///Power Budget – ROUGH!///
LAN9514 –> 114mA (typ)
FT234XD –> 8mA (typ)
MAX3221 –> 7mA (typ)
12x LED –> ~30mA
IP175G –> ~160mA (typ)
Observed = ~350mA @3V3

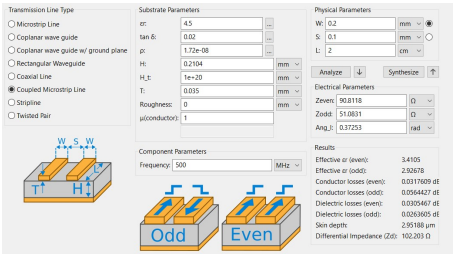
J16
CUI PJ-002B
Super Simple (D21)
Polarity/ESD Protection
ESD5Z5.0T5G
D21
Vext
L1
GZ1608D601TF
120Ω @100MHz
C1 22u
C3 0.1u
Vbuck-In
VBUS
U1
AP62150WU
VIN
EN
GND
SW
BST
FB
L6 3.3u
+3V3
3.3V +2.0% -1.6%
C46 0.1u
R75 49.9
R40 37.4k 0.1%
R41 12k 1%
FB 0.8Vref
0.802
C48 0.1u
C49 22u
L2
GZ1608D601TF
120Ω @100MHz
+3.3VA
C4 1u
R2 0
D22
NSR0520V2T1G
Backfeed Risk
If Vext < VBin-Vdiode
HOST usb may hit OCL
J1
CUI UJ2-BH-1-TH
USB Type B
VBUS
D+
D-
Shield
GND
VBin
4.75 to 5.25V
R1 0
GNDPWR
D1 ESD5Z5.0T5G
D2 ESD8351XV2T1G
D3 ESD8351XV2T1G
R17 12k
5*(24/36)=3.33V
5V Tolerant
VB_DET
R35 12k
R38 12k
C2 0.1u
Rbias
R3 12k
R13 12k
R14 12k
R4 12.4k
AMDIX_EN
EXRES
U2B
LAN9514
USB0DP
USB0DN
USBDP0
USBDM0
VBUS_DET
USBRBIAS
AUTOMDIX_EN
EXRES
USBDP2
USBDM2
PRTCTL2
USBDP3
USBDM3
PRTCTL3
USBDP4
USBDM4
PRTCTL4
USBDP5
USBDM5
PRTCTL5
Current-Mode
Line Drivers
TXP
TXN
RXP
RXN
USB-HUB
A1_DP
A1_DN
ENA1
B1_DP
B1_DN
ENB1
A2_DP
A2_DN
ENA2
B2_DP
B2_DN
ENB2
ETH-HUB
TXP
TXN
RXP
RXN
H1 Mount
H2 Mount
H3 Mount
H4 Mount

HW Dev
Vext
+3V3
R15 1k
R16 1k
Sign Of Life Leds
R15 Value Needs Tweak
D23 LED
D24 LED
VBUS+3V3
TP1 TP2 TP3 TP6
J7
Hdr_01x06
J6
Hdr_01x06
RESET
TRST
TMS
TDI
TDO
TCK
GPIO3
GPIO4
GPIO5
GPIO6
GPIO7
R11 12k
R12 12k
TP5

+3.3VA
C7 0.1u
C11 0.1u
C13 0.1u
C16 0.1u
C19 0.1u
C22 0.1u

Place Decoupling Near
Each VDD Pin
U2A
LAN9514
+3V3
+3.3VA
VDD33A
VDD33IO
VDD18CORE
VDD18ETHPLL
VDD18USBPLL
VDD18
C9 0.1u
C15 4.7u
C18 0.1u
C21 0.1u
L3
GZ1608D601TF
120Ω @100MHz
C10 1u
R7 12k
RESET
TRST
TMS
TDI
TDO
TCK
EECLK
EECS
EEDO
EEDI
DOtoDI
DItoDO
CLK24_EN
CLK24_OUT
TEST1
TEST2
TEST3
TEST4
GPIO7
GPIO6
GPIO5
GPIO4
GPIO3
SPD_LED/GPIO2
LNKA_LED/GPIO1
FDX_LED/GPIO0
XO
XI
GND
U3
AT93C56B-SSHM
SCLK
DI
DO
CS
ORG
VCC
GND
TP13
TP14
TP15
TP16
R74 12k
R110 12k
R8 1k D4 LED
R9 1k D5 LED
R10 1k D6 LED
R5 0
R6 1M
XO_b
XO_a
Xi
25MHz Y1
FL2500316Z
C5 22p
C6 22p
C5=C6=2*(CL-Cstray-Cpin)
C5=2*(20-3-5)=24pF -22pF
C8 0.1u
C12 0.1u
C14 0.1u
C17 0.1u
C20 0.1u
C23 0.1u

Diff Pairs
PCB Thickness : 1.2mm // JLC Stackup : JLC04121H-7628
W = 0.2mm, S = 0.1mm, Zdiff = 101.27Ω (ETH)
W = 0.25mm, S = 0.1mm, Zdiff = 93.68Ω (USB)

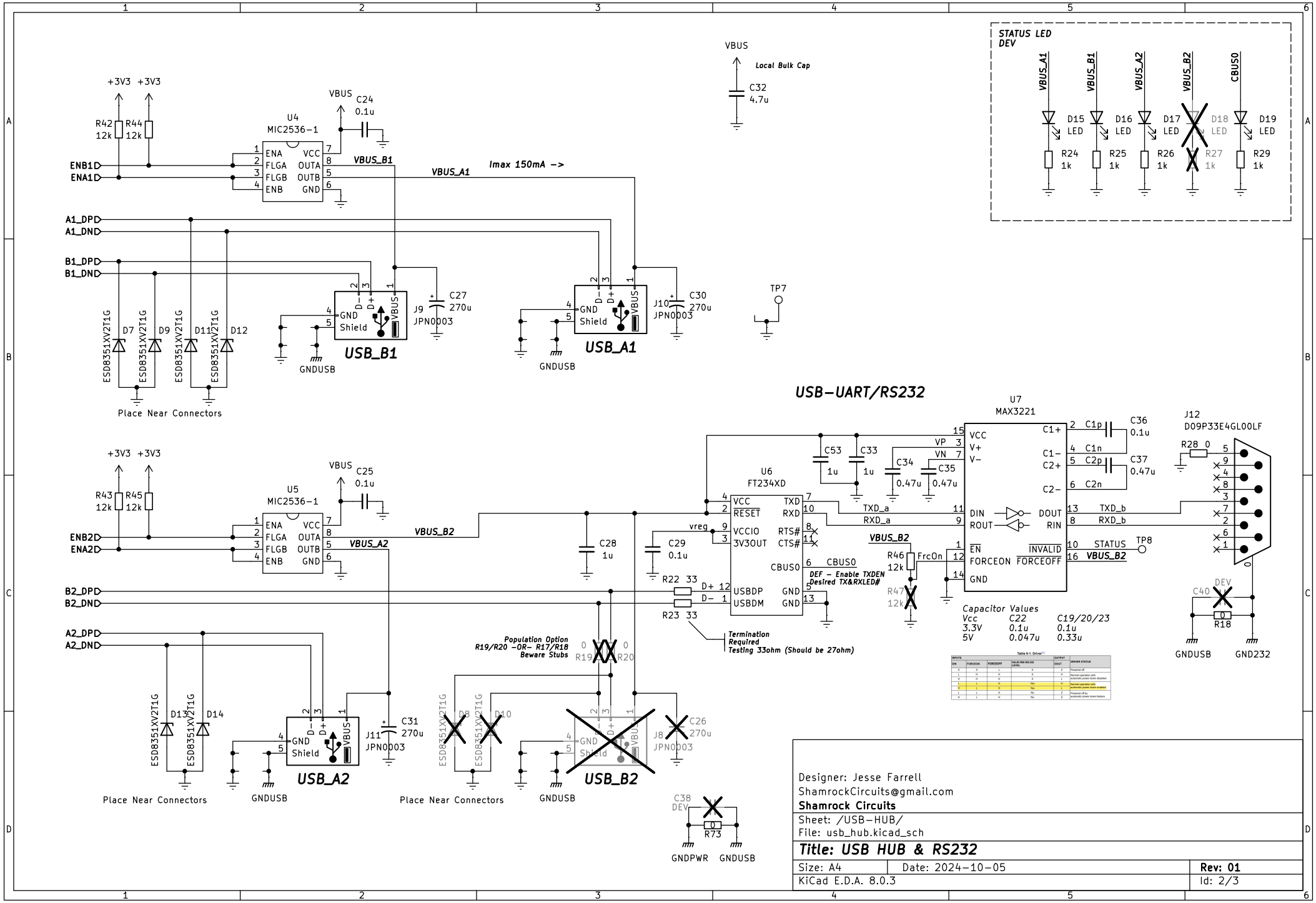


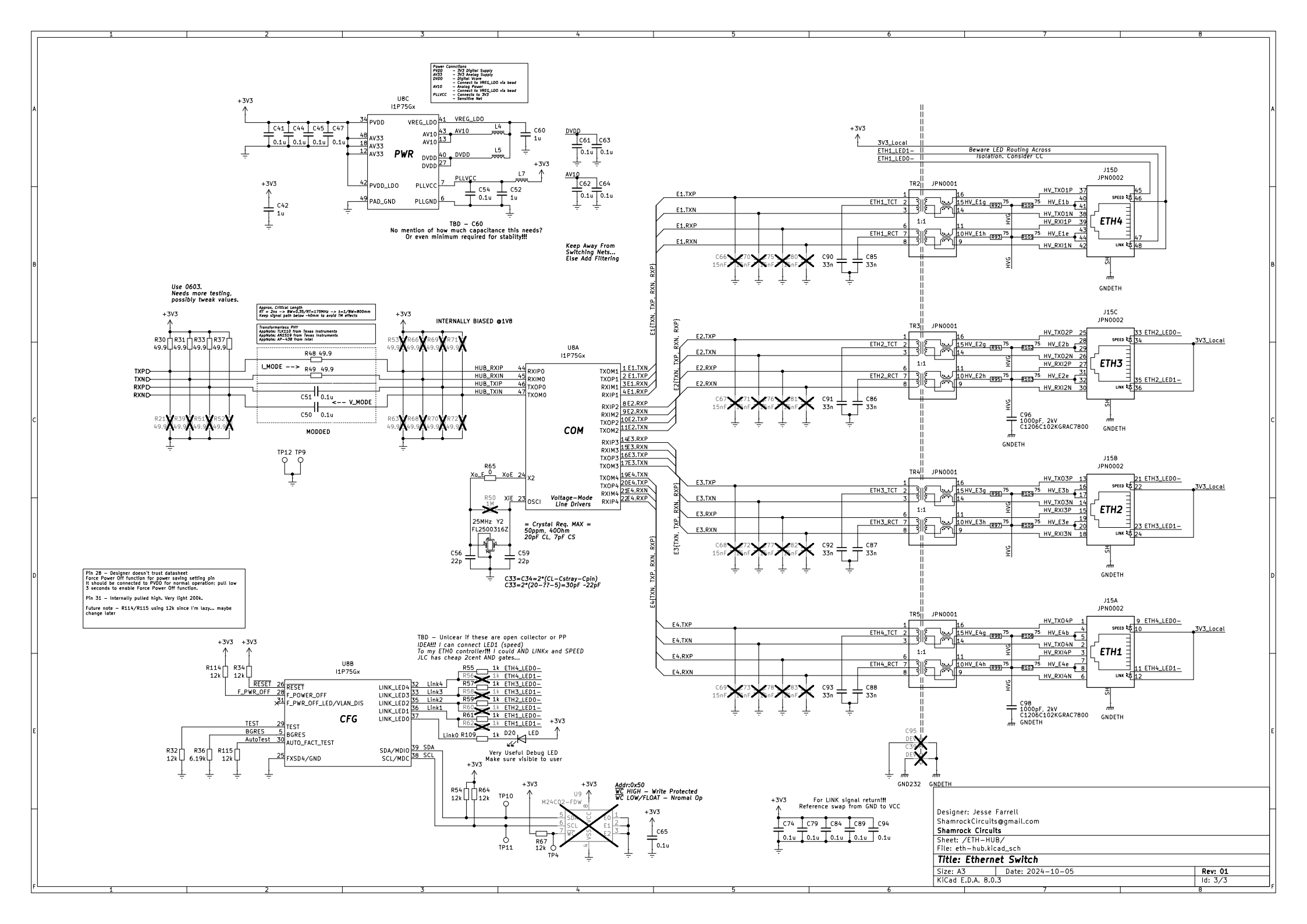
Designer: Jesse Farrell
ShamrockCircuits@gmail.com
Shamrock Circuits

Sheet: /
File: UsbEthHub_rev1.1.kicad_sch

Title: USB To Ethernet Adapter

Size: A4	Date: 2024-10-05	**Rev: 01**
KiCad E.D.A. 8.0.3		Id: 1/3


STATUS LED
DEV
VBUS_A1
VBUS_B1
VBUS_A2
VBUS_B2
CBUS0
D15 LED
D16 LED
D17 LED
D18 LED
D19 LED
R24 1k
R25 1k
R26 1k
R27 1k
R29 1k
VBUS
Local Bulk Cap
C32 4.7u
+3V3 +3V3
R42 12k
R44 12k
U4
MIC2536-1
C24 0.1u
ENB1
ENA1
VBUS_B1
VBUS_A1
Imax 150mA ->
A1_DPD
A1_DND
B1_DPD
B1_DND
ESD8351XV2T1G
D7
D9
D11
D12
Place Near Connectors
USB_B1
J9 JPN0003
C27 270u
GNDUSB
USB_A1
J10 JPN0003
C30 270u
TP7
USB-UART/RS232
U7
MAX3221
J12
D09P33E4GL00LF
R28 0
C36 0.1u
C37 0.47u
C1p
C1n
C2p
C2n
TXD_b
RXD_b
TP8
STATUS
VBUS_B2
U6
FT234XD
C53 1u
C33 1u
C34 0.47u
C35 0.47u
TXD_a
RXD_a
R46 12k
FrcOn
R47 12k
DEF – Enable TXDEN
Desired TX&RXLED#
R22 33
R23 33
Termination
Required
Testing 33ohm (Should be 27ohm)
Capacitor Values
Vcc C22 C19/20/23
3.3V 0.1u 0.1u
5V 0.047u 0.33u
C40 DEV
R18
GND232
+3V3 +3V3
R43 12k
R45 12k
U5
MIC2536-1
C25 0.1u
ENB2
ENA2
VBUS_B2
VBUS_A2
C28 1u
C29 0.1u
B2_DPD
B2_DND
A2_DPD
A2_DND
Population Option
R19/R20 –OR– R17/R18
Beware Stubs
R19
R20
D13
D14
USB_A2
J11 JPN0003
C31 270u
Place Near Connectors
D8
D10
USB_B2
J8 JPN0003
C26 270u
C38 DEV
R73
GNDPWR
GNDUSB
Designer: Jesse Farrell
ShamrockCircuits@gmail.com
Shamrock Circuits
Sheet: /USB-HUB/
File: usb_hub.kicad_sch
Title: USB HUB & RS232
Size: A4
Date: 2024-10-05
Rev: 01
KiCad E.D.A. 8.0.3
Id: 2/3


Power Connections
PVDD – 3V3 Digital Supply
AV33 – 3V3 Analog Supply
DVDD – Digital Vcore
– Connect to VREG_LDO via bead
AV10 – Analog Power
– Connect to VREG_LDO via bead
PLLVCC – Connects to 3V3
– Sensitive Net
U8C
I1P75Gx
PWR
PVDD
VREG_LDO
AV10
AV33
DVDD
PVDD_LDO
PLLVCC
PAD_GND
PLLGND
+3V3
C41 C44 C45 C47
0.1u 0.1u 0.1u 0.1u
C42 1u
C60 1u
L4 L5 L7
C54 0.1u
C52 1u
DVDD
C61 C63
0.1u 0.1u
AV10
C62 C64
0.1u 0.1u
TBD – C60
No mention of how much capacitance this needs?
Or even minimum required for stability!!!
Keep Away From
Switching Nets...
Else Add Filtering
Use 0603.
Needs more testing,
possibly tweak values.
Approx. Critical Length
RT = 2ns -> BW=0.35/RT=175MHz -> λ=1/BW=800mm
Keep signal path below ~40mm to avoid TM effects
Transformerless PHY
AppNote: TLK110 from Texas Instruments
AppNote: ANI519 from Texas Instruments
AppNote: AP-438 from Intel
R30 R31 R33 R37
49.9 49.9 49.9 49.9
TXP
TXN
RXP
RXN
R48 49.9
I_MODE -->
R49 49.9
C51 0.1u
<-- V_MODE
C50 0.1u
R21 R39 R51 R52
49.9 49.9 49.9 49.9
MODDED
INTERNALLY BIASED @1V8
R53 R66 R69 R71
49.9 49.9 49.9 49.9
R63 R68 R70 R72
49.9 49.9 49.9 49.9
HUB_RXIP
HUB_RXIN
HUB_TXIP
HUB_TXIN
U8A
I1P75Gx
COM
RXIP0
RXIM0
TXOP0
TXOM0
RXIP1
RXIM1
TXOP1
TXOM1
RXIP2
RXIM2
TXOP2
TXOM2
RXIP3
RXIM3
TXOP3
TXOM3
RXIP4
RXIM4
TXOP4
TXOM4
Voltage-Mode
Line Drivers
TP12 TP9
R65 0
Xo_E
XoE
X2
R50 1M
XIE
OSCI
25MHz Y2
FL2500316Z
= Crystal Req. MAX =
50ppm, 40Ohm
20pF CL, 7pF CS
C56 22p
C59 22p
C33=C34=2*(CL-Cstray-Cpin)
C33=2*(20-??-5)=30pF -22pF
Pin 28 – Designer doesn't trust datasheet
Force Power Off function for power saving setting pin
It should be connected to PVDD for normal operation; pull low
3 seconds to enable Force Power Off function.
Pin 31 – Internally pulled high. Very light 200k.
Future note – R114/R115 using 12k since I'm lazy... maybe
change later
TBD – Unlcear if these are open collector or PP
IDEA!!! I can connect LED1 (speed)
To my ETH0 controller!!! I could AND LINKx and SPEED
JLC has cheap 2cent AND gates...
U8B
I1P75Gx
CFG
R114 12k
R34 12k
RESET
F_PWR_OFF
F_POWER_OFF
F_PWR_OFF_LED/VLAN_DIS
TEST
BGRES
AUTO_FACT_TEST
FXSD4/GND
R32 12k
R36 6.19k
R115 12k
LINK_LED4
LINK_LED3
LINK_LED2
LINK_LED1
LINK_LED0
SDA/MDIO
SCL/MDC
R55 1k ETH4_LED0-
R56 1k ETH4_LED1-
R57 1k ETH3_LED0-
R58 1k ETH3_LED1-
R59 1k ETH2_LED0-
R60 1k ETH2_LED1-
R61 1k ETH1_LED0-
R62 1k ETH1_LED1-
Link0 R109 1k D20 LED
Very Useful Debug LED
Make sure visible to user
R54 12k
R64 12k
TP10
TP11
R67 12k
TP4
U9
M24C02-FDW
Addr:0x50
WC HIGH – Write Protected
WC LOW/FLOAT – Nromal Op
C65 0.1u
3V3_Local
ETH1_LED1-
ETH1_LED0-
Beware LED Routing Across
Isolation. Consider CC
J15D
JPN0002
ETH4
J15C
ETH3
J15B
ETH2
J15A
ETH1
TR2 TR3 TR4 TR5
JPN0001
1:1
E1.TXP
E1.TXN
E1.RXP
E1.RXN
E2.TXP
E2.TXN
E2.RXP
E2.RXN
E3.TXP
E3.TXN
E3.RXP
E3.RXN
E4.TXP
E4.TXN
E4.RXP
E4.RXN
ETH1_TCT
ETH1_RCT
ETH2_TCT
ETH2_RCT
ETH3_TCT
ETH3_RCT
ETH4_TCT
ETH4_RCT
HV_E1g
HV_E1h
HV_E1b
HV_E1e
HV_E2g
HV_E2h
HV_E2b
HV_E2e
HV_E3g
HV_E3h
HV_E3b
HV_E3e
HV_E4g
HV_E4h
HV_E4b
HV_E4e
HV_TXO1P
HV_TXO1N
HV_RXI1P
HV_RXI1N
HV_TXO2P
HV_TXO2N
HV_RXI2P
HV_RXI2N
HV_TXO3P
HV_TXO3N
HV_RXI3P
HV_RXI3N
HV_TXO4P
HV_TXO4N
HV_RXI4P
HV_RXI4N
HVG
SPEED
LINK
SH
GNDETH
C96 1000pF, 2kV
C1206C102KGRAC7800
C98 1000pF, 2kV
C1206C102KGRAC7800
C95 DEL
C30 DEL
DEL
GND232
For LINK signal return!!!
Reference swap from GND to VCC
C74 C79 C84 C89 C94
0.1u 0.1u 0.1u 0.1u 0.1u
Designer: Jesse Farrell
ShamrockCircuits@gmail.com
Shamrock Circuits
Sheet: /ETH-HUB/
File: eth-hub.kicad_sch
Title: Ethernet Switch
Size: A3
Date: 2024-10-05
Rev: 01
KiCad E.D.A. 8.0.3
Id: 3/3