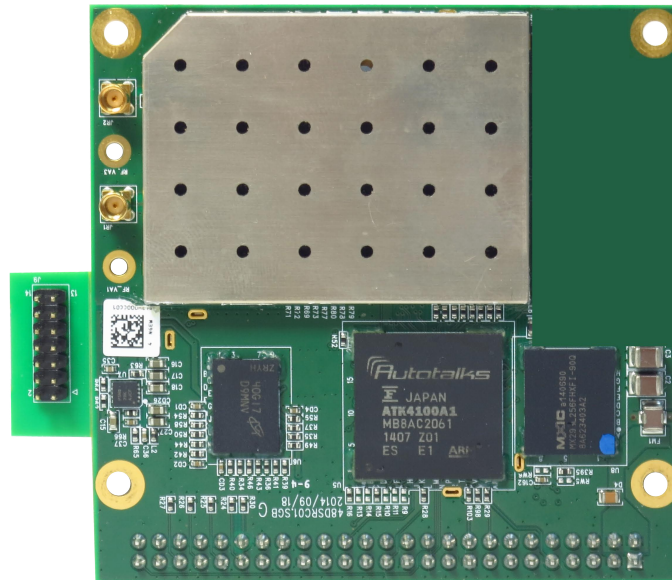




# VTX-201 Specification

DSRC V2X Subsystem Module, Autotalks® Craton/Pluton



## Overview:

An automotive-grade DSRC subsystem in 50-pin header module designed to seed V2X innovations, the VTX-201 provides flexible migration path on V2X system integration with different carrier boards, no impact on the software/services provided on the subsystem and ensure the same superior DSRC RF performance.

Modular architecture design concept to seed V2X innovations, Unex provides generic off-the-shelf hardware and software modules to enable V2X OBU, V2X RSU, V2X Sensor Fusion ECU applications to meet new business dynamic on-time:

1. PCB-201: GNSS/HSM carrier board for VTX-201
2. HVP-201: i.MX 6/Cellular/GNSS/HSM main board for VTX-201
3. VPS-201x: V2X protocol stack license
4. VAS-201x: V2X application service
5. VVT-201x: diagnostic firmware in field deployment

## Features:

### Subsystem:

- » System on module design of Autotalks® Craton 3-CPU core communication processor, Pluton RF transceiver, 128MB DDR3, and 32MB NOR enables V2X software applications on internal system, no external CPU required.
- » Automotive-grade -40°C ~ +85°C components and 50-pin header design secure environmental reliability.
- » Wide DC power input range from 6V ~ 40V provides application flexibility.
- » Power management support of Idle, ON, and OFF state.

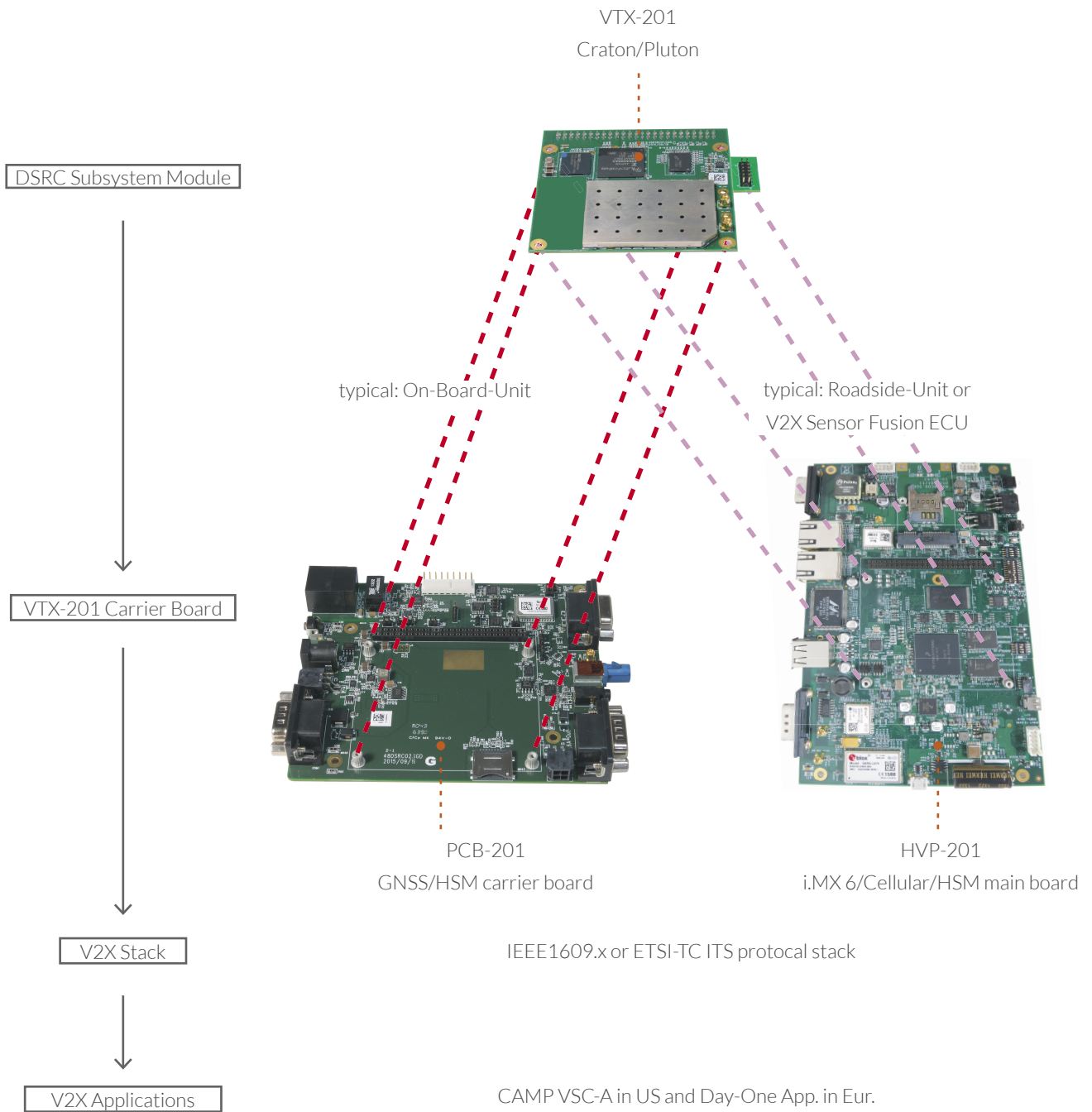
### Performance:

- » More than +20dBm Class C RF spectrum mask compliant with margins at MMCX antenna port.
- » Superior fading sensitivity in the typical ETSI defined C2C multipath scenarios increases wireless coverage.
- » Internal 40MHz BW filter provides immunity to out-of-band radio interferences in multi-channel operation.
- » Dual DSRC PHY supports concurrent dual channel operation.
- » Dedicated oscillator provides high frequency accuracy at  $\pm 6.0$ ppm in -40°C ~ +85°C temperature range.
- » Dynamic and accurate power control in a wide 4.5dBm ~ 25dBm output range provides superior performance stability.
- » Integrated RF ESD protectors on antenna ports provide robust surge protection.
- » High ESD protection design ensures immunity and robustness of all ports in ESD events. (IEC 61000-4-2 Level 4, Contact  $\pm 8$ kV, Air  $\pm 15$ kV)
- » 4-corner UV cured resin for BGA chips ensures vibrational and environmental reliability.

### Flexibility:

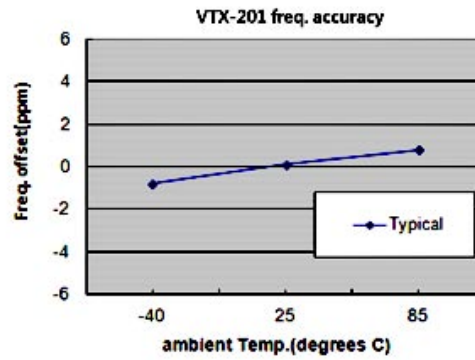
- » 50-pin header design provides feature rich I/O to meet connectivity requirement of V2X system integration.
- » Two on-board MMCX DIP antenna connectors provide robust RF performance up to 6GHz.
- » Optional off-the-shelf hardware and software modules enable V2X OBU, V2X RSU, V2X Sensor Fusion ECU applications.

# Typical Using Case:

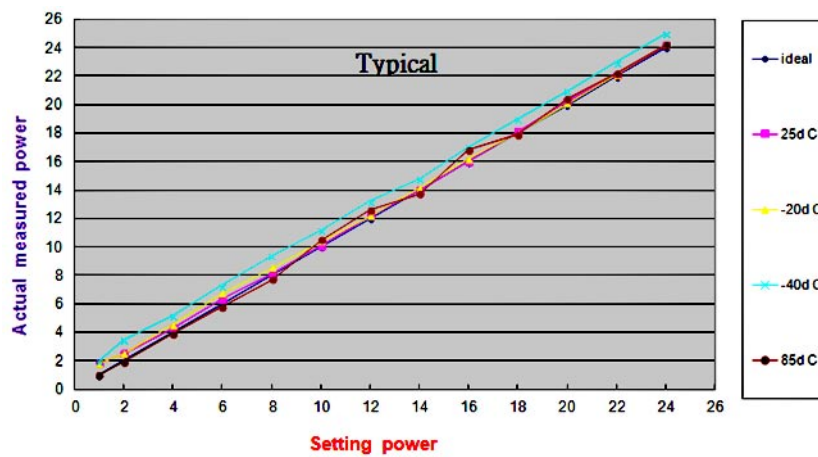


# Critical Facts of VTX-201:

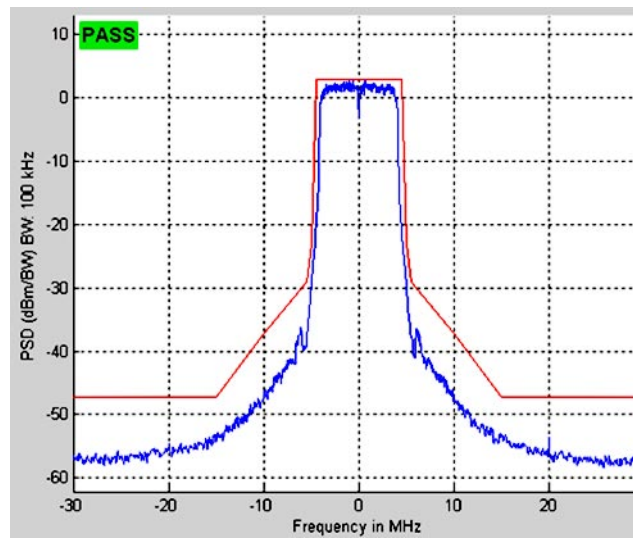
## 1. Frequency Accuracy



## 2. Power Control Accuracy



### 3. Class C mask performance at +20dBm from -40°C ~ +85°C

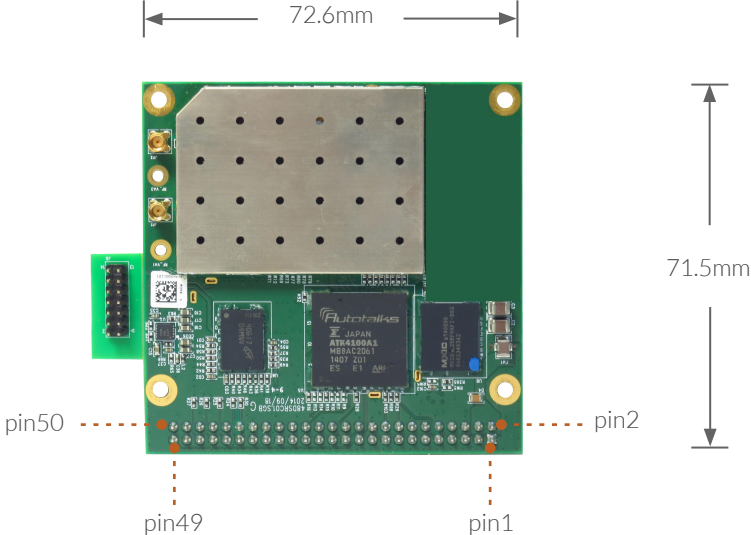


4. Consistent EVM performance over a wide 5~22dBm power levels and -40°C~+85°C temperature range provide high channel efficiency.

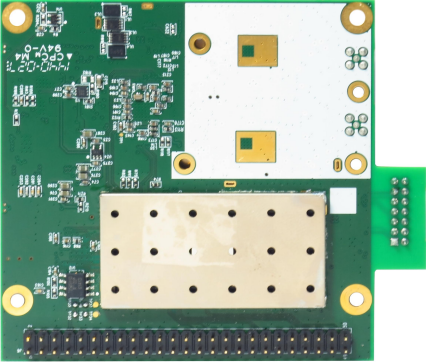
	25 degrees C		85 degrees C		-40 degrees C	
	TX2	TX1	TX2	TX1	TX2	TX1
dut1	-28	-28	-29	-27.8	-27.7	-27.5
dut2	-30.5	-27.5	-30	-27	-30	-27.4
dut3	-31.4	-26.3	-30.2	-28.8	-28	-27

# VTX-201 Image:

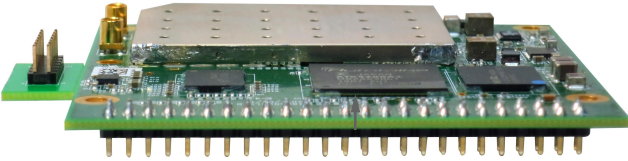
Top View



Back View



Side View



Gold plated pin: pitch 2.54mm, length  $2.5 \pm 0.3$ mm

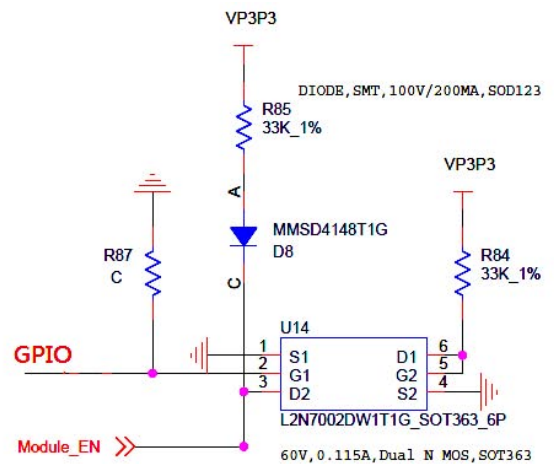
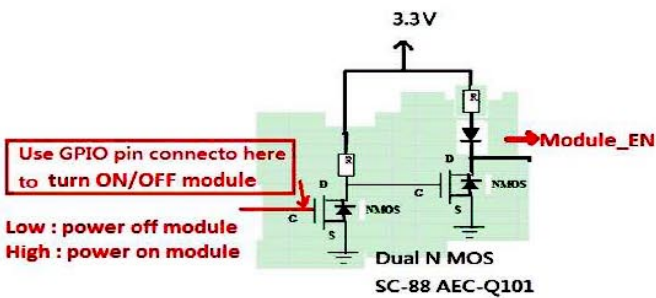
## Pin Definition and Function:

FUNCTION	Signal	Pin Number		Signal	FUNCTION
6~40V *a	VCC	2	1	Module_EN	Float this pin (internally conn. to VCC), or use it *b
6~40V *a	VCC	4	3	GND	VSS
VSS	GND	6	5	ETH_PHY_RESET_L	Ethernet Reset
CAN0_Physical	CAN0_H	8	7	Reset_n	Reset_n: "0" then "1" to Reset Dsrc module.
	CAN0_L	10	9	SPI1_SCLK	SPI1(default for uSD socket connection)
CAN1_Digital	CAN1_TXD	12	11	SPI1_TXD	
	CAN1_RXD	14	13	SPI1_RXD	
Default HCI(RMII)	RMII_MDC	16	15	SPI1_FRAME	VSS
	RMII_MDIO	18	17	GND	
GND	GND	20	19	I2C_SDA	I <sup>2</sup> C Master(for I <sup>2</sup> C sensors, GPIO expander, etc...)
Default HCI(RMII)	RMII_RXDV	22	21	I2C_SCL	
Noted: RXER could become I2S_BCLK(GPIO20)	RMII_RXER/I2S_BCLK	24	23	GND	VSS
	RMII_ERX0	26	25	SPIO_SCLK	SPIO
	RMII_ERX1	28	27	SPIO_TXD	
	RMII_CLK	30	29	SPIO_RXD	
	RMII_ETX1	32	31	SPIO_FRAME	VSS
	RMII_ETX0	34	33	GND	
	RMII_TXEN	36	35	PPS	GNSS PPS signal
VSS	GND	38	37	GPIO30	GPIO30: default for uSD CS pin)

FUNCTION	Signal	Pin Number		Signal	FUNCTION
Default for HSM(Infineon's SLE97xx)	GPIO26/SPI2_SCLK	40	39	UART_0_TXD	Console
	GPIO27/SPI2_Frame	42	41	UART_0_RXD	
	GPIO25/SPI2_TXD	44	43	UART_1_TXD	To GNSS module(Telit's SL869)
	GPIO24/SPI2_RXD	46	45	UART_1_RXD	
GPIO22/I2S_DATA	GPIO22/I2S_DATA	48	47	GPS_ON_GPIO16	default: GPIO to turn on/off GNSS module
GPIO1	GPIO1	50	49	GPIO21/I2S_WCLK	CPIO21/I2S_WCLK

\*a : VCC require steady DC from 6~40V range. No automotive load dump protection circuit on this module.

\*b : This pin is a internally connection to VCC (pin2 & pin4) for the control of whole module power system ON or OFF state. Either float this pin or follow suggested ckt. below to power ON/OFF module through external system GPIO.





## Specifications:

Operation System	ThreadX RTOS
Chipset	<ul style="list-style-type: none"><li>» Autotalks Craton (ATK4100) V2X communication processor, three 240MHz CPU cores.</li><li>» Autotalks Pluton (ATK3100) V2X RF Transceiver</li></ul>
Memory	32MB NOR system memory, 128MB DDR3 storage memory
Frequency Band	5.85 ~ 5.925 GHz (ITS-DSRC)
Radio Mode	802.11p, ITS-G
Channels	172, 174, 176, 178, 180, 182, 184
Channel Bandwidth	10MHz (5MHz & 20MHz by project)
Data Rate	3, 4.5, 6, 9, 12, 18, 24, 27Mbps for 10MHz BW signal
Frequency Accuracy	± 6.0ppm
RF Transmit Power	> +20dBm, Class C RF spectrum mask compliant with margins

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DSRC Static Sensitivity (typical, tolerance +2 / -2dB)

Conditions	-40°C	+25°C	+85°C
3Mbps	-97dBm	-93dBm	-92dBm
4.5Mbps	-97dBm	-93dBm	-92dBm
6Mbps	-95dBm	-91dBm	-91dBm
9Mbps	-93dBm	-89dBm	-89dBm
12Mbps	-90dBm	-86dBm	-85dBm
18Mbps	-86dBm	-83dBm	-83dBm
24Mbps	-80dBm	-75dBm	-75dBm
27Mbps	-78dBm	-74dBm	-73dBm

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DSRC Fading Sensitivity

- » Power @ 10% PER sensitivity (6Mbps, 1000B packet), fading channels as 5 typical C2C multipath scenarios defined by ETSI: ± 2dBm
  - » Rural LOS: -92.5dBm
  - » Highway LOS: -91.5dBm
  - » Urban Approaching LOS: -91.5dBm
  - » Crossing NLOS: -89.5dBm
  - » Highway NLOS: -88.5dBm
- 

Operation Voltage

DC 6.0 ~ 40V ± 5%

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Power Consumption

Conditions	12V power input		
	25°C	85°C	-40°C
Tx @ 20~8dBm (RF duty cycle = 7%)	0.3A	0.315A	0.3A
Idle	0.29A	0.3A	0.29A

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## On-board Interface

proprietary gold plated 50-pin (pitch 2.54 mm, length  $2.5 \pm 0.3$ mm) supports:

- » two CAN : one physical CAN with transceiver and one digital CAN
- » RMI for Ethernet or external CPU integration
- » SPI reserved for external Infineon SLE97xx HSM (default)
- » SPI reserved for external microSD flash memory (default)
- » SPI reserved for external SPI-to-USB converter (optional)
- » I2C master for I2C sensors or GPIO expander (default)
- » I2S reserved for audio codec (default)
- » PPS for GNSS PPS signal input
- » UART reserved for console and external Telit SL869 GNSS (default)

details per Pin Definition as above page

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## Antenna Connector

two MMCX DIP antenna connectors

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## Operation Temperature Range

ambient:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$

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## Storage Temperature Range

$-45^{\circ}\text{C} \sim +90^{\circ}\text{C}$

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## Operating Humidity

10% - 95%, non-condensing

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## Storage Humidity

max. 95%, non-condensing

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Environment-  
Friendly  
Compliance

REACH and RoHS

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Dimension

72.6 mm(L) x 71.5mm(W)

## Ordering Information:

VTX-201

DSRC V2X Subsystem, Autotalks® Craton/Pluton

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VTX-201E

DSRC V2X Subsystem, preloaded ETSI TC-ITS protocol stack

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VTX-201U

DSRC V2X Subsystem, preloaded IEEE 1609.x protocol stack

# Recommended off-the-shelf Hardware and Software Modules for VTX-201:

PCB-201	GNSS/HSM Carrier Board, SL869/SLE97
HVP-201	i.MX 6/Cellular/GNSS/HSM Main Board, iMX6/Sara/SL869/SLE97
VPS-201x	IEEE 1609.x and/or ETSI TC-ITS V2X protocol stack
VAS-201x	CAMP VSC-A or ETSI TC-ITS Day-One or field V2X applications
VVT-201	V2X Diagnostic Firmware

## Recommended ready-to-use V2X system (using VTX-201) with enclosure and antennas:

OBU-201	V2X On-Board Unit
OBU-201E	V2X On-Board Unit, ETSI TC-ITS protocol stack
OBU-201U	V2X On-Board Unit, 1609.x protocol stack
RSU-101	V2X Enabling Roadside Unit
RSU-101E	V2X Enabling Roadside Unit, ETSI TC-ITS protocol stack
RSU-101U	V2X Enabling Roadside Unit, 1609.x protocol stack
RSU-201	V2X Roadside Unit
RSU-201E	V2X Roadside Unit, ETSI TC-ITS protocol stack
RSU-201U	V2X Roadside Unit, 1609.x protocol stack