

**WT51F104 EVB**  
**Operation Manual**  
REV. 1.0  
April 26, 2012

Ver.	Date	Applicant	Description
1.0	2012/04/26	Louis	1 <sup>st</sup> version

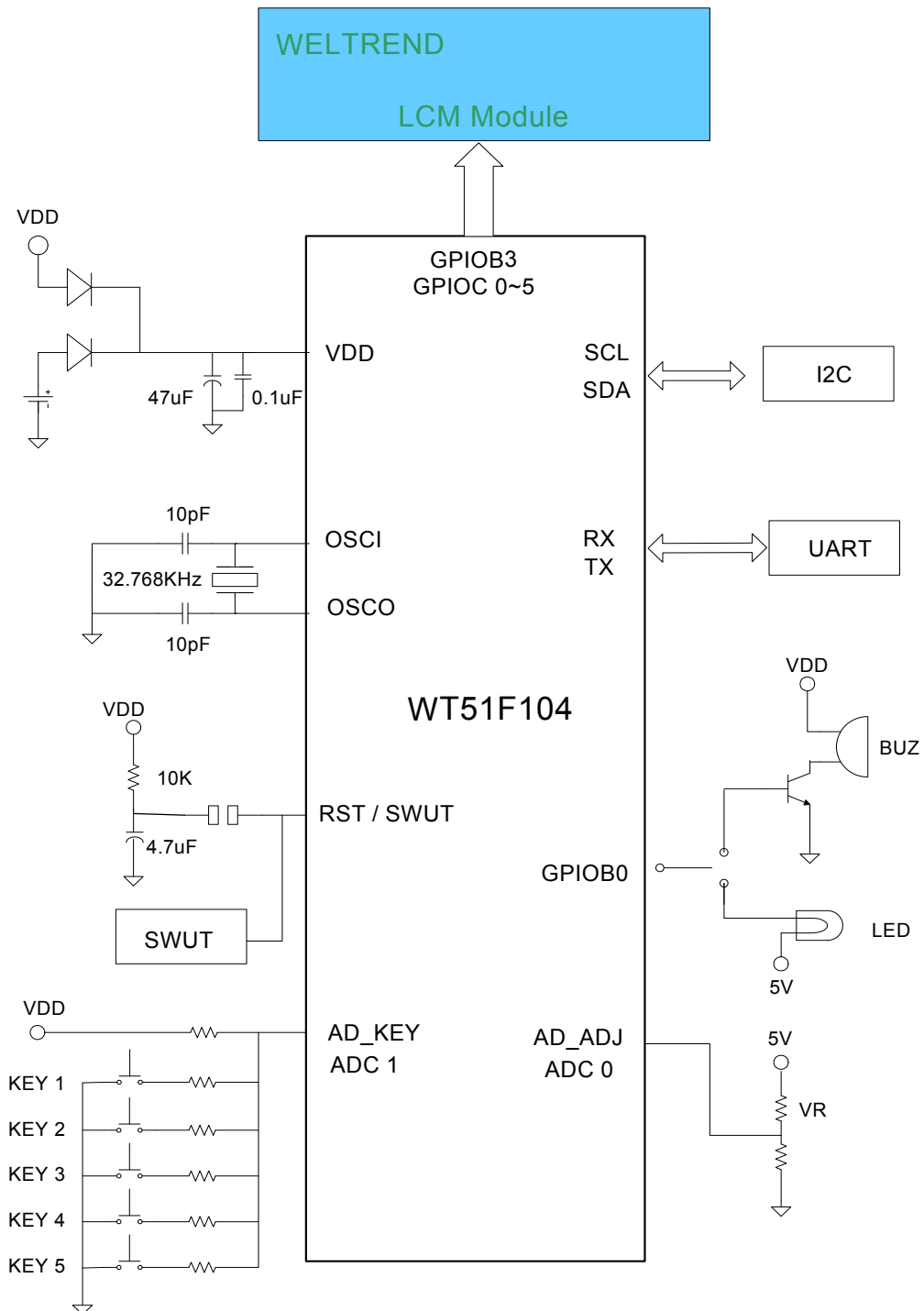
## Table of Contents

CHAPTER 1	WT51F104 EVB H/W DESCRIPTION .....	4
1.1	SYSTEM BLOCK DIAGRAM .....	4
1.2	EVB COMPONENT LOCATION .....	5
CHAPTER 2	WT51F104 EVB INPUT PORT DESCRIPTION .....	6
2.1	DC INPUT CONNECTOR (J2).....	6
2.2	BATTERY INPUT PORT (BTA1) .....	6
2.3	VDD VOLTAGE SELECTOR (JP1).....	7
2.4	SWUT (SINGLE WIRE UART) INTERFACE PROGRAMMING PORT (P3).....	7
2.5	I <sup>2</sup> C INTERFACE PORT.....	8
2.6	MICROCHIP PIC16F6XX PROGRAMMING PORT (P1) .....	8
2.7	UART INTERFACE PORT (P2) .....	9
2.8	BUZ / LED FUNCTION SELECTION (JP6) .....	9
2.9	EXTERNAL PWM INPUT PORT (JP5).....	10
2.10	RW (LCM) / LED FUNCTION SELECTION (JP10) .....	10
2.11	SWUT EARPHONE JACK INTERFACE PORT .....	11
2.12	TESTING PIN AND DAUGHTER BOARD INTERFACE (JP2) .....	11
CHAPTER 3	WT51F104 EVB CIRCUIT DESCRIPTION .....	13
3.1	MAIN POWER SYSTEM .....	13
3.2	VDD POWER OPTION .....	13
3.3	POWER CIRCUIT .....	14
3.4	RESET CIRCUIT .....	14
3.5	SINGLE WIRE EARPHONE JACK INTERFACE CIRCUIT .....	15
3.6	OSCILLATOR CIRCUIT.....	15
3.7	BUTTON FUNCTION .....	16
3.8	BUZZER CIRCUIT .....	16
CHAPTER 4	WT51F104 EVB OPERATION DESCRIPTION.....	17
4.1	WT51F104 TESTING AND DEMONSTRATION PLATFORM .....	17
4.2	LCM DISPLAY (PROGRAM MODULE DESCRIPTION) .....	18
4.3	ADC MEASUREMENT (PROGRAM MODULE DESCRIPTION).....	18
4.4	TIMER (PROGRAM MODULE DESCRIPTION).....	19
4.5	BUZZER (PROGRAM MODULE DESCRIPTION).....	19
4.6	PWM (PROGRAM MODULE DESCRIPTION).....	20
4.7	UART (PROGRAM MODULE DESCRIPTION).....	20
CHAPTER 5	PROGRAM MODULE.....	21
5.1	PROGRAM MODULE DESCRIPTION .....	21
5.2	LCM DRIVER MODULE <LCD.C> .....	22
5.3	ADC DRIVER MODULE <DRV_ADC.C>.....	22
5.4	RTC DRIVER MODULE <DRV_WTMR.C> .....	23
5.5	PWM DRIVER MODULE <DRV_PWM.C> .....	23
5.6	BUZZER DRIVER MODULE <API_MUSIC.C> .....	24
5.7	UART DRIVER MODULE <API_UARTDEBUG.C> .....	24
CHAPTER 6	APPENDIX.....	25
6.1	CIRCUIT .....	25
6.2	BOM .....	27
6.3	ORDERING INFORMATION .....	28

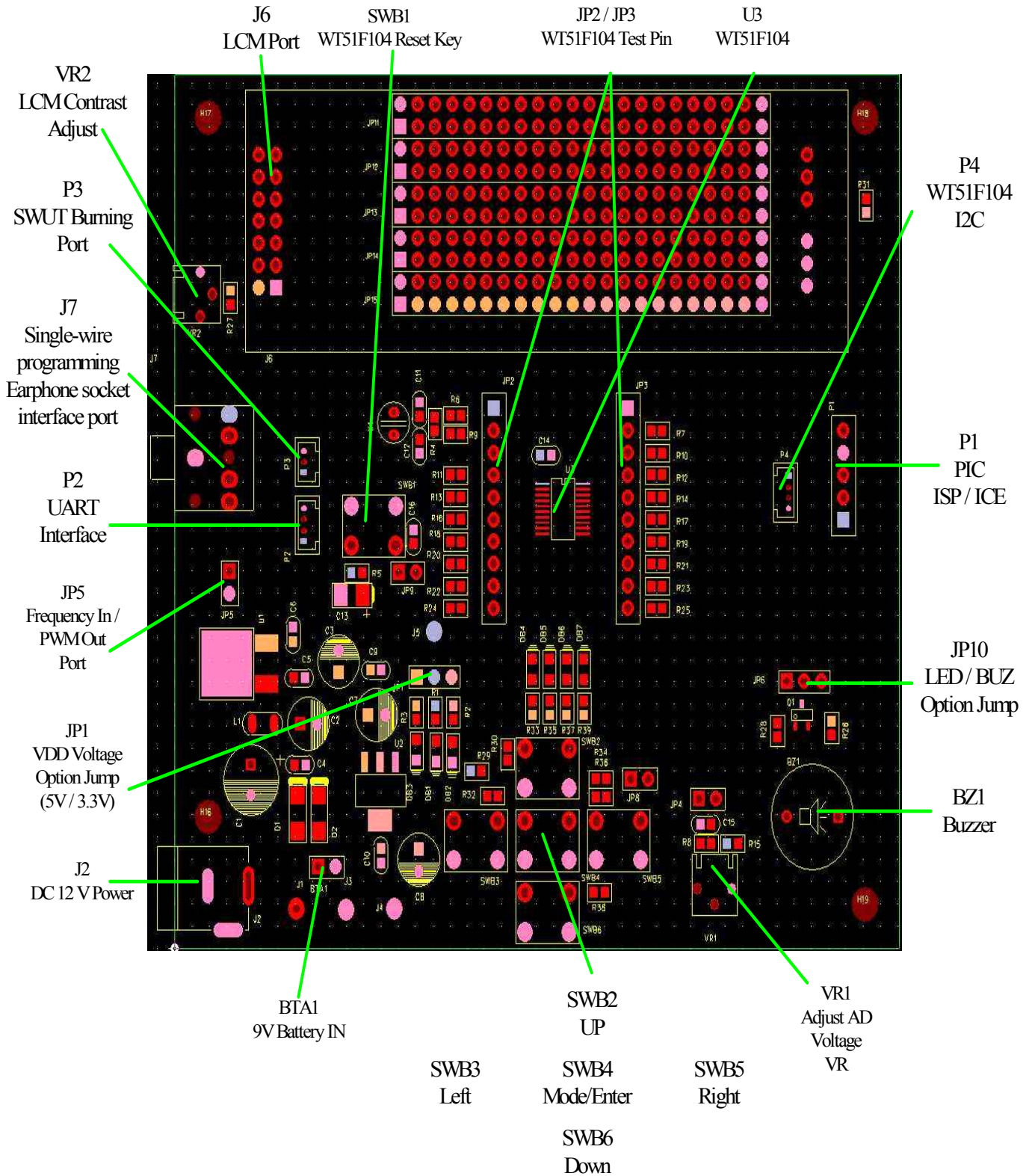
**Chapter 1 WT51F104 EVB H/W Description**

**1.1 System Block Diagram**

WT51F104 is an enhanced 8052 Microcontroller with a variety of peripheral functions, the EVB is designed for SSOP 20 pin PKG type. The system structure as the figure below is demonstrating its functions.



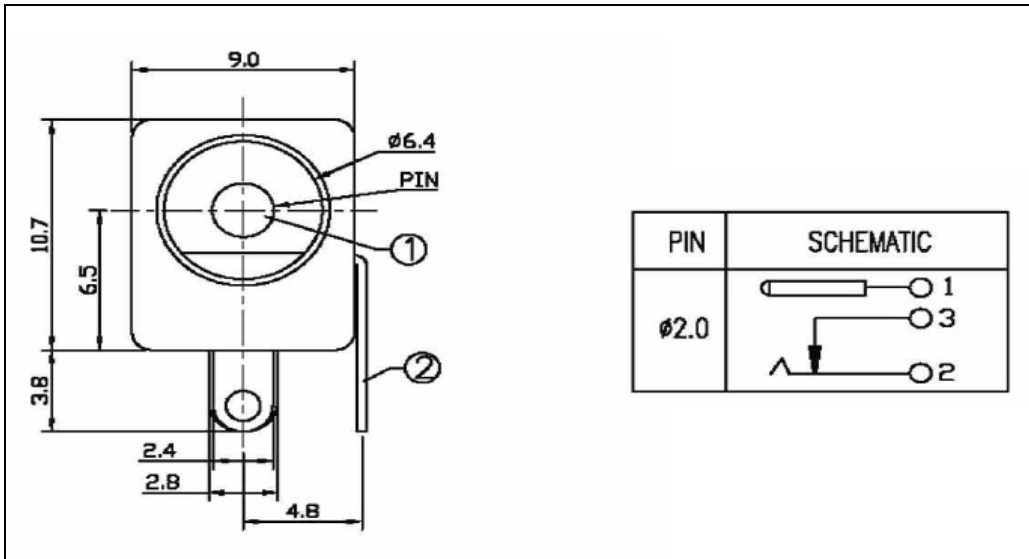
**1.2 EVB Component Location**



**Chapter 2 WT51F104 EVB Input Port Description**

**2.1 DC Input Connector (J2)**

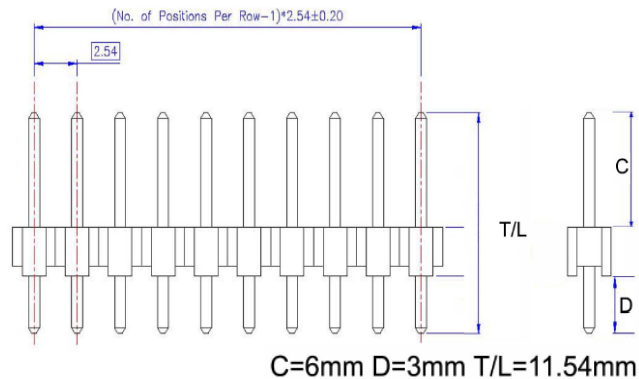
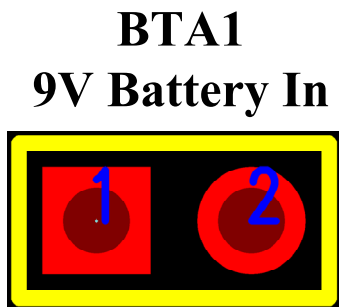
This is EVB DC input port (supporting voltage DC 7V ~ 18V).



Pad Number	Description
1	Positive pin input
2	--
3	Negative pin input

**2.2 Battery Input Port (BTA1)**

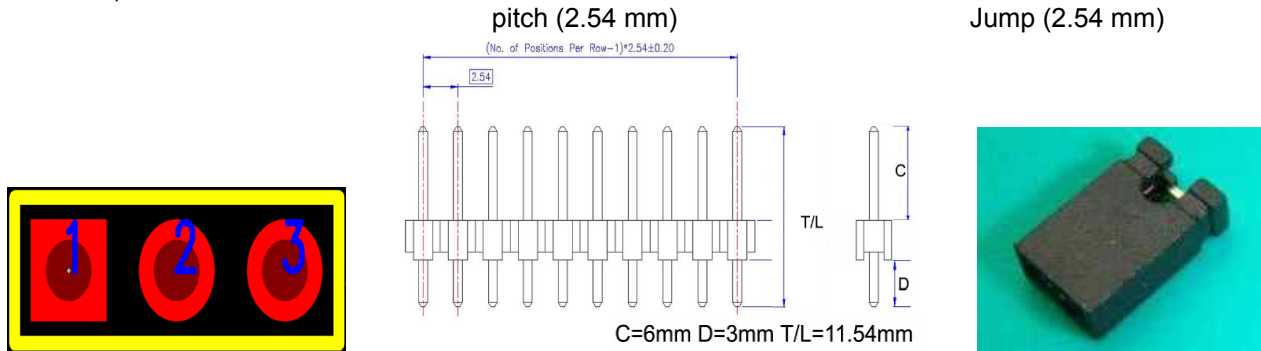
External battery port (battery voltage input range 7V ~ 18V)  
pitch (2.54 mm)



Pad Number	Description
1	Positive battery input
2	Negative battery input

### 2.3 VDD Voltage Selector (JP1)

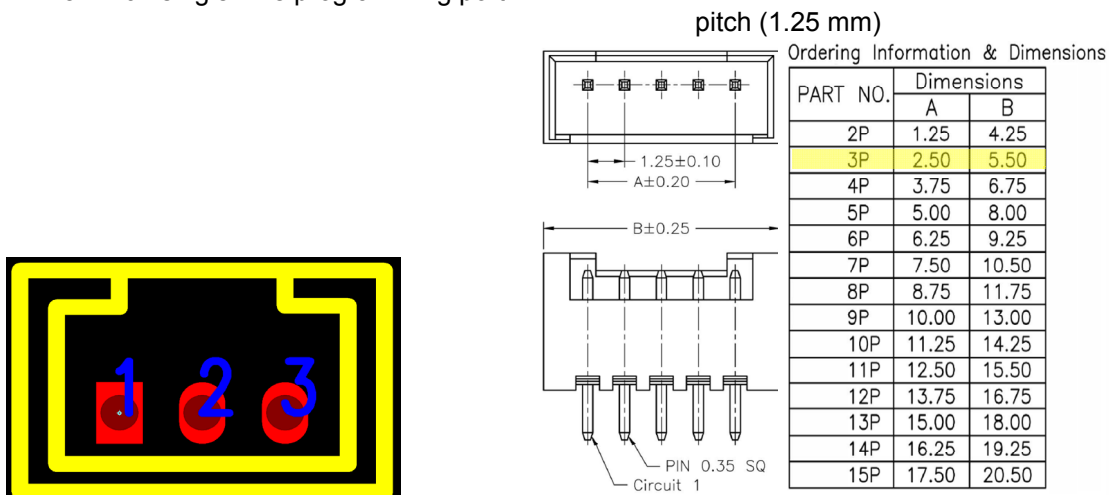
The VDD Voltage selector is for WT51F104, voltage can support 2.2V ~ 5.5V, the selector input is 3.3V or 5V voltage or use the external power to support (external power should be under 5.5V, according to the spec definition)



Pad Number	Description
1	5V (Jump 1-2 short)
2	VDD (external power input pin)
3	3.3V (Jump 2-3 short)

### 2.4 SWUT (Single Wire UART) Interface Programming Port (P3)

WT51F104 single wire programming port

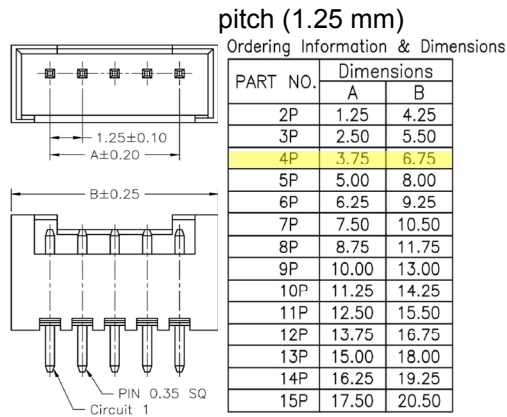
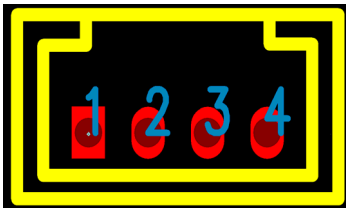


Pad Number	Description
1	VDD
2	SWUT
3	GND



## 2.5 I<sup>2</sup>C interface port

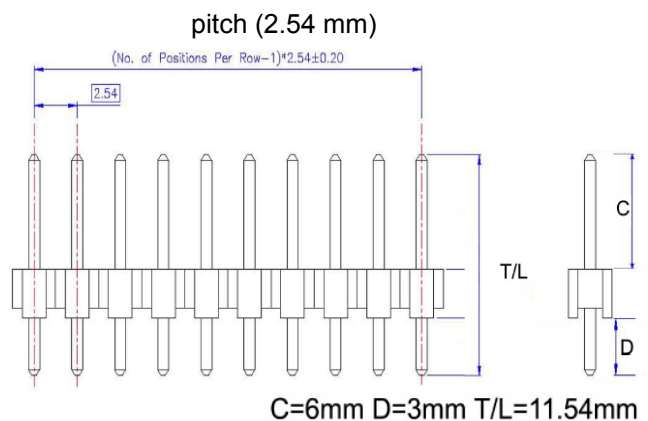
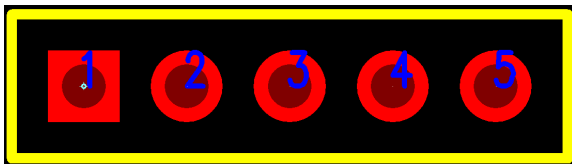
Component Location (JP4)  
SLAVE I<sup>2</sup>C Interface Port



Pad Number	Description
1	VDD
2	Slave_SCL
3	Slave_SDA
4	GND

## 2.6 Microchip PIC16F6XX Programming Port (P1)

WT51F104 pin to pin with Microchip PIC16F6XX s, the programming port support PIC16F6XX serials.

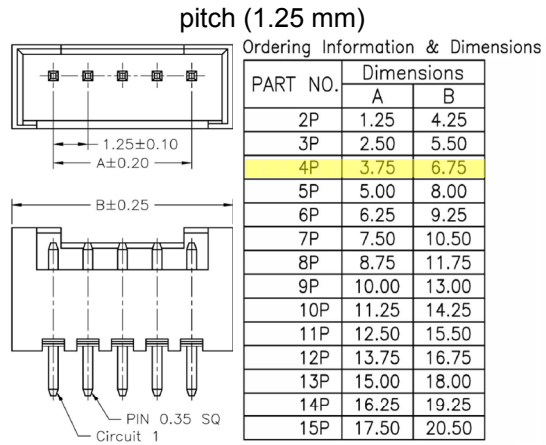
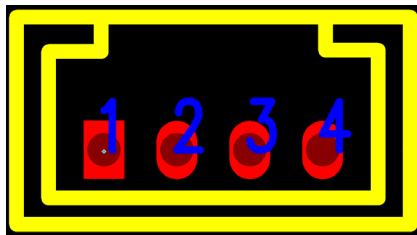


Pad Number	Description	Pad Number	Description
1	5V	4	GND
2	SCL	5	NRST
3	SDA	-	-



## 2.7 UART Interface Port (P2)

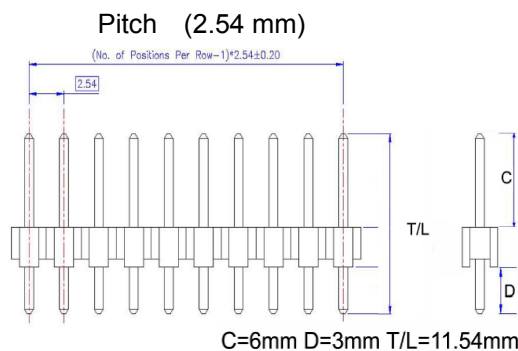
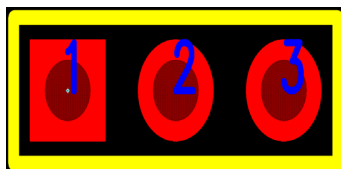
UART serial transmission interface port



Pad Number	Description
1	5V
2	TXD
3	RXD
4	GND

## 2.8 BUZ / LED Function Selection (JP6)

BUZ / LED function selection



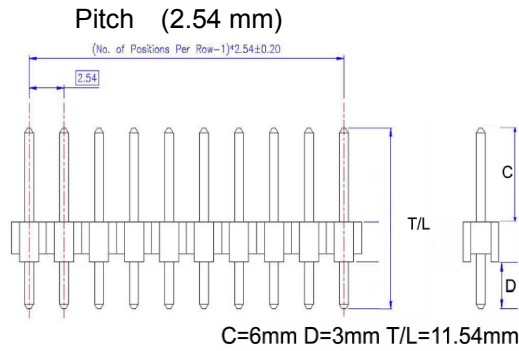
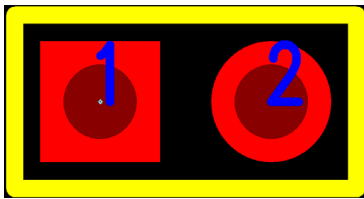
Jump (2.54 mm)



Pad Number	Description
1	BUZZER (Jump 1-2 short)
2	BUZ / LED (GPIOB0)
3	LED (Jump 2-3 short)

## 2.9 External PWM Input Port (JP5)

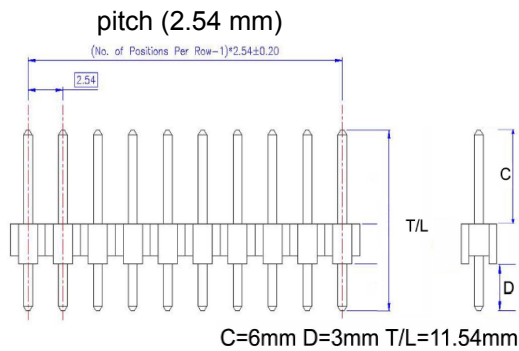
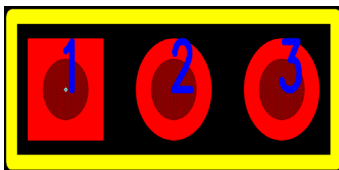
PWM Input Port



Pad Number	Description
1	External PWM Input
2	GND

## 2.10 RW (LCM) / LED Function Selection (JP10)

LCM RW Controller / LED function selection interface



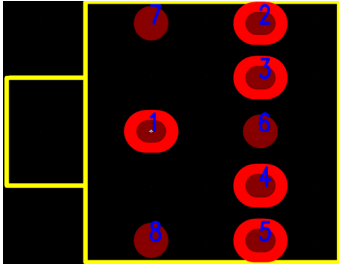
Jump (2.54 mm)



Pad Number	Description
1	LED (Jump1-2 short)
2	RW / LED (GPIOB3)
3	RW (LCM Controller, Jump 2-3 short)

### 2.11 SWUT Earphone Jack Interface Port

Component (J6)  
SWUT Earphone Jack interface Port

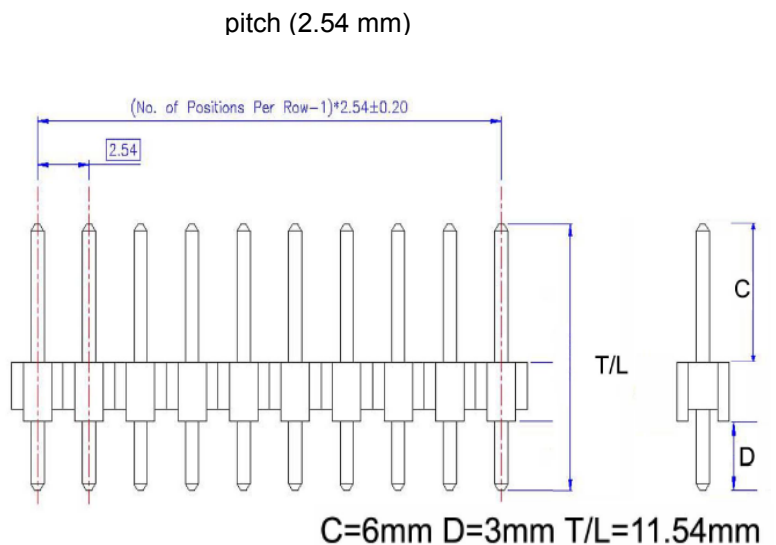
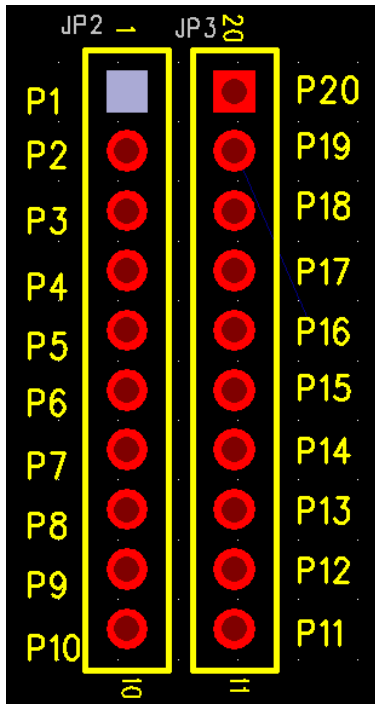


SCHEMATIC	
	MODEL NO
	U

Pad Number	Description	Pad Number	Description
1	GND	5	SWUT
2	VDD	6	NC
3	NC	7	NC
4	RESET	8	NC

### 2.12 Testing Pin and Daughter Board Interface (JP2)

This interface for signal pin and daughter board measurement (WT51F104 other PKG type).



Pad Number	Description	Pad Number	Description
1	VDD	11	GPIOC2
2	GPIOA5 / ADC15 / OSC1 / PWM1B	12	GPIOC1 / ADC7
3	GPIOA4 / ADC14 / OSC0 / PWM0B	13	GPIOC0 / ADC6
4	GPIOA3 / ADC13 / NRST / SWUT	14	GPIOB2 / ADC5 / STB / PWM0D
5	GPIOB5 / ADC12 / RXA / PWM1A	15	GPIOB1 / ADC4 / MOSI / SCK
6	GPIOB4 / ADC11 / TXA / PWM1D	16	GPIOB0 / ADC3
7	GPIOB3 / ADC10 / PWM0A	17	GPIOA2 / ADC2 / PWM1C
8	GPIOC5 / ADC9	18	GPIOA1 / ADC1 / RXB / SCL
9	GPIOC4 / ADC8	19	GPIOA0 / ADC0 / TXB / SDA / PWM0C
10	GPIOC3	20	VSS

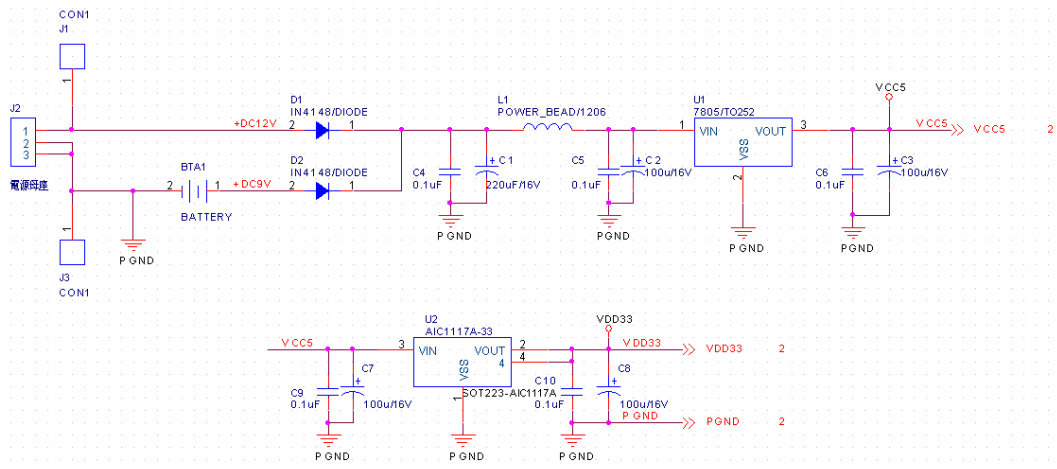
**Chapter 3 WT51F104 EVB Circuit Description**

**3.1 Main Power System**

There are three options for WT51F104 EVB main power to choose :

1. External DC-12 V (J2) input: Through regulator and produce DC power 5V and 3.3V.
2. Battery (BTA1) input: Through regulator and produce DC power 5V and 3.3V.
3. VDD input: There are no inputs for main power, please see below “VDD Power Option” description.

WT51F104 EVB main power circuit:

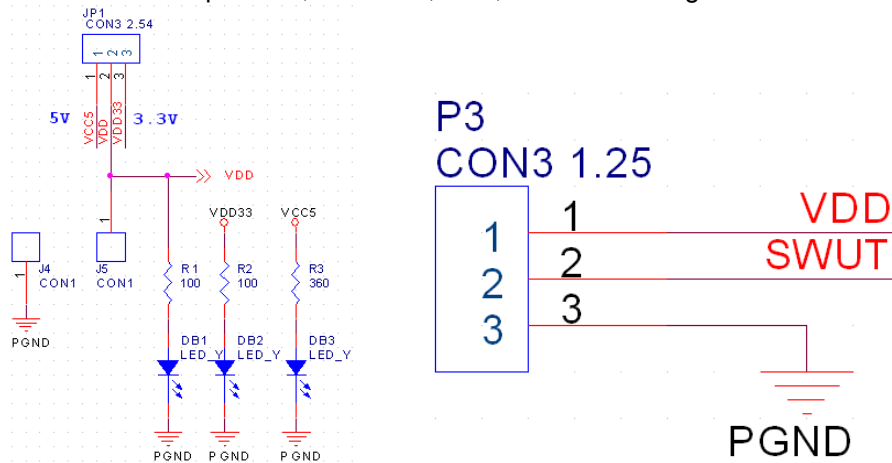


**3.2 VDD Power Option**

There are four options for WT51F104 VDD power, the operation voltage is 5V,3.3V or external input. (External input power must not exceed Max. 5.5V as spec. definition).

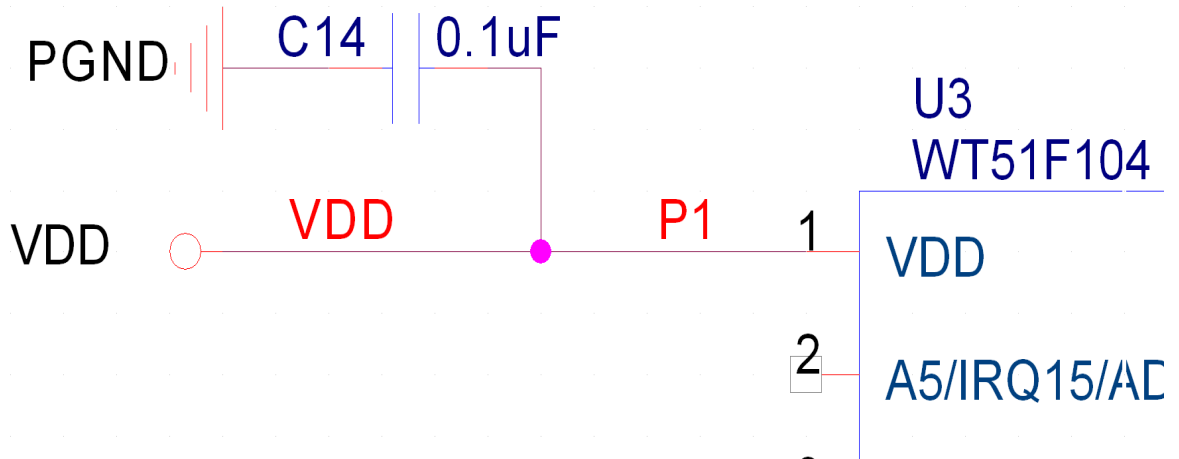
1. Pad JP1 1-2 connect: means WT51F104VDD operation voltage is 5 V.
2. Pad JP1 2-3 connect: means WT51F104 VDD operation voltage is 3.3V.
3. WLINK-SWUT VDD: Using WLINK-SWUT VDD for WT51F104 VDD power.
4. External VDD: It can input from J5 (positive), J4 (negative), external input VDD must not exceed Max. 5.5V as spec definition.

If power is in normal operation, then DB1, DB2, DB3 LED will light.



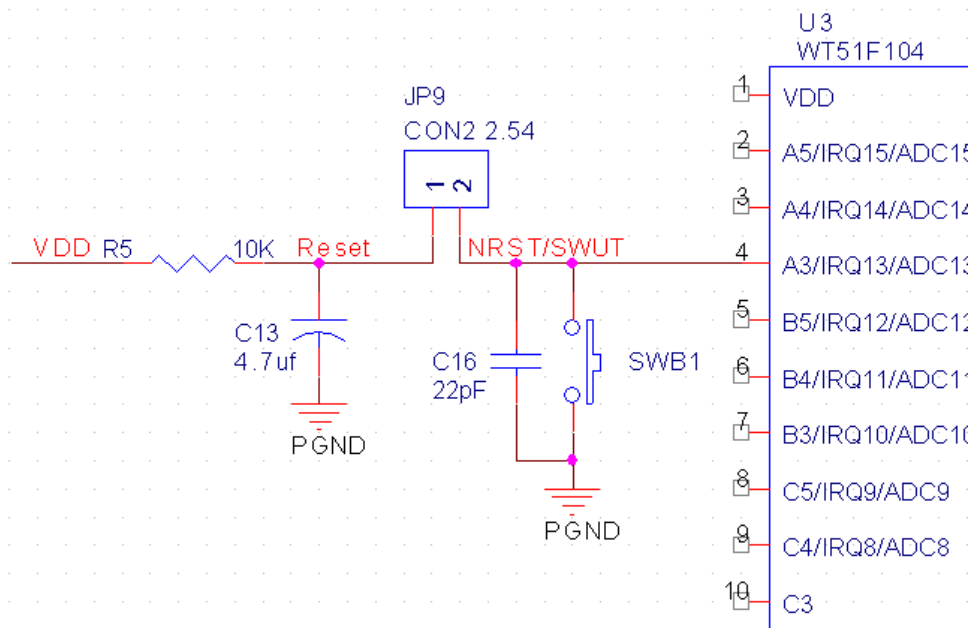
### 3.3 Power Circuit

VDD power input needs filter capacitor, its placement close the pin is better.



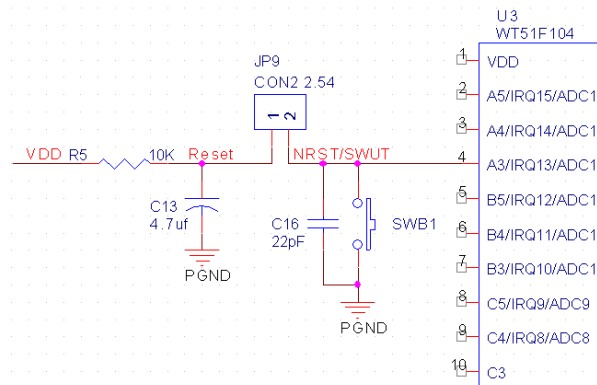
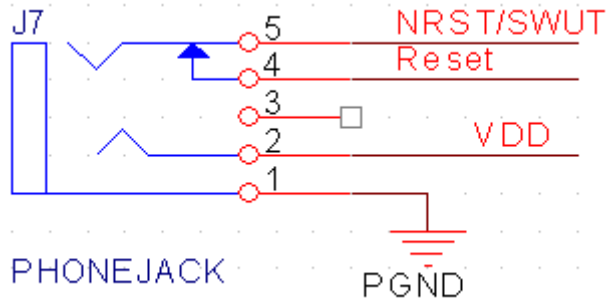
### 3.4 RESET Circuit

WT51F104 RESET circuit and SWUT single wire programming use the same pin, the related circuit as the figure below. When SWUT is on programming the JP9 JUMP should be power down, and the external RC RESET should disconnect from it. When programming is finished, if the REST function had been used, the JP9 JUMP, needs plug again.



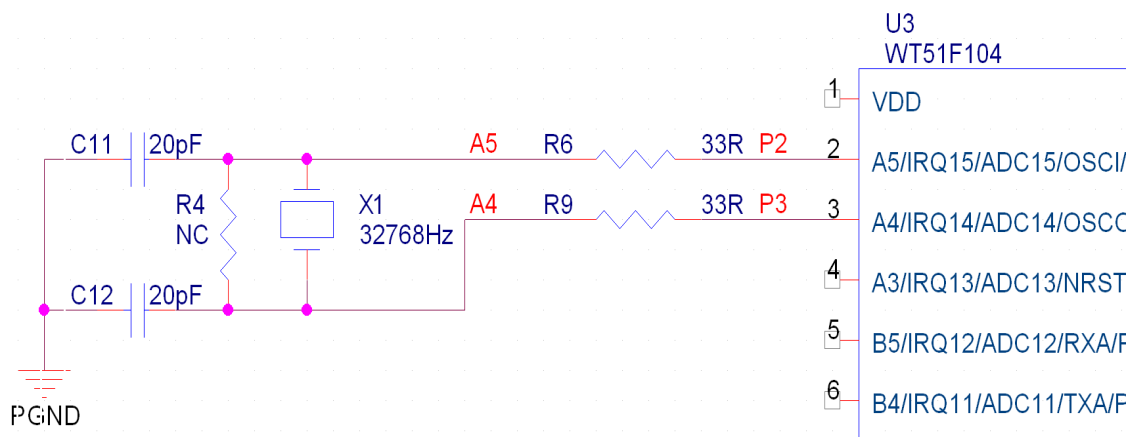
### 3.5 Single Wire Earphone Jack Interface Circuit

Since WT51F104 RESET circuit and SWUT single wire programming both use the same pin, for update easily when mass production, design the below circuit, when plug earphone programming cable, the RESET / SWUT (4-5) will break, and start to program, after programming finished, remove earphone programming cable, the springs of earphone jack let RESET / SWUT (4-5) short and RC will go back to REST state.



### 3.6 Oscillator Circuit

WT51F104 oscillator circuit as the figure below.

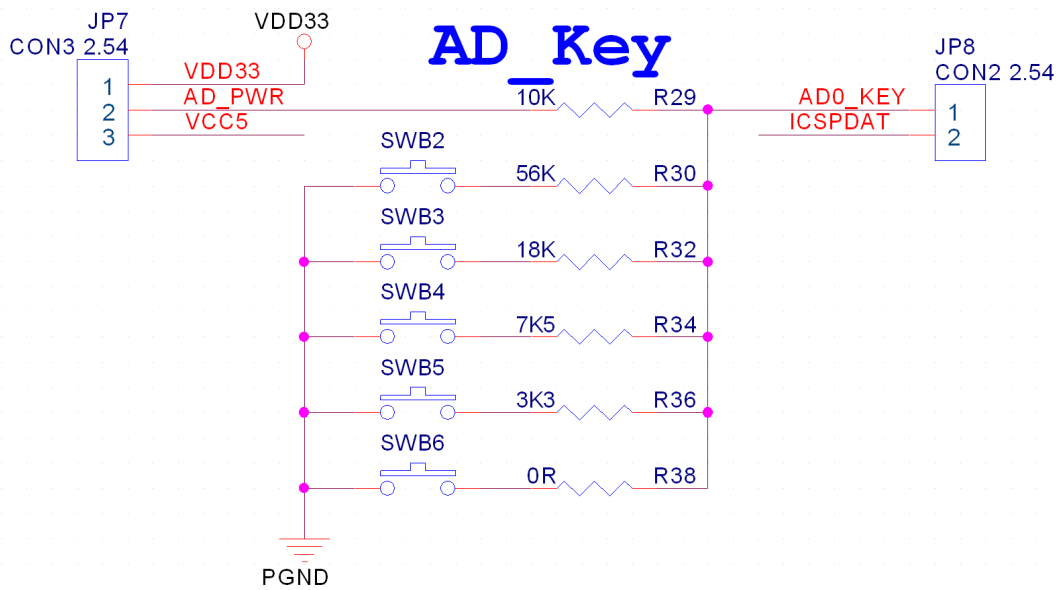




### 3.7 Button Function

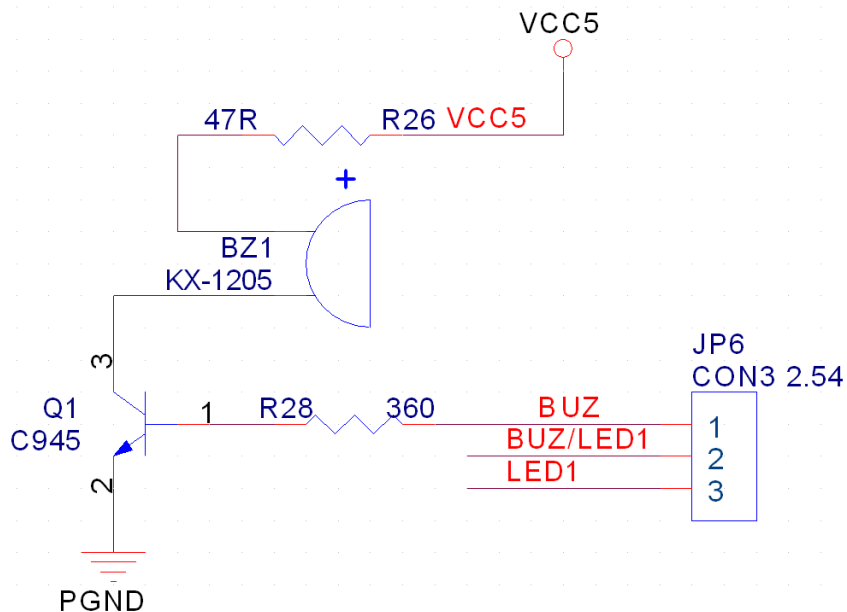
WT51F104 EVB reserves five function key (AD\_KEY).

1. UP (UP / SWB2)
2. Left (LEFT / SWB3)
3. Mode/Ok (Enter / SWB4) mode (3~4 seconds long press)/ ok (short press)
4. Right (RIGHT / SWB5)
5. Down (Down / SWB6)



### 3.8 BUZZER Circuit

BUZZER circuit as the figure below.



**Chapter 4 WT51F104 EVB Operation Description**

**4.1 WT51F104 Testing and Demonstration Platform**

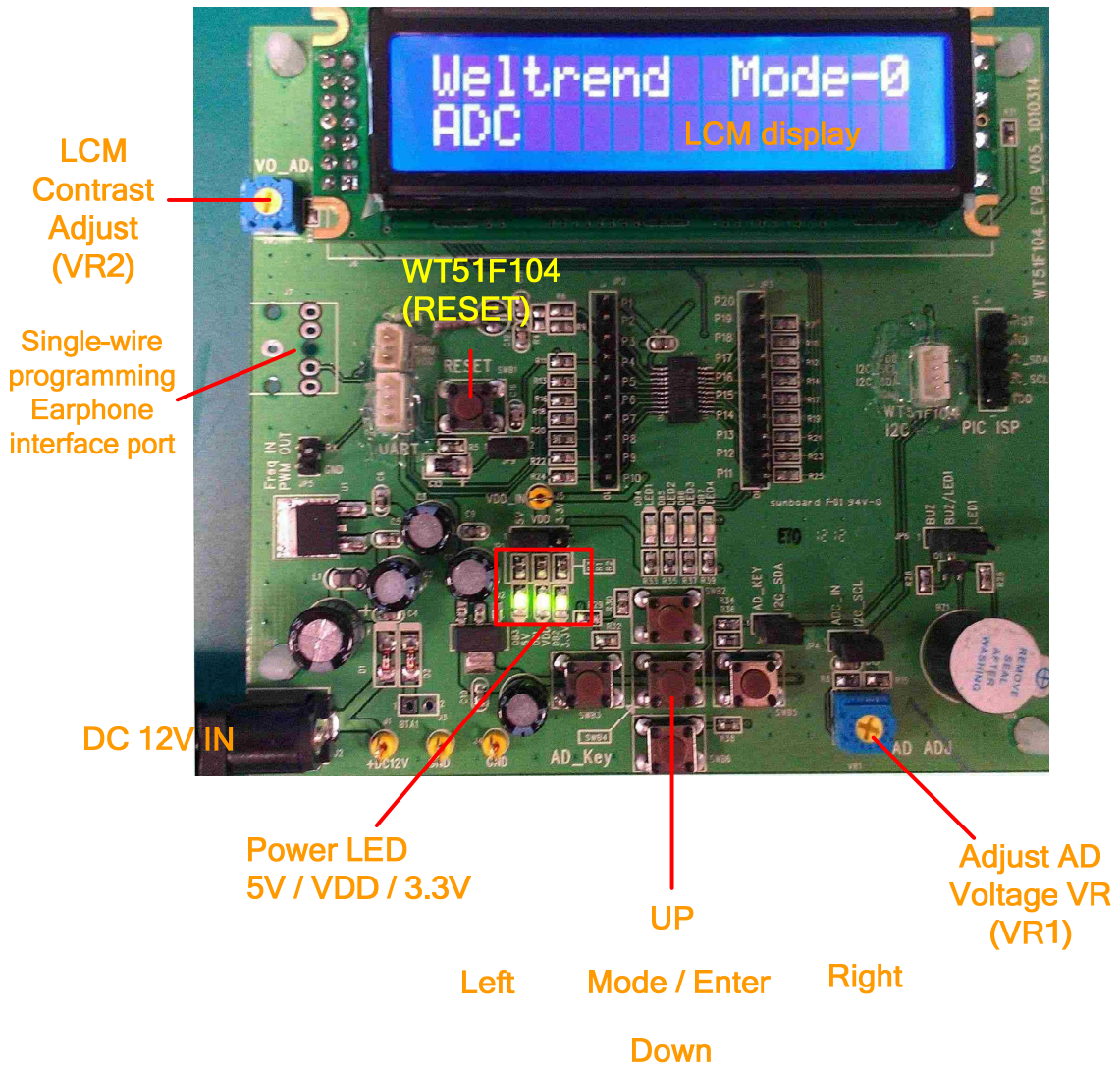
There are six function modes in WT51F104 EVB, for user application.

Mode :

1. LCD display
2. ADC measurement
3. Timer
4. Trigger Counter
5. Buzzer
6. UART

Button operation :

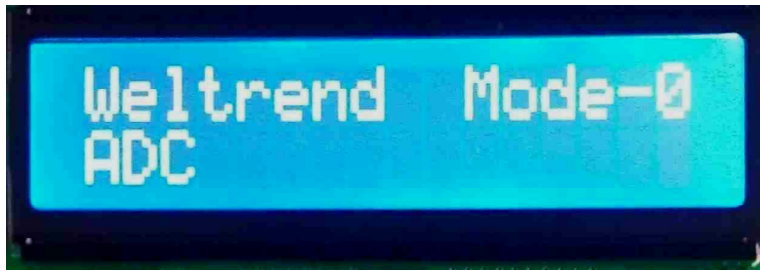
1. Up option (KEY1)
2. Left option (KEY2)
3. Mode/Ok (KEY3)  
Mode (3~4 seconds long press) / Ok(short press)
4. Right option (KEY4)
5. Down option (KEY5)



#### 4.2 LCM Display (program module description)

After power on, LCM display **【Weltrend / Mode-0】** screen, press “Mode/ok”, can execute mode 《Mode-0 ~ Mode-5》 function change.

### Main Screen



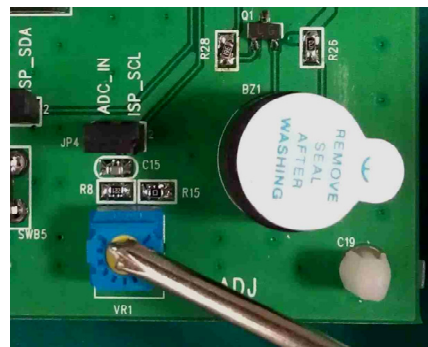
#### 4.3 ADC Measurement (program module description)

In “Mode-0 ADC” main screen, press “Down” button, then the program will execute AD detection function, now LCM will show 4- bit number, now adjust AD voltage button, voltage will be during 0V ~ 3.3V, LCM will transfer the voltage to 10 bit (0000 ~ 1023), long press “Down” can go back to main menu.

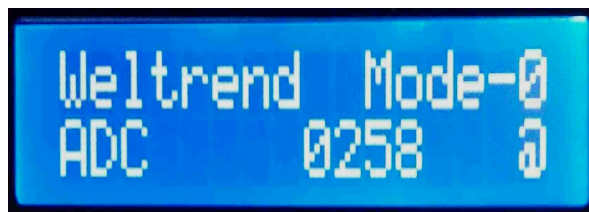
### Main Screen



### Adjust AD Voltage VR



### Execution Screen



**4.4 Timer** (Program Module Description)

In main screen press “mode/ok”, on LCM will show “Mode-1 RTC”, then press “Down”, program will execute RTC function, now on LCM will show hour-minute-second, long press “Down” button, you can go back to the main figure.

**Main Screen**



**Execution Screen**



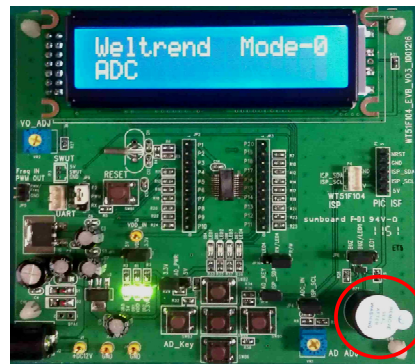
**4.5 Buzzer** (program module description)

In main screen press “mode/ok”, on LCM will show “Mode-3 Music” then press “Down”, the program will execute, then Buzzer will be issued by the seven scales automatically. Long press “Down” you can go back to main screen.

**Main Screen**



**Buzzer position**





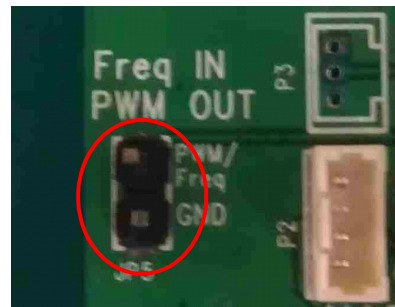
**4.6 PWM** (program module description)

In main screen press “Mode/OK”, LCM will show ”Mode-3 PWM”, then press ”Down”, program will execute PWM output function, now adjust AD voltage button, the voltage will produce 0V ~ 3.3V change, and PWM output will have different frequency. Output (12K ~ 2.4 MHz), long press “Down” you can go back to the main screen.

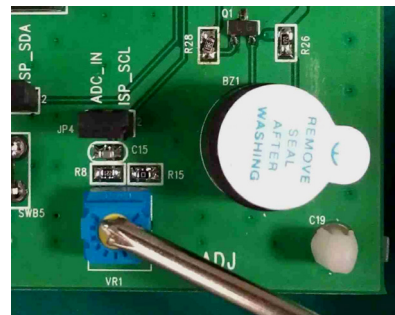
**Main Screen**



**PWM Output**



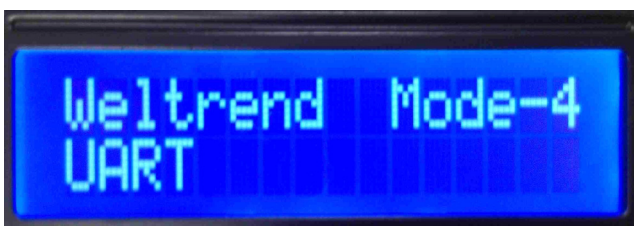
**Adjust AD Voltage VR**



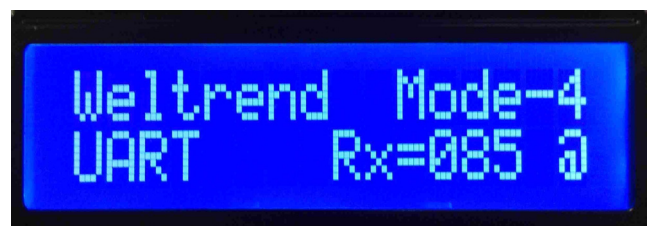
**4.7 UART** (program module description)

In main screen press “Mode/ok”, LCM will show 【Mode-5 UART】 , then press “Down”, program will execute, now will show 4-bit number, then connect WT51F104 EVB and PC through UART cable, now at PC Key IN 8-bit data (by Terminal tool and program), and LCM will show the decimal value which after converted. Long press “Down” you can go back to the main menu.

**Main Screen**



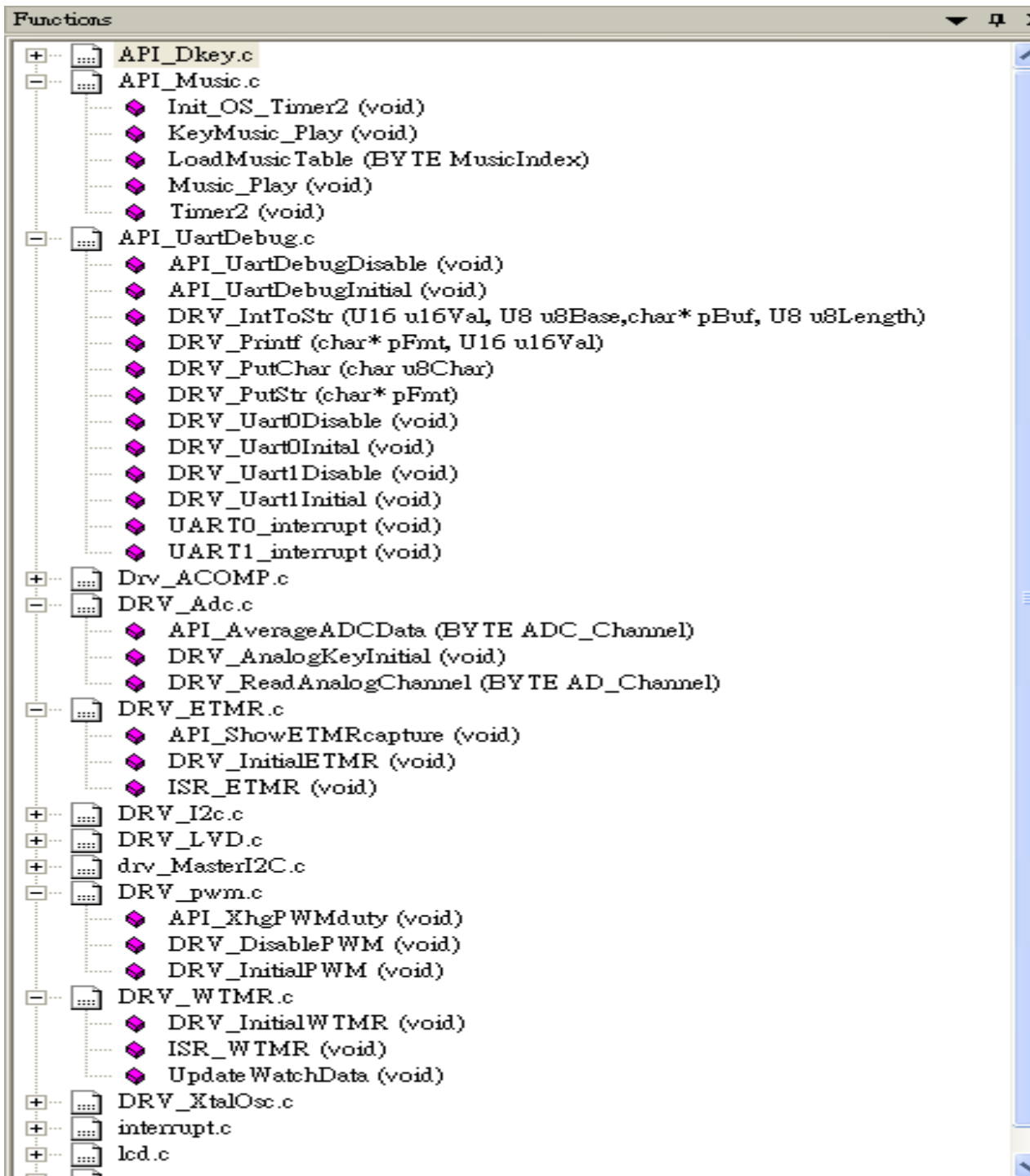
**Execution Screen**



**Chapter 5 Program Module**

**5.1 Program Module Description**

Please refer to the following program module.



## 5.2 LCM Driver Module <LCD.C>

Function	Description
void lcm_clear(void)	Clear LCM
void lcm_goto(BYTE pos, BYTE line)	The cursor jump to the specified location
void lcm_init( void)	Initialize the LCD display
void lcm_print_itemName(u8 itemNo)	print item name of demonstration
void lcm_print_itemResult(u8 itemNo)	print the execution result of demonstration
void lcm_putchar(BYTE c)	print a letter
void lcm_puts(const BYTE * s)	print a string
void lcm_write(BYTE c)	write command/data to LCM controller chip
void LcmDelayMs(BYTE cnt)	delay

## 5.3 ADC Driver Module <DRV\_ADC.C>

Function	Description
word API_AverageADCCData(BYTE ADC_Channel)	Take many times values of analog to digital for an average
Void DRV_AnalogKeyInitial(void)	Initialize ADC
word DRV_ReadAnalogChannel( BYTE AD_Channel)	Analog to digital conversion on the specified channel



## 5.4 RTC Driver Module <DRV\_WTMR.C>

Function	Description
void DRV_InitialWTMR(void)	Initialize "Timer"
void ISR_WTMR(void)	Timer interrupt solution
void UpdateWatchData(void)	Update Timer

## 5.5 PWM Driver Module <DRV\_PWM.C>

Function	Description
void API_XhgPWMduty(void)	Change PWM duty on/off percentage (duty cycle)
void DRV_DisablePWM(void)	Disable PWM
void DRV_InitialPWM(void)	Initialize PWM

## 5.6 Buzzer Driver Module <API\_Music.C>

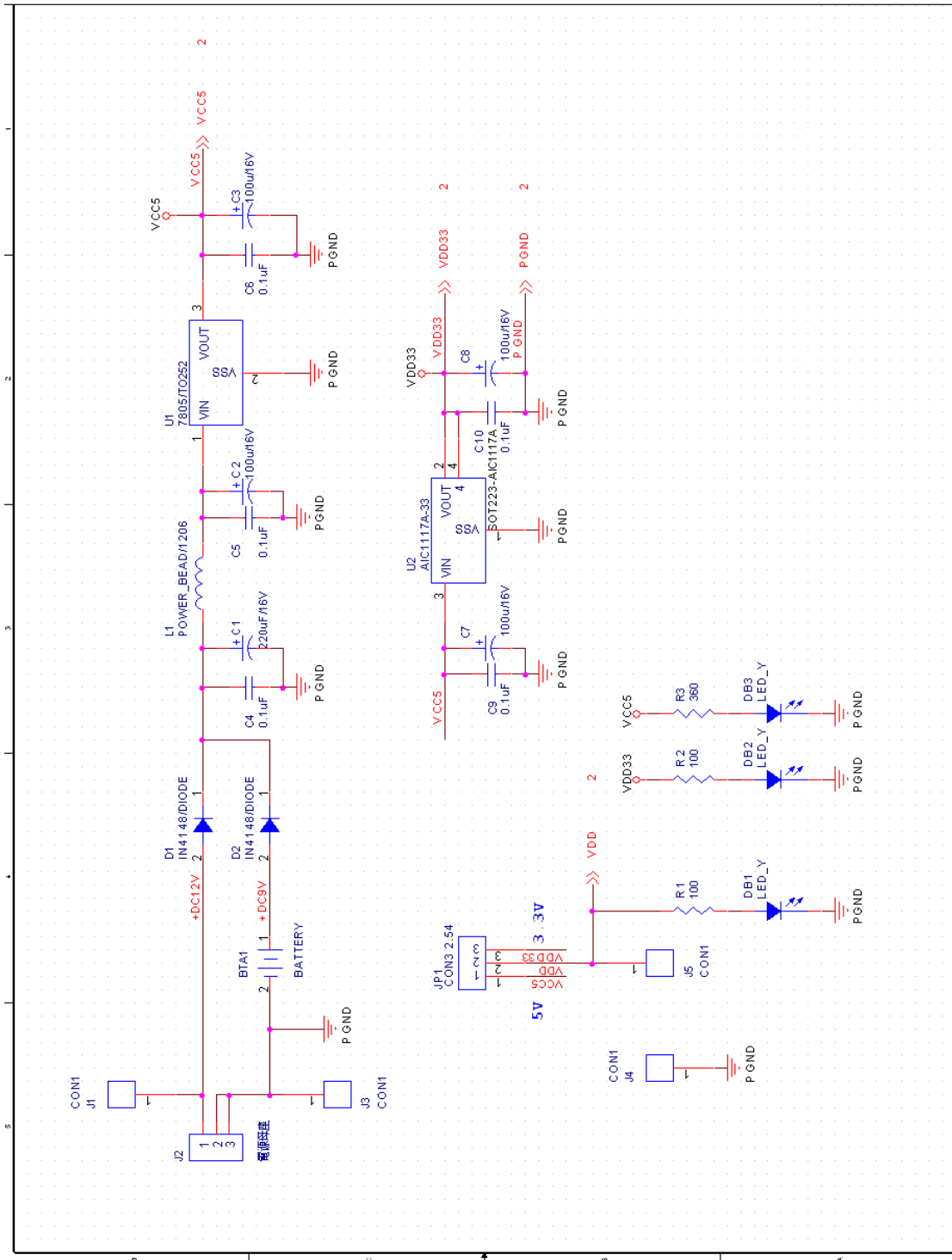
Function	Description
void Init_OS_Timer1(void)	Initialize "Timer 1"
void KeyMusic_Play(void)	Key sound
void LoadMusicTable(BYTE MusicIndex)	Take out musical corresponding to count value
void Music_Play(void)	Play music
void Timer1 (void) interrupt 5	"Timer 1" interrupt solution

## 5.7 UART Driver Module <API\_UartDebug.C>

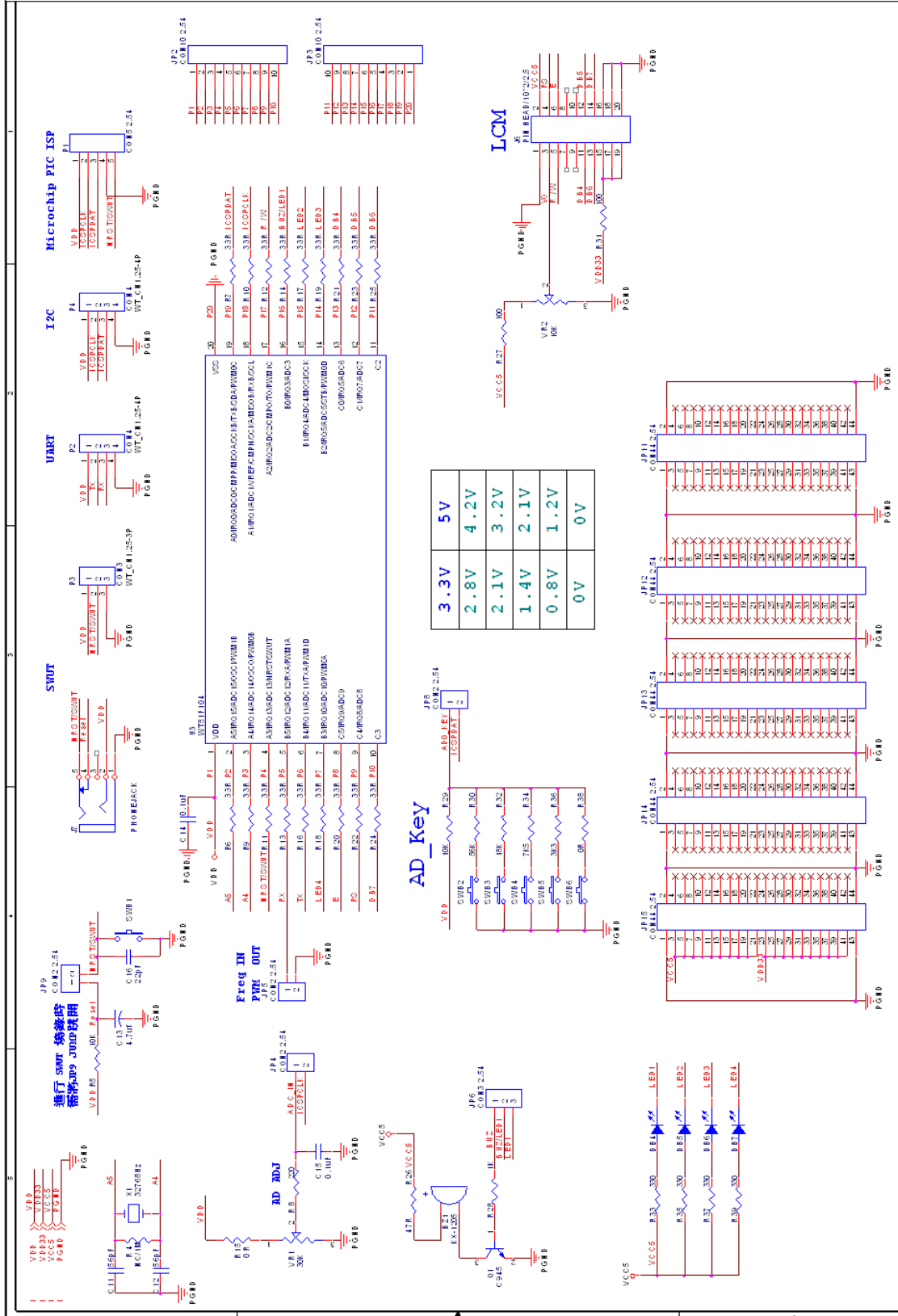
Function	Description
void DRV_Uart0Inital(void)	Initialize "serial port 0" (driver level)
void API_UartDebugInitial(void)	Initialize "serial port 0" (application level)
void API_UartDebugDisable(void)	Disable "serial port 0" (application level)
void DRV_Uart0Disable(void)	Disable "serial port0" (driver level)
void DRV_PutChar(char u8Char)	From "serial port 0" print a letter
void UART0_interrupt (void) interrupt 4	"serial port 0" receive/send interrupt solution

**Chapter 6 Appendix**

**6.1 Circuit**  
1. Power



## 2. WT51F104 (MCU)



## 6.2 BOM

WT51F104 EVB BOM				
Item	Quantity	Reference	Part	PCB Footprint
1	1	C16	22pF	SC0603
2	2	C11,C12	56pF	SC0603
3	7	C4,C5,C6,C9,C10,C14,C15	0.1uF	SC0603
4	1	C13	4.7uf	SCE-A
5	4	C2,C3,C7,C8	100u/16V	DCE030
6	1	C1	220uF/16V	DCE035
7	2	R15,R38	OR	SR0603
8	18	R6,R7,R9,R10,R11,R12,R13,R14,R16,R17, R18,R19,R20,R21,R22,R23,R24,R25	33R	SR0603
9	1	R26	47R	SR0603
10	4	R1,R2,R27,R31	100	SR0603
11	1	R8	220	SR0603
12	4	R33,R35,R37,R39	330	SR0603
13	1	R3	360	SR0603
14	1	R28	1K	SR0603
15	1	R36	3K3	SR0603
16	1	R34	7K5	SR0603
17	2	R5,R29	10K	SR0603
18	1	R32	18K	SR0603
19	1	R30	56K	SR0603
20	1	Q1	C945	SOT23
21	3	DB1,DB2,DB3	LED_Y	SLED0805
22	2	DB4,DB6	LED_BLUE	SLED0805
23	2	DB7,DB5	LED_YELLOW	SLED0805
24	2	D2,D1	IN4148/DIODE	DIODESMD
25	2	JP6,JP1	CON3 2.54	CM-3-2.54
26	2	JP3,JP2	CON10 2.54	CM-10-2.54
27	4	JP4,JP5,JP8,JP9	CON2 2.54	CM-2-2.54
28	5	JP11,JP12,JP13,JP14,JP15	CON44 2.54	HEADER2X22-2.54
29	4	J1,J3,J4,J5	CON1	TESTPIN_H2XP2.5
30	1	J2	電源母座	JACK-3P
31	1	J6	PIN HEAD/10*2/2.5	DISPLY_VC1624
32	1	J7	PHONEJACK	PHONE_JACK
33	1	L1	POWER_BEAD/1206	SL1206
34	1	P1	CON5 2.54	CM-5-2.54
35	2	P4,P2	CON4	WT_CN1.25-4P
36	1	P3	CON3	WT_CN1.25-3P
37	1	BTA1	BATTERY	CM-2-2.54
38	1	BZ1	KX-1205	KX-1205
39	6	SWB1,SWB2,SWB3,SWB4,SWB5,SWB6	POWER ON	KEY
40	1	U1	7805/TO252	TO252
41	1	U2	AIC1117A-33	SOT223-AIC1117A
42	1	U3	WT51F104	SSOP20-WT69P5
43	1	VR1	30K	VR3-DIPA
44	1	VR2	10K	VR3-DIPA
45	1	X1	32768Hz	XTAL-CRY32

## 6.3 Ordering Information

### 1. WT51F104 Development Kit

Kit	Product Name	Number
WT51F104 Development Kit	WLINK-SWUT x 1	WA000
	Development and demo board ( WT51F104 EVB With LCM Module) x 1	WB001
	SWUT Programming cable x 1	

### 2. WT51F104 Starter Kit

Kit	Product Name	Number
WT51F104 Starter Kit	WLINK-SWUT x 1	WA000
	WT51F104 Starter Kit Board x 1	WB006
	SWUT Programming cable x 1	

### 3. WT51F104 development and demo board

Kit	Product Name	Number
WT51F104 Development and Demo board	Development and Demo board (WT51F104 EVB With LCM Module)	WB001
	EVB Operation Manual	DOC13

### 4. WT51F104 Starter Kit Board (simple version)

Kit	Product Name	Number
WT51F104 Simple version	Simple Version (WT51F104 Starter Kit Board)	WB006
	EVB Operation Manual	DOC24

5. Single Wire Programming Board (WLINK-SWUT)

<b>Kit</b>	<b>Product Name</b>	<b>Number</b>
Single Wire Programming Board WLINK-SWUT	Single Wire Programming Board PL-2303 (WLINK-SWUT)	WA000
	Single Wire Programming Board CP-2102 (WLINK-SWUT)	
	WLINK-SWUT Operation Manual	DOC2