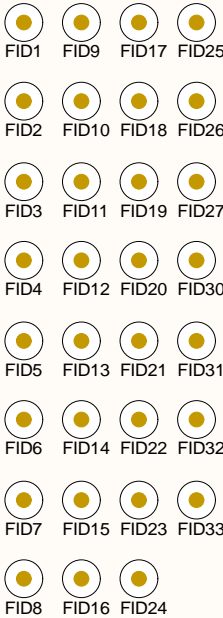
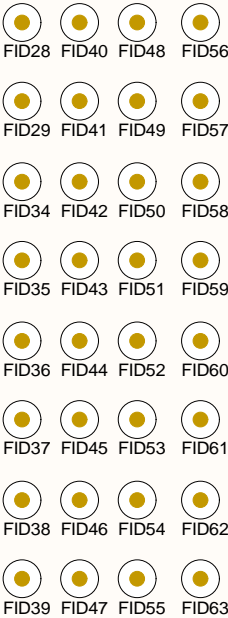


MECHANICAL AND HARDWARE

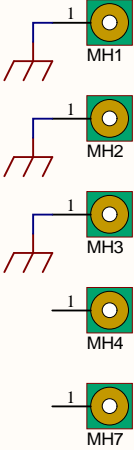
TOP FIDS



BTM FIDS



4-40 MNT



HARNESS

W100
CABLE
H3CCS-4006G
40 PIN IDC RIBBON CABLE ASSY

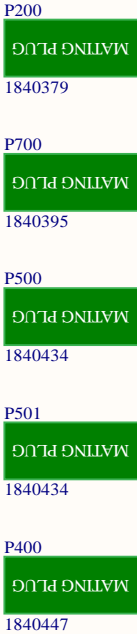
W101
CABLE
909
PANEL MOUNT ETHERNET EXTENSION C

W102
CABLE
TULIP-PN-TBD
RP SMA FEMALE TO RP SMA MALE RA PIGTAIL CABLE 20CM

W103
CABLE
978
PANEL MOUNT HDMI CABLE - 40 CM

W104
CABLE
14193
CABLE USB A TO 5 WAY CRIMP 100MM

PWR, I/O JACKS



LIGHT PIPES

FIBER OPTICS, SEE ASSEMBLY NOTES

H1
MECH
1841161

H2
MECH
1841161

H3
MECH
1841161

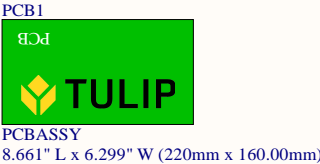
FIBER OPTICS ASSEMBLY NOTES

PHOENIX CONTACT OPTICS
PN: 1841161

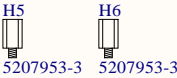
SNAP H1-H3 BETWEEN PIN 8 AND PIN 9
LOAD 1 TWO PIN ASSEMBLY, BIN THE OTHER 2P OPTICS

PN | POS. LOAD
J200: 1,2
J400: 3-10
J500, J501: 1-8

PCB



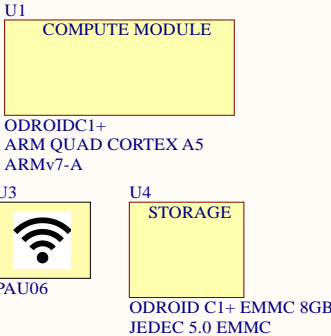
DB-9 JACKSCREWS



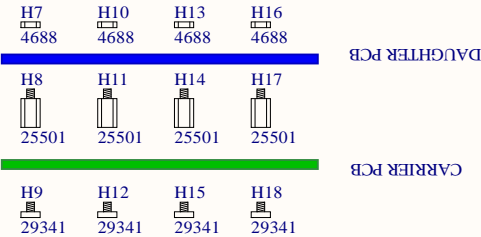
NULL MODEM CBL ASSY

W1
CABLE
AK143-3
Null Modem

COTS SBC



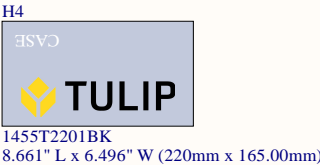
SBC STANDOFF



EARTH & RETURN SHUNT



ENCLOSURE



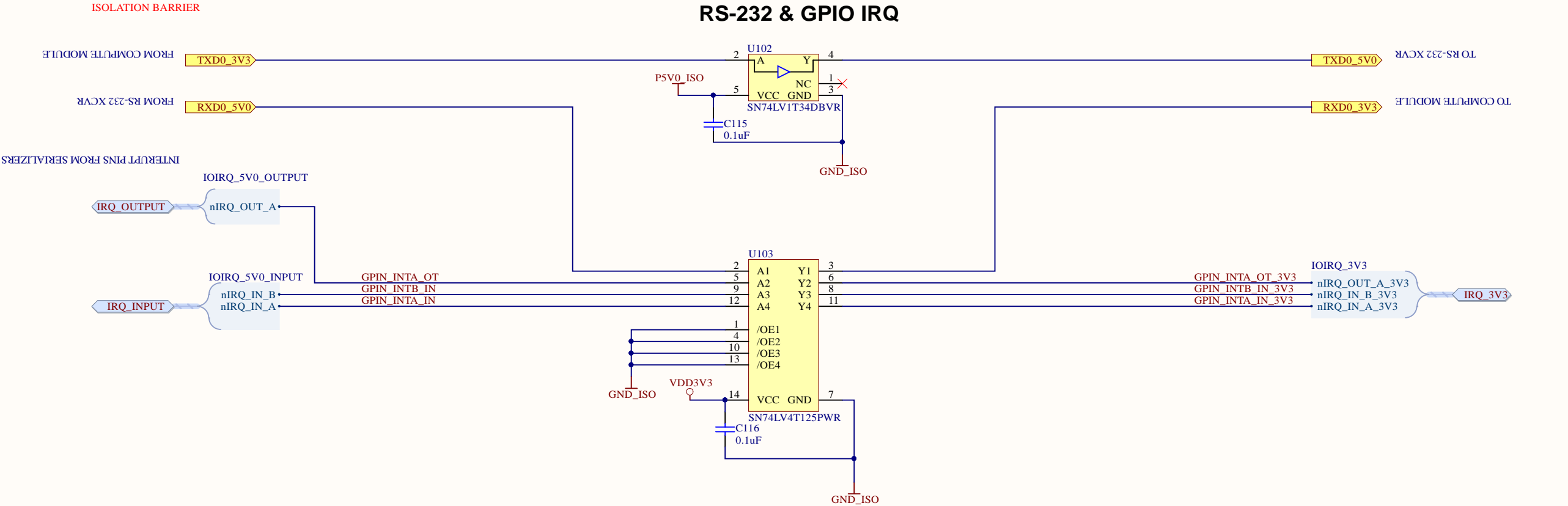
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Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\MECHANICAL.SchDoc	Drawn By:

4

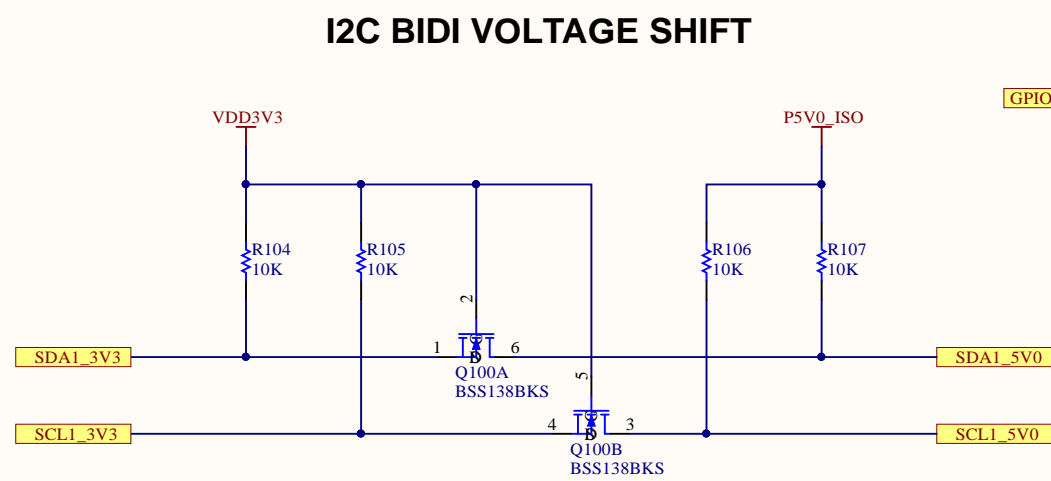
Title		
Size Legal	Number	Revision
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\COMPUTE HDR_SchDo	Drawn By:

LEVELSHIFTING

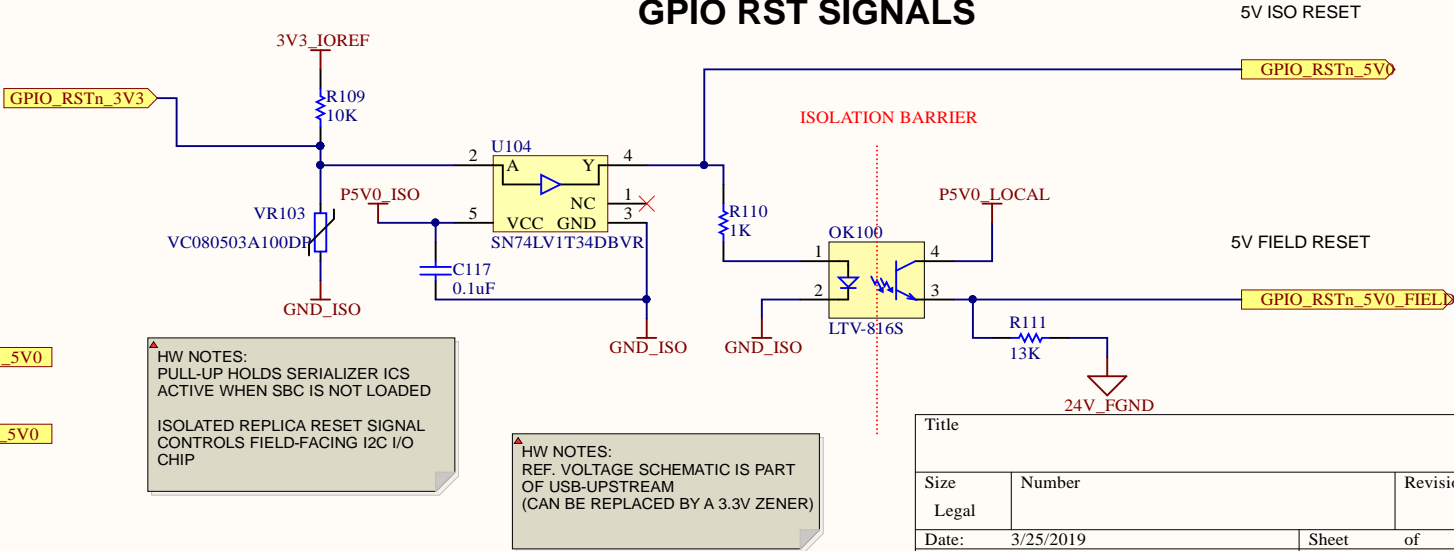
RS-232 & GPIO IRQ



I2C BIDI VOLTAGE SHIFT



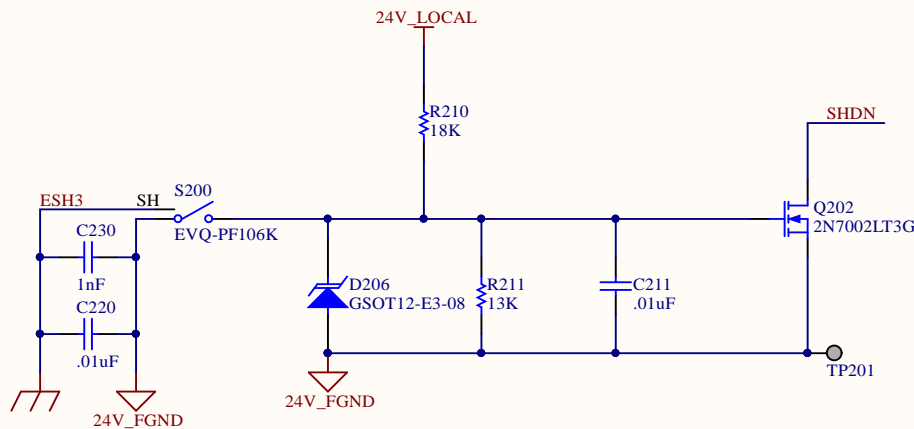
GPIO RST SIGNALS



Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\COMPUTE_LEVELSHIFTING.SchDoc	Doc

ISOLATED DC DC CONVERTER, FIELD-LV REFERENCE, AND SHUTDOWN

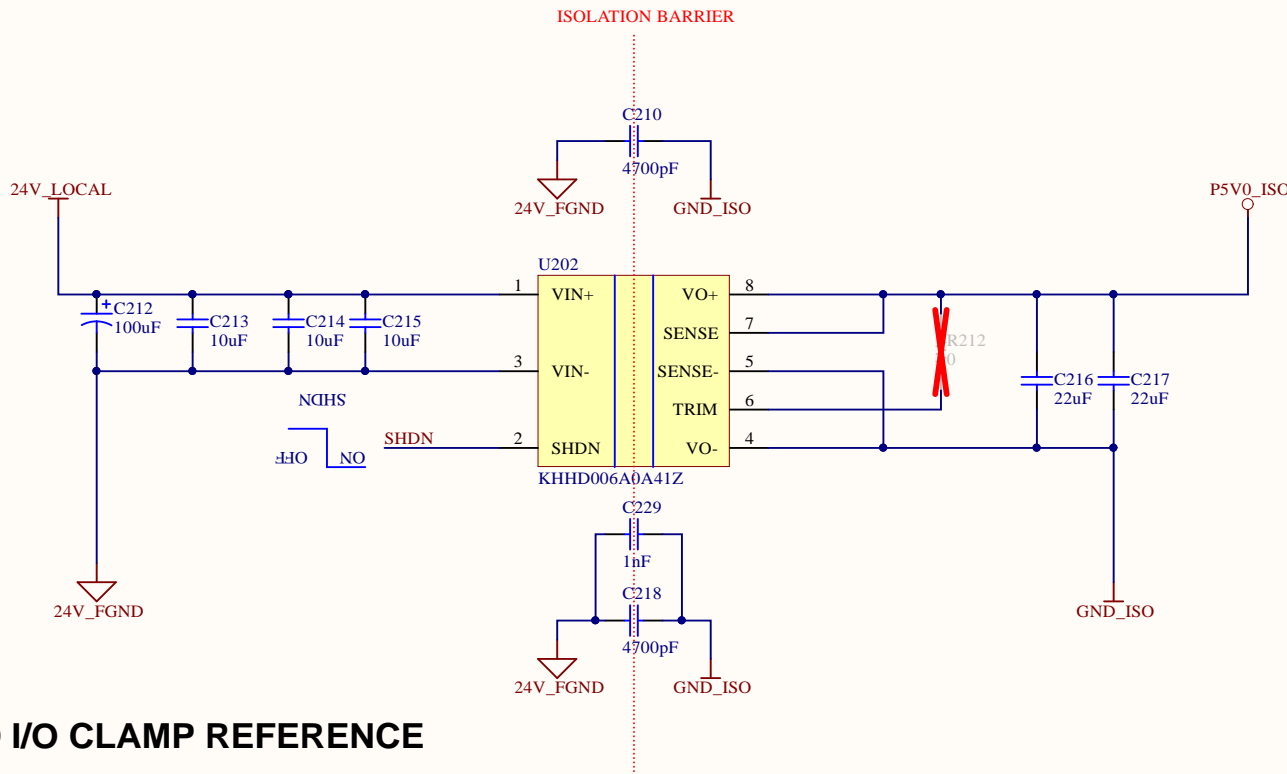
ISO POWER SHUTDOWN



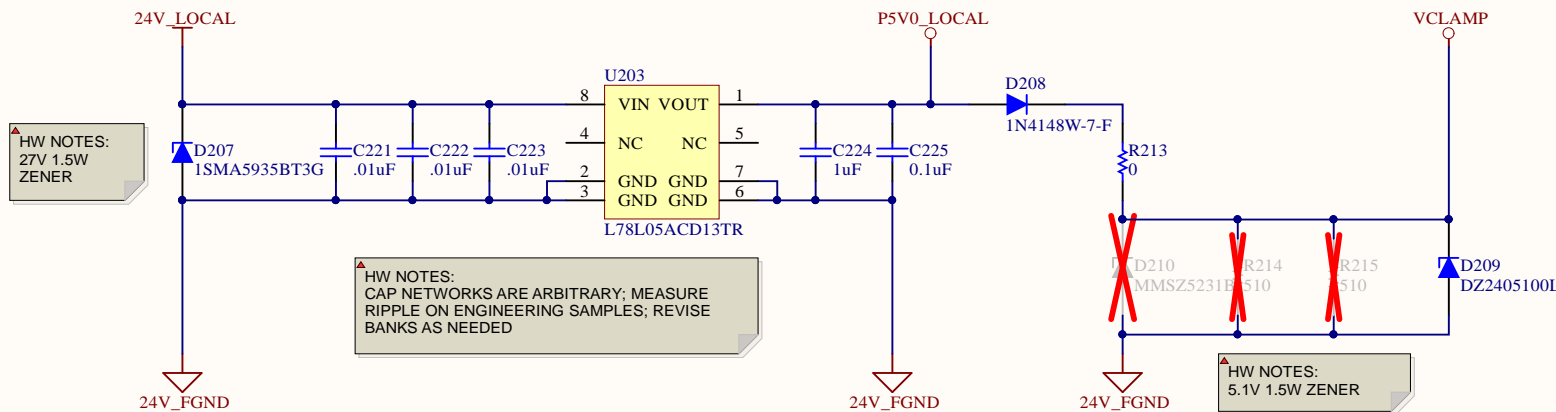
HW NOTES:
OPTION SHUNTING DIODES POST TVS

HW NOTES:
TP201 & Q202 GATE CAN BE USED TO PROTOTYPE
ISO'D IN-SYSTEM LOW VOLTAGE RST
(ACTIVE LOW)

2500V ISOLATED DC/DC MODULE



FIELD-SIDE LOW VOLTAGE SUPPLY AND I/O CLAMP REFERENCE



HW NOTES:
27V 1.5W
ZENER

HW NOTES:
CAP NETWORKS ARE ARBITRARY; MEASURE
RIPPLE ON ENGINEERING SAMPLES; REVISE
BANKS AS NEEDED

HW NOTES:
V_D OF DIODE IS APPROX 4.3V,
NETWORK CONDUCTS > 4.3V AND
ABOVE

ZENER NETWORK CONSISTS OF TWO
DIFFERENT POWER RATED
FOOTPRINTS. 500MW AND >1W.
SHUNT RESISTOR CAN SPLIT ZENER
CURRENT TO INCREASE OUTPUT
CURRENT IN GPIN STAGE

TEST & CONFIRM W/ ENGINEERING
SAMPLES

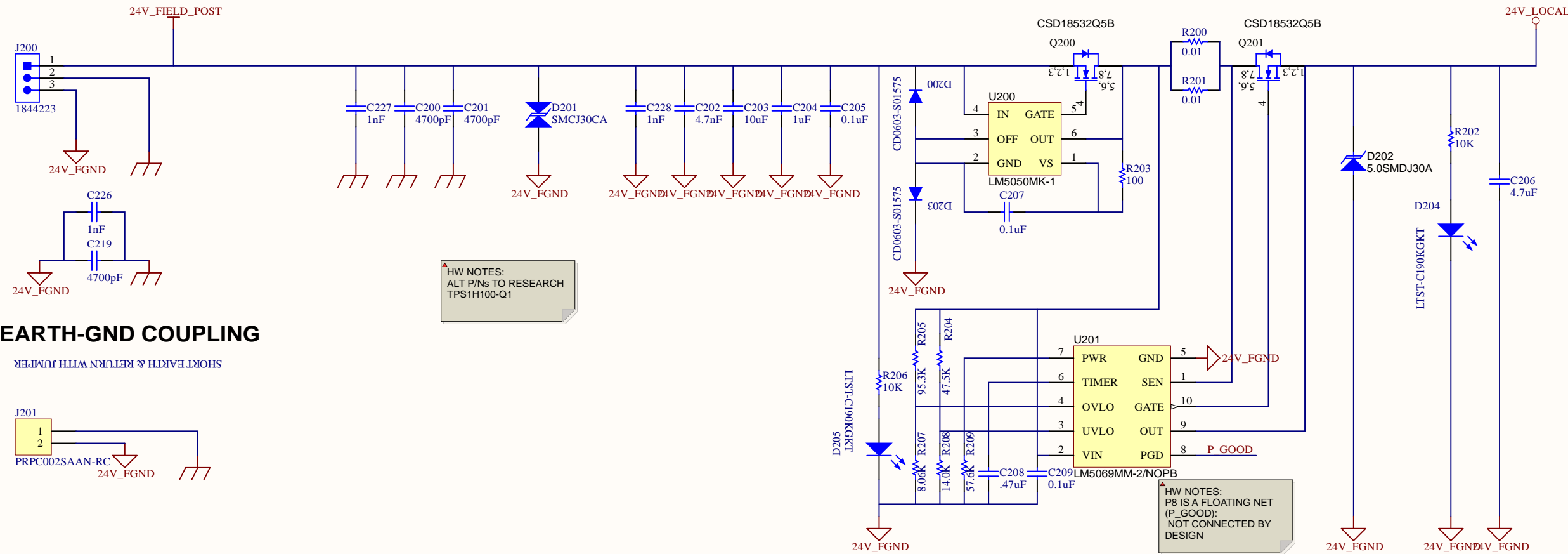
HW NOTES:
5.1V 1.5W ZENER

Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\tulip-hw\gateway\PWR.Sch	Drawn By:

FIELD VOLTAGE CONDITIONING

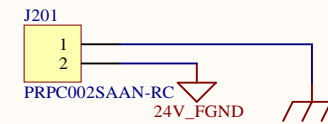
FIELD VOLTAGE IN

24V EFUSE

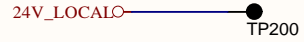


EARTH-GND COUPLING

SHORT EARTH & RETURN WITH JUMPER



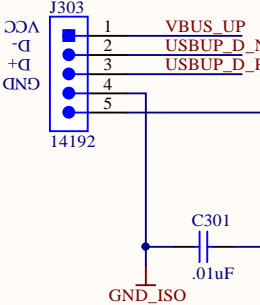
FUSE BYPASS TP



Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\PMIC.SchDoc	Drawn By:

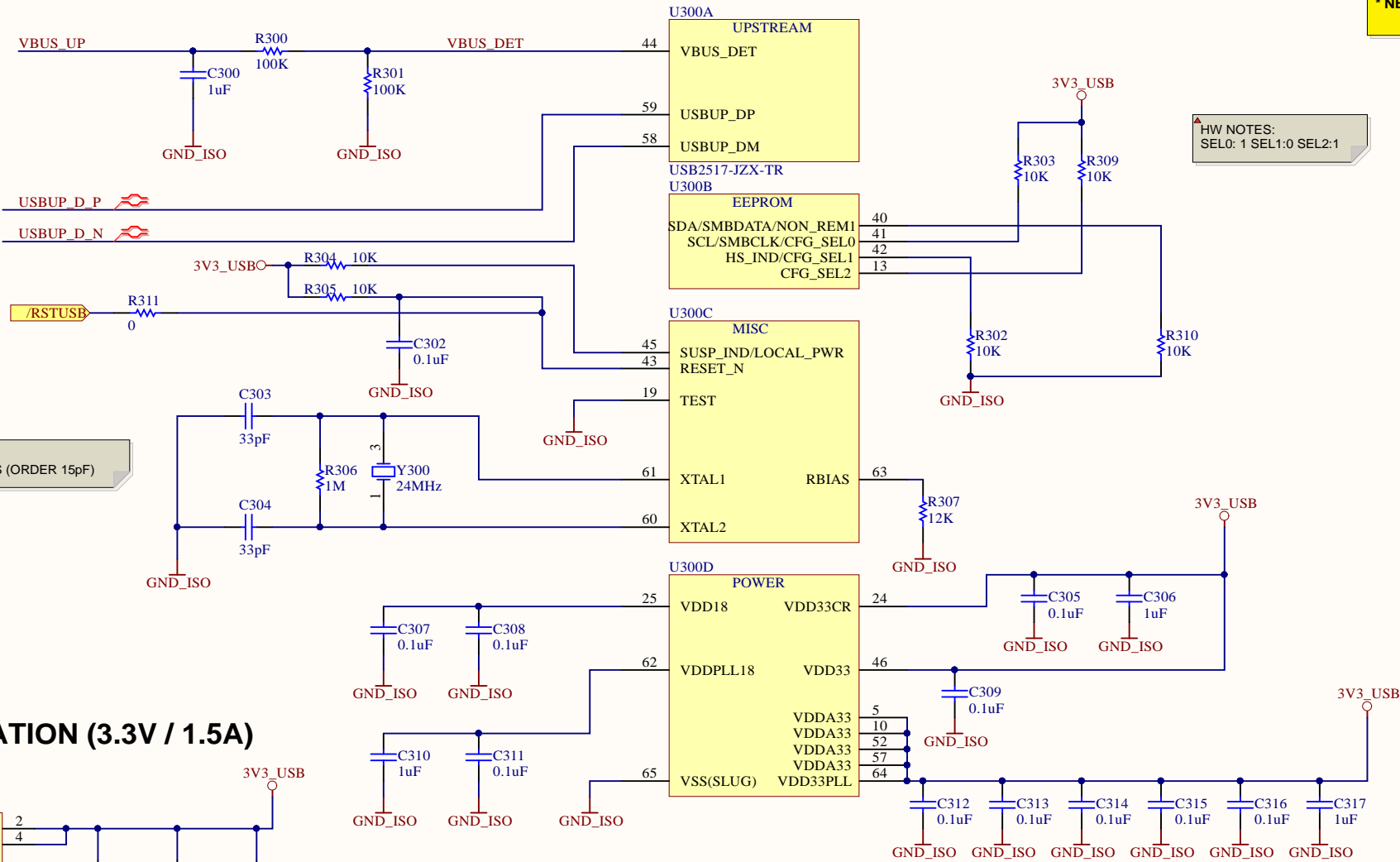
USB 2.0 UPSTREAM INTERFACE

USB BREAKOUT HDR



FW NOTES:
OPTION USB RST

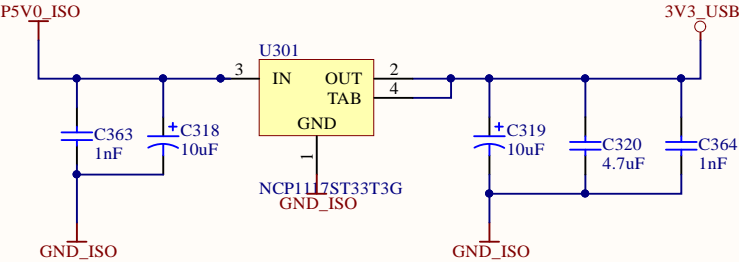
HW NOTES:
VERIFY CAPS (ORDER 15pF)



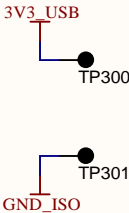
TODO:
*NEEDS TEST POINTS

HW NOTES:
SEL0: 1 SEL1:0 SEL2:1

LINEAR REGULATION (3.3V / 1.5A)



POWER TPS



INTERNAL BRD 3.3V REFERENCE



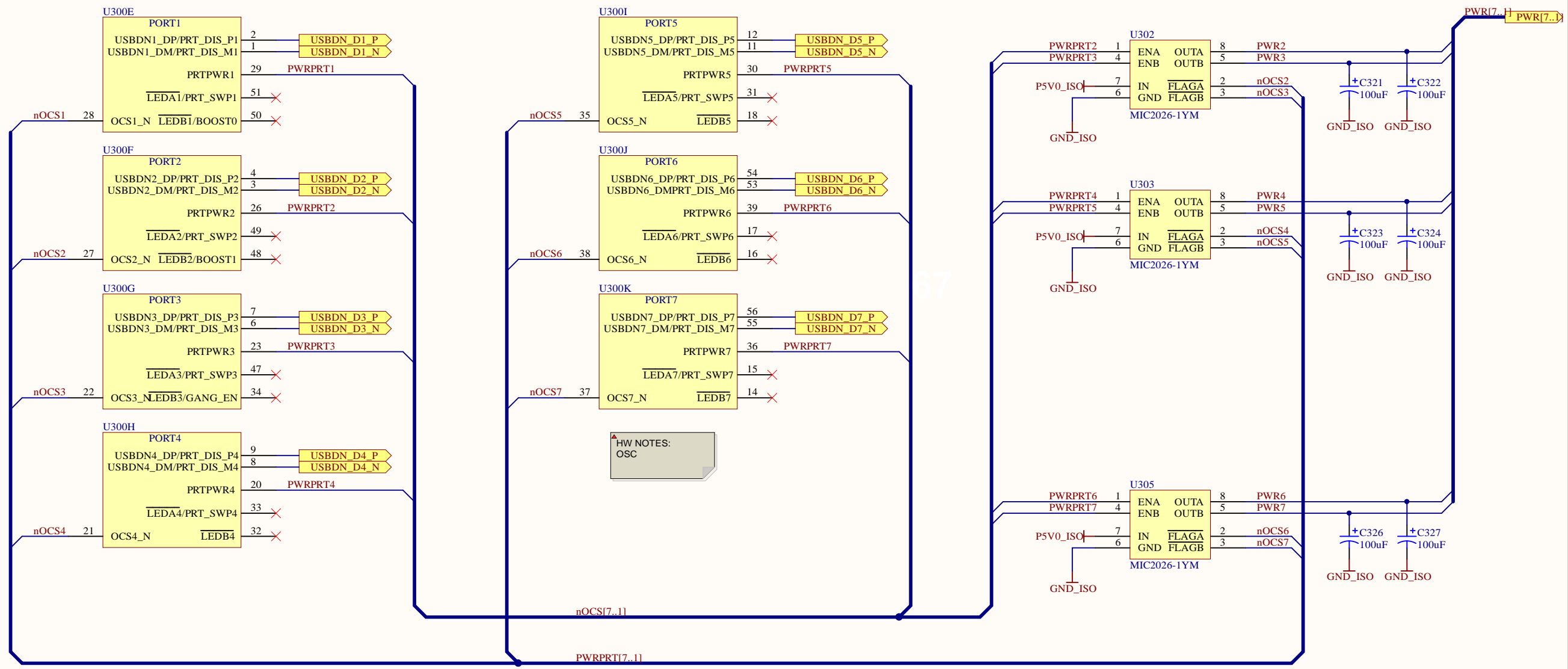
HW NOTES:
REFERENCE VOLTAGE (3V3_IOFEF) IS FOR PULL-UP APPLICATIONS ONLY

Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\USB_UPSTREAM.SchDoc	Drawn By:

USB 2.0 DOWNSTREAM PORTS AND POWER ENABLE

USB IC HUB [7..1]

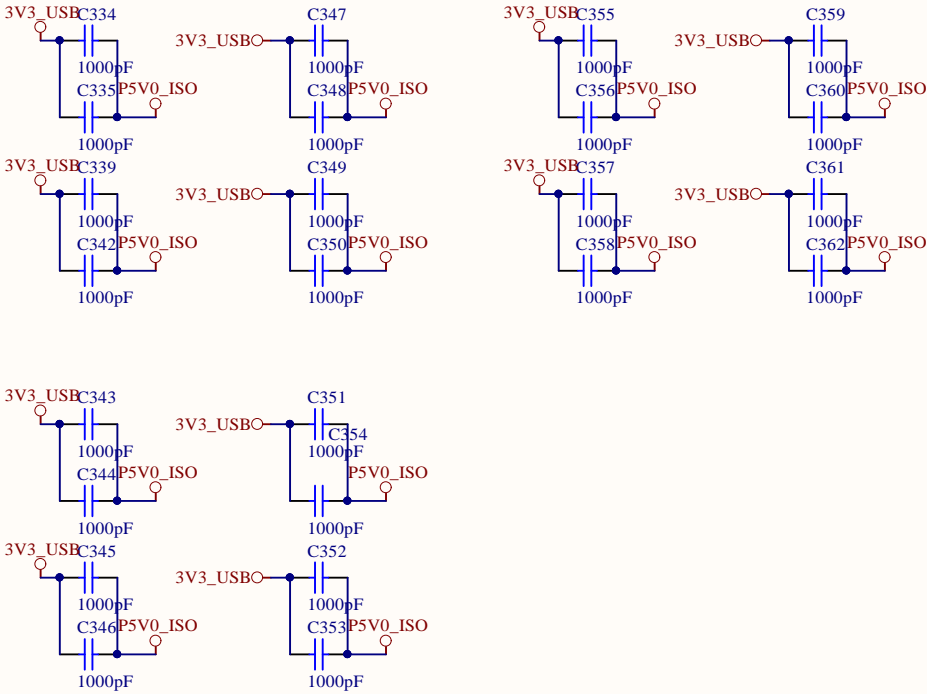
HUB PWR ENBL [7..1]



Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\USB_DOWNSTREAM.SchDoc By:	

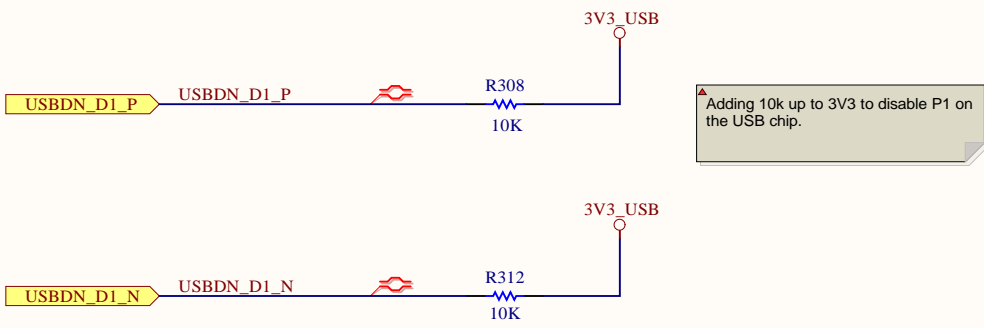
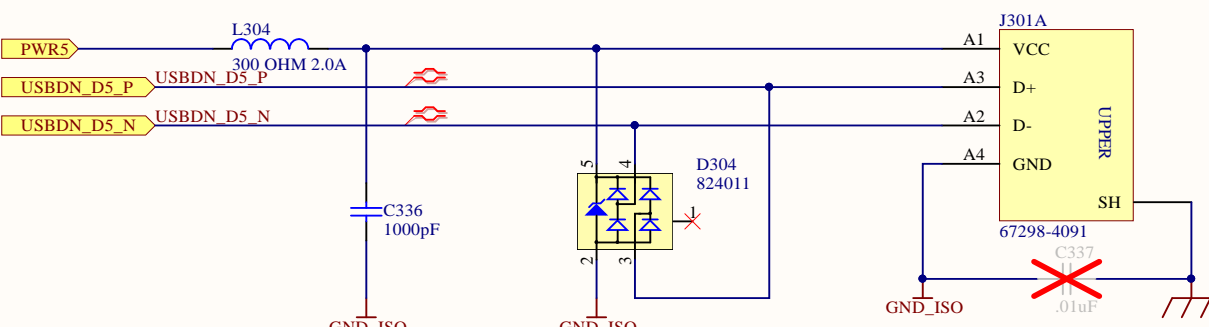
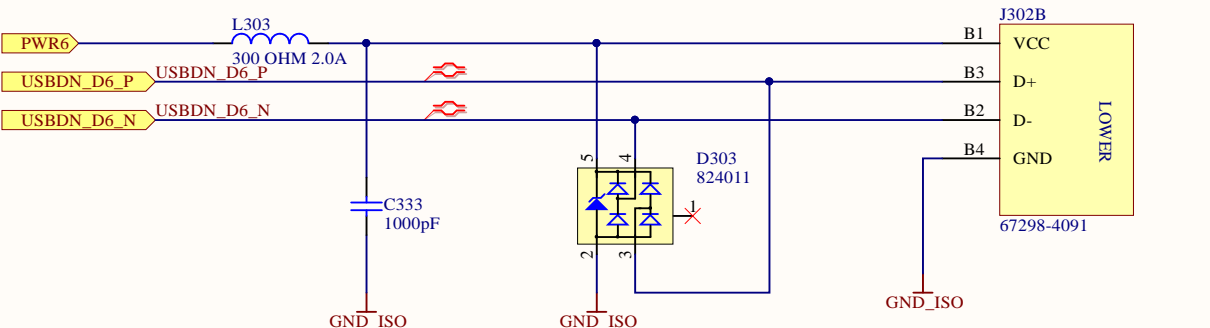
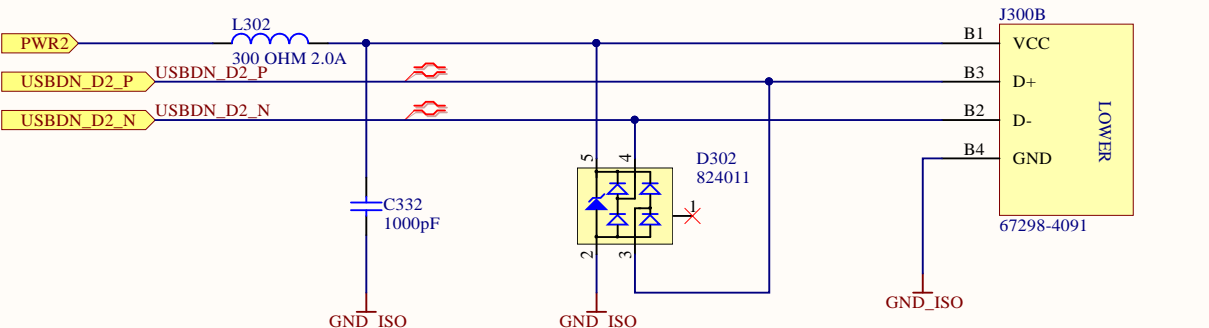
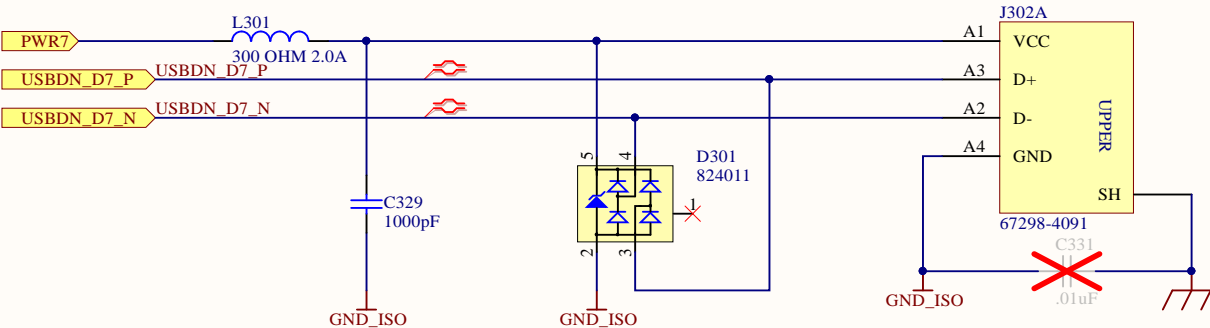
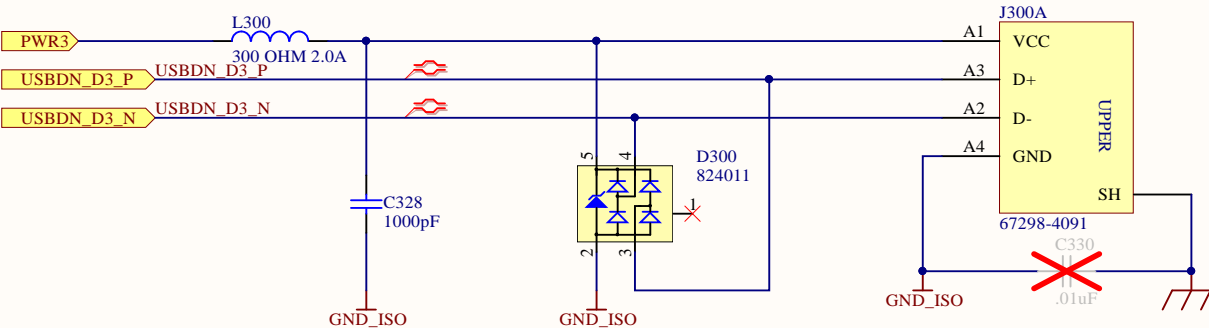
USB SIGNAL STICHING 5V/3.3V

POST LAYOUT 5V/3.3V STITCH



Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\..\USB_SIGNAL_PLANE	5 of 5

USB 2.0 7-PORT INTERFACE



HW NOTES:
OPTION EMI CHOKE D+/-:
742 792 641

Adding 10k up to 3V3 to disable P1 on the USB chip.

Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\USB_IF.SchDoc	Drawn By:

8 CHANNEL ISOLATED HIGH SIDE DRIVER

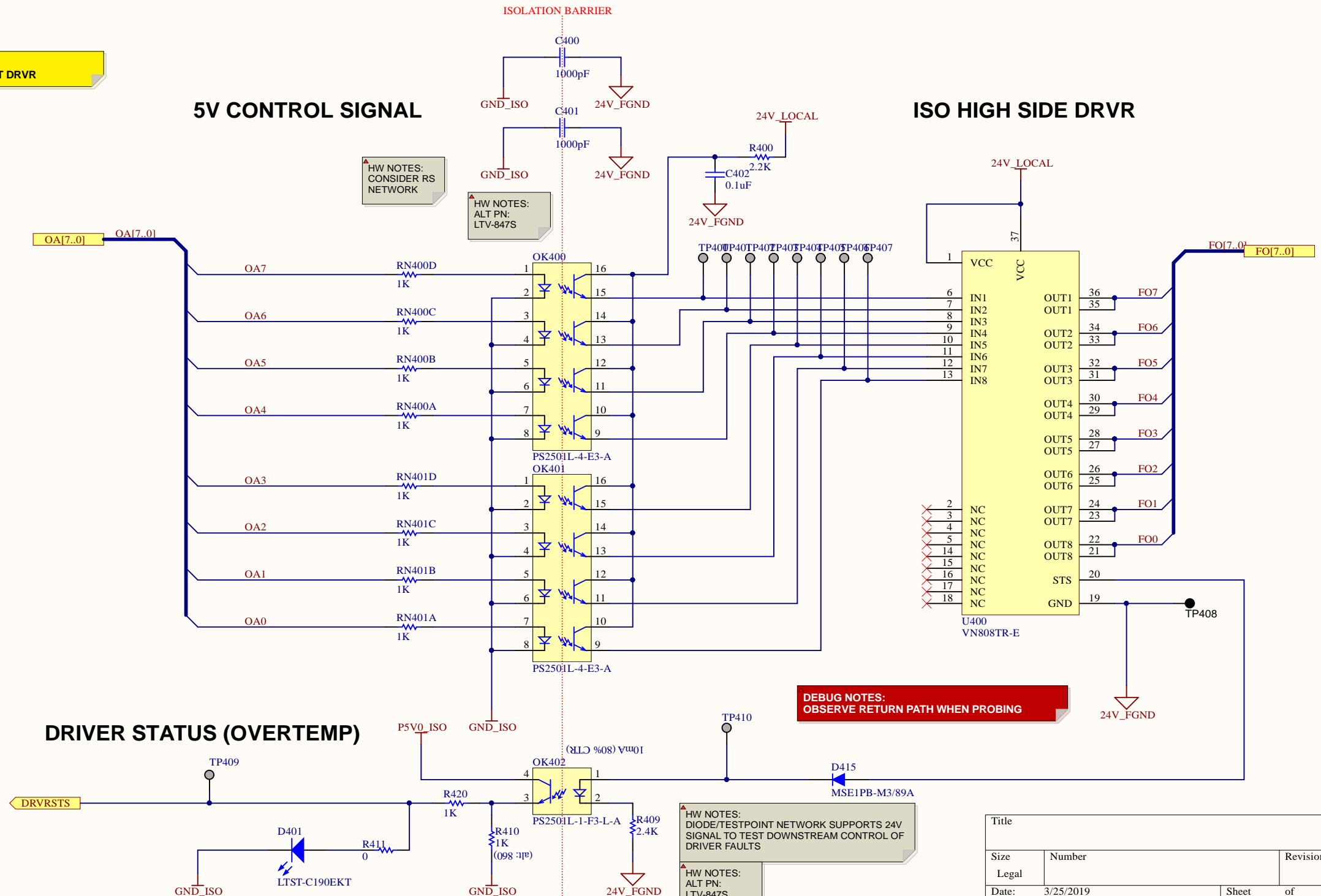
⚠ **TODO:**
* VALIDATE SINK LIMIT DRVR

5V CONTROL SIGNAL

HW NOTES:
CONSIDER I
NETWORK

▲ HW NOTES:
ALT PN:
LTV-847S

ISO HIGH SIDE DRVR



DEBUG NOTES:
OBSERVE RETURN PATH WHEN PROBING

HW NOTES:
DIODE/TESTPOINT NETWORK SUPPORTS 24V
SIGNAL TO TEST DOWNSTREAM CONTROL OF
DRIVER FAULTS

▲ HW NOTES
ALT PN:
LTV-847S

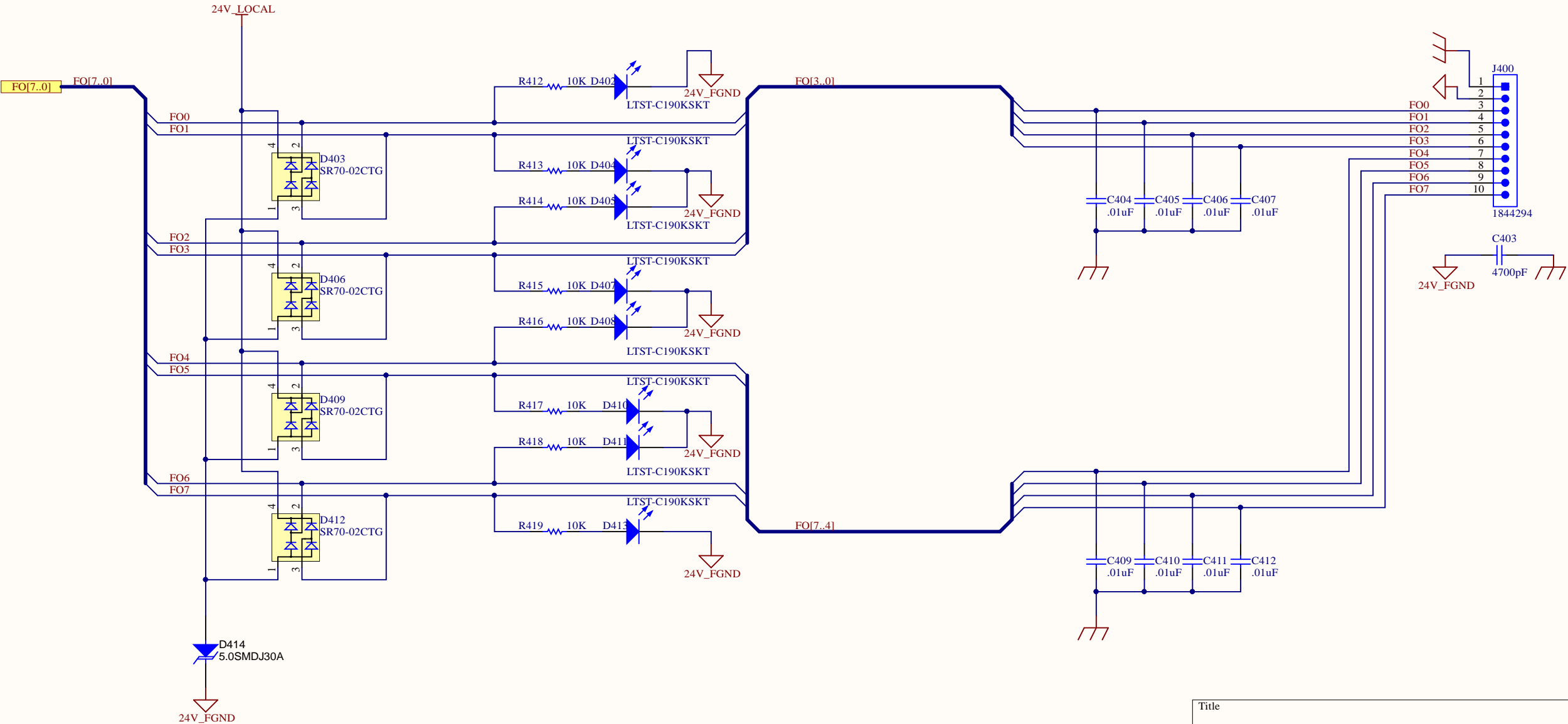
Title		
Size Legal	Number	Revision
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\GPOUT ISO BANKA S&P	Drawn By:

8 CHANNEL ISOLATED HIGH SIDE DRIVER INTERFACE

HIGHSIDE ESD

STS LEDS

CONNECTOR

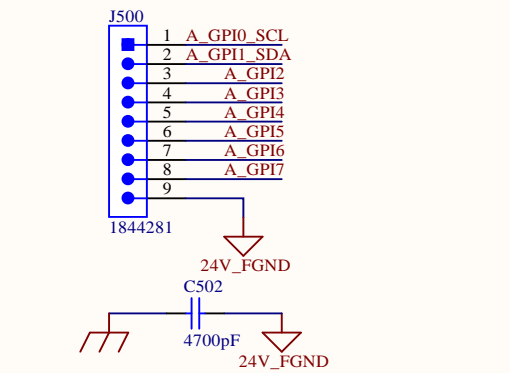


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Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\GPOUT_IF.SchDoc	Drawn By:

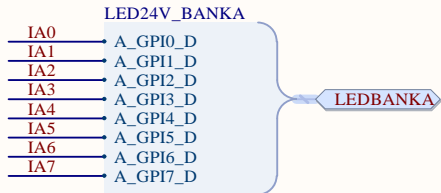
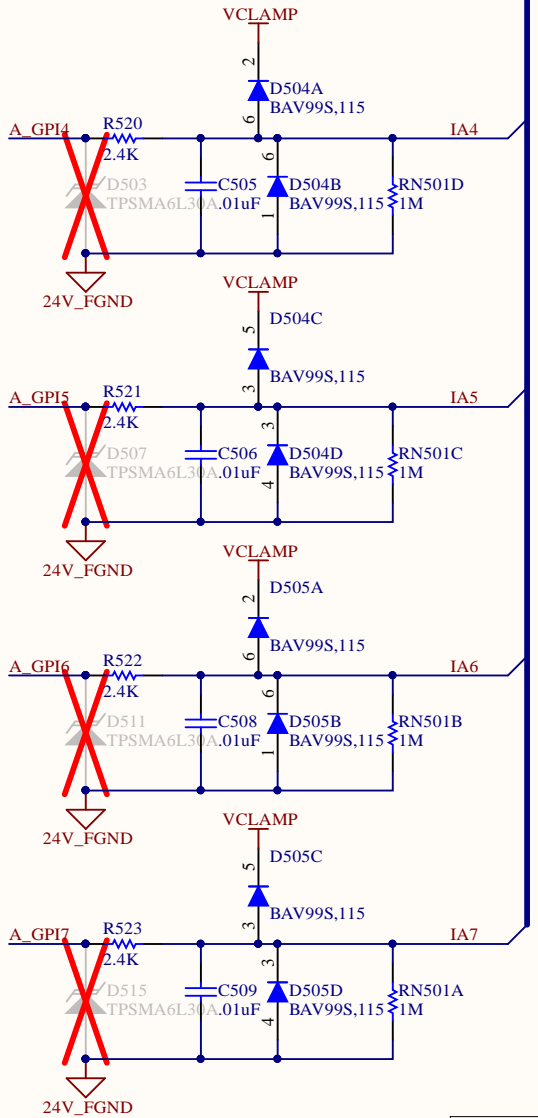
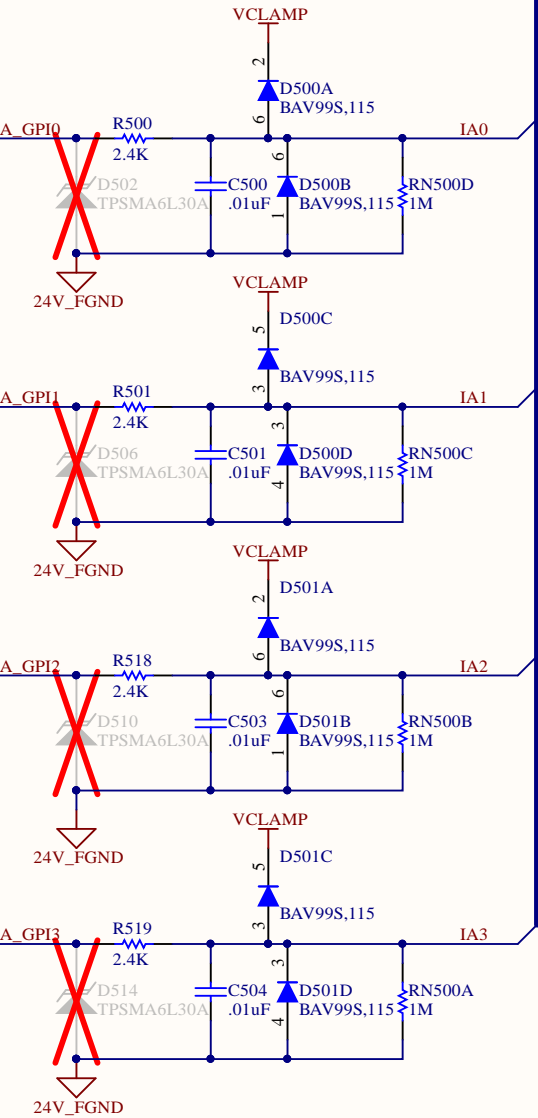
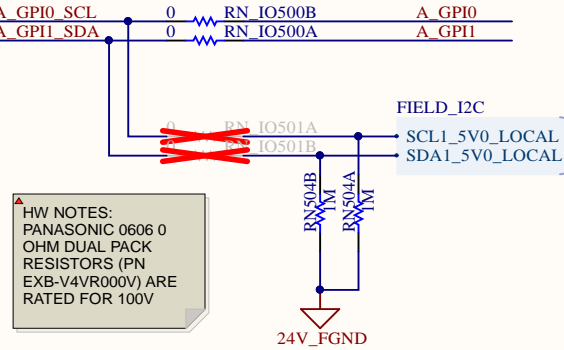
8 CHANNEL GENERAL PURPOSE INPUT/OUTPUT BANK A

INPUT CLAMPING

FIELD INTERFACE BANK A



GP-IO | I2C OPTION



HW NOTES:
Current shunted back to power in
voltage state:
 $i = (v_{in} - v_{d+v_clamp}) / r$
output current
 $i = v_{out_mcp230XX} / r$

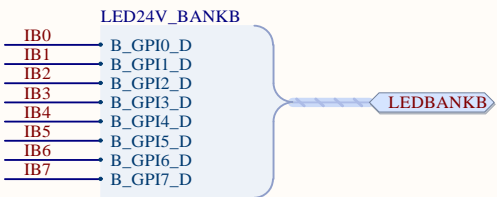
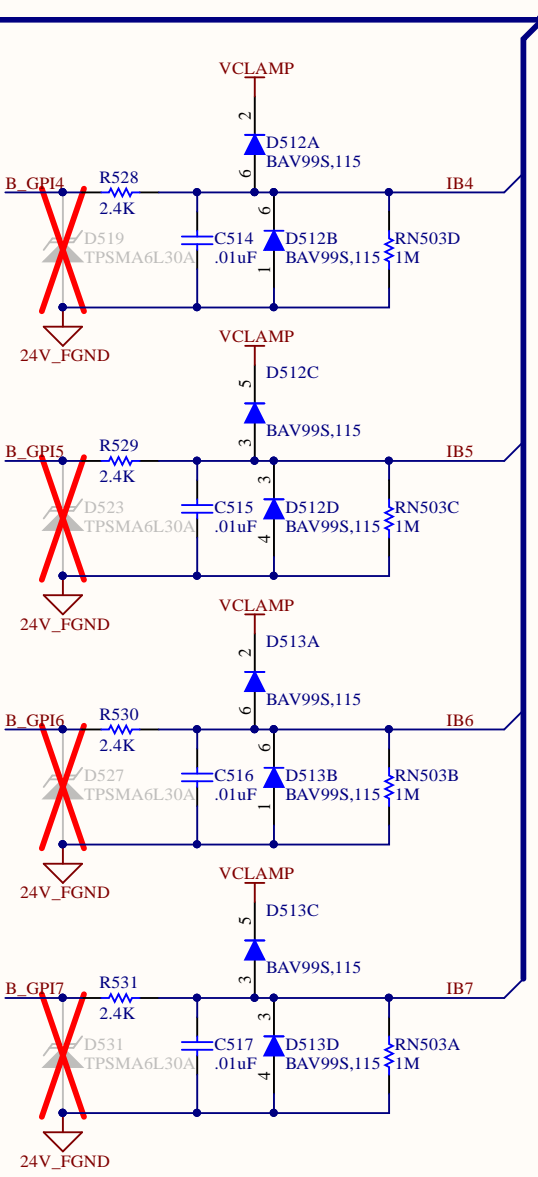
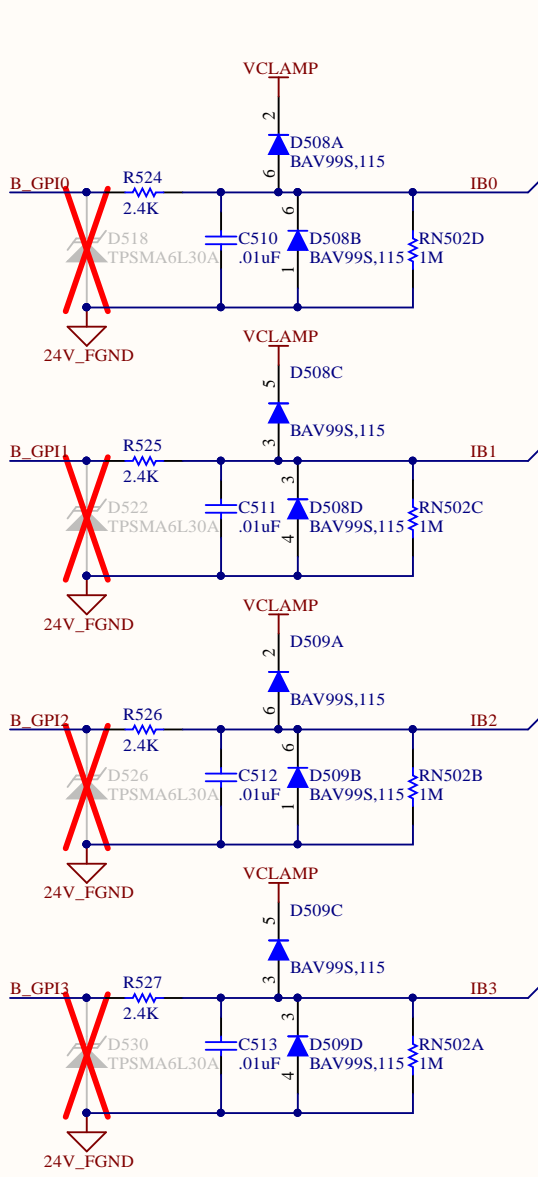
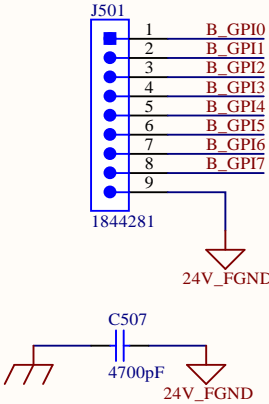
HW NOTES:
See Gdrive Link for Design
Calculator:
<https://docs.google.com/spreadsheets/d/13nk8ObWck-RUhyCKIa7hWd9EhgArbI4XJ7A0zWiv4EM/edit#gid=0>

Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\GPIN_ISO_BANKA.Sch	Down By:

8 CHANNEL GENERAL PURPOSE INPUT/OUTPUT BANK B

FIELD INTERFACE BANK B

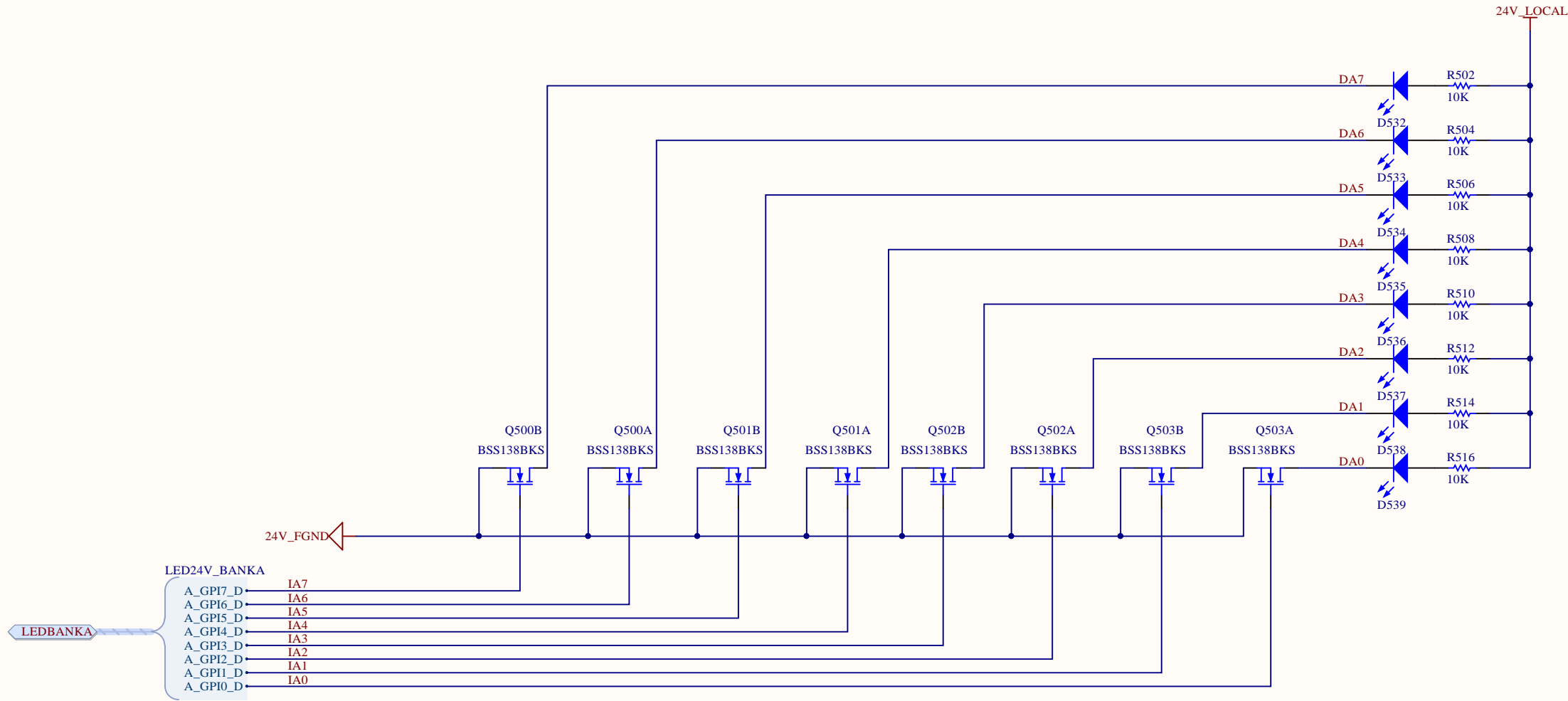
INPUT CLAMPING



Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\GPIN_ISO_BANKB.Sch	Drawn By:

GENERAL PURPOSE I/O INDICATORS: BANK A

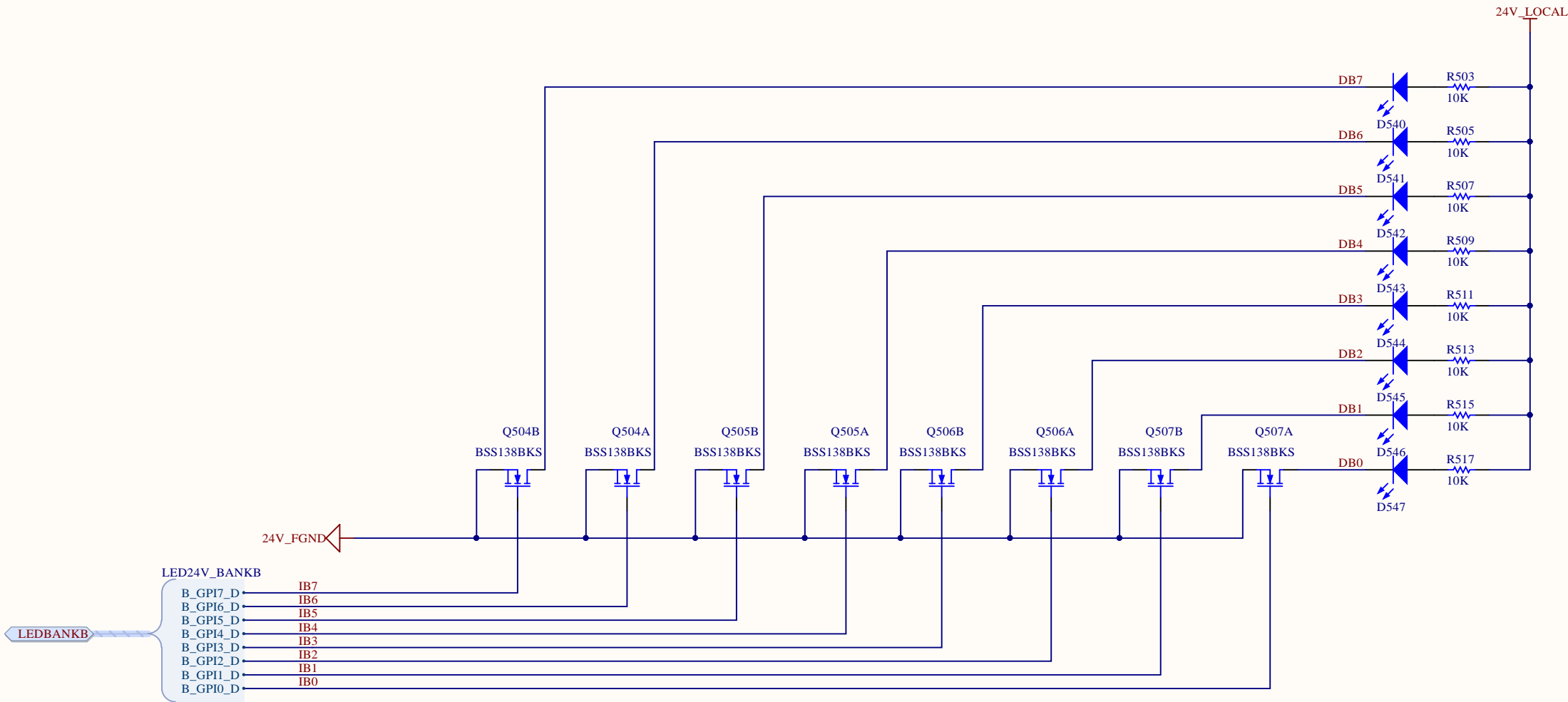
(COLLOCATE BY FIELD CONNECTORS)



Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\GPIN_INDICATOR_BANKA.schDoc	1 of 1

GENERAL PURPOSE I/O INDICATORS: BANK B

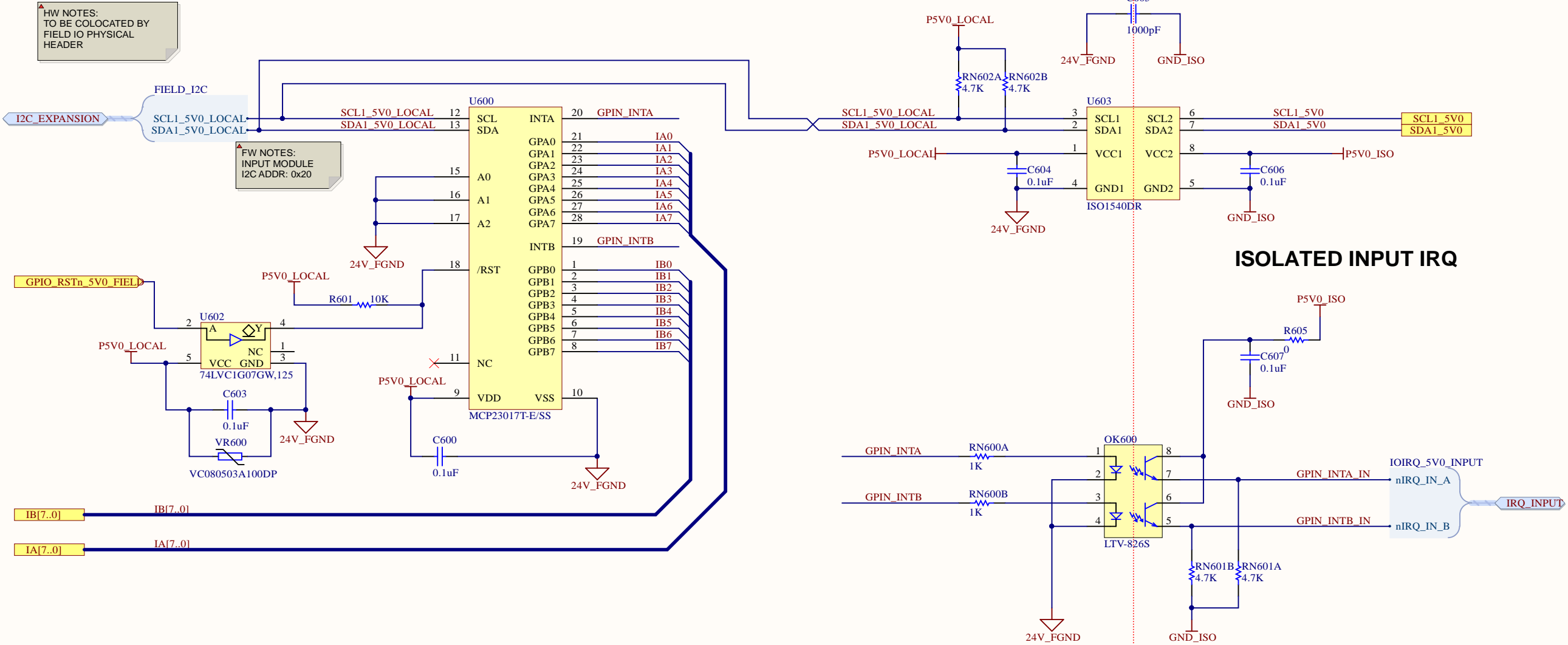
(COLLOCATE BY FIELD CONNECTORS)



Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\GPIN_INDICATOR_BANKB.SchDoc	4 of 4

LOW VOLTAGE I/O SERIALIZER

LOW VOLTAGE I/O WITH ISOLATED I2C



Title

Size

Legal

Number

Revision

Date:

3/25/2019

Sheet

of

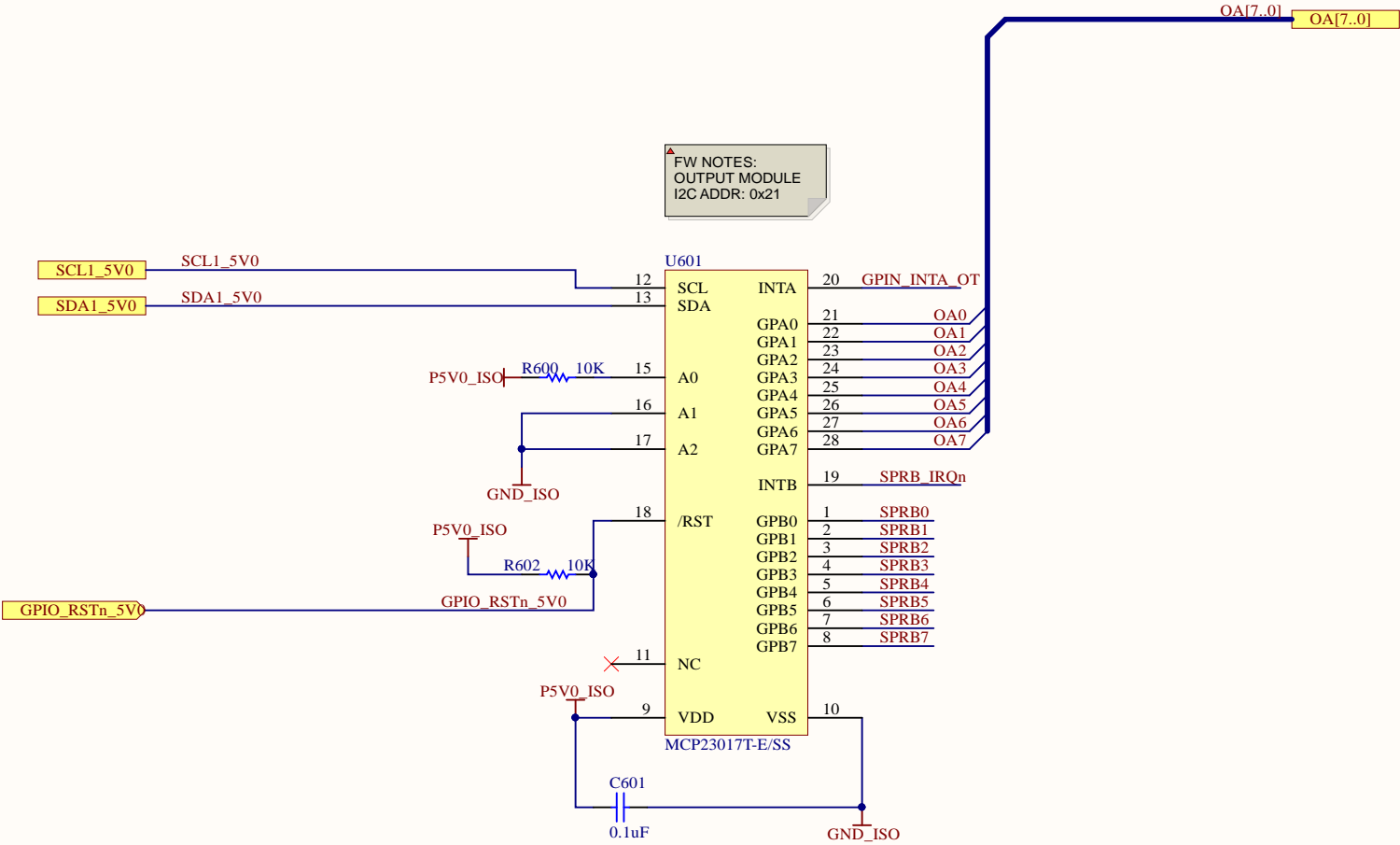
File:

Z:\SC-Tulip\...\GPIN_I2C.SchDoc

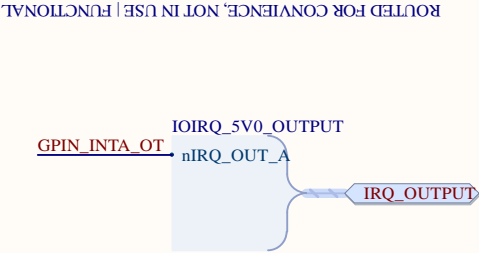
Drawn By:

24V OUTPUT DRIVER DESERIALIZER

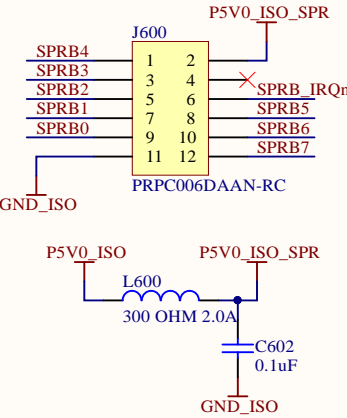
OUTPUT MODULE



IRQ-OUTPUT



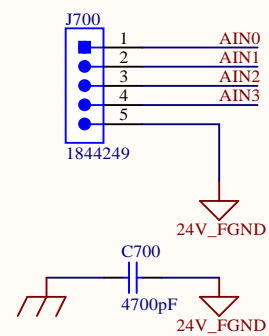
I/O SPARE



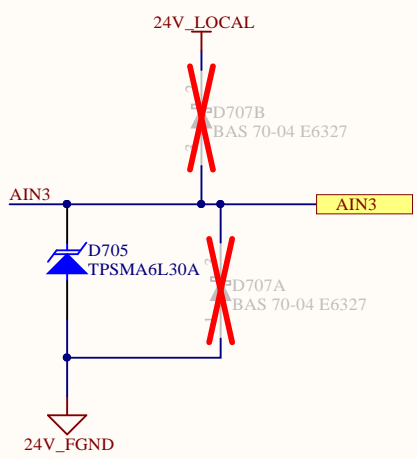
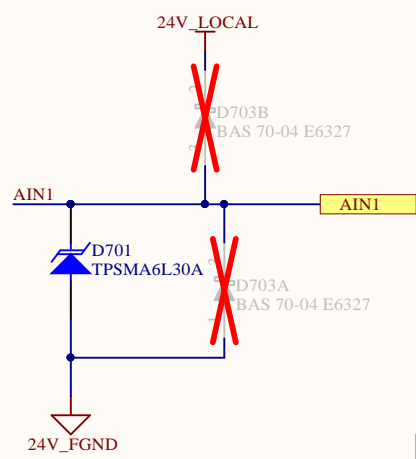
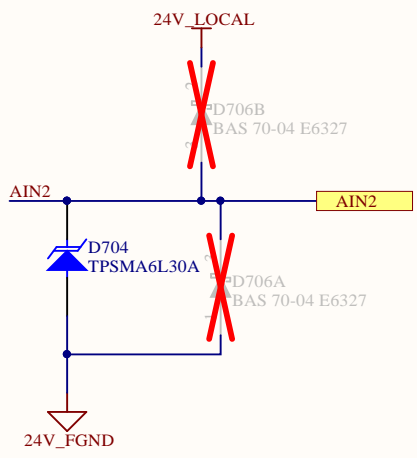
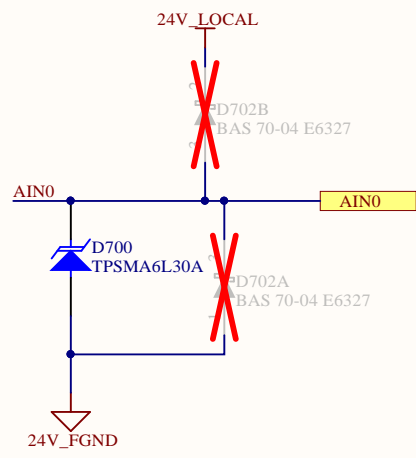
Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\...\GPOUT_I2C.SchDoc	Drawn By:

4 CHANNEL ANALOG INPUT AND CONDITIONING

FIELD IN ANALOG



ANALOG TRANSIENT PROTECTION

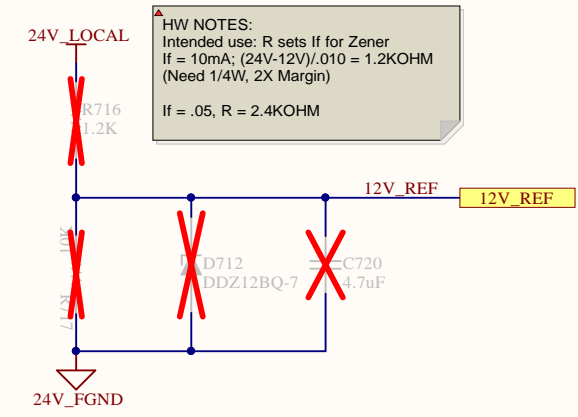


HW NOTES:
ALT TVS P/Ns

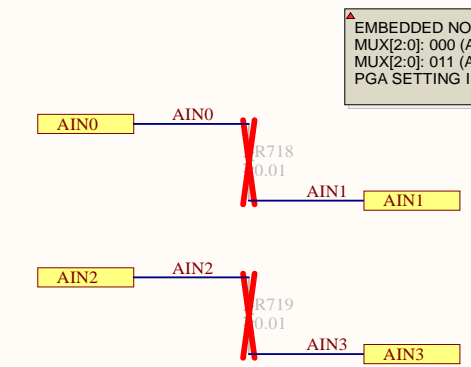
TA6F30A
TPSMA6L30A
PTVS30VP1UP

HW NOTES:
Can add 1KV 10pF to Earth post TVS

OPTION: INPUT BIASING (VREF)



OPTION: DIFFERENTIAL MEASUREMENTS



HW NOTES:
RESISTORS NEED TO BE SIZED FOR APP
(IE: CURRENT SENSE RESISTORS VS XFRMR
BURDEN RESISTORS)

Title		
Size	Number	Revision
Legal		
Date:	3/25/2019	Sheet of
File:	Z:\SC-Tulip\..\ADC_IF.SchDoc	Drawn By:

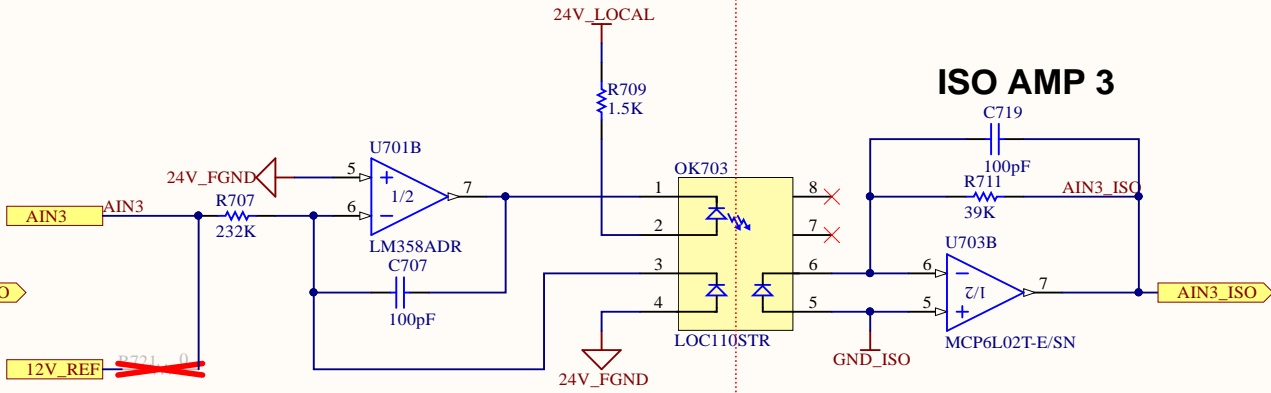
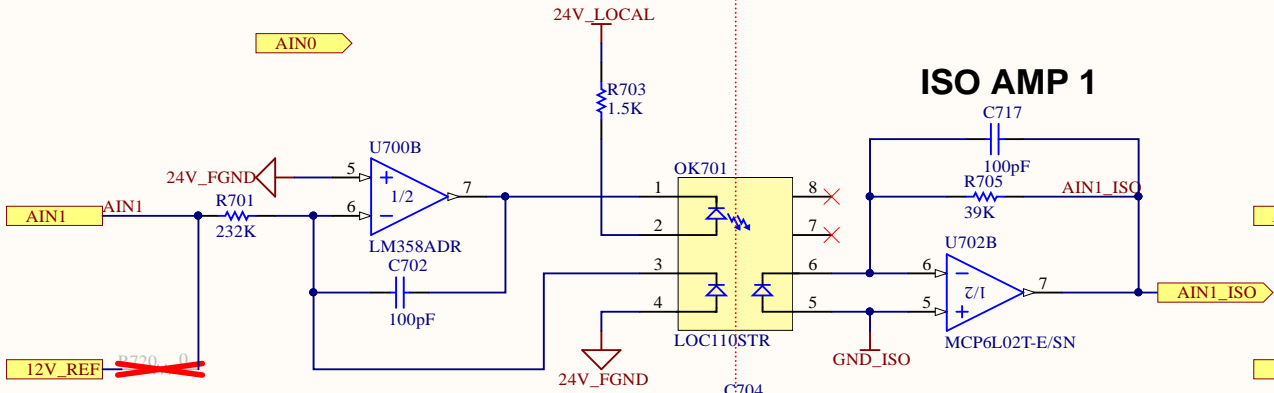
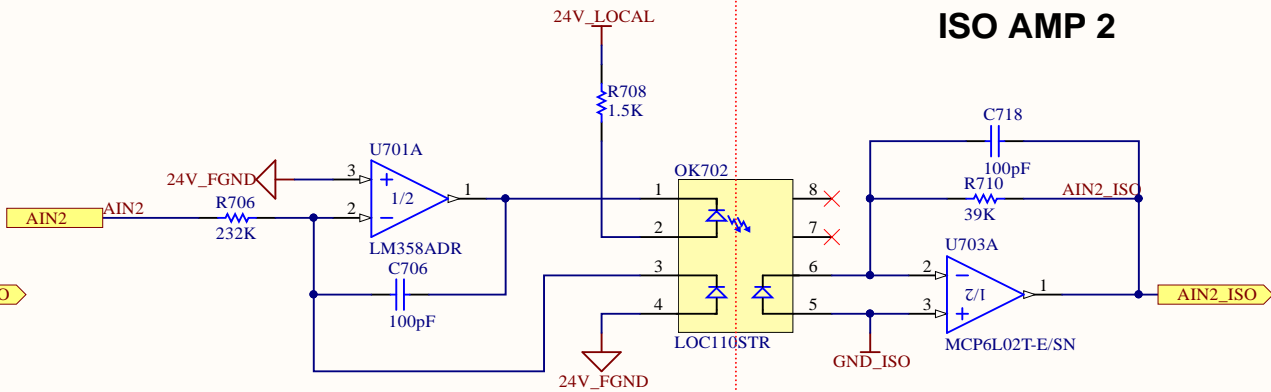
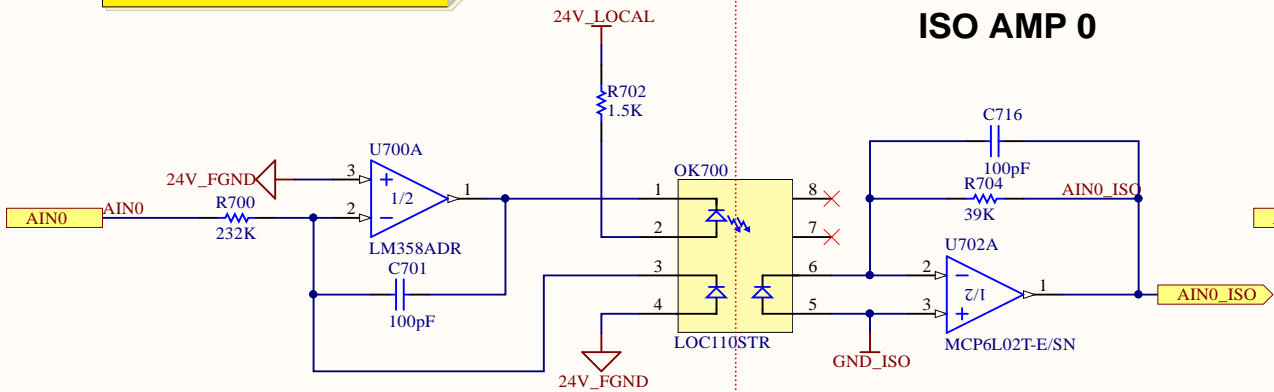
4 CHANNEL ANALOG ISOLATED INPUT (50KHz)

ISOLATION BARRIER

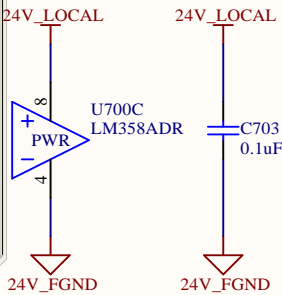
ISOLATION BARRIER

PHOTOVOLTAGE OPERATION

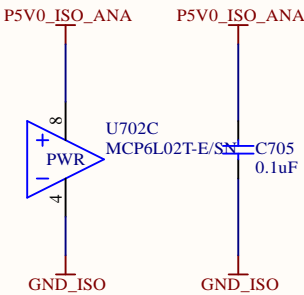
COMPUTE TODO:
* 11/20: SIZING CAPS ON ISO



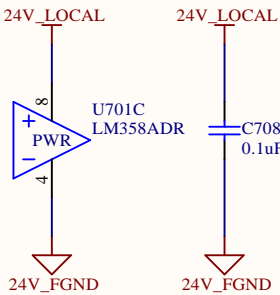
FIELD PWR & DCPL



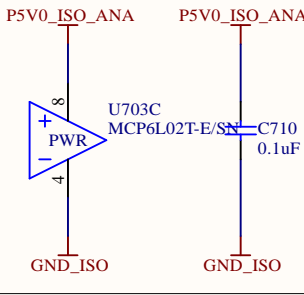
ISO PWR & DCPL



FIELD PWR & DCPL



ISO PWR & DCPL



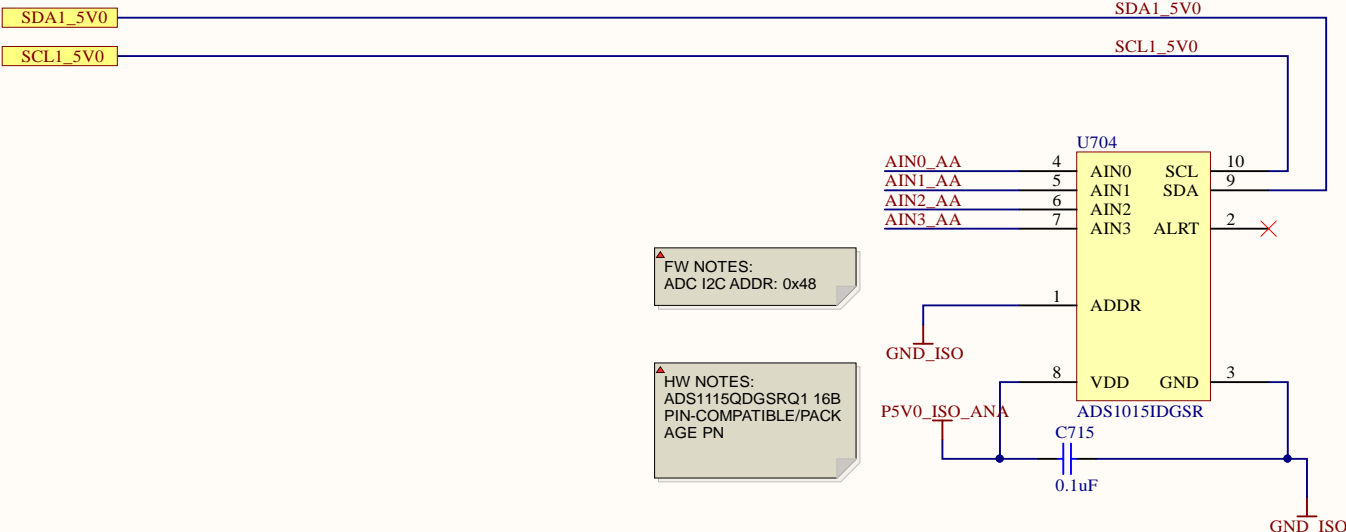
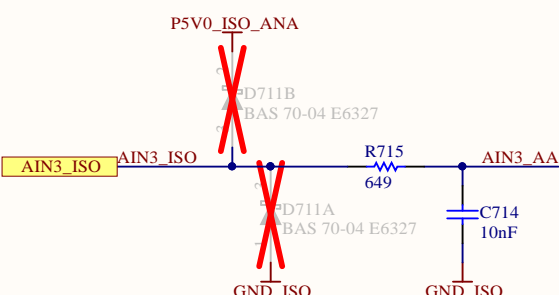
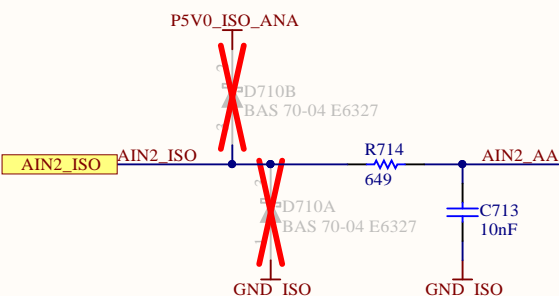
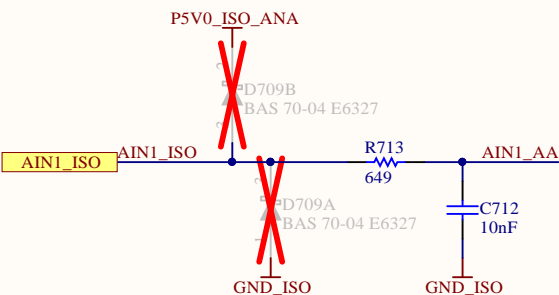
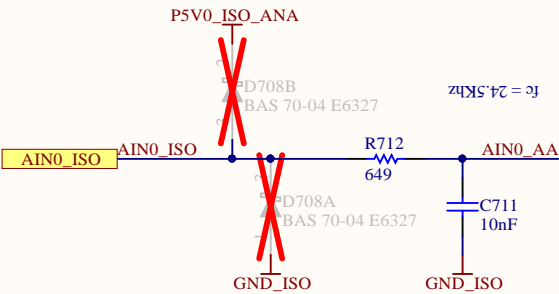
HW NOTES
PV MODE:
Vin=24V
Vout = 5V
VfLed = 1.2V
IFmax =15mA
K1 = 100uA/15mA = .007
K3 = K1/K2 = 1 (assume, bin dependent)
R1 = Vin/(K1 * IFmax)
Vout/Vin = (K3 * R2)/R1
R1 = 228.5K
R2 = 47.6K
REFs: VishayAN50
IXYS AN 107

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ISOLATED ANALOG TO DIGITAL MODULE

CLAMP AND ANTI-ALIAS

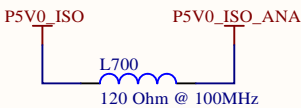
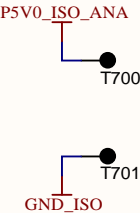
I2C ADC



FW NOTES:
ADC I2C ADDR: 0x48

HW NOTES:
ADS1115QDGSRQ1 16B
PIN-COMPATIBLE/PACK
AGE PN

ADC TPS



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