WT56F216
Evaluation Board
Operation Manual

REV. 1.1

April 20, 2012

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Version	Date	Applicant	Description
1.0	2012/1/10	Louis	
1.1	2012/04/20	Louis	1. Update the EVB parts and outline diagrams 2. Schematic update 3. Added single wire programmer earphone jack Interface instructions 4. BOM table updates 5. Remove RG441WT PKG Type instructions

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Table of Contents

CHAPTER 1 WT56F216 EVB H/W DESCRIPTION 5

1.1 SYSTEM BLOCK DIAGRAM 5
1.2 EVB COMPONENT LOCATION 6
WT56F216-RG440WT PKG TYPE 6

CHAPTER 2 WT56F216 EVB INPUT PORT DESCRIPTION 7

2.1 DC INPUT CONNECTOR 7
2.2 BATTERY INPUT PORT 7
2.3 VDD VOLTAGE SELECTOR 8
2.4 SWUT (SINGLE WIRE UART) INTERFACE PROGRAMMING PORT 8
2.5 SAMSUNG (S3F9488) PROGRAMMING PORT 9
2.6 SPI INTERFACE PORT 9
2.7 UART INTERFACE PORT 10
2.8 I^2C INTERFACE 10
2.9 SINGLE WIRE PROGRAMMER EARPHONE JACK INTERFACE PORT 11
2.10 WT6703 ISP INTERFACE 11
2.11 LCD DRIVER PORT 12

CHAPTER 3 WT56F216 EVB DIAGRAM 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 OSCILLATE CIRCUIT 15
3.7 BUTTON FUNCTION 16
3.8 BUZZER CIRCUIT 16
3.9 WT6703 FREQUENCY GENERATOR PERIPHERAL CIRCUIT 17

CHAPTER 4 WT56F216 EVB OPERATION DESCRIPTION 18

4.1 WT56F216 TEST AND DEMO PLATFORM 18
EVB OUTLINE (WT56F216-RG440WT PKG TYPE) 18
4.2 LCD DISPLAY (DRIVER DESCRIPTION) 19
4.3 ADC MEASURE (DRIVER DESCRIPTION) 19
4.4 TIMER MODE (DRIVER DESCRIPTION) 20
4.5 TRIGGER COUNTER (DRIVER DESCRIPTION) 20
4.6 BUZZER (DRIVER DESCRIPTION) 21
4.7 UART (DRIVER DESCRIPTION) 21

CHAPTER 5 DRIVER MODULE 22

5.1 DRIVER MODULE SUMMARY 22
5.2 LCD DRIVER PROGRAM <API_LCD4COM.C> 23
5.3 ADC DRIVER PROGRAM <DRV_ADC.C> 23
5.4 CLOCK (RTC) DRIVER PROGRAM <API_RTC.C> 24
5.5 TRIGGER COUNTER DRIVER <DRV_ENHANCE TIMER.C> 24
5.6 BUZZER FRIVER <API_MUSIC.C> 24
5.7 UART DRIVER <API_UARTDEBUG.C> 25
5.8 KEY PAD DRIVER PROGRAM <API_DKEY.C> 25

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CHAPTER 6 APPENDIX 26
6.1 CIRCUIT 26
EVB CIRCUIT (WT56F216-RG440WT PKG TYPE) 26
6.2 BOM 28
EVB BOM (WT56F216-RG440WT PKG TYPE) 28
6.3 LCD SPEC (4*18) 29
6.4 ORDERING INFORMATION 30

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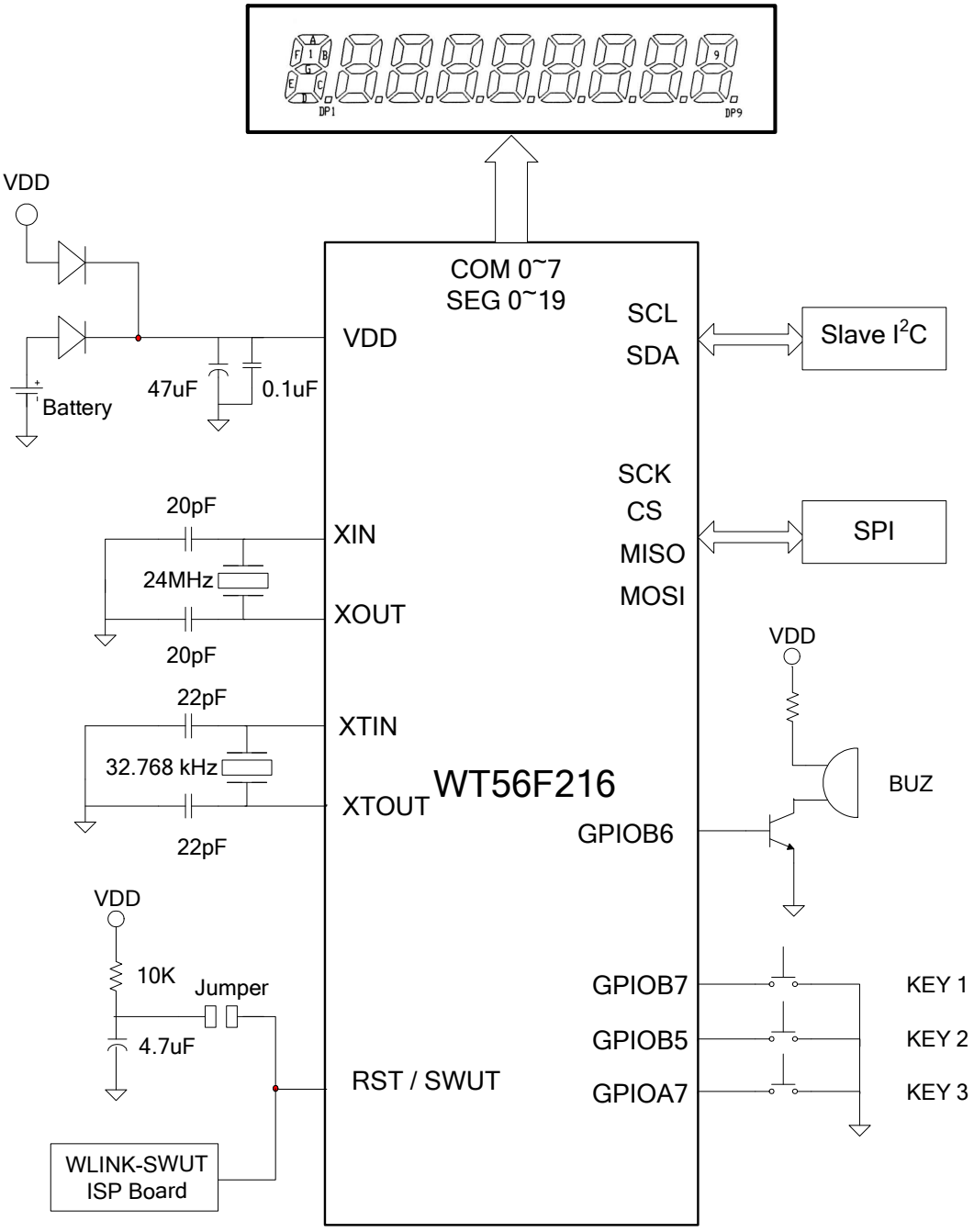
Chapter 1 WT56F216 EVB H/W Description

1.1 System Block Diagram

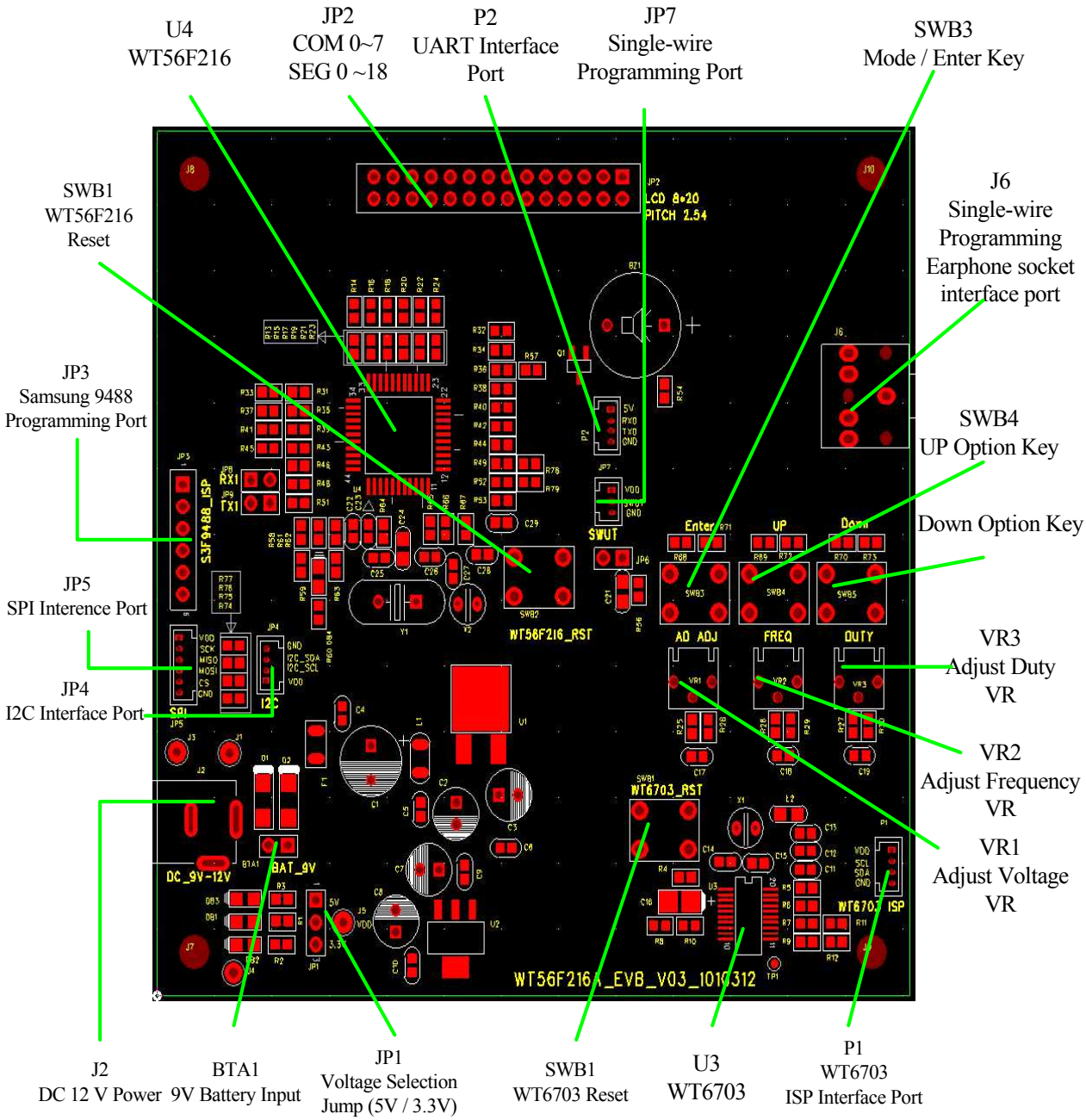
WT56F216 is an 8052 Micro Controller with LCD Driver enhanced, the EVB was designed by QFP44 pin PKG type, with the system structure as below.

WT56F216 EVB uses WT56F216-RG440WT PKG type (the pin count is the same as Samsung-S3F9488).



1.2 EVB Component Location

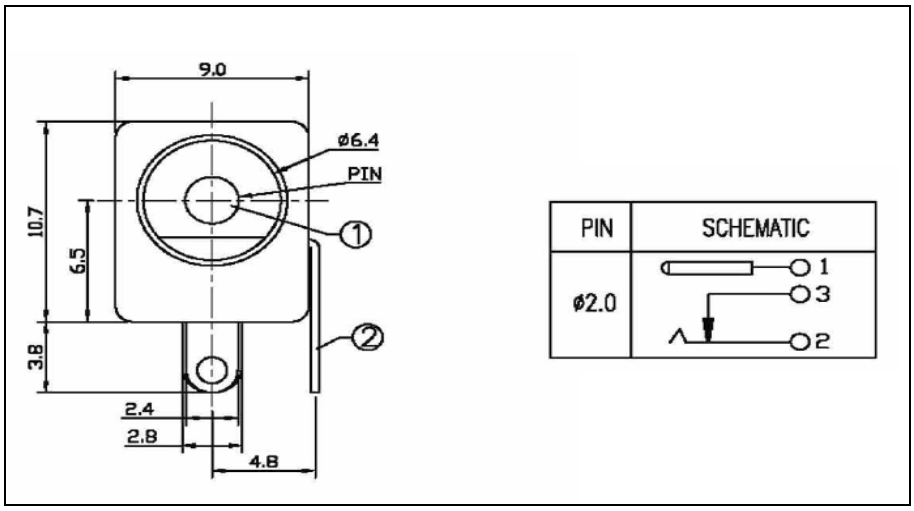
- WT56F216-RG440WT PKG type



Chapter 2 WT56F216 EVB Input Port Description

2.1 DC Input Connector

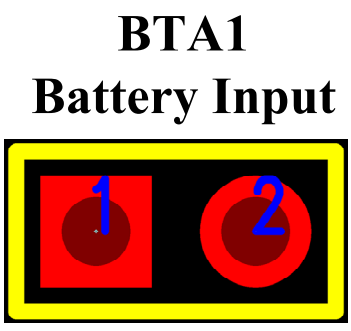
Component Location (J2)
EVB DC voltage input port (support voltage: DC 7V ~ 18V)



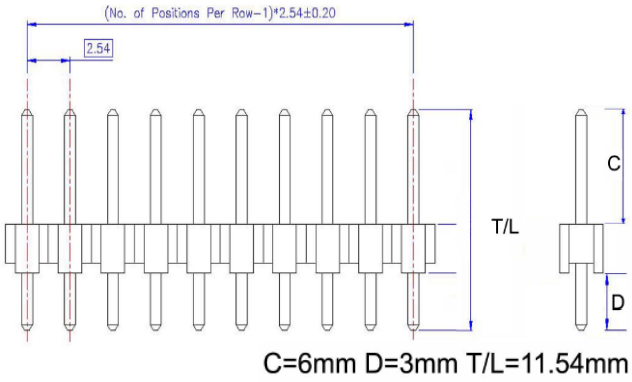
Pad Number	Description
1	positive pin input
2	--
3	negative pin input

2.2 Battery Input Port

Component Location (BTA1)
External Battery port (Battery Voltage Input range: 7V ~ 18V)



Pitch (2.54 mm)



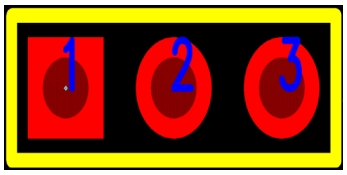
Pad Number	Description
1	positive battery input
2	negative battery input

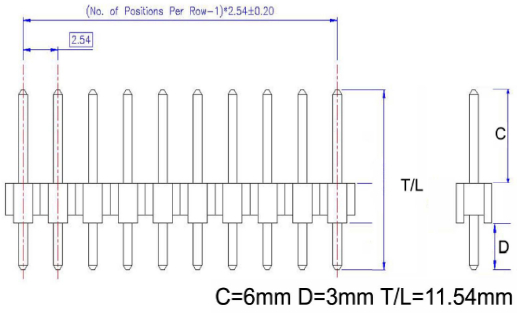
2.3 VDD Voltage Selector

Component Location (JP1)

The VDD Voltage Selector is for WT56F216, 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)

pitch (2.54 mm)





Jump (2.54 mm)

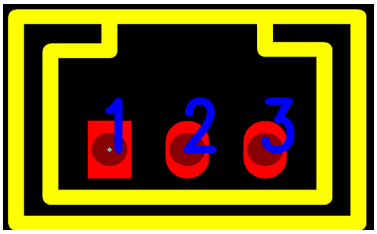
Pad Number	Description
1	5V (Jump 1-2 short)
2	VDD (external power input pin)
3	3.3V (Jump 2-3 short)

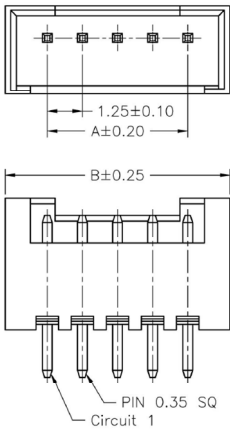
2.4 SWUT (Single Wire UART) Interface Programming Port

Component Location (JP7)

WT56F216 Single Wire Programming Port

pitch (1.25 mm)





Ordering Information & Dimensions

PART NO.	Dimensions	
	A	B
2P	1.25	4.25
3P	2.50	5.50
4P	3.75	6.75
5P	5.00	8.00
6P	6.25	9.25
7P	7.50	10.50
8P	8.75	11.75
9P	10.00	13.00
10P	11.25	14.25
11P	12.50	15.50
12P	13.75	16.75
13P	15.00	18.00
14P	16.25	19.25
15P	17.50	20.50

Pad Number	Description
1	VDD
2	SWUT
3	GND

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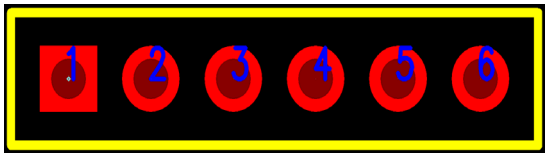
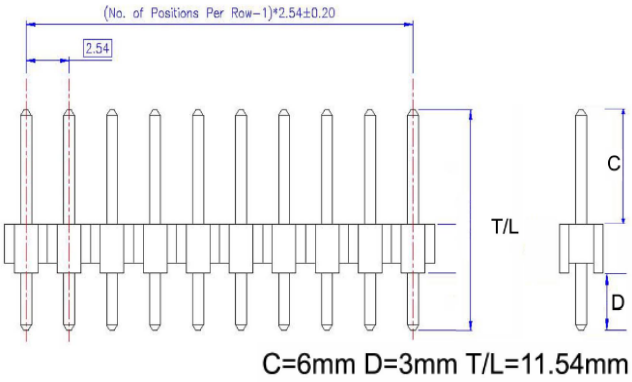
2.5 Samsung (S3F9488) Programming Port

Component Location (JP3)

WT56F216-RG440WT pin to pin with Samsung (S3F9488) programming port

Pitch (2.54 mm)





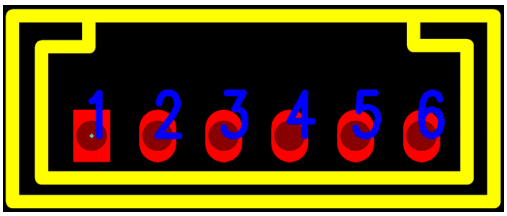
Pad Number	Description	Pad Number	Description
1	GND	4	SDA
2	VDD	5	VPP
3	SCL	6	RST

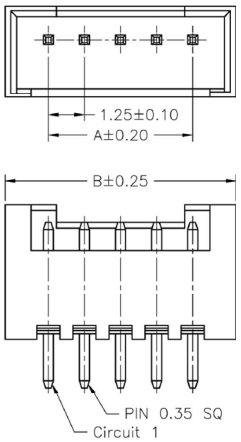
2.6 SPI Interface Port

Component Location (JP5)

This is SPI serial interface.

pitch (1.25 mm)





Ordering Information & Dimensions

PART NO.	Dimensions	
	A	B
2P	1.25	4.25
3P	2.50	5.50
4P	3.75	6.75
5P	5.00	8.00
6P	6.25	9.25
7P	7.50	10.50
8P	8.75	11.75
9P	10.00	13.00
10P	11.25	14.25
11P	12.50	15.50
12P	13.75	16.75
13P	15.00	18.00
14P	16.25	19.25
15P	17.50	20.50

Pad Number	Description	Pad Number	Description
1	VDD	4	MOSI
2	SCK	5	CS
3	MISO	6	GND

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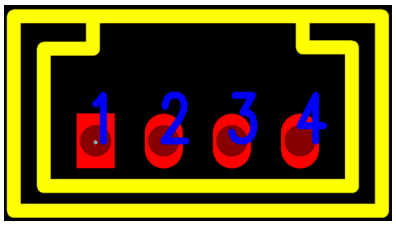
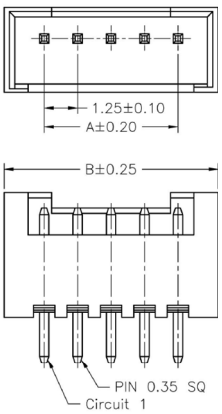
2.7 UART Interface Port

Component Location (P2)

This is UART serial transmission interface.



Pitch (1.25 mm)



Ordering Information & Dimensions

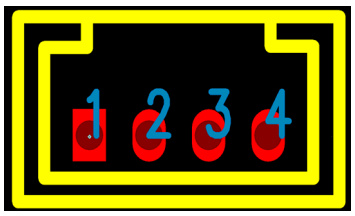
PART NO.	Dimensions	
	A	B
2P	1.25	4.25
3P	2.50	5.50
4P	3.75	6.75
5P	5.00	8.00
6P	6.25	9.25
7P	7.50	10.50
8P	8.75	11.75
9P	10.00	13.00
10P	11.25	14.25
11P	12.50	15.50
12P	13.75	16.75
13P	15.00	18.00
14P	16.25	19.25
15P	17.50	20.50

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

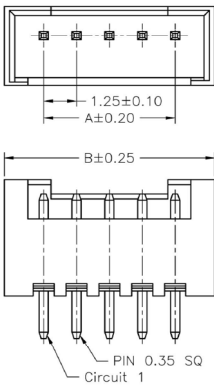
2.8 I²C Interface

Component Location (JP4)

I²C Interface for SLAVE



pitch (1.25 mm)



Ordering Information & Dimensions

PART NO.	Dimensions	
	A	B
2P	1.25	4.25
3P	2.50	5.50
4P	3.75	6.75
5P	5.00	8.00
6P	6.25	9.25
7P	7.50	10.50
8P	8.75	11.75
9P	10.00	13.00
10P	11.25	14.25
11P	12.50	15.50
12P	13.75	16.75
13P	15.00	18.00
14P	16.25	19.25
15P	17.50	20.50

Pad Number	Description
1	VDD
2	Slave_SCL
3	Slave_SDA
4	GND

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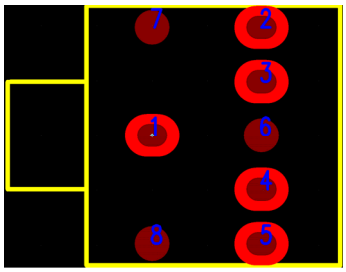
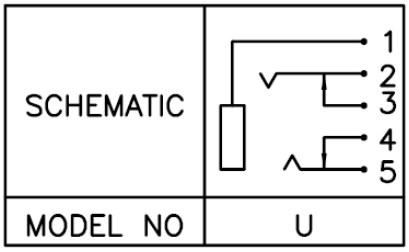
2.9 Single Wire Programmer Earphone Jack Interface port

Component Location (J6)
Single wire programmer (SWUT) Earphone Jack interface port

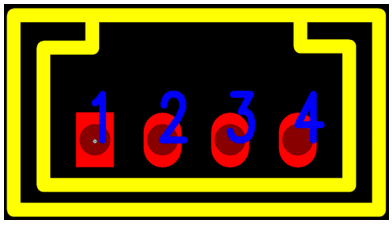




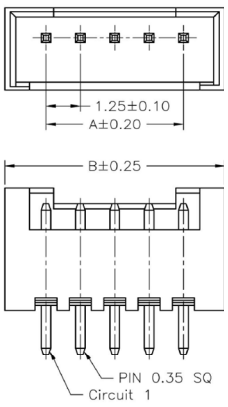
Pad Number	Description	Pad Number	Description
1	GND	5	SWUT
2	VDD	6	NC
3	NC	7	NC
4	RESET	8	NC

2.10 WT6703 ISP Interface

ISP Port for internal testing
ISP programming Port for WT6703F



pitch (1.25 mm)



Ordering Information & Dimensions

PART NO.	Dimensions	
	A	B
2P	1.25	4.25
3P	2.50	5.50
4P	3.75	6.75
5P	5.00	8.00
6P	6.25	9.25
7P	7.50	10.50
8P	8.75	11.75
9P	10.00	13.00
10P	11.25	14.25
11P	12.50	15.50
12P	13.75	16.75
13P	15.00	18.00
14P	16.25	19.25
15P	17.50	20.50

Pad Number	Description
1	VDD
2	DSCL
3	DSDA
4	GND

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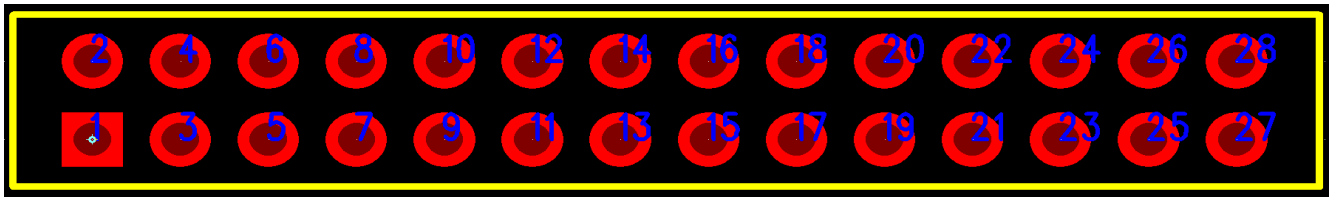
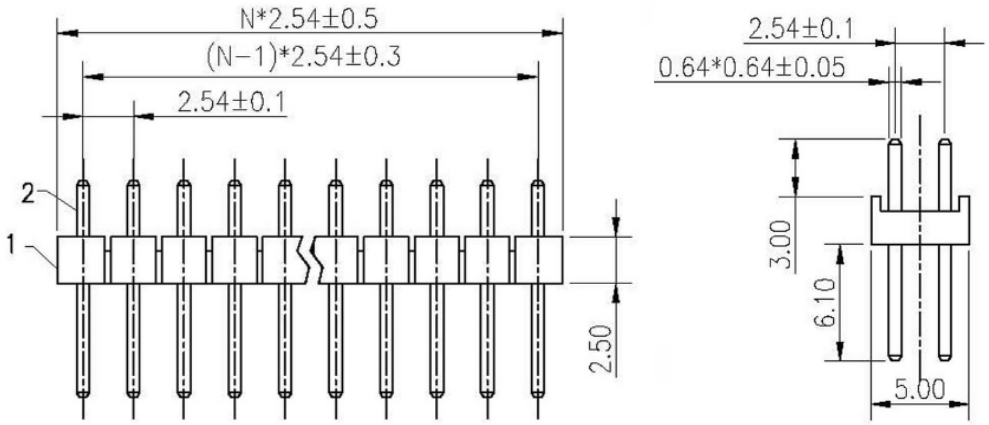
2.11 LCD Driver Port

Component Location (JP2)
LCD Driver Port:



Pitch (2.54 mm)



Pad Number	Description	Pad Number	Description
1	COM 0	15	SEGMENT 6
2	COM 1	16	SEGMENT 7
3	COM 2	17	SEGMENT 8
4	COM 3	18	SEGMENT 9
5	COM 4	19	SEGMENT 10
6	COM 5	20	SEGMENT 11
7	COM 6	21	SEGMENT 12
8	COM 7	22	SEGMENT 13
9	SEGMENT 0	23	SEGMENT 14
10	SEGMENT 1	24	SEGMENT 15
11	SEGMENT 2	25	SEGMENT 16
12	SEGMENT 3	26	SEGMENT 17
13	SEGMENT 4	27	SEGMENT 18
14	SEGMENT 5	28	SEGMENT 19

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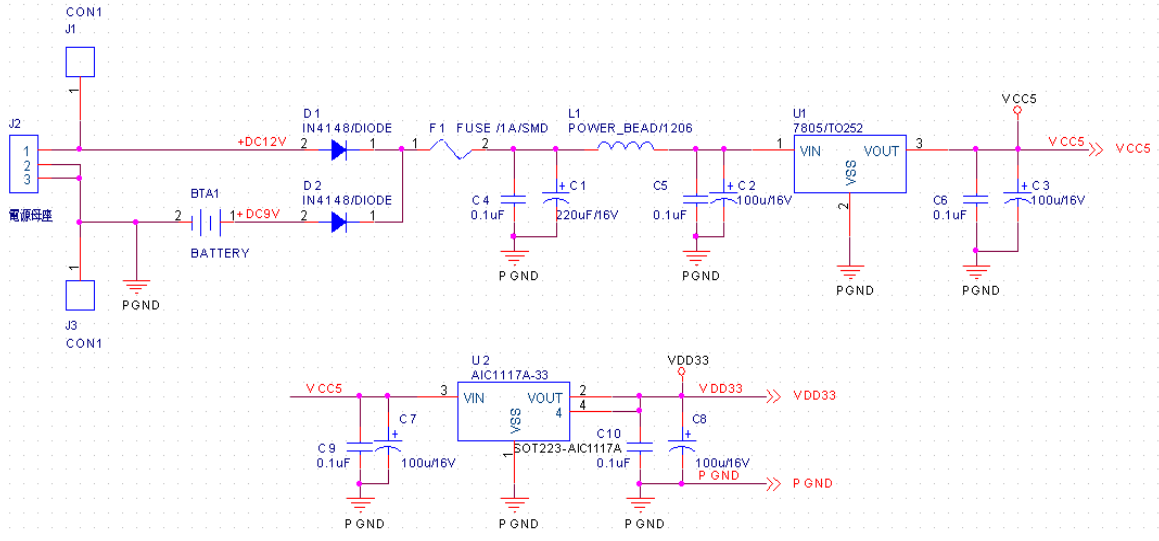
Chapter 3 WT56F216 EVB Diagram Description

3.1 Main Power system

There are three options for WT56F216 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 input for main power, please see below [VDD Power Option] description.

WT56F216 EVB Main Power Circuit:

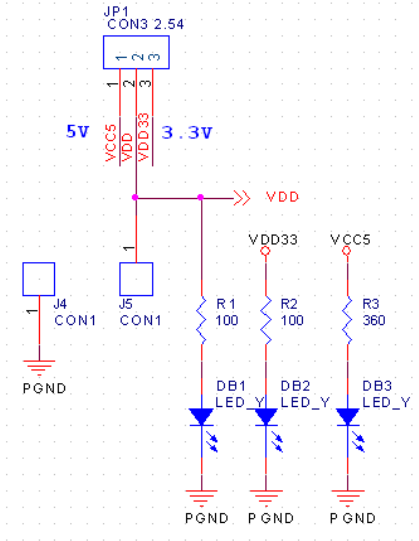


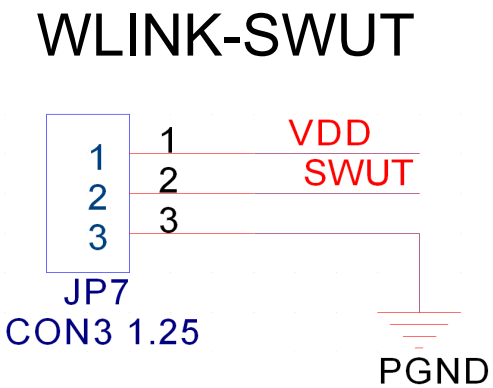
3.2 VDD Power Option

There are four options for WT56F216 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 WT56F216 VDD voltage is 5 V.
2. Pad JP1 2-3 connect: means WT56F216 VDD voltage is 3.3V.
3. WLINK-SWUT Adapter VDD: Using WLINK-SWUT Adapter VDD for WT56F216 VDD power.
4. External VDD: It can input from pad J5 (positive), J4 (negative), external input VDD must not exceed Max. 5.5V as spec. definition.

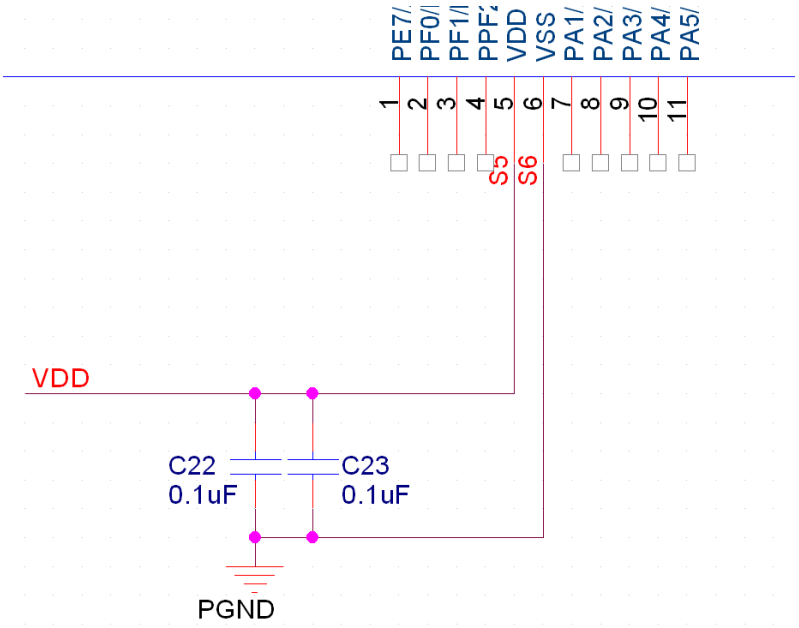
If power is normal operation, DB1, DB2, DB3 LED will light.





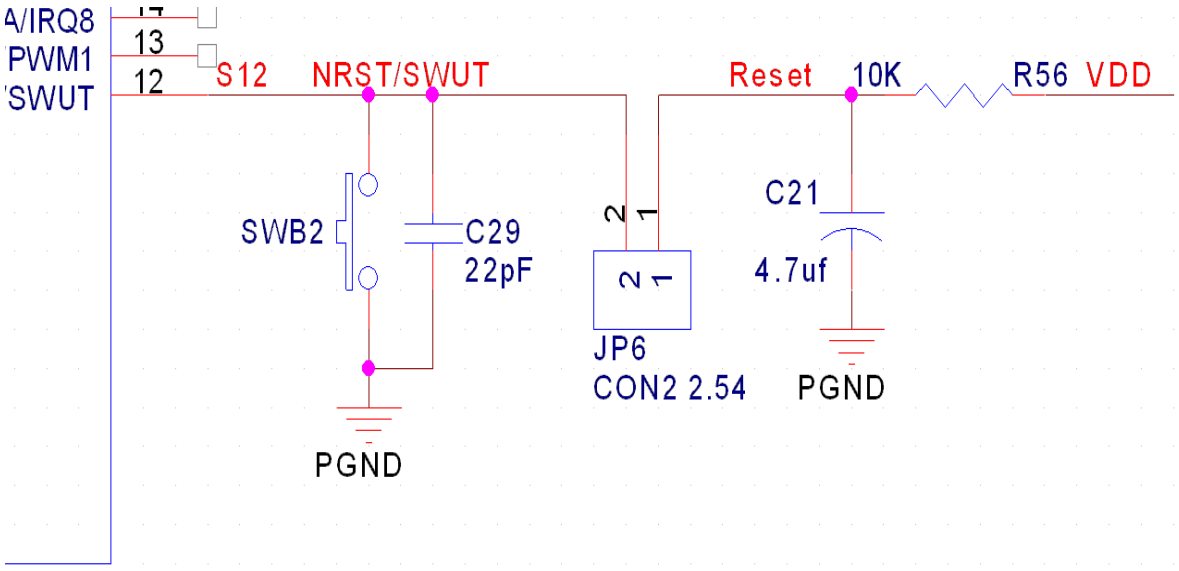
3.3 Power Circuit

VDD input needs filter capacitor, this is best that layout is close to the pin.



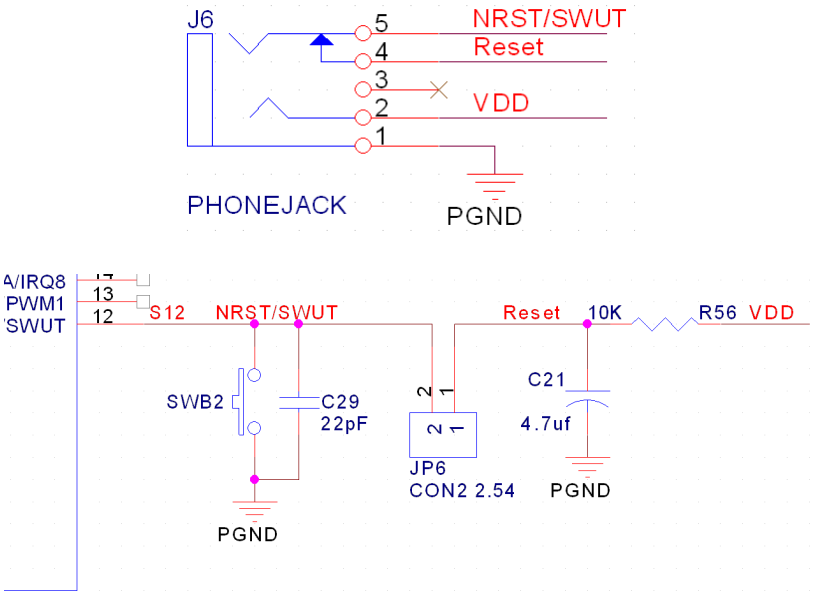
3.4 RESET circuit

WT56F216 RESET circuit and SWUT single wire programming use the same pin, the circuit is as follows.
When SWUT on programming the JP6 JUMP should be power down and the RC RESET should disconnect from it, if the REST functions had been used, when programming is finished, the JP6 JUMP needs to plug again.



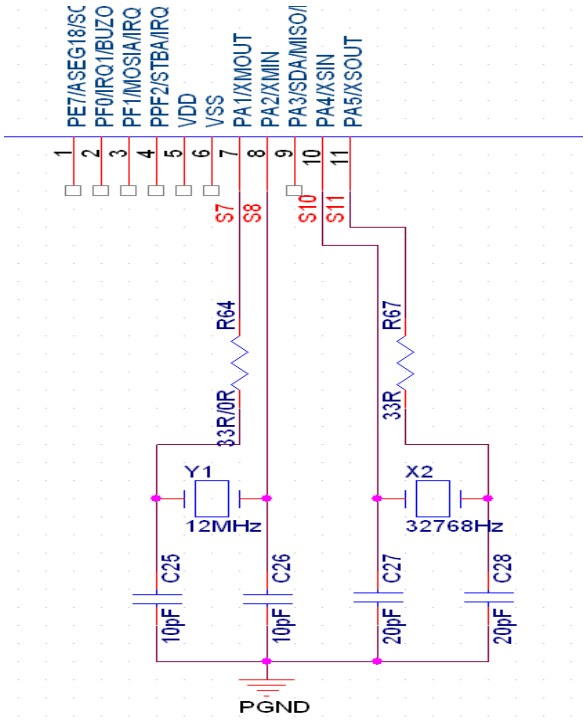
3.5 Single wire earphone Jack interface Circuit

Since reset WT56F216 circuit and SWUT single wire programming both used the same pin, for update easily when mass production, design the below circuit, when plugs the earphone programming line, the RESET / SWUT (4-5) will break, and start to program, after programming finished, removes the earphone programming line, the springs of earphone jack let RESET / SWUT(4-5) short, and RC will go back to RESET state.



3.6 Oscillate Circuit

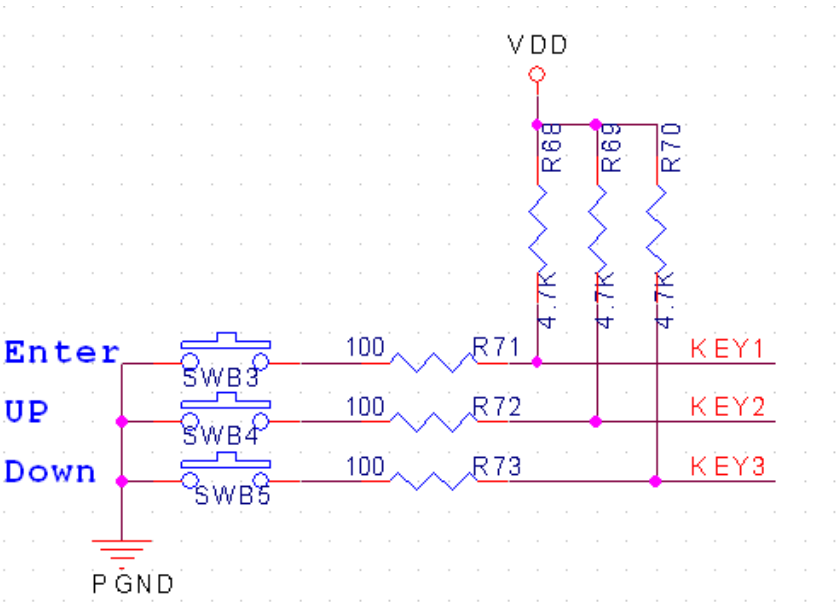
WT56F216 12 MHz and 32.768 kHz oscillator circuit are as bellow:



3.7 Button Function

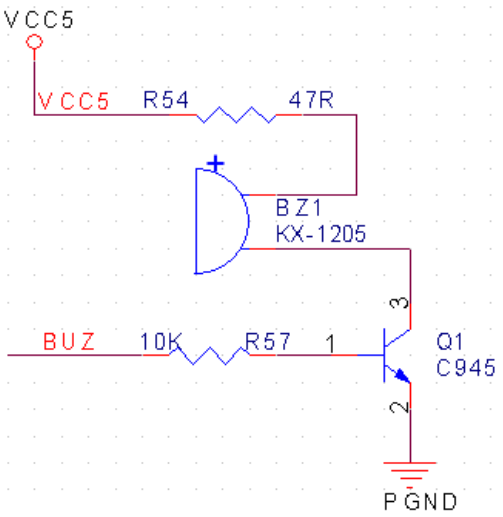
WT56F216 EVB reserves three function buttons.

1. Mode/Confirm (Enter)
   Mode (3~4 seconds press) / Confirm (Short press)
2. UP
3. Down



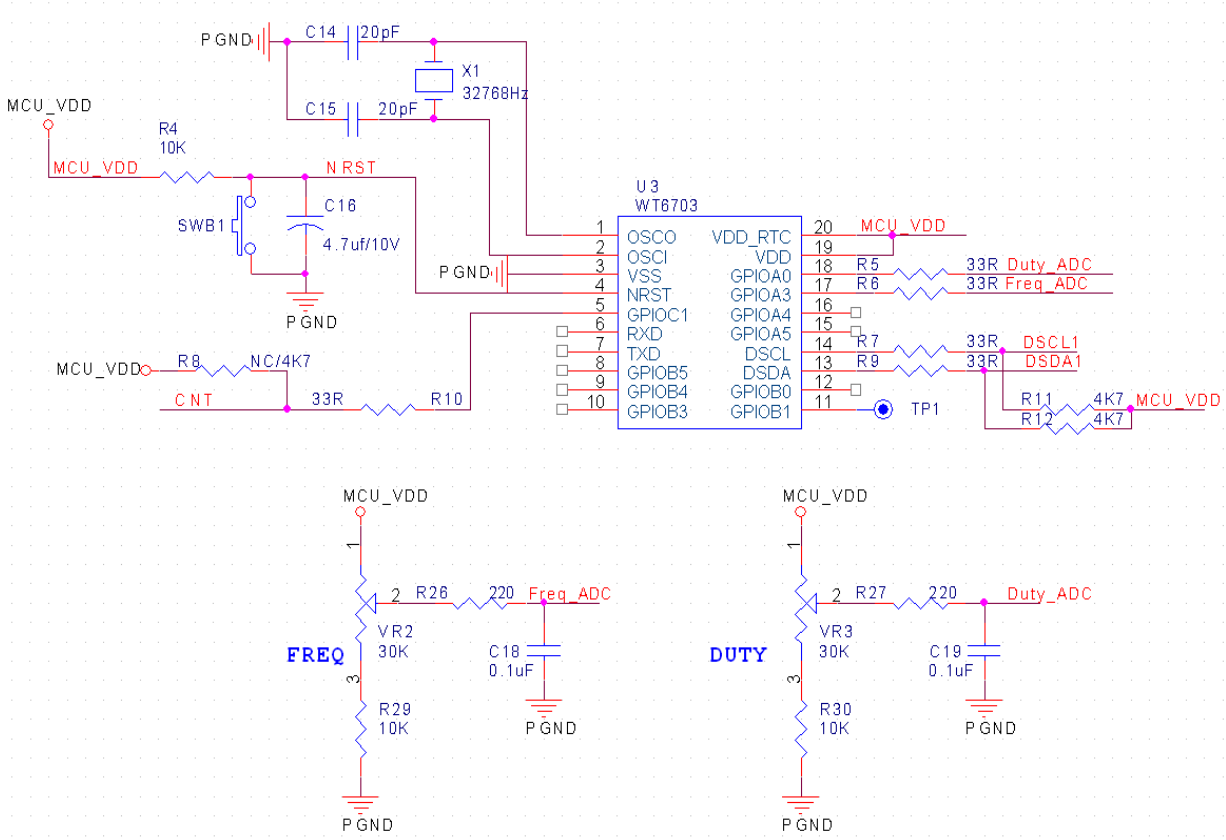
3.8 BUZZER Circuit

BUZZER Circuit is as below.



3.9 WT6703 Frequency Generator Peripheral Circuit

WT56F216 EVB insides WT6703 IC, it used for frequency generator. When the external resistor was adjusted, Duty-ADC Pin can produce 0V ~ 3.3V voltage input. According to the different voltages, WT6703 will produce 30 kHz ~ 60 kHz input to Freq_ADC Pin for WT56F216 count test.



Chapter 4 WT56F216 EVB Operation Description

4.1 WT56F216 Test and Demo Platform

There are six function modes in WT56F216 EVB:

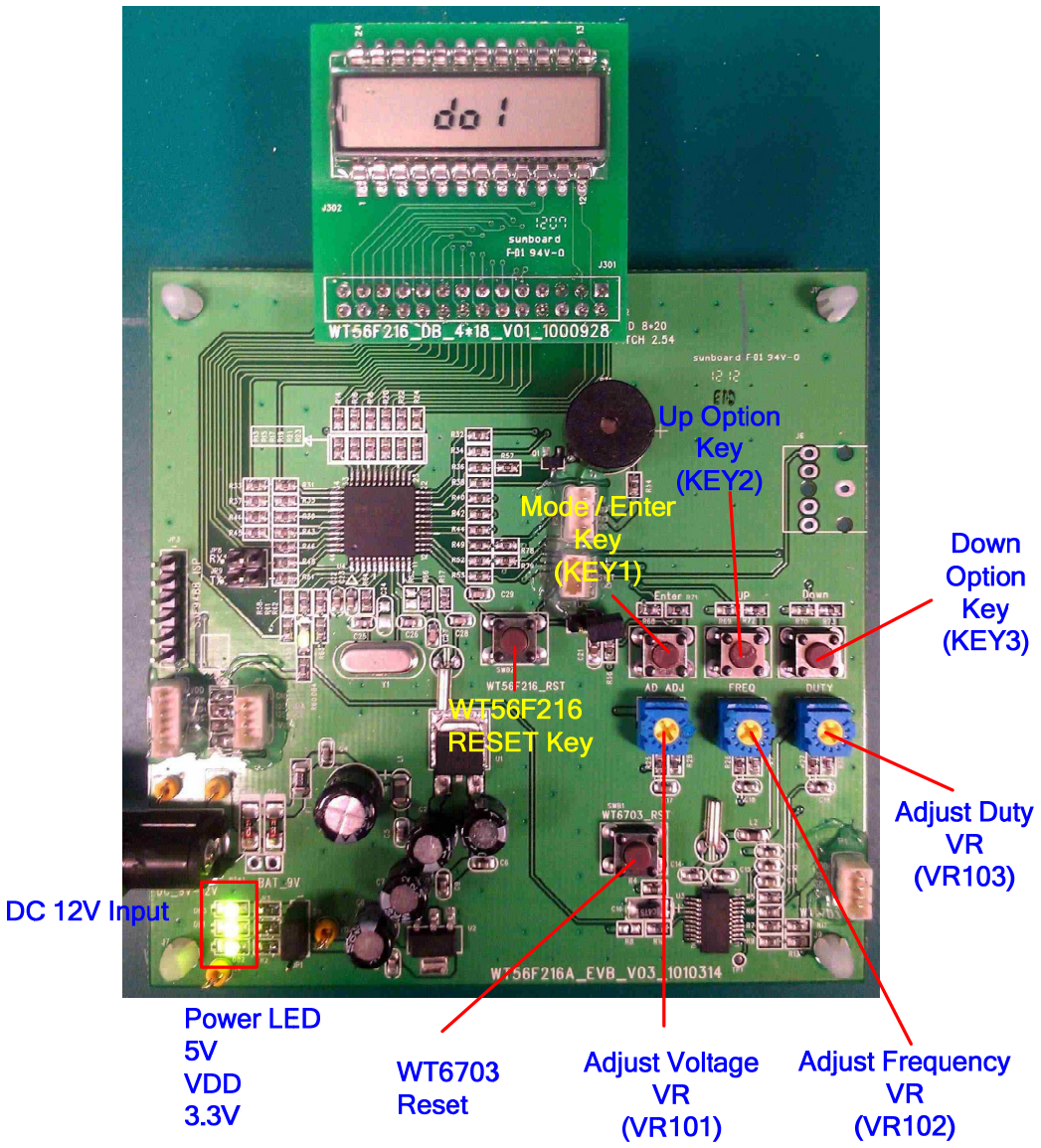
Mode:

1. LCD Display
2. ADC measure
3. Timer
4. Trigger Counter
5. Buzzer
6. UART

Button Operation:

1. Mode/ Confirm (KEY1)
   Mode (Press and Hold 3~4 seconds) / Confirm (Short Press)
2. Up Option (KEY2)
3. Down Option (KEY3)

➢ EVB Outline (WT56F216-RG440WT PKG type)



4.2 LCD Display (Driver Description)

When power on, LCD display【do 1】, and press『Mode/Confirm』, then LCD executes 000000000~999999999.
(Press and hold『Mode/Confirm』3~4 seconds, then back to main figure【do 1】)

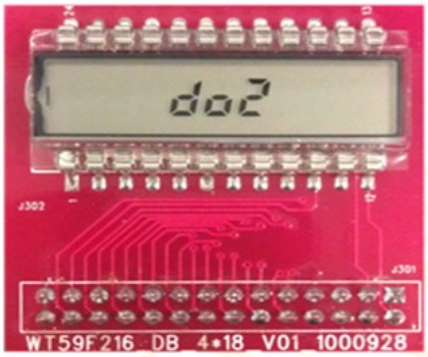
Main Screen

Execution screen

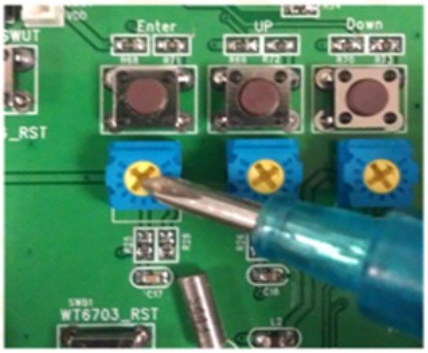
4.3 ADC Measure (Driver Description)

In main figure【do 1】, and press『UP Option』, then LCD display【do 2】; press again『Mode/Confirm』, then LCD displays 4 characters. Adjust ADC voltage button, and have voltage 0V ~ 3.3V, and LCD will make voltage transfer to 12-Bit (0000~4094).
(Press and hold『Mode/Confirm』3~4 seconds, it can back to main figure【do 1】)

Main Screen



Adjust AD Voltage
VR



Execution screen

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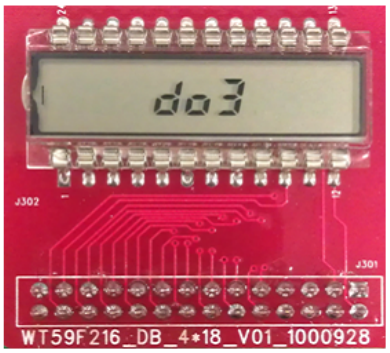
4.4 Timer mode (Driver Description)

In main figure【do 1】, press『Up Option』, and LCD display【do 3】; press『Mode/ Confirm』then LCD display hour-minute-second formats. Press 『Mode/ Confirm』, and second will show "Flicker" status then press 『Up Option』or『Down Option』, it can set up seconds. After setting up, please press『Mode/ Confirm』, it can set up minutes, and so on. After setting up hour-minute-second, press『Mode/ Confirm』then finish.
(Press and hold『Mode/ Confirm』3~4 seconds, and back to main figure【do 1】)

Main Screen



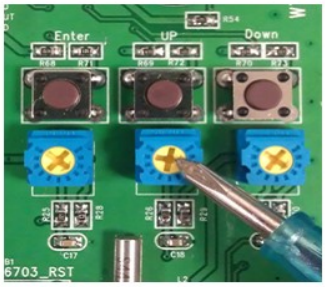
Execution screen

4.5 Trigger Counter (Driver Description)

In main figure【do 1】, press『Up Option』, LCD display【do 4】, and press『Mode/Confirm』, then LCD displays 5 characters. Adjust frequency button to make WT6703 produce 30K ~ 60K frequency and transfer to WT56F216 counters.
After counting, the values all display in LCD.
(Press and hold『Mode/ Confirm』3~4 seconds and back to main figure【do 1】)

Main Screen

Adjust Frequency VR



Execution screen

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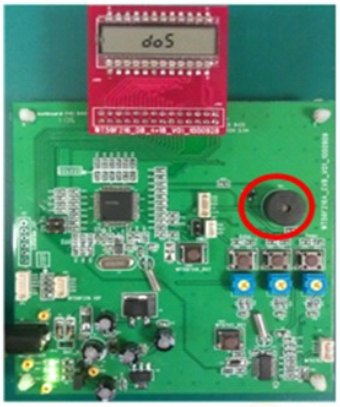
4.6 Buzzer (Driver Description)

In main figure【do 1】, press『Up Option』, LCD display【do 5】, and press『Mode/Confirm』, then Buzzer will be automatically issued by the seven scales.
(Press and hold『Mode/ Confirm』3~4 seconds and back to main figure【do 1】)

Main Screen

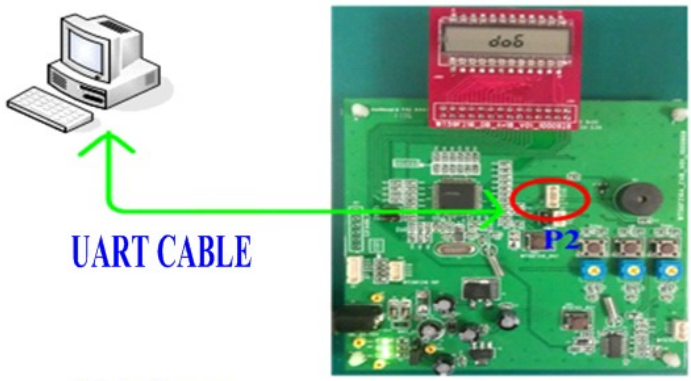
Buzzer position



4.7 UART (Driver Description)

In main figure【do 1】, press『Up Option』, LCD display【do 6】, and press『Mode/Confirm』, then LCD displays 2 characters. Connect WT56F216 EVB and PC by UART cable, then Key in 8 bit data in PC (Use Terminal Tool), and LCD displays this 8 bit data.
(Press and hold『Mode/ Confirm』3~4 seconds and back to main figure【do 1】)

Connection Diagram



Main Screen

Execution screen

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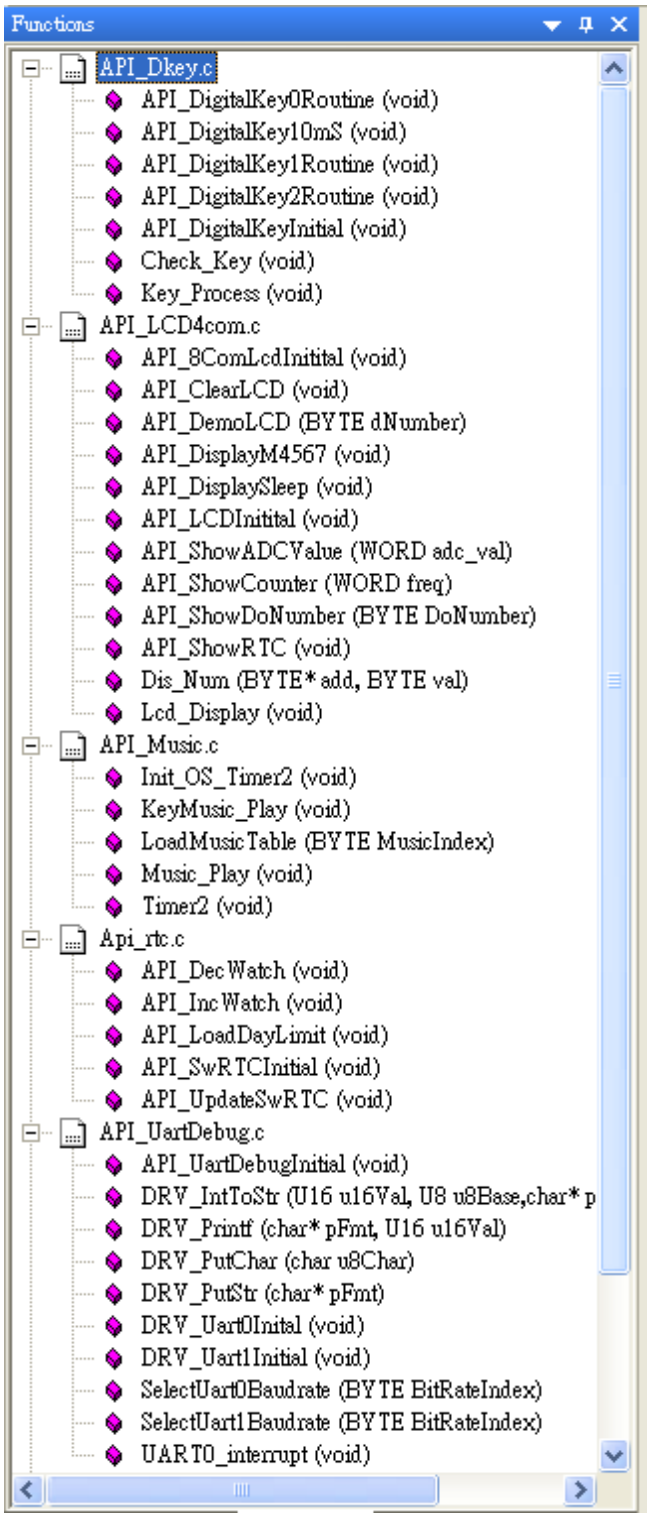
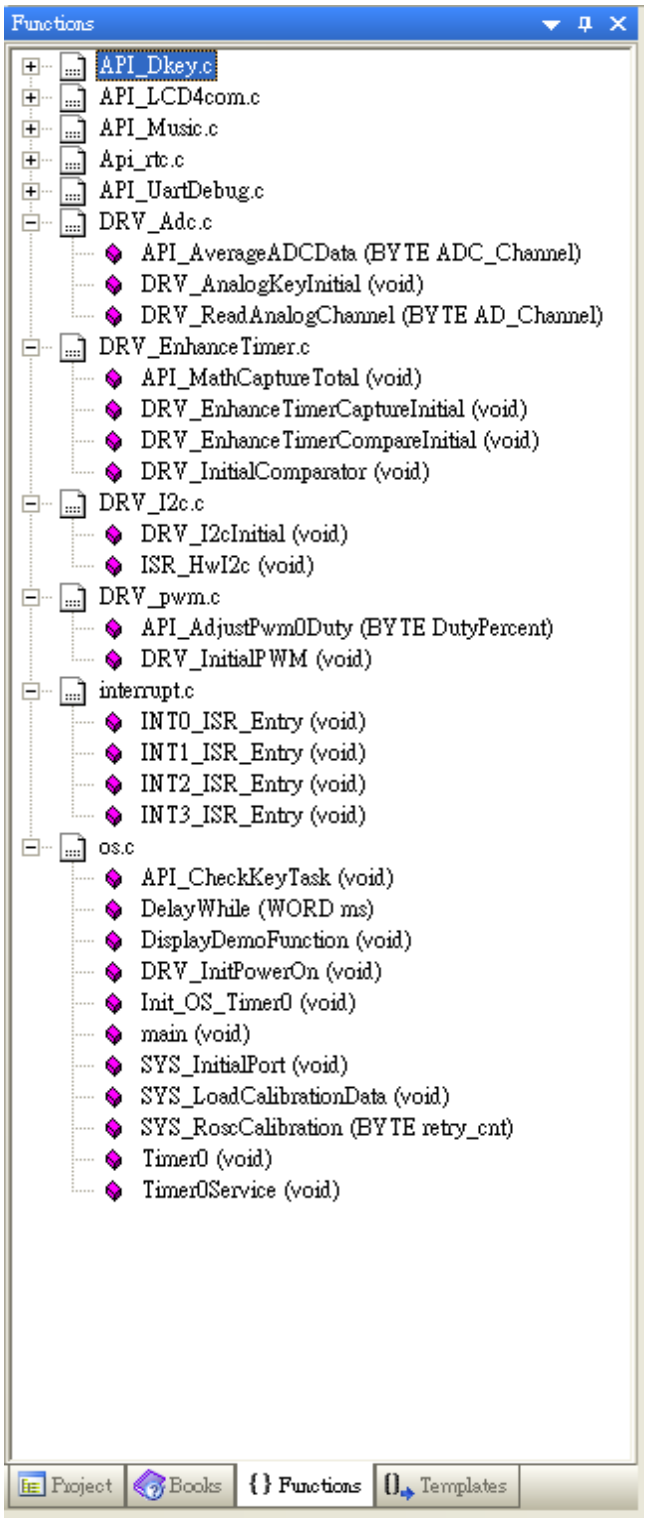
Chapter 5 Driver Module

5.1 Driver Module Summary

Please refer to the following program module:





5.2 LCD Driver Program <API_LCD4com.c>

Function	Description
void API_LCDInitital(void)	Initialized LCD, and set 4 Com LCD 1/3 bias, 1/4 duty
void API_ClearLCD(void)	Clear LCD mapped RAM
void API_DemoLCD(BYTE dNumber)	LCD demos program: LCD will continue to show 0 to 9
void API_DisplayM4567(void)	LCD2 demo program: LCD shows 12:00
void API_DisplaySleep(void)	Saving power demo program: LCD shows ”SLEEP” and MCU enters into saving power mode
void API_ShowADCValue(WORD adc_val)	ADC demo program: AD will show 0 to 4095 according to external voltage input
void API_ShowCounter(WORD freq)	Counter demo program: count external pin, count range 0 to 65535 Hz
void API_ShowDoNumber(BYTE DoNumber)	Main figure demo program: display do1 ~ do8
void API_ShowRTC(void)	Clock Program: shows time: minute: second
void Dis_Num(BYTE *add,BYTE val)	Load LCD TABLE to LCD BUFFER
void Lcd_Display(void)	Load LCD BUFFER to LCD RAM and input LCD
void API_8ComLcdInitital(void)	Initialize LCD and set 8 Com LCD 1/3 bias, 1/8 duty

5.3 ADC Driver Program <DRV_Adc.c>

Function	Description
WORD API_AverageADCData (BYTE ADC_Channel)	ADC average data for sampling 16 times
void DRV_AnalogKeyInitial(void)	Initialization of the ADC
WORD DRV_ReadAnalogChannel (BYTE AD_Channel)	ADC in specific channel

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5.4 Clock (RTC) Driver Program <API_rtc.c>

Function	Description
void API_SwRTCInitial(void)	Initialize real-time Timer every 0.5 seconds to generate INT0 interrupt
void INT0_ISR_Entry(void) interrupt 0	INT0 interrupted, including RTC automatic timing

5.5 Trigger Counter Driver <DRV_Enhance Timer.c>

Function	Description
void API_MathCaptureTotal(void)	Count “Enhance Timer/Counter” capture data, and transfer to real frequency
Void DRV_EnhanceTimerCaptureInitial(void)	Initialize “Enhanced Timer/Counter”

5.6 Buzzer Friver <API_Music.c>

Function	Description
void Init_OS_Timer2(void)	Initialize ”Timer 2”
void KeyMusic_Play(void)	Key Voice
void LoadMusicTable(BYTE MusicIndex)	Take out musical corresponding to count value
void Music_Play(void)	Play music to produce Do, Re, Mi; Fa, So, La, Si
void Timer2 (void) interrupt 5	”Timer 2” interrupt solution

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5.7 UART Driver <API_UartDebug.c>

Function	Description
void API_UartDebugInitial(void)	Initialize the debug side, according to UART_DEBUG_PORTchoosed UART0 or UART1
void DRV_Uart0Inital(void)	Initialize UART0 as 115200, n, 8, 1
void DRV_Uart1Initial(void)	Initialize UART1 as 115200, n, 8, 1
void SelectUart0Baudrate(BYTE BitRateIndex)	Set UART0 baud rate as 1200 to 230400
void SelectUart1Baudrate(BYTE BitRateIndex)	Set UART1 baud rate as 1200 to 230400
void DRV_IntToStr(U16 u16Val, U8 u8Base, char *pBuf, U8 u8Length)	Sub program will change value to word
void DRV_Printf(char *pFmt, U16 u16Val)	Type transfer: 0xAAF for 1234
void DRV_PutChar(char u8Char)	Data output from UART
void DRV_PutStr(char *pFmt)	String output from UART
void UART0_interrupt (void) interrupt 4	UART0 interrupt receiving sub program

5.8 KEY PAD Driver Program <API_Dkey.c>

Function	Description
void API_DigitalKey0Routine(void)	Detecting Down key if work
void API_DigitalKey1Routine(void)	Detecting Up key if work
void API_DigitalKey2Routine(void)	Detecting Enter key if work
void API_DigitalKey10mS(void)	Key delay and bouncing
void API_DigitalKeyInitial(void)	Initialize the GPIO to input and can promote the resistance
void Check_Key(void)	Sub program detect three key (Down, Up, Enter Keys)
void Key_Process(void)	Sub program for key function

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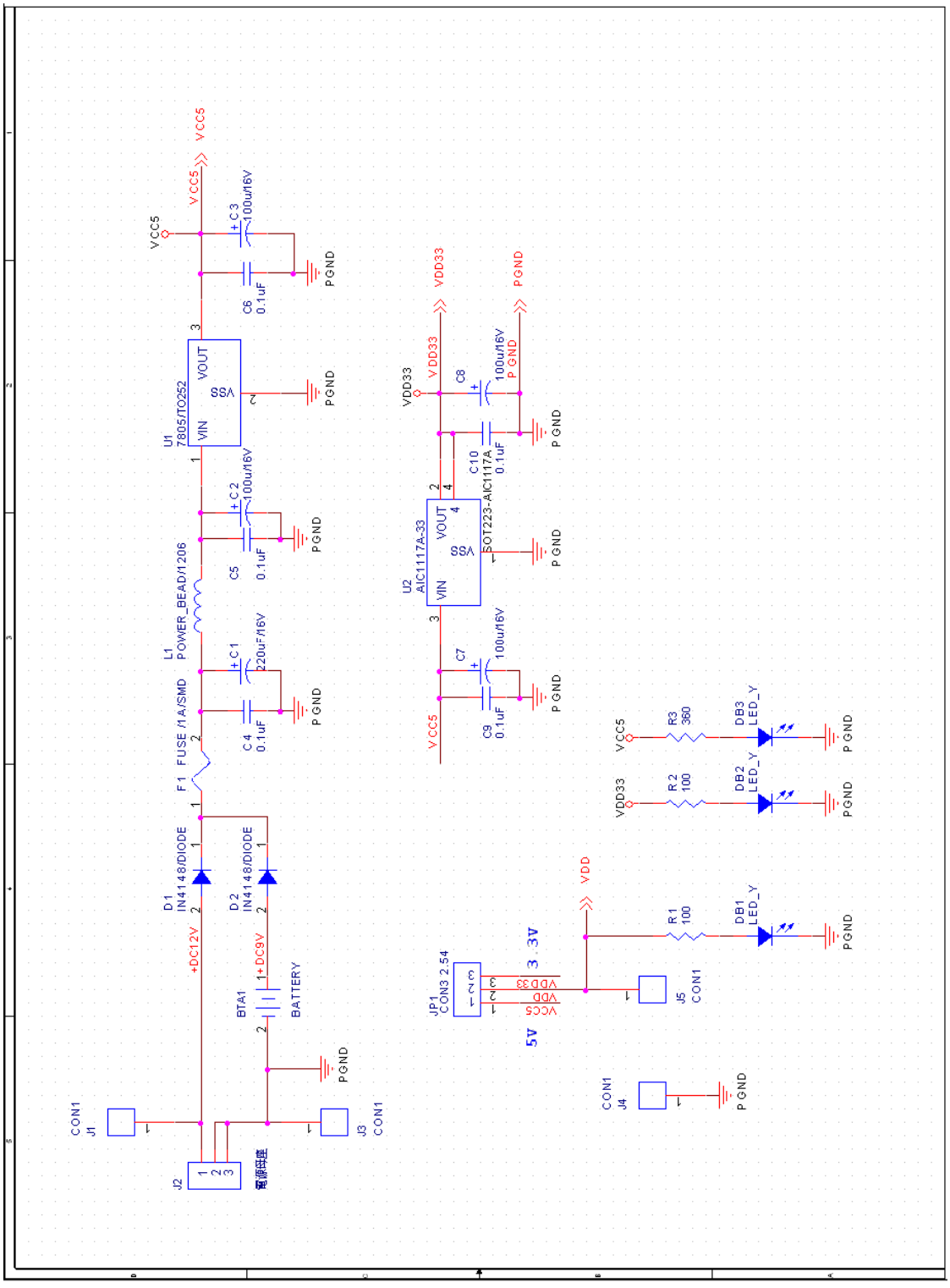
Chapter 6 Appendix

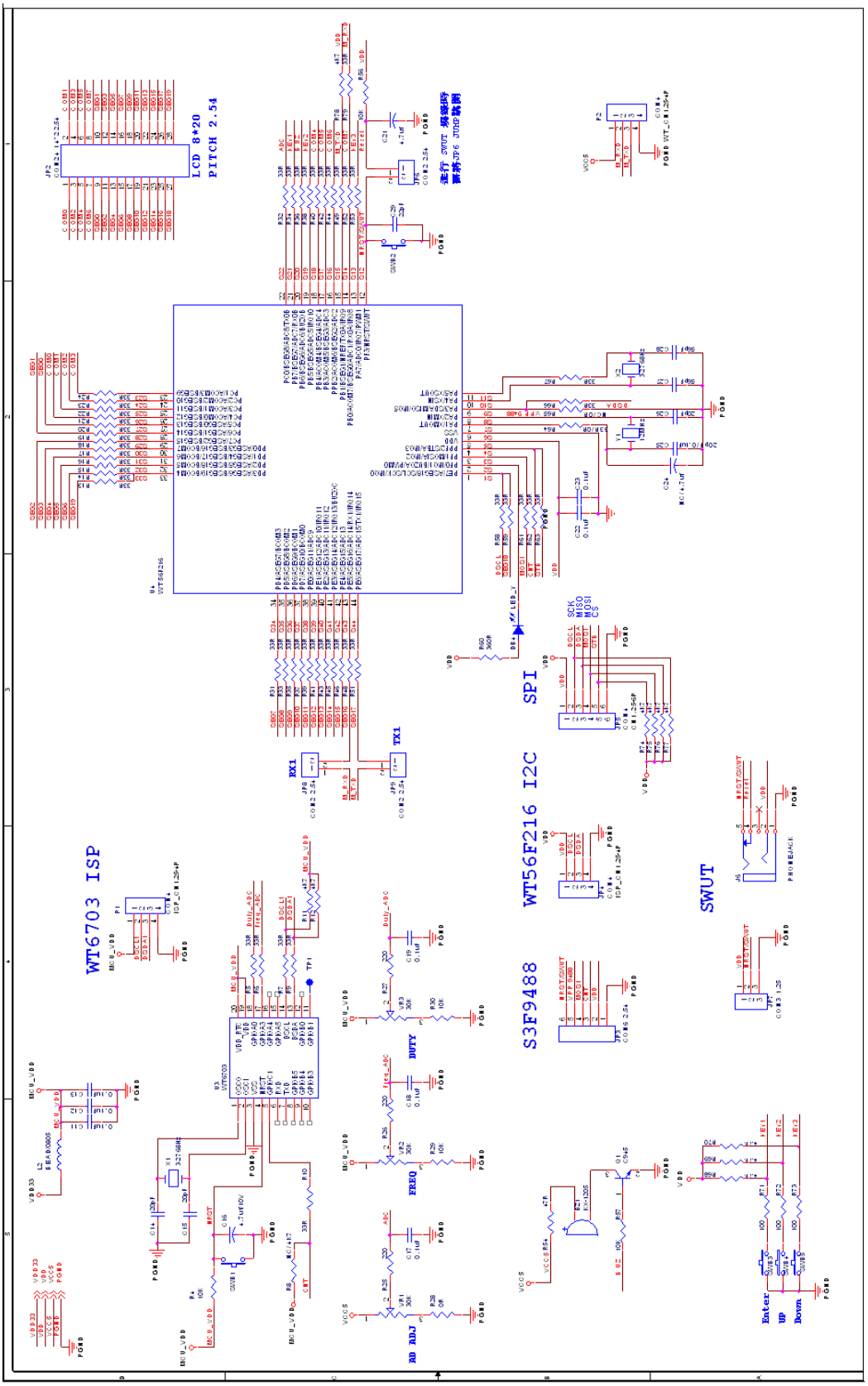
6.1 Circuit

- EVB Circuit (WT56F216-RG440WT PKG type)

1. Power



2. WT56F216 (MCU)



6.2 BOM

- EVB BOM (WT56F216-RG440WT PKG type)

WT56F216 BOM				
Item	Quantity	Reference	Part	PCB Footprint
1	3	C14,C15,C25,C26	20pF	SC0603
2	1	C29	22pF	SC0603
3	2	C27,C28	56pF	SC0603
4	13	C4,C5,C6,C9,C10,C11,C12,C13,C17,C18,C19,C22,C2	0.1uF	SC0603
5	1	C21	4.7uf	SC0805
6	1	C16	4.7uf/10V	SCE-A
7	4	C2,C3,C7,C8	100u/16V	DCE030
8	1	C1	220uF/16V	DCE040
9	1	R28	0R	SR0603
10	1	R54	47R	SR0603
11	47	R5,R6,R7,R9,R10,R13,R14,R15,R16,R17,R18,R19 R20,R21,R22,R23,R24,R31,R32,R33,R34,R35,R36 R37,R38,R39,R40,R41,R42,R43,R44,R45,R46,R48 R49,R51,R52,R53,R58,R59,R61,R62,R63,R64,R66 R67,R79	33R	SR0603
12	5	R1,R2,R71,R72,R73	100	SR0603
13	3	R25,R26,R27	220	SR0603
14	2	R3,R60	360	SR0603
15	7	R11,R12,R68,R69,R70,R74,R75,R76,R77,R78	4.7K	SR0603
16	5	R4,R29,R30,R56,R57	10K	SR0603
17	4	DB1,DB2,DB3,DB4	LED_Y	SLED0805
18	2	D2,D1	IN4148/DIODE	DIODESMD
19	1	F1	FUSE /1A/SMD	SR1206
20	1	JP1	CON3 2.54	CM-3-2.54
21	1	JP2	CON24 14*2 2.54	HEADER2X14-2.54
22	1	JP3	CON6 2.54	CM-6-2.54
23	2	JP4,P1	CON4	ISP_CN1.25-4P
24	1	JP5	CON4	CN1.25-6P
25	3	JP6,JP8,JP9	CON2 2.54	CM-2-2.54
26	1	JP7	CON3 1.25	WT_CN1.25-3P
27	4	J1,J3,J4,J5	CON1	H2 X P2.5
28	1	J2	電源母座	JACK-3P
29	1	J6	PHONEJACK	PHONE_JACK
30	1	L1	POWER_BEAD/1206	SL1206
31	1	L2	BEAD/0805	SL0805
32	1	P2	CON4	WT_CN1.25-4P
33	1	Q1	C945	SOT23-C945
34	5	SWB1,SWB2,SWB3,SWB4,SWB5	POWER ON	KEY
35	1	U1	7805/TO252	TO252
36	1	U2	AIC1117A-33	SOT223-AIC1117A
37	1	U3	WT6703	SSOP20-WT6703
38	1	U4	WT56F216	LQFP44P-WT61P802
39	3	VR1,VR2,VR3	30K	VR3-DIP
40	2	X1,X2	32768Hz	XTAL-CRY32
41	1	Y1	12MHz	XDIP-4MHZ

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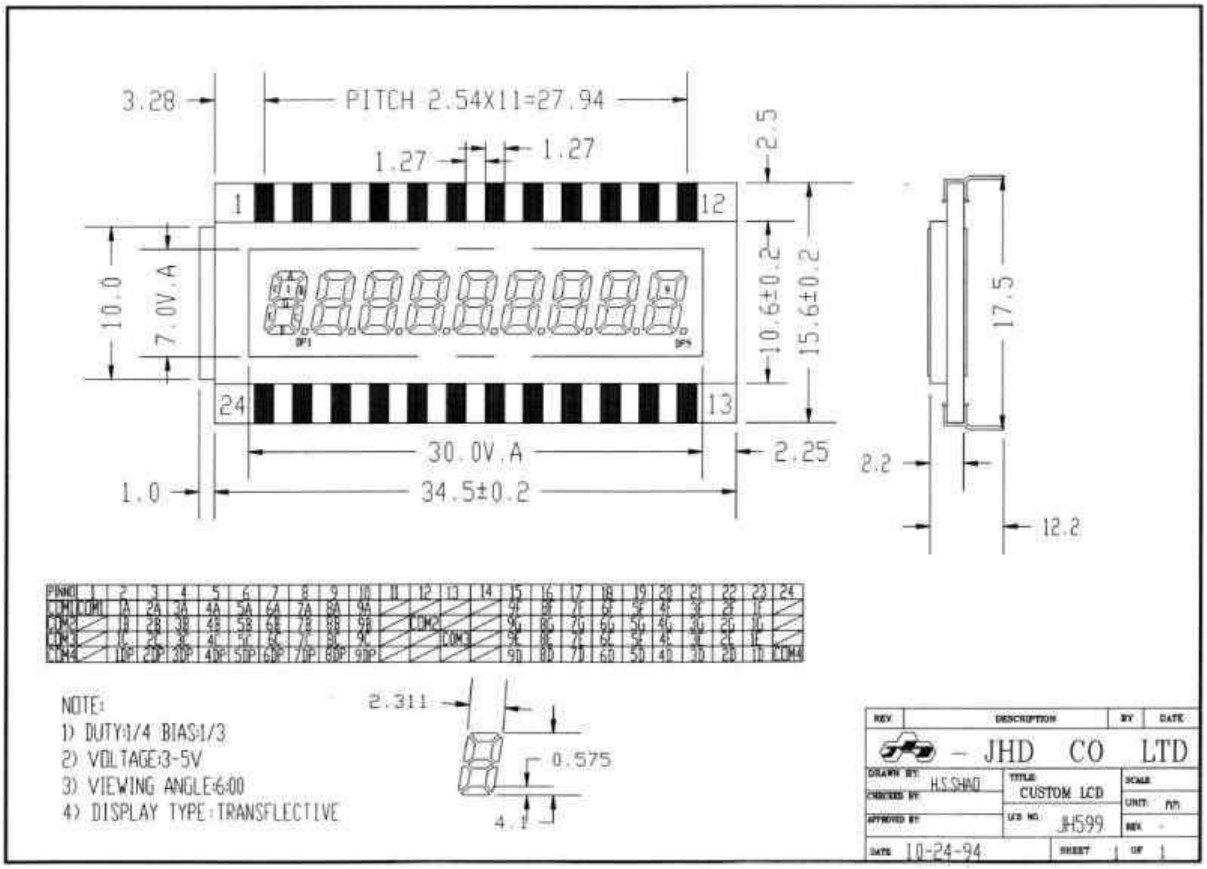
6.3 LCD Spec (4*18)



6.4 Ordering Information

1. WT56F216 Development Kit

Kit	Product Name	Number
WT56F216 Development Kit	WLINK-SWUT x 1	WA000
	Development and Demo board (WT56F216 EVB With LCD Module) x 1	WB000
	SWUT Programming Wire x 1	

2. WT56F216 Starter Kit

Kit	Product Name	Number
WT56F216 Starter Kit	WLINK-SWUT x 1	WA000
	Development and Demo Board (WT56F216 Starter Kit Board) x 1	WB005
	SWUT Programming Wire x 1	

3. WT56F216 Evaluation Board Development and Demo Board

Kit	Product Name	Number
WT56F216 Development and Demo Board	Development and Demo Board (WT56F216 EVB)	WB000
	EVB operation manual	DOC12

4. WT56F216 Starter Kit Board (simple version)

Kit	Product Name	Number
WT56F216 simple version	Simple version (WT56F216 Starter Kit Board)	WB005
	EVB Operation Manual	DOC23

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5. Single Wire Programming Board (WLINK-SWUT)

Kit	Product Name	Number
Single Wire Programmer 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