input, decode chip I/O_SELECT pin outputs a low level to make servo drive circuit not work, Q20 cuts off at the same time, Q21 is saturated on to make Q19 connected, DC OUT outputs VCC to provide with TV box.

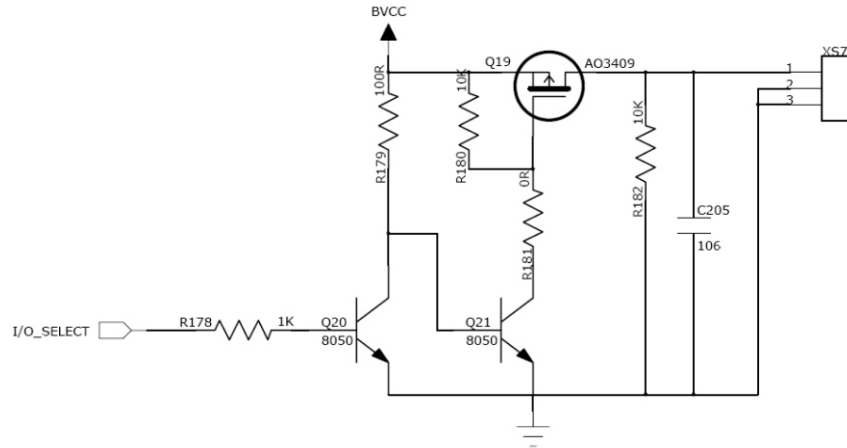


Figure 3.2.5.3 DC OUT control circuit diagram

3.2.6 Battery voltage detect circuit

1. Battery voltage detect circuit is shown in the figure 3.2.6.1:

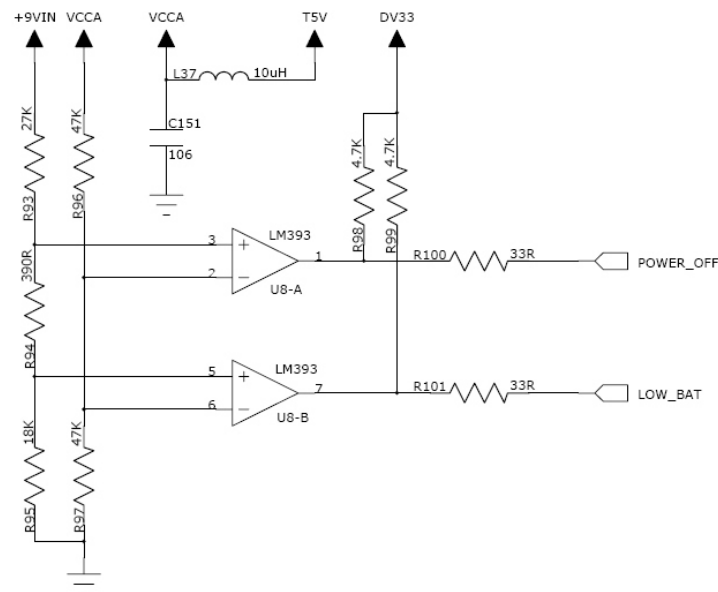


Figure 3.2.6.1 Battery voltage detect circuit diagram

2. Working principle: in battery voltage detect circuit, U8 is an operational amplifier and used as a comparator in circuit. Reverse input end inputs a VCC 5V, after voltage division by resistor R96 and R97, reference voltage (2.8V) is achieved. After +9 VIN is voltage divided by R93, R94, R95, two groups of voltage are achieved to supply for in-phase input end of operational amplifier. When in-phase input end voltage is lower than 2.8V, output pin of operational amplifier outputs a low level to decode chip to carry out the relevant action. In this machine, after calculating, when input voltage is lower than 6.5V, pin 7 of operational amplifier outputs low level, screen on machine displays low level; when input voltage is lower than 6.1V, pin1 of operational amplifier carry out the action of power off.

3.2.7 Audio output circuit

1. Audio output circuit block diagram is shown as in the following figure 3.2.7.1:

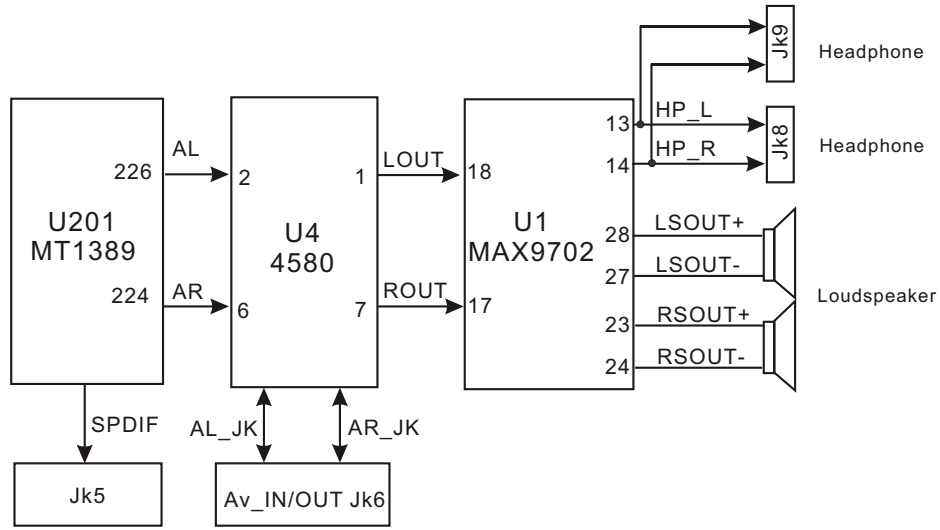


Figure 3.2.7.1 Audio output circuit block diagram

2. Working principle: signal read out by disc, through audio and video decoding, converse audio signal in MT1389 built-in DAC circuit to analog audio signal and output left and right channel analog signals from pin 226, 224 of MT1389, through TC35, TC36, coupled to pin 6, 2 of U4 and then output from pin 1, 7 of U4 through being filtering and amplifying by the active filter composed of U4 and send to audio output terminal and headphone amplifying output circuit.

(1) Headphone amplifying output circuit

Audio signal outputted by U4 inputs from pin 17, 18 of U1; audio signal after being amplified outputs from pin 13, 14 of U22 to headphone jack Jk1 and Jk2; audio signal outputs from pin 27, 28, 23, 24 of U22 to left and right loudspeaker.

(2) Headphone and loudspeaker output mode switch

Headphone and loudspeaker output mode switch is realized by U1 MAX9702. U1 switched headphone output through detecting high or low level of pin 20 HPS. When JK8 and JK9 have no headphone inserted to the jack, Diode D4, D5 are in cut-off state, triode Q6 cuts off, Q1 is connected to pull HPS down to ground, MAX9702 outputs audio signals to loudspeaker. When one of JK8 or JK9 inserts into headphone jack, grounding cuts and becomes high level. Only one of diode D4 and D5 is connected, Q6 collector electrode becomes high level and then is saturated on, Q1 collector electrode level pulls down to cut off, HPS voltage is 5V high level, MAX9702 switched to headphone output state.

3.2.8 Screen-off detect control circuit

1. Screen-off detect control circuit is shown in the figure 3.2.8.1:

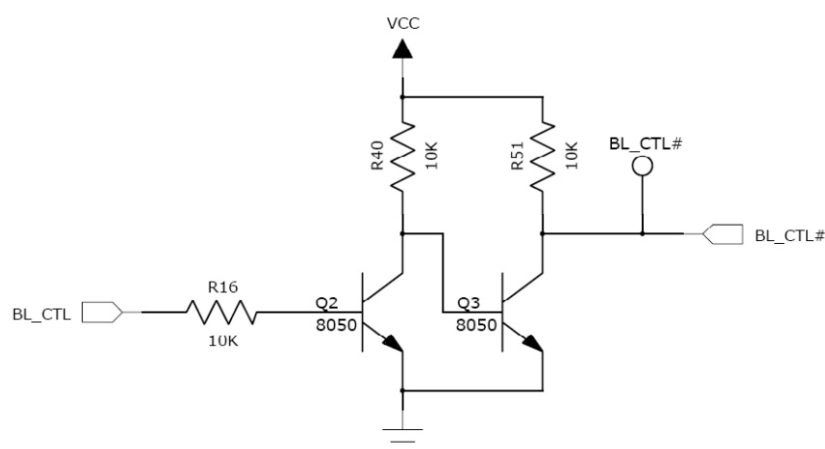


Figure 3.2.8.1 Screen-off detect control circuit diagram

2. Working principle: when machine power on, Mt1389 discharges high level BL_CTL, triode Q2 is connected but Q3 cuts off, BL_CTL# is high level, boost begins to work to lighten back light board. When screen is off or power off, BL_CTL high level disappears, triode Q2 cuts off but Q3 is connected, BL_CTL# is pulled down to ground, boost board stops working and background light of screen is off.

3.2.9 Video encoding and LCD—TFT drive circuit

1. Video encoding and LCD—TFT drive circuit block diagram is shown in the figure 3.2.9.1:

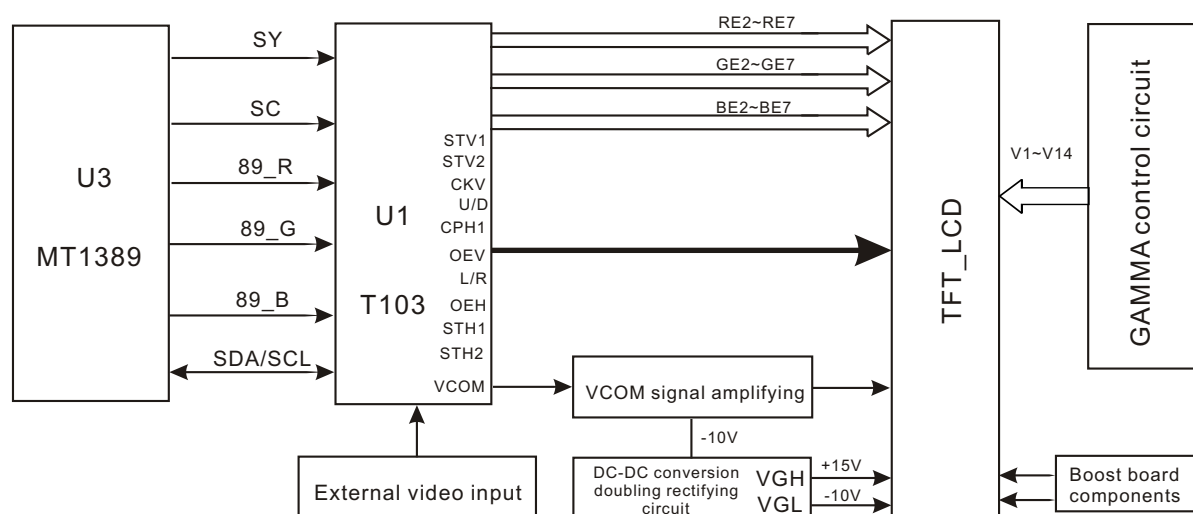


Figure 3.2.9.1 Video encoding and LCD—TFT drive circuit block circuit

2. Working principle: decode chip outputs Y/C analog video signal into T112 for encoding, through internal ADC circuit, converts analog signal to digital signal VR/VG/VB to drive LCD screen to display.

VCOM signal amplifying circuit: after VCOM being amplified by U24 (NJM3414), pin 6,7 outputs a display screen and uses as colour filtering plate of screen.

3.2.10 Doubling circuit

1. Working of display drive circuit needs high voltage, so +5V voltage is doubled, shown in the figure 3.2.10.1:

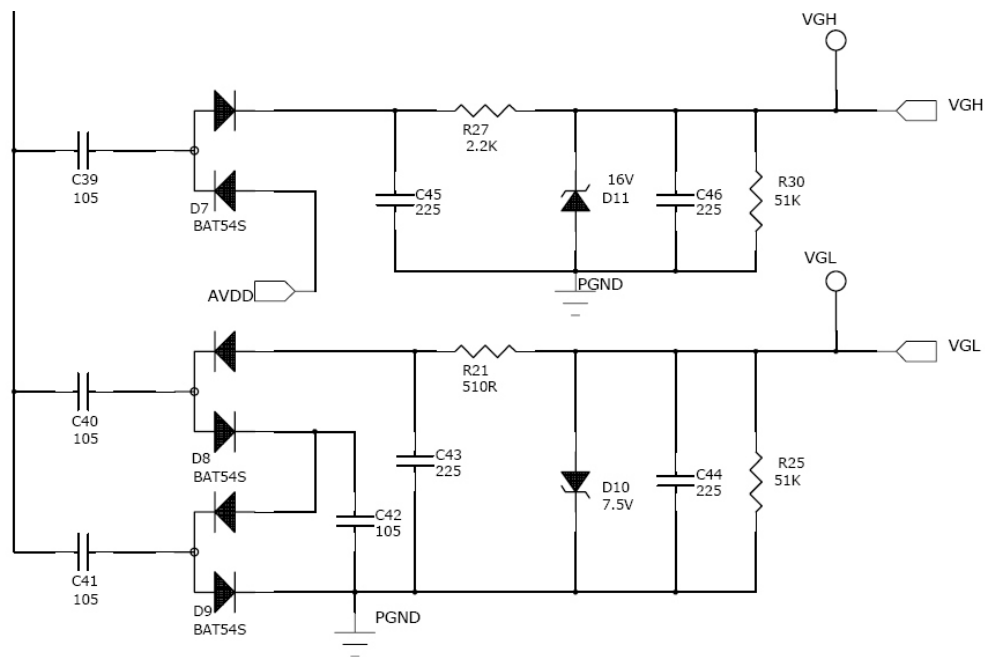


Figure 3.2.10 Doubling circuit

2. Working principle: VCC is sent to the 2 groups of doubling rectifying circuit composed by U26 and U27 through U7. VPWM controls whether Q22 is connected to control whether T5V is connected. During the course of inductor L65 on and off, the discharged electricity is outputted to U26 and U27. When input is negative, -14V DC voltage forms in the collector electrode of Q25, the -10V VGL voltage outputted after being voltage stabilized by Az431 is supplied to VCOM signal amplifying circuit and display screen. When input is positive, after being doubled by U27, the outputted +15V VGL DC power is supplied to display screen and other drive signal.

3. Function introduction to display screen pins is shown as follows:

Pin	Symbol	I/O	description
1	GND	-	Ground
2	VCC	P	Power line for logic

3	VGL	P	Gate driver negative voltage
4	VGH	P	Gate driver positive voltage
5	STV1	I/O	Gate driver START PULSE 1
6	STV2	I/O	Gate driver START PULSE 2
7	CKV	I	Gate driver scanning clock
8	U/D	I	Up/Down scanning change
9	OEV	I	Gate driver output enable
10	Vcom	I	HORIZONTAL SYNCHRONIZATION SIGNAL(Voltage applied to color filter substrate)
11	Vcom	I	Voltage applied to color filter substrate
12	L/R	I	Right / Left scanning change
13	MOD	I	Sampling mode change (H: Simultaneous, L: Sequential)
14	OEH	I	LATCH PULSE FOR COLUMN DRIVER
15	STH2	I/O	Source scanning start signal 2
16	STH1	I/O	Source scanning start signal 1
17	CPH1	I	INPUT DATA CLOCK
18	CPH1	I	INPUT DATA CLOCK
19	CPH1	I	INPUT DATA CLOCK
20	Vcc	P	Power line for logic
21	GND	P	Ground
22	VR	I	Red video signal
23	VG	I	Green video signal
24	VB	I	Blue video signal
25	AVdd	P	Power
26	AVss	P	Ground

3.2.11 Charge circuit and protection circuit

1. Battery: lithium-ion polymer chargeable battery. Charge method follows constant current firstly and then constant voltage, and then charge is performed in constant voltage status.

2. Lithium battery protection is divided into 3 parts (this PCB board is not repaired inside battery components): A. Over-voltage protection, that is charge protection; B. Under-voltage protection, that is Over-discharge protection; C. Over-current protection (including short-circuit protection). The protection delay and delay time for the above three items are different from each other, from 2 second to 0.1

Second to 10ms and delay is adjustable. Two lithium protection, no matter it is over-voltage protection or under-voltage protection, they are both the relationship of “or”, as long as one core reaches the condition, it is protected. This requires two battery cells on one group battery are equal basically, otherwise the entire capacity will be damaged seriously (when in over-voltage protection, battery cell of high voltage is protected firstly; when in under-voltage protection, low voltage battery cell is protected firstly).

3. Charge part (charge board is a separate PCB inside the player): core of charge part is single-chip machine, which adopts 10-bit A/D conversion PWM (12bits). Scheme of 8-bit single-chip machine of SAMSUNG Company (S3C9454) has the following features:

(1) Single-chip machine is with 10-bit A/D conversion with the precision 1/1024. Generally speaking, negative voltage of NI-MH is 3-6mv ($6\text{mv}/1500\text{mv}=1/250$), which can be satisfied well.

Lithium battery precision can be up to 5mv. Considering adjusting error, $\pm 20\text{mv}$ can be achieved, that is $4.2\text{V}\pm 0.02\text{V}$, so the advantage of high precision is obvious.

(2) PWM (Pulse Width Modulator) with the single-chip machine is used to control DC/DC conversion directly. The control method is supplied by software to achieve different constant current and constant voltage curve (different charge means may be designed according to client's requirement). The entire line is simple, with low-cost, high reliability, high efficiency power switch and little heat radiation.

(3) NI-MH, NI-CD, LI-ION battery may be charged well. How to judge whether it is fully charged: A. Max voltage; B. Max temperature increase; C. Negative voltage; D. Max charge time. It can be tested quickly (within 15 minutes) after fully charged and being loaded again and charge stops (this is very important for NIMH and NICD to prevent over charge to damage battery). When battery voltage is low, use small current to charge to restore the damaged battery.

4. Working principle: when external power adapter supplies power, power is supplied for charge circuit through DCB_IN1, and then supplied working voltage for U2 after being voltage stabilized by the voltage stabilizing circuit composed by Q3 and U4. U2 is single-chip machine of charge management control.

To supply power for PU, TI431 and a NPN are adopted. Though elements are many, precision is high, easy to correct and reach 1% and less adjusting. U4 and Q3 compose it.

Q6.Q7.Q8 and Q2 compose switch DC/DC circuit. Q7 and Q8 compose standard push-pull circuit to drive Q6 to make Q6 switch waveform good and decrease heat radiation.

Q6.L1.C17.C18 and D2 compose classical STEP DOWN circuit. When Q6 is connected, current is supplied power for battery and saved energy for inductor. When Q6 cuts off, electric energy in inductor discharges through D2 to charge battery.

Lm358 is a classical in-phase amplifying circuit. The reason of adding amplifying circuit is decrease Resistance test and heat radiation.

Function of Q9 is supply power for control end. When INPUT+ is low level, Q9 is connected and

Battery supplies power for load. When INPUT+ is high level, power adapter supplies power for load.

Q4 and Q5 compose protection circuit. When charge circuit or battery has trouble, B electrode of Q5 is high level, Q4 cuts off and 9V power stops supplying power for battery.

3.2.12 Decode circuit

1. Decode circuit block diagram is shown in the figure 3.2.12.1:

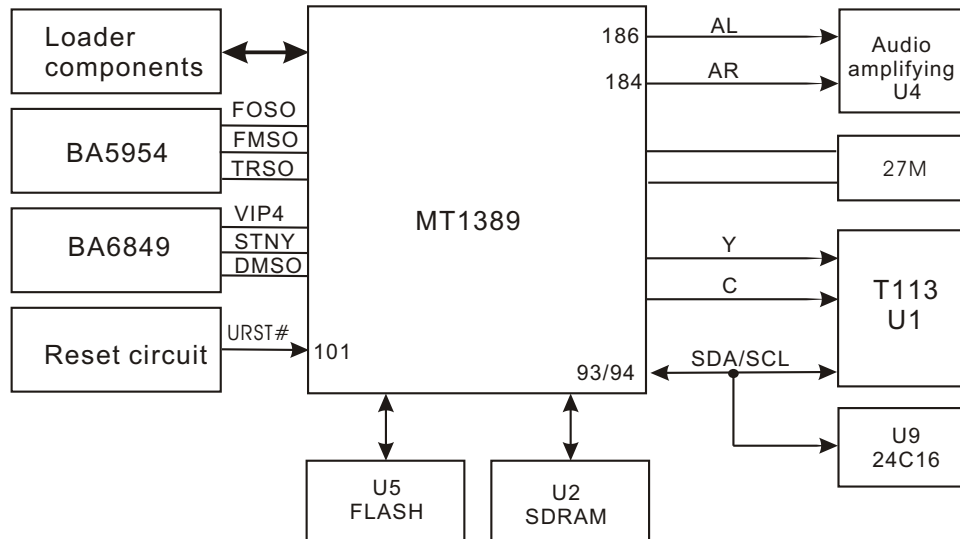


Figure 3.2.12.1 Decode circuit block diagram

2. Working principle

(1) Power: Mt1389 has two groups of power supply. One group is 1.8V voltage achieved through Lm1117 (U13) voltage stabilizing and it is supplied for logic circuit inside IC; and the other group is 3.3V voltage after DC-DC conversion. Also FLASH and SDRAM meet the conditions of power supply.

(2) System clock: clock signal is an important factor for the working of the player. Whether there is clock signal and whether it is normal both will affect the normal working of the player. This player adopts external clock (27M) which inputs to pin 234 of MT1389 and clock signal is generated from crystal oscillator X1.

(3) Data communication

1) Communication of MT1389 and SDRAM: the communication of MT1389 and SDRAM is to save the large amount of data after MT1389 decoding for calling up at any time. As shown in the figure 3.2.12.2, DMA0~DMA10 are address signals, DQ0~DQ15 are data signals, DCLK is synchronous clock, DCKE is enabled end, CS is chip selection signal, WE is write enabled signal and RAS, CAS are line and row address gating signals.

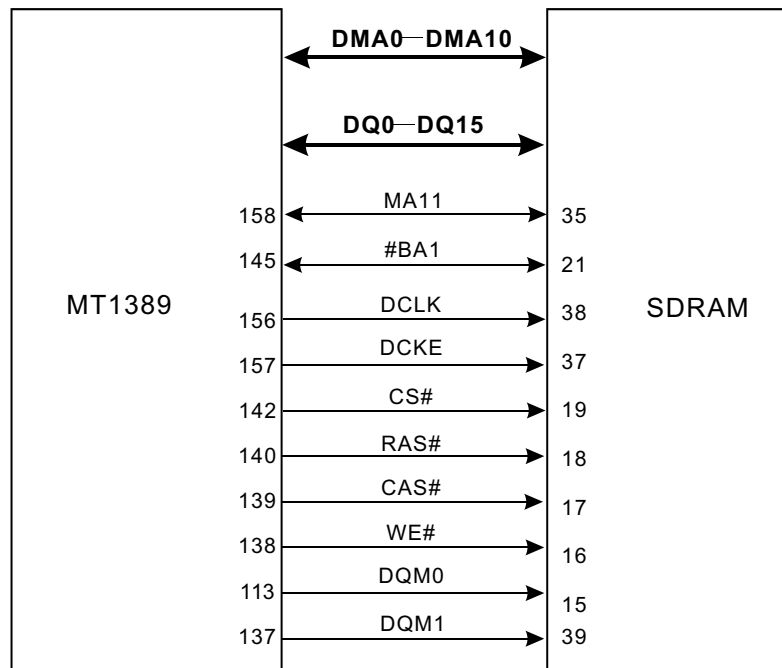


Figure 3.2.12.2 MT1389 and SDRAM communication block diagram

2) Communication of MT1389 and FLASH

Commination of MT1389 and FLASH is call the program and working instruction saved inside FLASH when power on. As shown in the figure 3.2.12.3, A0~A21 is address line, 2AD0~AD14 is data line, DWR# is read-write control, DCE# is chip selection and DRD# is read operation.

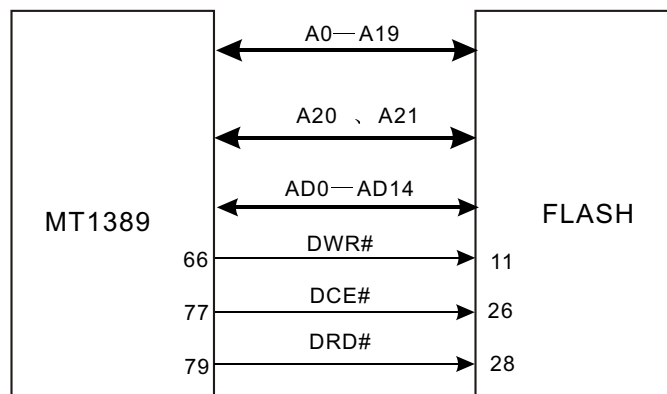


Figure 3.2.12.3 MT1389 and FLASH communication block diagram

3. AV output

(1) Video: MT1389 integrates video encoder inside. Analog video signals may output from inside MT1389 directly. DL387SI need to output analog signal, SC and SY output from pin 189 and pin 191 of Mt1389.

(2) Audio Mt1389 integrates audio D/A conversion inside, so analog audio signals output from inside MT1389 directly, and digital signals may also output and is converted by external D/A conversion IC with optical output function. DI385 needs to output digital signal. Pin 224 and 226 of Mt1389 output 89_R and 89_L and pin 216 of Mt1389 outputs SPDIF signal.

3.2.13 Mute circuit

1. Mute circuit is shown in the figure 3.2.13.1:

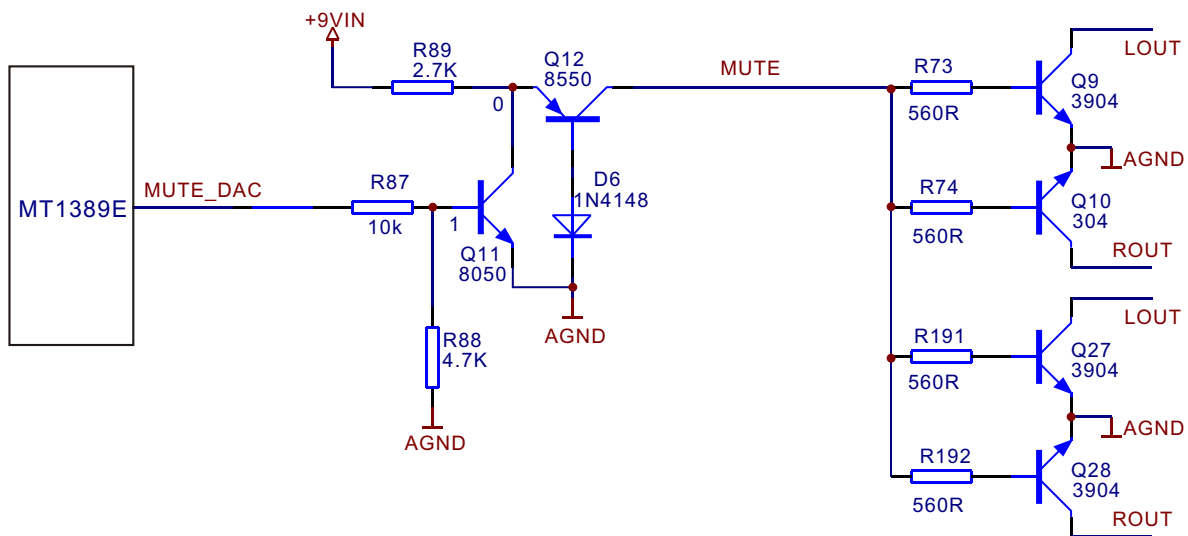


Figure 3.2.13.1 Mute circuit diagram

2. Working principle: after machine begins to power on with +9V, power arrives at the base electrode of Q9.Q10.Q27.Q28 through CE electrode of Q12 to make triode saturated on; audio signal output is short-circuited to ground. After machine resets and begins to read disc, pin 172 of MT1389 outputs a high level to make pin MUTE becomes low level from high level; Q9.Q10.Q27.Q28 cut off for base electrode is low level and audio signals may output normally.

3.2.14 USB/card read circuit

DL387SI has external USB jack and 3-in-1 card read slot, which may read contents in USB device and memory card.

After machine switched in USB/card read state, data in USB or memory card is sent to Mt1389 directly and processed by internal decode circuit and outputted by audio and video circuit.

3.2.15 Reset circuit

1. Reset circuit is shown in the figure 3.2.15.1:

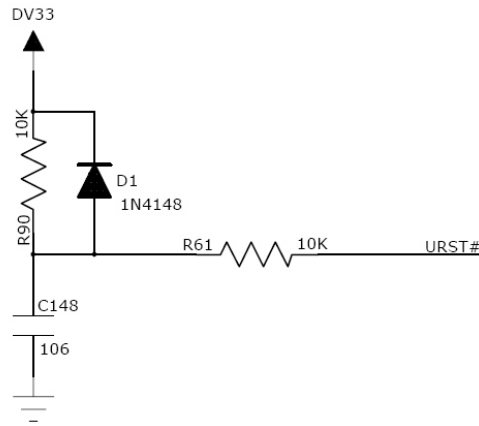


Figure 3.2.15.1 Reset circuit diagram

2. Working principle: after power on, DV33 charges C148 through R90. Voltage on two sides of capacitor cannot change suddenly, so anode voltage of C148 increases gradually and its increase time depends on R90 and C148. When machine is working normally, this voltage is the same with power voltage on the whole. After power off, electric charge saved in C148 discharges through D1 to ensure the reliable reset when power on the next time.

3.2.16 FM transmitting circuit

DL387SI has built-in FM transmitting circuit which may modulate audio signals to FM signal to send out. If the sound system is equipped with FM receiving function, it may revert audio signals.

FM transmitting circuit is composed of BH1417FV and peripheral circuit. Audio signals after being amplified input to pin 1 and 24 of BH1417FV. When FM transmitting turns on, Mt1389 controls BH1417FV to modulate audio signals and then output from pin 12 to FM antenna for FM transmitting.

Section Three Servicing Cases

3.3.1 Servicing cases

[Example 1] Symptom: do not read disc

Description: do not read any disc.

Analysis and troubleshooting: firstly, use a pointed pen to press down the switch to observe whether laser head can reset and the result is that laser head returns to the inner circle which can reset; then observe whether laser head has infrared ray emitting, but the main axis has no response. Main axis electric machine adopts HALL which is driven separately by Ba6849. Check main axis control signal DMSO of pin 21 of U10 and it is normal; and pin 22 V1P and pin 423 STBY are also normal; MO VCC is also normal, so we doubt that U10 has problem. Substitute U10 and trouble still exists. Use oscillograph to test the 3 groups of drive signals outputted by U10 and waveform is also normal, so we doubt the line between drive IC and electric machine. Check Xs3 and it has been oxidated. Change Xs3 and trouble is removed.

[Example 2] Symptom: battery cannot on

Description: power adapter can be on but battery cannot.

Analysis and troubleshooting: battery power supply B+ reaches load of the player through Q9. When checking Q9, we find that it has not been connected. Check G electrode and it is low level. We doubt that Q9 has been damaged. Change Q9 and trouble is removed.

[Example 3] Symptom: battery cannot be charged

Description: battery cannot be charged and red light flickers very quickly.

Analysis and troubleshooting: battery part of this player adopts battery charge protection circuit composed by CPU S3C9459, including over0current, short-circuit and under-voltage protection. After power on and reset, CPU S3C9459 will check whether battery exists. If there is battery, enter charge stage. Firstly place battery to charge and find indicator light flickers very quickly (red light should be in red constantly in normal cases), and it means circuit has trouble. Open machine casing to test voltage on two ends of R15 and it is 0V (if there is 0.02V voltage, it means there is charge current), which means charge loop has no current. Check power supply of U2 and its power supply circuit is composed serial voltage stabilizing by U4/Q3. Test pin 20 of U2 and it is 5V, which is normal, pin 2 and 3 clock is also

Normal, pin 4 reset is also normal, which means CPU working is normal. Check battery detect circuit Q1 and there is also detect waveform output, which is normal. When checking charge control circuit, we find Q5 has no charge waveform (there should be 125K PWM wave in normal cases). Check front stage Q7./Q8 and there is still no charge waveform. Check the former stage and find collector electrode of Q2 has charge waveform, thus the trouble is fixed on Q7.Q8 basically. Use multimeter to test bc electrode of Q7 and it has short-circuit. Change Q7.Q8 and trouble is removed (generally speaking, when in this case, we change one-to-one, since if there is one damaged, the other one is easy to damage)

[Example 4] Symptom: use battery to play and red light flickers.

Description: power adapter can be on, but when playing with battery and red light flickers.

Analysis and troubleshooting: battery power supply reaches load of the player through Q9 to form loop. When using battery to discharge normally, power will not reach VIN to supply power for battery charge part. Now, red light flickers and it means that charge part has worked. Test VIN end and it has 7.8V voltage. Check D2 and it has been stricken through. After changing it, trouble is removed.

[Example 5] Symptom: white screen

Description: TFT screen is white and there is no normal image output.

Analysis and troubleshooting: there is white screen display and it means boost board is normal. Then check whether system of the player is normal (10" machine adopts digital screen, if system works abnormally, there is also white screen). Load disc, disc can be read out and video output is normal, which means system works normally, so we preliminarily judge display drive part has trouble. Check each voltage of 3.3V and 2.5V of U1 and they are both normal. Test oscillation of drive board Y3 and it is also normal. Check line and file d synchronous signal and it is also normal. Test digital signal RGB outputted by U1 and it is normal basically. When in this case, we may consider screen or the line from U1 to screen. Change screen and trouble still exists. Check screen flat cable holder and it seems to have some oxidation. After weld again, trouble is removed.

[Example 6] Symptom: no external sound

Description: loudspeaker has no sound but headphone sound is normal

Analysis and troubleshooting: headphone has sound but loudspeaker has no sound and this means front stage of audio is normal and trouble may lie in headphone power amplifying circuit. Design of our circuit: if headphone output is inserted, the external sound is off. Unplug headphone external sound output, and this function is fulfilled by a headphone detect circuit. Headphone external sound identifying circuit is composed of headphone terminal, Jk8, Jk9, D4, D5, Q1 and Q6. When headphone is inserted, the end connected with D5 or D4 cut off from headphone terminal outer casing (ground), D5 or D4 outputs high level, Q6 is connected, Q1 cuts off, pin 20 of U1 inputs high level, U1 detects the headphone, sound is outputted by pin 13 and 14, loudspeaker is off, and vice versa. Check the trouble

And find that pin 20 of U1 is high level; check anode of D5 and it is high; check headphone terminal and find that Jk8 has open circuit. Change headphone terminal and trouble is removed. Headphone terminal is easy to damage because of long time inserting and unplugging.

[Example 7] Symptom: do not read disc

Description: do not read any disc

Analysis and troubleshooting: firstly use a peaked pen head to press down the door, thus it is easy to observe. Observe loader pick-up and it can reset to the most inner circle. Then check and find pick-up has infrared ray radiation, but light emission is weak. Load disc and check disc rotation speed. It is normal when rotating at the beginning and then slow down and "No disc" displays. Laser power of pick-up may be not enough or pick-up may be aged because of long time usage. Change loader components and trouble is removed.

[Example 8] Symptom: no output

Description: no image and indicator light is on

Analysis and troubleshooting: if there is no output, we should decide whether it is system trouble or display trouble. Firstly check whether pick-up has action and pick-up has not any acts. Then check whether there is video output and there is not any. When in this case, we doubt decode board system does not work. Open machine casing and check 5V, 3.3V, 1.8V power supply and they are all normal. Test crystal oscillator of 1389 and it has oscillation. Test whether SDCLK signal of SDRAM has 80M~100M and there is only 27M. According to our experience, we judge software does not work. Change software but trouble still exists. Check software and line of 1389 and there is no trouble. Weld 1389 again and trouble is removed.

[Example 9] Symptom: colour distortion

Description: image has virtual shadow

Analysis and troubleshooting: when in this case, we should confirm whether display drive part or decode part has trouble. Connect with video output and video output is also the same, which means trouble lies in decode part, and SDRAM and 1389 have the most possibility to have trouble. Change SDRAM and trouble is removed.

[Example 10] Symptom: picture mosaic

Description: after power on again, screen has colourful vertical strips and screen has mosaic.

Analysis and troubleshooting: when in this case, we should decide whether system working or display part has trouble. Load disc, disc can be read out and video output is also normal, which means system working is normal, and display drive part should have trouble. Check each voltage of 3.3V, 2.5V of U1 and they are both normal. Test oscillation of Y3 and it is normal. Test line and filed

Synchronous signal and it is normal. T112 works normally basically, so we consider whether display screen flat cable or the screen has trouble. Weld socket of display screen and trouble still exists. Substitute T112 and trouble is removed. The software communication between display screen and T112 may have trouble to cause working disorder.

[Example 11] Symptom: power not on

Description: after power on, green light of machine is on, but loader and display screen have no response.

Analysis and troubleshooting: check 9V voltage and it is normal; check whether there is 3.3V/5V output and find there is no 3.3V output. 3.3V is achieved through the DC-DC variable circuit composed of U32 output PWM wave and D16/L68. Check U32 PWM wave output but the output waveform is abnormal when compared with the normal ones. Check U32 working and there is 9V input. After changing U32, trouble still exists. When in this case, load or feedback circuit may probably have trouble. Use multimeter to test resistance to ground of C339 and it is normal. Check feedback circuit and there is no trouble. Check D16 and it has been damaged. Change it and trouble is removed.

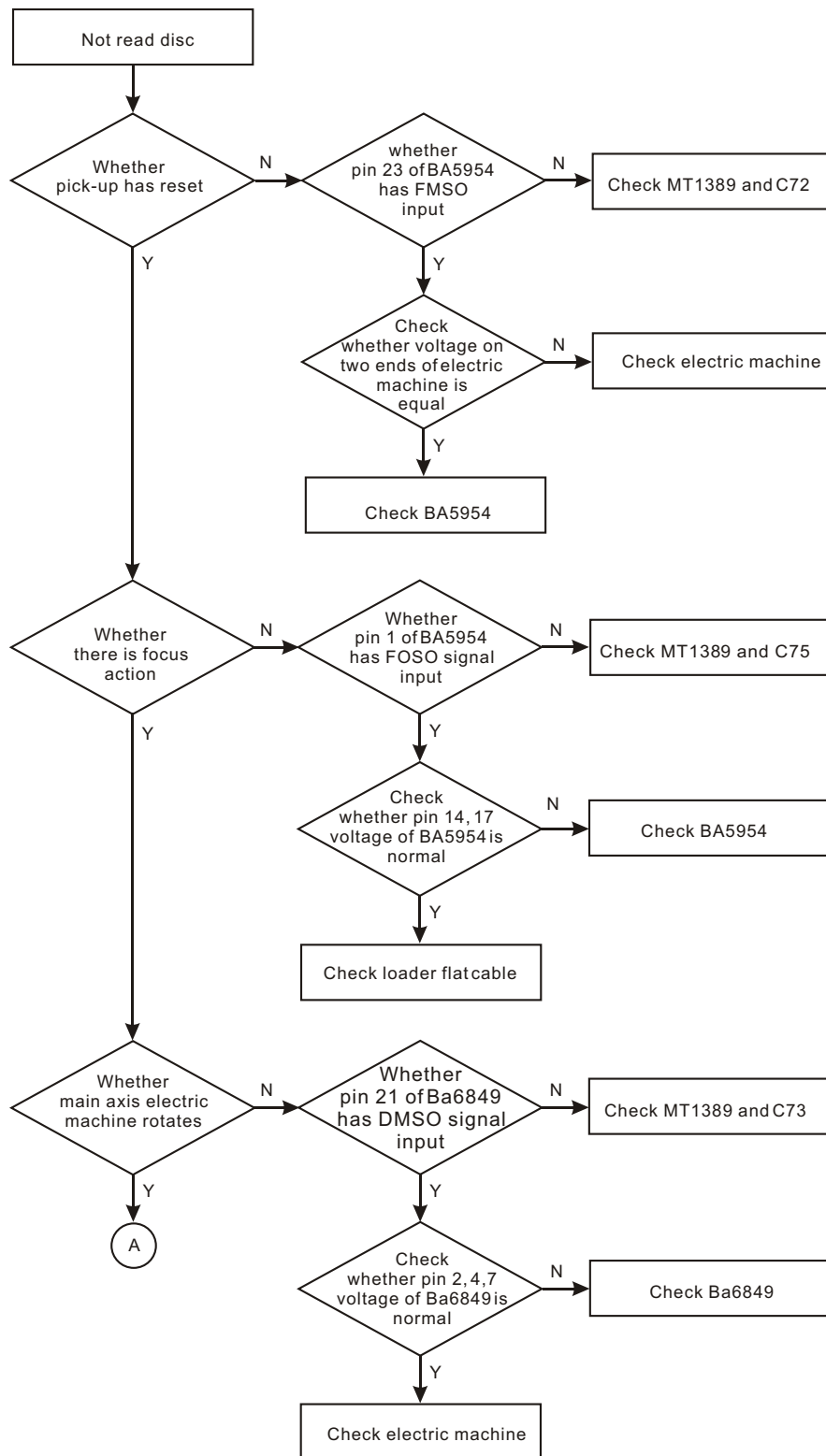
[Example 12] Symptom: do not read DVD disc

Description: CD/VCD disc read is normal, but DVD disc read is abnormal.

Analysis and troubleshooting: CD/VCD disc read is normal, so we preliminarily judge focus and trace are normal basically. Firstly we doubt whether disc identification circuit has trouble. Test voltage of pin 12 IOA of MT1389HD and it is 0.2V when reading DVD disc. Check identification circuit composed of Q8/Q7/Q13 and find Q8 may have rosin joint. Weld again and trouble is removed.

3.3.2 Troubleshooting flow chart

1. Troubleshooting process for “Not read sic” is shown in the figure 3.3.2.1:



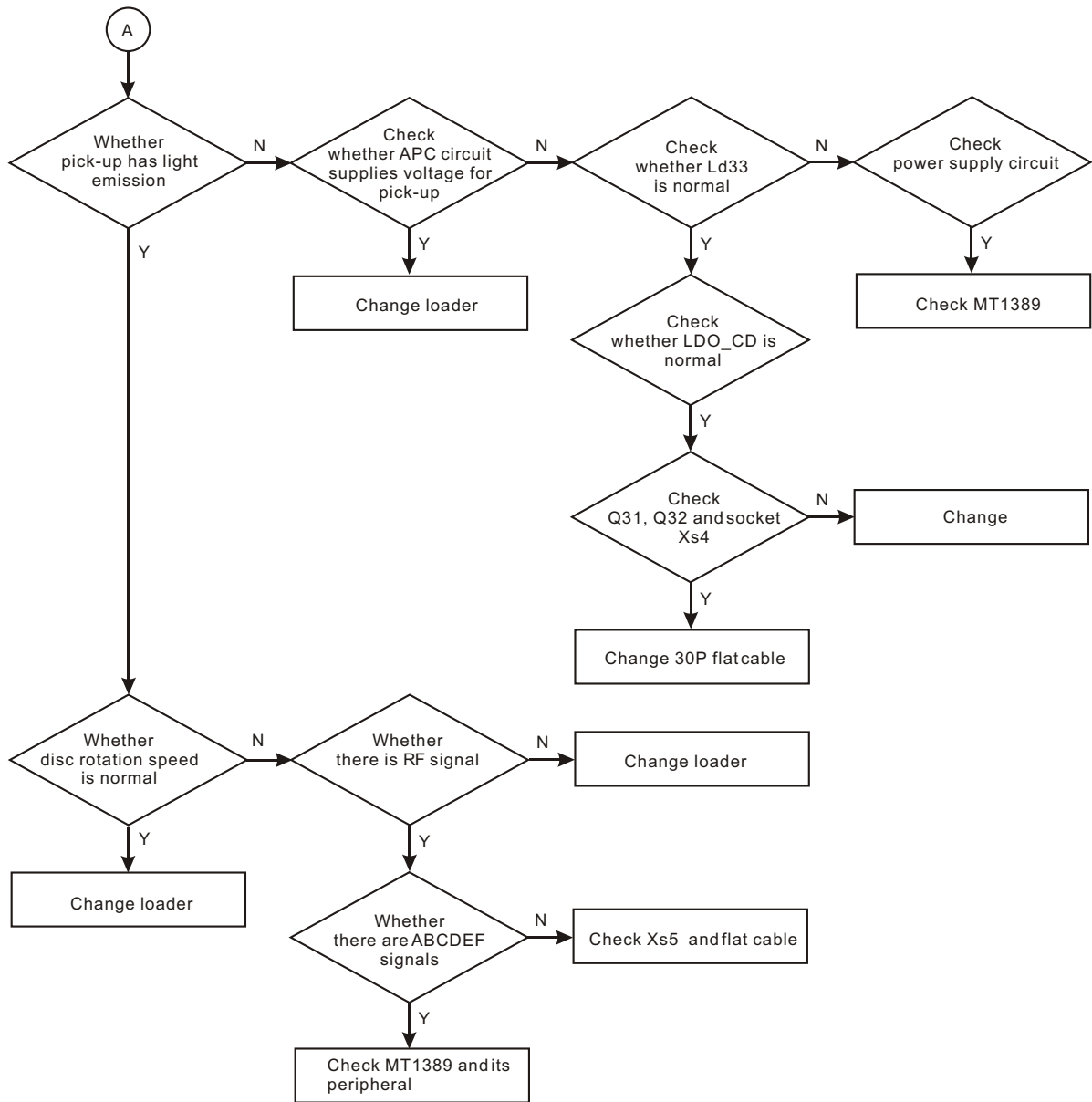
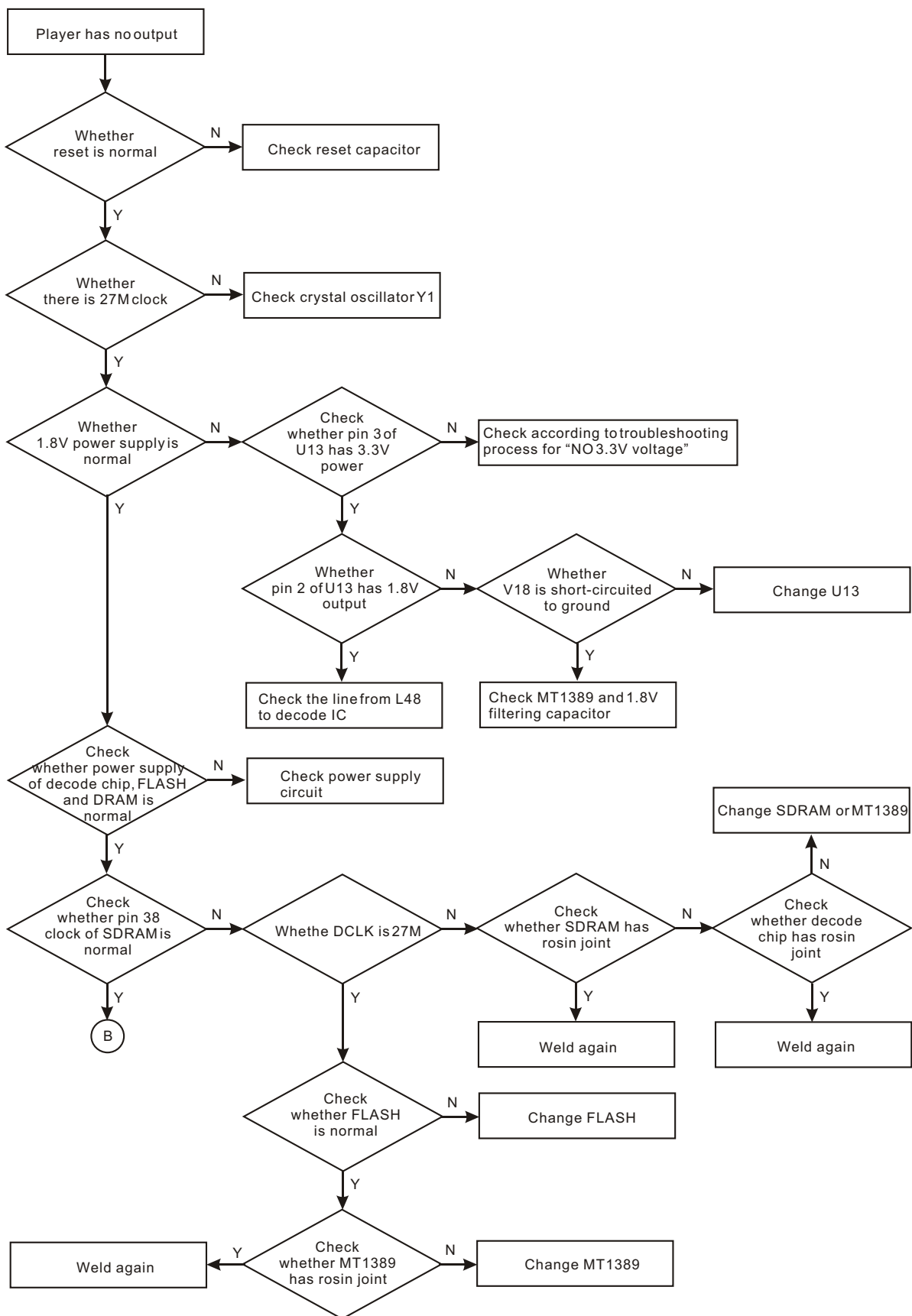


Figure 3.3.2.1 Troubleshooting flow chart for “Not read disc”

2. Troubleshooting process for “Player has no output” is shown in the figure 3.3.2.2:



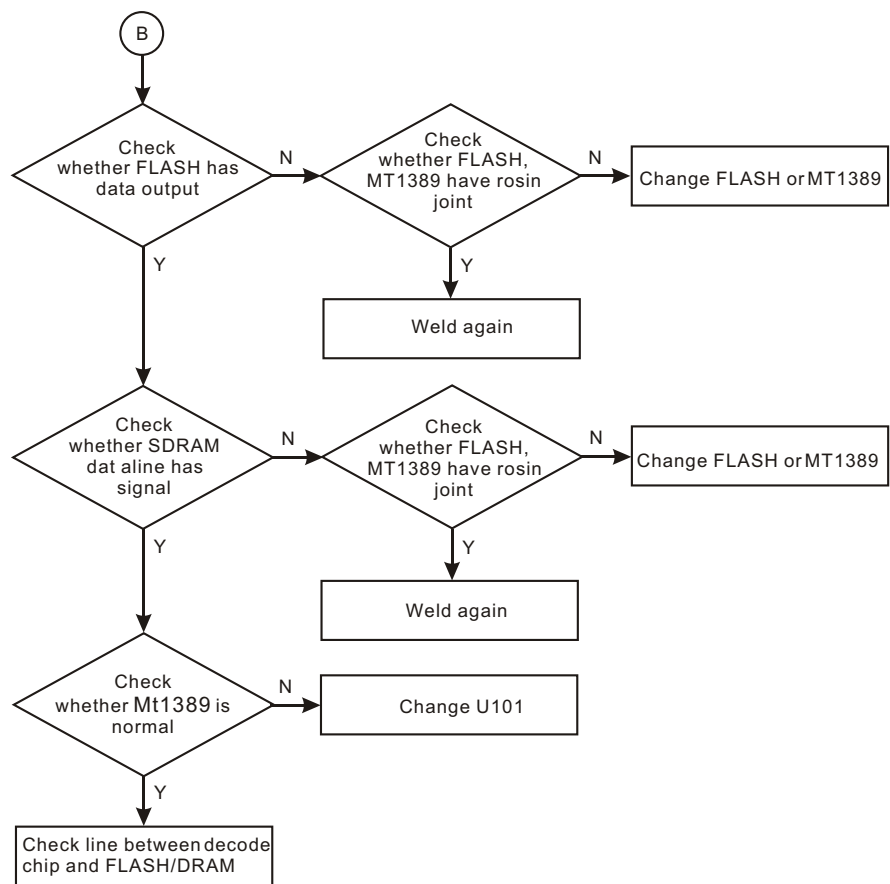


Figure 3.3.2.2 Troubleshooting flow chart for "Player has no output"

3. Troubleshooting process for “No 5V voltage” is shown in the figure 3.3.2.3:

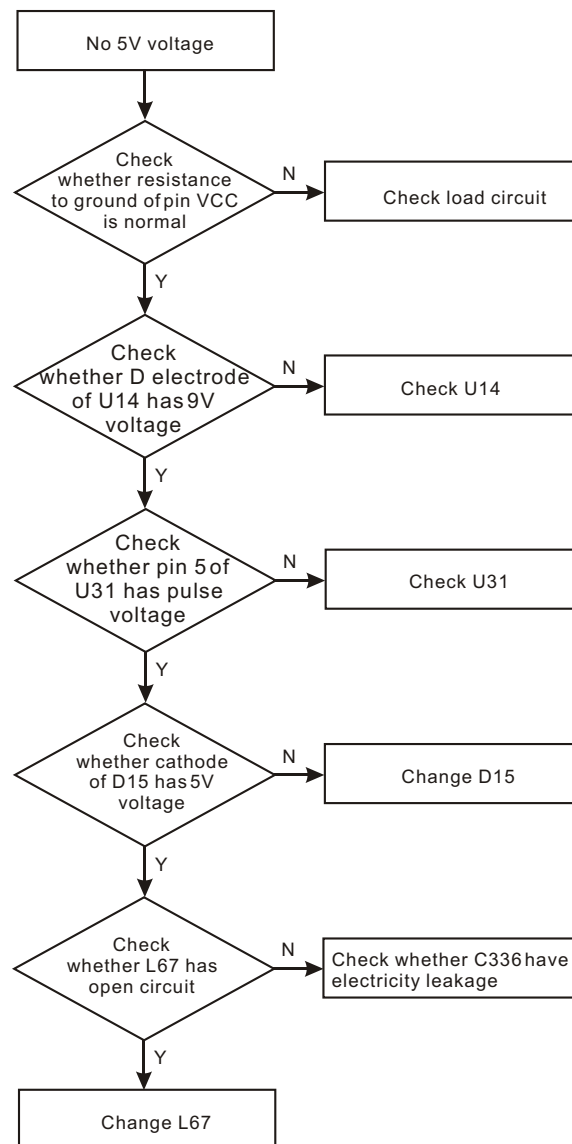


Figure 3.3.2.3 Troubleshooting flow chart for “No 5V voltage”

4. Troubleshooting process for “No DV33V voltage” is shown in the figure 3.3.2.4:

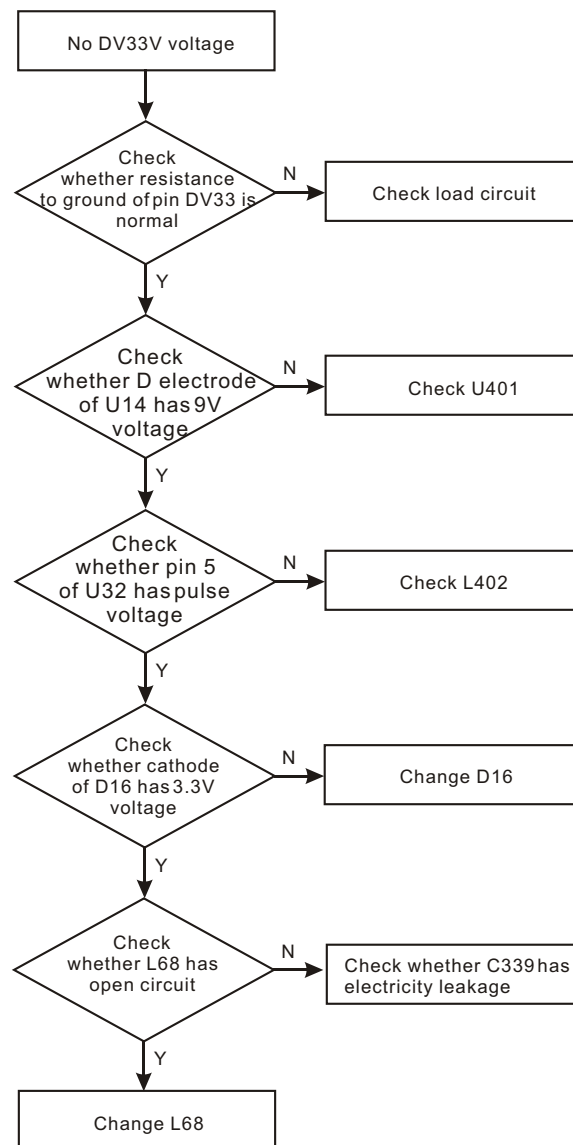
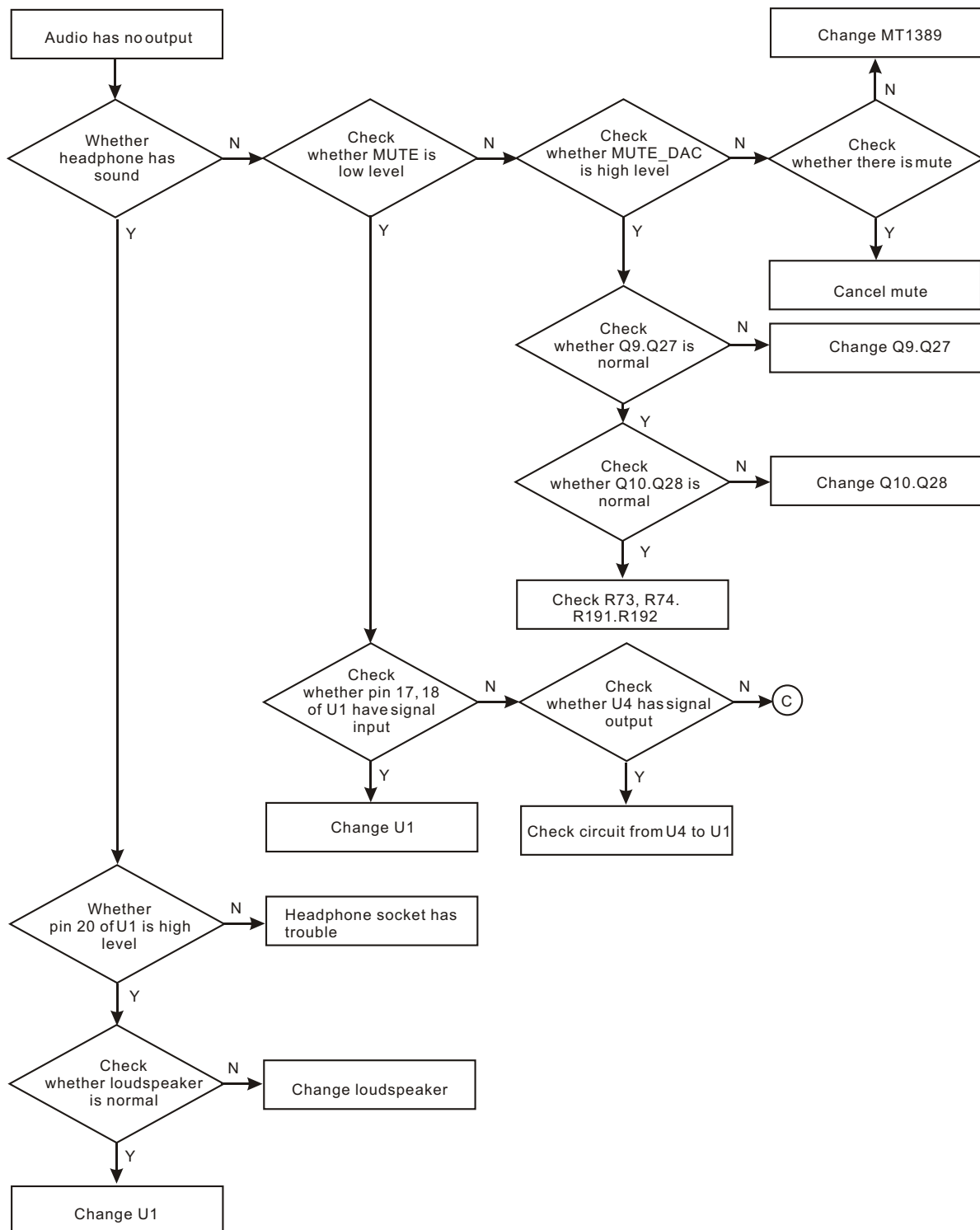


Figure 3.3.2.4 Troubleshooting flow chart for “No DV33V voltage”

5. Troubleshooting process for “Audio has no output” is shown in the figure 3.3.2.5:



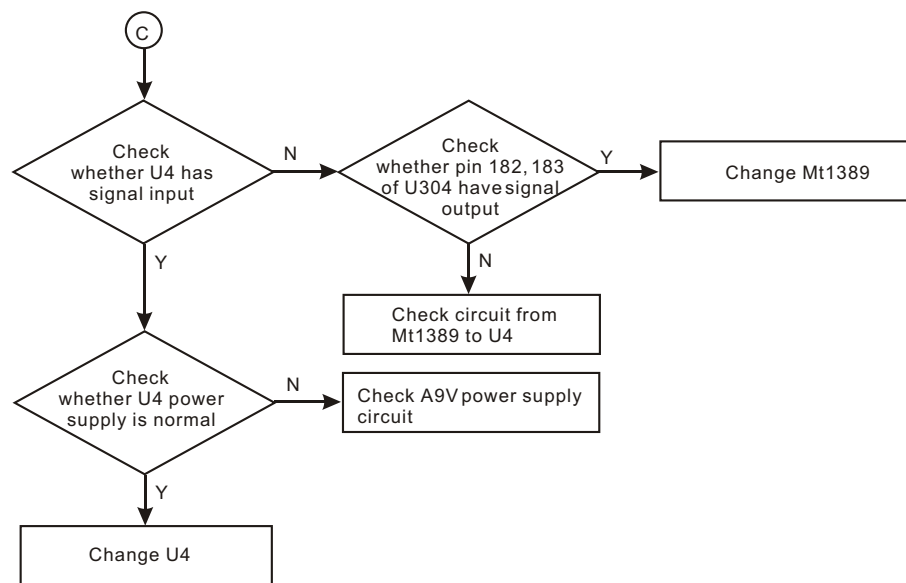
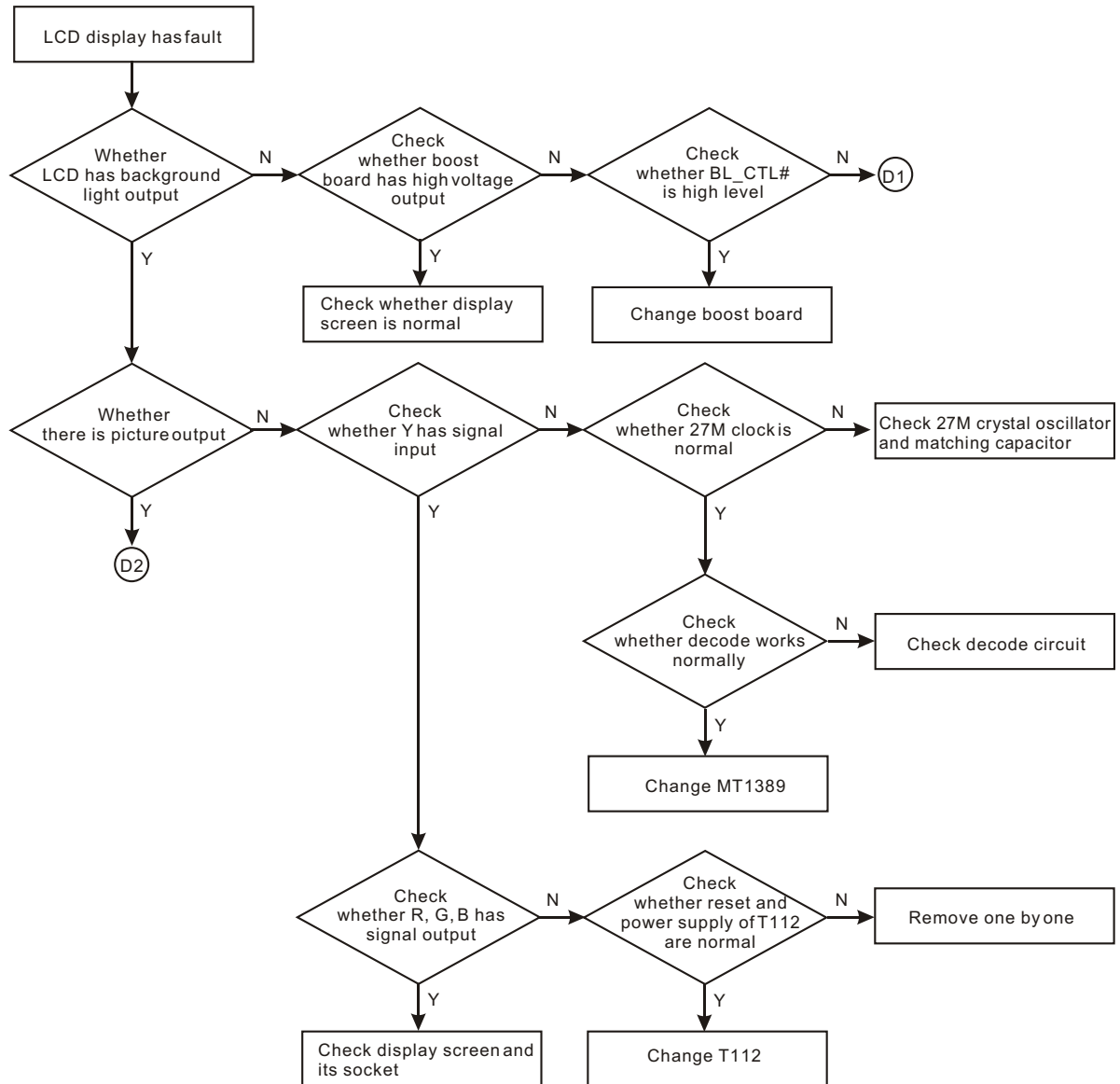


Figure 3.3.2.5.1 Troubleshooting flow chart fro "Audio has no output"

6. Troubleshooting process for “LCD display has fault” is shown in the figure 3.3.2.6:



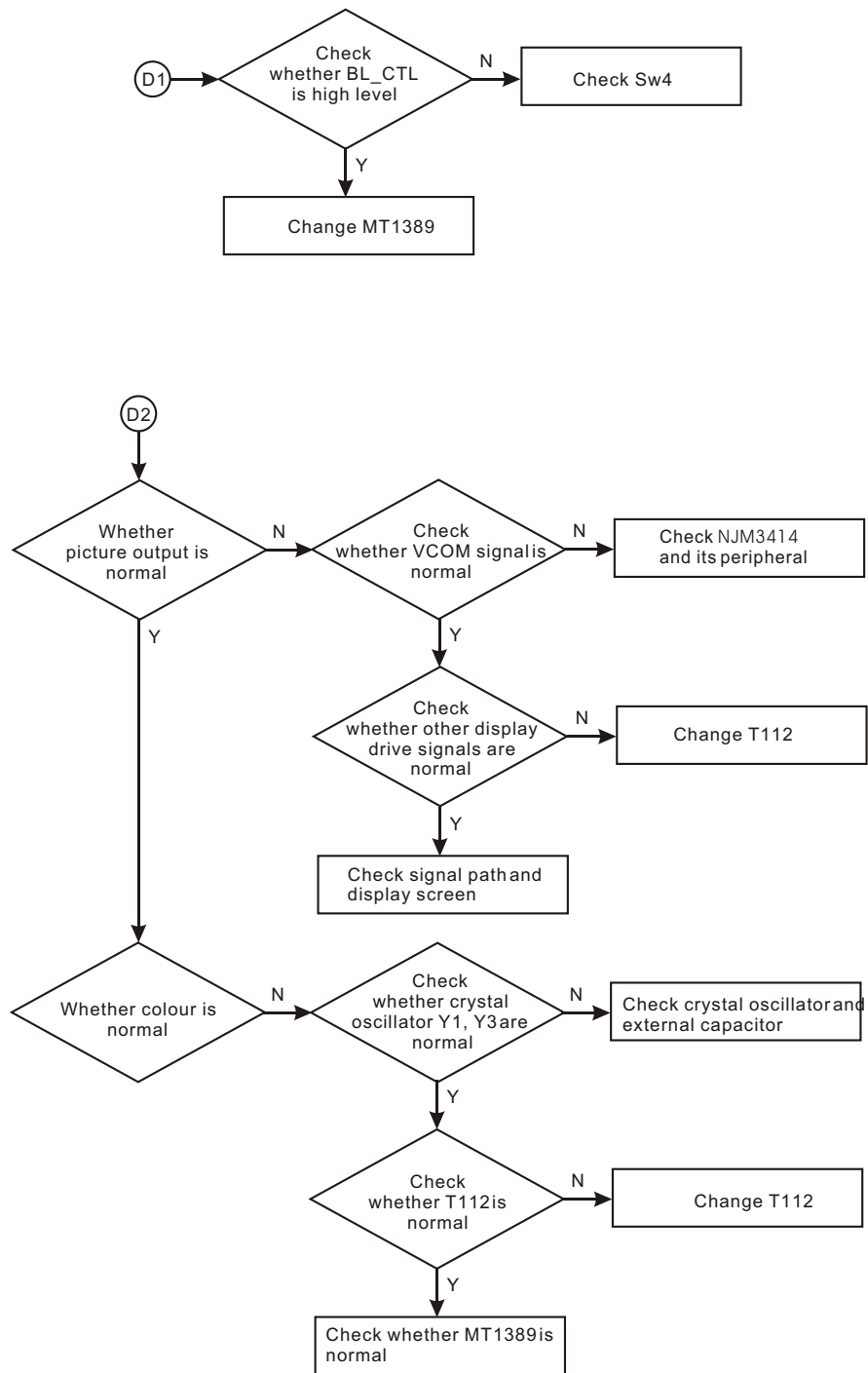
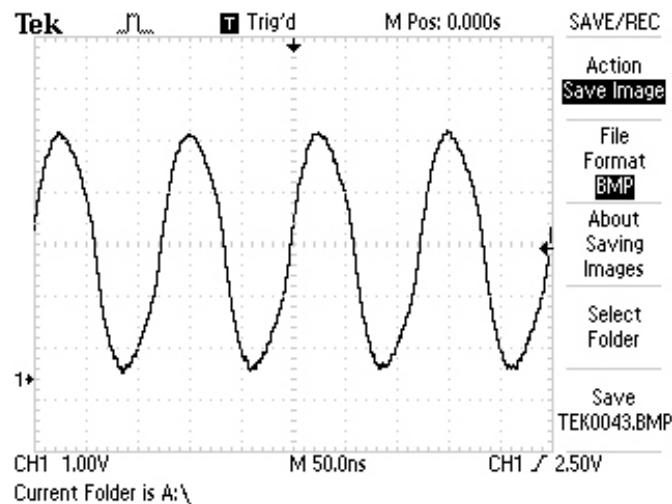


Figure 3.3.2.6 Troubleshooting flow chart for "LCD display has fault"

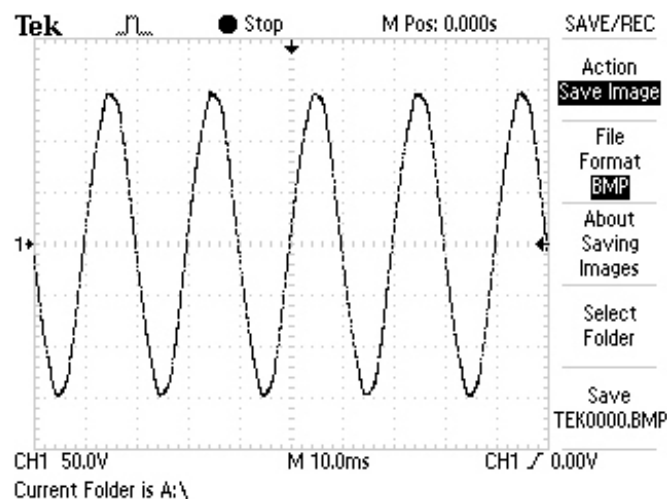
Section Four waveform diagram

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.

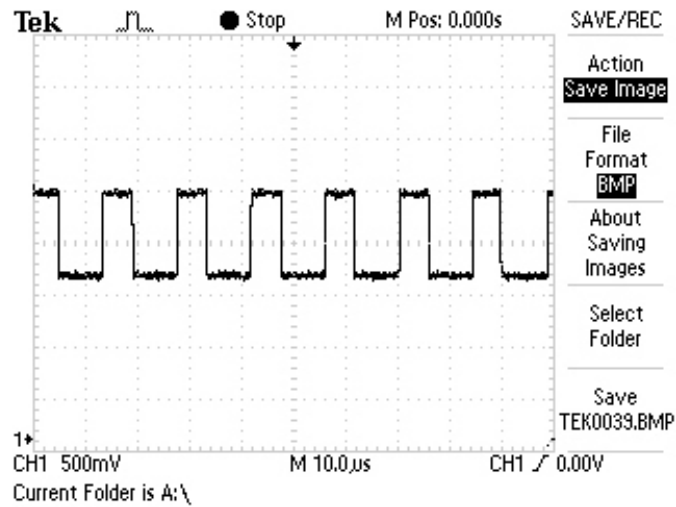
1. Charge managemtn IC U2 pin 2 8M waveform diagram



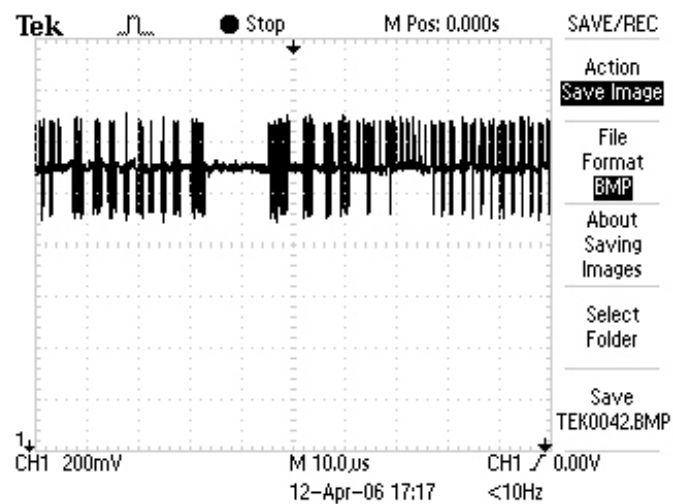
2. System main clock 27M crystal oscillator circuit



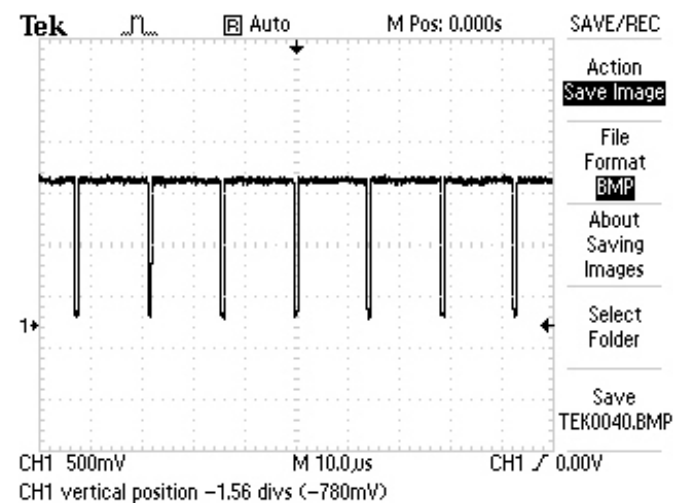
3. Waveform diagram of DMO outputted by decode chip



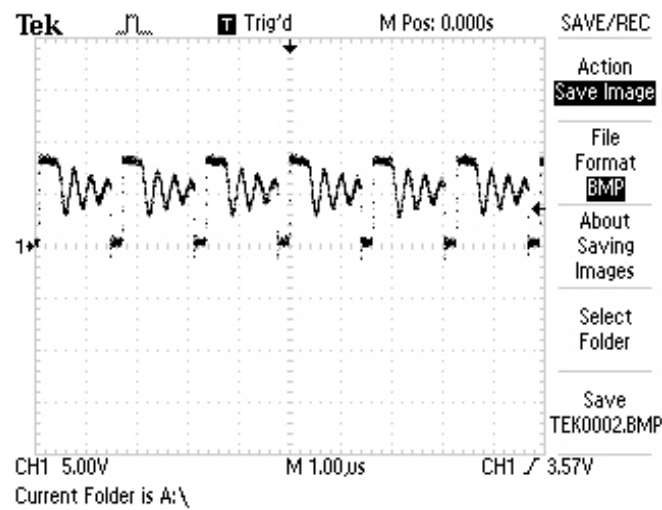
4. Waveform diagram of FOO outputted by decode chip



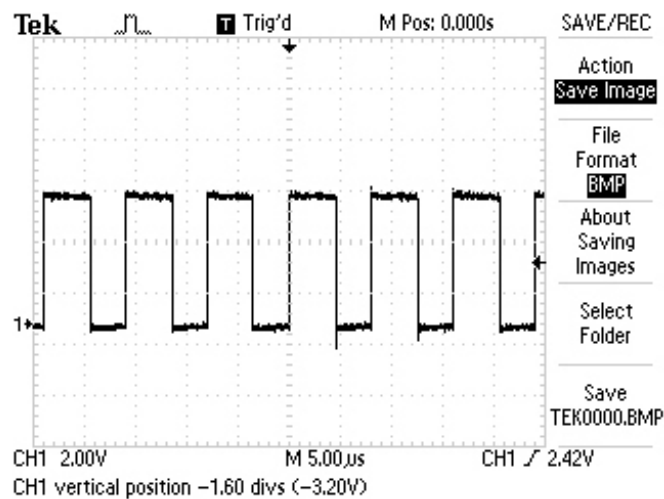
5. Waveform diagram of FMO outputted by decode chip



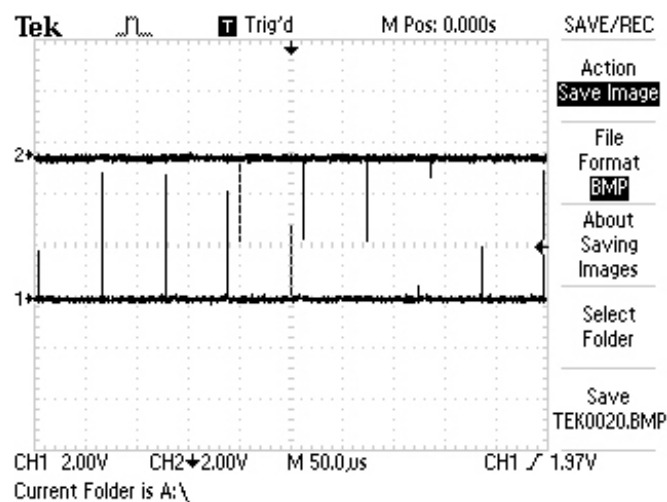
6. Q22 S signal waveform diagram



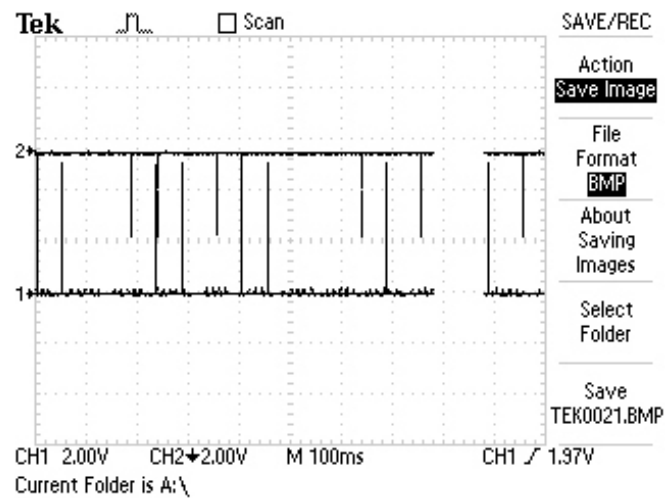
7. Charge management IC U2 pin 13 waveform diagram



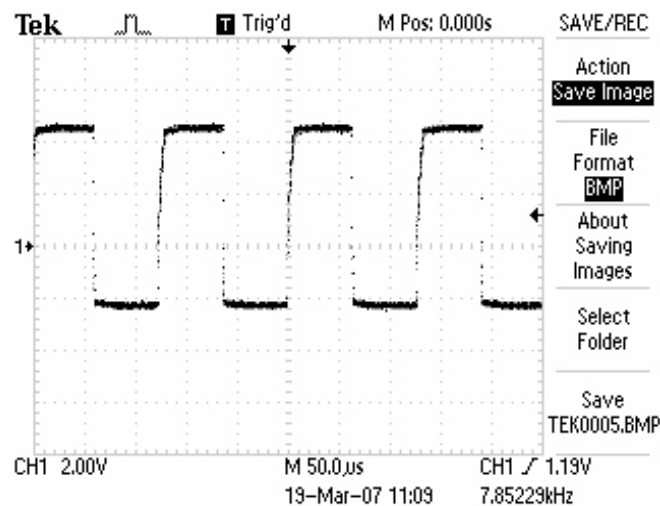
8. STHL waveform diagram



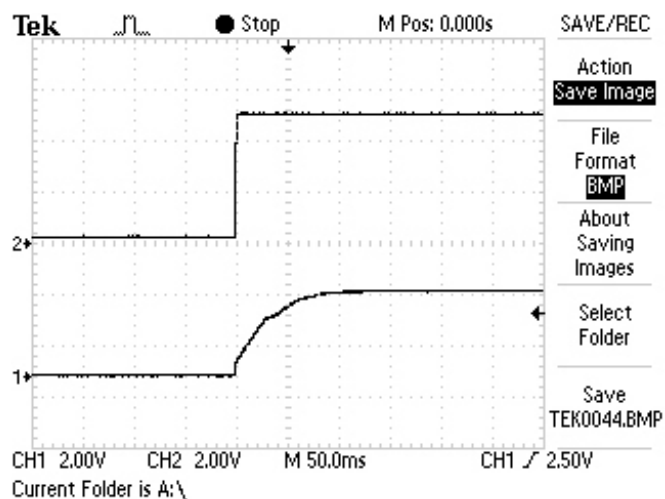
9. STVL1 waveform diagram



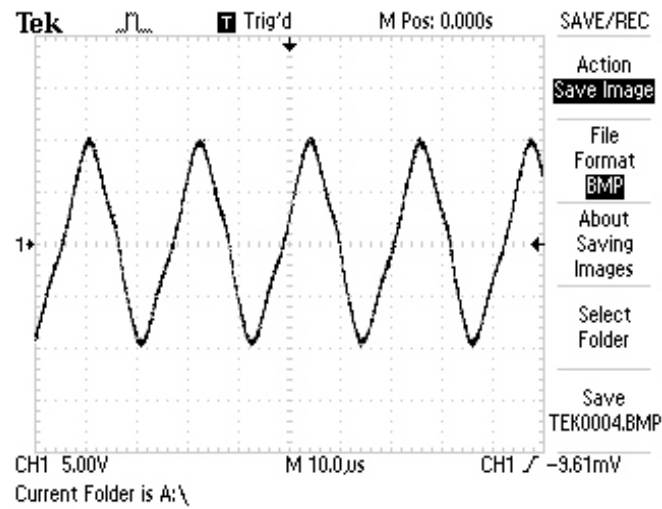
10. VCOM waveform diagram



11. URST waveform diagram



12. Background light drive voltage waveform diagram



Note: background drive voltage is high, when testing , do not make detect head of oscilloscope to contact with output terminal directly, and waveform will output only close to output terminal.

Section Five Function Introduction to IC

3.5.1 Function introduction to MT1389HD

1. Description

MT1389HD is a cost-effective DVD system-on-chip (SOC) which incorporates advanced features like MPEG-4 video decoder, high quality TV encoder and state-of-art de-interlace processing.

Based on MediaTek's world-leading DVD player SOC architecture, the MT1389HD is the 3rd generation of the DVD player SOC. It integrates the MediaTek 2nd generation front-end analog RF amplifier and the Servo/MPEG AV decoder.

To enrich the feature of DVD player, the MT1389HD equips a simplified MPEG-4 advanced simple profile (ASP) video decoder to fully support the DivX1 Home Theater profile. It makes the MT1389-based DVD player be capable of playback MPEG-4 content which become more and more popular.

The progressive scan of the MT1389HD utilized advanced motion-adaptive de-interlace algorithm to achieve the best movie/video playback. It also supports a 3:2 pull down algorithm to give the best film effect. The 108MHz/12-bit video DAC provides users a whole new viewing experience.

2. General Feature lists

- (1)Integration DVD player single chip
- High performance analog RF amplifier
- Servo controller and data channel processing
- MPEG-1/MPEG-2/JPEG video
- Dolby AC-3/DTS Decoder
- Unified memory architecture
- Versatile video scaling & quality enhancement
- OSD & Sub-picture
- Built-in clock generator
- Built-in high quality TV encoder
- Built-in progressive video processor
- Audio effect post-processor
- Built-in 5.1-ch Audio DAC

(2)High Performance Analog RF Amplifier

Programmable fc

Dual automatic laser power control

Defect and blank detection

RF level signal generator

(3)Speed Performance on Servo/Channel Decoding

DVD-ROM up to 4XS

CD-ROM up to 24XS

(4)Channel Data Processor

Digital data slicer for small jitter capability

Built-in high performance data PLL for channel data demodulation

EFM/EFM+ data demodulation

Enhanced channel data frame sync protection & DVD-ROM sector sync protection

(5)Servo Control and Spindle Motor Control

Programmable frequency error gain and phase error gain of spindle PLL to control spindle motor on CLV and CAV mode

Built-in ADCs and DACs for digital servo control

Provide 2 general PWM

Tray control can be PWM output or digital output

(6)Embedded Micro controller

Built-in 8032 micro controller

Built-in internal 373 and 8-bit programmable lower address port

1024-bytes on-chip RAM

Up to 2M bytes FLASH-programming interface

Supports 5/3.3-Volt. FLASH interface

Supports power-down mode

Supports additional serial port

(7)DVD-ROM/CD-ROM Decoding Logic

High-speed ECC logic capable of correcting one error per each P-codeword or Q-codeword

Automatic sector Mode and Form detection

Automatic sector Header verification

Decoder Error Notification Interrupt that signals various decoder errors

Provide error correction acceleration

(8)Buffer Memory Controller

Supports 16Mb/32Mb/64Mb SDRAM

Supports 16-bit SDRAM data bus

Provides the self-refresh mode SDRAM

Block-based sector addressing

(9)Video Decode

Decodes MPEG1 video and MPEG2 main level, main profile video (720/480 and 720x576)Decodes

MPEG-4 Advanced Simple Profile

Support DivX 3.11/4.x/5.x Home Theater Profile

Support Nero-Digital

Smooth digest view function with I, P and B picture decoding

Baseline, extended-sequential and progressive JPEG image decoding

Support CD-G titles

(10)Video/OSD/SPU/HLI Processor

Arbitrary ratio vertical/horizontal scaling of video, from 0.25X to 256X

65535/256/16/4/2-color bitmap format OSD,

256/16 color RLC format OSD

Automatic scrolling of OSD image

(11)Audio Effect Processing

Dolby Digital (AC-3)/EX decoding

DTS/DTS-ES decoding

MPEG-1 layer 1/layer 2 audio decoding

MPEG-2 layer1/layer2 2-channel audio

High Definition Compatible Digital (HDCD)

Windows Media Audio (WMA)

Dolby ProLogic II

Concurrent multi-channel and downmix out

IEC 60958/61937 output

PCM / bit stream / mute mode

Custom IEC latency up to 2 frames

Pink noise and white noise generator

Karaoke functions

Microphone echo

Microphone tone control

Vocal mute/vocal assistant

Key shift up to +/- 8 keys

Chorus/Flanger/Harmony/Reverb

Channel equalizer

3D surround processing include virtual surround and speaker separation

(12)TV Encoder

Four 108MHz/12bit DACs

Support NTSC, PAL-BDGHINM, PAL-60

Support 525p, 625p progressive TV format

Automatically turn off unconnected channels

Support PC monitor (VGA)

Support Macrovision 7.1 L1, Macrovision 525P and 625P

CGMS-AWSS

Closed Caption

(13)Progressive Scan Video

Automatic detect film or video source

3:2 pull down source detection

Advanced Motion adaptive de-interlace

Minimum external memory requirement

(14)Outline

216-pin LQFP package

3.3/1.8-Volt. Dual operating voltages

3. Pin Definitions

PIN	Main	Alt	Type	Description
RF interface (26)				
231	RFGND18		Ground	Analog ground
132	RFVDD 18		Power	Analog power 1.8V
252	OSP		Analog output	RF Offset cancellation capacitor connecting
253	OSN		Analog output	RF Offset cancellation capacitor connecting
254	RFGC		Analog output	RF AGC loop capacitor connecting for DVD-ROM
255	IREF		Analog input	Current reference input. It generates reference current for RF path. Connect an external 15K resistor to this pin and AVSS
256	AVDD3		Power	Analog power 3.3V
1	AGND		Ground	Analog ground
2	DVDA		Analog input	AC couple input path A
3	DVDB		Analog input	AC couple input path B
4	DVDC		Analog input	AC couple input path C
5	DVDD		Analog input	AC couple input path D
6	DVDRFIP		Analog input	AC coupled DVD RF signal input RFIP
7	DVDRFIN		Analog input	AC coupled DVD RF signal input RFIN
8	MA		Analog input	DC coupled main beam RF signal input A

9	MB		Analog input	DC coupled main beam RF signal input B
10	MC		Analog input	DC coupled main beam RF signal input C
11	MD		Analog input	DC coupled main beam RF signal input D
12	SA		Analog input	DC coupled sub-beam RF signal output A
13	SB		Analog input	DC coupled sub-beam RF signal output B
14	SC		Analog input	DC coupled sub-beam RF signal output C
15	SD		Analog input	DC coupled sub-beam RF signal output D
16	CDFON		Analog input	CD focusing error negative input
17	CDFOP		Analog input	CD focusing error positive input
18	TNI		Analog input	3 beam satellite PD signal negative input
19	TPI		Analog input	3 beam satellite PD signal positive input
ALPC (4)				
20	MIDI1		Analog input	Laser power monitor input
21	MIDI2		Analog input	Laser power monitor input
22	LDO2		Analog output	Laser driver output
23	LDO1		Analog output	Laser driver output
ADC Power (2)				
244	ADCVDD3		Power	Analog 3.3V Power for ADC
245	ADCVSS		Ground	Analog ground for ADC
VPLL (3)				
43	VPLLVSS		Ground	Analog ground for VPLL
44	CAPPAD		Analog In/Out	VPLL External Capacitance connection
45	VPLLVDD3		Power	Analog 3.3V Power for VPLL
Reference voltage (3)				
28	V2REFO		Analog output	Reference voltage 2.8V
29	V20		Analog output	Reference voltage 2.0V
30	VREFO		Analog output	Reference voltage 1.4V
Analog monitor output (7)				
24	SVDD3		Power	Analog power 3.3V
25	CSO	RFOP	Analog output	1) Central servo 2) Positive main beam summing output
26	RFLVL	RFON	Analog output	1) RFRP low pass, or 2) Negative main beam summing output
27	SGND		Ground	Analog ground

31	FEO		Analog output	Focus error monitor output
32	TEO		Analog output	Tracking error monitor output
33	TEZISLV		Analog output	TE slicing Level
Analog monitor output (6)				
246	RFVDD3		Analog output	Analog Power
247	RFRPDC		Analog Input	RF ripple detect output
248	RFRPAC		Analog output	RF ripple detect input(through AC-coupling)
249	HRFZC		Analog output	High frequency RF ripple zero crossing
250	CRTPLP		Analog output	Defect level filter capacitor connecting
251	RFGND		Ground	Analog Power
RF Data PLL Interface (9)				
235	JITFO		Analog output	Output terminal of RF jitter meter
236	JITFN		Analog Input	Input terminal of RF jitter meter
237	PLLSS		Ground	Ground pin for data PLL and related analog circuitry
238	IDACEXLP		Analog output	Data PLL DAC Low-pass filter
239	PLLDD3		Power	Power pin for data PLL and related analog circuitry
240	LPFON		Analog Output	Negative output of loop filter amplifier
241	LPFIP		Analog input	Positive input terminal of loop filter amplifier
242	LPFIN		Analog input	Negative input terminal of loop filter amplifier
243	LPFOP		Analog output	Positive output of loop filter amplifier
Motor and Actuator Driver Interface (10)				
34	OP_OUT		Analog output	Op amp output
35	OP_INN		Analog input	Op amp negative input
36	OP_INP		Analog input	Op amp positive input
37	DMO		Analog output	Disk motor control output. PWM output
38	FMO		Analog output	Feed motor control. PWM output
39	TROPENPW M		Analog output	Tray PWM output/Tray open output
40	PWMOUT1	ADIN0	Analog output	1) 1st General PWM output 2) AD input 0
41	TRO		Analog output	Tracking servo output. PDM output of tracking servo compensator
42	FOO		Analog output	Focus servo output. PDM output of focus servo compensator

50	FG (Digital pin)	ADIN1 GPIO	LVTTL3.3 Input, Schmitt input, pull up, with analog input path for ADIN1	1) Monitor hall sensor input 2) AD input 1 3) GPIO
General Power/Ground (18)				
55 93 142 160 174 213	DVDD18		Power	1.8V power pin for internal digital circuitry
81 178	DVSS		Ground	1.8V ground pin for internal digital circuitry
65 96 118 131 145 156 170 208	DVDD3		Power	3.3V power pin for internal digital circuitry
90 148	DVSS		Ground	3.3V ground pin for internal digital circuitry
Micro Controller and Flash Interface (48)				
62	HIGHA0		In/Out 4~16mA,SRPU	Microcontroller address 8
74	HIGHA1		In/Out 4~16mA,SRPU	Microcontroller address 9
73	HIGHA2		In/Out 4~16mA,SRPU	Microcontroller address 10
72	HIGHA3		In/Out 4~16mA,SRPU	Microcontroller address 11
71	HIGHA4		In/Out 4~16mA,SRPU	Microcontroller address 12
70	HIGHA5		In/Out 4~16mA,SRPU	Microcontroller address 13
69	HIGHA6		In/Out 4~16mA,SRPU	Microcontroller address 14
68	HIGHA7		In/Out 4~16mA,SRPU	Microcontroller address 15
89	AD7		In/Out 4~16mA,SRPU	Microcontroller address/data 7
86	AD6		In/Out 4~16mA,SRPU	Microcontroller address/data 6
85	AD5		In/Out 4~16mA,SRPU	Microcontroller address/data 5

84	AD4		In/Out 4~16mA,SRPU	Microcontroller address/data 4
83	AD3		In/Out 4~16mA,SRPU	Microcontroller address/data 3
82	AD2		In/Out 4~16mA,SRPU	Microcontroller address/data 2
80	AD1		In/Out 4~16mA,SRPU	Microcontroller address/data 1
79	AD0		In/Out 4~16mA,SRPU	Microcontroller address/data 0
92	IOA 0		In/Out 4~16mA,SRPU	Microcontroller address
77	IOA 1		In/Out 4~16mA,SRPU	Microcontroller address 1/ IO
56	IOA 2		In/Out 4~16mA,SRPU	Microcontroller address 2/ IO
57	IOA 3		In/Out 4~16mA,SRPU	Microcontroller address 3/ IO
58	IOA 4		In/Out 4~16mA,SRPU	Microcontroller address 4/ IO
59	IOA 5		In/Out 4~16mA,SRPU	Microcontroller address 5/ IO
60	IOA 6		In/Out 4~16mA,SRPU	Microcontroller address 6/ IO
61	IOA 7		In/Out 4~16mA,SRPU	Microcontroller address 7/ IO
67	A16		In/Out 4~16mA,SRPU	Flash address 16
91	A17		In/Out 4~16mA,SRPU	Flash address 17
63	A18		In/Out 4~16mA, SRPD,SMT	Flash address 18 /IO
64	A19		In/Out 4~16mA, SRPD,SMT	Flash address 19 /IO
75	A20	YUV0	In/Out 4~16mA, SRPD,SMT	5) Flash address 20 /IO 6) While External Flash size <= 1MB: I) Alternate digital video YUV output 0
87	A21	YUV7 GPIO	In/Out 4~16mA, SRPD,SMT	7) Flash address 21 /IO 8) While External Flash size <= 2MB: I) Digital video YUV output 7 II) GPIO
88	ALE		In/Out 4~16mA, SRPD,SMT	Microcontroller address latch enable
78	IOOE#		In/Out 4~16mA, SRPD,SMT	Flash output enable, active low / IO
66	IOWR#		In/Out 4~16mA, SRPD,SMT	Flash write enable, active low / IO
76	IOCS#		In/Out 4~16mA, SRPD,SMT	Flash chip select, active low / IO
94	UWR#		In/Out 4~16mA, SRPD,SMT	Microcontroller write strobe, active low

95	URD#		In/Out 4mA, SRPD,SMT	Microcontroller read strobe, active low
97	UP1_2		In/Out 4~16mA, SRPD,SMT	Microcontroller port 1-2
98	UP1_3		In/Out 4mA, SRPD,SMT	Microcontroller port 1-3
99	UP1_4		In/Out 4mA, SRPD,SMT	Microcontroller port 1-4
100	UP1_5		In/Out 4mA, SRPD,SMT	Microcontroller port 1-5
101	UP1_6	SCL	In/Out 4mA, SRPD,SMT	1) Microcontroller port 1-6 2) I2C clock pin
102	UP1_7	SDA	In/Out 4mA, SRPD,SMT	1) Microcontroller port 1-7 1) I2C data pin
103	UP3_0	RXD	In/Out 4mA, SRPD,SMT	1) Microcontroller port 3-0 2) 8032 RS232 RxD
104	UP3_1	TXD	In/Out 4mA, SRPD,SMT	1) Microcontroller port 3-1 2) 8032 RS232 TxD
105	UP3_4	RXD SCL	In/Out 4mA, SRPD,SMT	1) Microcontroller port 3-4 2) Hardwired RD232 RxD 3) I2C clock pin
106	UP3_5	RXD SDA	In/Out 4~16mA, SRPD,SMT	1) Microcontroller port 3-5 2) Hardwired RD232 TxD 3) I2C data pin
109	IR		Input SMT	IR control signal input
110	INT0#		In/Out 4~16mA, SRPD,SMT	Microcontroller external interrupt 0, active low
Audio interface (28)				
204	SPMCLK	SCLK0	In/Out	1) Audio DAC master clock of SPDIF input 2) While SPDIF input is not used: I) Serial interface port 0 clock pin II) GPIO
205	SPDATA	SDIN0	In/Out	1) Audio data of SPDIF input 2) While SPDIF input is not used: I) Serial interface port 0 data-in II) GPIO

206	SPLRCK	SDO0	In/Out	1) Audio left/right channel clock of SPDIF input 2) While SPDIF input is not used: I) Serial interface port 0 data-out II) GPIO
207	SPBCK	SDCS0 ASDATA 5	In/Out	1) Audio bit clock of SPDIF input 2) While SPDIF input is not used: I) Serial interface port 0 chip select II) Audio serial data 5 part I : DSD data sub-woofer Channel or Microphone output III) GPIO
209	ALRCK		In/Out 4mA, PD,SMT	1) Audio left/right channel clock 2) Trap value in power-on reset: I) 1: use external 373 II) 0: use internal 373
210	ABCK	Fs64	In/Out 4mA, SMT	1) Audio bit clock 2) Phase de-modulation
211	ACLK		In/Out 4mA, SMT	Audio DAC master clock
197	ASDATA0		In/Out 4mA, PD,SMT	1) Audio serial data 0 (Front-Left/Front-Right) 2) DSD data left channel 3) Trap value in power-on reset: I) 1: manufactory test mode II) 0: normal operation 4) While using external channels:) GPO_2
202	ASDATA1		In/Out 4mA, PD,SMT	2) Audio serial data 0 (Front-Left/Front-Right) 2) DSD data right channel 3) Trap value in power-on reset: I) 1: manufactory test mode II) 0: normal operation 4) While using external channels: I) GPO_2
203	ASDATA2		In/Out 4mA, PD,SMT	1) Audio serial data 1 (Left-Surround/Right-Surround) 2) DSD data left surround channel 3) Trap value in power-on reset: I) 1: manufactory test mode II) 0: normal operation 4) While using external channels: I) GPO_1

212	ASDATA3		In/Out 4mA, PD,SMT	1) Audio serial data 2 (Center/LFE) 2) DSD data right surround channel 3) Trap value in power-on reset: I) 1: manufactory test mode II) 0: normal operation 4) While only 2 channels output: I) GPO_0
214	ASDATA4	INT1#	In/Out 4mA, PD,SMT	1) Audio serial data 3 (Center-back/ Center-left-back/Center-right-back, in 6.1 or 7.1 mode) 2) DSD data center channel 18) While only 2 channels output: I) Digital video YUV output 6 II) GPIO
215	MC_DATA	INT2#	In/Out 2mA, PD,SMT	1) Microphone serial input 2) While not support Microphone: I) Microcontroller external interrupt 2 II) GPIO
216	SPDIF		Output 4~16mA, SR: ON/OFF	S/PDIF output
217	APLLVDD3		Power	3.3V Power pin for audio clock circuitry
218	APLLCAP		Analog In/Out	APLL External Capacitance connection
219	APLLVSS		Ground	Ground pin for audio clock circuitry
220	ADACVSS2		Ground	Ground pin for AUDIO DAC circuitry
221	ADACVSS1		Ground	Ground pin for AUDIO DAC circuitry
222	ARF		Output	1) AUDIO DAC Sub-woofer channel output 2) While internal AUDIO DAC not used: GPIO
223	ARS	GPIO	Output	1) AUDIO DAC Right Surround channel output 2) While internal AUDIO DAC not used: a. SDATA3 b. GPIO
224	AR	GPIO	Output	1) AUDIO DAC Right channel output 2) While internal AUDIO DAC not used: a. SDATA1 b. GPIO
225	AVCM		Analog	AUDIO DAC reference voltage

226	AL	GPIO	Output	1) AUDIO DAC Left Surround channel output 2) While internal AUDIO DAC not used: a. SDATA2 b. GPIO
227	ALS	GPIO	Output	1) AUDIO DAC Left Surround channel output 2) While internal AUDIO DAC not used: a. SDATA0 b. GPIO
228	ALF	GPIO	Output	1) AUDIO DAC Center channel output 2) While internal AUDIO DAC not used: GPIO
229	ADACVDD1		Power	3.3V power pin for AUDIO DAC circuitry
230	ADACVDD2		Power	3.3V power pin for AUDIO DAC circuitry
Video Interface (18)				
196	DACVDDC		Power	3.3V power pin for VIDEO DAC circuitry
195	VREF		Analog	Bandgap reference voltage
194	FS		Analog	Full scale adjustment
193	YUV0	CIN	Output 4MA, SR	1) Video data output bit 0 2) Compensation capacitor
192	DACVSSC		Ground	Ground pin for VIDEO DAC circuitry
191	YUV1	Y	Output 4MA, SR	1) Video data output bit 1 2) Analog Y output
190	DACVddb		Power	3.3V power pin for VIDEO DAC circuitry
189	YUV2	C	Output 4MA, SR	1) Video data output bit 2 2) Analog chroma output
188	DACVSSB		Ground	Ground pin for VIDEO DAC circuitry
187	YUV3	CVBS	Output 4MA, SR	1) Video data output bit 3 2) Analog composite output
186	DACVDDA		Power	3.3V power pin for VIDEO DAC circuitry
185	YUV4	Y/G	Output 4MA, SR	1) Video data output bit 4 2) Green or Y
184	DACVSSA		Ground	Ground pin for VIDEO DAC circuitry
183	YUV5	B/Cb/Pb	Output 4MA, SR	1) Video data output bit 5 2) Blue or CB
182	YUV6	R/Cr/Pr	Output 4MA, SR	1) Video data output bit 6 2) Red or CR

181	VSYN	V_ADIN1	Output 4mA, SR	1) Vertical sync input/output 2) While no External TV-encoder: I) Vertical sync for video-input II) Version AD input port 1 III) GPIO
180	YUV7	INT3# ASDATA 5	Output 4mA, SR	1) Video data output bit 7 2) While no External TV-encoder: I) Microcontroller external interrupt 3 II) Audio serial data 5 part II : DSD data sub-woofer channel or Microphone output III) GPIO
179	HSYN	INT4# V_ADIN2	Output 4mA, SR	1) Horizontal sync input/output 2) While no External TV-encoder: I) Horizontal sync for video-input II) Version AD input port 2 III) GPIO IV) Microcontroller external interrupt 4
Video Interface (12)				
160	DACVDDC		Power	3.3V power pin for video DAC circuitry
161	VREF		Analog	Bandgap reference voltage
162	FS		Analog	Full scale adjustment
163	DACVSSC		Ground	Ground pin for video DAC circuitry
164	CVBS		In/Out 4mA, SR	Analog composite output
165	DACVDDB		Power	3.3V power pin for video DAC circuitry
166	DACVSSB		Ground	Ground pin for video DAC circuitry
167	DACVDDA		Power	3.3V power pin for video DAC circuitry
168	Y/G		In/Out 4mA, SR	Green, Y, SY, or CVBS
169	DACVSSA		Ground	Ground pin for video DAC circuitry
170	B/CB/PB		In/Out 4mA, SR	Blue, CB/PB, or SC
171	R/CR/PR		In/Out 4mA, SR	Red, CR/PR, CVBS, or SY
MISC (12)				

108	PRST#		In/Out PD,SMT	Power on reset input, active low
107	ICE		In/Out PD,SMT	Microcontroller ICE mode enable
233	XTALO		Output	27MHz crystal output
234	XTALI		Input	27MHz crystal input
46	USB_VSS		USB Ground	USB ground pin
47	USBP		Analog In/Out	USB port DPLUS analog pin
48	USBM		Analog In/Out	USB port DMINUS analog pin
49	USB_VDD3		Analog In/Out	USB Power pin 3.3V
201	GPIO3		In/Out Pull-Down	GPIO
200	GPIO4		In/Out Pull-Down	GPIO
199	RCLKB	GPIO5	In/Out Pull-Down	GPIO
198	RVREF	GPIO6	In/Out Pull-Down	GPIO
Dram Interface (58) (Sorted by position)				
176	C_0	IO_0(RD1 6)	In/Out Non-pull	1) Digital Video output C bit 0 2) GPIO
175	C_1	IO_1(RD1 7)	In/Out Non-pull	1) Digital Video output C bit 1 2) GPIO
173	C_2	IO_2(RD1 8)	In/Out Non-pull	1) Digital Video output C bit 2 2) GPIO
172	C_3	IO_3(RD1 9)	In/Out Non-pull	1) Digital Video output C bit 3 2) GPIO
171	C_4	IO_4(RD2 0)	In/Out Non-pull	1) Digital Video output C bit 4 2) GPIO
169	C_5	IO_5(RD2 1)	In/Out Non-pull	1) Digital Video output C bit 5 2) GPIO
168	C_6	IO_6(RD2 2)	In/Out Non-pull	1) Digital Video output C bit 6 2) GPIO
167	C_7	IO_7(RD2 3)	In/Out Non-pull	1) Digital Video output C bit 7 2) GPIO
177	IO_17	(DQM2)	In/Out Pull- Up	GPIO
166	YUVCLK	IO_8(DQ M3)	In/Out Pull- Up	1) Digital Video output Clock 2) GPIO
165	Y_0	IO_9(RD2 4)	In/Out Non-pull	1) Digital Video output Y bit 0 2) GPIO

164	Y_1	IO_10(RD 25)	In/Out Non-pull	1) Digital Video output Y bit 1 2) GPIO
163	Y_2	IO_11(RD 26)	In/Out Non-pull	1) Digital Video output Y bit 2 2) GPIO
162	Y_3	IO_12(RD 27)	In/Out Non-pull	1) Digital Video output Y bit 3 2) GPIO
161	Y_4	IO_13(RD 28)	In/Out Non-pull	1) Digital Video output Y bit 4 2) GPIO
159	Y_5	IO_14(RD 29)	In/Out Non-pull	1) Digital Video output Y bit 5 2) GPIO
158	Y_6	IO_15(RD 30)	In/Out Non-pull	1) Digital Video output Y bit 6 2) GPIO
157	Y_7	IO_16(RD 31)	In/Out Non-pull	1) Digital Video output Y bit 7 2) GPIO
155	RA4		In/Out	DRAM address 4
154	RA5		In/Out	DRAM address 5
153	RA6		In/Out	DRAM address 6
152	RA7		In/Out	DRAM address 7
151	RA8		In/Out	DRAM address 8
150	RA9		In/Out	DRAM address 9
149	RA11		In/Out	DRAM address bit 11
147	CKE		In/Out Pull-Down	DRAM clock enable
146	RCLK		In/Out	Dram clock
144	RA3		In/Out	DRAM address 3
143	RA2		In/Out	DRAM address 2
141	RA1		In/Out	DRAM address 1
140	RA0		In/Out	DRAM address 0
139	RA10		In/Out	DRAM address 10
138	BA1		In/Out	DRAM bank address 1
137	BA0		In/Out	DRAM bank address 0
136	RCS#		output	DRAM chip select, active low
135	RAS#		output	DRAM row address strobe, active low
134	CAS#		output	DRAM column address strobe, active low
133	RWE#		output	DRAM Write enable, active low

132	DQM1		In/Out	Data mask 1
130	IO_18	(DQS1)	In/Out Non-pull	GPIO
129	RD8		In/Out	DRAM data 8
128	RD9		In/Out	DRAM data 9
127	RD10		In/Out	DRAM data 10
126	RD11		In/Out	DRAM data 11
125	RD12		In/Out	DRAM data 12
124	RD13		In/Out	DRAM data 13
123	RD14		In/Out	DRAM data 14
125	RD15		In/Out	DRAM data 15
121	RD0		In/Out	DRAM data 0
120	RD1		In/Out	DRAM data 1
119	RD2		In/Out	DRAM data 2
117	RD3		In/Out	DRAM data 3
116	RD4		In/Out	DRAM data 4
115	RD5		In/Out	DRAM data 5
114	RD6		In/Out	DRAM data 6
113	RD7		In/Out	DRAM data 7
112	IO_19	(DQS0)	In/Out	GPIO
111	DQM0		In/Out Non-pull	Data mask 0
JTAG Interface(4)				
51	TDI	V_ADIN4	In/Out Non-pull	1) Serial interface port 3 data-out 2) Version AD input port 4 3) GPIO
52	TMS	V_ADIN5	In/Out Non-pull	1) Serial interface port 3 data-out 2) Version AD input port 5 3) GPIO
53	TCK	V_ADIN6	In/Out Non-pull	1) Serial interface port 3 data-out 2) Version AD input port 6 3) GPIO
54	TDO	V_ADIN7	In/Out Non-pull	1) Serial interface port 3 data-out 2) Version AD input port 7 3) GPIO

3.5.2 function introduction to BA5954

1. DESCRIPTION

BA5954 is a servo drive IC with built-in 4-channel drive circuit. Digital focus, trace, feed and main axis drive signal outputted by MT1389E is sent to BA5954 for amplifying through RC integration circuit. The focus, trace, feed and main axis drive signal being amplified by BA5954 is sent to loader to fulfil the corresponding servo work.

2. PIN DESCRIPTION

PIN	Symbol	I/O	Description
1	VINFC	I	Focus control signal input
2	CF1	I	External feedback loop
3	CF2	I	External feedback loop
4	VINSL+	I	Forward control input, connected to reference voltage
5	VINSL-	I	Main axis control signal input
6	VOSL	O	External feedback resistor
7	VINFFC	I	Focus feedback signal input
8	VCC	P	5V power supply
9	PVCC1	P	5V power supply
10	PGND	P	Ground
11	VOSL-	O	Main axis drive reverse voltage output
12	VO2+	O	Main axis drive forward direction voltage output
13	VOFC-	O	Focus drive reverse voltage output
14	VOSC+	O	Focus drive forward voltage output
15	VOTK+	O	Trace drive forward direction voltage output
16	VOTK-	O	Trace drive reverse voltage output
17	VOLD+	O	Feed drive forward direction voltage output
18	VOLD-	O	Feed drive reverse voltage output
19	PGND	P	Ground
20	VINFTK	I	Trace feedback signal input
21	PVCC2	P	5V power supply
22	PREGND	P	Ground
23	VINLD	I	Feed control signal input
24	CTK2	I	External feedback loop
25	CTK1	I	External feedback loop
26	VINTK	I	Trace control signal input
27	BIAS	I	1.4V reference voltage input

28	STBY	I	Enable control signal
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3.5.3 function introduction to BA6849FM

1. DESCRIPTION

The BA6849 series are ICs developed for CD-ROM spindle motor drives. These ICs possess a short brake and reverse rotation brake for two types of brake functions, and also contain FG output and rotation direction detection (FR) circuits, making them high-functionality and high-performance ICs.

2. FEATURES

Three-phase, full-wave, pseudo-linear drive system.

Built-in power save and thermal shutdown functions.

Built-in current limiter and Hall bias circuits.

Built-in FG output.

Built-in rotation direction detector.

Built-in reverse rotation prevention circuit.

Built-in short brake pin.

3. PIN DESCRIPTION

PIN	Symbol	I/O	Description
2	A3	O	Output
4	A2	O	Output
7	A1	O	Output
8	GND	P	GND
9	H1+	I	Hall signal input
10	H1-	I	Hall signal input
11	H2+	I	Hall signal input
12	H2-	I	Hall signal input
13	H3+	I	Hall signal input
14	H3-	I	Hall signal input
15	VH		Hall bias
17	CNF		For connection of phase compensation capacitor
18	SB		Short brake
20	FR		Rotation direction detection
21	ECR	O	Output voltage control reference
22	EC	O	Output voltage control

23	PS		Power save
24	FG	O	FG signal output
25	VCC	P	Power supply
26	VM2	P	Motor power supply 2
27	VM1	P	Motor power supply 1
28	RNF		For connection of output current detection resistor

3.5.4 function introduction to 4558

1. Description

The RC4558 and RM4558 devices are dual general-purpose operational amplifiers with each half electrically similar to the μ A741 except that offset null capability is not provided.

The high common-mode input voltage range and the absence of latch-up make these amplifiers ideal for voltage-follower applications. The devices are short-circuit protected and the internal frequency compensation ensures stability without external components.

The RC4558 is characterized for operation from 0°C to 70°C, and the RM4558 is characterized for operation over the full military temperature range of –55°C to 125°C.

2. FEATURES

- Continuous-Short-Circuit Protection
- Wide Common-Mode and Differential Voltage Ranges
- No Frequency Compensation Required
- Low Power Consumption
- No Latch-Up
- Unity-Gain Bandwidth . . . 3 MHz Typ
- Gain and Phase Match Between Amplifiers
- Low Noise . . . 8 nV/√Hz Typ at 1 kHz
- Designed To Be Interchangeable With Raytheon RC4558 and RM4558 Devices

3. PIN CONFIGURATION

PIN No	Symbol	I/O	Description
1	1OUT	O	Output 1
2	1IN–	I	Inverting Input Pin 1
3	1IN+	I	Non-Inverting Input Pin 1

4	VCC–	I	Negative Power Supply
5	2IN+	I	Non-Inverting Input Pin 2
6	2IN–	I	Inverting Input Pin 2
7	2OUT	O	Output 2

3.5.5 Function introduction to SDRAM

64M 16-bit memorizer SDRAM with the player and the working clock frequency is 166/143MHZ. The function of 16SDRAM in DVD players is to memorizer the program of AML3298 taken out from FLASH and information of image and sound taken out from disc to form buffer, add the stability of information output and add anti-shaking effect of player. Pin function introduction is shown as the following table:

Pin	Name	Function	Signal flow	Pin	Name	Function	Signal flow
1	VDD	3.3V power supply	P	28	VSS	Ground	P
2	DQ0	Data bus	I/O	29	MA4	Address bus	I
3	VDDQ	3.3V power supply	I/O	30	MA5	Address bus	I
4	DQ1	Data bus	I/O	31	MA6	Address bus	I
5	DQ2	Data bus	I/O	32	MA7	Address bus	I
6	VSSQ	Ground	P	33	MA8	Address bus	I
7	DQ3	Data bus	I/O	34	MA9	Address bus	I
8	DQ4	Data bus	I/O	35	MA11	Address bus	I
9	VDDQ	3.3V power supply	P	36	NC	Blank	
10	DQ5	Data bus	I/O	37	CKE	Clock enable signal	I
11	DQ6	Data bus	I/O	38	CLK	System clock input	I
12	VSSQ	Ground	P	39	UDQM	Data input/output screen-shielded signal	I
13	DQ7	Data bus	I/O	40	NC	Blank	
14	VDD	3.3V power supply	P	41	VSS	Ground	P
15	LDQM	Data input/output screen-shielded signal	I	42	DQ8	Data bus	I/O
16	WE	Write control signal	I	43	VDDQ	3.3V power supply	
17	CAS	Line address gating signal	I	44	DQ9	Data bus	I/O
18	RAS	Row address gating signal	I	45	DQ10	Data bus	I/O
19	CS	Chip selection signal	I	46	VSSQ	Ground	P

20	SD-BS0	Segment address 0 gating signal	I	47	DQ11	Data bus	I/O
21	SD-BS1	Segment address 1 gating signal	I	48	DQ12	Data bus	I/O
22	MA10	Address bus	I	49	VDDQ	3.3V power supply	P
23	MA0	Address bus	I	50	DQ13	Data bus	I/O
24	MA1	Address bus	I	51	DQ14	Data bus	I/O
25	MA2	Address bus	I	52	VSSQ	Ground	P
26	MA3	Address bus	I	53	DQ15	Data bus	I/O
27	VDD	3.3V power supply	P	54	VSS	Ground	P

3.5.6 Function introduction to FLASH

29LV160BE is a 16Mbit FLASH memorizer, and the damage of U214 may cause troubles, such as power not on, no disc reading and power on picture mosaic. Pin function is shown as the following table:

Pin	Name	Function	Voltage (when no disc)	Data direction
1-9, 16-25, 48	AO-A19	20 bit address bus		I
11	WE	Write enable signal, low level is effective	3.23V	I
12	RESET	Reset, low level is effective	3.23V	I
10, 13, 14	NC	Blank pin		
15	RY/BY	Ready/system busy	3.23V	O
26	CE	Chip enable, low level effective	0V	I
27, 46	VSS	Ground		P
28	OE	Output enable signal, low level is effective	0V	I
29-3, 6, 38-44	DQ0-DQ14	15 bit data bus		O
37	VCC	5V power supply	+5V	P
45	DQ15/A-1	Take word extend mode as data line, and bit extend mode as address line		I/O
47	BYTE	Select 8-bit or 16-bit output mode. High level is 16-bit output and low level is 8-bit output		I

3.5.7 Function introduction to T112

1. DESCRIPTION

The T112 is a highly integrated All-in-one Visual Processor that provides major cost saving solution for the portable applications. T112 has built-in high performance dual ADCs, TCON, Triple DACs, Scaling Machine

with sophisticated upscaling and downscaling algorithms. The Innovative integrated “Frame-Buffer-Less” De-interlacer can significantly reduce system cost. The T112 also integrates On Screen Display engine with 1K-word of font RAM. The device can interface to an external micro-controller through 2-wire serial bus interface.

2. FEATURES

(1) Cost Effective Highly Integrated Triple ADC + 2D Video Decoder + OSD + Scaler + TCON

- Integrates 9-bit Analog to Digital Converters (ADC) & Phase Locked Loop (PLL)
- Scaler supports 2-D adaptive intra-field de-interlacer and non-linear 16:9 aspect ratio.
- Requires no external Frame Buffer Memory for deinterlacer.
- Advanced On Screen Display (OSD) function
- Programmable Timing Controller (Tcon) for Car TV applications
- Multi-standard color decoder with 2D adaptive comb filter
- Innovative and flexible design to reduce total system cost

(2) Triple 9-bit Analog to Digital Converters (ADC)

27 MSPS Conversion Rate

- Built-in Pre-amp, mid-level & ground clamp circuit
- Automatic Clamp Control for CVBS, Y and C
- Programmable Static Gain Control or Automatic Gain Control for CVBS or Y/C
- Max Input configuration up to 4xCVBS or 2xS-video

(3) Digital Video Enhancement

Separate Luminance and Chroma Enhancer

- Y Supports Luminance Peaking, DLTI, Black Level Expansion, Contrast and Brightness adjustment
- C Supports DCTI, Saturation and Hue adjustment.

(4) Advanced Scaling Engine

Two Dimensions FIR Scaler

- Coefficient based sharpness filters
- 2-D edge enhancement
- Independent vertical and horizontal scaling ratio
- 16:9 Non-linear Aspect ratio

LCD Interface

- Provides Gamma correction for panel compensation
- Supports image pan functions
- Programmable Timing Controller
- RGB Triple DAC output

Color Management

- Coef Programmable YCbCr-to-RGB Color Space Converter
- RGB Gamma Correction

Built-in On Screen Display Engine

- 1K-word OSD SRAM memory
- Supports font or bitmap modes
- Supports character blinking, overlay, shadow and border functions
- Fully programmable character mapping
- Supports alpha blending & Zoom-in/Zoom-out function
- Optional fonts can be stored in off-chip serial EEPROM

Versatile VBI Data Decoder

- Supports Close Caption, Wide Screen Signalling and Teletext

Crystal Oscillator Circuit

- Direct interface to a (27.0MHz) Crystal
- Also provide a buffered clock output for external Micro-controller

Digital Test Pattern Generator

- Programmable standard & special panel burn-in test patterns
- Support special border frame blocking mode

Independent Display Phase Lock Loop

- Generates pixel clock output to panel
- Supports free run OSD mode

Serial Bus Interface

- Supports 2-wire (normal speed)

Pulse Width Modulation Outputs

Design For Testability

- Scan chain insertion
- Separated analog & digital test modes

3. PIN DESCRIPTION

Symbol	Pin No.	Type	Description
Power Supplies			
VDD18	8,18,29,39	PWR	+1.8V digital core power supply
VDD33	6,19,31	PWR	+3.3V digital output power supply
AVDDG	49	PWR	+3.3V analog power supply for ADC channel 1
AVDDR	45	PWR	+3.3V analog power supply for ADC channel 0
GND	7,15,21,28, 40	GND	Digital ground

AGNDG	52	GND	Analog ground for ADC channel 1
AGNDR	48	GND	Analog ground for ADC channel 0
VD5V	4	PWR	+5.0V analog power supply for DAC
VD3V	64	PWR	+3.3V analog power supply for VCOM and DAC
AVDD	59	PWR	+1.8V Analog Power Supply for DAC
VS3V	2	GND	Analog ground for DAC
AVSS	58	GND	Analog ground for DAC
Output Interface Signals			
RSET	63	AO	DAC reference current adjustment
VBFG	62	AO	Voltage reference output
IOR	1	AO	Channel R current output
IOG	3	AO	Channel G current output
IOB	5	AO	Channel B current output
CPH1	20	DO	Output data clock
CPH2/sD0	17	DO	Output data clock/the bit 0 of serial interfaced panel
CPH3/sD1	16	DO	Output data clock/the bit 1 of serial interfaced panel
VSO/STH1	23	DO	Vertical synchronization output signal.
HSO/POL	24	DO	Horizontal synchronization output signal.
DEN/STH2	22	DO	Horizontal data enable
Timing Controller Interface Signals			
Q1H/sD2	14	DO	Source Driver Q1H/the bit 2 of serial interfaced panel
LP/sD3	13	DO	Latch pulse for source driver/the bit 3 of serial interfaced panel
GCLK/sD4	12	DO	Gate driver clock/the bit 4 of serial interfaced panel
GOE/sD5	11	DO	Gate driver output enable/the bit 5 of serial interfaced panel
STV1/sD6	10	DO	Gate Driver start pulse/the bit 6 of serial interfaced panel
STV2/sD7	9	DO	Gate Driver start pulse/the bit 7 of serial interfaced panel
VCOMAMP	61	DO	Analog VCOM amplitude
VCOMDC	60	DO	Analog VCOM DC offset
2-wire serial bus Interface Signals			
SCL	36	DI	2-wire serial bus clock. Power down does not affect SCL.
SDA/IICA3	37	I/O	2-wire serial bus data. Power down does not affect SDA.
Configuration interface Signals			

CPUINT	35	I/O	Internal Interrupt.
RSTB	38	DI	Whole chip reset. (Internal Pull-up)
ADC Interface			
AY1	51	AI	Analog input 1 of channel 1
AY0	50	AI	Analog input 0 of channel 1
ACR1	47	AI	Analog input 1 of channel 0
ACR0	46	AI	Analog input 0 of channel 0
PLL Reference Clock			
XTALI	34	DI	Output PLL reference clock input
XTALO	33	DO	Output PLL reference clock output
XCLK2MC	32	DO	Buffered XTALI for external microprocessor.
Power Management Interface Signals			
PWM1	30	DO	Pulse Width Modulation for volume/backlight control.
PWM2	27	DO	Pulse Width Modulation for volume/backlight control.

3.5.8 Function introduction to MAX9702

1. DESCRIPTION

The MAX9702 combines a highly efficient Class D speaker amplifier with a high-linearity Class AB headphone amplifier. This ensures maximum battery life in speaker mode and maximum performance in headphone mode. The MAX9702 delivers up to 1.8W per channel into an 8 Ω load from a 5V power supply. Maxim's 2nd-generation, spread-spectrum modulation scheme renders the traditional Class D output filter unnecessary.

The MAX9702 speaker amplifier offers two modulation schemes: a fixed-frequency (FFM) mode and a spread spectrum (SSM) mode that reduces EMI-radiated emissions.

The MAX9702 speaker amplifier features a fully differential architecture, full-bridged (BTL) output, and comprehensive click-and-pop suppression. The MAX9702 speaker amplifier features high 75dB PSRR, low 0.07% THD+N, and SNR in excess of 97dB. Short circuit and thermal-overload protection prevent the device from being damaged during a fault condition.

The headphone amplifier uses Maxim's patented Direct Drive™ architecture that produces a ground-referenced output from a single supply, eliminating the need for large DC-blocking capacitors, saving cost, board space, and component height. A high 80dB PSRR and low 0.02% THD+N ensures clean, low-distortion amplification of the audio signal.

An I²C interface sets the speaker and headphone gain, mono, stereo, and mute functions. The MAX9702 is available in 28-pin, thin QFN-EP (5mm x 5mm x 0.8mm) and 28-pin TSSOP packages. The MAX9702 is specified over the extended -40°C to +85°C temperature range.

2. FEATURES

Patented Spread-Spectrum Modulation Reduces EMI Emissions

Programmable Mono, Stereo, Mute, and Mix Functions

1.1W Stereo Output (8 Ω , VDD = 5V)

48mW Headphone Output (32 Ω , VDD = 3.3V)

95% Efficiency (RL = 8 Ω , PO = 1.1W)

High 73dB PSRR (f = 217Hz)

I2C Programmable Gain Up to +21dB

Integrated Click-and-Pop Suppression

Low-Power Shutdown Mode (0.1 μ A)

Short-Circuit and Thermal-Overload Protection

$\pm$ 8kV (HBM) ESD-Protected Headphone Driver Outputs

3. PIN DESCRIPTION

PIN No	Symbol	Description
4, 25	PVDD	H-Bridge Power Supply. Connect to VDD and bypass each PVDD with a 0.1 μ F capacitor to PGND.
5	SYNC_OUT	Clock Signal Output. Float SYNC_OUT if not used.
6	SCL	I2C Serial Clock. Connect a pullup resistor to VDD (see I2C Interface section).
7	SDA	I2C Serial Data. Connect a pullup resistor to VDD (see I2C Interface section).
8	BIAS	Common-Mode Voltage. Bypass to GND with a 1 μ F capacitor.
9	SYNC	Frequency Mode Select: SYNC = GND: Fixed-frequency mode with fS = 1100kHz. SYNC = Float: Fixed-frequency mode with fS = 1340kHz. SYNC = VDD: Spread-spectrum mode with fS = 1150kHz $\pm$ 50kHz. SYNC = Clocked: Fixed-frequency mode with fS = external clock frequency.
10	CPVDD	Charge-Pump Power Supply. Connect to VDD and bypass to CPGND with a 1 μ F capacitor.
11	C1P	Charge-Pump Flying-Capacitor Positive Terminal. Connect a 1 μ F capacitor from C1P to C1N.
12	CPGND	Charge-Pump Power Ground. Connect to PGND.
13	C1N	Charge-Pump Flying-Capacitor Negative Terminal. Connect a 1 μ F capacitor from C1N to C1P.
14	CPVSS	Charge-Pump Negative Output. Bypass with a 1 μ F capacitor to CPGND.
15	VSS	Headphone Amplifier Negative Supply. Connect to CPVSS.
16	HPL	Left-Channel Headphone Output
17	HPR	Right-Channel Headphone Output
18	VDD	Analog Power Supply. Bypass with a 1 μ F capacitor to GND.
19	GND	Analog Ground. Connect to PGND.
20	INR	Right-Channel Audio Input
21	INL	Left-Channel Audio Input

22	INM	Mono Audio Input
23	HPS	Headphone Sense: HPS = VDD: Headphone mode. HPS = GND: Speaker mode.
24	SHDN	Active-Low Shutdown. Connect to VDD for normal operation.
26	OUTR+	Right-Channel Positive Amplifier Output
27	OUTR-	Right-Channel Negative Amplifier Output
1, 28	PGND	Power Ground. Connect to GND.
2	OUTL-	Left-Channel Negative Amplifier Output
3	OUTL+	Left-Channel Positive Amplifier Output
—	EP	Exposed Pad. The external pad lowers the package's thermal impedance by providing a direct heat conduction path from the die to the printed circuit board. The exposed pad is internally connected to VSS. Connect the exposed thermal pad to an isolated plane if possible or VSS.

3.5.9 function introduction to NJM3414

1. DESCRIPTION

The NJM3414A integrated circuit is a high gain, high output current, high output voltage swing dual operational amplifier capable of driving 70mA.

2. FEATURES

Single Supply

Operating Voltage (+3V~+15V)

High Output Current (70mA typ.)

Slew Rate (1.0V/μs typ.)

Package Outline DIP8,DMP8,SIP8,SSOP8

Bipolar Technology

3.5.10 Function introduction to LM1117

1. Description

The LM1117 series of adjustable and fixed voltage regulators are designed to provide 1A output current and to operate down to 1V input-to-output differential. The dropout voltage of the device is guaranteed maximum 1.3V at maximum output current, decreasing at lower load currents.

On-chip trimming adjusts the reference voltage to within 1% accuracy. Current limit is also trimmed, minimizing the stress under overload conditions on both the regulator and power source circuitry.

The LM1117 devices are pin compatible with other three-terminal SCS regulators and are offered in the low profile surface mount SOT-223 package and in the TO-252 (DPAK) plastic package.

2. Features

Three Terminal Adjustable or Fixed Voltages 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5.0V

Output Current of 1A

Operates Down to 1V Dropout

Line Regulation: 0.2% Max.

Load Regulation: 0.4% Max.

SOT-223 and TO-252 package available

3. PIN DESCRIPTION

PIN No.	Symbol	I/O	Description
1	GND/adjust	I	Ground (fixed)/adjust (adjustable)
2	Vout	O	Voltage output
3	Vin	I	Voltage input

3.5.11 Function introduction to AMS1117

1. DESCRIPTION

The AMS1117 series of adjustable and fixed voltage regulators are designed to provide 1A output current and to operate down to 1V input-to-output differential. The dropout voltage of the device is guaranteed maximum 1.3V at maximum output current, decreasing at lower load currents.

On-chip trimming adjusts the reference voltage to 1%. Current limit is also trimmed, minimizing the stress under overload conditions on both the regulator and power source circuitry. The AMS1117 devices are pin compatible with other three-terminal SCSi regulators and are offered in the low profile surface mount SOT-223 package and in the TO-252 (DPAK) plastic package.

2. FEATURES

Three Terminal Adjustable or Fixed Voltages 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5.0V

Output Current of 1A

Operates Down to 1V Dropout

Line Regulation: 0.2% Max.

Load Regulation: 0.4% Max.

SOT-223 and TO-252 package available

3. PIN DESCRIPTION

PIN No.	Symbol	I/O	Description
1	GND/adjust	I	Ground (fixed)/adjust (adjustable)

2	Vout	O	Voltage output
3	Vin	I	Voltage input

3.5.12 function introduction to MP1411

1. Description

The MP1411 is a monolithic step-down switch mode converter with a built in internal power MOSFET. It achieves 2A continuous output current over a wide input supply range with excellent load and line regulation.

Current mode operation provides fast transient response and eases loop stabilization.

Fault condition protection includes cycle-by-cycle current limiting and thermal shutdown. In shutdown mode the regulator draws 23μA of supply current. Programmable soft-start minimizes the inrush supply current and the output overshoot at initial startup.

The MP1411 requires a minimum number of readily available standard external components.

2. Features

- 2A Output Current
- 0.2Ω Internal Power MOSFET Switch
- Stable with Low ESR Output Ceramic Capacitors
- Up to 95% Efficiency
- 23μA Shutdown Mode
- Fixed 380KHz Frequency
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Wide 4.75V to 18V Operating Input Range
- Output Adjustable from 0.92V to 16V
- Programmable Under Voltage Lockout
- Available in an MSOP10 with Exposed Pad Package

3. PIN DESCRIPTION

PIN No.	Symbol	I/O	Description
1	NC		No Connect.
2	BS	I	Bootstrap
3	NC		No Connect.
4	IN	P	Supply Voltage
5	SW	O	Switch
6	GND	P	Ground

7	FB	I	Feedback
8	COMP	I	Compensation
9	EN	I	Enable/UVLO
10	SS		Soft-Start

3.5.13 function introduction to PT2222A

1. DESCRIPTION

The PT2221 and PT2222 are remote control transmitters utilizing CMOS Technology specially designed for use on infrared remote control applications. They are pin-to-pin compatible with NEC μ PD6121 and μ PD6122 respectively.

PT2221 is packaged in 20 pins SO and capable of controlling 32 functions and 3 double keys. PT2222, on the other hand, is housed in 24 pins SO and capable of controlling 64 function keys and 3 double keys. PT2221/2 may be paired with PT2225 to construct a powerful remote control system.

2. FEATURES

CMOS Technology

Low Power Consumption ($V_{DD}=2.0 \sim 5.5V$)

Pin-to-Pin Compatible with μ PD6121/ μ PD6122

Using SEL pin, PT2221 can support 64+6 function codes

Using SEL pin, PT2222 can support 128 + 6 function codes

Customer Code can be selected (please contact PTC for details)

3.5.14 Function introduction to LM393

1. DESCRIPTION

The LM193 series consists of two independent precision voltage comparators with an offset voltage specification as low as 2.0 mV max for two comparators which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Application areas include limit comparators, simple analog to digital converters; pulse, square wave and time delay generators; wide range VCO; MOS clock timers; multi vibrators and high voltage digital logic gates. The LM193 series was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, the LM193 series will directly interface with MOS logic where their low power drain is a distinct advantage over standard comparators.

2. FEATURES

Wide supply

— Voltage range: 2.0V to 36V

— single or dual supplies: $\pm 1.0\text{V}$ to $\pm 18\text{V}$

Very low supply current drain (0.4 mA) — independent of supply voltage

Low input biasing current: 25 nA

Low input offset current: ± 5 nA

Maximum offset voltage: ± 3 mV

Input common-mode voltage range includes ground

Differential input voltage range equal to the power supply voltage

Low output saturation voltage, : 250 mV at 4 mA

Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems

3.5.15 function introduction to 24C16

1. Description

The AT24C01A/02/04/08/16 provides 1024/2048/4096/8192/16384 bits of serial electrically erasable and programmable read only memory (EEPROM) organized as 128/256/512/1024/2048 words of 8 bits each. The device is optimized for use in many industrial and commercial applications where low power and low voltage operation are essential. The AT24C01A/02/04/08/16 is available in space saving 8-pin PDIP, 8-pin and 14-pin SOIC packages and is accessed via a 2-wire serial interface. In addition, the entire family is available in 5.0V (4.5V to 5.5V), 2.7V (2.7V to 5.5V), 2.5V (2.5V to 5.5V) and 1.8V (1.8V to 5.5V) versions.

2. Features

Low Voltage and Standard Voltage Operation

5.0 (VCC = 4.5V to 5.5V)

2.7 (VCC = 2.7V to 5.5V)

2.5 (VCC = 2.5V to 5.5V)

1.8 (VCC = 1.8V to 5.5V)

Internally Organized 128 x 8 (1K), 256 x 8 (2K), 512 x 8 (4K), 1024 x 8 (8K) or 2048 x 8 (16K)

2-Wire Serial Interface

Bidirectional Data Transfer Protocol

100 kHz (1.8V, 2.5V, 2.7V) and 400 kHz (5V) Compatibility

Write Protect Pin for Hardware Data Protection

8-Byte Page (1K, 2K), 16-Byte Page (4K, 8K, 16K) Write Modes

Partial Page Writes Are Allowed

Self-Timed Write Cycle (10 ms max)

High Reliability

Endurance: 1 Million Cycles

Data Retention: 100 Years

Automotive Grade and Extended Temperature Devices Available

8-Pin and 14-Pin JEDEC SOIC and 8-Pin PDIP Packages

3. PIN DESCRIPTION

PIN No.	Symbol	I/O	Description
1	A0		To Ground
2	A1		To Ground
3	A2		To Ground
4	GND	P	To Ground
5	SDA	I/O	Serial Data input
6	SCL	I/O	Serial SCL input
7	WP	I/O	Write Protect
8	VCC	P	Positive Power Supply

3.5.16 Function introduction to AZ431

AZ431 is a 2.5V comparator, shown as the figure 3.5.16.1. Compared the inputted voltage of R end with 2.5V, when voltage of R end is more than 2.5V, KA end is on and photoelectric coupler starts to send out photocurrent; when voltage of R end is less than 2.5V, KA end is cutoff and photoelectric coupler does not send out photocurrent. CPU+3.3V in power board circuit must be kept in 3.3V, for the function of comparator. No matter more than or less than 3.3V, through on and off status of comparator, it will control the on state of the output end of photoelectric coupler LM431A to adjust the output space occupation ratio of switch module to control the output voltage of transformer and masthead the power.

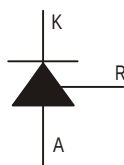


Figure 3.5.16.1 LM431A outside drawing

3.5.17 Function introduction to S3F9454

1. DESCRIPTION

Samsung's SAM88RCRI family of 8-bit single-chip CMOS micro controllers offers a fast and efficient CPU, a wide range of integrated peripherals, and various mask-programmable ROM sizes.

A address/data bus architecture and a large number of bit-configurable I/O ports provide a flexible programming environment for applications with varied memory and I/O requirements. Timer/counters with selectable operating modes are included to support real-time operations.

2. FEATURES

CPU

- SAM88RCRI CPU core
- The SAM88RCRI core is low-end version of the current SAM87 core.

Memory

- 2/4-Kbyte internal program memory
- 208-byte general purpose register area

Instruction Set

- 41 instructions
- The SAM88RCRI core provides all the SAM87 core instruction except the word-oriented instruction, multiplication, division, and some one-byte instruction.

Instruction Execution Time

- 400 ns at 10 MHz fOSC (minimum)

Interrupts

- 4 interrupt sources with one vector
- One interrupt level

General I/O

- Three I/O ports (Max 18 pins)
- Bit programmable ports

8-bit High-speed PWM

- 8-bit PWM 1-ch (Max: 156 kHz)
- 6-bit base + 2-bit extension

Built-in reset Circuit

- Low voltage detector for safe reset

Timer/Counters

- One 8-bit basic timer for watchdog function
- One 8-bit timer/counter with time interval modes

A/D Converter

- Nine analog input pins
- 10-bit conversion resolution

Oscillation Frequency

- 1 MHz to 10 MHz external crystal oscillator
- Maximum 10 MHz CPU clock
- Internal RC: 3.2 MHz (typ.), 0.5 MHz (typ.) in
VDD = 5 V

Operating Temperature Range

- – 40°C to + 85°C

Operating Voltage Range

- 2.0 V (LVR Level) to 5.5 V

Smart Option

Package Types

- S3C9452/C9454:
 - 20-DIP-300A
 - 20-SOP-375
 - 16-DIP-300A
- S3C9442/C9444
 - 8-DIP-300
 - 8-SOP-225

3. PIN DESCRIPTION

Pin Name	In/Out	Pin Description	Pin Type	Share Pins
P0.0–P0.7	I/O	Bit-programmable I/O port for Schmitt trigger input or push-pull output. Pull-up resistors are assignable by software. Port0 pins can also be used as A/D converter input, PWM output or external interrupt input.	E-1	ADC0–ADC7 INT0/INT1 PWM
P1.0–P1.1	I/O	Bit-programmable I/O port for Schmitt trigger input or push-pull, open-drain output. Pull-up resistors or pull-down resistors are assignable by software.	E-2	XIN, XOUT
P1.2	I	Schmitt trigger input port	B	RESET
P2.0–P2.6	I/O	Bit-programmable I/O port for Schmitt trigger input or push-pull, open-drain output. Pull-up resistors are assignable by software.	E E-1	– ADC8/CLO T0
XIN, XOUT	–	Crystal/Ceramic, or RC oscillator signal for system clock.		P1.0–P1.1
RESET	I	Internal LVR or External RESET	B	P1.2
VDD, VSS	–	Voltage input pin and ground		–
CLO	O	System clock output port	E-1	P2.6
INT0–INT1	I	External interrupt input port	E-1	P0.0, P0.1
PWM	O	8-Bit high speed PWM output	E-1	P0.6

T0	O	Timer0 match output	E-1	P2.0
ADC0–ADC8	I	A/D converter input	E-1 E	P0.0–P0.7 P2.6

Chapter Four

Disassembly and Assembly Process

In order to know the structure of DVD player DK1005S easily, visibly and quickly, now each key link of the disassembly and assembly process of the player is presented in means of pictures to prevent users from incorrect operating and damaging elements. This player is divided into: the unit, loader, loader components, control panel components, decode control components, power board components, AV board components, MIC board components and remote controller. You are suggested to operate according to illustrations strictly.

4.1 Disassembly process for the player



1. Remove bottom casing screw: take down battery and use electric screwdriver or "+"-shaped screwdriver to remove 13 screws of bottom casing.



2. Use hand to separate bottom casing and middle casing slightly as shown in the picture.



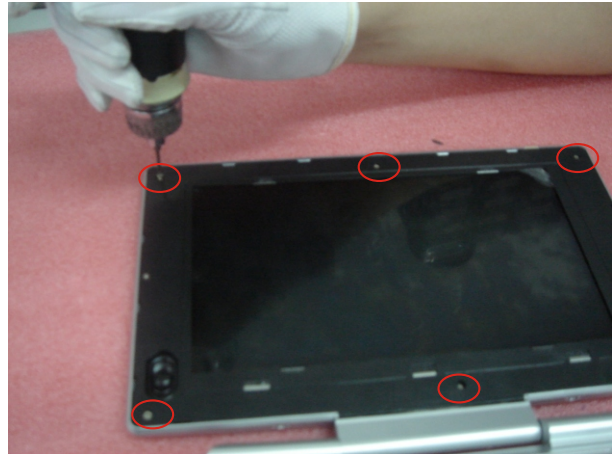
3. When separating bottom casing and middle casing, pay attention to press the flat cable shown in the picture to avoid breaking it when pulling.



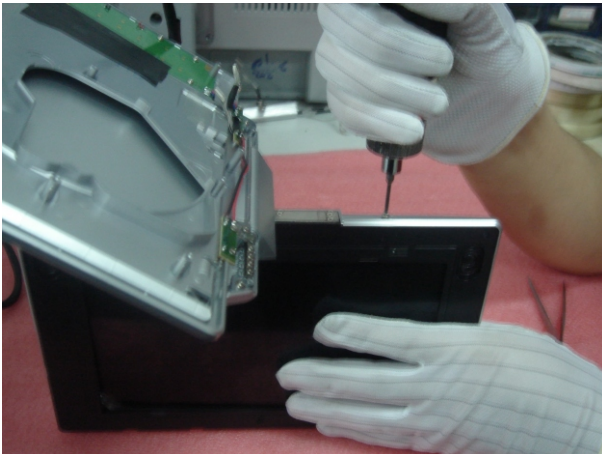
4. Unplug socket shown in the picture and then remove the flat cable shown in the picture.



5. Separate bottom casing and middle casing.



6. Use electric screwdriver or "+"-shaped screwdriver to remove 6 screw used for fixing display screen.



7. Use electric screwdriver or "+"-shaped screwdriver to remove 2 screws of display screen cover.



8. Take down rear cover of display screen.



9. Unplug flat cable from boost board to display screen.



10. Take out display screen as shown in the picture.



11. Unplug flat cable from decode board to display screen and the display screen may be taken down.



12. Remove rotary axis: use electric screwdriver or "+"-shaped screwdriver to remove screws shown in the picture and the rotary axis may be taken down.

4.2 Assembly process for the player

Assembly process of the player is similar to the disassembly process, only the sequence is reverse.

Chapter Cinque

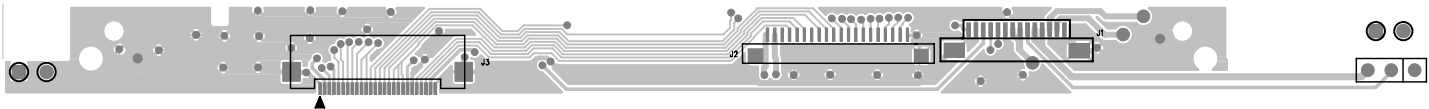
PCB board & Circuit diagram

Section One PCB board

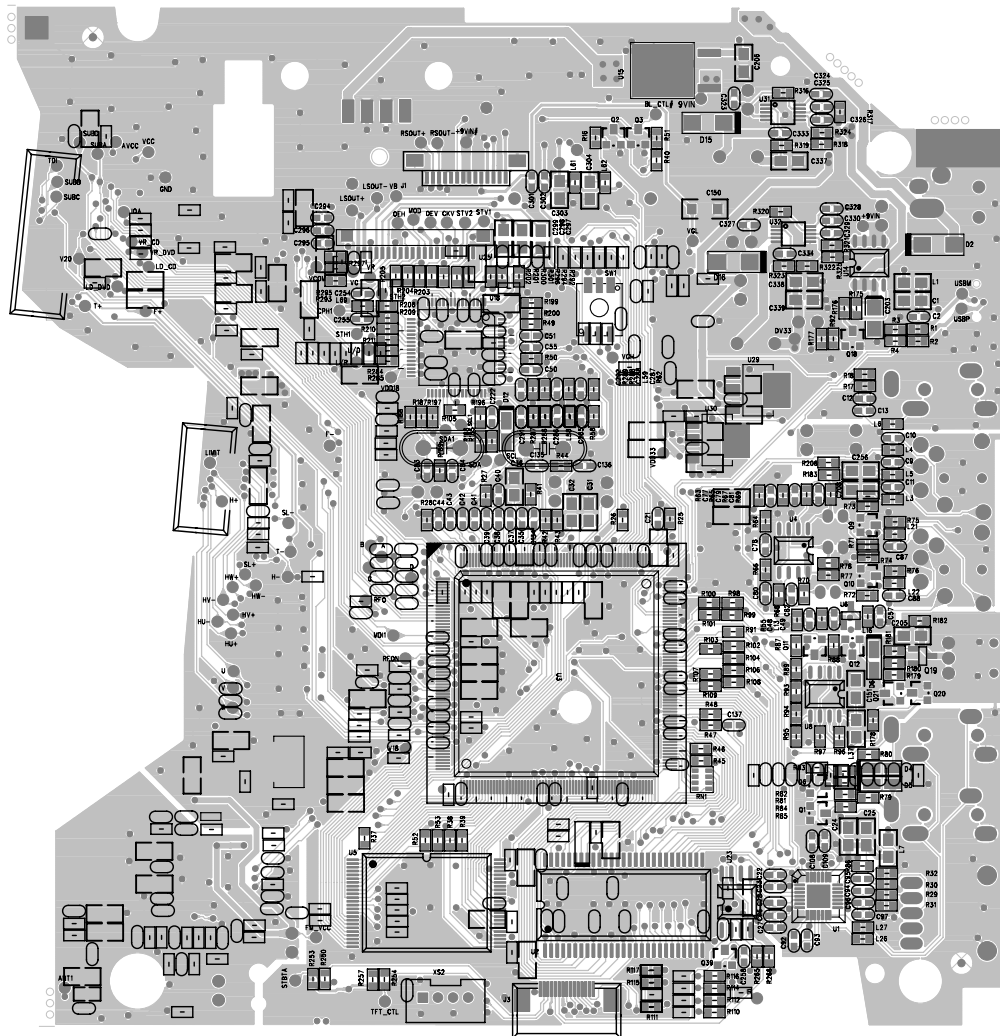
5.1.1 Surface layer of Drive Board



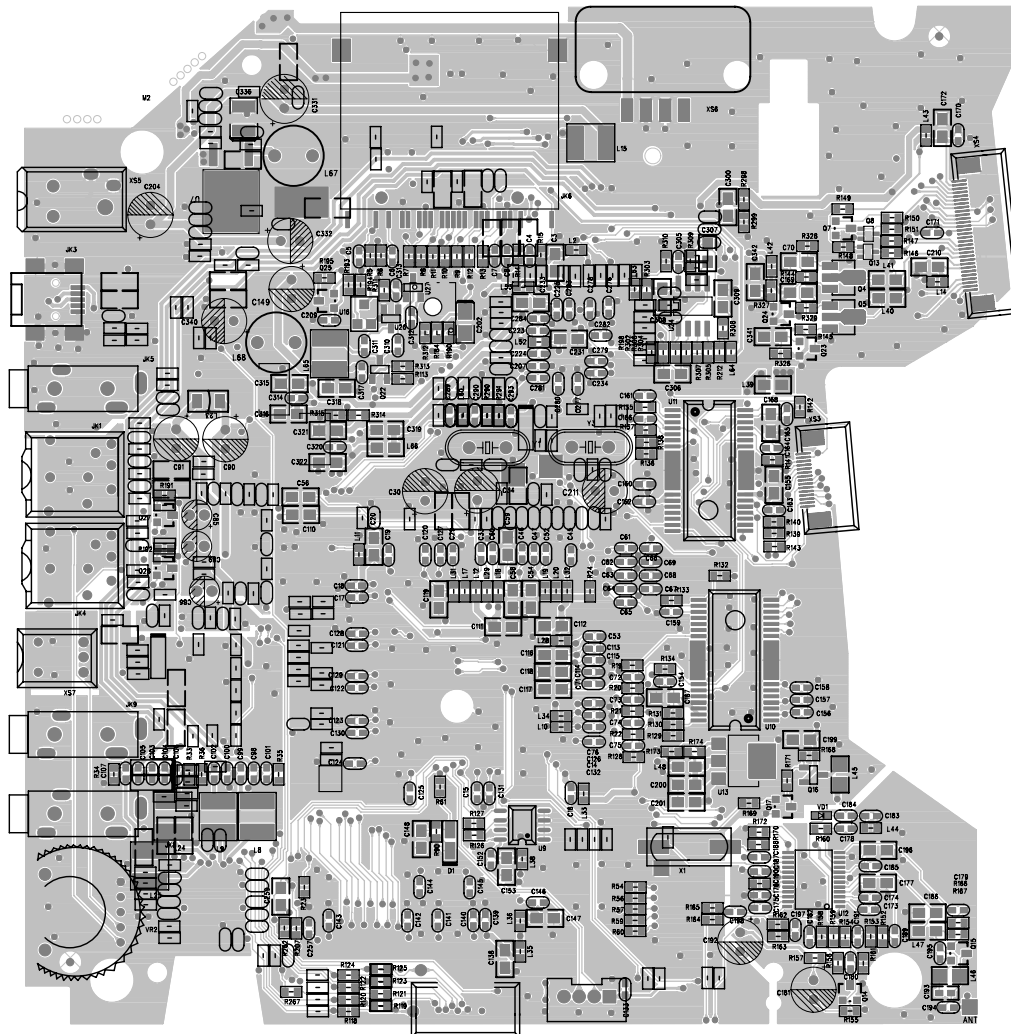
5.1.2 Bottom layer of Drive Board



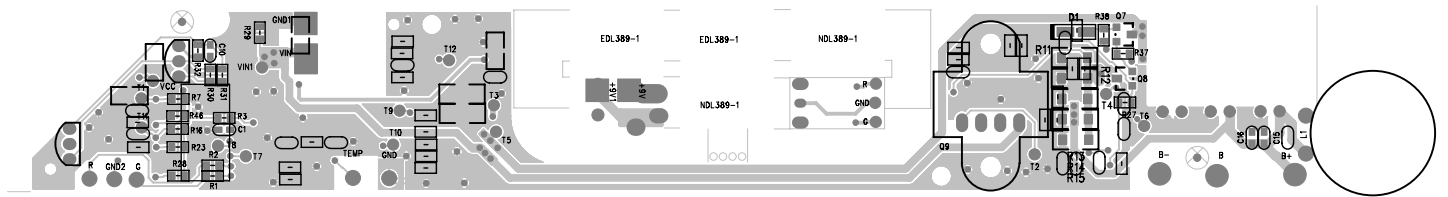
5.1.3 Surface layer of Decode Board



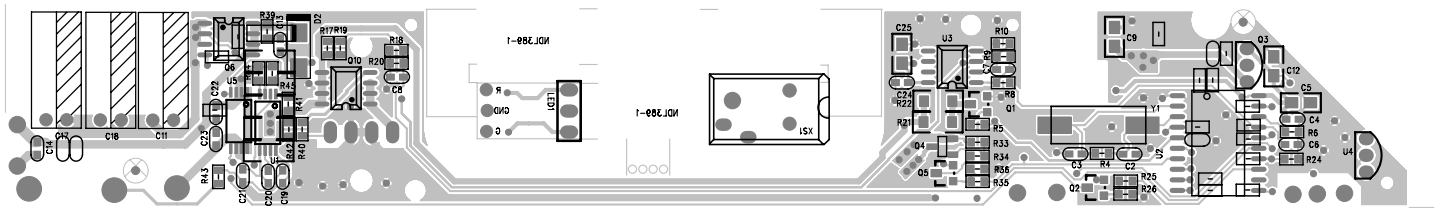
5.1.4 Bottom layer of Decode Board



5.1.5 Surface layer of Battery charge Board

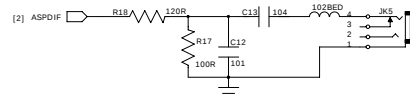
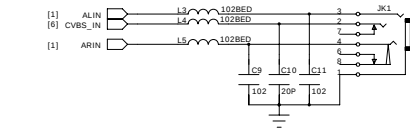
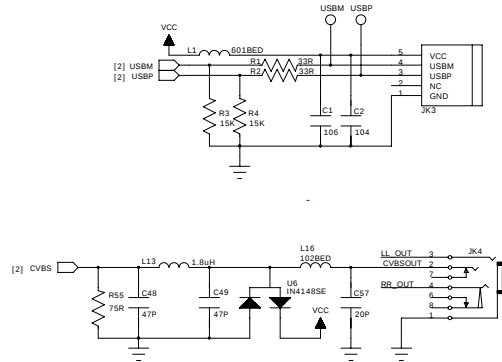
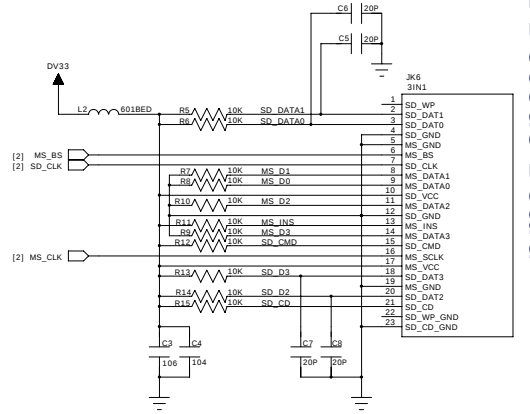
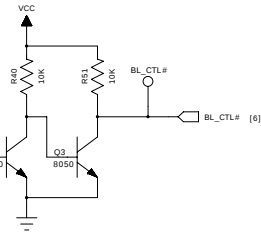
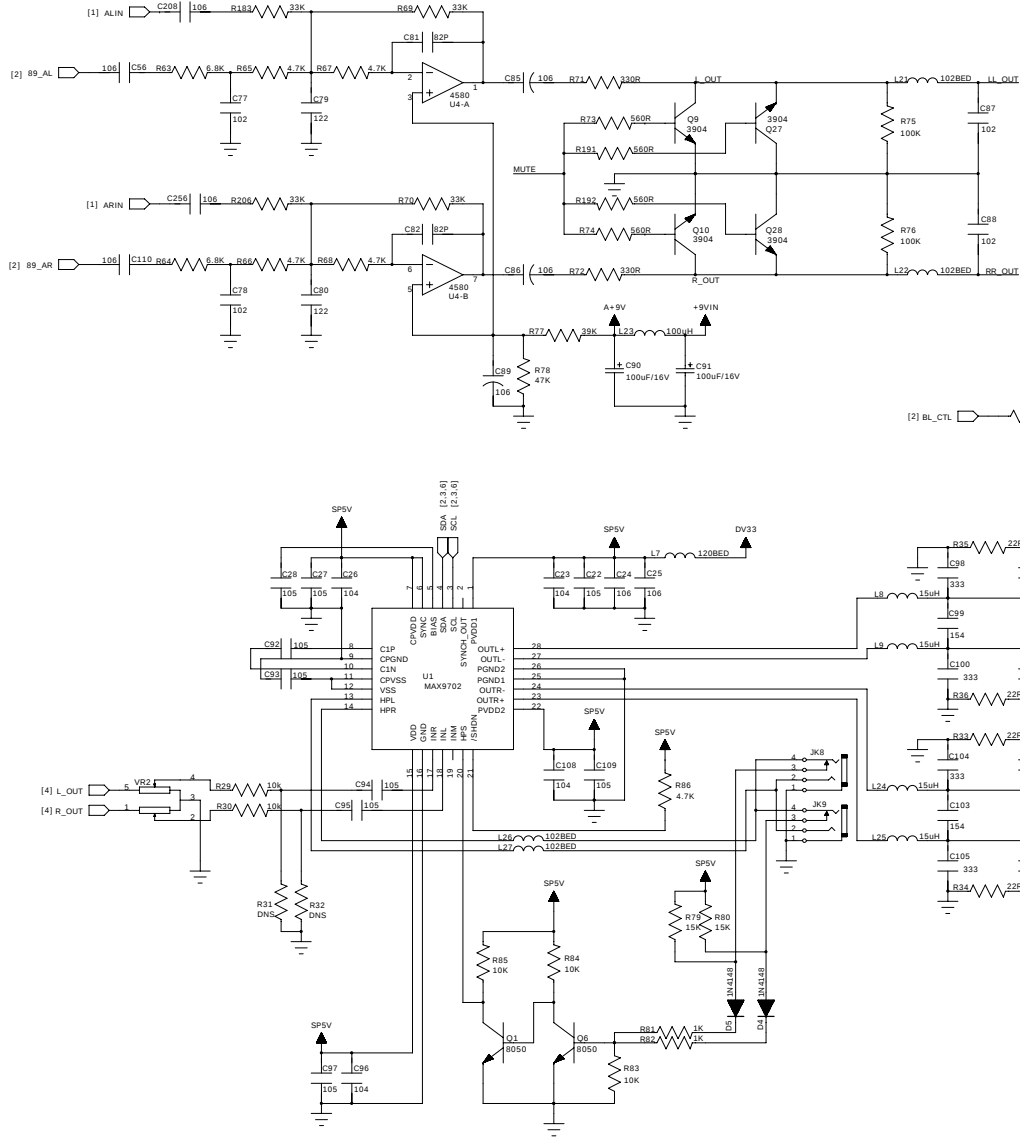


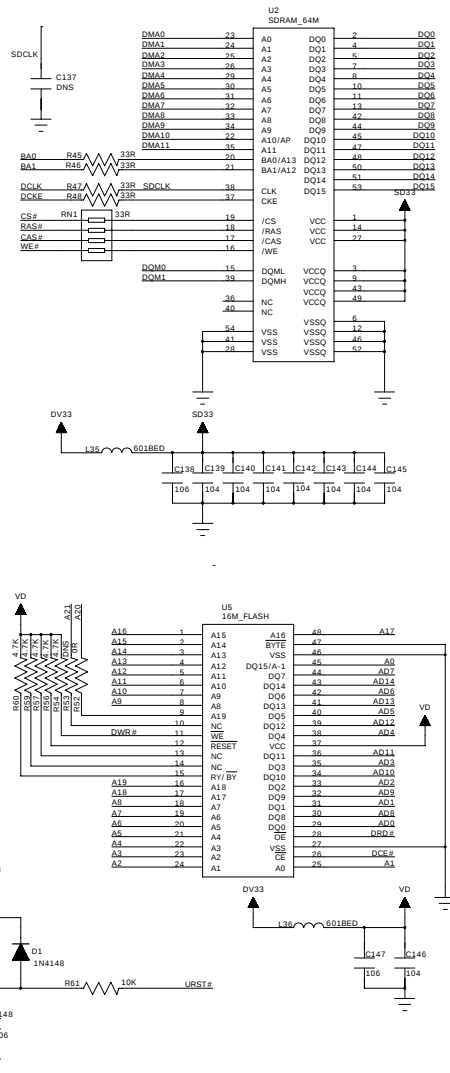
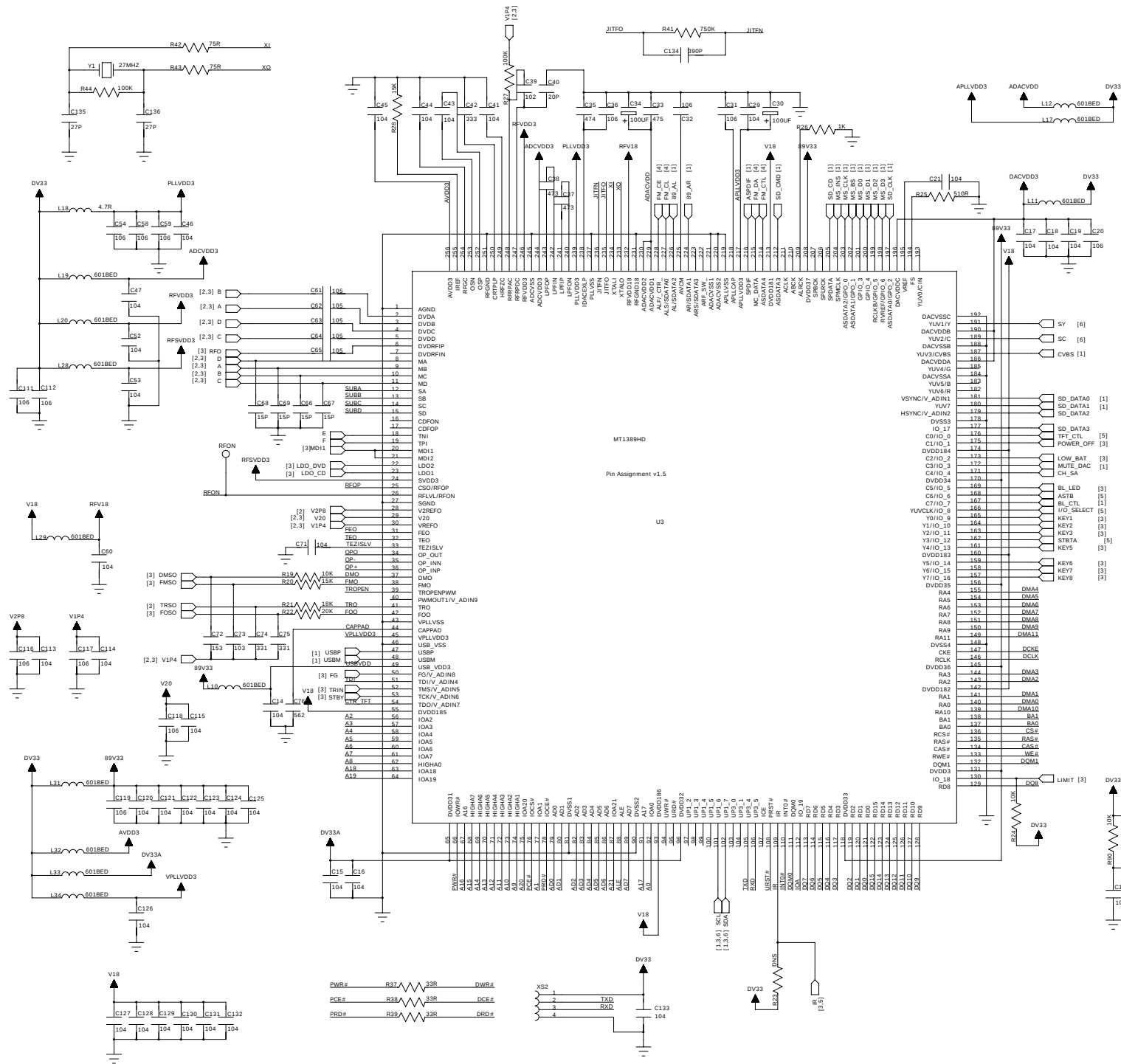
5.1.6 Bottom layer of Battery charge Board

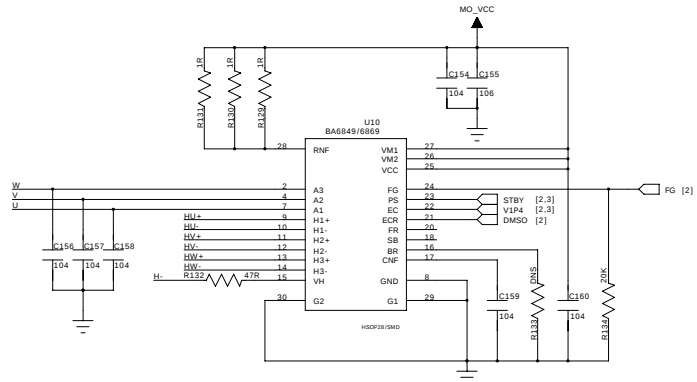
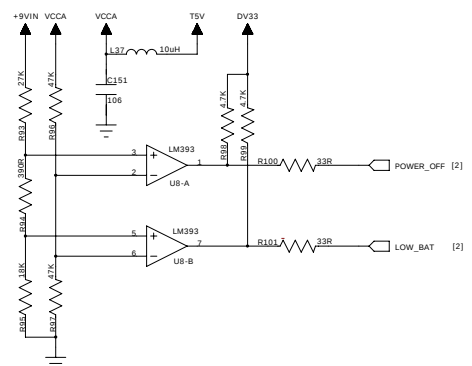
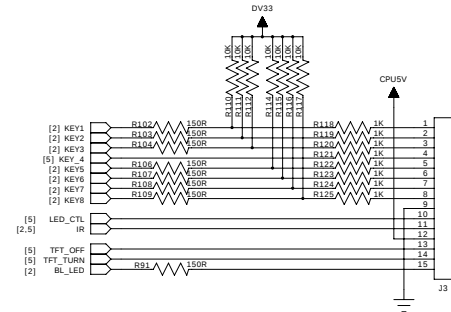
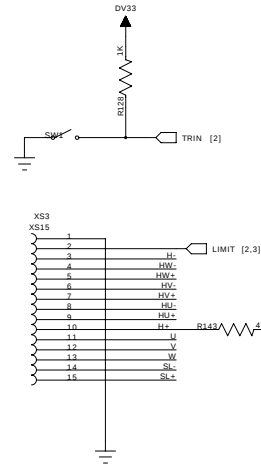
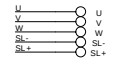
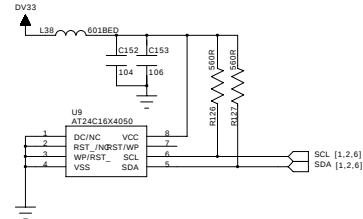
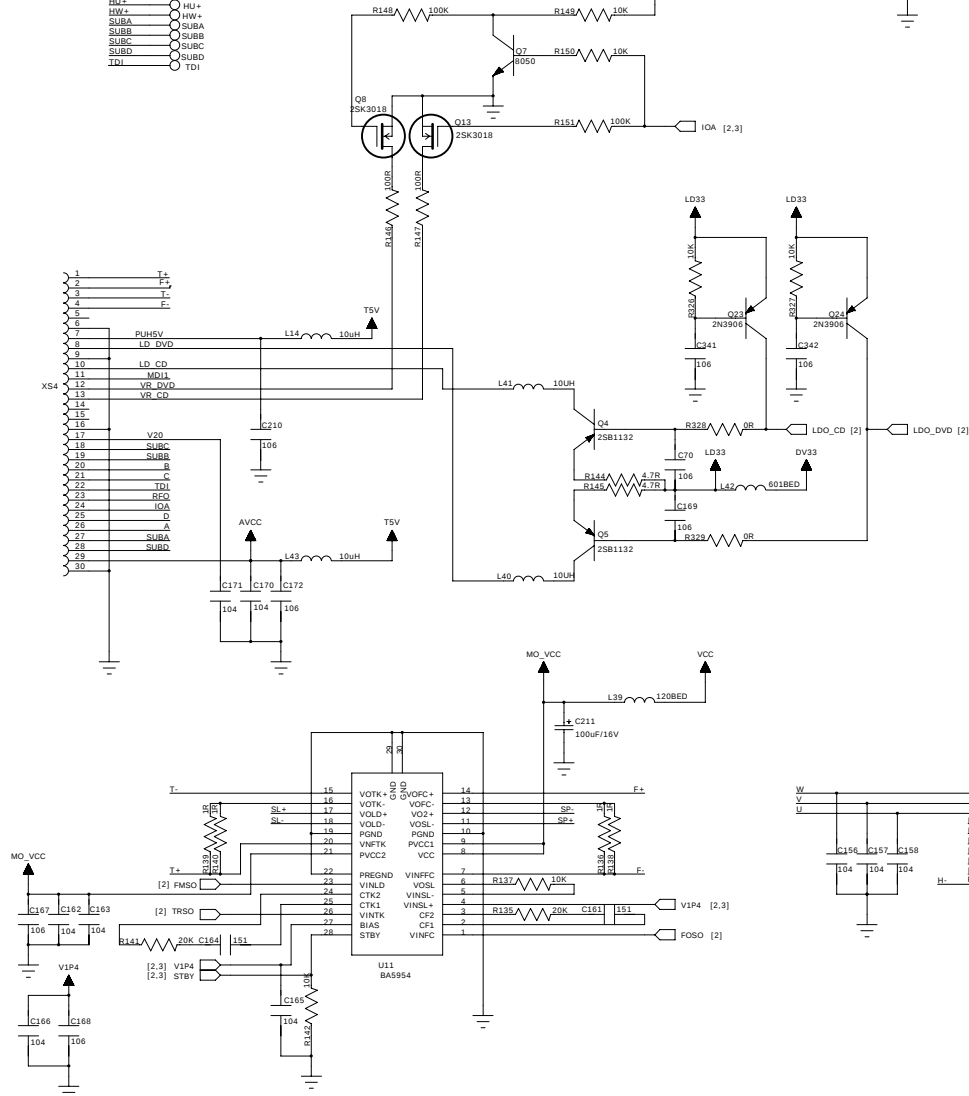


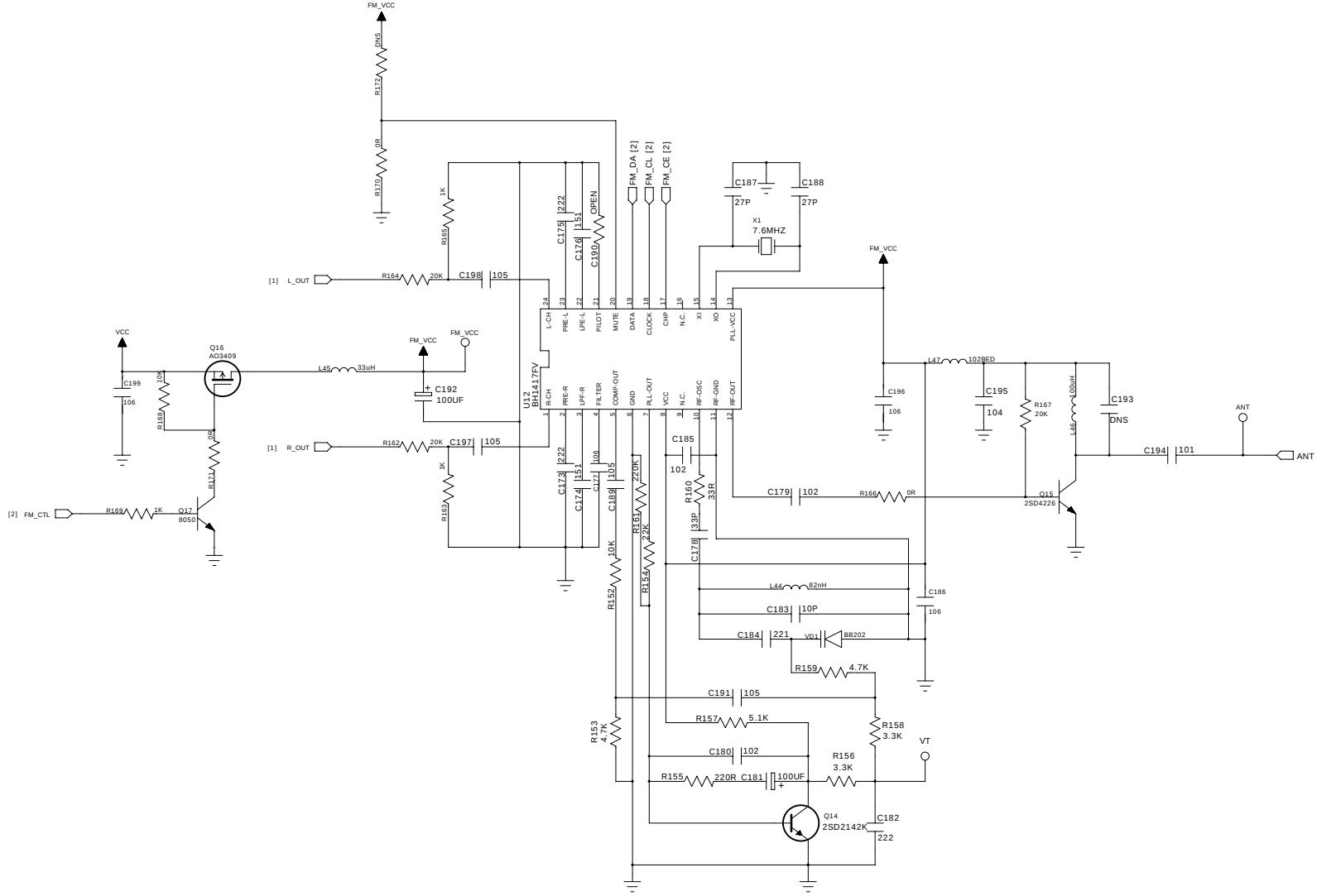
Section Two circuit diagram

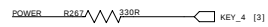
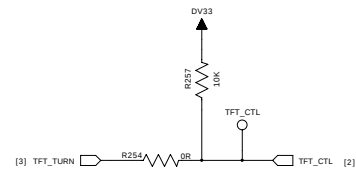
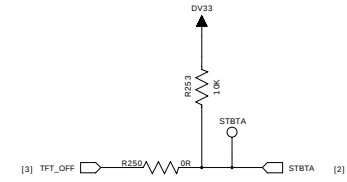
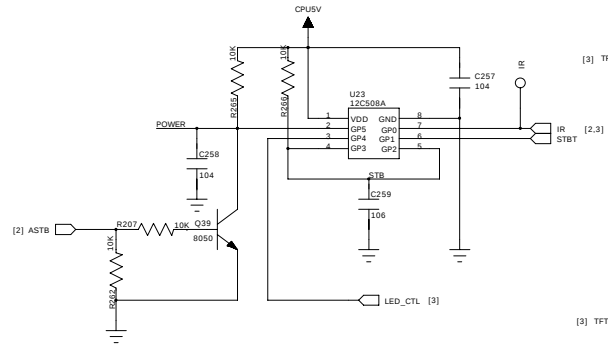
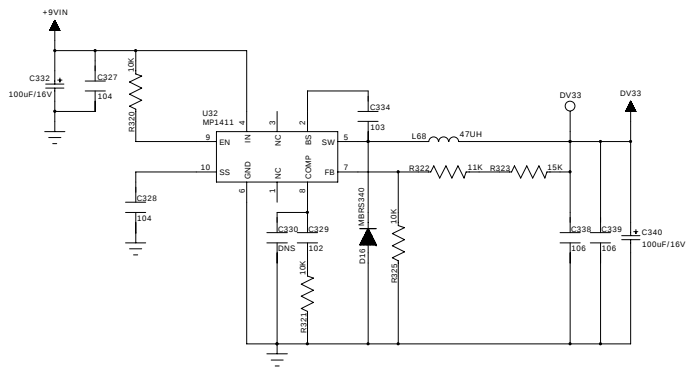
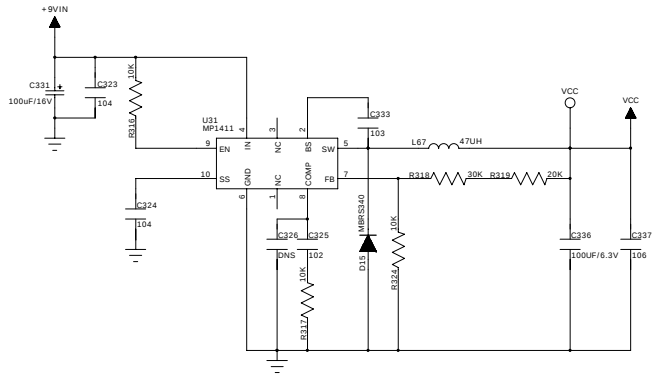
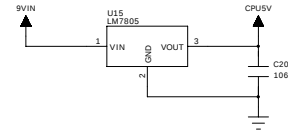
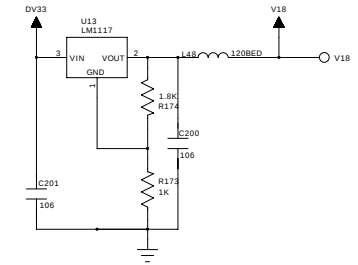
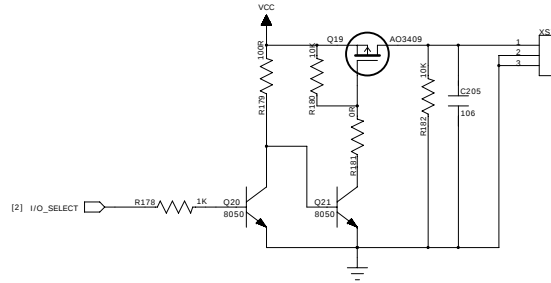
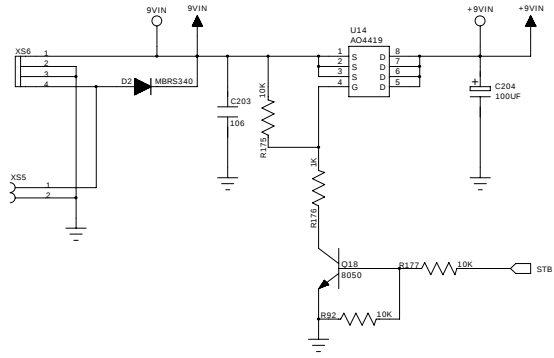
5.2.1 Decode Board

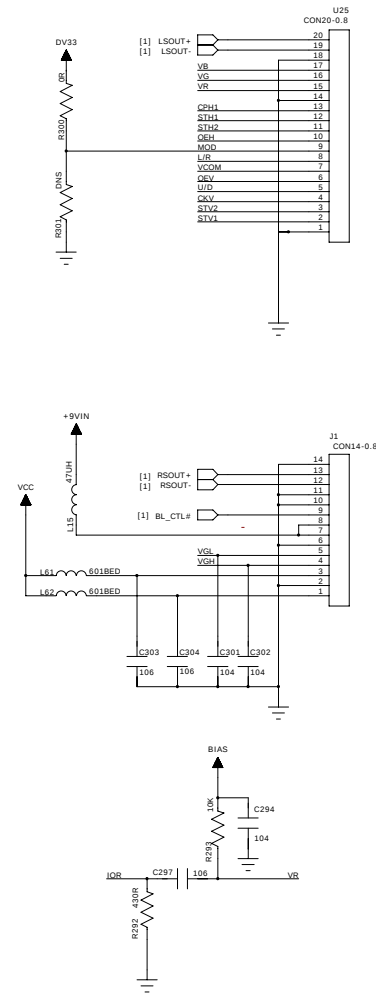




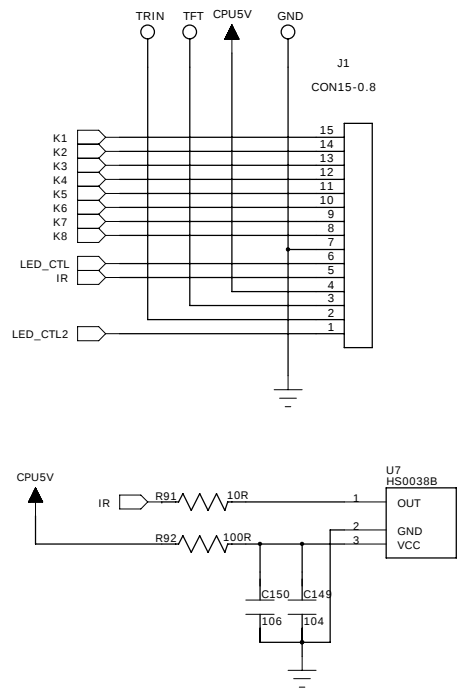
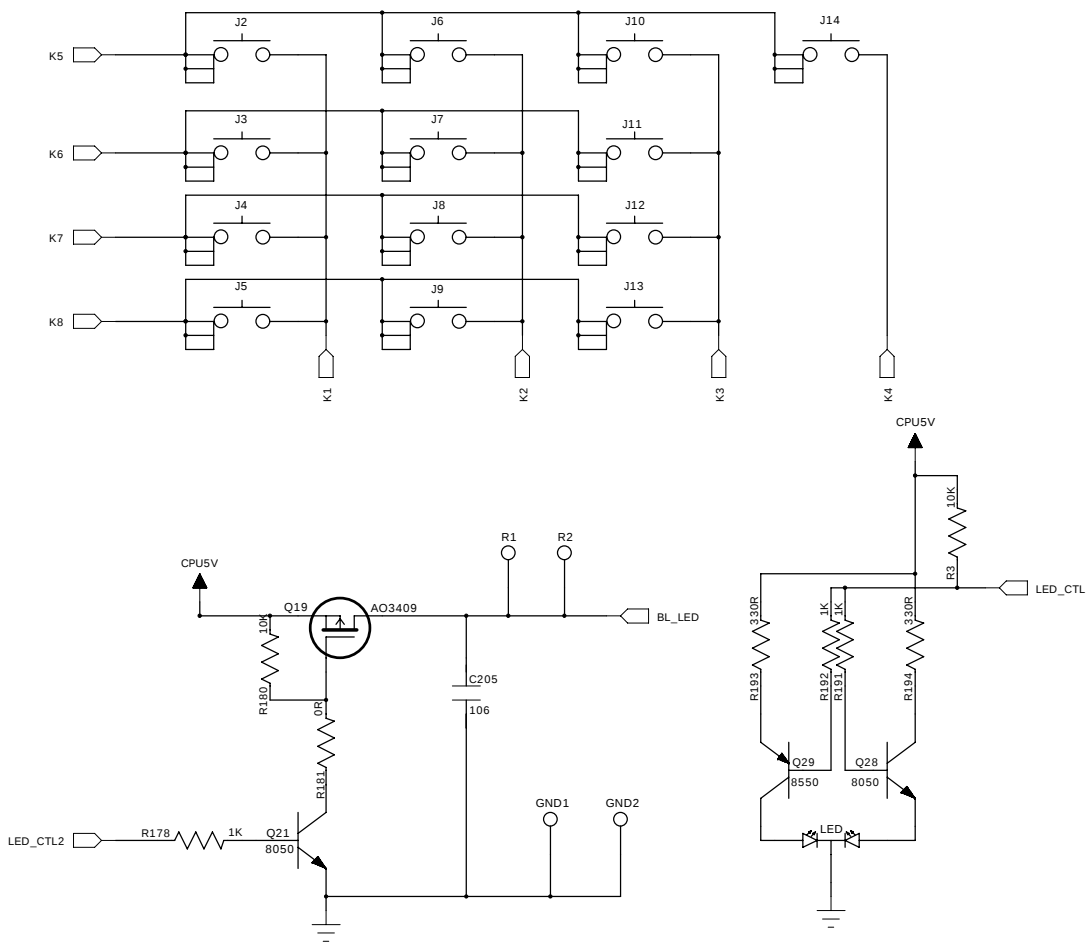




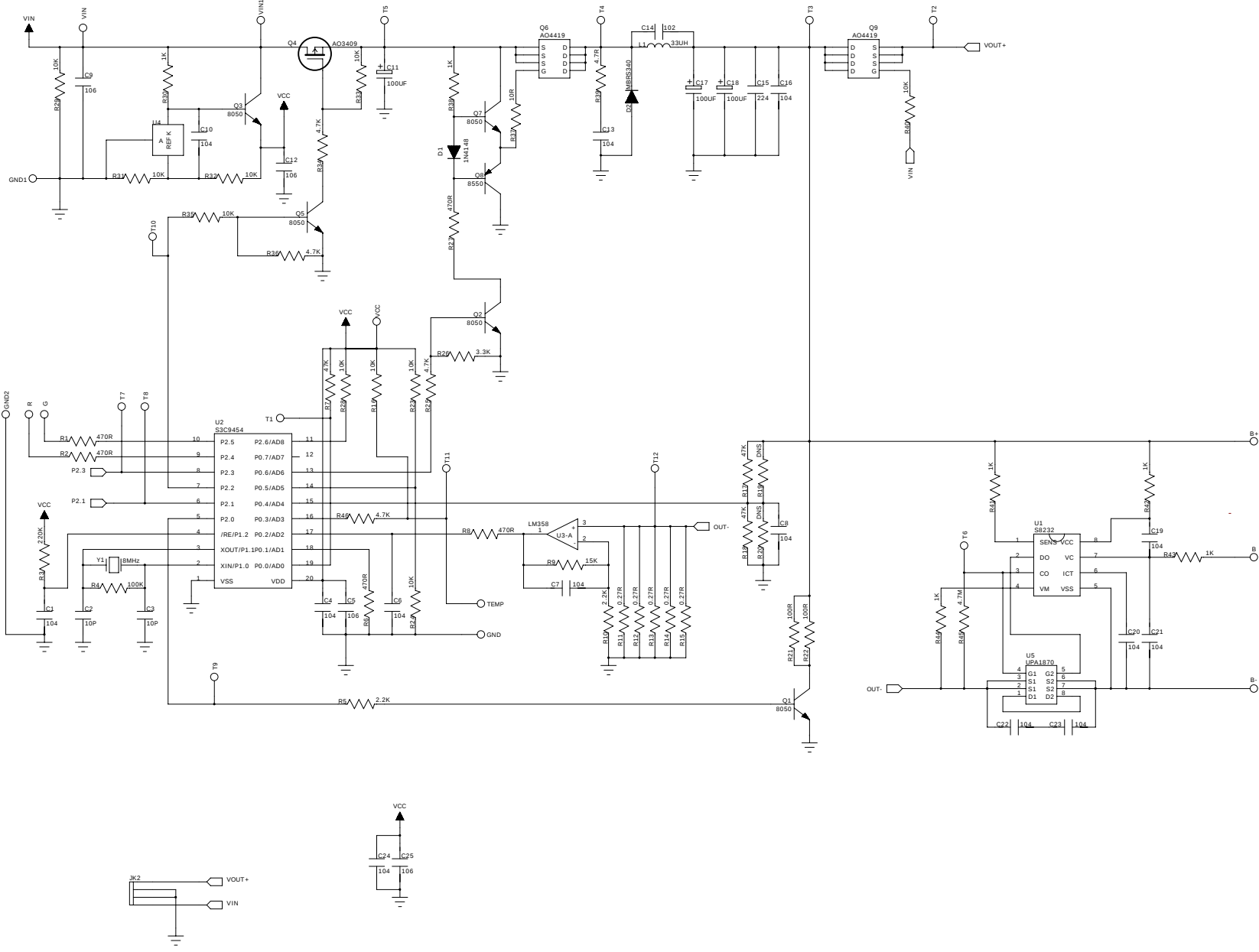




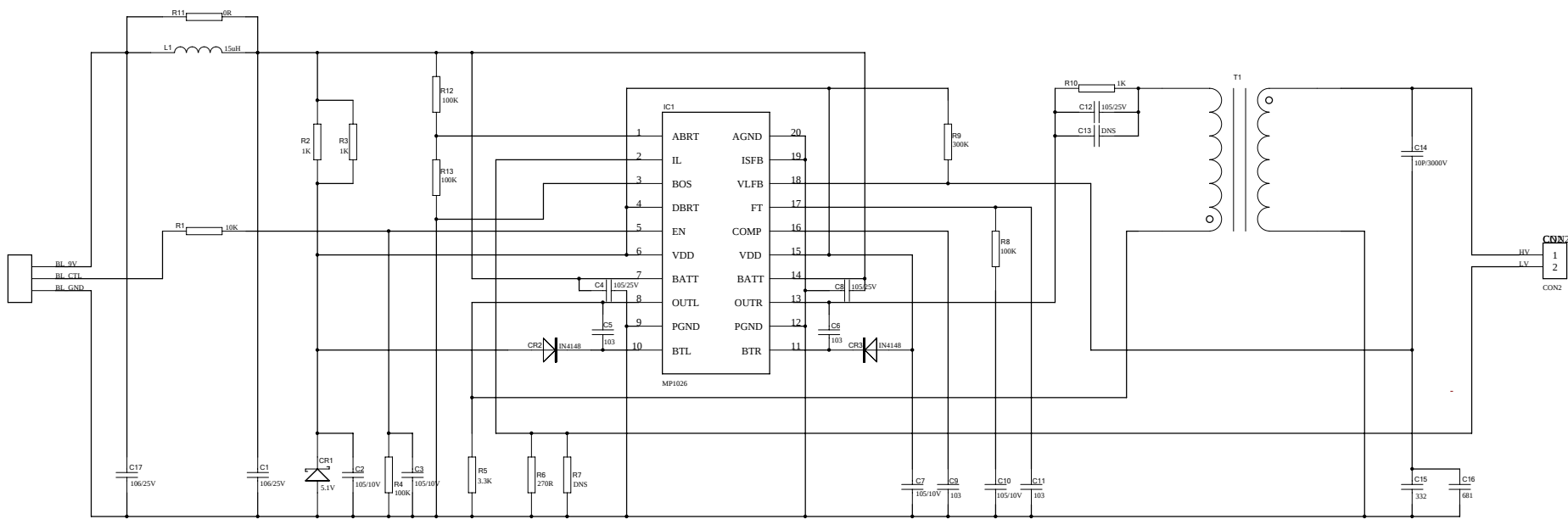
5.2.2 Main panel



5.2.3 Battery charge Board



5.2.4 Boost Board



Chapter six BOM List

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
DL387SI(RU) BLACK1389HD			
BATTERY CASE 5471969			
1510046	RECHARGEABLE BATTERY	3600mAh 7.2V LITHIUM 168×48×5	
3810099	CLASP SPRING O BATTERY CASE	23	
3810098	GLIDE PIECE SPRING O BATTERY CASE	23	
3072917	GLIDE PIECE O BATTERY CASE	23	
3072916	CLASP O BATTERY CASE	23	
3074205	BATTERY BUTTON	387SI(RU) BLACK	
3074207	TOP COVER OF BATTERY CASE	387SI(RU) BLACK	
3074208	BOTTOM COVER OF BATTERY CASE	387SI(RU) BLACK	
4000858	SELF-TAPPING SCREW	CB 2×4H BLACK NICKEL	FOR COVERING CASING
4000710	SELTAPPING SCREW	CB 1.7×4 WHITE NICKEL	2PCS FOR FIXING CHARGE BOARD, 2PCS FOR FIXING BATTERY PUSH BUTTON
3072918	LIGHT GLASS	023 TRANSPARENCE	
5236334	FOOT SPACER	Φ8×1 BLACK SILICA GEL	
1050013	HEAT SENSITIVITY RESISTOR	NTC 10K±5% B:3950K	
5235459	SOFT SPONGE SPACER	140×35×1.5 SINGLE-FACED,HARD	STICK ON UPPER COVER OF BATTERY CASE
5157107	RECHARGE BATTERY STICKER	387SI(RU)	
5449769	PCB SEMI-FINISHED PRODUCT	389-2 387SI(RU)	
5449768	PCB SEMI-FINISHED PRODUCT	389-1 387SI(RU)	
5449770	PCB SEMI-FINISHED PRODUCT	389-1 387SI(RU)	
5142620	SN LABEL	PORFABLE D BATTEMETAL OXIDE FILM RESISTOR WITH BAR CODE NUMBER	
2122380	FLAT CABLE	3P 95MM RED BLUE BLACK 28# CORD	CONNECT CHARGE BOARD AND LED BOARD
DL387SI(RU) BLACK1389HD			
BATTERY CHARGER 5449769			
410231	CHOKE COIL	VERTICAL 30UH 3A 15×5 5MM	L1
1860107	BATTEMETAL OXIDE FILM RESISTOR LINKER	4P2.5MM LI0406	Q9
260104	CD	CD110 25V 100UF±20% 6×12 2.5	C11,C17,C18
882462	IC	AZ431AZ-A TO-92	U4

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
780138	TRIODE	8050D	Q3
DL387SI(RU) BLACK1389HD			
BATTERY CHARGER BOARD-SMD		5449769	
310389	SMD CAPACITOR	10V 106 +80%-20% Y5V 0805	C5,C9,C12,C25
310112	SMD CAPACITOR	16V 224±10% 0603	C15
310594	SMD CAPACITOR	25V 104±10% 0603	C1,C4,C6~C8,C10,C13,C16,C19~C24
310066	SMD CAPACITOR	50V 102±10% 7R 0603	C14
882692	IC	S39454 SOP(379R/G)	U2
881535	IC	S8232 SOP	U1
880176	IC	L358M SOP	U3
790040	FIELD EFFECT TRANSISTOR	UP1870 SSOP	U5
790097	FIELD EFFECT TRANSISTOR	AO4419 SO8	Q6,Q10
310188	SMD CAPACITOR	50V 10P±5% NPO 0603	C2,C3
90233	SMD RESISTOR	1/16W 4.7MΩ±5% 0603	R45
90201	SMD RESISTOR	1/16W 220K±5% 0603	R3
90034	SMD RESISTOR	1/16W 100K±5% 0603	R4
90029	SMD RESISTOR	1/16W 47K±5% 0603	R7,R17,R18
90027	SMD RESISTOR	1/16W 27K±5% 0603	R9
90023	SMD RESISTOR	1/16W 10K±5% 0603	R16,R23,R24,R28,R29,R31~R33,R35,R40
90003	SMD RESISTOR	1/16W 10Ω±5% 0603	R37
90019	SMD RESISTOR	1/16W 4.7K±5% 0603	R25,R34,R36,R46
90018	SMD RESISTOR	1/16W 3.3K±5% 0603	R26
90017	SMD RESISTOR	1/16W 2.2K±5% 0603	R5,R10
90014	SMD RESISTOR	1/16W 1K±5% 0603	R41~R44,R30,R38
90011	SMD RESISTOR	1/16W 470Ω±5% 0603	R1,R2,R6,R8,R27
90135	SMD RESISTOR	1/8W 100Ω±5% 1206	R21,R22
90536	SMD RESISTOR	1/8W 0.27Ω±5% 1206	R11~R15
1633465	PCB	B 389-2	
960245	SMD CRYSTAL OSCILLATOR	8.00MHz±20ppm 49-S	Y1
790095	SMD FIELD EFFECT TRANSISTOR	AO3409 SO23	Q4
680028	SMD SCHOTTKY DIODE	MBRS340	D2
700007	SMD DIODE	14148	D1

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
780085	SMD TRIODE	8050D	Q1,Q2,Q5,Q7
780129	SMD TRIODE	8550D	Q8
DL387SI(RU) BLACK1389HD			
CAR POWER LINKER 5471546			
680065	SCHOTTKY DIODE	SR560 DO-27 SHAPED 20mm	VD1,VD3
283	CARBON FILM RESISTOR	1/41K±5% SHAPED 10	R1
620184	RADIATION DIODE	3O 3PD ORANGE	VD2
1632718	PCB	D333S-0	
5071052	DOUBLE-FACE GAS BEAD BAG	120×350	
2140367	POWER SUPPLY WIRE	2P 2m WITH Φ4.0DC CURVE PLUG	P+,P-
5232167	FIBRE SLEEVE	Φ1 WHITE	
3031156	UPPER COVER OFCAR POWER CONNECTING CASE	008 BLACK	
3040843	LOWER COVER OF CAR POWER CONNECTING CASE	008 BLACK	
3870754	SPACER	8	
3870755	TOUCH HEAD	8	
3630186	SHRAPNEL	8	
3810034	SPRING	8	
3870756	FUSE HOLDER	8	
3060299	TOUCH HEAD COVER	008 BLACK	
2110002	LEAD	24# 30mm RED	
2110004	LEAD	24# 40mm BLACK	
2300018	FUSE	3.15AL 250V (VDE/UL)	
5232168	DUST-PROOF NET	008 BLACK	
DL387SI(RU) BLACK1389HD			
DECODE BOARD 1.0/Ver2.00			
90109	SMD RESISTOR	1/16W 1MΩ±5% 0603	R189,R113
90212	SMD RESISTOR	1/16W 750K±5% 0603	R41
90034	SMD RESISTOR	1/16W 100K±5% 0603	R27,R44,R75,R76,R148,R151,R308
90029	SMD RESISTOR	1/16W 47K±5% 0603	R78,R96,R97,R306
90191	SMD RESISTOR	1/16W 39K±5% 0603	R77
90028	SMD RESISTOR	1/16W 33K±5% 0603	R69,R70,R183,R206
90189	SMD RESISTOR	1/16W 30K±5% 0603	R318

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
90027	SMD RESISTOR	1/16W 27K±5% 0603	R93
90026	SMD RESISTOR	1/16W 22K±5% 0603	R194
90025	SMD RESISTOR	1/16W 20K±5% 0603	R22,R61,R134,R135,R141,R309,R105,R319
90188	SMD RESISTOR	1/16W 18K±5% 0603	R21,R95
90492	PRECISION SMD RESISTOR	1/16W 18K±1% 0603	R305
90024	SMD RESISTOR	1/16W 15K±5% 0603	R3,R4,R20,R28,R79,R80,R323
90502	PRECISION SMD RESISTOR	1/16W 11K±1% 0603	R184,R322
90746	PRECISION SMD RESISTOR	1/16W 4.7K±1% 0603	R304
90023	SMD RESISTOR	1/16W 10K±5% 0603	R5~R16,R19,R24,R40,R51,R83~R85,R87,R90,R92,R110~R112,R114~R117,R137,R142,R149,R150,R175,R177,R180,R182,R207,R253,R257,R262,R265,R266,R293,R295,R297~R299,R307,R316,R317,R320,R321,R324~R327,R29,R30
90304	PRECISION SMD RESISTOR	1/16W 10K±1% 0603	R303
90020	SMD RESISTOR	1/16W 5.1K±5% 0603	R193
90021	SMD RESISTOR	1/16W 6.8K±5% 0603	R63,R64
90019	SMD RESISTOR	1/16W 4.7K±5% 0603	R54,R56,R57,R59,R60,R65~R68,R86,R88,R98,R99,R159,R196
90186	SMD RESISTOR	1/16W 7.5K±5% 0603	R49
90104	SMD RESISTOR	1/16W 2.7K±5% 0603	R89
90236	SMD RESISTOR	1/16W 1.8K±5% 0603	R174
90631	PRECISION SMD RESISTOR	1/16W 1.6K±1% 0603	R199
90234	SMD RESISTOR	1/16W 390Ω±5% 0603	R94
90014	SMD RESISTOR	1/16W 1K±5% 0603	R26,R50,R81,R82,R128,R173,R178,R190,R197,R200,R310,R118~R125,R311,R176
90012	SMD RESISTOR	1/16W 560Ω±5% 0603	R126,R127,R73,R74,R191,R192
90249	SMD RESISTOR	1/16W 510Ω±5% 0603	R25
90248	SMD RESISTOR	1/16W 430Ω±5% 0603	R292,R294,R296
90009	SMD RESISTOR	1/16W 330Ω±5% 0603	R71,R72,R195,R267,R314
90239	SMD RESISTOR	1/16W 200Ω±5% 0603	R208
90232	SMD RESISTOR	1/16W 150Ω±5% 0603	R58,R62,R91,R102~R104,R106~R109,R315
90221	SMD RESISTOR	1/16W 120Ω±5% 0603	R18
90181	SMD RESISTOR	1/16W 100Ω±5% 0603	R17,R146,R147,R179
90006	SMD RESISTOR	1/16W 75Ω±5% 0603	R42,R43,R55,R187,R188,R291
90230	SMD RESISTOR	1/16W 47Ω±5% 0603	R132,R143
90005	SMD RESISTOR	1/16W 33Ω±5% 0603	R1,R2,R37~R39,R45~R48,R100,R101,R185,R186,R201~R205,R209~R211,R284,R285

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
90004	SMD RESISTOR	1/16W 22 Ω $\pm$ 5% 0603	R33~R36
90106	SMD RESISTOR	1/16W 4.7 Ω $\pm$ 5% 0603	L18,R144,R145
90272	SMD RESISTOR	1/16W 1 Ω $\pm$ 5% 0603	R129~R131,R136,R138~R140
90001	SMD RESISTOR	1/16W 0 Ω $\pm$ 5% 0603	R52,R181,R198,R250,R254,R290,R300,R312,R328,R329,C310
90291	SMD RESISTOR	1/16W 56 Ω $\pm$ 5% 0603	R287,R289
90296	SMD RESISTOR	1/16W 18 Ω $\pm$ 5% 0603	R286,R288
260569	CD	CD11E 16V10U $\pm$ 20%4 $\times$ 5 1.5	C85,C86,C89
260568	CD	CD11E 16V100U $\pm$ 20%6.3 $\times$ 5 2.5	C30,C34,C90,C91,C204,C331,C332,C340,C149,C211
310654	SMD CERAMIC CAPACITOR	25V 106 +80%-20% Y5V 1206	C203,C150,C202
310389	SMD CAPACITOR	10V 106 +80%-20% Y5V 0805	C1,C3,C20,C24,C25,C31,C32,C36,C54,C56,C58,C59,C70,C110,C111,C112,C116~C119,C138,C147,C148,C151,C153,C155,C167~C169,C172,C200,C201,C205,C206,C208,C231,C233,C256,C259,C297~C300,C303,C304,C306~C309,C315,C316,C318,C319,C321,C322,C337~C339,C341,C342,C210
310548	SMD TANTALUMCAPACITOR	6.3V100UF $\pm$ 20% 3528(B2)	C336
310717	SMD CAPACITOR	6.3V 475 $\pm$ 20% 5R 0603	C33
310483	SMD CAPACITOR	10V 105 $\pm$ 10% 5R 0603	C22,C27,C28,C61~C65,C92~C95,C97,C109,C222,C312,C313,C317,C209
310566	SMD CAPACITOR	10V 225 +80%-20% Y5V 0603	C51
310379	SMD CAPACITOR	25V 474 +80%-20% Y5V 0603	C35,C291~C293,C311
310634	SMD CAPACITOR	25V 154 $\pm$ 10% 7R 0603	C99,C103
310594	SMD CAPACITOR	25V 104 $\pm$ 10% 0603	C2,C4,C13~C19,C21,C23,C26,C29,C41,C43~C47,C52,C53,C60,C71,C96,C108,C113~C115,C120~C133,C139~C146,C152,C154,C156~C160,C162,C163,C165,C166,C170,C171,C207,C223~C225,C234,C257,C258,C276~C284,C294~C296,C301,C302,C305,C314,C320,C323,C324,C327,C328
310206	SMD CAPACITOR	50V 683 $\pm$ 10% 0603	C101,C102,C106,C107
310205	SMD CAPACITOR	50V 473 $\pm$ 10% 0603	C37,C38
310204	SMD CAPACITOR	50V 333 $\pm$ 10% 0603	C42,C55,C98,C100,C104,C105
310201	SMD CAPACITOR	50V 153 $\pm$ 10% 7R 0603	C72
310199	SMD CAPACITOR	50V 562 $\pm$ 10% 7R 0603	C76
310231	SMD CAPACITOR	50V 122 $\pm$ 10% 0603	C79,C80
310072	SMD CAPACITOR	50V 103 $\pm$ 10% 7R 0603	C73,C333,C334,R313
310066	SMD CAPACITOR	50V 102 $\pm$ 10% 7R 0603	C9,C11,C39,C77,C78,C87,C88,C325,C329,C50
310054	SMD CAPACITOR	50V 681 $\pm$ 5% NPO 0603	C289

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
310052	SMD CAPACITOR	50V 391±5% NPO 0603	C134
310051	SMD CAPACITOR	50V 331±5% NPO 0603	C74,C75,C290
310048	SMD CAPACITOR	50V 151±5% NPO 0603	C161,C164
310047	SMD CAPACITOR	50V 101±5% NPO 0603	C12
310046	SMD CAPACITOR	50V 82P±5% NPO 0603	C81,C82
310045	SMD CAPACITOR	50V 47P±5% NPO 0603	C48,C49,C285~C288
310190	SMD CAPACITOR	50V 27P±5% NPO 0603	C135,C136
310043	SMD CAPACITOR	50V 22P±5% NPO 0603	C83,C84
310085	SMD CAPACITOR	50V 20P±5% NPO 0603	C5~C8,C10,C40,C57
310042	SMD CAPACITOR	50V 15P±5% NPO 0603	C66~C69
100019	SMD RESISTOR NETWORKS	1/16W 33Ω±5% 8P	RN1
790102	SMD FIELD EFFECT TRANSISTOR	AO3402 SO23	Q22
790095	SMD FIELD EFFECT TRANSISTOR	AO3409 SO23	Q19
790097	FIELD EFFECT TRANSISTOR	AO4419 SO8	U14
780040	SMD TRIODE	3904(100-300) SO23	Q9,Q10,Q27,Q28
780193	SMD TRIODE	2S3018	Q8,Q13
780115	SMD TRIODE	2SB1132	Q4,Q5
780041	SMD TRIODE	3906(100-300) SO23	Q23,Q24
780129	SMD TRIODE	8550D	Q12,Q25
780085	SMD TRIODE	8050D	Q1~Q3,Q6,Q7,Q11,Q18,Q20,Q21,Q39
680042	SMD SCHOTTKY DIODE	B54S SO23	U26,U27
700056	SMD DOUBLE DIODE	MMBD4148SE SO23	U6
700007	SMD DIODE	14148	D1,D4~D6,D12
680028	SMD SCHOTTKY DIODE	MBRS340	D2,D15,D16
390142	SMD MAGNETIC BEADS	FC1608-60102	L2,L10~L12,L17,L19,L20,L28,L29,L31~L36,L38,L42,L52,L53,L61~L64,L69
390170	SMD INDUCTOR	10UH±10% 1608	L43,L14
390025	SMD MAGNETIC BEADS	BGH2012B601L	L1,L66
390259	SMD MAGNETIC BEADS	FC2012-1202A	L7,L39,L48
390302	SMD MAGNETIC BEADS	MGHB1608S102	L3~L6,L16,L21,L22,L26,L27
390433	VERTICAL INDUCTOR	47uH±10% 8×5 5mm	L67,L68
390414	SMD CORES INDUCTOR	15UH±25% CDRH4D28C/LD	L8,L9,L24,L25
390279	SMD COIL THREAD INDUCTOR	100uH±10% 3225	L23

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
390472	SMD CORES INDUCTOR	47UH±30% CDRH4D28	L15
390524	SMD CORES INDUCTOR	15UH±20% SRD0504	L65
390044	SMD INDUCTOR	10UH±10% 2012	L37,L40,L41
390189	SMD INDUCTOR	2.7UH±10% 1608	L60
390096	SMD INDUCTOR	1.8UH±10% 1608	L13,L58,L59
160157	ROTATED POTENTIOMETER	WHE101GB-2B5016	VR2
960020	CMETAL OXIDE FILM RESISTORSTAL OSCILLATOR	27.00MHz 49-S	Y1,Y3
881182	IC	L1117ADJ SO223	U13,U30
882114	IC	AMS1117-3.3 SO223	U29
881513	IC	B6849FM HSOP	U10
883211	IC	AS7805 TO-252	U15
882322	IC	AZ431-2.5V SO23	U16
881405	IC	B5954FM HSOP	U11
881031	IC	24C02N SOP	U9
882634	IC	9702 TQFN	U1
883084	IC	1411 MSOP	U31,U32
882644	IC	1389FE/H(HD) QFP	U3
881539	IC	NJ3414AM SOP	U24
880361	IC	4558 SOP	U4
882105	IC	L393 SO8	U8
881415	IC	HY57V641620HG7 TSOP	U2
883082	IC	112 LQFP	U18
883212	IC	AZ2940 TO-252	U7
1980098	EARPHONE SOCKET	S0290D00-040-100	JK5,JK8,JK9
1980110	EARPHONE SOCKET	S0250D00-077-410	JK1,JK4
1990049	3-IN-1 CARD HOLDER	SD/MS/MMC R009-120	JK6
1870021	POWER SOCKET	DC-023	XS5
1870024	POWER SUPPLY SOCKET	DS-341-113	XS7
1940208	CABLE SOCKET	30P 0.5mm SMD WITH CLASP	XS4
1940229	CABLE SOCKET	15P 0.5mm SMD,NEXT MEET WITH CLASP	XS3,J3
1860132	USB SOCKET	3DD05S-30L	JK3
1940290	SOCKET	14P 0.8mm SMD	J1

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
1940237	SOCKET	20P 0.8mm SMD	U25
1350065	TESTING SWITCH	SPVE0010	SW1
1633836	PCB	2 389D-4	
DL387SI(RU) BLACK1389HD			
DRIVE BOARD : 5449765			
1633722	PCB	C 389-3	
1940194	CABLE SOCKET	26P 0.5mm SMD,SUBMIT MEET WITH CLASP	J3
1940290	SOCKET	14P 0.8mm SMD	J1
1940237	SOCKET	20P 0.8mm SMD	J2
DL387SI(RU) BLACK1389HD			
HEADREST BRACKET 5471745			
4000061	SELTAPPING SCREW	BB 2.6×7 COLOR ZINC	CONNECT HEAD REST BUTTON BOARD AND HEAD REST HANGING BOARD
5235199	MAGIC ROPE	339	
5235200	SOFT SPONGE SPACER	174×116×17 WITHOUT GLUE IN REAR SIDE,SOFT	
3060546	BACKBOARD O HOST MACHINE	339 BLACK	
3060547	HEADREST LOCK BOARD	339 BLACK	
3060548	HEADREST HANG BOARD	339 BLACK	
DL387SI(RU) BLACK1389HD			
LED BOARD: 5449768			
1633405	PCB	N 389-1	
620032	DUAL COLOR RADIATION DIODE	2RG 59SW RED GREEN 2×5×7	LED1
DL387SI(RU) BLACK1389HD			
MAIN PANEL: 5449767			
620032	DUAL COLOR RADIATION DIODE	2RG 59SW RED GREEN 2×5×7	LED
2360016	IR SENSOR	HS0038B3V	U7
DL387SI(RU) BLACK1389HD			
MAIN PANEL-SMD: 5449767			
1633723	PCB	4 389-3	
1940229	CABLE SOCKET	15P 0.5mm SMD,NEXT MEET WITH CLASP	J1
780129	SMD TRIODE	8550D	Q29
780085	SMD TRIODE	8050D	Q21,Q28

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
790095	SMD FIELD EFFECT TRANSISTOR	AO3409 SO23	Q19
310389	SMD CAPACITOR	10V 106 +80%-20% Y5V 0805	C150,C205
310594	SMD CAPACITOR	25V 104±10% 0603	C149
90023	SMD RESISTOR	1/16W 10K±5% 0603	R3,R180
90014	SMD RESISTOR	1/16W 1K±5% 0603	R178,R191,R192
90009	SMD RESISTOR	1/16W 330Ω±5% 0603	R193,R194
90181	SMD RESISTOR	1/16W 100Ω±5% 0603	R92
90003	SMD RESISTOR	1/16W 10Ω±5% 0603	R91
90001	SMD RESISTOR	1/16W 0Ω±5% 0603	R181
DL387SI(RU) BLACK1389HD			
POWER ADAPTER ASSEMBLY 5471935			
3051356	INDICATOR LIGHT MANTLE O POWER CASE	021 TRANSPARENCE	
3032041	UPPER COVER OF POWER CASE	021 BLACK	
3041506	BOTTOM COVER OF POWER CASE	021 BLACK	
5231264	FOOT SPACER	φ 7×1 RUBBER	
4000119	SELTAPPING SCREW	PB 3×8 WHITE	
5235873	PVC PIECE	20×15×0.2 WHITE SINGLE-FACED WITH GLUE IN REAR SIDE	
5449774	PCB SEMI-FINISHED PRODUCT	5 021-2 387SI(RU)	
DL387SI(RU) BLACK1389HD			
POWER BOARD 5449774			
4400001	NUT	3	1PCS FOR LEFT AND RIGHT HEAT RADIATION PLATE EACH
4230014	MACHINE-TAPPING SCREW	FM 3×8 WHITE NICKEL	1PCS FOR LEFT AND RIGHT HEAT RADIATION PLATE EACH
3580229	HEAT RADIATION PIECE	90×19×2	
3580230	HEAT RADIATION PIECE	21	
5235224	INSULATION PLATISC BAND	PZ-281 LENGTH:60M WIDTH:65MM DEEP YELLOW	WIND 3 LAYERS IN THE CORRESPONDING POSITION OF LEFT HEAT RADIATOR
5235791	INSULATION PLATISC BAND	PZ-281 LENGTH:60M WIDTH:18MM DEEP YELLOW	WIND 3 LAYERS AROUND POWER SWITCH TRANSFORMER
390052	MAGNETIC BEADS INDUCTOR	FB	J2
390273	COMMON MODE INDUCTOR	75uH±25%3A φ9×φ5×3 4mm	LF2
2100062	CONNENTION CORDS	Φ0.8 SHAPED 5MM	L2
200341	CERAMIC CAPACITOR	C81 250VAC 102±20% 10mm	C17,C2

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
210066	TERYLENE CAPACITOR	275V 104±20% 15mm	C1
1000060	POWER GRID FILTER	@JLB1020 30MH +∞-0% SJ	LF1
881934	IC	F0565R TO-2206L	IC1
2300058	FUSE	@1.6AL 250V WITH CANNULA CQC	F1
880553	IC	L431ACZ TO-92	IC3
620025	RADIATION DIODE	3R 4SD RED	LED
1080037	PHOTOELECTRIC COUPLER	@HS817 CQC	IC2
570014	DIODE	HER107	D5
680093	SCHOTTKY DIODE	SB10100CT PLASTIC SEALED TO-220	D10
460603	SWITCH POWER TRANSFORMER	@BC25-0106 SJ	TR1
200232	PORCELAIN CAPACITOR	500V 101±10% 5mm	C10
200166	PORCELAIN CAPACITOR	500V 103±20% 5mm	C3
200277	CERAMIC CAPACITOR	1000V222±20% SHAPED 7.5mm	C5
260792	CD	GS 105 400V47U M 16×25 7.5	C4
260790	CD	CD11 105 50V47U M 6×12 2.5	C8
570005	DIODE	1N4007	D1~D4
260794	CD	CD288H 25V1000U±20%10×16 5	C11,C12
2140350	POWER SUPPLY WIRE	2P1.2m Φ4.0DC FLEX INSERT	
1870029	POWER SUPPLY SOCKET	S2S (UL)	JK1
DL387SI(RU) BLACK1389HD			
POWER BOARD-SMD 5449774			
90050	SMD RESISTOR	1/10W 1K±5% 0805	R16
700007	SMD DIODE	14148	D6
310037	SMD CAPACITOR	50V 104±20% 0805	C13,C15
310182	SMD CAPACITOR	50V 473±20% 7R 0805	C6,C7
310092	SMD CAPACITOR	50V 103±20% 7R 0805	C14
90770	SMD RESISTOR	1/8240K±5% 1206	R5A,R5B,R6A,R6B
90750	SMD RESISTOR	1/8W 680K±5% 1206	R1,R2
90817	SMD RESISTOR	1/439K±5% 1206	R3
90816	SMD RESISTOR	1/447K±5% 1206	R4
90125	SMD RESISTOR	1/8W 22 Ω±5% 1206	R10,R11
90063	SMD RESISTOR	1/10W 10K±5% 0805	R15

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
90057	SMD RESISTOR	1/10W 4.7K±5% 0805	R18
90054	SMD RESISTOR	1/10W 3K±5% 0805	R5
90052	SMD RESISTOR	1/10W 2.2K±5% 0805	R8,R17
90778	PRECISION SMD RESISTOR	1/10430Ω±1% 0805	R14
90777	PRECISION SMD RESISTOR	1/101.2K±1% 0805	R13
1564487	PCB	@5021-2 CQC	
90141	SMD RESISTOR	1/10W 3.3Ω±5% 0805	R7
90653	SMD RESISTOR	1/8W 2K±5% 1206	R6 , R9
DL387SI(RU) BLACK1389HD			
POWER SUPPLY SOCKET BOARD: 5449770			
1870021	POWER SOCKET	DC-023	XS1
1633394	PCB	E 389-1	
DL387SI(RU) BLACK1389HD			
REMOTE CONTROL 5471933			
310048	SMD CAPACITOR	50V 151±5% NPO 0603	C802,C803
630009	EMISSION PIPE	TSAL4400	LED801
700007	SMD DIODE	14148	D801~D803
700001	SMD DIODE	LS4148	D801~D803
700002	SMD DIODE	LL4148	D801~D803
780130	SMD TRIODE	STC3265	Q801
880220	IC	P2222 SOP	U801
882379	IC	S0102B SOP	U801
970003	CERAMIC RESONATOR	455E	X801
4000038	SELTAPPING SCREW	PB 2.3×6 COLOR ZINC	FOR CONNECTING UPPER AND LOWER COVER
90272	SMD RESISTOR	1/16W 1Ω±5% 0603	R801
1564324	PCB	8516SI-3	
3032055	SURFACE CASING OF REMOTE CONTROL	RC026-15R BLACK	
3041399	BOTTOM CASING OF REMOTE CONTROL	026 BLACK 2#	
3051319	BATTERY CASE DOOR OF REMOTE CONTROL	026 BLACK 2#	
3051273	GLASS OF REMOTE CONTROLLER	026 MING PURPLE	
3850124	ANODE SPRING	RC026	

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
3850125	CATHODE SPRING	RC026	
3850126	ANODE/CATHODE SPRING	RC026	
4631103	CONDUCT GLUE O REMOTE CONTROL	RC026-10R	
5070070	PLASTIC BAG	85×250	
DL387SI(RU) BLACK1389HD			
RISE PRESS BOARD UNITS 5449766			
1633602	PCB	O 389-3	
460571	SWITCH POWER TRANSFORMER	002P502	T1
882914	IC	1026E TSSOP	IC1
390414	SMD CORES INDUCTOR	15UH±25% CDRH4D28C/LD	L1
700163	SMD VOLTAGE REGULATOR DIODE	5.1V±5% 0.2W SO323	CR1
700154	SMD TRIODE	14148WS SO323	CR2,CR3
1940280	SOCKET	S02B-BHSS-1-TB	CN2
310778	SMD CERAMIC CAPACITOR	3000V 10P±5% NPO 1808	C14
310549	SMD CERAMIC CAPACITOR	25V 106+80%-20% 1210	C1,C17
310483	SMD CAPACITOR	10V 105±10% 5R 0603	C3,C2,C7,C10
310658	SMD CAPACITOR	25V 105±10% 7R 0805	C4,C8,C12
310072	SMD CAPACITOR	50V 103±10% 7R 0603	C5,C6,C9,C11
310065	SMD CAPACITOR	50V 681±10% 7R 0603	C16
310070	SMD CAPACITOR	50V 332±10% 7R 0603	C15
90204	SMD RESISTOR	1/16W 300K±5% 0603	R9
90034	SMD RESISTOR	1/16W 100K±5% 0603	R4,R8,R12,R13
90023	SMD RESISTOR	1/16W 10K±5% 0603	R1
90227	SMD RESISTOR	1/16W 270Ω ±5%	R6
90018	SMD RESISTOR	1/16W 3.3K±5% 0603	R5
90014	SMD RESISTOR	1/16W 1K±5% 0603	R2,R3,R10
90001	SMD RESISTOR	1/16W 0Ω±5% 0603	R11
DL387SI(RU) BLACK1389HD			
TESTING SWITCH BOARD LEFT: 5449771			
1570190	PCB	M 389-2	
1250046	REED RELAY	RI-01C SOB	SW1
DL387SI(RU) BLACK1389HD			

MATERIAL CODE	MATERIAL NAME	SPECIFICATIONS	LOCATION
TESTING SWITCH BOARD RIGHT 5449772			
1570191	PCB	L 389-1	
1250046	REED RELAY	RI-01C SOB	SW1
DL387SI(RU) BLACK1389HD			
PROGRAM FLASH ROMDL387SIRU-0A(16M) 0911937			
881650	IC	29LV160BE-70PFTN TSOP	U5
SOFTWARE PROGRAM EPROM ROMDVK1000K-0A(520) 0900410			
881473	IC	12C508A SOP	U23