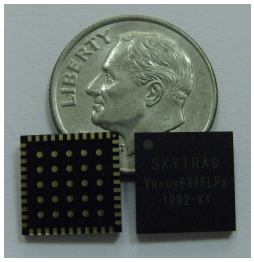
Venus638FLPx GPS Receiver

Data Sheet



10mmx 10mm

Venus638FLPx-L / Venus638FLPx-D

FEATURES

- 20Hz update rate
- -148dBm cold start sensitivity
- -165dBm tracking sensitivity
- 29 second cold start TTFF
- 3.5 second TTFF with AGPS
- 1 second hot start
- 2.5m accuracy
- Multipath detection and suppression
- Jamming detection and mitigation
- SBAS (WAAS / EGNOS) support
- 7-day extended ephemeris AGPS
- 67mW full power navigation
- Works directly with active or passive antenna
- Internal flash for optional 75K point data logging
- Supports external SPI flash memory data logging
- Complete receiver in 10mm x 10mm x 1.3mm size
- Contains LNA, SAW Filter, TCXO, RTC Xtal, LDO
- Pb-free RoHS compliant

Venus638FLPx is a high performance, low cost, single chip GPS receiver targeting mobile consumer and cellular handset applications. It offers very low power consumption, high sensitivity, and best in class signal acquisition and time-to-first-fix performance.

Venus638FLPx contains all the necessary components of a complete GPS receiver, includes 1.2dB cascaded system NF RF front-end, GPS baseband signal processor, 0.5ppm TCXO, 32.768kHz RTC crystal, RTC LDO regulator, and passive components. It requires very low external component count and takes up only 100mm^2 PCB footprint.

Dedicated massive-correlator signal parameter search engine within the baseband enables rapid search of all the available satellites and acquisition of very weak signal. An advanced track engine allows weak signal tracking and positioning in harsh environments such as urban canyons and under deep foliage.

The self-contained architecture keeps GPS processing off the host and allows integration into applications with very little resource.

Venus638FLPx is very easy to use, minimizes RF layout design issues and offers very fast time to market.

Product Series	**Product Description**
Venus638FLPx-L	Flash version GPS receiver (internal 1.2V LDO version) Suitable for Venus634FLPx direct drop-in replacement
Venus638FLPx-D	Flash version GPS receiver (external 1.2V version) Suitable for lower power application using external 1.2V supply

TECHNICAL SPECIFICATIONS

Receiver Type	L1 frequency GPS C/A code SBAS capable 65-channel architecture 8 million time-frequency searches per second
Accuracy	Position 2.5m CEP Velocity 0.1m/sec Timing 60ns
Open Sky TTFF	29 second cold start 3.5 second with AGPS 1 second hot start
Reacquisition	< 1s
Sensitivity	-165dBm tracking -148dBm cold start
Update Rate	1 / 2 / 4 / 5 / 8 / 10 / 20 Hz (default 1Hz)
Dynamics	4G
Operational Limits	Altitude < 18,000m[*1] , Velocity < 515m/s[*1]
Datum	Default WGS-84
Interface	UART LVTTL level
Baud Rate	4800 / 9600 / 38400 / 115200
Protocol	NMEA-0183 V3.01, GGA, GLL, GSA, GSV, RMC, VTG (default GGA, GSA, GSV, RMC, VTG) SkyTraq Binary
Main Supply Voltage	2.8V ~ 3.6V (Venus638FLPx-L) 2.8V ~ 3.6V, 1.08V ~ 1.32V (Venus638FLPx-D)
Backup Voltage	1.5V ~ 6V

Current Consumption

	Enhanced Acquisition	Low Power Acquisition	Tracking
Venus638FLPx-L	68mA @ 3.3V	50mA @ 3.3V	29mA @ 3.3V
Venus638FLPx-D	18mA @ 3.3V 50mA @ 1.2V	18mA @ 3.3V 32mA @ 1.2V	18mA @ 3.3V 11mA @ 1.2V

Assuming 75% efficiency switch-mode 3.3V-to-1.2V regulator is used, then

	Enhanced Acquisition	Low Power Acquisition	Tracking
Venus638FLPx-D	42mA @ 3.3V	33mA @ 3.3V	23mA @ 3.3V

Operating Temperature	-40 ~ +85 deg-C
Storage Temperature	-40 ~ +125 deg-C
Package	LGA69 10mm x 10mm x 1.3mm, 0.8mm pitch

*1: COCOM limit, either may be exceeded but not both

BLOCK DIAGRAM

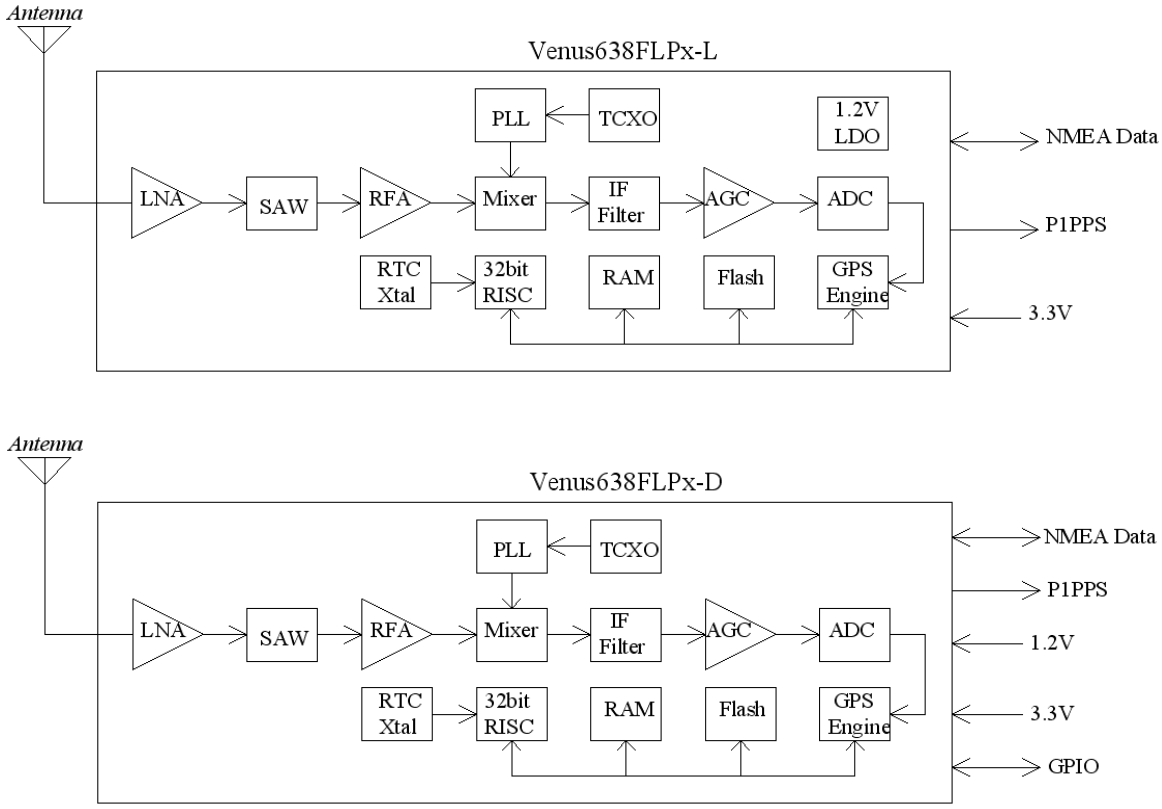


Figure-1 GPS Receiver based on Venus638FLPx

VENUS638FLPx PIN-OUT DIAGRAM

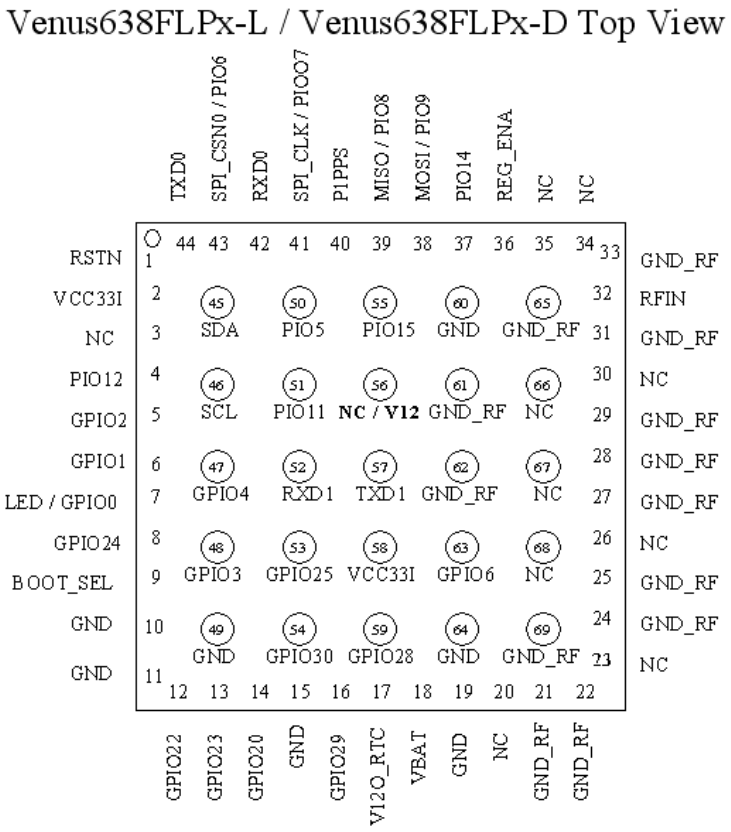


Figure-2b Venus638FLPx Pin-Out Diagram

VENUS638FLPx PIN DEFINITION

Pin Number	Signal Name	Type	Description
1	RSTN	Input	Active LOW reset input, 3.3V LVTTL
2	VCC33I	Power Input	Main voltage supply input, 2.8V ~ 3.6V
3	NC		Not connected, empty pin
4	PIO12	Bidir	General purpose I/O pin, 3.3V LVTTL
5	GPIO2	Bidir	General purpose I/O pin, 3.3V LVTTL
6	GPIO1	Bidir	General purpose I/O pin, 3.3V LVTTL
7	LED / GPIO0	Bidir	Navigation status indicator or General purpose I/O. 3.3V LVTTL
8	GPIO24	Bidir	General purpose I/O pin. 3.3V LVTTL Also serves as Search Engine Mode Selection upon power-up 1: low power acquisition mode 0: enhanced acquisition mode
9	BOOT_SEL	Bidir	Boot mode selection. Pull-high or pull-low using 10K resistor. Must not connect to VCC or GND directly. 1: execute from internal ROM 0: execute from internal Flash memory
10	GND	Power	System ground
11	GND	Power	System ground
12	GPIO22	Bidir	General purpose I/O pin, 3.3V LVTTL
13	GPIO23	Bidir	General purpose I/O pin, 3.3V LVTTL
14	GPIO20	Bidir	General purpose I/O pin, 3.3V LVTTL
15	GND	Power	System ground
16	GPIO29	Bidir	General purpose I/O pin, 3.3V LVTTL
17	V12O_RTC	Power Output	1.2V LDO output for RTC & backup memory. Normally unused.

18	VBAT	Power Input	Supply voltage for internal RTC and backup SRAM, 1.5V ~ 6V. VBAT should be powered by non-volatile supply voltage to have optimal performance. If VBAT is connected to VCC33I, powered off as VCC33I power is removed, then it'll cold start every time. For applications that do not care lesser performance cold starting every time, this pin can be connected to VCC33I.
19	GND	Power	System ground
20	NC		Not connected, empty pin
21	GND_RF	Power	RF section system ground
22	GND_RF	Power	RF section system ground
23	NC		Not connected, empty pin
24	GND_RF	Power	RF section system ground
25	GND_RF	Power	RF section system ground
26	NC		Not connected, empty pin
27	GND_RF	Power	RF section system ground
28	GND_RF	Power	RF section system ground
29	GND_RF	Power	RF section system ground
30	NC		Not connected, empty pin
31	GND_RF	Power	RF section system ground
32	RFIN	Input	GPS signal input, connect to GPS antenna.
33	GND_RF	Power	RF section system ground
34	NC		Not connected, empty pin
35	NC		Not connected, empty pin
36	REG_ENA	Input	Connect to pin-2 VCC33I
37	PIO14	Bidir	General purpose I/O pin, 3.3V LVTTL
38	MOSI / PIO9	Bidir	SPI data output or general purpose I/O pin, 3.3V LVTTL
39	MISO / PIO8	Bidir	SPI data input or general purpose I/O pin, 3.3V LVTTL
40	P1PPS	Output	1 pulse per second output. Active after position fix; goes HIGH for about 4msec, 3.3V LVTTL
41	SPI_CLK / PIOO7	Output	SPI clock or general purpose output pin, 3.3V LVTTL
42	RXD0	Input	Received input of the asynchronous UART port. Used to input binary command to the GPS receiver. 3.3V LVTTL
43	SPI_CSN / PIO6	Bidir	SPI chip select output or general purpose I/O pin, 3.3V LVTTL
44	TXD0	Output	Transmit output of the asynchronous UART port. Used to output standard NMEA-0183 sentence or response to input binary command. 3.3V LVTTL
45	SDA	Bidir	I2C data, 3.3V I/O
46	SCL	Bidir	I2C clock, 3.3V I/O
47	GPIO4	Bidir	General purpose I/O pin, 3.3V LVTTL
48	GPIO3	Bidir	General purpose I/O pin, 3.3V LVTTL
49	GND		System ground
50	PIO5	Output	General purpose output pin, 3.3V LVTTL
51	PIO11	Bidir	General purpose I/O pin, 3.3V LVTTL
52	RXD1	Input	Received input of the asynchronous UART port. 3.3V LVTTL
53	GPIO25	Bidir	General purpose I/O pin, 3.3V LVTTL
54	GPIO30	Bidir	General purpose I/O pin, 3.3V LVTTL
55	PIO15	Bidir	General purpose I/O pin, 3.3V LVTTL
56	NC / V12		NC pin for Venus638FLPx-L 1.2V supply input pin for Venus638FLPx-D
57	TXD1	Output	Transmit output of the asynchronous UART port. 3.3V LVTTL
58	VCC33I	Power Input	Main voltage supply input, 2.8V ~ 3.6V
59	GPIO28	Bidir	General purpose I/O pin, 3.3V LVTTL
60	GND	Power	System ground
61	GND_RF	Power	RF section system ground
62	GND_RF	Power	RF section system ground
63	GPIO6	Bidir	General purpose I/O pin, 3.3V LVTTL
64	GND	Power	System ground
65	GND_RF	Power	RF section system ground
66,67,68	NC		
69	GND_RF	Power	RF section system ground

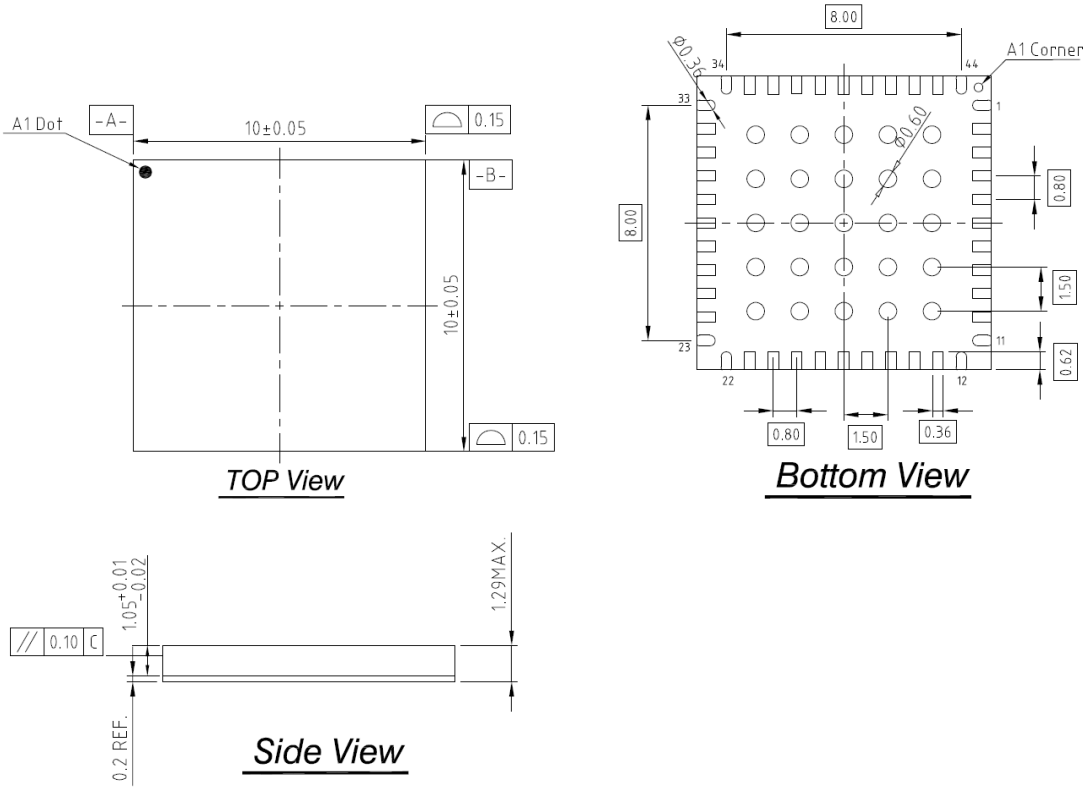
When using Venus638FLPx-L to replace Venus634FLPx, pin-45 ~ pin-69 can all be left unconnected.
When using Venus638FLPx-D, 1.2V need to be supplied at pin-56
The NC pins are to be left unconnected.

DC CHARACTERISTICS OF DIGITAL INTERFACE

Below is when VCC3I is at nominally 3.3V

Parameter	Min.	Typ.	Max.	Units
Input Low Voltage			0.8	Volt
Input High Voltage	2.0			Volt
Output Low Voltage, Iol = 2 ~ 16mA			0.4	Volt
Output High Voltage, Ioh = 2 ~ 16mA	2.9			Volt

MECHANICAL DIMENSION



RECOMMENDED PCB FOOTPRINT

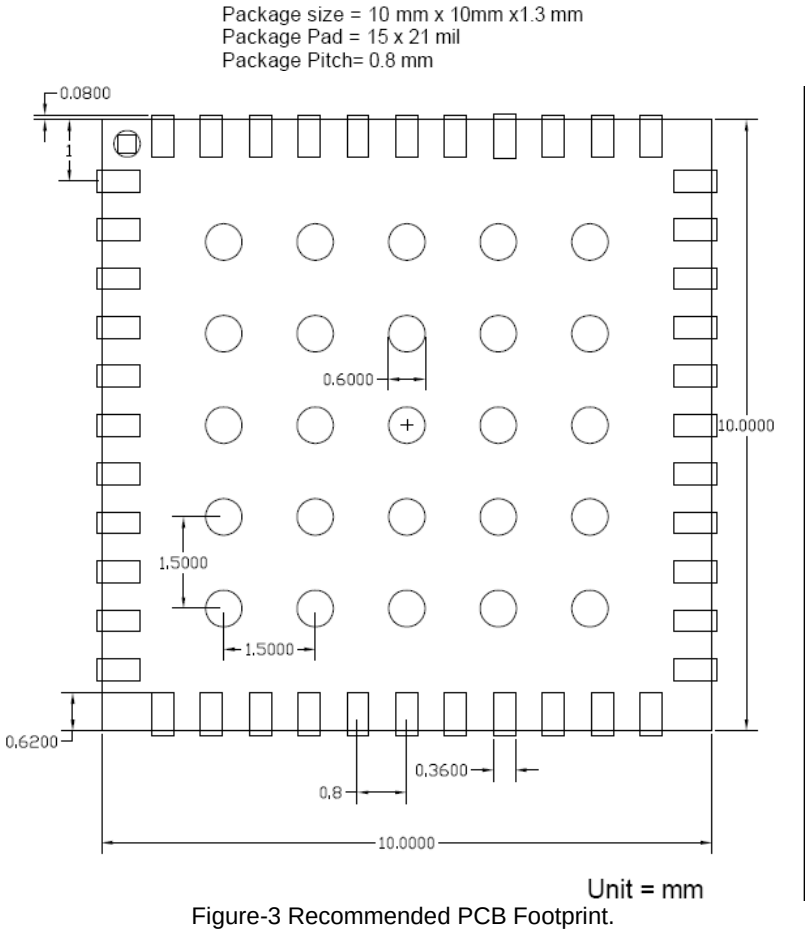
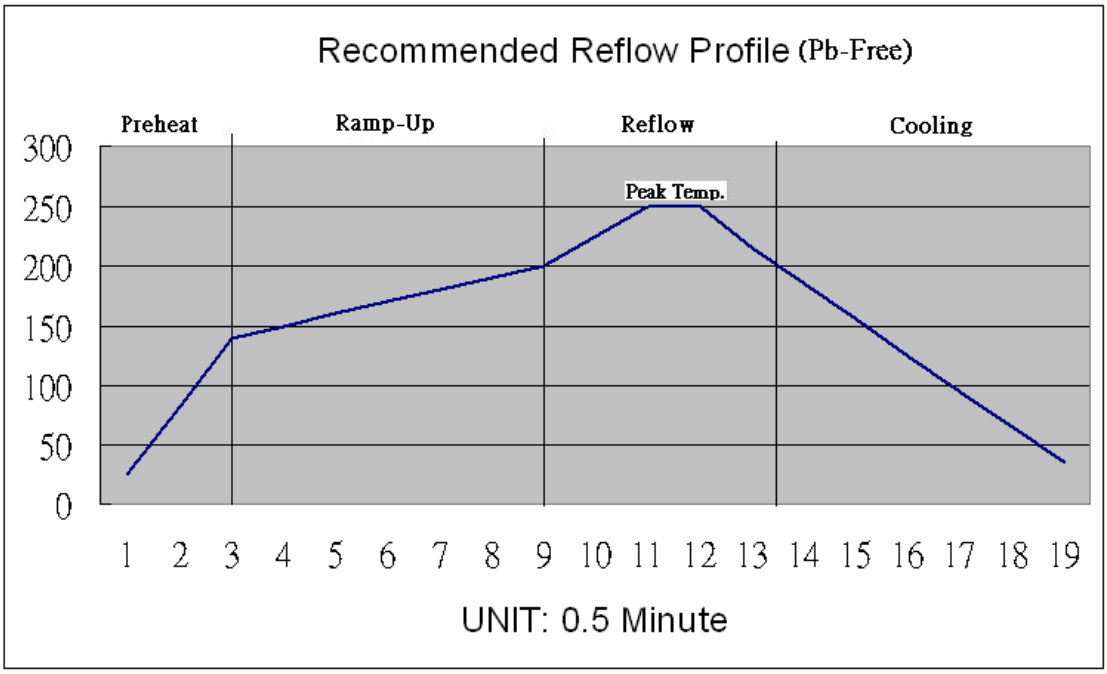


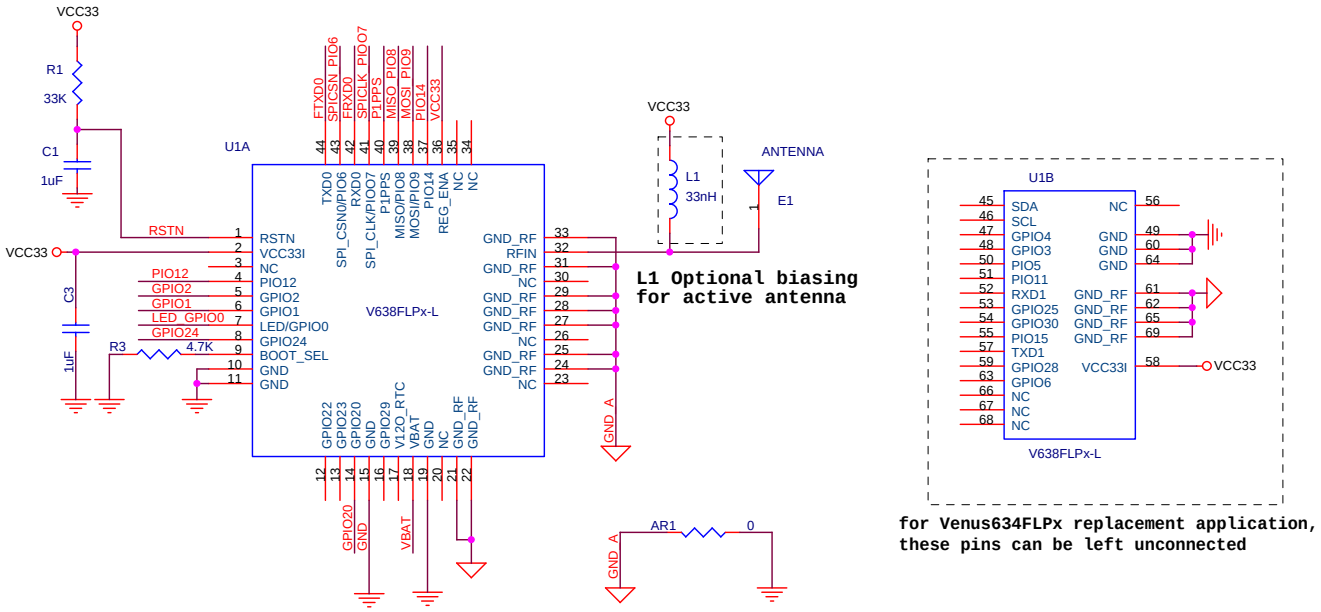
Figure-3 Recommended PCB Footprint.

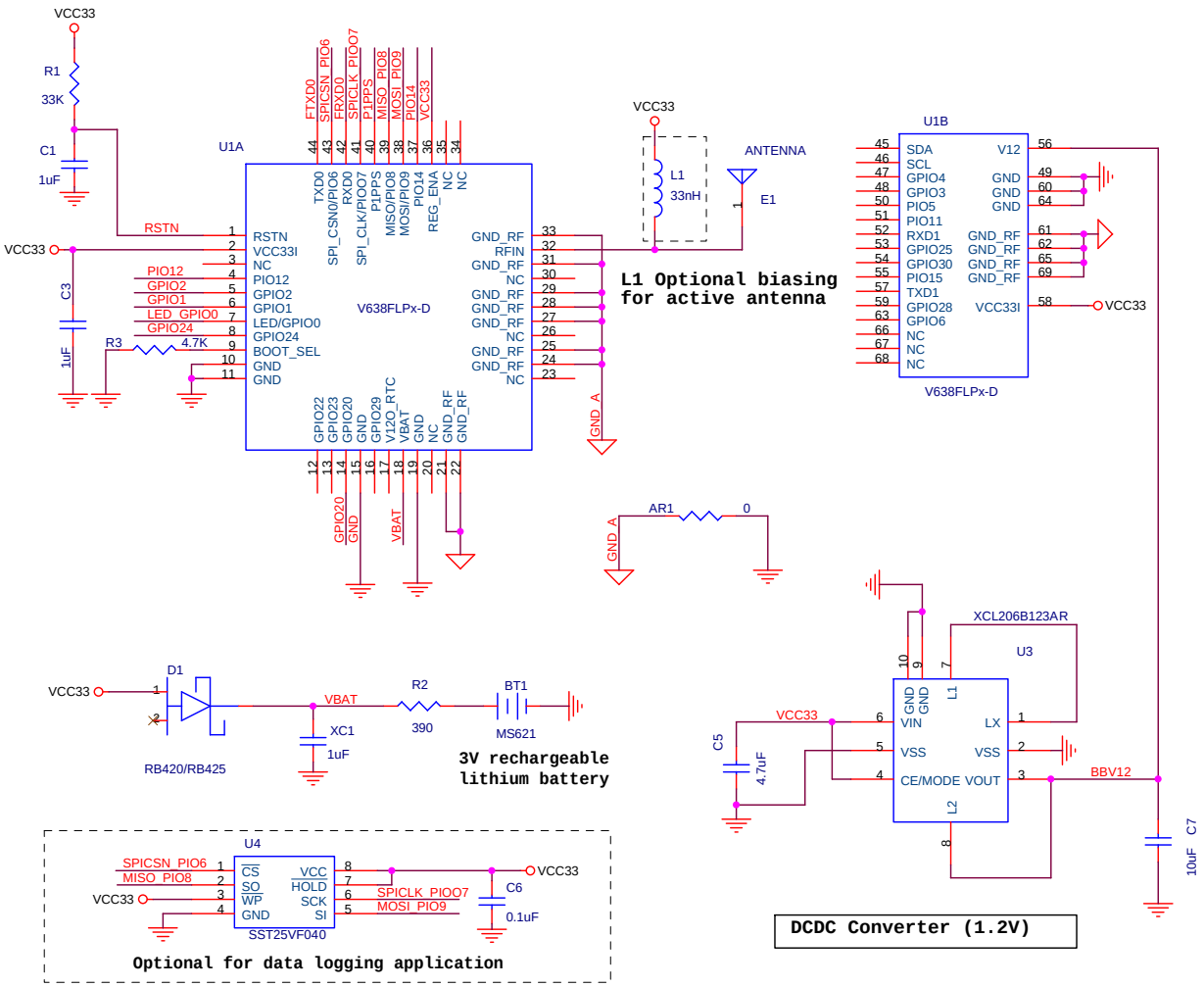
RECOMMENDED REFLOW PROFILE



Temperature (℃)	25	82.5	140	150	160	170	180	190	200	225	250	250	215	185	155	125	95	65	35
Time(minute)	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9

Profile Description	SnPb Eutectic Process	Lead Free Process
Preheat		
Maximum Temperature	100+/-10 ℃	140+/-10 ℃
Time(ΔT)	40~60s	50~70s
Ramp-Up		
Ramp-Up Rate	1 ℃/s Max.	1 ℃/s Max.
Time(ΔT)	120~150s	160~200s
Reflow		
Maximum Temperature	Peak Temp.	Peak Temp.
Minimum Temperature	180+/-5℃	200+/-10℃
Peak Temperature	220+/-2℃	250+/-2℃
Time(ΔT) during Peak Temp.+/-2℃	10~30s	20~40s
Reflow Time(ΔT)	120~150s	120~150s
Cooling		
Cooling Rate	1.5 ℃/s Max	1.5 ℃/s Max
Time(ΔT)	60~120s	150~180s


VCC33
R1
33K
C1
1uF
U1A
RSTN
VCC33
C3
1uF
PIO12
GPIO2
GPIO1
LED_GPIO0
GPIO24
R3
4.7K
RSTN
VCC33I
NC
PIO12
GPIO2
GPIO1
LED/GPIO0
GPIO24
BOOT_SEL
GND
GND
V638FLPx-L
FTXD0
SPICSN_PIO6
FRXD0
SPICLK_PIO07
P1PPS
MISO_PIO8
MOSI_PIO9
PIO14
VCC33
NC
NC
TXD0
SPI_CSN0/PIO6
RXD0
SPI_CLK/PIO07
P1PPS
MISO/PIO8
MOSI/PIO9
PIO14
REG_ENA
NC
NC
GND_RF
RFIN
GND_RF
NC
GND_RF
GND_RF
GND_RF
NC
GND_RF
GND_RF
NC
GND_A
GPIO22
GPIO23
GPIO20
GND
GPIO29
V12O_RTC
VBAT
GND
NC
GND_RF
GND_RF
GPIO20
GND
VBAT
VCC33
L1
33nH
ANTENNA
E1
L1 Optional biasing
for active antenna
GND_A
AR1
0
U1B
SDA
SCL
GPIO4
GPIO3
PIO5
PIO11
RXD1
GPIO25
GPIO30
PIO15
TXD1
GPIO28
GPIO6
NC
NC
NC
NC
GND
GND
GND
GND_RF
GND_RF
GND_RF
GND_RF
VCC33I
VCC33
V638FLPx-L
for Venus634FLPx replacement application,
these pins can be left unconnected
VCC33
D1
RB420/RB425
VBAT
R2
390
BT1
MS621
XC1
1uF
3V rechargeable
lithium battery
U4
SPICSN_PIO6
MISO_PIO8
VCC33
CS
SO
WP
GND
VCC
HOLD
SCK
SI
SPICLK_PIO07
MOSI_PIO9
C6
0.1uF
VCC33
SST25VF040
Optional for data logging application
GND_A
PIO12
GND
RSTN
VCC33
GPIO1
VBAT
GPIO2
SPICSN_PIO6
SPICLK_PIO07


VCC33
R1
33K
C1
1uF
U1A
RSTN
PIO12
GPIO2
GPIO1
LED_GPIO0
GPIO24
R3
4.7K
C3
1uF
V638FLPx-D
L1
33nH
ANTENNA
E1
L1 Optional biasing
for active antenna
U1B
V638FLPx-D
AR1
0
GND_A
D1
RB420/RB425
R2
390
BT1
MS621
XC1
1uF
3V rechargeable
lithium battery
U3
XCL206B123AR
C5
4.7uF
BBV12
C7
10uF
U4
SST25VF040
C6
0.1uF
Optional for data logging application
DCDC Converter (1.2V)

APPLICATION CIRCUIT INTERFACE SIGNALS

GND_A:	RF ground
LED:	Signal to indicate GPS position status, 3.3V LVTTL. Active low for no-fix, toggle every second after position fix.
PSE_SEL:	Search engine mode selection, sampled only at end of power-on reset cycle 1: Low power acquisition mode 0: Enhanced acquisition mode
GND:	Digital ground
P1PPS:	1 pulse per second time-mark (3.3V LVTTL)
RSTN:	Active low reset input
VCC33:	3.3V power input
FRXD0:	UART input (3.3V LVTTL)
FTXD0:	UART output (3.3V LVTTL)
VBAT:	Battery-backed RTC and SRAM supply input, 1.5V ~ 6V, must not be unconnected.

APPLICATION INFORMATION

1. For fast-rising power supply, a simple series R/C reset delay to pin-1, RSTN, as indicated in the application circuit is suitable. For system having slow-rising power supply, a reset IC providing 2~5ms reset duration may be necessary.

2. The RF input of Venus638FLPx is already matched to 50-ohm. Passive antenna matched to 50-ohm can be directly applied.

3. For using Venus638FLPx with active antenna, one with gain in range of 10~30dB and noise figure < 2dB can be used. Power to the active antenna needs to be applied externally.

4. Pin-18 VBAT supplies backup power to the real-time clock and backup SRAM for fast startup. For portable applications where there is battery with voltage in range of 1.5V ~ 6.0V as the main source, the VBAT pin can be directly connected to it. If VBAT is connected to main power as pin-2, no supply voltage as Venus638FLPx is powered off, then it'll cold start every time and GPS performance will not be optimal.

5. Like BGA device, the Venus638FLPx is moisture sensitive. It needs to be handled with care to void damage from moisture absorption and SMT re-flow. The device should be baked for 24 hours at 125-degC before mounting for SMT re-flow if it has been removed from the protective seal for more than 48[*1] hours.

6. The supported SPI Flash memory verified for data logging application are:

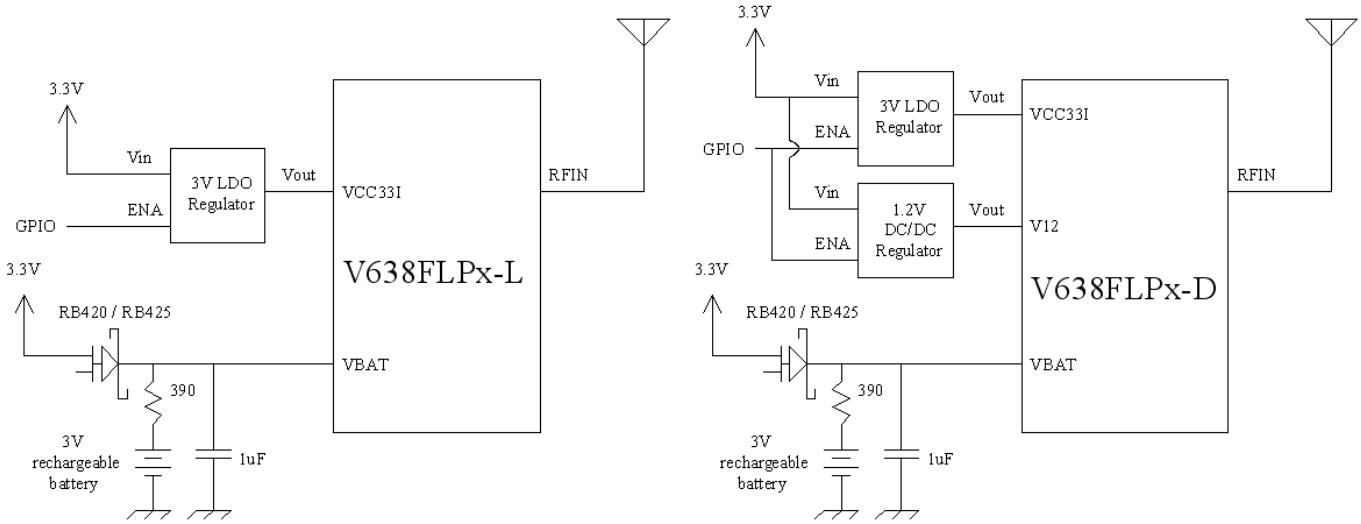
Manufacturer	Device ID	Size
EON	EN25F040	4Mbit
EON	EN25F080	8Mbit
MXIC	MX25L400	4Mbit
MXIC	MX25L800	8Mbit
MXIC	MX25L1605	16Mbit
MXIC	MX25L3205	32Mbit
MXIC	MX25L6405	64Mbit
WINBOND	W25X40	4Mbit
WINBOND	W25X80	8Mbit
WINBOND	W25X16	16Mbit
WINBOND	W25X32	32Mbit
WINBOND	W25X64	64Mbit
SST	SST25LF040	4Mbit
SST	SST25LF080	8Mbit
SST	SST25VF016	16Mbit
SST	SST 25VF032	32Mbit

7. The P1PPS pin must not be pulled-high during power on reset, or it'll enter into debug mode and freeze.

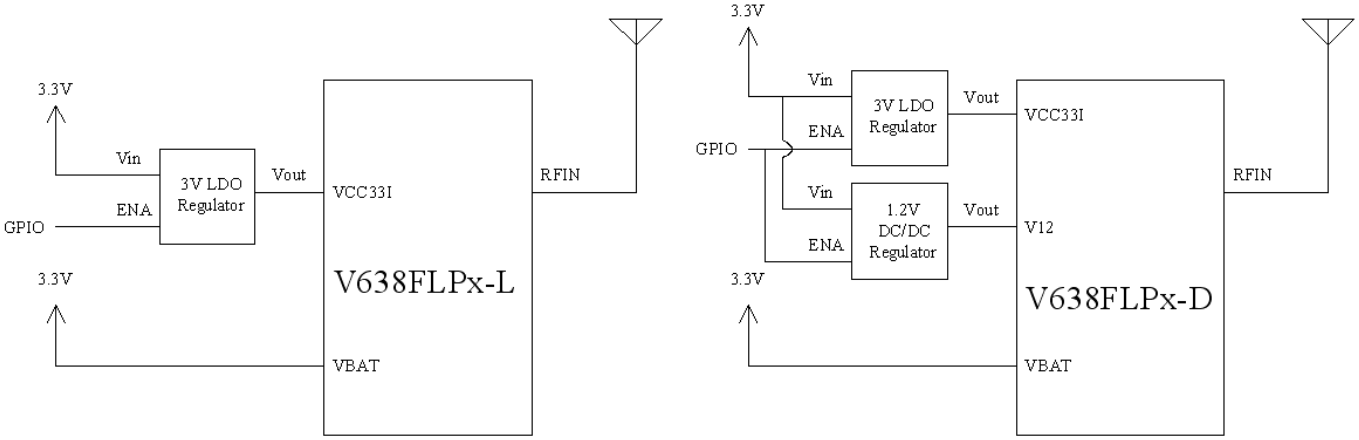
*1: Actual will be longer, moisture sensitivity level still undergoing verification.

SLEEP MODE

For application requiring sleep mode, it can be implemented using regulator with enable control as below figure shows. To put Venus638FLPx to sleep, the power to Venus638FLPx is cut off by disabling the regulator via host processor GPIO pin. In sleep mode, VBAT consume less than 10uA. Fast start up operation is provided by keeping supply voltage to VBAT constant, retaining the internal data and keep RTC running while Venus638FLPx is put to sleep or when supply 3.3V power is removed.

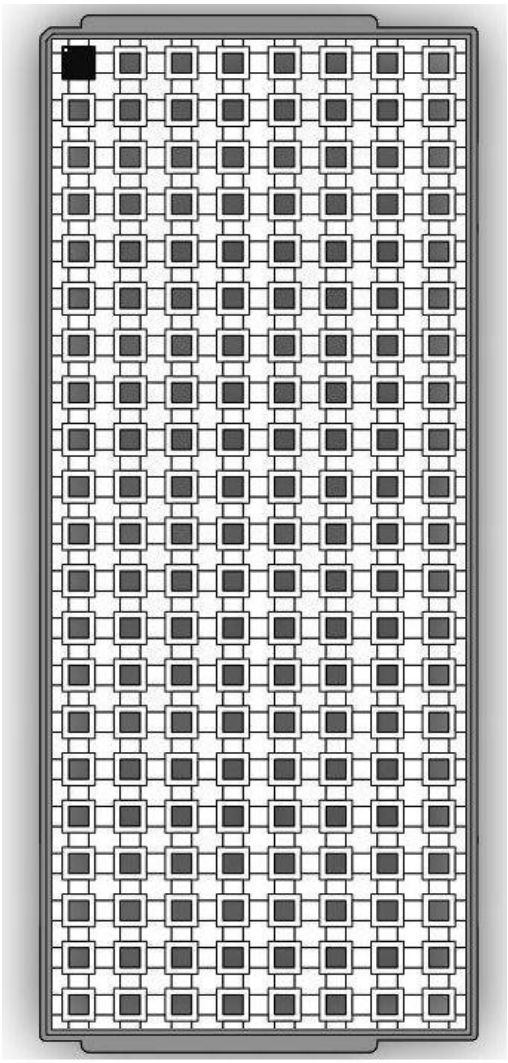


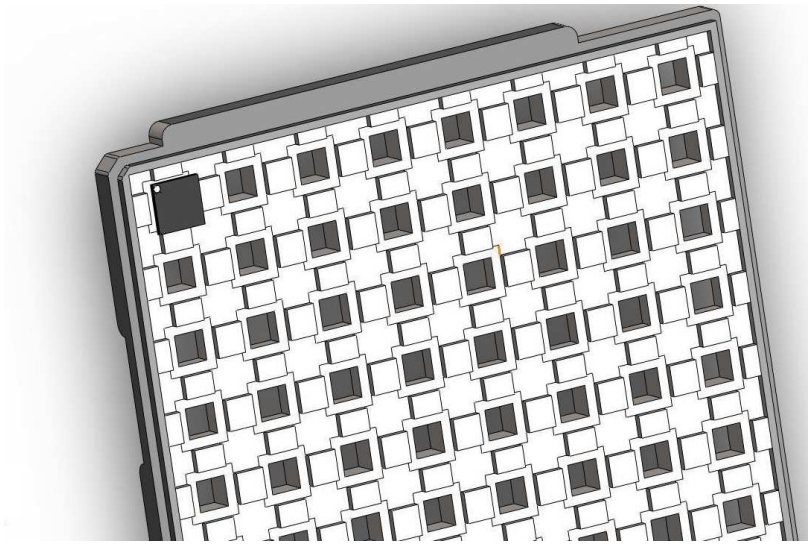
For applications needing sleep mode but cannot have extra cost of adding a rechargeable backup supply battery, it can be implemented as below figure shows. It will provide fast start up when Venus638FLPx is put to sleep and awakened, but will cold start every time when the 3.3V supply voltage is removed and re-applied again.



When using sleep mode, add 10K series resistor on pin-42 RXD0 and pin-44 TXD0.

PACKAGE





NMEA MESSAGES

The full descriptions of supported NMEA messages are provided at the following paragraphs.

GGA - Global Positioning System Fix Data

Time, position and fix related data for a GPS receiver.

Structure:

$GPGGA,hhmmss.sss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,x.x,x.x,M,,,,xxxx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11

Example:

$GPGGA,111636.932,2447.0949,N,12100.5223,E,1,11,0.8,118.2,M,,,,0000*02<CR><LF>

Field	Name	Example	Description
1	UTC Time	111636.932	UTC of position in hhmmss.sss format, (000000.000 ~ 235959.999)
2	Latitude	2447.0949	Latitude in ddmm.mmmm format Leading zeros transmitted
3	N/S Indicator	N	Latitude hemisphere indicator, 'N' = North, 'S' = South
4	Longitude	12100.5223	Longitude in dddmm.mmmm format Leading zeros transmitted
5	E/W Indicator	E	Longitude hemisphere indicator, 'E' = East, 'W' = West
6	GPS quality indicator	1	GPS quality indicator 0: position fix unavailable 1: valid position fix, SPS mode 2: valid position fix, differential GPS mode 3: GPS PPS Mode, fix valid 4: Real Time Kinematic. System used in RTK mode with fixed integers 5: Float RTK. Satellite system used in RTK mode. Floating integers 6: Estimated (dead reckoning) Mode 7: Manual Input Mode 8: Simulator Mode
7	Satellites Used	11	Number of satellites in use, (00 ~ 12)
8	HDOP	0.8	Horizontal dilution of precision, (00.0 ~ 99.9)
9	Altitude	108.2	mean sea level (geoid), (-9999.9 ~ 17999.9)
10	DGPS Station ID	0000	Differential reference station ID, 0000 ~ 1023 NULL when DGPS not used
11	Checksum	02	

GLL – Latitude/Longitude

Latitude and longitude of current position, time, and status.

Structure:

$GPGLL,ddmm.mmmm,a,dddmm.mmmm,a,hhmmss.sss,A,a*hh<CR><LF>

1 2 3 4 5 6 7 8

Example:

$GPGLL,2447.0944,N,12100.5213,E,112609.932,A,A*57<CR><LF>

Field	Name	Example	Description
1	Latitude	2447.0944	Latitude in ddmm.mmmm format Leading zeros transmitted
2	N/S Indicator	N	Latitude hemisphere indicator 'N' = North 'S' = South
3	Longitude	12100.5213	Longitude in dddmm.mmmm format Leading zeros transmitted
4	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
5	UTC Time	112609.932	UTC time in hhmmss.sss format (000000.000 ~ 235959.999)
6	Status	A	Status, 'A' = Data valid, 'V' = Data not valid
7	Mode Indicator	A	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
8	Checksum	57	

GSA – GNSS DOP and Active Satellites

GPS receiver operating mode, satellites used in the navigation solution reported by the GGA or GNS sentence and DOP values.

Structure:

$GPGSA,A,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x*hh<CR><LF>

1 2 3 3 3 3 3 3 3 3 3 3 3 3 4 5 6 7

Example:

$GPGSA,A,3,05,12,21,22,30,09,18,06,14,01,31,,1.2,0.8,0.9*36<CR><LF>

Field	Name	Example	Description
1	Mode	A	Mode 'M' = Manual, forced to operate in 2D or 3D mode 'A' = Automatic, allowed to automatically switch 2D/3D
2	Mode	3	Fix type 1 = Fix not available 2 = 2D 3 = 3D
3	Satellite used 1~12	05,12,21,22,30,09,18,06,14,01,31,,	Satellite ID number, 01 to 32, of satellite used in solution, up to 12 transmitted
4	PDOP	1.2	Position dilution of precision (00.0 to 99.9)
5	HDOP	0.8	Horizontal dilution of precision (00.0 to 99.9)
6	VDOP	0.9	Vertical dilution of precision (00.0 to 99.9)
7	Checksum	36	

GSV – GNSS Satellites in View

Number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value. Four satellites maximum per transmission.

Structure:

$GPGSV,x,x,xx,xx,xx,xxx,xx,…,xx,xx,xxx,xx *hh<CR><LF>

1 2 3 4 5 6 7 4 5 6 7 8

Example:

$GPGSV,3,1,12,05,54,069,45,12,44,061,44,21,07,184,46,22,78,289,47*72<CR><LF>

$GPGSV,3,2,12,30,65,118,45,09,12,047,37,18,62,157,47,06,08,144,45*7C<CR><LF>

$GPGSV,3,3,12,14,39,330,42,01,06,299,38,31,30,256,44,32,36,320,47*7B<CR><LF>

Field	Name	Example	Description
1	Number of message	3	Total number of GSV messages to be transmitted (1-3)
2	Sequence number	1	Sequence number of current GSV message
3	Satellites in view	12	Total number of satellites in view (00 ~ 12)
4	Satellite ID	05	Satellite ID number, GPS: 01 ~ 32, SBAS: 33 ~ 64 (33 = PRN120)
5	Elevation	54	Satellite elevation in degrees, (00 ~ 90)
6	Azimuth	069	Satellite azimuth angle in degrees, (000 ~ 359)
7	SNR	45	C/No in dB (00 ~ 99) Null when not tracking
8	Checksum	72	

RMC – Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data provided by a GNSS navigation receiver.

Structure:

$GPRMC,hhmmss.sss,A,dddmm.mmmm,a,dddmm.mmmm,a,x.x,x.x,ddmmyy,,,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11

Example:

$GPRMC,111636.932,A,2447.0949,N,12100.5223,E,000.0,000.0,030407,,,A*61<CR><LF>

Field	Name	Example	Description
1	UTC time	0111636.932	UTC time in hhmmss.sss format (000000.00 ~ 235959.999)
2	Status	A	Status 'V' = Navigation receiver warning 'A' = Data Valid
3	Latitude	2447.0949	Latitude in dddmm.mmmm format Leading zeros transmitted
4	N/S indicator	N	Latitude hemisphere indicator 'N' = North 'S' = South
5	Longitude	12100.5223	Longitude in dddmm.mmmm format Leading zeros transmitted
6	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
7	Speed over ground	000.0	Speed over ground in knots (000.0 ~ 999.9)
8	Course over ground	000.0	Course over ground in degrees (000.0 ~ 359.9)
9	UTC Date	030407	UTC date of position fix, ddmmyy format
10	Mode indicator	A	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
11	checksum	61	

VTG – Course Over Ground and Ground Speed

The Actual course and speed relative to the ground.

Structure:

GPVTG,x.x,T,,M,x.x,N,x.x,K,a*hh<CR><LF>

1 2 3 4 5

Example:

$GPVTG, 000.0,T,,M,000.0,N,0000.0,K,A*3D<CR><LF>

Field	Name	Example	Description
1	Course	000.0	True course over ground in degrees (000.0 ~ 359.9)
2	Speed	000.0	Speed over ground in knots (000.0 ~ 999.9)
3	Speed	0000.0	Speed over ground in kilometers per hour (0000.0 ~ 1800.0)
4	Mode	A	Mode indicator 'N' = not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
5	Checksum	3D	

ORDERING INFORMATION

Part Number	Description
Venus638FLPx-L	Flash version GPS receiver (internal 1.2V LDO version)
Venus638FLPx-D	Flash version GPS receiver (external 1.2V version)

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Change Log

Version 0.7, January 25, 2011

1. Changed latitude, longitude, speed, heading number of digits back to original format due to customer backward compatibility issue

Version 0.6, October 20, 2010

1. Edited performance spec due to firmware enhancement
2. Added 1 more decimal digit to latitude, longitude, speed, heading in NMEA sentence

Version 0.5, August 31, 2010

1. Added application information on P1PPS pin

Version 0.4, August 3, 2010

1. Pin-1 orientation in the shipping tray rotated 90-degree

Version 0.3, April 6, 2010

1 Modified for Flash type

Version 0.2, March 24, 2010

1. Added current consumption number for –D version at 3.3V

Version 0.1, February 24, 2010

1. Initial release

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