Notes

Calculations

Important Note

ADC, THERM CS:
LOW = ADC
HIGH = THERM

EXTI channels:
0: GPIO_0
1: GPIO_1
6: CTP_INT
11: LCD_WAIT
12: LCD_INT

Timer channels:
TIM1_CH1: BUZZER
TIM3_CH3: GPIO_0
TIM3_CH4: GPIO_1
TIM8_CH2N: GPIO_0?
TIM8_CH3N: GPIO_1?

uC1A

STM32F407VGT6

CL = (C1 * C2) / (C1 + C2) + Cstray
Rule of thumb: C1=C2 = 2*CL – 2*Cstray
Cstray 2-5pF, 3pF choosen here

NRST:
See page 114 in datasheet

Boot modes:

BOOT1	BOOT0	Mode
x	0	Flash
0	1	ST Bootloader

Cortex Debug

LCD_PWR draw
480 mA @ 3.3 V = 1.584 W
500 mA @ 5 V = 1.5 W
Datasheet page 12

LCD

ER-TFTM070-5

SDIO Pinout: http://www.keith-koep.com/service/doku.php/service/hardware/appnote/connectsdcard

Piezo Buzzer

External FLASH Memory

SST25VF016B

LEDs

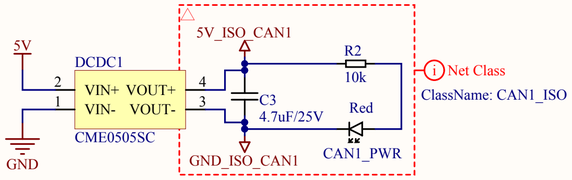
Title:	MCU & LCD
Size: A3	Number: 1 Revision: Rev 1
Date: 2014-08-17	Time: 13:28:24 Sheet 1 of 8
File:	Serial Monitor Schematic.SchDoc

Notes

Calculations

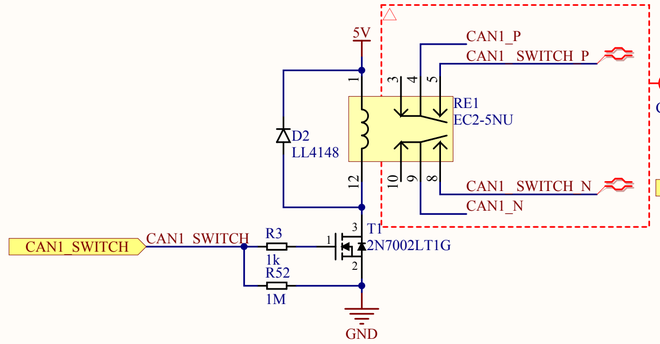
Important Note

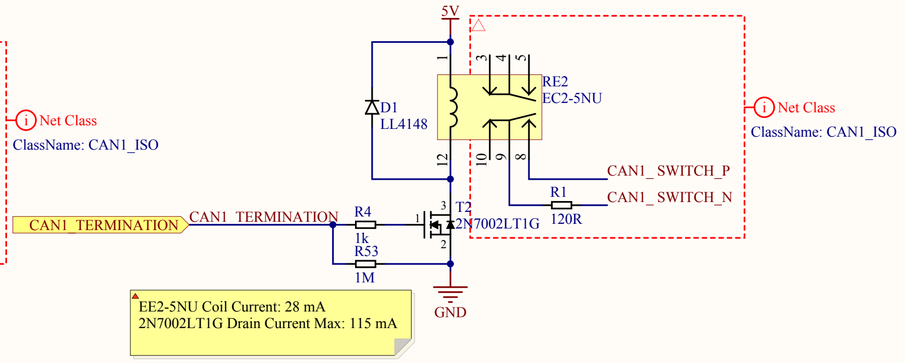
CAN1



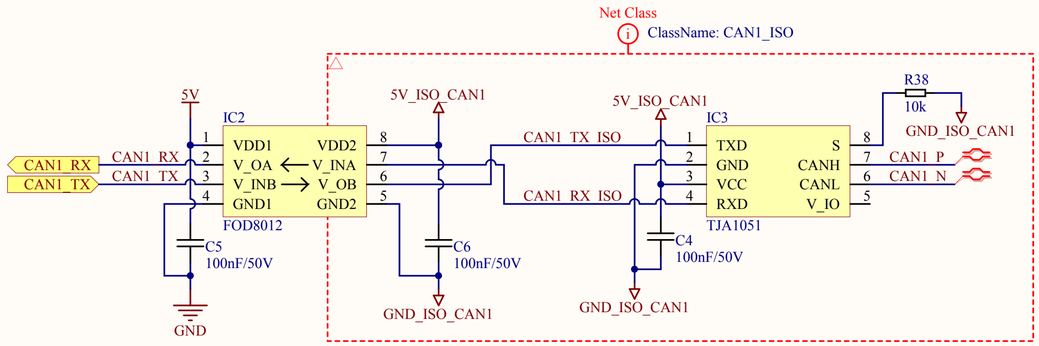
Current Usage 5V_ISO_CAN1:
ADUM1201: 8 mA max
TJA1051: 70 mA max
= 78 mA max

CME0505SC 150mA out max
-> 150-78 = 72 mA left

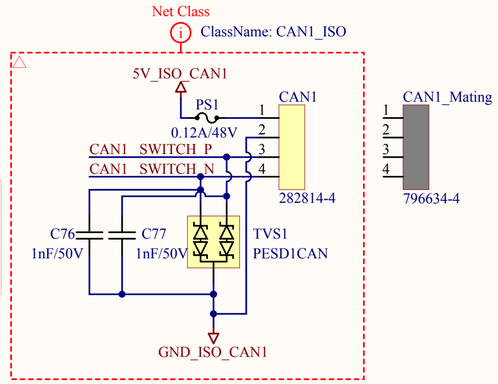




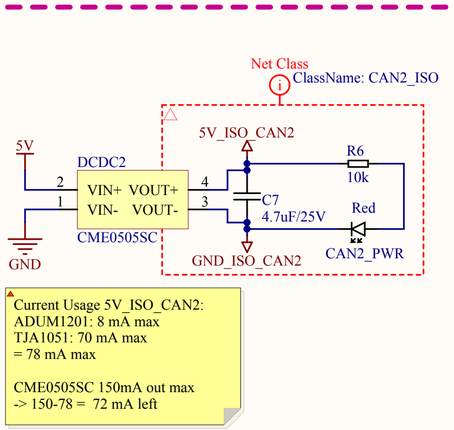
EE2-5NU Coil Current: 28 mA
2N7002LT1G Drain Current Max: 115 mA



The capacitors at the connector are used for ESD protection. Together with the resistance in the cable (1 to 2 ohm) they create a RC low pass filter with cut-off frequency of 15979.5 MHz which should work fine for this situation.

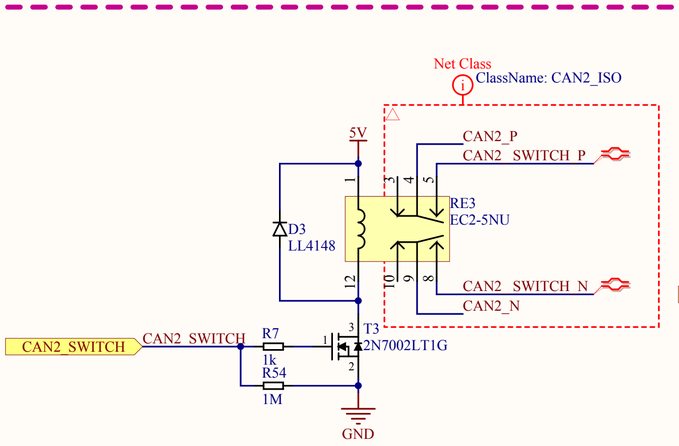


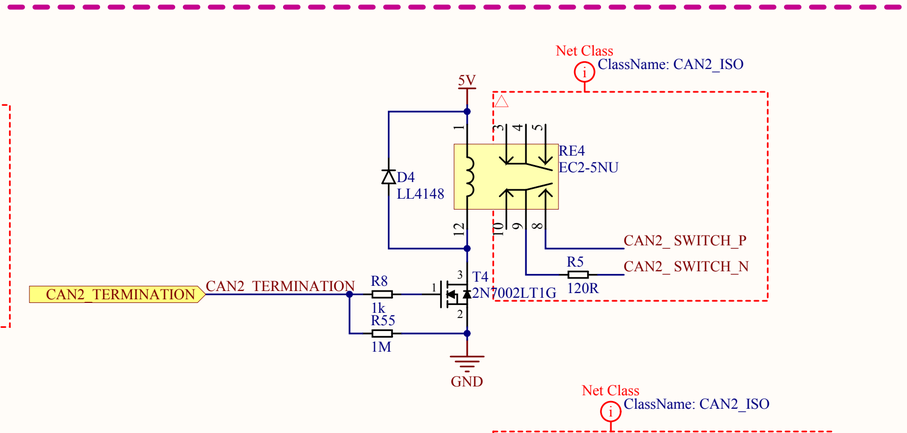
CAN2

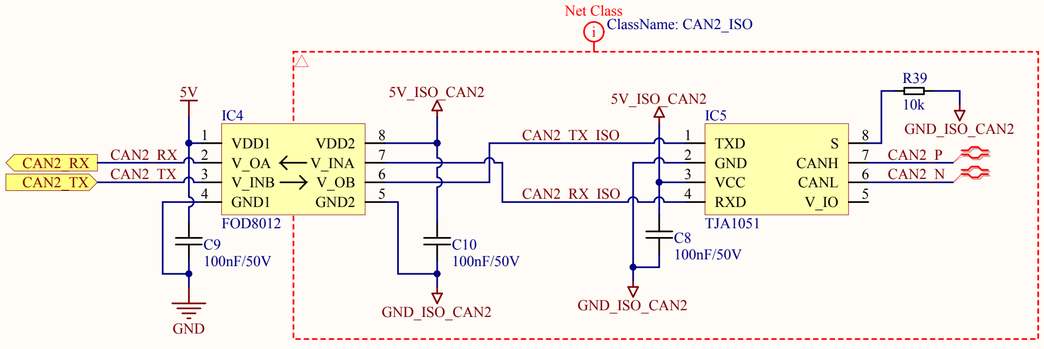


Current Usage 5V_ISO_CAN2:
ADUM1201: 8 mA max
TJA1051: 70 mA max
= 78 mA max

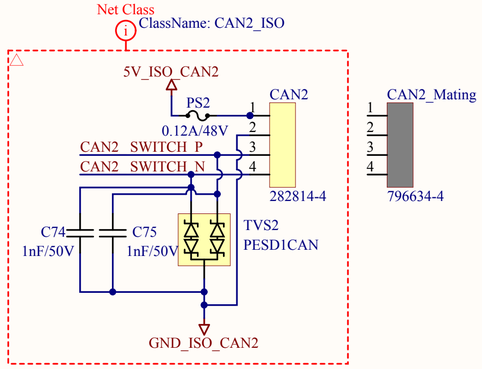
CME0505SC 150mA out max
-> 150-78 = 72 mA left







The capacitors at the connector are used for ESD protection. Together with the resistance in the cable (1 to 2 ohm) they create a RC low pass filter with cut-off frequency of 15979.5 MHz which should work fine for this situation.



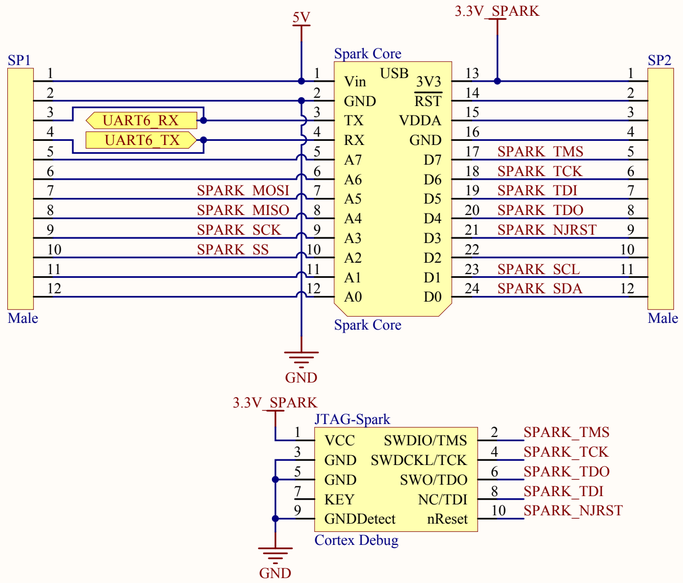
Title: CAN Channels		
Size: A3	Number: 2	Revision: Rev 1
Date: 2014-08-17	Time: 13:28:24	Sheet 2 of 8
File: CAN Schematic.SchDoc		

Notes

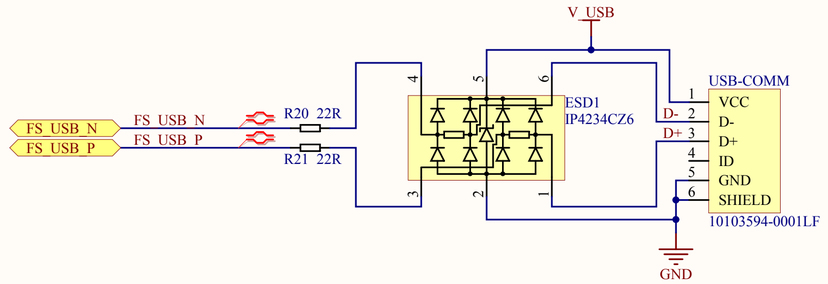
Calculations

Important Note

Spark Core

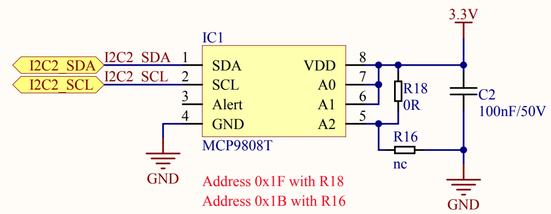


USB Peripheral

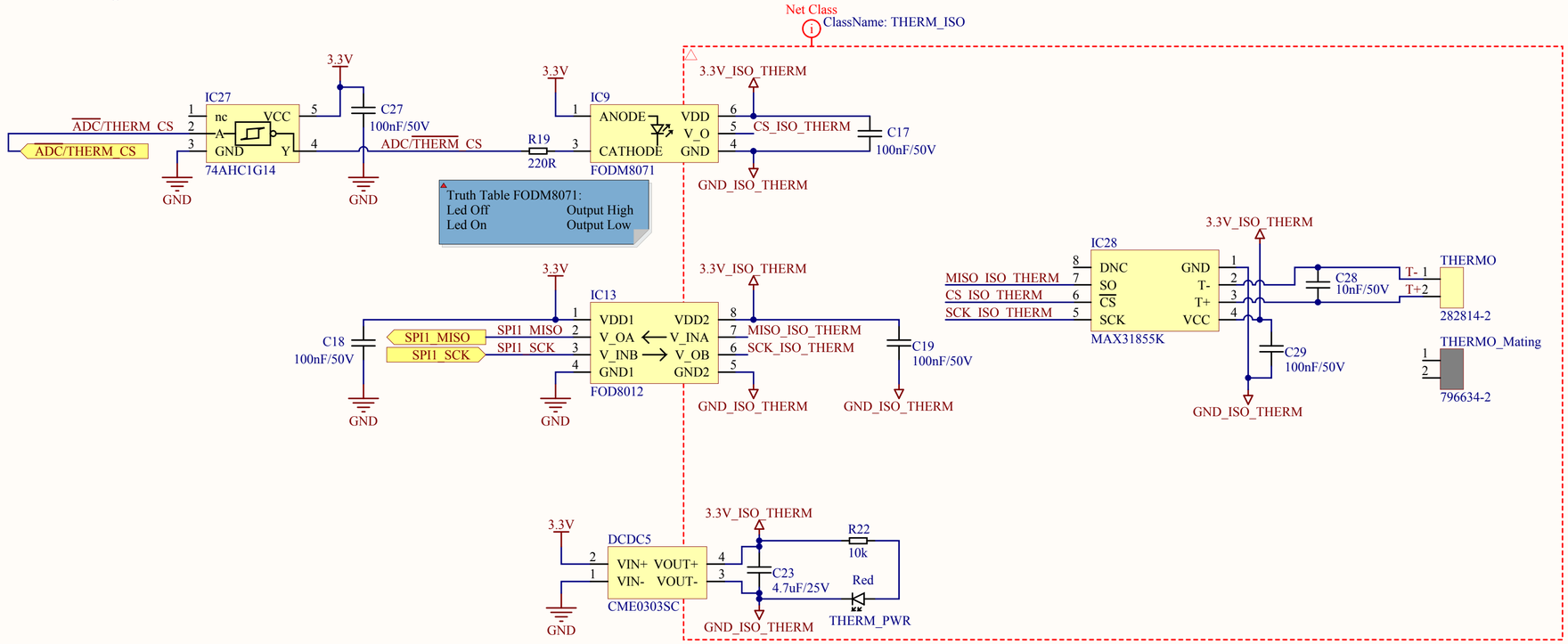


The OTG_FS_VBUS pin (PA9) is used for UART1 so we have to disable it in software in order for the USB interface to work.
From the reference manual (rev 7) p. 1229:
"The VBUS pin can be freed by disabling the VBUS sensing option. This is done by setting the NOVBUSSENS bit in the OTG_FS_GCCFG register. In this case the VBUS is considered internally to be always at VBUS valid level (5 V)."

Temperature Sensor



Thermocouple



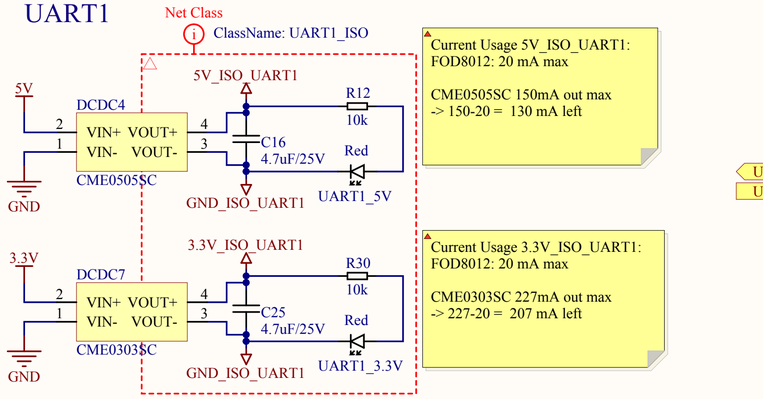
Title: Sensors & Communication		
Size: A3	Number: 3	Revision: Rev 1
Date: 2014-08-17	Time: 13:28:25	Sheet 3 of 8
File: Sensors & Communication Schematic.SchDoc		

Notes

Calculations

Important Note

UART1

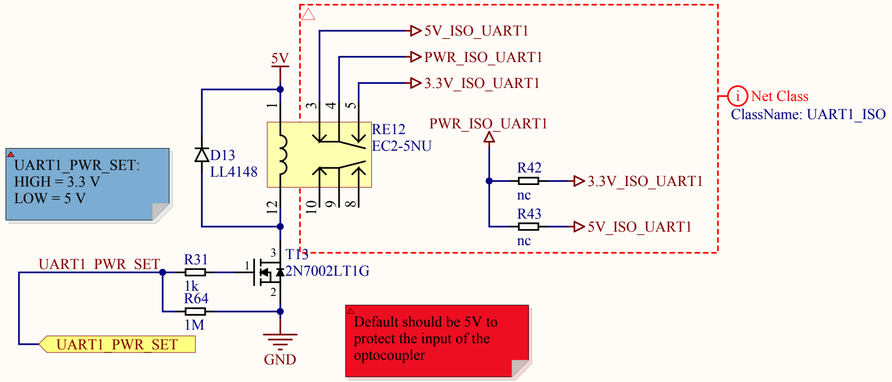


Current Usage 5V_ISO_UART1:
FOD8012: 20 mA max

CME0505SC 150mA out max
-> 150-20 = 130 mA left

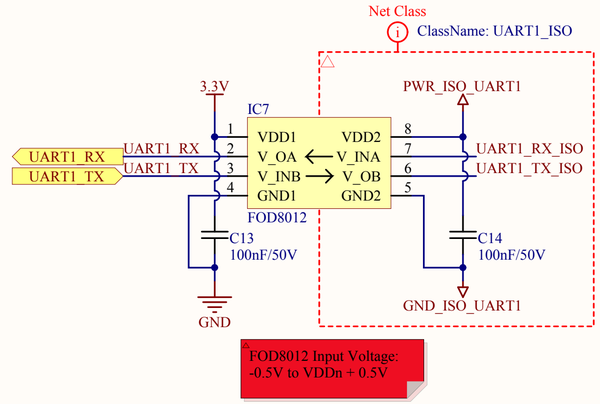
Current Usage 3.3V_ISO_UART1:
FOD8012: 20 mA max

CME0303SC 227mA out max
-> 227-20 = 207 mA left

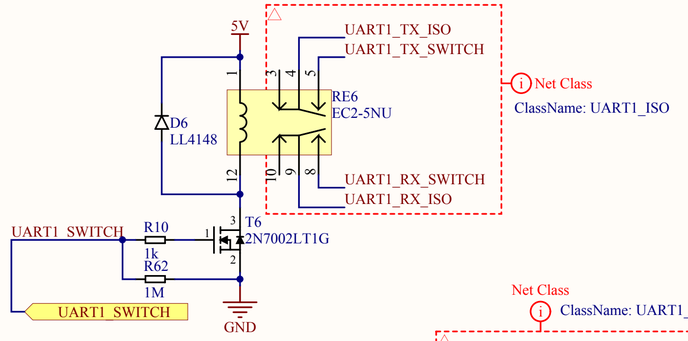


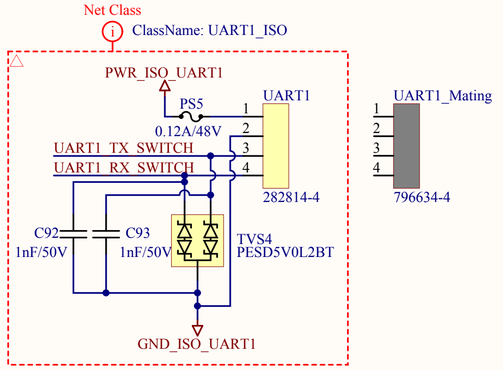
UART1_PWR_SET:
HIGH = 3.3 V
LOW = 5 V

Default should be 5V to protect the input of the optocoupler



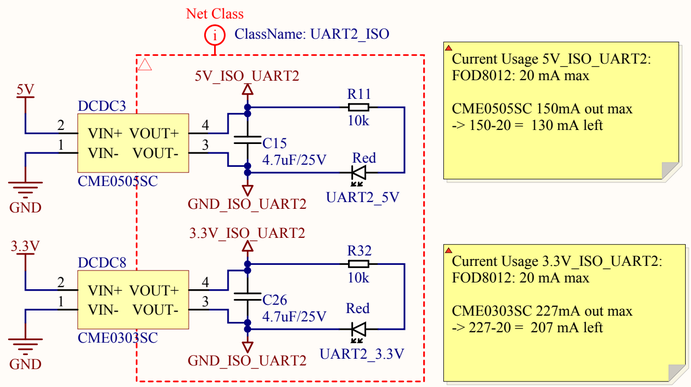
FOD8012 Input Voltage:
-0.5V to VDDn + 0.5V





The capacitors at the connector are used for ESD protection. Together with the resistance in the cable (1 to 2 ohm) they create a RC low pass filter with cut-off frequency of 15979.5 MHz which should work fine for this situation.

UART2

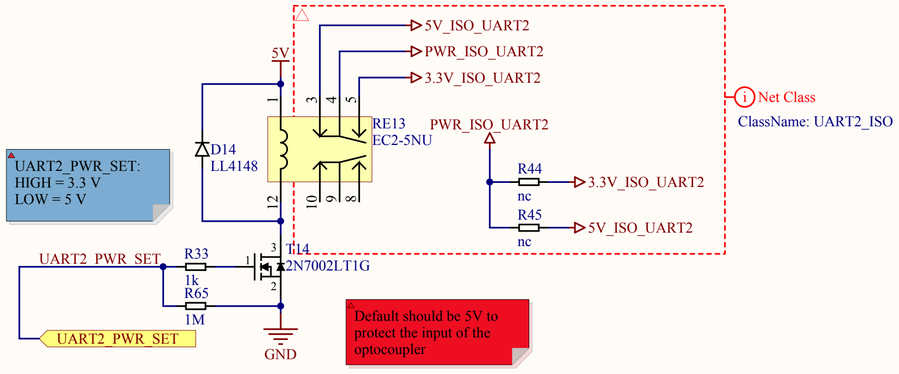


Current Usage 5V_ISO_UART2:
FOD8012: 20 mA max

CME0505SC 150mA out max
-> 150-20 = 130 mA left

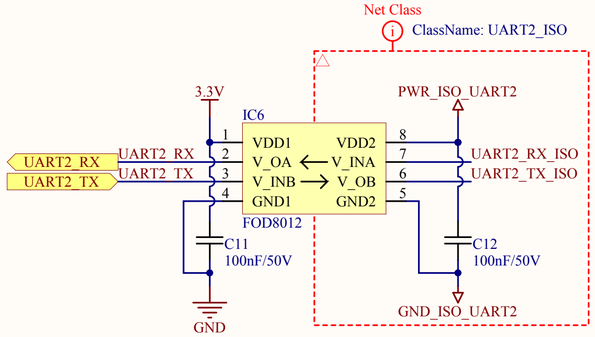
Current Usage 3.3V_ISO_UART2:
FOD8012: 20 mA max

CME0303SC 227mA out max
-> 227-20 = 207 mA left

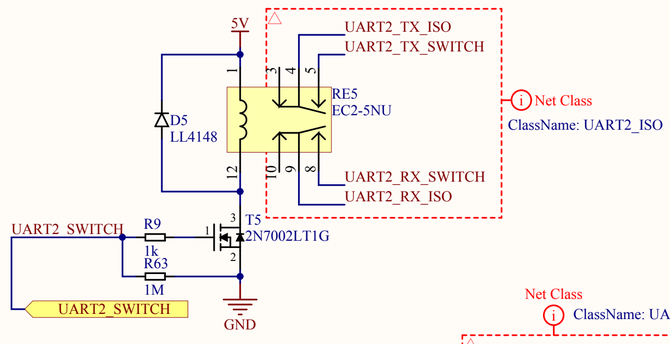


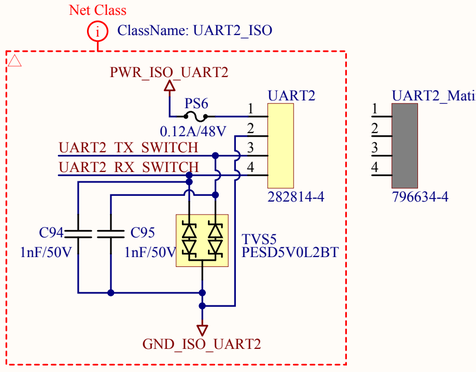
UART2_PWR_SET:
HIGH = 3.3 V
LOW = 5 V

Default should be 5V to protect the input of the optocoupler



FOD8012 Input Voltage:
-0.5V to VDDn + 0.5V





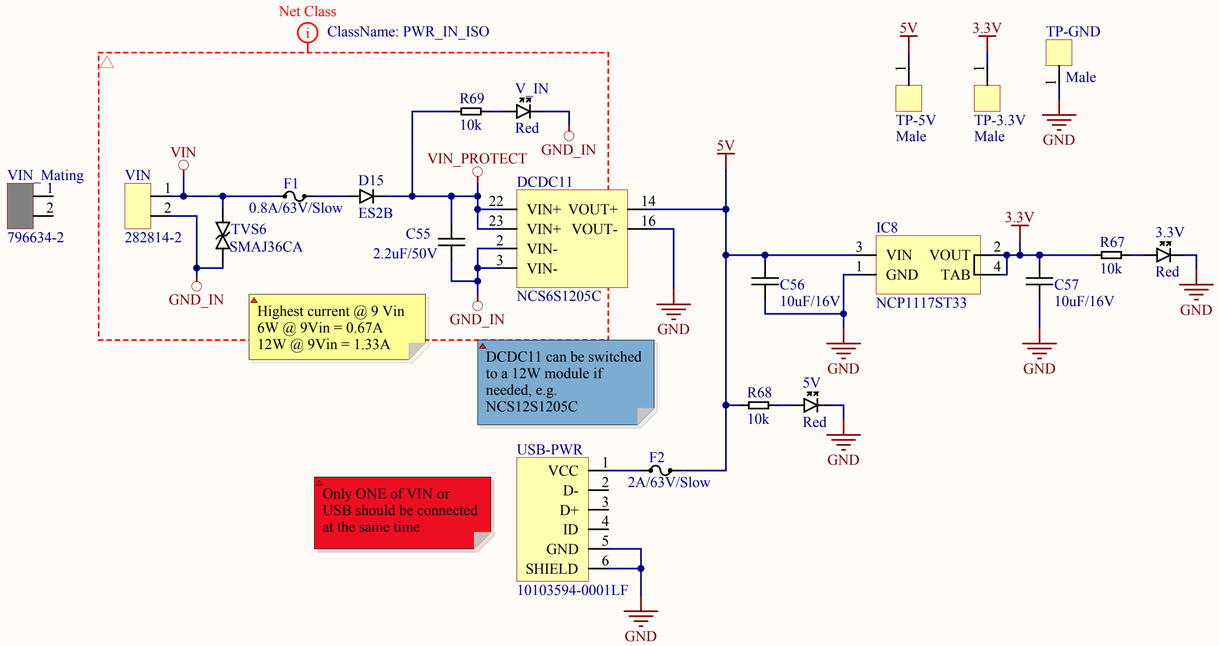
The capacitors at the connector are used for ESD protection. Together with the resistance in the cable (1 to 2 ohm) they create a RC low pass filter with cut-off frequency of 15979.5 MHz which should work fine for this situation.

Title: UART Channels		
Size: A3	Number: 4	Revision: Rev 1
Date: 2014-08-17	Time: 13:28:25	Sheet 4 of 8
File: UART Schematic.SchDoc		

Notes

Calculations

Important Note



Title: Power		
Size: A3	Number: 5	Revision: Rev 1
Date: 2014-08-17	Time: 13:28:25	Sheet 5 of 8
File: Power Schematic.SchDoc		

Notes

Calculations

Important Note

ADC

Forward voltage 1.35 V typical
3.3-1.35 = 1.95 V
With 220R -> 8.86 mA (20 mA is max)

Net Class
ClassName: ADC_ISO

3.3V
IC17
ANODE
CATHODE
VDD
V_O
GND
FODM8071
SPI1_SCK
R83
220R
5V_ISO_ADC
SCK_ISO_ADC
C72
100nF/50V
GND_ISO_ADC

Truth Table FODM8071:
Led Off — Output High
Led On — Output Low

3.3V
IC18
FODM8071
ADC/THERM_CS
R84
220R
CS_ISO_ADC
C73
100nF/50V

3.3V
IC16
VDD1
V_OA
V_INB
GND1
VDD2
V_INA
V_OB
GND2
FOD8012
SPI1_MISO
SPI1_MOSI
C34
100nF/50V
MISO_ISO_ADC
MOSI_ISO_ADC
C33
100nF/50V
GND

Net Class
ClassName: ADC_ISO

AVDD
C58 10uF/16V
C50 1uF/10V
C40 100nF/50V
C49 100nF/50V
C42 1uF/10V
C41 10uF/16V
GND_ISO_ADC
5V_ISO_ADC
C43 100nF/50V
IC14
DVDD
DVDDO
AVDD1
AVDD2
SCLK
CS
DIN
SSTRB
DOUT
CH0
CH1
CH2
CH3
REF
REFCAP
AGND1
AGND2
AGND3
DGND
DGNDO
MAX1301
SCK_ISO_ADC
CS_ISO_ADC
MOSI_ISO_ADC
MISO_ISO_ADC
AD1_IN+_SCALED
AD1_IN-_SCALED
AD2_IN+_SCALED
AD2_IN-_SCALED

Divide by 2

The capacitors at the connector are used for ESD protection. Together with the resistance in the cable (1 to 2 ohm) they create a RC low pass filter with cut-off frequency of 15979.5 MHz which should work fine for this situation.

R46 10k/0.1%
R47 10k/0.1%
R48 10k/0.1%
R49 10k/0.1%
R73 10k/0.1%
R72 10k/0.1%
R70 10k/0.1%
R71 10k/0.1%
C96 1nF/50V
C97 1nF/50V
C98 1nF/50V
C99 1nF/50V
TVS7 PESD24VL2BT
TVS8 PESD24VL2BT
ADC
282814-4
AD1_IN+_1
AD1_IN-_2
AD2_IN+_3
AD2_IN-_4
ADC_Mating
796634-4

IC15
OUTF
OUTS
NR
IN
GND
GNDS
MAX6126A41+
VREF
C39 100nF/50V
C38 1uF/10V
C37 4.7uF/10V
C36 100nF/50V
C59 1uF/10V
C35 100nF/50V

GNDS: Connect to ground connection at load
OUTS: Short OUTF to OUTS as close to the load as possible

H5
H6
H7
M3
GND_ISO_ADC

5V_ISO_ADC
AD-EXT
SCK_ISO_ADC
MOSI_ISO_ADC
CS_ISO_ADC
MISO_ISO_ADC
Male
Net Class
ClassName: ADC_ISO

This connector can be used to connect to an external board with another SPI-capable ADC on it

5V
DCDC9
VIN+
VIN-
VOUT+
VOUT-
CME0505SC
FB1
600R/500mA
R40
10k
C32
4.7uF/25V
ADC_5V
Red
Net Class
ClassName: ADC_ISO

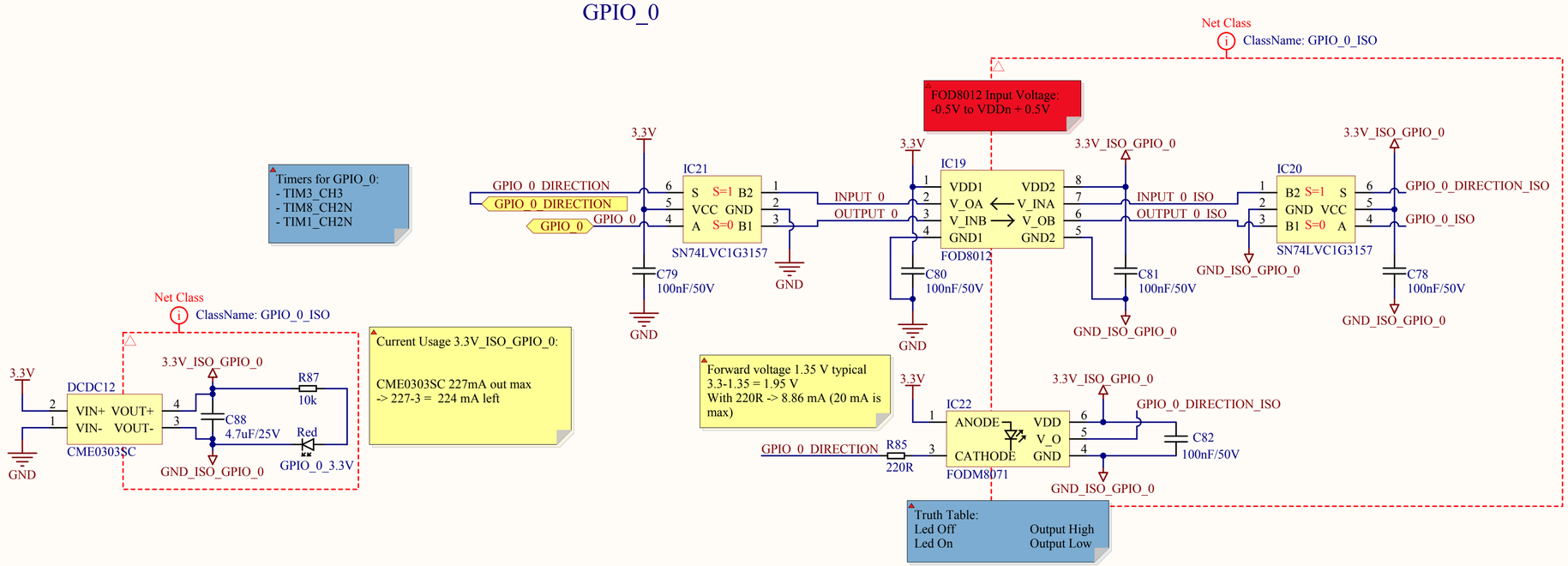
Title: ADC		
Size: A3	Number: 6	Revision: Rev 1
Date: 2014-08-17	Time: 13:28:25	Sheet 6 of 8
File: ADC Schematic.SchDoc		

Notes

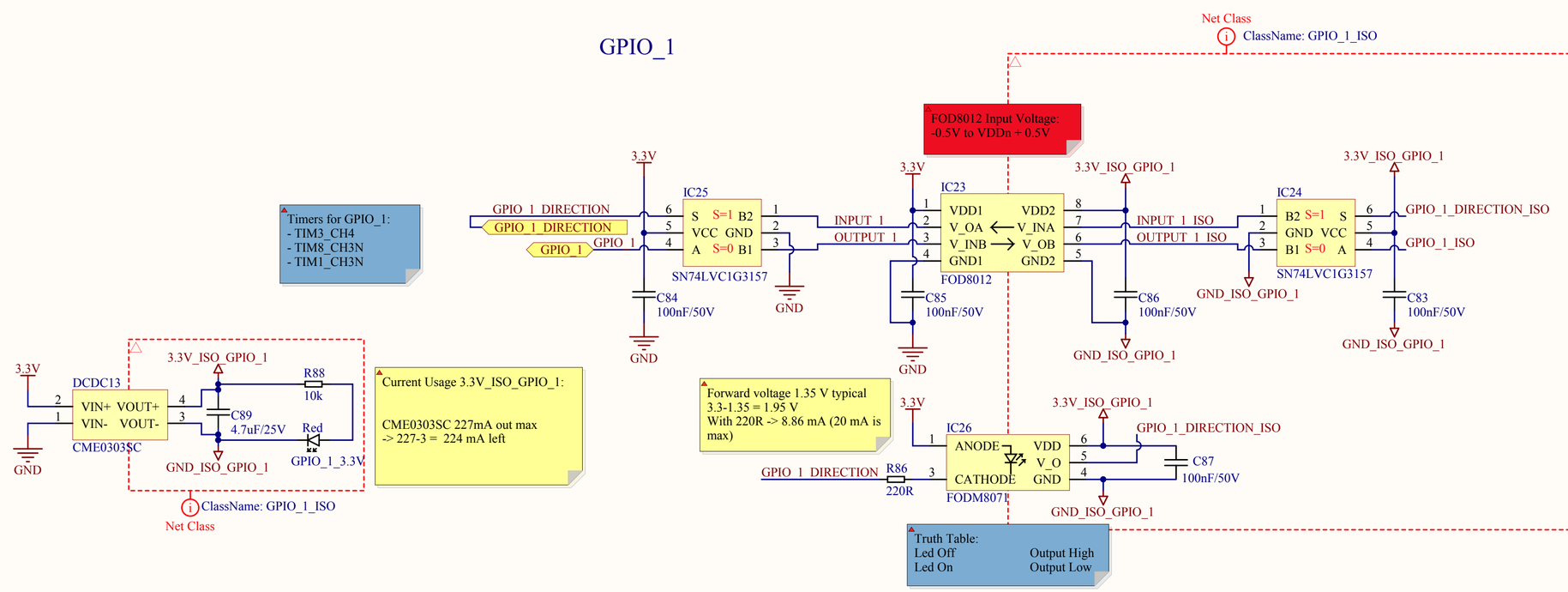
Calculations

Important Note

GPIO_0



GPIO_1



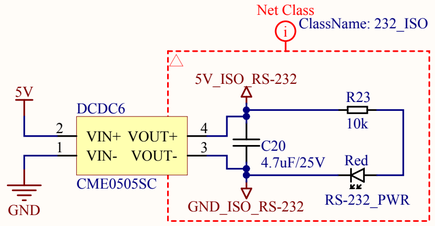
Title: ADC		
Size: A3	Number: 7	Revision: Rev 1
Date: 2014-08-17	Time: 13:28:25	Sheet 7 of 8
File: GPIO Schematic.SchDoc		

Notes

Calculations

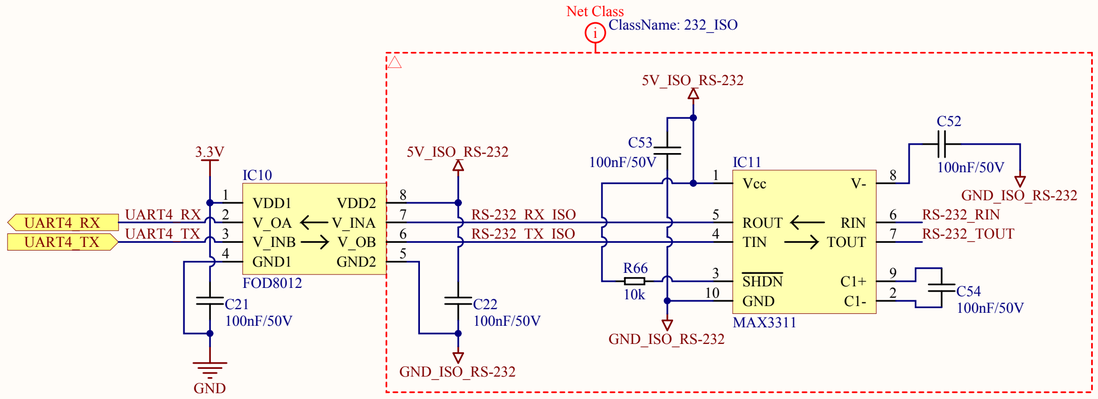
Important Note

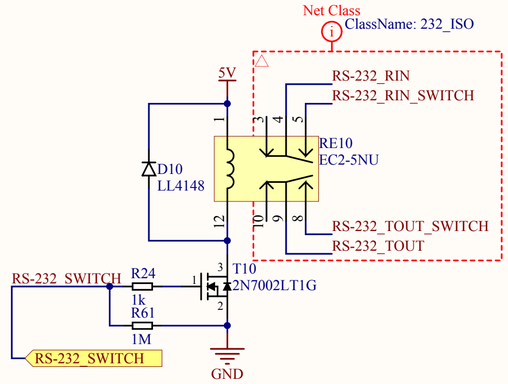
RS-232 (UART4)

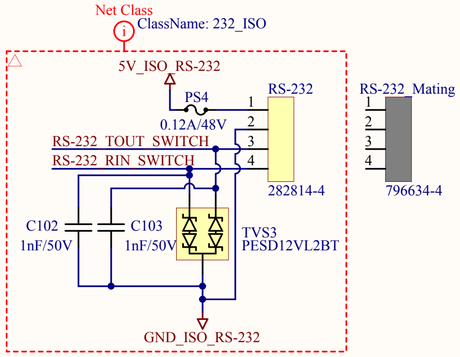


Current Usage 5V_ISO_RS-232:
FOD8012: 20 mA max
MAX3311: 12 mA max
= 32 mA max

CME0505SC 150mA out max
-> 150-32 = 118 mA left







The capacitors at the connector are used for ESD protection. Together with the resistance in the cable (1 to 2 ohm) they create a RC low pass filter with cut-off frequency of 15979.5 MHz which should work fine for this situation.

Title: I2C & RS-232 Channels		
Size: A3	Number: 8	Revision: Rev 1
Date: 2014-08-17	Time: 13:28:26	Sheet 8 of 8
File: RS232 Schematic.SchDoc		