Firmware working parts / protocol

Path to flash-file:
igloo/system/teamprojekt2/designer/impl1/top.pdb

Config:

* 9600 Baudrate
* 8 data bits
* 1 stop bit
* no parity
* no handshake

The CLK Pin of the Connector (main) component has to be connected to 1MHz clocksource.

Known Bugs

1. The oscillator for the AD Converter has a oscillation bug. In this bug-state the ADC can't convert any Voltage.
   - Quickfix: Disconnect all ports, connect at first the power supply and then the rest.
2. Due to a Overvoltage Protection it isn't possible to mesure negative voltages.
   - *If you know that you want to convert negative Voltages, you can change* GND *and* V+ on the channel and convert the negative voltage as a positive voltage.

Peripherals

LEDs

LED No.	Indication
LED1	Master busy
LED2	ADT7301 busy
LED3	EEPROM busy
LED4	AD7782 busy
LED5	Watchdog enabled
LED8	System alive (blinking)

Switches

Switch No.	Function
1	En/disable watchdog for debug purposes

Watchdog

If the watchdog is enabled and the busy-flag is active for more than ~130 ms, a software-reset for all components will be triggered.

The watchdog can be disabled via the switch 1 on the board.
Make sure all jumpers are set correctly.

Master

Device ID: 0b0000

get firmware version

can be used for connection pinging
better distinction between firmware versions

TX

0x00
get firmware version command

RX

0xAA	0bHHHHLLLL
OK-byte	H-4 high-bits, L-4 low-bits, eg. 0b10000100 = version 8.4

EEPROM

Refer to Microchip 93LC66 datasheet
Device ID: 0b0001
read

TX

0x10	0bxxxxxxxA	0bAAAAAAAA
read command	x-don't care, A-address MSB	A-address

RX

0xAA	0bDDDDDDDD
OK-byte	D-byte at address A

read 16bit

TX

0x17	0bAAAAAAAA
read 16bit command	A-address

RX

0xAA	0bDDDDDDDD	0bddddddddd
OK-byte	D-byte at address A	d-byte at address A+1

write

must be handled with care: only 1 000 000 cycles endurance
(should only be called by user, not automatically)
writeprotection is disabled automatically triggered by reset

TX

0x11	0bxxxxxxxA	0bAAAAAAAA	0bDDDDDDDD
write command	x-don't care, A-address MSB	A-address	D-byte

RX

0xAA	0xBB
OK-byte	Done-byte

write 16bit

must be handled with care: only 1 000 000 cycles endurance
(should only be called by user, not automatically)
writeprotection is disabled automatically triggered by reset

TX

0x18	0bAAAAAAAA	0bDDDDDDDD	0bddddddddd
write 16bit command	A-address	D-byte	d-byte for address A+1

RX

0xAA	0xBB
OK-byte	Done-byte

erase all

erases complete memory (all bits set to 1)

must be handled with care: only 1 000 000 cycles endurance
(should only be called by user, not automatically)
eraseprotection is disabled automatically triggered by reset

TX

0x12
erase all command

RX

0xAA	0xBB
OK-byte	Done-byte

AD Converter

Refer to Analog Devices AD7782
datasheet
Device ID: 0b0010

HEX Code to Voltage calculation

AIN: analog input (the real voltage you print out)
Vreff: reference voltage = 2.5
rng: range select
N = 24 : number of bits got by ADC (MISO)
dec_input: MISO (24 bit Vector) in Decimal

GAIN = 1 IF rng=2,56V ELSE 16;
v = 1.024 * VReff;
a = 2^(N-1);
AIN = (v*((dec_input/a)-1))/GAIN;

read

Reads all 24 bit seperated in three bytes (from MSB to LSB).
The 24 bit value is Signed!
Highest bit '1': Indicates a zero or positive full-scale voltage.
Highest bit '0': Indicates a negative full-scale voltage.

TX

0x20
read command

RX

0xAA	0bDDDDDDDD	0bDDDDDDDD	0bDDDDDDDD
OK-byte	MSB	middle byte	LSB

CH1

Set the channel for the next AD conversion to CH1.

TX

0x23
channel select command

RX

0xAA
OK-byte

CH2

Set the Channel for the next AD Conversion to CH2.

TX

0x24
channel select command

RX

0xAA
OK-byte

RNG1

Set the range for the next AD conversion to +- 2.56V

TX

0x25
range select command

RX

0xAA
OK-byte

RNG2

Set the range for the next AD Conversion to +- 0.16V

TX

0x26
range select command

RX

0xAA
OK-byte

ADT Temperature sensor

Refer to Analog Devices ADT7301 datasheet

Device ID: 0b0011

temperature is updated on sensor every 1.5 sec

TX

0x30
read temperature command

RX

0xAA	0b00TTTTTT	0bttttttt
OK-byte	T-temperature data (signed, MSB)	t-temperature data (LSB)