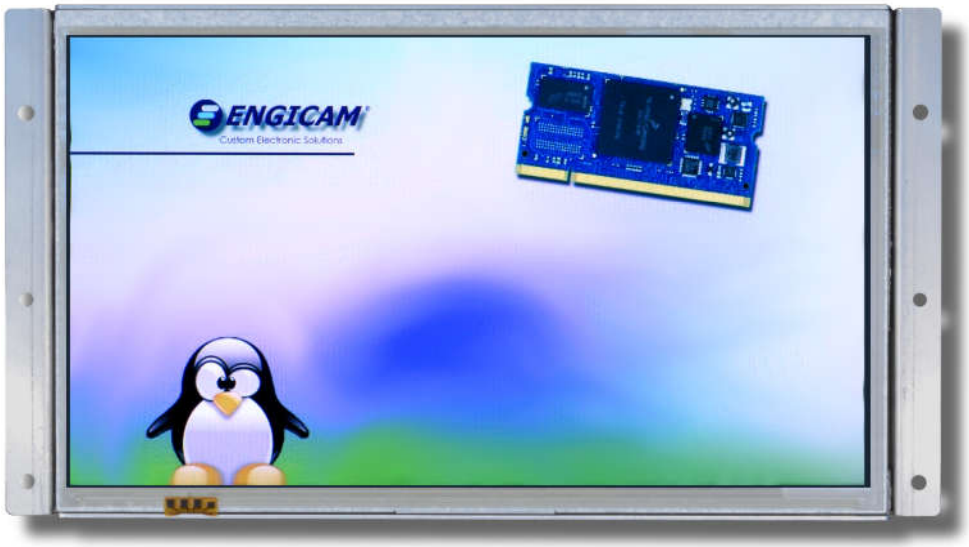
Openframe LOW COST 10.1 USR Manual 2.0.6



***** REV 2.0.6 *****

DATE	REVISION	CHANGE DESCRIPTION
19/06/14	1.0.0	Release
06/05/15	2.0.0	New board upgrade and new mechanical
12/05/15	2.0.1	Added bootargs update
07/08/15	2.0.2	Added Ordering Code informations for modules with Yocto U-Boot
02/05/16	2.0.3	Added carrier board mechanical specifications, modified bootargs informations, Ordering info updated
18/07/16	2.0.4	General enhancement
16/09/16	2.0.5	Added new ordering codes and new display
03/05/17	2.0.6	Added “Product Compliance” chapter

Summary

1. Cable Map Overview

This document is an overview about cable connecting map of Open-Frame system.
It describes the connector and the interface unit available to user, and it specifies the electrical characteristic of signals.

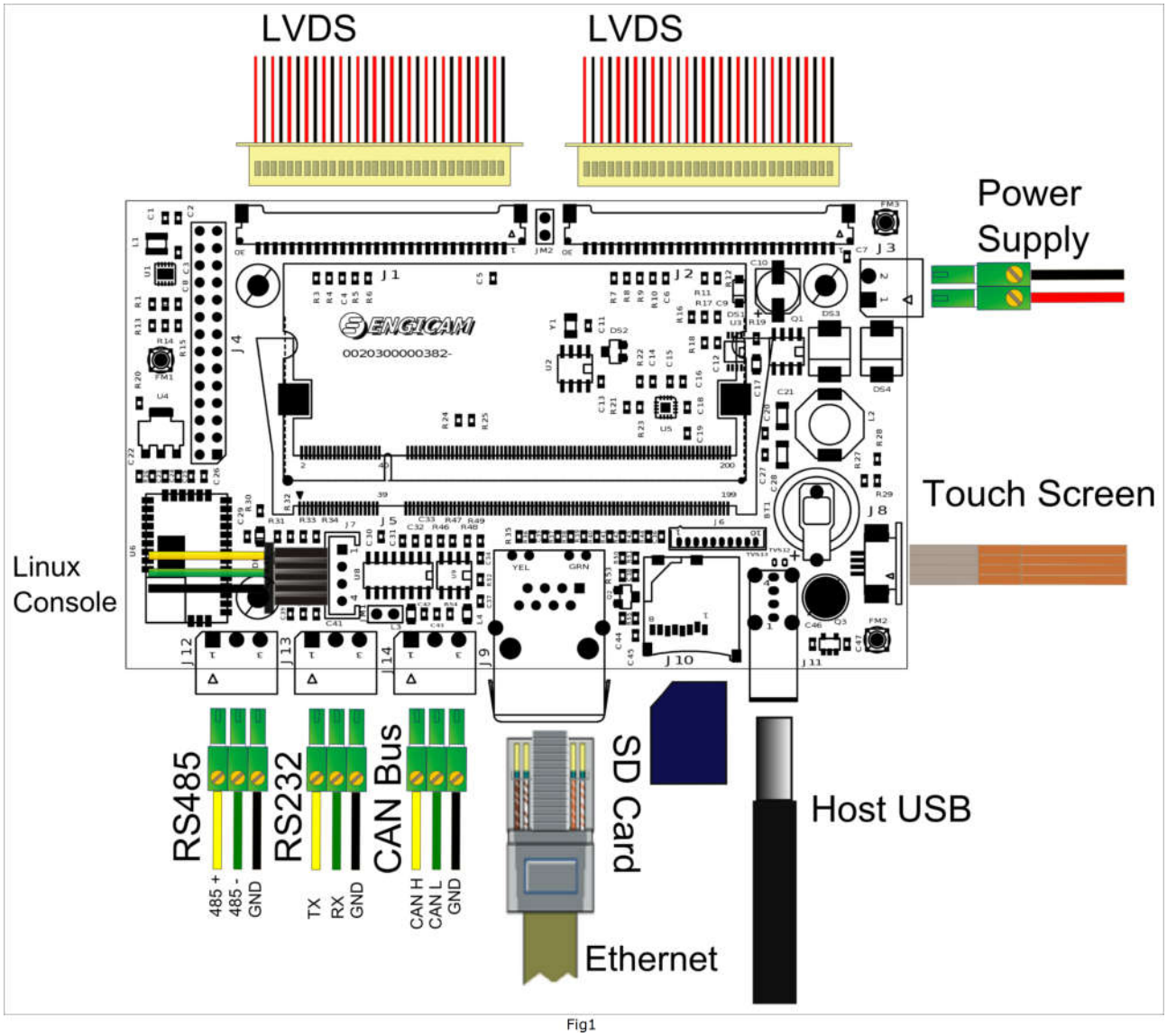


Fig1

The figure1 shows the whole wiring map and its join connectors.
This document will try to analyse all type of used connections to help the user's start up.

2. Carrier Board Specifications

In this chapter are described the informations about the carrier board 10.1" LOCO, these specifications include the descriptions of all the available peripheral assembled on the board and the code or the family of any mating connectors for each interface.

Concerning the useful requirements for the design of a complete customized system, are reported the informations about the mechanical dimensions of the carrier board, and the fixed points and the size of the holes

2.1 Mechanical informations

In the following picture is reported the drawing and the size of the carrier board. This can be useful for the customer for integrate and fix the carrier into a custom system.

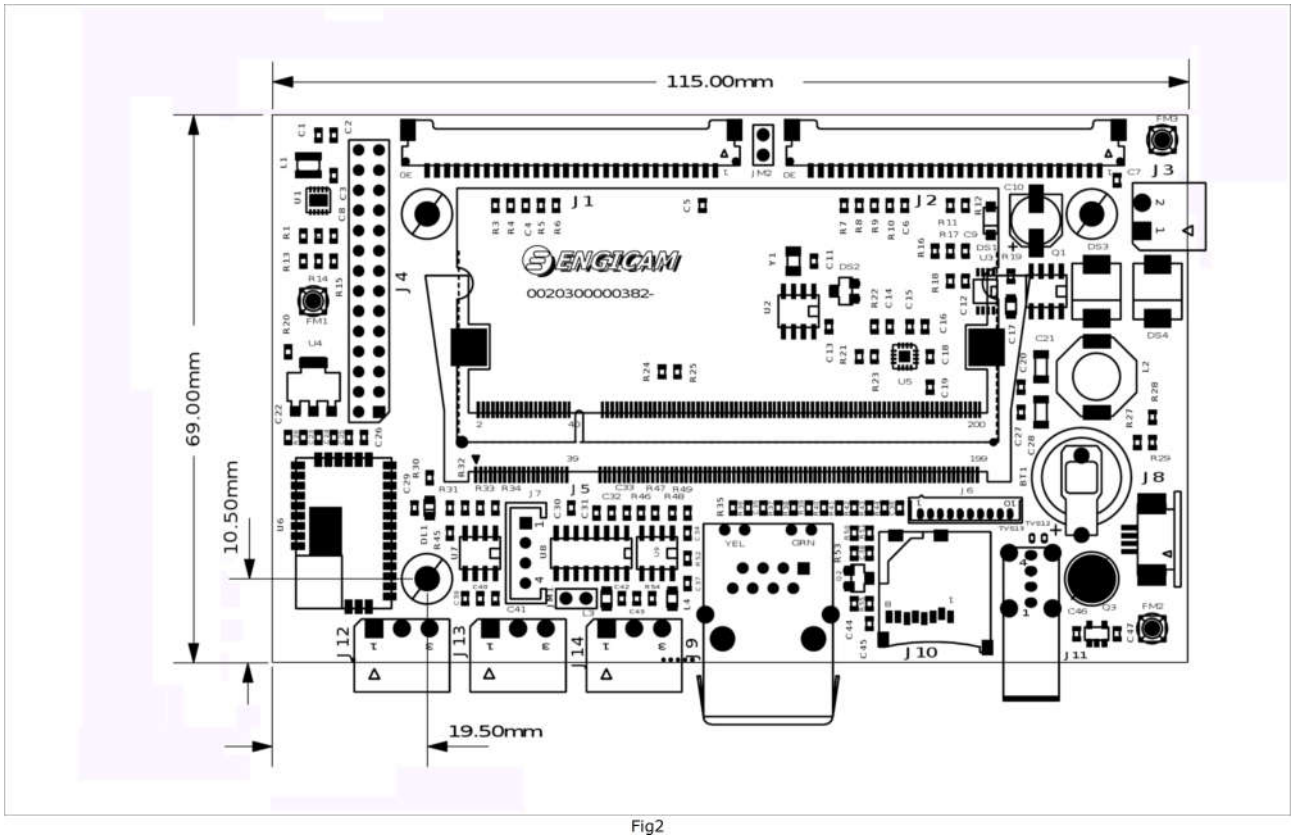


Fig2

***Note**: all the unit reported measure are in mm*

2.2 Micro SD Connections

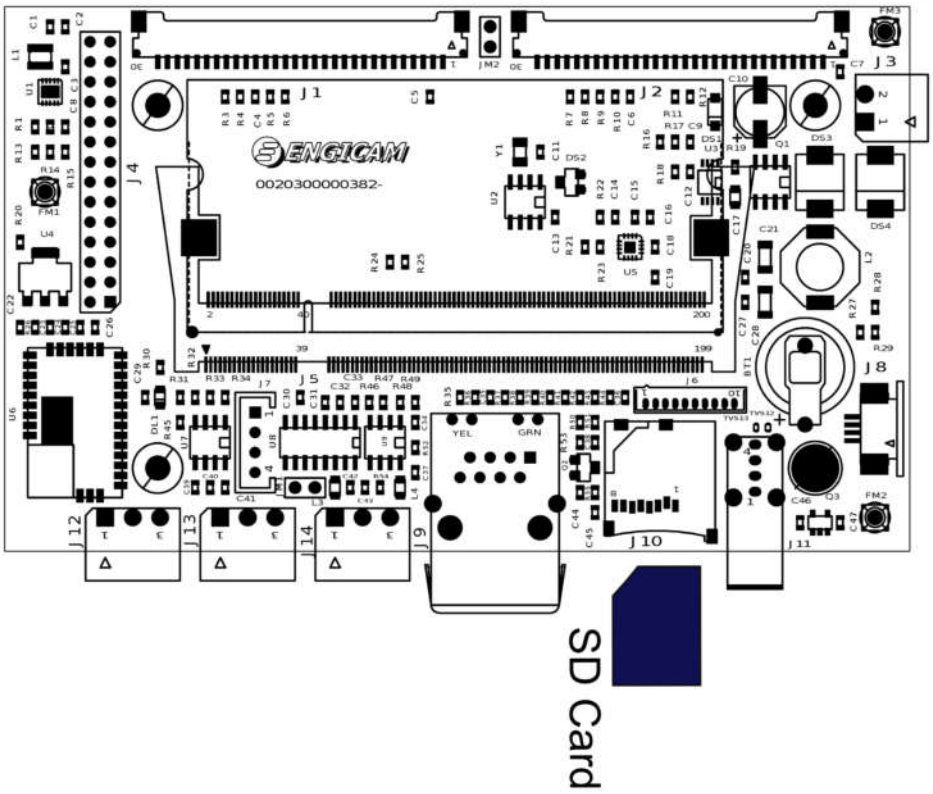


Fig3

The Open-Frame board has a Micro SD switch detected connector (J10). It uses both SD standard type card and SD High Capacity type card

Micro SD card features are:

- Capacity: variable from 32 MB to 32 GB
- Length: 15 mm
- Depth:11 mm
- Height: 1 mm
- Voltage supply 2,7 V 3,6 V
- Slot : TransFlash
- MTBF: 1.000.000 h/e

2.3 RS 485 RS 232 & CAN Bus Connections

The following figure represents the connections of the RS485, RS232 and CAN bus's signals. Both RS485, RS232 and CAN bus are connected through a terminal male connector (Phoenix code MC 1.5/3-G-3.5 - 1844223 90° or compliant) mounted on PCB and referenced J12, J13, J14.

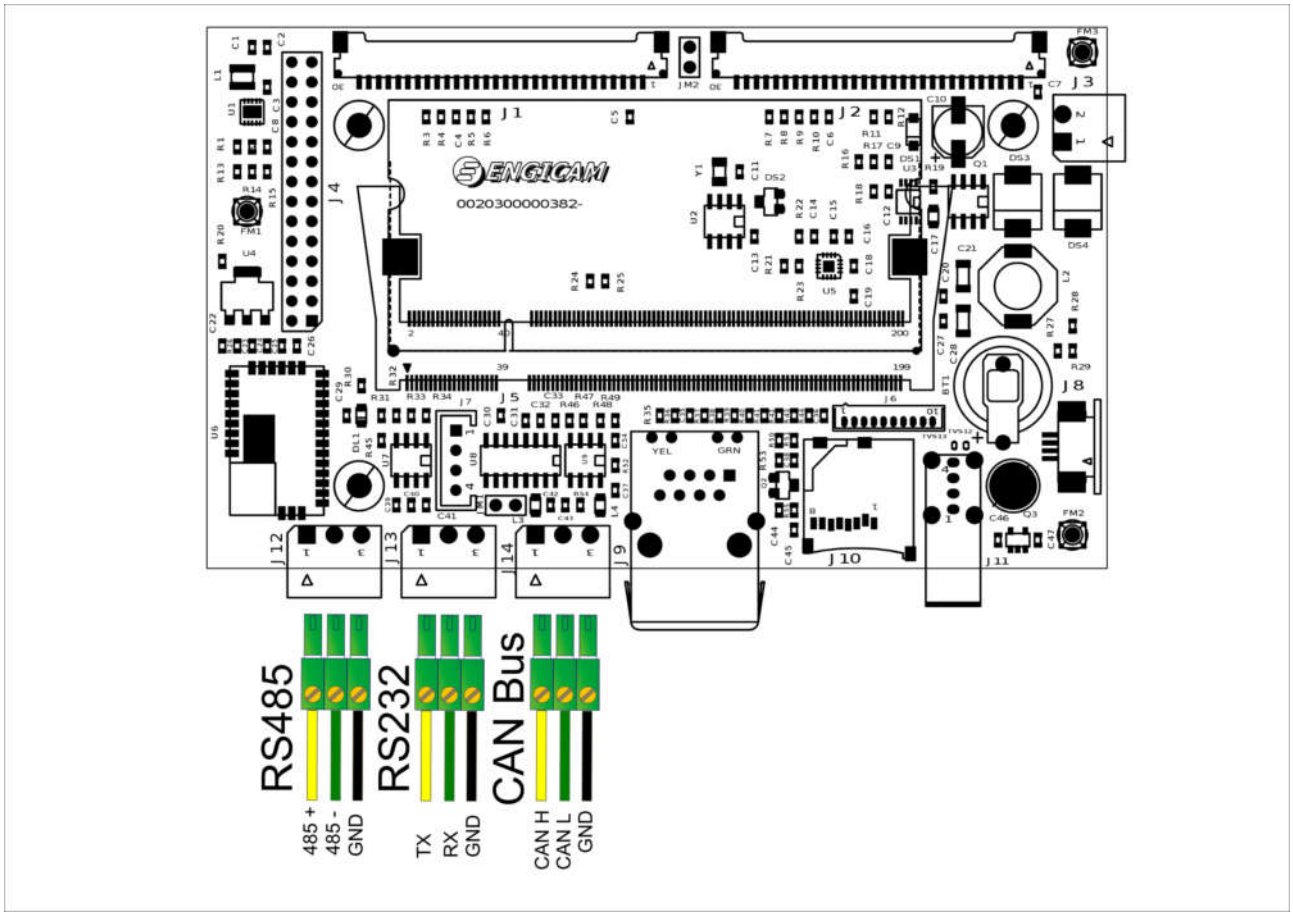


Fig4

The wiring map of female connector (Phoenix code MC 1.5/3-ST-3.5 - 1840379) used for Uarts&Can is shown in the following table.

J14

Pin number	Signal Name	Function Description	Voltage reference
1	CAN H	High level can bus line	Standard CAN Compliant
2	CAN L	Low level can bus line	Standard CAN Compliant
3	GND	Power Signal	-

Table 1

The CAN bus may be terminated by the using of jumper JM1 (120 Ohm)

Following are reported the cable maps for the UART interface.

J13 RS232

Pin number	Signal Name	Function Description	Voltage reference
1	TX	Transmit Signal Output	RS232 Standard
2	RX	Receive Signal Input	RS232 Standard
3	GND	Power Signal	-

Table 2

J12 RS485

Pin number	Signal Name	Function Description	Voltage reference
1	RS485 P	Non Inverting Receiver In/Driver Out	RS485 Standard
2	RS485 N	Inverting Receiver In/Driver Out	RS485 Standard
3	GND	Power Signal	-

Table 3

***Note**: **Do NOT** use the UART RS232 on connector J13 as Linux console*

2.4 USB Connections

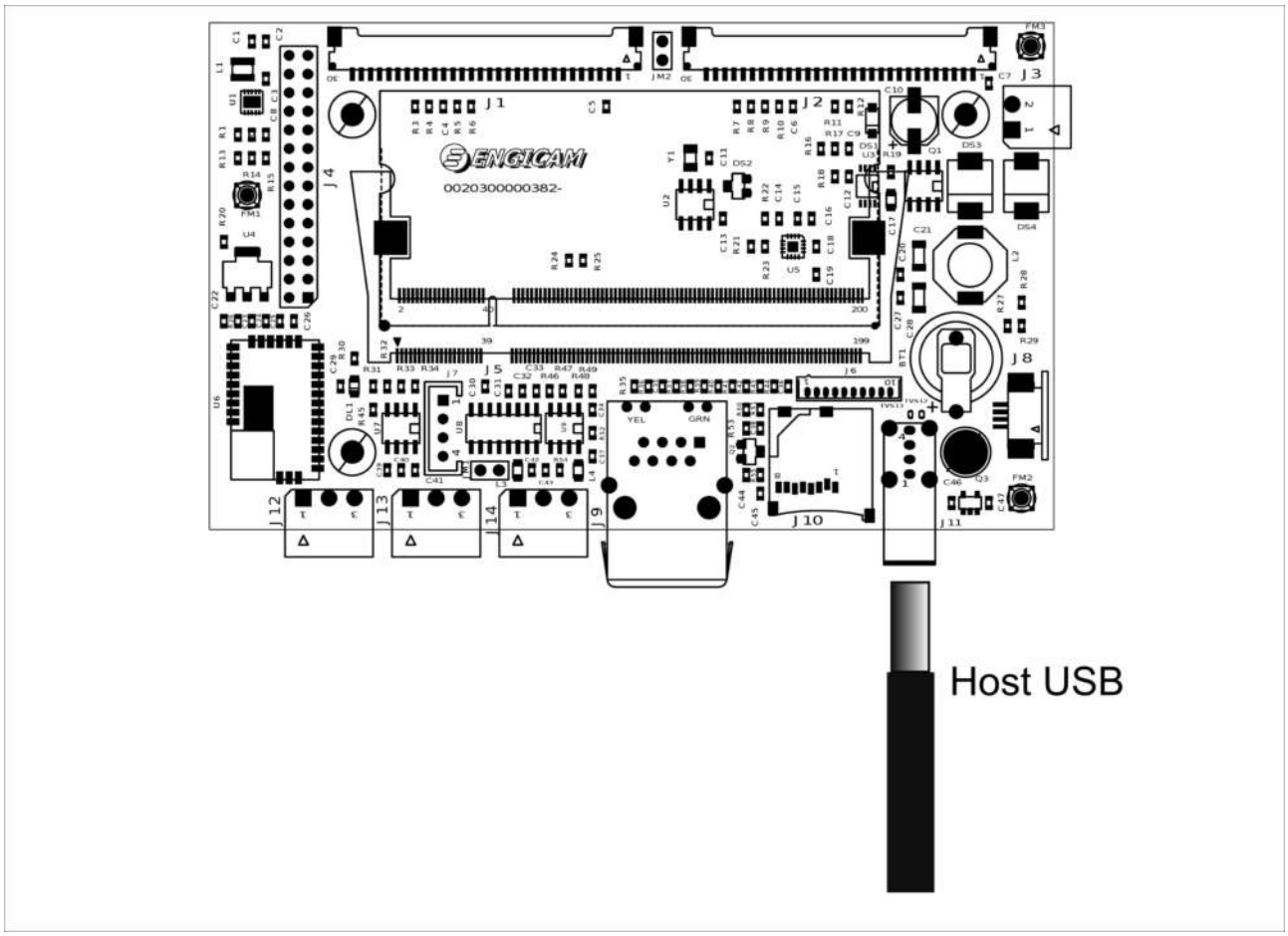


Fig5

In the following tables are represented the electrical connection of the USB standard interface connections (USB type A plug)

Pin number	Signal Name	Function Description	Voltage reference
1	VBUS	Power Signal	Standard USB
2	DM	Data N	Standard USB
3	DP	Data P	Standard USB
4	GND	Power Signal	Standard USB

Table 4

2.5 Ethernet Connections

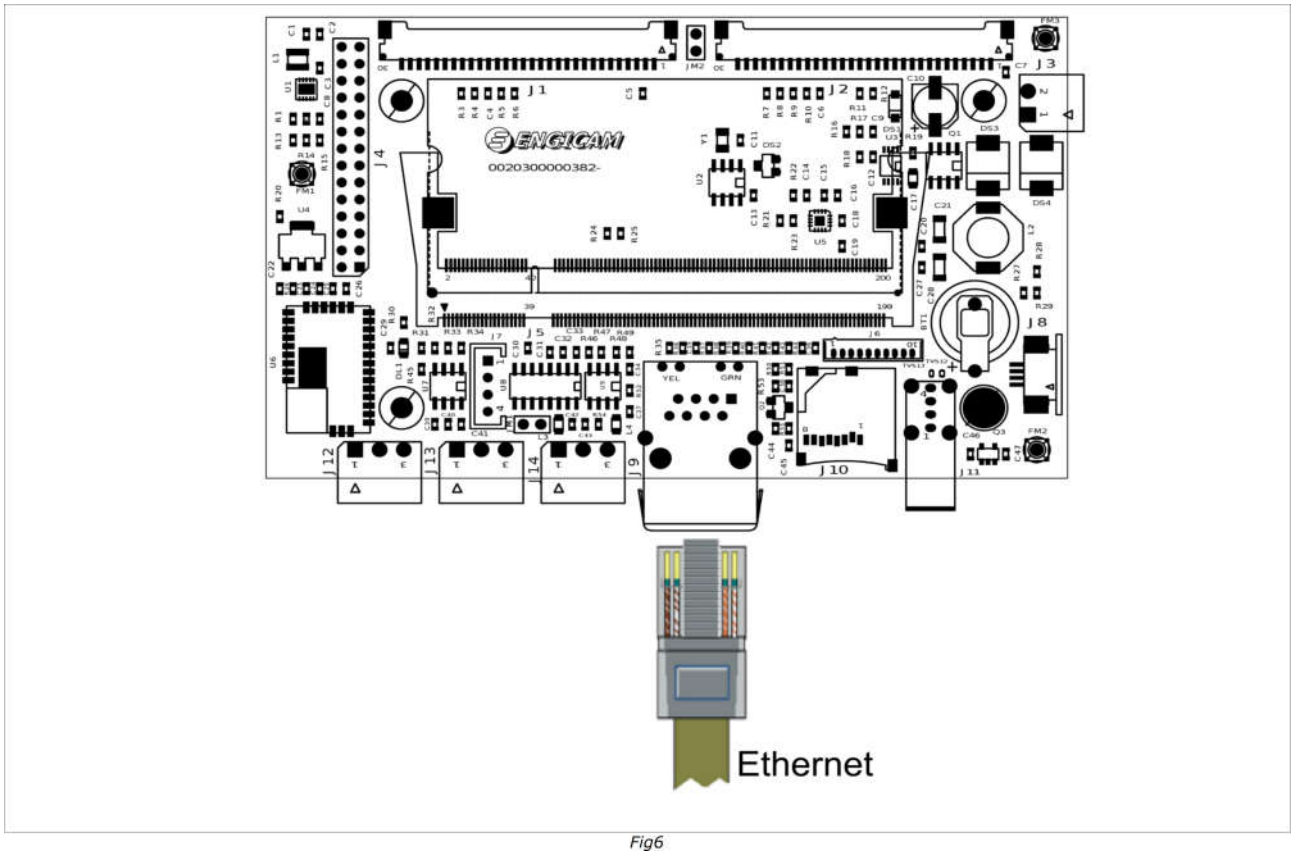


Fig6

The figure5 represents the Ethernet 10/100 connection. This connection uses a RJ45 standard plug (8 wires) and the following table shows the wiring map.

Pin number	Signal Name	Function Description	Voltage reference
1	TX-	Transmit positive signal	Standard Ethernet
2	TX+	Transmit negative signal	Standard Ethernet
3	RX+	Receive positive signal	Standard Ethernet
4	NC	-	-
5	NC	-	-
6	RX-	Receive negative signal	Standard Ethernet
7	NC	-	-
8	NC	-	-

Table 5

2.6 Power Supply Connections

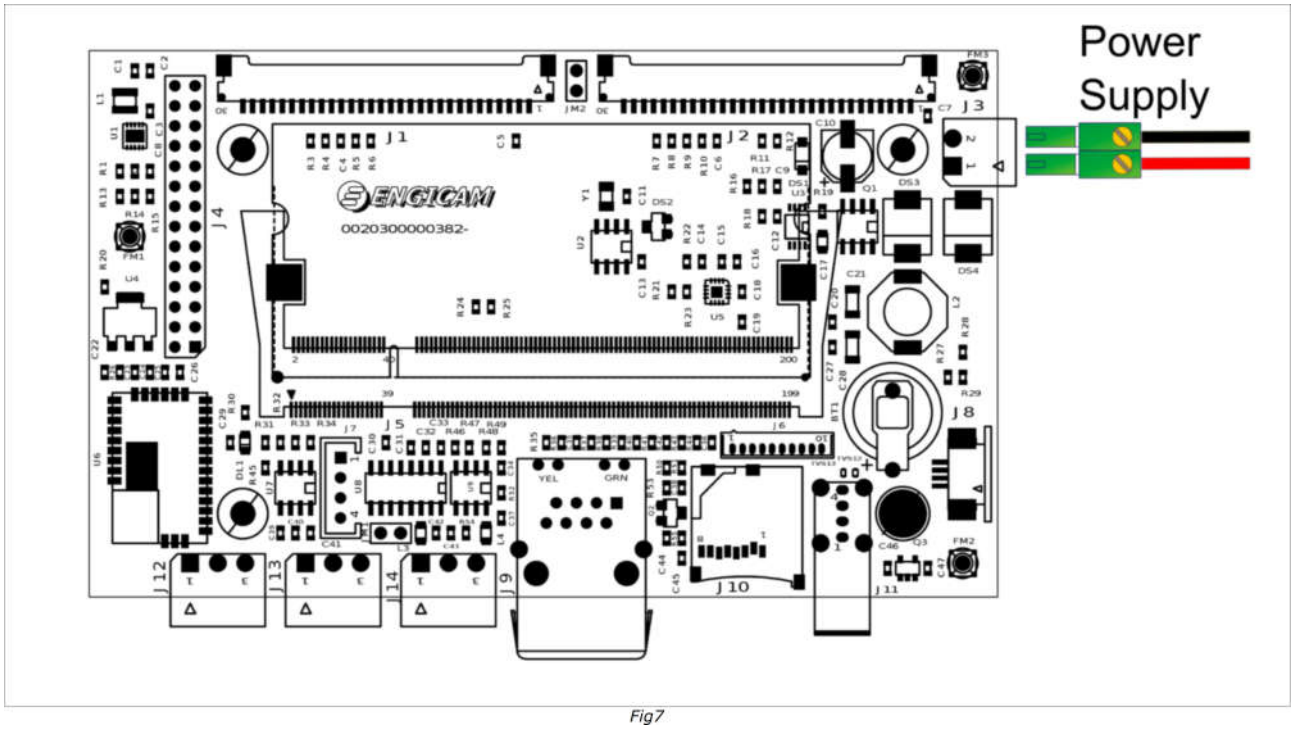


Fig7

The figure shows the power supply connection. The Open-Frame receives an input DC voltage, which ranging from +10V to +30V. J5 is Phoenix MC 1.5/2-G-3.5 1844210 90° positions p.3.5mm male connector, linked as follows:

Pin number	Signal Name	Function Description	Voltage reference
1	+VIN	Power Signal	Up 10 to 30 VDC
2	GND	Power Signal	-

Table 6

2.7 Current consumption

The following table shows the system's current consumption measured at 12 V and at 24 V

i.CoreM6S on Board	Current @ 12V	Current @ 24V
Open-Frame 10,1”	500 mA	260 mA

Table 7

The measure is done during the standard operating mode, the LCD switched on.

2.8 Linux Console Debug Connections

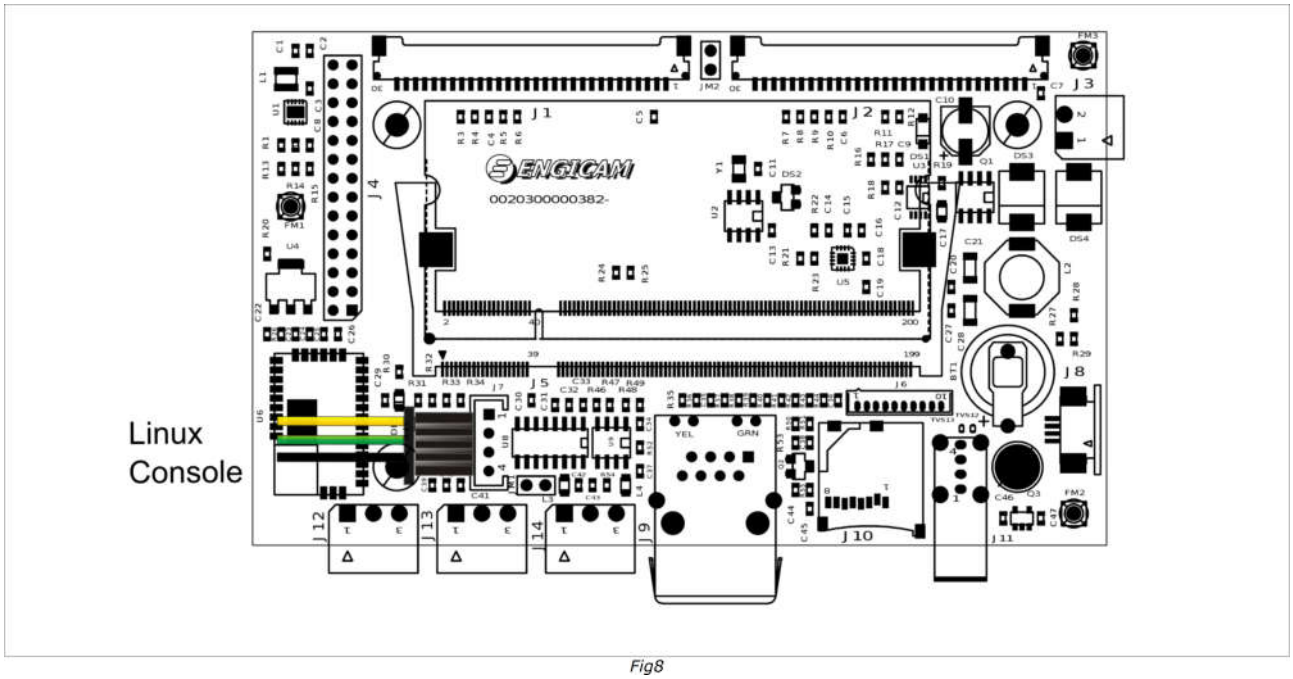


Fig8

When Linux OS is installed on the Open-Frame module, UART1 is used like console debug. The connector used is Modu II type; in the following table is shown the electrical features:

Pin number	Signal Name	Function Description	Voltage reference
1	TX	Transmit Signal	Standard RS232
2	RX	Receive Signal	Standard RS232
3	GND	Power Signal	-
4	NC	-	-

Table 8

The default communications settings is shown in following table

Console Default Settings	
Baud rate	115200
Data length	8 bit
Parity	none
Stop	1bit

Table 9

2.9 LCD Interface

The board is provided by two LCD different interface, the first is a parallel LCD, the second is a LVDS interface.

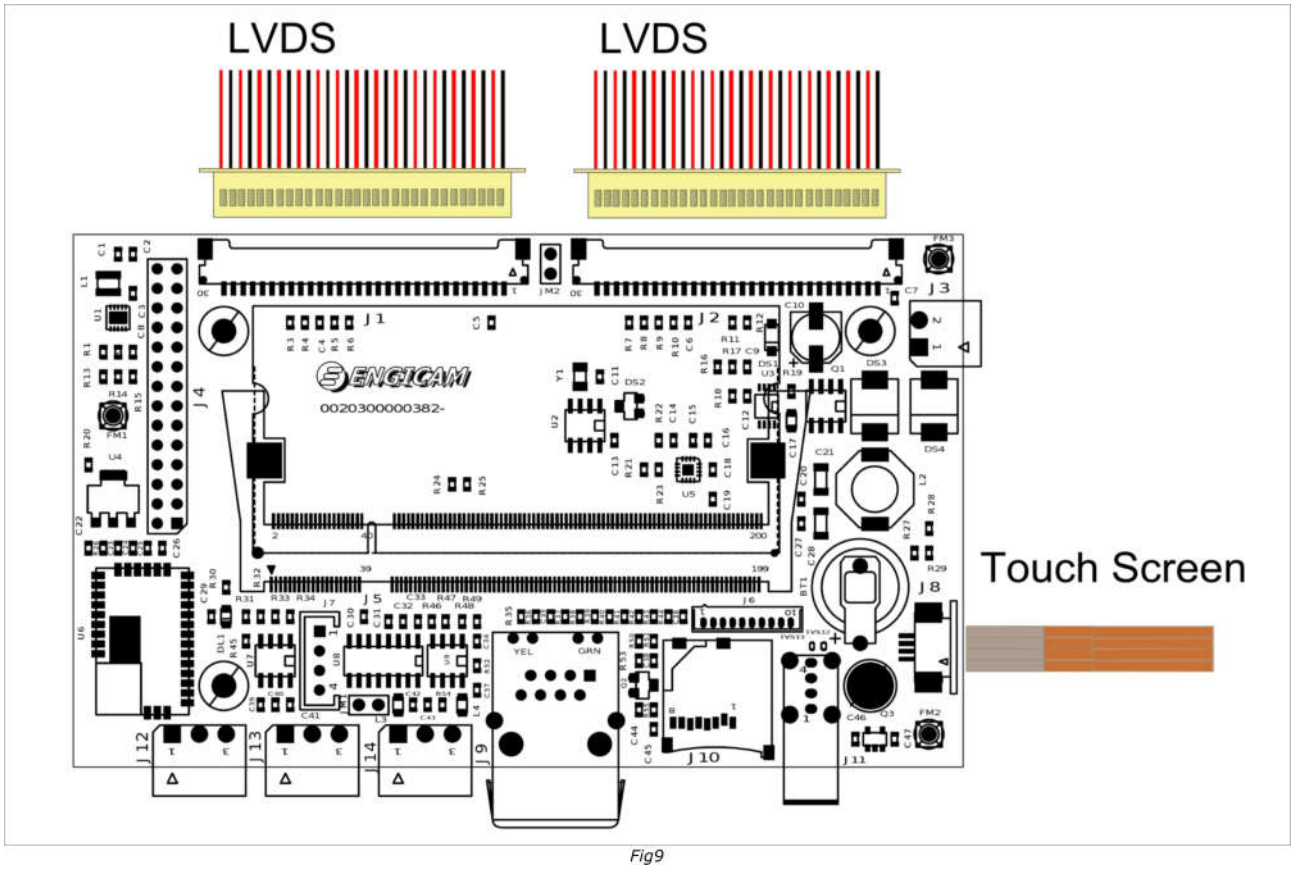


Fig9

Following the map of the LVDS Interface. The board connector, reference J2, mates with the cable connector code DF14-30S-1.25C (HIROSE) or compliant

Pin number	Signal Name	Function Description	Voltage reference
1	GND	Power PIN	-
2	+3V3_LCD	Power PIN	-
3	+3V3_LCD	Power PIN	-
4	GPIO_1_CONTRAST	PWM (Display Contrast)	-
5	+3V3_LCD	Power PIN	-
6	+3V3_LCD	Power PIN	-
7	GND	Power PIN	-
8	LVDS0_TX0_N	LVDS Interface's Signals	+2,5V
9	LVDS0_TX0_P	LVDS Interface's Signals	+2,5V
10	GND	Power PIN	-

Pin number	Signal Name	Function Description	Voltage reference
11	LVDS0_TX1_N	LVDS Interface's Signals	+2,5V
12	LVDS0_TX1_P	LVDS Interface's Signals	+2,5V
13	GND	Power PIN	-
14	LVDS0_TX2_N	LVDS Interface's Signals	+2,5V
15	LVDS0_TX2_P	LVDS Interface's Signals	+2,5V
16	GND	Power PIN	-
17	LVDS0_CLK_N	LVDS Interface's Signals	+2,5V
18	LVDS0_CLK_P	LVDS Interface's Signals	+2,5V
19	GND	Power PIN	-
20	+5V	Power PIN	-
21	GND	Power PIN	-
22	NC	-	-
23	PU (+3V3_LCD)		+3,3V
24	PD (GND)		-
25	GND	Power PIN	-
26	GND	Power PIN	-
27	TS0_XP	Touch screen interface	-
28	TS0_YN	Touch screen interface	-
29	TS0_XN	Touch screen interface	-
30	TS0_YP	Touch screen interface	-

Table 10

[1)] U/D# signal is controlled by:

R7, 5,6K Ohm pull-up resistor (Not Mounted)

R8, 5,6K Ohm pull-down resistor (Mounted on the standard PCB configuration)

[2)] 8/6# bit signal is controlled by:

R9, 5,6K Ohm pull-up resistor (Not Mounted)

R10, 5,6K Ohm pull-down resistor (Mounted on the standard PCB configuration)

2.10 Wi-Fi Interface (optional)

The Open-Frame carrier is provided by a fully integrated single 2.4GHz band 802.11 b/g/n module designed for portable and battery-powered applications that need Wi-Fi connectivity.

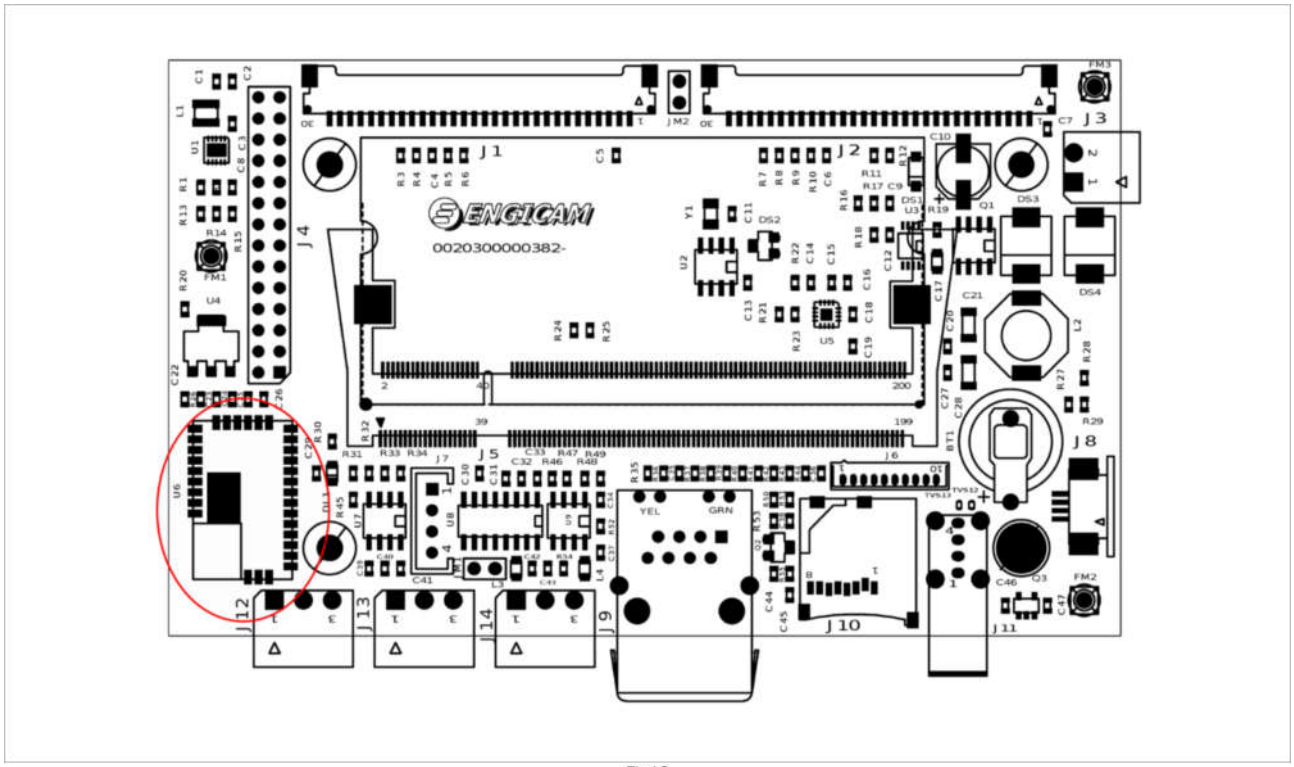


Fig10

The Wi-Fi module integrates an IEEE 802.11 b/g/n radio, antenna or U.FL antenna connector, and SDIO host interface. It provides a low cost and simple Wi-Fi solution for devices that run an operating system and a TCP/IP stack on-board, but still offers the benefits of a module – small form factor, certifications, and easy integration. It also offers the drivers for the Linux and Android operating systems.
The Wi-Fi module is implemented on SD2 host interface of module the signals involve are shown in the following table.

Pin on Module	Signal Name	Function Description	Voltage reference
166	SD2_D3	eSDHC 2 DAT 3 signal	+3,3V
167	SD2_CMD	eSDHC 2 CMD signal	+3,3V
168	SD2_D0	eSDHC 2 DAT 0 signal	+3,3V
169	SD2_CLK	eSDHC 2 CLK signal	+3,3V
170	SD2_D2	eSDHC 2 DAT 2 signal	+3,3V
171	SD2_D1	eSDHC 2 DAT 1 signal	+3,3V

Table 11

For further details please refer to i.CoreM6 series Sw Manual

2.11 Expansion Connector

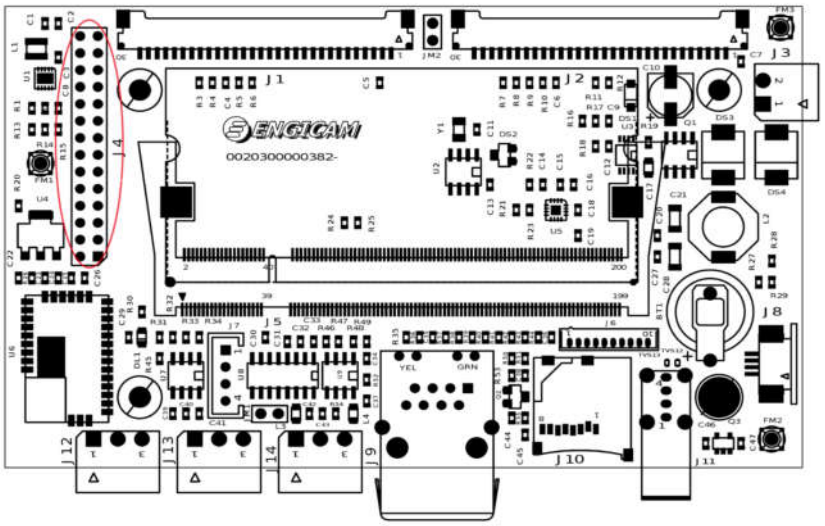


Fig11

The Open-Frame is provided of Expansion connector (STRIP 2x14 Pole, 2.54mm step referenced J4) which allows to connect the following module's pins:

Pin Number on Expansion Connector	Pin on Module	Function Description	Voltage reference
1	134	Power Signal	+3,3V_OUT
2	135	Power Signal	+3,3V_OUT
3	1, 2	Power Signal	+1.8V
4	197, 198, 199, 200	Power Signal	+5V
5	24	*	+3,3V
6	23	*	+3,3V
7	195	*	USB OTG Comp
8	193	*	USB OTG Comp
9	192	*	USB OTG Comp
10	191	*	USB OTG Comp
11	GND	Power Signal	-
12	171	*	+3,3V
13	170	*	+3,3V
14	169	*	+3,3V
15	168	*	+3,3V
16	167	*	+3,3V

Pin Number on Expansion Connector	Pin on Module	Function Description	Voltage reference
17	166	*	+3,3V
18	12	*	+3,3V
19	14	*	+3,3V
20	15	*	+3,3V
21	16	*	+3,3V
22	34	*	+3,3V
23	17	*	+3,3V
24	114	*	+3,3V
25	122	*	+3,3V
26	115	*	+3,3V
27	124	*	+3,3V
28	GND	Power Signal	-

Table 12

*** Note:** for the signal function please refer to modules' Hardware manual. To customise the use of those signals with alternative pin's functions please consult the modules' reference manual.

**** Note:** from the PCB revision "A", added GPIO pin used as Master Clock (pin 22) for the I2S implemented on pin 24-27.

3. Compiling options for the Modules

When you compile the kernel to use it on an Open-Frame you have to remember to add the following compiling options.

This option is required only if you have a previous version of the BSP to 2.3

system type -->
    Freescale i.MXA implementation -->
        [*] Support i.CoreM6 resistive Openframe

Using these options you also manage in the correct way the turn on/off of the display.
These option fix also all the problems with synchronism of the signal on LCD, that may be the cause of wrong colours and noise's effects.

4. Bootargs Setup

Following is shown how to set up the bootargs to enable the TFT display used in the Open-Frame LOCO configuration.

Power on the Open-Frame after have connected the serial port and have ran the hyperterminal or similar application. To enter in the shell console pressing any keys on the keyboard before the end of the countdown.

Then run the following command

```
setenv video_type 'mxcfb0:dev=ldb'
setenv lcd_panel 'LDB-WSGA,if=RGB666 ldb=sin0'
setenv board 'OF.L10'                                    (only for YOCTO Dizzy)
```

this will then be enough to modified the bootargs:

Use "**print**" command to check the set up of **bootargs**. *After the set up remember to **save** the configuration.*

Using YOCTO BSP distribution remind to load the app

WARNING:
After have edited the TFT string a calibration of the touch screen may be necessary, using the command in the shell:

ts_calibrate

Then press the centre of the crosses with a pen or finger. After this operation reboot the Open-Frame.

Note:** for further details please refer to **i.Core M6 "Series" SW manual Yocto

5. Open-Frame LOCO 10.1” assembly plan

This chapter provides to guide and to illustrate the method to installing an Open-Frame LOCO in an own system. They'll be specified the methodologies of insertion, of installation and the mechanical dimensions, useful to the designer, to determinate the size requirements to design a custom product containing the Open-Frame.
To help to achieve the best results, the size and the dimensions with their tolerances (0,2mm if not specified) will be described, this will allow the integration of the Open-Frame, that will interact with any system through its display and its touch screen.
Therefore the attention will be focus on the possibility of adjust the positioning through the tolerances left on the constraints and the use of appropriate screws.
In this way the user will be able to place the Open-Frame within its system, ensuring accuracy and reproducibility of the production process.

5.1 Overall Dimensions

In the following pictures are reported the drawing with the size of the Open-Frame LOCO. This can be useful to calculate the encumbrance area to consider during the designing.

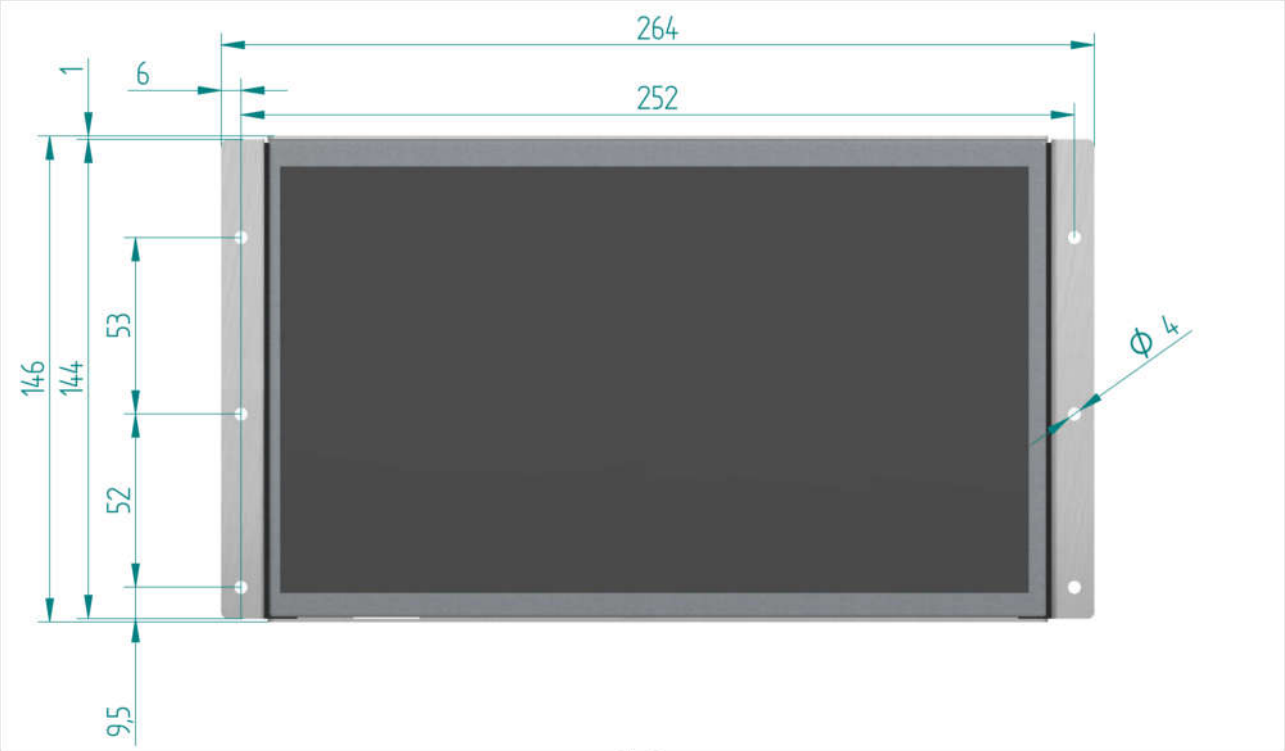


Fig12

The figure also underlines the size of the PCB board and the size of the display. The diameter of the holes is designed for standard screw M4.

In the pictures below are shown the maximum size of the Open-Frame system also in its depth (in which are considered also the dimensions of PCB and the higher components assembled).

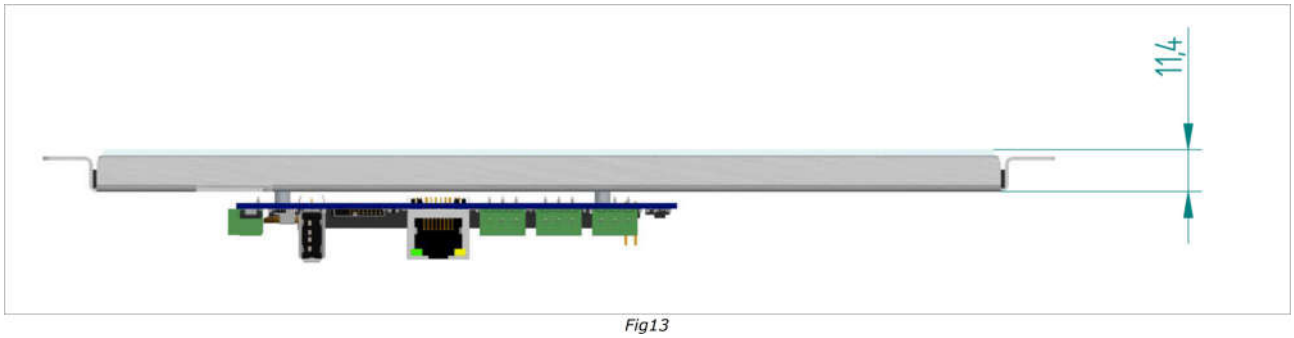


Fig13

These can be useful to calculate and consider the volume necessary to place or to integrate the Open-Frame within another system and to design a suitable mounting points.

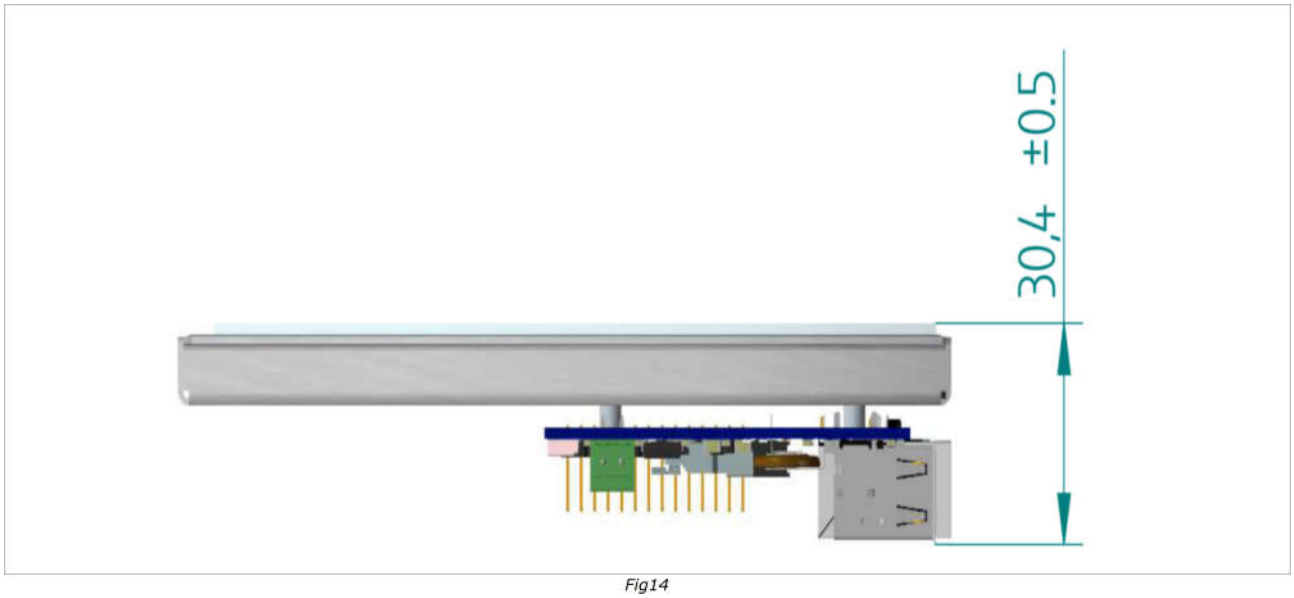


Fig14

***Note**: the thickness of metal sheet is 1 mm*

5.2 Positioning and Balancing

This chapter tries to show to the user how position the Open-Frame and how to centre the display in a "window". In the following figure it's possible to find the spacing between the fixing hole and their sizes. Based on the following measure it's possible to find the position compared to the four fixing hole.

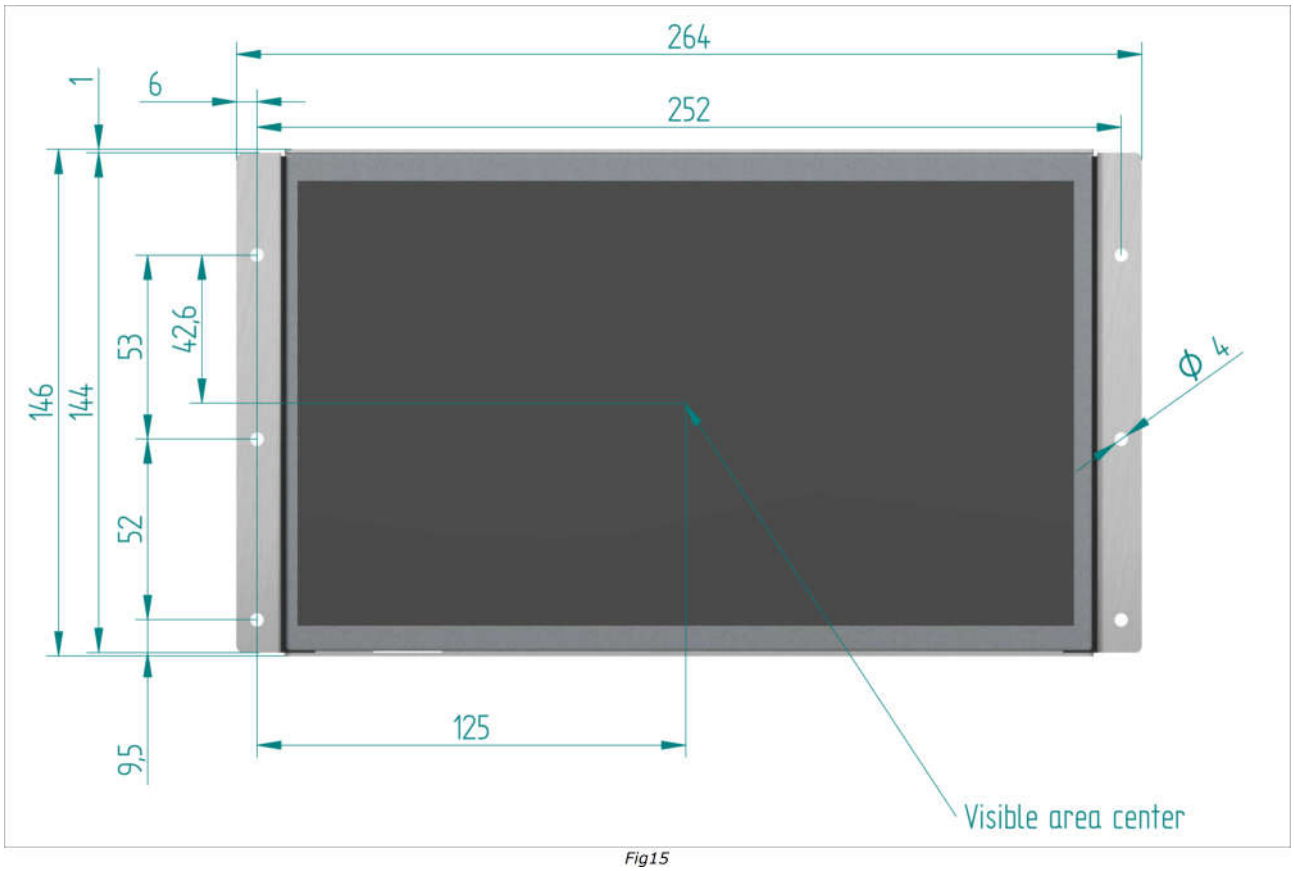


Fig15

The type of the screws are M4, to have a more flexible constraint during the centring of the Open-Frame into the system it's possible to use smaller screws; in this way it's possible to have more tolerance on the centring the display visible or active area (also considering drilling tolerances). To achieve the same results using the threaded PEM instead of screws, it's possible to reduce the size of the PEM's diameter (e.g. 3,5 mm).

Warning:
for any doubt about the positioning do not hesitate to contact Engicam support

5.3 General specifications for display 10.1”

In the table are shown the displays' specifications driven by Open-Frame carrier board:

	10.1”
Operating temperature range	-20; +70 °C
Size	10.1 inch
Luminance	240 cd/mq
Colour	262K
Resolution	1024 x (RGB) x 600
View Angles	TYP: 70 Deg
Interface	LVDS 6-bit

Table 13

In the following picture is reported the drawing with the size of the display. This can be useful to determinate the encumbrance viewing area and the multiple active area to consider during the system designing.

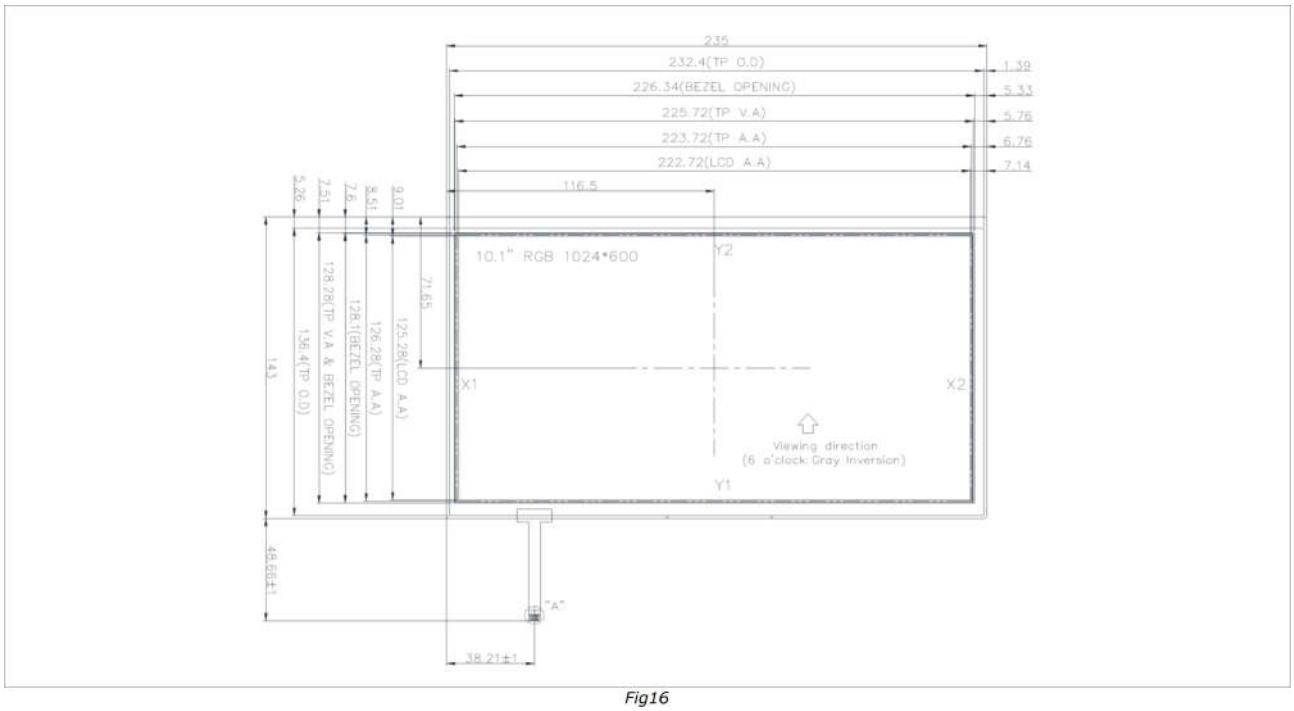


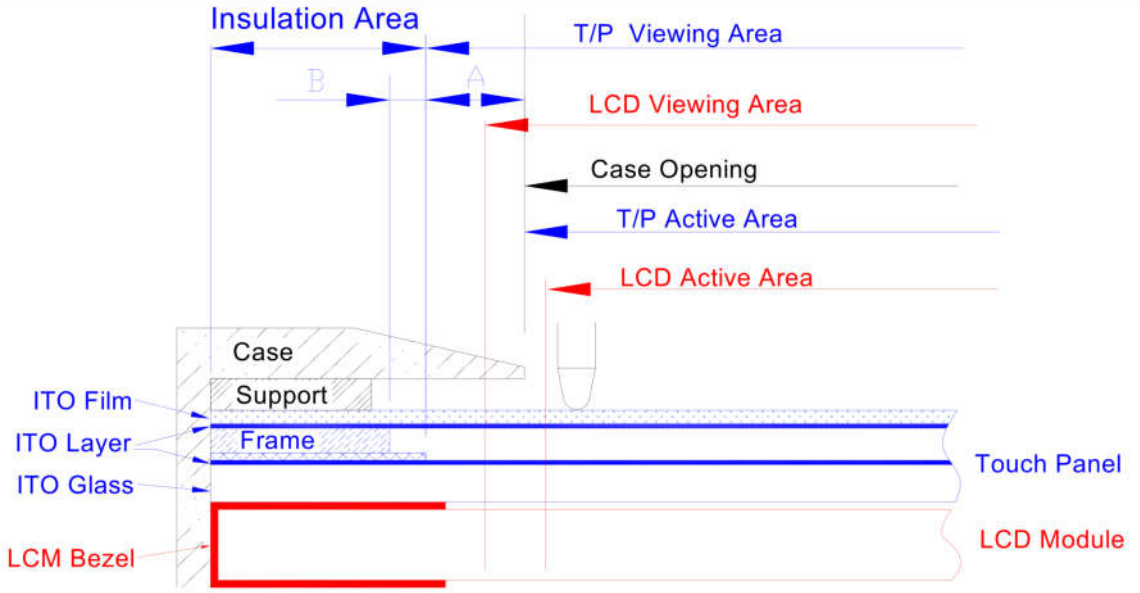
Fig16

***Note**: all the unit reported measure are in mm*

5.4 Centring the active area

Referring to the figure above it's also possible to calculate the positioning of the Open-Frame and it's also possible to hit the centre of the display active area.
In the image are also reported the quotes of the active area relative to the fixing holes and the centre of the display area.
Basing on this measures it's possible to integrate the Open-Frame inside the own system and also design the cover, calculate the tolerances and whatever is needed on the project.

In the following figure is represented the general precautions to take to design the mechanical system.



(1) T/P Active Area : Means T/P guaranteed active area , where the feature and function of the T/P can be assured.

(2) Area A : Where the T/P can be operated but the feature and function are not guaranteed.

(3) Area B : This area is prohibited to contact , it is easy to hurt the ITO film and lose function once be touched .

(4) a.Customer should design the "Support " in between the case and T/P ,with sufficient thickness to ensure once the case was deformed or pressed unintendedly , the T/P can still work normally .

Fig17

WARNING!

During the cover's designing, remember that, the size of the touch active area is bigger than the active area in both horizontal and vertical direction.

6. Ordering Information

6.1 Ordering Information (LOCO 10.1 standard)

Following the ordering informations and the description for the Basic technical specifications:

Ordering Code	MPQ	Description	Operating temperature range °C
0025700001002B	1	Open-Frame Low cost 10.1"	-20 to +70 *
0025700001032A	1	Open-Frame Low cost 10.1" CL	-20 to +70 *
00257000010630	1	LOCO Open Frame Carrier board	-40 to +85

Table 14

* LCD excluded (see Chapter about display specifications)

6.2 WiFi option

The board is also available with a WiFi option. In this case a proper WiFi 802.11b/g/n chip is mounted on it. *The standard order codes shown in the tables above shall be modified as follow:*

0025 - Q - W - 000 - CCCC - D

Q	MPQ
7	58
8	1

W	Options
0	No Wi-Fi mounted
1	Wi-Fi module option: mounted

CCCC	Description
1002	Open-Frame Low cost 10.1"
1032	Open-Frame Low cost 10.1" CL
1063	LOCO Open Frame Carrier board

D	Reserved

Table 15

7. Product Compliance

In order to respect own internal policy regarding the environmental regulations and safety laws, Engicam in this chapter confirms the compliant, when applicable, of its own products to the normatives ROHS and REACH and to the recognized hazards.

Warning!
The current product board mounts a VL-1220/HFN Rechargeable Battery, that has the following elements included into the SVHC list:

- ***1,2-dimethoxyethane, ethylene***

8. Technical support

Engicam provides to its customers the latest versions of its BSP of development. In the time between one version and the other a few changes or improvements can be published and shared via patch or textual documents.
Every customer that bought a BSP has at its disposal a virtual account in which find all this informations.
In case you do not have an account, it can be requested by the following form:

http://www.engicam.com/en/component/users/?view=registration

Once the account is confirmed, to enable the BSP download please contact your sales person or send an email to support@engicam.com.

Every new release of a BSP will contain all the patches and improvements described and released during the time between the release of a BSP and the other. For this reason, older versions will gradually be removed. We recommend to keep aligned the own material with respect to the official releases of a BSP.

8.1 How to upgrading your BSP using patch

If you have already started the development and customization of the kernel, you can keep up to date through the use of patches using your account. This chapter gives some information on how to manage and update your BSP. If you have already achieved a stable version of the system it is advisable to only apply patches that may affect your application.

8.1.1 Structure of the patch folder

This folder contains any patches of the downloadable version. The patches have the following order:

PATCH_*KERNEL/BOOT***_BSP_***X.X***

In the name it's specified "KERNEL or BOOT", where the patch must be applied and the BSP revision "X.X"
Inside the folder you find the main patches that have the following method:

*00X***_main_patch_***YYMMDD***.patch**

main patch at the date YYMMDD that aligns the whole kernel with our mainline.

Then you can find the singular patch with the following method:

*00X.0Y_argument_name***.patch**

where "00X" specified the membership to the main patch, "0Y" is an incremental number, the "argument_name" is the name of the fixed problem by the patch.
These Patches solves the individual problem and are usually used by the customer who has already customized the kernel so that is not necessary having to apply the main patch.

8.1.2 Patch structure

A patch consists of several sections of code to add or remove, these sections are localized reporting the previous and subsequent lines of code where to edit the changes.

```
diff --git a/arch/arm/mach-mx6/Kconfig b/arch/arm/mach-mx6/Kconfig
index 0c6e89e..db1a58b 100644
--- a/arch/arm/mach-mx6/Kconfig
+++ b/arch/arm/mach-mx6/Kconfig
@@ -222,6 +222,14 @@ config MACH_MX6Q_MINIMUM_FREQ400
          This features set the minimum CPU clock frequency to 400 Mhz instead of 200 Mhz.
          Recommended option for the use of video codecs.

+config MACH_MX6Q_ICORE_OPENFRAME_RESISTIVE
+       bool "Support i.CoreM6 resistive OpenFrame"
+       depends on MACH_MX6Q_ICORE
+       help
+         Include the support for Engicam openframe. This features enabled
+         the correct power up and power down of the on-board LVDS controller.
+          This features is mandatory.
+
 config MACH_MX6Q_ICORE_STARTERKIT_CAP_EDT
        bool "Support i.Core capacitive starterkit"
        depends on MACH_MX6Q_ICORE
```

Diff —- indicates the file and the location you want to edit.
@ indicates the code lines where edit the modifies.

Following are shown the lines of code that should not be changed.

With **+** or **–** are shown the lines to add or remove to edit the file. The remaining code is used to identify where to apply the patch

8.1.3 How to apply the patch

A patch is applied if the command patch can correctly identify where to insert the code parts. Otherwise, it generates an error file and the patch must be changed manually.
In case you have customized the code, you can follow the structure of the patch and apply it manually to avoid errors in editing. Refer to the previous chapter for a description of the structure of the patch. To apply a patch follow the below procedures. Enter the folder you want to edit (U-Boot or kernel). Copy the patch inside the folder:

cd linux

with the dry-run command you can try to apply a patch and see if it returns an error to evaluate whether it is possible to apply the patch.

patch -p1 --dry-run < 002.02_iCoreM6_openframe_lvds.patch

Once you have tested the application, if there are not too many mistakes, you may apply the patch using the command:

patch -p1 < 002.02_iCoreM6_openframe_lvds.patch

If the application is successful, rebuild the kernel and update it on the device. In the case of errors you will have an output like this:

patching file arch/arm/mach-mx6/Kconfig
Hunk #1 FAILED at 222.
1 out of 1 hunk FAILED -- saving rejects to file arch/arm/mach-mx6/Kconfig.rej
patching file arch/arm/mach-mx6/board-mx6q_icore.c
Hunk #1 FAILED at 107.
Hunk #2 succeeded at 264 (offset -6 lines).
Hunk #3 succeeded at 417 (offset -8 lines).
Hunk #4 succeeded at 1427 with fuzz 2 (offset -19 lines).
Hunk #5 succeeded at 1629 (offset -33 lines).
1 out of 5 hunks FAILED -- saving rejects to file arch/arm/mach-mx6/board- mx6q_icore.c.rej

In the above example the patch failed the application of the Kconfig file and board-mx6q_icore.c.

The failed parts are available in the file .rej that are generated by the patch command. Then open the file and manually enter the parts not included.

8.2 Technical support contact

For help, write an email to:

support@engicam.com