

TCL

SERVICE MANUAL

65P8M/RT51HT-AP

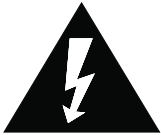
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1. Caution.....
 2. specification.....
 3. Alignment Procedure.....
 4. Block diagram.....
 5. Scheme Diagram
 6. Troubleshooting.....
 7. Explode drawing.....

This manual is the latest at the time of printing, and does not include the modification which may be made after the printing, by the constant improvement of product

1. CAUTION

CAUTION:

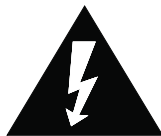
Use of controls, adjustments or procedures other than those specified herein may result in hazardous radiation exposure.



CAUTION
RISK OF ELECTRIC SHOCK DO NOT OPEN.



CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



The lighting flash with arrowhead symbol, with an equilateral triangle is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to the person.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: TO REDUCE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

IMPORTANT SAFETY INSTRUCTIONS

CAUTION:

Read all of these instructions. Save these instructions for later use. Follow all Warnings and Instructions marked on the audio equipment.

1. Read Instructions- All the safety and operating instructions should be read before the product is operated.
2. Retain Instructions- The safety and operating instructions should be retained for future reference.
3. Heed Warnings- All warnings on the product and in the operating instructions should be adhered to.
4. Follow Instructions- All operating and use instructions should be followed.

FOR YOUR PERSONAL SAFETY

1. When the power cord or plug is damaged or frayed, unplug this television set from the wall outlet and refer servicing to qualified service personnel.
2. Do not overload wall outlets and extension cords as this can result in fire or electric shock.
3. Do not allow anything to rest on or roll over the power cord, and do not place the TV where power cord is subject to traffic or abuse. This may result in a shock or fire hazard.
4. Do not attempt to service this television set yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
5. Never push objects of any kind into this television set through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the television set.
6. If the television set has been dropped or the cabinet has been damaged, unplug this television set from the wall outlet and refer servicing to qualified service personnel.
7. If liquid has been spilled into the television set, unplug this television set from the wall outlet and refer servicing to qualified service personnel.
8. Do not subject your television set to impact of any kind. Be particularly careful not to damage the picture tube surface.
9. Unplug this television set from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- 10.1. Do not place this television set on an unstable cart, stand, or table. The television set may fall, causing serious injury to a child or an adult, and serious damage to the appliance. Use only with a cart or stand recommended by the manufacturer, or sold with the television set. Wall or shelf mounting should follow the manufacturer's instructions, and should use a mounting kit approved by the manufacturer.
- 10.2. An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.



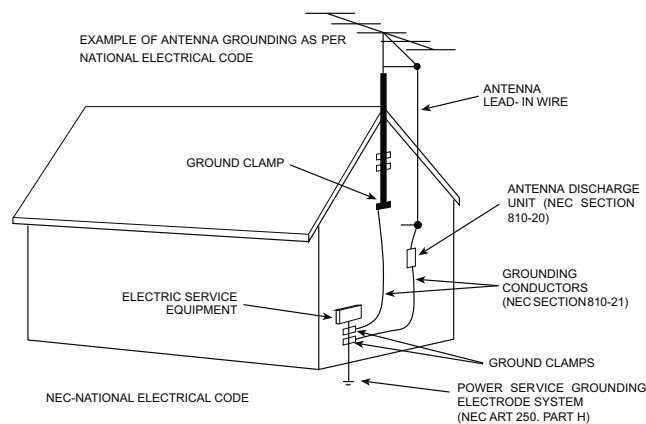
PROTECTION AND LOCATION OF YOUR SET

11.
 - Do not use this television set near water ... for example, near a bathtub, washbowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool, etc.
 - Never expose the set to rain or water. If the set has been exposed to rain or water, unplug the set from the wall outlet and refer servicing to qualified service personnel.
12. Choose a place where light (artificial or sunlight) does not shine directly on the screen.
13. Avoid dusty places, since piling up of dust inside TV chassis may cause failure of the set when high humidity persists.
14. The set has slots, or openings in the cabinet for ventilation purposes, to provide reliable operation of the receiver, to protect it from overheating. These openings must not be blocked or covered.
 - Never cover the slots or openings with cloth or other material.
 - Never block the bottom ventilation slots of the set by placing it on a bed, sofa, rug, etc.
 - Never place the set near or over a radiator or heat register.
 - Never place the set in a "built-in" enclosure, unless proper ventilation is provided.

PROTECTION AND LOCATION OF YOUR SET

- 15.1. If an outside antenna is connected to the television set, be sure the antenna system is grounded so as to provide some protection against voltage surges and built up static charges, Section 810 of the National Electrical Code, NFPA No. 70-1975, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrode, and requirements for the grounding electrode.

EXAMPLE OF ANTENNA GROUNDING AS PER NATIONAL ELECTRICAL CODE INSTRUCTIONS



- 15.2. Note to CATV system installer : (Only for the television set with CATV reception)

This reminder is provided to call the CATV system installer's attention to Article 820-40 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

16. An outside antenna system should not be located in the vicinity of overhead power lines or other electric lights or power circuits, or where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them might be fatal.
17. For added protection for this television set during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna. This will prevent damage due to lightning and power-line surges.

OPERATION OF YOUR SET

18. This television set should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply at your home, consult your television dealer or local power company. For television sets designed to operate from battery power, refer to the operating instructions.
19. If the television set does not operate normally by following the operating instructions, unplug this television set from the wall outlet and refer servicing to qualified service personnel. Adjust only those controls that are covered in the operating instructions as improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the television set to normal operation.
20. When going on a holiday : If your television set is to remain unused for a period of time, for instance, when you go on a holiday, turn the television set " off " and unplug the television set from the wall outlet.

IF THE SET DOES NOT OPERATE PROPERLY

21. If you are unable to restore normal operation by following the detailed procedure in your operating instructions, do not attempt any further adjustment. Unplug the set and call your dealer or service technician.
22. Whenever the television set is damaged or fails, or a distinct change in performance indicates a need for service, unplug the set and have it checked by a professional service technician.
23. It is normal for some TV sets to make occasional snapping or popping sounds, particularly when being turned on or off. If the snapping or popping is continuous or frequent, unplug the set and consult your dealer or service technician.

FOR SERVICE AND MODIFICATION

24. Do not use attachments not recommended by the television set manufacturer as they may cause hazards.
25. When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer that have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards.
26. Upon completion of any service or repairs to the television set, ask the service technician to perform routine safety checks to determine that the television is in safe operating condition.

PRODUCT SPECIFICATION RELEASE

Model: L65P8M/RT51HT-AP/SD9W02/TCL

Version: 1.0

Issued On: 2019-03-18

Basic Information

Product Type	LED UHD Android Smart DTV
Chassis	RT51HT-AP
CPU	64bit A55x4 900MHz~1.1GHz
GPU	Mali470x3 600MHz-800MHz
OS	Android P, Certified by Google Android TV
RAM/ROM	2G Byte(DDR3-1866MHz)/16G Byte ROM
UI Style	Google Launcher + T Channel
Launcher HomePages Show	Google Play、Netflix、Youtube、TV Guard、Apps、T Channel、Customise channels etc.
OSD Language	English/Vietnamese/Thai/Chinese/Russian/Arabic/Chinese Traditional/Indonesian/France/Spanish(LatinAmerica)/Farsi/Mongol/Uzbek/Hebrew/Malay/Portuguese/Burmese/ etc.
TV System	ATV: Auto/PAL/NTSC/SECAM, DK/BG/I/M DTV: DVB-T/T2
AV System	PAL、NTSC
HDMI&HDCP Version	HDMI1.4&HDMI2.0, HDCP1.4&HDCP2.2
HDR	HDR10 Decoding
Power Supply	AC 100V-240V 50/60Hz
Power Consumption (TV On)	145W
Power Consumption (Standby)	< 0.5W
ECO Energy Efficiency	Yes
Certification	CB、Dolby/MS12、HDMI、CE-RED(WIFI+BT Module) YouTube、NETFLIX、Google CTS
Internet Link	2.4GHz WiFi 802.11 b/g/n 2T2R Ethernet Network
LED Indicator Status	Below the middle of the frame, White in Standby Normal/Flashing/Off
Button on Panel	Below the middle of the frame One key for virtual menu control of long click
Input lags	15ms

Basic Function

Initial Setup	Yes, for user settings in TV first starting
Instant Power on	a special standby mode for starting less than 4s
Channels Edit	Yes, For TV Channel renamed
Input Settings	For Input source device name choice and Edit
Input Method	T-IME/Google Indic Keyboard/Gboard
System Update	Yes
T-Link (CEC)	Yes
Teletext	Yes
Audio Language/Nicam	Yes
PVR/Timeshift	Yes (Only for DTV Programme)
EPG	Yes (Only for DTV Programme)
Subtitle	Yes (Only for DTV Programme)
E-Manual	General basic function introduction.
E-Sticker	Yes, Show key features in shop with demo mode
Parental Control	Yes

Picture

Picture Mode	Standard/Smart HDR/Sport/Movie/Dynamic
Screen Mode	16:9/4:3/Cineraama/14:9 zoom/ 16:9 zoom/16:9 zoom up
Noise Reduction	Low/Middle/HighAuto/Off
Backlight Adjustable	Yes (0~100)
Color Temperature	Yes (-5~+5)
Color Space	Auto/Native/Custom
Dynamic Contrast	On/off
Dynamic Backlight	Off/ECO/Brightness+
Sport Mode	Yes, Enhance perception of football game
Picture Reset	Yes
Micro Dimming	Yes, Signal processing in sub-area
10 Point white balance	Yes, for user adjust

USB Device Media Format

Music	MP3/AC3/AAC/AC4
Picture	JPEG/PNG/BMP/GIF/HELF
Multimedia Video/Audio Decoder	H.265/H.264,MPEG1/2/4, VP8, VP9
Video Format up to	4K@60Hz-12bit 4:2:2、4K@60Hz-8bit 4:4:4

Sound

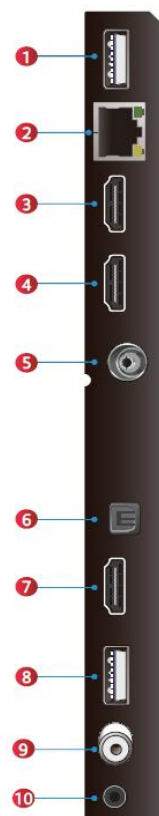
Speakers	Integrated speaker box (Bottom side)
Audio Power Output (THD=7%)	2×8W
Sound Preset	Dynamic/Standard/Movie/Music/Voice/Game/Stadium
TV Placement	Desk top / Wall mount
Digital audio out delay	Yes(0~100ms)
Dolby Audio	MS12

Panel Specification

Backlight Technology	DLED
Panel supplier	Samsung
Aspect Ratio	16:9
Panel Active Size (inch)	64.5"
Display Resolution	3840*2160
Brightness (cd/m2)	300nit (Typical)
Contrast Ratio	5000:1
Response Time (G to G)	8ms (Typical)
Viewing Angle (H/V)	178°/178°
Life Time(Typ.)	30,000hrs
Color	1.07B(10bit)
Refresh Rate	60Hz

Terminals

- 1 USB 2.0
- 2 LAN
- 3 HDMI 1
- 4 HDMI 2
- 5 ANTENNA/CABLE IN
- 6 SPDIF
- 7 HDMI 3
- 8 USB 2.0
- 9 AV IN adapter
- 10 HEADPHONE



Correct specifications/outward depend on the actual model, all specifications are subject to change without prior notice.



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Featured Application List

Netflix	Watch TV Shows Online, Watch Movies Online
YouTube	Push Popular VOD posters to Homepage
TV+ App Store	Store with lots of Apps
T-Browser	Webpage Browser
Dailymotion	Millions of people experience music, news, and culture through Dailymotion's immersive viewing experience
T-CAST	Wireless Mirroring connecting, to deliver picture, audio, video content from smartphone to TV Connect Mobile phone to TV sets and control the TV like Remote Control
YUPPTV	Over-the-Top (OTT) content provider for South Asian Content, as live TV, Catch-up TV, and Unlimited Movies
Media center	Media/Music play for USB Device
Google Play	Google Play Movies and TV and Music etc
Google Play store	Many apps in the Google play store
Streaming channels	Google Play Movies and TV
Chromecast	A better way to get your video, music and games to your TV

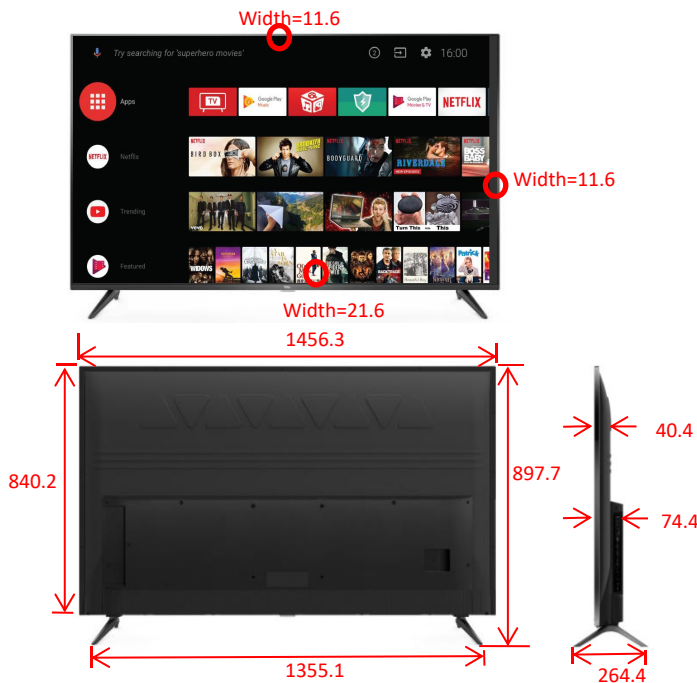
Essential Accessories (Default)

Operation Manual	English(Default)
Remote Control and batteries	RC802V (with 2 batteries)
Base Stand	Integrated Packaging
AC Power Cord	1 pcs



Mechanical ID Picture

Unit: mm



Mechanical Key Specification

Carton Dimensions LxWxH (mm)	1645*190*1000
Container Loading---20 feet (pcs)	82/ 72(With Pallet)
Container Loading---40 feet (pcs)	172/ 168(With Pallet)
Container Loading---40 feet High (pcs)	172/ 168(With Pallet)
Net Weight With Stand (Kg)	18.5
Net Weight Without Stand (Kg)	18.2
Gross Weight With Packaging (Kg)	25

Material

Finish on front	Metal
Lower front frame	Texture molding
finish on back	Texturing Injection
finish on stand	Cast aluminium

Base Stand Specifications

Screw Size	M5*25
Screw Length (mm)	25
Screw Pitch (mm)	0.8
Screw Quantity	4

Wall-Mount VESA

VESA Mounting	WMB433
VESA Hole Pattern	400*200
Screw Size	M6*12
Screw Length (mm)	12
Screw Quantity	4

Drafted by: hxm

Approved by:

TCL World-Wide R&D

FPD CENTER



Test & Alignment Specification (TAS) for RT2851 Series Version0.01

PREPARED BY : 刘全 唐煜辉 DATE : 2018-12-14

CHECKED BY :DATE :

APPROVED BY :DATE :

Disclosure

The information contained in this document is proprietary to TCL SZ FPD lab and shall not be disclosed by the recipient to third persons without the written permission of the team leader or GM of R&D.

Revision History

Version	Issue Date	Description of changes
V0.01	2018-12-14	This is the initial version

These chassis are designed for European LCD TV markets Ready for IPTV. The main chip is from realtek RT2851 series with embedded Android core and supports below features matrix:

Class	Item	RT51HS-EU				
Inputs & Outputs	ATV (PAL B/G D/K I, SECAM B/G D/K L/L')	√				
	DTV MPEG-2, MPEG-4, MHEG 1.06, MHP (1.3 broadband)	DVB-T/T2 DVB-C DVB-S/S2				
	HDMI (480i/p, 576i/p, 720p up to 2160p, compliant v2.0 with HDCP2.2)	2R(2xHDMI2.0a,4K@60Hz,YUV4:2:0)+ 2S(2xHDMI2.0a,4K@60Hz,YUV4:4:4, 1S-MHL、1S-ARC)				
	VGA	×				
	VGA/DVI audio	×				
	CMP (YPbPr can support from 480i up to 1080p, audio)	×				
	SCART1 (CVBS &RGB,audio,AV OUT)	×				
	SCART2 (CVBS &YC,audio)	N/A				
	Side AV or Back AV (CVBS,audio)	√				
	Side AV OUTor Back AV out (CVBS,audio)	N/A				
	USB thumb drive	2*USB2.0, - Picture, Video, Audio Playback - Mouse, Keyboard - Hub	-	-	-	-
	SCART1 output (CVBS,audio)	×				
	SCART2 output (CVBS,audio)	N/A				
	Headphone output	√				
	SPDIF output	Optical				
Functions	MEMC	N/A				
	OAD, OND	√				
	CI+	√				
	WIFI Ready	Built in				
	DIVX	×				
	DLNA (DMP)	√				
	Internet	Netflix, YouTube, HbbTV, GoogleCast				

		(see FDS for details)				
Functions	3D (auto, top & bottom, side by side, frame sequencing, ...) 1920x2205@24Hz (1920x1080p x2) 1280x1470@50Hz (1280x720p x2) 1280x1470@60Hz (1280x720p x2)	N/A				
	Audio Return Channel (ARC)	√				
Others	Serial connector	N/A				
	VGA connector	N/A				
	I2C connector of MEMC module	N/A				

IC Details & Position

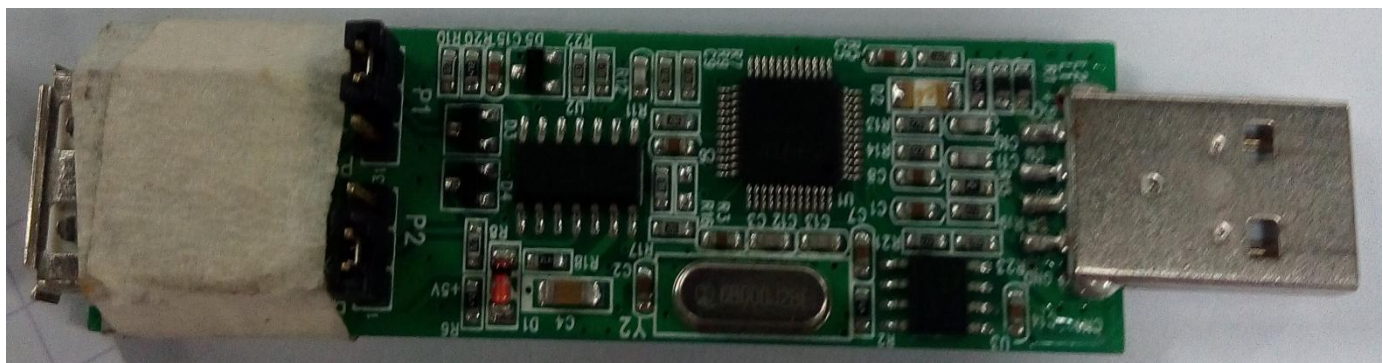
IC Details & Position	Market	RT51HS-EU		
	Main SW	UE1		
	EMMC(8GB/16GB)	16GB		
	BIN image	V8-R851T02-LF1V001		
	HDMI SWITCH - EDID BIN image	HDMI EDID and HDCP Embedded in main chip Include in main SW		
	MEMC software BIN image	N/A		

- **Manufacturing Connectors Pinout**

ISP-UART / P15 Pin1:NC Pin2:RXD Pin3:TXD Pin4:GND

- **USB to UART Bridge Adapter (FT2232D chipset series)**

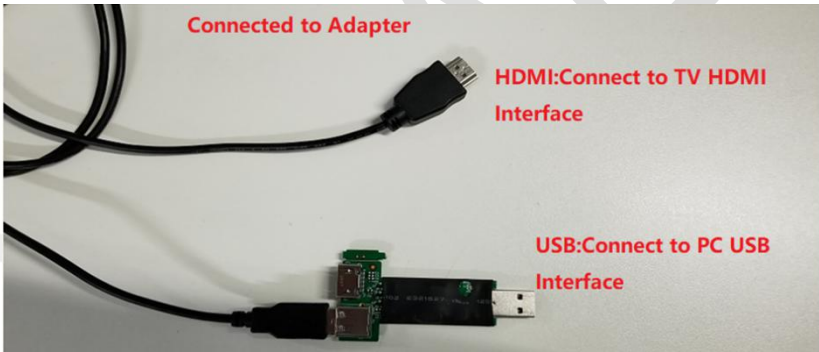
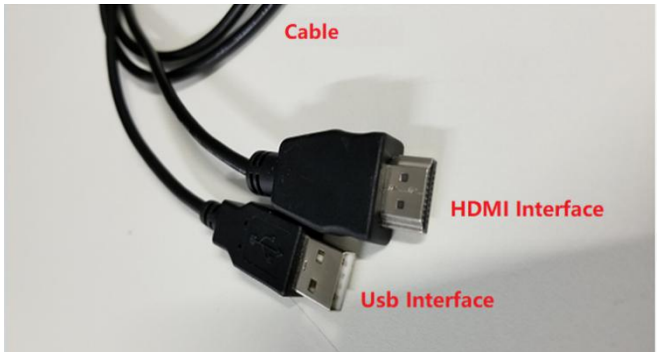
To communicate with TV product for debugging, adjustment and so on, It's required suitable 5V Serial Interface like following snapshots (further details are described on below sections):





▪ **HDMI to USB and HDMI to HDMI cables**

The wire connecting the TV to the adapter is shown below:



HDMI -> USB



HDMI -> HDMI



INFO:

- ↳ All tests and measurements mentioned hereafter have to be carried out at a normal mains voltage (**220 ~ 240 VAC**)
- ↳ All voltages have to be measured with respect to ground, unless otherwise stated
- ↳ All final tests have to be done on a complete set including LCD panel in a room with temperature of **25+/-7°C**
- ↳ The Picture Performance assessment such as Gamma Correction and White Balance (luminance and colortemperature) has to be performed into subdued lighted room after at least **45min** of warm-up in order to avoid any temperature drift influence (colorimetric vs. time)

1. PCB/SKD Assembly: Test & Alignment**1.1. Pre-Conditions and DC/DC Check**

Before power-on, please check the board according to the relevant block diagram and circuit diagram, and make sure that no serious issue or mistake can destroy the board. For example, the output of DC/DC and LDO should not be shorted to ground.

Supply a suited voltage and power-on, then check the voltage according to the relevant block diagram, circuit diagram and voltage specification.

For example, check SoC voltage(AVDD3V3,DVDD3V3,VCCK_1V0,AVDD1V0_STB,095VM,3V3SB, etc.), DDR voltage (DDRV_1V5,1V5M) , audio amplifier voltage(24V AMP_VCC),etc...

Measurements should fulfill specification within $\pm 5\%$ tolerances.

Note①: See enclosed circuit diagram for more details.

1.2. SW Image download

Download the latest release SW from below FTP server:

- Link: \\10.120.99.200\
- Folder: \\10.120.99.200\Software_release\Official_Release_SW\NPI\SW_SQA_Pass\Realtek\RTK 外销机芯

1.2.1 LR or PR step. ---Only test

In case of starting from blanked flash / eMMC, it's necessary to use "rticetool" to update the SW.

See Appendix (1)**"How to upgrade main SW using tool"**

See Appendix (2)**"How to upgrade SW using USB"**

See Appendix (3)**"How to upgrade main SW using USB and RCU"**

1.2.2 MP Step

In case of starting from blanked flash, it's necessary to write "tcl.img" file via factory copy in advance.

- **OAD Stream(This function is not ready by SW)**

To manage quicker mass reflashing on predefined DVB Channel, some licensed IBL tools ('xxx2lli.exe', 'lli2dsm.exe', dsmmerge.exe ...) from Intel byte Inc. might be necessary to create appropriate DVB SSU image. Over some predefined

settings such as repeated data block insertion, null packets size, ... that are controllable in configuration file, here below are mandatory OUI entries structure to prepare DSM-CC carousel image format:

- export CUST_OAD_OUI **0x001C50**
- export CUST_OAD_HW_MODEL **0x5395**
- export CUST_OAD_HW_VERSION **0x0000**
- export CUST_OAD_SW_MODEL **0x0001**
- export CUST_OAD_SW_VERSION **0x00..**

OAD reflashing is managed within 4 steps operation: multiplex detection, DVB transfer, flashing and warm-start.

See Appendix (4)“How to upgrade FLASH SW by OAD”

1.3. UART & IR Parser

To use both UART and/or IR parser, TV has to be set in Factory mode with its USB port well connected to suitable UART device or an IR emitter device correctly facing up TV (see below “section 2.0- Product Assembly” how to activate “Factory Hotkey”).

The UART parser engine is enabled by sending following command “**0x10**” from host to TV within following presets **115200/8/n/1**.

Once initialized, “**PS**” caption is toggle displayed on bottom left screen (“S” like Serial).

To communicate with TV depending on SIACP revision layout implementation, you need to fulfill UART/IR commands protocol and format described on enclosed SIACP requirements document (rev. v8.31).

1.4. Project ID Modification

There are different IDs stored into the eMMC depending on different Panels settings and Models features, but there’s only one key branching ProjectID that includes all. So it’s not recommended to modify Panel ID with Hyper terminal as other ID features may not change!

To modify ProjectID, first of all you need to enable Factory Hotkey (See below “section 2.0-Product Assembly”). After that, go through 1950 to “**Main menu → Service menu → 8-Project ID**”, then turn left or right with RCU “◀/▶” key” keys to suitable ID (Project name is dynamically refreshed). Restart TV.

See Appendix (5)“How to change ProjectID with RCU”

See below is the ProjectID table for reference:

MODEL-EU	ProjectID	PanelID	Panel Name		MODEL-EU	ProjectID	PanelID	Panel Name

Note②:Because more and more projects will be added in the future.

1.5. Functional Test

Once the boards (chassis, KB, IR, PSU...) and the panel are well interconnected, plug all external generator devices to relevant below inputs/outputs using respective test patterns format to check picture and sound quality:

Source	Test Signal	Test Pattern
Analog /Digital Tuner (VHF/UHF & CATV)	RF cable generator	2D - Movie 1280x720 2D - Static Picture 1920x1080 1. Frequency Range: full band 2. Standard: PAL / SECAM 3. DVB-T/T2/C
Satellite Tuner - DiSEqC v1.0 (A, B, C, D) and Tone Burst (A, B) - Double LNB frequency (band change by 22KHz Tone)	Compliant DVB-S/S2 source from generator or dish antenna with switch	2D - Movie 720x576 1. Frequency Range: 950MHz..2150MHz 2. Symbol Rate Range: DVB-S 1..30MHz (for QPSK) DVB-S2 1..45MHz (for QPSK) 1..30MHz (for 8PSK) 3. LNB Voltage Range: Vertical 12.85V..14.2V Horizontal 17.6V..19.5V 4. 22KHz Tone Range Frequency 20.5KHz..23.5KHz Amplitude 400mV..900mV Current ≥400mA
SPDIF	Audio Amplifier	PCM or Dolby D+
PCMCIA	CI CAM card adaptor	Conax, Irdeto, Viaccess, ...
CMP via mini jack adaptor (YPbPr& Audio)	Chroma/QuantumData generator	1920x1080i@60Hz Half Color & Gray bars
AVIN share with Y,R,L (CVBS &Audio)	Chroma/ QuantumDatagenerator	1920x1080i@60Hz Half Color & Gray bars
HDMI (Video & Audio)	with beyond HDMI 1.3 and HDCP compliant DVD/BD player With HDMI 2.0 and HDCP2.2 player	2D - Movie 1280x720i@60Hz 3D - Movie 1920x1080p@24Hz HDMI1&2 support 4K*2K- Movie 3820x2160@50&60Hz(4:4:4),HDCP2.2 HDMI3&4 support 4K*2K- Movie 3820x2160@50&60Hz(4:2:0),HDCP2.2
RJ45 (LAN)	DHCP Server	ICMP packets echo request
Headphone via mini jack adapter	RF signal	Suitable channel
Loud Speakers / Enclosures	RF signal	Suitable channel

Audio tones can be defined by the factory (ie: 1KHz & 3KHz, sweep, ...).

Picture video formats can be changed by the factory according to their own standard.

1.6. AD Calibration Test

As the A/D self-calibration mechanism is built-in soc, there's no any ADC to perform.

1.7. DDC & EDID & T-Link Test

The E-EDID data structures are according to VESA Enhanced EDID 1.3 (and EIA/CEA-861B for HDMI). CEA Timing Extension structure has been extended to support all 3D capable timings.

All HDMI structures have their own BIN profile which are part of main SW and uploaded at power-on into soc chipset:

For EDID check, it's needed to check whether the correct EDID is downloaded by checking corresponding EDID NVM Checksum or read them out to check bit by bit if it is in line with the released EDID bin file.

1.8. HDCP Test

For HDCP compliancy, it's needed to check whether the HDCP key has been well set by connecting suitable generator.

1.9. CI+Key Upgrade, Activation and Test

See Appendix (6) "How to upgrade CI Key using USB"

See Appendix (7) "How to upgrade Widewine Key using USB"

See Appendix (8) "How to upgrade PlayReady Key using USB" (not support at this time)

See Appendix (9) "How to upgrade HDCP key key using USB"

1.10. LAN and WLAN Test (MAC address and Device/User ID codes)

Here are some representative codes examples:

Device ID	User ID	MAC Address
6fa0806936a0ada733262a3f8e8595d5586ce5cb	111382090	00:1C:50:E2:B1:EC

▪ **MAC Address Upgrade (IPv6)**

MAC can be set using UART commands described on enclosed SIACP requirements (rev. v8.31).

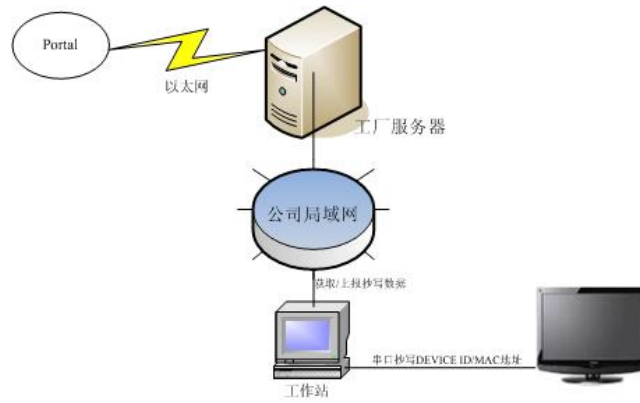
- Writing MAC command <0xB3>, Data length <6>, Data type <HEXA> (see below command example from above MAC code)

<AA 0B B3 00 1C 50 E2 B1 EC 36 78>

See Appendix (10) "How to upgrade MAC Address using USB"

▪ **DeviceID (DID)**

Purpose is to allow Other Network Download (OND) and further specific Services via dedicated abroad portal (UK tbc). At final, when TV may ask for portal connection, there'll be Device ID matching control sent by host (TV client) to ensure total integrity.



For such, specific DID (40 bytes) needs to be paired and overwritten into memory for internal client encryption. All DID and MAC codes have to be download from portal local service via suitable factory workstation LAN system. Then during production lot, it's necessary to send/write all those codes to each TV. DID codes can only be set using UART commands described above on enclosed SIACP requirements (rev. v8.31).

- Writing Device ID command <0xB2>, Data length <32>, Data type <ASCII> (see below command example from above DID code)

```
<AA 25 B2 42 45 34 46 32 35 35 42 42 44 31 30 36 42 43 38 46 38 30 36 41 45 34 35 36 33 35 30 44 39 31 46 48 93>
```

▪ LAN Test

A rough LAN test can be done by connecting DHCP server to TV's RJ45 and check that IP, subnet mask, DNS, ... addresses are visible on **"Settings→ Network →IP settings(Ethernet)"**. More in-depth test can be performed faster using suitable UART/IR commands following SIACP requirements. SW will internally manage Network ID (NID) flag controlling all MAC/DID/UID integrity to facilitate PA screening further.

See Appendix (11) **"Network Connection Setup"**

See Appendix (12) **"How to upgrade Flash SW using Network"**

Note③: It's not necessary to check video and audio from DLNA server.

2. Product Assembly (PA): Test & Alignment

2.1. Factory Menu&Main Menu\

▪ How to Enable Factory hotkey

Follow the below steps to pop-up the Factory menu in case of **"Factory hotkey"** is disabled:

Enable Factory hotkey method:

Method one:

- Press RCU **"MENU"** key to display main menu
- Select **"Settings→Picture→Advanced setting→ Contrast"**, Scroll down to **"Contrast"** item
- Press the subsequence RCU keys **"9"**, **"7"**, **"3"** and **"5"**

- Select "**9-Sita P mode**", Press RCU "**◀/▶**" key change the values to ON
- Reboot TV
- 'Factory Hotkey' will be ON automatic.

Method two(Not supported yet):

- Create a file named '**sita_P**' with no suffix, note the capitalization.
- Put the file 'sita_P' into the U disk, delete all PKG and BIN files.
- Put the U disk into the TV.
- Power on TV by AC, at the same time press "power on" key which on the board for 10s until the TCL logo show.
- 'Factory Hotkey' will be ON automatic.

If "**Factory hotkey**" is enabled, just press RCU "**Return**" key () to pop-up again the Factory menu.

The status of "**Factory hotkey**" can be changed in "**Factory menu->Factory hotkey**"

Press RCU "**OK/▶**" key to enter the submenu.

Press RCU "**Menu**" key to go back to the root menu.

Press RCU "**◀/▶**" key to change the values.

Press RCU "**OK**" key run the function.

Press RCU "**Exit**" key exit the Factory menu.

▪ Factory Captions Description

While "**Factory hotkey**" is enabled, there're some toggled display information (~2s) relative to SW, ProjectID, CI+, NetworkID to facilitate 100% quick screening without accessing to whatever else menu:

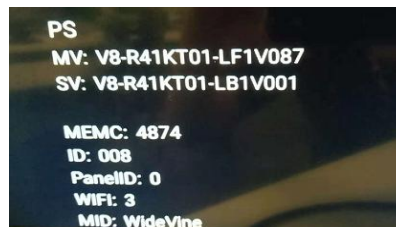
MV (Main SW Version)

ID (Project ID)

Panel ID

MEMC (FRC SW Version)

MID(Internet info for factory)



P (Production/Factory mode flag) / S (Factory UART Parser mode flag) / W (Warm-Up mode flag)

See Appendix (13) "Factory Menu Description"

▪ How to enter Main Menu\

- Press RCU "**MENU**" key to display main menu
- Select "Settings→Picture→Advanced setting→ Contrast", Scroll down to "**Contrast**" item
- Press the subsequence RCU keys "**1**", "**9**", "**5**" and "**0**"
- Then the Main Menu\ will be displayed on the screen.

See Appendix(14) "Design mode Menu Description"

2.2. Warm-up Test

Following TCL standard and practices, it's required minimum **15min** of **Warm-Up** that can be considered as Burn-In. Additional Aging for White Balance alignment is no more necessary due to consistent Picture Performance with

Cloning usage.

First you need to enable Factory Key. After that selecting "**Factory menu → WARM UP**", pressing RCU "**OK/▶**" key and then leaving Factory menu by pressing "**Exit**" key. To release/disable Burn-in mode, press the menu button on the TV panel. Other faster methods via UART/IR commands are available on enclosed SIACP requirements (rev. v8.31).

2.3. White Balance & Automatic Gamma correction

For the white balance & automatic gamma correction, we only need do one of them based on the value of Align_mode in PDM system or the method gave by AOE or R&D.

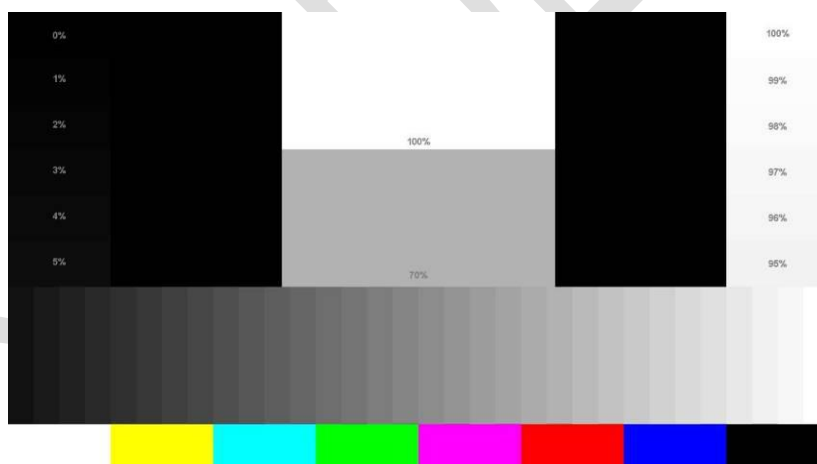
The detail instruction of Align_mode is as below table:

Prop Name	Description	Value
Align_mode	WB alignment or Auto Gamma correction	0 -- > WB alignment 1-- > Gamma correction

▪ White Balance alignment (Golden sample)

As some color coordinates discrepancies can be noticed from panel batches to others, it may necessary to perform slight touch-up.

For Color temperature adjustment, switch TV on leading **HDMI** input where should be connected suitable generator providing following format **1280x720p@60Hz** test pattern. A 32 steps grey scale is recommended to assess relevant colorimetry tracking and low/high light saturation points.



Ensure that TV's picture enhance is off.

Ensure that TV is in Factory mode to access to "**White Balance**" adjustment submenu.

WB Normal is the first mode which is adjusted in HDMI source, the next are HDMI warm and cool mode.

Warm and **Cool** Tone are relatives to **Normal** mode. WB adjust need to fix default G Gain. Offset registers needn't to be adjusted.

➤ "**Gain**" registers set need to be adjusted at 70IRE.

Note: The operation must enable factory "P" mode

▪ Automatic Gamma correction

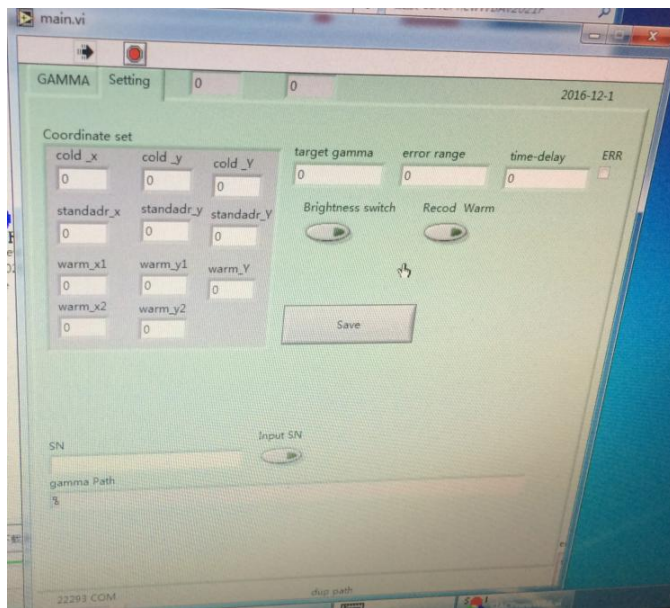
Gamma correction, or often simply gamma, is the name of a nonlinear operation used to encode and decode

luminance or tristimulus values in video or still image systems.

You need adjust 4+3 gamma for different samples based on the color coordinates and target gamma offered by PQ engineer. So each sample can get almost the same effect as PQ golden sample. The 4+3 gamma include 4 gamma based on 4 different color temperature (cool, normal, warm1, warm2) and 3 gamma related to SDR to HDR (cool, normal, warm).

For the automatic gamma correction, we can do as below, but please refer to “**Gamma correction specification (v1.00)**”for detail.

- Initialize the picture, turn off dynamic backlight, dynamic contrast, and set picture mode as computer desktop mode;
- Get the color coordinates (x, y, Y) and target gamma in the PDM of the target model;
- Open the factory menu of TV, Open the tools **SIACP** and **main.vi** on the PC, connect the equipment correctly (CA310, serial port, PC, TV);
- Fill the color coordinates (x, y, Y) target gamma, error range and time-delay in the main.vi tool that made by AOE, and save it;



- Put the probe on the middle of the panel, then run **main.vi**. The 4+3 gamma will be created and calibrated automatically and saved in the TV.

As 4+3 gamma is a new and good way for PQ especially for HDR, we need adjust it in the factory now. And if we do the 4+3 gamma, there is no need to adjust the white balance. But we need do the initial setup of white balance.

See Appendix(15)“How to do initial setup of white balance”

Note: The operation must enable factory “P” mode

▪ **Targets and Tolerances for all inputs**

(According to company uniform LED color temperature standard of panel)

The measured and adjustable parameters should be mainly “x”, “y” coordinates.

The White Balance alignment and Automatic Gamma correction should be performed using a well calibrated and contact less analyzer (ex: Minolta CA210 or CA310). The analyzer may not touch the screen surface, and measurement must be performed in a dark environment keeping the probe(s) at 90+/-2° from the panel center.

The results should fulfill specification for each TV set offered by R&D and below tolerances:

MT5658	Panel name	Energy Efficient	FW Min (Nits)	Preset Targets (x, y)&CA310				Gamma	
Model			FW>Min	Cool	Normal	Warm	Warm2	Target	Error range
U65S9906	LVU650SD6L SD9W01	B	300	267 276	279 287	313 329	314 351	2.2	±0.05

Note④: *We will add more project ID later.*

- Cloning

Other faster access methods via UART/IR commandshare available on enclosed SIACP requirements (rev. v8.31).

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2.4. High Pot. and Insulating Resistance Tests

At the end of the process, a “High Voltage” and an “Insulating Resistance” tests are required to fulfill Safety Electrical requirements (CEI 65065).

▪ **High Voltage Withstanding requirements**

- “Voltage” ⇒ **3500VAC**
- “Max Leakage Current” ⇒ **10 mA**
- “Test Time” ⇒ **3 sec**

▪ **Insulating Resistance requirements**

- “Voltage” ⇒ **500VDC**
- “Threshold Min” ⇒ **4M Ω**
- “Test Time” ⇒ **2 sec**

2.5. SHOP-END Test

At final process stage, it's necessary to perform “**Reset shop**” before any packing to leave Factory mode and restore User default presets.

First you need to enable Factory HotKey. After that selecting “**Factory menu → Reset Shop**”, then pressing RCU “**OK/▶**” key. Other faster methods via UART/IR commands are available on enclosed SIACP requirements (rev. v8.31).

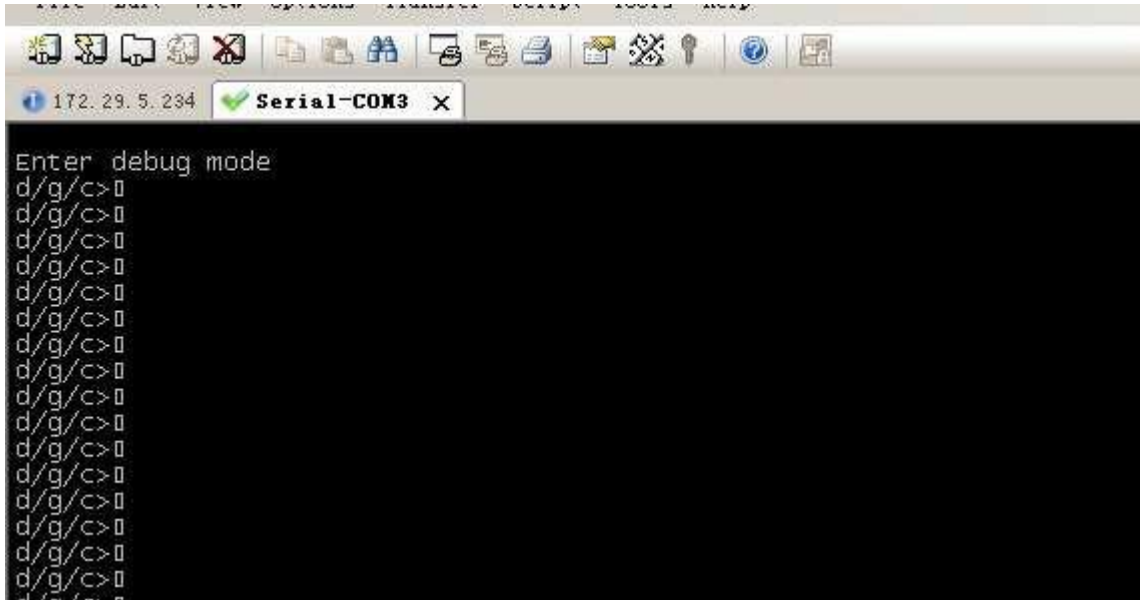
*Note⑤: A password might be required in case of Parental Control function is locked, use default “**1234**” password or “**0423**” super password to clean-up existing ones if forgotten.*

END

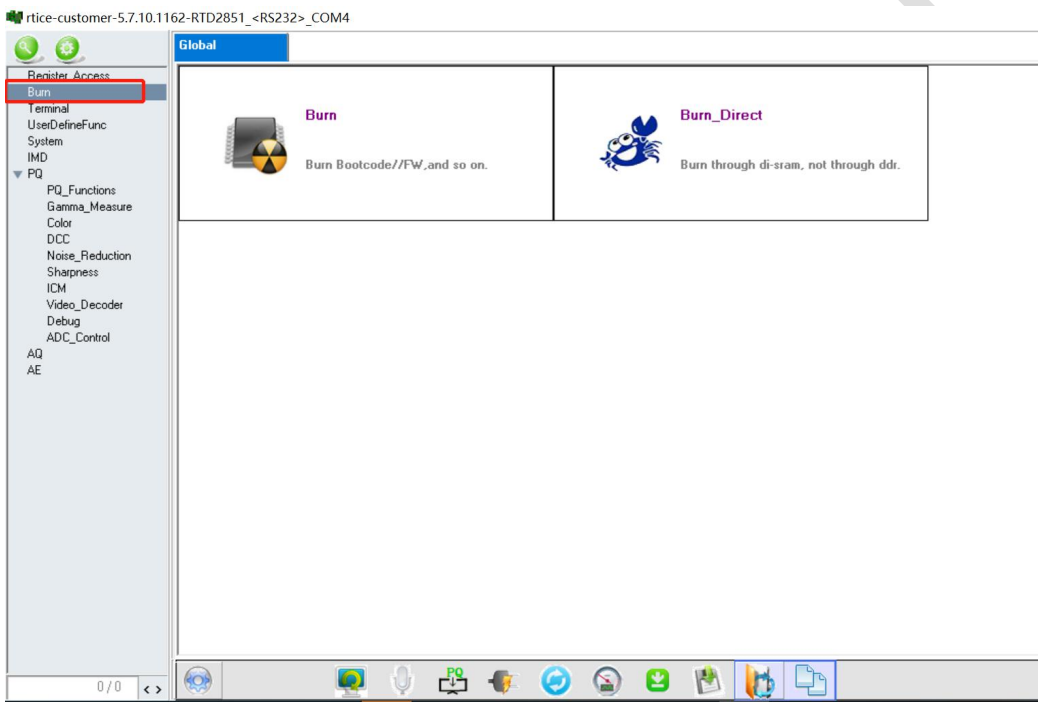
▪ **Appendix(1)“How to upgrade main SW using tool”**

▪ **Upgrade RT2851 main SW by using RTK tool**

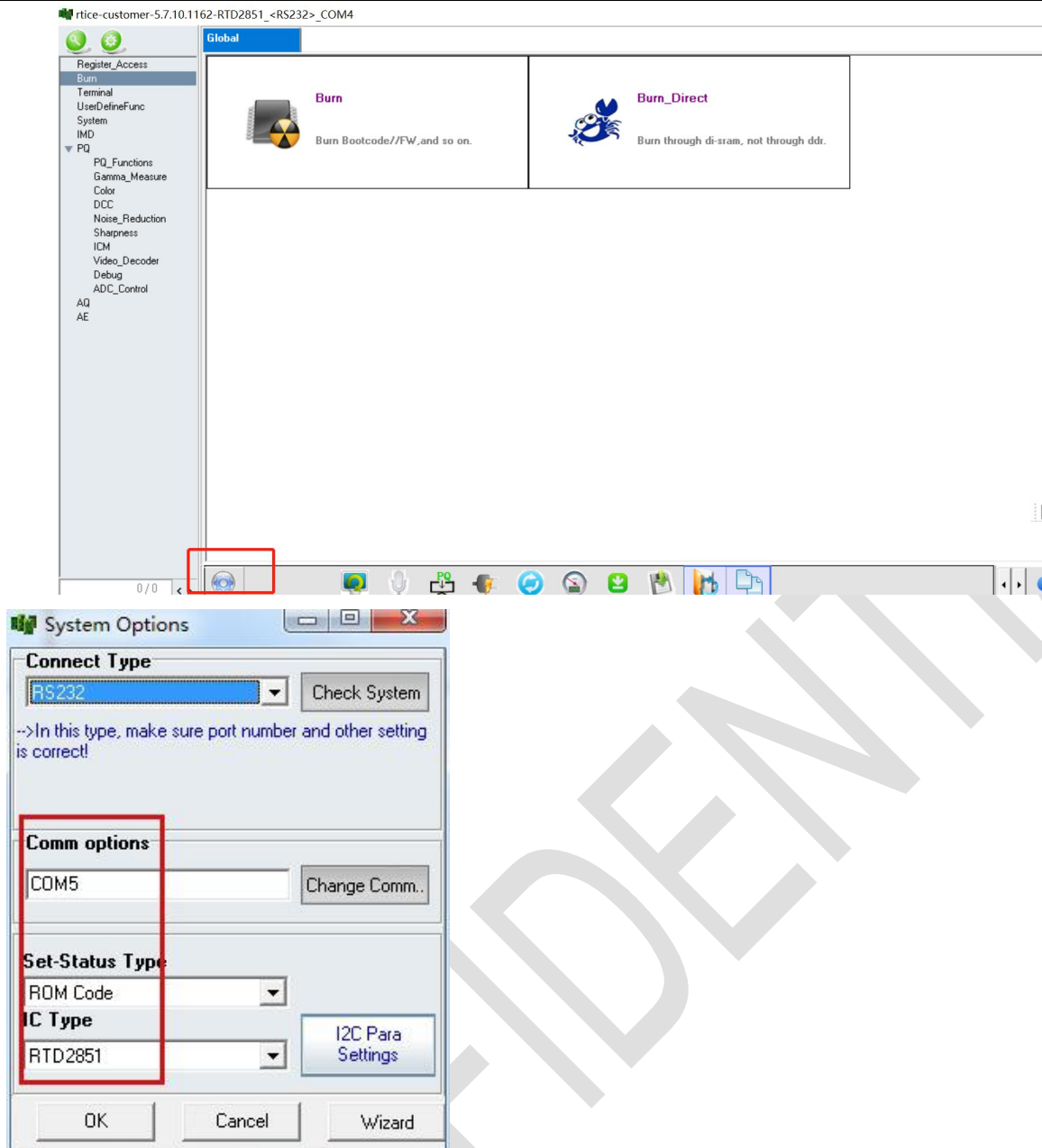
- Download boot bin “dvrboot.rescue.exe.bin”& “**bootcode_for_rtice.bin**”&main software “Update.img” from the software route.
- Connect UART interface to suitable manufacturing TV input connector, upgrade boot bin first to blank IC.
 - 1) Turn off your TV, and then connect the Serial Interface to USB debug port
 - 2) .Turn on the TV ,while input the “Ctrl+Q” by Serial port tool ,as shown below



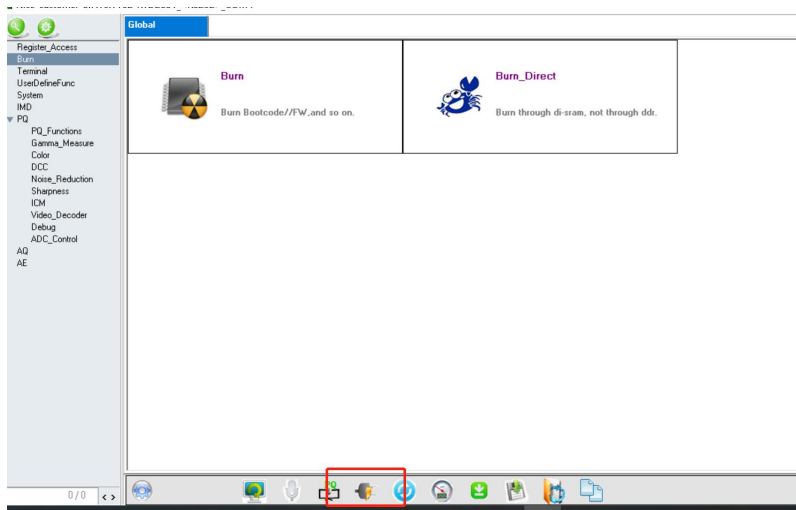
3) Close the serial port tool. open the rtice software, select the Burn page as shown below.



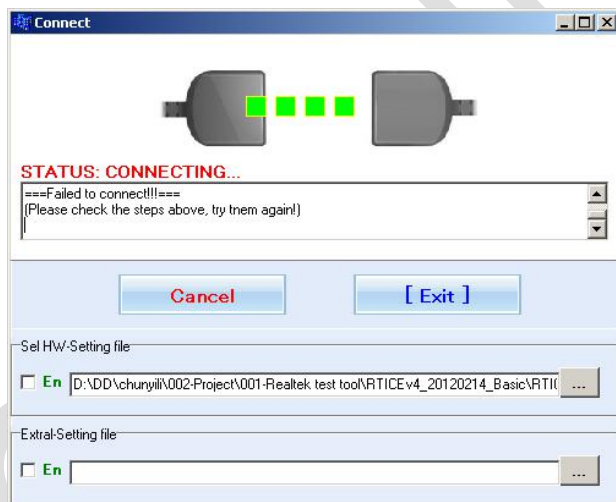
4) Click the settings icon, open the settings page, and configure it as shown below.



- Connect Type select RS232;
 Comm port selects the corresponding serial port;
 Set-Status type option ROM Code;
 IC Type Selection **RTD2851**;
 Then click ok.
 5) Serial Interface to USB debug port



Select connect

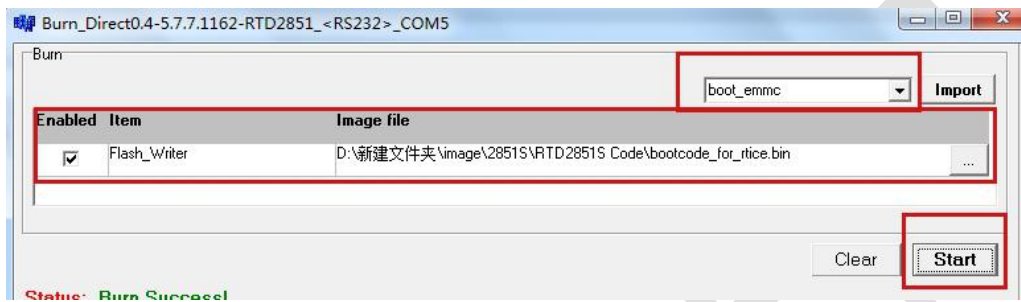
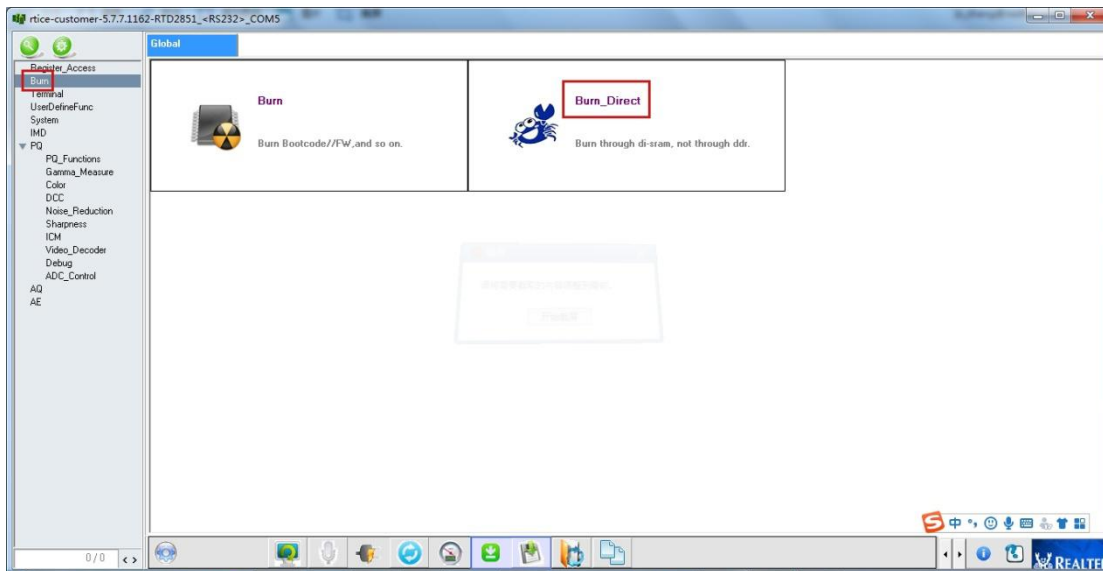


Success

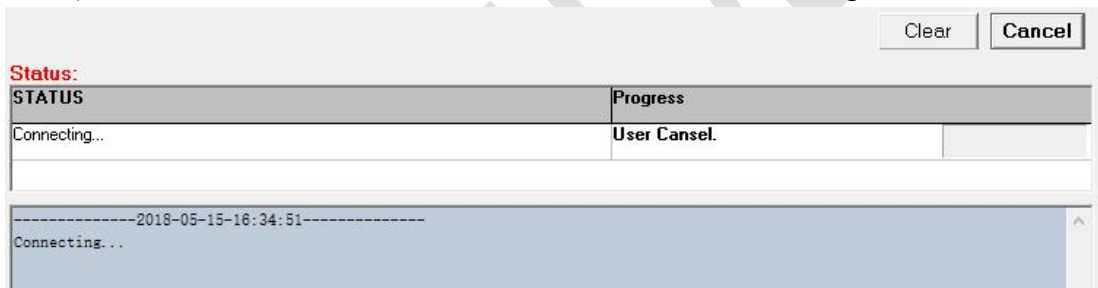


6) Select the Burn → **burn_Direct**, Configure Burn parameters and select bootcode “**bootcode_for_rtice.bin**” load path,

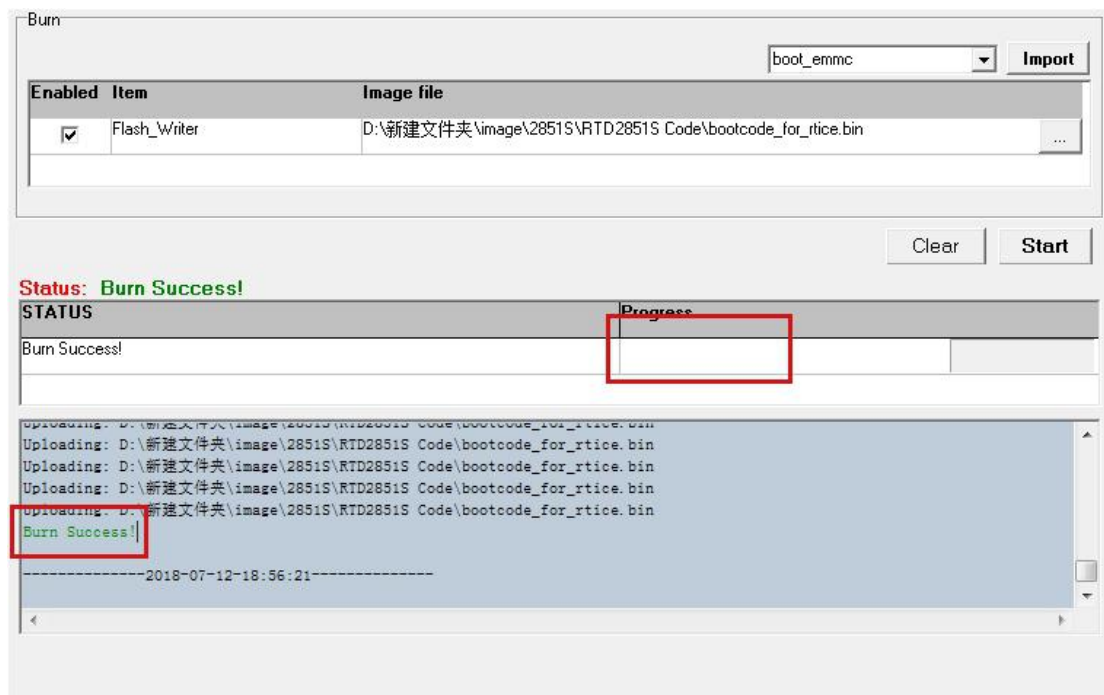
as shown below.



7) Click the Start button to enter the boot state and the state will change to the connect state as shown below.

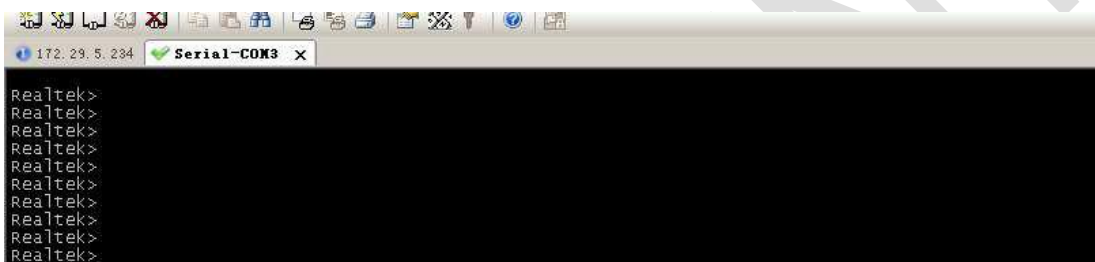


8) After the burn is successful as shown below



9) Turn off the TV ,close rtice software, open the Serial prot tool and connect.

10) Turn the TV on and press the “ESC” by the Serial port tool,enter the boot command states as shown below



11) Input the boot commad

usb start

fatload usb 0:1 0x1500000 dvrboot.rescue.exe.bin

Note:if shown as below after the “fatload usb 0:1 0x1500000 dvrboot.rescue.exe.bin

” **change to input** “fatload usb **0:4** 0x1500000 dvrboot.rescue.exe.bin”

```
Realtek> fatload usb 0:1 0x1500000 dvrboot.rescue.exe.bin
** Unable to use usb 0:1 for fatload **
Realtek>
$
```

go 0x1500000

- Then Upgrade Main SW , Copy Main SW “Update.img” into USB stick (pen drive) root path,
- Insert USB to TV USB port, long press the “MENU/STB” button of local keyboard , and then Power on TV by AC, The light of IR will flicker, it means TV is updating SW.
- After finish update SW, TV will reboot automatically and please remove the USB.

Appendix (2) “How to upgrade SW using USB”

▪ Upgrade RT2851 main SW

- Copy the “Update.img” into USB stick (pen drive) root path.
- Please delete other xxx.img files from USB stick.
- Plug USB stick to the TV.

- Power on TV by AC, at the same time press “power on” key for 10s, TV will update SW automatically.
- When reflashing is successful, TV should restart automatically (about 4min).

*Note®: If “upgrade” was performed, a “Welcome Setup” menu should be displayed, otherwise new SW version should be displayed into relevant Factory mode caption info or on bottom of “**Factory menu**”*

*If the P mode is reflashing after upgrade and can not be closed, go to “**Factory menu**” and select ‘Sita P mode’ to ON, restart TV. Then go to “**Factory menu**” again and select ‘Factory hotkey’ to OFF.*

Appendix (3) “How to upgrade SW using USB and RCU”

Appendix (4) “How to upgrade FLASH SW by OAD” (not support now)

Appendix (5) “How to change Project ID with RCU”

- Process following subsequence IR codes to change projectID: **062598++xxx** (xxx:ProjectID, ex: 001)
- If it works, the TV will restart automatically.

Appendix (6) “How to upgrade CI Key using USB”

- **Enable Factory Key**
- Create the folder named “CIKEY”, change the CI key to “CIKEY_xxx.bin” (xxx is the number), put CI key into the folder.
- Plus the USB into the TV.
- Go to “**Main menu→ Service menu→ USB Update →CI Key Upgrade**”, click the right button.
- If the toast show CI Update OK, it means burn the key success.
- After burning, the CI key will move to the folder CIKEY_BACKUP.

Note: The operation must enable factory “P” mode

Note®: If unfortunately the process failed, you may need to download new CI key and repeat operation again.

Appendix (7) “How to upgrade Widevine Key using USB”

- **Enable Factory Key**
- Create the folder named “WIDEVINEKEY”, change the Widevine key to “WIDEVINE_xxx.bin”(xxx is the number), put Widevine key into the folder.
- Plus the USB into the TV.

- Go to “**Main menu→ Service menu→ USB Update →Widevine Key Upgrade** “, click the right button.
- If the toast show Widevine Update OK, it means burn the key success.
- After burning, the Widevine key will move to the folder WIDEVINEKEY_BACKUP.

Note: The operation must enable factory “P” mode

Appendix (8)“How to upgrade PlayReady Key using USB”(not support now)

Appendix (9)“How to upgrade HDCP & HDCP2. 0 key using USB”

HDCP

- Create the folder named “HDCP”, change the HDCP key to “HDCP_xxx.bin”(xxx is the number), put HDCP key into the folder.
- Enable Factory Key
- Plus the USB into the TV.
- Go to “**Main menu→ Service menu→ USB Update →[HDCP] Upgrade**“, click the right button.
- If the toast shows HDCP Update OK, it means burn the key success.
- After burning, the HDCP key will move to the folder HDCP_BACKUP.

HDCP2.0

- Create the folder named “HDCP2”, change the HDCP2.0 key to “HDCP2_xxx.bin”(xxx is the number), put HDCP2.0 key into the folder.
- Enable Factory Key
- Plus the USB into the TV.
- Go to “**Main menu→ Service menu→ USB Update →[HDCP2_0] Upgrade**“, click the right button.
- If the toast shows HDCP2.0 Update OK, it means burn the key success.
- After burning, the HDCP2.0 key will move to the folder HDCP2_BACKUP.

Appendix (10) “How to upgrade MAC Address using USB”

- Create the folder named “MAC”, change the MAC key to “MAC_xxx.bin”(xxx is the number), put MAC key into the folder.
- Enable Factory Key
- Plus the USB into the TV.
- Go to “**Main menu→ Service menu→ USB Update → MAC Upgrade**“, click the right button.
- If the toast show MAC Update OK, it means burn the key success.
- After burning, the MAC key will move to the folder MAC_BACKUP.

Note@: There is no this function which is only displaying.

Appendix (11) “Network Connection Setup”

NoteⓈ: You can set up your TV so that it can access the Internet through your local area network (LAN) using a wired or wireless connection.

Wired Network Connection

You can connect your TV to your LAN using cable in three ways:

- 1) Plug your TV to your LAN by connecting the LAN port on your TV to an external modem using a Cat5 cable.
- 2) Plug your TV to your LAN by connecting the LAN port on your TV to an IP Sharer which is connected to an external modem. Use Cat5 cable for the connection
- 3) Depending on how your network is configured, you may be able to plug your TV to your LAN by connecting the LAN port on your TV directly to a network wall outlet using a Cat5 cable (Note that the wall outlet is attached to a modem or router elsewhere in your house)
- 4) Select “**Menu**  → **Network Settings** → **Ethernet**” to check if the network has connected. If not then select “**IP settings**” to connect to network.

▪ Wireless Network Connection

To connect your TV to your wireless network, you need a wireless router or modem and a Wireless LAN Adapter.

- Select “**Menu**  → **Network Settings** → **Wi-Fi** → **On**”, then it will appear the valid wireless networks near your area.
- Select available access point and press “**OK/▶**” to connect the TV to it.

Note (11) :

*- If you select a protected access point, you will have to enter the corresponding password. Press “**OK**” on the remote control to display virtual keyboard to enable you to enter the password.*

▪ Network Setup

- Connect your TV and the available network with the network cable first.
- Press “**Menu**  ” on the remote control and select “**Network Settings** → **Ethernet**” to check if the network has connected.
- If connected, the Internet connection will display Connected. If not, If not it will display “Not Connected” and you can try to enter your IP address manually to connect the network follow below steps
 - Select “**Advanced options**” → “**IP Settings**” → “**Static**” by pressing “**OK/▶**” key
 - Enter the “**IP address**”, “**Gateway**”, “**Network prefix length**”, “**DNS1**” and “**DNS2**” values. Use remote control digital keys to enter numbers and “**◀/▶**” key to move from one to other field location
 - After setting all required inputs and save successful, to check the Internet connectivity again
- Select “**Menu**  → **Network Settings** → **Ethernet**”, then press “**OK/▶**” key to display current connection details, such as Internet connection status, IP address, MAC address etc..

Appendix (12) “How to upgrade Flash SW using Network”(not support now)

Appendix (13) “Factory Menu Description”

1-Factory Hotkey submenu

Item	Sub-item	Value	Note
Hotkey		OFF/ON	Enable Hotkey flag by pressing “◀▶” key to have possibility to access Factory menu with “RETURN” key (↻) (default is disabled)

Note:Sita P mode submenu change to ON and reboot TV for the first time to enable the Factory Hotkey submenu.

2-Warm-Up Mode submenu

Item	Sub-item	Value	Note
Burning Mode		OFF/ON	Enable Burning mode by pressing “◀▶” key, then press “EXIT” key to activate it Press “Menu” key on local keyboard to exit the Burning mode

Note:Factory Hotkey submenu must be ON.

3-Reset Shop submenu

Item	Sub-item	Value	Note
Reset Shop		>	Press “OK▶” key to remove Factory presets (channel Maps, bargraph context...) and restore User settings. All adjustments are not impacted!

Note:Factory Hotkey submenu must be ON.

4-NVM Reset submenu

Item	Sub-item	Value	Note
Reset ALL		>	Press “OK▶” key to default NVM according to selected Project ID (all adjustments are defaulted, channel Maps are cleared, Hotkey is enabled, ...)

Note:Factory Hotkey submenu must be ON.

5-Power on Mode submenu

Item	Sub-item	Value	Note
Power on Mode		ON STB LAST	Select starting sequence by pressing “◀▶” key - ON: Force TV to start

			-STB: Force TV to standby - Last: Force TV to standby or to start depending on latest operation
--	--	--	--

Note: Factory Hotkey submenu must be ON.

6-USB Clone submenu

Item	Sub-item	Value	Note
USB Clone	All Clone: USB TO TV	ALL Channel list EEPROM Users Settings	Enable factory Hotkey; Press “ OK ” to copy USB template content to TV depending on Cloning mode
	All Clone: TV TO USB	ALL Channel list EEPROM Users Settings	Press “ OK ” to copy TV template context to USB depending on Cloning mode

7-Preset Factory Channel submenu

Item	Sub-item	Value	Note
Preset Factory Channel	Factory Area	HZ PL	Choose the factory area
	Channel Preset		Preset TV Channel

8-DeviceID Test submenu

Item	Sub-item	Value	Note
DeviceID Test		DO	Test device ID

9-Sita P mode submenu

Item	Sub-item	Value	Note
Sita P mode		OFF/ON	

Note (12) : A quick access to suitable submenu item can be achieved by pressing it prefixed RCU key number (ex: pressing “6” to directly highlight “USB Clone” item).

Appendix (14) “Design mode Menu Description”

- Other submenu

Item	Sub-item	Value	Note
TestPattern		>	Enable TestPattern by pressing “◀▶” key, Hold “ Menu ” key on local keyboard , select “TV” source to exit TestPattern.
UartEnable		OFF/ON	Enable console by pressing “◀▶” key.

			- ON: Enable print by console -OFF: Unable print by console
ScreenPixel			Not used
DeviceID			Not used
MAC		MAC Address	
SN		SN	
Register Code		Register Code	
HuanID			Not used
ClientType		Client Type	
ReadEeprom To USB			Not used
WatchDog		OFF/ON	Enable Watch Dogby pressing “◀▶” key - ON: Open Watch Dog -OFF: Close Watch Dog
ADB		OFF/ON	Enable ADB by pressing “◀▶” key - ON: Open ADB -OFF: Close ADB

- Service menu submenu

Item	Sub-item	Value	Note
0-Project SN		Project SN	
1-EPolisy Number		EPolisy Number	
2-HardwareI		HardwareI	
3-Software		Software Version	
4-ProjectName		Project Name	
5-frcVersion		Frc Version	
6-stbc version		stbc version	
7-Bootloader		Bootloader	
8-Project ID		Project ID	Factory Hotkey submenu must be ON.
9-Panel ID		Panel ID	
10-USB Update	Main Upgrade	>	Upgrade Main Software
	[HDCP] Upgrade		Upgrade HDCPkey
	[HDCP2_0] Upgrade		Upgrade HDCP2.0/2.2 key
	[FRC_IMAGE] Upgrade		Upgrade FRC
	DONGLE Upgrade[RC65]		Not used
	DONGLE Upgrade[RC71]		Not used
	MAC Upgrade		Upgrade MAC Address
	LocalDimming Upgrade		Upgrade LocalDimming

	LocalDimming Version		Show LocalDimmingVersion
	CI Key Upgrade		Upgrade CI Key
11-Nonstand ard			Not used
12-Non-stand ard_DTV			Not used
13- HotelMenu		OFF/ON	Enable HotelMenuby pressing “◀▶” key - ON: Enable HotelMenu -OFF: Unable HotelMenu
14-Suspend To Ram		OFF/ON	Enable STR by pressing “◀▶” key - ON: Open STR -OFF: Close STR

Note:Factory Hotkey submenu must be ON for item 8, item 10 and item 14

-Param setting submenu

Item	Sub-item	Value	Note
0-Sound Setting	Sound mode	["Music","Movies", ,"News","Standar d","User"]	Switch soundmodeby pressing “◀▶” key.
	Balance	[0~100]	Adjust sound balanceby pressing “◀▶” key.
	Auto audio	OFF/ON	Enable Auto audioby pressing “◀▶” key - ON: Enable Auto audio -OFF: Unable Auto audio
	Sound Scene	VOL_WALL / VOL_DESKTOP	Switch sound sceneby pressing “◀▶” key.
	Sys_audio	["BG","DK","I","M", ,"L"]	Switch audio format by pressing “◀▶” key.
1-Picture Curve	Source	SOURCE_ATV, SOURCE_DTV, SOURCE_AV, SOURCE_YBPBR, SOURCE_HDMI, SOURCE_VGA, SOURCE_DV, SOURCE_STORAGE	
	Curve Setting	"Brightness", "Contrast", "Saturation", "Hue", "Sharpness", "Backlight"	
	Curve_0		Adjust value of Curve by pressing “◀▶” key.
	Curve_25		

	Curve_50		
	Curve_75		
	Curve_100		
2-Picture Setting	Picture mode	"Standard", "Vivid", "Dynamic", "Mild", "User"	Switch picture modeby pressing “◀▶” key.
	Brightness	0~100	Adjust Brightnessby pressing “◀▶” key.
	Contrast	0~100	Adjust Contrastby pressing“◀▶” key.
	Backlight	0~100	Adjust Backlightby pressing“◀▶” key.
3-SSC(Spre ad Spectrum clocking) Adjust			Not used
4-DBC(Dyna mic Backlight Control)	DBC_Mode	0~2	Switch nature light modeby pressing “◀▶” key.
	APL1	0~255	Adjust value ofAPL1by pressing“◀▶” key.
	APL1_BL	0~255	Adjust value of APL1_BLby pressing“◀▶” key.
	APL2	0~255	Adjust value of APL2by pressing“◀▶” key.
	BP	0~255	Adjust value of BPby pressing“◀▶” key.
	K	0~100	Adjust value of Kby pressing“◀▶” key.
	Print_Enable	OFF/ON	Switch DBC Print mode by pressing “◀▶” key. - ON: Enable DBC Print -OFF: Unable DBC Print
	Energy saving	"OFF", "LOW", "HIGH"	Switch Energy saving modeby pressing “◀▶” key.
5-Overscan	Source	SOURCE_ATV, SOURCE_AV, SOURCE_YPBPR, SOURCE_HDMI, SOURCE_VGA, SOURCE_STORAGE	
	H Position		Adjust value bypressing“◀▶” key.
	H.size		
	V Position		
	V.size		
6-WIFI			Press “OK” on remote control to

CHEAK			check if WIFI works.
7-MEMC LEVEL			Not used

-Hotel menu submenu

Item	Sub-item	Value	Note
CH LOCK		OFF/ON	Enable CH LOCK by pressing “◀▶” key. -ON:EnableChannel scan -OFF:Unabled Channel scan
MAX VOL		0~100	Adjust max sound volby pressing “◀▶” key.
AUTO SET		OFF/ON	Enable AUTO SET by pressing “◀▶” key. -ON:Enable set “ PIC MODE ”, “ SOUND MODE ” etc. -OFF:Unabled set “ PIC MODE ”, “ SOUND MODE ” etc.
PIC MODE		"Standard" "Vivid" "Mild" "Studio" "User" "Dynamic" "Stadium" "Digital cinema"	Switch preset picture mode by pressing “◀▶” key. Option menu depend on model.ini with opposite Project ID. Format in model.ini : [Factory] PictureModePreset = STANDARD:VIVID:MILD:STUDIO: USER:DYNAMIC:STADIUM:CINE MA
SOUND MODE		"Music" "Movie" "News" "Standard" "User" "Subwoofer" "Stadium" "Game" "Sport"	Switch preset sound mode by pressing “◀▶” key. Option menu depend on model.ini with opposite Project ID. Format in model.ini: [Factory] SoundModePreset = MUSIC:MOVIE:NEWS:STANDAR D:USER:SUBWOOFER:STADIUM :GAME:SPORT
PRESET VOL		0~100	Adjust preset sound volby pressing “◀▶” key.
Input preset		ATV DTV AV1 AV2 YPBPR VGA HDMI1 HDMI2 HDMI3	Switch preset sound mode by pressing “◀▶” key. Option menu depend on model.ini with opposite Project ID. Format in model.ini: [Factory] InputSourceList= MUSIC:MOVIE:NEWS:STANDAR D:USER:SUBWOOFER:STADIUM

		HDMI4	:GAME:SPORT
Channel preset			If source is ATV, start from 9001; If source is DTV,start from 1; Channel preset is unable while source is on other situation.
KEY LOCK		OFF/ON	Enable KEY LOCK by pressing “◀▶” key. -ON:Enablelocal keyboard -OFF:Unalelocal keyboard
TV to USB		>	Press “◀▶” key to copy data from TV to USB
USB to TV		>	Press “◀▶” key to copy data from USB to TV

-Reset ALL submenu

Item	Sub-item	Value	Note
Reset ALL		>	Press“>” to Reset all factory data.

Note: Bofore do this operation, the Factory Hotkey submenu must be ON.

Appendix (15) “How to do initial setup of white balance”

Firstly, you need to enable Factory Key:

- Press RCU “MENU” key to display main menu
- Select “Settings → Picture → Advanced setting → Contrast”, Scroll down to “Contrast” item
- Press the subsequence RCU keys “9”, “7”, “3” and “5”
- Select “9-Sita P mode”, Press RCU “◀/▶” key change the values to ON
- Reboot TV
- 'Factory Hotkey' will be ON automatic.

Secondly, press RCU Option, Select Picture → Advanced setting → Contrast → Press RCU “1950” enter design main menu → Reset all

Done

Appendix (16)“How to upgrade MGK key using USB”

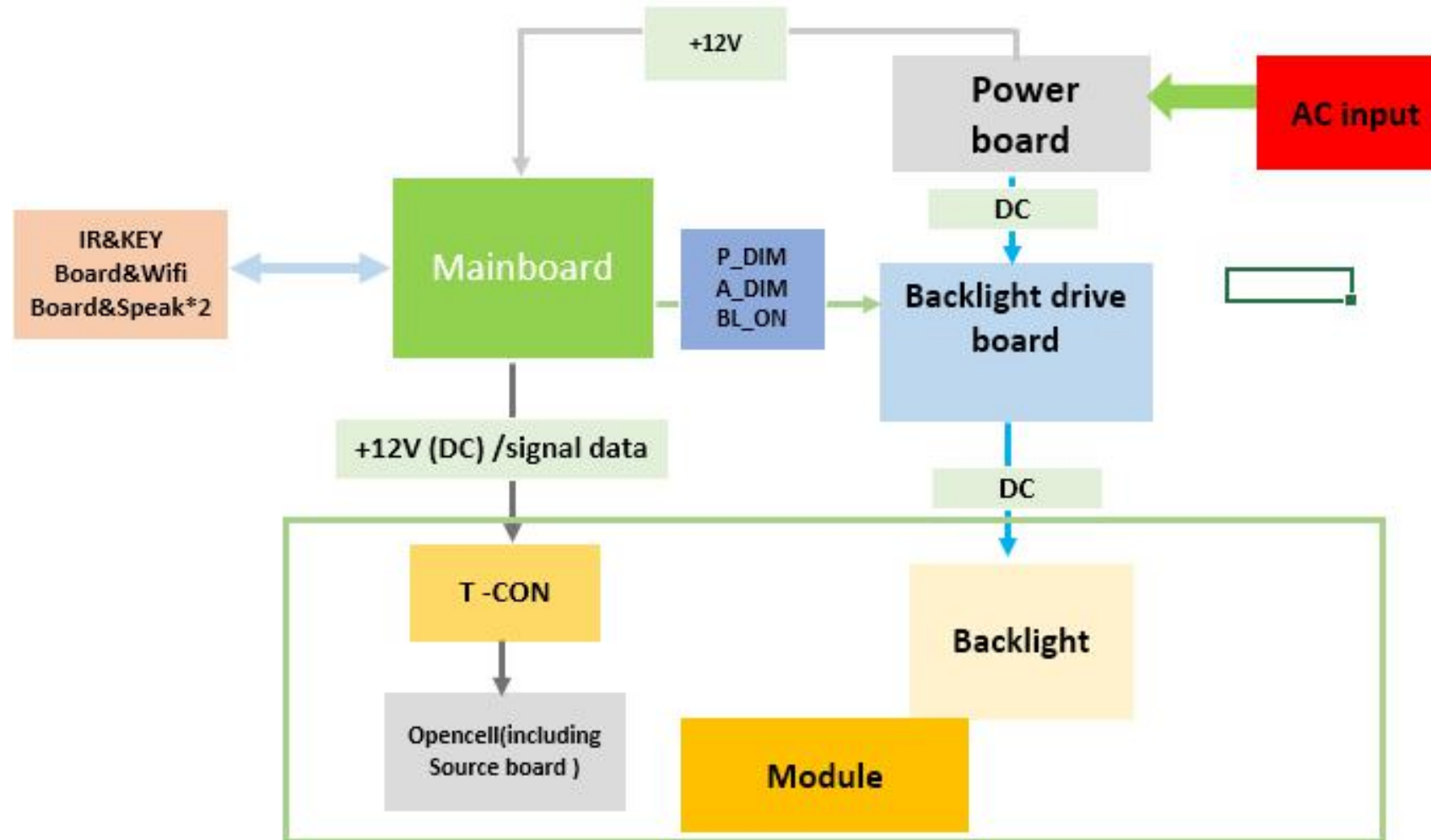
- **Enable Factory Key**
- Create the folder named “MGKKEY”, change the MGK key to “MGK_xxx.bin”(xxx is the number), put MGK key into the folder.
- Plus the USB into the TV.
- Go to “**Main menu→ Service menu→ USB Update →Netflix MGK Key Upgrade** “, click the right button.
- If the toast show NetflixMGKKey Update OK, it means burn the key success.

- After burning, the MGK key will move to the folder MGKKEY_BACKUP.

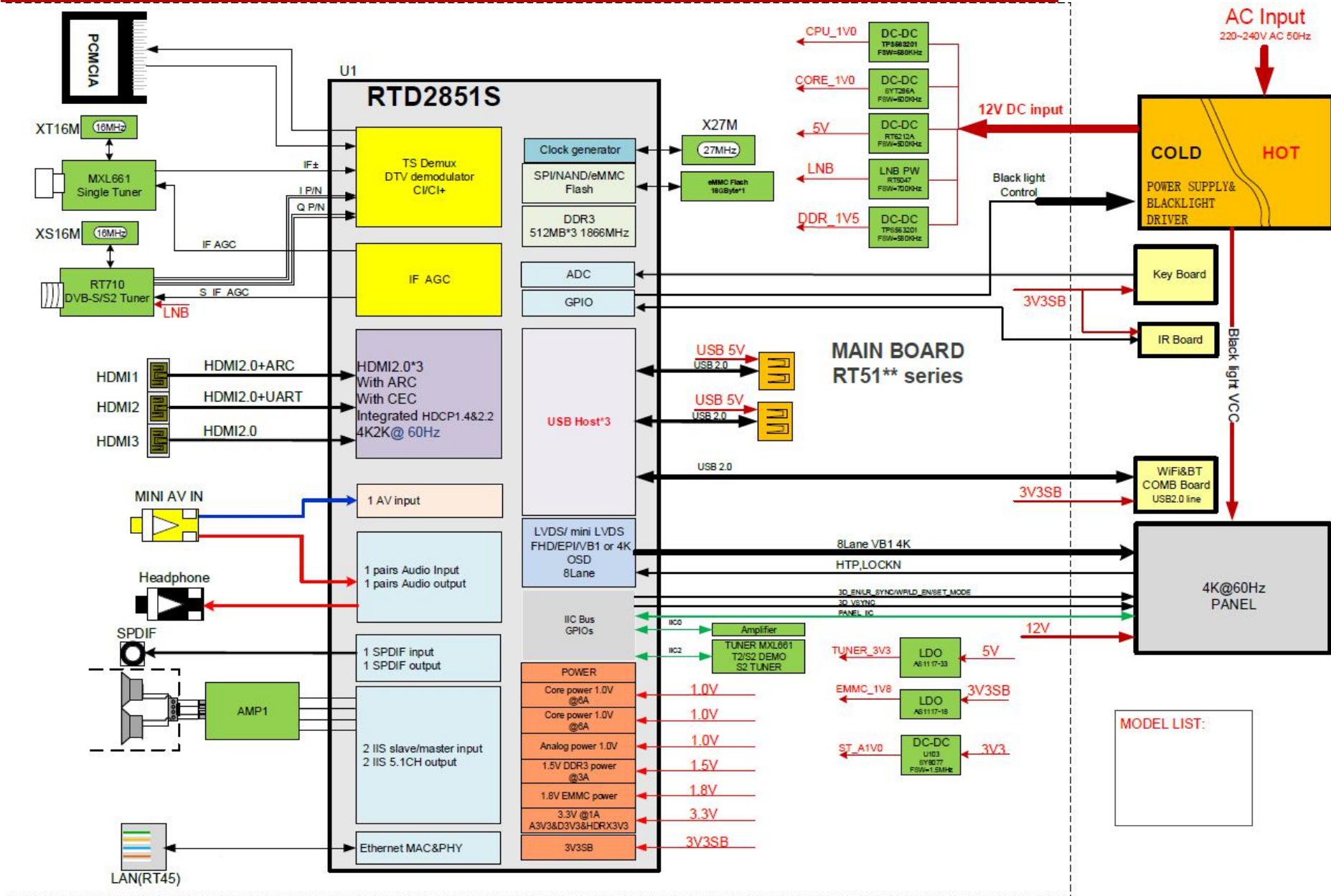
Note: The operation must enable factory "P" mode

CONFIDENTIAL

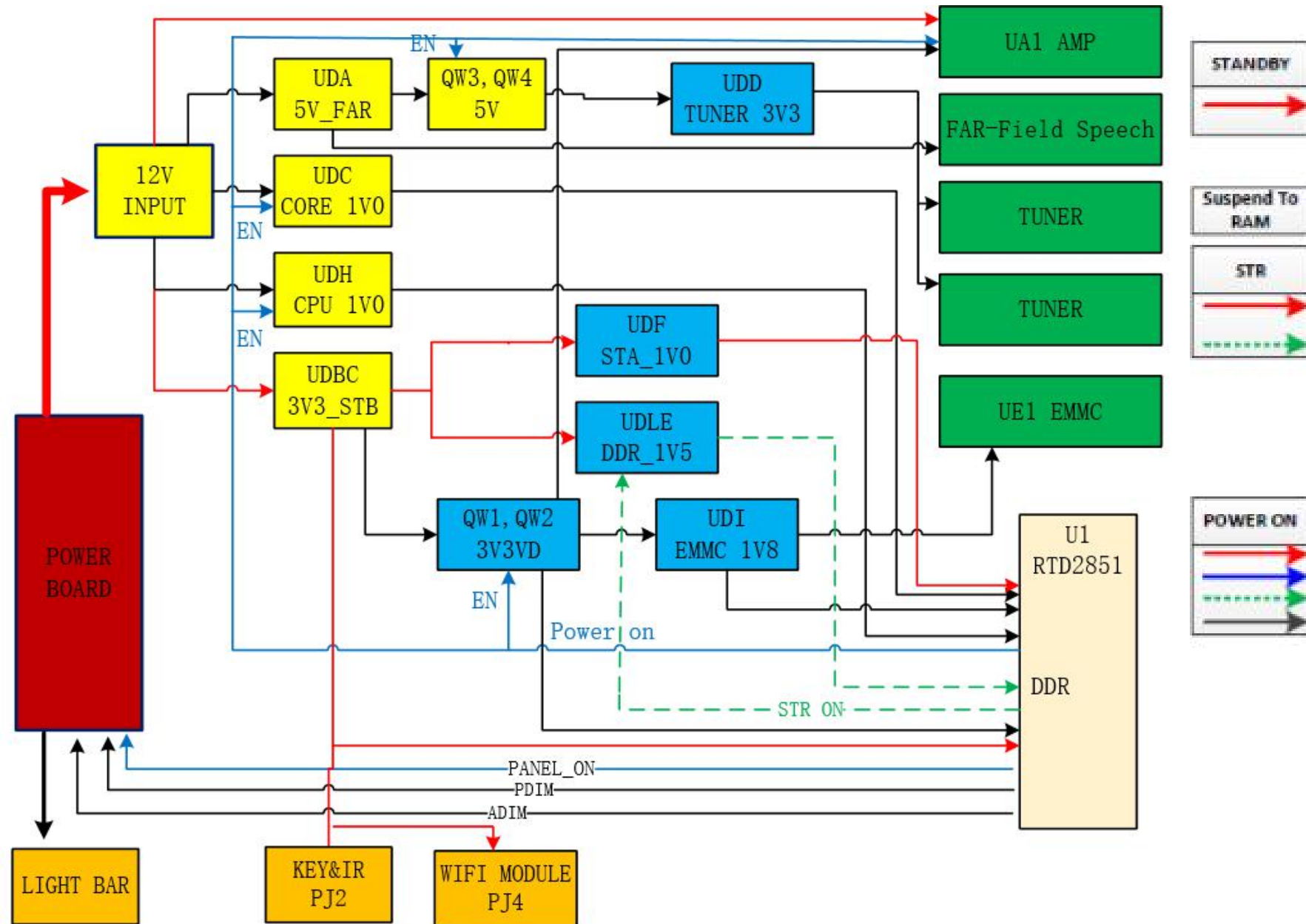
■RT51—Block diagram



RT51—Chassis Block Diagram



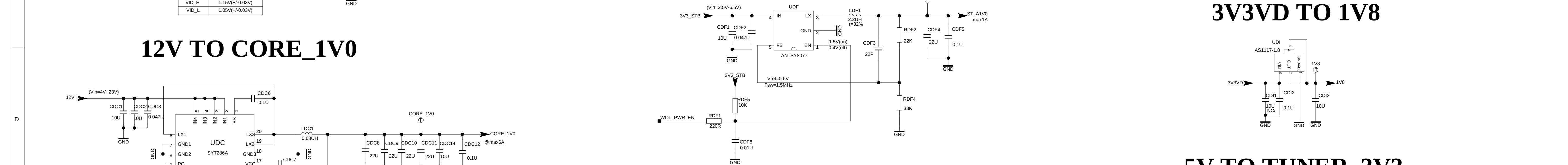
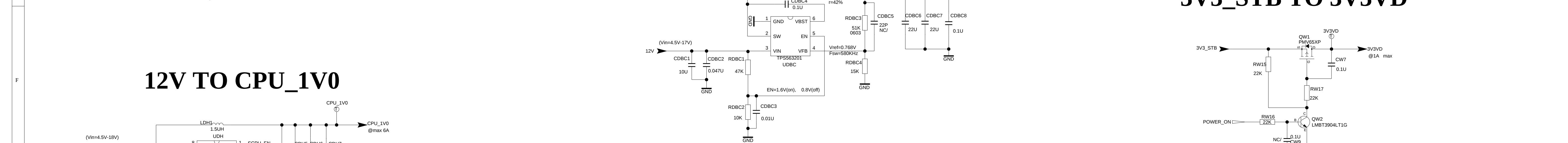
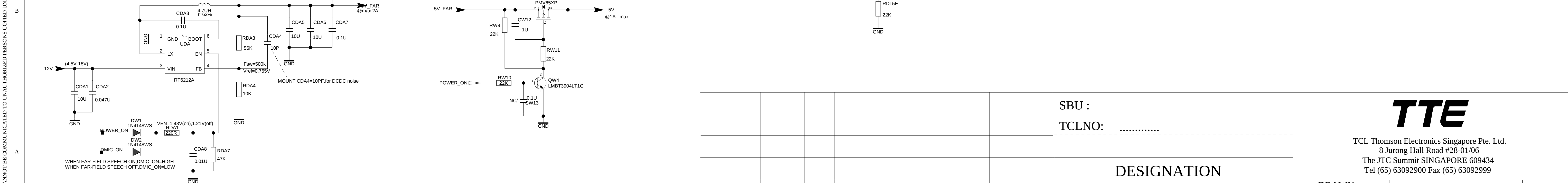
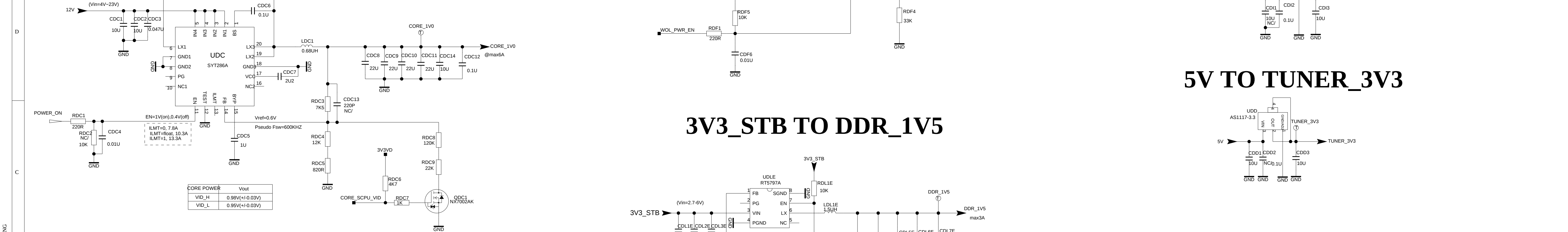
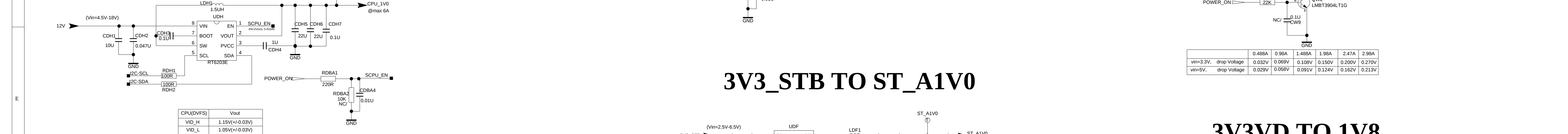
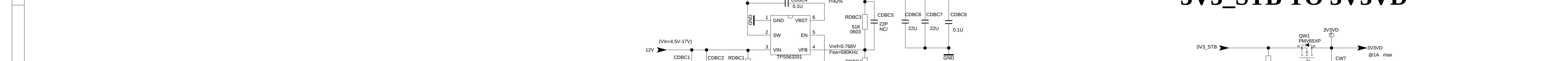
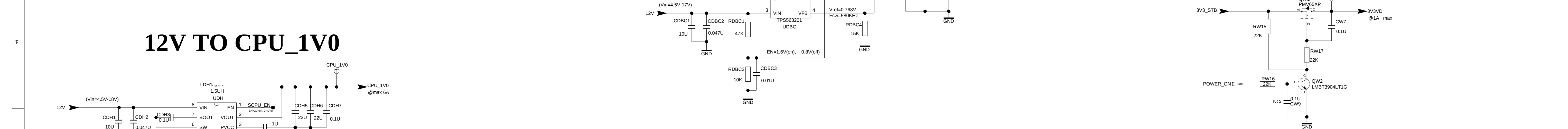
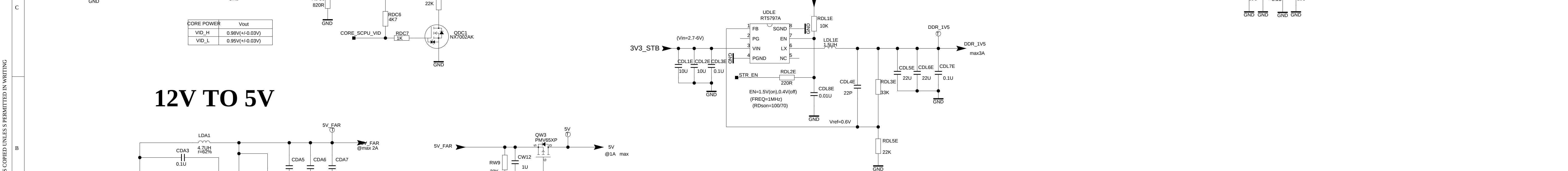
Power supply Block Diagram



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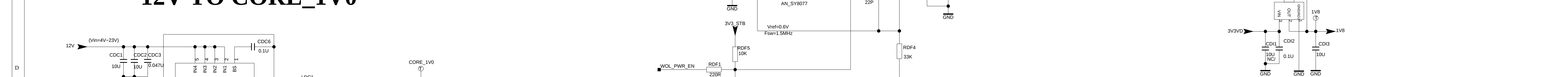
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PAGE2	POWER																																									
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PAGE5	USB/SPDIF/NET/EAR/AV																																									
PAGE6	SOC																																									
PAGE7	PCMCIA/EMMC																																									
PAGE8	AUDIO AMP																																									
PAGE9	WIFI/BLUETOOTH/VB1																																									
<table><tr><td>REFDES</td><td>Component</td><td colspan="2">I2C Address</td></tr><tr><td>UDH</td><td>6203E</td><td colspan="2">0x68</td></tr><tr><td>UT1</td><td>MX661</td><td colspan="2">0xC0</td></tr><tr><td>UF1</td><td>RT710</td><td colspan="2">0xF4</td></tr><tr><td>UA1</td><td>AD82088</td><td colspan="2">0x30</td></tr></table>							REFDES	Component	I2C Address		UDH	6203E	0x68		UT1	MX661	0xC0		UF1	RT710	0xF4		UA1	AD82088	0x30																	
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Only for 12V(14PIN) **3V3_STB TO DMIC_3V3**

[illegible]

	0.488A	0.98A	1.488A	1.98A	2.47A	2.98A
Vin=3.3V, drop Voltage	0.032V	0.069V	0.108V	0.150V	0.200V	0.270V
Vin=5V, drop Voltage	0.029V	0.058V	0.091V	0.124V	0.162V	0.213V

12V TO CORE 1V0



POWER_ON RDC1

EN=1V(on),0.4V(off)

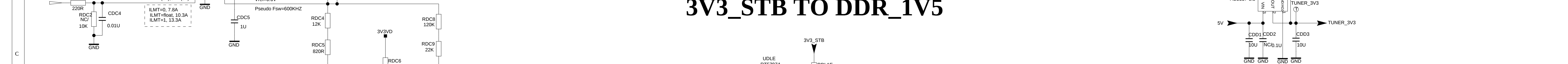
Vref=0.6V

RDC3 7K5

CDC13 220pF NC

UDD

AS1117-3.3



The schematic diagram illustrates the electrical connections for a device, likely a mobile phone or PDA as indicated by the title. It is divided into two main functional areas: Power and Microphone.

Power Section:

- A 10U capacitor is connected between VCC and GND.
- A 0.047U capacitor is connected between VCC and GND.
- The POWER_ON signal is connected to the cathode of diode DW1 (1N4148WS).
- The MIC_ON signal is connected to the cathode of diode DW2 (1N4148WS).
- Both diodes (DW1 and DW2) have their anodes connected to a common point labeled VEN=1.43V(on), 1.21V(off).
- This common point is connected to the RDA1 pin of the RDA7 integrated circuit.
- A 220R resistor is connected between the common point and the RDA1 pin.
- The RDA7 IC has its other pins connected to CDA8, 0.01U capacitors, and GND.

Microphone Section:

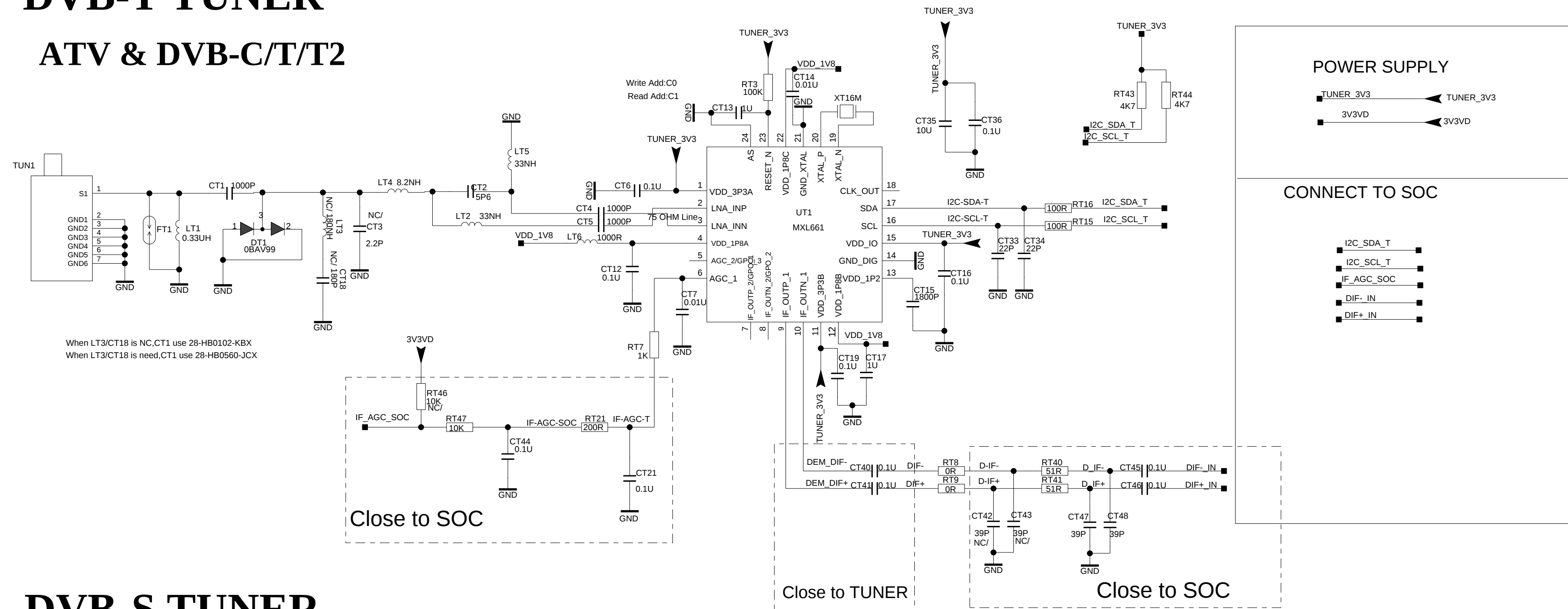
- The NC pin of the microphone component is connected to a 0.1U capacitor, which is then connected to GND.
- The W pin of the microphone component is connected to GND.

Legend:

- WHEN FAR-FIELD SPEECH ON, DMIC_ON=HIGH
- WHEN FAR-FIELD SPEECH OFF, DMIC_ON=LOW

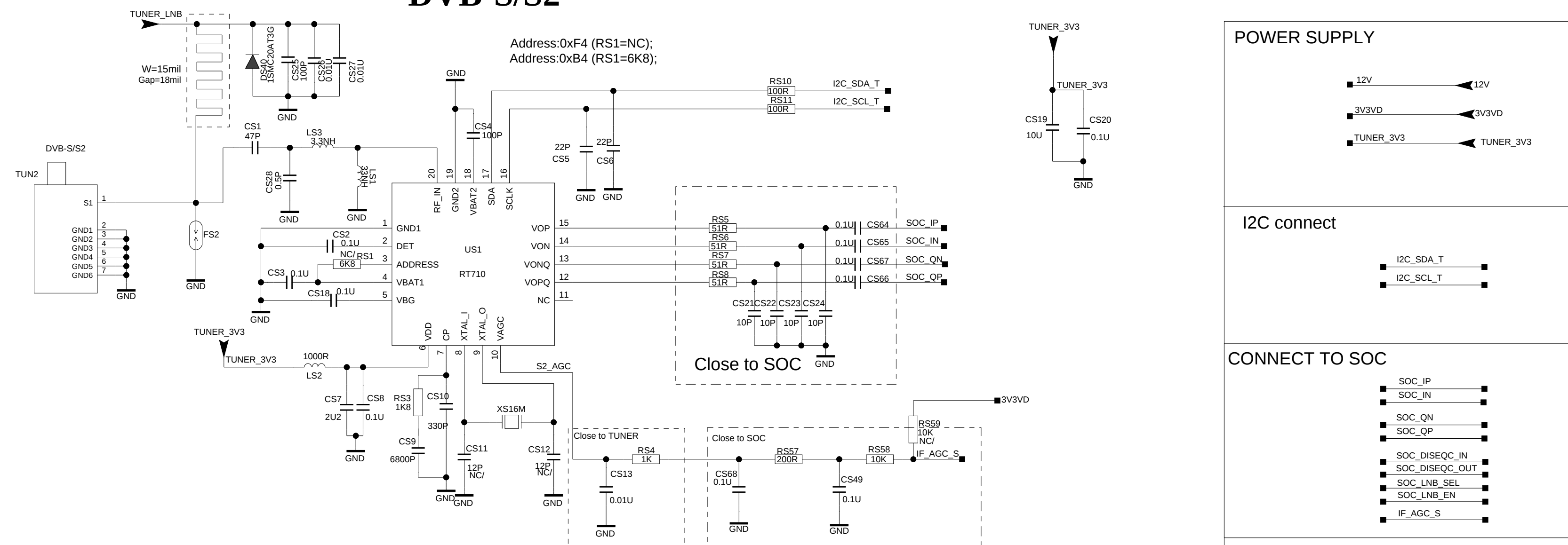
DVB-T TUNER

ATV & DVB-C/T/T2



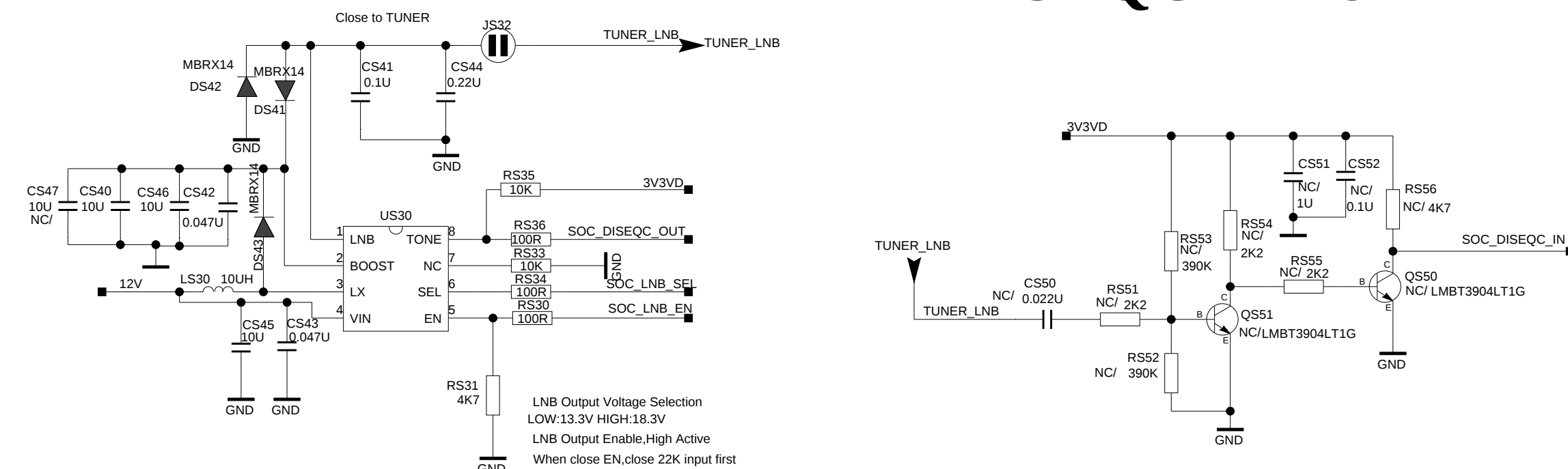
DVB-S TUNER

DVB-S/S2



12V TO TUNER LNB

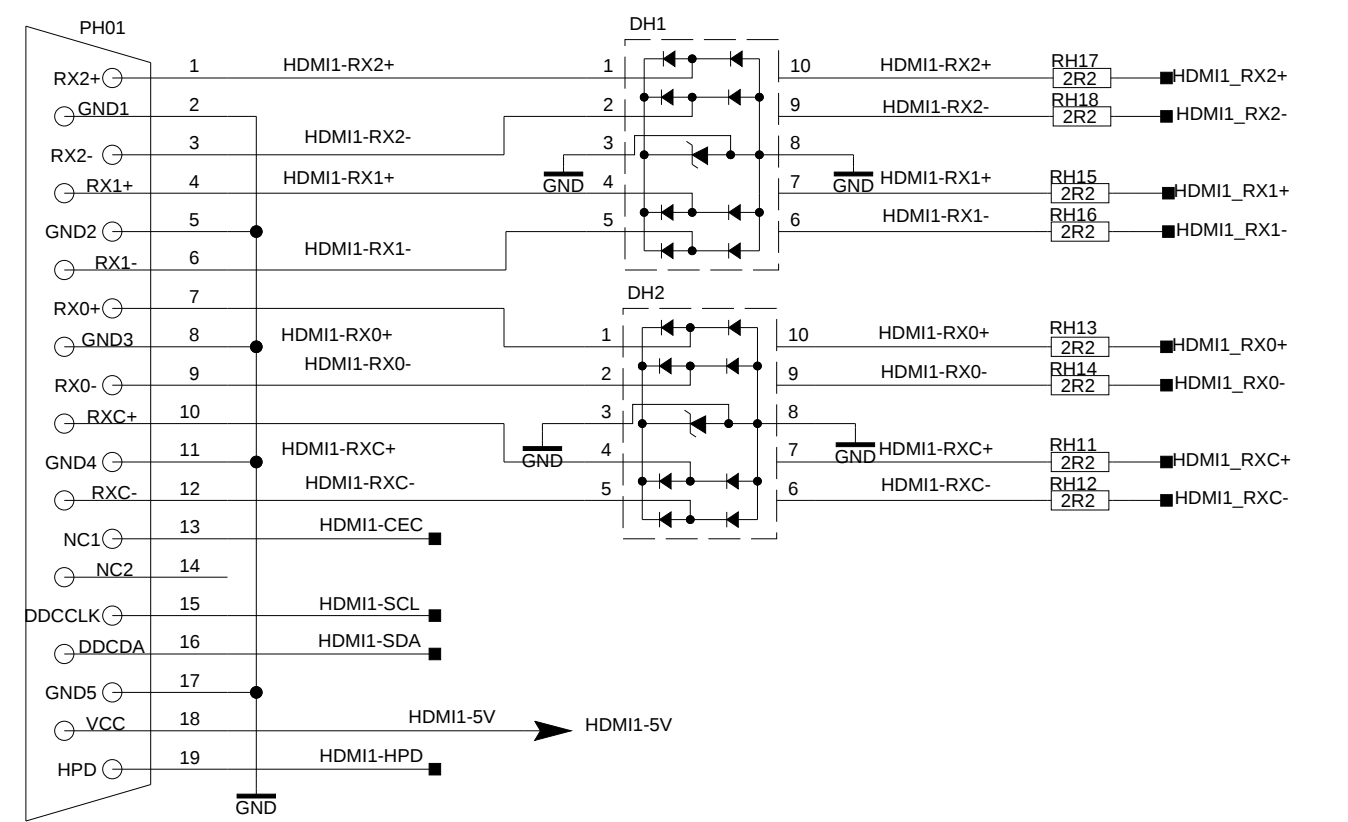
DISEQC INPUT



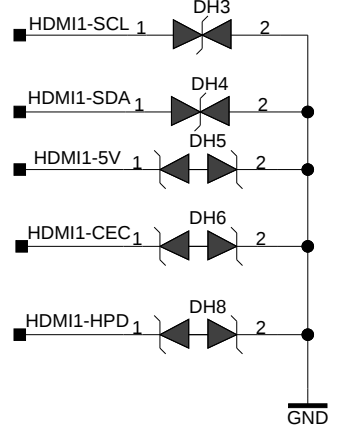
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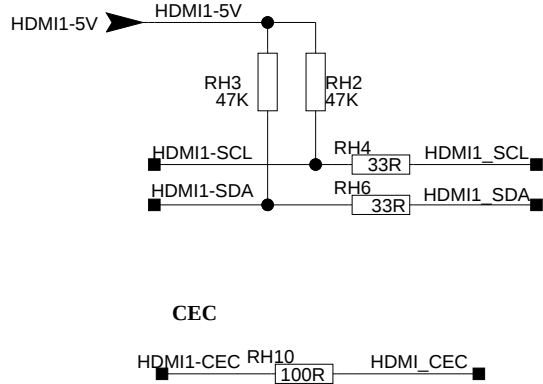
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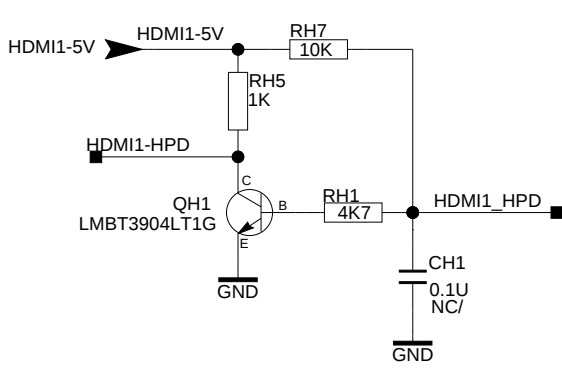
ESD Protection



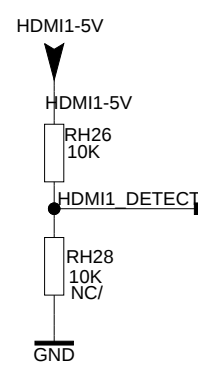
HDMI-DDC



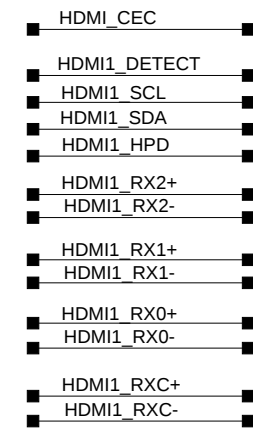
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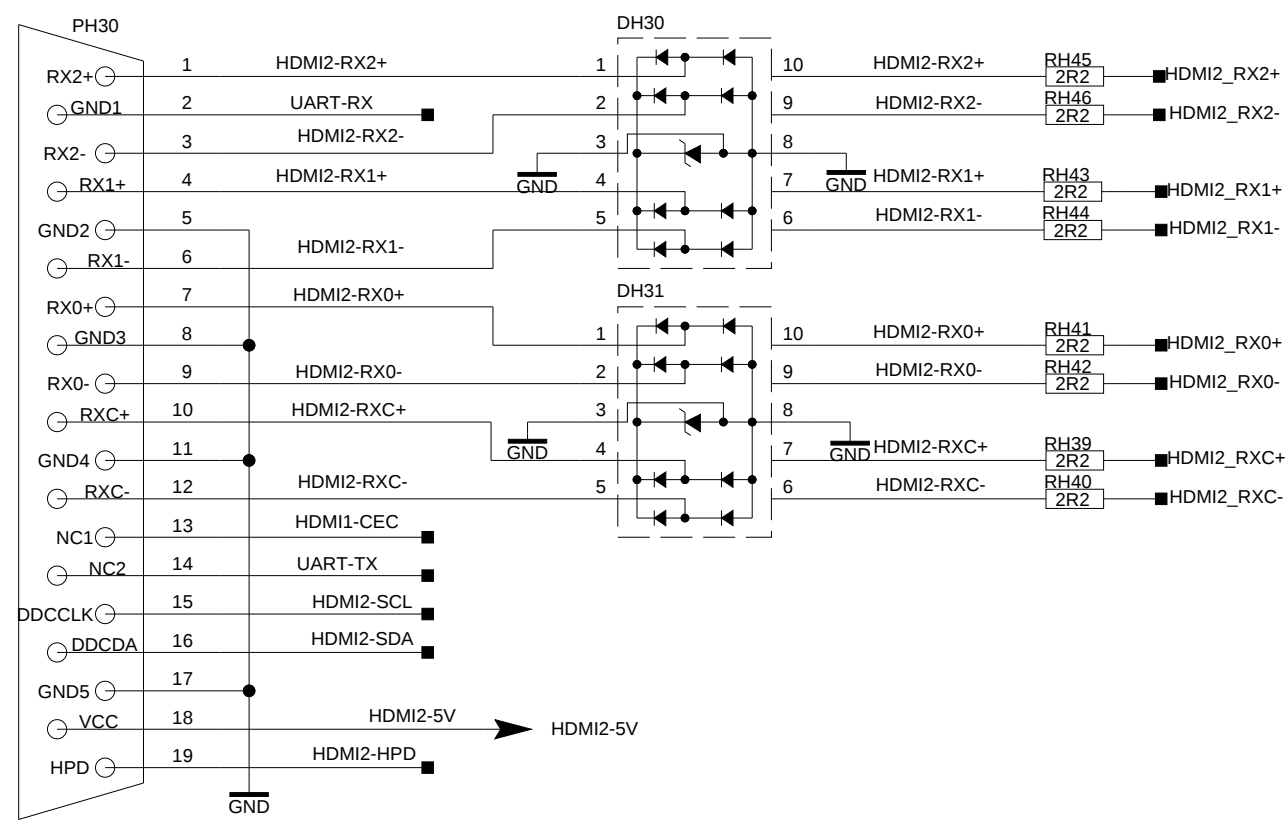
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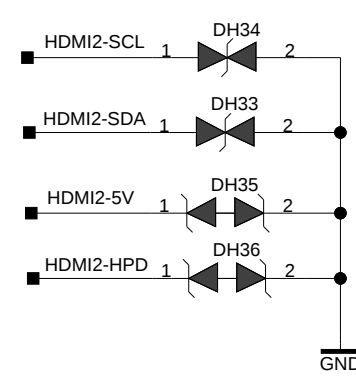
Connect to SOC



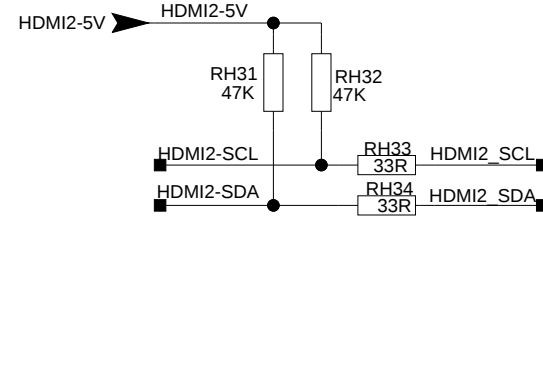
HDMI2(CEC&UART)



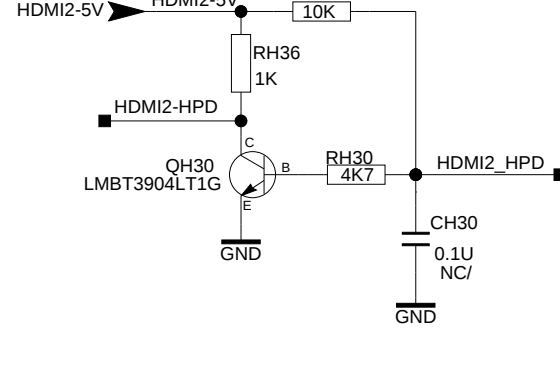
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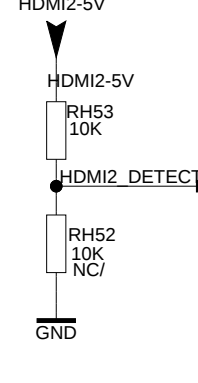
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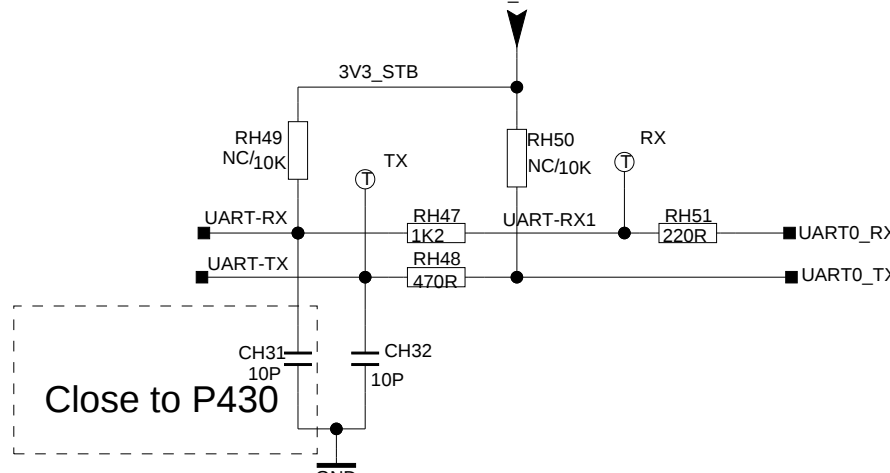
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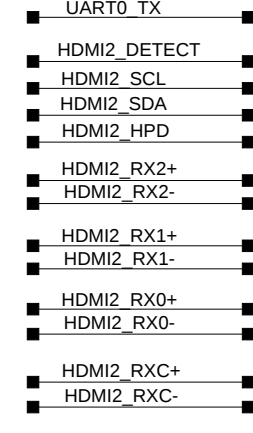
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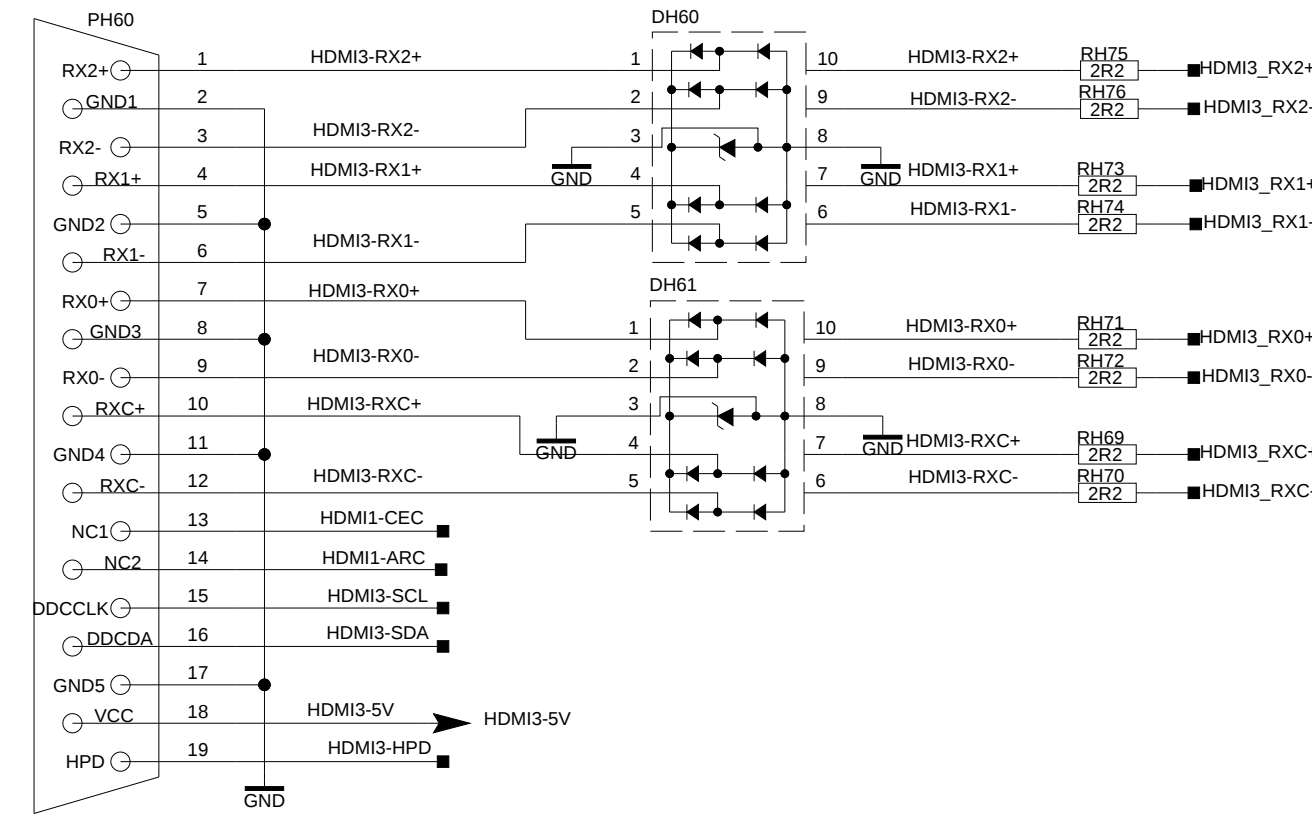
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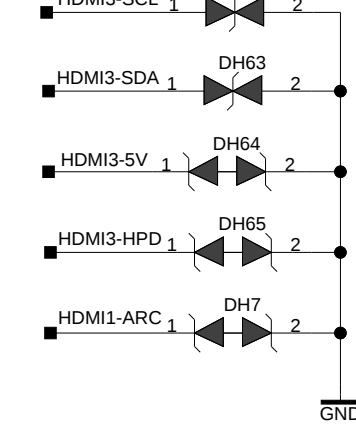
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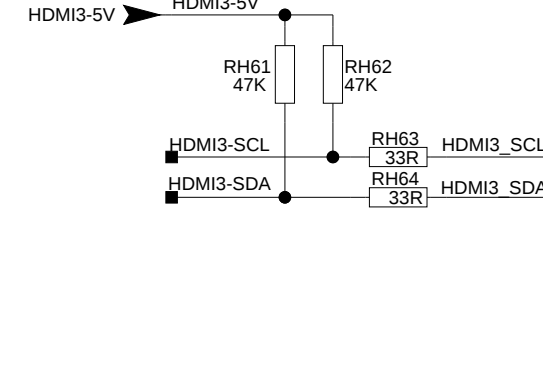
HDMI1(CEC & ARC)



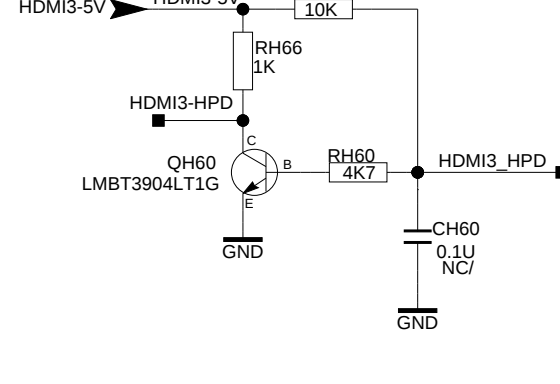
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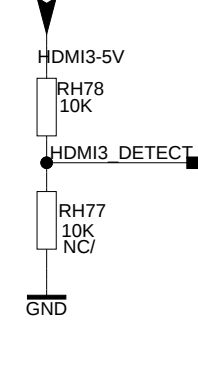
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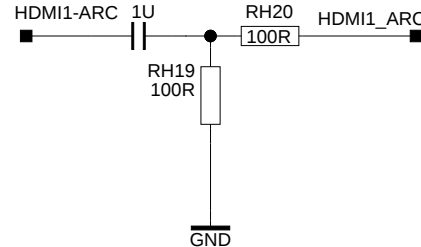
Hot-Plug



FOR REALTEK

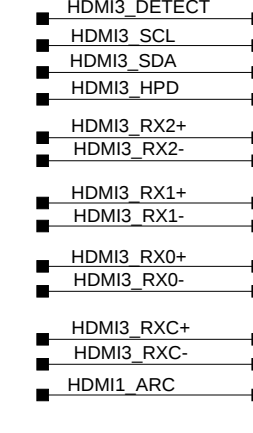


ARC FOR REALTEK



SoC

Connect to SOC



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Index-Lab	DATE	NAME	DESCRIPTION	Last modif						
										

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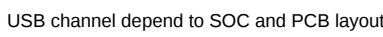
TCL Thomson Electronics Ltd.
B Building, TCL Tower, Nanhai Road
Nanshan District, Shenzhen, Guangdong
Tel +86-755-3331xxxx Fax +86-755-3331xxxx

A

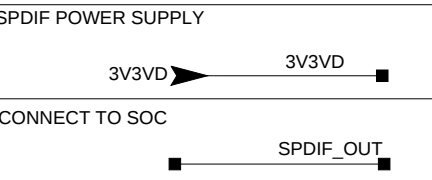
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Ethernet



SPIDIF(Optical)



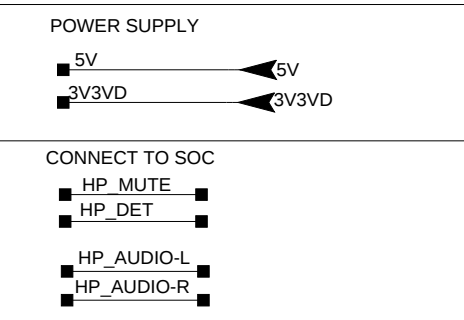
CONNECT TO SOC

CVBS_IN
VCOM

AUL_IN
AUR_IN



HEADPHONG OUTPUT



TTE

TCL Thomson Electronics Singapore Pte. Ltd.
8 Jurong Hall Road #28-01/06
The JTC Summit SINGAPORE 609434
Tel (65) 63092900 Fax (65) 63092999

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The diagram illustrates the DDR1 memory interface for the RTD2851E. It shows the connection of the DDR1 memory (U1) to the DDR1_V5 power supply. The memory is connected to the DDR1_V5 supply through a series of resistors (R01-R04) and capacitors (C01-C04). The memory is also connected to the DDR1_V5 supply through a series of resistors (R05-R08) and capacitors (C05-C08). The diagram includes labels for the memory pins (B17, C17, D17, E17, H15, J15, K15, L15) and the power supply pins (VREF, ZQ1, ZQ2, ZQ3, ZQ4). The diagram also shows the connection of the DDR1_V5 supply to the DDR1_V5 pin of the RTD2851E. The diagram includes a note about the near SOC side and the far side option.

The diagram illustrates the internal connections of the RTD2851E board. It features several functional blocks: RGB, CVBS, Audio, and SPDIF. The board is connected to a U1 chip. The RGB section includes connections for VSYNC, HSYNC, and various video signals (VIN_0P, VIN_1P, VIN_2P, VIN_BN, VIN_0N, VIN_1N, VIN_2N). The CVBS section includes connections for VIN_10P, VIN_AON, TST_13P, and SCART_FSW_0. The Audio section includes connections for AUL IN, AUR IN, AIL, AIR, A2L, A2R, A3L, A3R, A10L, A10R, HP AUDIO-L, and HP AUDIO-R. The SPDIF section includes connections for SPDIF_OUT/GPIO107, VDACCOUT, ADGC, BBG, and VCM8B. Power and ground connections (L06, L07, C38, C39) are shown at the bottom.

CI PCMCIA

PC_CD1# R17
PC_CE1# L20
PC_OE1 L20
PC_ODRW# L19
PC_DW# L18
PC_RST H20
PC_WE# K19
PC_WAIT# H19
PC_IRQ# K17
PC_ADDR0 G19
PC_ADDR1 G20
PC_ADDR2 H17
PC_ADDR3 H18
PC_ADDR4 J20
PC_ADDR5 C21
PC_ADDR6 D19
PC_ADDR7 D20
PC_ADDR8 D21
PC_ADDR9 E18
PC_ADDR10 E20
PC_ADDR11 E19
PC_ADDR12 F21
PC_ADDR13 F20
PC_ADDR14 P17
PC_ADDR15 N18
PC_ADDR16 M18
PC_ADDR17 M18
PC_D0#G0P065
PC_D1#G0P067
PC_D2#G0P069
PC_D3#G0P028
PC_D4#G0P30
PC_D5#G0P32
PC_D6#G0P34
PC_D7#G0P36
PC_D0#G0P064
PC_D1#G0P066
PC_D2#G0P029
PC_D3#G0P033
PC_D4#G0P31
PC_D5#G0P033
PC_D6#G0P033
PC_D7#G0P037
PC_CLK#G0P053
PC_VAL#G0P060
PC_SYNC#G0P062
PC_D0#G0P064
PC_D1#G0P044
PC_D2#G0P045
PC_D3#G0P047
PC_D4#G0P49
PC_D5#G0P033
PC_D6#G0P033
PC_D7#G0P037
PC_CLK#G0P052
PC_VAL#G0P062
PC_SYNC#G0P042

SPI

SPI_HOLD#G0P018
SPI_CFG#G0P018
SPI_DCLK#G0P018
SPI_DQ#G0P018
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Pin diagram of the RTD28S1E chip. The chip is rectangular with pins on all four sides. The top edge has pins T11, V9, T8, U11, T12, U12, T10, U10, V10, U8, T9, and U9. The right edge has pins U1, V1, V11, P0, BN, P0, BP, P0, CN, P0, CKP, P0, GN, P0, GP, P0, RN, P0, RP, Y1, P1, BN, P1, CN, P1, CKP, P1, GN, P1, RN, P1, RP, Y6, P2, BN, P2, BP, P2, CN, P2, CKP, P2, GP, P2, GN, P2, RN, P2, RP, and Y7. The bottom edge has pins RTD28S1E. The diagram shows internal connections between pins and various functional blocks: ARC/ST_GPIOD2, CEC, HDMI, and RECT. The HDMI block is connected to pins T11, V9, T8, U11, T12, U12, T10, U10, V10, U8, T9, and U9. The ARC/ST_GPIOD2 block is connected to pins U1, V1, V11, P0, BN, P0, BP, P0, CN, P0, CKP, P0, GN, P0, GP, P0, RN, P0, RP, Y1, P1, BN, P1, CN, P1, CKP, P1, GN, P1, RN, P1, RP, Y6, P2, BN, P2, BP, P2, CN, P2, CKP, P2, GP, P2, GN, P2, RN, P2, RP, and Y7. The CEC block is connected to pins V1, P0, BN, P0, BP, P0, CN, P0, CKP, P0, GN, P0, GP, P0, RN, P0, RP, Y1, P1, BN, P1, CN, P1, CKP, P1, GN, P1, RN, P1, RP, Y6, P2, BN, P2, BP, P2, CN, P2, CKP, P2, GP, P2, GN, P2, RN, P2, RP, and Y7. The RECT block is connected to pins Y1, P1, BN, P1, CN, P1, CKP, P1, GN, P1, RN, P1, RP, Y6, P2, BN, P2, BP, P2, CN, P2, CKP, P2, GP, P2, GN, P2, RN, P2, RP, and Y7.

U1

LSA

I2C/UART

CUST_GPIO05

DA/ST_GPIO04

XP

XN

ETN

TCL Thomson Electronics Singapore Pte. Ltd.
8 Jurong Hall Road #28-01/06
The JTC Summit SINGAPORE 609434
Tel (65) 63092900 Fax (65) 63092999

DESIGNATION

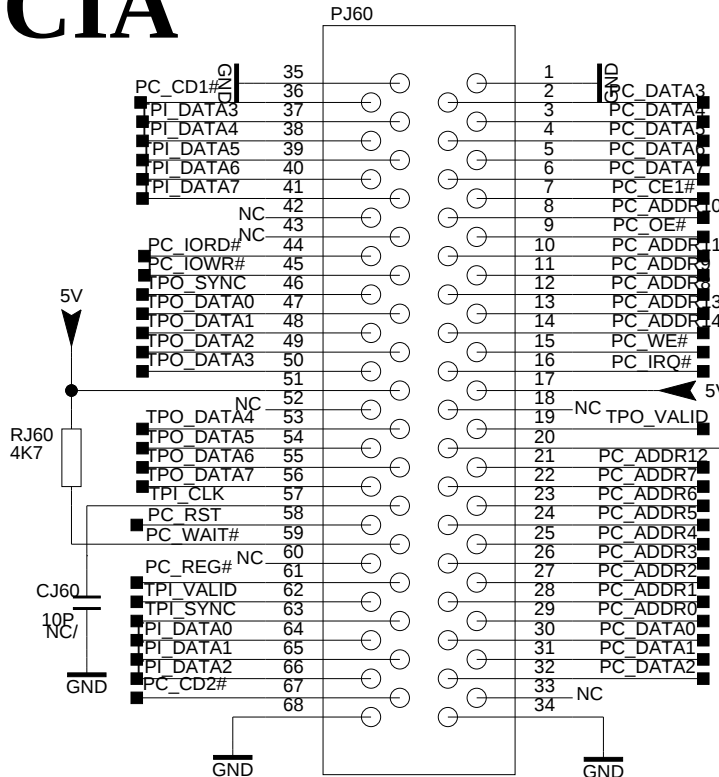
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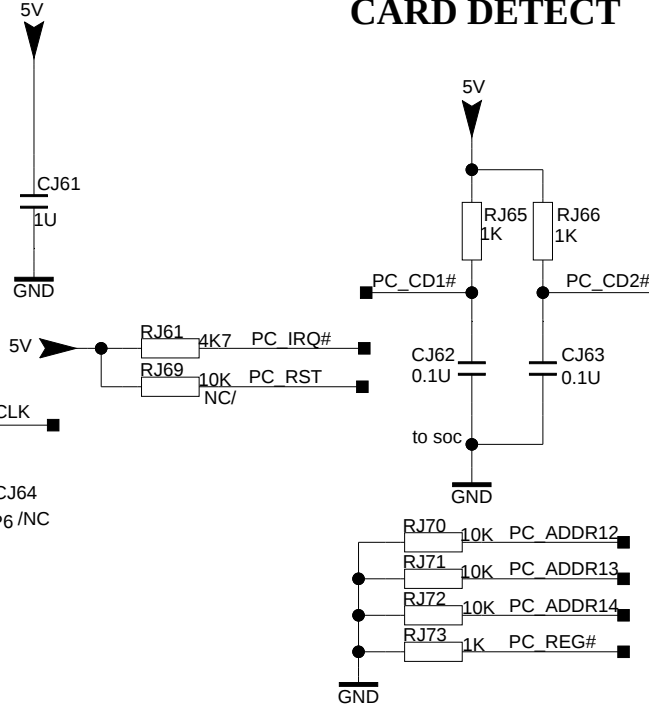
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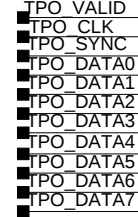
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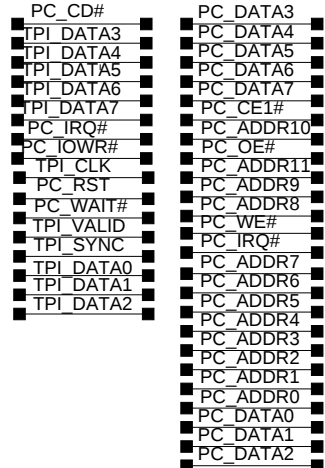
CARD DETECT



CONNECT TO SOCIETY

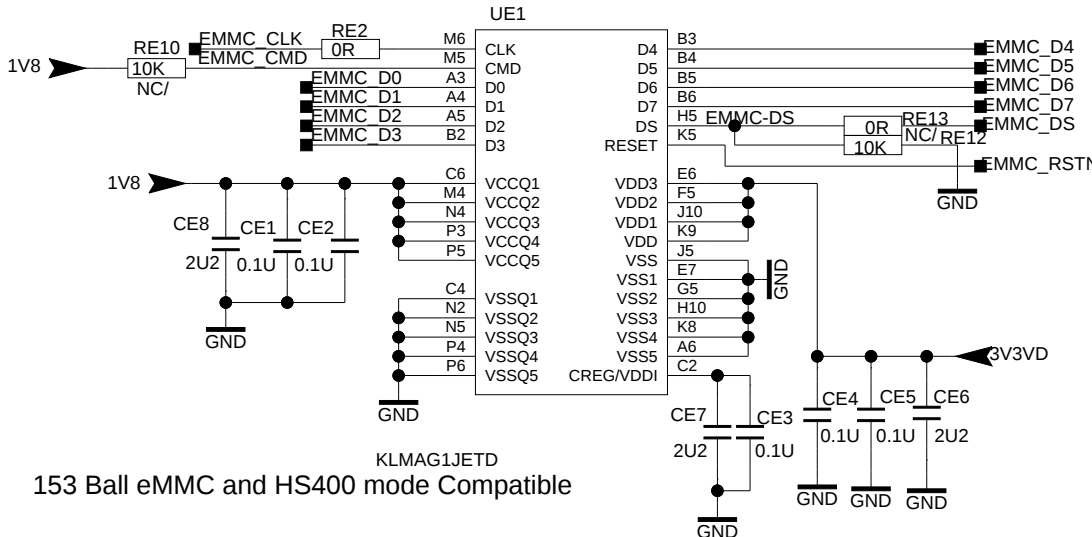


CONNECT TO SOC

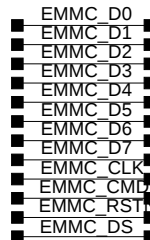


eMMC

J5/A6=GND & H5=DS Controlled by SoC For HS400 Mode
NC For Other Mode



CONNECT TO SOC



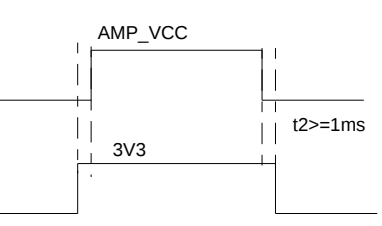
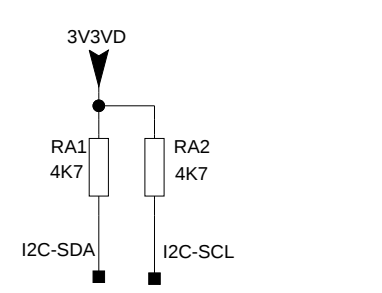
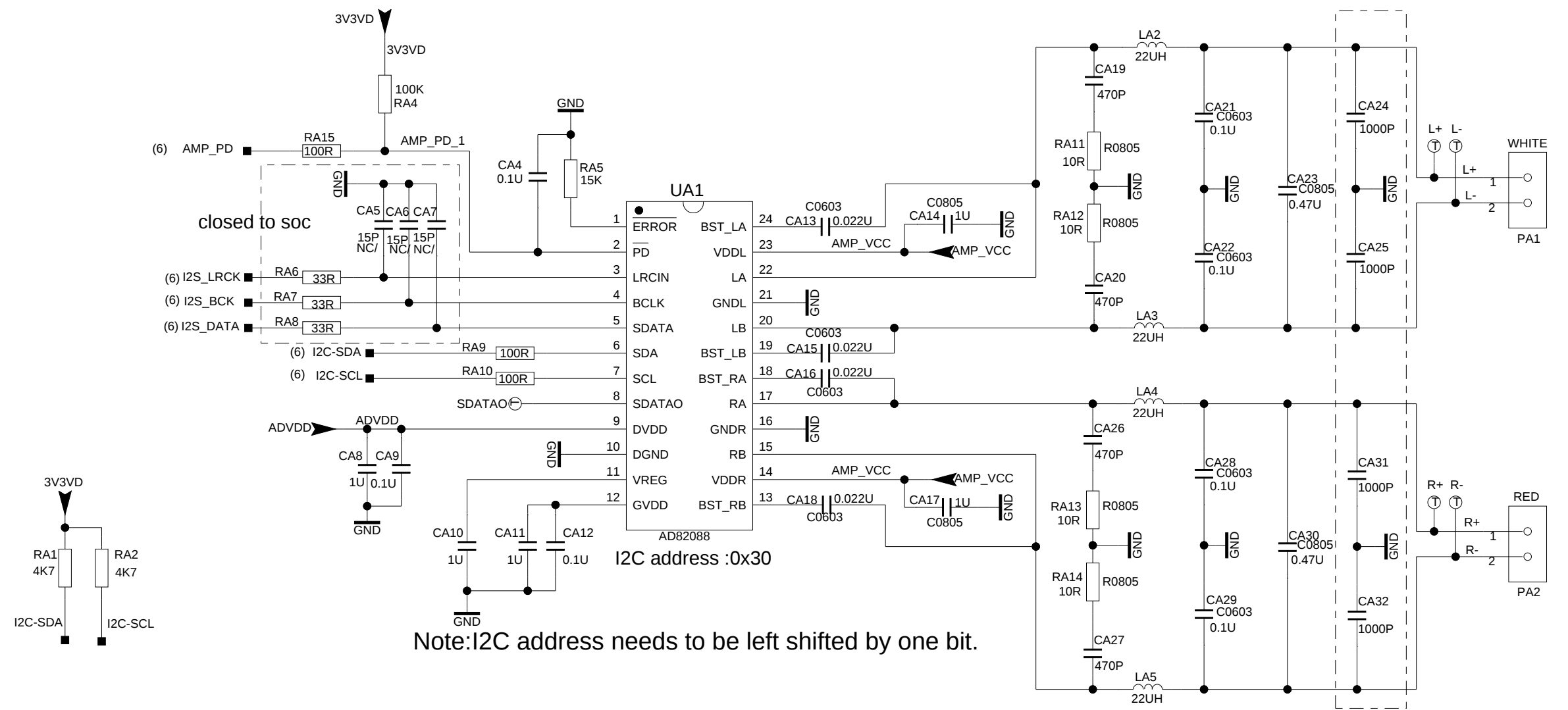
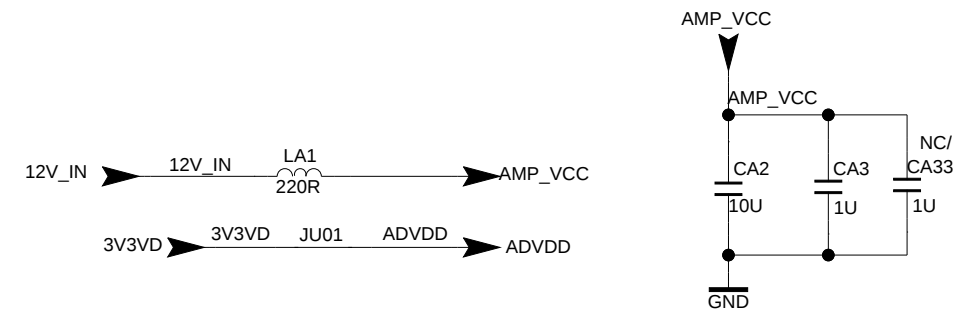
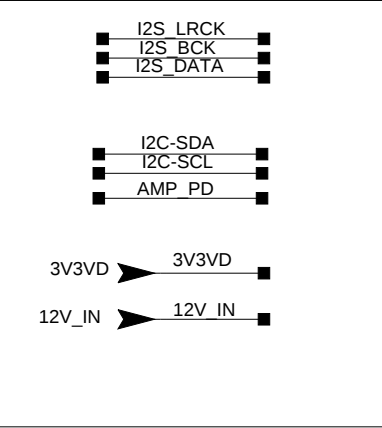
eMMC VCC Power



					SBU :	TTE TCL Thomson Electronics Singapore Pte. Ltd. 8 Jurong Town Hall Road #28-01/06 The JTC Summit SINGAPORE 609434 Tel (65) 63092900 Fax (65) 63092999							
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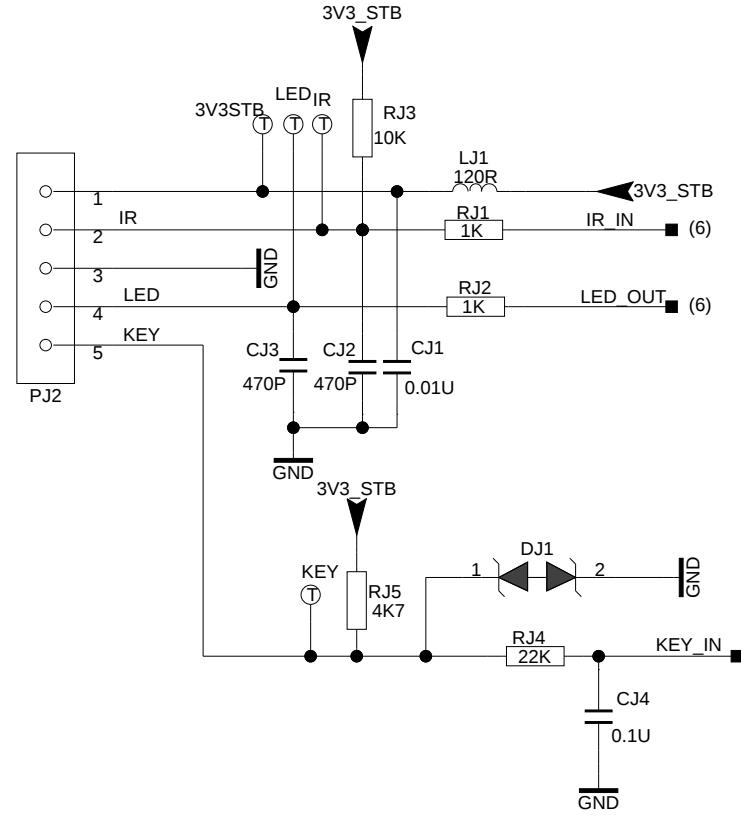
Note:I2C address needs to be left shifted by one bit.

8ohm Speaker,CA23/CA30 use 0.22u:28-BB0224-KBX
6ohm bass,CA23/CA30 use 0.47u:28-BB0474-KBX

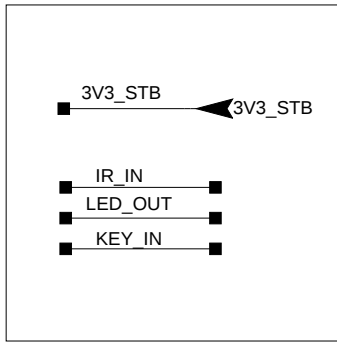
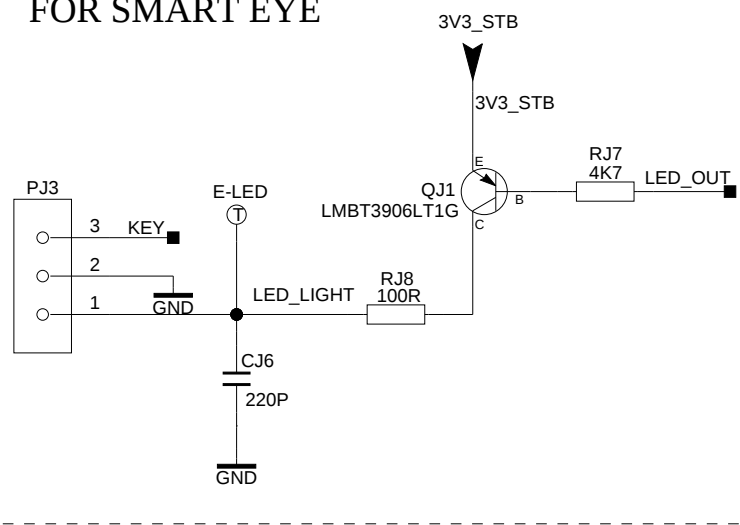
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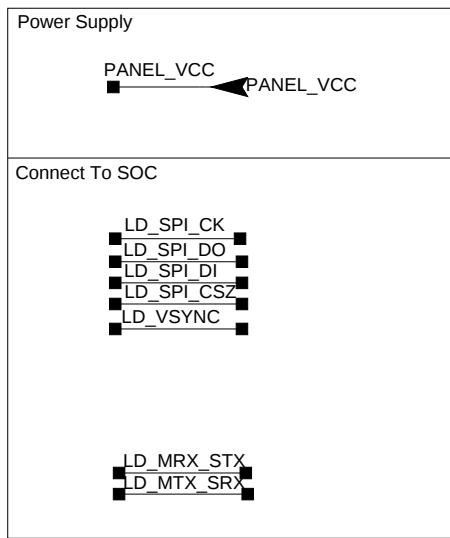
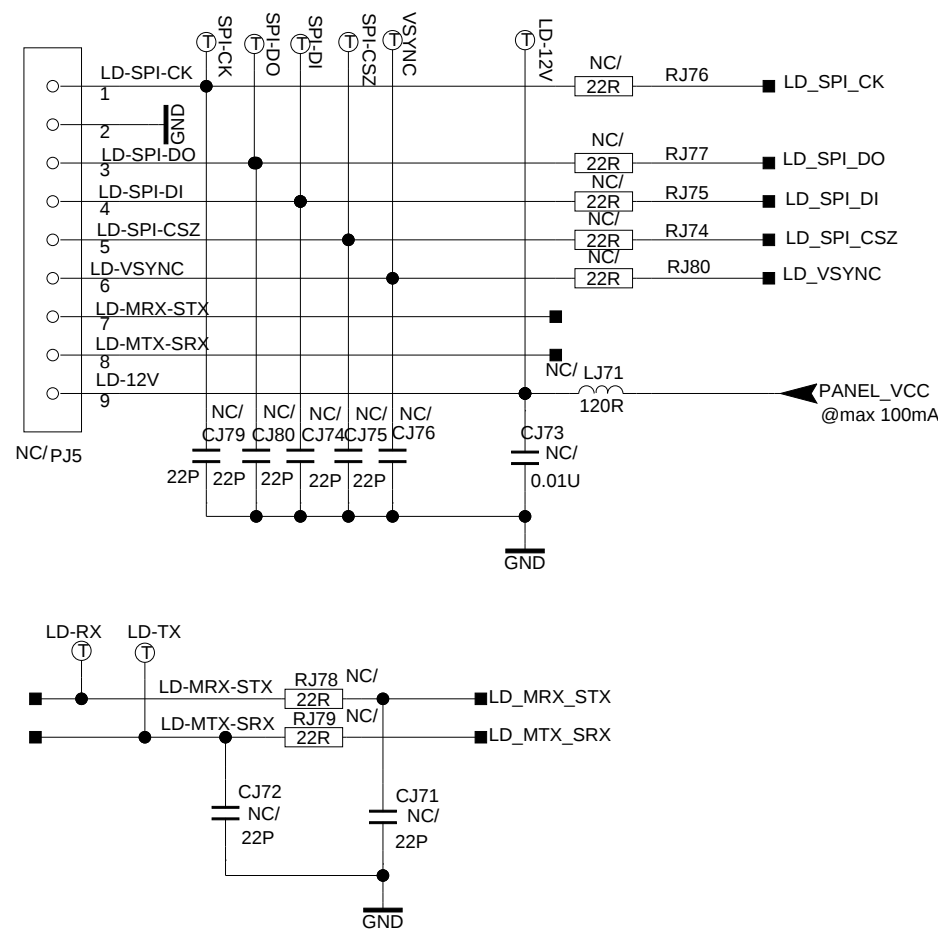


FOR SMART EYE



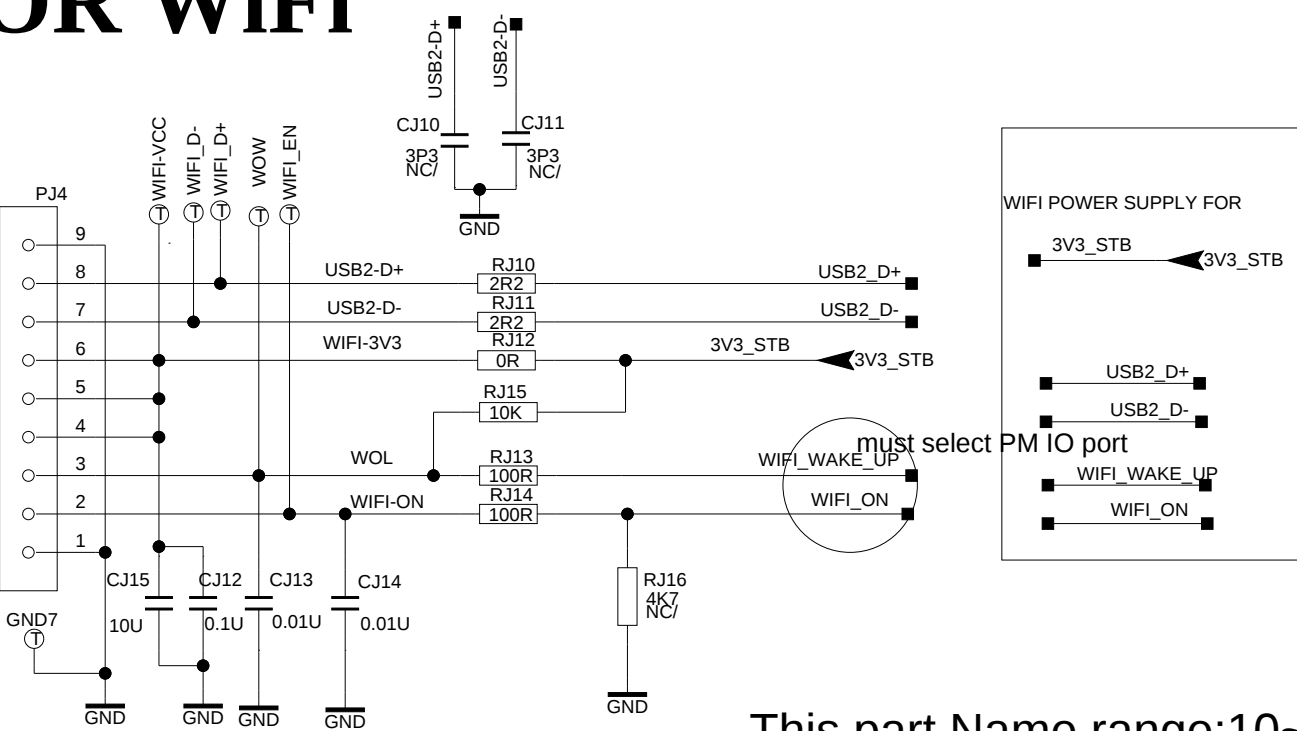
This part Name range:1~9

LOCAL DIMMING(FOR MAIN BOARD)



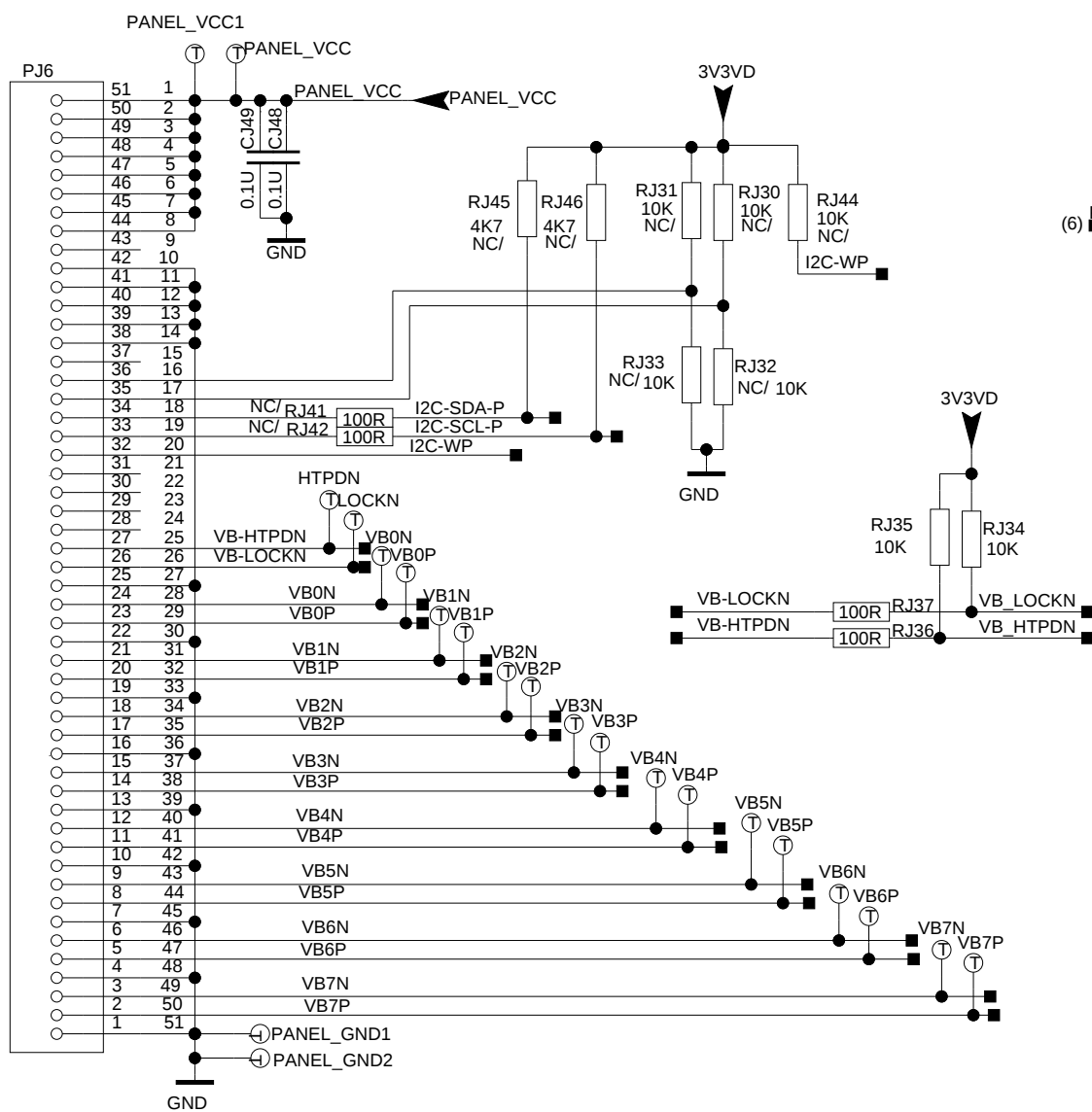
This part Name range:70~99

FOR WiFi

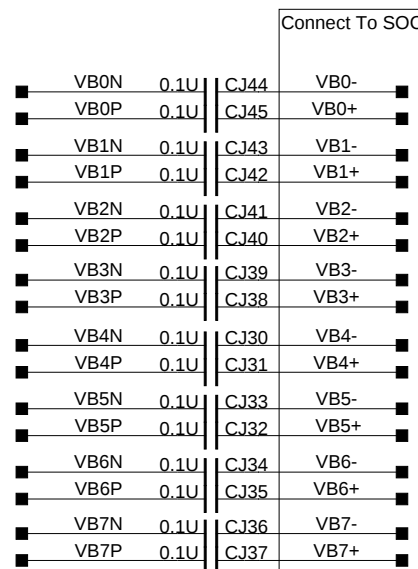
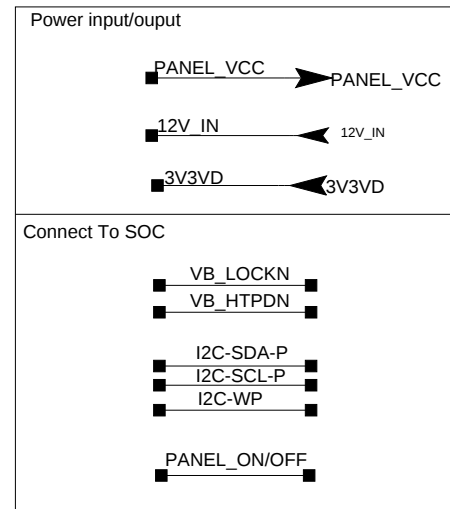
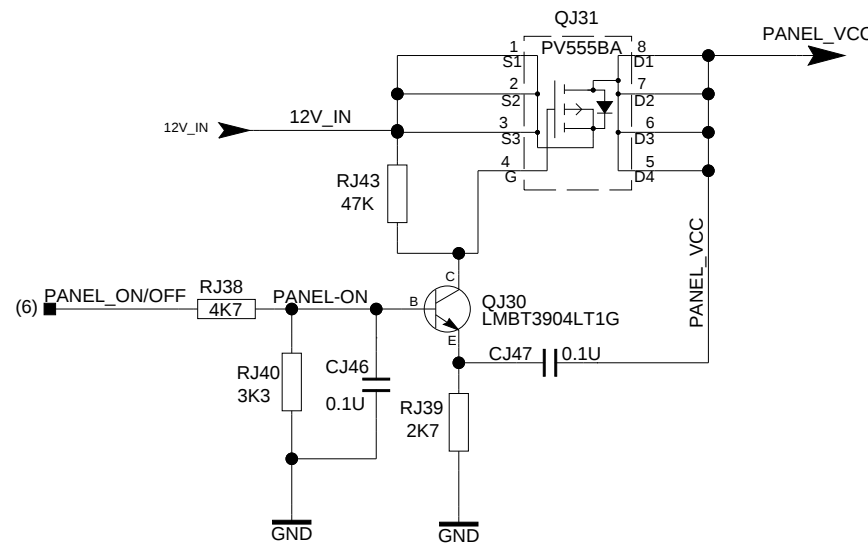


This part Name range:10~19

VB1 Panel Interface



Panel Power



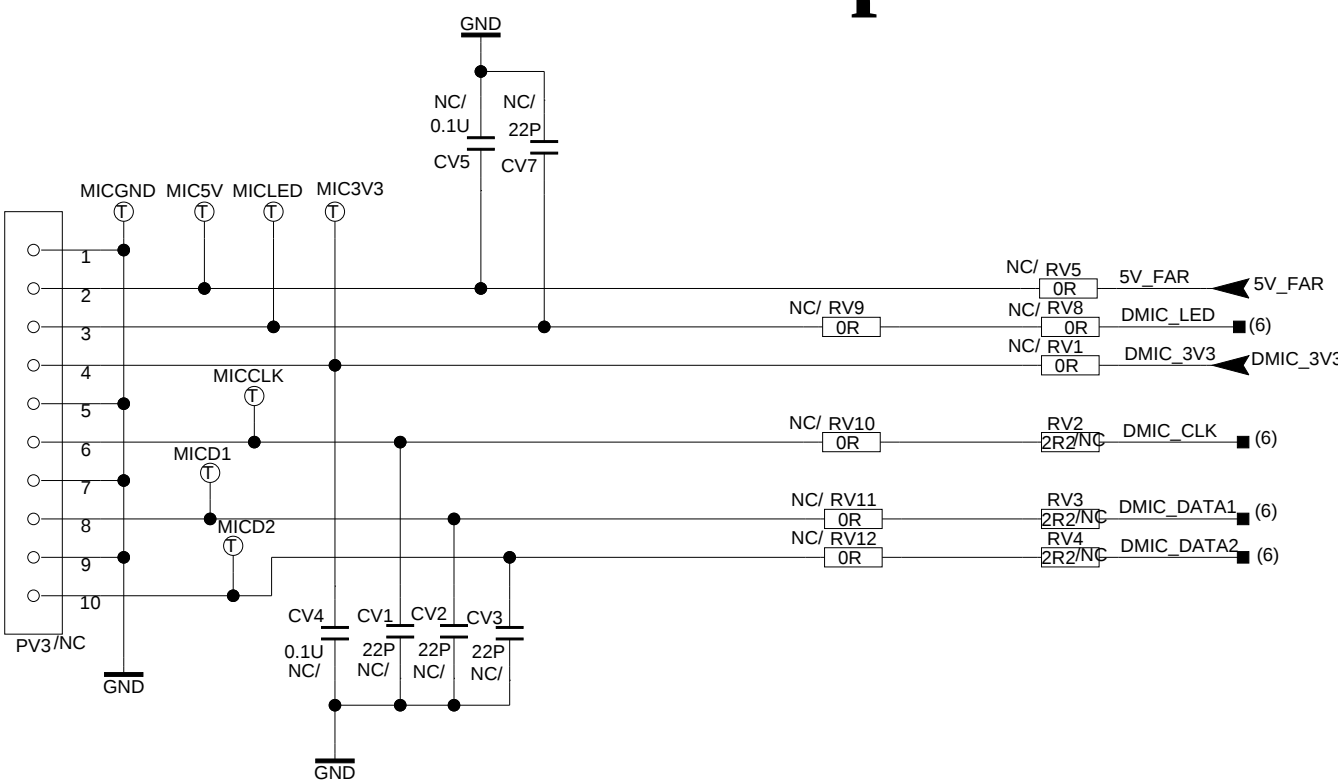
1: IIC option for panel

PANEL	AUO	OTHER
RJ41	100	NC
RJ42	100	NC
RJ44	10K	NC

2:DIM option for panel

PANEL	LG	OTHER
RJ31	NC	NC
RJ33	10K	NC
RJ30	10K	NC
RJ32	NC	NC

Far-field Speech



SMT

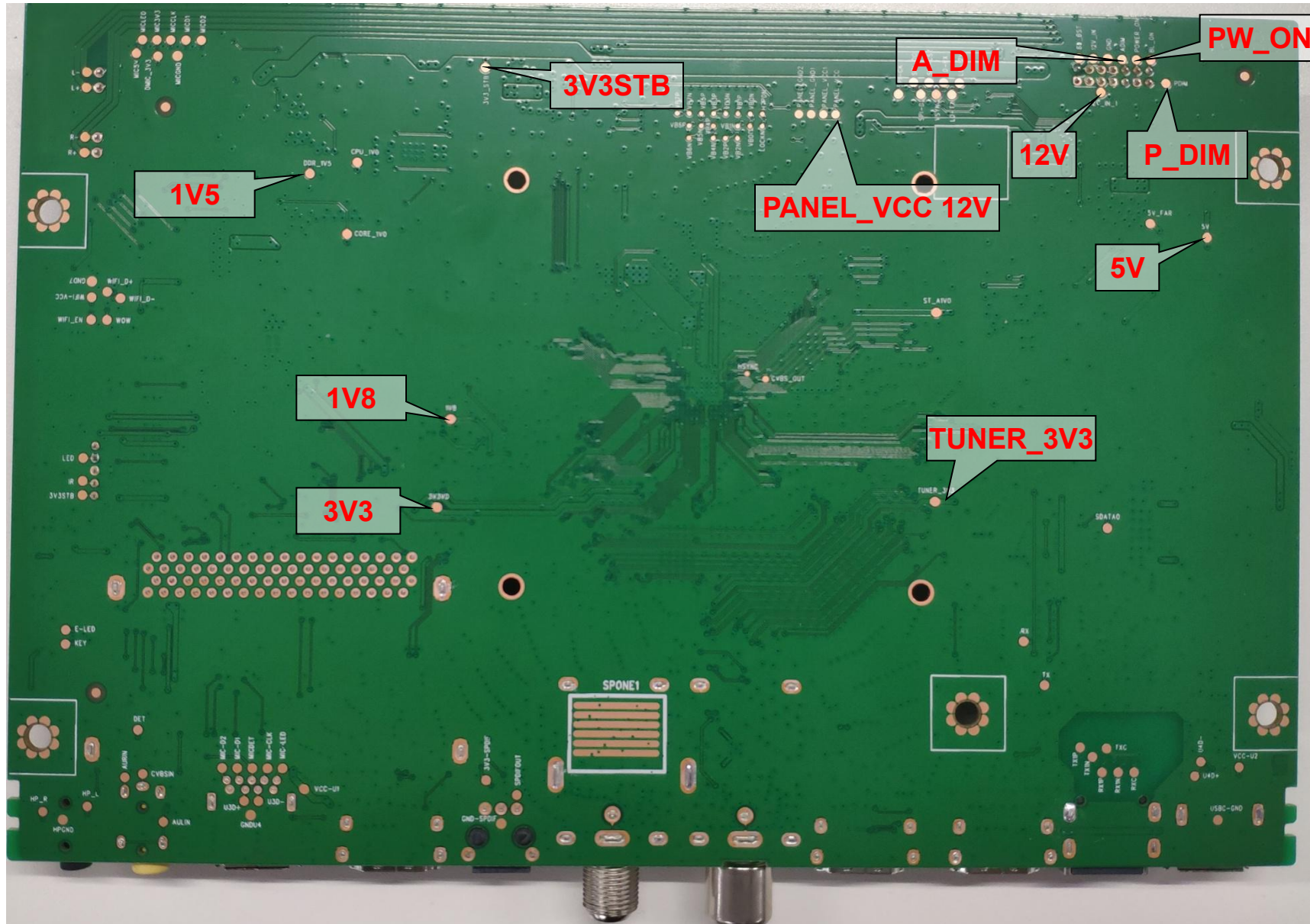
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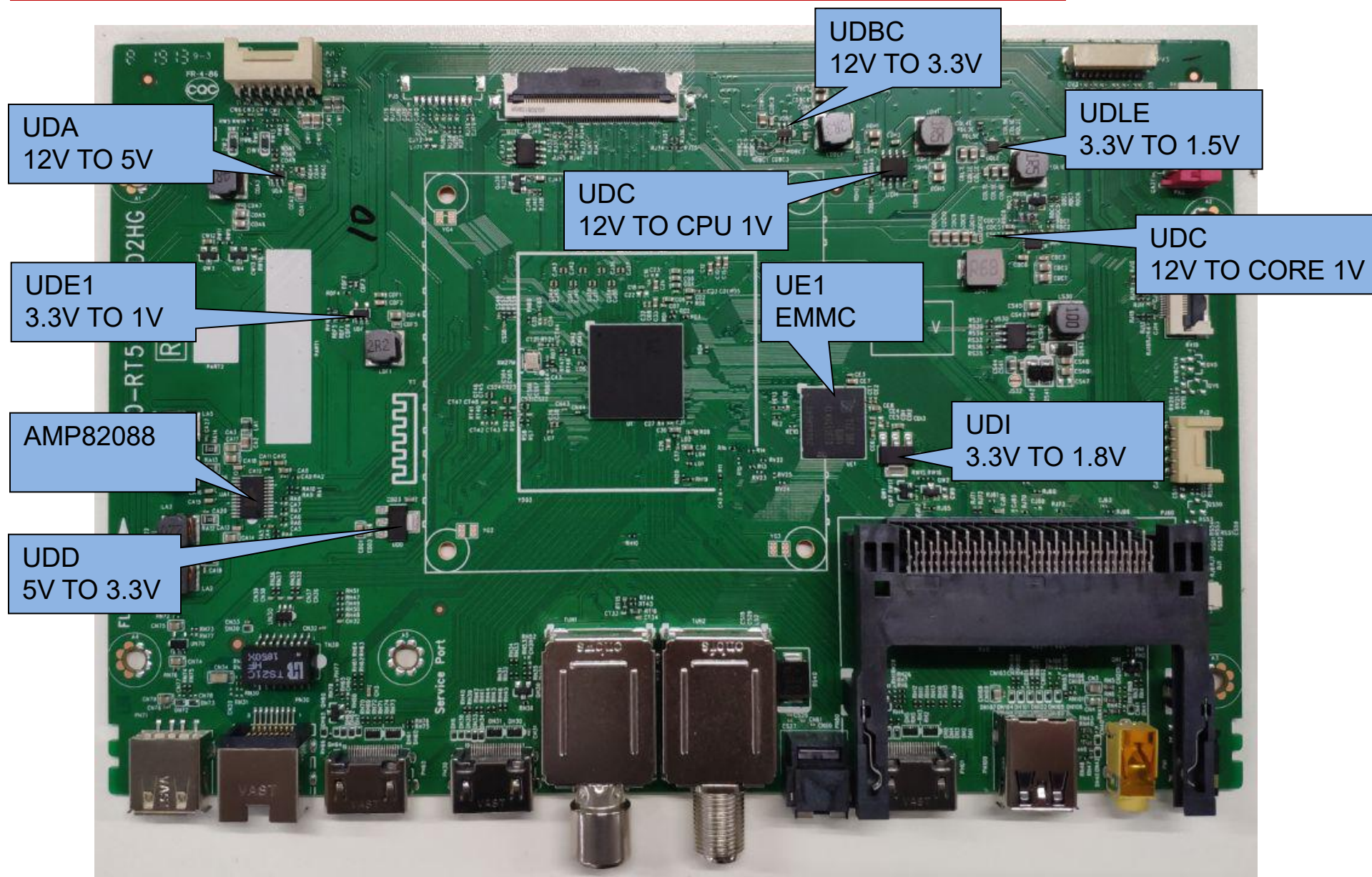
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8 Jurong Hall Road #28-01/06
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RT51—Key Components



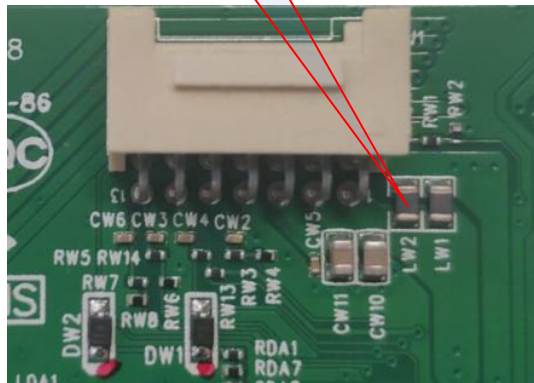
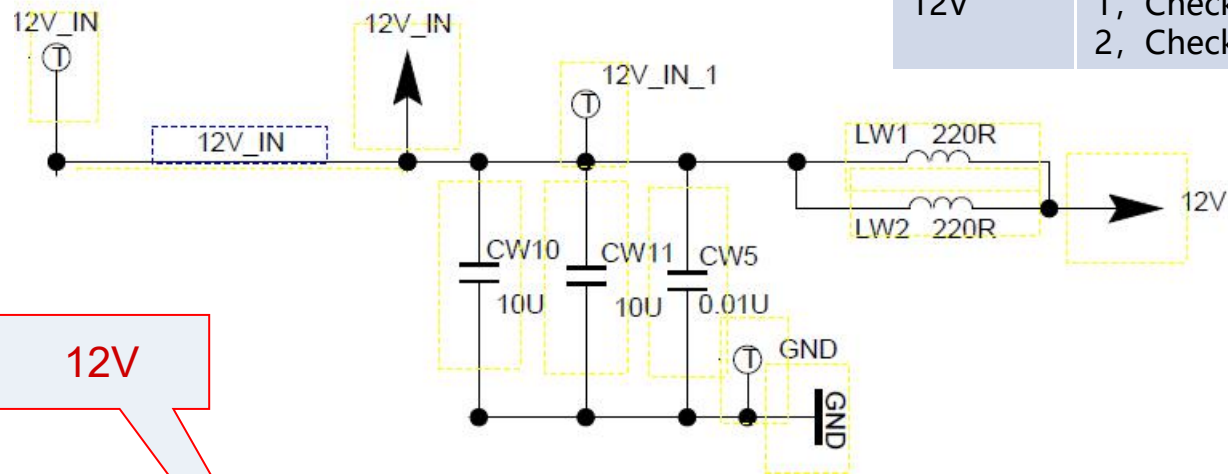
■RT51—Key Components



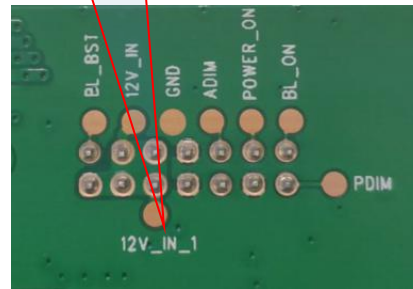
■Key Test Point

-----Main Power Supply

Normal	Abnormal
12V	1, Check the impedance if short to GND? 2, Check if the power supply board is work.

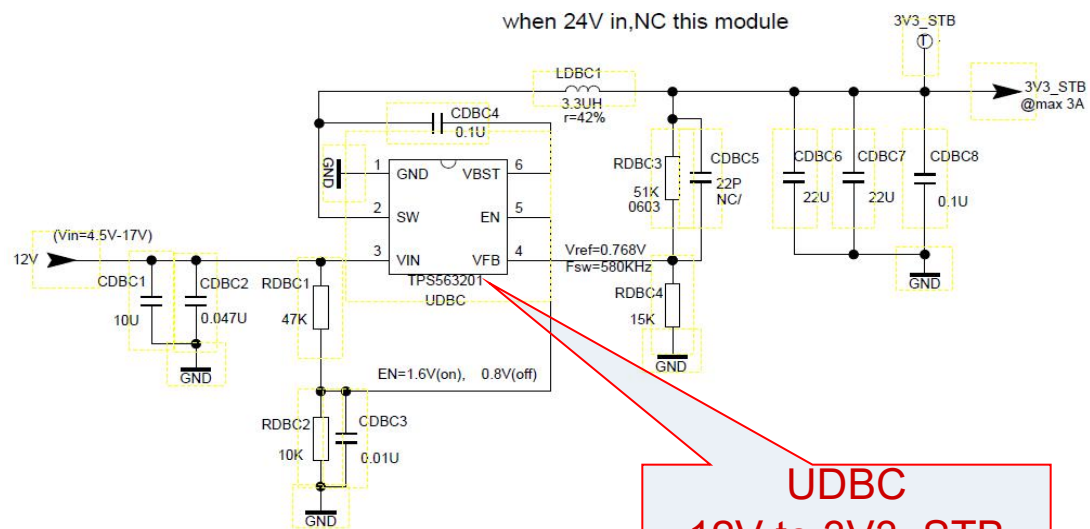


12V Test point



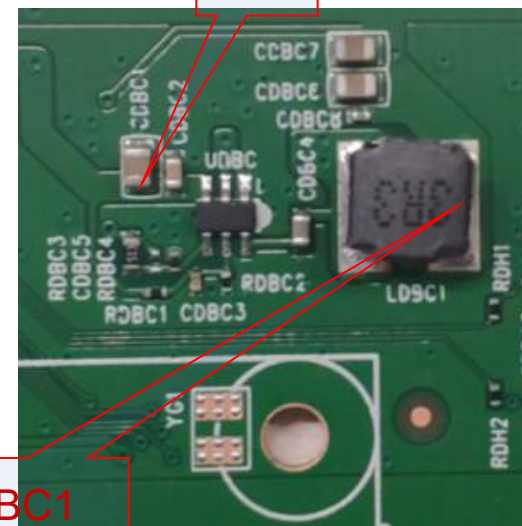
■Key Test Point

----DC to DC 12V TO 3V3_STB

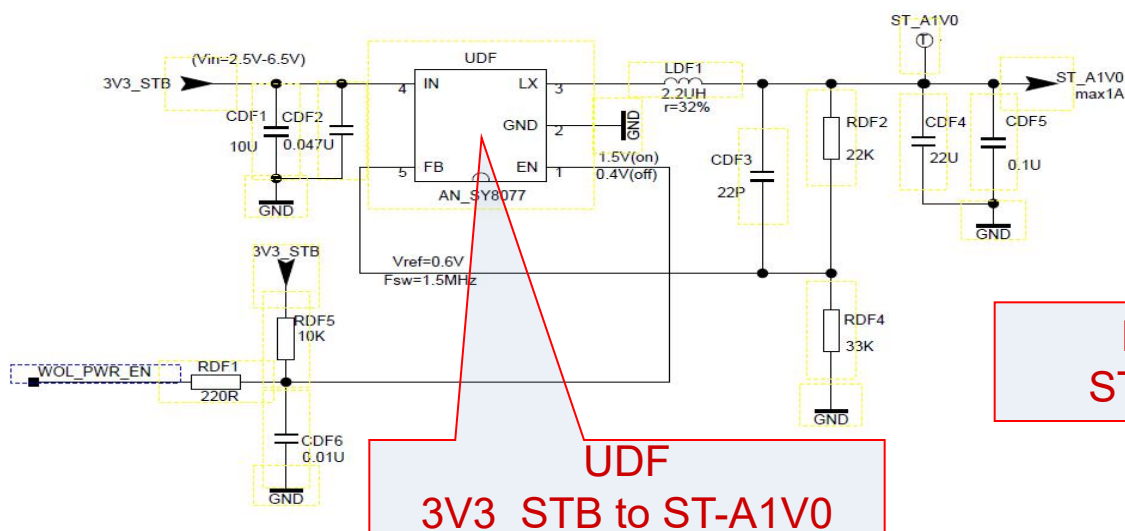


UDBC
12V to 3V3_STB

LDBC1
3V3_STB

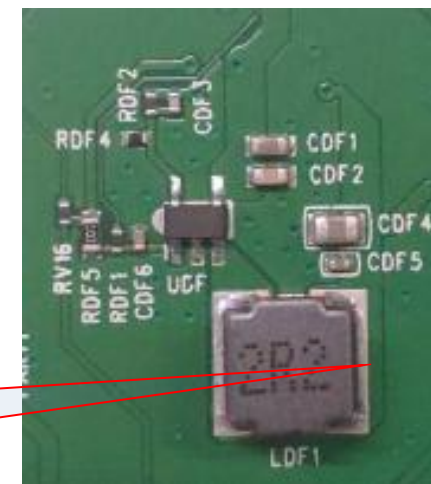


3V3_STB TO ST_A1V0



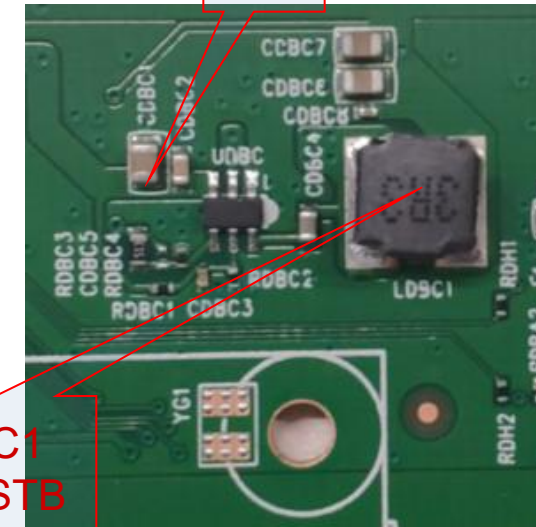
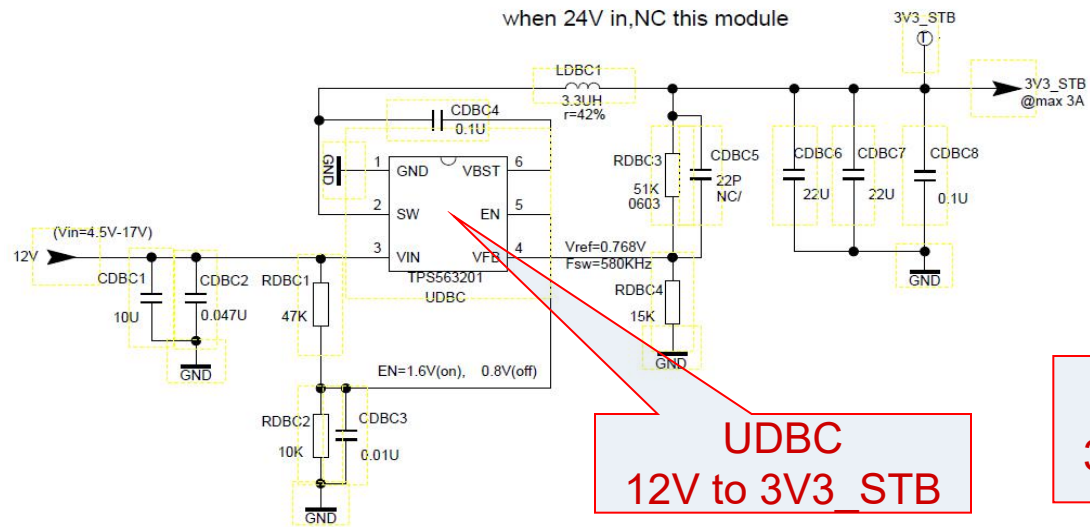
UDF
3V3_STB to ST-A1V0

LDF1
ST-A1V0



■Key Test Point

----DC to DC **12V TO 3V3_STB**

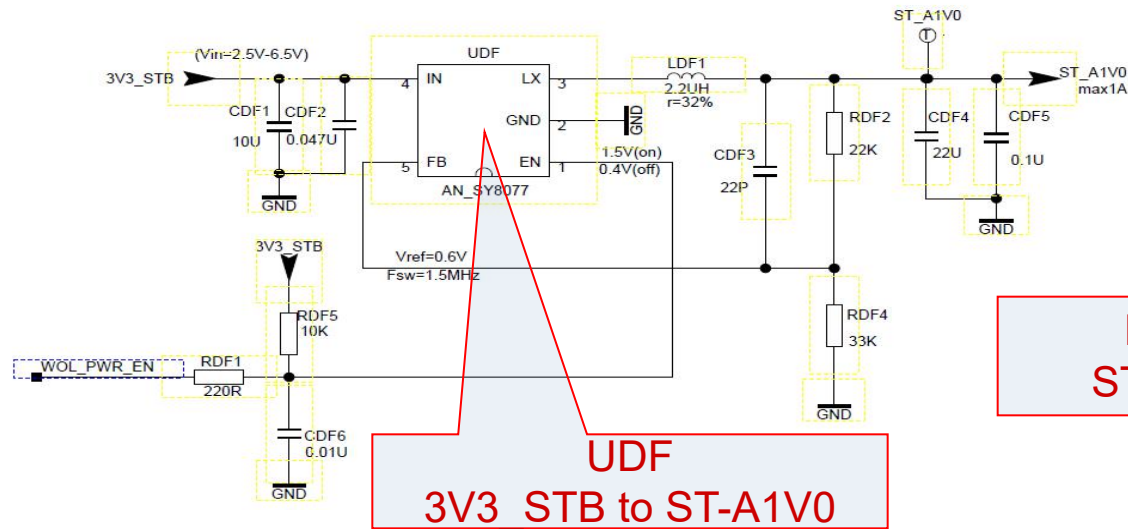


UDBC		
PIN	Impedance	Voltage
1	0	0V
2	17K	3.3V
3	>1M	12V
4	12K	0.7V
5	9K	2V
6	OPEN	8.7V

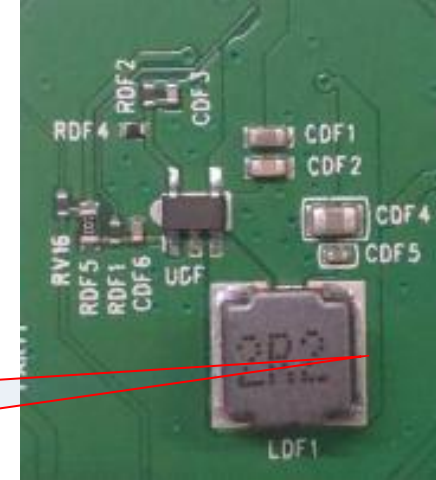
■Key Test Point

----DC to DC

3V3_STB TO ST_A1V0



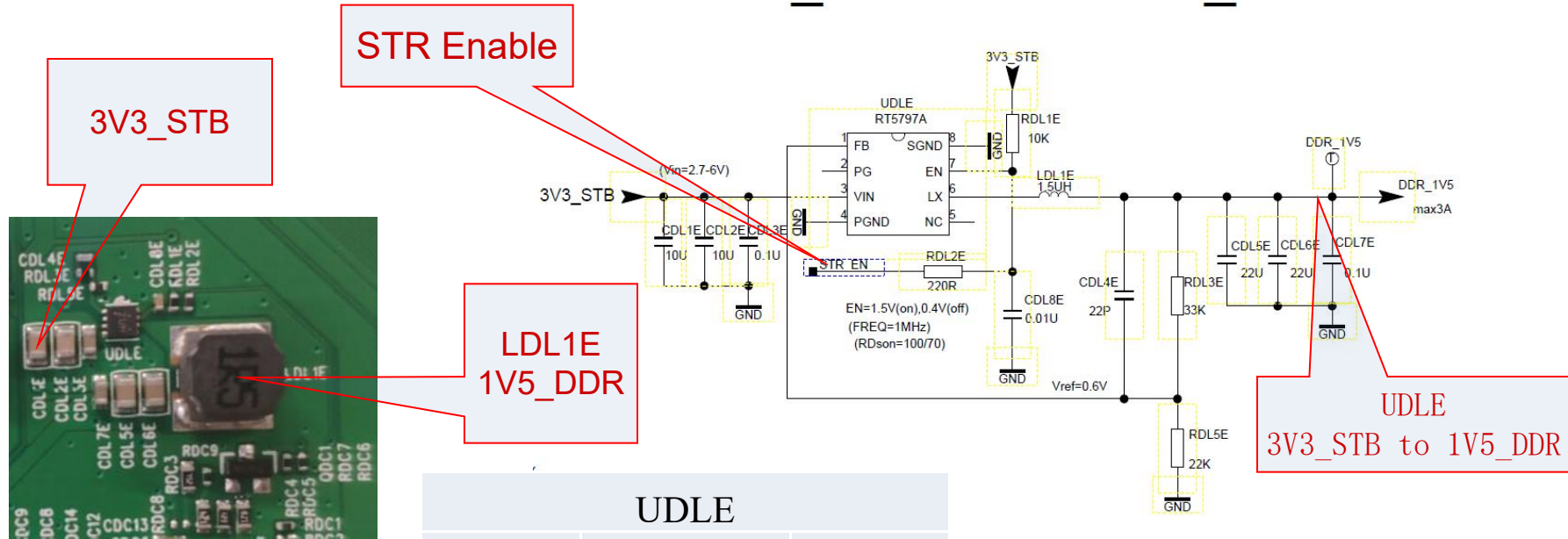
LDF1
ST-A1V0



UDF		
PIN	Impedance	Voltage
1	0	3.3V
2	17K	0V
3	>1M	0.99V
4	12K	3.3V
5	9K	0.59V

■Key Test Point

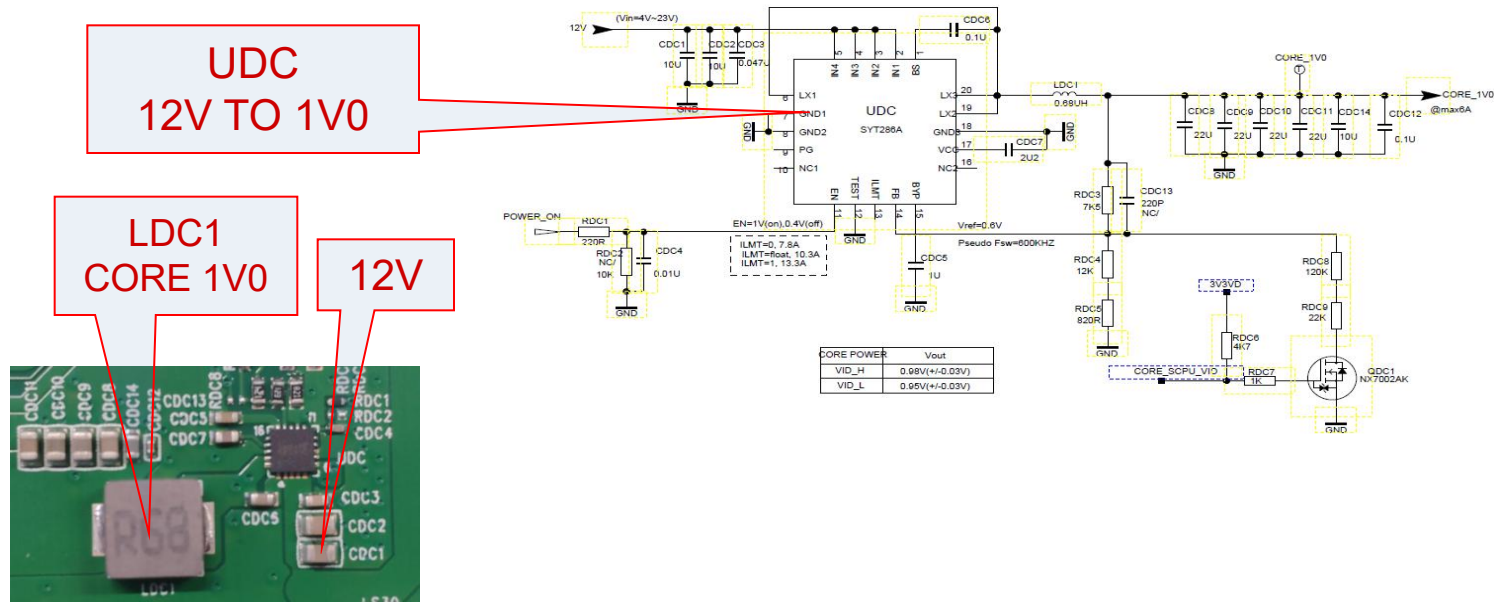
3V3_STB TO DDR_1V5



UDLE		
PIN	Impedance	Voltage
1	13.2K	0.5V
2	NC	NC
3	16.1K	3.3V
4	0	0V
5	NC	NC
6	1.3K	1.48V
7	24K	3.3V
8	0	0V

Key Test Point

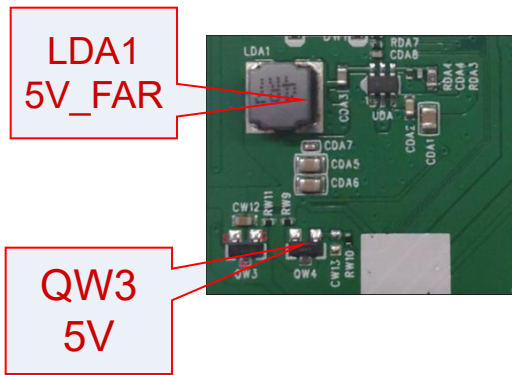
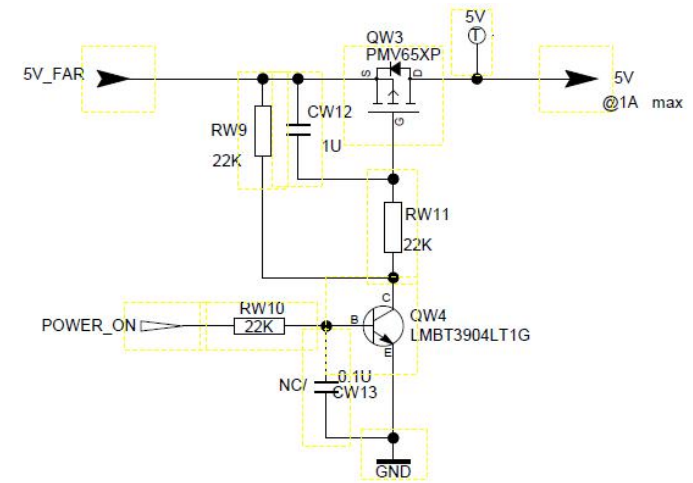
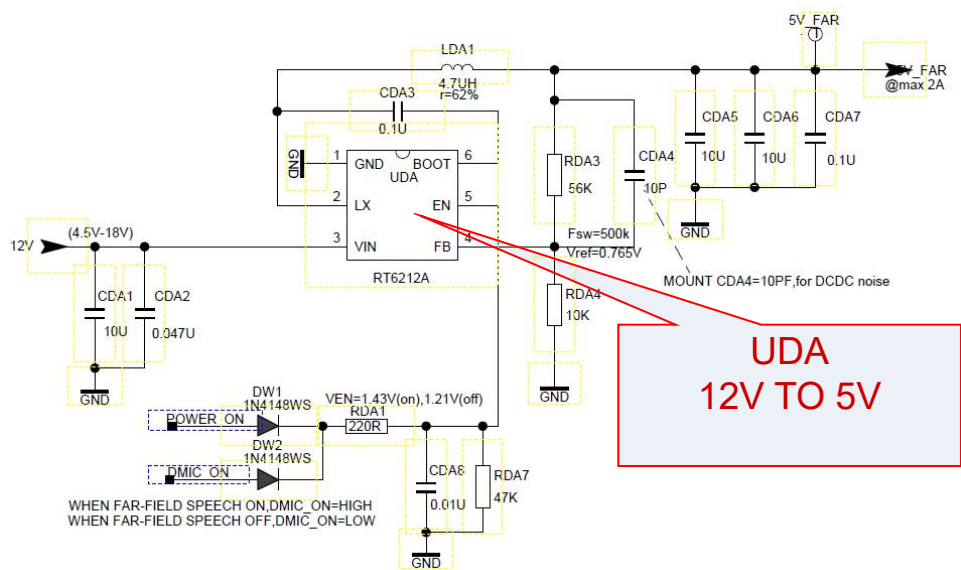
12V TO CORE_1V0



UDC					
PIN	Impedance	Voltage	PIN	Impedance	Voltage
1	OPEN	4.23V	11	21K	3.27V
2	38K	12V	12	0.0V	
3	38K	12V	13	NC	0V
4	38K	12V	14	4.5K	0.58V
5	38K	12V	15	OPEN	0V
6		0.9V	16	NC	
7		0.0V	17	OPEN	3.27V
8		0.0V	18	0V	0V
9	NC	0V	19	68.5	0.9V
10	NC	0V	20	68.5	0.9V

Key Test Point

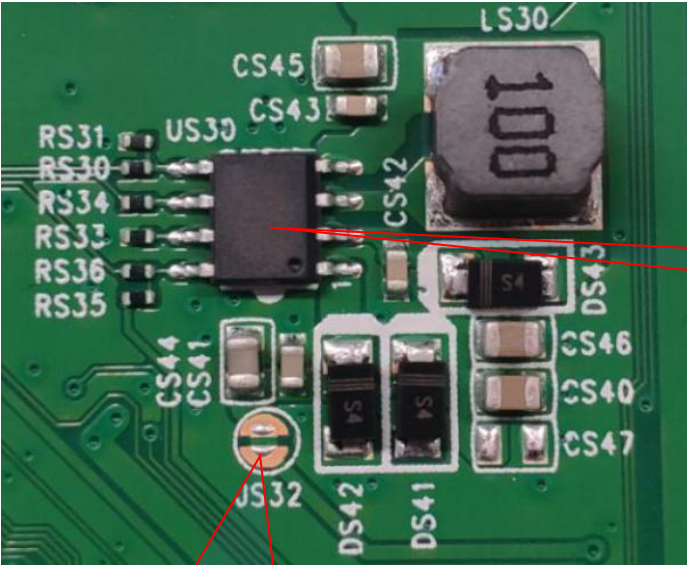
12V TO 5V



UDA		
PIN	Impedance	Voltage
1	0	0V
2	57.6K	5.1V
3	10K	12V
4	9.5K	0.7V
5	38.5K	2.82V
6	OPEN	9.6V

■ Key Test Point

----LNB power supply(Only for DVB-S)

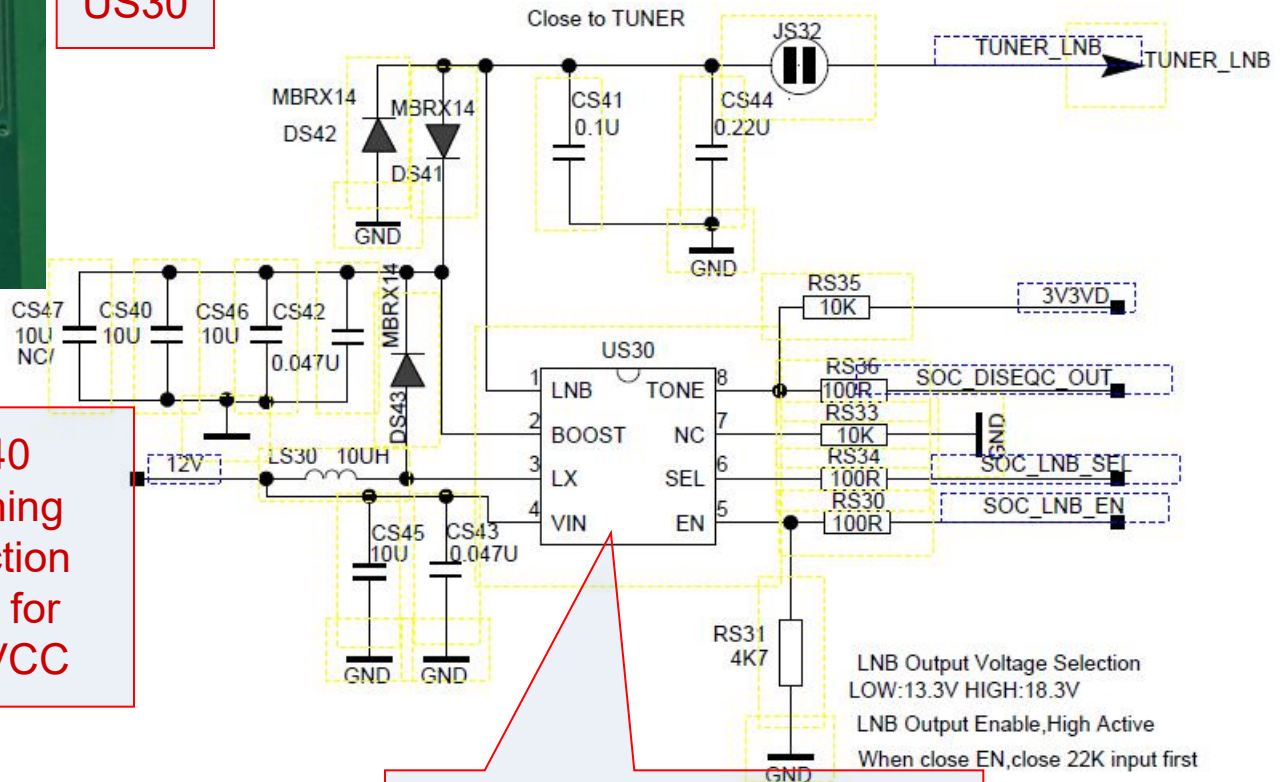


US30

JS32 LNB VCC

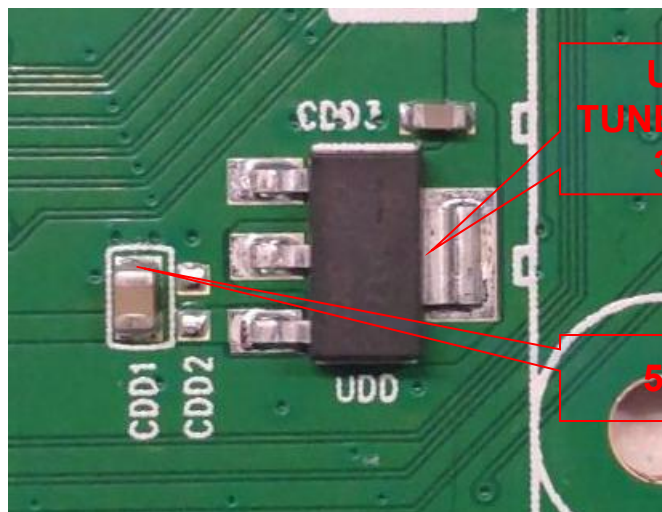


DS40
Lightning
protection
diode for
LNB VCC



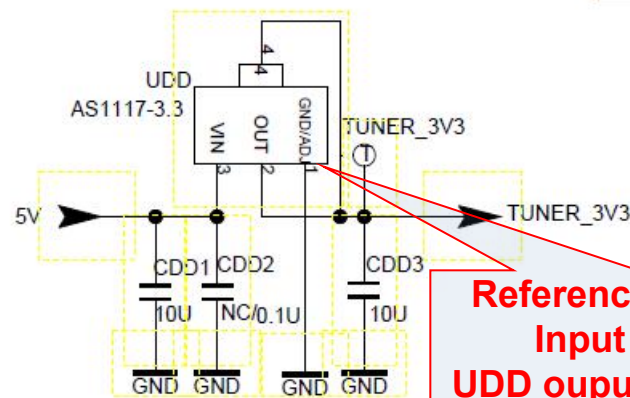
US2
12V to 13.5V or 18.5V
LNB VCC

■Key Test Point



----LDO

5V TO TUNER_3V3



Reference voltage:GND
Input voltage:5V
UDD ouput: TUNER_VCC
3V3

UDD		
PIN	Impedance	Voltage
1	0	0V
2	1K	3.3V
3	52K	5V
4	1K	3.33V

When UDD is failure, The bad symptoms of TV is
Unable to receive TV signal;

■Key Test Point

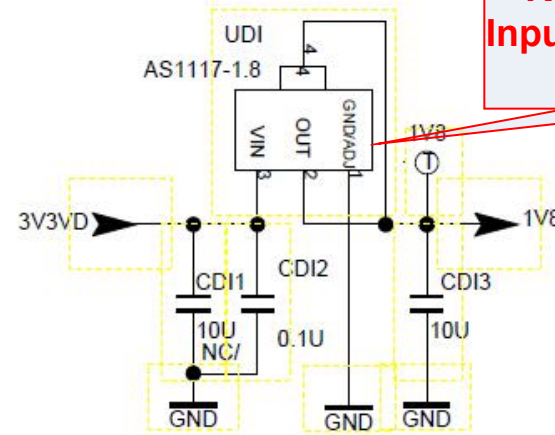


3V3VD

UDI
1V8

----LDO

3V3VD TO 1V8



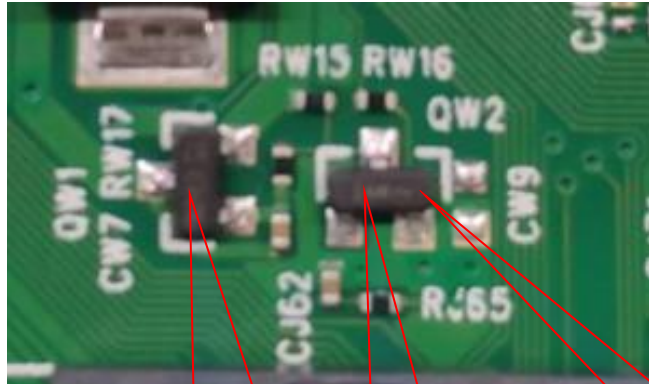
Reference voltage:GND
Input voltage:3V3_NORMAL
U202 ouput: 1V8

UDI		
PIN	Impedance	Voltage
1	0	0V
2	1K	1.77V
3	52K	3.33V
4	1K	1.77V

■Key Test Point

----POWER SWITCH

3V3_STB TO 3V3VD



QW1 "D"
3V3_NORMAL

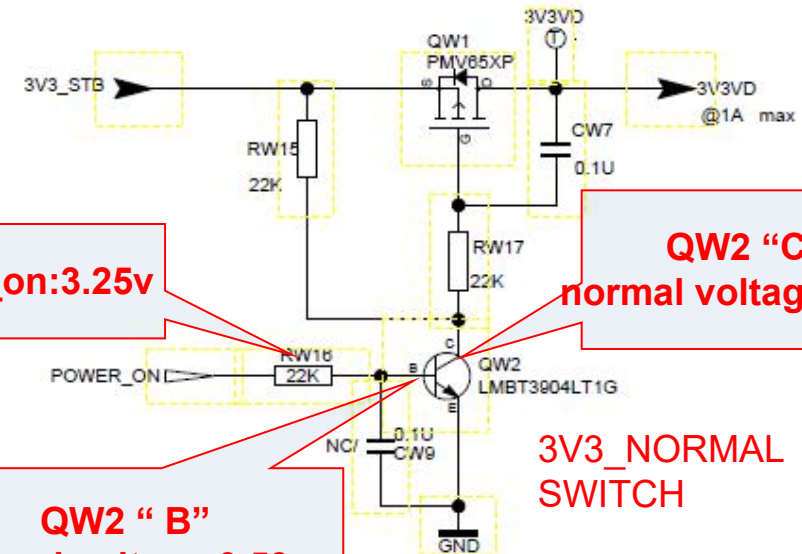
QW2 "G"
POWER_ON

QW2 "S"
3V3_STB

Power_on:3.25v

QW2 " B"
normal voltage:0.59v

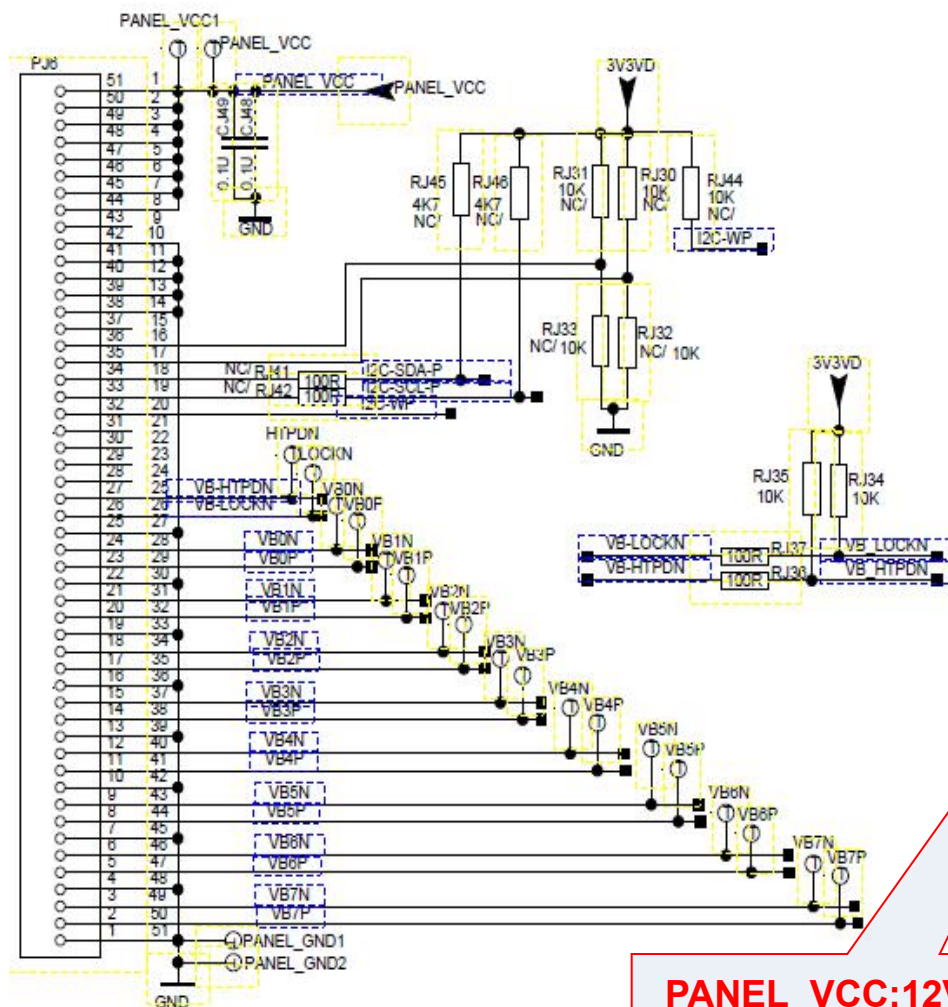
QW2 "C"
normal voltage:0.04v



3V3_NORMAL
SWITCH

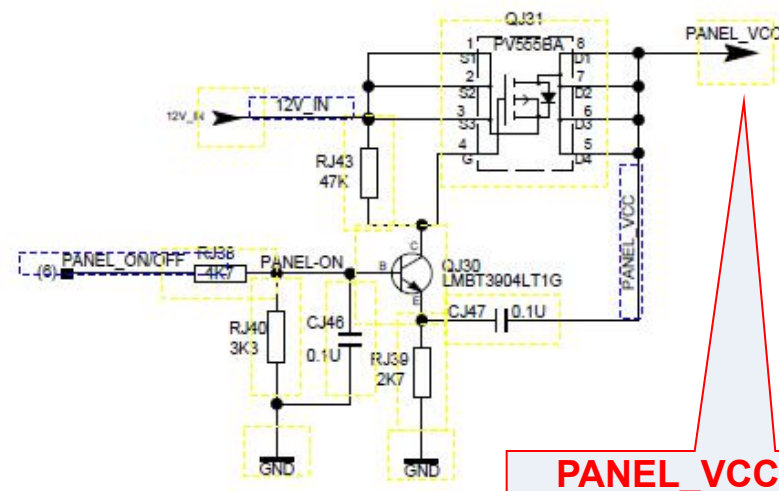
■Key Test Point

VB1 Panel Interface

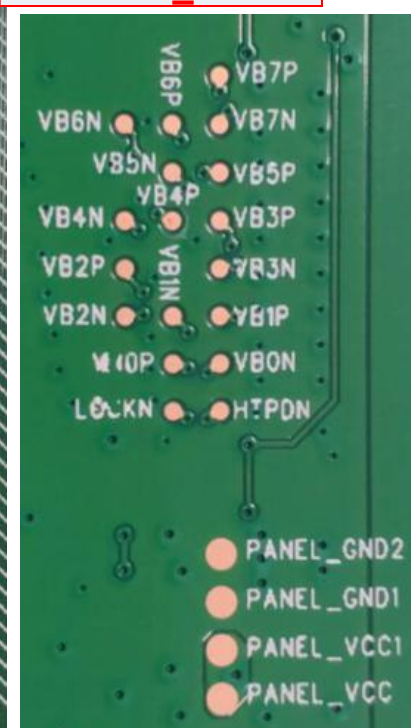
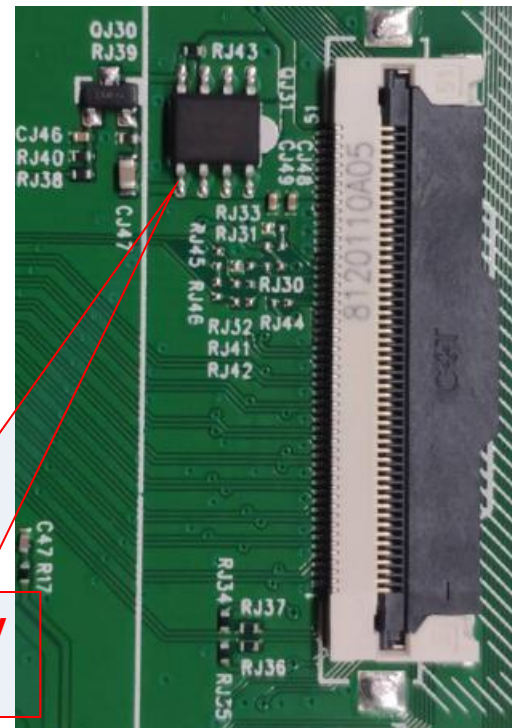


PANEL_VCC:12V
QJ31

Panel Power

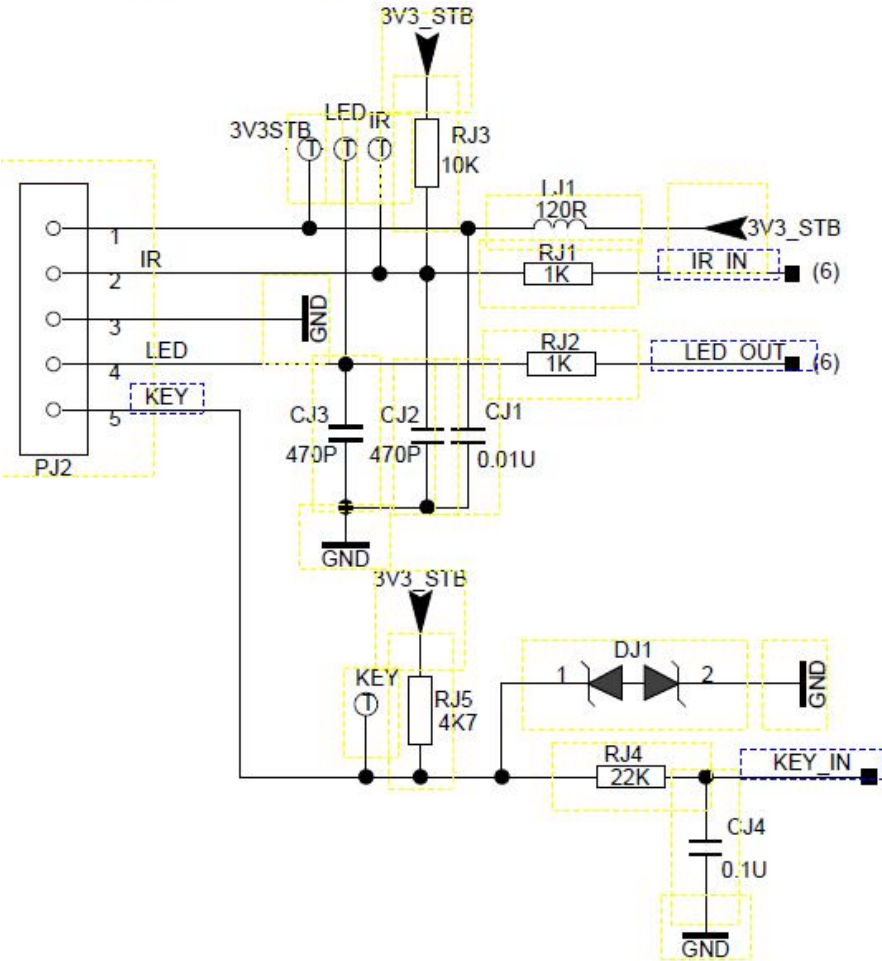


PANEL_VCC



■Key Voltage

KEY&IR



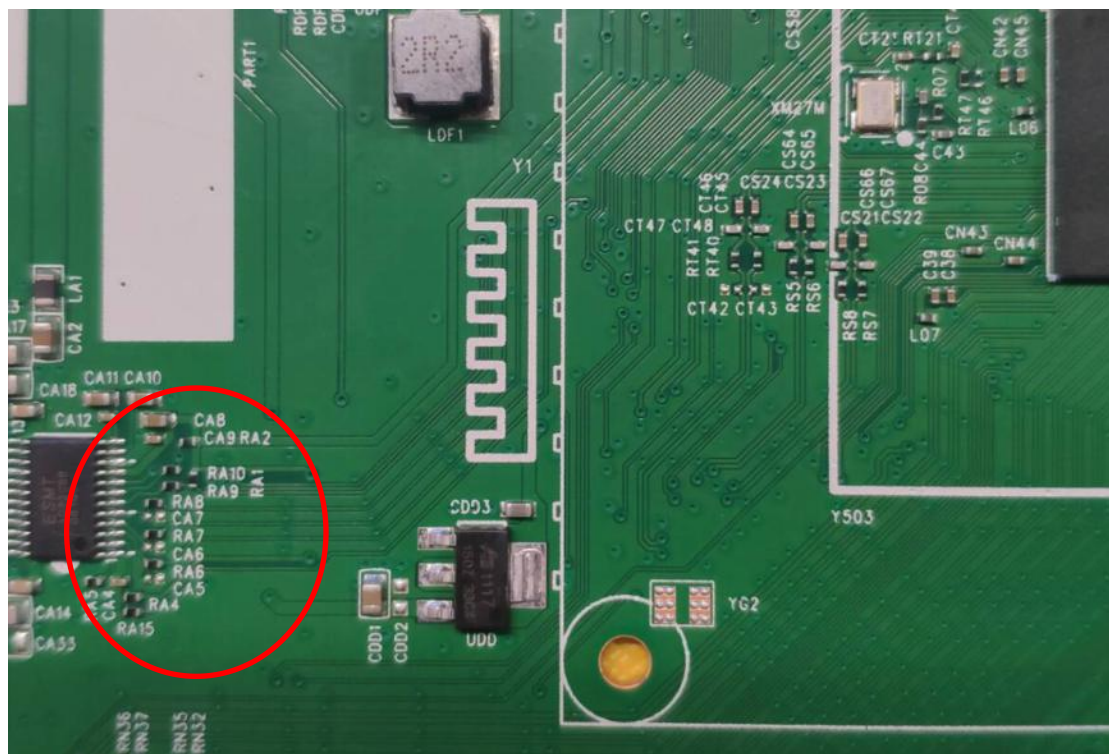
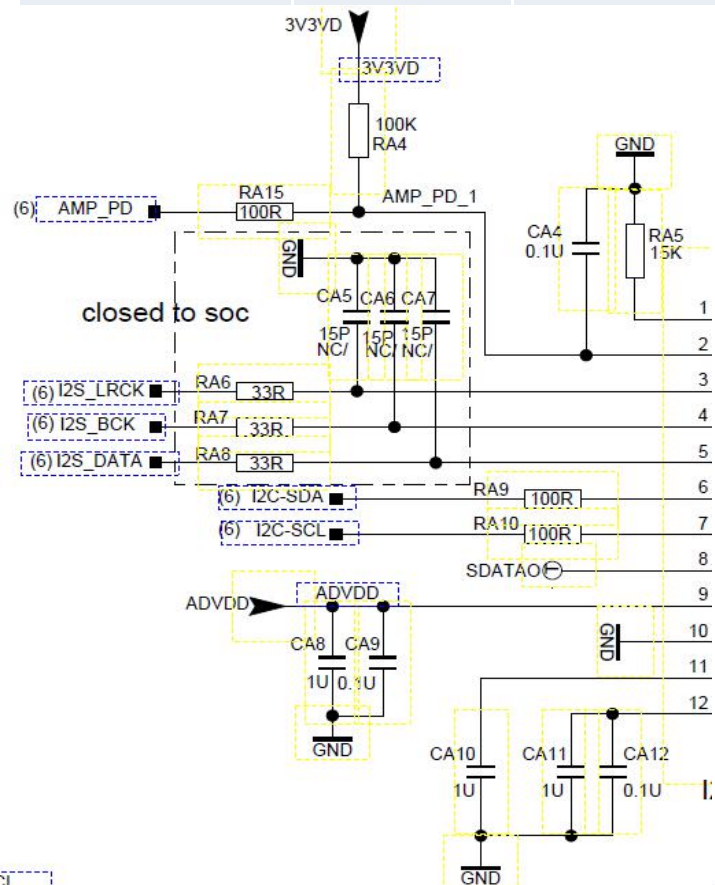
Key Voltage for RTD2851	
	RTD2851
POWER(normal)	3.3V
POWER(pressed)	0V



Test Point

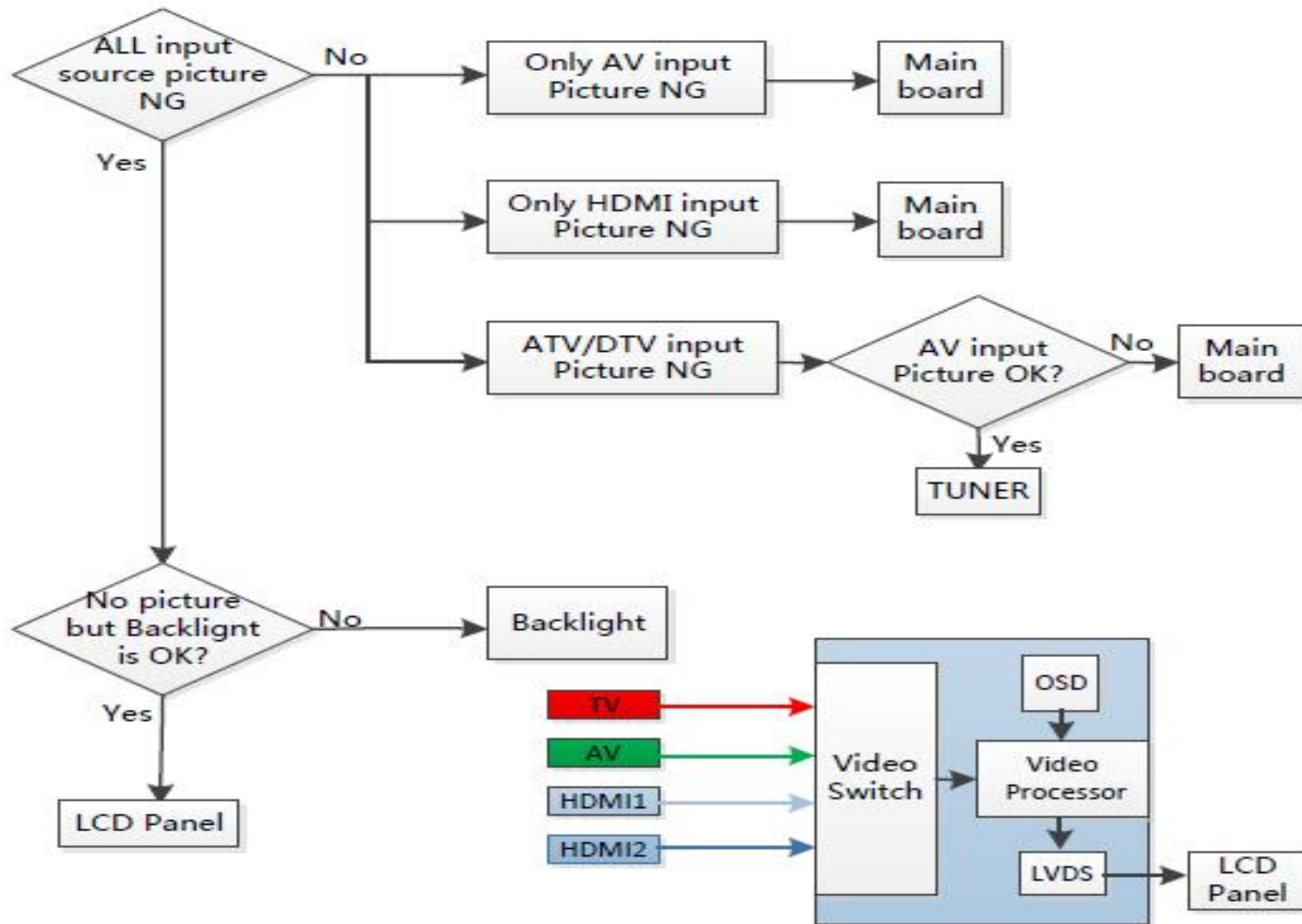
TCL

	RA6	RA7	RA8	RA9	RA10	RA15
SOC	≈3.3M	≈3.3M	≈3.3M	≈67K	≈67K	≈162K
AMP	≈3.3M	≈3.3M	≈3.3M	≈67K	≈67K	≈162K



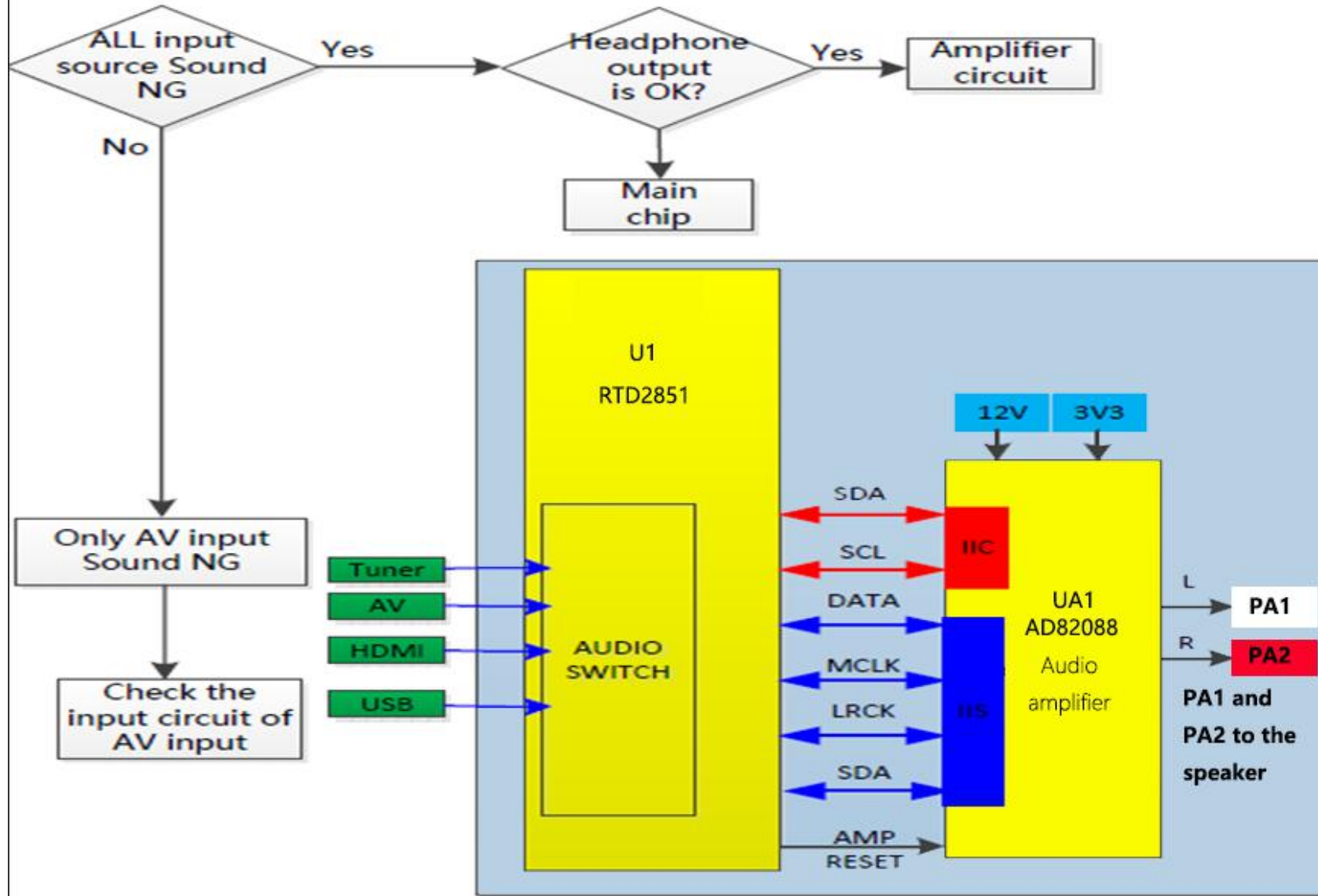
■ Trouble Shooting

Picture NG and Sound OK



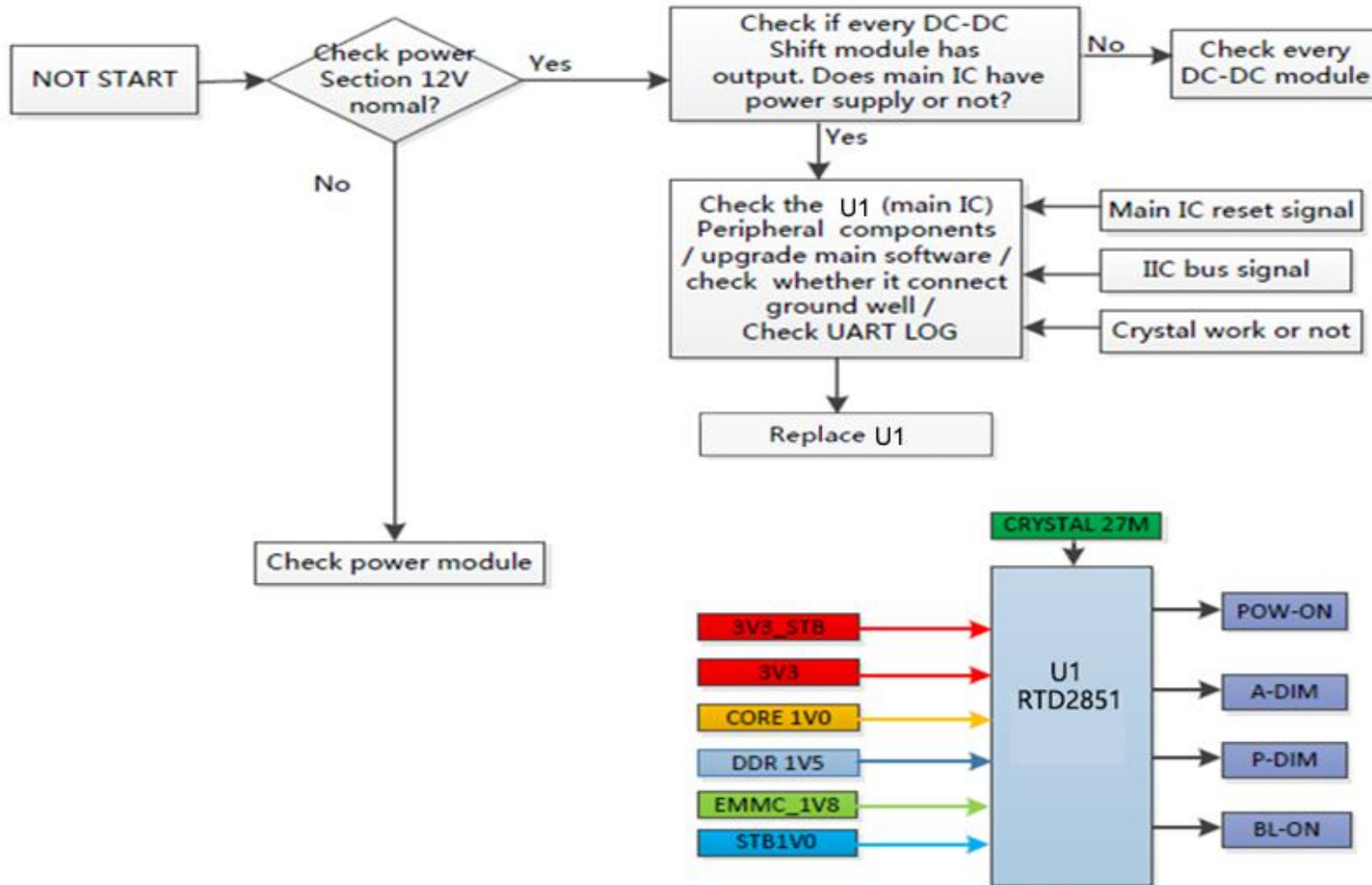
■ Trouble Shooting

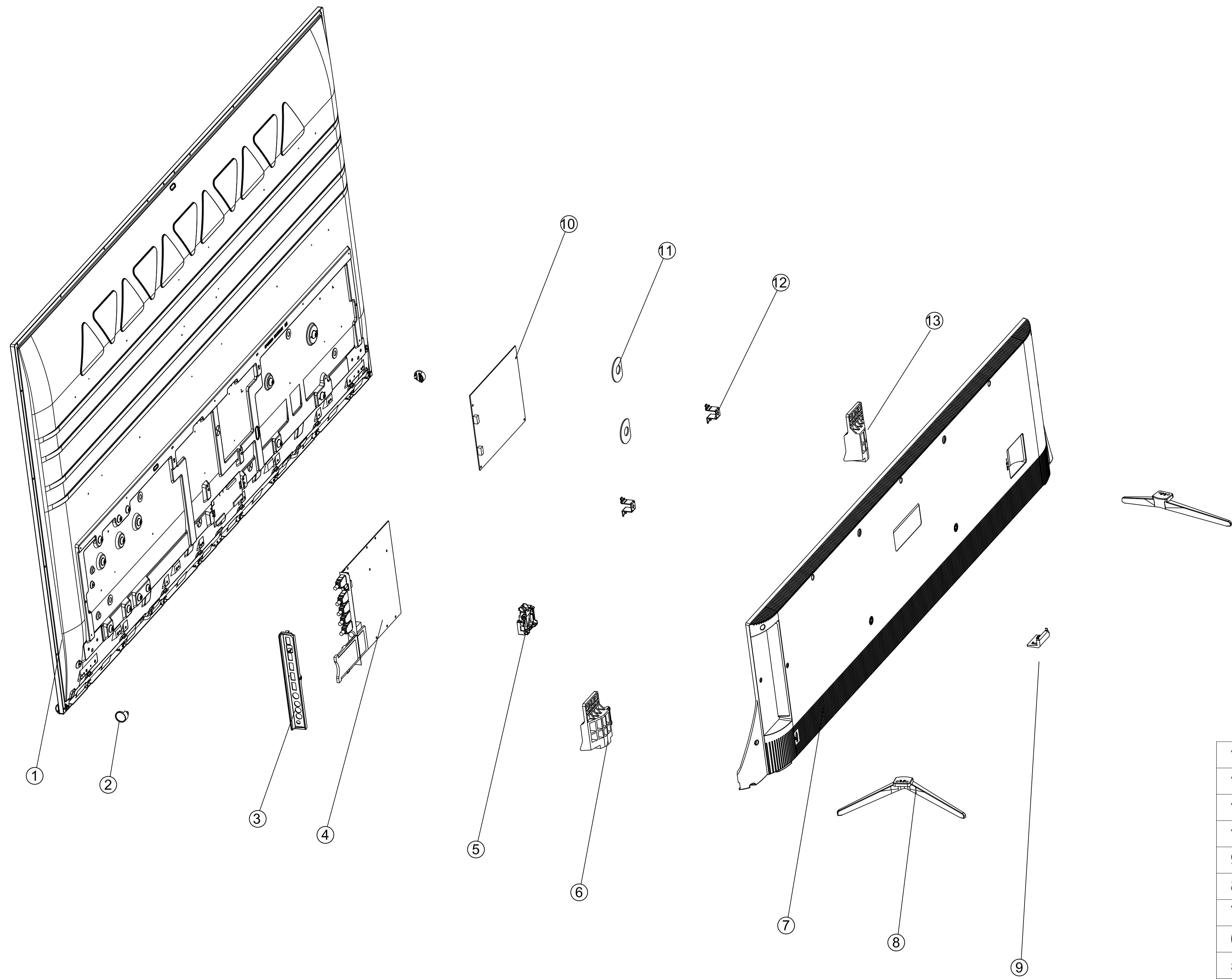
Picture OK and **Sound NG**



■ Trouble Shooting

Not Start





13	STD SPPT R	62-605830-2HJG	ABS+10%GF	1	
12	VESA BKT	67-747940-0MG	SGCC	2	
11	PSU V0 SPPT	62-606320-0ULG	HIPS-V0	2	
10	PSU			1	
9	LENS	56-610200-1VH5ZG	PC	1	
8	STD-ASSY	68-606920-0ZA01	AL	2	
7	SBC-ASSY	08-65D6002-RC200AA	HIPS	1	
6	STD SPPT L	62-605820-2HJG	ABS+10%GF	1	
5	WIFI SPPT	62-607630-0HLG	HIPS	1	
4	SSB			1	
3	AV SUPPORT	56-74806B-0HN6RG	HIPS	1	
2	FC DECO	56-609840-0HA01G	ABS	2	
1	Panel	08-65F6000-LPM001B		1	
No. 序号	Description 名 称	Code No. 物料编号	Material 材 料	Qty's 数量	Remark 备 注

图上未标注公差 尺寸按右表公差	>0~25	>25~100	>100~200	>200~400	>400~700	>700~1000	>1000	ANGLE_90°
	±0.1	±0.15	±0.2	±0.3	±0.4	±0.5	±0.6	±1°
Part Name: 65P8M-Explode			Model Name:					
Part Number:			Designer: 徐正权		Project:			
Mechanical Department			Check:		Material:		Scale: 1:1	
			Approve:		Weight (g):		Sheet: 1/1	