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Part S1 Hardware Description

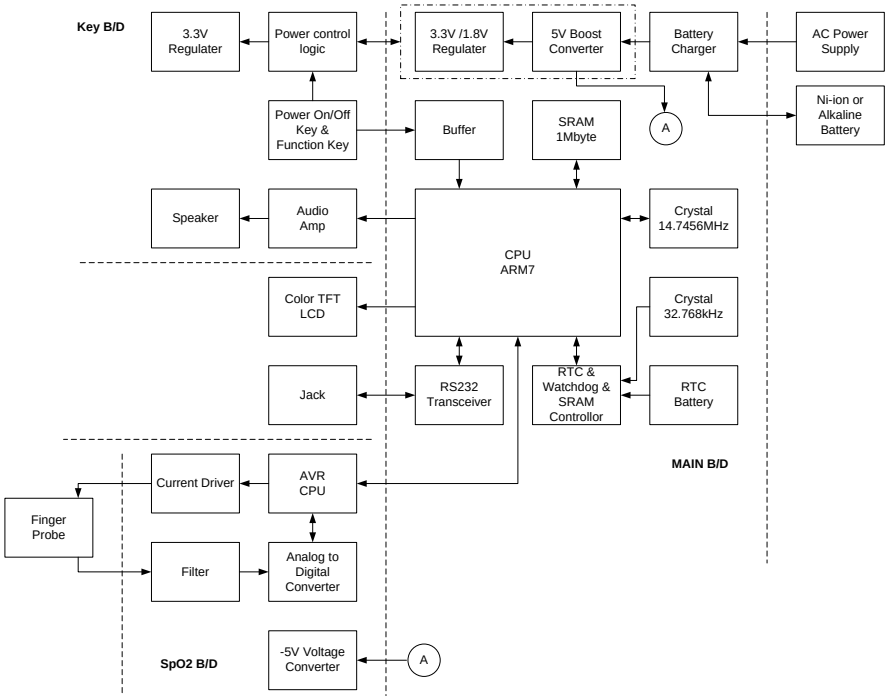


Fig. Whole Block Diagram

This product consists of three boards including Main, Key and Analog (Spo2) boards. On individual board, Main board has general system control and power supply parts and Key board is equipped with function buttons and a sound amplifier to generate sound. Lastly Analog (SpO2) board can detect analog signals.

Description of Main Board

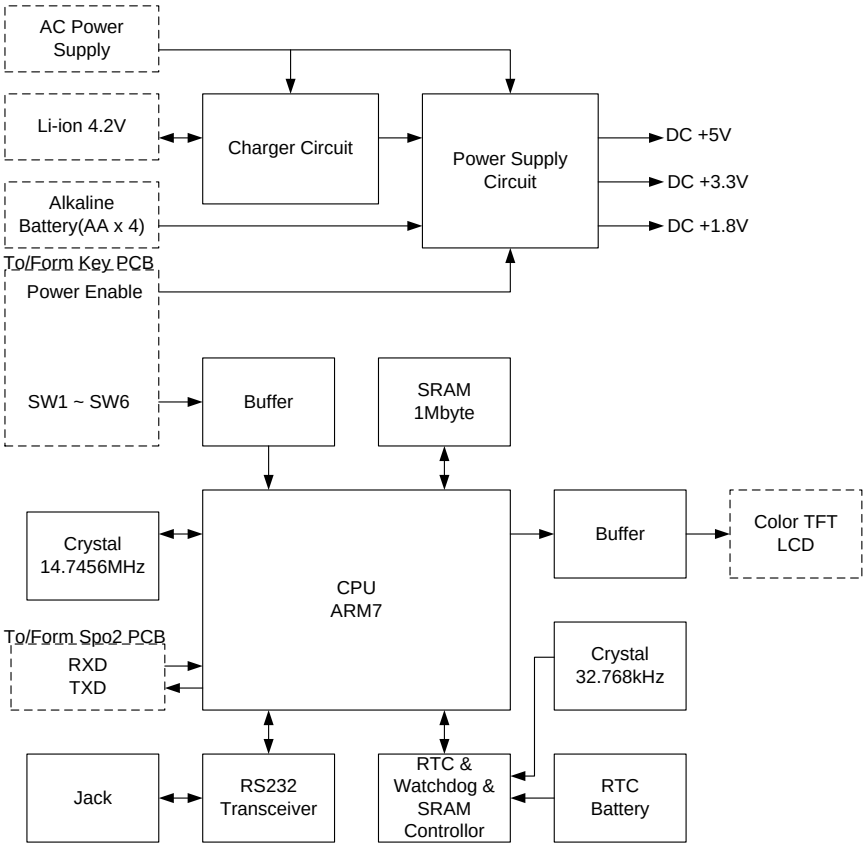


Fig. Block Diagram of Main board

▣ CPU

- Structure of CPU

• 16/32-bit ARM7TDMI-S Micro Controller

• 16 kB One Chip RAM

• 128/256 kB One Chip Flash Program Memory

• 10-bit A/D Converter

• Two 32-bit Timer, Real-time Clock and Watchdog

- Functions of CPU

• To control brightness of LCD.

• To display saturation level of oxygen and pulse frequency for the patient.

• To store values measured from the patient.

• To check button pressed and execute the functions upon it.

• To calculate saturation level of oxygen and pulse frequency.
• To generate alarm, pulsation sound and button pressing sound.
• To check remaining battery capacity and control power supply of the product.

▣ Charging Circuit

• To check voltage and current of Li-ion battery (4.2V) in real-time and charge it by applying Voltage.
• To check voltage, current and charging time constantly to ensure safe charging.

▣ Power Supply Circuit

• If input voltage goes down under 5V, a step-up converter operates to generate stable voltage +5V so that alkaline battery can be used.
• To generate +3.3V and +1.8V to be used on Main board.

▣ SRAM

• It consists of 1MByte RAM, which stores values measured from the patient and settings for the product.

▣ Real-time Clock (RTC), Watchdog, SRAM Controller

• bq4802 includes all functions for Real-time Clock (RTC), Watchdog, SRAM Controller, etc.
• Real-time Clock (RTC) is used to set the current time.
• Watchdog carries out reset when CPU doesn't work so that it can operate again.
• SRAM controller protects SRAM from storing any abnormal data when turning on/off power supply at the beginning or the power is unstable.

Description on Key Board

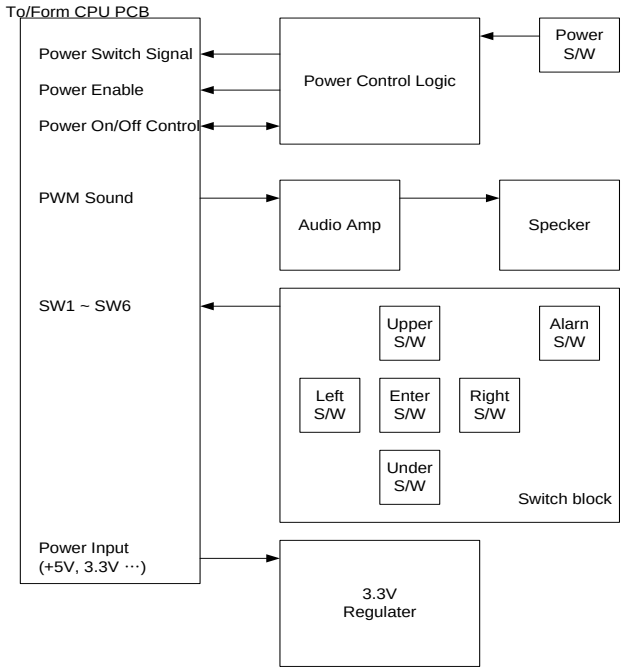


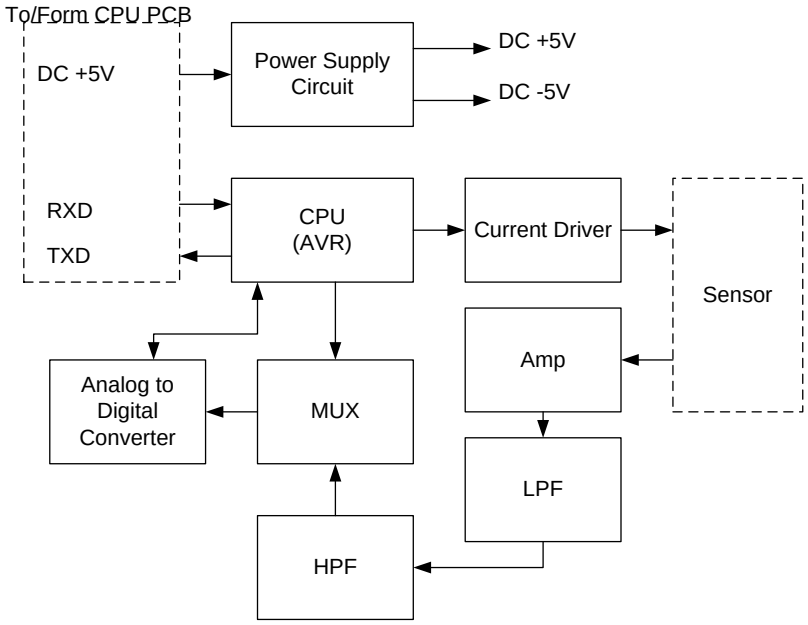
Fig. Block Diagram of Key Board

▣ Power Control Logic sends signals to power circuit and CPU on Main Board to turn on/off the product when pressing power button.

▣ It receives power applied from Main board and generates +3.3V to allow power control logic to operate.

▣ It has six buttons except power button, of which pressing status are transferred to CPU.

Description on Analog (SpO2) Board



Block Diagram of Analog (SpO2) Board

▣ CPU (AVR)

• It consists of 8bit micro controller to carry out functions such as communication with Main CPU, current control, signal separation, A/D converter control, etc.

▣ Procedures to Extract Signals

• To control current driver with value set by CPU to apply it to the sensor.

• When a finger enters into the probe (sensor), it amplifies the signal and extracts the signal through low pass and high pass filters. The extracted signals are divided into RED and IR signals through MUX.

• The divided signals are fitted with the protocols set by CPU, and sent to CPU on Main Board through serial port.

Part S2 Performance verification

-. Required Equipment

Equipment	Description
Pulse Oximetry Sensor	Charmcare reusable Sensor
Pulse Oximetry Functional Tester	Fluke Index2 

Note

A functional tester cannot be used to assess the accuracy of a pulse oximeter monitor. However, it can be used to demonstrate that a particular pulse oximeter monitor reproduces a calibration curve that has been independently demonstrated to fulfill a particular accuracy specification.

-. Pulse Oximetry Functional Test items

Item	Description
Pulse rate(BPM)	The test procedure simulates an sensor attached to a patient indicating 60 BPM and 200 BPM.
SpO2	The test procedure simulates an sensor attached to a patient indicating 66%blood oxygen saturation and 96% blood oxygen saturation.

-. Pulse Oximetry Functional Tests

1	With the monitor turned off, connect the pulse oximetry sensor to the sensor port.
2	The Index2 tester set 96% blood oxygen saturation and 60 BPM (Main Menu1 → SIM → MAN → SPO2 and RATE)
3	Connect the Index2 tester to the other end of the sensor
4	Turn on the monitor by pressing the Power button.

5	Check SpO2 and pulse rate measurement values. -.%SpO2 indication between 94 and 98 inclusive. -.BPM indication between 57 and 63 inclusive.
6	The Index2 tester set 66% blood oxygen saturation and 200 BPM (Main Menu1 → SIM → MAN → SPO2 and RATE)
7	Check SpO2 and pulse rate measurement values -.%SpO2 indication between 63 and 69 inclusive. -.BPM indication between 197 and 203 inclusive.

Part S3 Troubleshooting

-. Password for maintenance menu

Password is required to access maintenance. The password is **1289**.

-. Troubleshooting

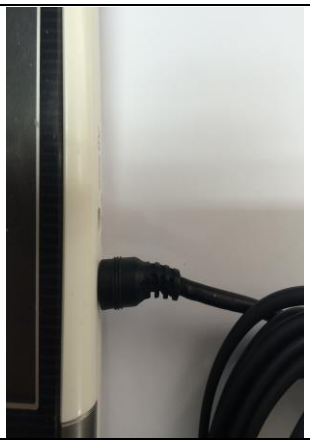
Symptom	Problem	Action
Power does not turn on.	In case a cable between main board and key board is unstable or broken.	Check connection status of cable and its own status. (J1 on main board and J1 on key board)
	In case battery connection has any problem.	In case of using disposable battery, check the cable connected to the main board.
		In case of using rechargeable battery, check charging status or the cable connected to the main board.
Power turns on but other button does not work.	In case a cable between main board and key board is unstable or broken.	Check connection status of cable and its own status. (J3 on main board and J1 on key board)
Screen does not appear.	No initial setting	▲Press and hold (upper) button and ▼(lower) button, and turn on power.
	In case a cable between LCD and main board is unstable.	Check connection status of cable. (J3 on main board)
No sound.	In case connection between speaker and key board is broken or unstable.	Check connection status of cable and its own status. (J2 on key board)
	In case a cable between main board and key board is unstable or broken.	Check connection status of cable and its own status. (J1 on main board and J1 on key board)
As screen did not appear, initial setup was carried out to display the screen. However, when turning power again,	Connect on backup battery has any problem or the battery has been exhaustively discharged.	Check or replace backup battery. (BT1 on main board)

the screen does not appear again.		
Screen displays [SPO2 FAULT].	Main board and analog (SPO2) board cannot communicate each other.	Check connection status of main board and analog (SPO2) board. (J8 on main board J5 on analog board)
Screen displays [CLOCK ERROR].	Current time setting exceeds allowable range.	Set up the current time again on main board.

Part S4 Process for software up-grade

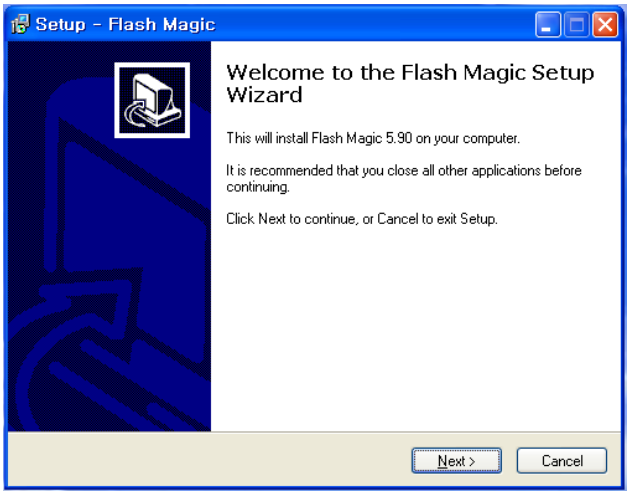
PC to device

Picture	Description
	prepare the download cable – RS232 (Serial 9pin).
	Check the existence of serial port(COMx) in the back of your computer.
	Connect the download cable to serial port(COMx).

	Connect the other end of the cable with in the back of the device. No connection is completed.

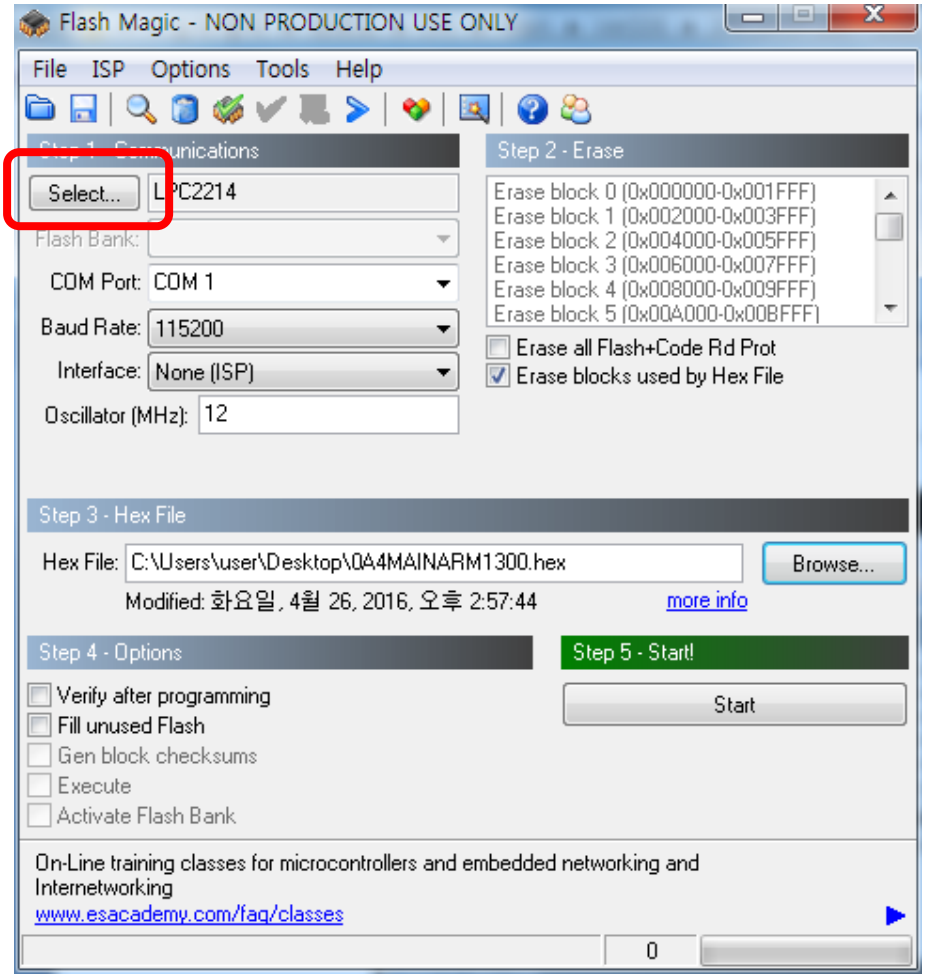
To prepare download program (PC)

1. Install the file of “FlashMagic_VerX.X.exe” Charmcare offered..



Act & Set up FlashMagic

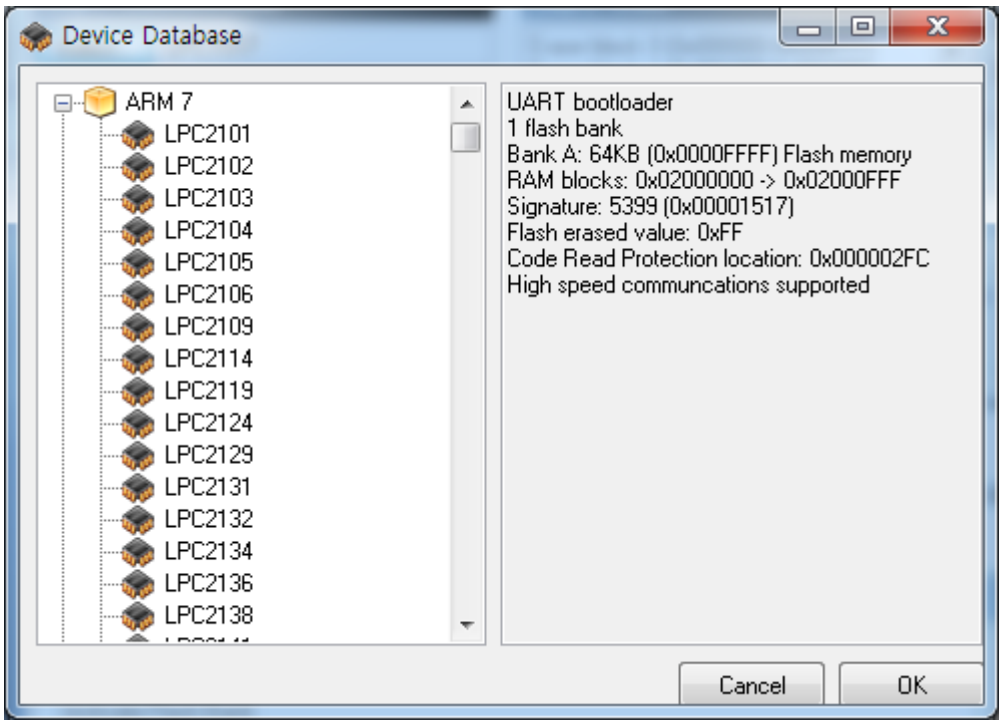
1. Do the following instructions to set up as the following picture.



[Pic. 1]

Step1) Communication

1) Press the button of “Select Device” → Select ARM7 → Select “LPC2214”



[Pic. 2]

2) Set up COM port.

COM Port	: COM1
Baud Rate	:115200
Interface	:None(ISP)
Oscillator(MHz)	:12

Step2) Erase

Set up as [Pic. 1].

Step3) Hex File

Press the button of “Browse”, and select **”0A4MAINARm1xxx.hex”** file Charmcare offered.

Step4) Options

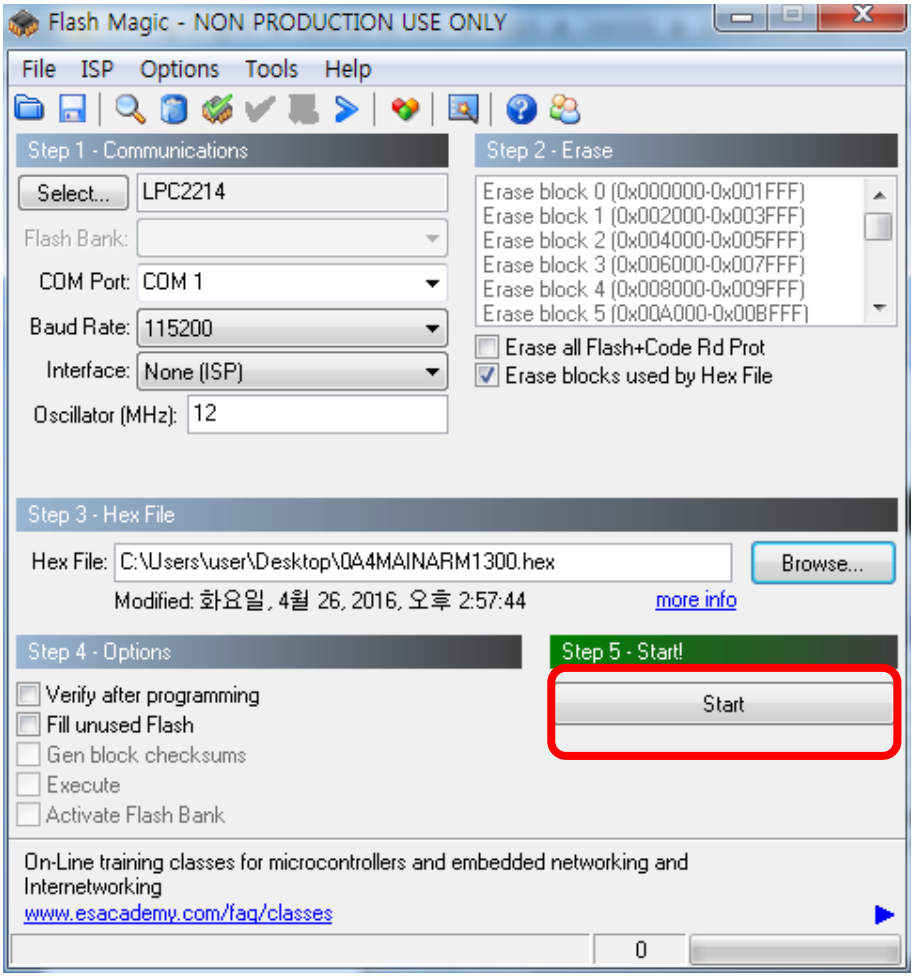
Set up as [Pic. 1].

Executing update of program

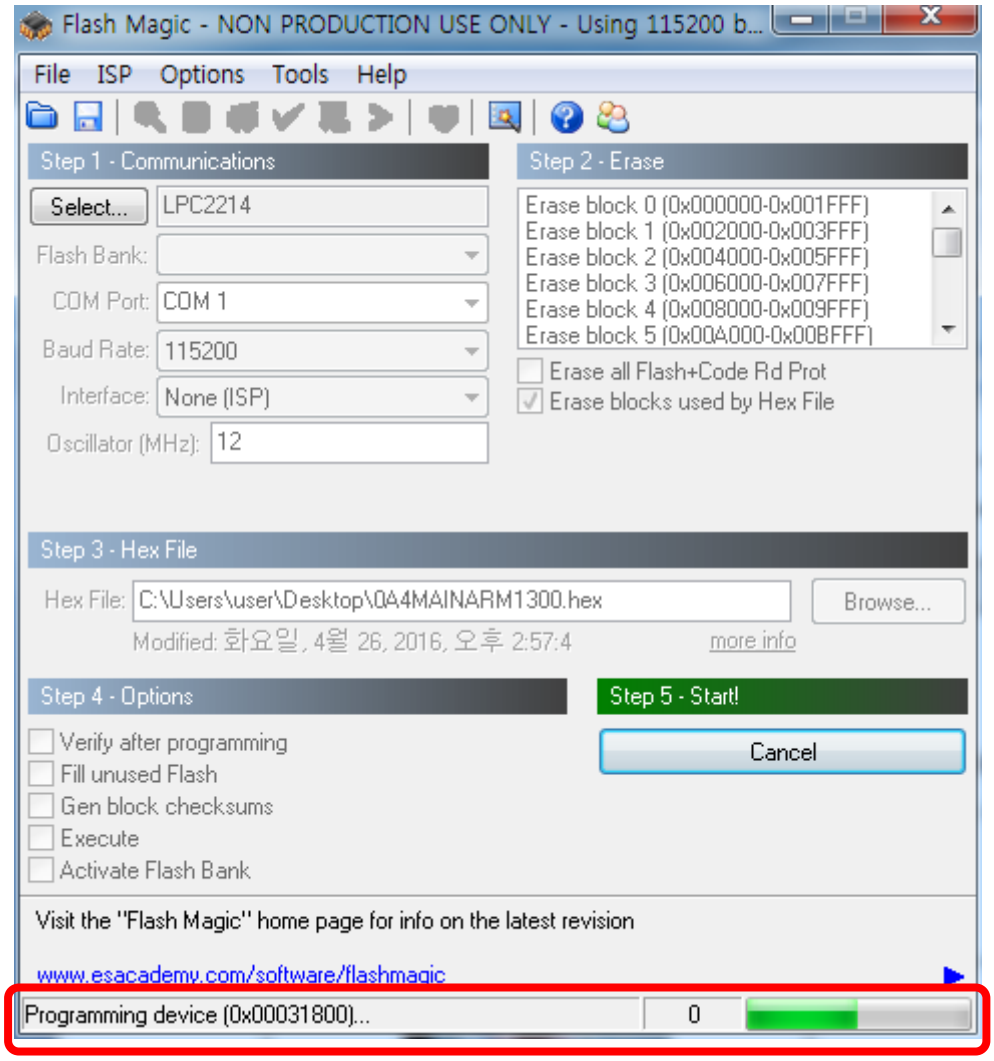
1) Check whether the cable connects normally PC and the device.
2) Power on the device.

   Notice) The screen of the device is not powered on at this moment.
3) Execute the program, “FlashMagic.exe”, and check the set up status.
4) Press Step5)”**Start**” button of “FlashMagic.exe” for updating.

   Its progress status appears at the bottom of screen as the following picture.



[Pic. 3]



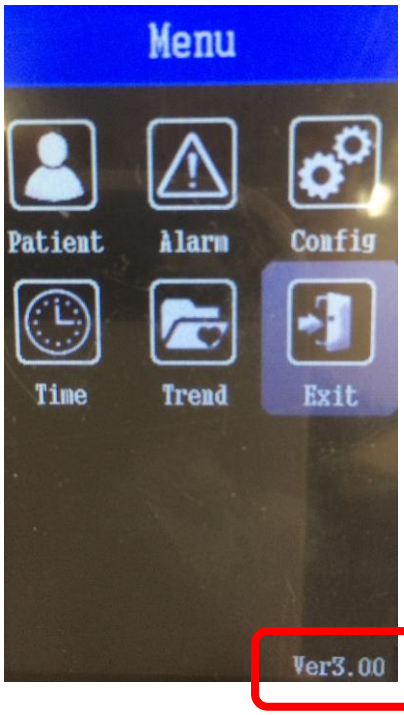
[Pic. 4]

5) If Update is done, the program status disappears.

6) Unplug the cable connected to the device, and then press the power button roughly for 2 seconds to power off.

Double checking update status by

1) Check whether the cable is connected to the device. If it's connected, unplug it.
2) Power on by pressing the power button of the device.
3) Press the Menu button to move to the main Menu screen.
4) Version No. and the date for this programming appears at the bottom of Menu screen as the following picture.

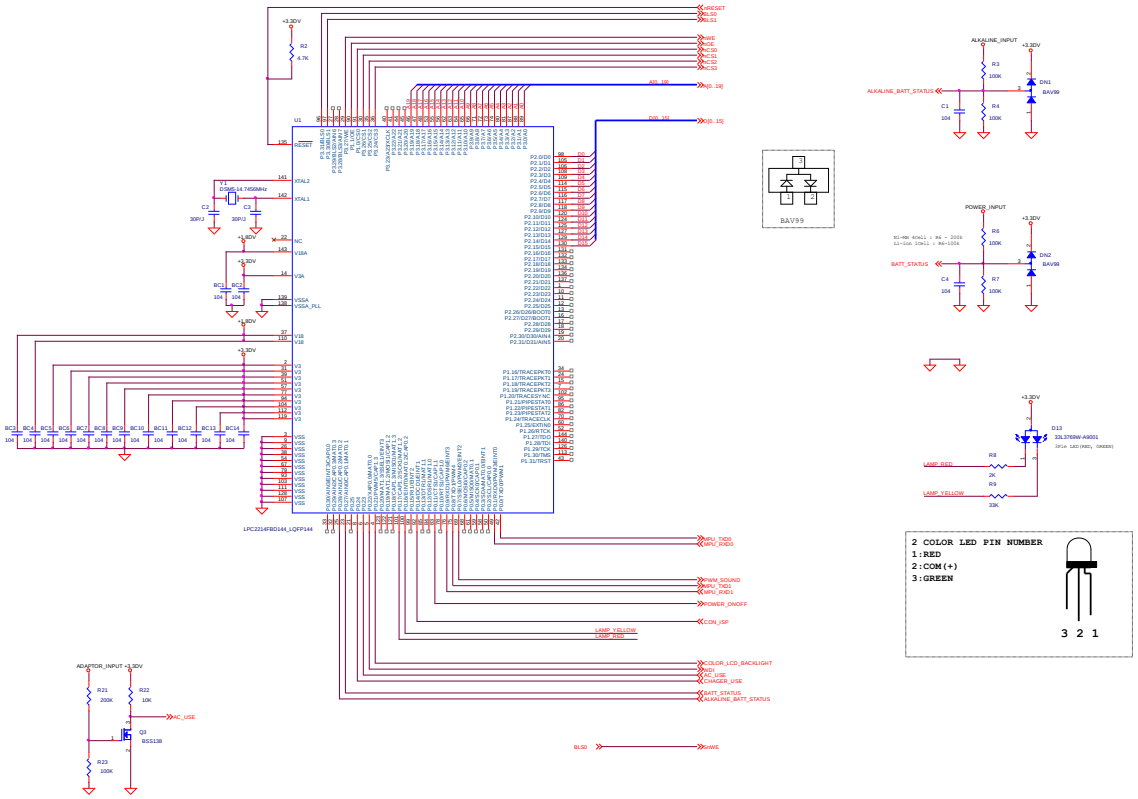


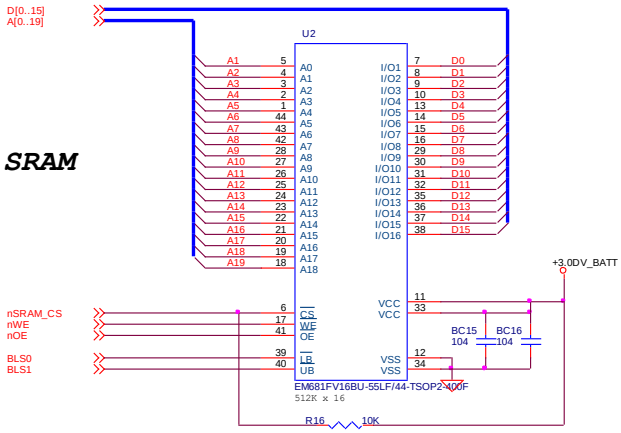
Version

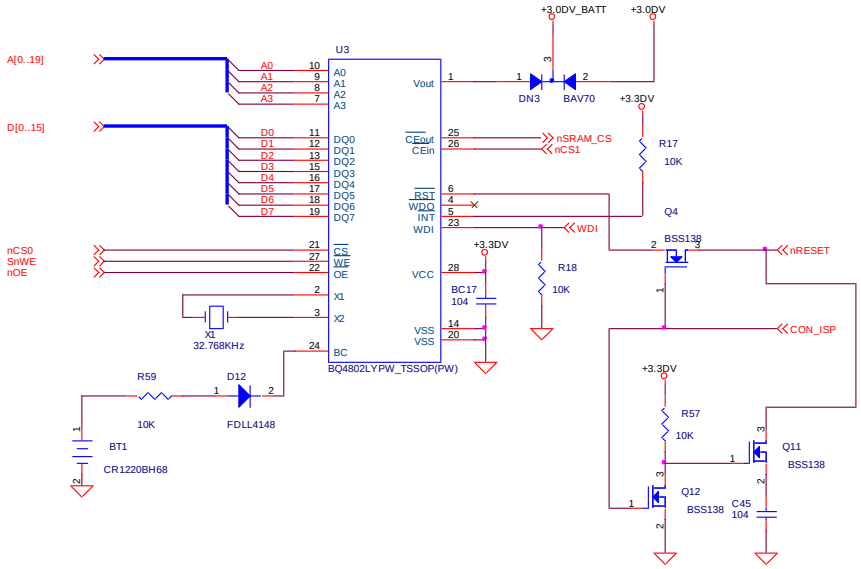
Part S5 Board circuit

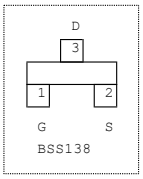
No	Board List
1	Main board
2	Spo2 board
4	Key board

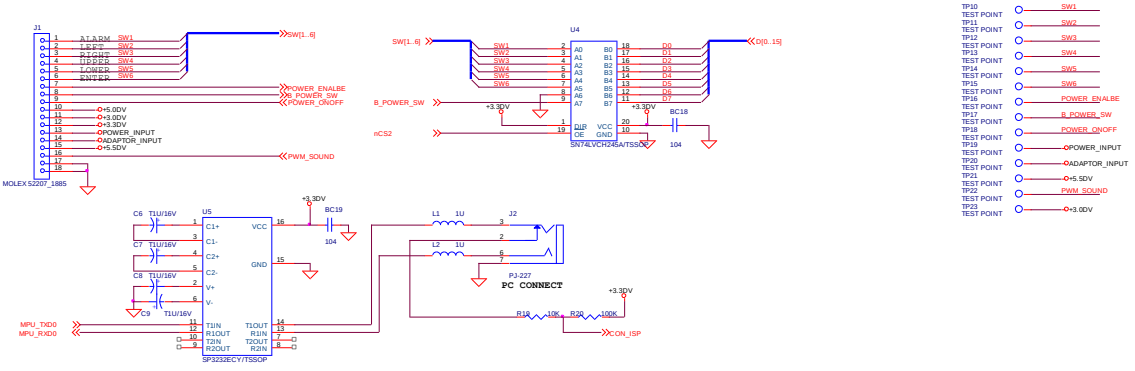
Main board

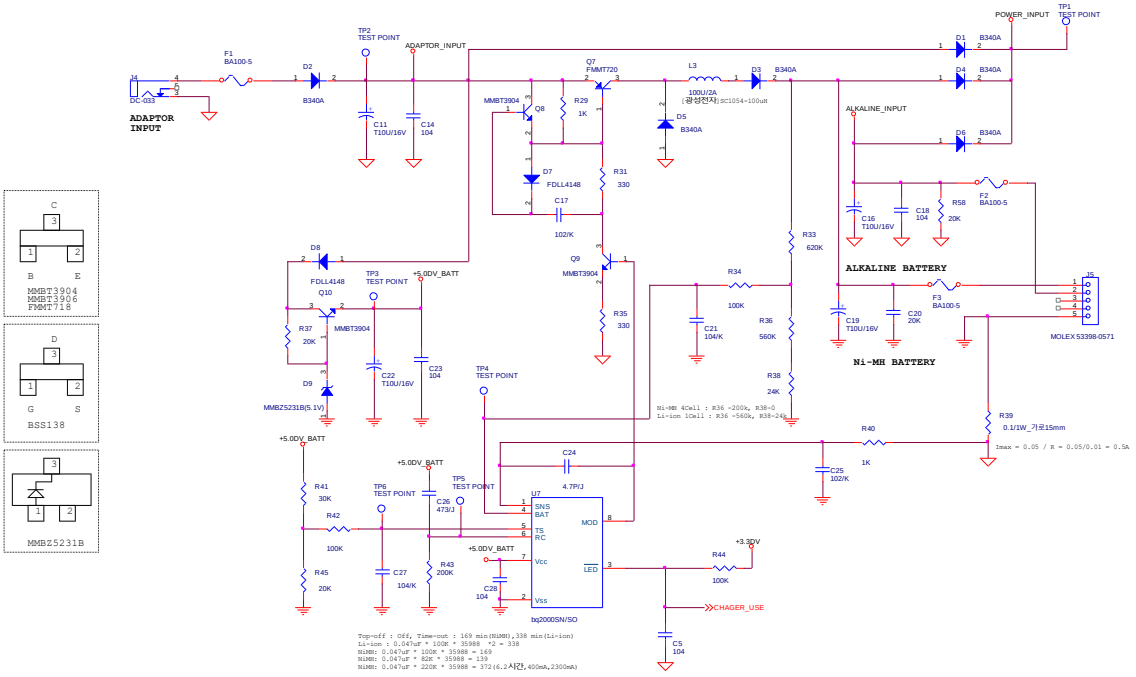

ALKALINE_INPUT
POWER_INPUT
BAV99
2 COLOR LED PIN NUMBER
1:RED
2:COM(+)
3:GREEN
3 2 1
LPC2214FBD144_LQFP144
ADAPTOR_INPUT

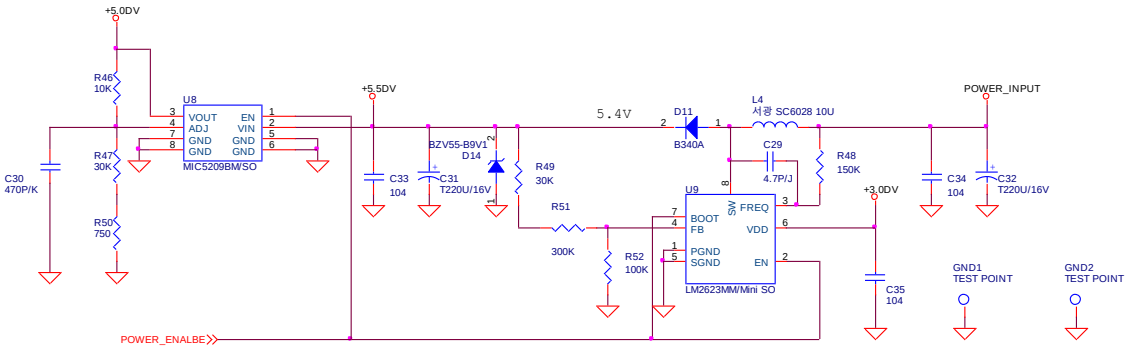

SRAM
U2
D[0..15]
A[0..19]
nSRAM_CS
nWE
nOE
BLS0
BLS1
+3.0DV_BATT
BC15
104
BC16
104
EM681FV16BU-55LF/44-TSOP2-400F
512K x 16
R16
10K

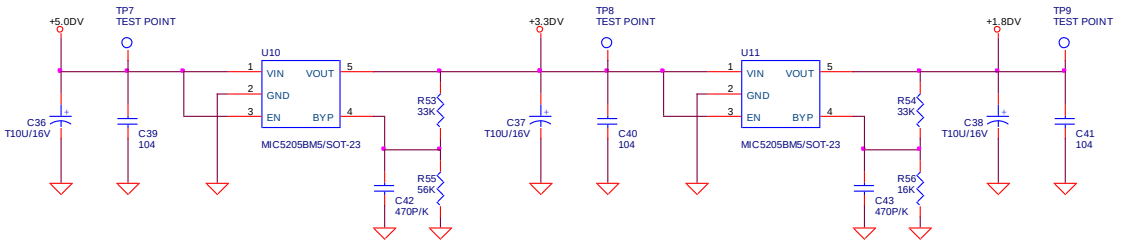

U3
A[0..19]
D[0..15]
nCS0
SnWE
nOE
+3.0DV_BATT
+3.0DV
DN3
BAV70
+3.3DV
R17
10K
nSRAM_CS
nCS1
Q4
BSS138
WDI
R18
10K
nRESET
CON_ISP
BC17
104
X1
32.768KHz
BQ4802LYPW_TSSOP(PW)
R59
10K
D12
FDLL4148
BT1
CR1220BH68
R57
10K
Q11
BSS138
Q12
BSS138
C45
104

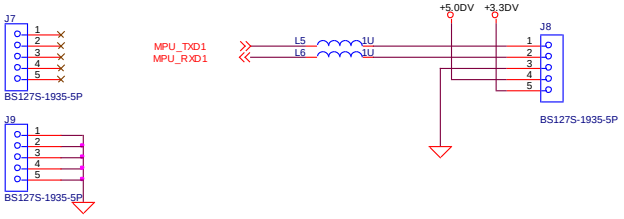

D
G
S
BSS138

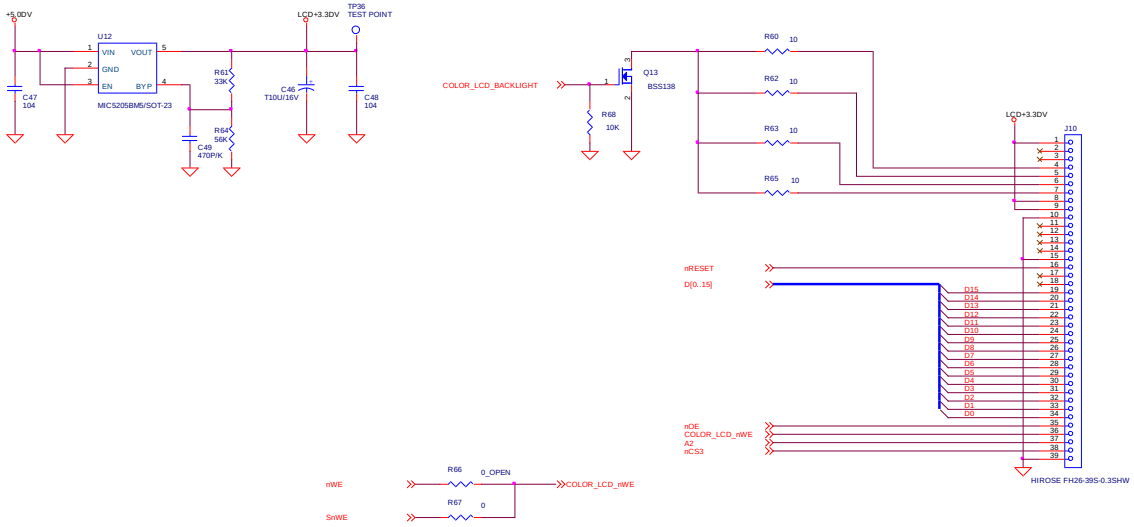

J1
MOLEX 52207-1885
U4
SN74LVCH245ATSSOP
U5
SP3232ECY/TSSOP
PC CONNECT
PJ-227
MPU_TXD0
MPU_RXD0
B_POWER_SW
nCS2
CON_ISP
PWM_SOUND
POWER_ONOFF
POWER_INPUT
ADAPTOR_INPUT


ADAPTOR INPUT
ADAPTOR_INPUT
POWER_INPUT
ALKALINE_INPUT
ALKALINE BATTERY
Ni-MH BATTERY
MOLEX 53398-0571
MMBT3904
MMBT3906
FMMT718
BSS138
MMBZ5231B
bq2000SN/SO
CHAGER_USE

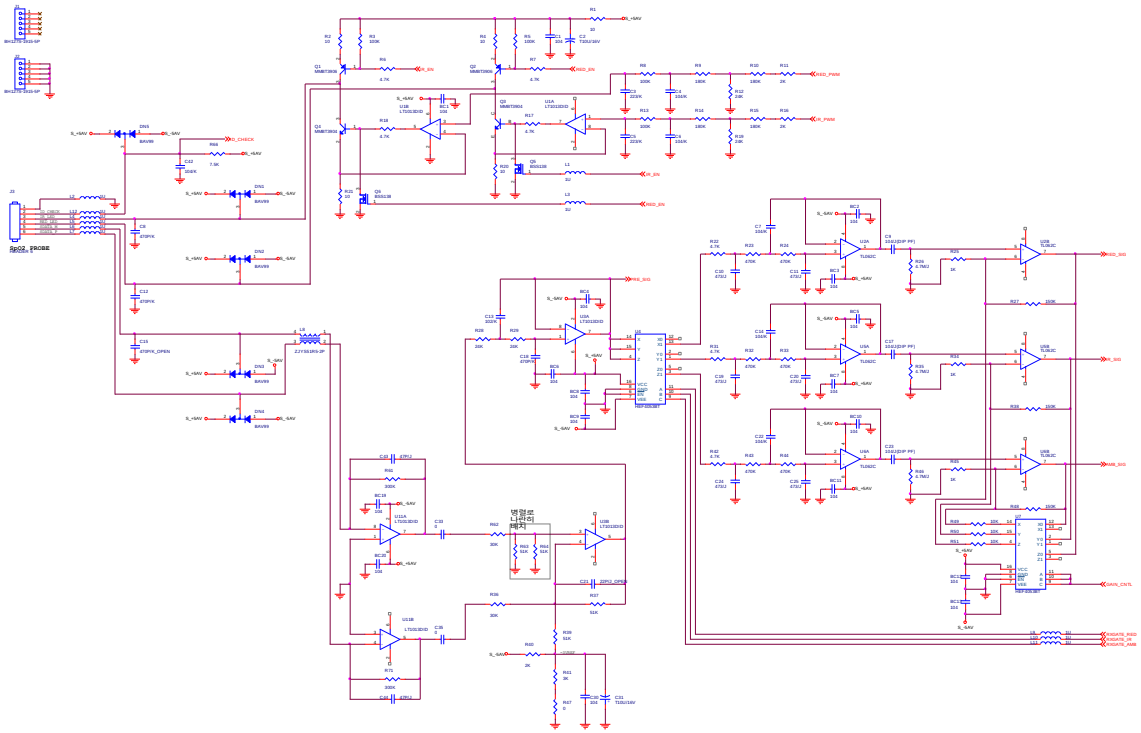

+5.0DV
+5.5DV
5.4V
POWER_INPUT
MIC5209BM/SO
LM2623MM/Mini SO
POWER_ENALBE
GND1 TEST POINT
GND2 TEST POINT


+5.0DV
+3.3DV
+1.8DV
MIC5205BM5/SOT-23

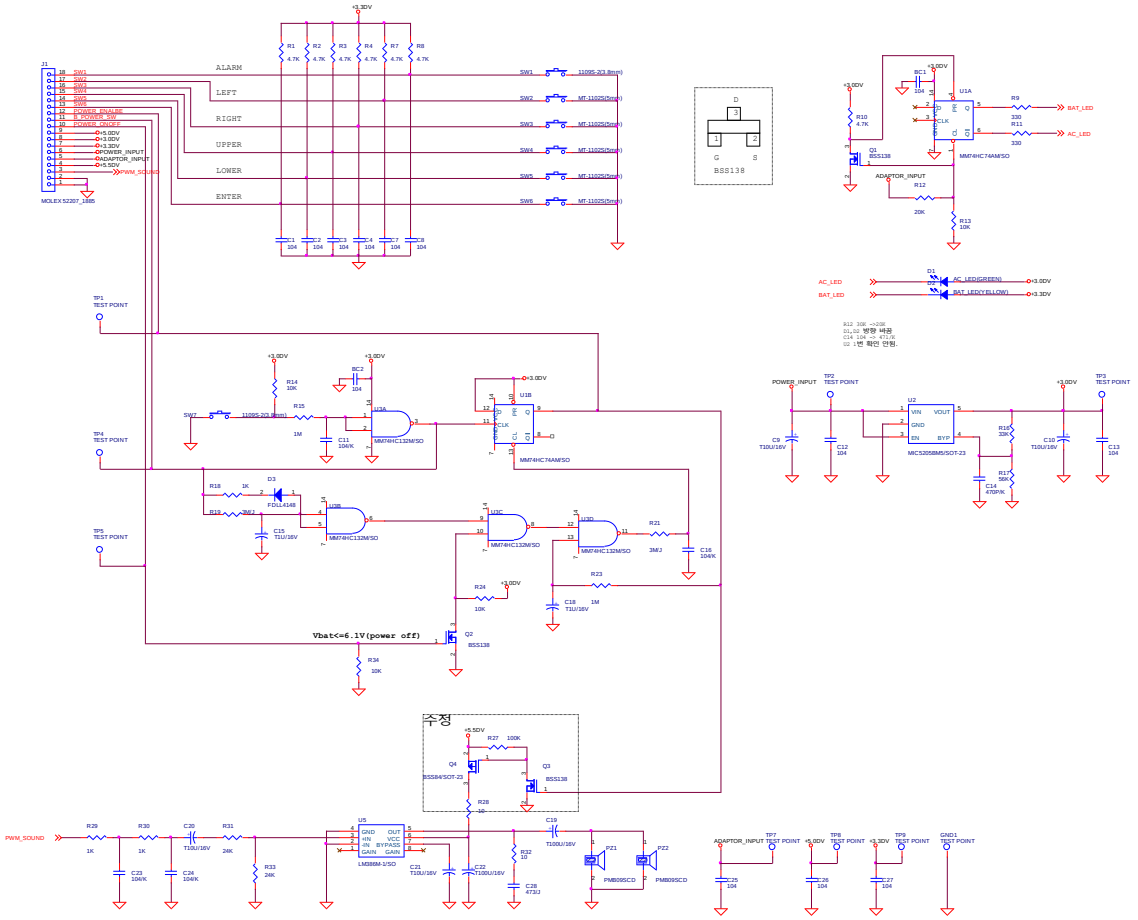

MPU_TXD1
MPU_RXD1
BS127S-1935-5P


+5.0DV
U12
VIN
VOUT
GND
EN
BYP
MIC5205BM5/SOT-23
C47
104
R61
33K
R64
56K
C49
470P/K
LCD+3.3DV
C46
T10U/16V
TP36
TEST POINT
C48
104
COLOR_LCD_BACKLIGHT
Q13
BSS138
R68
10K
R60
10
R62
10
R63
10
R65
10
LCD+3.3DV
J10
nRESET
D[0..15]
D15
D14
D13
D12
D11
D10
D9
D8
D7
D6
D5
D4
D3
D2
D1
D0
nOE
COLOR_LCD_nWE
A2
nCS3
HIROSE FH26-39S-0.3SHW
nWE
R66
0_OPEN
COLOR_LCD_nWE
SnWE
R67
0

Spo2 board



Key board


ALARM
LEFT
RIGHT
UPPER
LOWER
ENTER
MOLEX 52207-1885
BSS138
MM74HC74AM/SO
MM74HC132M/SO
MIC5205BM5/SOT-23
LM386M-1/SO
PMB09SCD
Vbat<=6.1V(power off)
수정