GPS Smart Antenna Engine Board

Optional TTL interface

Specification

D2523T-6

Introduction

1.1. Overview

The D2523T-6 is a complete GPS smart antenna engine board, which includes a built-in Sarantel's GeoHelix high-gain, low-noise amplifier active antenna and GPS receiver circuits, designed for hand- held or portable device that are going to integrate GPS function. The engine board is powered by the high performance 50-channel u-blox 6 technology, these modules provide excellent performance at an economical price. Besides, it can provide you with superior sensitivity and performance even in urban canyon and dense foliage environment. The miniature size makes it the best choice to be integrated into portable devices, such as portable media players and portable navigation devices.

A dedicated massive-correlator (over 1 million) signal parameter search engine enables rapid search of all available satellites and acquisition of very weak signals. Once acquired, satellites are passed on to a power-optimized dedicated tracking engine. This arrangement allows the GPS and GALILEO engine to simultaneously track up to 16 satellites while searching for new one. The D2523T-6 allows weak signal tracking and positioning in severe environments such as urban canyons and under deep foliage.

The GPS module D2523T-6 brings high performace of the u-blox 6 positioning engine to the industry standard. These versatile, stand-alone receivers combine an extensive array of features with flexible connectivity options. Their ease of integration results in fast times-to-market for a wide range of automotive, consumer and industrial applications with strict size and cost requirements.

1.2. Main Feature

- 50-channel u-blox 6 engine with over 1 million effective correlators
- 1 second Time To First Fix for Hot and Aided Starts
- -162dBm Super Sense® acquisition and tracking sensitivity
- Accelerated startup at weak signals for modules with Kick Start feature
- Supports Assist Now Online and Assist Now Offline A-GPS services; OMA SUPL compliant
- High immunity to jamming
- 5 Hz position update rate
- PCB main board Size 25 x 23 (mm)
- UART(TTL) interface
- 3.3V supply voltage for low power consumption
- Built-in Sarantel active antenna @Typical Gain:+26dBic
- RoHS compliant

2. Technical Specification

Receiver type		**Output Message Format**	
Chipset	UBX-G6010 chip	GPS Protocol: NMEA, UBX binary GGA, GLL, GSA, GSV, RMC, VTG, TXT	
Frequency	GPS L1 C/A code SBAS: WAAS, EGNOS, MSAS, GAGAN		
C/A Code	1.023MHz chip rate	**Multipath Suppression**	
Channels	Supports 50 channels	Intelligent multipath detection and suppression	
Sensitivity			
Tracking & Navigation	-162dBm	**A-GPS**	
Acquisition	-162dBm	Supports Assist Now® Online and Offline, OMA SUPL compliant	
Cold Start (Autonomous)	-148dBm		
Time to First Fix (TTFF) (Open Sky)			
Cold Start	26 sec	**Device Size**	
Warm Start	26 sec	25 x 23 (mm)	
Hot Start	1 sec		
Aided Start	1 sec	**Environmental Characteristics**	
Accuracy		Operating Temperature	- 40°C to + 85°C
Horizontal Position	< 2.5 m autonomous < 2.0 m SBAS	Storage Temperature	- 40°C to + 85°C
Accuracy of Time pulse signal	30ns RMS	**Power**	
Max Navigation Update Rate	5 Hz (Max.)	Peak Supply Current	Max= 67mA
		Max Performance Mode[notel1]	Acquisition= 47mA
Dynamic Conditions			Tracking= 39mA
Velocity	< 515 m/s (1000 knots)	Eco Mode[note1]	Tracking= 37mA
Acceleration	≤ 4g	Power Save Mode [note1]	Tracking= 11mA
		Power Input	3.3V ±10% VDC input
Note1: With strong signals, all orbits available. For cold starts typical 12 min after First Fix. For hot starts typical 15 sec after First Fix. Power Save Mode at 1 fix/s.			

3. Mechanical Dimensions

3.1 D2523T-6

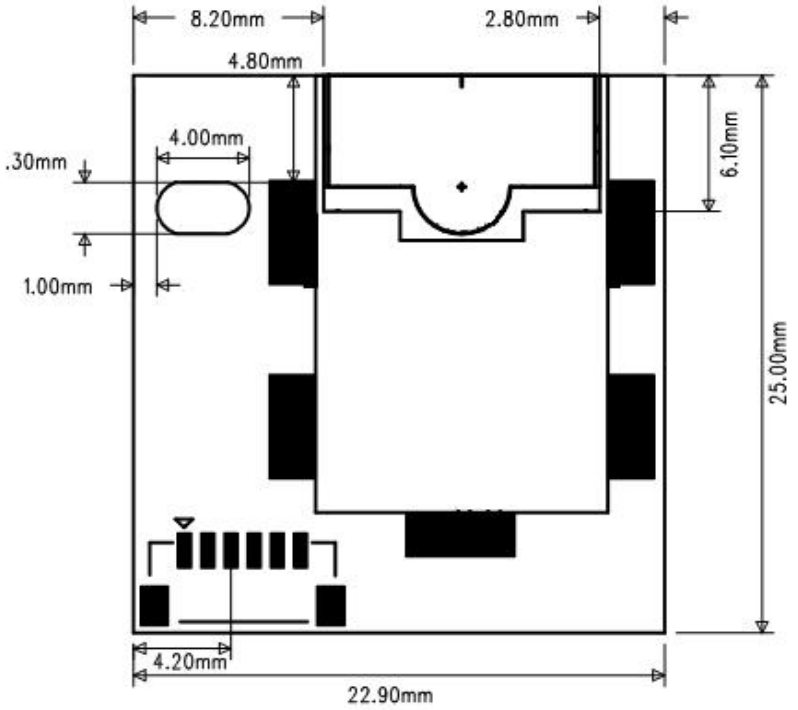

Figure 1: Board dimension

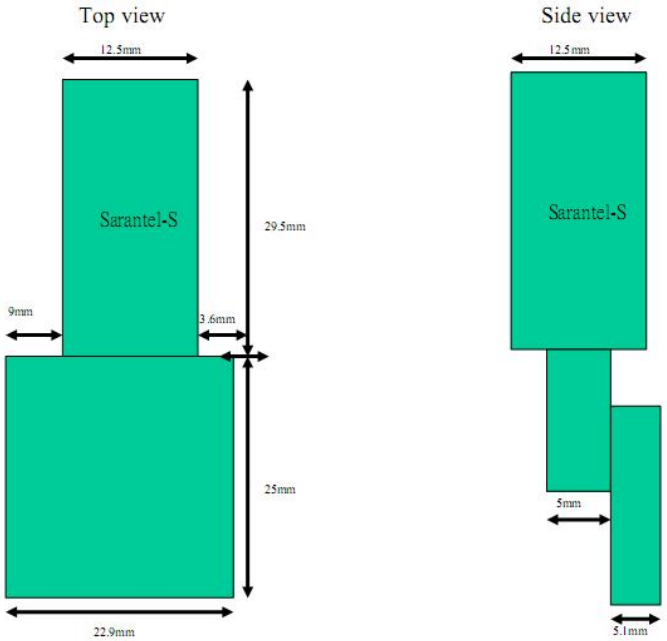

Figure 2: Main board with active antenna dimension

4. Engine Board Connector Pin Define

No	Name	I/O	Description	Remark
1	RX	I	Data input (TTL level)	
2	TX	O	Data output (TTL level)	
3	GND	G	Ground	
4	VIN	I	Supply voltage	3.3V
5	VBAT	I	Backup battery supply voltage	
6	GPS LED	**O**	LED indicator.	

5. Block Diagram

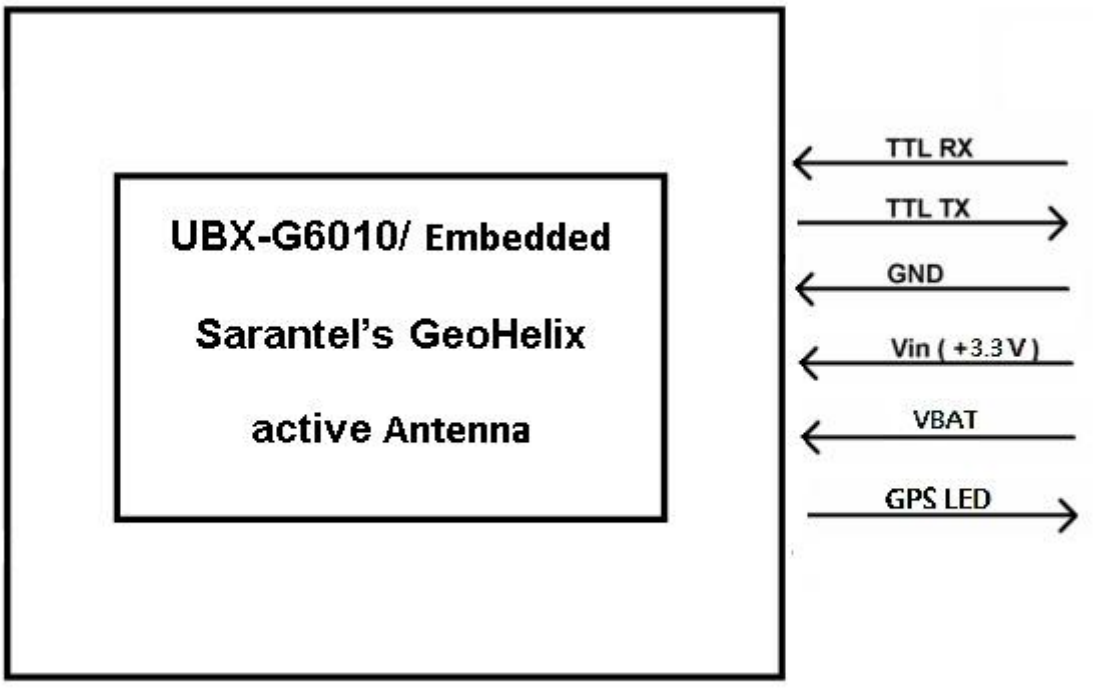

Figure 3: Block Diagram

Electrical Specifications

5.1. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Condition
Power supply voltage	VIN	3.0	3.6	V	
Backup battery voltage	VBAT	2.0	3.6	V	
RF_VOUT output current	Iccrf		100	mA	
GPS_RF_IN	Prfin		-5	dBm	
Human Body Model (HBM: 100pF, 1.5kOhm)	VESD(HBM)		1500	V	RF pins
			2000	V	All pins except RF pins
Machine Model (MM: 200pF, 0.75mH)	VESD(MM)		150	V	RF pins
			200	V	All pins except RF pins
Charged Device Model (CDM)	VESD(CDM)		no rating	V	RF pins
			500	V	All pins except RF pins

Note: Absolute maximum ratings indicate limits beyond which damage to the device may occur.

Appendix A: GENERAL NMEA-0183 FORMAT

The general NMEA format consists of an ASCII string commencing with a '$' character and terminating with a <CR><LF> sequence. NMEA standard messages commence with 'GP' then a 3-letter message identifier.

The message header is followed by a comma delimited list of fields optionally terminated with a checksum consisting of an asterisk '*' and a 2 digit hex value representing the checksum. There is no comma preceding the checksum field. When present, the checksum is calculated as a bitwise exclusive of the characters between the '$' and '*'. As an ASCII representation, the number of digits in each number will vary depending on the number and precision, hence the record length will vary. Certain fields may be omitted if they are not used, in which case the field position is reserved using commas to ensure correct interpretation of subsequent fields.

The tables below indicate the maximum and minimum widths of the fields to allow for buffer size allocation.

$GPGGA

This message transfers global positioning system fix data. The $GPGGA message structure is shown below:

Field	Format	Min chars	Max chars	Notes
Message ID	$GPGGA	6	6	GGA protocol header.
UTC Time	hhmmss.sss	2,2,2.3	2,2,2.3	Fix time to 1ms accuracy.
Latitude	float	3,2.4	3,2.4	Degrees * 100 + minutes.
N/S Indicator	char	1	1	N=north or S=south
Longitude	float	3,2.4	3,2.4	Degree * 100 + minutes.
E/W indicator	Char	1	1	E=east or W=west
Position Fix Indictor	Int	1	1	0: Fix not available or invalid. 1: GPS SPS mode. Fix available.
Satellites Used	Int	2	2	Number of satellites used to calculate fix.
HDOP	Float	1.1	3.1	Horizontal Dilution of Precision.
MSL Altitude	Float	1.1	5.1	Altitude above mean seal level
Units	Char	1	1	M Stands for “meters”.
Geoid Separation	Int	(0) 1	4	Separation from Geoids can be blank.
Units	Char	1	1	M Stands for “meters”.
Age of Differential Corrections	int	(0) 1	5	Age in seconds Blank (Null) fields when DGPS is not used.
Diff Reference Corrections	int	4	4	0000.
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

$GPGLL

This message transfers Geographic position, Latitude, Longitude, and time. The $GPGLL message structure is shown below:

Field	Format	Min chars	Max chars	Notes
Message ID	$GPGLL	6	6	GLL protocol header.
Latitude	Float	1,2.1	3,2.4	Degree * 100 + minutes.
N/S Indicator	Char	1	1	N=north or S=south.
Longitude	Float	1,2.1	3,2.4	Degree * 100 + minutes.
E/W indicator	Character	1	1	E=east or W=west.
UTC Time	hhmmss.sss	1,2,2.1	2,2,2.3	Fix time to 1ms accuracy.
Status	Char	1	1	A Data Valid. V Data invalid.
Mode Indicator	Char	1	1	A Autonomous
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR><LF>	2	2	ASCII 13, ASCII 10.

$GPGSA

This message transfers DOP and active satellites information. The $GPGSA message structure is shown below:

Field	Format	Min chars	Max chars	Notes
Message ID	$GPGSA	6	6	GSA protocol header.
Mode	Char	1	1	M Manual, forced to operate in selected mode. An Automatic switching between modes.
Mode	Int	1	1	1 Fix not available. 2 2D position fix. 3 3D position fix.
Satellites Used	Int	2	2	SV on channel 1.
Satellites Used	Int	2	2	SV on channel 2.
…	.	..	..	..
Satellites Used	Int	2	2	SV on channel 12.
PDOP	Float	1.1	3.1	
HDOP	Float	1.1	3.1	
VDOP	Float	1.1	3.1	
Checksum	*xx	0	3	2 digits
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10

$GPGSV

This message transfers information about satellites in view. The $GPGSV message structure is shown below. Each record contains the information for up to 4 channels, allowing up to 12 satellites in view. In the final record of the sequence the unused channel fields are left blank with commas to indicate that a field has been omitted.

Field	Format	Min chars	Max chars	Notes
Message ID	$GPGSV	6	6	GSA protocol header.
Number of messages	Int	1	1	Number of messages in the message sequence from 1 to 3.
Message number	Int	1	1	Sequence number of this message in current sequence, form 1 to 3.
Satellites in view	Int	1	2	Number of satellites currently in view.
Satellite Id	Int	2	2	Satellite vehicle 1.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Satellite Id	Int	2	2	Satellite vehicle 2.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Satellite Id	Int	2	2	Satellite vehicle 3.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Satellite Id	Int	2	2	Satellite vehicle 4.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

$GPRMC

This message transfers recommended minimum specific GNSS data. The $GPRMC message format is shown below.

Field	Format	Min chars	Max chars	Notes
Message ID	$GPRMC	6	6	RMC protocol header.
UTC Time	hhmmss.sss	1,2,2.1	2,2,2.3	Fix time to 1ms accuracy.
Status	char	1	1	A Data Valid. V Data invalid.
Latitude	Float	1,2.1	3,2.4	Degrees * 100 + minutes.
N/S Indicator	Char	1	1	N=north or S=south.
Longitude	Float	1,2.1	3,2.4	Degrees * 100 + minutes.
E/W indicator	Char	1	1	E=east or W=west.
Speed over ground	Float	1,1	5.3	Speed over ground in knots.
Course over ground	Float	1.1	3.2	Course over ground in degrees.
Date	ddmmyy	2,2,2	2,2,2	Current date.
Magnetic variation	Blank	(0)	(0)	Not used.
E/W indicator	Blank	(0)	(0)	Not used.
Mode	Char	1	1	A Autonomous
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

$GPVTG

This message transfers Velocity, course over ground, and ground speed. The $GPVTG message format is shown below.

Field	Format	Min chars	Max chars	Notes
Message ID	$GPVTG	6	6	VTG protocol header.
Course (true)	Float	1.1	3.2	Measured heading in degrees.
Reference	Char	1	1	T = true heading.
Course (magnetic)	Float	1.1	3.2	Measured heading (blank).
Reference	Char	1	1	M = magnetic heading.
Speed	Float	1.1	4.2	Speed in knots.
Units	Char	1	1	N = knots.
Speed	Float	1.1	4.2	Speed
units	Char	1	1	K = Km/h.
Mode	Char	1	1	A Autonomous
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

$GPTXT

This message transfers various information on the receiver, such as power-up screen, software version etc. The $GPTXT message format is shown below.

Example	Format	Name	Unit	Description
$GPTXT	string	$GPTXT	-	Message ID, TXT protocol header.
01	numeric	xx	-	Total number of messages in this transmission, 01..99
01	numeric	yy	-	Message number in this transmission, range 01..xx
02	numeric	zz	-	Text Identifier, u-blox GPS receivers specify the severity of the message with this number. - 00 = ERROR - 01 = WARNING - 02 = NOTICE - 07 = USER
ADH tech	string	string	-	Any ASCII text
*67	hexadecimal	cs	-	Checksum
-	character	<CR><LF>	-	Carriage Return and Line Feed