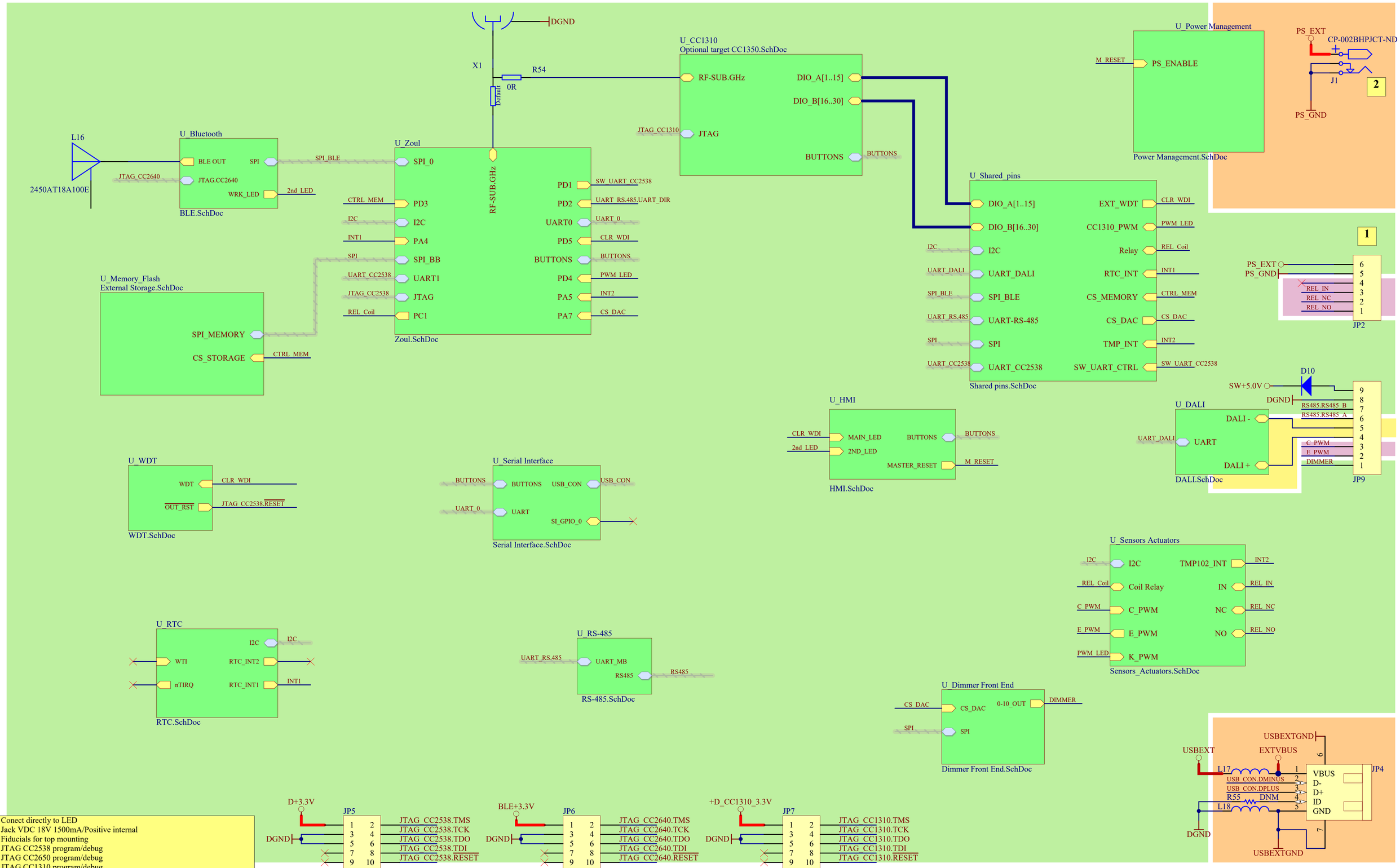
DGND
X1
R54
0R
Default
U_CC1310
Optional target CC1350.SchDoc
RF-SUB.GHz
DIO_A[1..15]
DIO_B[16..30]
JTAG_CC1310
JTAG
BUTTONS
BUTTONS
U_Power Management
M_RESET
PS_ENABLE
Power Management.SchDoc
PS_EXT
CP-002BHPJCT-ND
J1
2
PS_GND
L16
2450AT18A100E
U_Bluetooth
BLE OUT
SPI
JTAG_CC2640
JTAG.CC2640
WRK_LED
2nd_LED
SPI_BLE
BLE.SchDoc
U_Zoul
SPI_0
RF-SUB.GHz
CTRL_MEM
PD3
I2C
I2C
INT1
PA4
SPI
SPI_BB
UART_CC2538
UART1
JTAG_CC2538
JTAG
REL_Coil
PC1
PD1
SW_UART_CC2538
PD2
UART_RS.485.UART_DIR
UART0
UART_0
PD5
CLR_WDI
BUTTONS
BUTTONS
PD4
PWM_LED
PA5
INT2
PA7
CS_DAC
Zoul.SchDoc
U_Shared_pins
DIO_A[1..15]
DIO_B[16..30]
I2C
I2C
UART_DALI
UART_DALI
SPI_BLE
SPI_BLE
UART_RS.485
UART-RS-485
SPI
SPI
UART_CC2538
UART_CC2538
EXT_WDT
CLR_WDI
CC1310_PWM
PWM_LED
Relay
REL_Coil
RTC_INT
INT1
CS_MEMORY
CTRL_MEM
CS_DAC
CS_DAC
TMP_INT
INT2
SW_UART_CTRL
SW_UART_CC2538
Shared pins.SchDoc
1
PS_EXT
PS_GND
REL_IN
REL_NC
REL_NO
JP2
U_Memory_Flash
External Storage.SchDoc
SPI_MEMORY
CS_STORAGE
CTRL_MEM
U_HMI
CLR_WDI
2nd_LED
MAIN_LED
2ND_LED
MASTER_RESET
BUTTONS
BUTTONS
M_RESET
HMI.SchDoc
D10
SW+5.0V
DGND
U_DALI
UART_DALI
UART
DALI -
DALI +
RS485.RS485_B
RS485.RS485_A
C_PWM
E_PWM
DIMMER
DALI.SchDoc
JP9
U_WDT
WDT
CLR_WDI
OUT_RST
JTAG_CC2538.RESET
WDT.SchDoc
U_Serial Interface
BUTTONS
BUTTONS
USB_CON
USB_CON
UART_0
UART
SI_GPIO_0
Serial Interface.SchDoc
U_Sensors Actuators
I2C
I2C
TMP102_INT
INT2
REL_Coil
Coil Relay
IN
REL_IN
C_PWM
C_PWM
NC
REL_NC
E_PWM
E_PWM
NO
REL_NO
PWM_LED
K_PWM
Sensors_Actuators.SchDoc
U_RTC
I2C
I2C
WTI
RTC_INT2
nTIRQ
RTC_INT1
INT1
RTC.SchDoc
U_RS-485
UART_RS.485
UART_MB
RS485
RS485
RS-485.SchDoc
U_Dimmer Front End
CS_DAC
CS_DAC
0-10_OUT
DIMMER
SPI
SPI
Dimmer Front End.SchDoc
USBEXTGND
USBEXT
EXTVBUS
L17
USB_CON.DMINUS
USB_CON.DPLUS
R55
DNM
L18
DGND
VBUS
D-
D+
ID
GND
JP4
USBEXTGND
D+3.3V
DGND
JP5
JTAG_CC2538.TMS
JTAG_CC2538.TCK
JTAG_CC2538.TDO
JTAG_CC2538.TDI
JTAG_CC2538.RESET
4
BLE+3.3V
DGND
JP6
JTAG_CC2640.TMS
JTAG_CC2640.TCK
JTAG_CC2640.TDO
JTAG_CC2640.TDI
JTAG_CC2640.RESET
5
+D_CC1310_3.3V
DGND
JP7
JTAG_CC1310.TMS
JTAG_CC1310.TCK
JTAG_CC1310.TDO
JTAG_CC1310.TDI
JTAG_CC1310.RESET
6
1. Conect directly to LED
2. Jack VDC 18V 1500mA/Positive internal
3. Fiducials for top mounting
4. JTAG CC2538 program/debug
5. JTAG CC2650 program/debug
6. JTAG CC1310 program/debug
1.
DALI plane
DALI_GND
Power Supply Plane
DGND
Digital Plane
DGND
Isolated
3
FD1
FD2
FD3
FD4
FD5
FD6
LG1
Zolertia Logo
Performed
Revised
Approved
Comments
Project Name
ZOL-BO002
Sheet
1
Title
Main
Version
Proto A
Author
Javi Sanchez
Date
27/05/2016
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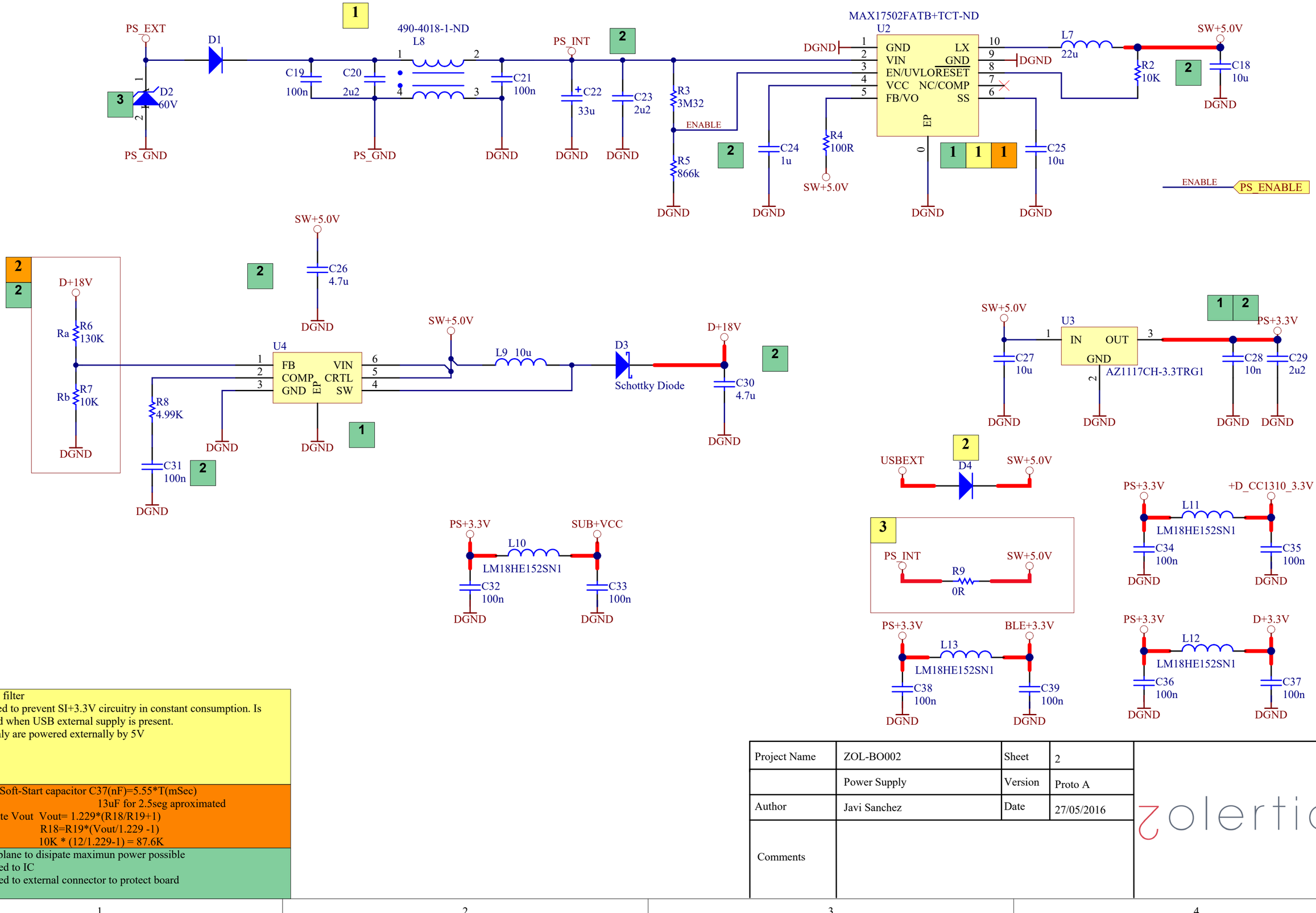

1. Input EMI filter
2. Circuit used to prevent SI+3.3V circuitry in constant consumption. Is only powered when USB external supply is present.
3. Place if only are powered externally by 5V

1. For select Soft-Start capacitor C37(nF)=5.55*T(mSec)
   13uF for 2.5seg aproximated
2. To calculate Vout Vout= 1.229*(R18/R19+1)
   R18=R19*(Vout/1.229 -1)
   10K * (12/1.229-1) = 87.6K

1. Place big plane to disipate maximun power possible
2. Place closed to IC
3. Place closed to external connector to protect board

Project Name	ZOL-BO002	Sheet	2
	Power Supply	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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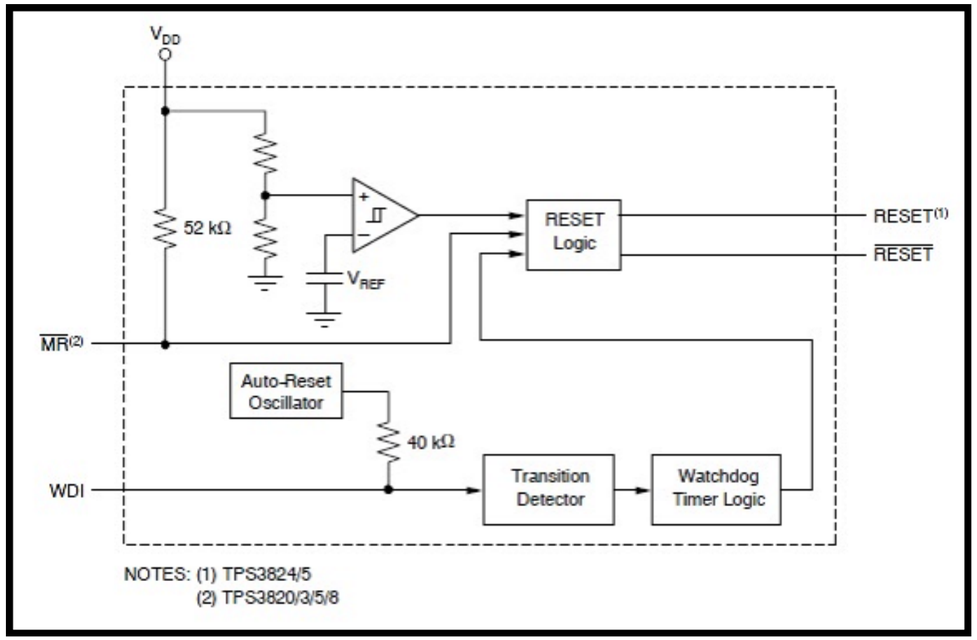


TPS3823 Block Diagram

INPUTS		OUTPUTS	
MR(1)	VDD > VIT	RESET	RESET(2)
L	0	L	H
L	1	L	H
H	0	L	H
H	1	H	L

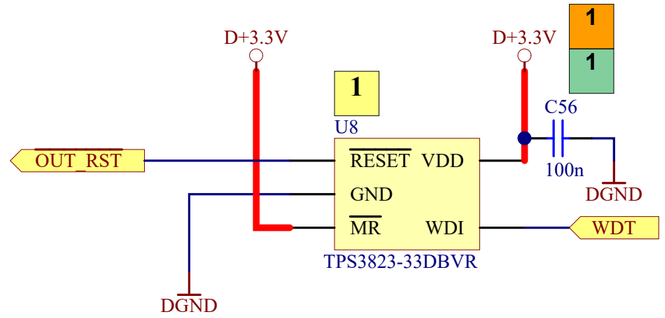
(1) TPS3820/3/5/8
(2) TPS3824/5

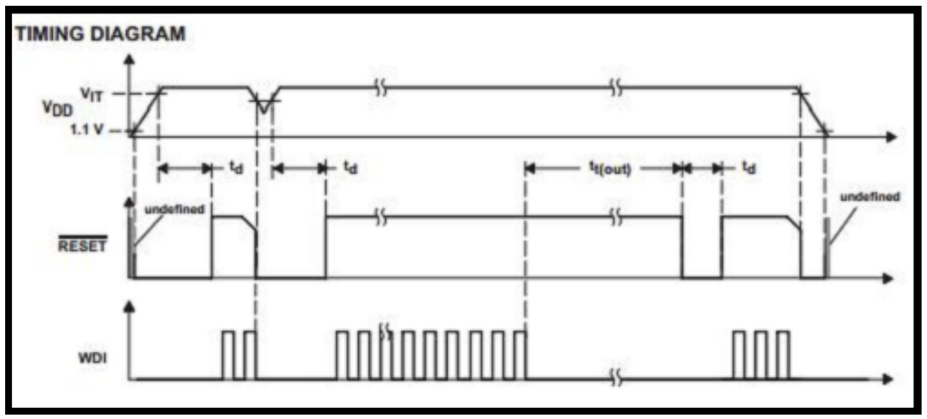
TPS3823 Function/Truth Table

1 - The TPS382x family of supervisors provide circuit initialization and timing supervision, primarily for DSP and processor-based systems.

1 - Decoupling capacitors.
2- MOSFET design is used to cut RESET pulse signal from WDT when USB programming is connected. It should be necessary to program over BSL if WDT is mounted.

1 - Put capacitor as close as possible to IC.





PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{tout}	Watchdog time out	TPS3820	$V_{DD} \geq V_{IT-} + 0.2$ V, See timing diagram	112	200	310	ms
		TPS3823/4/8		0.9	1.6	2.5	s
t_d	Delay time	TPS3820	$V_{DD} \geq V_{IT-} + 0.2$ V, See timing diagram	15	25	37	ms
		TPS3823/4/5/8		120	200	300	

Project Name	ZOL-BO002	Sheet	3
Title	WDT	Version	Proto A
Author	Toni Lozano	Date	27/05/2016
Comments			

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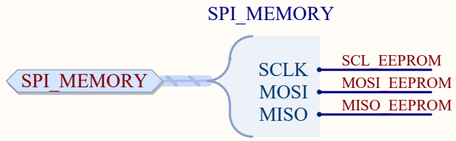

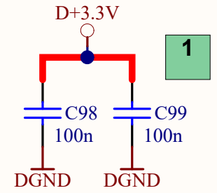

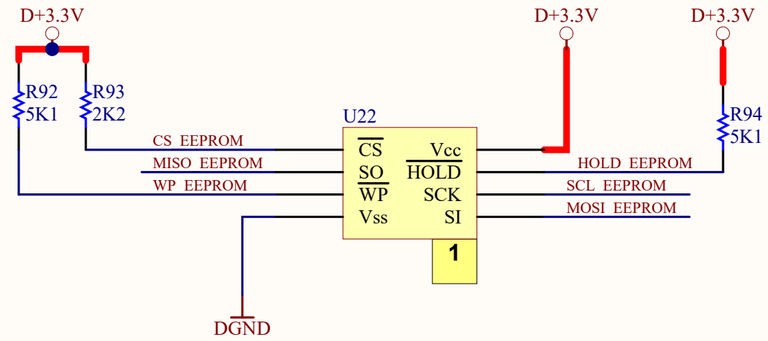

1. 25AA128 SPI Serial EEPROM:

Max. clock	104MHz (3.3V)
Size memory	4Mbit (512K*8-bit)
Endurance	More than 100,000 erase/write cycles
Uniform erasable	4KB, 32KB and 64KB regions

1. Placed close to IC

Project Name	ZOL-BO002	Sheet	4
Title	External Storage	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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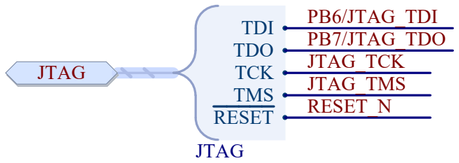

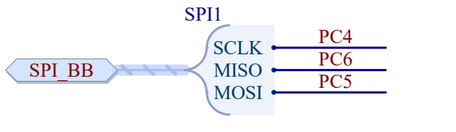

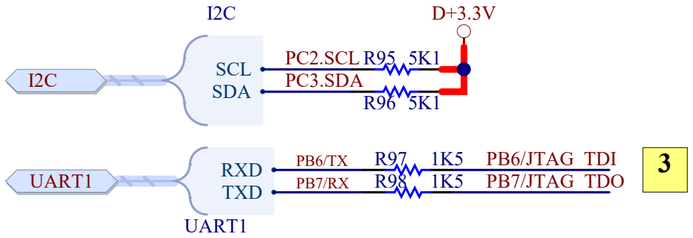

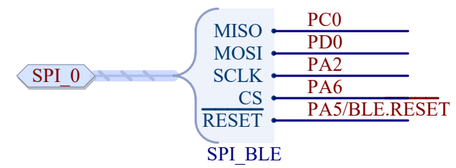

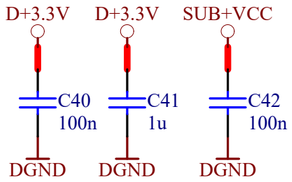

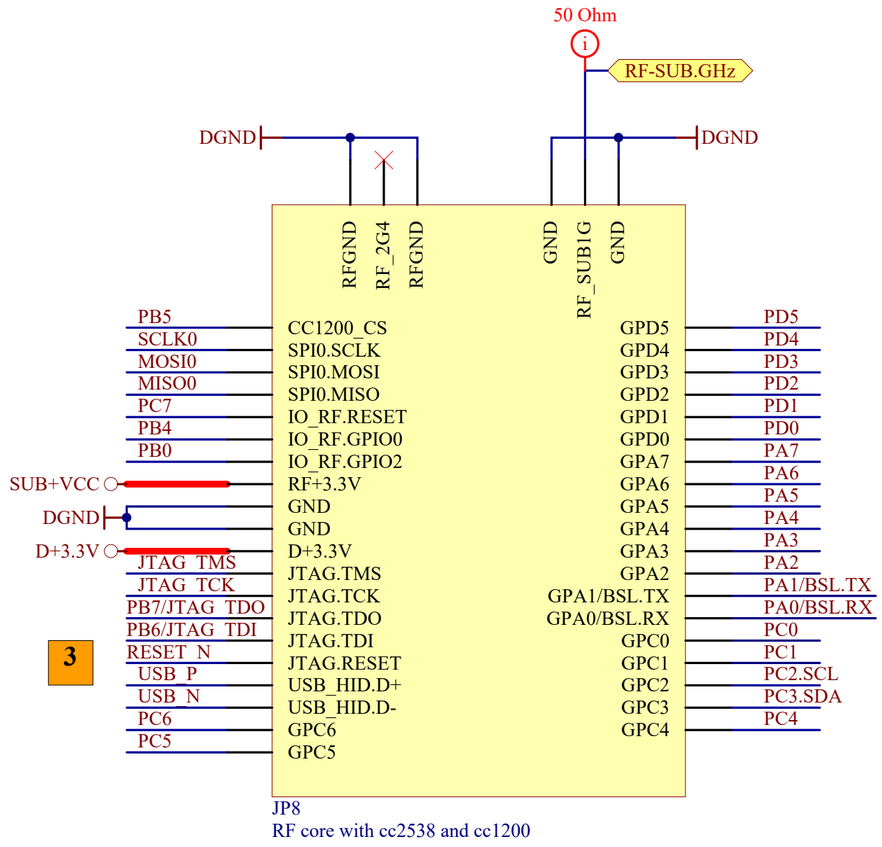

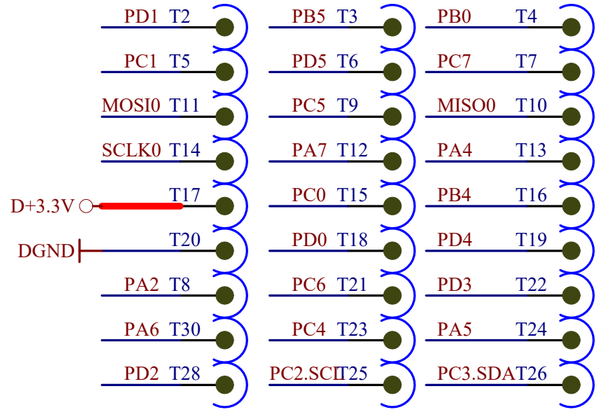

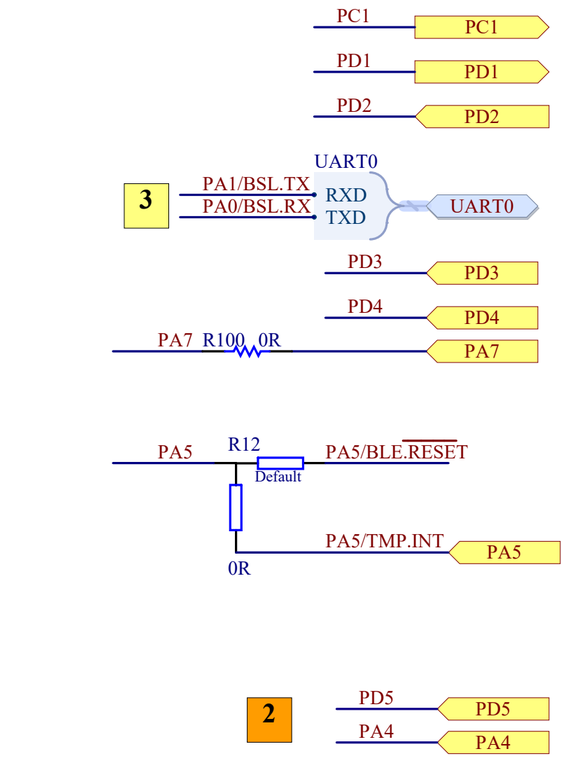

1. External pull up resistor enables USB only as 2.0 protocol.
2. Jumper to mesure SOC consumption
3. If WDT is mounted, are necesary remove mosfet to control RED led

1. DVDD_USB voltage limit is 3.3v
2. Low-Pass Filter
3. internal Pull-up resistor is placed in zoul for reset pin.

1. Place capacitors close to Core
2. Pin 4 (NC) better connect to GND to avoid noise , because cap can go more closer
3. Place jumper closer to R9

Project Name	ZOL-BO002	Sheet	5
Title	Zoul	Version	Proto A
Author	Toni Lozano	Date	24/05/2016
Comments			

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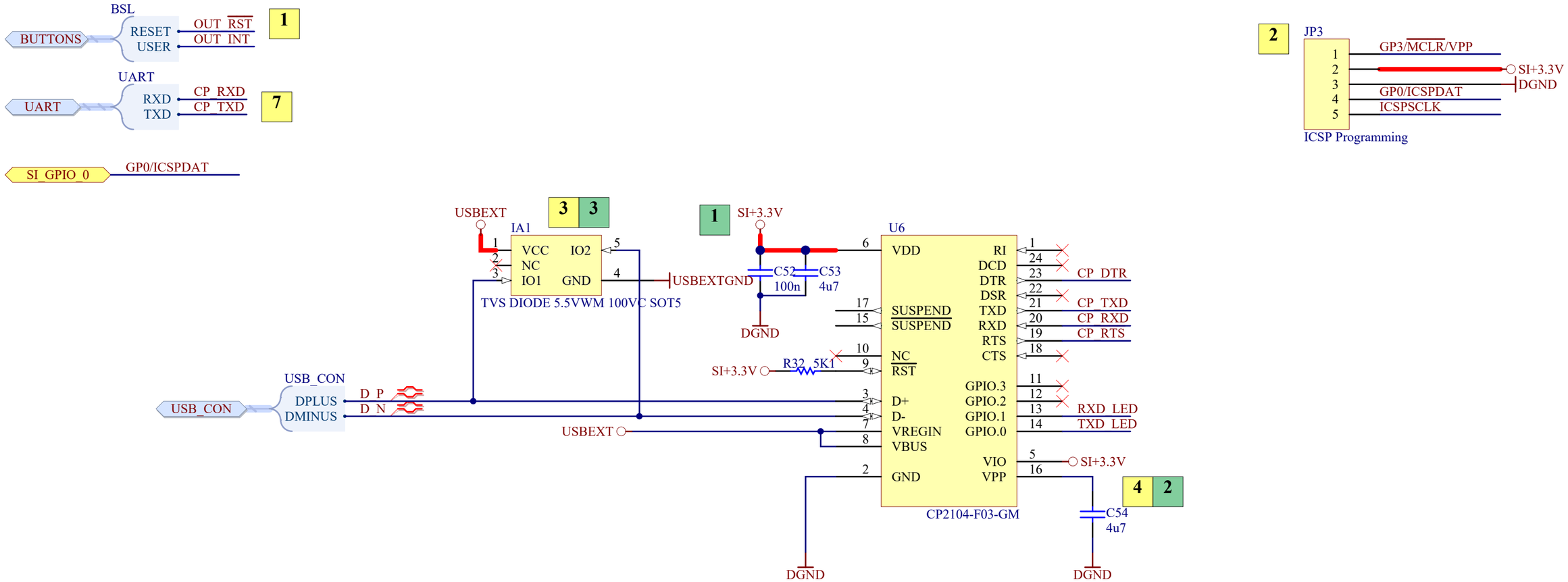

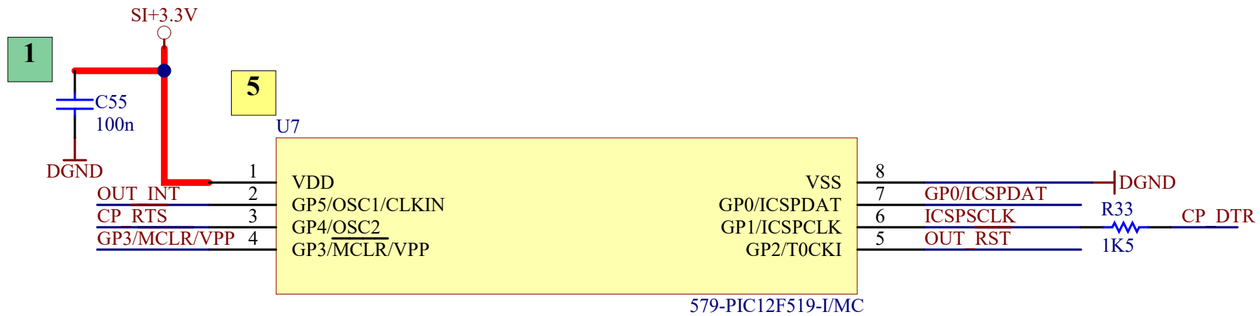

1.- Pins needed to program using BSL are: DTR (connected to GP1) and RTS (connected to GP4)
2.- PIC Programming connector
3.- ESD-Protection for High-Speed Data Interfaces
4.- Capacitor to enable program of CP2104. Remove this to protect the writing config of the cp2104.
5.- PIC12F519 8-Pin, 8-Bit Flash Microcontroller

Program Memory Type	Flash
Program Memory (KB)	1.5
CPU Speed (MIPS)	2
RAM Bytes	41
Data EEPROM (bytes)	64
Timers	1 x 8-bit
Temperature Range (C)	-40 to 125
Operating Voltage Range (V)	2 to 5.5
Pin Count	8

7.-Crossed in MCU sheet

1.- Ensure that we can't reach at 5V.

1.- Place components as close possible to source.
2.- Capacitor to enable the CP2104 programming parameters
3.- Place component as close possible to external connector

Project Name	ZOL-BO002	Sheet	6
Title	Serial Interface	Version	Proto A
Author	Aitor Mejias	Date	27/05/2016
Comments			

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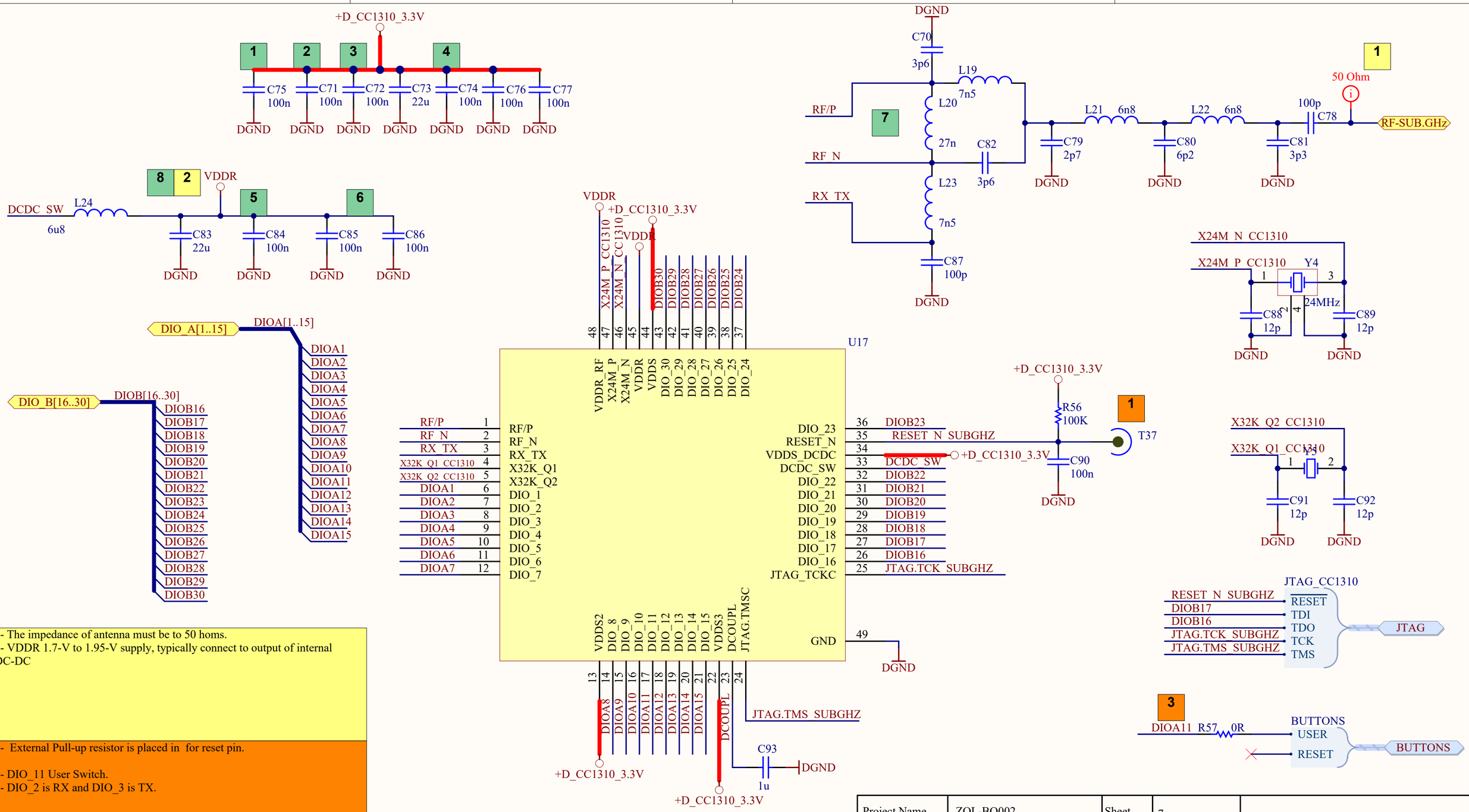

1- The impedance of antenna must be to 50 homs.
2- VDDR 1.7-V to 1.95-V supply, typically connect to output of internal DC-DC

1- External Pull-up resistor is placed in for reset pin.

3- DIO_11 User Switch.
4- DIO_2 is RX and DIO_3 is TX.

1- Pin 13 (VDDS2) Connection point.
2- Pin 22 (VDDS3) Connection point.
3- Pin 44 (VDDS) Connection point.
4- Pin 34 (VDDS_DCDC) Connection point.
5- Pin 45 (VDDR) Connction point.
6- Pin 48 (VDDR_RF) Connection point.
7- The length of the tracks in Pin 1 (RF_P) and Pin 2 (RF_N) must be the same.
8- Place L and C close to pin 33. Low inductance C to ground plane

Performed	Revised	Approved

Project Name	ZOL-BO002	Sheet	7
Title	CC1350	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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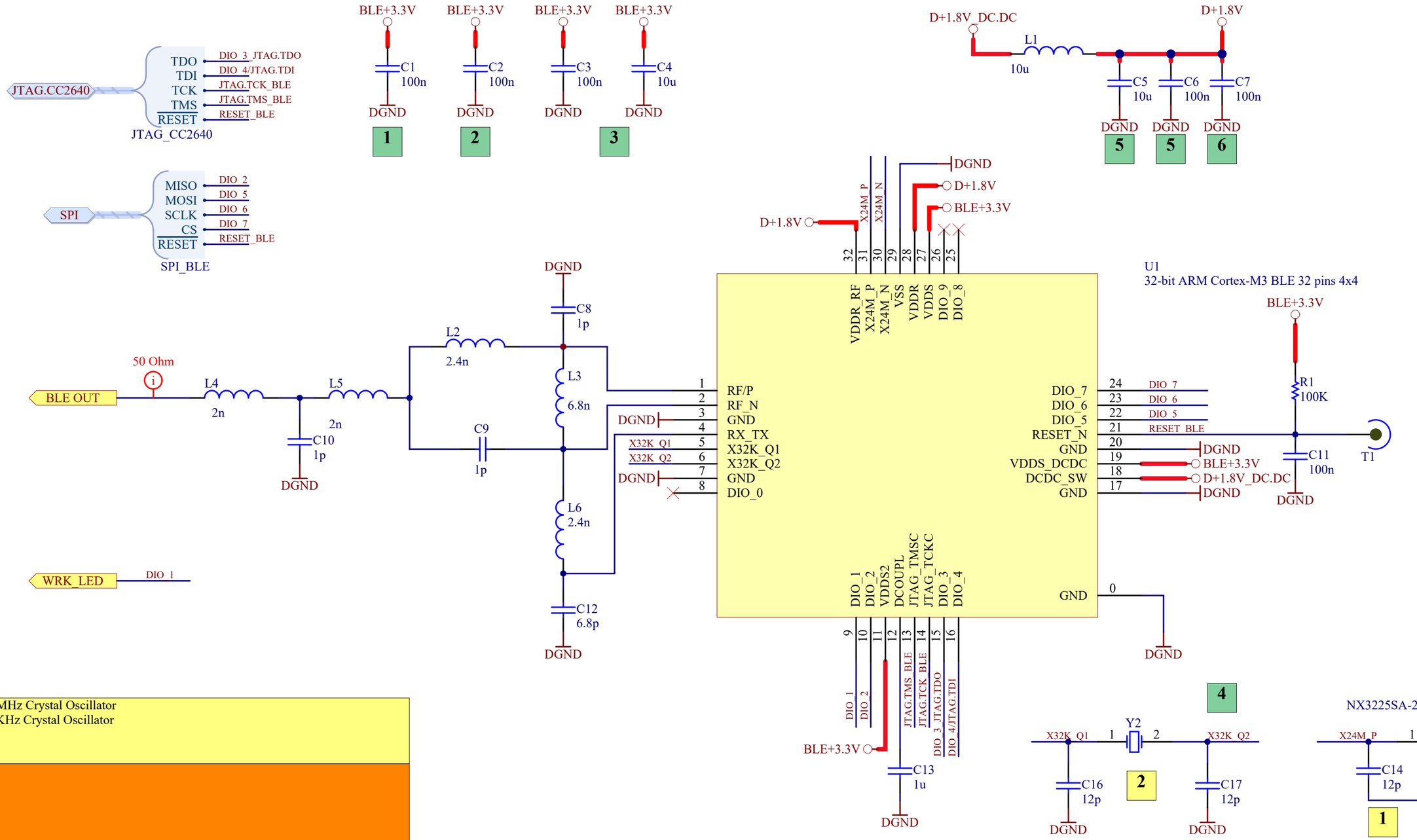

1. 24MHz Crystal Oscillator
2. 32KHz Crystal Oscillator

1. Place close to pin-11
2. Place close to pin-27
3. Place close to pin-18
4. Place close to integrated
5. Place close to pin-29
6. Place close to pin-32

Project Name	ZOL-BO002	Sheet	8
Title	BLE	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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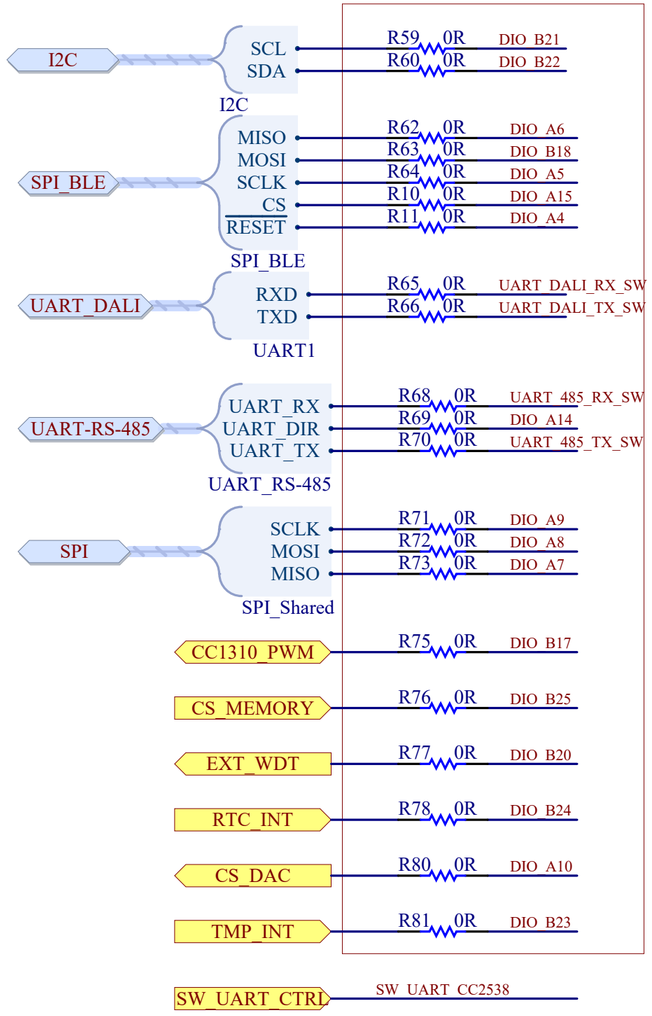

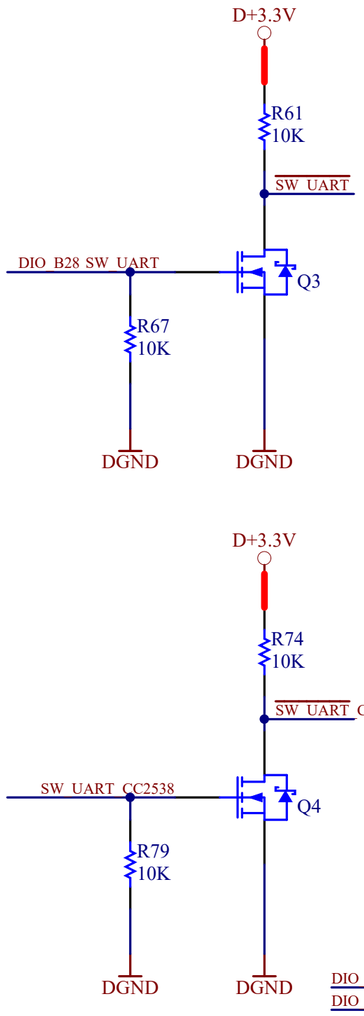

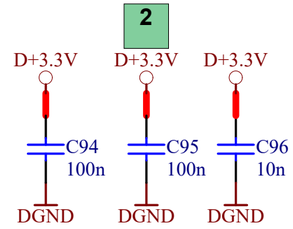

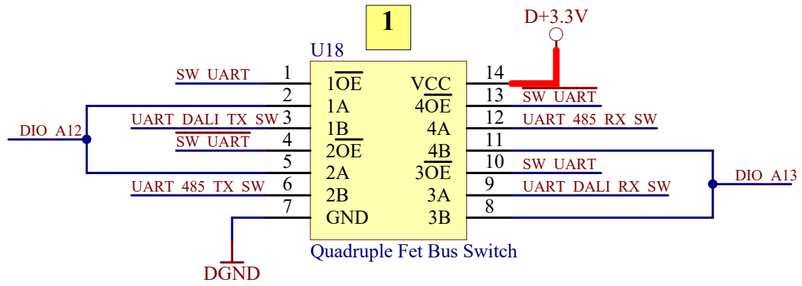

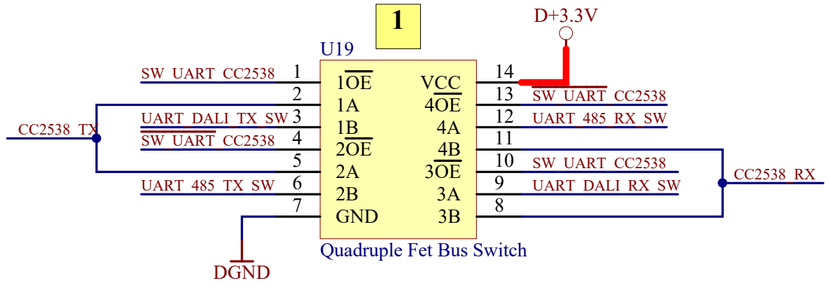

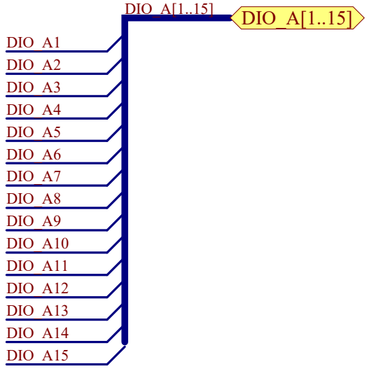

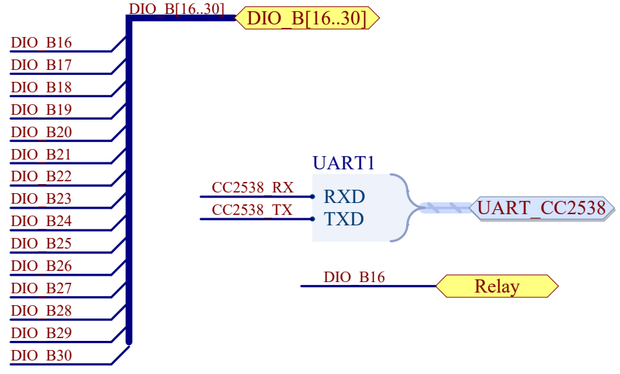

1. SW UART, CC1310 only support one
2. Place 0R resistor when CC1310 are placed on board

1

1. If are possible place close ont from the other for if possible place 0R array
2. Place closed to U18 and U19

Cannot open file C:\Users\jsg_8\Documents\Altium\Projects\Zoul\Breakout\ZOL-BO002\Documentation\SW_UART.JPG

1

Project Name	ZOL-BO002	Sheet	9
Title	Shared pins	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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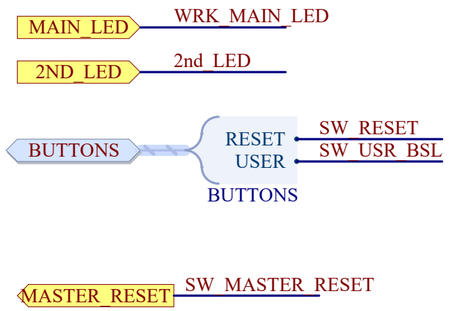
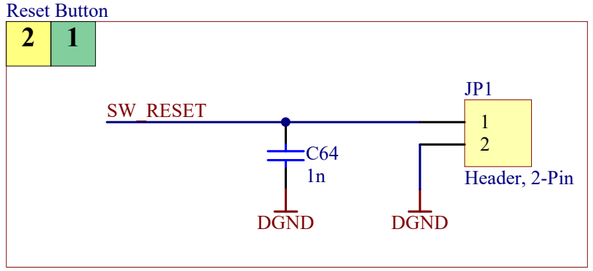
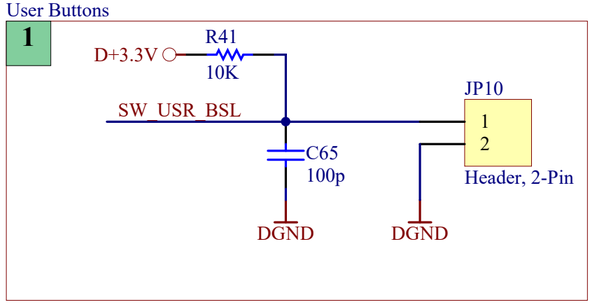


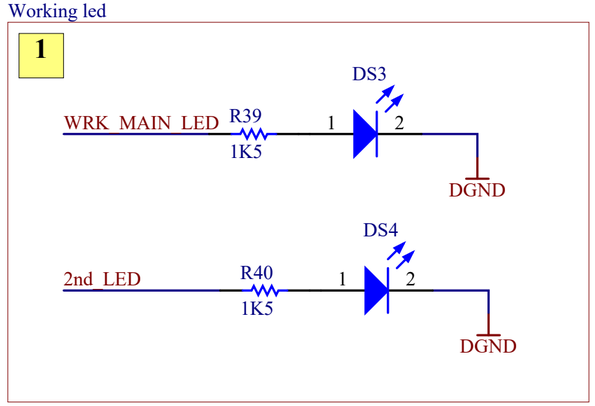
Reset Button



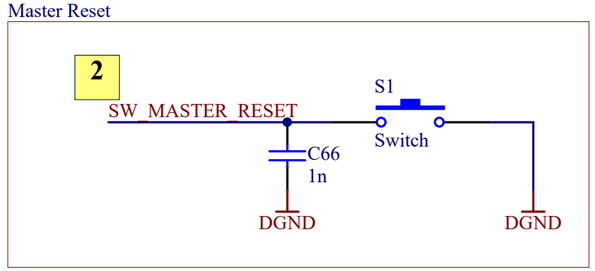
User Buttons



Working led



Master Reset



1.Working led, active '1'
2. Pull up on MCU sheet

1.

1. Jumper to solder external buttons

Project Name	ZOL-BO002	Sheet	10
Title	HMI	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments	* * *		

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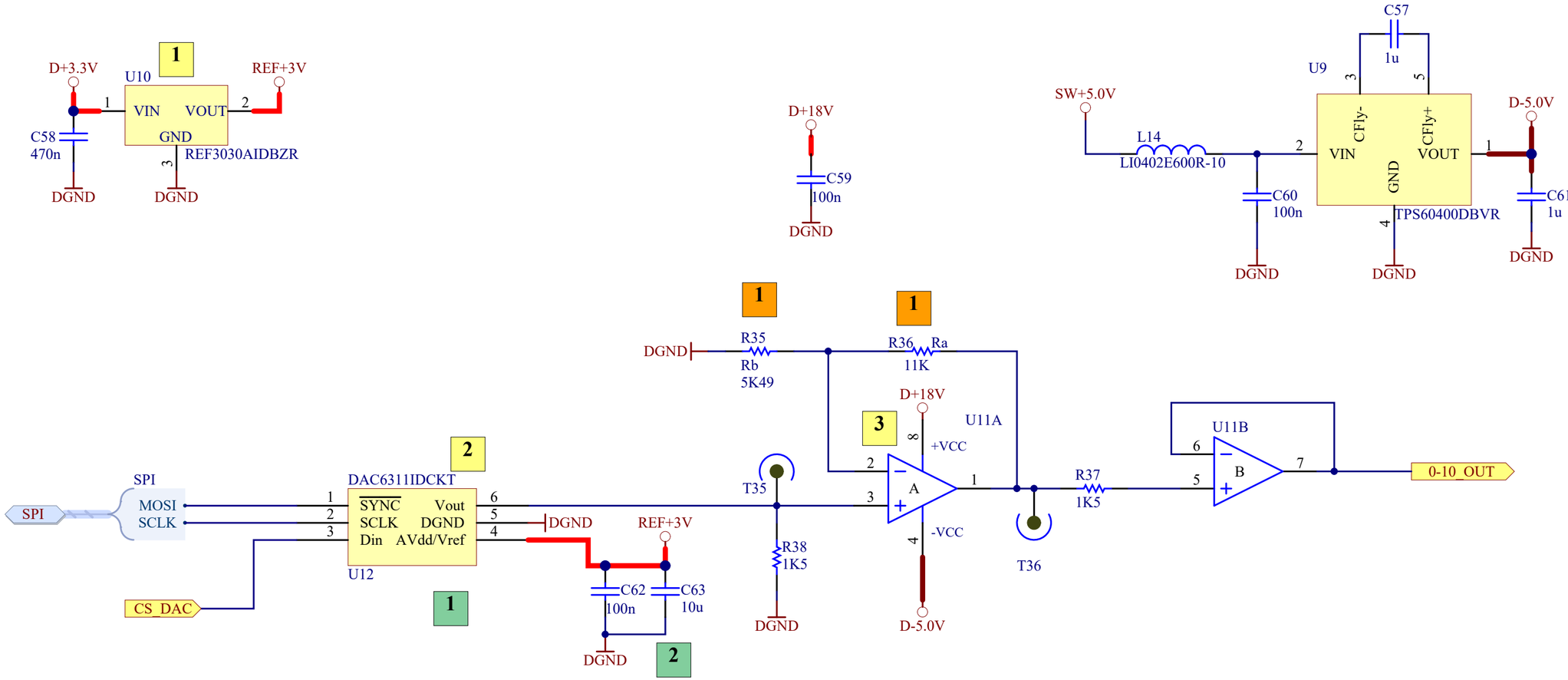

1. REF3030, 3V 50ppm/°C Max, 50µA in SOT23-3 CMOS VOLTAGE REFERENCE
2. DAC6310 10-Bit Micro Power Digital-to-Analog Converter with an SPI-Compatible Interface.
3. LOW-POWER SINGLE OPERATIONAL AMPLIFIER with supply range from 3V to 30V.

1. A gain of 3.333 is obtained to amplify the signal to 0-10V. This is the corresponding equation:
   Av = Vo / Vi = 1 + Ra / Rb
   Av = 10/ 3 = 1 + 11K/5K49

1. For best accuracy and minimum noise, separate analog and digital areas, place power analog and digital planes in the same layer and place a unique ground plane in all the printed circuit area.
Avoid crossover of analog and digital signals.
2. Place capacitors as close as possible to the supply pin

Project Name	ZOL-BO002	Sheet	11
Title	Dimmer Front End	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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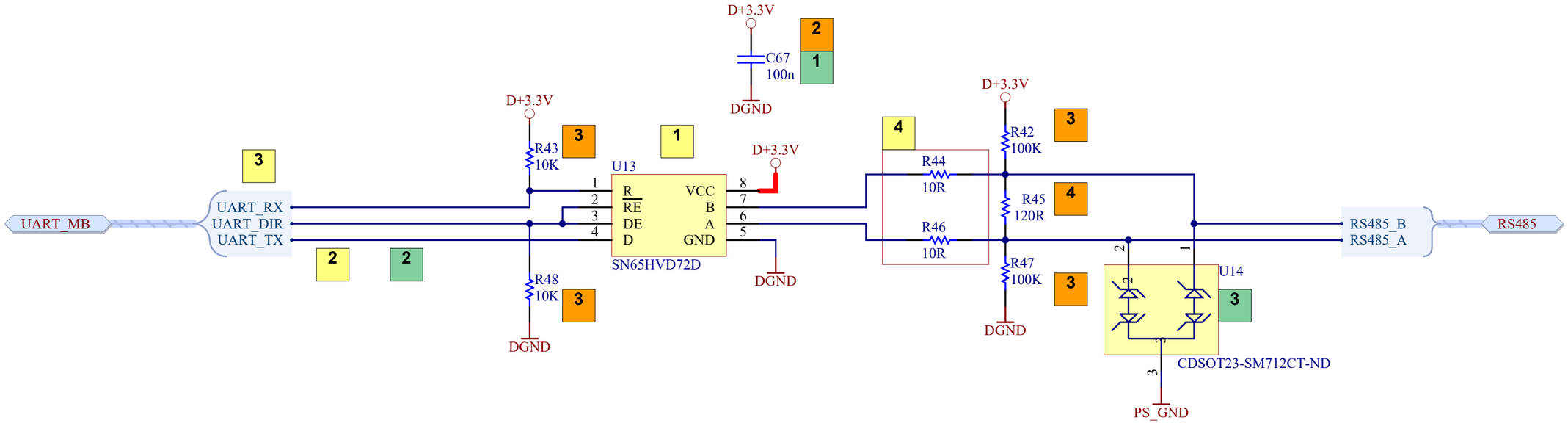


5

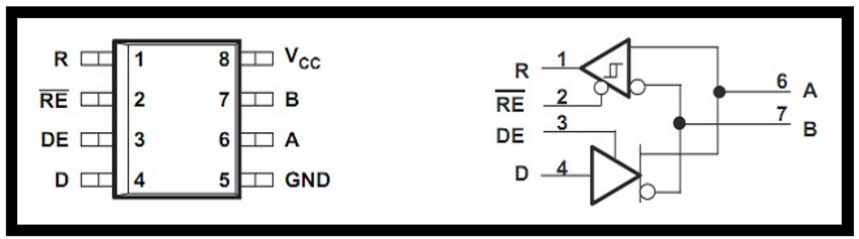
INPUT	ENABLE	OUTPUTS		
D	DE	A	B	
H	H	H	L	Actively drive bus High
L	H	L	H	Actively drive bus Low
X	L	Z	Z	Driver disabled
X	OPEN	Z	Z	Driver disabled by default
OPEN	H	H	L	Actively drive bus High by default

SN65HVD72D Driver Table

DIFFERENTIAL INPUT	ENABLE	OUTPUT	
$V_{ID} = V_A - V_B$	RE	R	
$V_{IT+} < V_{ID}$	L	H	Receive valid bus High
$V_{IT-} < V_{ID} < V_{IT+}$	L	?	Indeterminate bus state
$V_{ID} < V_{IT-}$	L	L	Receive valid bus Low
X	H	Z	Receiver disabled
X	OPEN	Z	Receiver disabled by default
Open-circuit bus	L	H	Fail-safe high output
Short-circuit bus	L	H	fail-safe high output
Idle (terminated) bus	L	H	fail-safe high output

SN65HVD72D ReceiverTable

1



SN65HVD72D connection and logic diagram

1 - Half-Duplex RS-485 Transceiver, interface between RS485 and UART
2 - Test points to connect logic analyzer if communication issue
3 - UART direction pin is needed to control transceiver communication direction, normally must be in listening mode
4. These resistors limit the residual clamping current into the transceive and prevent it from latching up. If not work correctly place 0R resisto

1 - SN65HVD72D connection and logic diagram
2 - Decoupling capacitors
3 - Pull-up and pull-down resitor for signal stability
4 - Terminator resistor, recommended 110O - 120O (not mounted)
5 - SN65HVD72D Transmitting and Receiving tables

1 - Put decoupling capacitors as close as possible to IC
2 - Place aligned test points
3 - Place closed than external connector

Project Name	ZOL-BO002	Sheet	12
Title	RS-485	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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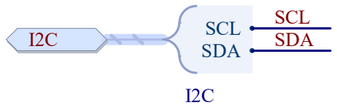

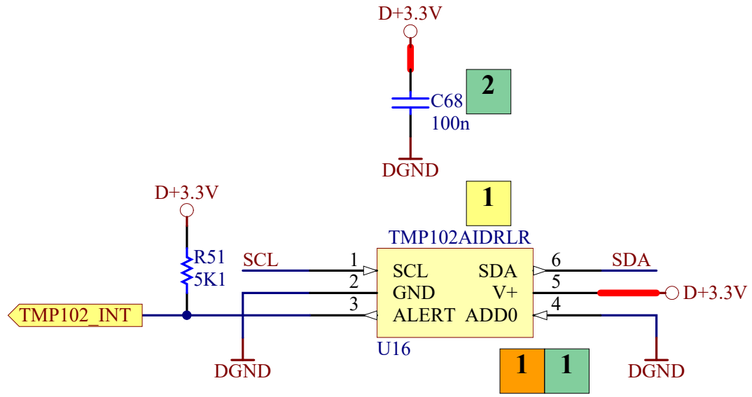

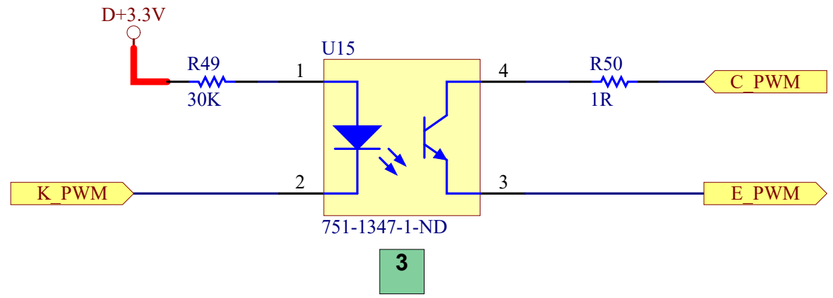

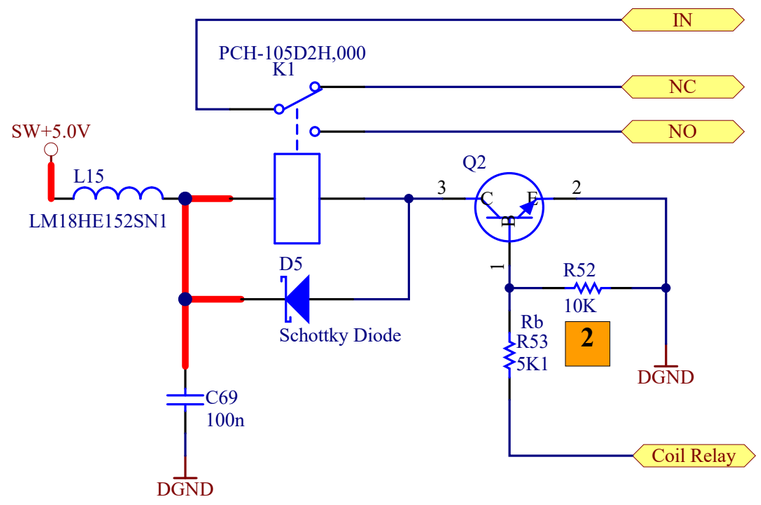

1. Temperature Sensor, 12-bit ADC offers resolutions down to 0.0625°C

1. TMP I2C address, ADD0:
   1001 000x Ground
   1001 001x VCC
   1001 010x SDA
   1001 011x SCL

2. Rb= (VCC-0.7) / (Icoil/hfe)
   Rb =(5-0.7) / (40mA/50)= 5375 Ohms

1.Place the maximun away to Power Supply
2. Place to closer to Ic
3. Separate planes to garantee isolation

Project Name	ZOL-BO002	Sheet	13
Title	Digital Sensors	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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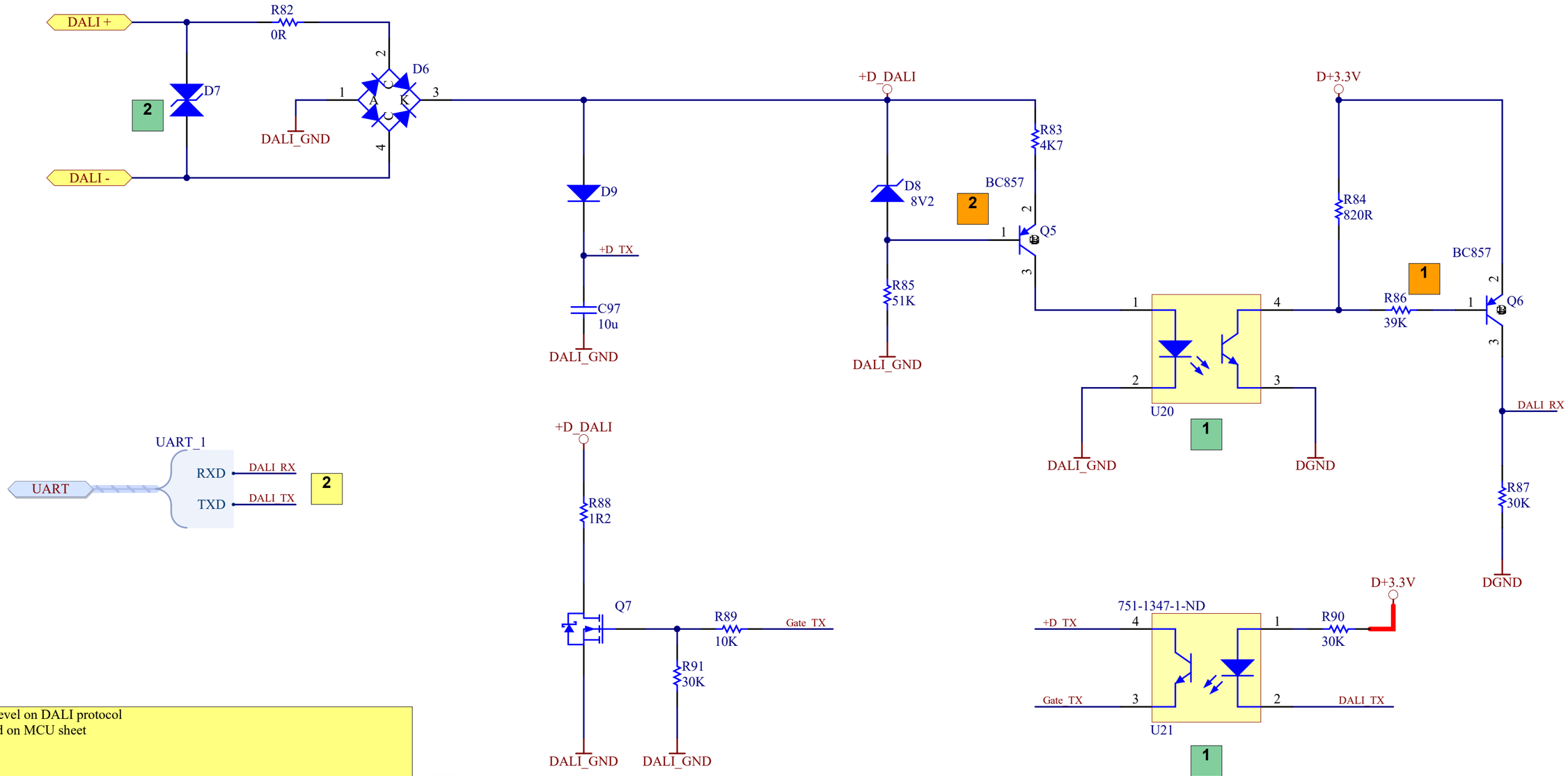
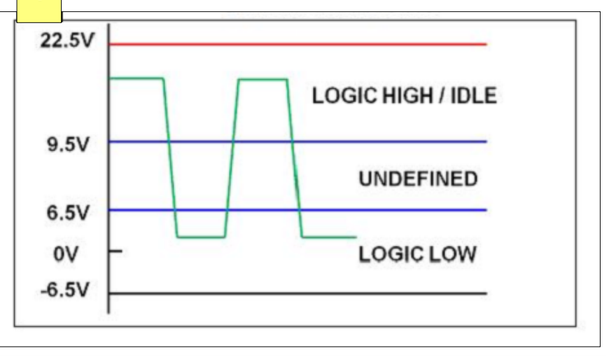


1. Logic level on DALI protocol
2. Crossed on MCU sheet

1. Rb= (Vbc-0.7) / (Ic / hFe)
   Rb = (3.3-0.7) / (110u / 90) = 2M1
   Placed smaller to garantee saturation
2.Rb= (Vbc-0.7) / (Ic/hFe)
   Rb = (13.8-0.7) / (4.6m / 90) = 256K
   Placed smaller to garantee saturation

1.Separate planes to garantee isolation
2. Place close to terminal to reduce damage if are a big voltage on this pins



Project Name	ZOL-BO002	Sheet	14
Title	DALI	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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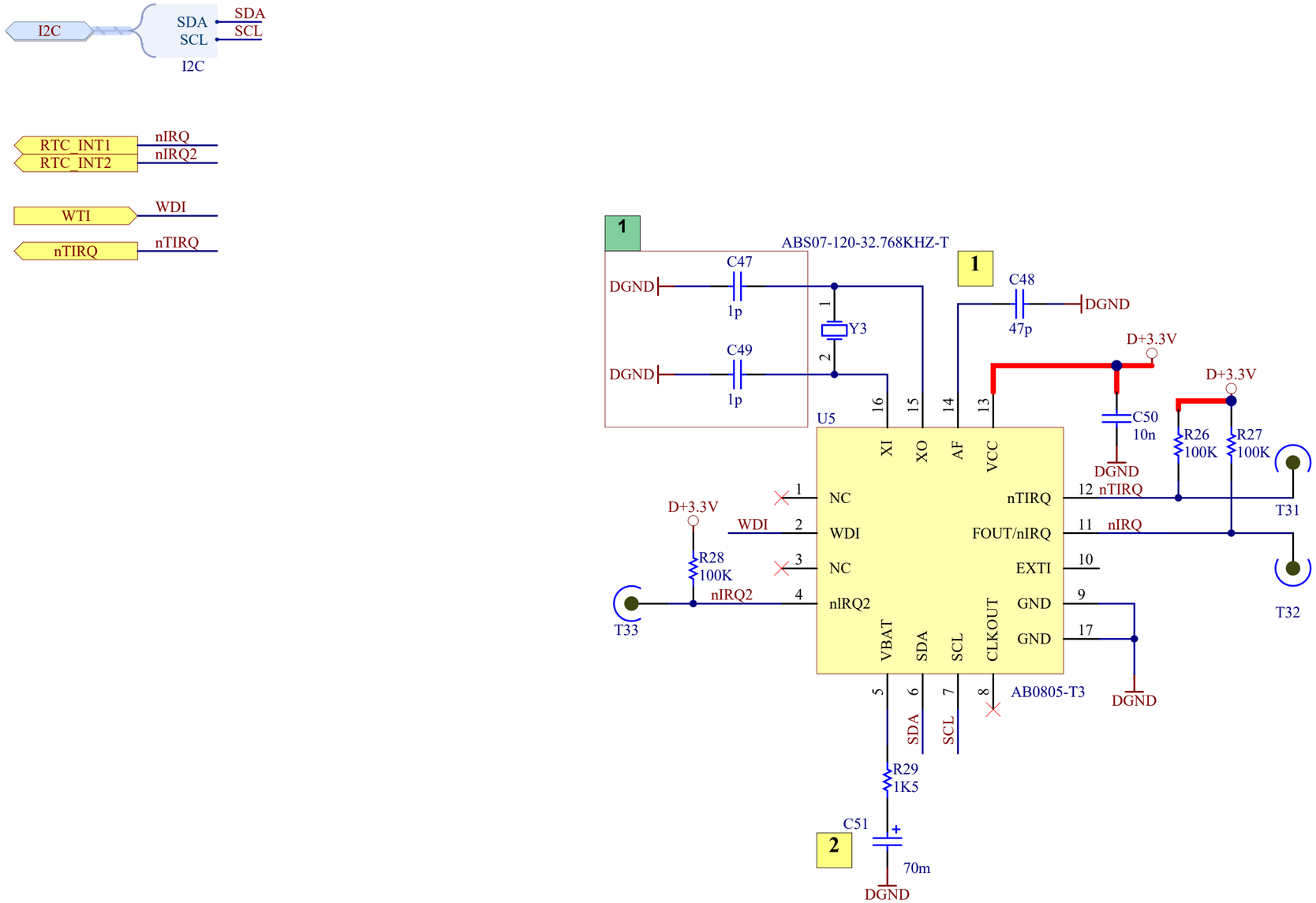

1- Required to autocalibration mode
2- SuperCap, requied chargue command to correct operation

1.

1. Optinal mounted

Project Name	ZOL-BO002	Sheet	15
Title	RTC	Version	Proto A
Author	Javi Sanchez	Date	27/05/2016
Comments			

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