

WaRP7

User Manual

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This kit is a custom built evaluation kit destined for professionals to be used solely at research and development facilities for such purposes.

Revision History:

Version	Date	Description
1.0	2017-02-28	Original Version
1.1	2017-05-08	Magnetic calibration added
1.2	2017-08-21	Update display outlines
1.3	2017-08-22	Content Continuity, Formatting
1.4	2017-08-29	Final Review/Released Copy

Table of Contents

1	Product Overview	5
1.1	Introduction	5
1.1.1	Packing List	5
1.1.2	Key Product Features	5
1.2	Features/Specifications	5
1.3	Board Dimensions and Operating Environment	7
2	Introduction to the Hardware System	8
1.1	Central Processing Unit (CPU) Board	8
1.1.1	CPU (Freescale MCIMX7S3DVK08SA)	8
1.1.2	Memory eMCP – LPDDR3 and eMMC	9
1.1.3	Video and Display	10
1.1.4	Connectivity	12
1.1.5	Power Management	14
1.2	IO Board	15
1.2.1	Audio	15
1.2.2	Sensors	16
1.2.3	Peripheral Expansion Port	18
2	Introduction to the Software System	19
1.3	Linux System Structure of WaRP7	19
1.4	Software Resources	19
1.5	Introduction to the Drivers	20
1.6	Quick Start	21
1.6.1	Burning the System Image to the WaRP7	21
1.6.2	System Boot	24
1.7	System Update	25
1.8	Android Testing	27
1.8.1	LCD & Touch Test	27
1.8.2	Watch Test	28
1.8.3	Audio	29
1.8.4	Video	30
1.8.5	Bluetooth Test	31

1.8.6	Wi-Fi Test	32
1.8.7	Sensor Test	33
1.8.8	Camera Test	36
1.8.9	Launcher	38
1.8.10	Charging over USB Test	39
1.8.11	USB Test	40
1.8.12	NFC Test	40
1.8.13	Sound Recording Test	40
4	Technical Support and Warranty	42
4.1	Technical Support	42
4.1	Warranty Conditions	43
4.2	Contact Information	43

1 Product Overview

1.1 Introduction

WaRP7 is an evaluation board based on an NXP ARM processor for areas such as wearable devices and IoT end nodes. The platform consists of a main board and a daughter card. The main board is based on the NXP® i.MX 7Solo applications processor that features an advanced implementation of the ARM® Cortex®-A7 core, as well as the ARM® Cortex®-M4 core. This unique heterogeneous multicore architecture enables low-power modes critical for most designs, but also provides the power to drive a higher level operating system and a rich user interface. WaRP7 includes extensive on-board connectivity including Wi-Fi, Bluetooth, NFC and other hardware features such as sensors, a memory module integrated 8GB eMMC 5.0 and 4GB LPDDR3, rechargeable battery, and power management.

1.1.1 Packing List

WaRP7 Development Board (WaRP7):

- WaRP7 CPU Board x1
- WaRP7 I/O Board x1
- Lithium-Polymer Battery x1

WaRP7 LCD (TDO-QVGA0126A62065):

- WaRP7 LCD x1

1.1.2 Key Product Features

- NXP i.MX 7Solo applications processor
- Murata Wi-Fi® (802.11/b/g/n) and Bluetooth (4.1 Bluetooth Smart + EDR) Module
- Kingston MCP with 8 GB NAND flash and 4Gb LP-DDR3 Memory
- NXP NT3H1101 NFC Tag IC
- 180 mAh Li-ion battery, NXP BC3770 battery charger & NXP PF3001 Power management IC
- NXP MPL3115A2, FXOS8700, FXAS21002 sensors
- Multimedia: MIPI Display, MIPI Camera, Audio Playback and Recording

1.2 Features/Specifications

Features

CPU Board		
Processor	Freescale iMX7S	
	ARM Cortex-A7/Cortex-M4	
Memory	8GB, 8bit Embedded MMC / 512MB LPDDR3	
PMIC	PF3000 PMIC and BC3770 battery charger	
Wireless	Combo Wi-Fi / BLE	
Display/Camera interface	MIPI-DSI connector	
	MIPI-CSI connector	
Power Source	USB/Battery	
PCB	38mm x 23mm	10 Layers
Indicators	1-Power, 1-User	
IO Board		
Debug Support	JTAG, Serial Header	
Sensors	Accelerometer, Magnetometer Pressure Sensor Gyroscope	
Audio	Stereo codec – Mic In / Line Out	
Expansion	MikroE Click header	

Figure 1-1 WaRP7 Key Features

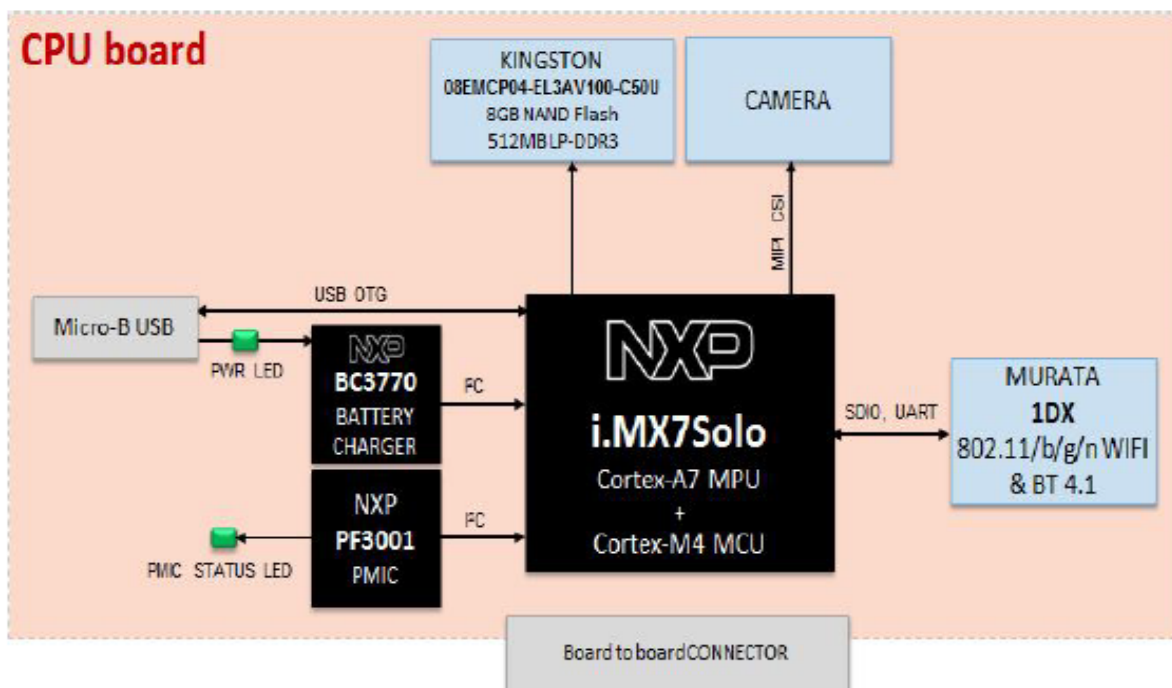


Figure 1-2 CPU Board

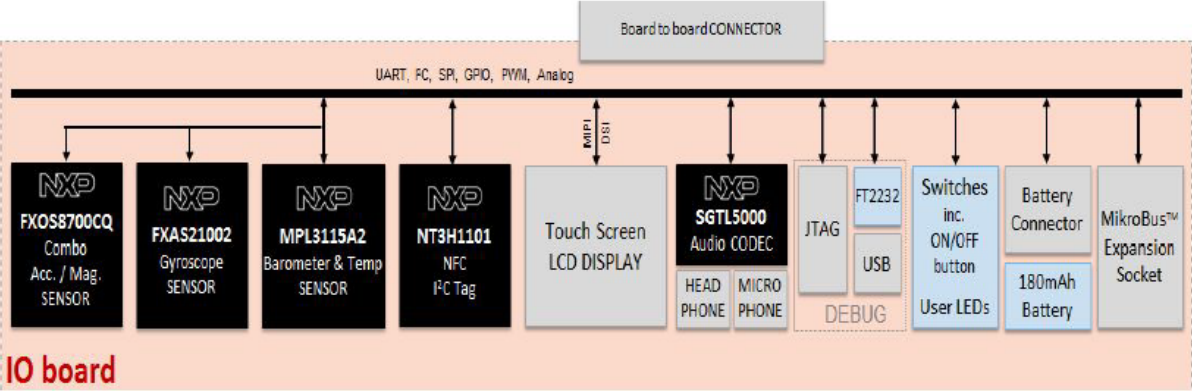
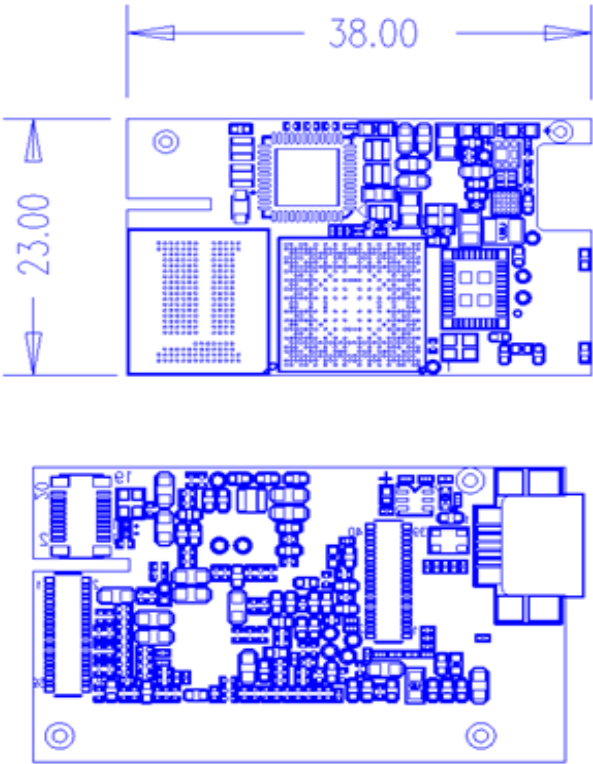


Figure 1-3 IO Board

1.3 Board Dimensions and Operating Environment

Table 1-2 WaRP7 CPU Board Dimensions

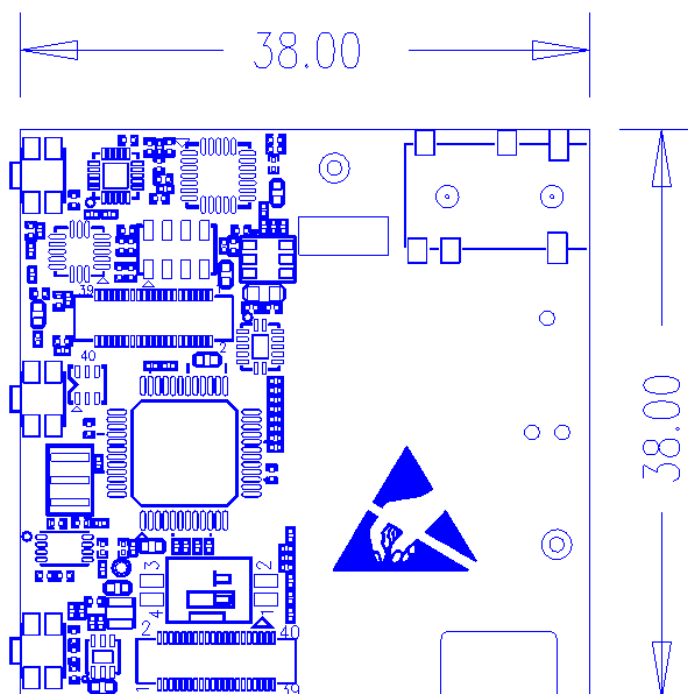
Length	38 mm
Width	23 mm
PCB Thickness	1.0 mm



The board operates in the commercial temperature range, 0°C ~ 50°C.

Table 1-3 WaRP7 IO Board Dimensions

Length	38 mm
Width	38 mm
PCB Thickness	0.8 mm



2 Introduction to the Hardware System

This section will introduce in detail the structure, expansion and peripheral interfaces of WaRP7 hardware system.

1.1 Central Processing Unit (CPU) Board

1.1.1 CPU (Freescale MCIMX7S3DVK08SA)

The i.MX7S applications processor houses an ARM Cortex-A7 core and an ARM Cortex-M4. The device is targeted for e-reader, low-power handheld point-of-sale and general embedded markets.

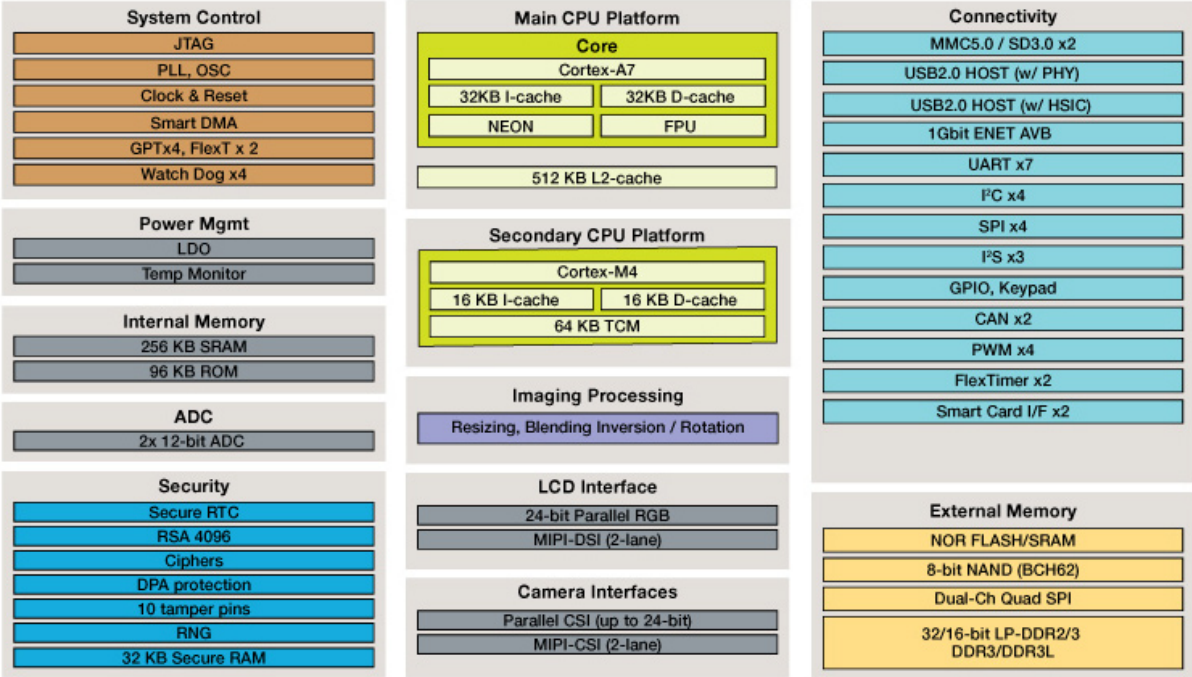


Figure 1-4 iMX7S SoC Diagram

1.1.2 Memory eMCP – LPDDR3 and eMMC

The CPU Board features a Multi-Chip Package Memory 08EMCP04-EL3AV100-C30U from Kingston, which combines a n 8GB eMMC and a 512MB Low Power DDR3 synchronous dynamic RAM. This comes in a 221-ball FBGA package.

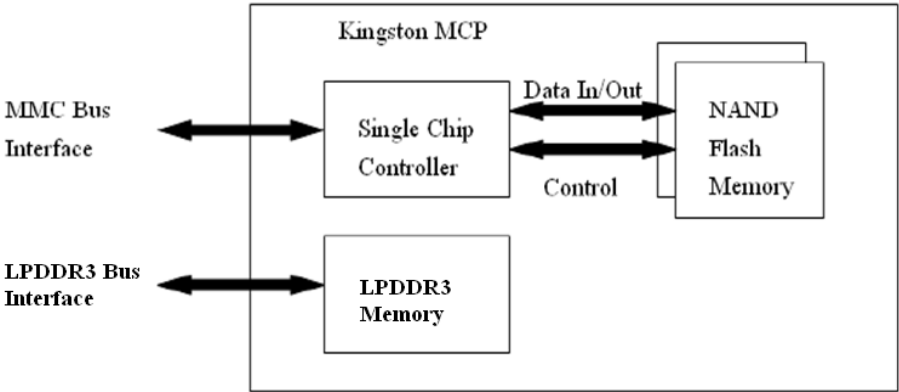


Figure 1-5 Kingston eMCP Block Diagram

1.1.3 Video and Display

The WaRP7 CPU board provides output video from MIPI® DSI and accepts input through MIPI® CSI.

2.1.3.1 MIPI® DSI

The video outputs from the CPU board to IO board through a board-to-board connector. The IO board includes an MIPI® DSI connector for an external LCD.

DSI

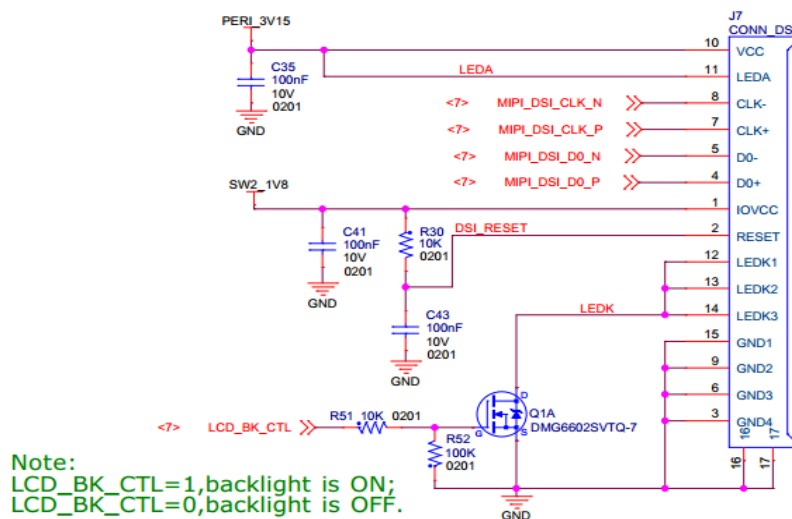


Figure 1-6 MIPI® DSI connector

2.1.3.2 Capacitive Touch Screen

The touch signal inputs from the IO board to the CPU board through a board-to-board connector. The IO board also includes an 8-pin connector for connecting an external touch screen plane.

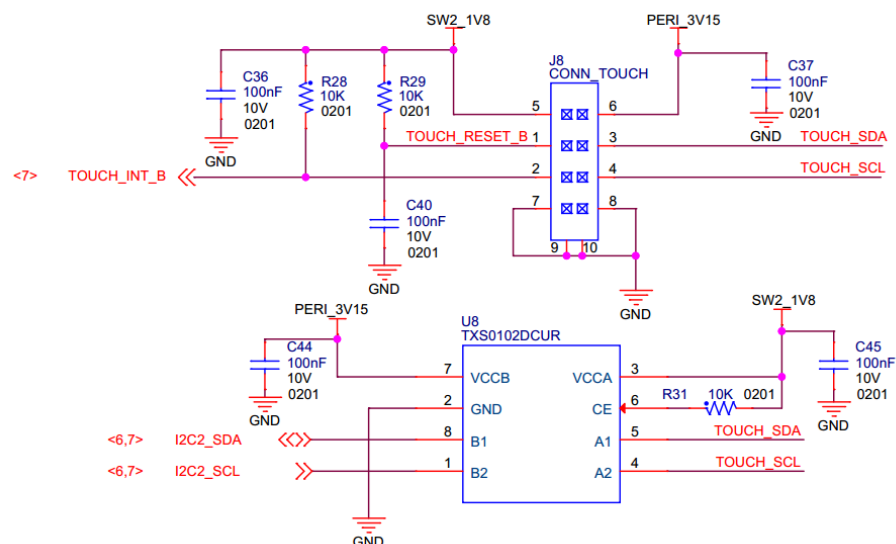
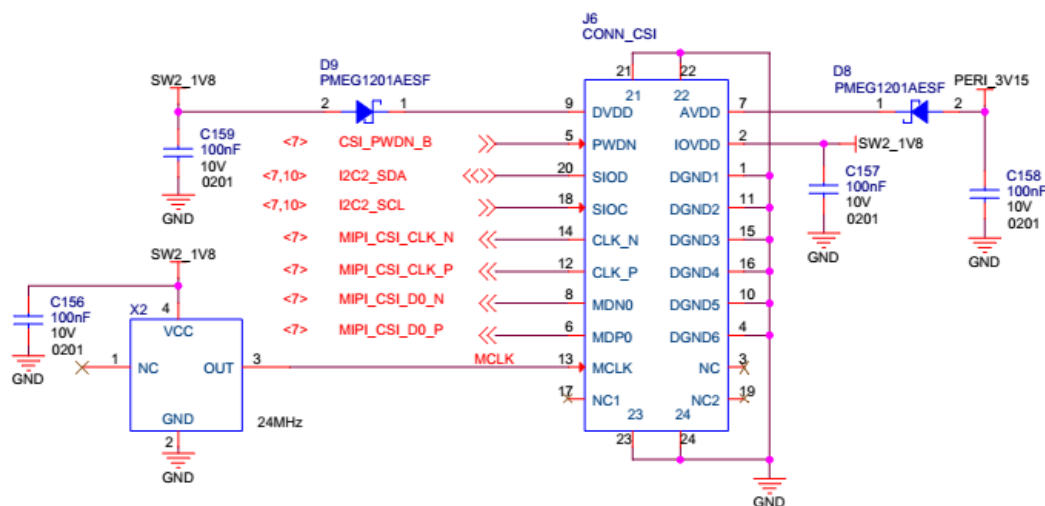


Figure 1-7 Touch Screen Interface

2.1.3.3 MIPI® CSI

The CPU board includes an MIPI® CSI camera connector for connecting a CSI camera module.



Note: The camera module's IIC address is 0x6C(write), 0x6D(read).

Figure 1-8 MIPI CSI connector

1.1.4 Connectivity

The WaRP7 board provides a number of options for connectivity; include Wi-Fi, Bluetooth, Bluetooth (BLE), and USB-OTG. There are also provisions for near-field communication (NFC) as a passive tag used primarily for Bluetooth pairing.

2.1.4.1 WI-FI / Bluetooth

The Murata Type 1DX module is an ultra-small module that includes 2.4GHz WLAN IEEE 802.11b/g/n and Bluetooth Version 4.1 plus EDR functionality. Based on Broadcom BCM4343W, the module provides high-efficiency RF front end circuits.

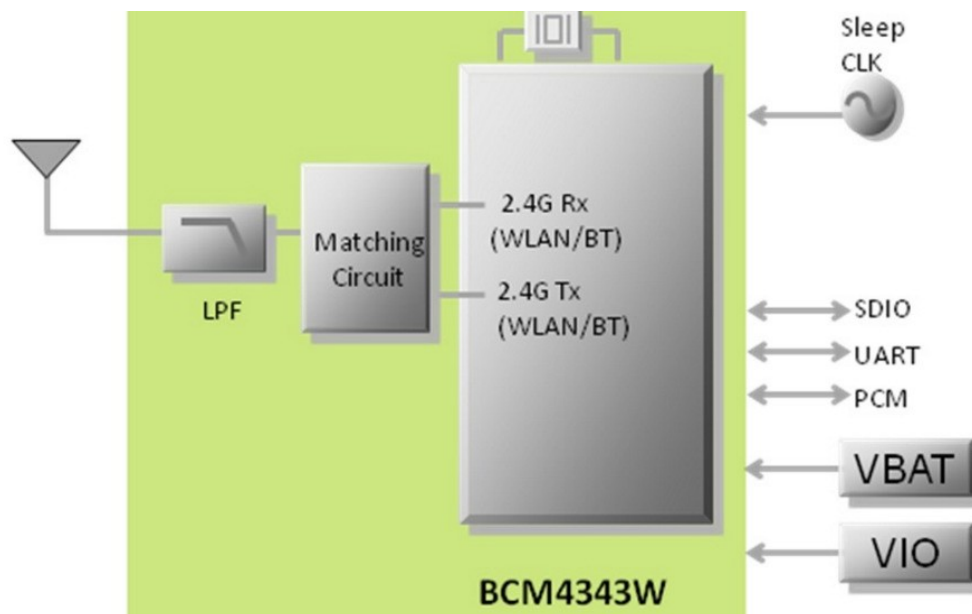
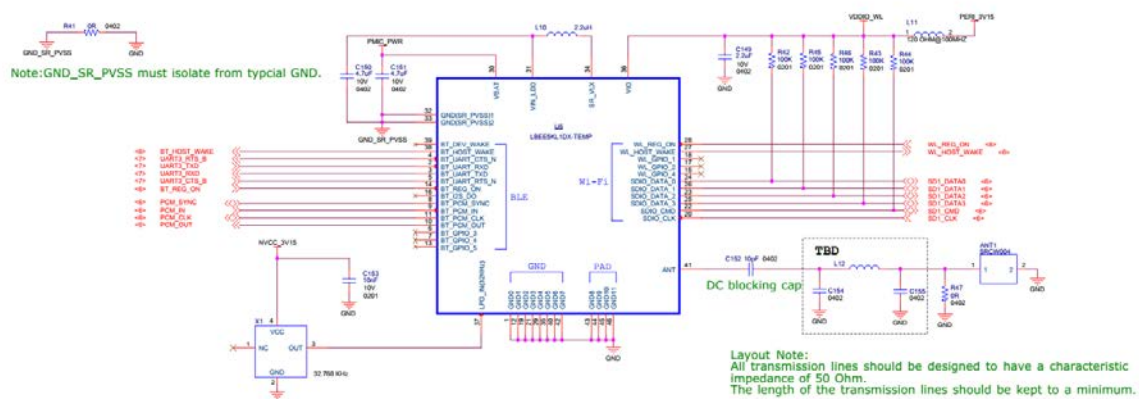


Figure 1-9 1 Murata 1DX module



2.1.4.2 USB-OTG (On-The-Go) Cable

The CPU board provides a USB micro-AB connector to support USB-OTG function powered by the USB OTG1 module on i.MX7S.

2.1.4.3 Near Field Communication (NFC)

The board provides support for NFC using the NXP NT3H1101W0FHK. In addition to the passive NFC Forum compliant contactless interface, the IC features an I2C contact interface, which can communicate with a microcontroller if the NTAG I2C is powered from an external power supply. An additional externally powered SRAM mapped into the memory allows a fast data transfer between the RF and I2C interfaces and vice versa, without the write cycle limitations of the EEPROM memory.

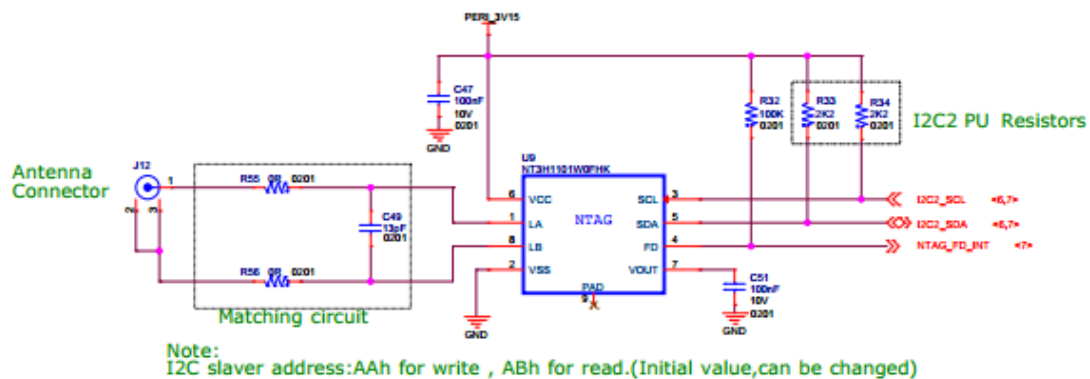


Figure 1-11 NFC circuitry

1.1.5 Power Management

2.1.5.1 Power Management Integrated Circuit (PMIC)

The Freescale PF3000 power management integrated circuit (PMIC) features a configurable architecture that supports numerous outputs with various current ratings, as well as programmable voltage and sequencing. This enables the PF3000 to power the core processor, external memory, and peripherals to provide a single-chip system power solution.

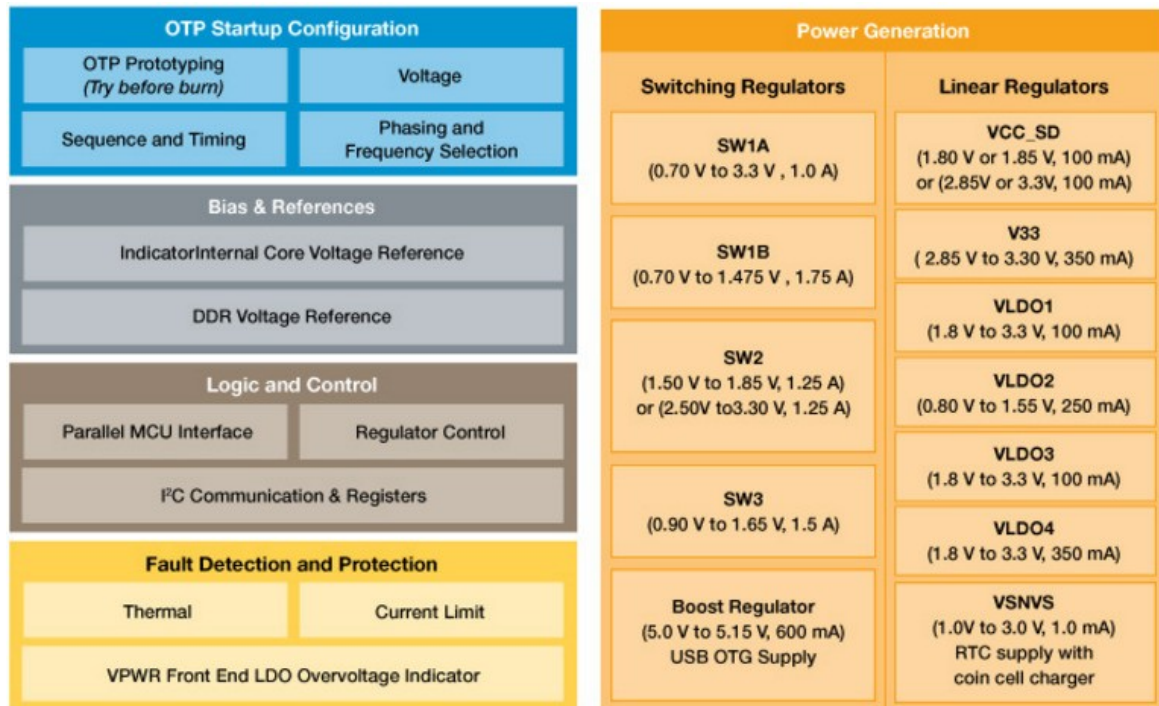


Figure 1-12 PF3000 Functional Block diagram

2.1.5.2 Power Tree Design

The usage of PF3000 output is as shown in Table 1-4 below:

Table 1-4 PF3000 Output Power Up Sequence and Usage

PF0300 Channel	Voltage	Power up sequence	Output Current	i.MX7 Power Rail
SW1A	1.15 V	1	1000 mA	VDD_ARM
SW1B	1.15 V	1	1750 mA	VDD_SOC
SW2	1.8 V	2	1250 mA	VDDA_1P8_IN FUSE_FSOURCE VDD_XTAL_1P8 VDD_ADC1_1P8

SW3	1.2 V	3	1500 mA	NVCC_DRAM NVCC_DRAM_CKE
VSNVS	3.0 V	0	1 mA	VDD_SNVS_IN
SWBST		-	600 mA	
VREFDDR		3	10 mA	DRAM_VREF
VLDO1	1.8 V	2	100 mA	VDD_LPSR_IN
VLDO2	1.2 V	-	250 mA	
VLDO3	1.8 V	2	100 mA	NVCC_GPIO1/2
VLDO4	1.8 V	-	350 mA	
V33	3.15 V	2	350 mA	NVCC_xxx VDD_USB_OTG1_3P3_IN
VCC_SD	3.15 V	3	100 mA	NVCC_SD2

The following i.MX7S power rails must use the internal LDO outputs.

Table 1-5 iMX7S Power Rails – Internal LDO

i.MX7S internal LDO output	i.MX7S Power Rail
VDDD_1P0_CAP	VDD_MIPI_1P0
VDDA_PHY_1P8	VDDA_MIPI_1P8
VDD_1P2_CAP	VDD_USB_H_1P2
VDDA_1P0_CAP	n/a

2.1.5.3 Battery Charger

The Freescale BC3770 is a fully programmable switching charger with dual-path output for single-cell Li-Ion and Li-Polymer battery. The dual-path output allows mobile applications with a fully discharged battery to boot up the system.

- High efficiency and switch-mode operation reduces heat dissipation and allows for higher current capability for a given package size.
- Single input with a 20V withstanding input and charges the battery with an input current up to 2A.
- Charging parameters and operating modes are fully programmable over an I2C Interface that operates up to 400 kHz.
- Highly integrated featuring OVP and Power FETs.
- Supports 1.5 MHz switching capabilities.

1.2 IO Board

1.2.1 Audio

The IO board includes the Freescale SGTL5000 – an ultra-low power audio codec with

MIC In and Line Out capability.

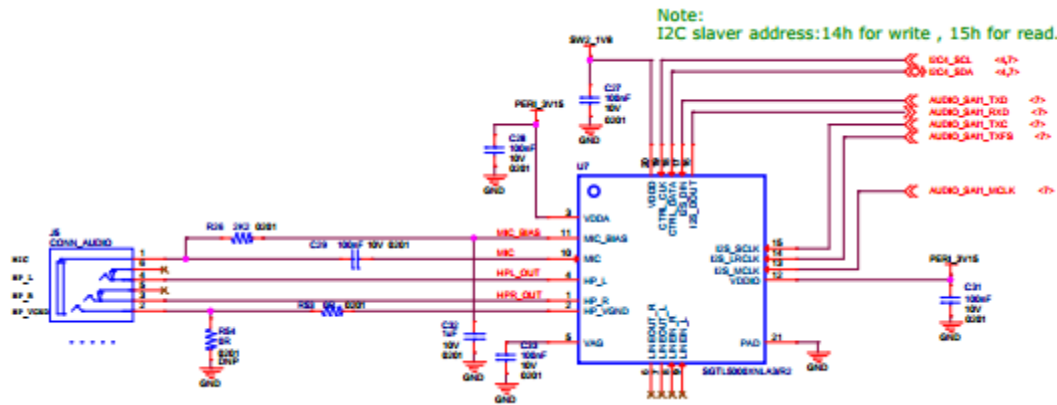


Figure 1-13 Freescale SGTL5000 Audio Codec

1.2.2 Sensors

The WaRP7 board includes three sensors: an altimeter, accelerometer and gyroscope. These three sensor chips share the I2C bus on i.MX7S. The sensors interrupts are wired to the processor as an OR circuit. The software determines which device asserts the interrupt.

2.2.2.1 Altimeter

The board features Freescale's MPL3115A2 precision altimeter. The MPL3115A2 is a compact piezo resistive absolute pressure sensor with an I2C interface. MPL3115 has a wide operating range of 20kPa to 110kPa, a range that covers all surface elevations on Earth. The fully internally compensated MEMS in conjunction with an embedded high resolution 24-bit equivalent ADC provide accurate pressure [Pascals]/altitude [meters] and temperature [degrees Celsius] data.

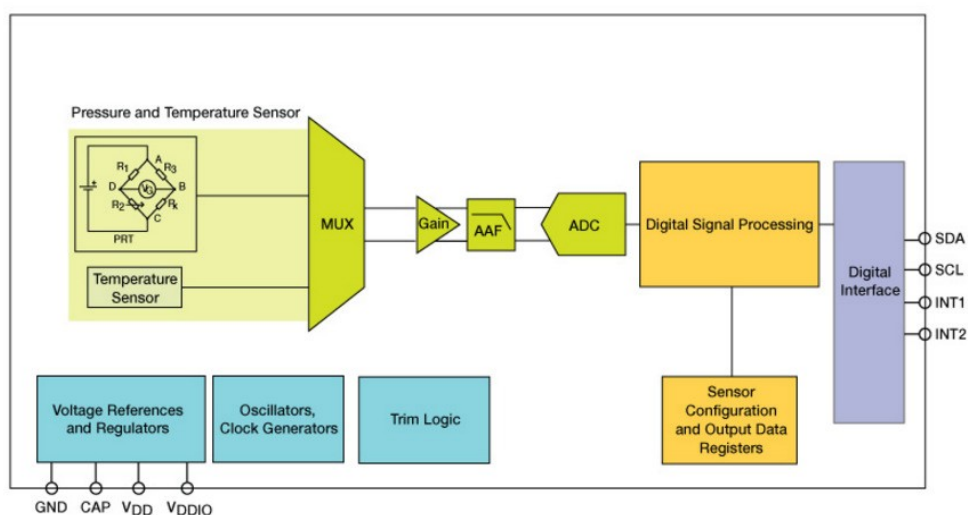


Figure 1-14 MPL3115A2 Block Diagram

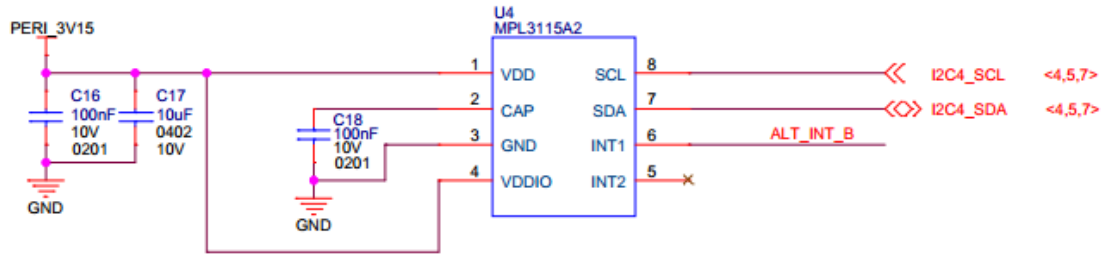


Figure 1-15 Altimeter schematics

2.2.2.2 Accelerometer and Magnetometer

The board also features FXOS8700CQ 6-axis sensor combines a n industry-leading 14-bit accelerometer and a 16-bit magnetometer sensor in a small 3mm x 3mm x 1.2mm QFN plastic package.

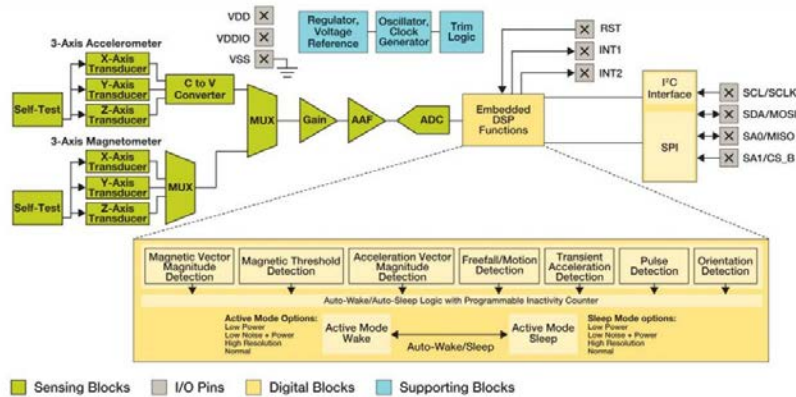


Figure 1-16 FXOS8700CQ – Accelerometer/Magnetometer Block Diagram

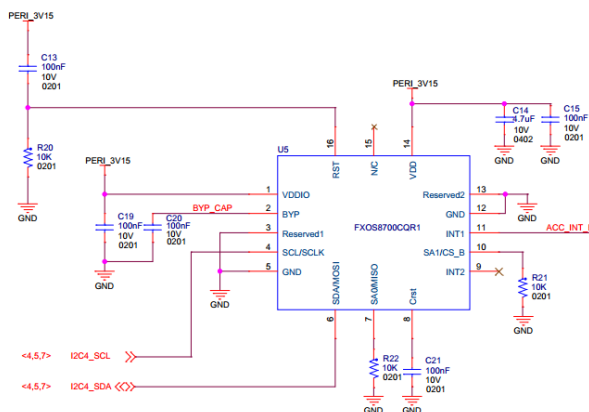


Figure 1-17 Accelerometer/Magnetometer schematics

2.2.2.3 Gyroscope

The IO board also features the Freescale's 3-axis digital gyroscope - FXAS21002.

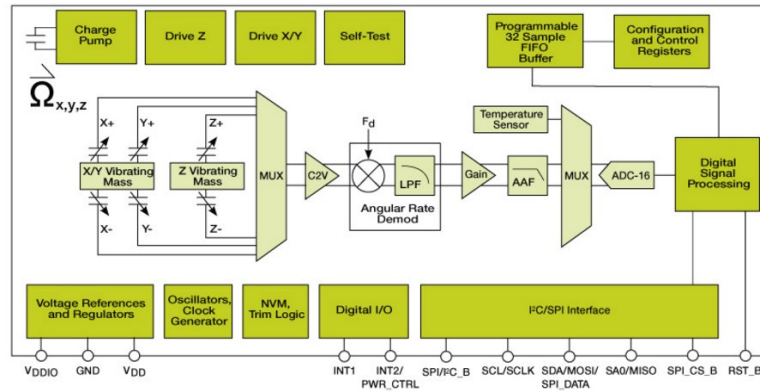


Figure 1-18 FXAS21002 Gyroscope Block Diagram

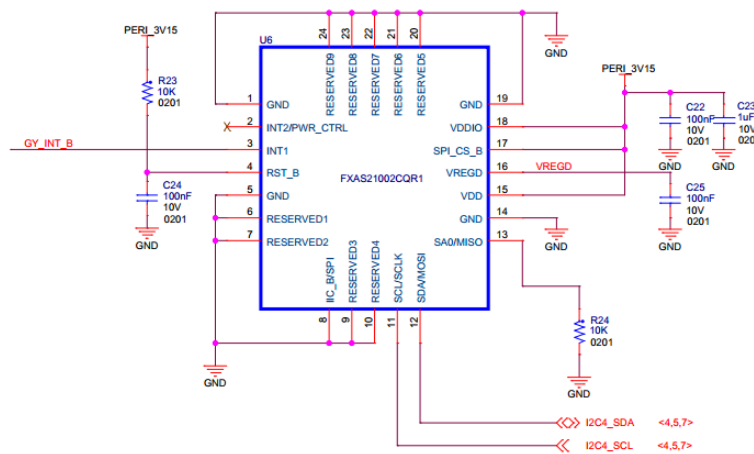


Figure 1-19 Gyroscope schematics

1.2.3 Peripheral Expansion Port

The board provides expansion headers compatible with the **mikroBUS™** socket connection standard for accessing the following communication modules on i.MX7S:

- I2C
- SPI
- PWM
- UART
- GPIO

2 Introduction to the Software System

NOTE: The commands shown with prefix `$` are to be run on a host machine (like Ubuntu etc.).
 Commands shown with prefix `=>` are to be run on the uboot prompt.
 Commands shown with prefix `~#` are to be run on board after Linux up.

1.3 Linux System Structure of WaRP7

The eMMC of WaRP7 that installs the Android system is composed of three main blocks: Kernel, system and user data. The following Figure 1-20 is an illustration of the structure, followed with brief description for each block.

Boot0	Boot1	/dev/mmcblk2p1	/dev/mmcblk2p2	/dev/mmcblk2p3
		u-boot kernel	System.img	User data

Figure 1-20 Embedded Linux system structure

The WaRP7 Partitions

Table 1-6 Partitions

Partition	Format	Functions
mmcblk2p1	Fat32	uboot / kernel / dtb
mmcblk2p2	Ext4	Android system
mmcblk2p3	Ext4	Android user data

- **Boot0 \ Boot1:** This is the boot partition of the eMMC. Once used, it is then blank and unused in WaRP7.
- **mmcblk2p1:** The u-boot and kernel are within this partition. It uses a fat file system, responsible for interacting with users, updating images, and loading kernels.
- **mmcblk2p2:** This partition uses the Ext file system. System.img, Android boot files, and system files are in this partition.
- **mmcblk2p3:** This partitions file system format is the same as the mmcblk2p2 partition and is also available for users.

1.4 Software Resources

You can download demos, operating system source code, tools, and pre-built images by visiting the links in the following table:

Table 1-7 Software resources

Categories	URLs
u-boot	https://github.com/Freescale/u-boot-fslc
kernel	https://github.com/WaRP7/linux-fslc/tree/linux_4.1.29
Android system	http://commondatastorage.googleapis.com/git-repo-downloads/repo https://github.com/WaRP7/android_manifest.git

1.5 Introduction to the Drivers

This section will introduce the main WaRP7 drivers and their source code paths. The following Table 1-8 contains this information.

Table 1-8 Drivers

Names		Descriptions	Source Code Path
Device Drivers	LCD	Three parts are included, iMx7s LCD controller driver, Truly LCD panel driver and Android HAL code.	<u>imx lcd controller:</u> <code>drivers/video/fbdev/core/fbmem.c</code> <u>Truly lcd mipi panel:</u> <code>drivers/video/fbdev/mxc/mxcfb_st7796_wvga.c</code> <u>Android HAL :</u> <code>hardware/imx/mx7/gralloc/</code>
	Touchscreen	TP driver and Android input configuration.	<u>Linux:</u> <code>drivers/input/touchscreen/synaptics_dsx</code> <u>Android input configure:</u> <code>device/fsl/common/input/</code>
	USB OTG	USB OTG driver changes for supporting Android USB connections.	<code>drivers/usb/gadget/function/f_accessory.c</code> <code>drivers/usb/gadget/function/f_audio_source.c</code> <code>drivers/usb/gadget/function/f_fs.c</code> <code>drivers/usb/gadget/function/f_mass_storage.c</code> <code>drivers/usb/gadget/function/f_mass_storage.h</code> <code>drivers/usb/gadget/function/f_mtp.c</code> <code>drivers/usb/gadget/function/f_mtp.h</code>

Names		Descriptions	Source Code Path
			drivers/usb/gadget/function/f_ptp.c drivers/usb/gadget/function/f_rndis.c drivers/usb/gadget/function/rndis.c drivers/usb/gadget/function/rndis.h drivers/usb/gadget/function/u_ether.h drivers/usb/gadget/legacy/Kconfig drivers/usb/gadget/legacy/Makefile drivers/usb/gadget/legacy/acm_ms.c drivers/usb/gadget/legacy/android.c drivers/usb/gadget/legacy/inode.c drivers/usb/gadget/legacy/mass_storage.c drivers/usb/gadget/legacy/multi.c drivers/usb/gadget/udc/pxa27x_udc.c
	BT&WIFI	BT/WIFI module driver	<u>Linux driver:</u> drivers/net/wireless/bcmdhd
	camera	Camera related drivers.	Drivers/media/platform/mxc/subdev/mx6s_capture.c Drivers/media/platform/mxc/subdev/mxc_mipi_csi.c Drivers/media/platform/mxc/subdev/ov5640_1lc_mipi.c
	Audio	Audio card driver	Linux/sound/soc/codecs/sgtl5000.c

1.6 Quick Start

1.6.1 Burning the System Image to the WaRP7

Connect USB cables as follows:



Figure 1-21 Connection

Update the image to WARP7 eMMC:

Power on the WARP7 board and use ums command in U-boot to start the USB removable stick.

=> `ums emmc 0`

```
U-Boot 2015.10-00061-g1fb5230-dirty (Feb 17 2016 - 19:45:26 -0600)

CPU:   Freescale i.MX7D rev1.0 at 792MHz
CPU:   Commercial temperature grade (0C to 95C) at 46C
Reset cause: POR
Board: WARP7
I2C:   ready
DRAM:  512 MiB
PMIC:  PFUZE3000 DEV_ID=0x30 REV_ID=0x11
MMC:   FSL_SDHC: 0
In:    serial
Out:   serial
Err:   serial
Net:   CPU Net Initialization Failed
No ethernet found.
Hit any key to stop autoboot:  0
=> ums mmc 0
UMS: disk start sector: 0x0, count: 0xe18000
/
```

Figure 1-22 About Ums Command

Download and install “Win32 Disk Imager” from

<https://sourceforge.net/projects/win32diskimager/>

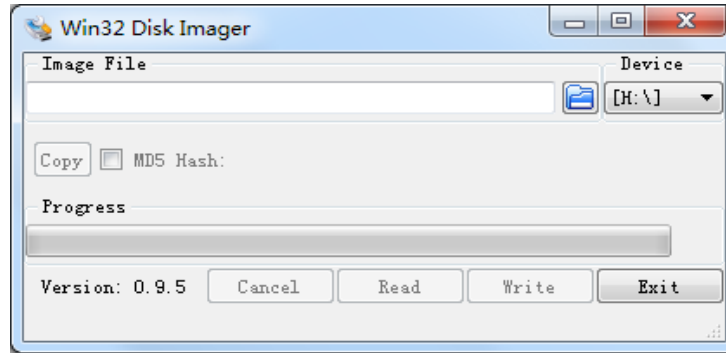


Figure 1-23 About Install-1

Select the system image: Warp7_Android_Image_Rev1.x.img

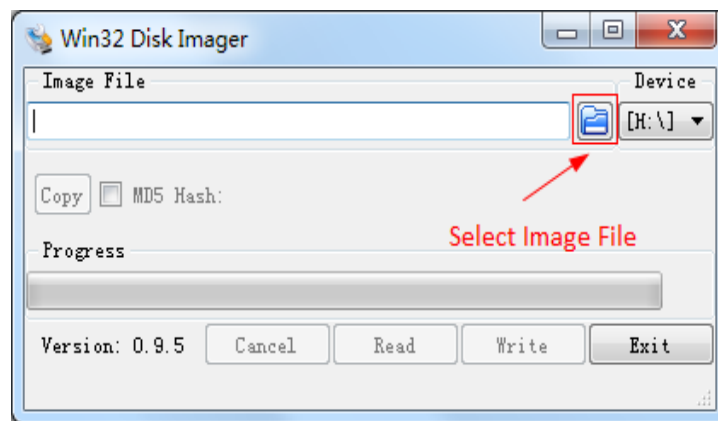


Figure 1-24 About Install-2

Click the “Write” button to burn the images:

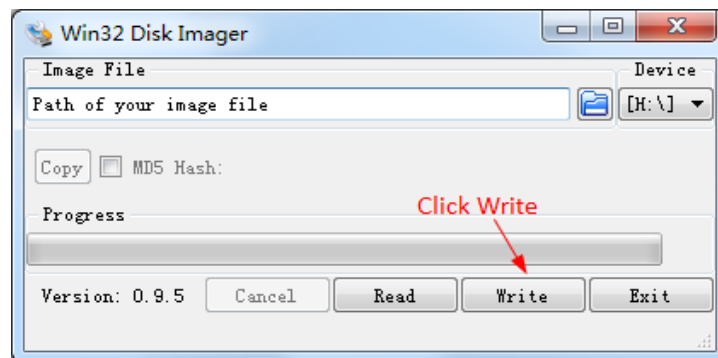


Figure 1-25 Step 3 About Install

After the image is burnt in, the three partitions listed below will be found in the host PC.

```
Disk /dev/sde: 7566 MB, 7566524416 bytes
4 heads, 16 sectors/track, 230912 cylinders, total 14778368 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x1dbe4620

   Device Boot      Start         End      Blocks   Id  System
/dev/sde1            2048        978687       488320    b   W95 FAT32
/dev/sde2          999936       1999999       500032   83   Linux
/dev/sde3        2000000       14778367      6389184   83   Linux
root@hul-VirtualBox:~/freescale/warp7#
```

Figure 1-26 Reference Part1

```
root@hul-VirtualBox:~/freescale/warp7# df
Filesystem      1K-blocks    Used Available Use% Mounted on
/dev/sda1       11932756 4235760   7098316  38% /
udev            1023496      4    1023492   1% /dev
tmpfs           412308     1068    411240   1% /run
none             5120        0      5120    0% /run/lock
none            1030768     200    1030568   1% /run/shm
/dev/sdb1       31816340 5174316  25047208  18% /home/hul/ti
/dev/sdc1       31816340 9040136  21181388  30% /home/hul/freescale
/dev/sde2        363088    295424     67664   82% /media/57f8f4bc-abf4-655f-bf67-946fc0f9f25b
/dev/sde1        480128    146248     333880   31% /media/46BE-3C77
/dev/sde3        6369232    580304     5469472  10% /media/47a09db9-4b48-44b8-88b9-e71c9b0789cd
```

Figure 1-27 Reference Part2

1.6.2 System Boot

Install Serial Console (e.g. SecureCRT), configure the corresponding port number, baud rate as 115200, data bits as 8, stop bits as 1, parity as none.

Power on and boot up the system.

```
U-Boot 2015.10-00061-g1fb5230-dirty (Feb 17 2016 - 19:45:26 -0600)
CPU:   Freescale i.MX7D rev1.2 at 792MHz
CPU:   Extended Commercial temperature grade (-20C to 105C) at 24C
Reset cause: POR
Board: WARP7
I2C:   ready
DRAM:   512 MiB
PMIC:   PFUZE3000 DEV_ID=0x30 REV_ID=0x11
MMC:   FSL_SDHC: 0
In:     serial
Out:    serial
```

Figure 1-28 Boot Part


```
Starting kernel ...

Booting Linux on physical CPU 0x0
Linux version 4.1.29-01733-g8f7beb3-dirty (root@Embtest-Lech) (gcc version 4.8.4 (Ubuntu/Linaro 4.8.4-2ubuntu1~14.04.1) ) #9 SMP PREEMPT Thu
Dec 29 12:15:39 CST 2016
CPU: ARMv7 Processor [410fc075] revision 5 (ARMv7), cr-10c53c7d
CPU: PIPT / VIPT nonaliasing data cache, VIPT aliasing instruction cache
Machine model: Warp i.MX7S Board
Reserved memory: created CMA memory pool at 0x8c000000, size 320 MiB
Reserved memory: initialized node linux,cma, compatible id shared-dma-pool
Memory policy: Data cache writealloc
PFRCPU: Embedded 12 pages/cpu @8hh73000 s16960 r8192 d74000 u49157
Built 1 zonelists in Zone order, mobility grouping on. Total pages: 130048
Kernel command line: console=ttyMXC0,115200 init=/init androidboot.hardware=freescale androidboot.selinux=disabled
PID hash table entries: 2048 (order: 1, 8192 bytes)
Dentry cache hash table entries: 65536 (order: 6, 262144 bytes)
Inode-cache hash table entries: 32768 (order: 5, 131072 bytes)
Memory: 178040K/524288K available (8110K kernel code, 466K rwdma, 2836K rodata, 1180K init, 542K bss, 18568K reserved, 327680K cma-reserve
d, 0K highmem)
Virtual kernel memory layout:
vector : 0xfffff0000 - 0xfffff1000 ( 4 kB)
fixmap : 0xfffc00000 - 0xffff00000 (3072 kB)
vmalloc : 0xa08000000 - 0xff0000000 (1512 MB)
...
```

Figure 1-29 Kernel Part

1.7 System Update

This section will introduce how to use mfgtools to update the firmware into the eMMC of WaRP7.

The WaRP7 device includes an IO board and a CPU board. Ensure the connection of the IO board and CPU board are both successfully established.

The boot mode is selected by the DIP switch. It has two pins, therefore four kinds of boot modes in total. Select the correct boot mode as per Table 1-9 below:

Table 1-9 Boot Mode

Boot Mode	Pin 1	Pin 2
BOOT_MODE	1	0
FUSES	0	0
MANUFACTURE	0	1
INTERNAL BOOT	1	0
TEST MODE	1	1

NOTE: Select MANUFACTURE mode only when using MFGtools to boot the WaRP7 board.

Once the correct boot mode has been selected, follow the steps below:

1. Select the firmware which has been built and place it into the mfgtools folder. The folder access location is:

mfgtools_warp7_partitions\Profiles\Linux\OS Firmware\files

The files you should see are listed below:

- imx7d-warp.dtb
- u-boot.imx
- zImage
- system.img (the firmware built from the Android project)
- data.tar.bz2 (the third partition compression files using 'tar cvjfp' with attribution)

unchanged)

2. Set the Switch of the IO board to 0-1 as below, then connect the serial and power wire.

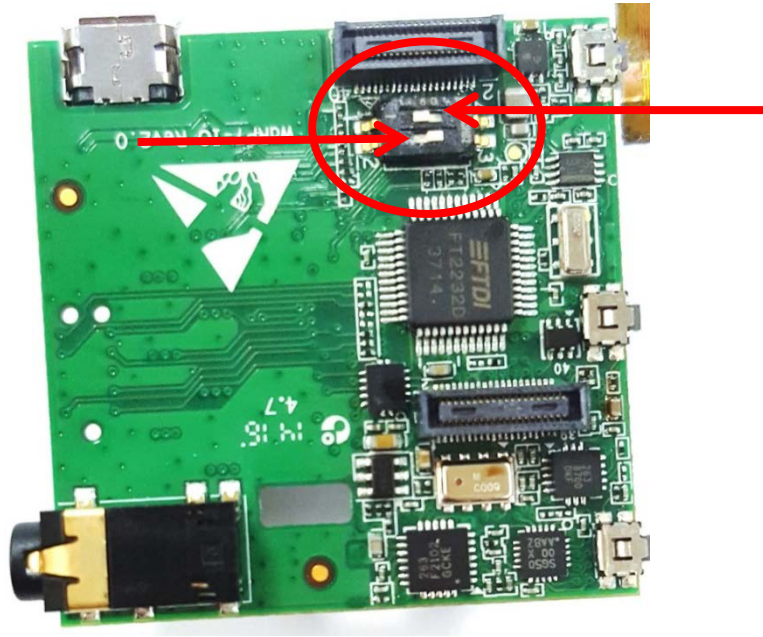


Figure 1-30 IO board switch

3. Open the mfgtools, the “HID-compliant device” will be visible if the device is connected successfully. Click “Start”.



Figure 1-31 Connect mfgtools

4. Wait a few minutes; if the dialog shown below in Figure 1-32 is displayed, then the update has been successful.

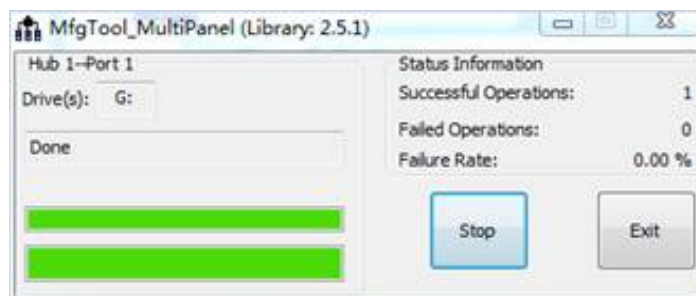


Figure 1-32 Update success

Switch the IO board to INTERNAL BOOT (switch 10) then power the device. The system will start up from eMMC.

NOTE: Do not connect the USB Serial Port cable while carrying out a system update. Doing so can cause a failed update.

1.8 Android Testing

1.8.1 LCD & Touch Test

When the boot process of the WaRP7 has been completed the following image shown in Figure 1-33 will be displayed. Lightly touch the screen to unlock it.



Figure 1-33 Touch screen unlock

The desktop view shown in Figure 1-34 below will be shown.



Figure 1-34 Desktop

1.8.2 Watch Test



Select the Time icon to open the watch. This application includes a time and date display, a timer and an alarm.



Figure 1-35 Time & Date Display

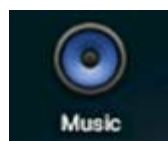


Figure 1-36 Timer



Figure 1-37 Alarm

1.8.3 Audio



Select the Music icon to start the MP3 music player.

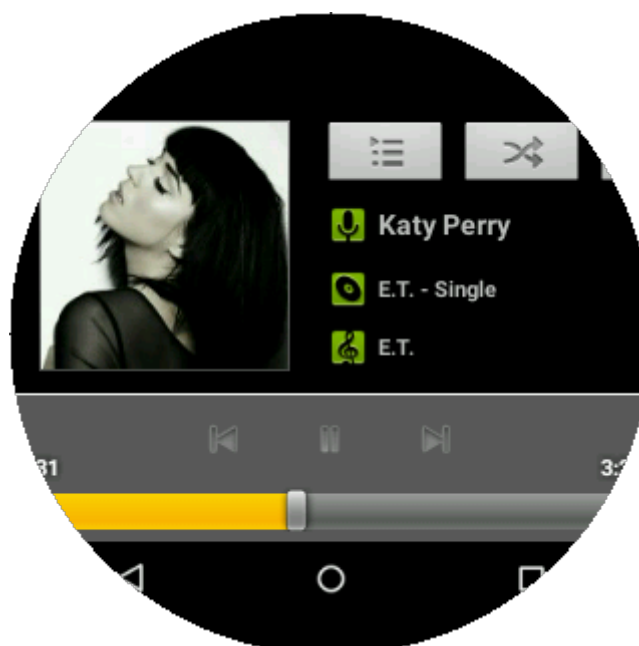


Figure 1-38 Music player

1.8.4 Video



Select the KMPlayer icon to start the KMP video player. This is a free multimedia player where you can select and play videos.

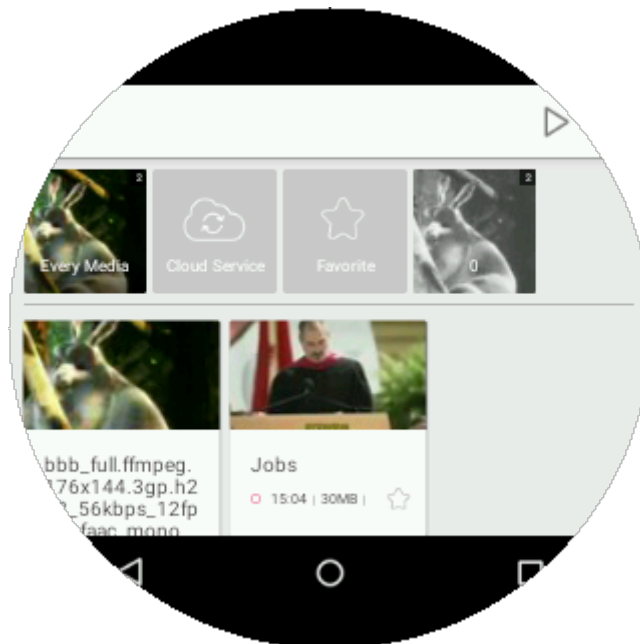


Figure 1-39 Video List

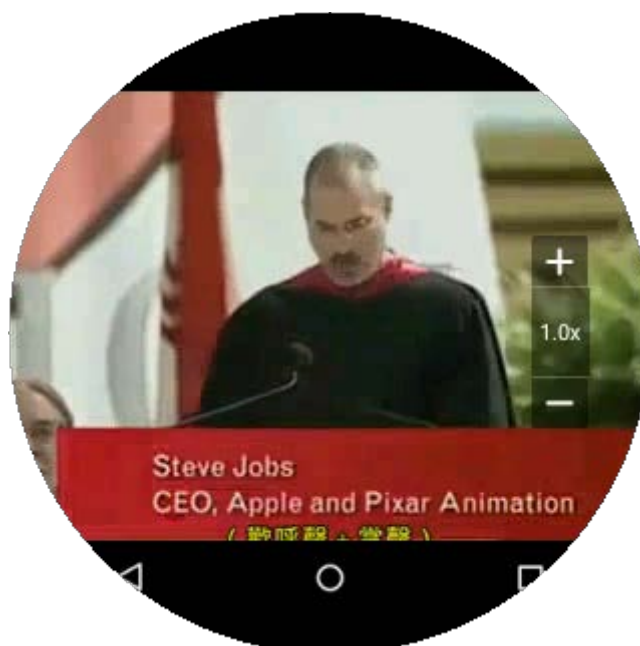
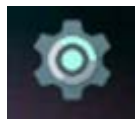


Figure 1-40 Play Video

1.8.5 Bluetooth Test



Click on the Settings icon and then select Bluetooth. You will see a screen similar to Figure 1-41 or Figure 1-42 below:

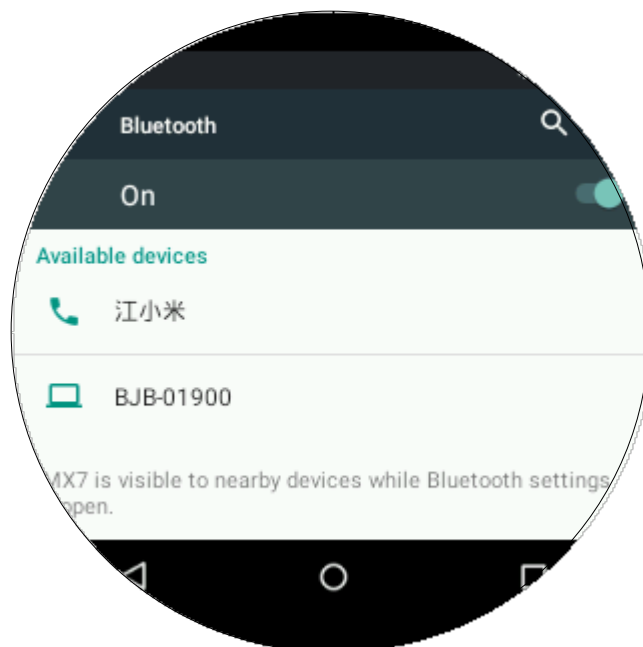


Figure 1-41 Bluetooth

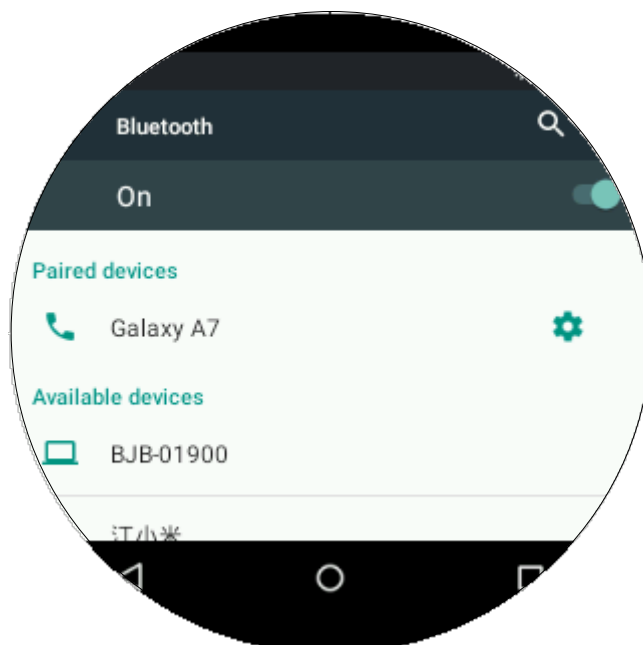


Figure 1-42 Paired Devices

1.8.6 Wi-Fi Test



Click on the Settings icon then select Wi-Fi. A display similar to the ones shown in Figure 1-43 and Figure 1-44 will be seen.

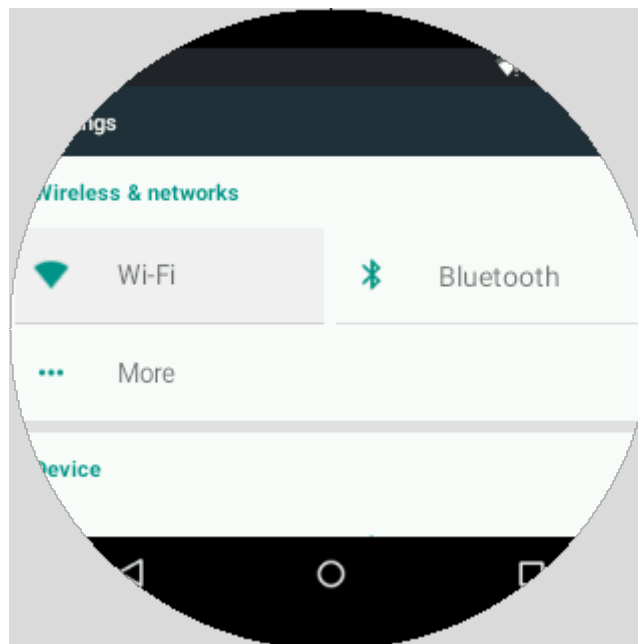


Figure 1-43 Wi-Fi Select

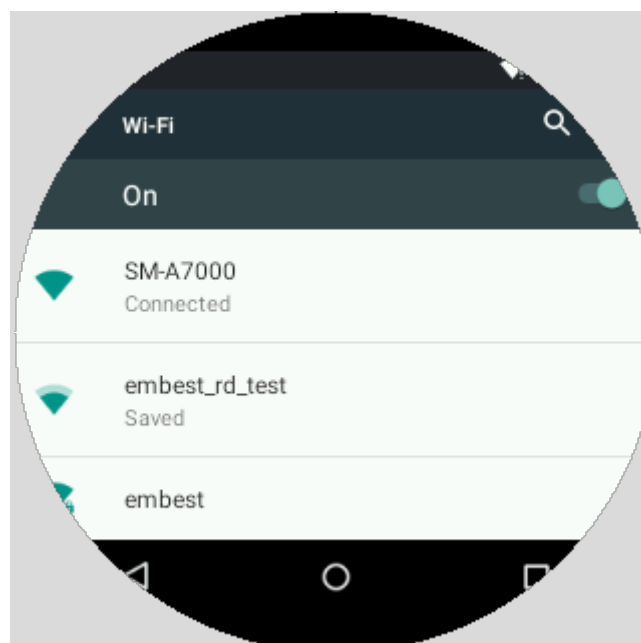


Figure 1-44 Wi-Fi connected

If the connection is successful, you will be able to view the web via the browser.



From the Launcher click the Browser icon, then input a website address, for example www.bbc.com, into the address bar. Click button Go. If a Wi-Fi connection has been made, the web page will be displayed in the browser.



Figure 1-45 Browser

1.8.7 Sensor Test

Before using the magnetic sensor a calibration must be done.

The calibration process occurs in three states. Each state is based on a value of completion and displayed as a percentage.

Table 1.9 Calibration Process States

State	Percentage	Comment
Not Good	0%-49%	The magnetic data is not correct.
Good	50%-99%	The magnetic data is almost good enough to use, but has not yet be the best.
Completed	100%	Calibration complete!



Figure 1-46 Calibration Process States

NOTE: A calibration is required every time the device restarts from power off.

To calibrate, open the MagneticCalibration APP and follow the instructions.



Select the Android Sensor icon to start the Android Sensor App. The accelerometer, gyroscope and magnetometer information will be shown as in Figure 1-47 below.

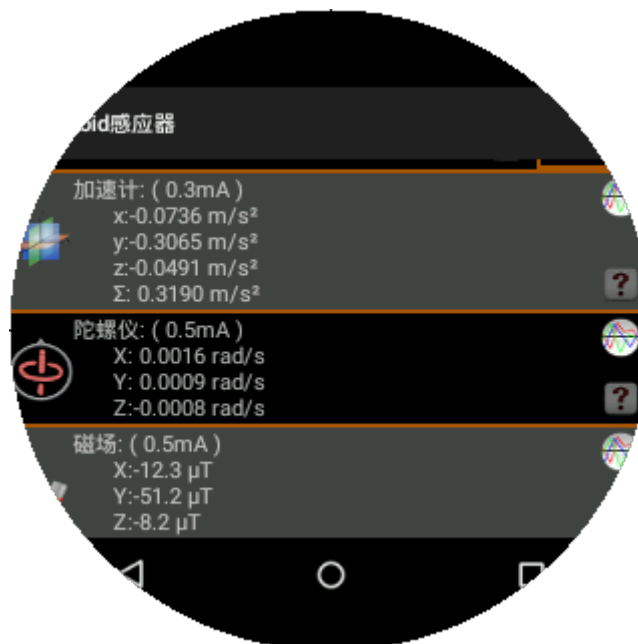
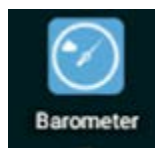


Figure 1-47 Sensor test

The gyroscope use can also be demonstrated within the Compass App as shown in Figure 1-48 below:



Figure 1-48 Compass



Select the Barometer icon from the Launcher to open the Barometer App. A display similar to the one shown below in Figure 1-49 will be seen.

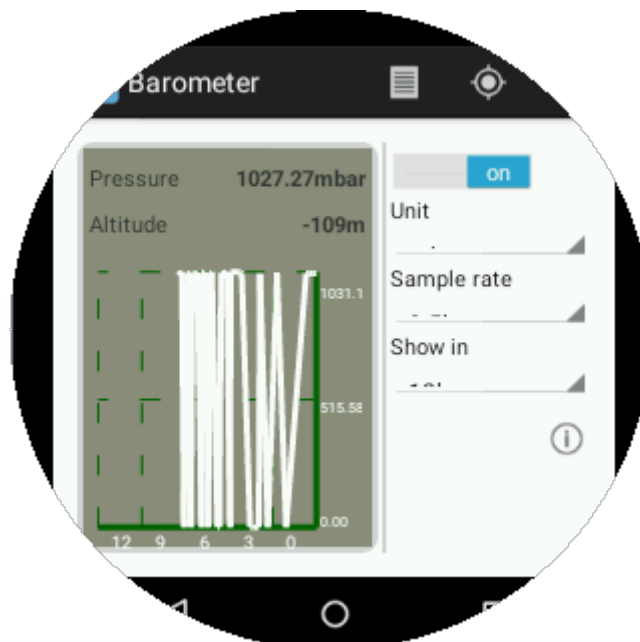


Figure 1-49 Barometer

These three sensors can also be tested with TestSensors App.



Figure 1-50 TestSensors App

1.8.8 Camera Test

Android APK Camera Test

Within the “\linux\arch\arm\boot\dtb” directory, you should be able to see an “imx7d-warp-ov5640.dtb” file, which is built out by imx7d-warp-ov5640.dts.

You should use this file as the WaRP7 camera sensor is ov5640.

Rename the “imx7d-warp-ov5640.dtb” to “imx7d-warp.dtb” and download it to WaRP7 board.

Start the device and then launch the Camera app to preview the picture.

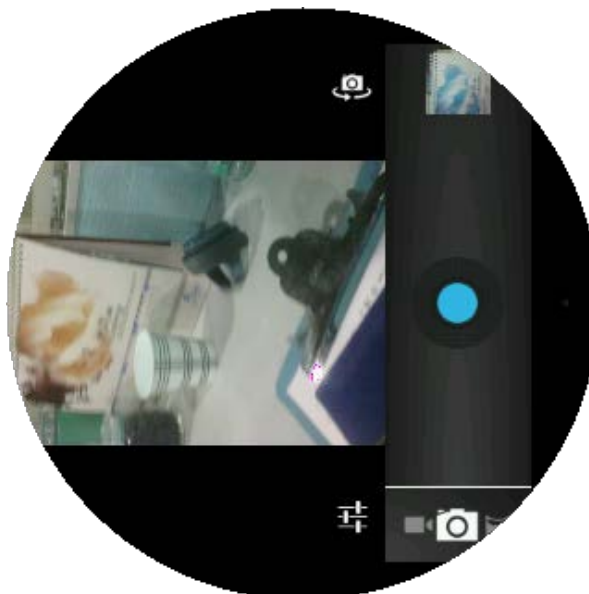




Figure 1-51 Picture Preview

Click on the Camera Button  to take a picture. To view your recent picture, click on the image in the right-hand side of the display. 

Take a video.

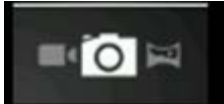

Switch to Video mode by clicking the icon  in the bottom left-hand corner of the display and select the video option.



Figure 1-52 Recording (a)

Press the shutter button  to start recording. Re-click it to stop recording.

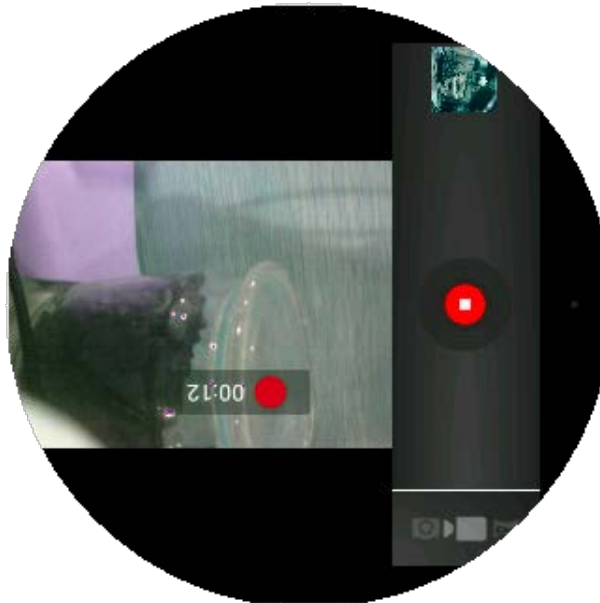


Figure 1-53 Recording (b)

To view your recorded video open the KMPlayer from the home screen.

NOTE: Because WaRP7 has no GPU and only has 512M RAM, low memory and high CPU usage when recording video may cause the system halt. To prevent this, recordings should be no longer than 20 seconds long. This is an aspect currently being reviewed.

1.8.9 Launcher



From the WaRP7 home screen, select the Apps icon to enter the applications menu. This will provide a list of Java APK.



Figure 1-54 Java APK List

1.8.10 Charging over USB Test

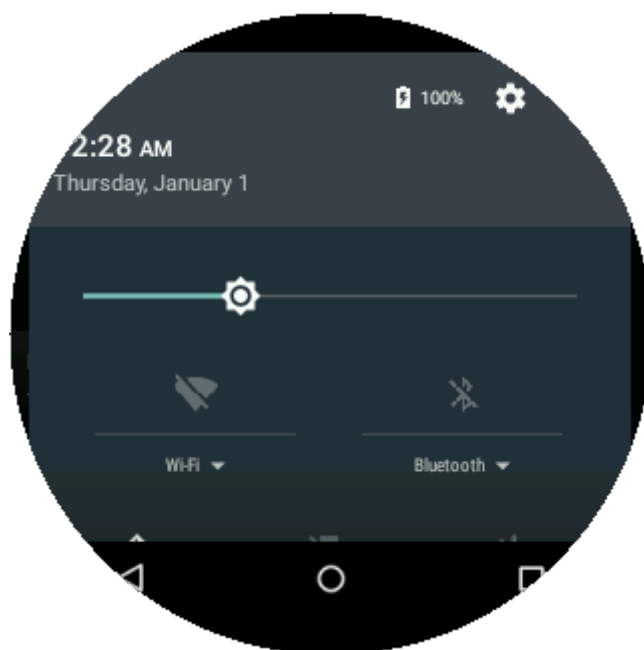

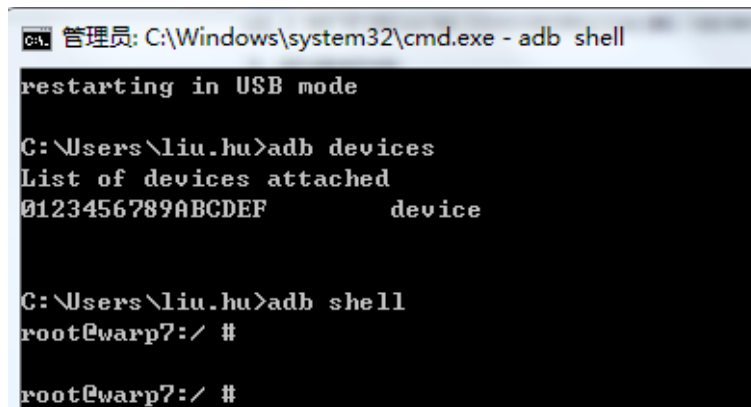


Figure 1-55 Charging

Connect the USB line to power supply, the charging icon  will be showed.

1.8.11 USB Test

The ADB which is android debug tools can be connected to Wrap7 with USB.



```

C:\Users\liu.hu>adb devices
List of devices attached
0123456789ABCDEF    device

C:\Users\liu.hu>adb shell
root@warp7:/ #
root@warp7:/ #
  
```

Figure 1-56 USB test

1.8.12 NFC Test

WaRP7 has a NFC Tag module and user could use it to realize some useful functions, such as quickly open an internet web, show an ID information text, and any other usual NFC Tag function.

NXP developed a “NTAG I²C demo application for Android”, which the user could use it to demonstrate or configure the NFC Tag. In a word, install this APK onto a NFC supporting Android phone, and use this phone to connect with the WaRP7 NFC Tag module. For detail, please refer to the document and source code to figure out how to operate it.

APK source code for “NTAG I²C demo application for Android”

<http://www.nxp.com/documents/software/SW309711.zip>

Document for “NTAG I²C demo application for Android”

http://www.nxp.com/documents/application_note/AN11597.pdf

1.8.13 Sound Recording Test



Click icon to start up Sound Recording App.

You should insert a headset with microphone.

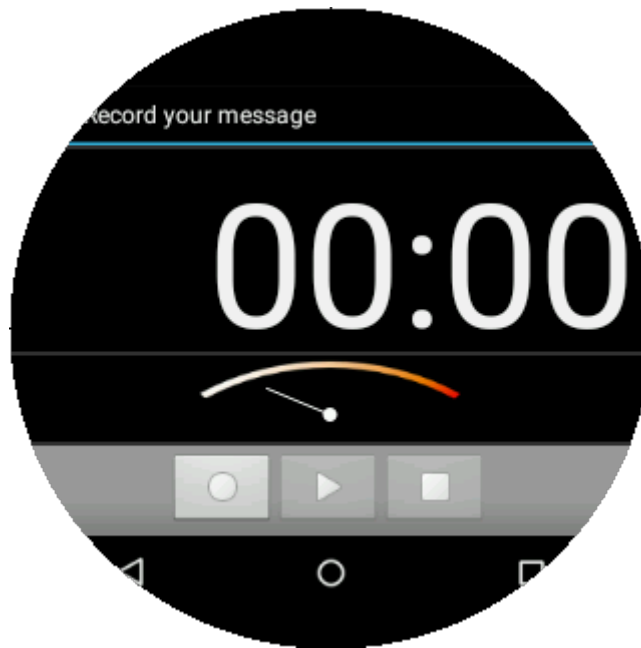


Figure 1-57 Sound Record (a)

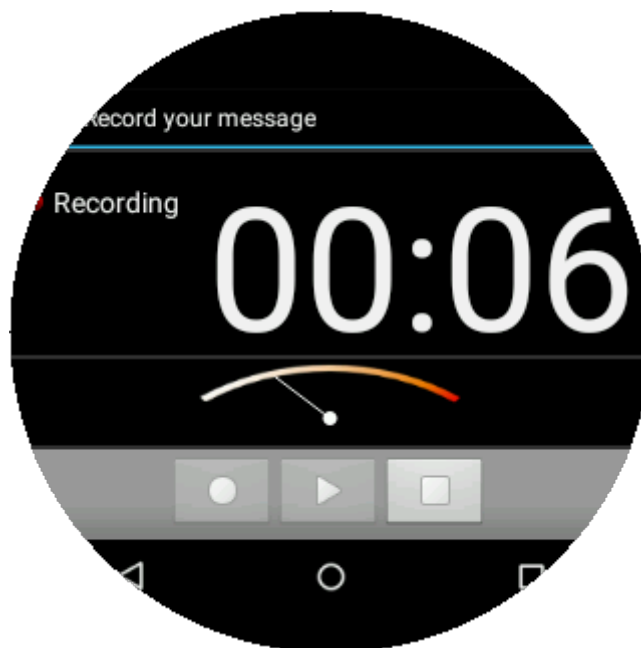





Figure 1-58 Sound Record (b)

Click button  to starting sound recording, and  stop.

Before clicking “Done” button, click  to play the record file.

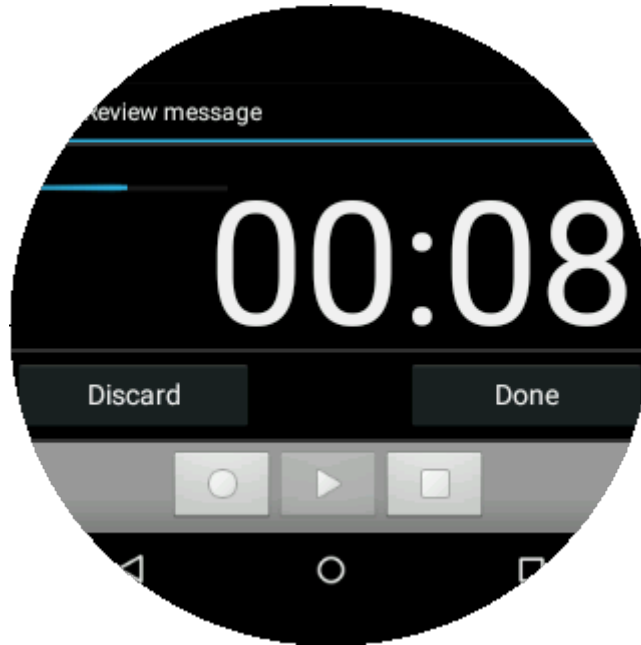


Figure 1-59 Sound Record (c)

4 Technical Support and Warranty

4.1 Technical Support

Embest Technology (A Premier Farnell Company) provides its product with one-year free technical support including:

- Providing software and hardware resources related to the embedded products of Embest Technology;
- Helping customers properly compile and run the source code provided by Embest Technology;
- Providing technical support service if the embedded hardware products do not function properly under the circumstances that customers operate according to the instructions in the documents provided by Embest Technology;
- Helping customers troubleshoot the products.



The following conditions will not be covered by our technical support service. We will take appropriate measures accordingly:

- Customers encounter issues related to software or hardware during their development process;
- Customers encounter issues caused by any unauthorized alter to the embedded operating system;
- Customers encounter issues related to their own applications;
- Customers encounter issues caused by any unauthorized alter to the source code provided by Embest Technology;

4.1 Warranty Conditions

- 1) 12-month free warranty on the PCB under normal conditions of use since the sales of the product;
- 2) The following conditions are not covered by free services; Embest Technology will charge accordingly:
 - Customers fail to provide valid purchase vouchers or the product identification tag is damaged, unreadable, altered or inconsistent with the products.
 - Products are damaged caused by operations inconsistent with the user manual;
 - Products are damaged in appearance or function caused by natural disasters (flood, fire, earthquake, lightning strike or typhoon) or natural aging of components or other force majeure;
 - Products are damaged in appearance or function caused by power failure, external forces, water, animals or foreign materials;
 - Products malfunction caused by disassembly or alter of components by customers or, products disassembled or repaired by persons or organizations unauthorized by Embest Technology (A Premier Farnell Company), or altered in factory specifications, or configured or expanded with the components that are not provided or recognized by Embest Technology (A Premier Farnell Company) and the resulted damage in appearance or function;
 - Product failures caused by the software or system installed by customers or inappropriate settings of software or computer viruses;
 - Products purchased from unauthorized sales;
 - Warranty (including verbal and written) that is not made by Embest Technology and not included in the scope of our warranty should be fulfilled by the party who committed. Embest Technology has no any responsibility;
- 3) Within the period of warranty, the freight for sending products from customers to Embest Technology should be paid by customers; the freight from Embest to customers should be paid by us. The freight in any direction occurs after warranty period should be paid by customers.
- 4) Please contact technical support if there is any repair request.

NOTE: Embest Technology (A Premier Farnell Company) will not take any responsibility on the products sent back without the permission of the company.

4.2 Contact Information

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Website: <http://uk.farnell.com/technical-support?ICID=PromoS-technical-support>

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