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ELECTRICAL SPECIFICATIONS

CK-1W(FREDDIE)(Freddie) car kit
12 NC xxxx xxx xxxxx

CLASS N°	**ELECTRICAL SPECIFICATIONS Car kit CK-1W(FREDDIE) (Freddie)**			~~Draft V0.1~~	~~27/08/2004~~	
				~~Draft V0.2~~	~~24/09/2004~~	
				Draft V0.3	28/09/2004	
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1 Updates

Date	Change
27/08/04	Creation draft V0.1
24/09/04	Update 29/04/04 V0.2
28/09/04	V 0.3 update at Nokia reviewed in Le Mans

2 General description

2.1 General overview

This document describes the electrical specifications for the CK-1W(FREDDIE)

This CK-1W(FREDDIE) consists of one single PCB containing the following functions :

- Base Band part (OM6780)
- RF part (BGB947)
- Audio part (CODEC PCF87757) amplifier (TPA3007)
- Power supply

For more information, please consult the schematics and the part list :

- Schematics CAR KIT BLUETOOTH 1_FRED 12 NC : 3111 283 30121
- Part list of the Fred Car kit main board 12 NC : 3111 288 06690

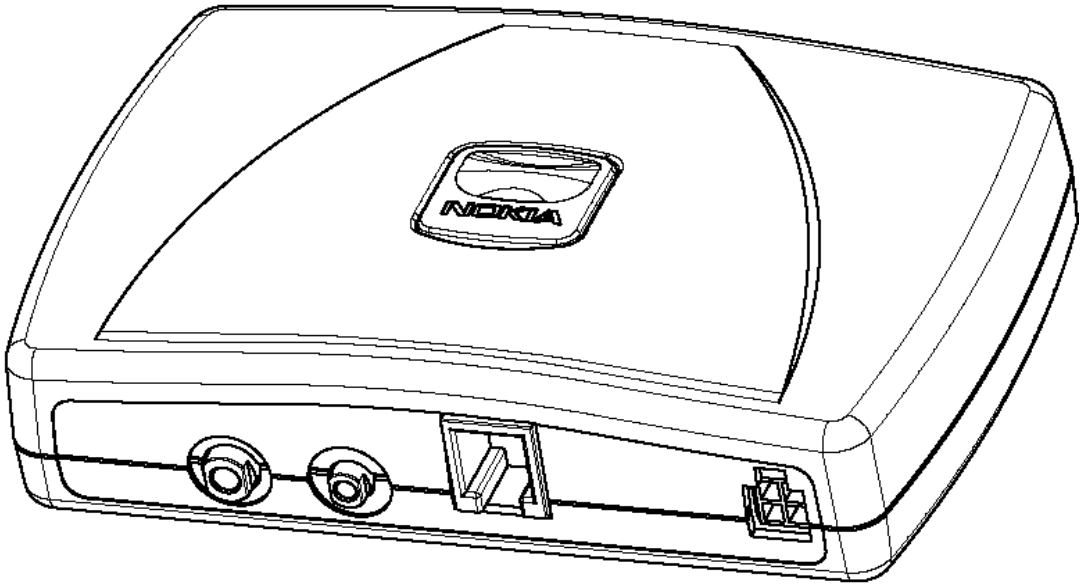
PF codes in the partlist

CK-1W(FREDDIE)			
PCB CK-1W(FREDDIE)	200	EMC, Safety	2A0
Housing	280	Audio Amplifier	2C0
Packaging	290	Shielding	247
Radio	240	Power supply	2B0
~~Antenna~~	~~243~~	~~Base band power supply~~	~~2B5~~

		Base Band	2R0

2.2 Outlook of the CK-1W(FREDDIE)

The car installation CK-1W(FREDDIE) includes a Remote Control Button CU-2 a Microphone HFM-8 which is connected to the HF-2W (to be decided) (Main Box unit) with a cable. The speaker (HFS-12) volume of the CK-1W(FREDDIE) can be controlled with a rotary switch in the CU-2. It is also possible to answer a call, to redial or activate the phone's voice recognition function by pressing a send/end push button in the CU-2. The supply of the car kit is provided by the power supply cable CA-7P.



3 Main features

Bluetooth full compatible protocol (V1.1) Hands Free Profile V1.0

10 meters range (out-door).

10.8 Volts to 16 Volts supply Voltage.

4 Key components

4.1 Key components used in CK-1W(FREDDIE)

OM 6780	Philips Semicondutor Bluetooth baseband controller
TPA3007	Texas instrument Audio Amplifier
BGB947	Bluetooth Radio Module

4.2 Risks of key components

- All components are in mass production except the TPA3007 which is a cost down version of the TPA3001.

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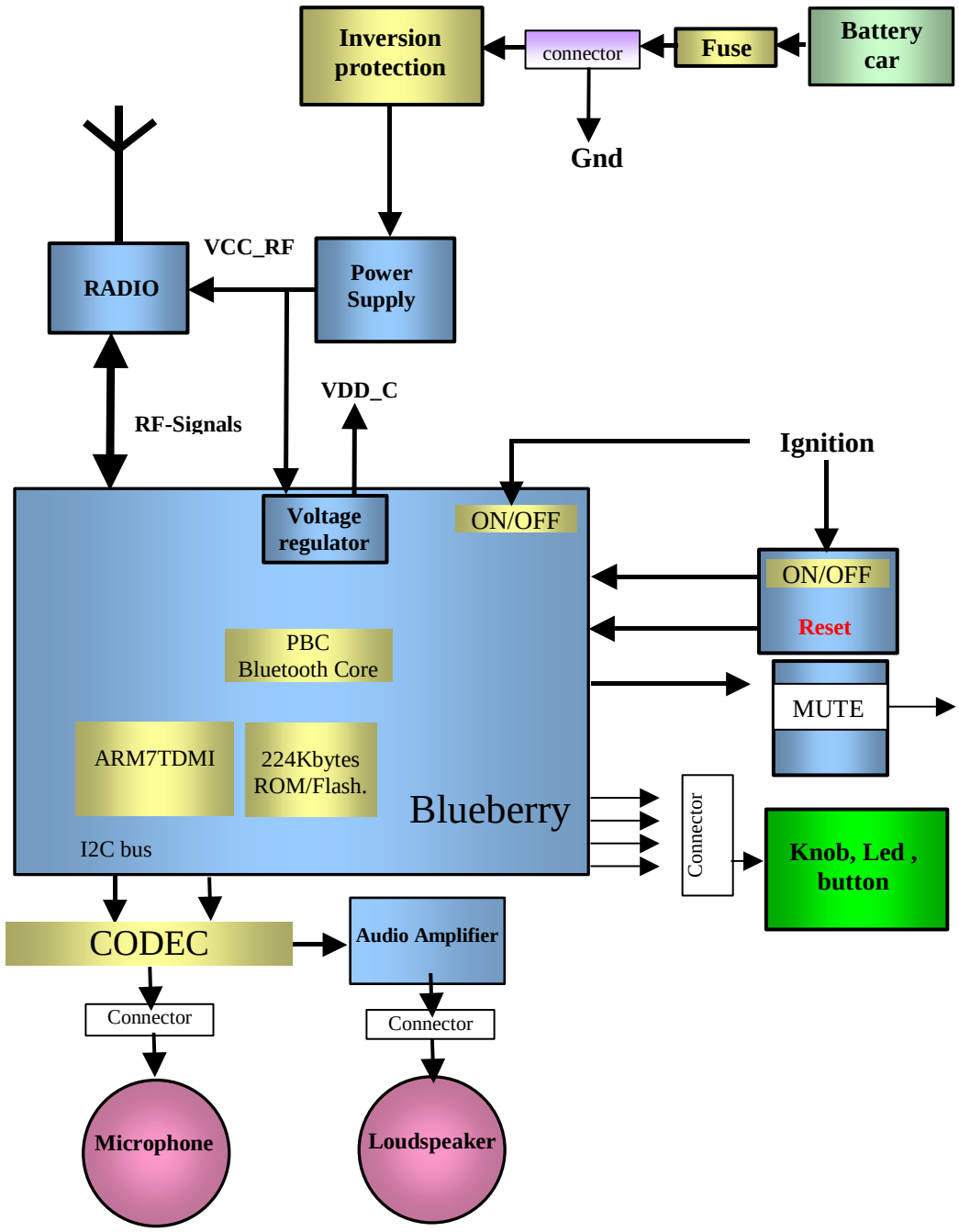
5 CK-1W(FREDDIE) block diagram



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6 Physical and mechanical data

6.1 Dimensions

The size of the PCB: 74 mm x 110 mm one sided 4 layers PCB, V0, FR4, class 6B.

6.2 Marking

There will be no special marking on the PCB.

7 Environmental and reliability data

7.1 General

The CK-1W(FREDDIE) is designed to ensure that it meets all requirements imposed upon in relation to its environment. Please consult the **Quality Development Plan** for more details or test and spec that the product will pass

7.2 Climatic conditions

The CK-1W(FREDDIE) will full fill all these conditions:

Parameter	Specification
Temperature range	
Storage	-40 to 85 °C
Operating permanent	-25 to 55 °C
Maximum temperature change rate	
Storage	10 °C per hour
Operating	10 °C per hour
Relative humidity	
Storage	5 to 95 %
Operating	5 to 95 %
Humidity change rate	
Storage	10 % per hour
Operating	10 % per hour

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7.3 Mechanical conditions

The construction requirement for such equipment is according to Philips standard UAN-D636.

7.4 Atmospheric and other conditions

The CK-1W(FREDDIE) is accordance to Nokia requirement DHT 587, TPR V2.2, for the list of tests, please consult the **Quality Development plan Fred**

7.5 Safety requirements

The CK-1W(FREDDIE) is in accordance with the regulations of EN 60 950.

7.6 Electrical

The CK-1W(FREDDIE) is classified as Class II equipment and conforms to EN 60 950.

7.7 Inflammability

Materials used in the construction of the CK-1W(FREDDIE) are in accordance with the regulations of EN 60 950. The PCB is in V0 material.

7.8 Electromagnetic compatibility

The CK-1W(FREDDIE) is classified as Class B equipment and is designed to meet the requirements of ETS 300 329, FCC part 15 and the ICC spec with respect to both radiated and conducted interference.

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8 Electrical data

8.1 CK-1W(FREDDIE) current consumptions

Parameter	Condition	Specification			Unit
		Min	Typ	Max	
Standby current (idle – unconnected)			5	10	mA
Locked standby current (off mode)			2	5	mA
Talk current			500	1500	mA
IGNITION OFF			0.5 mA		
Sniff parameter			500 ms sniff		

8.2 CK-1W(FREDDIE) RF specifications

Parameter	Value
Frequency range	2400 ... 2483 MHz ISM band
Channel spacing	1 MHz
Number of RF channels	79
Transmit power	0 dBm, nominal
Operation mode	TDD (Time Division Duplex), frequency hopping
Modulation	GFSK (Gaussian Frequency Shift Keying)
Receiver sensitivity	< -70 dBm BER < 0.1%

9 Power supply chain

9.1 Power supply concept

The power supply is coming from the power supply connector. A high voltage power transistor is protected the product against automotive environment load dump. A diode is protecting the product against polarity protection. A regulator generates a 3.2 Volts supply. This regulator has got a low current consumption with no load, like this we are achieving the IGINITION OFF power consumption. The Audio power amplifier is directly supply by the car battery voltage.

9.2 Power supply specifications

9.2.1 Output voltages

Name of the Output	For	Min	Value (volts)	Max
VCC_12V	Audio amplifier	Car battery voltage	12	Car battery voltage
VCC_RF	Radio	2.9	3.1	3.3
VCC_B	Base Band memory	1.7	1.8	1.9
VMIC	Microphone amplifier supplier	1.7	1.8	1.9

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10 Acoustics & Audio amplifier

10.1 CK-1W(FREDDIE) audio characteristics

TABLE WRONG FIGURE INVERTED

Parameter	Condition		Specification			Unit
			Min	Typ	Max	
Sending loudness rating SLR			16	20	24	dB
Sending distortion	- 6dBm0, 1Khz			0.1	0.4	%
Receiving loudness rating RLR		Level 1		+12		dB
		Level 2		+ 10		dB
		Level 3		+ 6		dB
		Level 4		+ 4		dB
		Level 5		Nominal +2		dB
		Level 6		0		dB
		Level 7		- 2		dB
		Level 8		-4		dB
		Level 9		- 6		dB
		Level 10		- 8		dB

10.2 Acoustic interface

There are 2 different acoustic parts.

- A loudspeaker connected to the output of the audio amplifier.

- A microphone connected to AIP and AIN through a polarisation circuit: the power supply is given by the VREF output of the Blueberry, which is regulated and compensate in temperature.

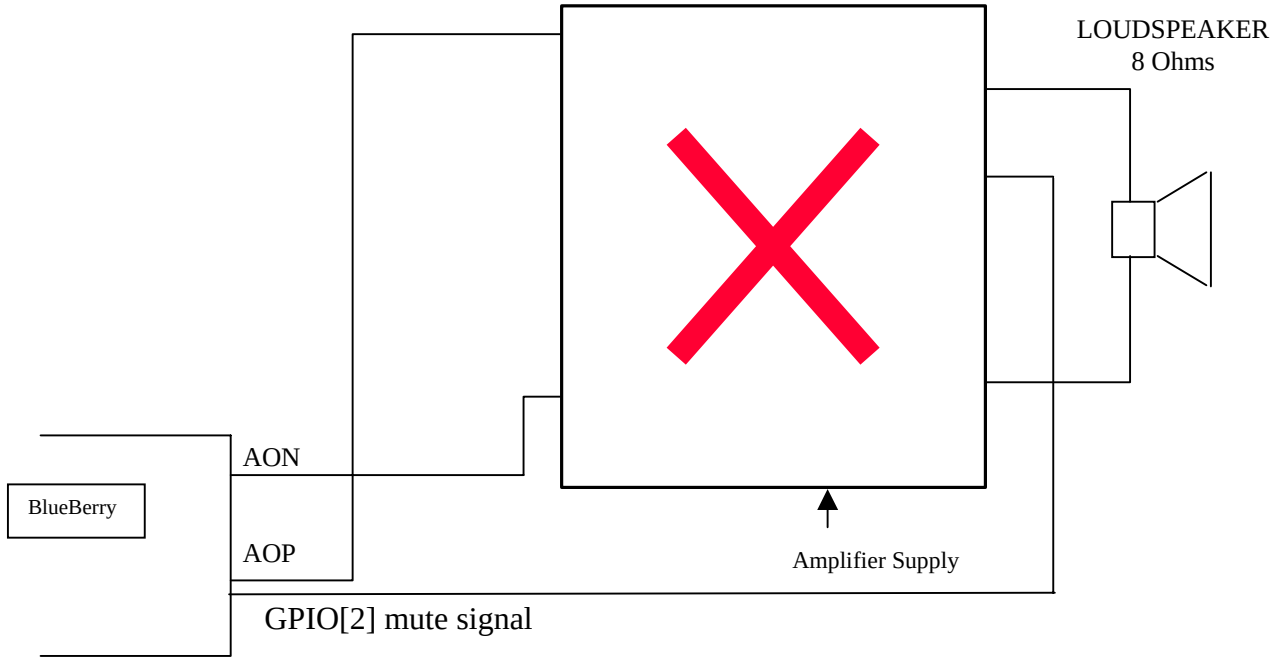
All this audio inputs and outputs can be turned on and off by software.

10.2.1 Limiting values

Device	Référence	Acoustic Characteristics	ø (mm)	Z (ohms)	Power ratings at 1khz Max THD 10% / Peak
Loudspeaker	Fooster	89 +/-2 dB at 1W/1m / aver. freq		8	3 watts
Microphone		Sensit. -42dB Consump. 350uA max Note : +/- 4 dB if AKG +/- 3 dB if other	9.7	2.2k	-

10.2.2 Principle

We use a class D power amplifier. The advantage of this technology is that no heat sink is required. This allowed the CK-1W(FREDDIE) unit to be fully functional and even during heavy load test at high temperature + 55 degrees. This is an audio amplifier used in a bridge configuration. The mute/stand bye is controlled by the GPIO[2] on the blueberry.



Audio amplifier block diagram

Several capacitors and filtering is inserted in order to get the good audio characteristic. These are low pass filter in the input of the amplifier and also LC low pass filter in the output. Please consult the schematics for more details.

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10.2.3 Electrical specification

Parameter	Min	typ	Max	notes	
Output noise Noise		140	300		uVrms
Ouput voltage		1.4	5	VAC rms (differential), load 8 ohm. NOTE! SPL of speaker must never exceed 118dB at 1 meter.	Vac
Stand-bye mute current			100		uA
Thermal resistance from jonction to case		3			K/W
Output power THD = 1% R= 4 Ohms		3			W

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11 Reset Circuit

11.1 Principle

If the Software of the base band controller is not responding, we must be able to make a reset. The push button of the remote control is used for this. If we press 10 seconds then the White LED will blink with a Ton = Toff period = 200 ms during 5 seconds. The hardware reset will be performed just before the LED blinking starts. Also the all bluetooth subscription will be lost. Bluetooth subscription will be only erased after such a reset. The user can make the reset only when the signal IGNS is OFF.

12 Application information

12.1 BLUEBERRY chip (PCF87552)

The Blueberry chip is the main component of the base band. It includes an ARM7TDMI controller, a Philips Bluetooth Core, a 32 KRAM, a 324k ROM/FLASH, an SBC codec. Its voltage range is 1.8 to 3.6V. It's a LFBGA81 package. For more details, see the *Blueberry datasheet.*

12.2 Crystal specifications

For BLUETOOTH applications, the radio specifications concerning the HF1W set a maximum reference clock frequency variation to 30 ppm from - 30°c to 85°c.

The reference clock can be fine tuned by means of the RX-TUNE register. This setting allows to correct a clock frequency deviation up to +/-50ppm with a +/-1ppm accuracy.

The A.F.C. (Automatic Frequency Control) algorithm used by the CK-1W(FREDDIE) software allows is offereing the feature of keeping the CK-1W(FREDDIE) crystal frequency within the tolerance. This compensation is working via a temperature measurement and a timing measurement made by the PBC. For more details, see the ***Temperature_software_specification.doc***

The crystal used on the CK-1W(FREDDIE) has the following characteristics:

- Frequency: 13.000Mhz
- Tolerance @ 25°C: +/- 15 ppm
- Tolerance from – 10 °C to +60 °C : +/- 15 ppm
- Aging: +/- 5ppm
- Packaging: tbd (supplier NDK)
- C_load: 18pF
- Drive level: 1mW

-> The maximum deviation according to the temperature and the aging is +/-25ppm.

12.3 Temperature measurement.

The Blueberry is measuring the PCB temperature via its internal temperature sensor or the one being integrated inside the codec. Like. This temperature compensation is used to change base band and radio parameter.

12.4 Port definition TO BE UPDATED

See also the CK-1W(FREDDIE) Synoptic document: ***190_car_kit_synoptic.doc***.
This pinning concerns the PCx87750 BGA 81pins version

Pin	Name	I/O	Reset state	Supply domain	Active state / function
			UART		
G7	CTS_UART	I	I pull up	VDDIO2A	Selftest if connected to ground
G6	RTS_UART	O	I pull up	VDDIO2A	Not used
G9	TXD_UART	O	I pull up	VDDIO2A	Transmit UART
G8	RXD_UART	I	I pull up	VDDIO2A	Receive UART
			JTAG		
B9	TCK	I	I pull down	VDDIO2A	JTAG test clock
C7	TMS	I	I pull up	VDDIO2A	JTAG test mode select
D7	TDI	I	I pull up	VDDIO2A	JTAG test data input
D8	TDO	O	O tri state	VDDIO2A	JTAG test data output
			Reset		
F6	NRESET	I	I pull up	VDDIO2	Reset input
			RF interface		
E1	T_DATA	O	undefined	VDDA	Transmit data output
F1	R_DATA	I		VDDA	RF data in
E2	RSSI	I		VDDA	RSSI input
D2	SIF_DATA	O	O low	VDDIO1	Serial Interface data
C1	SIF_CLK	O	O low	VDDIO1	Serial Interface Clock
F4	SIF_EN	O	O low	VDDIO1	Serial Interface Enable
D1	REF_CLK	O	O low	VDDIO1	Ref. Clock for Synthesiser
B1	RF_SIG4	O	O low	VDDIO1	RF timing output[4]
B2	RF_SIG3	O	O low	VDDIO1	RF timing output[3]
D3	RF_SIG2	O	O low	VDDIO1	RF timing output[2]
			Audio interface		
J4	AON	O	undefined	VDDA	Analogue output negative, audio CODEC
J5	AOP	O	undefined	VDDA	Analogue output positive, audio CODEC
J7	AIN	I		VDDA	Analogue input negative, audio CODEC
J6	AIP	I		VDDA	Analogue input positive, audio CODEC
J8	VMIC	O	undefined	VDDA	Electrec microphone voltage supply (VREF = 2V)
J9	VBGP	O	active	VDDA	Band gap voltage (VBGP = 1.25V)
			Power management		
H9	VBAT	I		VDDA	Power supply voltage measurement input
G5	VANLI	I/O	I	VDDA	Voltage input auxiliary AD converter
F5	VANLO	O	undefined	VDDA	Analogue output from auxiliary DA converter

G3	VR1_CTRL	O	O low	VDDA	Analogue control output of voltage regulator 1 control unit
G4	VR2_CTRL	O	O low	VDDA	Analogue control output of voltage regulator 2 control unit
H3	PWR_Switch	O	Pull up	VDDIO1	Power switch control output for DC/DC converter
E7	EXTWakeup	I		VDDIO2A	Wake up input signal for EBC
Key board management					
A1	GPIO14	I/O	I pull up	VDDIO1	Volume down - C1 - (active on Low level)
A2	GPIO15	I/O	I pull up	VDDIO1	Multifunction - C2 - (active on Low level)
A3	GPIO16	I/O	I pull up	VDDIO1	Volume up - C3 - (active on Low level)
LED White colour management					
A6	GPIO7	I/O	I pull up	VDDIO1	L1 = White LED ON, (4mA)
A7	GPIO8	I/O	I pull up	VDDIO1	
Phone Charger Management					
D9	GPIO2	I	I pull up	VDDIO2B	For extended application
F9	GPIO4	O	I pull up	VDDIO2B	L = charge is OFF H = charge is ON

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13 Annexes

13.1 Reference documents

- ***Temperature_software_specification.doc*** D.Glavier 28 Sept 2001