Hardware

Documentation

Version 1.01
(2012-11-23)

PicoMOD7A LVDS

About This Document

This document describes the hardware of the PicoMOD7A-digital for LVDS display interface. For the TTL display interface version of this product there is a separate document. The latest version of this document can be found at http://www.fs-net.de.

History

Date	V	Platform	A,M,R	Chapter	Description	Au
2012-06-29	1.00	PicoMOD7A	A	-	Hardware documentation, preliminary	DB
2012-11-23	1.01	PicoMOD7A	A	2.4	Added connector type	DB

V	Version
A,M,R	Added, Modified, Removed
Au	Author

Table of Contents

1 Technical Data Connectors

The PicoMOD7A is equipped with a TycoElectronics 5177984-6 (140 pin, 0.8mm) connector from ‘0.8mm Free Height (FH) Connectors’ series.
For position and orientation please look chapter 4 “DimensionsA”

Matching connectors are:

5mm stacking height:	TycoElectronics 5177983-6
9mm stacking height:	TycoElectronics 5-5179009-6
13mm stacking height:	TycoElectronics 5-5179010-6

2 Connectors

2.1 Counting of the connector pins

The connector plug of PicoMOD7A LVDS will be treated as follows.
Pin 1 is marked in Figure 1. The row with pin 1 contains all odd-numbered pins (1, 3, 5, 7 etc.), and corresponding to this, the row without pin 1 contains all even-numbered pins (2, 4, 6, 8 etc.).

2.2 IO-Pin limitations

PicoMOD7A LVDS is equipped with 45 pins that can be used as digital-IO. Most of these pins are multiplexed, so you have to make sure that these pins are used for one purpose only. For example, if you intend to use IO0 to IO3 you have to make sure that the COM2 is disabled. Additionally there are some IO-Pins which are used internally and whose primary function can't be disabled completely.

2.3 Connector J1 (main connector)

J1			
Pin	**Signal**	**Default Interface**	**Alternative Function**
1	IO64	I/O-Pin 64	SPI CS
2	IO65	I/O-Pin 65	SPI CLK
3	IO66	I/O-Pin 66	SPI MISO
4	IO67	I/O-Pin 67	SPI MOSI
5	CAN-TX	CAN2.0 TX	
6	CAN-RX	CAN2.0 RX	
7	RX-	Ethernet RX-	
8	TX-	Ethernet TX-	
9	RX+	Ethernet RX+	
10	TX+	Ethernet TX+	
11	V33	+3,3V ±5% DC	
12	V33	+3,3V ±5% DC	
13	GND	GND	
14	GND	GND	
15	/PONRES	CPU Reset (active low)	
16	VBAT	+3V … +3,6V DC (Battery buffering RTC) (*)	

J1			
Pin	**Signal**	**Default Interface**	**Alternative Function**
17	IO1	COM2 TxD	I/O-Pin 1
18	IO0	COM2 RxD	I/O-Pin 0
19	IO3	COM2 RTS	I/O-Pin 3 / COM4 TX
20	IO2	COM2 CTS	I/O-Pin 2 / COM4 RX
21	IO5	COM1 TxD	I/O-Pin 2
22	IO4	COM1 RxD	I/O-Pin 4
23	IO7	I/O-Pin 7	COM3 TxD
24	IO6	I/O-Pin 6	COM3 RxD
25	OTGDM	USB2.0 OTG Dev./Host -	
26	USBDN	USB2.0 Host -	
27	OTGDP	USB2.0 OTG Dev./Host +	
28	USBDP	USB2.0 Host +	
29	IO9	I/O-Pin 9 / GPIO5	
30	IO8	I/O-Pin 8	USB Host Power On
31	IO11	I/O-Pin 11	I2C SDA
32	IO10	I/O-Pin 10	USB Device Detect
33	IO76	I/O-Pin 76	
34	IO12	I/O-Pin 12	I2C SCL
35	BOOTSEL0	NC (do not use)	
36	IO77	I/O-Pin 77	
37	BOOTSEL1	NC (do not use)	
38	BOOTSEL2	NC (do not use)	
39	GND	GND	
40	GND	GND	
41	IO14	I/O-Pin 14 / GPIO1	
42	IO13	I/O-Pin 13 / GPIO0	
43	IO16	I/O-Pin 16 / GPIO3	
44	IO15	I/O-Pin 15 / GPIO2	
45	IO18	I/O-Pin 18	SD-Card CLK
46	IO17	I/O-Pin 17 / GPIO4	
47	IO20	I/O-Pin 20	SD-Card DAT0
48	IO19	I/O-Pin 19	SD-Card CMD
49	IO22	I/O-Pin 22	SD-Card DAT2

J1			
Pin	**Signal**	**Default Interface**	**Alternative Function**
50	IO21	I/O-Pin 21	SD-Card DAT1
51	IO24	I/O-Pin 24	SD-Card Detect
52	IO23	I/O-Pin 23	SD-Card DAT3
53	IO26	I/O-Pin 26	SD-Card Write Protect
54	IO25	I/O-Pin 25	SD-Card Power Enable
55	IO28	I/O-Pin 28	LCD DEN (Display enable)
56	IO27	I/O-Pin 27	LCD Enable
57	IO30	I/O-Pin 30	LCD VCFL On
58	VDDCAM	Camera Interface Voltage	
59	GND	GND	
60	IO31	I/O-Pin 31	LCD VEEK
61	CAMDATA0	Camera Data 0	
62	GND	GND	
63	CAMDATA1	Camera Data 1	
64	HDMITX2+		
65	CAMDATA2	Camera Data 2	
66	HDMITX2-		
67	CAMDATA3	Camera Data 3	
68	HDMITX1+		
69	CAMDATA4	Camera Data 4	
70	HDMITX1-		
71	CAMDATA5	Camera Data 5	
72	HDMITX0+		
73	CAMDATA6	Camera Data 6	
74	HDMITX0-		
75	CAMDATA7	Camera Data 7	
76	HDMICLK+		
77	CAMMCLK	Camera Clock Out	
78	HDMICLK-		
79	CAMHREF	Camera HRef	
80	CAMRESET	Camera Reset	
81	CAMFIELD	Camera Field	
82	CAMVSYNC	Camera VSync	

J1			
Pin	**Signal**	**Default Interface**	**Alternative Function**
83	GND	GND	
84	GND	GND	
85	GND	GND	
86	CAMPCLK	Camera Clock In	
87	IO70	I/O-Pin 70	
88	IO71	I/O-Pin 71	
89	/WAIT	Bus Wait (active low)	
90	IO72	I/O-Pin 72	
91	CS4	Chip Select 2	
92	CS5	Chip Select 3	
93	IO73	I/O-Pin 73	
94	IOxx	I/O-Pin	
95	IOxx	I/O-Pin	
96	/OE	Output Enable	
97	/WE	Write Enable	
98	IO74	I/O-Pin 74	
99	A0	Address 0	
100	A1	Address 1	
101	A2	Address 2	
102	A3	Address 3	
103	A4	Address 4	
104	A5	Address 5	
105	A6	Address 6	
106	A7	Address 7	
107	A8	Address 8	
108	A9	Address 9	
109	A10	Address 10	
110	D0	Data 0	
111	D1	Data 1	
112	D2	Data 2	
113	D3	Data 3	
114	D4	Data 4	
115	D5	Data 5	

J1			
Pin	**Signal**	**Default Interface**	**Alternative Function**
116	D6	Data 6	
117	D7	Data 7	
118	D8	Data 8	
119	D9	Data 9	
120	D10	Data 10	
121	D11	Data 11	
122	D12	Data 12	
123	D13	Data 13	
124	D14	Data 14	
125	D15	Data 15	
126	IO75	I/O-Pin 75	
127	CS0	Chip Select 1	
128	ETH-ACT	Ethernet Activity	
129	STA1	Status 1	
130	STA2	Status 2	
131	LOUT	Audio Left Out	
132	ROUT	Audio Right Out	
133	LIN	Audio Left In	
134	RIN	Audio Right In	
135	MICIN	Microphone In	
136	MICBIAS	Microphone Bias	
137	X+	Touch X+	
138	X-	Touch X-	
139	Y+	Touch Y+	
140	Y-	Touch Y-	

See PicoMOD7A Starterkit documentation for connection examples.

See software documentation for configuration of alternative functions.

2.4 Connector J2 LVDS

J2		
Pin	**Signal**	**Description**
1	VLCD	LCD Voltage 3.3V switched
2	VLCD	LCD Voltage 3.3V switched
3	GND	Ground
4	GND	Ground
5	TX0-	LVDS Transmit 1 negative
6	TX0+	LVDS Transmit 1 positive
7	GND	Ground
8	TX1-	LVDS Transmit 2 negative
9	TX1+	LVDS Transmit 2 positive
10	GND	Ground
11	TX2-	LVDS Transmit 3 negative
12	TX2+	LVDS Transmit 3 positive
13	GND	Ground
14	CLK-	LVDS Clock negative
15	CLK+	LVDS Clock positive
16	GND	Ground
17	TX3-/NC	LVDS Transmit 3 negative (only with 24bit version)
18	TX3+/NC	LVDS Transmit 3 positive (only with 24bit version)
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	VLCD	LCD Voltage 3.3V switched
24	VCFL_ON	Backlight On Signal 3.3V active high
25	BL_PWM	Backlight Dimming PWM Signal 3.3V

These signals are not supported on the TTL version of this product. Please refer to the document “PicoMOD7A_TTL_Hardware_eng.pdf” for TTL version.

Connector on the PicoMOD7A is a JAE FI-S25P-HFE. Mating connector is JAE FI-S25S.

2.5 microSD connector

The on board microSD connector can be used on same time as the SD interface on J1. There is no sharing with any signal of the connector J1. There is no hotplug detection for this connector, so the software can't detect a card insert after switching on the board.

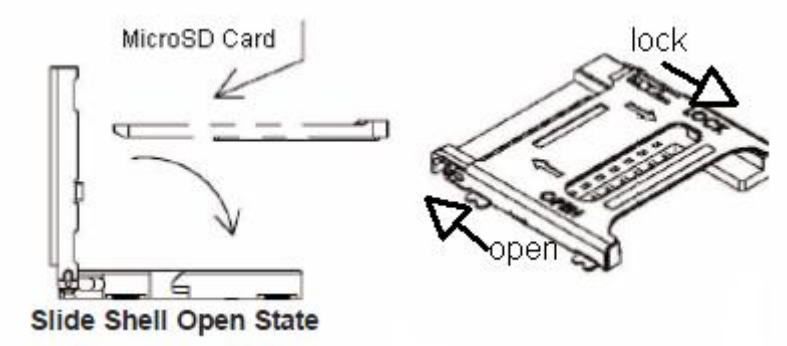

Figure 1: microSD connector

3 Interface and Signal description

3.1 Ethernet connection

LAN TX+/- and RX+/- are 100 ±20% Ohm differential pairs to a 1:1/1:1 transformer. We recommend a connector with integrated transformer in short distance (less than 4 inch = 100 mm) to the module connector. The RX pair should have a 0.2 inch min. distance to TX pair to avoid crosstalk. The intra pair mismatch of each differential pair should be <50 mil (1.27mm). Please also refer our "Ethernet Routing Guidelines" on our web download area and refer the comments at our forum.
The LED signals are low active to drive a 3.3V powered LED with 5mA directly.
If ethernet is not used please leave signals unconnected.

3.2 Serial port

Serial ports are provided with 3.3V TTL signals. These signals are not 5V compliant. Please use a transceiver with 3.3V power supply.
If you don't need the serial port this pins can be used optional as GPIOs.

3.3 USB Host

The 90 Ohm differential pair of USB signals doesn't need any termination. For external ports EMV protection is required nearby the USB connector.
With the USB_PWR signal you can switch on the USB power on your current limiting IC.
From the usb.org webpage you can download "High Speed USB Platform Design Guidelines" which provides highly recommended information for a proper working USB design.
If the USB port is not used please leave open.

3.4 USB device

The 90 Ohm differential pair of USB signals doesn't need any termination. For external ports ESD and EMV protection is required nearby the USB connector.
The USB_CNX signal is for detecting a connection to a host. This signal connects directly to the USB 5V power (4.75 - 5.25V). A buffer can be added to prevent excessive current flow from the USB connector to the board.
From the usb.org webpage you can download "High Speed USB Platform Design Guidelines" which provide highly recommended information for a proper working USB design.
If the USB device port is not used please leave open.

3.5 SPI

The module supports a HS SPI (Serial Peripheral Interface) with a chip select. Signals are 3.3V compliant.

3.6 I2C

The module supports an I2C interface. Signals are 3.3V compliant and don't have pull-ups on module. Please add 2.2 kOhm pull-ups to 3.3V on baseboard. 5V devices on baseboard need a level shifter.
I2C for camera and HDMI is soft I2C on GPIO, see starterkit schematics for connection examples.

3.7 CAN

The module provides the CAN TX and CAN RX signals with .3.3V TTL level
The RX signal has an internal pull-up and can be left unconnected when not used.
A 3.3V transceiver like SN65HVD230 is needed to connect to the CAN bus.

3.8 SD card

The interface is supporting a SD card channel. For specification and licensing please refer the website of the SD Association http://www.sdcard.org. Pull-ups are integrated on the module. Signals are 3.3V compliant.
Unused signals should be left unconnected.
Signals can be optional used as GPIO.

3.9 Touch

The integrated resistive touch controller will support 4 wire analog resistive touch panels without any additional circuit.
Optional these signals can be used as analog input.

3.10 Audio I/F

The onboard sound codec supports an analog stereo input and an analog stereo output with 1 V_{RMS} signal level. These signals need serial capacitors.

3.11 IO / IRQ

Multiple general purpose pins with 3.3V logic signal level.

3.12 /PONRES

Reset input. Drive with open drain or open collector 3.3V compliant signal. We recommend to pull low this pin with the powergood signal from power supply or using a voltage supervisor. For proper function this signal must be connected.

3.13 Camera

Please contact F&S (sales@fs-net.de) for more information on the camera interface.
A camera adapter kit is available.

If HDMI is not used, please leave unconnected.

3.14 HDMI

The PicoMOD7A LVDS module allows to connect HDMI or single channel DVI monitor without any transmitter chip. Audio transmitting is not supported. The signals should be routed with 100 ohm ±15% differential lines. The length difference between a differential pair should be limited to 5 mils maximum. Each pair should be length-matched to within ± 20 mils of any other signal pair.
If HDMI is not used, please leave unconnected.
See starterkit schematics for connection example.

3.15 Address/Data-Bus

The PicoMOD7A module does provide an address/data bus to connect ICs for additional functions. Bus supports 3.3V TTL level. This interface can be used to implement a NetDCU compatible FS-Bus (8bit with data/address select)

Address	A10..0
Data	D15..0
Chip select	/CS0
Output Enable	/OE
Write Enable	/WE

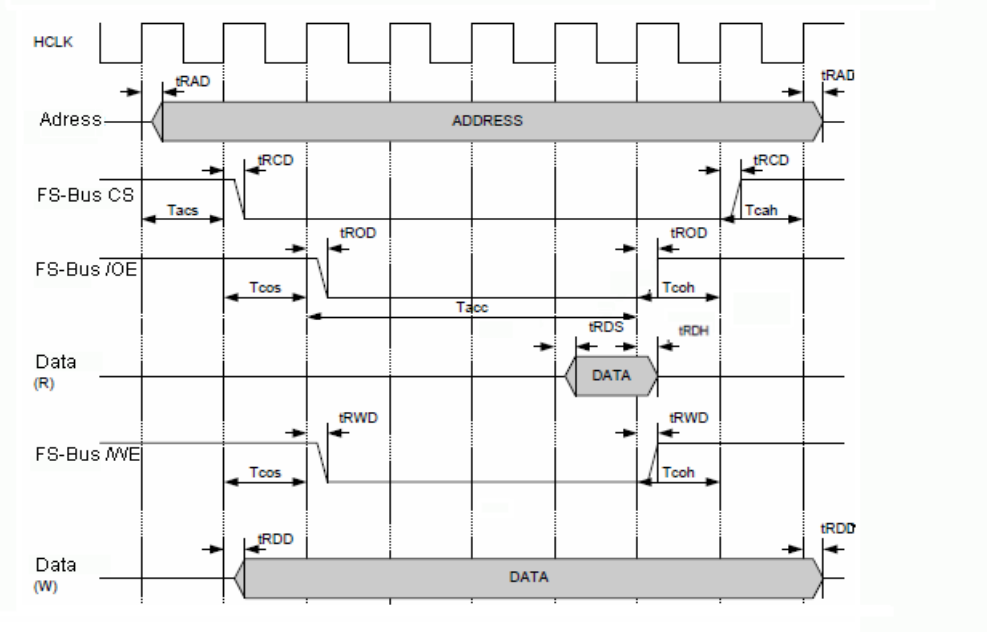

Figure 2: FS-Bus timing

Parameter	Symbol	Min	Max	Unit
ROM/SRAM Address Delay	tRAD	1.2823	7.8220	ns
ROM/SRAM Chip Select Delay	tRCD	1.9564	6.6403	ns
ROM/SRAM nOE(Output Enable) Delay	tROD	1.8143	6.4113	ns
ROM/SRAM nWE(Write Enable) Delay	tRWD	1.7700	6.2336	ns
ROM/SRAM Output Data Delay	tRDD	1.1940	8.2706	ns
ROM/SRAM Read Data Setup Time	tRDS	2.0000	-	ns
ROM/SRAM Write Data Hold Time	tRDH	1.0000	-	ns

4 Dimensions

Board thickness:	1.6 mm
Height of parts on top side:	3.0 mm
Height of parts on bottom side (without connectors):	2.0 mm
Pin pitch of connector:	0.8 mm
Mounting hole diameter:	2.8 mm

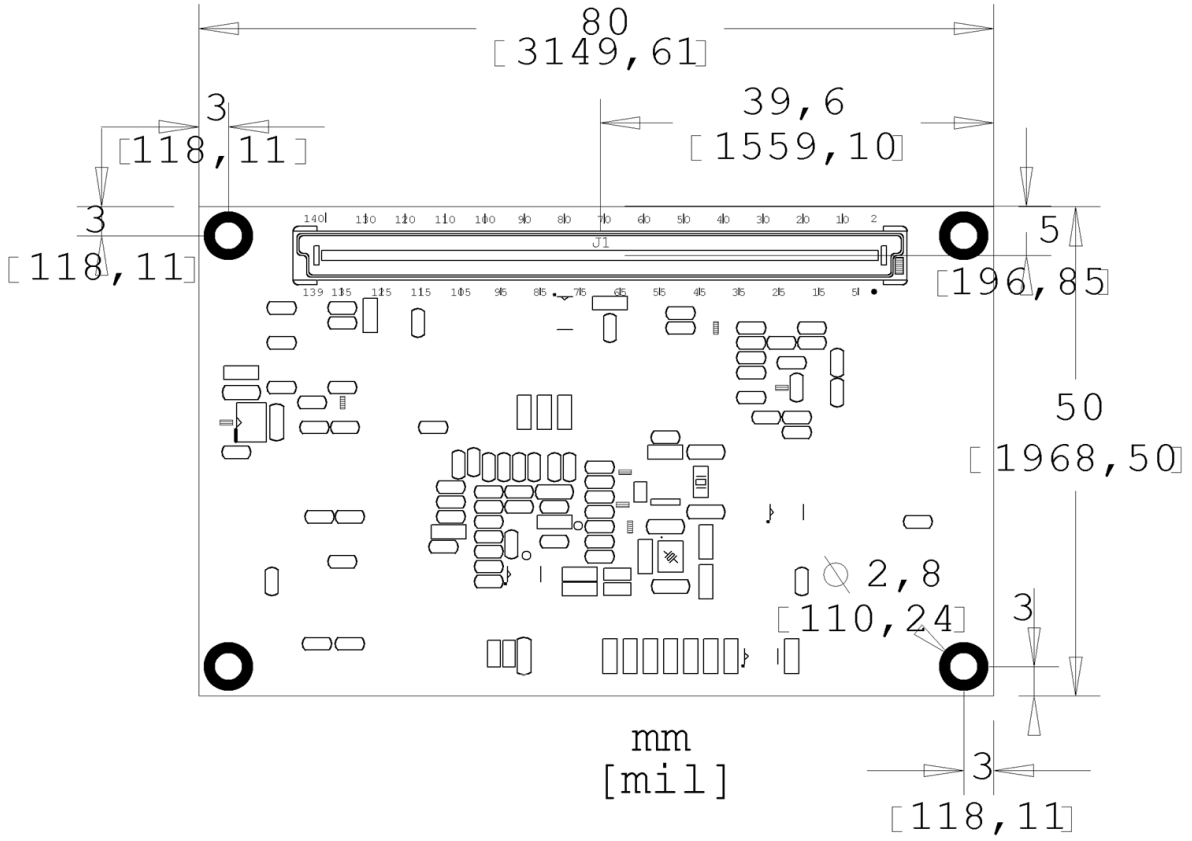

Figure 3: Bottom view – dimension

All values can have tolerances of ±0,5mm.

To avoid EMC and ripple pickup the mounting holes are isolated and not connected to any voltage.

5 Technical Data

Power Supply:	+3.3V DC / ±5%
Current Consumption:	max. 1500mA (256MByte Ram) max. 1900mA (512MByte Ram)
Power supply VBAT	2.0 … 3.6 V
typical current consumption VBAT:	3 µA
Inputs/Outputs:	max. 45 I/O lines (shared with dedicated interfaces)
Touch-Screen:	4 wire touch input, resistive
Interfaces:	1x Ethernet 10/100Mbit 3x Serial with 3,3V-level (1x with RTS/CTS) or 4x Serial without RTS/CTS 1x Serial when CAN2.0 not assembled (optional) 1x USB2.0 Device or USB2.0Host (high speed 480Mbit/s) 1x USB2.0 Host (high speed 480Mbit/s) 1x CAN2.0 1x I2C 1x SPI 1x Audio (Line in, Line out, Micro in) 1x microSD slot onboard 1x SD-Card (external) 1x Address/Data-Bus interface 1x HDMI 1x Camera
TFT LCD-interface:	up to 1280x720 pixel, 256/65536 colours Hardware rotation 90°/180°/270° 2D/3D graphic (OpenGL) Multi format CODEC (MPEG4, H.264, WMV9) Vector Floating Point Coprocessor (VFP)
RAM:	256 MByte DDR2-RAM (optional 512MByte)
Flash:	128 MByte Flash (optional 1GByte)
CPU:	Samsung S5PV210 1GHz
Operating Temperature:	–25°C … +85°C
Dimensions (l x w x h):	80 x 50 x 4 mm without connector 80 x 50 x 8 mm with connector
Weight:	20 gr.

5.1 6.2 DC electrical characteristics for 3.3V IO pins

VDD= 3.3V +/- 5%

Parameter	Description	Condition	Min	Max	Unit
Vih	High Level Input Voltage		0.7*VDD	VDD+0.3	V
Vil	Low Level Input Voltage		-0.3	0.3*VDD	V
Voh	High Level Output Voltage	Ioh=-100µA	VDD-0.2		V
Vol	Low Level Output Voltage	Ioh=100µA		0.2	V
Io	Output current	VDD=3.3V		2.6	mA

6 Appendix

6.1 Important Notice

The information in this publication has been carefully checked and is believed to be entirely accurate at the time of publication. F&S Elektronik Systeme assumes no responsibility, however, for possible errors or omissions, or for any consequences resulting from the use of the information contained in this documentation.

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