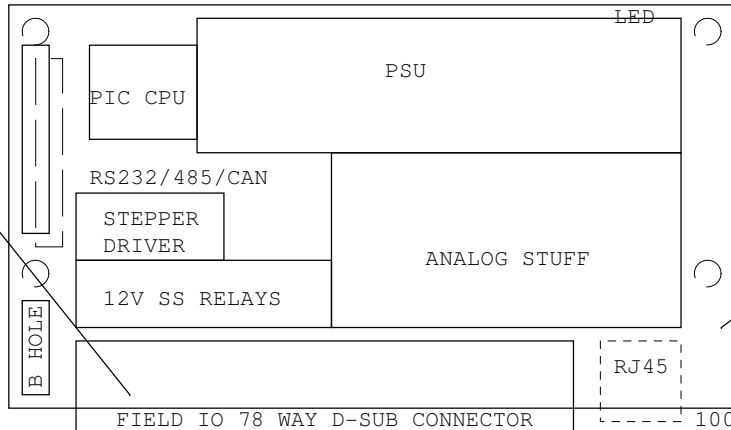
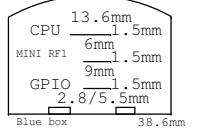


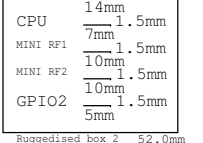
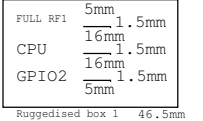
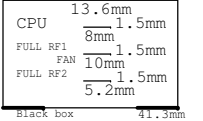
- IO CONNECTOR (78WAY)
- 12 GND
 - 1 +/-15V POWER OUT
 - 1 24V POWER OUT
 - 1 12V POWER IN FOR RELAYS
 - 6 SWITCHED 12V OP (300mA)
 - 1 STEPPER MOTOR DRIVER
 - 7 TEMPERATURES
 - 8 ANALOG IP (or 4-20mA)
 - 2 AC VOLTAGE SENSE *
 - 1 OIL LEVEL PROBE *
 - 2 DC 48V SENSE
 - 1 RPM INPUT
 - 1 RS485/MODBUS
 - 1 RS232
 - 1 CAN BUS
 - 4 3V3 GPIO



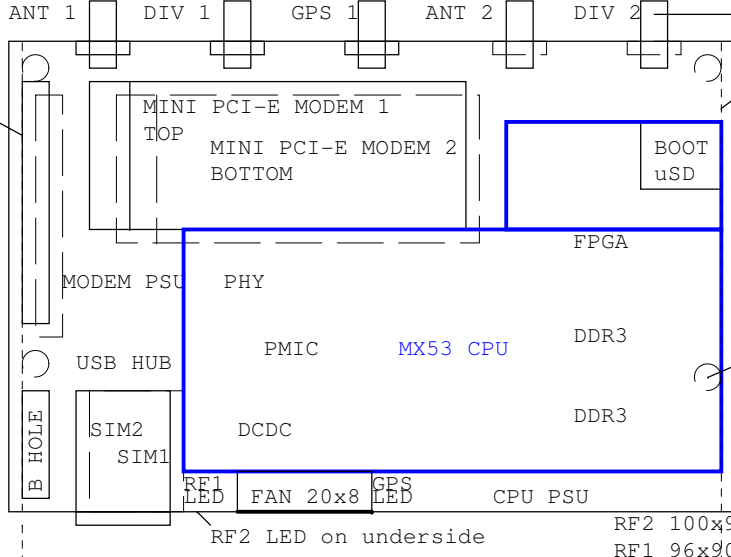
- RF1/RF2 DIFFERENCES:
- HEADER HEIGHT
 - HEADER ROTATION
 - ID RESISTORS
 - USB SELECT
 - ETHERNET SELECT
 - RESET SELECT
 - POWER ENABLE SELECT
 - SILK SCREEN
 - I2C GPIO ADDRESS
 - PCB WIDTH



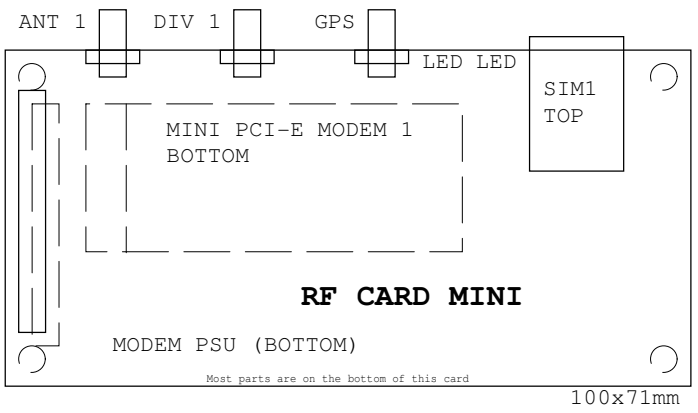
PCB's 1.5mm +0mm, -0.1mm
GPIO, MiniRF AND RF2 FULL WIDTH



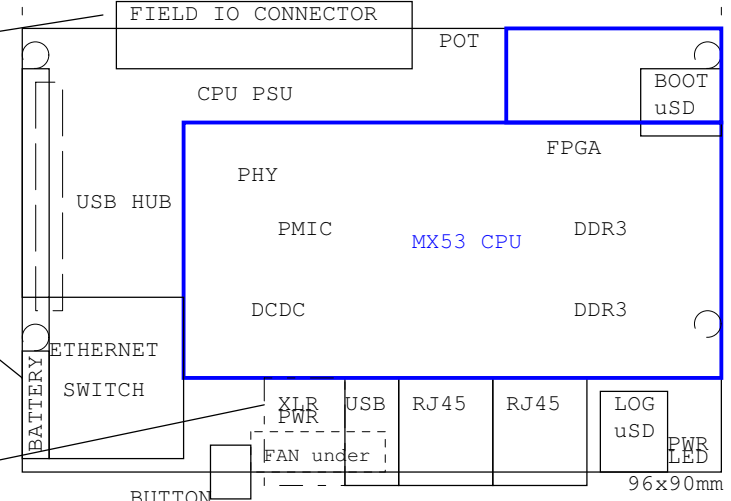
- STACKABLE HEADER (100 WAY)
- ETHERNET X2
 - USB2 X3
 - RS232 X3
 - I2C
 - 1V8 GPIO BUS 10 WAY
 - PCB RESET X3
 - MASTER RESET
 - 1V8 POWER
 - 3V3 POWER
 - 1V8 POWER
 - 1V8 POWER
 - 12V INLET POWER
 - GND



WIFI via USB or mPCIE slot
ZIGBEE via uSD slot



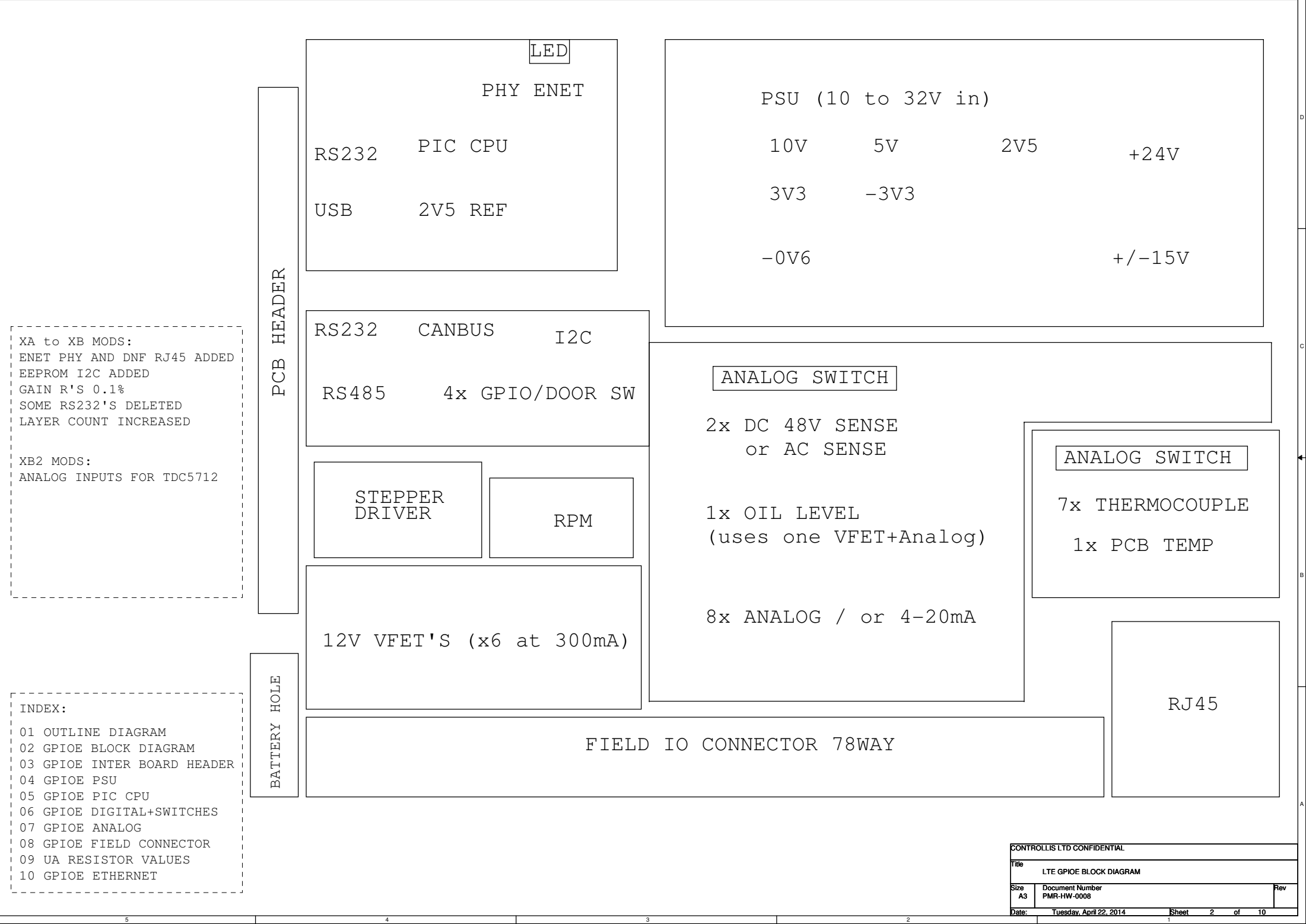
- IO CONNECTOR (34 WAY)
- 6 GND
 - 1 12V POWER IN
 - 1 12V POWER OUT
 - 1 3V3 POWER OUT
 - 1 CAN BUS
 - 1 RS232
 - 1 RS485/MODBUS
 - 1 LCD 16 WIRE INTERFACE (or 11 GPIO)



MX3 CPU LAYOUT IS COPIED

10-32V DC MINI-XLR (Farnell 171-5967)

| | | | |
|-----------------------------|-----------------------------|-------|---------|
| CONTROLLIS LTD CONFIDENTIAL | | | |
| Title | LTE GPIOE - OUTLINE DIAGRAM | | |
| Size A3 | Document Number PMR-HW-0023 | Rev | XC1A |
| Date: | Tuesday, September 16, 2014 | Sheet | 1 of 10 |



XA to XB MODS:
 ENET PHY AND DNF RJ45 ADDED
 EEPROM I2C ADDED
 GAIN R'S 0.1%
 SOME RS232'S DELETED
 LAYER COUNT INCREASED

XB2 MODS:
 ANALOG INPUTS FOR TDC5712

INDEX:

- 01 OUTLINE DIAGRAM
- 02 GPIOE BLOCK DIAGRAM
- 03 GPIOE INTER BOARD HEADER
- 04 GPIOE PSU
- 05 GPIOE PIC CPU
- 06 GPIOE DIGITAL+SWITCHES
- 07 GPIOE ANALOG
- 08 GPIOE FIELD CONNECTOR
- 09 UA RESISTOR VALUES
- 10 GPIOE ETHERNET

PCB HEADER

BATTERY HOLE

LED

PHY ENET

RS232 PIC CPU

USB 2V5 REF

PSU (10 to 32V in)

10V 5V 2V5 +24V

3V3 -3V3

-0V6 +/-15V

RS232 CANBUS I2C

RS485 4x GPIO/DOOR SW

ANALOG SWITCH

2x DC 48V SENSE
or AC SENSE

1x OIL LEVEL
(uses one VFET+Analog)

8x ANALOG / or 4-20mA

ANALOG SWITCH

7x THERMOCOUPLE

1x PCB TEMP

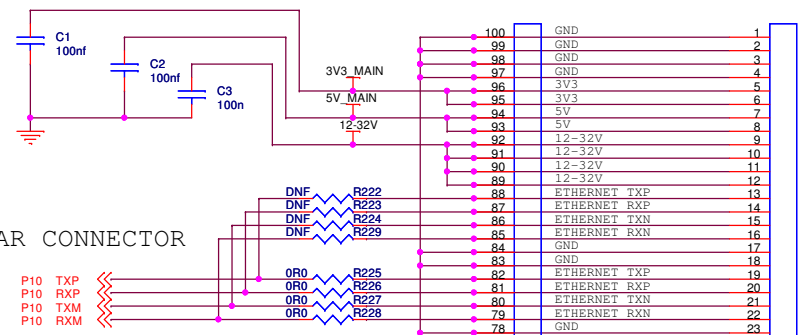
STEPPER
DRIVER

RPM

12V VFET'S (x6 at 300mA)

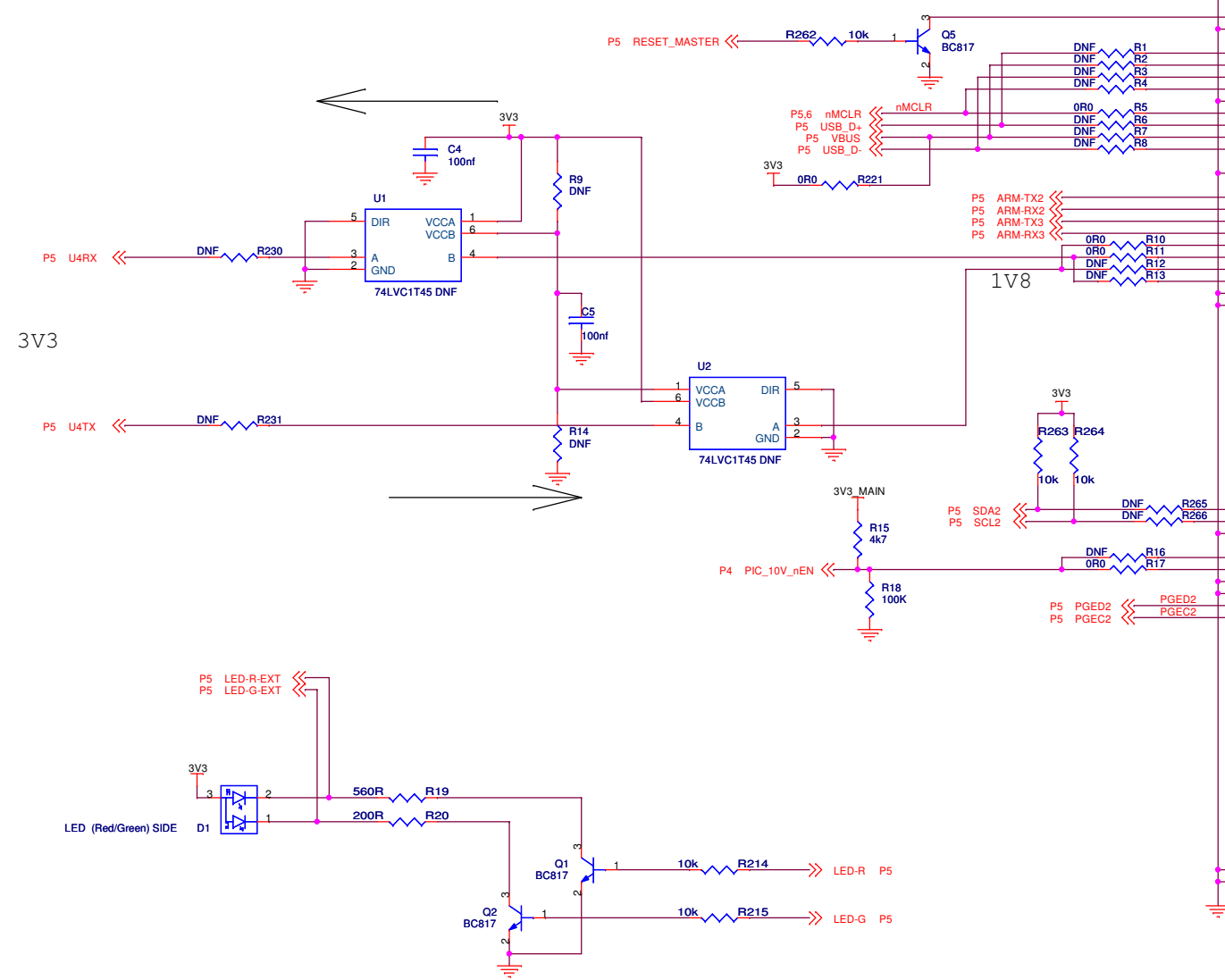
FIELD IO CONNECTOR 78WAY

RJ45

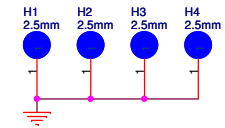


PLACE R'S NEAR CONNECTOR

TEXT LABELS ARE FROM A SLAVE CARD PERSPECTIVE



THE HEIGHT OF THESE CONNECTORS VARIES BETWEEN BUILDS



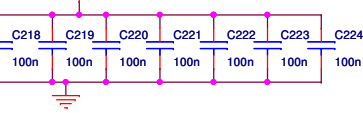
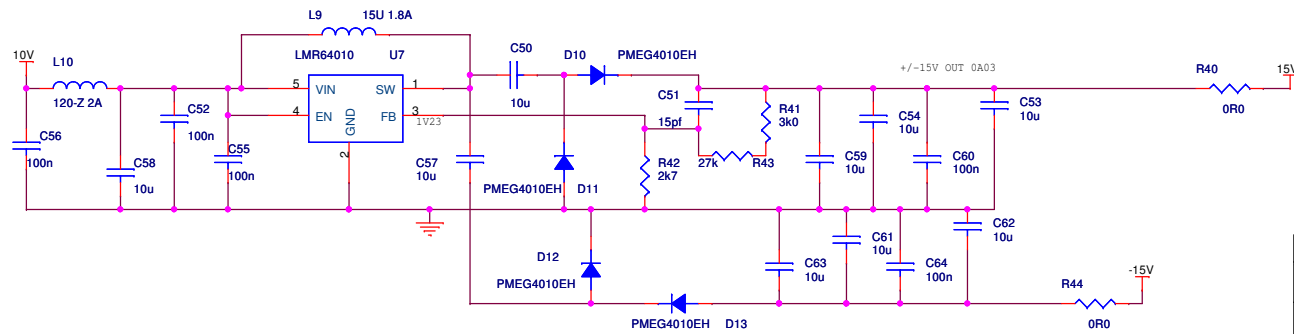
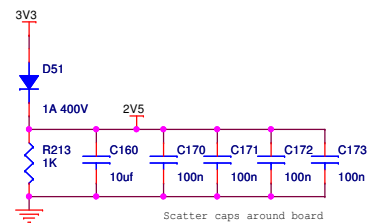
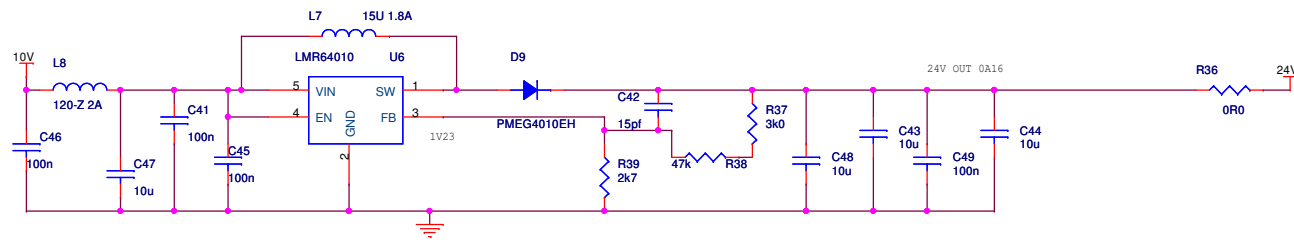
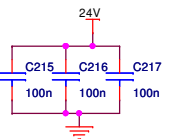
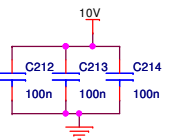
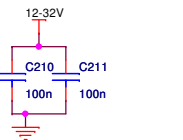
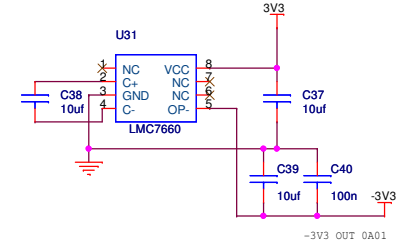
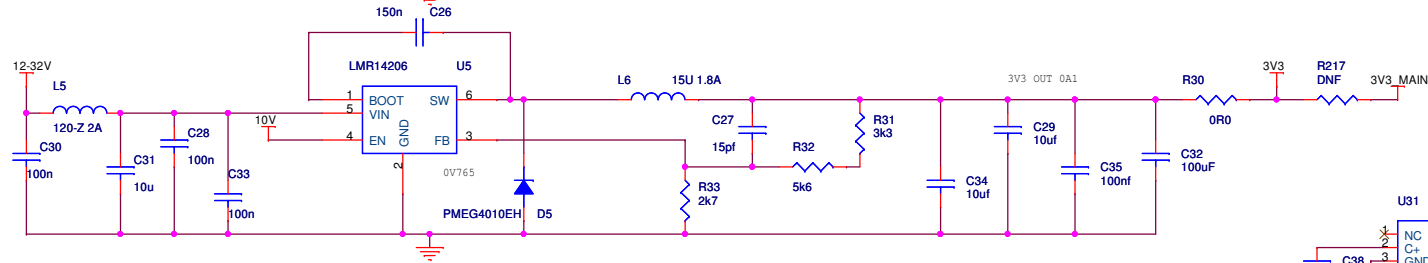
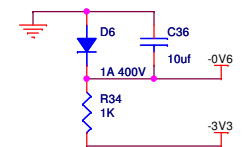
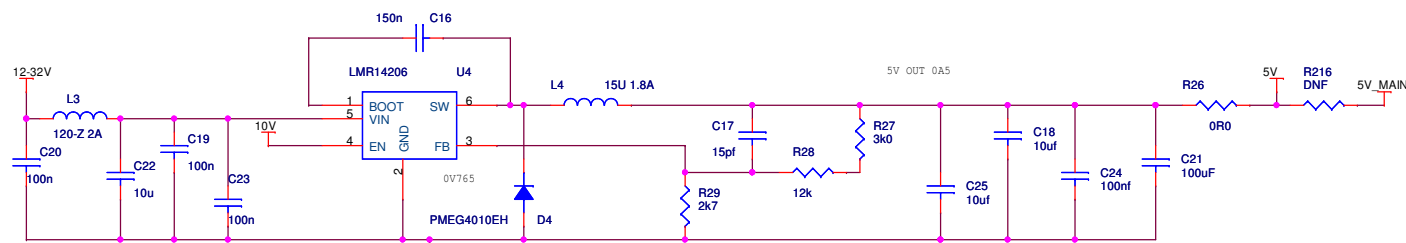
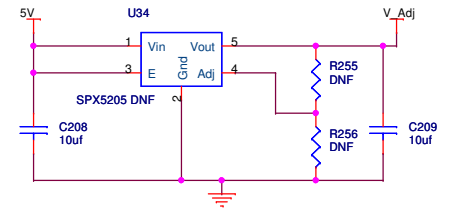
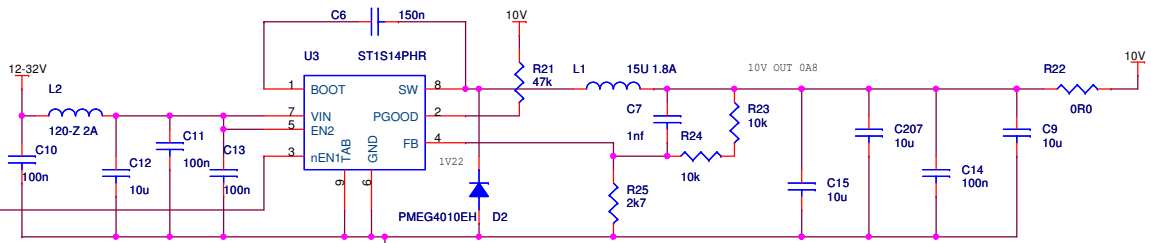
BOTTOM

TOP

| | | | |
|-----------------------------|------------------------------|-------|---------|
| CONTROLLIS LTD CONFIDENTIAL | | | |
| Title | LTE GPIOE INTER BOARD HEADER | | |
| Size | Document Number | | Rev |
| A3 | PMR-HW-0008 | | |
| Date: | Thursday, May 08, 2014 | Sheet | 3 of 10 |

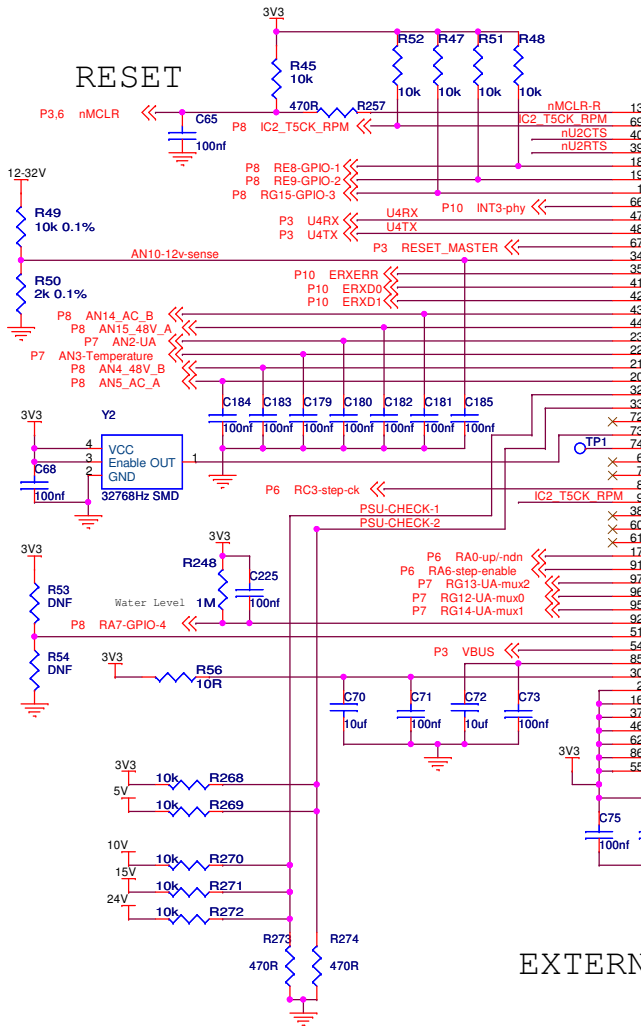
FROM MAIN MX53

P3 PIC_10V_nEN

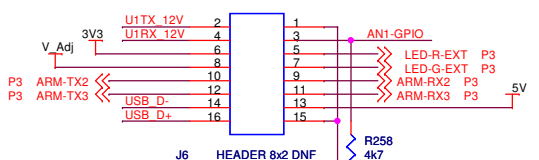


| | | | |
|-----------------------------|--------------------------|-------------|---------|
| CONTROLLIS LTD CONFIDENTIAL | | | |
| Title | LTE GPIOE PSU | | |
| Size A3 | Document Number | PMR-HW-0008 | Rev |
| Date: | Thursday, April 24, 2014 | Sheet | 4 of 10 |

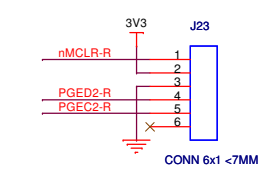
RESET



SERIAL HEADER

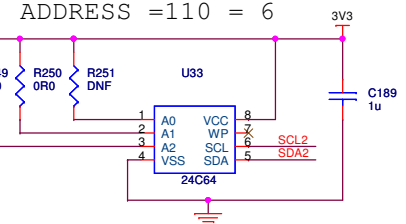


PIC DEBUG HEADER



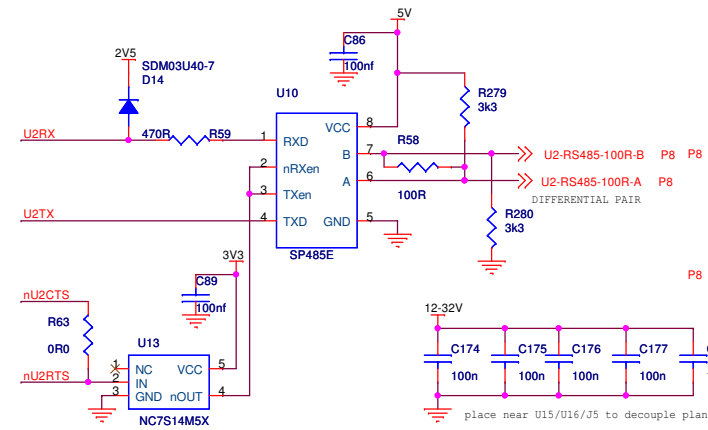
UART 1 RS232 HEADER 12V
 UART 2 RS485 EXTERNAL
 UART 4 RS232 EXTERNAL or ARM via DNF

EEPROM

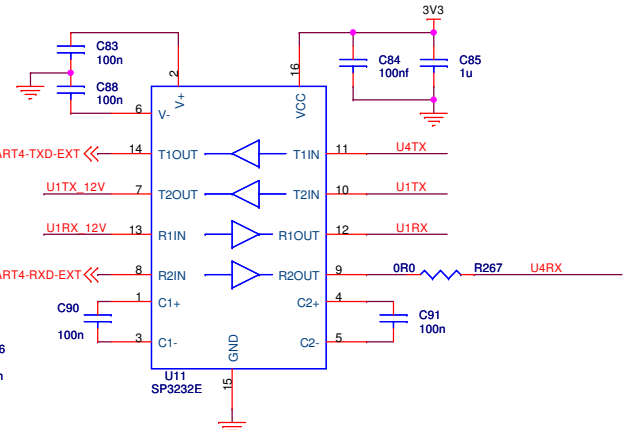


EXTERNAL V REFERENCE MUST BE USED IN SW

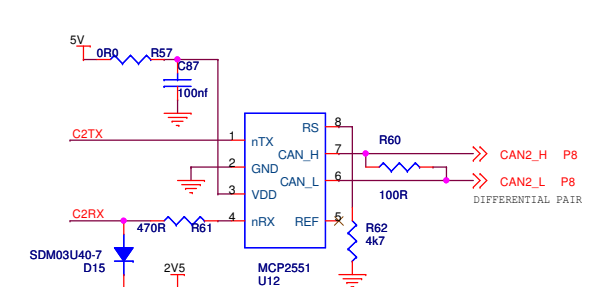
RS485 DRIVER UART2



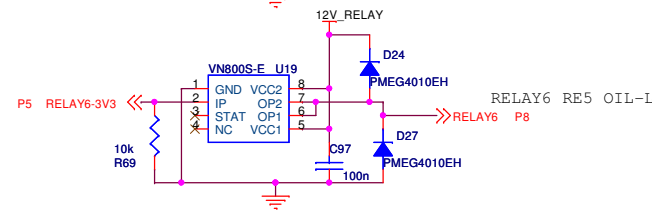
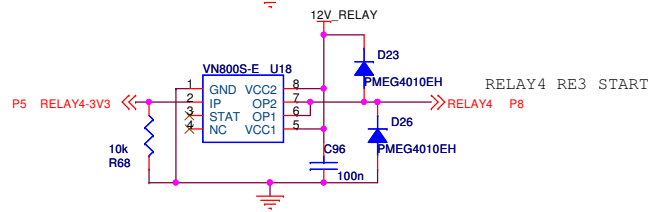
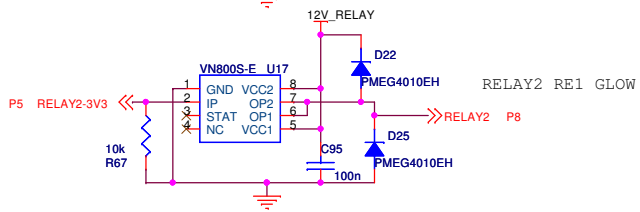
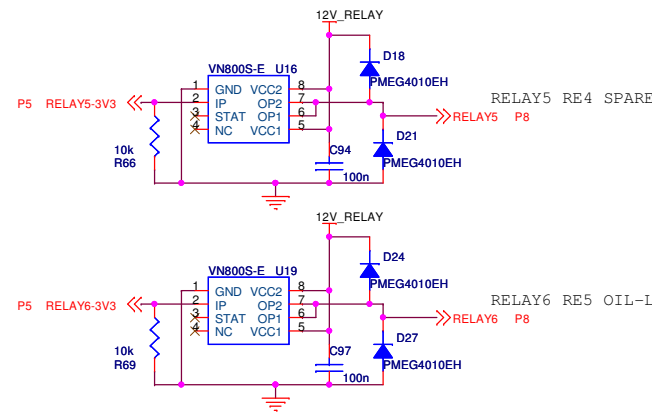
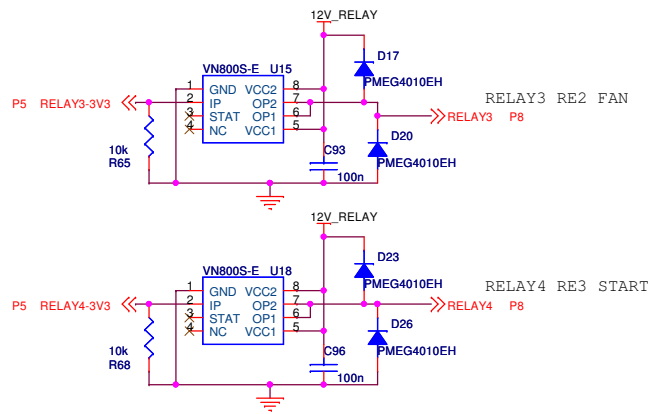
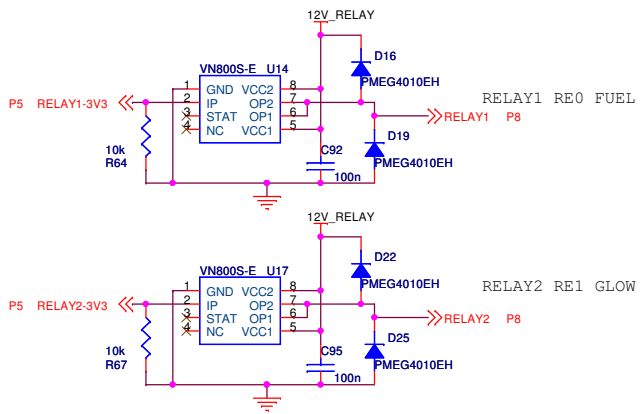
RS232 DRIVER UART1/4



CAN BUS

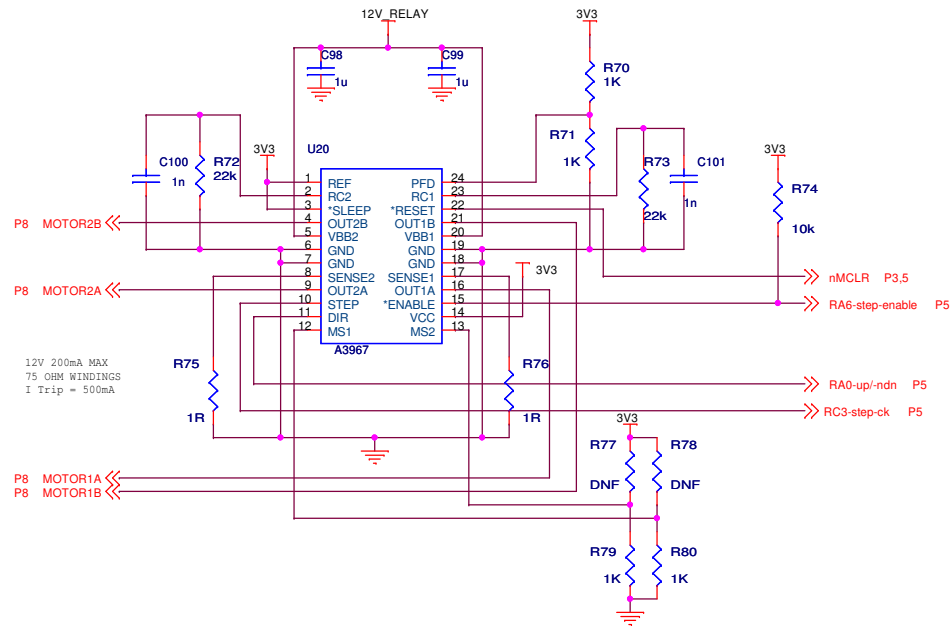


| CONTROLLIS LTD CONFIDENTIAL | | | |
|-----------------------------|-----------------------------|-----------------|-------------|
| Title | PIC GPIO CPU | | |
| Size | A3 | Document Number | PMR-HW-0009 |
| Date: | Tuesday, September 16, 2014 | Sheet | 5 of 10 |



PLACE PLENTY OF COPPER AROUND VN800'S

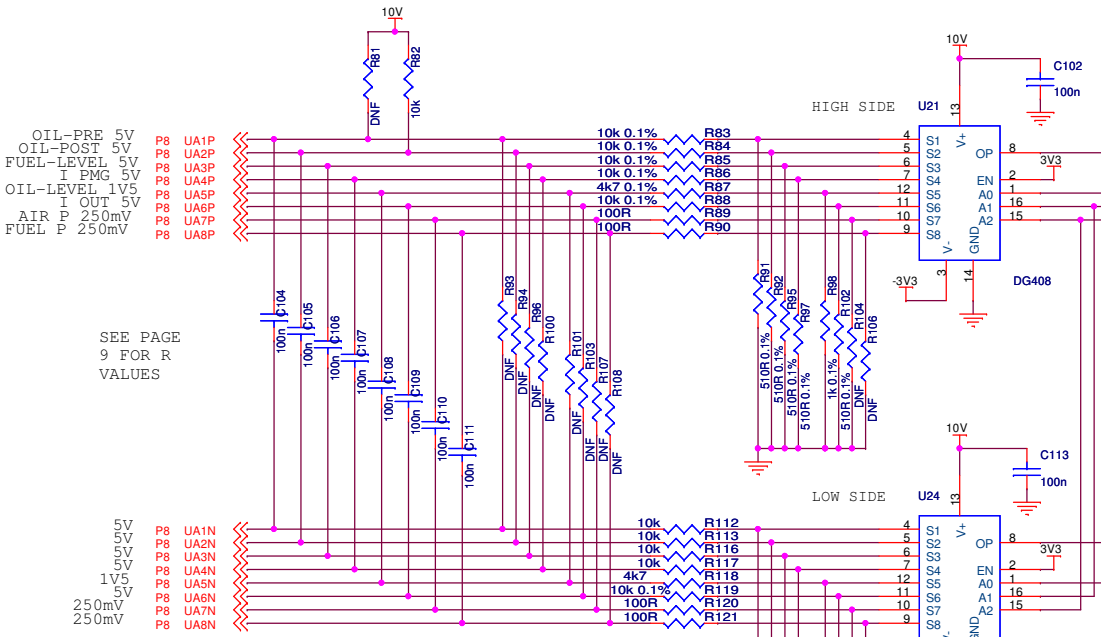
STEPPER MOTOR DRIVER



| | | |
|-----------------------------|--------------------------|---------------|
| CONTROLLIS LTD CONFIDENTIAL | | |
| Title | GPIOE DIGITAL + SWITCHES | |
| Size | Document Number | Rev |
| A3 | PMR-HW-0008 | |
| Date: | Tuesday, April 22, 2014 | Sheet 6 of 10 |

T=7*RC FOR 0.1% SETTling

UNIVERSAL ANALOG INPUTS



T=70ms for 0.1% SETTling

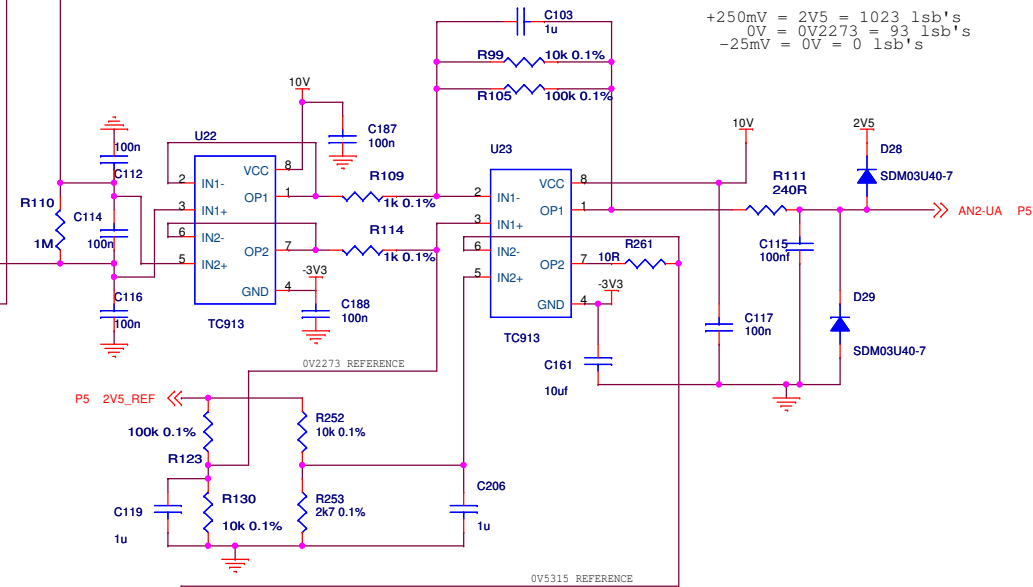
OP= 0V227+IP*9.091

+250mV = 2V5 = 1023 lsb's
 0V = 0V2273 = 93 lsb's
 -25mV = 0V = 0 lsb's

SEE PAGE 9 FOR R VALUES

- OIL-PRE 5V P8 UA1P
- OIL-POST 5V P8 UA2P
- FUEL-LEVEL 5V P8 UA3P
- I PMG 5V P8 UA4P
- OIL-LEVEL 1V5 P8 UA5P
- AIR T OUT 5V P8 UA6P
- FUEL P 250mV P8 UA7P
- FUEL P 250mV P8 UA8P

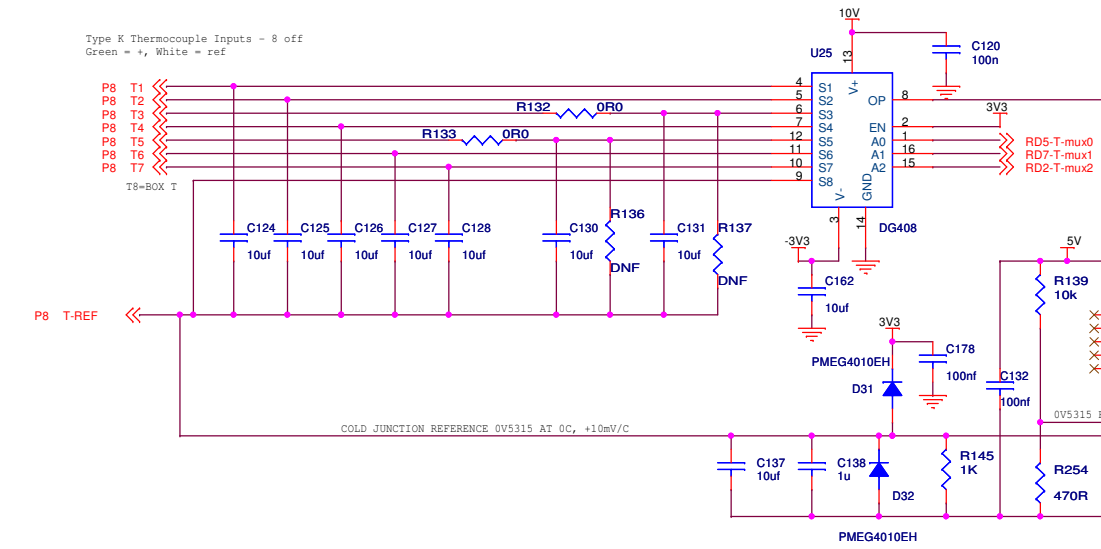
- 5V P8 UA1N
- 5V P8 UA2N
- 5V P8 UA3N
- 1V5 P8 UA4N
- 5V P8 UA5N
- 250mV P8 UA6N
- 250mV P8 UA7N
- 250mV P8 UA8N



TYPE K THERMOCOUPLE INPUTS

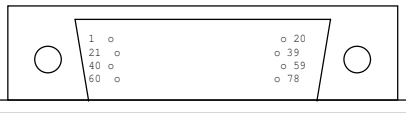
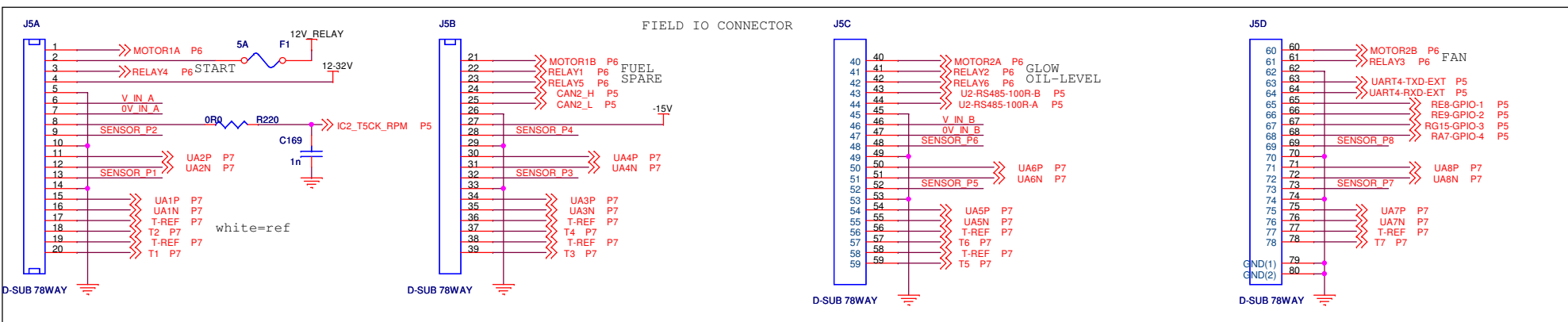
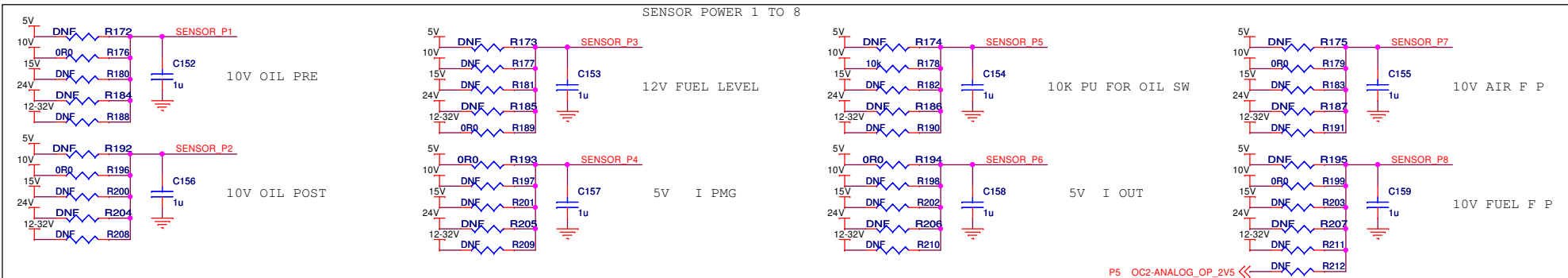
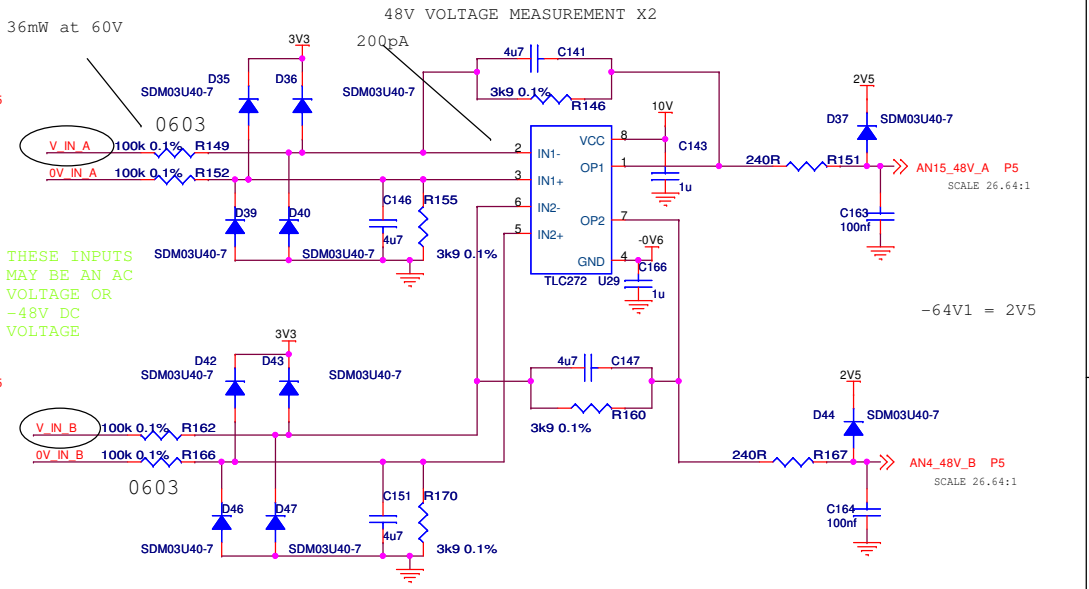
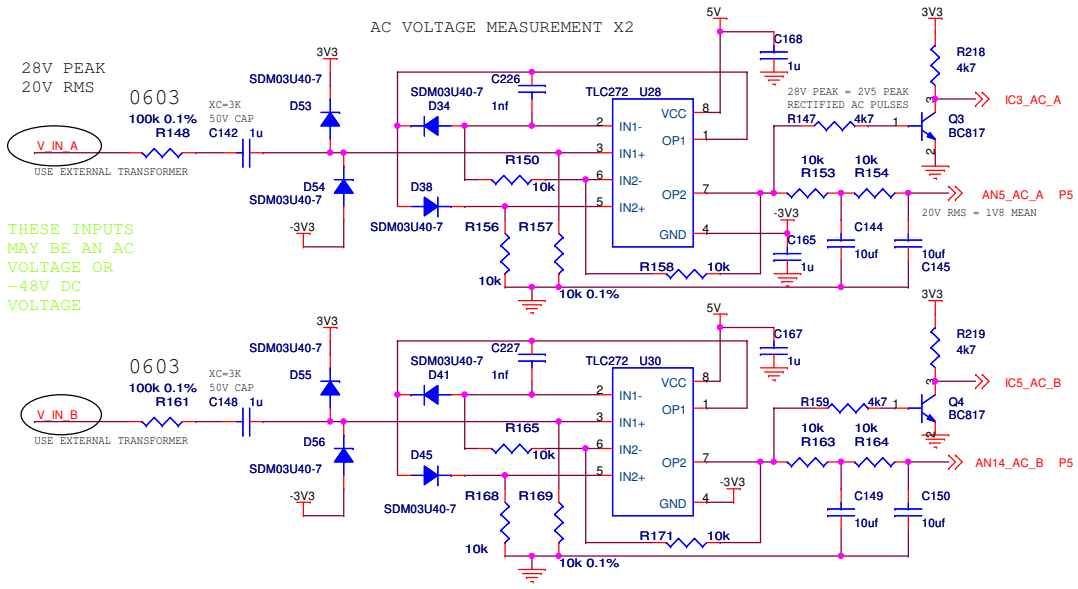
40.74uV/DEGREE-C

Type K Thermocouple Inputs - 8 off
Green = +, White = ref



SCALE FACTOR
 10mV/DEGREE-C
 0V=-53 DEGREE C
 0V5315=0 DEGREE C
 2V5=197 DEGREE C
 THIS CHANGES IF RESISTORS ON INPUTS FITTED

| | | | |
|-----------------------------|-----------------------------|-------|---------|
| CONTROLLIS LTD CONFIDENTIAL | | | |
| Title | GPIOE ANALOG | | |
| Size | Document Number | | Rev |
| A3 | PMR-HW-0008 | | |
| Date: | Tuesday, September 16, 2014 | Sheet | 7 of 10 |



NOTE: LCD DRIVE IS ON MAIN CPU CARD

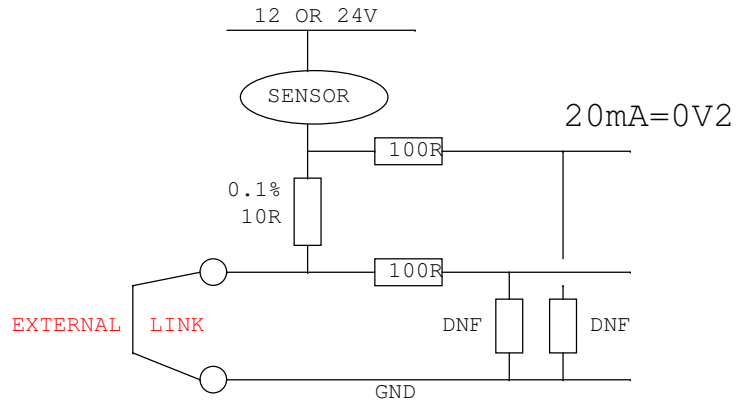
CONTROLLIS LTD CONFIDENTIAL

| | | | | | |
|-------|-----------------------------|-----------------|-----------------------|----|-----|
| Title | | | GPIOE FIELD CONNECTOR | | |
| Size | A3 | Document Number | PMR-HW-0008 | | Rev |
| Date: | Tuesday, September 16, 2014 | Sheet | 8 | of | 10 |

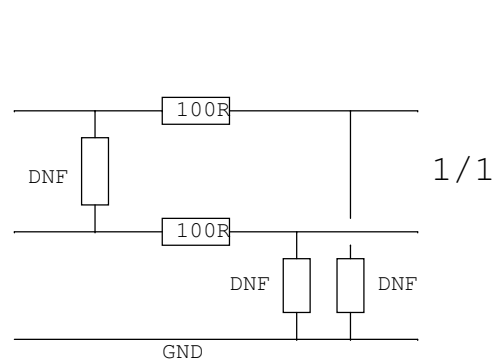
ANALOG AMPLIFIER GAIN SETTING RESISTORS FOR PAGE 7

(OUTPUT SUPPLY INDIVIDUAL VOLTAGE MUST ALSO BE SET ON PAGE 8)

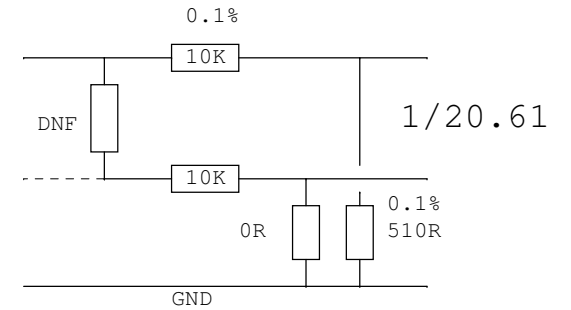
4-20mA LOOP (12 or 24V SUPPLY)



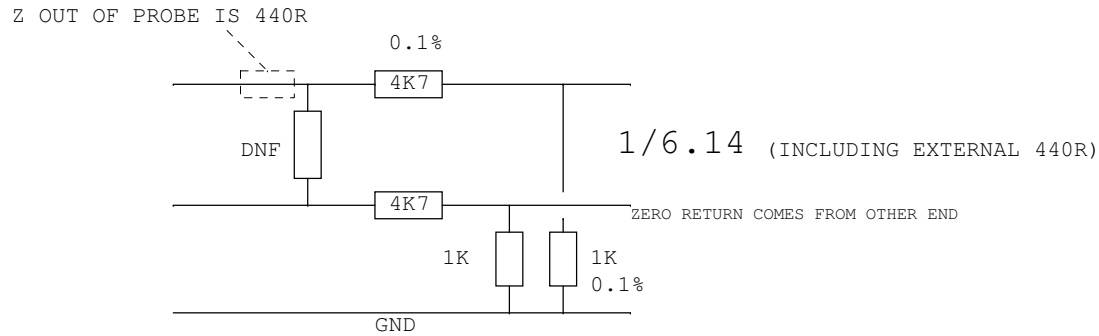
250mV PRESSURE (10V SUPPLY)



0-5V (10 or 12V SUPPLY)

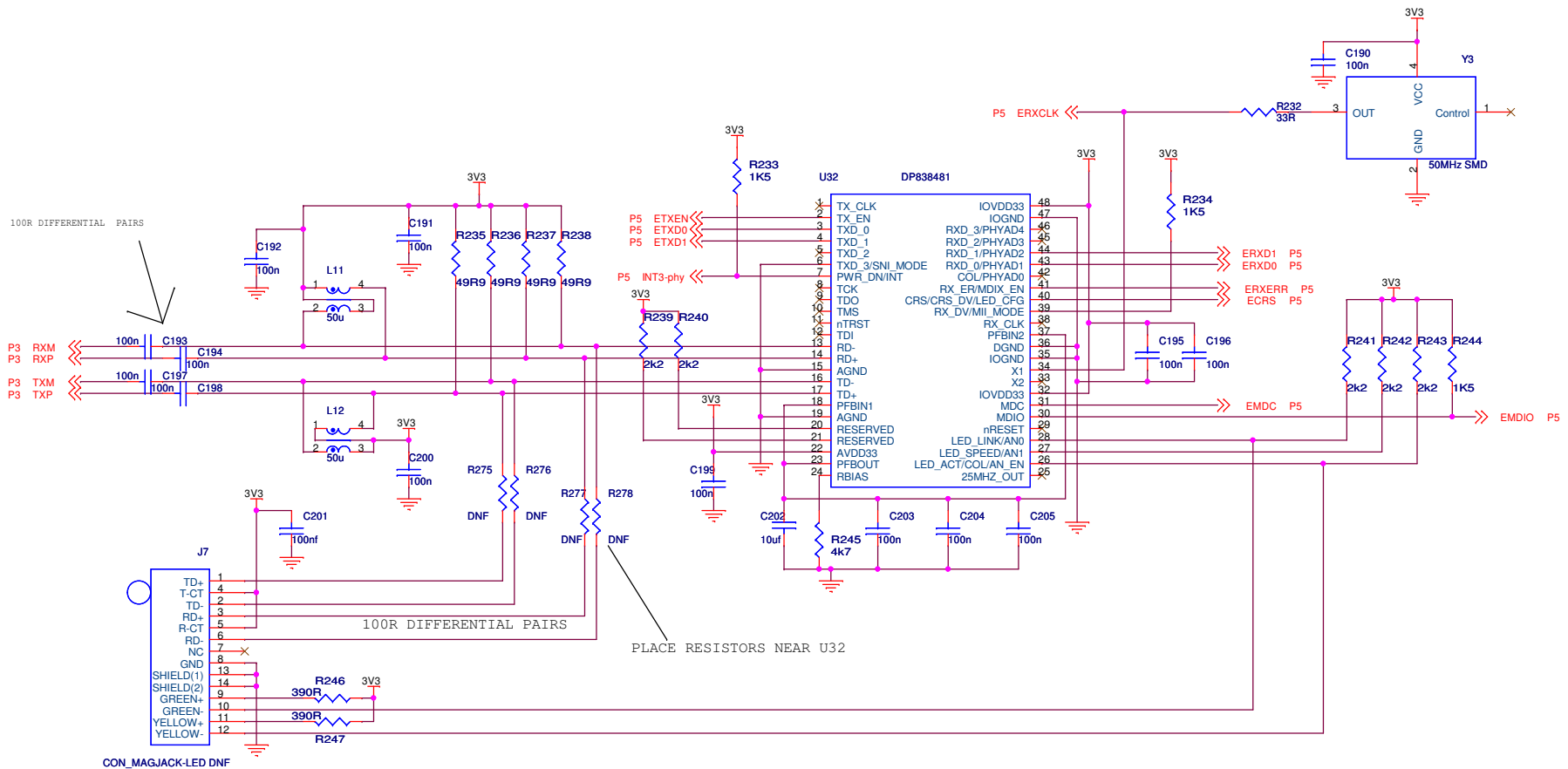


0-1.5V OIL LEVEL (12V SUPPLY)



RESISTORS 1% UNLESS STATED OTHERWISE

| | | |
|-----------------------------|-----------------------|---------------|
| CONTROLLIS LTD CONFIDENTIAL | | |
| Title | | |
| LTE GPIOE RESISTOR VALUES | | |
| Size | Document Number | Rev |
| A3 | | |
| Date: | Monday, June 10, 2013 | Sheet 9 of 10 |



| | | | |
|-----------------------------|-------------------------|-------|----------|
| CONTROLLIS LTD CONFIDENTIAL | | | |
| Title | LTE GPIO ETHERNET | | |
| Size | Document Number | | Rev |
| A3 | | | |
| Date: | Thursday, June 20, 2013 | Sheet | 10 of 10 |