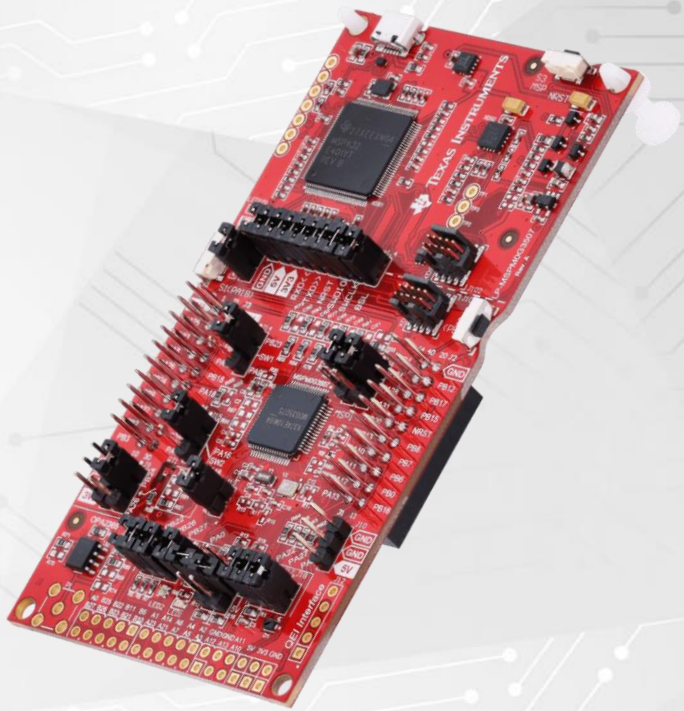
本文档根据TI官网手册整理，如有错误，请参考文档slau869

LP-MSPM0G3507硬件描述



· 谢胜祥

· 31342592@qq.com

· 2024.1.29

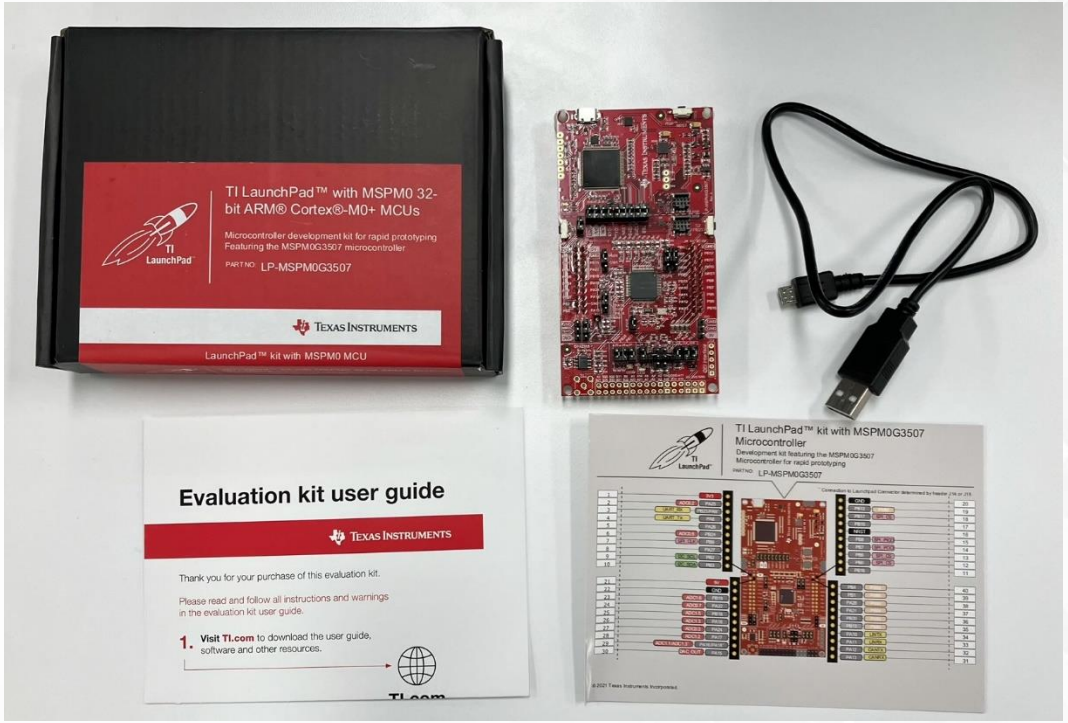
内容概述

- Launchpad套件概述
  - 板卡特性/MCU特性
- 调试器
- 系统供电
- 具体功能电路
  - MCU小系统
  - 按键、LED、……
- 接口和跳线帽小结

Launchpad套件

LP-MSPM0G3507套件包含:

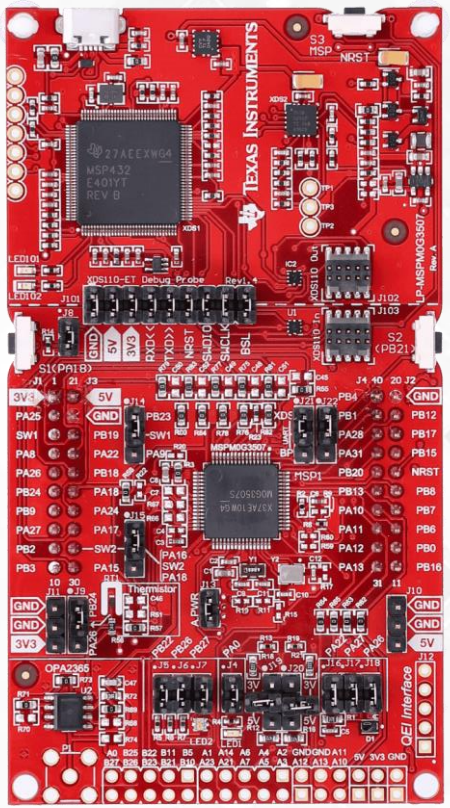
- MSPM0G3507 LaunchPad 板卡 x1
- Micro USB 数据线 x1
- 《快速入门指南》纸卡 x1



LP-MSPM0G3507特性

基本特性

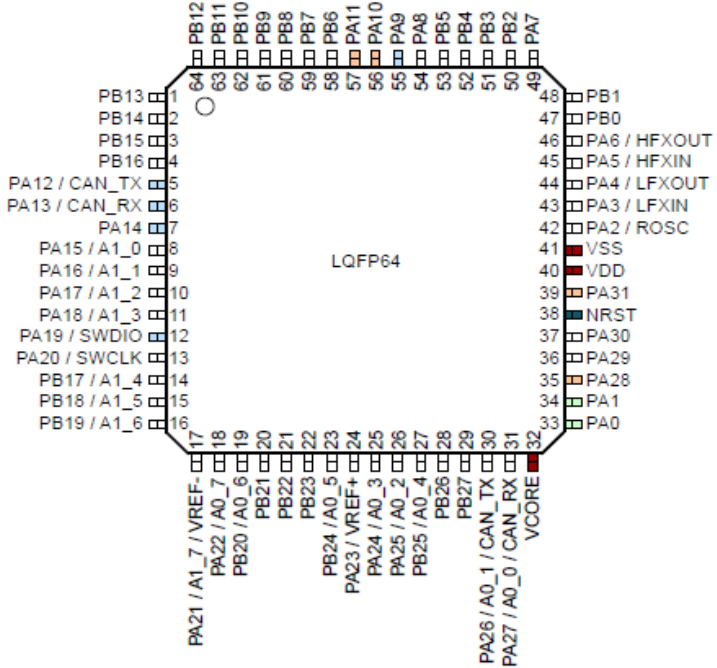
- 带外扩接口的板载 XDS110 -ET调试器
  - 可用于超低功耗调试的EnergyTrace 技术（配合CCS使用）
  - USB到PC的虚拟UART（USB-TTL转换器）
- 2 个用户按键(S1和S2)
- 1 个单色 LED1 和 1 个 RGB三色LED2
- 温度传感器电路（热敏电阻）
- 光传感器电路
- OPA2365电路（默认缓冲模式）可用于评估 4Msps 的ADC
- ADC 输入的 RC 滤波器（默认未焊接）
- 所有引脚都引出



MCU—MSPM0G3507

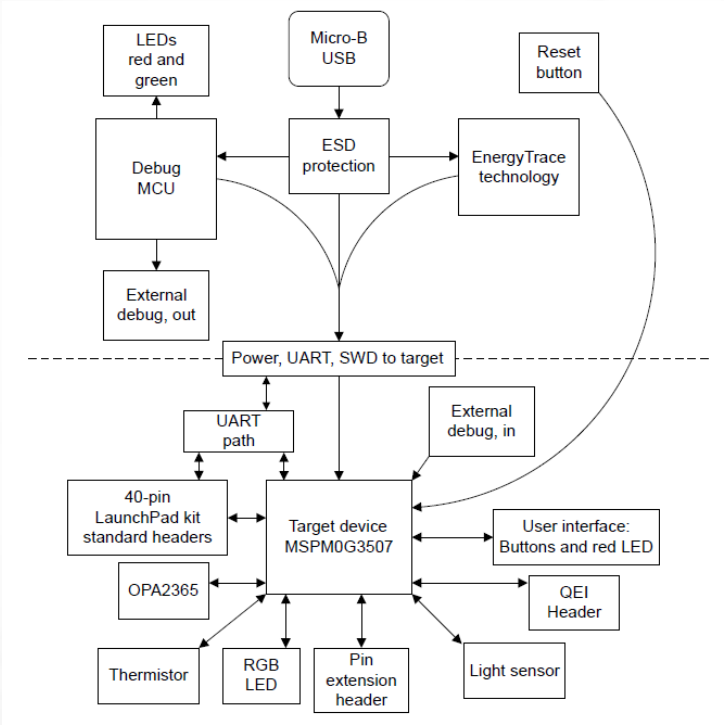
芯片特性：

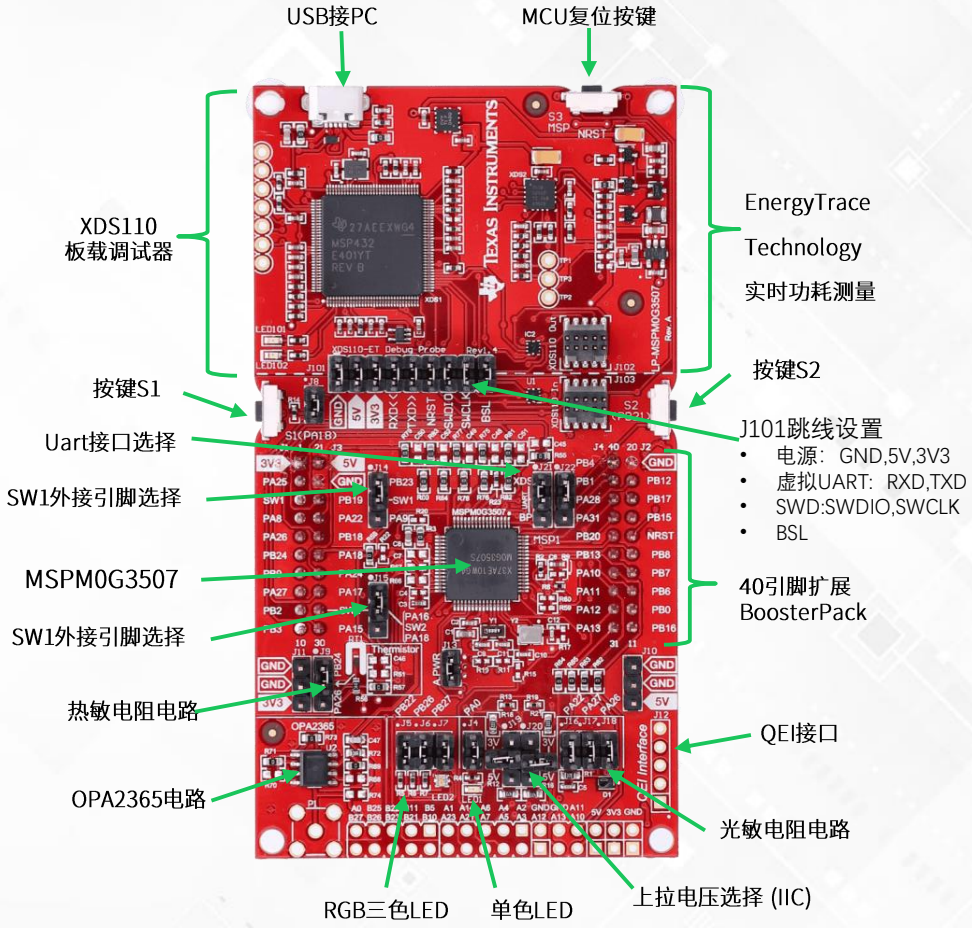
- Arm 32 位 Cortex-M0+内核，最高80MHz
- 宽电源电压范围：1.62 V 至 3.6 V
- 工作温度范围：-40℃ ~ 125 ℃
- 具有纠错码128KB 闪存，32KB SRAM
- 2个总计多达17个外部通道的12 位 4Msps同步采样ADC
- 1个具有集成输出缓冲器的 12 位 1Msps DAC
- 2个零漂移、零交叉斩波运算放大器OPA
- 1个通用运算放大器GPAMP
- 3个带8位DAC参考的高速比较器
- 内部参考电压（1.4V或2.5V）
- 4个UART，2个IIC，2个SPI，1个CAN
- 7个 定时器，2个窗口式看门狗定时器，RTC
- 60个 GPIO



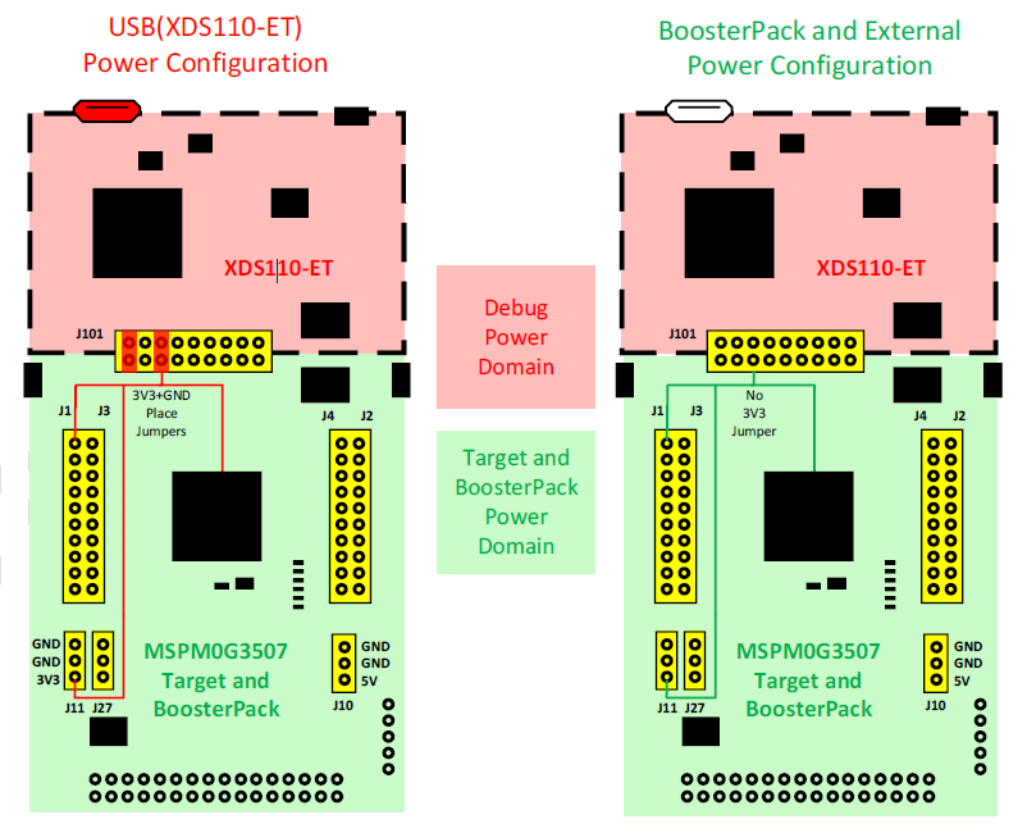
更多特性描述请查考器件手册

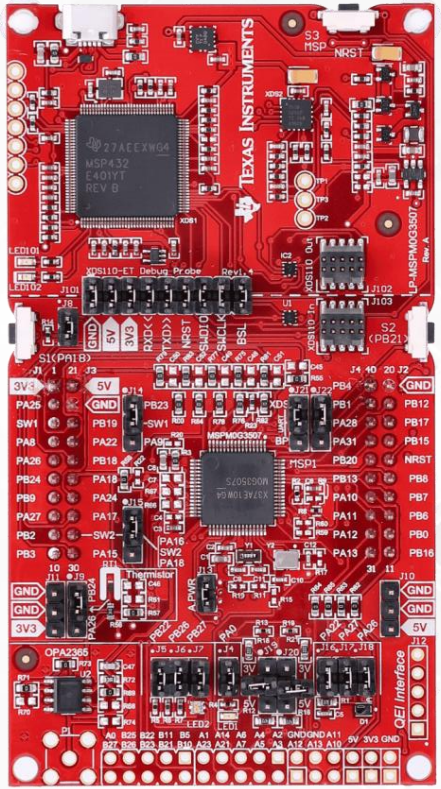
功能框图


LEDs red and green
Micro-B USB
Reset button
Debug MCU
ESD protection
EnergyTrace technology
External debug, out
Power, UART, SWD to target
UART path
External debug, in
40-pin LaunchPad kit standard headers
Target device MSPM0G3507
User interface: Buttons and red LED
OPA2365
QEI Header
Thermistor
RGB LED
Pin extension header
Light sensor


USB接PC
MCU复位按键
XDS110
板载调试器
EnergyTrace
Technology
实时功耗测量
按键S1
按键S2
J101跳线设置
• 电源：GND,5V,3V3
• 虚拟UART：RXD,TXD
• SWD:SWDIO,SWCLK
• BSL
Uart接口选择
SW1外接引脚选择
MSPM0G3507
40引脚扩展
BoosterPack
SW1外接引脚选择
热敏电阻电路
QEI接口
OPA2365电路
光敏电阻电路
RGB三色LED
单色LED
上拉电压选择 (IIC)

板卡供电描述--电源(3.3V)



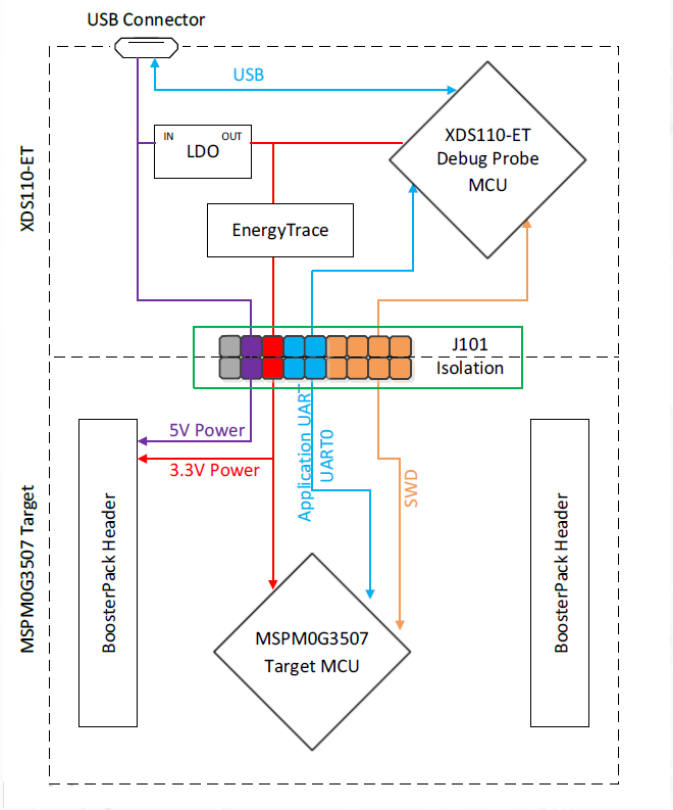


板载调试器

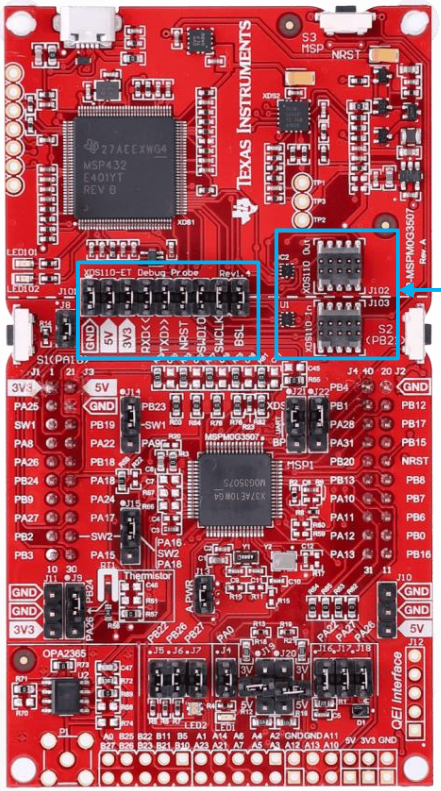
- 支持EnergyTrace技术的 XDS110-ET 板载调试器
  - 调试器连接：跳线帽的设置
- XDS110-ET调试器对外使用（SWD）
- XDS110-ET调试器用于外部板卡(JTAG)
- 使用外部调试器代替板载 XDS110-ET

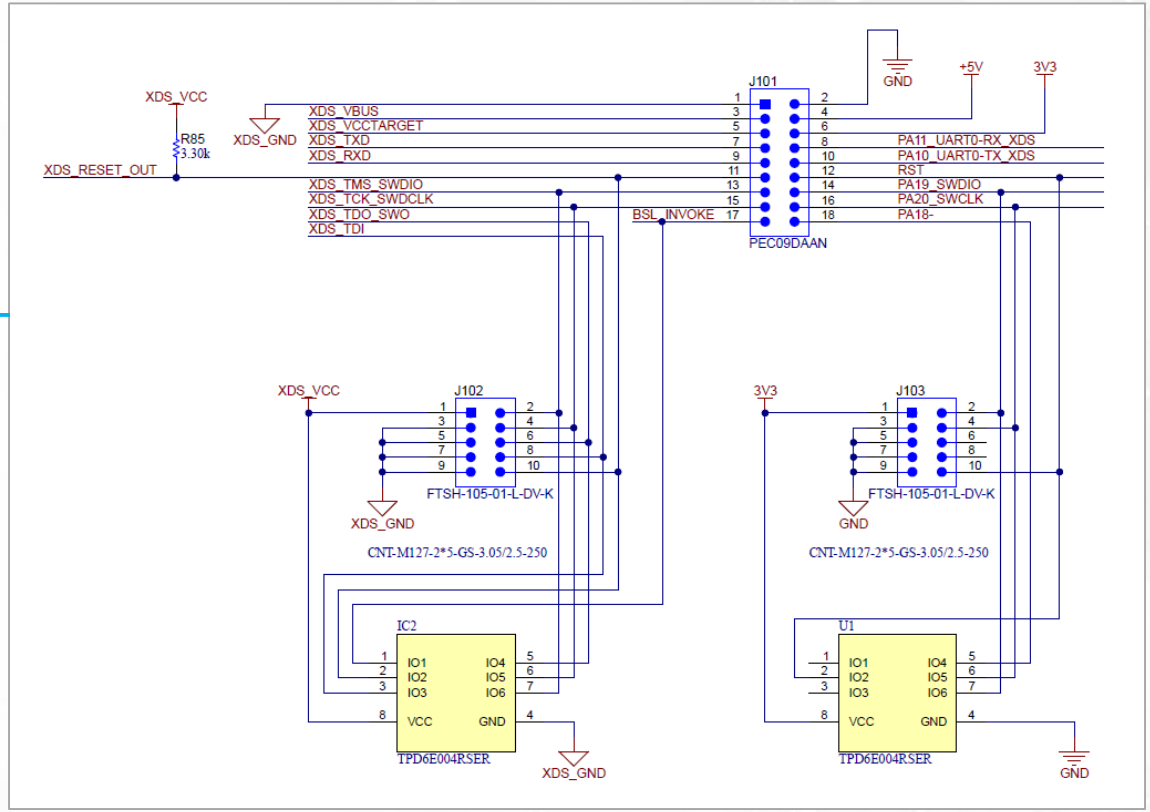
跳线	描述
GND	地
5V	来自USB的VBUS 5V
3V3	3.3V，从XDS110-ET域的VBUS出取得
RXD<<	虚拟UART: MSPM0G3507从该引脚接收数据
TXD>>	虚拟UART: MSPM0G3507发送数据到该引脚
NRST	RST信号
SWDIO	SWD调试信号：SWDIO数据信号
SWCLK	SWD调试信号：SWCLK时钟信号
BSL	Bootstrap Loader信号

J101接口描述



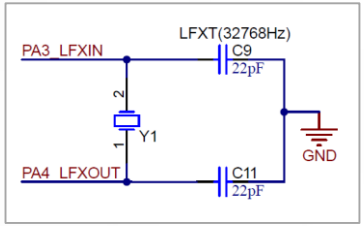
调试器接口


XDS110-ET Debug Probe
TEXAS INSTRUMENTS
MSP432
QEI Interface

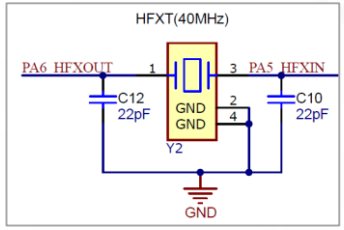

XDS_VCC
R85
3.30k
XDS_GND
XDS_RESET_OUT
J101
XDS_VBUS
XDS_VCCTARGET
XDS_TXD
XDS_RXD
XDS_TMS_SWDIO
XDS_TCK_SWDCLK
XDS_TDO_SWO
XDS_TDI
BSL_INVOKE
PEC09DAAN
GND
+5V
3V3
PA11_UART0-RX_XDS
PA10_UART0-TX_XDS
RST
PA19_SWDIO
PA20_SWCLK
PA18-
J102
FTSH-105-01-L-DV-K
CNT-M127-2*5-GS-3.05/2.5-250
J103
IC2
U1
IO1
IO2
IO3
IO4
IO5
IO6
VCC
TPD6E004RSER

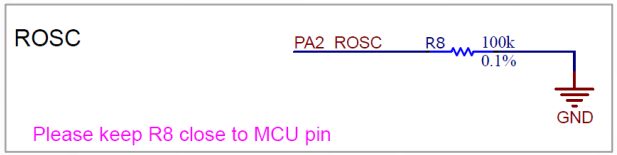
MCU小系统

低频晶振



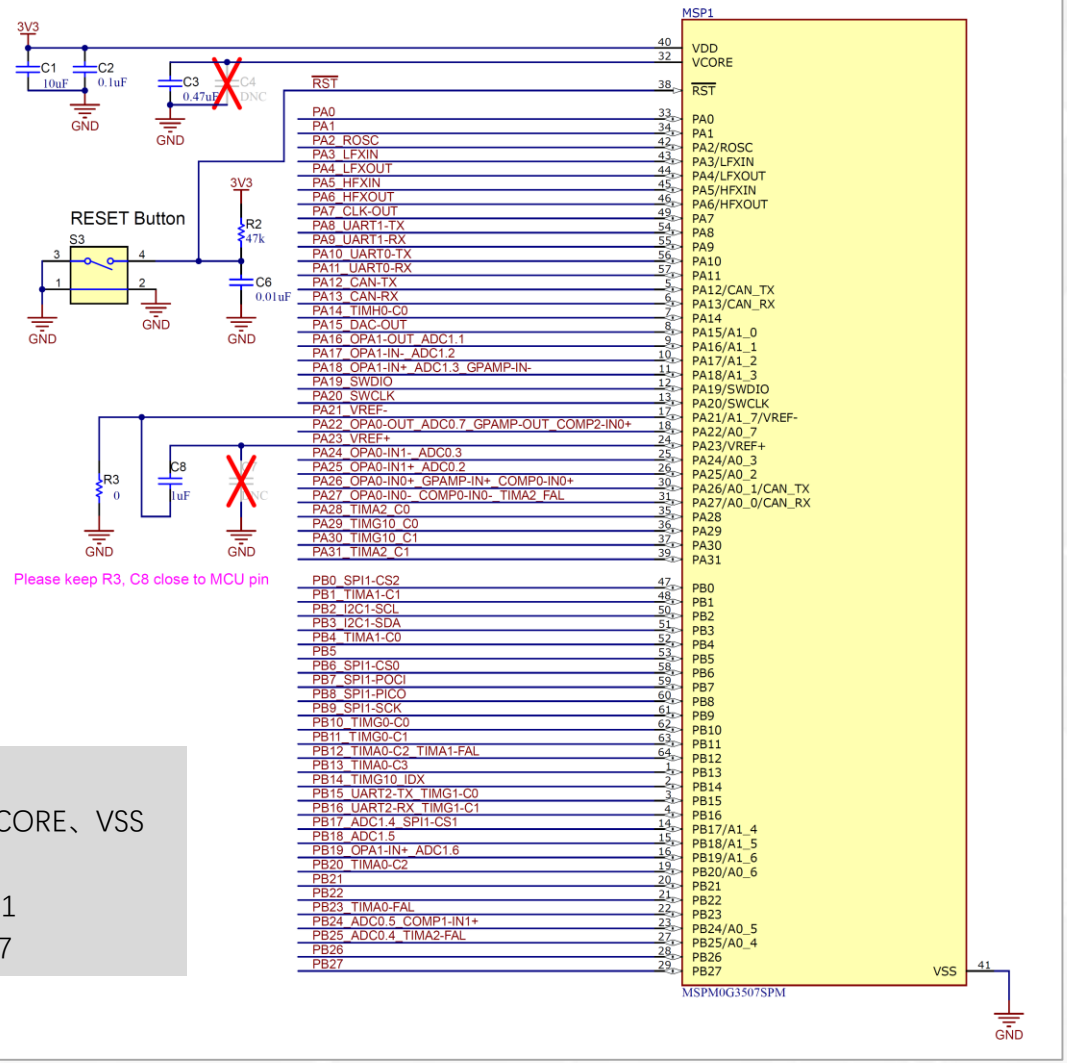
高频晶振



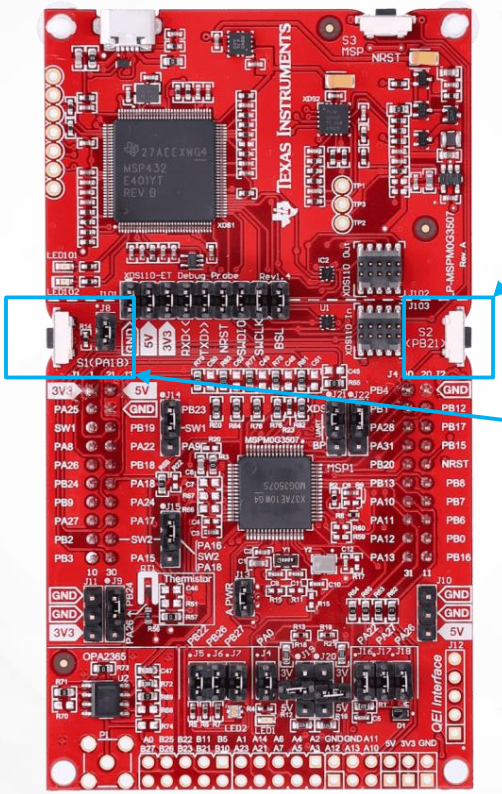


芯片共64个引脚:

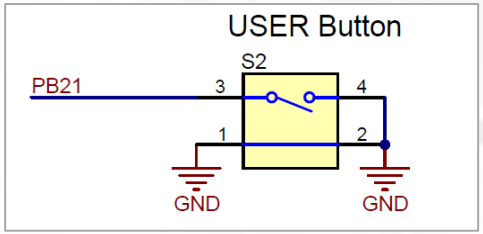
- 3 个： VDD、VCORE、VSS
- 1 个： RST
- 32个: PA0-PA31
- 28个: PB0-PB27



按键

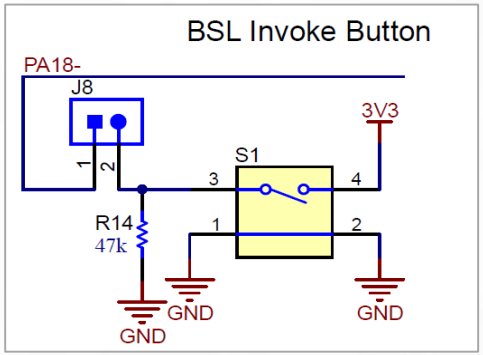


用户按键S2



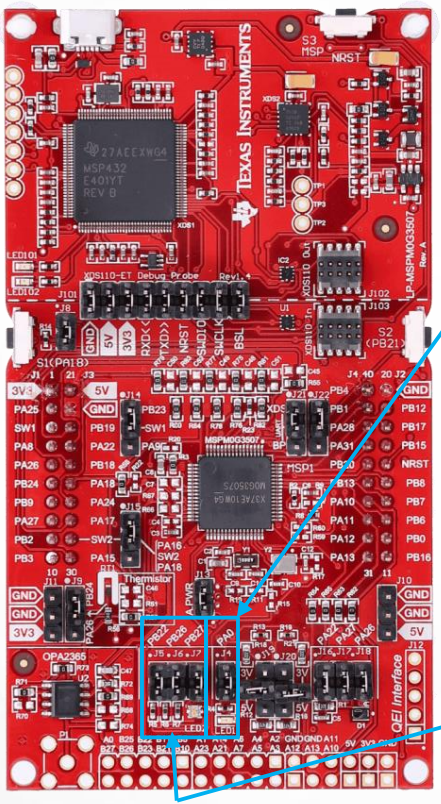
PB21配置输入，还需配置内部上拉，按键未按下时为高电平；按键按下时为低电平

BSL按键S1

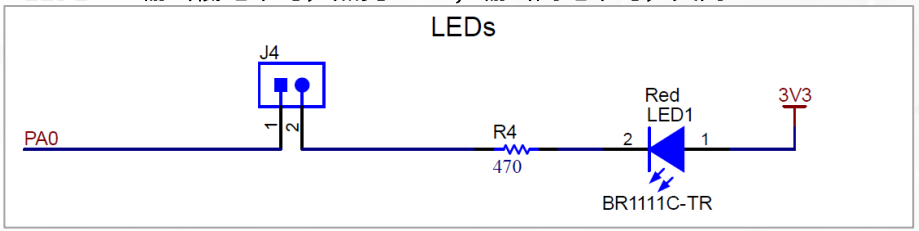


不用使能内部电阻，S1按键未按下时为低电平；按键按下时为高电平

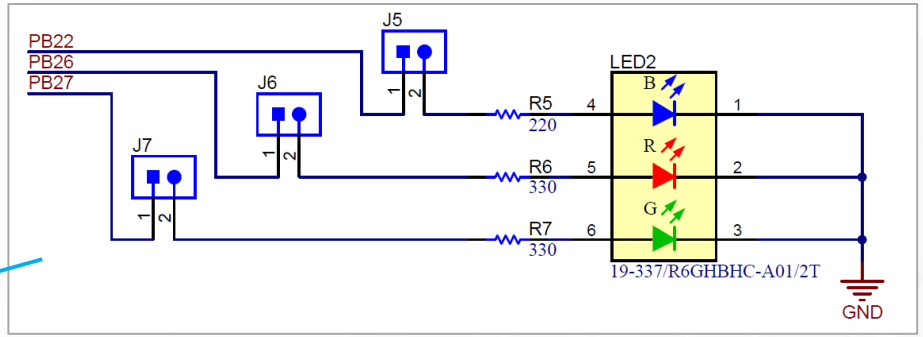
LEDs



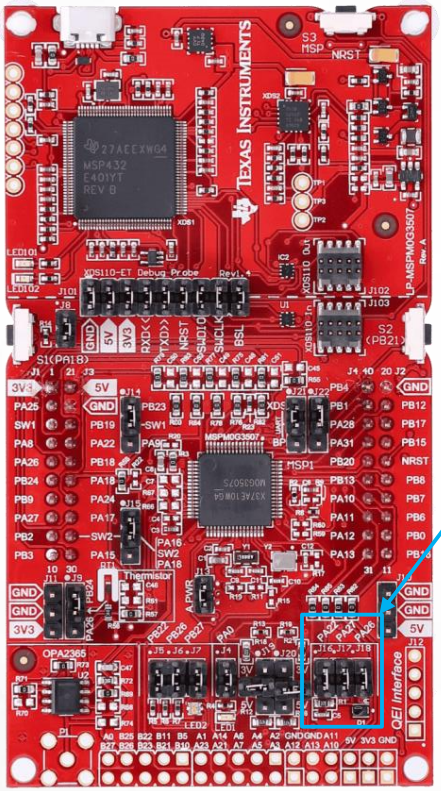
LED1　　输出低电平时，点亮LED1；输出高电平时，关闭LED1

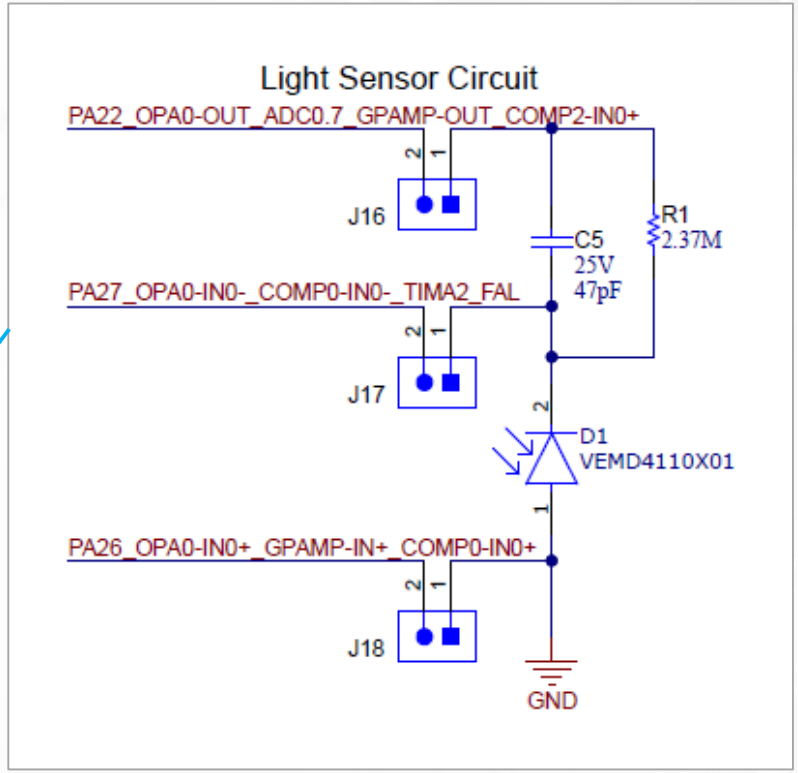


LED2,三色LED　　输出高电平时，点亮LED；输出低电平时，关闭LED

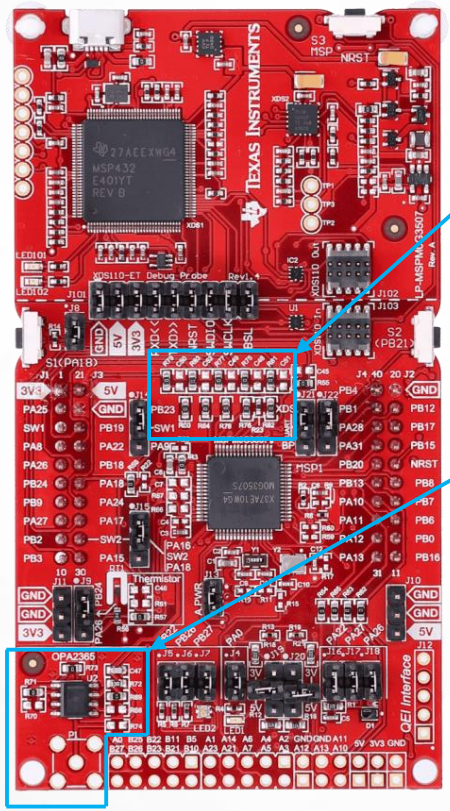


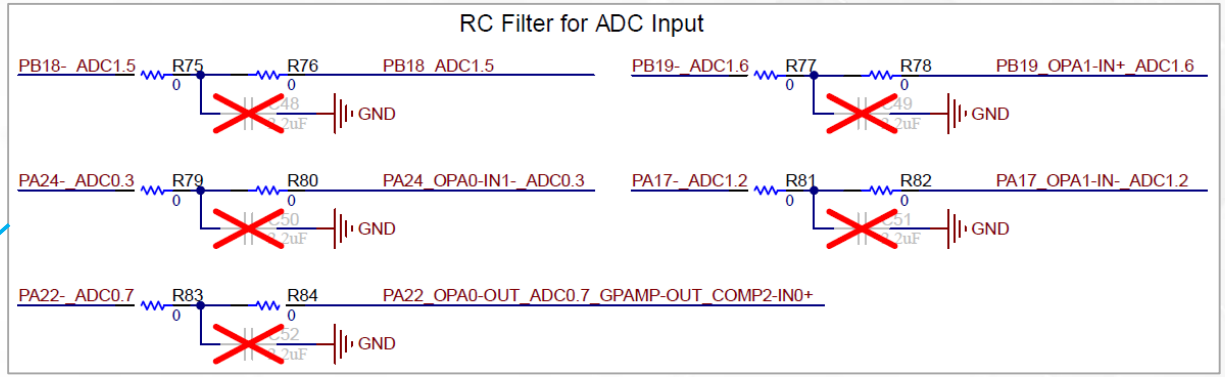
光照度传感器电路

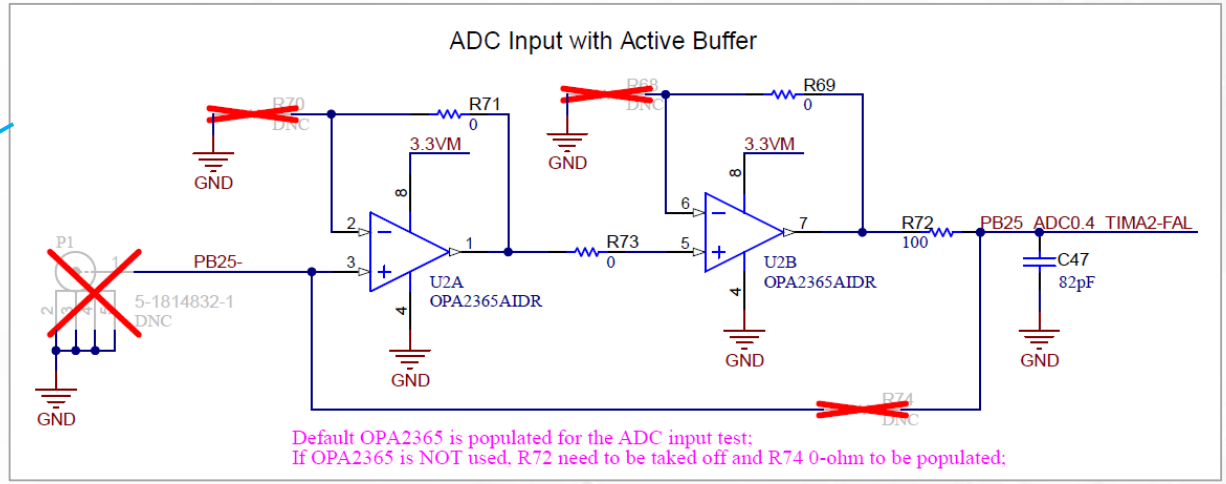



Light Sensor Circuit
PA22_OPA0-OUT_ADC0.7_GPAMP-OUT_COMP2-IN0+
J16
C5
25V
47pF
R1
2.37M
PA27_OPA0-IN0-_COMP0-IN0-_TIMA2_FAL
J17
D1
VEMD4110X01
PA26_OPA0-IN0+_GPAMP-IN+_COMP0-IN0+
J18
GND

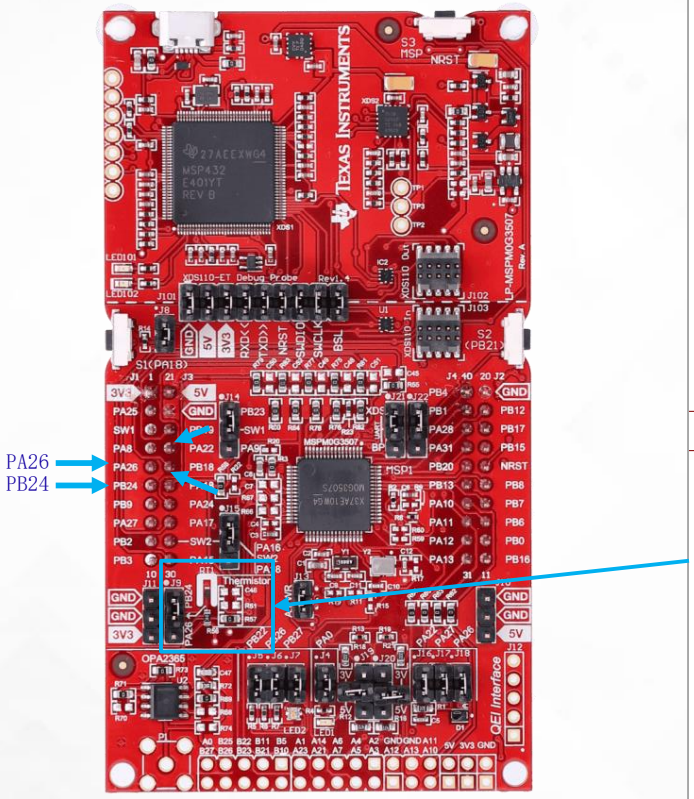
ADC测试电路

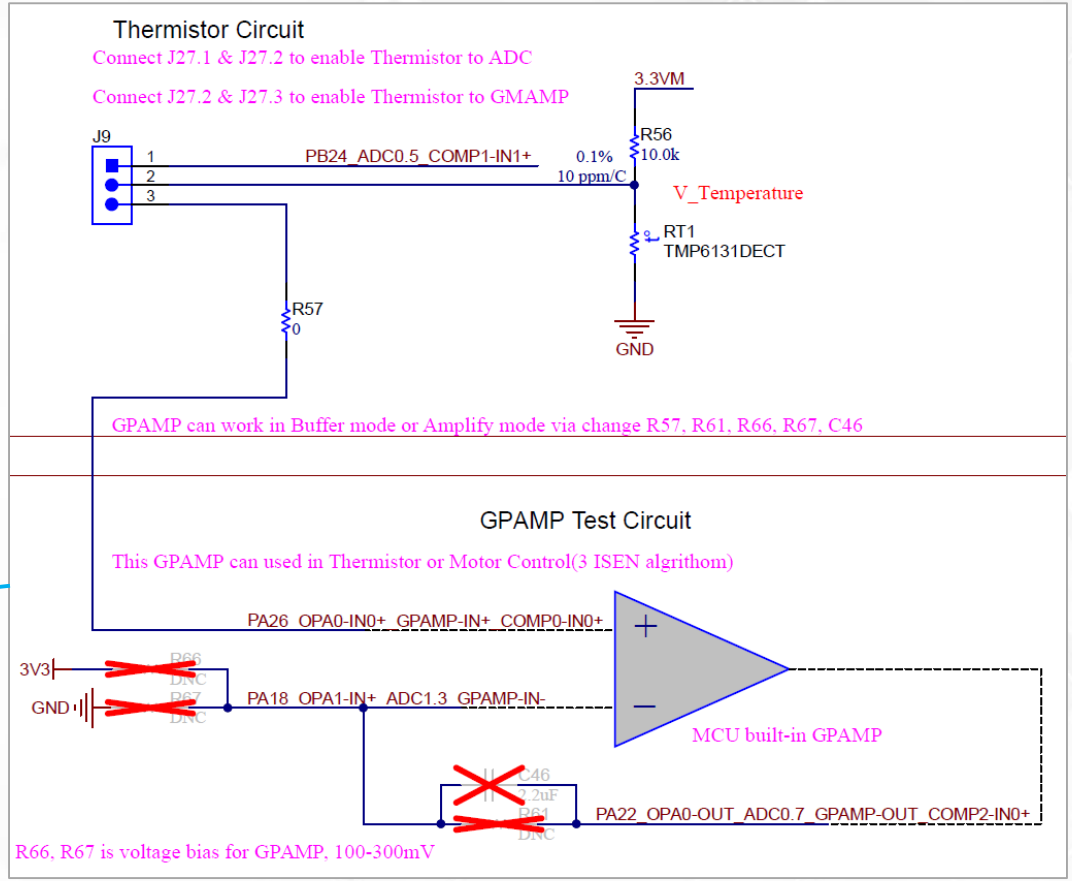



RC Filter for ADC Input
PB18_ ADC1.5
R75
0
R76
0
PB18_ADC1.5
48
2uF
GND
PB19_ ADC1.6
R77
0
R78
0
PB19_OPA1-IN+_ADC1.6
49
2uF
GND
PA24_ ADC0.3
R79
0
R80
0
PA24_OPA0-IN1-_ADC0.3
50
2uF
GND
PA17_ ADC1.2
R81
0
R82
0
PA17_OPA1-IN-_ADC1.2
51
2uF
GND
PA22_ ADC0.7
R83
0
R84
0
PA22_OPA0-OUT_ADC0.7_GPAMP-OUT_COMP2-IN0+
52
2uF
GND

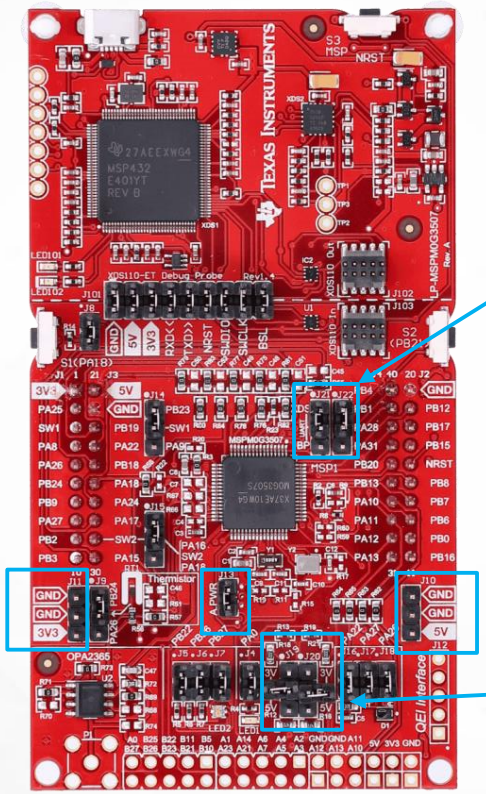

ADC Input with Active Buffer
R70
DNC
R71
0
3.3VM
GND
R68
DNC
R69
0
3.3VM
GND
P1
PB25-
5-1814832-1
DNC
U2A
OPA2365AIDR
U2B
OPA2365AIDR
R73
0
R72
100
PB25_ADC0.4_TIMA2-FAL
C47
82pF
GND
R74
DNC
Default OPA2365 is populated for the ADC input test;
If OPA2365 is NOT used, R72 need to be taked off and R74 0-ohm to be populated;

热敏电阻和通用运放


PA26
PB24

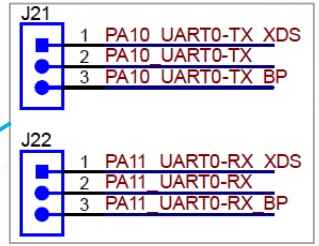

Thermistor Circuit
Connect J27.1 & J27.2 to enable Thermistor to ADC
Connect J27.2 & J27.3 to enable Thermistor to GMAMP
3.3VM
J9
1
2
3
PB24_ADC0.5_COMP1-IN1+
0.1%
10 ppm/C
R56
10.0k
V_Temperature
RT1
TMP6131DECT
R57
0
GND
GPAMP can work in Buffer mode or Amplify mode via change R57, R61, R66, R67, C46
GPAMP Test Circuit
This GPAMP can used in Thermistor or Motor Control(3 ISEN algrithom)
PA26_OPA0-IN0+_GPAMP-IN+_COMP0-IN0+
3V3
GND
R66
DNC
R67
DNC
PA18_OPA1-IN+_ADC1.3_GPAMP-IN-
MCU built-in GPAMP
C46
2.2uF
R61
DNC
PA22_OPA0-OUT_ADC0.7_GPAMP-OUT_COMP2-IN0+
R66, R67 is voltage bias for GPAMP, 100-300mV

跳线帽设置



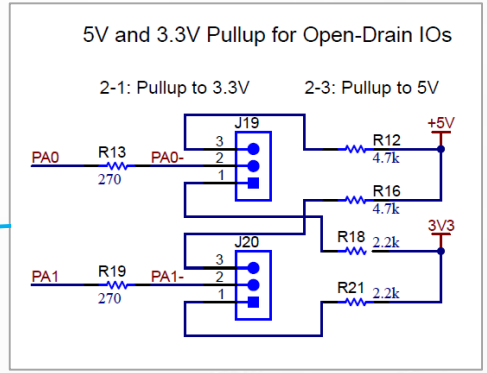
芯片的uart引脚通过跳线：

- 连接到xds
- 连接到可以BP

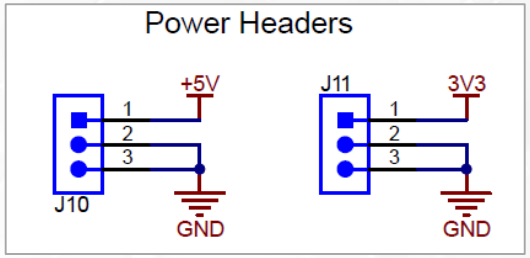


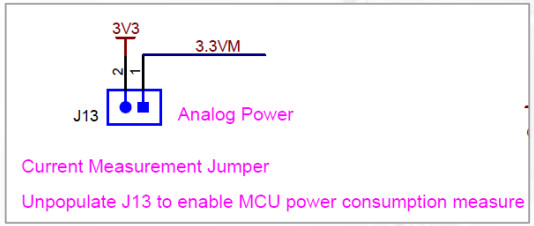
开漏输出的引脚选择上拉电源

- 3.3V
- 5V

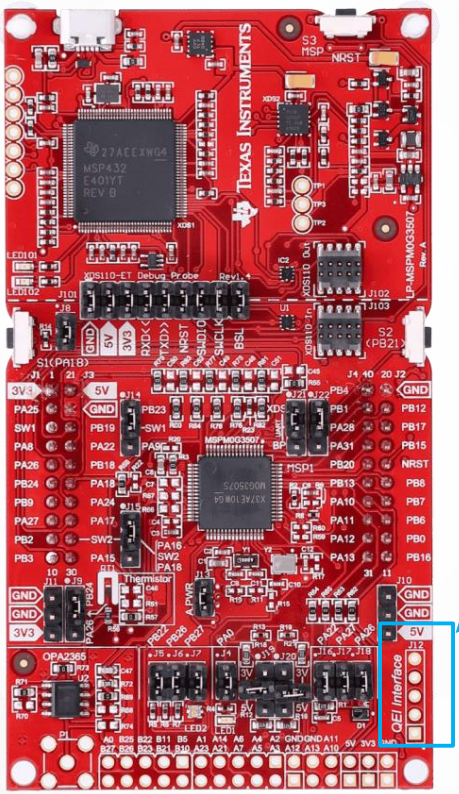


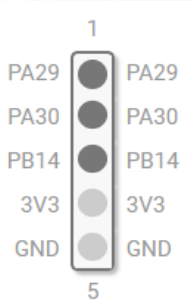
电源接口



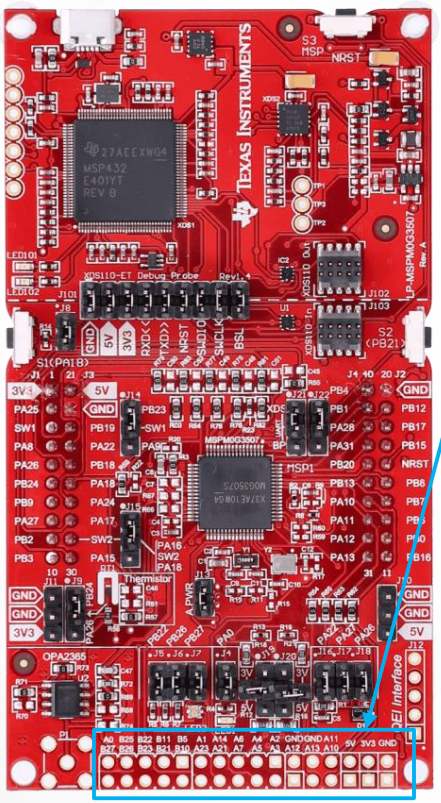


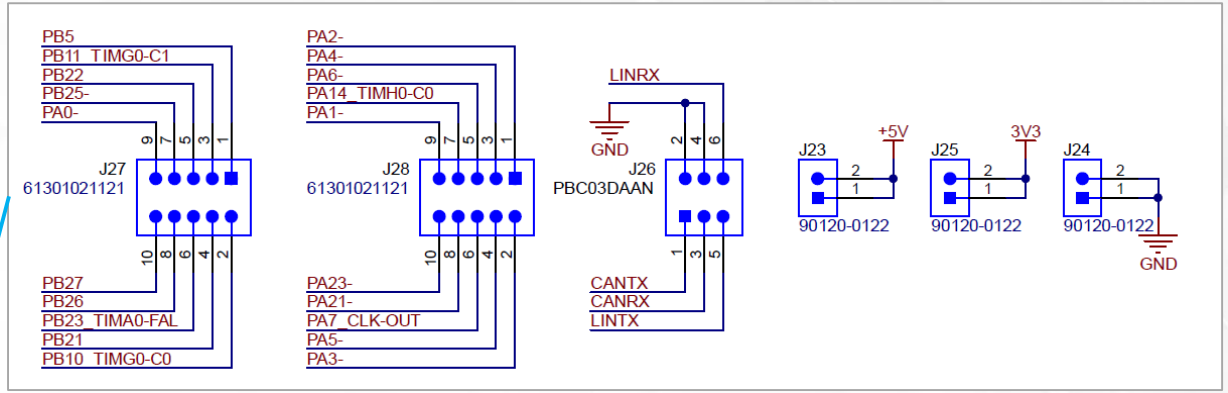
QEI接口

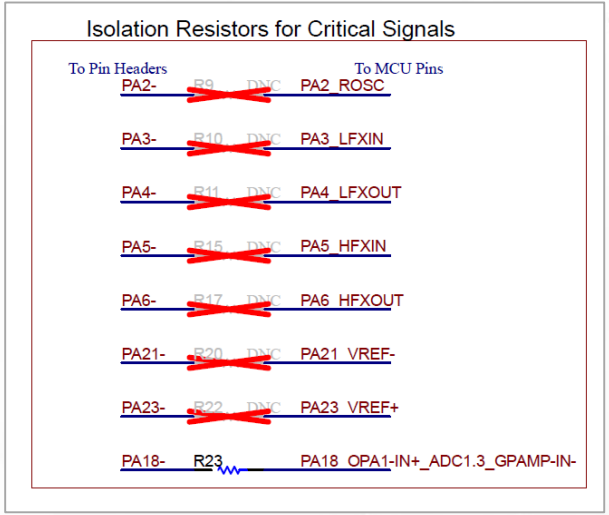

QEI Interface
J12
PA29_TIMG10_C0
PA30_TIMG10_C1
PB14_TIMG10_IDX
3V3
GND
1
2
3
4
5
HTSW-105-07-G-S


1
PA29
PA30
PB14
3V3
GND
PA29
PA30
PB14
3V3
GND
5

底部的扩展接口



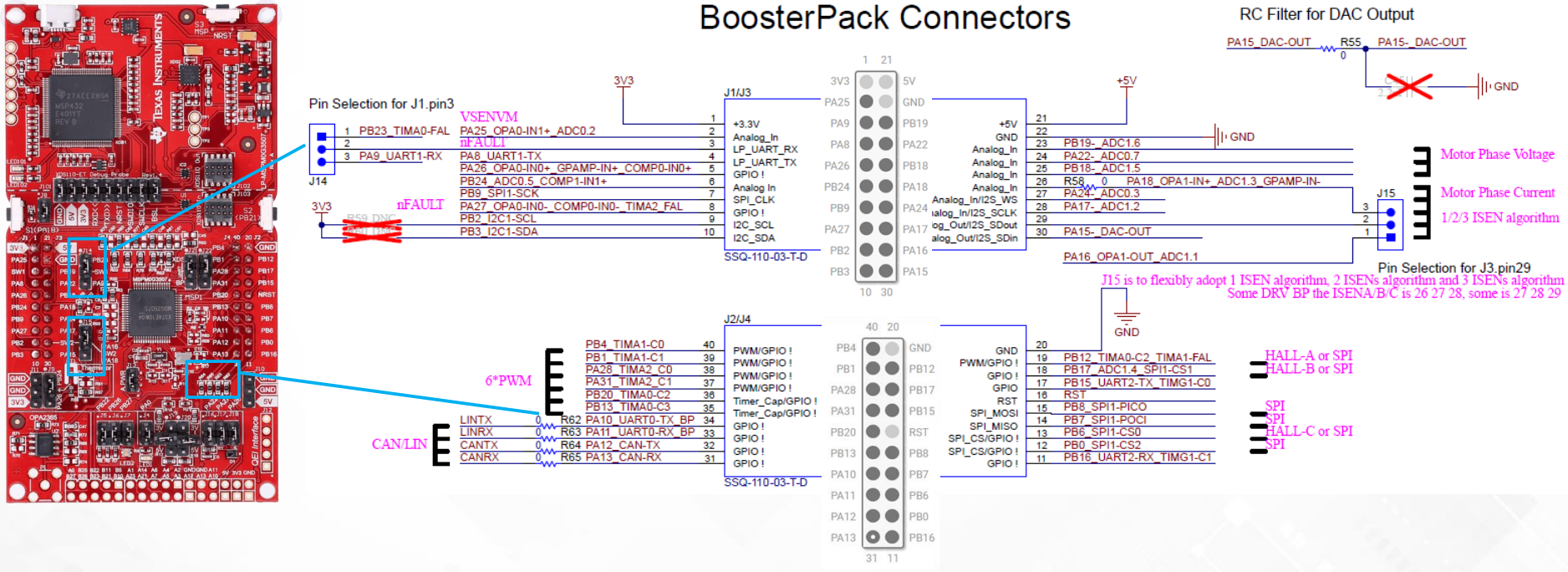




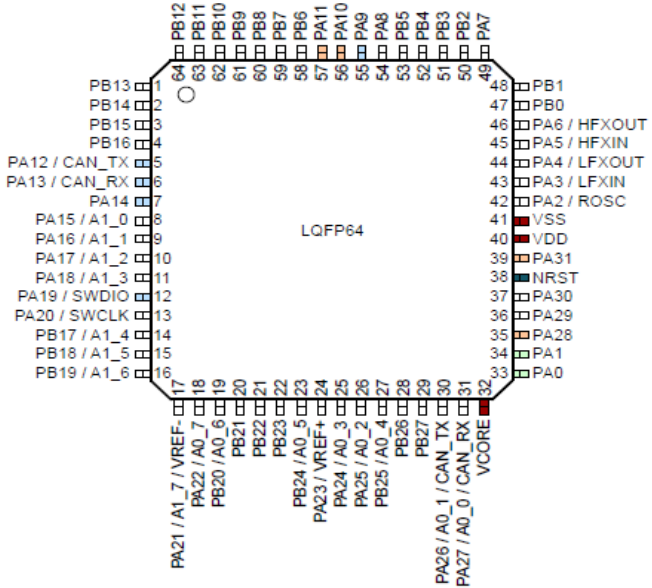
部分特殊功能引脚也对外引出到底部的接口，通过0欧电阻配置。

默认0欧电阻未焊接，是断开的。

BoosterPack接口



接口描述



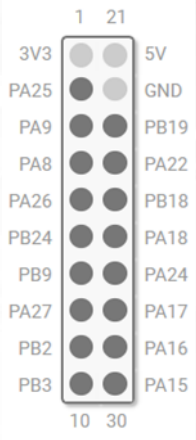
芯片共64个引脚:

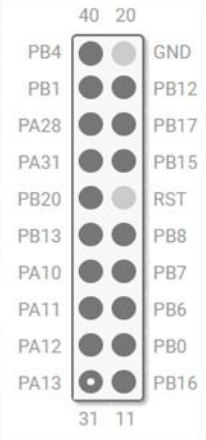
3 个： VDD、VCORE、VSS

1 个： RST

32个：PA0-PA31

28个：PB0-PB27

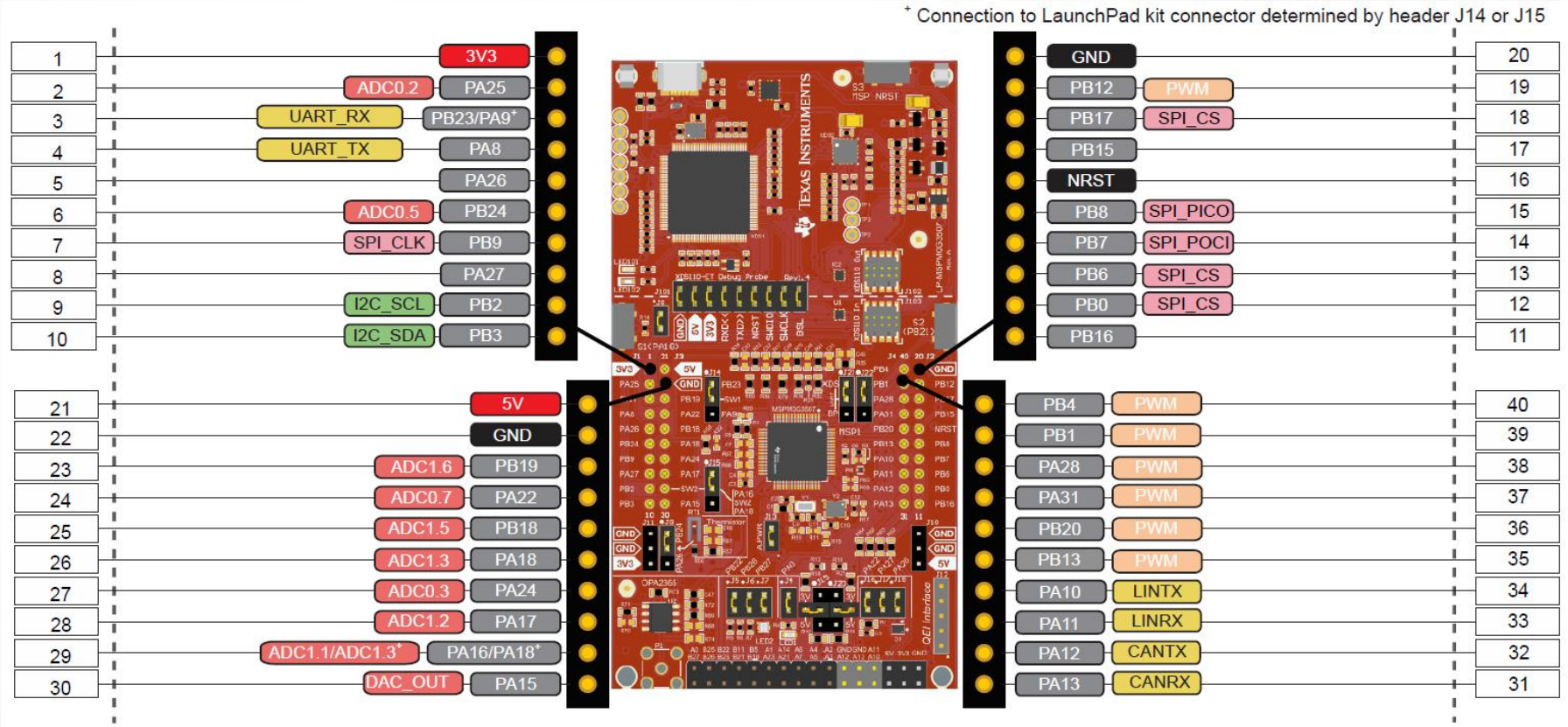




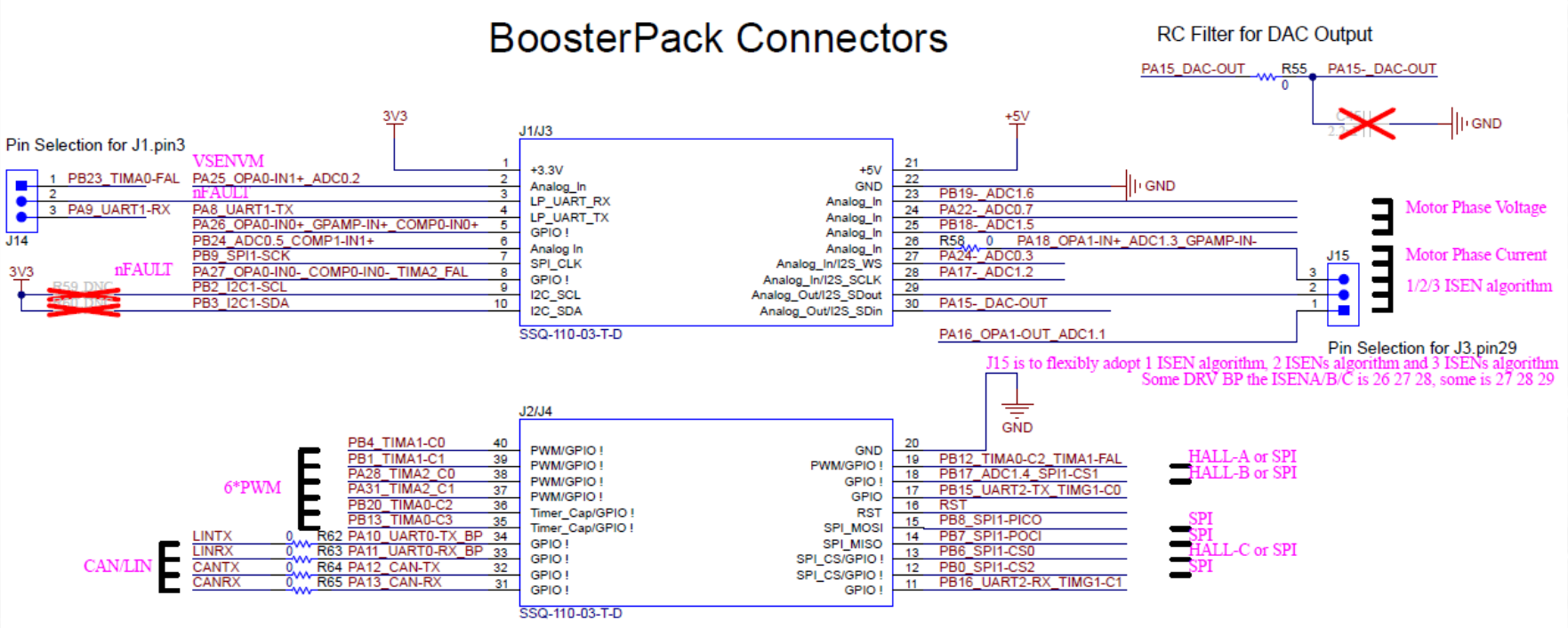
所有的IO引脚都引出来了

但是功能有复用，需参考具体电路

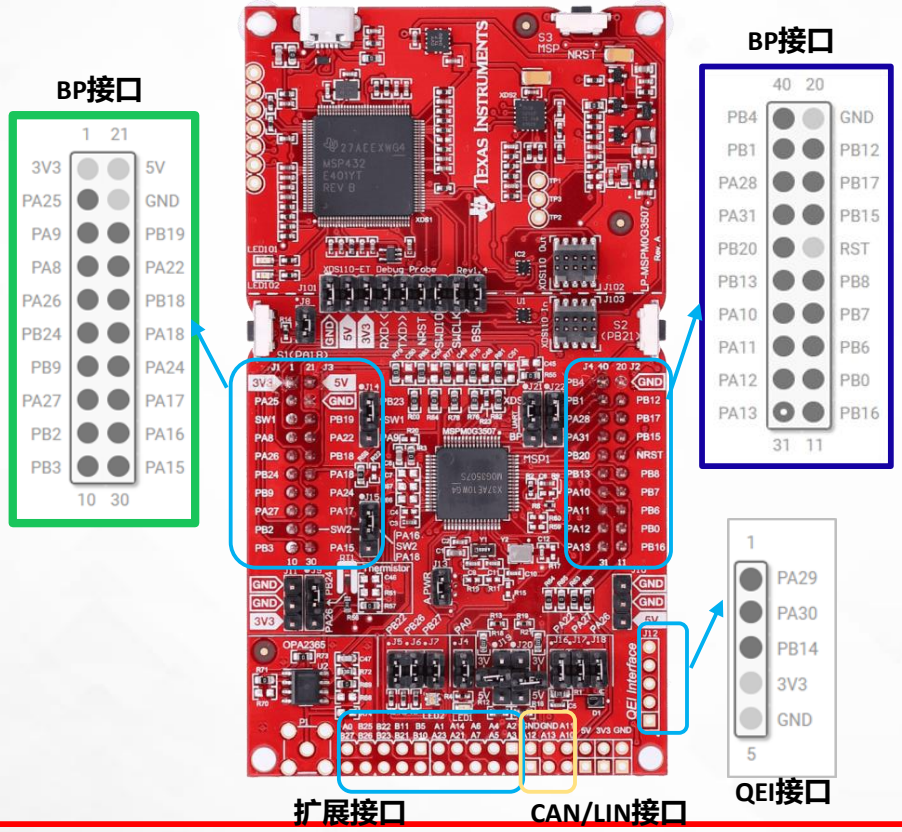
BoosterPack接口



BoosterPack接口



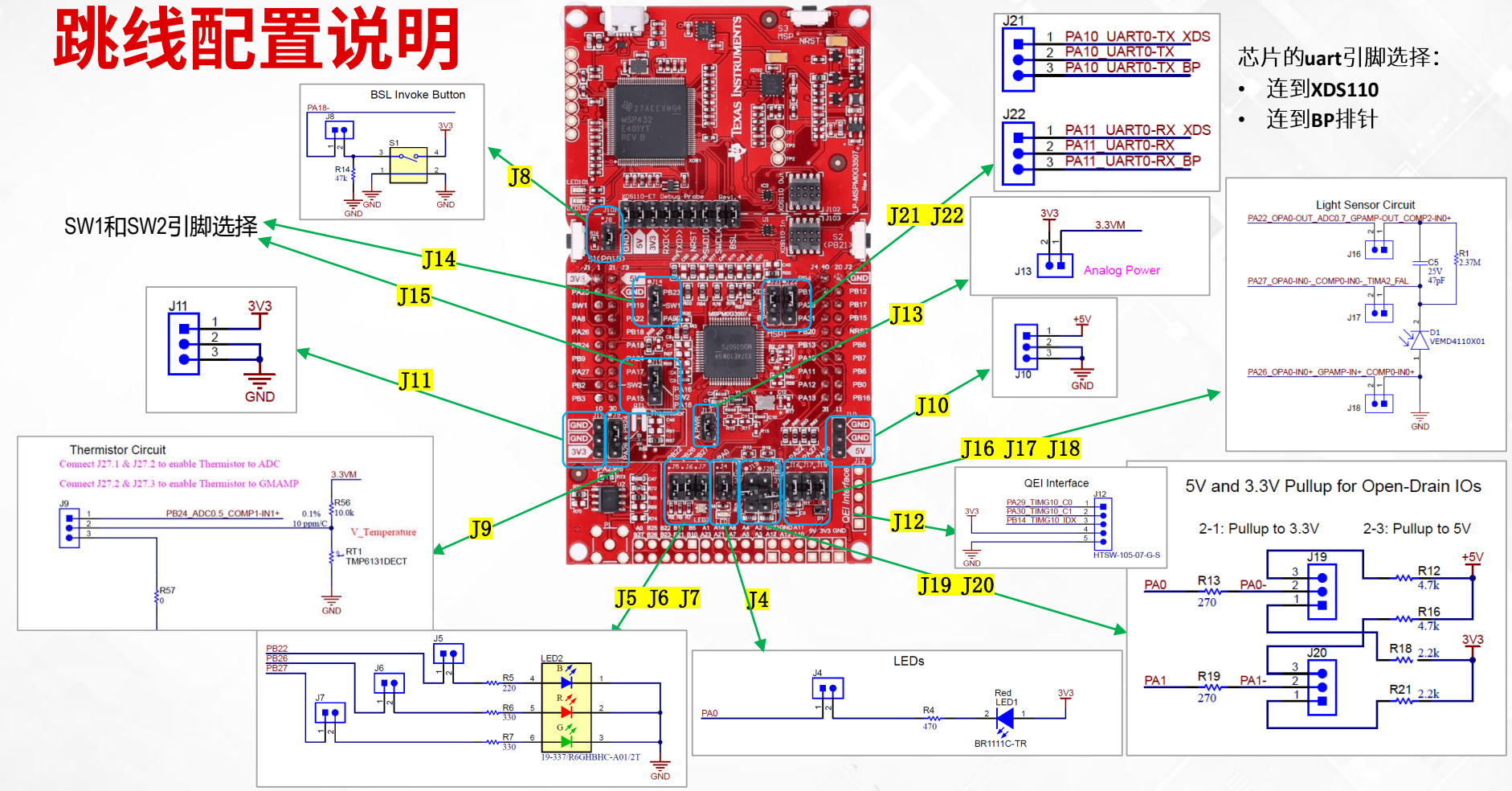
引脚示意图



PA0 → J4 → LED1 ; →J19 IIC上拉;
PA1 →J20 IIC上拉
PA2 → ROSC
PA3 低频晶振
PA4 低频晶振
PA5 高频晶振
PA6 高频晶振
PA7
PA8 → J16 TARGET_TXD
PA9 → J17 TRAGET_RXD
PA10 → J21, UART0_TX_IXDS →LIN
PA11 → J22, UART0_RX_XDS →LIN
PA12 CAN
PA13 CAN
PA14
PA15
PA16 → J15
PA17
PA18 →J8 S1按键; →J15→PA16
PA19 SWDIO
PA20 SWCLK
PA21 VREF- → GND
PA22 ← J16
PA23 VREF+
PA24
PA25
PA26 → J18 → GND RGB LED红色
PA27 → J17 → 光传感器负端
PA28
PA29 → QEI接口
PA30 → QEI接口
PA31

PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PB8
PB9
PB10
PB11
PB12
PB13
PB14 → QEI接口
PB15
PB16
PB17
PB18
PB19
PB20
PB21 ← S2按键
PB22 →J5 → RGB LED
PB23 →J14 → BP
PB24 ← J9 ← 热敏电阻
PB25 ← OPA2365←底部接口
PB26 →J6 → RGB LED
PB27 →J7 → RGB LED

跳线配置说明


BSL Invoke Button
PA18-
J8
S1
3V3
R14
47k
GND
J8
SW1和SW2引脚选择
J14
J15
J11
J11
3V3
GND
Thermistor Circuit
Connect J27.1 & J27.2 to enable Thermistor to ADC
Connect J27.2 & J27.3 to enable Thermistor to GMAMP
J9
PB24_ADC0.5_COMP1-IN1+
0.1%
10 ppm/C
3.3VM
R56
10.0k
V_Temperature
RT1
TMP6131DECT
R57
0
GND
J9
PB22
PB26
PB27
J5
J6
J7
LED2
R5
220
R6
330
R7
330
19-337/R6GHBHC-A01/2T
GND
J5 J6 J7
J4
LEDs
PA0
R4
470
Red
LED1
3V3
BR1111C-TR
J4
J21
1 PA10_UART0-TX_XDS
2 PA10_UART0-TX
3 PA10_UART0-TX_BP
J22
1 PA11_UART0-RX_XDS
2 PA11_UART0-RX
3 PA11_UART0-RX_BP
J21 J22
3V3
3.3VM
J13
Analog Power
J13
+5V
J10
GND
J10
芯片的uart引脚选择:
• 连到XDS110
• 连到BP排针
Light Sensor Circuit
PA22_OPA0-OUT_ADC0.7_GPAMP-OUT_COMP2-IN0+
J16
R1
2.37M
C5
25V
47pF
PA27_OPA0-IN0-_COMP0-IN0-_TIMA2_FAL
J17
D1
VEMD4110X01
PA26_OPA0-IN0+_GPAMP-IN+_COMP0-IN0+
J18
GND
J16 J17 J18
QEI Interface
PA29_TIMG10_C0
PA30_TIMG10_C1
PB14_TIMG10_IDX
J12
3V3
GND
HTSW-105-07-G-S
J12
5V and 3.3V Pullup for Open-Drain IOs
2-1: Pullup to 3.3V
2-3: Pullup to 5V
PA0
R13
270
PA0-
J19
R12
4.7k
+5V
R16
4.7k
PA1
R19
270
PA1-
J20
R18
2.2k
3V3
R21
2.2k
J19 J20

谢谢！