

BLINKIN  
LABS

maxim  
integrated

DIODES

RELEASE

Page	Index	Page	Index	Page	Index
1	Cover Page	11	.....	21	.....
2	Block Diagram	12	.....	22	.....
3	ESP32	13	.....	23	.....
4	Serial Console	14	.....	24	.....
5	Amplifier	15	.....	25	.....
6	Power Supply	16	.....	26	.....
7	.....	17	.....	27	.....
8	.....	18	.....	28	.....
9	.....	19	.....	29	.....
10	.....	20	.....	30	.....

DESIGN CONSIDERATIONS

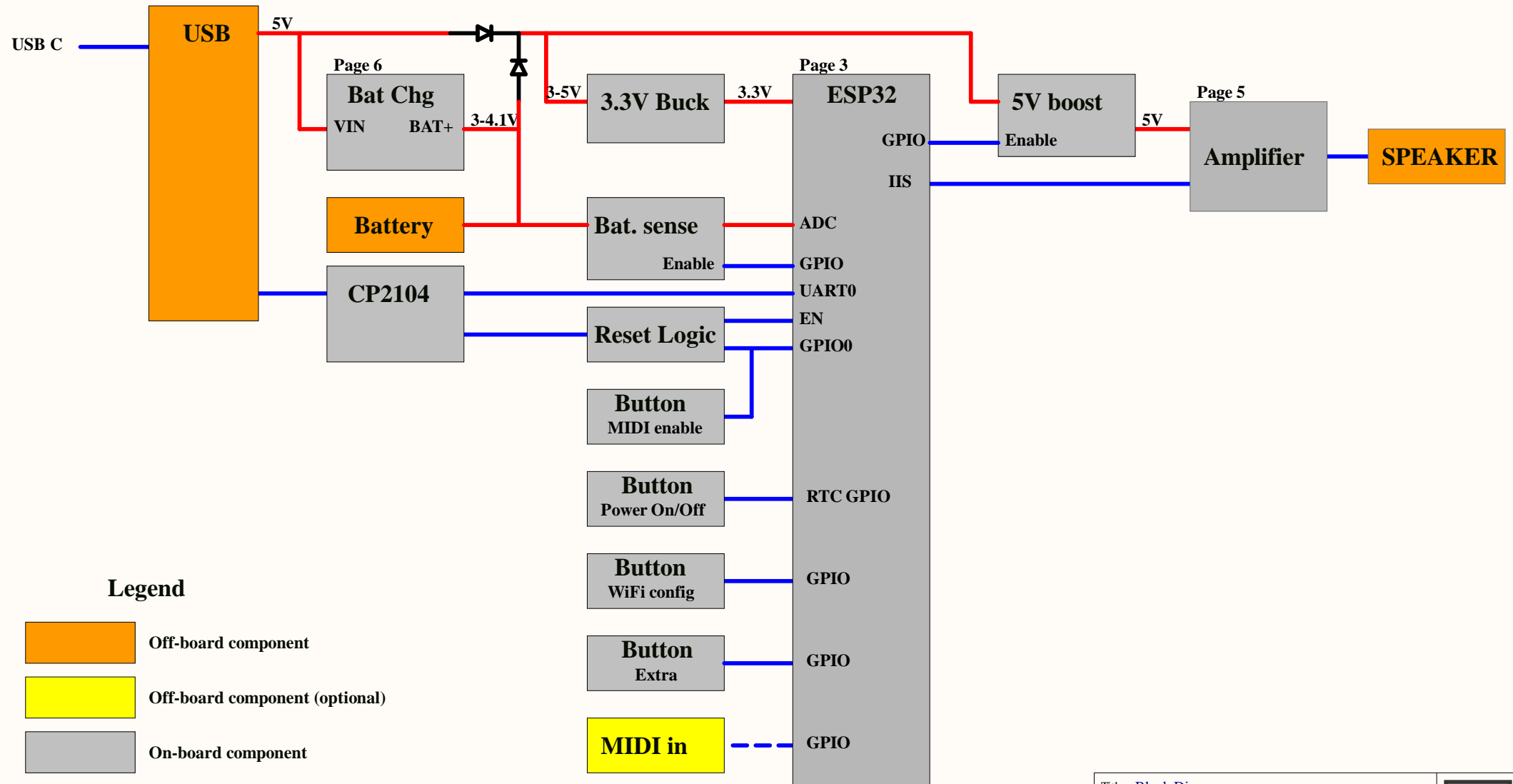
DESIGN NOTE:  
Example text for informational  
design notes .

DESIGN NOTE:  
Example text for critical  
design notes.

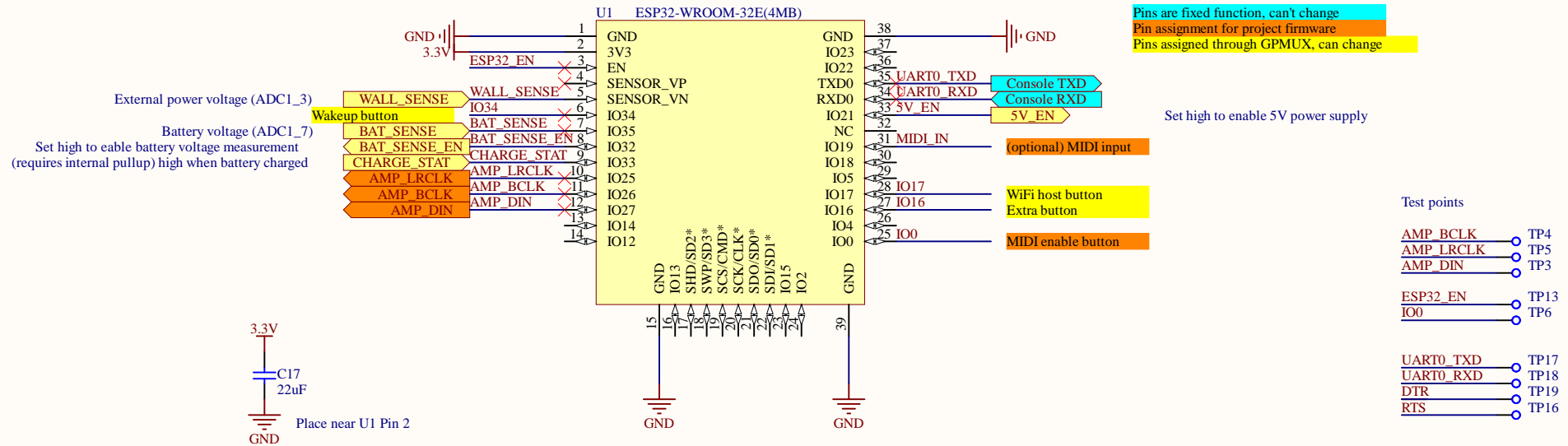
DESIGN NOTE:  
Example text for cautionary  
design notes.

LAYOUT NOTE:  
Example text for critical  
layout guidelines.

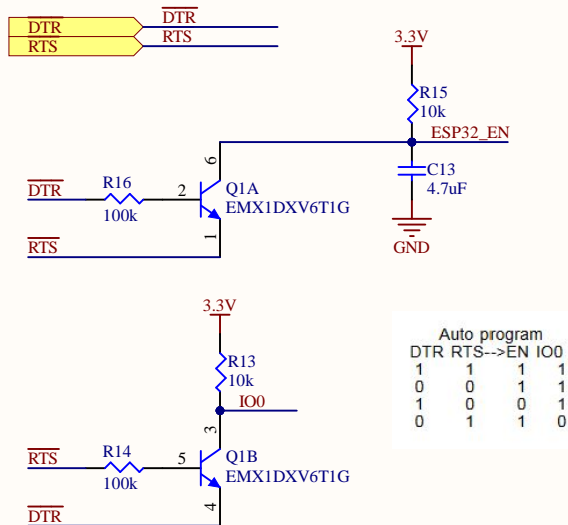
# Alles



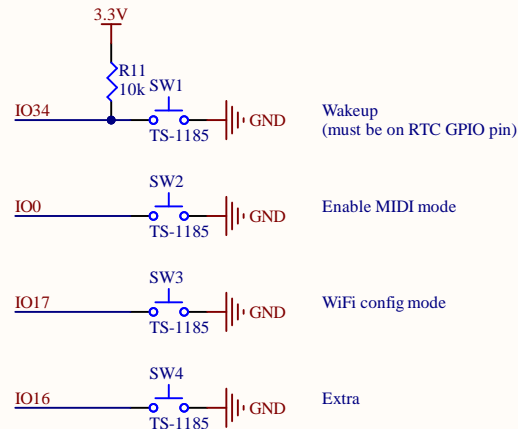
# ESP32



## Auto-reset

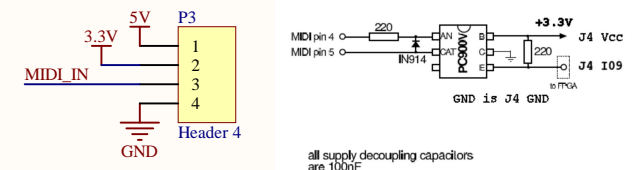



## Configuration buttons



Note: use 2.5mm tall buttons

## Support for optional MIDI input

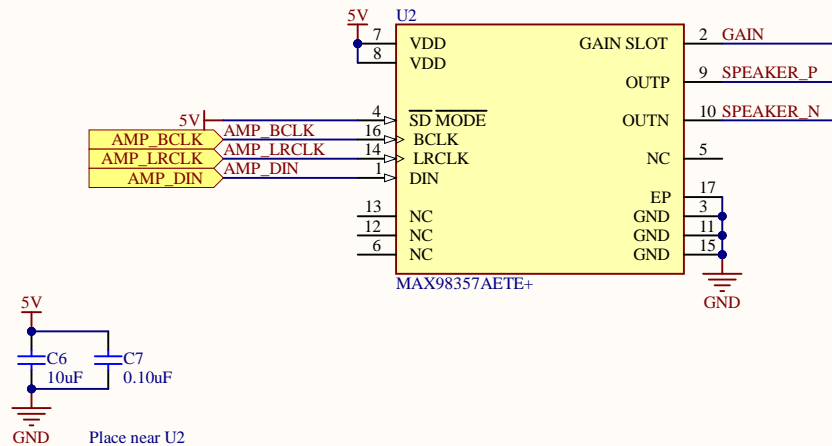


Title: ESP32			
Project: Alles		Revision: RevD	
Date: 10/5/2021	Time: 12:25:17 AM	Sheet 3 of 7	

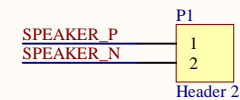


# Amplifier

Amplifier IC



Speaker output header



Amplifier gain

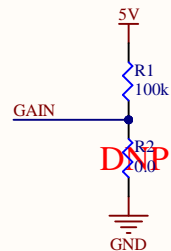


Table 8. Gain Selection

GAIN_SLOT	I <sup>2</sup> S/LJ GAIN (dB)
Connect to GND through 100kΩ ±5% resistor	15
Connect to GND	12
Unconnected	9
Connect to V <sub>DD</sub>	6
Connect to V <sub>DD</sub> through 100kΩ ±5% resistor	3

Note: GAIN tied high in project description, possible to change with resistor jumper

Expected power usage

Quiescent Current	I <sub>DD</sub>	T <sub>A</sub> = +25°C	2.75	3.35	mA
		T <sub>A</sub> = +25°C, V <sub>DD</sub> = 3.7V	2.4	2.85	
Shutdown Current	I <sub>SHDN</sub>	SD_MODE = 0V, T <sub>A</sub> = +25°C	0.6	2	μA
Standby Current	I <sub>STNDBY</sub>	SD_MODE = 1.8V, no BCLK, T <sub>A</sub> = +25°C	340	400	μA

Maximum power calculation:

Speaker is 4ohm  
Gain is set to 6dB

According to the datasheet 'electrical characteristics' table, maximum power output with 12dB setting into 4ohm load is 3.2W. From the 'efficiency vs output power' section, the efficiency with a 4ohm speaker is roughly 80%, so the input power would need to be 4W. Finally, to derate the power output to a 6dB setting, the maximum output would be 1/4 of the 12dB setting, or 1W.

Using that number, the maximum input current to the device with a 5V power supply can be calculated as:

$$P=V*I \text{ so } I = 1/5 = .2A$$

Title: DAC

Project: Alles

Date: 10/5/2021

Time: 12:25:18 AM

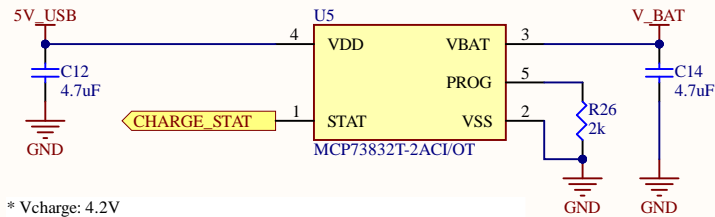
Revision: RevD

Sheet 5 of 7



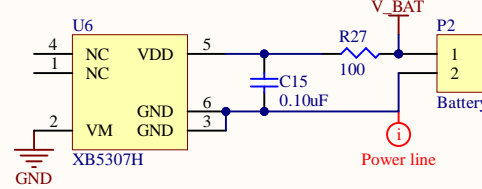
# Power Supply

Battery charger



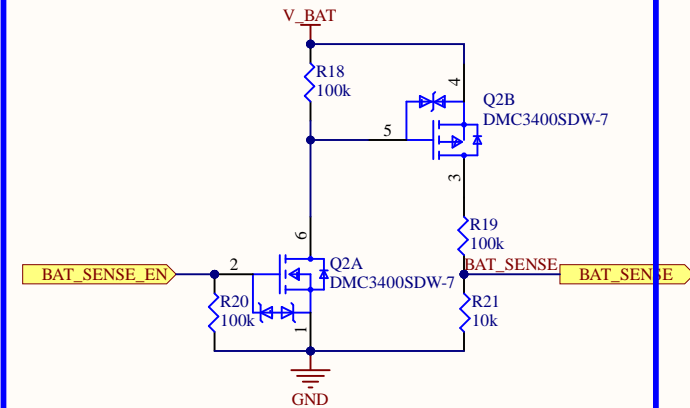
\* Vcharge: 4.2V  
\* max charge current: 500mA @2K reference  
\* STAT is active pull down

Battery protection

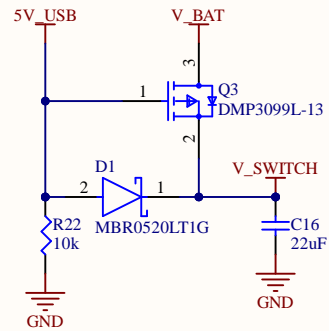


Vovercharge: 4.425V (4.25V release)  
Vunderdischarge: 2.9V (3.0V release)  
Overcurrent: 5A  
Normal power consumption: 2.8uA

Battery sense (enable only when measuring battery)

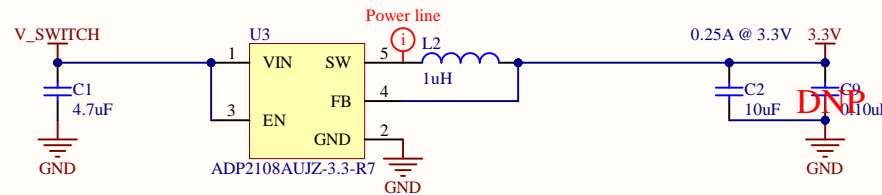


Power in with battery switchover



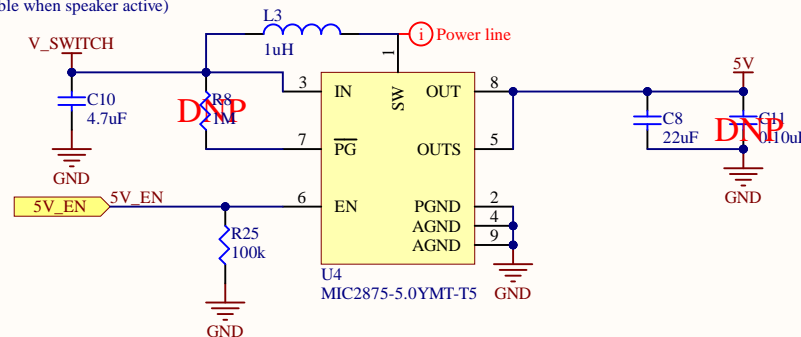
See Microchip App note AN1149

3.3V, low quiescent current supply (always on)

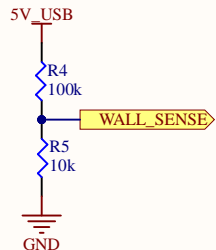


Power draw in hibernation mode:  
\* ADP2108 has 18uA quiescent current  
\* low load efficiency = 88%, esp takes 10uA in deep sleep/hibernate  
\* Total <50uA @battery (verified in RevB)

5V boost (enable when speaker active)



External power sense



Power delivery requirements:

.2A @ 5V (amplifier)  
.25A @ 3.3V (esp32, WiFi TX, periodic)  
.1A @ 3.3V (esp32, WiFi RX)



Title: Power Supply

Project: Alles

Revision: RevD

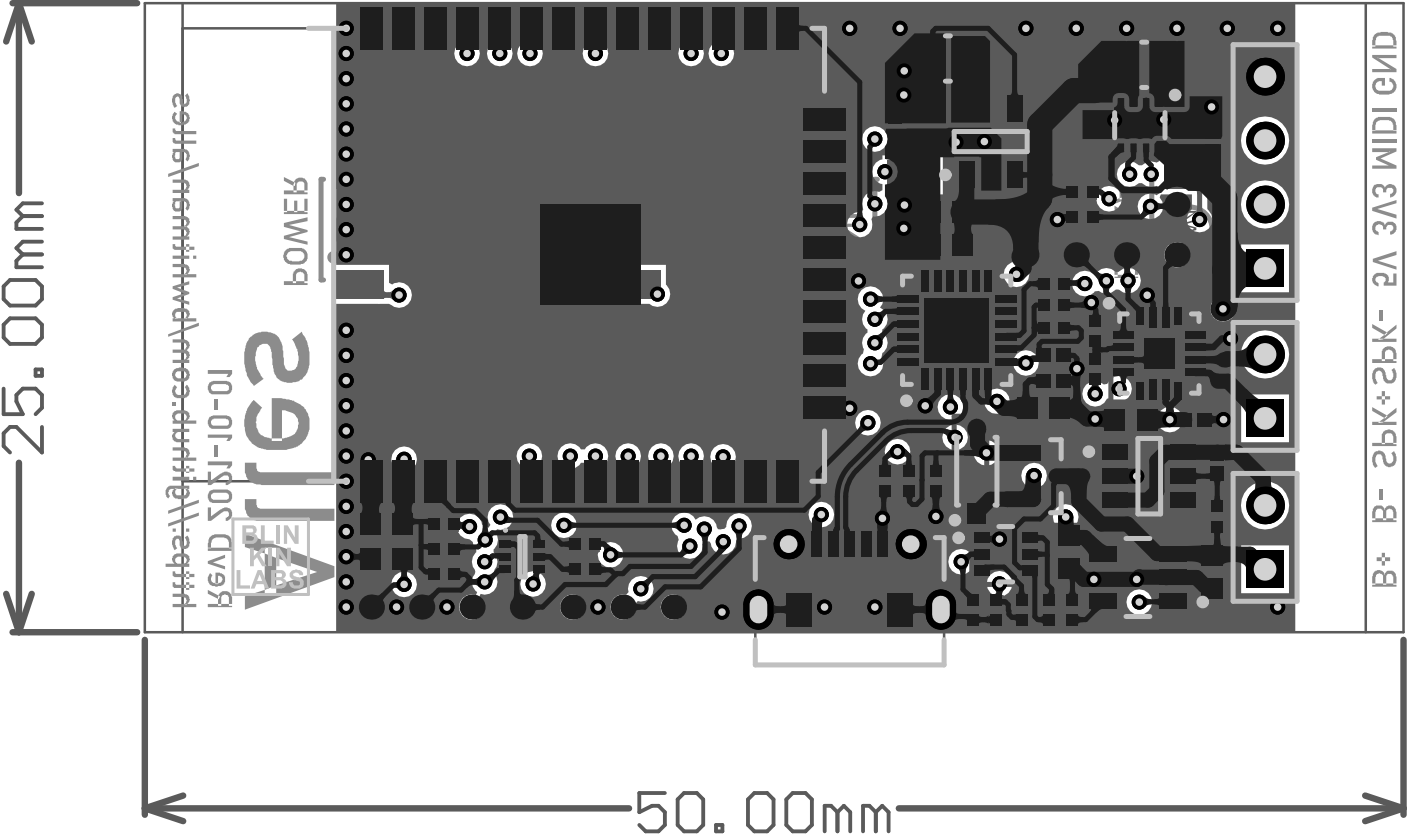
Date: 10/5/2021 Time: 12:25:18 AM

Sheet 6 of 7



	1	2	3	4																
A	<div>Designator [01] cover page.SchDoc</div> <div></div>	<div>Designator [02] Block Diagram.SchDoc</div> <div></div>	<div>Designator [03] ESP32.SchDoc</div> <div></div>	<div>Designator [04] Serial Console.SchDoc</div> <div></div>	<div>Designator [05] Amplifier.SchDoc</div> <div></div>	<div>Designator [06] Power Supply.SchDoc</div> <div></div>	A													
B							B													
C							C													
D						<div>BLIN KIN LABS</div>	D													
	1	2	3	<table><tr><td colspan="2">Title: *</td><td rowspan="3"><div>BLIN KIN LABS</div></td></tr><tr><td>Project:</td><td>Alles.PrjPcb</td></tr><tr><td>Date: 10/5/2021</td><td>Time: 12:25:18 AM</td></tr><tr><td colspan="2"></td><td>Revision: RevD</td></tr><tr><td colspan="2"></td><td>Sheet 7 of 7</td></tr></table>			Title: *		<div>BLIN KIN LABS</div>	Project:	Alles.PrjPcb	Date: 10/5/2021	Time: 12:25:18 AM			Revision: RevD			Sheet 7 of 7	4
Title: *		<div>BLIN KIN LABS</div>																		
Project:	Alles.PrjPcb																			
Date: 10/5/2021	Time: 12:25:18 AM																			
		Revision: RevD																		
		Sheet 7 of 7																		





Layer	Name	Material	Thickness	Constant
	Top Overlay			
	Top Solder	SM-001	0.013mm	4
1	Top Layer	Copper	0.035mm	
	Dielectric 2	PP-022	0.200mm	4.6
2	Layer 1	Copper	0.018mm	
	Dielectric 3	Core-039	0.665mm	4.8
3	Layer 2	Copper	0.018mm	
	Dielectric 4	PP-022	0.200mm	4.6
4	Bottom Layer	Copper	0.035mm	
	Bottom Solder	SM-001	0.013mm	4
	Bottom Overlay			

Total board thickness:

1.197mm

## Design Rules Verification Report

Filename : C:\Users\matt\Blinkinlabs-Repos\alles-pcb\pcb\Alles.PcbDoc

Warnings 0  
Rule Violations 0

Warnings	
Total	0

Rule Violations	
Clearance Constraint (Gap=0.127mm) (InAnyDifferentialPair),(InAnyDifferentialPair)	0
Clearance Constraint (Gap=0.2mm) (All),(All)	0
Short-Circuit Constraint (Allowed=No) (All),(All)	0
Un-Routed Net Constraint ( All )	0
Modified Polygon (Allow modified: No), (Allow shelved: No)	0
Width Constraint (Min=0.2mm) (Max=1mm) (Preferred=0.6mm) (InNetClass('POWER'))	0
Width Constraint (Min=0.2mm) (Max=0.6mm) (Preferred=0.254mm) (All)	0
Power Plane Connect Rule(Relief Connect )(Expansion=0.508mm) (Conductor	0
Width=0.254mm)	0
Hole Size Constraint (Min=0.025mm) (Max=2.54mm) (All)	0
Hole To Hole Clearance (Gap=0.254mm) (All),(All)	0
Net Antennae (Tolerance=0mm) (All)	0
Component Clearance Constraint ( Horizontal Gap = 0.254mm , Vertical Gap = 0.254mm )	0
Height Constraint (Min=0mm) (Max=25.4mm) (Preferred=12.7mm) (All)	0
Total	0

## Electrical Rules Check Report

Class	Document	Message
Warning	[03] ESP32.SchDoc	5V_EN contains IO Pin and Output Port objects (Pin U1-33, Port 5V_EN).
Warning	[03] ESP32.SchDoc	BAT_SENSE_EN contains IO Pin and Output Port objects (Pin U1-8, Port BAT_SENSE_EN).
Warning	[03] ESP32.SchDoc	CHARGE_STAT contains IO Pin and Input Port objects (Pin U1-9, Port CHARGE_STAT).
Warning	[06] Power Supply.SchDoc	Floating Power Object 3.3V at (8600mil,2200mil)
Warning	[06] Power Supply.SchDoc	Floating Power Object 5V at (8600mil,2400mil)
Warning	[06] Power Supply.SchDoc	Floating Power Object 5V_USB at (8600mil,2800mil)
Warning	[06] Power Supply.SchDoc	Floating Power Object GND at (8600mil,1800mil)
Warning	[06] Power Supply.SchDoc	Floating Power Object V_BAT at (8600mil,2000mil)
Warning	[06] Power Supply.SchDoc	Floating Power Object V_SWITCH at (8600mil,2600mil)
Warning	[04] Serial Console.SchDoc	Net USB_RESET has no driving source (Pin R3-1, Pin U15-9)

