

# TDS-GU7020W

## GPS Smart G-Mouse Datasheet

(Chip: u-blox7 UBX-G7020-KT)

**Revision 0.2**

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## 1. Instruction

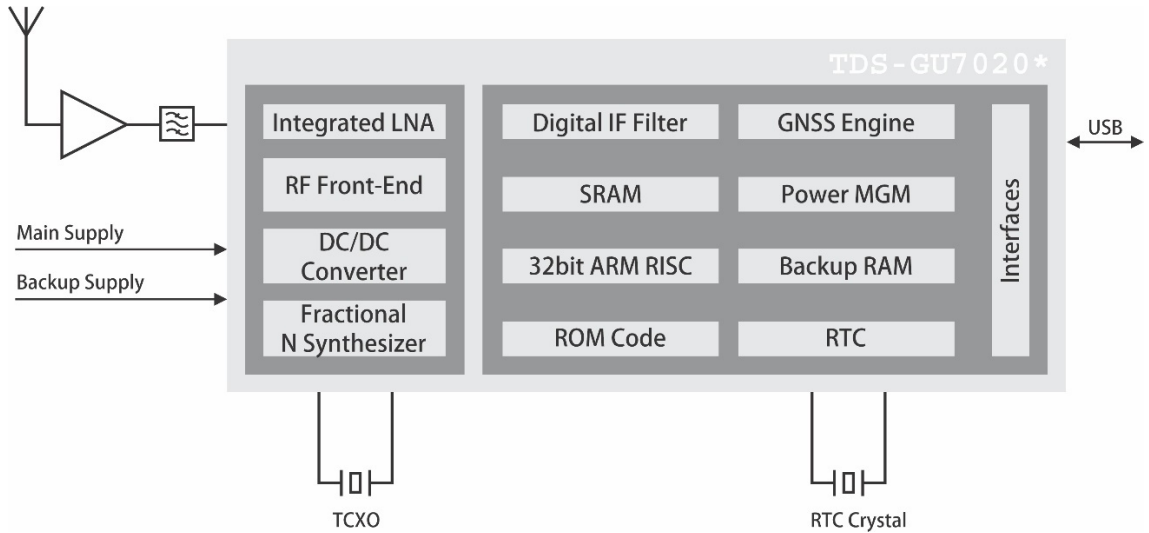
### 1.1 Overview

The G-MOUSE suitable for integration in variety of consumer devices such as PDA, Personal Navigation Device, Digital Camera Vehicle Navigation, Telematics and other applications requiring Position, Velocity and Time. High Sensitivity GPS technology provides unprecedented indoor and outdoor positioning capability including urban canyon and under thick foliage. provides standard NMEA output for compatibility with all user applications, and map engines.

### 1.2 Features

- \* u-blox7 UBX-G7020-KT GPS chip
  - \* Active jammer detection and reduction
  - \* Multi-path detection and compensation
  - \* DGPS(WAAS/EGNOS/MSAS/GAGAN) QZSS support
  - \*Support SBAS ranging
  - \* Update Rate: 1Hz (max up to 10Hz, configurable by firmware)
  - \* RoHS compliant
  - \* Support u-blox USB driver
  - \* NMEA-0183 compliant protocol
- \* If you need a USB driver file, please go to [www.u-blox.com](http://www.u-blox.com) to download and install the driver.

### 1.3 System Block Diagram



### 1.4 Product Applications

- \* Handheld GPS receiver application
- \* Automotive application
- \* Car navigations and tracking
- \* Aviation application
- \* Ideal for PDA, Pocket PC and other consumer devices requiring positioning capability

## 2. Technical Specifications

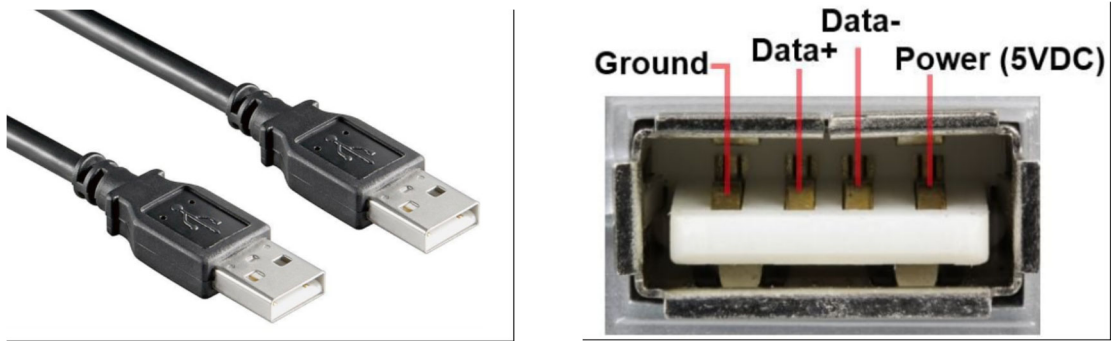
### 2.1 Specification List

<b>Frequency</b>	L1, 1575.42 MHz
<b>Receiver Type</b>	56 Channel
<b>Electrical Interface</b>	Full Duplex Serial Communications
<b>Baud rate</b>	9,600 bps (Default)
<b>Position</b>	2.5 m (Autonomous) / 2.0 m SBAS (CEP 50%)
<b>Velocity</b>	0.1 m/s
<b>Time</b>	1 PPS
<b>Hot Start</b>	< 1.5 sec., Autonomous
<b>Cold Start</b>	< 29 sec., Autonomous
<b>Tracking Sensitivity</b>	-162 dBm, Typical
<b>Acquisition Sensitivity</b>	-148 dBm, Autonomous Cold Start
<b>Reacquisition</b>	-160 dBm, Typical
<b>Operation Current</b>	GPS: 30 mA_Acquisition, 25 mA_Tracking
<b>Backup Current</b>	20 uA
<b>Altitude</b>	50,000 m
<b>Velocity</b>	500 m/s
<b>Acceleration</b>	4 g
<b>Jerk</b>	1 g/s
<b>Power Supply Voltage</b>	+5V
<b>Backup Voltage</b>	+1.4 to +3.6V
<b>Dimension</b>	33.0 x 45.0 x 11.5mm (±0.2mm)

### 3. Hardware interface

#### 3.1 Pin Configuration

The TDS-GU7020W External pin connection is presented in the figure below.



This product is optimized for USB 2.0.

Using USB 3.0 may result unfavorable performance.

Please contact your USB supplier for any issues when using USB 3.0.

#### 3.2 Pin Assignment

Pin	Signal Name	I/O	Description
1	VCC	P	DC Power Input (5V)
2	Dm	O	USB minus
3	Dp	I	USB plus
4	GND	G	Ground

#### **VCC**

This is the main DC power supply input pin. IT provides voltage to module.

#### **Dm, Dp**

USB Data I/O.

#### **GND**

GND provides the ground.

### 3.3 Cable Specifications

<b>Name and Specifications</b>	UL Certified 28AWGx4C Cable / Material: Non-toxic Cable-4Wire
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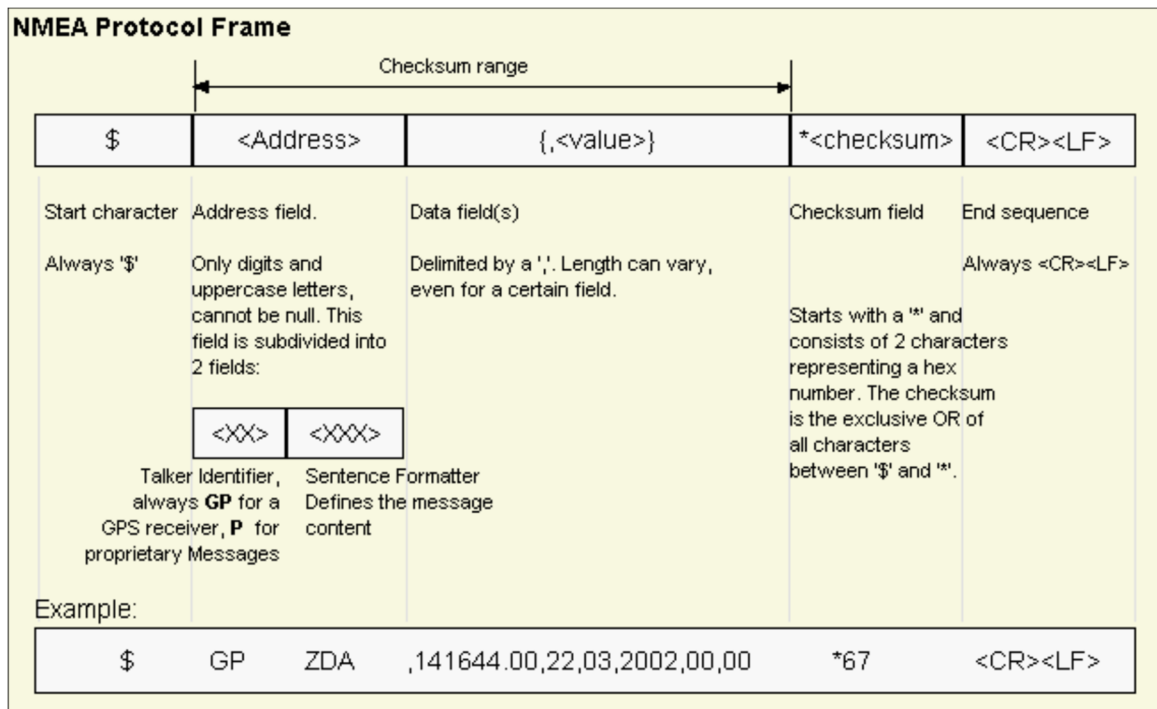
Inspected Category	Specification
<i>Appearance</i>	Must have no cracks or surface defects
<i>Overall Diameter</i>	3.0 ± 0.05 mm
<i>Conductor Diameter</i>	0.88 ± 0.02 mm
<i>Flexibility Test</i>	Confirmed through accurate testing
<i>Conductor Color</i>	Black, Red, Green, White
<i>Conductor Configuration</i>	28AWG, 7/0.127TA
<i>Shielding</i>	Aluminum Tape
<i>Sheath Color</i>	Black

Cable Environmental Test						
Test Item	Unit	Specification	Result			
<i>Differential Mode Impedance</i>	Ω	99-81	MEAN: PASS			
<i>High-Temperature Aging Test</i>	75°C, exposure for 30 min. and 1-hour aging prevention		No Abnormalities			
RoHS Details						
Component	Cd	Cr <sup>6</sup>	Pb	Hg	Br	Cl
<i>Standard (ppm)</i>	50	700	700	700	900	900
<i>Measured (ppm)</i>	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PASS

## 4. NMEA Output Sentences

NMEA messages sent by the GPS receiver are based on the NMEA 0183 Version 2.x.

The following picture shows the structure of a NMEA protocol message.



For further information on the NMEA Standard please refer to NMEA 0183 Standard

For Interfacing Marine Electronic Devices, Version 2.30, March 1, 1998. See <http://www.nmea.org/> for ordering instructions.

The NMEA standard allows for proprietary, manufacturer-specific messages to be added. These shall be marked with a manufacturer mnemonic.



### GGA Global Positioning System Fix Data

<i>Message</i>	GAA		
<i>Description</i>	Global Positioning System Fix Data		
<i>Type</i>	Output Message		
<i>Comment</i>	The output of this message is dependent on the currently selected datum (Default: WGS84) Time and position, together with GPS fixing related data (number of satellites in use, and the resulting HDOP, age of differential data if in use, etc).		
<i>Message Info</i>	<a href="#">ID for CFG-MSG</a>	Number of Fields	
	0xF0 0x00	17	

Message Structure:

\$GPGGA,hhmmss.ss,Latitude,N,Longitude,E,FS,NoSV,HDOP,msl,m,Altref,m,DiffAge,DiffStation\*cs<CR><LF>

Example:

\$GPGGA,092725.00,4717.11399,N,00833.91590,E,1,8,1.01,499.6,M,48.0,M,,0\*5B

Field No.	Example	Format	Name	Unit	Description
0	\$GPGGA	string	\$GPGGA	-	Message ID, GGA Protocol Header
1	092725.00	hhmmss.ss	hhmmss.ss	-	UTC Time, Current Time
2	4717.11399	ddmm.mmmmm	Latitude	-	Latitude, Degrees + minutes, see <a href="#">format description</a>
3	N	character	N	-	N/S Indicator, N=north or S=south
4	00833.91590	dddmm.mmmm	Longitude	-	Longitude, Degrees + minutes, See <a href="#">format description</a>
5	E	character	E	-	E/W indicator, E=east or W=west
6	1	digit	FS	-	Positioning Fix Status Indicator, see table below and <a href="#">position fix flags description</a>
8	8	numeric	NoSV	-	Satellites Used, Range 0 to 12
9	499.6	numeric	msl	m	MSL Altitude
11	48.0	numeric	Altref	m	Geoid Separation
12	M	character	uSep	-	Units, Meters (fixed field)
13	-	numeric	DiffAge	s	Age of Differential Corrections, Blank (Null) fields when DGPS is not used
14	0	numeric	DiffStation	-	Diff. Reference Station ID
15	*5B	hexadecimal	cs	-	Checksum

**GLL Latitude and Longitude, with Time of Position Fix and Status**

<i>Message</i>	GLL		
<i>Description</i>	Latitude and Longitude, with Time of Position Fix and Status		
<i>Type</i>	Output Message		
<i>Comment</i>	The output of this message is dependent on the currently selected datum (Default: WGS84) -		
<i>Message Info</i>	<a href="#">ID for CFG-MSG</a>	Number of Fields	
	0xF0 0x01	(9) or (10)	

Message Structure:

\$GPGLL,Latitude,N,Longitude,E,hhmmss.ss,Valid,Mode\*cs<CR><LF>

Example:

\$GPGLL,4717.11364,N,00833.91565,E,092321.00,A,A\*60

Field No.	Example	Format	Name	Unit	Description
0	\$GPGLL	string	\$GPGLL	-	Message ID, GLL Protocol Header
1	4717.11364	ddmm.mmmmm	Latitude	-	Latitude, Degrees + minutes, see <a href="#">format description</a>
2	N	character	N	-	N/S Indicator, hemisphere N=north or S=south
3	00833.91565	dddmm.mmmmm	Longitude	-	Longitude, Degrees + minutes, see <a href="#">format description</a>
4	E	character	E	-	E/W indicator, E=east or W=west
5	092321.00	hhmmss.sss	hhmmss.sss	-	UTC Time, Current Time
6	A	character	Valid	-	V = Data invalid or receiver warning, A = Data valid. see position fix flags description
Start of Optional Block					
7	A	character	Mode	-	Positioning Mode, see position fix flags description
End of Optional Block					
7	*60	hexadecimal	cs	-	Checksum

**GSA GPS DOP and Active satellites**

Message	GSA		
Description	GPS DOP and Active Satellites		
Type	Output Message		
Comment	<ul style="list-style-type: none"> <li>• If less than 12 SVs are used for navigation, the remaining fields are left empty. If more than 12 SVs are used for navigation, only the IDs of the first 12 are being output.</li> <li>• The SV Numbers (Fields 'Sv') are in the range of 1 to 32 for GPS satellites, and 33 to 64 for SBAS satellites (33 = SBAS PRN 120, 34 = SBAS PRN 121 and so on)</li> </ul>		
Message Info	ID for CFG-MSG	Number of Fields	
	0xF0 0x02	20	

Message Structure:

\$GPGSA,Smode,FS{,sv},PDOP,HDOP,VDOP\*cs<CR><LF>

Example:

\$GPGSA,A,3,23,29,07,08,09,18,26,28,,,,,1.94,1.18,1.54\*0D

Field No.	Example	Format	Name	Unit	Description
0	\$GPGSA	string	\$GPGSA	-	Message ID, GSA protocol header
1	A	character	Smode	-	Smode, see first table below
2	3	digit	FS	-	Fix status, see second table below and position fix flags description
Start of Repeated Block (12 times)					
3 + 1*N	29	numeric	sv	-	Satellite Number
End of Repeated Block					
15	1.94	numeric	PDOP	-	Position Dilution of Precision
16	1.18	numeric	HDOP	-	Horizontal Dilution of Precision
17	1.54	numeric	VDOP	-	Vertical Dilution of Precision
18	*0D	hexadecimal	cs	-	Checksum

**GSV GPS Satellites in View**

Message	GSV		
Description	GPS Satellites in View		
Type	Output Message		
Comment	The number of satellites in view, together with each PRN (SV Id), elevation and azimuth, and C/No (Signal/Noise Ratio) value. Only four satellite details are transmitted in one message. There are up to 4 messages used as indicated in the first field NoMsg.		
Message Info	<a href="#">ID for CFG-MSG</a>	Number of Fields	
	0xF0 0x03	7..16	

Message Structure:

\$GPGSV,NoMsg,MsgNo,NoSv,{,sv,elv,az,cno}\*cs<CR><LF>

Example:

\$GPGSV,3,1,10,23,38,230,44,29,71,156,47,07,29,116,41,08,09,081,36\*7F

Field No.	Example	Format	Name	Unit	Description
0	\$GPGSV	string	\$GPGSV	-	Message ID, GSV protocol header
1	3	digit	NoMsg	-	Number of messages, total number of GPGSV messages being output
2	1	digit	MsgNo	-	Number of this message
3	10	numeric	NoSv	-	Satellites in View
Start of repeated block (1..4 times)					
4+4*N	23	numeric	sv	-	Satellite ID
End of Repeated Block					
5.. 16	*7F	hexadecimal	cs	-	Checksum
6.. 16	-	character	<CR><LF>	-	Carriage Return and Line Feed

**RMC Recommended Minimum data**

Message	RMC		
Description	Recommended Minimum Data		
Type	Output Message		
Comment	The output of this message is dependent on the currently selected datum (Default: WGS84) The Recommended Minimum sentence defined by NMEA for GPS/Transit system data.		
Message Info	<a href="#">ID for CFG-MSG</a>	Number of Fields	
	0xF0 0x04	15	

Message Structure:

\$GPRMC,hhmmss,status,latitude,N,longitude,E,spd,cog,ddmmyy,mv,mvE,mode\*cs<CR><LF>

Example:

\$GPRMC,083559.00,A,4717.11437,N,00833.91522,E,0.004,77.52,091202,,,A\*57

Field No.	Example	Format	Name	Unit	Description
0	\$GPRMC	string	\$GPRMC	-	Message ID, RMC protocol header
2	A	character	Status	-	Status, V = Navigation receiver warning, A = Data valid, see <a href="#">position fix flags description</a>
3	4717.11437	ddmm. mmmm	Latitude	-	Latitude, Degrees + minutes, see <a href="#">format description</a>
4	N	character	N	-	N/S Indicator, hemisphere N=north or S=south
5	00833.91522	dddmm. mmmm	Longitude	-	Longitude, Degrees + minutes, see <a href="#">format description</a>
6	E	character	E	-	E/W indicator, E=east or W=west
7	0.004	numeric	Spd	knot s	Speed over ground
9	091202	ddmmyy	Date	-	Date in day, month, year format
10	-	numeric	mv	degrees	Magnetic variation value, not being output by receiver
11	-	character	mvE	-	Magnetic variation E/W indicator, not being output by receiver
13	*57	hexadecimal	cs	-	Checksum
14	-	character	<CR><LF>	-	Carriage Return and Line Feed

### VTG Course over ground and Ground speed

<i>Message</i>	VTG		
<i>Description</i>	Course over ground and Ground Speed		
<i>Comment</i>	Velocity is given as Course over Ground (COG) and Speed over Ground (SOG).		
<i>Message Info</i>	<a href="#">ID for CFG-MSG</a>	Number of Fields	
	0xF0 0x05	12	

Message Structure:

\$GPVTG,cogt,T,cogm,M,sog,N,kph,K,mode\*cs<CR><LF>

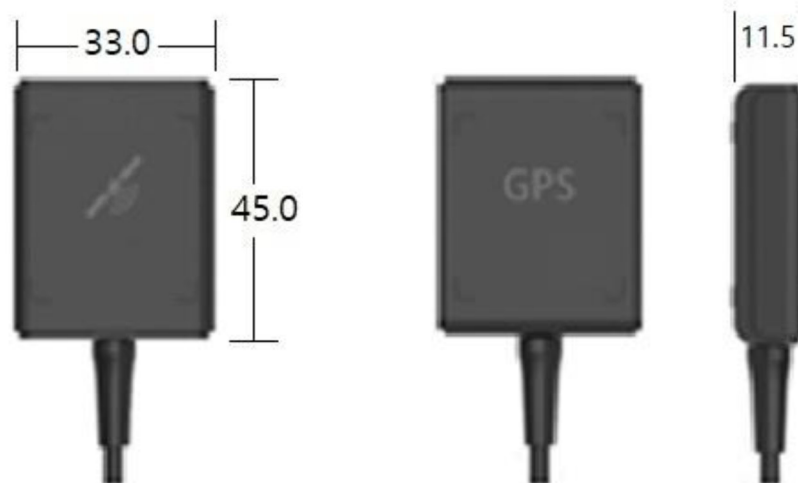
Example:

\$GPVTG,77.52,T,,M,0.004,N,0.008,K,A\*06

Field No.	Example	Format	Name	Unit	Description
0	\$GPVTG	string	\$GPVTG	-	Message ID, VTG protocol header
1	77.52	numeric	cogt	degrees	Course over ground (true)
2	T	character	T	-	Fixed field: True
3	-	numeric	cogm	degrees	Course over ground (magnetic), not output
4	M	character	M	-	Fixed field: Magnetic
5	0.004	numeric	Sog	knots	Speed over ground
6	N	character	N	-	Fixed field: Knots
7	0.008	numeric	Kph	km/h	Speed over ground
8	K	character	K	-	Fixed field: kilometers per hour
9	A	character	Mode	-	Mode Indicator, see <a href="#">position fix flags description</a>
10	*06	hexadecimal	cs	-	Checksum
11	-	character	<CR><LF>	-	Carriage Return and Line Feed

## 5. Outline Drawing

Dimension: (Unit: mm, Tolerance: +/- 0.2mm)



\*Cable length: 188cm(78") +/-0.5cm

## 6. Contact Information

Address: 1505 Luna Road, Suite 180, Carrollton, Texas 75006, USA

E-Mail: [support@TexasDatalinkSolutions.com](mailto:support@TexasDatalinkSolutions.com)