

Bringing LoRaWAN® to the Mass Market

Introducing Murata Module Lineups and Product development kits with LoRa®

Suman THAPA // **Murata**
Carlo Tinella // **SEMTECH**

Introduction of speakers



Suman THAPA
Murata



Carlo TINELLA
SEMTECH

Agenda

- ☑ LoRa® Market adoption
 - ☑ Semtech LoRa transceivers portfolio
 - ☑ Murata LoRa Modules Roadmap
 - ☑ LoRa applications for Murata Modules
 - ☑ Why LoRa modules ?
 - ☑ Walk through Murata module lineups
- Semtech
- Murata

- ✓ LoRa® Market adoption
- ✓ Semtech LoRa transceivers portfolio

SEMTECH



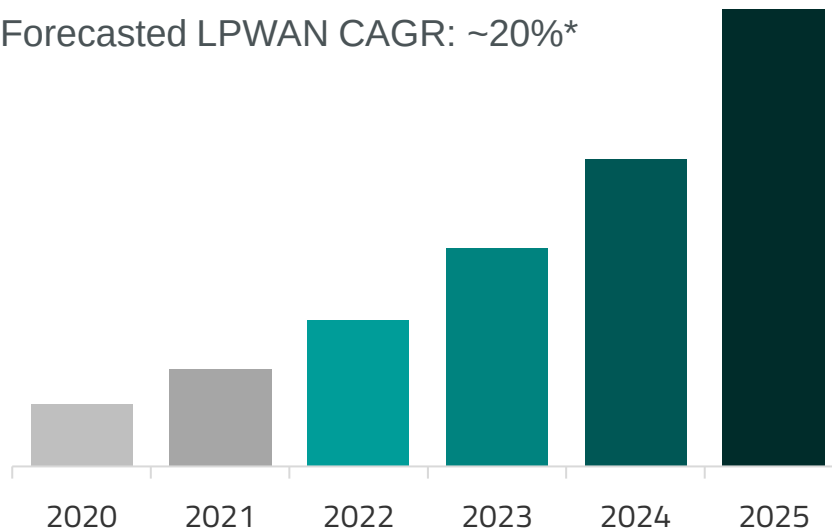
Carlo TINELLA

LoRa®: The Catalyst for Low Power IoT

LoRaWAN® is the preferred network choice for many low-power IoT applications

OMDIA Research | Sept 2022

- Forecasted LoRa-enabled CAGR: ~40%*
- Forecasted LPWAN CAGR: ~20%*



LoRa Growth Forecast*

*Low Power Wireless Market Tracker 2022 OMDIA Research

- Established global leader in Low Power Wide Area Networks
- Supports private & public networks
- Wide adoption: ~300M connected devices
- Leader in sustainability use cases
- Installed infrastructure supports 5B sensor end node devices

Emerging **'Sensing as a Service'** Business
enables IoT transformation

LoRa Connect™ Portfolio

Sub-GHz, 2.4GHz and dual-band transceivers

1st Generation

SX1278
(137-525MHz)

SX1272
(862-1020MHz)

SX1276
(137-1020MHz)

SX1280
(2.4GHz & ranging)

2nd Generation

SX1268
(410-810MHz)

SX1261/2
(150-960MHz)

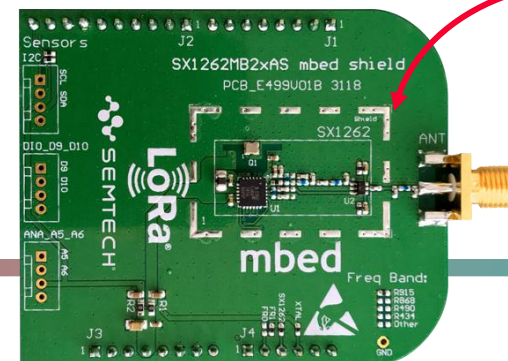
LLCC68
(150-960MHz)

3rd Generation

Improved Sensitivity
(+3dB)

LR1121
(subGHz & 2.4GHz)

Each transceiver is launched with a companion shield board implementing a Semtech reference

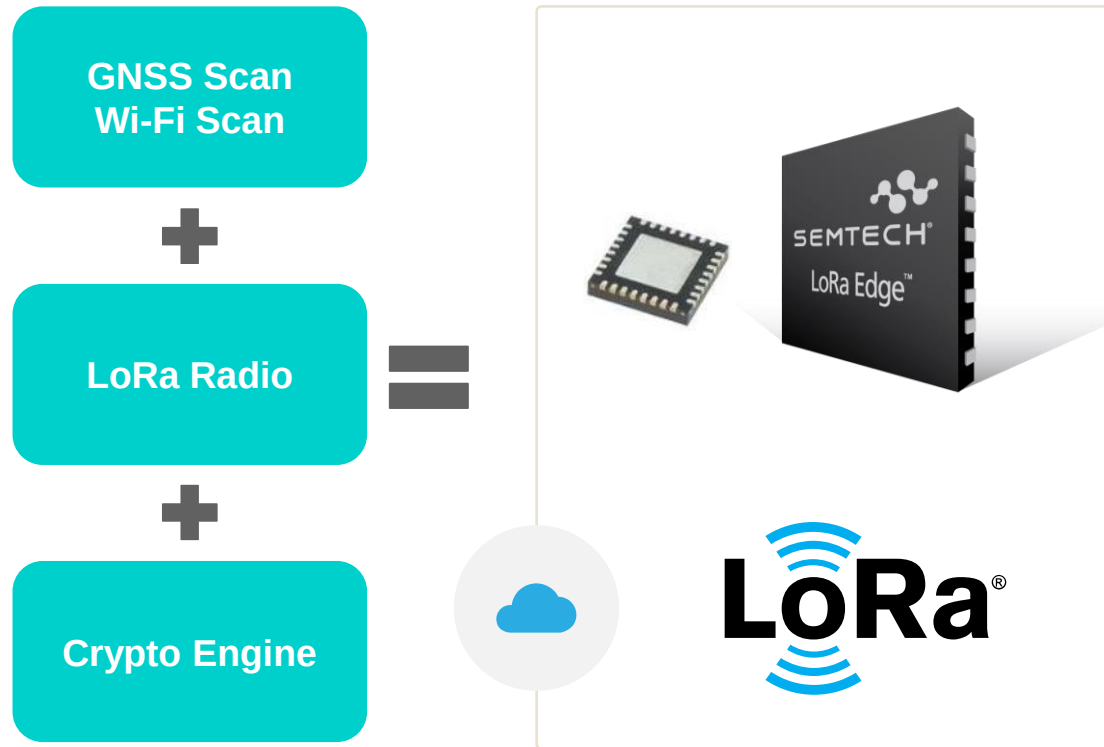


Reference Design
Section

LoRa Edge™

Power & Cost Optimized Chip-to-Cloud Geolocation

LoRa Edge = Multi-technology radio + LoRa Cloud™



What's Unique?

- Combines LoRa transceiver with GNSS receiver and Wi-Fi “sniffer” on monolithic silicon
- Cloud-based solver to deliver Lat and Long, significantly reducing on-chip power consumption
- Cryptographic engine for key derivation (Ntwk/Session) and encryption

Benefits

- Lower active and sleep currents than comparable solutions
- Lower BoM cost
- Easier key management & provisioning

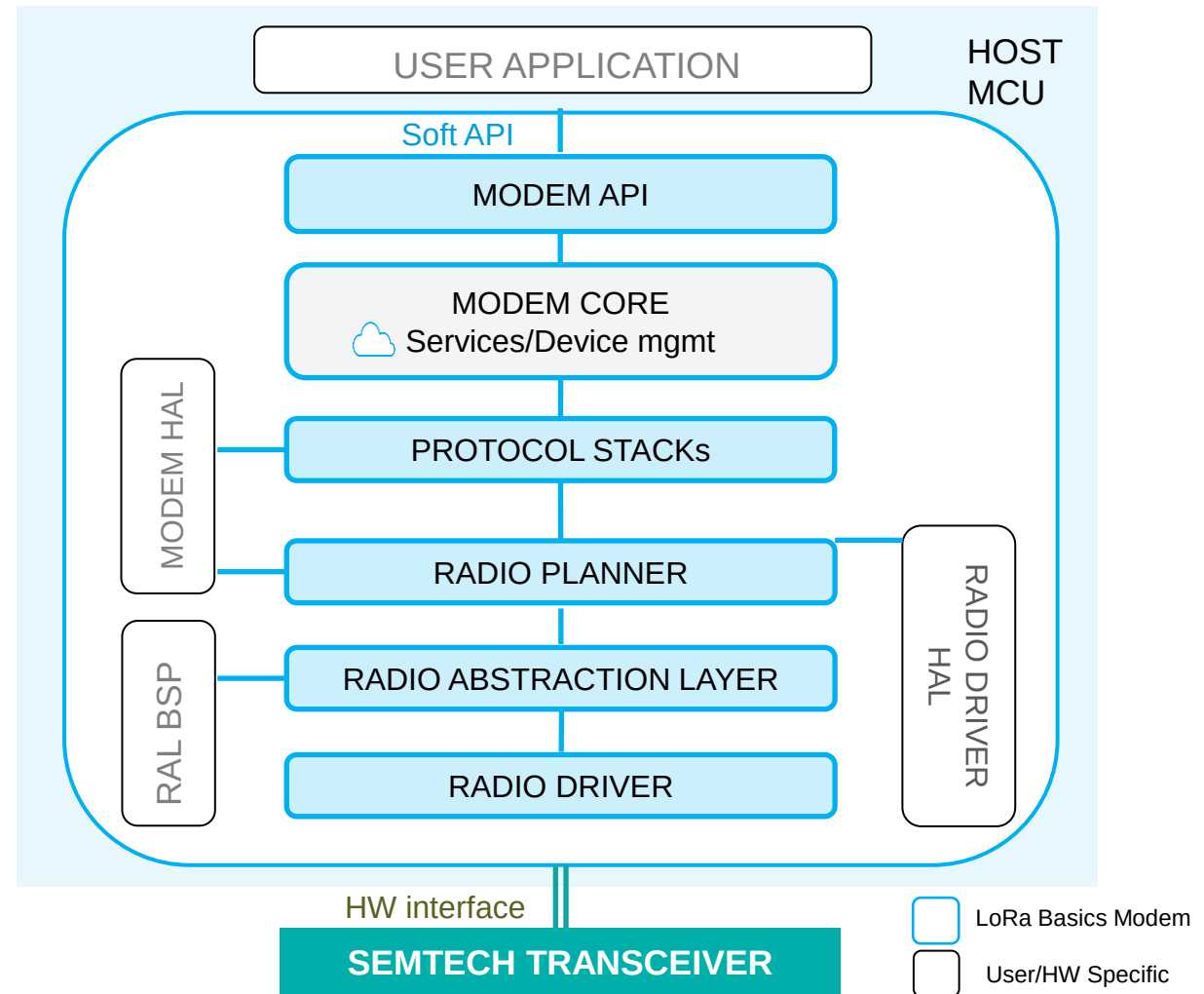
LoRa Edge™ Portfolio

Ultra Low-Power Geo-location LoRa Embedded Platform

 Connectivity		LR1110 LoRa Edge™	LR1120 LoRa Edge™
Sub-GHz LoRa		✓	✓
SATCOM S-band		-	✓
2.4GHz LoRa		-	✓
LoRa Edge Ultra Low Power Cloud Based Geolocation 	 GNSS scan	✓	✓
	 Wi-Fi scan	✓	✓

LoRa Basics™ Modem

- LoRa Basics Modem is a software library provided as open-source code
- Seamless integration with all LoRa Cloud™ services
- Protocol stacks
 - LoRaWAN®
 - LoRa® 2.4GHz
- New radio abstraction layers for easy porting
 - Semtech transceivers
 - MCU
- Example:
LoRa Basics Modem for SX126x,
w class A, B & C, w US ~68.2KB



WHERE IS LoRa Basics™ Modem found?

 **LoRa®** <https://github.com/LoRa-Net>
196 followers Camarillo (CA, USA) <http://www.semtech.com/lora>

[Overview](#) [Repositories 30](#) [Projects](#) [Packages](#) [People](#)

Pinned

 **LoRaMac-node** Public

Reference implementation and documentation of a LoRa network node.

● C ☆ 1.7k 🍴 1k

 **SWL2001** Public

LoRa Basics Modem LoRaWAN stack

● C ☆ 17 🍴 10

 **SWSD001** Public

LoRa Basics Modem SDK

● C ☆ 12 🍴 8

 **SWDR001** Public

Driver for LR11xx chip (LR1110 / LR1120 / LR1121)

● C ☆ 10 🍴 3

 **SWSD004** Public

Demonstration application for LoRa Edge tracker reference design - compatible with LoRa Basics Modem

● C ☆ 7 🍴 3

 **SWSD003** Public

LR11xx chip (LR1110 / LR1120 / LR1121) and SX126x chip (SX1261 / SX1262 / SX1268) SDK

● C ☆ 1

Non LoRa Basics Modem examples

WHERE IS LoRa Basics™ Modem found?

 DEVELOPER PORTAL

LEARN BUILD SOLUTIONS DOCUMENTATION COMMUNITY SUPPORT 

SIGN UP FREE » LOGIN

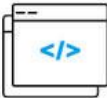
Build

OVERVIEW TOOLS NETWORK SERVER SOFTWARE LoRa CLOUD SERVICES DEVELOPMENT KITS PCB Design Review Service

HOME » BUILD » SOFTWARE

Software

The Semtech Software Library offers a number of software resources to ease and enhance development of your IoT solutions.

**LoRa Basics™**

A rich set of tools for quickly developing IoT solutions featuring LoRa® radio modulation over LoRaWAN® networks, the LoRa Basics™ tools consist of fully-maintained ready-to-use building blocks you can use to accelerate your IoT solution development and deployment.

[Go To LoRa Basics »](#)

**LoRaMAC-Node™**

Available in GitHub, LoRaMAC-Node™ provides an endpoint LoRaWAN® stack implementation, with examples of Class A, B, and C devices. It supports drivers and firmware updates over the air for a number of chips that comply with the LoRaWAN standard.

[Go To LoRaMAC-Node »](#)

**Software Distribution Center**

Looking for code to accelerate the development of your IoT solutions? Check out our Software Distribution Center!

[Go To Software Distribution »](#)

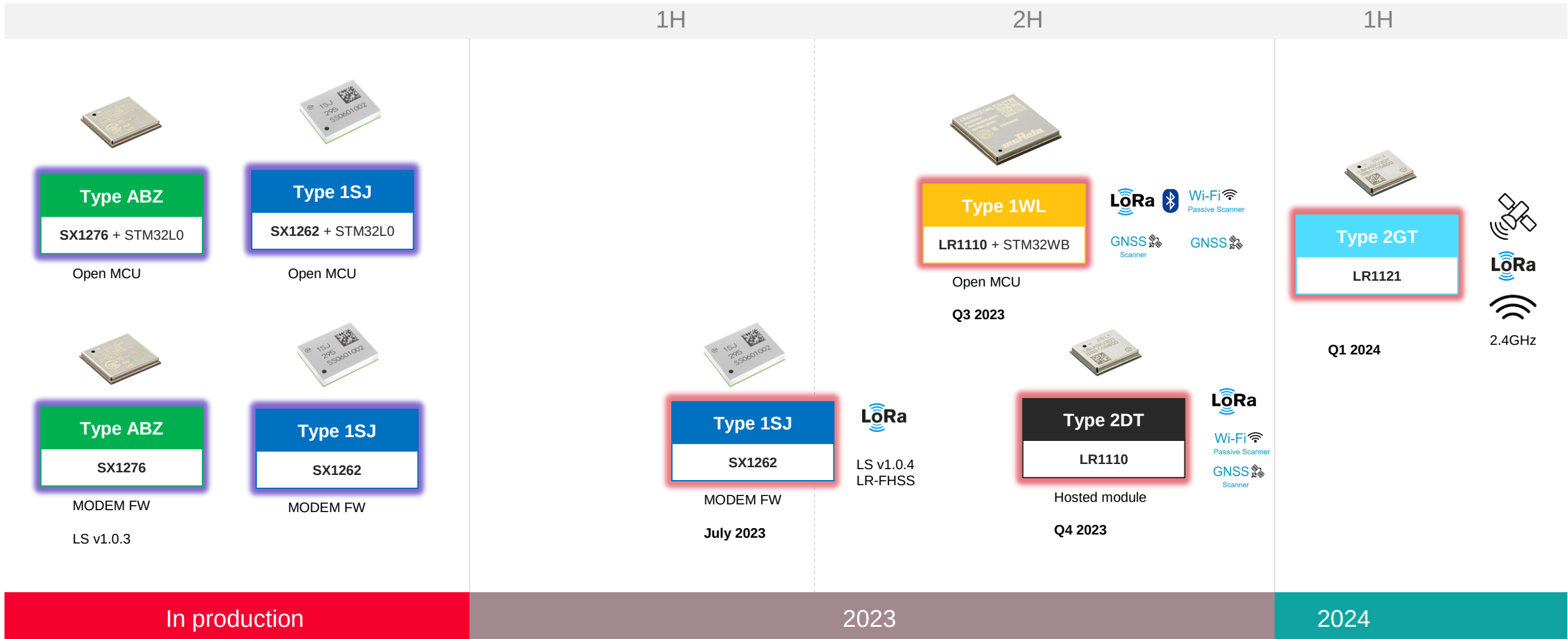
- ☑ Murata LoRa Modules Roadmap
- ☑ LoRa applications for Murata Modules
- ☑ Why LoRa modules ?
- ☑ Walk through Murata modules

Murata



Suman THAPA

LoRa Modules Roadmap



LoRa Applications for Murata Modules

Connected space



Smart Home

- Co2/ air quality sensor
- Humidity & Temperature
- Smoke detector
- Thermostat
- Garden maintenance



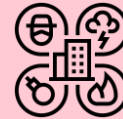
Smart Agriculture

- Smart soil sensor
- Pest / bird monitoring
- Water level detection
- Smart water irrigation
- Green desert



Smart city

- Street lighting
- Water leakage
- Garbage container
- Parking sensor



Smart building

- Humidity & Temperature
- Co2/ air quality sensor
- Occupancy sensor
- Security system
- Smart facilities
- Heat pump



Railway monitoring

- Railway maintenance
- Railroad crossing
- Point switching

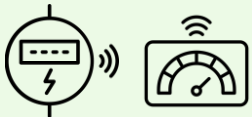


Disaster prevention / environmental monitor

- Heavy Rain gauge
- Water level detection
- Weather report
- Flood level
- Snow level

Murata LoRa Solutions

Utilities



Smart Utilities

- Water meter
- Gas meter
- Electricity meter
- LPG meter
- Electricity switchboard
- Meter connectivity module



Energy

- Sun tracking panel
- Windmill



Supply chain & Logistics

- Container tracker
- Cold chain monitoring
- Fleet management



Anti theft

- Smart locks
- Vehicle tracker
- Alarm alert



Animal safety

- Pet tracker
- Livestock monitoring



Industrial Asset tracking

- Machinery tools
- Palette tracking
- Rental tools tracking



Shared transportation

- Bicycle tracking
- e scooter

Asset management



Human safety

- Children bubble
- Elderly location
- Constructor monitoring
- Geofencing
- Guard tour monitoring

Why Murata LoRa modules ?



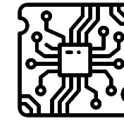
Small size



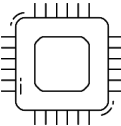
Regulatory certification



Superior Quality



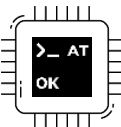
Simple PCB Design



Open MCU Design



Antenna design support



AT commands MODEM



Worldwide sales channels



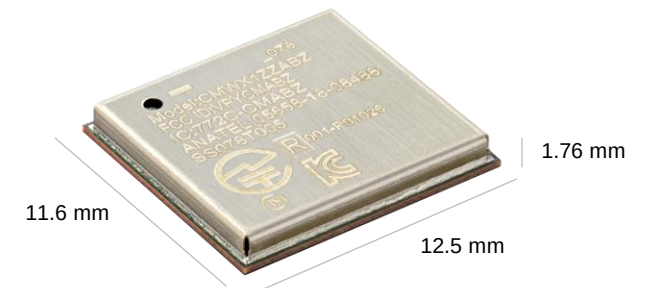
Low power consumption



Competitive price package

Type ABZ Module

- Mass market LoRaWAN™ modules
 - Small, compact form factor
 - Open MCU & AT command modem



Type ABZ Module

MPN: CMWX1ZZABZ-xxx

Connected Space



Smart Home



Smart Building



Smart city



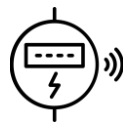
Smart Agriculture



maintenance



Logistics



Smart utilities

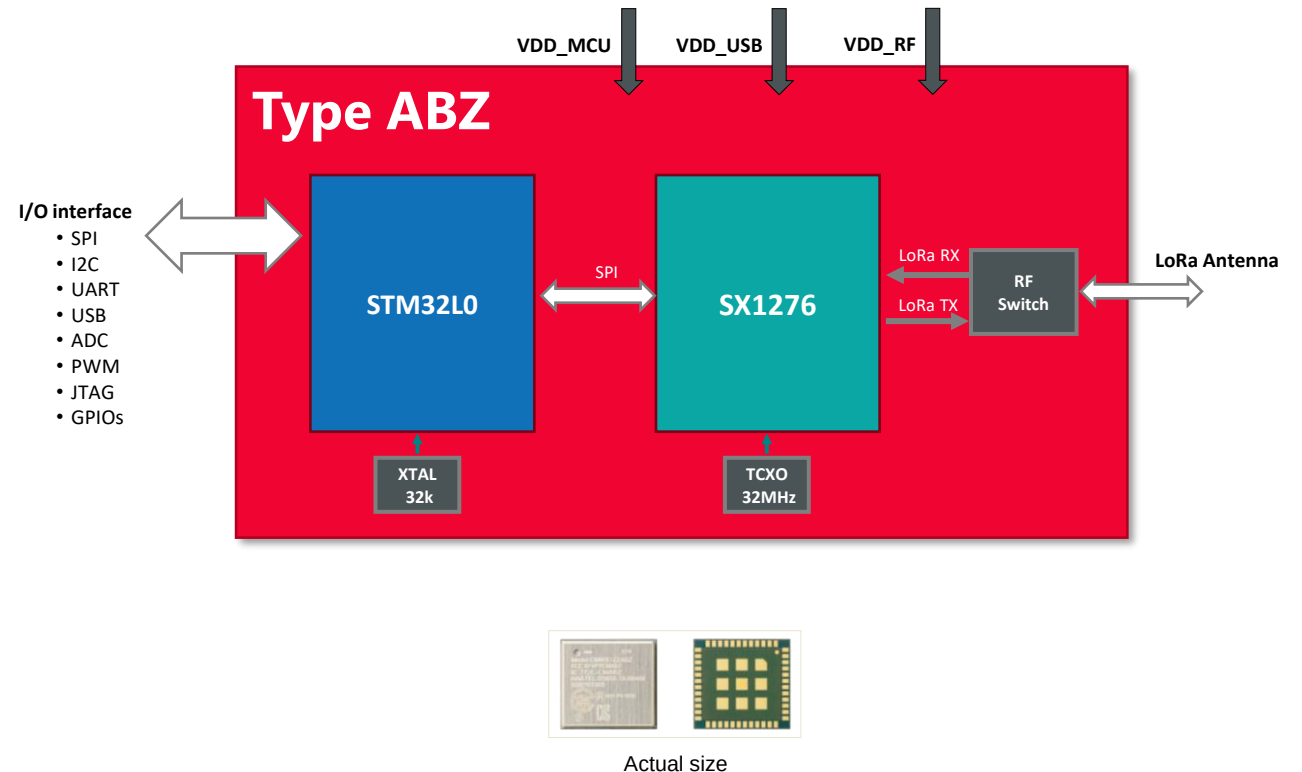


Environment

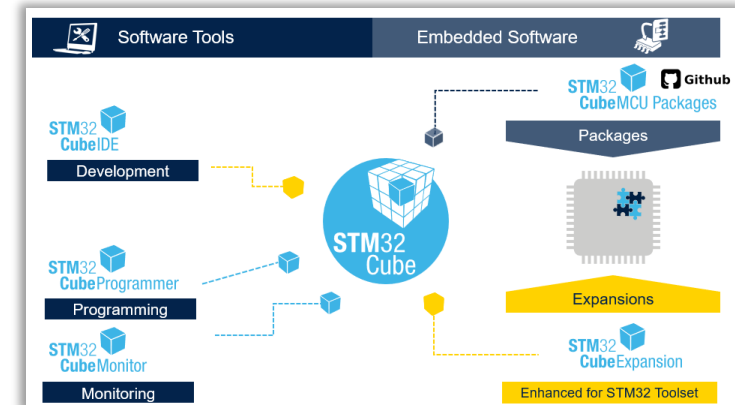
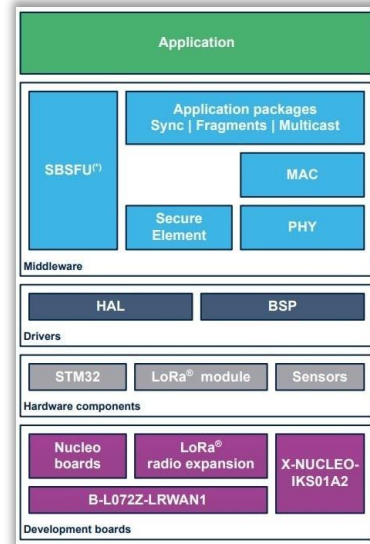


Type ABZ Module

- LGA package: 11.6 x 12.5 x 1.76 mm(max)
- STM32L0/Cortex M0+ : 192kB Flash, 20kB RAM
- Semtech SX1276 LoRa Connect™
- AT command MODEM FW available
- Low power consumption
- Peripheral I/F:
 - GPIOs, ADC, I2C, SPI, JTAG, UART, USB, ADC
- Regulatory certification:
 - FCC, IC, CE, TELEC, KC, ANATEL, NBTC, WPC
- LoRaWAN precertification



Type ABZ Resources



LoRa Discovery kit

- MPN: **B-L072Z-LRWAN1**
- Introductory tool for Type ABZ Module
- Available from STMicroelectronics distributor partners

 [Discovery kit details](#)

SDK & Firmware

- **I-CUBE-LRWAN**
- Includes an application running on B-L072Z-LRWAN1
- Available from STMicroelectronics website

 [I-CUBE-LRWAN SDK link](#)

Software tools & Ecosystem

- Available from ST website
- STM32CUBE IDE
- Cube Programmer
- Cube Monitor

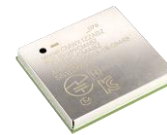
Soil monitoring system



Wireless high-performance soil sensor designed specifically for the smart agriculture market using Murata CMWX1ZZ**ABZ**-093 module



GAIA soil monitoring system



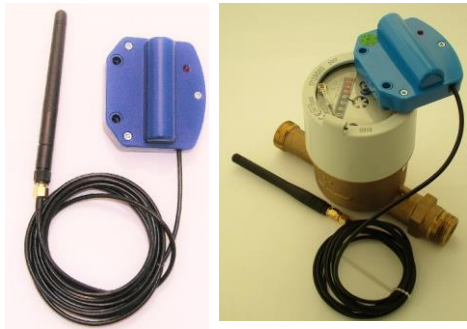
Leveraging Type ABZ-093

- Superior Quality
- AT Command MODEM
- Low power consumption
- Multiple I/Os
- Certification

CODEA's connectivity Module for Utilities Meter



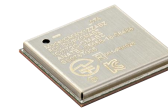
Snap-on unit for mechanical water meters powered by Murata CMWX1ZZ**ABZ-078** module for invoicing cold and hot water in large buildings.



FLS-LR



FL4-LR

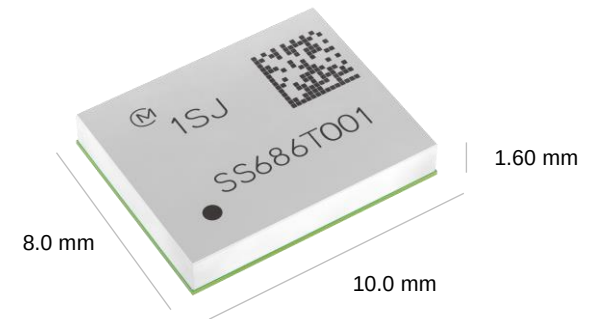


Leveraging Type ABZ-078

- Small module size
- OPEN MCU design
- Superior Quality
- Low power consumption
- Certification

Type 1SJ Module

- Smallest LoRaWAN™ modules in the industry.
 - Small, compact form factor
 - Open MCU & AT command modem
 - Robust, Shielded Resin Mold



Type 1SJ Module

MPN: LBAA0QB1SJ-xxx

Connected Space



Smart Home



Smart Building



Smart city



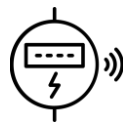
Smart Agriculture



maintenance



Logistics



Smart utilities



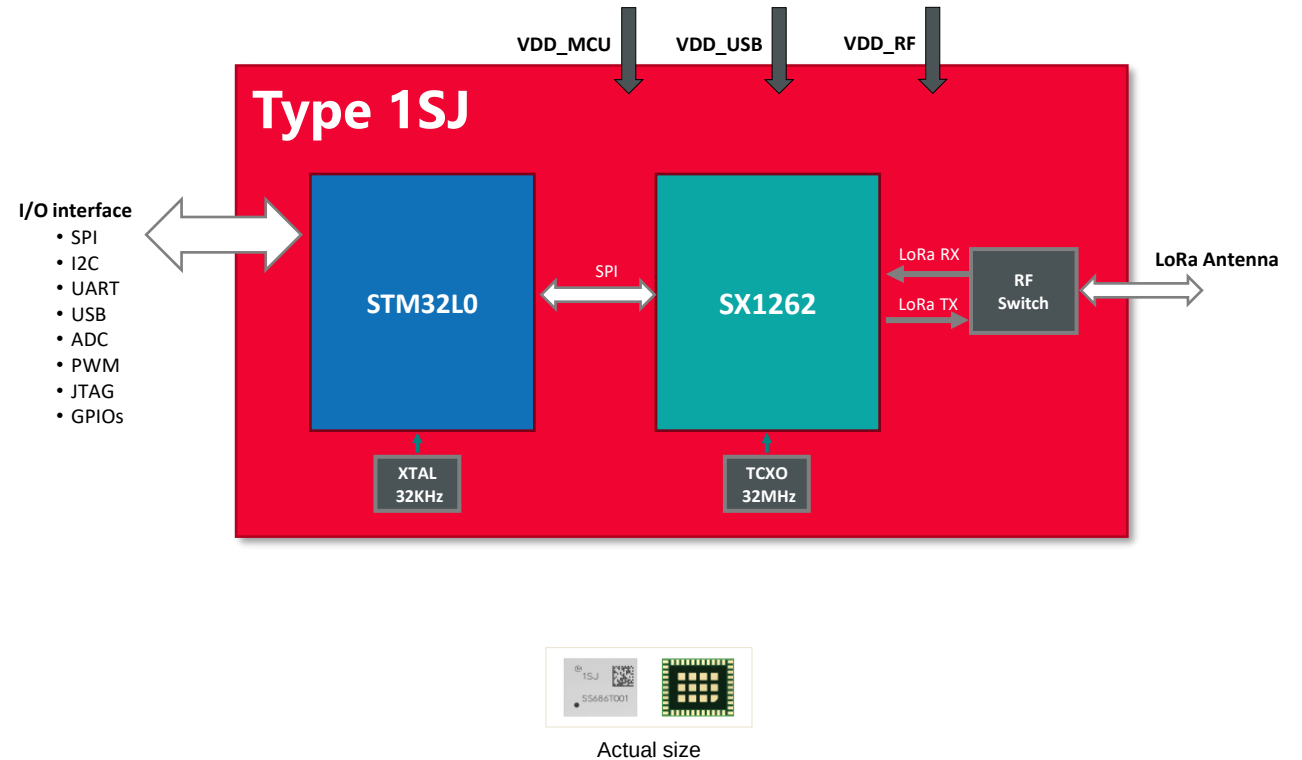
Environment



Type 1SJ Module block diagram

Features

- LGA package: 10.0 x 8.0 x 1.60(max)
- STM32L0/Cortex M0+ : 192kB Flash, 20kB RAM
- Semtech SX1262 LoRa Connect™
- AT command MODEM FW available
- LR-FHSS modulation
- Peripheral I/F: GPIOs, ADC, I2C, SPI, JTAG, UART, USB, ADC
- Regulatory certification: FCC, IC, CE, ANATEL
 - Planned: Japan, Korea, Taiwan
- LoRaWAN certification

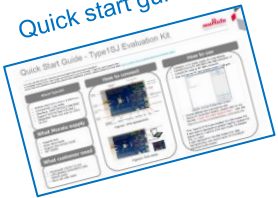


1SJ Product development model

Datasheet, Application Notes, Design Guide

Type 1SJ patch file for I-CUBE-LRWAN

Quick start guide



Hardware reference

MPN: LBAA0QB1SJ-TEMP-EVK



Type 1SJ patch file

I-CUBE-LRWAN



Customer Product based on
Murata Type 1SJ Module

- Faster Time to Market
- Easier development: Less cost/resources



SW, IDEs, Docs, Tools, support
Develop, Prototype

Invue OnePOD Wireless for Interactive experience

INVUE



OnePOD Wireless

powered by Murata LBAA0QB1SJ-295 module,
interact with phones and tablets without restrictive
cords and wires, all while protecting against theft



Leveraging Type 1SJ-295

- Small module size
- Quality
- Open MCU Design
- Attractive price

Murata-Abeeway co developed Type 1WL Module

- Single solution for Indoor-Outdoor geolocation
 - Multi-technology (LoRa Edge™, BLE)
 - Small, compact form factor
 - Open MCU Design
 - Low touch geolocation services



Type 1WL Module

MPN: LBEU5ZZ1WL-xxx

Asset management



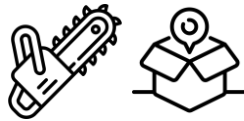
Logistics



Anti theft



Animal safety



Industrial Asset tracking



Human safety

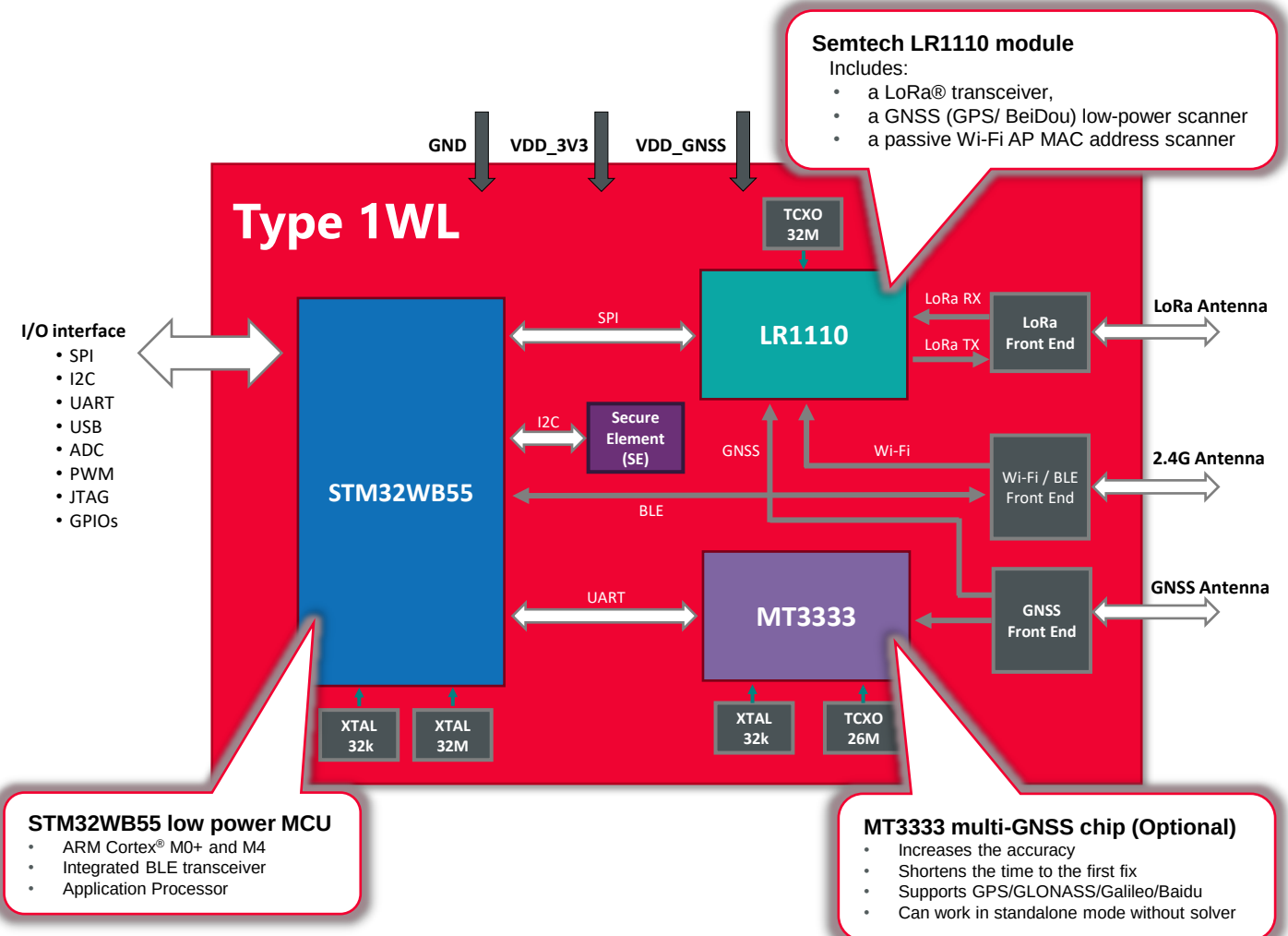


Shared transportation



Type 1WL Module Block Diagram

- LGA package: 17 x 17.5 x 2.15 mm (max)
- STM32WB55/Cortex M4
 - Application processor with 1MB of Flash Memory
- Semtech LR1110 LoRa Edge™
- MT3333 Airoha GNSS chipset (optional)
- TO136 as secure element (optional)
- Ultra low power sleep mode
- Peripheral I/F:
 - GPIOs, ADC, I2C, SPI, JTAG, UART, USB, ADC
- FCC, IC, CE, TELEC certified
- LoRaWAN & BLE 5.3 precertification

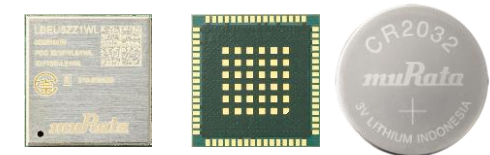


Type 1WL Module Benefits

- Type 1WL Module includes all necessary components of a multi-technology tracker device.
 - Simplify PCB design with fewer layers
 - Simplify procurement process
 - Reduce Production cost
 - The module's RF certification can be reused for end-product certification
 - The Evaluation Board is provided for quick start of hardware development
 - Develop applications with Abeeway SDK



17.5 x 17.0 mm



Actual size

1WL Product development model

ThingParkMarket
by Activity



Hardware reference



Running on FreeRTOS, middleware for
GNSS, LoRa Basic™ Modem, BLE 5.3
IDE and Documentation available on GitHub

Targets:

- Embedded Developers
- IoT evangelist
- OEMs
- Mass market

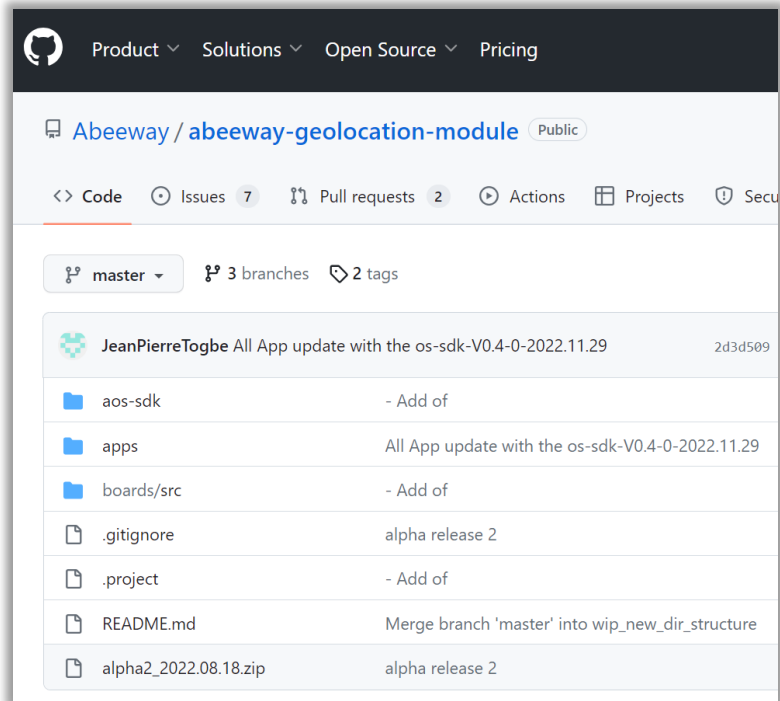


Customer Product based on
Murata Type 1WL Module

- Faster Time to Market
- Easier development: Less cost/resources
- Benefits supports from Abeeway and MURATA

Directory structure of 1WL SDK

(Abeeway-geolocation-module)



 [Download from here](#)

```
abeeway-geolocation-module
├── aos-sdk
│   ├── Release
│   ├── documentation
│   └── include
├── apps
│   ├── abeeway
│   │   ├── app-abw_cli
│   │   │   ├── .project
│   │   │   ├── .cproject
│   │   │   └── main.c
│   │   └── ...
│   └── community
│       ├── app-cmty_cli
│       │   ├── .project
│       │   ├── .cproject
│       │   └── main.c
│       │   └── ...
│       ├── app-cmty_demo
│       │   ├── .project
│       │   ├── .cproject
│       │   └── main.c
│       │   └── ...
├── README.md
└── docs
```

AOS SDK (*Abeeway Operating System*) Driver Library

Demo Apps from Abeeway

Demo Apps by the Abeeway Community

Development Documentation published on GitHub

Abeeway Asset Tracker Firmware

Type 1WL Module

Asset Tracker Firmware

Multi-technology geo-localization

GPS BLE Scanning Quuppa beaconing
LP-GPS WiFi Scanning

Several tracking operation modes

Permanent tracking BLE Zoning / Geo-fencing
Motion tracking
Start/End of movement tracking

Several non-tracking operation modes

Activity monitoring Scan collection

Shock detection

SoS op. mode

Connection with smart phone as a BLE peripheral device

What kind of geo-location
solutions can be built from this
module?

Geo-location solutions that can be built from 1WL module



Industrial tracker

Large battery, hardened casing, high-precision tracking : designed to last IP65, 19Ah type D battery.
Up to 3 years battery life in motion tracking mode at 120 position per day.



Micro tracker

Light, handy, yet powerful. Enables you to track and protect things (or people and pets) of value.
IP 65, ATEX*, 450mAh rechargeable battery
Buzzer, multimode button.

Battery life :

- Proximity mode : 5 days to 2 weeks depending on data precision
- Location mode : 90 days battery life at 40 fix per day with indoor/outdoor positioning.



Compact tracker

Solid and lightweight, built for heavy-duty tracking.
Asset tracking and management, even in the harshest environments.
3xAA 2.7Ah replaceable batteries, IP 68, ATEX*, temperature & motion sensors
Up to 4 years battery life in LP GPS at 24 fix per day.



Smart Badge

Sleek, smart, and multi-functional.
ideal for worker protection and zone alerts
IP65, ATEX*, Buzzer with 100dB high volume, industrialized magnetic connector, 1300mAh rechargeable battery, multimode button.

Battery life :

- Proximity mode : 1 to 2 months depending on data precision
- Location mode : 120 days battery life at 60 fix per day with indoor/outdoor positioning.

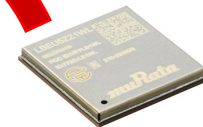


Abeeway Combo Compact Tracker



Combo Compact Tracker

Multi-technology tracker powered by Murata LBEU5ZZ1WL-633 module that combines LoRaWAN, NB-IoT, LTE-M radio technologies for maximum flexibility in terms of coverage.

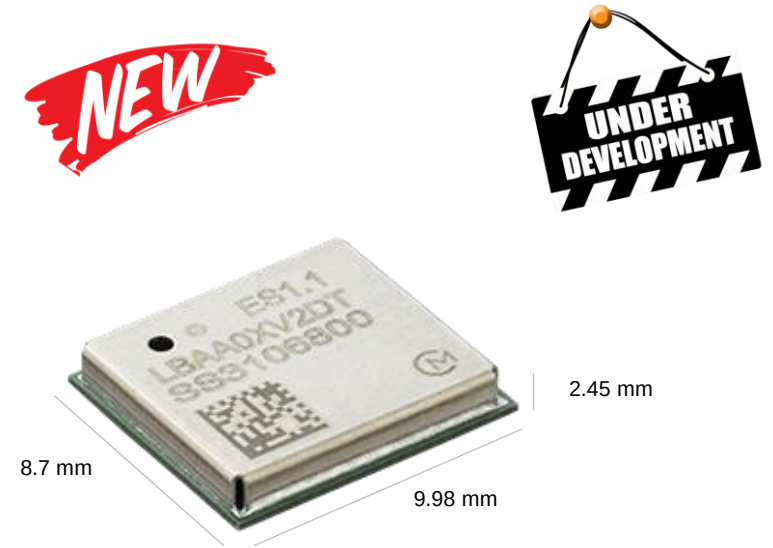


Leveraging Type 1WL-633

- Quality
- Open MCU Design
- Low power consumption
- Certification
- I/Os
- Multi radio for geolocation

Type 2DT

- Compact module for LoRa® asset tracker
 - Small size
 - Ultra-low power
 - Single solution for indoor Outdoor tracking



Type 2DT Module

MPN: LBAA0XV2DT-xxx

Asset management



Logistics



Anti theft



Animal safety



Industrial Asset tracking



Human safety



Shared transportation



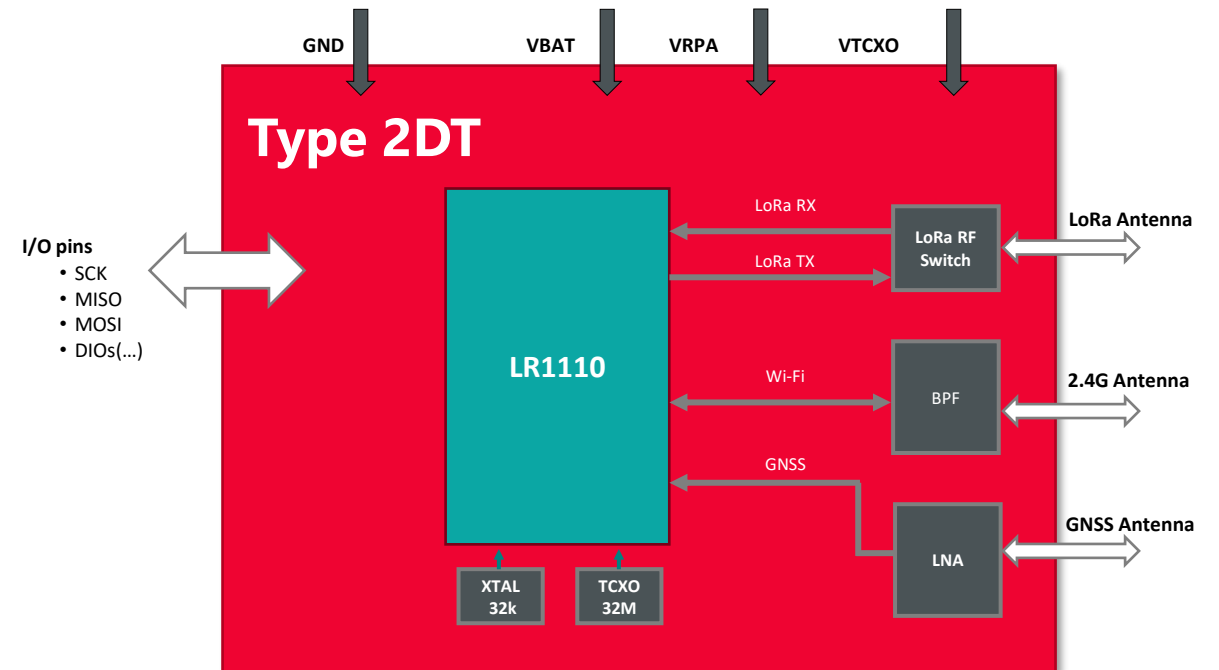
Wi-Fi
Passive Scanner

GNSS
Scanner

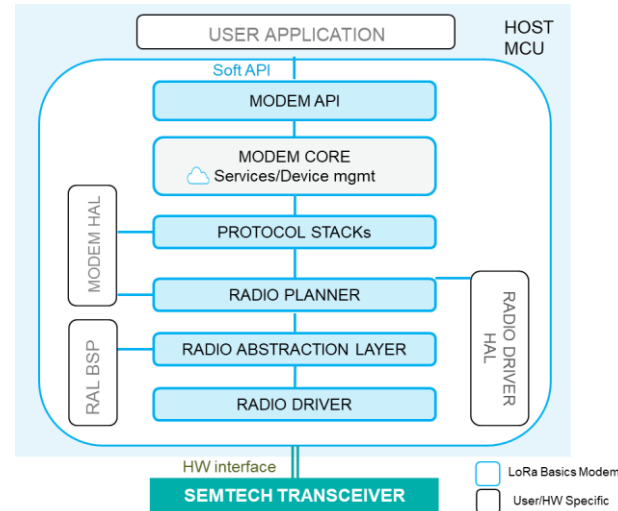
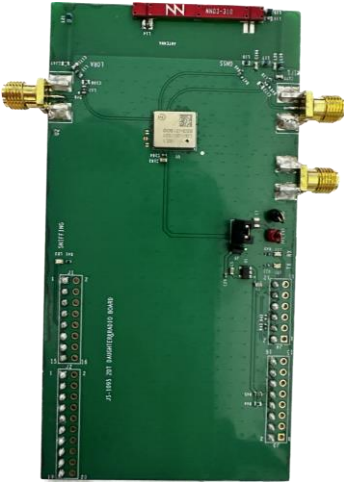
Type 2DT Module Block Diagram

Features

- LGA package: 9.98 x 8.7 x 2.45 mm (max)
- Semtech LR1110 LoRa Edge™
 - LoRa®: 860 ~ 930 MHz
 - WLAN scanner: IEEE802.11b/g/n (2.4G)
 - GNSS scanner: GPS, Beidou
- LR-FHSS modulator
- Dual power +14 /+22dBm
- Ultra low power positioning
 - Supports Semtech's LoRa Cloud™ Geolocation
- FCC/IC/CE certification



Type 2DT Resources



STMicroelectronics

Silicon Labs

..and many more

Evaluation Board

- Introductory tool for Type 2DT Module
- Available through Murata distributors
- Easily connect to various MCU EVK

SDK & Firmware

- LoRa Basics™ Modem
- Available from SEMTECH GitHub
- SWSD001: LBM examples
- SWSD004: Geolocation examples & LoRa Edge Tracker demo

Supported MCU

- Initial porting:
 - STM32WBxx //ST, completed
 - STM32L4xx //ST, completed
 - EFR32BG24 //Silabs, completing
- Next:
 - Voice of Customer

Type 2GT

- Multi-Band module for LoRa[®] connectivity
 - Small size
 - Sub GHz & 2.4 GHz radio
 - S-Band satellite communication

Connected Space



Smart Home



Smart Building



Smart city



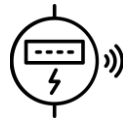
Smart Agriculture



Streetlights



Asset tracking



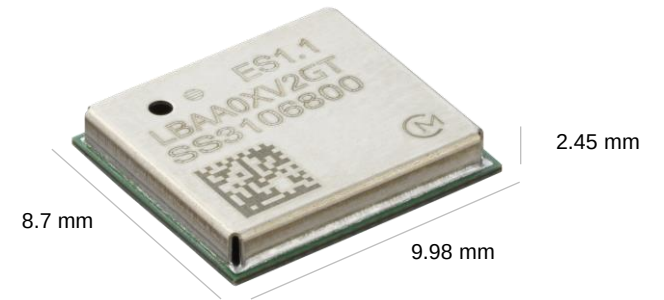
Smart utilities



Retail store sensors

NEW

UNDER
DEVELOPMENT



Type 2GT Module

MPN: LBAA0XV2GT-xxx



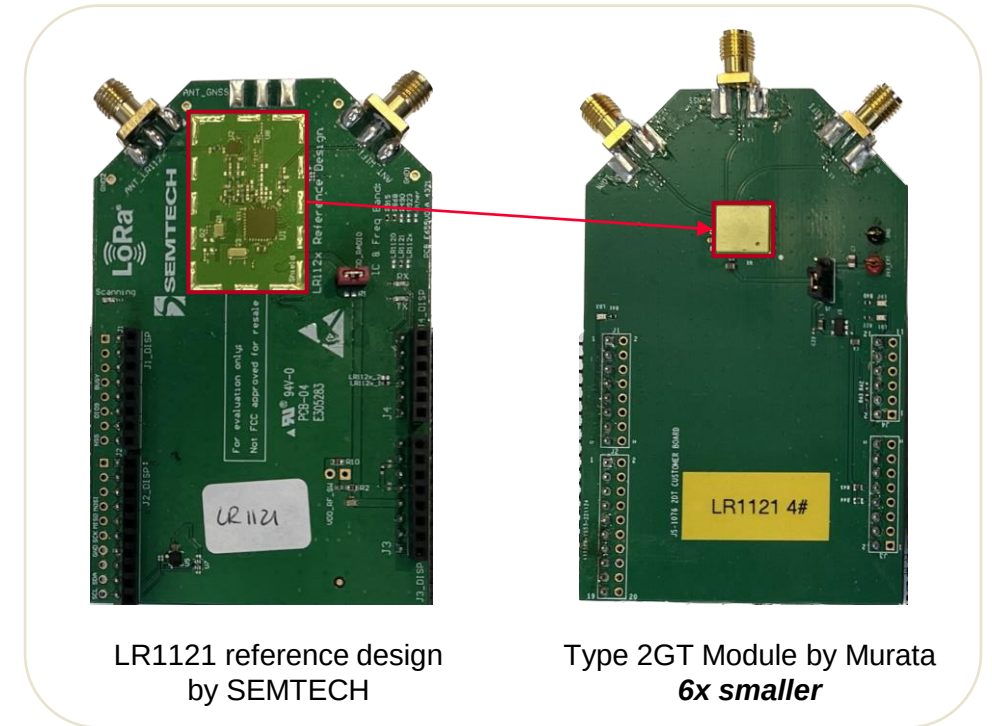
Satellite



2.4GHz

Type 2GT Module Features

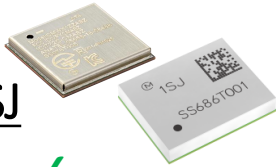
- LGA package: 9.98 x 8.7 x 2.45 mm (max)
- Semtech LR1121 LoRa Connect™
 - Sub-GHz LoRa®: 860 ~ 930 MHz
 - 2.4GHz LoRa
 - 2.1GHz S-Band
- LR-FHSS modulator
- Dual power +14/+22dBm (Sub-GHz)
- LoRa Basics™ Modem software compatible
- Cryptographic Engine
- FCC/IC/CE certification



Actual size

Murata modules Distribution partners

Type ABZ & 1SJ



- Module samples ✓
- Module EVK ✓
- Module MP parts ✓

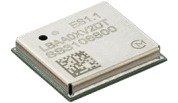
Type 1WL



- Module samples ✓
- Module EVK ✓
- Module MP parts: Q3 2023

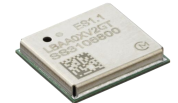


Type 2DT



- Module samples ✓
- Module EVK ✓
- Module MP parts: Q4 2023

Type 2GT



- Module samples ✓
- Module EVK ✓
- Module MP parts: Q1 2024

Please contact your distributor for more product information

Collaterals

-  [Type ABZ product page](#)
-  [Type ABZ LoRa support page](#)
-  [ABZ LoRa Discovery kit EVK](#)
-  [Type 1SJ product page](#)
-  [Type 1SJ LoRa support page](#)
-  [I-CUBE-LRWAN](#)
-  [All Murata Evaluation kits](#)

-  [Type 1WL Murata product page](#)
-  [Type 1WL Abeeway product page](#)
-  [1WL EVK purchase via Thingpark market](#)
-  [1WL SDK Abeeway GitHub](#)
-  [Abeeway Technical support site for 1WL](#)
-  [Type 1WL Abeeway documents](#)
-  [LoRa Basic Modem & SDK](#)

Q&A



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Thanks for joining us today.

Please contact your distributor for
more product information