RAK7393 WisGate Connect Outdoor Datasheet

Overview

Description

The **RAK7393 WisGate Connect Outdoor** is a gateway based on the Raspberry Pi CM4/CM5, designed to support various radio modules. It features standard interfaces to accommodate different radio and backhaul configurations.

The device can function as a LoRaWAN gateway, supporting up to two (2) separate modules. This allows for configurations such as:

- A **16-channel sub-GHz LoRaWAN gateway** and a **2.4 GHz LoRaWAN gateway** operating on the same device, or
- a **multi-protocol gateways** (e.g., LoRaWAN with mioty and LTE backhaul).

The RAK7393 supports both **DC power supply** (with RS485 interface for external power monitoring, such as RAK's Battery Plus solutions) and **PoE**. It continuously monitors its power supply, and its ultracapacitors provide backup power during outages. This ensures the system can send notifications or handle brief power interruptions seamlessly.

Features

Hardware

- Supports the full range of CM4/CM5 modules (including Lite variants)
- 9-36 VDC IN terminal (with RS485 interface) with surge protection
- 1 GB Ethernet with 802.3at PoE support
- 3x mPCIe slots
- USB2.0 on the 3 MiniPCIe (mPCIe) slots
- USB Type-C port for updating the CM4/CM5
- Accessible switch and reset button to enable flash mode

- Micro SD card socket for CM4/CM5 Lite modules
- Debug UART port with USB-C interface
- PCF85063AT RTC with battery socket and CM4/CM5 wake-up capability
- ATECC608 Crypto Chip
- u-blox ZOE-M8Q/MAX-10 GNSS
- 3 supercapacitors for dying-gasp functionality
- IP67/NEMA-6 industrial-grade enclosure with cable glands

Software

A custom OS distribution called RAKPiOS has been developed for the WisGate Connect Outdoor. It is a fork of Raspberry Pi OS, and more information is available in the RAKPiOS documentation . It comes with:

- All necessary device drivers
- Security enhancements
- Helper scripts
- Preinstalled Docker

You can easily deploy several IoT services using curated Docker containers available directly on the device.

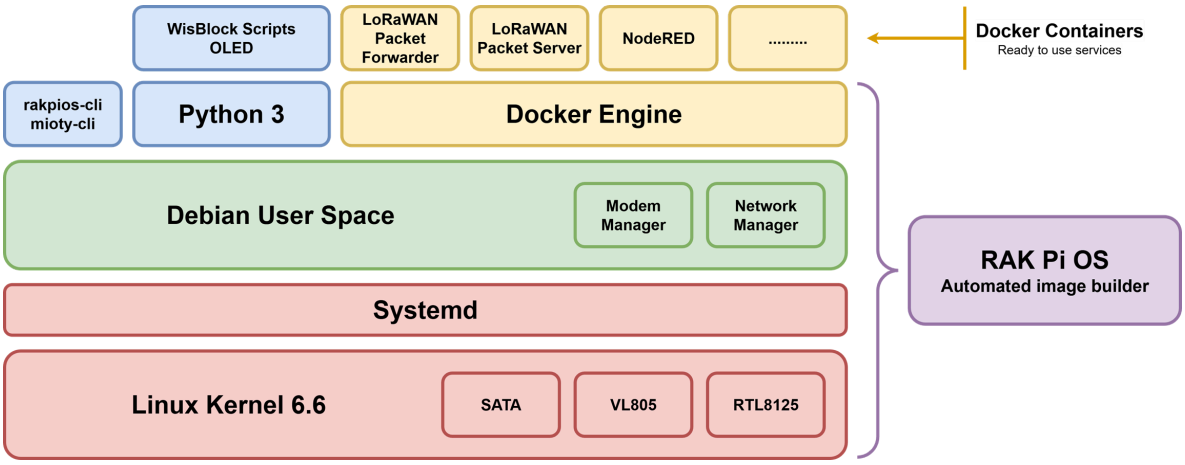

Figure 1: RAK7393 software structure

Typical Application

- LoRaWAN gateway (multichannel and multiband)
- Multi-protocol gateway (LoRaWAN, mioty, Zigbee, etc.)
- Edge or standalone gateway (with embedded LNS and application services)

Specifications

Overview

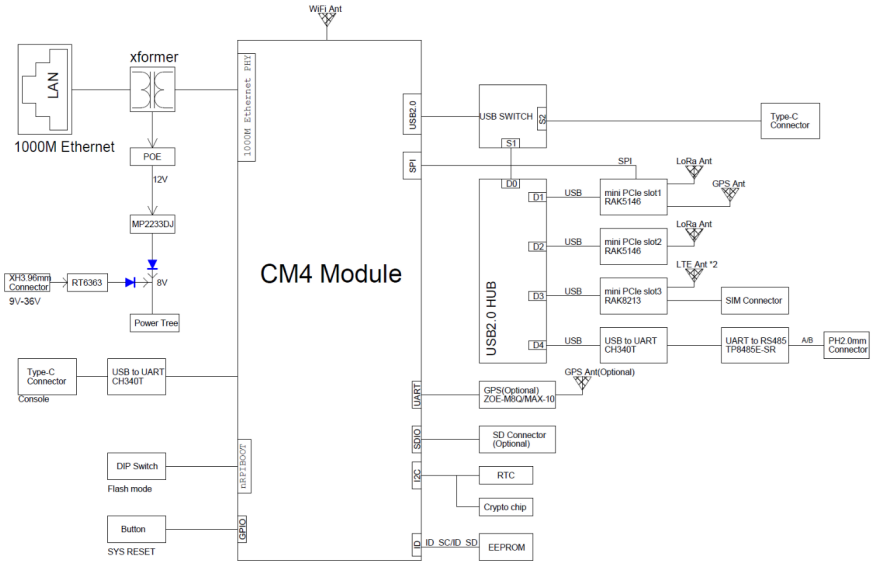

Figure 2: RAK7393 block diagram

Hardware

The hardware specification is divided into three (3) parts:

1. **Power Source and Backhaul Connectivity**: Details the primary specifications for power and network connectivity options.
2. **Interfacing Options**: Explains the various interfacing capabilities available on the device.
3. **Pinouts**: Provides the pinout details for the RAK7393 WisGate Connect Outdoor.

Main Specifications

Power

Feature	Value
DC inputs	2 (DC, PoE)
DC voltage	9-36 V
PoE	Active IEEE 802.3at

Wireless (Optional, Depends On the CM4/CM5 Module Model)

Feature	Value
Wireless 2.4 GHz generation	WiFi 5
Wireless 2.4 GHz standards	IEEE 802.11 b/g/n/ac
Wireless 5.0 GHz generation	WiFi 5
Wireless 5.0 GHz standards	IEEE 802.11 b/g/n/ac
Bluetooth Low Energy	5.0

Ethernet

Feature	Value
1 GB Ethernet Port	1 (PoE enabled)

Peripherals

Feature	Value
mPCIe slot #1	USB, UART, GPIO
mPCIe slot #2	USB, GPIO
mPCIe slot #3	USB, GPIO, USIM

Enclosure

Feature	Value
Ingress protection	IP67
Enclosure material	Aliminum and plastic
Dimensions	240 × 240 × 89.5 mm

Feature	Value
Installation method	Pole or wall mounting

Other

Feature	Value
Voltage monitor	Yes
PCB temperature monitor	Yes
Real-time clock	Yes
Operating temperature	-20° C to 85° C
Operating humidity	0 to 95% RH

Compute Module Connector

The RAK7393 is based on Raspberry Pi CM4. The following table shows the CPU features:

Feature	Description
CPU	Broadcom BCM2711
Architecture	ARMv8 Cortex-A72 64 bits
CPU core count	4
CPU nominal frequency	1.5 GHz
Operating system	RAKPiOS
RAM	1/2/4/8 GB DDR4-3200
Storage	0/8/16/32 eMMC

The RAK7393 is also compatible with the Raspberry Pi CM5. The following table shows the CPU features:

Feature	Description
CPU	Broadcom BCM2712
Architecture	ARMv8 Cortex-A76 64 bits
CPU core count	4
CPU nominal frequency	2.4 GHz
Operating system	RAKPiOS
RAM	2/4/8/16 GB DDR4-4267
Storage	0/16/32/64 eMMC

PSU Input

You can choose between two main power supply solutions:

- Kway K20-T4 connector (4 pins 9-36 V_{DC} with RS485)
- Active IEEE 802.3at PoE on 1 Gb Ethernet connector

> **IMPORTANT**
>
> Use only one power source (either DC or PoE) at a time. Do not use both simultaneously.

The required current from the PSU is dependent on the application and what is connected to the RAK7393. It is recommended to budget 25 W for the CM4/CM5. The PoE input voltage ranges from 42 V to 57 V, with a maximum output of 30 W on AT modules.

Interfaces

Figure 3: RAK7393 interfaces

Ethernet

The RAK7393 features a 1 Gb Ethernet port with PoE support, directly connected to the CM4/CM5 PHY interface.

USB 2.0 Hub

The RAK7393 board includes an onboard USB 2.0 hub, which expands a single USB 2.0 port from the CM4/CM5 into four ports:

- Three ports are available through the mPCIe connectors.
- One port is used for the RS485 (USB-UART-RS485) interface.

> **NOTE**
>
> The RAK7393 does not leverage the USB3 interfaces available on the Raspberry Pi CM5. Only USB 2.0 signals are available on the mPCIe slots.

USB Type-C Flash Connector

The Type-C Flash connector is used to flash the eMMC on CM4/CM5 non-lite versions via `rpiboot`. When a Type-C cable is connected, the USB 2.0 hub is automatically disabled, and the CM4/CM5 functions as a USB device.

To enable flash mode on the CM4/CM5 module, set the flash switch to ON and press the reset button or power cycle the device.

Micro SD Card Socket

The micro SD Card socket is a **PUSH-PUSH** socket. To release the micro SD Card a gentle push on the micro SD card will enable it to be removed. This socket is only used with CM4/CM5 Lite modules that do not have an onboard eMMC.

Real-Time Clock

The RAK7393 has a PCF85063AT RTC onboard. A battery socket is provided for a CR2032 battery. On initial setup, the **CLKOUT** of the RTC should be disabled to save power. The RTC alarm output can wake the CM4/CM5 from halt mode or act as a watchdog trigger if configured.

MiniPCIe (mPCIe) Interfaces

The RAK7393 has three (3) mPCIe interfaces, which can connect different products, making the product very flexible. See the RAK7393 Compatible Hardware page for information about products supported on these interfaces.

The mPCIe interfaces schematics:

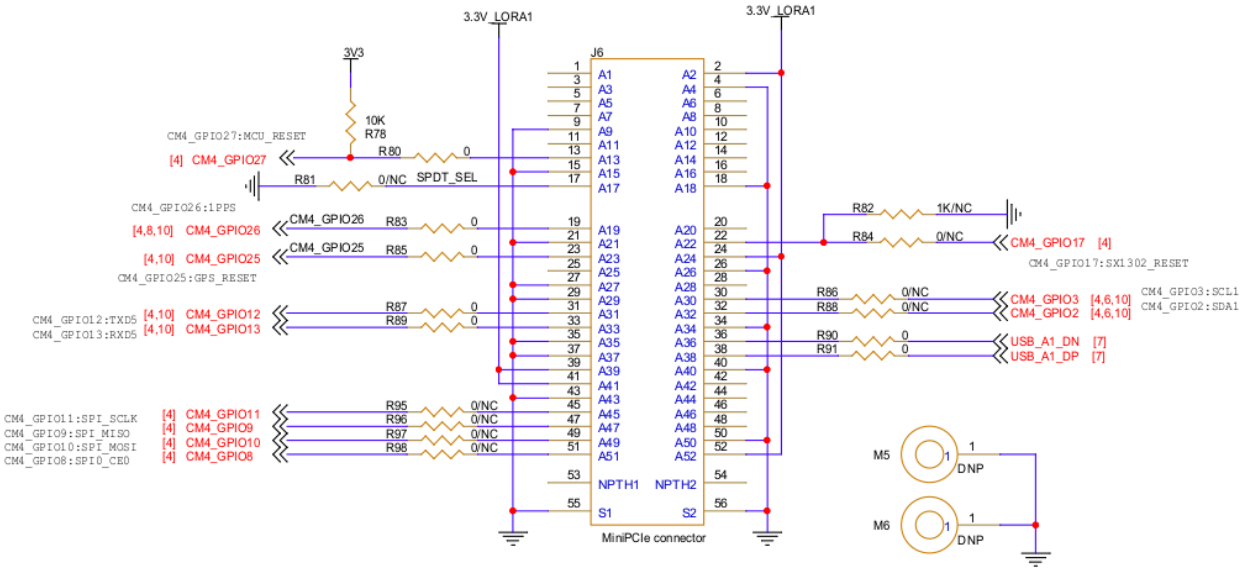

Figure 4: mPCIe slot 1 schematic

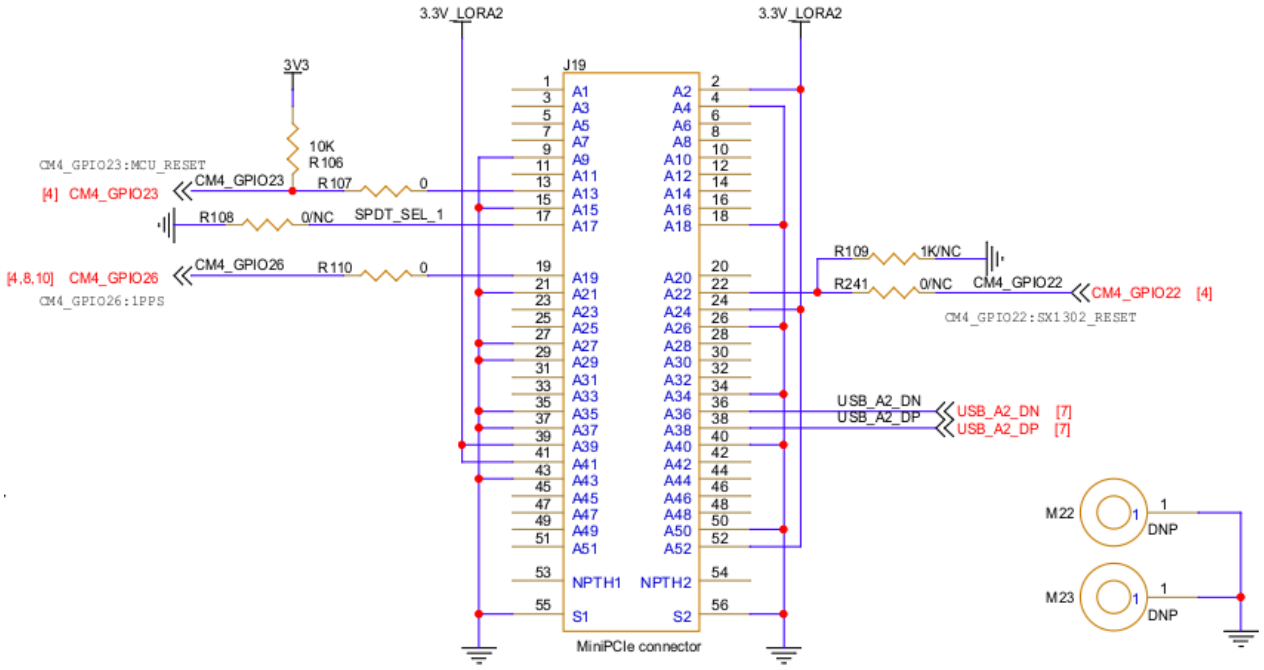

Figure 5: mPCIe slot 2 schematic

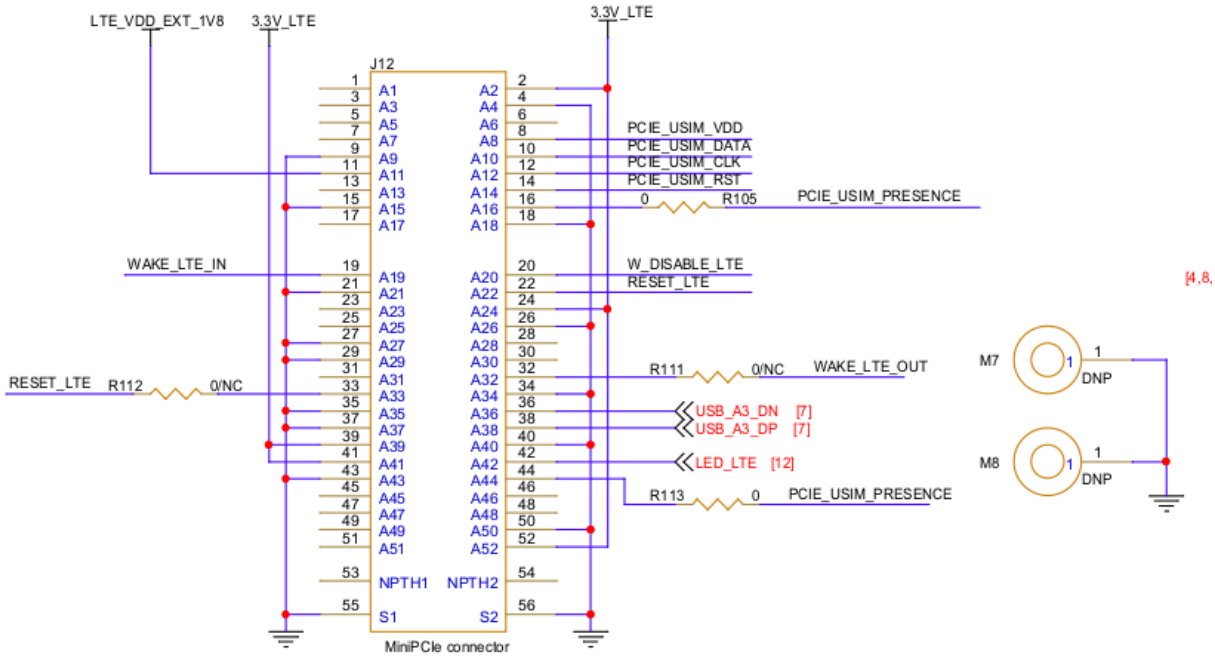

Figure 6: mPCIe slot 3 schematic

- UART5 (GPIO 12/13) is available on **Slot 1**
- I2C1 (GPIO 2/3) is available on **Slot 1**
- USB2.0 is available on **Slot 1, 2 and 3**
- GPIO17 is reset signal on **Slot 1** (SX130X_RESET)
- GPIO27 is connected to **Slot 2 pin 13** with a pull-up (WAKE)
- GPIO25 is connected to **Slot 1 pin 23** (RESET_GPS on some LoRaWAN concentrators)

- GPIO26 is connected to **Slot 1** and **Slot 2 pins 19** (PPS on some LoRaWAN concentrators)
- GPIO27 is connected to **Slot 1 pin 13** with a pull-up (WAKE)
- USIM lines to external SIM slot are connected to **Slot 3**

UART Interface

MiniPCIe slot #1 has its UART connected to the UART5 on the CM4/CM5. If you are using, for example, a LoRaWAN concentrator with GPS support over UART, install it in this slot.

To enable the UART, add the following line to your `/boot/firmware/config.txt` file (under the **cm4**, **cm5**, or **all** section):

```
dtoverlay=uart5
```

Then, disable the login shell and enable the serial port. You can do this using `raspi-config` or via the command line with the following commands:

```
sudo raspi-config nonint do_serial_cons 1
sudo raspi-config nonint do_serial_hw 0
sudo reboot
```

> **NOTE**
>
> You have to reboot the system to apply the changes. Once back the GPS data will be accesible on `/dev/ttyAMA0` or `/dev/ttyS0`.

Certification

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