



AVRcard's Playground Activity Board

User Manual

Board Rev.: 1.1
Document Rev.: 1.1a
Revision Date: 13.11.2003

PRELIMINARY

Copyright © 2003 by AVRcard.com

Contents

Product Overview	4
Key Features.....	4
Additional Resources.....	4
Getting started	5
Hardware Description	6
Functional Blocks.....	6
Header Connectors	7
Jumpers	9
Circuit Diagrams	10
Bill of Materials.....	11
Connectors Pinout Summary	12
References	15
Data Sheets.....	15
Contact	15
Figures	
Figure 1 – Top View of the Playground.....	6
Figure 2 - General Pinout of I/O Port Headers	7
Figure 3 – A0-7 Connector Pinout.....	8
Figure 4 – I2C Bus Connector Pinout.....	8
Figure 5 – SPI Bus Connector Pinout.....	8
Figure 6 – Monitoring LED Connector Pinout	8
Figure 7 – Speaker Connector Schematic	9
Figure 8 – Serial Port Configuration Jumpers	9
Tables	
Table 1 – List of Parts	11
Table 2 – Port A Connector Pinout	12
Table 3 – Port B Connector Pinout	12
Table 4 – Port C Connector Pinout	12
Table 5 – Port D Connector Pinout.....	12
Table 6 – Port E Connector Pinout	13
Table 7 – Port F Connector Pinout	13
Table 8 – A0-7 Connector Pinout.....	13
Table 9 – I2C Connector Pinout.....	13
Table 10 – SPI Connector Pinout	14
Table 11 – Serial Port 2 Connector Pinout.....	14

Table 12 – LED Connector Pinout 14
Table 13 – SPKR Connector Pinout 14

Section 1

Product Overview

The AVRcard's Playground has been designed as a base board for the AVRcard. It provides easy connection options, and a number of additional features.

Key Features

- Plug-in AVRcard with Atmega128 processor
- Plug-in TCP/IP module
- Plug-in 4x20 character LCD
- Slot for MultiMedia Card
- 4 general purpose monitoring LEDs
- Piezo speaker
- Voltage regulator, allows for use of inexpensive power supply
- Standard D-Sub connectors for both RS-232 interfaces
- CPU ports routed to headers with STK500 compatible pinout
- Separate connectors for I2C and SPI buses
- Address bus demultiplexed
- 32Kbytes SRAM
- Euro card size (100 x 160mm)

Additional Resources

- Product Information – All updated product information can be retrieved at the Web Site, www.avrcard.com.
- Application Support – Please check the Resources pages regularly at www.avrcard.com for design notes and application hints. Further support is available by email from support@avrcard.com.
- Custom Designs – Custom population or customized versions of the product are available. For inquiries please contact info@avrcard.com.

Section 2
Getting started

Tbd.

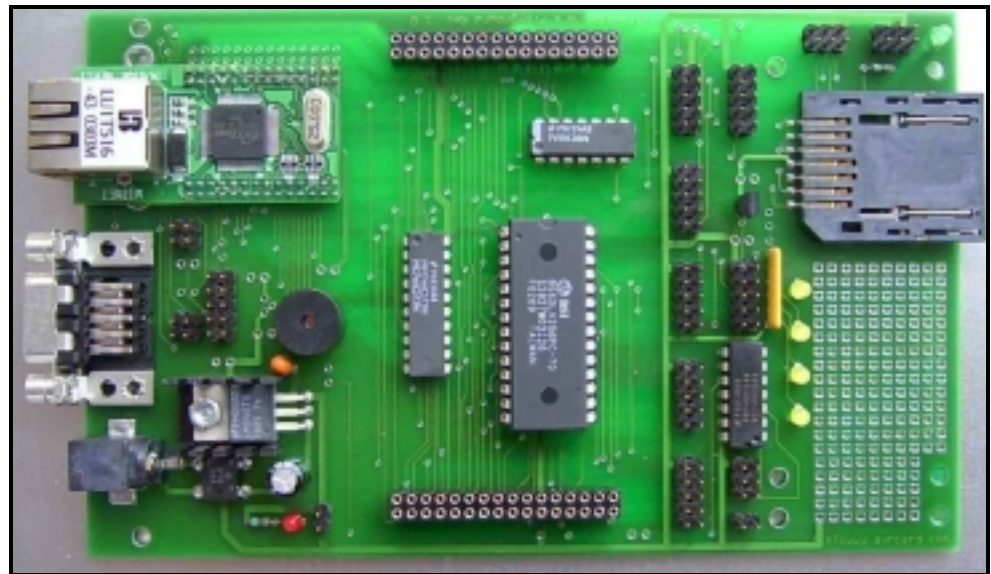
Section 3

Hardware Description

Functional Blocks

Figure 1 shows the V1.1 activity board and its different functional areas. These areas are detailed in the following sections.

Figure 1 – Top View of the Playground



AVRcard slot

Two 32-pin headers connect to power and ports. A 6-pin header connects to the CPU reset signal, as there is no reset signal on the standard connectors of AVRcard. The reset signal is used only in conjunction with the TCP/IP module.

TCP/IP Module

This slot receives the IIM7010 Ethernet module. Two positions are provided:

- Memory mapped
- I2C connection

D-Sub connectors

Two D-Sub connectors, one female and one male, are provided for easy connection to the two RS-232 interfaces of the AVRcard. Pin assignment of each connector can be configured by jumpers (J13, J15).

The second D-Sub connector shares its board position with the TCP/IP Module. If this module is used, the second D-Sub connector can be connected via the 10-pin header J18.

Power supply

A standard 7805 voltage regulator is provided for the 5V supply. DC power is applied through the power jack J8. A bridge rectifier ensures correct polarity.

For the Ethernet-Module, a separate 3.3V regulator is used. A second 3.3V regulator is used for the MMC.

External SRAM The Playground contains a footprint for a 28-pin DIP socket (U3) where an external SRAM device can be mounted. Make sure the SRAM device has the same voltage range as the rest of the design.

Note: The SRAM is disabled by default. To enable SRAM support, put a jumper on J14. The SRAM occupies the memory space from \$1000-\$7FFF.

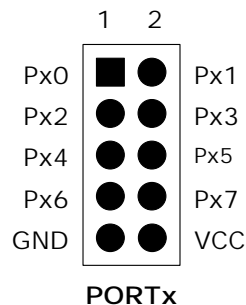
LCD A small alphanumeric LCD (4 lines, 20 characters) can be mounted across the prototyping area (J25). The connector pinout is designed for the EA DIP204-4 module from Electronic Assembly. It is connected to the SPI bus. Please refer to [5] for further details on this display.
Display contrast is adjusted by R5. R4 sets the background LED current.

MMC Connector An adapter for MultiMediaCards (MMC) can be mounted on position J17. The MMC is connected to the SPI bus via level converters 74VHC08 (U6). Bit5 of PortB is used as SS signal in order not to interfere with the standard SPI Bus Connection.

Header Connectors All CPU ports and some additional signals can be connected by standard 0.1" headers. Pin 1 has a square pad.

Port Connectors The pinout for the I/O port headers is explained in Figure 2. The square marking indicates pin 1.

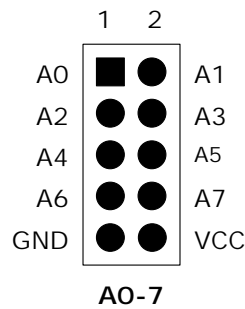
Figure 2 - General Pinout of I/O Port Headers



A0-7 Connector The connector J20, marked A0-7 contains the 8 least-significant bits of the external address bus. The purpose of the connector is to provide easy access to the address bus. The 8 most significant bits can be found on the Port C connector J4.

This connector is handy when interfacing external devices.

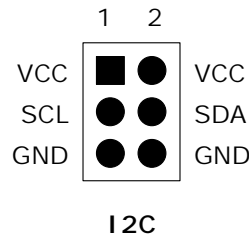
Figure 3 – A0-7 Connector Pinout



I2C Bus Connection

The I2C bus can be connected either to the PortD connector or to the dedicated connector J12. This pinout is compatible to the modules with I2C interface from E-Lab Computers. Please refer to [6] for further details on these modules.

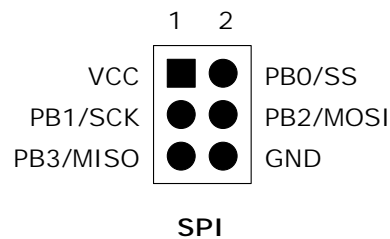
Figure 4 – I2C Bus Connector Pinout



SPI Bus Connection

The SPI bus can be connected either to the PortB connector or to the dedicated connector J16.

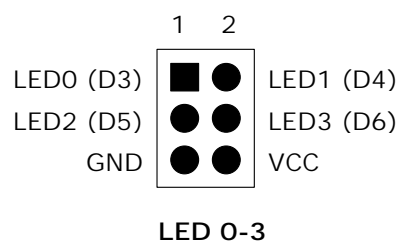
Figure 5 – SPI Bus Connector Pinout



LED Connector

Four general purpose monitoring LEDs are provided. The LEDs are driven by the hex inverter U11. Figure 6 shows the pinout of J23.

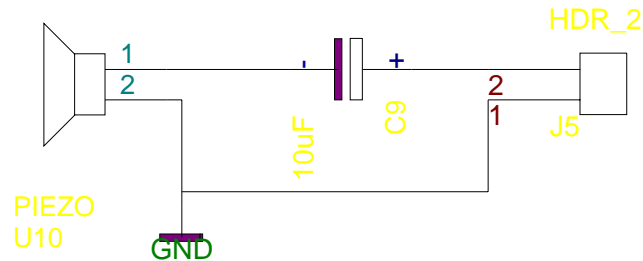
Figure 6 – Monitoring LED Connector Pinout



Piezo Speaker Connector

A piezo speaker can be connected to any port to deliver audible signals. The figure below shows the pinout of the speaker connector J5

Figure 7 – Speaker Connector Schematic



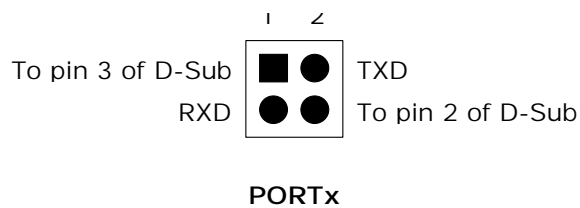
Jumpers

Jumpers are standard (0.1").

Pinout Selection for D-Sub

The RXD and TXD signals can be interchanged on each of the D-Sub connectors. Figure 8 applies to J13 and J15.

Figure 8 – Serial Port Configuration Jumpers



External Power Enable

If the AVRcard is powered from a battery through the DC-DC converter, the jumper J9 must be left open.

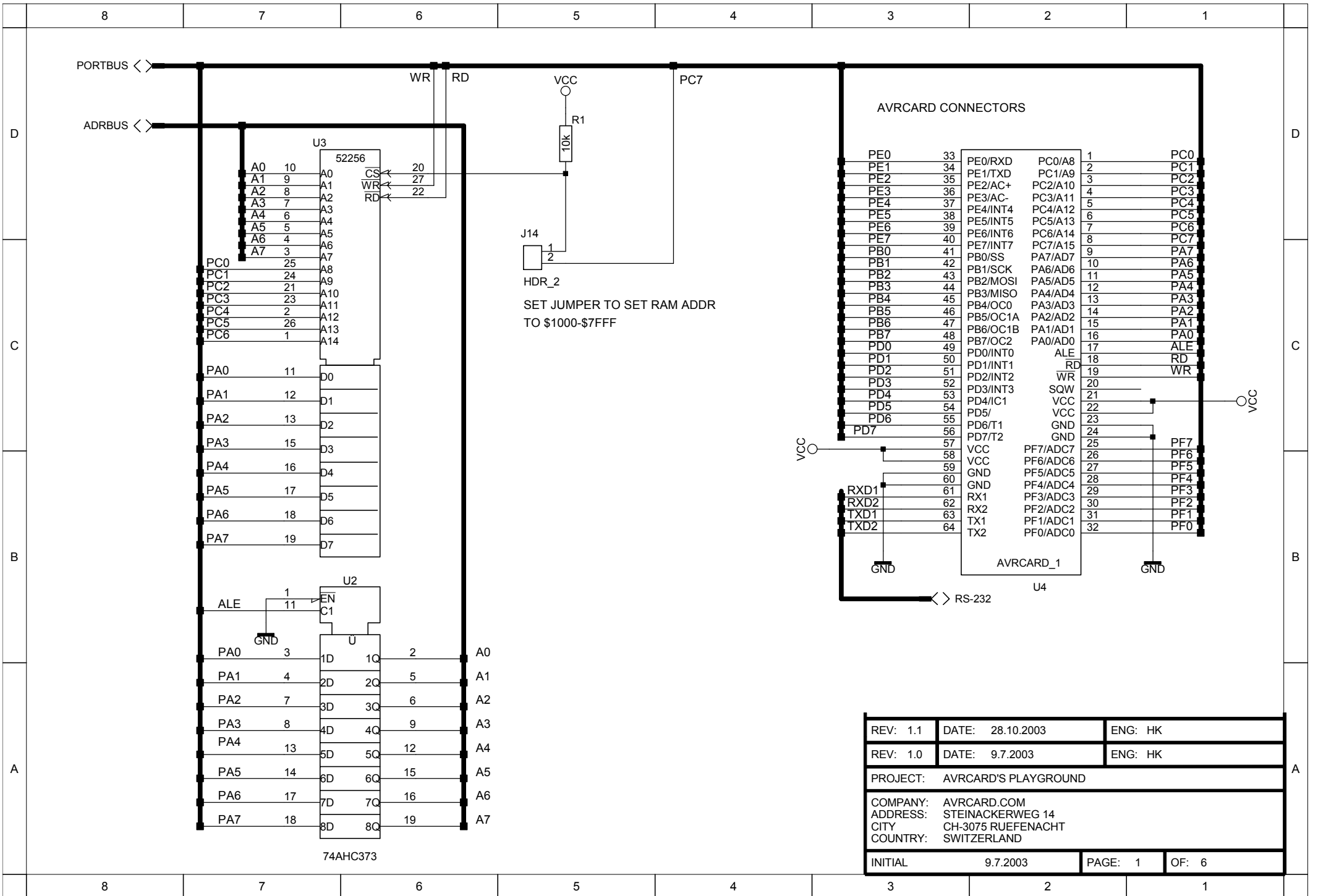
Mode Selection for Ethernet-Module

When the Ethernet module is used in memory-mapped mode, closing of jumper J19 selects the non clocked mode. Please refer to [4] for further details.

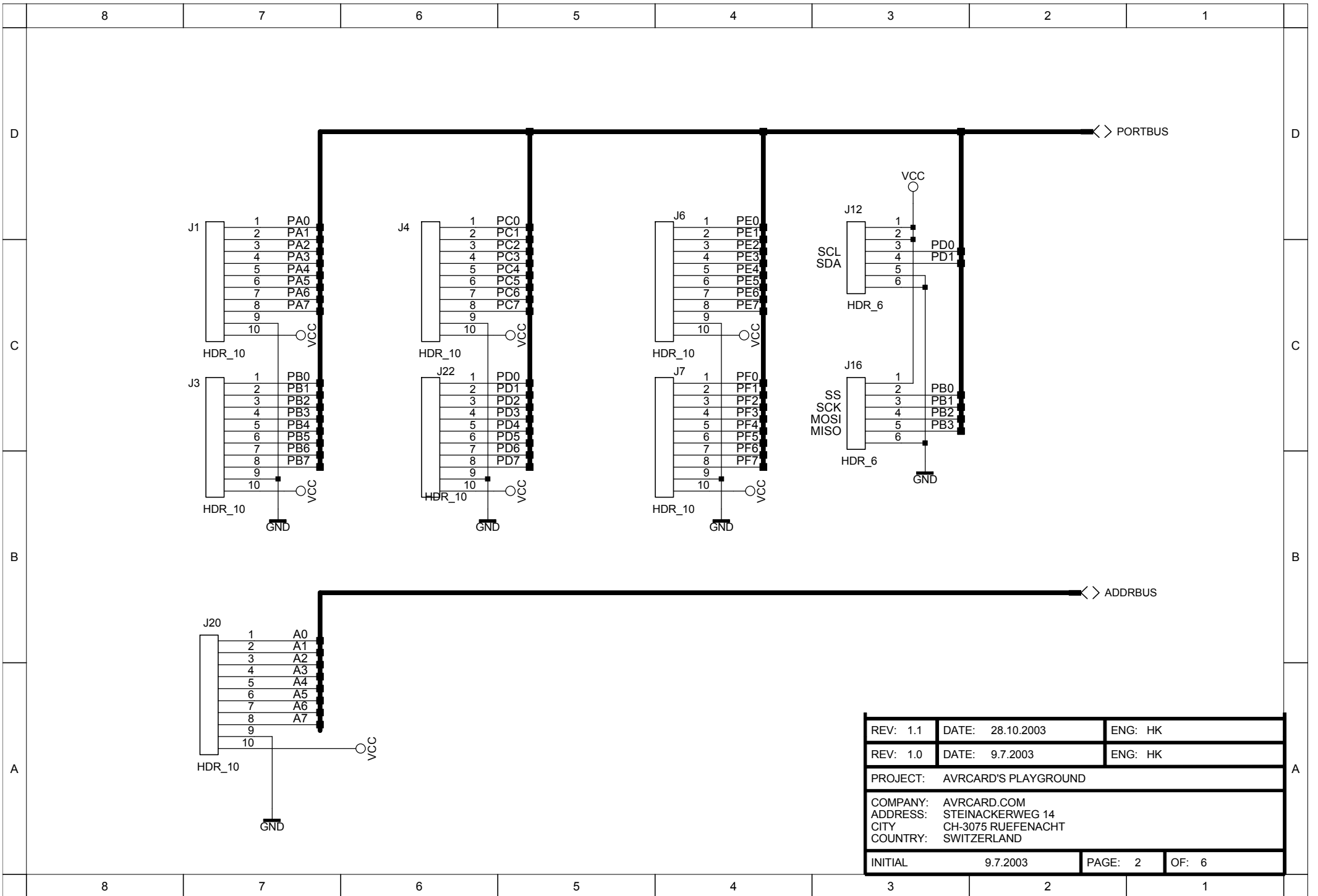
Section 4

Circuit Diagrams

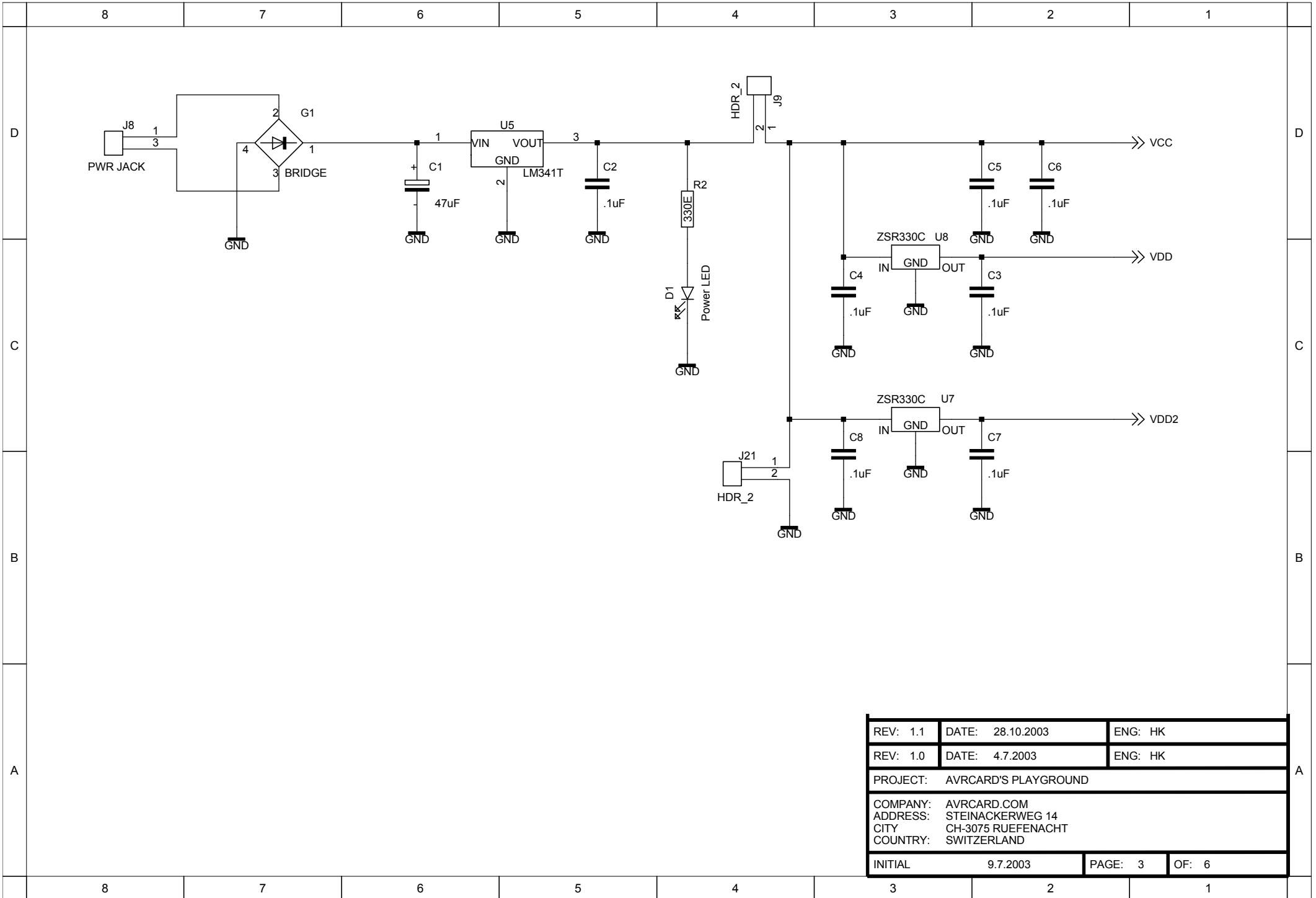
The diagrams on the following pages are also available in a separate document.



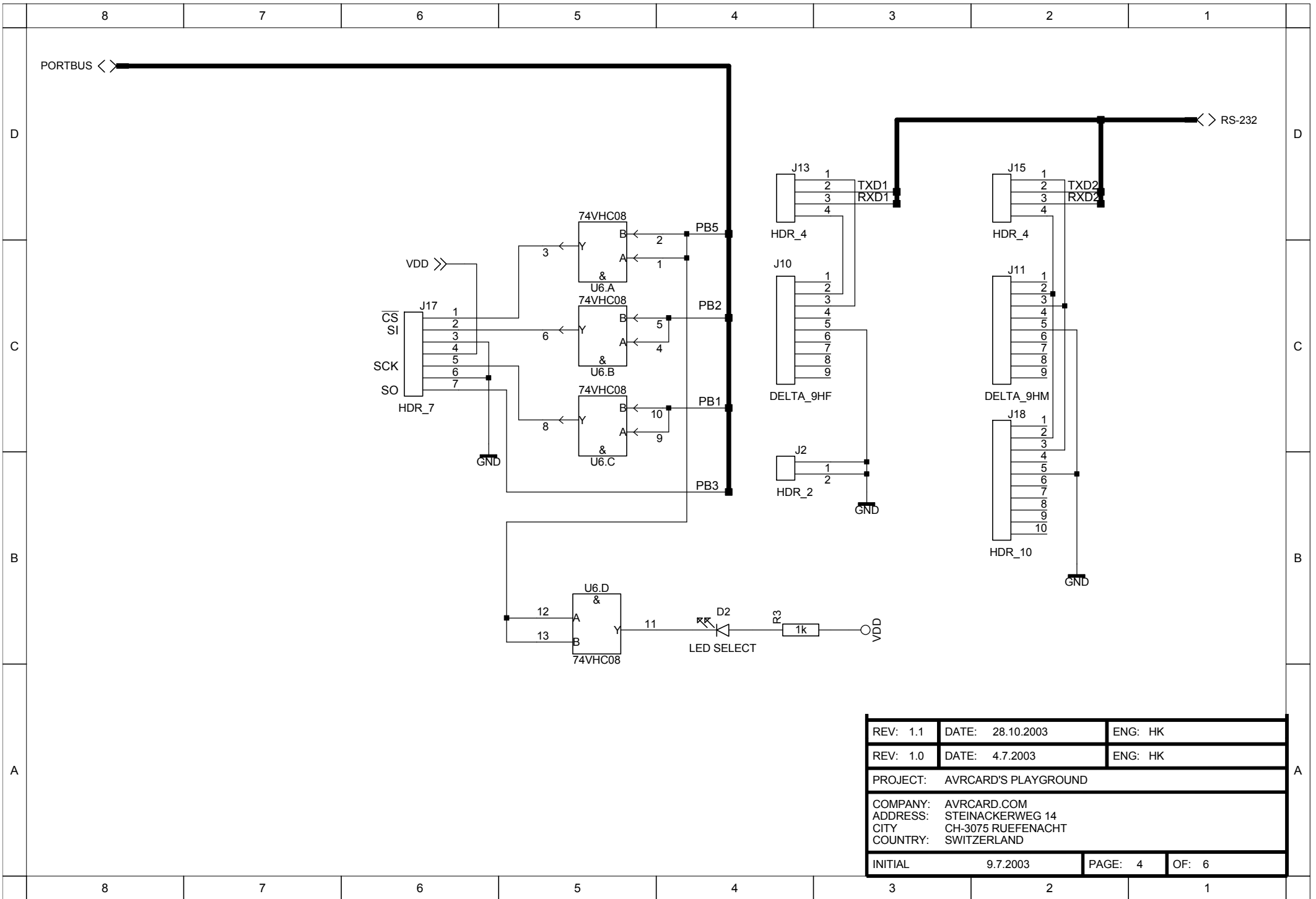
REV: 1.1	DATE: 28.10.2003	ENG: HK
REV: 1.0	DATE: 9.7.2003	ENG: HK
PROJECT: AVRCARD'S PLAYGROUND		
COMPANY: AVRCARD.COM		
ADDRESS: STEINACKERWEG 14		
CITY: CH-3075 RUEFENACHT		
COUNTRY: SWITZERLAND		
INITIAL	9.7.2003	PAGE: 1 OF: 6



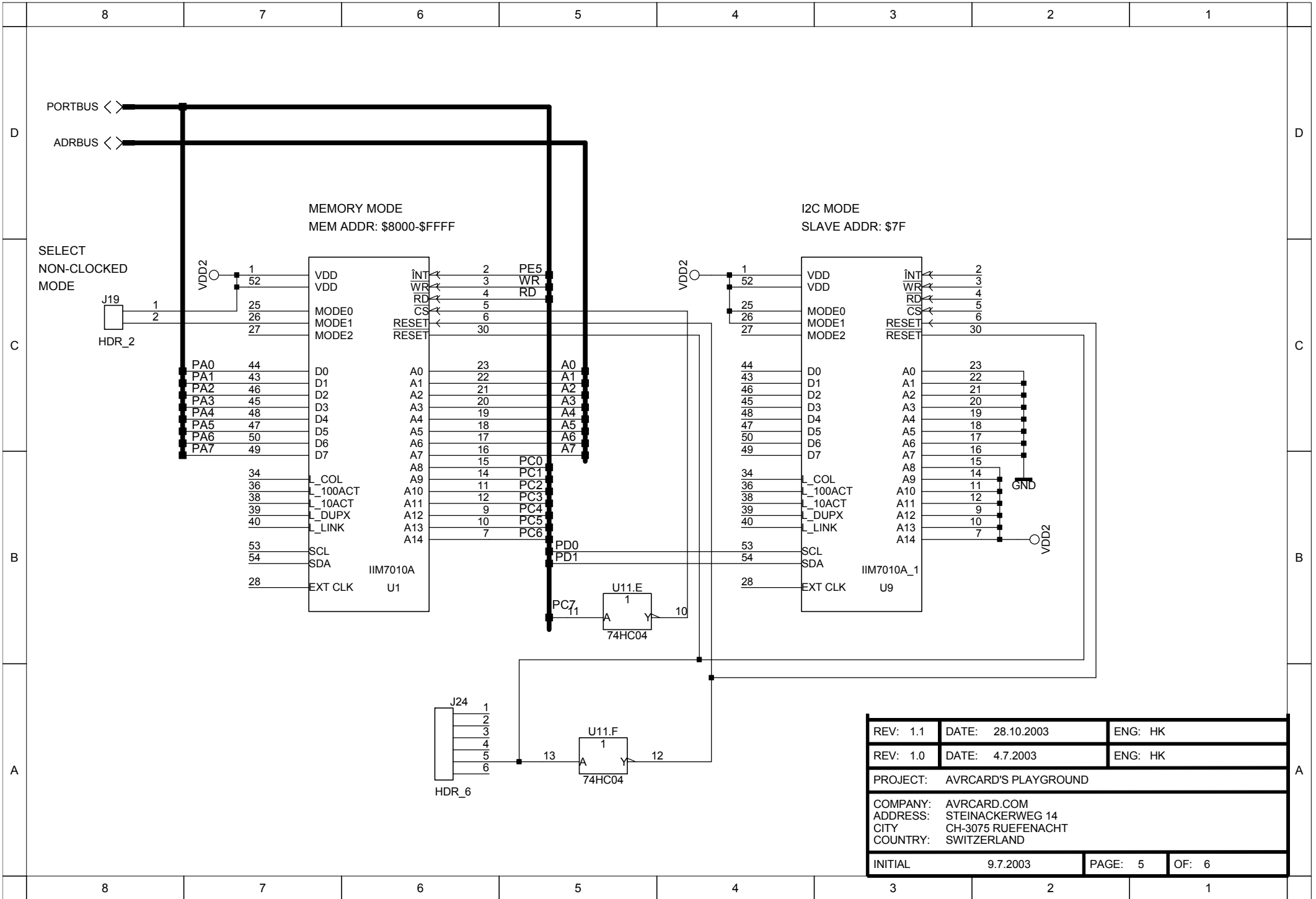
REV: 1.1	DATE: 28.10.2003	ENG: HK
REV: 1.0	DATE: 9.7.2003	ENG: HK
PROJECT: AVRCARD'S PLAYGROUND		
COMPANY: AVRCARD.COM		
ADDRESS: STEINACKERWEG 14		
CITY: CH-3075 RUEFENACHT		
COUNTRY: SWITZERLAND		
INITIAL	9.7.2003	PAGE: 2 OF: 6



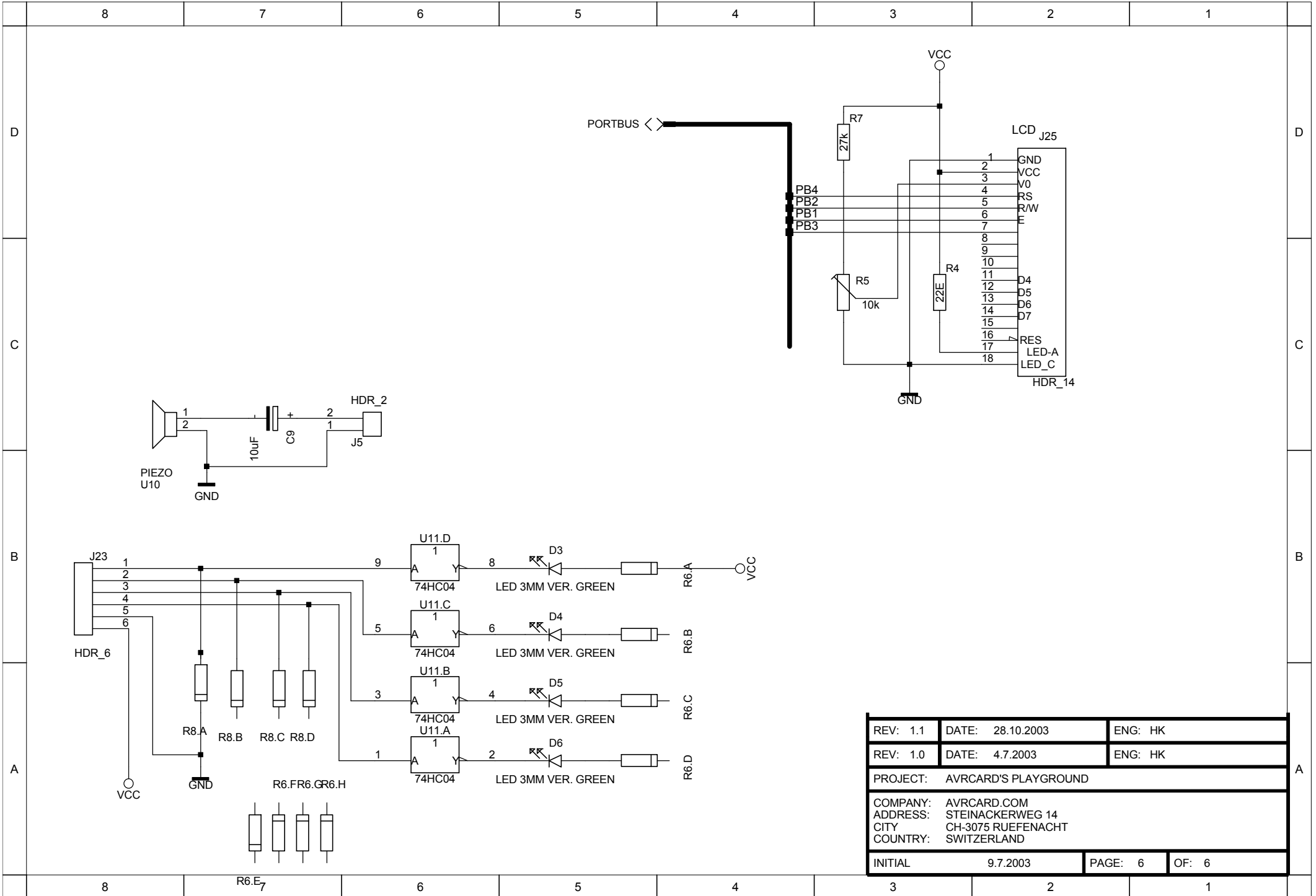
REV: 1.1	DATE: 28.10.2003	ENG: HK
REV: 1.0	DATE: 4.7.2003	ENG: HK
PROJECT: AVRCARD'S PLAYGROUND		
COMPANY: AVRCARD.COM		
ADDRESS: STEINACKERWEG 14		
CITY: CH-3075 RUEFENACHT		
COUNTRY: SWITZERLAND		
INITIAL	9.7.2003	PAGE: 3 OF: 6



REV: 1.1	DATE: 28.10.2003	ENG: HK
REV: 1.0	DATE: 4.7.2003	ENG: HK
PROJECT: AVRCARD'S PLAYGROUND		
COMPANY: AVRCARD.COM		
ADDRESS: STEINACKERWEG 14		
CITY: CH-3075 RUEFENACHT		
COUNTRY: SWITZERLAND		
INITIAL	9.7.2003	PAGE: 4 OF: 6



REV: 1.1	DATE: 28.10.2003	ENG: HK
REV: 1.0	DATE: 4.7.2003	ENG: HK
PROJECT: AVRCARD'S PLAYGROUND		
COMPANY: AVRCARD.COM		
ADDRESS: STEINACKERWEG 14		
CITY: CH-3075 RUEFENACHT		
COUNTRY: SWITZERLAND		
INITIAL	9.7.2003	PAGE: 5 OF: 6



REV: 1.1	DATE: 28.10.2003	ENG: HK
REV: 1.0	DATE: 4.7.2003	ENG: HK
PROJECT: AVRCARD'S PLAYGROUND		
COMPANY: AVRCARD.COM		
ADDRESS: STEINACKERWEG 14		
CITY: CH-3075 RUEFENACHT		
COUNTRY: SWITZERLAND		
INITIAL	9.7.2003	PAGE: 6 OF: 6

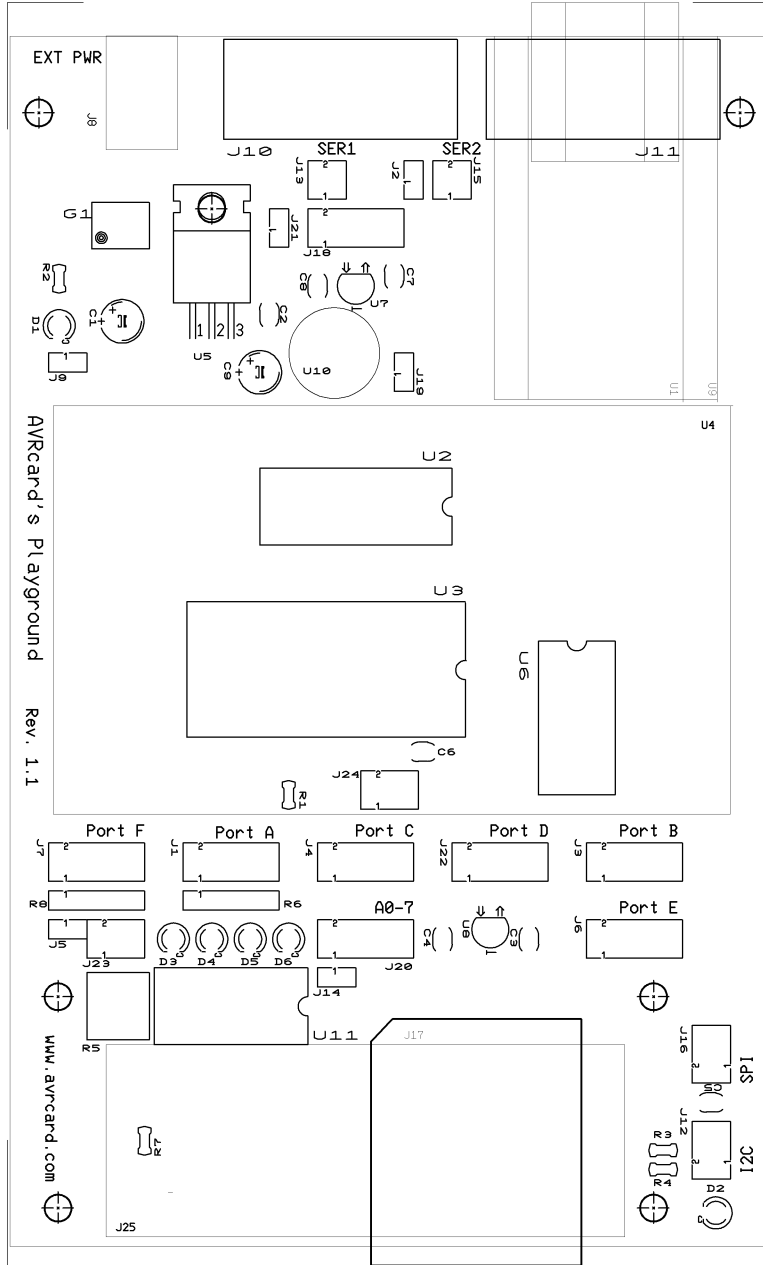


Table 1 – List of Parts

Bill of Materials

Qty	Description	Value	Case	RefDefs
1	SRAM	52256	DIP28	U3
1	Demultiplexer	74AHC373	DIP20	U2
1	Hex Inverter	74HC04	DIP14	U11
1	Level converter	74VHC08	DIP14	U6
1	AVRCARD V1.1	-		U4
1	BRIDGE		BR-DL	G1
1	DELTA_9HF	DELTA_9HF		J10
1	DELTA_9HM	DELTA_9HM		J11
1	ELCO	10uF	ELKO5R2_5	C9
1	ELCO	47uF	ELKO5R2_5	C1
1	Header	HDR 1x2		J2
1	MMC_SLOT	HDR_7	MMC_SLOT	J17
1	Ethernet Module	IIM7010A		U1 or U9
1	LED	LED red	3mm vert.	D1
1	LED	LED green	3mm vert.	D2
1	PIEZO		BUZZER12R10	U10
1	POT.METER_2	10k		R5
1	PWR JACK	HDR_2		J8
1	Resistor Array 8	10k	HEADER1X9	R8
1	Resistor Array 4	1k	HEADER1X5	R6
1	Resistor	10k		R1
1	Resistor	1k		R3
1	Resistor	22E		R4
1	Resistor	27k		R7
1	Resistor	330E		R2
2	Voltage Regulator	ZSR330C	78LXX	U7, U8
2	Header	HDR_4	HDR2X2	J13, J15
4	Header	HDR_6	HDR2X3	J12, J16, J23, J24
4	LED	LED yellow	3mm vert.	D3, D4, D5, D6
5	Header	HDR_2	HDR1X2	J9, J5, J14, J19, J21
7	CAPACITOR	0.1uF		C2, C3, C4, C5, C6, C7, C8
8	Header	HDR_10	HDR2X5	J1, J3, J4, J6, J7, J18, J20, J22
1	LCD	EA DIP204-4	EA_DIP_LCD	J25
1	Voltage Regulator	LM341T	TO220H	U5

Section 5

Connectors Pinout Summary

J1

Table 2 – Port A Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	PA0	AD0	I/O	U3/D0, U1/D0, U2/0D
2	PA1	AD1	I/O	U3/D1, U1/D1, U2/1D
3	PA2	AD2	I/O	U3/D2, U1/D2, U2/2D
4	PA3	AD3	I/O	U3/D3, U1/D3, U2/3D
5	PA4	AD4	I/O	U3/D4, U1/D4, U2/4D
6	PA5	AD5	I/O	U3/D5, U1/D5, U2/5D
7	PA6	AD6	I/O	U3/D6, U1/D6, U2/6D
8	PA7	AD7	I/O	U3/D7, U1/D7, U2/7D
9	GND		PWR	
10	VCC		PWR	

J3

Table 3 – Port B Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	PB0	SS	I/O	J16/2
2	PB1	SCK	I/O	J16/3, MMC/5 (via U6), LCD/6
3	PB2	MOSI	I/O	J16/4, MMC/2 (via U6), LCD/5
4	PB3	MISO	I/O	J16/5, MMC/7, LCD/7
5	PB4	OC0	I/O	LCD/4
6	PB5	OC1A	I/O	MMC/1 (via U6)
7	PB6	OC1B	I/O	
8	PB7	OC2	I/O	
9	GND		PWR	
10	VCC		PWR	

J4

Table 4 – Port C Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	PC0	A8	I/O	U3/A8, U1/A8
2	PC1	A9	I/O	U3/A9, U1/A9
3	PC2	A10	I/O	U3/A10, U1/A10
4	PC3	A11	I/O	U3/A11, U1/A11
5	PC4	A12	I/O	U3/A12, U1/A12
6	PC5	A13	I/O	U3/A13, U1/A13
7	PC6	A14	I/O	U3/A14, U1/A14
8	PC7	A15	I/O	U3/CS (via J14), U1/CS (inverted)
9	GND		PWR	
10	VCC		PWR	

J22

Table 5 – Port D Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	PD0	INT0/SCL	I/O	J12/3
2	PD1	INT1/SDA	I/O	J12/4
3	PD2	INT2	I/O	
4	PD3	INT3	I/O	
5	PD4		I/O	

Pin	Function	Alt. Function	I/O	Internal Connections
6	PD5	IC1	I/O	
7	PD6	T1	I/O	
8	PD7	T2	I/O	
9	GND		PWR	
10	VCC		PWR	

J6

Table 6 – Port E Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	PE0	RXD	I/O	
2	PE1	TXD	I/O	
3	PE2	AC+	I/O	
4	PE3	AC-	I/O	
5	PE4	INT4	I/O	
6	PE5	INT5	I/O	
7	PE6	INT6	I/O	
8	PE7	INT7	I/O	
9	GND		PWR	
10	VCC		PWR	

J7

Table 7 – Port F Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	PF0	ADC0	I/O	
2	PF1	ADC1	I/O	
3	PF2	ADC2	I/O	
4	PF3	ADC3	I/O	
5	PF4	ADC4	I/O	
6	PF5	ADC5	I/O	
7	PF6	ADC6	I/O	
8	PF7	ADC7	I/O	
9	GND		PWR	
10	VCC		PWR	

J20

Table 8 – A0-7 Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	A0		I/O	U3/A0, U2/1Q, U1/A0
2	A1		I/O	U3/A1, U2/2Q, U1/A1
3	A2		I/O	U3/A2, U2/3Q, U1/A2
4	A3		I/O	U3/A3, U2/4Q, U1/A3
5	A4		I/O	U3/A4, U2/5Q, U1/A4
6	A5		I/O	U3/A5, U2/6Q, U1/A5
7	A6		I/O	U3/A6, U2/7Q, U1/A6
8	A7		I/O	U3/A7, U2/8Q, U1/A7
9	GND		PWR	
10	VCC		PWR	

J12

Table 9 – I2C Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	VCC		PWR	
2	VCC		PWR	
3	SCL		I/O	J22/1
4	SDA		I/O	J22/2
5	GND		PWR	
6	GND		PWR	

J16

Table 10 – SPI Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	VCC		PWR	
2	SS		I/O	J3/0
3	SCK		I/O	J3/1
4	MOSI		I/O	J3/2
5	MISO		I/O	J3/3
6	GND		PWR	

J18

Table 11 – Serial Port 2 Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1				
2	RXD		I/O	J15/4
3	TXD		I/O	J15/1
4				
5	GND		PWR	
6				
7				
8				
9				
10				

J23

Table 12 – LED Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	D3		I	U11/9
2	D4		I	U11/5
3	D5		I	U11/3
4	D6		I	U1/1
5	GND		PWR	
6	VCC		PWR	

Table 13 – SPKR Connector Pinout

Pin	Function	Alt. Function	I/O	Internal Connections
1	GND		PWR	
2	SPKR		I	

Section 6

References

Data Sheets

- [1] ATmega128: www.atmel.com
- [2] FM24C256-SE: www.ramtron.com
- [3] DS1307, MAX202, MAX485, MAX1674: www.maxim-ic.com
- [4] Ethernet-Module IIM7010A www.i2chip.com
- [5] EA DIP204-4 LCD www.lcd-module.de
- [6] E-Lab Computers www.e-lab.de

Contact

Elektronik-Atelier
Hans Kallen
Steinackerweg 14
CH-3075 Rüfenacht
Switzerland

www.avrcard.com
info@avrcard.com

Phone: +41 31 832 1441
Fax: +41 31 832 1442