NXP Technology Days

[Solution Seminar, 5 July 2019]

Introducing Murata WIFI/ Bluetooth Connectivity Modules for NXP i.MX & RT Platform

Gary Han

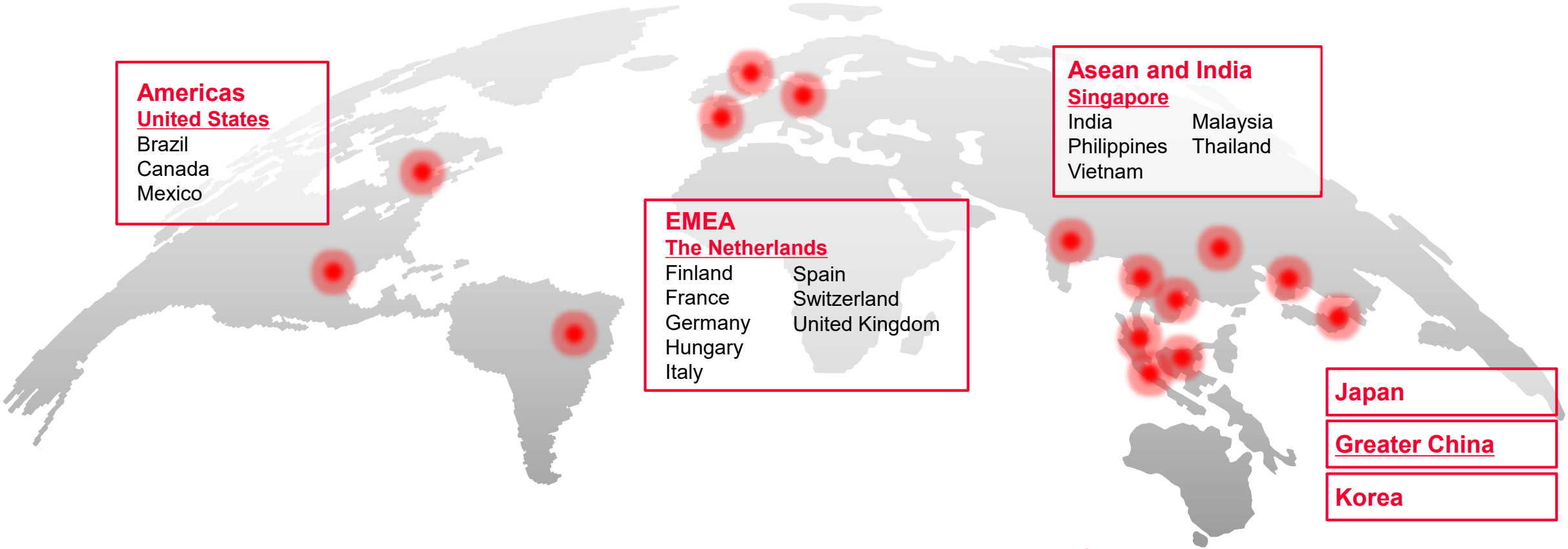
General Manager

Regional Product Marketing

(ASEAN, India & Oceania)

Murata Electronics Singapore

About Murata



Americas
United States
Brazil
Canada
Mexico

EMEA
The Netherlands
Finland
France
Germany
Hungary
Italy
Spain
Switzerland
United Kingdom

Asean and India
Singapore
India
Philippines
Vietnam
Malaysia
Thailand

Japan

Greater China

Korea

A total of **92*** manufacturing facilities around the world

No. of Employees:

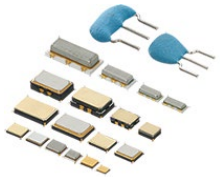
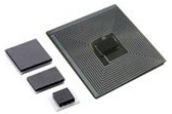
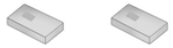
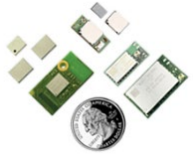
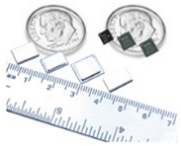
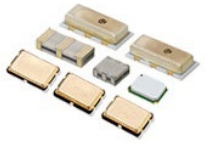
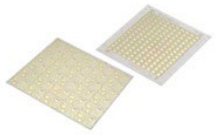
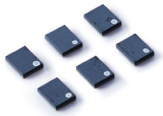
77,571

*as of March 31, 2019
*Murata Manufacturing Co., Ltd. is not included in the number of subsidiaries

Our Products

- Capacitors
- Inductors (Coils)
- Noise / EMI Suppression Products and Filters
- Ultra Low Power Short Range RF-IC
- Resistors
- Thermistors
- Sensors
- Timing Devices
- Sound Components
- Power Devices
- Micromechatronics
- RFID
- Matching Devices
- RF Components
- RF Modules
- Batteries
- Filters
- Substrates
- Ionizers/ Ozonizers
- Front-end Modules

Comprehensive Product Portfolio

				
Capacitors	Inductors (Coils)	Noise / EMI suppression products and filters	Resistors	Thermistors
				
Sensors	Timing devices	Sound components	Power devices	Micromechatronics
				
RFIDs	Matching devices	RF components	RF modules	Batteries
				
Ultra low power short range RF-IC	Filters	Substrates	Ionizers/Ozonizers	Front-end modules

ASEAN Smart Cities

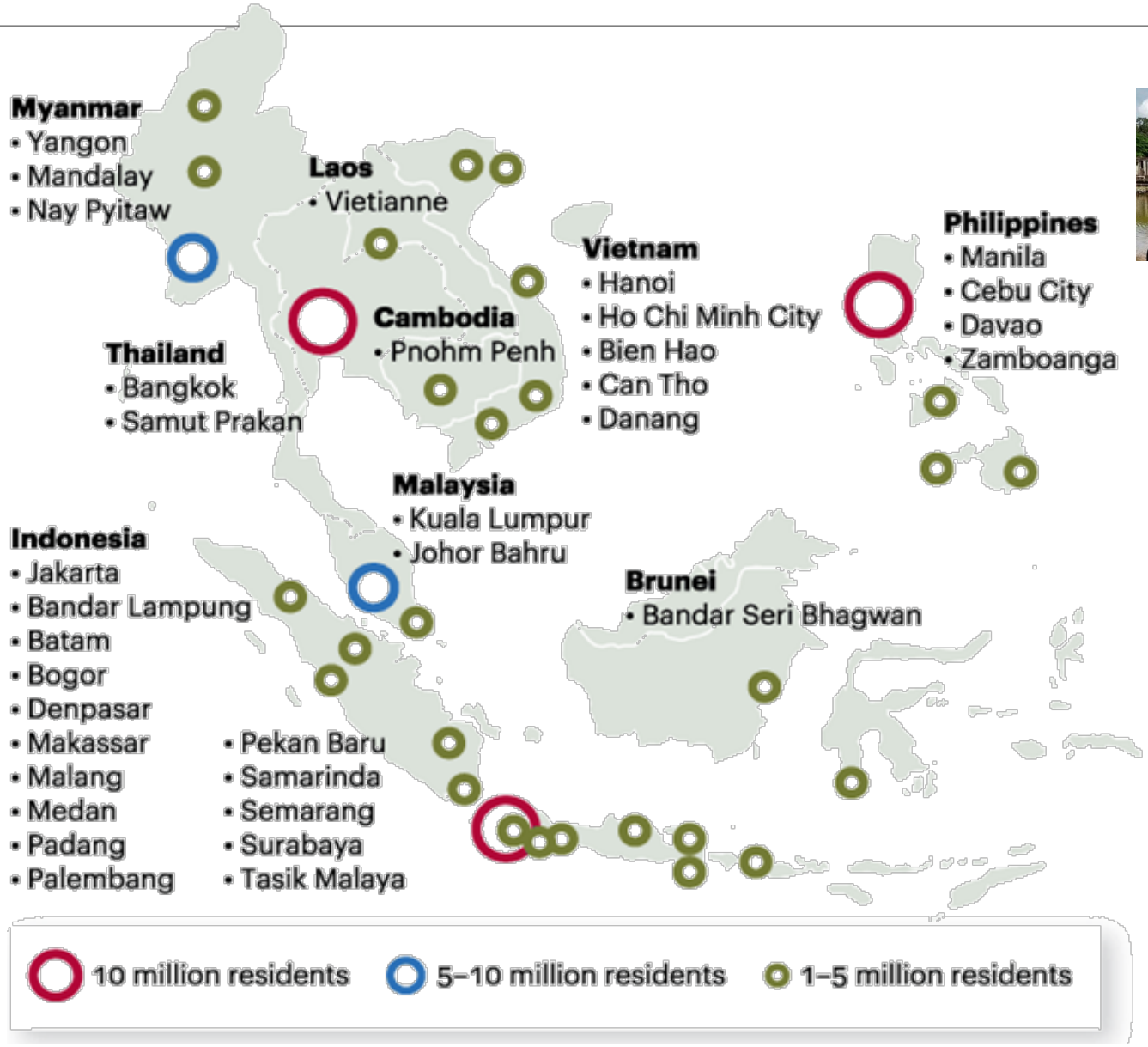
35 Smart Cities in 10 Countries

Myanmar

Thailand

Malaysia

Indonesia



Cambodia

Vietnam

Philippines

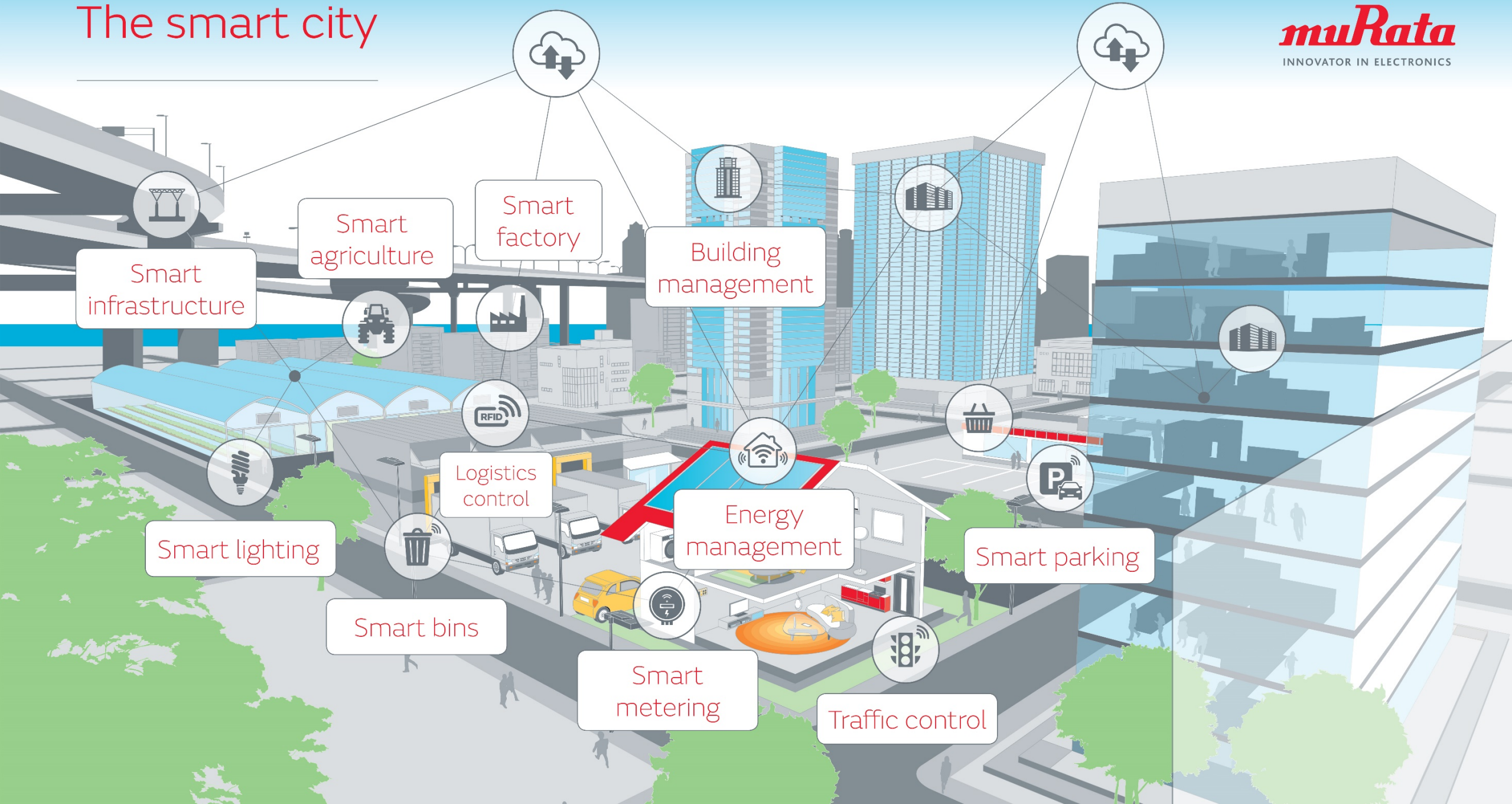
Singapore

Brunei

Source: A.T. Kearney analysis

The smart city

muRata
INNOVATOR IN ELECTRONICS



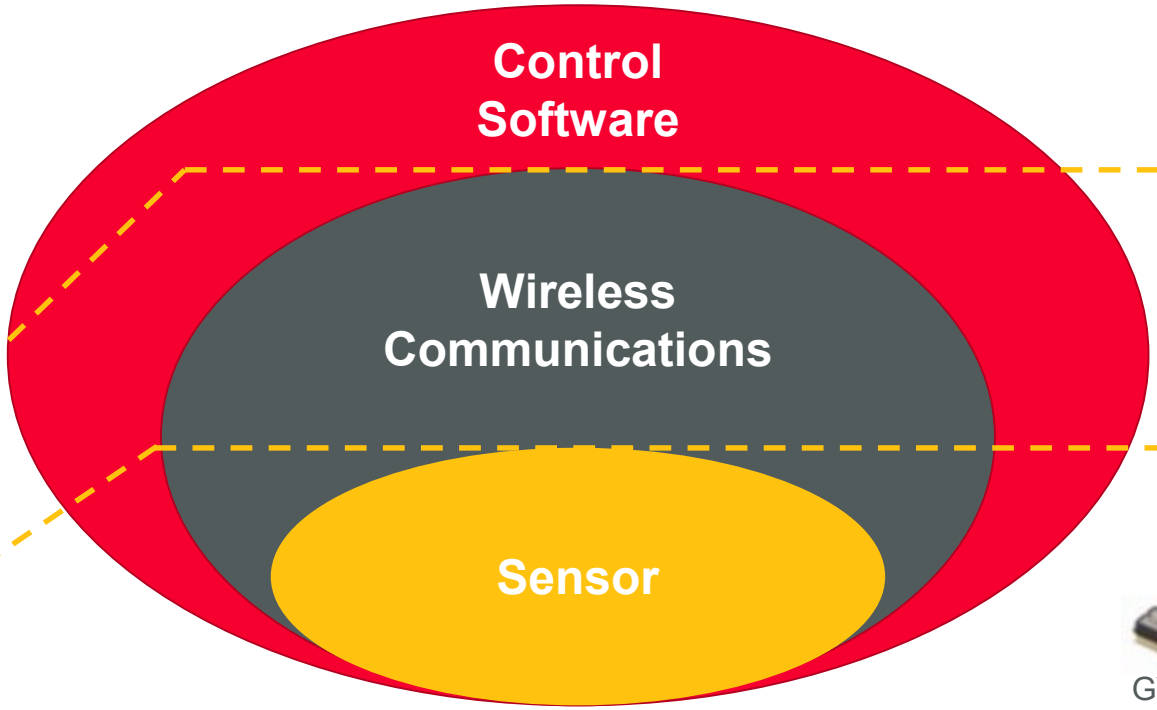
Connectivity Solution for IoT

Murata provides total solutions combining – sensors, wireless technology and software to help build infrastructure for the "Internet of Things"

- Application Software
- Middle-ware
- Cloud

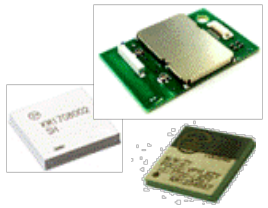
- Communications
- Controller

- Terminal
- Sensor



- Wireless Communication
- IC Driver

- Wi-Fi / BLE
- LPWA
- 802.15.4/ Zigbee
- V2X DSRC 11p




PIR


Ultrasonic


Shock


GYRO


Temp


MEMS


AMR

Area	Advantages
Software	Software technology developed in the markets for mobile phones and Wi-Fi
Wireless Communications	Ensure connections with a target without cross-talk in a network comprising of multiple devices
Sensor	Comprehensive offerings of high performance, high reliability sensing products

Time to Market

Simplify Wireless Development and Radio Certification

RF Connectivity Modules

(Wi-Fi, Bluetooth, LPWA)

- **Small Form Factor**
- **High Reliability**
- **Variety of Antenna Configuration**
- **Partnerships with Market Leading IC Manufacturers**

Why Murata?

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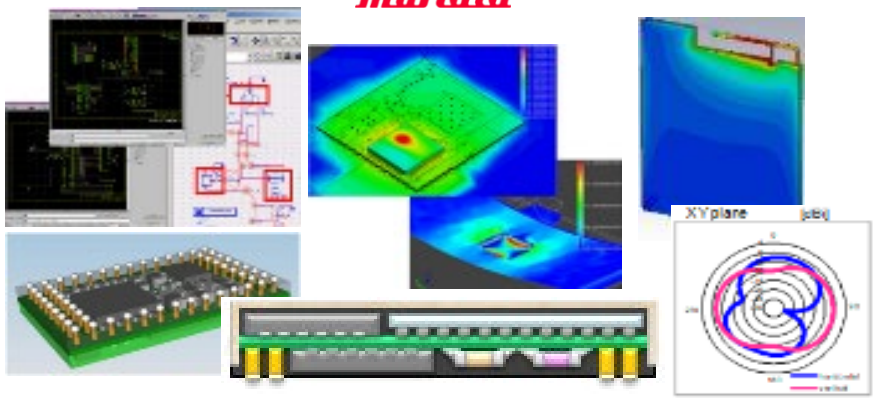
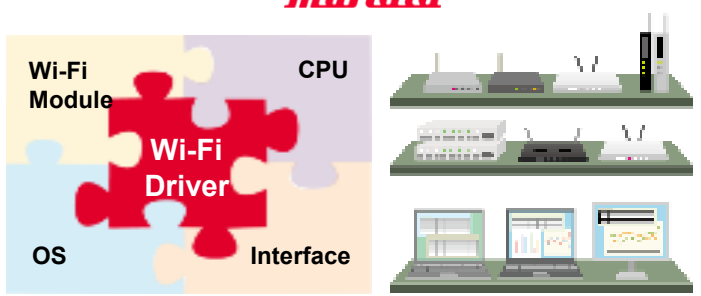
HW / RF Design

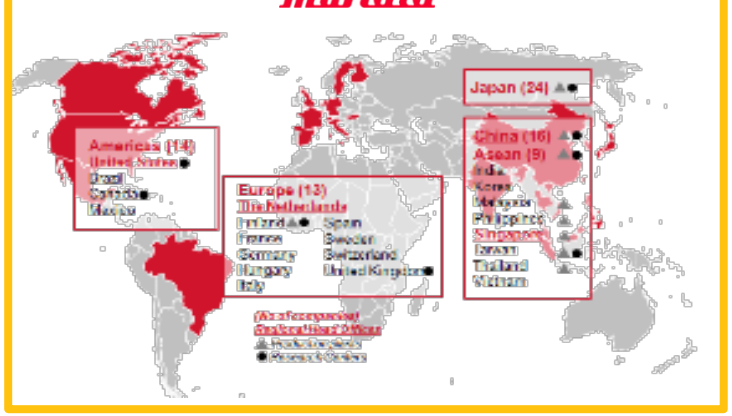


SW / Cert. Support

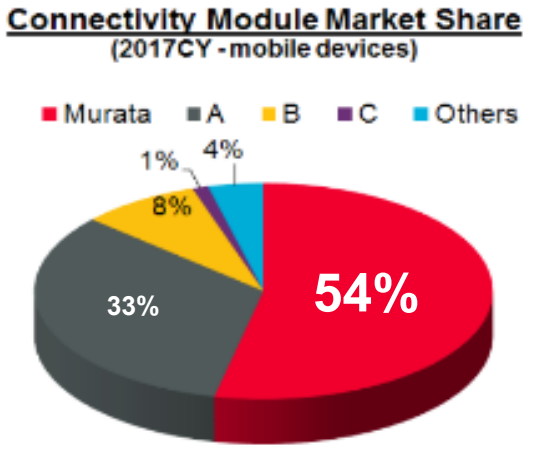


- ✓ Driver Porting
- ✓ Debug w/ System Level
- ✓ Certification Supports

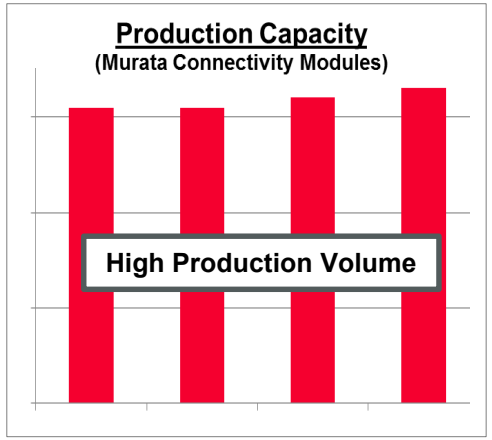
Global Network

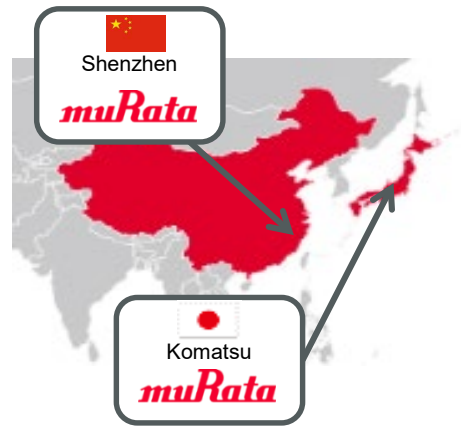


Market Share



Supply Capability
(Flexible / Multi Factory locations)





Partnership

IoT market presents huge opportunity for Electronics industry, however, there are tremendous challenges!

Collaboration on “Getting Connected”

NXP

CYPRESS
EMBEDDED IN TOMORROW™

muRata
INNOVATOR IN ELECTRONICS

Overview of Evaluation Boards & Kits Available

Murata Connectivity Modules

- Embedded Artists' Wi-Fi/ Bluetooth M.2 EVB

NXP Platform

- Murata uSD-M.2 Adapter Kit + Embedded Artists' Wi-Fi/ Bluetooth M.2 EVB on NXP i.MX Development Kit

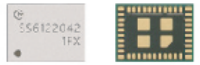
Embedded Artists Platform

- Embedded Artists' Wi-Fi/ Bluetooth M.2 EVB on Embedded Artists' Development Kit

Murata (Cypress-based) Modules for i.MX

Type 1FX

PN: LBWA1KL1FX-875
CYW43364 Chipset



6.95 x 5.15 x 1.1mm

802.11 b/g/n

For Industrial IoT, Smart Home, Sensor Network

Type 1DX/1LN

PN: LBEE5KL1DX-883
LBEE5KL1LN-081
CYW4343W Chipset

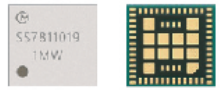
6.95 x 5.15 x 1.1mm

802.11 b/g/n + Bluetooth® 4.2

For Industrial IoT, Smart Home, Sensor Network, Gateway

Type 1MW

PN: LBEH5HY1MW-230
CYW43455 Chipset



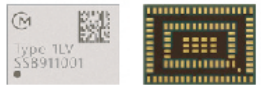
7.9 x 7.3 x 1.1mm

802.11 a/b/g/n/ac + Bluetooth® 5.0

For Industrial IoT, Smart Home, Audio/ Video/ Voice, Gateway

Type 1LV

PN: LBEE59B1LV-278
CYW43012 Chipset



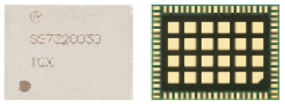
10.0 x 7.2 x 1.4mm

802.11 a/b/g/n/ac-friendly™ + Bluetooth® 5.0

For Industrial IoT, Smart Home, Sensor Network, Gateway

Type 1CX

PN: LBEH5UL1CX-887
CYW4356 Chipset



11.5 x 8.8 x 1.0mm

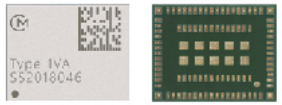
- 2 x 2 Multiple-In Multiple-Out (MIMO)

802.11 a/b/g/n/ac (2 x 2 MIMO) + Bluetooth® 5.0

For Industrial IoT, Smart Home, Audio/ 4K Video/ Voice, Gateway

Type 1VA

PN: LBEE5XV1VA
CYW88359 Chipset



11.4 x 8.9 x 1.3mm

- 2 x 2 Multiple-In Multiple-Out (MIMO)
- Real Simultaneous Dual Band (RSDB)

802.11 a/b/g/n/ac (2 x 2 MIMO) + Bluetooth® 5.0

For Audio/ 4K Video/ Voice

Wi-Fi / Bluetooth M.2 Modules

	 1DX M.2	 1MW M.2	 1LV M.2	 1CX M.2	1VA M.2
Chipset (Cypress)	CYW4343W	CYW43455	CYW43012	CYW4356	CYW88359
WLAN standards	802.11 b/g/n	802.11 a/b/g/n/ac	802.11 a/b/g/n 802.11 ac-friendly™	802.11 a/b/g/n/ac (2x2 MIMO)	802.11 a/b/g/n/ac (2x2 MIMO, RSDB)
WLAN Interface	SDIO 2.0 (SDR25@50MHz)	SDIO 3.0 (SDR104@200MHz)	SDIO 3.0 (SDR40@80MHz)	PCIe	PCIe or SDIO 3.0 (SDR104@200MHz)
WLAN frequency	2.4 GHz	2.4 GHz and 5 GHz	2.4 GHz and 5 GHz	2.4 GHz and 5 GHz	2.4 GHz and 5 GHz
WLAN data rate	11, 54, 65 Mbps	11, 54, 65, 150, 433 Mbps	11, 54, 65, 78 Mbps	11, 54, 65, 150, 866 Mbps	11, 54, 65, 150, 866 Mbps
Bluetooth® standards	4.2	5.0	5.0	5.0	5.0
Bluetooth® Interface	4-wire UART@3MBaud	4-wire UART@3MBaud	4-wire UART@3MBaud	4-wire UART@3MBaud	4-wire UART@3MBaud
Operating temperature	-30 to +70°C	-20 to +75°C	-20 to +70°C	-20 to +75°C	-30 to +85°C
M.2 module size	44 x 22 mm	44 x 22 mm	44 x 22 mm	30 x 22 mm	30 x 22 mm

Type 1DX (CYW4343W) M.2 Module

Reference Certified PCB Trace Antenna

Snap-off option - for customers needing to adhere to MAX 30mm length (UFL connector used)

UFL Connector for external antenna or conducted testing

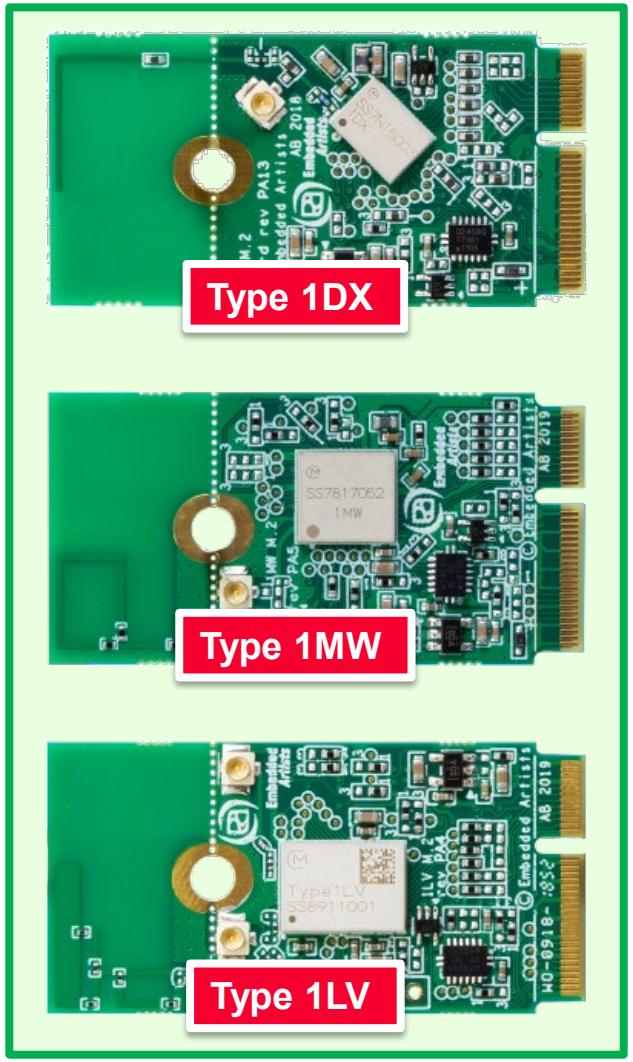
Murata Type 1DX Module
CYW4343W = 802.11 b/g/n + BT/BLE 4.2
Interfaces = WLAN SDIO 2.0; BT UART/PCM

Comprehensive test points

Reference: *https://www.embeddedartists.com/products/1dx-m-2-module/*

Type 1DX / 1MW / 1LV Options

Starting Point: Customer evaluates EA's 1DX/1MW/1LV with reference certified PCB Trace Antenna



Customer needing specific antenna solution

1. Re-uses Murata's FCC conducted testing
2. Applies for Class II permissive change after finishing radiated testing

Customer with form factor permitting trace antenna

1. Copies Reference PCB trace antenna
2. Re-uses Murata's FCC regulatory certifications

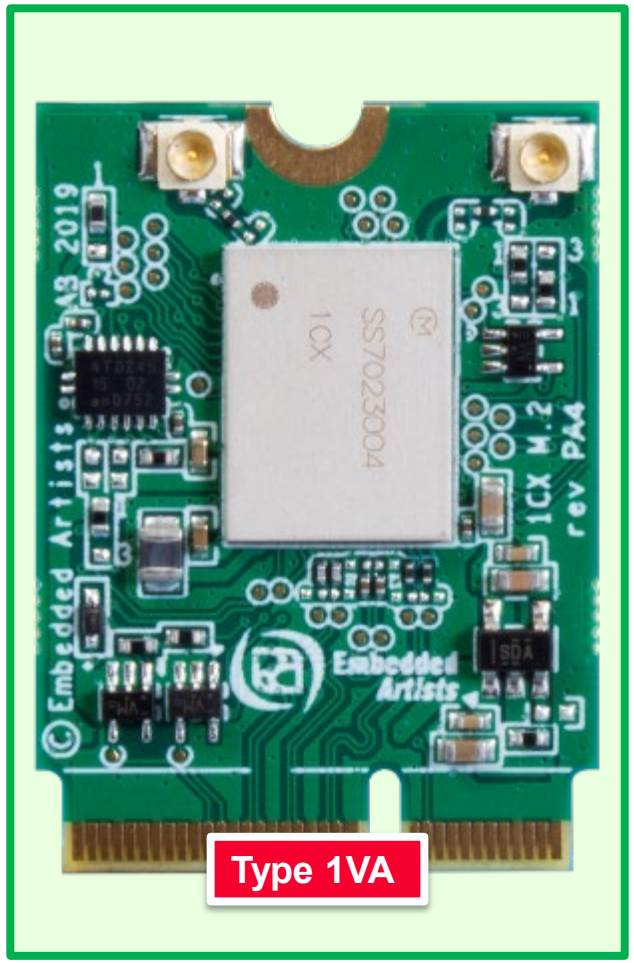
Customer with M.2 compatible form factor

1. Lower volume customers can buy 100 packs of EA M.2 EVB; or request quote for 1000+ pieces
2. Higher volume (5K~10K) customers will initiate cost-optimized M.2 re-design *(no test points, reduced component options, reduced layers)*
3. Re-uses Murata's FCC regulatory certifications

Difficulty Goes Up

Type 1VA Options

Starting Point: Customer Evaluates EA's 1VA with reference certified UFL-connected patch antennas



NOTE: *1CX is pictured for illustrative purposes.*

Customer needing specific antenna solution	1. Re-uses Murata's FCC conducted testing 2. Applies for Class II permissive change after finishing radiated testing
Customers who can re-use Murata's pre-certified UFL-connected patch antennas	1. Customer re-uses Murata's FCC regulatory certifications.
Customer with M.2-compatible form factor and can re-use Murata's pre-certified UFL-connected patch antennas	1. Lower volume customer can already buy 100 packs of EA M.2 EVB; or request quote for 1000+ pieces 2. Higher volume (5K~10K) customers will initiate cost-optimized M.2 re-design (no test points, reduced component options, and reduced layers) 3. Re-uses Murata's FCC regulatory certifications

Difficulty Goes Up

NXP i.MX InterConnect

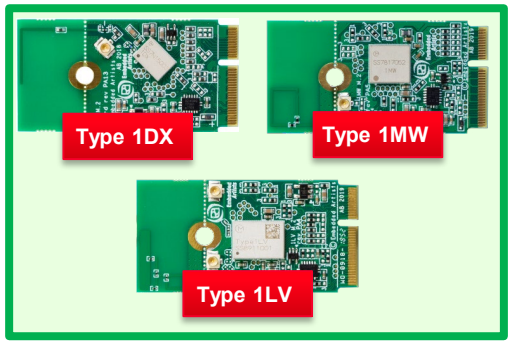
Murata Module	CYW Chipset	RT 1020 1050 1060 1064	6UL	6ULL	6SL (WLAN Only)	6SLL	6SoloX	6DuaLite/ 6Solo	6Quad (Plus)	8M Mini (WLAN only)	8M Quad
1DX	4343W	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2		
1MW	43455		uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2		
1LV	43012	uSD-M.2	uSD-M.2	uSD-M.2							
1CX	4356									M.2	M.2
1VA*	88359									M.2	M.2
1WZ*	88359		uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2		

M.2 = Only EA M.2 EVB required;
uSD-M.2 = Murata uSD-M.2 Adapter Kit + EA M.2 EVB required

- All i.MX 6 have MAX SDIO Clock Frequency of 50 MHz. This impacts WLAN performance testing for 1MW and upcoming 1WZ.
- i.MX RT platforms should support 100 MHz SDIO frequency. Not yet validated.
- Type 1VA (WLAN-PCIe) and 1WZ (WLAN-SDIO) to be released in Q3/2019.

NXP i.MX 6

Embedded Artists'
Wi-Fi/BT M.2 EVB



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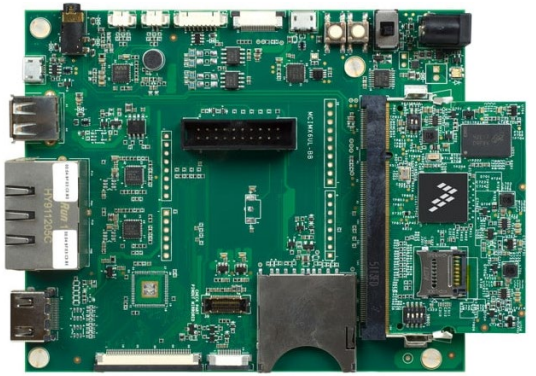
Murata
uSD-M.2 Adapter Kit

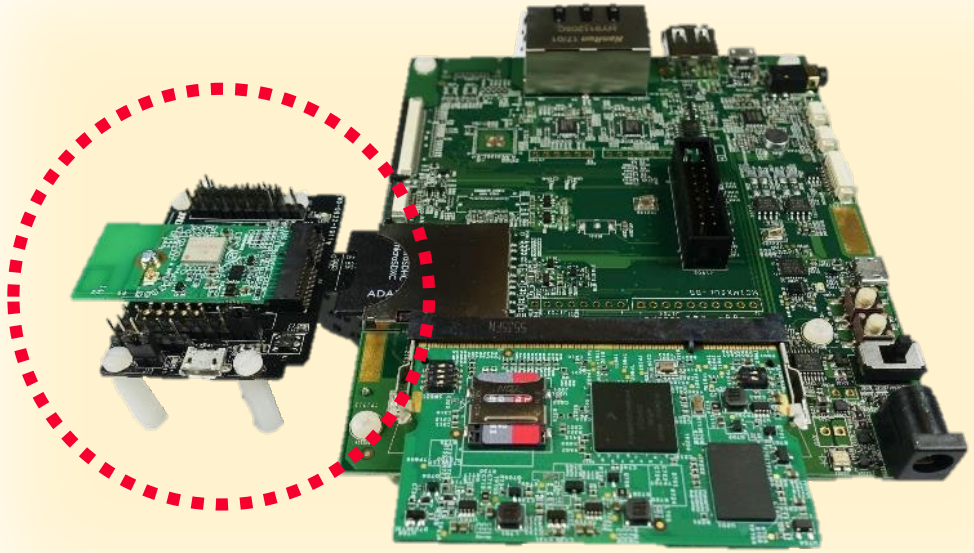
a) J10
b) J6 = 20-pin ribbon cable is necessary for connecting to NXP platform - this is equivalent to previous V2 Adapter (with Samtec)

+

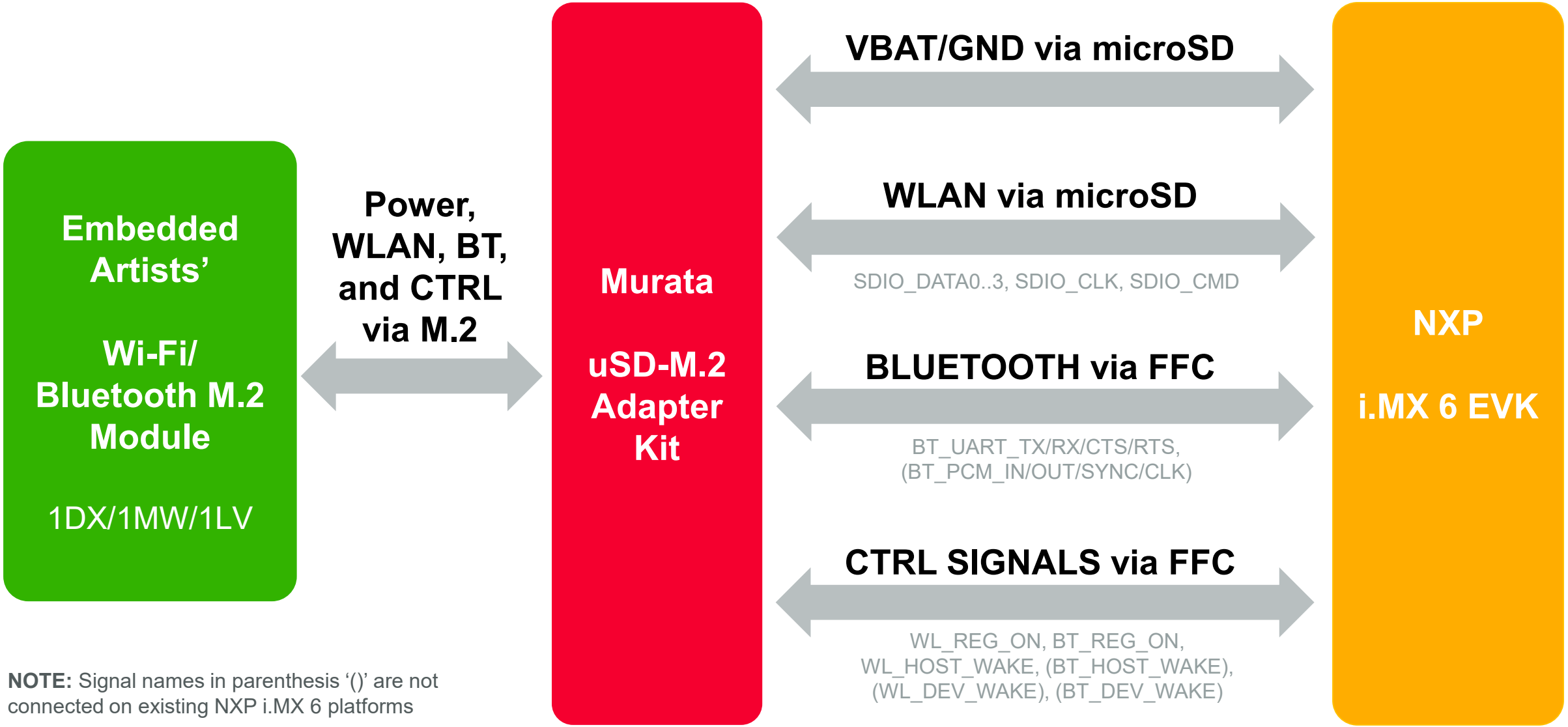
NXP
i.MX 6UL EVK



- Type 1MW M.2 EVB
- uSD-M.2 Adapter Kit



NXP i.MX 6 InterConnect Block Diagram

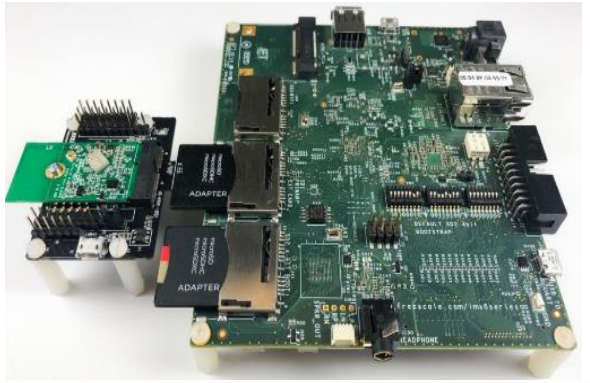


NOTE: Signal names in parenthesis '()' are not connected on existing NXP i.MX 6 platforms

NXP i.MX 6 uSD-M.2 Adapter Kit Solution

i.MX 6SX SoloX + uSD-M.2 + 1MW M.2 EVB

i.MX 6Quad Sabre + uSD-M.2 Adapter + 1MW M.2 EVB



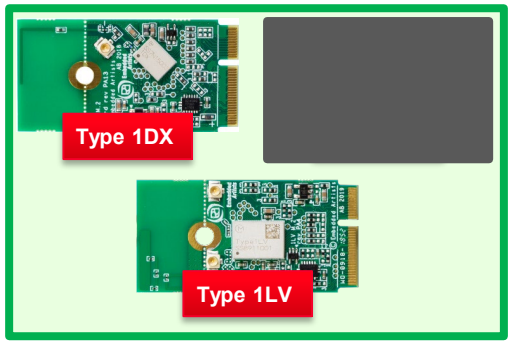
i.MX 6SL EVK + uSD-M.2 Adapter + 1DX M.2 EVB*

i.MX 6UL EVK + uSD-M.2 Adapter + 1LV M.2 EVB

NXP i.MX 6	Type 1DX (Murata)	Type 1MW (Murata)	Type 1LV (Murata)
	CYW4343W (Cypress)	CYW43455 (Cypress)	CYW43012 (Cypress)
6UL/ ULL/ (ULZ)	Y	Y	Y
6SL/ SLL	Y*	Y*	-
6SX	Y	Y	-
6DL/ Q/ QP	Y	Y	-

- 6ULZ is low-cost version of 6ULL (*no ethernet)
- 6ULL EVK is used for 6ULZ evaluation
- *6SL is WLAN only
- Type 1LV is 1.8V VIO only; thus only i.MX 6UL/ULL supports 1.8V VIO interface

Embedded Artists'
Wi-Fi/BT M.2 EVB



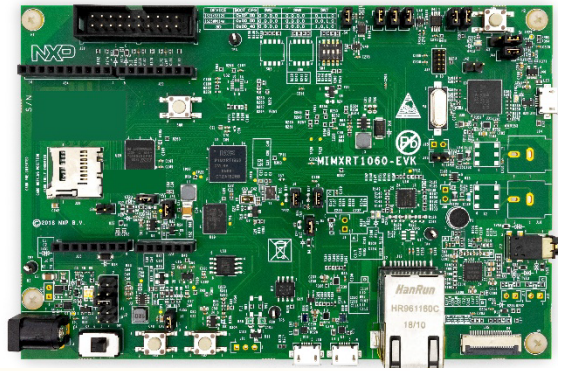
+

Murata
uSD-M.2 Adapter Kit

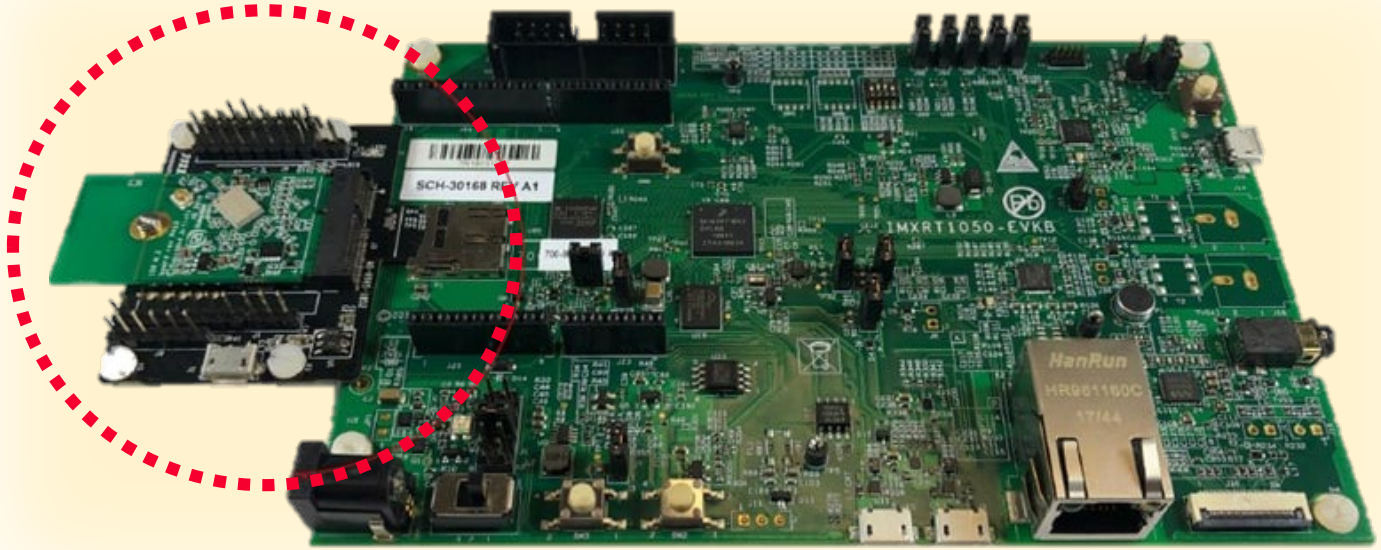
a) J10
b) J6 = 20-pin ribbon cable is necessary for connecting to NXP platform - this is equivalent to previous V2 Adapter (with Samtec)

+

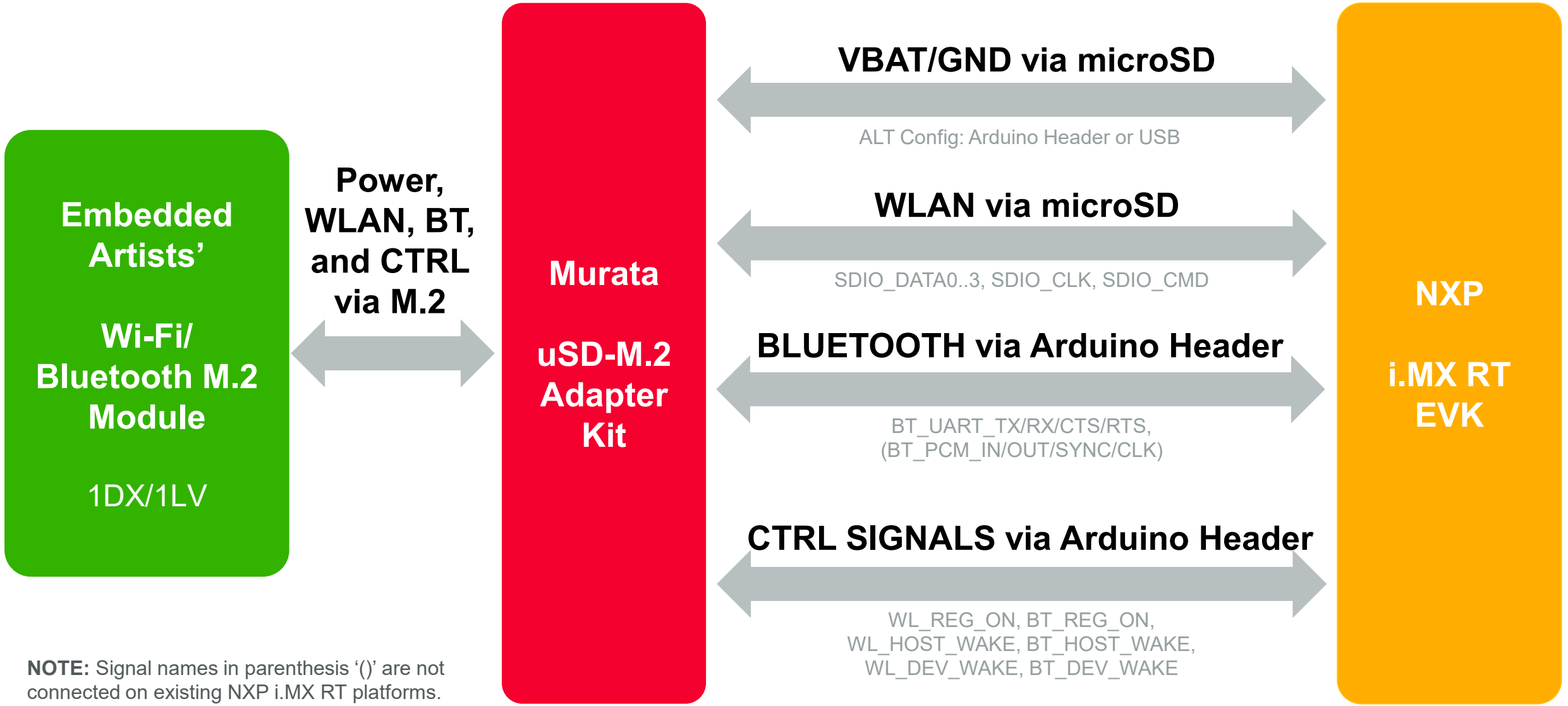
NXP
i.MX RT EVK



- Type 1DX M.2 EVB
- uSD-M.2 Adapter Kit



NXP i.MX RT InterConnect Block Diagram



NOTE: Signal names in parenthesis '()' are not connected on existing NXP i.MX RT platforms.

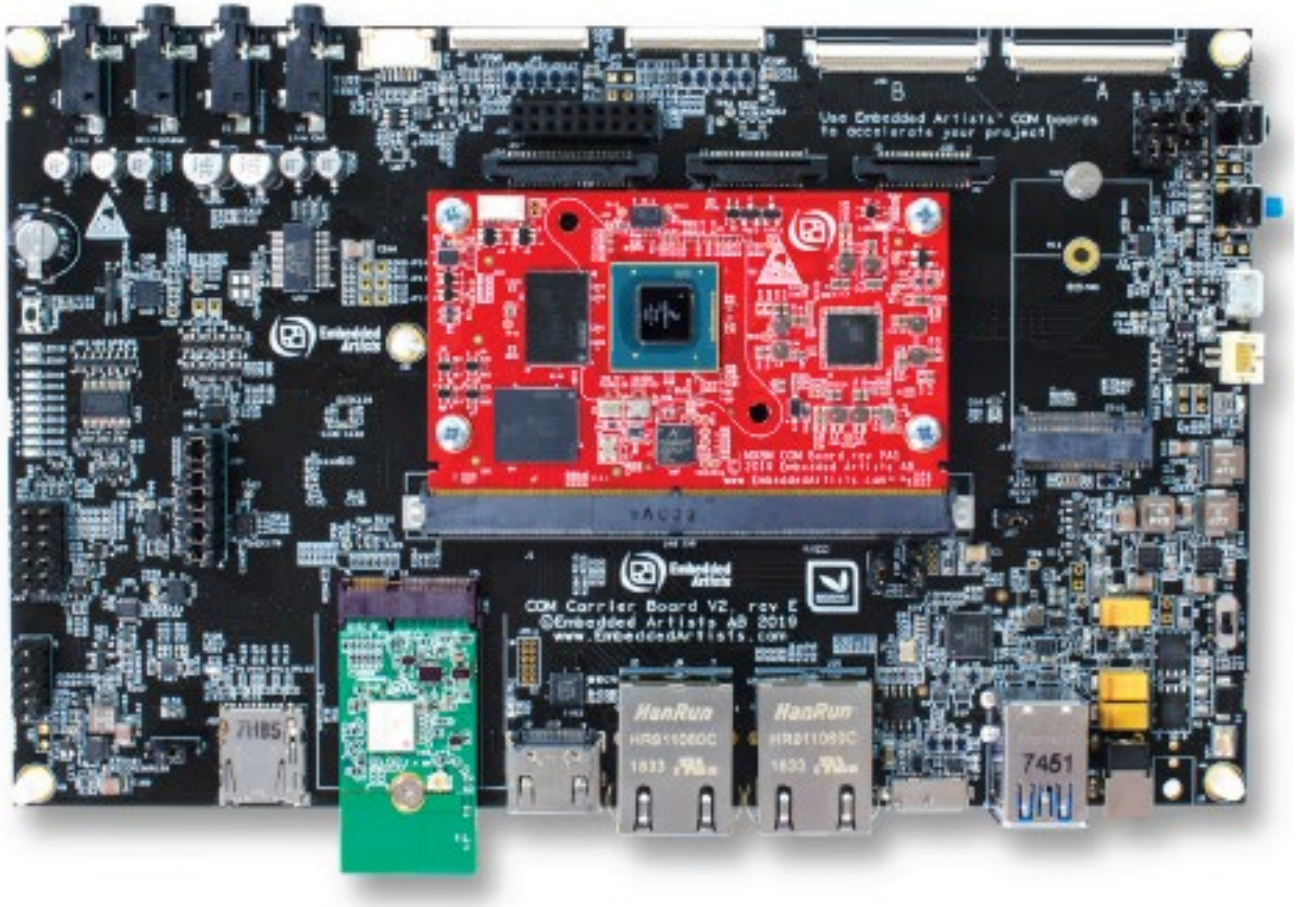
i.MX InterConnect

Murata Module/ EA M.2 EVB	CYW Chipset	RT 1052 RT 1062	6UL	6SoloX	6DualLite	6Quad	7Dual	8MQuad	8M Mini*	7ULP*
1DX / M.2	4343W	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2
1MW / M.2	43455		M.2	M.2	M.2	M.2	M.2	M.2	M.2 / uCom	M.2
1LV / M.2	43012	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2 / uCom
1CX / M.2	4356			M.2	M.2	M.2	M.2	M.2	M.2	
1VA*	88359			M.2	M.2	M.2	M.2	M.2	M.2	
1WZ*	88359		M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2

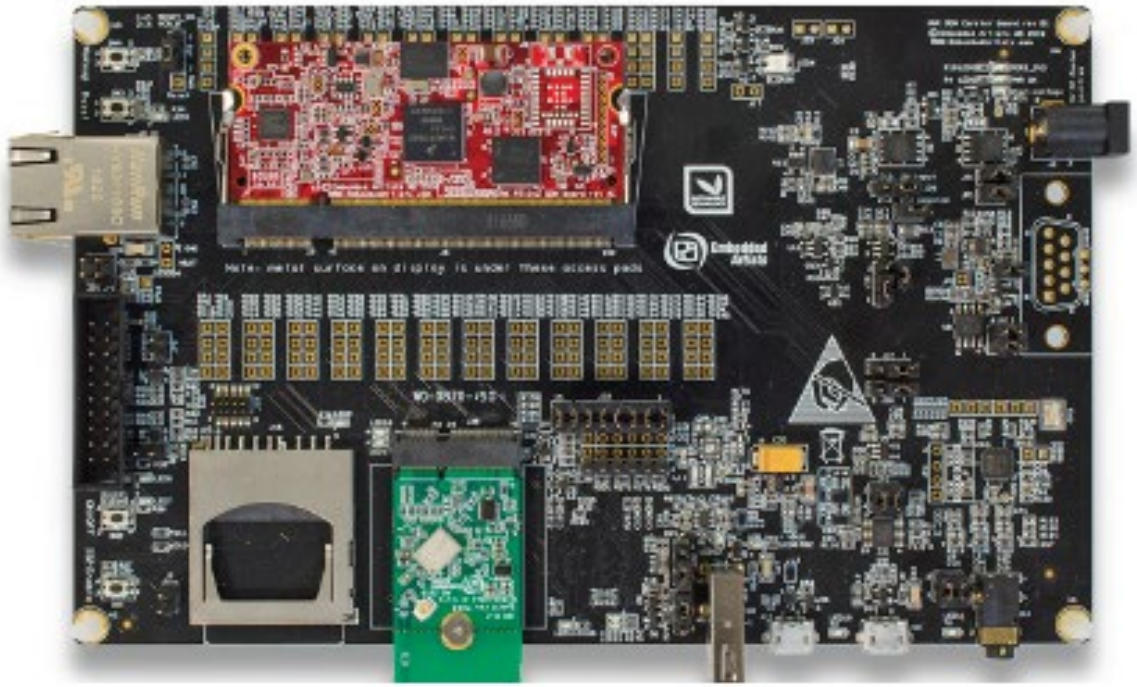
M.2 = Only Embedded Artists' M.2 EVB required (Murata module soldered down on M.2 EVB)
uCOM = Embedded Artists' uCOM board has solder-down option for selected module: i.MX 8M Mini (1MW), and i.MX 7ULP (1LV)

- i.MX RT does not support PCIe interface. Also, Type 1WZ is not part of software roadmap for MCUXpresso.
- i.MX 6UL/7ULP with Type 1CX/1VA: neither processor supports PCIe interconnect.
- i.MX RT1052 Dev Kit currently shipping with non-M.2 OEM Carrier Board.
- Type 1VA (WLAN-PCIe), and 1WZ (WLAN-SDIO) to be released in Q3/2019.

i.MX8M Quad Dev Kit V2 + Type 1MW



i.MX RT1062 Dev Kit + Type 1DX



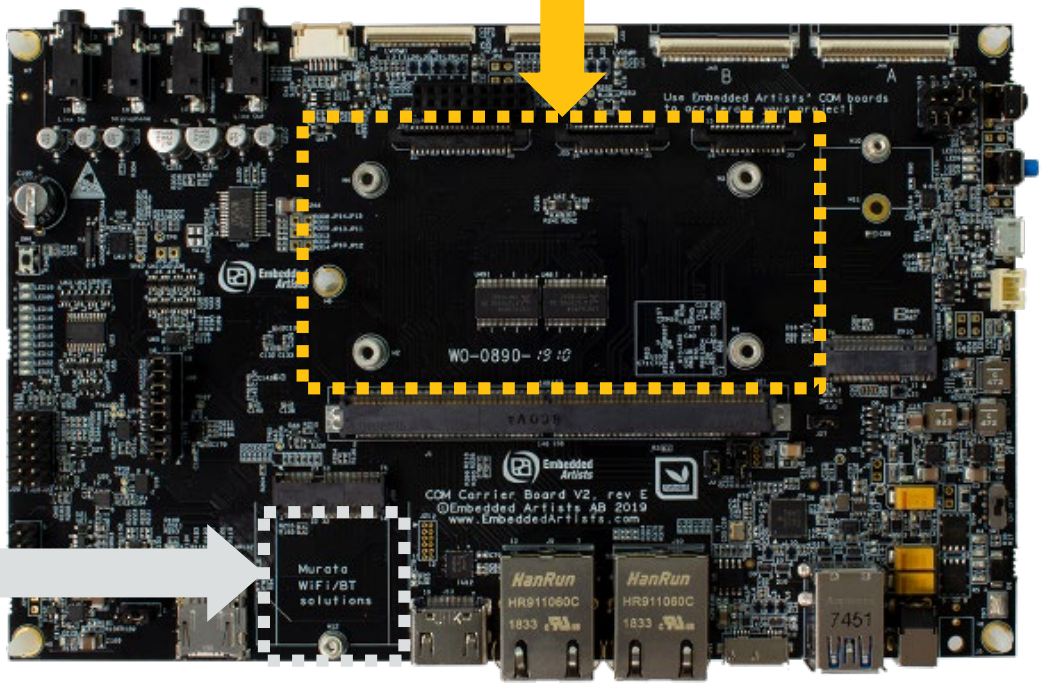
Versatility of a *"Swiss Army Knife"*

Combine i.MX (u)COM with Wi-Fi/ Bluetooth M.2 EVB

6Quad COM	6Dual COM	6SoloX COM	7Dual COM	6UL COM	7Dual uCOM*	8MQuad COM	7ULP uCOM*	8M Mini uCOM*
								

**7Dual, 7ULP, and 8M Mini uCom uses Interposer COM board*

1DX	1MW	1LV	1CX	1VA (PCIe) 1WZ (SDIO)
CYW 4343W	CYW 43455	CYW 43012	CYW 4356	CYW 88359
				*Avail Q3/2019*

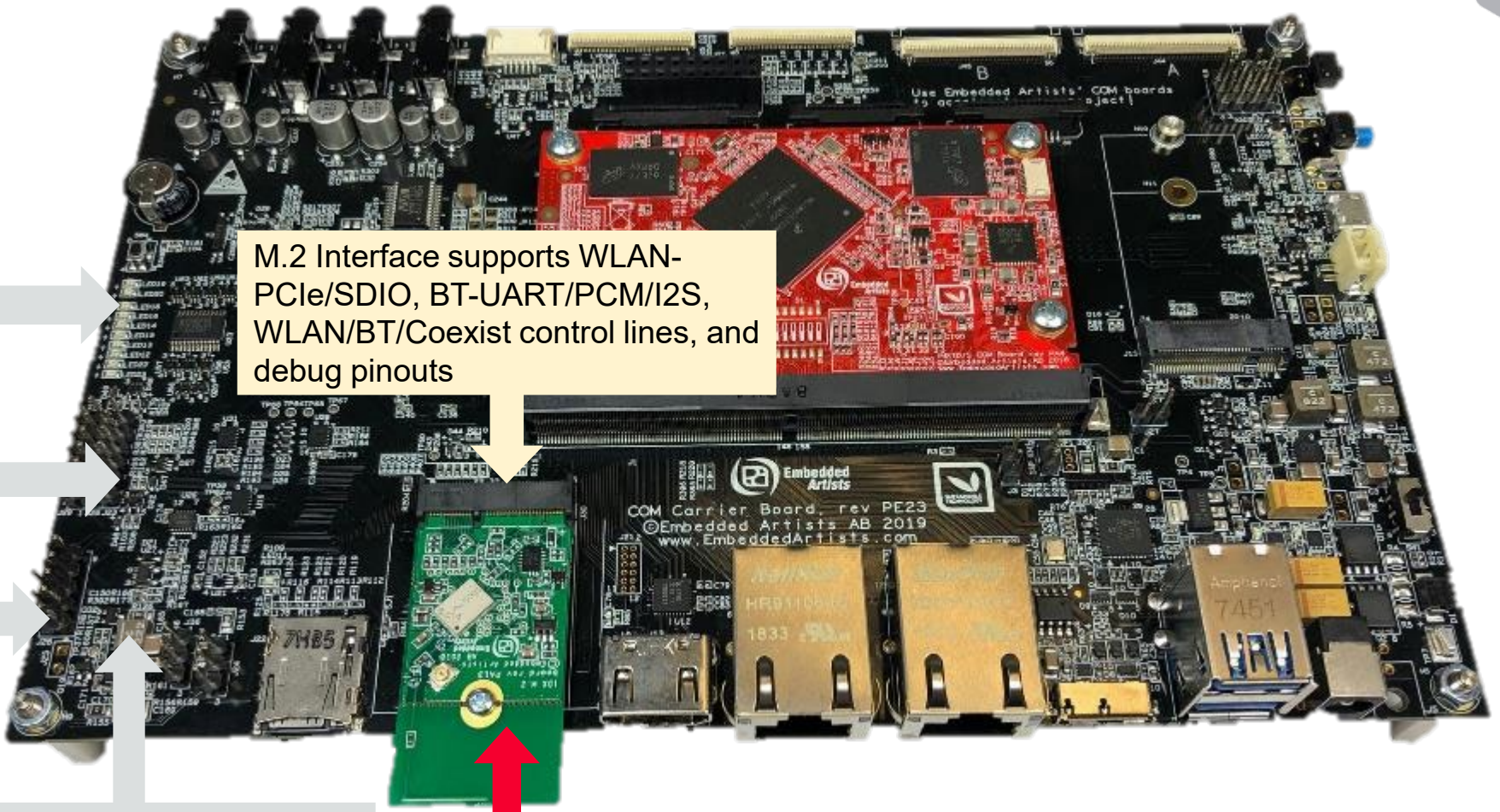


Advanced Features

Operational LED's: indicate current mode (VBAT/ VDDIO/ WLAN-PCIe or WLAN-SDIO/etc.)

BT-UART and WLAN/BT TX/RX Debug UART pinout: use FTDI TTL-232R USB-to-UART Cable

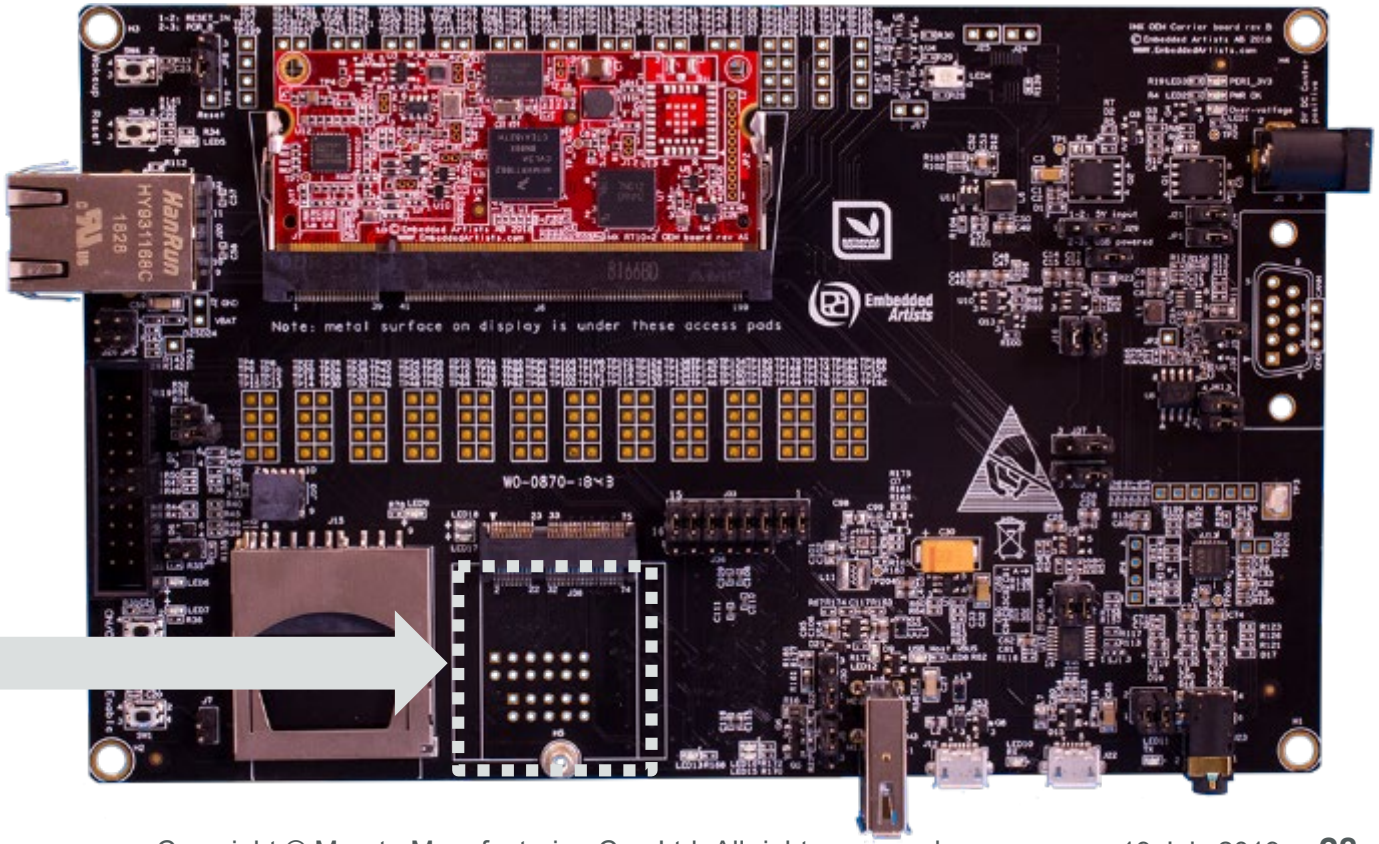
JTAG/EXT COEX



Combine i.MX RT with Wi-Fi/ Bluetooth M.2 EVB

- Embedded Artists' i.MX RT 1062 Dev Kit is already shipping
- Provides comprehensive hardware interface with all options (debug pins, PCM, etc.)
- Solid interconnect: secure M.2 EVB – no adapter
- EA provides drop-in patch on top of NXP i.MX RT SDK release

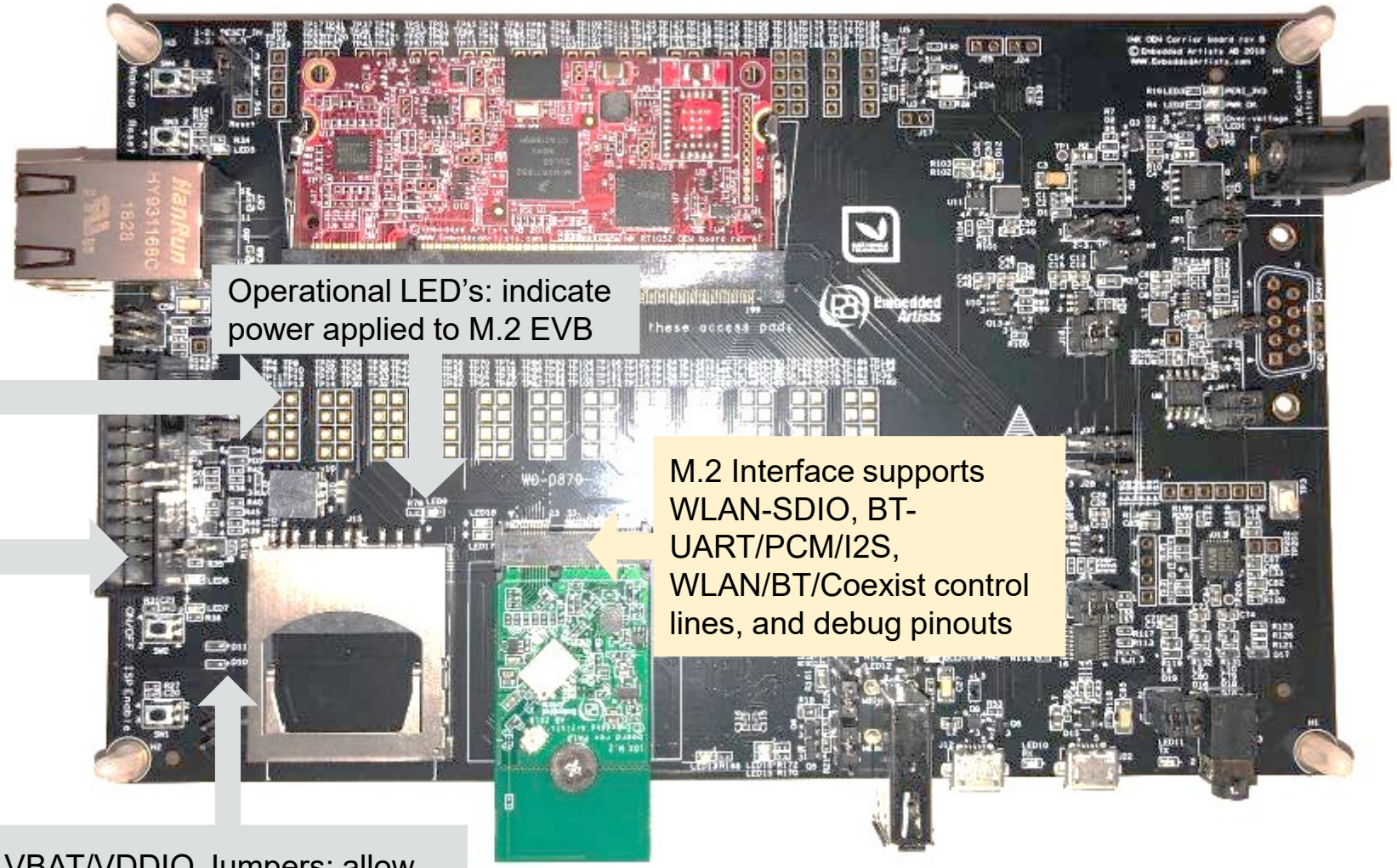
1DX	1MW	1LV
CYW 4343W	CYW 43455	CYW 43012
		



Advanced Features

All interface pins from i.MX RT brought out except high-speed SDIO: can be probed on M.2 EVB directly

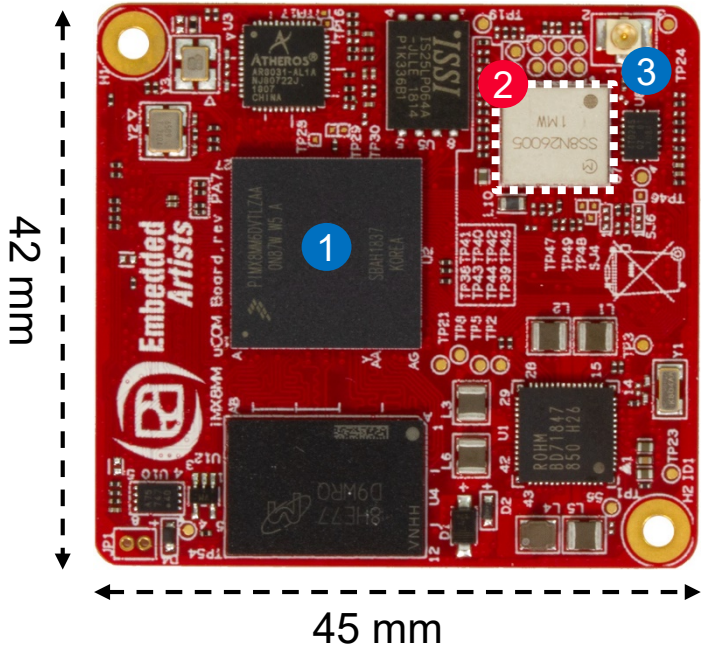
Debug Connections include:
1) BT-UART
2) WLAN/BT TX/RX Debug UART
3) JTAG/EXT COEX



Wireless-enabled uCOM Boards

- Compact, highly-integrated i.MX MPU solution with Murata wireless module on-board
- Embedded Artists' Developer Kits are shipped with Murata module de-populated; allowing users to test with Wi-Fi/BT M.2 EVB options

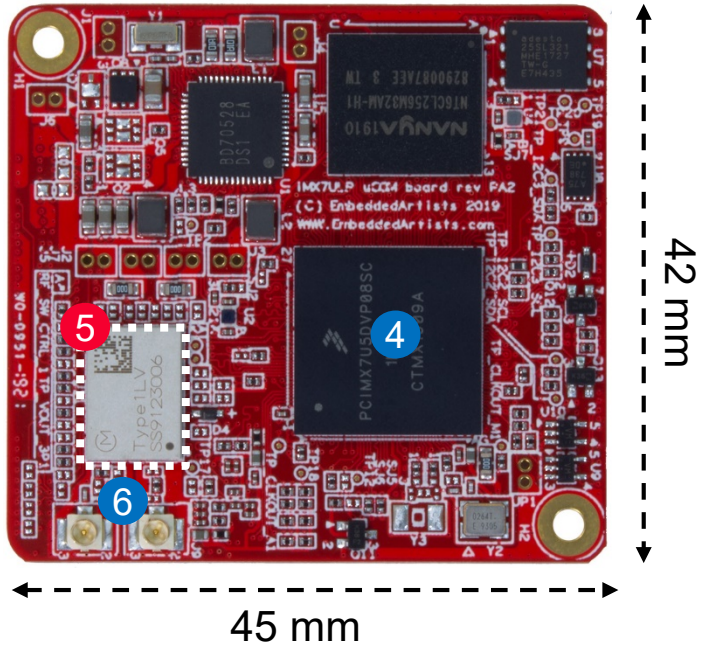
iMX8M Mini uCOM



1) NXP i.MX 8M Mini Processor
2) **Murata Type 1MW (CYW43455) Module**
3) U.FL Connector (WLAN/BT)

4) NXP i.MX 7ULP Processor
5) **Murata Type 1LV (CYW43012) Module**
6) U.FL Connectors (WLAN/BT + Optional BT Only)

iMX7ULP uCOM



i.MX: InterConnect Summary

NXP

Murata Module	CYW Chipset	RT 1020 1050 1060 1064	6UL	6ULL	6SL (WLAN Only)	6SLL	6SoloX	6DualLite/ 6Solo	6Quad (Plus)	8M Mini (WLAN only)	8M Quad
1DX	4343W	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2		
1MW	43455		uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2		
1LV	43012	uSD-M.2	uSD-M.2	uSD-M.2							
1CX	4356									M.2	M.2
1VA*	88359									M.2	M.2
1WZ*	88359		uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2		

Embedded Artists'

Murata Module/ EA M.2 EVB	CYW Chipset	RT 1052 RT 1062	6UL	6SoloX	6DualLite	6Quad	7Dual	8MQuad	8M Mini*	7ULP*
1DX / M.2	4343W	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2
1MW / M.2	43455		M.2	M.2	M.2	M.2	M.2	M.2	M.2 / uCom	M.2
1LV / M.2	43012	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2 / uCom
1CX / M.2	4356			M.2	M.2	M.2	M.2	M.2	M.2	
1VA*	88359			M.2	M.2	M.2	M.2	M.2	M.2	
1WZ*	88359		M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2

Solution Partners

SUPPORT PATH

Murata WiFi/BT on NXP i.MX

Primary Support	https://community.nxp.com/community/imx
WiFi/Bluetooth Q&A	https://community.cypress.com/community/linux
WiFi/Bluetooth Specific Queries | i.MX/Wireless Drill-down	email to: imxfaq@murata.com

***Murata Wi-Fi Forum (available Q3/2019)**
(Meanwhile, please email imxfaq@murata.com, to escalate priority postings on NXP or Cypress Community Forums)

Embedded Artists/ Murata Solution

Primary Support	https://www.embeddedartists.com/contact-us
WiFi/Bluetooth Q&A	https://community.cypress.com/community/linux
i.MX Specific Queries	https://community.nxp.com/community/imx
WiFi/Bluetooth Specific Queries | i.MX/Wireless Drill-down	email to: imxfaq@murata.com

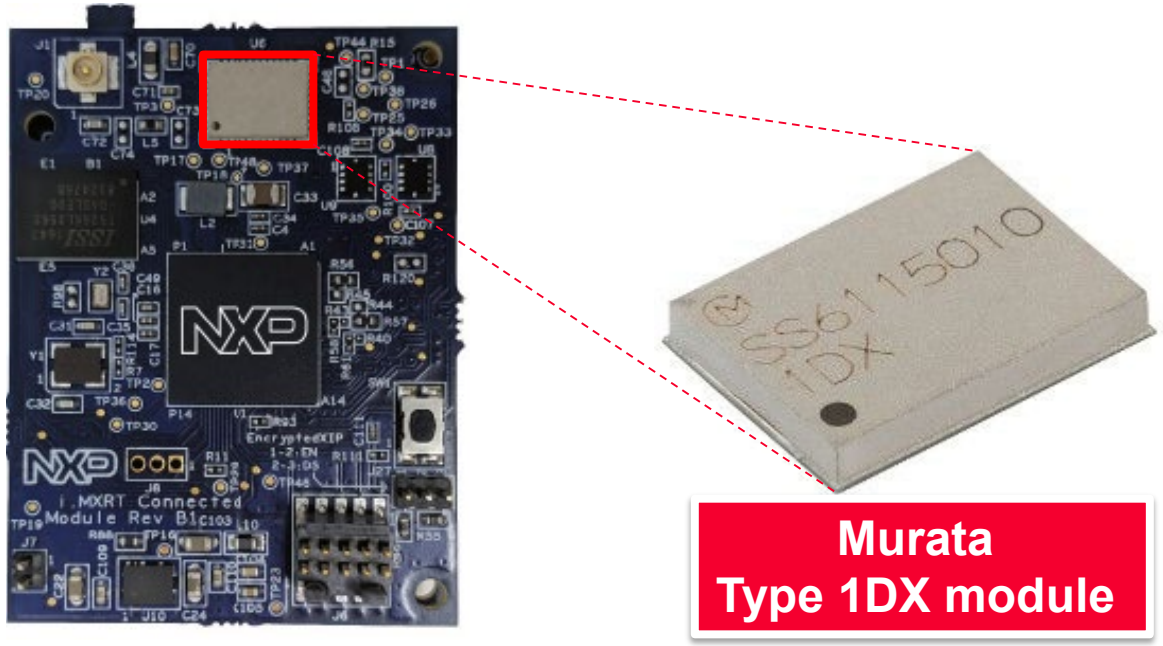
***Murata Wi-Fi Forum (available Q3/2019)**
(Meanwhile, please email imxfaq@murata.com, to escalate priority postings on NXP or Cypress Community Forums)

First MCU-based Solution Qualified for Amazon's Alexa Voice Service (AVS) launched by NXP

NXP i.MX RT MCU AVS Solution

MCU-based Solution for Alexa Voice Service

- First MCU-based AVS development kit
- Targets smart home for Alexa built-in
- Enables significantly lower cost
- Turnkey design shortens time-to-market
- Built-in with **Murata Type 1DX module**



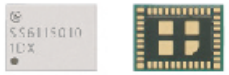
i.MX RT MCU Alexa Voice Service Solution: Circuit Diagram

muRata
INNOVATOR IN ELECTRONICS

Type 1DX

PN: LBEE5KL1DX-883

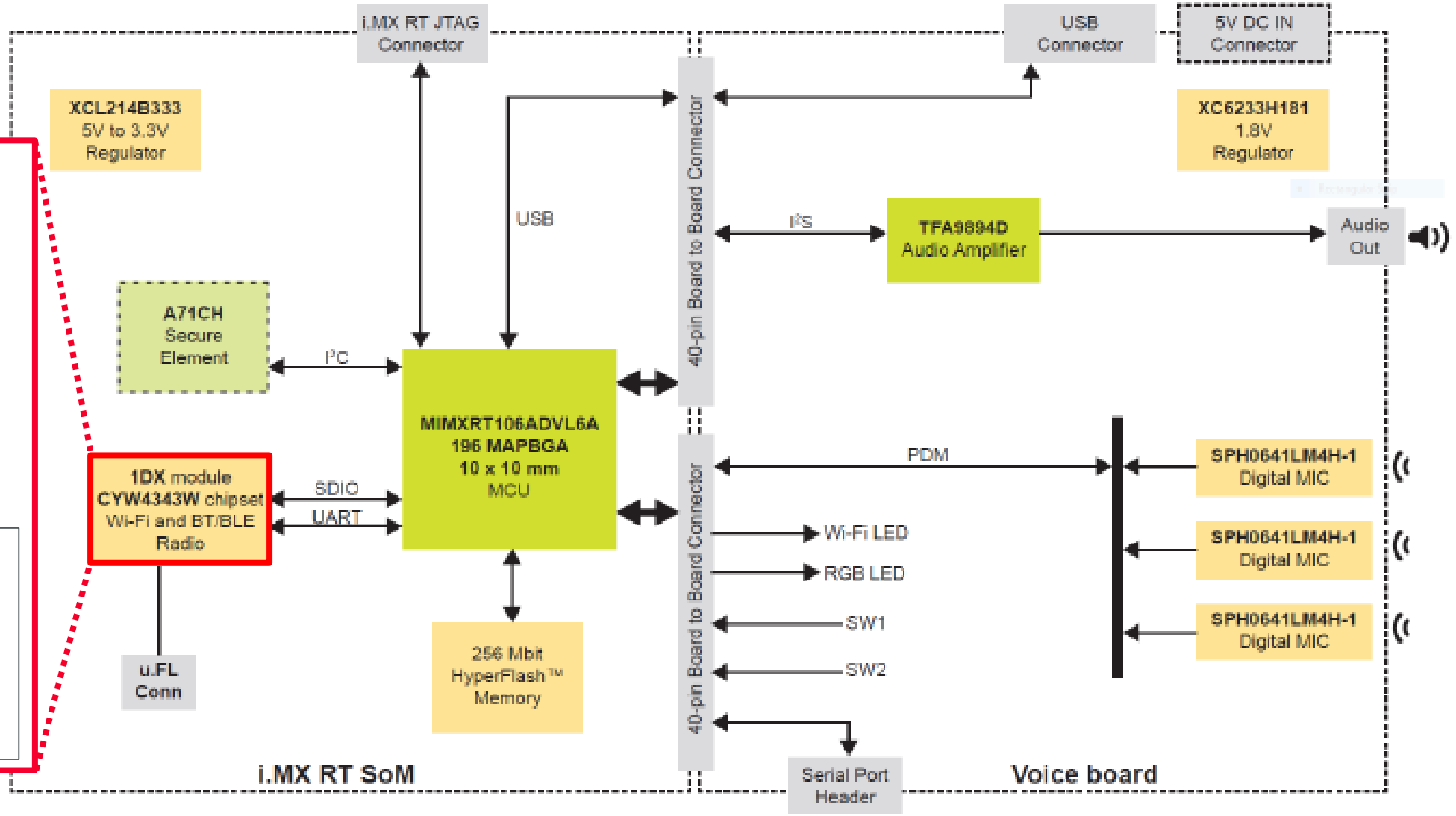
CYW4343W Chipset

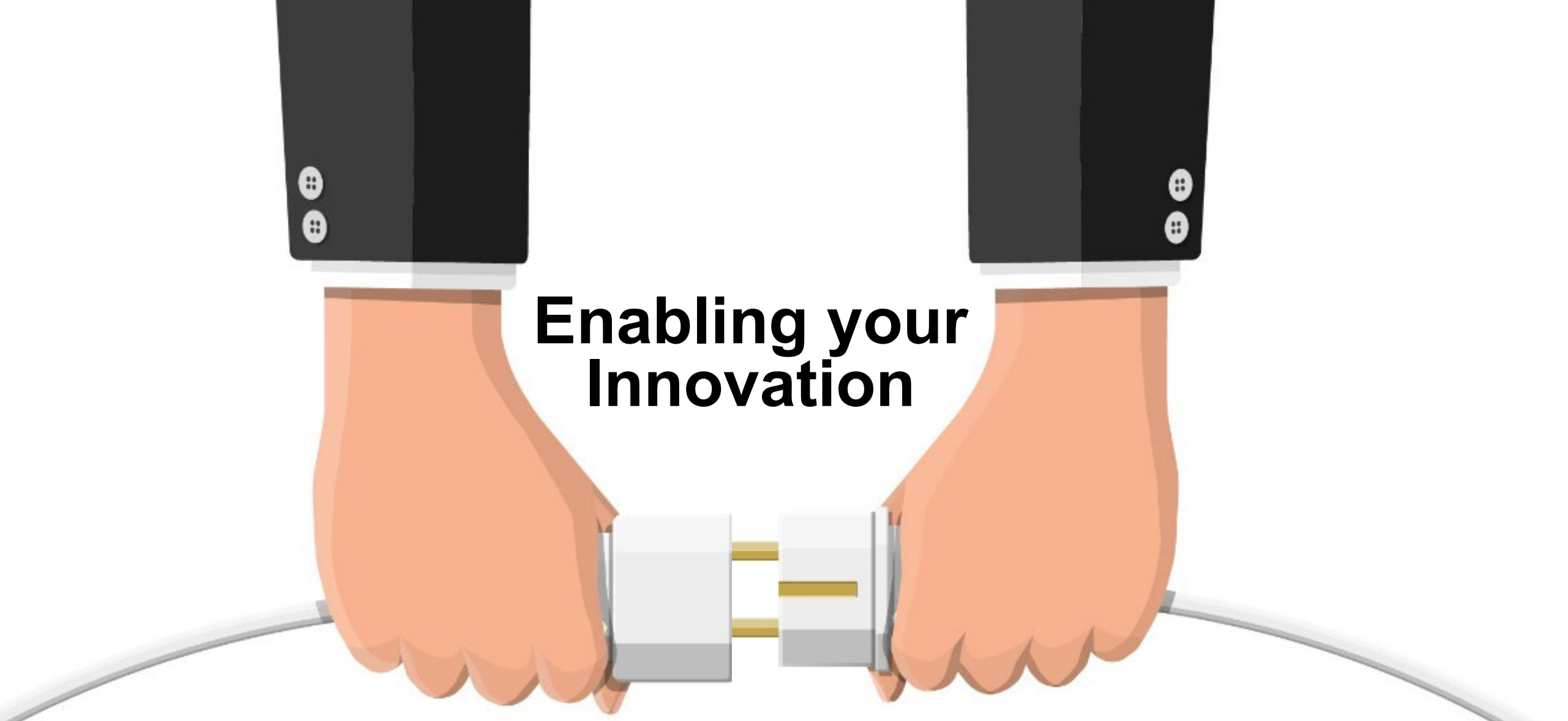


6.95 x 5.15 x 1.1mm

802.11 b/g/n + Bluetooth® 4.2

For
- Smart switches (lighting/shade/fan controls and smart plugs/outlets)
- Smart appliances
- Garage door openers
- Room A/C
- Thermostats
- Smoke detectors





Get Connected with Murata

To find out more about these evaluation kits, check out at our booth today. Thank you!

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