

De Longhi EAM 3500 - Power Board

Due to some problems with my De Longhi mashine I decided to reverse engineer the whole schematic, while I was waiting for some parts from my vendor in china. Now this is what I came up with.

Special Designators

The designators are not places well on the silk mask. Many of them are not readable. So I decided to give them a special designator. There are two conventions. The first is "a" which means "above" and the second is "b" for below. For example: In a designator "RaR10" are three informations. the first is "R", which represents this Part as a Resistor, as normally. The second information is "a" which says "above". Finally the third information "R10" which represents the component "R10". All in all this means: "The Resistor above R10". There are several different combinations, like "RaC15", "CbR12" or "CbD11" and so on.

Below and above are relativ to the physical hight of the component in the mashine. So the lowest possible part on this board (nothing could be below that) are the mains input (F0 - F4). The highest part (nothing could be above that) is the PC interface pcb edge connector ("J4").

Licensing

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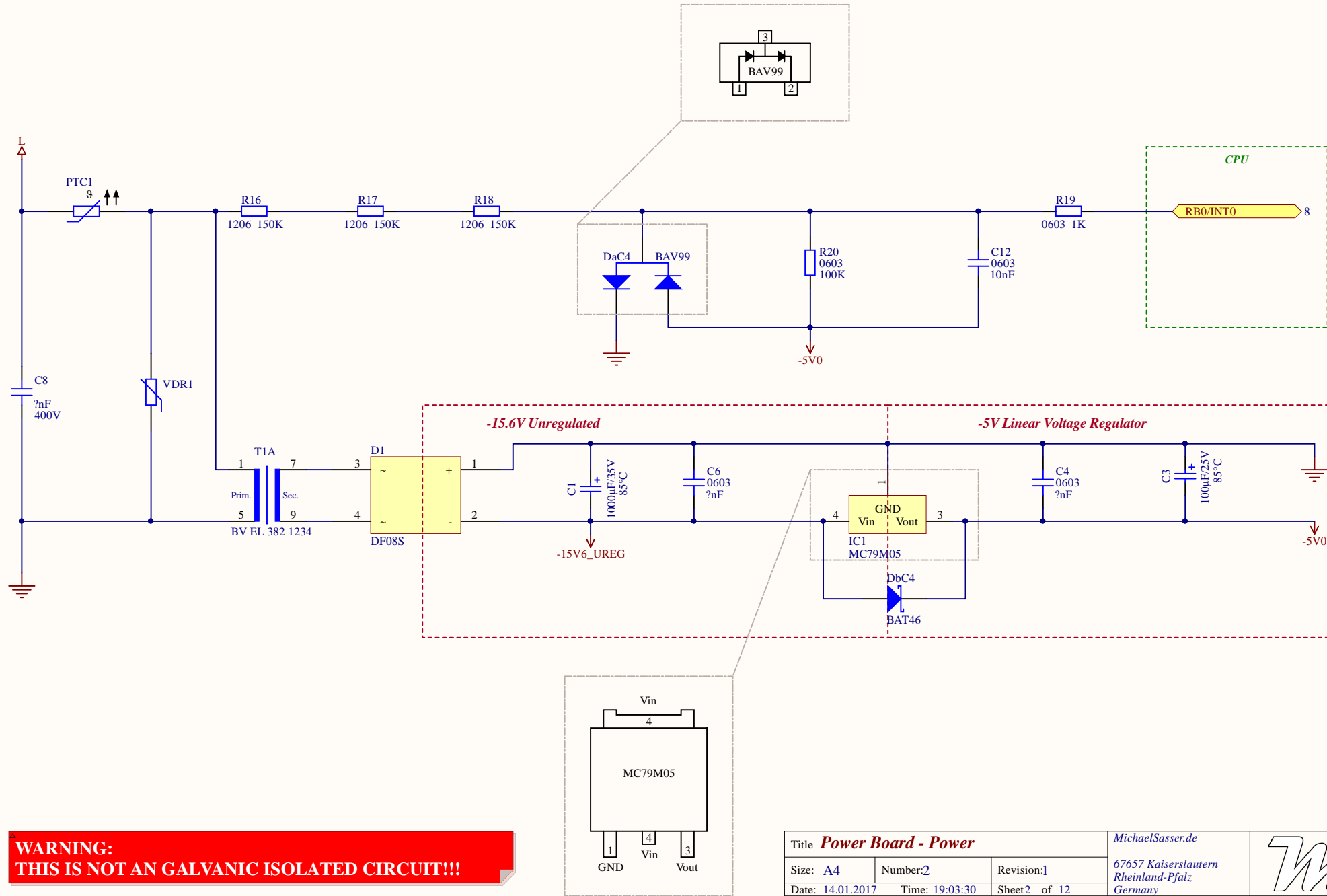
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**WARNING:
THIS IS NOT AN GALVANIC ISOLATED CIRCUIT!!!**

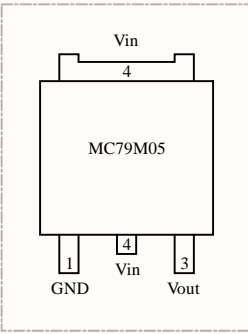


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Title DeLonghi EAM3500 - Power Board			MichaelSasser.de	
Size: A4	Number: 1	Revision: 1	67657 Kaiserslautern Rheinland-Pfalz	
Date: 14.01.2017	Time: 19:03:30	Sheet 1 of 12	Germany	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\Power Board.SchDoc				



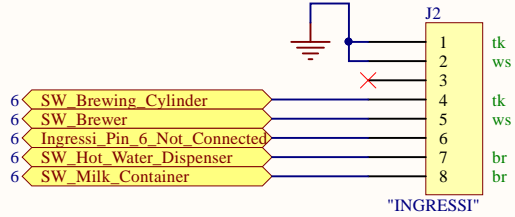
**WARNING:
THIS IS NOT AN GALVANIC ISOLATED CIRCUIT!!!**



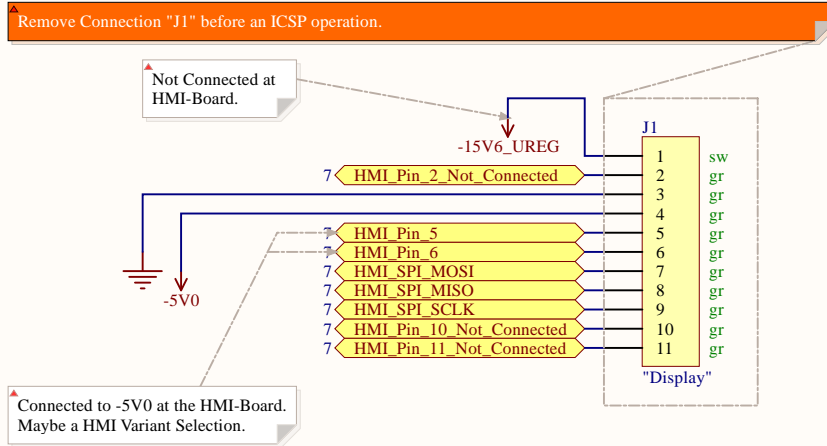
Title Power Board - Power			MichaelSasser.de
Size: A4	Number:2	Revision:1	67657 Kaiserslautern Rheinland-Pfalz Germany
Date: 14.01.2017	Time: 19:03:30	Sheet2 of 12	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\Power.SchDoc			



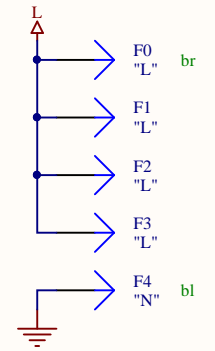
Microswitch Input Connector



HMI Board Connector



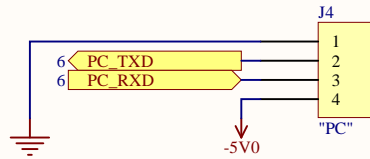
MAINS INPUT ARRAY



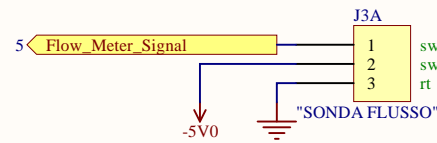
PE is distributed with post bindings on the metal housing and is not connected to the PCB.

WARNING! THIS IS A MAINS REFERENCED DEVICE. DON'T CONNECT ANYTHING DIRECTLY TO IT!!! THERE IS NO GALVANIC ISOLATION!!! YOU CAN LOSE UP YOUR LIFE AND/OR DAMAGE YOUR DEVICES!!! DON'T BE STUPID!!! FIRST HOOK UP AN OPTO-ISOLATOR OR SOMETHING COMPARABLE AND THEN:
 RXD and TXD are using 5V TTL level to communicate. To connect this interface to an RS232 Port on a PC you need proper levelshifter for this type of connection, like the MAX232. Or if you wish to use a USB to RS232 transformer IC, take a look at the FT232RL

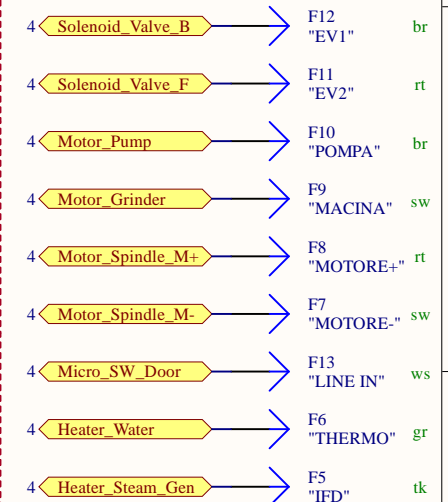
UART Connector



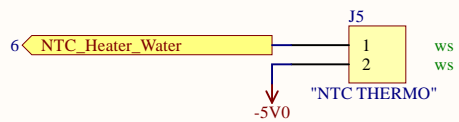
Flow Sensor Connector



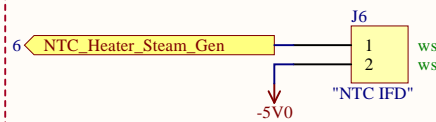
High Current Connector Array



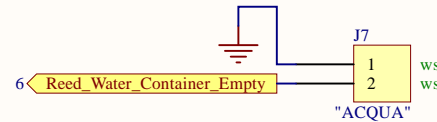
Water Heater NTC Connector



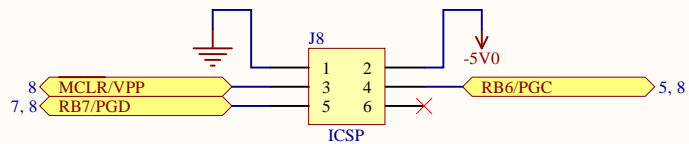
Steam Generation Heater NTC Connector



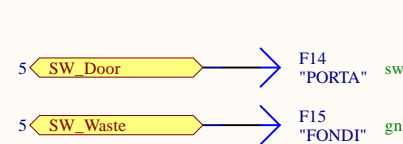
Water Container Status Connector



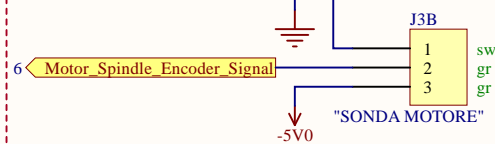
ICSP Connector



Door and Waste Status Connector



Hall Board Connector



xx -> Lables like this represents the cable color code (DIN47002)

Title Power Board - Connections

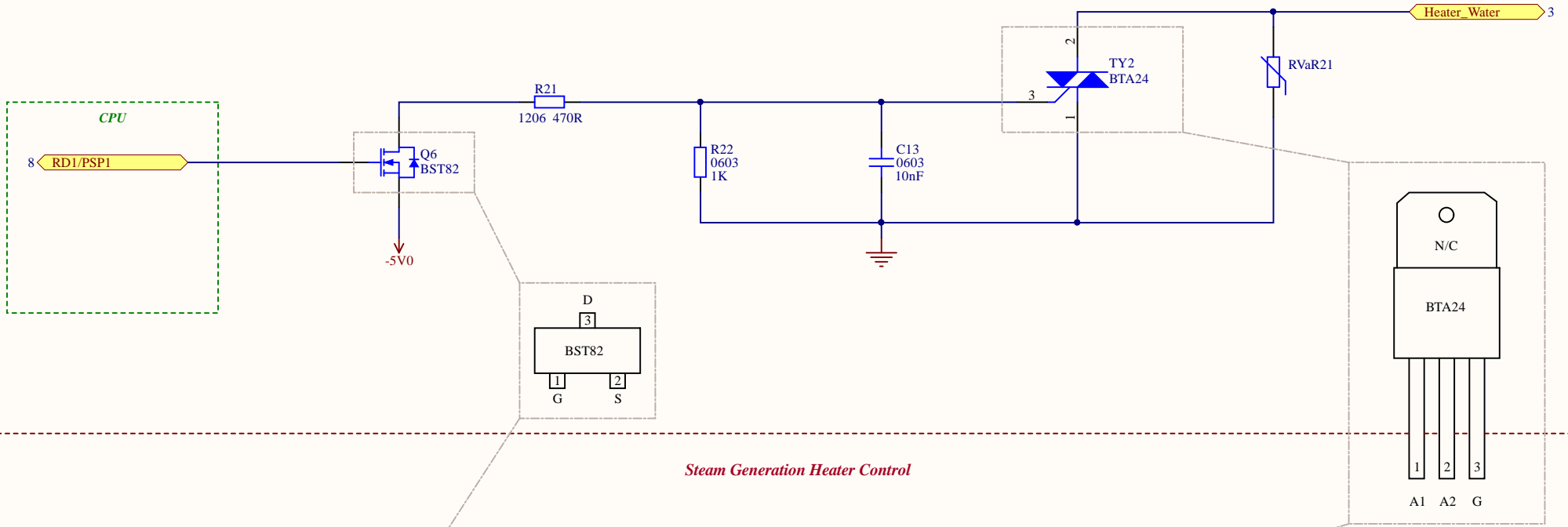
Size: A4 Number:3 Revision:1
 Date: 14.01.2017 Time: 19:03:30 Sheet3 of 12
 File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\Connectors.SchDoc

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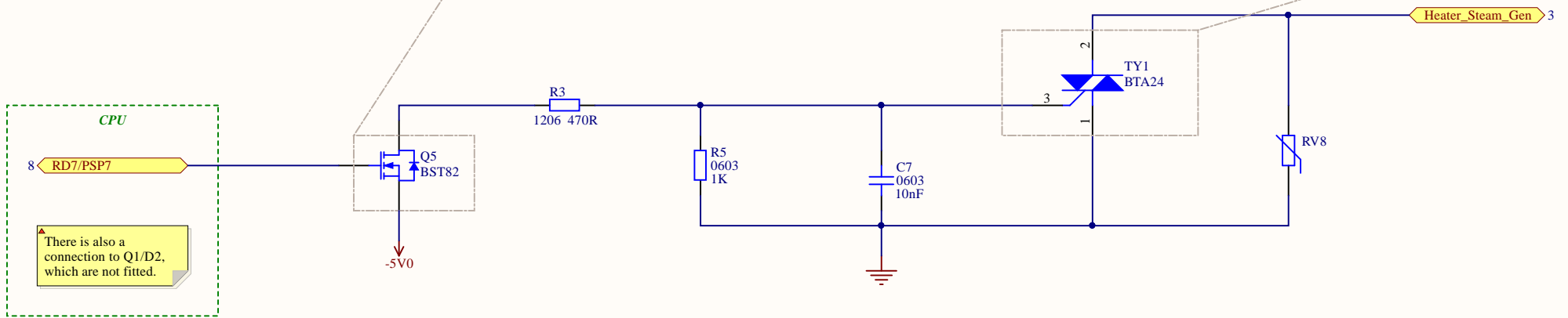
67657 Kaiserslautern
 Rheinland-Pfalz
 Germany



Water Heater Control



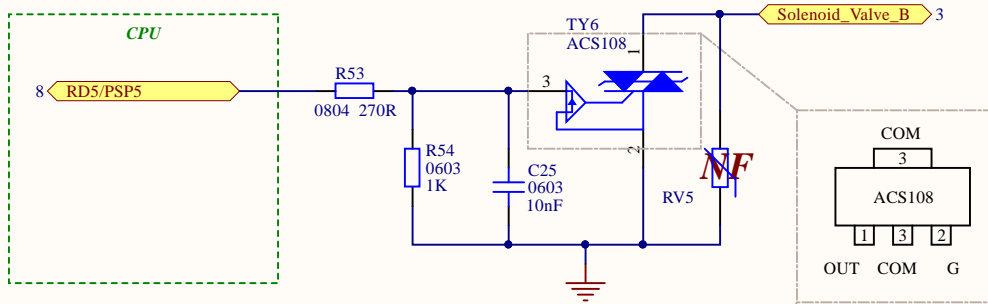
Steam Generation Heater Control



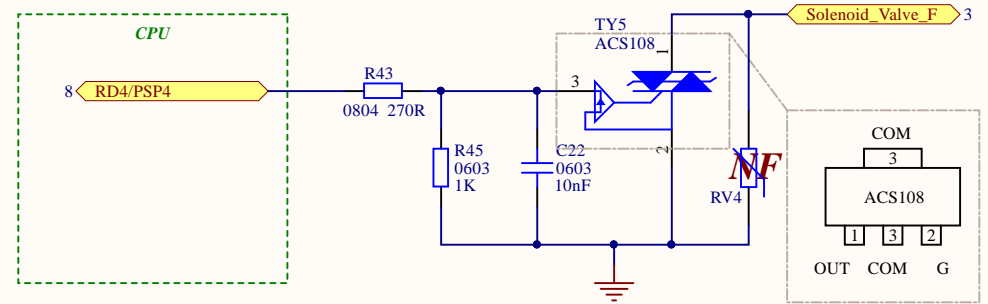
There is also a connection to Q1/D2, which are not fitted.

Title Power Board - Heaters			MichaelSasser.de	
Size: A4	Number: 4	Revision: 1	67657 Kaiserslautern Rheinland-Pfalz	
Date: 14.01.2017	Time: 19:03:30	Sheet 4 of 12	Germany	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\Heaters.SchDoc				

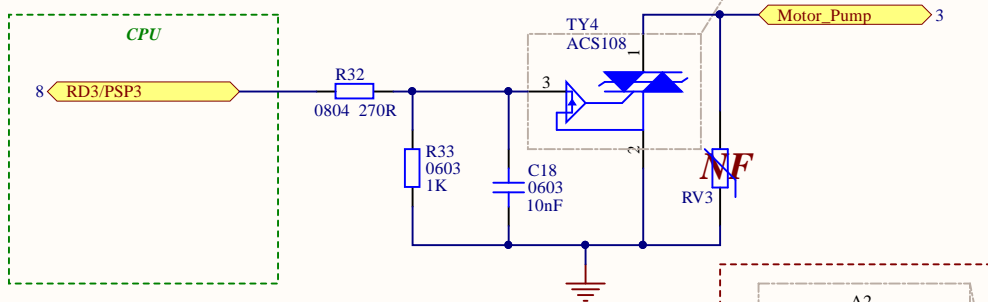
Backside Solenoid Valve Control



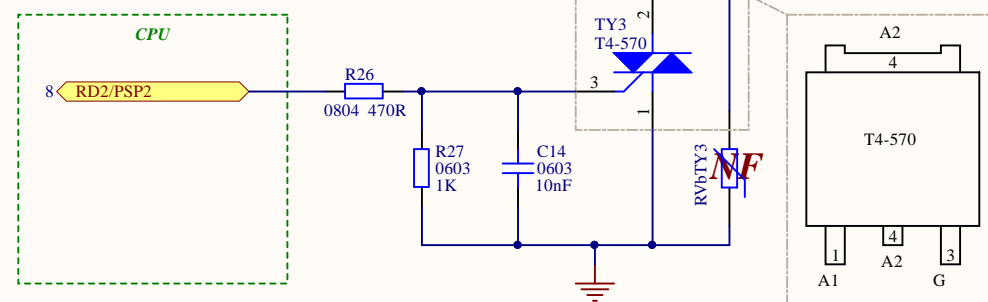
Frontside Solenoid Valve Control



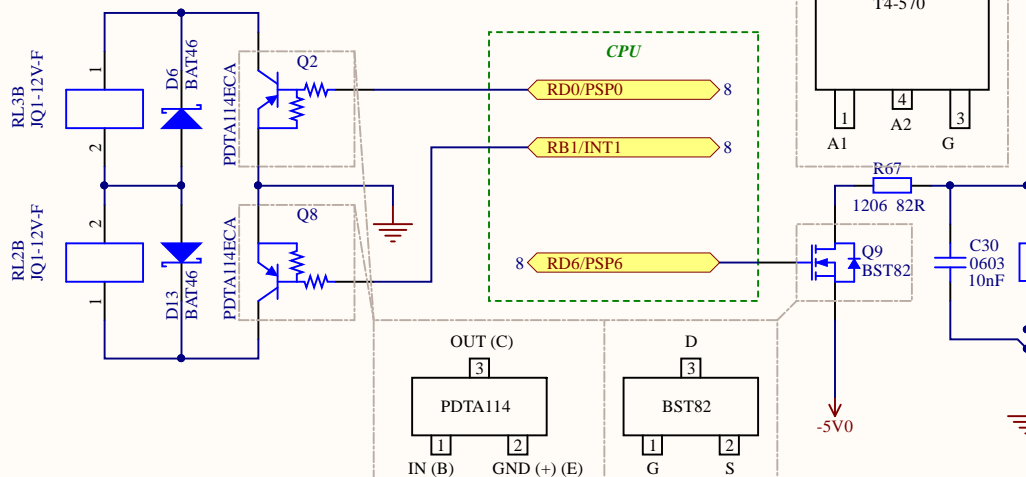
Pump Motor Control



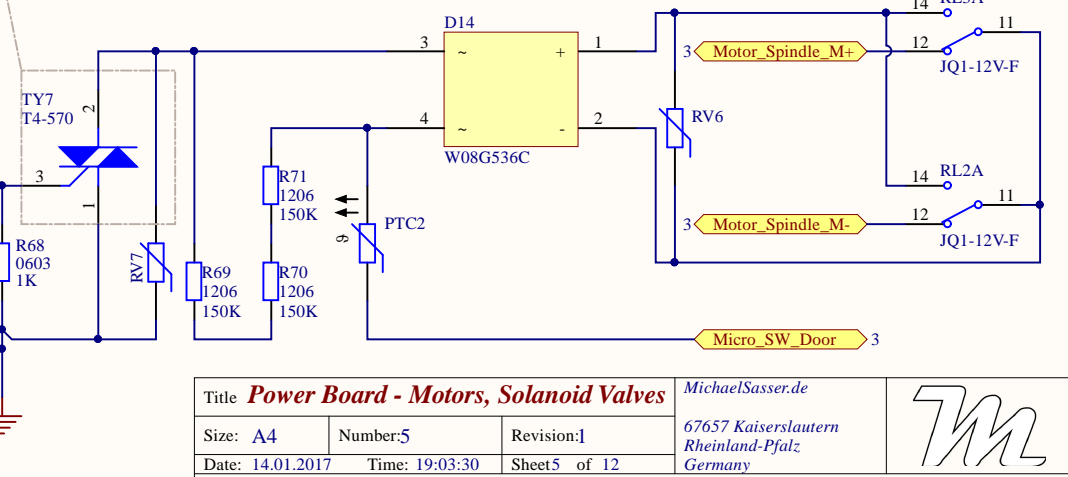
Grinder Motor Control



Spindle Motor Control



Spindle Motor Control



Title Power Board - Motors, Solenoid Valves			MichaelSasser.de
Size: A4	Number:5	Revision:1	67657 Kaiserslautern Rheinland-Pfalz Germany
Date: 14.01.2017	Time: 19:03:30	Sheet 5 of 12	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\Motors, Solenoid Valves.SchDoc			



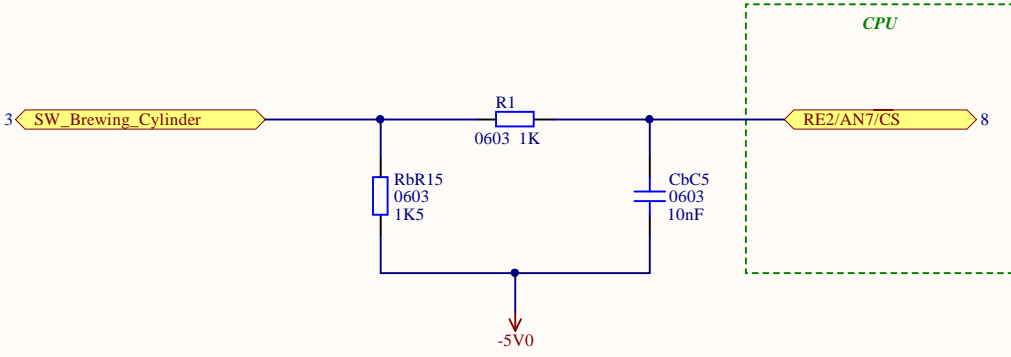
1

2

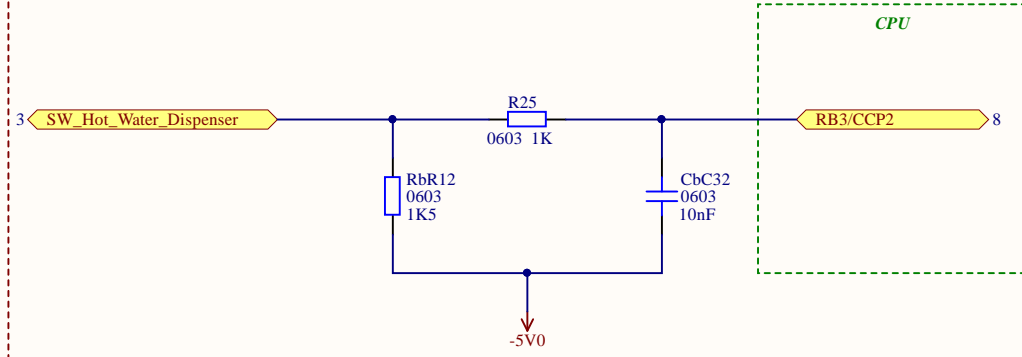
3

4

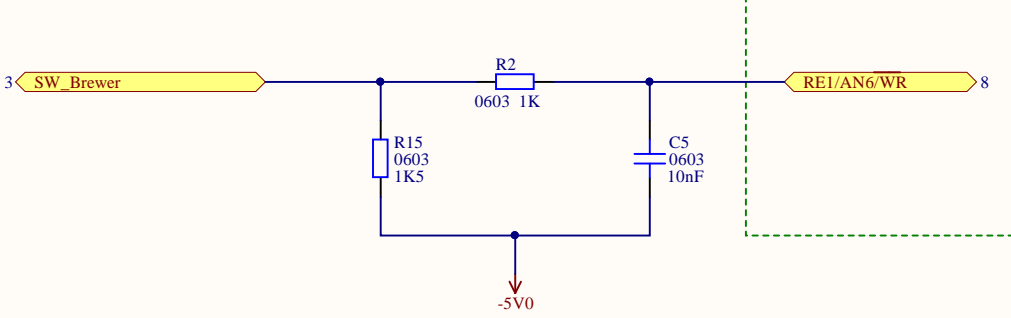
Brewing Cylinder State



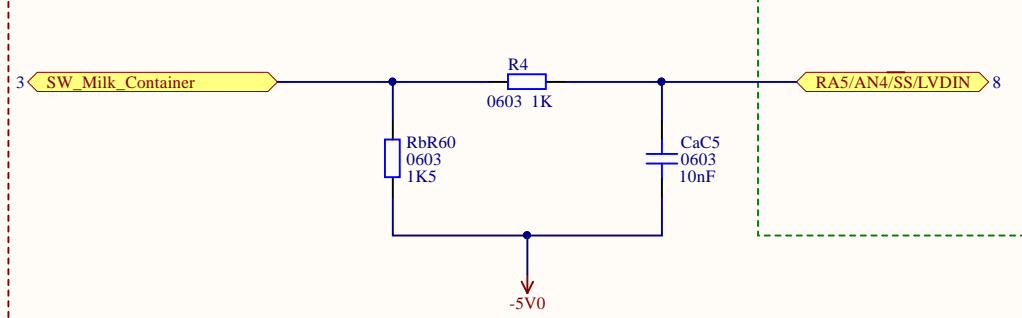
Hot Water Dispenser Nozzle Status



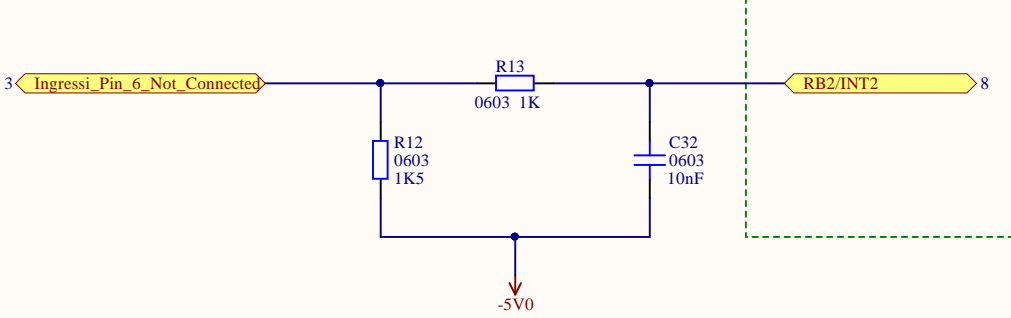
Brewer State




Milk Container Status



Not Connected



Title Power Board - State Switches			MichaelSasser.de	
Size: A4	Number:6	Revision:1	67657 Kaiserslautern Rheinland-Pfalz	
Date: 14.01.2017	Time: 19:03:30	Sheet6 of 12	Germany	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\State Switches.SchDoc				

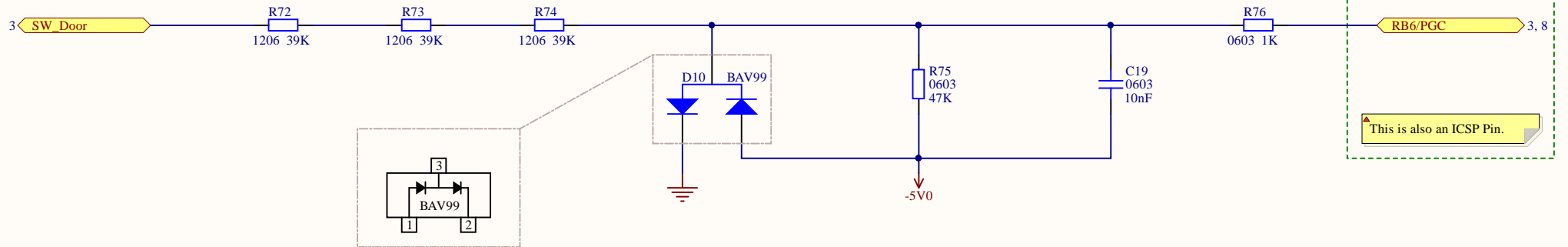
1

2

3

4

Service Door State Sensor

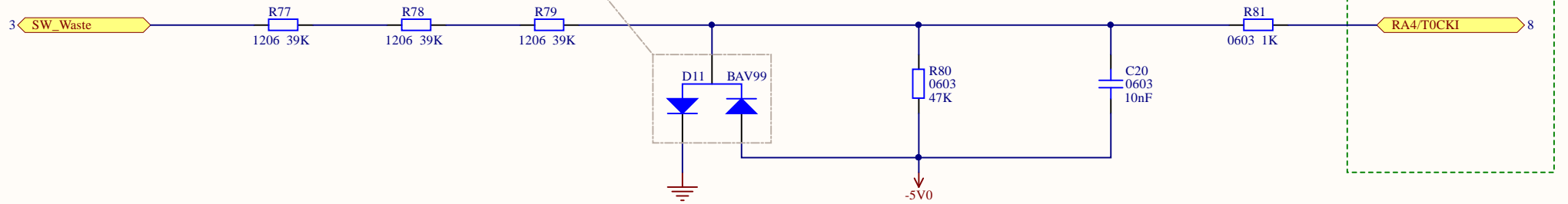


CPU

RB6/PGC 3.8

This is also an ICSP Pin.

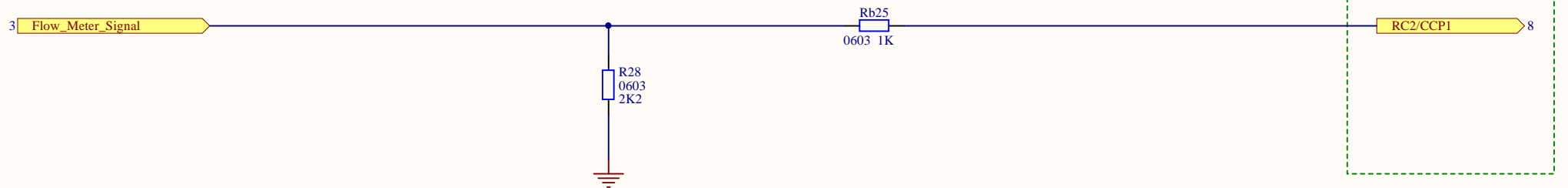
Ground/Waste Container Status Sensor



CPU


RA4/T0CKI 8

Flow Sensor



CPU

RC2/CCP1 8

Title Power Board - Flow, Door, Waste			MichaelSasser.de	
Size: A4	Number:7	Revision:1	67657 Kaiserslautern Rheinland-Pfalz	
Date: 14.01.2017	Time: 19:03:30	Sheet 7 of 12	Germany	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\Flow, Door Waste.SchDoc				

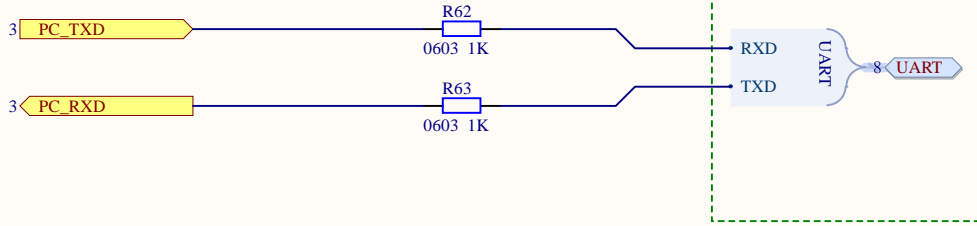
1

2

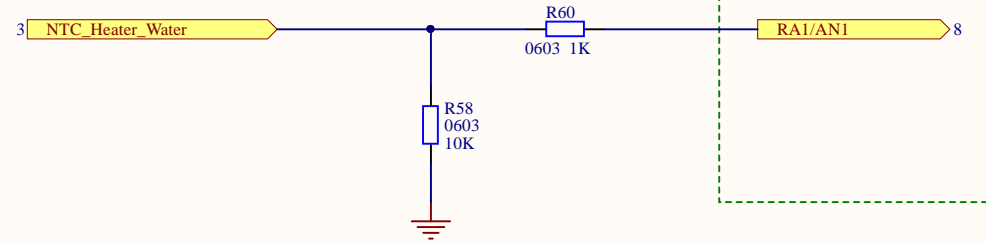
3

4

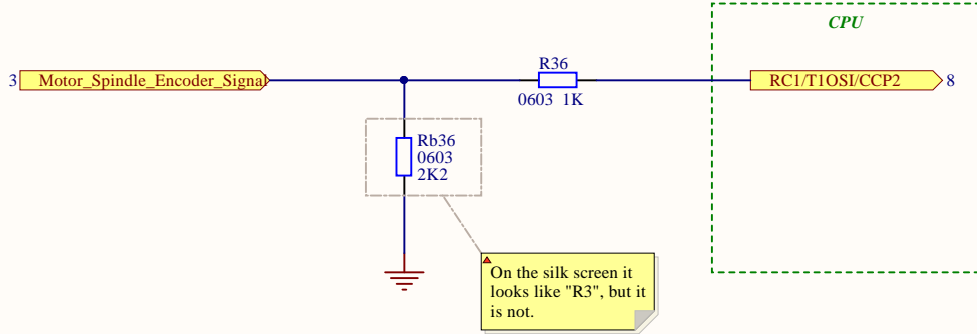
UART



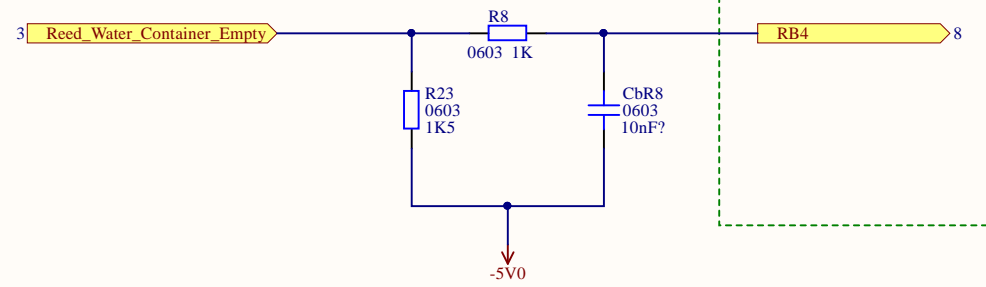
Water Heater Temperature Sensor



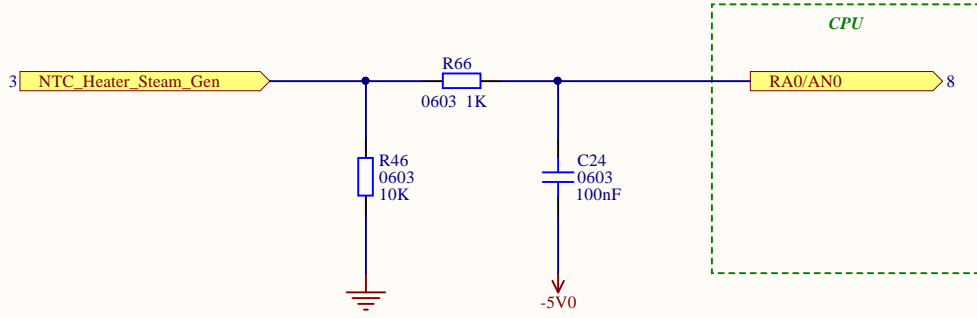
Hall Sensor




Water Container Status



Steam Generating Heater Temperature Sensor



Title Power Board - UART, HALL, Water			MichaelSasser.de	
Size: A4	Number:8	Revision:1	67657 Kaiserslautern Rheinland-Pfalz	
Date: 14.01.2017	Time: 19:03:30	Sheet 8 of 12	Germany	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\UART, Hall, NTCs, Water.SchDoc				

1

2

3

4

A

A

B

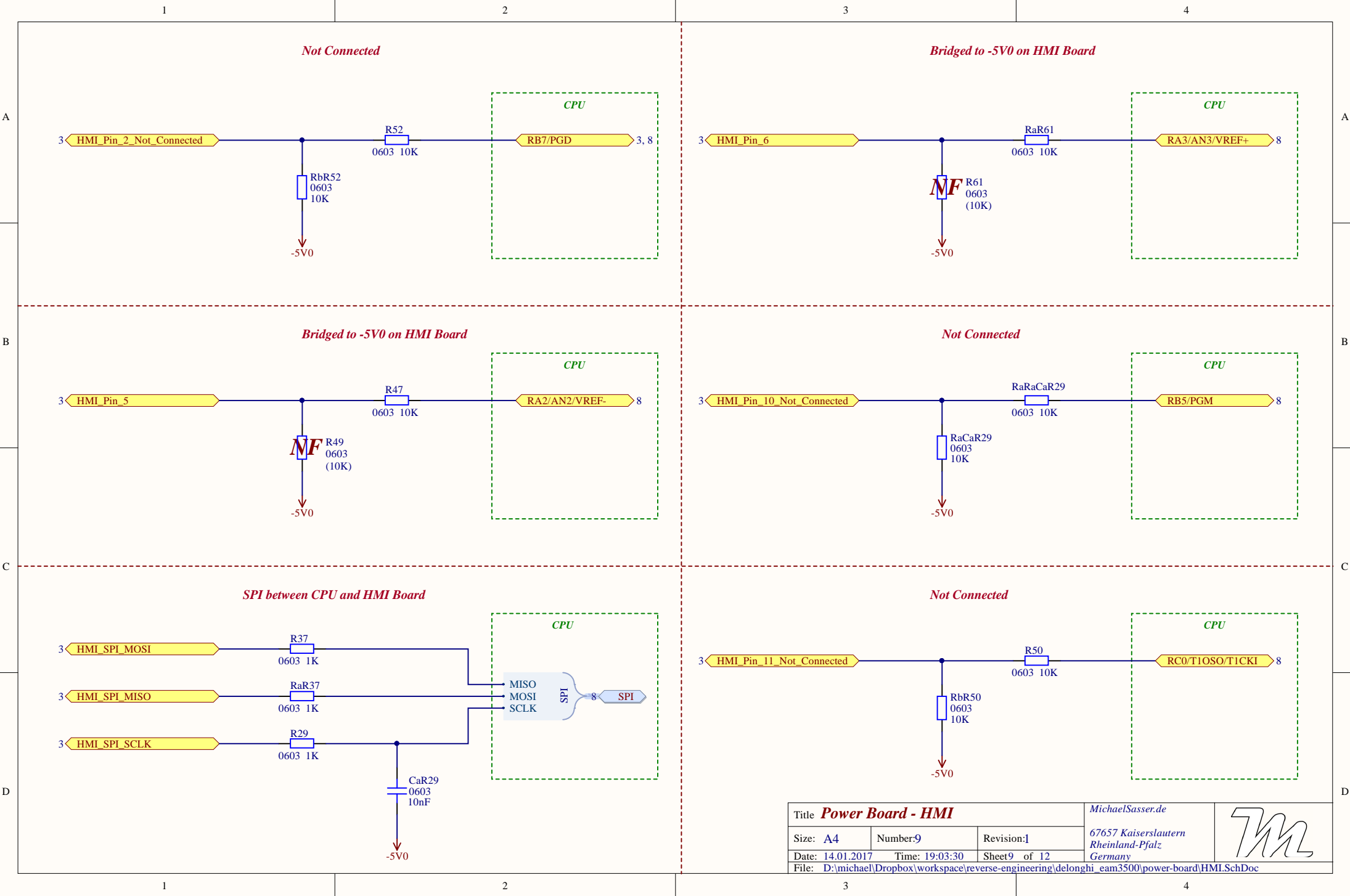
B


C

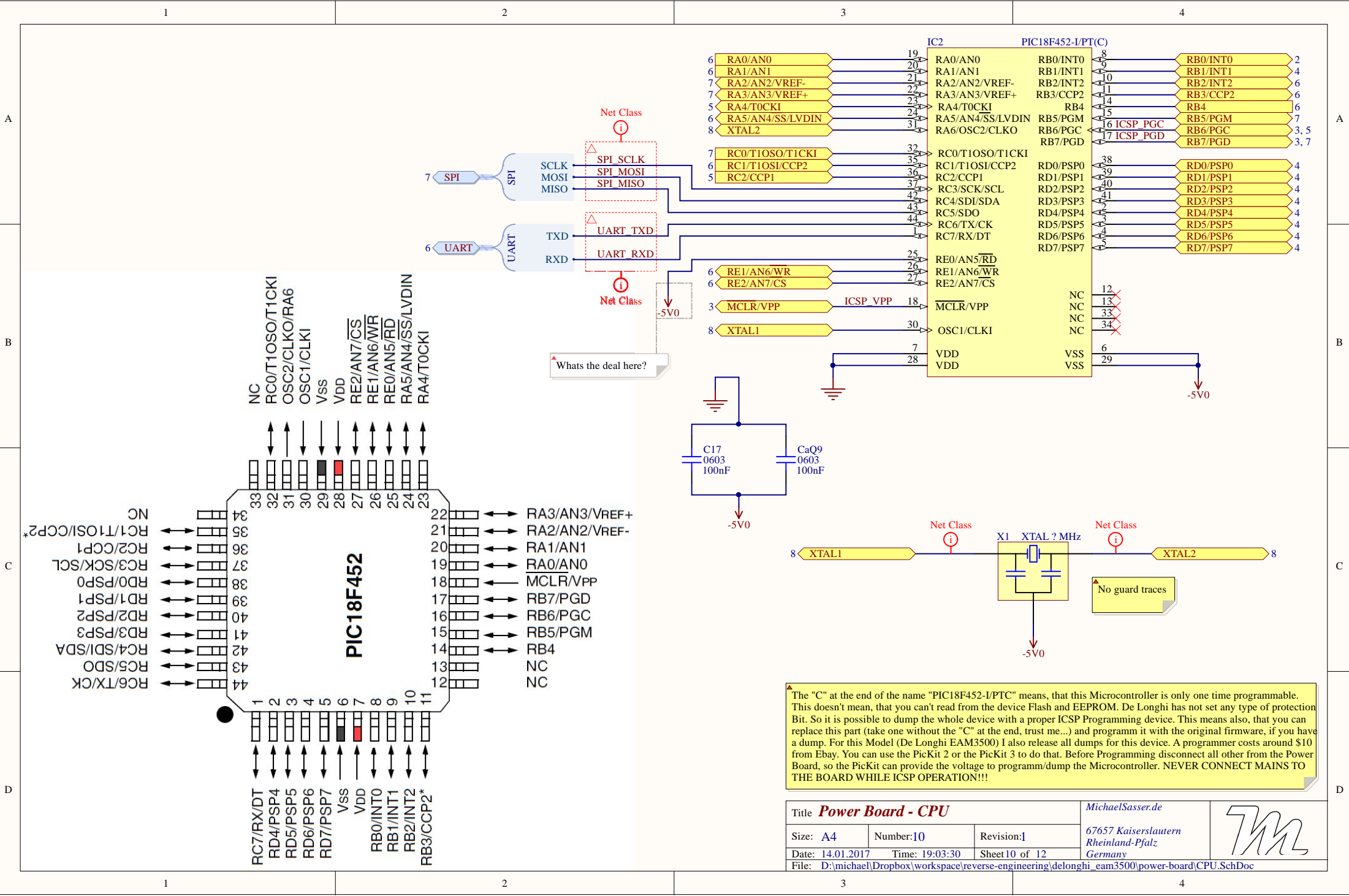
C

D

D



Title Power Board - HMI			MichaelSasser.de	
Size: A4	Number:9	Revision:1	67657 Kaiserslautern Rheinland-Pfalz	
Date: 14.01.2017	Time: 19:03:30	Sheet9 of 12	Germany	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\HMI.SchDoc				




The "C" at the end of the name "PIC18F452-I/PTC" means, that this Microcontroller is only one time programmable. This doesn't mean, that you can't read from the device Flash and EEPROM. De Longhi has not set any type of protection Bit. So it is possible to dump the whole device with a proper ICSP Programming device. This means also, that you can replace this part (take one without the "C" at the end, trust me...) and program it with the original firmware, if you have a dump. For this Model (De Longhi EAM3500) I also release all dumps for this device. A programmer costs around \$10 from Ebay. You can use the PicKit 2 or the PicKit 3 to do that. Before Programming disconnect all other from the Power Board, so the PicKit can provide the voltage to programm/dump the Microcontroller. NEVER CONNECT MAINS TO THE BOARD WHILE ICSP OPERATION!!!

Title Power Board - CPU			MichaelSasser.de
Size: A4	Number:10	Revision:1	67657 Kaiserslautern Rheinland-Pfalz Germany
Date: 14.01.2017	Time: 19:03:30	Sheet 10 of 12	
File: D:\michael\Dropbox\workspace\reverse-engineering\delonghi_eam3500\power-board\CPU.SchDoc			

1	2	3	4
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