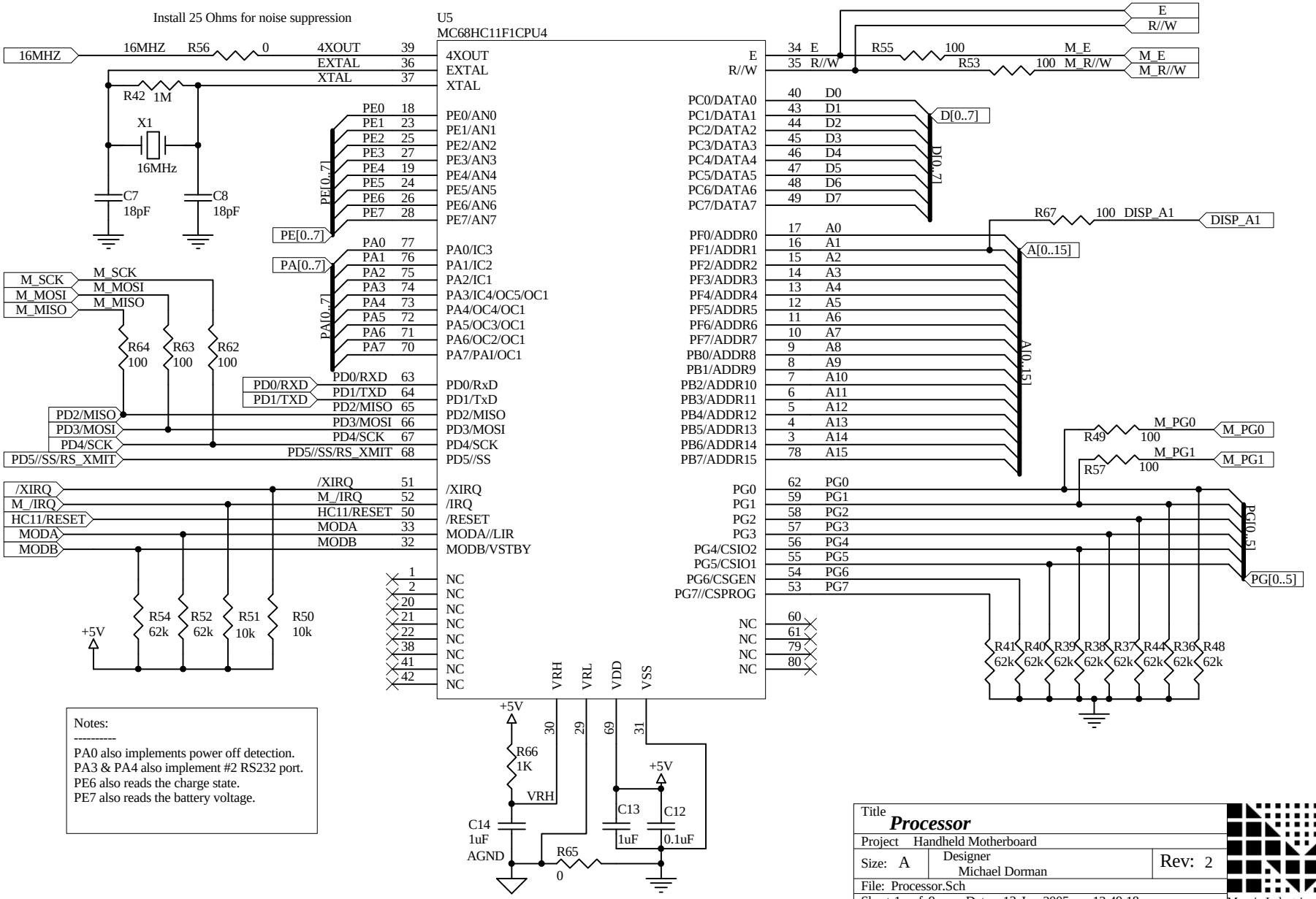
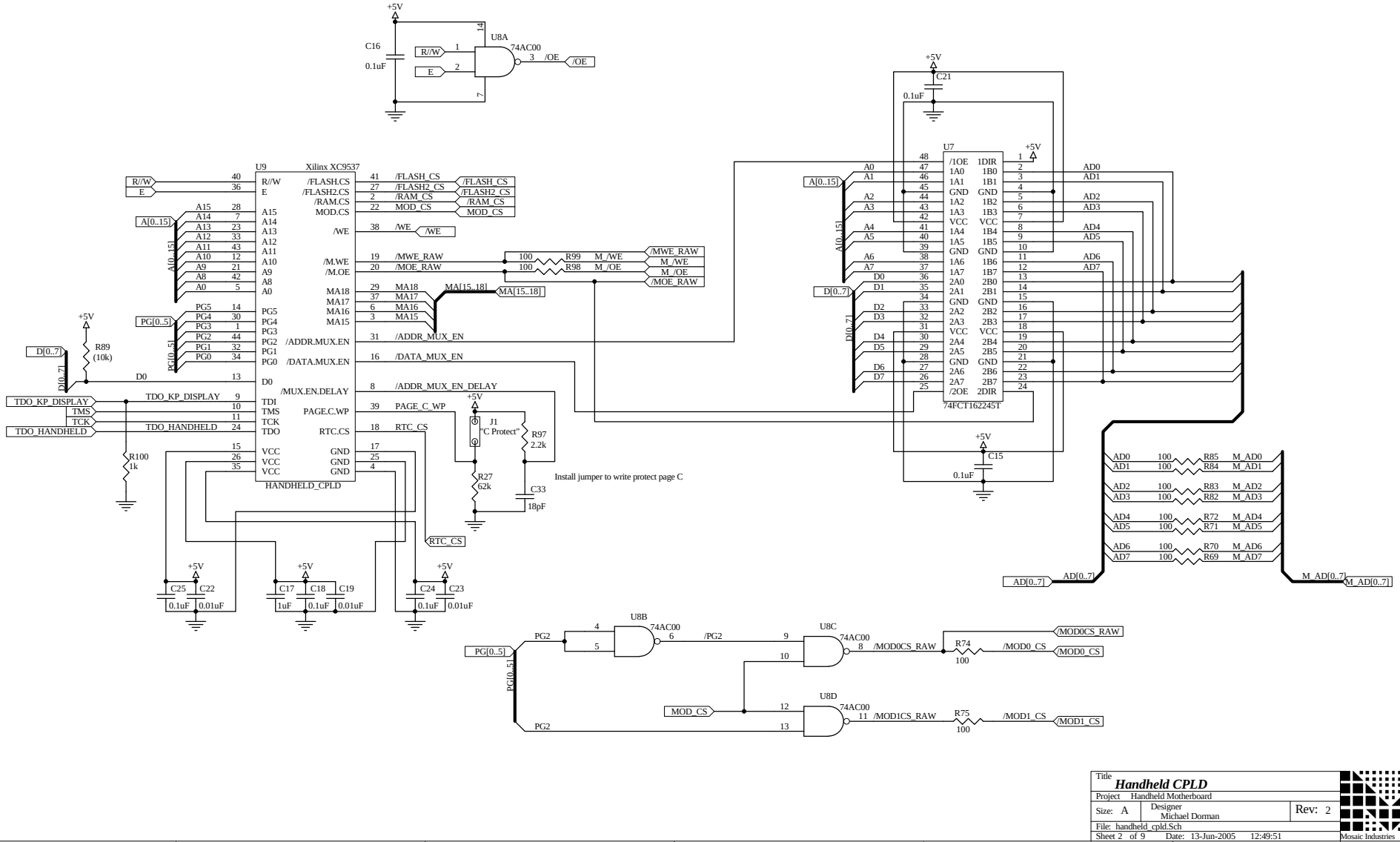


Notes:

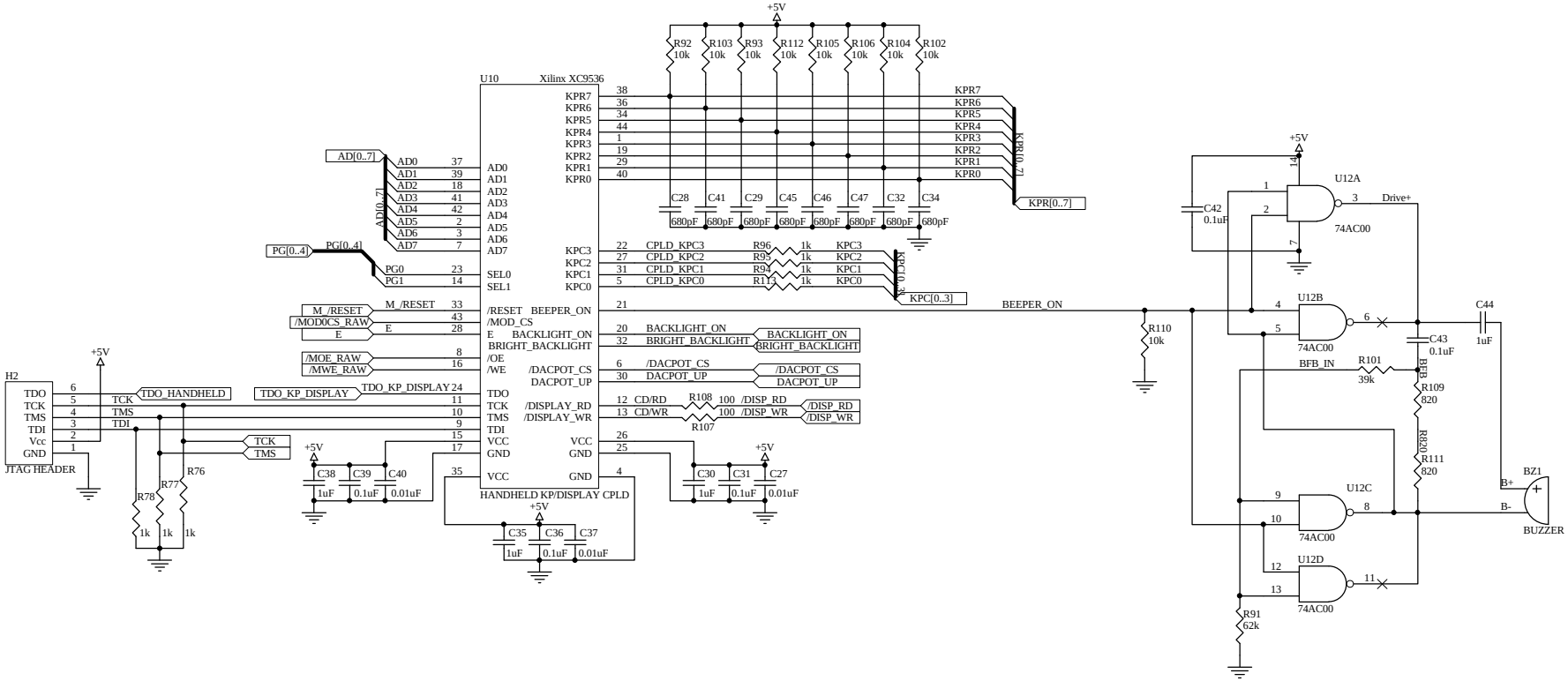
PA0 also implements power off detection.
PA3 & PA4 also implement #2 RS232 port.
PE6 also reads the charge state.
PE7 also reads the battery voltage.

Title ***Processor***		
Project Handheld Motherboard		
Size: A	Designer Michael Dorman	Rev: 2
File: Processor.Sch		
Sheet 1 of 9	Date: 13-Jun-2005 12:49:18	Mosaic Industries

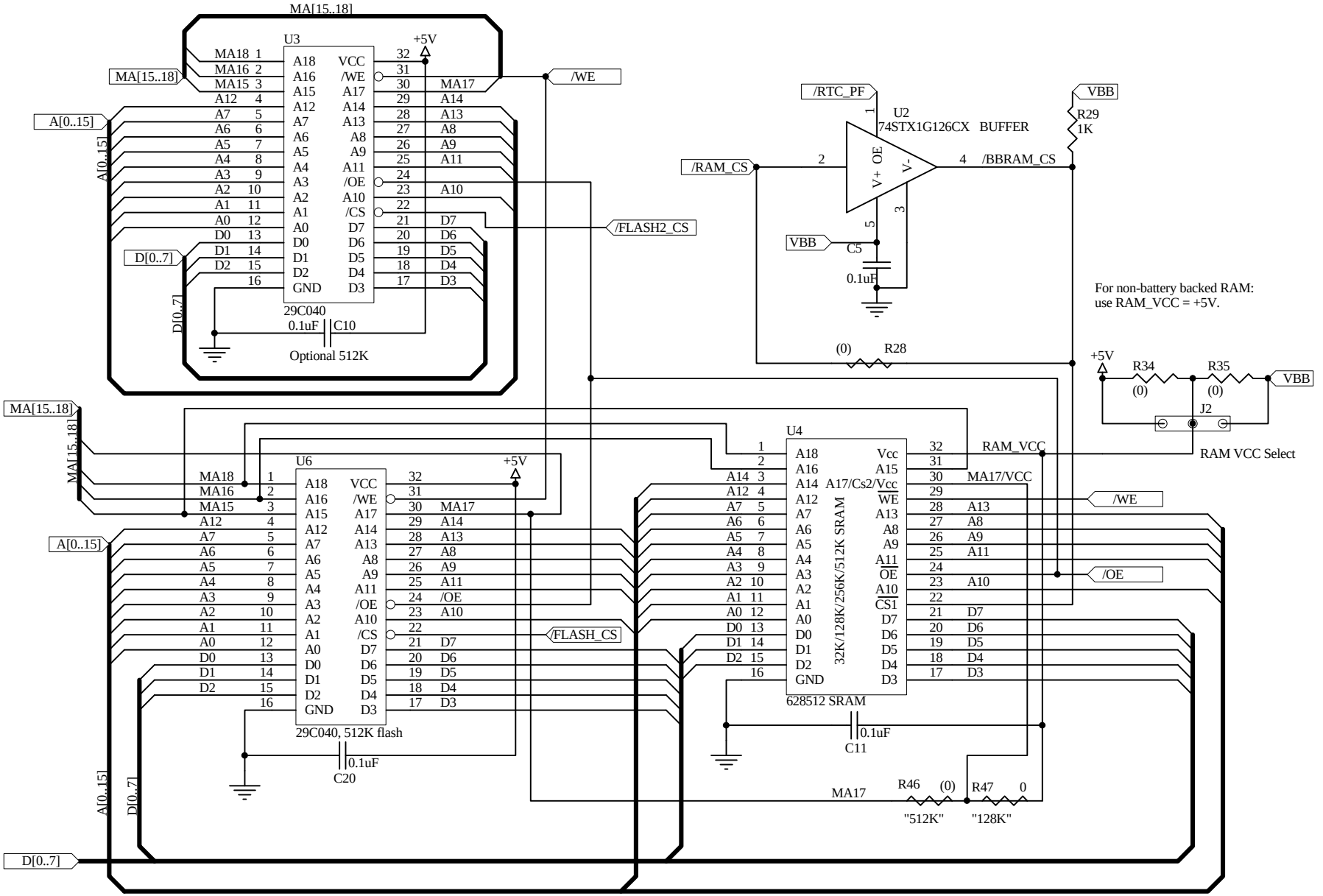


Title	***Handheld CPLD***
Project	Handheld Motherboard
Size: A	Designer: Michael Dorman
Rev: 2	
File: handheld_cpld.Sch	
Sheet 2 of 9	Date: 13-Jun-2005 12:49:51

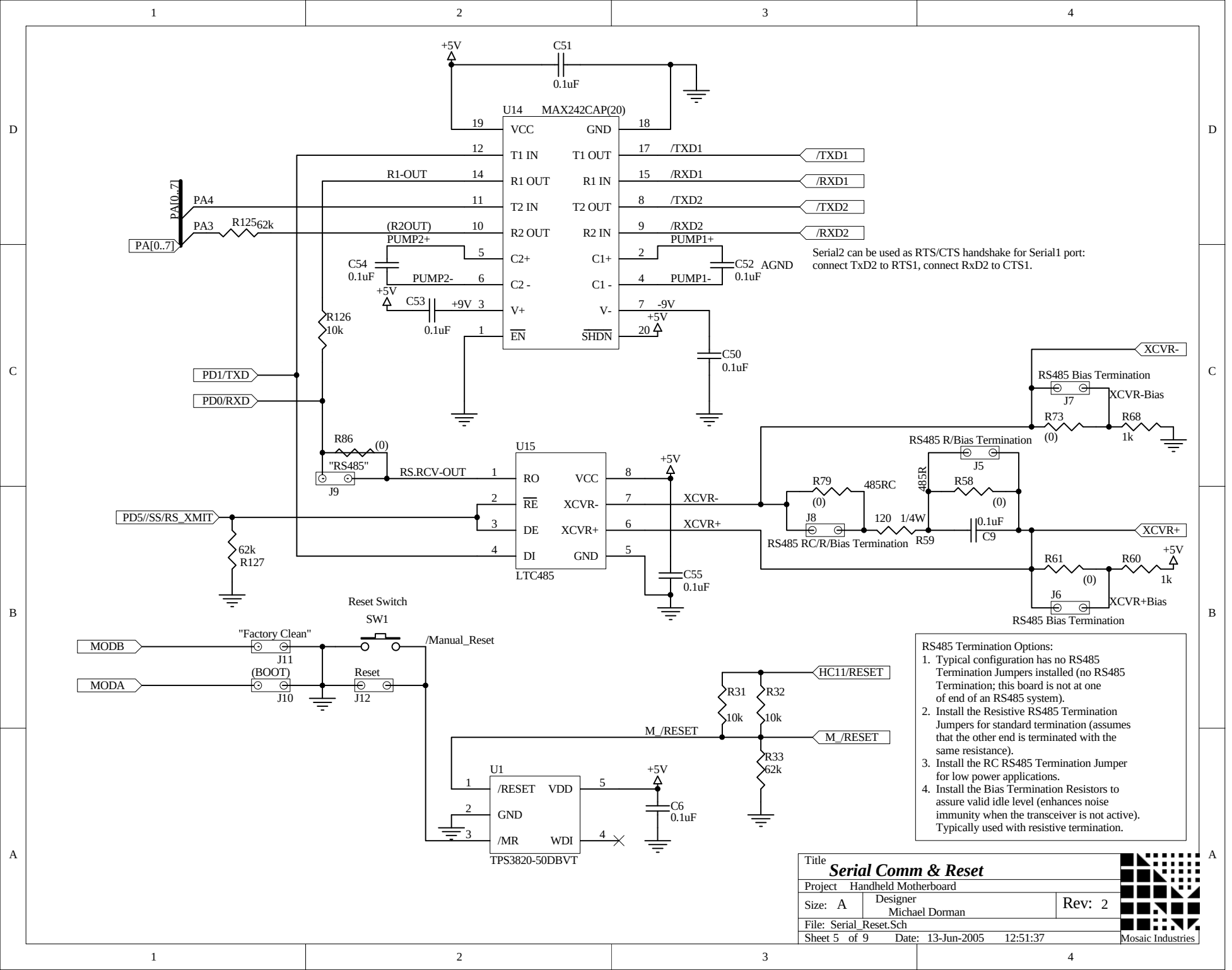
Mosaic Industries

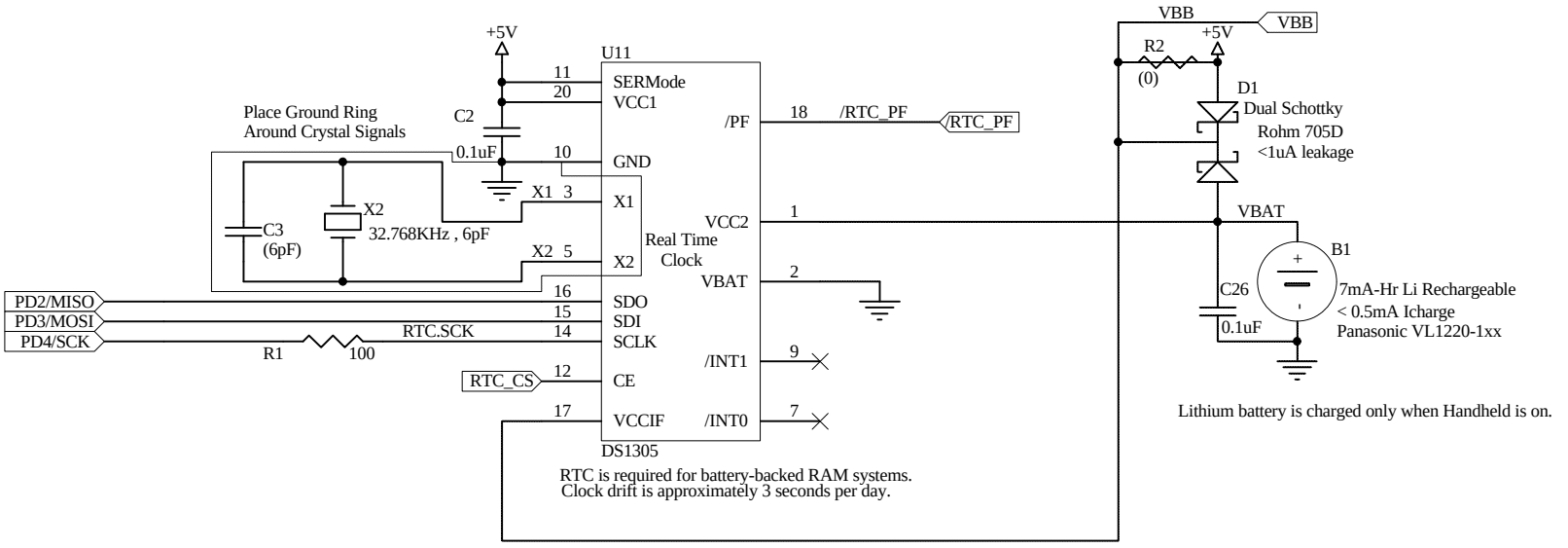


Title	***Keypad/Display CPLD***
Project	Handheld Motherboard
Size: A	Designer: Michael Dorman
Rev: 2	
File: kp_dispay_cpld.sch	
Sheet 3 of 9	Date: 13-Jun-2005 12:50:59
Mosaic Industries	

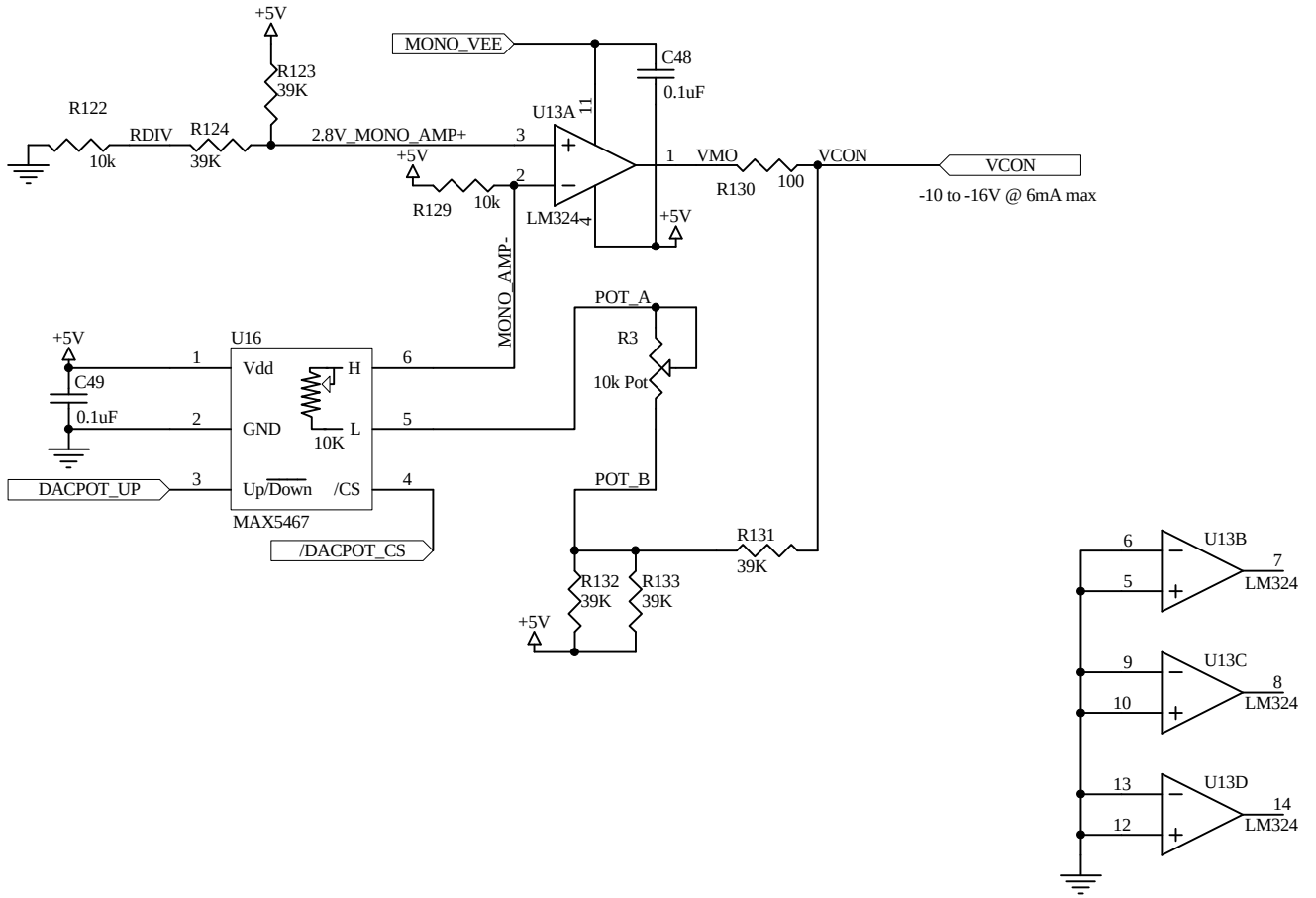


Title	***Memory***	
Project	Handheld Motherboard	
Size: A	Designer Michael Dorman	Rev: 2
File: Memory.sch		
Sheet 4 of 9	Date: 13-Jun-2005 12:51:19	Mosaic Industries

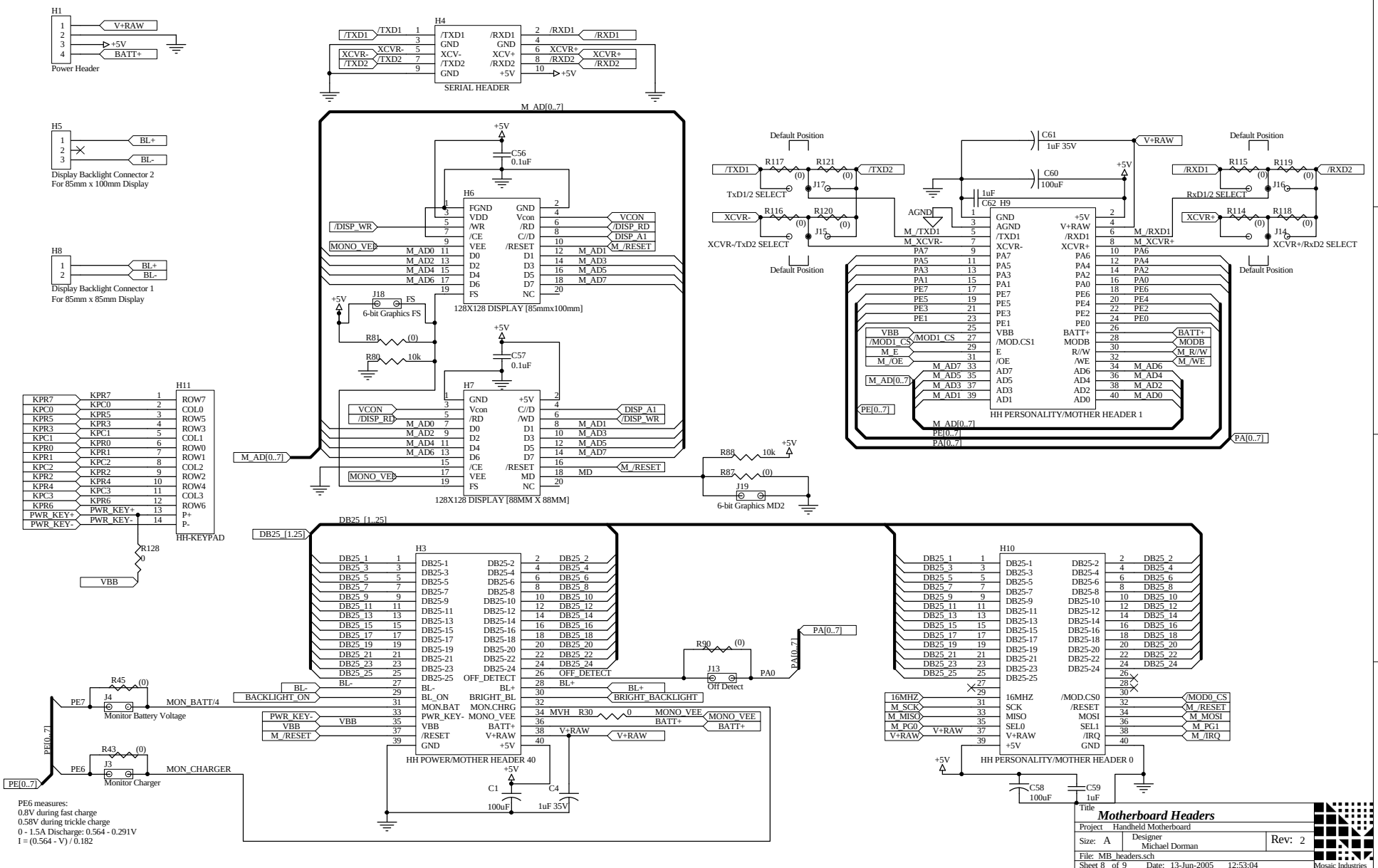

+5V
C51
0.1uF
U14 MAX242CAP(20)
VCC
GND
T1 IN
T1 OUT
/TXD1
R1-OUT
R1 OUT
R1 IN
/RXD1
PA4
T2 IN
T2 OUT
/TXD2
PA3
R125 62k
(R2OUT)
R2 OUT
R2 IN
/RXD2
PA[0..7]
PUMP2+
C2+
C1+
PUMP1+
C54 0.1uF
C52 0.1uF
AGND
PUMP2-
C2 -
C1 -
PUMP1-
+5V
C53
+9V
V+
V-
-9V
0.1uF
R126 10k
EN
SHDN
C50 0.1uF
Serial2 can be used as RTS/CTS handshake for Serial1 port:
connect TxD2 to RTS1, connect RxD2 to CTS1.
PD1/TXD
PD0/RXD
XCVR-
RS485 Bias Termination
J7
XCVR-Bias
R73 (0)
R68 1k
R86 (0)
"RS485"
J9
RS.RCV-OUT
U15
RO
VCC
RS485 R/Bias Termination
J5
R79 (0)
485RC
485R
R58 (0)
PD5//SS/RS_XMIT
RE
XCVR-
XCVR+
DE
XCVR+
J8
120 1/4W
0.1uF
C9
RS485 RC/R/Bias Termination
R59
62k
R127
DI
GND
LTC485
C55 0.1uF
R61 (0)
R60 1k
J6
XCVR+Bias
RS485 Bias Termination
Reset Switch
SW1
"Factory Clean"
/Manual_Reset
MODB
J11
(BOOT)
Reset
MODA
J10
J12
HC11/RESET
R31 10k
R32 10k
M_/RESET
R33 62k
U1
/RESET
VDD
GND
/MR
WDI
C6 0.1uF
TPS3820-50DBVT
RS485 Termination Options:
1. Typical configuration has no RS485 Termination Jumpers installed (no RS485 Termination; this board is not at one of end of an RS485 system).
2. Install the Resistive RS485 Termination Jumpers for standard termination (assumes that the other end is terminated with the same resistance).
3. Install the RC RS485 Termination Jumper for low power applications.
4. Install the Bias Termination Resistors to assure valid idle level (enhances noise immunity when the transceiver is not active). Typically used with resistive termination.
Title
Serial Comm & Reset
Project Handheld Motherboard
Size: A
Designer
Michael Dorman
Rev: 2
File: Serial_Reset.Sch
Sheet 5 of 9
Date: 13-Jun-2005 12:51:37
Mosaic Industries

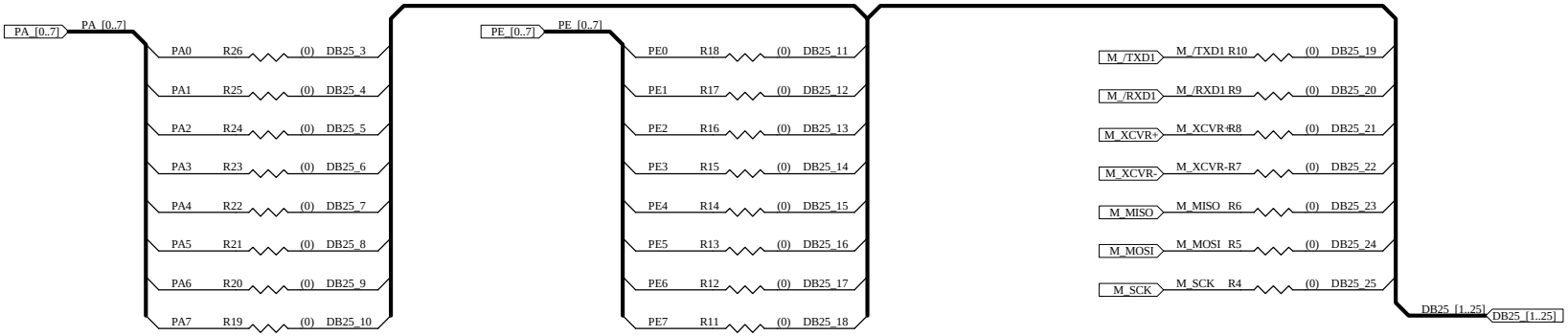


Title: ***Real-Time Clock***		
Project: Handheld Motherboard		
Size: A	Designer: Michael Dorman	Rev: 2
File: RTC.Sch		
Sheet 6 of 9	Date: 13-Jun-2005 12:52:01	Mosaic Industries



Title: ***LCD Contrast Adjust***		
Project: Handheld Motherboard		
Size: A	Designer: Michael Dorman	Rev: 2
File: LCD_Contrast.Sch		
Sheet 7 of 9	Date: 13-Jun-2005 12:52:32	Mosaic Industries

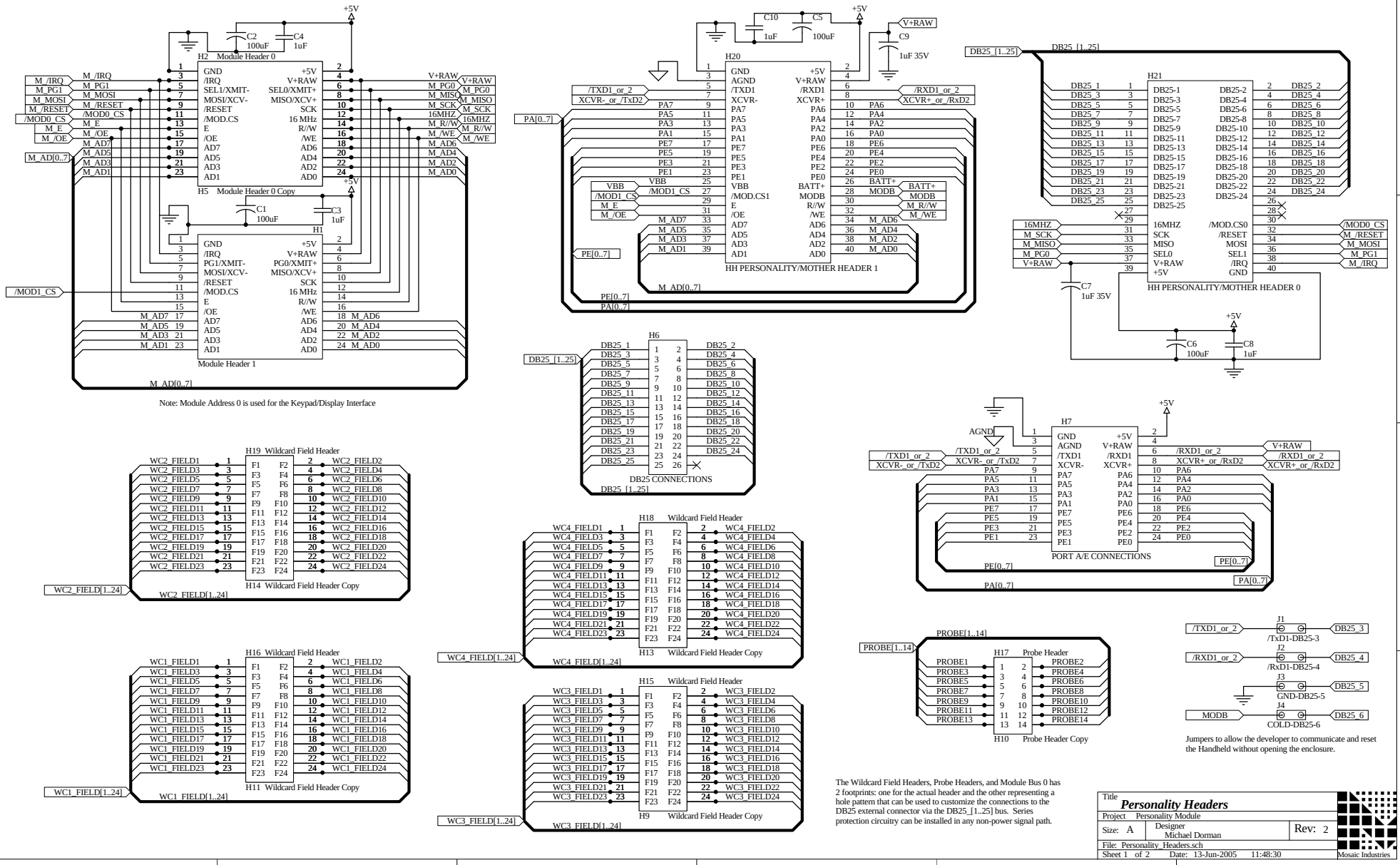

H1
V+RAW
+5V
BATT+
Power Header
H4
/TXD1
/RXD1
XCVR-
XCVR+
/TXD2
/RXD2
GND
+5V
SERIAL HEADER
H5
BL+
BL-
Display Backlight Connector 2
For 85mm x 100mm Display
H8
Display Backlight Connector 1
For 85mm x 85mm Display
M_AD[0..7]
H6
128X128 DISPLAY [85mmx100mm]
H7
128X128 DISPLAY [88MM X 88MM]
C56
0.1uF
C57
0.1uF
R81
R80
10k
J18
6-bit Graphics FS
R88
R87
J19
6-bit Graphics MD2
H11
HH-KEYPAD
R128
VBB
Default Position
TxD1/2 SELECT
XCVR-/TxD2 SELECT
RxD1/2 SELECT
XCVR+/RxD2 SELECT
C61
1uF 35V
C60
100uF
C62
1uF
H9
HH PERSONALITY/MOTHER HEADER 1
PA[0..7]
PE[0..7]
DB25_[1..25]
H3
HH POWER/MOTHER HEADER 40
R90
J13
Off Detect
R45
J4
Monitor Battery Voltage
MON_BATT/4
R43
J3
Monitor Charger
MON_CHARGER
C1
100uF
C4
1uF 35V
H10
HH PERSONALITY/MOTHER HEADER 0
C58
100uF
C59
1uF
PE6 measures:
0.8V during fast charge
0.58V during trickle charge
0 - 1.5A Discharge: 0.564 - 0.291V
I = (0.564 - V) / 0.182
Title
Motherboard Headers
Project Handheld Motherboard
Size: A
Designer
Michael Dorman
Rev: 2
File: MB_headers.sch
Sheet 8 of 9
Date: 13-Jun-2005 12:53:04
Mosaic Industries

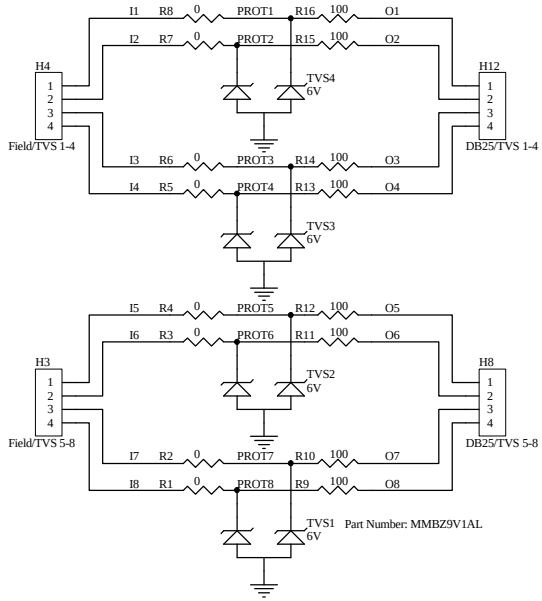


Note:

These resistors are only installed for a system without a Personality Board. With these resistors installed, Port A, Port E, Serial 1, Serial 2, and the SPI are mapped to pins of the DB25 connector.

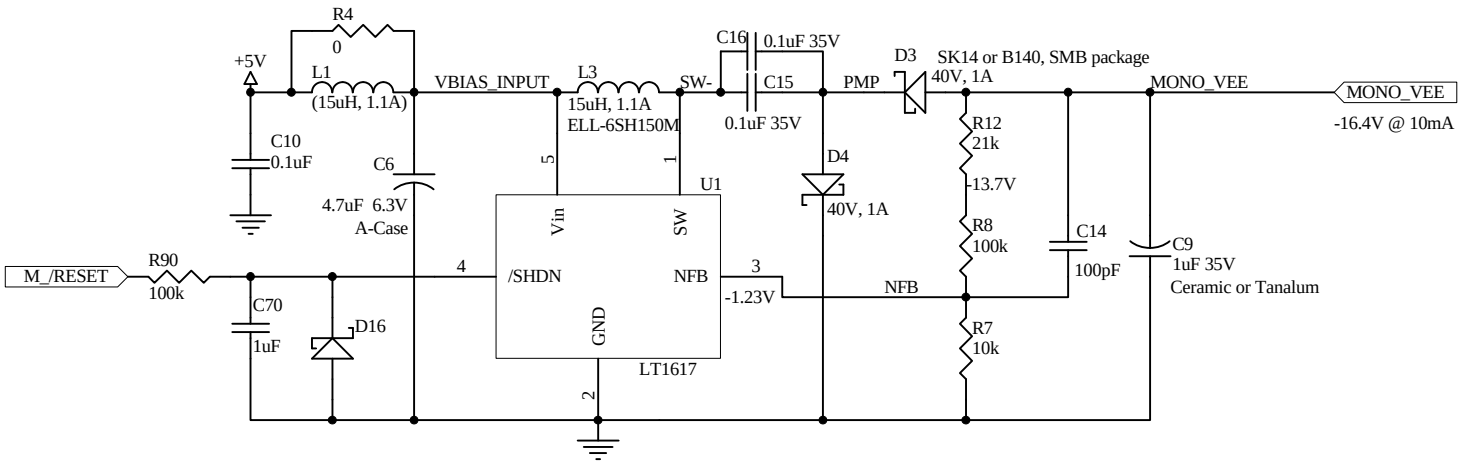
Title	***Motherboard Jumpers***	
Project	Handheld Motherboard	
Size: A	Designer Michael Dorman	Rev: 2
File: MB_Jumpers.sch		
Sheet 9 of 9	Date: 13-Jun-2005 12:53:19	Mosaic Industries


H2 Module Header 0
H5 Module Header 0 Copy
H1
Module Header 1
M_AD[0..7]
Note: Module Address 0 is used for the Keypad/Display Interface
H20
HH PERSONALITY/MOTHER HEADER 1
PE[0..7]
PA[0..7]
H21
HH PERSONALITY/MOTHER HEADER 0
H6
DB25 CONNECTIONS
DB25_[1..25]
H7
PORT A/E CONNECTIONS
H19 Wildcard Field Header
H14 Wildcard Field Header Copy
WC2_FIELD[1..24]
H18 Wildcard Field Header
H13 Wildcard Field Header Copy
WC4_FIELD[1..24]
H16 Wildcard Field Header
H11 Wildcard Field Header Copy
WC1_FIELD[1..24]
H15 Wildcard Field Header
H9 Wildcard Field Header Copy
WC3_FIELD[1..24]
H17 Probe Header
H10 Probe Header Copy
PROBE[1..14]
J1 /TXD1-DB25-3
J2 /RXD1-DB25-4
J3 GND-DB25-5
J4 COLD-DB25-6
Jumpers to allow the developer to communicate and reset the Handheld without opening the enclosure.
The Wildcard Field Headers, Probe Headers, and Module Bus 0 has 2 footprints: one for the actual header and the other representing a hole pattern that can be used to customize the connections to the DB25 external connector via the DB25_[1..25] bus. Series protection circuitry can be installed in any non-power signal path.
Title Personality Headers
Project Personality Module
Size: A
Designer Michael Dorman
Rev: 2
File: Personality_Headers.sch
Sheet 1 of 2
Date: 13-Jun-2005 11:48:30
Mosaic Industries

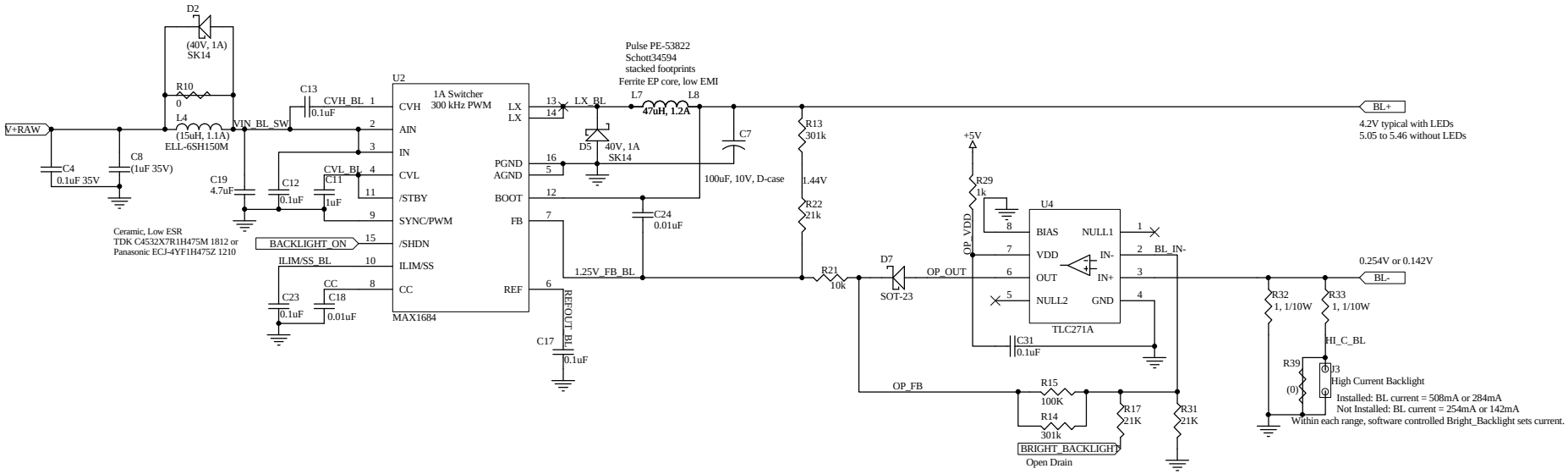


A series protection circuit can be installed in any non-power signal path between a node on the Field/TVS Header and the DB25/TVS Header. This schematic shows protection circuits configured for input signals. For outputs from the Handheld, reverse the 0 ohm and 100 ohm resistors for maximum protection.

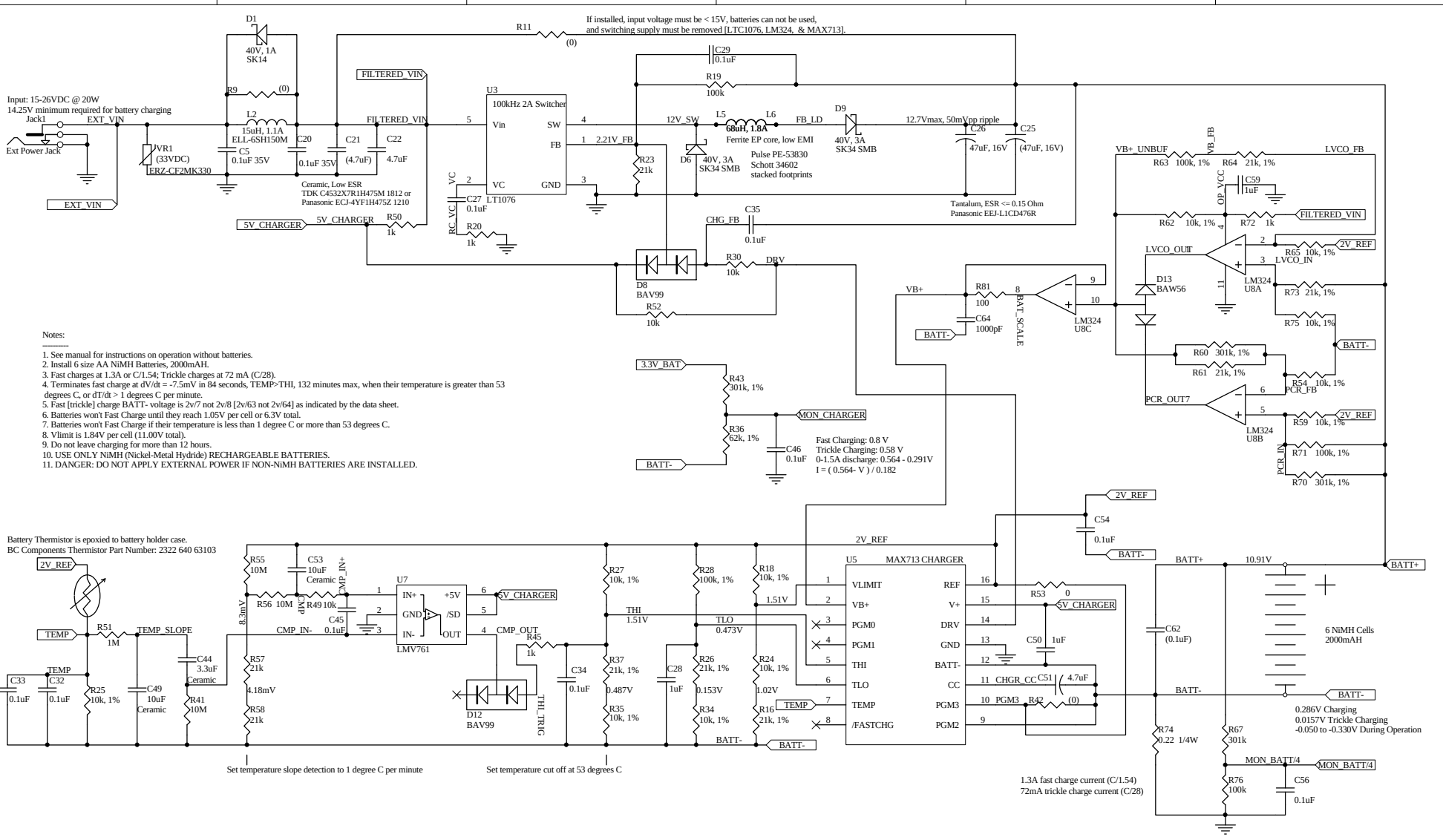
Title: ***Protection***		
Project: Personality Module		
Size: A	Designer: Michael Dorman	Rev: 2
File: Protection.sch		
Sheet 2 of 2	Date: 13-Jun-2005 11:37:50	Mosaic Industries



Title: ***LCD Bias Supply***		
Project: Handheld Power Board		
Size: A	Designer: Michael Dorman	Rev: 4
File: LCD_Bias.Sch		
Sheet 1 of 5	Date: 13-Jun-2005 12:55:49	Mosaic Industries



Title	***Backlight Supply***	
Project	Handheld Power Board	
Size: A	Designer: Paul Clifford	Rev: 4
File: Backlight.sch		
Sheet 2 of 5	Date: 13-Jun-2005 12:56:13	Mosaic Industries


If installed, input voltage must be < 15V, batteries can not be used, and switching supply must be removed [LTC1076, LM324, & MAX713].
Input: 15-26VDC @ 20W
14.25V minimum required for battery charging
Jack1
Ext Power Jack
EXT_VIN
D1
40V, 1A
SK14
R9 (0)
L2
15uH, 1.1A
ELL-6SH150M
C5
0.1uF 35V
C20
0.1uF 35V
C21
(4.7uF)
C22
4.7uF
VR1
(33VDC)
ERZ-CF2MK330
Ceramic, Low ESR
TDK C4532X7R1H475M 1812 or
Panasonic ECJ-4YF1H475Z 1210
FILTERED_VIN
5V_CHARGER
R50
1k
R11 (0)
C29
0.1uF
R19
100k
U3
100kHz 2A Switcher
Vin
SW
FB
GND
VC
LT1076
C27
0.1uF
R20
1k
R23
21k
2.21V_FB
12V_SW
L5
68uH, 1.8A
Ferrite EP core, low EMI
Pulse PE-53830
Schott 34602
stacked footprints
L6
FB_LD
D9
40V, 3A
SK34 SMB
D6
40V, 3A
SK34 SMB
12.7Vmax, 50mVpp ripple
C26
47uF, 16V
C25
(47uF, 16V)
Tantalum, ESR <= 0.15 Ohm
Panasonic EEJ-L1CD476R
CHG_FB
C35
0.1uF
R30
10k
DRV
D8
BAV99
R52
10k
VB+_UNBUF
VB_FB
LVCO_FB
R63 100k, 1%
R64 21k, 1%
OP_VCC
C59
1uF
R62 10k, 1%
R72 1k
LVCO_OUT
2V_REF
R65 10k, 1%
LVCO_IN
LM324
U8A
D13
BAW56
R73 21k, 1%
R75 10k, 1%
BATT-
R60 301k, 1%
R61 21k, 1%
R54 10k, 1%
PCR_FB
PCR_OUT7
R59 10k, 1%
PCR_IN
R71 100k, 1%
R70 301k, 1%
VB+
R81
100
C64
1000pF
BAT_SCALE
LM324
U8C
3.3V_BAT
R43
301k, 1%
MON_CHARGER
R36
62k, 1%
C46
0.1uF
Fast Charging: 0.8 V
Trickle Charging: 0.58 V
0-1.5A discharge: 0.564 - 0.291V
I = (0.564- V) / 0.182
Notes:
1. See manual for instructions on operation without batteries.
2. Install 6 size AA NiMH Batteries, 2000mAH.
3. Fast charges at 1.3A or C/1.54; Trickle charges at 72 mA (C/28).
4. Terminates fast charge at dV/dt = -7.5mV in 84 seconds, TEMP>THI, 132 minutes max, when their temperature is greater than 53 degrees C, or dT/dt > 1 degrees C per minute.
5. Fast [trickle] charge BATT- voltage is 2v/7 not 2v/8 [2v/63 not 2v/64] as indicated by the data sheet.
6. Batteries won't Fast Charge until they reach 1.05V per cell or 6.3V total.
7. Batteries won't Fast Charge if their temperature is less than 1 degree C or more than 53 degrees C.
8. Vlimit is 1.84V per cell (11.00V total).
9. Do not leave charging for more than 12 hours.
10. USE ONLY NiMH (Nickel-Metal Hydride) RECHARGEABLE BATTERIES.
11. DANGER: DO NOT APPLY EXTERNAL POWER IF NON-NiMH BATTERIES ARE INSTALLED.
Battery Thermistor is epoxied to battery holder case.
BC Components Thermistor Part Number: 2322 640 63103
2V_REF
TEMP
R51
1M
TEMP_SLOPE
C44
3.3uF
Ceramic
C33
0.1uF
C32
0.1uF
R25
10k, 1%
C49
10uF
Ceramic
R41
10M
R55
10M
C53
10uF
Ceramic
R56 10M
R49 10k
CMP_IN+
CMP_IN-
C45
0.1uF
8.3mV
4.18mV
R57
21k
R58
21k
U7
LMV761
IN+
IN-
+5V
/SD
OUT
GND
5V_CHARGER
CMP_OUT
R45
1k
D12
BAV99
THI_TRIG
C34
0.1uF
Set temperature slope detection to 1 degree C per minute
Set temperature cut off at 53 degrees C
R27
10k, 1%
THI
1.51V
R37
21k, 1%
0.487V
R35
10k, 1%
R28
100k, 1%
TLO
0.473V
R26
21k, 1%
0.153V
R34
10k, 1%
C28
1uF
R18
10k, 1%
1.51V
R24
10k, 1%
1.02V
R16
21k, 1%
TEMP
BATT-
U5
MAX713 CHARGER
VLIMIT
VB+
PGM0
PGM1
THI
TLO
TEMP
/FASTCHG
REF
V+
DRV
GND
BATT-
CC
PGM3
PGM2
CHGR_CC
PGM3
R42
(0)
R53
0
C50
1uF
C51
4.7uF
C54
0.1uF
BATT+
10.91V
C62
(0.1uF)
6 NiMH Cells
2000mAH
0.286V Charging
0.0157V Trickle Charging
-0.050 to -0.330V During Operation
R74
0.22 1/4W
R67
301k
MON_BATT/4
R76
100k
C56
0.1uF
1.3A fast charge current (C/1.54)
72mA trickle charge current (C/28)
Title
Battery Charger
Project Handheld Power Board
Size: A
Designer
Paul Clifford
Rev: 4
File: Charger.sch
Sheet 3 of 5
Date: 13-Jun-2005
12:56:43
Mosaic Industries

Notes:
1. Instrument may be turned on or off using the power key.
2. Instrument powers up instantly when power key is pressed (if a power supply or battery is present).
3. If Auto-on is jumpered, instrument turns on when ext power is applied.
4. To turn the instrument off, hold down power key for 3 seconds or more.
5. Instrument maintains power state through power interruptions.
6. When the instrument is on, configure PA0 as IC1 to capture rising edge when power key is pressed. This allows you to have orderly shutdown of your software. Configuring PA0 as an output and then setting PA0 low will shut instrument off.
7. The lithium battery or the rechargeable NiMH batteries must be installed for the On/Off key to work.

PWR_KEY+ is tied to VBB through a 0 Ohm resistor on Motherboard.

Install to automatically power up processor when external power is applied.

Install jumper on motherboard to detect when power key is pressed.

Install to power up processor whenever any power is available.

ECJ-2FF0J106Z 0805, 6.3V
ECJ-2FF1A106Z 0805,10V
ECJ-3YF1A106Z 1206, 10V

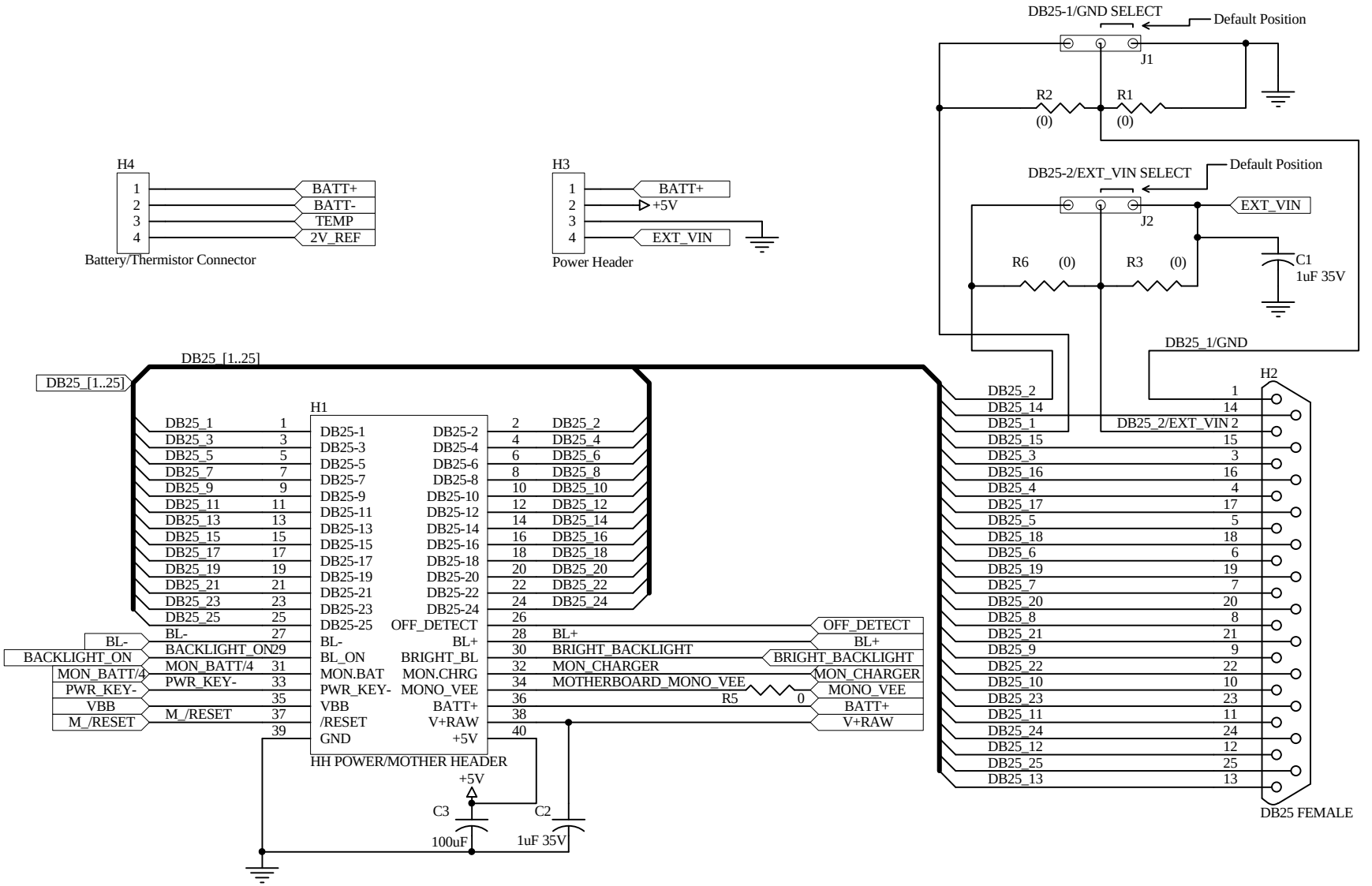
Ceramic, Low ESR
TDK C4532X7R1H475M 1812 or
Panasonic ECJ-4YF1H475Z 1210

Tantalum, ESR <= 0.1 Ohm
Panasonic EEJ-L1AD107R
or AVX TPSD107M010R0100

Regulated directly from NiMH battery stack.

Title	5V Regulator
Project	Handheld Power Board
Size: A	Designer: Michael Dorman/Paul Clifford
Rev: 4	
File: 5V_Regulator.sch	
Sheet 4 of 5	Date: 13-Jun-2005 12:57:21

Mosaic Industries



Title	***Power Board Headers***	
Project	Handheld Power Board	
Size: A	Designer Michael Dorman	Rev: 4
File: Power_Headers.sch		
Sheet 5 of 5	Date: 13-Jun-2005 12:57:42	Mosaic Industries