

Quectel GNSS Module Product Overview

April, 2018

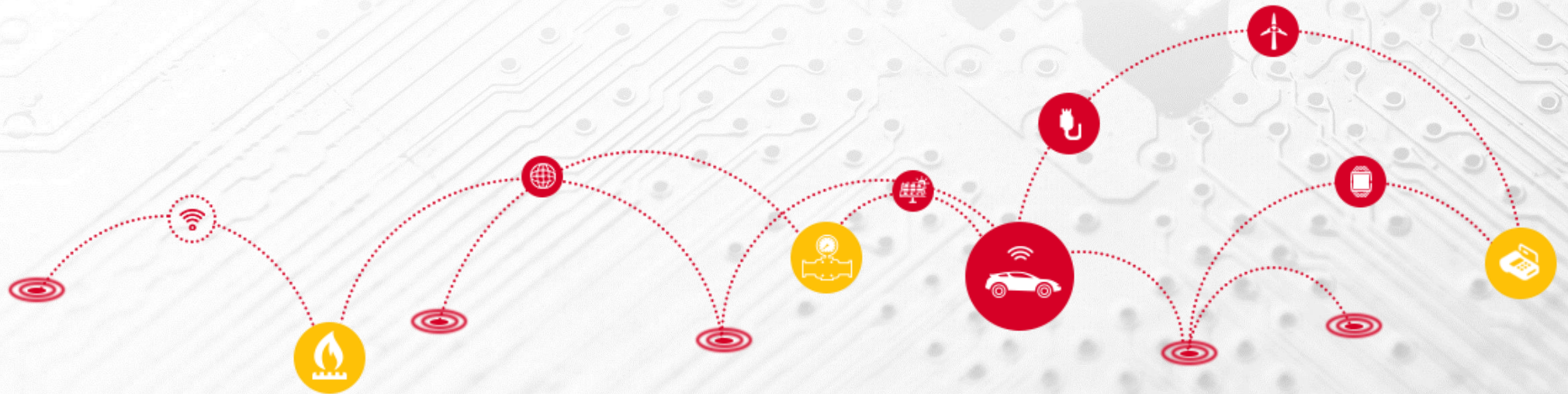
GNSS Module Portfolio

Technologies











GNSS Engine Comparison

Module Comparison Table

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Build a Smarter World

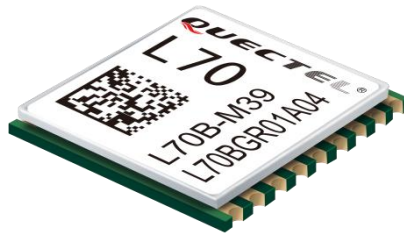


GNSS Modules Roadmap

	Stand-alone Modules	Modules with Antenna Embedded		
GPS		<div data-bbox="1905 282 2237 415">  <p>L80</p> <ul style="list-style-type: none"> 12-pin LCC MT3339 </div> <div data-bbox="1905 432 2237 565">  <p>L80-R</p> <ul style="list-style-type: none"> 12-pin LCC MT3337 </div>		
GNSS	<div data-bbox="377 718 766 872">  <p>L26C NEW</p> <ul style="list-style-type: none"> 24-pin LCC Built-in LNA </div> <div data-bbox="377 1036 703 1175">  <p>L26</p> <ul style="list-style-type: none"> 24-pin LCC MT3333 </div>	<div data-bbox="945 704 1332 815">  <p>L76C NEW</p> <ul style="list-style-type: none"> 18-pin LCC Built-in LNA </div> <div data-bbox="945 836 1256 948">  <p>L76</p> <ul style="list-style-type: none"> 18-pin LCC MT3333 </div> <div data-bbox="945 969 1256 1080">  <p>L76B</p> <ul style="list-style-type: none"> 18-pin LCC MT3333 </div> <div data-bbox="945 1102 1256 1213">  <p>L76-L</p> <ul style="list-style-type: none"> 18-pin LCC MT3333 Built-in LNA </div>	<div data-bbox="1447 789 1778 929">  <p>L96</p> <ul style="list-style-type: none"> 31-pin LCC MT3333 </div> <div data-bbox="1905 789 2237 929">  <p>L86</p> <ul style="list-style-type: none"> 12-pin LCC MT3333 </div>	
	12.2mm × 16.0mm × 2.4mm	10.1mm × 9.7mm × 2.5mm	14.0mm × 9.60mm × 2.0mm	16.0mm × 16.0mm × 6.45mm (L80) 18.4mm × 18.4mm × 6.45mm (L86)

GPS Module Specifications

L70 GPS Module



10.1mm × 9.7mm × 2.5mm
MT3339

- 18 pins with LCC
- High Sensitivity: -165dBm
- Default baud rate: 9600bps
- Voltage 2.8V to 4.3V, 3.3V typ.
- Low power consumption:
 - 12mA @Tracking mode
 - 18mA @Acquisition mode
 - 7uA @Backup mode
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (AlwaysLocate™/Periodic mode/Standby mode/ Backup mode)
- FLP mode: only 5mA in static receiving
- LOCUS, built-in logger solution
- Support SDK command

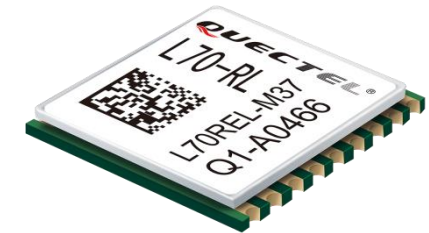
L70-R GPS Module



10.1mm × 9.7mm × 2.5mm
MT3337

- 18 pins with LCC
- High Sensitivity: -165dBm
- Default baud rate: 9600bps
- Voltage 2.8V to 4.3V, 3.3V typ.
- Low power consumption:
 - 13mA @Tracking mode
 - 16mA @Acquisition mode
 - 8uA @Backup mode
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (Standby mode/ Backup mode)

L70-RL GPS Module



10.1mm × 9.7mm × 2.5mm
MT3337

- 18 pins with LCC
- High Sensitivity: -167dBm
- Default baud rate: 9600bps
- Voltage 2.8V to 4.3V, 3.3V typ.
- Low power consumption:
 - 18mA @Tracking mode
 - 21mA @Acquisition mode
 - 8uA @Backup mode
- AGPS function: EASY™ technology, EPO
- Built-in LNA
- Multiple power saving modes (Standby mode/ Backup mode)

GNSS Module Specifications

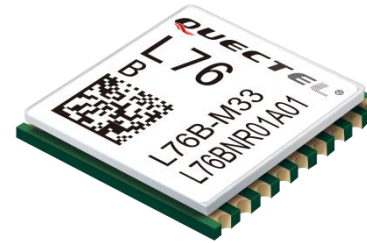
L76 GNSS Module



10.1mm x 9.7mm x 2.5mm
MT3333

- 18 pins with LCC
- GPS, GLONASS, Galileo and QZSS
- High Sensitivity: -165dBm
- Default baud rate: 9600bps
- Voltage 2.8V to 4.3V, 3.3V typ.
- Low power consumption:
 - 18mA (GPS+GLONASS) @Tracking mode
 - 25mA (GPS+GLONASS) @Acquisition mode
 - 7uA @Backup mode
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (AlwaysLocate™/ Period mode/ Standby mode/ Backup mode)
- LOCUS, built-in logger solution
- Support SDK command

L76B GNSS Module



10.1mm x 9.7mm x 2.5mm
MT3333

- 18 pins with LCC
- GPS, **BeiDou** and QZSS
- High Sensitivity: -165dBm
- Default baud rate: 9600bps
- Voltage 2.8V to 4.3V, 3.3V typ.
- Low power consumption:
 - 18mA (GPS+BeiDou) @Tracking mode
 - 23mA (GPS+BeiDou) @Acquisition mode
 - 7uA @Backup mode
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (AlwaysLocate™/ Period mode/ Standby mode/ Backup mode)
- LOCUS, built-in logger solution

L76-L GNSS Module



10.1mm x 9.7mm x 2.5mm
MT3333

- 18 pins with LCC
- GPS, GLONASS, Galileo and QZSS
- High Sensitivity: -167dBm
- Default baud rate: 9600bps
- Voltage 2.8V to 4.3V, 3.3V typ.
- Low power consumption:
 - 22mA (GPS+GLONASS) @Tracking mode
 - 29mA (GPS+GLONASS) @Acquisition mode
 - 7uA @Backup mode
- AGPS function: EASY™ technology, EPO
- Built-in LNA
- Multiple power saving modes (AlwaysLocate™/ Period mode/ Standby mode/ Backup mode)
- LOCUS, built-in logger solution
- Support SDK command

L76C GNSS Module*



16.0mm x 12.2mm x 2.4mm

- 18 pins with LCC
- GPS, **BeiDou** and QZSS
- Default baud rate: 9600bps
- Voltage 1.7V to 3.6 V, 3.3V typ.
- Low power consumption:
 - TBD (GPS+Beidou) @Tracking mode
 - TBD (GPS+Beidou) @Acquisition mode
- AGPS supported
- Support SDK command

* Under development

GNSS Module Specifications



L26 GNSS Module

16.0mm x 12.2mm x 2.4mm
MT3333

- 24 pins with LCC
- GPS, GLONASS, Galileo and QZSS
- High Sensitivity: -167dBm
- Default baud rate: 9600bps
- Voltage 2.8V to 4.3 V, 3.3V typ.
- Low power consumption:
 - 21mA (GPS+GLONASS) @Tracking mode
 - 29mA (GPS+GLONASS) @Acquisition mode
 - 7uA @Backup mode
- AGPS function: EASY™ technology, EPO
- Built-in LNA
- Multiple power saving modes (AlwaysLocate™/ Periodic mode/ Standby mode/ Backup mode)
- LOCUS, built-in logger solution
- Short-circuit protection and detection for active antenna
- Support SDK command



L26C GNSS Module*

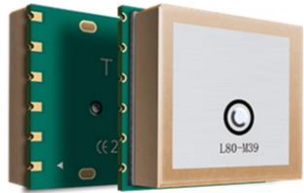
16.0mm x 12.2mm x 2.4mm

- 24 pins with LCC
- GPS, **BeiDou** and QZSS
- Default baud rate: 9600bps
- Voltage 2.8V to 3.6 V, 3.3V typ.
- Low power consumption:
 - TBD (GPS+Beidou) @Tracking mode
 - TBD (GPS+Beidou) @Acquisition mode
- AGPS supported
- Short-circuit protection and detection for active antenna
- Support SDK command

* Under development

GNSS Module (with Antenna Embedded) Specifications

L80 GPS Module



16.0mm x 16.0mm x 6.45mm
MT3339

- 12 pins with LCC
- Patch Antenna (15.0mm*15.0mm*4.0mm) on the top of module
- High Sensitivity: -165dBm
- Default baud rate: 9600bps
- Voltage 3V to 4.3V, 3.3V typ.
- Low power consumption
20mA @Tracking mode
25mA @Acquisition mode
7uA @Backup mode
- Short-circuit protection and detection for active antenna
- Active antenna switching function
- Built-in LNA
- Large size of pins (Length=1.5mm; Width=1.0mm)
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (AlwaysLocate™/ Periodic mode/ Standby mode/ Backup mode)
- FLP mode: only 50% power consumption of normal mode
- LOCUS, built-in logger solution
- Support SDK command

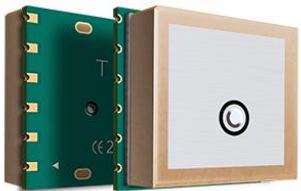
L86 GNSS Module



18.4mm x 18.4mm x 6.45mm
MT3333

- 12 pins with LCC
- Patch Antenna (18.4mm*18.4mm*4.0mm) on the top of module
- High Sensitivity: -167dBm
- Default baud rate: 9600bps
- Voltage 3V to 4.3V, 3.3V typ.
- Low power consumption
26mA (GLONASS+GPS) @Tracking mode
30mA (GLONASS+GPS) @Acquisition mode
7uA @Backup mode
- Short-circuit protection and detection for active antenna
- Active antenna switching function
- Built-in LNA
- Large size of pins (Length=1.5mm; Width=1.0mm)
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (AlwaysLocate™/ Periodic mode/ Standby mode/ Backup mode)
- LOCUS, built-in logger solution
- Support SDK command

L80-R GPS Module



16.0mm x 16.0mm x 6.45mm
MT3337

- 12 pins with LCC
- Patch Antenna (15.0mm*15.0mm*4.0mm) on the top of module
- High Sensitivity: -165dBm
- Default baud rate: 9600bps
- Voltage 3V to 4.3V, 3.3V typ.
- Low power consumption
20mA @Tracking mode
25mA @Acquisition mode
7uA @Backup mode
- Built-in LNA
- Large size of pins (Length=1.5mm; Width=1.0mm)
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (Standby mode/ Backup mode)

L96 GNSS Module



14mm x 9.6mm x 2.0mm
MT3333

- 31 pins with LCC
- Multi-GNSS engine for GPS, GLONASS, BeiDou, Galileo (RLM supported) and QZSS
- With Chip Antenna embedded on the top of module
- High Sensitivity: -165dBm @Tracking
- Default baud rate: 9600bps
- Voltage 2.8V~4.3V, typical 3.3V
- Low power consumption
20mA (GLONASS+GPS) @Tracking mode
25mA (GLONASS+GPS) @Acquisition mode
7uA @Backup mode
- Built-in LNA
- AGPS function: EASY™ technology, EPO
- Multiple power saving modes (AlwaysLocate™/ Periodic mode/ Standby mode/ Backup mode)
- LOCUS, built-in logger solution
- Support SDK command
- Dual SAW filters integrated for noise cancellation

Difference Table - L70 Series

Product		L70-R	L70-RL	L70
Packaging		18-pin LCC	18-pin LCC	18-pin LCC
Chip Solution		MT3337	MT3337	MT3339
Satellite Constellation		GPS/ QZSS	GPS/ QZSS	GPS/ QZSS
Dimensions		10.1mm × 9.7mm × 2.5 mm	10.1mm × 9.7mm × 2.5 mm	10.1mm × 9.7mm × 2.5 mm
Receiver Channels		66 acquisition/ 22 tracking	66 acquisition/ 22 tracking	66 acquisition/ 22 tracking
Memory Type		ROM	ROM	Flash
TTF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS
	Hot Start	<1s	<1s	<1s
Sensitivity	Autonomous Acquisition	-148dBm	-149dBm	-148dBm
	Reacquisition	-160dBm	-161dBm	-160dBm
	Tracking	-165dBm	-167dBm	-165dBm
Timing Accuracy		10ns	10ns	10ns
Update Rate		1Hz (default), Max 5Hz	1Hz (default), Max 5Hz	1Hz (default), Max 10Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-45°C to 125°C	-45°C to 125°C
Power Supply		2.8V to 4.3V	2.8V to 4.3V	2.8V to 4.3V
Power Consumption	Acquisition	16mA @3.3V	21mA @3.3V	18mA @3.3V
	Tracking	13mA @3.3V	18mA @3.3V	12mA @3.3V
Power Saving Mode Consumption	AlwaysLocate™	Not supported	Not supported	1.4mA typ. @3.3V
	Backup Mode	8uA	8uA	7uA
Oscillator		TCXO	TCXO	TCXO
Build-in LNA		No	Yes	No
Enhanced Features	AGPS	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO
	Locus	Not supported	Not supported	Supported
	Anti-Jamming	Supported	Supported	Supported
	SBAS	Not supported	Not supported	WAAS, EGNOS, MSAS, GAGAN
	Fitness Mode	Not supported	Not supported	Supported
	SDK Command	Not supported	Not supported	Supported

Difference Table - L76 Series

Product		L76 / L76B	L76-L	L76C*
Packaging		18-pin LCC	18-pin LCC	18-pin LCC
Satellite Constellation		L76: GPS/ GLONASS/ Galileo/ QZSS L76B: GPS/ BeiDou/ QZSS	GPS/ GLONASS/ Galileo/ QZSS	GPS/ BeiDou/ QZSS
Dimensions		10.1mm × 9.7mm × 2.5 mm	10.1mm × 9.7mm × 2.5 mm	10.1mm × 9.7mm × 1.8 mm
Receiver Channels		99 acquisition/ 33 tracking	99 acquisition/ 33 tracking	64 tracking
Memory Type		Flash	Flash	Flash
TTF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS	<29s <5s, With AGPS
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS	TBD
	Hot Start	<1s	<1s	<1s
Sensitivity	Autonomous Acquisition	-148dBm	-149dBm	-147dBm
	Reacquisition	-160dBm	-161dBm	-158dBm
	Tracking	-165dBm	-167dBm	-160dBm
Timing Accuracy		10ns	10ns	10ns
Update Rate		1Hz (default), Max 10Hz	1Hz (default), Max 10Hz	1Hz (default), Max 10Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-45°C to 125°C	-45°C to 125°C
Power Supply		2.8V to 4.3V	2.8V to 4.3V	1.7V to 3.6V
Power Consumption	Acquisition	25mA (GPS+GLONASS)	29mA (GPS+GLONASS)	TBD mA (GPS+Beidou)
	Tracking	18mA (GPS+GLONASS)	22mA (GPS+GLONASS)	TBD mA (GPS+Beidou)
Power Saving Mode Consumption	AlwaysLocate™	2.6mA typ. @3.3V	2.7mA typ. @3.3V	/
	Backup Mode	7uA	7uA	TBD uA
Oscillator		TCXO	TCXO	TCXO
Build-in LNA		No	Yes	Yes
Enhanced Features	AGPS	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO	Online/offline
	Locus	Supported	Supported	TBD
	Anti-Jamming	Supported	Supported	Supported
	SBAS	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS, GAGAN
	Fitness Mode	Supported	Supported	NA
	SDK Command	Supported	Supported	Supported

Difference Table – L26 Series

Product		L26	L26C*
Packaging		24-pin LCC	24-pin LCC
Satellite Constellation		GPS/ GLONASS/ Galileo/ QZSS	GPS/ BeiDou/ QZSS
Dimensions		16.0mm × 12.2mm × 2.4mm	16.0mm × 12.2mm × 1.8mm
Receiver Channels		99 acquisition/ 33 tracking	64 tracking
Memory Type		Flash	Flash
TTF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	<29s <5s, With AGPS
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	TBD
	Hot Start	<1s	<1s
Sensitivity	Autonomous Acquisition	-148dBm	-147dBm
	Reacquisition	-160dBm	-158dBm
	Tracking	-165dBm	-160dBm
Timing Accuracy	10ns	10ns	
Update Rate	1Hz (default), Max 10Hz	1Hz (default), Max 10Hz	
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-45°C to 125°C
Power Supply	2.8V to 4.3V	2.8V to 3.6V	
Power Consumption	Acquisition	25mA (GPS+GLONASS)	TBD mA (GPS+Beidou)
	Tracking	18mA (GPS+GLONASS)	TBD mA (GPS+Beidou)
Power Saving Mode Consumption	AlwaysLocate™	2.6mA typ. @3.3V	/
	Backup Mode	7uA	TBD uA
Oscillator	TCXO	TCXO	
Build-in LNA	No	Yes	
Enhanced Features	AGPS	EASY™ (autonomous) EPO	Online/offline
	Locus	Supported	TBD
	Anti-Jamming	Supported	Supported
	SBAS	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS, GAGAN
	Fitness Mode	Supported	NA
	SDK Command	Supported	Supported

Difference Table - L8x Series/L96



Product		L80-R	L80	L86	L96 (NEW)
Packaging		12-pin LCC	12-pin LCC	12-pin LCC	31-pin LCC
Chip Solution		MT3337	MT3339	MT3333	MT3333
Satellite Constellation		GPS/ QZSS	GPS/ QZSS	GPS/ GLONASS/ Galileo/ QZSS	GPS/ GLONASS/ Galileo (RLM supported)/ QZSS
Dimensions		16.0mm × 16.0mm × 6.45mm	16.0mm × 16.0mm × 6.45mm	18.4mm × 18.4mm × 6.45mm	14mm × 9.6mm × 2.0mm
Receiver Channels		66 acquisition/ 22 tracking channels	66 acquisition/ 22 tracking channels	99 acquisition/ 33 tracking channels	99 acquisition/ 33 tracking channels
Memory Type		ROM	Flash	Flash	Flash
TTFF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS
	Hot Start	<1s	<1s	1s	<1s
Sensitivity	Autonomous Acquisition	-148dBm	-148dBm	-149dBm	-148dBm
	Reacquisition	-160dBm	-160dBm	-161dBm	-160dBm
	Tracking	-165dBm	-165dBm	-167dBm	-165dBm
Timing Accuracy		10ns	10ns	10ns	10ns
Update Rate		1Hz (default), Max 5Hz	1Hz (default), Max 10Hz	1Hz (default), Max 10Hz	1Hz (default), Max 10Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-45°C to 125°C	-45°C to 125°C	-45°C to 125°C
Power Supply		3.0V to 4.3V	3.0V to 4.3V	3.0V to 4.3V	2.8V to 4.3V
Power Consumption	Acquisition	25mA @3.3V	25mA @3.3V	30mA (GPS+GLONASS)	25mA (GPS+GLONASS)
	Tracking	20mA @3.3V	20mA @3.3V	26mA (GPS+GLONASS)	20mA (GPS+GLONASS)
Power Saving Mode Consumption	AlwaysLocate™	Not supported	1.4mA typ. @3.3V	2.6mA typ. @3.3V	2.8mA typ. @3.3V
	Backup Mode	7uA	7uA	7uA	7uA
Oscillator		TCXO	TCXO	TCXO	TCXO
Build-in LNA		YES	YES	YES	YES
Enhanced Features	AGPS	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO
	Locus	Not supported	Supported	Supported	Supported
	Anti-Jamming	Supported	Supported	Supported	Supported
	SBAS	Not supported	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS, GAGAN
	Fitness Mode	Not supported	Supported	Not supported	Not supported
	SDK Command	Not supported	Supported	Supported	Supported
	Antenna Automatic Switch	Not supported	Supported	Supported	Not supported
	Antenna Short-circuit Detection/Protection	Not supported	Supported	Supported	Not supported
	Antenna Open-circuit Detection	Not supported	Supported	Supported	Not supported

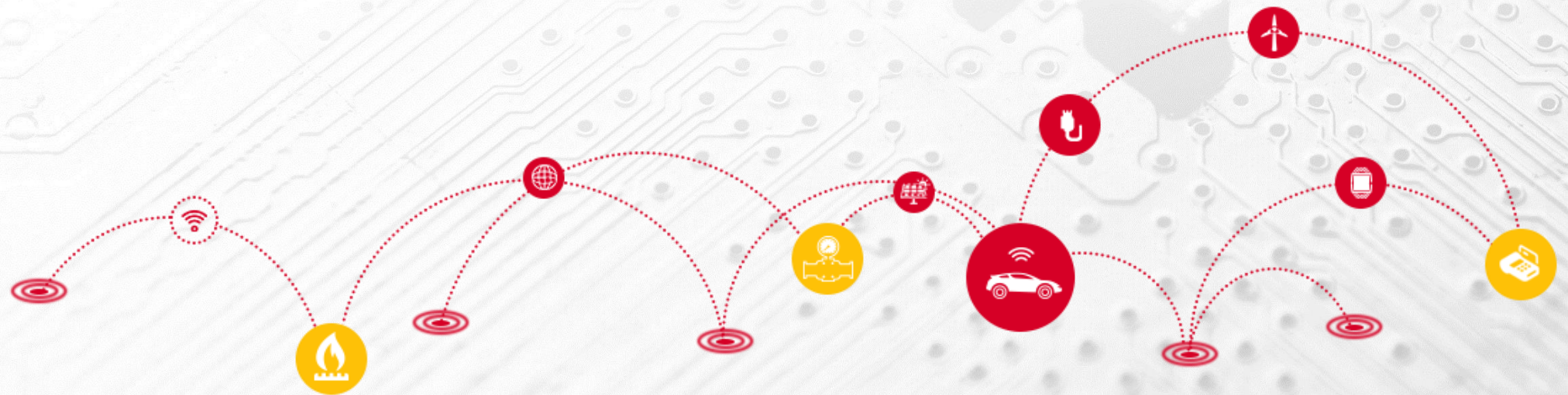
GNSS Module Portfolio

Technologies

GNSS Engine Comparison

Module Comparison Table

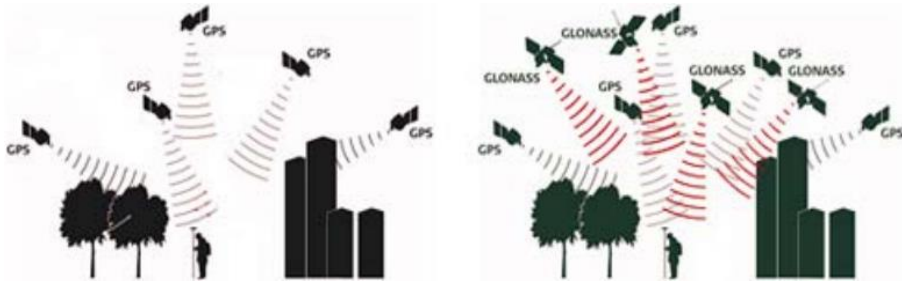
QUECTEL[®]
Build a Smarter World



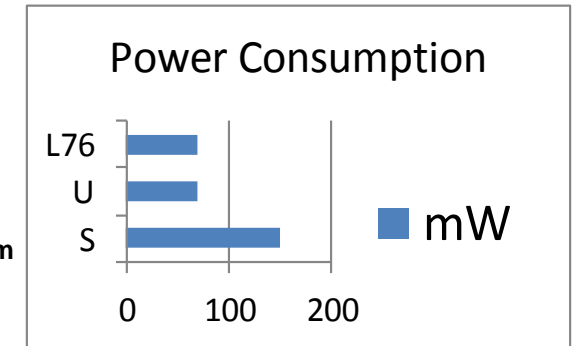
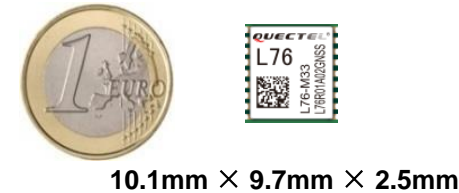
GNSS Module Advantages

1. More satellites, wider coverage

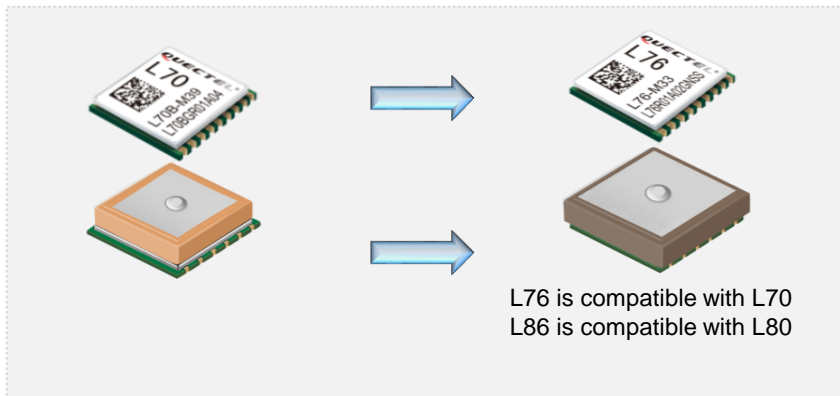
- 12 GPS satellites and 12 GLONASS satellites
- operate simultaneously
- Saving times of acquisition
- High accuracy and precision



3. Extremely compact size, lower power consumption



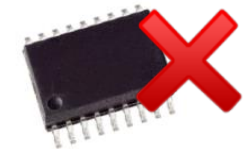
2. GNSS modules are compatible with GPS modules



4. Self-AGPS without the need of external flash

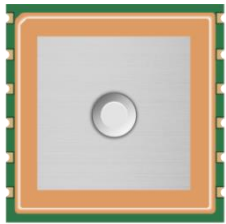
With EASY™ technology, L76 & L86 can self-generate orbit prediction for 3 days and save the ephemeris data into the internal flash memory.

- TTFF cold start <15s
- TTFF warm start <5s
- TTFF hot start <1s



GNSS Modules with Antenna Embedded

L80-R/ L80 MT3337/ MT3339

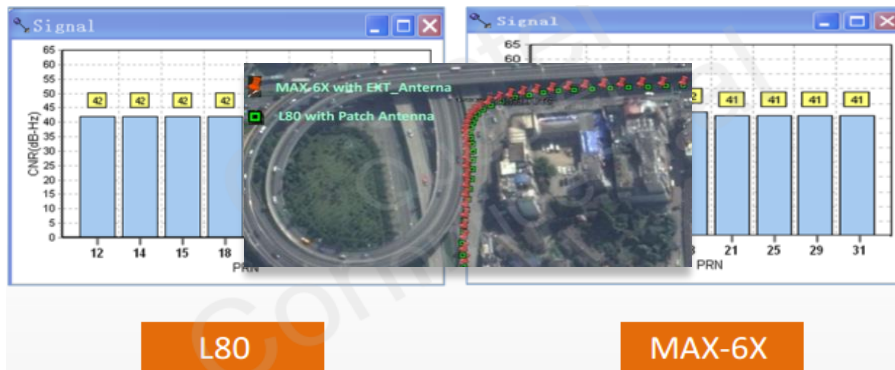


L86 MT3333



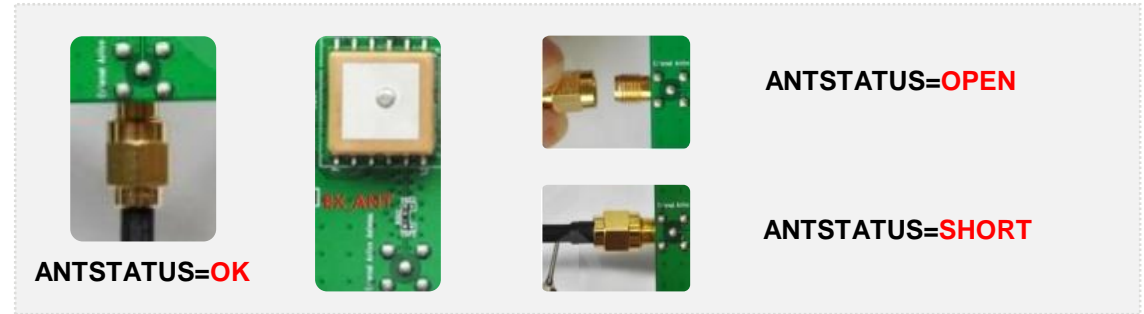
1. Excellent performance on RF

CN value is measured by a 8-channel GNSS signal simulator under coupling testing mode with a -110dBm signal level.



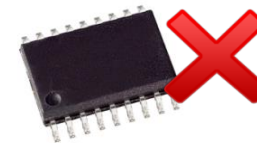
2. Automatic antenna switch function

- External active antenna status notification
- Short circuit protection
- Open connection detection

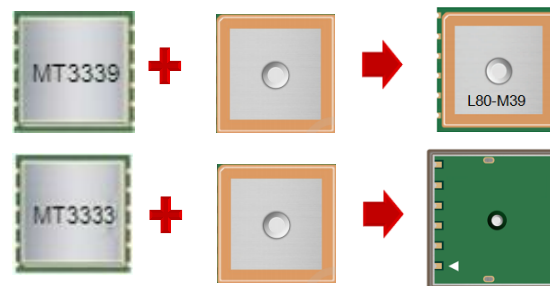


3. Self-AGPS without the need of external flash

- TTFF cold start <15s
- TTFF warm start <5s
- TTFF hot start <1s

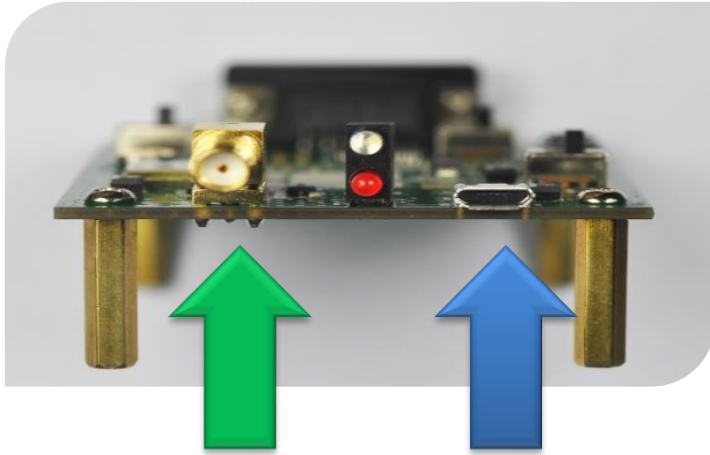


4. Patch on the top of GNSS module

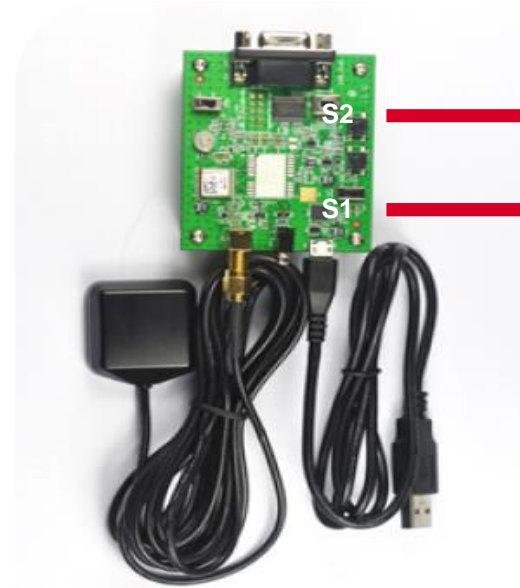


- Build-in off-chip LNA for excellent sensitivity
- Save main PCB size
- 12 pins, easy for SMT and manual soldering
- Suitable for OBD, GPS mouse, etc.

Easy to Evaluate



Connect Active Antenna and Micro-USB Cables to Corresponding Interfaces



b. Switch S2 to "USB"

c. Switch S1 to "ON"



a. Connect EVB to PC via Micro-USB Cable

Enhanced Technology 1 - Power Management

Power Management Mode	L70	MAX-7X	JNX
Full on @Acquisition	18mA	39.5mA	41mA
Full on @Tracking	12mA	29.5mA	32mA
Backup	7uA	15uA	40uA
Standby	200uA	N/A	N/A
Periodic standby	2.6mA	N/A	N/A
Periodic backup	2.4mA	N/A	N/A
AlwaysLocate™ standby	1.5mA	N/A	N/A
AlwaysLocate™ backup	1.4mA	N/A	N/A

Quectel GNSS modules provide multi-mode power management including Backup, Standby, Periodic and AlwaysLocate™ modes, to reduce current consumption greatly.

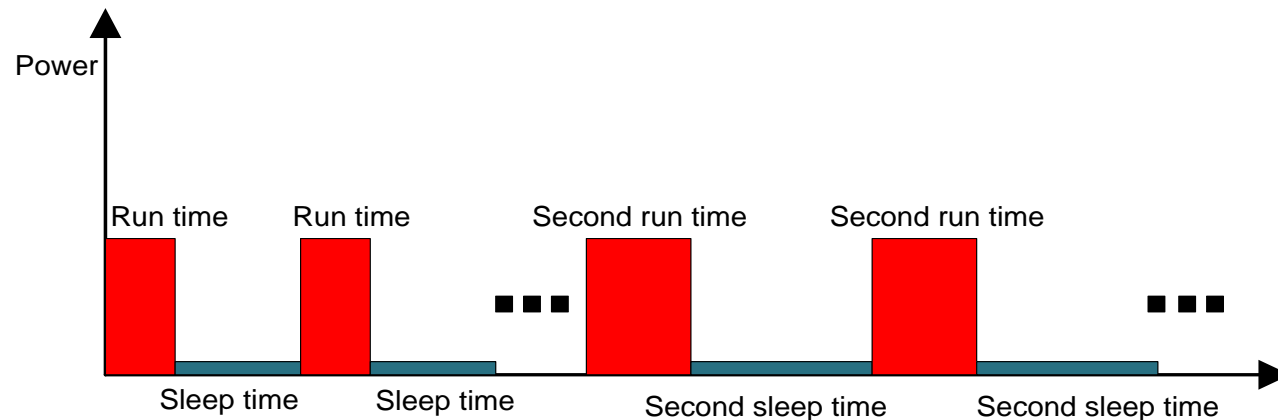


Enhanced Technology 2 - Periodic Mode

Periodic Standby/ Backup Mode

Periodic Standby/ Backup mode can control power on/off time of GNSS periodically to reduce average power consumption, and on/off time can be configured by using PMTK command. For details, see the figure below. Periodic Standby/ Backup mode can be entered by sending the following PMTK command.

\$PMTK255, Type, Run time, Sleep time, Second run time, Second sleep time



Run time: Tracking mode period (ms)
Sleep time: Standby/ backup mode period (ms)
Second run time: Extended acquisition period (ms) when GNSS acquisition fails during the Run time
Second sleep time: Extended standby/ backup mode period (ms) when GNSS acquisition fails during the Run time

Note:

Normally, the GNSS module will enter the periodic mode after successfully fixing position. But if acquisition fails, the GNSS module still can enter this mode. If GNSS acquisition fails during the **Run time**, in order to ensure the success of reacquisition, it is better to set a longer **Second run time**.

Example: \$PMTK225,1,3000,12000,18000,72000*16 for periodic mode means 3s in tracking mode and 12s in backup mode. The average current for both GPS and GLONASS is about 4.2mA. But for GPS only, it is about 2.5mA.

Enhanced Technology 3 - EASY™ AGPS Technology

EASY™ is the abbreviation for Embedded Assist System for quick positioning. With EASY™ technology, the GNSS engine can calculate and predict automatically single ephemeris (up to 3 days) when the power is on, and then save the predict information into the memory. So the GNSS engine can use the information for positioning later if there is not enough information received from the satellites.

With EASY™ technology, Quectel modules can decrease the TTFF (Time To First Fix) considerably.

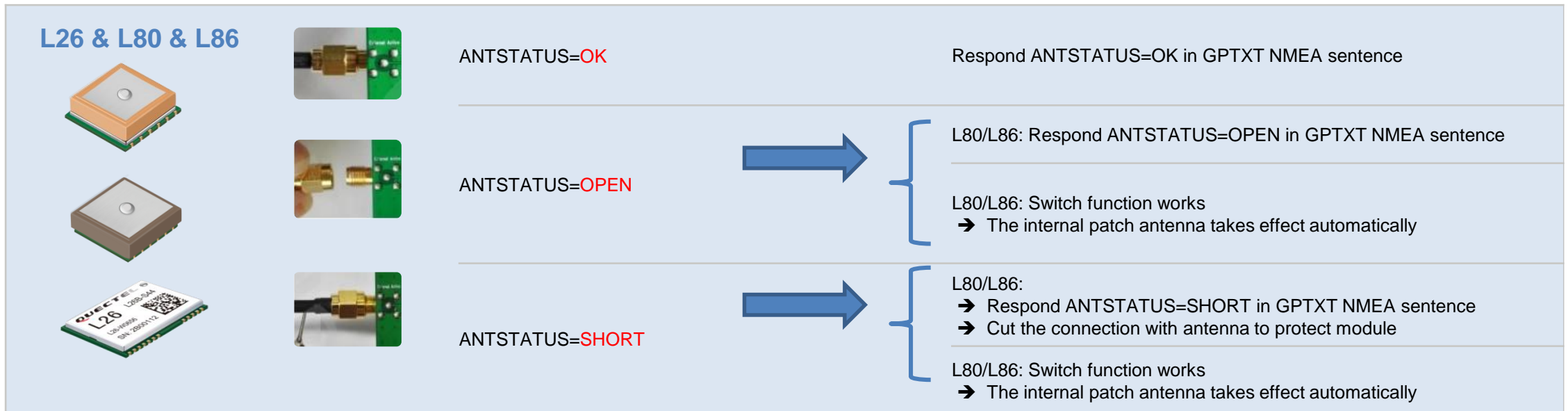
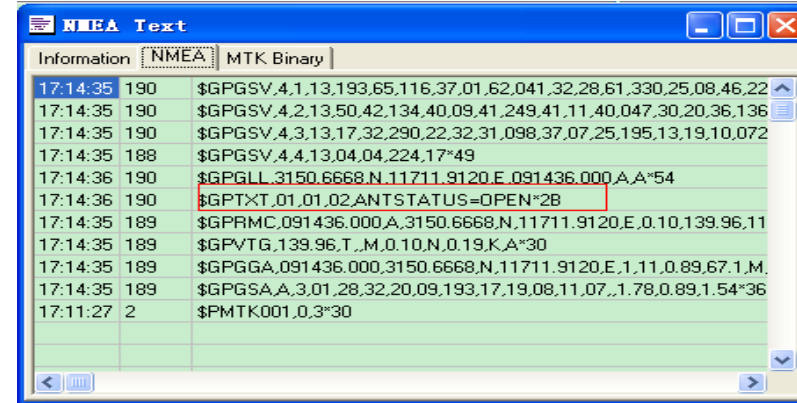
L80 Patch Antenna Module with EASY™				L80 Patch Antenna Module without EASY™				MAX-7X			
CN0 39dB	TTFF (result of 10 times of testing) (s)			CN0 39dB	TTFF (result of 10 times of testing) (s)			CN0 39dB	TTFF (result of 10 times of testing) (s)		
	Cold start	Warm start	Hot start		Cold start	Warm start	Hot start		Cold start	Warm start	Hot start
Min.	12	2.2	0.3	Min.	23	20.1	0.7	Min.	19.133	21.31	0.562
Max.	20.7	4.9	0.9	Max.	38.4	33.8	0.9	Max.	36.922	35.35	1.127
Mean	14.84	3.3	0.56	Mean	29.4	28.45	0.76	Mean	30.31	28.5	0.78

EASY™ function is enabled by default in Quectel modules. The command “\$PMTK869,1,0*34” can be used to disable EASY™.

Enhanced Technology 4 - Antenna Supervisor

- Antenna Supervisor is used to detect external active antenna status:
 - ✓ Connected
 - ✓ Open circuit
 - ✓ Short-circuit
- With Antenna Supervisor Technology, L80/L86 can offer automatic antenna switching function.

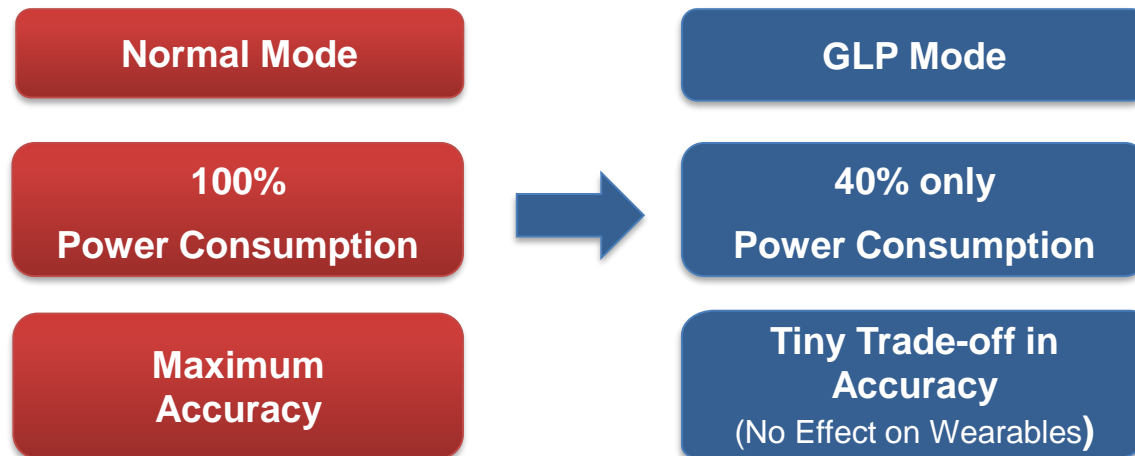
NMEA sample:



Enhanced Technology 5 – GNSS Low Power Mode

Low power mode is an optimized solution for wearables, fitness devices and tracking device. It provides a GNSS Low Power (GLP) mode for Quectel GNSS modules to reduce power consumption with tiny accuracy trading-off. The low power mode can be easily set by using a specific message.

In GLP mode, the module has good route consistence in walking and running scenarios, and can switch dynamic duty operation automatically. It will come back to normal mode in difficult environment to keep good accuracy as well, thus realizing maximum performance with the lowest power consumption.



FLP Mode vs Normal Mode Average Current Comparison (L70)

Scenario	FLP Mode (mA)	Normal Mode (mA)
Static	5.036	12.783
Walking	5.374	12.249
Running	5.469	12.975
Driving	8.479	12.663

Enhanced Technology 6 - SDK Function

Quectel GNSS module functions developed based on SDK command

Quectel offers unique features which are developed based on SDK, and those features are:

PQ Command	Description
PQBAUD	Set NEMA port baud rate
PQEPE	Get estimated position error in horizontal and vertical directions
PQFLP/PQGLP	Set the module into FLP/GLP mode
PQJAM	Jamming detection
PQTXT	Enable/disable GPTXT sentence output
PQODO	Start/stop odometer reading
PQPZ90	Enable/disable switching from WGS84 to PZ-90.11
PQVEL	Get velocity component values of 3 directions
PQ1PPS	Set the type and pulse width of 1PPS's output
PQECEF	Enable/disable ECEFPOSVEL sentence output
PQGEO	Set Geo-fence type and parameters
PQRLM	Get return link message information
PQGBS	Get RAIM information



Note:

Please refer to [Quectel_GNSS_SDK_Commands_Manual](#) for the detailed information about these commands.

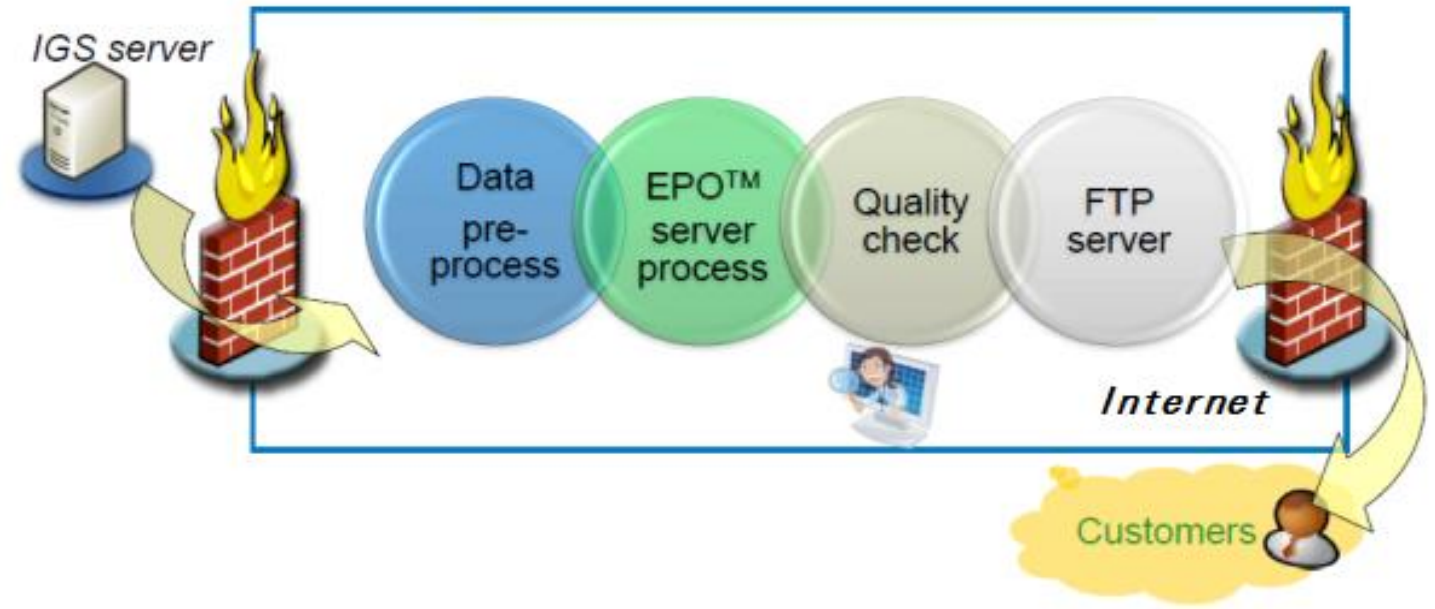
Enhanced Technology 7 - EPO Technology

EPO™ (Extended Prediction Orbit) supplies the predicated Extended Prediction Orbit data to speed up TTFF, customers can download the EPO data to GNSS engine from the their own FTP server by internet or wireless network, the GNSS engine will use the EPO data to assist position calculation when there are not enough navigation information or in weak signal areas.

EPO data service supports 3/6/9/12/18/21/24/27/30 days' orbit predictions. There is no need to download EPO data from EPO server every day. Aiding information like ephemeris, almanac, satellites status and an optional time synchronization signal will reduce the time to first fix significantly.

Note:

Any authorized customer can download EPO data to MTK EPO server, without the need of any external server.



Enhanced Technology 8 - LOCUS

LOCUS is the name of MTK (MT3339/MT3333) innate logger solution, the embedded logger function does not need host CPU (MCU) and external flash to handle the operation, GPS engine will use internal flash (embedded in GNSS chipset) to log the GNSS data (Data format: UTC, Latitude, Longitude, Height).

Benefits:

- Auto logging data to chipset internal flash, no need to wake up HOST
- Smart overlapping mechanism to keep the latest logger data always (4KB base)
- Logger capability in chipset internal flash:
 - A. With 1 sector flash (64KB), users can log >16 hours
 - B. With AlwaysLocate™, users can log up to 48hrs (2days) under standard scenario.

Logging Mode:

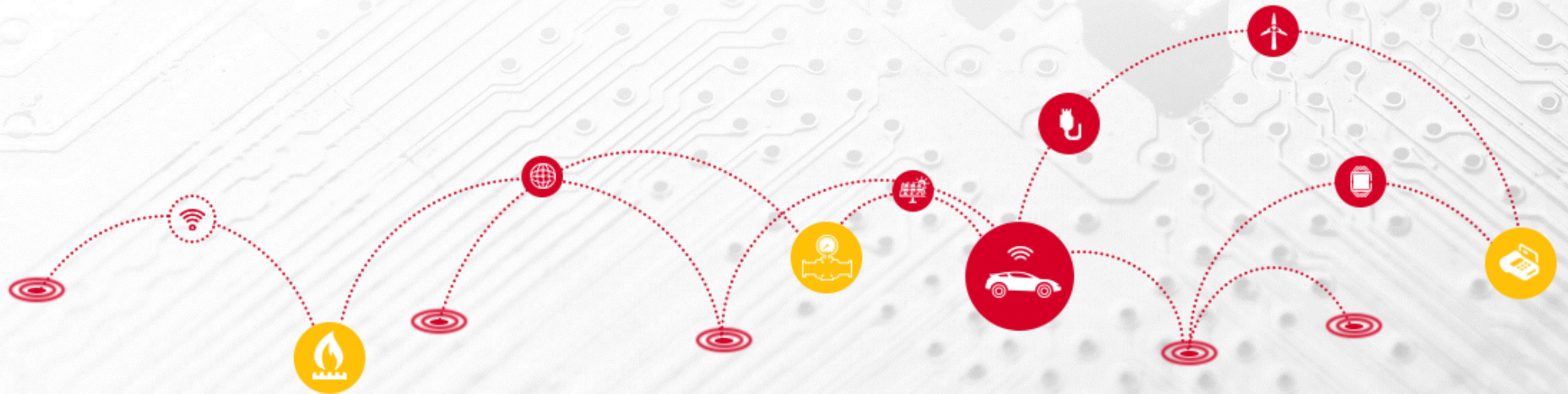
- AlwaysLocate™ Mode:
It can be used to save internal flash space and only log once before entering sleep when GNSS module is in the AlwaysLocate™ mode.
- Fix only mode: Logging GNSS data when 3D-fix only.
- Interval mode: Logging one time per 15s interval.

GNSS Module Portfolio

Technologies

GNSS Engine Comparison

Module Comparison Table



GNSS Engine Comparison - MTK 3337/3339 VS SiRF IV



Product Features		MT3337	MT3339	SiRF IV
Satellite System		GPS only	GPS only	GPS only
ROM/Flash		ROM	Flash	ROM
Power Consumption	Acquisition Mode	Around 16mA	Around 18mA	Around 30mA
	Tracking Mode	Around 13mA	Around 12mA	Around 25mA
Voltage Range	Power Supply	2.8V to 4.3V	2.8V to 4.3V	1.71V to 1.89V
	I/O Voltage	2.7V to 2.9V	2.7V to 2.9V	1.71V to 1.89V
AGPS Technology		EASY™ without external memory	EASY™/EPO without external memory	CGEE with external EPPROM
TTFF with AGPS @ -130dBm	Warm Start	<5s (EASY™)	<5s (EASY™)	10s (CGEE)
	Cold Start	<15s (EASY™)	<15s (EASY™)	25s (CGEE)
Power Saving Mode		8uA @Backup mode	7uA @Backup mode, 200uA @standby mode, period mode, AlwaysLocate™ mode, Fitness Low Power mode	20uA @Hibernate mode ATP, PTF
Innate Logger Solution		Not Supported	LOCUS without the need of host and external flash	Not Supported

GNSS Engine Comparison - MTK 3333 VS SiRF V



Product Features		MT3333	SiRF V
Satellite System		GPS/ GLONASS/ BeiDou/ Galileo	GPS/ GLONASS/ BeiDou/ Galileo
ROM/Flash		Flash	ROM
Power Consumption	Acquisition Mode	Around 25mA (GPS+GLONASS) @3.3V	Around 45.9mA
	Tracking Mode	Around 18mA (GPS+GLONASS) @3.3V	Around 36.6mA
Voltage Range	Power Supply	2.8V to 4.3V	1.71V to 1.89V
	I/O Voltage	2.7V to 2.9V	1.71V to 1.89V
AGPS Technology		EASY™/EPO without external memory	CGEE with external EEPROM
TTFF with AGPS @-130dBm	Warm Start	<5s (EASY™)	10s (CGEE)
	Cold Start	<15s (EASY™)	25s (CGEE)
Power Saving Mode		7uA @Backup mode, 200uA @standby mode, period mode, AlwaysLocate™ mode	20uA @Hibernate mode ATP, PTF
Innate Logger Solution		LOCUS without the need of host and external flash	Not Supported

GNSS Engine Comparison - MTK 3333 VS u-company M8



Product Features		MT3333	u-company M8
Satellite system		GPS/ GLONASS/ BeiDou/ Galileo	GPS/ GLONASS/ BeiDou/ Galileo
ROM/Flash		Flash	ROM
Power Consumption	Acquisition Mode	Around 25mA (GPS+GLONASS) @3.3V	Around 27mA
	Tracking Mode	Around 18mA (GPS+GLONASS) @3.3V	Around 26mA
Voltage Range	Power Supply	2.8V to 4.3V	2.7V to 3.6V
	I/O Voltage	2.7V to 2.9V	2.7V to 3.6V
AGPS Technology		EASY™/EPO	AssistNow™
TTFF with AGPS @-130dBm	Warm Start	<5s (EASY™)	unknown
	Cold Start	<15s (EASY™)	<27s
Power Saving Mode		7uA @Backup mode, 200uA @standby mode, period mode, AlwaysLocate™ mode	15uA @Backup mode, PSMCT & PSMOO
Innate Logger Solution		LOCUS without the need of host and external flash	Not Supported

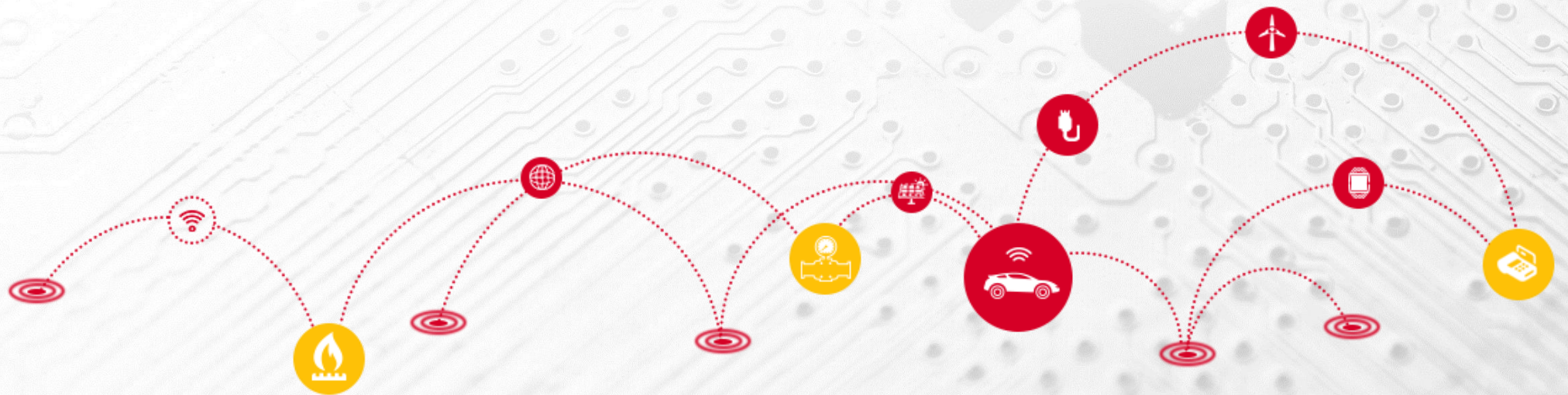
GNSS Module Portfolio

Technologies

GNSS Engine Comparison

Module Comparison Table

QUECTEL[®]
Build a Smarter World



Comparison Table: L70/MAX-7X/JNX/JFX



Product		L70	MAX-7X	JNX	JFX
Packaging		18-pin LCC GPS module	18-pin LCC GPS module	24-pin LCC GPS module	32-pin QFN GPS module
Chip Solution		MTK: MT3339	u-blox 7	SiRF4	SiRF4
Dimensions		10.1mm × 9.7mm × 2.5mm	10.1mm × 9.7mm × 2.5mm	16.0mm × 12.2mm × 2.4mm	11mm × 11mm × 2.3mm
Receiver Channels		66 acquisition/ 22 tracking channels	56 channels	48 search channels	48 channels
Memory Type		Flash	ROM	ROM or Flash	ROM or Flash
TTFF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	29s	<35s	<35s
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	28s	<35s	<35s
	Hot Start	<1s	1s	1s	1s
Sensitivity	Autonomous Acquisition	-148dBm	-148dBm	-147dBm	-147dBm
	Reacquisition	-160dBm	-160dBm	Unknown	Unknown
	Tracking	-165dBm	-161dBm	-163dBm	-163dBm
Timing Accuracy		10ns	30ns RMS	Unknown	Unknown
Update Rate		1Hz (default), Max 10Hz	1Hz (default), Up to 10Hz	1Hz (default), Max 5Hz	1Hz (default), Max 5Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-40°C to 85°C	40°C to 85°C	-40°C to 85°C
Power Supply		2.8V to 4.3V	2.7V to 3.6V (MAX-7Q/W)	2.85V to 3.6V	1.75V to 1.9V
Power Consumption	Acquisition	18mA (GPS) @3.3V	39.5mA @3V (MAX-7W)	41mA	46mA
	Tracking	12mA (GPS) @3.3V	29.5mA @3V (MAX-7W)	32mA	37mA
Power Saving Mode Consumption	AlwaysLocate™	1.4mA typ. @3.3V	Not supported	Not supported	Not supported
	Backup Mode	7uA	15uA (MAX-7Q/W)/300uA (MAX-7C)	40uA	Unknown
External LNA		No	No	No	No
Oscillator		TCXO	Crystal (Max-7C)/TCXO (MAX-7Q/W)	TCXO	TCXO
Enhanced Features	AGPS	EASY™ (autonomous) EPO	AssistNow autonomous	CGEE with external memory	CGEE with external memory
	AlwaysLocate™	Supported	Not supported	Not supported	Not supported
	1PPS	Supported	Supported	Supported	Supported
	Locus	Supported	Not supported	Not supported	Not supported
	Anti-Jamming	Supported	Supported	Supported	Supported
	SBAS	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS, GAGAN

Comparison Table: L70-R/L70-RL/MAX-7X/SL87X-S



Product		L70-R	L70-RL	MAX-7X	SL87X-S
Packaging		18-pin LCC GPS module	18-pin LCC GPS module	18-pin LCC GPS module	18-pin LCC GNSS module
Chip Solution		MTK: MT3337	MTK: MT3337	u-blox 7	MTK: MT3337
Dimensions		10.1mm × 9.7mm × 2.5mm	10.1mm × 9.7mm × 2.5mm	10.1mm × 9.7mm × 2.5mm	10.1mm × 9.7mm × 2.4mm
Receiver Channels		66 acquisition/ 22 tracking channels	66 acquisition/ 22 tracking channels	56 channels	66 acquisition/ 22 tracking channels
Memory Type		ROM	ROM	ROM	ROM
TTFF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS	29s	<35s
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS	28s	<28s
	Hot Start	<1s	<1s	1s	1s
Sensitivity	Autonomous Acquisition	-148dBm	-149dBm	-148dBm	-148dBm
	Reacquisition	-160dBm	-161dBm	-160dBm	-160dBm
	Tracking	-165dBm	-167dBm	-161dBm	-165dBm
Timing Accuracy		10ns	10ns	30ns RMS	10ns
Update Rate		1Hz (default), Max 5Hz	1Hz (default), Max 5Hz	1Hz (default), Up to 10Hz	1Hz (default), Max 5Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-45°C to 125°C	-40°C to 85°C	-40°C to 85°C
Power Supply		2.8V to 4.3V	2.8V to 4.3V	2.7V to 3.6V (MAX-7Q/W)	2.8V to 4.3V
Power Consumption	Acquisition	16mA (GPS) @3.3V	21mA (GPS) @3.3V	39.5mA @3V (MAX-7W)	15.5mA @3.3V
	Tracking	13mA (GPS) @3.3V	18mA (GPS) @3.3V	29.5mA @3V (MAX-7W)	13mA @3.3V
Power Saving Mode Consumption	AlwaysLocate™	Not supported	Not supported	Not supported	Not supported
	Backup Mode	8uA	8uA	15uA (MAX-7Q/W)/300uA (MAX-7C)	8uA
External LNA		No	Yes	No	No
Oscillator		TCXO	TCXO	Crystal (Max-7C)/ TCXO (MAX-7Q/W)	TCXO
Enhanced Features	AGPS	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO	AssistNow autonomous	Yes
	AlwaysLocate™	Not supported	Not supported	Not supported	Not Supported
	1PPS	Supported	Supported	Supported	Supported
	Locus	Not supported	Not supported	Not supported	Not Supported
	Anti-Jamming	Supported	Supported	Supported	Supported
	SBAS	Not supported	Not supported	WAAS, EGNOS, MSAS	Not supported

Comparison Table: L26/NEX-M8X/SL89X-V2



Product		L26	NEX-M8X	SL86X-V2
Packaging		24-pin LCC GPS module	24-pin LCC GPS module	24-pin LCC GNSS module
Chip Solution		MTK: MT3333	u-blox M8	MTK: MT3333
Receiver Channels		99 acquisition/ 33 tracking channels	72 channels	99 acquisition/ 33 tracking channels
Dimensions		16.0mm × 12.2mm × 2.4 mm	16.0mm × 12.2mm × 2.4mm	16.0mm × 12.2mm × 2.4mm
TTFF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	26s @NEX-M8N/Q 27s @NEX-M8M	<35s
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	Unknown	<28s
	Hot Start	<1s	<1s	<1s
Sensitivity	Autonomous Acquisition	-148dBm	-148dBm	-148dBm
	Reacquisition	-160dBm	-160dBm	-160dBm
	Tracking	-167dBm	-167dBm	-165dBm
Timing Accuracy		10ns	30ns RMS	10ns
Update Rate		1Hz (default), Max 10Hz	1Hz (default), Max 10Hz	1Hz (default), Max 10Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-40°C to 85°C @NEX-M8N/Q -40°C to 105°C @NEX-M8M	-40°C to 85°C
Power Supply		2.8V to 4.3V	2.7V to 3.6V @NEX-M8N/Q 1.65V to 3.6V @NEX-M8M	3.0V to 3.6V
Power Consumption	Acquisition	29mA (GPS+GLONASS) @3.3V	34mA @NEX-M8N (GPS+GLONASS) 24.5mA @NEX-M8M (GPS+GLONASS) 29.5mA @NEX-M8M (GPS+GLONASS)	30mA (GPS+GLONASS)
	Tracking	21mA (GPS+GLONASS) @3.3V	34mA @NEX-M8N (GPS+GLONASS) 23.5mA @NEX-M8M (GPS+GLONASS) 28.5mA @NEX-M8M (GPS+GLONASS)	25mA (GPS+GLONASS)
Power Saving Mode Consumption	AlwaysLocate™	2.7mA typ. @3.3V	Not supported	Unknown
	Backup Mode	7uA	15uA	10uA
External LNA		Yes	optional	Yes
Oscillator		TCXO	Crystal (NEX-M8M)	TCXO
Enhanced Features	AGPS	EASY™ (autonomous) EPO	AssistNow autonomous	EASY™
	1PPS	Supported	Supported	Supported
	Locus	Supported	Not supported	Supported
	Anti-Jamming	Supported	Supported	Supported
	SBAS	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS	WAAS, EGNOS, MSAS, GAGAN

Comparison Table: L76/L76-L/MAX-M8X/SL87X



Product		L76	L76-L	MAX-M8X	SL87X
Packaging		18-pin LCC GNSS module	18-pin LCC GNSS module	18-pin LCC GNSS module	18-pin LCC GNSS module
Chip Solution		MTK: MT3333	MTK: MT3333	u-blox M8	MTK: MT3333
Dimensions		10.1mm × 9.7mm × 2.5mm	10.1mm × 9.7mm × 2.5mm	10.1mm × 9.7mm × 2.5mm	10.1mm × 9.7mm × 2.4mm
Receiver Channels		99 acquisition/ 33 tracking channels	99 acquisition/ 33 tracking channels	72 channels	99 acquisition/ 33 tracking channels
Memory Type		Flash	Flash	ROM	Flash
TTFF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	<35s, Autonomous <15s, With EASY™ A-GPS	26s @MAX-M8Q/W 27s @MAX-M8C	<31s
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	<30s, Autonomous <5s, With EASY™ A-GPS	Unknown	<28s
	Hot Start	<1s	<1s	<1s	<1s
Sensitivity	Autonomous Acquisition	-148dBm	-149dBm	-148dBm @MAX-M8Q/W -147dBm @MAX-M8C	-148dBm
	Reacquisition	-160dBm	-161dBm	-160dBm @MAX-M8Q/W -159dBm @MAX-M8C	-160dBm
	Tracking	-165dBm	-167dBm	-167dBm	-165dBm
Timing Accuracy		10ns	10ns	30ns RMS	10ns
Update Rate		1Hz (default), Max 10Hz	1Hz (default), Max 10Hz	1Hz (default), Max 10Hz	1Hz (default), Max 10Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-45°C to 125°C	-40°C to 85°C @MAX-M8Q/W -40°C to 105°C @MAX-M8C	-40°C to 85°C
Power Supply		2.8V to 4.3V	2.8V to 4.3V	2.7V to 3.6V @MAX-M8Q/W 1.65V to 3.6V @MAX-M8C	3.0V to 3.6V
Power Consumption	Acquisition	21mA (GPS) @3.3V 25mA (GPS+GLONASS) @3.3V	29mA (GPS+GLONASS) @3.3V	21mA (GPS) @MAX-M8Q/C 35mA (GPS) @MAX-M8W 27mA (GPS+GLONASS) @MAX-M8Q/C 44mA (GPS+GLONASS) @MAX-M8W	20mA (GPS) 28mA (GPS+GLONASS)
	Tracking	15mA (GPS) @3.3V 18mA (GPS+GLONASS) @3.3V	22mA (GPS+GLONASS) @3.3V	19mA (GPS) @MAX-M8Q/C 33.5mA (GPS) @MAX-M8W 25mA (GPS+GLONASS) @MAX-M8Q/C 43mA (GPS+GLONASS) @MAX-M8W	17mA (GPS) 22mA (GPS+GLONASS)
Power Saving Mode Consumption	Alwayslocate™	2.6mA typ. @3.3V	2.7mA typ. @3.3V	Not supported	7mW typ.
	Backup Mode	7uA	7uA	15uA @MAX-M8Q/W 100uA @MAX-M8C	7uA
External LNA		No	Yes	No	No
Oscillator		TCXO	TCXO	Crystal (MAX-M8C)	TCXO
Enhanced Features	AGPS	EASY™ (autonomous) EPO	EASY™ (autonomous) EPO	AssistNow autonomous	EASY™
	AlwaysLocate™	Supported	Supported	Not supported	Supported
	1PPS	Supported	Supported	Supported (Time pulse)	Supported
	Locus	Supported	Supported	Not supported	Supported
	SBAS	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS	WAAS, EGNOS, MSAS, GAGAN
Anti-Jamming		Supported	Supported	Supported	Supported

Comparison Table: L96/CAM-M8X



Product		L96	CAM-M8X
Packaging		31-pin LCC GNSS module	31-pin LCC GNSS module
Chip Solution		MTK: MT3333	u-blox M8
Dimensions		14mm × 9.6mm × 2.0mm	14mm x 9.6mm x 1.95mm
Receiver Channels		99 acquisition/ 33 tracking channels	72 channels
Memory Type		Flash	ROM
TTF (Time To First Fix)	Cold Start	<35s, Autonomous <15s, With EASY™ A-GPS	26s
	Warm Start	<30s, Autonomous <5s, With EASY™ A-GPS	Unknown
	Hot Start	<1s	<1s
Sensitivity	Autonomous Acquisition	-148dBm	-148dBm @CAM-M8Q -148dBm @CAM-M8C
	Reacquisition	-160dBm	-160dBm @CAM-M8Q -160dBm @CAM-M8C
	Tracking	-165dBm	-167dBm @CAM-M8Q -164dBm @CAM-M8C
Timing Accuracy		10ns	30ns RMS
Update Rate		1Hz (default), Max 10Hz	1Hz (default), Max 10Hz
Temperature Range	Operating	-40°C to 85°C	-40°C to 85°C
	Storage	-45°C to 125°C	-40°C to 85°C
Power Supply		2.8V to 4.3V	2.7V to 3.6V @CAM-M8Q 1.65V to 3.6V @CAM-M8C
Power Consumption	Acquisition	25mA (GPS+GLONASS) @3.3V	26mA (GPS) 30mA (GPS+GLONASS) @CAM-M8Q 32mA (GPS+GLONASS) @CAM-M8C
	Tracking	20mA (GPS+GLONASS) @3.3V	23mA (GPS) @3V 28mA (GPS+GLONASS) @3V
Power Saving Mode Consumption	Alwayslocate™	2.8mA typ. @3.3V	Not supported
	Backup Mode	7uA	15uA @CAM-M8Q 100uA @CAM-M8C
External LNA		Yes	Yes
Oscillator		TCXO	TCXO @CAM-M8Q Crystal @CAM-M8C
Enhanced Features	AGPS	EASY™ (autonomous) EPO	AssistNow autonomous
	AlwaysLocate™	Supported	Not supported
	1PPS	Supported	Supported (Time pulse)
	Locus	Supported	Not supported
	SBAS	WAAS, EGNOS, MSAS, GAGAN	WAAS, EGNOS, MSAS
Anti-Jamming		Supported	Supported

Thank you!

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