

NXP Technology Days

[Solution Seminar, 5 July 2019]

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

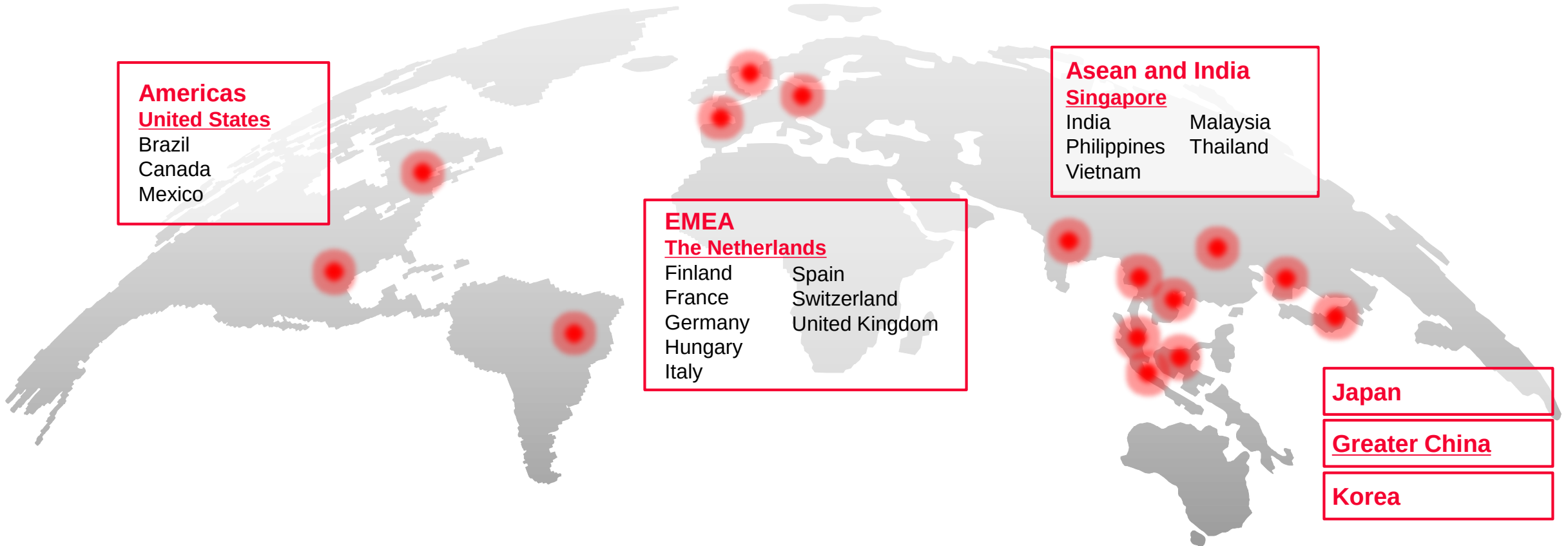
Gary Han

General Manager
Regional Product Marketing
(ASEAN, India & Oceania)

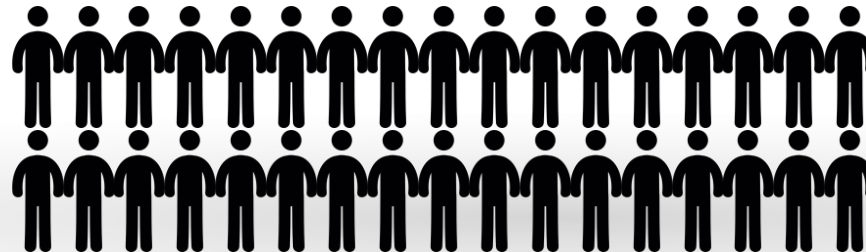
Murata Electronics Singapore



About Murata



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*

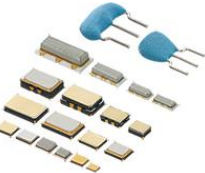
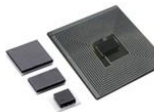
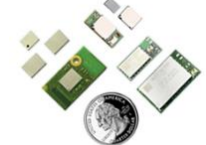
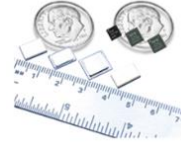
Our Products

- 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



Myanmar

- Yangon
- Mandalay
- Nay Pyitaw

Laos

- Vietianne

Thailand

- Bangkok
- Samut Prakan

Cambodia

- Pnohm Penh

Vietnam

- Hanoi
- Ho Chi Minh City
- Bien Hao
- Can Tho
- Danang

Philippines

- Manila
- Cebu City
- Davao
- Zamboanga

Malaysia

- Kuala Lumpur
- Johor Bahru

Indonesia

- Jakarta
- Bandar Lampung
- Batam
- Bogor
- Denpasar
- Makassar
- Malang
- Medan
- Padang
- Palembang
- Pekanbaru
- Samarinda
- Semarang
- Surabaya
- Tasik Malaya

Brunei

- Bandar Seri Bhagwan

○ 10 million residents ○ 5-10 million residents ● 1-5 million residents

Cambodia



Vietnam



Philippines



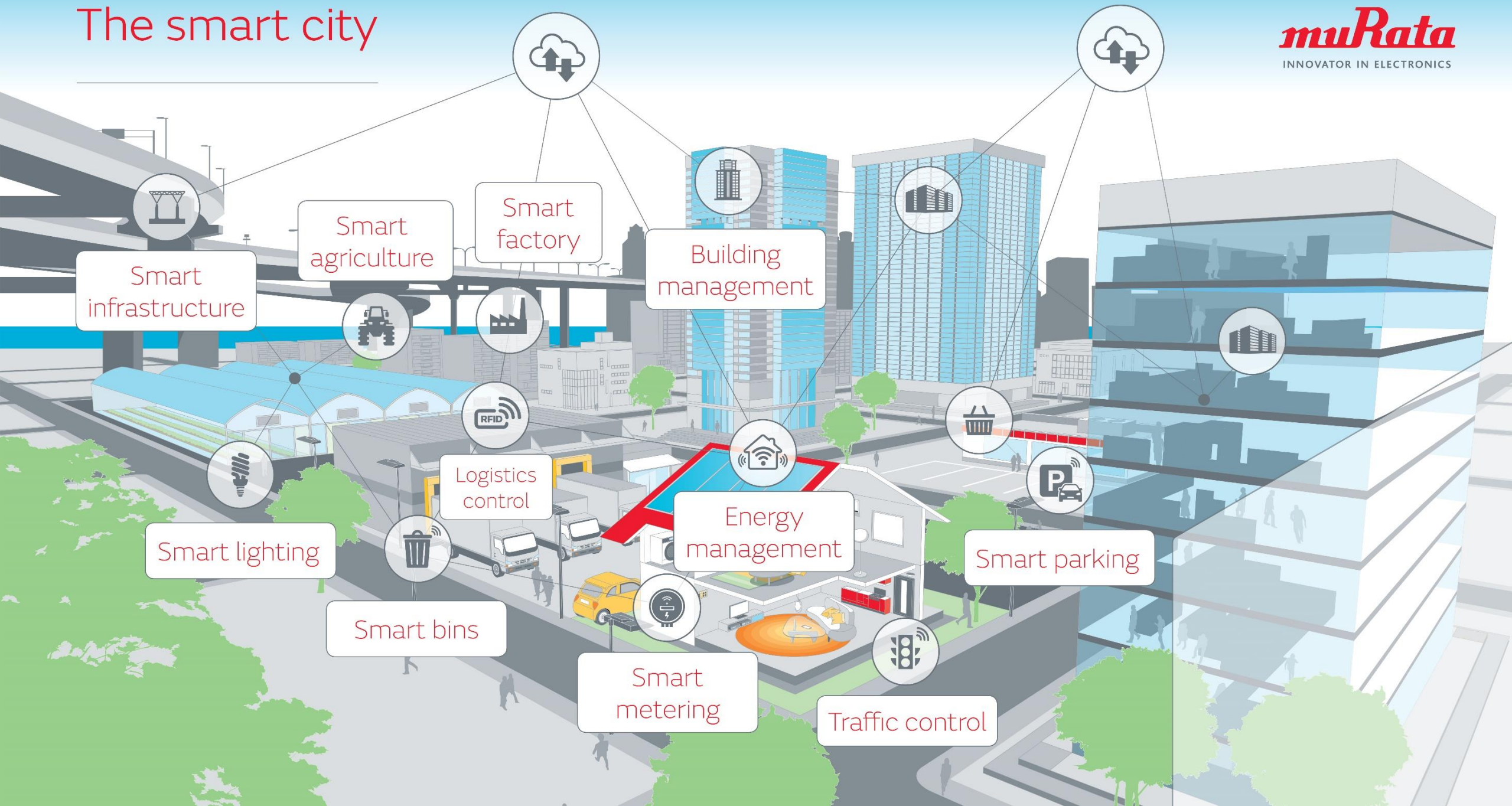
Singapore



Brunei

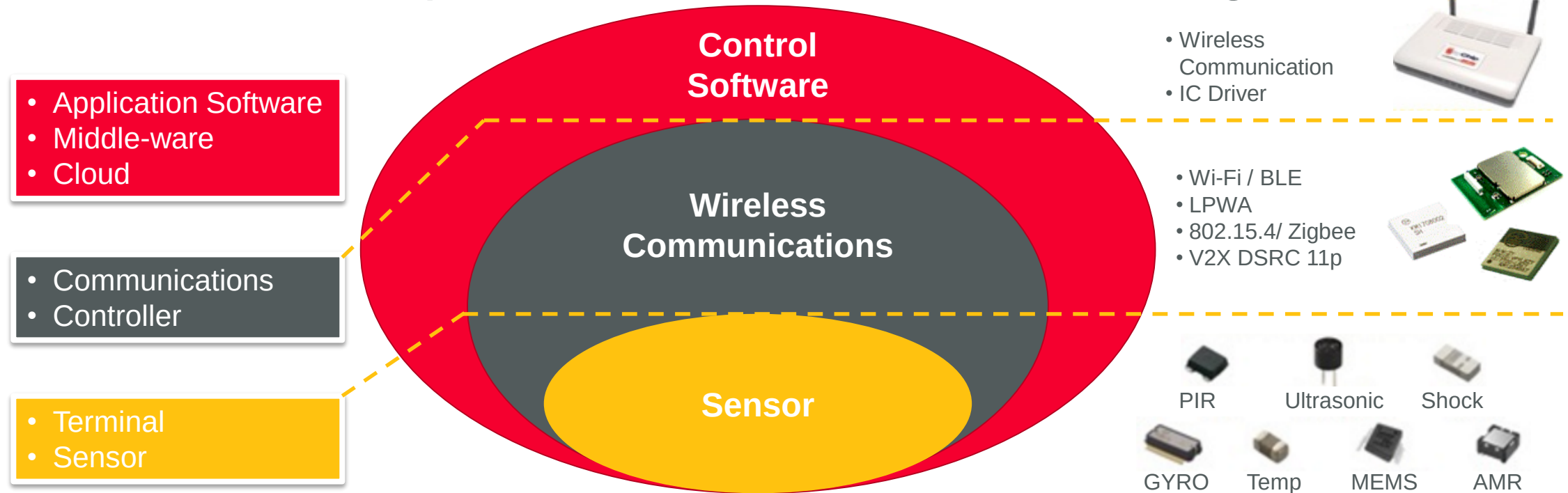


The smart city



Connectivity Solution for IoT

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



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

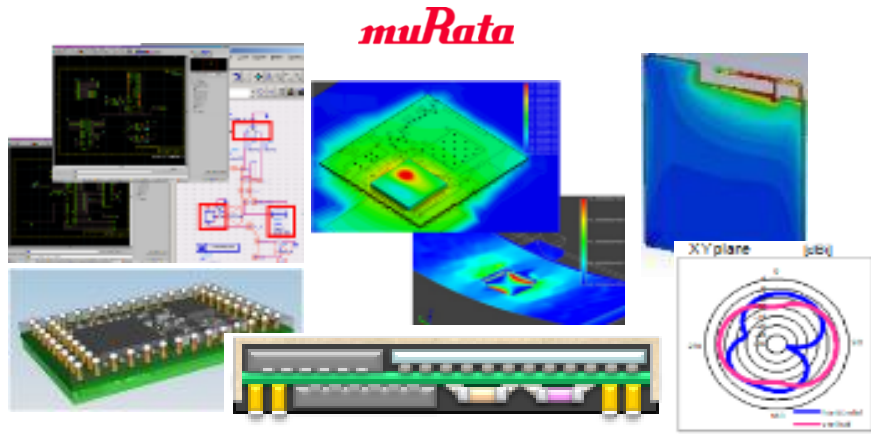
(Wi-Fi, Bluetooth, LPWA)

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

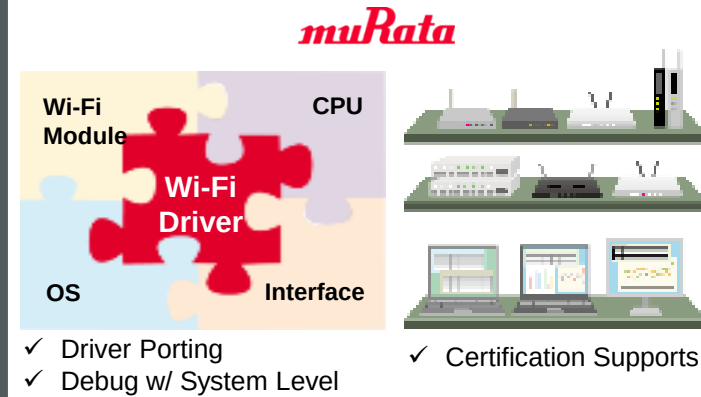


Why Murata?

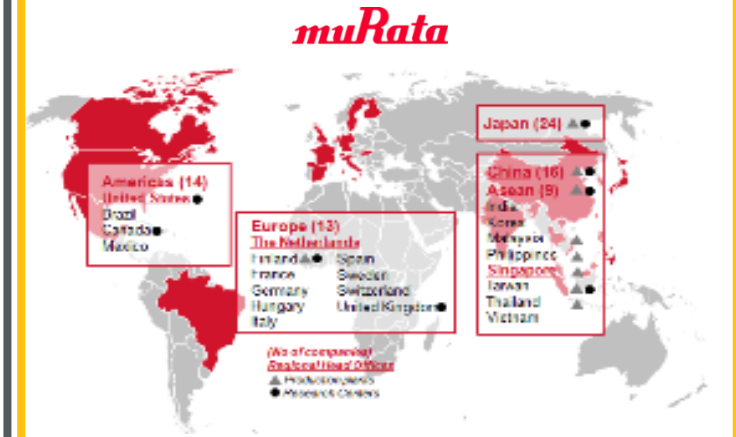
HW / RF Design



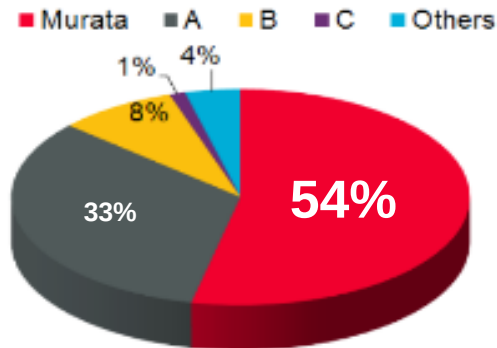
SW / Cert. Support



Global Network

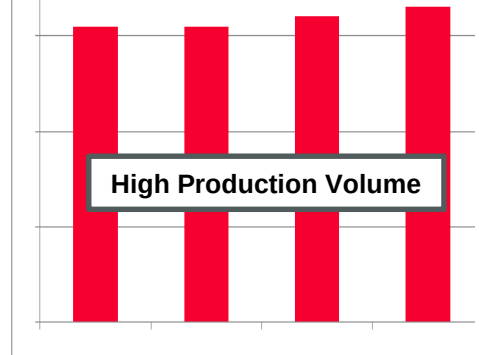


Connectivity Module Market Share (2017CY - mobile devices)



Market Share

Production Capacity (Murata Connectivity Modules)



Supply Capability (Flexible / Multi Factory locations)



Partnership

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



muRata

INNOVATOR IN ELECTRONICS



NXP



**Embedded
Artists**



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 Modules for i.MX

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

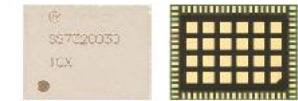


802.11 a/b/g/n/ac-friendly™
+ Bluetooth® 5.0

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

Wi-Fi / Bluetooth M.2 Modules



1DX M.2



1MW M.2



1LV M.2



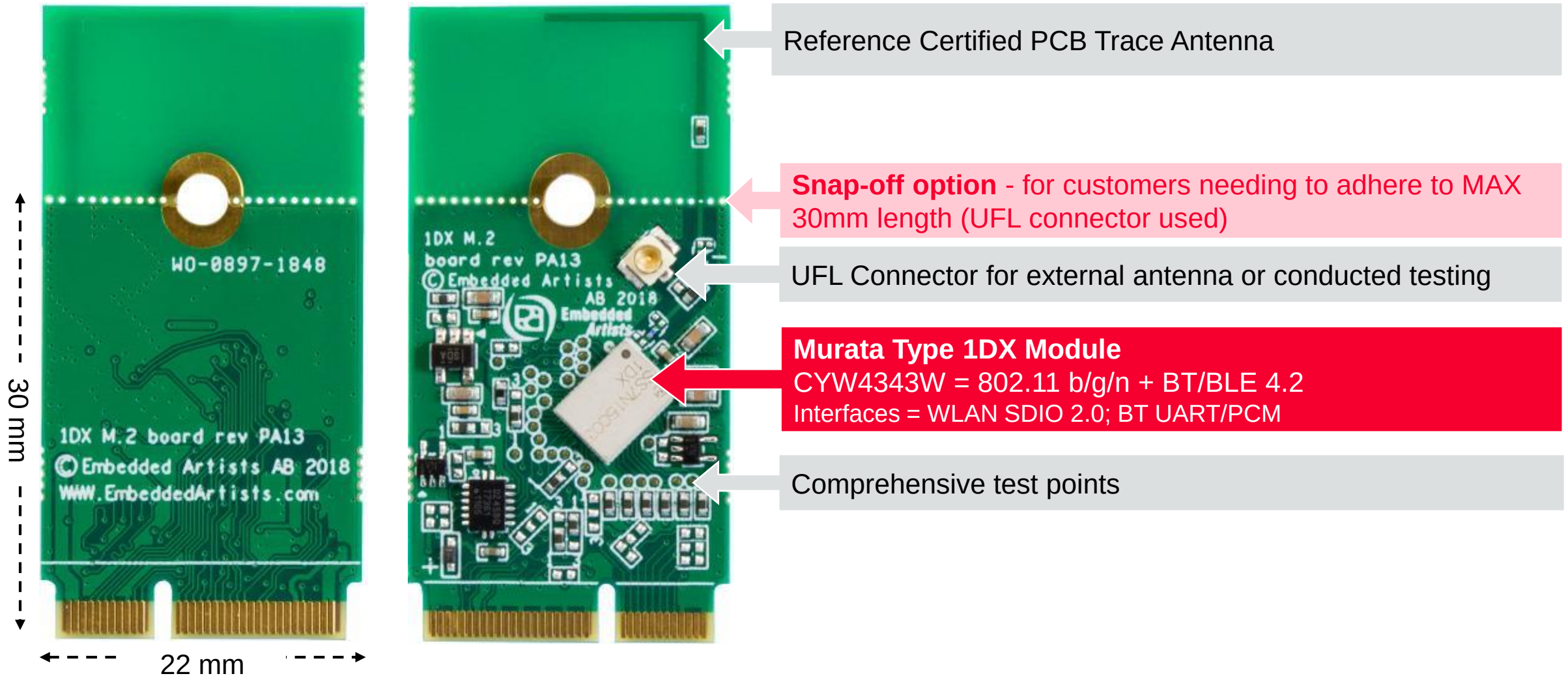
1CX M.2



1VA M.2

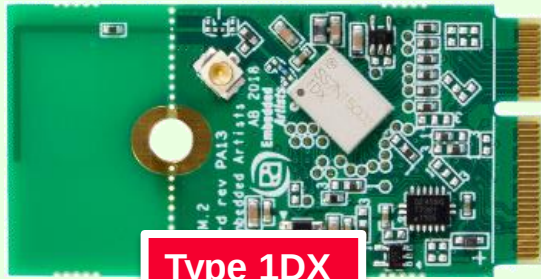
Chipset (Cypress)	CYW4343W	CYW43455	CYW43012	CYW4356	CYW88359
WLAN standards	802.11 b/g/n	802.11 a/b/g/n/ac	802.11 a/b/g/n 802.11 ac-friendly™	802.11 a/b/g/n/ac (2x2 MIMO)	802.11 a/b/g/n/ac (2x2 MIMO, RSDB)
WLAN Interface	SDIO 2.0 (SDR25@50MHz)	SDIO 3.0 (SDR104@200MHz)	SDIO 3.0 (SDR40@80MHz)	PCIe	PCIe 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



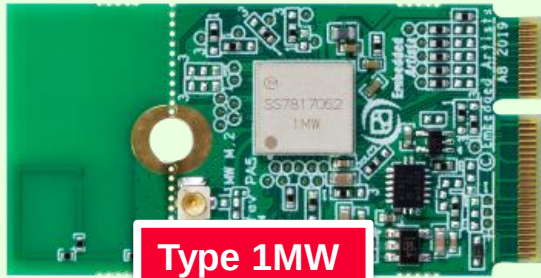
Type 1DX / 1MW / 1LV Options

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



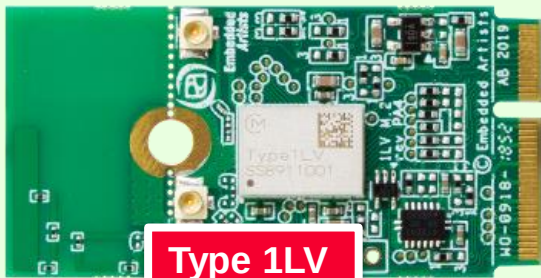
Customer needing specific antenna solution

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



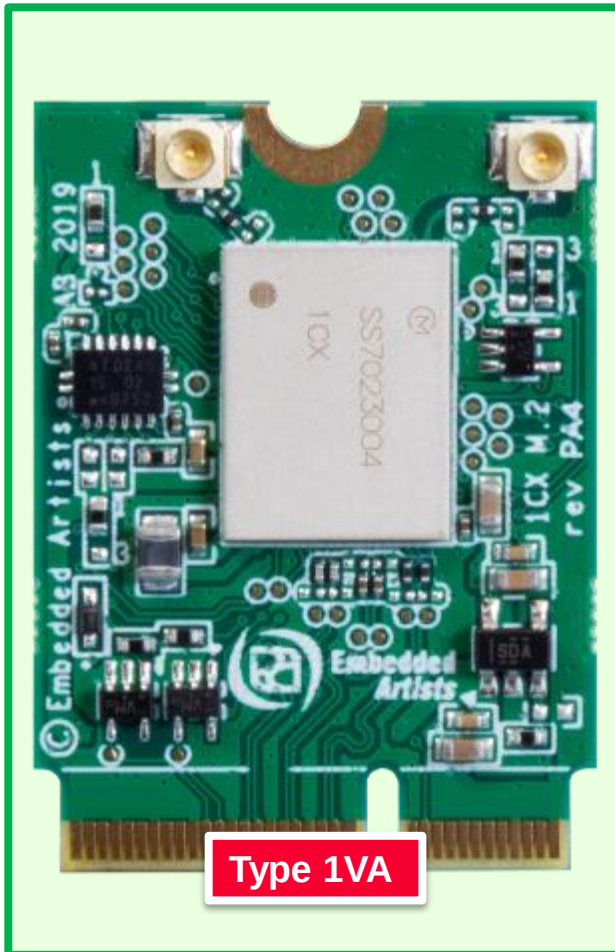
Customer with M.2 compatible form factor

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**



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

NOTE: 1CX is pictured for illustrative purposes.

Murata Module		RT 1020/50/ 1060/64	RT106A	6UL (L/Z)	6SL(L) (WLAN Only)	6SoloX	6QP/Q/ DL/Solo	7Solo	7ULP	8MQuad	8M Mini	8QXP
Driver Type		RTOS		Linux								
1DX	CYW4343W Chipset  6.95 x 5.15 x 1.1mm FC CE © 802.11 b/g/n + Bluetooth® 4.2	uSD-M.2	SOLN	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	WaRP7	EVK	-	-	-
	CYW43455 Chipset  7.9 x 7.3 x 1.1mm FC CE © 802.11 a/b/g/n/ac + Bluetooth® 5.0	uSD-M.2	-	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	-	-	-	EVK	-
	CYW43012 Chipset  10.0 x 7.2 x 1.4mm FC CE © 802.11 a/b/g/n/ac-friendly™ + Bluetooth® 5.0	uSD-M.2	-	uSD-M.2	uSD-M.2	-	-	-	-	-	-	-
	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	-	-	-	-	-	-	-	-	EVK	 M.2	 M.2

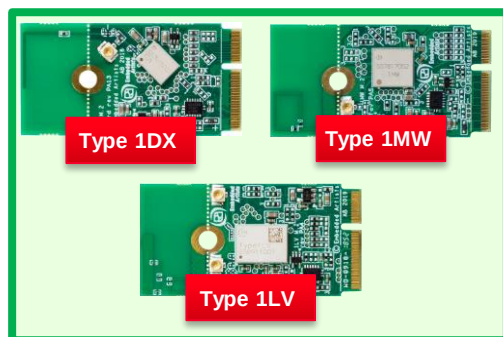
M.2 = Only EA M.2 EVB required;

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

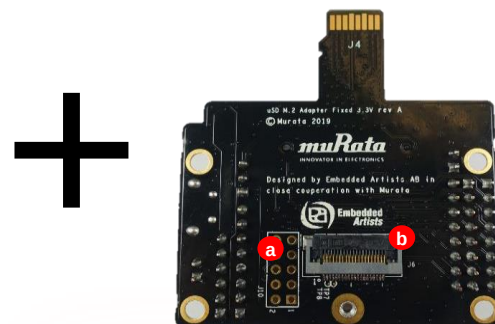
- All i.MX 6 have MAX SDIO Clock Frequency of 50 MHz.

**Please contact Murata for software*

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



Murata uSD-M.2 Adapter Kit

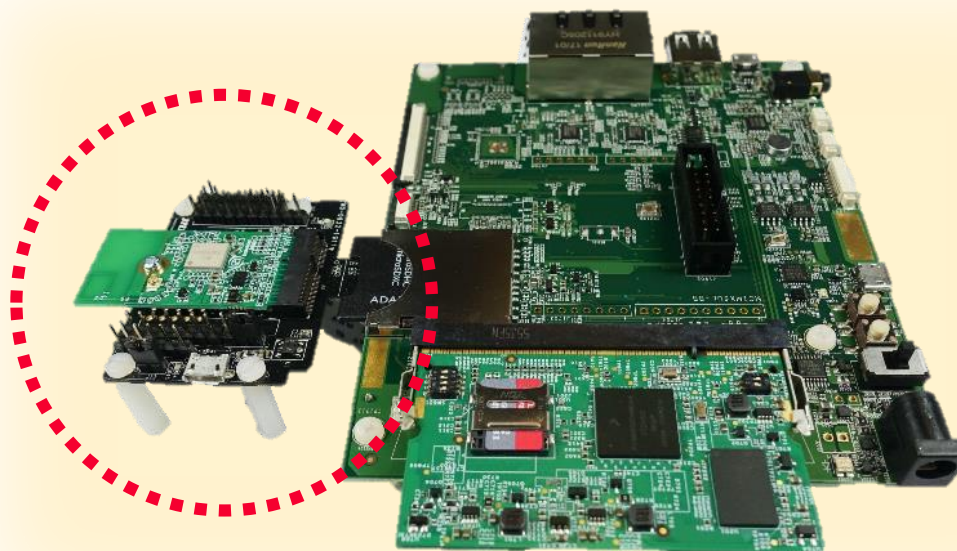


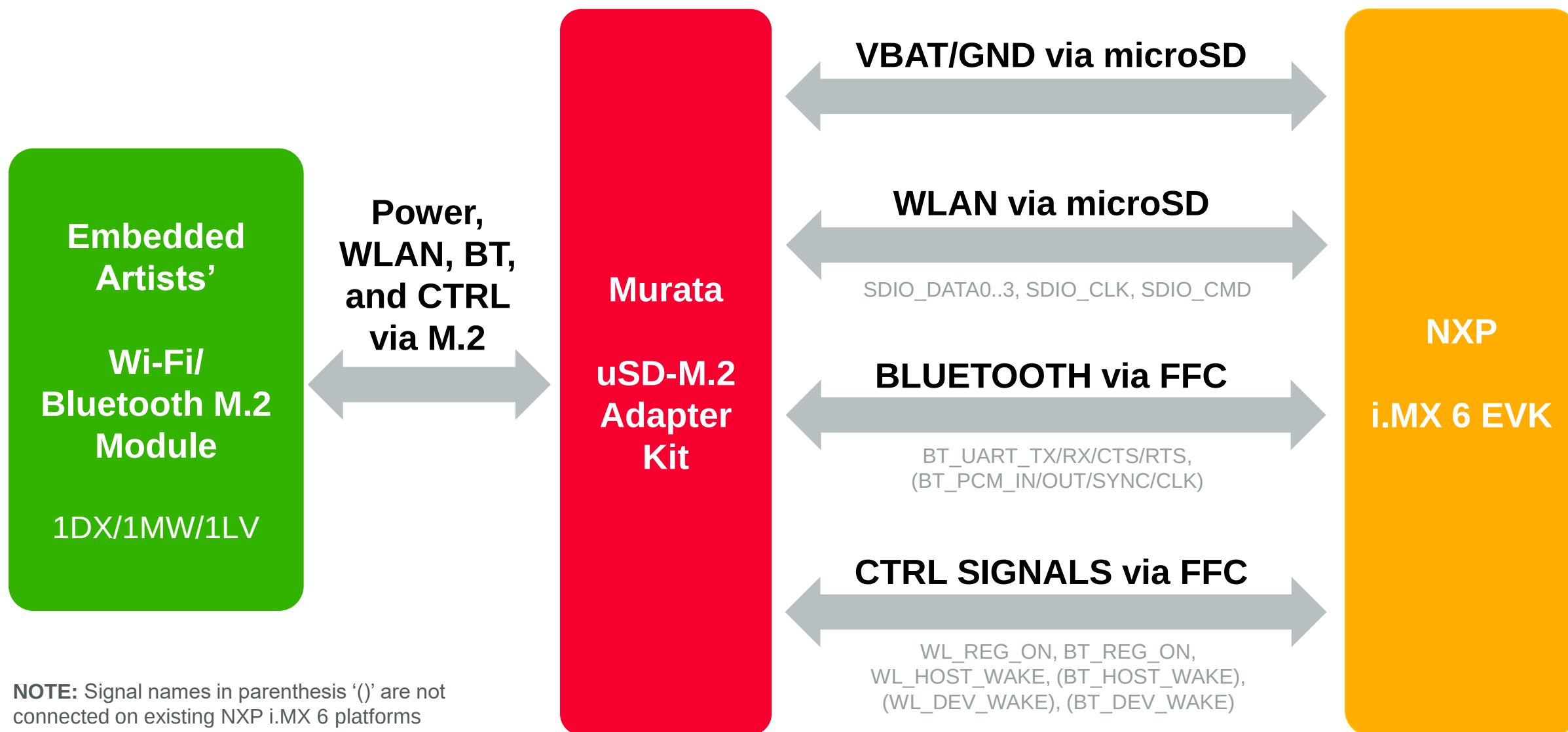
- a) J10
b) J6 = 20-pin ribbon cable
is necessary for
connecting to NXP
platform - this is
equivalent to previous V2
Adapter (with Samtec)

NXP i.MX 6UL EVK



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







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*

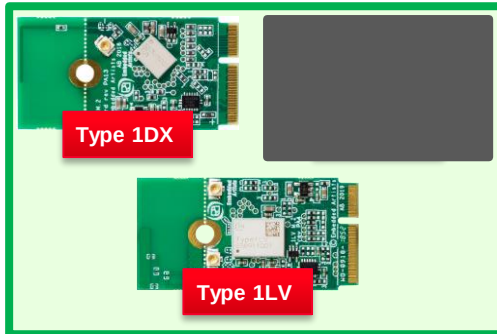


i.MX 6UL EVK + uSD-M.2
Adapter + 1LV M.2 EVB

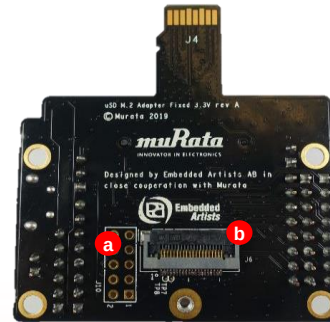
NXP i.MX 6	Type 1DX (Murata)	Type 1MW (Murata)	Type 1LV (Murata)
6UL/ ULL/ (ULZ)	Y	Y	Y
6SL/ SLL	Y*	Y*	-
6SX	Y	Y	-
6DL/ Q/ QP	Y	Y	-

- 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

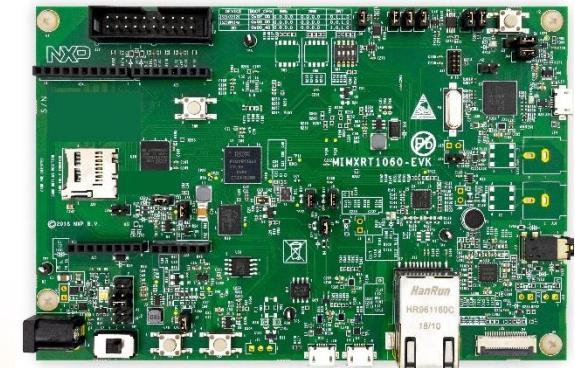


Murata uSD-M.2 Adapter Kit

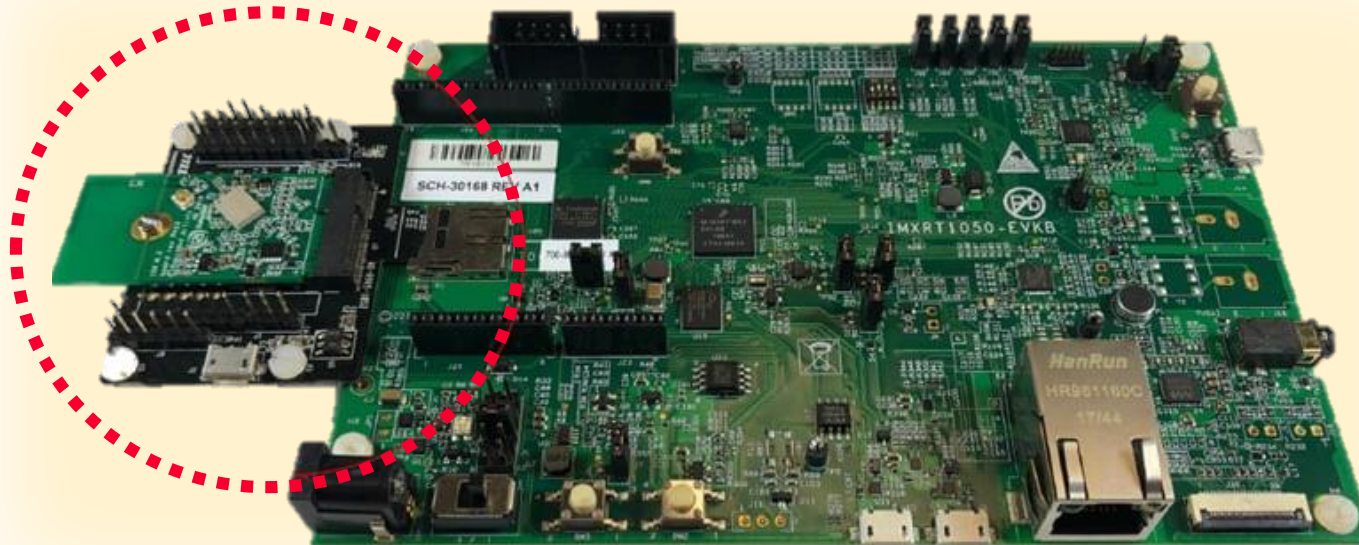


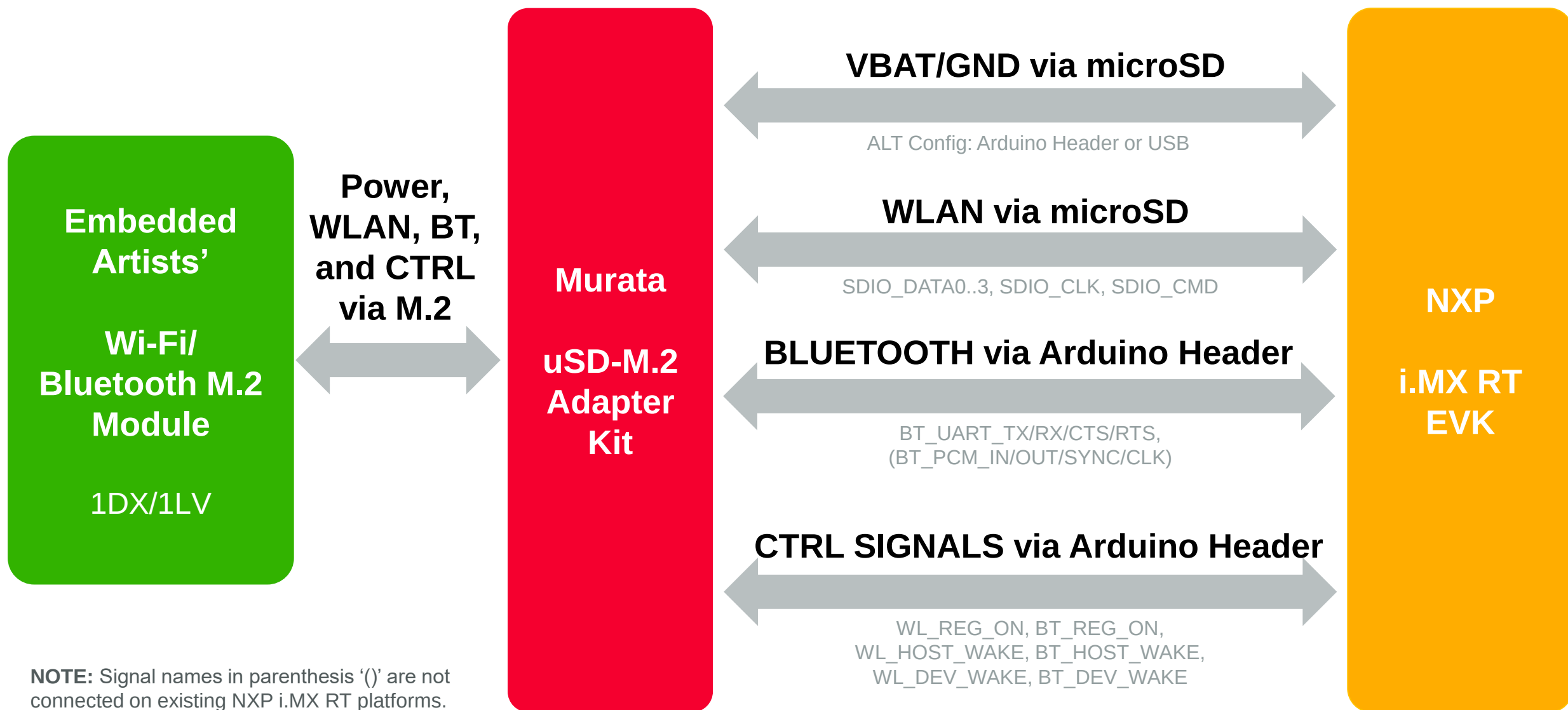
- a) J10
b) J6 = 20-pin ribbon cable is necessary for connecting to NXP platform - this is equivalent to previous V2 Adapter (with Samtec)

NXP i.MX RT EVK



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





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

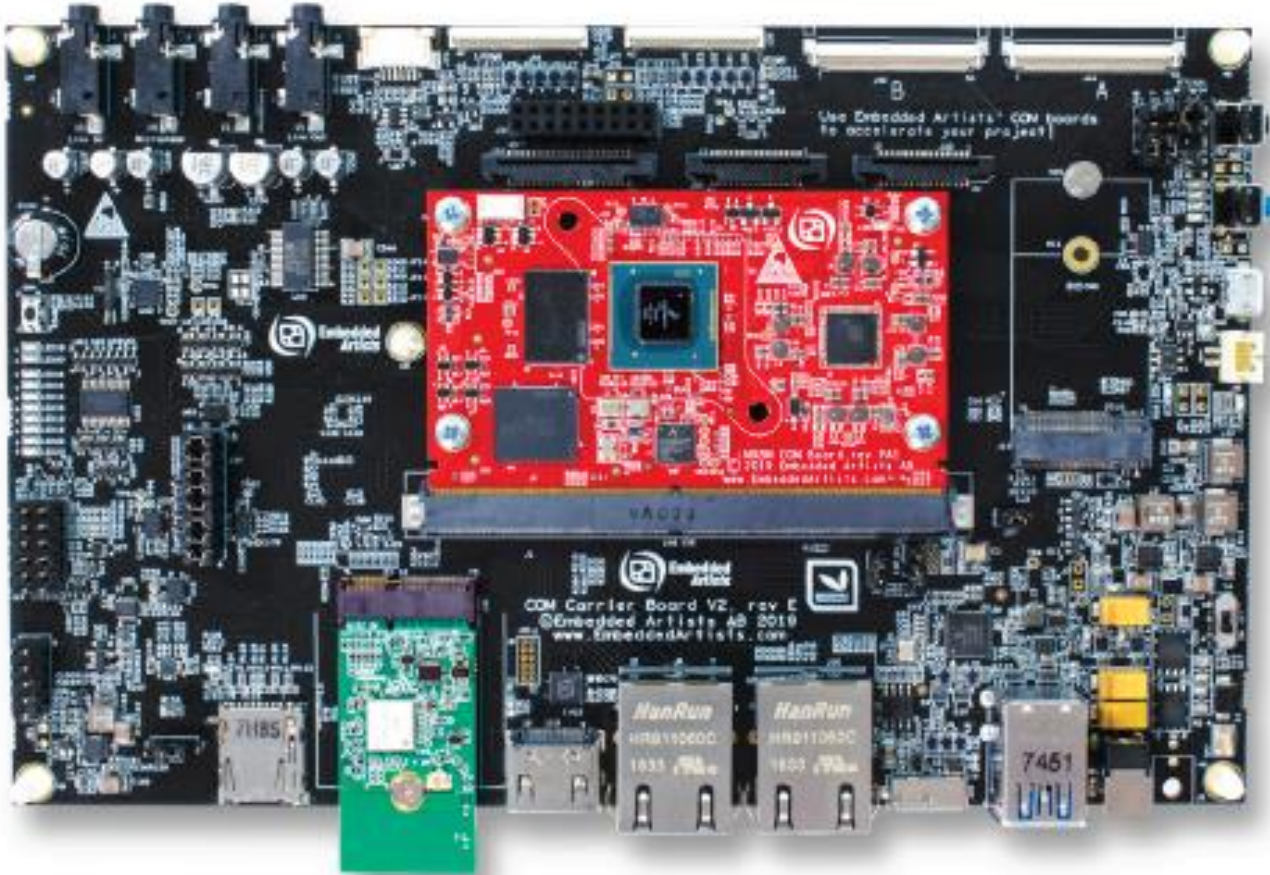
Murata Module	CYW Chipset	RT 1052 RT 1062	6UL	6SoloX	6DualLite	6Quad	7Dual	7ULP*	8MQuad	8M Mini/ Nano*
1DX	4343W	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2
1MW	43455	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2/ uCOM
1LV	43012	M.2	M.2	M.2	M.2	M.2	M.2	M.2/ uCOM	M.2	M.2
1CX	4356	-	-	M.2	M.2	M.2	M.2	-	M.2	M.2

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 Q4/2019.

i.MX8M Quad Dev Kit V2 + Type 1MW



i.MX RT1062 Dev Kit + Type 1DX

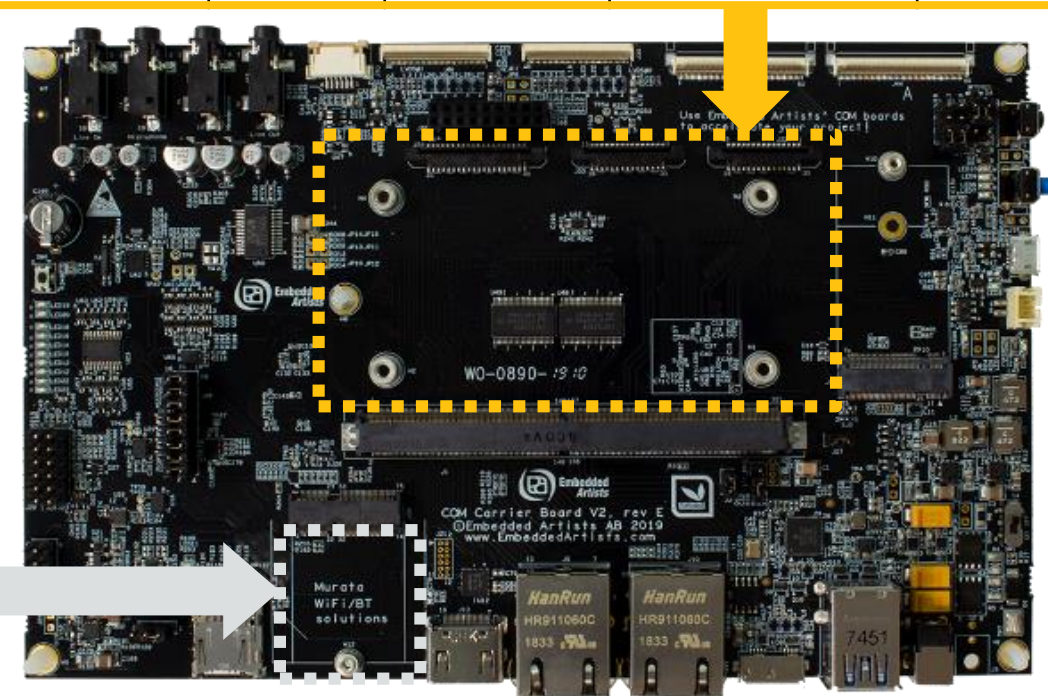


Combine i.MX (u)COM with Wi-Fi/ Bluetooth M.2 EVB

								
6Quad COM	6Dual COM	6SoloX COM	6UL COM	7Dual COM	7Dual uCOM*	7ULP uCOM*	8MQuad COM	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
				<i>Avail Q3/2019</i>



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

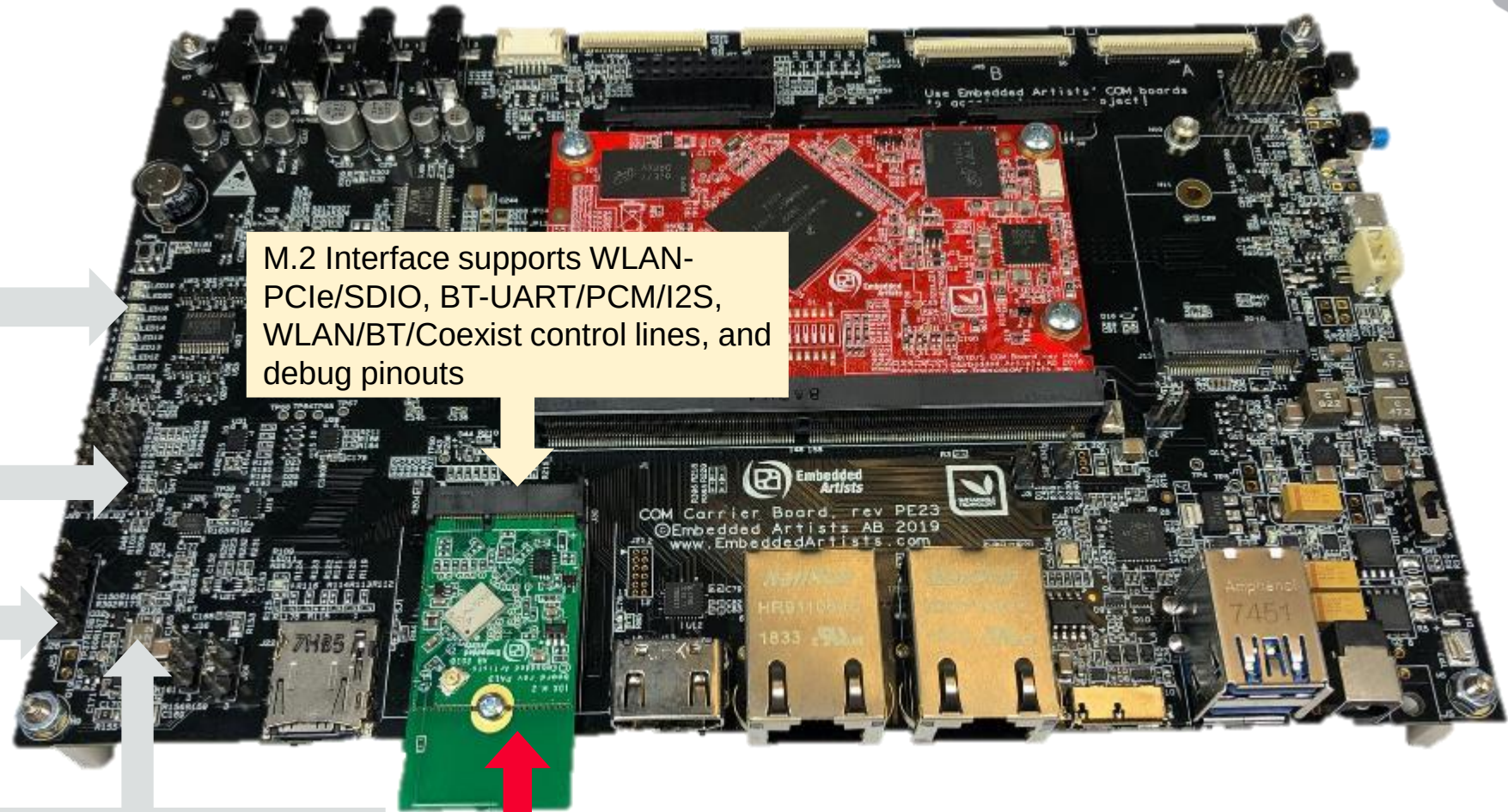
BT-UART and WLAN/BT TX/RX
Debug UART pinout: use
FTDI TTL-232R USB-to-UART Cable

JTAG/EXT COEX

VBAT/VDDIO Jumpers: allow
precise power (voltage/current)
measurement

M.2 Interface supports WLAN-
PCIe/SDIO, BT-UART/PCM/I2S,
WLAN/BT/Coexist control lines, and
debug pinouts

**Type 1DX M.2
EVB**



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
		



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

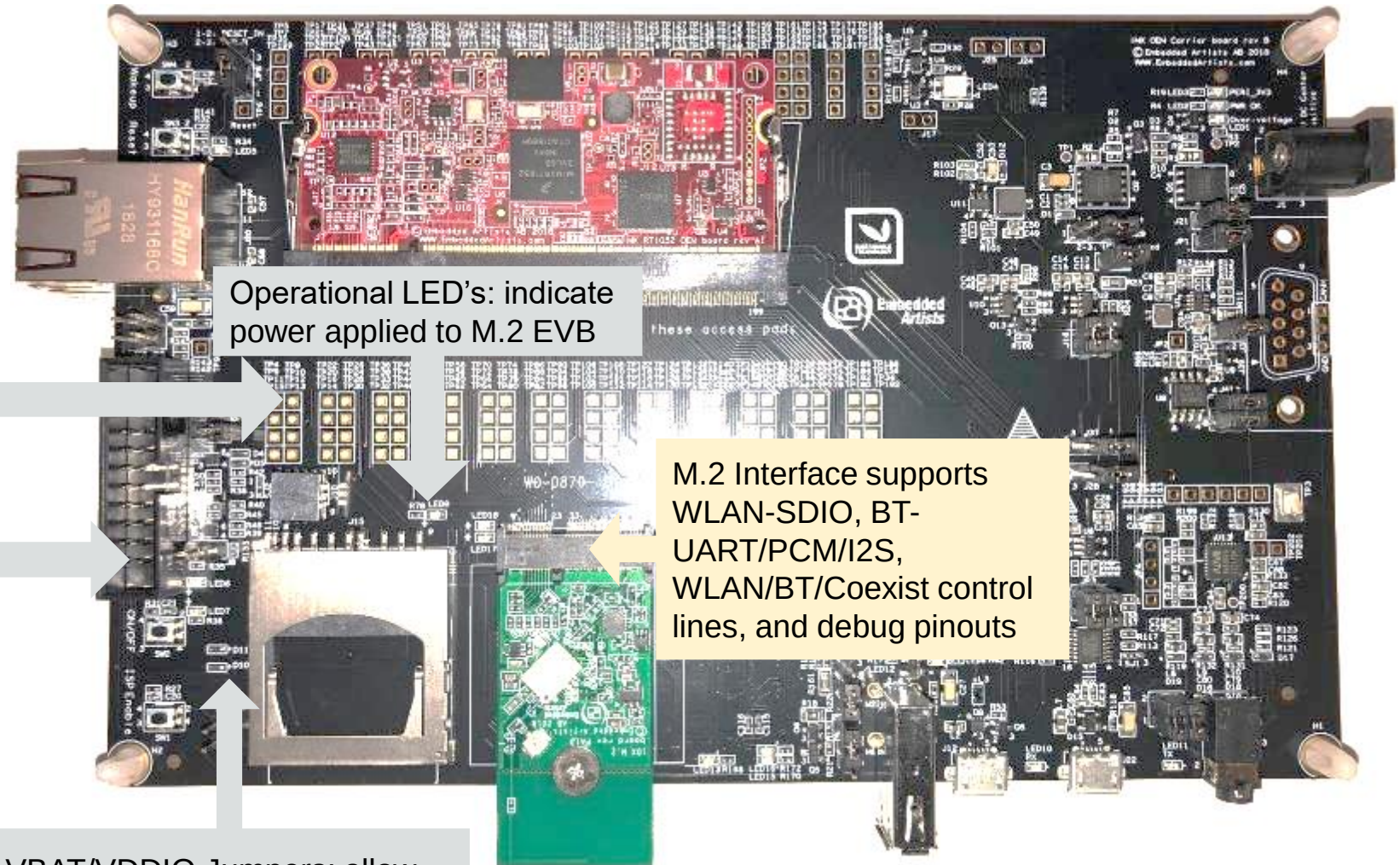
Debug Connections include:

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

Operational LED's: indicate power applied to M.2 EVB

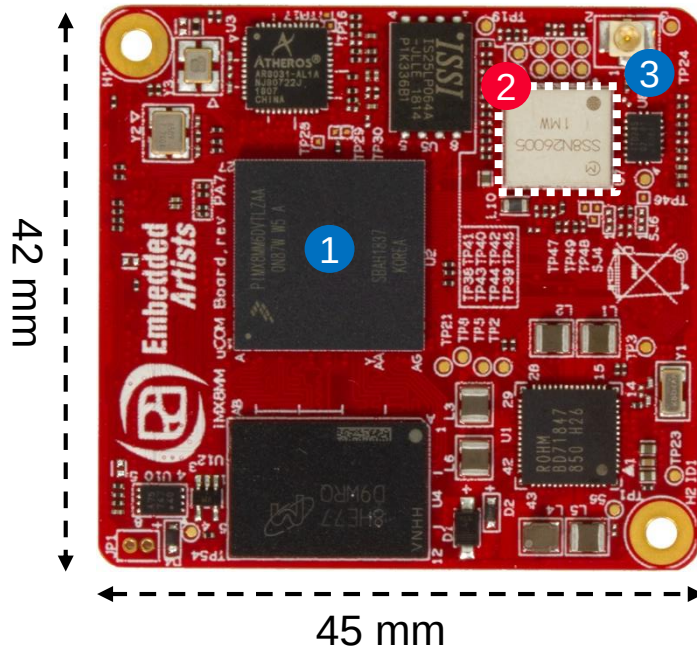
M.2 Interface supports WLAN-SDIO, BT-UART/PCM/I2S, WLAN/BT/Coexist control lines, and debug pinouts

VBAT/VDDIO Jumpers: allow precise power (voltage/current) measurement



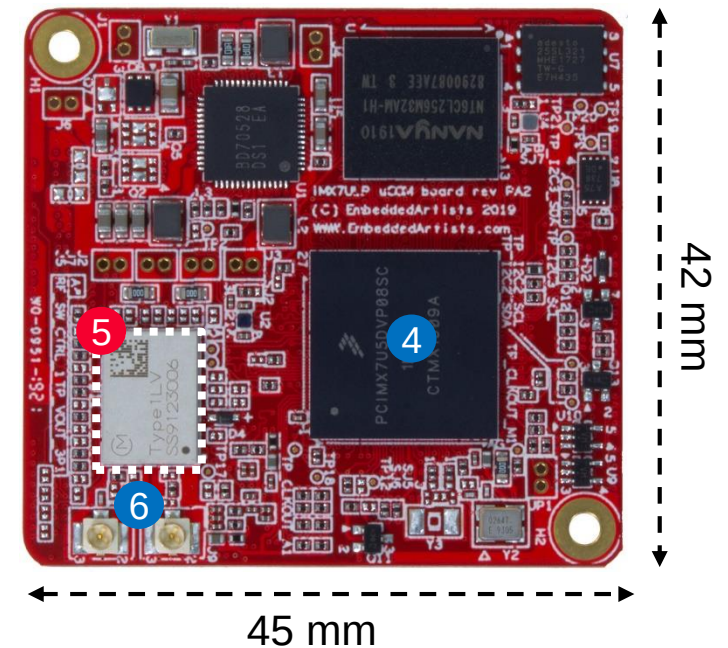
- Compact, highly-integrated i.MX MPU solution with Murata wireless module on-board
- Embedded Artists' Developer Kits are shipped with Murata module de-populated; allowing users to test with Wi-Fi/BT M.2 EVB options

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



NPX

Murata Module		RT 1020/50/ 1060/64	RT106A	6UL (L/Z)	6SL(L) (WLAN Only)	6SoloX	6QP/Q/ DL/Solo	7Solo	7ULP	8MQuad	8M Mini	8QXP
Driver Type		RTOS		Linux								
1DX	CYW4343W Chipset  6.95 x 5.15 x 1.1mm FCC CE RoHS 802.11 b/g/n + Bluetooth® 4.2	uSD-M.2	SOLN	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	WaRP7	EVK	-	-	-
1MW	CYW43455 Chipset  7.9 x 7.3 x 1.1mm FCC CE RoHS 802.11 a/b/g/n/ac + Bluetooth® 5.0	uSD-M.2	-	uSD-M.2	uSD-M.2	uSD-M.2	uSD-M.2	-	-	-	EVK	-
1LV	CYW43012 Chipset  10.0 x 7.2 x 1.4mm FCC CE RoHS 802.11 a/b/g/n/ac-friendly™ + Bluetooth® 5.0	uSD-M.2	-	uSD-M.2	uSD-M.2	-	-	-	-	-	-	-
1CX	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	-	-	-	-	-	-	-	-	EVK	 M.2	 M.2

i.MX: InterConnect Summary

Embedded Artists'

Murata Module	CYW Chipset	RT 1052 RT 1062	6UL	6SoloX	6DualLite	6Quad	7Dual	7ULP*	8MQuad	8M Mini/ Nano*
1DX	4343W	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2
1MW	43455	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2	M.2/ uCOM
1LV	43012	M.2	M.2	M.2	M.2	M.2	M.2	M.2/ uCOM	M.2	M.2
1CX	4356	-	-	M.2	M.2	M.2	M.2	-	M.2	M.2



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

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

NXP i.MX RT MCU AVS Solution

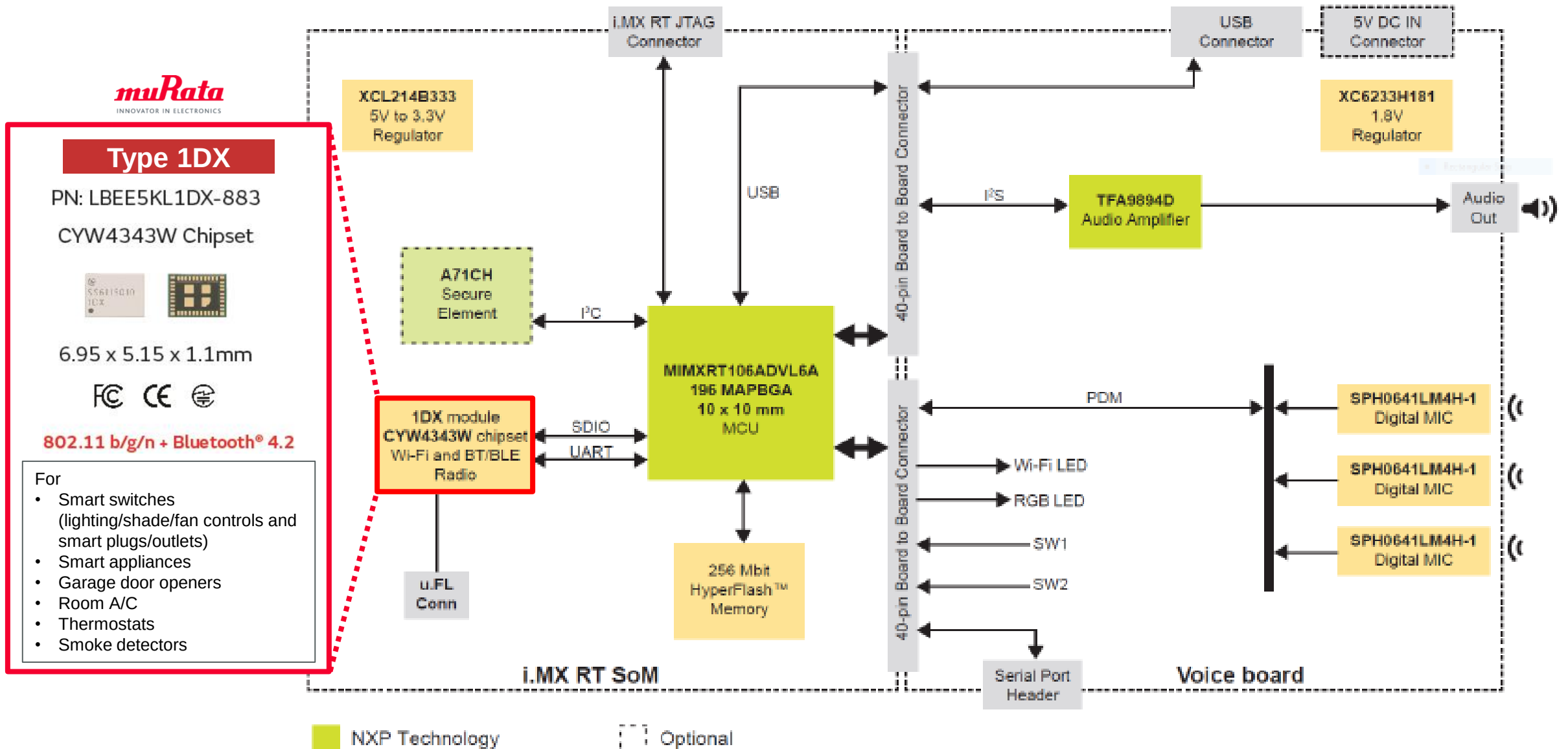
MCU-based Solution for Alexa Voice Service

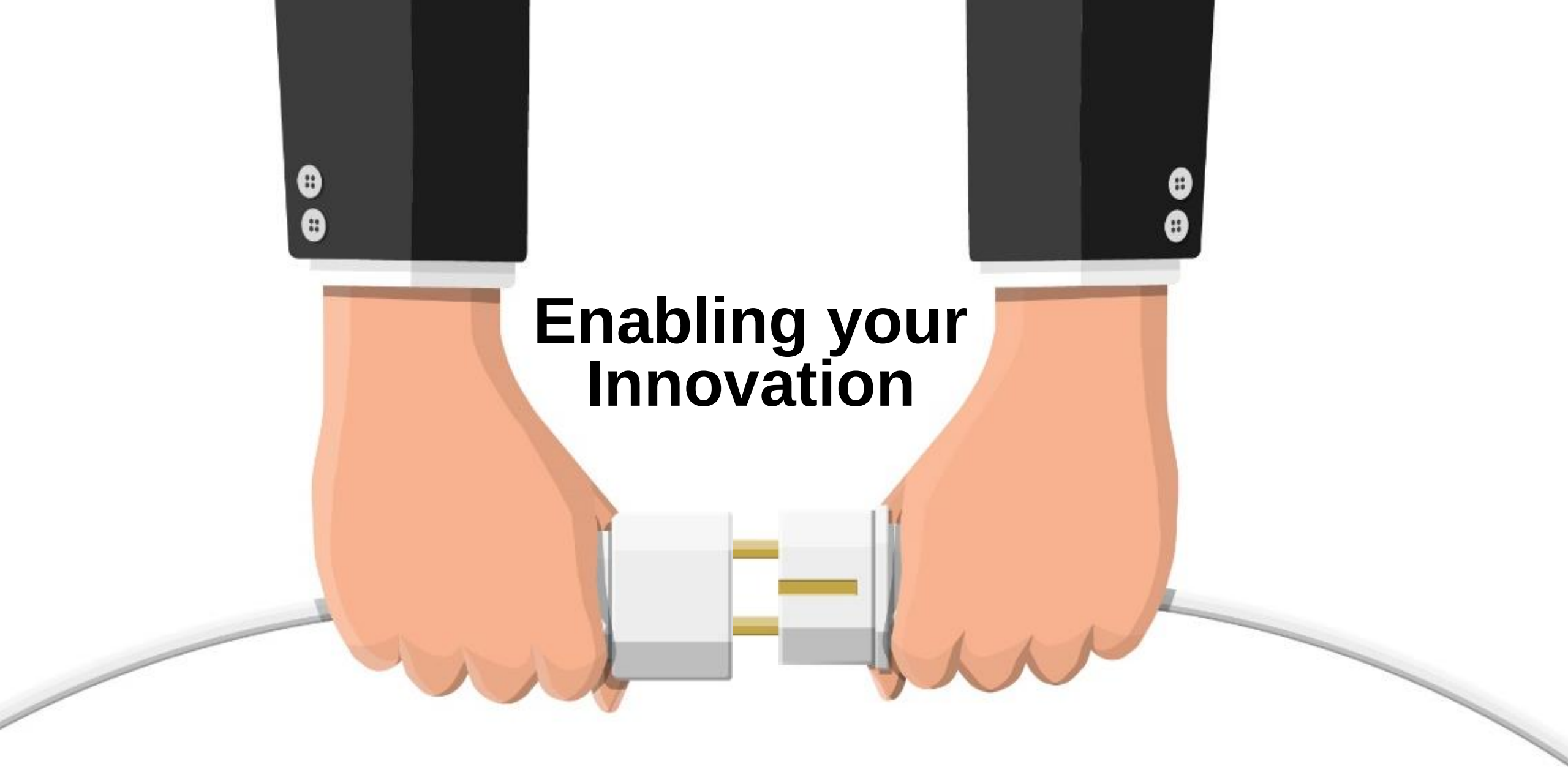
- First MCU-based AVS development kit
- Targets smart home for Alexa built-in
- Enables significantly lower cost
- Turnkey design shortens time-to-market
- Built-in with **Murata Type 1DX module**



**Murata
Type 1DX module**

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



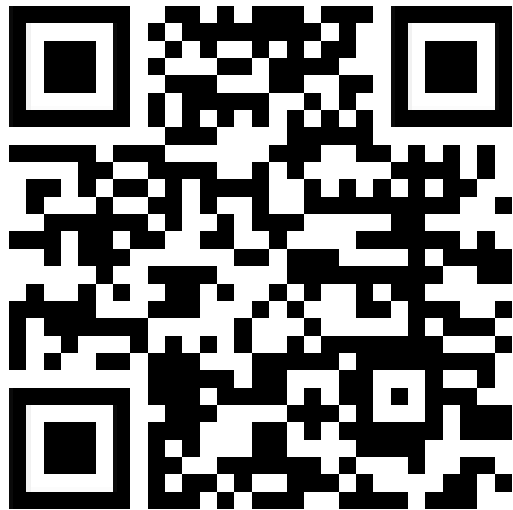


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check out at our booth today. Thank you!

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