

Description	AWA8820 Datasheet		
Customer			
Version	A0.00.00	Date	2010/10/24

Revision History

Version	Date	Description	Author
A0.00.00	20101024	Initial	Louis
A0.01.00	20101026	Features – Package QFN56	Louis
A0.01.01	20101028	1. AWA8810/AWA8800 is replaced with AWA8820 or AWA88x0	Louis

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Preliminary

1. General Description

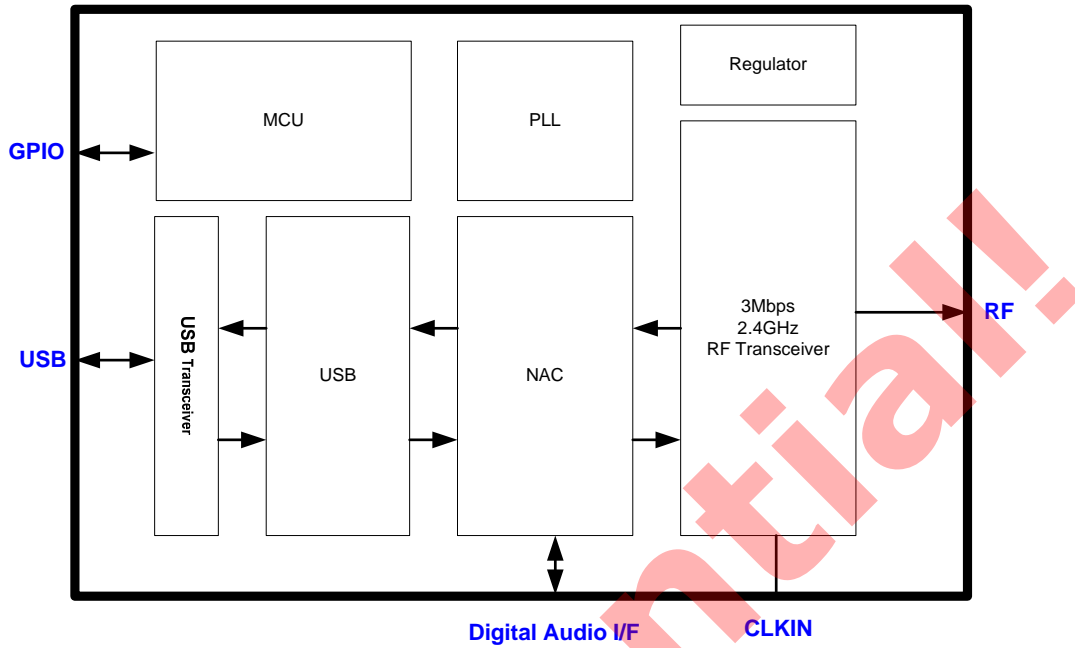
AlfaPlus AWA8820 is a Low Power 2.4GHz Wireless Digital Audio SOC embedded many valuable IP's including 2.4GHz 3Mbps GFSK RF transceiver, LDO, MCU and Full-speed USB. It reduces the BOM cost significantly.

2. Features

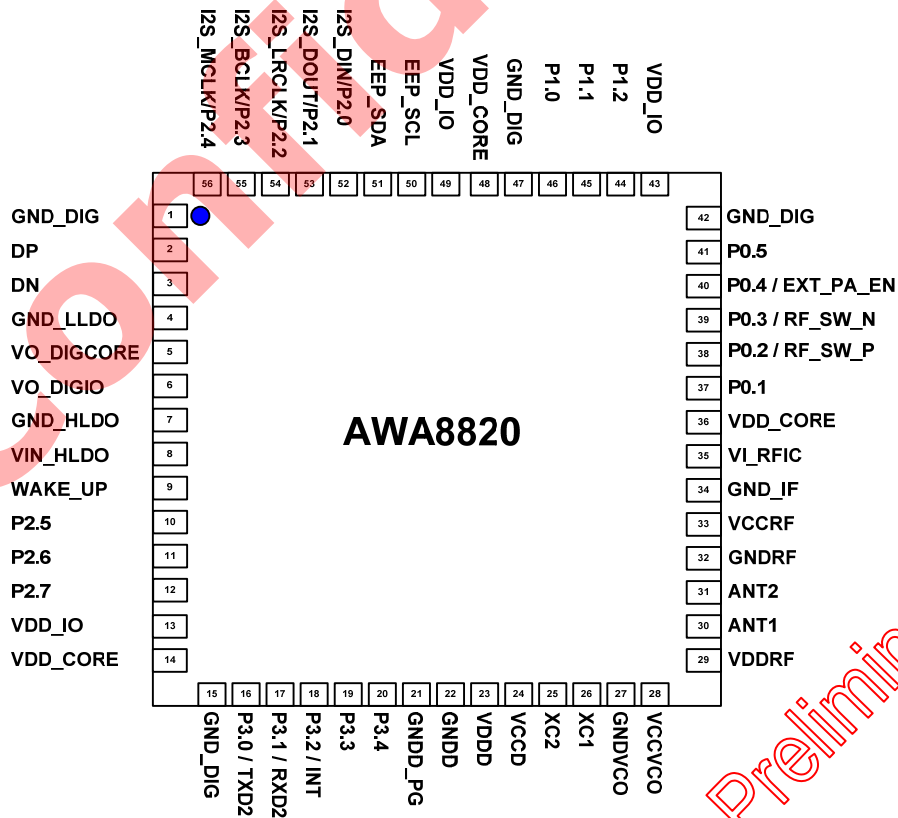
- **Single Chip with SOC**
- **Power Supply 5V – 2.0V**
- **3Mbps 2.4G RF Transceiver Embedded**
- **5V LDO Embedded**
- **8-Bit MCU Embedded**
- **Full-Speed USB**
- **Combo Audio Device – USB and Line-in**
- **Current Consumption**
 - ✓ Transmitter 40mA
 - ✓ Receiver 35mA
- **RF Characteristics**
 - ✓ 2.4G ISM Band
 - ✓ RF Power: 4dBm
 - ✓ Sensitivity: -81dBm with 1% P.E.R
 - ✓ Non-Overlay Channel Number: 26
 - ✓ Automatic Adaptive Frequency Channel Selection
 - ✓ Operating Range:
 - 150M Outdoor Line-of-Sight
 - 25M Indoor Line-of-Sight
- **Audio Characteristics**
 - ✓ Non-Compression 48KHz – 16 Bit
 - ✓ SNR: 95dB @ 20Hz - 20KHz
 - ✓ THD+N: -95dB @ 20Hz - 20KHz
 - ✓ Frequency Response: 20Hz – 23KHz
- **Voice 8KHz-16Bit without compression**
- **Master I²S Interface supporting 48KHz sampling rate**
- **Transmitter Slave Interface supporting 192KHz/96KHz/48KHz/44.1KHz and 32KHz sampling rate**
- **Built-In SRC (Sampling Rate Converter)**
- **Programmable Latency – minimum 12.5ms**
- **Unlimited Broadcasting Receivers**
- **Bi-directional User Control Data**
- **Supporting 16K8 / 8K8 I²C Serial EEPROM**
- **Programmable GPIO**
- **24MHz±30ppm Crystal**
- **Package QFN56, 7mm x 7mm**
- **Application**
 - ✓ Wireless Speaker
 - ✓ Headset/Headphone
 - ✓ iPhone/iPod Docking

Preliminary

3. Block Diagram



4. Pin Out Diagram



Preliminary

5. Pin Definition

A: Analog, PD: Pull-Down Digital IO, PU: Pull-up Digital IO

Name	No	IO	Description
XC1	26	A	Crystal Input Pin
XC2	25	A	Crystal Output Pin
ANT1	30	RF	RF TX/RX Differential Pair
ANT2	31	RF	RF TX/RX Differential Pair
DP	2	A	
DN	3	A	
WAKE_UP	9	A, PD	Wake-up Internal Pull-down Rising Edge to wake-up AWA8820 from Power Down mode
I2S_MCLK/P2.4	56	IO	I ² S Master Clock
I2S_BCLK/P2.3	55	IO	I ² S Bit Clock
I2S_LRCLK/P2.2	54	IO	I ² S LRCLK Clock
I2S_DOUT/P2.1	53	O	I ² S Serial Output Data
I2S_DIN/P2.0	52	I	I ² S Serial Input Data
EEP_SDA	51	IO	Serial EEPROM Data
EEP_SCL	50	O	Serial EEPROM Clock
P0.1	37	IO, PU	GPIO Pin Programmable internal pull-up resistor.
P0.2 / RF_SW_P	38	IO, PU	GPIO Pin Programmable internal pull-up resistor. RF_SW_P Control External RF Switch for External PA
P0.3 / RF_SW_N	39	IO, PU	GPIO Pin Programmable internal pull-up resistor. RF_SW_P Control External RF Switch for External PA
P0.4 / RF_PA_EN	40	IO, PU	GPIO Pin Programmable internal pull-up resistor. RF_PA_EN Enable External PA
P0.5	41	IO, PU	GPIO Pin

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Name	No	IO	Description
			Programmable internal pull-up resistor.
P1.2	44	IO, PU	GPIO Pin Programmable internal pull-up resistor.
P1.1	45	IO, PU	GPIO Pin Programmable internal pull-up resistor.
P1.0	46	IO, PU	GPIO Pin Programmable internal pull-up resistor.
P2.5	10	IO, PU	GPIO Pin Programmable internal pull-up resistor.
P2.6	11	IO, PU	GPIO Pin Programmable internal pull-up resistor.
P2.7	12	IO, PU	GPIO Pin Programmable internal pull-up resistor.
P3.0/TXD2	16	IO, PU	GPIO Pin Programmable internal pull-up resistor. This pin can be set as UART TXD function.
P3.1/RXD2	17	IO, PU	GPIO Pin Programmable internal pull-up resistor. This pin can be set as UART RXD function
P3.2/INT	18	IO, PU	GPIO Pin Programmable internal pull-up resistor. External H/W Interrupt An external H/W interrupt input to MCU
P3.3	19	IO, PU	GPIO Pin Programmable internal pull-up resistor. External H/W Interrupt An external H/W interrupt input to MCU
P3.4	20	IO, PU	GPIO Pin Programmable internal pull-up resistor. External H/W Interrupt An external H/W interrupt input to MCU
VO_DIGCORE	5	A	1.8V Output for AWA8820 digital core used.
VO_DIGIO	6	A	3.3V Output for AWA8820 digital core used.
VIN_HLDO	8	A	High Voltage LDO Input

Name	No	IO	Description
			Connected with USB Power
VI_RFIC	35	A	RF LDO Input
VDD_CORE	14,36,48	A	Digital Core Power Supply
VDD_IO	13, 43,49	A	Digital IO Power Supply
GND_DIG	1, 15,42, 47	A	Digital Ground
GND_LLDO	4	A	LDO Ground
GND_HLDO	7	A	LDO Ground
GNDD_PG	21	A	RF Ground
GNDD	22	A	RF Ground
VDDD	23	A	RF Power Supply
VCCD	24	A	RF Power Supply
GNDVCO	27	A	RF Ground
VCCVCO	28	A	RF Power Supply
VDDRF	29	A	RF Power Supply
GNDRF	32	A	RF Ground
VCCRF	33	A	RF Power Supply
GND_IF	34	A	RF Ground

6. Function Description

6.1 NAC (Network Audio Controller) Mode Selection

AWA8820 has many operating Mode called NAC mode which is used to decide the voice function enable/disable and how many audio receivers can use uplink user data. Besides, the latency is also decided when you choose the operating mode.

NAC Mode	Description
0 / 1	Application for Stereo Speaker Bi-directional Control is available
2 / 3	Application for One set of Headset Application Including Voice and bi-directional user control
4 / 5	Application for One set of Headset and 2 sets of Headphone The headset has the voice function and Bi-directional control. The headphone has the function Bi-directional control

Note: the sampling rate is 40KHz. It means that the frequency response is 19KHz.

Note: Latency is measured on I2S I/F

Note: AWA8820 with longer latency can resist more fading.

Note: In any mode, AWA8820 support unlimited Broadcast receivers.

Mode	Audio/Voice	Measured I/F	Latency (ms)	Note
0	Audio	I2S	12.5	48KHz Fs
1	Audio	I2S	17.5	48KHz Fs
2	Audio	I2S	17.5	48KHz Fs
2	Voice	I2S-USB	21	-
2	Voice	I2S	42	-
3	Audio	I2S	21	48KHz Fs
3	Voice	I2S-USB	21	-
3	Voice	I2S	42	-
4	Audio	I2S	21.4	48KHz Fs
4	Voice	I2S-USB	23.5	-
4	Voice	I2S	44.4	-
5	Audio	I2S	29.4	48KHz Fs
5	Voice	I2S-USB	23.4	-
5	Voice	I2S	44.5	-

6.1 I²S I Interface configuration

AWA8820 supports the digital audio interface, I²S, to connect with the external audio codec. As a transmitter, AWA8820 offers either Master mode or Slave Mode depending on the designer's choice. As a receiver, the master mode is supported only. In the master mode, AWA8820 only supports 48KHz sampling rate. The detail clock rate of I²S is listed in the table 6-1-1.

Table-6-1-1

Mode	Bits	LRCLK (Fs)	MCLK	BCLK
Master	24	48KHz	128 x Fs	MCLK / 2
Master	24	48KHz	256 x Fs	MCLK / 2
Master	24	48KHz	256 x Fs	MCLK / 4
Master	24	48KHz	512 x Fs	MCLK / 2
Master	24	48KHz	512 x Fs	MCLK / 4

Master	24	48KHz	512 x Fs	MCLK / 8
Slave	24	32KHz	Note	Fs x 64
Slave	24	32KHz	-	Fs x 128
Slave	24	32KHz	-	Fs x 256
Slave	24	44.1KHz	-	Fs x 64
Slave	24	44.1KHz	-	Fs x 128
Slave	24	44.1KHz	-	Fs x 256
Slave	24	48KHz	-	Fs x 64
Slave	24	48KHz	-	Fs x 128
Slave	24	48KHz	-	Fs x 256
Slave	24	96KHz	-	Fs x 64
Slave	24	96KHz	-	Fs x 128
Slave	24	96KHz	-	Fs x 256
Slave	24	192KHz	-	Fs x 64
Slave	24	192KHz	-	Fs x 128
Slave	24	192KHz	-	Fs x 256

Note: In slave mode, MCLK input is not required.

7. Register Sets

Please refer to the datasheet of AWA88x0_DTS_RegSets.

8. MCU

Please refer to the datasheet of AWA88x0_DTS_MCU

9. DC Characteristics

Name	Description	Min	Typ	Max	Unit
Absolute Maximum Rating					
-	Supply Voltage	0		5.25	V
-	Storage Temperature	-55		125	°C
Operating Condition					
To	Operation Temperature	-40		85	°C
VIN_HLDO	HV LDO Input Voltage Note: For USB Dongle operation, 5 Typical is	2.0	5	5.25	V

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Name	Description	Min	Typ	Max	Unit
	necessary				
VO_DIGCORE	Digital Core Power Supply		1.8		V
VO_DIGIO	Digital IO Power Supply		3.3		V
VDD_CORE	Digital Core Power Input		1.8		V
VDD_IO	Digital IO Power Input	2.0		3.6	V
VI_RFIC	RF LDO Input Voltage	2.0		3.6	V
DC Characteristics					
I_{ACT_TX}	Transmit Active Current		40		mA
I_{ACT_RX}	Receive Active Current		35		mA
I_{SLP}	Sleep Current		800		uA
I_{PD}	Power Down Current		1		uA
V_{IL}	Input Low Voltage	-0.3		0.8	V
V_{IH}	Input High Voltage	2.0		3.6	V
V_{OL}	Output Low Voltage		0		V
V_{OH}	Output High Voltage		3.3		V

10. RF Characteristics

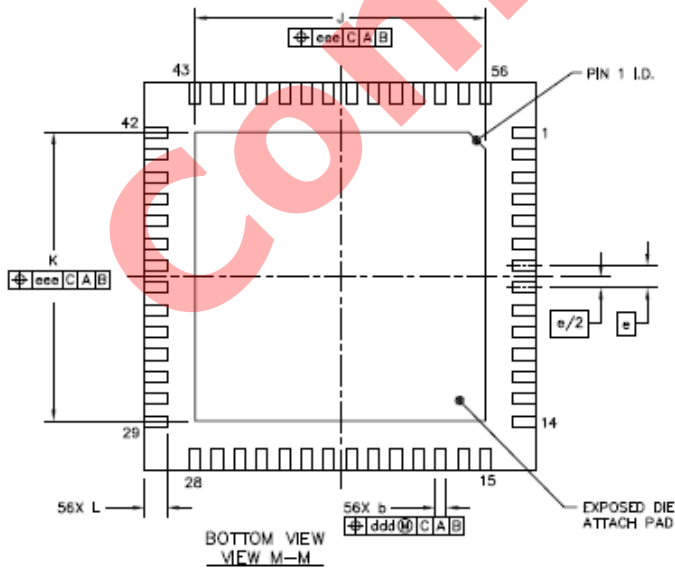
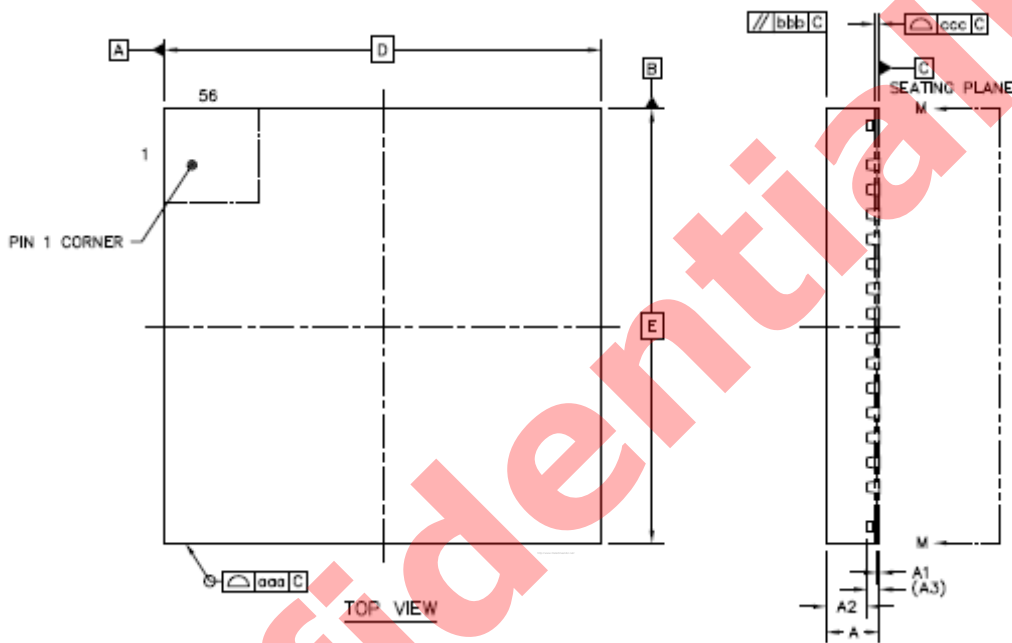
Name	Description	Min	Typ	Max	Unit
	Frequency Range	2403		2478	MHz
	RF Data Rate		3		Mbps
	Channel Spacing		3		MHz
	RF TX Power		4		dBm
	RF TX Frequency Drift		+/-50		KHz
	RX Sensitivity @ 1%PER		-81		dBm

11. Audio Characteristics

Name	Description	Min	Typ	Max	Unit
	Non-compression audio Sampling Rate		48		KHz
	Frequency Response	0.02		23	KHz
	SNR		95		dB

THD+N		-95	dB
Latency	12.5		ms
Voice Sampling Rate		8	KHz

12. Package Information



	SYMBOL	MIN	NOM	MAX	
TOTAL THICKNESS	A	0.8	0.85	0.9	
STAND OFF	A1	0	0.035	0.05	
MOLD THICKNESS	A2	---	0.65	0.67	
L/F THICKNESS	A3	0.203 REF			
LEAD WIDTH	b	0.15	0.2	0.25	
BODY SIZE	X	D 7 BSC			
	Y	E 7 BSC			
LEAD PITCH	e	0.4 BSC			
EP SIZE	X	J	5.1	5.2	5.3
	Y	K	5.1	5.2	5.3
LEAD LENGTH	L	0.35	0.4	0.45	
PACKAGE EDGE TOLERANCE	aaa	0.1			
MOLD FLATNESS	bbb	0.1			
COPLANARITY	ccc	0.08			
LEAD OFFSET	ddd	0.1			
EXPOSED PAD OFFSET	eee	0.1			

Pre