OriginGPS
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SPIDER (ORG4600-B01)

Evaluation Kit (ORG4600B01-UAR)

DATASHEET

OriginGPS.com

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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
LVTTL	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 Dide
QZSS	Quasi-Zenith Satellite System - Japanese satellite positioning system
RF	Radio Frequency
RTS	Ready To Send
RXD	Receive Data

Abbreviation	Description
SBAS	Satellite-based Augmentation Systems
SiP	System In Package
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

№	DOCUMENT NAME
1	Spider – ORG4600-B01 Datasheet

REVISION HISTORY

REVISION	DATE	CHANGE DESCRIPTION
1.0	November 7, 2019	First release
1.1	January 16, 2020	Added Block Diagrams and explanation about using OriginGPS EVB

Scope

This document describes the features and specifications of the Spider ORG4600-B01 Evaluation Kit.

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Safety Information

Improper handling or misuse of the product can cause permanent damage.

This product is an electronic sensitive device (ESD) and must be handled with care.

Disposal Information

This product must not be treated as household waste.

For more detailed information about recycling electronic components, contact your local waste-management authority.

Contact Information

Support: support@origingps.com or online form
Marketing and Sales: marketing@origingps.com
Website: www.origingps.com

1. About Spider Family

OriginGPS GNSS receiver modules have been designed to address markets where size, weight, standalone operation, highest level of integration, power consumption, and design flexibility are important. OriginGPS's Spider family breaks the size barrier, offering the industry's smallest, fully-integrated, highly-sensitive GPS / GNSS modules.

Spider family features OriginGPS's proprietary NFZ™ technology for high sensitivity and noise immunity even under marginal signal condition commonly found in urban canyons, under dense foliage, or when the receiver's position in space rapidly changes.

Spider family enables the shortest TTM (Time-to-Market) with minimal design risks.

Just connect an antenna and power supply on a 2-layer PCB, and you're good to go!

2. About Spider Module

The Spider is a complete SiP featuring a miniature LGA SMT footprint designed to commit unique integration features for high-volume, cost-sensitive applications.

Designed to support ultra-compact applications such as smart watches, wearable devices, trackers, and digital cameras, the ORG4600 module is a miniature, multi-channel GNSS with SBAS, QZSS, and other regional overlay systems receiver that continuously tracks all satellites in view, providing real-time positioning data in industry-standard NMEA format.

The ORG4600 module offers superior sensitivity and outstanding performance, achieving rapid TTFF in less than one second, accuracy of approximately one meter, and tracking sensitivity of -167dBm.

Sized only 10mm x 10mm, the ORG4600 GNSS module is pin- and footprint-compatible with OriginGPS's popular ORG4600 GPS module.

The ORG4600 module is capable of decoding extremely weak satellite signals simultaneously from GPS and GLONASS, thereby offering best-in-class positioning availability, unparalleled accuracy, and extremely fast fixes under challenging signal conditions, such as in built-up urban areas, dense foliage, or even indoors.

An internal GNSS SoC incorporating high-performance microprocessor and sophisticated GNSS firmware keeps positioning payloads off the host, enabling integration in embedded solutions even with low computing resources.

Innovative architecture can detect changes in context, temperature, and satellite signals to achieve a state of near continuous availability by maintaining and opportunistically updating its internal fine-time, frequency, and ephemeris data, while consuming mere microwatts of battery power.

3. ABOUT ORIGINGPS

OriginGPS is a world-leading designer, manufacturer, and supplier of miniature positioning modules, antenna modules, and antenna solutions.

OriginGPS modules introduce unparalleled sensitivity and noise immunity by incorporating Noise Free Zone system (NFZ™) proprietary technology for faster position fix and navigation stability even under challenging satellite signal conditions.

Founded in 2006, OriginGPS specializes in the development of unique technologies that miniaturize RF modules, thereby addressing the market requirement for smaller wireless solutions.

4. DESCRIPTION

The Evaluation Kit of the ORG4600-B01 GNSS Antenna Module comprises the Demo Board, USB to UART cable, and DOK with GNSS simulator software for PC and documentation.

The Demo Board is built of a Main Board, that incorporates 1.8V and 3.3V LDO regulators, UART connector, push-button, and various test points with a range of features for R&D processes.

In addition, it supports external active / passive antennas connected to U.FL connectors.

5. DEFAULT EVK STATE

5.1. EVK ORG4600-B01 Overview

- J8 – Vcc connected to internal LDO 3.3V
- J22 – Vbat connected to Vcc supplies power to the active antenna,.
- J29 – J29.2 connected to J29.3 by this connection; TXD connected without level shifter to J26.
- J26 – Switch UART to FTDI cable or micro USB connector.

Down position (same as below) is a state using the FTDI cable.

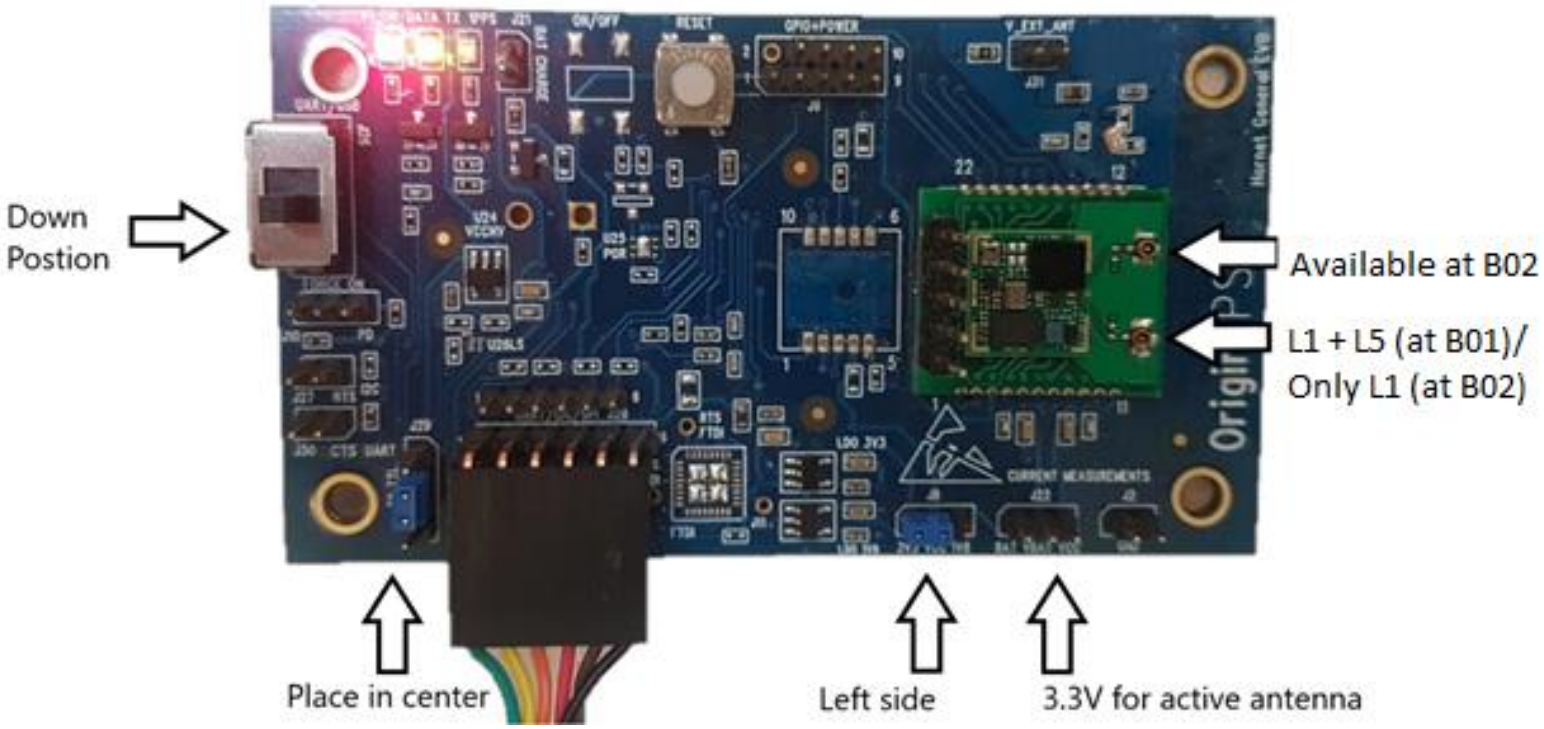


Figure 1. "Down" Position on PCB

5.2. PCB View

The following image shows all the functionality available on the board. The silkscreen in this view enables a better understanding of the board.

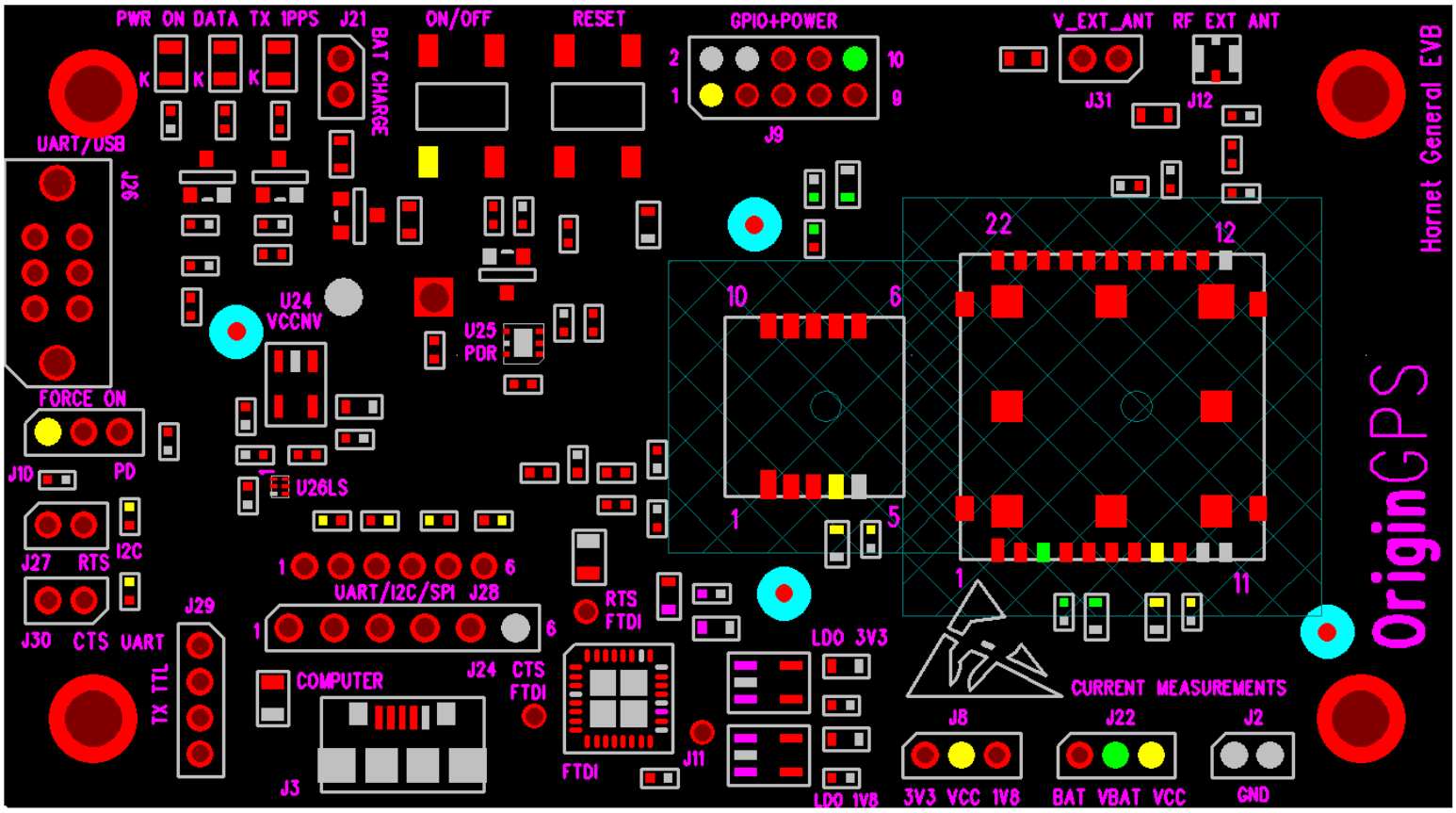
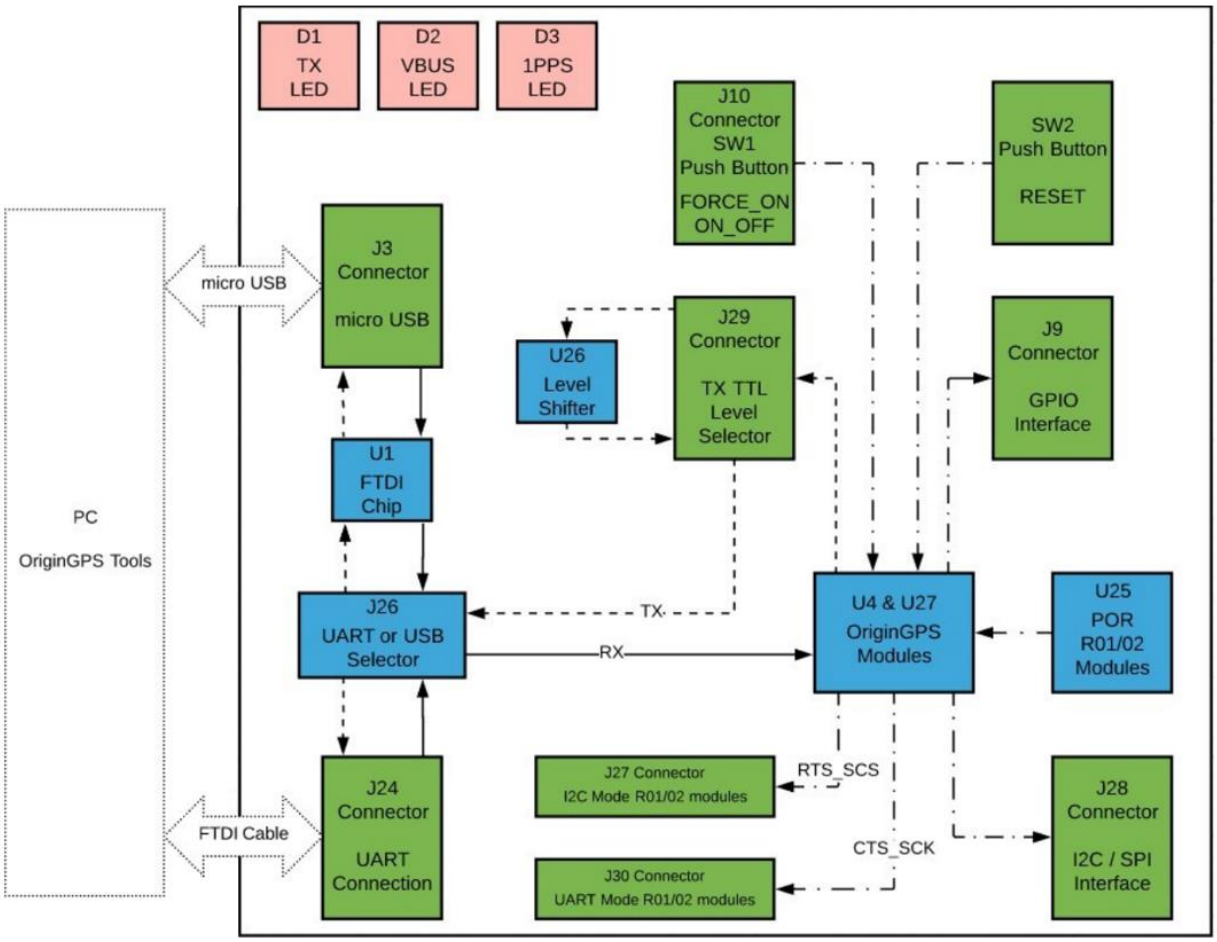


Figure 2. EVK PCB

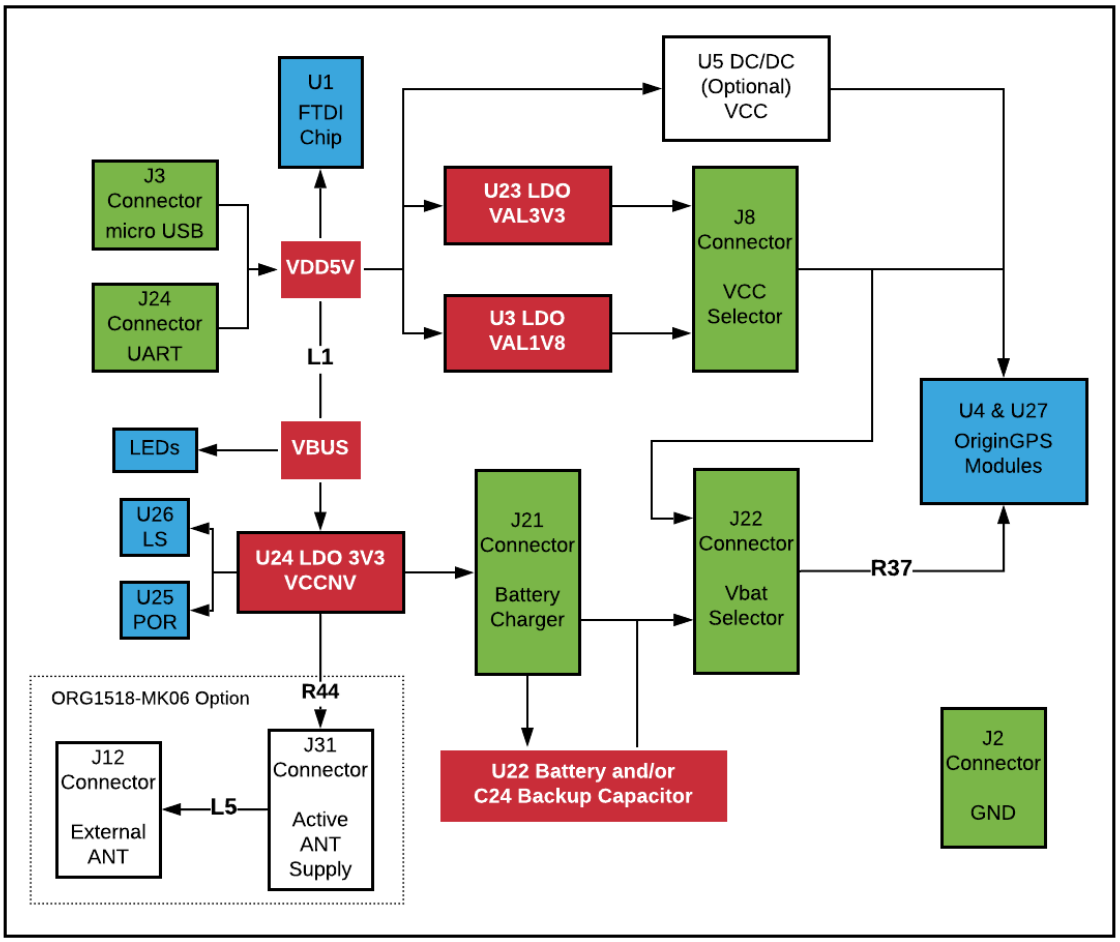
5.3. Interface View

The Block Diagram below describes all the functionality of the board regarding the Interfaces inside the board. The purpose of this view is user-friendly for understanding the board, each connector inside the board and all the options for manual control of theOriginGPS EVK.



5.4. Power Supply View

The Block Diagram below describes all the functionality of the board regarding the sources of Power suppliers inside the board. The purpose of this view is user-friendly for understanding the board, each connector inside the board and all the options for manual control of theOriginGPS EVK.



6. SCHEMATICS

The Evaluation Kit of the ORG4600-B01 can be used for all OriginGPS modules, Spider, and Hornet. Therefore, schematics contain all of the components, but the BOM is necessary to understand the assembled components for the ORG4600-B01.

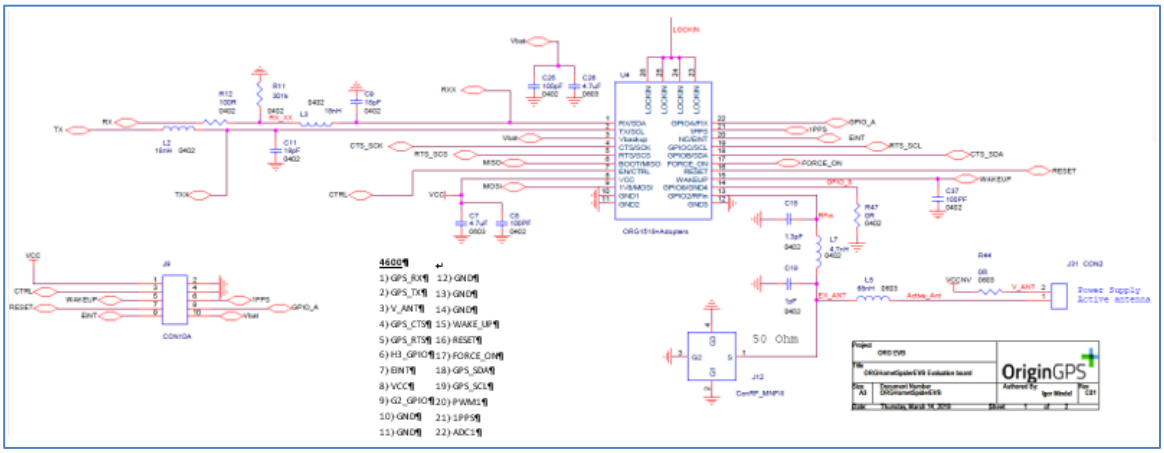


Figure 3. Schematics Page 1

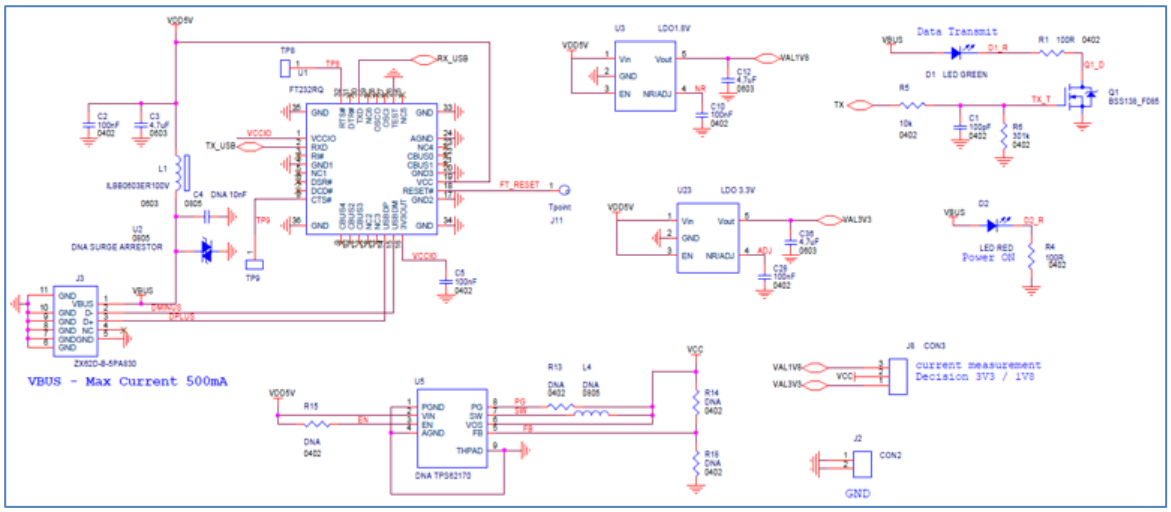


Figure 4. Schematics Page 2

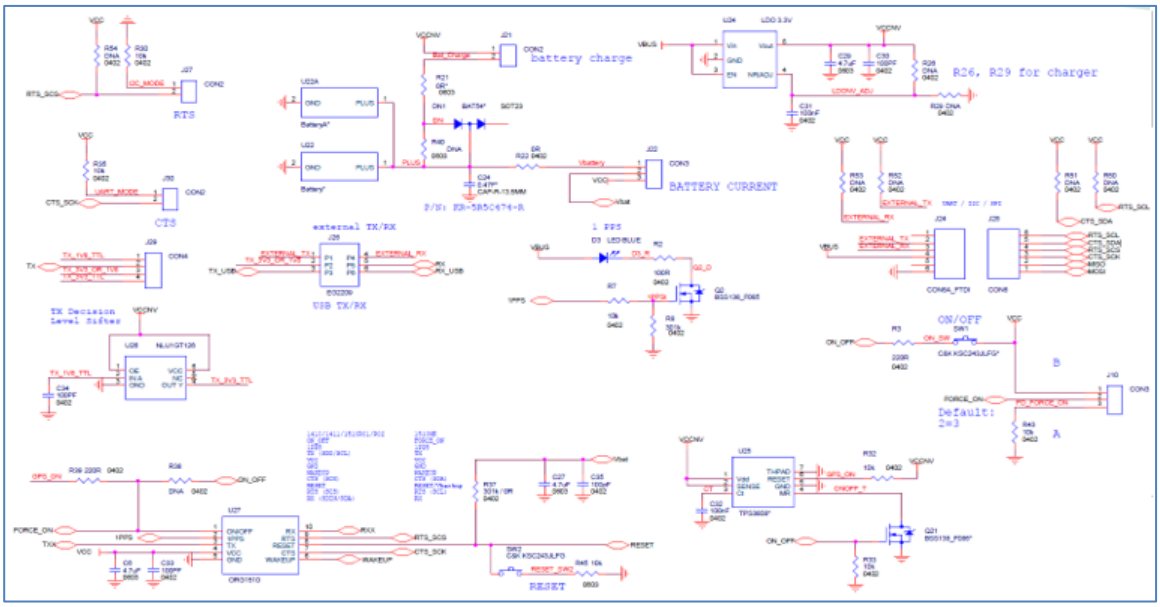


Figure 5. Schematics Page 3

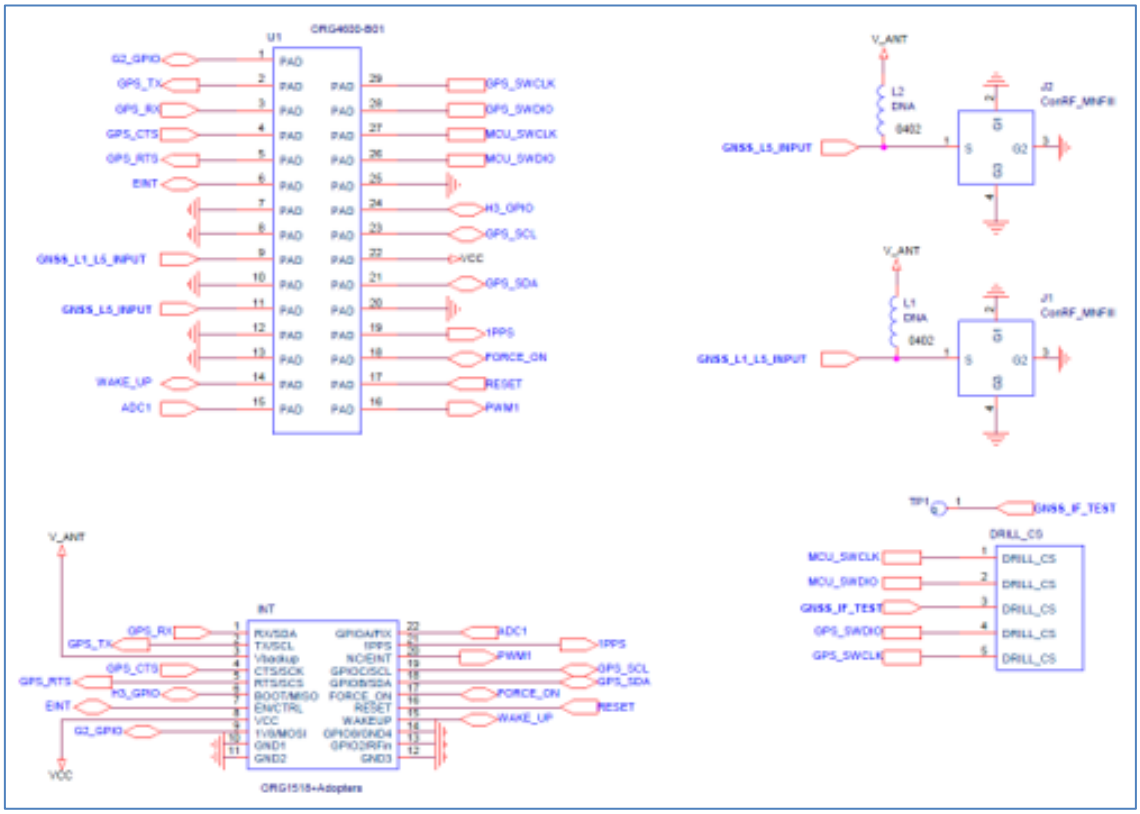


Figure 6. Adapter Schematics Page

7. BILL OF MATERIALS

Table 1. Bill of Materials

Refernce	Value	Description	P/N	MFG
R22, R38, R47, C18	0Ω	RES SMT 0402 0Ω ±5%	CRCW04020000Z0ED	VISHAY
R5, R7, R30, R32, R33, R35, R43	10KΩ	0	CRCW040210K0FKED	VISHAY
C9, C11	18pF	CAP SMT 0402 18pF ±5% 50V COG	GRM1555C1H180JA01D	MURATA
C2, C5, C10, C28, C31, C32	100nF	CAP SMT 0402 100nF ±10% 16V X7R	GRM155R71C104KA88D	MURATA
U3	LDO	LDO 1.8V	TLV70018DDCT	Texas Instruments
U23, U24	LDO	LDO 3.3V	TLV70033DDCT	Texas Instruments
C1, C8, C25, C30, C34, C37	100pF	CAP SMT 0402 100pF ±5% 50V COG	GRM1555C1H101JA01D	MURATA
L2, L3	18nH	CHIP EMIFIL INDUCTOR 18nH 5%	LQG15HS18NJ02D	MURATA
C3, C7, C12, C26, C29, C36	4.7uF	CAP SMT 0603 4.7uF ±10% 6.3V X5R	GRM188R60J475KE19D	MURATA
R6, R8, R11, R37	301KΩ	RES SMT 0402 301KΩ ±1%	CRCW 0402 -301K	VISHAY
U26	SB3S	Single Buffer 3 STATE	NLU1GT126CMUTCG	ON
R1, R2, R4, R12	100Ω	RES SMT 0402 100Ω ±1%	RM04FTN1000	TA-I
R21	0Ω	RES SMT 0603 0Ω ±5%	CRCW06030000Z0EA	VISHAY
SW1, SW2	SW	SMD TACT SWITCH	TJ-532-V-T/R	DIPTRONICS
J24	HDR	CON6A_FTDI	2211S-06G-F1	NELTRON
Q1, Q2, Q21	Transisor	BSS138_F085	BSS138_F085	ON Semiconductor
J3	u-USB	microUSB	ZX65D-B-5PA830	Hirose Connector
R3	220Ω	220R 0402	RM04F2200CT	TA-I
C4	10nF	0.01uF (10nF) 50V 0805	GCM219R91H103KA37D	MURATA
D3	LED	LED Blue SMT 0805 20mA	APT2012QBC/D	Kingbright
D1	LED	LED Green Water Clear SMT 0805 20mA	APT2012SGC	Kingbright
D2	LED	LED RED Water Clear SMT 0805 20mA	APT2012SRCPRV	Kingbright
L1	10	10R 25% FERRITE BEADS 0603	ILBB0603ER100V	VISHAY
U1	Convertor	FT232R Single Ch FTDI USB Interface IC	FT232RQ-TRAY	FTDI
DN1	schottky diode	200mA Fairchild SchoTtky Diodes & Rectifiers	BAT54S	VISHAY
U2	Zener diode	uppressors / TVS Diodes WE-VE ESD 0805 12V	82350120560	WURTH
U4	Adapter	ORG4600 Adapter	ORG4600 Adapter	OriginGPS
J2, J21, J27, J30	jumper	CON2	M22-2510205	Harwin
J8, J10 ,J22	jumper	CON3	M22-2510305	Harwin
J29	jumper	CON4	M22-2510405	Harwin
J28	HDR	CON6	M22-2510605	Harwin
J9	HDR	CON9A (Without Pad 2)	M22-2510505	Harwin
J26	ESW	12VDC 0.1 AMP E-SWITCH Slide Switches	EG2209	E-SWITCH

8. ASSEMBLY AND LAYOUT

8.1. Main Board for the ORG4600 – B01 is 2 Layers 1.6mm Thickness FR4 PCB.

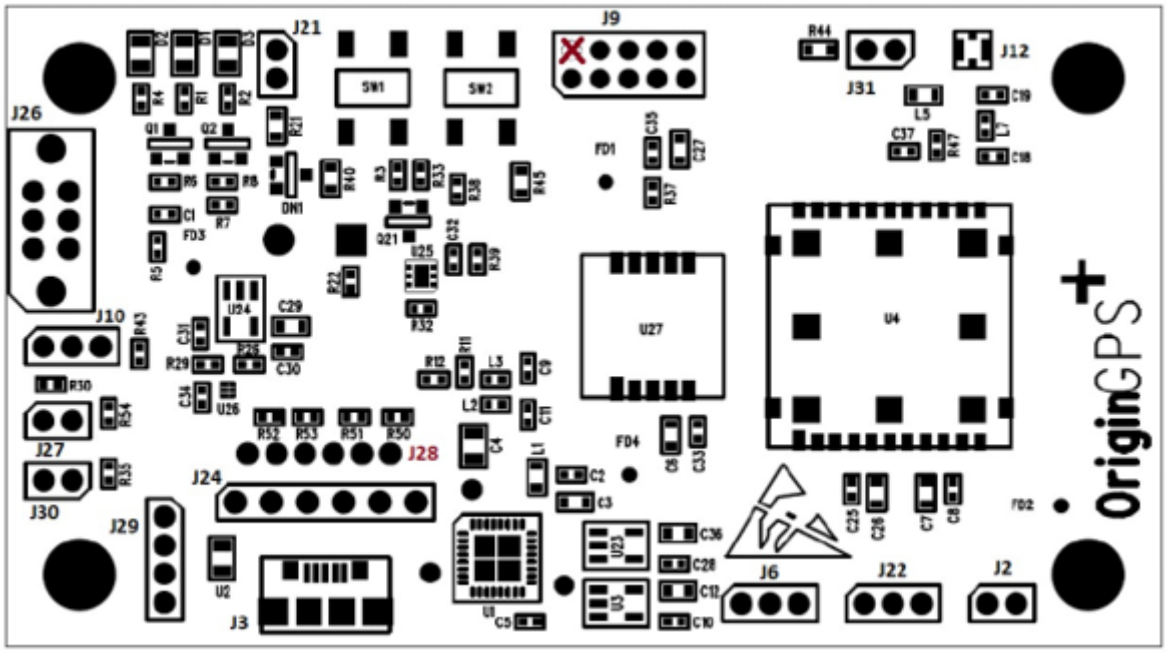


Figure 7. Main Board Components Placement (Top Side)

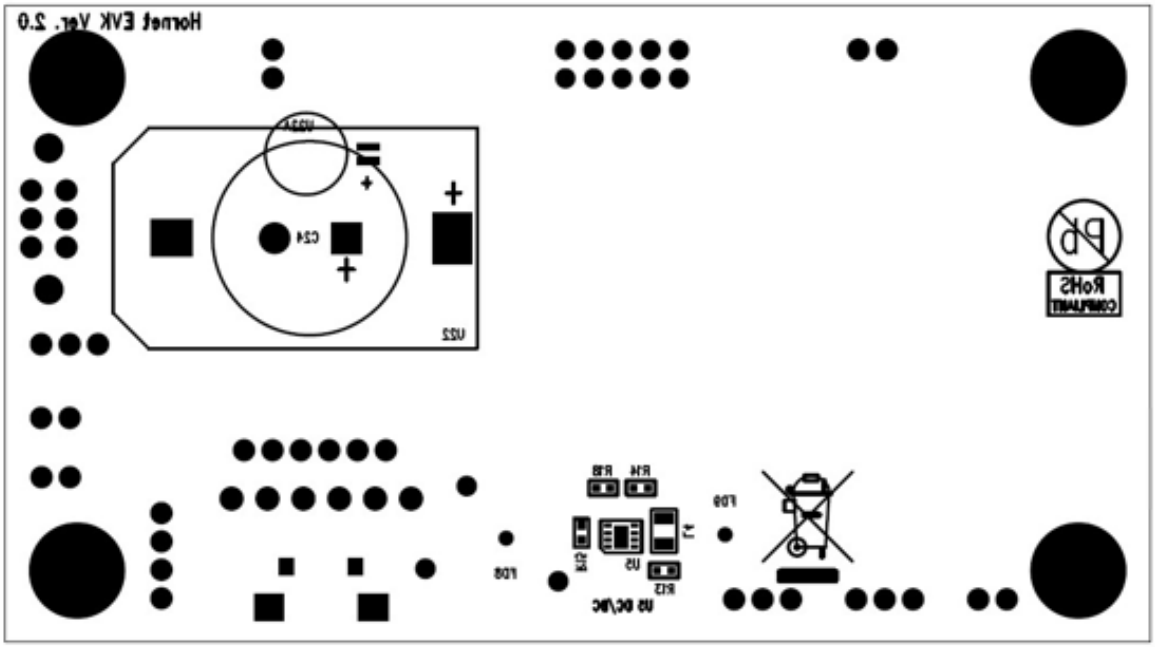


Figure 8. Main Board Components Placement (Bottom Side)

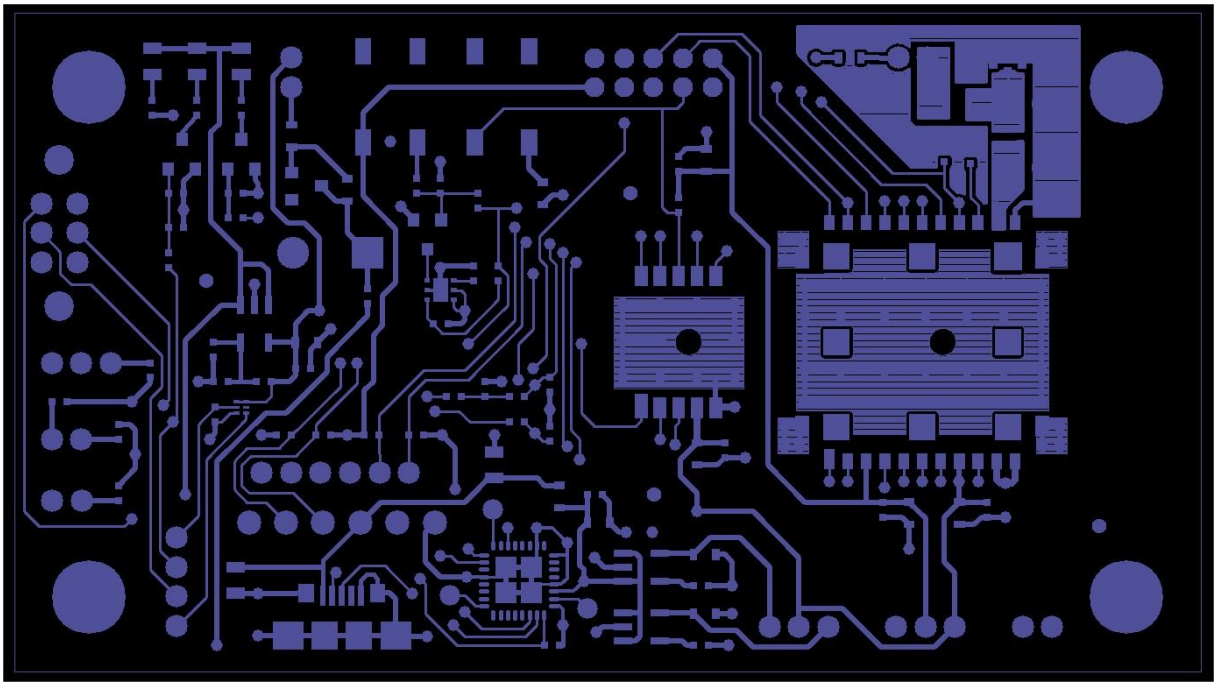


Figure 9. Gerber Top Side CS Layer

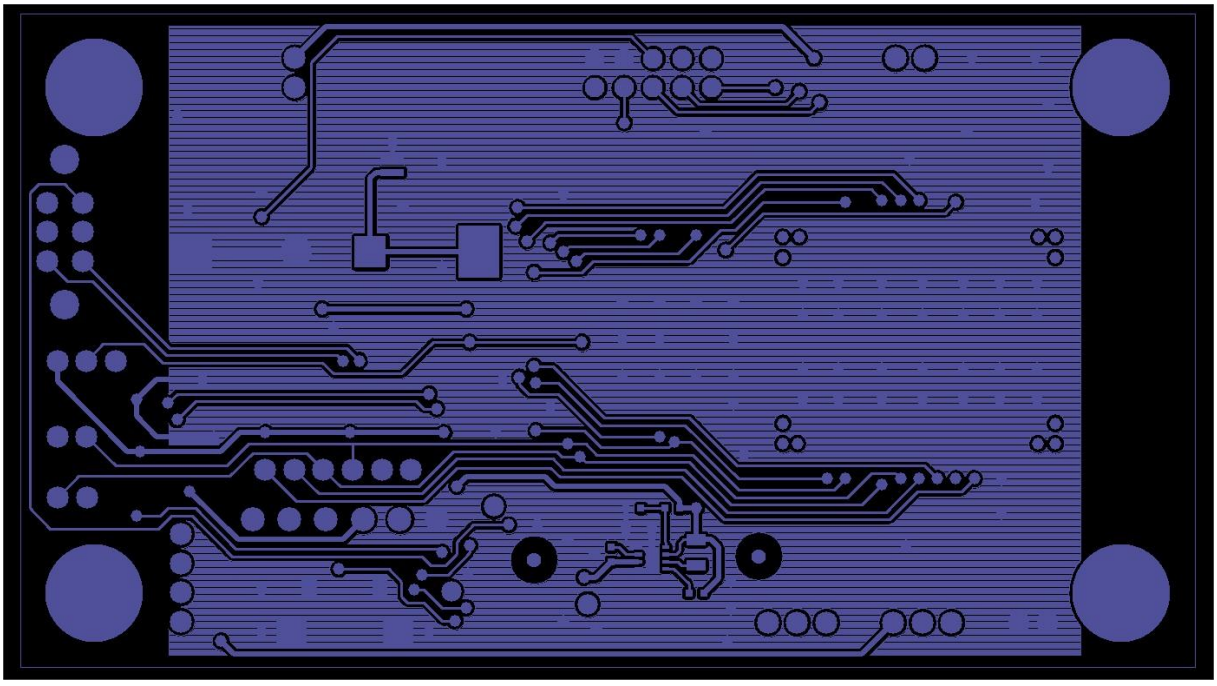


Figure 10. Gerber Bottom Side PS Layer

8.2. Adapter Board

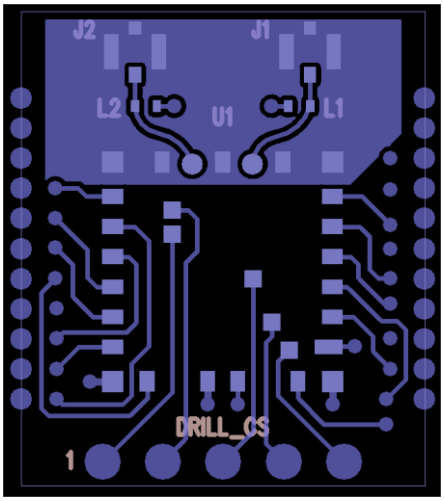


Figure 11. Interface Adapter Board Components Placement

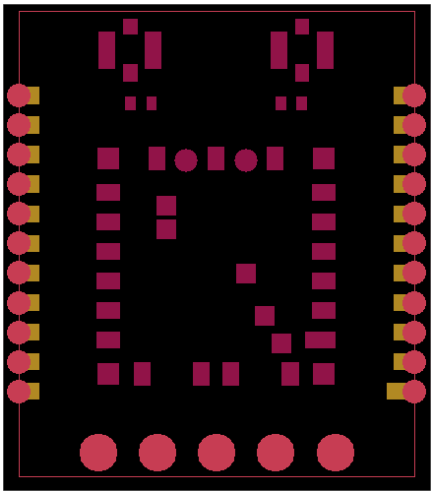


Figure 12. Interface Adapter Board Solder Mask

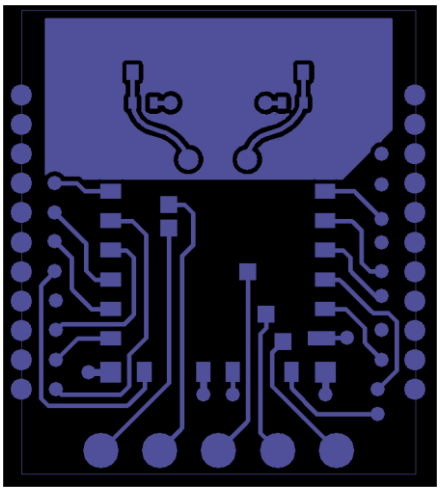


Figure 13. Interface Adapter Board Top Layer Routing

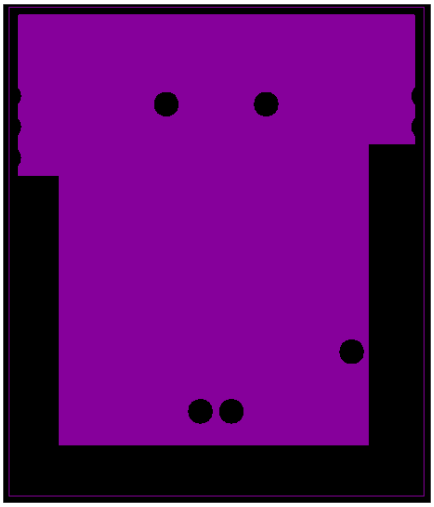


Figure 14. Interface Adapter Layer 1 Routing

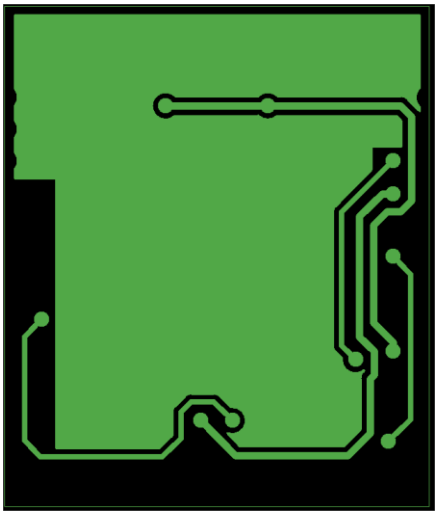


Figure 15. Interface Adapter Layer 2 Routing

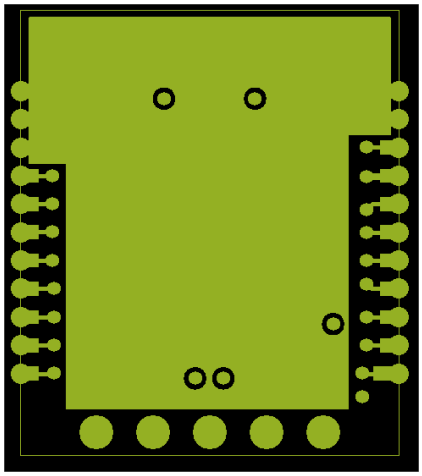


Figure 16. Interface Adapter Bottom Layer Routing

9. TTL-232R-3V3 USB-SERIAL CONVERTER CABLE*

The TTL-232R-3V3 is a USB-to-Serial converter cable that provides a simple way to connect devices with a UART interface to a PC.

The TTL-232R-3V3 uses an FTDI FT232RQ IC, which is housed inside the USB Type 'A' connector and terminates at the end of a 1.8-meter cable (6 ft.) with a 2.54mm (0.1 inch) pitch header socket, which provides access to UART standard Transmit Data (TxD) and Receive Data (RxD). These lines operate at 3.3V LVTTL levels.

Also brought out on the header are +5V and GND.

Figure 17. Pin Header Socket Bottom View

Table 2. USB-Serial Converter Cable Header Pin-Out

Pin Number	Name	Type	Color	Description
1	GND	Power	Black	Ground supply pin
2	CTS	Input	Brown	Clear to Send input – not in use
3	VCC	Power	Red	+5V power source, USB specified
4	TXD	Output	Orange	Asynchronous Data output – GPS input
5	RXD	Input	Yellow	Asynchronous Data input – GPS output
6	RTS	Output	Green	Request to Send output – not in use

Table 3. USB-Serial Converter Cable Operating Parameters

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Power Supply Voltage	V_{CC}	Defined by USB V_{BUS}	4.25	5.0	5.25	V
Power Supply Current	I_O		-	-	75	mA
Output Voltage Low State	V_{OL}	I_{OL} = 8mA	0.3	0.4	0.6	V
Output Voltage High State	V_{OH}	I_{OH} = -3mA	2.2	2.8	3.2	V
Input Voltage State Switching	V_{IN}	Low → High	1.0	1.2	1.5	V
Input Voltage State Switching	V_{HYST}	High → Low	20	25	30	mV
Operating Temperature	T_{AMB}		-40	+25	+85	^{0}C

Note : For more information refer to *FTDI Ltd. TTL-232R TTL to USB Serial Converter Range of Cables Datasheet*, Document Reference No.: FT_000054

10. ORDERING INFORMATION

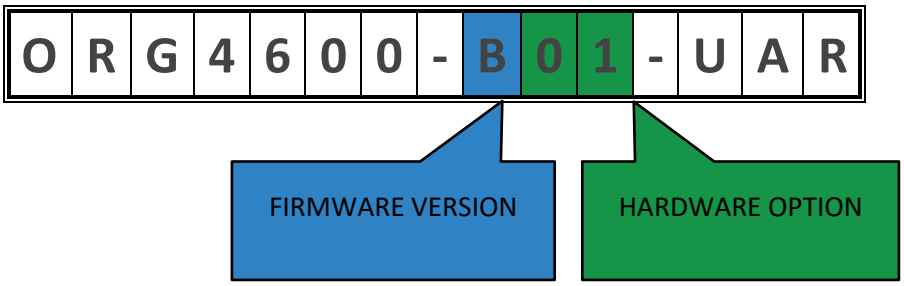


Table 4. Orderable devices

Part Number	FW Version	HW Option	VCC Range	Packaging	SPQ
ORG4600-B01-UAR	B	01	5V USB	Evaluation Kit	1

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