MPX

Debug Guide

Rev. 1.0

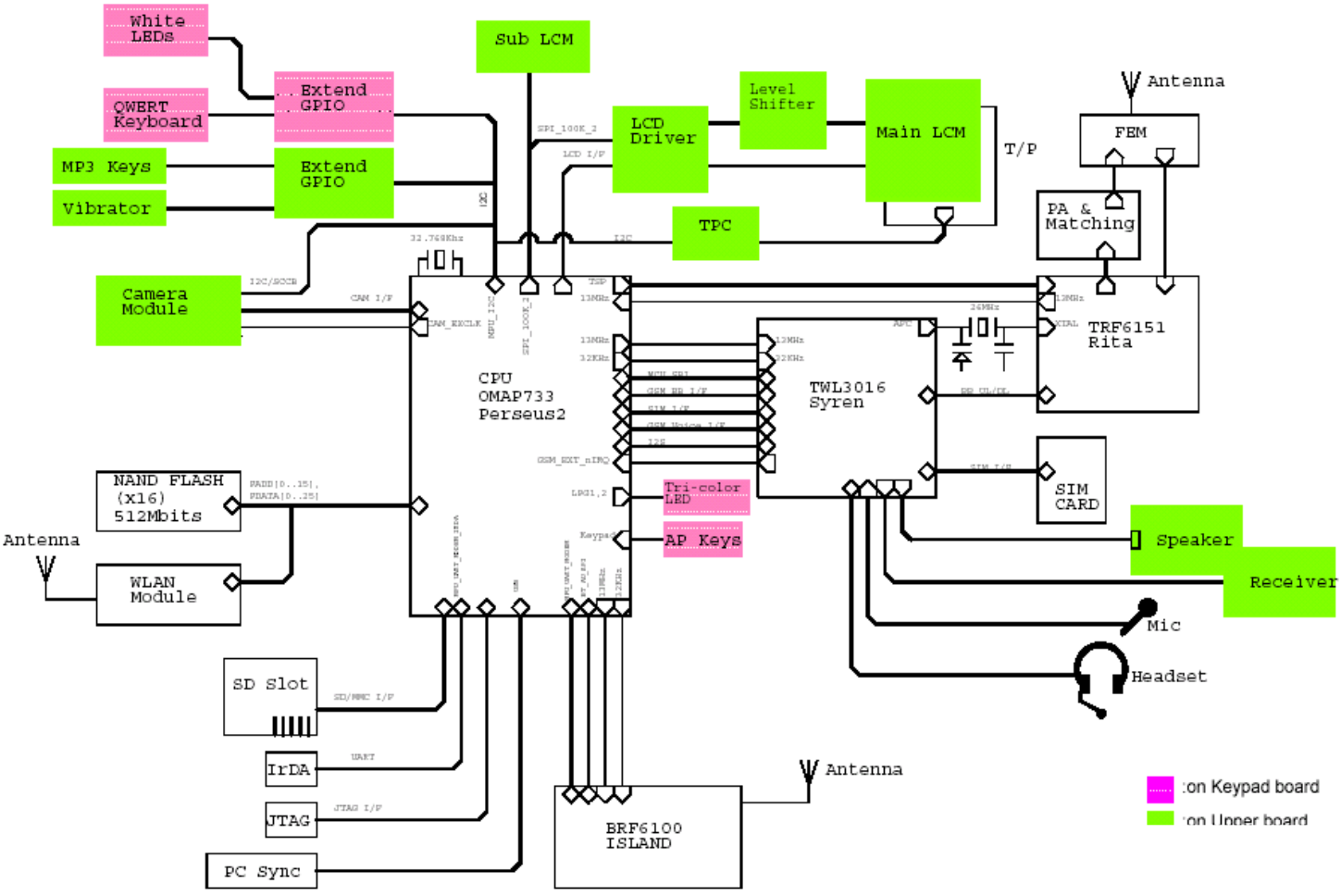
Applicable Range

P7T series produces

1. Purpose:

This document description of the complete circuit and describe the repair flow chart of component level.

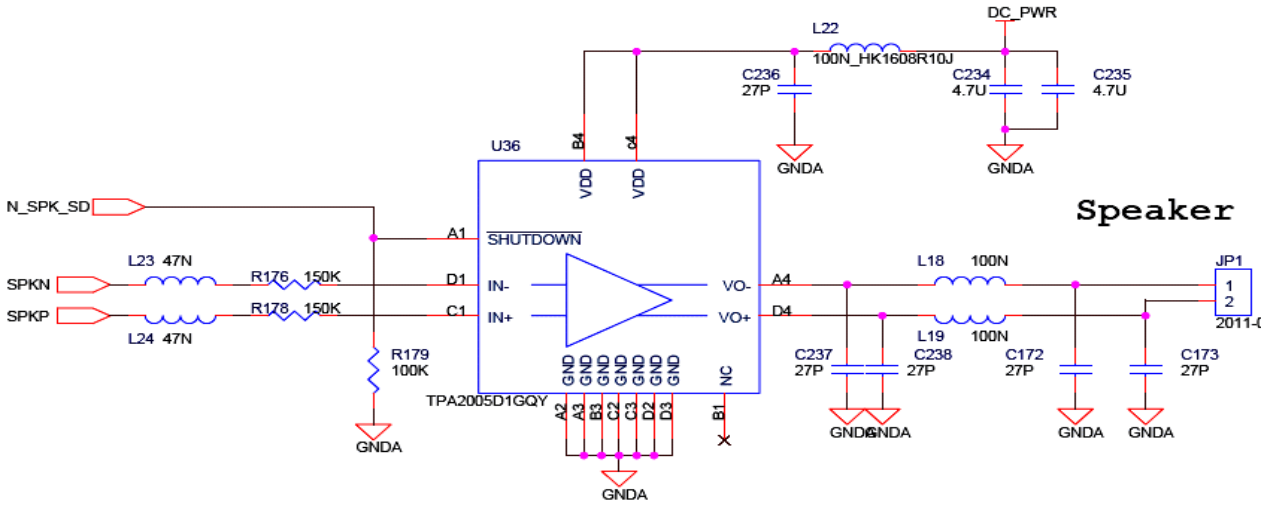
2. MPx Block Diagram:



3. Repair Flow Chart

3-1. Speaker Circuit

3-1-1. Speaker circuit description



Description

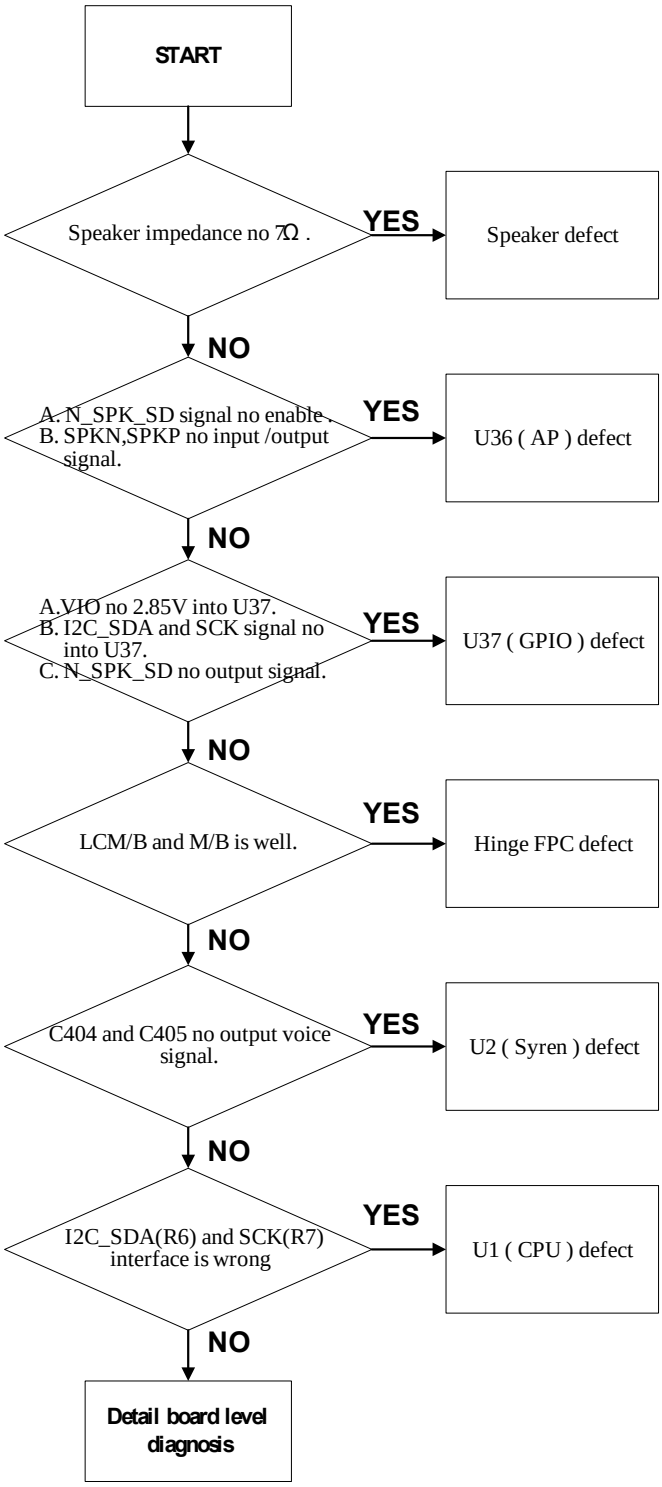
a. N_SPK_SD :S/W enable U37(GPIO) and control U36(AMP) on/off.

b. SPKN,SPKP:Front U2(Syrne) and control Audio output signal to speaker OP.

Application

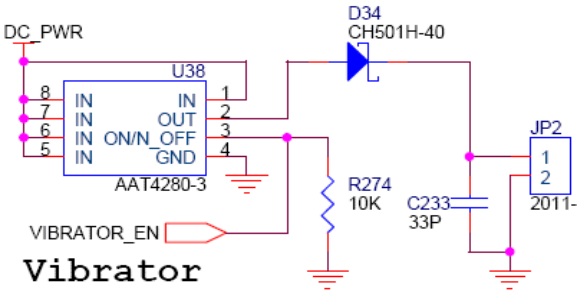
a: CPU enable U37(GPIO) and Syrne send signal to U36 (to amplify) then output signal to pass through L/C (filter) at the same time.

3-1-2. Speaker function failure analysis Flow Chart



3-2. Vibrator Circuit

3-2-1. Vibrator circuit description



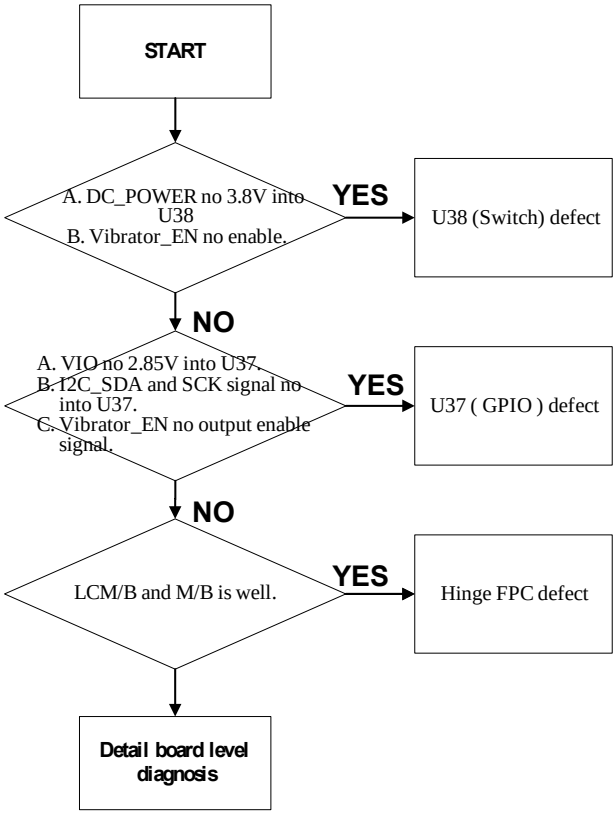
Description

Vibrator_EN: S/W enable U38(switch) on/off.

Application

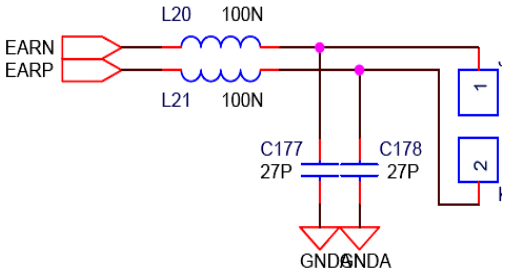
CPU control signal to U37(GPIO) then enable U38 to control Vibrator on/off.

3-2-2. Vibrator function failure analysis Flow Chart



3-3. Receiver Circuit

3-3-1. Receiver circuit description



Description

EARN,EARP : come from U2(Syrne) and control output voice signal.

Application

U2 control voice signal to pass through L/C (filter) to receiver.

3-4. Camera Flashlight Circuit

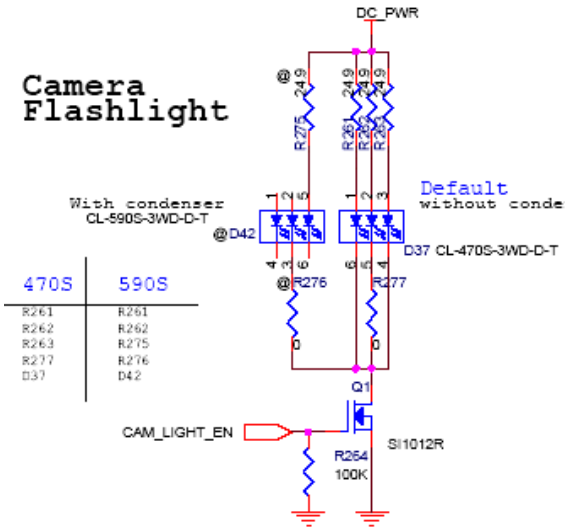
3-4-1. Camera Flashlight circuit description

Description

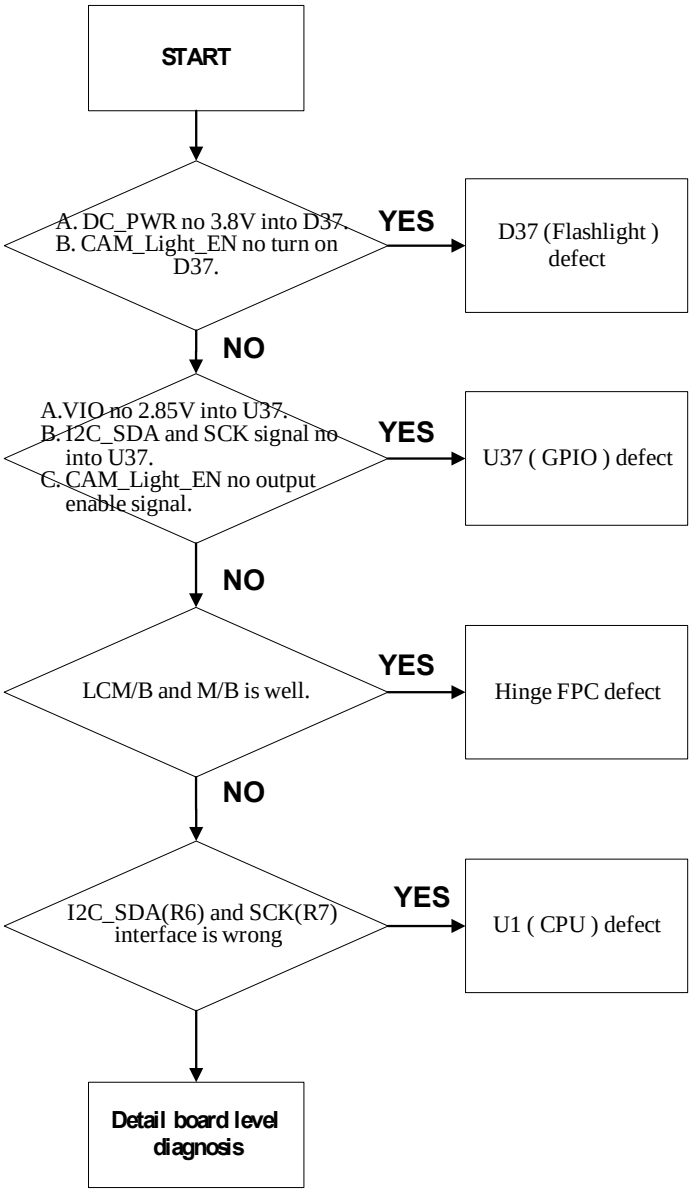
CAM_LIGHT_EN :S/W enable U37(GPIO) to control Q1 on/off.

Application

CPU send signal to U37(GPIO) then enable Q1 to control Flashlight on/off.

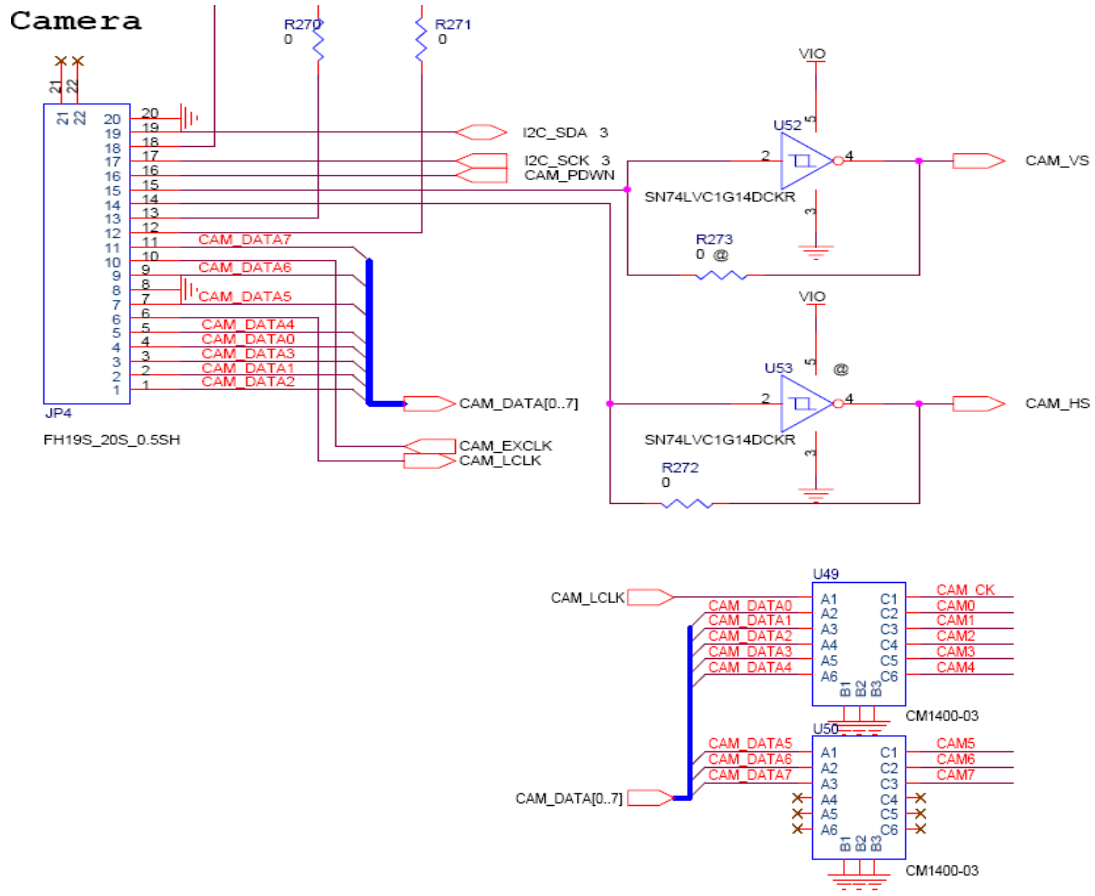


3-4-2. Camera Flashlight function failure analysis Flow Chart


START
A. DC_PWR no 3.8V into D37.
B. CAM_Light_EN no turn on D37.
YES
D37 (Flashlight) defect
NO
A.VIO no 2.85V into U37.
B. I2C_SDA and SCK signal no into U37.
C. CAM_Light_EN no output enable signal.
YES
U37 (GPIO) defect
NO
LCM/B and M/B is well.
YES
Hinge FPC defect
NO
I2C_SDA(R6) and SCK(R7) interface is wrong
YES
U1 (CPU) defect
Detail board level diagnosis

3-5. Camera Circuit

3-5-1. Camera circuit description



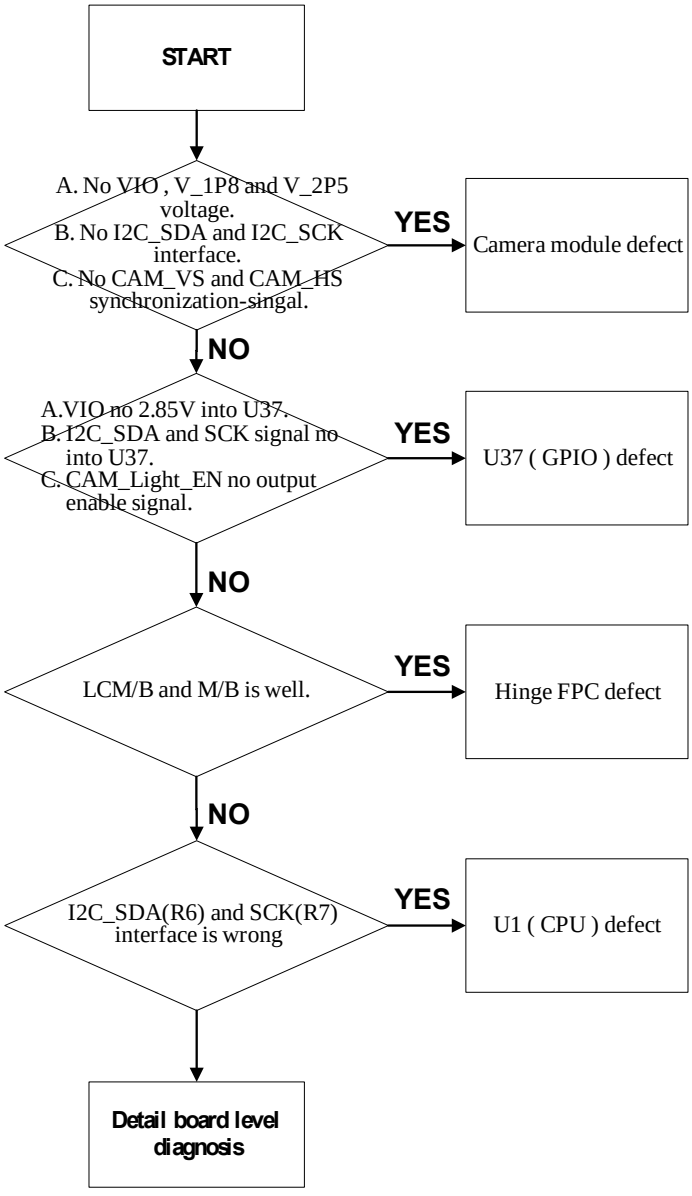
Description

a: CAM_PDWN : S/W enable control camera module on/off.
b: CAM_VS,CAM_HS : control vertical and level synchronization-signal.
c: I2C_SDA,I2C_SCK : Camera control interface.
d: CAM_DATA : send camera DATA to pass through U49,U50(filter) then into CPU.

Application

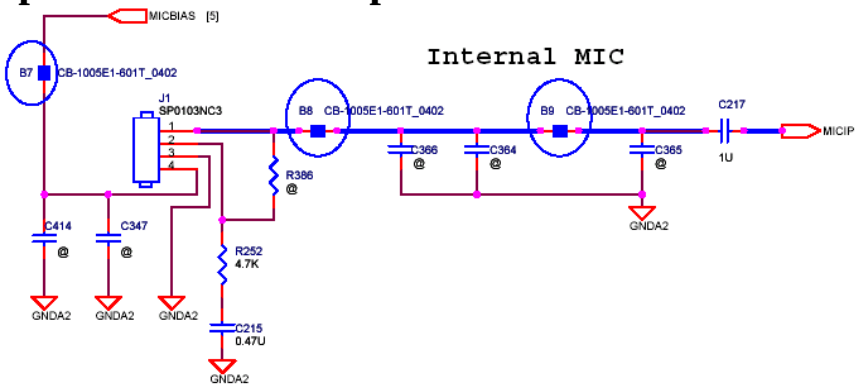
CPU control signal to U37(GPIO) then enable Camera Module on/off.

3-5-2. Camera function failure analysis Flow Chart



3-6. Microphone Circuit

3-6-1. Microphone circuit description



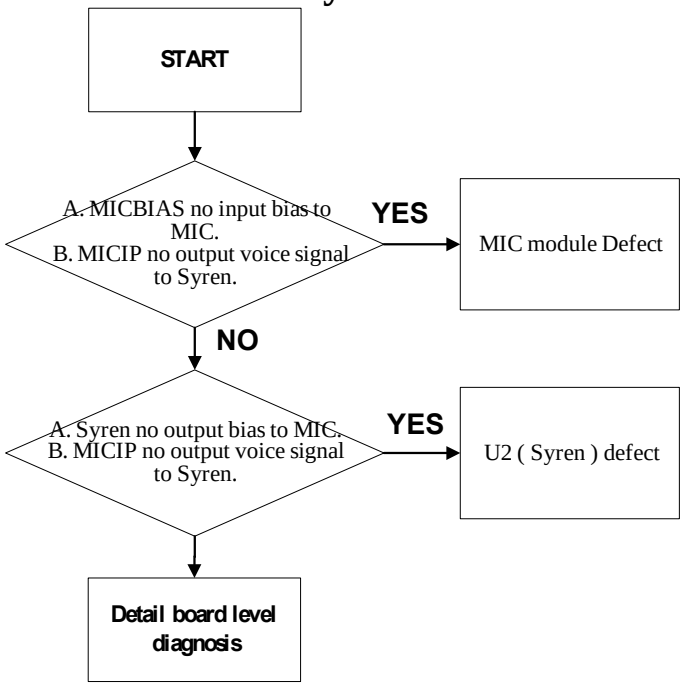
Description

a:MICBIAS : Syren output a bias to MIC and control on/off.
b:MICIP : Output voice-singal to Syren.

Application

Syren enable MIC then output voice-signal to pass through L/C (filter) into Syren.

3-6-2. Microphone function failure analysis Flow Chart

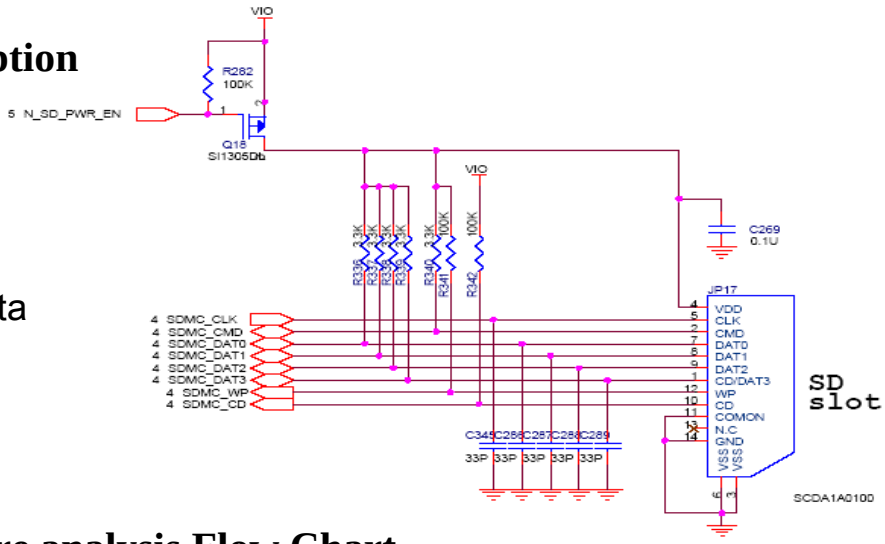


3-7. SD slot Circuit

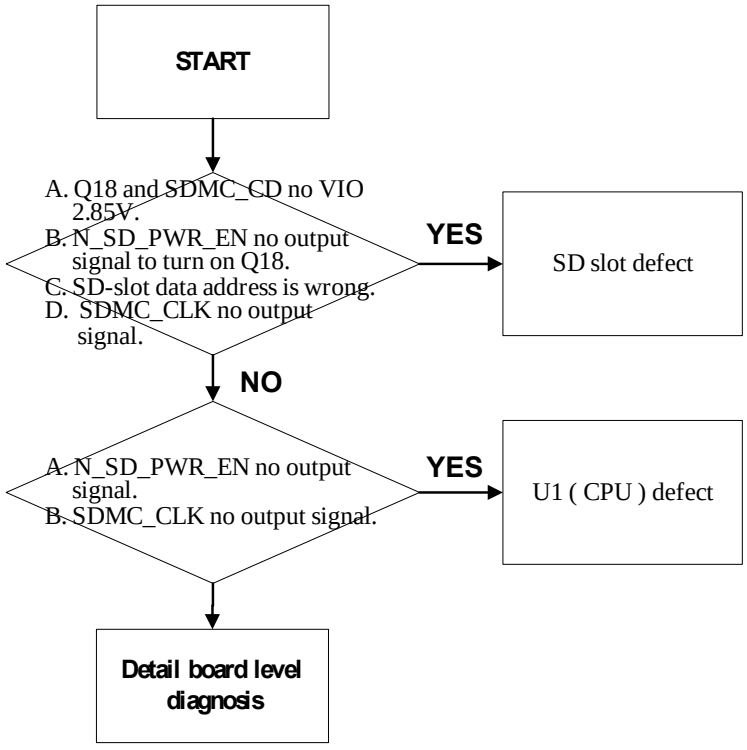
3-7-1. SD slot circuit description

Description

a: N_SD_PWR_EN :
On/Off SD card power
b: SDMC_DAT0-DAT3 :
Between CPU and SD card data

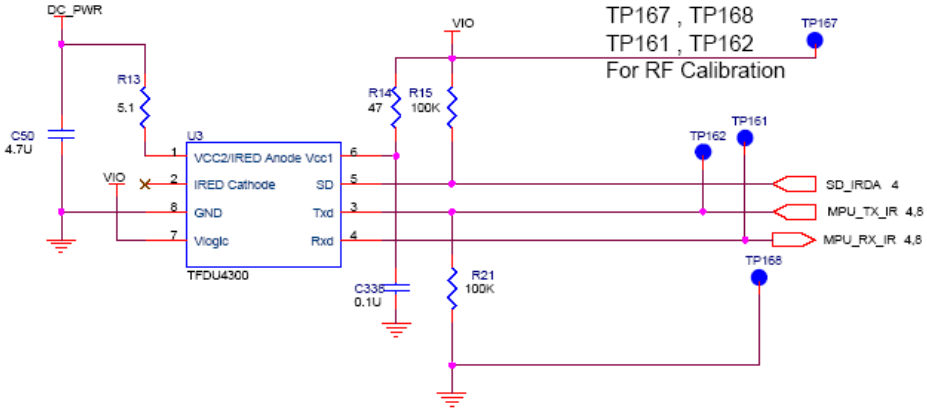


3-7-2. SD slot function failure analysis Flow Chart



3-8. IrDA Circuit

3-8-1. IrDA circuit description



Description

a: SD_IRDA :S/W enable U3 on/off.

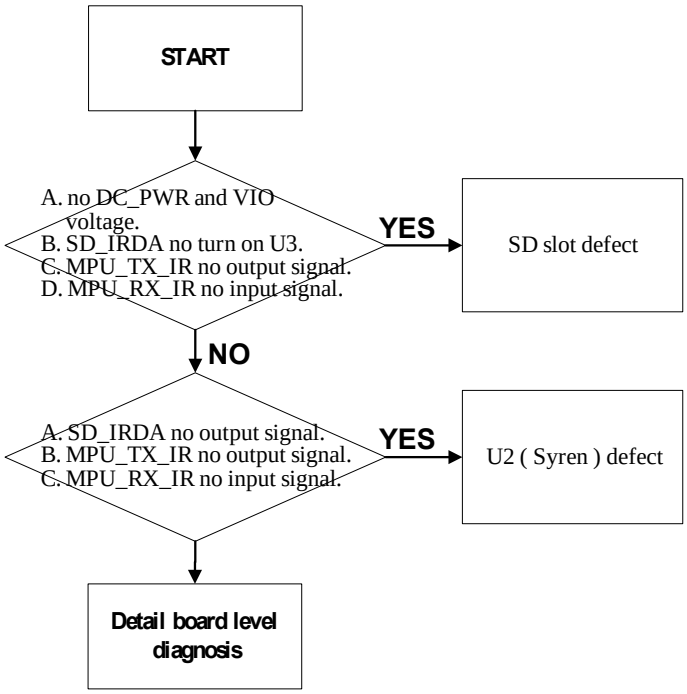
b: MPU_TX_IR :TX Path.

c: MPU_RX_IR :RX Path.

Application

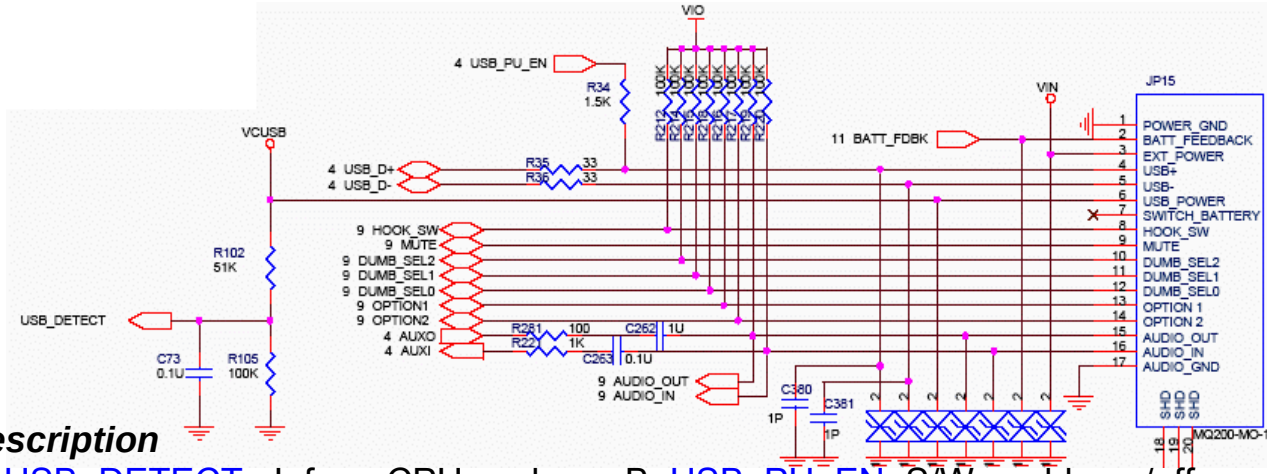
CPU turn on U3 and MPU_TX_IR send 115.2khz pulse-signal to search ,if get signal MPU_RX_IR feedback 115.2khz pulse-signal into CPU.

3-8-2. IrDA function failure analysis Flow Chart



3-9. USB Circuit

3-9-1. USB circuit description



Description

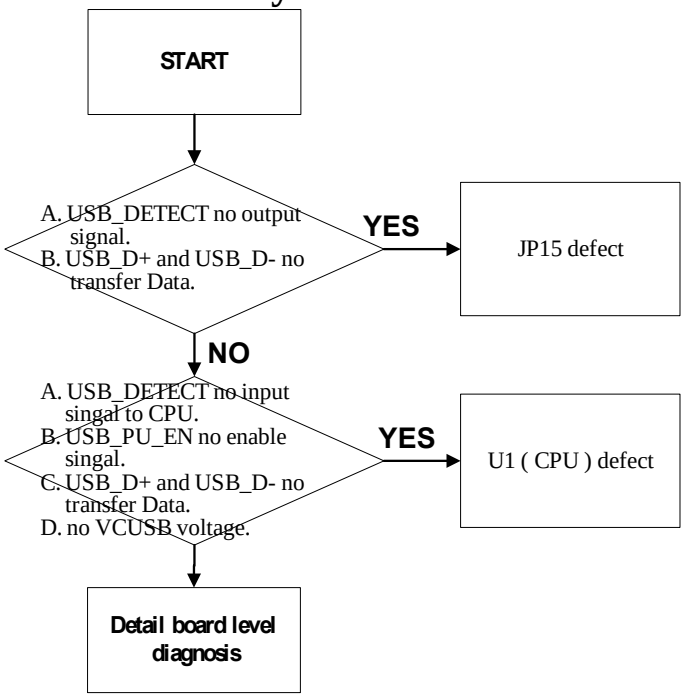
A: USB_DETECT : Inform CPU work. B: USB_PU_EN :S/W enable on/off

C: USB_D+,USBD- : Transfer DATA

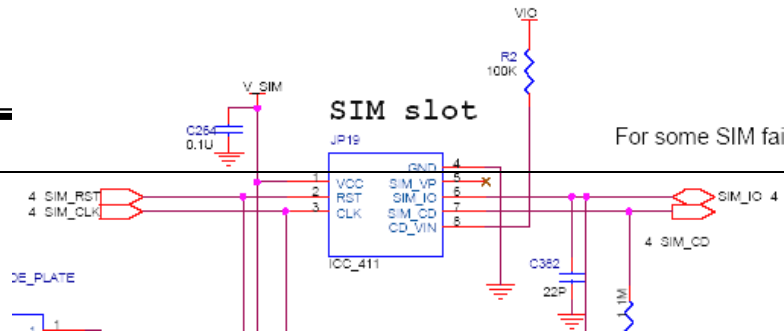
Application

USB_DEFECT inform CPU then CPU enable turn on USB.

3-9-2. USB function failure analysis Flow Chart



3-10. SIM slot Circuit



3-10-1. SIM slot circuit description

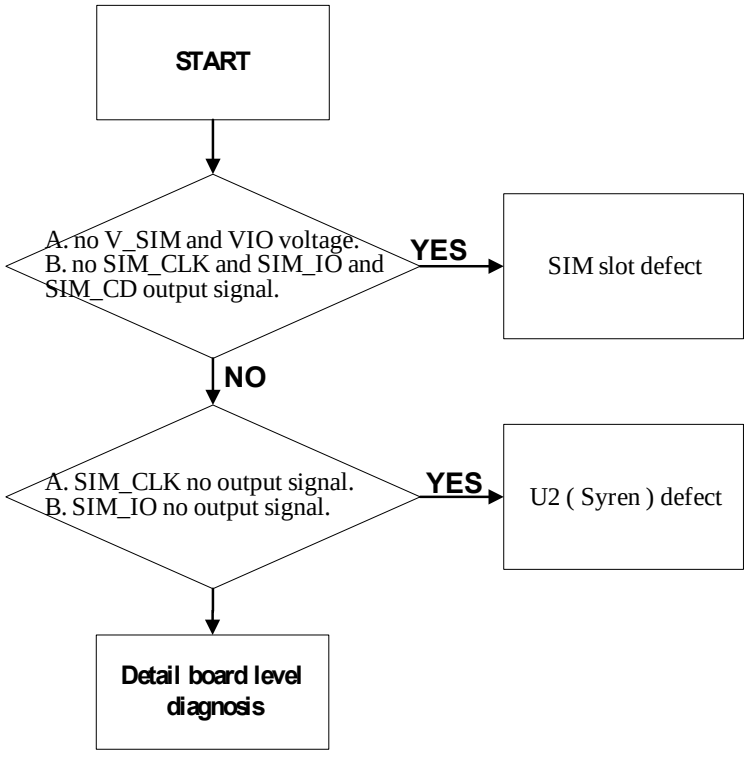
Description

A:SIM_RST :RESET
B:SIM_CLK : CLCK
C:SIM_IO : SIM DATA I/O
D:SIM_CD : Detect SIM Card
plug in

Application

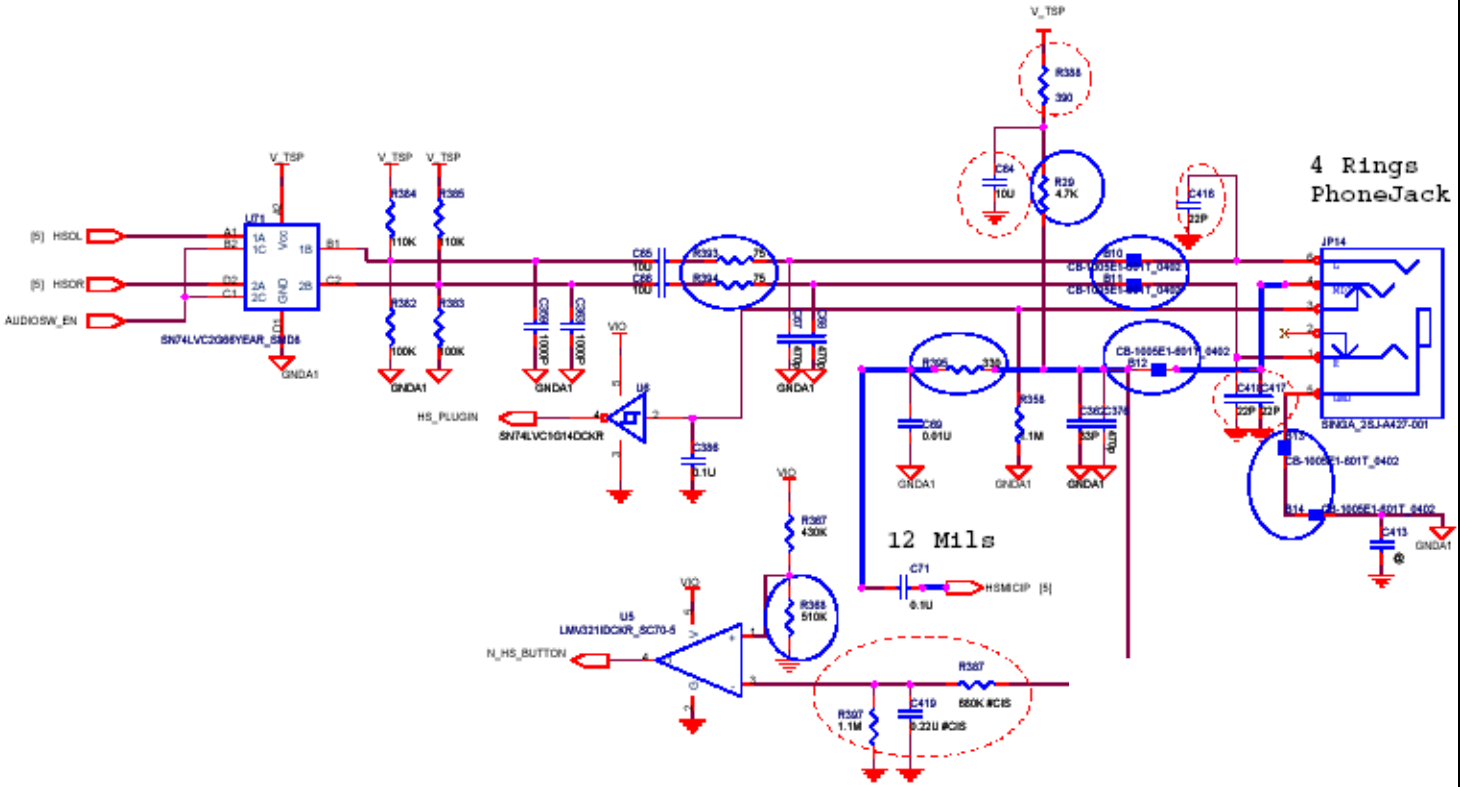
SIM Card plug in → ”SIM_CD” assert →notice CPU →system warm boot →CLK, data transfer → SIM function start work

3-10-2. SIM slot function failure analysis Flow Chart



3-11. Phonejack Circuit

3-11-1. Phonejack circuit description



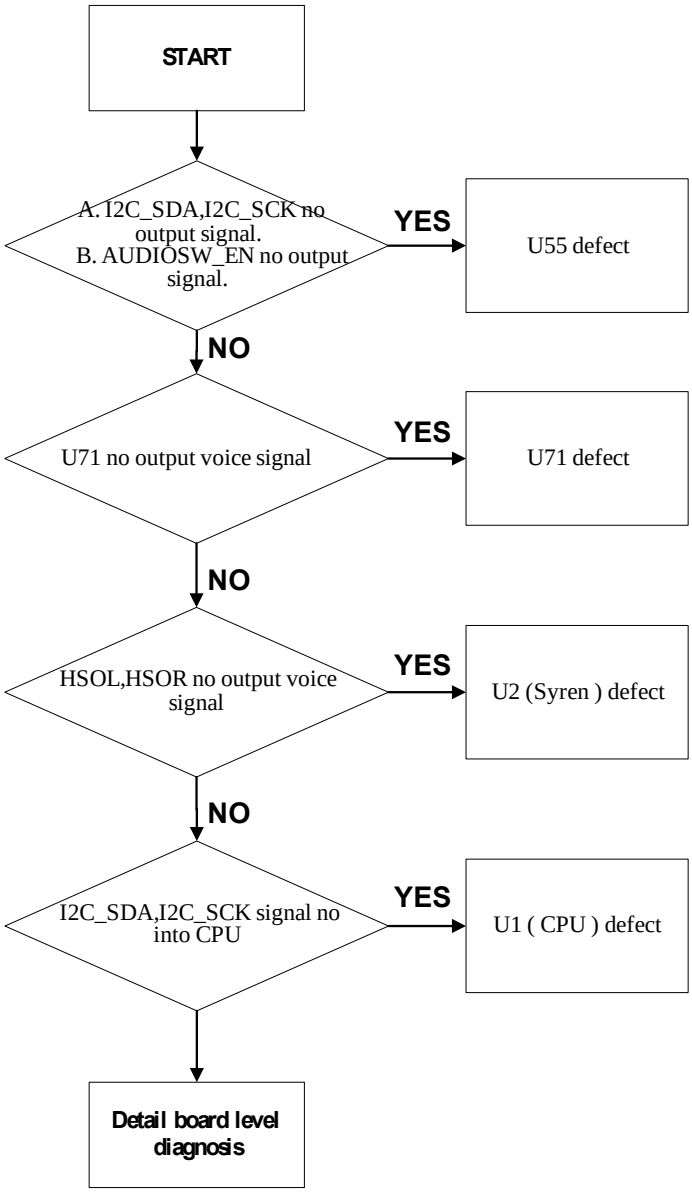
Description

A. HS_PLUGIN : Detect Phonejack
B. Audiosw_sw : SW enable
C. HSOL , HSOR : voice signal output

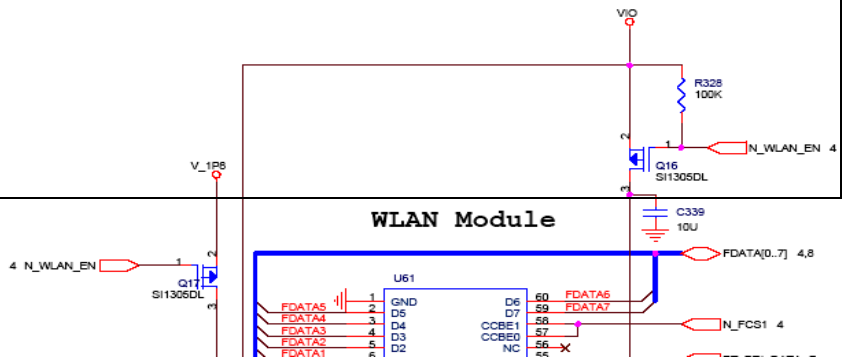
Application

HS_PLUGIN to U55(GPIO) -> output AUDIOSW_EN. U55 I2C inform CPU -> Syren output signal (HSOR,HSOL).

3-11-2. Phonejack function failure analysis Flow Chart



3-12. WLAN Circuit

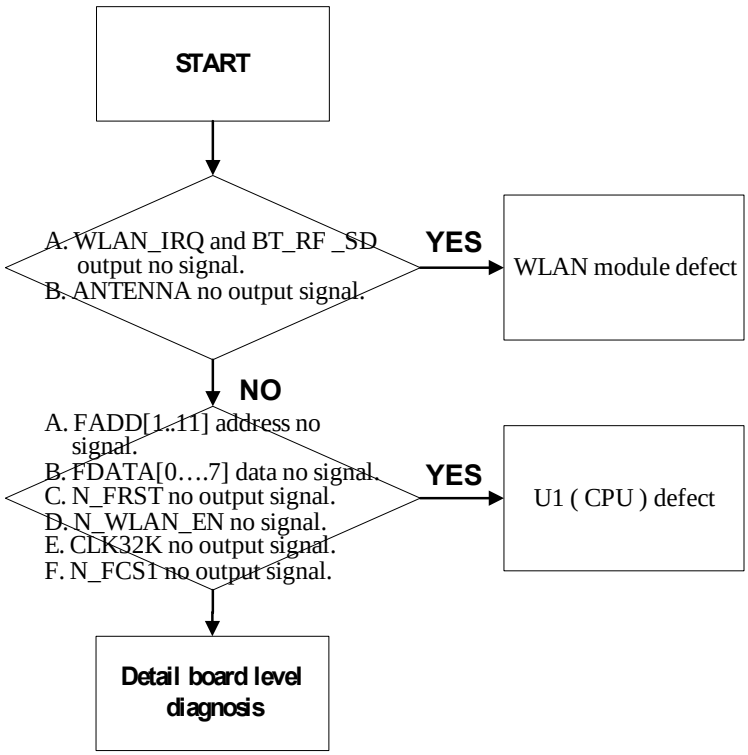


3-12-1. WLAN circuit description

Description

A: CLK32K : CLCK
B: N_WLAN_EN : SW enable
C: N_FCS1: chip select

3-12-2. WLAN function failure analysis Flow Chart



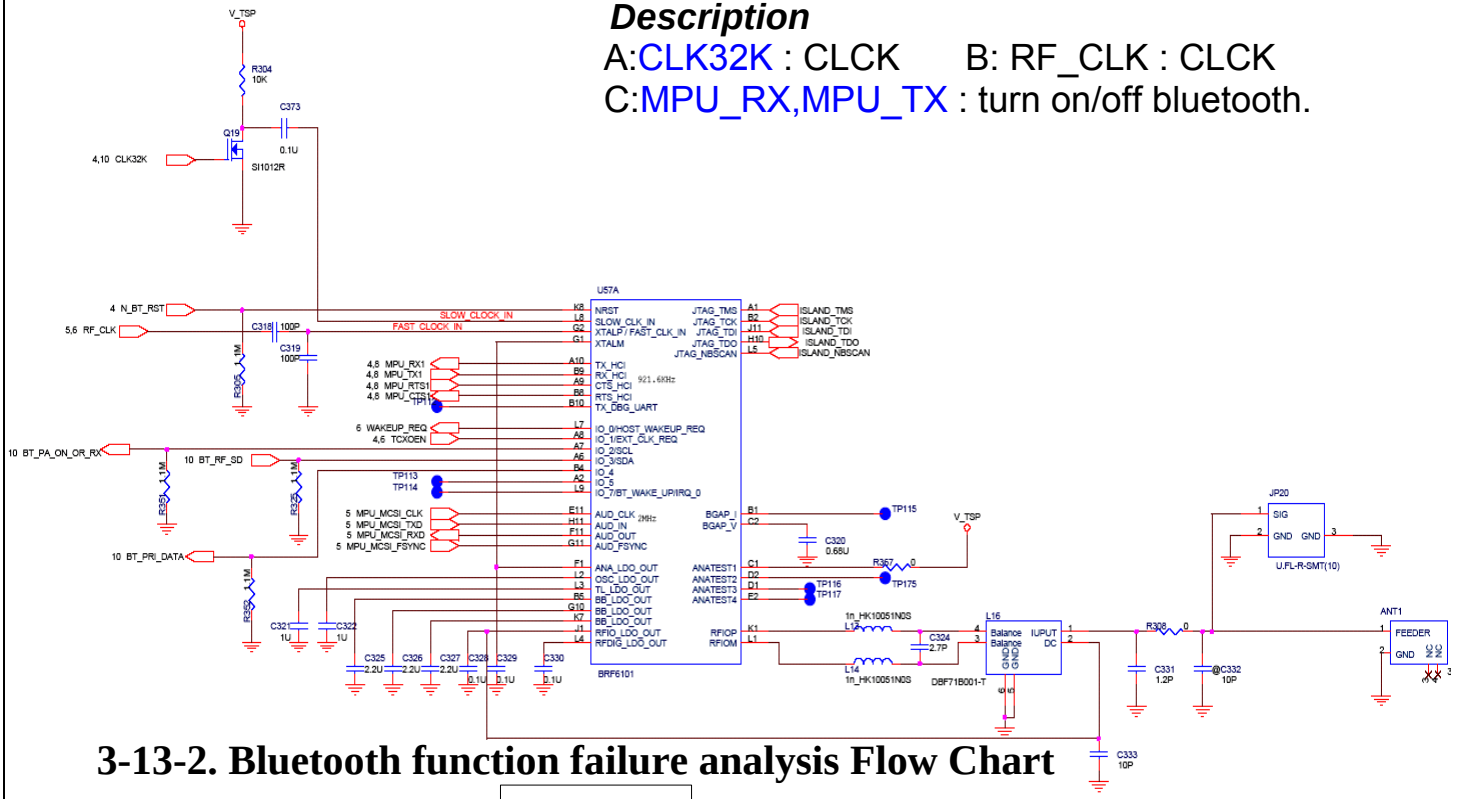
3-13. Bluetooth Circuit

3-13-1. Bluetooth circuit description

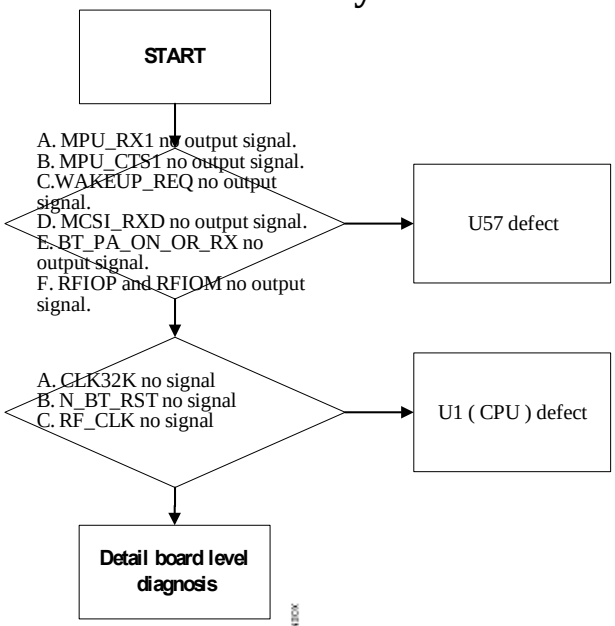
Description

A:CLK32K : CLCK B: RF_CLK : CLCK

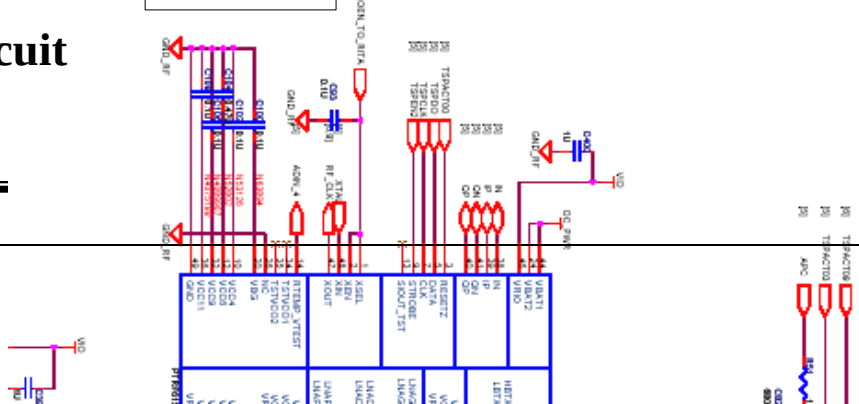
C:MPU_RX,MPU_TX : turn on/off bluetooth.



3-13-2. Bluetooth function failure analysis Flow Chart



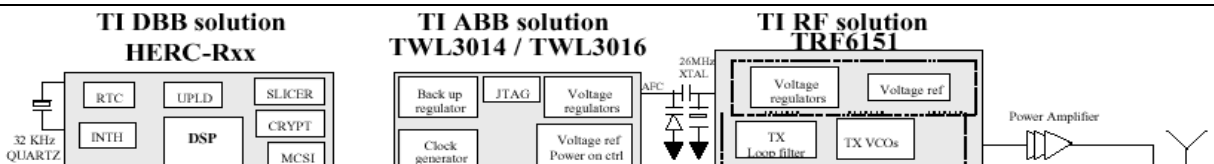
3-14. RF Circuit

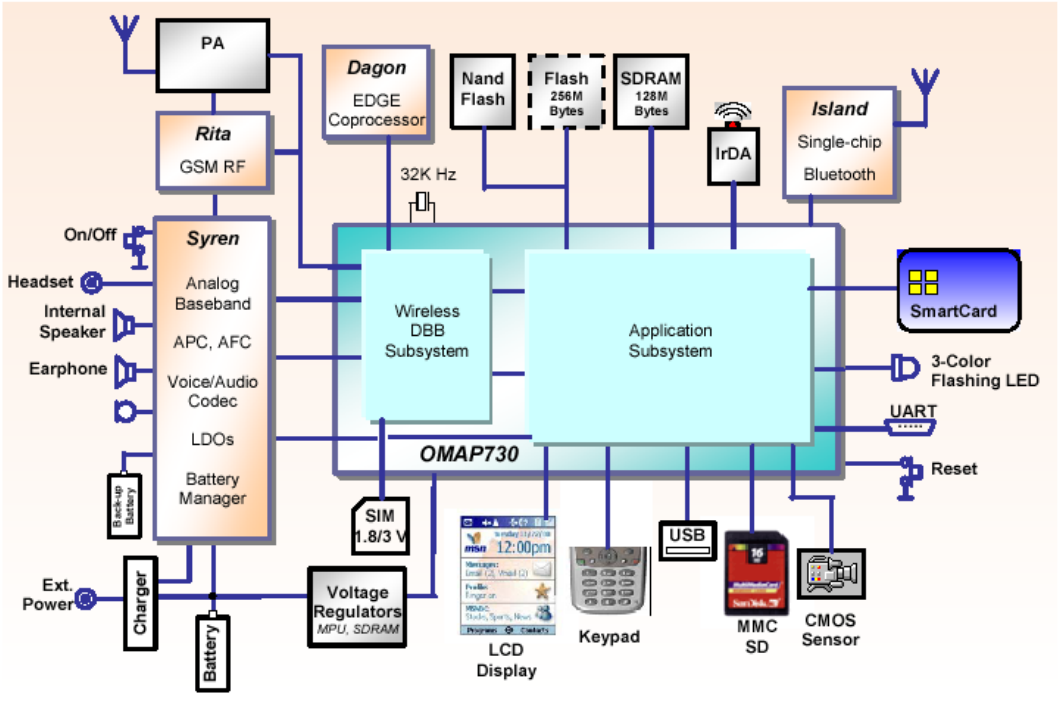


3-14-1. RF circuit description

A. Introduction

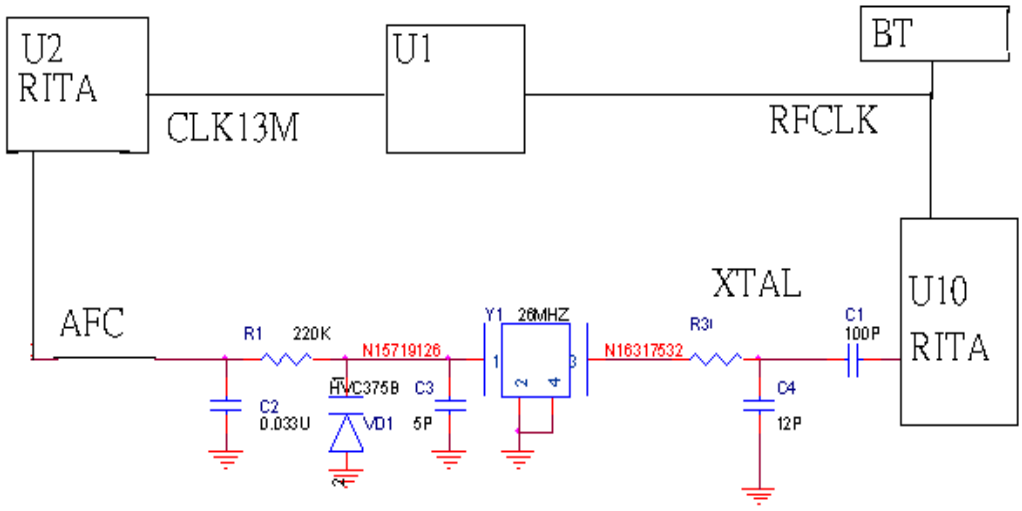
TI chipset = HERC-Rxx + TWL3014 / TWL3016 + TRF6151



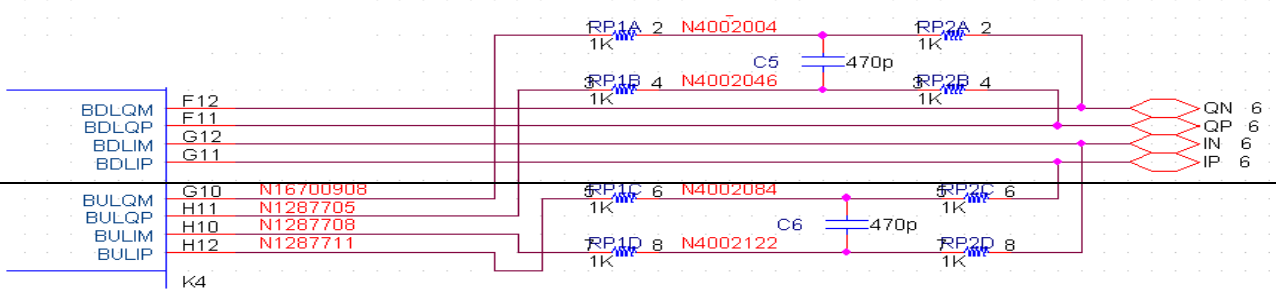


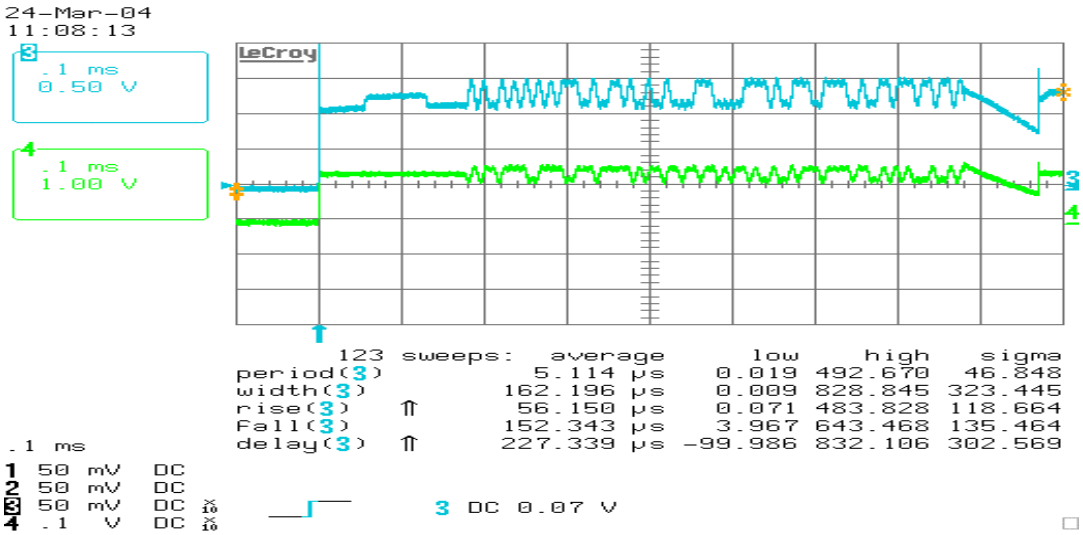
B. RF PCB appearance

C. External crystal (AFC circuit loop)



D. I/Q

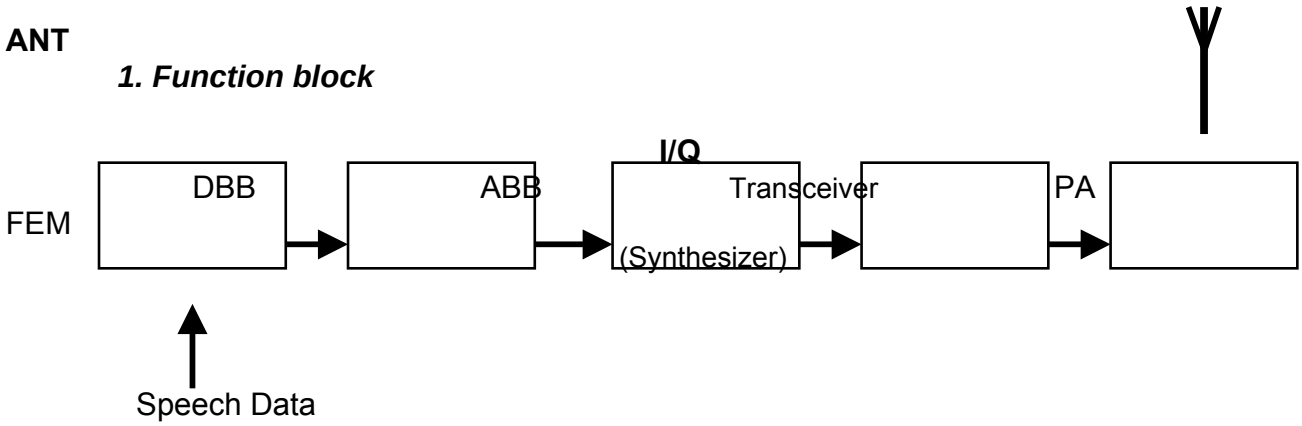




E. Transmitter path

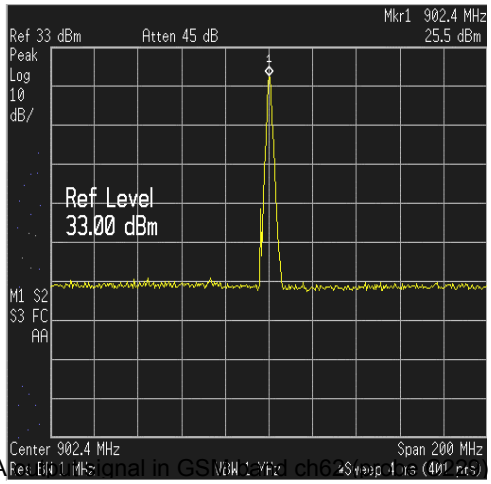
ANT

1. Function block

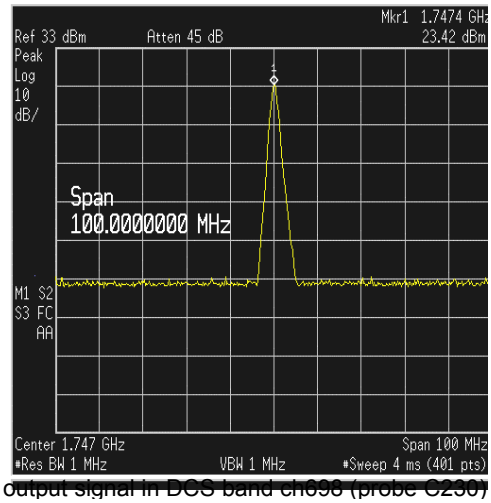


2. System view

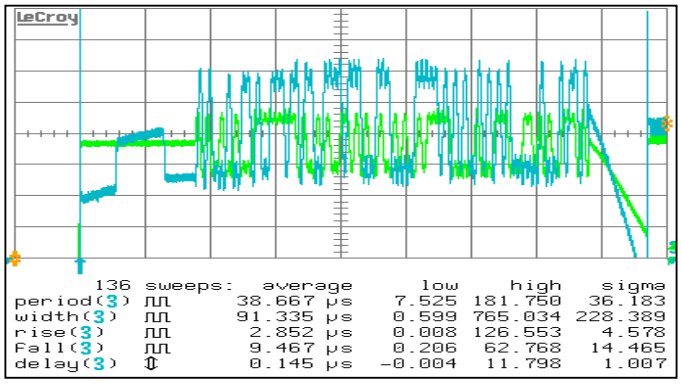
SYREN (I/Q) --> RITA (RF)--> PA --> FEM --> RF connector --> Ant(Radio)

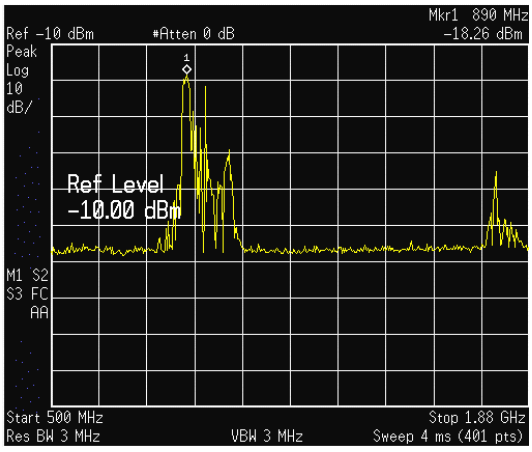


PA output signal in GSM band ch62 (probe C230)



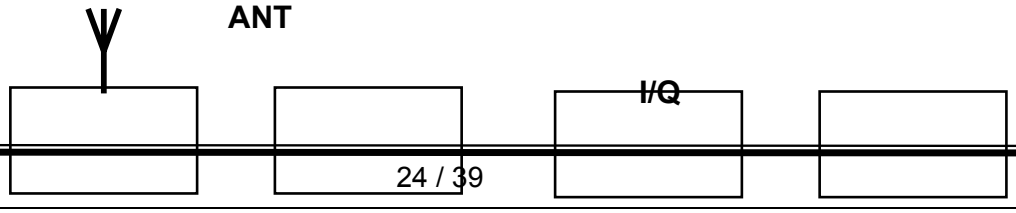
PA output signal in DCS band ch698 (probe C230)

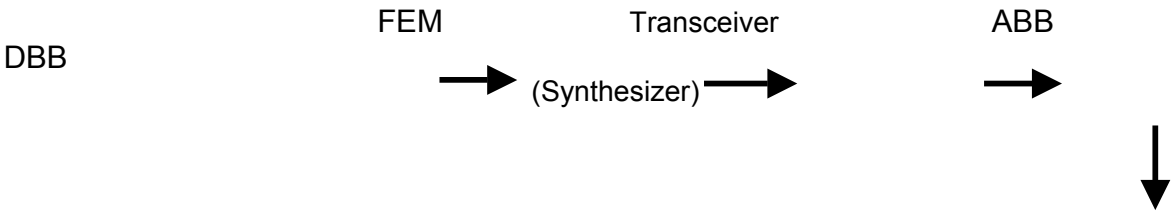




F. Receive path

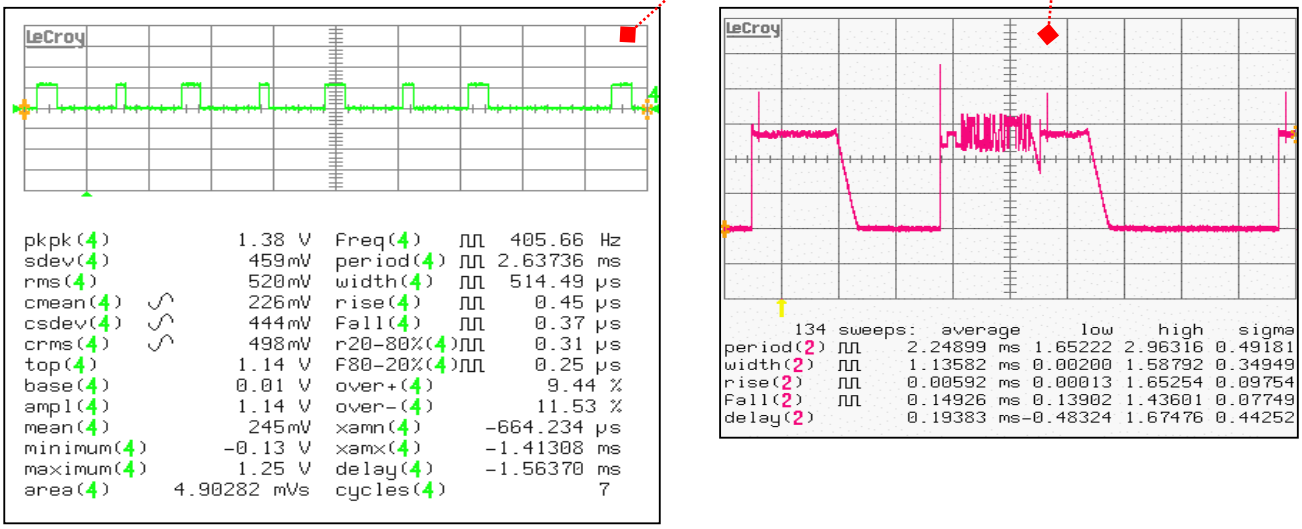
1. Function block





2. System view

Ant(Radio) --> RF connector --> FEM --> RITA (I/Q) --> SYREN



3-14-2. Transmitter failure analysis Flow Chart

1. Signal Tracking.
   -> Must make sure B.B is OK first ,like all clock , power are OK.

2. TX Control Signal

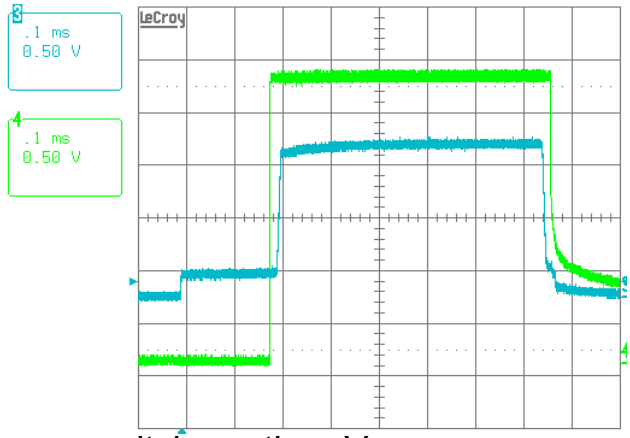
Band select pin2 (U9): switch PA works in which band from U1.

Tx enable pin3 (U9): enable PA works in burst mode from U1.

Tx switch on pin7, 8, 9 (U15): enable PA tx power through FEM to RF connector.

Switch	TX850/900	TX1800/1900	RX850
CTRL1	2.8V	0V	0V
CTRL2	0V	2.8V	0V
CTRL3	0V	0V	2.8V
All 0V for RX900/RX1800/RX1900			

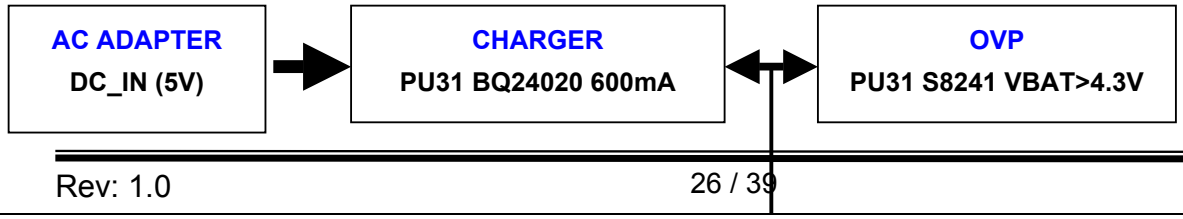
Vramp pin 6 (U9): ramp signal from U2.

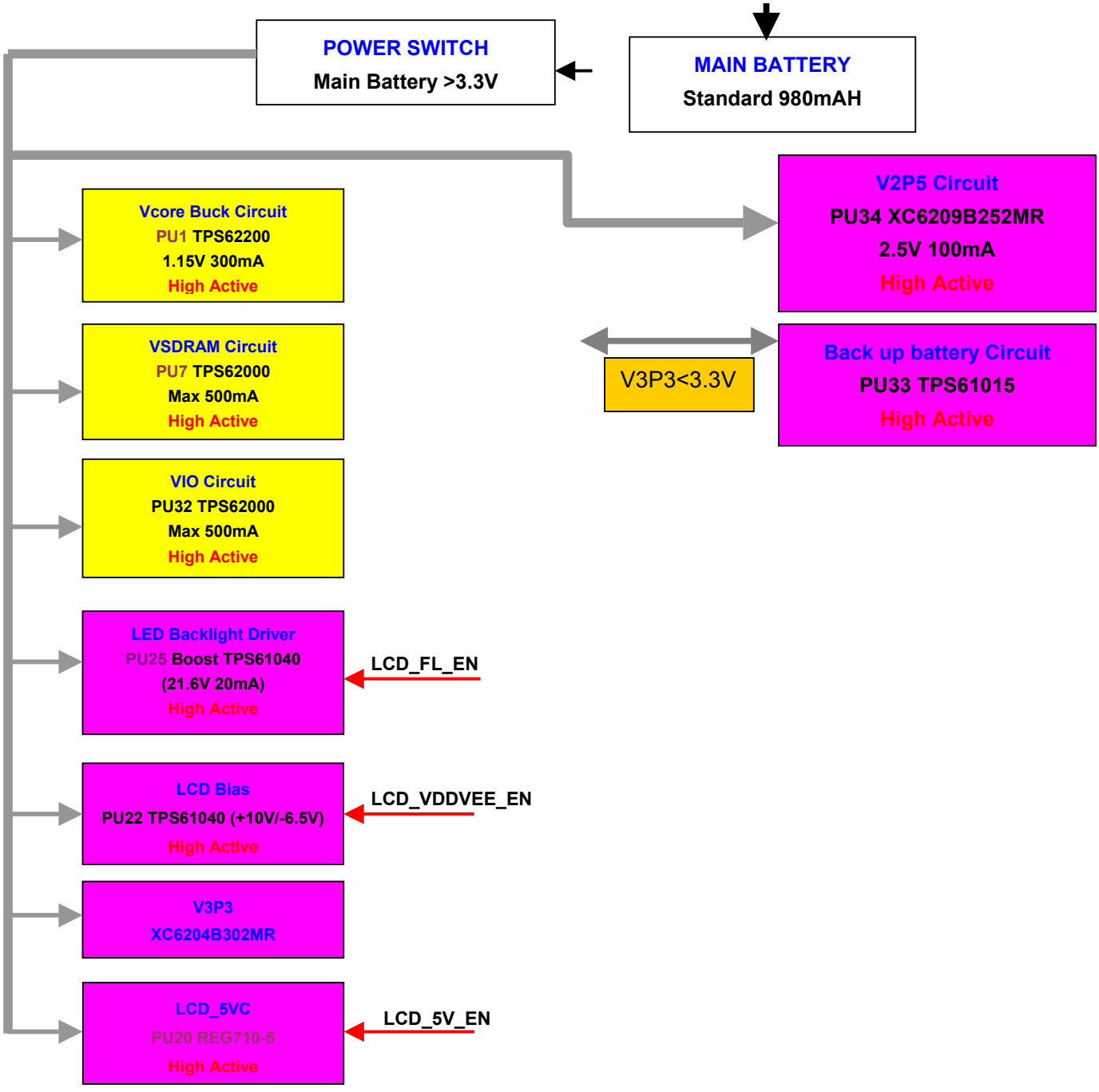


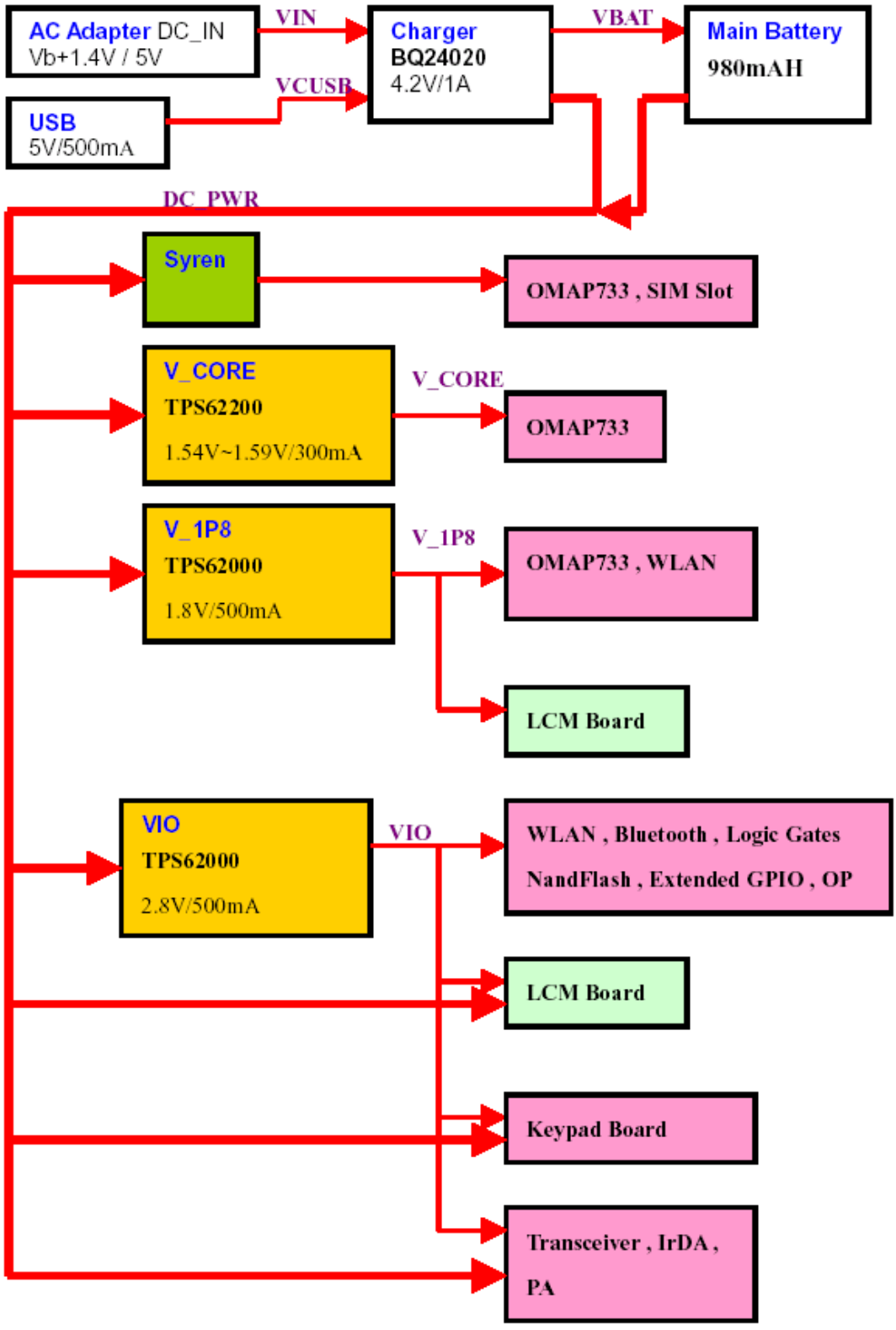
switch on ,then Vramp on

3-15. Charging & Power circuit description

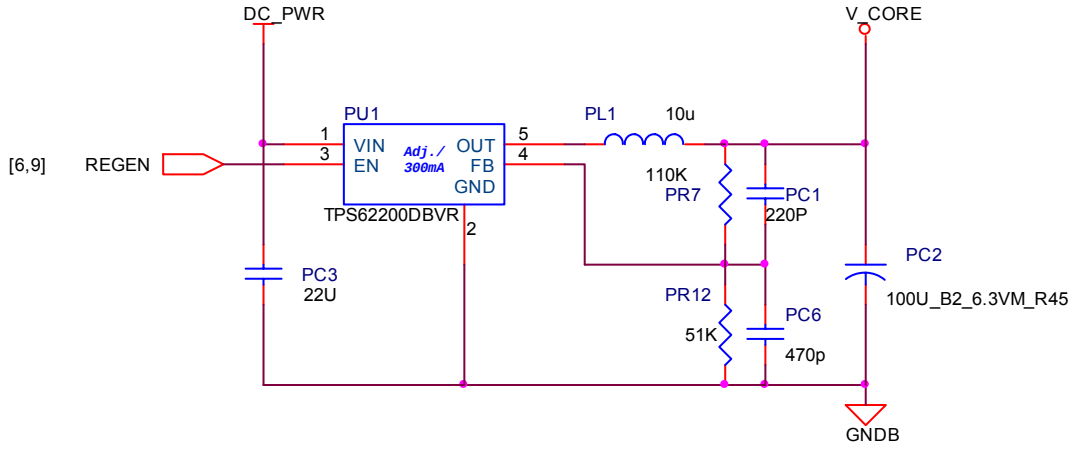
Power System Block Diagram




POWER SWITCH
Main Battery >3.3V
MAIN BATTERY
Standard 980mAH
V2P5 Circuit
PU34 XC6209B252MR
2.5V 100mA
High Active
Vcore Buck Circuit
PU1 TPS62200
1.15V 300mA
High Active
VSDRAM Circuit
PU7 TPS62000
Max 500mA
High Active
V3P3<3.3V
Back up battery Circuit
PU33 TPS61015
High Active
VIO Circuit
PU32 TPS62000
Max 500mA
High Active
LED Backlight Driver
PU25 Boost TPS61040
(21.6V 20mA)
High Active
LCD_FL_EN
LCD Bias
PU22 TPS61040 (+10V/-6.5V)
High Active
LCD_VDDVEE_EN
V3P3
XC6204B302MR
LCD_5VC
PU20 REG710-5
High Active
LCD_5V_EN

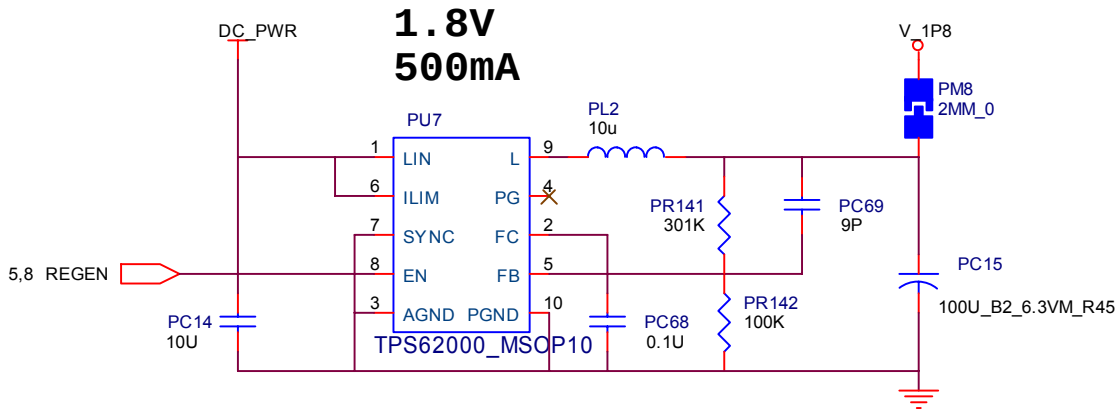

AC Adapter DC_IN
Vb+1.4V / 5V
VIN
Charger
BQ24020
4.2V/1A
VBAT
Main Battery
980mAH
USB
5V/500mA
VCUSB
DC_PWR
Syren
OMAP733 , SIM Slot
V_CORE
TPS62200
1.54V~1.59V/300mA
V_CORE
OMAP733
V_1P8
TPS62000
1.8V/500mA
V_1P8
OMAP733 , WLAN
LCM Board
VIO
TPS62000
2.8V/500mA
VIO
WLAN , Bluetooth , Logic Gates
NandFlash , Extended GPIO , OP
LCM Board
Keypad Board
Transceiver , IrDA ,
PA

3-15-1. V_CORE power 1.5VDC



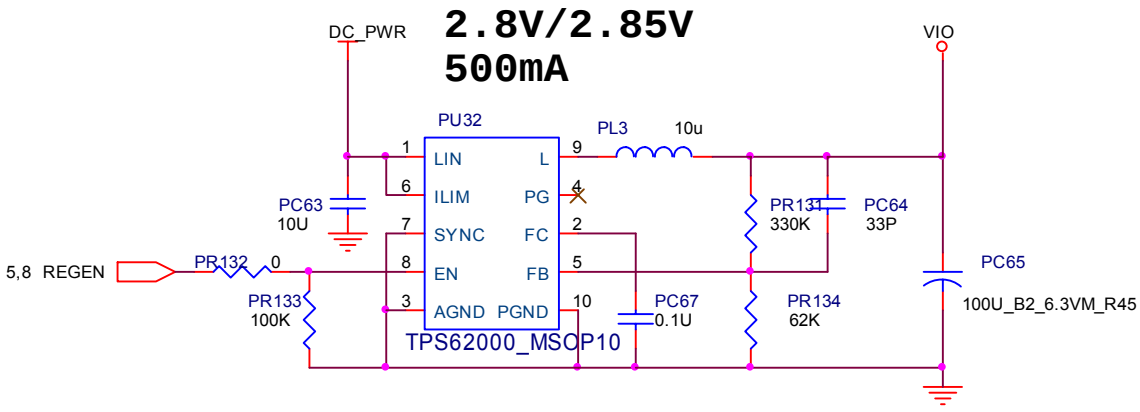
	MIN	TYPICAL	MAX	
PR7	108900	110000	111100	ohm
PR12	50589	51100	51611	ohm
VFB	0.485	0.5	0.515	V
VCORE	1.508357	1.576321	1.646007	V

3-15-1. VSDRAM power 1.8V



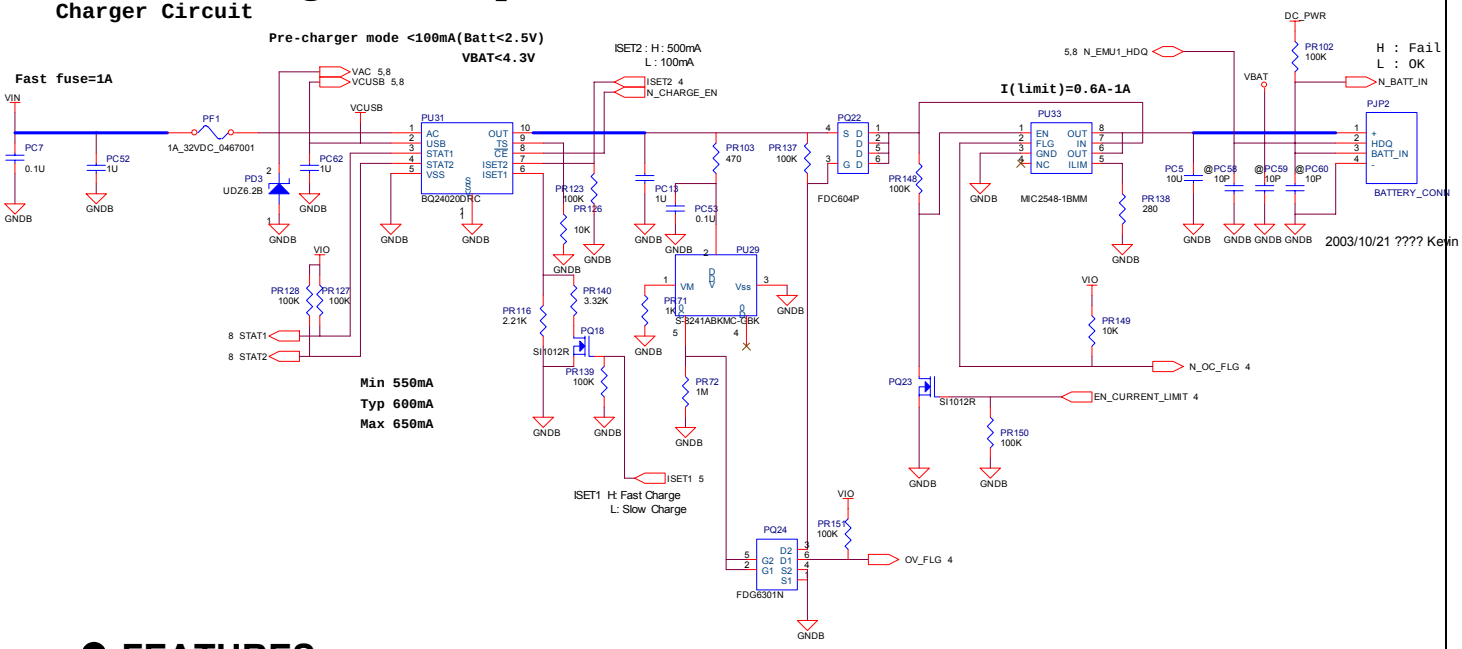
	MIN	TYPICAL	MAX	
PR141	297990	301000	304010	ohm
PR142	99000	100000	101000	ohm
PU8.FB	0.4365	0.45	0.468	V
V_3P3	1.724348	1.8045	1.905138	V

3-15-2. VIO power 1.8VDC



	MIN	TYPICAL	MAX	
PR131	328680	332000	335320	ohm
PR134	61380	62000	62620	ohm
PU8.FB	0.4365	0.45	0.468	V
V_3P3	2.727602	2.859677	3.024692	V

3-15-3. Charger circuit power



● FEATURES

Charges and Powers Systems from Either AC Adapter or USB With Autonomous Power-Source Selection

* Integrated USB Control With Selectable 100 mA and 500 mA Charge Rates
* Ideal for Low-Dropout Charger Designs for Single-Cell Li-Ion or Li-Pol Packs in Space Limited Portable Applications
* Integrated Power FET and Current Sensor for Up to 1-A Charge Applications From AC Adapter
* Pre-charge Conditioning With Safety Timer
* Power Good (AC Adapter Present) Status Output
* Optional Battery Temperature Monitoring Before and During Charge
* Automatic Sleep Mode for Low-Power Consumption
* Criteria For Main PCB Power
  - I (out) = 600mA
  - I (usb)=500mA/100mA

The bqTINY-II offers on-chip current regulation with programmable set point. The resistor connected between the ISET1 and VSS, RSET, determines the AC charge rate. The V(SET) and K(SET) parameters are specified in the specifications table.

$$I_{O\,(OUT)} = \frac{V_{(SET)} \times K_{(SET)}}{R_{SET}}$$

During a charge cycle if the battery voltage is below the V (LOWV) threshold, the bqTINY-II applies a pre-charge current, Io (PRECHG), to the battery. This feature revives deeply discharged cells. The resistor connected between the ISET1 and Vss; RSET, determines the pre-charge rate. The V (PRECHG) and K (SET) parameters are specified in the specifications table. Note that this applies to both AC and USB charging.

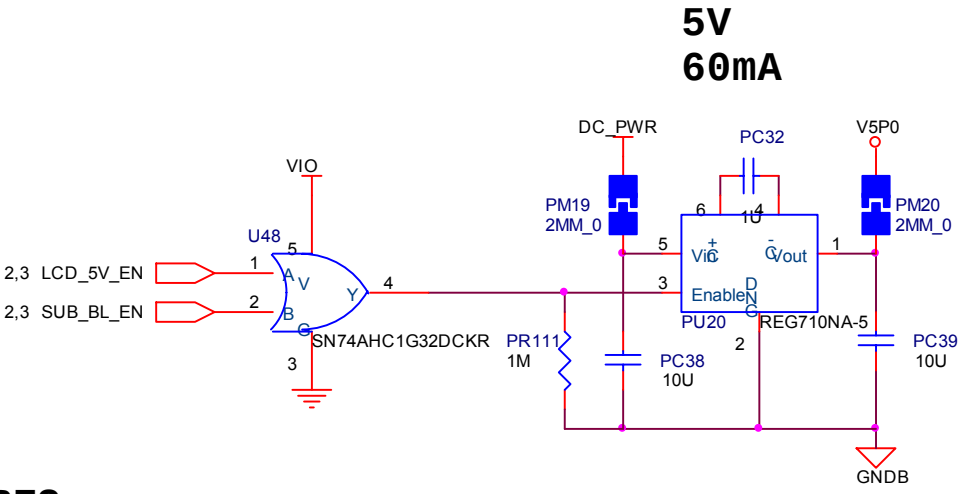
$$I_{O\ (PRECHG)} = \frac{V_{(PRECGH)} \times K_{(SET)}}{R_{SET}}$$

	MIN		MAX
MIC2548	184	230	276
			(MAX)1A
SET RES(OHM)(+/-0.5%)	278.6	280	281.4
SET CURRENT(A)	0.653873	0.821429	0.990668

SET RES(OHM)(+/-0.5%)	2198.95	2210	2221.05	
K(SET)	307	322	337	
V(SET)	2.463	2.5	2.538	
I(out)	0.340443	0.364253	0.388961	mA
			<400mA	
SET RES(OHM)(+/-0.5%)	3303.4	3320	3336.6	
RSET	1320.165	1326.799	1333.433	
K(SET)	307	322	337	
V(SET)	2.463	2.5	2.538	
I(out)	0.567063	0.606723	0.647878	mA
			<653.87mA	

Follow mic2548 current limit

3-15-4. LCD_5V 5VDC

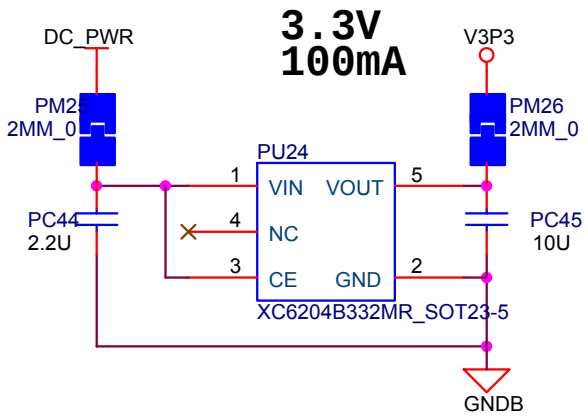


● FEATURES

_ Wide Input Range: 1.8V to 5.5V
_ Automatic Step-Up/Step-Down Operation
_ Low Input Current Ripple
_ Low Output Voltage Ripple
_ Minimum Number of External ComponentsÑNo Inductors
_ 1MHz Internal Oscillator Allows Small Capacitors
_ Shutdown Mode
_ Thermal and Current Limit Protection
_ Six Output Voltages Available: 5.5V, 5.0V, 3.3V, 3.0V, 2.7V, 2.5V
_ Small Packages: - SOT23-6 - TSOT23-6 (REG71055 and REG71050 Only)
_ Evaluation Modules Available:
REG710EVM-33, REG710EVM-5

- Criteria For Main PCB Power
  - Ip = 60mA
  - Vrp-p □ 150mV
  - Load regulation (max) : ±3%
  - Turns on : quiescent current (max) 30uA
  - PWR_EN = LCD_5V_EN

3-15-5. V3P3 power 3.3VDC



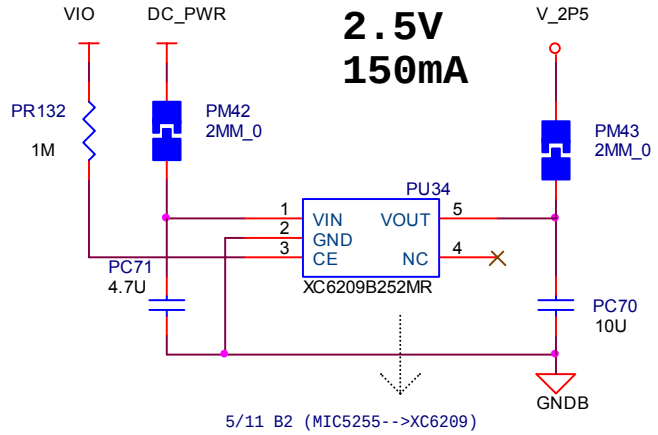
● FEATURES

Maximum Output Current: 150mA
Dropout Voltage: 200mV (IOUT = 100mA)
Maximum Operating Voltage: 10V
Output Voltage Range: 1.8V ~ 6.0V in 50mV increments
Highly Accurate : ± 2%
Low Power Consumption : TYP 75μA
Standby Current : less than 0.1μA
Low Output Noise : 30μVrms
Low ESR Capacitor Compatible: Ceramic capacitor

Criteria For Main PCB Power

- Ip = 100mA
- Vrp-p 99mV
- Load regulation (max) : ±3%
- Turns on: quiescent current (max) 3uA

3-15-6. V2P5 power 2.5VDC



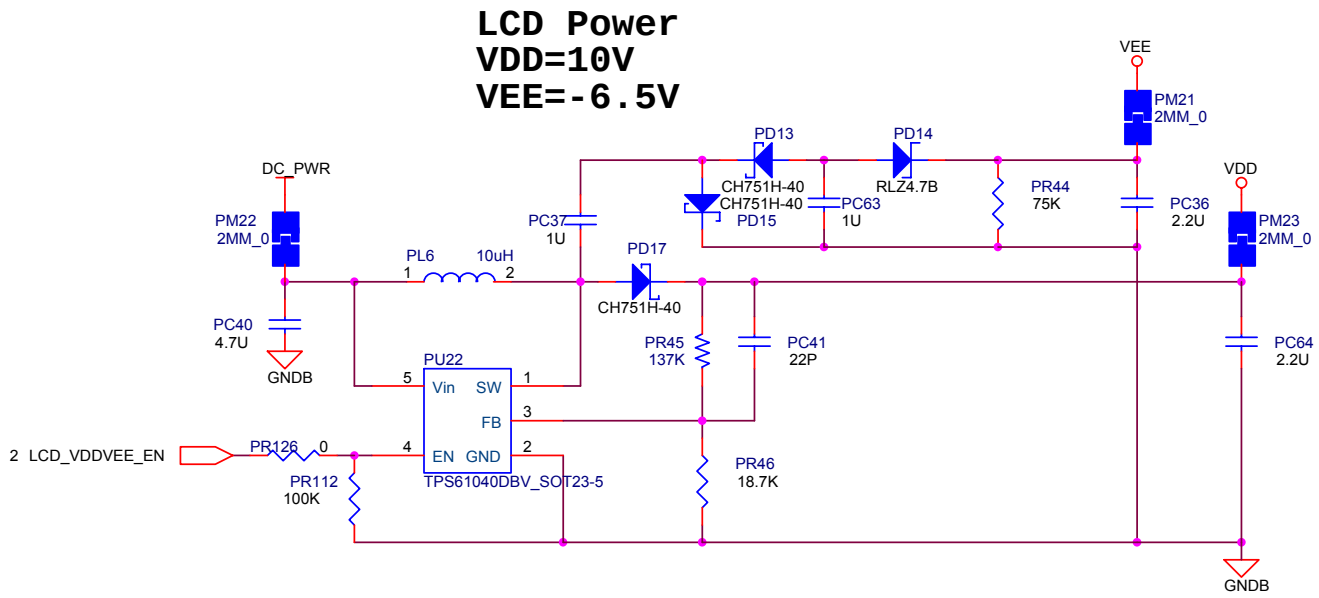
● FEATURES

Applications _Low Power Consumption : 25□A (TYP)
_Dropout Voltage: 30mA @ 60mV : 100mA @ 200mV
_Maximum Output Current : 200mA
_Highly Accurate: ±2% (±30mV less than 1.5V)
_Output Voltage Range : 0.9V ~ 6.0V (50mV Step)
_Low ESR capacitor compatible

Criteria For Main PCB Power

- Ip = 100mA
- Vrp-p □75mV
- Load regulation (max) : ±2%
- Turns on: quiescent current (max) 3uA

3-15-7. LCM power VDD VEE



● FEATURES

- 1.8V to 6V Input Voltage Range
- Adjustable Output Voltage Range to 28V
- 400mA Internals Switch Current
- Up to 1MHz Switching Frequency
- 28uA Typical No Load Quiescent Current
- 1uA Typical Shutdown Current
- Internal Soft start

■ Output Voltage Regulation

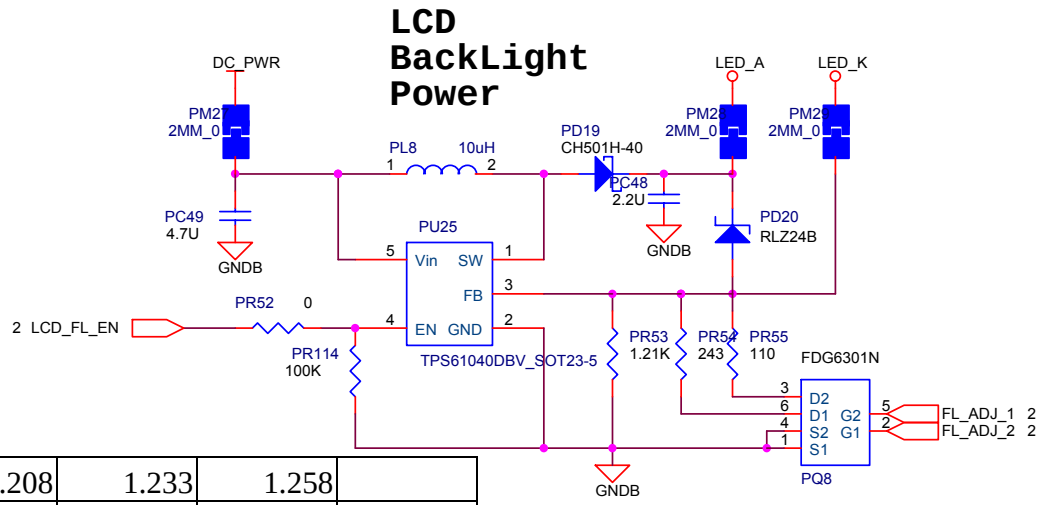
	min	typical	max	
PR45	135630	137000	138370	ohm
PR46	18909	19100	19291	ohm
PU22.VFB	1.208	1.233	1.258	V
VDD	9.701134	10.07703	10.46364	V

Follow the zener diode curve, we need give -6.5V

-6.5V/75000=86uA

VEE	max	10uA
From PD14 76uA		
Find Zener diode	-3.5V	RLZ4.7V

3-15-8. LCD back light power 15VDC



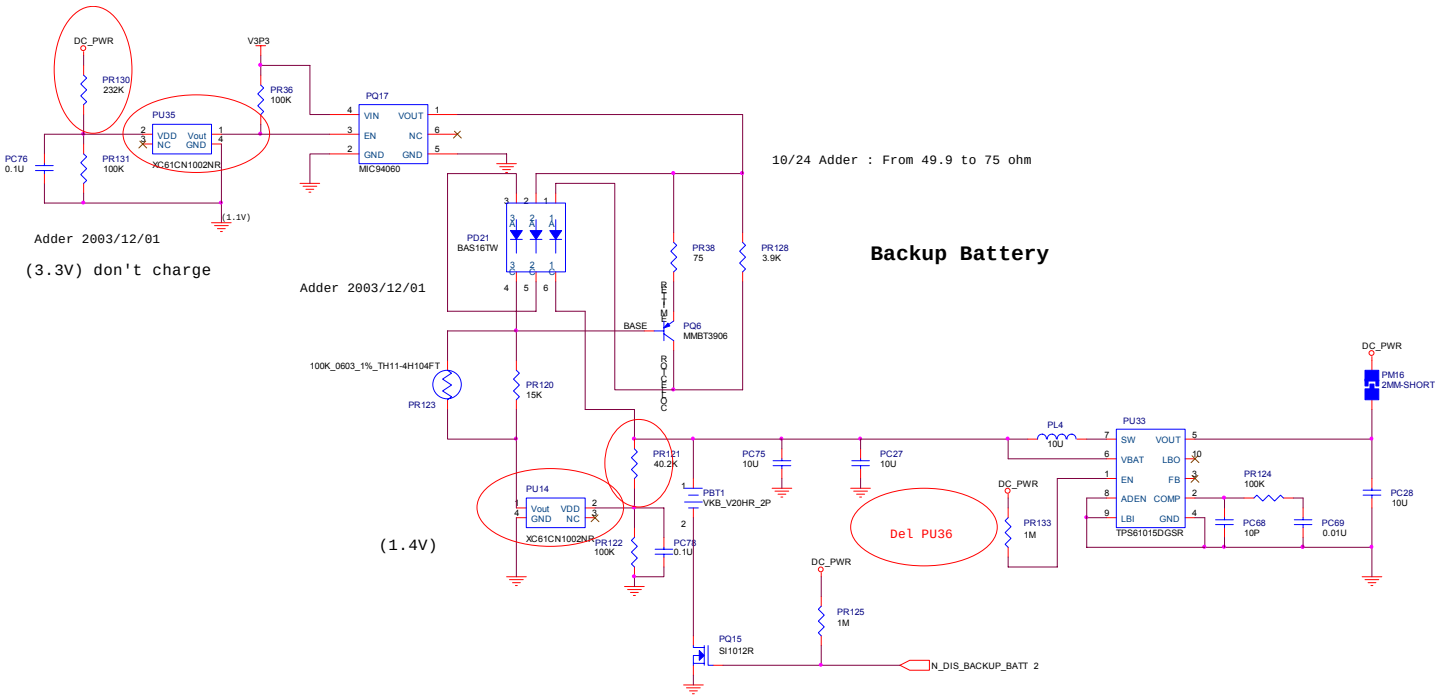
PU25.VFB	1.208	1.233	1.258	
PR53	1197.9	1210	1222.1	
PR54	240.57	243	245.43	
PR55	108.9	110	111.1	
STEP1	0.988462	1.019008	1.050171	mA
STEP2	5.910436	6.093082	6.279418	mA
STEP3	11.86155	12.2281	12.60205	mA
STEP4	16.78352	17.30217	17.8313	mA

output

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OUT}	Adjustable output voltage range		Vin		28	V
V_{ref}	Internal voltage reference			1.233		V
I_{FB}	Feedback input bias current	V_{FB} = 1.3 V			1	µA
V_{FB}	Feedback trip point voltage	1.8 V ≤ Vin ≤ 6.0 V	1.208	1.233	1.258	V
	Line regulation (see Note 3)	1.8 V ≤ Vin ≤ 6.0 V; Vout = 18 V; Iload = 10 mA Cff = not connected		0.05		%/V
	Load regulation (see Note 3)	Vin = 2.4 V; Vout = 18 V; 0 mA ≤ Iout ≤ 30 mA		0.15		%/mA

NOTE 3: The line and load regulation depend on the external component selection. Refer to the application section for further information.

3-15-9. Backup battery power 3.0VDC



● FEATURES

* Integrated Synchronous Rectifier for Highest Power Conversion Efficiency (>95%)
* Start-Up Into Full Load With Supply Voltages as Low as 0.9 V, Operating Down to 0.8 V.
* 200-mA Output Current From 0.9-V Supply.
* Power save-Mode for Improved Efficiency at Low Output Currents.
* Auto discharge Allows to Discharge Output Capacitor During Shutdown.
* Device Quiescent Current Less Than 50 mA _ Ease-of-Use Through Isolation of Load From Battery During Shutdown of Converter _ Integrated Anti-ringing Switch Across Inductor.
* Integrated Low Battery Comparator
* Micro-Small 10-Pin MSOP Package
* Applications Include All Single- or Dual-Cell Battery Operated Products Like Internet Audio Players, Pager, Portable Medical Diagnostic Equipment, Remote Control, Wireless Headsets ACTUAL SIZE

- Criteria For Main PCB Power
  - Ip = 5mA
  - Vrp-p □ 99mV
  - Load regulation (max): ±3%
  - Efficiency: 80% at 1Vdc input (only calculate LED)

    Full load: I load =5mA
  - Turn on quiescent current (max): 46uA

* Charge back up battery:
  Using current limit, Estimate 1ss355 VF=0.55 2PCS 0.65*2=1.3V
  MMBT3094 Vbe=0.8V, so PR33 terminal voltage is 0.3V
  0.3/49.9 ohm=0.005A charge current.

  XC61CN1002MR, PR21 and PR22 are voltage detect point.
  If voltage >1.4V we will stop charge back up battery.
  NTC resistance is following battery thermal compensation; we need to regulate full charge voltage to protect battery.

Output Voltage Regulation

PR121	26730	27000	27270	
PR122	99000	100000	101000	
PU14	1.078	1.1	1.122	
Back up	1.363296	1.397	1.43106	V