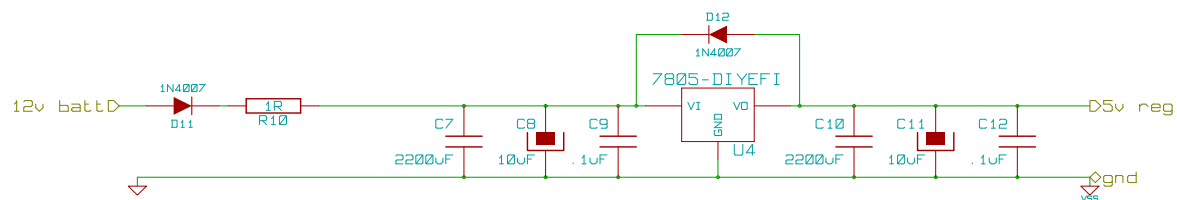


Starting from left and moving to the right we have in order :

- Power feed and ground from battery and/or block
- Reverse polarity hook up protection diode
- Current limiting resistor
- Zener over voltage clamping diode
- Charge storage electrolytic polarised 25V 1000uF capacitor (value may change, but 220 - 2200 is around what we want)
- High frequency tantalum 25V 10uF capacitor (35V units are expensive, as are 22uF)
- Ultra high frequency ceramic 0.1uF capacitor (larger units with similar frequency response would also be acceptable)
- 5V LDO (low drop out) voltage regulator
- Reverse voltage protection diode for the regulator in case of external capacitors discharging more quickly and/or to a lower level than internal ones (snubbing not required as this will not happen when things are actually running)
- High frequency tantalum 25V 10uF capacitor (35V units are expensive, as are 22uF)
- Ultra high frequency ceramic 0.1uF capacitor (larger units with similar frequency response would also be acceptable)
- Power feed and ground for CPU core

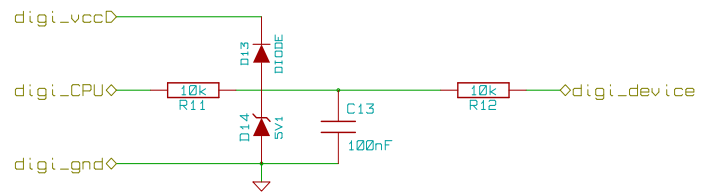
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KiCad E.D.A.		Sheet: 2/41



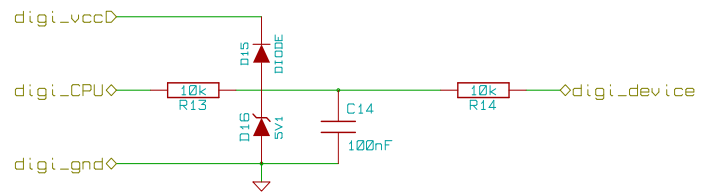
Starting from left and moving to the right we have in order :

- Power feed and ground from battery and/or block
- Reverse polarity hook up protection diode
- Current limiting resistor
- Zener over voltage clamping diode
- Charge storage electrolytic polarised 25V 1000uF capacitor (value may change, but 220 - 2200 is around what we want)
- High frequency tantalum 25V 10uF capacitor (35V units are expensive, as are 22uF)
- Ultra high frequency ceramic 0.1uF capacitor (larger units with similar frequency response would also be acceptable)
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- High frequency tantalum 25V 10uF capacitor (35V units are expensive, as are 22uF)
- Ultra high frequency ceramic 0.1uF capacitor (larger units with similar frequency response would also be acceptable)
- Power feed and ground for CPU core

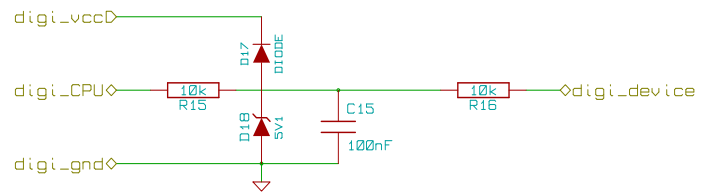
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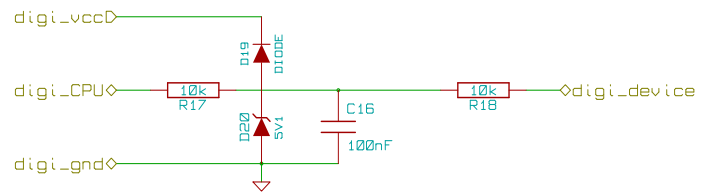
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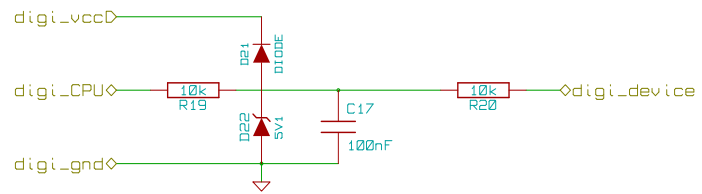
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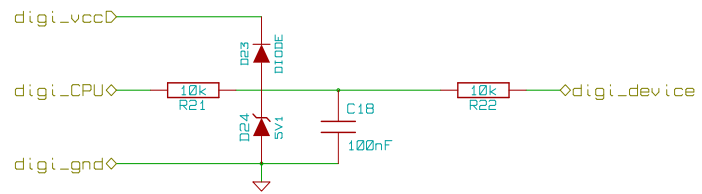
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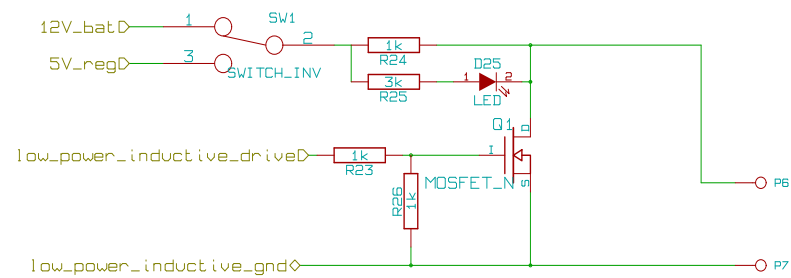
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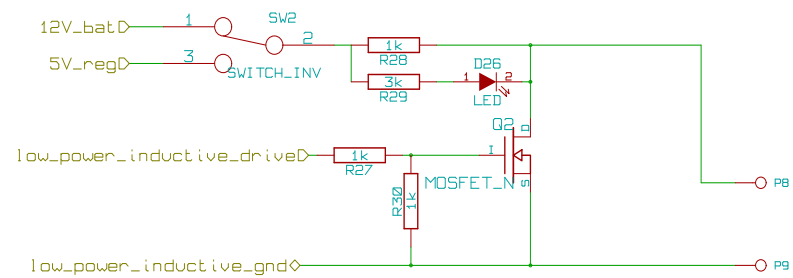
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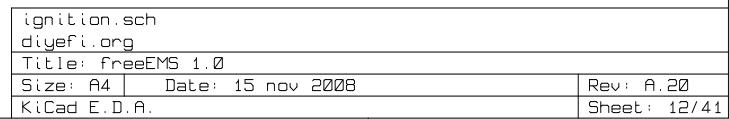
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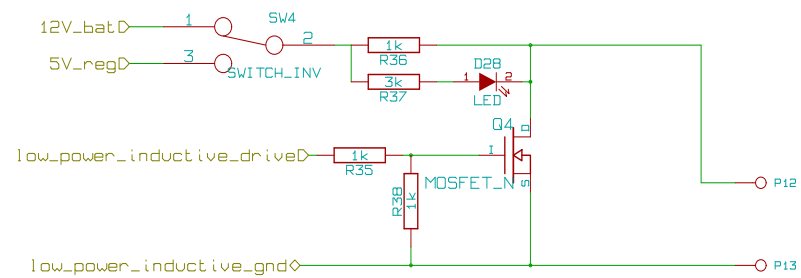


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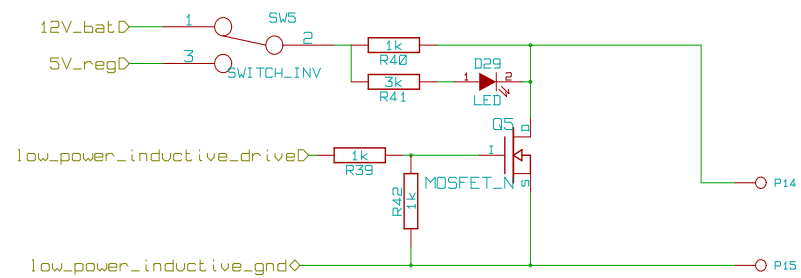


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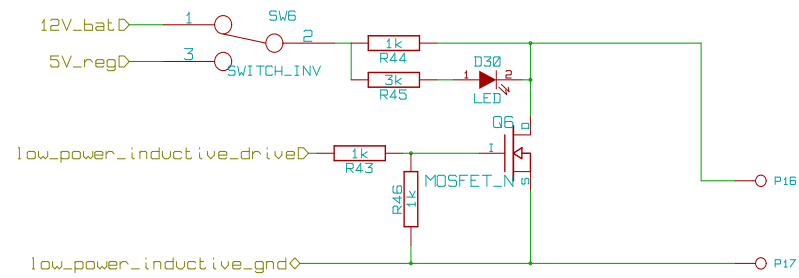




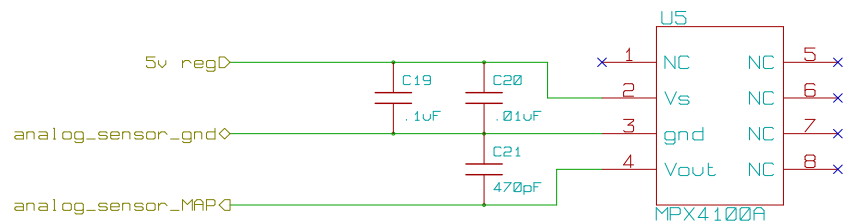
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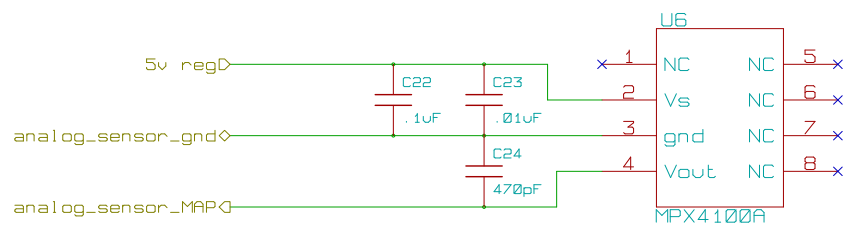
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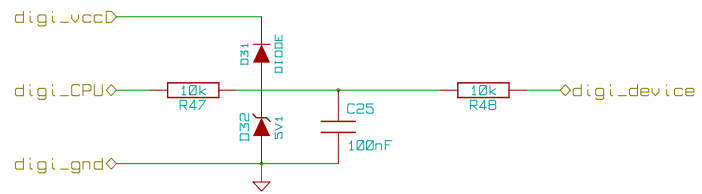
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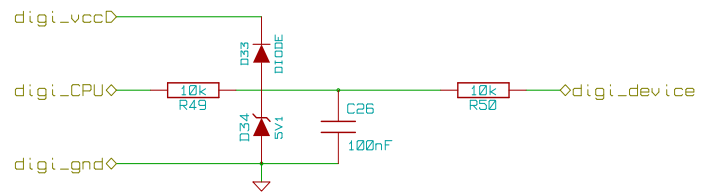
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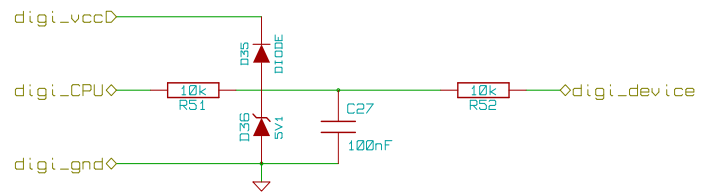
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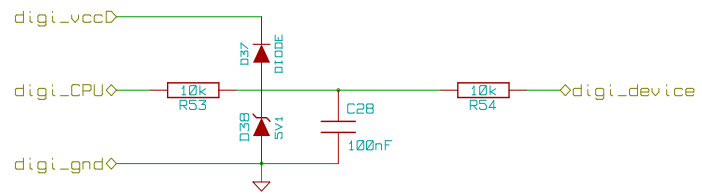
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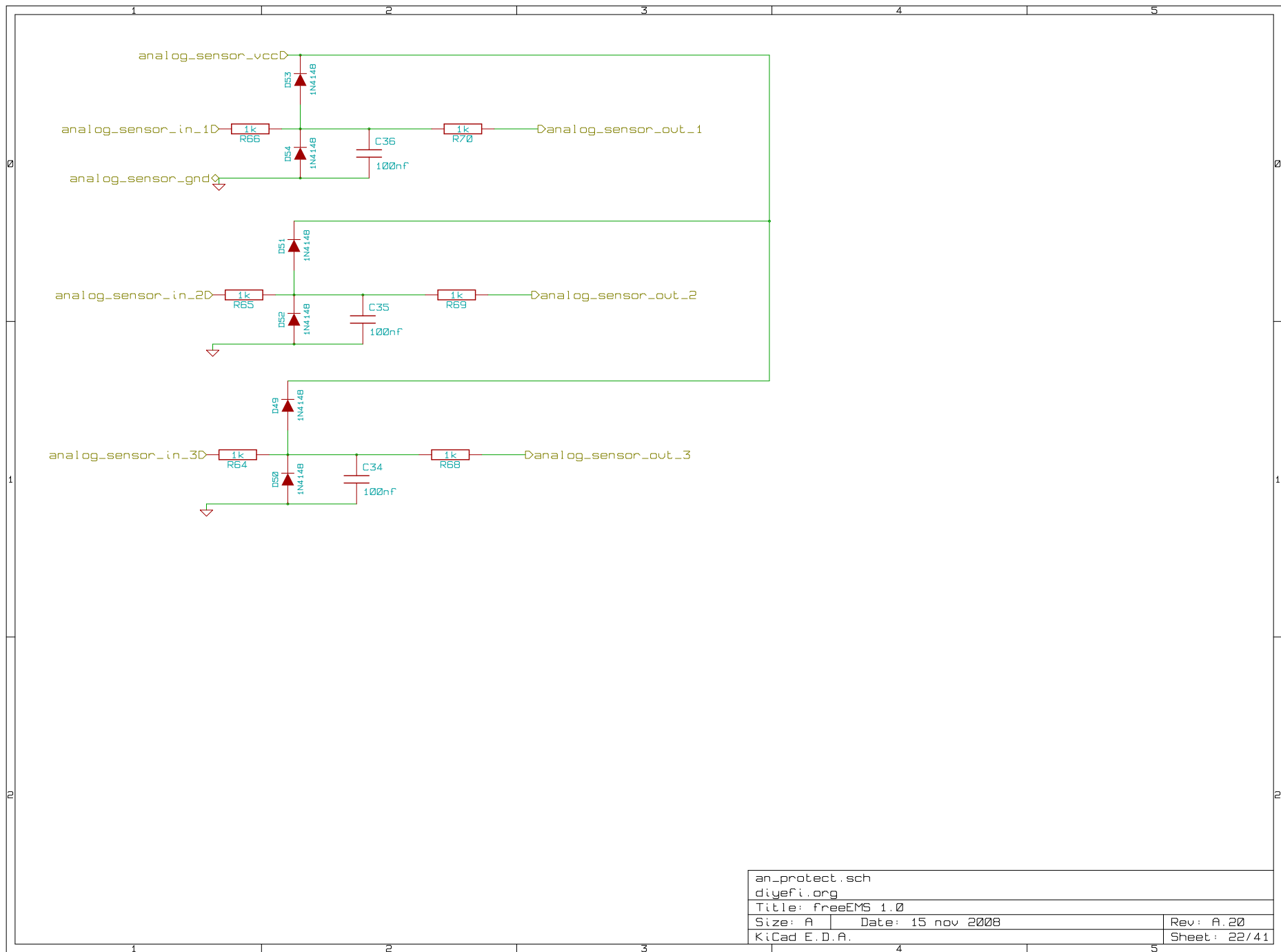
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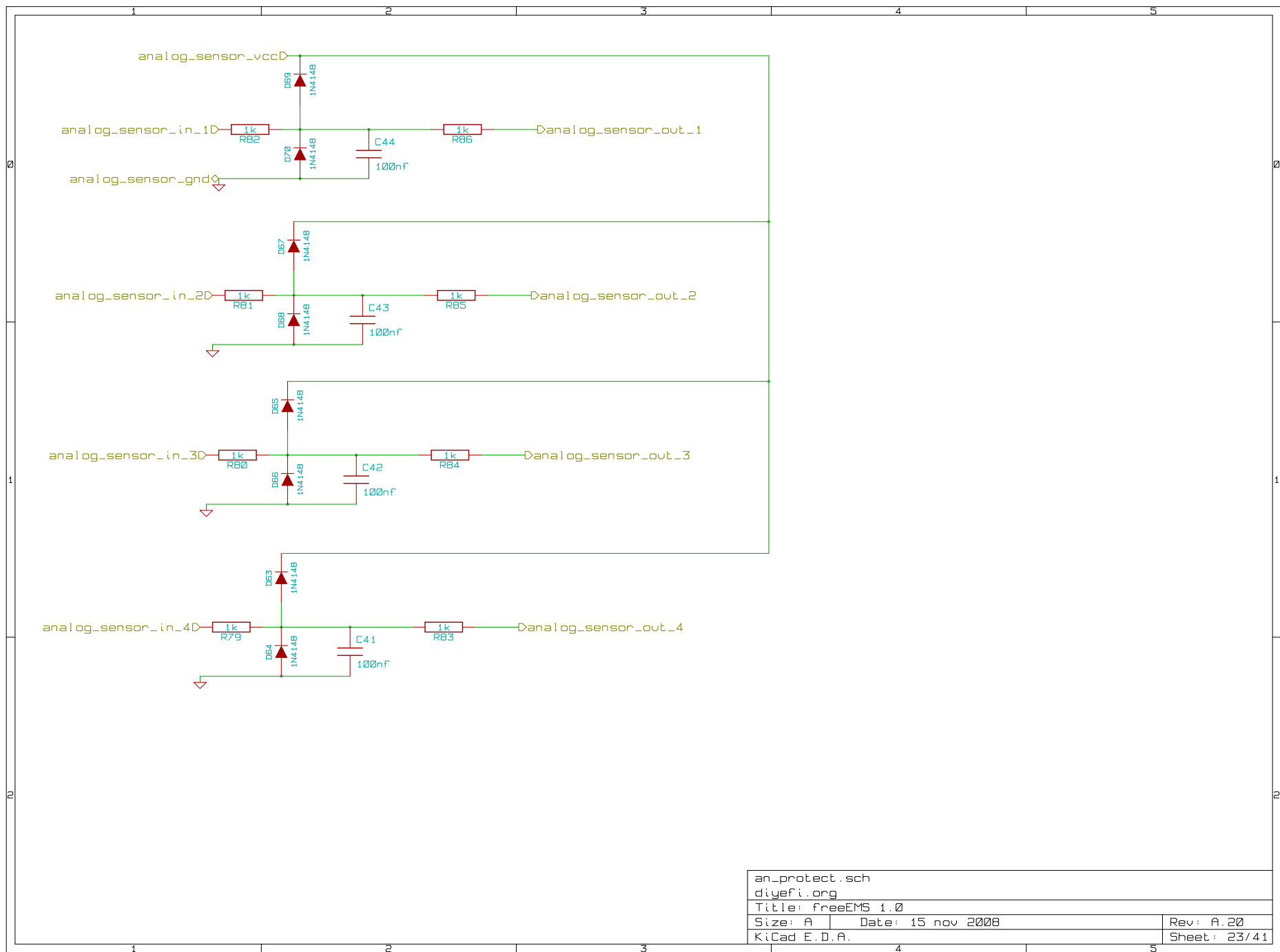


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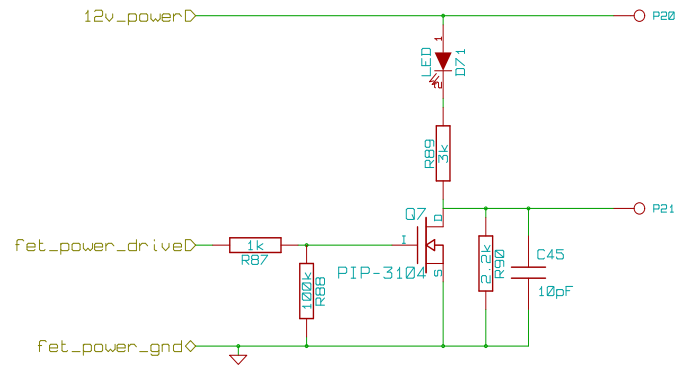




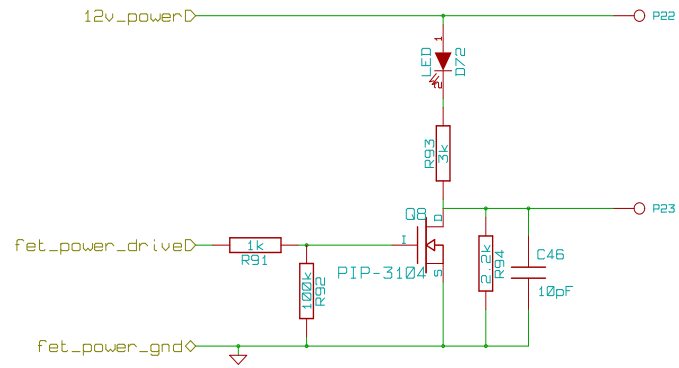
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analog_02G — P18
analog_sensor_gnd — P19

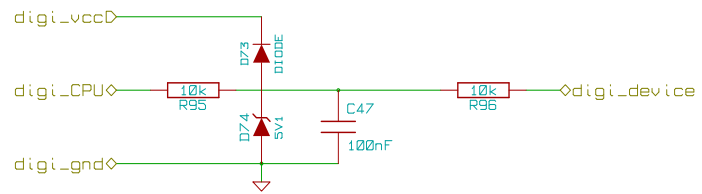
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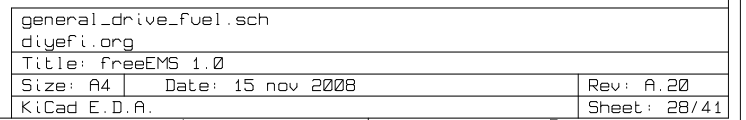
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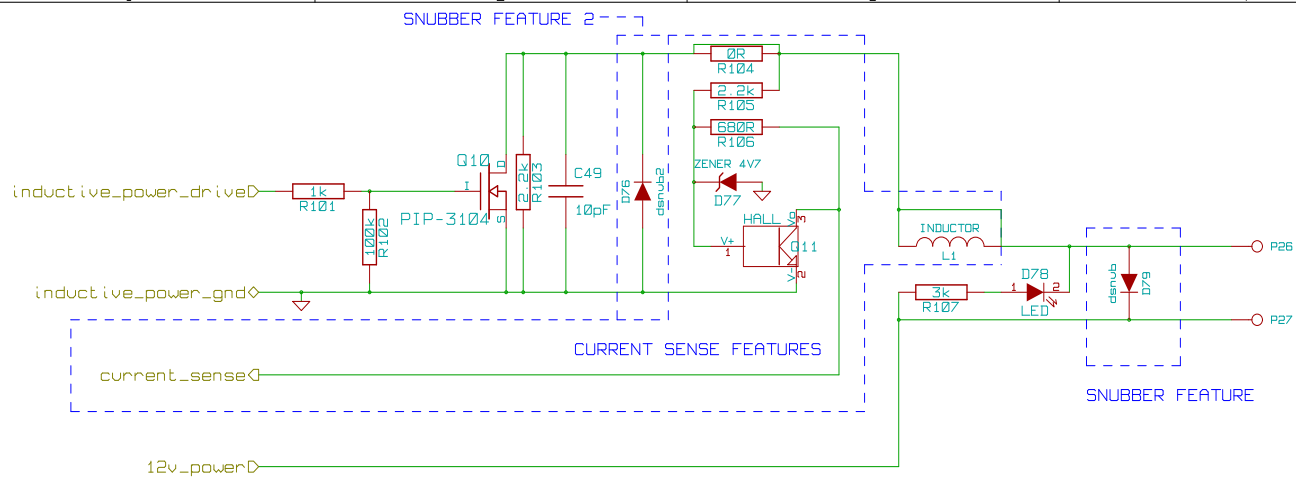


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KiCad E.D.A.		Sheet: 26/41



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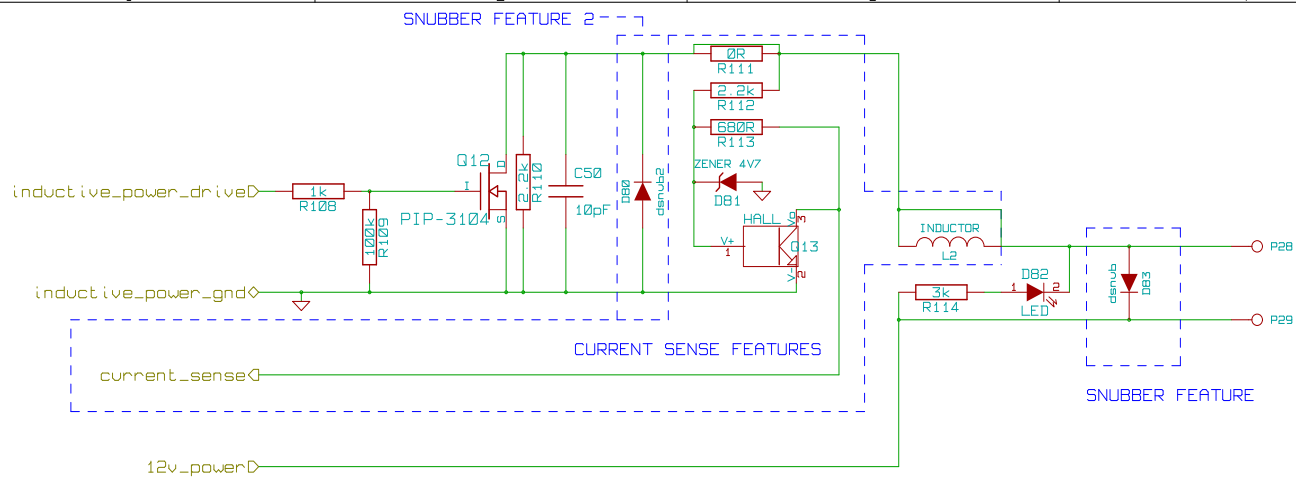
YOU CAN POPULATE DIFFERENT FEATRUES WITH THIS CIRCUIT

CURRENT SENSING ALLOWS YOU TO MEASURE WHEN THE INJECTOR IS ON VS OFF

THE SNUBBER DIODE TO DECREASE INDUCTIVE CURRENT SPIKES

IF YOU DON'T POPULATE THE SNUBBER FEATURE(S), THE MOSFET WILL DISAPATE ENERGY FROM THE INJECTOR

injector_drive.sch		
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Title: freeEMS 1.0		
Size: A4	Date: 15 nov 2008	Rev: A.20
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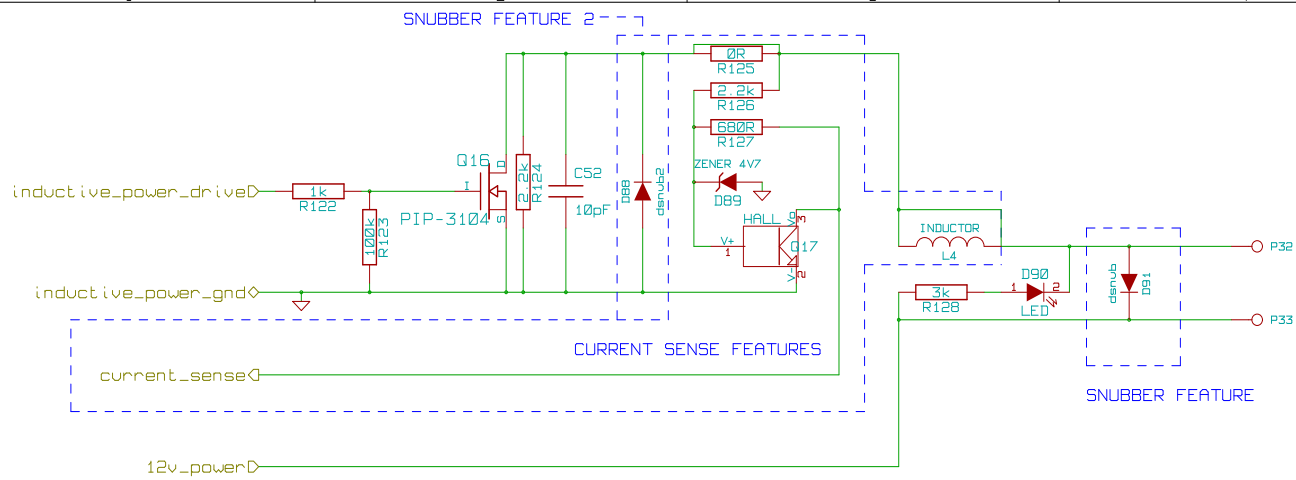
YOU CAN POPULATE DIFFERENT FEATRUES WITH THIS CIRCUIT

CURRENT SENSING ALLOWS YOU TO MEASURE WHEN THE INJECTOR IS ON VS OFF

THE SNUBBER DIODE TO DECREASE INDUCTIVE CURRENT SPIKES

IF YOU DON'T POPULATE THE SNUBBER FEATURE(S), THE MOSFET WILL DISAPATE ENERGY FROM THE INJECTOR

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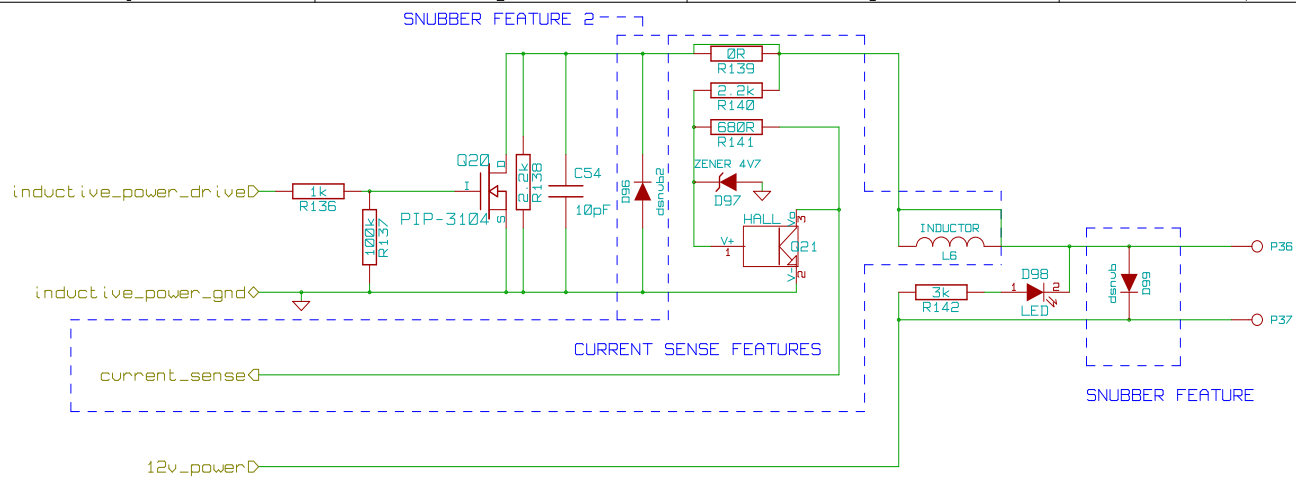
YOU CAN POPULATE DIFFERENT FEATRUES WITH THIS CIRCUIT

CURRENT SENSING ALLOWS YOU TO MEASURE WHEN THE INJECTOR IS ON VS OFF

THE SNUBBER DIODE TO DECREASE INDUCTIVE CURRENT SPIKES

IF YOU DON'T POPULATE THE SNUBBER FEATURE(S), THE MOSFET WILL DISAPATE ENERGY FROM THE INJECTOR

injector_drive.sch		
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KiCad E.D.A.		Sheet: 32/41



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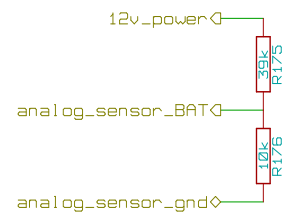
YOU CAN POPULATE DIFFERENT FEATRUES WITH THIS CIRCUIT

CURRENT SENSING ALLOWS YOU TO MEASURE WHEN THE INJECTOR IS ON VS OFF

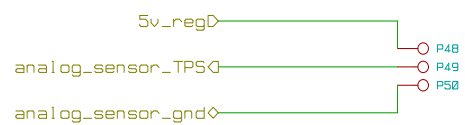
THE SNUBBER DIODE TO DECREASE INDUCTIVE CURRENT SPIKES

IF YOU DON'T POPULATE THE SNUBBER FEATURE(S), THE MOSFET WILL DISAPATE ENERGY FROM THE INJECTOR

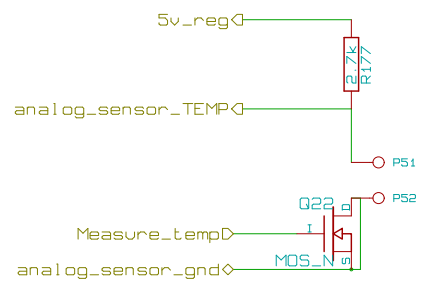
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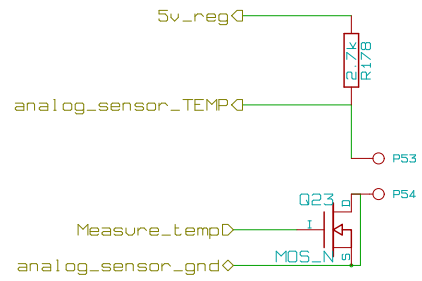
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 GND 1H49
 PE7 1H48
 PK7 1H47
 PK5 1H46
 PK4 1H45
 PK3 1H44
 PK2 1H43
 PK1 1H42
 PK0 1H41
 PJ0 1H40
 PJ7 1H39
 PJ6 1H38
 PM7 1H37
 PM6 1H36
 PM5 1H35
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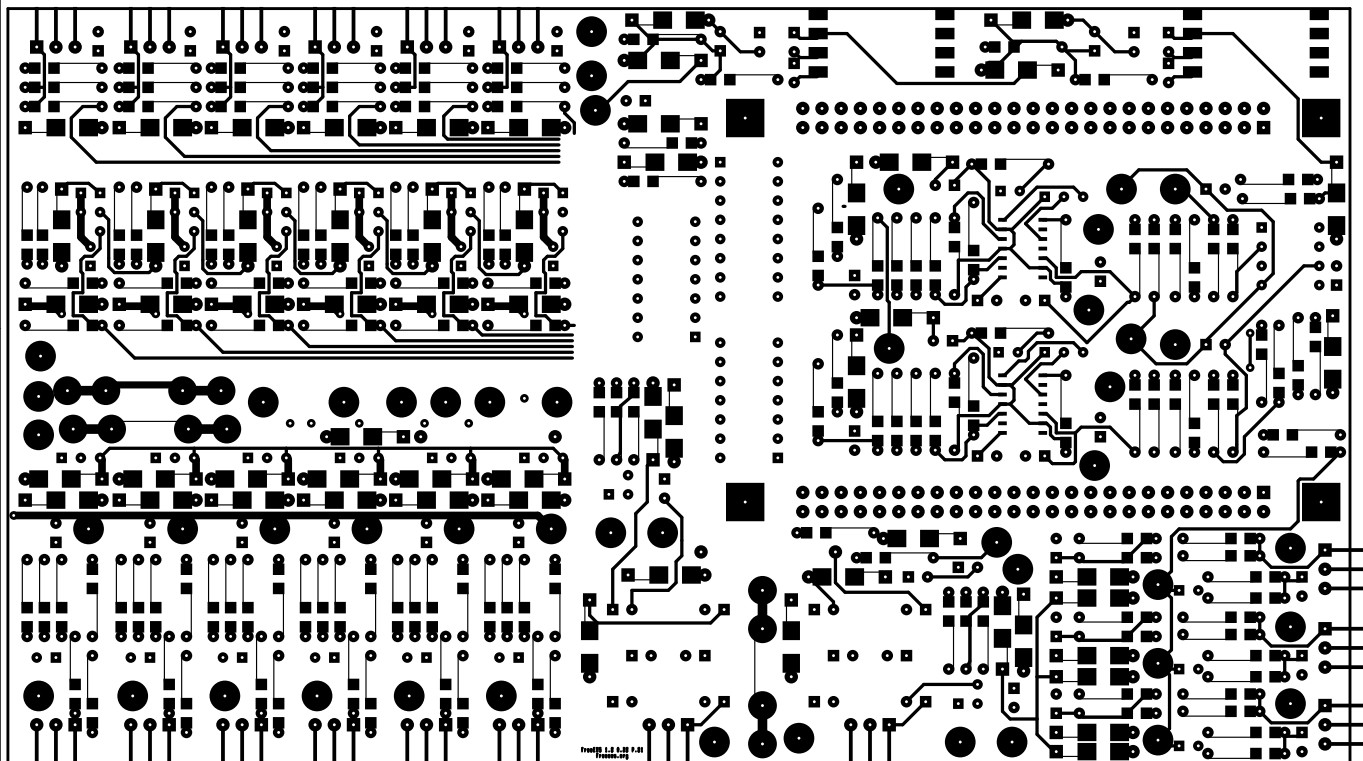
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1H01 PA7
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 1H24 AN10
 1H25 AN11

AN03 2H25
 AN02 2H24
 AN01 2H23
 AN00 2H22
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 PP2 2H19
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 PP7 2H14
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 2H34 PS2
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 2H40 PH2
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 2H42 PH0
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 2H44 RESET
 2H45 PE0
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 2H50 GND-3



FreeEMS 1.0 A.20 P.01
FreeEMS.org

diyefi.org

Title: FreeEMS 1.0

Size: A Date: 15 nov 2008

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Rev: A.20_P.01

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