



NANO HORNET (ORG1411)

EVALUATION KIT

Datasheet



INDEX

| | | |
|-------|---|----|
| 1. | SCOPE | 4 |
| 2. | DISCLAIMER | 4 |
| 3. | SAFETY INFORMATION | 4 |
| 4. | ESD SENSITIVITY | 4 |
| 5. | CONTACT INFORMATION | 4 |
| 6. | RELATED DOCUMENTATION | 4 |
| 7. | REVISION HISTORY | 5 |
| 8. | ABOUT HORNET FAMILY | 5 |
| 9. | ABOUT NANO HORNET MODULE | 5 |
| 10. | ABOUT ORIGINGPS..... | 6 |
| 11. | DESCRIPTION | 6 |
| 12. | SCHEMATICS | 7 |
| 12.1. | MAIN BOARD SCHEMATICS..... | 7 |
| 12.2. | INTERFACE ADAPTOR SCHEMATICS | 8 |
| 13. | BILL OF MATERIALS | 9 |
| 13.1. | MAIN BOARD BILL OF MATERIALS | 9 |
| 13.2. | INTERFACE ADAPTOR BILL OF MATERIALS | 9 |
| 14. | ASSEMBLY AND LAYOUT | 10 |
| 14.1. | MAIN BOARD PCB | 10 |
| 14.2. | INTERFACE ADAPTOR PCB..... | 12 |
| 15. | TTL-232R-3V3 USB-Serial CONVERTER CABLE | 15 |

TABLE INDEX

| | |
|---|----|
| TABLE 1 – RELATED DOCUMENTATION..... | 4 |
| TABLE 2 – REVISION HISTORY..... | 5 |
| TABLE 3 – MAIN BOARD BILL OF MATERIALS..... | 9 |
| TABLE 4 – INTERFACE ADAPTOR BILL OF MATERIALS | 9 |
| TABLE 5 – USB-SERIAL CONVERTER CABLE HEADER PIN-OUT | 15 |
| TABLE 6 – USB-SERIAL CONVERTER CABLE OPERATING PARAMETERS | 15 |



FIGURE INDEX

| | |
|---|----|
| FIGURE 1 – MAIN BOARD SCHEMATICS | 7 |
| FIGURE 2 – INTERFACE ADAPTOR SCHEMATICS..... | 8 |
| FIGURE 3 – MAIN BOARD COMPONENTS PLACEMENT | 10 |
| FIGURE 4 – MAIN BOARD SOLDER MASK | 10 |
| FIGURE 5 – MAIN BOARD TOP LAYER ROUTING | 11 |
| FIGURE 6 – MAIN BOARD BOTTOM LAYER ROUTING | 11 |
| FIGURE 7 – INTERFACE ADAPTOR BOARD COMPONENTS PLACEMENT | 12 |
| FIGURE 8 – INTERFACE ADAPTOR BOARD SOLDER MASK..... | 12 |
| FIGURE 9 – INTERFACE ADAPTOR BOARD TOP LAYER ROUTING | 13 |
| FIGURE 10 – INTERFACE ADAPTOR INNER LAYER 1 ROUTING | 13 |
| FIGURE 11 – INTERFACE ADAPTOR INNER LAYER 2 ROUTING | 14 |
| FIGURE 12 – INTERFACE ADAPTOR BOTTOM LAYER ROUTING..... | 14 |
| FIGURE 13 – PIN HEADER SOCKET BOTTOM VIEW | 15 |



1. SCOPE

This document describes the features and specifications of Nano Hornet ORG1411 evaluation kit.

2. DISCLAIMER

All trademarks are properties of their respective owners.

Performance characteristics listed in this document do not constitute a warranty or guarantee of product performance. OriginGPS assumes no liability or responsibility for any claims or damages arising out of the use of this document, or from the use of integrated circuits based on this document.

OriginGPS assumes no liability or responsibility for unintentional inaccuracies or omissions in this document. OriginGPS reserves the right to make changes in its products, specifications and other information at any time without notice.

OriginGPS reserves the right to conduct, from time to time, and at its sole discretion, firmware upgrades. As long as those FW improvements have no material change on end customers, PCN may not be issued.

OriginGPS navigation products are not recommended to use in life saving or life sustaining applications.

3. SAFETY INFORMATION

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

4. ESD SENSITIVITY

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



5. CONTACT INFORMATION

Support - support@origingps.com or [Online Form](#)

Marketing and sales - marketing@origingps.com

Web – www.origingps.com

6. RELATED DOCUMENTATION

| No | DOCUMENT NAME |
|----|--|
| 1 | Nano Hornet – ORG1411 Datasheet |
| 2 | Spider and Hornet - NMEA Protocol Reference Manual |
| 3 | Spider and Hornet - OSP® Reference Manual |
| 4 | Spider and Hornet - OSP® GNSS Extensions Reference Manual |
| 5 | Spider and Hornet - Low Power Modes Application Note |
| 6 | Spider and Hornet - Client Generated Extended Ephemeris Application Note |
| 7 | Spider and Hornet - Server Generated Extended Ephemeris Application Note |
| 8 | Spider and Hornet - Ephemeris Push Application Note |

TABLE 1 – RELATED DOCUMENTATION



7. REVISION HISTORY

| REVISION | DATE | CHANGE DESCRIPTION |
|----------|---------------|--------------------|
| A01 | May 1, 2012 | First release |
| 2.0 | June 25, 2015 | Format Update |

TABLE 2 – REVISION HISTORY

8. ABOUT HORNET FAMILY

OriginGPS GNSS receiver modules have been designed to address markets where size, weight, stand-alone operation, highest level of integration, power consumption and design flexibility - all are very important.

OriginGPS' Hornet family breaks size barrier, offering the industry's smallest fully-integrated, highly-sensitive GPS and GNSS modules with integrated antennas or on-board RF connectors.

Hornet family features OriginGPS' 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.

Hornet family enables the shortest TTM (Time-To-Market) with minimal design risks.

Just connect power supply on a single layer PCB.

9. ABOUT NANO HORNET MODULE

Nano Hornet is a complete SiP featuring miniature LGA SMT footprint designed to commit unique integration features for high volume cost sensitive applications, sharing same footprint, electrical interface and software with OriginGPS' Micro Hornet ORG1411 module in ultimate ultra-low profile of 3.8mm.

Designed to support space constrained applications such as smart watches, action cameras and wearable devices, Nano Hornet ORG1411 module is an ultra-compact, ultra-low profile and ultra-low weight multi-channel GPS with SBAS, QZSS and other regional overlay systems receiver that continuously tracks all satellites in view, providing real-time positioning data in industry's standard NMEA format.

Nano Hornet ORG1411 module offers superior sensitivity and outstanding performance, achieving rapid TTFF in less than one second, accuracy of approximately two meters, and tracking sensitivity of -163dBm.

Sized only 10mm x 10mm Nano Hornet ORG1411 module is industry's small sized, record breaking solution.

Nano Hornet module integrates OriginGPS proprietary low profile GPS antenna, dual-stage LNA, RF LDO, SAW filter, TCXO, RTC crystal and RF shield with market-leading SiRFstarIV™ GPS SoC.

Nano Hornet ORG1411 module is introducing industry's lowest energy per fix ratio, unparalleled accuracy and extremely fast fixes even under challenging signal conditions, such as in built-up urban areas, dense foliage or even indoor.

Integrated GPS SoC incorporating high-performance microprocessor and sophisticated firmware keeps positioning payload off the host, allowing integration in embedded solutions 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 satellite ephemeris data while consuming mere microwatts of battery power.



10. 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 is specializing in development of unique technologies that miniaturize RF modules, thereby addressing the market need for smaller wireless solutions.

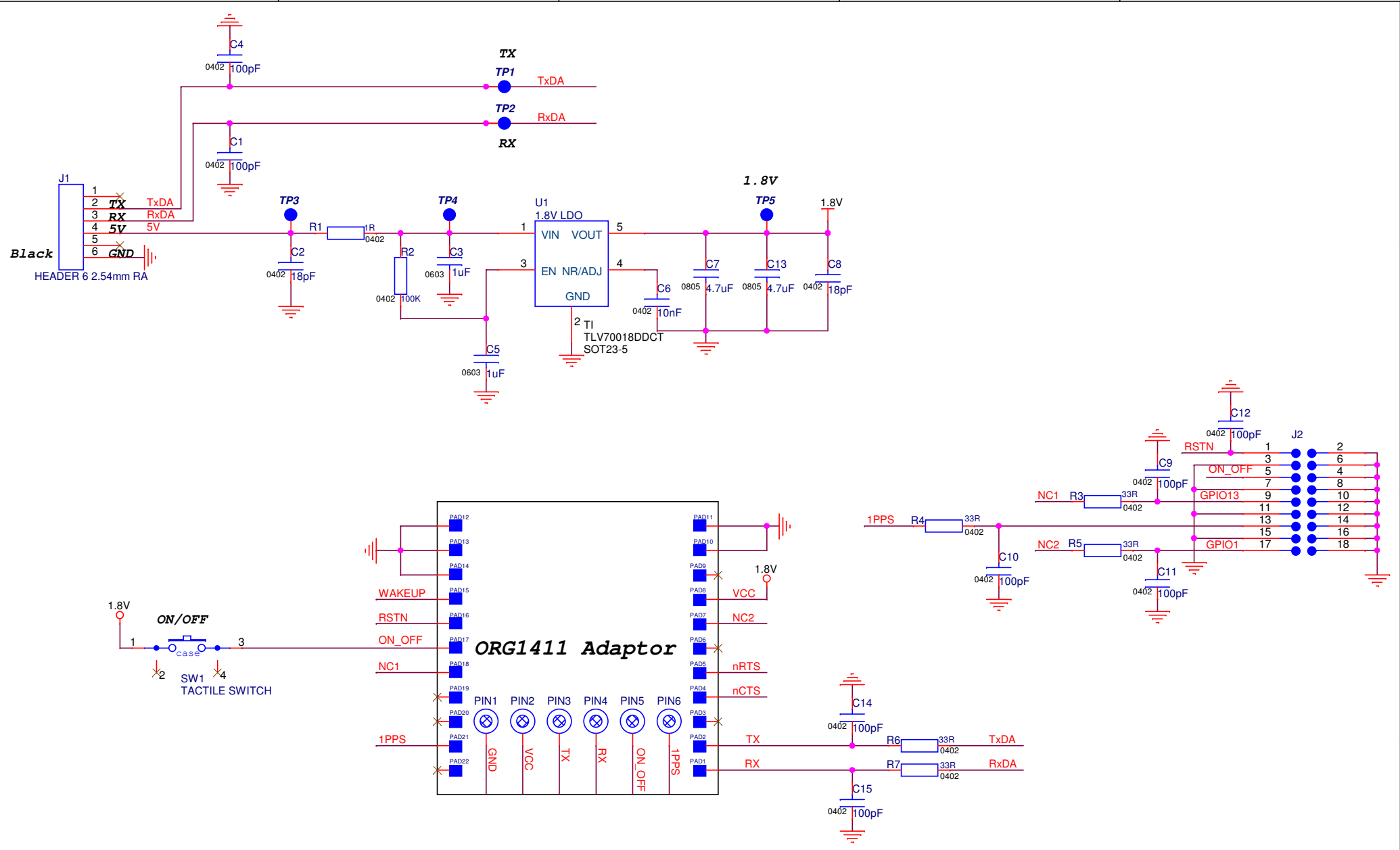
11. DESCRIPTION


Evaluation Kit of the ORG1411 GPS Antenna Module comprises the Demo Board, USB to UART cable and CD with GPS simulator software for PC and documentation.

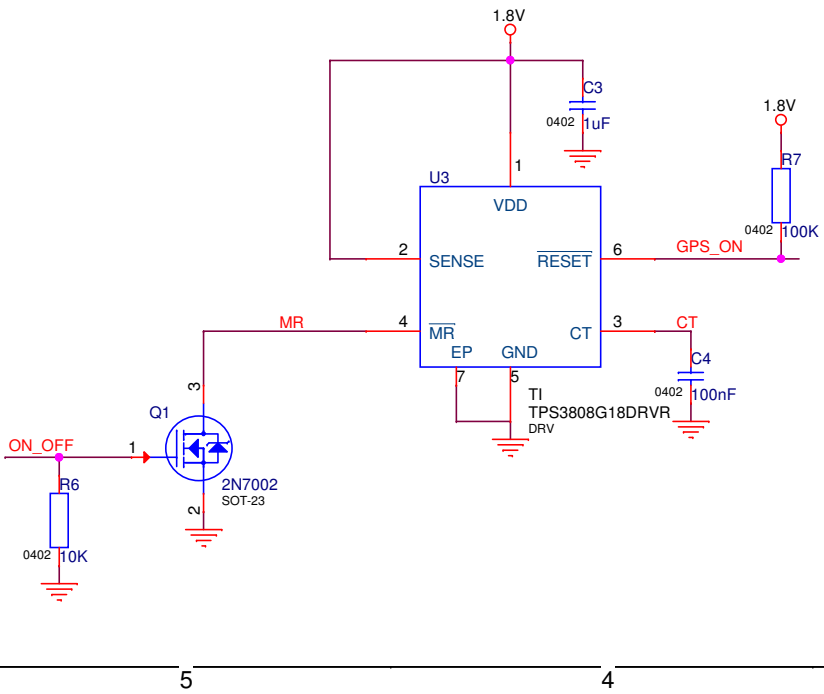
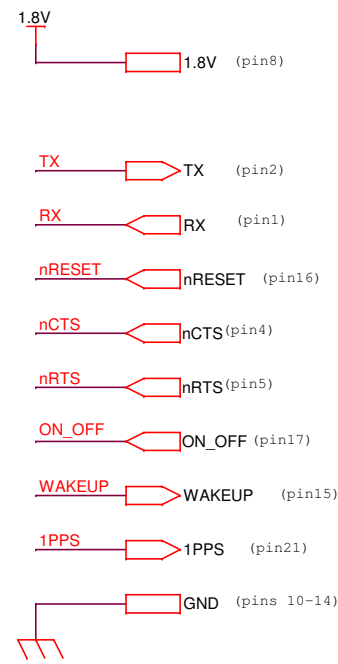
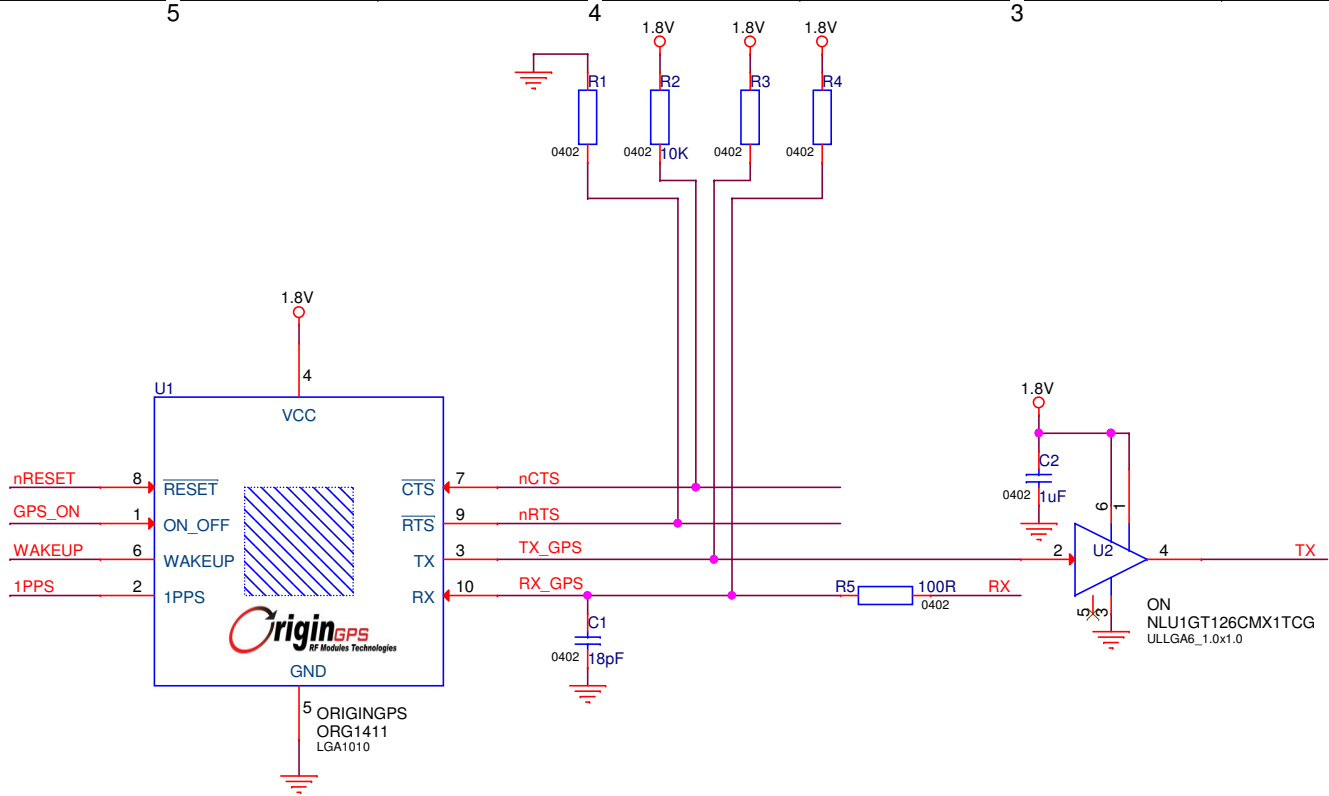
The Demo Board is built of Main Board, incorporating 1.8V LDO regulator, UART connector, push-button tactile switch for Push-To-Fix™ interrupt and various test points.

The ORG1411 GPS Antenna Module is soldered onto the Main Board through the Interface Adaptor.

The Interface Adaptor includes a single-bit buffer for voltage level translation of TX line, and a voltage supervisor for autonomous power-on pulse generation.



| | | | |
|---|-----------------|-------------------------------|-----|
|  | | Project | |
| | | ORG1411 UART Evaluation Board | |
| Title | | | |
| ORG1411 UART Demo Board | | | |
| Size | Document Number | Authored By: | Rev |
| A4 | ORG1411-DBUA | I. Divinsky | A00 |
| Date: Monday, April 30, 2012 | | Sheet 1 of 1 | |



| | | | |
|------------------------------|------------------------------------|--------------------------|---------|
| | | Project ORG1411-AD1 | |
| | | Title ORG1411 Adaptor | |
| Size A4 | Document Number PD-ORG1411-AD1-A00 | Authored By: I. Divinsky | Rev A00 |
| Date: Monday, April 30, 2012 | Sheet 1 | of 1 | 1 |



13. BILL OF MATERIALS

13.1 MAIN BOARD BILL OF MATERIALS

| Reference | Value | Description | P/N | MFG |
|-------------------------------------|-------|---------------------------------|--------------------|---------|
| C2, C8 | 18pF | CAP SMT 0402 18pF ±5% 50V COG | GRM1555C1H180JZ01D | MURATA |
| C1, C4, C9, C10, C11, C12, C14, C15 | 100pF | CAP SMT 0402 100pF ±5% 50V COG | GRM1555C1H101JA01D | MURATA |
| C6 | 10nF | CAP SMT 0402 10nF ±10% 25V X7R | GRM155R71E103KA01D | MURATA |
| C3, C5 | 1μF | CAP SMT 0603 1μF ±10% 10V X5R | GRM188R60J105KA01J | MURATA |
| C7, C13 | 4.7μF | CAP SMT 0805 4.7μF ±10% 16V X5R | GRM21BR61C475KA88L | MURATA |
| R1 | 1Ω | RES SMT 0402 1Ω ±1% | RM04FTN0010 | TA-I |
| R3, R4, R5, R6, R7 | 33Ω | RES SMT 0402 33Ω ±1% | RM04FTN0330 | TA-I |
| R2 | 100KΩ | RES SMT 0402 100KΩ ±1% | RM04FTN1003 | TA-I |
| J1 | HDR | HEADER 6 POS. 0.1" RIGHT ANGLE | 2211S-06G-F1 | NELTRON |
| SW1 | TSW | TACT SWITCH SMT | KSC222JLFS | C&K |
| U1 | LDO | LDO REG. SMT SOT23-5 3.3V 200mA | TLV70033DDCT | TI |

TABLE 3 - MAIN BOARD BILL OF MATERIALS

13.2 INTERFACE ADAPTOR BILL OF MATERIALS

| Reference | Value | Description | P/N | MFG |
|-----------|-----------|-----------------------------------|--------------------|-----------|
| C1 | 18pF | CAP SMT 0402 18pF ±5% 50V COG | GRM1555C1H180JZ01D | MURATA |
| C4 | 100nF | CAP SMT 0402 100nF ±10% 16V X7R | GRM155R71C104KA88D | MURATA |
| C2, C3 | 1μF | CAP SMT 0402 1μF ±10% 10V X5R | GRM155R61A105KE15D | MURATA |
| R5 | 100Ω | RES SMT 0402 100Ω ±1% | RM04FTN1000 | TA-I |
| R2, R6 | 10KΩ | RES SMT 0402 10KΩ ±1% | RM04FTN1002 | TA-I |
| R7 | 100KΩ | RES SMT 0402 100KΩ ±1% | RM04FTN1003 | TA-I |
| Q1 | 2N7002 | N-CH MOSFET SOT-23 | 2N7002KT1G | ON |
| U1 | MODULE | GPS ANTENNA MODULE SMT LGA | ORG1411 | ORIGINGPS |
| U2 | NLU1GT126 | SINGLE BUFFER 3-STATE | NLU1GT126CMX1TCG | ON |
| U3 | TPS3808 | LOW IQ POR SUPERVISOR W. MAN. RST | TPS3808G18DRVVR | TI |

TABLE 4 - INTERFACE ADAPTOR BILL OF MATERIALS



14. ASSEMBLY AND LAYOUT

14.1 MAIN BOARD PCB

Main Board for the ORG1411 GPS Antenna Module is 2 layers 1.6mm thickness FR4 PCB.

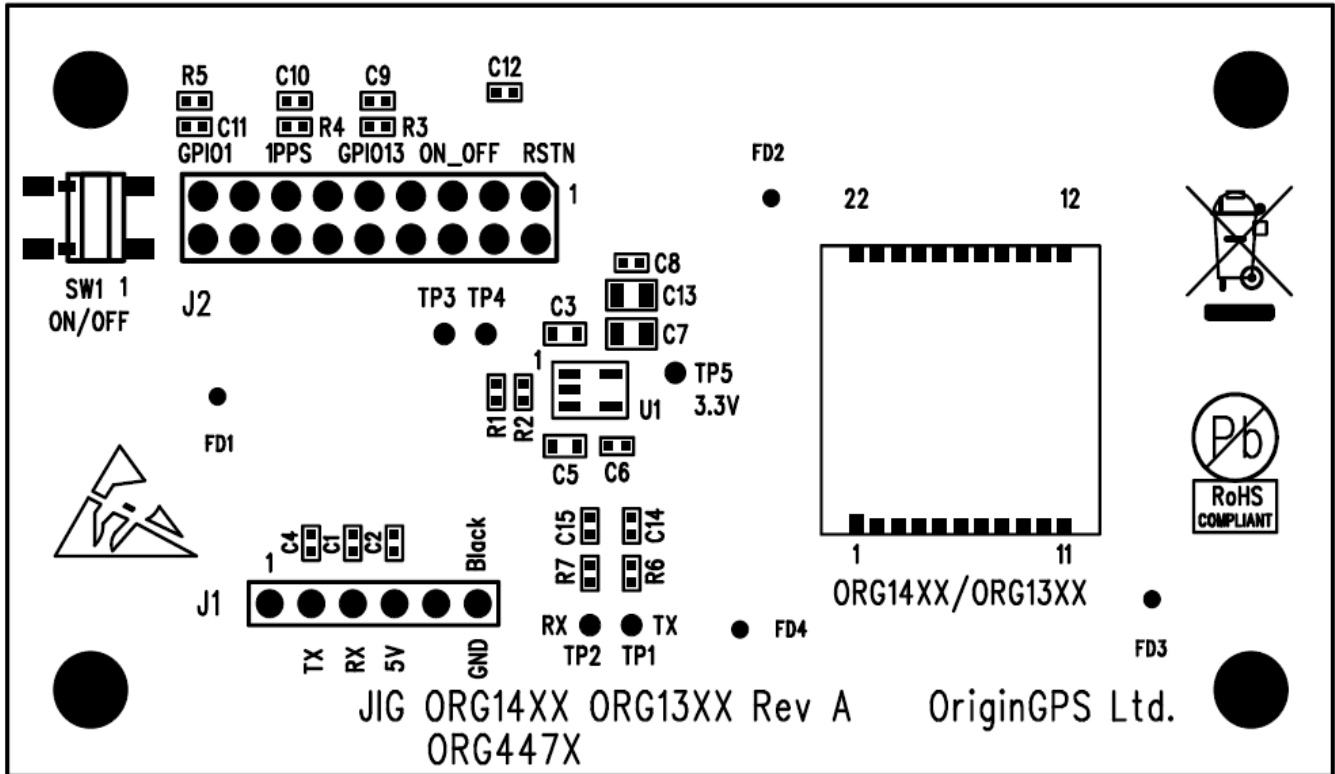


FIGURE 3 - MAIN BOARD COMPONENTS PLACEMENT

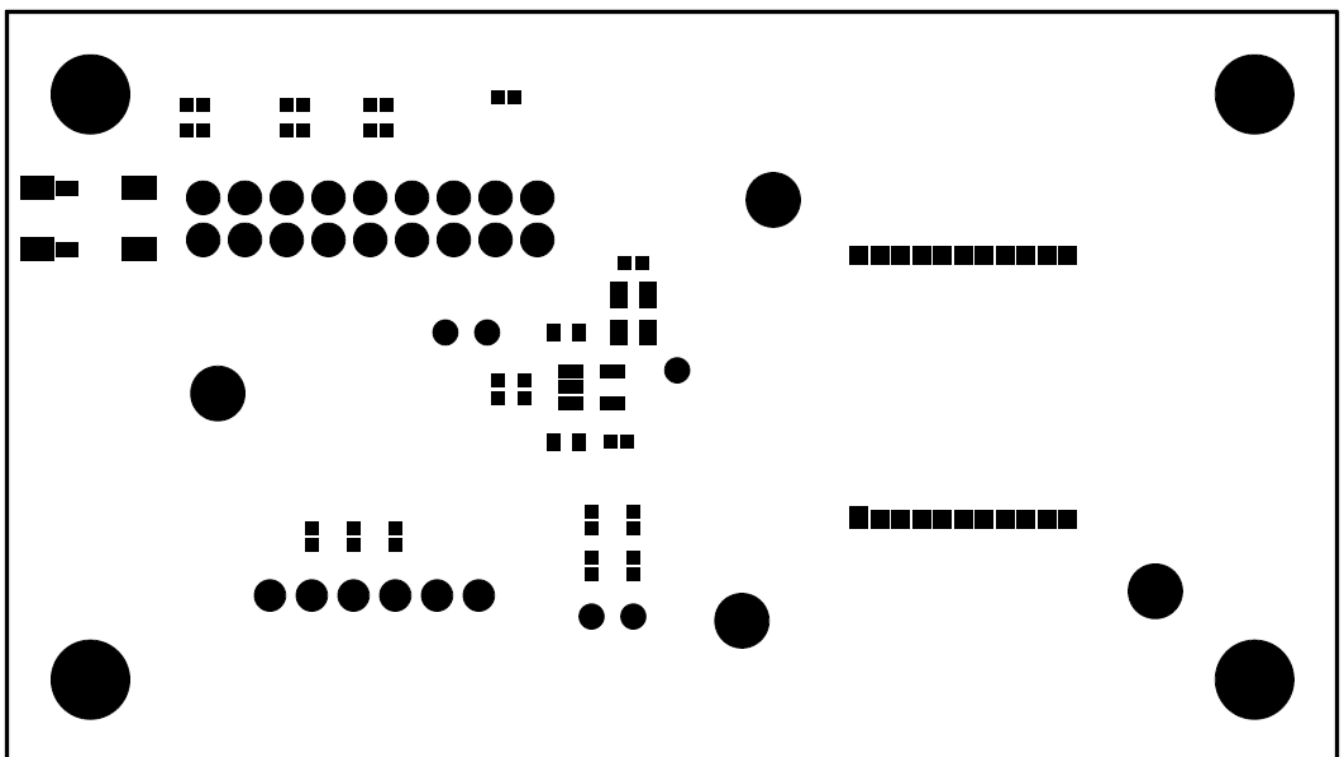


FIGURE 4 - MAIN BOARD SOLDER MASK

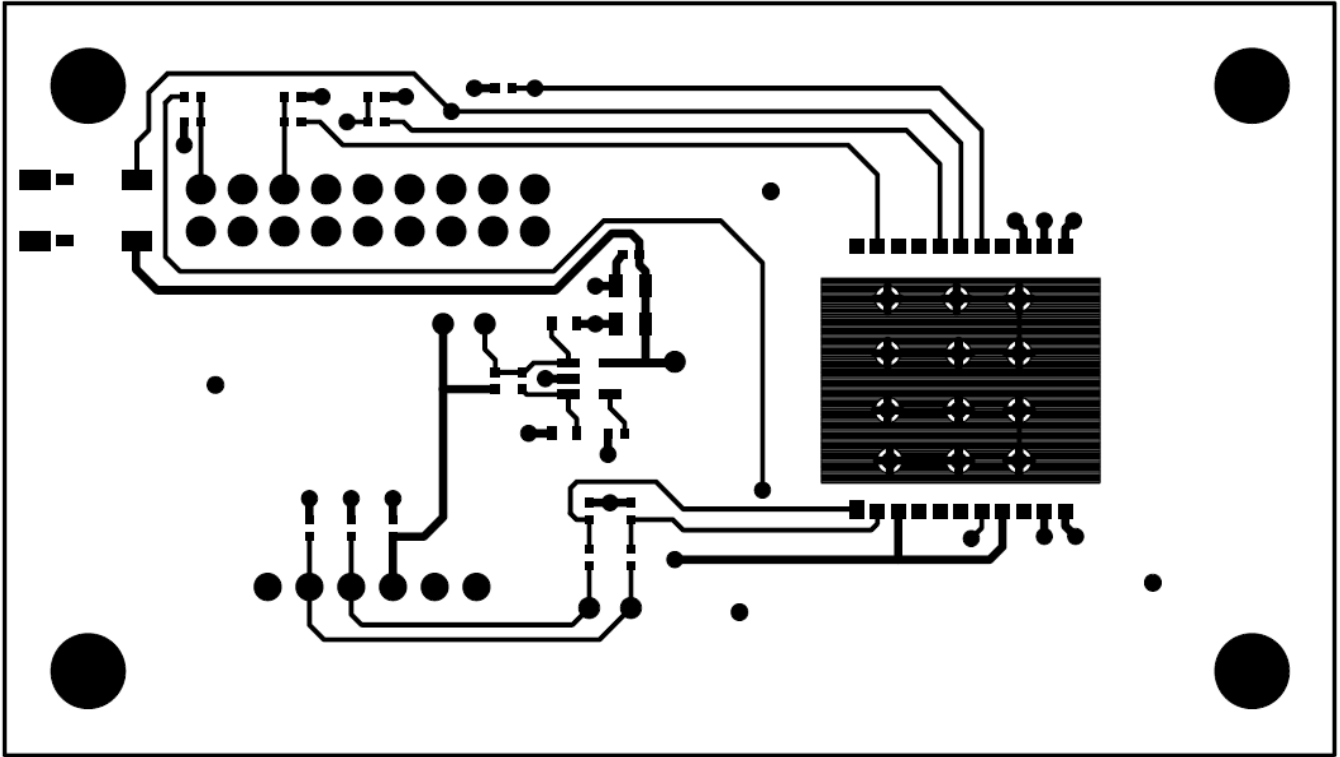


FIGURE 5 – MAIN BOARD TOP LAYER ROUTING

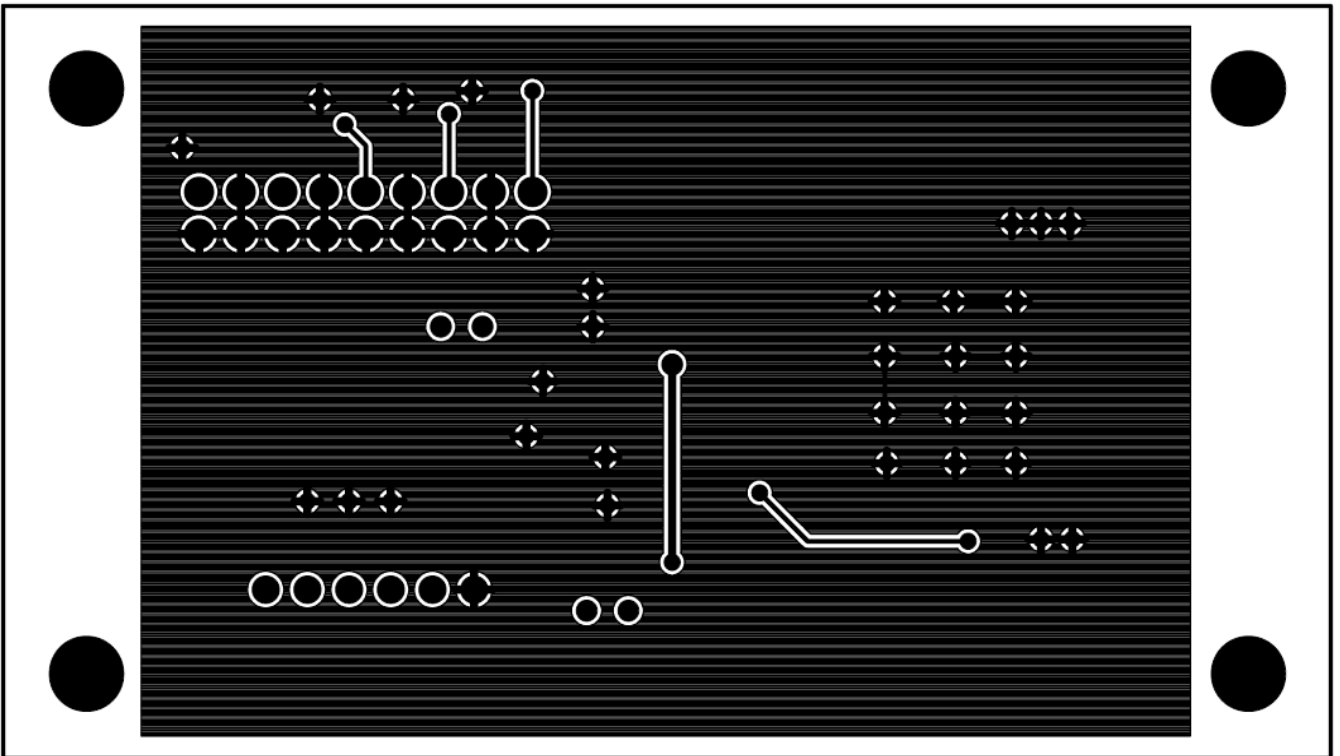


FIGURE 6 – MAIN BOARD BOTTOM LAYER ROUTING



14.2 INTERFACE ADAPTOR PCB

Interface Adaptor Board for the ORG1411 GPS Antenna Module is 17mm x 17mm 22 pads 4 layers 0.6mm thickness FR4 PCB.

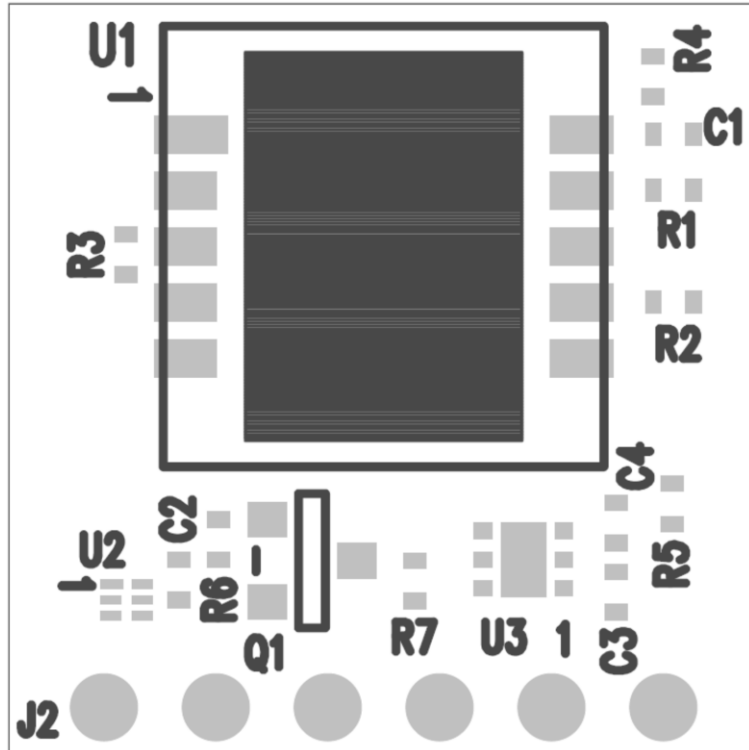


FIGURE 7 - INTERFACE ADAPTOR BOARD COMPONENTS PLACEMENT

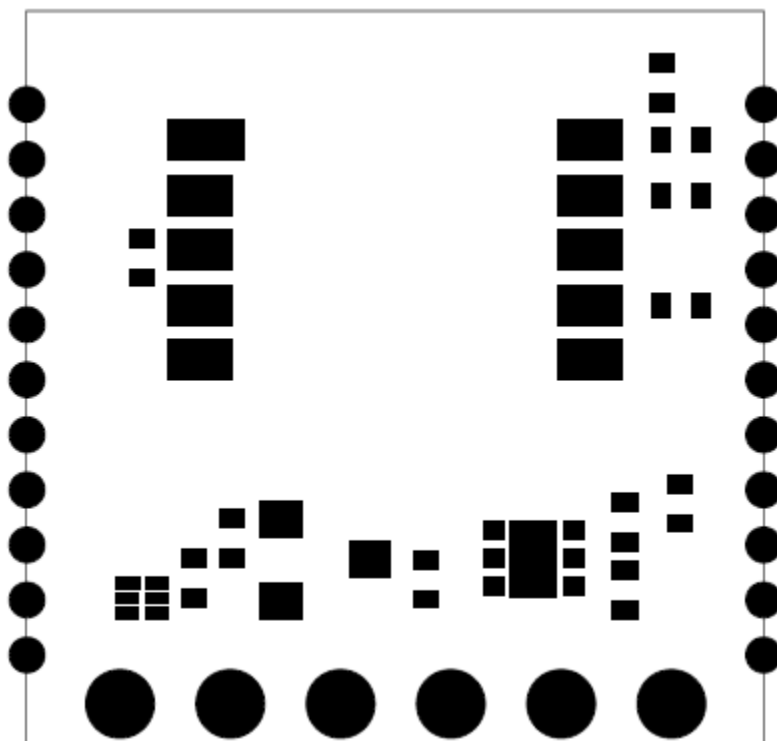


FIGURE 8 - INTERFACE ADAPTOR BOARD SOLDER MASK

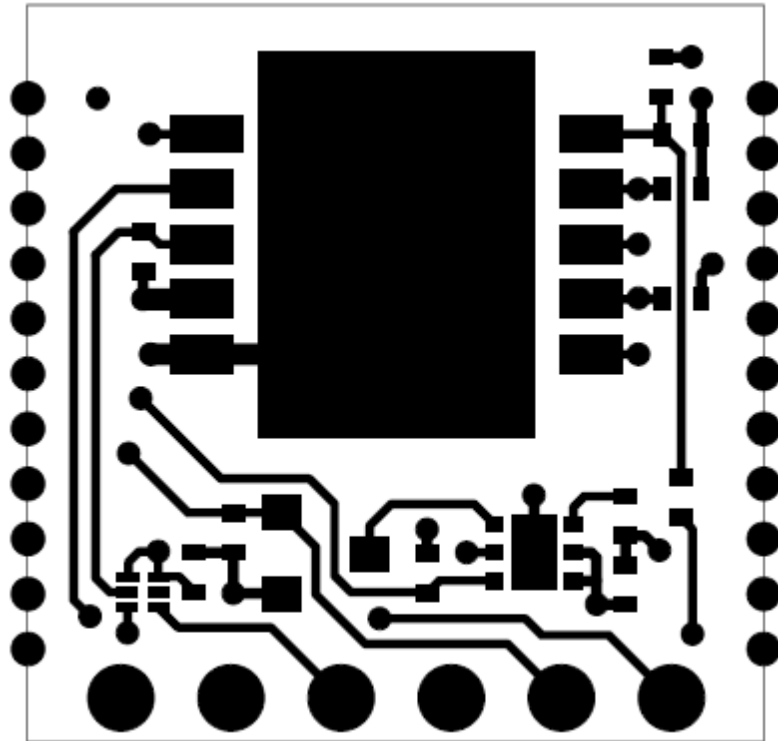
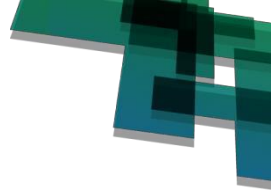


FIGURE 9 - INTERFACE ADAPTOR BOARD TOP LAYER ROUTING

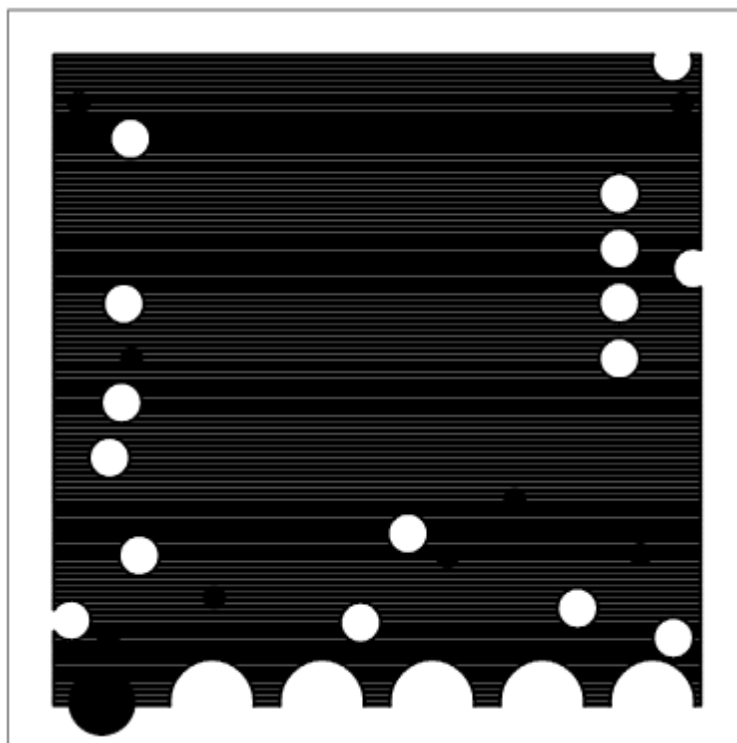


FIGURE 10 - INTERFACE ADAPTOR INNER LAYER 1 ROUTING

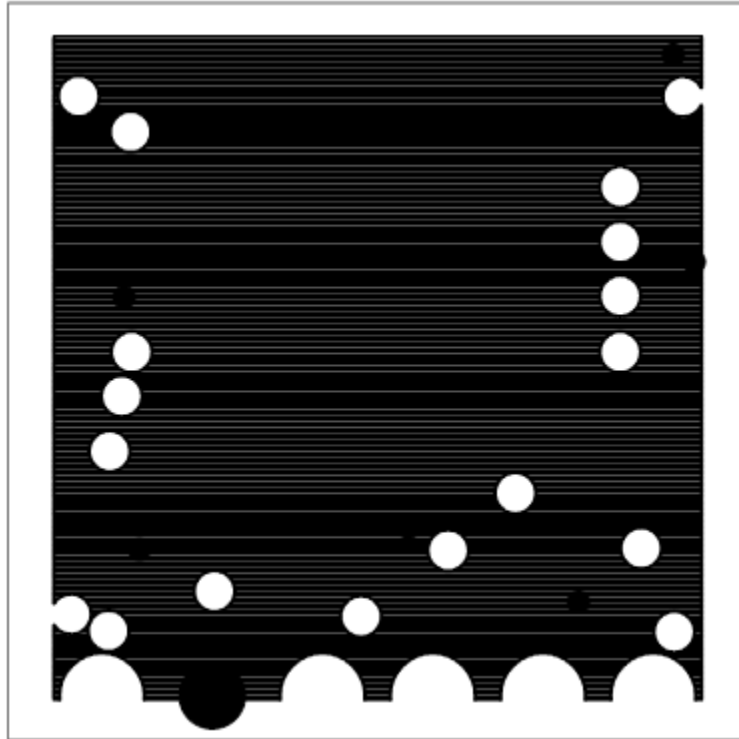
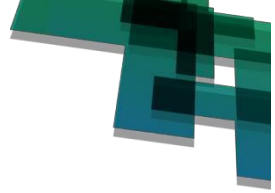


FIGURE 11 - INTERFACE ADAPTOR INNER LAYER 2 ROUTING

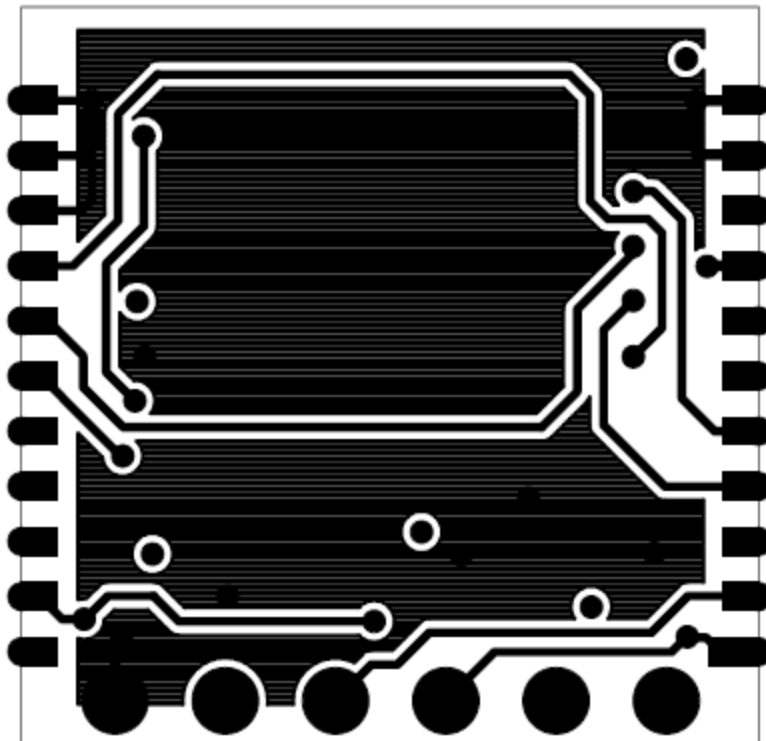


FIGURE 12 - INTERFACE ADAPTOR BOTTOM LAYER ROUTING



15. 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 UART interface to PC.

The TTL-232R-3V3 uses an FTDI FT232RQ IC which is housed inside the USB Type 'A' connector and is terminated at the end of a 1.8 meter cable (6 ft.) with a 2.54mm ("0.1) pitch header socket which provides an access to UART standard Transmit Data (TxD) and Receive Data (RxD). These lines are operating at 3.3V LVTTTL levels. Also brought out on the header are +5V and GND.



FIGURE 13 - PIN HEADER SOCKET BOTTOM VIEW

| Pin Number | Name | Type | Colour | 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 5 - USB-SERIAL CONVERTER CABLE HEADER PIN-OUT

| 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 Threshold | V_{IN} | Low \rightarrow High | 1.0 | 1.2 | 1.5 | V |
| Input Voltage State Switching Hysteresis | V_{HYST} | High \rightarrow Low | 20 | 25 | 30 | mV |
| Operating Temperature | T_{AMB} | | -40 | +25 | +85 | $^{\circ}C$ |

TABLE 6 - USB-SERIAL CONVERTER CABLE OPERATING PARAMETERS

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