STMicroelectronics

MB449
ST10F25x EVA Board

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User manual

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USER MANUAL

MB449
ST10F25x Eva Board

Introduction

The MB449 ST10F25x Eva board is a standalone evaluation board for the ST10F252E and ST10F251E devices.

The ST10F252E provides on-chip 256 KByte of single voltage Flash and 20 KByte of RAM.

The ST10F251E provides on-chip 128KByte of single voltage Flash and 12 KByte of RAM.

Main components

- Socket for ST10F25x microcontroller
- 256Kx16 Bit High Speed Static RAM
- L9616 CAN transceiver
- ST232ABDR RS232 transceiver
- Standardized CPU Board Connector connector providing access to off board I/O, PWM, SSC and power supply

Features

- Support for the following interfaces:
  - CAN
  - RS232 serial port
- User buttons and LED's
- Main power supply 5V

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1 Introduction

The MB449 ST10F25x Eva board is a standalone evaluation board for the ST10F252E and ST10F251E devices.

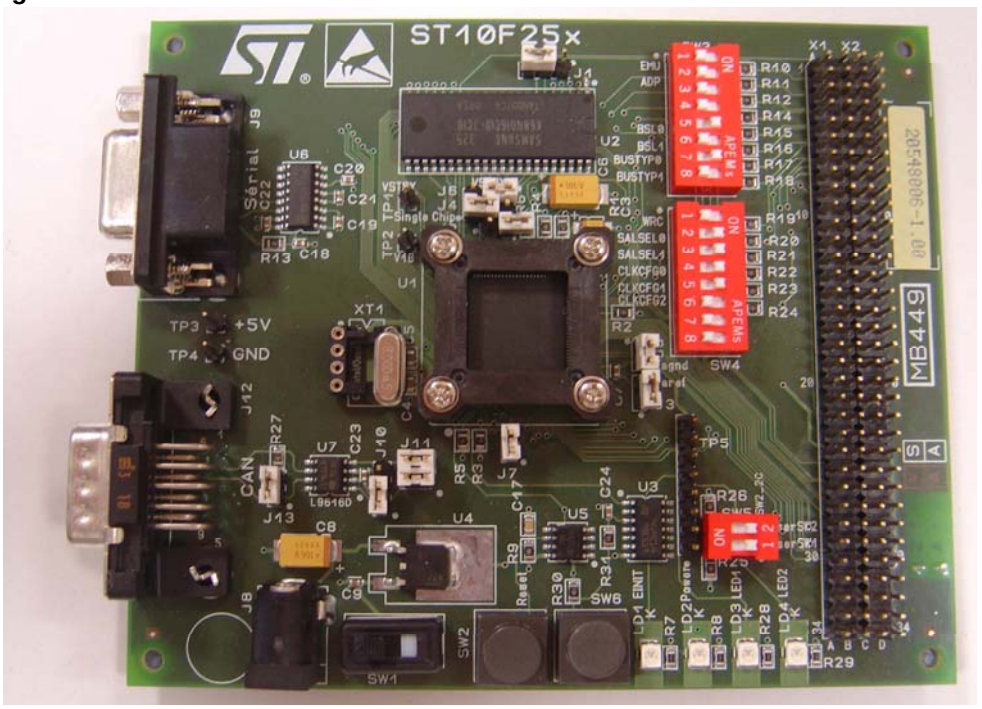
The ST10F252E provides on-chip 256 KByte of single voltage Flash and 20 KByte of RAM.

The ST10F251E provides on-chip 128KByte of single voltage Flash and 12 KByte of RAM.

The ST10F25x evaluation board comes with one CAN and one RS232 transceiver. Other features are available through the standard expansion connector. A set of user selectable switches (DIP) offers a very flexible handling of the CPU specific start-up configuration.

Please refer to the following chapters to get more details about the main features of the board, and the tools which are coming with this Evaluation Kit.

Figure 1. ST10F25x Eva Board



1.1 Features

The key features of the ST10F25x evaluation board are listed below. More features/ functionalities can be obtained by connecting a system or prototyping boards through the standard expansion connector.

The MB449 Eva board has the following features:

- CAN bus transceiver with slope control by jumper;
- RS232 transceiver;
- 256Kbyte of High Speed Static RAM are connected in 16 bit demultiplexed configuration;
- Expansion connector: APG application boards compatible (see details next chapter);

- External connectors:
  - 1 CAN;
  - 1 RS232 serial port;
  - external supply;
- Push buttons:
  - reset;
  - user push button;
- Switches:
  - to select CPU start-up configuration;
  - 2 user switches;
- LEDs :
  - board power;
  - EINIT (end of initialization) indicator;
  - 2 user connectable;
- Test-burn Yamaichi socket;
- Socket for external crystal or oscillator
- On board voltage regulator;
- Switches to disable the voltage regulator in order to be supplied the power supply to the device from an external voltage regulator through the standard expansion connector;
- Jumper for current measurements on CPU +5volt supply;
- Test points on +5Volt, +V18 and GND.

2 Before you start

2.1 Kit checklist

The ST10F25x evaluation kit contains the following items:

- Master board
- CD-ROM (board documentation and software);
- RS232 (DB9m/DB9f) cable
- 10 wires for fast connection
- Power supply 12V, 2A (220v/110v; European and US style);

2.2 Configuring the board

The following paragraphs explain how to setup the board to get started. The board is pre-configured in order to allow a quick startup.

The Bootmode Selection Jumper selects the Usermode(3) and a 8MHz crystals is mounted in XT1 Dip8 socket.

Please refer to *Chapter 3* for detailed information about these jumpers and their location. To setup your board successfully, please take care of the following steps:

1. Close Jumper J7;
2. Check for the correct user Mode configuration SW3 and SW4;
3. Check for Internal Flash or External RAM Start Configuration
4. Connect power supply on J8 connector
5. Switch on the board through SW1 power switch.

Note: Do not apply any voltages to the I/O pins or connectors while the evaluation board is unpowered.

2.3 Interfacing the board with XView Debugger

ST10F25x eva board can be simply interfaced with TASKING Xview debugger. To do it follow these steps:

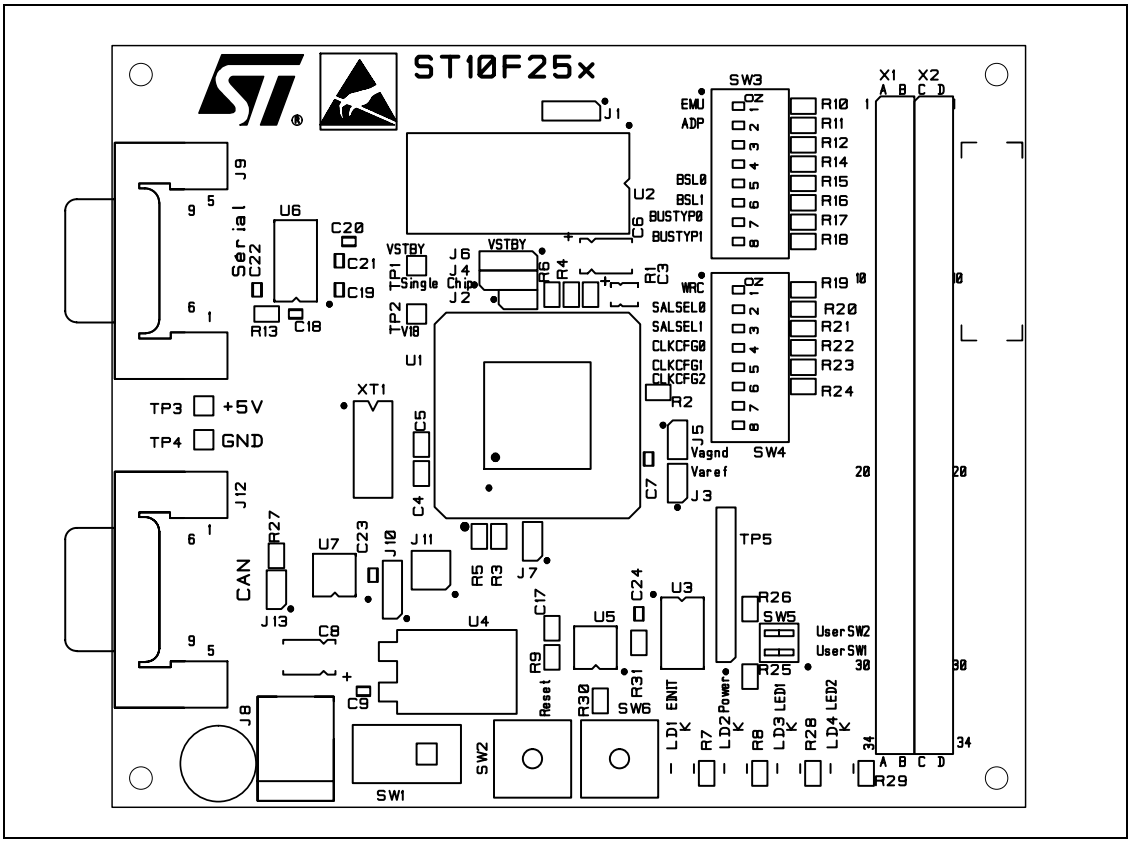
- copy the file "evaF252.cfg" from the CDROM to the directory that contains your project files
- from the TASKING project options (Project -> Project options) select "Crossview Pro" -> "Execution enviroment"
- choose "Other" in "Board manufacturer" and "User defined" in "Board configuration"
- select the "evaF252.cfg" in "Target configuration files" browsing the directory where you copied that file.

Crossview is now ready to work.

3 Hardware

This chapter describes all the hardware modules of the board.

Figure 2. MB449 ST10F25x Eva Board



3.1 Supported processor types

The board comes with an Yamaichi 100 pins Socket. It has been designed to support the ST10F25x devices in TQFP100 package.

3.2 ST10 start-up configuration selector

Some start-up configurations are latched by the ST10 upon reset. These configurations are selected by the switches SW3 and SW4 (*Figure 3.*). Refer to ST10 documentation for complete description of this functionality.

Table 1 describes the configuration for each mode.

Table 1. Boot / Configuration Mode

Name			Description
SW4 (4-5-6)	CLKCFG		**System Clock Selection**
			Internal clock multiplication factor after reset
		000	$f_{CPU} = 16 * f_{XTAL1}$
		001	$f_{CPU} = 0.5 * f_{XTAL1}$
		010	$f_{CPU} = 10 * f_{XTAL1}$
		011	$f_{CPU} = f_{XTAL1}$ (Direct Drive configuration)
		100	$f_{CPU} = 5 * f_{XTAL1}$
		101	$f_{CPU} = 8 * f_{XTAL1}$
		110	$f_{CPU} = 3 * f_{XTAL1}$
		111	$f_{CPU} = 4 * f_{XTAL1}$ (Default without pull-downs)
SW4 (2-3)	SALSEL		**Segment Address Line Selection** (Number of active segment address outputs)
		00	4-bit segment address: A19... A16
		01	No segment address lines at all
		10	8-bit segment address: A23... A16
		11	2-bit segment address: A17... A16 (Default without pull-downs)
SW4 (1)	WRC		**Write Configuration Control**
		0	Pin $\overline{WR}$ acts as $\overline{WRL}$, pin $\overline{BHE}$ acts as $\overline{WRH}$
		1	Pins $\overline{WR}$ and $\overline{BHE}$ retain their normal function (Default without pull-downs)
SW3 (7-8)	BUSTYP		**External Bus Type**
		00	8-bit Data Demultiplexed Address Bus
		01	8-bit Data Multiplexed Address Bus
		10	16-bit Data Demultiplexed Address Bus
		11	16-bit Data Multiplexed Address Bus (Default without pull-downs)
SW3 (5-6)	BSL		**Bootstrap Loader Mode**
		00	Reserved
		01	Alternate Boot Mode
		10	Standard Boot Mode
		11	User Mode
SW3 (4)	Reserved		

Name			Description
SW3 (3)	Reserved		
SW3 (2)	ADP		**Adapt Mode Enable**
		0	Device enters passive state: pins float to tristate or are deactivated
		1	Adapt Mode disabled (default)
SW3 (1)	Reserved		

3.3 Quartz Crystal

The board supports standard crystal or resonator circuitry. A 8MHz quartz crystal in standard HC-49S package is mounted into the DIP8 socket (XT1). This socket allows an easy change of the component to connect a different quartz, oscillator or an external generator.

Note: Please, refer to the device specification for oscillator absolute max ratings.

Table 2. Oscillator socket XT1

Pin	Description
1	V_{cc}
2	Not connected
3	Not connected
4	GND
5	XTAL1
6	Not connected
7	XTAL2
8	V_{cc}

Table 3. Oscillator socket

Pin	Figure	Description	Default
XT1	*Figure 3.*	quartz crystal	8MHz crystal in standard HC-49S package is connected between pin 5 and 6

3.4 External memory

256K x 16 Bit High-Speed CMOS Static RAM (U2) is mounted on this evaluation board. The SRAM is connected to the ST10F252 in 16 bit demultiplexed bus mode configuration. Since the ST10F252 has no pin dedicated to CS functionality, the jumper J1 (*Figure 3.*) in position 2-3 allows to enable the memory connecting the /CS pin to ground. Fast access time (10ns) allows to work at full speed without wait state at the maximum CPU frequency (48MHz).

3.5 CAN interface

The board mounts a L9616 high speed CAN transceiver with Slope Control (U7). For detailed information please refer to L9616D datasheet.

The CAN transceiver can be enabled by closing J11 (1-2, 3-4) jumpers; this connects the transceiver to the CAN1 of the ST10. If the mounted ST10 device provides another CAN on the CPU Board connector, it is possible to use it by connecting pin 2 and pin 4 of J11 to the corresponding TX and RX CAN pins on the connector.

If the bus is not terminated, a terminating resistor can be activated by closing jumper J13.

The transceiver support high (>250KB) and low speed (<250KB) operating modes by controlling the slope. Slew rate can be selected by jumper J10: connect pins 1-2 for high speed or pins 2-3 for slow speed buses.

Bus signals are present on connector J12 (9pin D-Sub male connector) see *Table 5.*

Table 4. CAN jumpers and connectors

Name	Figure	Description	Default
J11 pin 1	*Figure 3.*	ST10 CAN1TX	Open
J11 pin 2	*Figure 3.*	L9616 TX	
J11 pin 3	*Figure 3.*	ST10 CAN1RX	Open
J11 pin 4	*Figure 3.*	L9616 RX	
J10	*Figure 3.*	CAN slew rate control	pin 1-2 shorten
J12	*Figure 3.*	CAN bus connector	n/a
J13	*Figure 3.*	CAN bus termination	Closed

Table 5. CAN connector (J12) pinout

Pin	Description
1	Not connected
2	CAN_L
3	GND
4	Not connected
5	Shield
6	GND
7	CAN_H
8	Not connected
9	Not connected

3.6 RS232 serial interface

The MB449 mounts a ST232ABDR RS232 transceiver (U6). For more information please refer to ST232ABDR datasheet.

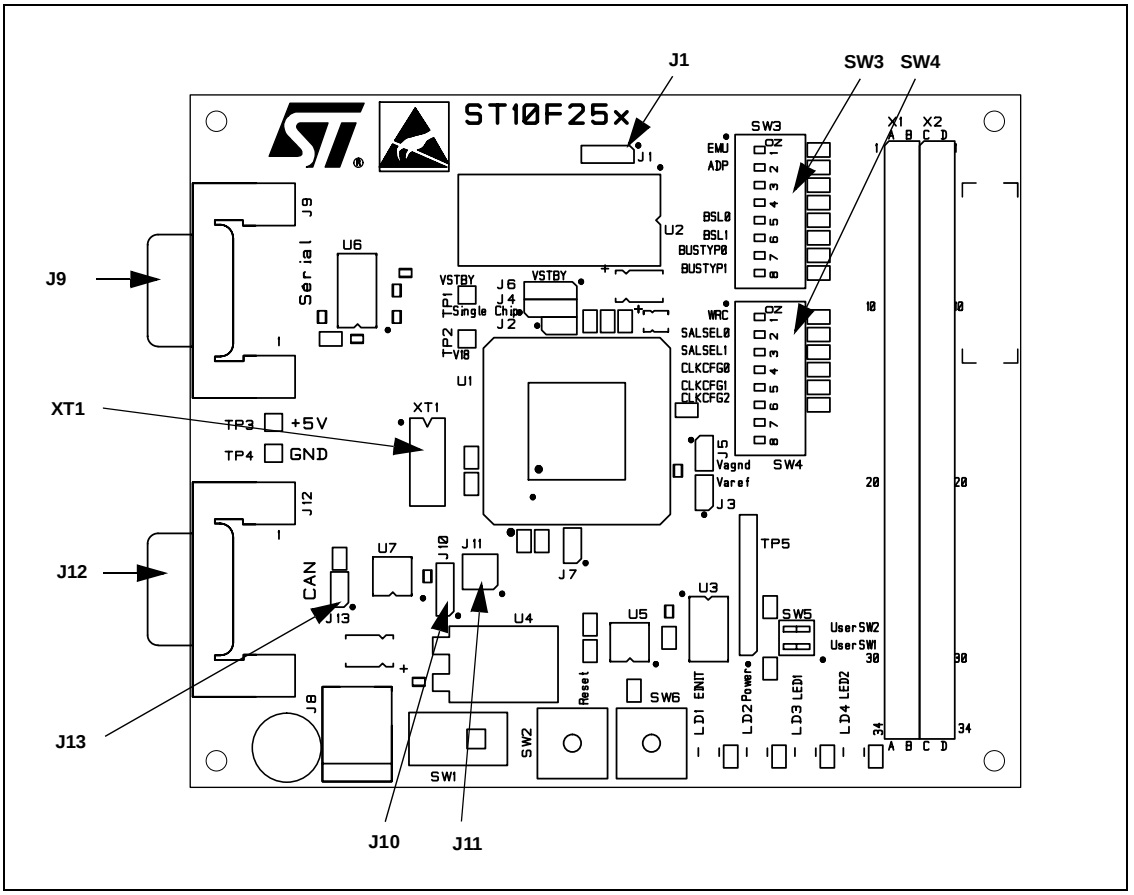
The serial transceiver is directly connected to the pins P3.10 (TX) and P3.11 (RX) of ASC0 interface.

A female RS232 D-sub connector (J9, *Figure 3.*) is connected to pins RX and TX of the ST232 driver/receiver. Pins RTS and DCD are not connected, cable shield is connected to GND.

Table 6. RS232 (J9) connector pinout

Pin	Description
1	Not connected
2	TX
3	RX
4	Not connected
5	GND
6	/DTR0
7	Not connected
8	Not connected
9	Not connected

Figure 3. Components placement



3.7 Power supply

The ST10F25x Evaluation Board can be supplied with a stabilized 10V-28V DC voltage on the power connector J8. The L4941BD2T (U4) is used to provide on board a voltage regulator with very low dropout 5V output.

To supply the board with the 5V provided by the regulator, switch the SW1 to On. To disconnect the 5V generated from the regulator and supply all V_{CC} nets on the board by the V_{CC} pins on CPU Board connector, switch off the SW1.

Analog references could come from the CPU Board connector, or from the pin 2 of the Jumpers J3 and J5 when they are open. Analog supply can be provided also from on board V_{CC} and V_{SS}, by closing Jumpers J3 and J5.

To measure the current consumption of the analog part of the device, when the Analog supply is provided from on board V_{CC}, open jumper J3 and connecting the meter to pins 1-2.

It is possible to measure the current consumption of the ST10 microcontroller by opening jumper J7 and connecting a meter to pins 1-2.

A Power On LED (LD2) is connected to V_{CC}, so the LED will light in both conditions: when is used the on board regulator and when an external power supply is applied from the CPU board connector.

Table 7. Power supply jumpers and switches

Name	Figure	Description	Default
J7	*Figure 5.*	Measurement current consumption	Closed
J8	*Figure 5.*	Power connector	n/a
J3 pin 1	*Figure 5.*	V_{cc}	Shorten
J3 pin 2	*Figure 5.*	Analog supply Varef	
J5 pin 1	*Figure 5.*	GND	Shorten
J5 pin 2	*Figure 5.*	Analog supply VAGND	
SW1	*Figure 5.*	Power switch	Off

3.8 Reset circuit and EINIT LED

A reset circuit guaranty the reset pin is pulled low until the voltage supply is stabilized at the correct level. In order to manually reset the device, press button SW2.

EINIT LED (*Figure 5.*) is connected to the RSTOUT pin of the ST10F25x devices. Depending on the line 1 of SW3 configuration, RSTOUT or RSTOUT2 function is selected.

- RSTOUT functionality:
  - EINIT is switched off by any reset event;
  - EINIT is switched ON after execution of the EINIT instruction (in the user application)
- RSTOUT2 functionality:
  - EINIT is switched off by hardware reset event and (user configured) watchdog or software reset events

– EINIT is switched ON during the internal start-up of the device.

Please refer to the device documentation for a complete description of RSTOUT pin functionality.

3.9 Vstby - $\overline{EA}$ pin

On ST10F25x devices the Vstby-$\overline{EA}$ pin has 2 functionalities:

- During RESET (pin $\overline{RSTIN}$ low), it is used as "External Access Enable pin". A low level forces the ST10F25x to begin execution out of external memory. A high level forces execution out of the internal Flash memory.
- Out of reset, it is used as Vstby: voltage supply during the Stand-by mode.

Out of RESET, this pin must always be at high level.

The ST10F25x eva board circuitry has been designed to match these 2 functionalities:

- Put Jumper J4 in position 1-2 and J2 open to have $\overline{EA}$ pin tied to low level.
- Put Jumper J4 in position 2-3 and J2 open to force $\overline{EA}$ pin to Vcc level.
- Put no jumper in J4 and close J2 to connect $\overline{EA}$ to +Vstby:
  - Put the Jumper J6 in position 1-2, if you want +Vstby connected to +5V.
  - Put the Jumper J6 in position 2-3, to connect +Vstby to an external power supply from the connector TP1.

Figure 4. Vstby $\overline{EA}$ schematic

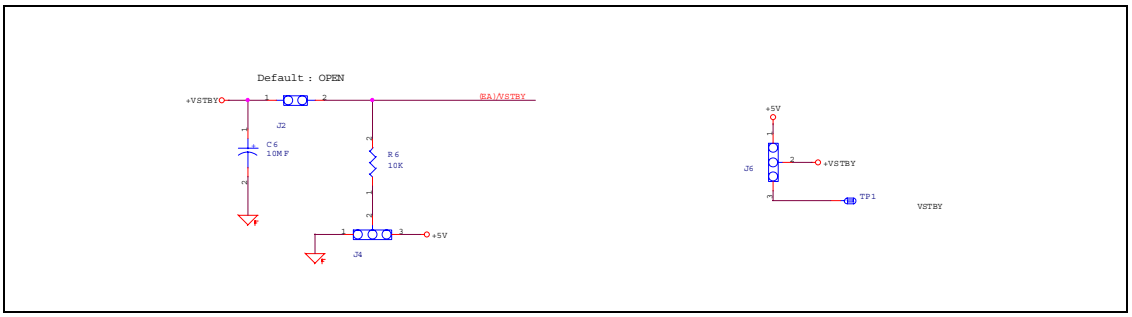
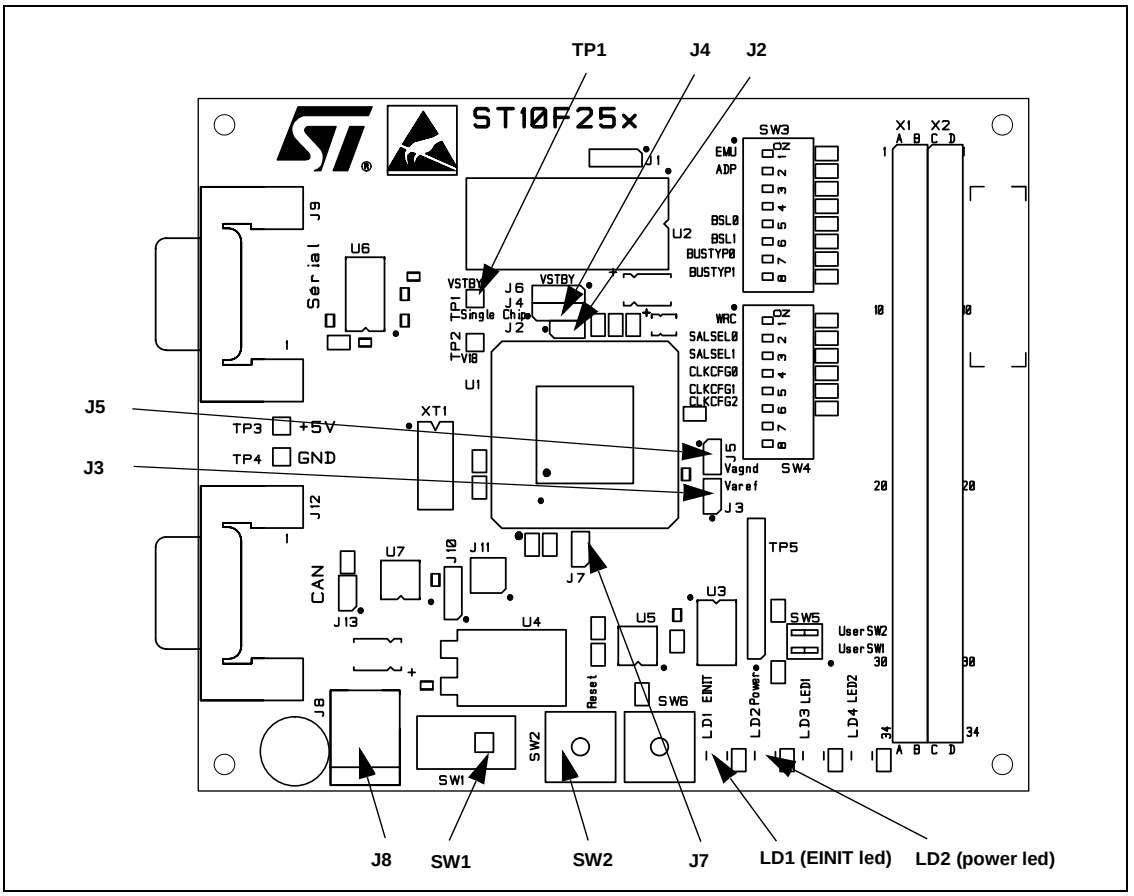


Table 8. Reset and Vstby $\overline{EA}$ jumpers

Name	Figure	Description	Default
SW2	*Figure 5.*	Reset push button	n/a
J2	*Figure 4.* & *Figure 5.*	Vstby - $\overline{EA}$ connection	open
J4	*Figure 4.* & *Figure 5.*	$\overline{EA}$ selector	close 1-2
J6	*Figure 4.* & *Figure 5.*	Vstby voltage selector	close 1-2
TP1	*Figure 4.* & *Figure 5.*	External Vstby voltage supply connector	n/a

Figure 5. Components placement



3.10 CPU Board connector

The CPU Board connector (X1,2) is placed on a 2.54mm (0.1”) grid, which allows connecting a prototyping/breadboard pcb with a standard grid.

The following table presents the pin out of the CPU Board connector. It is composed of 4 columns (a,b,c,d) with 34 pins each:

Table 9. CPU Board connector

Pin	A		B		C		D	
1	GND		GND		GND		VCC_IO	
2	A0	P1L.0	A1	P1L.1	D0	P0.0	D1	P0.1
3	A2	P1L.2	A3	P1L.3	D2	P0.2	D3	P0.3
4	A4	P1L.4	A5	P1L.5	D4	P0.4	D5	P0.5
5	A6	P1L.6	A7	P1L.7	D6	P0.6	D7	P0.7
6	A8	P1H.0	A9	P1H.1	D8	P0.8	D9	P0.9

Pin	A		B		C		D	
7	A10	P1H.2	A11	P1H.3	D10	P0.10	D11	P0.11
8	A12	P1H.4	A13	P1H.5	D12	P0.12	D13	P0.13
9	A14	P1H.6	A15	P1H.7	D14	P0.14	D15	P0.15
10	A16	P4.0	A17	P4.1	Not connected		Not connected	
11	A18	P4.2	A19	P4.3	ASC0_TX	P3.10	ASC0_RX	P3.11
12	$\overline{\text{RSTIN}}$		Not connected		$\overline{\text{RSTOUT}}$		Not connected	
13	Not connected		Not connected		ALE		($\overline{\text{EA}}$)/VSTBY	
14	Not connected		Not connected		$\overline{\text{NMI}}$		$\overline{\text{RD}}$	
15	GND		Not connected		CAN1_RX	P4.5	$\overline{\text{WRH}}$ $\overline{\text{BHE}}$	P3.12
16	Not connected		Not connected		CAN2_RX	P4.4	$\overline{\text{WR}}$ / $\overline{\text{WRL}}$	
17	CAN1_TX	P4.6	CAN2_TX	P4.7	Not connected		Not connected	
18	Not connected		Not connected		IO	P2.2	IO	P2.3
19	Not connected		Not connected		IO	P2.4	IO	P2.5
20	Not connected		Not connected		IO	P2.6	IO	P2.7
21	Not connected		Not connected		IO / Ext0 INT	P2.8	IO / Ext1 INT	P2.9
22	A16	P4.0	A17	P4.1	IO / Ext2 INT	P2.10	IO / Ext3 INT	P2.11
23	A18	P4.2	A19	P4.3	IO / Ext4 INT	P2.12	IO / Ext5 INT	P2.13
24	Not connected		Not connected		IO / Ext6 INT	P2.14	IO / Ext7 INT	P2.15
25	Not connected		Not connected		CLKOUT	P3.15	SCLK	P3.13
26	AIN0	P5.0	AIN1	P5.1	MTSR	P3.9	MRST	P3.8
27	AIN2	P5.2	AIN3	P5.3	T2IN	P3.7	T3IN	P3.6
28	AIN4	P5.4	AIN5	P5.5	Not connected		Not connected	
29	AIN6	P5.6	AIN7	P5.7	Not connected		CAPIN	P3.2
30	AIN8	P5.8	AIN9	P5.9	T6OUT	P3.1	T0IN	P3.0
31	Not connected		Not connected		VAREF		Not connected	
32	Not connected		Not connected		GND		GND	
33	Not connected		Not connected		VCC_IO		VCC_IO	
34	GND		GND		GND		VCC_IO	

3.11 LED’s, switches and push button

The board mounts some LED’s, switches and a push button for user’s application. LED’s, switches and push button are available on connector TP5.

The two user LED's (LED1 and LED2) are pulled into a high active level (Vcc) through a series resistor (1K5). To switch on these LED's, apply a low level to pin 3 for LED 1 or 4 for LED 2 of the TP5 connector, i.e. connecting an IO line on the CPU board connector. No additional resistors are needed.

Two user switches SW5 line 1 and SW5 line 2 provides on pin 1 and 2 of TP5 a low signal (GND) when it is switched off and a high signal (VCC) when it is switched on.

The denounced push button (SW6) provides on pin 5 of TP5 connector a low signal (GND) when not pressed and a high signal (VCC) when pressed.

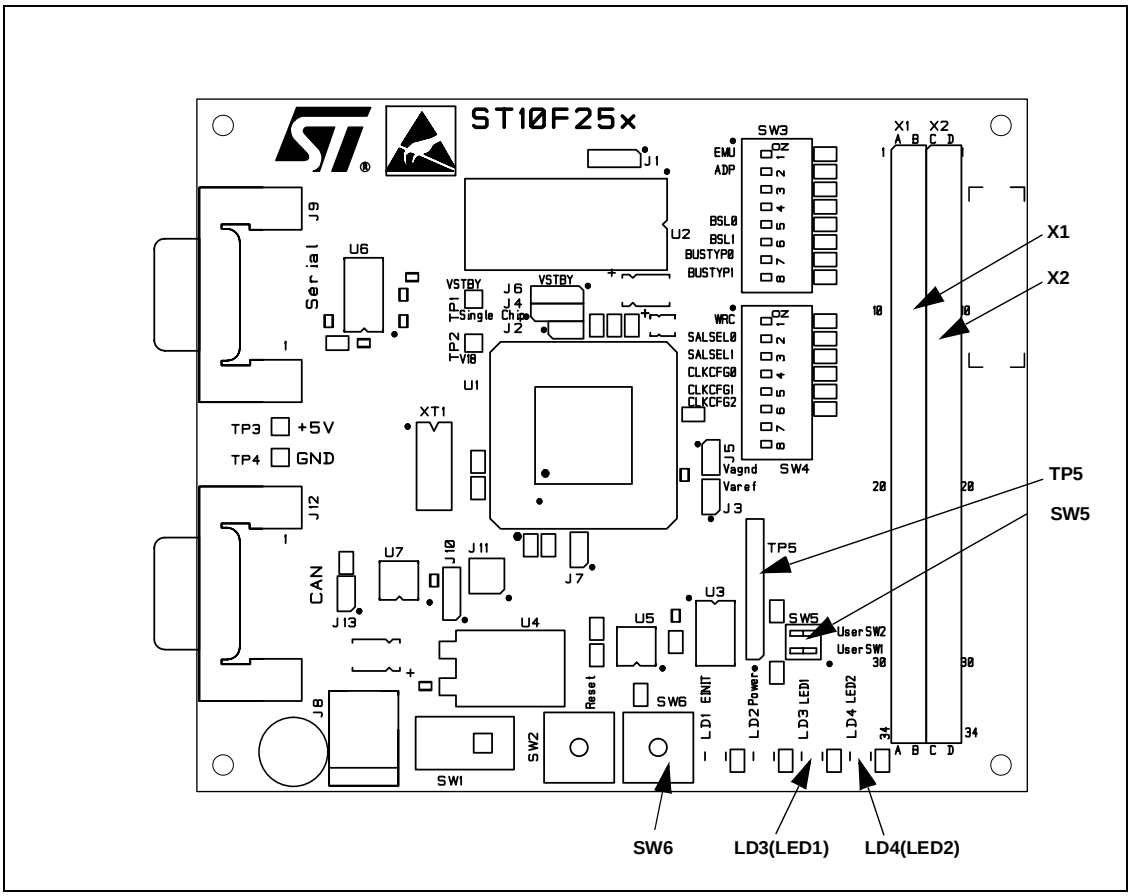
Table 10. LED, switches and push button connectors (TP5)

Name	Figure	Description
TP5 Pin 1	*Figure 6.*	User switch 1
TP5 Pin 2	*Figure 6.*	User switch 2
TP5 Pin 3	*Figure 6.*	User LED 1
TP5 Pin 4	*Figure 6.*	User LED 2
TP5 Pin 5	*Figure 6.*	Push button SW6
TP5 Pin 6	*Figure 6.*	+5V
TP5 Pin 7	*Figure 6.*	GND
TP5 Pin 8	*Figure 6.*	VAGND

Table 11. LED, switches and push button

Name	Figure	Description
LD1	*Figure 5.*	Power On LED
LD2	*Figure 5.*	EINIT LED
LD3	*Figure 6.*	LED 1
LD4	*Figure 6.*	LED 2
SW5 line 1	*Figure 6.*	User switch 1
SW5 line 2	*Figure 6.*	User switch 2
SW6	*Figure 6.*	User Push button

Figure 6. Components placement



4 Revision history

Date	Revision	Changes
24-Jan-2006	1	Initial release.

Appendix A Bill of materials

Item	Reference	Part
1	C1,C2,C7,C9,C12,C13,C14,C15,C16,C18,C19,C20,C21,C22,C23,C24	100nF_cms
2	C3	1MF
3	C4,C5	22pF
4	C8,C6	10MF
5	C10,C11,C17	10nF
6	J1,J4,J6,J10	JUMPER
7	J2,J3,J5,J7,J13	JUMPER_2
8	J8	JACK_2.5mm
9	J9	SUBD9C_F_COUDE
10	J11	JUMPER_x2
11	J12	SUBD9C_M_COUDE
12	LD1,LD2,LD3,LD4	LED_LST67K_Red
13	R1	220K
14	R2,R3,R4,R5,R6,R9,R10,R11,R12,R13,R14,R15,R16,R17,R18,R19,R20,R21,R22,R23,R24,R25,R26,R30,R31	10K
15	R7,R8,R28,R29	1.5K
16	R27	120
17	SW1	APEM 25000N
18	SW2,SW6	SW_KSA
19	SW3,SW4	SW_DIP8P_8C
20	SW5	SW2_2C
21	TP1,TP2,TP3,TP4	MW1X1C
22	TP5	MW1X8C
23	U1	Yamaichi TQFP100 socket
24	U2	K6R4016C1D-K
25	U3	74VHC14
26	U4	L4941BD2T
27	U5	STM703 M
28	U6	ST232ABDR
29	U7	L9616D
30	XT1	Dip8 socket + 8MHz crystal

31	X1	Header 2x34 AB
32	X2	Header 2x34 CD

Appendix B Schematics

Figure 7. ST10F25x Schematic

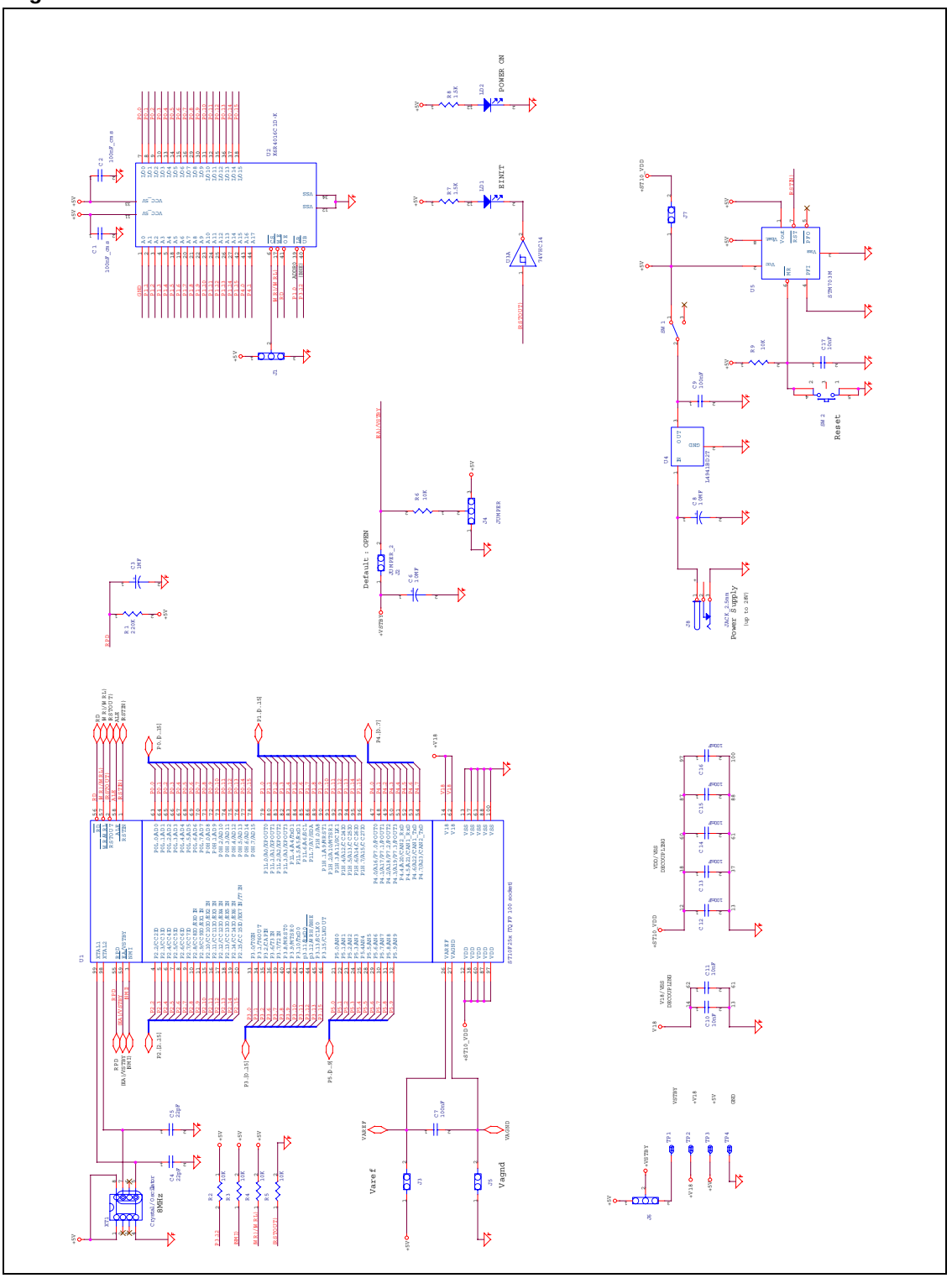


Figure 8. RS232 interface

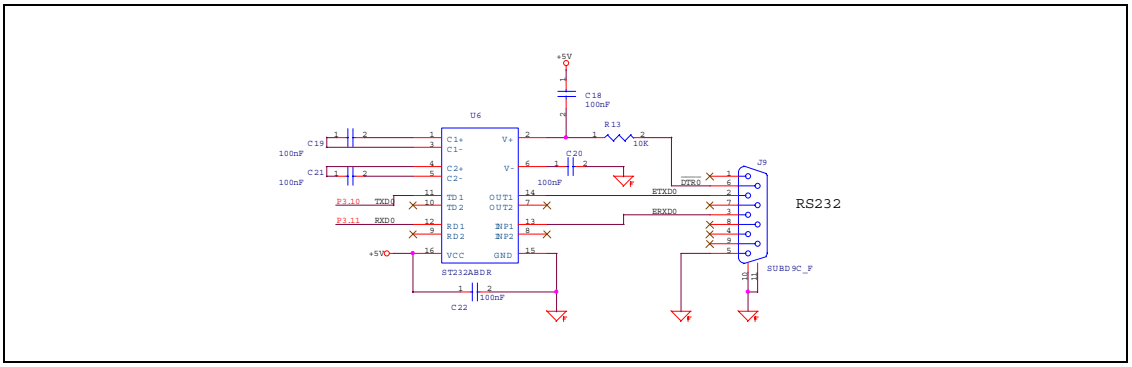


Figure 9. CAN interface

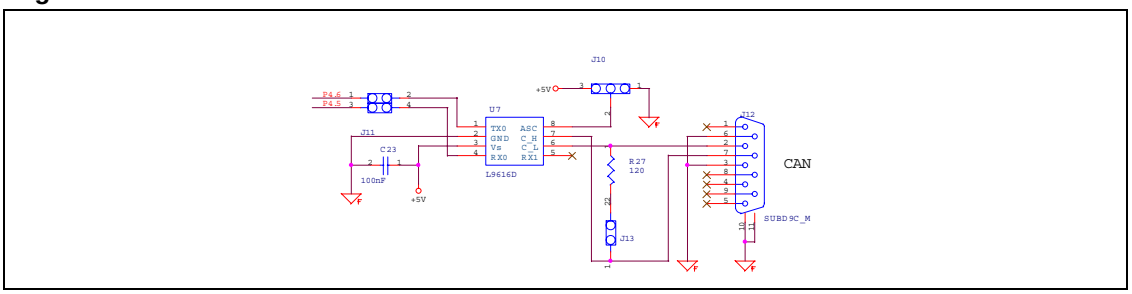


Figure 10. Boot mode configuration and LED's

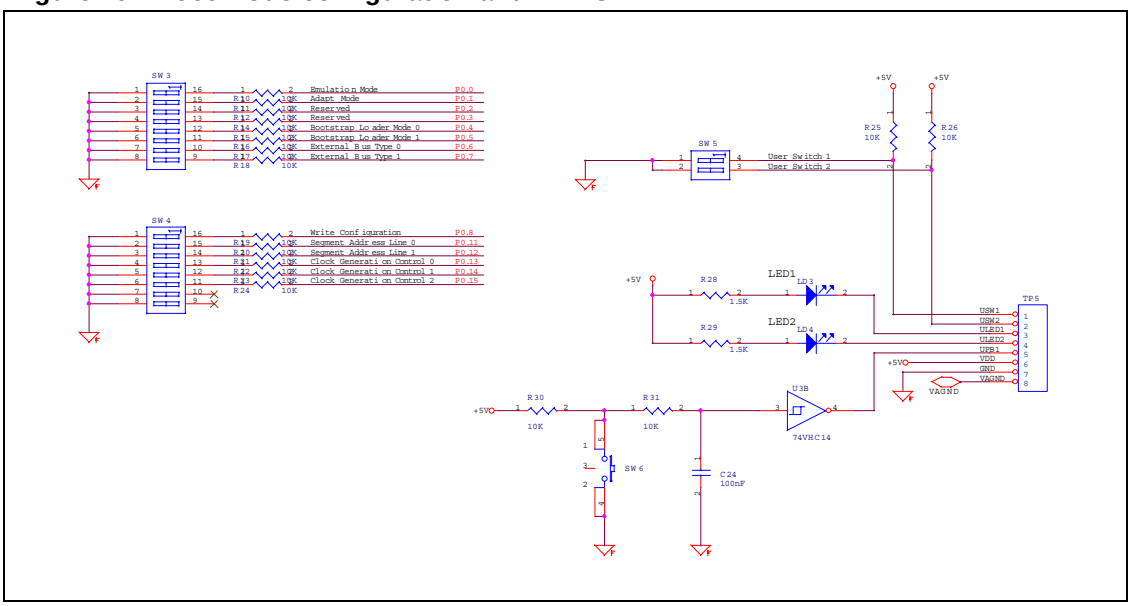
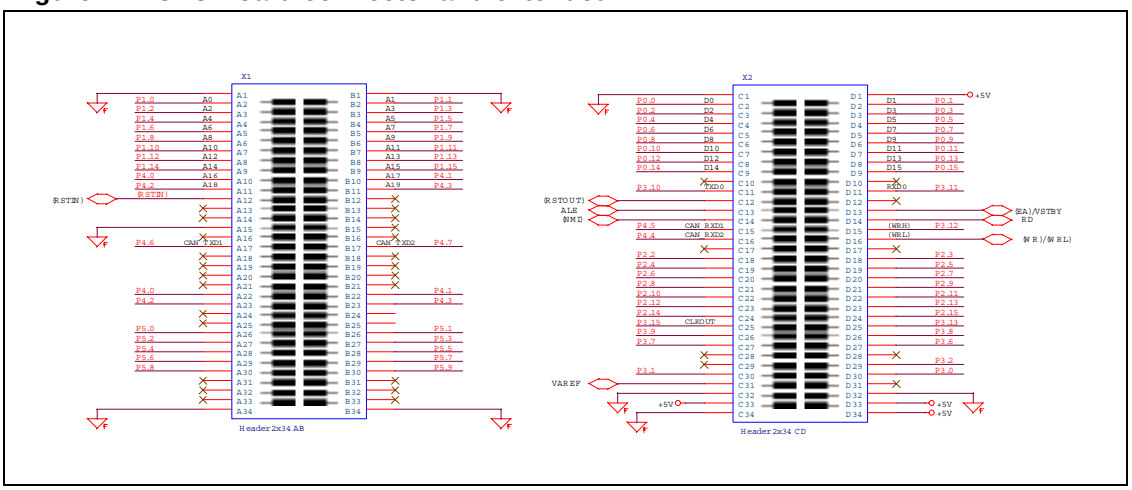


Figure 11. CPU Board connector and extended



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