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# CW6685X

## Bluetooth 3.0+EDR Audio Player SOC Product Specification

[CW6685X-PS-EN]

Versions: 1.3.0

Release Date: 2015-5-20

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# 1 Product Overview

## 1.1 Outline

CW6685X is an MCS-51™ Compatible high performance mixed signal microcontroller. It integrates advanced digital and analog peripherals to suit for Bluetooth audio playback and Bluetooth Communicate applications.

## 1.2 Features

- CPU Compatible with MCS-51™ instruction set;
- Compliant to Bluetooth 3.0 + EDR, backward-compatible with BT1.2, 2.0 and 2.1.
- Support HFP v1.6, HSP v1.2, A2DP 1.3, AVCTP 1.4, AVDTP 1.3 and AVRCP 1.5;
- Support SCMS-T content protection method;
- Class 2 power level, RF Performance: Tx:0dBm, Rx: -80dBm;
- Support simple pairing and auto reconnection function;
- Support MP3/SBC decoder;
- Support two pairs of AUX;
- Six Channels 10-bit SARADC;
- CW6685E/CW6685F support 16bit Stereo DAC with >90dB SNR, embedded with two class A/B headphone amplifier
- CW6685C/CW6685D support 16bit Mono DAC with >90dB SNR, embedded with two class A/B headphone amplifier
- 16bit Mono ADC with >90dB DR
- Support Audio record function to MIC ADPCM;
- Support Audio playback from SD/USB
- Keypad tone mixer;
- Two multi-function 8-bit timers, support Capture and PWM mode;
- Two multi-function 16-bit timers, support Capture and PWM mode;
- Watchdog Timer with on-chip RC oscillator;
- Support full-duplex IIS, UART, SPI, SD interface;
- Support IIC interface for FM function;
- 2 channels 16 levels Low Voltage Detector (0.2v/step);
- Power on Reset
- Support Full speed USB 2.0 PHY;
- Full speed USB 2.0 HOST/DEVICE controller;
- IR controller;
- Independent powered Real-Time Clock supporting 32.768kHz crystal
- Internal 26M crystal oscillator support ;
- Internal LDO regulator: 4.2V to 3.3V
- Built-in buck converter, DC-DC 4.2V to 1.9V

## 1.3 System Diagram

Figure 1-1 shows CW6685X System Diagram.

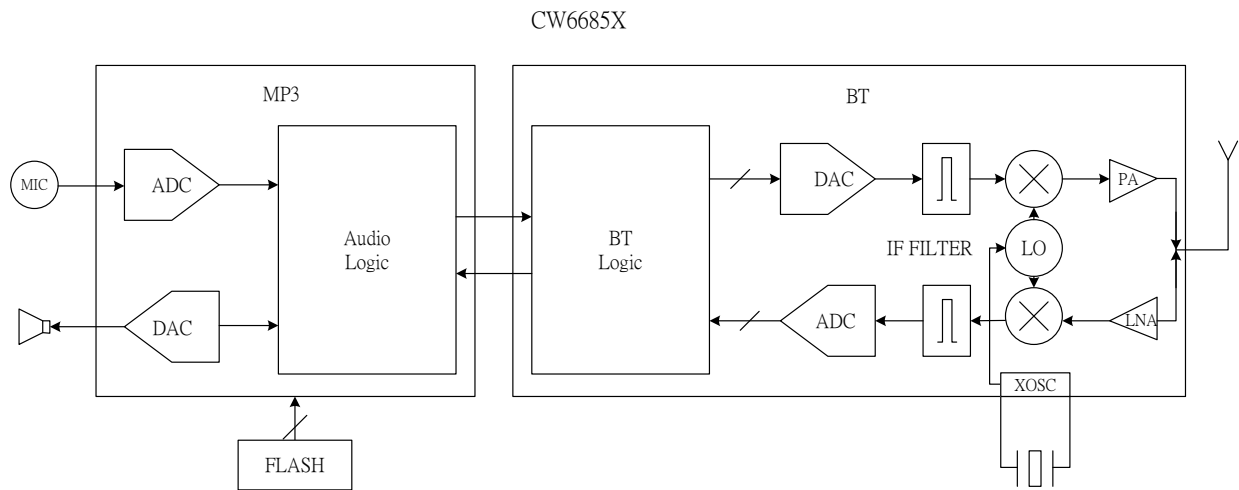


Figure 1-1 CW6685X System Diagram

## 2 Pin Definitions

[Table 2-1](#) shows the compares package type and part number of CW6685X.

Table 2-1 compares package type and part number of CW6685X

Project ID	Part Number	Package
CW6685X	CW6685E	LQFP48
CW6685X	CW6685C	LQFP48
CW6685X	CW6685D	LQFP48
CW6685X	CW6685F	LQFP48

### 2.1 CW6685E

#### 2.1.1 Package

LQFP48

#### 2.1.2 Pin Assignment

[Figure 2-1](#) shows the pin assignments of LQFP 48 package.

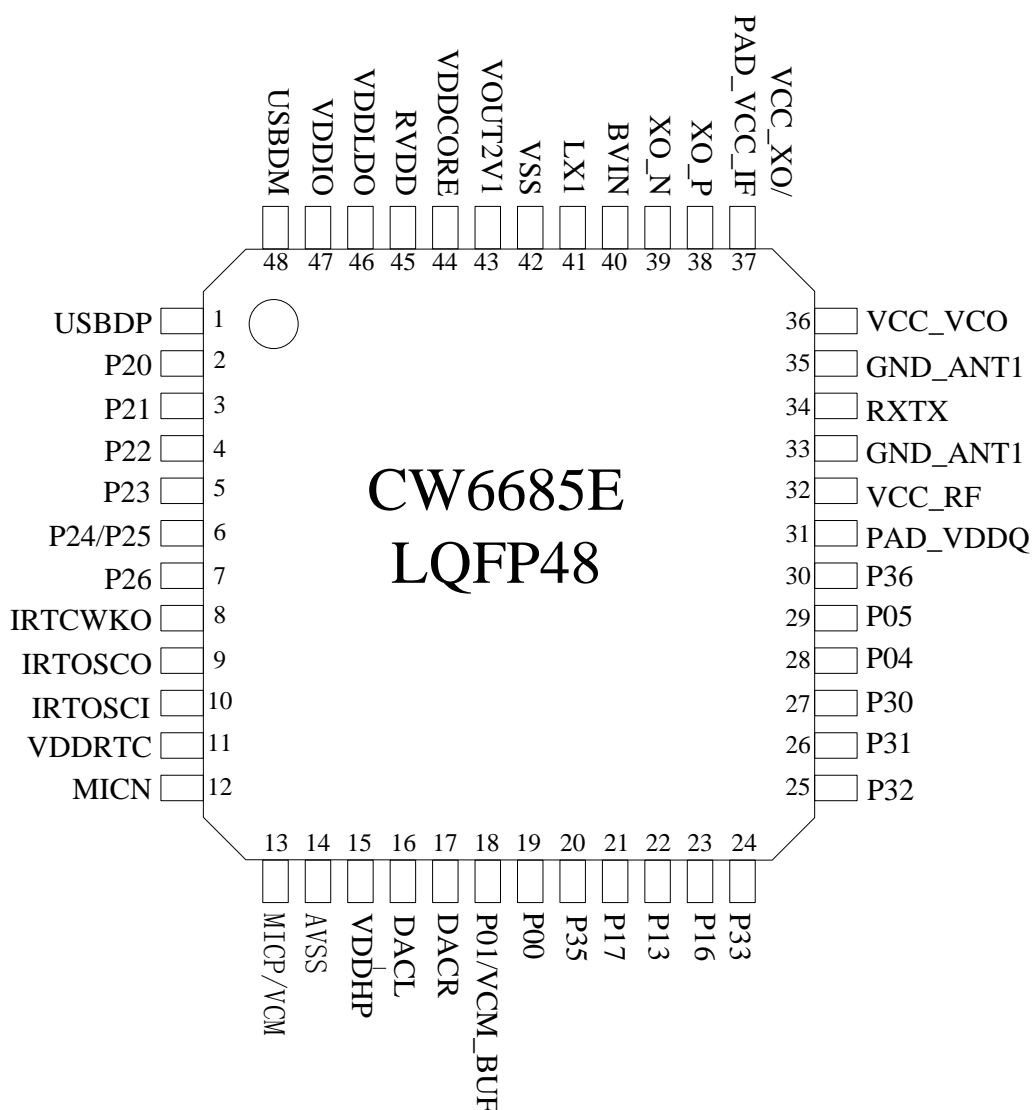


Figure 2-1 Pin assignment for LQFP48

### 2.1.3 Pin Descriptions

Table 2-2 shows the pin descriptions of LQFP48 package.

Table 2-2 LQFP48 pin description

Pin No.LQFP48	Name	Type	Function
1	USBDP	I/O	USB Positive Input/output
2	P20	I/O	GPIO AUXL2 SDCMD EMIDAT0 LCD_D0
3	P21	I/O	GPIO



Pin No.LQFP48	Name	Type	Function
			AUXR2 ADC1 SDCLK EMIDAT1 LCD_D1
4	P22	I/O	GPIO ADC3 EMIDAT2 IISDO1 LCD_D2
5	P23	I/O	GPIO EMIDAT3 IISDI1 LCD_D3
6	P24/P25	I/O	P24 GPIO EMIDAT4 P25 GPIO EMIDAT5 SPI0DIN0/DOU0 IISBCLK1
7	P26	I/O	GPIO BT UART1RX TMR2CKI IISWS0
8	IRTCWKO	I/O	RTC wakeup
9	IRTOSCO	A/O	RTC XOSC output
10	IRTOSCI	A/O	RTC XOSC input
11	VDDRTC	PWR	RTC power input
12	MICN	AIO	MIC Negative input
13	MICP/VCM	AIO	MIC Positive input DAC VCM output
14	AVSS	GND	Analog GND
15	VDDHP	PWR	Headphone power
16	DACL	AI/O	DAC left output GPIO input
17	DACR	AI/O	DAC right output GPIO input
18	P01/VCM_BUF	I/O	GPIO AUXR0 UARTTX1 PORT INT/WKUP0 SDDAT2

Pin No.LQFP48	Name	Type	Function
			DAC VCM buffer
19	P00	I/O	GPIO AUXL0 UARTRX1 SDDAT1 SPI0DIN2
20	P35	I/O	GPIO MUTE
21	P17	I/O	GPIO BT UART1RX TMR2CKI IISWS0
22	P13	I/O	GPIO ADC5 IISBCLK0
23	P16	I/O	GPIO ir_input BT UART1TX UARTTX0 TMR2CAP/TMR2PWM IISREF
24	P33	I/O	GPIO ADC0/LVD dect ir_input 32K/xosc12m sys_clk_output TRM1CAP
25	P32	I/O	GPIO SDDAT0 SPI0DOUT3/DIN3
26	P31	I/O	GPIO SDCMD SPI0DIN3
27	P30	I/O	GPIO ADC4 SDCLK SPI0CLK3
28	P04	I/O	GPIO SPI1DOUT/DIN1
29	P05	I/O	GPIO SPI1CLK
30	P36	I/O	GPIO

Pin No.LQFP48	Name	Type	Function
31	PAD_VDDQ	PWR	Power VDDQ
32	VCC_RF	PWR	RF Power VCC
33	GND_ANT1	GND	FR GND
34	RXTX	AI/	RF Rx and Tx pin
35	GND_ANT1	GND	RF GND
36	VCC_VCO	PWR	Power VCC
37	VCC_XO/PAD_VCC_IF	PWR	Power VCC
38	XO_P	A/O	BT 26MHz XOSC Positive Pin
39	XO_N	A/O	BT 26MHz XOSC Negative Pin
40	BVIN	PWR	PMU Power input Pin 4.2V(typ)
41	LX1	A/O	Switch Node Connection to Inductor
42	VSS	GND	GND
43	VOOUT2V1	PWR	BUCK DC/DC 2.1V power
44	VDDCORE	PWR	Core power VDD 1.8V
45	RVDD	PWR	RF power VDD
46	VDDLDO	PWR	LDO power input 4.2V(typ)
47	VDDIO	PWR	Power output VDDIO 3.3V
48	USBDM	I/O	USB Negative Input/output

## 2.2 CW6685C

### 2.2.1 Package

LQFP48

### 2.2.2 Pin Assignment

*Figure 2-2* shows the pin assignments of LQFP48 package

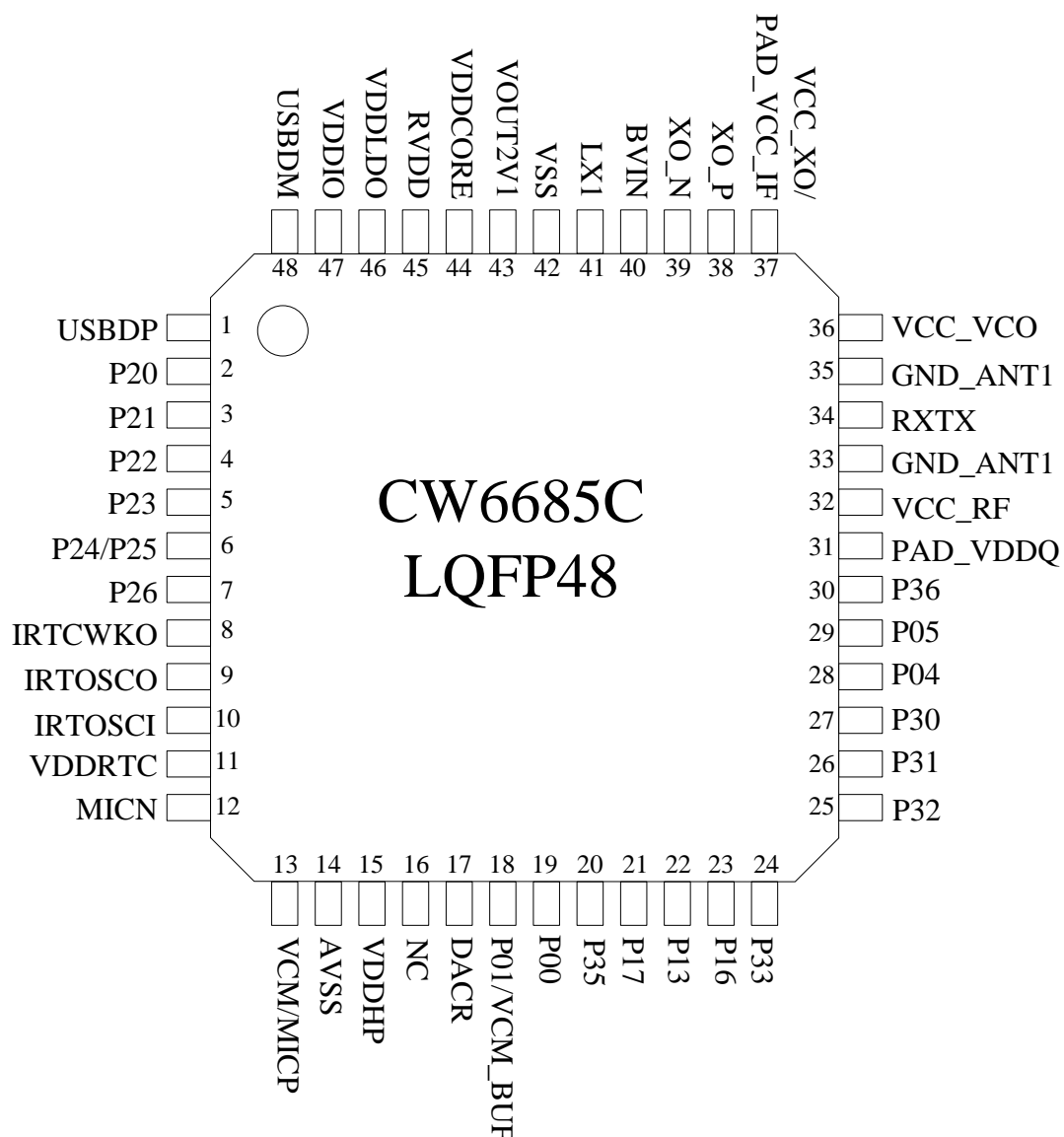


Figure 2-2 Pin assignment for LQFP48

### 2.2.3 Pin Descriptions

Table 2-3 shows the pin descriptions of LQFP48 package.

Table 2-3 LQFP48 pin description

Pin No.LQFP48	Name	Type	Function
1	USBDP	I/O	USB Positive Input/output
2	P20	I/O	GPIO AUXL2 SDCMD EMIDAT0 LCD_D0
3	P21	I/O	GPIO

Pin No.LQFP48	Name	Type	Function
			AUXR2 ADC1 SDCLK EMIDAT1 LCD_D1
4	P22	I/O	GPIO ADC3 EMIDAT2 IISDO1 LCD_D2
5	P23	I/O	GPIO EMIDAT3 IISDI1 LCD_D3
6	P24/P25	I/O	P24 GPIO EMIDAT4 P25 GPIO EMIDAT5 SPI0DIN0/DOUT0 IISBCLK1
7	P26	I/O	GPIO BT UART1RX TMR2CKI IISWS0
8	IRTCWKO	I/O	RTC wakeup
9	IRTOSCO	A/O	RTC XOSC output
10	IRTOSCI	A/O	RTC XOSC input
11	VDDRTC	PWR	RTC power input
12	MICN	AIO	MIC Negative input
13	MICP/VCM	AIO	MIC Positive input DAC VCM output
14	AVSS	GND	Analog GND
15	VDDHP	PWR	Headphone power
17	DACR	AI/O	DAC right output GPIO input
18	P01/VCM_BUF	I/O	GPIO AUXR0 UARTTX1 PORT INT/WKUP0 SDDAT2 DAC VCM buffer
19	P00	I/O	GPIO

Pin No.LQFP48	Name	Type	Function
			AUXL0 UARTRX1 SDDAT1 SPI0DIN2
20	P35	I/O	GPIO MUTE
21	P17	I/O	GPIO BT UART1RX TMR2CKI IISWS0
22	P13	I/O	GPIO ADC5 IISBCLK0
23	P16	I/O	GPIO ir_input BT UART1TX UARTTX0 TMR2CAP/TMR2PWM IISREF
24	P33	I/O	GPIO ADC0/LVD dect ir_input 32K/xosc12m sys_clk_output TRM1CAP
25	P32	I/O	GPIO SDDAT0 SPI0DOUT3/DIN3
26	P31	I/O	GPIO SDCMD SPI0DIN3
27	P30	I/O	GPIO ADC4 SDCLK SPI0CLK3
28	P04	I/O	GPIO SPI1DOUT/DIN1
29	P05	I/O	GPIO SPI1CLK
30	P36	I/O	GPIO
31	PAD_VDDQ	PWR	Power VDDQ
32	VCC_RF	PWR	RF Power VCC

Pin No.LQFP48	Name	Type	Function
33	GND_ANT1	GND	FR GND
34	RXTX	AI/	RF Rx and Tx pin
35	GND_ANT1	GND	RF GND
36	VCC_VCO	PWR	Power VCC
37	VCC_XO/PAD_VCC_IF	PWR	Power VCC
38	XO_P	A/O	BT 26MHz XOSC Positive Pin
39	XO_N	A/O	BT 26MHz XOSC Negative Pin
40	BVIN	PWR	PMU Power input Pin 4.2V(typ)
41	LX1	A/O	Switch Node Connection to Inductor
42	VSS	GND	GND
43	VOUT2V1	PWR	BUCK DC/DC 2.1V power
44	VDDCORE	PWR	Core power VDD 1.8V
45	RVDD	PWR	RF power VDD
46	VDDLDO	PWR	LDO power input 4.2V(typ)
47	VDDIO	PWR	Power output VDDIO 3.3V
48	USBDM	I/O	USB Negative Input/output

## 2.3 CW6685D

### 2.3.1 Package

LQFP48

### 2.3.2 Pin Assignment

*Figure 2-3* shows the pin assignments of LQFP 48 package.

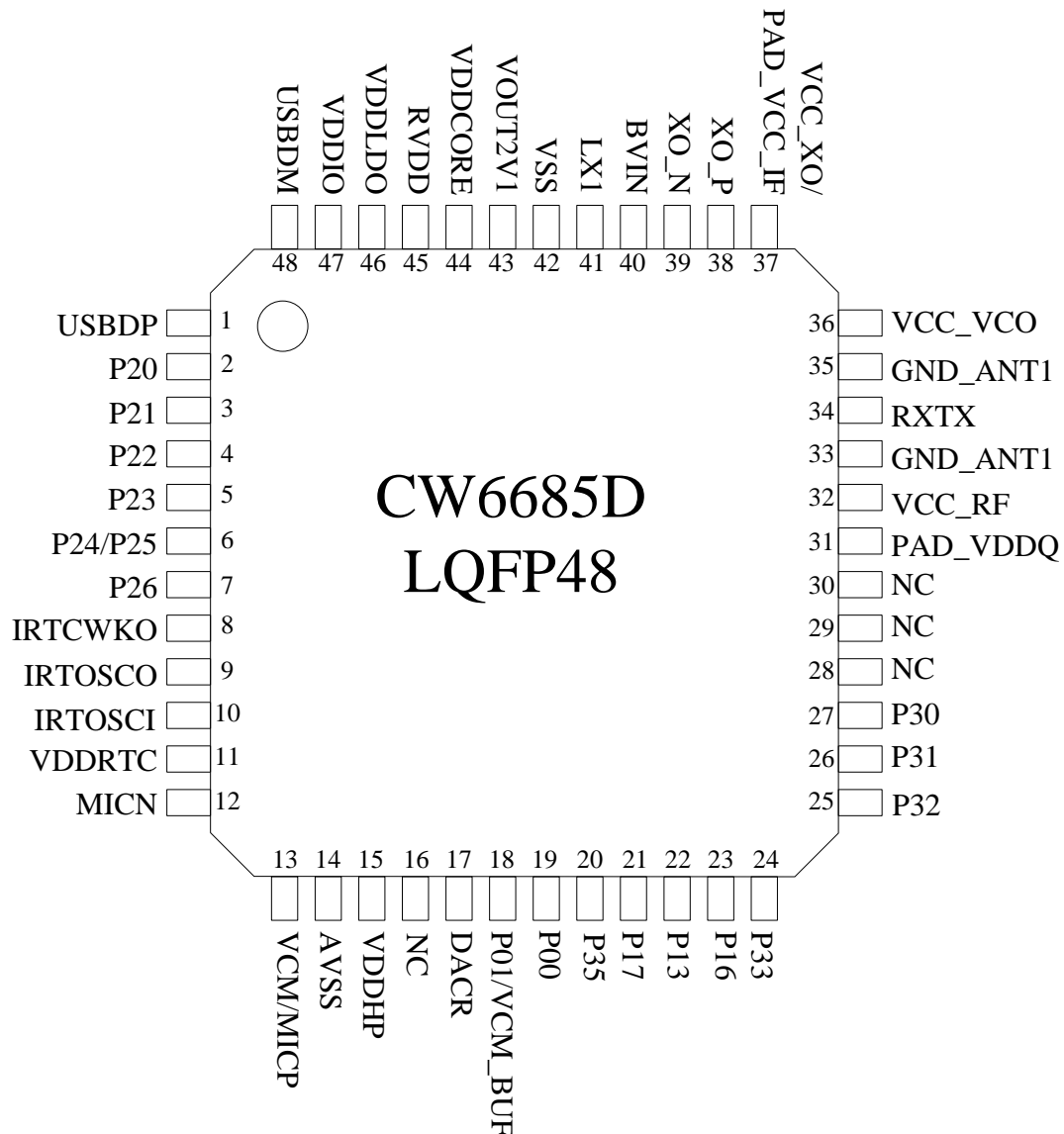


Figure 2-3 Pin assignment for LQFP48

### 2.3.3 Pin Descriptions

Table 2-4 shows the pin descriptions of LQFP48 package.

Table 2-4 LQFP48 pin description

Pin No.LQFP48	Name	Type	Function
1	USBDP	I/O	USB Positive Input/output
2	P20	I/O	GPIO AUXL2 SDCMD EMIDAT0 LCD_D0
3	P21	I/O	GPIO



Pin No.LQFP48	Name	Type	Function
			AUXR2 ADC1 SDCLK EMIDAT1 LCD_D1
4	P22	I/O	GPIO ADC3 EMIDAT2 IISDO1 LCD_D2
5	P23	I/O	GPIO EMIDAT3 IISDI1 LCD_D3
6	P24/P25	I/O	P24 GPIO EMIDAT4 P25 GPIO EMIDAT5 SPI0DIN0/DOUT0 IISBCLK1
7	P26	I/O	GPIO BT UART1RX TMR2CKI IISWS0
8	IRTCWKO	I/O	RTC wakeup
9	IRTOSCO	A/O	RTC XOSC output
10	IRTOSCI	A/O	RTC XOSC input
11	VDDRTC	PWR	RTC power input
12	MICN	AIO	MIC Negative input
13	MICP/VCM	AIO	MIC Positive input DAC VCM output
14	AVSS	GND	Analog GND
15	VDDHP	PWR	Headphone power
17	DACR	AI/O	DAC right output GPIO input
18	P01/VCM_BUF	I/O	GPIO AUXR0 UARTTX1 PORT INT/WKUP0 SDDAT2 DAC VCM buffer
19	P00	I/O	GPIO

Pin No.LQFP48	Name	Type	Function
			AUXL0 UARTRX1 SDDAT1 SPI0DIN2
20	P35	I/O	GPIO MUTE
21	P17	I/O	GPIO BT UART1RX TMR2CKI IISWS0
22	P13	I/O	GPIO ADC5 IISBCLK0
23	P16	I/O	GPIO ir_input BT UART1TX UARTTX0 TMR2CAP/TMR2PWM IISREF
24	P33	I/O	GPIO ADC0/LVD dect ir_input 32K/xosc12m sys_clk_output TRM1CAP
25	P32	I/O	GPIO SDDAT0 SPI0DOUT3/DIN3
26	P31	I/O	GPIO SDCMD SPI0DIN3
27	P30	I/O	GPIO ADC4 SDCLK SPI0CLK3
31	PAD_VDDQ	PWR	Power VDDQ
32	VCC_RF	PWR	RF Power VCC
33	GND_ANT1	GND	FR GND
34	RXTX	AI/	RF Rx and Tx pin
35	GND_ANT1	GND	RF GND
36	VCC_VCO	PWR	Power VCC
37	VCC_XO/PAD_VCC_IF	PWR	Power VCC

Pin No.LQFP48	Name	Type	Function
38	XO_P	A/O	BT 26MHz XOSC Positive Pin
39	XO_N	A/O	BT 26MHz XOSC Negative Pin
40	BVIN	PWR	PMU Power input Pin 4.2V(typ)
41	LX1	A/O	Switch Node Connection to Inductor
42	VSS	GND	GND
43	VOUT2V1	PWR	BUCK DC/DC 2.1V power
44	VDDCORE	PWR	Core power VDD 1.8V
45	RVDD	PWR	RF power VDD
46	VDDLDO	PWR	LDO power input 4.2V(typ)
47	VDDIO	PWR	Power output VDDIO 3.3V
48	USBDM	I/O	USB Negative Input/output

## 2.4 CW6685F

### 2.4.1 Package

LQFP48

### 2.4.2 Pin Assignment

*Figure 2-4* shows the pin assignments of LQFP 48 package.

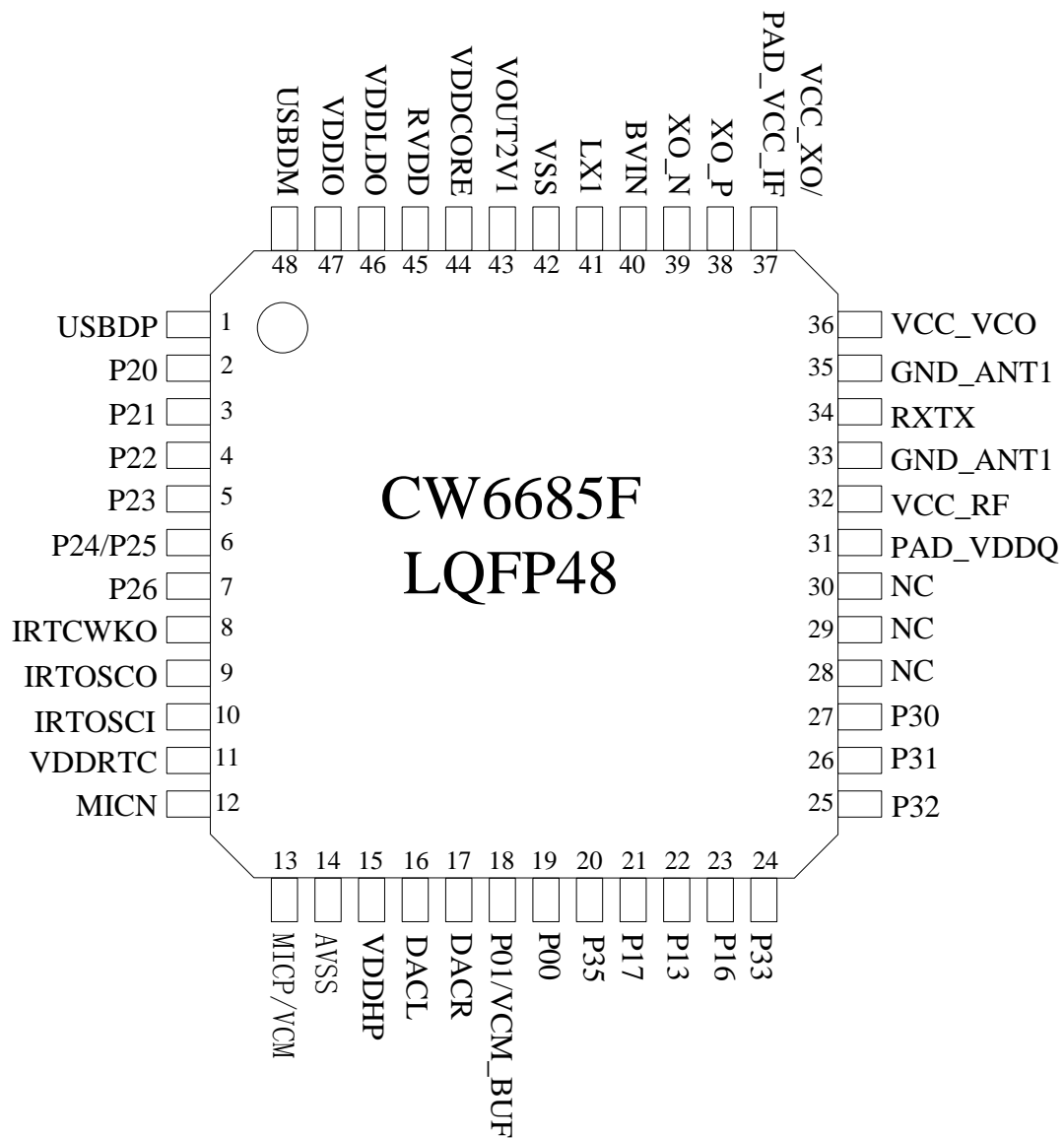


Figure 2-4 Pin assignment for LQFP48

### 2.4.3 Pin Descriptions

Table 2-5 shows the pin descriptions of LQFP48 package.

Table 2-5 LQFP48 pin description

Pin No.LQFP48	Name	Type	Function
1	USBDP	I/O	USB Positive Input/output
2	P20	I/O	GPIO AUXL2 SDCMD EMIDAT0 LCD_D0

Pin No.LQFP48	Name	Type	Function
3	P21	I/O	GPIO AUXR2 ADC1 SDCLK EMIDAT1 LCD_D1
4	P22	I/O	GPIO ADC3 EMIDAT2 IISDO1 LCD_D2
5	P23	I/O	GPIO EMIDAT3 IISDI1 LCD_D3
6	P24/P25	I/O	P24 GPIO EMIDAT4 P25 GPIO EMIDAT5 SPI0DIN0/DOUT0 IISBCLK1
7	P26	I/O	GPIO BT UART1RX TMR2CKI IISWS0
8	IRTCWKO	I/O	RTC wakeup
9	IRTOSCO	A/O	RTC XOSC output
10	IRTOSCI	A/O	RTC XOSC input
11	VDDRTC	PWR	RTC power input
12	MICN	AIO	MIC Negative input
13	MICP/VCM	AIO	MIC Positive input DAC VCM output
14	AVSS	GND	Analog GND
15	VDDHP	PWR	Headphone power
16	DACL	AI/O	DAC left output GPIO input
17	DACR	AI/O	DAC right output GPIO input
18	P01/VCM_BUF	I/O	GPIO AUXR0 UARTTX1 PORT INT/WKUP0

Pin No.LQFP48	Name	Type	Function
			SDDAT2 DAC VCM buffer
19	P00	I/O	GPIO AUXL0 UARTRX1 SDDAT1 SPI0DIN2
20	P35	I/O	GPIO MUTE
21	P17	I/O	GPIO BT UART1RX TMR2CKI IISWS0
22	P13	I/O	GPIO ADC5 IISBCLK0
23	P16	I/O	GPIO ir_input BT UART1TX UARTTX0 TMR2CAP/TMR2PWM IISREF
24	P33	I/O	GPIO ADC0/LVD dect ir_input 32K/xosc12m sys_clk_output TRM1CAP
25	P32	I/O	GPIO SDDAT0 SPI0DOUT3/DIN3
26	P31	I/O	GPIO SDCMD SPI0DIN3
27	P30	I/O	GPIO ADC4 SDCLK SPI0CLK3
31	PAD_VDDQ	PWR	Power VDDQ
32	VCC_RF	PWR	RF Power VCC
33	GND_ANT1	GND	FR GND
34	RXTX	AI/	RF Rx and Tx pin

Pin No.LQFP48	Name	Type	Function
35	GND_ANT1	GND	RF GND
36	VCC_VCO	PWR	Power VCC
37	VCC_XO/PAD_VCC_IF	PWR	Power VCC
38	XO_P	A/O	BT 26MHz XOSC Positive Pin
39	XO_N	A/O	BT 26MHz XOSC Negative Pin
40	BVIN	PWR	PMU Power input Pin 4.2V(typ)
41	LX1	A/O	Switch Node Connection to Inductor
42	VSS	GND	GND
43	VOUT2V1	PWR	BUCK DC/DC 2.1V power
44	VDDCORE	PWR	Core power VDD 1.8V
45	RVDD	PWR	RF power VDD
46	VDDLDO	PWR	LDO power input 4.2V(typ)
47	VDDIO	PWR	Power output VDDIO 3.3V
48	USBDM	I/O	USB Negative Input/output

## 3 Characteristics

### 3.1 PMU Parameters

Table 3-1 PMU Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
BVIN	buck input voltage	2.8	4.2	4.8	V	
VDDLDO	VDDLDO input voltage	2.8	4.2	4.8	V	
VOUT2v1	Buck output voltage		1.9		V	
VDDCORE	1.8V output voltage	-	1.8	-	V	
VDDRTC	1.8V input voltage	2.2	4.2	4.8	V	
VDDHP	3.0V output voltage		3.0		V	
VCM	1.5V output voltage		1.5		V	
RVDD	1.8V output voltage	-	1.8	-	V	
VDDIO	3.3V output voltage	-	3.3	-	V	

### 3.2 CORE PLL Parameters

Table 3-2 PLL Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
F <sub>I1</sub>	Frequency input	-	32.768	-	KHz	Low frequency OSC
F <sub>I2</sub>	Frequency input	1	12	15	MHz	High frequency OSC
F <sub>OUT1</sub>	Frequency output	-	48	-	MHz	
T <sub>LOCK1</sub>	PLL locked time	-	2	-	ms	Use low frequency OSC as input reference
T <sub>LOCK2</sub>	PLL locked time	-	0.1	-	ms	Use high frequency OSC as input reference

### 3.3 General purpose I/O Parameters

Table 3-3 I/O Parameters

Symbol	Description	Min	Typ	Max	Units	Conditions
V <sub>IL</sub>	Low-Level input voltage	-	-	30% * VDDIO	V	VDDIO = 3.3V
V <sub>IH</sub>	High-level input voltage	70% * VDDIO	-	-	V	VDDIO = 3.3V
R <sub>PUP0</sub>	Internal pull-up resister 0	2.64	3.3	3.96	KΩ	For PORT2
R <sub>PDN0</sub>	Internal pull-down resister 0	2.64	3.3	3.96	KΩ	For PORT2
R <sub>PUP1</sub>	Internal pull-up resister 1	8	10	12-	KΩ	For PORT0/1/3
R <sub>PDN1</sub>	Internal pull-down resister 1	8	10	12	KΩ	For PORT0/1/3
I <sub>LEVEL1</sub>	Level1 current driving	8	-	-	mA	For PORT1
I <sub>LEVEL2</sub>	Level2 current driving	24	-	-	mA	For Port1.1



### 3.4 Audio ADDA Parameters

Table 3-4 Audio DAC Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
DAC SNR&DR		-	90	-	dB	48PIN
DAC THD+N		-	-75	-	dB	10Kohm loading
PWR <sub>AB</sub>	ClassAB AMP power output	-	-	16	mW	32ohm loading
V <sub>PP</sub>	Maximum output voltage	-	-	2.6	V	10Kohm loading
ADC SNR/DR		-	90	-	dB	Voice Band
ADC THD+N		-	84	-	dB	Voice Band

### 3.5 USB PHY Parameters

Table 3-5 USB PHY Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
RDM <sub>PUP</sub>	DM pull-up resistor	-	120	-	KΩ	
RDP <sub>PUP</sub>	DP pull-up resistor	-	1.5	-	KΩ	
RDM <sub>PDN</sub>	DM pull-up resistor	-	15	-	KΩ	
RDP <sub>PDN</sub>	DP pull-up resistor	-	15	-	KΩ	

### 3.6 Bluetooth Parameters

Table 3-6 Bluetooth parameters

Items	Description
Bluetooth standard	V3.0+EDR
Temperature	-20℃ ~ +70 ℃
Storage Temperature	-40℃ ~ +150℃
Frequency Range	2402MHz ~ 2480MHz(total 79 channels)
Channel Frequency	2402+1(K-1)MHz, K=1, 2, 3 .....79
Maximum RF Transmit Power	+4dBm
Receive Sensitivity	-80dBm

Table 3-7 Operational Mode parameters

Operational Mode	Minimum	Typical	Maximum
Page scan, time internal 1.28s	-	1.0mA	-
Inquiry	-	38.9 mA	-
Page scan and Inquiry	-	1.6mA	-
ACL no traffic	-	15.2mA	-
ACL with file transfer	-	30.3mA	-
SCO HV3	-	38.4 mA	-
Sleep	-	25.0uA	-

# 4 Package Outline Dimensions

## 4.1 LQFP48

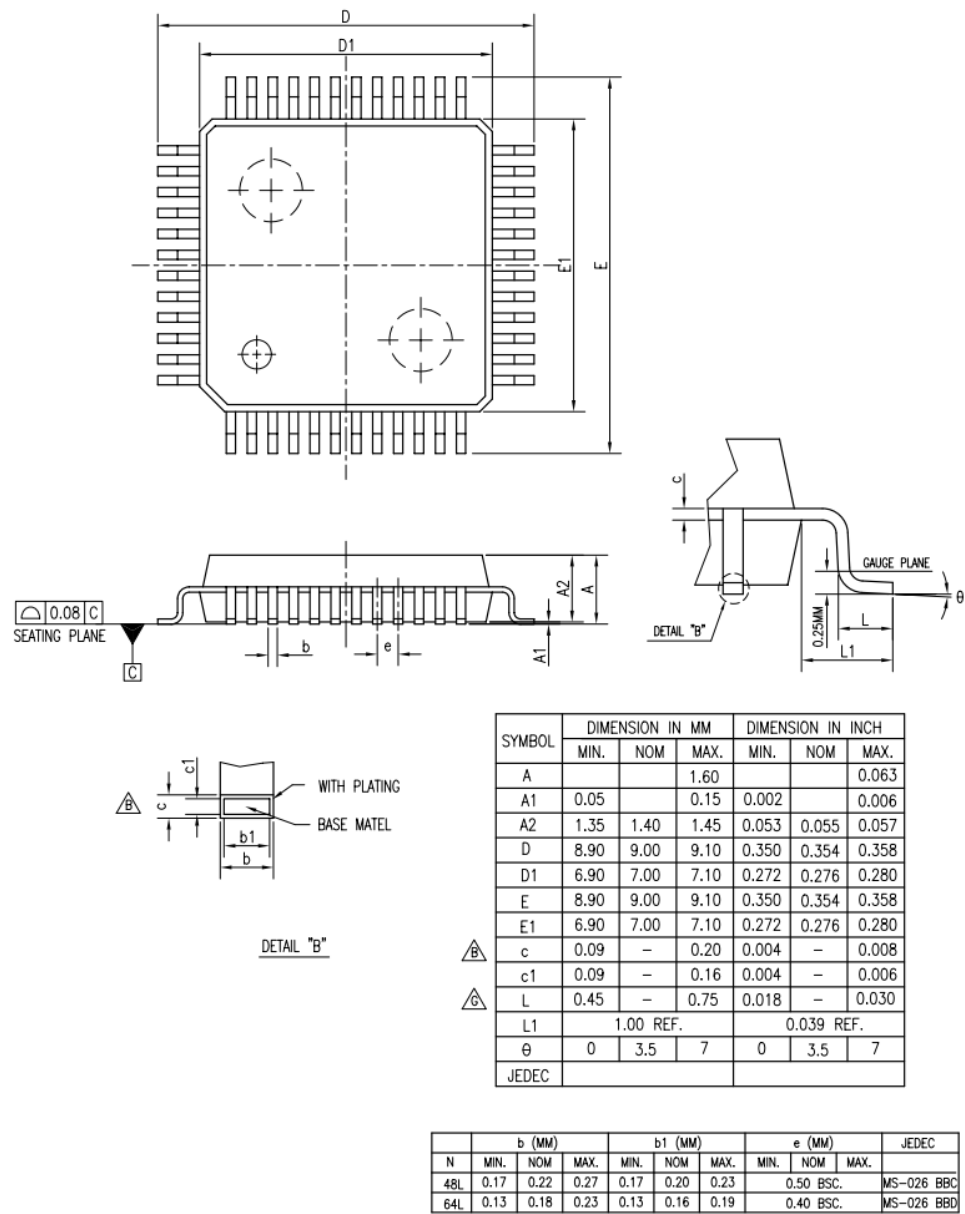


Figure 4-1 LQFP48 Package Outline Dimension

# Revision History

Date	Version	Comments	Revised by
2014-10-30	0.0.1	Initial version	Longdan
2014-11-17	0.0.2	Add CW6685C/D/F	Longdan
2015-3-12	0.0.3	Check	AE team
2015-3-13	1.0.0	Release	Yuanxue
2015-5-5	1.1.0	Modify feature,	Thomas/Yuanxue
2015-5-6	1.1.1	add POD	Zhenli/yuanxue
2015-5-11	1.2.0	Release	Yuanxue
2015-5-14	1.2.1	Modify typ voltage	Thomas
2015-5-21	1.3.0	release	Yuanxue

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