

GPS 수신기 모듈 (제품번호: AD-GPS V2.0) 메뉴얼

2013 년 5 월 5 일
(주)뉴티씨(NEWTC)



GPS 수신기 모듈(안테나 내장형) AD-GPS V2.0

이 문서에 포함된 모든 내용은 비밀사항이며, 주식회사 뉴티씨에
소유권이 있습니다. 이 자료를 수령하는 것은 그 이후로, 여기 포함된
자료와 정보가 비밀사항이며, 문서화된 뉴티씨의 허가문서 없이는 부분
또는 전체를 재생산할 수 없습니다.

Revision History

제품버전	출시일	판매회사	제조국
1.0	2012.02.12.	(주)뉴티씨(NEWTC)	Made in China
2.0	2013.05.03	(주)뉴티씨(NEWTC)	Made in Korea

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1 제품소개

이 스펙은 제품 스펙, 신뢰성 및 포장을 포함하는 GPS 모듈에 관한 내용이다.

1.1 AD-GPS V2.0 에 관하여

고도로 집적된 디지털 수신기인 **theu-blox6-FW7.03** 단일칩셋을 사용합니다.

- NEWTC GPS 모듈은 고성능과 low-poweru-blox6-FW7.03performers 은 탑재된 GPS 수신 회로와 함께 최고 수준의 정확도와 매우 컴팩트 한 스마트 안테나 모듈을 제공하며, -162 dBm 의 추적 및 수신기가 50 개 이상을 추적합니다 (획득: 32ch 추적 18ch)
- 하이브리드 GPS, GALILEO 와 SBAS (WAAS, EGNOS, MSAS, GAGAN) 엔진 .
- 어떤 장소에서 신호 획득과 고정점 획득은 어디서도 기대할 수 없었던 실용적인 실시간 위치에 대한 탐색을 제공하며, 이는 많은 실내 환경들, 도시의 빌딩숲들, 밀집된 숲 등에서의 서비스를 포함합니다.
- 소프트웨어 인공지능을 결합한 하드웨어 능력은 모든 종류의 네비게이션 응용들 또는 제품들에서 쉽게 사용될 수 있도록 돕습니다.

1.2 사양

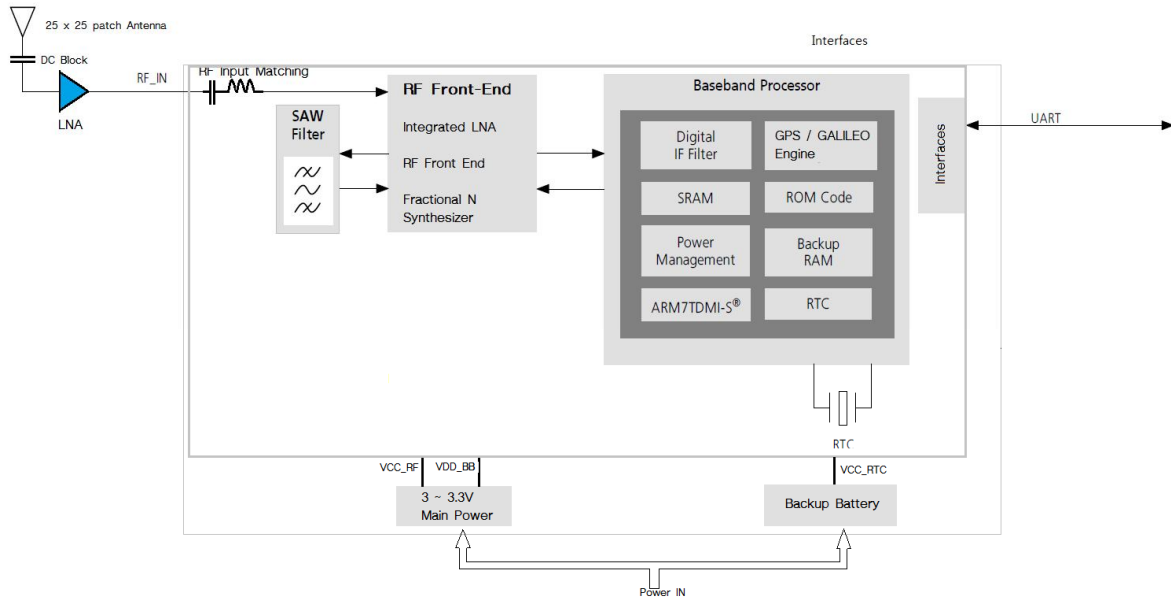
■ 높은 획득과 추적 감도

- 실내 고정점을 위한 높은 감도
- 낮은 전력 소모량
- 높은 RF 성능 : RF 이득 23dB, 잡음지수 1.1dB
- 위치기반 서비스들을 위한 실시간 탐색
- 낮은 신호 레벨들에서 매우 빠른 TTFF 들
- 빠른 시간의 첫 고정점 얻는 기능: TTFF (Fast Time-to-first-fix)
- RoHS Compliant (lead-free)

■ 높은 집적도의 소자

- Automatic pick and place assembly
- Fully automatic pick and place assembly.
- Reflow solderable
- Maximum flexibility
- Multiple I/O pin reserved and Extensively configurable
- EMI shielded for best performance in noisy environments.
- 2,000,000+ effective correlators for fast TTFF
- Supports 32-channel GPS receiver
- Ublox-6 IC with ARM7TDMI inside
- Delicate TCXO (± 0.5 ppm)
- Size & Volume 45X 45 X 13mm (GPS Smart Type)

1.3 블록 다이어그램



1.4 제품의 응용범위

- 자동차 응용관련
- GPS 및 다른 GPS 응용에 대한 정보단말
- 이동형 GPS 수신기 응용
- 해양과 자동차 네비게이션 응용
- 포켓 PC, PDA 그리고 다른 컴퓨팅 장치

2 제품의 스펙

2.1 전기적인 스펙

- 추천 입력 전압

Item	Symbol	Min	Typ	Max	Unit
전원 on	VCC	3	3.3	5	V

- RTC 블록을 위한 DC 동작 특성들 (백업 전압치)

Item	Symbol	Min	Typ	Max	Unit
RTC 공급전압	VBAT	2.0	3.3	5	V
공급 전류	VBAT		6		uA

- 절대 최대치

Parameter	Min	Max	Unit
전력 공급 전압 (VCC.VBAT)	-0.3	6	V
시리얼 포트 입력 전압	-0.3	6	V
GPIO 전압	-0.3	6	V

- Serial Port

NO	ITEM	SPEC
1	전기적 인터페이스 규격	시리얼 통신
2	보레이트	9600bps (기본설정)
3	프로토콜 메시지	NMEA-0183 그리고 UBX 프로토콜

2.2 안테나 스펙

Parameter	Maximum Value	Units
주파수	1575.42 ±1.023 MHz	MHz
편파특성	Right Hand Circular	
전력공급	3	V
이득	3	dB
NF	1.2	dB
출력 리턴로스	-15	dB

2.3 온도 요구사항

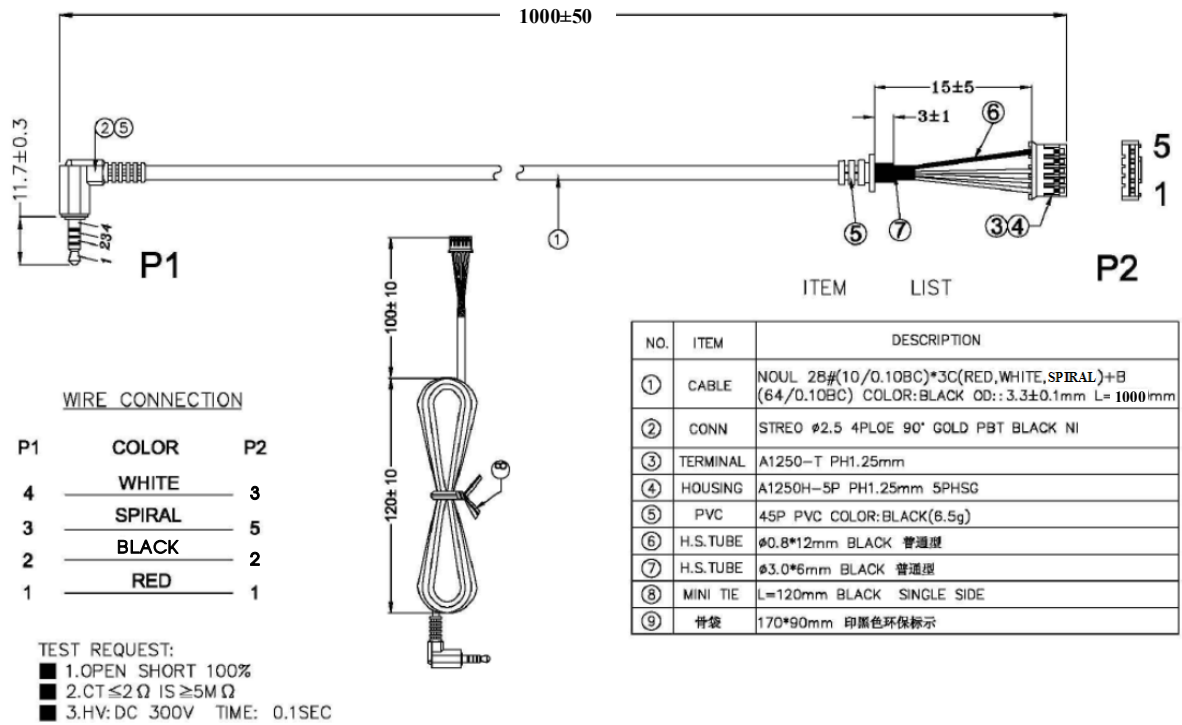
Items	Description
열 쇼크	-40℃ to +85℃
동작 온도	Low : -30℃ , High : +70℃
스토리지 온도	Low : -40℃ , High : +85℃

2.4 전력소모량

Characteristics	Symbol	Min	Typ	Man	Units
공급전류(추적)	Icc	16	38	42	mA
공급전류(획득)	Icc		48	49	mA

3 스테레오 2.5 파이 케이블 설명

그림 1 스테레오 2.5 파이케이블 설명



- 내부 선색 및 일부 스펙은 예고 없이 변경될 수 있습니다.

3.1 핀설명

P1	색	P2	신호
1	빨강	1	VCC
2	검정	2	TXDA
3	나사선	5	GND
4	하얀	3	RXDA

● RXDA

- 이 핀에서 호스트로부터 타겟 모듈로의 소프트웨어 명령들을 수신합니다.

● TXDA

- 이 핀에서 타겟모듈로부터 호스트까지 출력 네비게이션과 측정 데이터를 전송하기 위하여 사용됩니다.

● VCC

- GPS 주 전원인 3.0V~3.5V 가 모듈에 공급됩니다.

● GND

- 접지점

3.2 프로토콜

- AM-GPS V2.0 supports NMEA-0183 and UBX Binary Protocols.

3.2.1 NMEA-0183 (Ver 3.0)

- AM-GPS V2.0 does not provide information about the complete NMEA-0183 standard.Support below "Table 3-1 NMEA 0183 Output Protocol"
- Support below "Table 3-1 NMEA 0183 Output Protocol"
- Default BaudRate is 9600bps (4800, 9600, 19200, 38400, 57600 bps)

표 3-1 NMEA 0183 출력 메시지

Option	Description
GGA	Time, position and fix type data.
GLL	Latitude, Longitude, UTC time of position fix and status.
GSA	GPS receiver operating mode, satellite used in the position solution, and DOP values.
GSV	The number of GPS satellites in view satellite ID number, elevation, azimuth, and SNR values.
RMC	Time, date, position, course and speed data.
VTG	Course and speed information relative to the ground.

3.2.2 Ublox-6 UBX 프로토콜

- AM-GPS V2.0 is used to Debugging Mode. But not used in normally.

4 성능

4.1 일반

Frequency	1575.42 ±1.023 MHz
C/A code	1.023 MHz
Channel	50 Channel
Datum	WGS84
Correlators	2,000,000

4.2 TTFF

Conventional Mode : @ -135dBm (95%)

Hot	< 1 sec (average)
Warm	< 29 sec (average)
Cold	< 33 sec (average)

4.3 감도

Acquisition	-148dBm
Tracking	-162 dBm

4.4 정확도

Position	10 meters, 2D RMS
Velocity	0.1 meters/sec
Time	1 microsecond synchronized to GPS time

- Autonomous < 2.5M
- SBAS < 2.0M

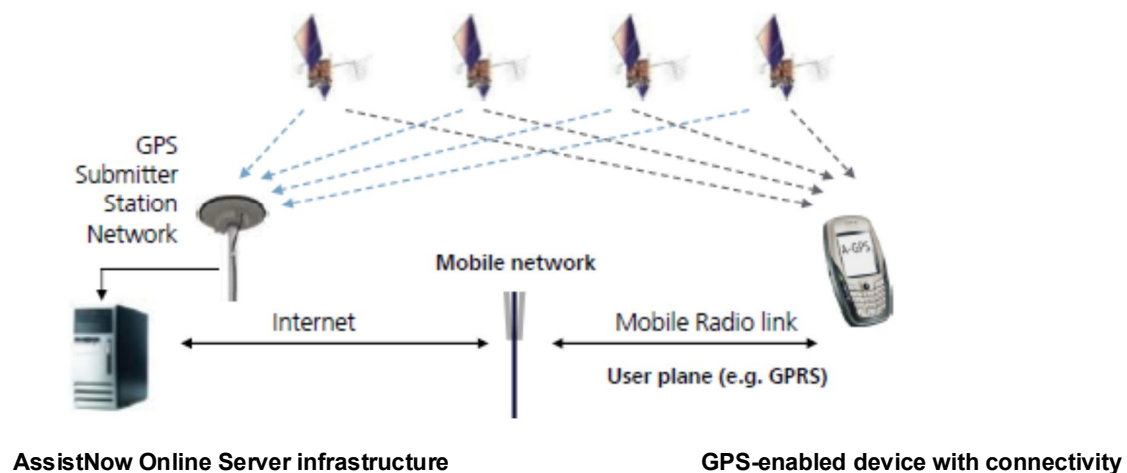
4.5 정확성을 도와주는 보조 GPS (A-GPS) 서비스

● AssistNow Online and Offline

	AssistNow Online	AssistNow Offline	AssistNow Autonomous
Data download	@ every startup	1x / 14 days	Never
Data retrieval at startup	from server	from local memory	Retrieved from local Memory
Data validity	2 -4 hrs	14 days offline	Up to 3 days
Size of downloaded data	1 -3 kB	10 kB for 1 day 90 kB for 14 days	None
Data type	Ephemeris, Time, Health, Almanac	Predicted Orbits	Automatically generated
Achievable TTFF	As low as 1 sec	As low as 5 sec	As low as 10seconds

● u-blox A-GPS AssistNow Online

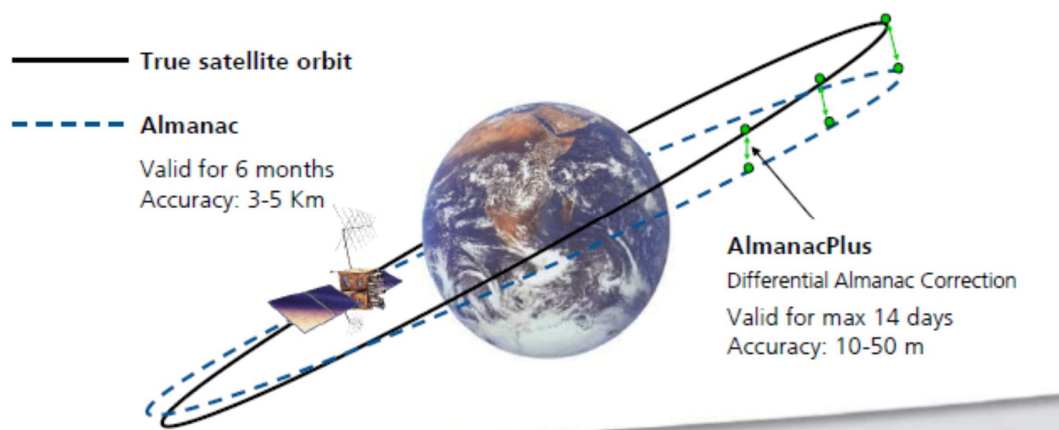
- Global GPS Submitter Network forwards satellite info to the AssistNow Online Server
- AssistNow Online Server provides aiding data to GPS receiver upon request
- GPS receiver achieves fast TTFF



● u-blox A-GPS AssistNow Offline

GPS receiver

- Combines Almanac with AlmanacPlus data to calculate position fix
- Uses valid ephemeris instead of AssistNow Offline data when available
- Reverts to AlmanacPlus when ephemeris expires



● u-blox AssistNow Autonomous

Benefits:

- No data download over Internet needed for aided GPS
- Faster time-to-first-fix(especially in weak signal environment or when noGPS signal is available at start-up, e.g. parking garage)

How does AssistNow Autonomous work?

- Orbit prediction data is generated locally on the GPS receiver per satellite
- Prediction data is available only for satellites seen before(AssistNow Offline covers all satellites)
- At start-up no broadcasted ephemeris need to be downloaded for those satellites that have AssistNow Autonomous data

➔ faster time-to-first-fix

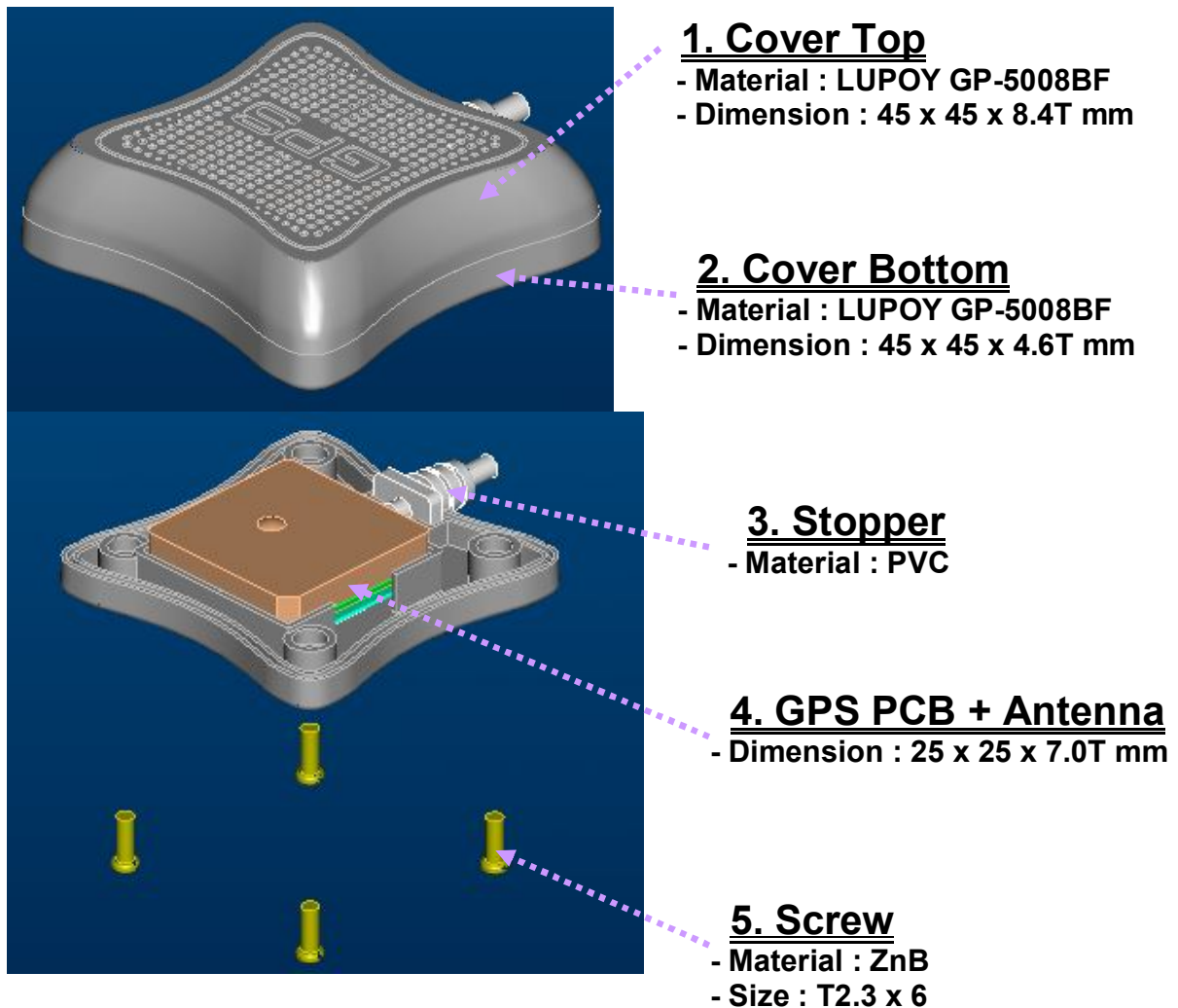
5 기계적인 크기들

5.1 마킹

- 제품번호 (회사 이름, 칩셋버전, 제품번호, 시리얼번호, 소프트웨어버전 등)이 기록될 수 있으나, 언제든지 그 내용은 알리지 않고 변경될 수 있음.

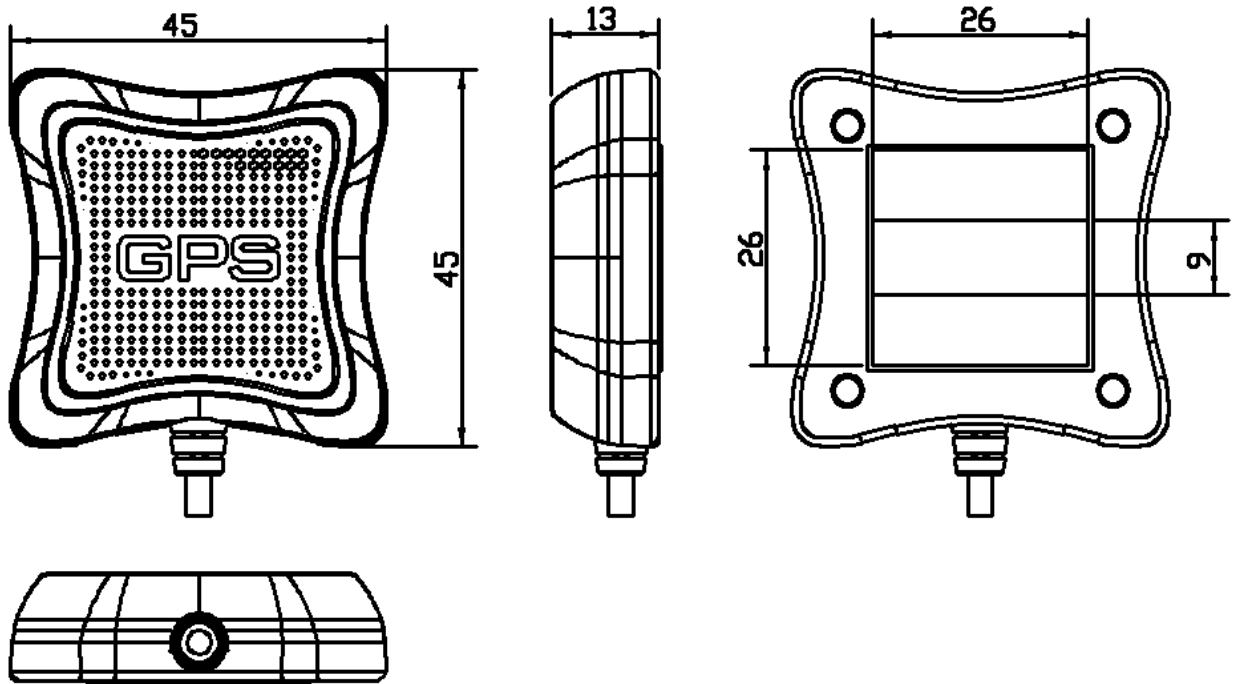
5.1.1 G-MOUSE 의 파트리스트

그림 2 G-MOUSE 의 파트리스트



5.1.2 외형 도면

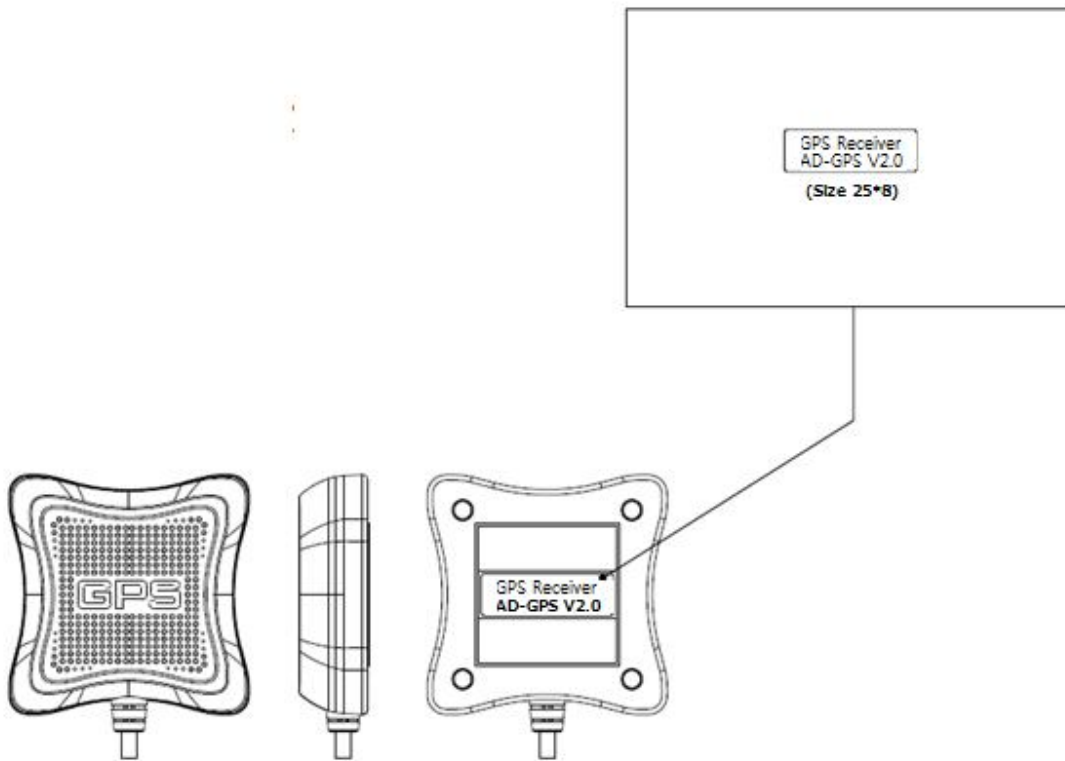
그림 3 외형 도면



항목	설명
Length	45.3 ± 0.1 mm
Width	45.3 ± 0.1 mm
Height	13.0 ± 0.1 mm

5.1.3 라벨 위치

그림 4 라벨 위치

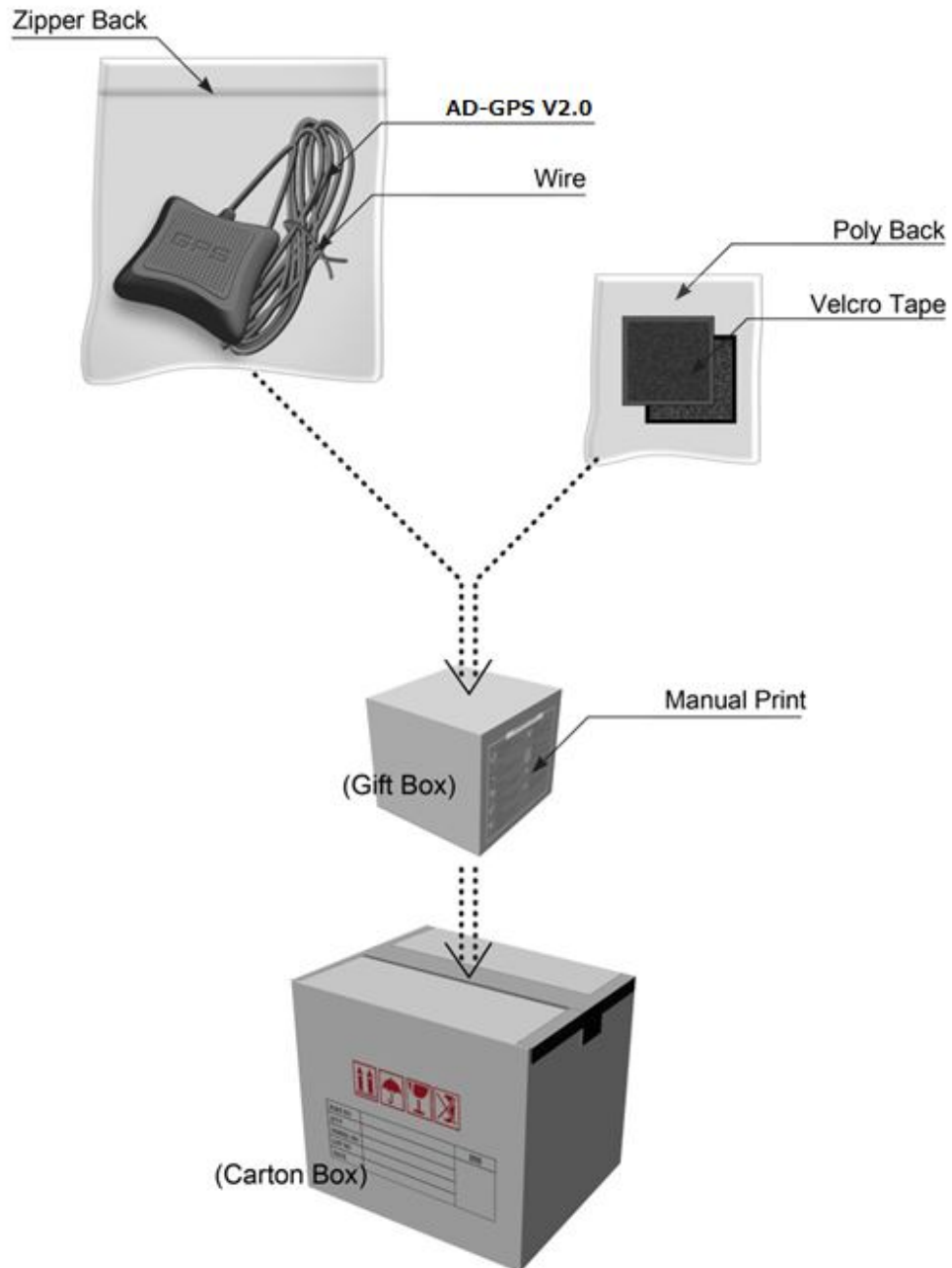


5.1.4 신뢰성 테스트

No	내용	상세 스펙	지속시간
1	Thermal Shock	-40℃, +85℃, non-power	Each 1 HR, 24 times
2	Low temperature storage	-40℃, non-power	48HR
3	Low temperature operation	-30℃	48HR
4	High temperature storage	+85℃, non-power	48HR
5	High temperature operation	+70℃	48HR
6	High temperature and humidity operation	+60℃ (95%)	48HR
7	Vibration	Sin wave test, Vibration bounds: 1 ~ 60Hz, Acceleration: 3g (29.4 $\frac{m}{s^2}$), axis of X/Y/Z, unpacking state	10cycles per each axis
8	Cycle of temperature and humidity	+60℃ (95%), -30℃	Each 1 HR, 8 times
9	Drop	- Unpacking state : 76cm, 6 side, - Packing : 150cm, 3 side	-10times per each side, -2times per each side
10	ESD	Contact : ± 6kV, Air : ± 15kV, 150pF±10%, 330Ω±10%	10times

표 5-1 신뢰성 테스트 내용

6 포장



7 NEWTC GPS 모듈 AD-GPS V2.0 ROHS

7.1 AD-GPS V2.0 회로판트 ROHS, PB_FREE 적용 상태

NO	부품명	설명	벤더	ROHS,Pb_Free
1	MAX-2659	GPS LNA	MAXIM	✓
2	AMY-6	GPS Chipset	Ublox	✓
3	AP7331-30SNG	Singal LDO Regulator	DIODES	✓
4	CM315	X-Tal,32.768KHz	TOKYO DENPA	✓
5	TTS18NSH	TCXO for GPS,26.000000MHz	TOKYO DENPA	✓
6	CSME414-TA	Backup Battery	VINATECH	✓
7	GPS_ANT	25*25 GPS ANT	파트론	✓
8	SAFEB1G57FM0F00	GPS RF SAW Filter	Murata	✓
9	SA1575GJ	GPS RF SAW Filter	Sawnics	✓
10	53261-0471	4Pin Con	Molex	✓
11	SDM20U30	Schottky Barrier diode	DIODES	✓
12	Capacitor,WALSIN	Chip Capacitor,C0402	WALSIN	✓
13	Capacitor NEC-TOKIN,	TANTAL_P	NEC-TOKIN	✓
14	Resistors,WALSIN	Chip Resistor,0402	WALSIN	✓
15	Inductor,WALSIN	Inductor,0402	WALSIN	✓
16	HB1M1005-121	Ferrite Bead	Createch	✓

표 7-1 ROHS, PB_FREE 적용상태

8 약어 및 약어 해설

- **2-D:** Two dimensional
- **3-D:** Three dimensional
- **Almanac:** A set of orbital parameters that allows calculation of the approximate GPS satellite positions and velocities. A GPS receiver uses the almanac as an aid to determine satellite visibility during acquisition of GPS satellite signals. The almanac is a subset of satellite ephemeris data and is updated weekly by GPS Control.
- **Altitude:** The distance between the current position and the nearest point on WGS84 reference ellipsoid. Altitude is usually expressed in meters and is positive outside the ellipsoid. In SiRFstar devices, this has no bearing on the height above mean sea level.
- **C/A Code:** Coarse/Acquisition Code. A spread spectrum direct sequence code that is used primarily by commercial GPS receivers to determine the range to the transmitting GPS satellite.
- **CEP:** Circular Error Probable. The radius of a circle, centered at the user's true location, that contains 50 percent of the individual position measurements made using a particular navigation system.
- **C/N0:** Carrier-to-Noise density ratio.
- **Cold Start:** A condition in which the GPS receiver can arrive at a navigation solution without initial position, time, and current Ephemeris.
- **dBic:** Decibel-Isometric-Circular (measure of power relative to an isometric antenna with circular polarization).
- **dBm:** Decibels relative to 1mW
- **DGPS:** Differential GPS. A technique to improve GPS accuracy that uses pseudorange errors recorded at known locations to improve the measurements made by other GPS receivers.
- **Doppler Aiding:** A signal processing strategy that uses a measured Doppler shift to help a receiver smoothly track a GPS signal to allow a more precise velocity and position measurement.
- **DoD:** The U.S. Government Department of Defense
- **DOP:** Dilution of Precision (see GDOP, HDOP, PDOP, TDOP, and VDOP).
- **DRMS :** Distance Root Mean Square. The square root of the average of the squared horizontal position errors (66%)
- **2DRMS :** Twice the Distance Root Mean Square : Twice the DRMS of the horizontal position errors (95%)
- **DTR:** Data Terminal Ready. A hardware handshake signal used in serial data links.
- **Ephemeris:** A set of satellite orbital parameters used by a GPS receiver to calculate precise GPS satellite positions and velocities. The ephemeris is used to determine the navigation solution and is updated frequently to maintain the accuracy of GPS receivers.

- **GDOP:** Geometric Dilution of Precision. A factor used to describe the effect of the satellite geometry on the position and time accuracy of the GPS receiver solution. The lower the value of the GDOP parameter, the less the errors in the position solution. Related indicators include PDOP, HDOP, TDOP, and VDOP.
- **GMT:** Greenwich Mean Time.
- **HDOP:** Horizontal Dilution of Precision. A measure of how much the geometry of the satellites affect the position estimate (computed from the satellite range measurements) in the horizontal (East, North) plane.
- **Hot Start:** Start mode of the GPS receiver when current position, clock offset, approximate GPS time, and current ephemeris data are all available.
- **L1:** The 1575.42MHz GPS carrier frequency that contains the C/A code, P-code, and navigation messages used by commercial GPS receivers.
- **L2:** A secondary GPS carrier, containing only P-code, used primarily to calculate signal delays caused by the atmosphere. The L2 frequency is 1227.60MHz.
- **Latitude:** Halfway between the poles lies the equator. Latitude is the angular measurement of a place expressed in degrees north or south of the equator. Latitude runs from 0° at the equator to 90°N or 90°S at the poles. When not qualified with letters N or S, it is assumed positive is north of the equator and negative is south of the equator. Lines of latitude run in an east-west direction. They are called parallels.
- **LNA:** Low Noise Amplifier
- **Longitude:** Lines of longitude, called meridians, run in a north-south direction from pole to pole. Longitude is the angular measurement of a place east or west of the prime meridian. This meridian is also known as the Greenwich Meridian, because it runs through the original site of the Royal Observatory, which was located at Greenwich, just outside London, England. Longitude runs from 0° at the prime meridian to 180° east or west, halfway around the globe. When not qualified with letters E or W, it is assumed positive is east of Greenwich and negative is west of Greenwich. The International Date Line follows the 180° meridian, making a few jogs to avoid cutting through land areas.
- **NMEA:** National Marine Electronic Association. Also commonly used to refer to Standard for Interfacing Marine Electronic Devices.
- **P-Code:** Precision Code. A spread spectrum direct sequence code that is used primarily by military GPS receivers to determine the range to the transmitting GPS satellite.
- **PDOP:** Position Dilution of Precision. A measure of how much the error in the three-dimensional position estimate produced from satellite range measurements is amplified by a poor satellite geometry with respect to the receiver antenna.
- **SA:** Selective Availability. The method used by the DoD to control access to the full accuracy achievable with the C/A code. (This method is no longer used.)
- **TTFF:** Time To First Fix. The actual time required by a GPS receiver to achieve a position solution. This specification varies with the operating state of the receiver, the length of time since the last position fix, the location of the last fix, and the specific receiver design. See also Hot Start, Warm Start, and Cold Start mode descriptions.

- **VDOP:** Vertical Dilution of Precision. A measure of how much the geometry of the satellites affects the position estimate (computed from the satellite range measurements) in the vertical (perpendicular to the plane of the user) direction.
- **Warm Start:** Start mode of the GPS receiver when current position, clock offset, and approximate GPS time are input by the user. Ephemeris data is not available.
- **WGS-84:** World Geodetic System (1984). A mathematical ellipsoid designed to fit the shape of the entire Earth. It is often used as a reference on a worldwide basis, while other ellipsoids are used locally to provide a better fit to Earth in a local region. GPS uses the center of the WGS-84 ellipsoid as the center of the GPS ECEF reference frame.