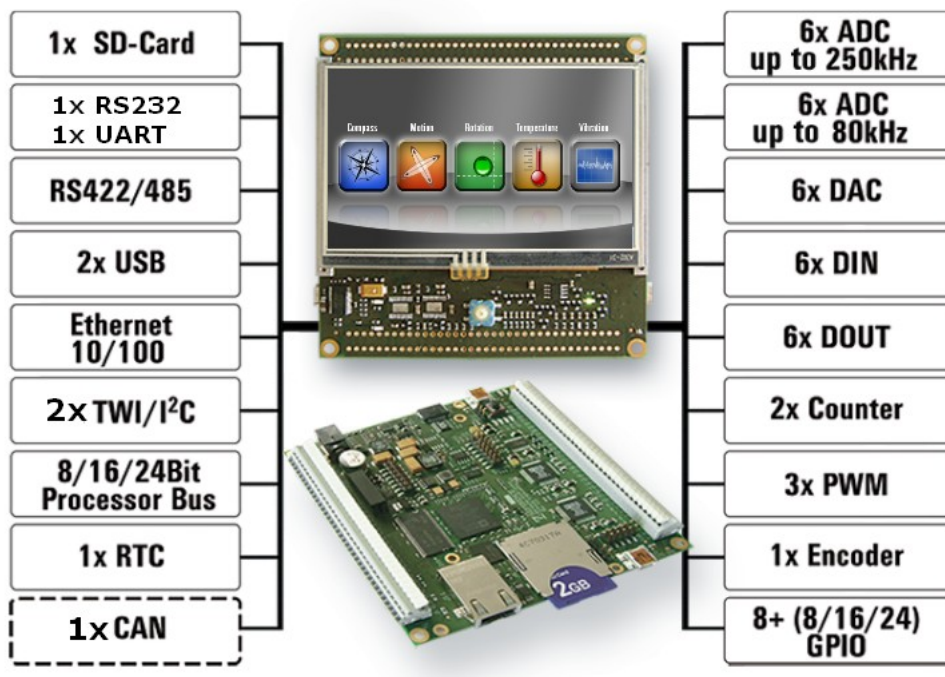


Preliminary

Zreference MC

Measurement & Control



Hardware Manual

Issue date: 15.02.2011
this manual applies to ZMC
V1.0 & V1.1

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1 Imprint

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Schmid Engineering AG
Mezikonerstrasse 9
9542 Münchwilen
Switzerland

email: tech.support@schmid-engineering.ch
homepage: www.schmid-engineering.ch
Online Wiki: <http://wiki.schmid-engineering.ch>

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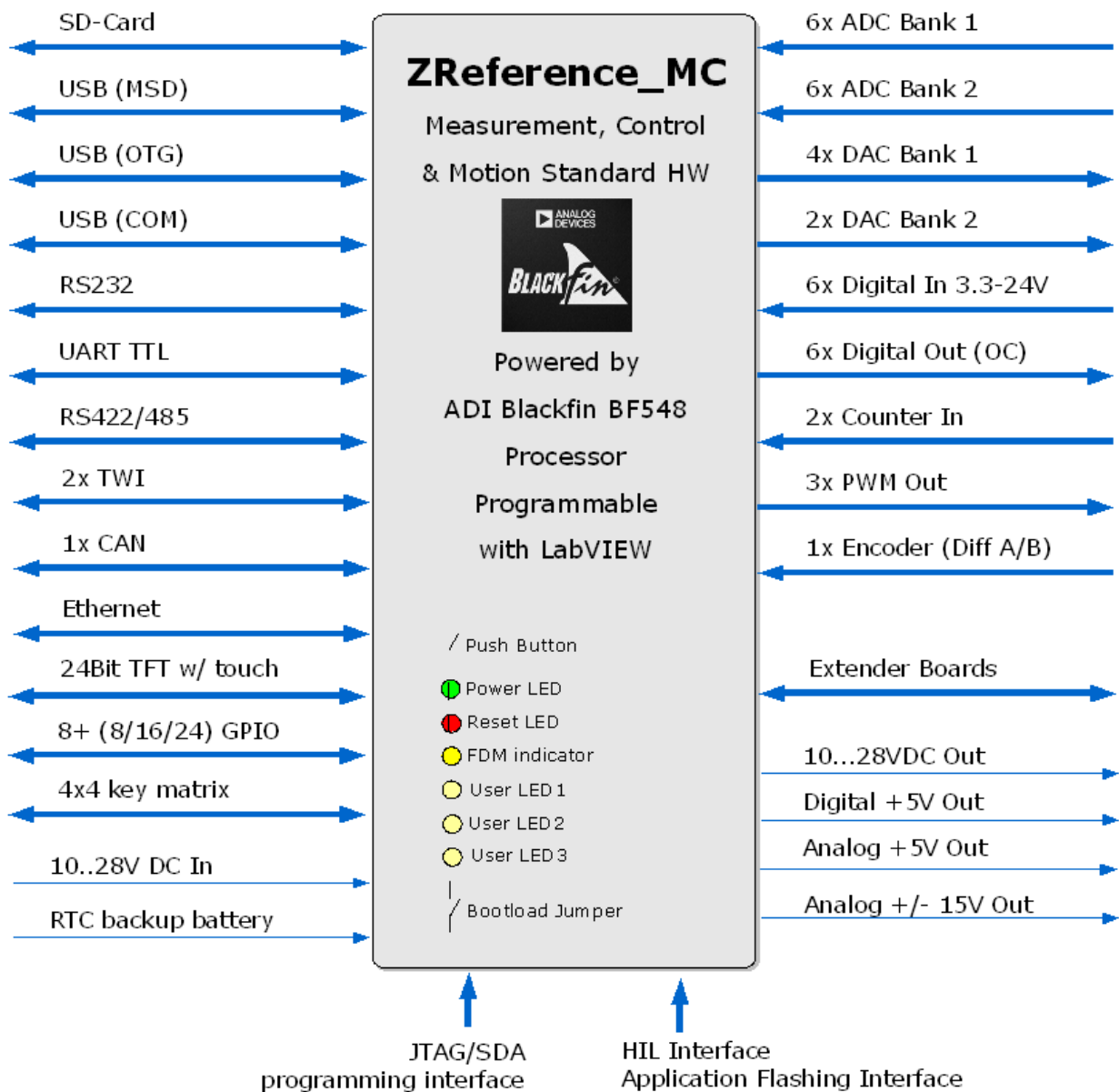


Warning: *ESD (electrostatic discharge) sensitive device.
Proper ESD handling required.*

2 Introduction

Zreference (ZMC) is a ruggedized and robust low power platform for embedded applications in industrial and mobile environments. It offers analog-, digital- and communications- I/O for measurement-, control and motion systems.

3 Block Diagram



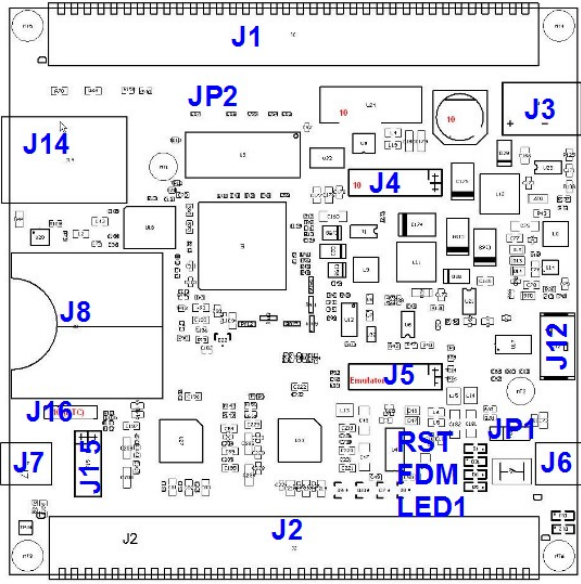
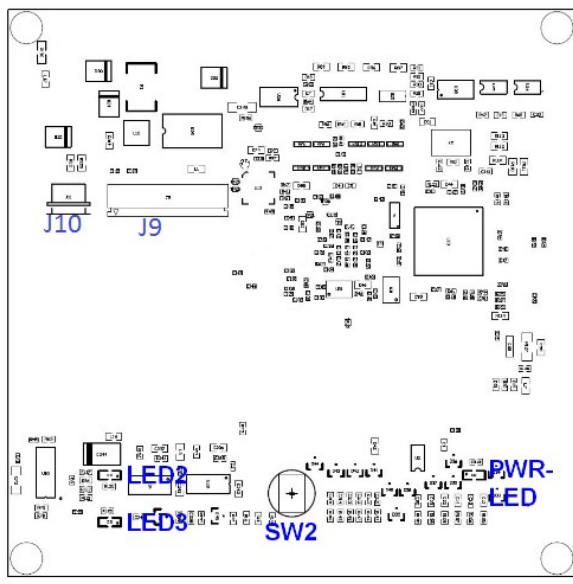
4 Fast Debug Mode

At delivery the board the FDM interpreter is pre flashed and indicates its activity by toggeling the FDM-LED. If the LED isn't toggeling, the FDM interpreter can be downloaded through the Emulator.

Note:

To run the board in FDM-Mode, use USB connector J6 (NOT J7!)

5 Connector Overview

Connector Side	Display Side
	
<p>J1 : Power, Digital IO, Communication J2 : Analog IO J3 : DC Power Supply J4 : ProdDongle, Extender J5 : Emulator J6 : Serial USB (Com-Port Emulation) J7 : USB (OTG: On the Go) J8 : SD-Card J12 : RS232 J14 : Ethernet J15 : 4x4 Key Matrix J16 : RTC backup battery connector</p> <p>JP1: Bootmode switch JP2: RS485 Bus Termination RST : Reset LED FDM : Fast Debug Mode LED LED1 : User programmable</p>	<p>PWR-LED : Power Indicator 3.3V LED2 : User programmable LED3 : User programmable SW2 : User programmable J9 : 24bit display connector J10 : extender board supply connector</p>

Note: Pin1 marked on board

6 Connector pin assignment

6.1 Legend Pin Type

I = Input

O = Output

OC = Open Collector Output

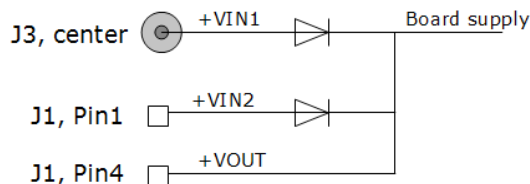
pu = pull up

pd = pull down

nc = not connected

6.2 Power Jack [J3]

Pin	Name	Type	Description	Conditions @ 25°C
Center	+VIN1	I	Power Supply Input	10..28V / 1A reverse polarity protected Separated via diode against +VIN2 on connector J1!
Shield	GND	-	Power GND	



6.3 USB, COM port emulation [J6]

This port emulates a serial COM port via USB. On the computer the appropriate driver must be installed. The driver is included within the board support package (BSP) and automatically installed during setup. Data rate up to 460.8kBaud.

6.4 USB 2.0 OTG [J7]

This port connects directly to the processors high speed USB interface. Currently only USB device (slave) mode is supported.

6.5 Power, Digital IO, Communication [J1]

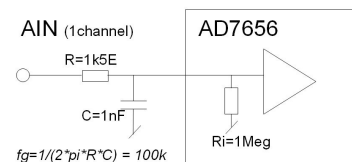
Pin	Name	Type	Description	Conditions @ 25°C
1	+VIN2	I	Power Supply Input	10..28V / 1A reverse polarity protected. Separated via diode against +VIN1 on connector J3!
2,3	GND	-	Power GND	
4	VOUT	O	Unregulated Power Supply Output (not available in Rev0.0)	VOUT = VIN1 or VIN2
5	5VOUT	O	Regulated 5V Output	5V / 300mA
6	DOUTB-CH0	OC	Digital Out Group B, Channel 0..5	U max = 28V I max = 400mA / channel I total < 1.2A NOT short circuit/over current protected
7	DOUTB-CH1			
8	DOUTB-CH2			
9	DOUTB-CH3			
10	DOUTB-CH4			
11	DOUTB-CH5			
12	DINB-CH0	I, pu	Digital In Group B, Channel 0..5	low = 0..0.8V high = 2..28V debounced (40ms) note: weakly pulled up (~50kOhm) For noisy environments please add external pull up resistor
13	DINB-CH1			
14	DINB-CH2			
15	DINB-CH3			
16	DINB-CH4			
17	DINB-CH5			
18	TWI0-SCL	O	Two Wire Interface 0, Clock	Output 3.3V, Input 5V tolerant Default data rate 100kbps
19	TWI0-SDA	IO	Two Wire Interface 0, Data	
20	RS422IN+	I, pu	UART2, RS422/485	data rate 500kbps, esd protected, slew rate limited. 120Ohm RX termination resistor selectable via JP2
21	RS422IN-	I, pd		
22	RS422OUT+	O		
23	RS422OUT-	O		
24	ENCA+	I, pu	Quadratur Encoder Interface	3..5V
25	ENCA-	I, pd		
26	ENCB+	I, pu		
27	ENCB-	I, pd		
28	DOUTA-CH0	O	Digital Out GroupA, Channel 0, PWM capability	U high = 3.3V (TTL compatible) U low < 0.4V I max = 10mA outputs high impedance (tristate) after power up
29	DOUTA-CH1			
30	DOUTA-CH2			
31	DINA-CH0	I, pu	Digital In GroupB, Measurement&Counter capability (32Bit, 25Mhz, 20ns Resolution)	3..5V Pull up 100k
32	DINA-CH1			
33	CAN0-H	IO	CAN0	
34	CAN0-L			
35	UART0-RX	I, pu	UART0, TTL <i>Note: Do NOT use this UART if Ethernet is being used</i>	Output 3.3V, TTL compatible, Input 5V tolerant Data rate 1Mbps
36	UART0-TX	O		

6.6 Analog IO [J2]

Pin	Name	Type	Description	Conditions @ 25°C
37	nc	-		
38,39	AGND	-	Analog GND	
40	ADCA-CH0	I	Analog In, Voltage, Group A, Channel 0..5 +-5V / +-10V input range (software selectable) 16Bit, up to 80kHz (Non-DMA), up to 250kHz (DMA), simultaneous	Input impedance typ 1M Ohm OVP -15..+15V, temperature stability typ. 2ppm/°C
41	ADCA-CH1			
42	ADCA-CH2			
43	ADCA-CH3			
44	ADCA-CH4			
45	ADCA-CH5			
46,47	AGND	-	Analog GND	
48	ADCB-CH0	I	Analog In, Voltage, Group B, Channel 0..5 +-5V / +-10V input range, software selectable 16Bit, up to 80 kHz (Non-DMA), simultaneous	Input impedance typ 1M Ohm OVP -15..+15V, temperature stability typ. 2ppm/°C
49	ADCB-CH1			
50	ADCB-CH2			
51	ADCB-CH3			
52	ADCB-CH4			
53	ADCB-CH5			
54,55	AGND	-	Analog GND	
56	DACA-CH0	O	Analog Out, Voltage, Group A, Channel 0..3 0..5V, 0..10V, +-5V, +-10V output range, software selectable	I max = 5mA short circuit protected
57	DACA-CH1			
58	DACA-CH2			
59	DACA-CH3			
60,61	AGND	-	Analog GND	
62	DACB-CH0	O	Analog Out, Current, Group B, Channel 0..1 0..20mA, 4..20mA current output, range software selectable.	Rload max = 500 Ohm
63	DACB-CH1			
64	AGND	-	Analog GND	
65	AGND	-	Analog GND	
66	TWI0-SDA	IO	Two Wire Interface 1, Data	Output 3.3V, Input 5V tolerant Default data rate 100kbps
67	TWI1-SCL	O	Two Wire Interface 1, Clock	
68,69	AGND	-	Analog GND	
70	A5VOUT	O	Analog 5V output	5V / 100mA, , NOT short circuit protected
71	-A15VOUT	O	Analog -15V output	typ -12..-15V / 10mA, NOT short circuit protected
72	+A15VOUT	O	Analog +15V output	typ +12..+15V / 10mA, NOT short circuit protected

Notes:

- Do **NOT** connect ANGND and GND externally. Use differential measurement (e.g. CH0-CH1) wherever possible.
- AIN-Input configuration (different configurations on request)



6.7 4x4 Key Matrix / GPIO [J15]

Pin	Name	Type	Description	Conditions @ 25°C
1	GND	-		
2	3V3	O	3.3V regulated out	<100mA
3	C0	IO	GPIO / Column 0	3.3V, 2mA this pins can be used either as general purpose IO (GPIO) or as 4x4 key matrix note: direct processor pins, unprotected
4	R0	IO	GPIO / Row 0	
5	C1	IO	GPIO / Column 1	
6	R1	IO	GPIO / Row 1	
7	C2	IO	GPIO / Column 2	
8	R2	IO	GPIO / Row 2	
9	C3	IO	GPIO / Column 3	
10	R3	IO	GPIO / Row 3	

6.8 RTC Backup Battery Connector [J16]

Pin	Name	Type	Description	Conditions @ 25°C
1	GND	-		
2	nc	-		
3	key	-		
4	VBAT	I	RTC Backup Battery	2.7..3.6V, 20uA typ.

Compliant with Backup Battery Maxwell, ER6K(10), Distrelec
number 97 03 88



6.9 RS232 [J12]

Pin	Name	Type	Description	Conditions @ 25°C
1	5V	O	Regulated 5V Output	5V / 300mA
2	GND	-		
3	CTS	I	RS232 handshake	All signals on RS232 level (+-6V) data rate 115kBaud max
4	RTS	O	RS232 handshake	
5	TX	O	RS232 data	
6	RX	I	RS232 data	

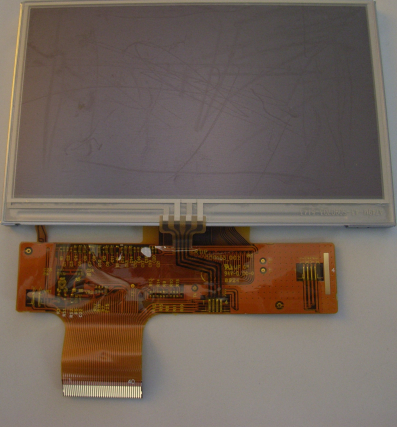
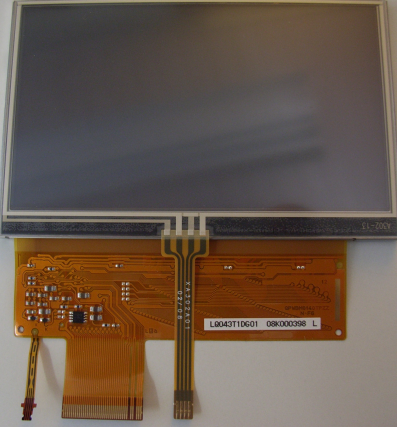
Connector : Minibridge 6pol from ERNI (www.erni.com)

NOTE: **DSUB9 adapter cables are available from the board supplier.**



6.10 Display [J9]

J9 connects directly to a high resolution 480x272 tft display with touch screen. Please note that ZMC V1 requires a different display than ZMC V0. (software compatible)

	
<p style="text-align: center;">PH480272T-005 (for ZMC V1)</p>	<p style="text-align: center;">LQ043T1DG01 (for ZMC V0)</p>

Adapters for different sized displays are available.

Suggestions for display mounting material:

- gasket : www.hus.ch, "Poron 470130"

J9 Pin assignment:

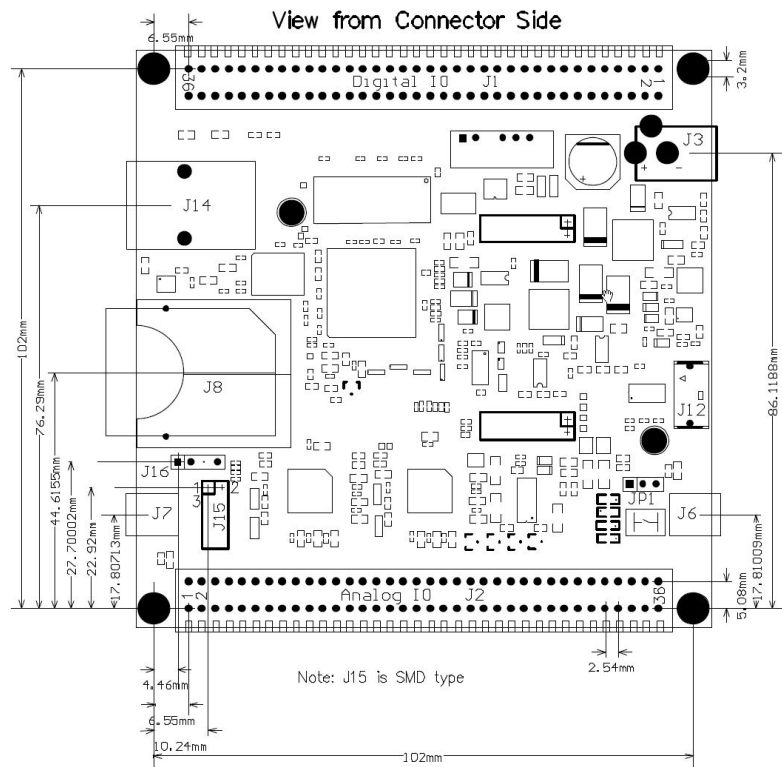
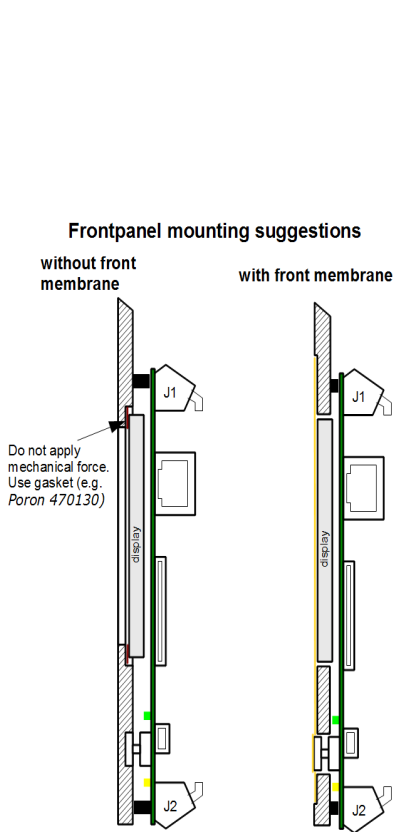
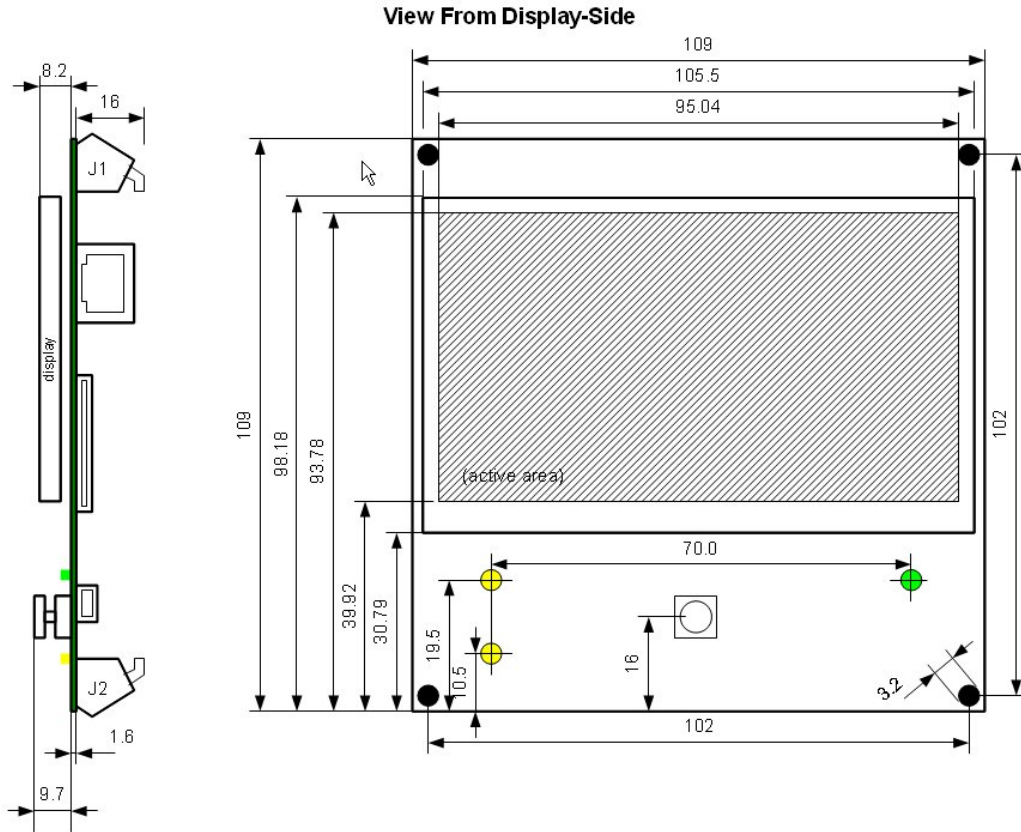
1	x	11	DIO	21	DIO	31	LCD-DISP
2	x	12	DIO	22	DIO	32	PPI0-FS1
3	x	13	DIO	23	DIO	33	PPI0-FS1
4	3V3	14	DIO	24	DIO	34	x
5	DIO	15	DIO	25	DIO	35	x
6	DIO	16	DIO	26	DIO	36	GND 1)
7	DIO	17	DIO	27	DIO	37	Touch-XR
8	DIO	18	DIO	28	DIO	38	Touch-YD
9	DIO	19	DIO	29	GND 1)	39	Touch-XL
10	DIO	20	DIO	30	PPI0-CLK	40	Touch-YU

x = do not connect, reserved for internal use

Pin [5..28] can be used as standard GPIO pins, 3.3V. Please note that these are direct, unprotected processor pins. I_{max}= 2mA.

1) be carefull not to create ground loops

7 Dimensions



8 DSP Clock Speed Power Savings

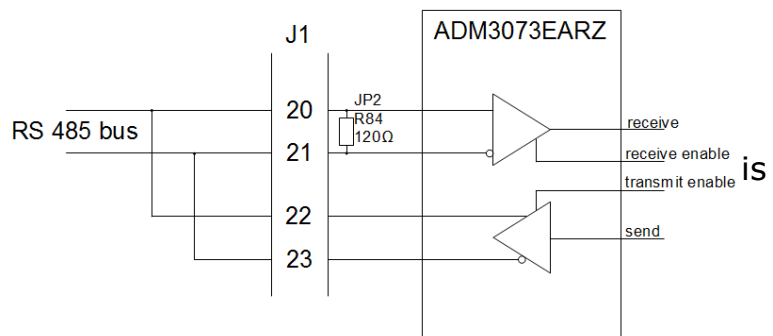
Mode	Core Clock [MHz]	Peripheral Clock [MHz] (DDR2-SDRAM)	Power Savings [W]
Maximum	525	131.25	0
Normal	500	100	-0.2
Economy	300	100	-0.7
Minimum	50	50	-0.9
Hybernate	0	0	-1.6

(specific values may vary and need to be evaluated for every application)

9 Connecting RS485 / RS422 Bus

This diagram shows how to connect the + and - signals to turn the RS422 (4wire) into a RS485 (2wire) bus.

Please Note, that the ADM3073 is limited to max. **500kbaud**. The receiver inputs have a true fail-safe feature, which eliminates the need for external bias resistors.



JP2 can be used to enable/disable bus termination. (Set JP2 if ZMC is at a bus end location)

For details on how to set up a proper bus topology refer to http://www.analog.com/static/imported-files/application_notes/AN-960.pdf

The data sheet of the bus driver can be found at

http://www.analog.com/static/imported-files/data_sheets/ADM3070E_3071E_3072E_3073E_3074E_3075E_3076E_3077E_3078E.pdf

10 NAND Flashdisk

Onboard solid state Flash-Disk 256MByte, e.g. for storing display graphics.

Please note, that when using the Flash-Disk, DINB0 and DINB1 become inactive! (The Flash-Disk spares some recoures with these two DIN-Pins)

11 Technical Data

Dimensions	109 x 109mm
Weight	100g (without display) 169g (with display)
Power Supply	10..28V, Typ. 1..4W
Temperature Range Ambient	-20..75°C (without display) -10..60°C (with display)
Humidity	10..90%, non condensing
ROHS	Compliant
Warranty	2 years product warranty

Processor : Analog Devices Blackfin Processor BF548, 600MHz
FLASH : 16MByte Burst Flash
SDRAM : 64MByte DDR2 SDRAM 133MHz
FRAM : 2kByte Nonvolatile RAM for parameter storage, unlimited
read/write cycles

12 Ordering Information

Picture	Ordering Code	Availability
	<p>Zreference-[C?]-[X]-[Y]</p> <p>[? = Configuration Number] 0 : Standard (Full)</p> <p>[X = Display Options] N : No display D : High resolution color display with touch</p> <p>[Y = connector J1/J2 options] N : No connector (free solder pads, RM2.54mm) S : Screw Terminals</p>	

13 Accessories

Picture	Ordering Code	Description	Availability
	-	Process IO simulator board	
	PH480272T-005	High resolution color display with touch for ZMCV1	
	LQ043T1DG01	High resolution color display with touch for ZMCV0	
	-	RS232-DSUB adapter cable	

14 Product Anomalies

Version	Changes
V0.0	ADC only 4 channels, only 14bit, Accuracy not optimized
V0.0, V0.1	RS422 termination fix on RX and TX

15 Product Changes

Version	Changes
V1.0	<ul style="list-style-type: none">- New Display Powertip PH480272T (replaces Sharp LQ043T1DG01)- UART0 available on J1 (replaces CAN1)- TWI1 available on J2- J4 is now Prog-Dongle instead of Debug Agent- USB OTG capable- New Pin Numbering (1..72 instead 2x1..36)- RS422 Termination selectable via JP2
V1.1	<ul style="list-style-type: none">- NAND Flashdisk 256MByte added- New Ethernetconnector Type

16 Document Revision History

Date		Revision
2009-03-23	ab	First Release
2009-06-20	ab	Pull Up Information added, data rates, Change Configuration Scheme
2009-07-09	ab	Weight added
2009-09-30	ab	Clock Speed table added, Counter resolution
2009-10-19	ab	Dimensions Connector Side added
2009-11-20	ab	Greyed out functions that are not supported yet (J1, J2), Update Sampling rates on ADC Group A and B
2010-02-19	ba	New Chapter 8 Connecting to RS485 RS422 bus
2010-03-08	ab	Correction of push button position, AIN-input configuration added
2010-03-22	ab	Correction of LED position
2010-08-30	ab	** Update ZMCV1.0 ** - UART0 available on J1 (replaces CAN1) - TWI1 available on J2 - New display type - Ex touch connector can be used for supply - J4 is now Prog-Dongle instead of Debug Agent - USB OTG
2010-10-19	ab	J9 pin assignment added
2011-02-15	ab	- Product Changes and Anomalies added - Flash-Disk added

17 Contact Information

Schmid Engineering AG
Mezikonerstrasse 9
CH-9542 Münchwilen
Switzerland

email: tech.support@schmid-engineering.ch

homepage: www.schmid-engineering.ch

Online Wiki: <http://wiki.schmid-engineering.ch>