I'm watch
Release note hardware

December 3, 2012

Date	Revision	Author	Notes
03/12/2012	0.0	Stefano Bianconi	First draft

Table 1: revision table

Contents

References

[1] EN 300 328 V1.7.1 (2006-05): Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

[2] EN 300 440-1 V1.6.1 (2010-04): Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 1: Technical characteristics and test methods.

[3] EN 300 440-2 V1.4.1 (2010-08): Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive.

[4] EN 60950-1 (2006): Safety of Information Technology Equipment Including Electrical Business Equipment

[5] UL/IEC 60950-1, 2nd edition (2005): Safety of Information Technology Equipment.

[6] EN 301 489-1 V1.8.1 (2008-02): Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.

[7] EN 301 489-17 V2.1.1 (2009-05): Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems.

[8] CEI EN 55022 (2009-01): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

[9] CEI EN 55024 (2012-03): Information technology equipment - Immunity characteristics - Limits and methods of measurement

[10] IEC 62209-2 (2010-03): Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human

models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)

[11] CFR47 Pt15,247 / RSS-210

[12] CFR47 Pt 15B / ICES-003

[13] IEEE 802.15.1-2005: IEEE Standard for Information Technology. Telecommunications and Information Exchange Between Systems. Local and Metropolitan Area Networks. Specific Requirements. Part 15.1: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Wireless Personal Area Networks (WPANs)

[14] Bluetooth 4.0: www.bluetooth.org

Prod. code	Board v.	Description
IMTBSPEBK	1107A10	I'm Tech Special Edition Titanium Black
IMSSLBL01C01	1107A10	I'm silver black 128Mb with black rubber band
IMSSLE01C01	1107A10	I'm silver gray 128Mb with gray rubber band

Table 2: Product variety

1 Introduction

This document is a brief description of the I'm watch hardware, including certification requirements for CE, UL, FCC marking.
The main purpose of this product is to act as a smart notification device to allow the user to receive SMS, voice calls, Social Network messages and updates as far as other kind of notifications from the web through a Bluetooth interface paired to the user's smart phone.
The Operating System for this platform is based on a customization of Android 1.6 to allow the customer to develop their own applications.

1.1 Device composition

The components developed by Si14 and included in the I'm watch are the following:

- Single board with main processor and Bluetooth IC, magnetodinamic speaker, antenna and battery pads, USB/Audio/power connection on a 3,5mm jack socket.
- LCD module, Capacitive Touch Panel module already glued together.
- Battery (soldered on board pads)

1.2 Product variety

Product variety can be found in table 2.

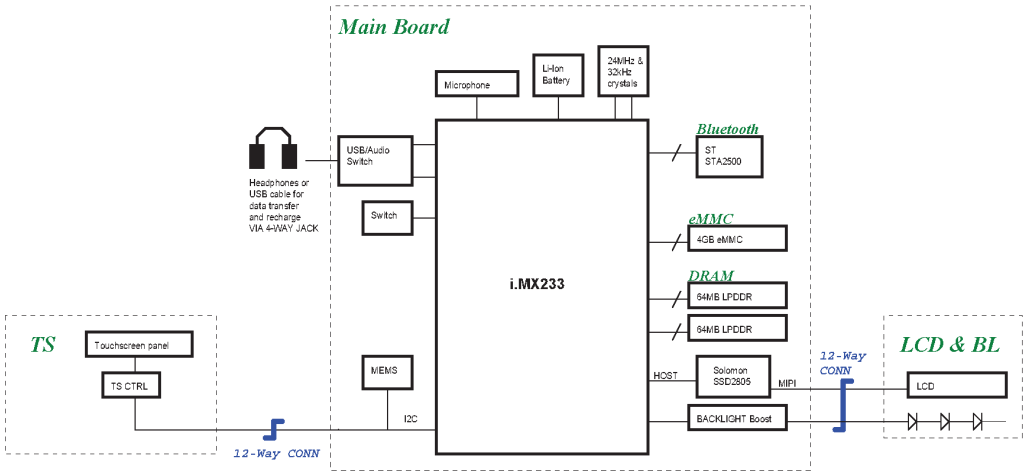

Figure 1: System architecture

2 System Architecture

2.1 Main Processor

The main processor is the Freescale i.MX233, core processor is a ARM9 running up to 474MHz. System SDRAM is a 1Gbit LPDDR running up to 133MHz. Solid state memory is a 4GByte eMMC connected on SDIO slot (bus width: 4bit) of i.MX233

2.1.1 Interface list

Table 3 lists the interfaces used on i.MX233 and the peripherals attached to the processor.

2.1.2 Power Management Unit

Power Management Unit is included in the i.MX233 package, LCD backlight drives a five LED (serie) up to 10,5mA. The Li-Po battery charger is included

Interface	Peripheral list	bus frequency
SDIO	eMMC	up to 48MHz
LCD	MCU 8080 8bit i/f	TBD
I2S	Digital microphone	TBD
I2C	Acceler., Magn., Touch panel controller	400kHz
UART0	Debug i/f	N/A
UART1	Bluetooth 2.1 + EDR	N/A

Table 3: Peripheral list

in the PMU. Supported operating points for the ARM core are described in i.MX233 datasheet.

2.1.3 Bootstrap configuration

Default bootstrap configuration is through internal fuses.

2.2 Peripherals

2.2.1 Audio Interface

The Analog Audio Interface is a stereo audio codec with integrated PLL and LDOs embedded in the i.MX233 package. The Codec shall support a wired headset output shared with USB bus through the FSA2000 and a Magneto-dynamic speaker for speakerphone calls.
A digital microphone is also included on the board as far as an analog microphone shared on a pin of the 3,5mm jack socket
The speaker output is driven by a Class-AB driver capable of driving up to 1W from a Li-Po battery source.

2.2.2 Accelerometer and Magnetometer

This device is a low power, digital 3-axis accelerometer/magnetometer combo. The device can be used to produce orientation independent accurate compass heading information. It features a standard I2C serial interface output and smart embedded functions. This device includes an interrupt mode mapped on a GPIO of i.MX233. The MEMS manufacturer and part number are the following: ST Microelectronics LSM303DLHC.

Manufacturer	Part Number	notes
LG	LH154Q01	EoL
AUO	H154QN01 V2	EoL

Table 4: Available LCD modules

2.2.3 Capacitive Touch Panel Module

The Focaltech chipset is a capacitive touchscreen controller with the sensing technology to resolve touch locations of multiple fingers on the touchscreen. It converts an array of intersecting sensors into digital values. This array of digital information is processed by touch detection and position resolution algorithms in the touchscreen controller to determine the location of each finger on the touchscreen.The Touch Panel controller manufacturer and part number are the following: Focaltech FT5206. Beside the I2C bus used to communicate with the host processor, a dedicated Reset, a Wake-up and Interrupt signals are provided to control the chipset.

2.2.4 Bluetooth Interface [14] [13]

The product shall support the Bluetooth 2.1 + EDR standard in the 2,4GHz frequency band. The Bluetooth interface is based on ST Microelectronics STA2500

3 User Interface and Mechanicals

The product is meant to be wearable on the used wrist, for this reason the overall dimensions is not exceeding 45x45mm including the housing. PCB size for electronic components is 36mmx18,5mm and shall include all the functions except for 2,4GHz antenna, battery and buzzer.
The product is provided with a high resolution LCD that can be used to display icons, maps and other informations. User interaction is implemented through a capacitive touch screen and one button. The touch screen can be used to detect gestures.

3.1 LCD Module

In table 4 there's a list of supported part numbers for the LCD module.

The LCD is a Color Active Matrix Liquid Crystal Display with Light Emission Diode(LED) backlight system. The matrix employs a-Si Thin Film Transistor as the active element.
It is transmissive type display operating in the normally white mode.
This TFT-LCD has 1.54 inch diagonally measured active display area with (240*RGB*240) resolution.
LCD interface is based on MIPI DSI interface, a bridge is required between the main processor, used in MCU 8080 8bit command mode, and the LCD module. The bridge manufacturer and part number are the following: Solomon SSD2805C.

3.2 Capacitive Touch Panel Module

Touch panel overall dimensions are specified in figure 2.

3.3 User Buttons

The board is provided with one button that can trigger the main processor resume from suspend or allow power down of the whole system if pressed for more than 15 seconds.

3.4 USB/Data Interface

A 3,5mm jack socket is provided to allow USB 2.0 communication with a host. The USB data link is shared with the headphone lines, switch between the two interfaces is provided by Fairchild's FSA2000. Simultaneous use of USB and Audio signals is not allowed.
This interface is protected from ESD up to 15kV (air discharge) [9].

3.5 Antennas

Bluetooth antenna is implemented in the metal housing, connecting the signal between the electronic board and the internal side of the metal housing through a wire.

Pin name	Maximum Voltage	Notes
USB_5V	+5,25V	
JACK_R	+5,25V	USB/Audio Bus
JACK_L	+5,25V	USB/Audio Bus
JACK_DET	+3,6V	Accessory detection pin
GND	0V	Ground pin

Table 5: Device connector recommended ratings

CE marking	UL/FCC marking	Other markings
Europe	USA	
Australia	Canada	
New Zealand		

Table 6: Country list

4 Device Operating Conditions

4.1 Environmental Operating Conditions

Operating temperature: 5°to +35°C.
Storage Temperature: -5°to 45°C.
Relative Humidity: 5% to 80% non condensing.

4.2 Device connector

Device electrical recommended operating conditions can be found in table 5.

5 Conformance to regulations

The product shall be compliant to CE, UL and FCC regulations. The countries where the product can be sold in the consumer market can be found in table 6.

Item	Standard	Notes
Safety	IEC/EN 60950-1[4][5]	CB-style report
Radio disturbance & immunity	EN 301 489-1 v1.8.1[6] EN 301 489-17 v2,1,1[7]	Class B product
Bluetooth	EN 300 328 v1,7,1[1]	class 1.5 radio
BODY SAR exposure	EN 62209-2: 2010[10]	

Table 7: CE regulatory list

Item	Standard	Notes
Radio disturbance & immunity	CFR47 Pt 15B / ICES-003[12]	
Bluetooth	CFR47 Pt15,247 / RSS-210[11]	

Table 8: FCC regulatory list

5.1 CE marking

Basing on the scheduled activities, CE compliance is a prerequisite for other certifications. For a detailed list of standards see table 7.

5.2 UL/FCC marking

Basing on the scheduled activities, CE compliance is a prerequisite for FCC certifications, UL certification is already included in the CB-style report for CE marking. For a detailed list of standards see table 8.

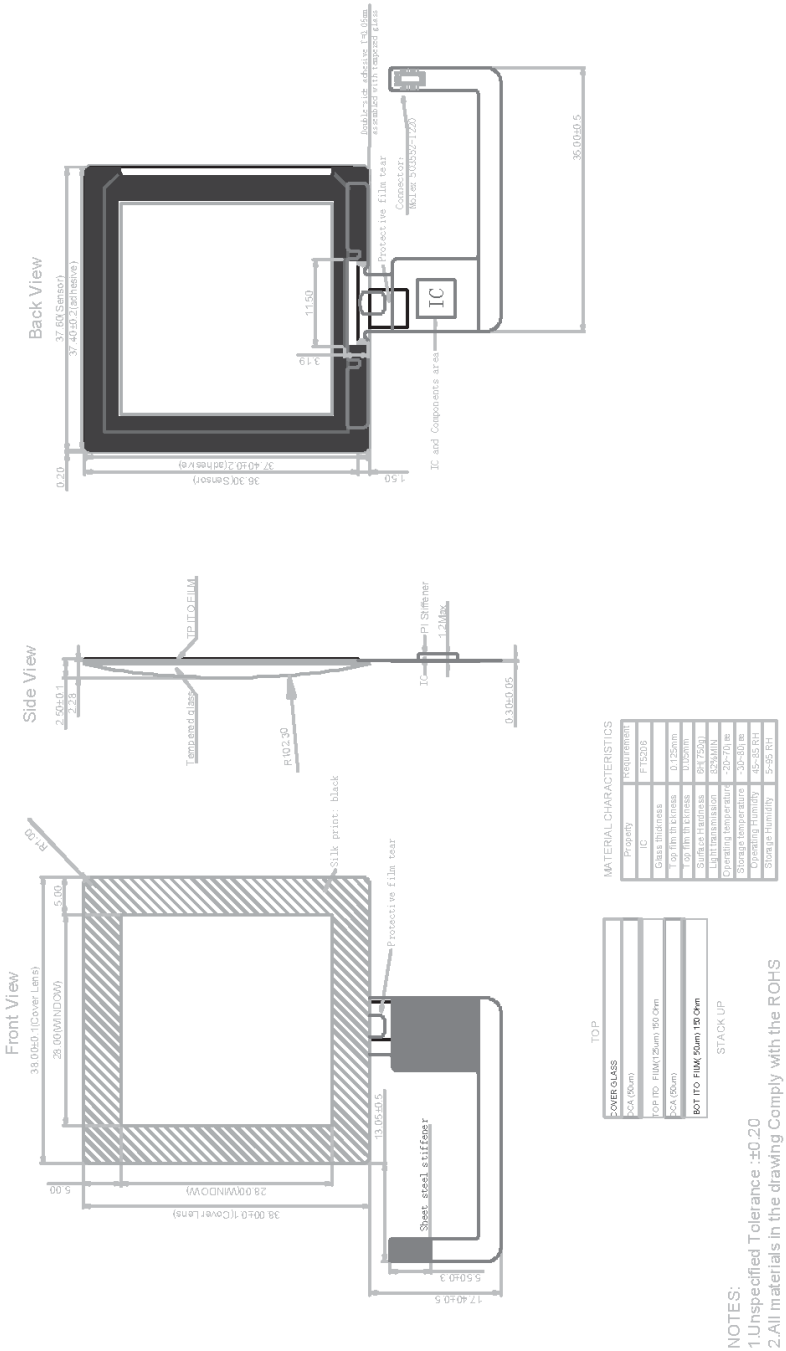

Figure 2: Touch panel mechanical specification