UM0504
User manual

ST72321M9 embedded web server evaluation board

Introduction

This user manual describes the operation of the ST72321M9 embedded web server board. (STEVAL-CDE001V1). The board offers temperature measurement via an on-board temperature sensor and displays it on the web page of the client PC connected via an Ethernet connection. In addition, there is an LCD available on the board for temperature display. There is an embedded web server firmware running on the board. This system can be used for remote monitoring solution for applications such as air conditioning control in industry, hospitals, etc. The same concept can also be utilized for other applications requiring web or Ethernet connectivity. The board has the following features:

- Provides temperature measurements in the range of -55 °C to 150 °C
- Ethernet-based temperature monitoring on a computer terminal
- 16*2 dot matrix interface LCD module
- Switches are provided for user interface
- 10-pin ICC programming and debugging connector
- Webpage is stored in internal flash of the microcontroller

The board operates on 5 V power supply. The board is comprised of the ST72F321M9 as the controller, with operating voltage range of 3.8 V to 5.5 V, Flash 60 KB, and the LQFP80 14x14 package. The microcontroller senses the temperature of the environment through an LM135 analog temperature sensor by using the analog-to-digital converter (ADC), and then the resulting temperature value is sent to the web page and displayed in HTML format on the computer terminal via the Ethernet hub. Since the temperature value is also available on the LCD mounted on the board, this can be used in absence of a web interface such as a front panel temperature display of a refrigerator, air conditioner, or any other home appliance.

Figure 1. ST72321M9 embedded web server board (order code: STEVAL-CDE001V1)

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1 Getting started

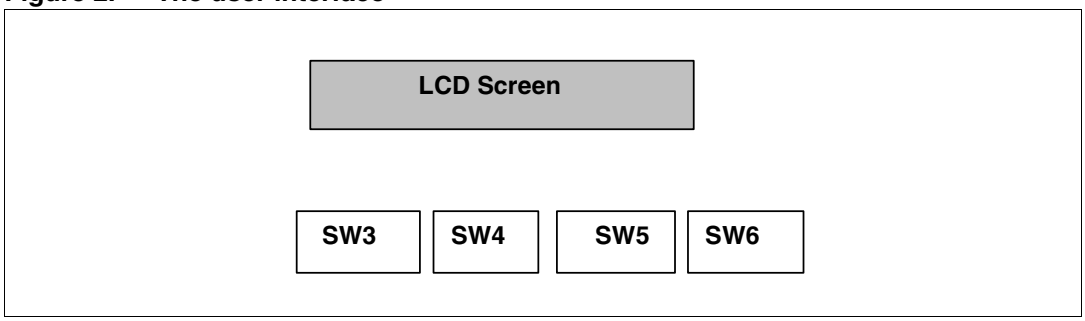
1.1 Powering on the board

The ST72321M9 embedded web sever board is designed to be powered by a 5 V DC power supply through the power jack (J22) on the board. J1 is provided to measure the current consumption of the board. By default J1 shall be fitted. Once the board is powered up, the power LED (D5) glows.

1.2 User interface to the ST72321M9 embedded web server board

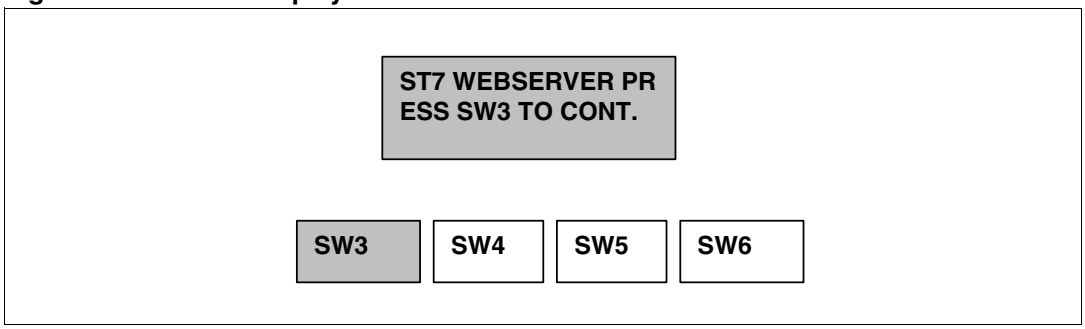
There are 4 switches as keys and a 2x16 LCD display to offer the user interface functionality. The user interface on the board appears as shown.

Figure 2. The user interface



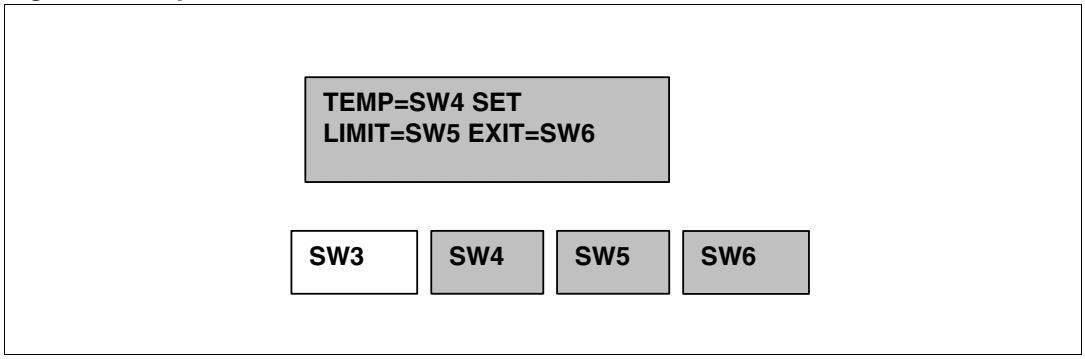
When the power is switched on, the default output on the LCD will look as shown below which means that the system is ready to take command. The highlighted switch in grey shows which keys are active to receive the command.

Figure 3. Default display state



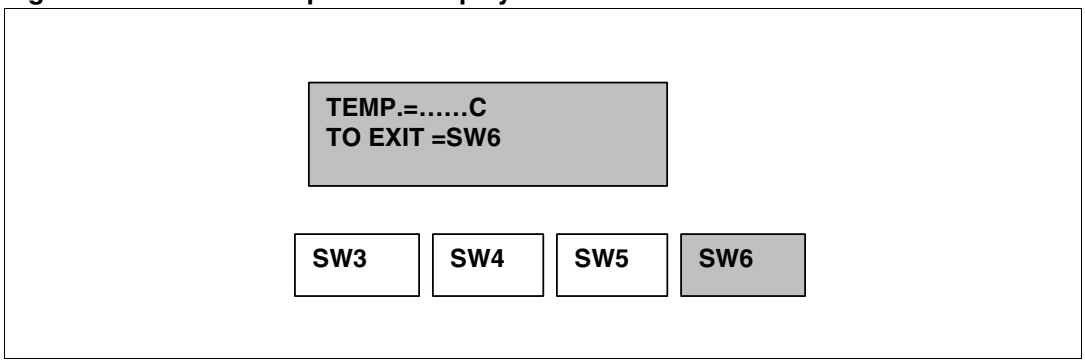
1. To display the options available at any moment, press SW3. Upon pressing SW3, the output on the LCD is as shown below:

Figure 4. Options



2. To display the current temperature, press SW4. The output on the LCD is as shown below:

Figure 5. Current temperature display

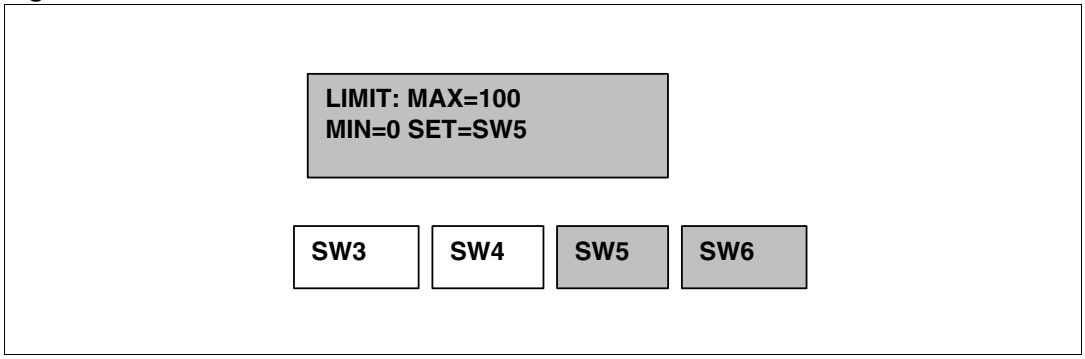


The SW6 can be used to exit from any menu.

To move to the default display state and to use other available options, SW6 is pressed.

3. To set the maximum and minimum temperature limit, press SW5. The output on the LCD is as shown below:

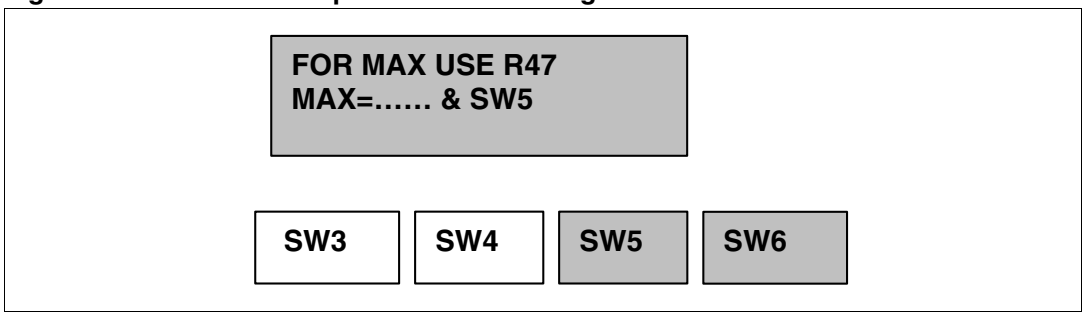
Figure 6. Default limits



Default maximum and minimum temperature limits are displayed. To set new temperature limits, press SW5. To maintain the default limit settings, press SW6.

4. Upon pressing SW5 in *Figure 6*, the output on LCD is as shown below.

Figure 7. Maximum temperature limit settings



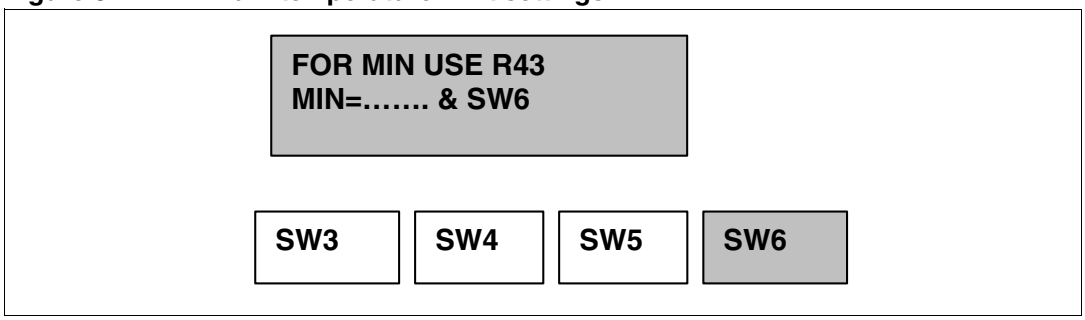
To set the maximum temperature limit, rotate the potentiometer (POT) R47. As the user rotates the POT R47, the change of limit is displayed simultaneously on the LCD screen. Press SW5 to set new maximum temperature limit.

To exit, press SW6.

Note: If the current temperature is more than the maximum limit, D8 LED glows.

5. On pressing SW5 in the *Figure 7*, the output on LCD is as shown below.

Figure 8. Minimum temperature limit settings



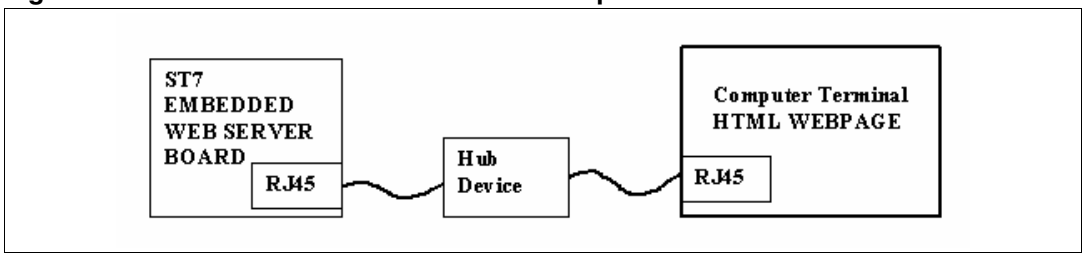
Note: To set the minimum temperature limit, rotate the potentiometer R43. As the user rotates the POT R43, the change of limit is displayed simultaneously on the LCD screen. To exit, press SW6. The minimum temperature limit is set.

Note: If the current temperature is less than the minimum limit, D9 LED glows.

1.3 How to connect to the network

Connect the ST72321M9 embedded web server board to the computer terminal via the Ethernet hub /switch device in order to provide Ethernet interfacing as shown in *Figure 9*.

Figure 9. The board is connected to the computer terminal via hub device



To display the webpage on the computer terminal, enter the IP address of the board in the address bar of the standard browser (Internet Explorer, Mozilla Firefox etc.)

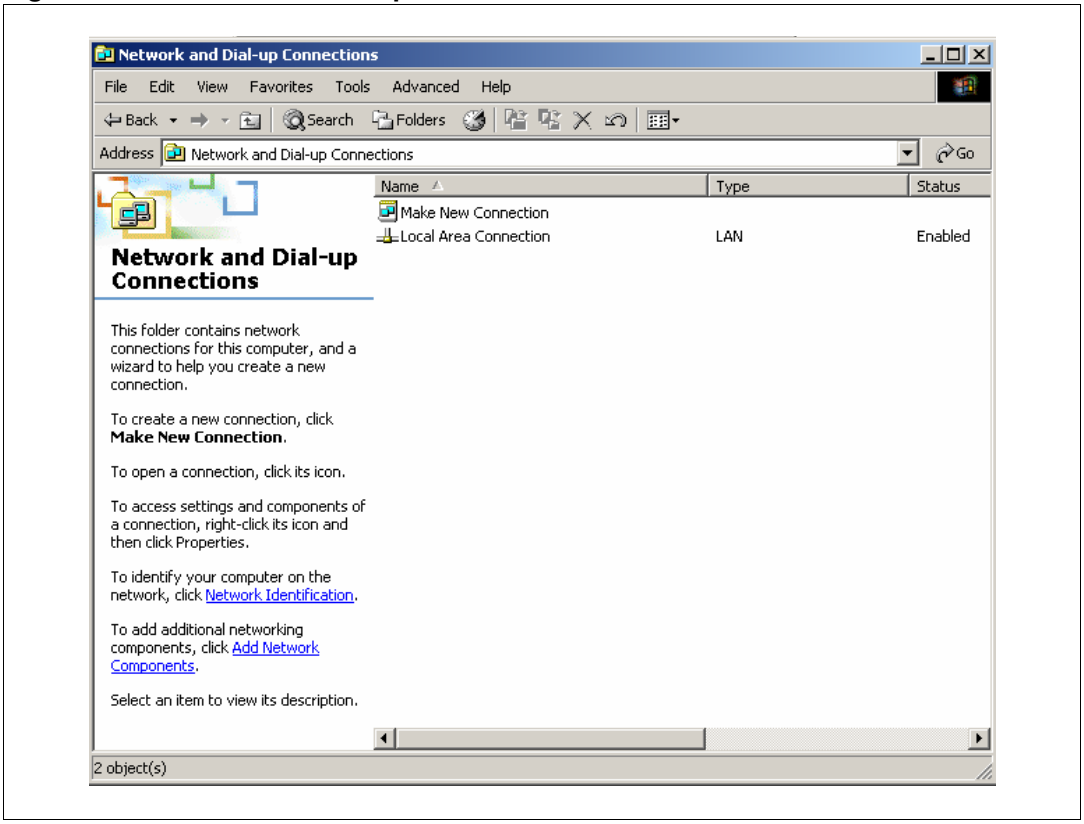
Note: http://192.168.2.3/ST72321M9.htm (IP address of board)

TCP/IP settings

To display the page on the computer, TCP/IP must be configured properly in Windows.

- Step1: Open the network and dial-up connections in the control panel. This window shows all devices that can be used to form network connections and their status. The window is as shown below:

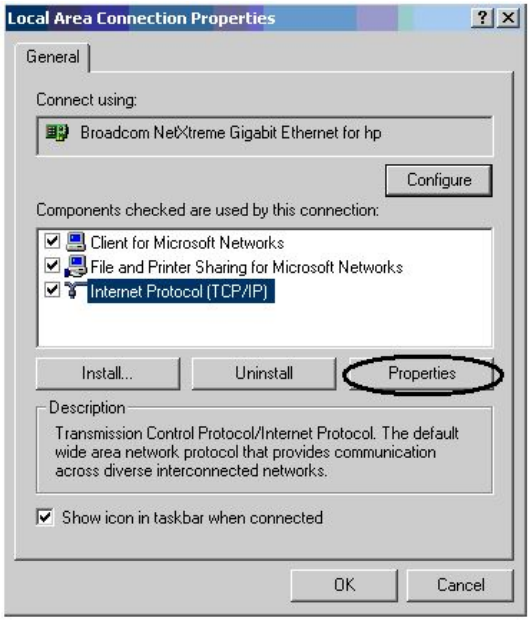
Figure 10. Network and dial-up connection window



- Step2: To view and set the IP settings of the client PC, right click the desired network device (Local Area Connection) and select properties.

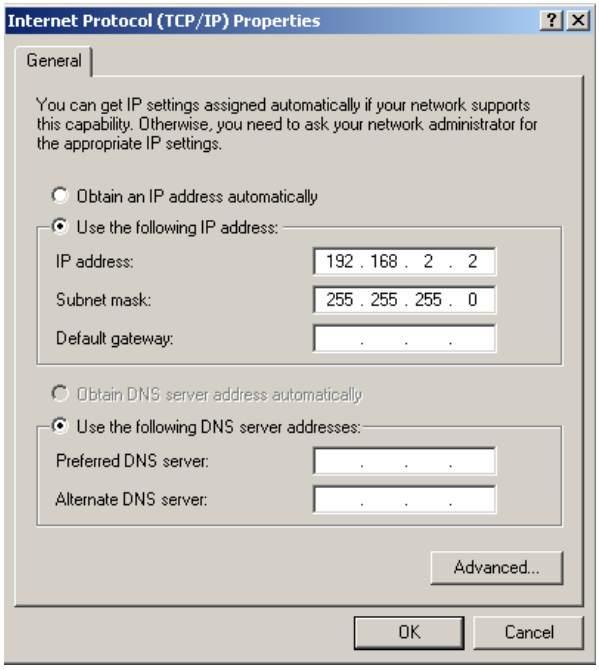
The window as shown in *Figure 11* is displayed.

Figure 11. Local area connection properties window



- Step3: Select Internet Protocol (TCP/IP) in above window and click properties. Then the following window is displayed:

Figure 12. Internet protocol properties

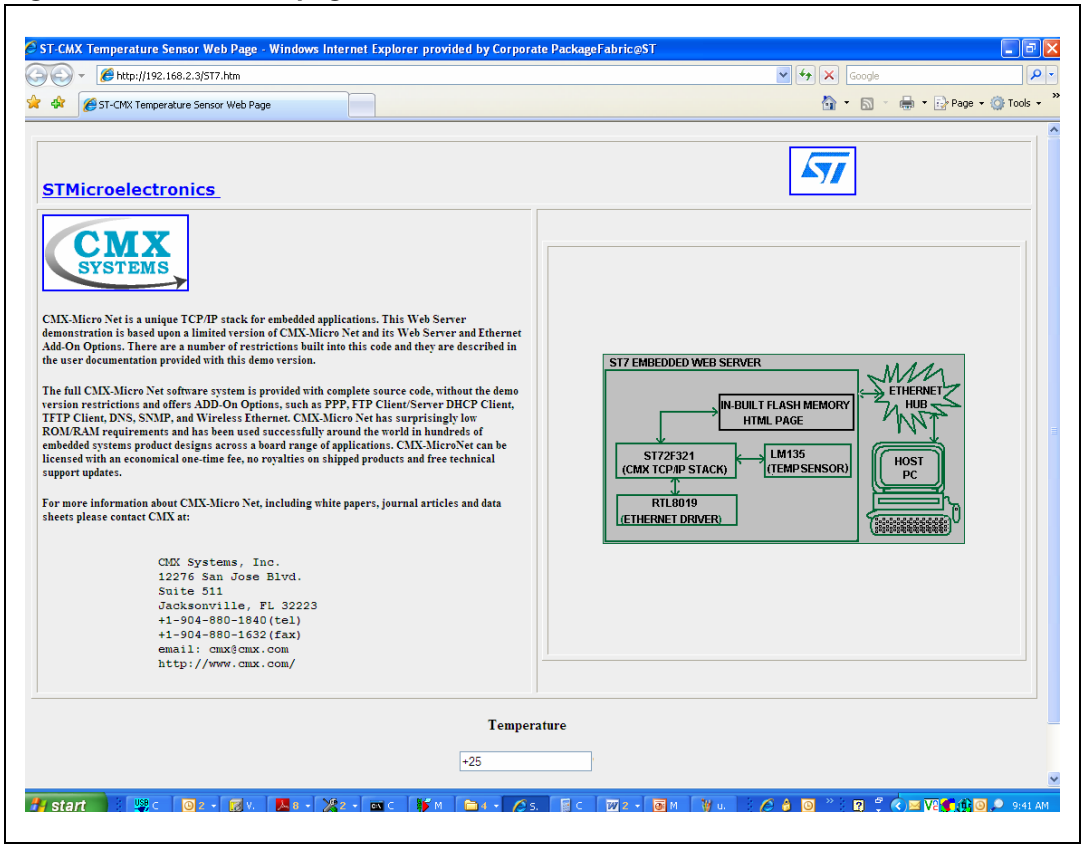


Here, enter the IP address and Subnet mask for the client and press ok.

Note: Set the IP address of the client pc to be different from the IP address of the embedded web server board. For example, 192.168.2.2 can be set as shown in Figure 12.

After making the required connections and setting the IP address, the user puts a request for the temperature by typing http://192.168.2.3/ST72321M9.htm in the address bar. Then the following page is displayed on the screen.

Figure 13. HTML web page



2 Hardware layout and configuration

The ST72321M9 embedded web server board is designed around the ST72F321M9 in an 80-pin LQFP package. The hardware block diagram *Figure 14* illustrates the connection between the ST72F321M9 and peripherals (LCD, temperature sensor, Ethernet EEPROM, serial Flash and debugging connector). *Figure 15* will help you locate these features on the actual web server board.

Figure 14. Hardware block diagram

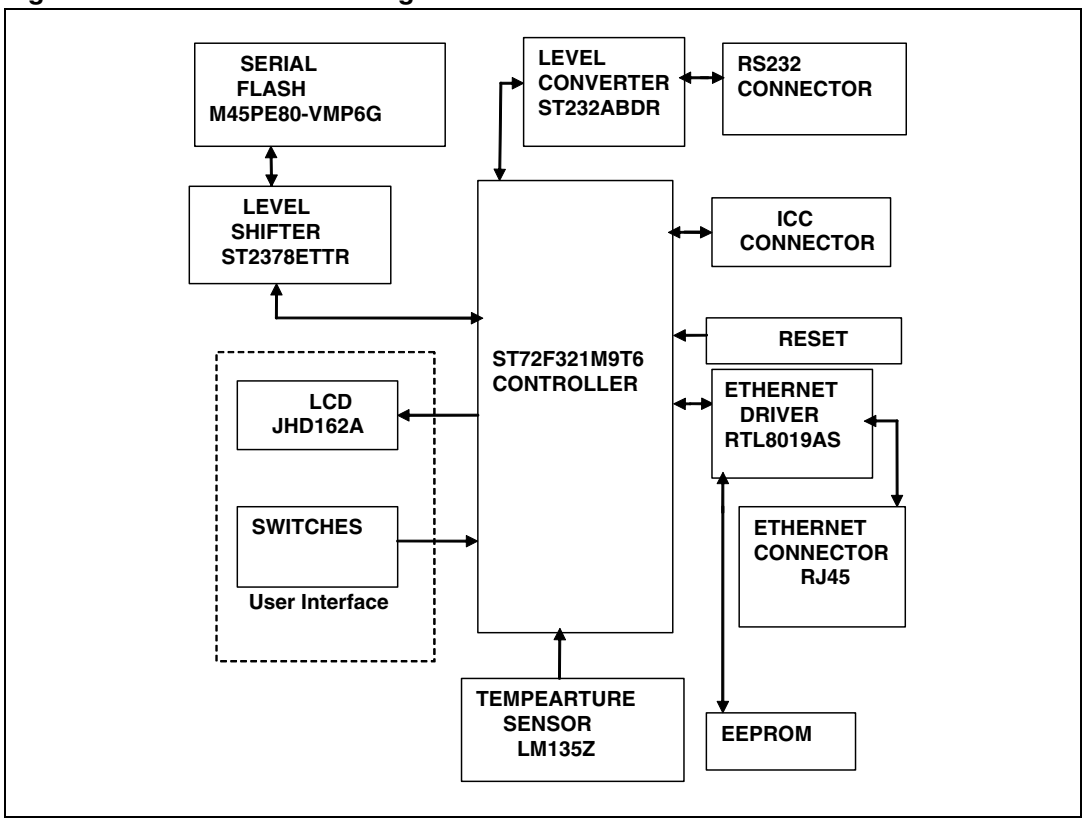
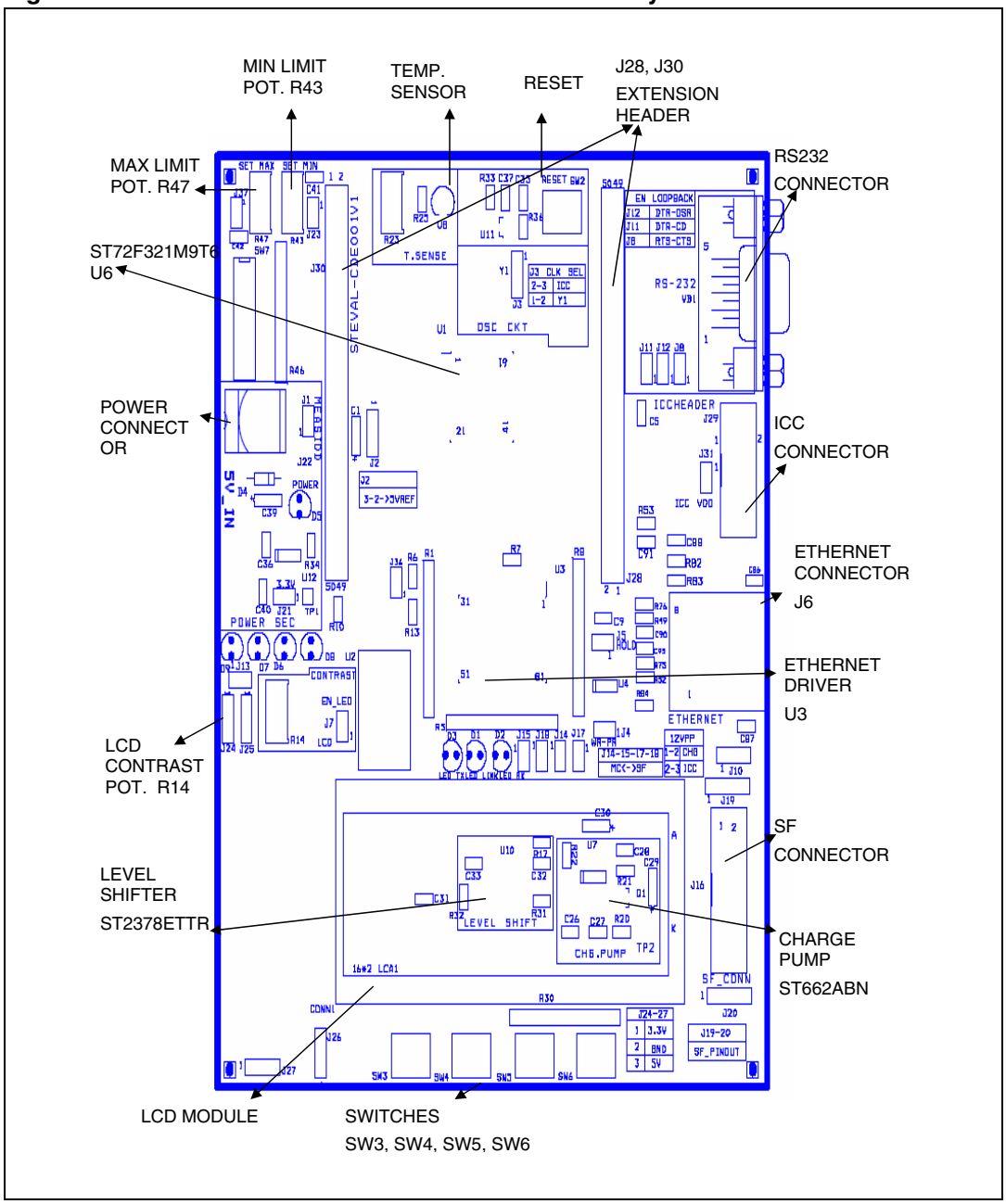


Figure 15. ST72321M9 embedded web server board layout



2.1 Power supply

The ST72321M9 embedded web sever board is designed to be powered by a 5 V DC power supply through the power jack (J22) on the board.

U12 (KF33BD-TR) mounted on the board generates the 3.3 V DC power supply which power(s) some parts of the board.

The power supply is configured by setting the related jumpers.

Table 1. Power related jumpers

Jumper	Description
JP21(1)	Put jumper on JP21 to obtain 3.3 V Default: not connected
J1	Put jumper to provide 5 V power to board. Default: connected

1. Make sure to ground the test point (TP1) to activate U12.

The LED D5 glows when the ST72321M9 embedded web server board is powered correctly.

2.2 Clock source

Two separate clock sources are available on the board for ST72321M9 and RTL8019AS.

- Y1, 16MHz Crystal for ST72321M9 microcontroller
- U2, 20MHz Crystal for RTL8019AS Ethernet driver clock settings for microcontroller are done using Jumper J3

Table 2. Jumper J3 settings for Y1

Pin no.	Description
2-3	Put jumper on pins 2 & 3 to enable the external clock to the microcontroller. This can be used for programming the microcontroller through the ICC tool
1-2	Put jumper on pins 1 & 2 to enable on- board 16 MHZ Crystal resonator clock to the microcontroller
Default setting	Put jumper on pins 1 & 2

U2 footprint on the board has the provision to mount the oscillator in the JC08 or JC14 package or the 2-pin quartz crystal per availability. If the user wants to connect the crystal, then J36 jumper has to be fitted.

Table 3. Jumper settings for U2

Jumper	Description
J36	Put jumper to connect the crystal at U2. Default: Jumper FITTED.

2.3 Reset source

The reset signal of ST72321M9 embedded web server board is active low and the reset source includes:

- Reset IC STM1001TWX6F
- RC circuit (R36 & C37)
- Reset button SW2

2.4 Temperature sensor

The board is provided with the temperature sensor LM135Z which is powered by a 5 V supply through resistor R25.

Table 4. Temperature sensor pin configuration

Pin no.	Description	Pin connection
1	V-	Connected to GND
2	V+	Output pin connected to AIN1/PD1 of ST72321M9
3	ADJ	Connected to pin 2 of POT R23. This is required for calibration.

2.5 Potentiometer R23

Potentiometer R23 is used to calibrate the temperature sensor for 2.98 V at 250 °C.

Table 5. Pin configuration

Pin no.	Pin connection
1	Connected to GND
2	Connected to ADJ pin(3) of LM135
3	Connected to 5 V

2.6 Serial Flash

The 1 Mbyte serial Flash U9 is powered by fixed 3.3 V.

The serial Flash is interfaced to the microcontroller using the SPI interface. Since both are operating on different voltage levels, a level shifter is connected between the serial flash and the microcontroller.

Table 6. Serial Flash

Feature	Description
Sales type	M45PE80-VMP6G or G/T or TG are the possible values
Capacity	1 Mbyte, Page erasable.
Interface	SPI
Package	VFQFPN8
Operating voltage	2.7 V to 3.6 V

Note: In the current version of the solution, the web page is embedded in the internal flash of the controller. For future use, serial flash is available to store the large size web page. Also refer to Section 2.14 and Section 3.4.

2.7 SPI serial bus EEPROM

A SPI based EEPROM (U4) is powered by 5 V.The EEPROM is interfaced with Ethernet driver RTL8019AS.

Table 7. Jumper settings

Jumper	Description
J4	Put the jumper to disable the write protection
J5	Put the jumper to end the hold condition

Note: U4 is not mounted on the board. The footprint is available on the board for future usage.

2.8 Potentiometer R43

Potentiometer R43 is used by the ADC of ST72321M9 to set a minimum temperature limit for the thermostat.

Table 8. Pin configuration

Pin no.	Pin connection
1	Connected to GND
2	Connected to PD0/AIN0 through J23
3	Connected to 5 V

Table 9. Jumper settings

Jumper	Description
J23	Put a jumper on J23 to connect pin 2 of R43 to PD0 of ST72321M9 to enable the ADC channel AIN0 Default: connected

2.9 Potentiometer R47

Potentiometer R43 is used by the ADC of ST72321M9 to set a maximum temperature limit.

Table 10. Pin configuration

Pin no.	Pin connection
1	Connected to GND
2	Connected to PD2/AIN2 through J37
3	Connected to 5 V

Table 11. Jumper settings

Jumper	Description
J37	Put a jumper on J37 to connect pin 2 of R47 to PD2 of ST72321M9 to enable the ADC channel AIN2 default: connected

2.10 Potentiometer R14

Potentiometer R14 is used to adjust the contrast of the LCD.

Table 12. Pin configuration

Pin no.	Pin connection
1	Connected to GND
2	Connected to CNT (pin no.3) of 16x2 LCD
3	Connected to 5 V

2.11 Display devices

16*2 alphanumeric LCD JHD162A is available as the display unit on the board to provide the user interface. The LCD module is powered by a 5 V supply.

Table 13. Jumper settings

Jumper	Description
J7	Put the jumper to power on the backlight of LCD.

Table 14. LCD connections to microcontroller

Pin no.	Description	Pin connection
1	GND	Connected to GND
2	VCC	Connected to + 5 V supply
3	CNT	Connected to PIN2 of R14
4	RS	Connected to PB1 of ST72321M9
5	RWR	Connected to PB2 of ST72321M9
6	CE	Connected to PB0 of ST72321M9
7	D0	Connected to PA0 of ST72321M9
8	D1	Connected to PA1 of ST72321M9
9	D2	Connected to PA2 of ST72321M9
10	D3	Connected to PA3 of ST72321M9
11	D4	Connected to PA4 of ST72321M9
12	D5	Connected to PA5 of ST72321M9

Table 14. LCD connections to microcontroller (continued)

Pin no.	Description	Pin connection
13	D6	Connected to PA6 of ST72321M9
14	D7	Connected to PA7 of ST72321M9
15	AN0	Connected to +5 V through R17
16	CAT	Connected to PD3 through J7

2.12 Switches

SW2 is the reset switch. SW3, SW4, SW5, SW6 are used to provide keyboard functionality to the LCD on the board. SW7 acts as the DIP switch (not mounted on the board). It can be used for setting the IP address of the web server. (It will need firmware modification).

2.13 Ethernet driver RTL8019AS

It is a 100-pin PQFP package full duplex Ethernet controller.

- Features:
  - It is operated on a 20 MHZ clock
  - Supports 4 diagnostic LED pins with programmable outputs

Three LED's D1 (LED-LINK), D2(LED-RX), D3(LED-TX)) are available on the board.

2.14 RS232 level converter U6

The ST232ABDR is used to provide the voltage levels required for RS232 communication. It has a supply voltage range of 4.5 to 5.5 V and a transmitter output voltage swing of ± 9 V.

2.15 Level shifter U10

ST2378ETTR is used to act as a ±15 kV ESD-protected level translator providing the level shifting necessary to allow data transfer in a multi-voltage system. This is connected between the serial flash and microcontroller since serial flash is operating on 3.3 V.

Table 15. Jumper settings

Jumper	Description
J14	Put jumper on J14 to connect the pin no.19 (MISO) to PC4 of ST72321M9
J15	Put jumper on J15 to connect the pin no.13 (MOSI) to PC5 of ST72321M9
J17	Put jumper on J17 to connect the pin no.17 (SCK) to PC6 of ST72321M9
J18	Put jumper on J18 to connect the pin no.5 (NSS) to PC0 of ST72321M9

Note: To program the serial Flash externally using the external serial programmer above, jumpers should not be fitted. For the details of external serial flash connector refer to Section 3.4.

2.16 Charge pump

The charge pump (U7) is used for programming the flash memory of the microcontroller. The charge pump provides 12 V from 5 V input. It is used for IAP application. The firmware needs to be updated for IAP application implementation.

Table 16. Charge pump

Feature	Description
Sales type	ST662ABN
Package	DIP-8

Note: U7 is not mounted on the board.

2.17 LEDs

LEDs D6, D7, D8 and D9 are connected to PF0, PF1, PE6 and PE7 respectively.

D8 is the “temperature above maximum limit” indicator. D9 is the “temperature below minimum temperature limit” indicator.

2.18 Development and debug support

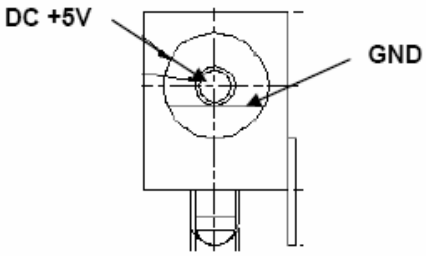
The STVD7 is used as the development environment. The InDart STX from Softec is used for programming the ST72321M9. The Indart STX or EMU3 are the debugging tools.

3 Connector details

3.1 Power supply connector

The ST72321M9 embedded web server board can be powered from a DC 5 V power supply via the external power supply jack (J22).

Figure 16. Power supply connector (J22)



3.2 RS232 connector VB1

Table 17. RS232 pin configuration

Pin no.	Description
1	Data carrier detect(CD)
2	Receive data connected to R1IN of ST232
3	Transmit data connected to T1OUT of ST232
4	Data terminal ready(DTR)
5	Signal ground
6	Data set ready (DSR)
7	Request to send (RTS) connected to T2OUT of ST232
8	Clear to send (CTS) connected to R2IN of ST232
9	Ring indicator

Figure 17. RS232 connector (DB9)

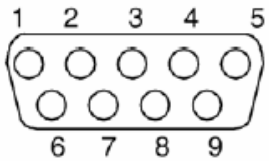


Table 18. Jumper settings with enabled loopback on RS232

Jumper	Description
J11	Put jumper on J11 to connect the pin DTR to DSR of DB9
J12	Put jumper on J12 to connect the pin DTR to CD of DB9
J8	Put jumper on J8 to connect the RTS to CTS of DB9

3.3 ICC connector J29

It is used for programming & debugging.

Figure 18. ICC connector J29

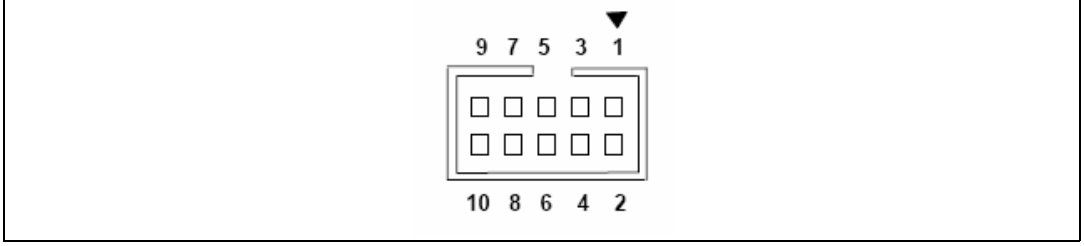


Table 19. ICC connector pin configuration

PIN no.	Description
1	GND
2	ICCDATA connected to PC4 of ST72321M9
3	GND
4	ICCCLK connected to PC6 of ST72321M9
5	GND
6	ICCRESET connected to reset pin ST72321M9
7	VDD_APPLI
8	ICC_VPP
9	ICCOSC to provide the external ICC clock.
10	GND

Table 20. Jumper settings

Jumper	Description
JP31	Put jumper on JP31 to provide the +5 V to ICC connector on PIN no.7 Default: put jumper on JP31 to allow programming and debugging through ICC connector.

Table 20. Jumper settings

Jumper	Description	
J10	Pin 1 & 2	Put jumper on pins 1 & 2 to get 12 V supply from programming tool for programming the microcontroller Flash (Default)
	Pin 2 & 3	Put jumper on pins 2 & 3 to get 12 V supply from U7 for programming the microcontroller flash for IAP (in application programming).

3.4 Serial Flash connector J16

The serial Flash connected on the board can be programmed externally using SF programmer via this SF_Conn connector J16.

Table 21. Pin description

Pin no	Description	Pin No:	Description
1	GND	8	SF_Q
2	3.3 V	9	GND
3	GND	10	SF_D
4	SF_NSS	11	NC
5	GND	12	RESET_1
6	SF_SCK	13	OE
7	GND	14	W_PR

These jumpers are provided for the user to connect large serial flash using an external daughter board.

Table 22. Serial Flash pinout

Jumper	Description
JP19-JP20	SF_PINOUT

3.5 Wrap area CONN1

This general purpose area is kept on the PCB for the user's usage.

3.6 Ethernet connector J22

CONN2 (RJ45) is 10/100 Base T SINGLE PORT TAB UP LED G/Y. It has a built-in transformer with turns ratio 1:1. It is connected to Ethernet driver RTL8019AS.

Figure 19. Ethernet connector figure

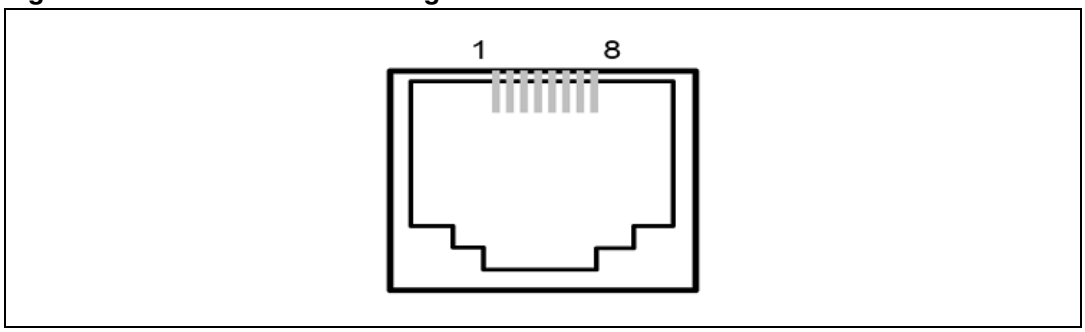


Table 23. Pin description

Pin no.	Description	Pin no.	Description
1	TxData+	5	Shield
2	TxData-	6	RxData-
3	RxData+	7	Shield
4	Shield	8	Shield

4 Schematics

Figure 20. ST72321M9 embedded web server - ST72F321M9T6

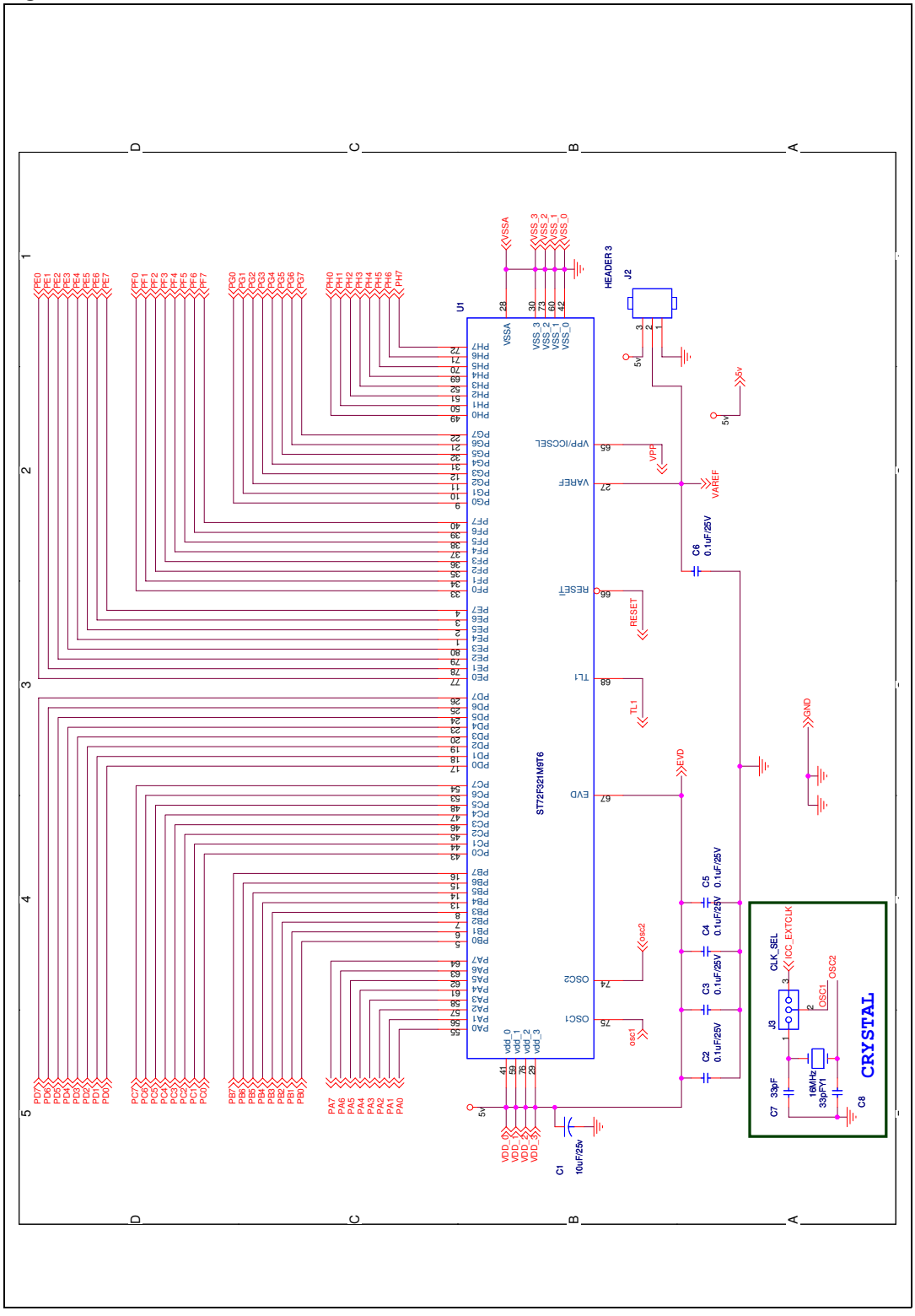


Figure 21. ST72321M9 embedded web server - ethernet

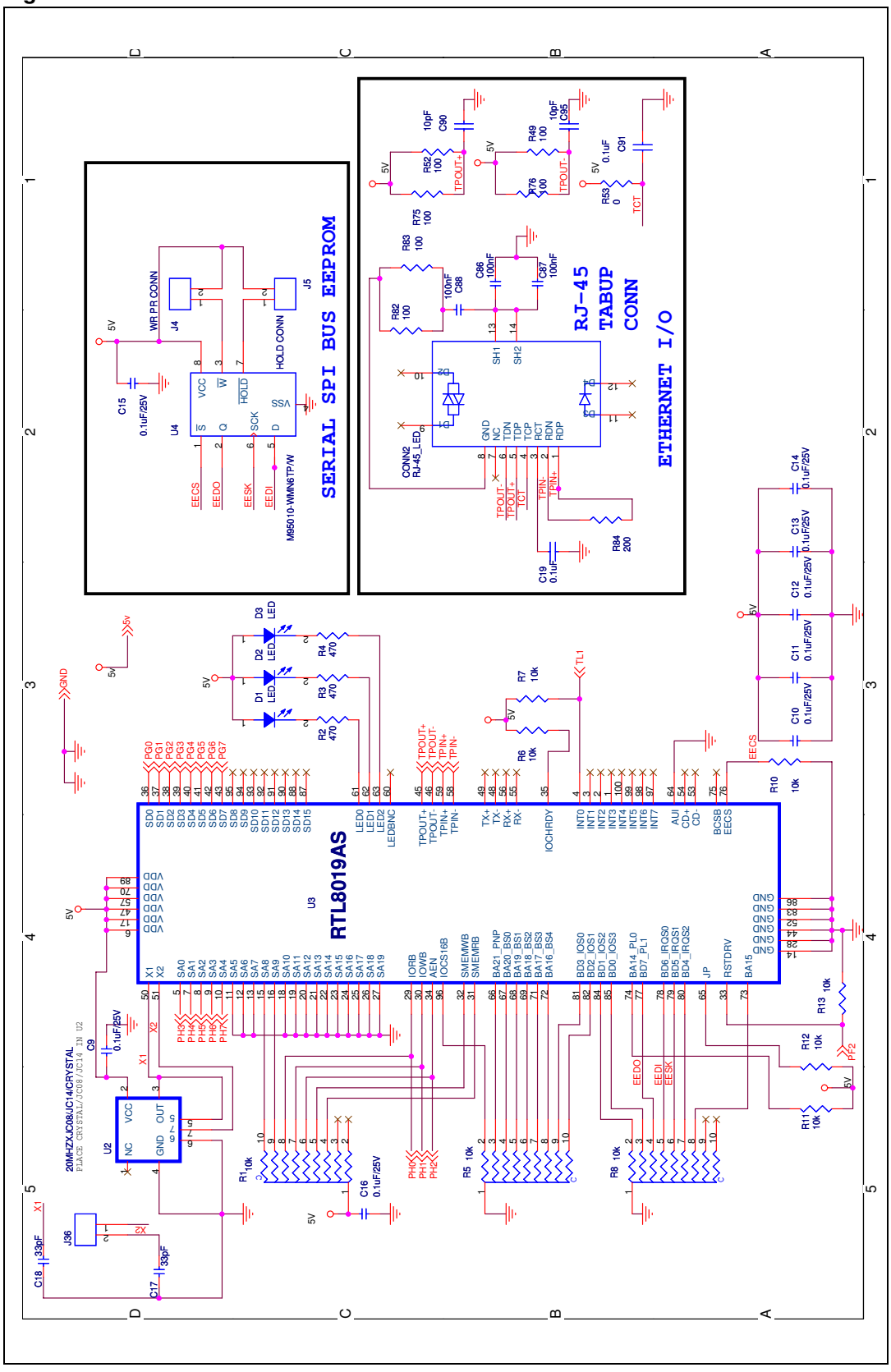


Figure 22. ST72321M9 embedded web server - temperature sensor, LCD, serial Flash and level translator

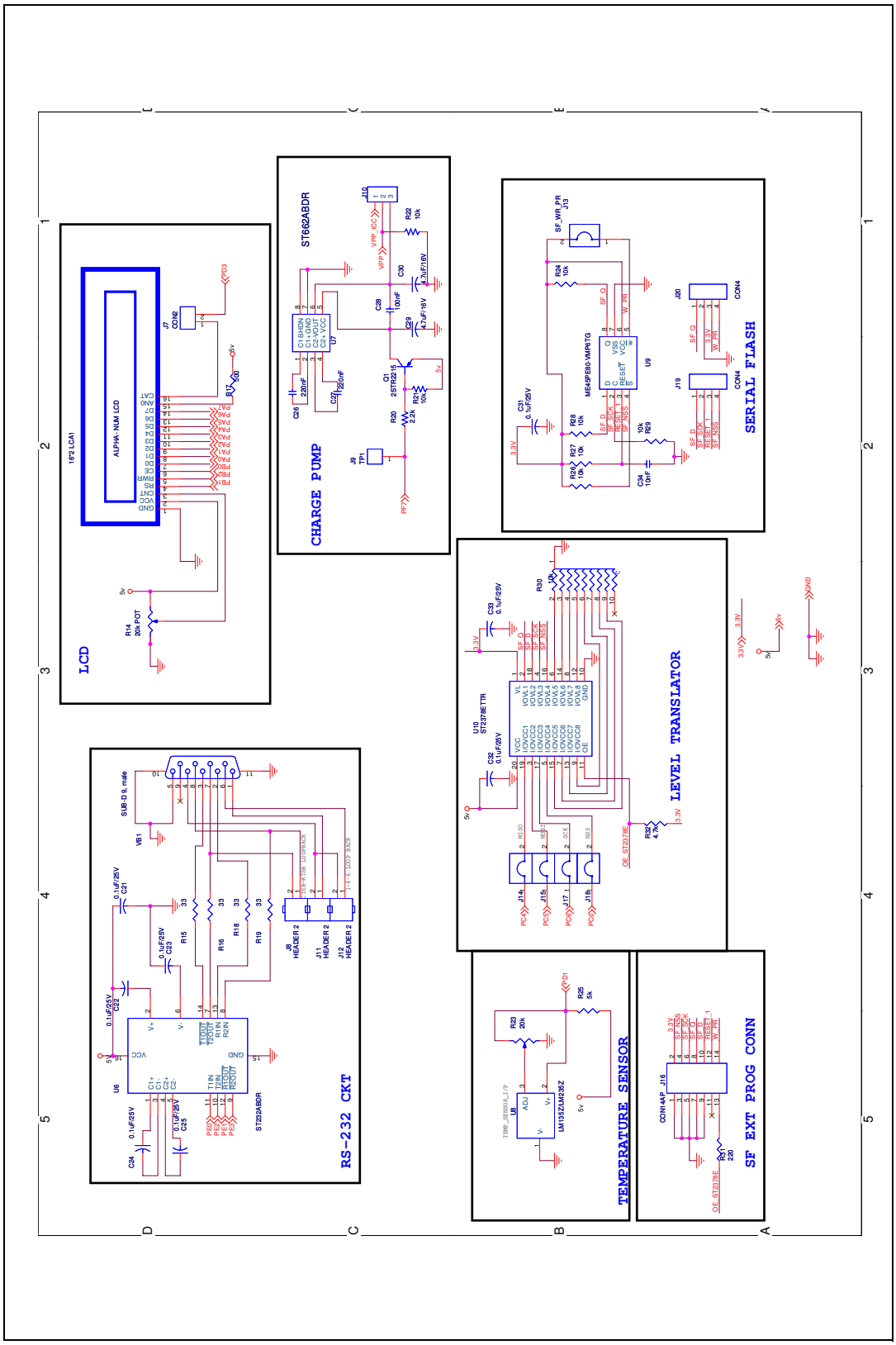
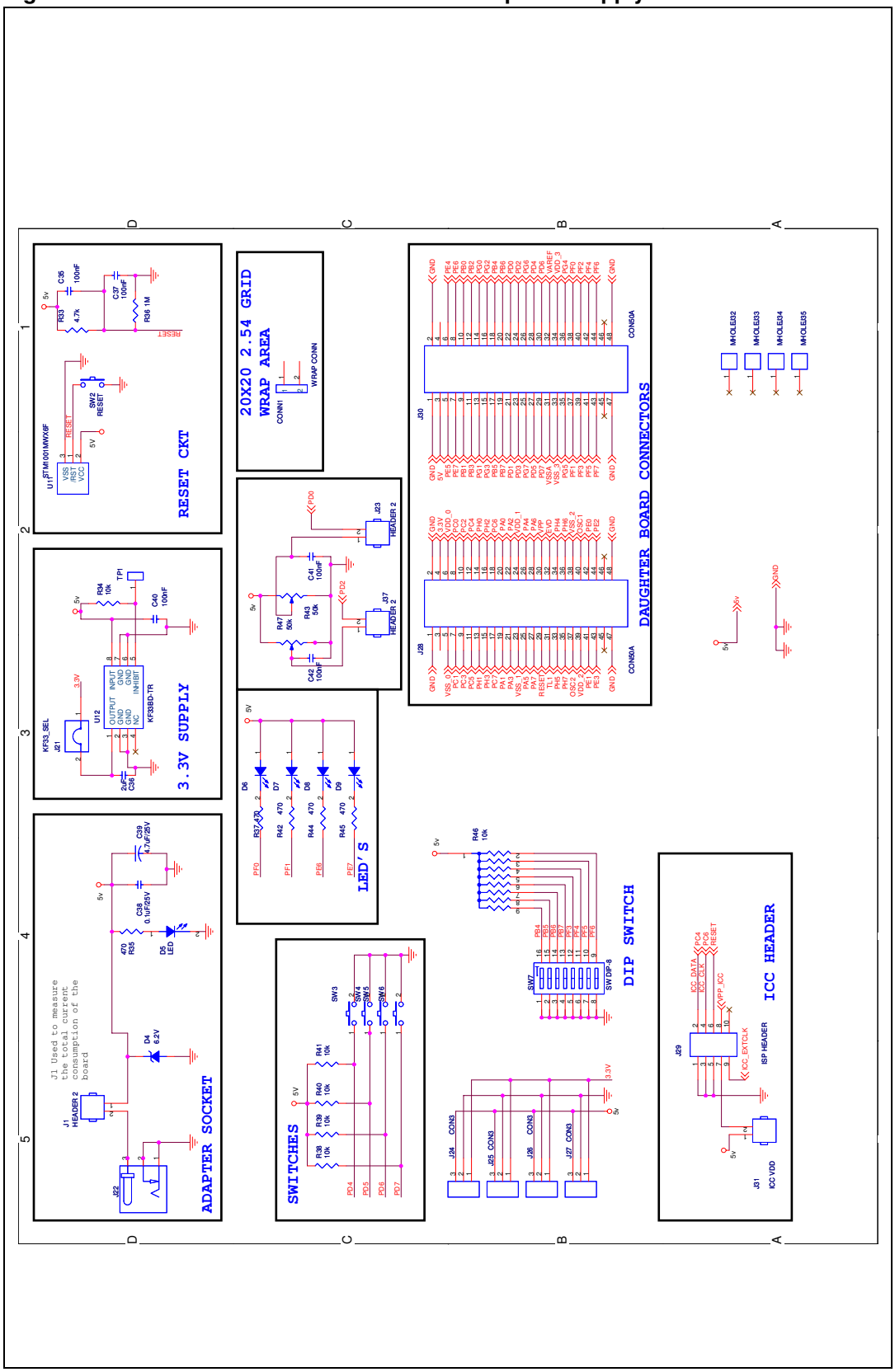


Figure 23. ST72321M9 embedded web server - power supply



5 Bill of materials

Table 24. BOM

Index	Qty	Ref.	Value-generic part number	Package	Man.	Manufacturer's ordering code/orderable part number	Supp.	Suppl. ordering code	Comment
Devices									
1	1	U1	Microcontroller	LQFP80 14x14	ST	ST72F321M9T6			
2	1	U4	SPI EEPROM	SO-8	ST	M95010-WMN6TP/W			Not mounted
3	1	U6	RS232 Transreceiver	SO-16	ST	ST232ABDR			
4	1	U7	Charge pump	SO-8	ST	ST662ABD-TR			Not mounted
5	1	U8	Temperature sensor	TO92	ST	LM235Z			LM135Z can also be used.
6	1	U9	Serial Flash	VFQFPN8	ST	M45PE80-VMP6TG			
7	1	U10	Level translator	TSSOP20	ST	ST2378ETTR			
8	1	U11	Reset supervisor	SOT23-3	ST	STM1001TWX6F			
9	1	U12	Voltage regulator	SO-8	ST	KF33BD-TR			
10	1	Q1	PNP power transistor	SOT-23	ST	2STR2215			Not mounted
11	1	U3	Ethernet controller	PQFP-100	Realte kΩ	RTL8019AS			
Crystals and oscillator									
1	1	Y1	Q16.0-SS4-30-30/30	SS4 (HC49/U4H) 11.35 mm x 4.35 mm	Jauch	Q16.0-SS4-30-30/30			
2	1	U2	Q20.0-SS4-30-30/30	SS4 (HC49/U4H) 11.35 mm x 4.35 mm	Jauch	Q20.0-SS4-30-30/30			Additionally user has the provision of JCO08, JCO14 oscillators

Table 24. BOM (continued)

Index	Qty	Ref.	Value-generic part number	Package	Man.	Manufacturer's ordering code/orderable part number	Supp.	Suppl. ordering code	Comment
Connectors and jumpers									
1	1	CONN2 (Ethernet)	RJ45 With Magnetics and G/YLED		TYCO Electronics	5-6605758-4	RS Components	6154412	
2	1	CONN1	WRAP CONN						
3	5	SW3,SW4, SW5, SW6, SW2	Push button switch	(6 mm X 6 mm) push button	Any				
4	2	TP2,TP1	Test point	Berg-stick pin	Any				
5	1	SW7	Switch	DIP-8	Any	Not mounted			
6	17	J1,J8,J11,J12, J23,J4, J5,J7,J13,J14, J15,J17,J18,J21,J23,J37,J31	Header 1x2	Jumper 2 pin, 2.54 mm pitch	Any				
7	7	J2,J3,J10,J24, J26,J25,J27	Header 1x3	Jumper 3 pin, 2.54 mm pitch	Any				
8	1	J29	ICC header	Header 2x5pin, 2.54 mmx2.54 mm pitch	Any				
9	1	J22	POWER JACK 2.5 mm	Power JACK-14.17 8.96 mm	CUI	PJ-102B			
10	2	J28,J30	Header 2x25pin	Header 2x25pin, 2.54 mm x 2.54 mm pitch	Any				
11	2	J19,J20	HEADER 1x4	Jumper 4 pin, 2.54 mm pitch	Any				

Table 24. BOM (continued)

Index	Qty	Ref.	Value-generic part number	Package	Man.	Manufacturer's ordering code/orderable part number	Supp.	Suppl. ordering code	Comment
12	1	J16	CON14AP	Header 2x7pin, 2.54 mm x 2.54 mm pitch	Any				
13	1	16*2 LCA1	16 CHAR x 2ROW 5x8 DRIVING MODE 1/16D CHAR LCD			JHD162A			
14	1	VB1	ER - connector,d-sub,pcb right angle plug,4-40 w/screwlock,0.318 footprint,9 pin cont	Any				Not mounted	
Passive components (capacitors)									
1	1	C1	10 µF/25 V Tantalum/Electrolytic	EIA 3528-21/ size B	Any				Mount when using RJ45 without internal Capacitor on Pin8 for example 1-6605758-1 else replace with 0R
2	1	C39	4.7 µF/25 V Tantalum/Electrolytic	EIA 3528-21/ size B	Any				
3	2	C29,C30	4.7 µF/16 V Tantalum/Electrolytic	EIA 3528-21/ size B	Any	Not mounted			

Table 24. BOM (continued)

Index	Qty	Ref.	Value-generic part number	Package	Man.	Manufacturer's ordering code/orderable part number	Supp.	Suppl. ordering code	Comment
4	30	C2,C3, C4,C5, C6,C9, C10, C11, C12, C13, C14, C15, C16, C19, C21, C22, C23, C24, C25, C31, C32, C33, C38, C91, C28, C35, C37, C40, C41, C42	100 nF	SMD0805	Any				
5	4	C7,C8, C17, C18	33 pF	SMD0805	Any				
6	2	C26,C27	220 nF	SMD0805	Any				
7	1	C34	10 nF	SMD0805	Any				
8	1	C36	2.2 µF	SMD0805	Any				
9	1	C88	1 nF/ 0 Ω	SMD0805	Any				Mount 0-Ω resistance in place of this capacitor for Ethernet connector with built-in capacitor. For example 5-6605758-4

Table 24. BOM (continued)

Index	Qty	Ref.	Value-generic part number	Package	Man.	Manufacturer's ordering code/orderable part number	Supp.	Suppl. ordering code	Comment
10	2	C90, C95	10 pF	SMD0805	Any	Not mounted			
Passive components (resistors)									
1	8	R2, R3, R4,R35, R37, R42, R44, R45	470	SMD0805	Any				
2	28	R6,R7, R10, R11, R12, R13, R21, R22, R24, R26, R27, R28, R29, R34, R38, R39, R40, R41	10 kΩ	SMD0805	Any				
3	1	R17	500	SMD0805	Any				
4	2	R25	5.1 kΩ	SMD0805	Any				
5	1	R84	200	SMD0805	Any				
6	1	R15, R16, R18, R19	33	SMD0805	Any				
7	2	R20	2.2 kΩ	SMD0805	Any				
8	3	R31	220	SMD0805	Any				
9	6	R32, R33	4.7 kΩ	SMD0805	Any				
10	5	R36	1 M	SMD0805	Any				
11	5	R83, R75, R52, R76, R49, R53		SMD0805	Any	Not mounted			

Table 24. BOM (continued)

Index	Qty	Ref.	Value-generic part number	Package	Man.	Manufacturer's ordering code/orderable part number	Supp.	Suppl. ordering code	Comment
12	1	R82	0	SMD0805	Any				
13		R1,R5, R8,R30, R46	10 kΩ	2.54 mm 10-pin resistor pack	Any				
14	4	R14, R23, R43, R47	20 kΩ POT	3296 W top adjust	BOURNS				
Diode									
1	8	D1,D2, D3,D5, D6,D7, D8,D9	LEDs	3 mm LED	Any				
2	1	D4	6.2 V Zener diode		Any				
Other information									
1	4	MHOLE 32,MH OLE33, MHOLE 34,MH OLE35	Mounting Holes	2.5 mm hole					

Appendix A ST72F321M9T6 connection details

Table 25. ST72321 details

ST72321 details		
	DEV BRD function	**Microcontroller function**
PA0	D0	
PA1	D1	
PA2	D2	
PA3	D3	
PA4	D4	
PA5	D5	
PA6	D6	I^2C Data
PA7	D7	I^2C CLK
PB0	LCD_E	PWM3
PB1	LCD_RS	PWM2
PB2	LCD_RW	PWM1
PB3		PWM0
PB4	DIP-0	PWM-ART external clock
PB5	DIP-1	PWM-ART input capture 1
PB6	DIP-2	PWM-ART input capture 2
PB7	DIP-3	
PC0	Serial Flash CE	ADC analog input 12
PC1		ADC analog input 13
PC2		Timer B input capture 2
PC3		Timer B input capture 1
PC4	SPI MISO serial Flash, ICC_DATA	ICC data input
PC5	SPI MOSI serial Flash	ADC analog input 14
PC6	SPI SCLK serial Flash, ICC_CLK	SPI serial clock/ICC clock output
PC7		SPI slave select/ADC analog input 15
PD0	MIN LIMIT POT	ADC analog input 0
PD1	Temp_sensor_I/P	ADC analog input 1
PD2	Max limit POT	ADC analog input 2
PD3	LCD_LED	ADC analog input 3
PD4	SWITCH3	ADC analog input 4
PD5	SWITCH4	ADC analog input 5

Table 25. ST72321 details (continued)

ST72321 details		
	DEV BRD function	**Microcontroller function**
PD6	SWITCH5	ADC analog input 6
PD7	SWITCH3	ADC analog input 7
PE0	RS232 TX	SCI transmit data out
PE1	RS232 RX	SCI receive data In
PE2	RS232 RTSB	
PE3	RS232 CTSB	
PE4		
PE5		
PE6	D8(LED)	
PE7	D9(LED)	
PF0	D6(LED)	Main clockout (fCPU)/ADC analog I/P 8
PF1	D7(LED)	Beep signal output
PF2	RSTDRV Ethernet	
PF3	DIP-4	TIMERA O/P COMPARE 2, ADC9
PF4	DIP-5	TIMERA O/P COMPARE 1, ADC10
PF5	DIP-6	TIMERA I/P CAPTURE 2, ADC11
PF6	DIP-7	TIMERA I/P CAPTURE 1
PF7	CHG_PUMP	TIMERA EXT clock source
Ethernet connections		
PG0	SD0 ethernet	
PG1	SD1 ethernet	
PG2	SD2 ethernet	
PG3	SD3 ethernet	
PG4	SD4 ethernet	
PG5	SD5 ethernet	
PG6	SD6 ethernet	
PG7	SD7 ethernet	
PH0	IORB ethernet	
PH1	IOWB ethernet	
PH2	AEN ethernet	
PH3	SA0 ethernet	
PH4	SA1 ethernet	
PH5	SA2 ethernet	

Table 25. ST72321 details (continued)

ST72321 details		
	DEV BRD function	Microcontroller function
PH6	SA3 ethernet	
PH7	SA4 ethernet	
Crystal/ceramic resonators		
OSC2		OSCOUT
OSC1		OSCIN

Revision history

Table 26. Document revision history

Date	Revision	Changes
22-Apr-2008	1	Initial release