

IoT

LTE



GNSS



3G

2G

MC60 GSM/GPRS+GNSS Combo Module Presentation

Aug., 2016

www.quectel.com

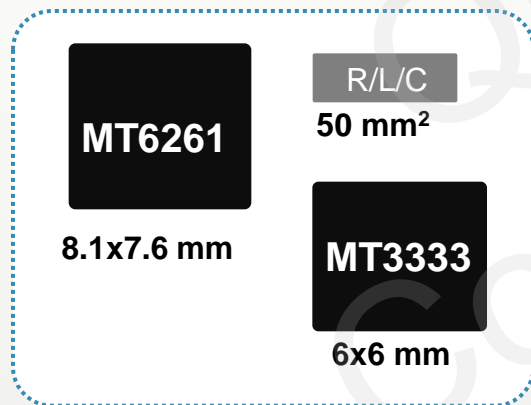


Build a Smarter World

Internet of Things

MC60 is a GSM/GPRS+GNSS combo module based on **MT2503D** platform which is the combination of GNSS platform MT3333 and GSM/GPRS platform MT6261. While offering the same performance as MT6261 and MT3333, **MT2503D** features greatly reduced size, and also offers more advanced features in GNSS part.

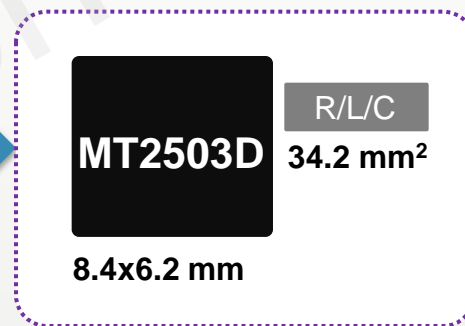
Old solution



Total Size: **148** mm²

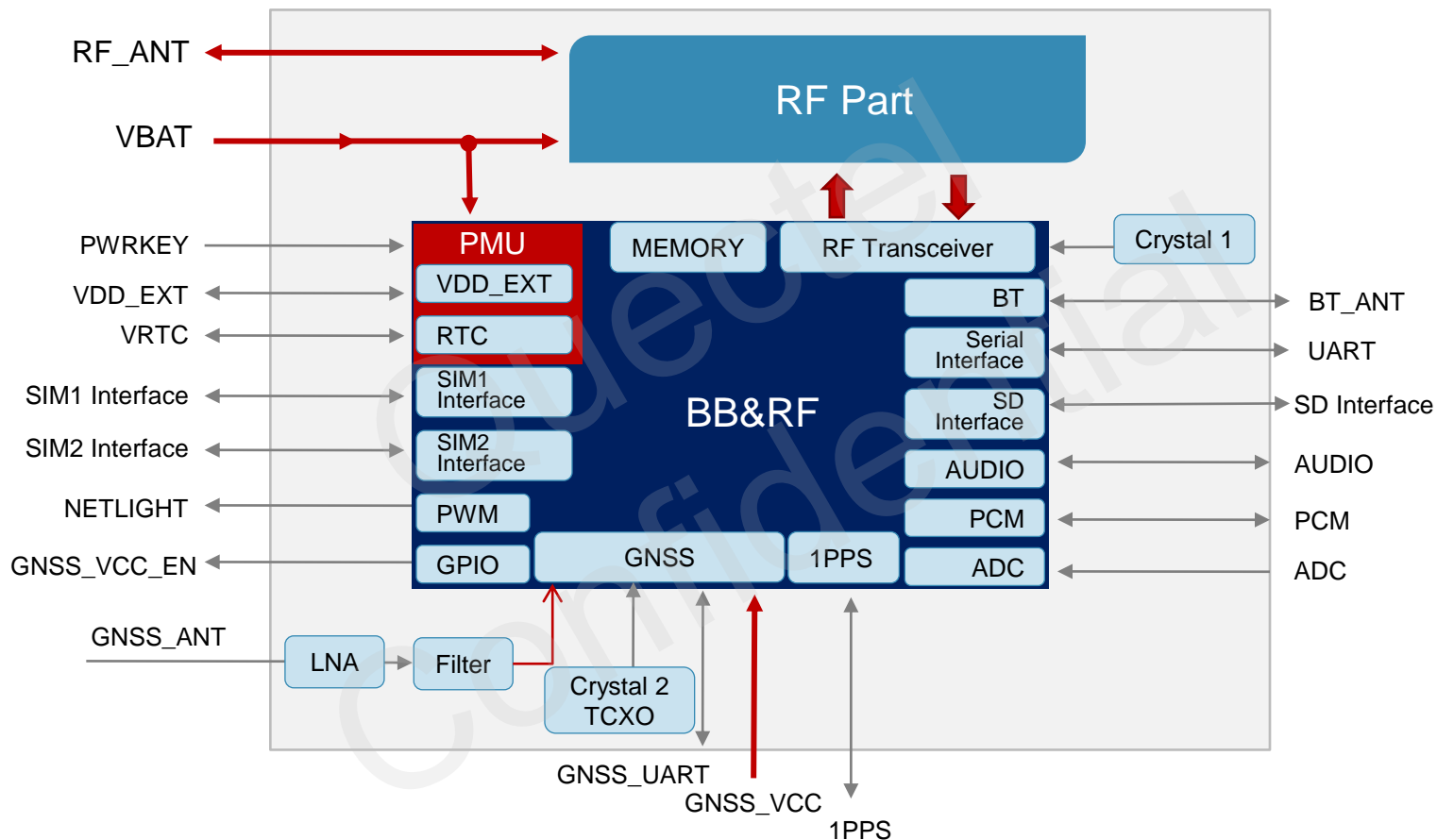
Save size up to 40%

MT2503D single chip



Total Size: **89.8** mm²

Block Diagram



GNSS Features

- GPS + GLONASS
- QuecFastFix Online
- EASY™
- LOCUST™
- GLP
- DGPS
- AlwaysLocate™
- Build-in LNA
- EPO™
- SDK
- 1PPS

Bluetooth

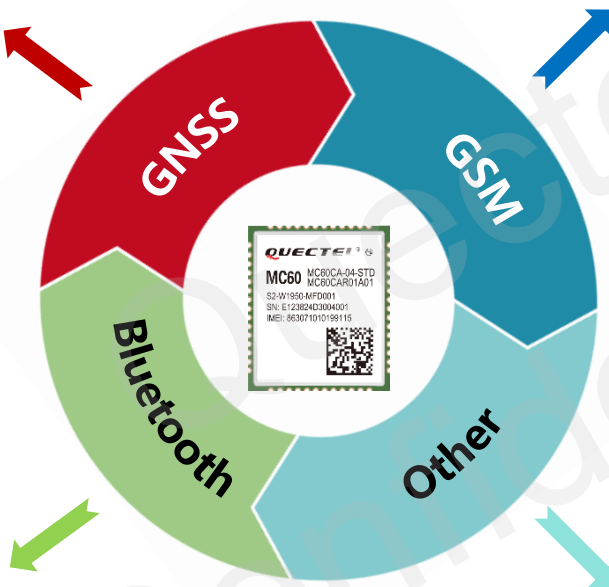
- BT3.0
- Profiles: SPP, HFP-AG

GSM/GPRS Features

- Quad-band: 850/900/1800/1900MHz
- GPRS Multi-slot Class: Class 12
- AT Commands: GSM 07.07, 07.05 and enhanced AT commands
- TCP/UDP/HTTP/FTP/PPP
- Jamming Detection
- Audio
- QuecFOTA™
- Dual SIM Single Standby
- OpenCPU

Others

- Extended temperature range: -40 °C~+85 °C
- Support 3V/1.8V SIM/USIM cards
- Highly compact size



* Under Development

Specifications

GPS L1 Band Receiver (1575.42MHz) GLONASS L1 Band Receiver (1601.71MHz)	Channel	33 tracking channels 99 acquisition channels 210 PRN channels	Quad-band	850/900/1800/1900MHz
	C/A code		GPRS Multi-slot Class	Class 12
	SBAS	WAAS, EGNOS MSAS, GAGAN	GPRS Mobile Station	Class B
Horizontal Position Accuracy	Autonomous	<2.5m CEP	Compliant to GSM Phase 2/2+	Class 4 (2W @850/900MHz) Class 1 (1W @1800/1900MHz)
Velocity Accuracy	Without Aid	<0.1m/s	Supply Voltage Range	3.3~4.6V 4.0V Typ.
Acceleration Accuracy	Without Aid	0.1m/s ²	Low Power Consumption	1.2mA @DRX=5
Timing Accuracy	1PPS	10ns	Operation Temperature	-40°C ~ +85°C
TTFF@-130dBm with QuecFastFix Online	Cold Start	<4.5s	Dimensions	18.7 × 16.0 × 2.1mm
TTFF@-130dBm with EASY™	Cold Start	<15s	Weight	Approx. 1.3g
	Warm Start	<5s	Control via AT Commands	GSM 07.07, 07.05 and other enhanced AT commands
	Hot Start	<1s	Speech Codec Modes	Half Rate (HR) Full Rate (FR) Enhanced Full Rate (EFR) Adaptive Multi-Rate (AMR)
TTFF@-130dBm without EASY™	Cold Start	<35s	Echo Arithmetic	Echo Cancellation Echo Suppression Noise Reduction
	Warm Start	<30s	Bluetooth	BT 3.0 Profiles: SPP, HFP-AG
	Hot Start	<1s	SIM/USIM	3V/1.8V
Sensitivity	Acquisition	-149dBm	UART	×3
	Tracking	-167dBm		
	Re-acquisition	-161dBm		

-

MC60's GNSS part supports PQ commands which are developed based on SDK. The commands and corresponding functions are:

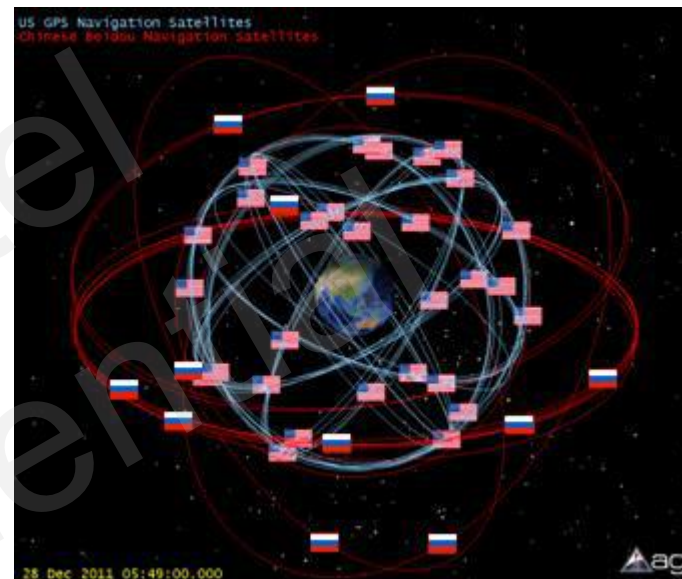
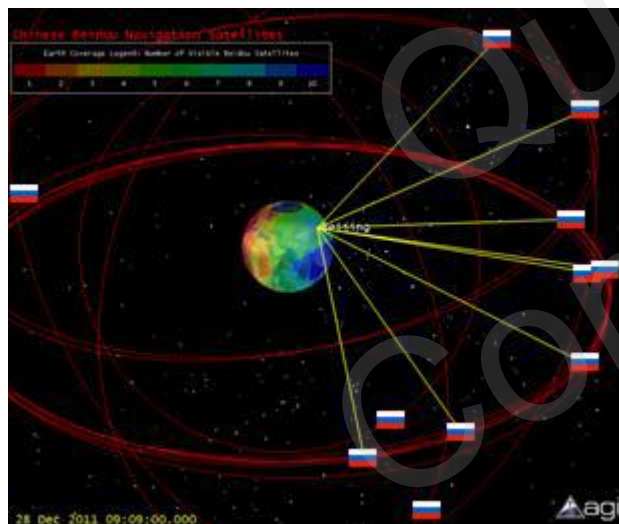
PQ Command	Description
PQBUAD	Set NMEA Port Baudrate
PQEPE	Enable/Disable PQEPE Sentence Output
PQGLP	Set the Module into GLP(GNSS Low Power) Mode
PQODO*	Start/Stop Odometer Reading
PQPZ90*	Enable/Disable Switching from WGS84 to PZ-90.11
PQVEL*	Enable/Disable 3 Ways Velocity Sentence Output
PQ1PPS*	Set the Type and Pulse Width of 1PPS's Output
PQECEF*	Enable/Disable ECEFPOSVEL Sentence Output



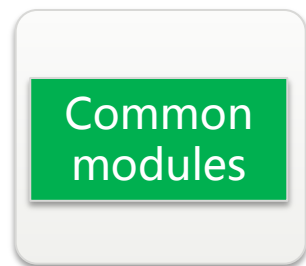
* Under Development

MC60 supports GPS+GLONASS

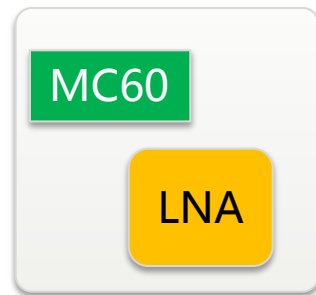
- GPS: max acquisition 10 SV
 - GPS+GLONASS: max acquisition 22 SV
- More satellites are available for position calculation, which greatly improves accuracy.



The two-constellation system is especially suitable for urban areas with high-rise buildings and complex environments.



- Expensive active antenna
- Increased external circuits



- Low-cost ceramic/chip antenna
- No need of external circuits



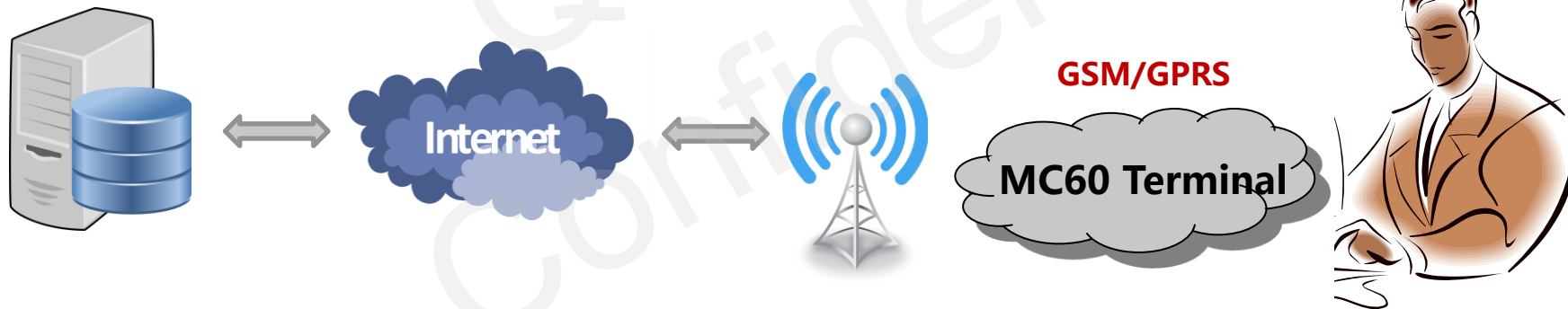
EPO Function

It is a kind of offline AGPS technology which provides predicted Extended Prediction Orbit to speed up TTFF.

Key Benefits:

- No need of extra server.
- EPO data downloading through GPRS network and upload to GNSS engine automatically.
- Small data size ensures short download time.

MTK EPO Server

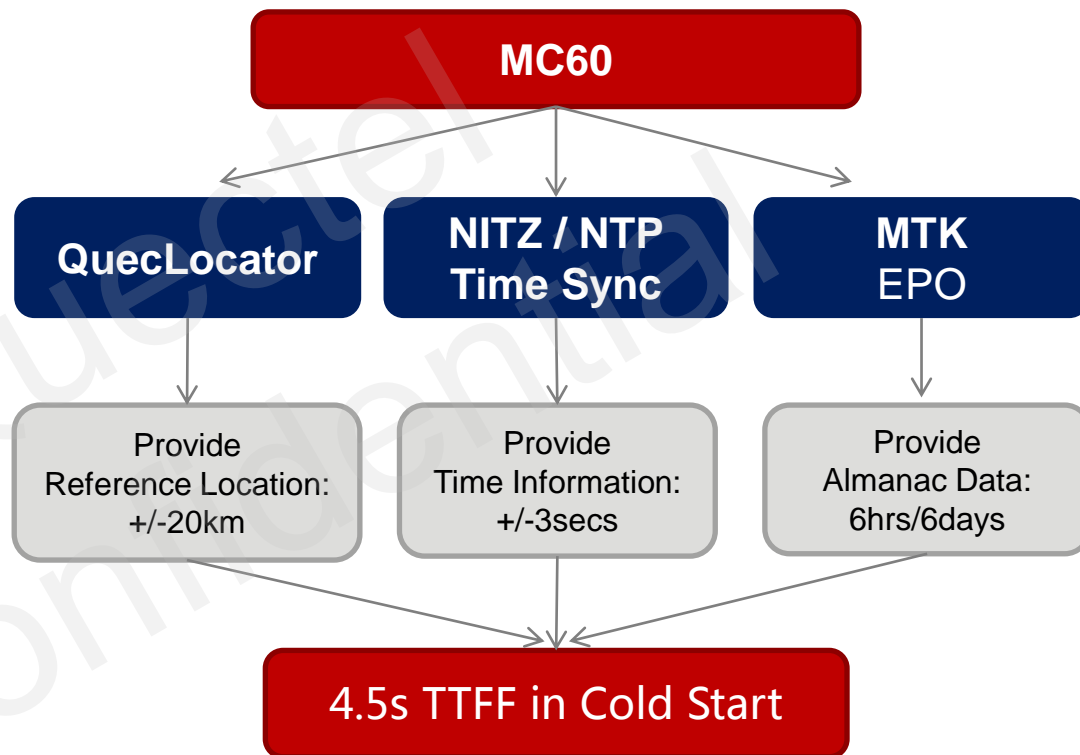




TTFF Comparison

Test Condition		TTFF without EPO™	TTFF with EPO™
Under real network conditions and conductive power level of -130dBm	Cold Start	<35s	<15s
	Warm Start	<30s	<5 s

QuecFastFix Online is an online AGPS technology which integrates EPO data, NITZ/NTP time sync, and QuecLocator to achieve 4.5 seconds cold start TTFF in OpenSky.



- In acquisition or tracking condition, GLP (GNSS Low Power) is the best power-saving mode.
- In GLP mode, MC60 module still outputs NMEA data at 1Hz data update rate.
- The module will automatically exit from GLP mode when positioning conditions are not satisfied.

Normal Mode

GLP Mode

100%

Power consumption

Only 40%

Power consumption

**Maximum
accuracy**

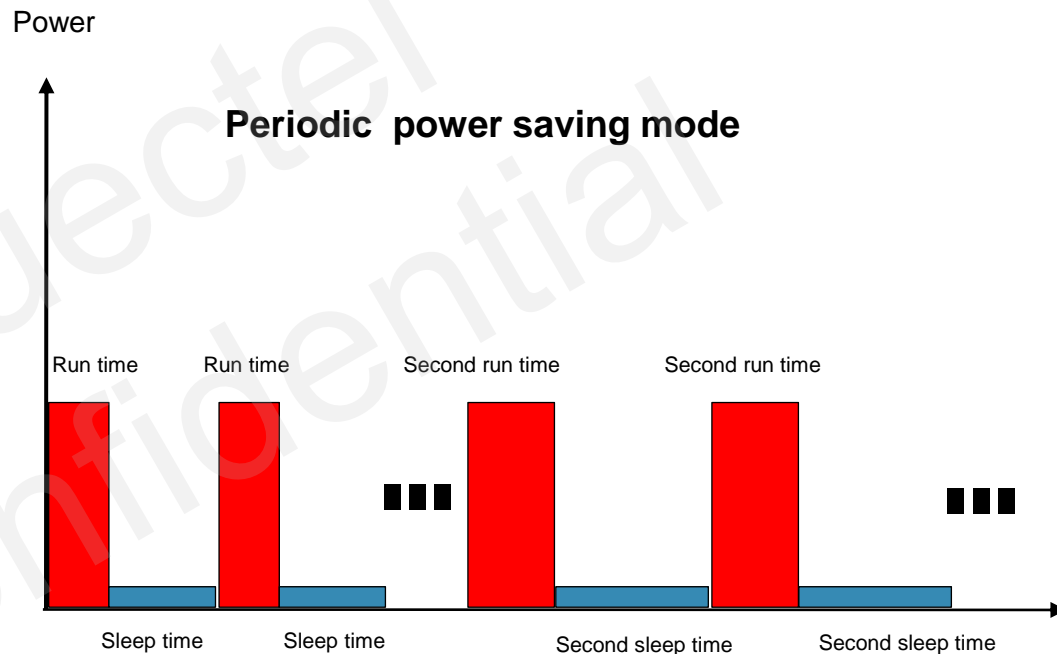
**Tiny Accuracy
Trade-off**

(No Effect on Wearable Devices)

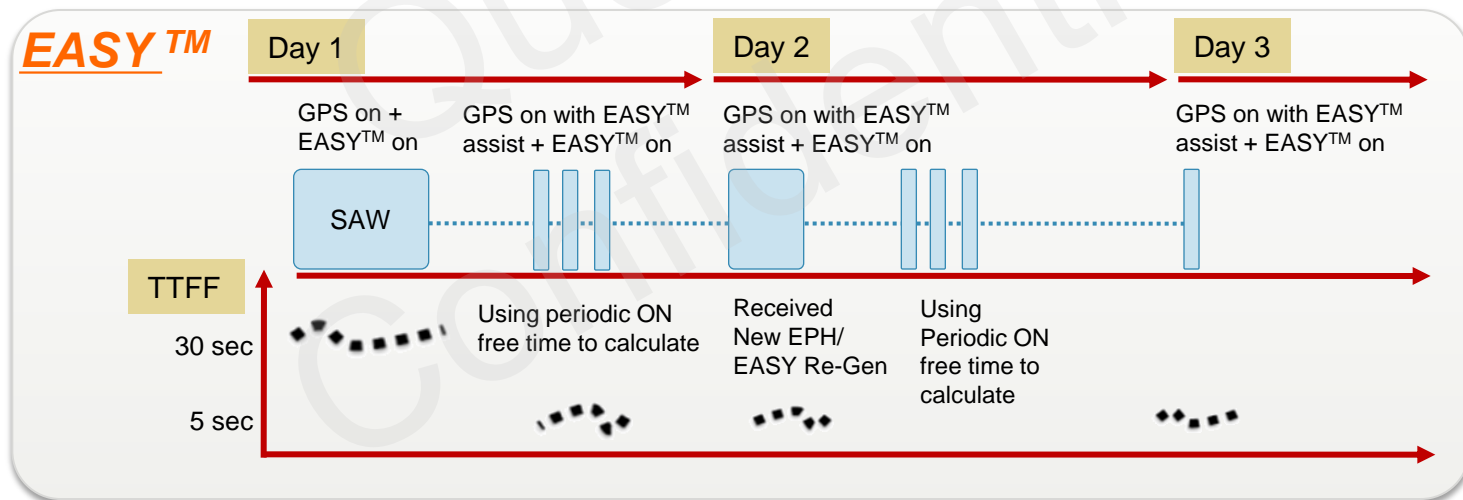
Average Current Consumption in GLP and Normal Modes

Scenario	In GLP Mode (mA)	In Normal Mode (mA)
Static	8.9	22
Walking	11.2	22
Running	11.5	22
Driving	21.5	22

- Periodic standby mode can control the power on/off time of MC60's GNSS part periodically to reduce average power consumption.
- The on/off time can be configured by using PMTK command. For details, please see the figure on the right.



EASY™ is the abbreviation of Embedded Assist System for quick positioning. With EASY™ technology, MC60's GNSS engine can automatically calculate and predict orbits automatically using the ephemeris data (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 no enough information received from the satellites.

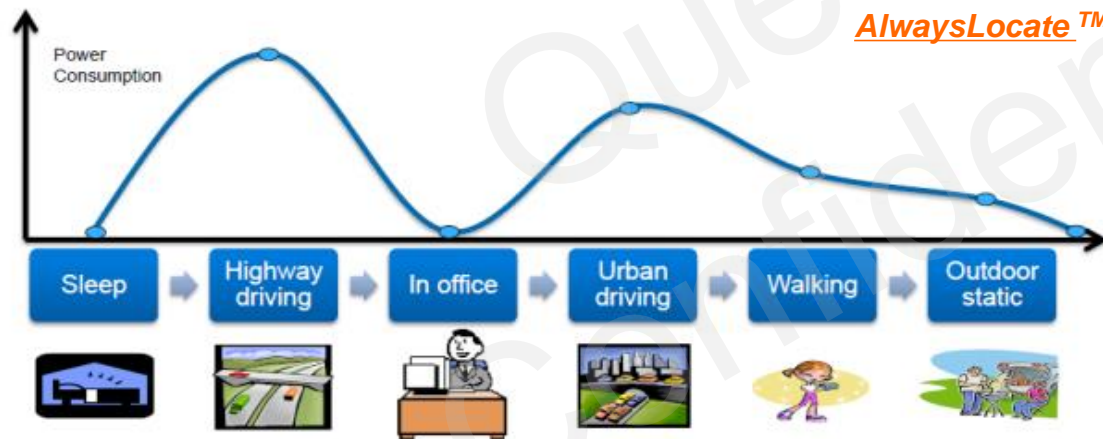




TTFF Comparison

Test Condition		TTFF without EASY™	TTFF with EASY™
Under GNSS signal generator, and conductive power level of -130dBm	Cold Start	<35s	<15s
	Warm Start	<30s	<5 s

AlwaysLocate™ is an intelligent controller of periodic mode.



MC60's GNSS part can adaptively adjust the on/off time to achieve balance between positioning accuracy and power consumption according to the environmental and motion conditions. So the average power consumption is lower in AlwaysLocate™ power saving mode than that in periodic power saving mode. The typical average power consumption is 2.8mA.

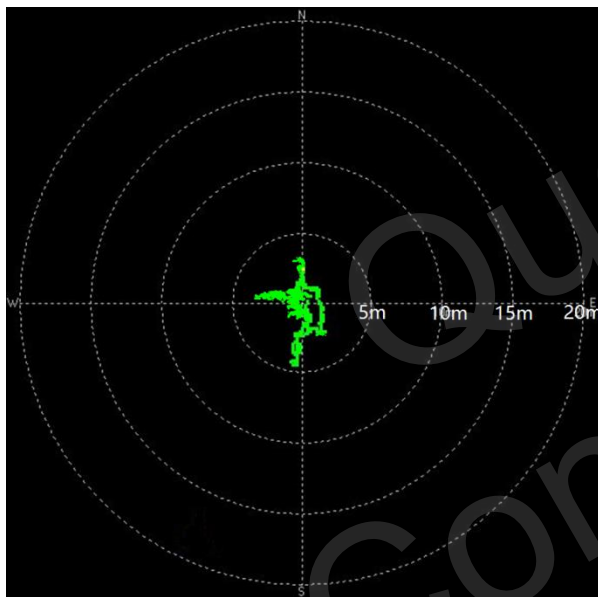
LOCUS is an embedded logger function of MC60's GNSS part. When enabled by PMTK command, it allows the module to log GNSS data (data format: UTC, Latitude, Longitude, Height) to internal flash memory automatically without the need of host CPU (MCU) or external flash.

Benefits:

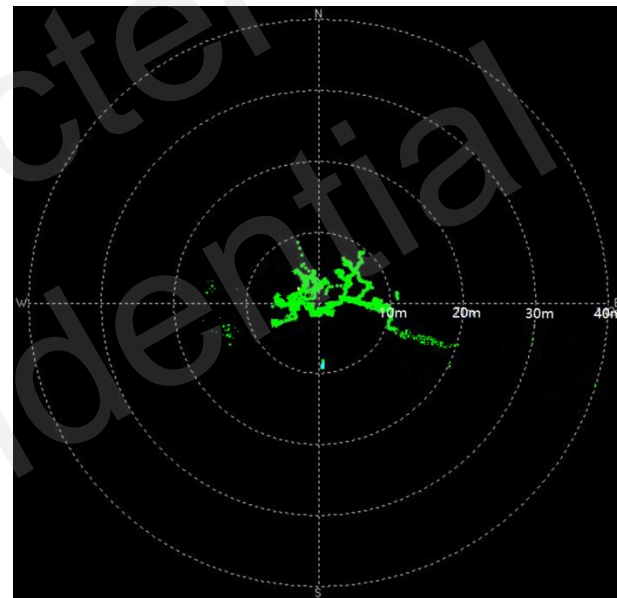
- Automatically log data to chipset internal flash, with the no need to wake up HOST
- Smart overlapping mechanism to keep the latest logger data (4KB base)
- **Logger capability in chipset internal flash:**
 - ✓ With 1 sector flash (64KB), user can log >16 hours
 - ✓ With AlwaysLocate™, user can log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



The following is a 12-hour testing result in static field.



GPS+GLONASS

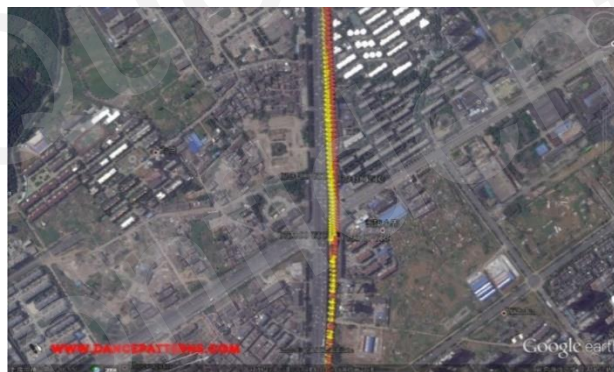


Only GPS

- Estimated Position Error:
Large error values can be filtered via **PQEPE** function.
- Static Speed Threshold:
Threshold setting can effectively suppress static drift .



Positioning - Dynamic Field Testing



U turning

Under Viaduct

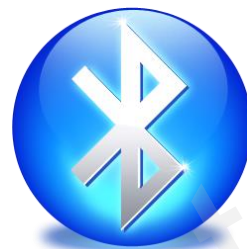
Turning



uCompany M8



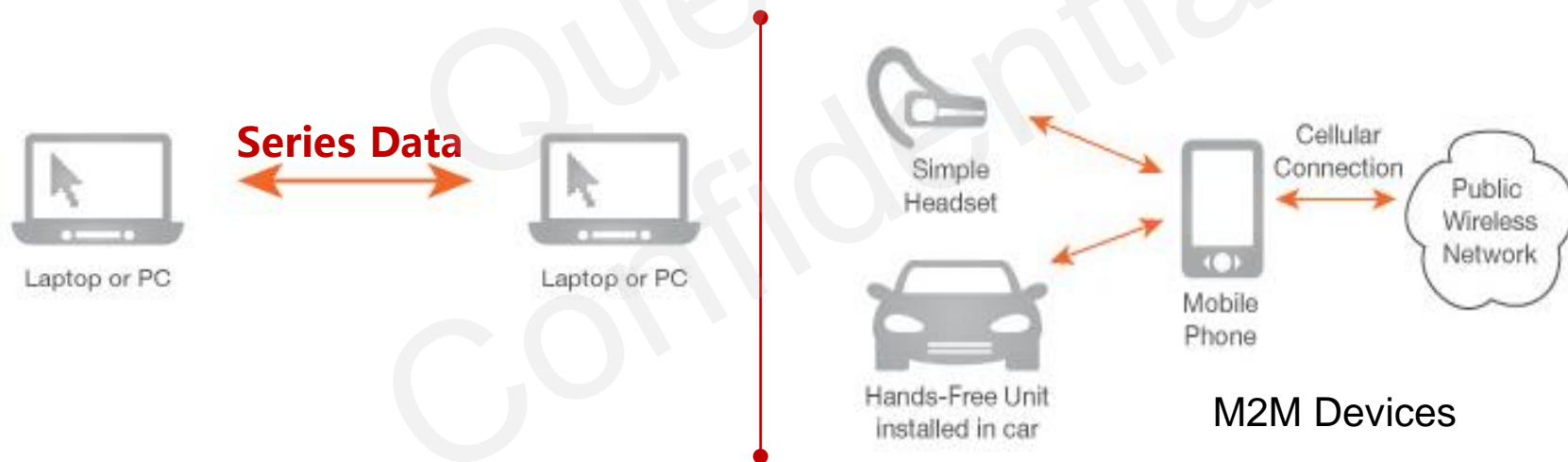
MC60



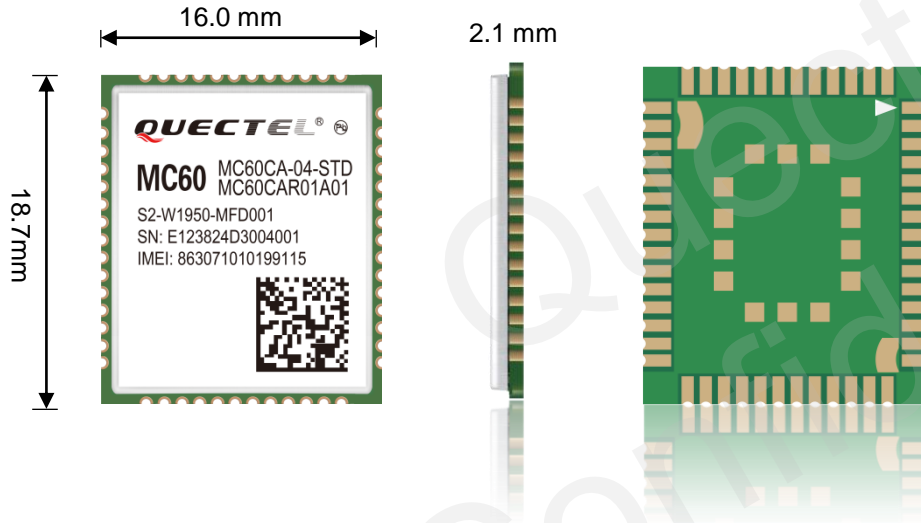
BT3.0

- Profile: SPP

- Profile: HFP-AG







Length: 18.7mm (± 0.15 mm)

Width: 16.0mm (± 0.15 mm)

Height: 2.1mm (± 0.2 mm)

Weight: Approx. 1.3g

- Highly compact size
- Easier soldering process with LCC package

Vehicle Tracker



Wearable Devices (e.g. watch)

Personal Tracker (e.g. shoe tracker)



Pet Tracker



Evaluation Board

GSM-EVB Kit

- GSM EVB Board
- GSM Antenna
- Serial port cable
- RF cable for GSM Antenna connection



MC60-TE-A Kit

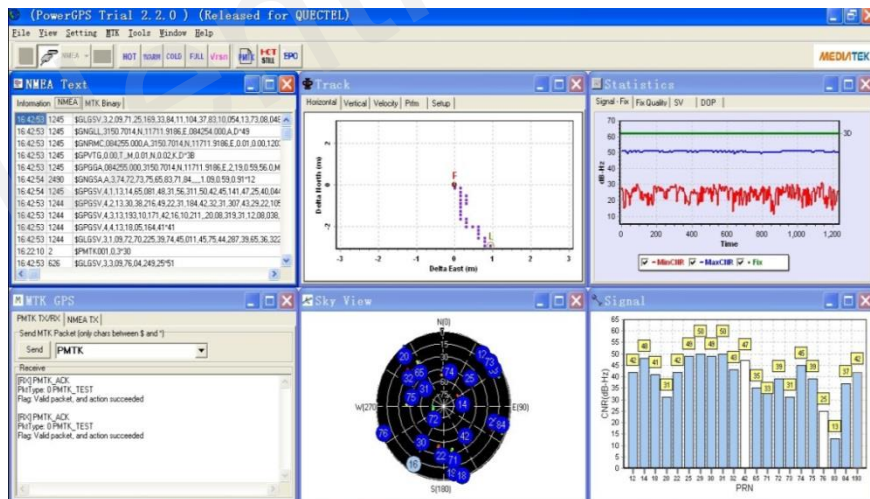
- MC60-TE-A
- GNSS Antenna
- RF cable for GNSS Antenna connection

Documents

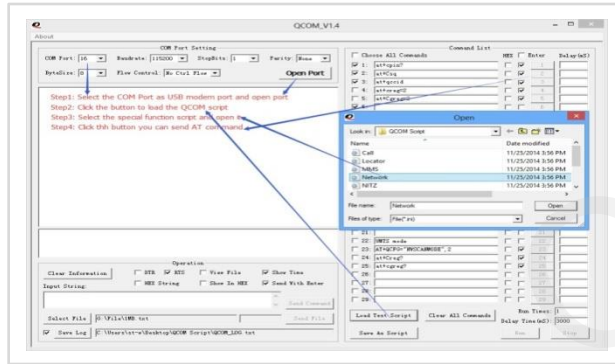
- [Specification](#)
- [Hardware Design](#)
- [MC60 AT Commands](#)
- [MC60 GNSS AT Commands](#)
- [Footprint&Part in PADS and Protel Formats](#)
- [GSM EVB/MC60-TE-A User Guide](#)
- [GNSS AGPS Application Note](#)
- [GNSS Protocol Specification](#)
- [Reference Design](#)

PC tool

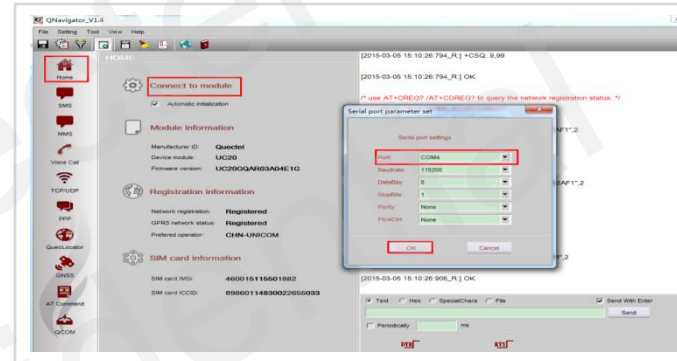
- [PowerGPS - GPS/GLONASS testing tool](#)



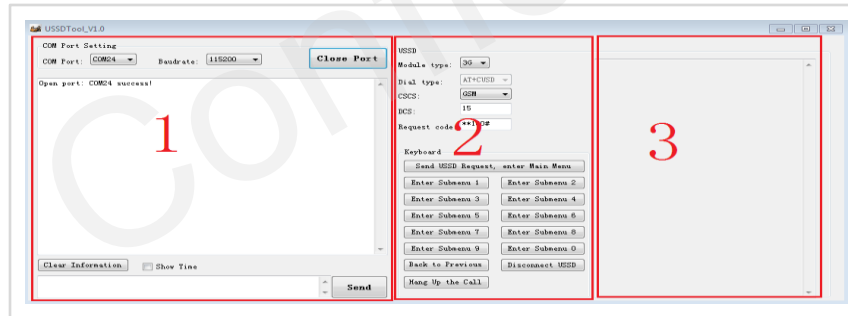
PC tool: QCOM/Qnavigator/USSDTool - GSM Test Tool



QCOM



Qnavigator



USSDTool

IoT

LTE



GNSS

3G



2G

Thank you!

Aug., 2016

www.quectel.com

Office # 501, Building 13, No. 99 Tianzhou Road, Shanghai, China 200233
Tel: +86-21-5108 6236 Fax: +86-21-5445 3668 Email: info@quectel.com