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iOKE868 LoRaWAN®

AN029 - PowerConsumption

Version 1.2

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Revision history

Date	Version	Chapter	Description
24.08.2020	0.1	all	• created
02.12.2020	0.2	all	• corrected and supplemented
02.12.2020	1.0	all	• reviewed
25.01.2021	1.1	• Scenario 1 • Scenario 2 • Electrical Characteristics	• changed distribution labeling • information added and corrected
11.10.2023	1.2	all	• update of the description • adjustment of battery assumption • correction of the calculation • consideration expanded to include self-discharge

Content

Power Consumption - Overview

In general, it is difficult to make a statement regarding the life time of a battery driven device. This applies especially to devices that operate within a radio network. The availability of the network has a significant influence on the radio settings and thus on the power consumption of the device.

For the iO881A device we therefore decribe and evaluate different operating scenarios. The calculation of the power consumption of the iO881A is based on several assumptions and is mainly influenced by the transmission period, the number of transmitted OBIS values and the radio settings of the device.

It is assumed that a meter sends data every four seconds on its infrared interface. From the data received by iO881A, the needed values are extracted and the LoRa upload is handled by confirmed data transfers. In addition, two further functions of the iO881A device are also considered. Firstly, the iO881A has the possibility to synchronize its local time with the time of the LoRaWAN network. For this purpose a request is sent to the Network Server. Furthermore, for monitoring purposes the iO881A can send a confirmed Status Packet. All messages exchanged between the device iO881A and the network are assumed to occur without error and retransmission.

This analysis assumes that the batteries used discharge evenly over their lifespan, so an unusable battery capacity of 20% is expected.

Within the following the different scenarios are decribed and the corresponding power consumptions are given.

Power Consumption - Electrical Characteristics / Assumptions

Unless otherwise specified, all characteristics are applied for T = 25°C, VDD = 4.5V and are typical consumption values.

Firmware Information	
Firmware	iOKE868_LoRaWAN
Version	V1.2
Build Count	130

Electrical Characteristics	
Power Supply (VDD)	Mignon alkaline batteries
	3x 1.5V, 2,8Ah, Size AA, in line
Current Consumption (typ.)	Transmit Mode: 35mA
	Receive Mode: • 13mA no data reception • 20mA during active packet reception
	Receive Infrared: • 5mA no active data transfer • 13mA during active data transfer
	Sleep Mode: 4µA (RTC on)

Assumptions	
Infrared	Data received after 3 seconds
	MeterID has a length of 8 byte
Mignon Alkaline Battery (AA)	Effective usable capacity 80% of the battery due to required operating voltage
	self-discharge approx. 0.3% per month
LoRaWAN	Confirmed Upload: No retransmissions necessary
	Confirmed Send Status: No retransmissions necessary
	Network Time Request: No retransmissions necessary

Power Consumption - Scenario 1

Description

In this scenario, the iO881A is configured in single mode to receive the current energy value. In order to achieve a good relationship between power consumption and data actuality, the meter reading is transmitted every hour. To keep the amount of transmitted data as low as possible, only the energy value together with the MeterID, the timestamp and the current status are transmitted. The transmitted data has a size of 40 bytes and is immediately uploaded via LoRaWAN.

For monitoring purpose the iO881A transmits a Status Packet daily and the time from the LoRaWAN network is requested once per week.

Configuration of the Calendar Events

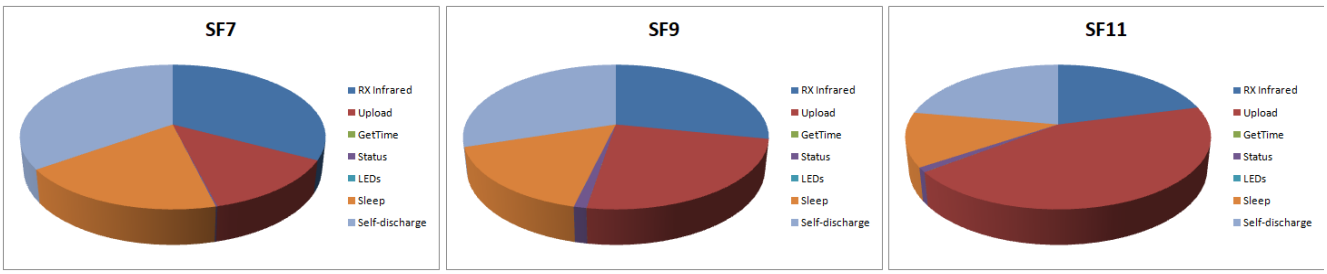
Calendar Event	Duration	Period
Single Mode (Filter on OBIS for energy)	until confirm is received	once per hour
Get & Synchronize Network Time over LoRaWAN®	until the O881A received timestamp	once per week
Send O881A Status over LoRaWAN®	completed after the iO881A received acknowledge	once per day

Consumption

To evaluate the power consumption of the LoRaWAN communication three scenarios with different spreading factors (SF) are considered.

	SF7	SF9	SF11
Consumption per year	189 mAh	236 mAh	353 mAh
Life Time in years (AA Battery Capacity 2800 mA)	8,25	7	5

Distribution



Power Consumption - Scenario 2

Description

The second scenario is used to monitor the current consumption and current values. The current values of the meter are sent every 90 seconds. No MeterID, timestamp or status are transmitted. The transmitted data has a size of 96 bytes and is immediately uploaded via LoRaWAN. Since this is not possible with a spreading factor of 11 due to the duty cycle, it is not considered here.

Configuration of the Calendar Events

Calendar Event	Duration	Period
Single Mode (Filter on 5 OBIS values)	until confirm is received	once every 90 seconds
Get & Synchronize Network Time over LoRaWAN®	until the iO881A received timestamp	once per week
Send O881A Status over LoRaWAN®	completed after the iO881A received acknowledge	once per day

Consumption

To evaluate the power consumption of the LoRaWAN communication three scenarios with different spreading factors are considered.

	SF7	SF9
Consumption per year	5381 mAh	7736 mAh
Life Time in days (AA Battery Capacity 2800 mA)	150	113

Distribution