SHEETS

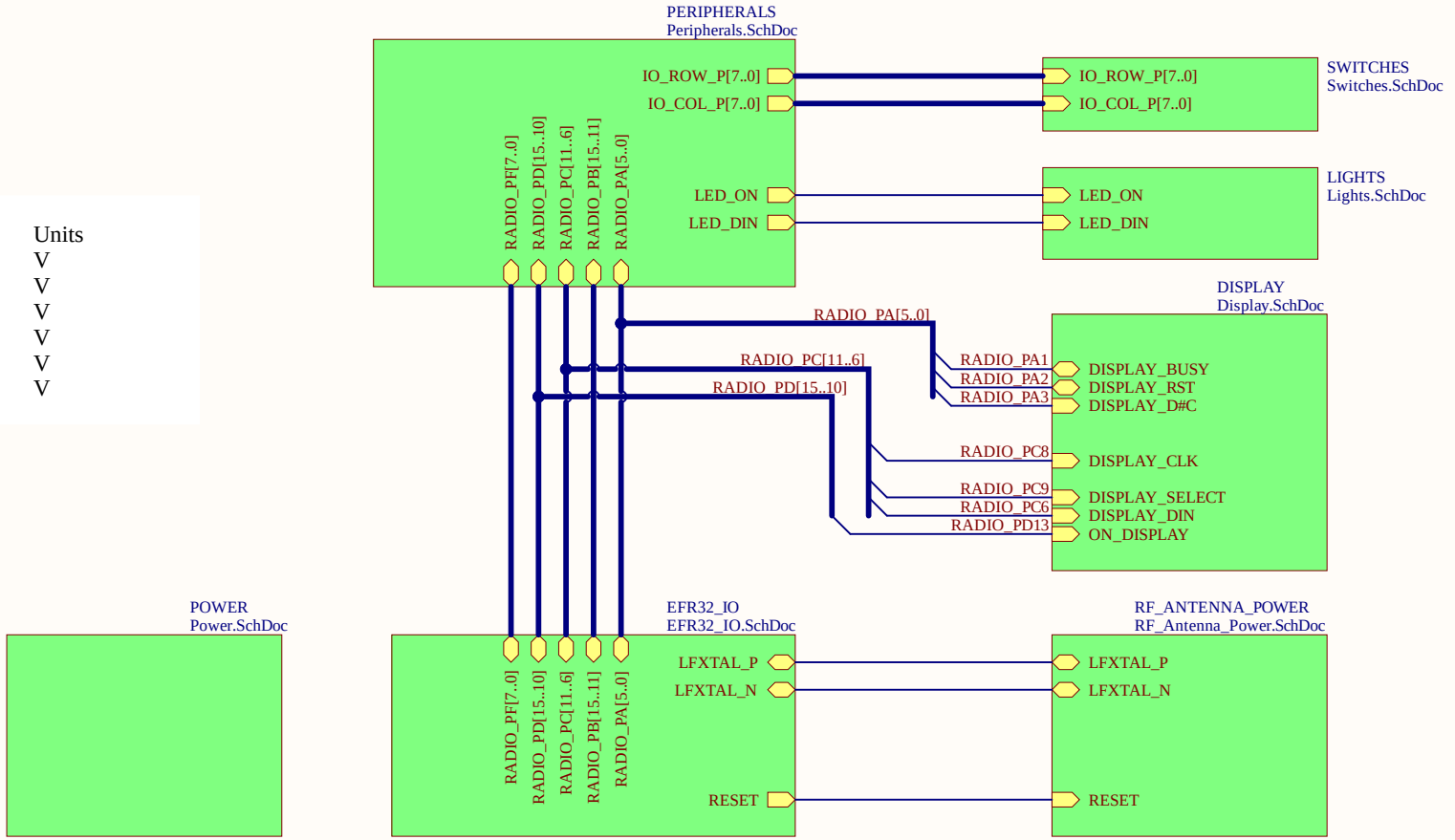
NAME	SHEET
RF_ANTENNA_POWER	2
EFR_GPIO	3
PERIPHERALS	4
POWER	5
SWITCHES	6
LIGHTS	8
DISPLAY	7

Voltage ranges

	Min	Typ	Max	Units
BlueGecko	1.8		3.8	V
PMIC	0.1		5.1	V
eInk Display	2.2		3.7	V
Load Switch	1.6		5.5	V
Temperature sensor	1.9		3.6	V
IO Expander	1.65		5.5	V

Test points

Modules	Designators	Signal
Interrupts	TP1	IO_ROW_INT
	TP2	IO_COL_INT
Temperature sensor	TP3	TEMP_LOAD_SW
Mini SWD connector	TP4	RESET
	TP5	SWDIO
	TP6	PTI_FRAME
	TP7	VCOM_RX
	TP8	VCOM_TX
	TP9	SWCLK
	TP10	PTI_DATA
	TP11	SWO
eInk display	TP12	DISPLAY_D#C
	TP13	DISPLAY_DIN
	TP14	DISPLAY_CLK
	TP15	DISPLAY_SELECT
I2C communication	TP16	SCL
	TP17	SDA
Power supply	TP18	VBAT
	TP19	Solar Pannel output
	TP21	VSTOR
	TP22	+3.3V
	TP23	VMCU
	TP25	VMCU
Crystals	TP26	HFXTAL_N
	TP27	HFXTAL_P
	TP28	LFXTAL_P
	TP29	LFXTAL_N



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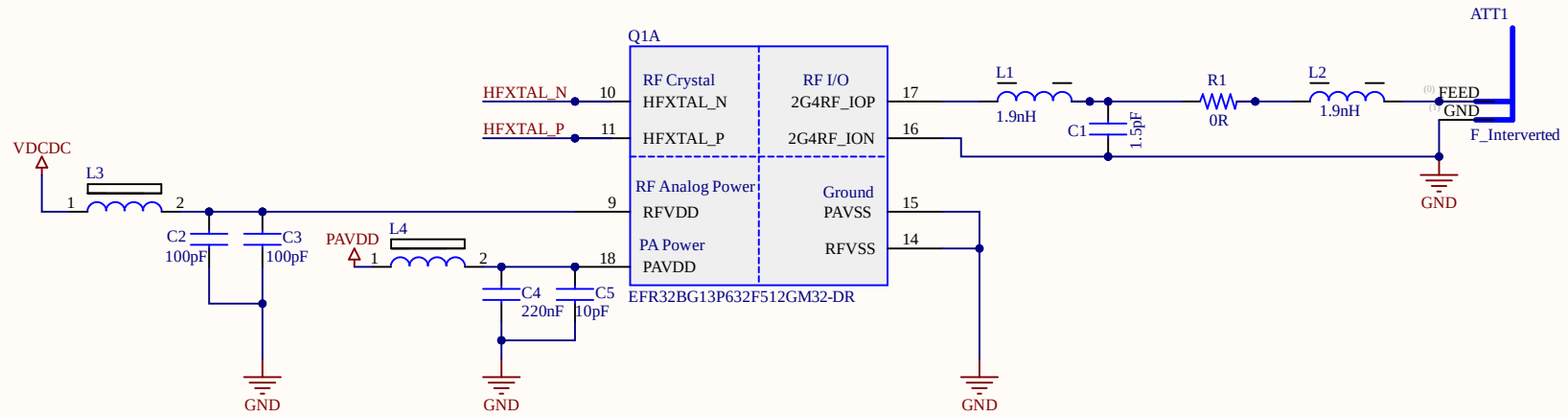
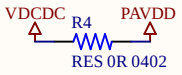
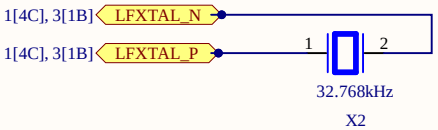
File: C:\Users\..\Keyboard-Left.SchDoc		Drawn By:

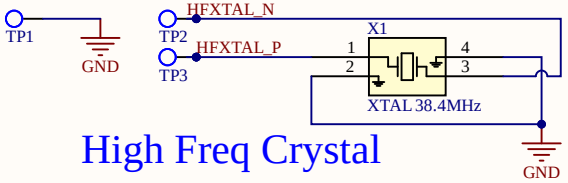


Antenna & Radio Interface

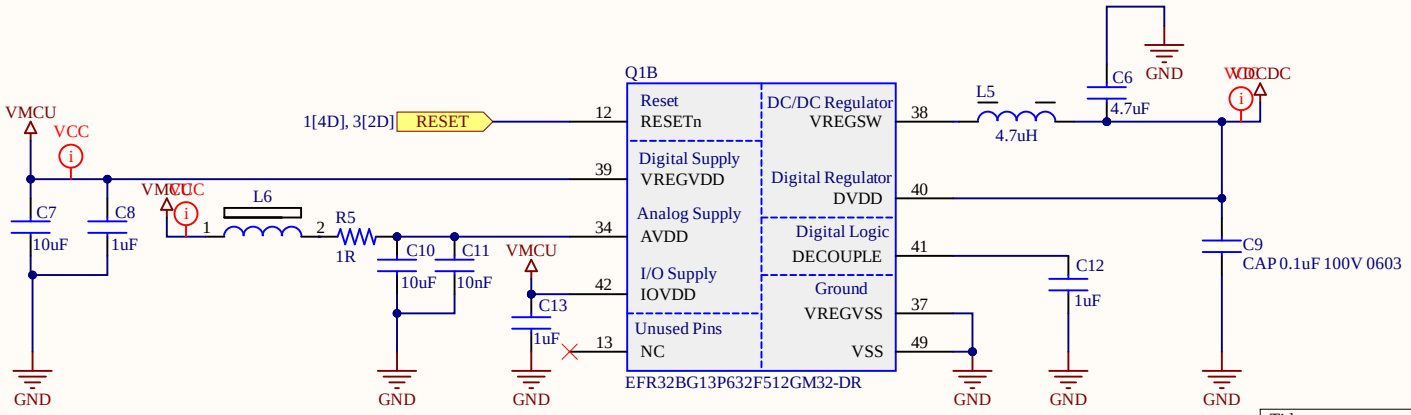




Low Freq Crystal



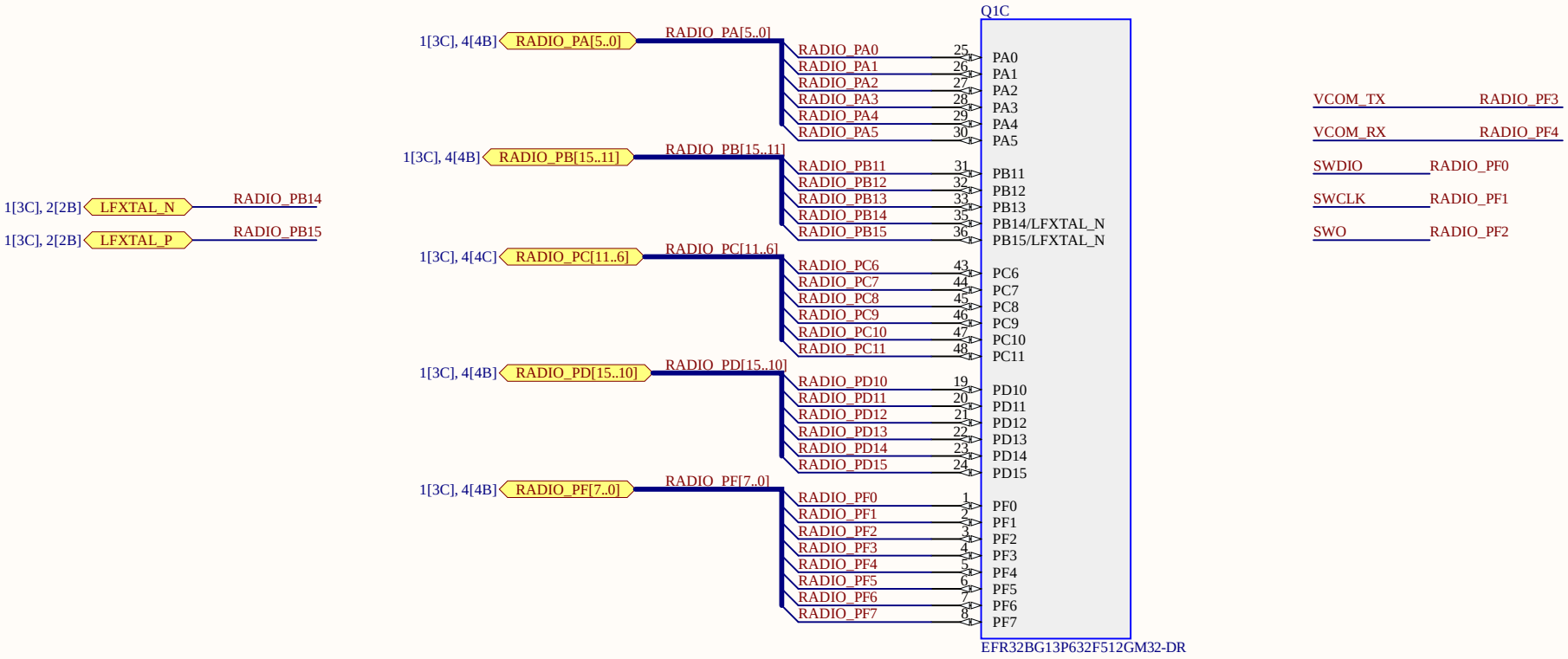
High Freq Crystal



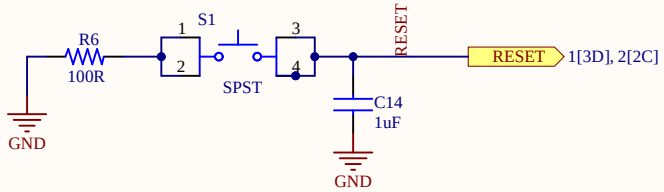
Power & Decoupling

Title	RF and Crystal		
Size: A4	Number: 2	Revision: v1.0	
Date: 10/24/2024	Sheet of	Low Self Esteam	
File: C:\Users\..\RF_Antenna_Power.SchDoc	Drawn By:	Parth Thakkar	

EFRBG13 GPIOs



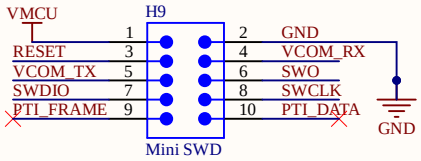
Reset input, active low. This pin is internally pulled up to AVDD. To apply an external reset source to this pin, it is required to only drive this pin low during reset, and let the internal pull-up ensure that reset is released.

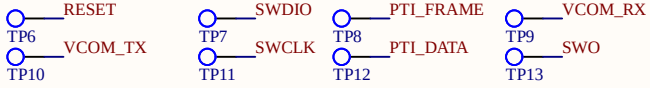


Reset

Mini Simplicity Connector

- Serial Wire Debug (SWD) with SWO
- Packet Trace Interface (PTI)
- Virtual COM port (VCOM)
- AEM monitored voltage rail





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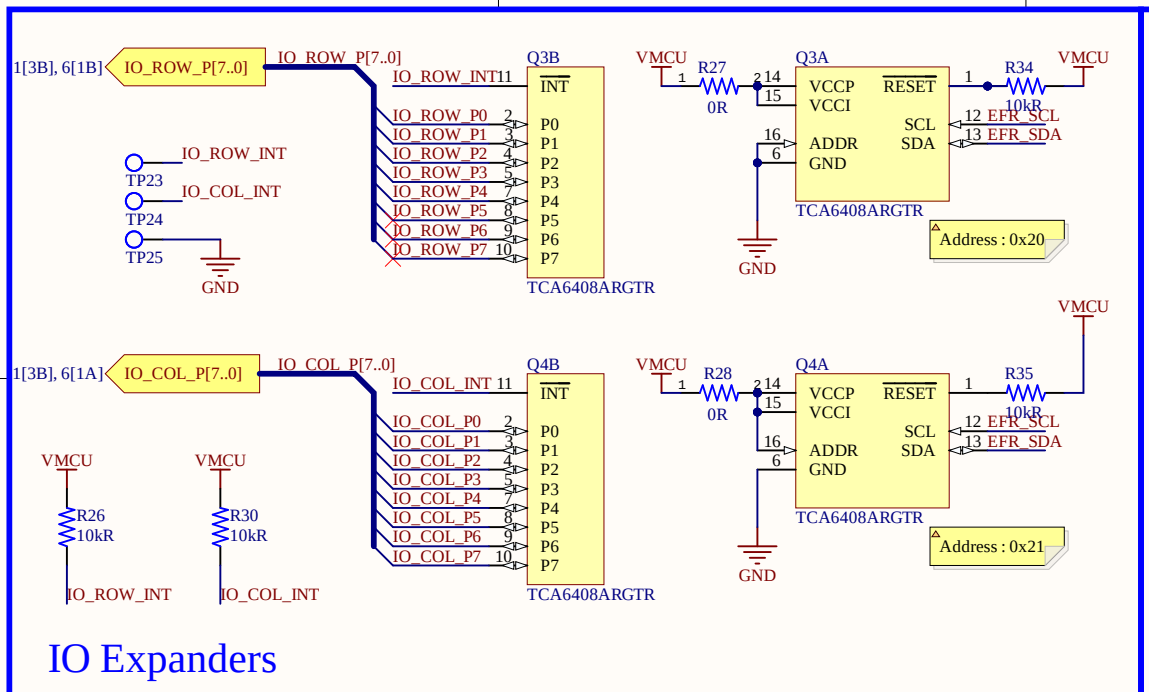
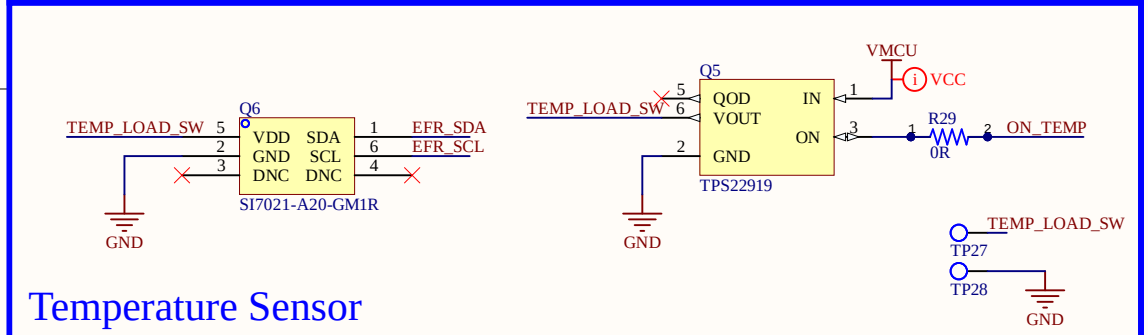
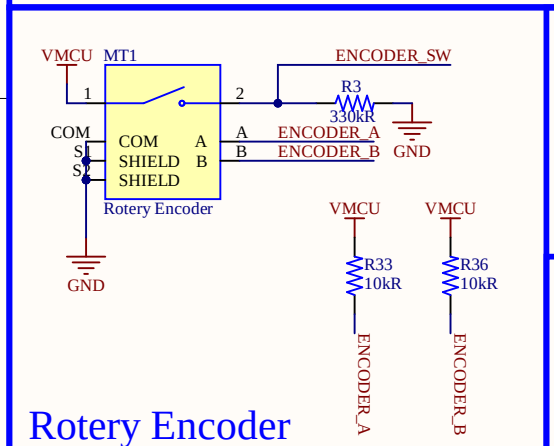
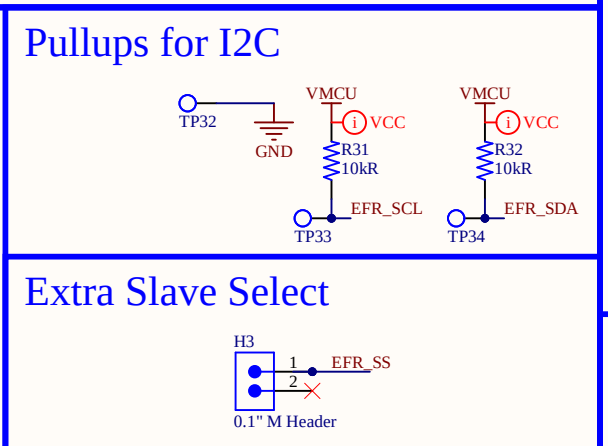
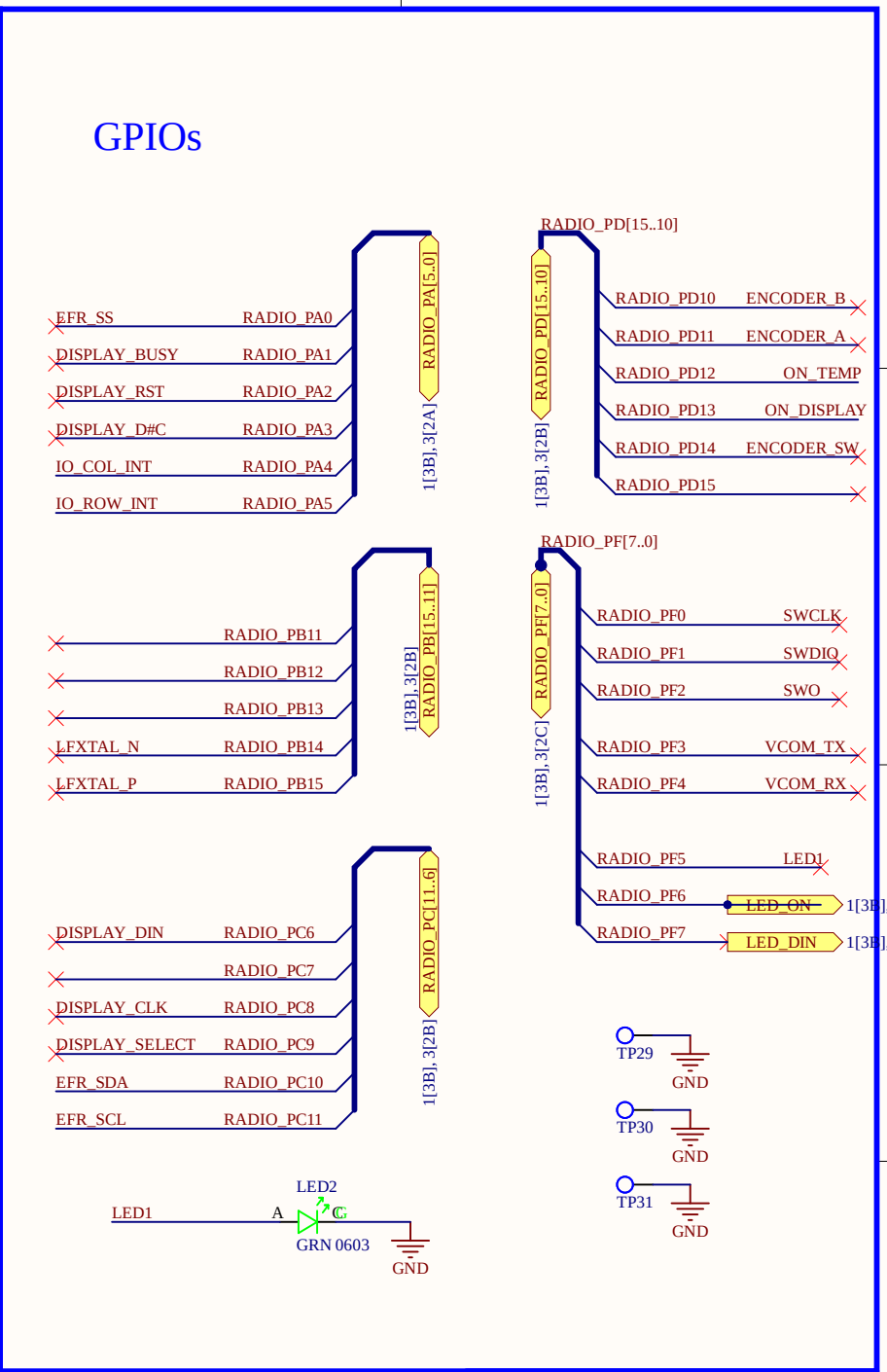
Size: Letter	Number: 3	Revision:
Date: 10/24/2024	Sheet of	
File: C:\Users\..\EFR32_IO.SchDoc	Drawn By:	











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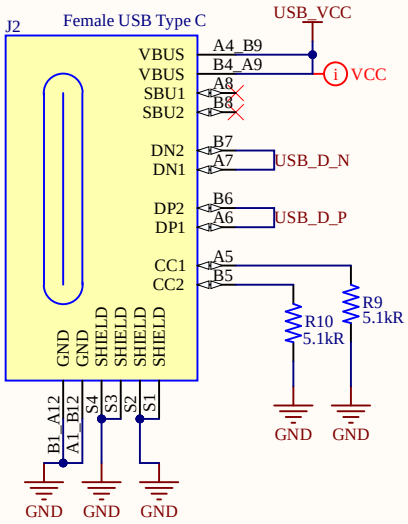
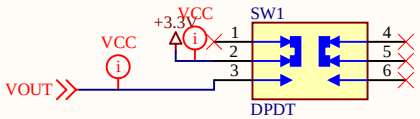
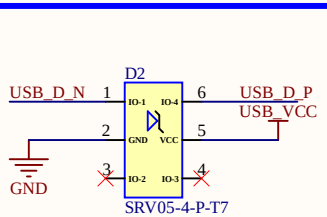
Size: Letter	Number: 4	Revision: *	
Date: 10/24/2024		Sheet of *	
File: C:\Users\..\Peripherals.SchDoc		Drawn By: *	



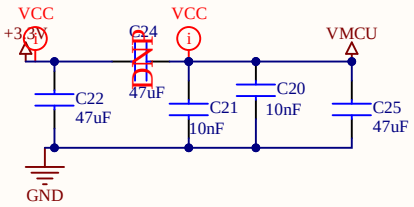
Type C



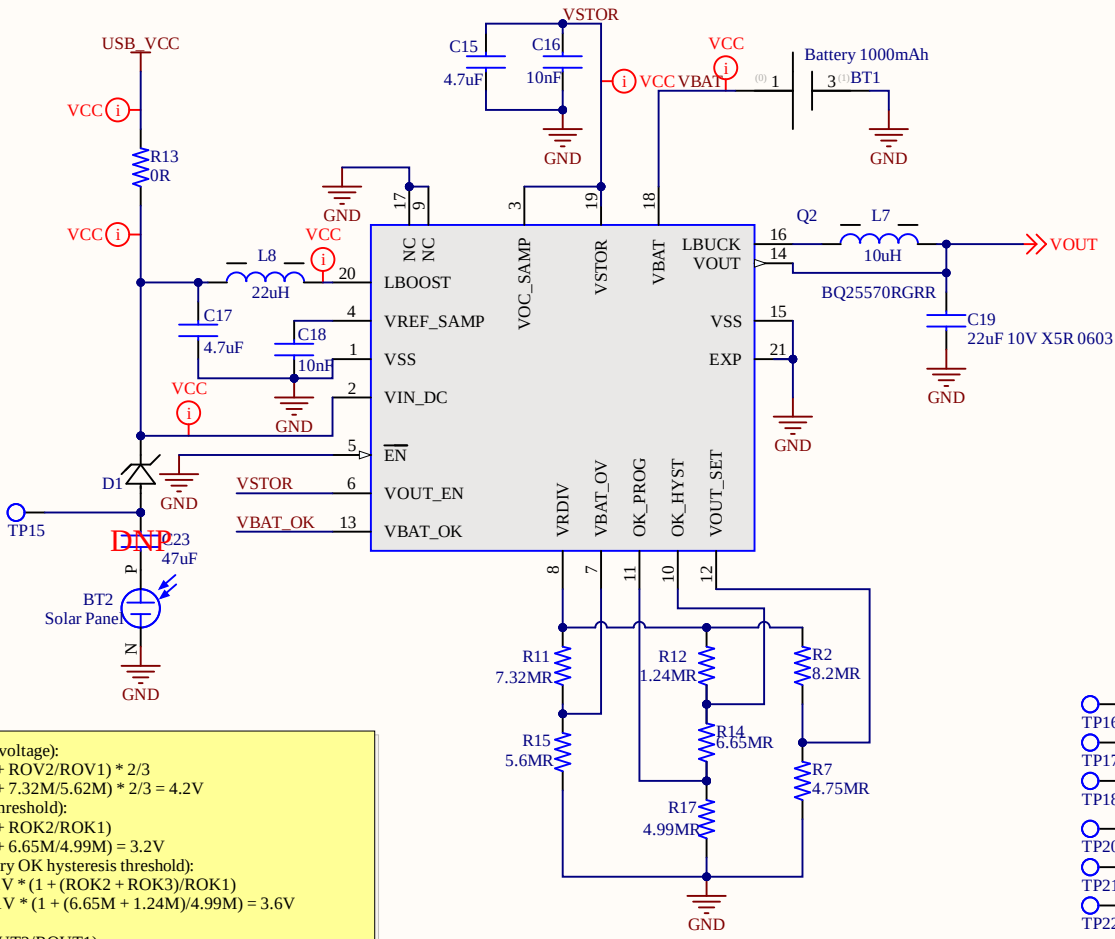
DPDT Switch



TVS Diode

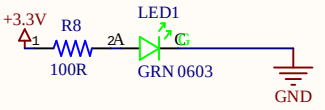


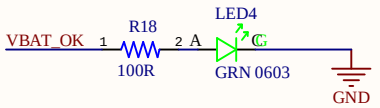
Decoupling and Bulk Cap



Power Management IC

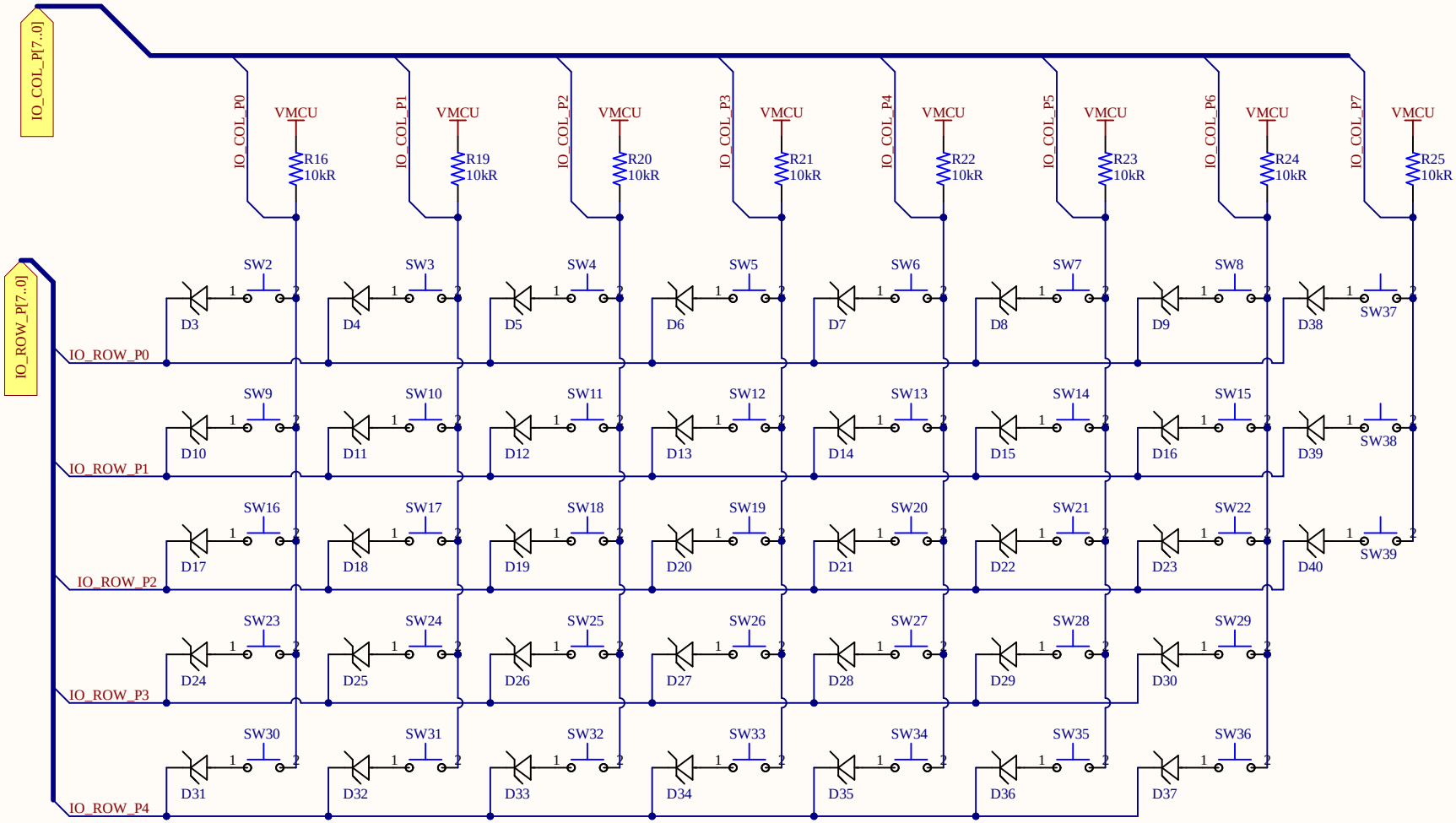
VBAT_OV (Battery Overvoltage):
VBAT_OV = 1.21V * (1 + ROV2/ROV1) * 2/3
VBAT_OV = 1.21V * (1 + 7.32M/5.62M) * 2/3 = 4.2V
VBAT_OK (Battery OK threshold):
VBAT_OK = 1.21V * (1 + ROK2/ROK1)
VBAT_OK = 1.21V * (1 + 6.65M/4.99M) = 3.2V
VBAT_OK_HYST (Battery OK hysteresis threshold):
VBAT_OK_HYST = 1.21V * (1 + (ROK2 + ROK3)/ROK1)
VBAT_OK_HYST = 1.21V * (1 + (6.65M + 1.24M)/4.99M) = 3.6V
VOUT (Output voltage):
VOUT = 1.21V * (1 + ROUT2/ROUT1)
VOUT = 1.21V * (1 + 0.9M/2.1M) = 3.3V
MPPT (Maximum Power Point Tracking):
VREF_SAMP = VIN_DC(OC) * (ROC2 / (ROC1 + ROC2))
3.35V = 4.15V * (2M / (8M + 2M))

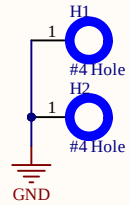




Title		
Power Management		
Size: A4	Number: 5	Revision: v1.0
Date: 10/24/2024	Sheet of	Low Self Esteam
File: C:\Users\..\Power.SchDoc	Drawn By:	Parth Thakkar

Mechanical Switches

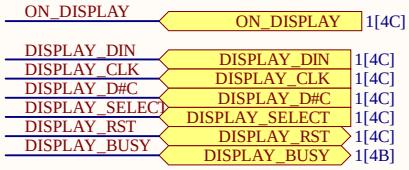


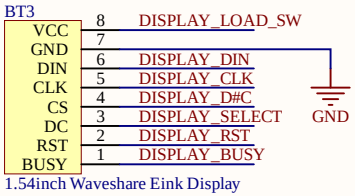


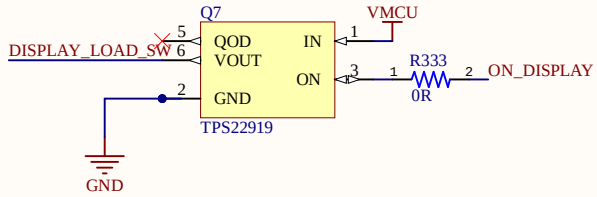
Mechanical Holes

Title: Mechanical Switches		
Size: A	Number: 6	Revision: v1.0
Date: 10/24/2024	Sheet of	Low Self Esteam
File: C:\Users\..\Switches.SchDoc	Drawn By:	Parth Thakkar

DISPLAY





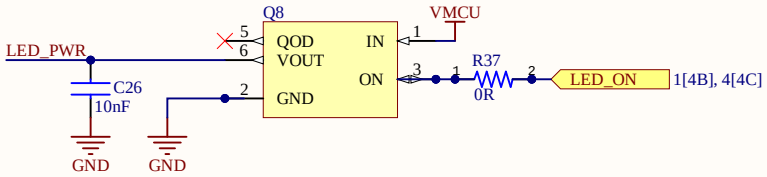


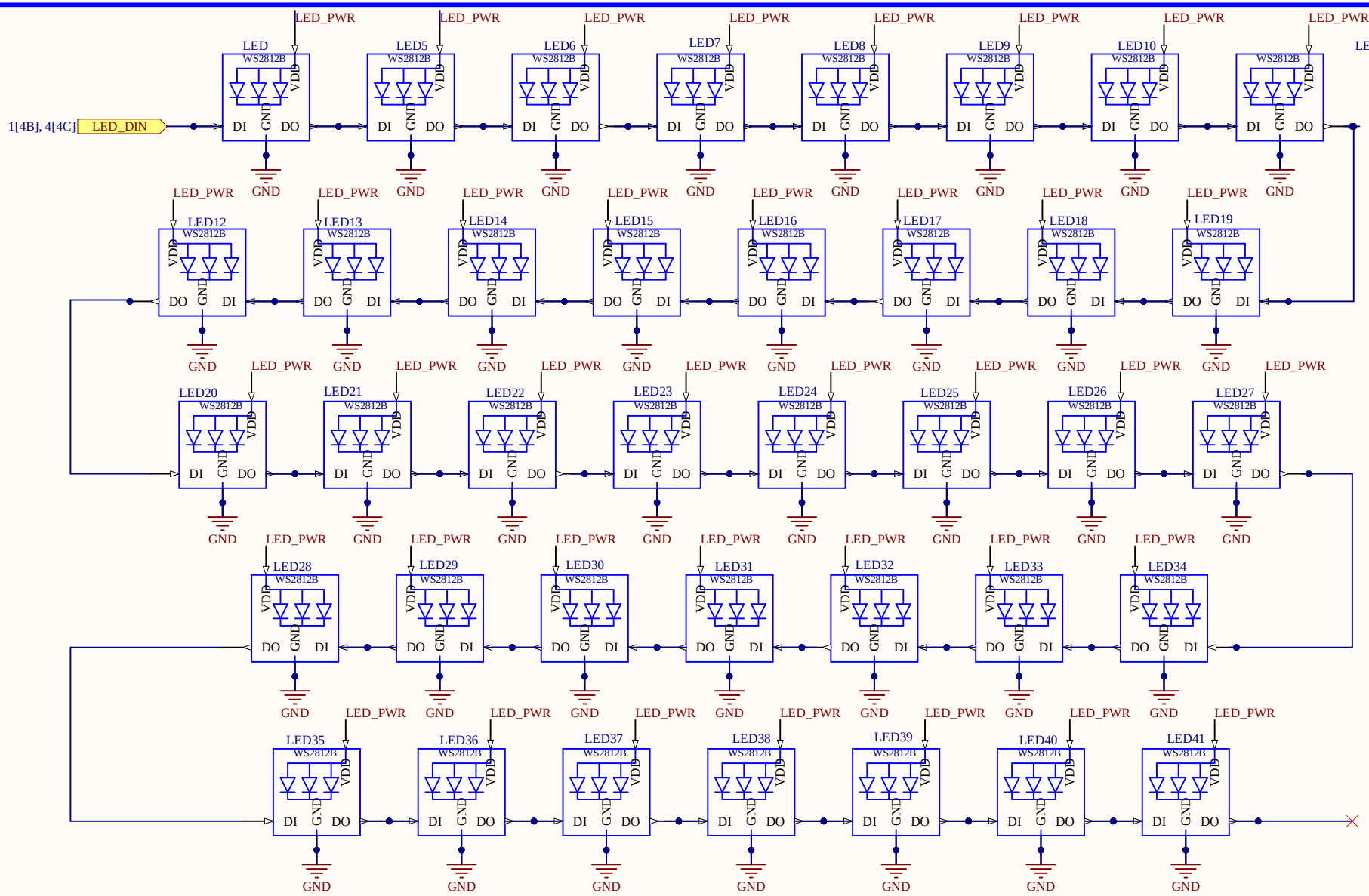
Waveshare's e 1.5inch e-Paper V2

Parameter	Test condition	Min	Typ	Max	
VDD		2.2		3.7	V
Operating temp		-40		105	degC
Current during update			0.0015	0.008	A
Sleep current				0.000002	A
Refresh time				2	s

Title	Display		
Size: A	Number: 7	Revision: v1.0	
Date: 10/24/2024	Sheet of	Insane Corp	
File: C:\Users\..\Display.SchDoc	Drawn By:	Parth Thakkar	

Load Switch

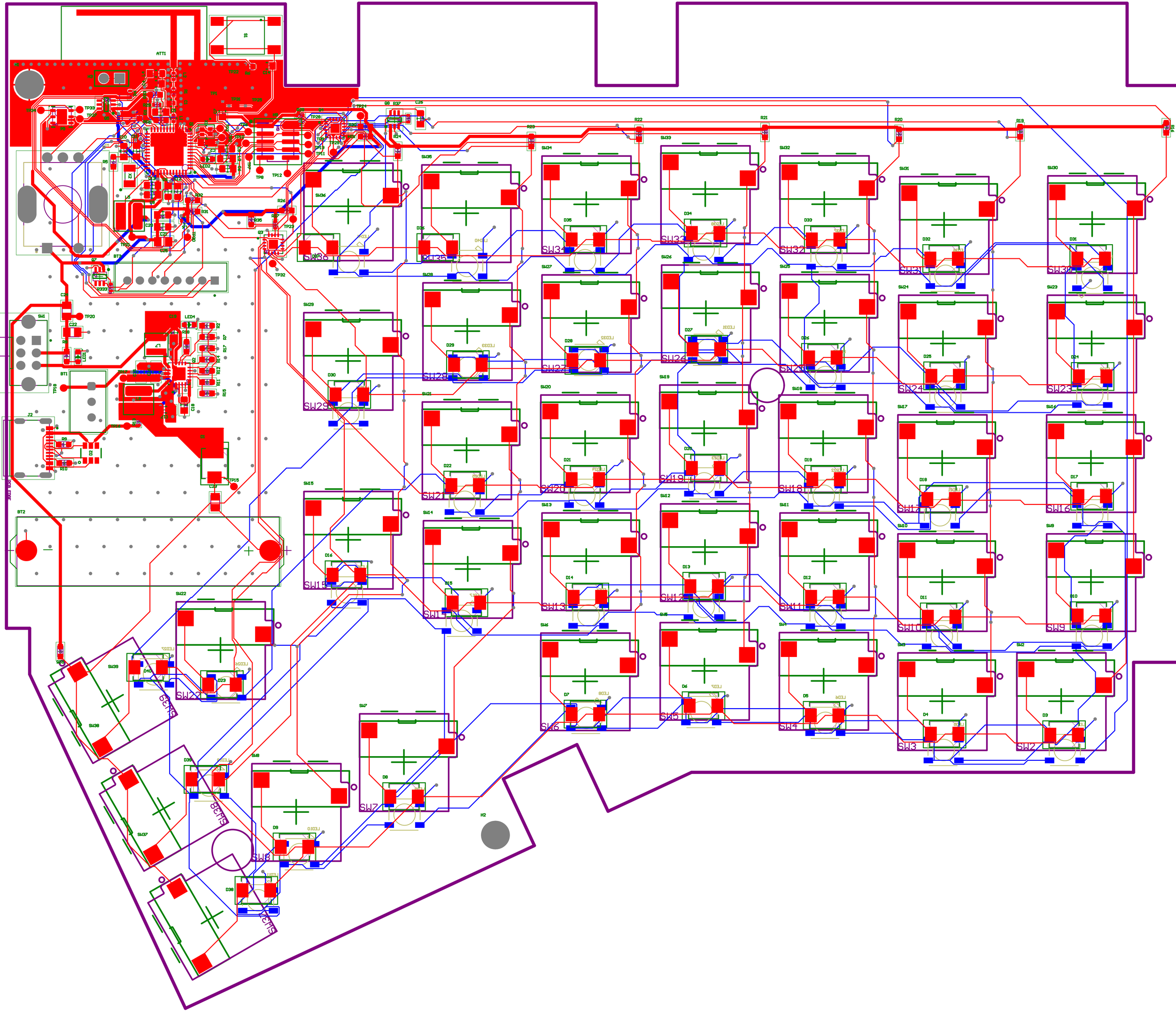




RGB LEDS

Title	*	
Size: Letter	Number: 8	Revision: *
Date: 10/24/2024		Sheet of *
File: C:\Users\..\Lights.SchDoc		Drawn By: *

Comment	Description	Designator	Footprint	LibRef	Quantity	Value	Manufacturer Part Number	Packaging	Case/Package
Battery 1000mAh	Batt Lith-ion 3.7V 1.05AH 404852	BT1	Battery	Battery 1000mAh	1		BL1200P40544815 1PCAC		
Solar Panel	Monocryst Solar Cell 184MW 4.15V	BT2	Solar panel	Solar Panel	1		SM141K06L		
1.54inch Waveshare Eink Display	No backlight, keeps displaying last content for a long time even when power down Ultra low power consumption, basically power is only required for refreshing SPI interface, for connecting with controller boards like Raspberry Pi/Arduino/Nucleo, etc. Onboard voltage translator, compatible with 3.3V/5V MCUs Comes with development resources and manual (examples for Raspberry Pi/Jetson Nano/Arduino/STM3	BT3	1.54inch waveshare eink	1.54inch Waveshare Eink Display	1				
CAP 1.5pF 50V 0402	Ceramic Capacitor, Multilayer, Ceramic, 50V, 3.33% +Tol, 3.33% -Tol, C0G, 30ppm/Cel TC, 0.0000015uF, Surface Mount, 0402	C1	Capacitor 0402	CAP 1.5pF 50V 0402	1	1.5pF	GJM1555C1H1R5 WB01D	Tape and Reel	0402
CAP 100pF 100V 0603	Ceramic Capacitor, Multilayer, Ceramic, 100V, 5% +Tol, 5% -Tol, C0G, 30ppm/Cel TC, 0.0001uF, Surface Mount, 0603	C2, C3	Capacitor 0603	CAP 100pF 100V 0603	2	100pF	GCM1885C2A101J A16D	Tape and Reel	0603
CAP 220nF 50V 0603	Ceramic Capacitor, Multilayer, Ceramic, 50V, 10% +Tol, 10% -Tol, X7R, 15% TC, 0.22uF, Surface Mount, 0603	C4	Capacitor 0603	CAP 220nF 50V 0603	1	220nF	GRM188R71H224K AC4D	Tape and Reel	0603
CAP 10pF 50V 0603	Ceramic Capacitor, Multilayer, Ceramic, 100V, 5% +Tol, 5% -Tol, C0G, 30ppm/Cel TC, 0.00001uF, Surface Mount, 0603	C5	Capacitor 0603	CAP 10pF 50V 0603	1	10pF	GRM1555C1H100F A01D	Tape and Reel	0402
CAP 4.7uF 25V 0603	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 4.7uF, Surface Mount, 0603	C6, C15, C17	Capacitor 0603	CAP 4.7uF 25V 0603	3	4.7uF	GRT188R61E475KE 13D	Tape and Reel	0603
CAP 10uF 10V 0603	Ceramic Capacitor, Multilayer, Ceramic, 10V, 20% +Tol, 20% -Tol, X5R, 15% TC, 10uF, Surface Mount, 0603	C7, C10	Capacitor 0603	CAP 10uF 10V 0603	2	10uF	GRM188R61A106 ME69D	Tape and Reel	0603
CAP 1uF 10V 0603	Ceramic Capacitor, Multilayer, Ceramic, 10V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0603	C8, C12, C13, C14	Capacitor 0603	CAP 1uF 10V 0603	4	1uF	GRM188R61A105K A61D	Tape and Reel	0603
CAP 0.1uF 100V 0603	Ceramic Capacitor, Multilayer, Ceramic, 100V, 10% +Tol, 10% -Tol, X7R, 15% TC, 0.01uF, Surface Mount, 0603	C9, C20, C21, C26	Capacitor 0603	CAP 0.1uF 100V 0603	4	10nF	GCM188R72A103K A37D	Tape and Reel	0603
CAP 10nF 100V 0603	Ceramic Capacitor, Multilayer, Ceramic, 100V, 10% +Tol, 10% -Tol, X7R, 15% TC, 0.01uF, Surface Mount, 0603	C11, C16, C18	Capacitor 0603	CAP 10nF 100V 0603	3	10nF	GCM188R72A103K A37D	Tape and Reel	0603
22uF 10V X5R 0603	Ceramic Capacitor, Multilayer, Ceramic, 6.3V, 20% +Tol, 20% -Tol, X5R, 15% TC, 22uF, Surface Mount, 0603	C19	Capacitor 0603	CAP 22uF 6.3V 0603	1	22uF	GRM188R61A226 ME15D	Reel	0603
CAP 47uF 10V 0805	Multilayer Ceramic Capacitors MLCC - SMD/SMT 0805 47uF 10volts *Derate Voltage/Temp	C22, C23, C24, C25	CAPACITOR 0805	CAP 47uF 10V 0805	4	47uF	GRM21BR61A476 ME15K	Tape and Reel	0805
Diode Schottky	Rectifier Diode, Schottky, 1 Phase, 1 Element, 1A, 15V V(RRM), Silicon, DO-214BA	D1, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28, D29, D30, D31, D32, D33, D34, D35, D36, D37, D38, D39, D40	Diode Schottky	Diode Schottky	39	150pF	LSM115JE3/TR13	10Packaging	
SRV05-4-P-T7	Trans Voltage Suppressor Diode, 300W, 5V V(RWM), Unidirectional, 1 Element, Silicon	D2	TVS	D_TVS_Diode	1	TVS DIODE 5.5V 6TSOP	SRV05-4.TCT		
0.1" M Header	CONN HEADER VERT 2POS 2.54MM	H3	2-PIN_MALE_HEADER_01-IN	PRPC002SAAN-RC	1		PRPC002SAAN-RC	Bulk	
Mini SWD	Mini SWD 0.05" Pitch Connector - 10 Pin SMT Box Header	H9	Mini Simplicity Connector	Debug Connector Mini SWD - 0.05"	1		4048		
Female USB Type C	USB-C (USB TYPE-C) Receptacle Connector 24 (6+18 Dummy) Position Surface Mount, Right Angle; Through Hole	J2	Type C	USB-C Power Connector	1		USB4125-GF-A_REVA2		
1.9nH	Inductor Chip 1.9nH 0.3nH Tolerance 2-Pin 0402 Paper T/R	L1, L2	Ferrite 0402	IND 1.9nH 0402	2	1.9nH	LQG15WZ1N9S02 D		0402
Ferrite Bead 600(601) 1LN	RFVDD, PAVDD, EFR	L3, L4	Ferrite 0603	Ferrite Bead 600(601) 1LN	2		BLM18AG601SN1 D	Tape and Reel	
IND 4.7uH 1515	General Purpose Inductor, 4.7uH, 30%, 1 Element, Ferrite-Core, SMD, 1515	L5	IND 22uH (1.6x4.3)	IND 4.7uH 1515	1		744031004	Tape and Reel	
Farrite Bead 102(1k)	Ferrite Chip, 1 Function(s), 0.05A, 2 Pin(s)	L6	Ferrite 0402	Farrite Bead 102(1k)	1		742841210	Tape and Reel	
IND 10uH 1111	General Purpose Inductor, 10uH, 30%, 1 Element, Ferrite-Core, SMD, 1111	L7	IND 10uH (1x3.2)	IND 10uH 1111	1		744029100	Tape and Reel	
IND 22uH 1515	General Purpose Inductor, 22uH, 30%, 1 Element, Ferrite-Core, SMD, 1515	L8	IND 22uH (1.6x4.3)	IND 22uH 1515	1		744031220	Tape and Reel	
GRN 0603	LED, 0603, GREEN, 430MCD, 520NM	LED1, LED2, LED4	LED 0603	LED Green 0603	3		150060GS75000	Tape & Reel (TR)	
WS2812B	Raspberry Pi HAT _40 pin_ Wheeled Robotics Kit	LED, LED5, LED6, LED7, LED8, LED9, LED10, LED11, LED12, LED13, LED14, LED15, LED16, LED17, LED18, LED19, LED20, LED21, LED22, LED23, LED24, LED25, LED26, LED27, LED28, LED29, LED30, LED31, LED32, LED33, LED34, LED35, LED36, LED37, LED38, LED39, LED40, LED41	WS2812B	WS2812B	38				
Rotery Encoder	Rotary Position Encoder, Single, 2 Channels	MT1	Rotery Encoder	Rotery Encoder	1		PEC12R-4222F-S0024		
EFR32BG13P632F512GM32-DR	BLue Gecko	Q1	EFR32BG	EFR32BG13P632F512GM32-DR	1		EFR32BG13P632F5 12GM32-DR		
BQ25570RGRR	Power Supply Support Circuit, Adjustable, 1 Channel, PQCC20	Q2	BQ25570RGRR	BQ25570RGRR	1		BQ25570RGRR		HVQCCN
TCA6408ARGTR	Parallel I/O Port, 8-Bit, 8 I/O, CMOS, PQCC16	Q3, Q4	TCA6408ARGTR - IO Expander	TCA6408ARGTR	2		TCA6408ARGTR		HVQCCN
TPS22919	Buffer/Inverter Based Peripheral Driver, 3A, PDSO6	Q5, Q7, Q8	TPS22919DCKR - Load SW	TPS22919	3		TPS22919DCKT		
SI7021-A20-GM1R	Serial Switch/Digital Sensor, 14 Bit(s), 0.40Cel, Square, Surface Mount	Q6	Si7021-A20 - Temp	SI7021-A20-GM1R	1		SI7021-A20-GM1R		
RES 0R 0402	Metal Glaze/thick Film, 0.0625W, 0ohm, Surface Mount, 0402	R1, R4, R13, R27, R28, R29, R37, R333	Resistor 0402	RES 0R 0402	8	0R	RC0402JR-070RL	Tape and Reel	0402
RES 8.2M 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 8200000ohm, 75V, 5% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R2	Resistor 0603	RES 8.2M 0603	1	8.2MR	RC0603JR-078M2L	Tape and Reel	0603
RES 330K 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 330000ohm, 75V, 5% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R3	Resistor 0603	RES 330K 0603	1	330kR	RC0603JR-07330KL	Tape and Reel	0603
RES 1R 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 1ohm, 75V, 1% +/-Tol, 200ppm/Cel, Surface Mount, 0603	R5	Resistor 0603	RES 1R 0603	1	1R	RC0603FR-071RL	Tape and Reel	0603
RES 100R 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 100ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R6, R8, R18	Resistor 0603	RES 100R 0603	3	100R	RC0603FR-07100RL	Tape and Reel	0603
RES 4.75M 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 4750000ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R7	Resistor 0603	RES 4.75M 0603	1	4.75MR	RC0603FR-074M75L	Tape and Reel	0603
RES 5.1K 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 5100ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R9, R10	Resistor 0603	RES 5.1K 0603	2	5.1kR	RC0603FR-075K1L	Tape and Reel	0603
RES 7.32M 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 7320000ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R11	Resistor 0603	RES 7.32M 0603	1	7.32MR	RC0402FR-077M32L	Tape and Reel	0402
RES 1.24M 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 1240000ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R12	Resistor 0603	RES 1.24M 0603	1	1.24MR	RC0603FR-071M24L	Tape and Reel	0603
RES 6.65M 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 6650000ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R14	Resistor 0603	RES 6.65M 0603	1	6.65MR	CRCW06036M65F KEA	Tape and Reel	0603
RES 5.62M 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 5620000ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R15	Resistor 0603	RES 5.62M 0603	1	5.6MR	RC0603JR-075M6L	Tape and Reel	0603
RES 10K 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 10000ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R16, R19, R20, R21, R22, R23, R24, R25, R26, R30, R31, R32, R33, R34, R35, R36	Resistor 0603	RES 10K 0603	16	10kR	RC0603FR-0710KL	Tape and Reel	0603
RES 4.99M 0603	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 4990000ohm, 75V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0603	R17	Resistor 0603	RES 4.99M 0603	1	4.99MR	RC0603FR-074M99L	Tape and Reel	0603
SPST	Keypad Switch, 1 Switches, SPST, Momentary-tactile, 0.05A, 50VDC, 2.55N, Solder Terminal, Surface Mount-straight	S1	SPST	SPST	1		TL3301NF260QG	Tape and Reel	
DPDT	Slide Switch, DPDT, Latched, Solder Terminal, Through Hole-right Angle	SW1	DPDT	DPDT	1		EG2208		
Gateron G Pro 2.0	Gateron G Pro 2.0, The 3-Pin switches are compatible with any 3-Pin/5-Pin MX mechanical keyboard	SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10, SW11, SW12, SW13, SW14, SW15, SW16, SW17, SW18, SW19, SW20, SW21, SW22, SW23, SW24, SW25, SW26, SW27, SW28, SW29, SW30, SW31, SW32, SW33, SW34, SW35, SW36, SW37, SW38, SW39	Mechanical Switch	Gateron G Pro 2.0	38				
XTAL 38.4MHz	Crystal 38.4000MHZ 10PF SMD	X1	XTAL 38.4MHz	XTAL 38.4MHz	1		XRCGB38M400F1S 3JR0		
32.768kHz	Parallel - Fundamental Quartz Crystal, 0.032768MHz Nom	X2	XTAL_32.768KHZ-T	XTAL 32.768kHz	1		ABS07-32.768KHZ-T		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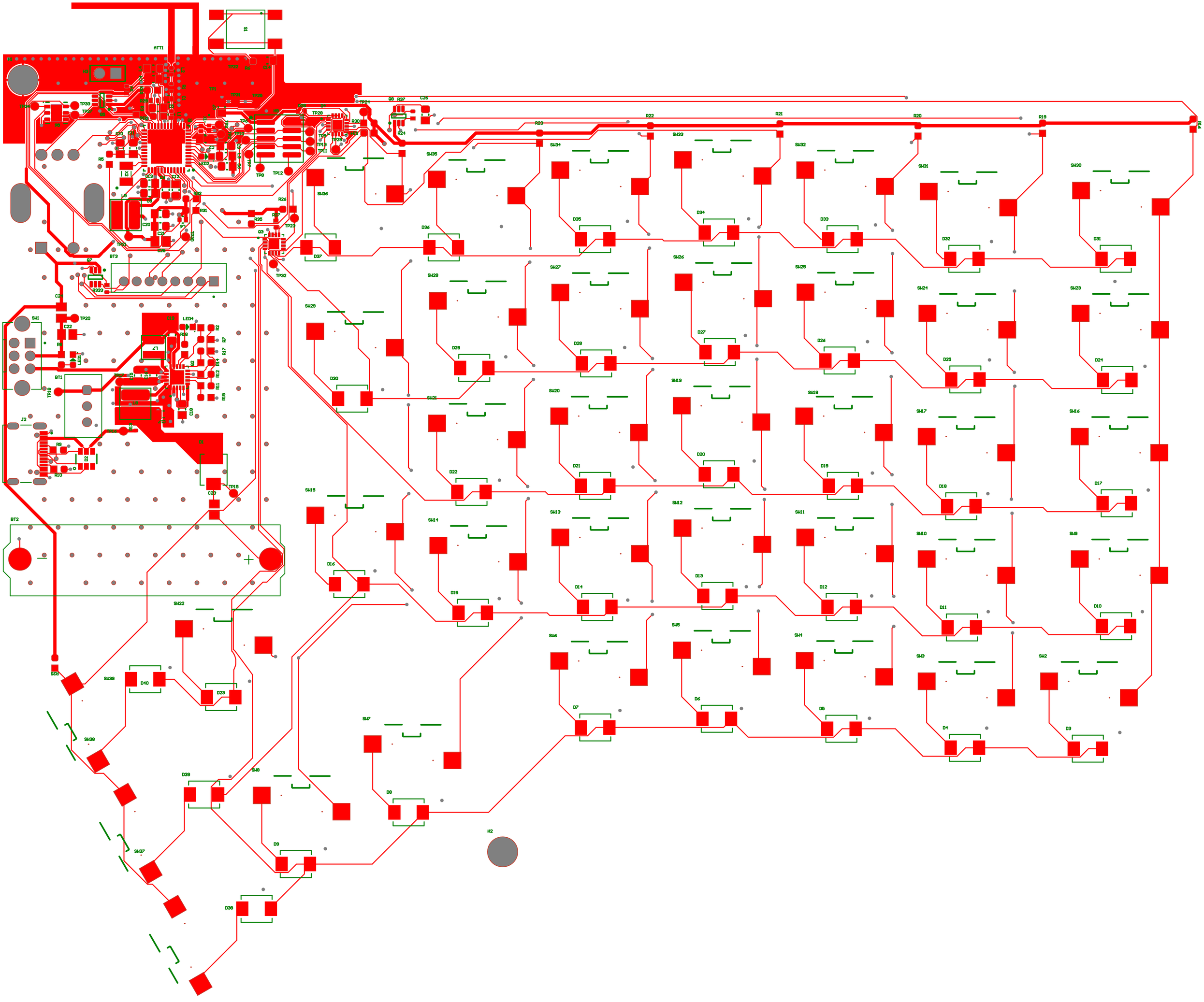
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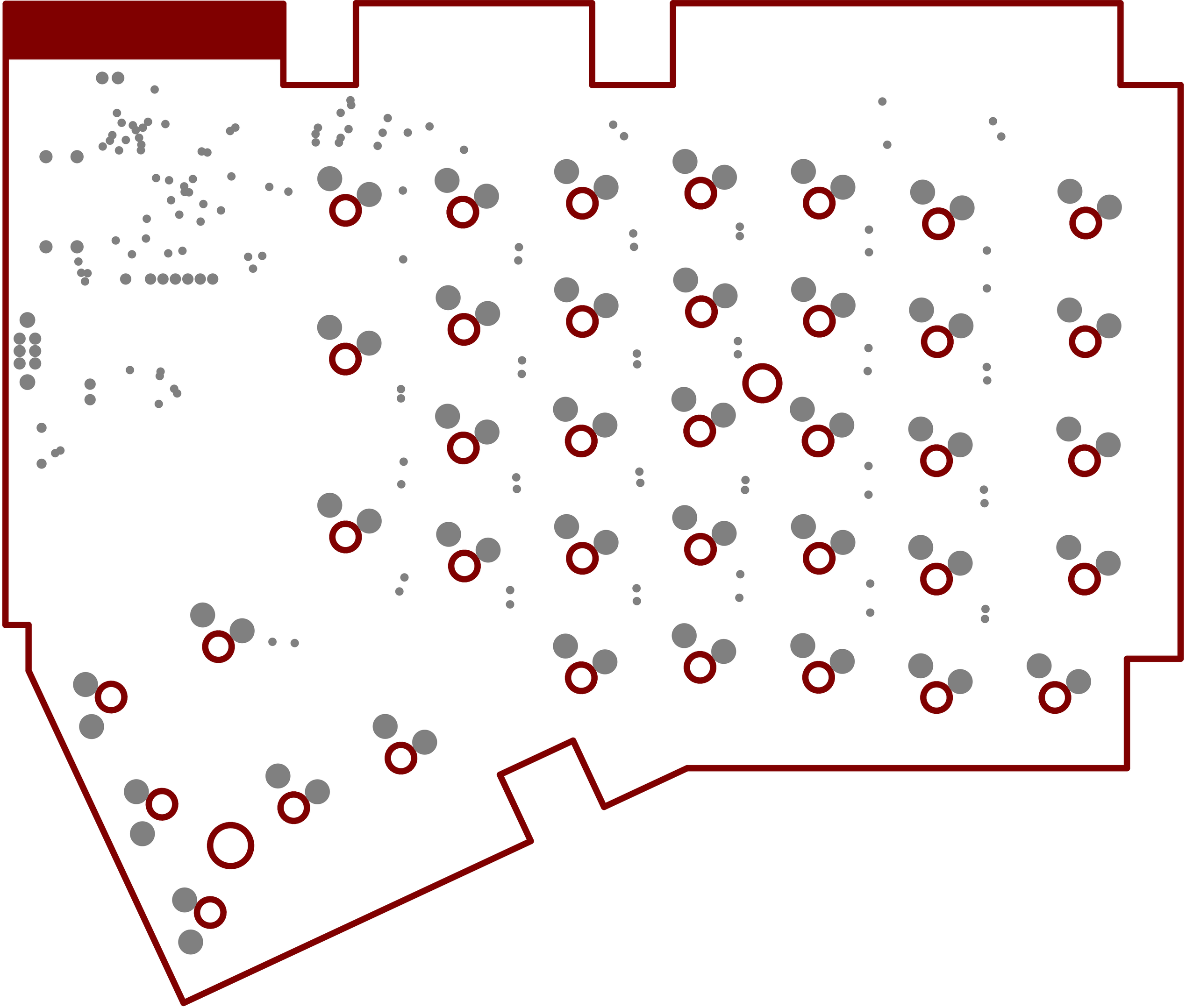

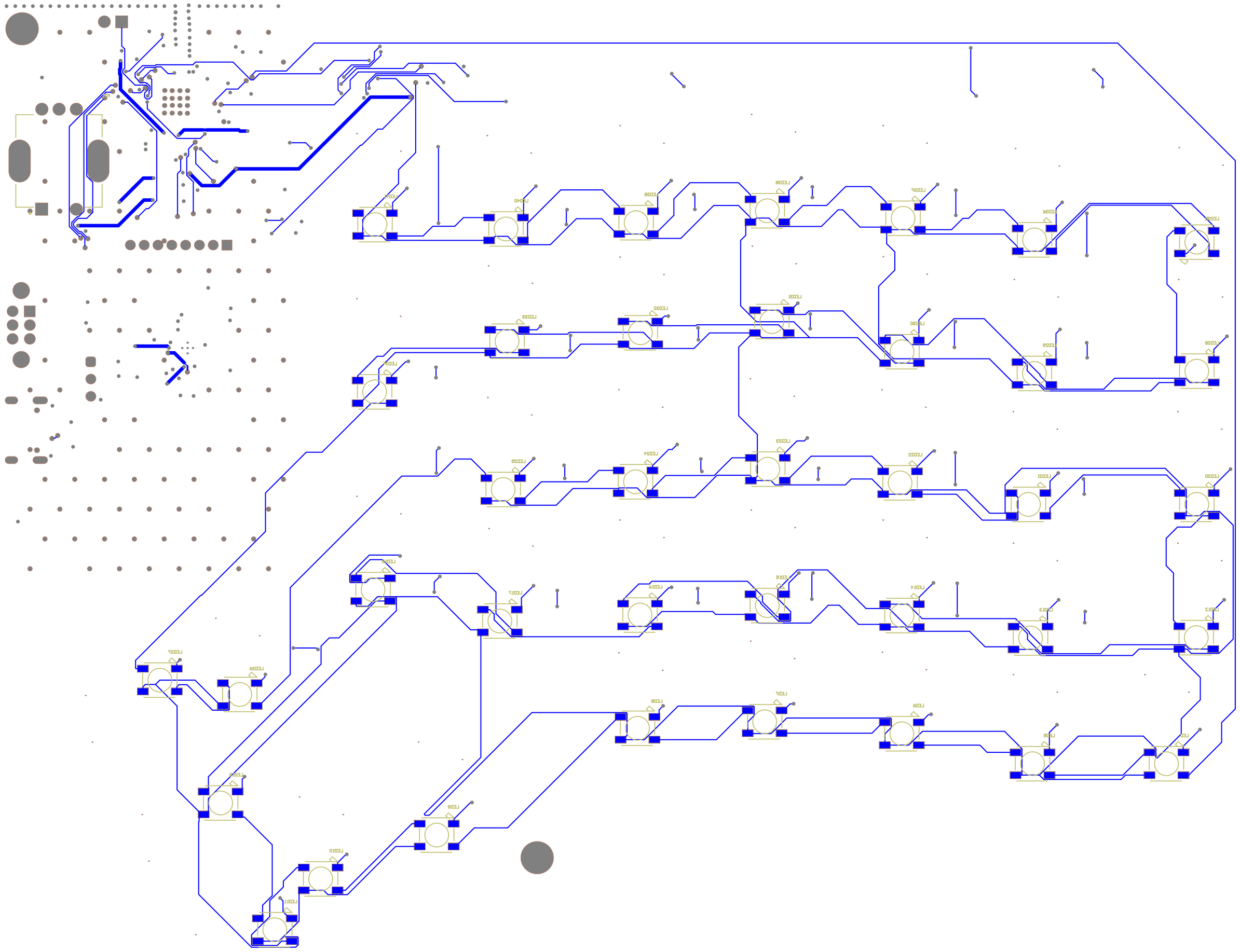


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