ASSA ABLOY

PANDO MINI 400662 AND 400663

PRODUCT DESIGN SPECIFICATION

Version: *400662A, 400663A*

VERSION HISTORY

Mini_main_board_400662 400663

Version #	Implemented By	Revision Date	Approved By	Approval Date	Reason
PA1	*Fredrik Blomqvist*	*2014-11-05*	------	------	Create new design
PA2	*Fredrik Blomqvist*	*2014-12-16*	------	------	Added new Alt 2. Small magnetic buzzer
PA3	*Fredrik Blomqvist*	*2015-05-04*	------	------	Design from hio to RS485
PA3-RS458	Martin Silvlund	2015-12-08	------	------	Completed the current design to RS485
A1	Jonas Bjurman	2016-07-26	-----	------	New board version A. Single board on both HiO and RS485 versions

Mini_RFID_400617

Version #	Implemented By	Revision Date	Approved By	Approval Date	Reason
PA1	*Fredrik Blomqvist*	2014-10-02	------	------	Create new design
PA2	*Fredrik Blomqvist*	2014-11-14	------	------	------
PA3	*Fredrik Blomqvist*	2014-12-03	------	------	------
PA4	Martin Silvlund	2015-12-08	------	------	Completed the current design
N/A	Jonas Bjurman	2016-07-26	-----	-----	Board removed

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1 INTRODUCTION

1.1 PURPOSE OF THE PRODUCT DESIGN SPECIFICATION DOCUMENT

The Product Design Specification document documents and tracks the necessary information required to effectively define architecture and system design in order to give the development team guidance on architecture of the system to be developed. The Product Design Specification document is created during the Planning Phase of the project. Some portions of this document such as the user interface (UI) may on occasion be shared with the client/user, and other stakeholder whose input/approval into the UI is needed.

2 PANDO MINI 400662 AND 400663

2.1 GENERAL OVERVIEW AND DESIGN GUIDELINES/APPROACH

Mini readers come in two different versions. They share most of components, housing, production flow and production tests. They differ in the connection interface to how the product communicates with other equipment.

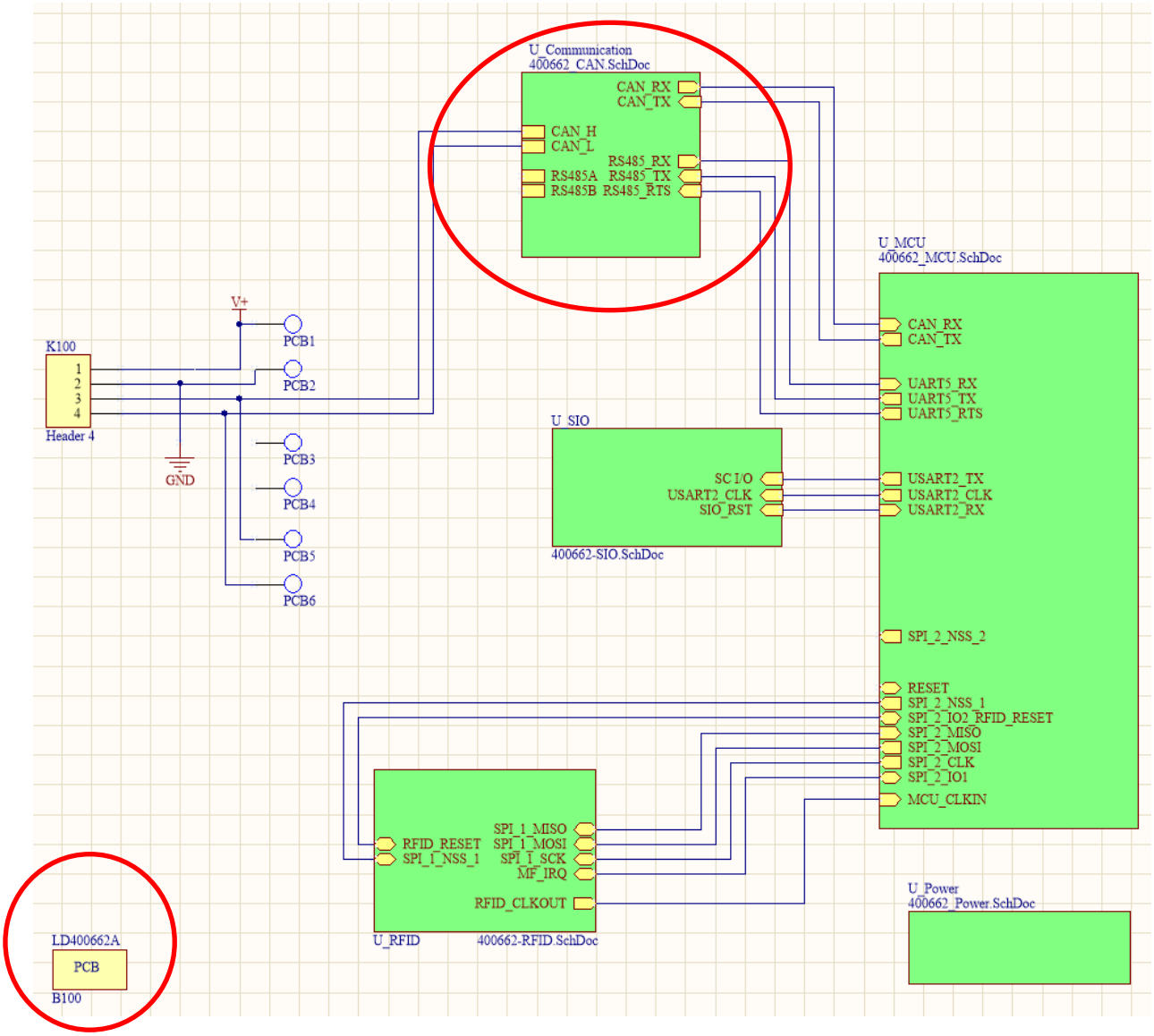
Versions: 400662 – HiO CAN interface, 400663 – RS485 interface.
Connections: 4 wire cable.

2.2 ARCHITECTURE DESIGN

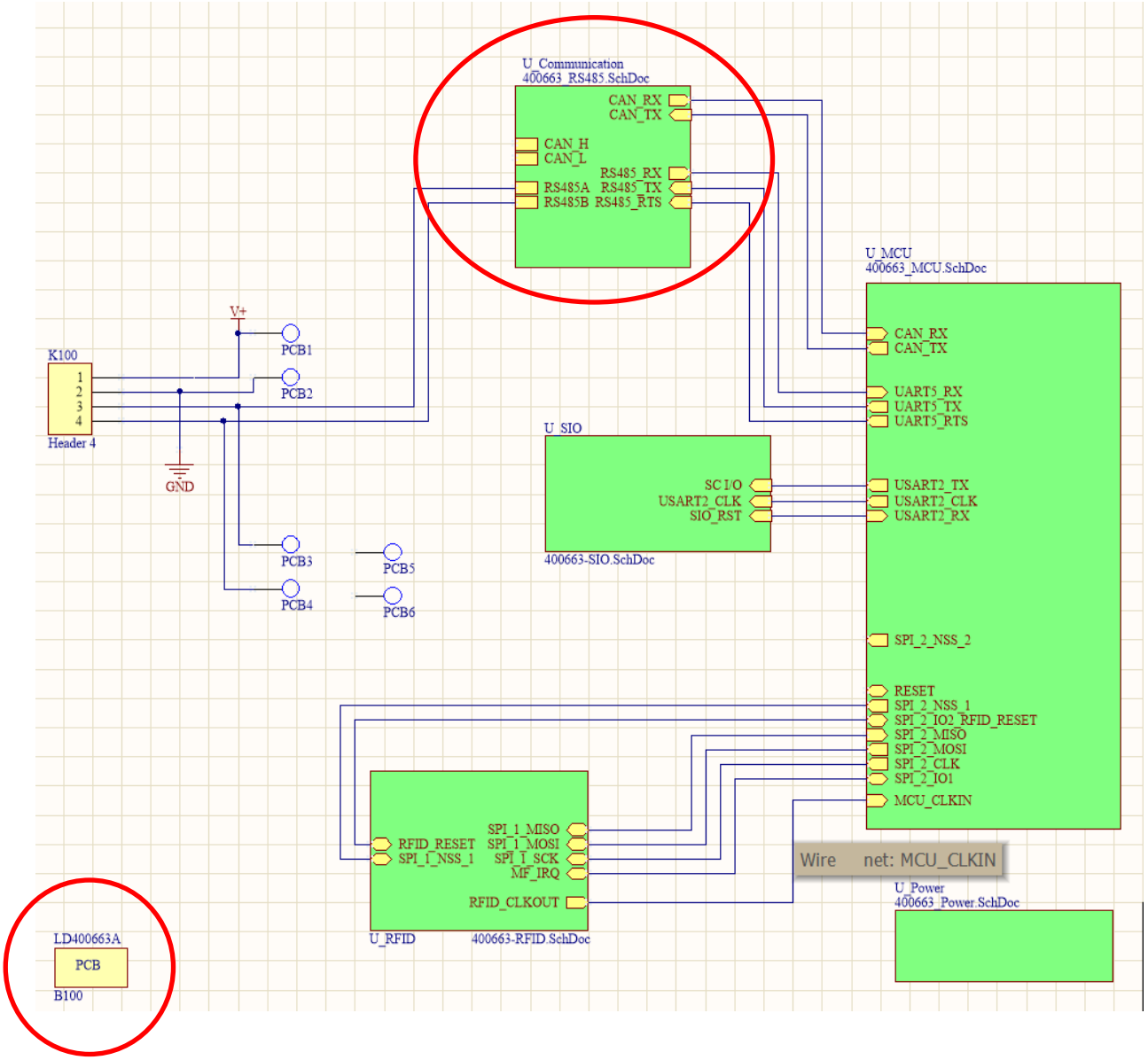
2.2.1 General signal diagram

The pictures below are a description of signal flow through the system.

2.2.1.1 HiO-Version 400662



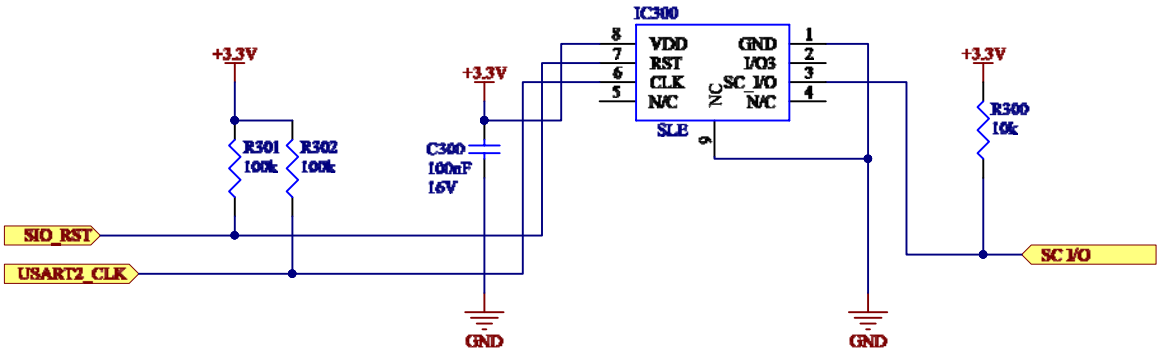
2.2.1.2 RS485-Version 400662



2.3 SHARED HARDWARE ARCHITECTURE ON VERSION 400662 AND 400663

2.3.1 SIO

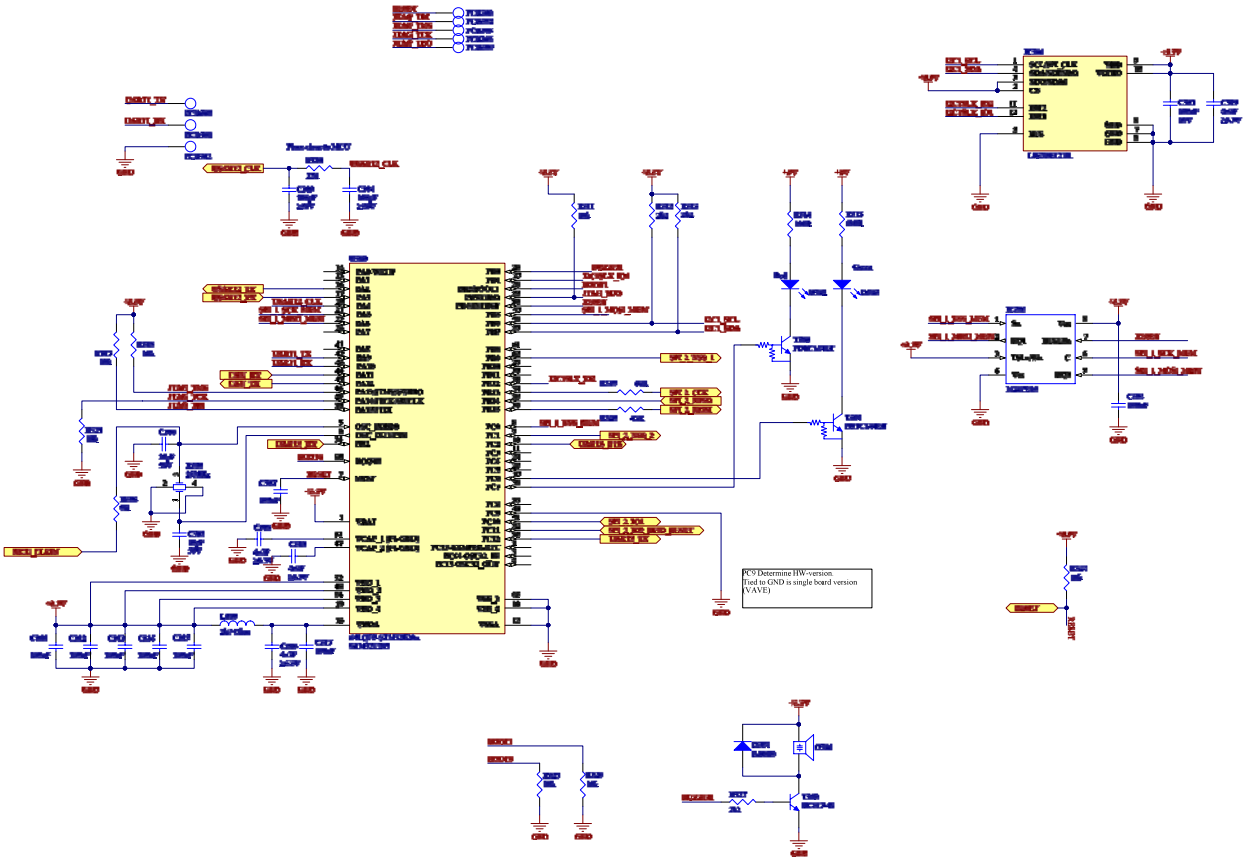
In the pic below IC300 is Secure Identity Object (SIO). The device used to identify / read accesses into the system.



2.3.2 MCU- STM32F205RET6

General picture of MCU design page.

For more specific descriptions about functionality in the design blow please see the following pictures.



2.3.2.1 MCU - STM32F205RET6

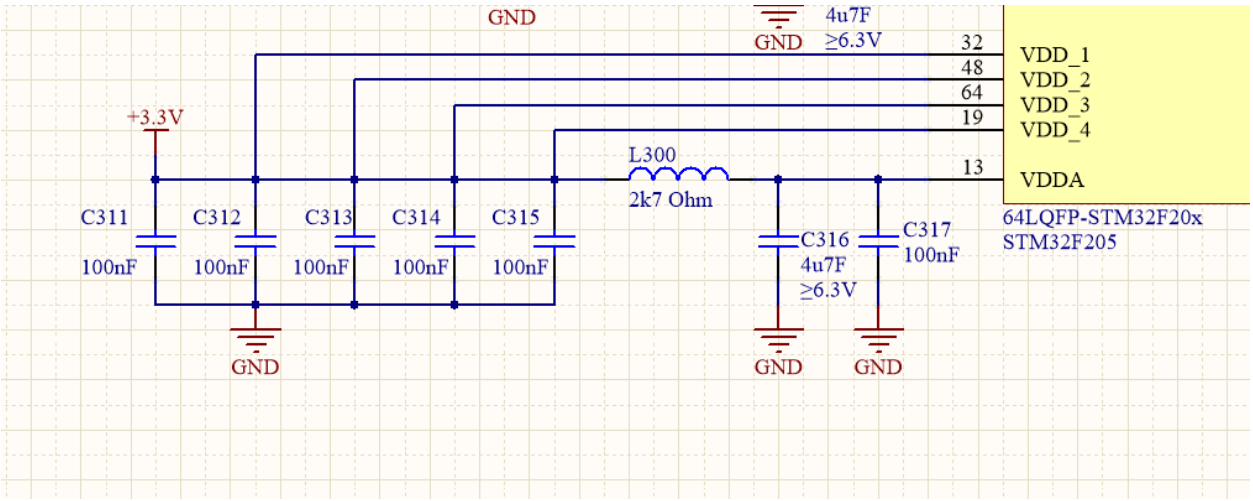
ARM-based 32-bit MCU, 150DMIPs, up to 1 MB Flash/128+4KB RAM, USB OTG HS/FS, Ethernet, 17 TIMs, 3 ADCs, 15 comm. interfaces & camera

For more information, commented to the link below:

http://www.st.com/content/ccc/resource/technical/document/datasheet/bc/21/42/43/b0/f3/4d/d3/CD00237391.pdf/files/CD00237391.pdf/jcr:content/translations/en.CD00237391.pdf

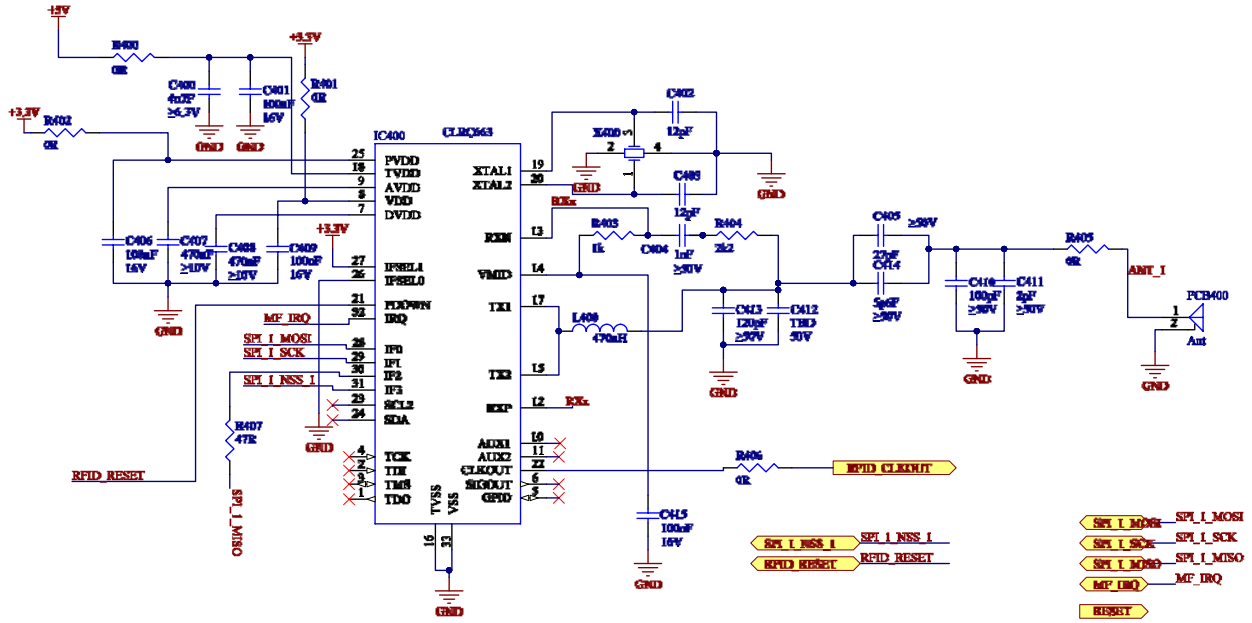
2.3.2.2 MCU Decoupling

Each capacitor placed close to specific pin in PCB layout.



2.3.3 RFID interface

RFID part is used to read different types of RFID cards.

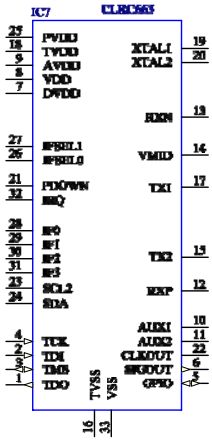


2.3.3.1 RFID transceiver CLRC66301HN

CLRC663's internal transmitter is able to drive a reader/writer antenna.

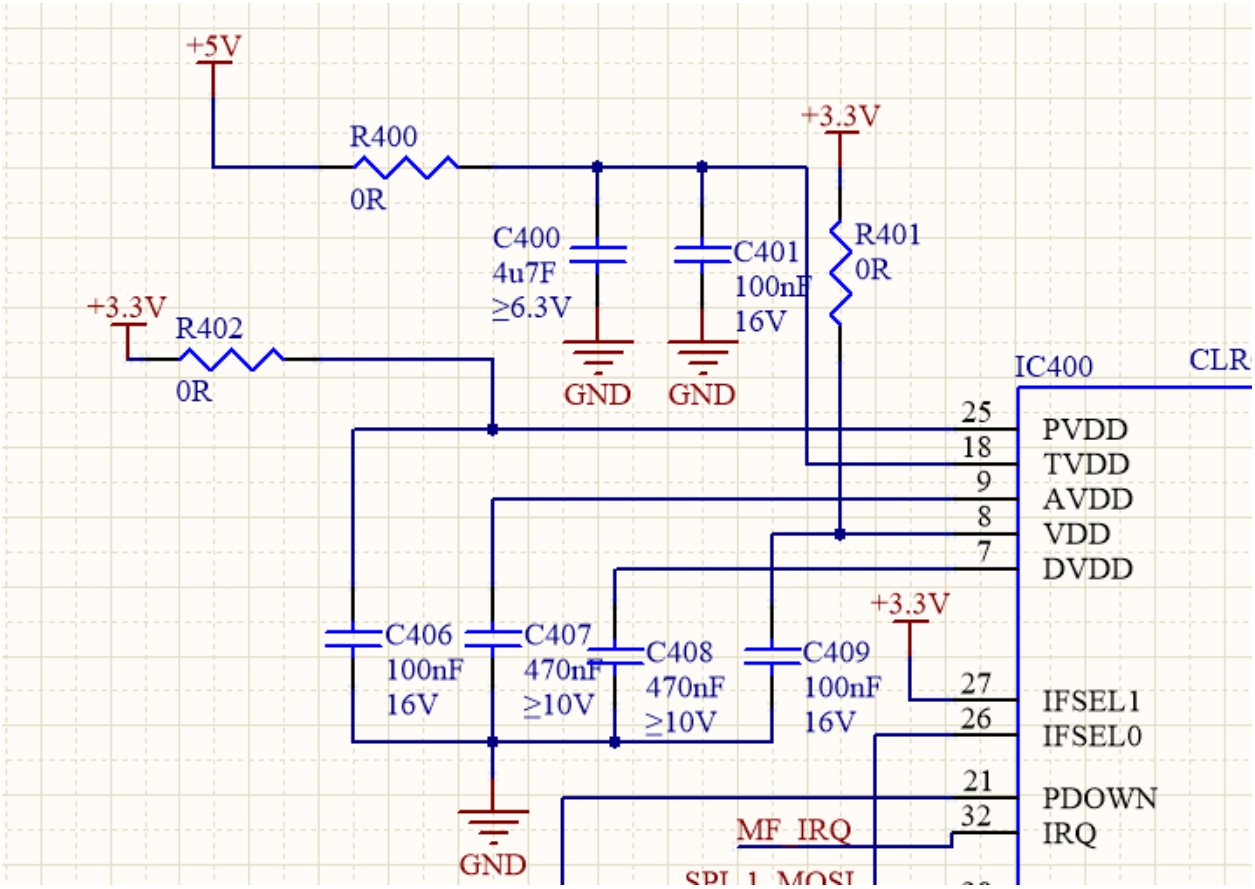
For more information commented to the link below:

http://www.nxp.com/documents/data_sheet/CLRC663.pdf



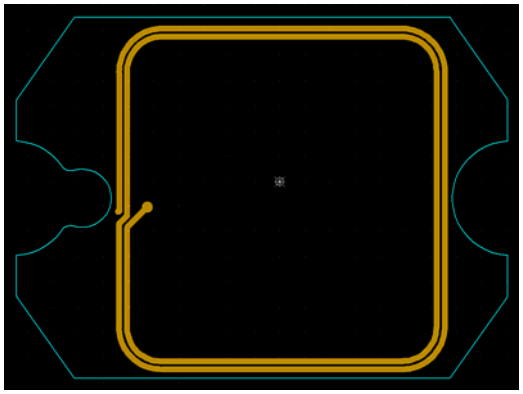
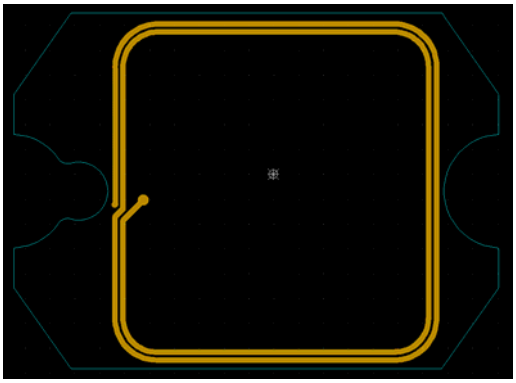
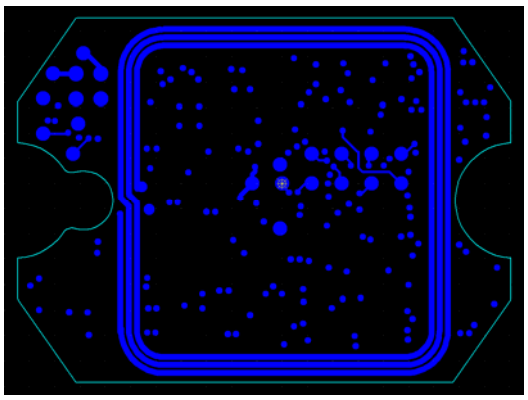
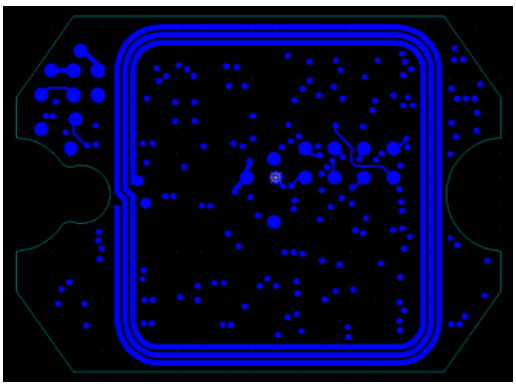
2.3.3.2 RFID decoupling

RFID decoupling is placed close to each transceiver pin.



2.3.3.3 RFID Antenna design

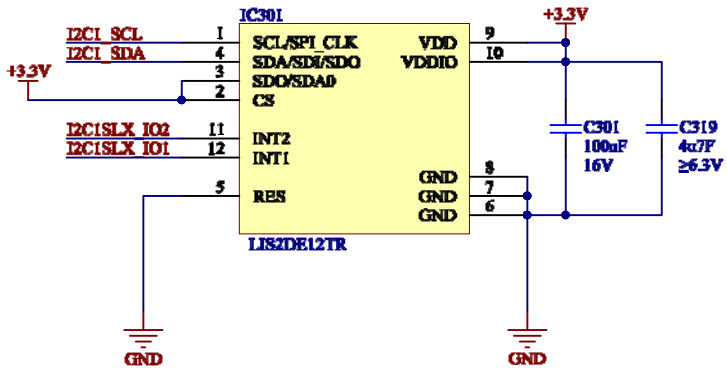
RFID antenna is an integrated loop antenna with 5 turns in PCB copper layer 7 and copper layer 8.

400662 - Layer 7	400663 - Layer 7
	
400662 - Layer 8	400663 - Layer 8
	

2.3.4 Accelerometer - LIS2DE12

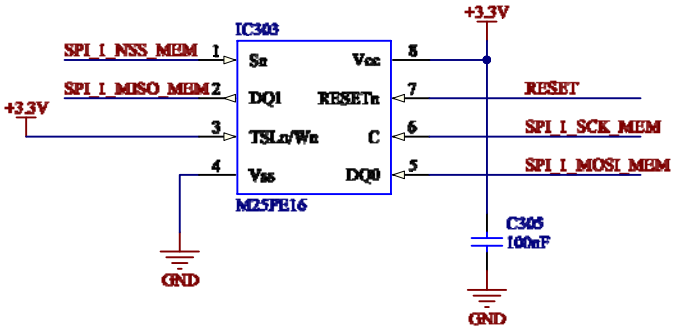
LIS2DE is a digital output motion sensor with ultra-low-power high performance 3-axes "nano" accelerometer

Accelerometer used to detect movement by external forces after installation and assembly the device.



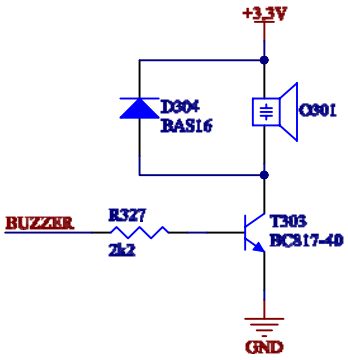
2.3.5 Flash memory- M25PE16

IC101(M25PE16) is a 16Mb (2Mb x 8-bit) serial-paged Flash memory device accessed by high-speed SPI-compatible bus.



2.3.6 Buzzer

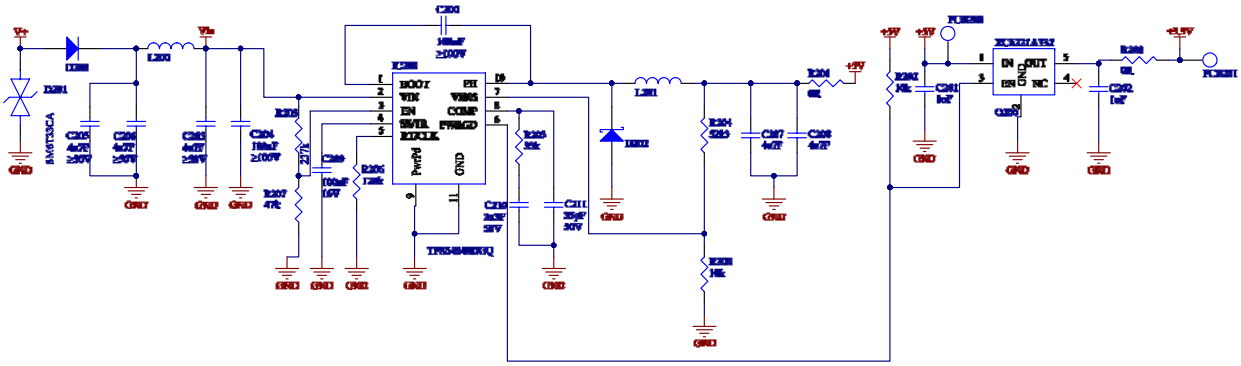
Magnetic buzzer as user interface to indicate card reading success or failure.



2.3.7 Power

General picture of power generating schematic page,

IC200 (TPS54040) device is a 42V, 0.5A, and step down regulator with an integrated high side MOSFET

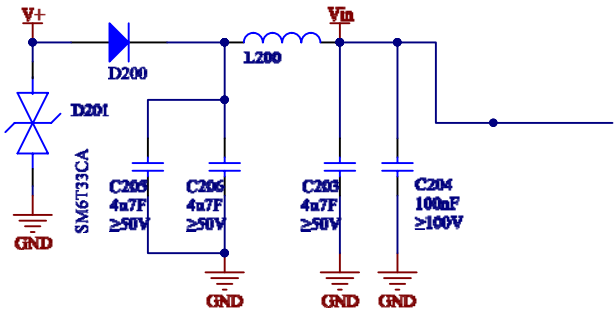


2.3.8 Decupling capacitors and power protection from EMC, ESD

D201 Used in the design to protect sensitive equipment against electrostatic discharges.

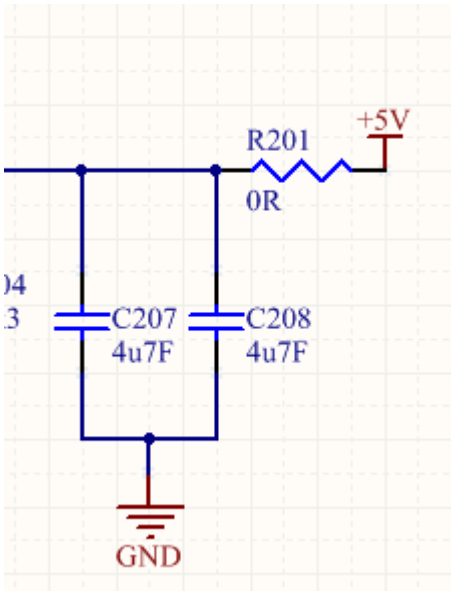
D200 Rectifier diode to protect from reverse polarity protection.

C205, C206, C203, C204, L200: Called π-filters protect the design from Electromagnetic compatible (EMC/EMI) and decupling to ground from Vin.



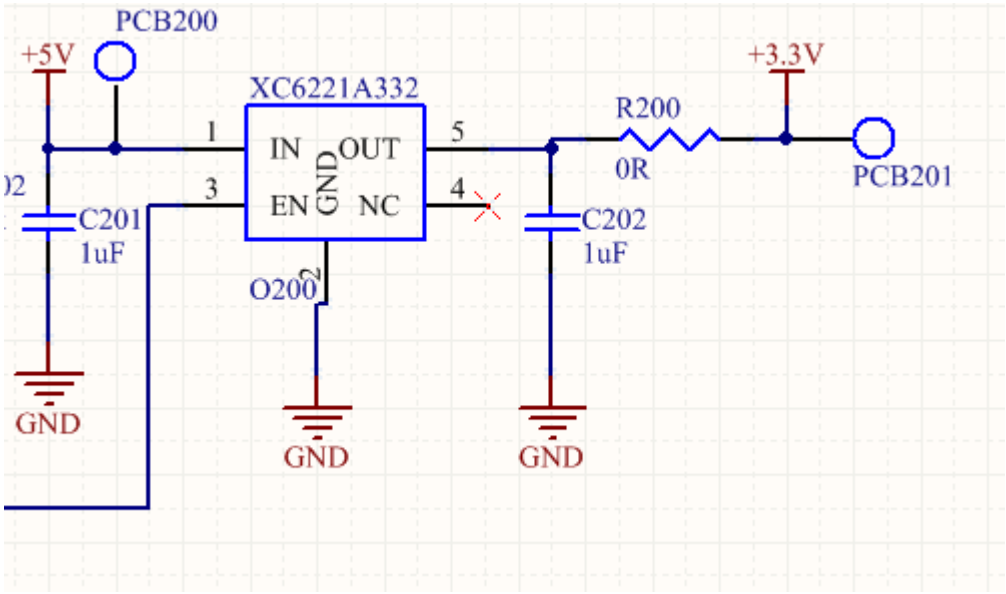
2.3.9 +5V generating's design part

In this part of power design generates +5V to be used for the rest of the design.



2.3.10 +3,3V generating's design part

O200 is DC/DC converter and in this part generating +3,3V DC from +5V DC.

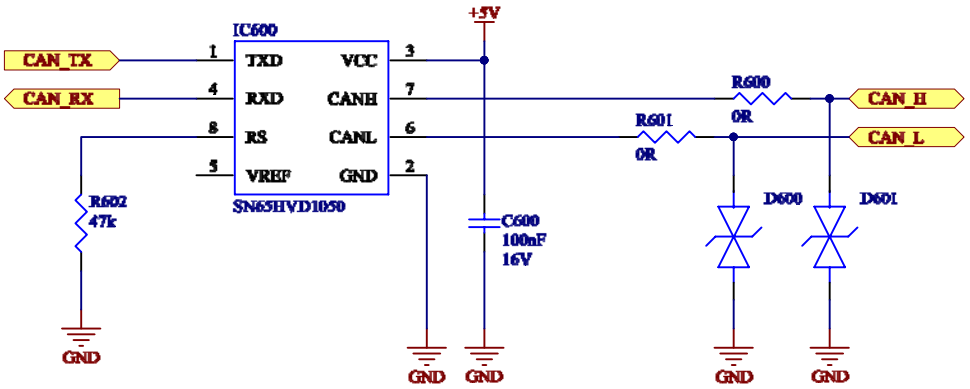


2.4 HARDWARE INTERFACE DIFFERENCE BETWEEN 400662 AND 400663

Hardware difference between HiO-400662 and RS485-400663 is only the connection interface that is CAN-bus or RS485-bus. They share the same component placement of common components.

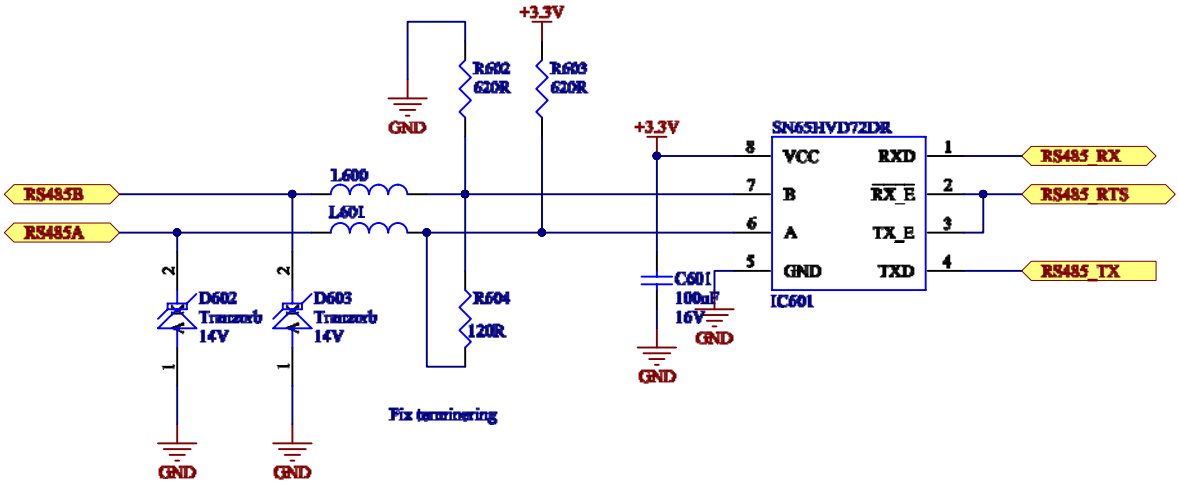
2.4.1 HiO-400662

SN65HVD1050 is used as transceiver interface for the HiO (CAN-bus) version of readers along with protection diodes D600, D601.

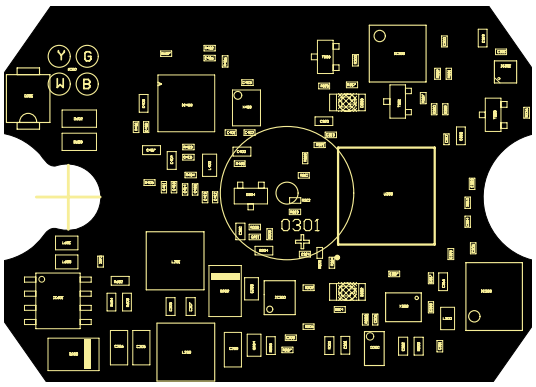
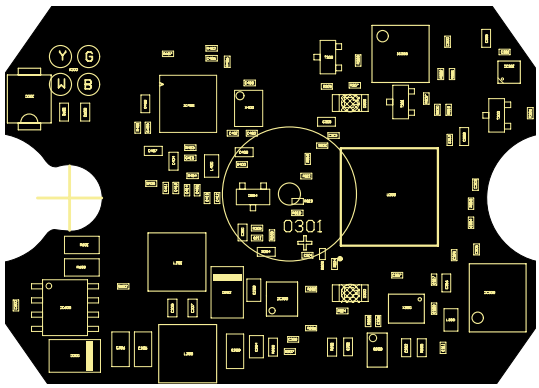
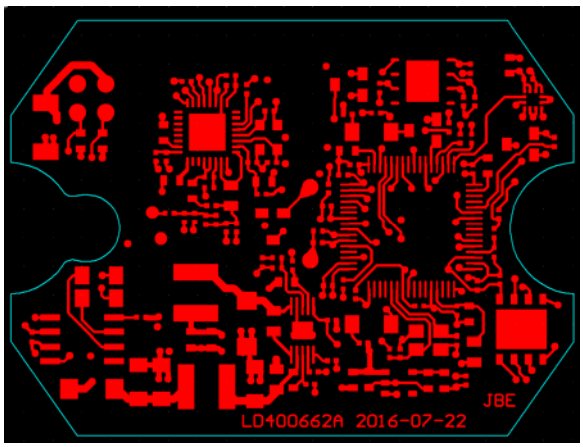
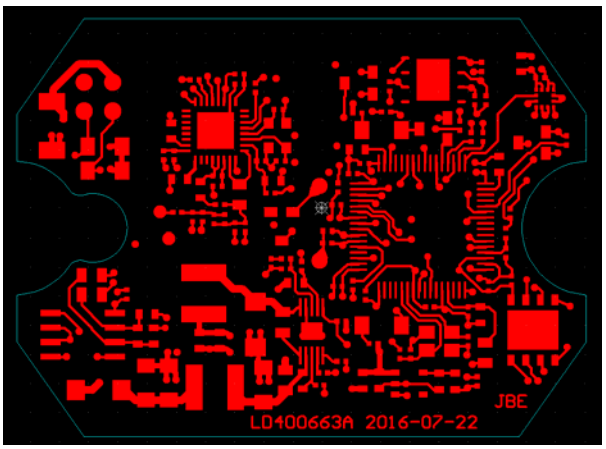


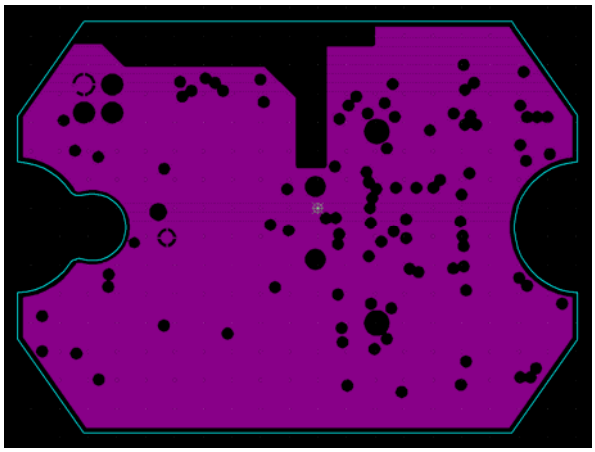
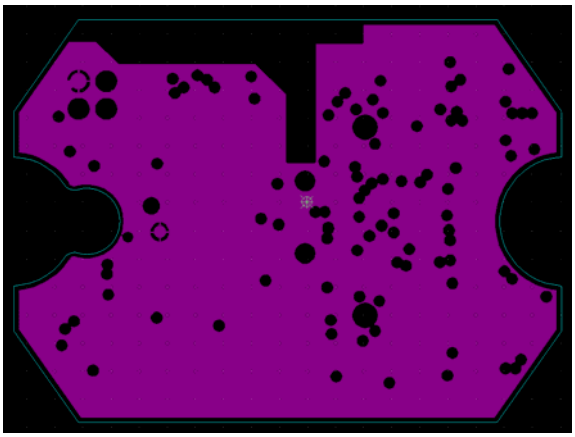
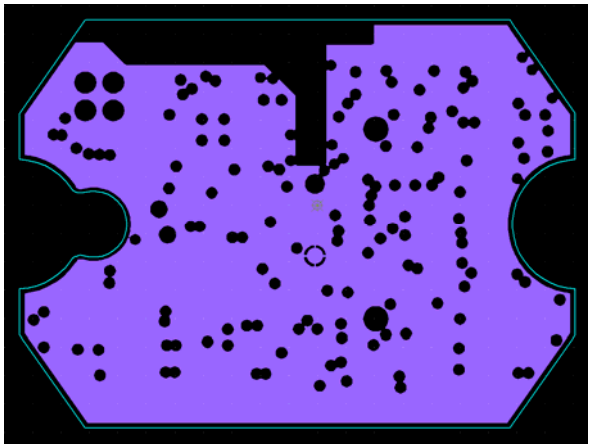
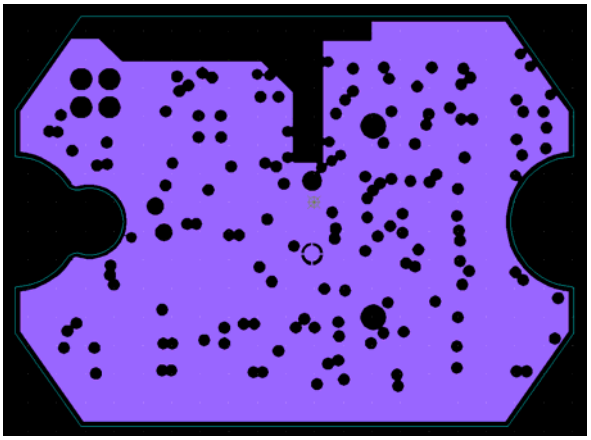
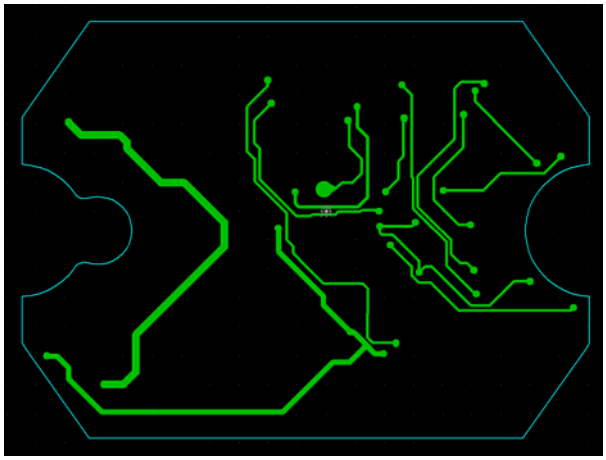
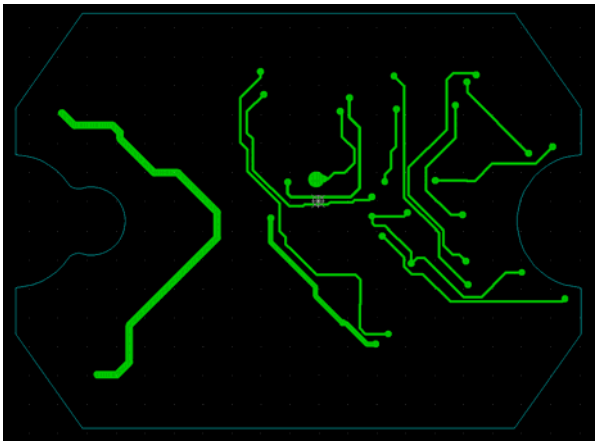
2.4.2 RS485-400663

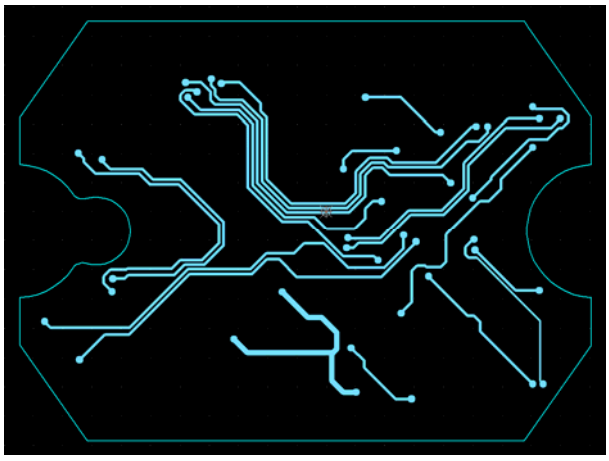
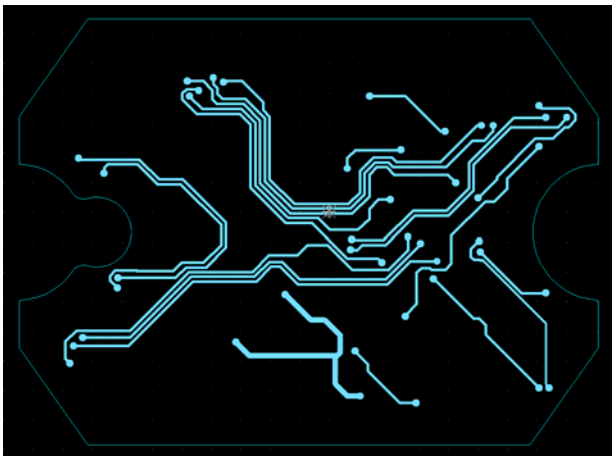
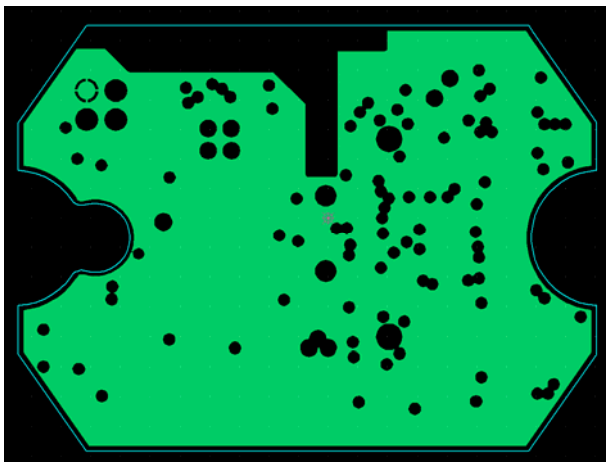
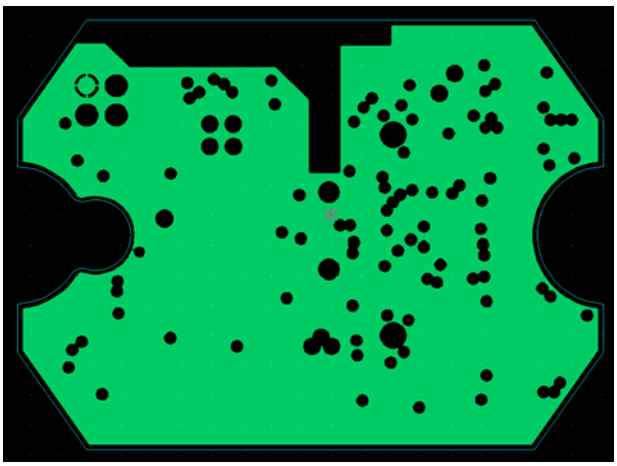
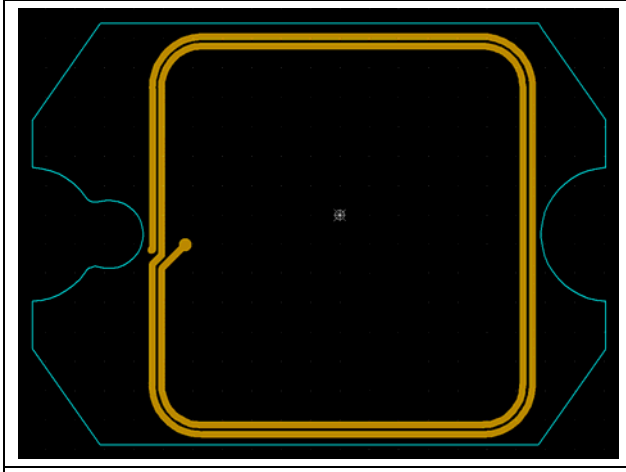
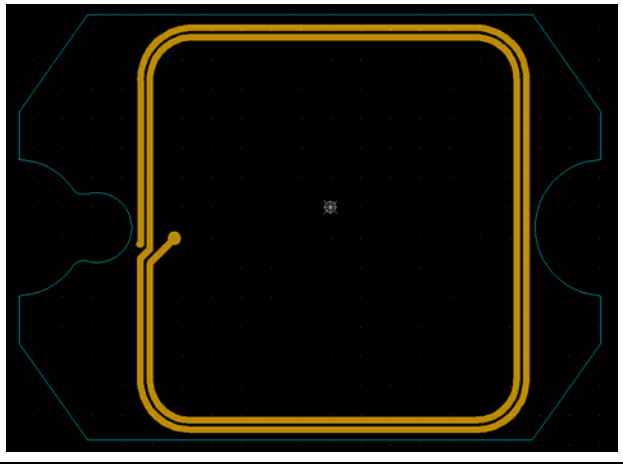
IC601 - SN65HVD72DR is as transceiver on the bus lines along with protection components D602, D603, L600, L601 filters.

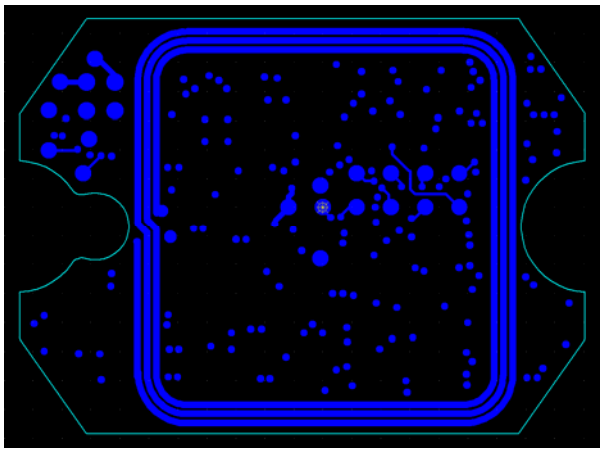
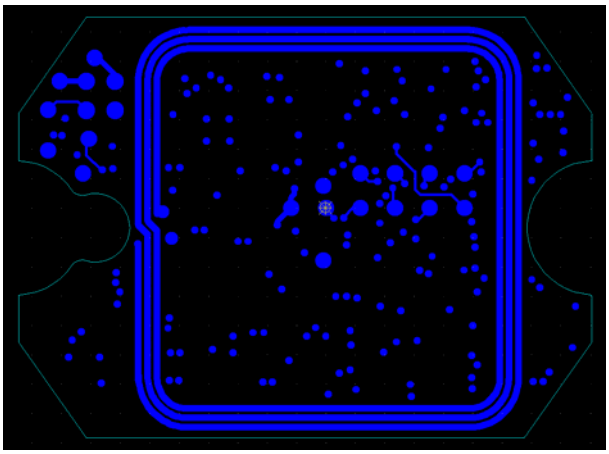


2.5 PCB LAYOUT

400662 HiO Version	400663 RS485 Version
	
400662-HiO Component Placement	400663-RS485 Component Placement
	
400662 - Layer 1	400663 - Layer 1

	
400662 - Layer 2	400663 - Layer 2
	
400662 - Layer 3	400663 - Layer 3
	
400662 - Layer 4	400663 - Layer 4

	
400662 - Layer 5	400663 - Layer 5
	
400662 - Layer 6	400663 - Layer 6
	
400662 - Layer 7	400663 - Layer 7

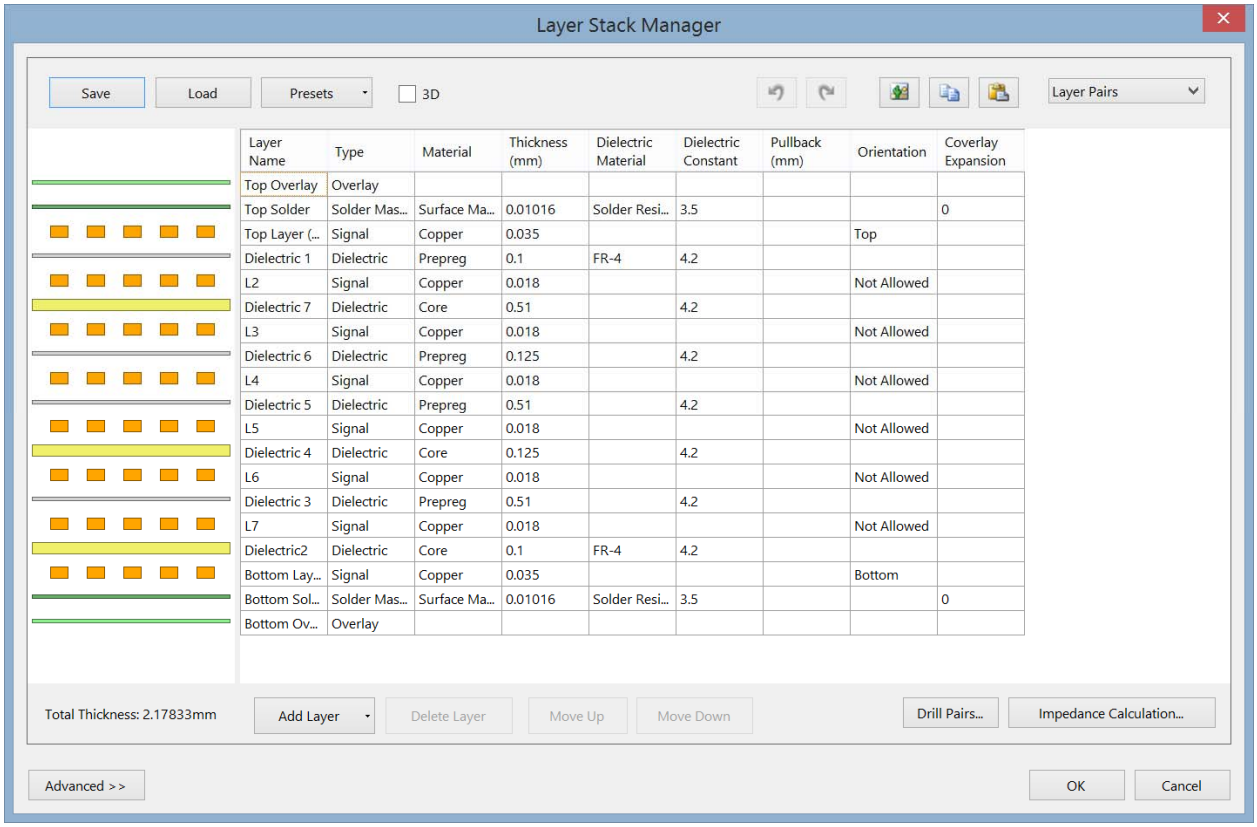
	
400662 - Layer 8	400663 - Layer 8

2.5.1 GND and Power - Layers

Layer 2 and Layer 6 is GND plane. Layer 3 is VDD (3.3V) plane to make signal integrity through the system more constant.

2.5.2 Layer stack up

PCB is 8 layers of copper with total thickness ~2.2mm. Stackup as below.



Layer Name	Type	Material	Thickness (mm)	Dielectric Material	Dielectric Constant	Pullback (mm)	Orientation	Coverlay Expansion
Top Overlay	Overlay							
Top Solder	Solder Mas...	Surface Ma...	0.01016	Solder Resi...	3.5			0
Top Layer (...	Signal	Copper	0.035				Top	
Dielectric 1	Dielectric	Prepreg	0.1	FR-4	4.2			
L2	Signal	Copper	0.018				Not Allowed	
Dielectric 7	Dielectric	Core	0.51		4.2			
L3	Signal	Copper	0.018				Not Allowed	
Dielectric 6	Dielectric	Prepreg	0.125		4.2			
L4	Signal	Copper	0.018				Not Allowed	
Dielectric 5	Dielectric	Prepreg	0.51		4.2			
L5	Signal	Copper	0.018				Not Allowed	
Dielectric 4	Dielectric	Core	0.125		4.2			
L6	Signal	Copper	0.018				Not Allowed	
Dielectric 3	Dielectric	Prepreg	0.51		4.2			
L7	Signal	Copper	0.018				Not Allowed	
Dielectric2	Dielectric	Core	0.1	FR-4	4.2			
Bottom Lay...	Signal	Copper	0.035				Bottom	
Bottom Sol...	Solder Mas...	Surface Ma...	0.01016	Solder Resi...	3.5			0
Bottom Ov...	Overlay							

3 LINK TO SCHEMATIC IN ASSA ABLOY SYSTEMS

Link to the design:

3.1 HIO_BOARD_400662

\Workspace\!READERS\tekla\SCH_PCB\MiniHio__Vave_(400662)\A

3.2 RS485_BOARD_400663

\Workspace\!READERS\tekla\SCH_PCB\Mini_RS485_vave_(400663)\A

4 TECHNICAL DETAILS

Highest frequency on board: 240MHz (internal PLL frequency in MCU)
Busses on board: SPI, I2C, Serial UART, CAN or RS485.
External Bus: RS485 or CAN Bus.
User interfaces: Red LED, Green LED, Buzzer, Accelerometer, RFID
Power input: 12-24V

5 PRODUCT DESIGN SPECIFICATION APPROVAL

The undersigned acknowledge they have reviewed the *PANDO MINI 400662 AND 400663* **Product Design Specification** document and agree with the approach it presents. Any changes to this Requirements Definition will be coordinated with and approved by the undersigned or their designated representatives.

Signature: _____ Date: _____

Print Name: _____

Title: _____

Role: _____

Signature: _____ Date: _____

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Signature: _____ Date: _____

Print Name: _____

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Role: _____

6 APPENDIX A: REFERENCES

The following table summarizes the documents referenced in this document.

Document Name and Version	Description	Location
400662A	*All information's about the project including Altium design schematic and PCB-layout*	*\Workspace\!READERS\tekla\SCH_PCB\MiniHio__Vave_(400662)\A*
400663A	*All information's about the project including Altium design schematic and PCB-layout*	*\Workspace\!READERS\tekla\SCH_PCB\Mini_RS485_vave_(400663)\A*

7 APPENDIX B: KEY TERMS

The following table provides definitions for terms relevant to this document.

Term	Definition
SIO	*Secure Identity Object*
EMC	*Electromagnetic compatible*
ESD	*Electrostatic discharges*
CMMR	*Common Mode Rejection Ratio*
MCU	*Microcontroller Unit*
USB	*Universal Serial Bus*
Decoupling	*Attach capacitor cross VCC and Ground to keep the voltage more stable and constant.*
PCB	*Printed Circuit Board*
NM	*No Mounted*