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The Connectivity Needs of All Industries

Murata Cellular Line-up and Roadmap for IoT and 5G Applications

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- Date: 24 Aug 2021
- Time: 14:00 ~ 16:00 (SGT)

Today's Topics

1. About Murata

- Introduction
- Why module solution
- Cellular line-up and roadmap for IoT and 5G

2. Murata Type 1SE “all-in-one” Module

- Specifications
- Features
- Use cases

3. Conclusion

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About Murata



Establishment	October 1944 (HQ in Kyoto)
Our business	Design, manufacture and supply of electronic components and solutions
Net sales	~US\$14.3 billion* (~JPY 1,630,193 million*)
Number of subsidiaries	89** (Japan: 29, Overseas: 60)
Number of employees	75,184*

* As of March 31, 2021
** Murata Manufacturing Co., Ltd. is not included in the number of subsidiaries

20 Years Experience in RF Module

Large Global Network

Connectivity Module Market Share

(2019CY – mobile devices)

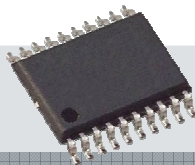
No.1 Market Share

Production Capacity

(Murata Connectivity Modules)

No.1 Supply Capability
(Flexible / Multi Factory locations)

Why module solution?



Chip-on-board

Certification required

Additional passives required

More space needed

Testing needed

More time and resources consuming

Production management investment



Module

✓ Reference certified

✓ Embedded passives

✓ Compact

✓ Pre-tested

✓ Easier implementation

✓ No extra investment

NB-IoT /Cat-M modules line-up

NB-IoT module

mass production

NB1

Type 1SS

PN: LBAD0XW1SS
Mediatek MT2625DA
Processor: ARM Cortex-M4 78MHz
4MB SRAM/ 4MB FLASH

AT command/ Open MCU



10.6 x 13.2 x 1.8 mm(max)

MEDIATEK

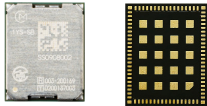
mass production

NB1/NB2

Type 1YS

PN: LBAD0XW1YS
Mediatek MT2625DPA
Processor: ARM Cortex-M4 156MHz
4MB SRAM/ 4MB FLASH
LwM2M1.1, NIDD

AT command/ Open MCU



10.6 x 13.2 x 1.8 mm(max)

MEDIATEK

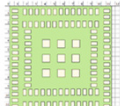
Under development

NB1/NB2

Type 2CS

PN: LBAD0XX2CS
Sony ALT1255
Processor: ARM Cortex-M4 80MHz
128kB SRAM/ 16MB FLASH
Internal iUICC (option)

AT command/ Open MCU



11.1 x 11.4 x 1.5 mm(max)

SONY

Cat-M/ NB-IoT module

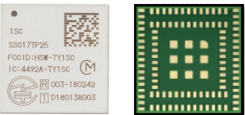
mass production

**Cat-M1/
NB1/ NB2**

Type 1SC

PN: LBAD0XX1SC
Sony ALT1250
Processor: ARM Cortex-M4 80MHz
128kB SRAM/ 16MB FLASH
Internal iUICC, Integrated GPS (option)

AT Command/ Open MCU



11.1 x 11.4 x 1.5 mm(max)



SONY

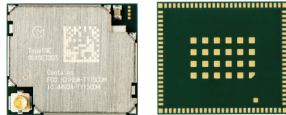
mass production

**Cat-M1/
NB1/ NB2**

Type 1SE

PN: LBAD0XX1SE
Sony ALT1250 + STMicro STM32L462
Processor: ARM Cortex-M4 80MHz
160kB SRAM / 1MB(+512KB) FLASH
Internal eUICC, Integrated GPS (option)
built-in U.FL antenna connector

Open MCU



15.4 x 18.0 x 2.5mm(max)



SONY

+ 2G fallback module

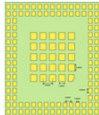
Under development

**Cat-M1/
NB1/ NB2
+2G fallback**

Type 2AS

PN: LBAD0XX2AS
Sony ALT1250
Processor: ARM Cortex-M4 80MHz
128kB SRAM/ 16MB FLASH
Internal iUICC, Integrated GPS (option)

AT Command/ Open MCU



15 x 16.5 x 1.9mm(Max)

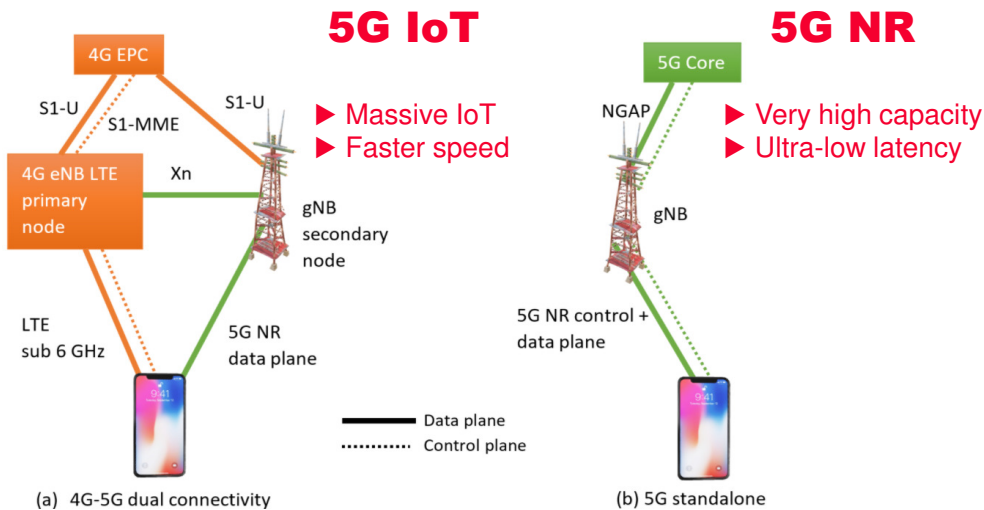
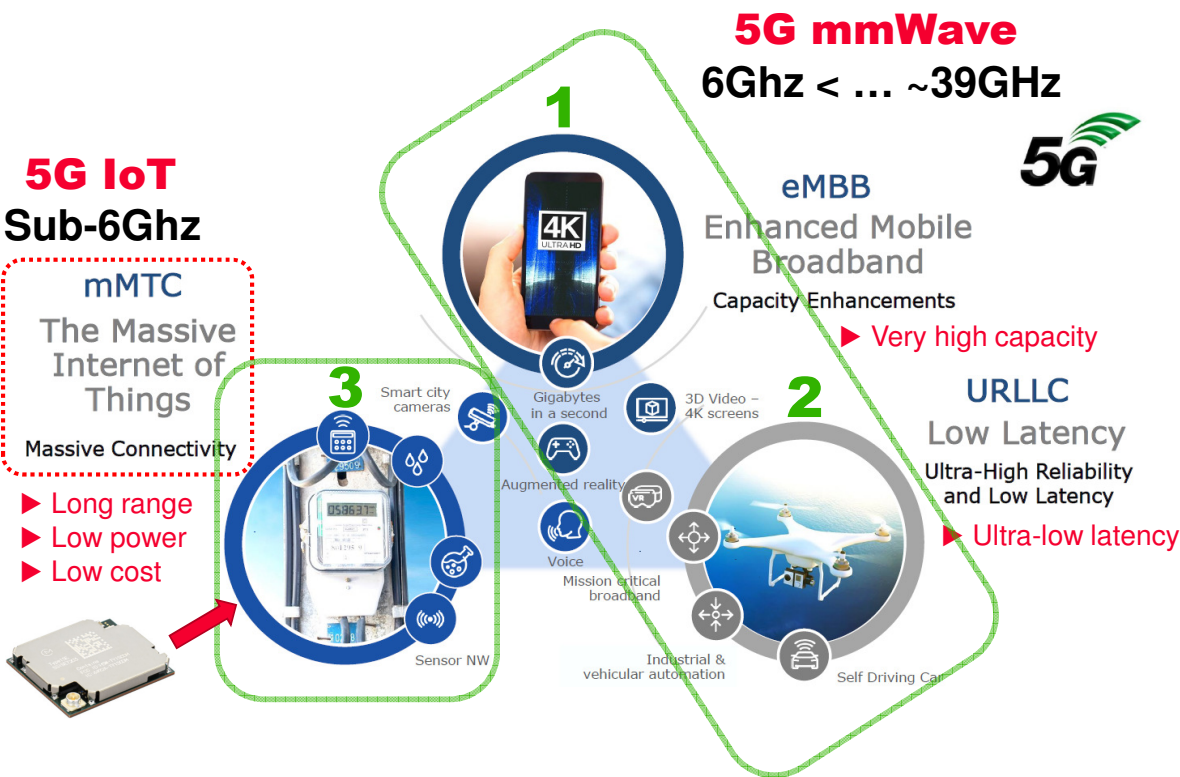
SONY

Watch video: <https://video.murata.com/en-global/detail/videos/lpwa-products/video/6188954909001>

Path from 4G LTE to 5G IoT

The 5th Generation of Cellular Technology

“Smooth” Transition from 4G to 5G IoT



Non-Standalone 5G
Sub-6GHz 5G with a 4G core

Standalone 5G
5G with a 5G core

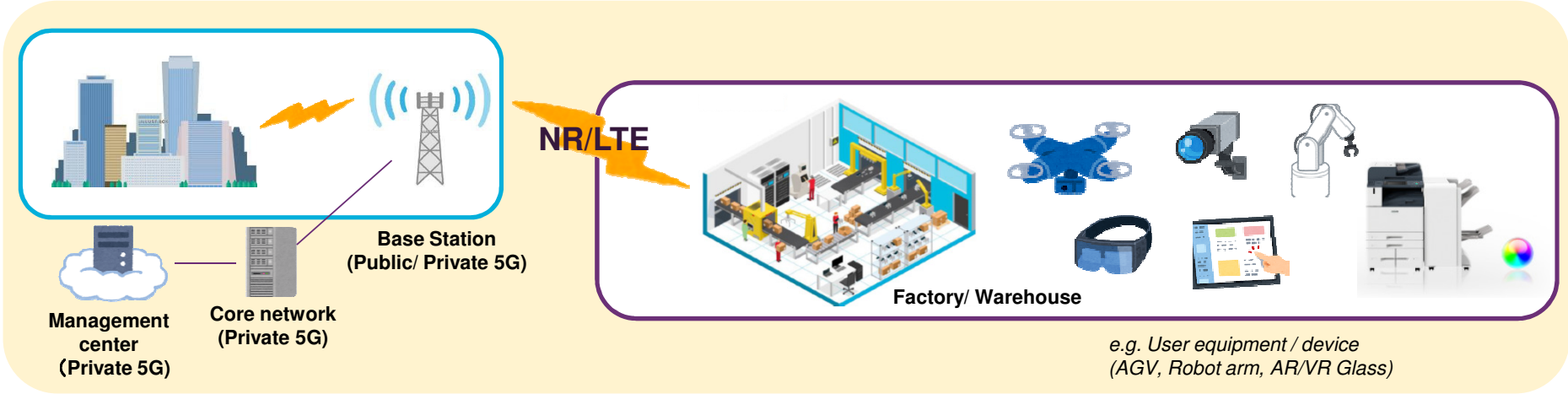
► use Dynamic Spectrum Sharing (DSS) for Cat-M1/NB-IoT coexistence in 5G NR and 4G LTE using the same low/mid band spectrum

Source: https://article.murata.com/en-global/article/5g-massive-iot?excid=ww_so-o_li_sns_s-y4_xx
<https://www.ericsson.com/4a8d35/assets/local/networks/documents/gsma-5g-mobile-iot.pdf>

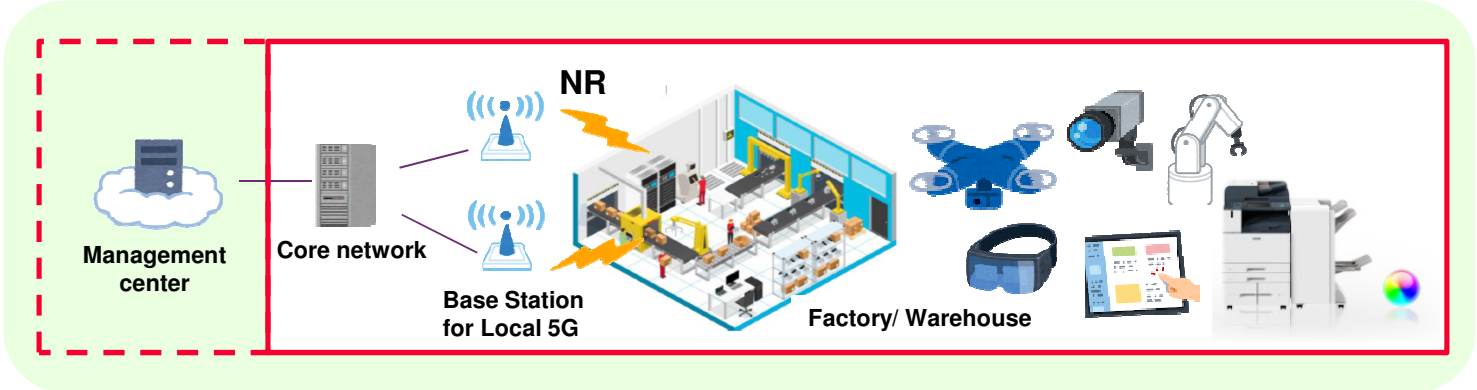
Public /Private /Local 5G

Public
5G

Private
5G



Local
5G



- 5G can replace Ethernet in Factory Automation to provide more flexible equipment environment and adjust quickly to production needs

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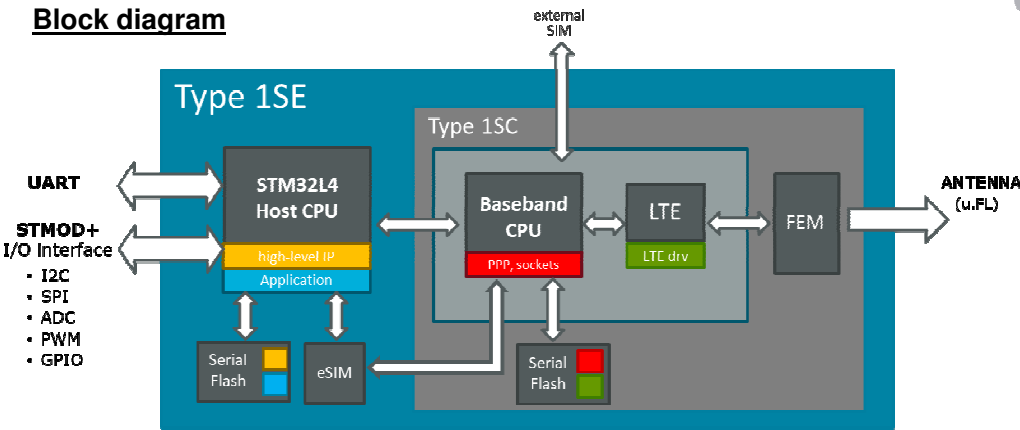
3. Conclusion



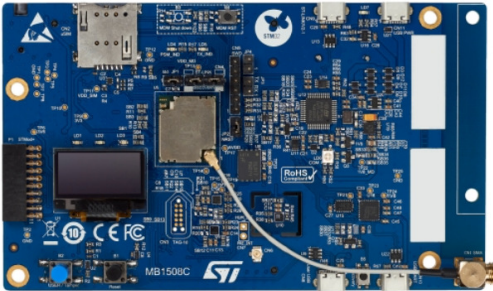
Murata Type 1SE: Cat-M/NB-IoT Module

Part Number	
Part number	LBAD0XX1SE (MP) LBAD0XX1SE-TEMP (Sample) B-L462E-CELL1 (EVK)
Chipset	
RF IC	Sony ALT1250
MCU	STM32L462
Features	
Connectivity	LTE Cat.M1 / NB-IoT Rel.13 (Rel.14-SW upgrade)
Support bands	Cat.M1/NB: Low-band: B5/B8/B12/B13/B14/B17/B18/B19/B20/B26/B28 Mid-band: B1/B2/B3/B4/B25
Power class	Cat.M1/NB: 23/20dBm
Interface	UART/SPI/I2C/I2S/ADC/GPIOs/JTAG/PWM
CPU core	ARM Cortex-M4, 80MHz
Software option	Cellular software expansion for STM32Cube X-CUBE-CELLULAR , eSIM(Optional), eSE(Optional), GNSS(Optional), VoLTE(Optional)
Memory	1MB on-board Serial Flash + 512KB Flash/160KB RAM in MCU
Dimensions L x W x H (mm)	15.4 x 18.0 x 2.5mm (max)
Shield/ Mold	Metal case, LGA package
Operating temp. (°C)	-40 to +85
Certification	
Regulatory	FCC/IC/ETSI/RED/GCF/PTCRB/TELEC/ACMA etc.
Carrier Certification	Tier1 operators, Truphone(MVNO)
Schedule	
Sample	Available
MP	Available

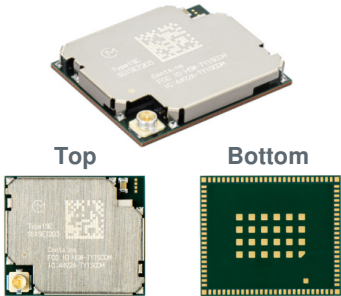
Block diagram



Evaluation kit



Module view



Dimension: 15.4 x 18.0 x 2.5 mm

50MB/90 Days of connectivity included !!

Murata Type 1SE: Features

Scalability

- WW frequency coverage in **one single module**
- Connect to public network & select frequency band automatically
- Globally certified

IoT Cloud Platforms

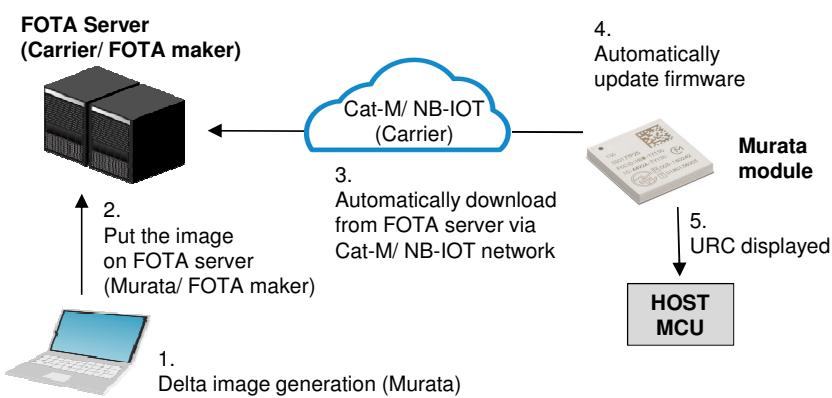
- Compatibility with major IoT Cloud platforms (AWS, other)
- Multiple protocols: MQTT, HTTPS, CoAP, UDP, TCP, LwM2M, SSL/TLS...
- Securely store credentials /certificates

Low Power

- Enable up to 10 years of battery life
- Hibernation current: 3uA
 - eDRX current: <50uA @ 8 hyperframes
 - PSM current: dormant window configurable

Firmware Upgrade Over-The-Air

Available FOTA download



SIM & Security

- Secure network authentication
- Secure Element

Features



Size	integrated in module or silicon directly
Fragility	users cannot reach, cannot damage or lose it
Physical security	separate secure enclave, hard to locate resist advanced hacking
Management and cost	simplify supply chain and management costs seamless global connectivity is possible by switching networks

Murata Type 1SE: Use cases

Cellular IoT communications are suitable for applications requiring:

- ▶ up to 10 km range (outdoor)
- ▶ in hard to reach location (deep indoor or remote area)
- ▶ to manage 24/7 operation (always on reliable secure network)

Standard	Range	Data Rate
WiFi	<100m	>50Mb/s
Zigbee	<100m	250kb/s
BLE	<50m	>1Mbps
CAT-M	>10km	<1Mb/s
NB-IoT	>10km	<150kb/s
LoRa	>10km	<10kb/s
Sigfox	>10km	100b/s

Smart City

Smart Meters

Street Lighting

Parking

Vehicle Fleet management

Environment Monitoring

Sewage Flood Monitoring

Waste Management

Smart Access

Smart Agriculture/ Aquaculture

Livestock Monitoring

Soil Sensing

Machinery Control

Water Quality Monitoring

Wearable / Trackers

Watches/ Bands/ Patches

Panic Buttons

Trackers

Industrial / Commercial

Vending Machines

POS Terminals

Retail/ Package Delivery

Smart Panels

Watch video: <https://video.murata.com/en-global/detail/videos/lpwa-products/video/6160742680001>

Murata Type 1SE: Use cases example in APAC

Use Case	Smart meter (Japan) 	Livestock tracking (ANZ/ Korea) 	Pest control (Singapore) 
Application	▪ smart water meter automate reading ▪ reduce operator maintenance	▪ track cattle location and health condition ▪ reduce manpower on field	▪ mapping of pest activity in facilities to plan next action ▪ reduce manual check on site
Challenges	▪ operate 10+Y on single battery ▪ deployment in large scale	▪ small form factor; battery size ▪ network availability	▪ operate 3+Y on single battery ▪ little experience in hardware and software design
Why Murata?	✓ reliability ✓ security ✓ FOTA ✓ eSIM / iSIM	✓ small size ✓ low power ✓ light weight ✓ integrated GPS	✓ low power ✓ technical support ✓ cost efficiency ✓ partnerships

Murata Type 1SE: Useful links

No.	Content	Link
1	1SE on-demand webinar	https://www.murata.com/webinars/connectivity-202104
2	1SE module overview	https://www.murata.com/products/connectivitymodule/lpwa/overview/lineup/type-1se
3	1SE technical documentation	https://my.murata.com/en/home
4	1SE EVK (B-L462E-CELL1)	https://www.st.com/en/evaluation-tools/b-l462e-cell1.html
5	1SE SDK (X-CUBE-CELLULAR)	https://www.st.com/en/embedded-software/x-cube-cellular.html
6	STM32Cube Ecosystem	https://www.st.com/content/st_com/en/ecosystems/stm32cube-ecosystem.html
7	STMicro Support	https://www.st.com/content/st_com/en/support/support-home.html
8	1SE eSIM activation portal demo video	https://vimeo.com/531879766/5bdaaa73f2
9	Truphone portal trial demo	https://iot.truphone.com/start/
10	Truphone for Things product	https://www.truphone.com/things/

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Conclusion

1	About Murata			
	■ No.1 supplier in the world	Type1SS/ 1YS	Type1SC	Type1SE
		■ Broad line-up of RF modules	 NB-IoT standalone	 Cat-M/NB-IoT GNSS, iSIM
2	Type 1SE “all-in-one” module			
	■ Scalability	WW SKU, IoT platforms, eSIM/iSIM, FOTA, globally certified		
	■ IoT Cloud Platforms	Cloud computing, leverage services such as AWS IoT		
	■ Long Range	Manage 24/7 operation in hard to reach location		
	■ Low Power	10 years possible using power saving modes		
	■ Security	Encryption, secure element, secured protocols		
3	Large ecosystem to address challenges by cellular IoT!			

Contact



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Product Marketing, Wireless Module

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Useful Links:

- **Module webpage:**
<https://www.murata.com/en-sg/products/connectivitymodule/lpwa/cellular>
- **Article on LPWA:**
<https://article.murata.com/en-sg/article/small-low-power-cellular-lpwa-module-1>
- **Module line-up:**
<https://video.murata.com/en-global/detail/videos/lpwa-products/video/6188954909001>
- **Application examples:**
<https://video.murata.com/en-global/detail/videos/lpwa-products/video/6160742680001>
- **5G Massive IoT:**
https://article.murata.com/en-global/article/5g-massive-iot?excid=ww_so-o_li_sns_s-y4_xx

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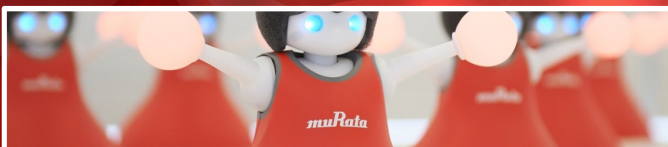


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