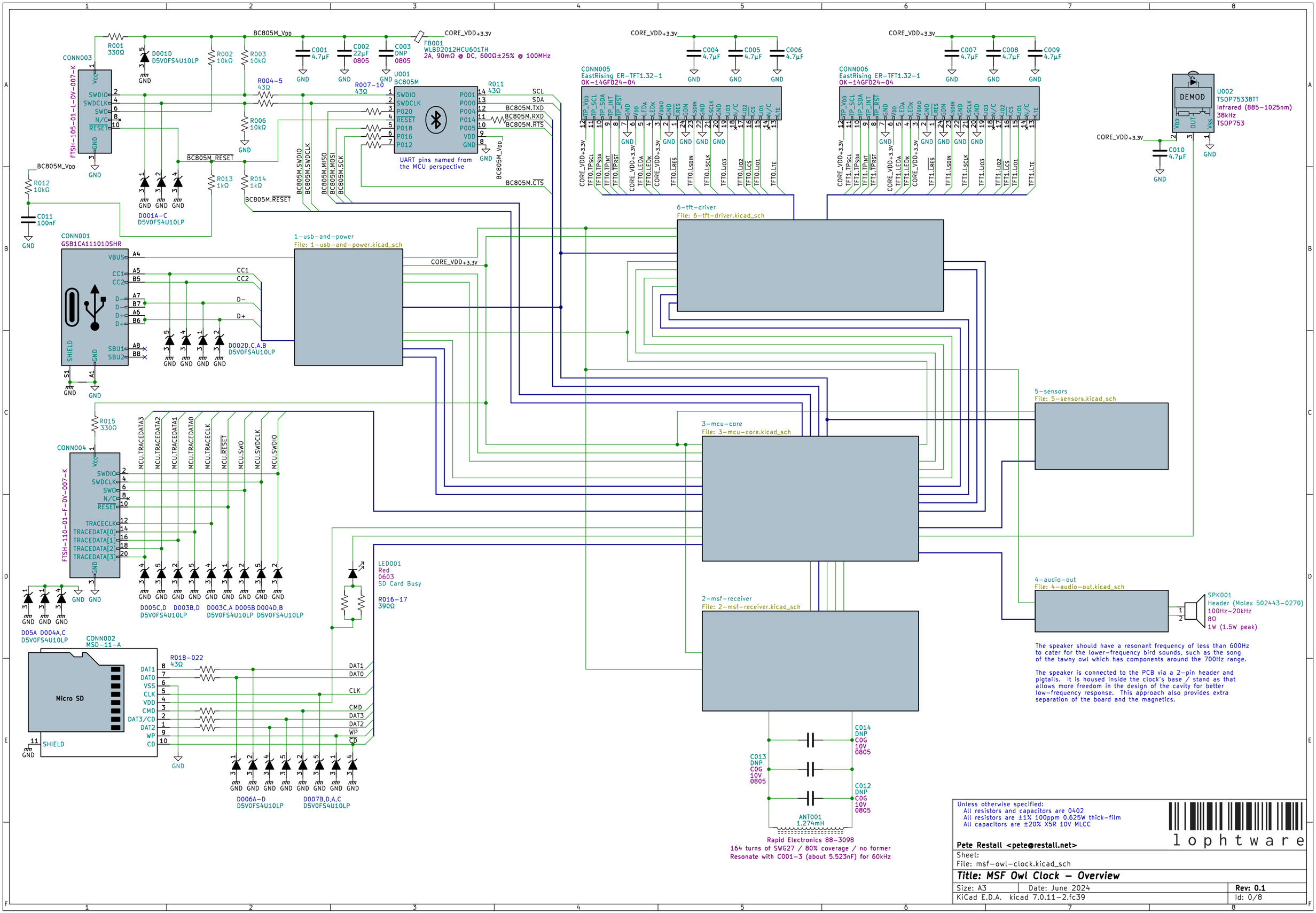
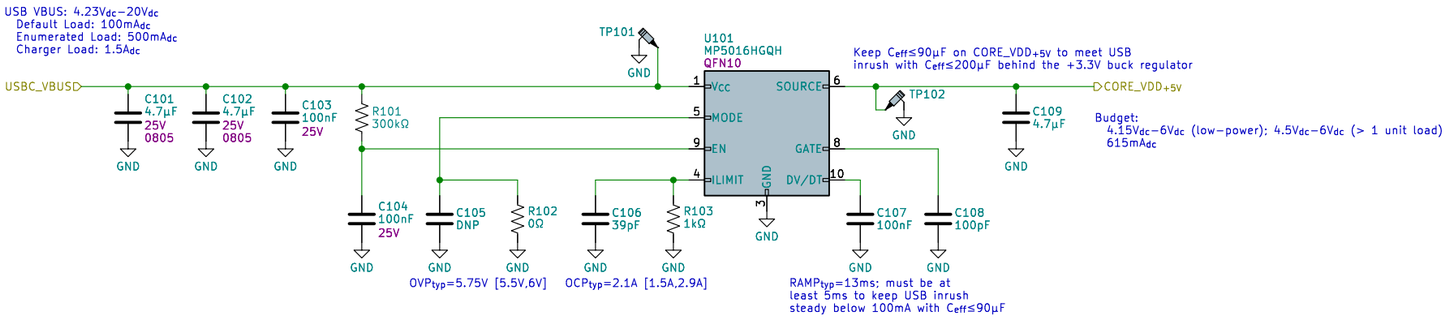

CONN003
FTSH-105-01-L-DV-007-K
R001 330Ω
D001D D5V0FS4U10LP
R002 10kΩ
R003 10kΩ
BC805M_VDD
C001 4.7µF
C002 22µF 0805
C003 DNP 0805
CORE_VDD+3.3V
FB001
WLBD2012HCU601TH
2A, 90mΩ @ DC, 600Ω±25% @ 100MHz
U001
BC805M
R004-5 43Ω
R007-10 43Ω
R011 43Ω
SCL
SDA
BC805M.TXD
BC805M.RXD
BC805M.RTS
BC805M.CTS
UART pins named from the MCU perspective
R006 10kΩ
BC805M_RESET
R012 10kΩ
C011 100nF
R013 1kΩ
R014 1kΩ
D001A-C D5V0FS4U10LP
BC805M.SWDIO
BC805M.SWDCLK
BC805M.MISO
BC805M.MOSI
BC805M.SCK
CONN005
EastRising ER-TFT1.32-1 OK-14GF024-04
C004 4.7µF
C005 4.7µF
C006 4.7µF
CONN006
EastRising ER-TFT1.32-1 OK-14GF024-04
C007 4.7µF
C008 4.7µF
C009 4.7µF
U002
TSOP75338TT
Infrared (885–1025nm)
38kHz
TSOP753
C010 4.7µF
CONN001
GSB1CA11101DSHR
D002D,C,A,B D5V0FS4U10LP
1-usb-and-power
File: 1-usb-and-power.kicad_sch
6-tft-driver
File: 6-tft-driver.kicad_sch
5-sensors
File: 5-sensors.kicad_sch
3-mcu-core
File: 3-mcu-core.kicad_sch
2-msf-receiver
File: 2-msf-receiver.kicad_sch
4-audio-out
File: 4-audio-out.kicad_sch
SPK001
Header (Molex 502443-0270)
100Hz–20kHz
8Ω
1W (1.5W peak)
The speaker should have a resonant frequency of less than 600Hz to cater for the lower-frequency bird sounds, such as the song of the tawny owl which has components around the 700Hz range.
The speaker is connected to the PCB via a 2-pin header and pigtails. It is housed inside the clock's base / stand as that allows more freedom in the design of the cavity for better low-frequency response. This approach also provides extra separation of the board and the magnetics.
CONN004
FTSH-110-01-F-DV-007-K
R015 330Ω
MCU.TRACEDATA3
MCU.TRACEDATA2
MCU.TRACEDATA1
MCU.TRACEDATA0
MCU.TRACECLK
MCU.RESET
MCU.SWO
MCU.SWDCLK
MCU.SWDIO
D005C,D D003B,D D003C,A D005B D004D,B D5V0FS4U10LP
D005A D004A,C D5V0FS4U10LP
LED001
Red
0603
SD Card Busy
R016-17 390Ω
CONN002
MSD-11-A
Micro SD
R018-022 43Ω
DAT1
DAT0
CLK
CMD
DAT3
DAT2
WP
CD
D006A-D D5V0FS4U10LP
D007B,D,A,C D5V0FS4U10LP
C013 DNP C0G 10V 0805
C014 DNP C0G 10V 0805
C012 DNP C0G 10V 0805
ANT001 1.274mH
Rapid Electronics 88-3098
164 turns of SWG27 / 80% coverage / no former
Resonate with C001-3 (about 5.523nF) for 60kHz
Unless otherwise specified:
All resistors and capacitors are 0402
All resistors are ±1% 100ppm 0.625W thick-film
All capacitors are ±20% X5R 10V MLCC
Pete Restall <pete@restall.net>
lophtware
Sheet:
File: msf-owl-clock.kicad_sch
Title: MSF Owl Clock – Overview
Size: A3
Date: June 2024
Rev: 0.1
KiCad E.D.A. kicad 7.0.11-2.fc39
Id: 0/8

Primary means of supply input protection (OVP and OCP) as well as USB inrush current limiting and soft-start mechanism



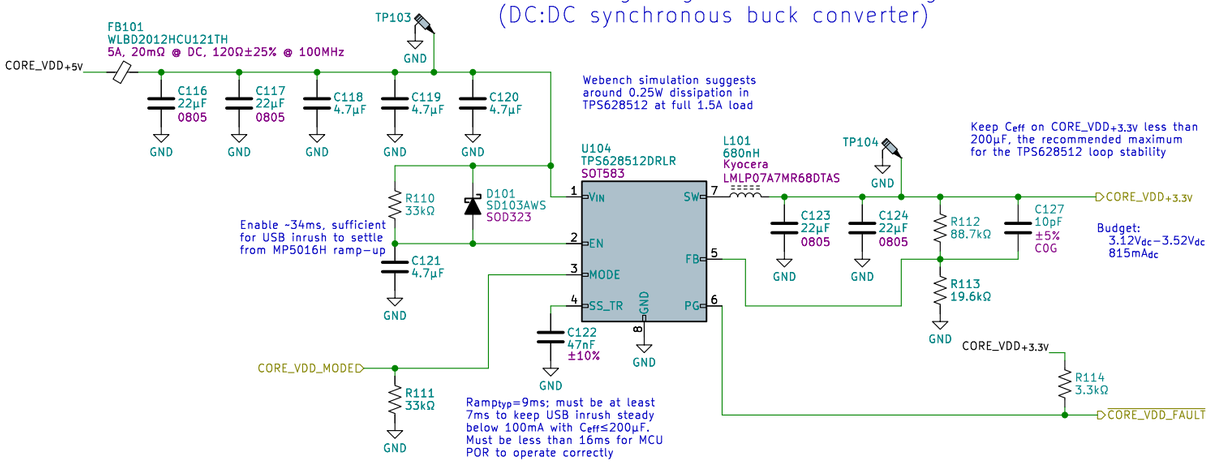
For C=22µF (CL21A226MPQNNN) between 4V–6V of DC bias (–77%≤ΔC≤–62%), over temperature 0°C–70°C (ΔC≤±5%) and at the extremes of tolerance (ΔC≤±20%), we can use the range 3.8µF<Ceff<10.6µF

Between 3.0V–3.6V of DC bias (–59%≤ΔC≤–51%) we can use the range 6.8µF<Ceff<13.6µF

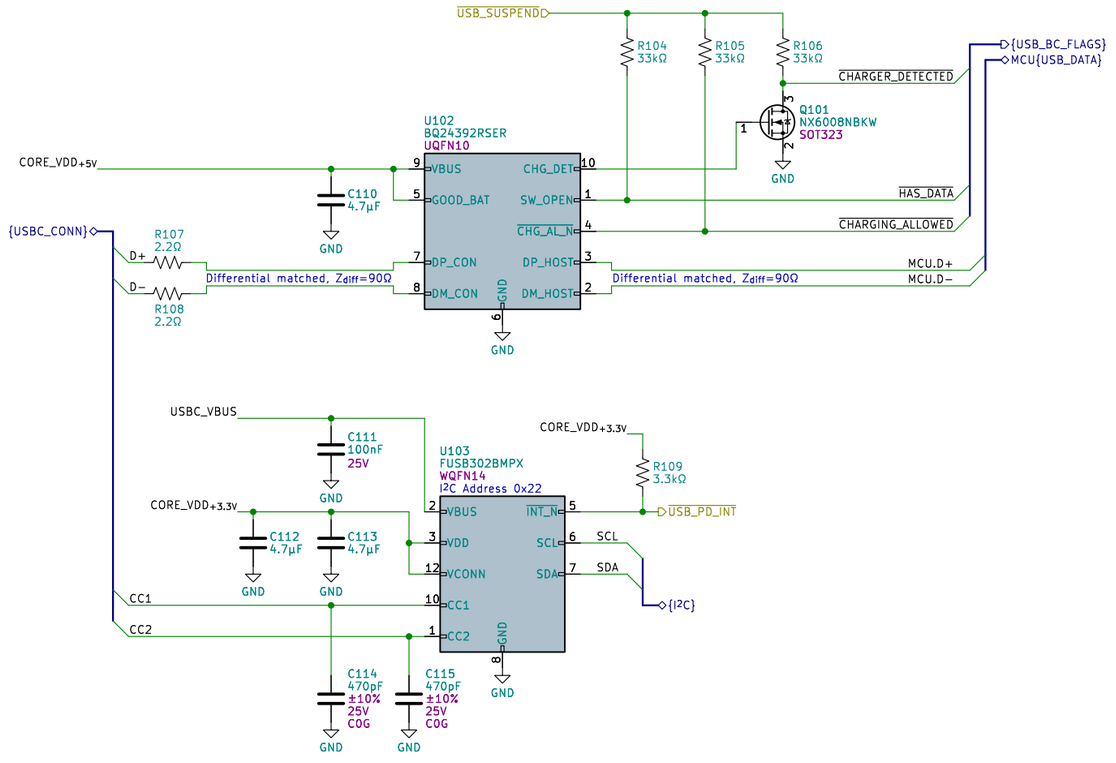
For C=4.7µF (CL05A475MP5NRN) between 4V–6V of DC bias (–80%≤ΔC≤–66%), over temperature 0°C–70°C (ΔC≤±5%) and at the extremes of tolerance (ΔC≤±20%), we can use the range 0.7µF<Ceff<2.1µF

Between 3.0V–3.6V of DC bias (–64%≤ΔC≤–55%) we can use the range 1.4µF<Ceff<2.7µF

Core voltage regulator for +3.3V logic (DC:DC synchronous buck converter)



USB Type-C, PD, BC and data interfaces



Unless otherwise specified:
All resistors and capacitors are 0402
All resistors are ±1% 100ppm 0.625W thick-film
All capacitors are ±20% X5R 10V MLCC

Pete Restall <pete@restall.net>

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Sheet: 1-usb-and-power
File: 1-usb-and-power.kicad_sch

Title: MSF Owl Clock – USB and Core Power Module

Size: A3	Date: June 2024	**Rev: 0.1**
KiCad E.D.A. kicad 7.0.11-2.fc39		Id: 1/8

Estimated from the datasheets, the in-band PSRR@60kHz is around −96dB (the TPS7A2040 around −30dB, TPS7A2036 around −50dB, the MCP6499 around −16dB). The maximum ripple on the +5V rail when used at a maximum gain of 88.6dB is 3.6mV$_{rms}$, which keeps the noise at the end of the signal chain about −6dB below the signal chain's (ie. op-amp's) noise: 19.1µV$_{rms}$ / 3.3mV$_{rms}$ for minimum / maximum gains, respectively (in a 118Hz bandwidth).

The allowed power-supply ripple of higher-frequency components, especially 180kHz which is the strongest alias at 240kHz sampling rate, is an order of magnitude above this and is unlikely to occur, so use 3.6mV$_{rms}$ as the target input rail ripple across all frequencies.

FB201
WLBD2012HCU601TH
2A, 90mΩ @ DC, 600Ω±25% @ 100MHz

U201
TPS7A2042PDBVR
SOT23

U202
TPS7A2036PDBVR
SOT23

TP201

TP202

CORE_VDD+5V

MSF_RCV_EN

MSF_VDD+3.6V

C201 22µF 0805
C202 22µF 0805
C203 4.7µF
C204 4.7µF
C205 4.7µF
C206 4.7µF
C207 22µF 0805
C208 22µF 0805
C209 4.7µF
C210 4.7µF
C211 4.7µF
C212 22µF 0805
C213 22µF 0805
C214 22µF 0805
C215 DNP 0805
C216 4.7µF
C217 4.7µF

U203E MCP6499
U204E MCP6499

R201 4.99kΩ ±0.1% ±25ppm Thin Film
R202 4.99kΩ ±0.1% ±25ppm Thin Film
D201 SD103AWS SOD323
C218 4.7µF
U203C MCP6499
R203 0Ω Thin Film
C219 DNP 0805
R204 DNP Thin Film
R205 27Ω Thin Film
TP203
C220 22µF 0805
C221 22µF 0805
C222 22µF 0805
C223 DNP 0805
D202 SD103AWS SOD323
D203 SD103AWS SOD323
MSF_RCV_VREF+1.8V

U203B/C – Topology for large capacitive load compensation.
Calculations can be found in Op-Amps for Everyone, p287.

R206 4.3kΩ ±0.1% ±25ppm Thin Film
R207 4.3kΩ ±0.1% ±25ppm Thin Film
D204 SD103AWS SOD323
R208 4.99kΩ ±0.1% ±25ppm Thin Film
C224 4.7µF
U203B MCP6499
R209 0Ω Thin Film
C225 DNP 0805
R210 DNP Thin Film
R211 27Ω Thin Film
TP204
C226 22µF 0805
C227 22µF 0805
C228 DNP 0805
C229 DNP 0805
D205 SD103AWS SOD323
MSF_RCV_VREF+2.5V

Single-Ended-to-Differential Bridge with equalised output delays. See Op-Amps for Everyone, p269.

2-msf-receiver-trf
File: 2-msf-receiver-trf.kicad_sch

MSF_ANT+
MSF_ANT−
MSF_VDD+3.6V
MSF_RCV_VREF+1.8V
PGA1
BPF 60kHz
PGA2
BPF 60kHz

C230 4.7nF ±5% C0G 0603
R212 2.49kΩ ±0.1% ±25ppm Thin Film
R213 2.49kΩ ±0.1% ±25ppm Thin Film
R214 68Ω ±0.1% ±25ppm Thin Film
R215 2.49kΩ ±0.1% ±25ppm Thin Film
R216 2.49kΩ ±0.1% ±25ppm Thin Film
R217 2.49kΩ ±0.1% ±25ppm Thin Film
R218 2.49kΩ ±0.1% ±25ppm Thin Film
R219 68Ω ±0.1% ±25ppm Thin Film
U204A MCP6499
U204D MCP6499

TP205
TP206
MSF_OUT+
MSF_OUT−

Route as length-matched differential pair, ideally with Z_{odd}=68Ω but this is not critical because transmission line effects will not be present.

Unfortunately the JLCPCB stack-up only lets us approach Z_{even}=103Ω (Z_{odd}=51.5Ω), about 25% less than our target.

ADC V_{fs}≈±2.5V$_{p-p}$−7% headroom
ADC V_{cm}≈1.25V

Under fault conditions or transients it is possible to see nearly 3.7V from the op-amp on the ADC pins. With a worst-case MCU V_{DD} of around 3.1V, there could be an excess 0.6V injecting current into the ESD protection diodes. The PIC32 datasheet states that the maximum injection current is ±15mA; the 68Ω series resistors should limit this to less than 9mA. Schottky diodes could have been used at the expense of offsets caused by reverse leakage currents and the distortion introduced by further mismatch of the differential inputs.

MSF_RCV+3.3V_IO
{MSF_RCV_GAINS}
C231 4.7µF
U205
74HC595BQ
DHVQFN16
DS
SHCP
STCP
R222 33kΩ
R223 33kΩ
R224 33kΩ
PGA1.SW_EN0
PGA1.SW_EN1
PGA1.SW_EN2
PGA1.SW_EN3
PGA2.SW_EN0
PGA2.SW_EN1
PGA2.SW_EN2
PGA2.SW_EN3

Firmware needs to set shift register low prior to USB SUSPEND to meet power consumption targets. The TMUX1511 is unaffected if its inputs are high whilst it is powered down, so no hardware protection measures are required in the case of a firmware error.

MSF_RCV_VREF+2.5V
R220 4.99kΩ ±0.1% ±25ppm Thin Film
D206 SD103AWS SOD323
R221 4.99kΩ ±0.1% ±25ppm Thin Film
C232 4.7µF

Unless otherwise specified:
All resistors and capacitors are 0402
All resistors are ±1% 100ppm 0.625W thick-film
All capacitors are ±20% X5R 10V MLCC

Pete Restall <pete@restall.net>

lophtware

Sheet: 2-msf-receiver
File: 2-msf-receiver.kicad_sch

Title: MSF Owl Clock – MSF Receiver Module

Size: A3	Date: June 2024	**Rev: 0.1**
KiCad E.D.A. kicad 7.0.11-2.fc39		Id: 2/8

MCU Power Pins

One bypass capacitor for each VDD pin

CORE_VDD+3.3V — C301 4.7µF — C302 4.7µF — C303 4.7µF — C304 4.7µF — C305 4.7µF — C306 4.7µF — C307 4.7µF — GND

L301 10µH 1.5ARMS / 1.5ASAT, 150mΩ±20% @ DC

MCU_VSW — L301 — TP304 — GND — MCU_VDDCORE

C308 22µF 0805 — C309 4.7µF — C310 4.7µF — GND

Inductor specifications on page 1719 (REG_27,29,31) of DS60001715G

FB301 WLBD2012HCU601TH 2A, 90mΩ @ DC, 600Ω±25% @ 100MHz

CORE_VDD+3.3V — FB301 — TP305 — GND — MCU_AVDD

C311 4.7µF — C312 4.7µF — C313 4.7µF — C314 4.7µF — GND

Crystal Oscillators

MCU_XOSC0_OUT / MCU_XOSC0_IN — R307 0Ω — XTAL301 24MHz±10ppm @ 12pF (AT) 3225 — C315 13pF ±1% C0G — C316 13pF ±1% C0G — GND

Calculations on page 1743 of DS60001715G; assuming 6.3pF and 5.9pF for pin parasitics

MCU_XOSC1_OUT / MCU_XOSC1_IN — R308 DNP — XTAL302 DNP 3225 — C317 DNP ±1% C0G — C318 DNP ±1% C0G — GND

Calculations on page 1745 of DS60001715G; assuming 3.1pF and 3.2pF for pin parasitics. 17pF is closer to the ideal 12.5pF load but is a much less common value.

MCU_XOSC32K_OUT / MCU_XOSC32K_IN — R309 0Ω — XTAL303 32.768kHz±20ppm @ 12.5pF (Tuning Fork) 3215 — C319 16pF ±1% C0G — C320 16pF ±1% C0G — GND

CORE_VDD+3.3V — R301–3 10kΩ — R304 10kΩ — R305 1kΩ — C321 100nF — GND

MCU.SWO, MCU.SWDIO, MCU.SWDCLK, MCU.RESET

R306 1kΩ — Q301 NX6008NBKW SOT323 — SDCARD_BUSYLED

MCU{ARM_DEBUG_TRACE}

R311 43Ω — CORE_VDD_MODE

Pins 97–100 and 3–4 (page 57 of DS60001715G) need to be static to minimise XOSC32 jitter

R312–17 43Ω

{SENSOR_FLAGS}: PRX_GPIO1, PRX_GPIO0, BAR_INT, HMD_ALERT

USB_SUSPEND — R310 33kΩ — GND

MSF_RCV_VREF+2.5V — C322 4.7µF — GND

Pins 5–20 are supplied by AVDD so are preferably only digital inputs to keep noise out of the analogue domain. Slow-moving digital outputs are also OK, according to Microchip tech support

{USB_BC_FLAGS}: CHARGING_ALLOWED, CHARGER_DETECTED, HAS_DATA

TP301 — GND — CORE_VDD_FAULT

MCU_XOSC32K_IN / MCU_XOSC32K_OUT

MSF_OUT+ / MSF_OUT− — C324 4.7nF ±2% C0G 0603 — C323 DNP ±2% C0G 0603 — C325 DNP ±2% C0G 0603 — GND

AMP_IN, AMP_EN, AMP_FAULT — Maximum DAC load is 5kΩ

DS, STCP, SHCP

{AUDIO_OUT}, {MSF_RCV_GAINS}

MSF_RCV_EN, SDCARD_FAULT

U301 PIC32CX1025SG41100-I/E5X TQFP100

1	PB03 / XIN32	MCU_XOSC32K_IN	
2	PB02 / XOUT32	MCU_XOSC32K_OUT	
3	PC00		
4	PC01		
5	PB01 / EXTINT[2]	CORE_VDD_FAULT	
6	PC03		
7	PB00 / DAC.VOUT[0]		
8	VREFA		
9	PB04		
10	PB05		
11	AVSS	GND	
12	AVDD	MCU_AVDD	
13	PB06 / EXTINT[6]	SDCARD_FAULT	
14	PB07		
15	PA08 / ADC0.AIN[2]		
16	PA09 / ADC0.AIN[3]		
17	PA04	MSF_RCV_EN	
18	PA05 / DAC.VOUT[1]		
19	PA06	AMP_IN	
20	PA07	AMP_EN	
21	PC05	AMP_FAULT	
22	PC06	DS	
23	PC07	STCP	
24	VSS	GND	
25	VDD	CORE_VDD+3.3V	
26	PA27 / QSPI.DATA[0]	DATA0	R335–39 41.2Ω
27	PA28 / QSPI.DATA[1]	DATA1	
28	PB31 / QSPI.DATA[2]	DATA2	
29	PB30 / QSPI.DATA[3]	DATA3	
30	VDD	CORE_VDD+3.3V	
31	VSS	GND	
32	PA29 / QSPI.SCK	SCK	
33	PA30 / QSPI.CS	SS	
34	PB29 / EXTINT[12]	TFT_TEAR1	
35	PB28 / EXTINT[13]	TFT_TEAR0	
36	PB27 / TC5.WO[0]	TFT_BACKLED1	
37	PB26 / TC5.WO[1]	TFT_BACKLED0	
38	VSS	GND	
39	VDD	CORE_VDD+3.3V	
40	PC10	TFT_RESET	
41	PC11	TFT_QSPI_SEL	
42	PC12 / EXTINT[13]	TFT_TP_INT0	
43	PC13 / EXTINT[14]	TFT_TP_INT1	
44	PC15	SDCARD_EN	
45	SERCOM4.PAD[1]		
46	PA13 / XOSC0.XIN	MCU_XOSC0_IN	
47	PA14 / XOSC0.XOUT	MCU_XOSC0_OUT	
48	VSS	GND	
49	PB22 / XOSC1.XOUT	MCU_XOSC1_OUT	
50	PB23 / XOSC1.XIN	MCU_XOSC1_IN	
51	VDD	CORE_VDD+3.3V	
52	SERCOM1.PAD[0]		
53	SERCOM1.PAD[1]		
54	SERCOM1.PAD[2]		
55	SERCOM1.PAD[3]		
56	SERCOM6.PAD[0]		
57	SERCOM6.PAD[1]		
58	SERCOM6.PAD[2]		
59	SERCOM6.PAD[3]		
60	PC20		
61	PC21		
62	VSS	GND	
63	VDD	CORE_VDD+3.3V	
64	SDHC1.SDCD		
65	SDHC1.SDWP		
66	SDHC1.SDDAT[0]		
67	SDHC1.SDDAT[1]		
68	SDHC1.SDDAT[2]		
69	SDHC1.SDDAT[3]		
70	SDHC1.SDCMD		
71	SDHC1.SDCK		
72	SERCOM3.PAD[0]		
73	SERCOM3.PAD[1]		
74	USB.DM	MCU.D−	
75	USB.DP	MCU.D+	
76	VSS	GND	
77	VDD	CORE_VDD+3.3V	
78	XOSC1.XOUT	MCU_XOSC1_OUT	
79	XOSC1.XIN	MCU_XOSC1_IN	
80	PB24		
81	PB25		
82	PC24 / EXTINT[3]	MCU.TRACEDATA3	
83	PC23 / EXTINT[2]	MCU.TRACEDATA2	
84	PC22 / EXTINT[1]	MCU.TRACEDATA1	
85	PC14 / EXTINT[0]	MCU.TRACECLK	
86	PB21 / EXTINT[14]	MCU.TRACEDATA0	
87	RESET	USB_PD_INT	
88	PB20	MCU.RESET	
89	VDDCORE	MCU_VDDCORE	
90	VSS	GND	
91	VDD	MCU_VSW	
92	PB19	CORE_VDD+3.3V	R312–17 43Ω
93	PB18 / TC0.WO[1]	MCU.SWDCLK	
94	PB17 / TC0.WO[0]	MCU.SWDIO	
95	PB16	MCU.SWO	
96	PB15		
97	PB14		
98	PB13		
99	PB12		
100	PB11		

Firmware to set unused pins as outputs

Use internal pull-downs on TF_TEARx pins to prevent floating interrupt lines in the event that the connector is pulled out

MCU{USB_DATA}

TP302 — GND — Fast-Mode I²C (400kHz)

CORE_VDD+3.3V — R318 1.8kΩ — R319 1.8kΩ — {I2C}: SCL, SDA

TP303 — GND

{SDCARD_DATA}: CLK, CMD, DAT3, DAT2, DAT1, DAT0

R320–25 43Ω

R326 33kΩ — R327 33kΩ — USB_SUSPEND

WP, CD

SD specification says that DAT lines are inputs during initialisation or idle; use MCU's internal pull-ups as they are under software control.

The 50kΩ pull-up on DAT3, which is internal to the SD card, needs to be disabled via the SET_CLR_CARD_DETECT command after initialisation.

R328–29 330Ω

R330–34 43Ω

BC805M.SWDIO, BC805M.SWDCLK, BC805M.RESET, BC805M.MOSI, BC805M.SCK, BC805M.MISO, BC805M.CTS, BC805M.RTS, BC805M.RXD, BC805M.TXD

BC805M{ARM_DEBUG}, BC805M{SPI}, BC805M{UART}

R342 33kΩ — CORE_VDD+3.3V — IR_RCV_DATA

TFT_TP_INT[0..1], TFT_I2C_SEL, TFT_BACKLED[0..1], TFT_TEAR[0..1], {TFT_QSPI}

Bypass Capacitors

Make up to a total of 30x 4.7µF for the MCU_VDD (CORE_VDD+3.3V) rail. Spread around the board.

CORE_VDD+3.3V — C337 4.7µF — C338 4.7µF — C339 4.7µF — C340 4.7µF — C341 4.7µF — C342 4.7µF — C343 4.7µF — GND

CORE_VDD+3.3V — C344 4.7µF — C345 4.7µF — C346 4.7µF — C347 4.7µF — C348 4.7µF — C349 4.7µF — C350 4.7µF — GND

Current-Limited SD Card Supply

U302 AP22653AW6 SOT26

CORE_VDD+3.3V — C326 4.7µF — GND

SDCARD_EN — R343 33kΩ — GND

R344 33kΩ — GND

R345 5.1kΩ — GND

R346 39kΩ — GND

483mA≤Imax≤639mA SD specification gives performance based on 1.44W to a UHS-I card; 0.72W for default speed

SDCARD_FAULT

TP306 — GND — SDCARD_VDD

C327 4.7µF — C328 4.7µF — C329 4.7µF — C330 4.7µF — C331 4.7µF — GND

C332 4.7µF — C333 4.7µF — C334 4.7µF — C335 4.7µF — C336 4.7µF — GND

Unless otherwise specified:
All resistors and capacitors are 0402
All resistors are ±1% 100ppm 0.625W thick-film
All capacitors are ±20% X5R 10V MLCC

Pete Restall <pete@restall.net>

Sheet: 3-mcu-core
File: 3-mcu-core.kicad_sch

Title: MSF Owl Clock – Microcontroller Module

Size: A3	Date: June 2024	**Rev: 0.1**
KiCad E.D.A. kicad 7.0.11-2.fc39		Id: 3/8

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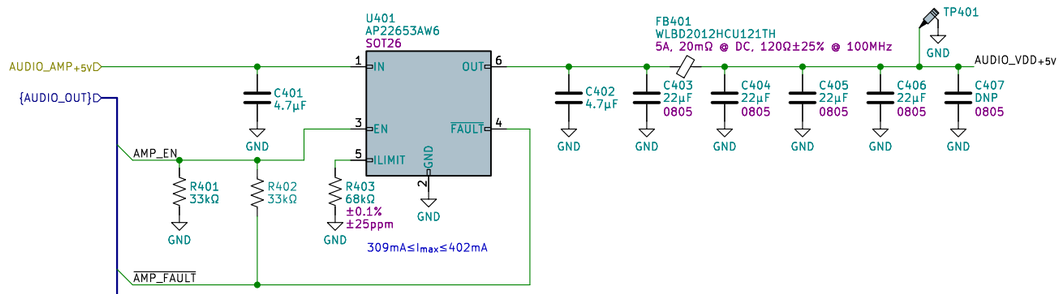
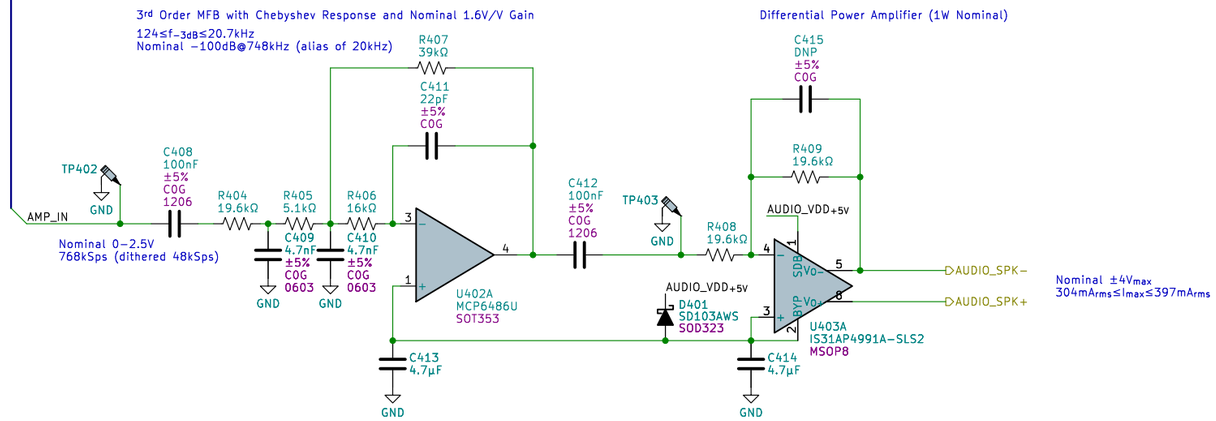
Current limiting to reduce the probability of an 8Ω±15% speaker
being damaged if more than 1.5W is dissipated due to a fault,
such as the op-amp pegging to the rails and putting DC across it.

The latch-on-fault 'A' variant ensures current is removed and
not merely limited in the event of a fault.

The tolerances of the speaker and current limiter are such that
loud sounds could also cause trips, but this is easily rectified
by appropriate volume control in firmware.





Unless otherwise specified:
All resistors and capacitors are 0402
All resistors are ±1% 100ppm 0.625W thick-film
All capacitors are ±20% X5R 10V MLCC

Pete Restall <pete@restall.net>

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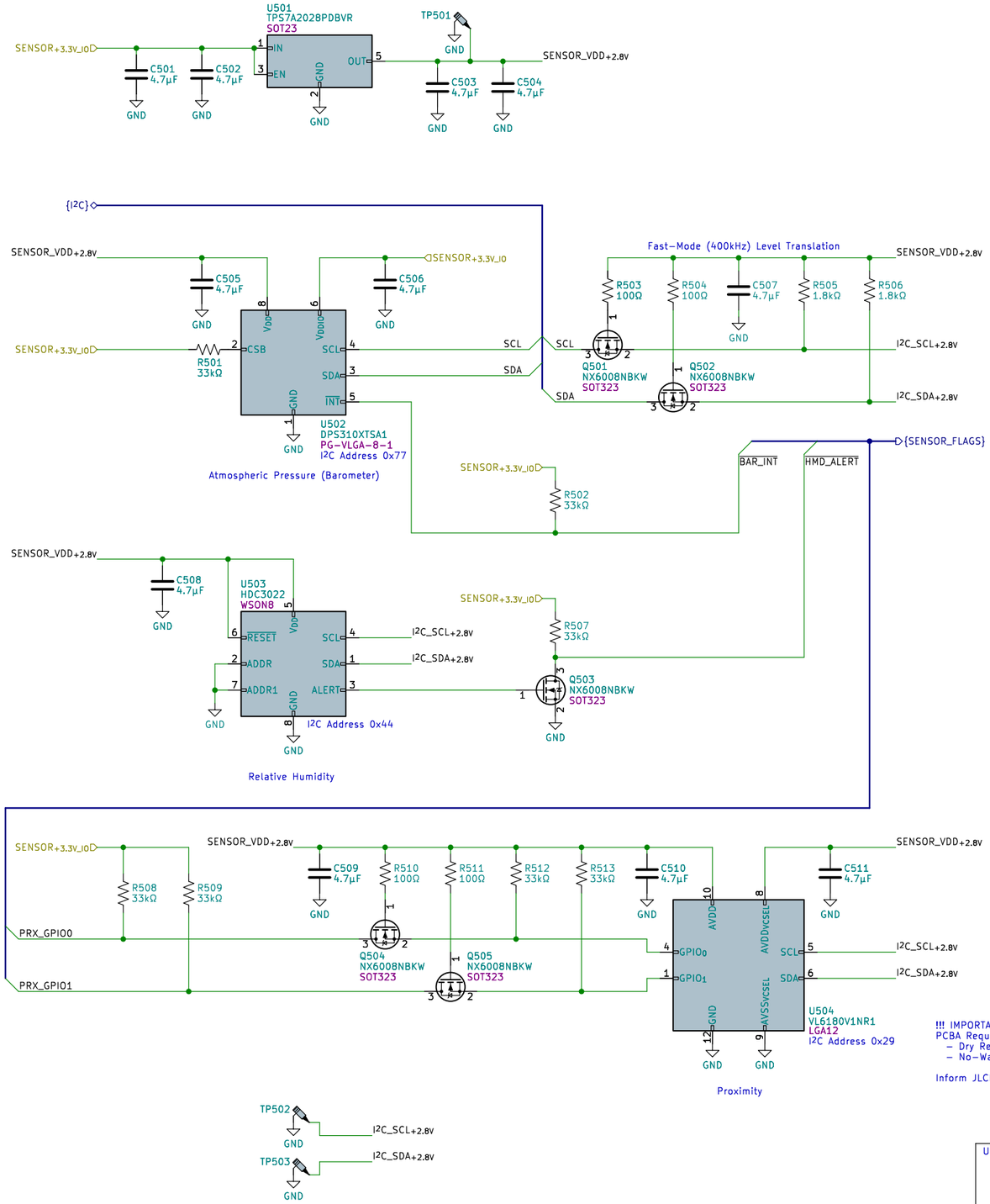
Sheet: 4-audio-out
File: 4-audio-out.kicad_sch

Title: MSF Owl Clock – Audio Output Module

Size: A3	Date: June 2024	**Rev: 0.1**
KiCad E.D.A. kicad 7.0.11-2.fc39		Id: 4/8



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All resistors are ±1% 100ppm 0.625W thick-film
All capacitors are ±20% X5R 10V MLCC

Pete Restall <pete@restall.net>

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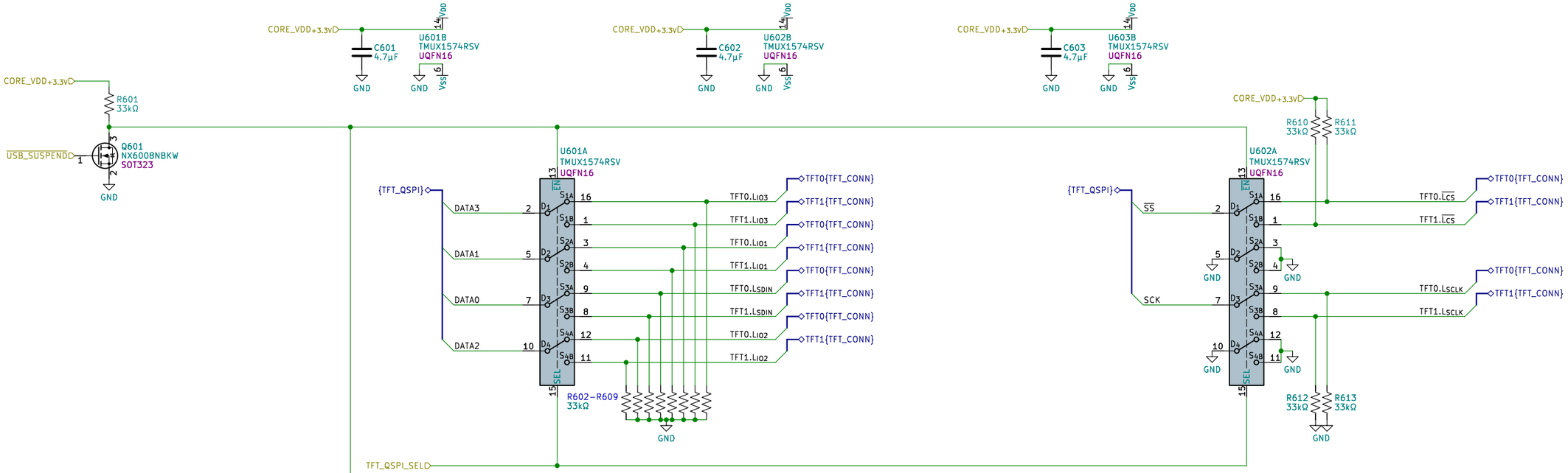
Sheet: 5-sensors
File: 5-sensors.kicad_sch

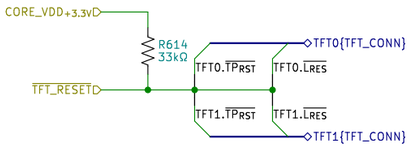
Title: MSF Owl Clock – Environmental Sensors Module

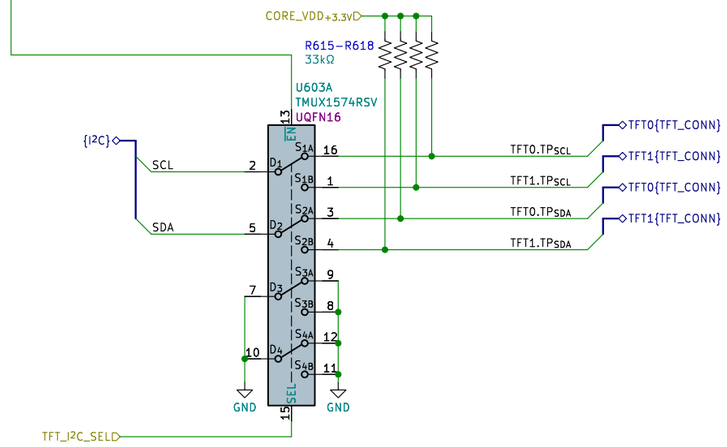
Size: A3	Date: June 2024	**Rev: 0.1**
KiCad E.D.A. kicad 7.0.11-2.fc39		Id: 5/8

Bidirectional QSPI and I²C Multiplexing

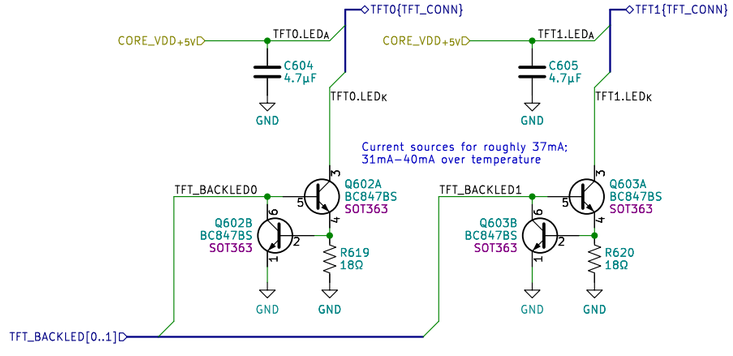


Screen and Touch Resets

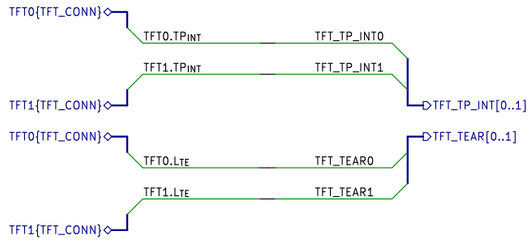




Constant-Current LED Backlight Drivers (PWM Brightness Control)



Touch and Tear Interrupt Wiring



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All capacitors are ±20% X5R 10V MLCC

Pete Restall <pete@restall.net>

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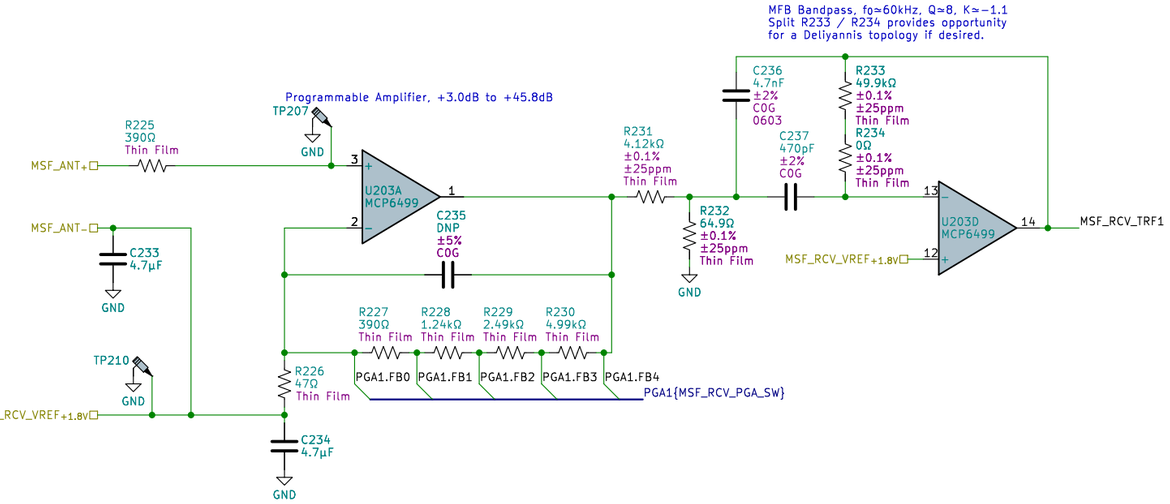
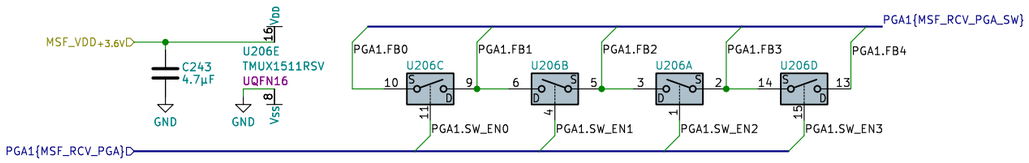
Sheet: 6-tft-driver
File: 6-tft-driver.kicad_sch

Title: MSF Owl Clock – TFT Display Driver / Multiplexer Module

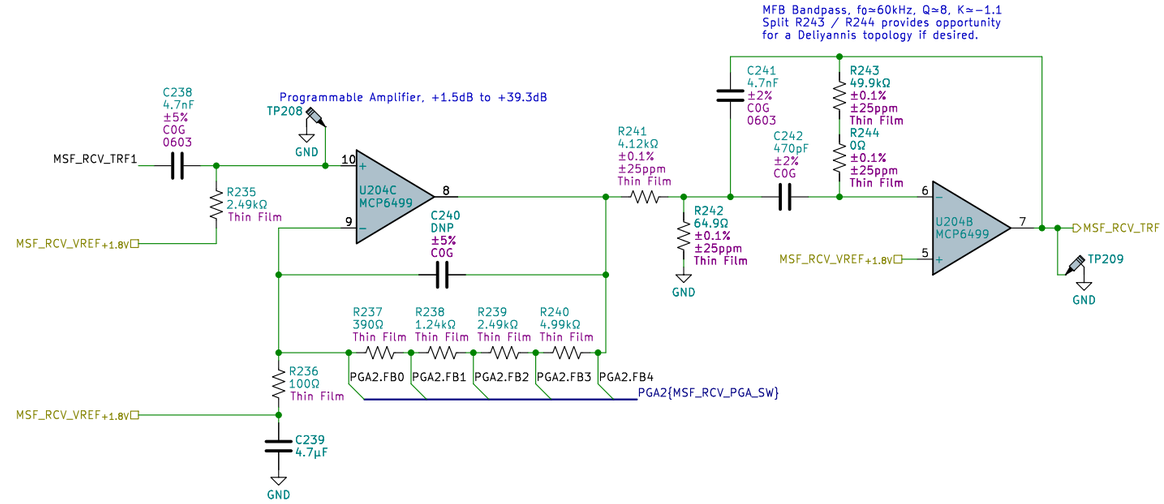
Size: A3	Date: June 2024	**Rev: 0.1**
KiCad E.D.A. kicad 7.0.11-2.fc39		Id: 6/8

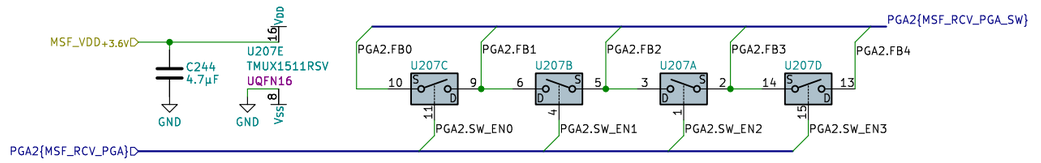
Tuned RF Section 1





Tuned RF Section 2





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All capacitors are ±20% X5R 10V MLCC

Pete Restall <pete@restall.net>

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Sheet: 2-msf-receiver-trf
File: 2-msf-receiver-trf.kicad_sch

Title: MSF Owl Clock - MSF Receiver Module (Tuned RF)

Size: A3	Date: June 2024	**Rev: 0.1**
KiCad E.D.A. kicad 7.0.11-2.fc39		Id: 2a/8