AVR-TLCD-128CAN development board
Users Manual

Rev.A, July 2008
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INTRODUCTION:

AVR-TLCD-128CAN adds cool LCD and touchscreen interface to your next project. There is AT90CAN128 on board with all microcontroller pins available for plug-in additional boards

BOARD FEATURES:

- MCU: **AT90CAN128** 128KB Flash memory, 4096B RAM, 4096B EEPROM
- TOUCH SCREEN LCD 160x160 dots B/W 81x60 mm view area
- Stainless steel front panel (102x85 mm 4x3.35") with easy to mount x4 3 mm fixing screws
- JTAG connector for programming and debugging with AVR-JTAG-L or AVR-JTAG-USB
- ICSP connector for programming with AVR-PG1 or AVR-GP2
- SD/MMC card connector
- CAN driver and connector
- UEXT connector for connection to other Olimex modules like MOD-MP3, MOD-NRF24Lx, MOD-GPS and many others
- 8 MHz crystal
- Extension connectors for all AT90CAN128 ports
- +(4.5–6.0) battery connector
- PCB: FR-4, 1.5 mm (0,062"), soldermask, silkscreen component print
- Dimensions 102x85 mm (4 x 3.35")

ELECTROSTATIC WARNING:

The AVR-TLCD-128CAN board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

BOARD USE REQUIREMENTS:

Cables: 1.8 meter USB A-B cable to connect AVR-JTAG-USB to USB host on PC. If you use AVR-JTAG(-L) or AVR-PG1, you will need RS232 cable. If you use AVR-PG2 you will need LPC cable. Other cables might be required in case of other programming/debugging tools.

Hardware: Programmer/Debugger – **AVR-JTAG(-L)**, **AVR-JTAG-USB, AVR-PG1, AVR-PG2** or other compatible programming/debugging tool.

Software: **AVR Studio 4.13** (or later) + **WinAVR** (latest version) or IAR AVR. AVR Studio and WinAVR are free to download and use. Take a note that AVR Studio 4.13 has a bug and doesn't read the fuses correctly. On our request to Atmel support they had confirmed the bug and had suggested to fix the bug by "AVR Studio 4.13 SP2 JTAGICE Fix" available from http://www.atmel.no/beta_ware/. For programming with AVR-PG1 you could use **PonyProg** and for programming with AVR-PG2 you could use **PonyProg, AVR Dude** or other compatible tools.

PROCESSOR FEATURES:

AVR-TLCD-128CAN board use MCU **AT90CAN128** from Atmel with these features:

High-performance, Low-power AVR® 8-bit Microcontroller

Advanced RISC Architecture

- 133 Powerful Instructions – Most Single Clock Cycle Execution
- 32 x 8 General Purpose Working Registers + Peripheral Control Registers
- Fully Static Operation
- Up to 16 MIPS Throughput at 16 MHz
- On-chip 2-cycle Multiplier

Non volatile Program and Data Memories

- 128K Bytes of In-System Reprogrammable Flash
    - Endurance: 10,000 Write/Erase Cycles
- Optional Boot Code Section with Independent Lock Bits
    - Selectable Boot Size: 1K Bytes, 2K Bytes, 4K Bytes or 8K Bytes
    - In-System Programming by On-Chip Boot Program (CAN, UART, ...)
    - True Read-While-Write Operation
- 4K Bytes EEPROM (Endurance: 100,000 Write/Erase Cycles)
- 4K Bytes Internal SRAM (AT90CAN32/64/128)
- Up to 64K Bytes Optional External Memory Space
- Programming Lock for Software Security

JTAG (IEEE std. 1149.1 Compliant) Interface

- Boundary-scan Capabilities According to the JTAG Standard
- Programming Flash (Hardware ISP), EEPROM, Lock & Fuse Bits
- Extensive On-chip Debug Support

CAN Controller 2.0A & 2.0B - ISO 16845 Certified

- 15 Full Message Objects with Separate Identifier Tags and Masks
- Transmit, Receive, Automatic Reply and Frame Buffer Receive Modes
- 1Mbits/s Maximum Transfer Rate at 8 MHz
- Time stamping, TTC & Listening Mode (Spying or Autobaud)

Peripheral Features

- Programmable Watchdog Timer with On-chip Oscillator
- 8-bit Synchronous Timer/Counter-0
    - 10-bit Prescaler
    - External Event Counter
    - Output Compare or 8-bit PWM Output
- 8-bit Asynchronous Timer/Counter-2
    - 10-bit Prescaler
    - External Event Counter
    - Output Compare or 8-Bit PWM Output
    - 32Khz Oscillator for RTC Operation
- Dual 16-bit Synchronous Timer/Counters-1 & 3
    - 10-bit Prescaler
    - Input Capture with Noise Canceler
    - External Event Counter
    - 3-Output Compare or 16-Bit PWM Output
    - Output Compare Modulation
- 8-channel, 10-bit SAR ADC
    - 8 Single-ended Channels
    - 7 Differential Channels

- o 2 Differential Channels With Programmable Gain at 1x, 10x, or 200x
- On-chip Analog Comparator
- Byte-oriented Two-wire Serial Interface
- Dual Programmable Serial USART
- Master/Slave SPI Serial Interface
  - o Programming Flash (Hardware ISP)

Special Microcontroller Features
- Power-on Reset and Programmable Brown-out Detection
- Internal Calibrated RC Oscillator
- 8 External Interrupt Sources
- 5 Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down & Standby
- Software Selectable Clock Frequency
- Global Pull-up Disable

I/O and Packages
- 53 Programmable I/O Lines
- 64-lead TQFP and 64-lead QFN

Operating Voltages: 2.7 - 5.5V

Operating temperature: Industrial (-40°C to +85°C)

Maximum Frequency: 8 MHz at 2.7V, 16 MHz at 4.5V
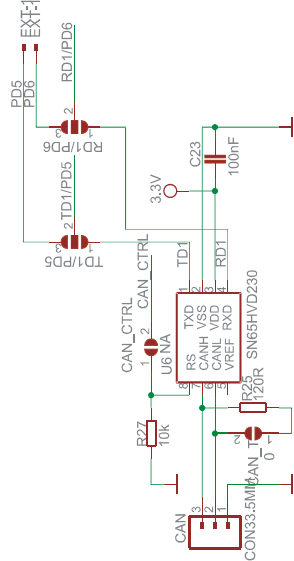
BLOCK DIAGRAM:

MEMORY MAP:

Program Memory
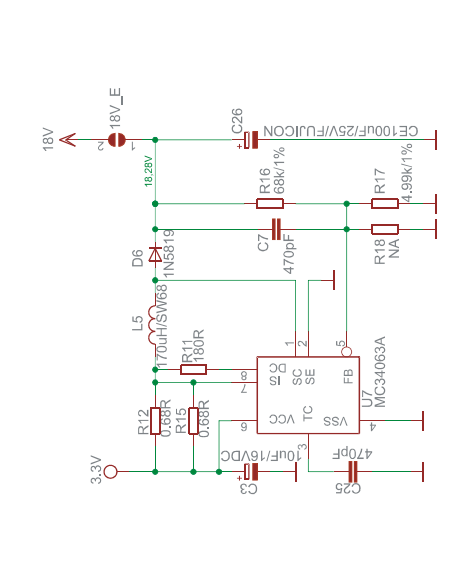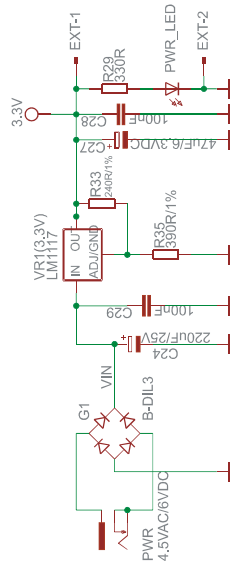
	0x0000
Application Flash Section	
Boot Flash Section	
	Flash end

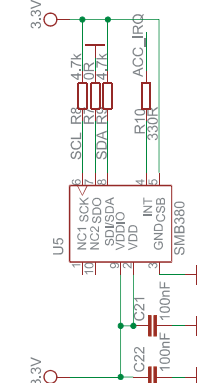| Data Memory	
32 Registers	0x0000 - 0x001F
64 I/O Registers	0x0020 - 0x005F
160 Ext I/O Reg.	0x0060 - 0x00FF
Internal SRAM (ISRAM size)	ISRAM start
	ISRAM end XMem start
External SRAM (XMem size)	
	0xFFFF
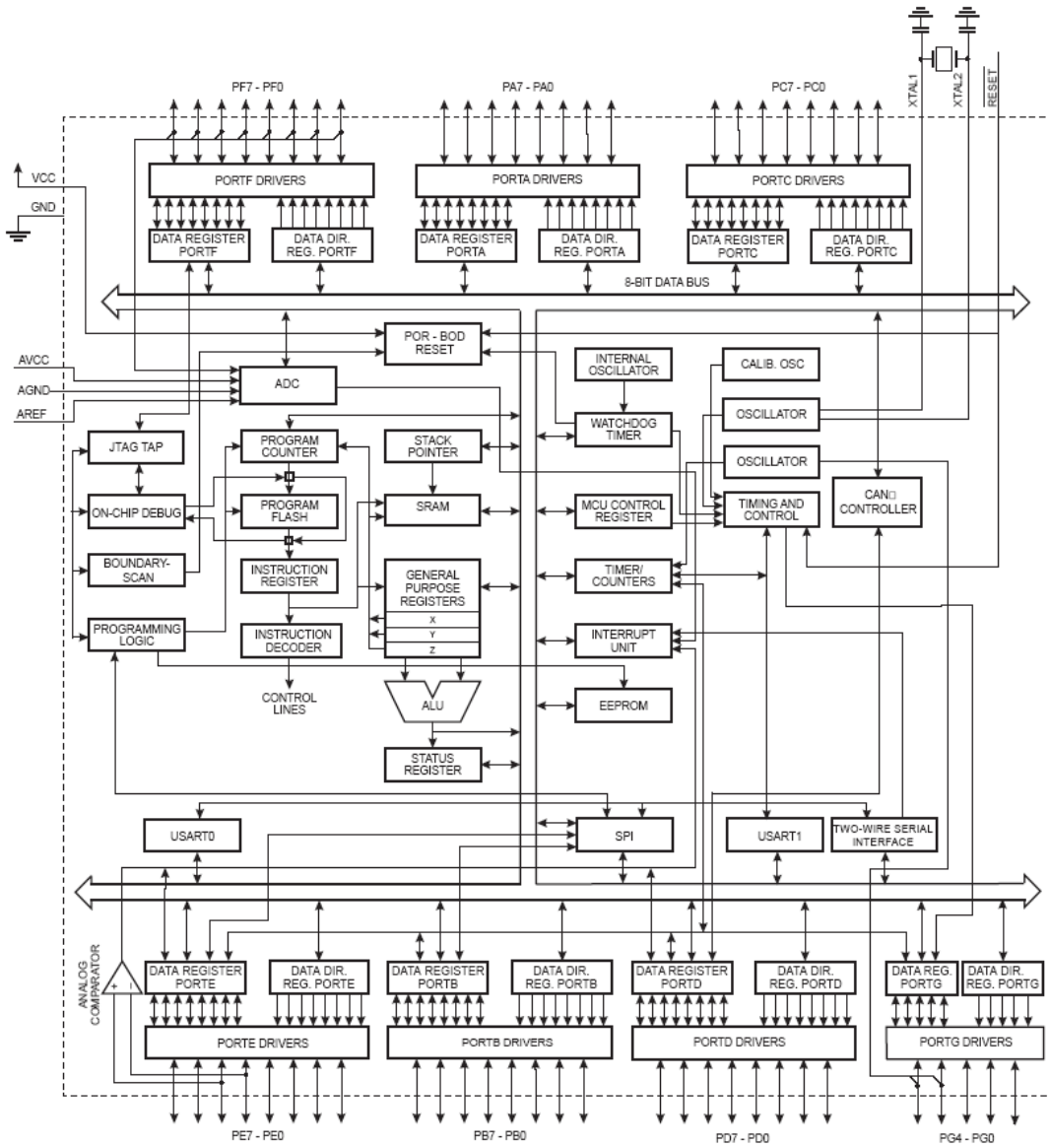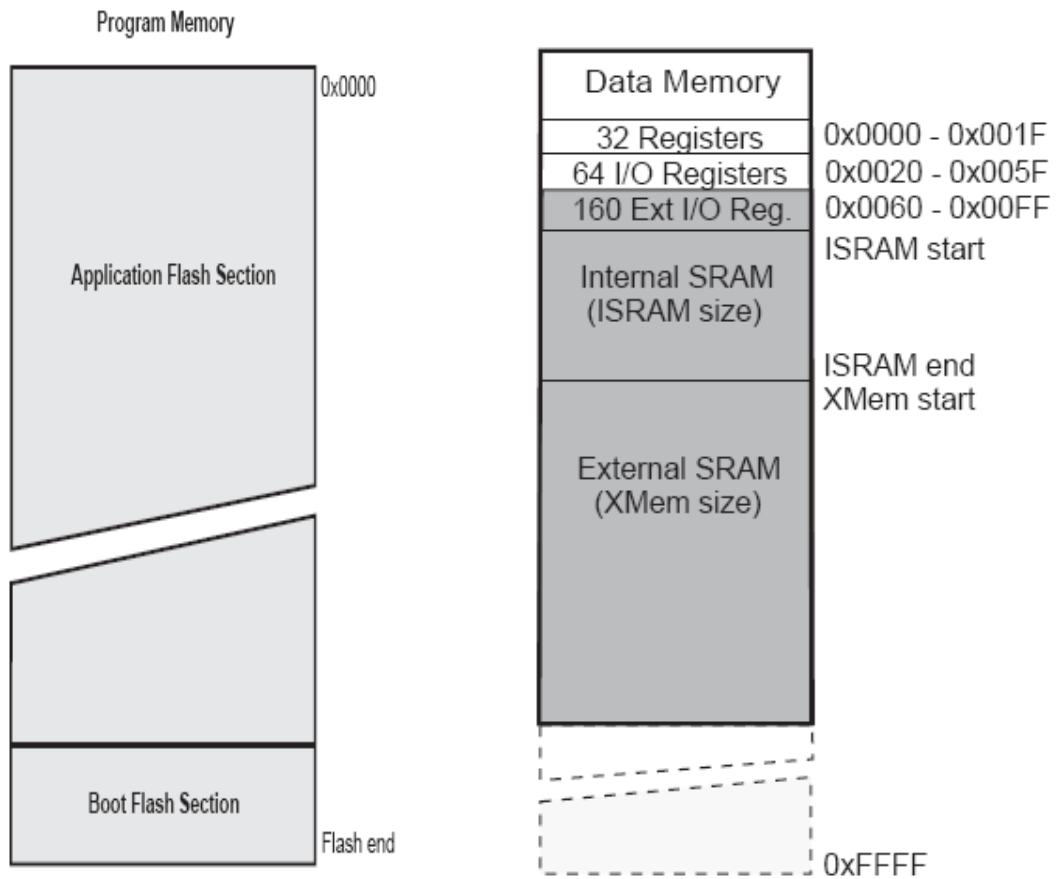
SCHEMATIC:
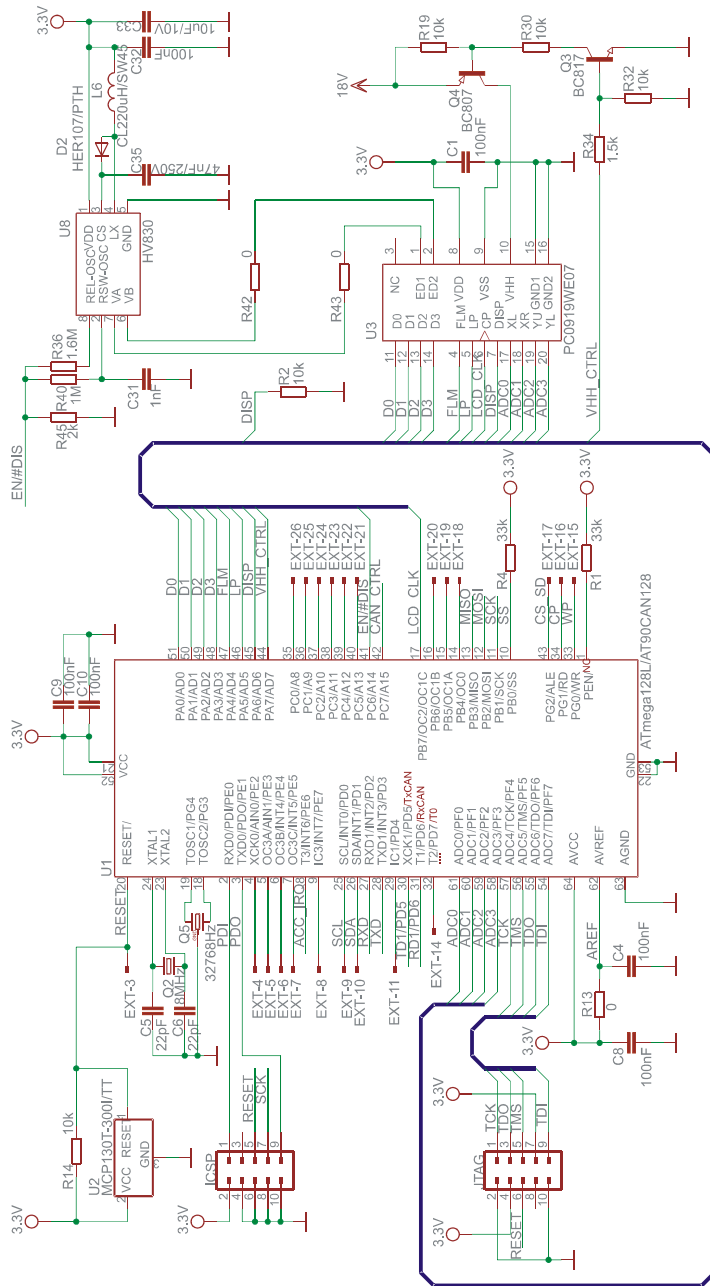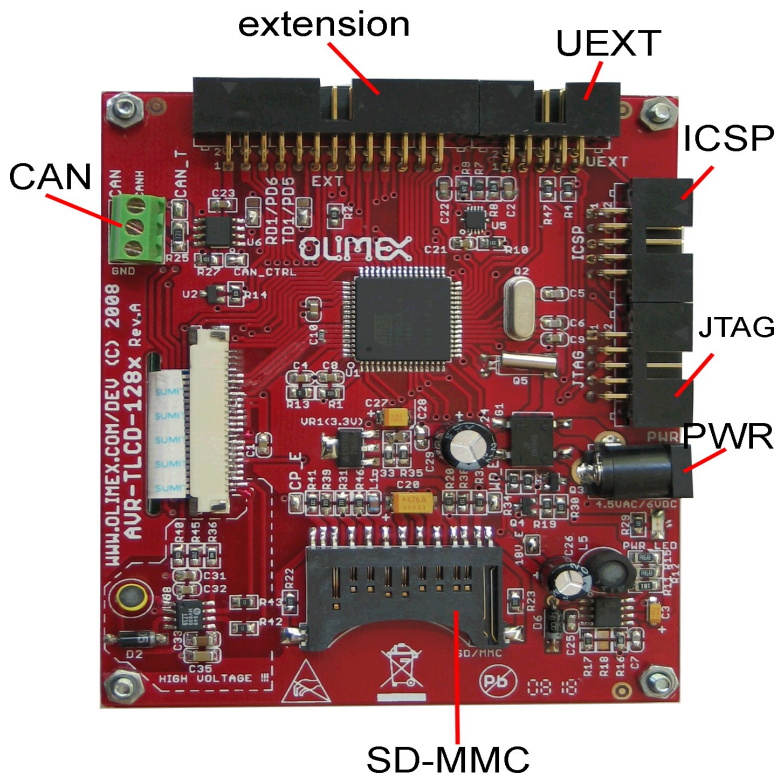
AVR-TLCD-128 REV.A

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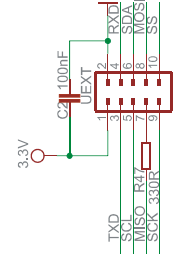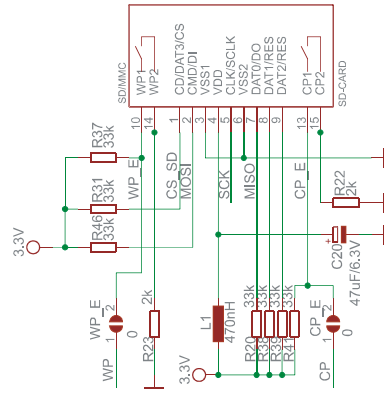
BOARD LAYOUT:

POWER SUPPLY CIRCUIT:

AVR-TLCD-128CAN should be powered by 4.5VAC or +(6-9VDC).

The board power consumption at 8 VDC the consumption is about 20 mA.

RESET CIRCUIT:

AVR-TLCD-128CAN reset circuit is realized with MCP130T which on power failure or if you apply low level at EXT-3 resets the MCU.

CLOCK CIRCUIT:

Quartz crystal 8 MHz is connected to AT90CAN128 pin 24 (XTAL1) and pin 23 (XTAL2).

Quartz crystal 32.768 kHz is connected to **AT90CAN128** pin 19 (TOSC1/PG4) and pin 18 (TOSC2/PG3) and supplies the internal Asynchronous Timer/Counter (Timer/Counter2 in asynchronous operation).

JUMPER DESCRIPTION:

18V_E

Enables 18 V power supply for the **AT90CAN128** and all other devices.

Default state is closed.

CAN_T

This jumper assures correct work of the CAN. At each end of the bus it should be closed. This means that if you have only two devices with CAN, the jumpers of both devices should be closed. If you have more than two devices, only the two end-devices should be closed.

Default state is closed.

CAN_CTRL

If this jumper is closed the MCU controls the CAN.
Default state is closed.

WP_E

Enables the Write Protect input signal to the AT90CAN128.
Default state is closed.

CP_E

Enables the Card Present input signal to the AT90CAN128.
Default state is closed.

TD1/PD5

CAN to TD1/PD5.

When in position 1-2 shorted, outputs the TD1 signal to the controller. When in position 2-3 shorted, EXT-12 is connected

Default position is 1-2 shorted.

RD1/PD6

CAN to RD1/PD6.

When in position 1-2 shorted, inputs the RD1 signal from the controller. When in position 2-3 shorted, EXT-13 is connected
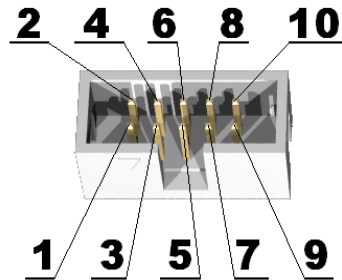
Default position is 1-2 shorted.

INPUT/OUTPUT:

Power-on red LED with name **PWR_LED** connected to EXT-1 and EXT-2.
Accelerometer SMB380.
Touchscreen LCD PC0919WE07.

EXTERNAL CONNECTORS DESCRIPTION:
ICSP:

| Pin #	Signal Name
1	PDI
2	+3.3V
3	NC
4	GND
5	RESET
6	GND
7	SCK
8	GND
9	PDO
10	GND

PDI   Input   **Programming Data In.** This pin is used for data input while programming the MCU through ICSP.
PDO   Output**Programming Data Out.** This pin is used for daa output while programming the MCU through ICSP.
SCK   Input   **Serial (Synchronization) Clock.** This pin is input for the MCU while programming.

JTAG:

Pin #	Signal Name
1	TCK
2	GND
3	TDO
4	+3.3V
5	TMS
6	RESET
7	+3.3V
8	NC
9	TDI
10	GND
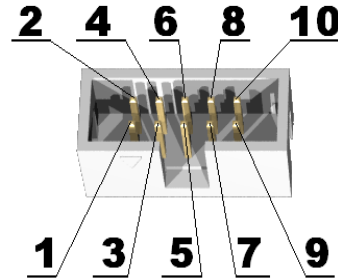
TCK Input **Test Clock**. This allows shifting of the data in, on the TMS and TDI pins. It is a positive edge triggered clock with the TMS and TCK signals that define the internal state of the device.

TDO Output **Test Data Out**. This is the serial data output for the shift register. Data is shifted out of the device on he negative edge of the TCK signal.

TMS Input **Test Mode Select**. The TMS pin selects the next state in the TAP state machine.

TDI Input **Test Data In**. This is the serial data input for the shift register.

UEXT:

Pin #	Signal Name
1	+3.3V
2	GND
3	TXD
4	RXD
5	SCL
6	SDA
7	MISO
8	MOSI
9	SCK
10	SS
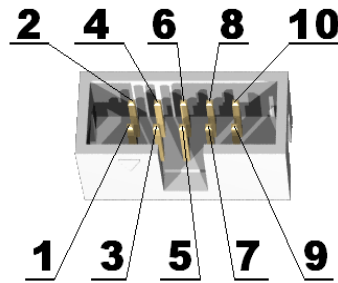
TXD   Output   **Transmit Data.** This is the output data line for the UART.

RXD   Input   **Receive Data.** This is the input data line for the UART.

SCL   I/O   **Serial (Synchronization) Clock.** This is the synchronization clock for the data transfer through I2C interface. This could be either input or output depending on whether the MCU is master or slave.

SDA   I/O   **Serial Data.** This pin is data input or output (depending on the data flow direction) for the I2C interface.

MISO   I/O   **Master In Slave Out.** This pin could be either data input (MCU is master) or data output(MCU is slave). The signal is pat of the SPI interface.

MOSI   I/O   **Master Out Slave In.** This pin is be used for communication through SPI interface and it is either data output from the MCU (when it is master) or data input for the MCU (when it is slave).

SCK   I/O   **Serial (Synchronization) Clock .** This is the synchronization clock for the data transfer through the SPI interface. It could be either input or output depending on whether the MCU is master or slave.
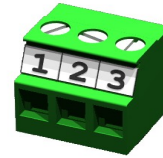
PWR:

Pin #	Signal Name
1	PWR
2	GND
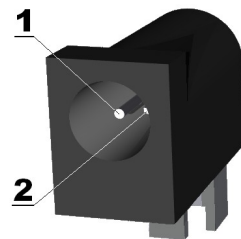
At the PWR pin should be applied voltage 4.5VAC or +(6-9)VDC.

CAN:

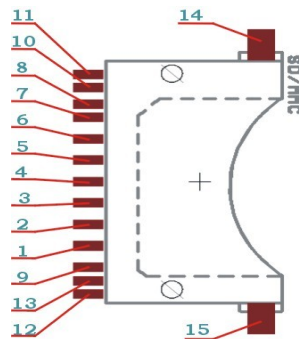| Pin #	Signal Name
1	GND
2	CANL
3	CANH

CANL and CANH are either deferential input, or differential output depending on the function of the SN65FVD230 CAN controller (receiving or transmitting data).

SD/MMC card slot:

Pin #	Signal Name	Pin #	Signal Name
1	CS_SD	2	MOSI
3	GND	4	VDD (+3.3V)
5	SCK	6	GND
7	MISO	8	+3.3V
9	+3.3V	10	WP_E
11	-	12	-
13	CP_E	14	GND
15	GND		

CS_SD Output **Chip Select SD.** The signal on this pin enables or disables the SD/MMC.

MOSI Output **Master Out Slave In.** As the access to the memory is via SPI interface, this is data output from the MCU (which is master) and input for the memory card (which is slave).

SCK Output **Serial (Synchronization) Clock.** This is the synchronization clock for the data transfer.

MISO   I/O   **Master In Slave Out.** As the access to the memory card is via SPI interface, this is data input for the MCU(which is master) and data output from the memory card (which is slave).

WP_E   Input   **Write Protect Enable.** This signal is input for the MCU.

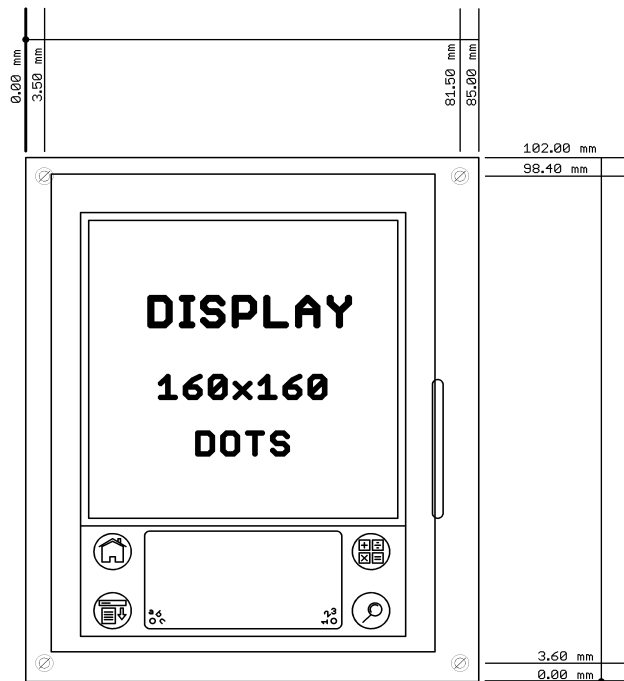**CP_E**   Input   **Card Present Enable.** This signal is input for the MCU.

EXT:
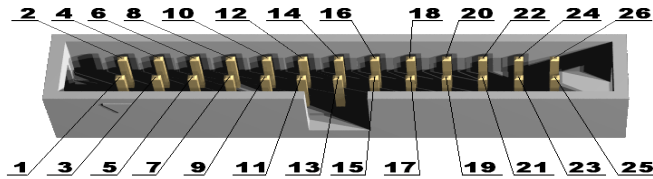
Pin #	Signal Name	Pin #	Signal Name
1	+3.3V	2	GND
3	RESET	4	XCK0/AIN0/PE2
5	OC3A/AIN1/PE3	6	OC3B/INT4/PE4
7	OC3C/INT5/PE5	8	IC3/INT7/PE7
9	SCL	10	SDA
11	IC1/PD4	12	PD5
13	PD6	14	T2/PD7/T0
15	WP	16	CP
17	CS_SD	18	PB4/OC0
19	PB5/OC1A	20	PB6/OC1B
21	PC5/A13	22	PC4/A12
23	PC3/A11	24	PC2/A10
25	PC1/A9	26	PC0/A8

MECHANICAL DIMENSIONS:

All measures are in mm

AVAILABLE DEMO SOFTWARE:

You could find information about AVR-TLCD-128CAN demo software at
www.olimex.com/dev.

ORDER CODE:

AVR-TLCD-128CAN – assembled and tested (no kit, no soldering required)

How to order?
You can order to us directly or by any of our distributors.
Check our web www.olimex.com/dev for more info.

All boards produced by Olimex are RoHS compliant

Revision history:

REV.A   - created   July 2008

Disclaimer: