



## ORG1510-AG (HORNET)

Evaluation Kits:

ORG1510-AG05-UAR

DATASHEET

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## ABBREVIATIONS

Abbreviation	Description
BOM	Bill Of Materials
CS	Component Side
CTS	Clear to Send
DOK	Disk On Key
ESD	Electronic Sensitive Device
EVK	Evaluation Board
FW	Firmware
GLONASS	GLObal NAVigation Satellite System – Russian Satellite Positioning System
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System – American Satellite Positioning System
IC	Integrated Circuit
IO	Input/Output
IOH	High Level of IO Value
IOL	Low Level of IO Value
LDO	Low Dropout Regulator
LGA	Low Gain Amplifier
LVTTTL	Low voltage Transistor–transistor Logic
NFZ	Noise Free Zone
NMEA	National Marine Electronics Association Protocol
PC	Personal Computer
PCB	Printed Circuit Board
PCN	Pseudo-Random Noise
PS	Printed Side
QZSS	Quasi-Zenith Satellite System - Japanese satellite positioning system
RF	Radio Frequency
RTS	Ready To Send
RXD	Receive Data
SBAS	Satellite-based Augmentation Systems
SiP	System In Package

Abbreviation	Description
SMT	Surface-Mount Technology
SoC	System on Chip
TAMB	temperature for Absolute Maximum
TTFF	Time To First Fix
TTL	Transistor–Transistor Logic
TTM	Time-to-Market
TXD	Transmit Data
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
Vbat	Battery Voltage
Vcc	Common Collector Voltage
VBUS	Bus Voltage
VHYST	Hysteresis Voltage
VIN	Input Voltage
VOH	High level Output Voltage
VOL	Low level Output Voltage

## RELATED DOCUMENTATION

Nº	Document Name
1	ORG1510-AG05 Datasheet

## REVISION CHANGES

Revision	Date	Change Description
1.0	July 24, 2023	First release

## SCOPE

This document describes the features and specifications of the ORG1510-AG05 Evaluation kits.

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## SAFETY INFORMATION

Incorrect handling and use can cause permanent damage to the product.

## ESD SENSITIVITY

This product is an ESD-sensitive device and must be handled with care.

## CONTACT INFORMATION

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



## 1. ABOUT THE HORNET FAMILY

OriginGPS' GNSS modules cater to markets valuing size, weight, autonomy, integration, power efficiency, and design adaptability. The Hornet family stands out with the industry's smallest fully integrated, highly sensitive GPS and GNSS modules sporting integrated antennas or on-board RF connectors. These modules use OriginGPS' NFZ™ technology for noise immunity and high sensitivity, even under challenging signal conditions like urban canyons, dense foliage, or dynamic receiver positions. The Hornet modules' single layer PCB requires only a power supply, ensuring the shortest TTM and minimal design risks.



## 2. ABOUT THE ORG1510-AG MODULE

The ORG1510-AG module is a compact SiP with an LGA SMT footprint, offering unique integration features for high volume, cost-sensitive applications. Its versatility suits smartwatches, wearable devices, and asset trackers, functioning as a miniature multi-channel receiver for GPS, Galileo, GLONASS, BeiDou, and SBAS, QZSS. It continuously tracks all visible satellites, delivering real-time positioning data in standard NMEA format.

Remarkably small at 10mm x 10mm, the ORG1510-AG module stands as the industry's tiniest solution. It boasts the lowest energy-per-fix ratio, exceptional accuracy, and rapid fixes, even in challenging signal conditions like built-up urban areas, dense foliage, or indoor environments.

Embedded with an integrated GNSS SoC, this module houses a high-performance microprocessor and advanced firmware. This architecture efficiently manages positioning payload, allowing seamless integration in low-computing-resource embedded solutions.

Notably innovative, the module can detect context, temperature changes, and satellite signals, maintaining near-continuous availability. It achieves this by opportunistically updating its internal fine time, frequency, and satellite ephemeris data while consuming mere microwatts of battery power.



### **3. ABOUT ORIGINGPS**

OriginGPS specializes in developing, manufacturing, and supplying the world's smallest GNSS and cellular IoT solutions. These high-performance miniature GNSS products offer support for multiple constellations, enabling you to track valuable assets for both personal and business use.

With the OriginIoT™ technology, IoT-enabled devices become more affordable and accessible, eliminating the need for additional embedded software and RF engineering expertise. The low power cellular IoT system further reduces project costs and significantly shortens time-to-market when creating cellular IoT devices.

OriginGPS' miniature products cater to various market verticals, including asset tracking, fleet management, industrial IoT, law enforcement, pet/people tracking, precision agriculture, smart cities, sports, and wearables. Whatever your specific application, these solutions provide reliable and efficient tracking capabilities for a wide range of industries and use cases.





## 4. **ORG1510-AG MODULES DESCRIPTION**

The Evaluation Kit for the ORG1510-AG GNSS Module includes essential components such as a demo board, a USB to UART cable, a DOK (Documentation Kit) with GNSS simulator software for PC, and comprehensive documentation.

The demo board consists of a main board featuring 1.8V and 3.3V LDO regulators, a UART connector, a push-button, and multiple test points designed to facilitate research and development processes. It offers a diverse range of features to aid in the evaluation and testing of the module's capabilities.



## 5. DEFAULT EVK STATE

### 5.1. ORG1510-AG Evaluation Kit - Overview

The evaluation kit consists of several main elements, each serving specific functions and working together seamlessly:

- J8: Vcc Connection - This element is linked to an internal LDO (Low Dropout Regulator) set at 1.8V. It provides the necessary power supply to the GNSS module.
- J9: J9.10 connected to J9.9, creates connection between V\_Backup to VCC.
- J29: TX Connection - TX is connected to J26 through a level shifter. The level shifter ensures compatibility and smooth communication between the UART interface and the FTDI chipset.
- J26: UART Switching - This element allows the user to switch between two different communication interfaces:
  - Micro-USB Connector - For USB data transfer and communication.
  - FTDI Cable - Provides an alternative communication interface of UART through the FTDI cable.

The “Up” position, shown in Figure 1 depicts a state using the micro-USB cable.

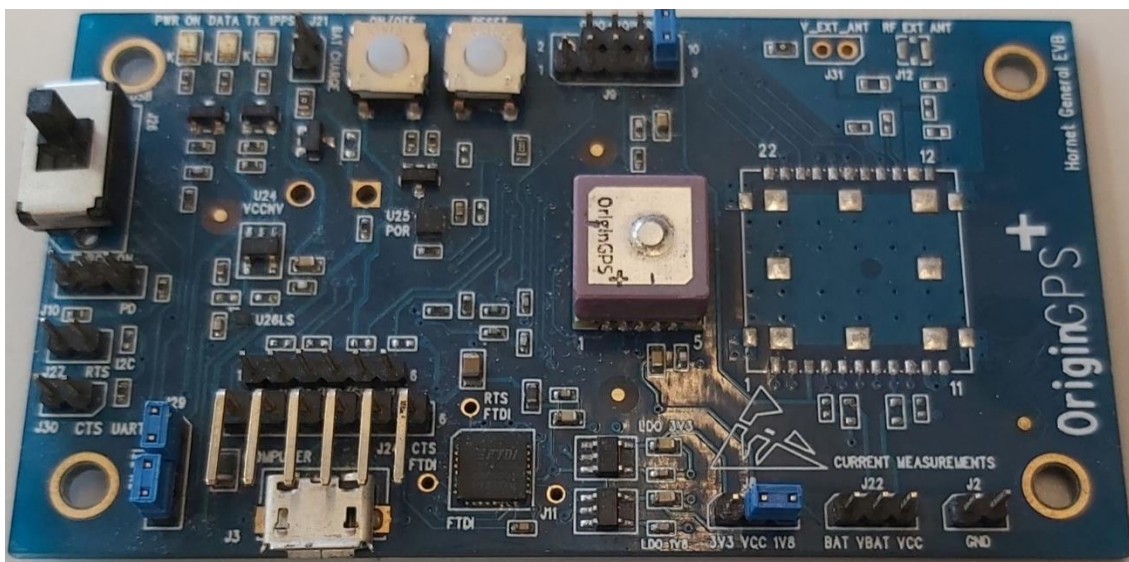


Figure 1. Evaluation Kit PCB



## 5.2. PCB View

The figure provides offers a visual representation of the board's functionality, and the silkscreen aids in better comprehension of its features.

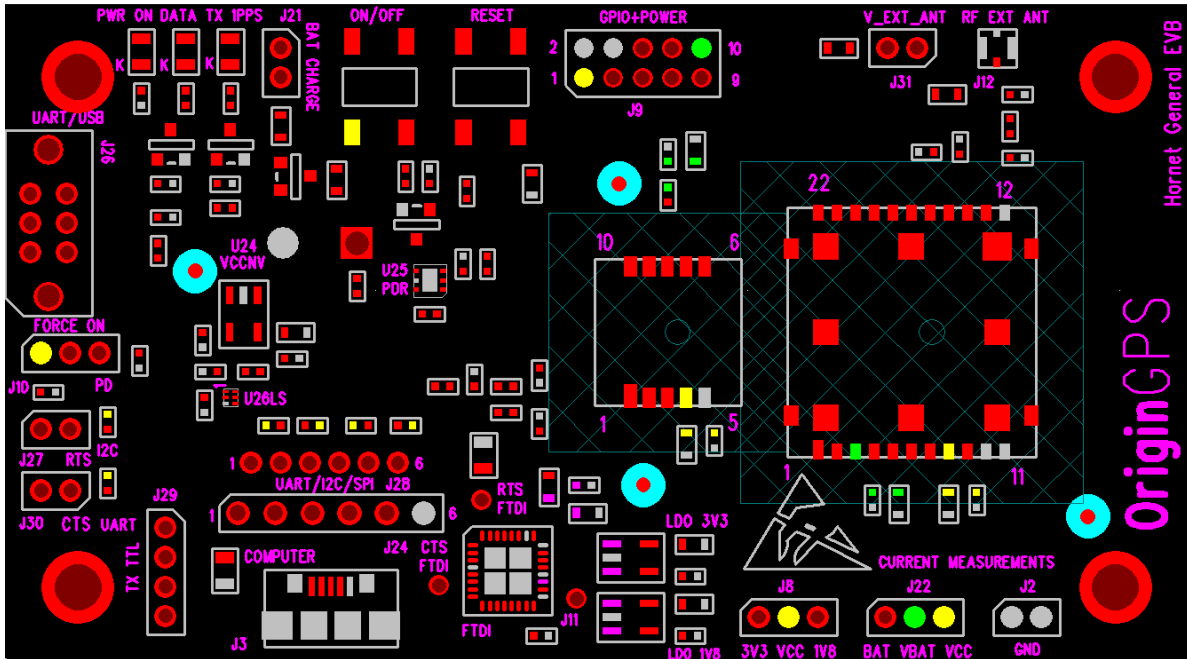


Figure 2. ORG1510-AG Evaluation Kit PCB



### 5.3. Flow Chart - Interfaces

In the below Figure, the board's functionality is visually presented, focusing on the interfaces and toggle options used to control the OriginGPS Evaluation Kit. The figure provides a clear overview of how different components interact and allows users to understand how to manipulate the kit effectively.

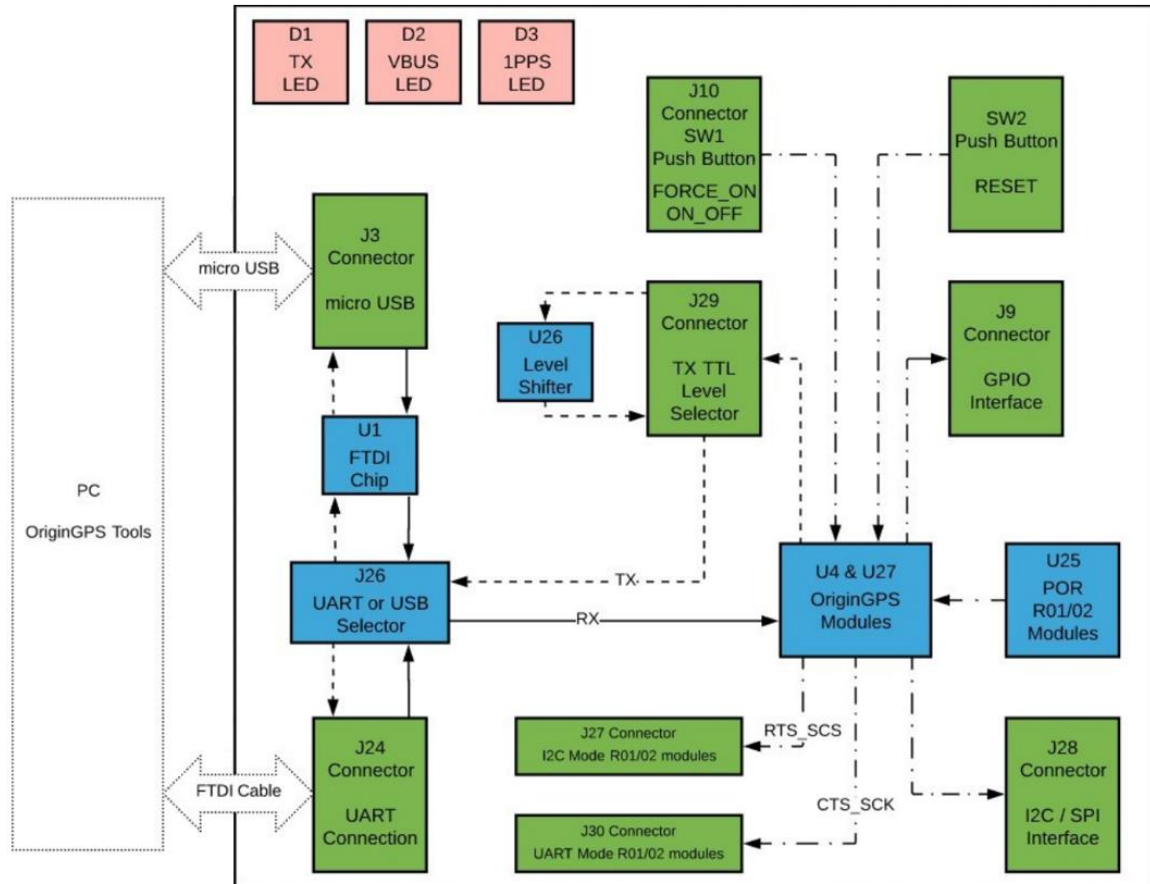


Figure 3. Flow Chart – Interfaces



## 5.4. Flow Chart - Power Supply Components

The below Figure depicts the functionality of the board, specifically relating to the power source components. The diagram enables viewing the power supply components, the connectors and the toggle options to control the OriginGPS Evaluation Kit.

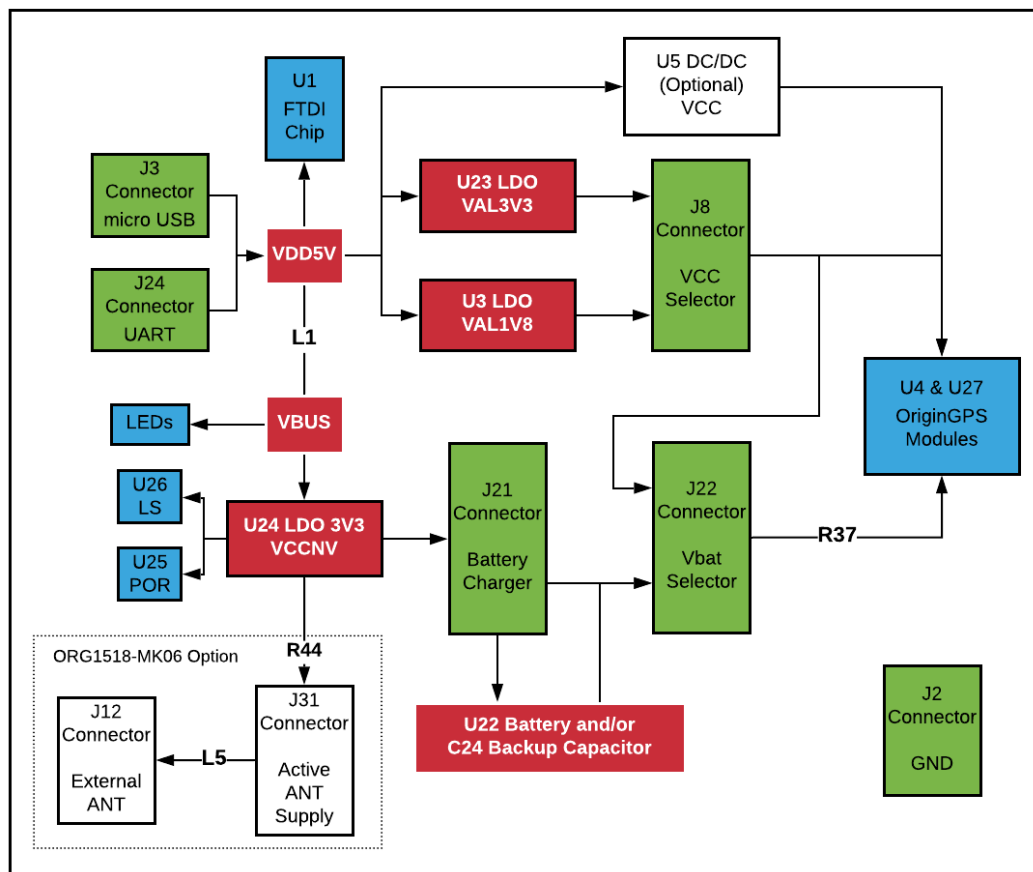


Figure 4. Flow Chart - Power Supply Components



## 6. SCHEMATICS

The ORG1510-AG Evaluation Kit can be used for all OriginGPS modules, Spider, and Hornet. Therefore, while schematics contain all the components, the BOM is necessary to understand the assembled components for the ORG1510-AG05 module.

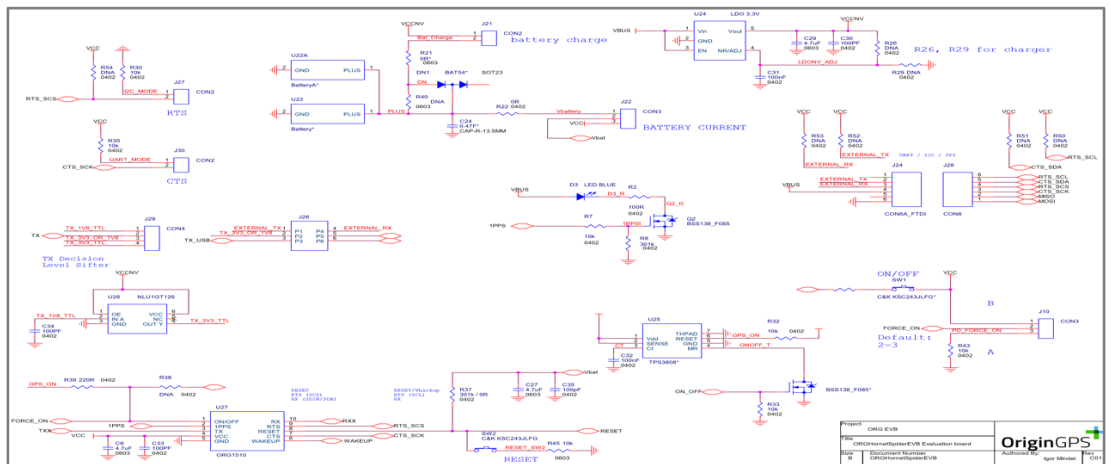
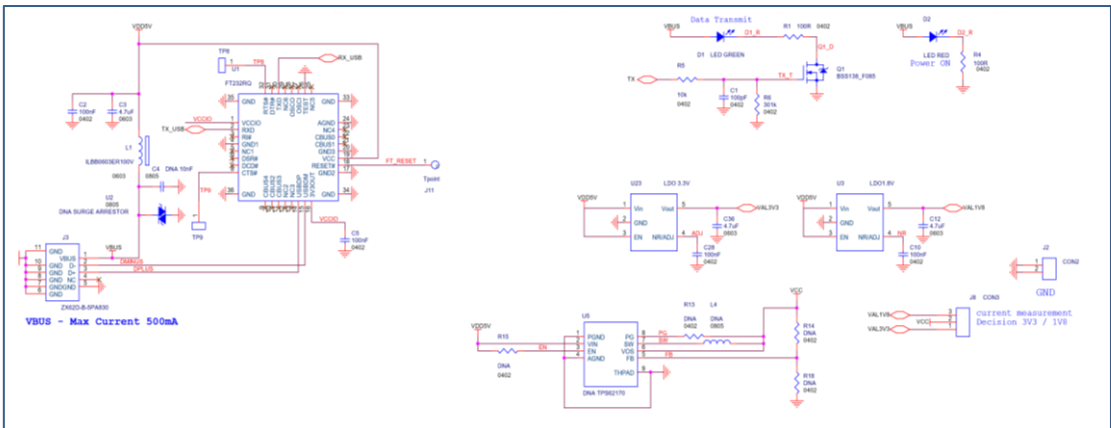
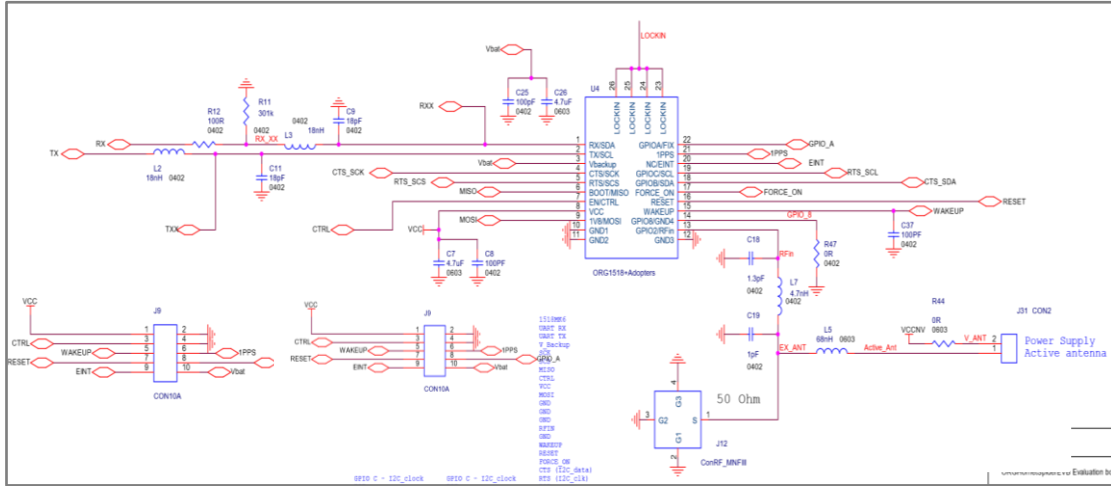


Figure 5. ORG1510-AG Evaluation Kit - Schematics Pages



## 7. BILL OF MATERIALS

Table 1. Bill of Materials

Ref	Component Designation	Qty	Component Description	Catalog Number	Manufacturer	Packaging	Notes
CS	R22, R37	2	RES SMT 0402 0Ω ±5%	CRCW04020000Z0ED	Vishay	0402	Main
				RM04JTNO	TA-I		Subs
				RC0402JR-070RL	Yageo		Subs
				CR02JL6-0R	TMTEC		Subs
CS	R5, R7, R30, R32, R33, R35, R43	7	RES SMT 0402 10K ±1%	CRCW040210K0FKED	Vishay	0402	Main
				RM04FTN1002	TA-I		Subs
				RC0402FR-0710KL	Yageo		Subs
				CR02FL6-10K	TMTEC		Subs
CS	C9, C11	2	CAP SMT 0402 18pF ±5% 50V COG	GRM1555C1H180JA01D	Murata	0402	Main
				UMK105CH180JV-F	Taiyo Yuden		Subs
CS	C2, C5, C10, C28, C31, C32	6	CAP SMT 0402 100nF ±10% 16V X7R	GRM155R71C104KA88D	Murata	0402	Main
				EMK105V7104KV-F	Taiyo Yuden		Subs
					TDK		Subs
CS	U3	1	LDO 1.8V	TLV70018DDCT		SOT25	Main
CS	U23, U24	2	LDO 3.3V	TLV70033DDCT		SOT25	Main
CS	C1, C30, C33, C34, C35	5	CAP SMT 0402 100pF ±5% 50V COG	GRM1555C1H101JA01D	Murata	0402	Main
				UMK105CH100JW-F	Taiyo Yuden		Subs
CS	L2, L3	2	CHIP EMIFIL INDUCTOR 18nH 5%	LQG15HS18NJ02D	Murata	0402	Main
CS	C3, C6, C12, C27, C29, C36	6	CAP SMT 0603 4.7uF ±10% 6.3V X5R	GRM188R60J475KE19D	Murata	0603	Main
				JMK107BJ475KA-T	Taiyo Yuden		Subs
					TDK		Subs
CS	R6, R8, R11	3	RES SMT 0402 301KΩ ±1%	CRCW 0402 -301K	Vishay	0402	Main
				CR02FL6-301K	TMTEC		Subs



Ref	Component Designation	Qty	Component Description	Catalog Number	Manufacturer	Packaging	Notes
CS	U26	1	Single Buffer 3 STATE	NLU1GT126CMUTCG	ON	ULLGA6_1.0x1.0	Main
					TI		Subs
CS	U25	1	POR PROGR. DELAY IC	TPS3808G18DRVR	TI	DRV	Main
CS	R1, R2, R4, R12	4	RES SMT 0402 100Ω ±1%	RM04FTN1000	TA-I	0402	Main
				CR02FL6-100R	TMTEC		Subs
					Vishay		Subs
CS	R21, R44	2	RES SMT 0603 0Ω ±5%	CRCW06030000Z0EA	Vishay	0603	Main
				RM06JTNO	TA-I & Bitel		Subs
CS	SW1, SW2	2	SMD TACT SWITCH	TJ-532-V-T/R	Diptronics	TJ-532	Main
				IT1158A-200G	Switchtronic		Subs
CS	Q1, Q2, Q21	3	BSS138_F085	BSS138_F085	ON Semiconductor	SOT23	Main
CS	J3	1	Micro USB	ZX65D-B-5PA830		USB-MICRO-B-TH	Main
CS	R3	1	220R 0402	RM04F2200CT	TA-I	0402	Main
CS	C4	1	0.01uF (10nF) 50V 0805	GCM219R91H103KA37D		805	Main
CS	L1	1	10R 25% FERRITE BEADS 0603	ILBB0603ER100V		603	Main
CS	U1	1	FT232R Single Ch FTDI USB Interface IC	FT232RQ-TRAY		QFN32	Main
CS	D3	1	LED Blue SMT 0805 20mA	APT2012QBC/D	Kingbright	805	Main
CS	D1	1	LED Green Water Clear SMT 0805 20mA	APT2012SGC	Kingbright	805	Main
CS	D2	1	LED RED Water Clear SMT 0805 20mA	APT2012SRCPRV	Kingbright	805	Main
CS	DN1	1	30V 200mA Fairchild SchoTtky Diodes & Rectifiers 30V	BAT54S		SOT23	Main
				BAT54SLT1G			Subs
CS	R45	1	10K 0603	CRCW060310K0FKEAC		603	Main





Ref	Component Designation	Qty	Component Description	Catalog Number	Manufacturer	Packaging	Notes
CS	U2	1	ESD Suppressors / TVS Diodes WE-VE ESD 0805 12V 56pF	82350120560		805	Main
CS	U27	1	GNSS module	ORG1510-AG05	OriginGPS	1510rf	Main
CS	J2, J21, J27, J30	1	CON2	M22-2510205		SIP2-2MM	Main
CS	J8, J10, J22	1	CON3	M22-2510305		SIP3-2MM	Main
CS	J29	1	CON4	M22-2510405		SIP4-2MM	Main
CS	J28	1	CON6	M22-2510605		SIP6-2MM	Main
CS	J9	1	CON9A (Without Pad 2)	M22-2510505		SIP2X5-2MM	Main
CS	J24	1	CON6A_FTDI	2211S-06G-F1	Neltron	HEADER6X1	Main
CS	J26	1	12VDC 0.1 AMP E-SWITCH Slide Switches	EG2209	E-Switch	SW-EDGE- SLIDE-6	Main
PS	J9.1-J9.9	1	Wire connection between VCC and V_backup	-	-	-	-



## 8. ASSEMBLY AND LAYOUT

### 8.1. ORG1510-AG EVK Main Board

The main board of the ORG1510-AG comprises 2 layers with thickness of 1.6mm FR4 PCB.

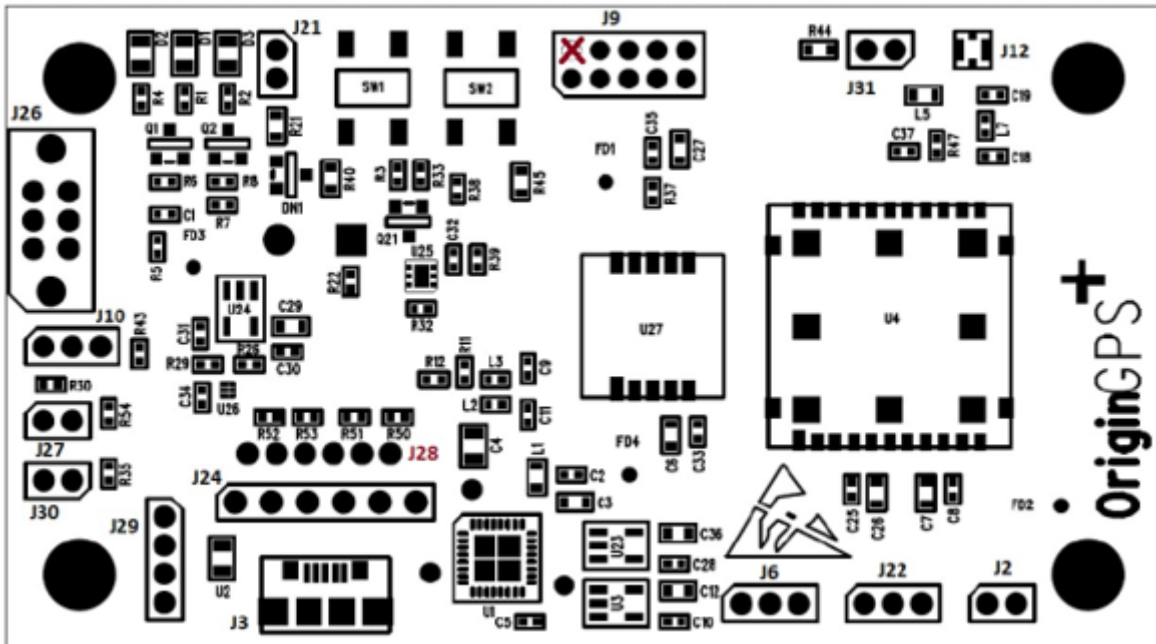


Figure 6. Main Board Components Placement (Top Side)

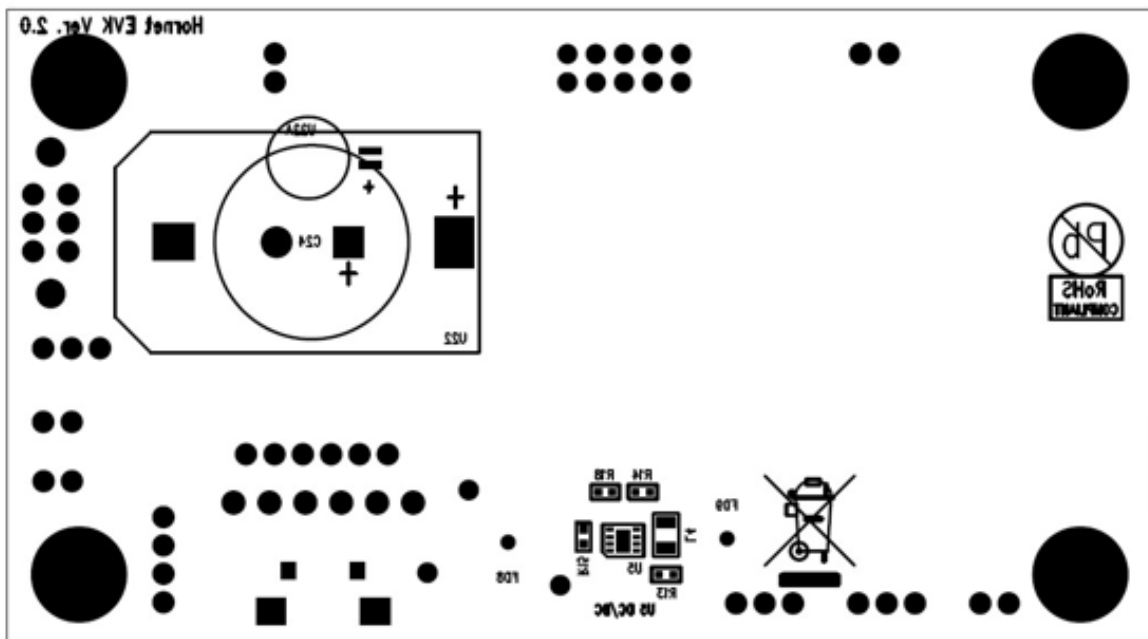


Figure 7. Main Board Components Placement (Bottom Side)

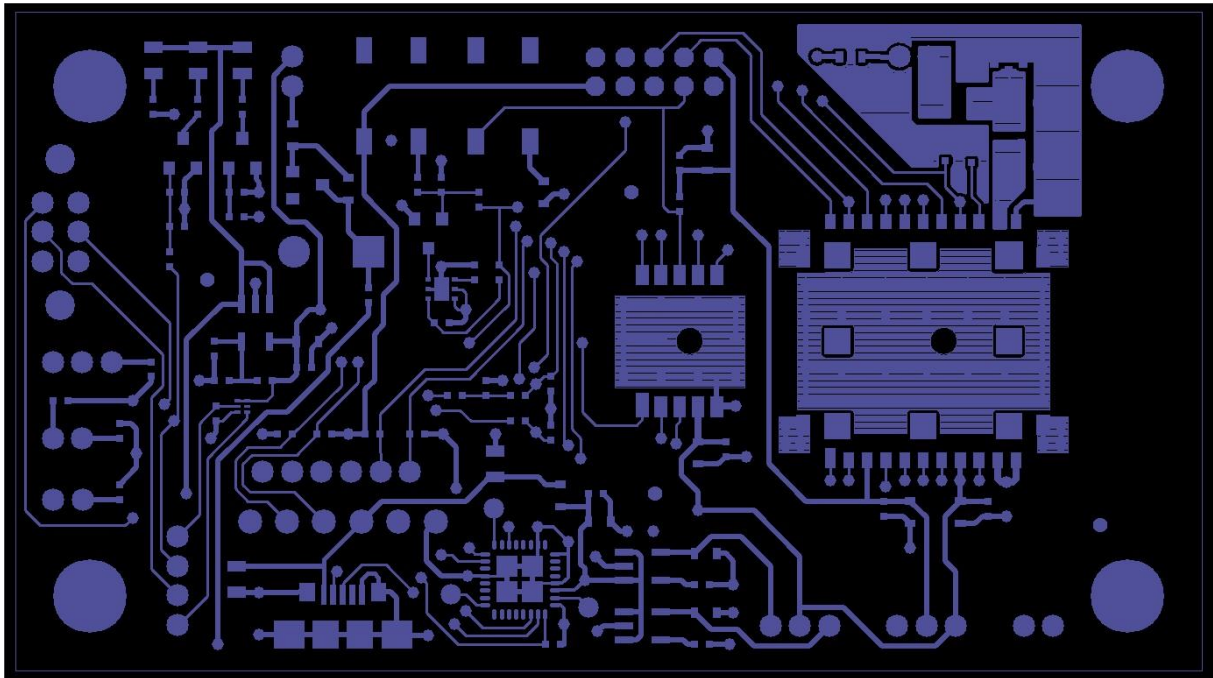


Figure 8. Gerber Top Side CS Layer

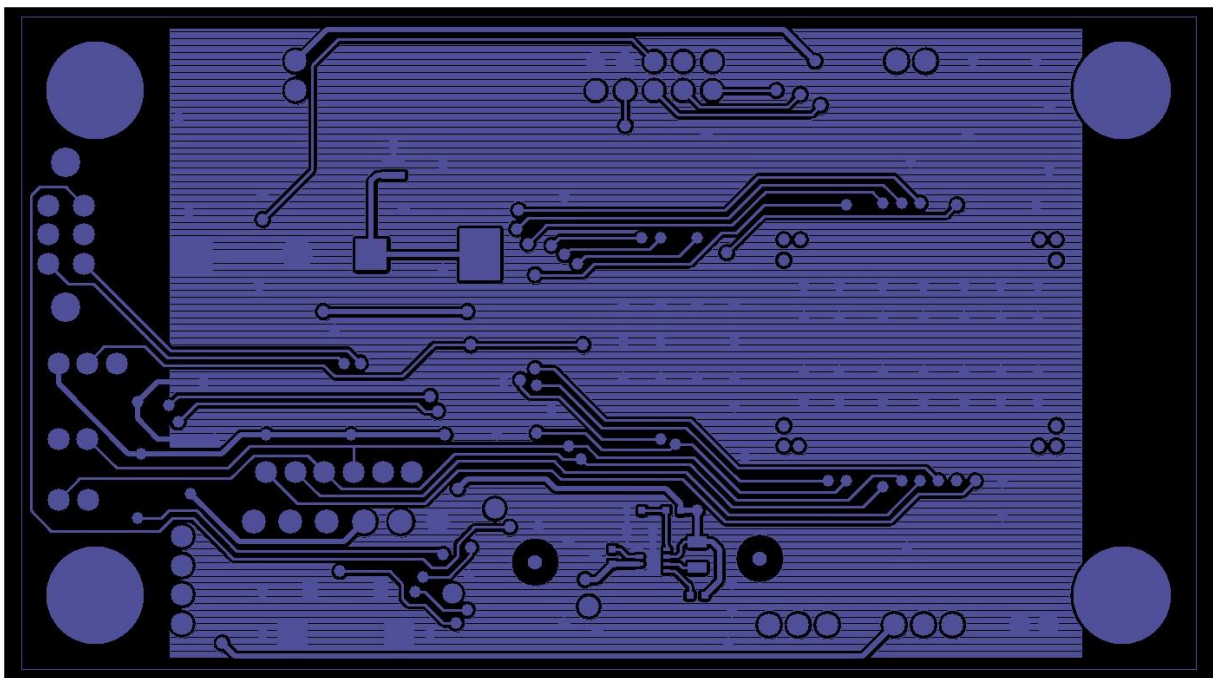
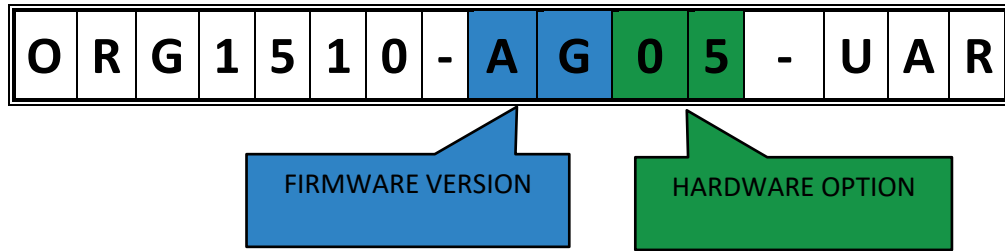


Figure 9. Gerber Bottom Side PS Layer



## 9. ORDERING INFORMATION



**Table 2. Orderable Devices**

Part Number	Firmware Version	Hardware Option	VCC Range	Packaging	SPQ
ORG1510-AG05-UAR	AG	05	5V USB	Evaluation Kit	1