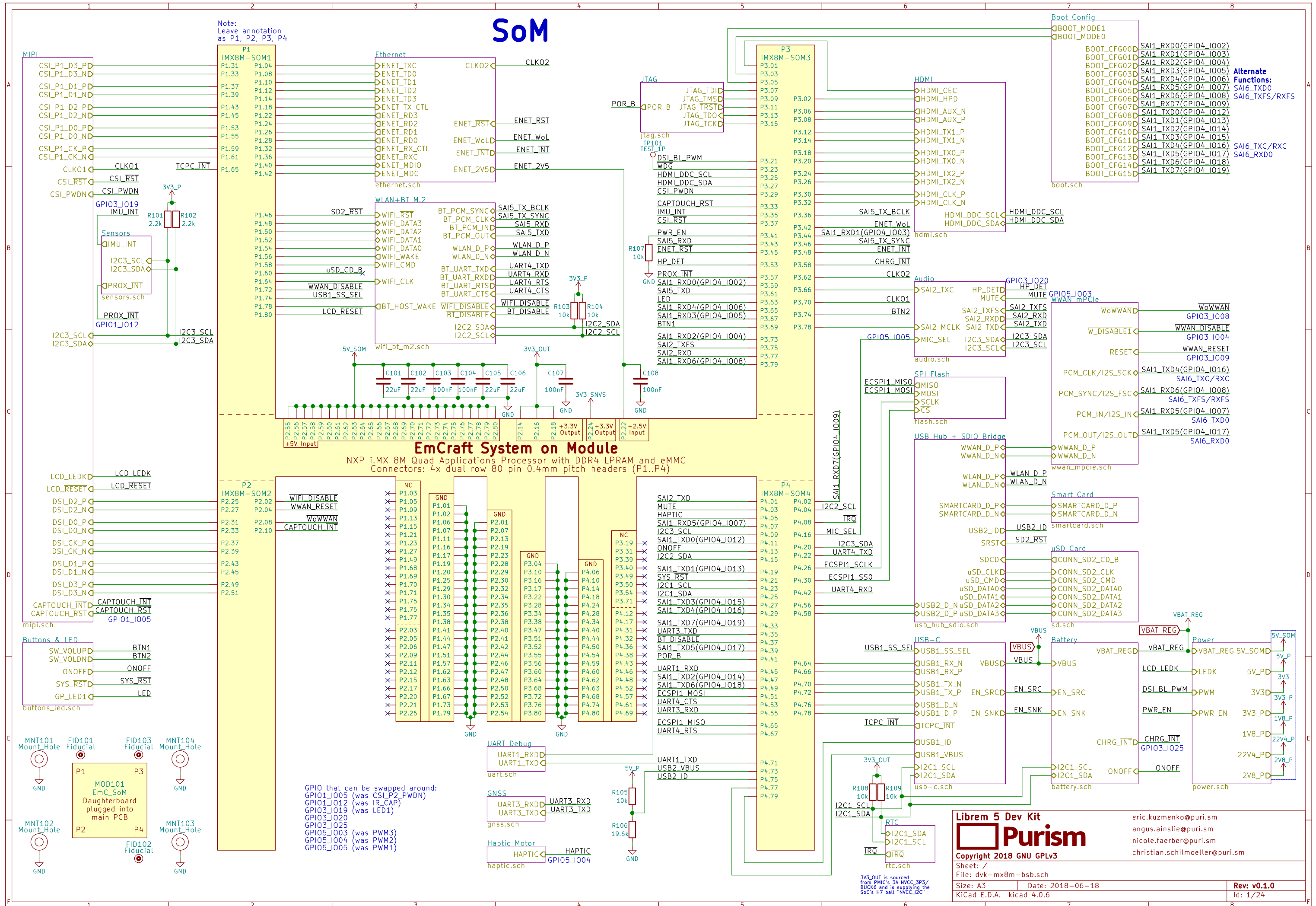


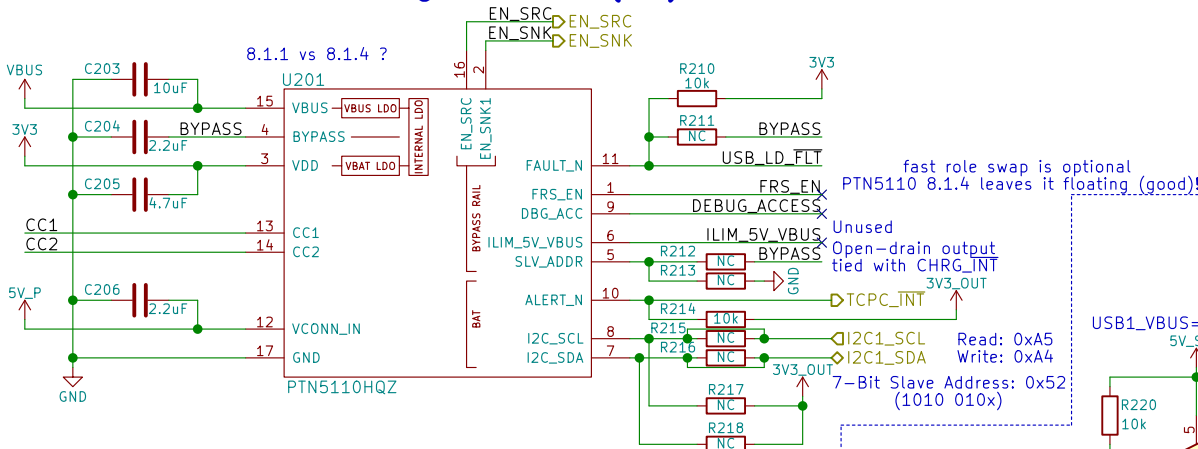
SoM

Note:
Leave annotation
as P1, P2, P3, P4



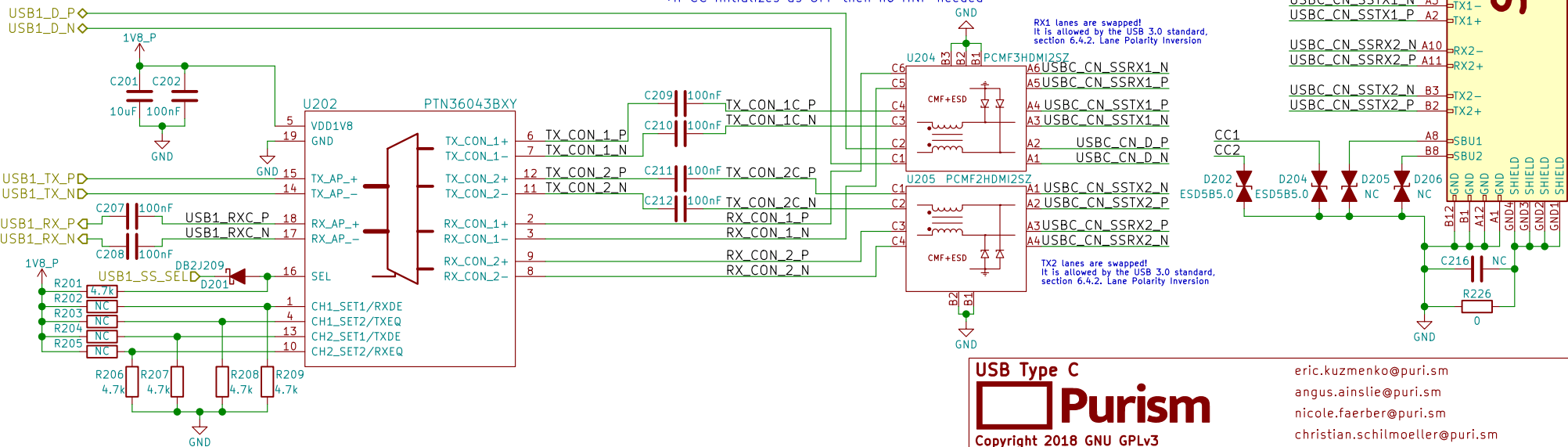
USB-C TCPC – Config Channel (CC) and PD Role Controller

USB-C



"Under dead battery operation, PTN5110 applies voltage clamps to both CC pins so that the system may receive power as a Sink. To support platforms with buck-boost configuration, PTN5110 asserts EN_SNK1 pin based on validity of VBUS voltage (facilitates 5 V VBUS sinking)."

Initialize as the UFP (device)
read CC_STATUS to determine role
use Host Negotiation Protocol (HNP)
to become an DFP (host)
∴ USB ID is effectively unused
⇒ Legacy devices would "wait" for this
⇒ If CC initializes as UFP then no HNP needed



USB Type C

Purism

Copyright 2018 GNU GPLv3

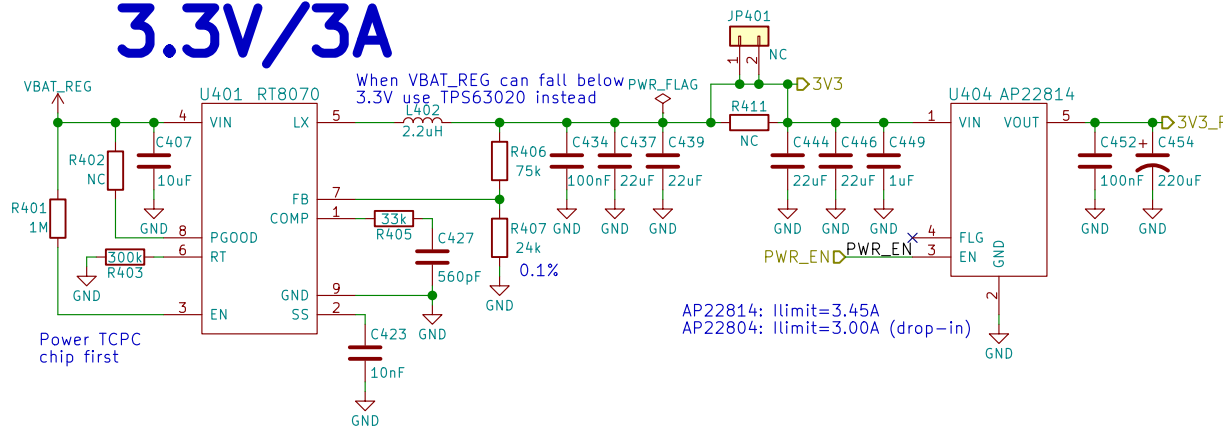
Sheet: /USB-C/
File: usb-c.sch

Size: A4
KiCad E.D.A. kicad 4.0.6

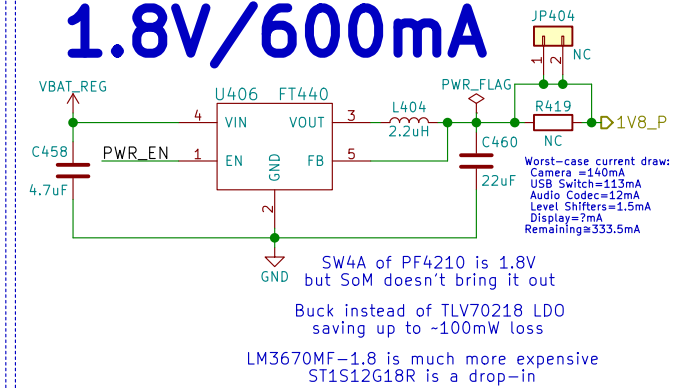
eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
nicole.faeber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 2/24

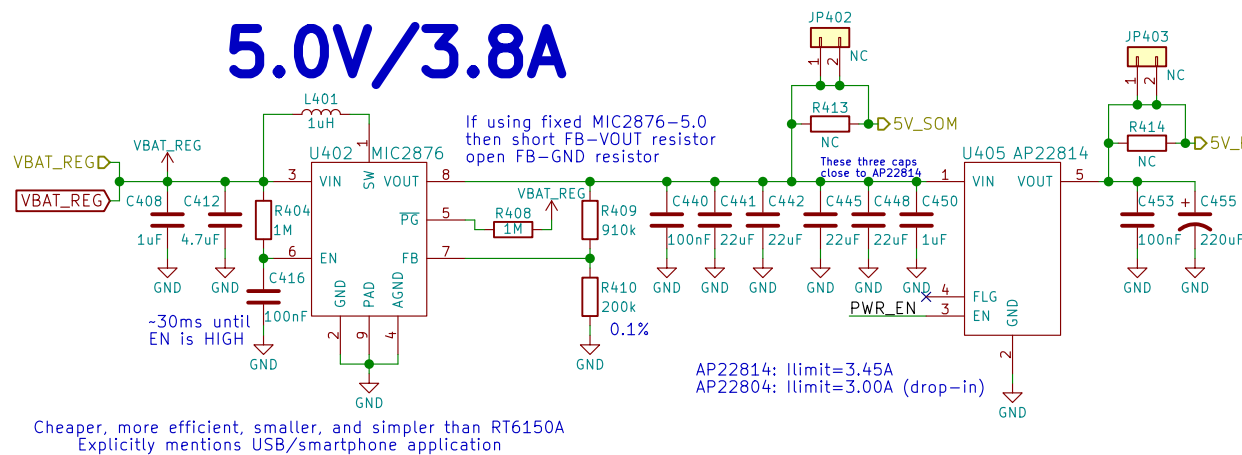
3.3V/3A



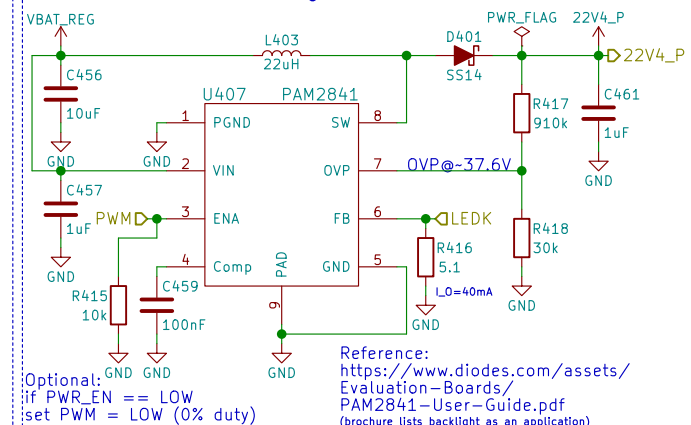
1.8V/600mA



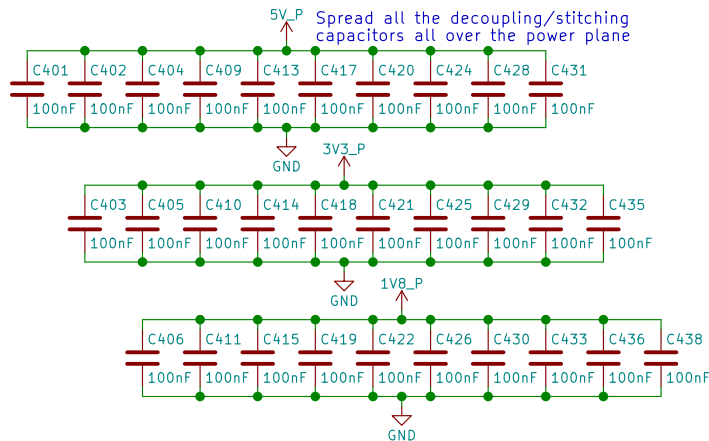
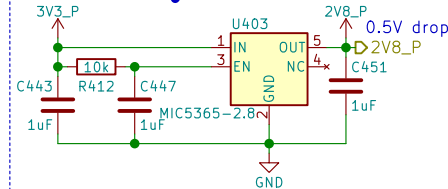
5.0V/3.8A



22.4V/40mA



2.8V/150mA



Power

Power

Purism

Copyright 2018 GNU GPLv3

Sheet: /Power/
File: power.sch

Size: A4
KiCad E.D.A. kicad 4.0.6

Date: 2018-06-18

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

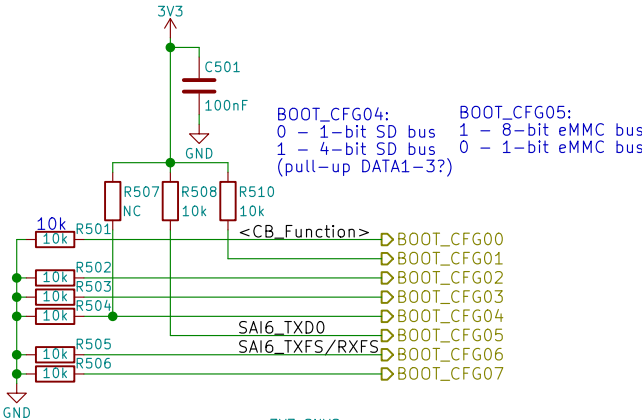
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

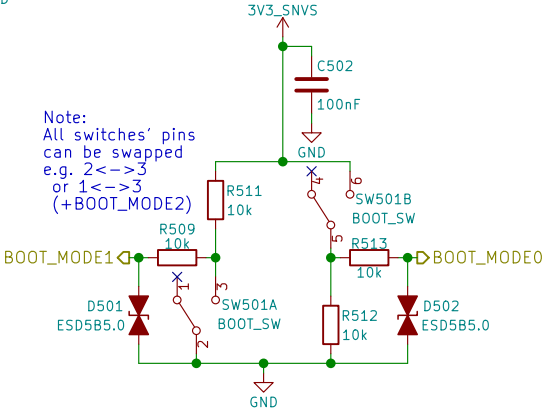
Rev: v0.1.0

Id: 4/24

Boot Config

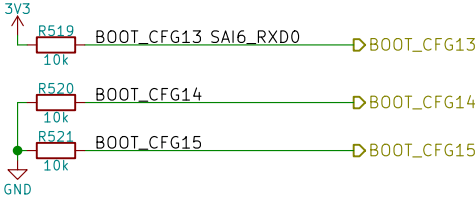
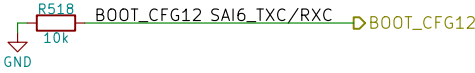
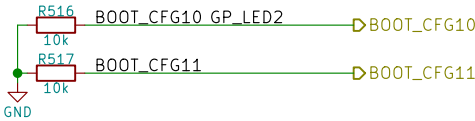
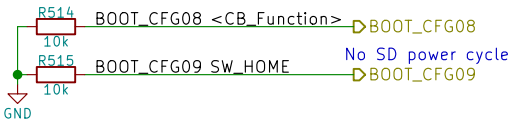


Note:
All switches' pins
can be swapped
e.g. 2<->3
or 1<->3
(+BOOT_MODE2)



2->1: eMMC 2->3: USB (Serial Downloader)	
BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

Only eMMC					
BOOT_CFG[14:12]			Boot device		
001			SD/eSD		
010			MMC/eMMC		
011			NAND		
Fuse	Config	Definition	GPIO ¹	Shipped value	Settings
BOOT_CFG[11:10]	OEM	USDHC port selection	Yes	00	00 - USDHC-1 01 - USDHC-2 10 - USDHC-3 else - reserved



Boot Configuration
 Purism

Copyright 2018 GNU GPLv3

Sheet: /Boot Config/
File: boot.sch

Size: A4
KiCad E.D.A. kicad 4.0.6

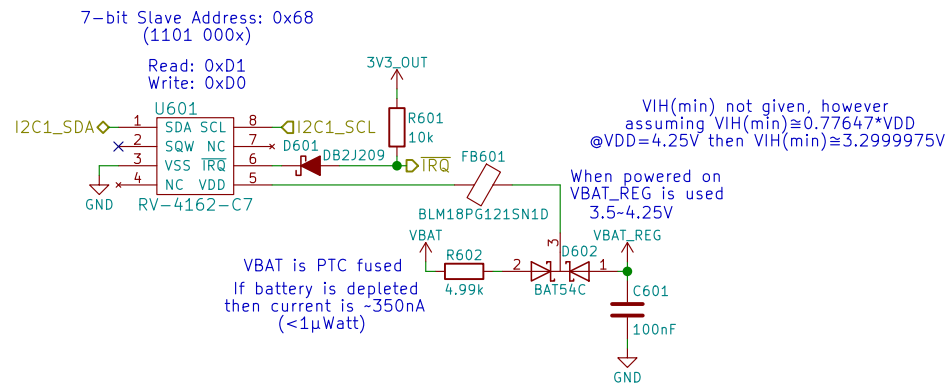
Date: 2018-06-18

Rev: v0.1.0

Id: 5/24

eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

Real-Time Clock



Note:

Datasheet says slave address is 0xD0
with a R/W bit appended, since 0xD must
be 4-bits wide the actual 7-bit address is
0x68 (110 1000), and becomes 0xD0 during a
write operation (1101 0000)

Reference:

https://github.com/HIO-Project/linux-imx6-nano-imx_3.10.17_1.0.1_ga/blob/8848e94b2f889fe44f6736e2d4c98851a2282275/arch/arm/boot/dts/imx6qdl-mtp.dtsi#L351

RTC



Copyright 2018 GNU GPLv3

Sheet: /RTC/

File: rtc.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

Id: 6/24

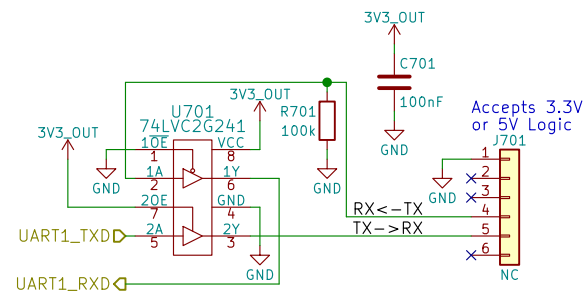
eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

UART Debug



UART Debug



Copyright 2018 GNU GPLv3

Sheet: /UART Debug/

File: uart.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

Id: 7/24

eric.kuzmenko@puri.sm

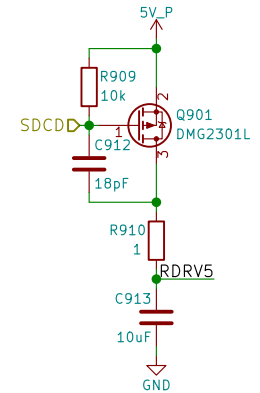
angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Purism

Rev: v0.1.0
Id: 8/24

[illegible]

Can be swapped around depending on layout

 $C_{stray} \cong 3 \text{ pF}$

Purism

Sheet: /USB Hub + SDIO Bridge/
File: usb_hub_sdio.sch

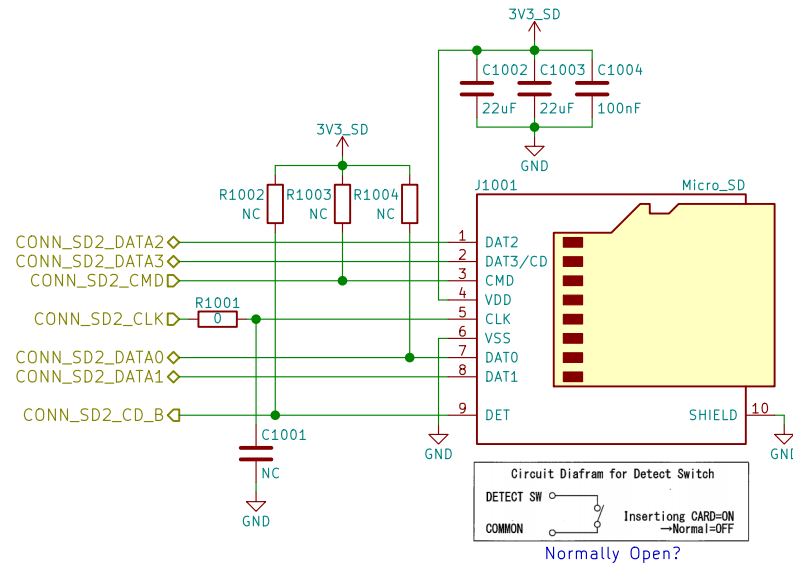
KiCad E.D.A.	kiCad 4.0.6
--------------	-------------

christian.schiller@univie.ac.at

christian.schilmoeller@puri.sm

Id: 9/24

μSD



uSD Card



Purism

Copyright 2018 GNU GPLv3

Sheet: /uSD Card/

File: sd.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

Id: 10/24

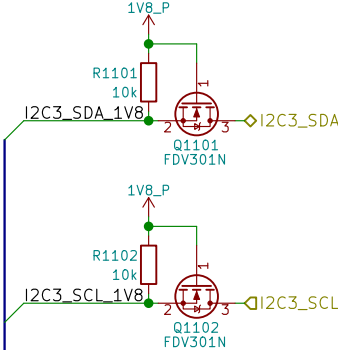
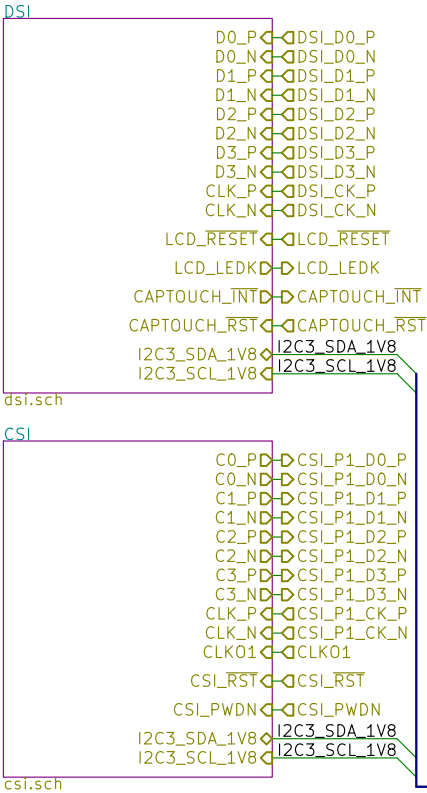
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

MIPI



MIPI



Copyright 2018 GNU GPLv3

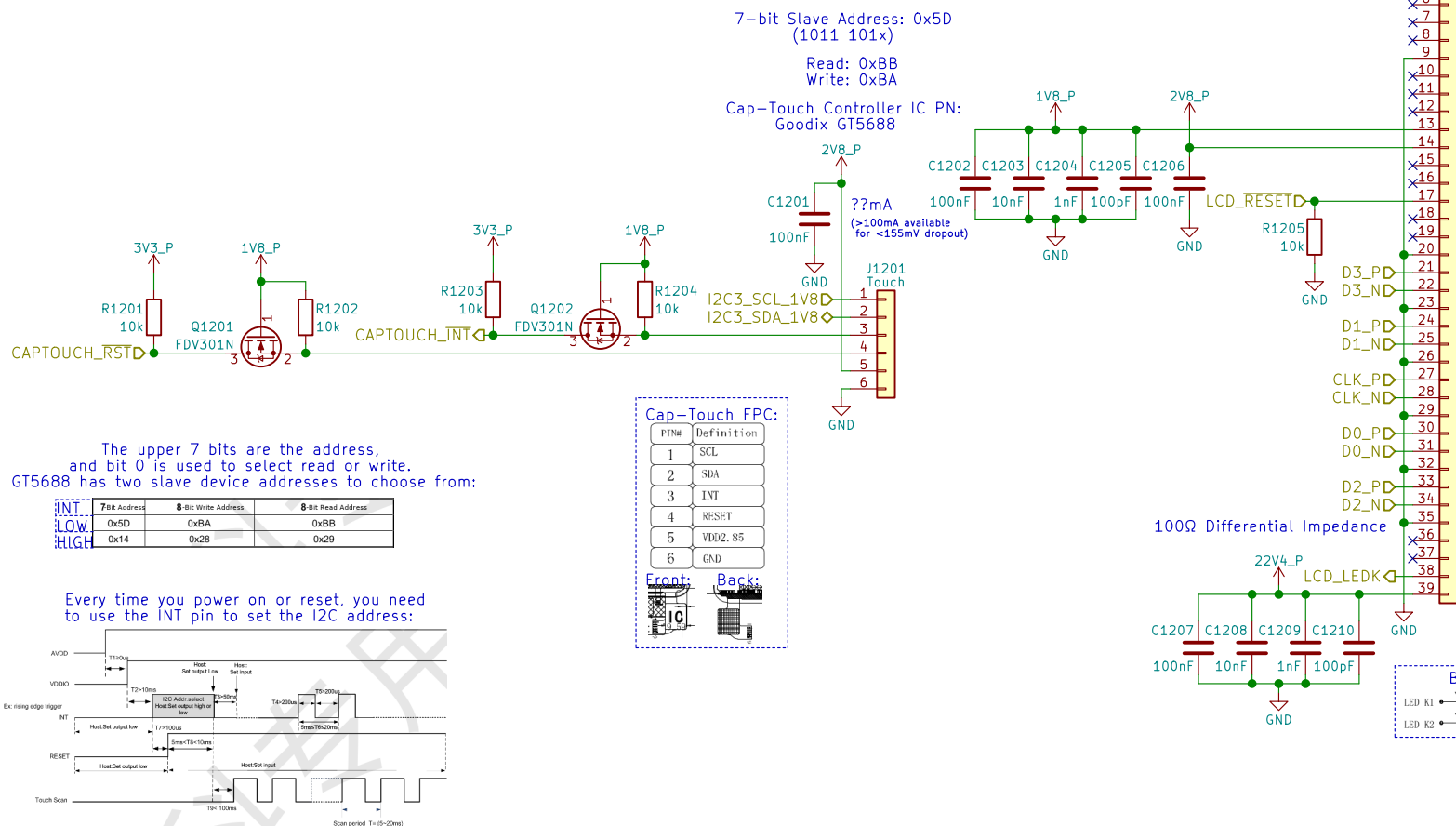
Sheet: /MIPI/
File: mipi.sch

Size: A4	Date: 2018-06-18	Rev: v0.1.0
KiCad E.D.A. kicad 4.0.6		Id: 11/24

eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

Display & Touch Controller

LCD PN:
Shenzhen Jinghong Electronics Co., Ltd.
JH057N00900



Display_JH057N00900

DISP1201

5.7 "
RGB
720 x 1440
pixels

FPC6
Touch

FPC39
Display +
Backlight

DSI FPC:
Front: Back:

Backlight Array:

LED K1 LEDA1
LED K2 LEDA2

MIPI DSI

Purism

Copyright 2018 GNU GPLv3

Sheet: /MIPI/DSI/
File: dsi.sch

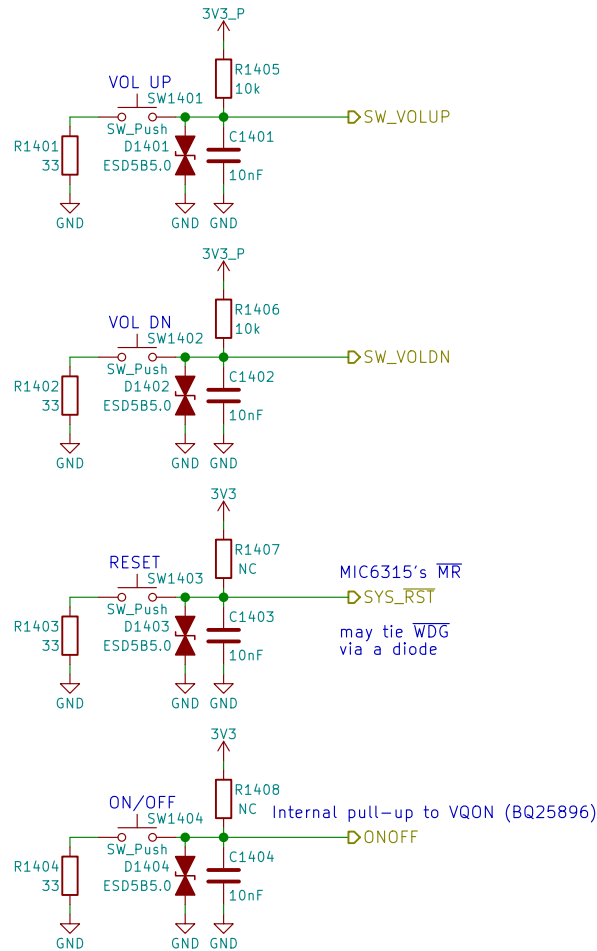
Size: A4 Date: 2018-06-18
KiCad E.D.A. kicad 4.0.6

eric.kuzmenko@puri.sm
angus.ainstie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

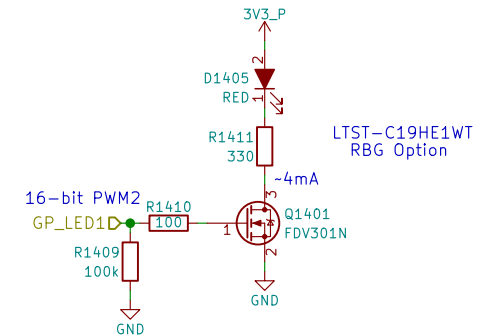
Rev: v0.1.0
Id: 12/24

Id: 13/24

Buttons & LED



Use PWM2_PWMSAR to set the compare value (duty cycle)
Use PWM2_PWMCR[15:4] to set the PRESCALER (frequency)
Use PWM2_PWMPR to set the top of the counter (frequency)



Buttons & LED



Copyright 2018 GNU GPLv3

Sheet: /Buttons & LED/
File: buttons_led.sch

Size: A4 Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

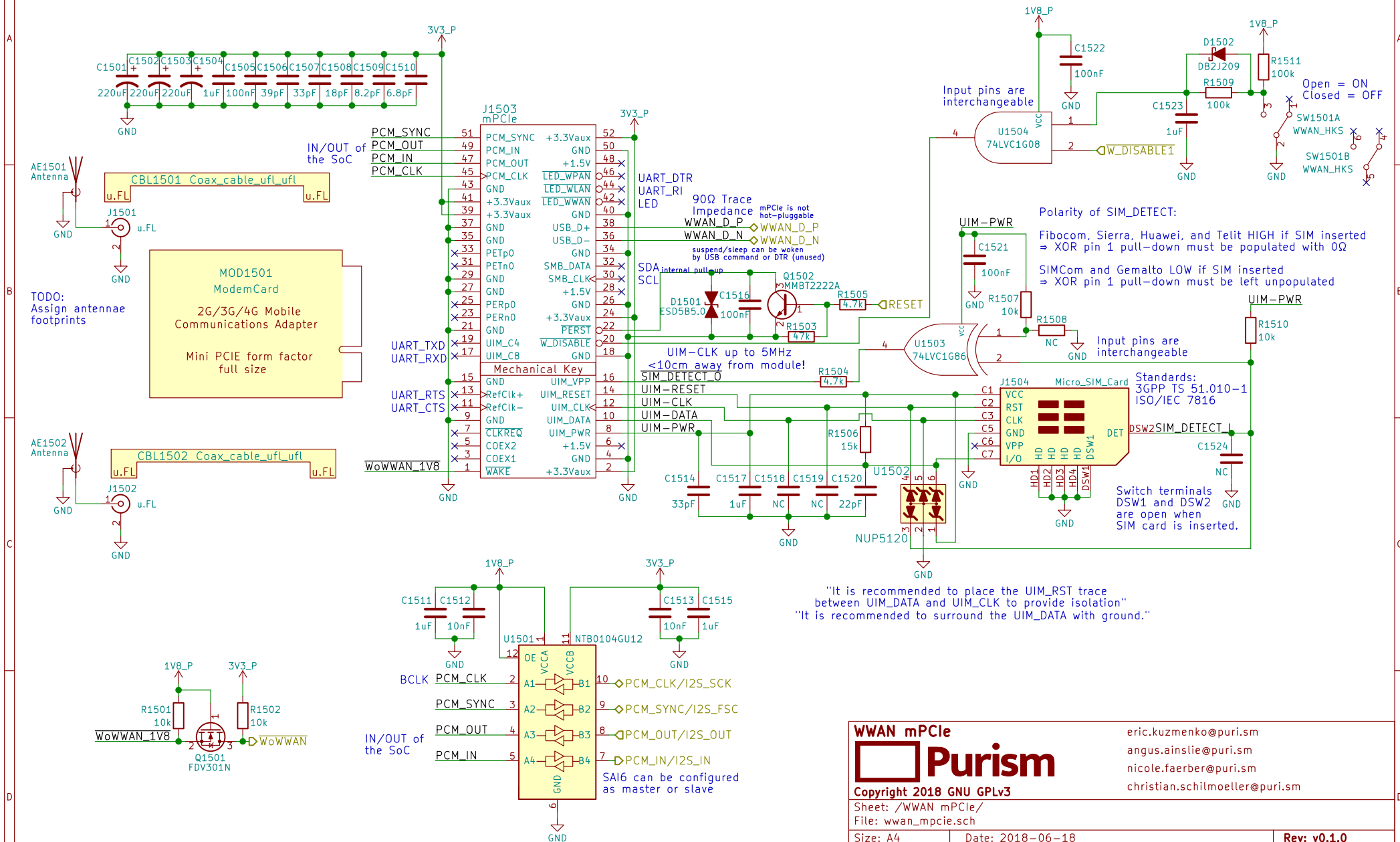
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 14/24

WWAN mPCle



WWAN mPCIe



Purism

Copyright 2018 GNU GPLv3

Sheet: /WWAN mPCIe/
File: wwan_mpcie.sch

Size: A4	Date: 2018-06-18
----------	------------------

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 15/24

Audio

Reference:
http://www.52rd.com/S_txt/2011_3/TXT26685.htm
<http://www.sengpielaudio.com/calculator-transferfactor.htm>
<https://electronics.stackexchange.com/questions/31442/how-can-i-switch-this-audio-jack-using-its-own-mechanical-switches-without-cre>
 (Nit6 does the same)
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

"HP Output - 62.5mW max, 1.02kHz sine into 16Ω load at 3.3 V"
 $\Rightarrow (1V)^2 / (16\Omega) = 62.5mW$
 $\therefore V_{rms} = 1V \Rightarrow V_p(\text{amplitude}) = 1.414V$
 $\therefore I_{rms}(\text{max}) = 62.5mA$

If HP_DET is HIGH for >100ms then HPs are present

S/E button on earbud headsets shorts the mic for key function

Could use FSA8008 to detect mic



Pin 5 (tip switch) is NC, open when inserted
 If just headphones then HP_DET=HIGH, R(mic)=0
 may add ~220uF cap parallel to Zener

Ext-Mic enabled MIC_SEL=HIGH
 Int-Mic enabled MIC_SEL=LOW
 Add TVS next to int-mic? (OpenMoko does this)
 $-37dB = 14.1254mV/Pa$
 $\therefore \text{mic produces } 14.1254mV_{rms} \text{ when exposed to a } 1kHz \text{ tone of } 94dB-SPL \text{ at the capsule (or } 19.98mV \text{ amplitude)}$
 $\Rightarrow 40dB \text{ gain would produce } -2V \text{ amplitude (4Vpp, clipping)}$
 $30dB \text{ gain would produce } -0.632V \text{ amplitude (1.264Vpp)}$
 $38.33dB \text{ gain would yield } 3.3V_{pp}$

SW Mute Mic: MUTE_ADC=1

Note:
 All switches' pins can be swapped
 e.g. 5<->4 or 5<->6 (+camera)

DPDT with camera

5->4 = ON
 5->6 = OFF

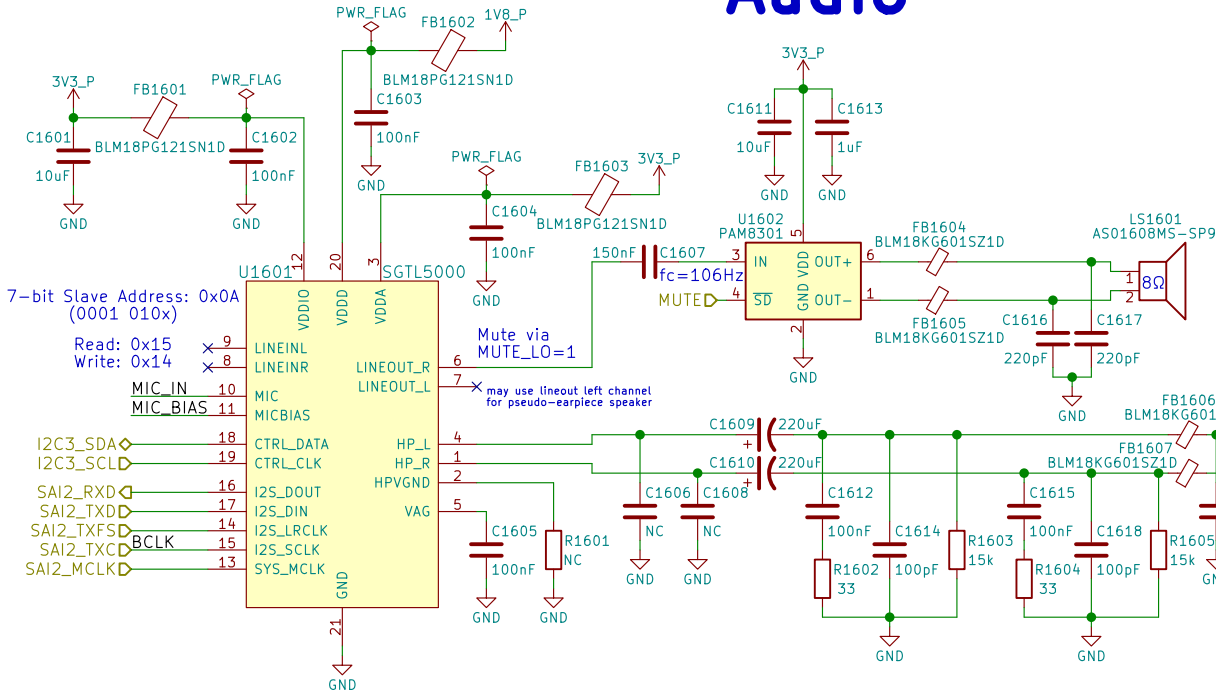
DPDT with camera

5->4 = ON
 5->6 = OFF

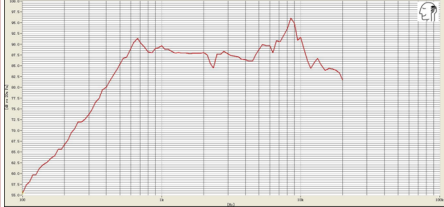
DPDT with camera

5->4 = ON
 5->6 = OFF

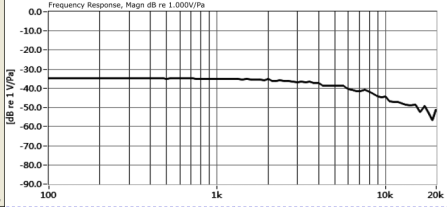
DPDT with camera



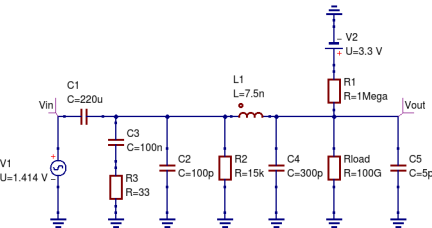
Built-In Speaker's Frequency Response:



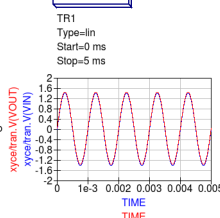
Built-In Mic's Frequency Response:



Simulation of HP_DET @ 1kHz output without HP jack inserted:



transient simulation



LCR Measurements:

Earbud Microphone:
 @1kHz
 $L_s = 3.844mH$
 $L_p = 15.757H$
 $C_s = 6.583uF$
 $C_p = 1612.8pF$
 $R_s = 1.5465kOhms$
 $R_p = 1.5478kOhms$
 $\theta = -0.8deg$

Headset Speaker:
 @1kHz
 $L_s = 244.4uH$
 $L_p = 141.99mH$
 $C_s = 103.6uF$
 $C_p = 178.77nF$
 $R_s = 36.860hms$
 $R_p = 36.860hms$
 $\theta = -2.3deg$

Earbud Speaker:
 @1kHz
 $L_s = 25.2uH$
 $L_p = 311.0mH$
 $C_s = 1.0mF$
 $C_p = 81.95nF$
 $R_s = 17.0300hms$
 $R_p = 17.0340hms$
 $\theta = 0.5deg$

Audio

Purism

Copyright 2018 GNU GPLv3

Sheet: /Audio/
 File: audio.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

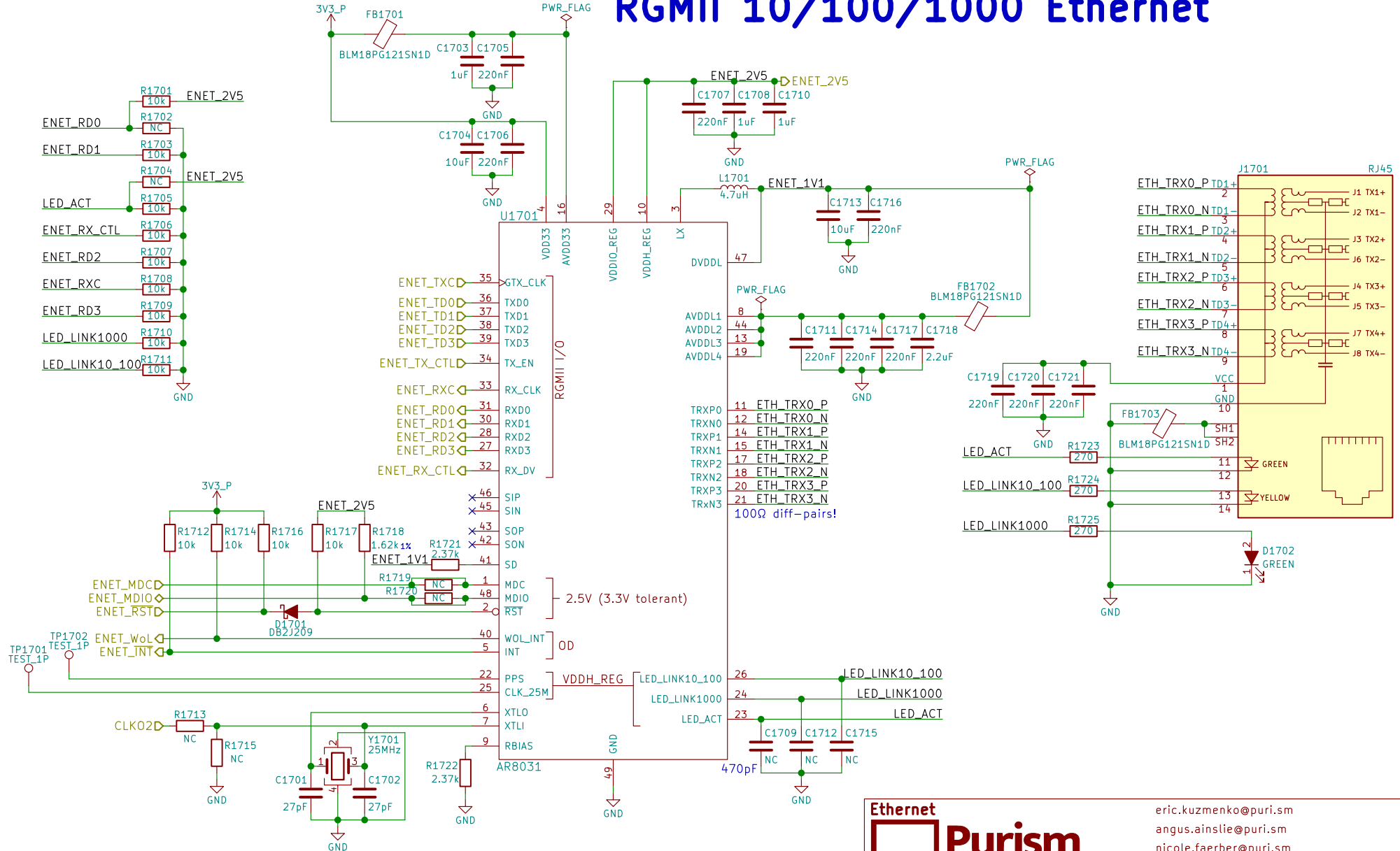
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 16/24

RGMII 10/100/1000 Ethernet



Ethernet

Purism

Copyright 2018 GNU GPLv3

Sheet: /Ethernet/
File: ethernet.sch

Size: A4 Date: 2018-06-18
KiCad E.D.A. kicad 4.0.6

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 17/24

WLAN+BT M.2

RS9116 NC:
RTS, CTS, BT_HOST_WAKE

RS9116 datasheet says
no WIFI_WAKE
but the schematic has it

RedPine RS9116 MB0
Requires 5V on
Pin 54 if USB used

Socket: Table 46
Module: Table 23

M.2 Key E

3V3_P

NC

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

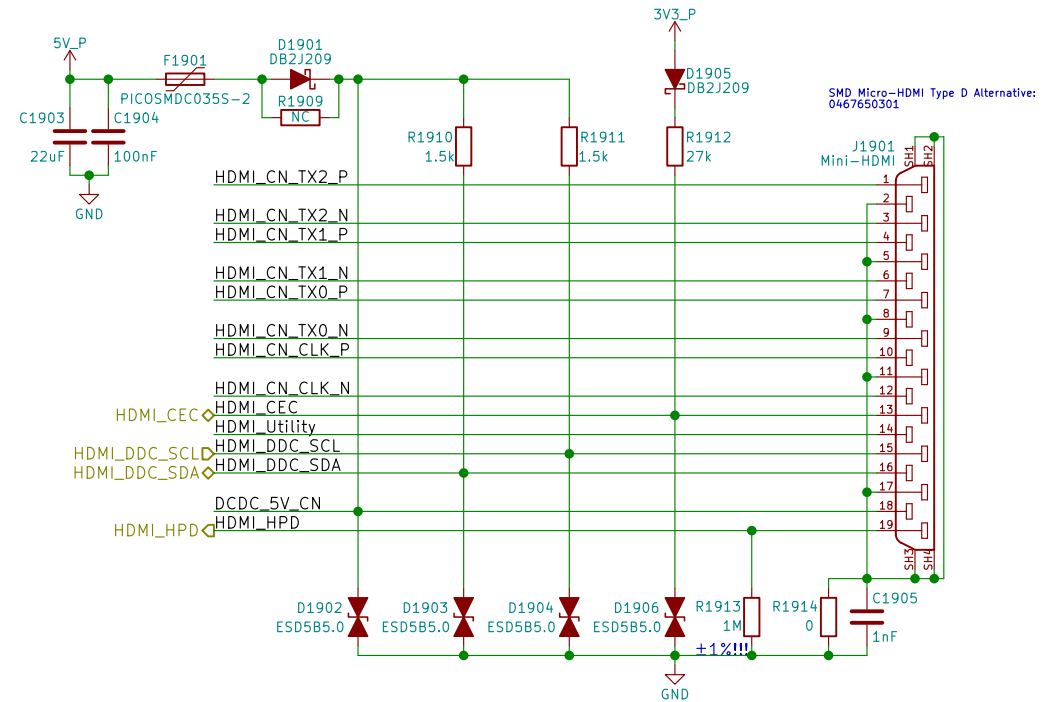
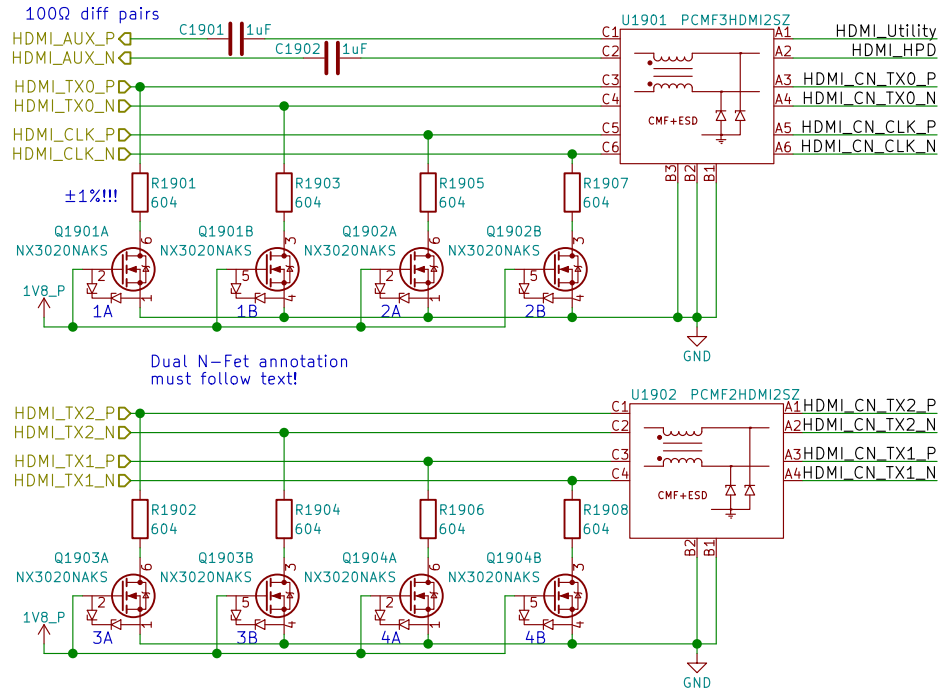
290

291

TUSB1046 can be used for DP over USB-C

HDMI

Layout Note:
May need swap some signals
due to micro-HDMI pinout diff
depending on pin location/routing



HDMI



Copyright 2018 GNU GPLv3

Sheet: /HDMI/
File: hdmi.sch

Size: A4 Date: 2018-06-18
KiCad E.D.A. kicad 4.0.6

eric.kuzmenko@puri.sm
angus.ainstie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 19/24

1

B



C

D

1

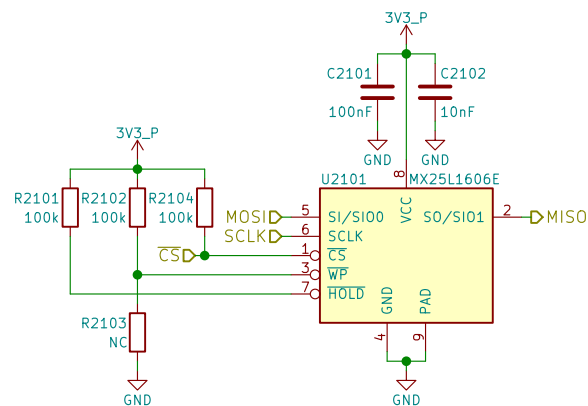


1



1

SPI NOR Flash



SPI NOR Flash



Copyright 2018 GNU GPLv3

Sheet: /SPI Flash/
File: flash.sch

Size: A4 Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 21/24

Smart Card



eric.kuzmenko@puri.sm
angus.ainslie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

Id: 22/24

GNSS



References:

https://www.u-blox.com/sites/default/files/MAX-M8_HardwareIntegrationManual_L%28UBX-13004876%29.pdf
https://www.u-blox.com/sites/default/files/MAX-8-M8-FW3_HardwareIntegrationManual_L%28UBX-15030059%29.pdf

GNSS



Copyright 2018 GNU GPLv3

Sheet: /GNSS/

File: gnss.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

Id: 23/24

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

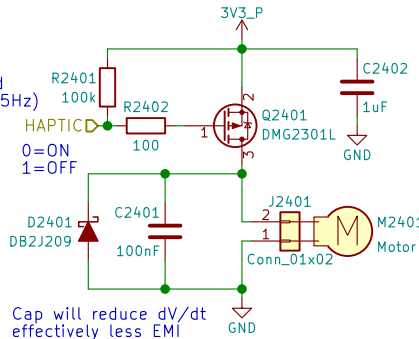
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Haptic Motor

PWM pins occupied:
 GPIO1_I001 - LCD Backlight
 GPIO1_I013 - LED
 GPIO1_I014 - Ethernet (CLK0_25MHz)
 GPIO1_I015 - CSI (CLK02)

PWM needed?
Only needs to be toggled
ON 1 sec, OFF 1 sec (0.5Hz)
Can MUX as either
GPIO or PWM2
swapping with LED



When the motor is off
both terminals are at GND
Motor will have wire leads
with a 2-pin Molex or Boom Precision
connector installed (by request)
Metal housing is floating
thick adhesive layer underneath
(not connected to either pin)

Haptic/Vibration Motor



Purism

Copyright 2018 GNU GPLv3

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

Sheet: /Haptic Motor/

File: haptic.sch

Size: A4	Date: 2018-06-18
----------	------------------

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

Id: 24/24