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文件編號：

Approval Sheet

Date : 2-July-2013

Customer	**Wistron**
Part Number	
Description	**Bluetooth Stereo ROM Module Board**
Customer's Project	Sound Bar system
Manufacturer	**Rayson Technology Co., Ltd**
Model Name	**B6Z-400_A1**

Supplier Level：■New Source □Second Source

Contact Person：_____ Tel：+886-3-5633666

Approval status :

E.E. engineer：_____ ■Approval □Reject

M.E. engineer：_____ □Approval □Reject

P.E. engineer：_____ □Approval □Reject

Approval：_____

Accessories：

■ Specification ■ Sample □ Drawing □ Test Report

□ AT Command sets □ Packing Diagram

Document History

Revision	Date	Change Reason
1	2013-4-16	Draft
2	2013-7-2	Add two Tan-Capacitor to A1 Revision

Rayson *Bluetooth® Module*

B6Z-400

The BTM645 based module board.

Features

- The module is a Max.4dBm(Class2) module.
- Fully Qualified Bluetooth v4.0.
- Integrated Switched-Mode Regulator.
- Integrated Battery Charger.
- Embedded Kalimba DSP Co-Processor.
- Integrated 16-bit Stereo Audio CODEC 93dB SNR for DAC.
- CSR's latest CVC technology for narrowband and wideband voice connections including wind noise reduction.
- Wideband speech supported by HFP v1.6 Profile and mSBC codec.
- Multipoint HFP connection to 2 phones for voice.
- Multipoint A2DP connection enables a headset(A2DP) connection to 2 A2DP source device for music playback.
- SBC , APTX decoder support.
- MP3, AAC, Faststream decoder support. (option)
- HSP v1.2/ HFP v1.6/ A2DP v1.2/ AVRCP v1.4
- RoHS compliant.
- Small outline. 13.4 x13.4 x1.8mm(64K EEPROM)
- Integrated audio power amplifier TPA6112

Outline

General Electrical Specification

Absolute Maximum Ratings:		
Ratings	**Min.**	**Max.**
Storage Temperature	**-40 ℃**	**+85 ℃**
Supply Voltage (VCHG)	**-0.4V**	**5.75V**
Supply Voltage (VREG_ENABLE,VBAT_SENSE)	**-0.4V**	**4.2V**
Supply Voltage (LED[2:0])	**-0.4V**	**4.4V**
Supply Voltage (PIO_POWER)	**-0.4V**	**3.6V**
Recommended Operating Condition:		
Operating Condition		
Operating Temperature range	**-20 ℃**	**+75 ℃**
Supply Voltage (VBAT)	**2.7V**	**4.25V**
Supply Voltage (VCHG)	**4.75V / 3.10 V**	**5.25V**
Supply Voltage (VREG_ENABLE,VBAT_SENSE)	**0V**	**4.2V**
Supply Voltage (LED[2:0])	**1.10V**	**4.25V**
Supply Voltage (PIO_POWER)*	**1.7V**	**3.6V**

Regulator Enable

VREG_ENABLE, Switching Threshold	**Min**	**Typ**	**Max**	**Unit**
Rising threshold	1.0	-	-	V

(a) superseded electrical characteristics are listed in this table.

Stereo Codec: Analogue to Digital Converter

Analogue to Digital Converter						
Parameter	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Resolution	-		-	-	16	Bits
Input Sample Rate, Fsample	-		8	-	48	kHz
SNR	fin = 1kHz B/W = 20Hz→Fsample/2 (20kHz max) A-Weighted THD+N < 1% 1.6Vpk-pk input	**F_{sample}**				
		8kHz	-	89	-	dB
		16kHz	-	85	-	dB
		32kHz	-	85	-	dB
		44.1kHz	-	85	-	dB
		48kHz	-	85	-	dB

THD+N	fin = 1kHz B/W = 20Hz→Fsample/2 (20kHz max) 1.6Vpk-pk input	F_{sample}				
		8kHz	-	0.0036	-	%
		48kHz	-	0.0052	-	%
Digital gain	Digital gain resolution = 1/32		-24	-	21.5	dB
Analogue gain	Pre-amplifier setting = 0dB, 9dB, 21dB or30dB Analogue setting = -3dB to 12dB in 3dB steps		-3	-	42	dB
Stereo separation (crosstalk)			-	-86	-	dB

Stereo Codec: Digital to Analogue Converter

Digital to Analogue Converter							
Parameter	**Conditions**			**Min**	**Typ**	**Max**	**Unit**
Resolution	-			-	-	16	Bits
Output Sample Rate, Fsample	-			8	-	96	kHz
SNR	fin = 1kHz B/W = 20Hz→20kHz A-Weighted THD+N < 0.1% 0dBFS input	**Fsample**	**Load**				
		48kHz	100kΩ	-	92	-	dB
		48kHz	32Ω	-	93	-	dB
		48kHz	16Ω	-	93	-	dB
THD+N	fin = 1kHz B/W = 20Hz→20kHz 0dBFS input	**Fsample**	**Load**				
		8kHz	100kΩ	-	0.0019	-	%
		8kHz	32Ω	-	0.0024	-	%
		8kHz	16Ω	-	0.0032	-	%
		48kHz	100kΩ	-	0.0026	-	%
		48kHz	32Ω	-	0.0036	-	%
		48kHz	16Ω	-	0.0052	-	%
Digital Gain	Digital Gain Resolution = 1/32			-24	-	21.5	dB
Analogue Gain	Analogue Gain Resolution = 3dB			-21	-	0	dB
Stereo separation (crosstalk)				-	-88	-	dB

Digital

Digital Terminals	**Min**	**Typ**	**Max**	**Unit**
Input Voltage				
V_{IL} input logic level low	-0.4	-	0.4	V
V_{IH} input logic level high	0.7xPIO_POWER	-	PIO_POWER+0.4	V
Tr/Tf	-	-	25	ns

Output Voltage				
V_{OL} output logic level low, I_{OL} = 4.0mA	-	-	0.4	V
V_{OH} output logic level high, I_{OH} = -0.4mA	0.75xPIO_POWER	-	-	V
Tr/Tf	-	-	5	ns
Input and Tristate Currents				
Strong pull-up	-150	-40	-10	uA
Strong pull-down	10	40	150	uA
Weak pull-up	-5	-1.0	-0.33	uA
Weak pull-down	0.33	1.0	5.0	uA
C_I input Capacitance	1.0		5.0	pF

LED Driver Pads

LED Driver Pads		Min	Typ	Max	Unit
Current, I_{PAD}	High impedance state	-	-	5	µA
	Current sink state	-	-	10	mA
LED pad voltage, V_{PAD}	I_{PAD} = 10mA	-	-	0.55	V
LED pad resistance	V_{PAD} < 0.5V	-	-	40	Ω
V_{OL} output logic level low[(a)]		-	0	-	V
V_{OH} output logic level high[(a)]		-	0.8	-	V
V_{IL} input logic level low		-	0	-	V
V_{IH} input logic level high		-	0.8	-	V

(a) LED output port is open-drain and requires a pull-up

Auxiliary ADC

Auxiliary ADC		Min	Typ	Max	Unit
Resolution		-	-	10	Bits
Input voltage range(a)		0	-	1.35	V
Accuracy	INL	-1	-	1	LSB
(Guaranteed monotonic)	DNL	0	-	1	LSB
Offset		-1	-	1	LSB
Gain error		-0.8	-	0.8	%
Input bandwidth		-	100	-	kHz
Conversion time		1.38	1.69	2.75	µs
Sample rate(b)		-	-	700	Samples/s

(a) LSB size = VDD_AUX/1023

(b) The auxiliary ADC is accessed through a VM function. The sample rate given is achieved as part of this function.

Power Consumption

DUT Role	Connection		Packet Type	Packet Size	Average Current	Unit
Slave	SCO		HV3	30	11.0	mA
Slave	eSCO		EV3	30	11.8	mA
Slave	eSCO		2EV3	60	9.2	mA
Slave	SCO	2-mic CVC	HV3	30	12.6	mA
Slave	eSCO	2-mic CVC	2EV3	60	10.8	mA
Slave	eSCO	2-mic CVC	2EV3	60	11.4	mA
Slave	Stereo high quality SBC: ■ SBC ■ 48KHz sampling ■ No sniff				13.3	mA
Slave	Stereo high quality: ■ MP3 ■ 48KHz sampling ■ No sniff				12.5	mA
Slave	ACL	Sniff = 500ms	-	-	213	mA
Slave	ACL	Sniff = 1280ms	-	-	142	mA
Master	SCO		HV3	30	10.8	mA
Master	eSCO		EV3	30	11.2	mA
Master	eSCO		2EV3	60	8.8	mA
Master	SCO	2-mic CVC	HV3	30	12.5	mA
Master	eSCO	2-mic CVC	2EV3	60	10.5	mA
Master	eSCO	2-mic CVC	2EV3	60	11.0	mA

Note:

Current consumption values are taken with:

- VBAT pin = 3.7V
- RF TX power set to 0dBm
- No RF retransmissions in case of eSCO
- Microphones and speakers disconnected
- Audio gateway transmits silence when SCO/eSCO channel is open
- LEDs disconnected
- AFH classification master disabled

RF Specification: Temperature=+20℃

Transmitter

	Min	Typ	Max	Bluetooth Specification	Unit
Maximum RF transmit power	-	2	-	-6 to +4	dBm
RF power control range	3	4.5	5.5	≥16	dB
20dB bandwidth for modulated carrier	-	900	-	≤1000	kHz
Adjacent channel transmit power F = F0 ± 2MHz	-	-32	-	≤-20	dBm
Adjacent channel transmit power F = F0 ± 3MHz	-	-38	-	≤-40	dBm
Adjacent channel transmit power F = F0 ± > 3MHz	-	-65	-	≤-40	dBm
Δf1avg Maximum Modulation	-	165	-	140<f1avg<175	kHz
Δf2max Minimum Modulation	-	140	-	115	kHz
Δf1avg/Δf2avg	-	0.9	-	≥0.80	
Initial carrier frequency tolerance	-	±15	-	±75	kHz
Drift Rate		±7		≤20	kHz/50μ
Drift (single slot packet)	-	±10	-	≤25	kHz
Drift (five slot packet)	-	±10	-	≤40	kHz
2nd Harmonic Content	-	-27	-	≤-30	dBm
3rd Harmonic Content	-	-26	-	≤-30	dBm

Receiver

	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity at 0.1% BER for all packet types	2.402	-	-86	-	≤-70	dBm
	2.441	-	-90	-		
	2.480	-	-90	-		
Maximum received signal at 0.1% BER		-	>-10		≥-20	dBm
C/I co-channel		-	5	-	≤11	dB
Adjacent channel selectivity C/I F = F0 + 1MHz		-	-5	-	≤0	dB
Adjacent channel selectivity C/I F = F0 - 1MHz		-	-2	-	≤0	dB
Adjacent channel selectivity C/I F = F0 + 2MHz		-	-40	-	≤-30	dB
Adjacent channel selectivity C/I F = F0 - 2MHz		-	-32	-	≤-20	dB
Adjacent channel selectivity C/I F = F0 + 3MHz		-	-47	-	≤-40	dB
Adjacent channel selectivity C/I F = F0 - 5MHz		-	-45	-	≤-40	dB
Adjacent channel selectivity C/I F = FImage		-	-29	-	≤-9	dB
Maximum level of intermodulation interferers		-	-15	-	≥-39	dBm
Spurious output level		-	-155	-		dBm/Hz

B6Z-400 Pin Functions

No.	Pin Name	Pin Type	Pin Description
1	NC	--	--
2	SPKR_R	Analogue	Speaker output positive, right
3	SPKR_L	Analogue	Speaker output negative, left
4	AGND	Analogue	Analog Ground
5	PIO8	Digital I/O	PIO8 of BTM645
6.	PIO9	Digital Input	PIO9 of BTM645, (Reset Pairing List)
7.	PIO20	Digital Input	PIO20 of BTM645, (Next Track)
8.	PIO21	Digital Input	PIO21 of BTM645, (Volume +)
9.	PIO19	Digital Input	PIO19 of BTM645, (Previous Track)
10.	PIO18	Digital Input	PIO18 of BTM645, (Play/Pause)
11.	PIO7	Digital Input	PIO7 of BTM645, (Volume -)
12.	PIO6	Digital Output	PIO6 of BTM645, (Amplifier Enable Control)
13.	PIO17	Digital Output	PIO17 of BTM645, (To Enter Pairing mode)
14	GND	System Ground	System Ground
15	VBAT_3V3	Power Input	The main Power supply to B6Z-400
16.	VREG_ENABLE	Analogue	Regulator enable input
17.	SPI_MISO	Bi-directional	SPI_MOSI:SPI data input
18.	SPI_CLK	Bi-directional	SPI_CLK:SPI clock input
19.	SPI_MISO	Bi-directional	SPI_MISO:SPI data output
20.	SPI_CSB	Bi-directional	SPI_CSB:SPI Select input
21.	LED2	Open drain output	LED Driver
22.	LED1	Open drain output	LED Driver
23	LED0	Open drain output	LED Driver
24	RST#	Input with strong pull-up	Active low. Pull low for minimum 5ms to cause a reset
25.	AIO0	Bi-directional	Analogue programmable input/output line

Interfaces

Analogue I/O Ports, AIO

B6Z-400 has 1 general-purpose analogue interface pin, AIO[0]. Typically, this connects to a thermistor for battery pack temperature measurements during charge control.

LED Drivers

B6Z-400 includes a 3-pad synchronised PWM LED driver for driving RGB LEDs for producing a wide range of colours. All LEDs are controlled by firmware.

The terminals are open-drain outputs, so the LED must be connected from a positive supply rail to the pad in series with a current-limiting resistor.

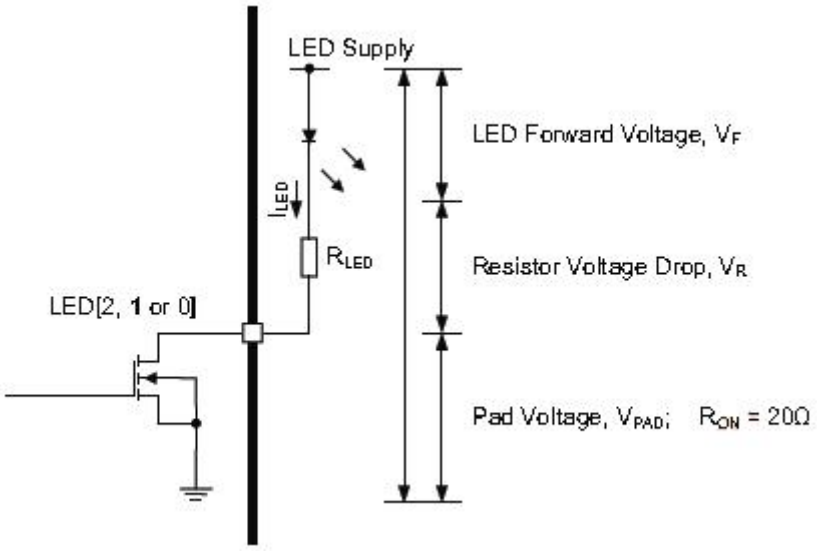


Figure 2.1: LED Equivalent Circuit

From Figure 2.1 it is possible to derive Equation 2.1 to calculate ILED. If a known value of current is required through the LED to give a specific luminous intensity, then the value of RLED is calculated.

$$I_{LED} = \frac{VDD - V_F}{R_{LED} + R_{ON}}$$

Equation 2.1: LED Current

For the LED pads to act as resistance, the external series resistor, RLED, needs to be such that the voltage drop across it, VR, keeps VPAD below 0.5V. Equation 2.2 also applies.

$$VDD = VF + VR + VPAD$$

Equation 2.2: LED PAD Voltage

Note:

The LED current adds to the overall current. Conservative LED selection extends battery life.

Reset, RST#

B6Z-400 is reset from several sources:

- RST# pin
- Power-on reset
- USB charger attach reset

- Software configured watchdog timer

The RST# pin is an active low reset and is internally filtered using the internal low frequency clock oscillator. Rayson recommends applying RST# for a period >5ms.

At reset the digital I/O pins are set to inputs for bidirectional pins and outputs are set to tristate.

Digital Pin States on Reset

Table 3.3.1 shows the pin states of B6Z-400 on reset.

Pin Name / Group	I/O Type	Full Chip Reset
USB_DP	Digital bidirectional	N/A
USB_DN	Digital bidirectional	N/A
PIO[0]	Digital bidirectional	PUS
PIO[1]	Digital bidirectional	PUS
PIO[2]	Digital bidirectional	PDW
PIO[3]	Digital bidirectional	PDW
PIO[4]	Digital bidirectional	PDW
PIO[5]	Digital bidirectional	PDW
PIO[6]	Digital bidirectional	PDS
PIO[7]	Digital bidirectional	PDS
PIO[8]	Digital bidirectional	PUS
PIO[9]	Digital bidirectional	PDS
PIO[16]	Digital bidirectional	PUS
PIO[17]	Digital bidirectional	PDS
PIO[18]	Digital bidirectional	PDW
PIO[19]	Digital bidirectional	PDW
PIO[20]	Digital bidirectional	PDW
PIO[21]	Digital bidirectional	PDW

Table 3.3.1: Pin States on Reset

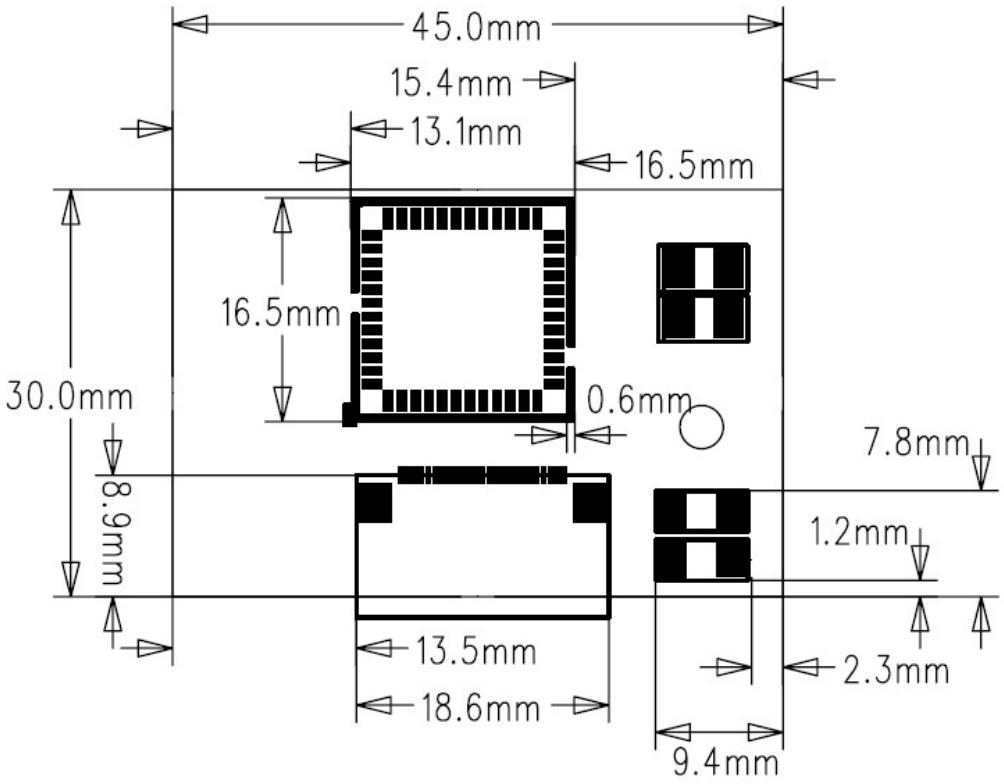
Note:

PUS = Strong pull-up

PDS = Strong pull-down

PUW = Weak pull-up

PDW = Weak pull-down


45.0mm
15.4mm
13.1mm
16.5mm
16.5mm
30.0mm
0.6mm
7.8mm
8.9mm
1.2mm
13.5mm
18.6mm
2.3mm
9.4mm

Federal Communications Commission (FCC) Statement

15.21
You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user’ s authority to operate the equipment.

15.105(b)
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1) this device may not cause harmful interference, and
2) this device must accept any interference received, including interference that may cause undesired operation of the device.

FCC RF Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note: The end product shall has the words “Contains Transmitter Module FCC ID: PU5B6Z400”