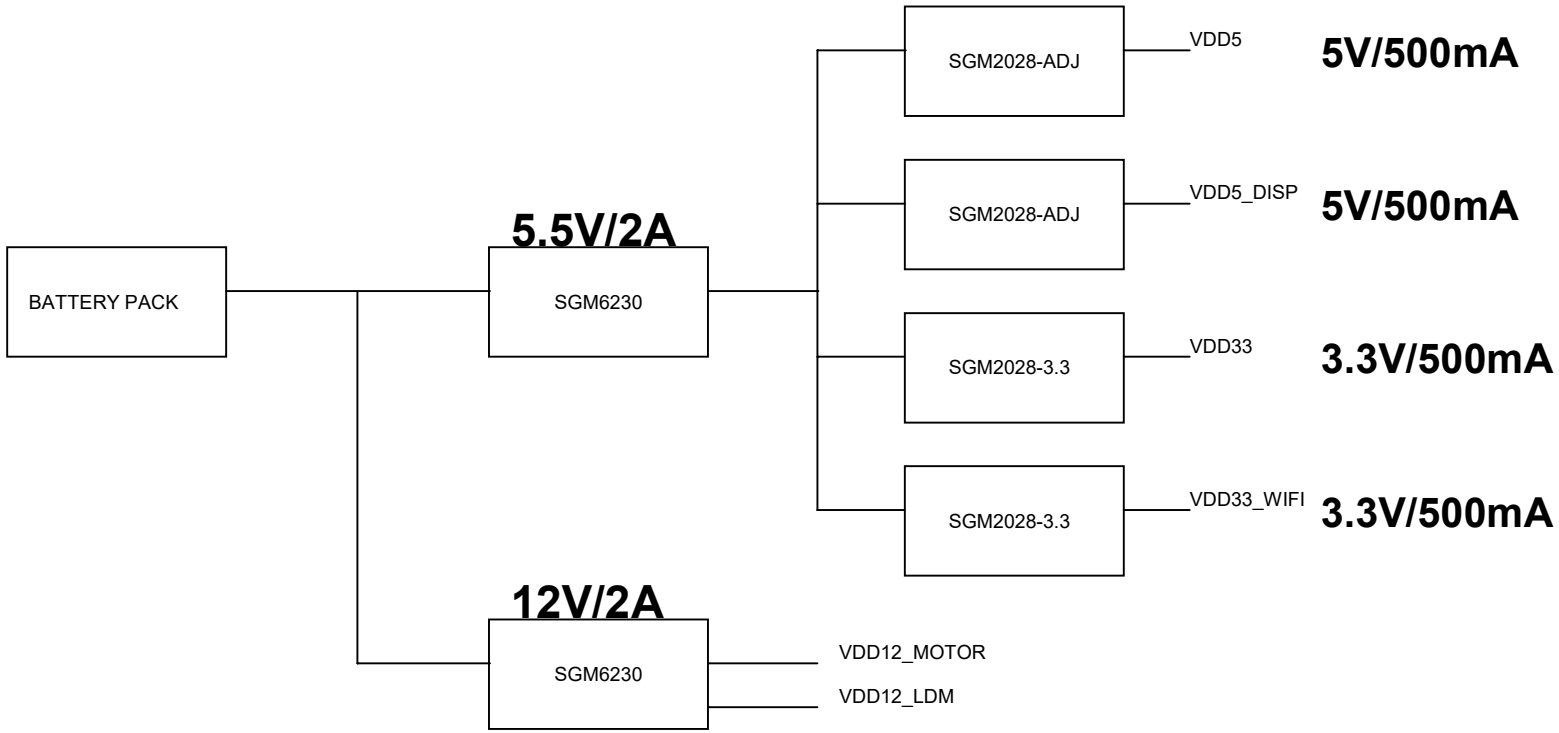
TELECTRICIAN

ALL-IN-ONE



Title	0-POWER-TREE	
Size A	Document Number FLASH LIGHT	Rev A1
Date: Friday, January 07, 2022	Sheet 1 of 1	

18650 Battery Pack (3.7V~4.2V)*8S=29.6V~33.6V

OVER VOLTAGE PROTECTION AND ANTI-REVERSE CONNECTION

VEN=2K/(20K+2K)*Vin=2.69V~3.0545V

P-MOSFET
VGS(th)=-1.5(Min), -2.6(Typ), -3.5(Max)
@VDS=VGS,ID=-250μA

VEN<6V

0.8V

VGS=±20V(Max)
R
=(29.6V~33.6V-5.1V)/5mA
=4.9K~5.7K

Ic=(33.6V-Vce)/5.49K=(29.6V~33.6V-0.5V)/5.49K=5.3mA~6mA

VFB=0.8V=(6.28K/(33K+6.28K))*Vout
Vout=5.5V

ZENER DIODE
Forward Voltage Drop@IF10mA,VF=0.9V
Zener Voltage Vz=34.2(min)~37.8(max)
Izt=5mA,90-ohms
Izk=1mA,250-ohms

IDZ=IR+IL=(Vin-Vz)/R-IL=(38V-36V)/IR+IL
1mA<=IDZ<=5mA
Assume IL=0mA,then
IDZ=2/IR=1mA, IR=2000-ohms=2K-ohms
IDZ=2/IR=5mA, IR=400-ohms
400-ohms<=IDZ<=2K-ohms

PNP TRANSISTOR
IB=(38V-VBE-36V)/200=(38-0.6-36)/200=7mA

500mA, Ultra-Low Dropout,Low Power, RF Linear Regulator
Input Voltage: 2.5V(Min)~5.5V(Max)
Dropout Voltage
54~90mV(Max)@Iout=100mA
162~270mV(Max)@Iout=300mA
270~420mV(Max)@Iout=500mA

Equation: R1=R2*(Vout/1.206V-1)
Choose R2=47K-ohms
So,R1=47k*(5V/1.206V-1)=147.859k
We choose 147k from EIA resistor codes,
So verification below
Vout=1.206*(R1/R2+1)=4.97795V

5V/500mA
OLED+CMOS

12V/2A

VFB=0.8V=(2.37K/(33K+2.37K))*Vout
Vout=11.94V

3.3V/500mA
WiFi-UART

To reach the full scale,
here we suppose the maximum voltage is 4V.
So equation calculation below
V=(16.2K/(16.2K+16.2K))*4V=2V

To reach the full scale,
here we suppose the maximum voltage is 6V.
So equation calculation below
V=(8.25K/(16.2K+8.25K))*6V=2.025V

2V

2.025V

Gain=1

Gain=1

SGM58031 (-40℃ to +125℃)
Ultra-Small, Low-Power, 16-Bit ADC with Internal Reference

VDD = 3.3V, Full-Scale (FS) = ±2.048V
Internal Reference=2.048V
Full-Scale Input Voltage Vin=(AIN+)-(AIN-), Type: ±4.096/PGA
Analog Input Voltage AIN+ or AIN- to GND: GND(min)-VDD(max)

FS=2.048V

ADDR=GND,So Slave address=1001000

Standard mode:100kHz
Fast mode :400kHz
High-speed mode:3.4MHz

When in continuous conversion mode,
he SGM58031 provides a brief (8μs) pulse on the ALERT/RDY pin at the end of each conversion.

When in single-shot shutdown mode,
the ALERT/RDY pin asserts low at the end of a conversion if the COMP_POL bit is set to '0',
and clears ALERT/RDY pin by next conversion.

Gain=2 @ CCS Mode
Gain=1 @ CVS Mode

Gain=2 @ CCS Mode
Gain=1 @ CVS Mode

Voltage Divider Network for CVS Mode

For potential high voltage input
Enable DNP if input exceed threshold.

NON-INVERTING AMPLIFIER
Gain=1+Rf/Rin
Input Impedance=Rf//Rin

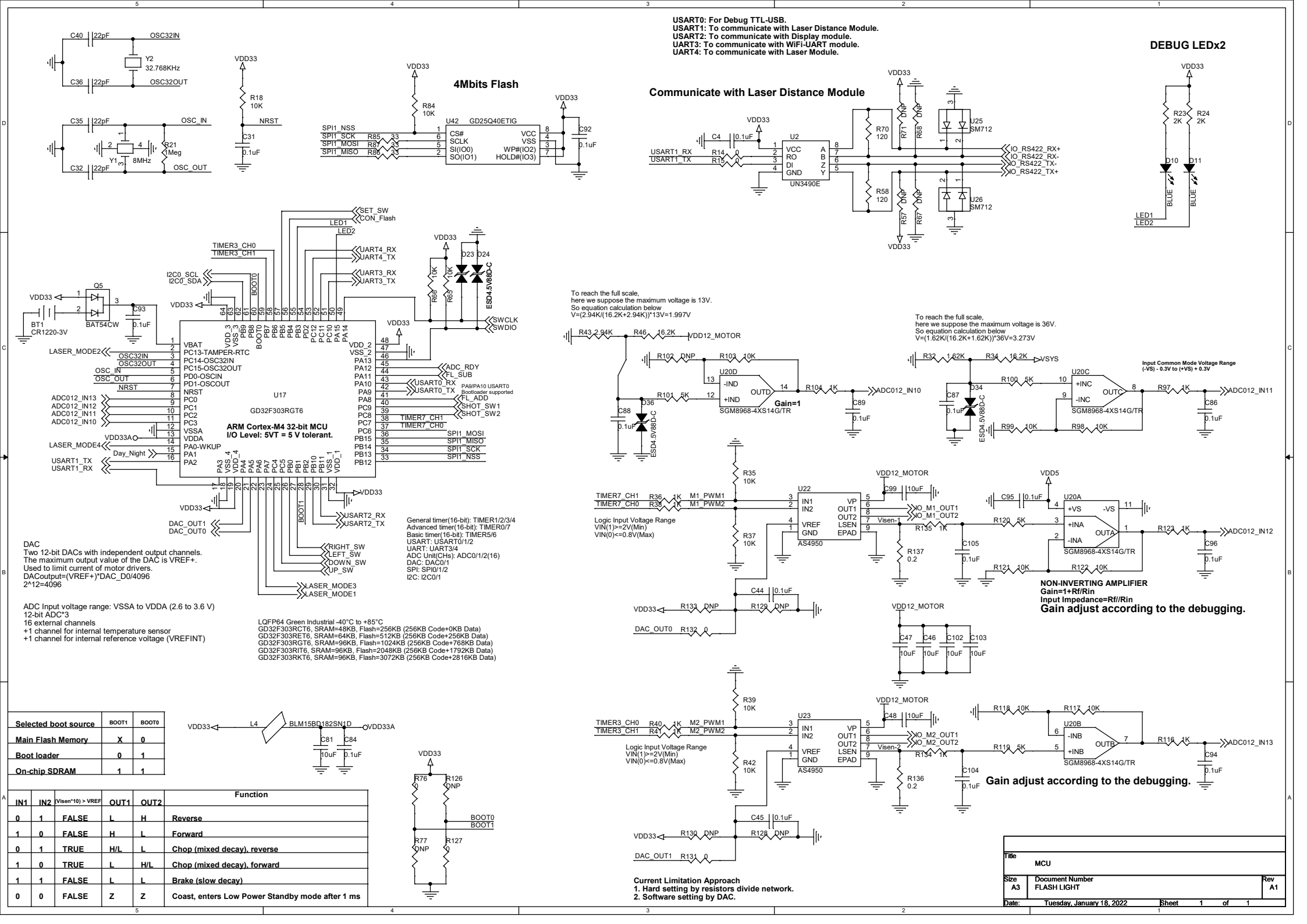
SGM8968-4 (-40℃ to +125℃)
10MHz, High Precision, Low Noise,Rail-to-Rail I/O, CMOS Operational Amplifiers

Manual focal length adjust buttons
EXTI

Laser shot trigger switch
EXTI

SGM7SZ14 (Y=~A)
Small Logic Inverter with Schmitt Trigger Input

Title	PWR + ADC
Size	A3
Document Number	FLASH LIGHT
Rev	A
Date:	Tuesday, January 18, 2022
Sheet	1 of 1


USART0: For Debug TTL-USB.
USART1: To communicate with Laser Distance Module.
USART2: To communicate with Display module.
UART3: To communicate with WiFi-UART module.
UART4: To communicate with Laser Module.
DEBUG LEDx2
4Mbits Flash
Communicate with Laser Distance Module
ARM Cortex-M4 32-bit MCU
I/O Level: 5VT = 5 V tolerant.
GD32F303RGT6
U17
DAC
Two 12-bit DACs with independent output channels.
The maximum output value of the DAC is VREF+.
Used to limit current of motor drivers.
DACoutput=(VREF+)*DAC_D0/4096
2^12=4096
ADC Input voltage range: VSSA to VDDA (2.6 to 3.6 V)
12-bit ADC*3
16 external channels
+1 channel for internal temperature sensor
+1 channel for internal reference voltage (VREFINT)
LQFP64 Green Industrial -40°C to +85°C
GD32F303RCT6, SRAM=48KB, Flash=256KB (256KB Code+0KB Data)
GD32F303RET6, SRAM=64KB, Flash=512KB (256KB Code+256KB Data)
GD32F303RGT6, SRAM=96KB, Flash=1024KB (256KB Code+768KB Data)
GD32F303RIT6, SRAM=96KB, Flash=2048KB (256KB Code+1792KB Data)
GD32F303RKT6, SRAM=96KB, Flash=3072KB (256KB Code+2816KB Data)
General timer(16-bit): TIMER1/2/3/4
Advanced timer(16-bit): TIMER0/7
Basic timer(16-bit): TIMER5/6
USART: USART0/1/2
UART: UART3/4
ADC Unit(CHs): ADC0/1/2(16)
DAC: DAC0/1
SPI: SPI0/1/2
I2C: I2C0/1
To reach the full scale,
here we suppose the maximum voltage is 13V.
So equation calculation below
V=(2.94K/(16.2K+2.94K))*13V=1.997V
To reach the full scale,
here we suppose the maximum voltage is 36V.
So equation calculation below
V=(1.62K/(16.2K+1.62K))*36V=3.273V
Input Common Mode Voltage Range
(-VS) - 0.3V to (+VS) + 0.3V
Gain=1
SGM8968-4XS14G/TR
AS4950
Logic Input Voltage Range
VIN(1)>=2V(Min)
VIN(0)<=0.8V(Max)
NON-INVERTING AMPLIFIER
Gain=1+Rf/Rin
Input Impedance=Rf//Rin
Gain adjust according to the debugging.
Current Limitation Approach
1. Hard setting by resistors divide network.
2. Software setting by DAC.
Selected boot source
BOOT1
BOOT0
Main Flash Memory
Boot loader
On-chip SDRAM
IN1
IN2
(Visen*10) > VREF
OUT1
OUT2
Function
Reverse
Forward
Chop (mixed decay), reverse
Chop (mixed decay), forward
Brake (slow decay)
Coast, enters Low Power Standby mode after 1 ms
Title
MCU
Size
A3
Document Number
FLASH LIGHT
Rev
A1
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Tuesday, January 18, 2022
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1
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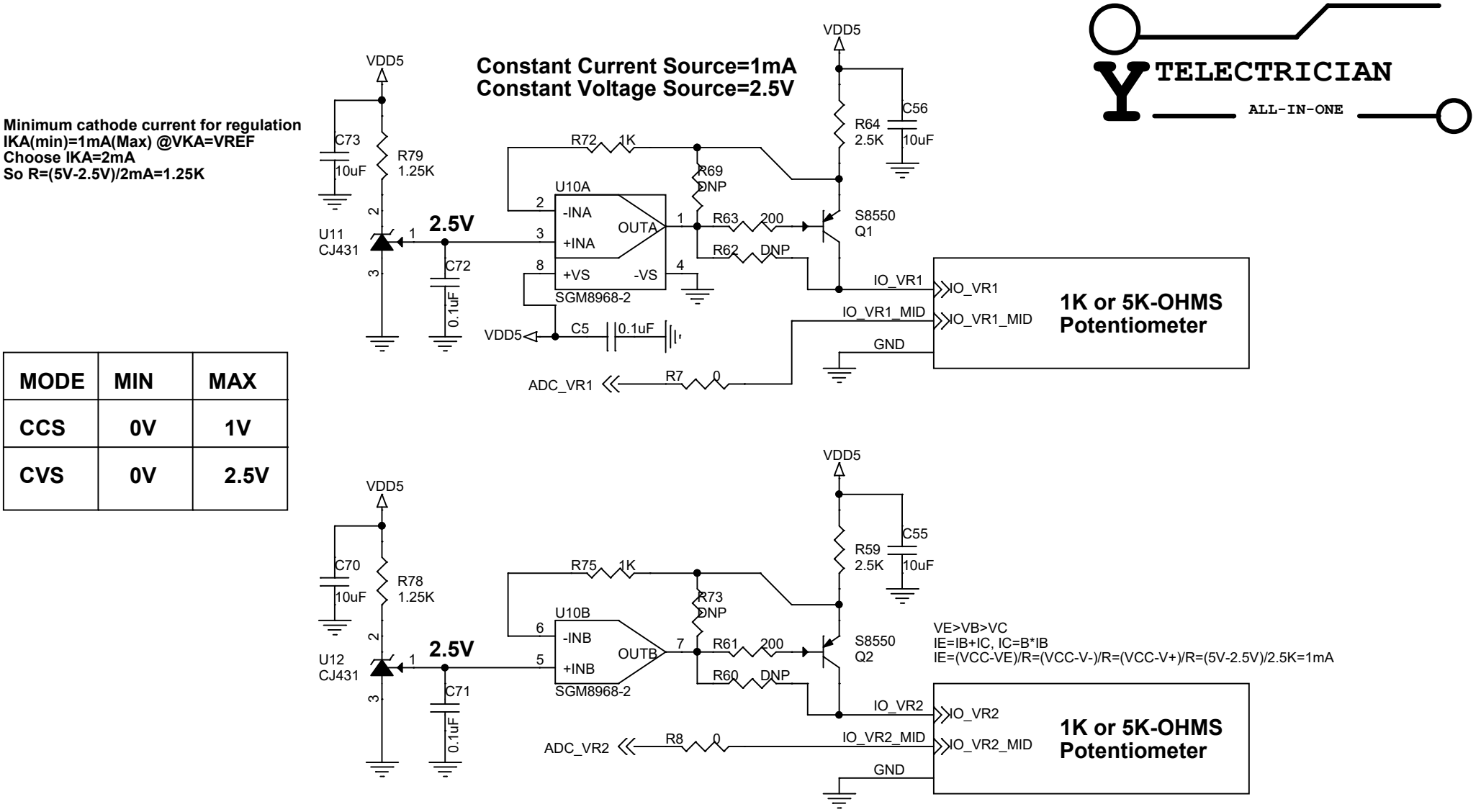
1



MODE	MIN	MAX
CCS	0V	1V
CVS	0V	2.5V

Constant Voltage Source Enabled to Hit 5K-ohms Potentiometer
SGM8968-2 Output Current (Iout)>=19mA
I=2.5V/5K=0.5mA

Constant Current Source Enabled to Hit 1K-ohms Potentiometer
V=1mA*1K-ohms=1V

Title: 3-SENSOR EXCITING			
Size: A	Document Number: FLASH LIGHT		Rev: A1
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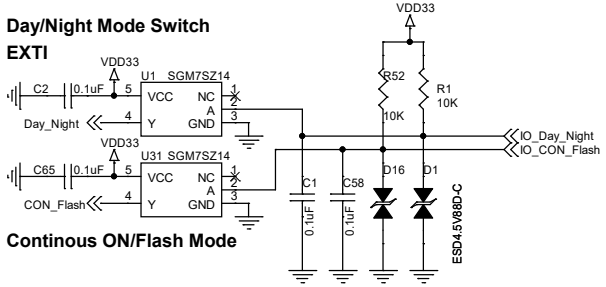
Day/Night Mode Switch

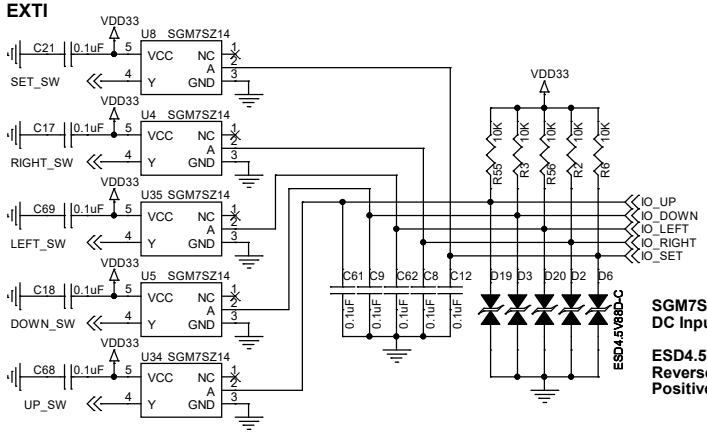
EXTI



Continous ON/Flash Mode

Arrows(Up/Down/Left/Right+Set)

EXTI



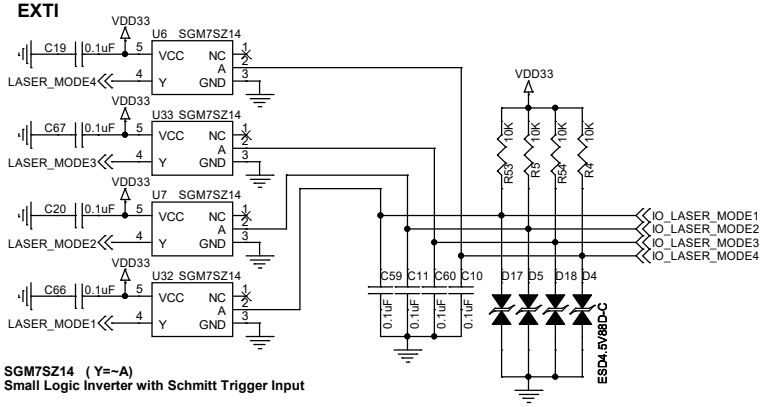
SGM7SZ14 (Absolute Maximum Ratings)
DC Input Voltage Range,Vin=-0.5V to 6V

ESD4.5V88D-C
Reverse Working Voltage=(VBWM)=4.5V (Max)
Positive Clamping Voltage=6.5V(Max)

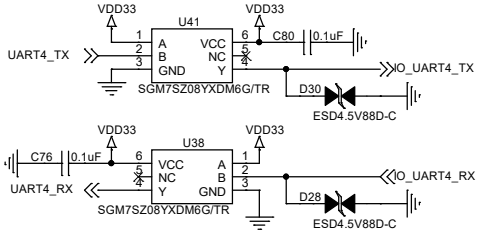
SGM7SZ14 (Y=~A)
Small Logic Inverter with Schmitt Trigger Input

Fast to change Laser Module Working Mode

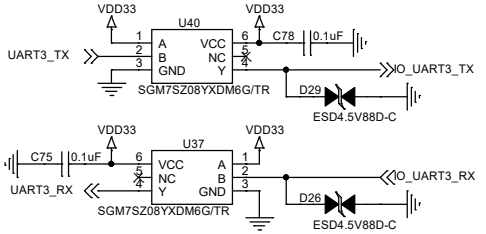
EXTI



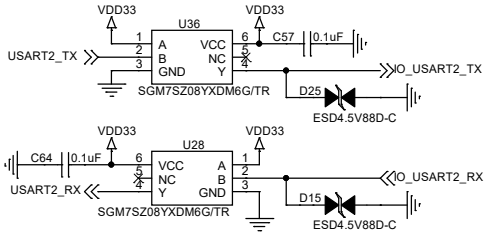
SGM7SZ14 (Y=~A)
Small Logic Inverter with Schmitt Trigger Input



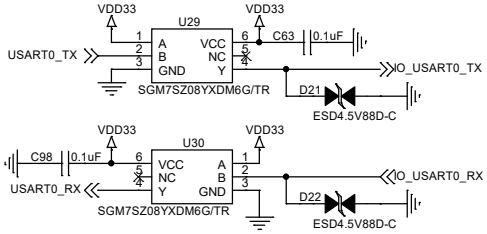
UART4
For Laser Module



UART3
For WiFi-UART Module

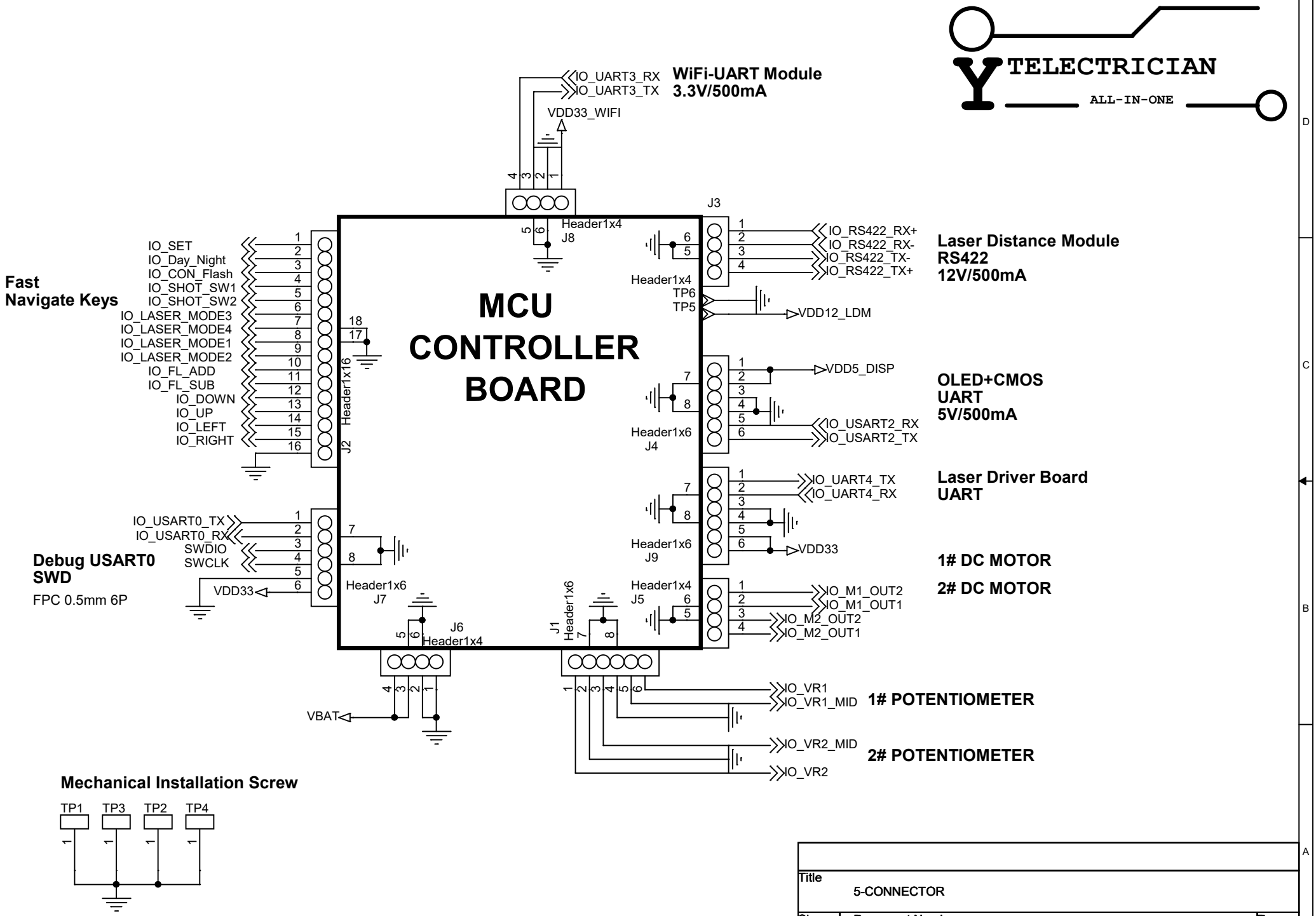


USART2
For Display Module



USART0
For Debug TTL-USB

Title: 4-I/O BUFFER		
Size: A3	Document Number: FLASH LIGHT	Rev: A1
Date: Tuesday, January 18, 2022	Sheet 1 of 1	



Title	5-CONNECTOR	
Size A	Document Number FLASH LIGHT	Rev A1
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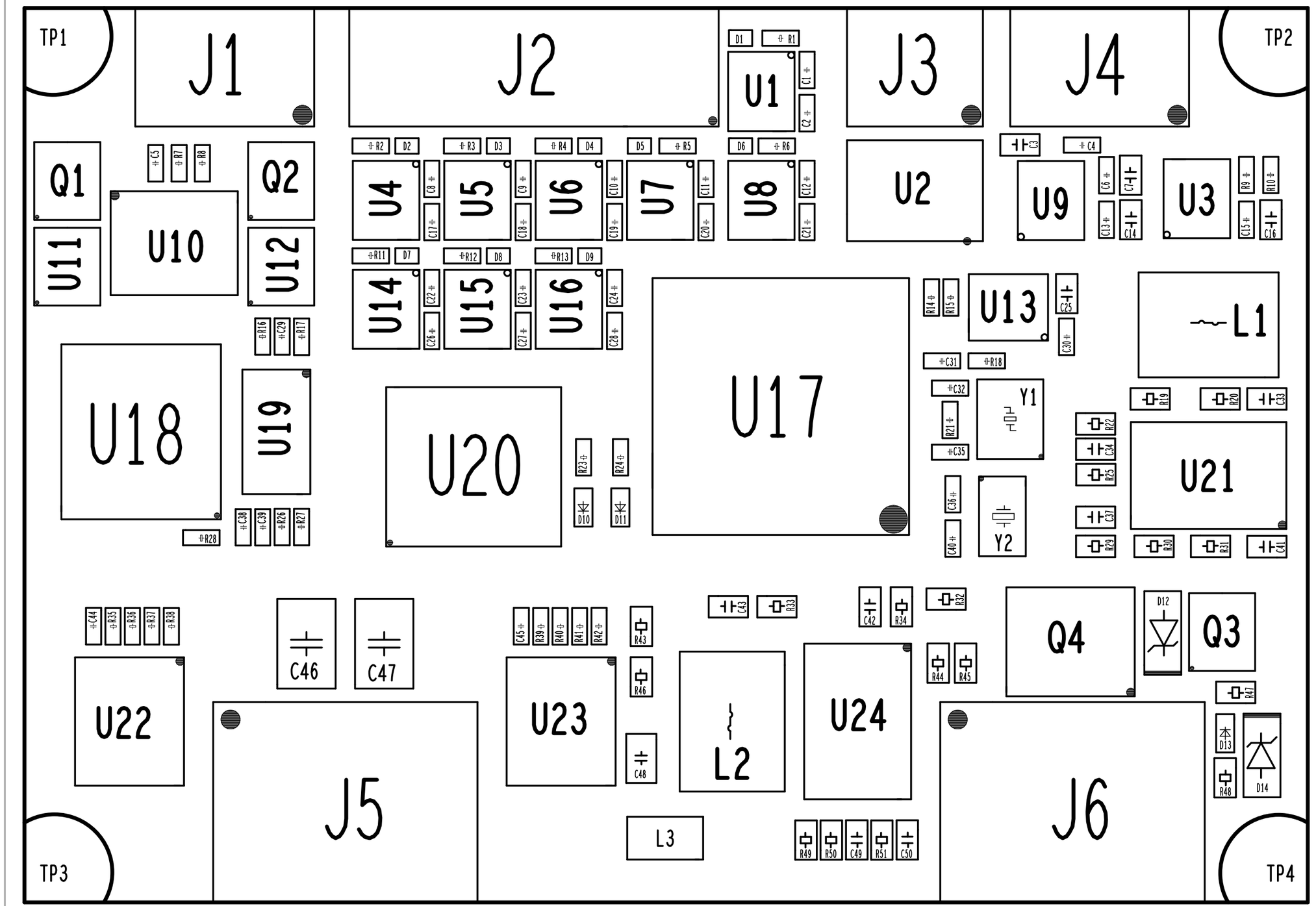
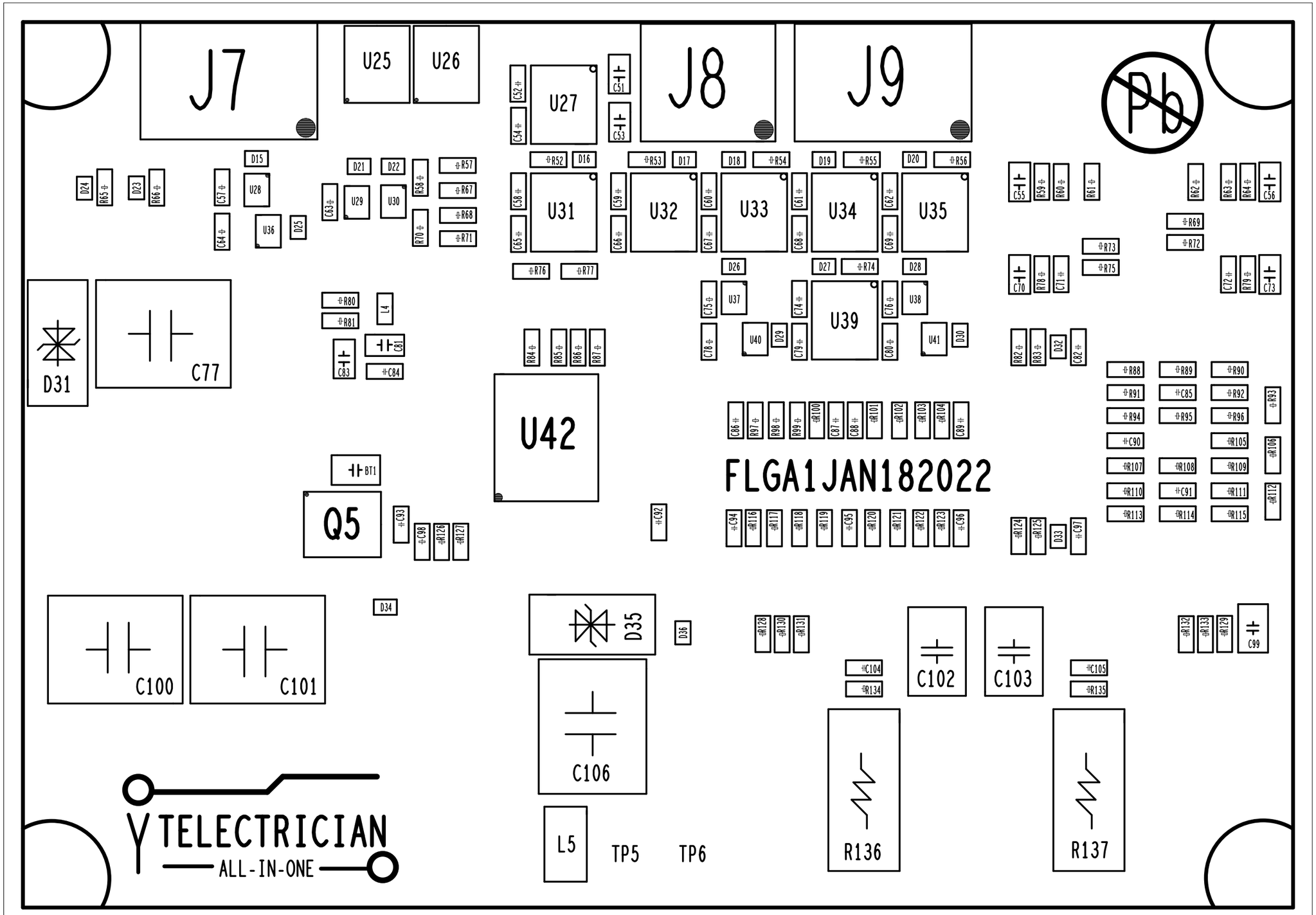
REF


TP1
J1
J2
U1
J3
J4
TP2
Q1
U11
U10
Q2
U12
U2
U9
U3
U18
U19
U20
U17
U13
L1
U21
U22
C46
C47
U23
L2
U24
Q4
Q3
J5
L3
J6
TP3
TP4


J7
U25
U26
J8
J9
U27
U28
U29
U30
U31
U32
U33
U34
U35
U36
U37
U38
U39
U40
U41
U42
D31
C77
Q5
BT1
C100
C101
C106
D35
L5
TP5
TP6
R136
R137
C102
C103
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