压力容器数据记录模块

硬件设计文档

**Part1. MCU STM32L431RCT**

1. **元件信息**
2. **基本属性：**

|  |  |
| --- | --- |
| **项目** | **值** |
| 型号 | STM32L431RCT |
| 封装 | LQFP |
| 引脚数 | 64 |
| 尺寸 | 12mil×12mil×1.6mil |

1. **初始化配置**
2. **全局：**

**Clock Configuration:**

|  |  |
| --- | --- |
| **项目** | **值** |
| Enable CSS>>PLLCLK | True |
| HCLK(MHz) | 80 |
| I2C2 Clock Mux>>To ADC(MHz) | 12 |

1. **外设：**
2. **串口：**

**UART**

|  |  |  |  |
| --- | --- | --- | --- |
| **名称** | **TX端口** | **RX端口** | **功能** |
| **USART1** | **PA9** | **PA10** | **外部RS232** |
| **USART2** |  |  | **外部Modbus** |
| **LPUART1** | **PC1** | **PC0** | **内部NB-IoT** |

**SPI**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **名称** | **NSS端口** | **SCK端口** | **MISO端口** | **MOSI端口** | **功能** |
| **SPI-1** | **PA4** | **PA5** | **PA6** | **PA7** | **外部ADC通信** |

**USART1**

|  |  |
| --- | --- |
| **项目** | **值** |
| Mode | Asynchronous |
| Baud Rate | 115200 |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

**USART2**

|  |  |
| --- | --- |
| **项目** | **值** |
| Mode | Asynchronous |
| Baud Rate | 115200 |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

**LPUART1**

|  |  |
| --- | --- |
| **项目** | **值** |
| Mode | Asynchronous |
| Baud Rate | 115200 |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

1. **ADC：**

**基本**

|  |  |
| --- | --- |
| **项目** | **值** |
| 分辨率 | 12位 |
| 范围 | 0-4095 |

**Pinout & Configuration>>Parameter Settings>>ADC\_Settings**

|  |  |
| --- | --- |
| **项目** | **值** |
| Clock Prescaler | Asynchronous clock mode divided by 2 |
| Resolution | ADC 12-bit resolution |
| Continuous Conversion Mode | Enabled |
| DMA Continuous Requests | Enabled |

**Pinout & Configuration>>Parameter Settings>>ADC\_Regular\_ConversionMode**

|  |  |
| --- | --- |
| **项目** | **值** |
| Rank>>Sampling Time | 640.5 Cycles |

**Pinout & Configuration>>DMA Settings**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **DMA Request** | **Channel** | **Direction** | **Priority** | **Mode** | **Peripheral>>Data Width** | **Memory>>Data Width** |
| ADC1 | DMA1 Channel 1 | Peripheral To Memory | High | Circular | Word | Word |

**Part2. NB-IoT模块 China Mobile M5311**

1. **元件信息**
2. **基本属性：**

|  |  |
| --- | --- |
| **项目** | **值** |
| 型号 | 中国移动M5311 |
| 封装 | LCC |
| 引脚数 | 40 |
| 尺寸 | 16 mm × 18 mm × 2.2 mm |

**Part3. 高精度ADC**

1. **元件信息**
2. **ADC芯片基本属性：**

|  |  |
| --- | --- |
| **项目** | **值** |
| ADC芯片型号 | LTC2380-24 |
| 封装 | MSOP |
| 引脚数 | 16 |
| 位数 | 24位 |
| 通道数 | 1 |
| 工作频率 | 1.5MHz |
| 功耗 | 28mW |
| SNR典型值 | 100dB |
| 内部滤波器 | 16位实时平均（16个转换结果） |
| 接口 | SPI |

1. **精密基准电压源芯片基本属性：**

|  |  |
| --- | --- |
| **项目** | **值** |
| 芯片型号 | LTC6655 |
| 封装 | MSOP |
| 引脚数 | 8 |
| 基准电压 | 2.5V |
|  |  |

**Part4. 模块连接**

**1. 串口**

**(1) 分配：**

|  |  |  |  |
| --- | --- | --- | --- |
| **名称** | **TX端口** | **RX端口** | **功能** |
| USART1 | PA9 | PA10 | 外部RS232 |
| USART2 |  |  | 外部Modbus |
| LPUART1 | PC1 | PC0 | 内部NB-IoT |

**(2) USART1：**

**(3) USART2:**

**(4) LPUART1:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **项目** | | **值** | | |
| 连接对象 | | STM32-M5311 | | |
| 连接方式 | | 电平转换 | | |
| **项目** | **TX(MCU端)** | | **RX(MCU端)** | |
| **Designator** | LPUART\_TX | | LPUART\_RX | |
| **PIN(MCU)** | 9(PC1) | | 8(PC0) | |
| Tolerant | 5V | Tolerant | 5V |
| **PIN(M5311)** | 10(UART1\_RXD) | | 9(UART1\_TXD) | |
| Tolerant | 1.8V | Tolerant | 1.8V |
| VILmax | 0.6V | VOLmax | 0.4V |
| VIHmin | 1.6V | VOHmin | 1.62V |
| VIHmax | 1.98V | VOHmax | 1.98V |