Prepared by	Checked by	Approved by

SPECIFICATION

Customer	
Item	**CruizCore® GA6100R**
Description	**3D-DR/GPS MODULE**
Customer P/N	

Received by	Checked by	Approved by
20 . .	**20 . .**	**20 . .**

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1. Functional Description

1.1. Overview

The CruizCore® GA6100R is 3D-DR/GPS signal processing module that gives continuously precise 3D navigation information in harsh GNSS environments. This product requires an external odometer, reverse signal (UART) for 3D-DR/GPS operation. The product guarantees continuous position reporting even all GNSS signals are obscured. In many city-driving situations, tall buildings and narrow streets obscure most or all of the GNSS signals. These urban canyons can also degrade visibility of GNSS signals by reflections or multi-path. Under urban canyon conditions, the product has the ability to reject the degraded signals condition. The GA6100R enhances the position accuracy and availability with Dead Reckoning functions. It is optimizes position information for automobiles by federate kalman filter method. The measurement of odometer and gyroscope are integrated in the product with the GNSS navigation information to provide more accurate position estimates than either system operate stand-alone. The product is designed as single board module including micro-processor, GNSS, gyro, accelerometer, barometer and it has external port to integrate odometer signal. The product will report map aided DR/GPS navigation solutions, when the map aiding messages are entered in GA6100R from map software. Today, most navigation device displays 3D map information, but it is merely 3D graphics based 2D navigation information. True 3D location based service can be made by GA6100R.

1.2. Block diagram

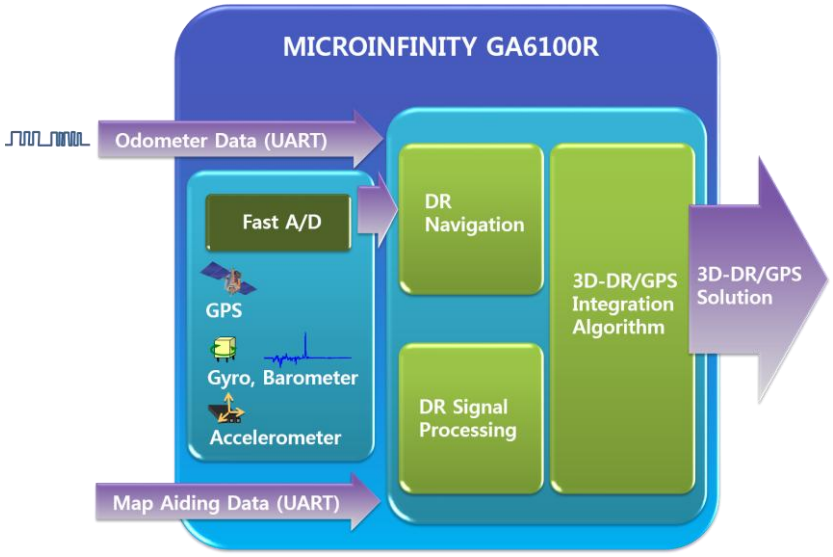

Figure 1 Functional diagram.

1.3. Features

- Low power consumption
- Compact package
- Fast startup
- MEMS gyroscope contained
- Accelerometer contained
- Barometer contained
- GNSS receiver contained
- Automatic DR calibration
- DR/GPS with federated kalman filter
- Map aiding function prepared

1.4. Operating modes

Table 1 Operating modes

Operating modes	Description
Run mode	Operation mode for 3D-DR/GPS navigation. The VDD and VBAT must be supplied for run mode operation.
Standby mode	Mode for backup register operation only. To enter this mode, VDD is needed to be powered off

1.5. System start-up

Table 2 Start-up mode

Start-up modes	Description
*DR cold start	During cold start, the system requires stabilization time, which can take about 10 minutes (GNSS fix and over 40km/h speed driving condition)
**DR warm start	Once the parameters are set, the DR/GPS starts in warm start mode.

* During the stabilization time the performance of the DR/GPS is mostly based on GNSS, once the parameters are determined, the DR/GPS will combine all sensor data to estimate position.

** Backup power (VBAT) must be maintained continuously for warm start.

1.6. Installation

Mounting in the Vehicle

GA6100R must be mounted securely in the vehicle so that it cannot move. Mounted angle of GA6100R is allowed within ±30deg. For the best performance of GA6100R, zero mounted angle is recommended.

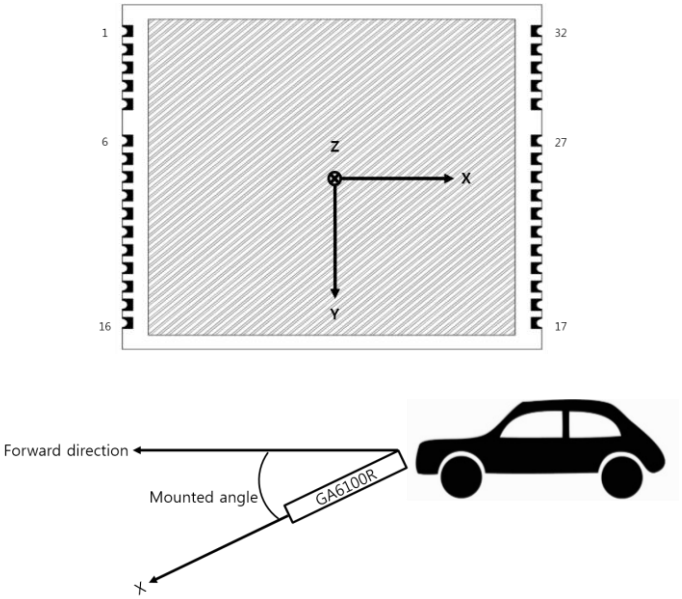

Figure 2 CruizCore® GA6100R coordinates system

Data Output

The CruizCore® 3D-DR/GPS module GA6100R provides both integrated DR/GPS and GNSS information as defined by Microinfinity. Other custom formats are available as an option. The module outputs data position information and can received certain commands using the serial interface. The default communication settings are:

Baud Rate per second	57,600
Data bits	8
Stop bits	1
Parity Check	No

2. Mechanical specification

2.1. Outline drawing

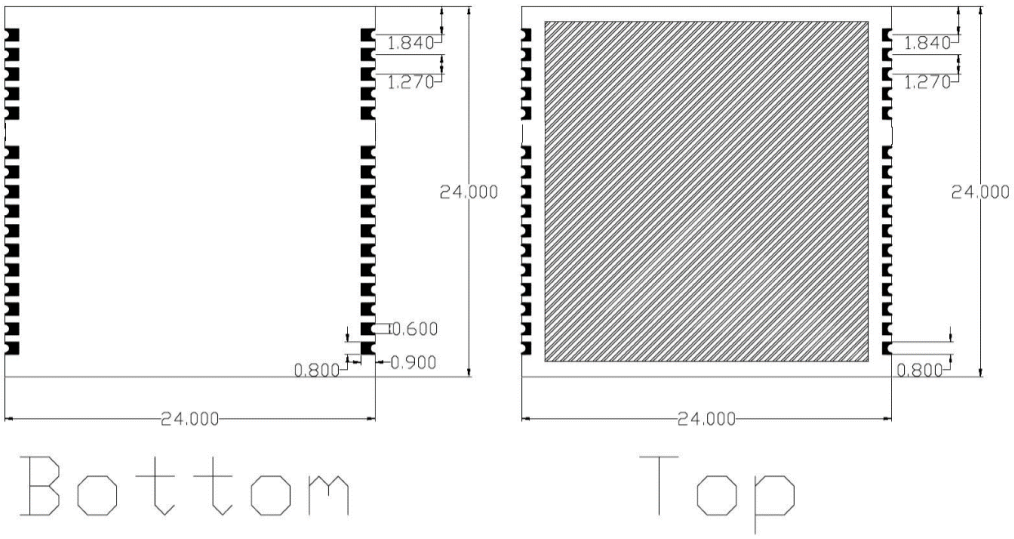

Figure 3 Dimensions

2.2. Specification

Table 3 Mechanical specification

Parameter	Specification	Tolerance	Comment
Length	24.0	±0.2	Unit : millimeter
Width	24.0	±0.2	
Height	3.2	±0.3	
Weight	5.0	-2.0	Unit : gram

3. Interface Specification

3.1. Pin Configuration

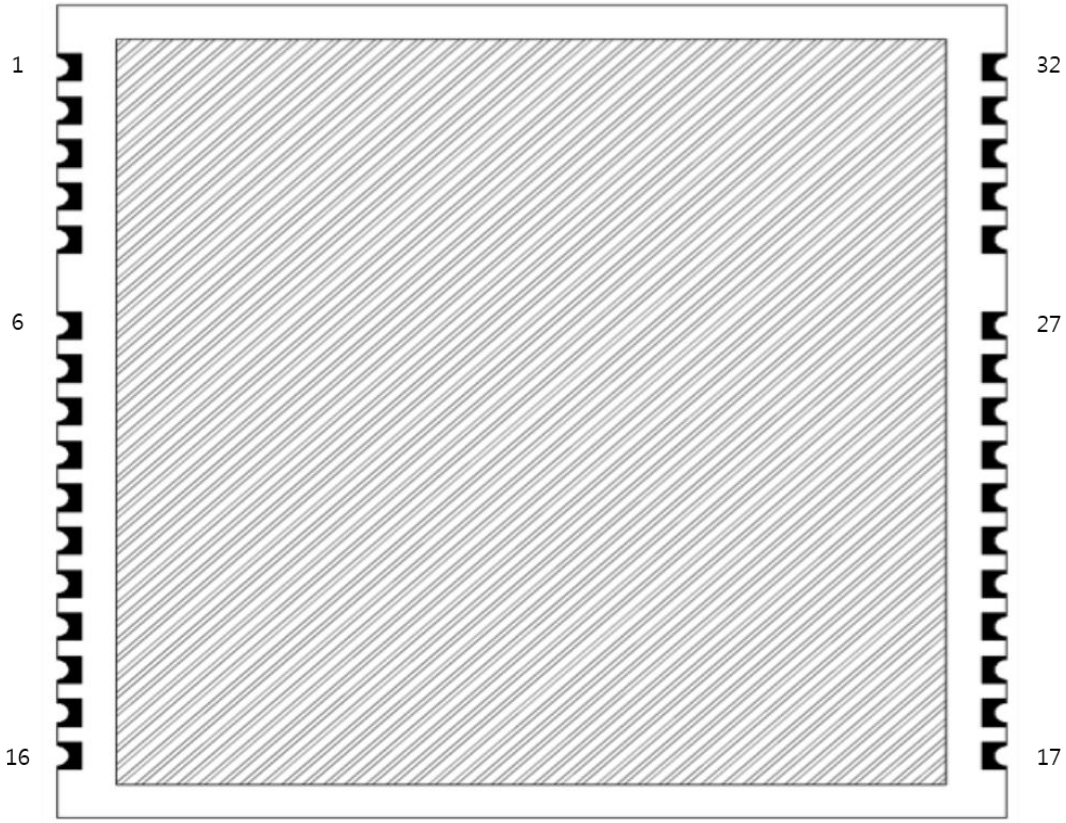

Figure 4 Pin configuration of connectors

3.2. Pin Definition

Table 4 Pin definition of main connector

No	Pin Name	I/O	Description
1	GND	-	Ground
2	VCC_BACKUP	-	Backup power supply
3	GND	-	Ground
4	nReset	I	System reset (Active low, open drain)
5	GND	-	Ground
6	nBackward	I	Backward signal input
7	RXD_B (Secondary serial port)	I	Serial port (LVTTL UART RX)
8	TXD_B (Secondary serial port)	O	Serial port (LVTTL UART TX)
9	GND	-	Ground
10	MODE_SEL	I	Switch to Boot mode (Nomal mode: High)
11	NC	-	Not connect
12	RXD_A (COMMAND)	I	Serial port (LVTTL UART RX)
13	TXD_A (NAVIDATA)	O	Serial port (LVTTL UART TX)
14	GND	-	Ground
15	VCC	-	Main power supply
16	GND	-	Ground
17	RF GND	-	Ground of RF antenna
18	VCC_ANT	-	Antenna power supply
19	RF GND	-	Ground of RF antenna
20	RF_IN	I	GNSS Signal from antenna
21	RF GND	-	Ground of RF antenna
22	NC	-	Not connect
23	NC	-	Not connect
24	NC	-	Not connect
25	NC	-	Not connect
26	NC	-	Not connect
27	NC	-	Not connect
28	GND	-	Ground
29	GND	-	Ground
30	GND	-	Ground
31	GND	-	Ground
32	GND	-	Ground

4. Electrical Specification

Table 5 Recommended operating conditions

Symbol	Parameter	Value			Unit
		Min	Typ	Max	
V_{S_IN}	Main power supply voltage	3.0	3.3	3.6	V
V_{B_IN}	Backup power supply voltage	1.62	3.3	3.6	V
V_{A_IN}[1)]	Antenna power supply voltage	3.0	-	5.5	V
T_{OPR}	Operating temperature	-30	-	85	℃
T_{STG}	Storage temperature	-40	-	85	℃

1) It depends on the specifications of antenna.

Table 6 DC electrical characteristics

Pin Name	Symbol	Parameter	Value			Unit
			Min	Typ	Max	
nBackward RXD_B MODE_SEL RXD_A	V_{IH}	Input high level	2.0	-	3.6	V
	V_{IL}	Input low level	-0.3	-	0.8	V
TXD_B TXD_A	V_{OH}	Output high level	2.9	-	-	V
	V_{OL}	Output low level	-	-	0.4	V

Table 7 Power consumptions

Pin Name	Symbol	Condition	Value			Unit
			Min	Typ	Max	
VCC	I_{S_RS}	V_{S_IN} = 3.3 V V_{B_IN} = 1.8 V @Run mode		400		mW
VCC_BACKUP	I_{B_RB}	V_{S_IN} = 3.3 V V_{B_IN} = 1.8 V @Run mode		1.2		mW
	I_{B_SB}	V_{S_IN} = 0 V V_{B_IN} = 1.8 V @Standby mode		130		uW

5. Performance Specification

Table 8 GNSS performance specification

Parameter	Specification	
General	GPS L1 1575.42MHz GLONASS L1 1602.00 MHz SBAS L1 32 Tracking channels and 2 fast acquisition channels Support of ST-AGPS Multimode assisted GPS(extended ephemeris solution)	
Acquisition Time	Cold Start Warm Start Hot Start	35 sec (open sky, typical) 34 sec (open sky, typical) 1 sec (open sky, typical)
Receiving Sensitivity	Tracking	-161dBm
Sensitivity in Acquisition	Cold Start Warm Start Hot Start	-145 dBm -145 dBm -155 dBm
Dynamics	Maximum Altitude range Maximum Velocity range Acceleration range	18,000 m 515 m/s 4 g max
Position Accuracy	GPS Only	1.5m (CEP, 24hr static at –130dBm)

* CEP(Circular Error Probability): It is defined as the radius of a circle into which a position of solution will locate at least 50% of the time.

Table 9 DR/GPS performance specification

Parameter	Specification	
Heading Error/Drift	2D DR only	<0.1°/sec (typical)
	DR/GPS	<5° (open sky, typical)
Position accuracy	DR only	<5% of running distance traveled up to 1km(typical)
3D Altitude Error/Drift	DR only	<1m/min (relative drift, typical)
	DR/GPS	<10m (open sky, typical)

* In run mode, automatic calibration of DR sensor is executed repeatedly.