muRata SPEAKS
TECHNOLOGY | SOLUTIONS | INNOVATIONS
Questions & Answers

1 How did Sony manage to achieve such low-power consumption with the ALT1250 IC?

The PROCESS technology selection and ground up silicon design dedicated to achieving the best power consumption numbers for IoT devices.
We also integrated our baseband, power management and RF transceiver on a single die to eliminate inter-chip inefficiencies (minimize high power consumption)

2 Apart from AWS, what about Azure IoT?

This webinar featured End-to-End solution from Murata RF module onto AWS IoT Cloud platform, hence referencing to AWS. It is technically possible to use Azure IoT Cloud platform as well with Murata modules. For instance, AVSystem device management platform with Type 1SE also support connector to Azure IoT. Reference link:*https://iotdevzone.avsystem.com/docs/*.
For more information, please feel free to reach out to Murata.

3 When will Telstra support RAI on Cat-M1?

RAI is already supported on NB-IoT. RAI is in Telstra's roadmap for Cat-M1 as well. The plan will be announced later on.

4 Does Telstra support deploying a Murata Type 1SC with iSIM in Australia?

Currently, Telstra does not support iSIM, neither with Murata's Type 1SC nor with other vendors' modules. Type 1SC iSIM is available only with a few MNO (e.g. Vodafone) and MVNO (e.g. Kigen, Truphone plan). Public use case example in EU,
Link: *https://www.vodafone.com/business/news-and-insights/blog/gigabit-thinking/how-bayer-is-innovating-its-supply-chain-with-integrated-sim*

5 How are iSIMs managed/activated on the Telstra network?

Currently, Telstra does not support iSIM, neither with Murata Type 1SC nor with other module vendors. Type 1SC iSIM is available only with a few MNO (e.g Vodafone) and MVNO (like Kigen, Truphone plan). Here is the link to the public use case example in EU -

https://www.vodafone.com/business/news-and-insights/blog/gigabit-thinking/how-bayer-is-innovating-its-supply-chain-with-integrated-sim

6 What is the lead time for Murata module?

Lead time will depend on **a) volume** (module quantity ordered), and **b) grade** (samples or mass production products). Currently, the lead time is longer than usual due to global IC shortage. However, for samples, the lead time can be only a few weeks as there is usually available stock. In the case of mass production grade, the lead time can be several months depending on the quantity to deliver.

7 What RTOS are being supported by the cube?

Both FreeRTOS and AzureRTOS are available.

8 When will 1SE and 1SC modules Telstra certification be added to the *https://www.telstra.com.au/content/dam/shared-component-assets/tecom/iot/capabilities/certified-devices/telstra-m2m-certified-devices-modules.pdf* ?

Type 1SC module has completed Telstra certification in Feb'22. It will be added in the next release of certified modules list by Telstra. The link will be shared thereupon.
Type 1SE embeds Type 1SC module, so it is considered as an "end device". It comes by default with Truphone connectivity provisioned in the eSIM and is globally certified. It will be roaming on Telstra network when connecting in Australia. Type 1SE can also utilize external SIM card from Telstra or other operator, as it has suitable interface for external SIM.
Please visit this link to Truphone Global Coverage for more detail - *https://web.truphone.com/things/plans/coverage/*

9 How could we show customers, from either Murata or Telstra website, that the products are Telstra-certified ?

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Check out Truphone Global Coverage here: *https://web.truphone.com/things/plans/coverage/*

10 What foundry and process is the Sony chipset fabricated with?

Global Foundries

11 Is Telstra certification compulsory to use a IoT product on the Telstra network?
Is it required to re-test an IoT product with Telstra if a Telstra-certified module is used to develop a product?

Telstra certifcation is recommended in order to ensure best interoperability on their network, however it is optional. Using a Telstra-certifed module such as Murata Type 1SC already offers good guarantee of network interoperability. It is possible to take Telstra certification on top as well to ensure the highest level of confidence.

12 **How do we send a message from the clould and ask a remote unit to connect and perform a task?**
Having the unit continuously poll (for a result that is 99% negative) results is many open connections or many connection events using lots of data.

The general idea would be connecting the device to the Cloud platform and setting up a job to perform your required task.
The recommended solution for Type 1SE EVK would be using AVSystem's CoioteDM platform integrated with AWS, because of the readily available documentation from AVSystem and AWS to help users get started.
To learn more, here are some useful links:
1) B-L462E-CELL1/TYPE1SC - Coiote IoT Device Management Docs (avsystem.com)
https://iotdevzone.avsystem.com/docs/Anjay_integrations/Anjay_ST_integration/B-L462E-CELL1-TYPE1SC/

2) Configuring the integration - Coiote IoT Device Management Docs (avsystem.com)
https://iotdevzone.avsystem.com/docs/AWS_Integration_Guide/Configuring_AWS_integration/

3) Performing LwM2M operations - Coiote IoT Device Management Docs (avsystem.com)
https://iotdevzone.avsystem.com/docs/AWS_Integration_Guide/Device_operations/Operation_types/

13 **Is the TLS stack on 1SE FIPS certified?**

The Type 1SE EVK uses the X-Cube-Cellular package which is not FIPS certified for cryptographic applications. Please use the X-Cube-Crypto library from STMicroelectronics with STM32Cube software.

14 **I'm testing B-L462E-CELL1 in Thailand. However, I cannot connect to Truphone (*already registered and activated eSim) even CAT-M1 available in coverate map in their website. When I used external sim card from TRUE (ISP in Thailand), it connected to the Internet without any problem. Is Truphone NB-IOT, CAT-M1 availble in Thailand for Type 1SE module?**

This is the coverage checker for Truphone (LTE Cat-M1): *https://web.truphone.com/things/plans/coverage/*
If AIS LTE Cat-M1 network is available in your area, then 1SE EVK should connect to AIS Cat-M1 network using Truphone roaming agreement. Alternately, 1SE EVK can also connect to live network using any other MNO SIM card (e.g. True) to insert in SIM socket on the EVK, provided there is network coverage available in the area where you are trying to connect. If you still face any connection issue, please reach out to Murata. We can help to liaise with Truphone and AIS.

15 **Where is the AWS cloud data hosted for Australian customers?**

For Australia AWS region, please check this: *https://aws.amazon.com/about-aws/global-infrastructure/regions_az/*

16 **Inside 1SE module, I want to know the spec of internal LDO regulator, your datasheet said 3.3-5V. However, my application is electronic water meter in Thailand and Vietnam market, I used 3V Lithium CR17450 Battery, and it works well until the voltage drop below 2.6V. In competitive solution, Quectel, Simcom, I can use battery as below as 2.1V, and this will effect a lot for battery lifecycle of my product. So I want to know the minimum voltage that 1SE module can operate correctly. Do I need extenal buck-boost regulator to genarate 3.3V, do you have any suitable part number to use with?**

You are right. Type 1SE supply voltage condition is: Min 3.3V; Max 5.0V. If you prefer to use battery with lower supply voltage, you could use buck-boost converter in between the module, or select another battery in between supply voltage condition. Most common battery in the market is 3.6V.
Type 1SE is optimized for operating at very low power (Tx, Rx, Sleep mode, etc.), than other module (modem) brands mentioned and these are modem only (meaning, MCU is not embedded). You will need to use an external host MCU that also requires power supply and consume battery.
It is also important to consider battery that can supply peak current during transmission that can be up to 400mA for LTE Cat-M1 mode.
In order to access the full documentation of Type 1SE module, we suggest user to register on **my.murata**: *https://my.murata.com/en/home*

17 **Does Telstra support NB-IOT outside of Australia and New Zealand?**

Not yet. Roaming agreement on NB-IoT are still under discussion with other Telcos in the APAC region. However, roaming agreement on NB-IoT are already in place between Telco in Eupore and North America. For Cat-M1, Telstra has roaming agreement with some Telcos partners overseas.

18 **What is the power consumption of Type 1SC in mA? What about the transient peak in transmission and sleep?**

LTE Cat M1: Tx 23 dBm: Avr 200 mA
LTE Cat M1: Rx: 90 mA
PSM floor <1.5uA
e-DRX 81.92s, PTW=1.28s <45uA

19 **For AWS IoT, https://solution.murata.com/en-global/technology/aws-iot-core, there is no Type 1SE module in the website. As I understand, I cannot use AT command directly as 1SC module. Do you have example the source code to connect to AWS IOT? I was not able to find it in ST website. Do I have to use the AVSystem as a bridge to AWS IoT core?**

You are correct. For Type 1SE on AWS IoT, we suggest to use AVSystem device management platform, that is the simpliest implementation. Please refer to the video that will be available on the webinar recap page, explaining how to use the AVSystem solution easily.

20 **How do you see addressing the fragmentation of use-cases with this one solution? How scalable it is of being cloud agnostic for chip-to-cloud of choice connectivity?**

Type 1SE is recommended to be able to cover multiple different IoT use cases, being an all-in-one module solution. It can cover "as is" majority of use cases requirements. Using AVSystem solution with Type 1SE, you can easily access both major cloud platform offering IoT services (AWS IoT and Azure IoT). Solution is easily scalable, and you can utilize built-in connecvitiy from Truphone to access network in over 100 countries globally. Check this out: *https://web.truphone.com/things/plans/coverage/*

21 **In terms of distribution, how many projects are going from PoC stage to final stage? How do you convince end customers with the business case as the time spent on connecting a few thousand devices could be more and ROI comes to the top of the mind for everyone?**

This decision depends on each customer and use case to define based on the economic equation of their business case. Number of IoT use cases are pretty much unlimited, so are economic equations. LTE Cat-M1 and NB-IoT are efficient technologies to develop End-to-End Smart IoT Devices and Solutions from a technical implementation perspective. As for business case, it is entirely up to the solution provider and end user to define it.

22 **Does Cat-M support emergency voice call?**

VoLTE over Cat-M1 feature is supported in Type 1SC module, but only few Telcos LTE Cat-M1 network so far. The feature will be available to use once enabled on the network side. Please feel free to inquire with your Telco operator provider. Meanwhile, an alternative could be to use VoIP for Cat-M1 if you need to support voice call independently from network capability.

23 **Is there any telecom operator approval for Australia/ New Zealand?**

Type 1SC: Telstra (certified), Vodafone AUS & NZ (globally certified), Optus (tested). Spark (New Zealand) on-going
Type 1SE: Truphone (globally certified); can also be used with any Telco external SIM card. Type 1SE uses Type 1SC as modem inside the module.
for more detail on Truphone's global coverage: *https://web.truphone.com/things/plans/coverage/*

24 **Price estimation, please.**

Please contact Murata or your Distributor to ask for quotation, based on volume forecast.

25 **I like to understand the product roadmap and longevity plans, including how we can minimise impact to our product line as network technologies evolve.**

With 2G and 3G being shutdown globally in coming years, 4G and 5G are the recommended technologies to consider for new project to ensure sustainable solution. Cat-M1 and NB-IoT are ideally suited for IoT applications, especially those requiring low power and long range, and with possibility to scale solution globally with 1 SKU. Cat-M1 and NB-IoT are currently operating on 4G network, and already provisioned in 5G IoT specification.

26 **What about the availability of hardware modules and MCU?**

Both Type 1SE and Type 1SC modules are available for evaluation and mass production. Please contact Murata or your distributor.

27 **I am looking at how to implement my IoT devices with encryption through AWS over the Telstra network.**

Please contact Murata, we can assist you using Cloud Connector service aids with simplified device authentication when connecting to AWS IoT platform using Type 1SC and Type 1SE modules.

28 **When will Telstra enable RAI on Cat-M1?**

RAI is already supported on NB-IoT. RAI is in Telstra's roadmap for Cat-M1 as well. Plan will be announced later on.

29 **Can you please share more on the real life power consumption/ battery life numbers from ultra-low power NB-IoT/ CAT-M1 applications? Due to the nature of the solution and as some of the parameters are ruled by the Telco operator, it seems very difficult to estimate.**

There are indeed several factors to consider in order to estimate power consumption related to NB-IoT/CAT-M1 connection.
Firstly, the operating mode for the radio modem - whether it is **1) power off**; or in **2) idle mode**; or in **3) eDRx mode**, meaning, modem is listening for a pending data indication on network more often; or **4) PSM mode** that is deep sleep for longer period and modem cannot be reached by network.

For example, Type 1SC has one of lowest PSM floor <1.5uA, and e-DRX (81.92s, PTW=1.28s) <45uA
When the modem tries connect to network, what you need to consider is the **Total Energy**, meaning Power by Time.
i. First module will scan the network searching for tower cell nearby. This phase can take few 100's ms up to 10s. Type 1SC embeds a searching algorithm to help reduce searching time down to few 100's ms.
ii. Then next step is for modem to actually attach to network that is called registration. Type 1SC supports warm boot to shorten boot up time and attach network almost immediately (in few ~100 mS) instead of few seconds that will also help reduce significantly registration energy. besides if in PSM mode. The registration energy will also be lower compare to if modem needs to power on if it was completely off.
iii. Finally when modem will transmit and receive data from network, you need to consider the average energy consummed during both transmission and reception of data ($E = u \times I \times t$)
LTE Cat M1 – Tx 23 dBm: Avr 200 mA, LTE Cat M1 – Rx: 90 mA

If you would like to estimate the battery consumption for your product using Murata modules, please contact Murata. We are happy to support.

30 **I am curious about an example use case complete rundown from start to finish on how a module would be set up, operated, and end of life processes. For instance, do you need to subscribe or unsubscribe from the network, etc.? Please enlighten.**

I am afraid we are unable to provide an adequate answer to this question as it is too broad. It would be helpful if you are able to streamline your query, so that we can help to clarify the process together with our partners (Telco oeperator, Cloud, etc.) to provide you a more precise answer. If you have any specific use case in mind, please feel free to contact Murata. We are happy to help.

Generally speaking, module set-up on network is rather a straight-forward process. You need to subscribe the connectivity plan with an operator of our choice to provide/ manage connectivity of your fleet of devices over whole lifetime. That is the similar process as using a mobile phone, and purchase connectivity plan from an operator.

31 How to configure a cloud connection from a Bluetooth device through a cellular/ Bluetooth bridge?

It is possible to connect an MCU using AWS FreeRTOS BLE to a mobile device and then using the mobile device (phone, tablet, laptop) as a MQTT proxy to send data to AWS IoT Core.

These articles from AWS are some examples on how to connect your device to AWS IoT.
1) Bluetooth Low Energy (BLE) IoT Mobile Application with AWS Amplify, AWS IoT and Swift | Front-End Web & Mobile (amazon.com).
https://aws.amazon.com/blogs/mobile/bluetooth-low-energy-ble-iot-mobile-application-with-aws-amplify-aws-iot-and-swift/

2) Using Bluetooth Low Energy with Amazon FreeRTOS on Espressif ESP32 | The Internet of Things on AWS – Official Blog.
https://aws.amazon.com/blogs/iot/using-bluetooth-low-energy-with-amazon-freertos-on-espressif-esp32/

32 What are the trade-off performance characteristics of Power versus Data Rates?

If this question is about how transmitted signal power and bit rate are related, then the answer would be:
As bit rate increases, so must the transmitted signal power to maintain the required signal to noise ratio (SNR).
This is because higher bit rate would be more susceptible to noise and corrupt the bits transmitted. To overcome noise, we would need to increase the signal strength.
An analogy would be if you are at a noisy bar and trying to talk to a friend. You would have to use more energy and more power to talk louder and ensure your friend can hear whatever you are saying, which is the data you are sending in your context. Thus, more transmission power would be required for higher data rate. However, it is not so simple in actual. In RF communication, if your wireless node is sending at a very high transmission power, this will cause interference with other nodes and increase the bit error rate.

If the question is about the relation between power consumption and data rate, then usually the case is that higher data rate would require higher power consumption because of the same reason mentioned earlier.

33 What LWM2M client config guidance is available for use with this module?

Two possible solutions for LwM2M client configuration are available from our partners AVSystem and IoTerop.
These links might be helpful:
1) B-L462E-CELL1/TYPE1SC — Coiote IoT Device Management Docs (avsystem.com):
https://iotdevzone.avsystem.com/docs/Anjay_integrations/Anjay_ST_integration/B-L462E-CELL1-TYPE1SC/

2) Developer Resources — Ioterop:
https://ioterop.com/iot-dev-24-7/

34 Is VoLTE going to be supported on Cat-M1?

It is still under consideration. If you have a business case, please kindly reach out to Murata and Telstra, to discuss the opportunity to test this feature (*available in both Type 1SC and Type 1SE modules)

35 When can we get the LoRa gateway module for Asia frequency?

We suggest to contact your local distributor to inquire about LoRa gatweway supporting Asia bands.
Murata is also supplier of LoRa Modules to bring connecvitiy to smart devices. If you are looking for LoRa module too, please feel free to contact Murata:
https://www.murata.com/en-sg/products/connectivitymodule/lpwa/overview/lora
Type ABZ: *https://www.murata.com/en-sg/products/connectivitymodule/lpwa/overview/lineup/type-abz*
Type 1SJ: *https://www.murata.com/en-sg/products/connectivitymodule/lpwa/overview/lineup/type-1sj*

36 Is Telstra's network present outside of Australia? Or do Telstra's customers 'roam' on Telstra's roaming partners' IoT networks when deploying IoT nodes outside of Australia?

Please reach out to Telsta to check on the roaming agreements outside Australia, especially on LTE Cat-M1. As a matter of fact, there are already roaming agreements in place with some Telcos in North America and Europe.

37 I am looking for ultra-wide-band and Bluetooth Low Energy in the same module. Is there anything that you can recommend?

Please refer to Murata Type 2AB module: *https://www.murata.com/en-sg/products/connectivitymodule/ultra-wide-band/qorvo*
Murata UWB modules: *https://www.murata.com/en-sg/products/connectivitymodule/ultra-wide-band*

38 How to increase the NB-IoT connection so that it can be connected with other NB-IoT, if for the network itself there must be certain permissions?

It requires roaming agreement specifically on NB-IoT between Telcos in each in the country where you plan to deploy your solution. Please reach out to your Telco operator to inquire about the roaming agreement needed on NB-IoT (With which other operator? In which country?)

39 How to easily connect your devices to Telstra network & AWS IoT platform?

For Telstra network, simply request for a IoT data plan and the SIM card: IoT Data SIM plans (telstra.com.au).
https://www.telstra.com.au/small-business/internet-of-things/data-sim-plans

Then download the Anjay Client (GitHub - AVSystem/Anjay-freertos-client: LwM2M client based on Anjay and FreeRTOS for STM32 devices.) and request for CoioteDM user account from AVSystem. *https://github.com/AVSystem/Anjay-freertos-client*

After which, follow the integration guide (Configuring the integration - Coiote IoT Device Management Docs (avsystem.com)) to create the AWS IoT integration.
https://iotdevzone.avsystem.com/docs/AWS_Integration_Guide/Configuring_AWS_integration/

40   **Is there blockchain technology useful for IoT?**

We have not seen use IoT cases using blockchain technology as yet. However, that does not mean it cannot be useful for some IoT use cases. If you might have any idea, please feel free to reach out to Murata. Let's discuss more. *https://www.murata.com/en-us/support/contactinformation*

41   **What about network in INDIA ? How we can test it in INDIA ?**

We suggest to reach out to Reliance Jio that is the only Telco referenced on GSMA website having officially deployed NB-IoT in India. So they could confirm about the coverage in your area, and provide SIM card for testing with Murata modules.
https://www.gsma.com/iot/mobile-iot-commercial-launches/

Note: Truphone built-in connectivity in Type 1SE module eSIM does not cover India (*They do not have the roaming agreement yet in India). Hence, you will need to use external SIM card provided by Reliance Jio or another operator in order to be able to connect to NB-IoT live network locally in India.
https://web.truphone.com/things/plans/coverage/

42   **Where we can use the Cloud IoT?**

Please refer to AWS IoT webpage. *https://aws.amazon.com/iot/*

To learn more about Murata qualified modules on AWS IoT, you can also refer to Murata Solution page: *https://solution.murata.com/en-sg/technology/aws-iot-core*

43   **How to go about connecting with Embedded IoT controls for 'Recording Data' example, say, DYSON Air Cleaner?**

If I interpret your question correct,you are asking if it is possible to use Type 1SE EVK and integrate it to an air purifier to collect data?
For the former, it is possible. Although for air quality monitoring, you would need to have the appropriate sensors for air quality monitoring. The on-board sensors available are - temperature, humidity, pressure, accelerometer, magnetometer.
With that said, some of the newer Dyson air purifiers have embedded sensors which collect data and can be used with their Dyson app for monitoring.