

UM11965

MR CANHUBK344软件用户手册

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用户手册

文档信息

信息	内容
关键词	MR_CANHUBK3、MR_CANHUBK344、以太网转CAN、CAN转以太网、IEEE1722、ACF-CAN、S32K344、FS26、SE050、TJA1103、TJA1443、TJA1463、TJA1153。
摘要	基于IEEE1722协议的CAN over Ethernet软件示例用户手册。这份用户手册包含了软件包内容、使用方法、已知问题、解决方案以及使用限制等信息。



1 介绍

本文档是MR-CANHUBK344演示软件的发布说明，该软件使用IEEE 1722 ACF-CAN协议实现以太网和CAN的双向转换。

本用户手册还介绍了该套件的内容、已知问题、变更、解决方案以及已发布版本的使用限制。

此版本的交换代码支持所有六个CAN端口和100BASE-T1以太网端口。100BASE-T1端口已启用自动模式检测，因此无需进一步调整。

注意：如需移动机器人团队、汽车软件栈以及相关RTOS的其他代码示例，请访问 nxp.com.cn/mr-canhubk344。

1.1 缩略语

表1. 缩略语

缩略语	描述
IEEE1722	第2层传输协议工作组，用于时间敏感的数据流
100BASE-T1	使用单双绞线实现全双工通信的以太网标准
CAN	控制器局域网1Mbps“经典CAN”，但有时可能包括CAN-FD
CAN FD	CAN灵活数据速率（最高8 Mbps）
CAN SIC	使用信号质量提升CAN PHY的CAN FD
CAN SCT	使用安全CAN收发器的CAN FD
JTAG	联合测试行动组，软件调试常用接口
KB	1024字节
MAC	媒体访问控制，MAC地址就是所谓的物理地址
Mbit/s	每秒百万比特（10 ⁶ 比特/秒）
NFC	近场通信
PCB	印刷电路板
SDK	软件开发包

2 MR-CANHUBK344套件内含物

已发布的套件包括：

- 硬件部分：
 - MR-CANHUBK344开发板
 - DCD-LZ编程适配器板（提供控制台UART接口）
 - USB-UART适配器电缆（可连接至DCD-LZ）
 - 电源适配器电缆，包括JST-JH到普通红色SY连接器、筒形连接器、XT-60 Lipo电池连接器
 - 6条CAN电缆
 - 6块CAN终端板
 - 1条T1以太网电缆（使用JST-GH连接器）
 - 多条通用JST-GH电缆，可用于UART/SPI/I2C接口或根据具体需求定制
 - 小型OLED显示屏
 - 连接到安全芯片的NFC天线
- 文档和软件部分：
 - [MR-CANHUBK344硬件用户手册](#)
 - [MR-CANHUBK344硬件设计资料](#)
 - [MR-CANHUBK344软件用户手册](#)
 - [S32 Design Studio工程文件](#)

3 变更

表2. 变更

项目	描述
软件版本	MR-CANHUBK344 IEEE1772 ACF-CAN over ethernet演示
文档	

4 使用限制

表3. 使用限制

项目	描述
软件栈	使用限制： （目前尚未报道） 影响：

5 已知问题

表4. 已知问题

项目	描述
硬件错误PCB版本1	使用限制： （目前尚未报道）。 影响：

6 电路板连接

MR-CANHUBK344电路板具有多种接口。电路板的设计适用于小型移动机器人应用领域的测试。您可以使用基于Linux的DroneCode连接器。该套件提供了多条电缆，您可以根据需要使用外壳和预压接电缆进行轻松组装和定制。此外，也可以直接插入许多现成的模块。套件中通常都提供电缆，您可以根据具体需求对电缆进行剪切或修改。

6.1 电源输入

电源输入连接和PMIC支持5 V到40 V的宽范围输入电压，可以直接连接到不同类型的电池，例如12 V汽车电池或2S、3S、4S锂电池。

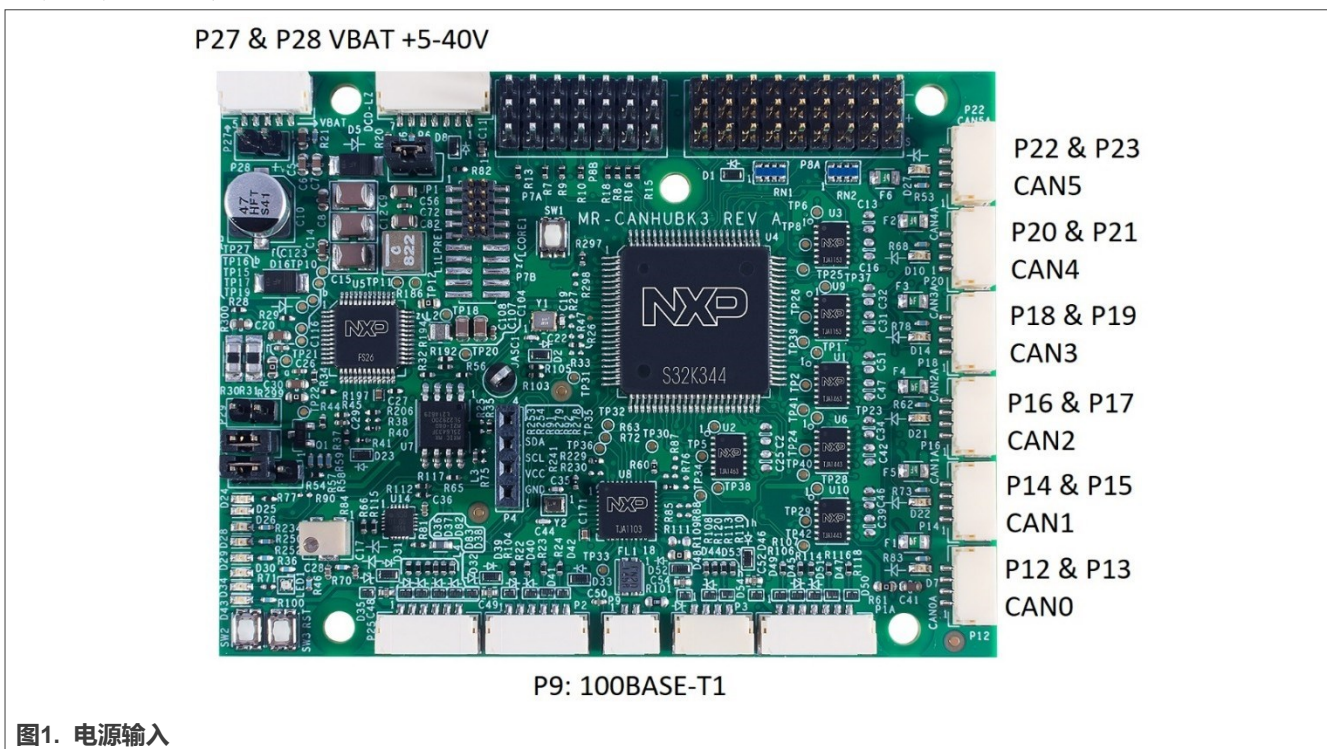


图1. 电源输入

您可以使用电路板左上角的P27连接器（五引脚，其中引脚1-2为电源、引脚3为NC、引脚4-5为接地）（见图1）或P28连接器（两引脚，其中引脚1为电源、引脚2为接地）来连接电源线缆。电路板的工作电流大约为100 mA @12 V。

6.2 CAN总线连接

CAN总线接口分别为P12-P23，其引脚分配如下。

表5. CAN总线接口引脚分配

引脚号	信号	电压规格
1	5V4	5.4 V
2	CANx_H	5.0 V
3	CANx_L	5.0 V
4	GND	0 V

CAN总线通常需要在两端进行端接；如果CANHUBK344位于总线的一端，则在相应的CAN连接器上连接一个随附的CAN-TERM端接板即可完成这一端的端接。

MR-CANHUBK344的CAN端口通过引脚1向连接设备提供5 V电源。如果您不需要这个功能，可将连接器上的引脚1线拆除。

请注意，虽然这些CAN-TERM板也可以通过USB接口从电路板获取5 V的电源，您也应该谨慎使用，并检查这是否符合您系统的要求。

6.3 100Base-T1以太网连接

T1连接器（P9）是一个双引脚JST-GH连接器，支持100 Mbps双绞线以太网。信号经过电容耦合，具有P和N两种极性。该电路板上的TJA1103 T1接口芯片可以自动调整错误的极性。该电缆可与Mobile Robotics的其他电路板直接连接，如UCANS32K1SIC、UCANS32K1SCT、RDDRNET1ETH8和NavQPlus。

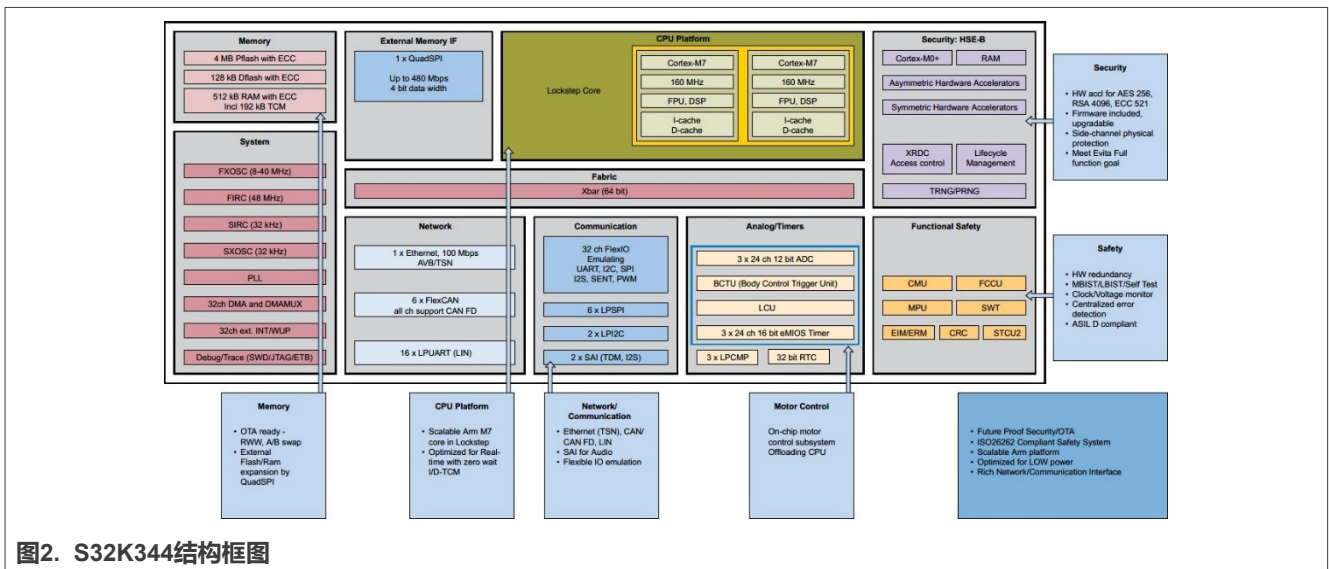
RDDRNET1ADAPT可转换为RJ45连接类型。您也可以根据实际需求，通过剪切电缆和焊接电缆，将此电缆焊接到其他类型的连接器上。

在PCB背面，有一个黄色LED（D88），用于指示连接状态。如果它闪烁，说明已经建立了连接。

6.4 主要半导体元器件

本节简要介绍了这块紧凑型电路板上的一些重要的半导体元器件。有关这些元器件的更多详细资料可上网查阅。

6.4.1 S32K344 MCU



S32K344是恩智浦半导体的一款汽车通用MCU。图2显示了该芯片的结构框图。本文档所涉及的软件是运行在它内置Lockstep Arm Cortex M7内核上的。

注意：该芯片还有同级别的型号（S32K324），拥有两个可以独立运行的内核。

6.4.2 FS26功能安全SBC

FS26是恩智浦半导体公司的一款低功耗安全系统基础芯片，符合ASIL D级的要求。图3显示了该电源芯片的结构框图。该芯片具有多种功能，但在本设计中，它主要用于实现紧凑的电源设计并支持高输入电压。

FS26通过SPI接口与S32K344连接，实现了挑战者窗口看门狗功能。如果定时窗口内响应无效或不及时，FS26将复位S32K344 MCU。本示例代码中没有实施挑战者看门狗功能。相反，在启动S32K344时，示例应用程序会向FS26发送一个请求，禁用看门狗功能，从而避免S32K344复位。

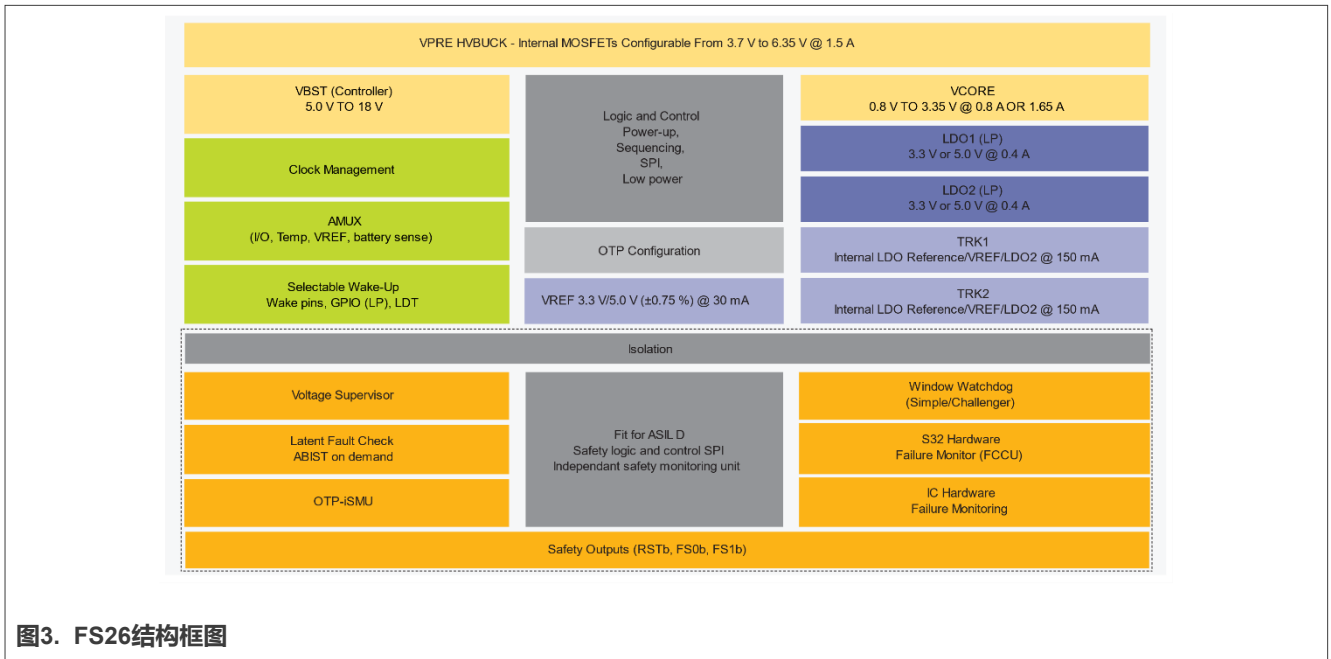


图3. FS26结构框图

7 电路板上电顺序

如第6.4.2节所述，FS26 默认实现了挑战者窗口看门狗，如果挑战未被管理，看门狗会持续复位S32K344 MCU。要避免这种情况，FS26必须进入调试模式。具体方法是移除JP1，在P27或P28上提供12.0V电压，然后插入JP1跳线。

完成后，复位LED D24停止闪烁，表明S32K344不会被FS26连续复位。

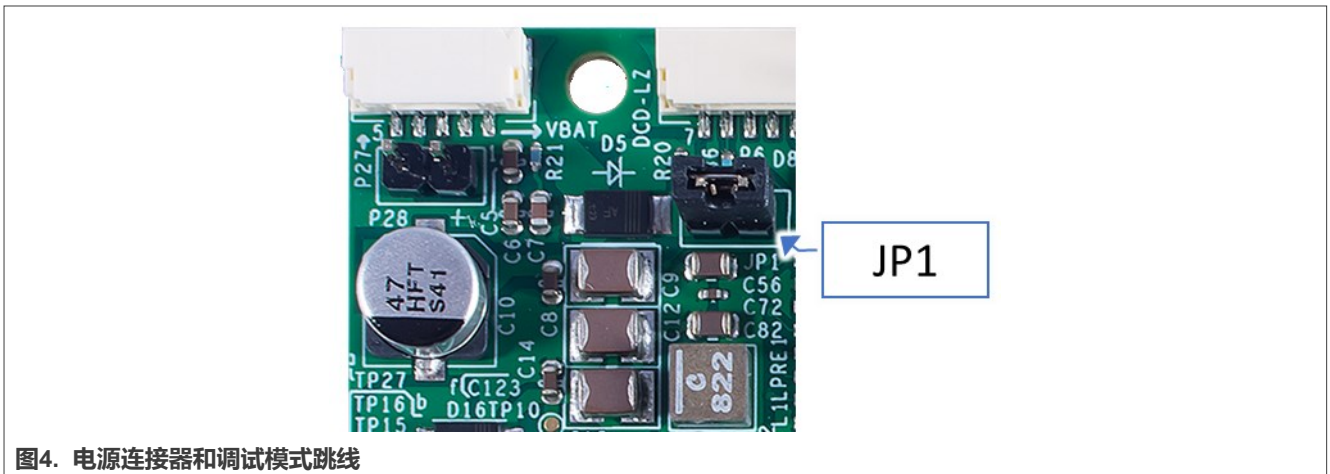


图4. 电源连接器和调试模式跳线

8 S32 design示例项目

随附的MR_CANHUBK3_IEEE1722.zip [项目文件](#)与S32 Design Studio for [S32 Platform V3.4](#)兼容。

注意： S32DS 3.4版位于上一个选项卡下。



图5. 汽车软件 - S32K3 - S32 Design Studio (上一个选项卡)

要构建该项目，您需要安装以下扩展：

- [FreeRTOS for S32K3 2.0.0](#)
- [S32K3 RTD AUTOSAR 4.4 V2.0.0](#)
- [S32K3xx开发包V3.4.3](#)

图6显示了S32 Design Studio扩展管理器应显示的内容。单击“添加更新站点”链接来添加手动下载的更新站点文件。

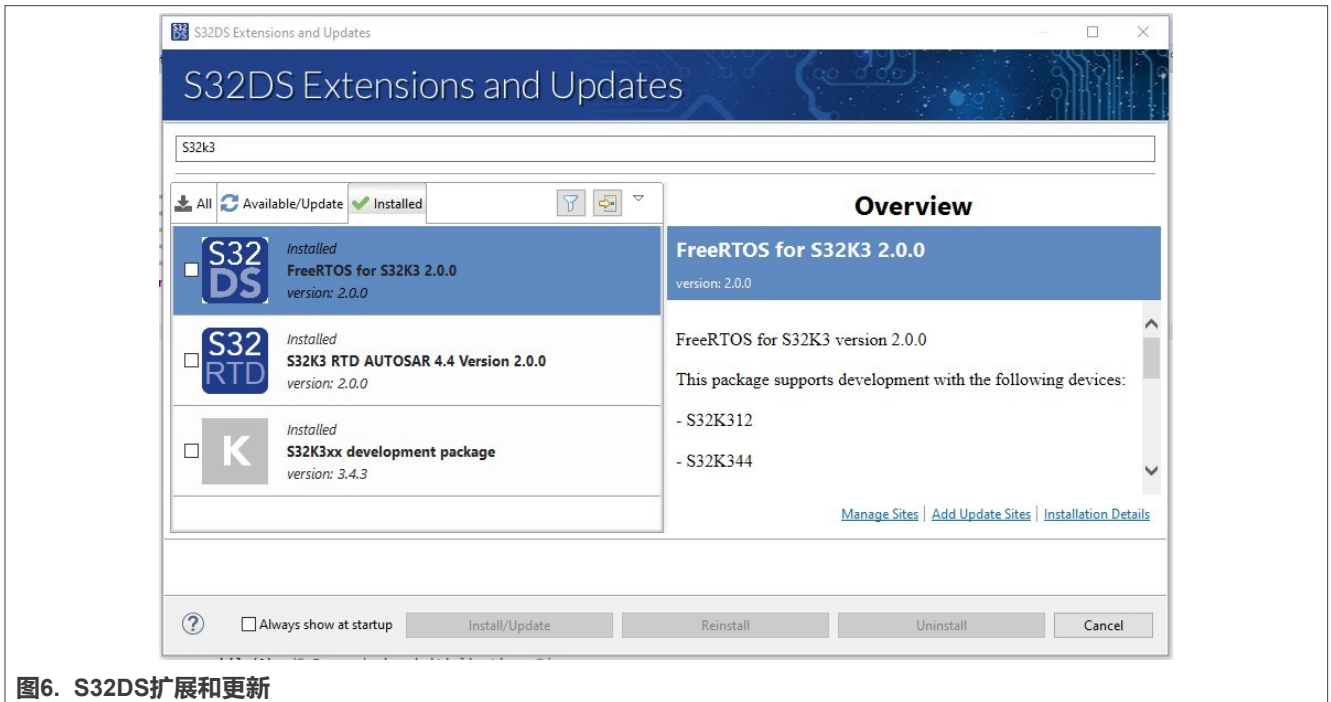


图6. S32DS扩展和更新

要导入随附的MR_CANHUBK3_IEEE1722.zip，需要从文件菜单中打开File -> Import -> General -> Project，然后选择Project.zip归档文件。

项目导入后，在项目浏览器中右击“MR_CANHUBK3_IEEE1722”，然后选择S32 Configuration Tools -> Open Pins。

此时会出现S32引脚工具视图，在菜单中点击“更新代码”按钮，选择“确定”即可生成驱动程序配置文件。

返回项目浏览器，右击“MR_CANHUBK3_IEEE1722”并选择“Build Project (构建项目)”。现在，您可以使用编程器烧录“MR_CANHUBK3_IEEE1722.elf”。

有关S32 Design Studio、S32配置工具和调试的更多信息，请参阅[S32K3和S32DS快速入门指南](#)。

8.1 应用程序

将MR_CANHUBK3_IEEE1722成功烧录到MR-CANHUBK344电路板上后，它将作为ETH <-> CAN IEEE1722协议转换器来使用。

CAN0到CAN5上收到的CAN报文转换成IEEE1722 ACF-CAN格式，并通过以太网广播出去。要查看接收到的CAN帧，可以在Windows/Linux机器上安装WireShark (<https://www.wireshark.org/>)。

注意：调试以太网帧需要100BaseTx至100BASE-T1媒体转换工具（不包含在电路板中）。您可以使用[恩智浦RDDRONE-T1ADAPT](#)等工具。

您也可以通过按下SW1或SW2来模拟发送CAN报文。

SW1向CAN0发送CAN报文，SW2向CAN1发送CAN报文。

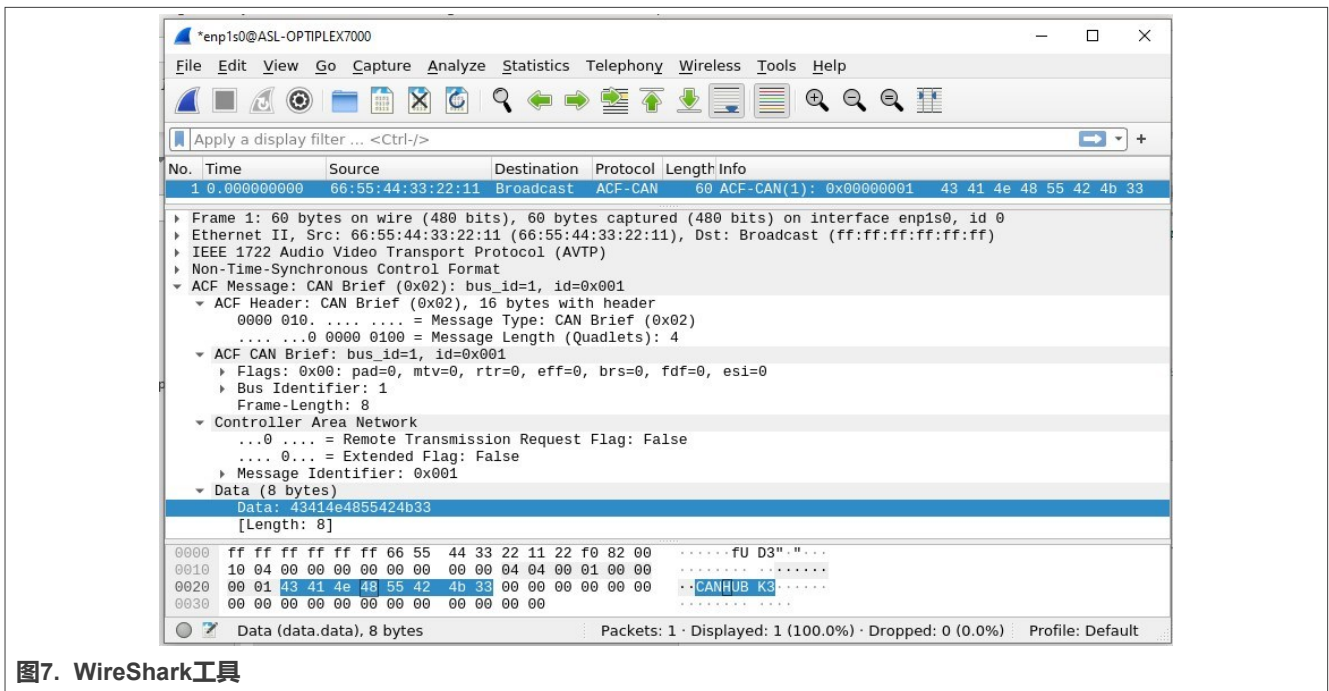


图7. WireShark工具

您可以使用附带的电缆将CAN0 (P12)连接回CAN1 (P14)，以创建一条总线，用于没有CAN外围设备的设置。此外，将CAN-Term板连接至P13，以完成总线的端接。当您按下SW1或SW2时，LED指示灯D7和D22都会亮起，表明有CAN数据包在传输。如图6所示，当您把电路板连接到运行WireShark的PC时，会显示使用IEEE1722发送了CAN数据包。

8.2 电路板状态LED指示灯

如表6所示，MR-CANHUBK344有多个LED指示状态。正常情况下，LED指示灯的状态如下表所示：

表6. 板状态LED

Dxx	LED名称	正常状态	说明
D24	RESET_K3	关	显示S32K344是否处于复位状态
D25	P1V8_TRK2	开	显示FS26 SBC 1V8_TRK2状态
D26	P3V3_TRK1	开	显示FS26 SBC 3V3_TRK1状态
D28	P3V3_LDO2	开	显示FS26 SBC 3V3_LDO2状态
D29	P3V3_LDO1	开	显示FS26 SBC 3V3_LDO1状态
D30	VBATP_SW	开	显示VBAT状态
D34	V15_MCU	开	显示FS26 SBC V15状态
D43	P5V4	开	显示FS26 SBC P5V4状态
LED1	RGB状态LED	绿灯	由软件控制，绿灯表示正常运行，蓝灯表示初始化，红灯表示发生错误。

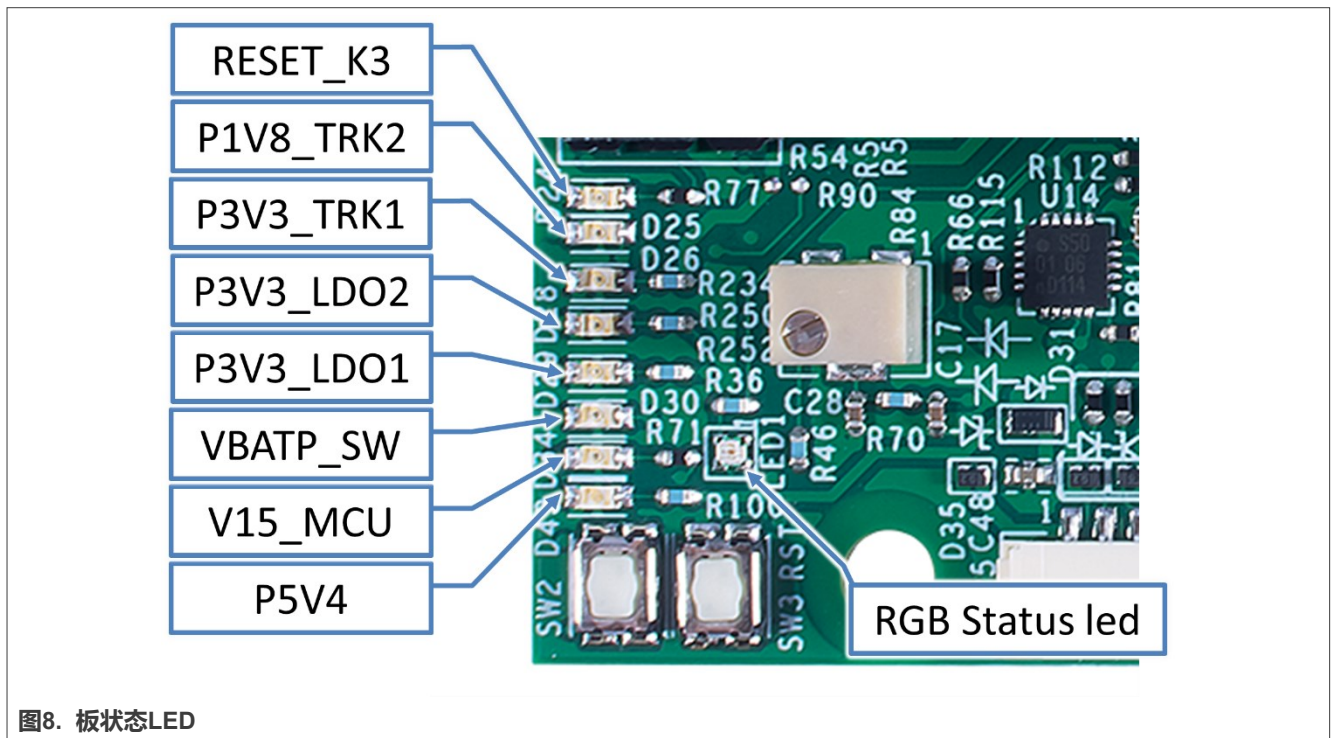


图8. 板状态LED

9 修订历史

表7. 修订历史

版本号	日期	实质性变更
第0版	2023年8月	初版发布

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