Introduction
EPSON GPS History

History

◆ 1996: Developed world wide No1 low power GPS.
◆ 1998: Launched “Locatio” the PDA with GPS.
     Started “i-Point”, Location based web service with DG
◆ 2000: Provided A-GPS assistance server for NTT docomo 2G
◆ 2003: Launched the handy GPS equipment for children & elderly
◆ 2006: Providing GPS module for ALL NTT docomo phones on 3G.
◆ 2010: Launch XPOSYS (July) : World wide No1 sensitivity CMOS 1chip GSP solution with Infineon.
◆ 2011: Launch Ultra GPS module (Z36)
◆ 2012: Launch SEIKO ASTRON (GPS Watch)
     Launch Wrist Run (GPS Logger)
◆ 2013: Provide GPS Module for QZSS
## GPS product Roadmap

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S31X, S32X-ND</strong></td>
<td>X33IP</td>
<td>X34IP</td>
<td>X34&quot;IP</td>
<td>Z36 Engine</td>
<td>XIP Ultra High Sensitivity</td>
<td>QZSS GPS</td>
</tr>
<tr>
<td></td>
<td>• Module include RF</td>
<td>• Module include RF</td>
<td>• Module include RF</td>
<td>• -160 dBm sensitivity</td>
<td>• -160 dBm sensitivity</td>
<td>??????</td>
</tr>
<tr>
<td></td>
<td>• Host based architecture</td>
<td>• Host based architecture</td>
<td>• Host based architecture</td>
<td>• A-GPS</td>
<td>• A-GPS</td>
<td>Ultra High Sensitivity</td>
</tr>
<tr>
<td></td>
<td>• A-GPS</td>
<td>• A-GPS</td>
<td>• Improved performance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>S32X-ND2 Low Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td>Z36 GPS+CPU</td>
<td>XPOSYS 1chip</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Module include RF</td>
<td>• Module include RF</td>
<td>• Module include RF</td>
<td>• GPS+CPU: 1module Solution</td>
<td>• 1Chip with RF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Host based architecture</td>
<td>• Host based architecture</td>
<td>• Host based architecture</td>
<td>• Ultra Low power consumption</td>
<td>• Low power consumption</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A-GPS</td>
<td>• A-GPS</td>
<td>• A-GPS</td>
<td>• A-GPS</td>
<td>• Host based architecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 7 × 6 × 1.28 mm</td>
<td>• 7 × 6 × 1.28 mm</td>
<td>• Improved performance</td>
<td>• 2.8 × 2.9 × 0.6 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specifications**

- **S33IP**
  - -160 dBm sensitivity
  - A-GPS
  - Improved performance

- **S32X-ND2**
  - Low Cost
  - Module include RF
  - Host based architecture
  - A-GPS
  - 7 × 6 × 1.28 mm

- **X33IP**
  - Module include RF
  - Host based architecture
  - A-GPS
  - 7 × 6 × 1.28 mm

- **X34IP**
  - -160 dBm sensitivity
  - A-GPS
  - Improved performance

- **X34”IP**
  - -160 dBm sensitivity
  - A-GPS
  - Improved performance

- **Z36 Engine**
  - -160 dBm sensitivity
  - Ultra Low Power
  - Improved Accuracy

- **XIP Ultra High Sensitivity**
  - -166 dBm sensitivity
  - Low Power Functions
  - New RF architecture
  - A-GPS

- **XPOSYS 1chip**
  - 1Chip with RF
  - Low power consumption
  - Host based architecture
  - A-GPS
  - 2.8 × 2.9 × 0.6 mm

- **Z36 GPS+CPU**
  - GPS+CPU: 1module Solution
  - Ultra Low power consumption
  - A-GPS+ Autonomous
  - 6.6 × 5.3 × 1.0 mm
Ultra high sensitivity 1Chip-GPS (XPOSYS)

Feature

- CMOS 1Chip GPS
  - World Wide leading technology: RF-CMOS technology by Infineon Technologies (German)
- 65nm Process Size
  - RF 1chip (Reduce Analog design work)
- High Cost Performance: Low Chip Cost & High GPS Performance
  - World wide No.1 performance & the minutest process & low cost 1 Chip GPS module

Specifications / Functions

- High Sensitivity: -165dBm
  - The highest sensitivity
  - Improve GPS performance at middle level GPS signal strength area (-135dBm - -155dBm)
- Small Package: 2.8mm × 2.9mm × 0.6mm
  - WCSP
  - 0.4mm Pitch
- Low Power Tracking Mode equipped
  - Tracking Mode⇒Low Power Tracking: Power consumption reduce
- Energy saved by profile
  - Set power mode by profile --- Change High sensitivity or Energy saving
- Small Board Space
  - Decrease the number of the peripherals ---- Reduce the space & cost (< 30mm2)
- Variable Clock: 10～52MHz
- Host Based Arctecture
- Uni power supply / Low Voltage supply
  - 1.8V Uni power (Include RF)
  - Power supply / Low Voltage supply
Low Power Z36 Module

- Concept
  - High sensitivity GPS with Ultra low power
    (The world wide No.1 lowest power consumption)

- Feature
  - Tracking power consumption: 20mW (50% lower than others)
    - Sensitivity (Hot start): -160dBm
      (Cold start): -146dBm
    - Accuracy: <5m (Outdoor)
    - Standard NMEA output (UART)
    - SPI (Light protocol use)
    - Working interval: Available to set
    - Data for performance analyze: Available to output
GPS Watch (ASTRON)

The world first GPS watch by SEIKO
(Launched September 2012)

Available 39 time zones all over the World
Receive time signal in the vehicle or walking
Available on summer time zone
Provide flight mode (GPS receive off mode)
100% Solar Power Watch (Low power GPS use)

GPS Signal Receive ⇒ Accurate time
Position (Recognize time zone)

Low power GPS module

GPS ring antenna
Wristable GPS (EPSON)

GPS watch for athlete-Use low power GPS

Get Position by GPS & Sensor

- Open Sky ---- GPS
- Urban canyon ---- Sensor (Stride sensor)
- Thin antenna built in
- Recognize the pulse
- Calculate the calorie consumption
- Connection with Smart phone application
History of Location Business
1999: EPSON launched GPS mobile Phone “Locatio”

1998年: Pre-Marketing model for ANA (Provided at Hanada Airport)
1999年: Launched consumer model
2000年: Lower price model launched
Locatio Application

- Get the position by GPS or PHS
- Mapping
- Take pictures by DSC
- Get information by Multi media mail
- Send own position & pictures by Multi media mail
- Connect with PC
- Privacy management
- Internet access
EPSON provided the network service for position information named 「I-Point」.

**Contents service with position parameter**

- Point to Point Navi
- Contents search
- Yellow page with the position

**Accurate position data**

- Differential GPS service
- Position by PHS

**Multi media communication include position data**

- Message board on the map
- MM mail

**Personal data service**

**Communication service**

- ISP service

**Contents**

- Multi media mail (MM mail)

**GPS**

- Mail

**i-Point network**
i-Point network structure

- Position Data (DGPS・PHS)
- MM mail・User grouping
- Digital Map・Digital contents
- Member management・Charge
- Internet Access Point

Connect with various equipments
Docomo Location Platform (DLP)

NTT docomo started to provide position data platform service in 2001
「DLP」(DoCoMo Location Platform)

DLP
Common platform service by NTT docomo
Define position data management and protocol
Free carriers service for GPS equipment
History of GPS cellular phone

NTTドコモ（PDC, W-CDMA）
- F661: Launched 2002, PDC method
  The first GPS cellular phone by docomo
  GPS: Qualcomm (-148dbm)
- F505iGPS: Launched 2003, PDC method
  GPS: Qualcomm (-148dbm)

WCDMA service was from 2005

au（CDMA-1x CDMA-2000）
- 2001: The first GPS cellular phone was launched
  GPS: Qualcomm (-148dbm)

Approx.10M
Application service for GPS cellular phone

**Security service**
- Location search of infant child & old people by cellular phone
- Emergency mail service with position

**Family search**
- Easy to get the location among family (Not related security company)
- Easy to get the position of own vehicle
- Mail service which can sent own position

**Emergency service at climbing & sailing**
- SOS call with position at mountain & the sea

**Security service**
- Security officer go to in case of emergency
navigation service by Navitime Japan

\[
\{ \text{NTT DoCoMo} \\ \text{au (KDDI)} \}
\]

Navitime Japan provided Navigation service both docomo and au

Function

Map search
Search the contents by position Address Telephone number and landmark

Navigation Service
Route information by Train Vehicle and walking

Train information & Time table
Train connection information based on time table

Around contents search
Spot information around the position

Map mail
Send map URL by mail
EPSON business performance

EPSON GPS share: Approx. 100% for docomo GPS cellular phones
EPSON shipped Approx. 43M GPS for domestic GPS cellular phones
(GPS module & GPS-IP)
Auto GPS service

**NTT docomo started new GPS application service from 2009**

- GPS cellular phone get the position in every 5 minutes automatically and that position is sent to the application server.
- The application server sends various information based on the position according to the cellular phone owner preference.
  - Point weather forecast, Good restaurants, Time table of transportation, Navigation, Map information etc.

Many subscribers are interested in GPS function in cellular phone

⇒ The volume of GPS cellular phone increases

Low power GPS is important for Auto GPS service

The seamless positioning is important mixed with sensor solution
Smart Phone in GPS

The evolution for GPS

People up own position to the Application board without any hesitation

Smart phone GPS has to improve for power consumption and sensitivity
Future
GPS Market Potential

GPS, Galileo, Glonass, QZSS, Compass start to service (Multi GNSS)

⇒ Easy to get accurate position include floor information in everywhere

⇒ Fast TTFF (Saved power)

Low power consumption GPS module are provided

⇒ Easy to build in small equipment with small battery

M2M market has big potential for GPS

Mobile Network, Wi-Fi

Improve mobile fee

Automotive

Train

Electric equipment

Medical equipment

Mail, Parcel
EU & Japan should cooperate to build common location platform (GIS platform) to accelerate location business.

All position data saved on the same GIS.
Vertical consolidation of various field position information.
Common protocol and API should be defined.
(Compliance with 3GPP, ETSI, M2M-Consolidation)
Mobile careers and network (Wi-Fi) free.