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Technical Note

Audio HW on Globe6 platform

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1 Document Mission/Scope

1.1 Mission

This document describes the audio features of Globe6 – BP30 platform.

1.2 Scope

This document helps HW audio designers and SW driver designers.

2 List of Acronyms

Abbreviation / Term	Explanation / Definition
HW	hardware
Mic	microphone
SW	software
FM	frequency modulation

3 Introduction

The Globe6 audio scheme is designed to perform maximum flexibility in operation modality and an end-user complete solution for a GSM phone. Due to the many audio features a complete overview on the audio HW scheme is being proposed.

4 Audio circuits in Globe6

4.1 Audio circuit overview

The Globe6 audio sources are selectable between the EGOLDradio downlink audio output and FM radio audio output. Audio output signals can be reproduced by earpiece, loud speaker, handset, and stereo headphone. Audio input transmitted by EGOLDradio uplink came from internal microphone, hand free microphone or hand set microphone.

Globe6 is designed to perform five operation modes:

- Normal mode, where earpiece and internal mic are used
- Viva voice mode, where loud speaker and internal mic are used
- Hand free mode, where stereo headphone with integrated mic are used
- Handset mode, where I/O audio transducers are in the handset
- FM radio mode, where audio output is reproduced by stereo headphone

The following block diagram shows how audio devices are connected together:

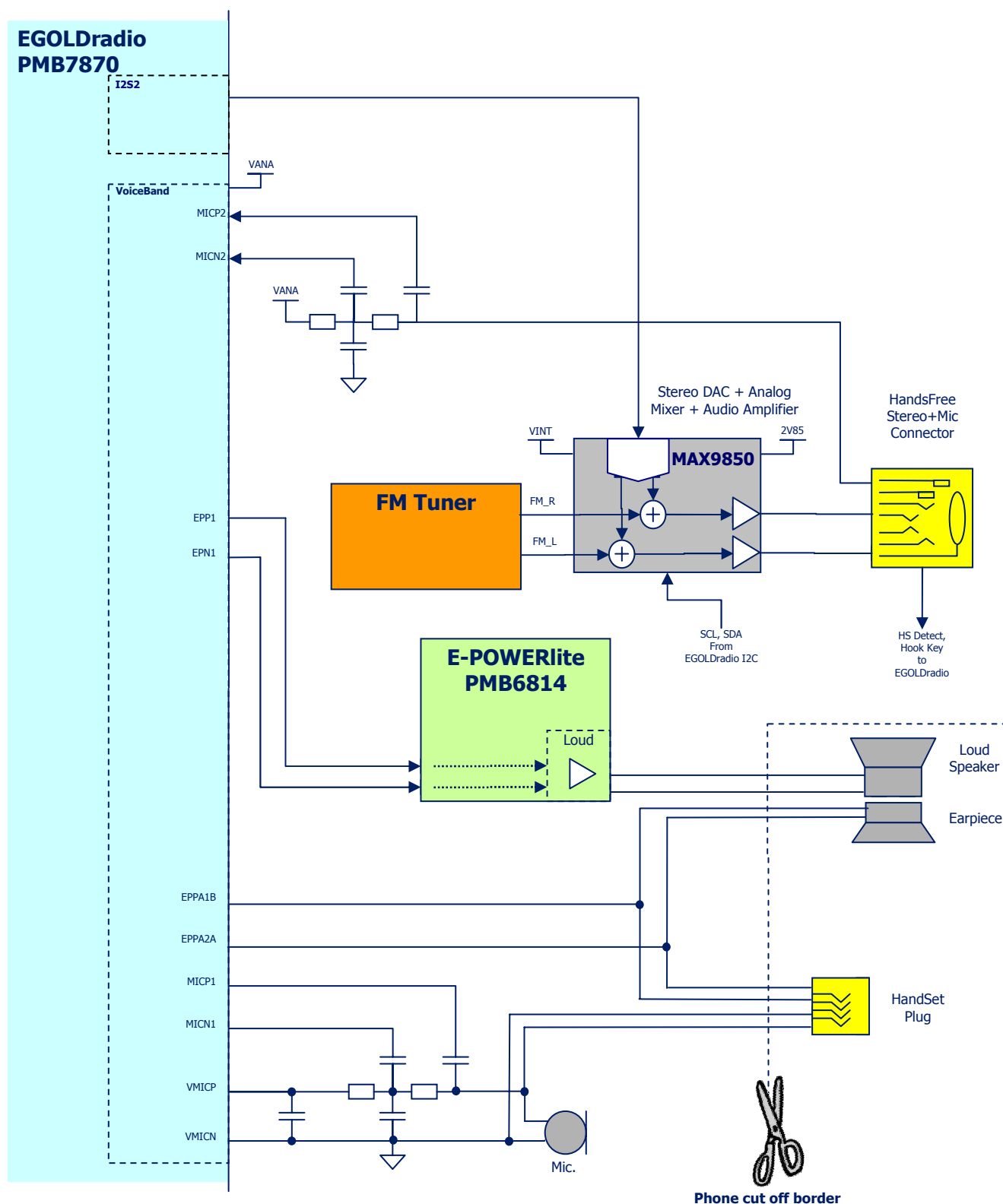


Fig. 1 Block diagram of audio devices.

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4.2 Audio transducers

Internal microphone is the OB410P by Sambu Communics CO. It provides pin lead which can be direct soldered on PCB board and it has metal case for RF-noise shielding. Internally it has two bypass capacitors (10 and 33 pF) to increase the RF-noise resistance.

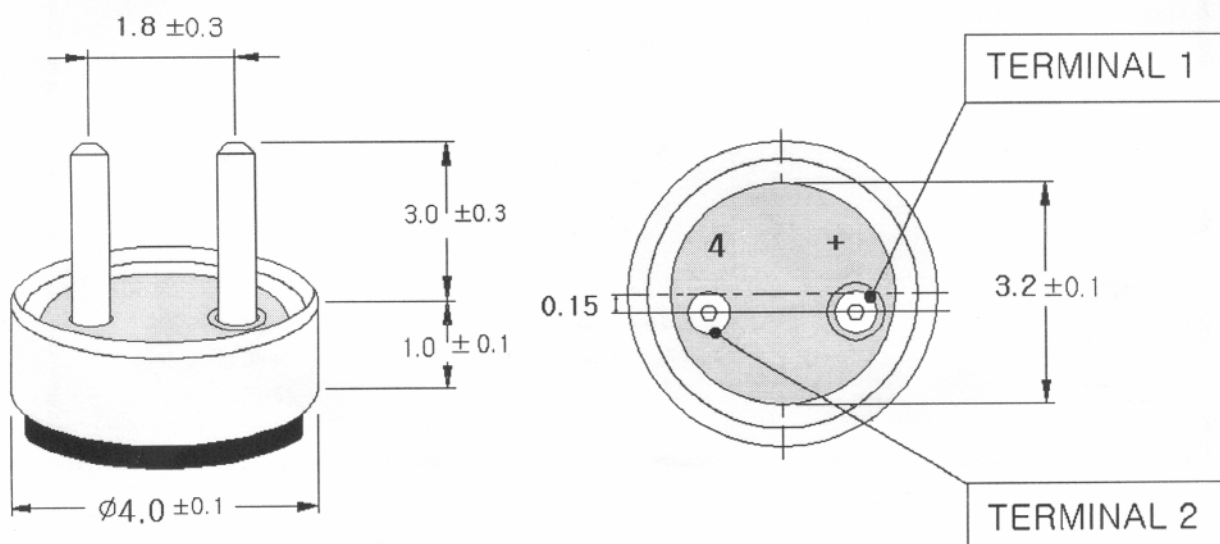


Fig. 2 Mechanical drawing and frequency response of OB410P microphone

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Earpiece and loudspeaker are mechanically assembled together in the Keyrin Telecom Co. 1813-TW2 transducer.

Earpiece has 30mW of input rated power and 32 ohm impedance. Loud speaker has 0.5W of input rated power and 8 ohm impedance.

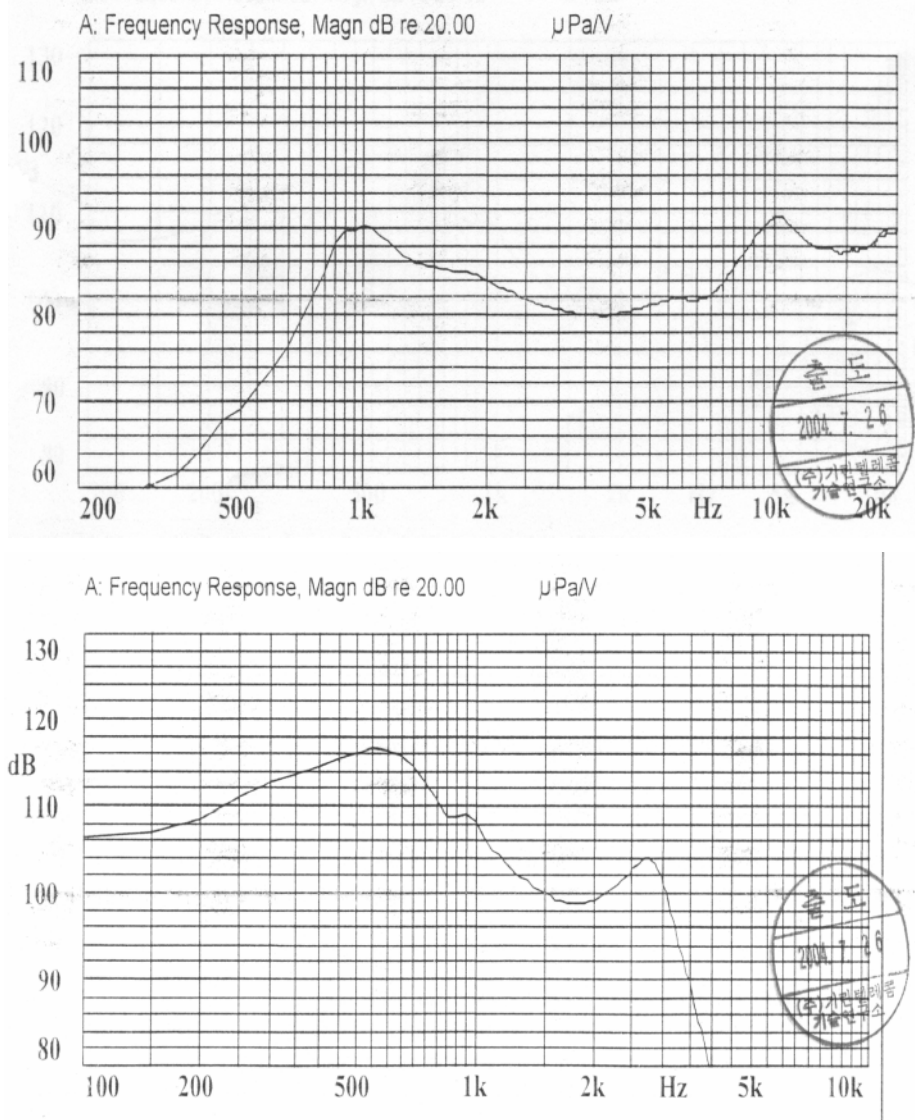
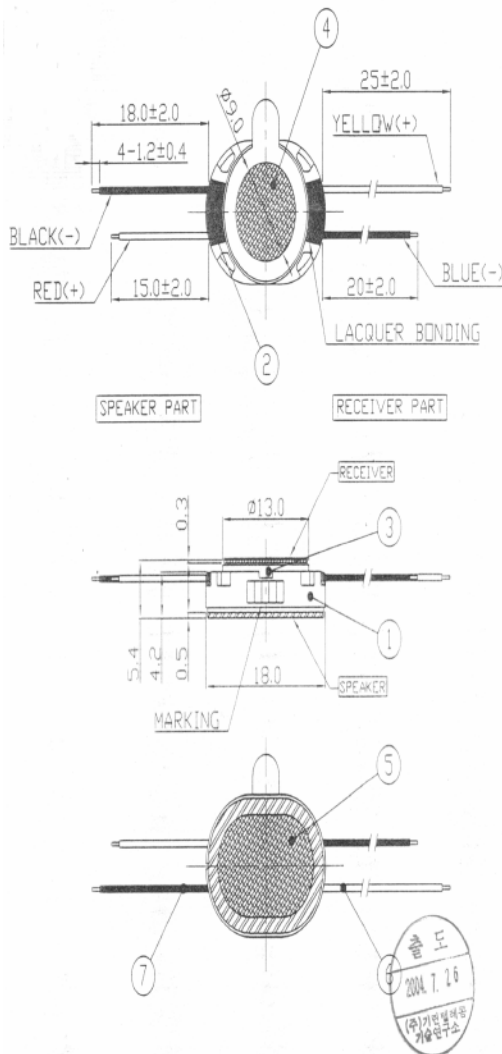


Fig. 3 Mechanical drawing of 1813-TW2 transducers and frequency response of earpiece (down) and loud speaker (up)

These devices are connected to the pass trough pads on the top of the Globe6 display module and to the board display connector by a flexible PCB bus.

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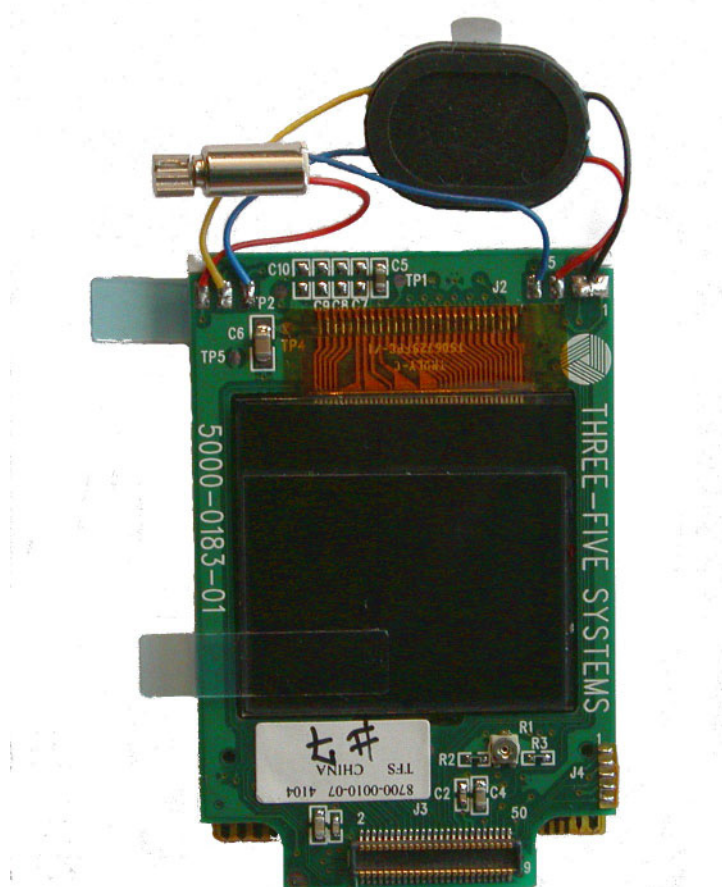


Fig. 4 Display module with Keyrin earpiece/loud speaker transducers soldered on the pass trough pad.

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The stereo earphone is the Vansonic Enterprise Co. VS755S, with two speakers which have 5mW of rated input power and 32 ohm impedance.



Fig. 5 Vansonic VS755S earphone.

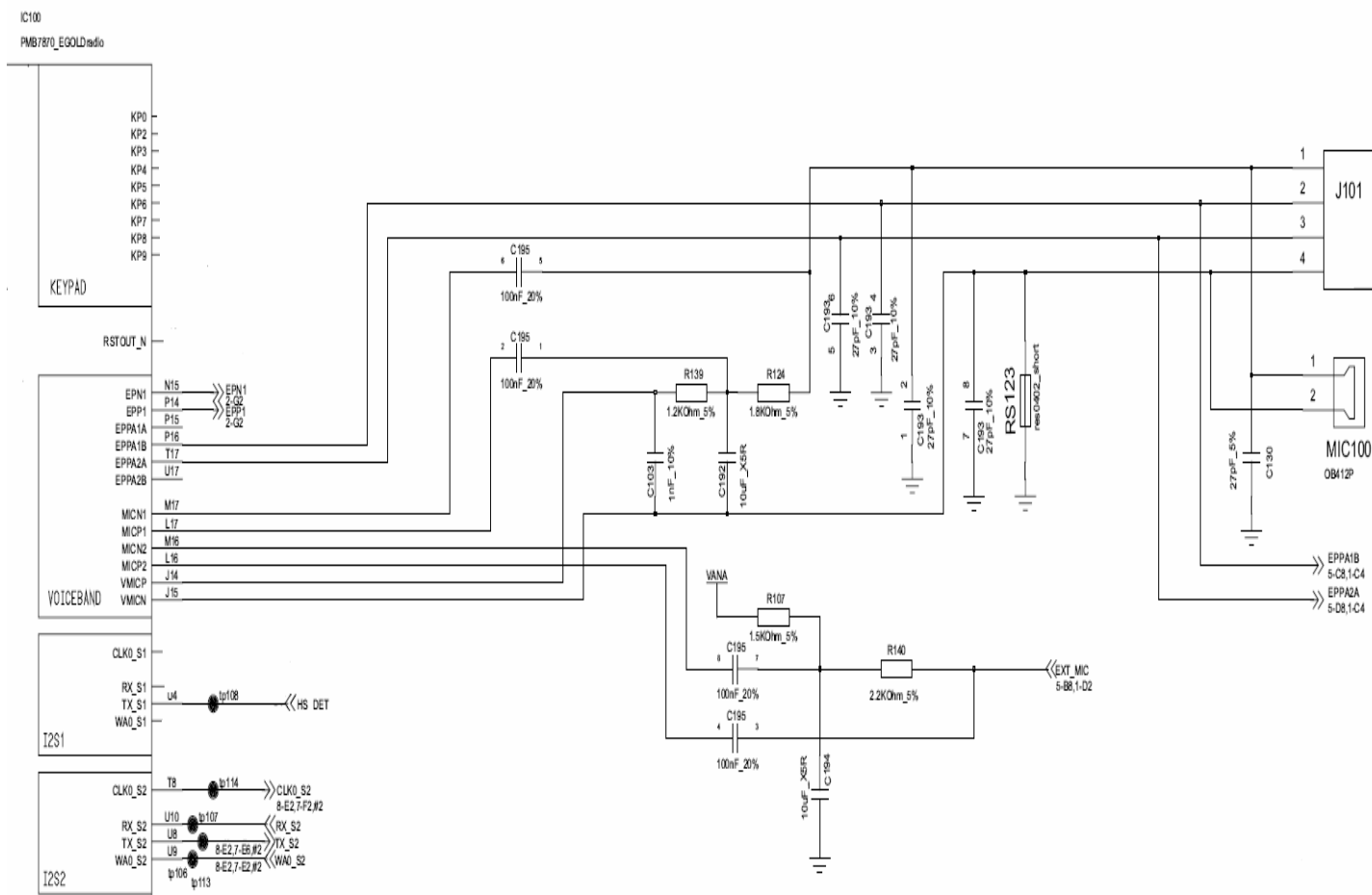
The earphone has integrated microphone with a button for hand free response to a call. Connector is a standard 2,5mm four poles jack.

Handset is a standard KIRK telecom A/S product with RJ11 connector.

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4.3 Normal Mode

When in normal mode, MINCN1 and MINCP1 audio inputs of EGOLDradio are used. They are connected to the OB410P microphone by an R-C circuit (Fig. 6 see R124, R139, C103, C192) which adapts the differential mode inputs of EGOLDradio to the common mode output of the microphone. The internal preamplifier of the microphone is supplied by VMICP pin of the EGOLDradio.



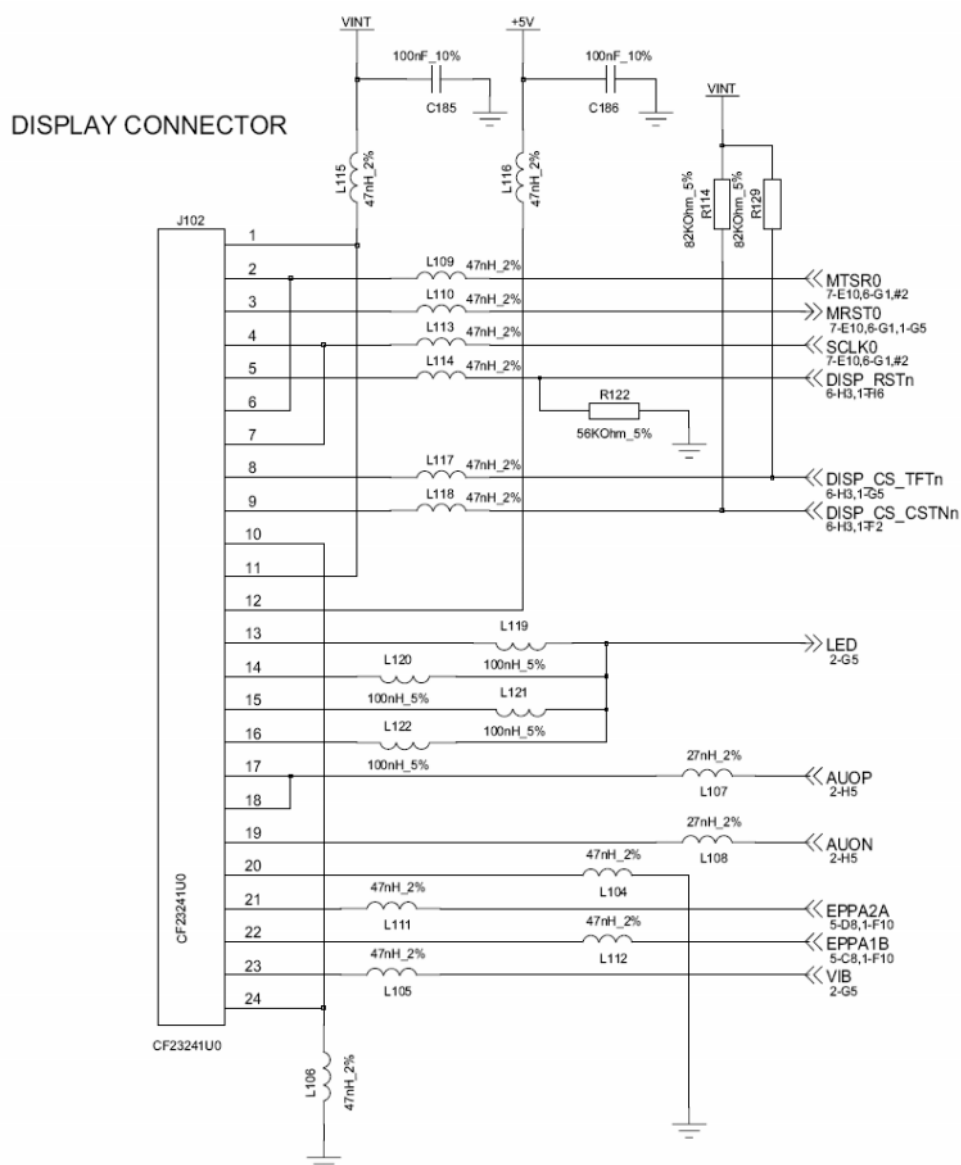


Fig. 7 Display connector scheme with audio lines.

DEVICE	MIC1	MIC2	EPPA	EPP	MAX9850	PMB6814	TEA5761UK
DESCRIPTION	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	Stereo DAC amplifier	EPOWERlite built-in amplifier	FM radio receiver
CONTROL LINES	N.A.	N.A.	N.A.	N.A.	SDA CLK	EP_SDA EP_CLK	SDA CLK
STATE	ON	OFF	ON	OFF	OFF	OFF	OFF

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4.4 Handset mode

Handset RJ11 plug-in connector (Fig. 6 see J201) is connected in parallel with the mic and speaker lines already explained for the normal mode operation.
A 27pF capacitor array (Fig. 6 see C193) is placed close to the connector and performs the RF bypass function.

DEVICE	MIC1	MIC2	EPPA	EPP	MAX9850	PMB6814	TEA5761UK
DESCRIPTION	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	Stereo DAC amplifier	EPOWERlite built-in amplifier	FM radio receiver
CONTROL LINES	N.A.	N.A.	N.A.	N.A.	SDA CLK	EP_SDA EP_CLK	SDA CLK
STATE	ON	OFF	ON	OFF	OFF	OFF	OFF

4.5 Viva voice mode

In viva voice operation mode the mic signal path is the same of the normal mode.

Audio output is provided by the EPP amplifier build into the EGOLDradio. Its EPN1 and EPP1 differential outputs go into the power audio amplifier build into the EPOWERlite PMB6814.

The last has fully differential outputs and variable gain selected by the I2C control of the EPOWERlite.

It provides enough power to supply the Keyrin loud speaker section on its AUOP and AUON outputs.

On the display connector the AUOP line is connected to two parallel pass trough lines of the display module in order to reduce the series resistance.

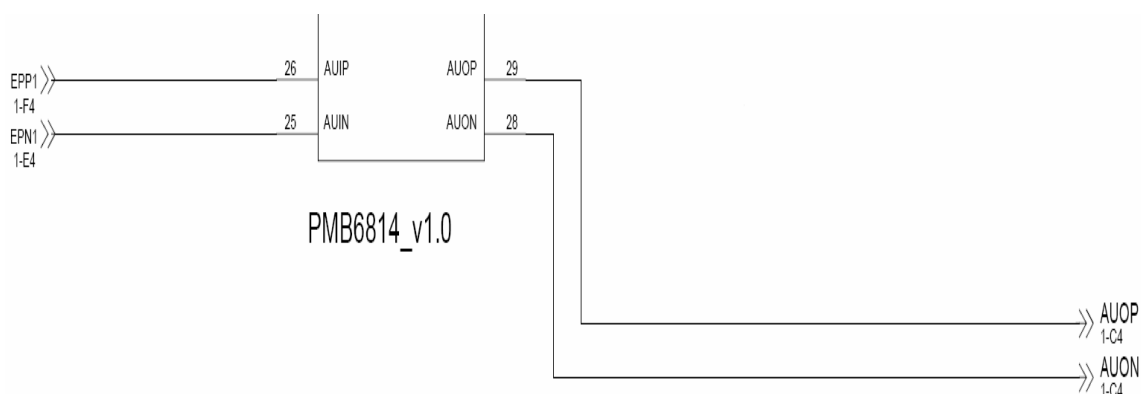


Fig. 8 EPOWERlite audio scheme.

DEVICE	MIC1	MIC2	EPPA	EPP	MAX9850	PMB6814	TEA5761UK
DESCRIPTION	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	Stereo DAC amplifier	EPOWERlite built-in amplifier	FM radio receiver
CONTROL LINES	N.A.	N.A.	N.A.	N.A.	SDA CLK	EP_SDA EP_CLK	SDA CLK
STATE	ON	OFF	OFF	ON	OFF	ON	OFF

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4.6 Hands free mode

The first functionality of the hand free operation mode is to recognize when earphone is inserted into the jack female connector (Fig. 9 see J501). This function is performed by the normally close contact present between pin 1 and pin 2 of the connector. When the jack is inserted this contact is opened and the voltage present on the HS_DET line rise to the VINT value from the previous value fixed by the R516 and R541 resistive divider. The HS_DET signal is connected to the TX_S2 pin of the EGOLDradio which can be programmed to detect with an interrupt the rising and the falling wave-fronts.

Secondly the pressure on the response button in the earphone has to be detected. When the button is pressed it connect together pin 3 and pin 5 (ground) of the jack connector. The line EXT_MIC connected to pin 3 goes through a resistive divider into the M1 EGOLDradio ADC input. In this way EGOLDradio processor can read the voltage value present on EXT_MIC line and detect when it is short-circuited to ground.

When in hands free mode, the MICP2 and MICN2 inputs of EGOLDradio are used. An R-C circuit (Fig. 9 see R107, R140 and C194) adapts the differential mode inputs of EGOLDradio to the common mode output of the microphone which is supplied with VANA voltage by R140 2.2Kohm resistor.

Earphone speakers are connected to the output of a stereo DAC plus audio amplifier MAX9850. It has built in charge pump power supply which generates a negative voltage to eliminate the necessity of decoupling capacitors on the outputs lines. In this way the amplifier has good response at low frequency.

The MAX9850 is controlled by a I2C bus, and has a built in analog mixer a Sigma-Delta stereo DAC with external 3 wire bus digital audio connections, and stereo power amplifier which performs 65mW on a 32 ohm load.

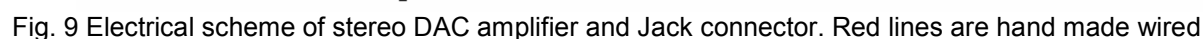
The analog mixer is used as input for the audio signal that comes from FM radio receiver.

Earphone performs also the FM antenna function. The RF signal captured by earphone lines goes into FM_ANT line passing through the C503 capacitors array. The chokes array L503 separates RF signal from audio signals.

Main goal of the MAX9850 is the use of the digital audio connection with the EGOLDradio in order to minimize the TDMA audio noise when GSM call is established. Moreover the built in charge pump power supply minimizes the components amount into the Bill of Material.

DEVICE	MIC1	MIC2	EPPA	EPP	MAX9850	PMB6814	TEA5761UK
DESCRIPTION	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	EGOLDradio built-in	Stereo DAC amplifier	EPOWERlite built-in amplifier	FM radio receiver
CONTROL LINES	N.A.	N.A.	N.A.	N.A.	SDA CLK	EP_SDA EP_CLK	SDA CLK
STATE	OFF	ON	OFF	OFF	ON	OFF	OFF

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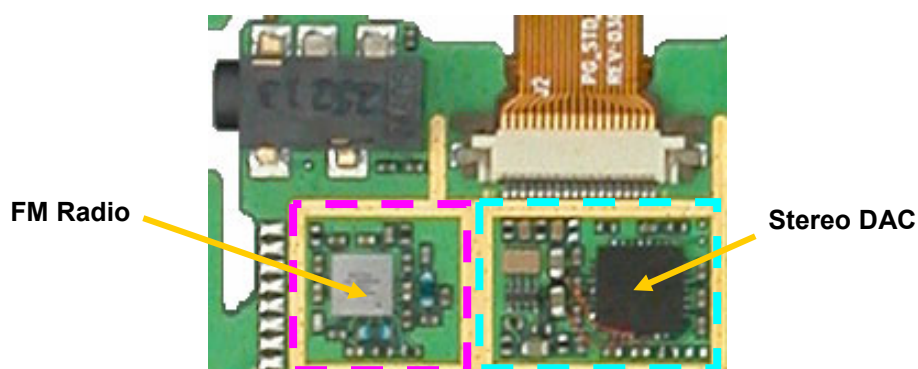


Fig. 11 Board implementation of FM radio and stereo amplifier circuit.

5 Document change report

Change Reference			Record of changes made to previous released version	
Rev	Date	CR	Section	Comment
1.0	11/01/2006	N.A.		First release

6 Approval

Revision	Approver(s)	Date	Source/signature
1.0	Massimo Vlacci	30/01/2006	Document stored on N7 server

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