MC60 GSM/GPRS+GNSS

Combo Module Presentation

Aug., 2016

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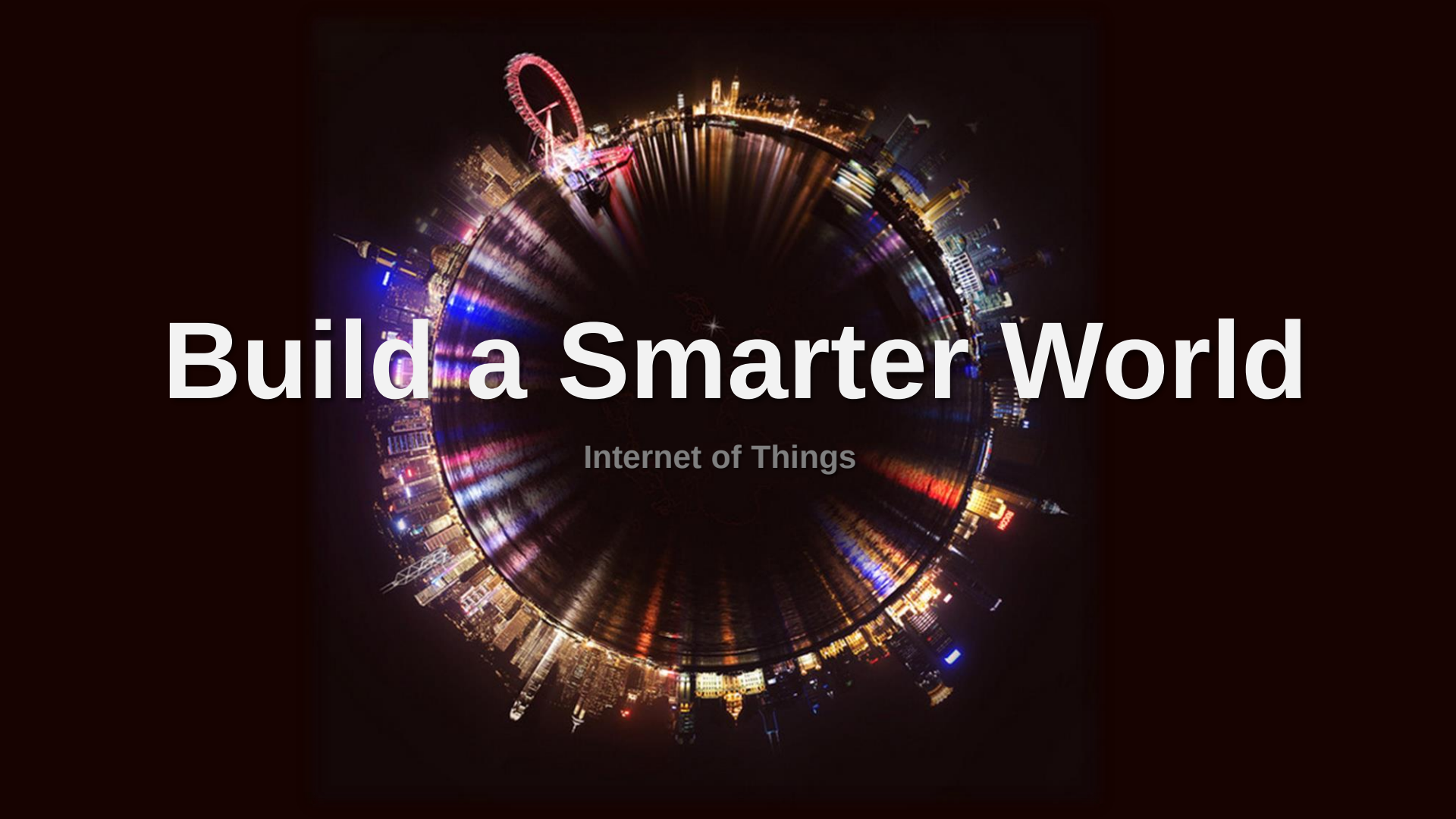
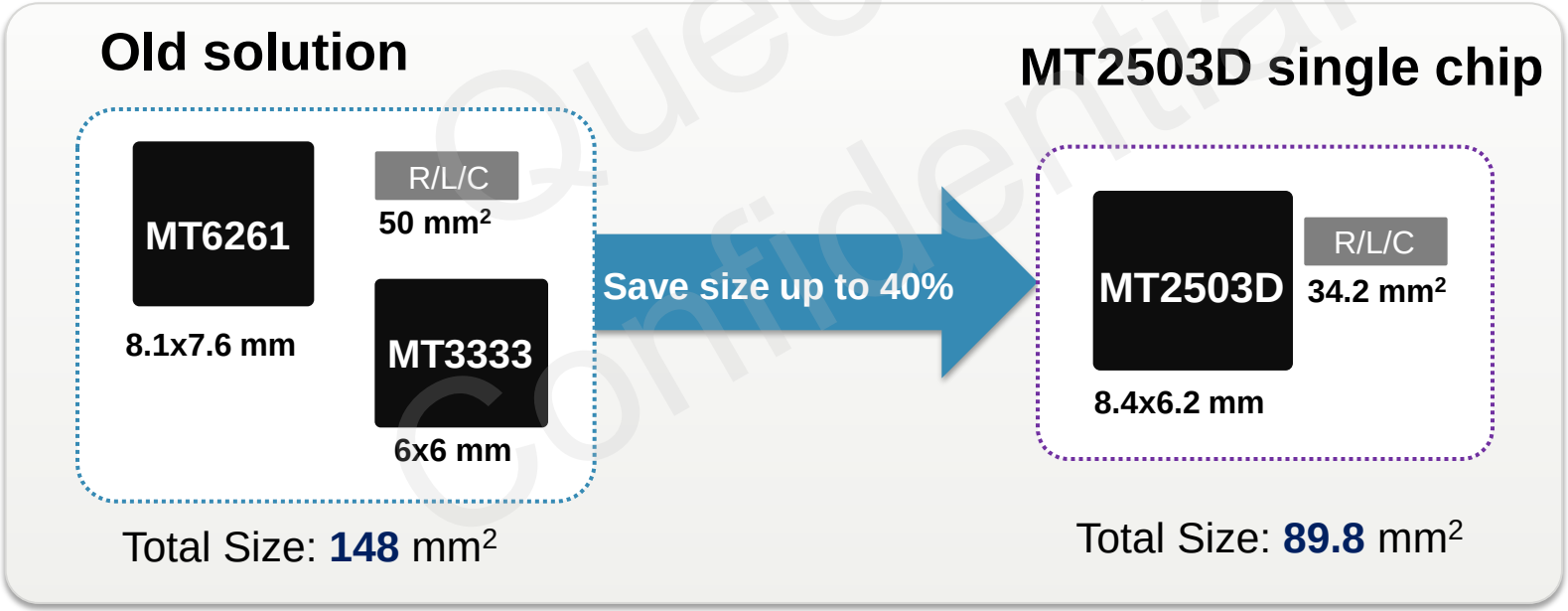
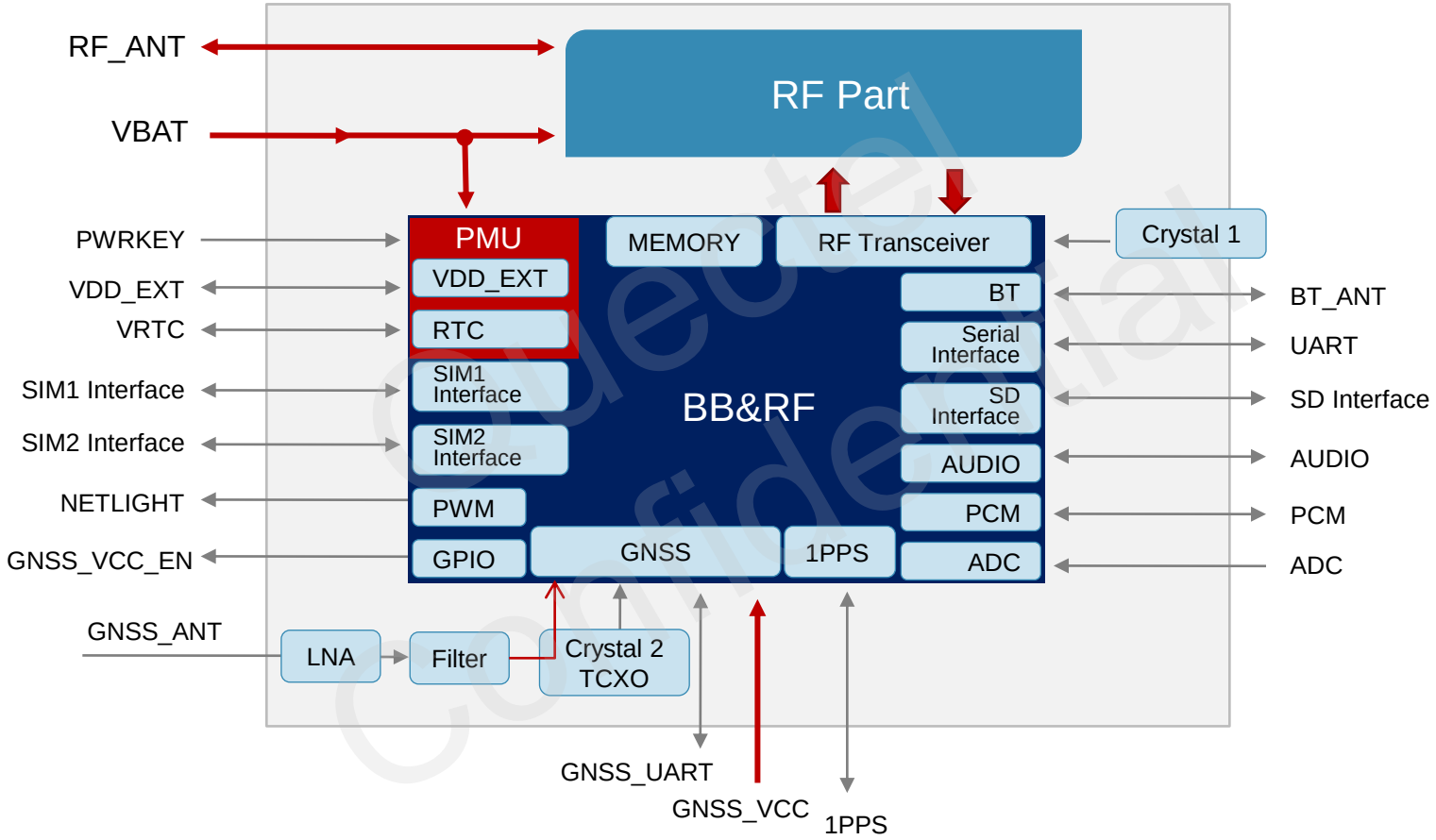

Build a Smarter World
Internet of Things

Introduction

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.



Block Diagram



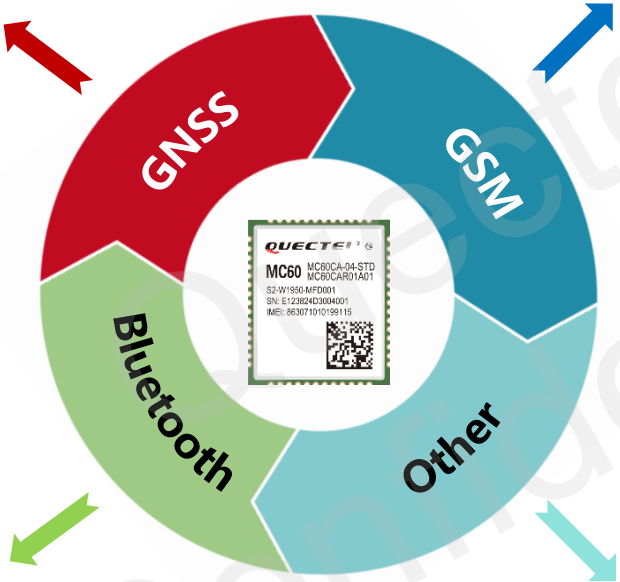
Advanced Features

GNSS Features

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

Bluetooth

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



* Under Development

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

Specifications

GPS L1 Band Receiver (1575.42MHz) **GLONASS L1 Band Receiver (1601.71MHz)**	Channel	33 tracking channels 99 acquisition channels 210 PRN channels
	C/A code	
	SBAS	WAAS, EGNOS MSAS, GAGAN
Horizontal Position Accuracy	Autonomous	<2.5m CEP
Velocity Accuracy	Without Aid	<0.1m/s
Acceleration Accuracy	Without Aid	0.1m/s²
Timing Accuracy	1PPS	10ns
TTFF@-130dBm with QuecFastFix Online	Cold Start	<4.5s
TTFF@-130dBm with EASY™	Cold Start	<15s
	Warm Start	<5s
	Hot Start	<1s
TTFF@-130dBm without EASY™	Cold Start	<35s
	Warm Start	<30s
	Hot Start	<1s
Sensitivity	Acquisition	-149dBm
	Tracking	-167dBm
	Re-acquisition	-161dBm

Quad-band	850/900/1800/1900MHz
GPRS Multi-slot Class	Class 12
GPRS Mobile Station	Class B
Compliant to GSM Phase 2/2+	Class 4 (2W @850/900MHz) Class 1 (1W @1800/1900MHz)
Supply Voltage Range	3.3~4.6V 4.0V Typ.
Low Power Consumption	1.2mA @DRX=5
Operation Temperature	-40°C ~ +85°C
Dimensions	18.7 × 16.0× 2.1mm
Weight	Approx. 1.3g
Control via AT Commands	GSM 07.07, 07.05 and other enhanced AT commands
Speech Codec Modes	Half Rate (HR) Full Rate (FR) Enhanced Full Rate (EFR) Adaptive Multi-Rate (AMR)
Echo Arithmetic	Echo Cancellation Echo Suppression Noise Reduction
Bluetooth	BT 3.0 Profiles: SPP, HFP-AG
SIM/USIM	3V/1.8V
UART	×3

Enhanced AT Commands

- Standard V.25ter AT commands
- GSM 07.07
- GSM 07.05 (SMS)
- GPRS AT commands in accordance with GSM 07.07
- TCP/IP stack AT commands
- STK (SIM Application Toolkit)
- Quectel defined AT commands (Enhanced Functions)

PQ Commands Based on SDK

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

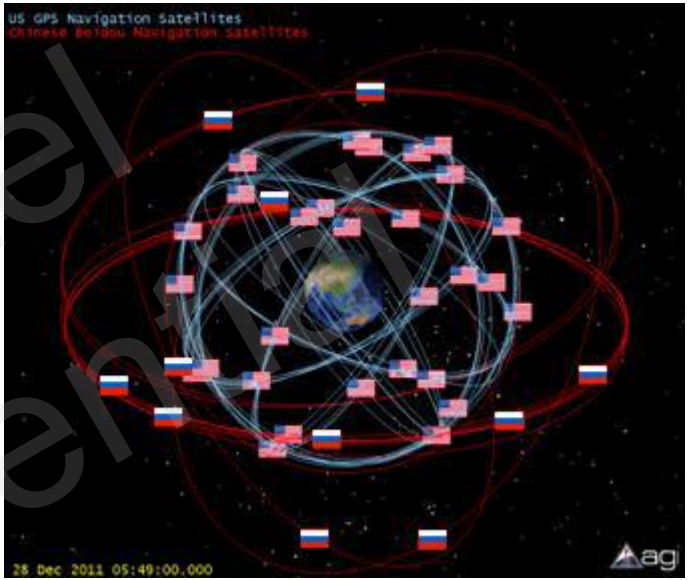
* Under Development

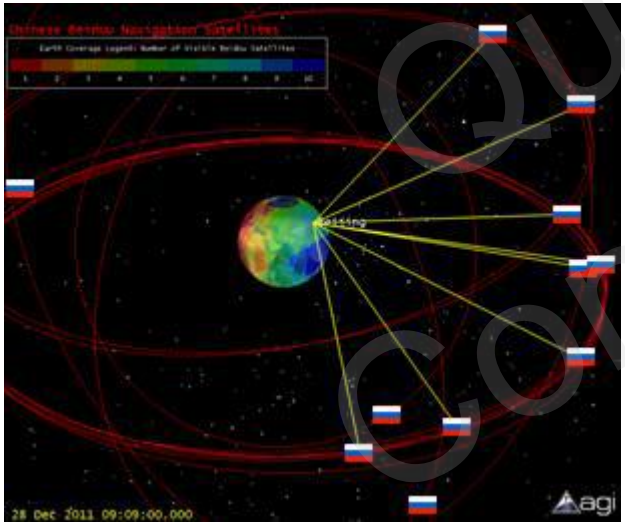
Positioning - Multi-Constellation GNSS

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.

Positioning - Build-in LNA

Common modules

- Expensive active antenna
- Increased external circuits

MC60

LNA

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

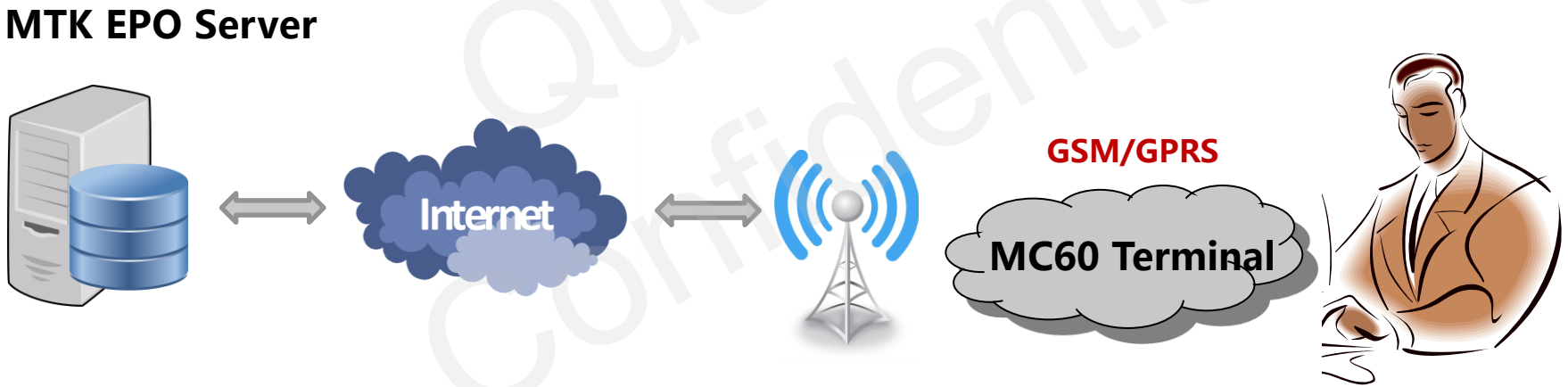
Positioning - EPO (1)

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.



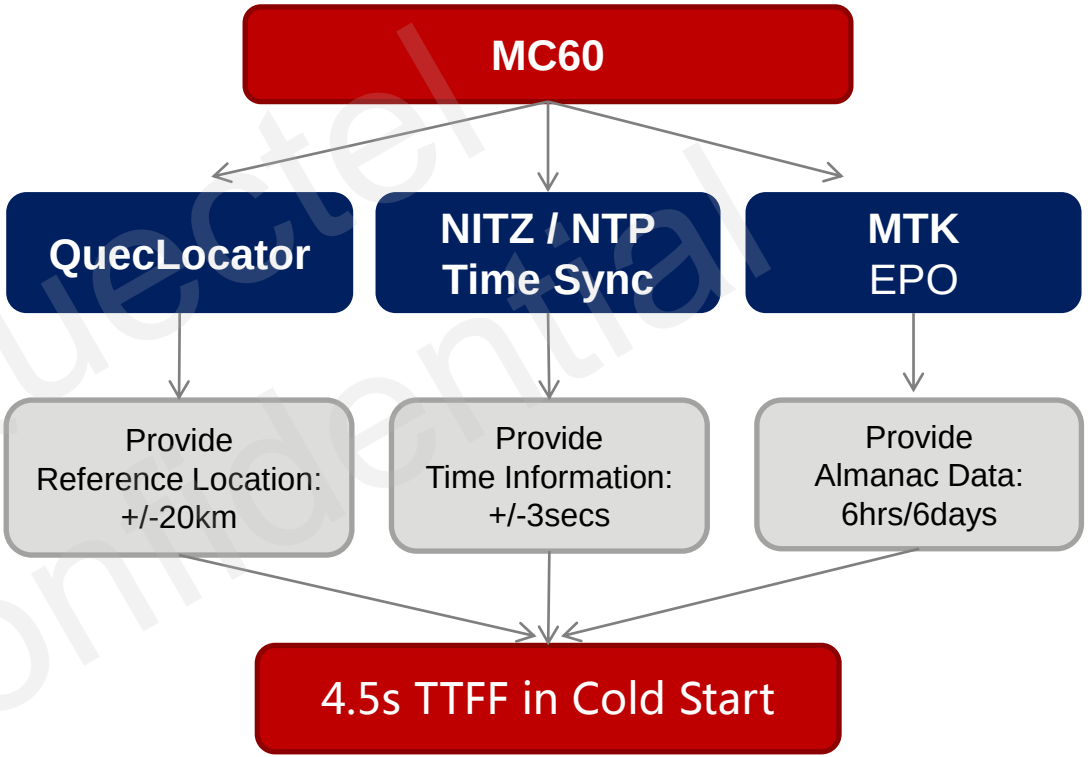
Positioning - EPO (2)

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

Positioning – QuecFastFix Online

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.



Positioning - GLP (1)

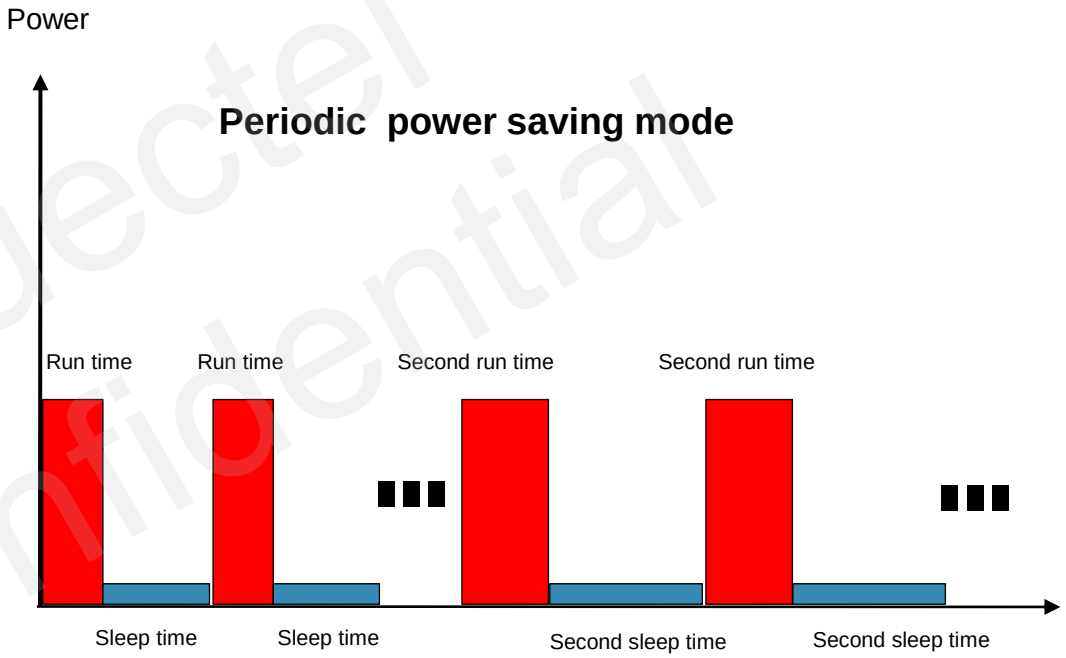
- In acquisition or tracking condition, GLP (GNSS Low Power) is the best power-saving mode.
- In GLP mode, MC60 module still outputs NMEA data at 1Hz data update rate.
- The module will automatically exit from GLP mode when positioning conditions are not satisfied.

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

Positioning - Periodic Mode

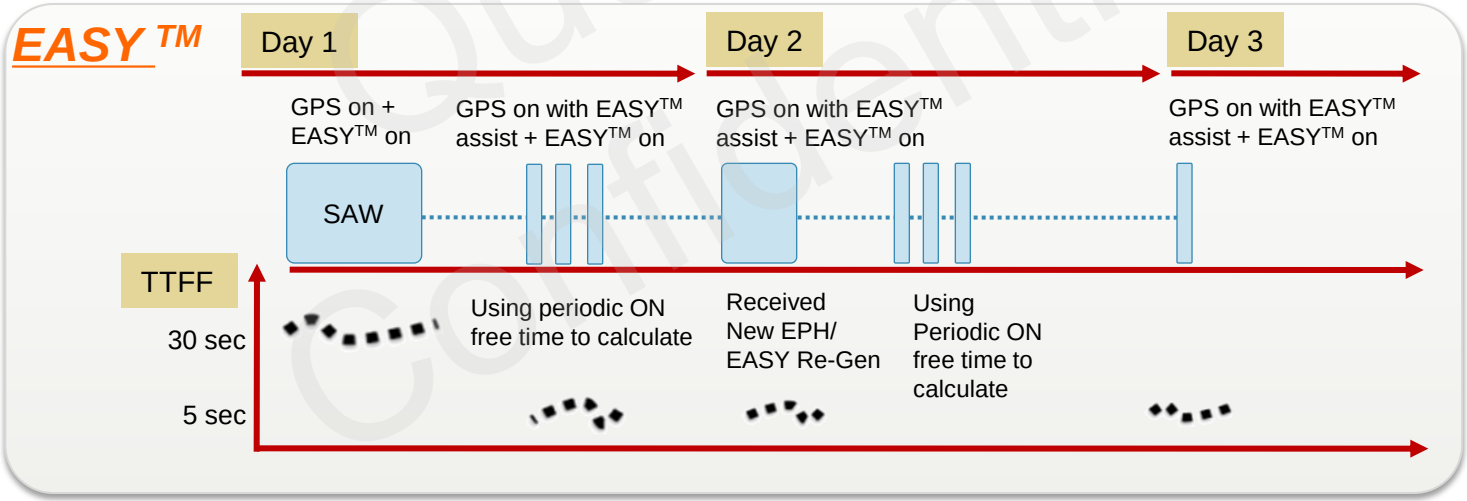
- Periodic standby mode can control the power on/off time of MC60's GNSS part periodically to reduce average power consumption.
- The on/off time can be configured by using PMTK command. For details, please see the figure on the right.



Positioning - EASY™ Technology (1)

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.

This function is helpful for positioning and TTFF improvement under indoor or urban conditions.

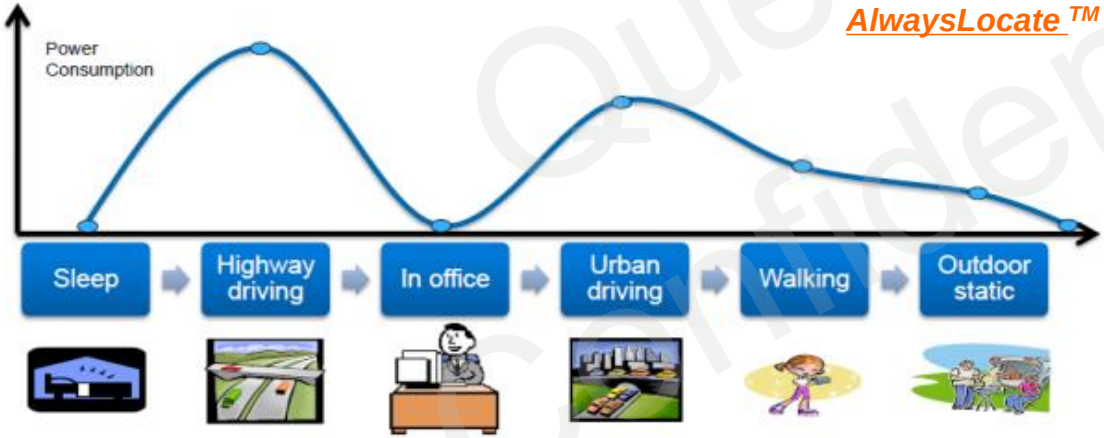


Positioning - EASY™ Technology (2)

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.

Positioning - LOCUS™ Technology

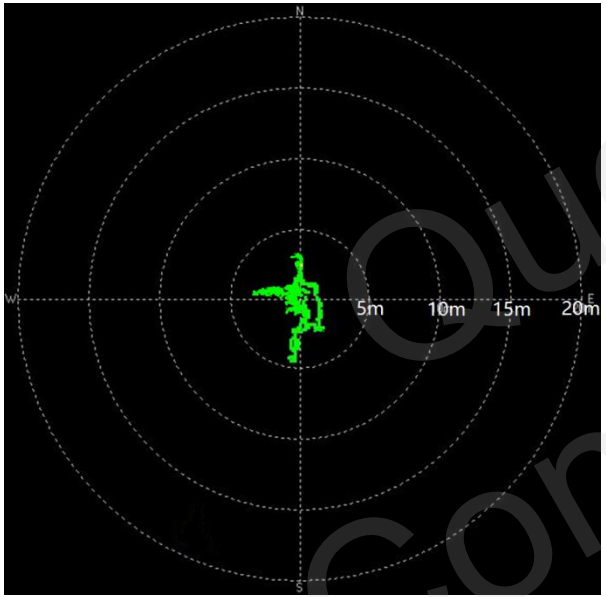
LOCUS is an embedded logger function of MC60's GNSS part. When enabled by PMTK command, it allows the module to log GNSS data (data format: UTC, Latitude, Longitude, Height) to internal flash memory automatically without the need of host CPU (MCU) or external flash.

Benefits:

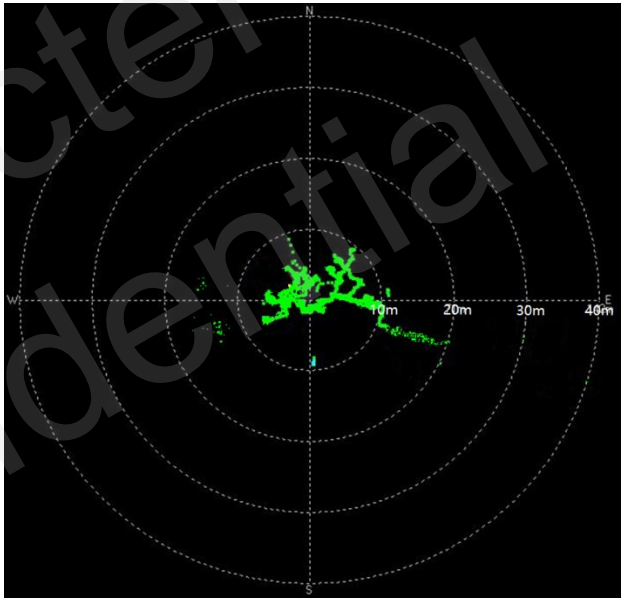
- Automatically log data to chipset internal flash, with the no need to wake up HOST
- Smart overlapping mechanism to keep the latest logger data (4KB base)
- **Logger capability in chipset internal flash:**
  - ✓ With 1 sector flash (64KB), user can log >16 hours
  - ✓ With AlwaysLocate™, user can log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

Positioning – Static Filed Test

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



GPS+GLONASS



Only GPS

Positioning - Estimated Position Error

- 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

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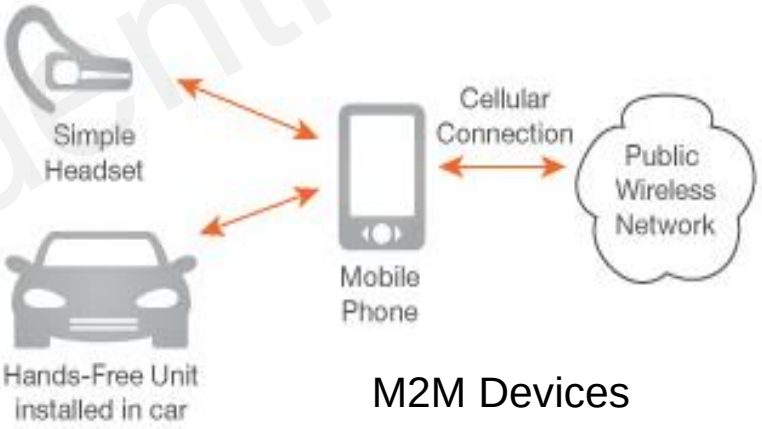
MC60

Bluetooth Function – Bluetooth Profiles

BT3.0

- Profile: SPP

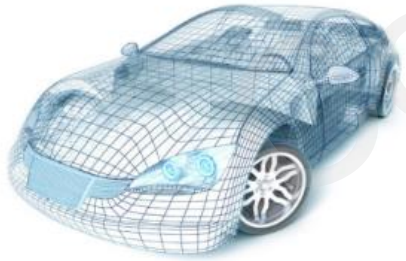
- Profile: HFP-AG



M2M Devices

Bluetooth Application

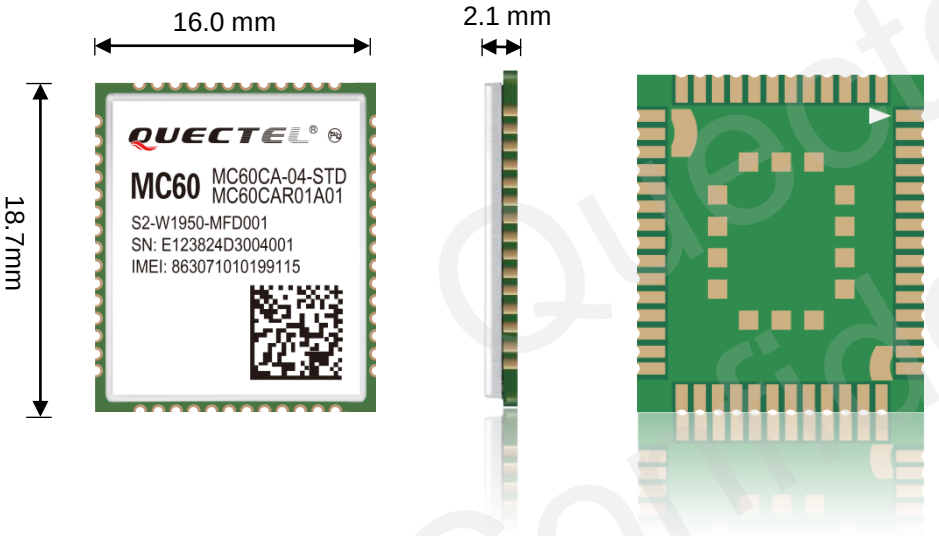
GSM/GPRS



TPM

Application on vehicles

Mechanical Dimensions



Length: 18.7mm (±0.15mm)

Width: 16.0mm (±0.15mm)

Height: 2.1mm (±0.2mm)

Weight: Approx. 1.3g

- Highly compact size
- Easier soldering process with LCC package

Target Applications

Vehicle Tracker

Wearable Devices
(e.g. watch)

Personal Tracker
(e.g. shoe tracker)

Pet Tracker

Support Package (1)

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*

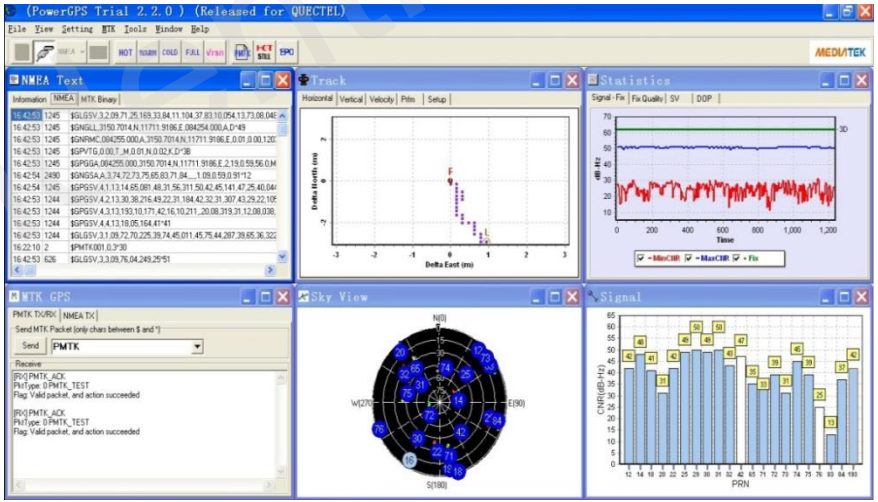
Support Package (2)

Documents

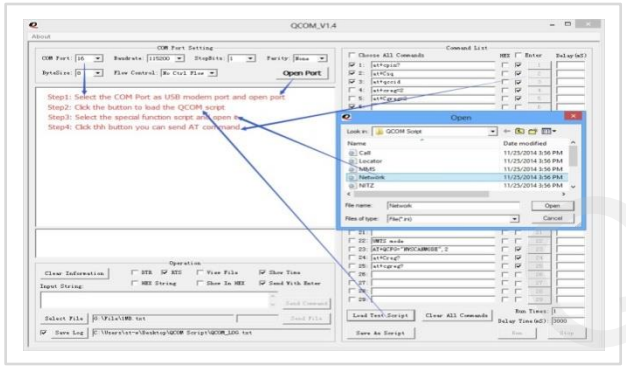
- *Specification*
- *Hardware Design*
- *MC60_AT Commands*
- *MC60_GNSS_AT_Commands*
- *Footprint&Part in PADS and Protel Formats*
- *GSM EVB/MC60-TE-A User Guide*
- *Reference Design*

PC tool

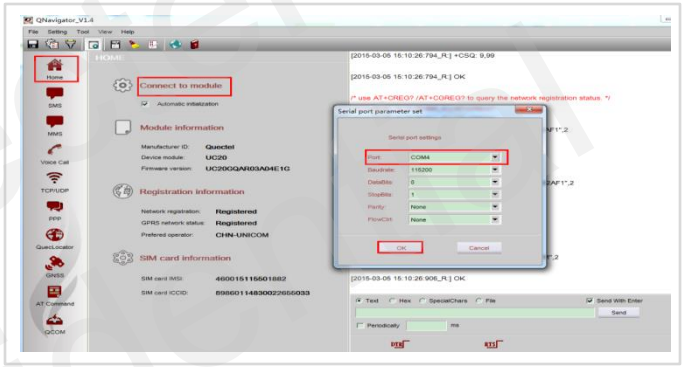
- *PowerGPS - GPS/GLONASS testing tool*



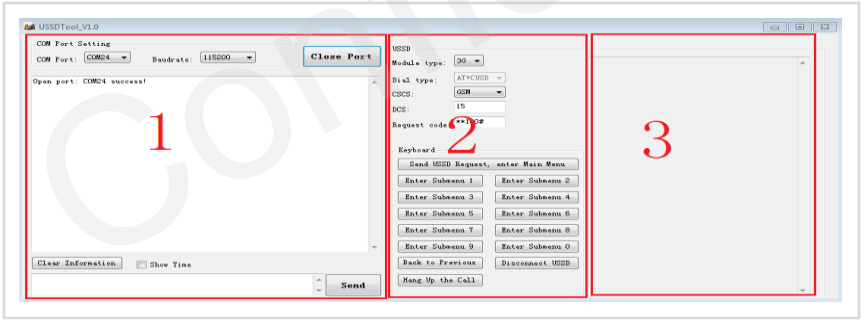
PC tool: QCOM/Qnavigator/USSDTool - GSM Test Tool



QCOM



Qnavigator



USSDTool

Thank you!

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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