



CONDOR C1722 GPS RECEIVER MODULE

TECHNICAL HIGHLIGHTS

Receiver: GPS L1 frequency (1575.42 MHz), C/A code, 22-channel continuous tracking

NMEA output and input: serial port, USB port

On-board low noise amplifier

Use with passive or active antennas; with active antennas, the maximum gain at the RF input is 25 dB

Built-in antenna circuit protection

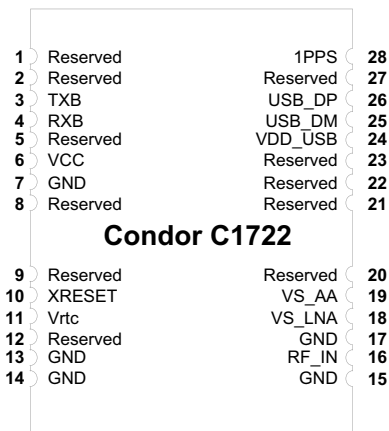
SBAS (WAAS, EGNOS, MSAS) capable

aGPS capable

Update rate up to 5 Hz

PPS timing output

28 surface mount castellations



Pin Out Diagram

GENERAL OVERVIEW

Trimble's Condor C1722 GPS receiver module is a smart alternative to a GPS chipset for many consumer and commercial positioning applications. Use the C1722 to bring innovative products to market faster.

The Condor C1722 receiver features powerful positioning performance in a 17.0 x 22.4 x 2.13 mm package.

The module's 28 reflow-solderable surface-mount edge castellations provide an interface for your design without the need for costly I/O and RF connectors.

The Condor C1722 provides an L1 Frequency GPS receiver, with NMEA protocol from both a serial port and a USB port, and also a PPS timing output.



Pin 1 location — Top View: Condor C1722

The C1722 has an onboard low noise amplifier (LNA) that is compatible with both active and passive antenna implementations.

The C1722 has built-in antenna detection for open and short circuit conditions; alerts are on by default, but can be turned off by command.

Choose the Condor C1722 for top tier positioning performance, the best components, and the highest production quality standards.

PIN#	FUNCTION	I/O	DESCRIPTION
1–2	Reserved		Do not connect
3	TXB	Output	Serial port Transmit @ 2.8 V LVTTTL
4	RXB	Input	Serial port Receive @ 2.8 V LVTTTL
5	Reserved		Do not connect
6	V _{CC}	Input	Main power supply 3.0 V to 3.6 V
7	GND		Ground
8–9	Reserved		Do not connect
10	XRESET	Input	Pull low 100 ms for reset; do not connect if not used
11	V _{RTC}	Input	Optional backup power 2.0 V to V _{CC}
12	Reserved		Do not connect
13–15	GND		Ground
16	RF_IN	Input	GPS signal input 50 Ω unbalanced (coaxial) RF input
17	GND		Ground
18	VS_LNA	Output	Output voltage RF section *
19	VS_AA	Input	Antenna bias voltage *
20–23	Reserved		Do not connect
24	VDD_USB	Input	USB power (V _{DDU})
25	USB_DM	Input/Output	USB data minus
26	USB_DP	Input/Output	USB data plus
27	Reserved		Do not connect
28	1PPS	Output	PPS Interface Time pulse

* If not using antenna detection, connect pin 18 to 19

GPS PERFORMANCE SPECIFICATIONS

GPS performance statistics are clear view, stationary. Sensitivity based on signals measured at the antenna.

PARAMETER	VALUE(S)
Update Rate	1 Hz (default), up to 5 Hz
Number of Channels	22
Accuracy	
Position (autonomous)	<2.5 m 50%, <5 m 90%
Position (SBAS)	<2 m 50%, <4 m 90%
Altitude (autonomous)	<5 m 50%, <8 m 90%
Altitude (SBAS)	<3 m 50%, <5 m 90%
PPS	< ±25 ns @ 50%
Acquisition time	
Re-acquisition	2 s 50%
Hot Start	2 s 50%
Warm Start	35 s 50%
Cold Start	38 s 50%
Sensitivity	
Tracking	-160 dBm
Acquisition	-146 dBm
Dynamics	
Acceleration	2 g
Max Operational Velocity	515 m/s

ELECTRICAL SPECIFICATIONS

PARAMETER	VALUE(S)
Serial Interface – UART	
Level	2.8 V LVTTTL level
USB Interface	
	USB 2.0, 1 differential serial line NMEA
PPS Interface	
Level	2.8 V LVTTTL level
PPS Accuracy to UTC	< ±25 ns @ 50%
Pulse Width	4.2 µs default (configurable)
GPS Input RF Interface	
	GPS signal input 50 Ω unbalanced (coaxial) RF input
Main Power Supply	
V _{CC} DC Levels	3.0 V to 3.6 V; 3.3 V typical
Consumption (current)	<37 mA
RTC and Backup Power Supply	
V _{RTC} DC Levels	2.0 V to V _{CC}
Consumption (current)	6 µA typ @ +25°C
USB Supply Power (V _{DDU})	
	3.0 V to 3.6 V; 3.3 V typical

GPS COMMUNICATION PARAMETERS

GPS output is available from either a serial interface (UART) or a USB interface. The output adheres to NMEA 0183 protocol with the following characteristics.

PARAMETER	VALUE(S)
Protocol	NMEA 0183
Baud Rate	
Default	9600
Other	4800, 19200, 38400, 57600, 115200
Message Output Rate	Up to 5 Hz
Number of message types restricted by baud rate	

NMEA 0183 MESSAGES

MESSAGE	DEFAULT	DESCRIPTION
GGA	Default	GPS fix data
GSA	Default	GPS DOP and active satellites
GSV	Default	GPS satellites in view
RMC	Default	Recommended minimum specific GPS/Transit data
CHN	Other	GPS channel status
GLL	Other	Geographic position – Latitude/Longitude
VTG	Other	Track Made Good and Ground Speed
ZDA	Other	Time and date

ENVIRONMENTAL SPECIFICATIONS

PARAMETER	VALUE(S)
Temperature	
Operating	-40 °C to +85 °C
Storage	-55 °C to +105 °C
Humidity	
	5% to 95% non-condensing @ 60 °C
Vibration	
5 Hz to 20 Hz	0.008 g ² /Hz
20 Hz to 100 Hz	0.05 g ² /Hz
100 Hz to 900 Hz	-3 dB/octave

PHYSICAL SPECIFICATIONS

PARAMETER	VALUE(S)
Dimensions	17.0 x 22.4 x 2.13 mm
Weight	0.953 g

ABSOLUTE MAXIMUM RATINGS

CAUTION—Absolute maximum ratings indicate conditions beyond which permanent damage to the device may occur. Electrical specifications do not apply when operating the device outside its recommended operating conditions.

PARAMETER		MIN	MAX	UNIT
Main power supply voltage	(V_{CC})	-0.3	4.0	V
RTC power supply voltage	(V_{RTC})	-0.3	4.0	V
USB supply voltage	(V_{DDU})	-0.3	3.6	V
Antenna input power at RF input	(dBm)		+10 max	dBm
Storage temperature	(T_s)	-55	+105	°C

RECOMMENDED CONDITIONS OF OPERATION

PARAMETER		MIN	MAX	UNIT
Primary power supply voltage ¹	(V_{CC})	3.0	3.6	V
RTC power supply voltage	(V_{RTC})	2.0	V_{CC}	V
USB supply voltage	(V_{DDU})	3.0	3.6	V
Input pin voltage range (RXB, Reserved Pins, XRESET)				
with Status = High	(V_{IH})	2.0	V_{CC}	V
with Status = Low	(V_{IL})	-0.3	0.8	V
Output pin voltage range (TXB)				
with Status = High ($I_{OH} = 1.6$ to 14 mA)	(V_{OH})	2.4	V_{CC}	V
with Status = Low ($I_{OL} = 1.6$ to 14 mA)	(V_{OL})	-0.3	0.4	V
Hardware XRESET (assert XRESET pin)	(XRESET)	100		ms
Ambient operating temperature	(T_A)	-40	+85	°C

1. See "Supply Voltage Requirement" below.

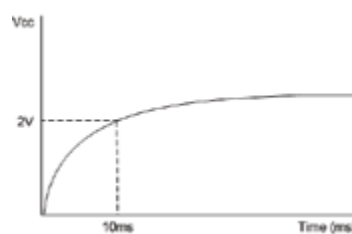
ELECTRICAL CHARACTERISTICS

Characteristics apply to corresponding operating conditions as stated, with typical @25 °C. Measurements are made over temperature range -40 °C to +85 °C. Measured results are typical and not a guarantee of performance.

PARAMETER	TYP	MAX	UNIT
Current draw, continuous tracking		37	mA
Power supply, power consumption, continuous tracking		133	mW
Current draw, standby mode (only Vrtc)	6	14.5	µA
Supply ripple noise, 1 Hz to 1 MHz		50	mV _{PP}
Supply ripple noise, GPS TCXO frequency 16.368 MHz ±5 kHz		1	mV _{PP}
Input gain at RF input		25	dB
External LNA noise		2	dB

SUPPLY VOLTAGE REQUIREMENT

The Primary Supply Voltage (V_{CC}) slope from 0 V to 2 V must have a rise time that is less than 10 ms.



Supply Voltage Requirement

FEATURES

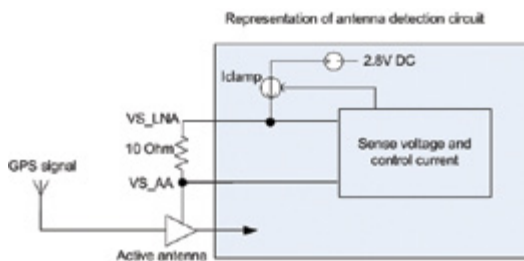
Antenna Input RF_IN (Pin 16) and Circuit Detection

The RF input pin is the 50 Ω unbalanced GPS RF input, and can be used with active or passive antennas.

For active antenna applications, the C1722 has built-in antenna circuit status detection for open and short circuit conditions. By default, the open and short alerts are turned on. You can turn them off using the \$PMTK324 command.

The SHORT alert is triggered if more than 19 mA is drawn from the antenna pin; the current is further restricted to a maximum of 33 mA by a current clamp.

This diagram shows the active antenna drawing current through an external 10 Ω sense resistor, supplied by an internal 2.8 V regulator. As a result, there will be an associated voltage drop as the current increases.



Antenna Detection Circuit

1PPS – Pulse-Per-Second Output (Pin 28)

This logic level output provides a 1 Hz timing signal to external devices. The default pulse width of this signal is 4.2 μs. (The pulse width is configurable by using the \$PMTK324 command.)

For timing applications, you must capture the time from the ZDA timing message. Position messages contain a timestamp that can be 1 to 2 seconds in the past. Therefore, you can take the following steps to ensure that you acquire the correct time.

Do the following to acquire the correct time:

1. Confirm that the UTC offset has been downloaded (\$PMTK457) and that the receiver is generating 3D fixes (GSA). This eliminates the UTC offset jump.
2. Confirm that the receiver is configured so that it only outputs a PPS on a 3D fix (\$PMTK424).
3. Capture the time from the ZDA packet. Once time is acquired, add 1 to the whole second on the next PPS for the correct time.

USB Data IO and Power (Pins 24 – 26)

There are three connectors for one differential serial USB line. USB_DM (pin 25) is for USB data minus; USB_DP (pin 26) is for USB data plus. VDD_USB (pin 24) is for USB power. Refer to the Condor manual for more information on USB.

Serial Port Default Settings (Pins 3, 4)

The Condor C1722 GPS module supports one serial port. Baud rate is user configurable. Data bits, parity and stop bits are not. Flow control is not available.

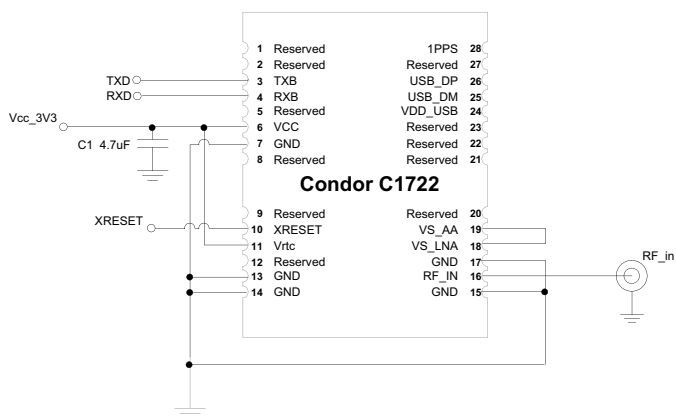
XRESET (Pin 10)

Connects to the host system reset controller or GPIO for host-controlled resetting of the GPS module.

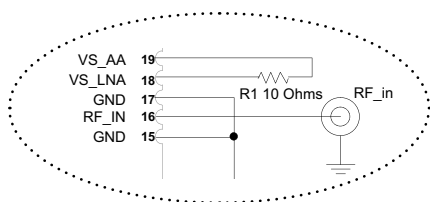
SERIAL PORT DEFAULT SETTINGS

PORT DIRECTION	PIN #	PROTOCOL	CHARACTERISTICS				
			Default Baud Rate	Data Bits	Parity	Stop Bits	Flow Control
TXB	3	NMEA out	9600	8	None	1	None
RXB	6	NMEA in	9600	8	None	1	None

APPLICATION NOTES



*Condor C1722 with No Antenna Detection
(for either Passive or Active Antenna)*



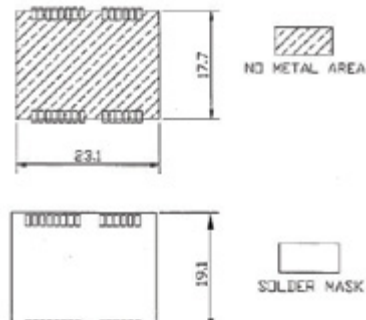
*Condor C1722 with Antenna Detection
(for Active Antenna Only)*

SOLDERING INFORMATION

When soldering the Condor module to a PCB, keep an open cavity underneath the Condor module.

Do not place copper traces or solder mask underneath the module.

Solder Mask

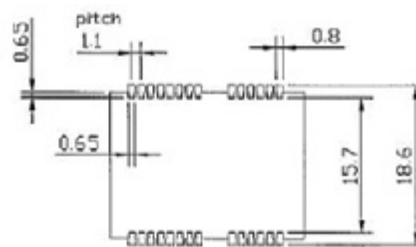


Suggested Solder Mask

Paste Mask

To ensure good mechanical bonding with sufficient solder to form a castellation solder joint, use a solder mask ratio of 1:1 with the solder pad.

When using a 5 ± 1 mil stencil to deposit the solder paste, Trimble recommends a 4 mil toe extension on the stencil.



(This is recommendation only and not specification.)

Suggested Paste Mask

Notes for Application Antenna Circuit

For *No Antenna Detection* (with either Passive or Active Antenna)

- VS_LNA on pin 18 must be connected to pin 19.

For *Antenna Detection* (with Active Antenna Only)

- VS_LNA on pin 18 is connected via a 10Ω sense resistor to pin 19 for determination of antenna open, short, or normal operation.
- The external LNA gain range is 17 dB to 25 dB.

General Notes

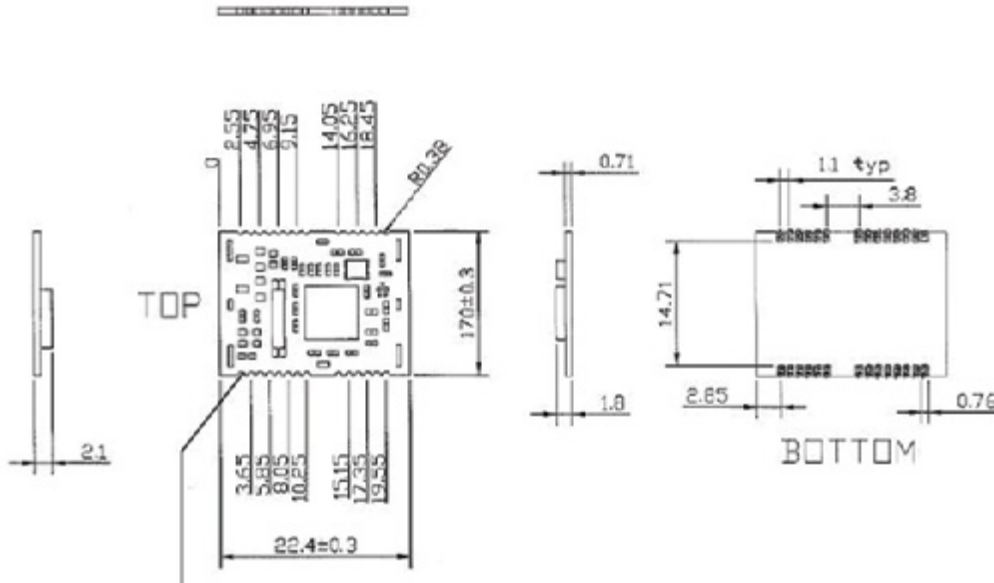
- A backup battery is not connected to pin 11 (Vrtc) in this example, but may be added to maintain the current GPS data and RTC if main power is removed.

If a backup battery is not used, leave pin 11 either unconnected or connected to V_{CC}.

- XRESET is connected to the host microcontroller or host reset controller.
- Do not connect any of the Reserved pins.
- Trimble recommends the use of X5R dielectric for capacitor C1.
- Capacitor C1 should be placed as close as possible to the VCC pin of the module.

See "Supply Voltage Requirement" on page 3.

MECHANICAL OUTLINE DRAWING



ORDERING INFORMATION

Model	Part #	Packaging		Starter Kit P/N
		36-pc tray	500-pc reel reel	
C1722	68675-00	√	√	N/A

SUPPORT INFORMATION

Get support information, including documentation and support software, at trimble.com:

<http://www.trimble.com/embeddedsystems/condor-gps-module.aspx?dtID=support>

Note: See the *Condor Series GPS Modules User Guide* for RF Layout Considerations and Soldering Guidelines.

NORTH AMERICA

Trimble Navigation Limited
Corporate Headquarters
935 Stewart Drive
Sunnyvale, CA 94085
+1-800-787-4225 Phone
+1-408-481-7741 Phone

Email: AD_Sales@trimble.com

EUROPE

Trimble Navigation Europe
+46 70-544-10-20 Phone

KOREA

Trimble Export Ltd, Korea
+82-2-555-5361 Phone

CHINA

Trimble Navigation Ltd, China
+86-10-8857-7575 Phone

