ST87M01
Databrief

**Ultra-Compact NB-IoT Cat NB2 Module with Ultra-Low Power Consumption**

Features

- LTE, Category NB2, Release15
- Worldwide regional bands coverage
- Single Tone / Multi Tone / Extended TBS and 2 HARQ
- Up to DL: 127kbps, UL: 159kbps
- eDRX and PSM support
- Ultra-Low Power Mode <3uA
- Ultra-Compact size
- Embedded IoT internet protocols
- LTE network-based positioning support
- Differential FOTA support
- Up to 23dBm Power Output
- Multiple I/F and GPIO
- GCF Certified (planned)
- Optional eSIM GSMA compliant with an additional Secure Element
- Optional A-GNSS
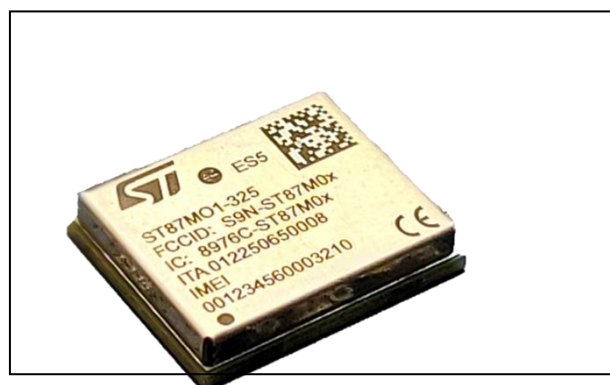
Description

The ST87M01 is a high-performance, ultra-compact, ultra-low power, cost efficient, multi-band certified ST LTE Cat NB2 NB-IoT and GNSS module series offering worldwide coverage while maintaining super compact form factor.

Contents

1. Product Concept

The ST87M01 is a high-performance, with ultra-low power consumption, NB-IoT (LTE Cat NB2) 3GPP Release 15 and GNSS certified module series for worldwide coverage.

The ST87M01 module series supports multi frequency bands, with an extended multi-regional coverage, enabling almost a complete world-wide NB-IoT data communication. In addition, the presence of the GNSS receiver allows to support multiple satellite constellations to address high accuracy localization applications.

Moreover, the ultra-compact module form factor makes ST87M01 family perfect choice for size critical applications, allowing for miniaturization. In fact, the ultra-compactness is a crucial characteristic addressed by the ST87M01 series, hereby presented in an LGA package of only 10.6mm x 12.8mm (with 51 pin).

Furthermore, thanks to ultra-low power consumption and industrial qualification grade over the industrial temperature range, the ST87M01 family represents the best choice for a wide range of IoT applications: ranging from smart grid, energy smart metering, smart city, factory automation, industrial IoT and asset tracking to any smart monitoring applications matching Low Power Wide Area Network (LPWAN) communication requirements.

Besides, the ST87M01 series can receive FW updates and additional features via firmware upgrades over the air with optimized firmware upgrade procedures (e.g. Differential FOTA).

Additionally, ST87M01 series embeds text and PDU SMSs service and internet protocols for NB-IoT products, including TCP/IP, TLS/DTLS, CoAP, LwM2M, MQTT and HTTP/HTTPS which enable a multiple and broad set of IoT applications. On top, simple IoT applications can be managed directly by ST87M01 module memory/processing internal resources.

At last, full support of Power Saving Mode (PSM) and Extended Discontinuous Reception (eDRX) mechanisms, along with ultra-lower power silicon technology adoption and a dedicated interface to wake-up module on interrupt-base, allow ST87M01 series to achieve an extra-long battery life on a single cell primary battery.

Eventually, the ST87M01 series is designed and qualified according to industrial grade: each manufactured module is fully tested, traced and satisfies ST stringent reliability and quality requirements, to meet the highest levels of product quality and reliably for 15 years long term use in the field.

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2. Key Specifications

2.1 KEY Features

LTE NB-IOT SPECS	LTE, Category NB2, 3GPP Release 15
FDD BANDS	B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B26/B28/B65/B66/B70/B71/B85 (Supported by same HW, certification on selected band over the hardware capability)
DATA TRANSMISSION MODE (THROUGHPUT)	Single Tone (DL: 26kbps, UL: 16kbps) Multi Tone (DL: 26kbps, UL: 66kbps) Extended TBS (Transport Block Size) and 2 HARQ (CatNB2) (DL: 127kbps, UL: 159kbps)
POWER SUPPLY RANGE (TYPICAL)	VPMU/VDCDC: 2.2 to 3.3V VPA: 1.8V to 3.0V VIO: 1.8V to 3.3V
POWER CLASS	Class-3, +23 dBm Class-5, +20 dBm Class-6, +14 dBm Configurable via AT commands
POWER CONSUMPTION	<3uA @PSM
POWER SAVING	eDRX PSM

2.2 Software

PROTOCOLS	IPV6 -TCP/UDP - CoAP (Constrained Application Protocol) - LWM2M (Lightweight M2M) - MQTT (MQ Telemetry Transport) - HTTP/HTTPS - TLS/DTLS
AT COMMANDS	3GPP TS 27.005/3GPP TS 27.007 AT commands ST Enhanced AT commands
SMS	Only PDU Mode
FIRMWARE DOWNLOAD AND UPGRADE	Host via UART and D-FOTA over LWM2M SPI flash (for production only)
LOCALIZATION SERVICES	LTE network-based positioning support Optional A-GNSS: GPS, Galileo, optimized concurrent mode Optional eSIM with additional Secure Element

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2.3 Interfaces

SERIAL	UART x 2 SPI x 1 I^{2}C x 2
GPIO	28
ADC	x 2
PWM	x 1
USIM I/F	x 1 ISO/IEC 7816-3 compliant, enabling the module to access to an external 1.8V USIM card at 1.8V
FUNCTIONALS	WAKEP UP x 1 RESET x 1
ANTENNAS	50Ω impedance control for NB-IoT x 1 50Ω for GNSS x 1 (optional)

2.4 Package

TYPE	LGA metallic shielded package (47pins + 4 exposed GND pads)
DIMENSION	12.8mm (L) x 10.6 mm (P) x 2.4mm (H)

2.5 Environmental data, quality & reliability

STORAGE TEMPERATURE	-40°C to +85°C
ROHS COMPLIANT	Free-Lead
GRADE	Industrial

2.6 Certifications and Approvals

3GPP	3GPP 36.523-2 User Equipment Conformance Specification 3GPP 36.521-2 User Equipment Conformance Specification; Radio transmission and reception 3GPP 31.121 for USIM
GCF	B3, B8, B20, B28 (first release) Additional bands can be certified in future releases with the same HW RSE (LTE: 3GPP TS 36.124) NB-IoT (3GPP TS 36.521-2, 3GPP TS 36.523-2)

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	USIM (3GPP TS 31.121-2) UICC (ETSI TS 102 230-1) USAT (3GPP TS 31.124)
RED / CE	EMC (EN 301 489-1 V2.2.3, Draft EN 301 489-19 V2.2.0 and EN 301 489-52 V1.1.2)
	RF (EN 301 908-1 V13.1.1, EN 301 908-13 V13.1.1, EN 303 413 V1.1.1)
	MPE (EN 62311:2020)
	Safety (EN 62368-1:2014/AC:2015)

ADDITIONAL CERTIFICATIONS AND APPROVALS UNDER DEFINITION

3. Ordering Information

ST87M01-ABCD is the product family name, that will be specified for each single PN as described below and reported in the following tables:

- "A" indicates the subset of FDD certified frequency bands addressed by the specific PN;
- "B" indicates the GNSS option type addressed by the specific PN;
- "C" indicates the presence or absence of the eSIM for the specific PN;
- "D" indicates the certifications for the specific PN;

A		B		C		D	
Code	Description	Code	Description	Code	Description	Code	Description
1	**B3, B8, B20, B28**	0	No GNSS	0	No eSIM	0	TBD

ST87M01 series	Status	Option Type
ST87M01-1000	Active	Default
ST87M01-1100	Future version	Default + GNSS
ST87M01-1010	Future version	Embedded SIM +Secure Element
ST87M01-1110	Future version	Embedded SIM +Secure Element + GNSS
ST87M01-ABCD	Future version	TBD