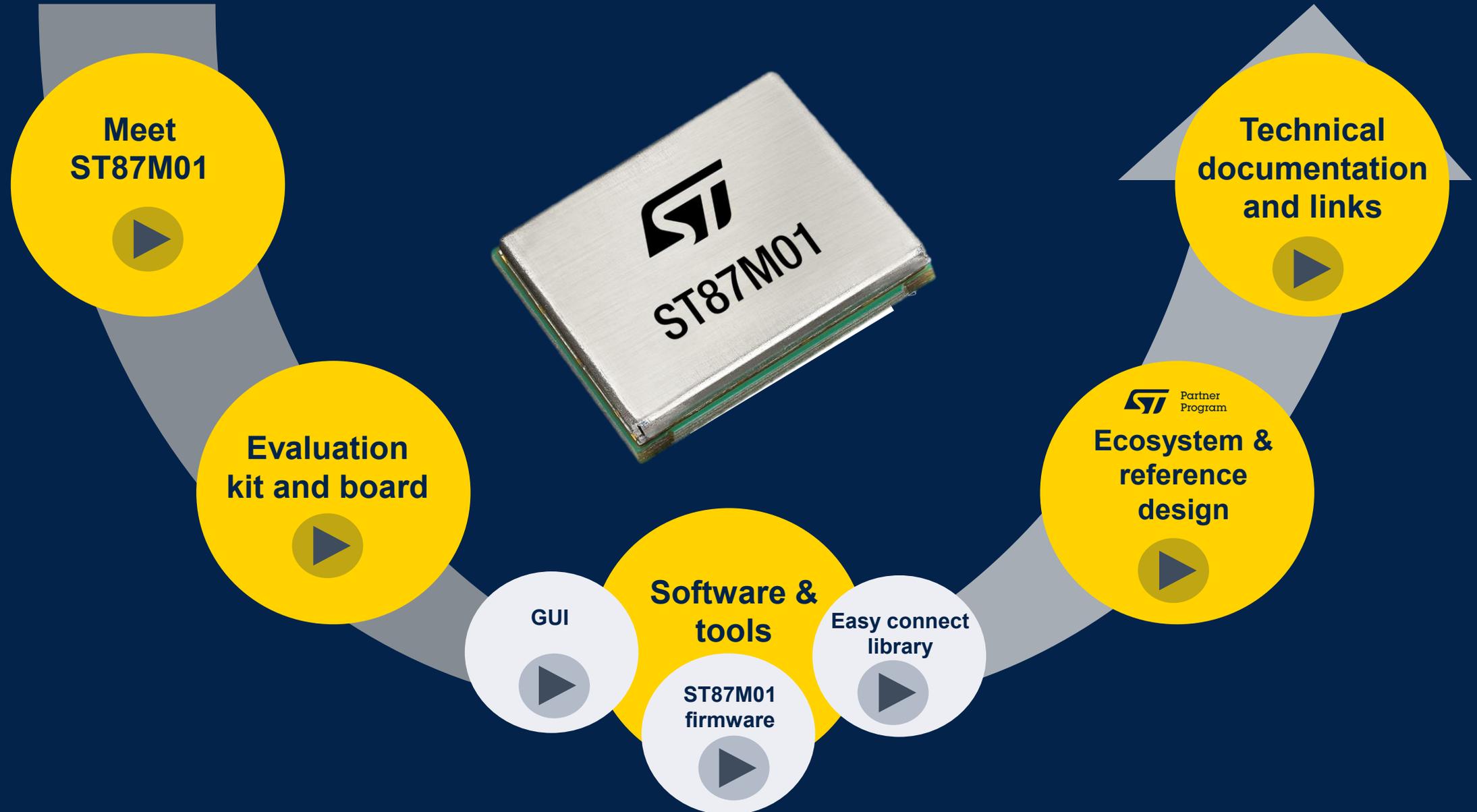




NB-IoT connectivity at the edge Getting started with STM87M01

Ultra-compact, low-power NB-IoT industrial module



Why NB-IoT?



Low power consumption



Deep indoor penetration



Low data rate



Reduced complexity



High security



Cost competitive



Smart metering



Smart industry



Asset tracking



Smart city / building

Answering today's key NB-IoT challenges

Millions of IoT devices need **reliable long-range connectivity** and **positioning** with minimal design complexity



All-in-one solution

LTE CatNB2, Release 15

NB-IoT + Wi-Fi
Positioning + GNSS

Battery-powered, space-constrained devices need **multi-year lifetime** in a **very small footprint**



Ultra-compact and ultralow-power

The smallest NB-IoT Rel15 module on the market



Long-lifecycle IoT deployments need **supply-chain control**, reliability and strong **security over time**, while mitigating geopolitical risk.



End-to-End ownership & security

100% of ST ownership of the NB-IoT SoC, RF-FE and Module Design

Developers need to **reduce risk** and **accelerate time-to-market** for new IoT products



Complete NB-IoT ecosystem ready to use





ST87M01 fully certified module

Power consumption

PSM floor current (@ 2.5 V):

- < 1.8 μA (PSM < 6 h)
- < 1.2 μA (PSM > 6 h)

$I_{\text{OFF}} < 0.5 \mu\text{A}$

Overview

Fully certified module

Qualified radio by major EMEA MNOs

Extensive field tests executed across different regions

Embedded protocol stacks

CoAP/LWM2M
MQTT
HTTP/HTTPS
TCP/UDP DTLS
IPv4/IPv6

Module hardware

12.8 x 10.6 x 2.4 mm

Industrial grade GCF and PTCRB certification - 40 to + 85 °C

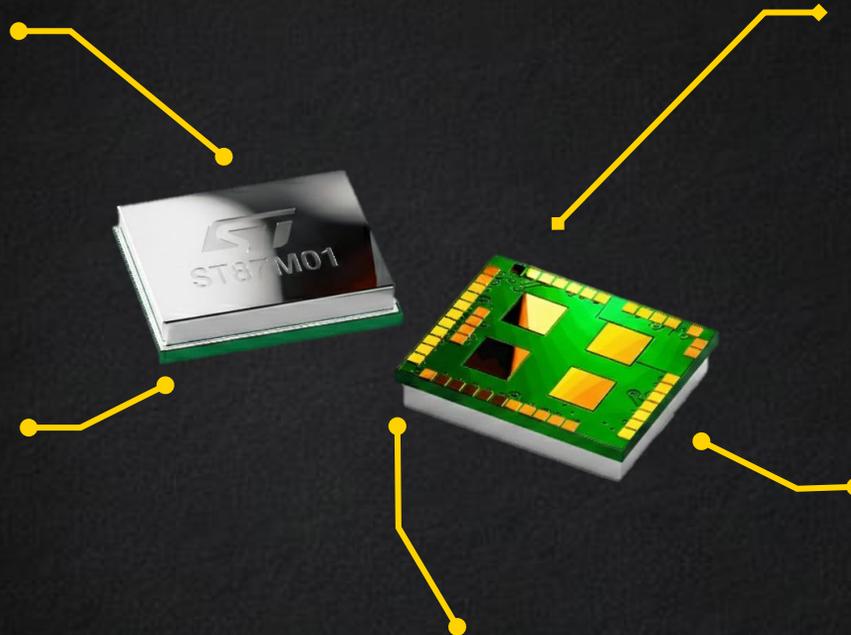
NB-IoT modem

LTE Category NB2, Release 15

B1/B3/B5/B8/B20/B28 **certified for EMEA**

B14/B17/B18/B19/B25/B26/B65/B70/B71 compatible

Large set of AT commands over UART I/F (3GPP compatible & ST custom)



Different options to suit your needs



	NB-IoT	Extra ADC	GNSS	Wi-Fi Positioning	WMBUS	Embedded SIM**
● ST87M01-1001	✓	✓				
● ST87M01-1301	✓	✓	✓	✓		
● ST87M01-1000	✓					
● ST87M01-1100	✓		✓	✓*		
● ST87M01-1101	✓	✓	✓	✓*		
● ST87M01-11nX	✓	✓	✓	✓*		✓
● ST87M01-1400	✓				✓	

● Supported LTE FDD frequency bands: B1, B3, B5, B8, B20, B28

n: network operator identifier

X: customer identifier

*Wi-Fi localization requires a firmware upgrade to the version 2.7.0 minimum

**on-demand



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[Get samples](#)

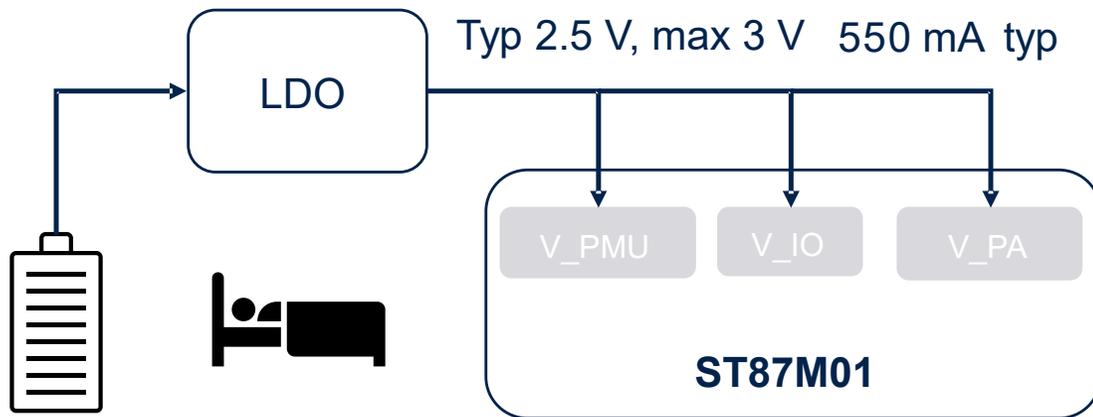
Globally certified and ready to deploy



- ✓ NB-IoT modem certified and ready to deploy
- ✓ No customer certification process needed on module
- ✓ 15 Year ST longevity commitment program

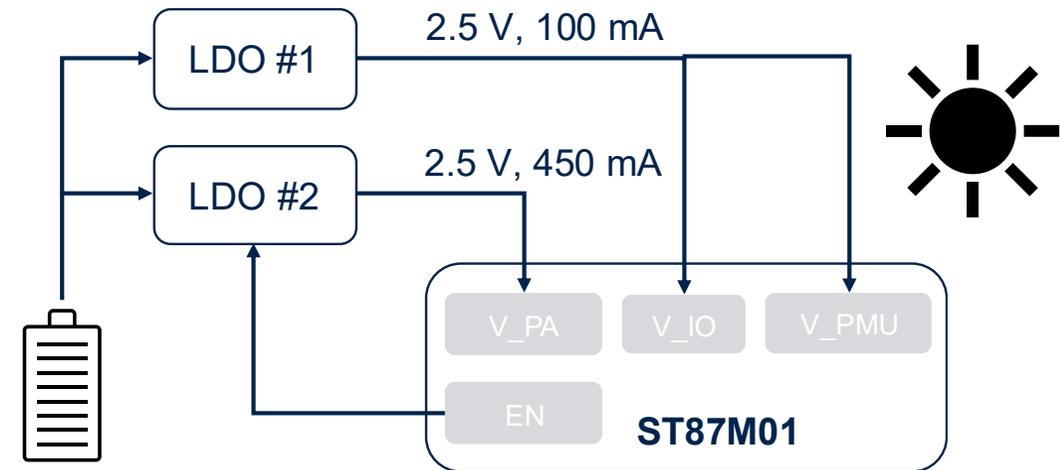
ST87M01 typical power management

Simplicity



- Always OFF applications (MCU to wake-up ST87M01)
- Recommended 2.5 V voltage supply for all rails
- The best solution if no constraints on power consumption
- Lowest BOM cost (compared to DC-DC)

Highest efficiency

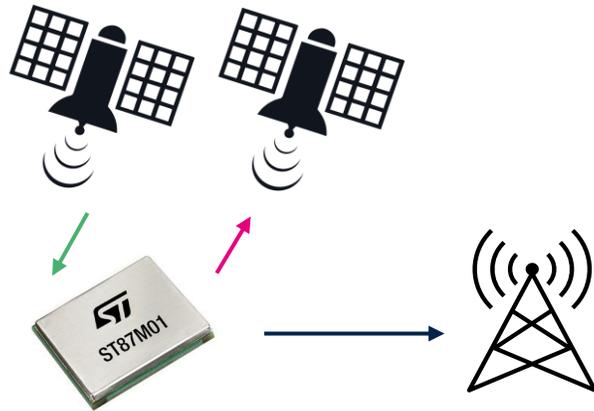


- Always ON applications with LDO #2 enabled in Tx only
- Require the same voltage for V_PMU, V_IO and V_PA
- Use Enable PIN to shut down LDO #2 during Tx sleep

GNSS & Wi-Fi positioning for full geolocation coverage

Outdoor geolocation

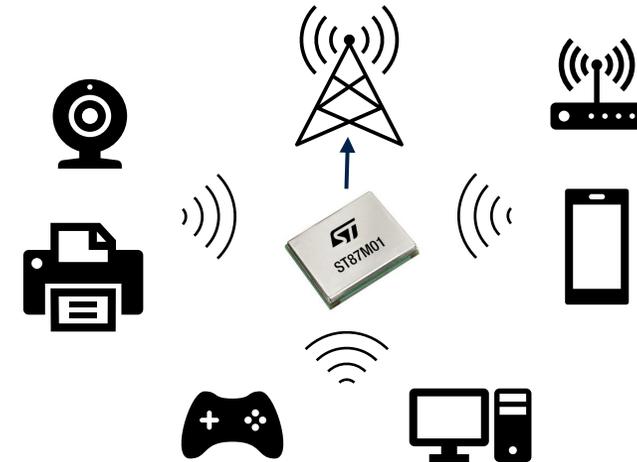
GNSS tracking



Can switch by leveraging the ST87M01 software-defined radio capabilities

Indoor geolocation

Wi-Fi positioning tracking



GNSS technology provides precise and reliable outdoor geolocation by leveraging satellite signals. The ST87M01 module receives and decodes signals from multiple satellite constellations, like GPS and Galileo, to determine accurate real-time positioning.

The **Wi-Fi positioning** feature enables precise indoor geolocation by detecting nearby Wi-Fi networks and taking SSID, MAC, and RSSI public information for accurate positioning. The collected data is then transmitted via the NB-IoT network to allow the customer to triangulate the asset location.

ST87 Energy Estimator (ST87-E²)

How to get the energy consumed of the product in unpredictable conditions?



The problem

- Energy consumption of an NB-IoT modem depends on the network conditions
- Network performance varies with operator settings
- Battery-powered products do not have the budget for real-time energy measurement

The solution

- ST87-E² is an application running inside ST87M01
- Thanks to ST87 design, we can monitor the activity of the modem and deliver its relevant energy consumption
- Target accuracy above 90%
- Customers are now able to get the remaining capacity

Wireless M-Bus implementation on ST87M01

Provides protocol switch on the field in case of poor NB-IoT coverage

- T1 & C1 modes fully operational,
- T2 & C2 ready

WM-Bus PHY layer hosted in ST87M01 as fallback DSP firmware vs NB-IoT

PHY layer EN 13757-4 Release 2013

Initial development on T1 and C1 modes (unidirectional) compatible with walk-by/drive-by receivers

Mode T1: FSK 100 kcps at 868.95 MHz – code 3 out of 6

Mode C1: FSK 100 kcps at 868.95 MHz – code NRZ

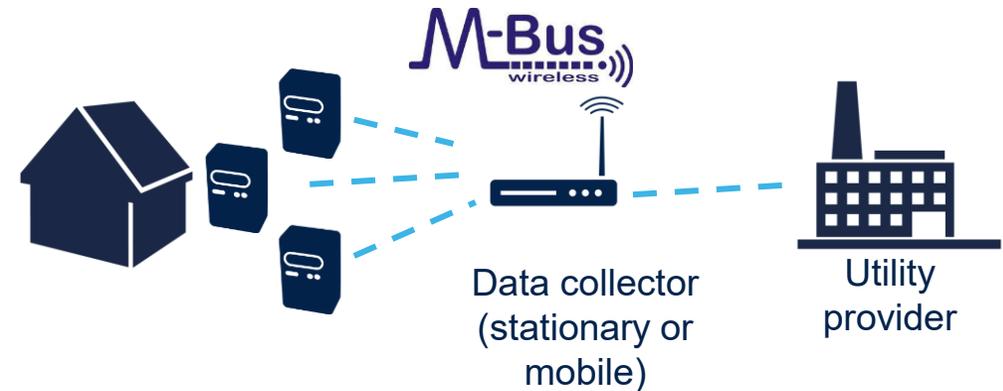
External host MCU running stack & application layer (OMS)

Main configuration



Poor NB-IoT coverage → the meter can revert to Wireless M-Bus to ensure that the utility doesn't lose data. The meter can periodically switch back to NB-IoT to verify whether the connectivity has been restored.

Backup configuration



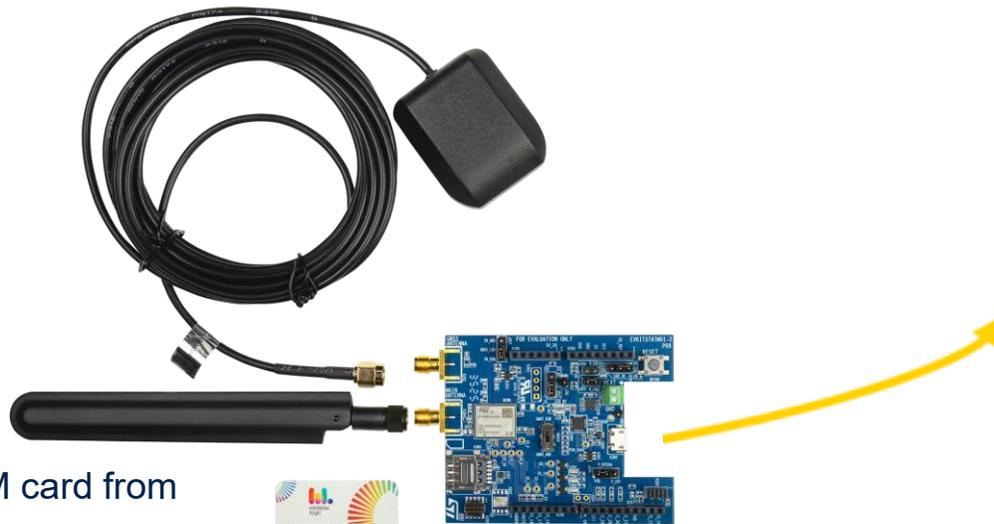
ST87M01 easy evaluation with EVKITST87M01-2



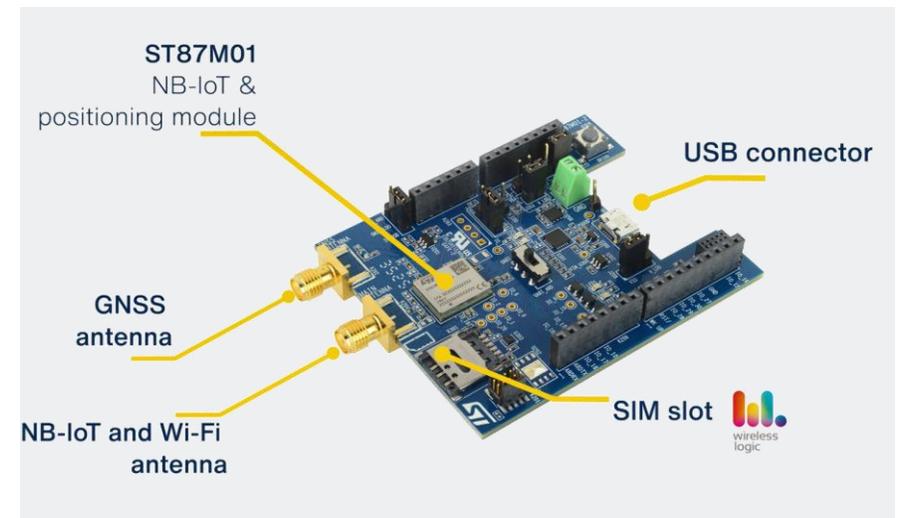
[Discover EVKITST87M01-2](#)

[Get your kit](#)

[Read the user manual](#)



Conexa IoT SIM card from Wireless Logic:
50 MB for 6 months free of charge with the evaluation kit



NB-IoT and W-MBus evaluation kit overview

EVST87M01W-1

Evaluation hardware

- EVST87M01W-1 evaluation kit specific for NB-IoT with Wireless M-Bus fallback
- User manual



CAD resources

- EVST87M01W-1 BOM
- EVST87M01W-1 schematic
- EVST87M01W-1 PCB layout
- Hardware user manual

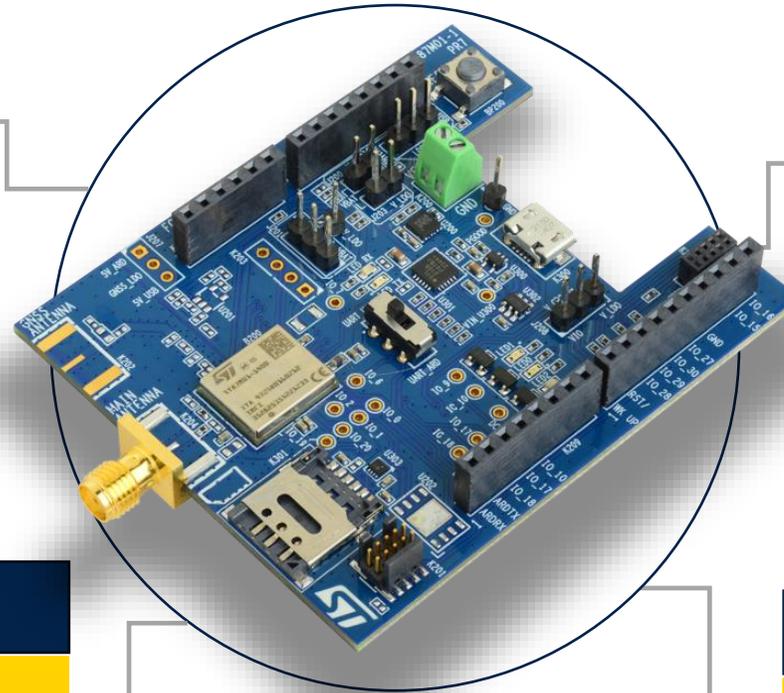


Documentation

- AT commands user manual
- Application notes (GNSS, MQTT, startup, TCP IP/UDP)
- Datasheet / data brief

Tools & software

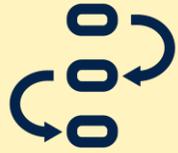
- ST87M01 GUI
- User manual



[Discover
EVST87M01W-1](#)

STSW-ST87MGUI

ST87Mxx startup package



Easy installation and intuitive GUI

Windows tool that installs without admin rights and offers an easy-to-use graphical interface to control ST87Mxx modules.



Complete ST87Mxx feature control

Single environment to manage firmware download, AT command console, GNSS/Wi-Fi positioning, spectrum, ST Engineering trace, and diagnostic tools.



Integrated documentation and user guides

Startup package includes built-in user guides and reference material to simplify setup and accelerate ST87M01 evaluation.

ST87MGUI GUI for a seamless navigation experience

Console

- Send single/group of AT commands by specifying a "Text Script" file

Configuration panel

- Define commands shortcuts buttons

Download panel

- Program firmware images into the module

Trace panel

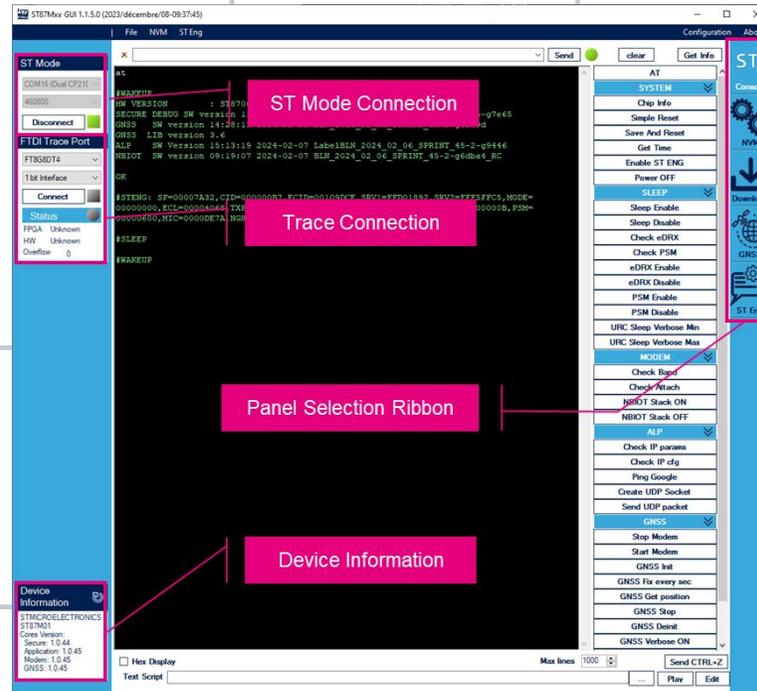
- Manage module debug trace capabilities

GNSS panel

- Manage positioning services

ST Eng panel

- Manage NB-IoT network / radio link information




[Download
ST87Mxx startup
package](#)


[Read the
databrief](#)

Firmware bundle for the STSW-ST87M01 module family

The module supports the following three types of bundles:

Type 1 = NB-IoT FW + Secure FW + Application FW

Type 2 = NB-IoT FW + Secure FW + Application FW + GNSS Wi-Fi FW

Type 3 = NB-IoT FW + Secure FW + Application FW + WMBUS FW

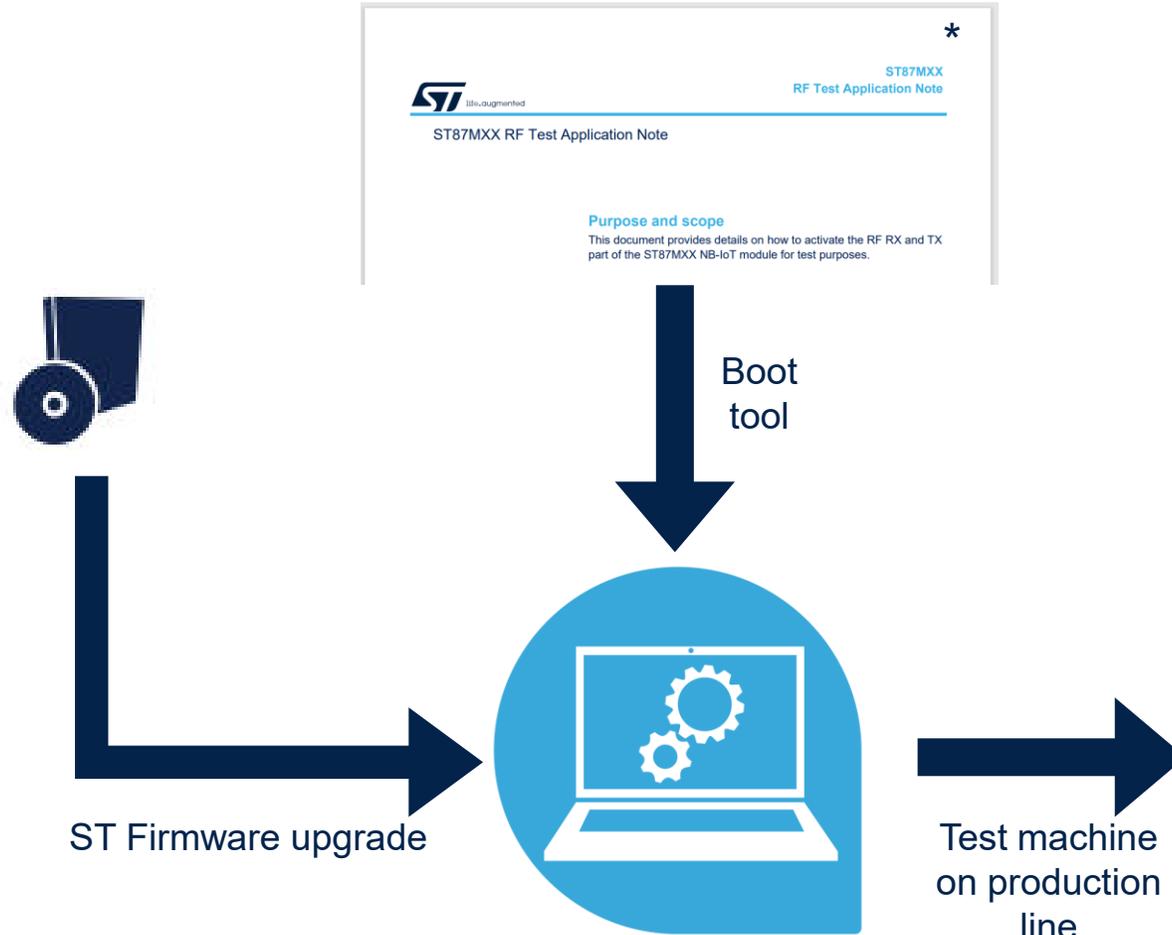


[Download
ST87M01 firmware](#)



[Read the
databrief](#)

ST87M01 firmware upgrade at production line



Boot Tool is a procedure and software that – installed on customer’s test machine in the production line – allows ST87M01 firmware upgrade on the field. It takes our executable file as input to perform firmware upgrades efficiently and reliably.



ST87M01 Easy Connect library

ST87M01 **Easy Connect Library** provided as **source code** to manage AT commands



- **Simplify** access to ST87M01 NB-IoT, GNSS, Wi-Fi, and WMBUS resources
- Give guidance for customer via **precoded** sequences
- Set default **settings to preferred ones** (best performance oriented)
- Make configuration as simple as possible for users



- **No OS dependency** (OS agnostic)
- C-coded agnostic interface (no hardware dependency)
- Static configuration (config.h, ...)
- Minimal API number to perform actions

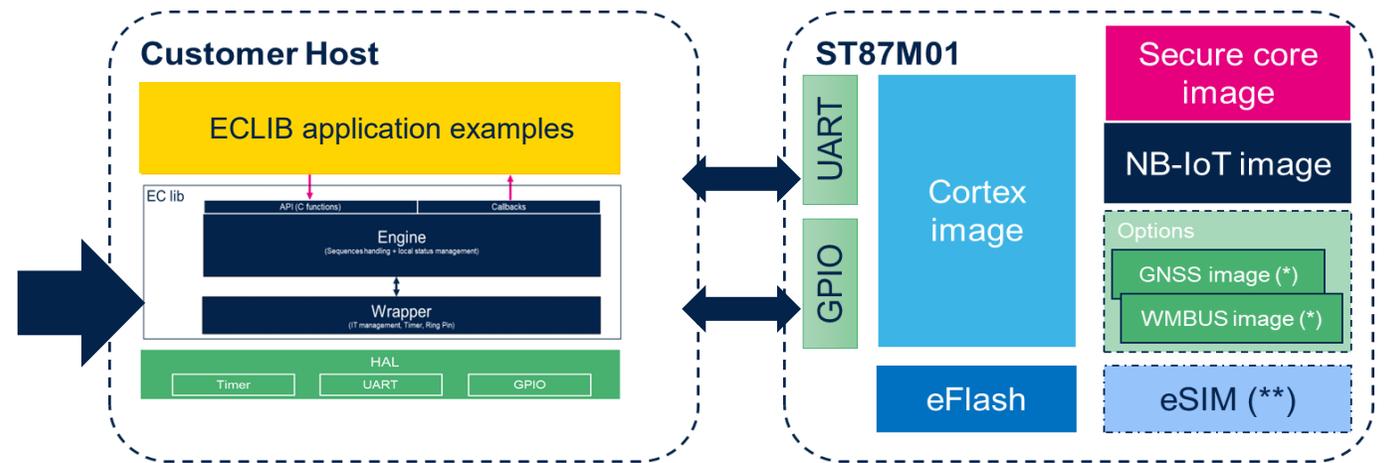

[Download STSW-ST87ECLIB](#)


[ST87Mxx easy connect library release note](#)

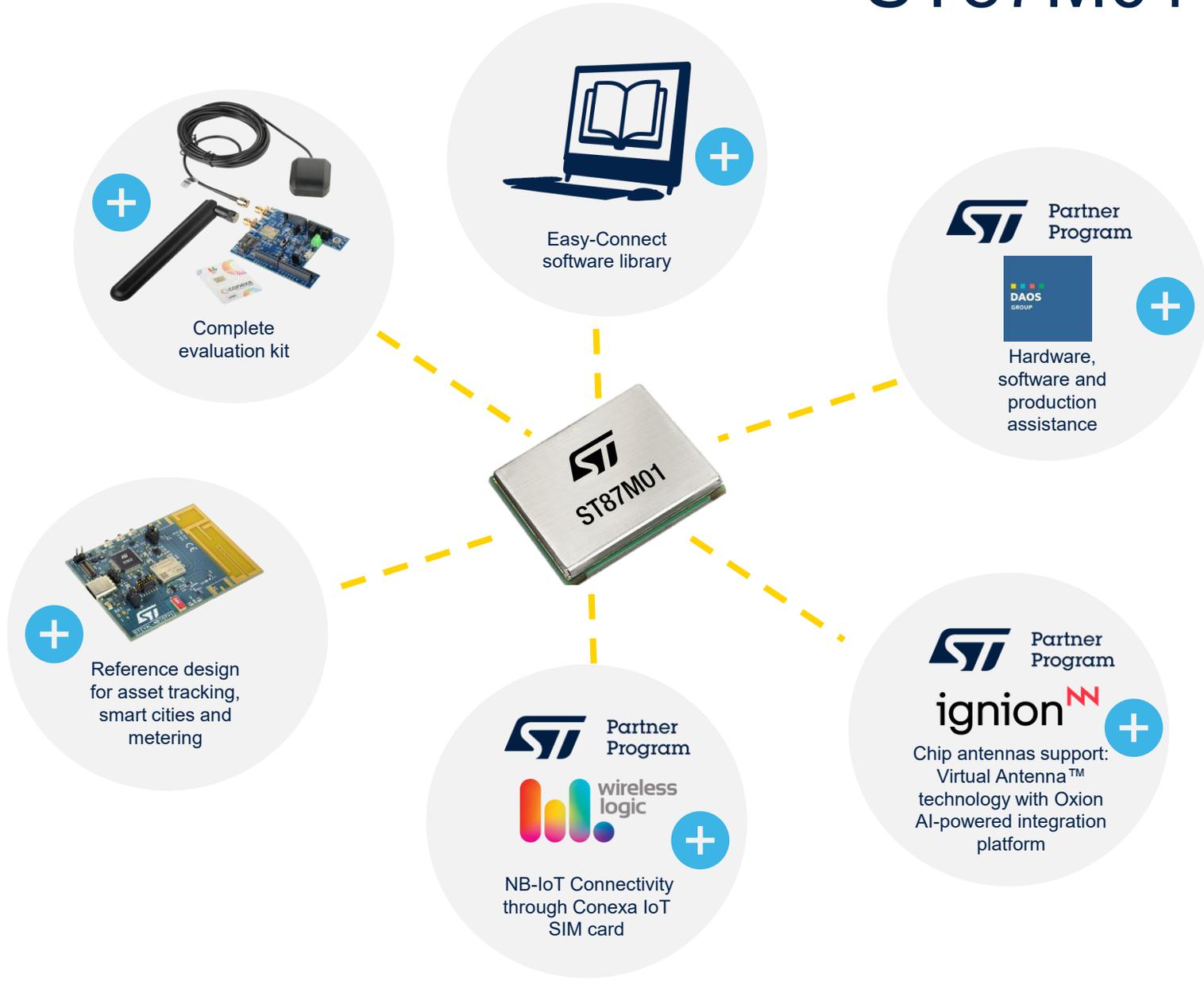

[MCU easy connect library for ST87Mxx data brief](#)


[ECLIB application examples](#)

Provided in source code



ST87M01 ecosystem



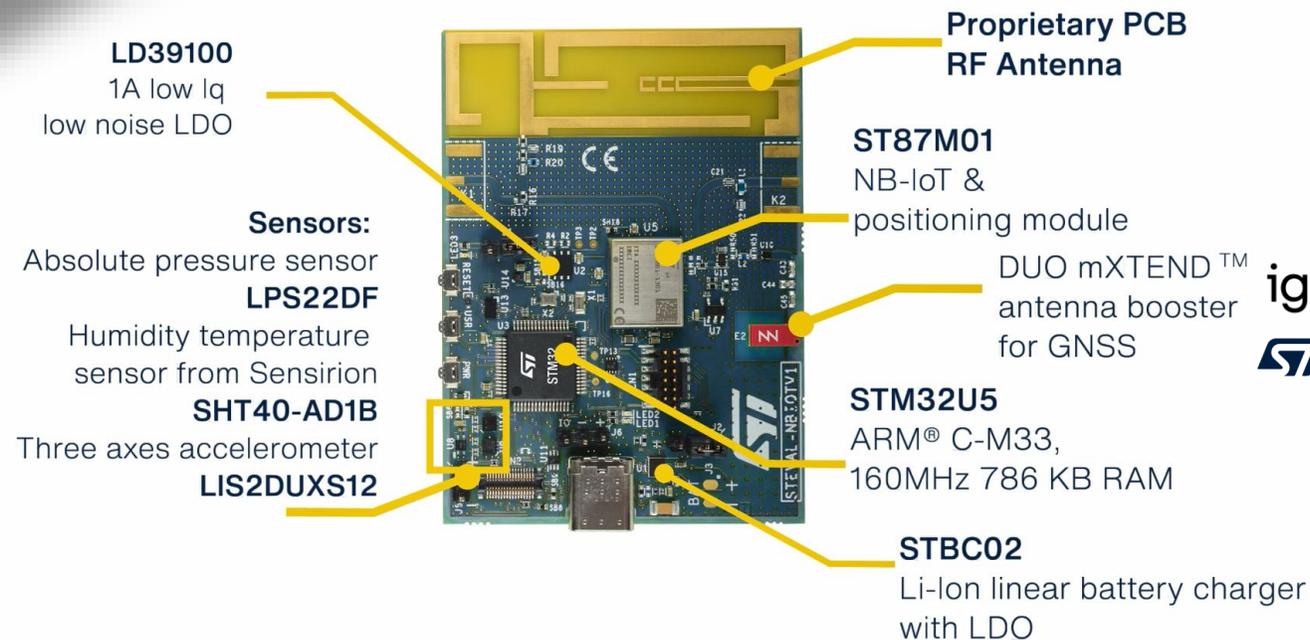
STEVAL-NBIOTV1: ST87M01 reference design



NB-IoT evaluation platform and reference design for asset tracking and smart cities with ST87M01



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Technical documentation and links

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Easy connect library

[ST87Mxx easy connect library release note](#)

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[ECLIB application examples](#)

Design guide and application notes

These documents are installed with the ST87M01 startup package (GUI) – [ST87Mxx startup package](#)– and are available from the “Help” drop-down menu.

ST87M01 firmware

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