Quectel SC686A Series Smart Module

Introduction

Build a Smarter World

Duty of Confidentiality

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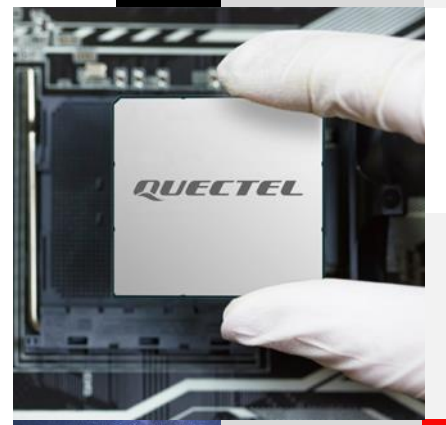
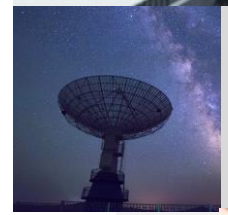
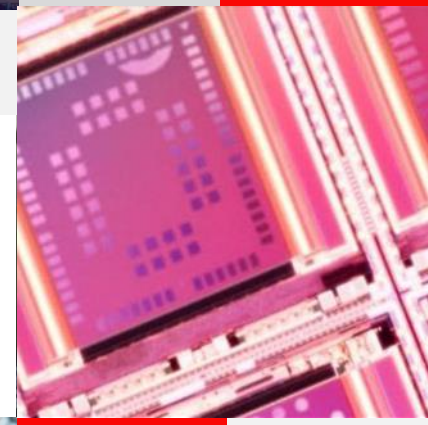
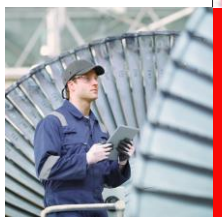








Smart Solution Introduction

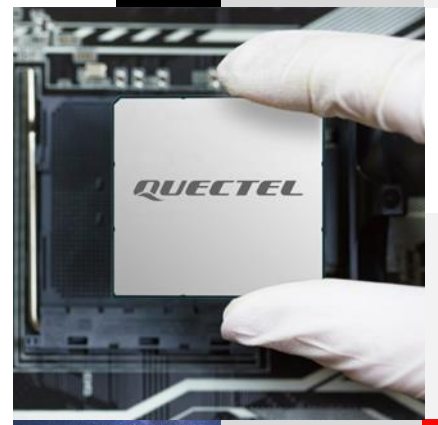
Smart Module Portfolio

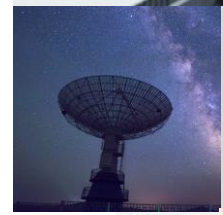
Specifications & Timelines

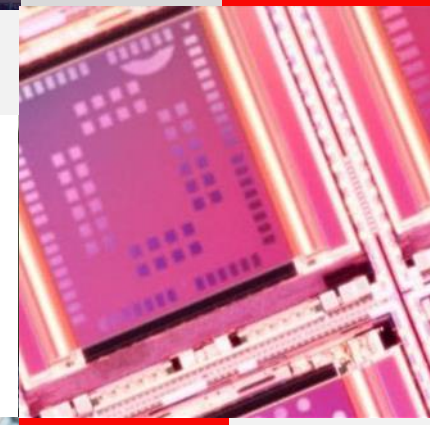
Typical Applications

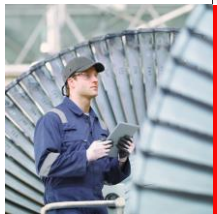
Customer Support

Enhancements









Build a Smarter World

Quectel Smart Solution Advantages

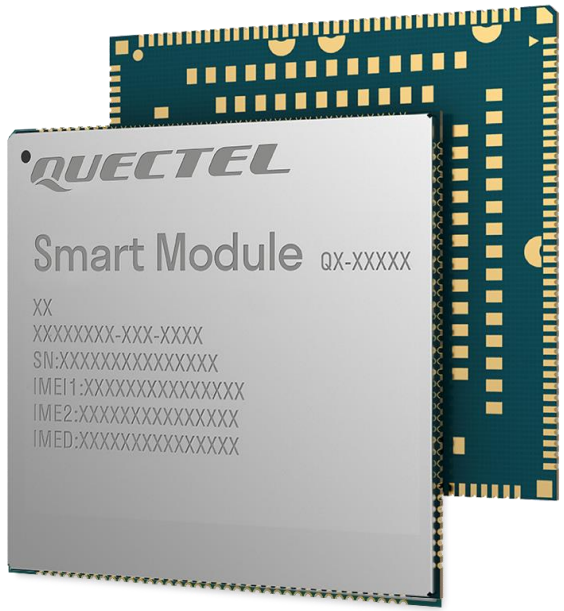
SoC Platforms

High-performance CPU/ GPU/ NPU/ DSP

Various Multimedia Functions: LCD/ Audio/ Camera/ Video

Global Certifications

Open Android or Linux



Multi-Mode: 5G/ LTE/ UMTS/ GSM

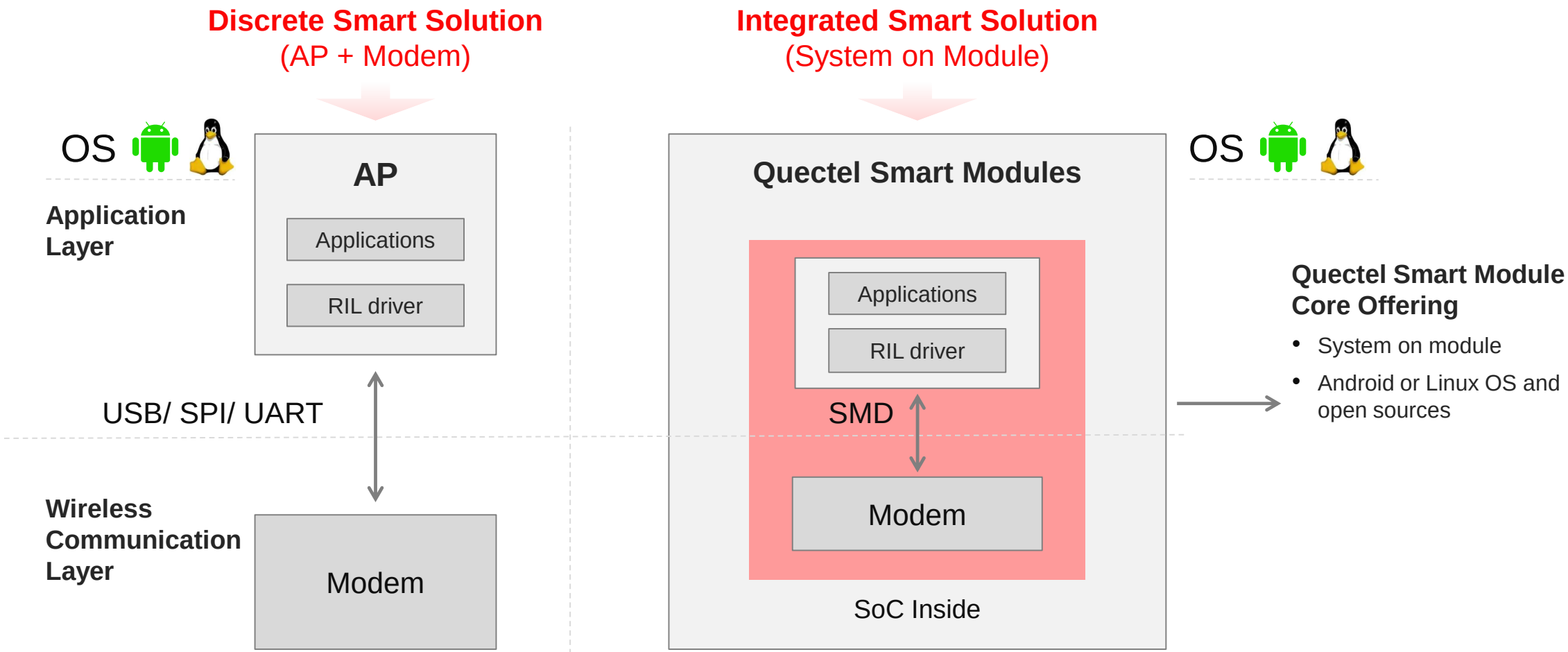
Built-in Wi-Fi/ Bluetooth/ GNSS

Abundant Peripheral Interfaces

Strong Customer Support

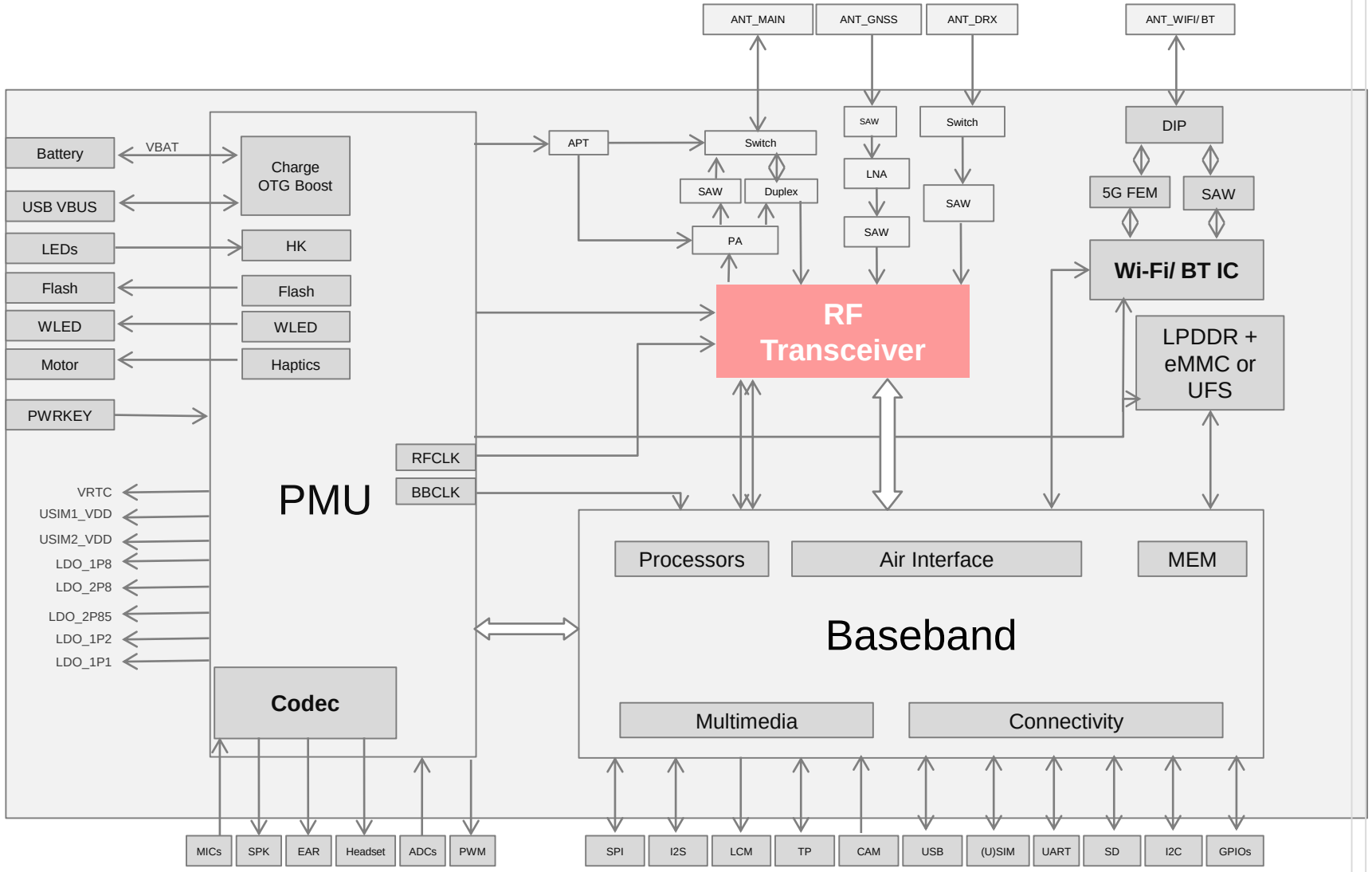
GPU: Graphics Processing Unit DSP: Digital Signal Processing NPU: Neural Processing Unit LCD: Liquid-crystal Display

Smart Solution Architecture Comparison



AP: Application Processor.
OS: Operating System.
SMD: Shared Memory Driver.
SoC: System On a Chip.

Smart Module Hardware Block Diagram

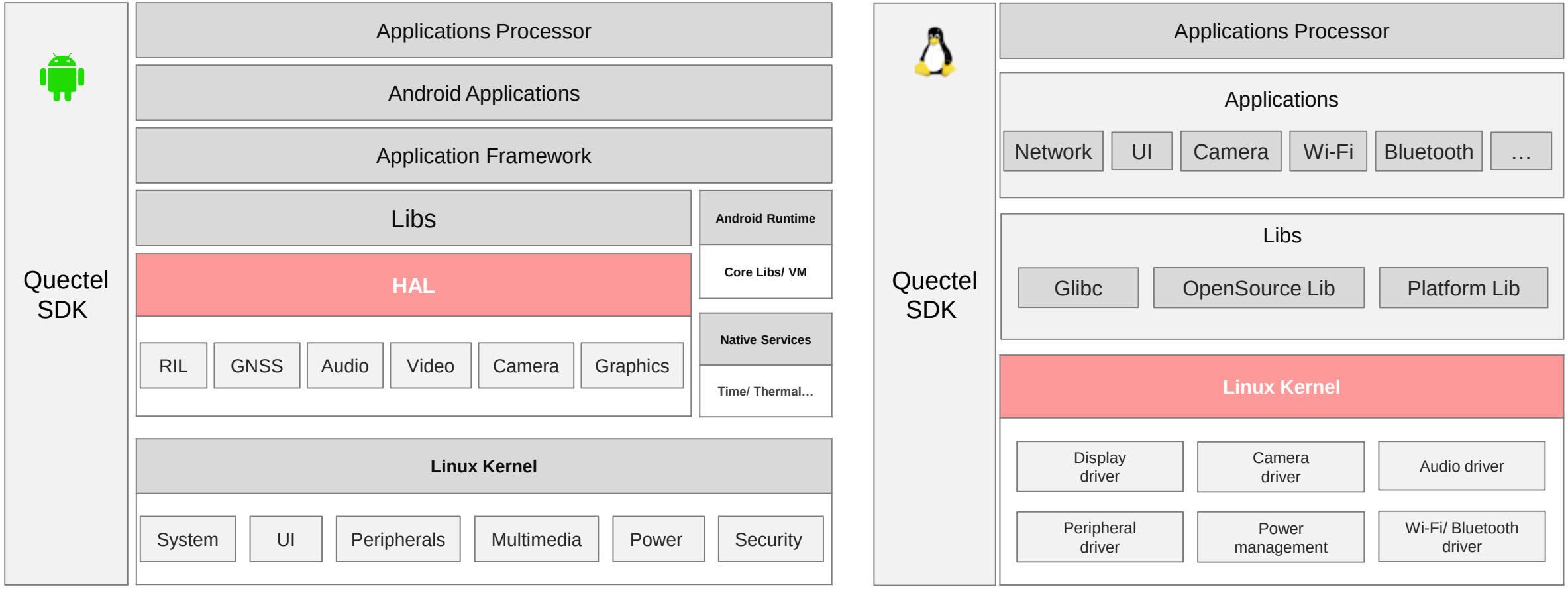


- Baseband: SoC with CPU, GPU, DSP, NPU processors, multimedia and other digital peripherals
- PMU: Provides power supply internally; some PMUs have codec inside
- RF Transceiver: Implements 2G/ 3G/ 4G/ 5G and GNSS functionalities
- Wi-Fi/ Bluetooth IC: Implements Wi-Fi/ Bluetooth functionalities
- LPDDR + eMMC or UFS: Internal DDR and storage

PMU: Power Management Unit LPDDR: Low-power Double Data Rate

Smart Module SDK System Architecture

Quectel provides Android AOSP or Linux SDK which include libs and source codes to customers under NDA.



AOSP: Android Open-source Project HAL: Hardware Abstraction Layer VM: Virtual Machine RIL: Radio Interface Layer

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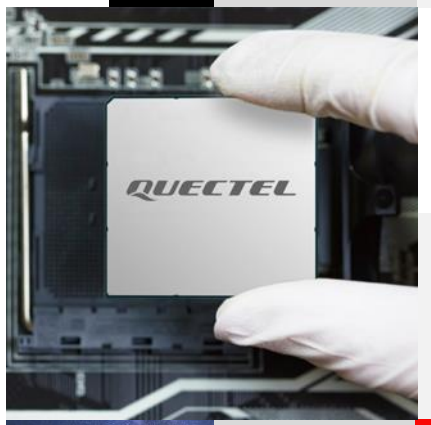
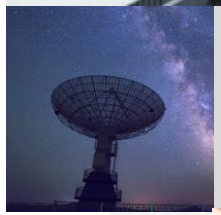
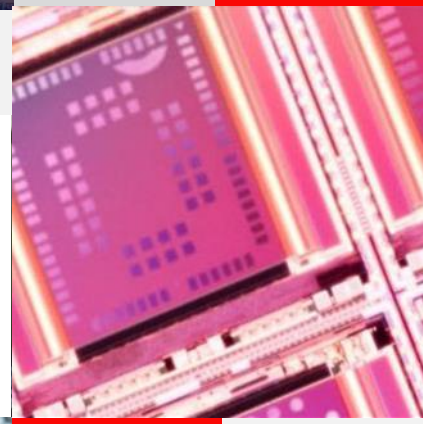
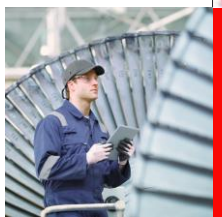
Enhancements

Customer Support









Build a Smarter World

Smart Module Portfolio

Premium Level

SG865W

- QCS8250 ①
- CPU: 8x Kryo585 2.84 GHz
- GPU: Adreno 650
- Camera: 64 MP
- Video: 4K @ 240 fps/ 8K @ 60 fps
- Wi-Fi: 2 × 2 11ax; Bluetooth 5.1

SG885G

- QCS8550 ①
- CPU: 1 + 4 + 3 Kryo™ CPU (3.2/ 2.8/ 2.0 GHz)
- GPU: Adreno 740 – 4K 120 fps UI
- Camera: 64 MP
- Video: 4K @ 240 fps / 8K @ 60 fps
- Wi-Fi: 2.4 & 5 & 6 GHz, Wi-Fi 7; Bluetooth 5.3

High Level

SC600T

- MSM8953 ①
- CPU: 8x A53 2.0 GHz
- GPU: Adreno 506
- Camera: 24 MP
- Video: 4K @ 30 fps
- Wi-Fi: 11ac; Bluetooth 4.2
- Modem: LTE Cat 6
- GNSS: L1

SC66

- SDM660 ①
- CPU: 4 + 4 Kryo260 2.2/ 1.8 GHz
- GPU: Adreno 512
- Camera: 24 MP
- Video: 4K @ 30 fps
- Wi-Fi: 2 × 2 11ac; Bluetooth 5.0
- Modem: LTE Cat 6
- GNSS: L1

SC668S

- QCM6125 ①
- CPU: 4 + 4 Kryo260 2.0/ 1.8 GHz
- GPU: Adreno 610
- Camera: 24 MP
- Video: 4K @ 30 fps
- Wi-Fi: 11ac; Bluetooth 5.0
- Modem: LTE Cat 4
- GNSS: L1

SG560D

- QCM6490 ①
- CPU: 1 + 3 + 4 Kyro670 (2.7/ 2.4/ 1.9 GHz)
- GPU: Adreno 643
- Camera: 64 MP
- Video: 4K30D/ 4K30E
- Wi-Fi: 2 × 2 11ax DBS; Bluetooth 5.2
- Modem: 5G Sub 6/ LTE Cat 18
- GNSS: L1 + L5

SC606T

- MSM8953 ①
- CPU: 8x A53 2.0 GHz
- GPU: Adreno 506
- Camera: 24 MP
- Video: 4K @ 30 fps
- Wi-Fi: 11ac; Bluetooth 4.2
- Modem: LTE Cat 6
- GNSS: L1

SC696S

- QCM6125 ①
- CPU: 4 + 4 Kryo260 2.0/ 1.8 GHz
- GPU: Adreno 610
- Camera: 24 MP
- Video: 4K @ 30 fps
- Wi-Fi: 11ac; Bluetooth 5.0
- Modem: LTE Cat 4
- GNSS: L1

Medium Level

SC600Y

- SDM450 ①
- CPU: 8x A53 1.8 GHz
- GPU: Adreno 506
- Camera: 21 MP
- Video: 1080P @ 60 fps
- Wi-Fi: 11ac; Bluetooth 4.2
- Modem: LTE Cat 6
- GNSS: L1

SC200K

- UIS8581E ②
- CPU: 8x A55 1.6 GHz
- GPU: GE8322
- Camera: 16 MP
- Video: 1080P @ 60 fps
- Wi-Fi: 11ac; Bluetooth 5.0
- Modem: LTE Cat 4
- GNSS: L1

SC680A

- QCM4290 ①
- CPU: 4 + 4 Kryo260 2.0/ 1.8 GHz
- GPU: Adreno 610
- Camera: 25 MP
- Video: 1080P @ 60 fps
- Wi-Fi: 11ac; Bluetooth 5.1
- Modem: LTE Cat 6
- GNSS: L1

SG520B

- QCM4490 ①
- CPU: 2 + 6 Kyro CPU (2.4/ 2.0 GHz)
- GPU: Adreno 613
- Camera: 25 MP
- Video: 1080P @ 60fps
- Wi-Fi: 2 × 2 11ax DBS; Bluetooth 5.2
- Modem: 5G Sub 6/ LTE Cat 15
- GNSS: L1

SC686A

- QCM4290 ①
- CPU: 4+4 Kryo260 2.0/ 1.8 GHz
- GPU: Adreno 610
- Camera: 25 MP
- Video: 1080P @ 60 fps
- Wi-Fi: 11ac; Bluetooth 5.1
- Modem: LTE Cat 6
- GNSS: L1

Entry Level

SC200R

- QCM2150 ①
- CPU: 4x A53 1.3 GHz
- GPU: Adreno 308
- Camera: 13 MP
- Video: 1080P @ 30 fps
- Wi-Fi: 11n; Bluetooth 4.2
- Modem: LTE Cat 4
- GNSS: L1

SC200L

- SL8541E ②
- CPU: 4x A53 1.4GHz
- GPU: Mali-T820
- Camera: 8 MP
- Video: 1080P @ 30 fps
- Wi-Fi: 11ac; Bluetooth 5.0
- Modem: LTE Cat 4
- GNSS: L1

SC200E

- QCM2290 ①
- CPU: 4x A53 2.0 GHz
- GPU: Adreno 702
- Camera: 25 MP
- Video: 1080P @ 30 fps
- Wi-Fi: 11ac; Bluetooth 5.0
- Modem: LTE Cat 4
- GNSS: L1

SG150H

- SL8521E ②
- CPU: 2x A53 1.3GHz
- GPU: Mali-T820
- Camera: 5 MP
- Video: 720P @ 30 fps
- Wi-Fi: 11n; Bluetooth 4.2
- Modem: LTE Cat 4
- GNSS: L1

SC20

- MSM8909 ①
- CPU: 4x A7 1.1GHz
- GPU: Adreno 304
- Camera: 8 MP
- Video: 1080P @ 30 fps
- Wi-Fi: 11n; Bluetooth 4.2
- Modem: LTE Cat 4
- GNSS: L1

SC206E

- QCM2290 ①
- CPU: 4x A53 2.0 GHz
- GPU: Adreno 702
- Camera: 25 MP
- Video: 1080P @ 30 fps
- Wi-Fi: 11ac; Bluetooth 5.0
- Modem: LTE Cat 4
- GNSS: L1

①: Qualcomm. ②: Unisoc. DBS: Dual Band Simultaneous.

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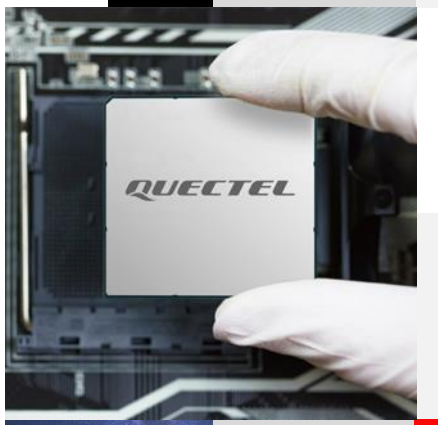
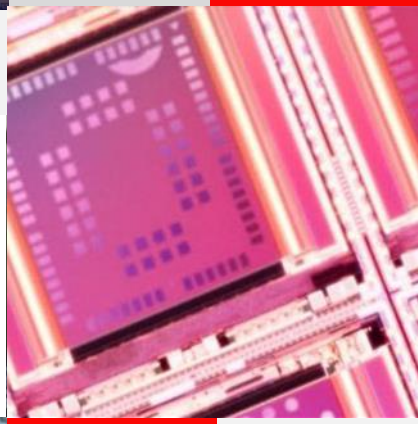
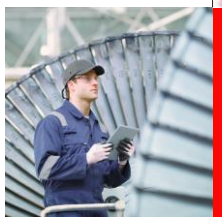
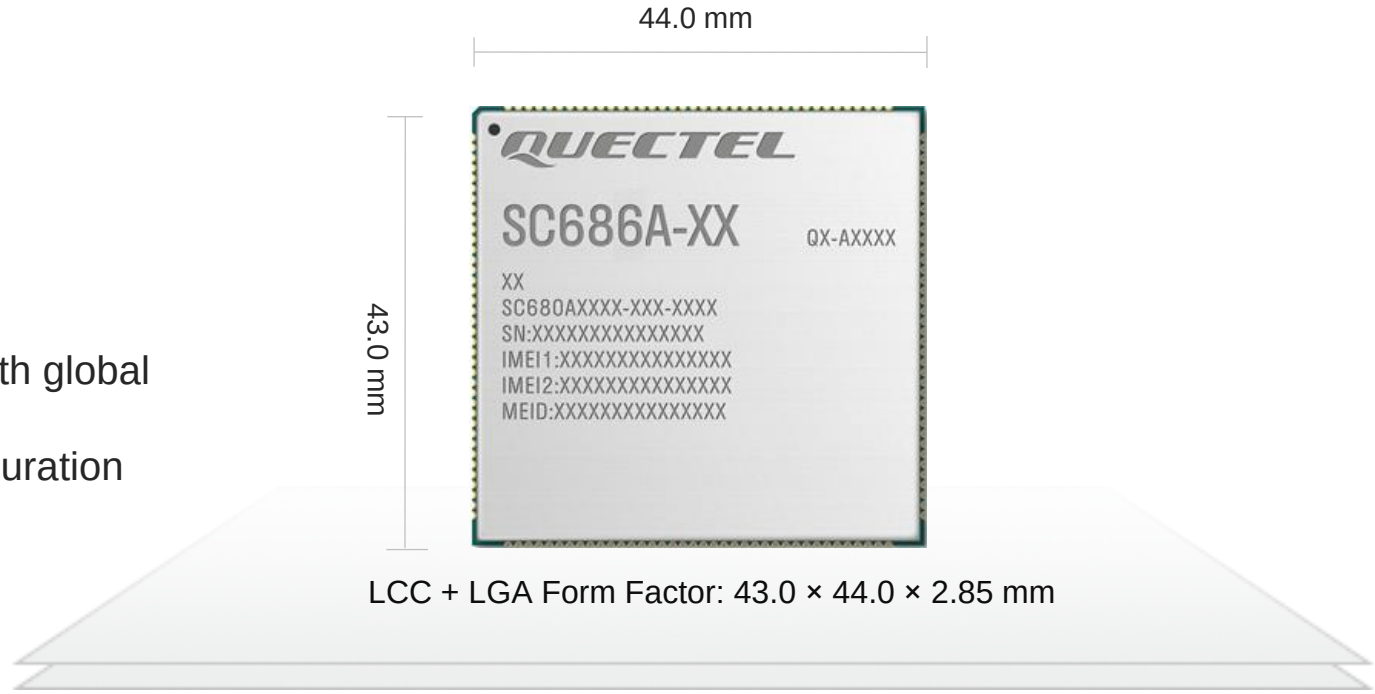






SC686A Series Highlights

Multiple Variants:
- Multi-region variants with global certifications
- Multiple memory configuration



LCC + LGA Form Factor: 43.0 × 44.0 × 2.85 mm

Linux OS:
Yocto Linux (Kernel 5.4.191)

Chipset platform: QCM4290. Powerful system performance, multimedia, LTE Cat 6, Wi-Fi 802.11ac, Bluetooth, GNSS L1

Long life time:
Till the year of 2028

Compatible with SC600Y, SC600T, SC606T and SC680A series

SC686A Series Specifications

Variant		SC686A-EM	SC686A-NA	SC686A-WF
Region		EMEA/ Korea/ South Asia/ Latin America/ India/ Australia/ New Zealand/ South Africa	North America	Global
LTE	**FDD Band**	B1/ 2/ 3/ 4/ 5/ 7/ 8/ 20/ 28	B2/ 4/ 5/ 7/ 12/ 13/ 14/ 17/ 25/ 26/ 66/ 71	-
	TDD Band	B38/ 40/ 41	B41	-
UMTS	**WCDMA Band**	B1/ 2/ 4/ 5/ 8	-	-
GSM/ EDGE		Quad-band	-	-
GNSS		Supported	Supported	-
Wi-Fi/ Bluetooth Interface		Supported	Supported	Supported
Certification		**Regulatory:** GCF/ CE/ UKCA/ KC/ RCM	**Carrier:** Verizon*/ AT&T/ T-Mobile **Regulatory:** GCF/ PTCRB/ FCC/ IC	**Regulatory:** CE/ KC/ JATE/ TELEC/ RCM/ FCC/ IC/ UKCA
Project Stage		MP	MP	MP

*: Under development/ in progress/ planning

SC686A Series Features and Interfaces

Key Features		Interfaces	
CPU	QCM4290, A customized 64-bit Arm v-8.0 compliant applications processor (Qualcomm® Kryo™ 260 CPU) Kryo 260 Gold: quad high-performance cores 2.0 GHz + Kryo 260 Silver: quad low-power cores 1.8 GHz	**LCM**	4-lane MIPI DSI; DSI D-PHY 1.2; Split link supported FHD+ (2520 × 1080) aspect ratio, up to 10 bpc QSEED4, 4 L, Q-SYNC, SVI, CABL, and FOSS
GPU	Qualcomm® Kryo™ GPU 610 Graphics Processing Unit (GPU) @ 950 MHz	**Camera**	3 × ISP, (13 MP + 13 MP) or (25 MP + 5 MP) @ 30 fps or (16 MP + 16 MP) @ 24 fps Three 4-lane MIPI CSI, up to 2.5 Gbps/ lane Support 4 cameras, up to 25 MP with triple ISP
Video	**Encoding:** 4K @ 60 fps; H.265/ H.264/ VP8 **Decoding:** • 4K @ 60 fps; H.265/ H.264/ VP8/ VP9 • 1080P @ 60 fps; MPEG-2	**Touch Panel**	Capacitive touch panel, I2C controls
Memory	2 GB + 16 GB (LPDDR4X eMCP, Default) 3 GB + 32 GB (LPDDR4X eMCP, Optional)	**Audio**	**Analog channels:** 3 inputs: MIC1, MIC2, MIC3 (including one noise-canceling MIC) 3 outputs: speaker, earpiece, headphone
OS	Yocto Linux (Kernel 5.4.191)	**USB**	× 1 USB 2.0/ 3.1 (Type-C)
Wi-Fi	2.4 & 5 GHz, 802.11a/ b/ g/ n/ ac/ ax-ready	**(U)SIM**	× 2 Support 1.8/ 2.95 V (U)SIM cards, with (U)SIM card detection function DSDS supported
Bluetooth	Bluetooth 2.1 EDR/ 3.0 HS/ 4.2 LE/ 5.1 LE	**UART**	× 4 Up to 4 Mbps, one of them supports hardware flow control
GNSS ①	• GPS/ BDS/ GLONASS/ Galileo/ NavIC/ QZSS/ SBAS • L1	**SD Card**	× 1 SD 3.0, 4-bit SDIO
Modem	3GPP Release 10	**I2C/ SPI/ ADC/ GPIO/ PWRKEY**	Supported
Battery Charge	Supported	**Antenna**	× 4 Main/ Rx-diversity/ GNSS/ Wi-Fi & Bluetooth

①: GNSS is not supported on SC686A-WF.

SC686A-NA Timelines

2023												2024		
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.

Project Stage

SC686A-NA MP

Certification

Carrier Verizon

ES: Engineering samples ready. Basic functions are available for customers' simple demo purpose.
CS: Commercial samples ready. Stable hardware design and quite stable software design. New software features can be added upon request.
MP: Hardware and software ready for mass production. For certification status, please refer to the "certification schedule".

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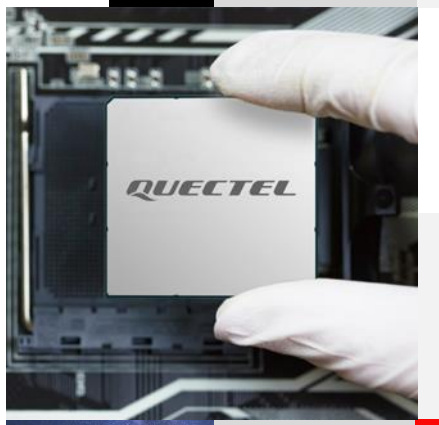
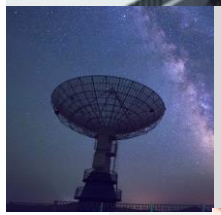
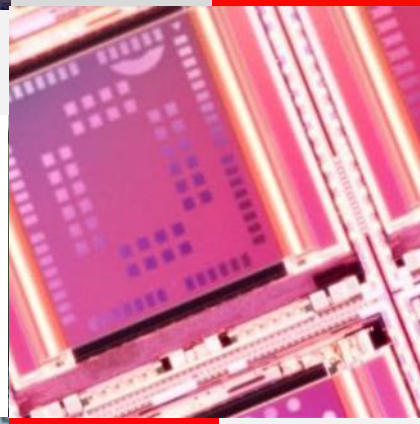
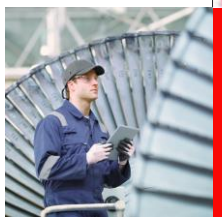


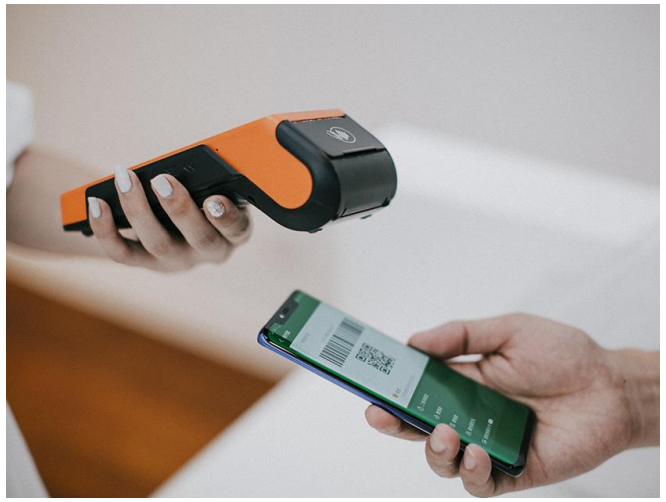






Retail

POS and Payment Terminal



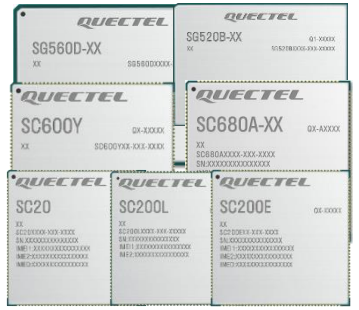
Vending Machine

Electronic Cash Register and Kiosk

Configuration

- Magnetic strip cards, IC cards, contactless/ NFC, 1D & 2D codes reader
- Android
- Processor: Quad-Core or Octa-Core
- Memory: eMCP, 1 GB + 8 GB or higher
- Camera: 2 MP or higher
- Display: HD with touchscreen
- 5G/ 4G/ 3G/ Wi-Fi/ Bluetooth/ GNSS
- SAM, SIM Cards
- Audio
- USB ports

Recommended Smart Modules



Industrial Handheld

Different Industrial Applications

- Retail
- Transportation
- Manufacturing
- Field Mobility
- Warehouse Management
- Hospitality

Configuration

- Android
- Processor: Quad-Core or Octa-Core CPU
- Memory: 2 GB + 16 GB or higher
- Camera: 20MP or higher pixel cameras
- Display: 5'' HD with touch or higher
- 5G/ 4G/ 3G/ Wi-Fi/ Bluetooth/ GNSS
- RFID
- Scanner
- Audio
- Battery
- IP Sealing: IP68
- TUMBLE: Meet IEC tumble spec
- Drop: Multiple 1.8 m drops to concrete per MIL STD 810H

Recommended Smart Modules

Vehicle Aftermarket — Infotainment & DashCam

Smart modules provide flexible, reliable, safe, and secure integration for In-Vehicle Infotainment and DashCam products.

Supported functionalities

- 360 reversing camera
- Voice recognition
- Real time navigation
- App store
- Multi-view
- CarPlay

Configuration

- Android
- Processor: Quad-Core or Octa-Core CPU
- Memory: 2 GB + 16 GB or higher
- Camera: AHD 2M or higher pixel reversing cameras
- Display:10’’ HD with touch
- 5G/ 4G/ 3G/ Wi-Fi/ Bluetooth/ GNSS
- DSP audio, speaker power amplifier, Mic
- 360 cameras input
- CAN bus protocol interface
- USB ports spec

Recommended Smart Modules

Vehicle Aftermarket — 2-Wheeler, Small Electric Car

Supported functionalities

- Real time navigation
- Music
- Voice recognition
- Call

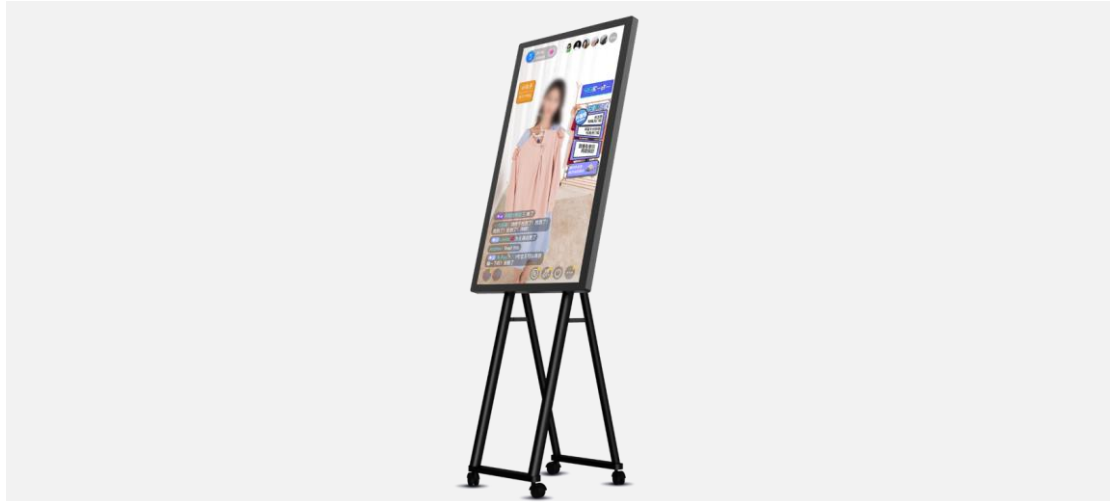
Configuration

- Android
- Processor: Quad-Core or Octa-Core CPU
- Memory: 2 GB + 16 GB or higher
- Display: 7’’ HD with touch
- 4G/ Wi-Fi/ Bluetooth/ GNSS
- Speaker, Mic
- USB ports
- Mileage: 80–100 km
- Battery: 48 V or higher

Recommended Smart Modules

Livestreaming and Video Conferences

Live shopping and B2B live broadcast have become the new normal of world's e-commerce development. Video conference system enables people to join the meeting remotely just the same as the off-line meeting. Smart modules provide the premium system performance and are very suitable to be the platforms to design these types of products.



Supported functionalities

- Multi-function
- Mic
- Virtual background
- Multi app
- Multi shot switching
- App store

Configuration

- Android
- Processor: Octa-Core CPU
- Memory: 8 GB + 256 GB or higher
- Camera: 21M or higher pixels
- Video: 4K,1080p
- TOPS: 3.5–12.5 TOPS
- Display: 10'', 32/43'' with touch
- 4G/ Wi-Fi/ Bluetooth/ GNSS
- Speaker, Mic
- Remote control

Recommended Smart Modules

Robotics

Application Scenarios

- Reception
- Airport guider
- Bank guider
- Lawn mower
- Hospital guider
- Hotel reception
- Logistics

Configuration

- Android or Linux
- Processor: Octa-Core CPU
- TOPS: 3.5–12.5 TOPS
- Memory: 8 GB + 256 GB or higher
- Camera: 21M or higher pixels
- Video: 4K,1080p, 720p
- Display: 10’’ or larger with touch
- 4G/ Wi-Fi/ Bluetooth/ GNSS
- Speaker, Mic
- Battery
- Machinery parts

Recommended Smart Modules

AR/ VR

Augmented Reality

Augmented reality overlays computer-generated images on the view of the natural world with the camera on smart phones, tablets, or other mobile devices. Quectel works hard to bring the vision of lightweight and stylish AR glasses to life.

Virtual Reality

Through cutting-edge graphics, best-in-class hardware, and artistically rendering experiences, VR lets us explore new worlds, defy obstacles. VR has enormous potential to transform how we play, work, learn, communicate, and experience the world around us.

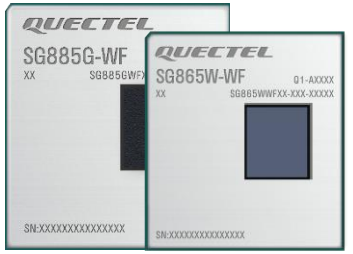
3D Scanner

3D measurement scanners can measure cross-sections, thickness, and perform GD&T measurements in a single scan.

Configuration

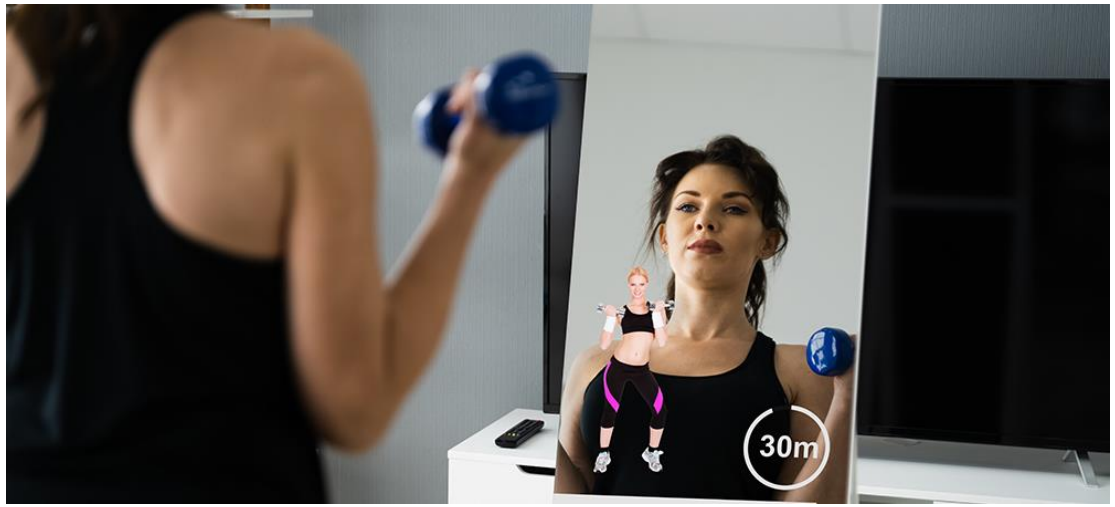
- Android or Linux
- Memory: 8 GB + 64 GB or higher
- TOPS: 12.5 TOPS

Recommended Smart Modules



Intelligent Fitness Mirror

Intelligent fitness mirror is the product of home fitness needs. It can play fitness course videos and the virtual coaches can correct users' fitness movements in real time.



Installation method and supported functionalities

Floor standing

Wall mount

Full HD IPS

Touch

Infrared sensor

Camera

Configuration

- Android
- Processor: Octa-Core CPU
- Memory: 4 GB + 64 GB or higher
- Camera: 21M or higher pixels
- Video: 4K,1080p
- TOPS: 3.5–12.5 TOPS
- Display: 43'' or 55'' with touch
- Wi-Fi/ Bluetooth
- Speaker, Mic
- Adapter
- Machinery parts

Recommended Smart Modules

ARM Based SoC Array Server

Mobile applications mushroom and the demands for edging computing increase with the rapid development of mobile Internet. The ARM based SoC array server, instead of the traditional x86 architecture, can be well compatible with mobile applications since most mobile applications are developed based on the ARM architecture.

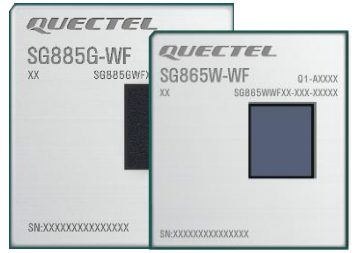
Application Scenarios

- Distributed storage
- Distributed computing
- Edge computing
- Operation management

Configuration

- Android or Linux
- ARM Based SoC Array Server
- Memory: 8 GB + 64 GB or higher
- Blade quantity: 16
- Net work: 1 Gbps or higher
- TOPS: 12.5 TOPS
- Power supply: AC 100–240 V
- Heat dissipation: Fan or Sink

Recommended Smart Modules



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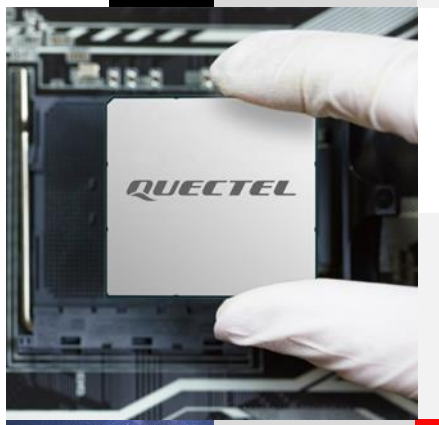
Specifications & Timelines

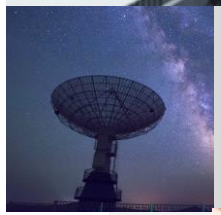
Typical Applications

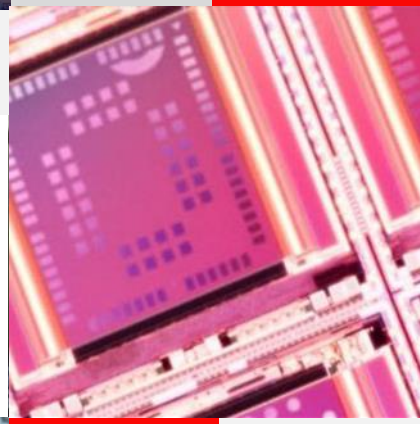
Enhancements

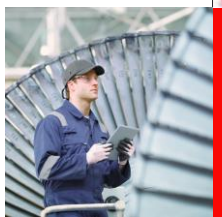
Customer Support

Build a Smarter World

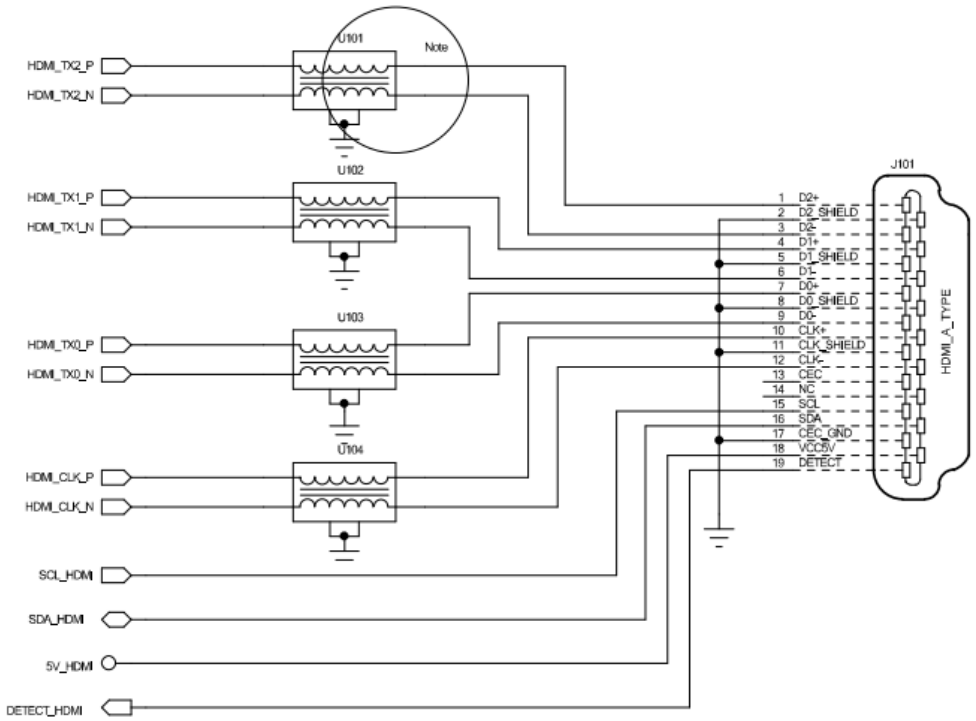


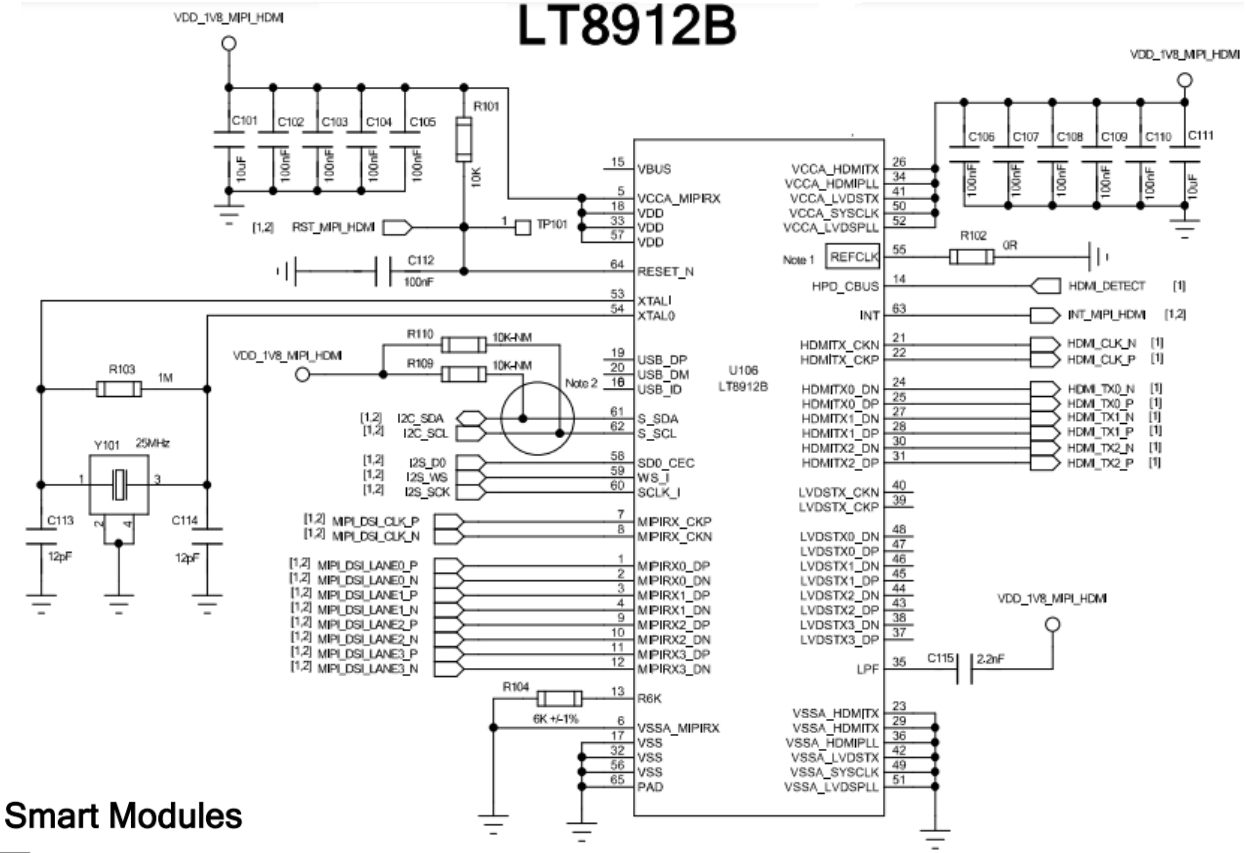




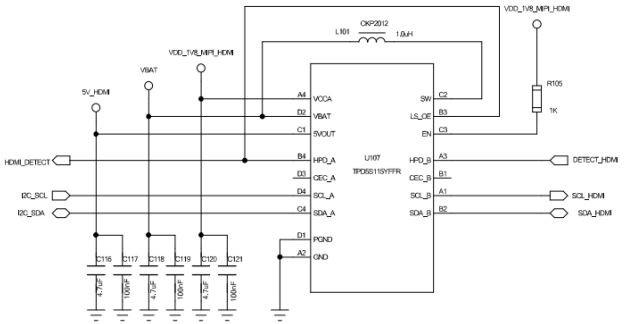


Extensive Function – MIPI DSI to HDMI

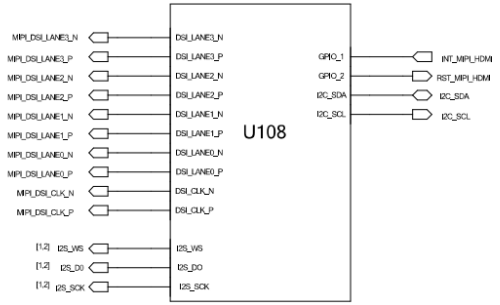




HDMI Companion Chip



DSI/I2S Interfaces of Smart Modules

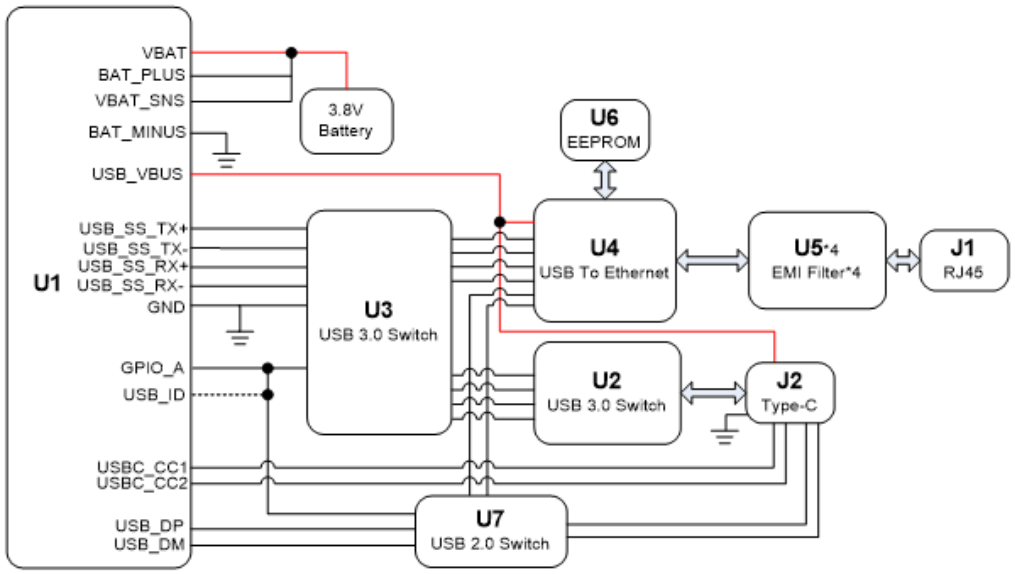


With external MIPI DSI to HDMI conversion chipset, HDMI display can be supported by smart modules.

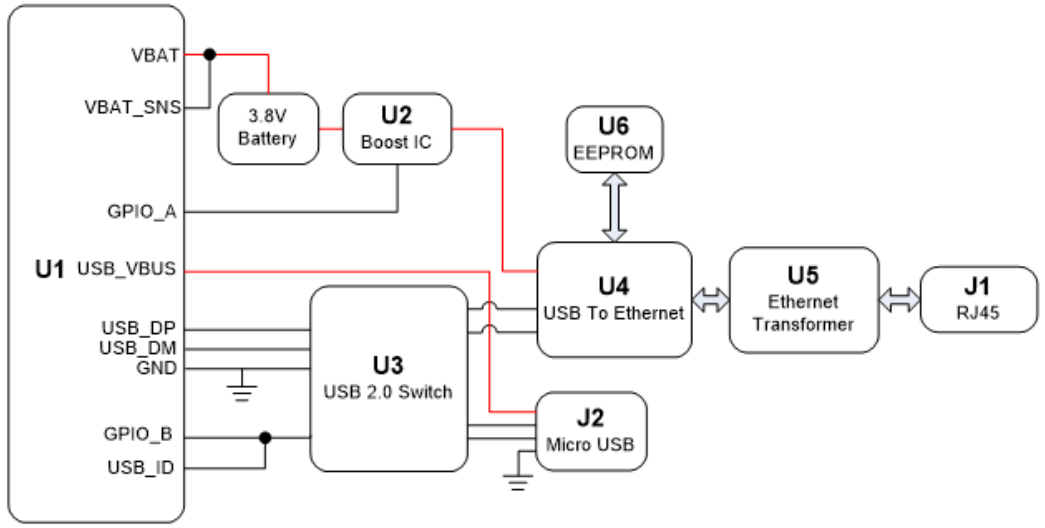
Extensive Function – USB to Ethernet

Smart modules have no Ethernet interface, while the USB can be converted to Ethernet when the smart modules work in Host mode. External conversion chipset is needed for the conversion.

USB 3.0 to 10/ 100/ 1000M Ethernet

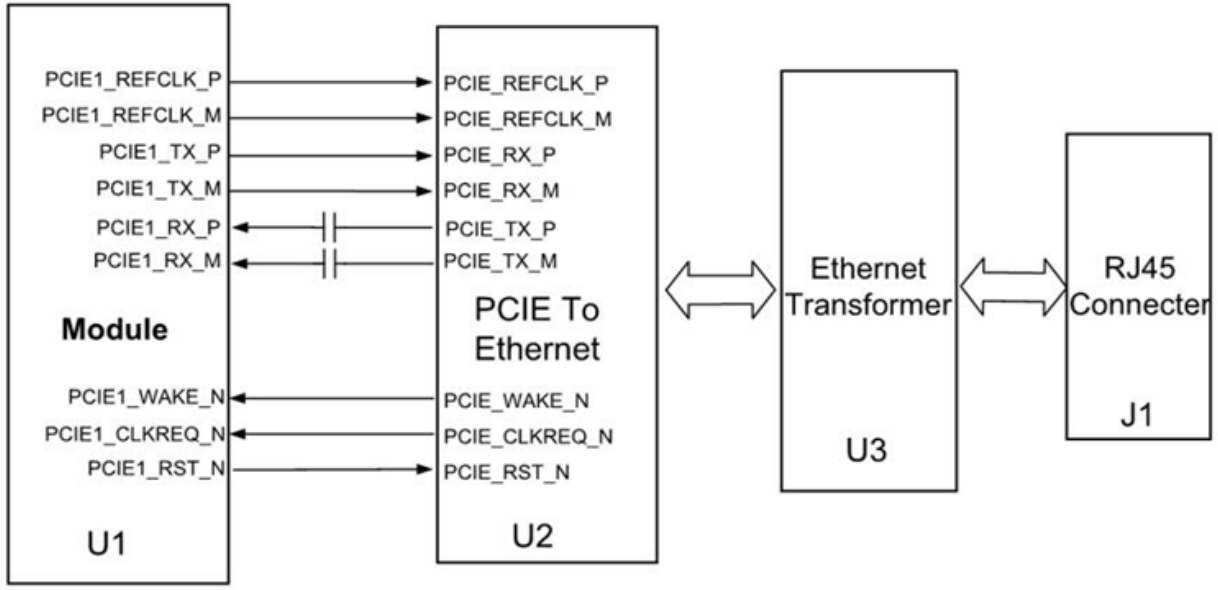


USB 2.0 to 10/ 100M Ethernet

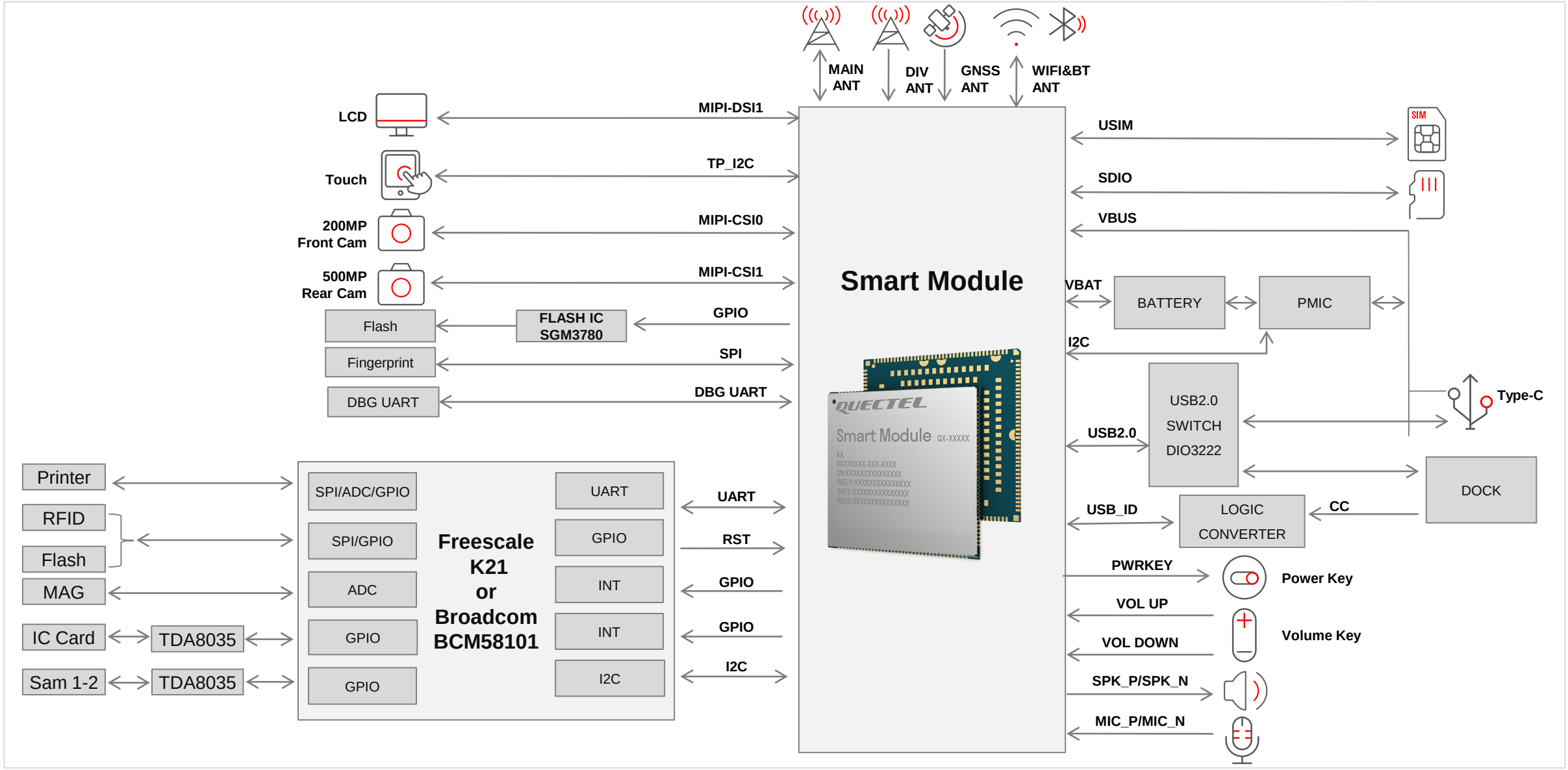


Extensive Function – PCIe to Ethernet

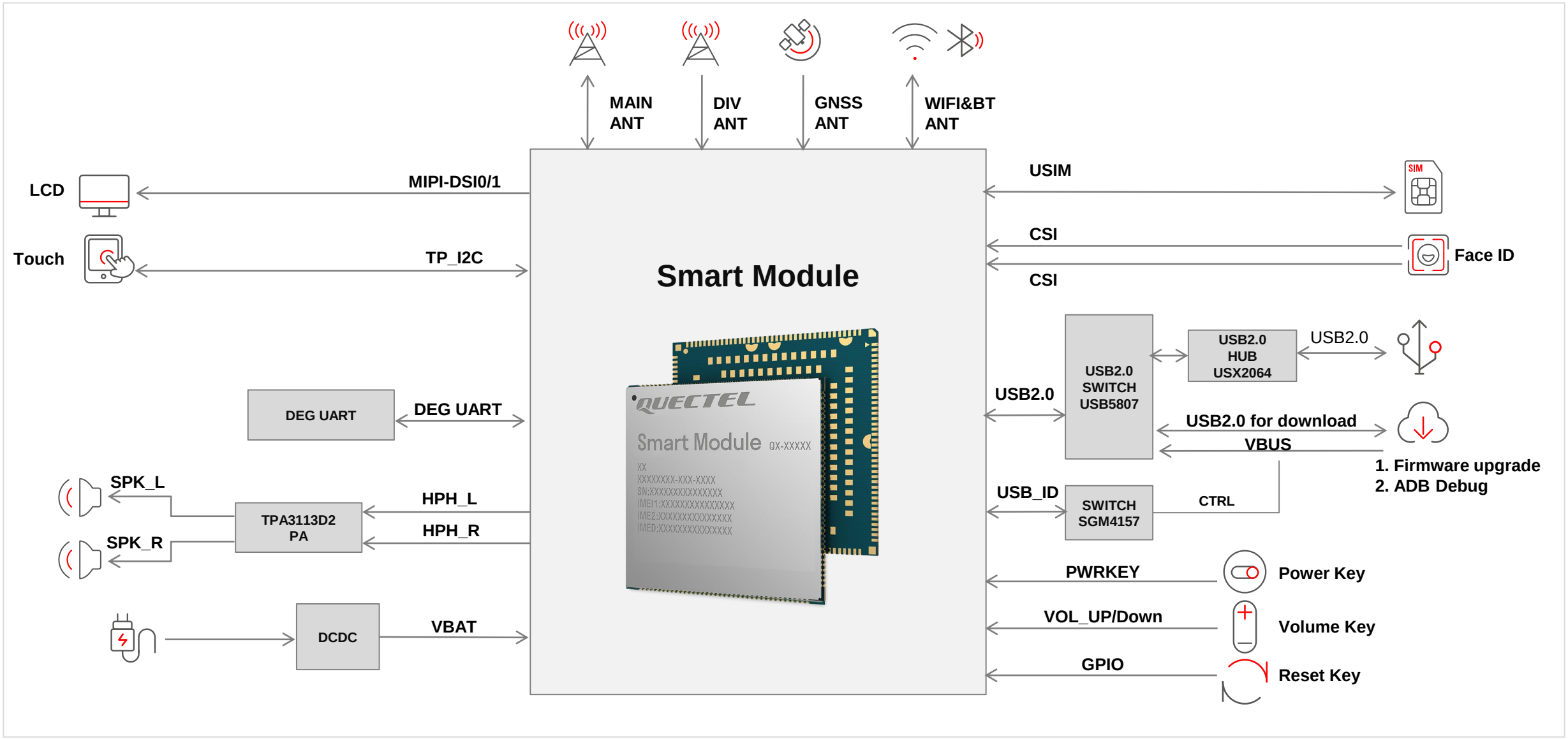
Smart modules have no Ethernet interface, while the PCIe can be converted to Ethernet. External conversion chipset is needed for the conversion.



Typical Solution – POS



Typical Solution – Access Control



Support Package

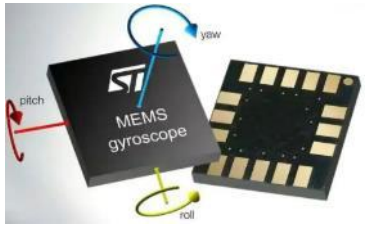
EVB

SMARTEVBG5-INT-KIT: SC686A

Key Components Supply Services

Customers may face difficulties in finding key components used in their board locally. To accelerate customers' development and shorten the time to market, Quectel will use the supply chain to provide the key components to customers.

- ✓ Main key components:
  - LCM + TP
  - Camera module
  - Sensors, NFC ICs, extension ICs, etc.



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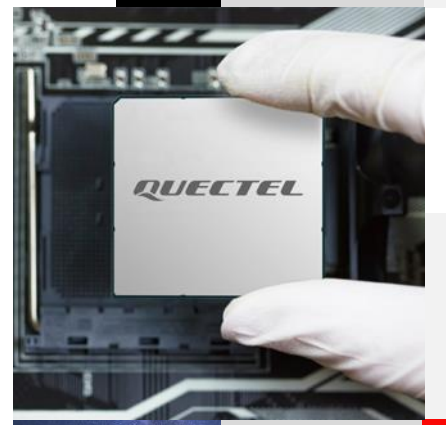
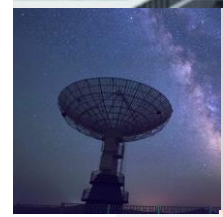
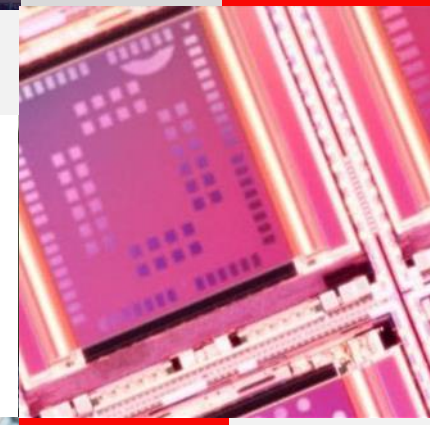
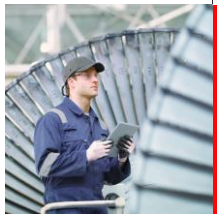




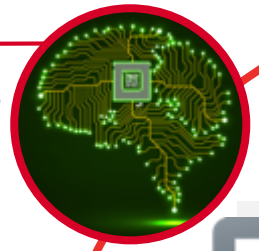




360 Degree Support

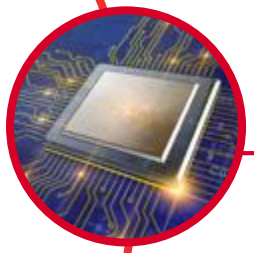
1. System Evaluation

- Analyzing customer requirements
- Recommending the right module for the customer
- Evaluating antenna placement
- Designing antennas



2. Design In

- Recommending referenced hardware designs
- Checking schematics and layouts
- Providing software design support



3. Prototype

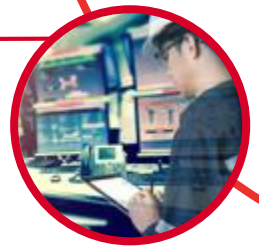
- Providing design validation testing
- Recommending suppliers

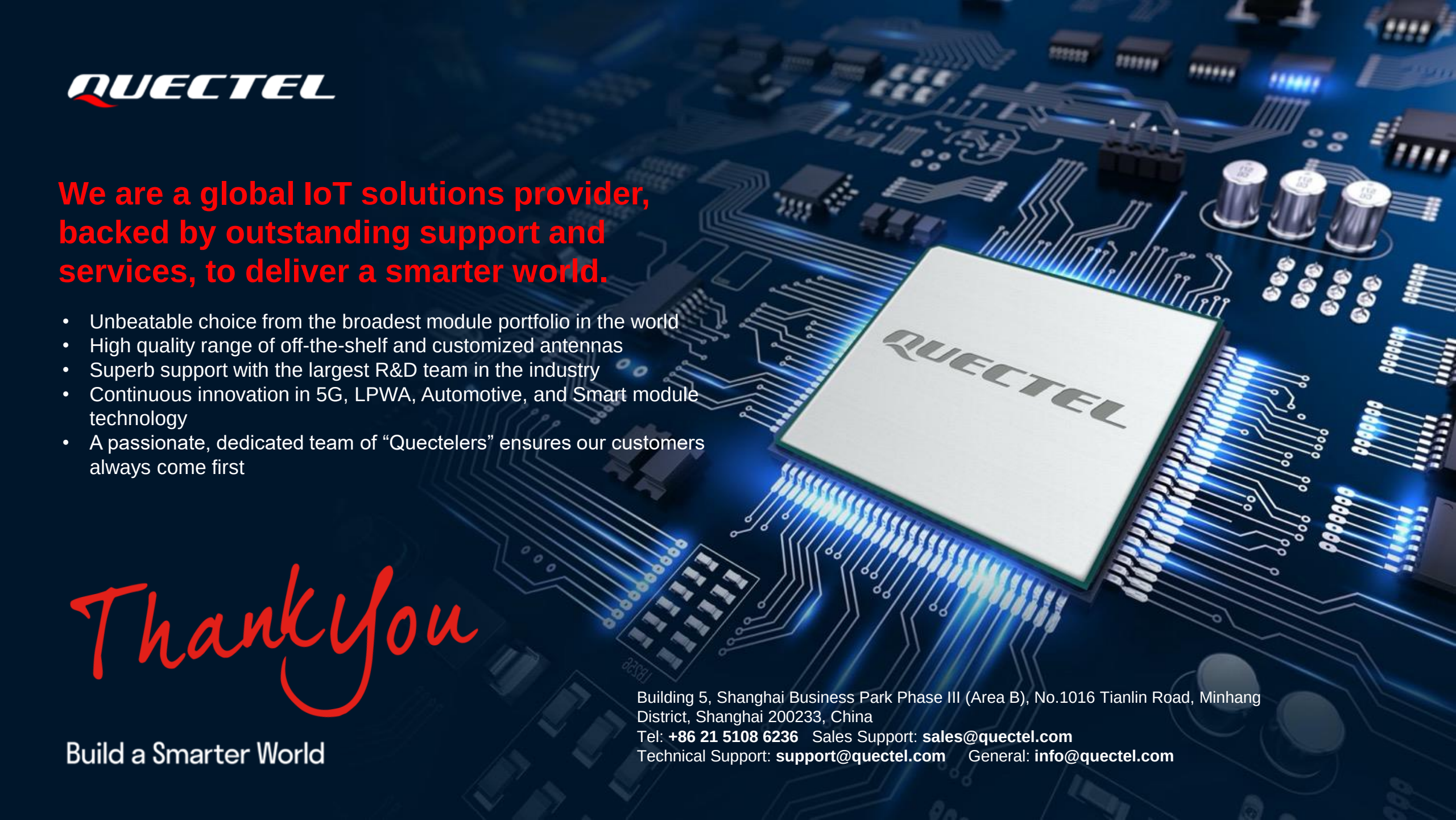
4. Testing Service

- RF testing
- Power consumption testing
- Audio testing
- Reliability & environmental testing
- ESD testing
- Certification testing
- Antenna debugging

5. Mass Production

- Providing assembly and testing guidelines
- Providing after-sales services





QUECTEL

We are a global IoT solutions provider, backed by outstanding support and services, to deliver a smarter world.

- Unbeatable choice from the broadest module portfolio in the world
- High quality range of off-the-shelf and customized antennas
- Superb support with the largest R&D team in the industry
- Continuous innovation in 5G, LPWA, Automotive, and Smart module technology
- A passionate, dedicated team of “Quectelers” ensures our customers always come first

ThankYou

Build a Smarter World

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