Quectel BG77xA-GL&BG95xA-GL LPWA Module

Introduction

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Duty of Confidentiality

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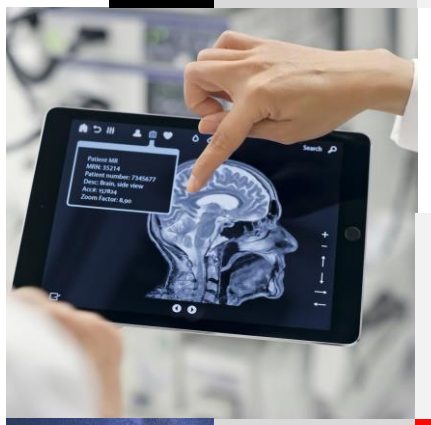

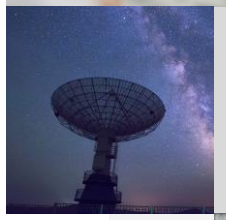

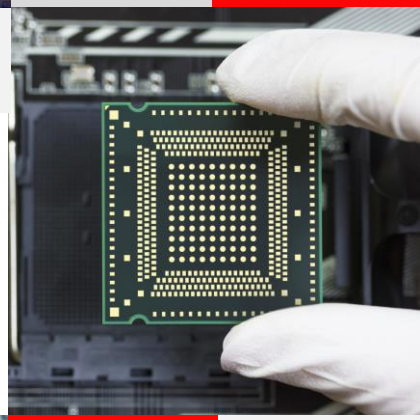

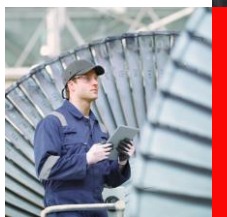

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LPWA Roadmap
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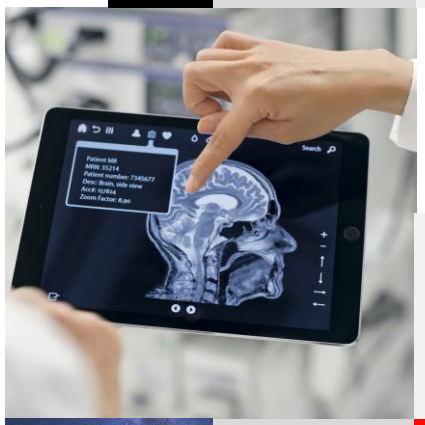

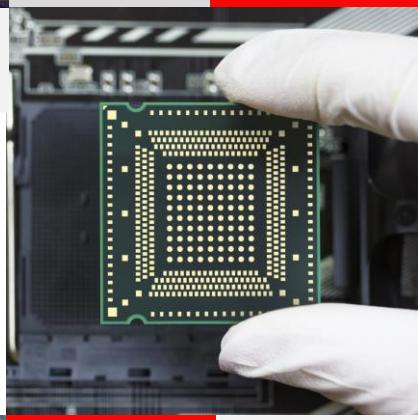

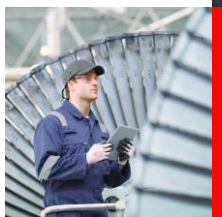

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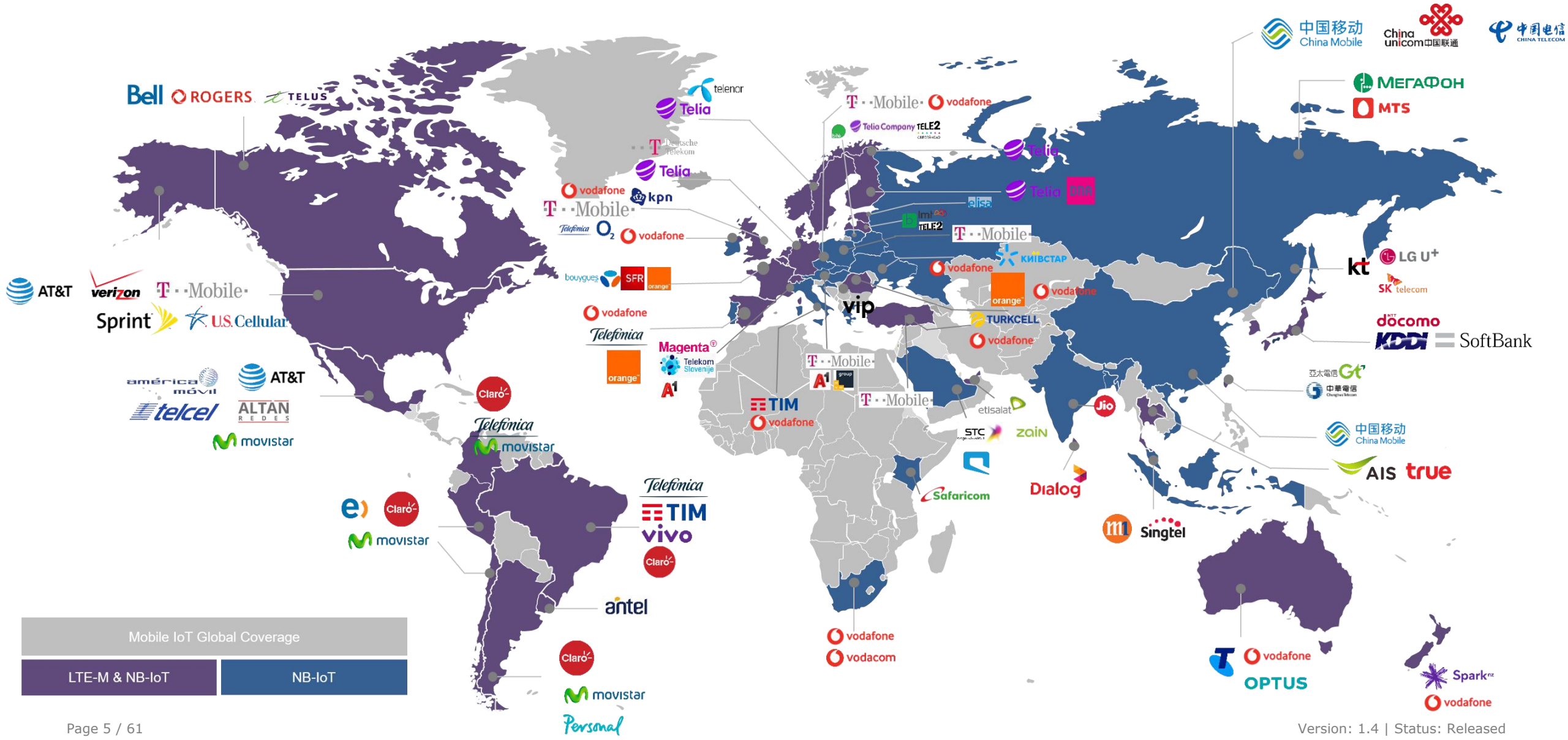
LPWA Advantages

Note: VoLTE is supported on LTE Cat M1 only.

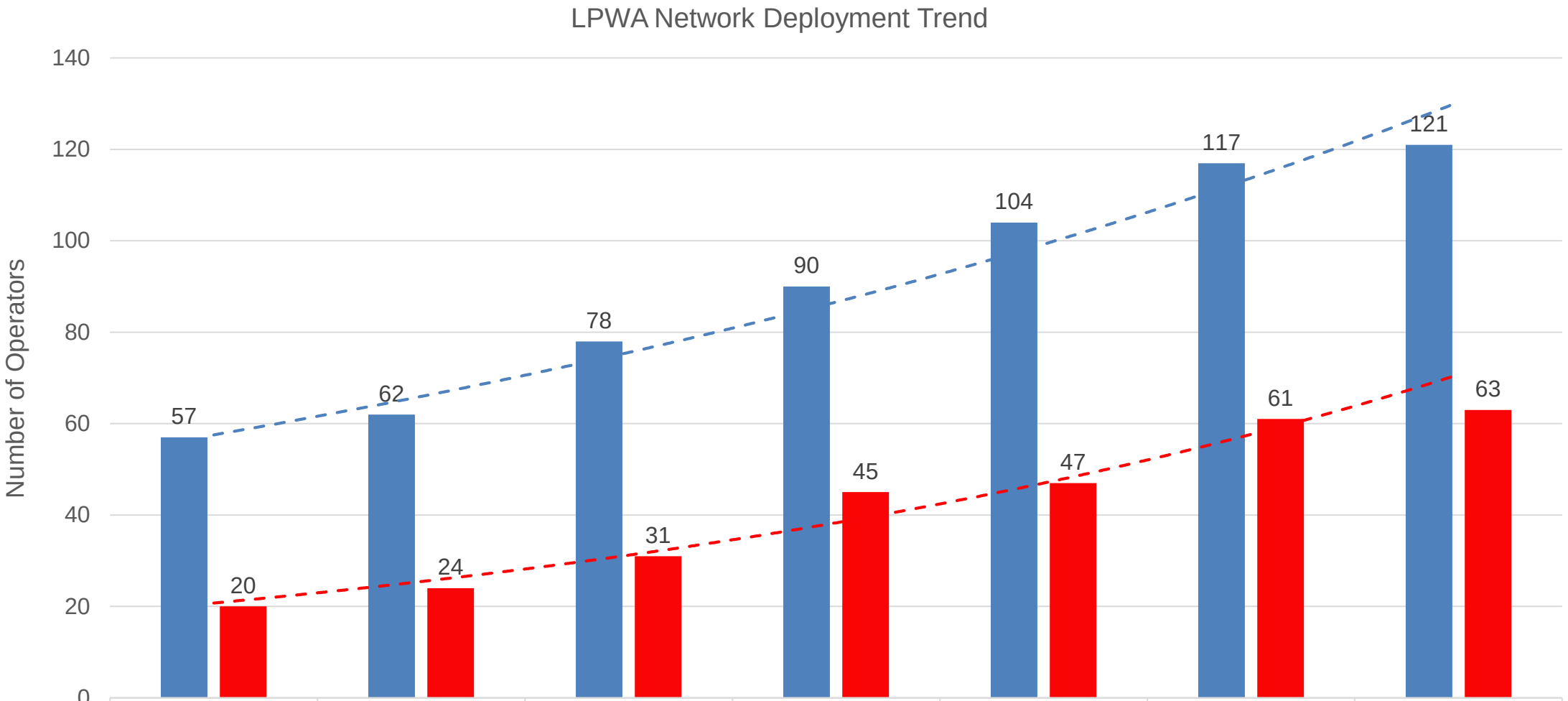
LPWA Network Deployment (Based on GSMA Data up to April, 2022)



Mobile IoT Global Coverage

LTE-M & NB-IoT | NB-IoT

LPWA Network Deployment Trend



	Dec. 2018	Mar. 2019	Jun. 2019	Oct. 2019	Feb. 2020	Aug. 2021	Apr. 2022
NB-IoT	57	62	78	90	104	117	121
LTE-M	20	24	31	45	47	61	63

NB-IoT Deployment (1) (Based on GSMA Data up to April, 2022)

NB-IoT = 121								
Country/Region	**Operator**	**Bands**	**Country/Region**	**Operator**	**Bands**	**Country/Region**	**Operator**	**Bands**
Argentina	Claro	4, 28	China	China Telecom	5	France	SFR	20
Argentina	MNO Personal	28	China	China Unicom	3, 8	Germany	Telefónica	8, 20
Argentina	Movistar	4, 28	China(Hong Kong)	3	8	Germany	Vodafone	20
Australia	Telstra	28	China(Hong Kong)	China Mobile	3	Germany	Deutsche Telekom	8, 20
Australia	Vodafone	8	China(Hong Kong)	SmarTone	8	Greece	Vodafone	20
Australia	Optus	28	China(Taiwan)	APTG	8	Greece	T-Mobile (Cosmote)	20
Austria	A1	20	China(Taiwan)	Chunghwa	8	Hungary	T-Mobile	20
Austria	T-Mobile (Magenta)	8	China(Taiwan)	FarEasTone	28	Hungary	Vodafone	20
Bangladesh	Grameenphone	3, 8 (TBC)	China(Taiwan)	Taiwan Mobile	28	India	Reliance Jio	3, 5
Belarus	A1	/	Colombia	Claro	5	Indonesia	Telkomsel	8
Belarus	Velcom	8	Colombia	Movistar	5	Indonesia	XL Axiata	8
Belgium	BASE (Telenet)	3, 20	Croatia	A1	20	Ireland	Vodafone	20
Belgium	Proximus	20	Croatia	T-Mobile (DT)	8, 20	Italy	Vodafone	20
Belgium	Orange	3,20	Czech	Vodafone	8, 20	Italy	Telecom Italia/TIM	20
Brazil	Claro	3, 28	Denmark	Telenor	20	Japan	SoftBank	1, 8
Brazil	Vivo	3, 28	Denmark	Telia	20, 8	Kazakstan	KCELL	/
Brazil	Telecom Italia/TIM	28	Denmark	TDC	20	Kenya	SafariCom	8
Canada	Rogers	4, 5, 12	Estonia	Telia	20	Latvia	Bite	20
Chile	Claro	28	Estonia	Elisa	20	Latvia	LMT	20
Chile	Movistar	28	Finland	Telia	20	Latvia	Tele2	20
Chile	Entel	28	Finland	DNA	20, 3	Lithuania	Bite	28
China	China Mobile	8	Finland	Elisa	20, 3	Lithuania	Telia	28

NB-IoT Deployment (2) (Based on GSMA Data up to April, 2022)

NB-IoT = 121								
Country/Region	**Operator**	**Bands**	**Country/Region**	**Operator**	**Bands**	**Country/Region**	**Operator**	**Bands**
Lithuania	Tele2	28	Saudi Arabia	STC	12	Turkey	Turkcell	1, 8, 20
Malaysia (6 Cities)	Maxis	3	Serbia	Vip Mobile (A1)	20, 8	Turkey	Vodafone	8, 20
Malta	Vodafone	/	Singapore	M1	8	UAE	DU	20
Mexico	ALTAN	28	Singapore	StarHub	3, 8	UAE	Etisalat	20
Mexico	AT&T	5	Singapore	Singtel	8	Ukraine	Kyivstar	3
Mexico	Telcel	5	Slovakia	T-Mobile (Slovakia Telecom)	20	Ukraine	Vodafone	3
Netherlands	T-Mobile (DT)	20	Slovenia	A1	20	United Kingdom	Vodafone	20
Netherlands	Vodafone	20	Slovenia	Telekom Slovenije	20	Uruguay	Antel	3,28
New Zealand	Vodafone	28	South Africa	Vodafone	8	USA	AT&T	2, 4, 12
Norway	Telenor	8, 20	South Africa	Vodacom	3, 8, 28	USA	T-Mobile	2, 4, 12, 66, 71, 85
Norway	Telia	20	South Korea	KT	3	USA	Verizon	13
Peru	Claro	28	South Korea	LGU+	5			
Peru	Movistar	28	Spain	Telefónica	20			
Poland	T-Mobile (DT)	20	Spain	Vodafone	8, 20			
Portugal	Altice	20	Spain	Orange	20			
Portugal	Vodafone	8, 20	Sri Lanka	Dialog Axiata	3, 8			
Portugal	NOS	3,20	Sri Lanka	Mobitel	3,8			
Romania	Vodafone	20	Sweden	Telia	20			
Russia	MegaFon	20, 8, 3	Switzerland	Swisscom	20			
Russia	MTS	3	Thailand	AIS	8			
Saudi Arabia	Zain	3	Thailand	TRUE	8			
Saudi Arabia	Mobily	20	Thailand	DTAC	28			

LTE-M Deployment (Based on GSMA Data up to April, 2022)

LTE-M = 63								
Country/Region	**Operator**	**Bands**	**Country/Region**	**Operator**	**Bands**	**Country/Region**	**Operator**	**Bands**
Argentina	Claro	28	Germany	Deutsche Telekom	8, 20	Singapore	SingTel	3, 8
Argentina	MNO Personal	28	Germany	Telefónica	20	South Korea	KT	3
Argentina	Movistar	4,28	Hungary	MVM Group	31	South Korea	LGU+	5
Argentina	Personal	4,28	Japan	KDDI	18, 26	South Korea	SKT	3, 5
Australia	Telstra	28	Japan	NTT DOCOMO	1, 19	Spain	Orange	3, 20
Belgium	Orange	20	Japan	SoftBank	1, 3, 8	Spain	Telefonia	20
Brazil	Claro	3, 28	Latvia	LMT	20	Sri Lanka	Dialog Axiata	8
Brazil	Vivo	3,28	Mexico	ALTAN	28	Sweden	Telenor	20
Canada	Bell	12	Mexico	América Móvil	4	Sweden	Telia	20
Canada	Rogers	4, 5, 12	Mexico	AT&T	4	Switzerland	Swisscom	20
Canada	Telus	2, 4, 5, 12	Mexico	Movistar	2	Thailand	AIS	3, 8
Chile	Claro	28	Mexico	Telcel	4	Turkey	Turkcell	20
China(Taiwan)	APTG	8	Netherlands	KPN	20	UAE	Etisalat	5
China(Taiwan)	Chunghwa	3	Netherlands	T-Mobile (DT)	8	UK	O2 Telefonica	20
Colombia	Claro	5	Netherlands	Vodafone	20	Uruguay	Antel	3, 28
Colombia	Movistar	4	New Zealand	Spark	28	US	USCC	2, 4, 5, 12
Colombia	Telefonica	2	New Zealand	Vodafone	28, 3, 8	USA	AT&T	2, 4, 12
Denmark	Telenor	20	Norway	Telenor	20	USA	Verizon	4, 13
Estonia	Elisa	/	Peru	Claro	28	USA	Sprint	25
Finland	DNA	20, 3	Peru	Entel	2, 28			
France	Bouygues Telecom	20	Peru	Movistar	4			
France	Orange	20, 3	Romania	Orange	3			

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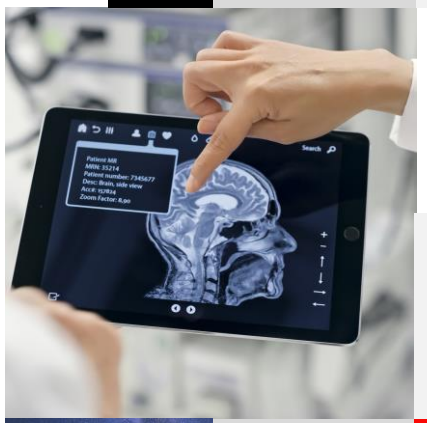

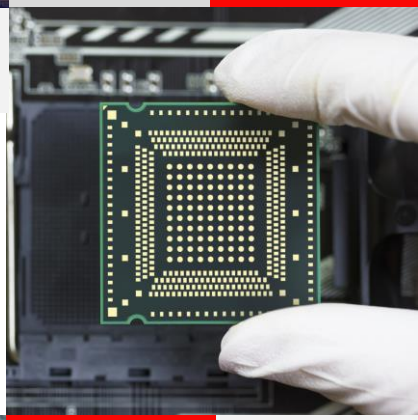
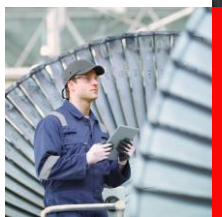

LPWA Modules (Sony Platform) Roadmap

ATL1250

SONY

BG77xA-GL is Pin-to-Pin Compatible with BG77

BG770A-GL
- Cat M1/ NB1/ NB2*/ GNSS
- Ultra small size
- Low power consumption

BG772A-GL
- Cat M1/ NB1/ NB2*/ GNSS
- Ultra small size
- QuecOpen®

BG773A-GL*
- Cat M1/ NB1/ NB2*/ GNSS
- Ultra small size
- iSIM

BG95xA-GL is Pin-to-Pin Compatible with BG95 Series

BG950A-GL
- Cat M1/ NB1/ NB2*/ GNSS
- Low power consumption

BG951A-GL
- Cat M1/ NB1/ NB2*/ GNSS
- Low power consumption
- LTE&GNSS Concurrency

BG952A-GL
- Cat M1/ NB1/ NB2*/ GNSS
- Low power consumption
- QuecOpen®

BG955A-GL*
- Cat M1/ NB1/ NB2/ GNSS/ GPRS
- Low power consumption

BG953A-GL*
- Cat M1/ NB1/ NB2*/ GNSS
- Low power consumption
- iSIM

2021 | **2022**

BG77xA-GL & BG95xA-GL Overview

Module	Model	Features				Bands	Dimensions (mm)	Compatibility	Target Carrier Certifications	Status
		LTE&GNSS Concurrency	QuecOpen®	iSIM	2G Fall Back					
BG77xA-GL	BG770A-GL	-	-	-	-	**Cat M1:** LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66 **Cat NB1/NB2*:** LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66	14.9 × 12.9 × 1.9	BG77	All major global carriers, depending on customers' requirements	MP
	BG772A-GL	-	Supported	-	-					ES
	BG773A-GL*	-	-	Supported	-					Pre-ES
BG95xA-GL	BG950A-GL	-	-	-	-	**Cat M1:** LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66 **Cat NB1/NB2*:** LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66	23.6 × 19.9 × 2.2	BG95 Series/ BG96/ BC95-GV/ BC92/ EG9x/ UG9x/ M95	All major global carriers, depending on customers' requirements	CS
	BG951A-GL	Supported	-	-	-					CS
	BG952A-GL	-	Supported	-	-					ES
	BG953A-GL*	-	-	Supported	-					Pre-ES
	BG955A-GL*	-	-	-	Supported	**Cat M1:** LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66 **Cat NB1/NB2:** LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66 **GPRS:** GSM850/EGSM900/DCS1800/PCS1900				Pre-ES

** under development*

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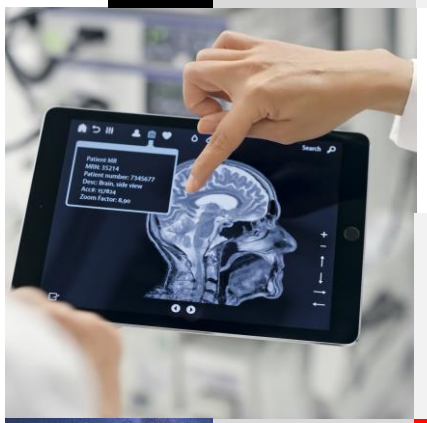

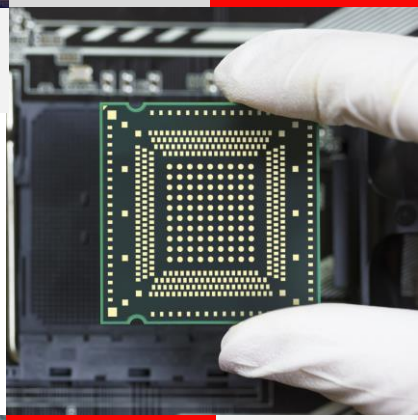

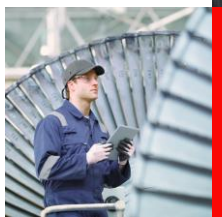

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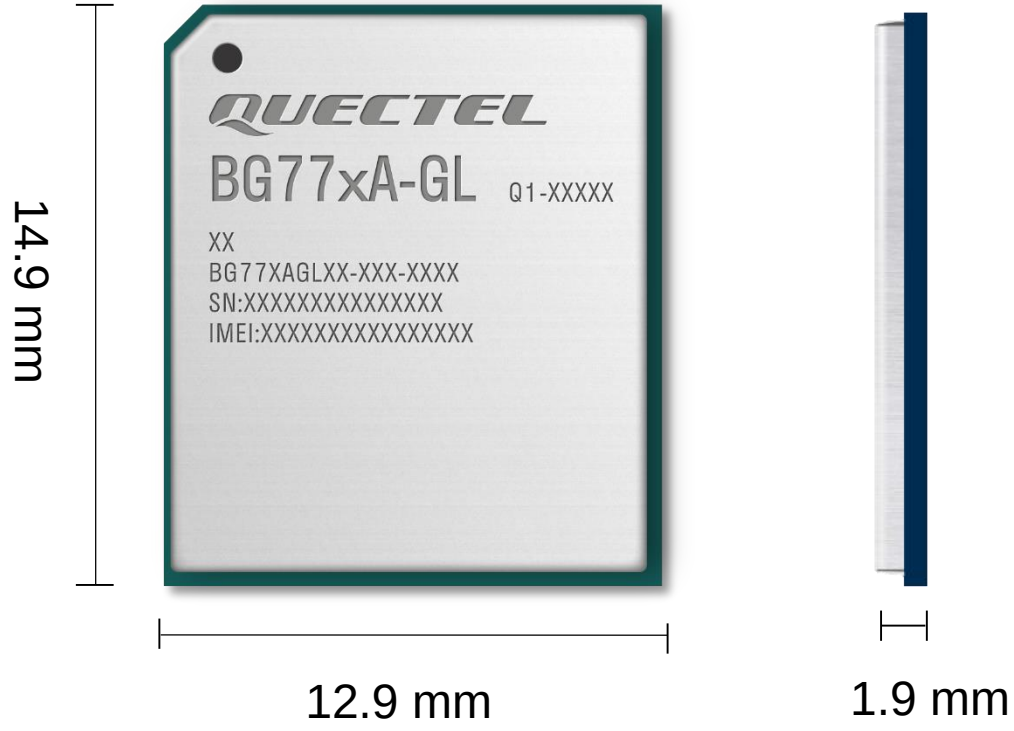
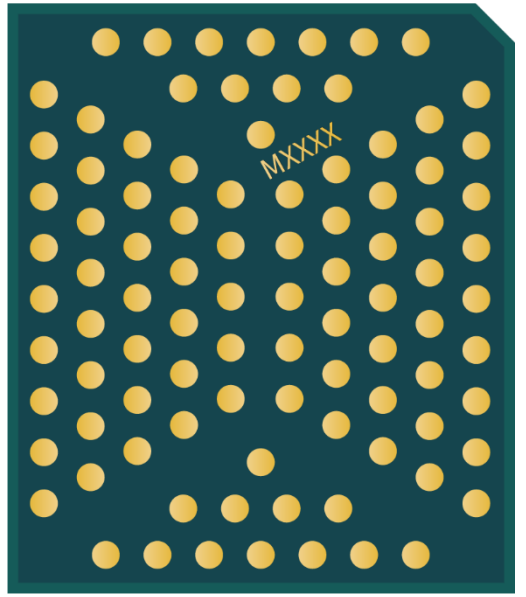
BG77xA-GL Mechanical Dimensions

Ultra Compact LTE Cat M1/ Cat NB1/ Cat NB2* Module (ALT1250)





Length: 14.9 mm (± 0.20 mm)
Width: 12.9 mm (± 0.20 mm)
Height: 1.9 mm (± 0.20 mm)

BG77xA-GL Highlights

Highlights	Description
Super Compact Size	14.9 mm × 12.9 mm × 1.9 mm
Global Bands	Cat M1: LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66 Cat NB1/ NB2*: LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66
Rich Hardware Interfaces	UART/ (U)SIM/ USB*/ I2C*①/ SPI①/ ADC/ GPIO/ GRFC*/ NET_STATUS/ STATUS/ Antenna
Abundant Protocols	PPP/ TCP/ UDP/ SSL/ DTLS/ FTP(S)/ HTTP(S)/ NITZ/ PING/ NIDD/ MQTT/ NTP/ LwM2M/ CoAP
Power Supply	Supply voltage range: VBAT_BB: 2.2–4.35 V; VBAT_RF: 3.1–4.35 V; Typ. 3.3 V Low voltage supply allows the battery to be powered by Lithium manganese or Lithium zinc cells
Wakeup	Hardware wakeup: Power Key
Ultra Low Power Consumption ②	• Power Saving Mode: 1.4 μA • Rock Bottom: 45 μA • Sleep Mode: 1.1 mA @ DRX = 1.28 s (Cat M1); 2.2 mA @ DRX = 1.28 s (Cat NB1) 0.06 mA @ eDRX = 40.96 s; PTW = 1.28 s; DRX = 1.28 s (Cat M1) 0.16 mA @ eDRX = 40.96 s; PTW = 2.56 s; DRX = 1.28 s (Cat NB1) • Idle Mode: 16.5 mA @ DRX = 1.28 s (Cat M1); 17.0 mA @ DRX = 1.28 s (Cat NB1) 16.0 mA @ eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s (Cat M1) 16.0 mA @ eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s (Cat NB1)
Security*	ISE - hardware-based security features
GNSS	GPS, GLONASS
Advanced Features	• QuecLocator® • Polte • DFOTA • QuecOpen® ① • iSIM ③
Compatibility	Compatible with Quectel BG77

** means under development* *① Only supported on BG772A-GL.* *② Power consumption data of BG770A-GL is provided for reference.* *③ Only supported on BG773A-GL*.*

BG77xA-GL Specifications 1

14.9 mm × 12.9 mm × 1.9 mm

Cat M1/Cat NB1/Cat NB2*

Super Compact Size: 14.9 mm × 12.9 mm × 1.9 mm

Package: 94-pin LGA

Supply Voltage: VBAT_BB: 2.2–4.35 V; VBAT_RF: 3.1–4.35 V; Typ. 3.3 V

Data Rate:

- Rel-13: LTE Cat M1: Max. 300 kbps (DL)/375 kbps (UL)
- Rel-13: LTE Cat NB1: Max. 27.2 kbps (DL)/62.5 kbps (UL)
- Rel-14: LTE Cat M1*: Max. 588 kbps (DL)/1119 kbps (UL)
- Rel-14: LTE Cat NB2*: Max. 127 kbps (DL)/158 kbps (UL)

Protocols: PPP/ TCP/ UDP/ SSL/ DTLS/ FTP(S)/ HTTP(S)/ NITZ/ PING/ NIDD/ MQTT/ NTP/ LwM2M/ CoAP

Functions: Data Transfer/ GNSS/ DFOTA/ NITZ/ PING/ Jamming Detection/ Triangle Location/ Polte/ iSIM ①

Interfaces: UART/ USB (FS Only)*/ (U)SIM/ I2C* ②/ ADC/ SPI ②/ GPIO/ GRFC/ NET_STATUS/ STATUS/ Antenna

Power Consumption (Typical): 1.4 μA @ PSM (USB and UART disconnected)

** means under development.*
① Only supported on BG773A-GL.*
② Only supported on BG772A-GL.

BG77xA-GL Specifications 2

LTE Cat M1/Cat NB1/Cat NB2* Module

14.9 mm × 12.9 mm × 1.9 mm
Rel-13: LTE Cat M1: Max. 300 kbps (DL)/375 kbps (UL)
Rel-13: LTE Cat NB1: Max. 27.2 kbps (DL)/62.5 kbps (UL)
Rel-14: LTE Cat M1*: Max. 588 kbps (DL)/1119 kbps (UL)
Rel-14: LTE Cat NB2*: Max. 127 kbps (DL)/158 kbps (UL)

Items	BG77xA-GL
Cat M1	LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66
Cat NB1/NB2*	LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66
GNSS	GPS, GLONASS
Certification	All major global carriers

** means under development*

BG770A-GL Power Consumption

Modes		Current Consumption	Notes
PSM		1.4 µA	
Rock Bottom		45 µA	**AT+CFUN=0** **AT+QSCLK=2**
Sleep Mode	**Cat M1; DRX = 1.28 s**	1.1 mA	
	Cat NB1; DRX = 1.28 s	2.2 mA	
	Cat M1; eDRX = 40.96 s; PTW = 1.28 s; DRX = 1.28 s	0.06 mA	**AT+QSCLK=2**
	Cat NB1; eDRX = 40.96 s; PTW = 2.56 s; DRX = 1.28 s	0.16 mA	**AT+QSCLK=2**
Idle Mode	**Cat M1; DRX = 1.28 s**	16.5 mA	
	Cat NB1; DRX = 1.28 s	17.0 mA	
	Cat M1; eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s	16.0 mA	
	Cat NB1; eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s	16.0 mA	

BG772A-GL Power Consumption

Modes		Current Consumption	Notes
Power Saving Mode + QuecOpen @Shutdown mode		1.4 μA	
Rock Bottom	**QuecOpen @Shutdown mode**	43 μA	**AT+CFUN=0** **AT+QSCLK=2**
	QuecOpen @Standby mode	45 μA	
	QuecOpen @Stop mode	0.68 mA	
Sleep Mode + QuecOpen @Standby mode	**Cat M1; DRX = 1.28 s**	1.1 mA	
	Cat NB1; DRX = 1.28 s	2.2 mA	
	Cat M1; eDRX = 40.96 s; PTW = 1.28 s; DRX = 1.28 s	0.06 mA	**AT+QSCLK=2**
	Cat NB1; eDRX = 40.96 s; PTW = 2.56 s; DRX = 1.28 s	0.16 mA	**AT+QSCLK=2**
Idle Mode + QuecOpen @Standby mode	**Cat M1; DRX = 1.28 s**	16.5 mA	
	Cat NB1; DRX = 1.28 s	17.0 mA	
	Cat M1; eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s	16.0 mA	
	Cat NB1; eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s	16.0 mA	

BG77xA-GL Main Interfaces

Interface	BG770A-GL	BG772A-GL	BG773A-GL
(U)SIM	1 (Supports 1.8 V only)	1 (Supports 1.8 V only)	1 (Supports 1.8 V only)
UART	3	Max. 2	3
USB*	1 (Full speed only)	1 (Full speed only)	1 (Full speed only)
I2C*	-	Max. 2	-
ADC	2	Max. 2	2
SPI	-	Max. 2 (1 for master only, 1 for master/slave)	-
GPIO	7	Max. 15	7
GRFC	2	2	2
NET_STATUS	1	1	1
STATUS	1	1	1
Antenna Interface	2 (For main antenna and GNSS antenna, respectively)	2 (For main antenna and GNSS antenna, respectively)	2 (For main antenna and GNSS antenna, respectively)

** means under development*

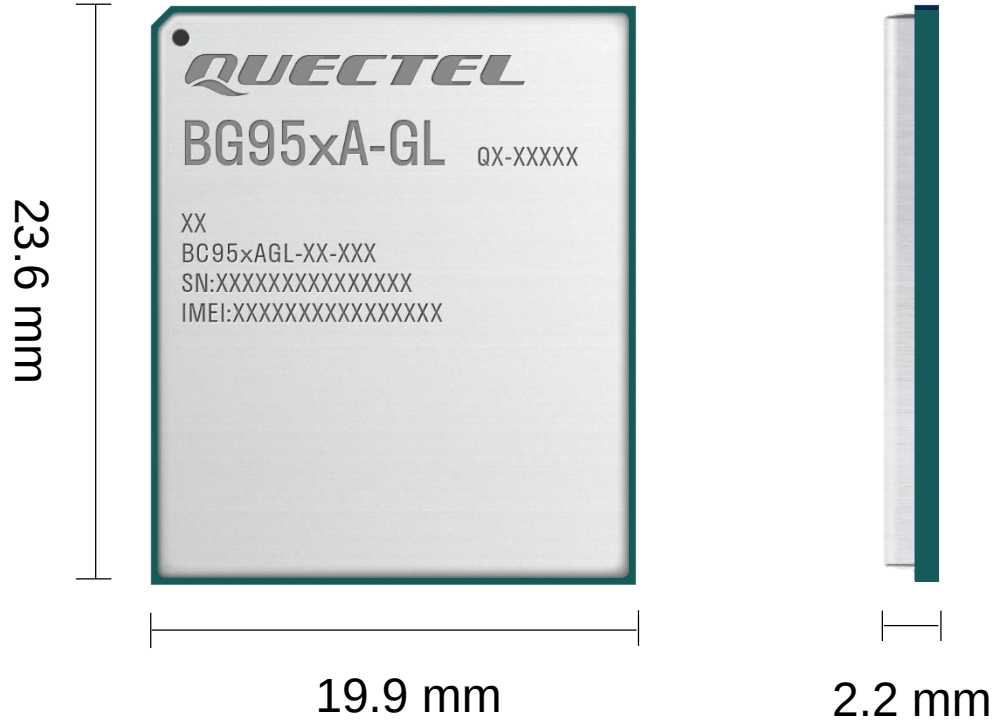
BG77xA-GL Main Functions

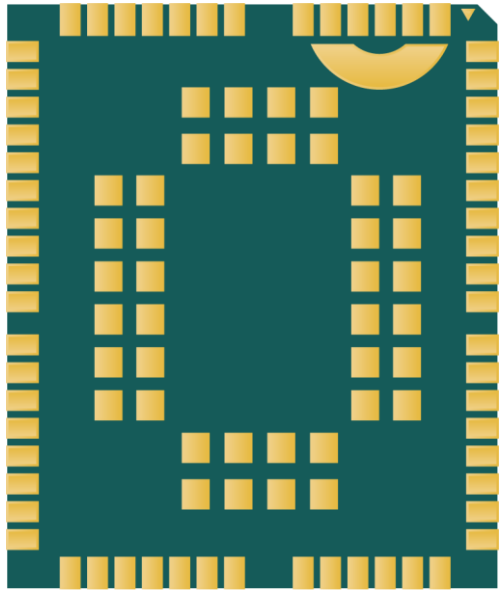
Function	Description
Protocols	PPP/ TCP/ UDP/ SSL/ DTLS/ FTP(S)/ HTTP(S)/ NITZ/ PING/ NIDD/ MQTT/ NTP/ LwM2M/ CoAP
SMS	Point-to-Point MO and MT; Text and PDU modes
DFOTA	Delta Firmware Upgrade Over-The-Air
LwM2M	Supported
GNSS	GPS, GLONASS
LTE Cell Track	QuecLocator®, Polte
QuecOpen® ①	Support the second development of embedded applications, ARM Cortex M4 processor, running FreeRTOS
iSIM ②	Support integrated SIM functionality

"" means under development.*
① Only supported on BG772A-GL.
② Only supported on BG773A-GL.*

BG95xA-GL Mechanical Dimensions

Multi-Mode Cat M1/ Cat NB 1/ Cat NB2*/ GPRS Module (ALT1250)





Length: 23.6 mm (± 0.2 mm)
Width: 19.9 mm (± 0.2 mm)
Height: 2.2 mm (± 0.2 mm)
Weight: Approx. 2.15 g

BG95xA-GL Series Highlights

Highlights	Description
Compatible Size	23.6 mm × 19.9 mm × 2.2 mm
Global Bands	Cat M1: LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66 Cat NB1/ NB2*: LTE-FDD B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66 GPRS ①: GSM850/EGSM900/DCS1800/PCS1900
Rich Hardware Interfaces	UART/ (U)SIM/ USB*/ I2C* ②/ SPI ②/ ADC/ GPIO/ GRFC*/ NET_STATUS/ STATUS/ Antenna
Abundant Protocols	TCP/ PPP/ UDP/ SSL/ MQTT/ FTP(S)/ HTTP(S) /LwM2M/ IPv4/ IPv6/ TLS/ DTLS/ PING/ CoAP/ NITZ
Power Supply	Supply voltage range: 2.2–4.35 V, typical 3.3 V Low voltage supply allows the battery to be powered by Lithium manganese or Lithium zinc cells.
Wakeup	Hardware wakeup: Power key
Ultra Low Power Consumption ③	• Power Saving Mode: 1.5 μA • Rock Bottom: 39 μA • Sleep Mode: 1.1 mA @ DRX = 1.28 s (Cat M1); 2.2 mA @ DRX = 1.28 s (Cat NB1) 0.12 mA @ eDRX = 40.96 s; PTW = 1.28 s; DRX = 1.28 s (Cat M1) 0.16 mA @ eDRX = 40.96 s; PTW = 2.56 s; DRX = 1.28 s (Cat NB1) • Idle Mode: 15.0 mA @ DRX = 1.28 s (Cat M1); 16.0 mA @ DRX = 1.28 s (Cat NB1) 15.0 mA @ eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s (Cat M1) 15.0 mA @ eDRX = 81.92 s; PTW = 2.56 s; DRX = 1.28 s (Cat NB1)
Security*	ISE - hardware-based security features
GNSS	GPS, GLONASS, Galileo, BDS, QZSS (*Galileo, BDS, QZSS and LTE&GNSS concurrency* only supported on BG951A-GL*)
Advanced Features	• QuecLocator® • Polte • DFOTA • QuecOpen® ② • iSIM ④
Compatibility	Compatible with Quectel BG95 series

① Only supported on BG955A-GL. ② Only supported on BG952A-GL. ③ Power consumption data of BG951A-GL is provided for reference. ④ Only supported on BG953A-GL*.*

** means under development.*

BG95xA-GL Specifications 1

23.6 mm × 19.9 mm × 2.2 mm

Cat M1/Cat NB1/Cat NB2*/GPRS

Package: 102-pin LGA

Supply Voltage: 2.2–4.35 V, typ. 3.3 V

Data Rate:

- Rel-13: LTE Cat M1: Max. 300 kbps (DL)/ 375 kbps (UL)
- Rel-13: LTE Cat NB1: Max. 27.2 kbps (DL)/ 62.5 kbps (UL)
- Rel-14: LTE Cat M1: Max. 588 (DL)/ 1119 (UL)
- Rel-14: LTE Cat NB2: Max. 127 kbps (DL)/ 158 kbps (UL)
- GPRS: Max. 85.6 kbps (DL)/ 42.8 kbps (UL)

Protocols: TCP/ PPP/ UDP/ SSL/ MQTT/ FTP(S)/ HTTP(S) /LwM2M/ IPv4/ IPv6/ TLS/ DTLS/ PING/ CoAP/ NITZ

Functions: Data Transfer/ GNSS/ DFOTA/ NITZ/ PING/ Jamming Detection/ Triangle Location/ Polte/ QuecOpen® ①/ iSIM ②

Interfaces: UART/ USB* (FS Only)/ I2C* ①/ SPI ①/ (U)SIM/ ADC/ GPIO/ GRFC*/ NET_STATUS/ STATUS/ Antenna

Power Consumption (Typical) ③: 1.5 μA @ PSM (USB and UART disconnected)

① Only supported on BG952A-GL
*② Only supported on BG953A-GL**
③ Preliminary data
"" means under development*

BG95xA-GL Specifications 2

23.6 mm × 19.9 mm × 2.2 mm
Rel-13: LTE Cat M1: Max. 300 kbps (DL)/375 kbps (UL)
Rel-13: LTE Cat NB1: Max. 27.2 kbps (DL)/62.5 kbps (UL)
Rel-14: LTE Cat M1: Max. 588 kbps (DL)/1119 kbps (UL)
Rel-14: LTE Cat NB2: Max. 127 kbps (DL)/158 kbps (UL)
GPRS: Max. 85.6 kbps (DL)/42.8 kbps (UL)

Cat M1/Cat NB1/Cat NB2*/GPRS Module

Items	BG95xA-GL
Cat M1	LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66
Cat NB1/NB2*	LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66
GPRS ①	GSM850/EGSM900/DCS1800/PCS1900
GNSS	GPS, GLONASS, Galileo, BDS, QZSS (*Galileo, BDS, QZSS and LTE&GNSS concurrency* only supported on BG951A-GL*)
Certification (Planning)	All major global carriers

** means under development ① Only supported on BG955A-GL*.*

BG95xA-GL Main Interfaces

Interface	BG950A-GL	BG951A-GL	BG952A-GL	BG953A-GL	BG955A-GL
(U)SIM	1 (Supports 1.8 V only)	1 (Supports 1.8 V only)	1 (Supports 1.8 V only)	1 (Supports 1.8 V only)	1 (Supports 1.8 V only)
UART	3	3	Max. 2	3	3
I2C*	-	-	Max. 2	-	-
SPI	-	-	Max. 2 (1 for master only, 1 for master/slave)	-	-
USB*	1 (FS only)	1 (FS only)	1 (FS only)	1 (FS only)	1 (FS only)
ADC	2	2	Max. 2	2	2
GPIO	9	9	Max. 15	9	9
GRFC*	2	2	2	2	2
NET_STATUS	1	1	1	1	1
STATUS	1	1	1	1	1
Antenna Interface	2 (For main antenna and GNSS antenna, respectively)	2 (For main antenna and GNSS antenna, respectively)	2 (For main antenna and GNSS antenna, respectively)	2 (For main antenna and GNSS antenna, respectively)	2 (For main antenna and GNSS antenna, respectively)

** means under development*

BG95xA-GL Main Functions

Function	Description
Protocols	PPP/ TCP/ UDP/ SSL/ MQTT/ FTP(S)/ HTTP(S)/ LwM2M/ IPv4/ IPv6/ TLS/ DTLS/ PING/ CoAP/ NITZ
SMS	Point-to-Point MO and MT; Text and PDU mode
DFOTA	Delta Firmware Upgrade Over-The-Air
LwM2M	Supported
GNSS	GPS, GLONASS, BDS, Galileo, QZSS (*only BG951A-GL supports BDS, Galileo and QZSS as well as LTE&GNSS concurrency**)
LTE Cell Track	QuecLocator®, Polte
QuecOpen® ①	Support the second development of embedded applications, ARM Cortex M4 processor, running FreeRTOS
iSIM ②	Support integrated SIM functionality

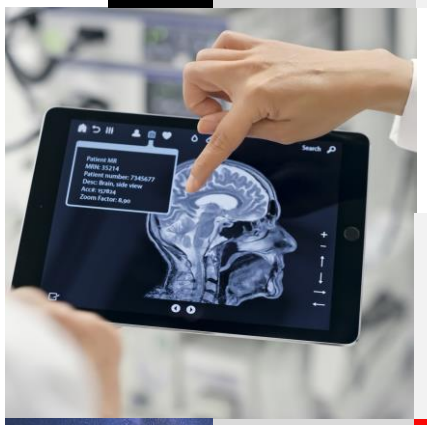
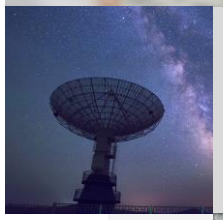
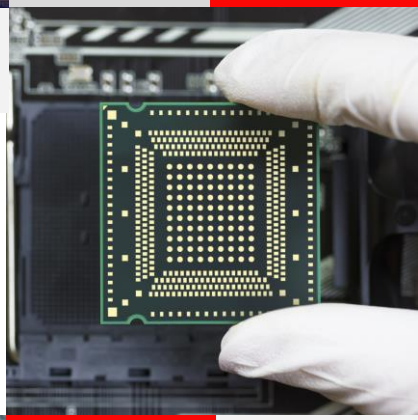
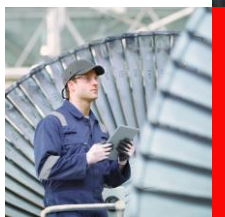
"" means under development*
*① Only supported on BG952A-GL ② Only supported on BG953A-GL**

Technical Background
LPWA Roadmap
Highlights & Specifications

Development Timeline

Technical Details
Applications

Build a Smarter World

BG770A-GL Development Schedule

2021												2022				
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May

ES — CS — MP (I) — MP (II)

Version: BG770AGLR01A02 (Add new features)

- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- FILE
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6

Version: BG770AGLR01A03 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS

Completed: AT&T
Ongoing: Vodafone/ Verizon

Version: BG770AGLR01Axx (Add new features)

- Platform bug fix
- Add new features to meet certification demands

Version: BG770AGLR01Axx (Add new feature)

- Add USB feature

Completed: Deutsche Telekom/ PTCRB

The timeline will be adjusted according to the actual development status.

BG770A-GL Timeline

2021										2022							
Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.

Project Stage

BG770A-GL MP

Carrier Certification

Deutsche Telekom/ AT&T/ KT/ SKT **Completed**

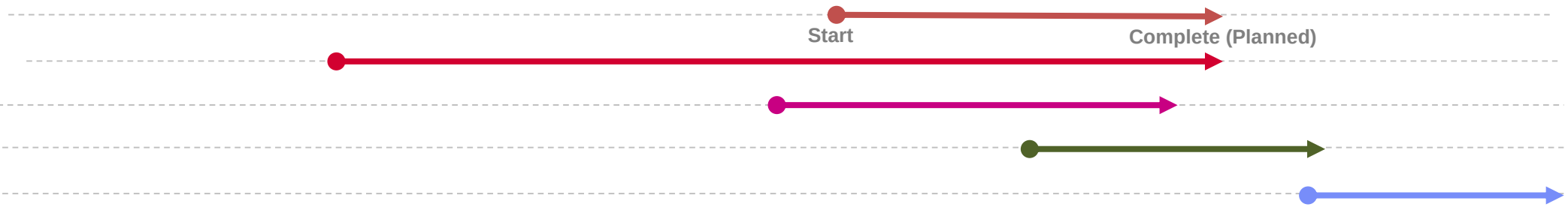
Vodafone

Verizon

LGU+

KDDI

Telstra



NTT DOCOMO **TBD**

Regulatory Certification

GCF/ CE/ PTCRB/ FCC/ IC/ KC/ JATE/ TELEC/ RCM/ ICASA **Completed**

SRRC/ NAL/ CCC/ NCC **TBD**

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

BG772A-GL Development Schedule

2021	2022											
Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Version: BG772AGLR01A02 (Add new features)

- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- FILE
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6
- QuecOpen®

Version: BG772AGLR01A03 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS
- USB

Completed: Deutsche Telekom
Plan for: Vodafone/ AT&T/ Verizon/ PTCRB

Version: BG772AGLR01Axx (Add new features)

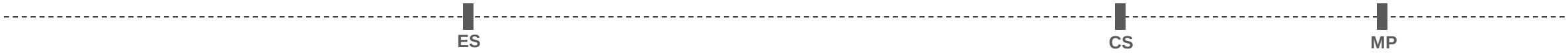
- Platform bug fix
- Add new features to meet certification demands

The timeline will be adjusted according to the actual development status.

BG772A-GL Timeline

2021					2022							
Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.

Project Schedule



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 below.

Carrier Certification

Deutsche Telekom **Completed**

Telstra

Verizon/ AT&T/ SKT/ LGU+ **TBD**

Regulatory Certification

KC/ JATE/ TELEC/ CE/ FCC/ IC/ RCM **Completed**

GCF/PTCRB

NCC **TBD**

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

BG773A-GL Development Schedule

2021	2022											
Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Version: BG773AGLR01A01 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6
- FILE
- USB

Version: BG773AGLR01Axx (Add new features)

- Platform bug fix

Version: BG773AGLR01Axx (Add new features)

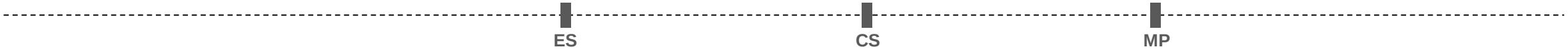
- Platform bug fix

The timeline will be adjusted according to the actual development status.

BG773A-GL Timeline

2022												2023			
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

Project Schedule



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.

Carrier Certification

TBD

Regulatory Certification

GCF/ CE/ FCC / PTCRB	**TBD**

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

BG950A-GL Development Schedule

2021							2022						
Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.

Version: BG950AGLR01A01 (Add new features)

- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- FILE
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6

Version: BG950AGLR01A02 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS

Plan for: Vodafone/ Deutsche Telekom/ Verizon / AT&T/ PTCRB

Version: BG950AGLR01Axx (Add new features)

- Platform bug fix
- Add new features to meet certification demands
- Add USB feature

The timeline may be adjusted according to the actual development status.

BG950A-GL Timeline

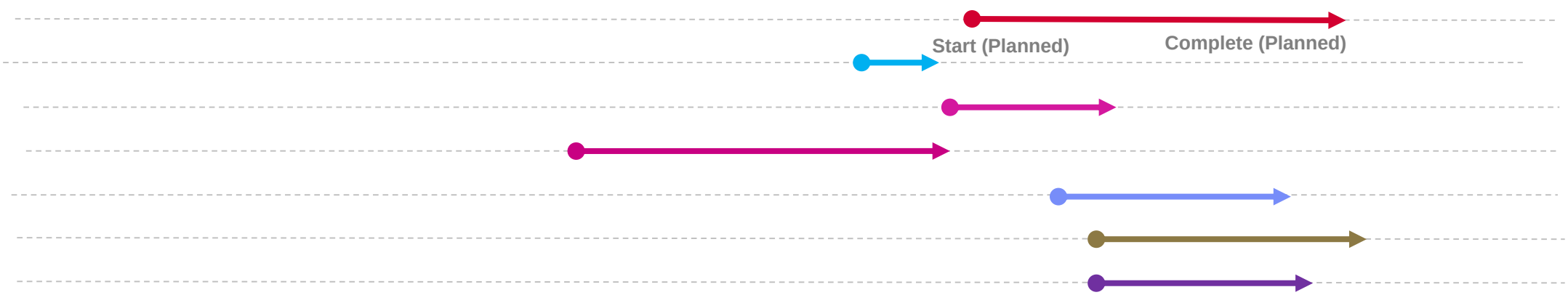
2021								2022										
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.

Project Schedule

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.

Carrier Certification

Deutsche Telekom **Completed**



Vodafone/ Telefónica **TBD**

Regulatory Certification

CE/ FCC/ IC/ RCM/ GCF/PTCRB/ KC/ JATE/TELEC **Completed**

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

BG951A-GL Development Schedule

2021						2022				
Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May

Version: BG951AGLR01A02 (Add new features)

- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- FILE
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6

Version: BG951AGLR01A03 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS

Plan for: Vodafone/ Deutsche Telekom/ Verizon / AT&T/ PTCRB

Version: BG951AGLR01Axx (Add new features)

- Platform bug fix
- Add new features to meet certification demands
- Add USB feature

The timeline may be adjusted according to the actual development status.

BG951A-GL Timeline

2021				2022											
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Schedule

ES CS MP

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.

Carrier Certification

Deutsche Telekom Completed

Verizon

AT&T Start (Planned) Complete (Planned)

T-Mobile

LGU+

Telstra

Vodafone

Telefónica TBD

Regulatory Certification

CE/ FCC/ IC/ RCM/ KC/ JATE/ TELEC Completed

GCF/PTCRB

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

BG952A-GL Development Schedule

2022												2023			
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

Version: BG952AGLR01A01 (Add new features)

- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- FILE
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6
- QuecOpen®

Version: BG952AGLR01A02 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS
- USB

Version: BG952AGLR01Axx (Add new features)

- Platform bug fix
- Add new features to meet certification demands

The timeline may be adjusted according to the actual development status.

BG952A-GL Timeline

2022												2023			
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

Project Schedule

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.

Carrier Certification

TBD

Regulatory Certification

GCF/ CE/ FCC/ IC/ RCM/ JATE/ TELEC/ PTCRB/ KC	**TBD**

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

BG953A-GL Development Schedule

2021	2022											
Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Version: BG953AGLR01A01 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6
- FILE
- USB

Version: BG953AGLR01Axx (Add new features)

- Platform bug fix

Version: BG953AGLR01Axx (Add new features)

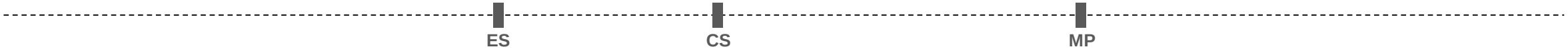
- Platform bug fix

The timeline will be adjusted according to the actual development status.

BG953A-GL Timeline

2022												2023			
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

Project Schedule



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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.

Carrier Certification

TBD

Regulatory Certification

GCF/ CE/ FCC/ PTCRB	**TBD**

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

BG955A-GL Development Schedule

2022												2023			
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

Version: BG955AGLR01A01 (Add new features)

- Basic AT commands
- TCP/IP/PPP/UDP
- SMS
- QPING
- FILE
- SSL/TLS
- FTP(S)
- HTTP(S)
- MQTT
- GNSS
- IPv4/6

Version: BG955AGLR01A02 (Add new features)

- CoAP
- BIP
- EMUX
- DFOTA
- DTLS
- LwM2M
- Polte
- QuecLocator®
- Jamming Detection
- RF FTM
- AGPS

Version: BG955AGLR01Axx (Add new features)

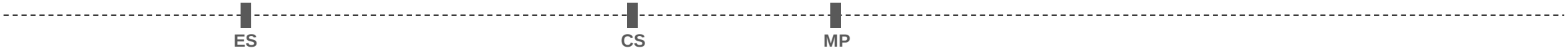
- Platform bug fix
- Add new features to meet certification demands

The timeline may be adjusted according to the actual development status.

BG955A-GL Timeline

2022												2023			
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

Project Schedule



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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.

Carrier Certification

TBD

Regulatory Certification

GCF/ CE/ FCC	**TBD**

The timeline may be adjusted according to the maturity of chipset baseline and chipset certification progress.

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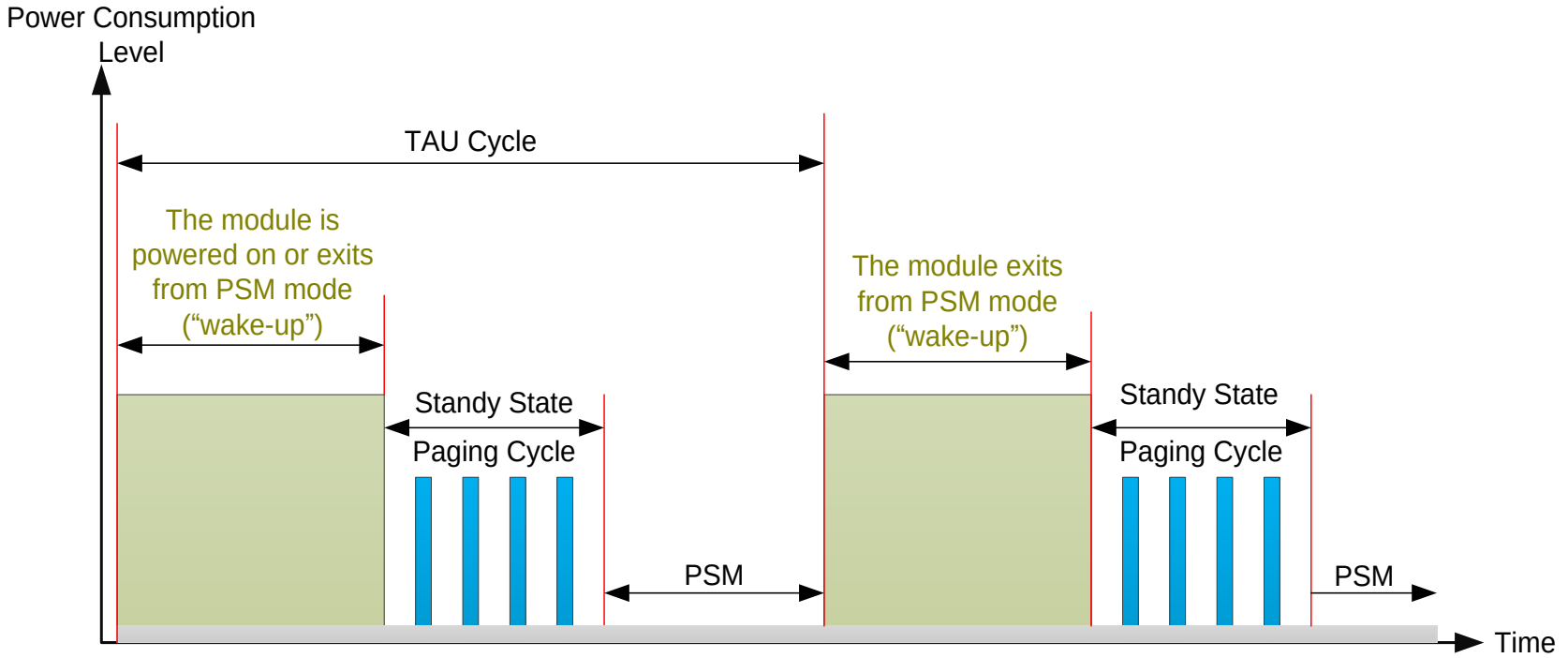
Key Technique – PSM

The Power Saving Mode (PSM) is similar to a power-off status, with one difference being that the module in PSM remains registered on the network. Therefore, when the module is woken up from PSM, there is no need to re-attach it to the network. When the module is in PSM, it is not reachable for mobile terminating services. PSM is thus intended for applications that expect only infrequent mobile originating and terminating services and those which can accept a corresponding latency in the mobile terminating communication.

If the module is to use PSM, it shall request an Active Time value during every Attach and TAU procedures. A network that supports PSM and allows the module to enter it will confirm the enablement of PSM by allocating an Active Time value to the module.

The following figure illustrates the power consumption cycle of the module.

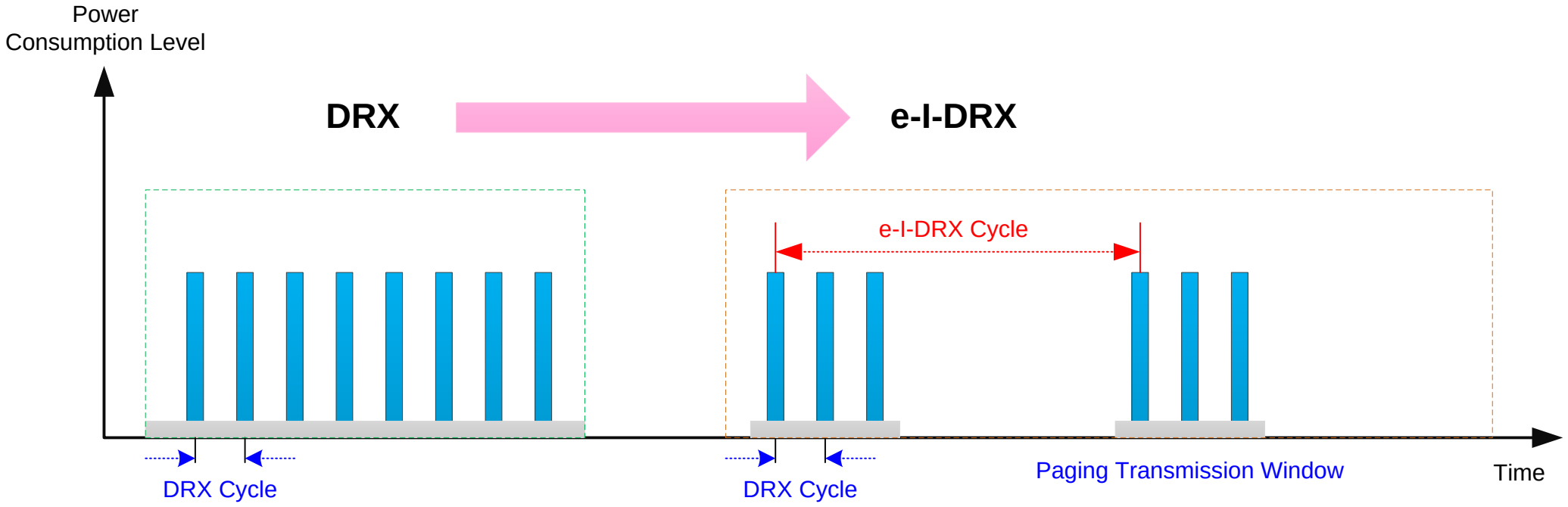


Key Technique – e-I-DRX

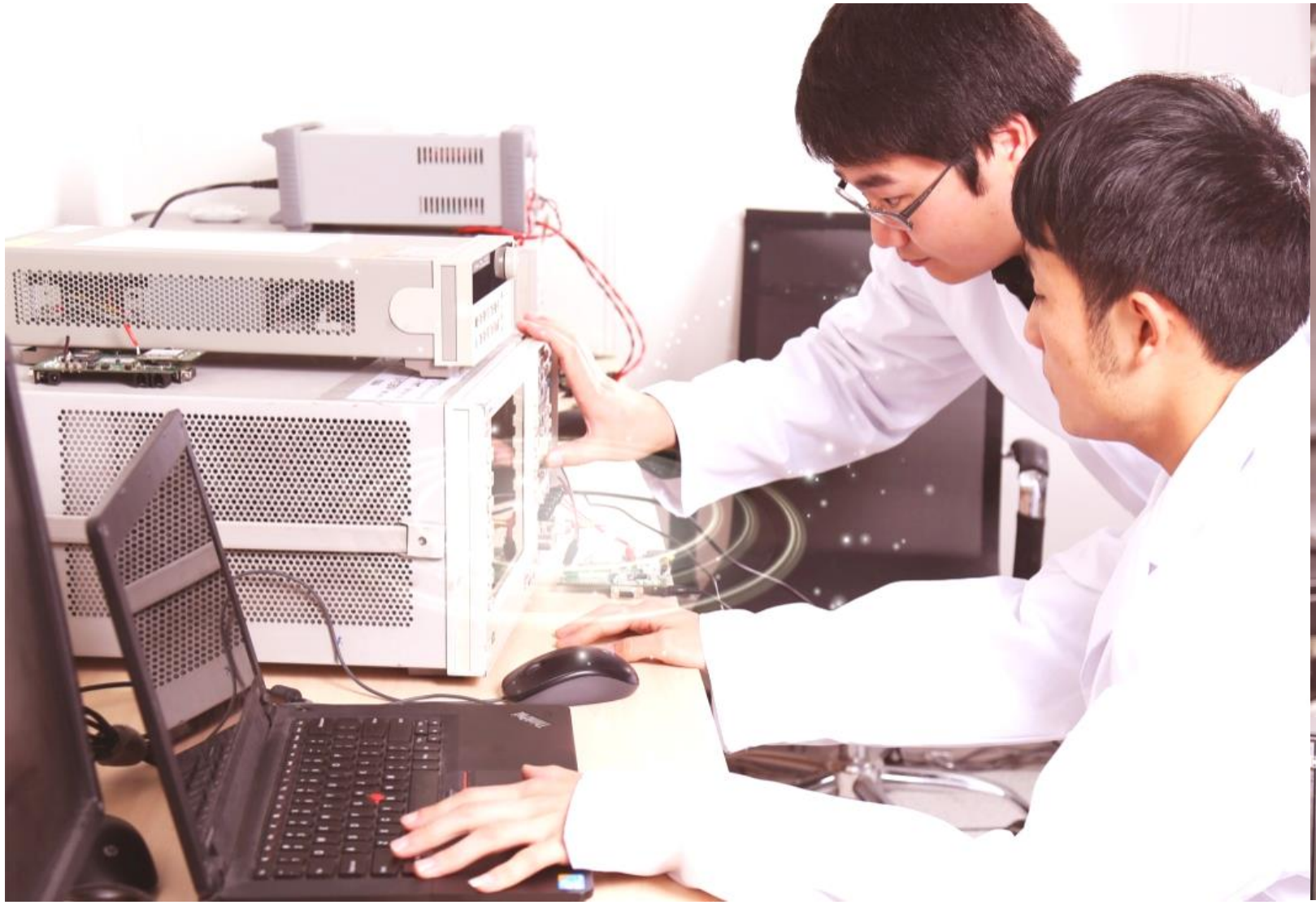
The module (UE) may negotiate with the network in the non-access stratum over the use of e-I-DRX to reduce its power consumption while remaining responsive to mobile terminated data and/or network originated procedures with a delay depending on the DRX cycle value.

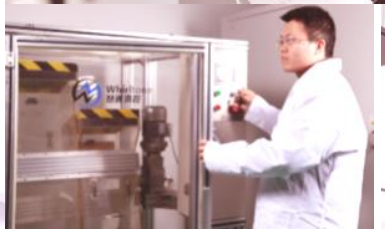
To use e-I-DRX in applications, two things need consideration: its special handling of mobile terminating services and data transfers, and, most importantly, the delay tolerance of mobile terminated data.

The following figure illustrates the DRX and e-I-DRX cycle of the module.



Quectel Comprehensive Technical Support

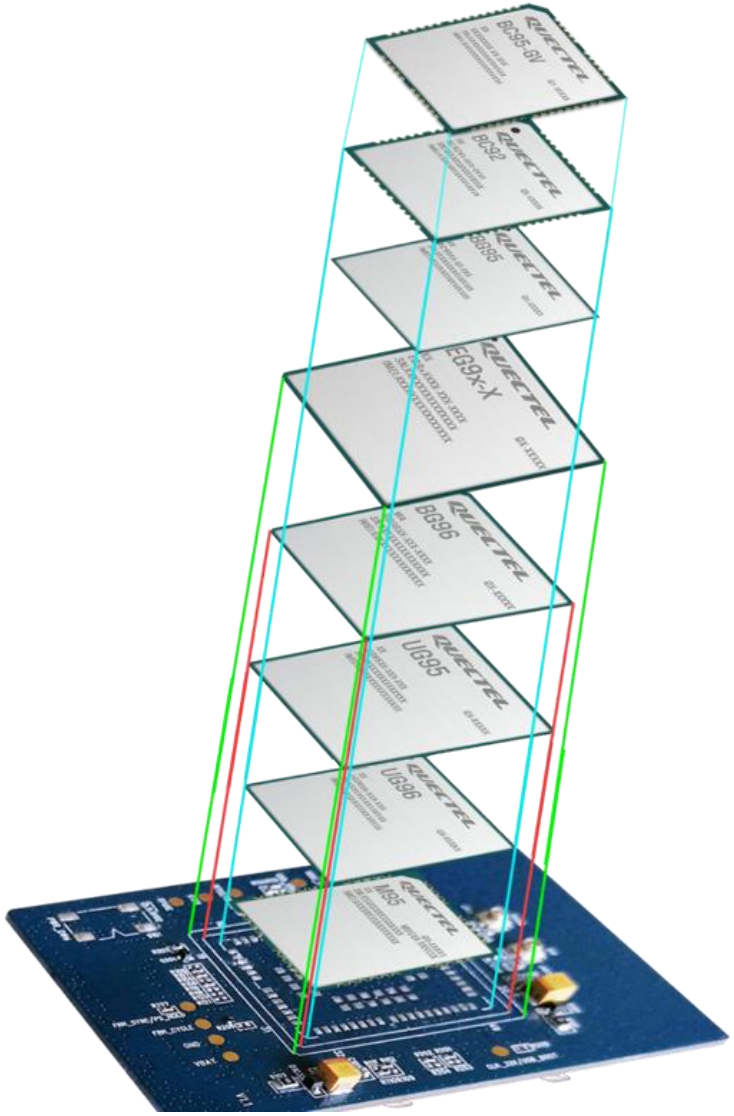




BG95xA-GL Layout Compatibility

BG95xA-GL module is compatible with the following Quectel modules:

- GSM/GPRS module M95
- UMTS/HSPA modules UG96/UG95
- LTE Cat 4/Cat 1 module EG95/EG91
- LPWA module BG95/BG96/BC95-GV/BC92



1. The compatibility diagram shown above is for illustration purpose only. The actual label design of the modules may be different.
2. In the figure on the right, EG9x-X refers to EG95 and EG91, BG95 refers to BG95 and BG95xA-GL.
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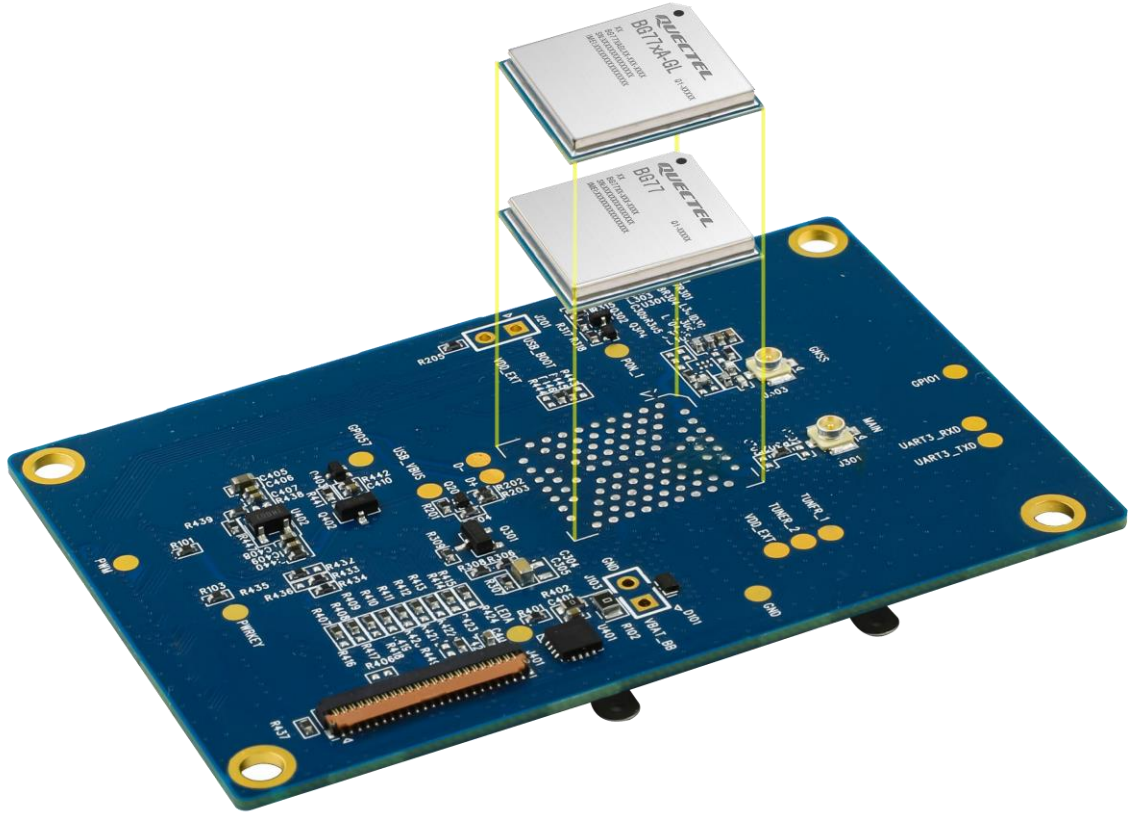
BG77xA-GL Layout Compatibility

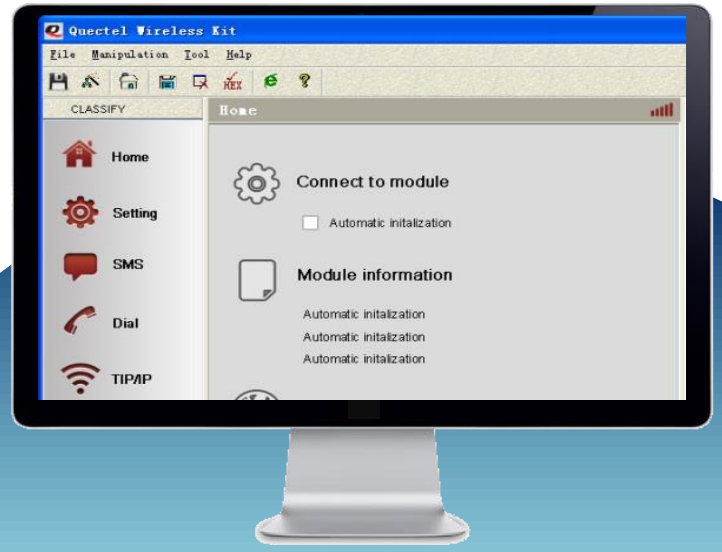
BG77xA-GL module is compatible with

- Quectel LPWA module BG77



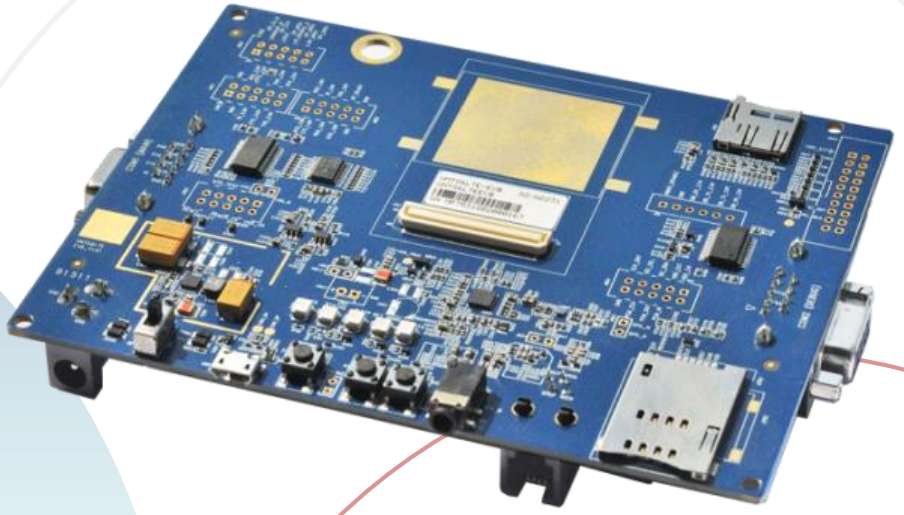
The compatibility diagram shown above is for illustration purpose only.
The actual label design of the modules may be different.

BG95xA-GL&BG77xA-GL Support Package



Quectel offers a GUI tool named **QNavigator**. It can help customers quickly test Quectel module's functionality.

eMTC & UMTS & LTE EVB Kit



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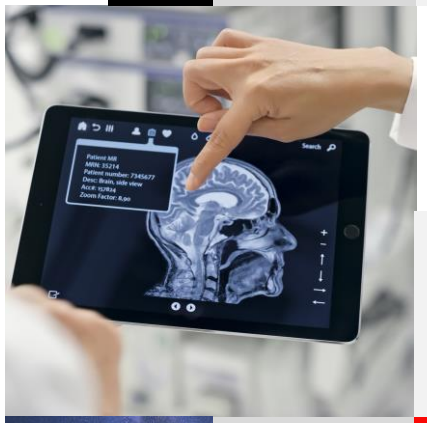
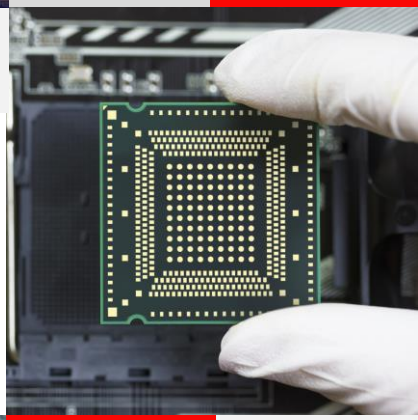
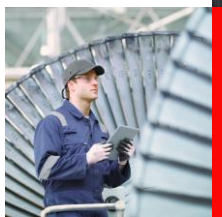
Build a Smarter World



LPWA Application Scenarios

Public Utilities

- Water/Gas Metering
- Smart Parking
- Fire Hydrant
- Smoke Detector
- Street Lighting
- Smart Dustbin

Smart Life

- Asset Tracking
- Wearable Devices
- Person/Pet Tracking

Quectel Module

Industry & Agriculture

- Gas Detector
- Soil PH/Optical Sensor
- Machine Alarm
- Irrigation Controller

Smart Home

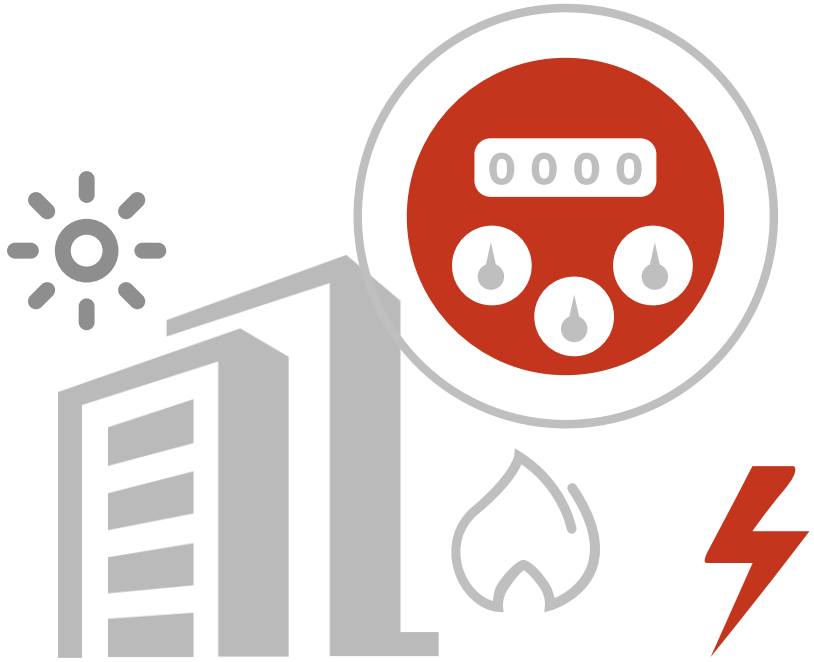
- Intelligent Door Lock
- Intelligent Control

Public Utilities – Smart Metering

By 2024, there will be

1.9 billion

connected meters ①



Water Meter

Gas Meter

Heat Meter

Electricity Meter

Domestic Meters | Wind Power Plant | Factory | Workplace

Nuclear Power Plant | Thermal Power Plant | Hydraulic Power Plant

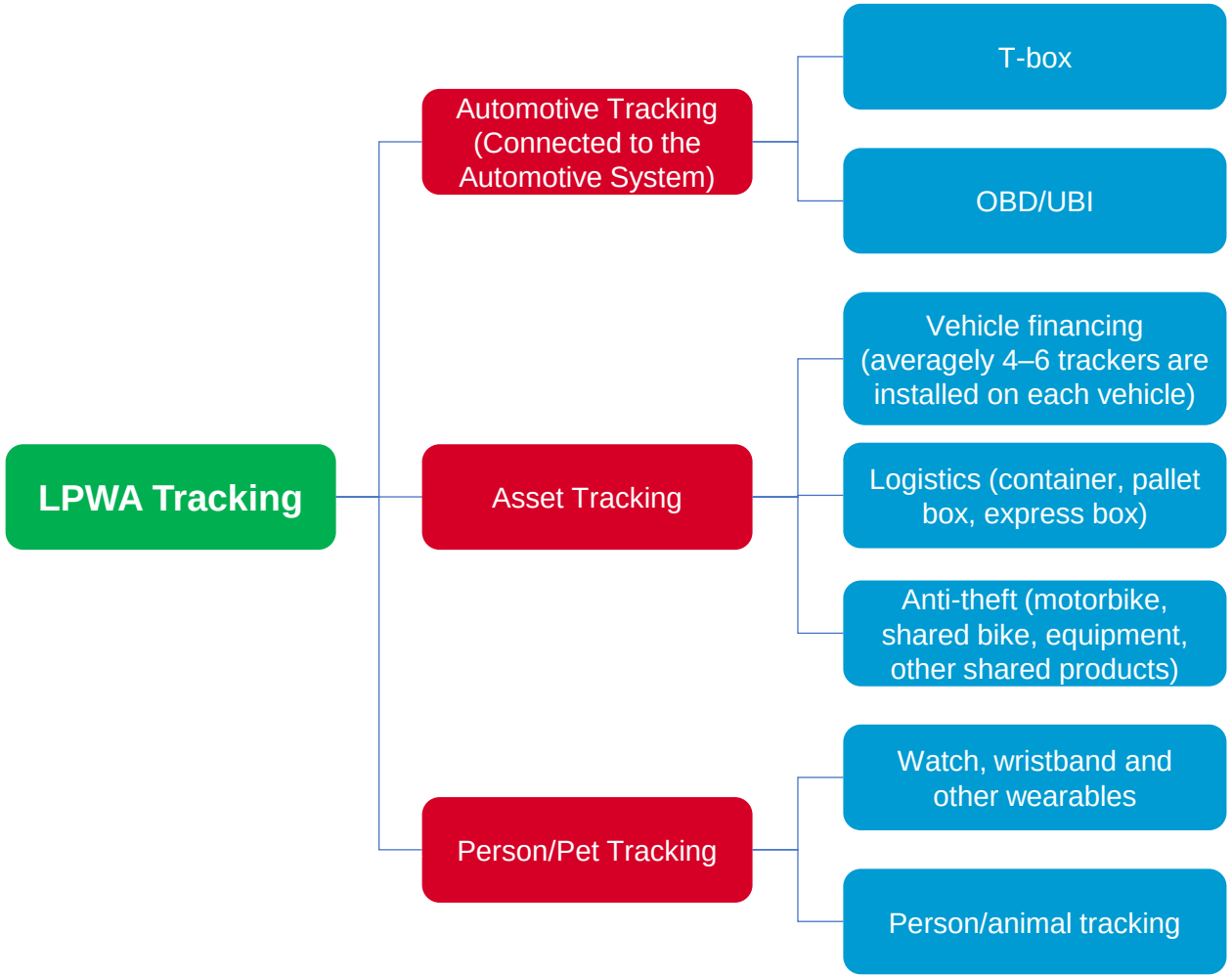
Renewable Energy | Ecological Vehicle | Photoelectricity

① *2016 Machina report on smart metering*

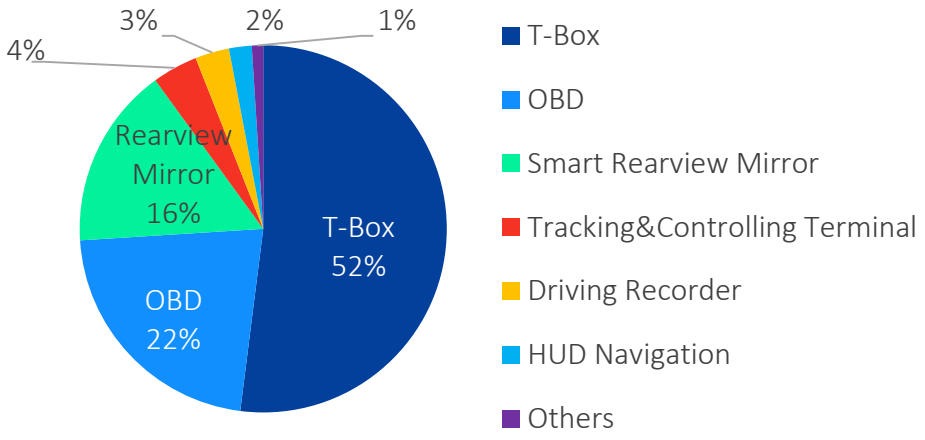
Public Utilities – Street Lighting

- Real time data feeds directly to the operation center
- Manual brightening of lighting when required
- Improved energy efficiency

Smart Life – LPWA Tracker



According to CAICT ①, 10 million automotive wireless terminals were sold in 2018 in China:



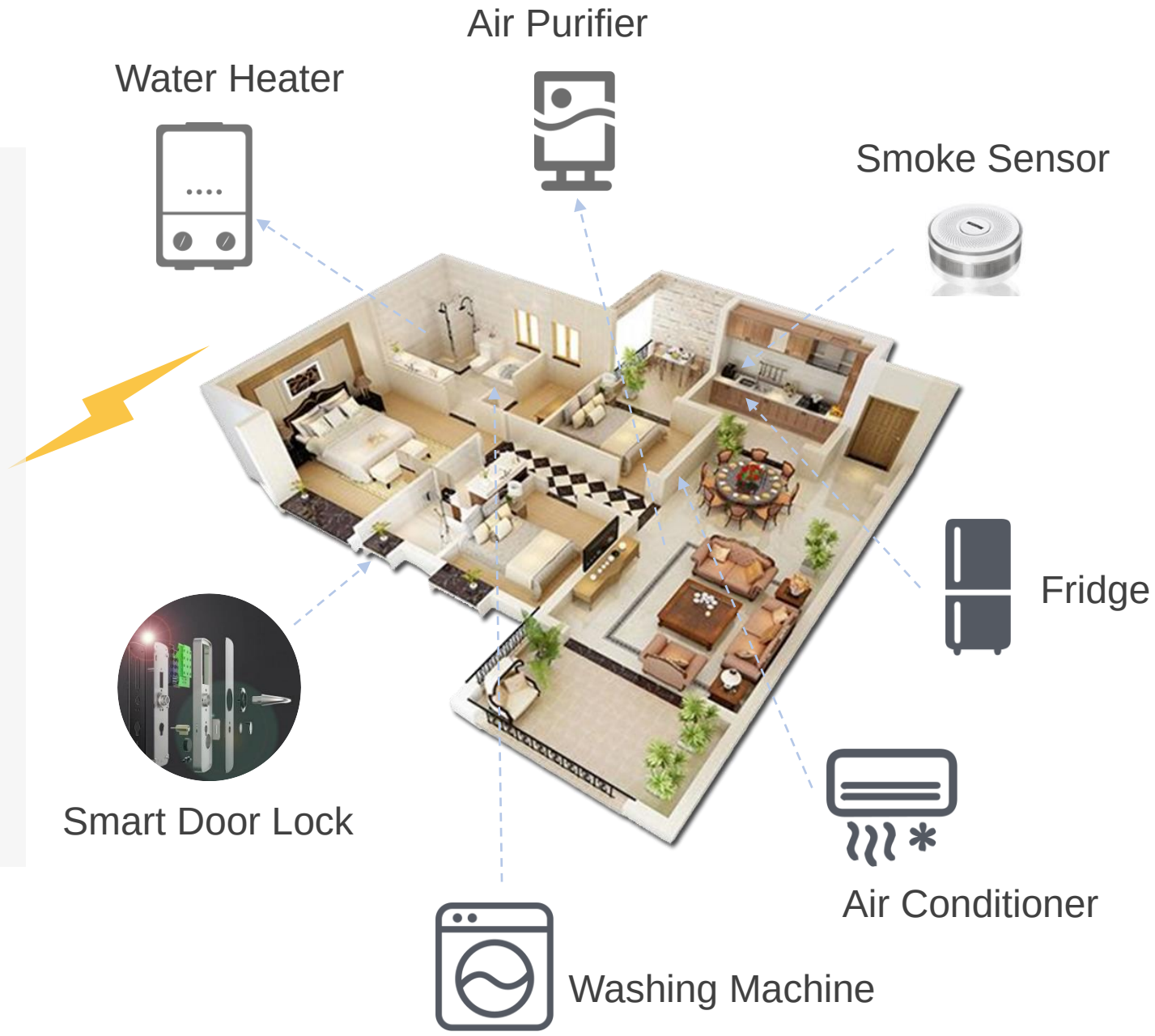
① China Academy of Information and Communication Technology

Smart Home

Feature: Non-inductive connection, automation, machine learning

Trend: Smarter, more convenient, safer, more energy-efficient

Including: White goods, black goods, security, monitors, medical treatment, healthcare, wearables, wireless controllers, etc.



Industry & Agriculture – Multi-gas Detector

- Hazardous gas monitoring, including VOCs, combustibles and toxics, etc.
- Real-time gas concentration reading, location, alarm and status indication

Industry & Agriculture – Robotic Lawn Mower

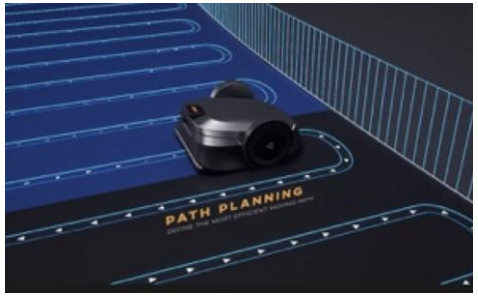
Smart Robotic Lawn Mower

(Based on Quectel LPWA module)

1 Wireless Communication
Easy Operation with APP

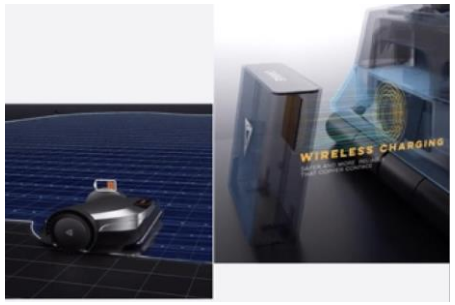
Positioning technology & Easy Installation

2 Intelligent Cutting
Smart Route



Smart Algorithm

3 Wireless Charging
High-Efficiency Cutting



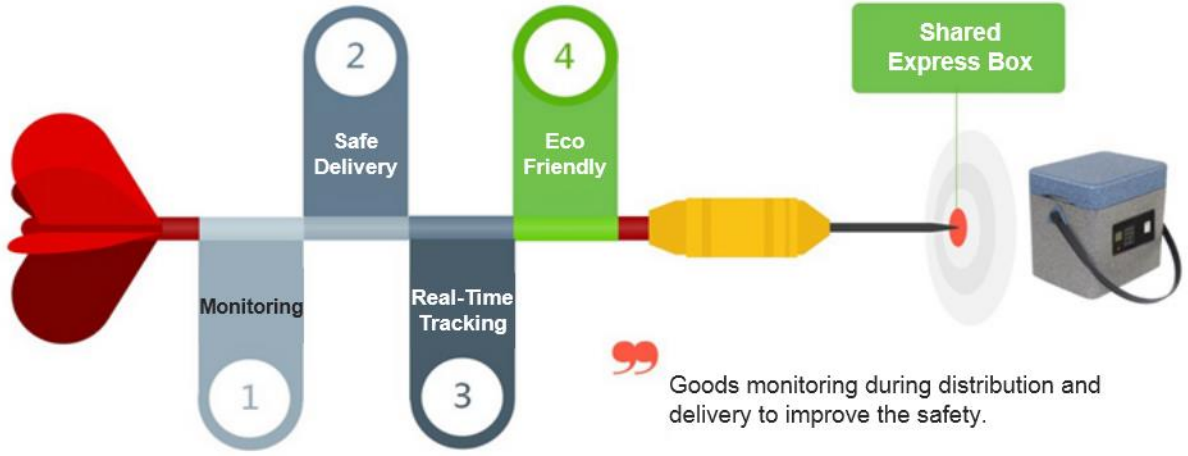
Self Charging

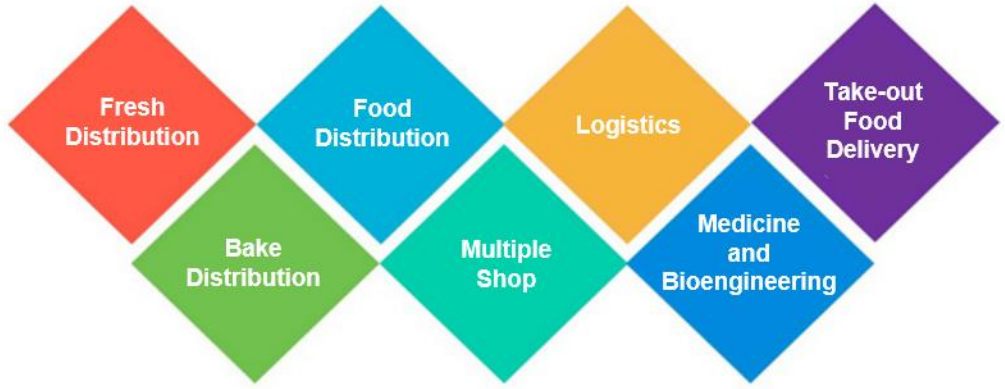
4 Safe & Eco-Friendly
Low Noise and Power Consumption

Lower Noise

Smart Logistics – NB-IoT Shared Express Box

Smart IoT express box, featuring heat preservation, safe lock, real-time location, real-time temperature, integrates information technology and equipment IoT automation

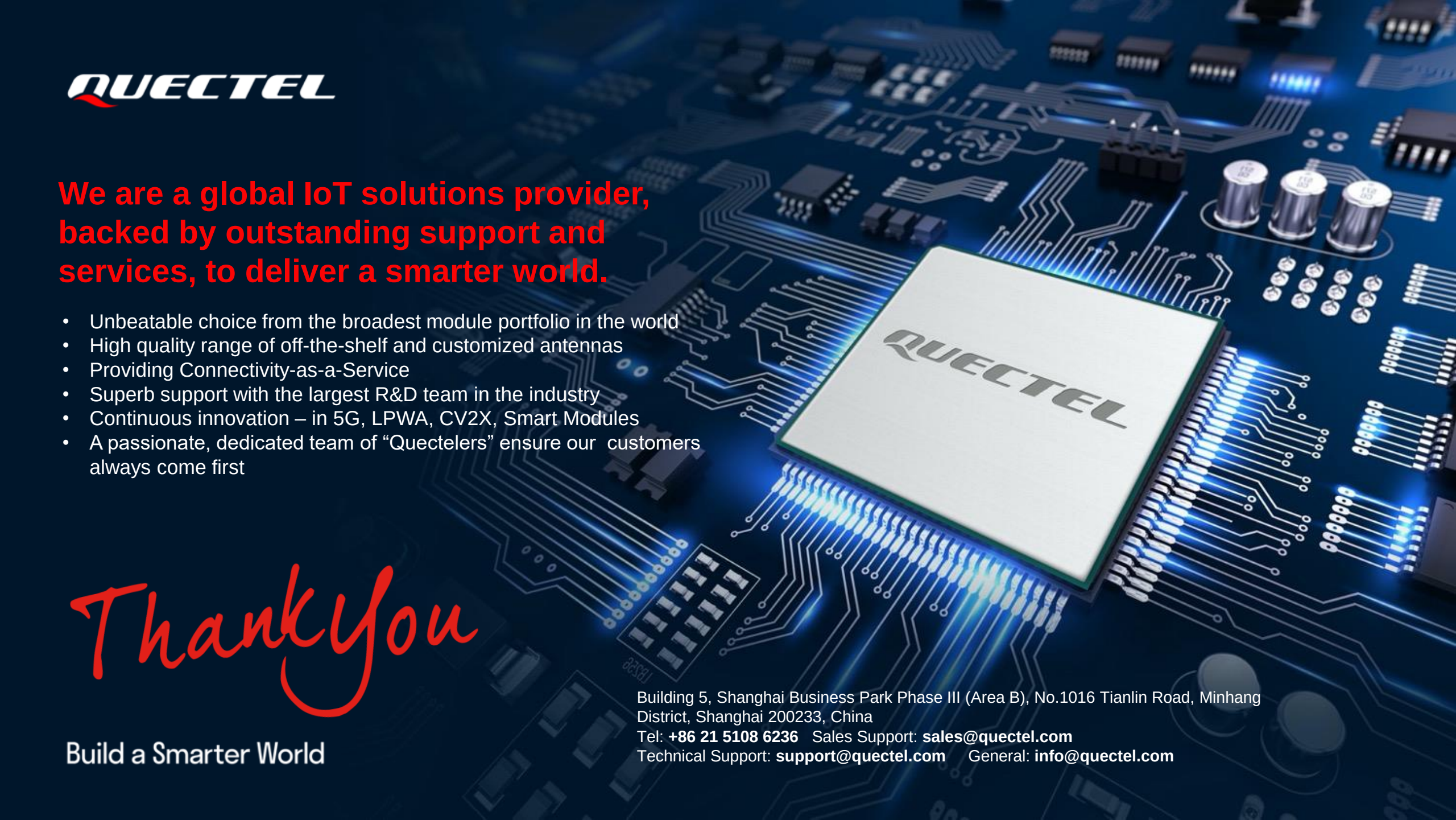




QUECTEL

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
- Providing Connectivity-as-a-Service
- Superb support with the largest R&D team in the industry
- Continuous innovation – in 5G, LPWA, CV2X, Smart Modules
- A passionate, dedicated team of “Quectelers” ensure our customers always come first



Thank You

Build a Smarter World

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