

54321

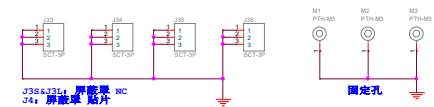
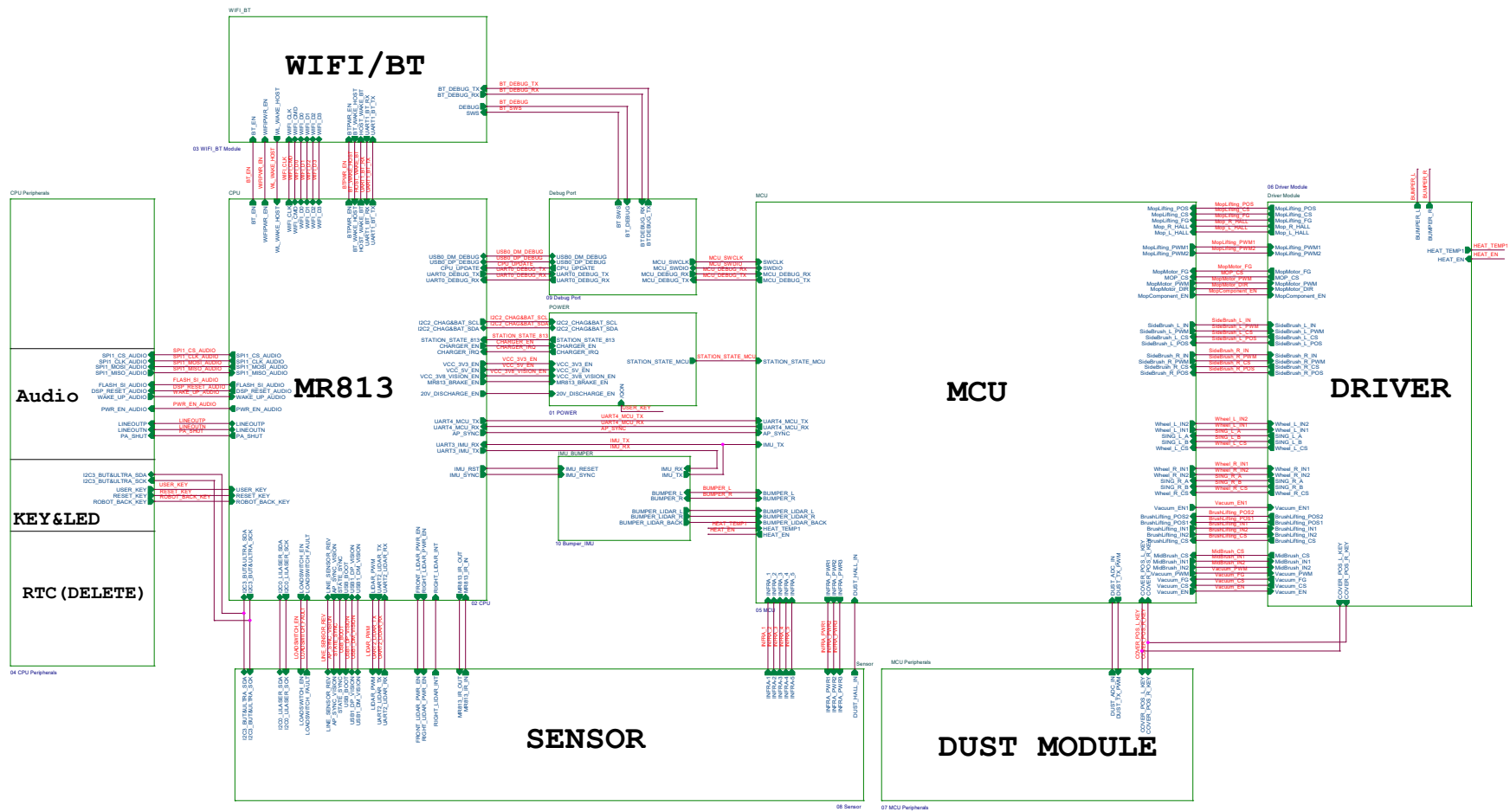
项目名称：IP1207 ROBOT MB01

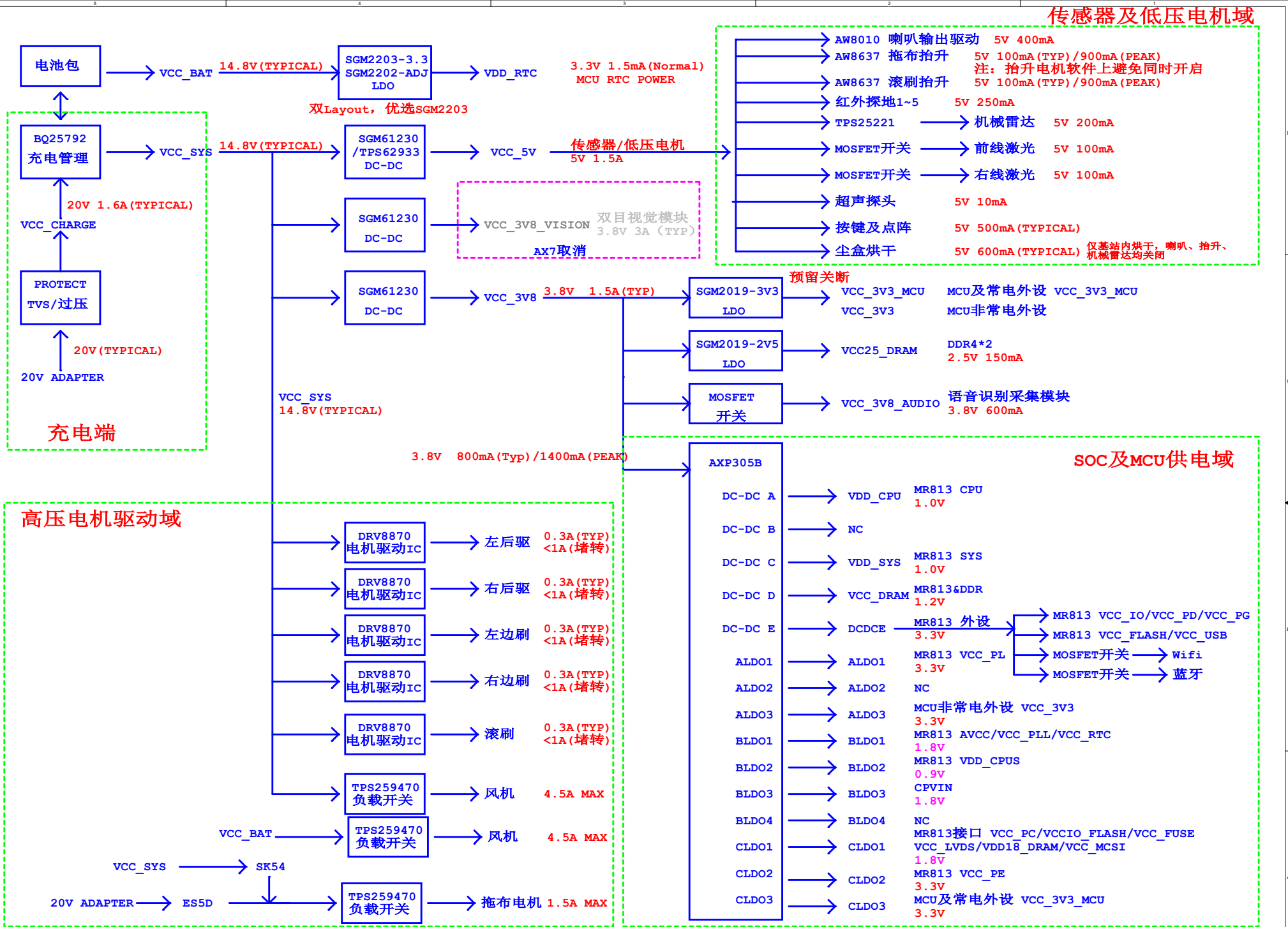
项目说明：扫地机器人主板AX7 V1_1401上修改

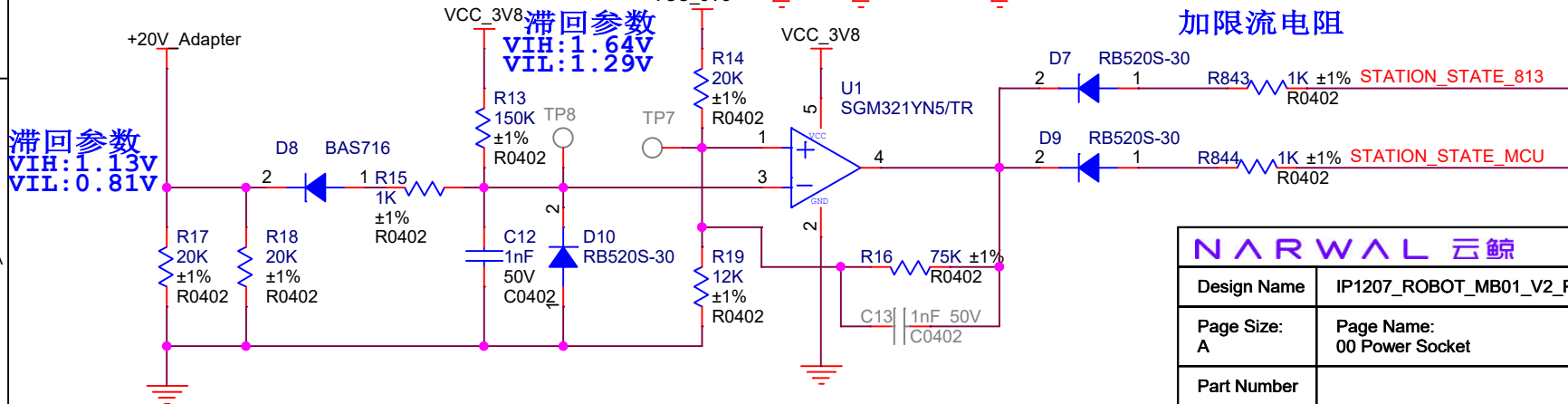
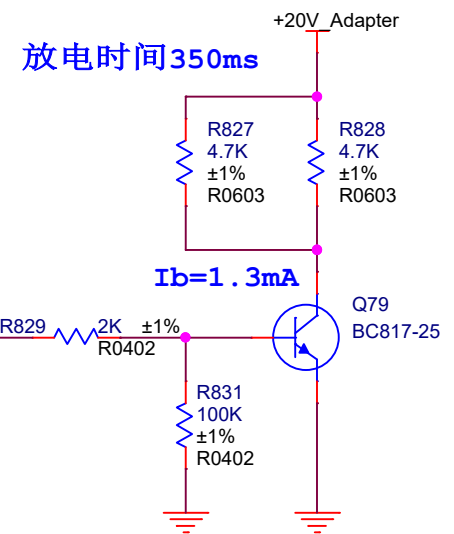
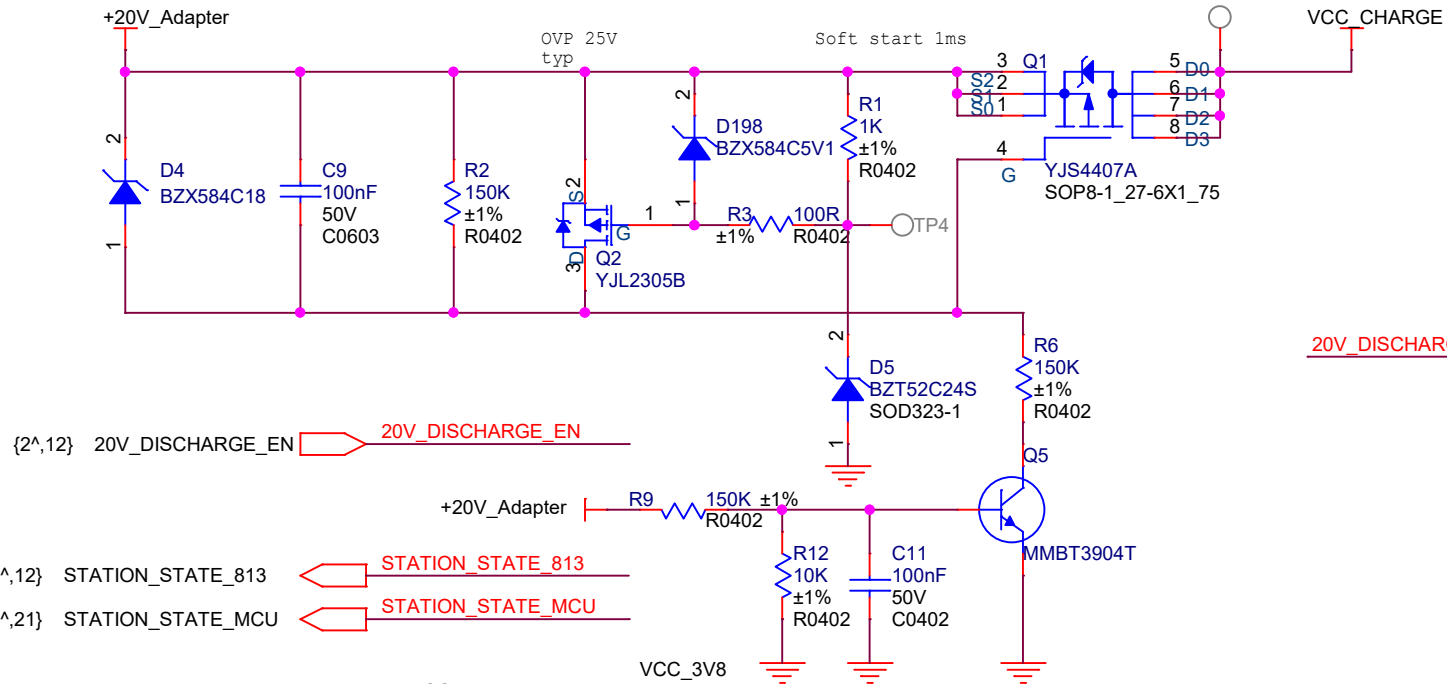
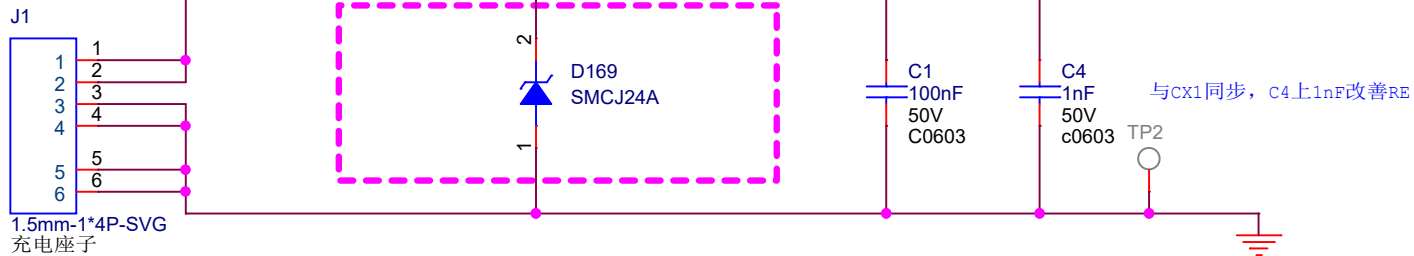
版本号	作者	更改说明	修订时间
V1	梁伟粤	1、不改板。针对以下内容修改BOM原理图 2、MCU、CPU版本号修改为V0 3、双目修改为前线激光 4、语音模块NC 5、滚刷抬升NC 6、尘盒检测NC	2024.3.22
V2	梁伟粤	1、边刷控制正反转 2、MCU版本号修改为V2	2024.7.18

NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A	Page Name: 01 Revision History	Rev: V1
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54321

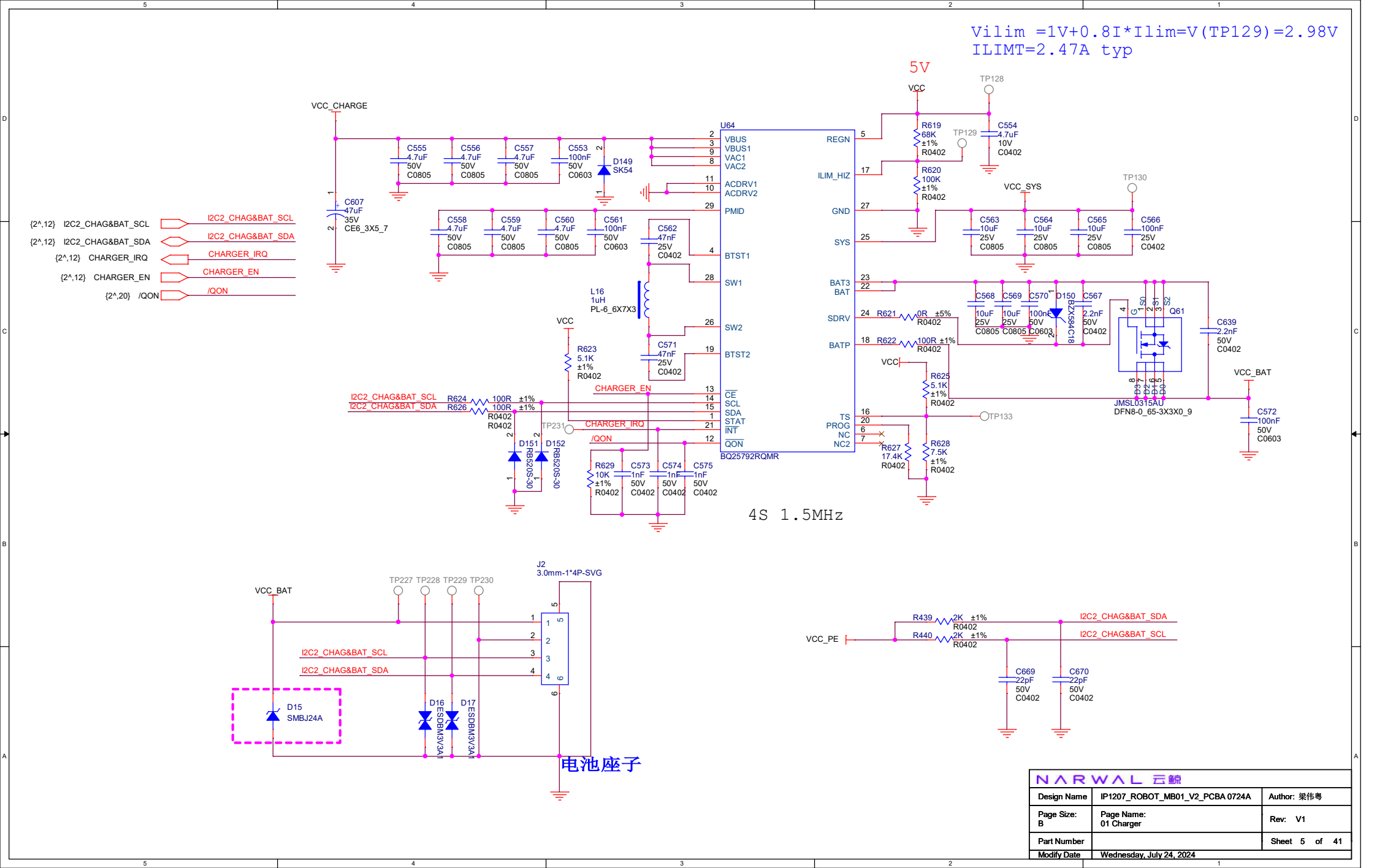






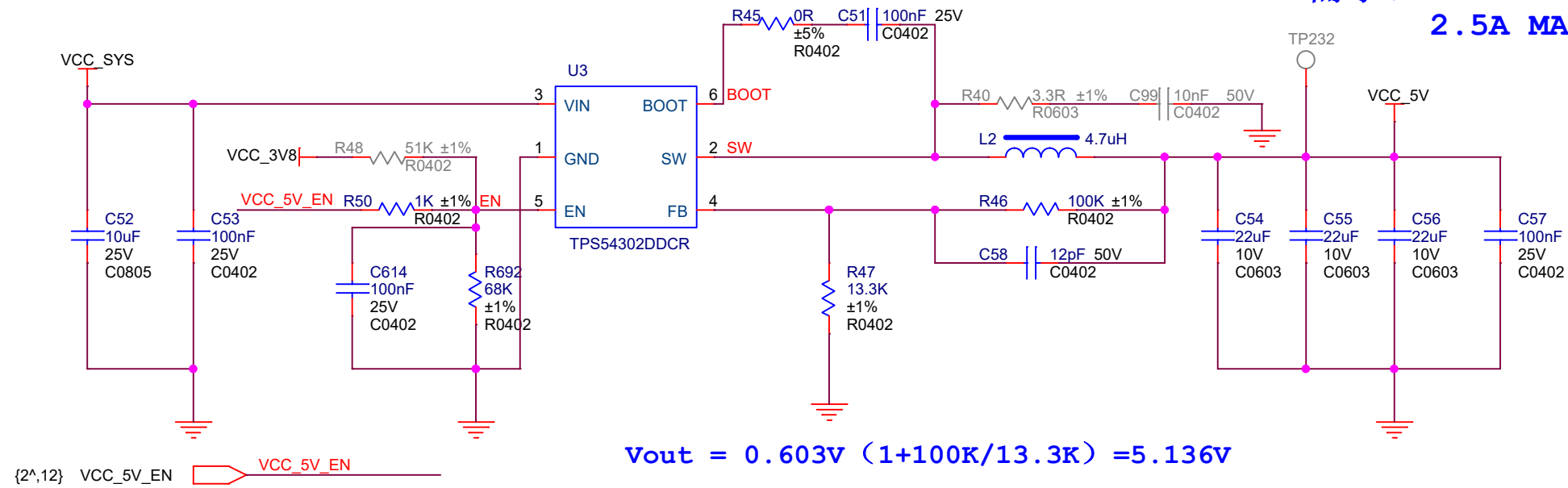
NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A	Page Name: 00 Power Socket	Rev: V1
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$$V_{lim} = 1V + 0.8I \cdot I_{lim} = V(TP129) = 2.98V$$
$$I_{LIMT} = 2.47A \text{ typ}$$



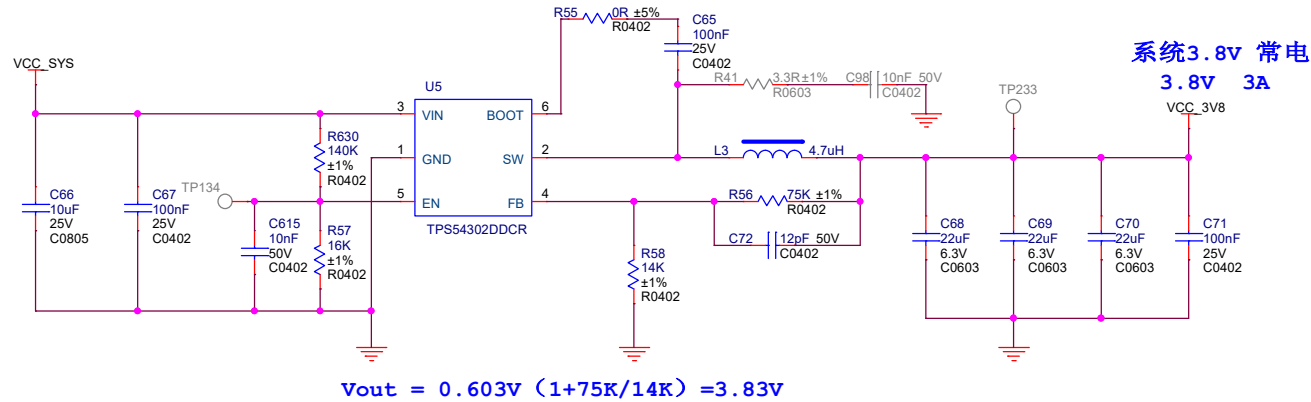
NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 01 Charger	Rev: V1
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输出: 5V 3A
需求: 5V 1.5A
2.5A MAX

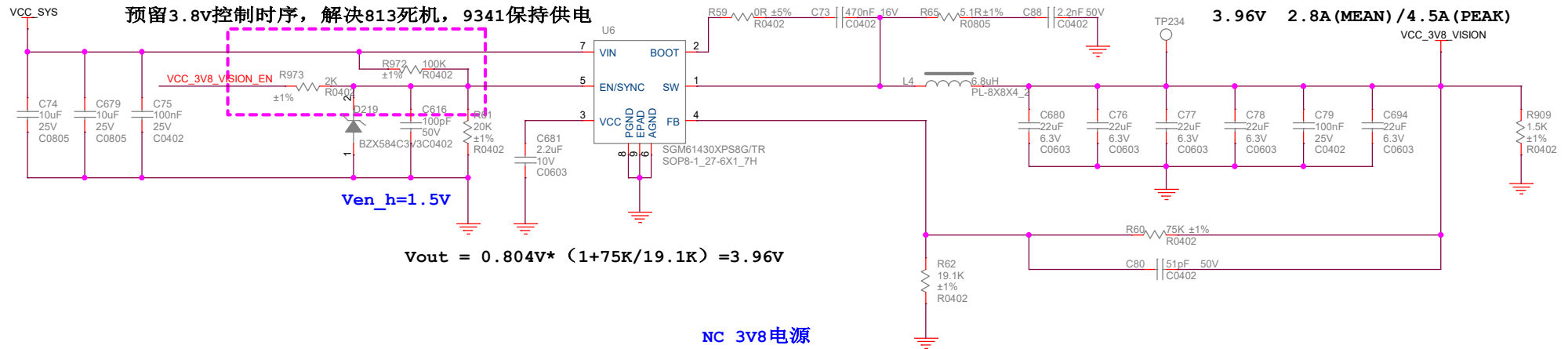


NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A	Page Name: 02 5V BUCK	Rev: V1
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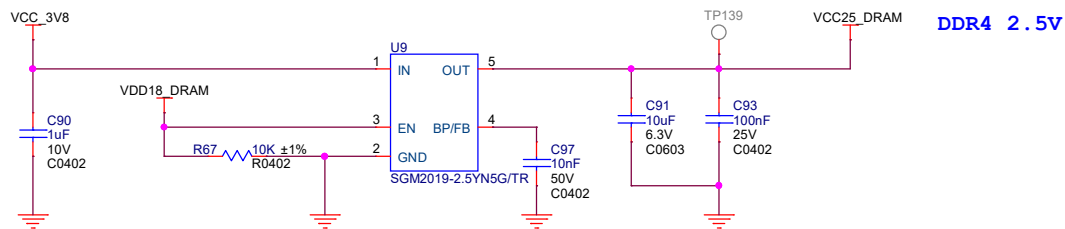
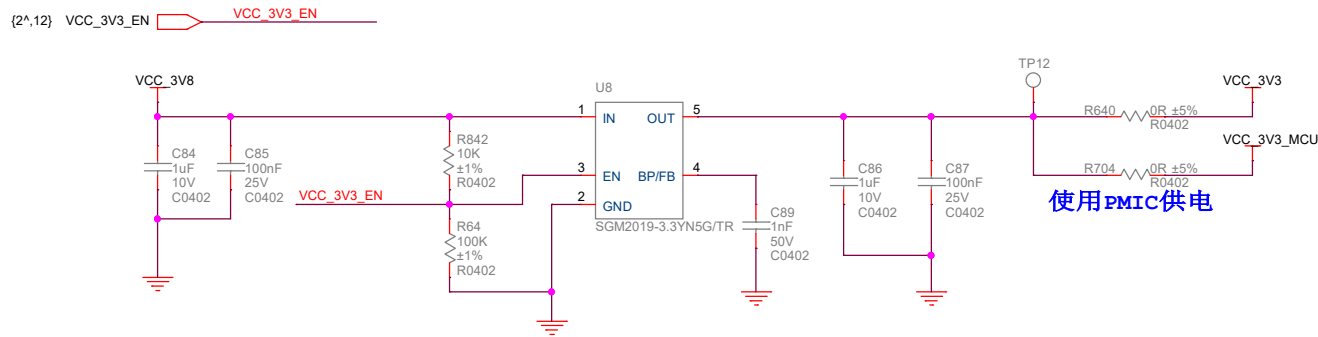
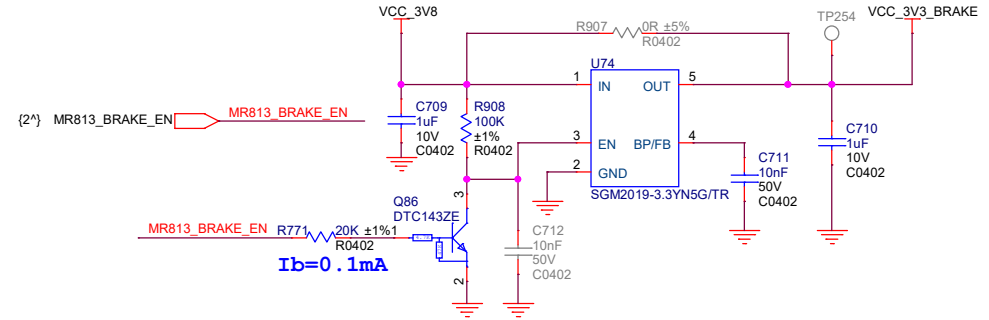
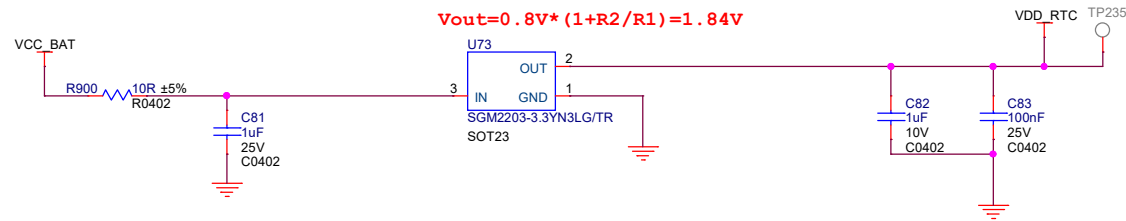
(2^,12) VCC_3V8_VISION_EN VCC_3V8_VISION_EN



预留3.8v控制时序，解决813死机，9341保持供电

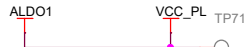


NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 03 3V8 BUCK	Rev: V1
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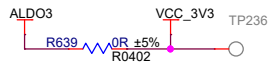


NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 04 LDO	Rev: V1
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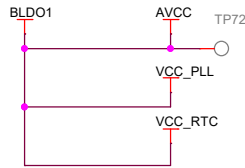
3.3V



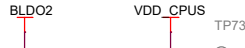
3.3V



1.8V



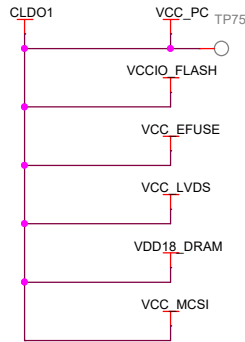
0.9V



1.8V



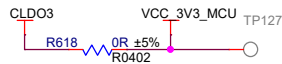
1.8V



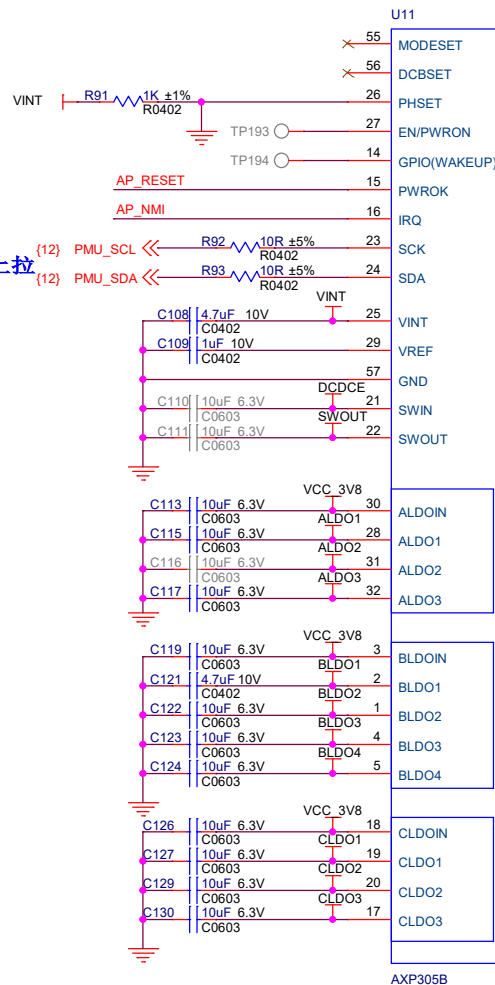
3.3V



3.3V



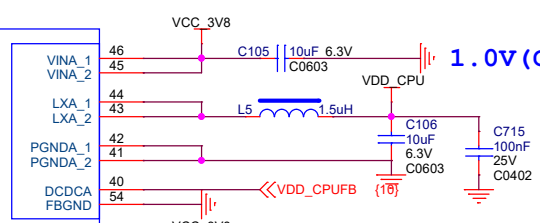
PMIC的I2C使用内置上拉



{11} AP_RESET <<

{11} AP_NMI <<

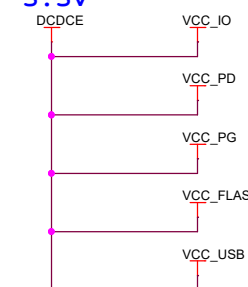
1.0V (CPU调整)



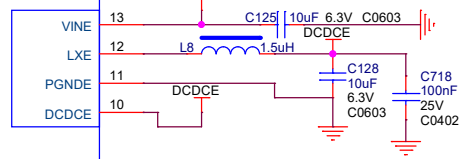
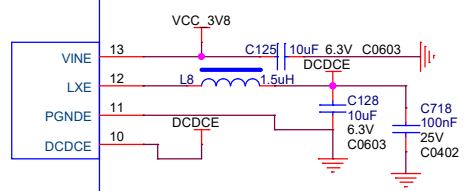
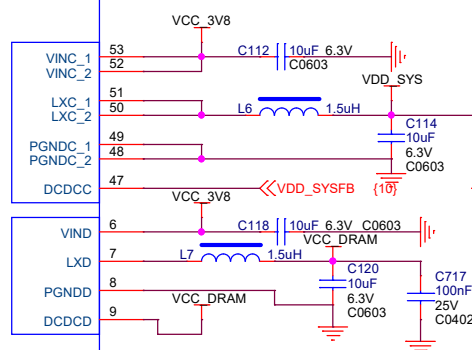
0.9V



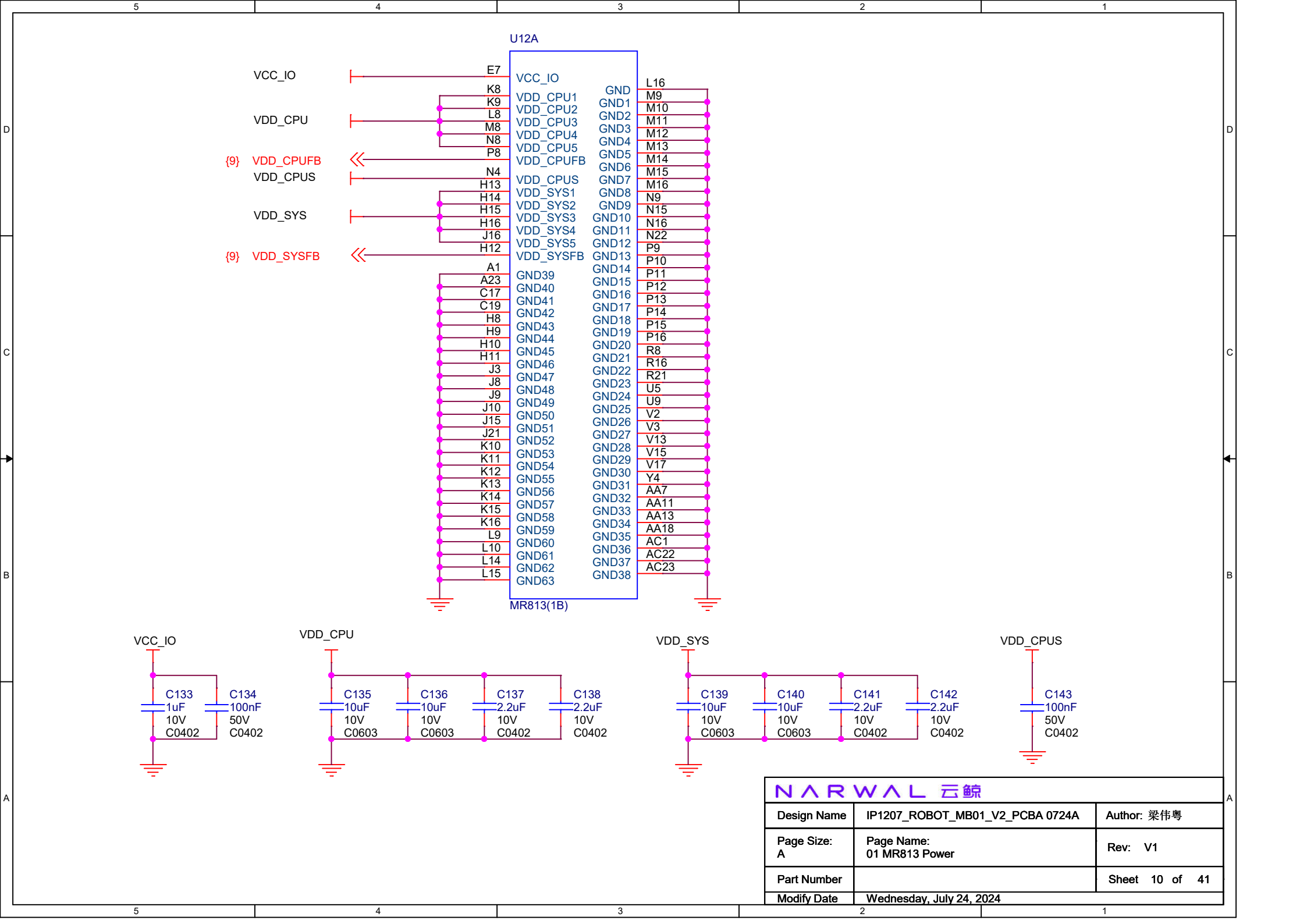
3.3V



1.2V

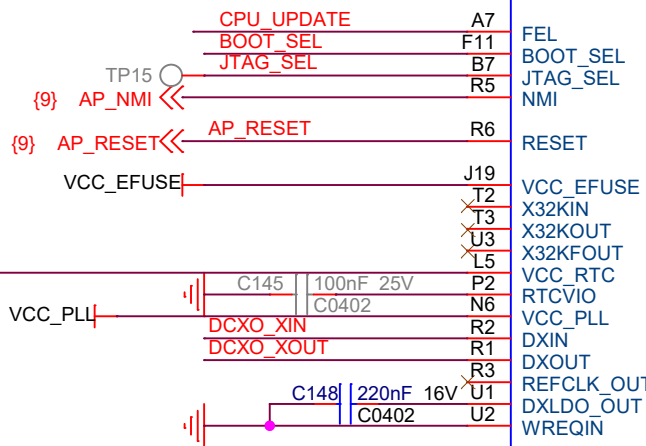
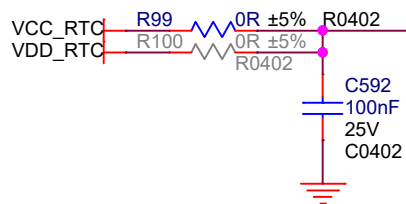


NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 00 PMIC	Rev: V1
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{2^,38} CPU_UPDATE CPU_UPDATE

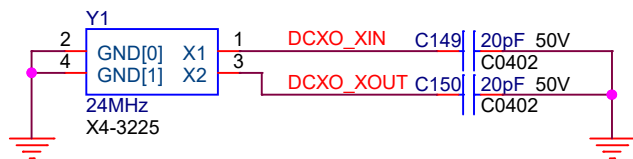
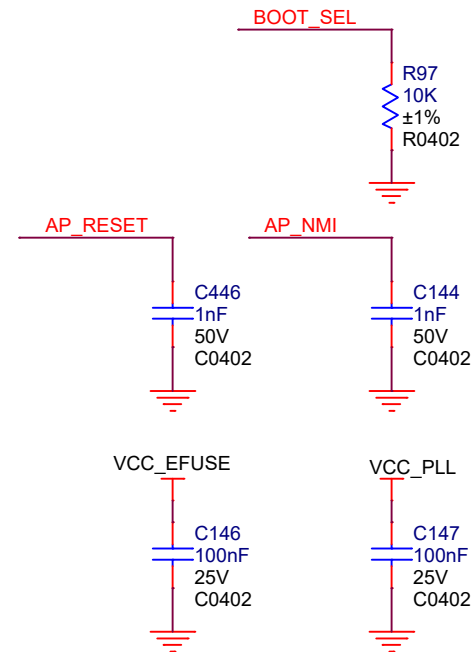
用PMIC供电



U12B

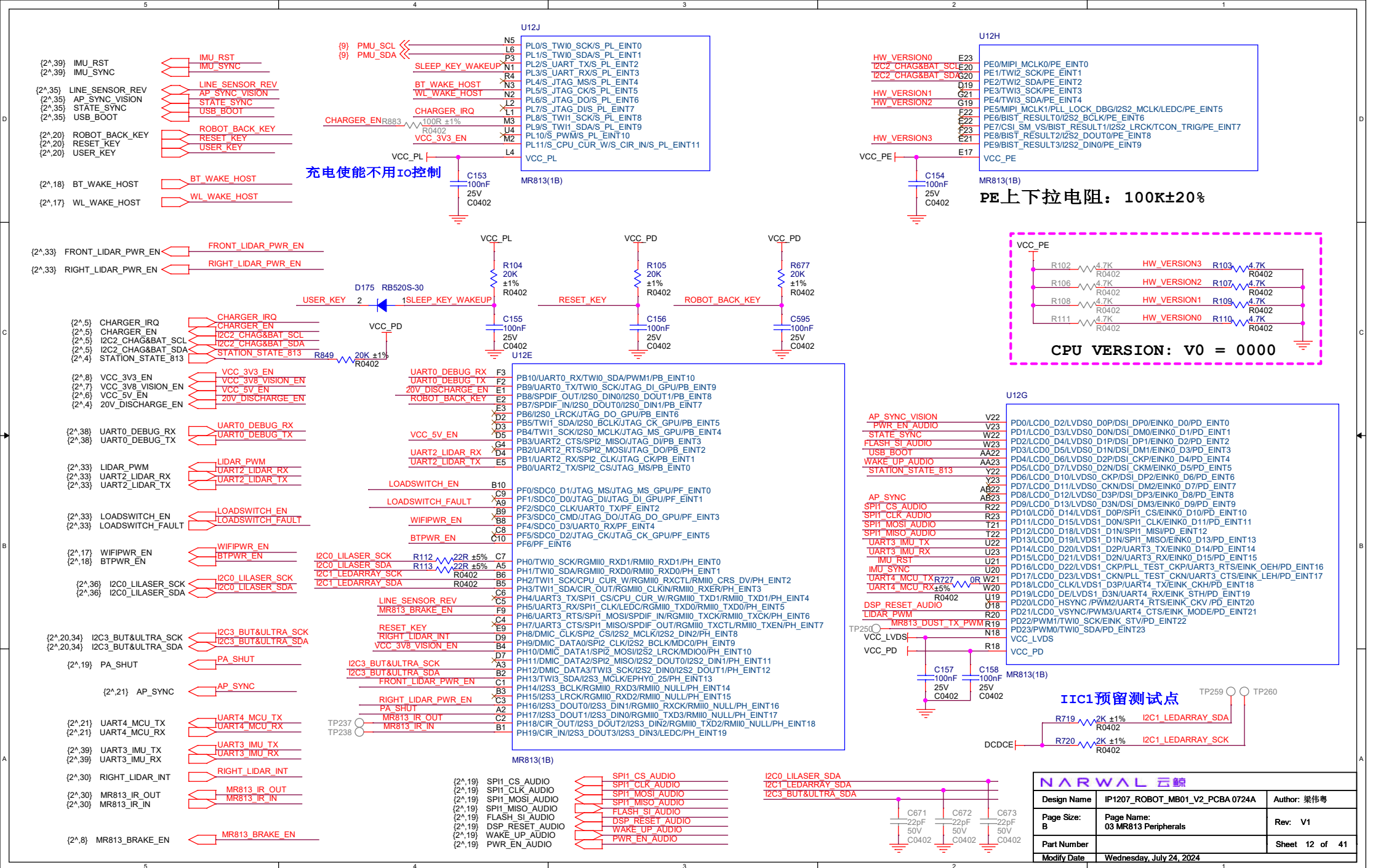
FEL
BOOT_SEL
JTAG_SEL
NMI
RESET
VCC_EFUSE
X32KIN
X32KOUT
X32KFOUT
VCC_RTC
RTCIO
VCC_PLL
DXIN
DXOUT
REFCLK_OUT
DXLDO_OUT
WREQIN

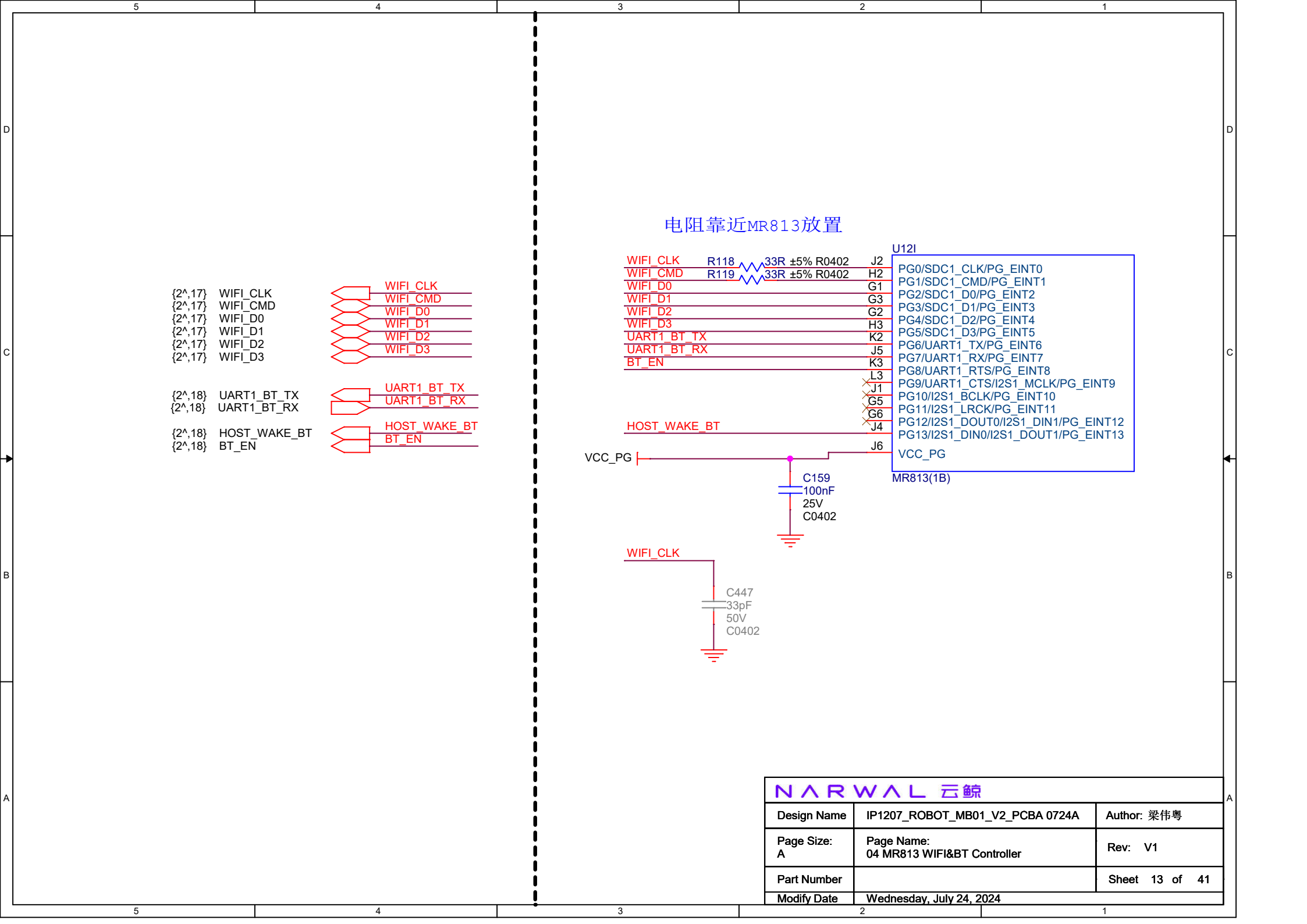
MR813(1B)

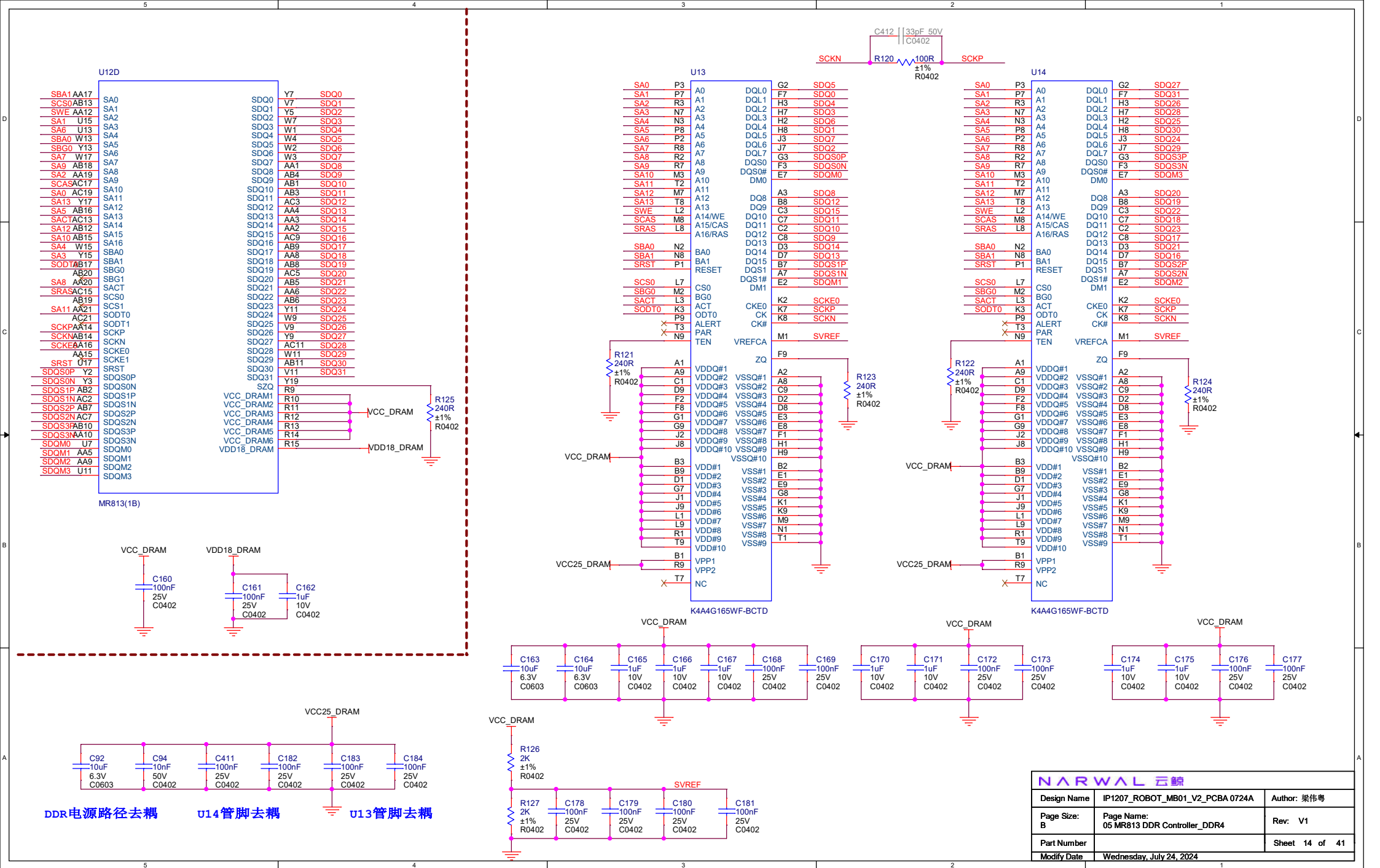


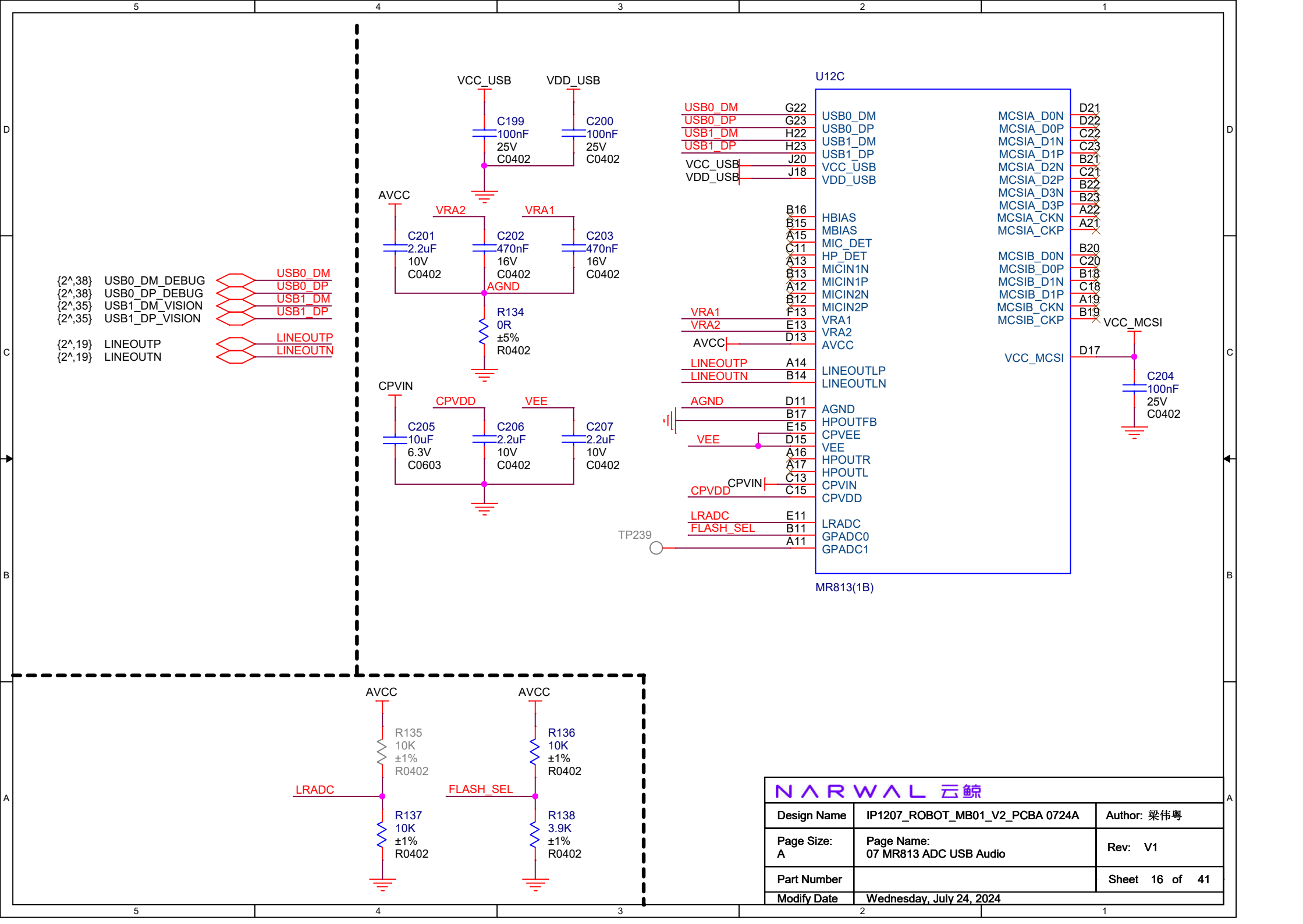
NARWAL 云鲸

Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A	Page Name: 02 MR813 OSC	Rev: V1
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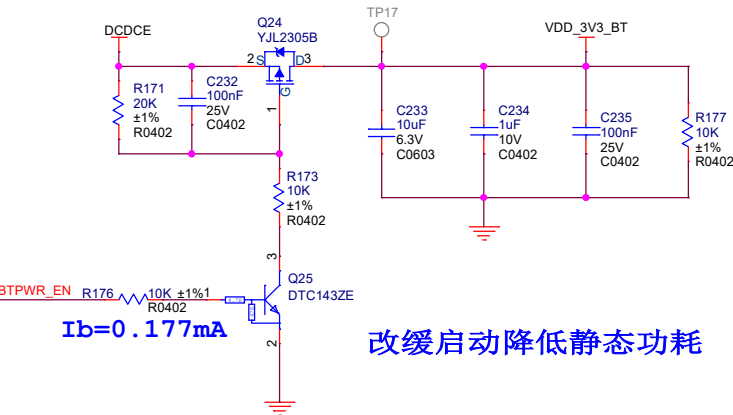
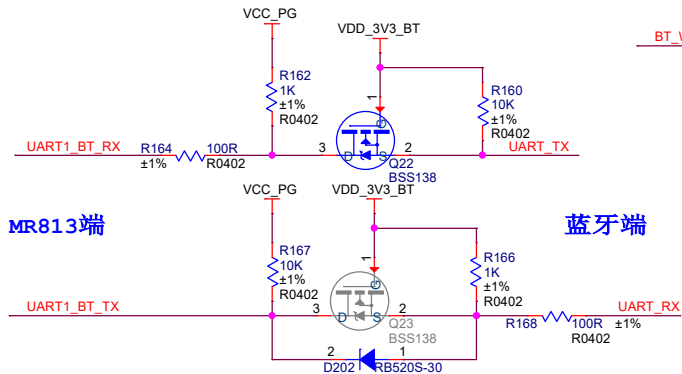
{2^,38} DEBUG
{2^,38} SWS
{2^,13} BT_EN
{2^,13} UART1_BT_TX
{2^,13} UART1_BT_RX

{2^,13} HOST_WAKE_BT
{2^,12} BT_WAKE_HOST

{2^,12} BTPWR_EN

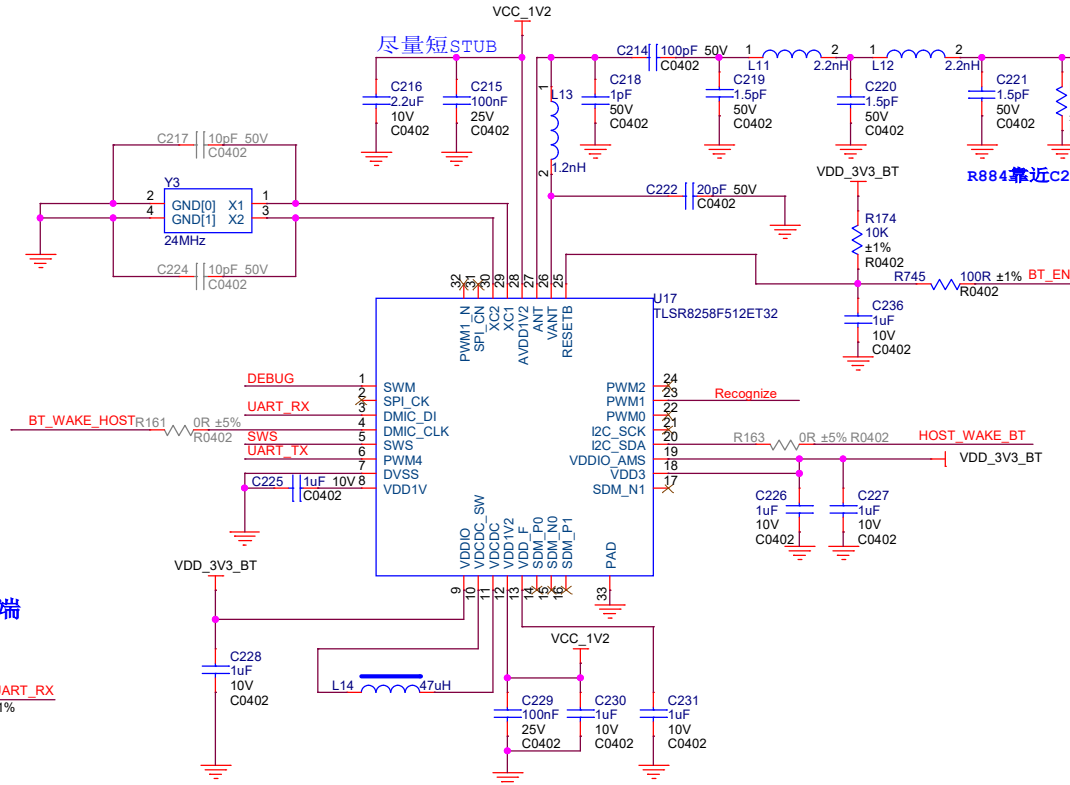
{2^,38} BT_DEBUG_RX
{2^,38} BT_DEBUG_TX

靠近BT模组，测试信号质量时去掉防止STUB

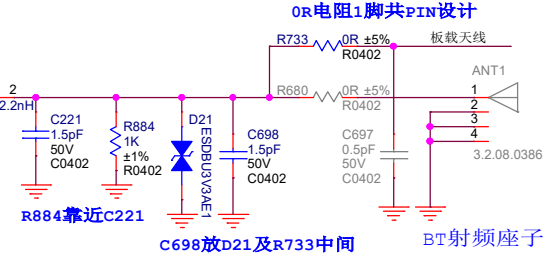


$I_b = 0.177\text{mA}$

改缓启动降低静态功耗



尽量短STUB



0R电阻1脚共PIN设计

板载天线
1
2
3
4
3.2.08.0386

C698放D21及R733中间

BT射频端子

蓝牙电源关闭，MOSFET关闭，防倒灌

蓝牙电源打开，

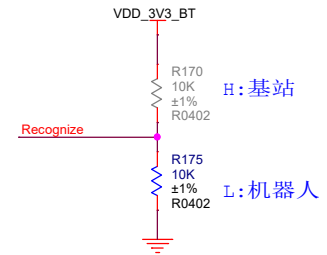
UART_TX=0，Q22打开，UART_BT_RX=0

UART_TX=1，Q22关闭，UART_BT_RX被R162上拉到1

蓝牙电源打开，

UART_BT_TX=1，Q22关闭，UART_RX被R166上拉到1

UART_BT_TX=0，Q22关闭，UART_RX被Q23二极管拉到低

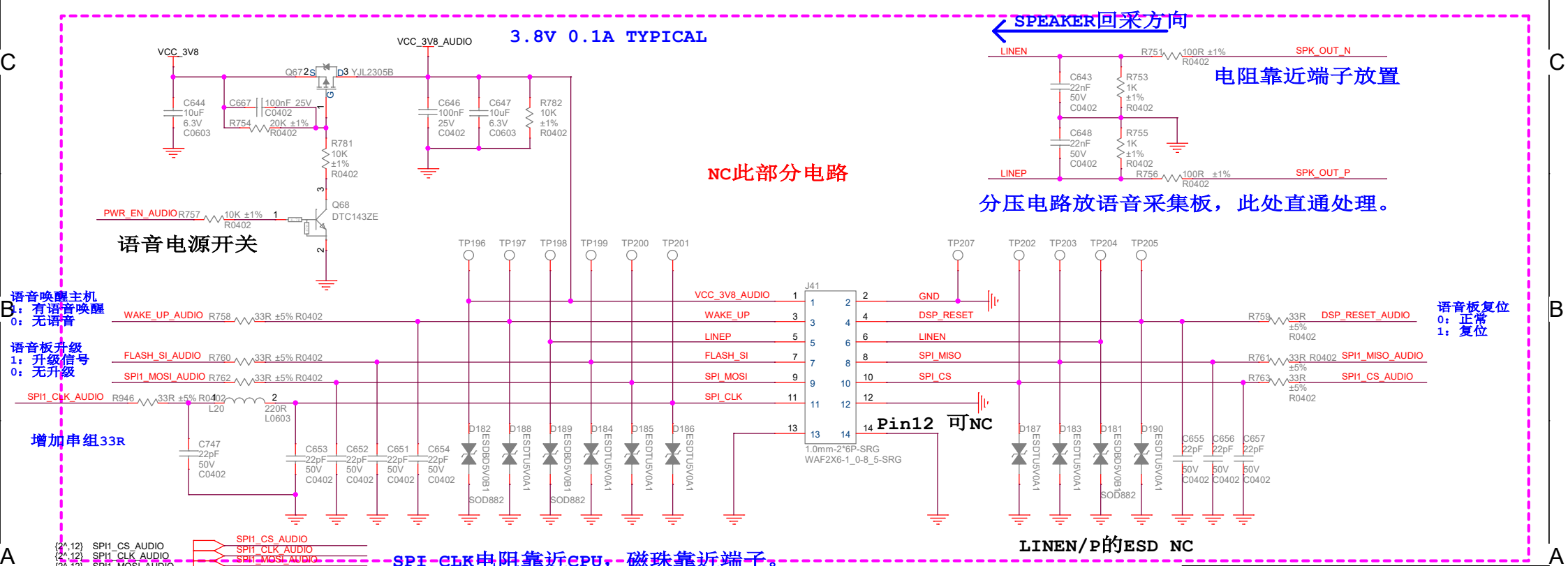
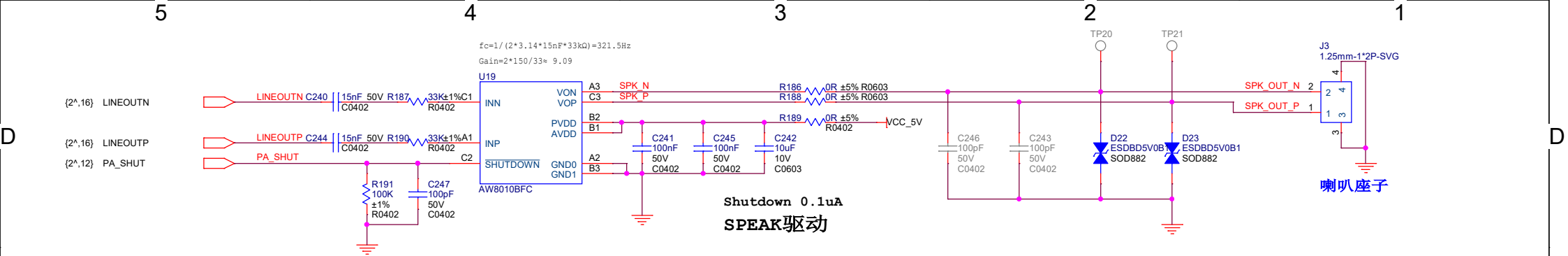


H: 基站

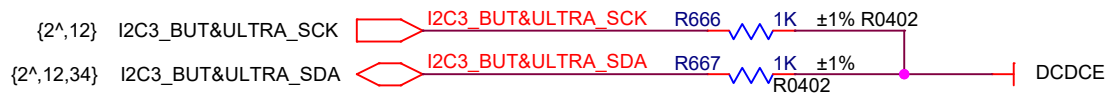
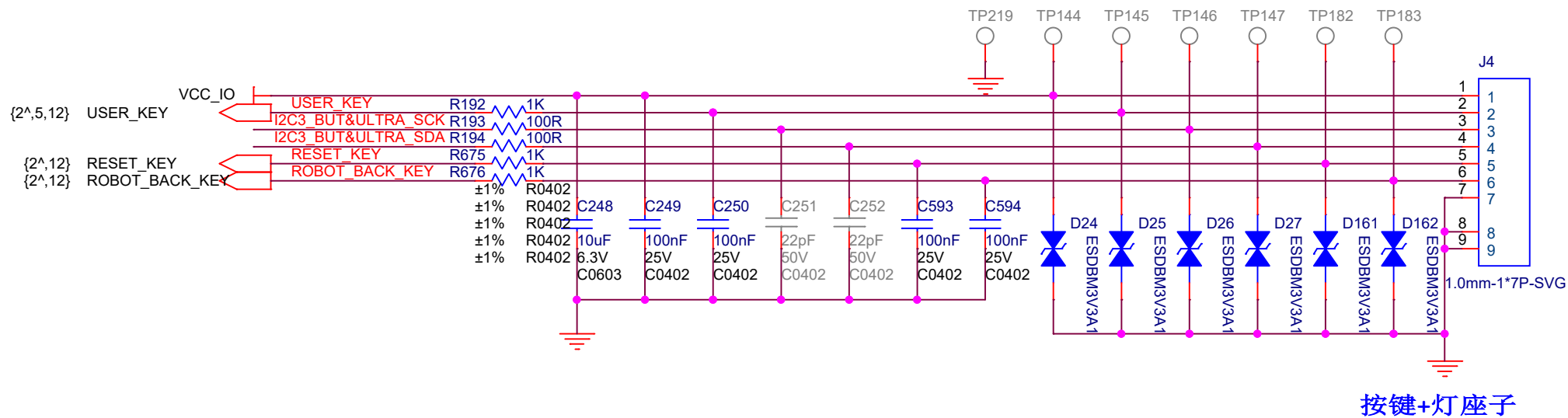
L: 机器人

蓝牙模组识别

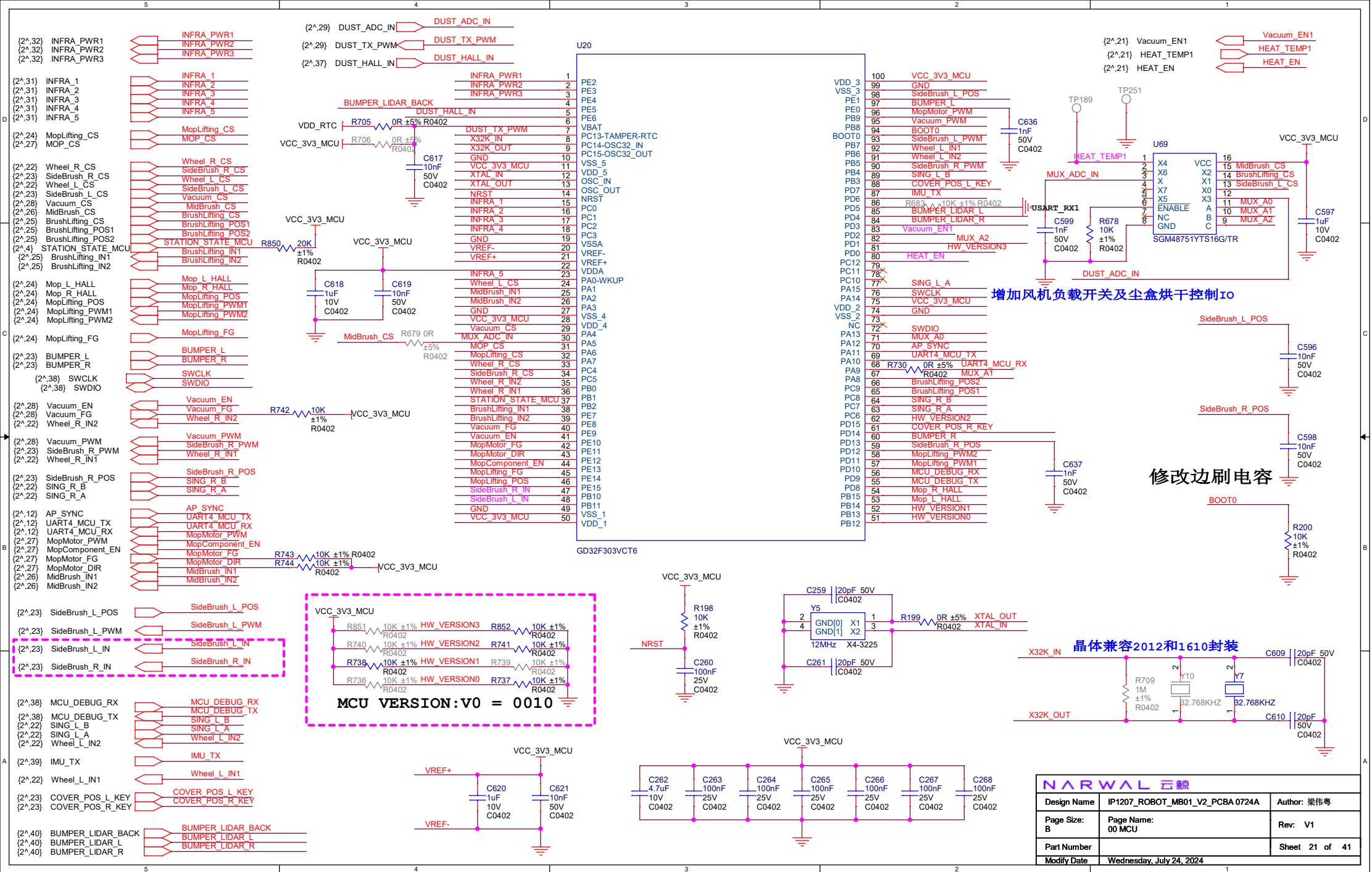
NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 01 BT Module	Rev: V1
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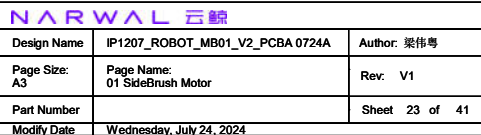
NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size:	Page Name: 01 Audio	Rev: V1
Part Number	Sheet 19 of 41	
Modify Date	Wednesday, July 24, 2024	

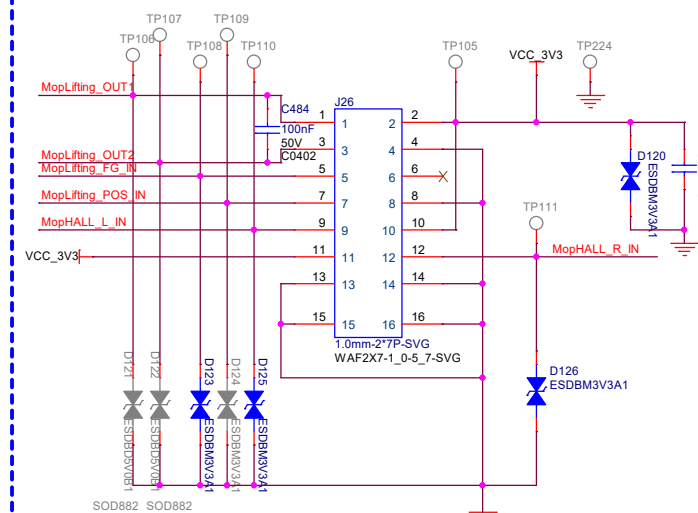
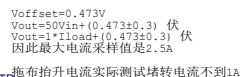
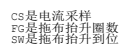


NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A	Page Name: 02 KEY_LED	Rev: V1
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Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Part Size: A3	Page Name: 00 Wheel Component	Rev: V1
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Design Name	IP1207_ROBOT_MB01_V2_PCB A 0724A	Author: 梁伟粤
Page Size: A3	Page Name: 02 MopLifting Component	Rev: V1
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{2^,21} BrushLifting_IN1
{2^,21} BrushLifting_IN2

{2^,21} BrushLifting_CS
{2^,21} BrushLifting_POS1
{2^,21} BrushLifting_POS2

BrushLifting_IN1

BrushLifting_IN2

BrushLifting_CS

BrushLifting_POS1

BrushLifting_POS2

BrushLifting_POS_IN2

BrushLifting_POS_IN1

BrushLifting_OUT2

BrushLifting_OUT1

J27
1.25mm-1*5P-SVG
WAF5-1_25-4_2-SVG

NC滚刷抬升

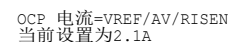
Voffset=0.473V
Vout=50Vin+ (0.473±0.3) 伏
Vout=1*Iload+ (0.473±0.3) 伏
因此最大电流采样值是2.5A

滚刷抬升电流实际测试堵转电流不到1A

NARWAL 云鲸

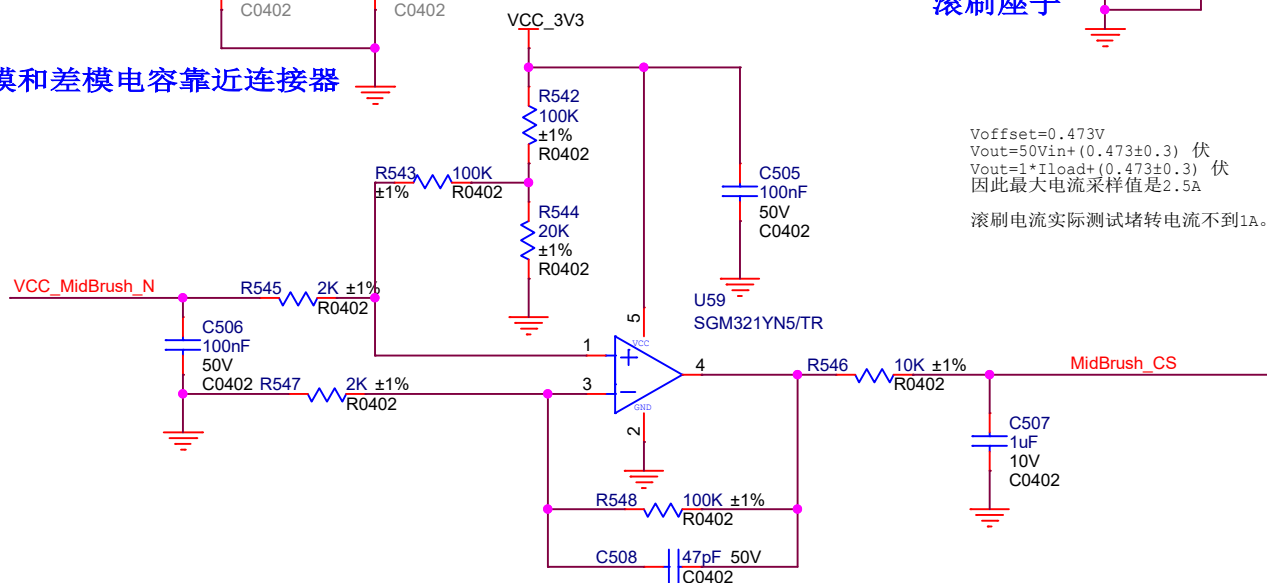
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A4	Page Name: 03 MidBrushLifting Motor	Rev: V1
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AMP 组件NC



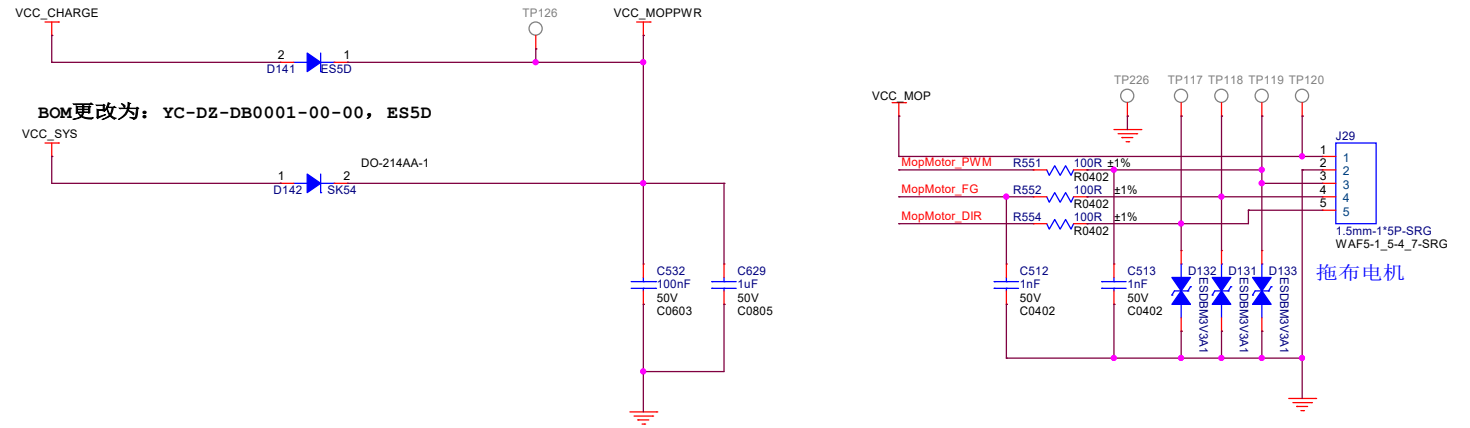
Voffset=0.473V
 $V_{out}=50V_{in}+(0.473\pm0.3)$ 伏
 $V_{out}=1*I_{load}+(0.473\pm0.3)$ 伏
 因此最大电流采样值是2.5A

滚刷电流实际测试堵转电流不到1A。规格书2.1A

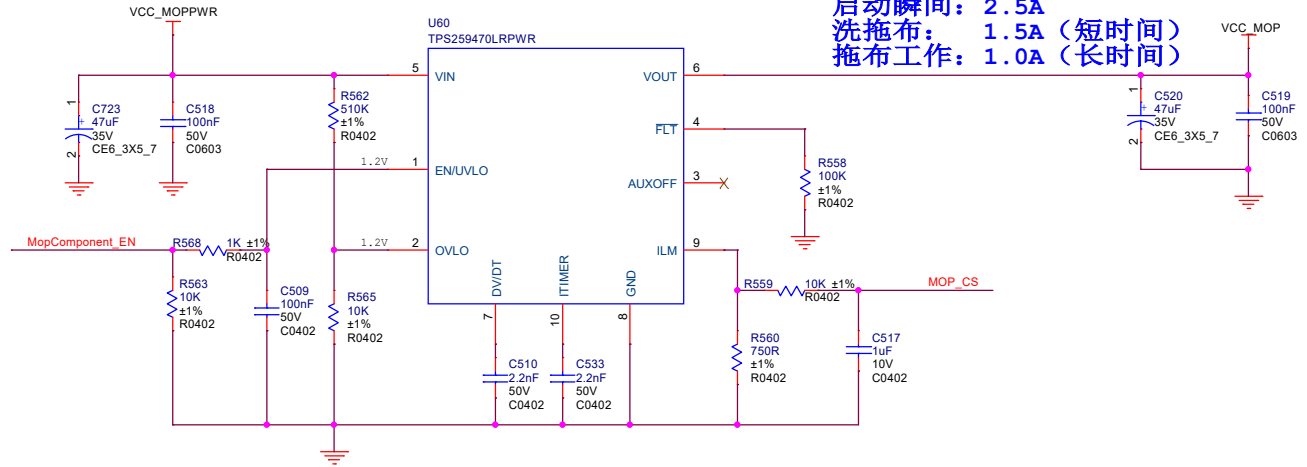


NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A4	Page Name: 04 MidBrush Motor	Rev: V1
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- {2^,21} MopMotor_PWM MopMotor_PWM
- {2^,21} MopMotor_DIR MopMotor_DIR
- {2^,21} MopMotor_FG MopMotor_FG
- {2^,21} MOP_CS MOP_CS
- {2^,21} MopComponent_EN MopComponent_EN

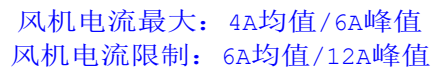
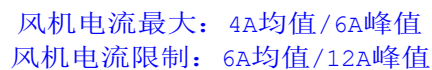


拖布电机
启动瞬间: 2.5A
洗拖布: 1.5A (短时间)
拖布工作: 1.0A (长时间)



$$V_{cs}(\mu V) = I_{out}(A) * R_{ilm}(R) * G(\mu A/A) = 1A * 750R * 182\mu A/A = 136.5mV/A \quad +/-10\%$$
$$I_{limit} = 3334/R = 3334/750R = 4.45A \quad +/-10\%$$
$$T_{time} = V_{timer} * C_{timer} / I_{timer} = 2.2 * 1.51 / 1.8\mu A = 1.84ms$$

NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A3	Page Name: 05 Mop Motor	Rev: V1
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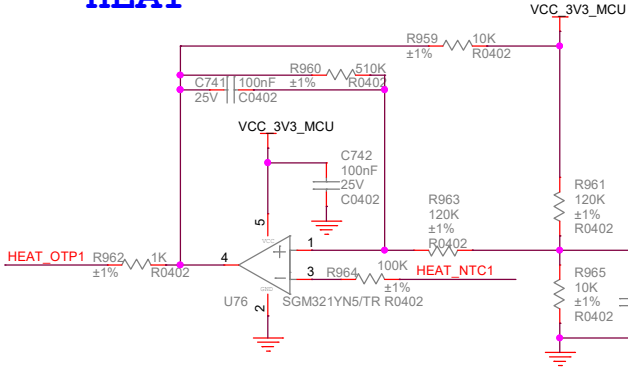


NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCB A 0724A	Author: 梁伟粤
Page Size: A3	Page Name: 06 Vacuum Component	Rev: V1
Part Number		Sheet 28 of 41
Modify Date	Wednesday, July 24, 2024	

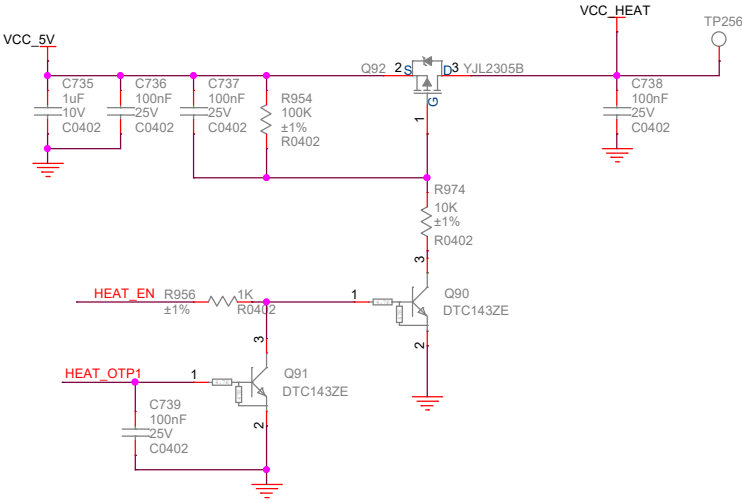
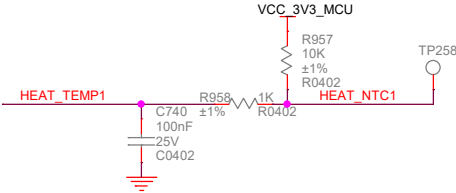
{2^,21} HEAT_EN
{2^,21} HEAT_TEMP1



HEAT



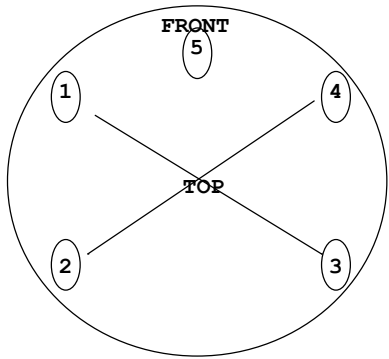
100℃时NTC电阻值为0.67674K，理论对应的分压值为0.209v，实际设置0.205v 触发硬件保护
50℃时NTC电阻值为3.60777K，对应的分压值为0.875v，实际设置0.834v 释放硬件保护



NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 07 Heat&Temperature &humidit	Rev: V1
Part Number		Sheet 29 of 41
Modify Date	Wednesday, July 24, 2024	

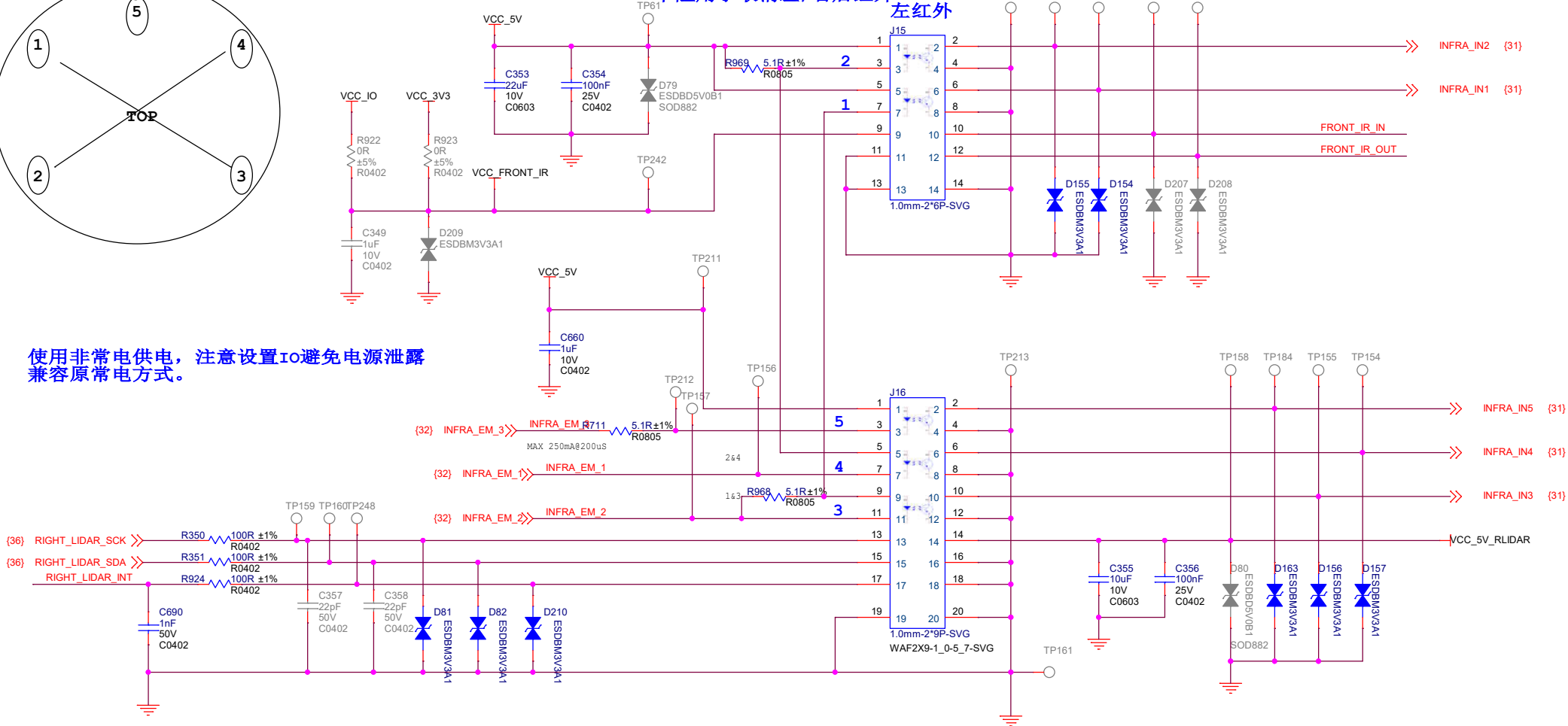


NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCB 0724A	Author: 梁伟粤
Page Size: B	Page Name: 00 DUST_COVER	Rev: V1
Part Number		Sheet 30 of 41
Modify Date	Wednesday, July 24, 2024	

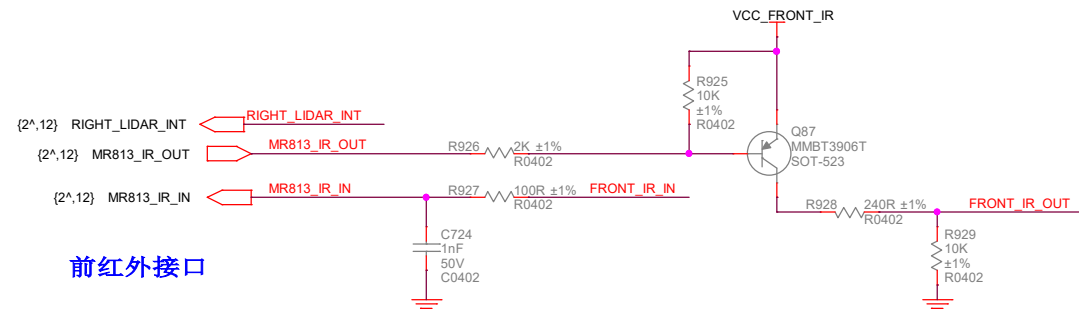


使用非常电供电，注意设置IO避免电源泄露
兼容原常电方式。

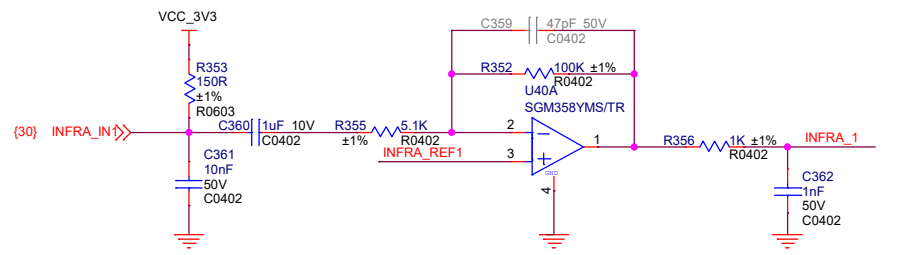
串阻用于取消左/右后红外
左红外



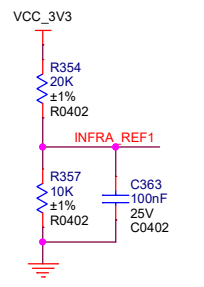
前红外接口



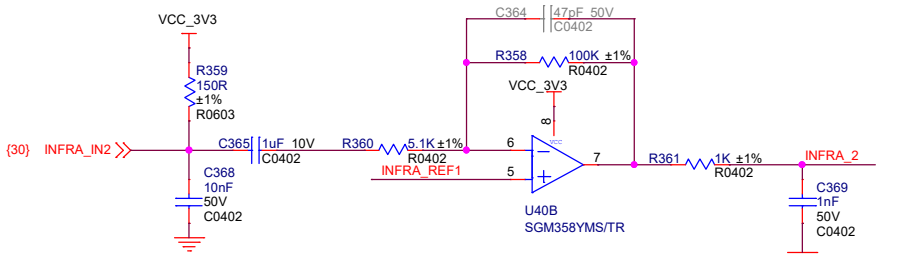
NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 00 Infra Cliff Interface	Rev: V1
Part Number		Sheet 31 of 41
Modify Date	Wednesday, July 24, 2024	



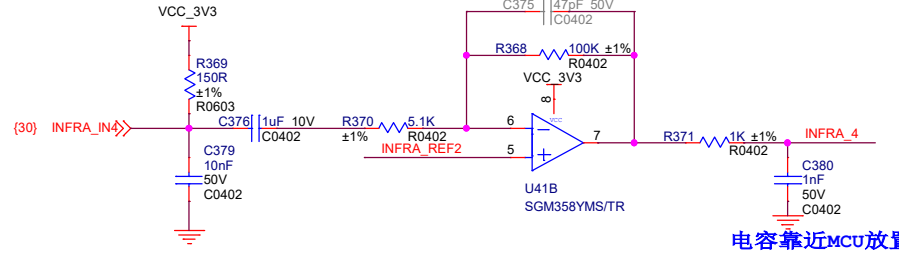
电容靠近MCU放置



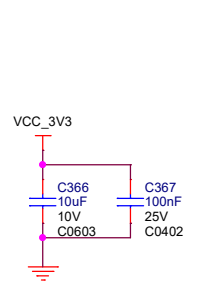
电容靠近MCU放置



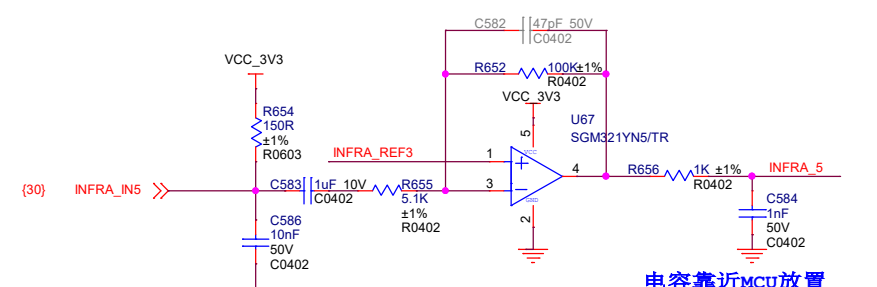
电容靠近MCU放置



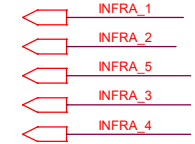
电容靠近MCU放置



电容靠近MCU放置

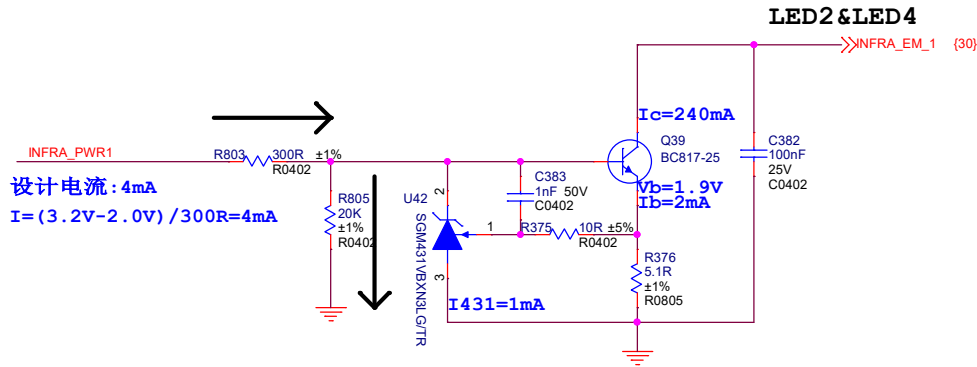


- [2^,21] INFR-1
- [2^,21] INFR-2
- [2^,21] INFR-5
- [2^,21] INFR-3
- [2^,21] INFR-4

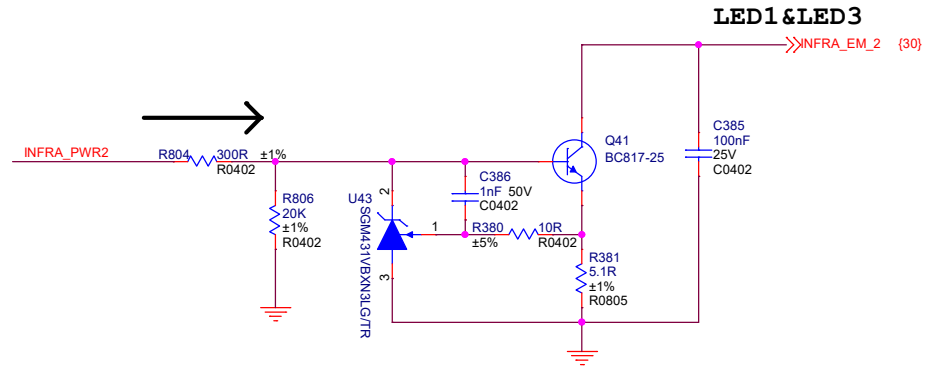


NARVAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 01 Infra Cliff RX	Rev: V1
Part Number		Sheet 32 of 41
Modify Date	Wednesday, July 24, 2024	

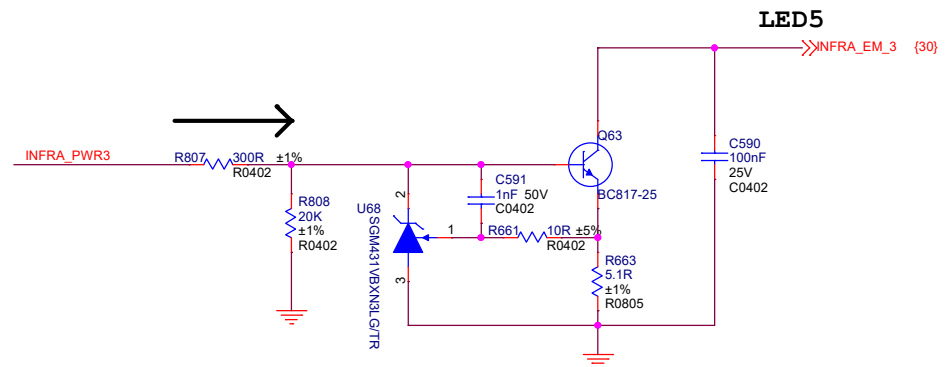
IO驱动能力: 8mA/20mA



SGM431稳压电流范围: 0.1mA~70mA IO电流需求: 2.15mA
TL432稳压电流范围: 1mA~100mA IO电流需求: 3.05mA
恒流源驱动: $I = V_{ref} / R = 1.25V / 5.1R = 245mA$



恒流源驱动: $I = V_{ref} / R = 1.25V / 5.1R = 245mA$



恒流源驱动: $I = V_{ref} / R = 1.25V / 5.1R = 245mA$

NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 02 Infra Cliff TX	Rev: V1
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超声 5V 10mA
按键及点阵LED 5V 500mA MAX

机械激光雷达 5V 200mA/450mA (启动瞬时电流)

$$I_{OS} (mA) = 55960 (V) / R_{ilim} \wedge 1.004 (k) = 822mA$$

前线激光雷达 5V 100mA
Vgsth>-1.0V

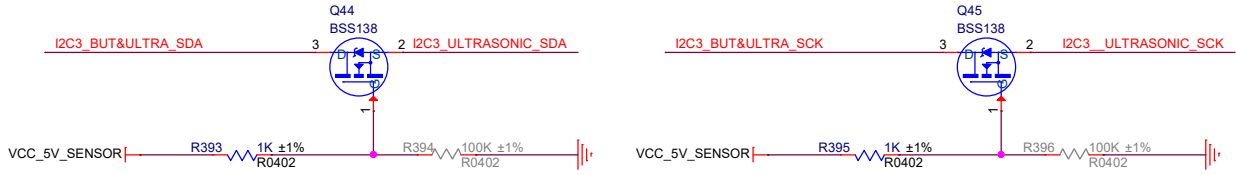
沿边线激光雷达 5V 100mA
Vgsth>-1.0V

机械雷达: 5V 200/300mA (450mA MAX)
兼容 国科光芯/乐动 雷达

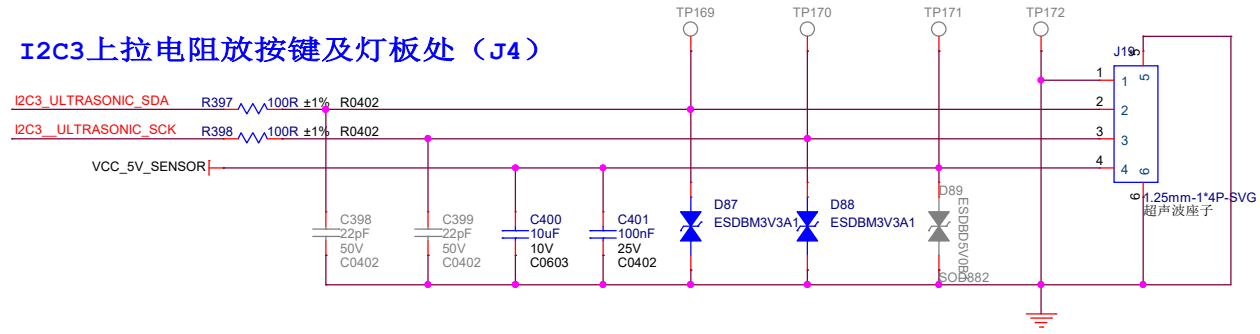
- (2*,12) UART2_LIDAR_RX < UART2_LIDAR_RX
(2*,12) UART2_LIDAR_TX < UART2_LIDAR_TX
(2*,12) LIDAR_PWM < LIDAR_PWM
(2*,12) LOADSWITCH_FAULT < LOADSWITCH_FAULT
(2*,12) LOADSWITCH_EN < LOADSWITCH_EN

NARVAL 云螭		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟考
Page Size: C	Page Name: 03 LIDAR_Loadswitch	Rev: V1
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{2^,12} I2C3_BUT&ULTRA_SCK I2C3_BUT&ULTRA_SCK
{2^,12,20} I2C3_BUT&ULTRA_SDA I2C3_BUT&ULTRA_SDA



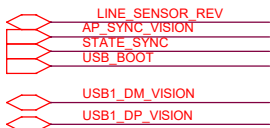
I2C3上拉电阻放按键及灯板处（J4）



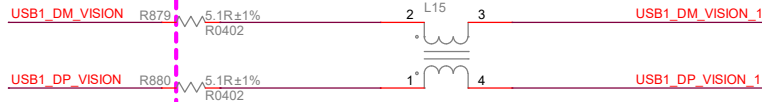
NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 04 Ultrasonic Sensor	Rev: V1
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{2^,12} LINE_SENSOR_REV
{2^,12} AP_SYNC_VISION
{2^,12} STATE_SYNC
{2^,12} USB_BOOT

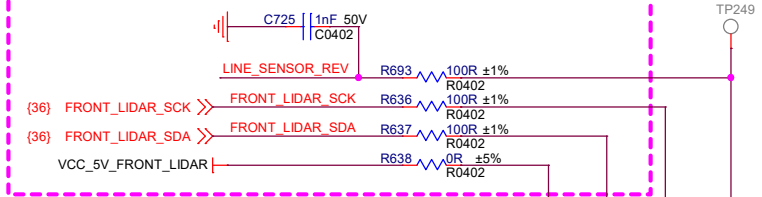
{2^,16} USB1_DM_VISION
{2^,16} USB1_DP_VISION



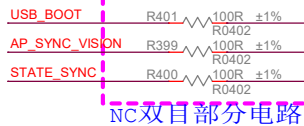
NC双目部分电路



适配前线激光



主机控制从机升级
主机跟从机时钟同步
从机跟主机状态同步

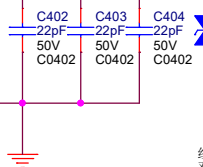


NC双目部分电路

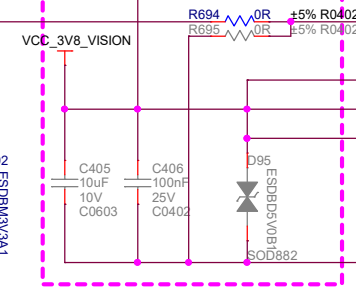
前线激光: R693/R636/R637/R638/R694
双目模块: R399/R400/R401/R879/R880/R695/L15/D93/D94
R693/R636/R637/R638/R694
R399/R400/R401/R879/R880/R695/L15/D93/D94

贴片
NC
贴片

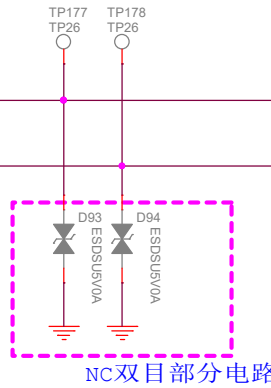
TP173



线激光: D90上件ESD5D150TA
双目: D90上件ESD3V3D250TA



适配前线激光 NC双目部分电路



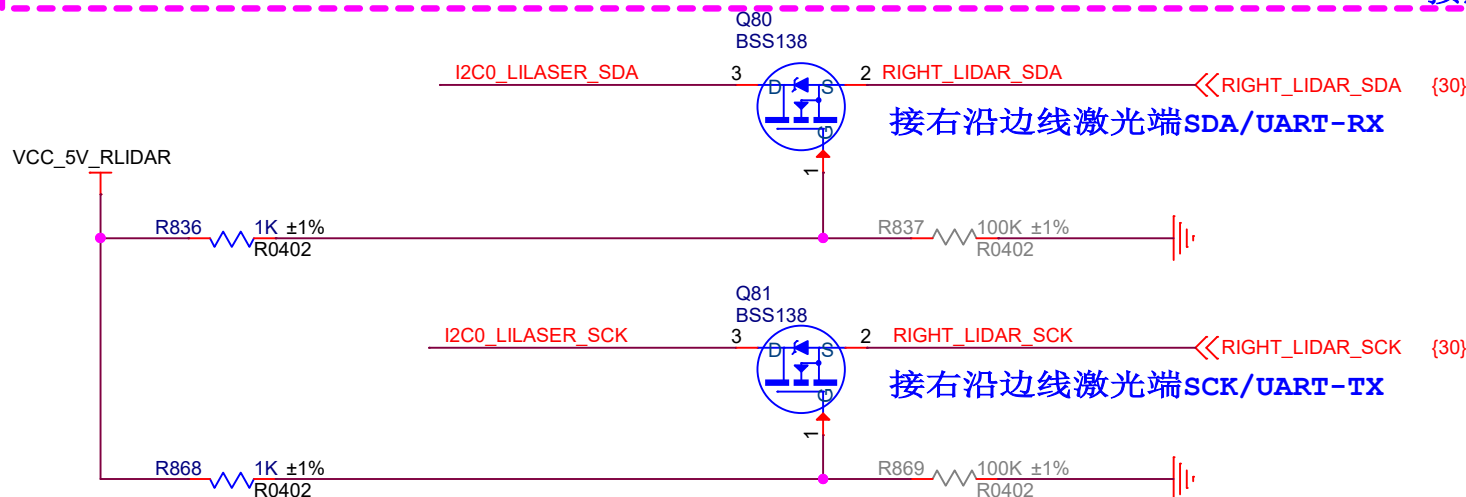
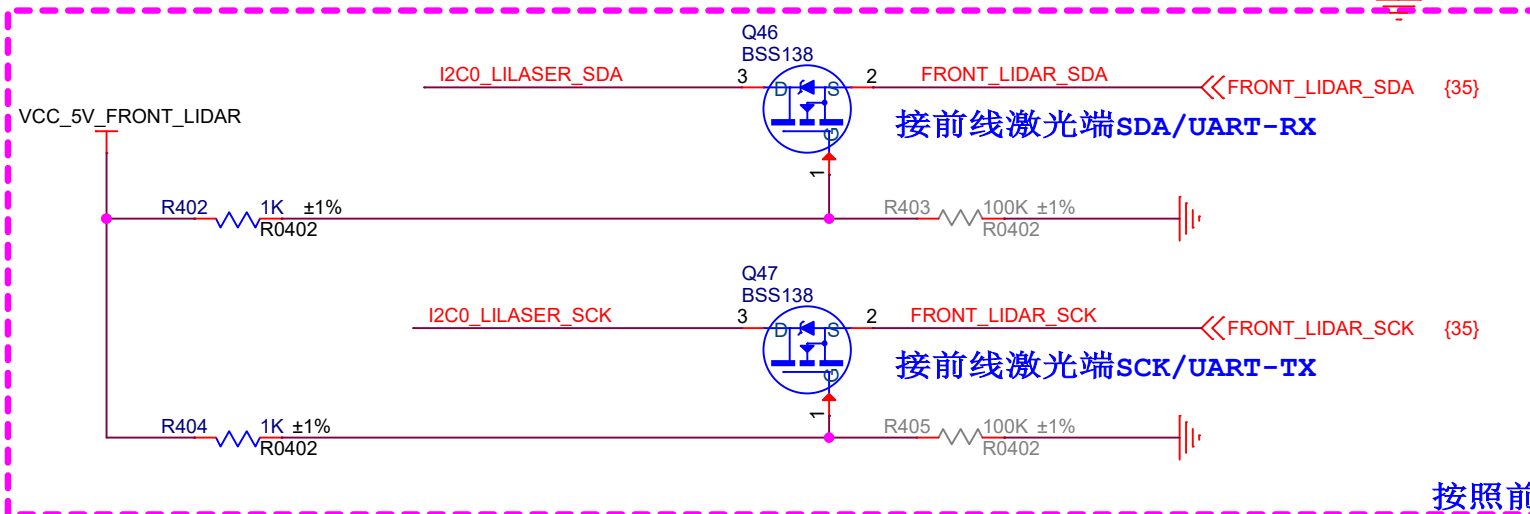
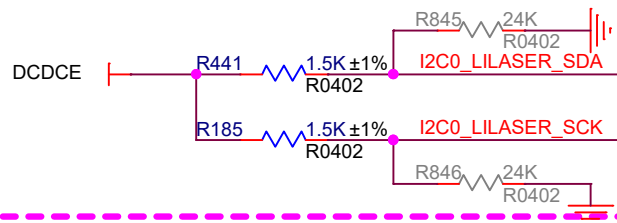
NC双目部分电路

1.0mm-1*12P-SVG
WAF12-1_0-4_5-SVG

双目座子

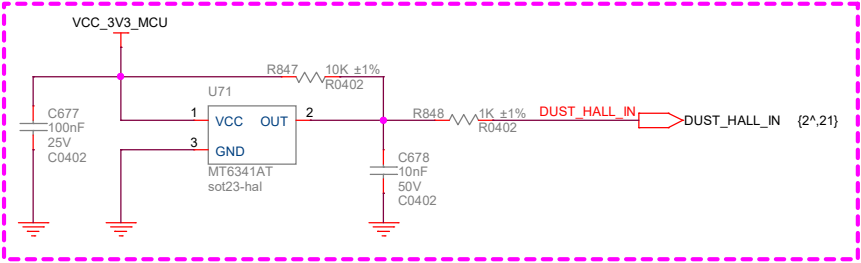
NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 05 Vision Module	Rev: V1
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{2^,12} I2C0_LILASER_SCK I2C0_LILASER_SCK
{2^,12} I2C0_LILASER_SDA I2C0_LILASER_SDA



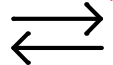
NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A	Page Name: 06 Line Sensor	Rev: V1
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NC尘盒霍尔传感器

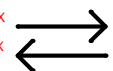


NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 07 HALL	Rev: V1
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MCU



MR813



MCU烧录（不含地）

813烧录

MCU DEBUG

蓝牙烧录（不含地）

813通信串口

调试烧录接口

量产时NC

{2^,21}	MCU_DEBUG_RX	MCU_DEBUG_RX
{2^,21}	MCU_DEBUG_TX	MCU_DEBUG_TX
{2^,11}	CPU_UPDATE	CPU_UPDATE
{2^,16}	USB0_DP_DEBUG	USB0_DP_DEBUG
{2^,16}	USB0_DM_DEBUG	USB0_DM_DEBUG
{2^,18}	BT_SWS	BT_SWS
{2^,18}	BT_DEBUG	BT_DEBUG
{2^,12}	UART0_DEBUG_RX	UART0_DEBUG_RX
{2^,12}	UART0_DEBUG_TX	UART0_DEBUG_TX
{2^,21}	MCU_SWCLK	MCU_SWCLK
{2^,21}	MCU_SWCLK	MCU_SWCLK
{2^,18}	BT_DEBUG_TX	BT_DEBUG_TX
{2^,18}	BT_DEBUG_RX	BT_DEBUG_RX

VCC_3V3_MCU

R881
10K
±1%
R0402

MCU_DEBUG_RX

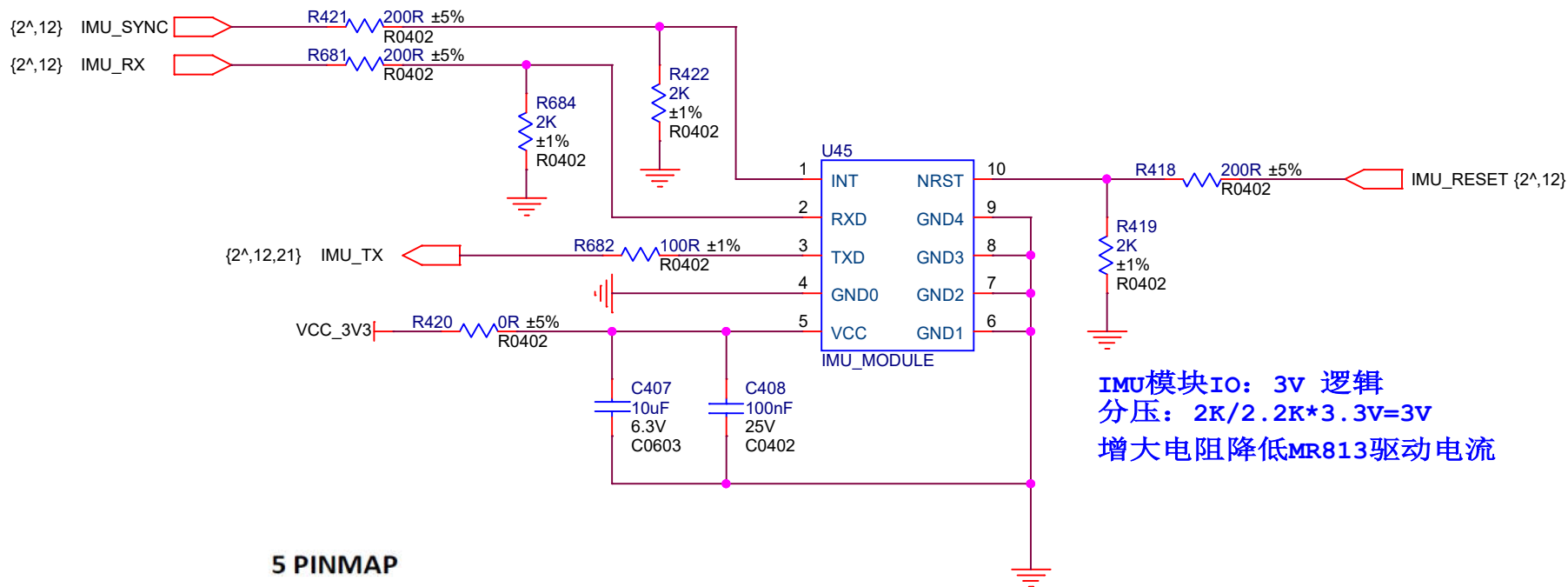
VCC_IO

R882
10K
±1%
R0402

UART0_DEBUG_RX

NARVAL 云鲸

Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 00 DEBUG	Rev: V1
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IMU模块IO: 3V 逻辑
分压: $2K/2.2K \times 3.3V = 3V$
增大电阻降低MR813驱动电流

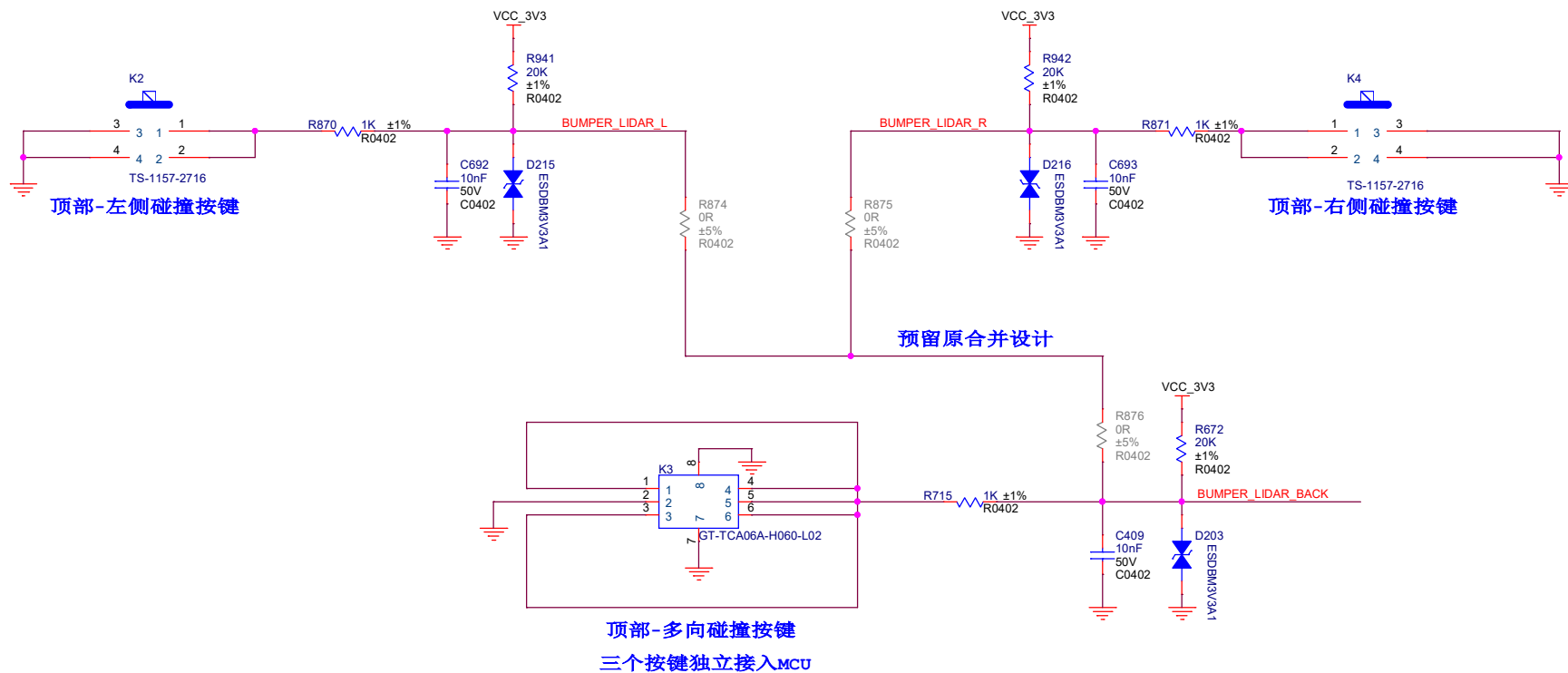
NARWAL 云鲸

Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: A	Page Name: 00 IMU	Rev: V1
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{2^,21} BUMPER_LIDAR_BACK
{2^,21} BUMPER_LIDAR_L
{2^,21} BUMPER_LIDAR_R

{2^,23} BUMPER_L
{2^,23} BUMPER_R

两颗上拉电阻NC



NARWAL 云鲸		
Design Name	IP1207_ROBOT_MB01_V2_PCBA 0724A	Author: 梁伟粤
Page Size: B	Page Name: 01 BUMPER	Rev: V1
Part Number		Sheet 41 of 41
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