EMDB6812 V1.1 MANUAL

VERSION 1.0

CONTENTS

1. INTRODUCTION

This document describes EMDB6812 Demoboard for EM6812 microcontroller.
This board contains a Flash EM6812 microcontroller and additional parts to evaluate EM6812 product and test your application.
You will be able to :

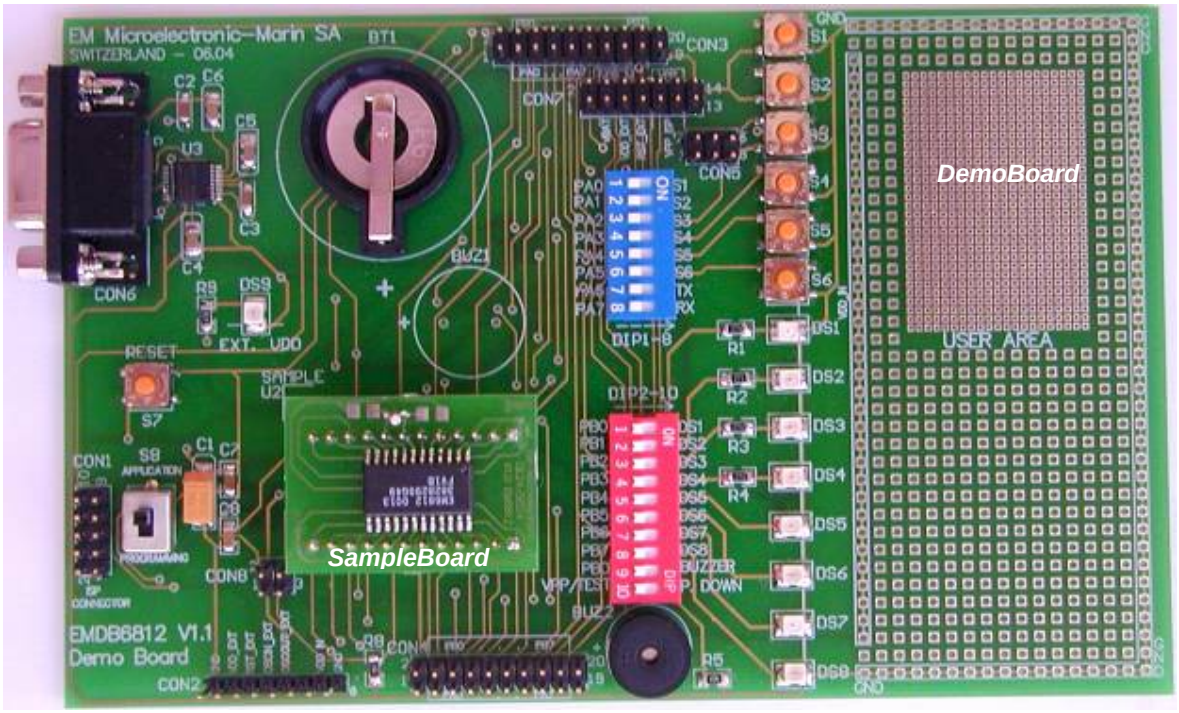
- Program with external programmer the Flash EM6812 through the dedicated In-System-Programming connector or by On-Socket insertion mode
- Evaluate or run your application with the help of the existing components assembled on the board (push-button, leds, buzzer, RS232 interface, switches) and open extensions (connectors, user area).

2. HARDWARE DESCRIPTION

2.1 PARTS

The EMDB6812 is based on two PCBs :

- Main board (DemoBoard 6812)
- Socket for EM6812 Flash microcontroller (SampleBoard 6812)

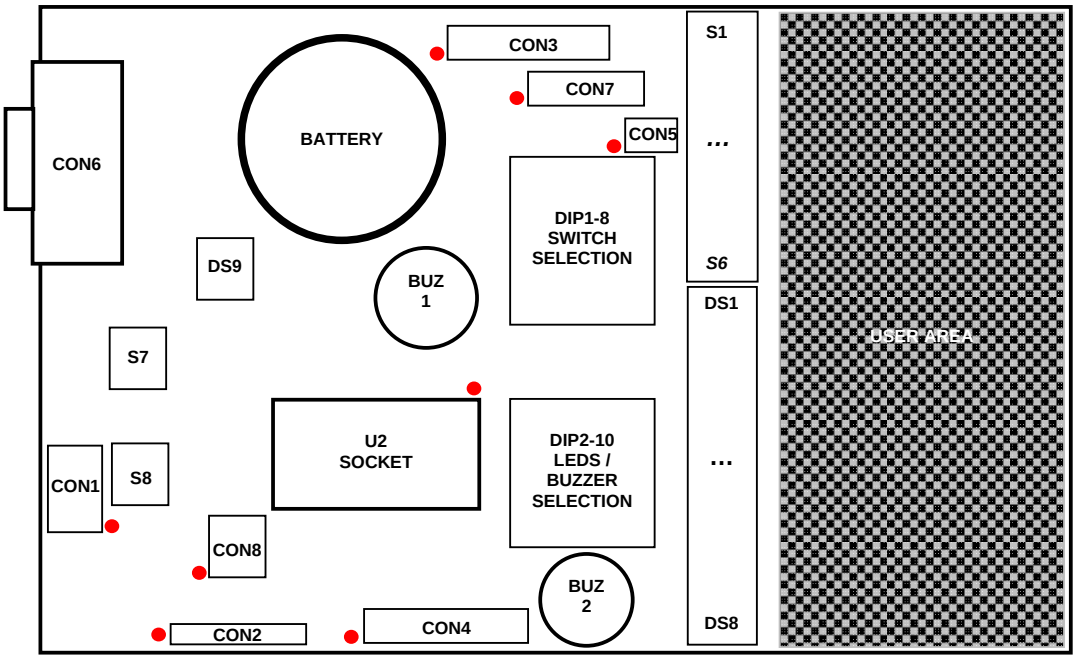


2.2 HARDWARE BOARD VERSIONNING

DemoBoard V1.1
SampleBoard V1.0

2.3 DEMOBOARD DESCRIPTION

PCB size : 160 mm x 100 mm



USER AREA	Free user area (2.54 mm and 1.27 mm) with power lines (GND and VDD_IN)
S1…S6	6 Push-Buttons connected to PA0…PA5 through DIP1-8 switches
DS1…DS8	8 Low-power red leds connected to PB0…PB7 through DIP2-10 switches
BUZ1/BUZ2	Buzzers connected to PB0 through DIP2-10 switches
DIP1-8	Switches for S1…S6 connections (PA0…PA5), RX (PA6), TX (PA7)
DIP2-10	Switches for DS1…DS8 connections (PB0…PB7), Buzzers (PB0), pull-down (VPP_TEST)
BATTERY	Battery socket (2032)
U2	Socket (DIL24) for Sample Board
DS9	Low-power red led connected to EXT_VDD
S8	Switch for programming / application mode
S7	Reset Push-Button
CON1	In-System-Programming connector
CON2	User connections (Ground, Power, Reset, …)
CON3 & CON4	Port A, Port B user connector
CON5	User connections (Ground, Power, Reset)
CON6	DB9 connector for RS232
CON7	Power / Reset configuration connector
CON8	External oscillator connections

2.3.1 Connector description

2.3.1.1. CON1

In-System-Programming connector (compatibility Elnec programmer ISP cable)
Header 2x5 male – 2.54 mm

1	Power	VDD_IN	EM6812 VDD supply
2	X	N.C.	No Connect
3	In	RST_EXT	External reset
4	X	N.C.	No Connect
5	X	N.C.	No Connect
6	Inout	SDIO	Data IO program.
7	Power	GND	Ground
8	In	SCLK	Clock program
9	Power	GND	Ground
10	Power	VPP/TESTISP	VPP/TESTISP program.

2.3.1.2. CON2

User connector
Header 1x8 male – 2.54 mm

1	Power	GND	Ground
2	Power	VDD_EXT	External VDD supply
3	In	RST_EXT	External reset
4	In	OSCIN_EXT	External OSCIN connection
5	In	OSCOUT_EXT	External OSCOUT connection
6	X	N.C.	No Connect
7	Power	VDD_IN	EM6812 VDD supply
8	Power	GND	Ground

2.3.1.3. CON3, CON4

Port user connector
Header 2x10 male – 2.54 mm

1	Power	GND	Ground
2	Power	GND	Ground
3	Inout	PA0	Port A bit 0
4	Inout	PB0	Port B bit 0
5	Inout	PA1	Port A bit 1
6	Inout	PB1	Port B bit 1
7	Inout	PA2	Port A bit 2
8	Inout	PB2	Port B bit 2
9	Inout	PA3	Port A bit 3
10	Inout	PB3	Port B bit 3
11	Inout	PA4	Port A bit 4
12	Inout	PB4	Port B bit 4
13	Inout	PA5	Port A bit 5
14	Inout	PB5	Port B bit 5
15	Inout	PA6	Port A bit 6
16	Inout	PB6	Port B bit 6
17	Inout	PA7	Port A bit 7
18	Inout	PB7	Port B bit 7
19	Power	GND	Ground
20	Power	GND	Ground

2.3.1.4. CON5

User connector
Header 2x3 male – 2.54 mm

1	Power	GND	Ground
2	Power	VDD_EXT	External VDD supply
3	In	RST_EXT	External reset
4	Power	VDD_IN	EM6812 VDD supply
5	Power	GND	Ground
6	X	N.C.	No Connect

2.3.1.5. CON6

RS232 User connector
DB9 female

1	X	N.C.	No Connect
2	Out	TX	RS232 Transmitter output
3	In	RX	RS232 Receiver input
4	X	N.C.	No Connect
5	Power	GND	Ground
6	X	N.C.	No Connect
7	X	N.C.	No Connect
8	X	N.C.	No Connect
9	X	N.C.	No Connect

2.3.1.6. CON7

Configuration connector
Header 2x7 male – 2.54 mm

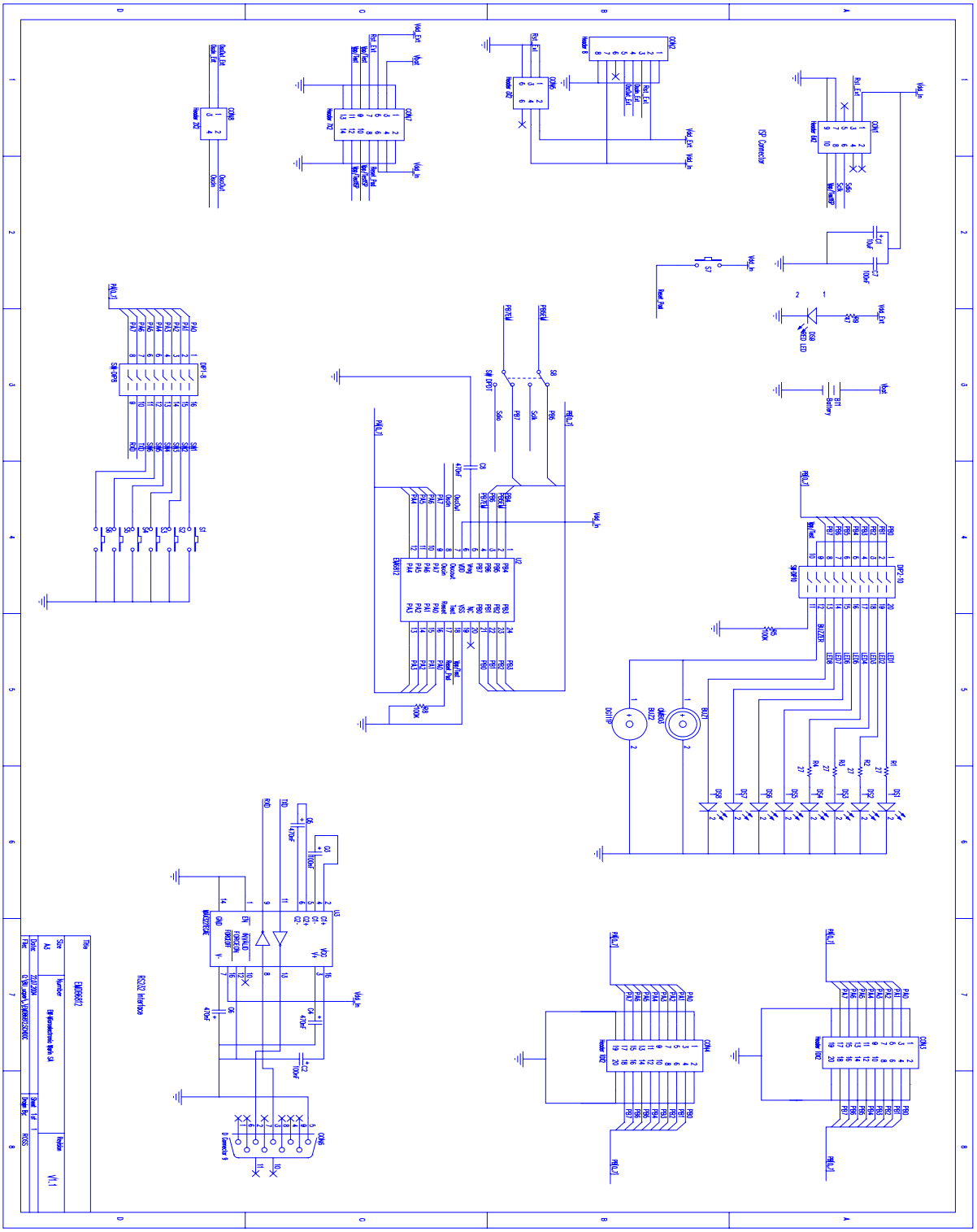
1	Power	GND	Ground
2	Power	GND	Ground
3	Power	VBAT	Battery power supply
4	Power	VDD_IN	EM6812 VDD supply
5	Power	VDD_EXT	External VDD supply
6	Power	VDD_IN	EM6812 VDD supply
7	In	RST_EXT	External reset
8	In	RESET_PAD	EM6812 reset
9	Power	VPP/TEST	EM6812 VPP/TEST
10	Power	VPP/TESTISP	VPP/TESTISP program.
11	Power	VPP/TEST	EM6812 VPP/TEST
12	Power	VPP/TESTISP	VPP/TESTISP program.
19	Power	GND	Ground
20	Power	GND	Ground

2.3.1.7. CON8

External oscillator connector
Header 2x2 male – 2.54 mm

1	In	OSCOUT_EXT	External OSCOUT connection
2	In	OSCOUT	EM6812 OSCOUT connection
3	In	OSCIN_EXT	External OSCIN connection
4	In	OSCIN	EM6812 OSCIN connection

2.3.2 Demoboard Schematic



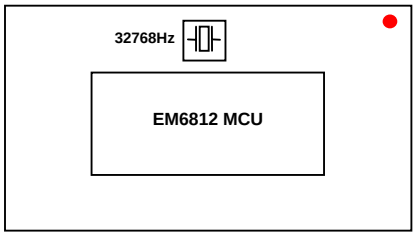
2.4 SAMPLE BOARD DESCRIPTION

PCB size : 35.56 mm x 24.88 mm

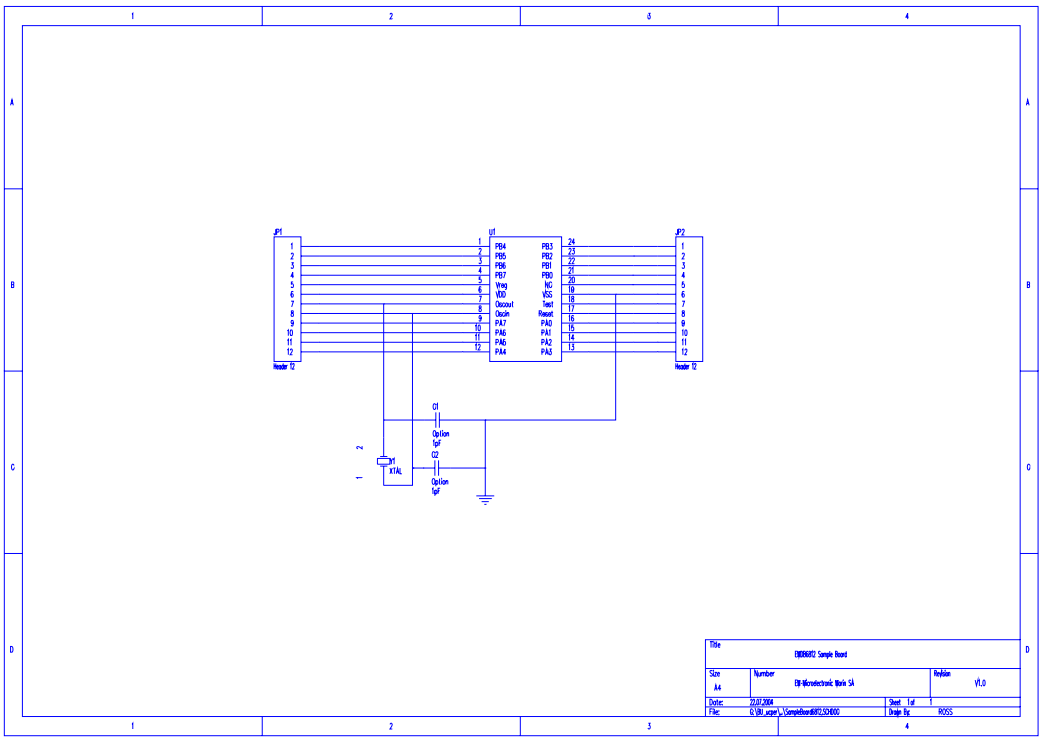
Existing SampleBoard are one to one wired converter :

- DIL24 (600 mils width) to SOIC24(1.27 mm pitch – 300 mils body width)
- DIL24 (600 mils width) to TSSOP24 (0.65 mm pitch – 4.4mm body width)

Each SampleBoard contains an EM6812 Flash Microcontroller and a Crystal 32768 Hz.



2.4.1 SampleBoard schematic



2.5 PARTLIST

Description	Designator	Footprint	Value	Constructor	Ref Constructor
Battery Support for Typ 2032	BT1	BAT-2		KEYSTONE	
Polarized Capacitor (Surface Mount)	C1	2917	10uF		
Polarized Capacitor (Surface Mount)	C2	1206	100nF		
Polarized Capacitor (Surface Mount)	C3	1206	100nF		
Polarized Capacitor (Surface Mount)	C4	1411	470nF		
Polarized Capacitor (Surface Mount)	C5	1411	470nF		
Polarized Capacitor (Surface Mount)	C6	1411	470nF		
Capacitor (Semiconductor SIM Model)	C7	1206	100nF		
Capacitor (Semiconductor SIM Model)	C8	1206	470nF		
Header, 5-Pin, Dual row	CON1	HDR2X5			
Header, 8-Pin	CON2	HDR1X8			
Header, 3-Pin, Dual row	CON5	HDR2X3			
DB9, Right Angle	CON6	DSUB1.385-2H9			
Header, 7-Pin, Dual row	CON7	HDR2X7			
DIP Switch	DIP1-8	DIP-16		Multicomp	MCNDI-08S
DIP Switch	DIP2-10	DIP-20		Multicomp	MCNDI-10S
RED GaAs LED	DS1	LED		Temic	TLMT3100
RED GaAs LED	DS2	LED		Temic	TLMT3100
RED GaAs LED	DS3	LED		Temic	TLMT3100
RED GaAs LED	DS4	LED		Temic	TLMT3100
RED GaAs LED	DS5	LED		Temic	TLMT3100
RED GaAs LED	DS6	LED		Temic	TLMT3100
RED GaAs LED	DS7	LED		Temic	TLMT3100
RED GaAs LED	DS8	LED		Temic	TLMT3100
RED GaAs LED	DS9	LED		Temic	TLMT3100
Header, 10-Pin, Dual row	CON3	HDR2X10			
Header, 10-Pin, Dual row	CON4	HDR2X10			
Header, 10-Pin, Dual row	CON8	HDR2X10			
Resistor	R1	1206	27		
Resistor	R2	1206	27		
Resistor	R3	1206	27		
Resistor	R4	1206	27		
Resistor	R5	1206	100K		
Resistor	R8	1206	100K		
Resistor	R9	1206	47		
Switch	S1	SPST-2		ITT Canon	KSC421J
Switch	S2	SPST-2		ITT Canon	KSC421J
Switch	S3	SPST-2		ITT Canon	KSC421J
Switch	S4	SPST-2		ITT Canon	KSC421J
Switch	S5	SPST-2		ITT Canon	KSC421J
Switch	S6	SPST-2		ITT Canon	KSC421J
Switch	S7	SPST-2		ITT Canon	KSC421J
Switch	S8	DPDTOS2020		ITT Canon	OS202011MS2QN1
Low profil support 600 Mils DIL24	U2	DIP24			
RS-232 Transceiver with AutoShutdown	U3	SSO-G16/X.4		Maxim	MAX3221CAE

3. HARDWARE CONFIGURATION

3.1 POWER-SUPPLY

EM6812 samples can be powered (VDD_IN) with two different sources :

- Battery : VBAT
- External Power-supply : VDD_EXT

Selection is done with a jumper configuration on CON7

	Jumper CON7-3 / CON7-4	Jumper CON7-5 / CON7-6
Battery configuration	ON	OFF
External configuration	OFF	ON

VBAT :

- Requires CR2032 3V battery in socket BT1
- Can be measured on CON7-3

VDD_EXT :

- Can be applied or measured on CON2-2 and CON5-2
- When applied will light on DS9 red led

VDD_IN / IDD_IN:

- VDD_IN is the operating power supply for the EM6812
- IDD_IN current measurement can be done by placing ammeter between CON7-3 / CON7-4 (Battery source) or CON7-5 / CON7-6 (External source)

Notes :

1. For In-System-programming step refer to ISP programming application note for power-supply details. Safe operation procedure is to apply VDD_IN EM6812 from the programmer power-supply (CON1) : No other VBAT and VDD_EXT supplied and no load on the In-System-Programming connections.

2. VDD_IN is connected to EM6812 VDD pin as the MAX3221 RS232 transceiver VCC (U3 + C2 capacitor) !

3.2 VPP/TEST

During programming sequence a jumper is needed on CON7-9 / CON7-10 or CON7-11 / CON7-12. This jumper does not need to be removed after programming.
Optionally, an external pull-down can be connected on EM6812 TEST pin (Select ON for the DIP2-10 position 10).

3.3 PORT A SWITCHES

S1…S6 switches can be connected to EM6812 Port A (Port A bit 0 … 5). Select ON for the corresponding DIP1-8 position (1…6).
When the switch is activated, corresponding Port A bit is tied to ‘0’.
RS232 transceiver (TX) can be connected to Port A bit 6. Select ON for the DIP1-8 position 7.
RS232 transceiver (RX) can be connected to Port A bit 7. Select ON for the DIP1-8 position 8.

3.4 PORT B LEDS

DS1…DS8 leds can be connected to EM6812 Port B (Port B bit 0 … 7). Select ON for the corresponding DIP2-10 position (1…8).
Buzzer (BUZ1 or BUZ2) can be connected to Port B bit 0. Select ON for the DIP2-10 position 9.

3.5 OSCILLATOR

By default, a 32768Hz crystal is assembled on each SampleBoard. Optionally crystal capacitance can be added (2 empty footprints).
For specific EM6812 modes, it can be necessary to use OSCIN/OSCOUT for other purpose. If necessary connect external signals on CON2-4 (OSCIN_EXT) or CON2-5 (OSCOUT_EXT) and place jumpers on CON8-1/CON8-2 or CON8-3/CON8-4.

3.6 PROGRAMMING

During In-System-Programming it is recommended to isolate pins PB5 (SCLK) and PB7 (SDIO) from the application connections. Refer to ISP programming application note for details.
A slide switch S8 selects the mode (programming or application) for both pins. For the current mode to be executed, you must ensure the appropriate switch position selection.

3.7 RESET

A reset switch S7 reset the EM6812. It is also possible to add an external reset. This external reset (RST_EXT) must be applied on CON2-3 and must be enabled by adding a jumper on CON7-7/CON7-8.

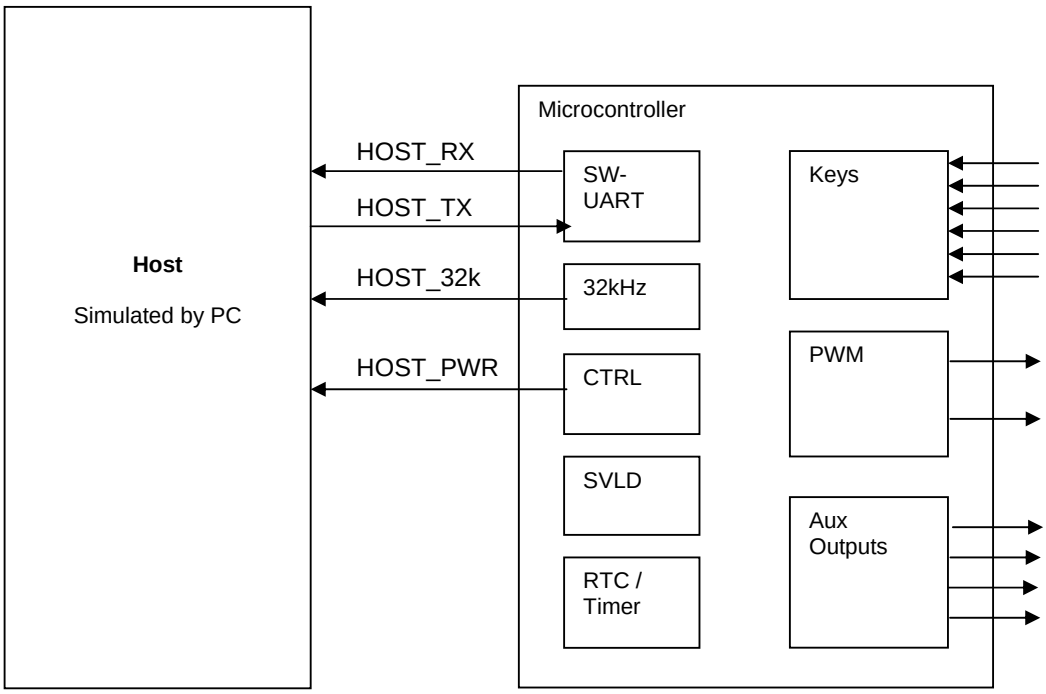
4. APPENDIX : DEMO APPLICATION

4.1 INTRODUCTION

The goal is to run a typical User Front-end Controller which allows to keep the power consumption in standby mode at a minimum while RTC, Timer and Keyboard- handling are still fully working. Furthermore this controller shall serve as Power-On Reset, Battery Level Detector and IO Extension.

Note:
o = output i = input

4.2 ARCHITECTURE



The Microcontroller has the following functions:

- Power-On Reset
- Serial Interface to the Host (Software UART)
- RTC Timer
- 32kHz digital clock output to the host
- Power-Up of the Host
- Battery Level Detector
- Auxiliary Outputs
- Key Inputs

4.3 FUNCTION

When powering up the system, the Microcontroller is reset automatically, as soon as the Reset-Threshold of its Power-On-Reset is reached. It will then initialize itself, Power-Up the Host, and enable the 32kHz Source which can be used by the Host. From now on, the Host can send commands via the serial interface to the Microcontroller to get/set the corresponding information. Available commands are:

- PowerDown, Powers down the Host (eg. if battery level too low)
- GetTime, Read the Time from the RTC
- SetTime, Set the RTC
- SetTimer, Set a Timer. As soon as it reaches zero, the Host is powered up.
- SetPWM (eg. PWM Outputs, can be used eg. for Led backlight)
- SetOutput, Set the Aux outputs
- GetKeys, Get the Key States
- GetEOL, get the Battery Level

As soon as the Microcontroller detects that a key has been pressed, it sends the new key-State automatically to the Host!

4.4 SOFTWARE

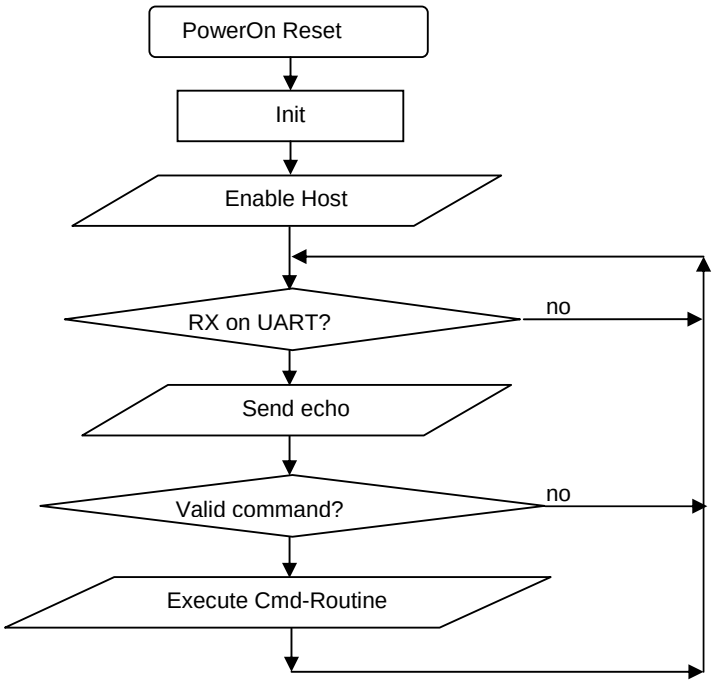
The Microprocessor has a Software-Half-Duplex UART incorporated which runs at 2400bps with 1 start-bit, 8 databits and 1 stopbit.
Via this UART the following commands can be executed:

- PowerDown
- GetTime
- SetTime
- SetTimer
- SetPWM (eg. For Led backlight)
- SetOutput
- GetKeys
- GetEOL

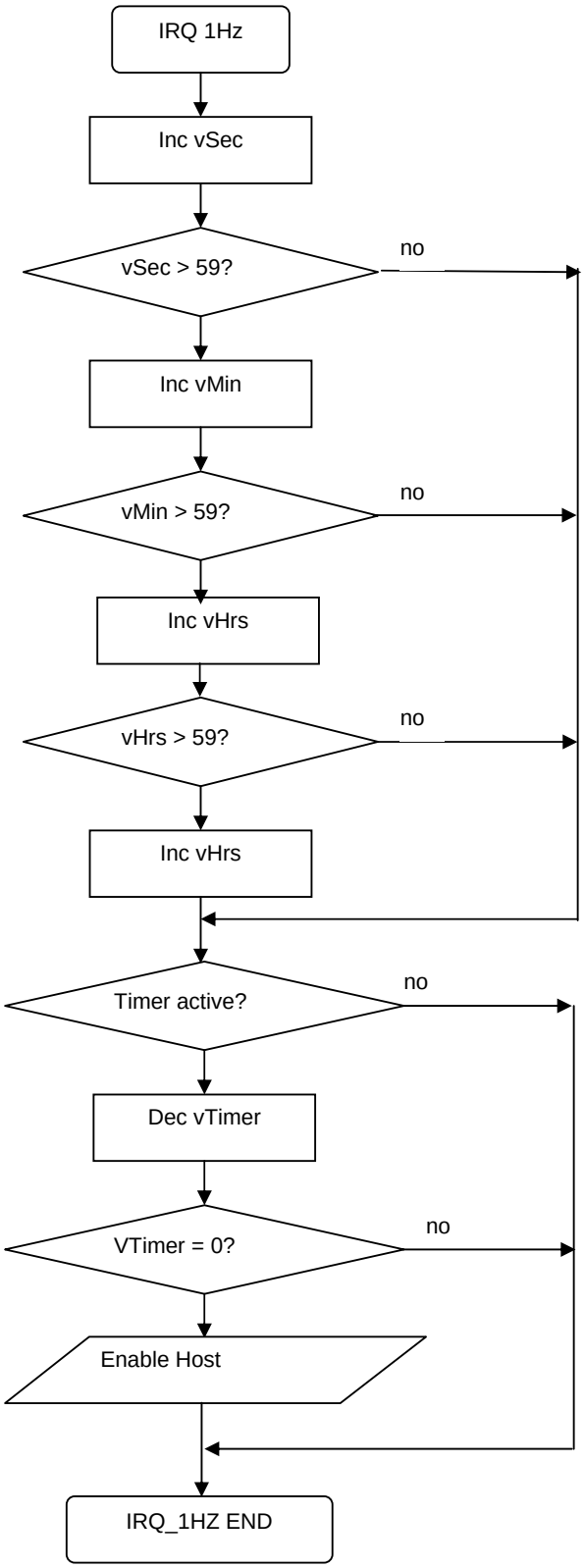
4.4.1 CPU operation Modes

The 32kHz Oscillator is always on for keeping accurate RTC timing
The CPU clock is switched off during Idle mode
During UART Reception/Transmission the Microcontroller uses the RC Oscillator, which runs at approximately 1MHz

4.4.2 Main loop



4.4.3 RTC

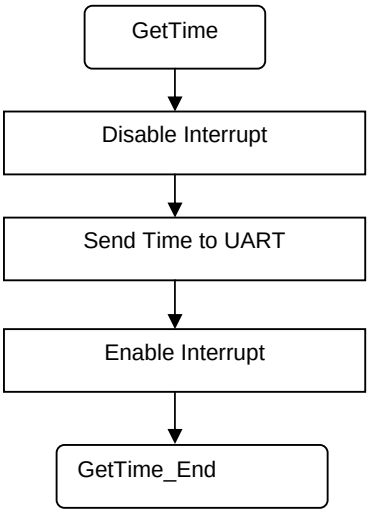

IRQ 1Hz
Inc vSec
vSec > 59?
no
Inc vMin
vMin > 59?
no
Inc vHrs
vHrs > 59?
no
Inc vHrs
Timer active?
no
Dec vTimer
VTimer = 0?
no
Enable Host
IRQ_1HZ END

4.4.4 *Command GetTime, 0xA0*

Time is counted inside the microcontroller with a resolution of 1sec. The Host can set and read the time.

	Start	Cmd	Echo	Hour	Minutes	Seconds
TX	10000000	10100000				
RX			10100000	000ooooo	00oooooo	00oooooo

Subroutine GetTime(void);

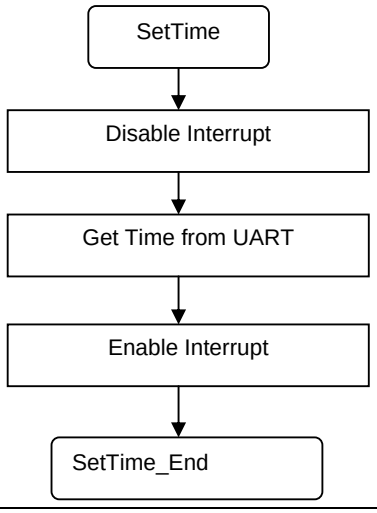


4.4.5 *Command SetTime, 0xA1*

Time is counted inside the microcontroller with a resolution of 1sec. The Host can set and read the time.

	Start	Cmd	Echo	Hour	Minutes	Seconds
TX	10000000	10100001		000ooooo	00oooooo	00oooooo
RX			10100001			

Subroutine SetTime(void);

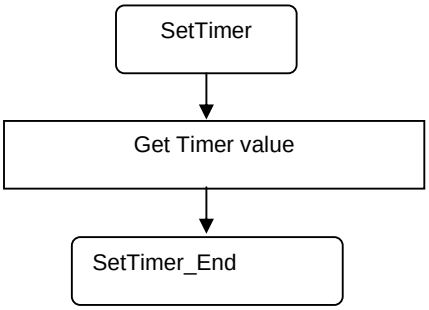


4.4.6 *Command SetTimer, 0xA2*

Before sending the Power-Down request to switch itself off, the Host can load the timer with a value between 1 and 255 seconds (0 is off).
As soon as the timer reaches zero, the Microcontroller will start the Power-up sequence for the Host.

	Start	Cmd	Echo	Timer Sec
TX	10000000	10100010		oooooooo
RX			10100010	

Subroutine SetTimer(void);

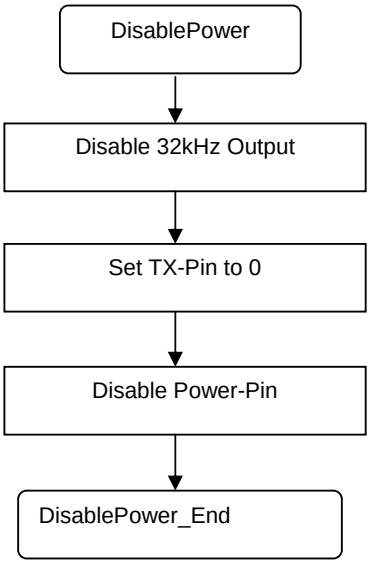


4.4.7 *Command DisablePower, 0x80*

Power down the Host.

	Start	Cmd	Echo
TX	10000000	10000000	
RX			10000000

Subroutine DisablePower(void) ;

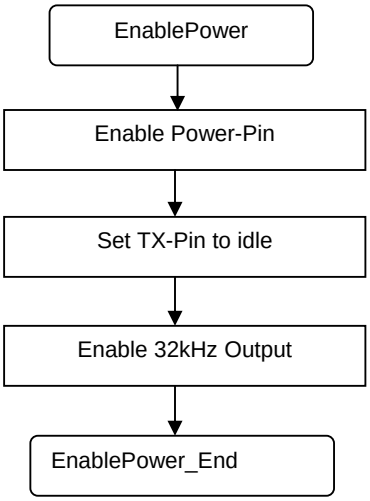


4.4.8 *Command EnablePower, 0x81*

Power up the Host. This command cannot be used in normal operation. Power-up is only executed, if Timer reaches 0 or an external key has been pressed.

	Start	Cmd	Echo
TX	10000000	10000001	
RX			10000001

Subroutine EnablePower(void) ;



4.4.9 *Command SetPWM1, 0x82*

Sets the PWM output. 0 is off. Can be used for controlling for example a Led-Backlight.

	Start	Cmd	Echo	PWM Val.
TX	10000000	10000010		oooooooo
RX			10000010	

4.4.10 *Command SetPWM2, 0x83*

Sets the PWM output. 0 is off. Can be used for controlling for example a Led-Backlight.

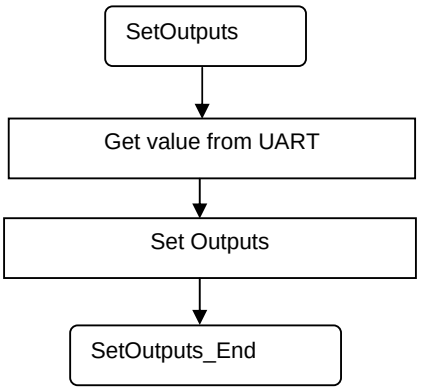
	Start	Cmd	Echo	PWM Val.
TX	10000000	10000011		oooooooo
RX			10000011	

4.4.11 *Command SetOutputs, 0x84*

Set the Outputs.

	Start	Cmd	Echo	PWM Val.
TX	10000000	10000100		xxxxoooo
RX			10000100	

Subroutine SetOutputs(void) ;



4.4.12 Command GetKeys, 0x90

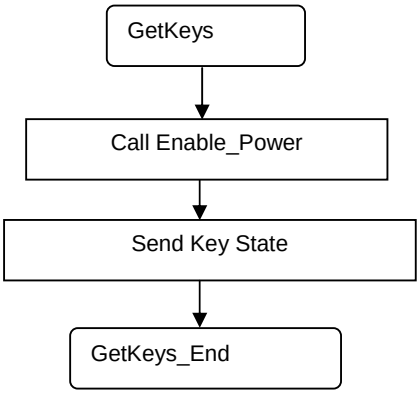
Gets the state of the keys.

	Start	Cmd	Echo	Key State
TX	10000000	10010000		
RX			10010000	iiiiiiii

As soon as a key is pressed, the Host is Powered up (if it was down) and the 2nd part of the message is send to the host automatically:

	Command	Key State
TX		
RX	10010000	iiiiiiii

Subroutine GetKeys(void) ;

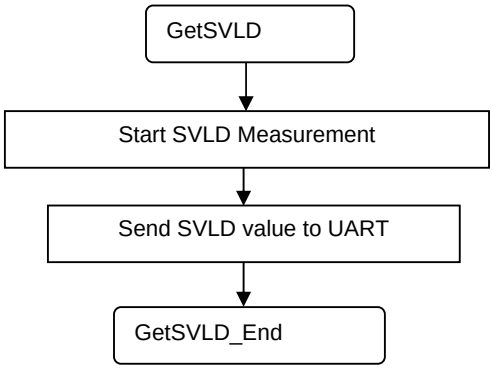


4.4.13 Command GetSVLD, 0x92

Start a measurement of the Supply Voltage and return the result. 0x3f means, that there has an error occurred during measurement..

	Start	Cmd	Echo	Key State
TX	10000000	10010010		
RX			10010010	iiiiiiii

Subroutine GetSVLD(void) ;

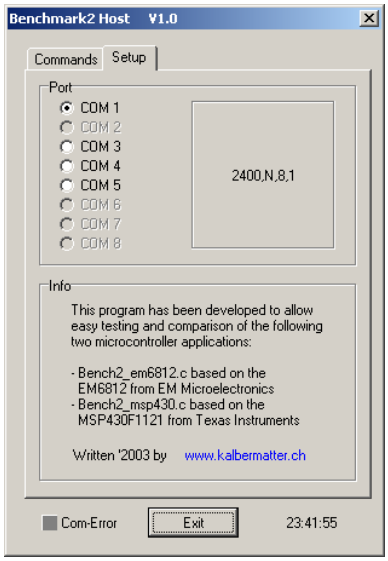


4.5 HOST APPLICATION

For testing the Microcontroller software, a MS-Windows based utility has been developed, which allows to send/receive the Host-Commands via serial COM-Ports. USB to RS232 converters are also supported.

4.5.1 Setup

First you have to select the Com-Port you want to use. The Hardware has to be connected to the corresponding Com-Port by a 9pol serial cable. Wiring is 1:1



4.5.2 Commands

Here you can send the different commands. Please note, that after sending the Power-down command, the chip will no longer respond to serial-commands until you press one of the keys connected to the chip or the Timer in the micro controller has been active and reached 0.