

AscenKorea Inc.

**RGS-2828S4(RS232)**

**Module Datasheet**

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**AscenKorea Inc.**

Rm. 710, 7F, Halla Sigma Valley B/D, Gasandigital 2Ro 53, Geumcheon-gu, Seoul, Korea  
Tel: +82 02 1544 3818 Fax: +82 02 6499 2940 / [www.AscenKorea.com](http://www.AscenKorea.com) / [sales@ascen.co.kr](mailto:sales@ascen.co.kr)

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## Features

### High Performance Solution:

- High performance PVT engine
- High sensitivity navigation engine (PVT) tracks as low as -163dBm
- 48 track verification channels
- SBAS (WAAS or EGNOS)

### Adaptive Micropower Controller:

- Only 50 to 500µA maintains hot start capability
- <10mW required for TricklePower™ mode

### Active Jammer Remover:

- Removes in-band jammers up to 80 dB-Hz
- Tracks up to 8 CW jammers

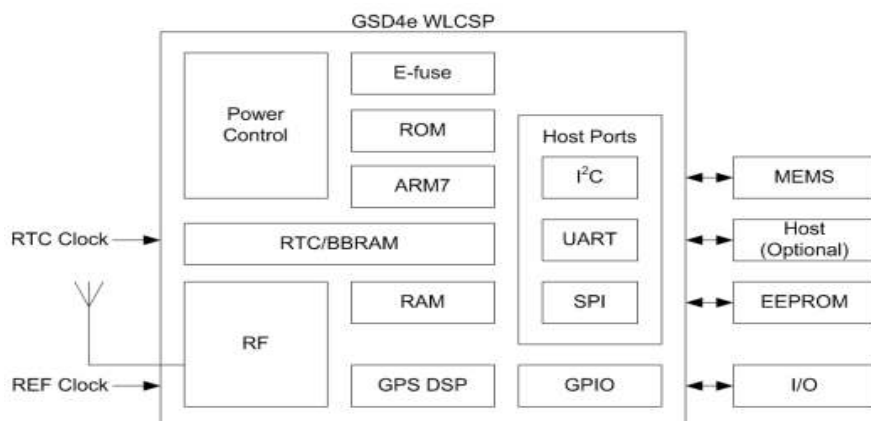
### Advanced Navigation Features:

- Smart sensor I<sup>2</sup>C interface
- Interrupt input for context change detection

## Applications

- Asset tracking
- Health and fitness
- Cellular handset
- Tablet computers

## Block Diagram



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## GNSS Performance

- Horizontal positioning accuracy (24 hr static, -130 dBm):

Autonomous <2.5 m

- Velocity accuracy (@ 30 m/s)

Speed <0.01 m/s

Heading <0.01 °

- Time To First Fix (-130 dBm)

Hot start < 1 s

Warm start <35 s

Cold start <35 s

- Sensitivity

Acquisition -148 dBm

Tracking -163 dBm

Navigation -160 dBm

- Receiver

Tracking L1, CA code

Channels 48

Max update rate 1 Hz

Max altitude/velocity < 18,288 m / < 510 m/s

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## Electrical Characteristics

▪ Absolute maximum ratings

Parameter	Min	Max	Unit
DC Supply Voltage(VCC)	-0.3	6.0	V
I/O Pin Voltage	-0.3	±15	V
RF input power	-	10	dBm
Storage Temperature	-40	150	°C

▪ Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
DC Supply Voltage (VCC)	3.0	5.0	5.5	V
Operating Temperature	-30	-	+85	°C

▪ Current Usage

Parameter	Min	Typ	Max	Unit
Peak acquisition current	-	56	98	mA
Average acquisition current	-	50	-	mA
Average tracking current	-	45	-	mA
Shutdown current	-	50	-	uA

▪ ESD Protection

Parameter	Class	Max
Human Body Model Contact Discharge per JEDEC EIA/JESD22-A114	1C	2000 V (all pins)

▪ I/O Port (RS-232)

Parameter	Min	Typ	Max	Unit
Tx Voltage Swing	±5.0	±5.4		V
Rx Voltage Range	-15		+15	V
Rx Threshold LOW	0.6	1.2		V
Rx Threshold HIGH		1.5	2.4	V

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Tel: +82 02 1544 3818 Fax: +82 02 6499 2940/ www.AscenKorea.com /sales@ascen.co.kr

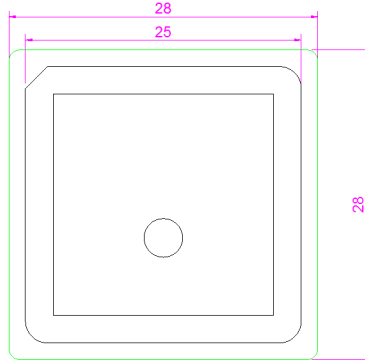
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## Dimensions

UNIT [mm]

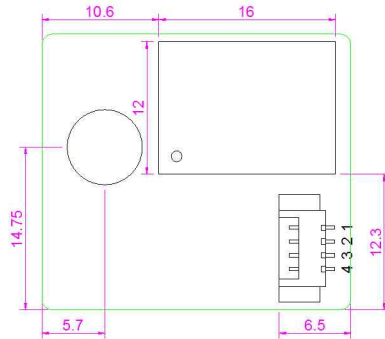
Top



Side



Bottom



연호 12505-04  
1.25mm pitch  
Connector

## Pin Functions

No.	Name	Funtions	Descriptions
1	VCC	Main Power Input	5.0V Typical
2	TXD	TX for RS-232	9,600 bps
3	RXD	RX for RS-232	9,600 bps
4	GND	Ground	

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Rm. 710, 7F, Halla Sigma Velley B/D, Gasandigital 2Ro 53, Geumcheon-gu, Seoul, Korea  
Tel: +82 02 1544 3818 Fax: +82 02 6499 2940/ www.AscenKorea.com /sales@ascen.co.kr

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## Output Messages

Option	Description
GGA	Time, position and fix type data.
GLL	Latitude, longitude, UTC time of position fix and status.
GSA	GPS receiver operating mode, satellites used in the position solution, and DOP values.
GSV	The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values.
MSS	Signal-to-noise ratio, signal strength, frequency, and bit rate from a radio-beacon receiver.
RMC	Time, date, position, course and speed data.
VTG	Course and speed information relative to the ground.
ZDA	PPS timing message (synchronized to PPS).
150	OK to send message.

A full description of the listed NMEA messages are provided in the following sections.

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## GGA – Global Positioning System Fixed Data

Note - Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

contains the values for the following example:

```
$GPGGA,161229.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M, , , ,0000*18
```

### GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Time	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 1-4
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	
Units	M	meters	
Geoid Separation		meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message termination

### Position Fix Indicator

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3-5	Not supported
<i>6</i>	<i>Dead Reckoning Mode, fix valid</i>

Note -

A valid status is derived from all the parameters set in the software. This includes the minimum number of satellites required, any DOP mask setting, presence of DGPS corrections, etc. If the default or current software setting requires that a factor must be met, then if that factor is not met, the solution is marked as invalid.

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## GLL – Geographic Position for Latitude/Longitude

Note – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

contains the values for the following example:

```
$GPGLL,3723.2475,N,12158.3416,W,161229.487,A,A*41
```

### GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Time	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
<i>Mode</i>	<i>A</i>		<i>A=Autonomous, D=DGPS, E=DR (Only present in NMEA version 3.00)</i>
Checksum	*41		
<CR> <LF>			End of message termination

- (1) Position was calculated based on one or more of the SVs having their states derived from almanac parameters, as opposed to ephemerides.
- (2) This feature is supported in the GSD4e product only.
- (3) This feature is supported in the GSD4e product, version 1.1.0 and later.

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## GSA – GNSS DOP and Active Satellites

Note – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

contains the values for the following example:

```
$GPGSA,A,3,07,02,26,27,09,04,15, , , , ,1.8,1.0,1.5*33
```

### GSA Data Format

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1	A		See Table 1-7
Mode 2	3		See Table 1-8
Satellite Used <sup>1</sup>	07		Sv on Channel 1
Satellite Used <sup>1</sup>	02		Sv on Channel 2
....			....
Satellite Used <sup>1</sup>			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

### 1. Satellite used in solution

#### Mode 1

Value	Description
M	Manual—forced to operate in 2D or 3D mode
A	2D Automatic—allowed to automatically switch 2D/3D

#### Mode 2

Value	Description
1	Fix not available
2	2D (<4 SVs used)
3	3D (>3 SVs used)

An example of only GLONASS satellites used in:

```
$GLGSA,A,3,73,66,88,83,81,68, , , , ,  
.1.8,1.0,1.5*2E<CR><LF>
```

An example of a solution using a mix of GPS and GLONASS satellites:

```
$GPGSA,A,3,07,66,26,83,09,68, , , , ,  
.1.8,1.0,1.5*22<CR><LF>
```

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## GSV – GNSS Satellites in View

contains the values for the following example:

```
$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71
```

```
$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41
```

### GSV Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Messages <sup>1</sup>	2		Range 1 to 3
Message Number <sup>1</sup>	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1 (Range 1 to 32)
Elevation	79	degrees	Channel 1 (Maximum 90)
Azimuth	048	degrees	Channel 1 (True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
....			....
Satellite ID	27		Channel 4 (Range 1 to 32)
Elevation	27	degrees	Channel 4 (Maximum 90)
Azimuth	138	degrees	Channel 4 (True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR> <LF>			End of message termination

(1) Depending on the number of satellites tracked, multiple messages of GSV data may be required. In some software versions, the maximum number of satellites reported as visible is limited to 12, even though more may be visible.

An example of GLONASS only satellites in view reporting messages:

```
$GLGSV,2,1,07,73,14,302,39,66,33,037,39,80,13,251,38,83,16,313,38*64
```

```
$GLGSV,2,2,07,81,36,083,36,68,29,185,31,82,53,003,43*53<CR><LF>
```

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## MSS – MSK Receiver Signal

Note - Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

contains the values for the following example:

\$GPMSS,55,27,318.0,100,1,\*57

### MSS Data Format

Name	Example	Units	Description
Message ID	\$GPMSS		MSS protocol header
Signal Strength	55	dB	SS of tracked frequency
Signal-to-Noise Ratio	27	dB	SNR of tracked frequency
Beacon Frequency	318.0	kHz	Currently tracked frequency
Beacon Bit Rate	100		bits per second
<i>Channel Number</i>	<i>1</i>		<i>The channel of the beacon being used if a multi-channel beacon receiver is used</i>
Checksum	*57		
<CR> <LF>			End of message termination

Note - The MSS NMEA message can only be polled or scheduled using the MSK NMEA input message. See “MSK-MSK Receiver Interface” on page 2-9.

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## RMC – Recommended Minimum Specific GNSS Data

Note - Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

contains the values for the following example:

```
$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,*10
```

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	161229.487		hhmmss.sss
Status <sup>1</sup>	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation <sup>2</sup>		degrees	E=east or W=west
East/West Indicator <sup>2</sup>	E		E=east
<i>Mode</i>	<i>A</i>		<i>A=Autonomous, D=DGPS, E=DR</i>
Checksum	*10		
<CR> <LF>			End of message termination

### RMC Data Format

1. A valid status is derived from the SiRF Binary M.I.D 2 position mode 1. See the SiRF Binary Protocol Reference Manual
2. CSR Technology Inc. does not support magnetic declination. All “course over ground” data are geodetic WGS84 directions relative to true North.
3. Position was calculated based on one or more of the SVs having their states derived from almanac parameters, as opposed to ephemerides.
4. This feature is supported in the GSD4e product only.
5. This feature is supported in the GSD4e product, version 1.1.0 and later.

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## VTG – Course Over Ground and Ground Speed

Note - Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

contains the values for the following example:

\$GPVTG,309.62,T, ,M,0.13,N,0.2,K,A\*23

### VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course	309.62	degrees	Measured heading
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic <sup>1</sup>
Speed	0.13	knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	km/hr	Measured horizontal speed
Units	K		Kilometers per hour
<i>Mode</i>	<i>A</i>		<i>A=Autonomous, D=DGPS, E=DR</i>
Checksum	*23		
<CR> <LF>			End of message termination

## ZDA – SiRF Timing Message

Outputs the time associated with the current 1 PPS pulse. Each message is output within a few hundred ms after the 1 PPS pulse is output and tells the time of the pulse that just occurred.

contains the values for the following example:

\$GPZDA,181813,14,10,2003,00.00\*4F

### ZDA Data Format

Name	Example	Units	Description
Message ID	\$GPZDA		ZDA protocol header
UTC time	181813		Either using valid IONO/UTC or estimated from default leap seconds
Day	14		01 TO 31
Month	10		01 TO 12
Year	2003		1980 to 2079
Local zone hour	00	knots	Offset from UTC (set to 00)
Local zone minutes	00		Offset from UTC (set to 00)
Checksum			
<CR> <LF>			End of message termination

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## Contact

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Rm. 710, 7F, Halla Sigma Valley B/D, Gasandigital 2Ro  
53, Geumcheon-gu, Seoul, Korea

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[www.AscenKorea.com](http://www.AscenKorea.com) /

Sales & Support Email : [sales@ascen.co.kr](mailto:sales@ascen.co.kr)

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Tel: +82 02 1544 3818 Fax: +82 02 6499 2940/ [www.AscenKorea.com](http://www.AscenKorea.com) /[sales@ascen.co.kr](mailto:sales@ascen.co.kr)

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