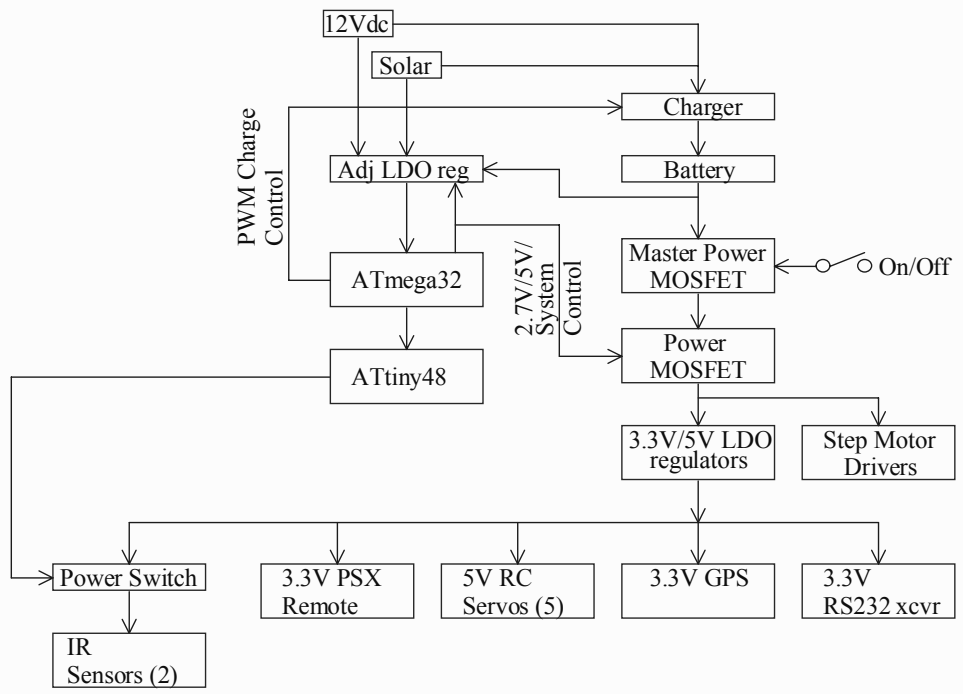
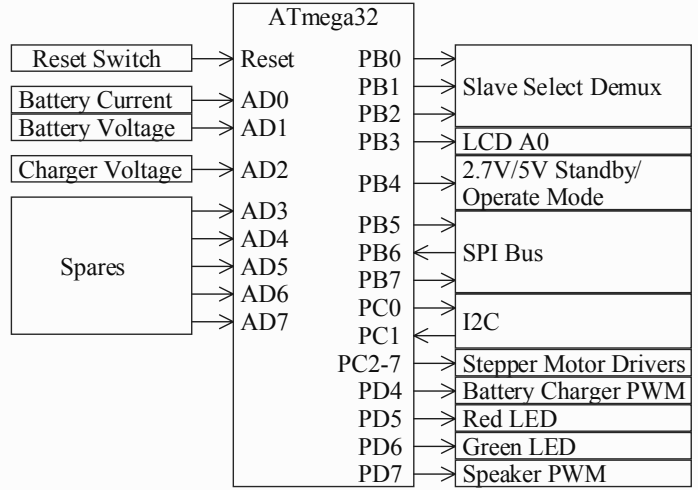


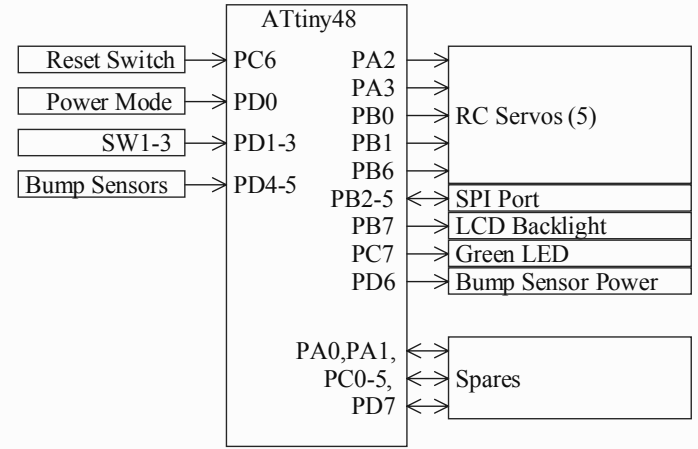
### Power Flow



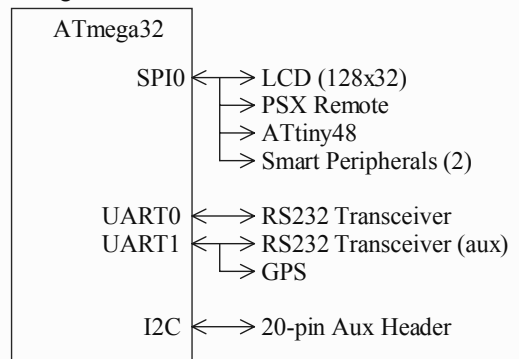
### ATmega I/O



### ATtiny I/O



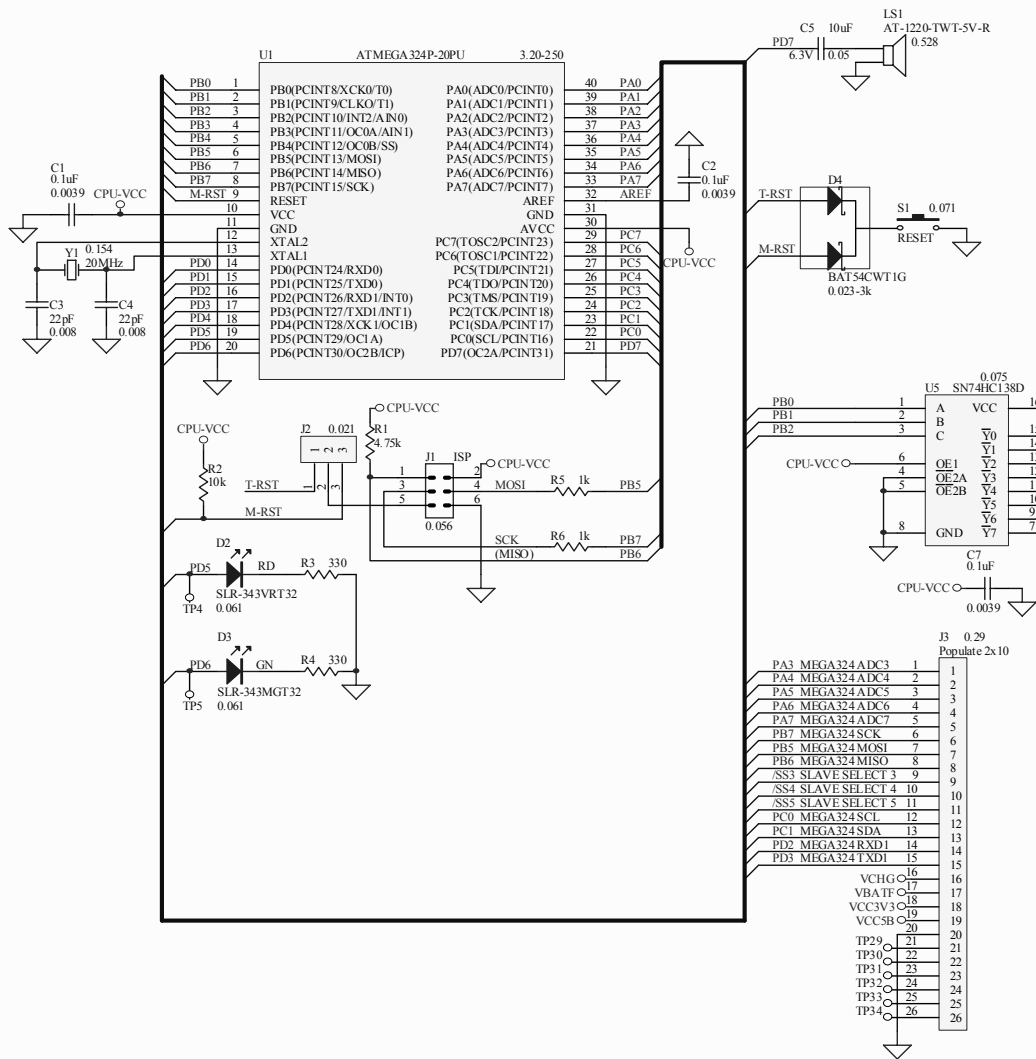
### ATmega Communications



### I/O Connectors

- Battery Connector
- Charger Connector
- PSX Remote (female)
- DB9 RS-232 (male)
- RS-232 Aux (3-pin header)
- GPS (5-pin JST)
- Aux Header (20-pin shrouded)
- RC Servos (5x 3-pin header)
- Stepper Motors (2x 4-pin Molex hdr)
- IR Sensors (2x 4-pin Molex hdr)
- AVR ISP (6-pin header)
- DB9 Smart Sensors (2x female)

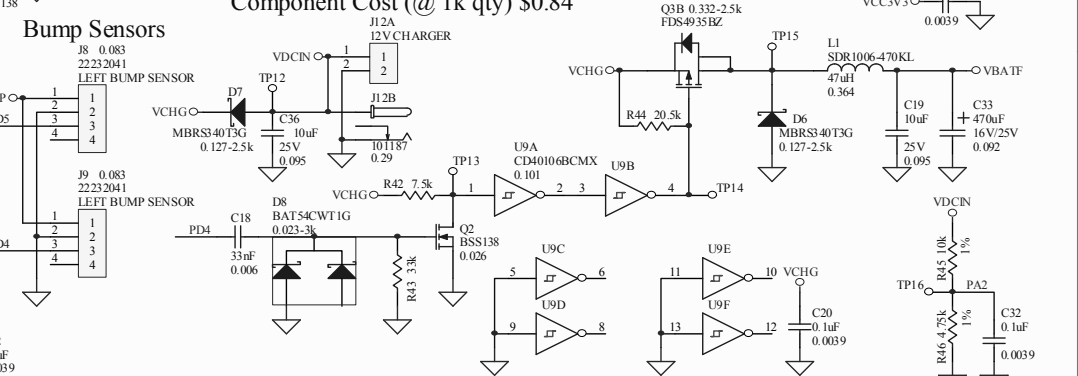
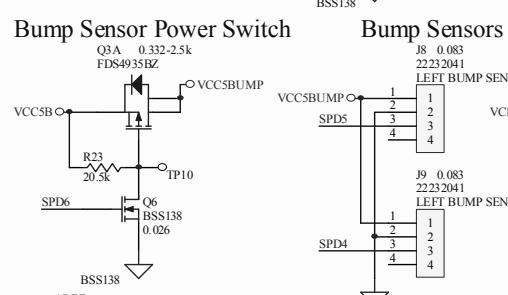
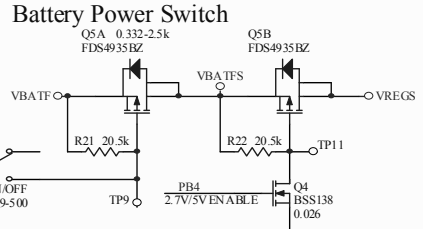
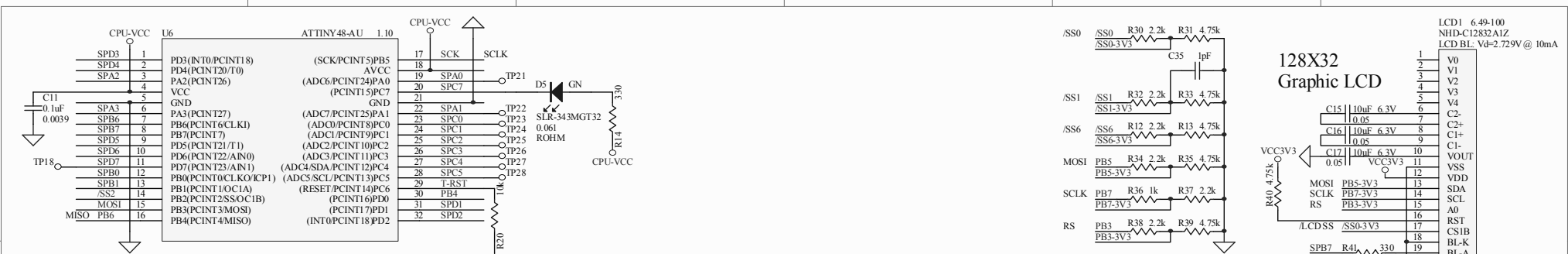
|  |                           |          |
|--|---------------------------|----------|
| Title<br>www.team-critter.com 324 CEENBoT System Schematic |                           |          |
| Size<br>B  | Number                    | Revision |
| Date:<br>1/12/2010   | Sheet 1 of 4              |          |
| File:<br>E:\My Dropbox\...\Block Diagram SchDoc            | Drawn By:<br>David Gilson |          |



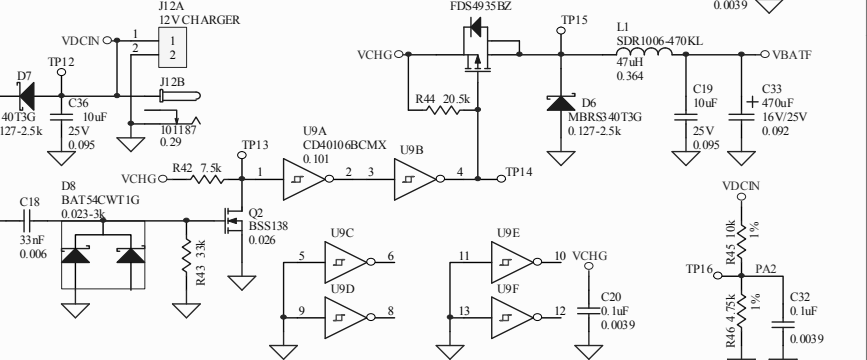
| Pin | MEGA324 Function                  |
|-----|-----------------------------------|
| PA0 | ADC Battery Current               |
| PA1 | ADC Battery Voltage               |
| PA2 | ADC Charger Voltage               |
| PA3 | ADC Spare                         |
| PA4 | ADC Spare                         |
| PA5 | ADC Spare                         |
| PA6 | ADC Spare                         |
| PA7 | ADC Spare                         |
| PB0 | Out: Slave Sel Mux A              |
| PB1 | Out: Slave Sel Mux B              |
| PB2 | Out: Slave Sel Mux C              |
| PB3 | Out: LCD Backlight 0=On/LCD A0    |
| PB4 | Out: 0=2.7V Low Pwr/1=5V Full Pwr |
| PB5 | MOSI                              |
| PB6 | MISO                              |
| PB7 | SCK                               |

| Pin | MEGA324 Function      |
|-----|-----------------------|
| PC0 | SCL: J1, J2, J3       |
| PC1 | SDA                   |
| PC2 | Out: Left Motor A     |
| PC3 | Out: Left Motor B     |
| PC4 | Out: Left Motor C     |
| PC5 | Out: Right Motor A    |
| PC6 | Out: Right Motor B    |
| PC7 | Out: Right Motor C    |
| PD0 | In: RXD0              |
| PD1 | Out: TXD0             |
| PD2 | In: GPS/Aux RXD1      |
| PD3 | Out: GPS/Aux TXD1     |
| PD4 | Out: Charger PWM OC1B |
| PD5 | Out: LED Red          |
| PD6 | Out: LED Green        |
| PD7 | Out: Speaker PWM OC2A |

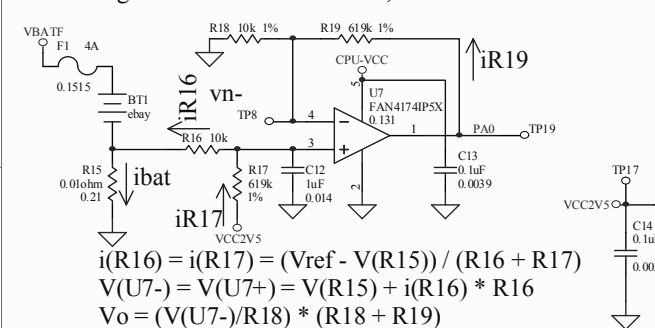
|  |   |  |
|--|---|--|
| Title<br>www.team-critter.com 324V2.21 |   |  |
| Size<br>B                              | Number                                    | Revision<br>PCB2.21                    |
| Date:<br>File:                         | 12/17/2009<br>C:\My Dropbox\324CPU.SchDoc | Sheet 2 of 4<br>Drawn By: David Gilson |



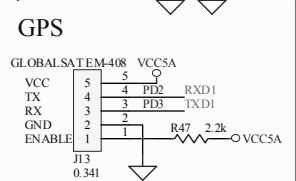
**Battery Charger**  
Component Cost (@ 1k qty) \$0.84



**Battery and Current Monitor**  
max ideal gain =  $5.0V / 80mV = 62.5$ , actual = 61.9



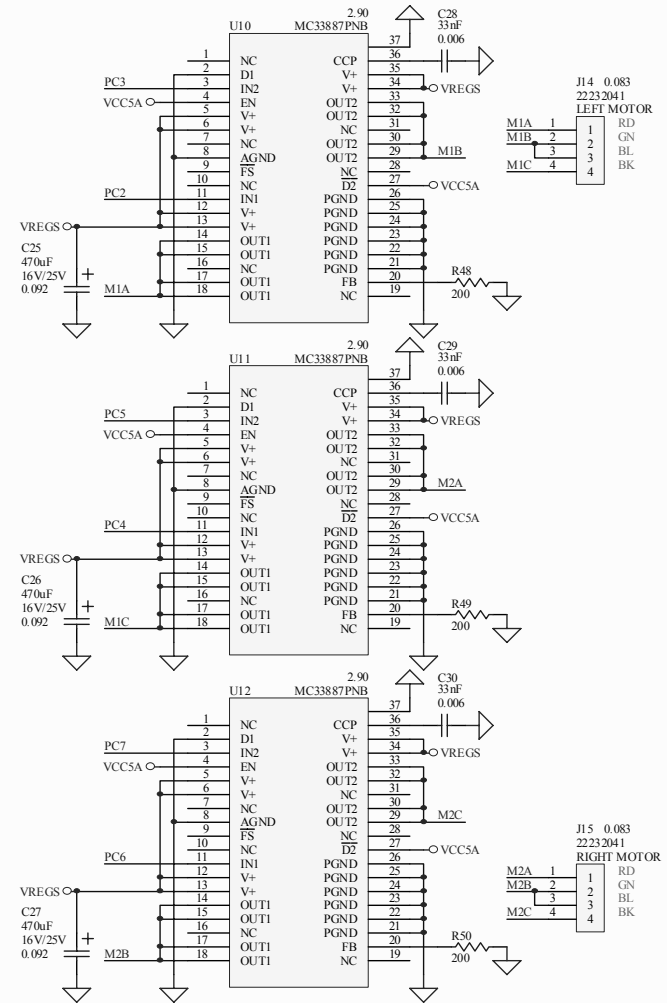
| Mode      | i(R15) | V(R15) | i(R16)  | V(U7+)  | V <sub>o</sub> |
|-----------|--------|--------|---------|---------|----------------|
| charge    | 4A     | 40mV   | 3.911uA | 79.11mV | 4.976V         |
| idle      | 0A     | 0V     | 3.975uA | 39.75mV | 2.500V         |
| discharge | -4A    | -40mV  | 4.038uA | 0.381mV | 0.024V         |



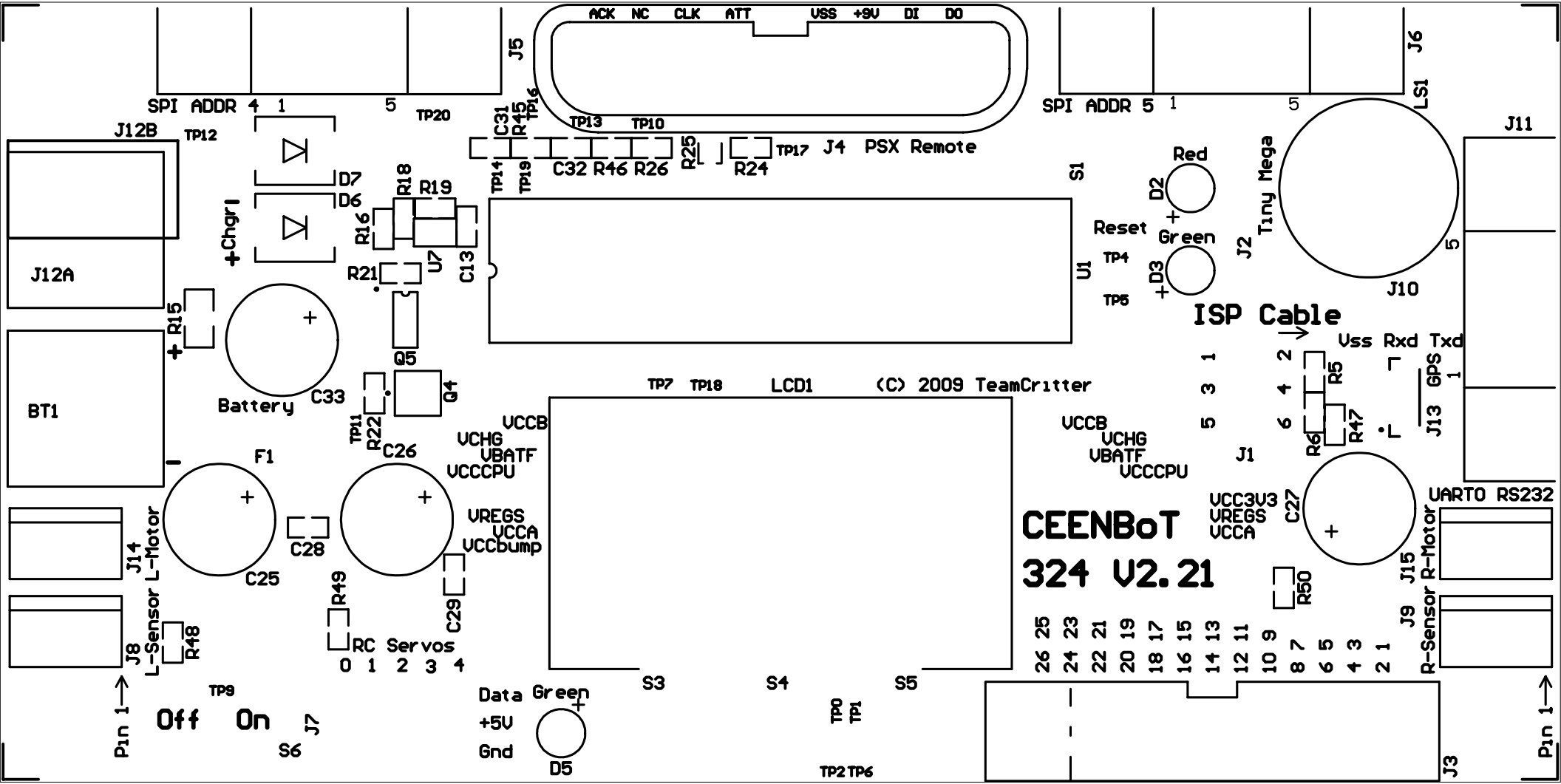
|       |                                     |                               |  |
|-------|-------------------------------------|-------------------------------|--|
| Title |                                     | www.team-critter.com 324V.2.1 |  |
| Size  | Number                              | Revision                      |  |
| B     |                                     | PCB2.2.1                      |  |
| Date: | 4/7/2010                            | Sheet 3 of 4                  |  |
| File: | C:\DB-ecan\bin\front\324IOP1_SchDoc | Drawn By: David Gilson        |  |

| Pin | TINY48 Function             |
|-----|-----------------------------|
| PA0 | ADC Spare                   |
| PA1 | ADC Spare                   |
| PA2 | Out: RC Servo PWM0          |
| PA3 | Out: RC Servo PWM1          |
| PA4 | N/A                         |
| PA5 | N/A                         |
| PA6 | N/A                         |
| PA7 | N/A                         |
| PB0 | Out: RC Servo PWM3          |
| PB1 | Out: RC Servo PWM4          |
| PB2 | In: Slave Sel Active Low    |
| PB3 | In: MOSI                    |
| PB4 | Out: MISO                   |
| PB5 | In: SCLK                    |
| PB6 | Out: RC Servo PWM2          |
| PB7 | LCD Backlight (1=On, 0=Off) |

| Pin | TINY48 Function                   |
|-----|-----------------------------------|
| PC0 | ADC Spare                         |
| PC1 | ADC Spare                         |
| PC2 | ADC Spare                         |
| PC3 | ADC Spare                         |
| PC4 | ADC Spare                         |
| PC5 | ADC Spare                         |
| PC6 | In: Reset                         |
| PC7 | Out: LED Green                    |
| PD0 | In: ATmega324 PB4 0=2.7V, 1=5V    |
| PD1 | In: SW-A (0=Pressed)              |
| PD2 | In: SW-B (0=Pressed)              |
| PD3 | In: SW-C (0=Pressed)              |
| PD4 | In: Right Bump Sensor (0=Blocked) |
| PD5 | In: Left Bump Sensor (0=Blocked)  |
| PD6 | Out: Bump PowerEnable (1=Enabled) |
| PD7 | Spare                             |



|  |              |                        |
|--|--------------|------------------------|
| Title<br>www.team-critter.com 324V2.21 |              |                        |
| Size<br>B                              | Number       | Revision<br>PCB2.21    |
| Date:<br>12/18/2009                    | Sheet 4 of 4 | Drawn By: David Gilson |
| File:<br>C:\My Dropbox\324IOP2.SchDoc  |              |                        |



**CEENBot  
324 V2.21**

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|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|
| 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | - | - | - | - | - | - | - | - | - |

