# SWRduino™ KT-001

## SWR RF bridge compatible with Arduino™ Uno shield
## Up to 20 W continuous RF power
## 1.8-30 MHz frequency range

## Main Features

- Highly integrated QRP HF band SWR bridge up to 20 W
- Full compatibility with Arduino™ Uno board
- Tandem Match configuration for best directivity
- Only THT components for easy assembly
- Easy access to measured values ($P_{fwd}$ and $P_{ref}$) from ANALOG_IN input section
- Germanium diodes for best sensitivity
- Optional trimmers for fine adjustments
- SMA connectors for size critical applications (BNC also can be mounted)
- Equipped with ISP connector (2x3 pin header)
- Only passive components; no current consumption
- CE marked
- RoHS compliant
- 1-year warranty

## Mechanical Characteristics

- Full mechanical and electrical compatibility with Arduino™ Uno Board
- Double-layer PCB
- Double-sided connectors/plugs
- Compact design: 68 x 54 x 12 mm

## Application

- Experimental SWR measurement system for amateur radio
- Part of Arduino's controlled antenna tuner
- Part of RF beacons (CW, BPSK, WSPR)
- ALC detector module for experimental TX modules
- Experimental remote measurement circuitry

## General Description

The KT-001 SWRduino™ is a fully integrated standing-wave-ratio (SWR) measuring circuit fully compatible with Arduino™ Uno platform. SWRduino™ is built as the tandem match configuration, which provides excellent directivity in comparison to other popular topologies.

The JP1 connector allows programming the Arduino™ Uno device through 2x3 pin header.

The SWRduino™ has only passive components so no additional energy is drained from the power source.

## Absolute Maximum Ratings

| | |
|---|---|
| Maximum Input Voltage: | 31,6 Vrms (+43 dBm) |
| Power Dissipation @ +25°C: | <0.5 W |
| Operating Temperature Range: | -45°C to +85°C |
| Lead Temperature (Soldering 10 sec): | +300°C |




**FIGURE 1.** Assembled SWRduino™ KT-001 board

## Assembly Instructions

It is strongly recommended to start the assembly with the smallest parts and then install the ferrite cores with windings. All types of connectors should be installed last.

### Ferrite core winding procedure

1) Recommended primary winding length is 4,5 cm. Please note that the „pass thru" winding has to be connected between points C and D.

2) Recommended secondary winding length is 25 cm. The secondary winding (recommended 12 turns) has to be soldered between points A and B.

### Please note that:

▪ It is important to make sure that the winding direction is the same for the primary and the secondary (both start at points A and C).

▪ Each pair of points are doubled for more flexibility during assembly process (if needed).

▪ If the next module (a shield board) will be stacked over SWRduino™ shield it is required to assembly the ferrite cores in horizontal position to meet the limit of height to the next board.

▪ If the overall height is not critical, the ferrite cores can be mounted vertically, which improves the directivity of the SWR bridge.

► It is good practice to spread the windings over the entire toroidal ferrite core for the best coupling.

### Installing connectors

The SWRduino™ PCB has been designed in such a way that it is possible to mount two types of connectors (one of them):

▪ BNC type (X1, X2)

▪ SMA type (X3, X4)

### Insulation consideration

► Pay attention for a required distance to the next stacked shield board. Please put there an additional insulation to avoid a short circuit.

## Components List

**Table 1.** Components list

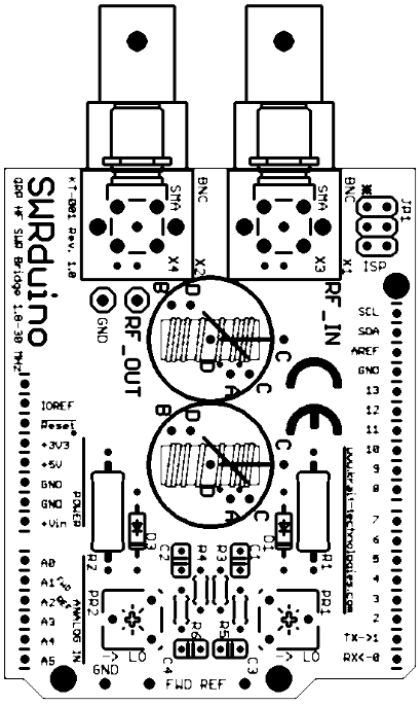
| No. | DESIGNATOR | DESCRIPTION | QTY | PART NUMBER | VALUE |
|---|---|---|---|---|---|
| 1 | R1, R2 | 51R/1W resistor | 2 | | |
| 2 | R3, R4 | Not assembled | – | – | – |
| 3 | R5, R6 | 47k/0.25W resistor | 2 | | |
| 4 | PR1, PR2 | 10k/0.1W trimmer | 2 | | |
| 5 | D1, D2 | Germanium diode | 2 | 1N5711 or equivalent | |
| 6 | C1, C2, C3, C4 | 10nF/50V, 10%, THT, 2.54 mm pitch | 4 | CC-10N | 10 nF |
| 7 | X1, X2 (optional)<br>X3, X4 (optional) | BNC THT angle connector[1]<br>SMA THT angle connector[1] | 2<br>2 | | |
| 8 | JP1 | 2x3 pin header, 2,54 mm pitch | 1 | | |
| 9 | TR1, TR2 | Toroidal ferrite core | 2 | FT50-43 | |
| 10 | SH1 | 1x10 pin header<br>1x8 pin header<br>1x6 pin header | 1<br>2<br>1 | | |
| 11 | PCB | Printed board circuit | 1 | KT-001P | |
| 12 | Enamel wire | AWG #28 | 0.7 m | | |
| 13 | Enamel wire | AWG #20 | 0.1 m | | |

1) Included RF connectors depend on a kit version. Please refer to Table 3.

## Pin Configurations

**Table 2.** Pin configurations

| PIN CONNECTIONS | |
|---|---|
| **ARDUINO standard** | **Function on SWRduino** |
| – | – |
| – | – |
| – | – |
| – | – |
| N.C. | N.C. |
| IOREF | N.C. |
| /RESET | **Reset (ISP)** |
| +3V3 | N.C. |
| +5V | **+5V (ISP)** |
| GND | **GND (ISP)** |
| GND | **GND (ISP)** |
| +Vin | N.C. |
| A0 | N.C. |
| A1 | **V_FWD** |
| A2 | **V_REF** |
| A3 | N.C. |
| A4 | N.C. |
| A5 | N.C. |




| PIN CONNECTIONS | |
|---|---|
| **ARDUINO standard** | **Function on SWRduino** |
| SCL | N.C. |
| SDA | N.C. |
| AREF | N.C. |
| GND | **GND (ISP)** |
| 13 | **SCK (ISP)** |
| 12 | **MISO (ISP)** |
| 11 | **MOSI (ISP)** |
| 10 | N.C. |
| 9 | N.C. |
| 8 | N.C. |
| 7 | N.C. |
| 6 | N.C. |
| 5 | N.C. |
| 4 | N.C. |
| 3 | N.C. |
| 2 | N.C. |
| 1 (TX) | N.C. |
| 0 (RX) | N.C. |

**FIGURE 2.** Descriptive layer of SWRduino™ KT-001 board

## Schematic Diagram

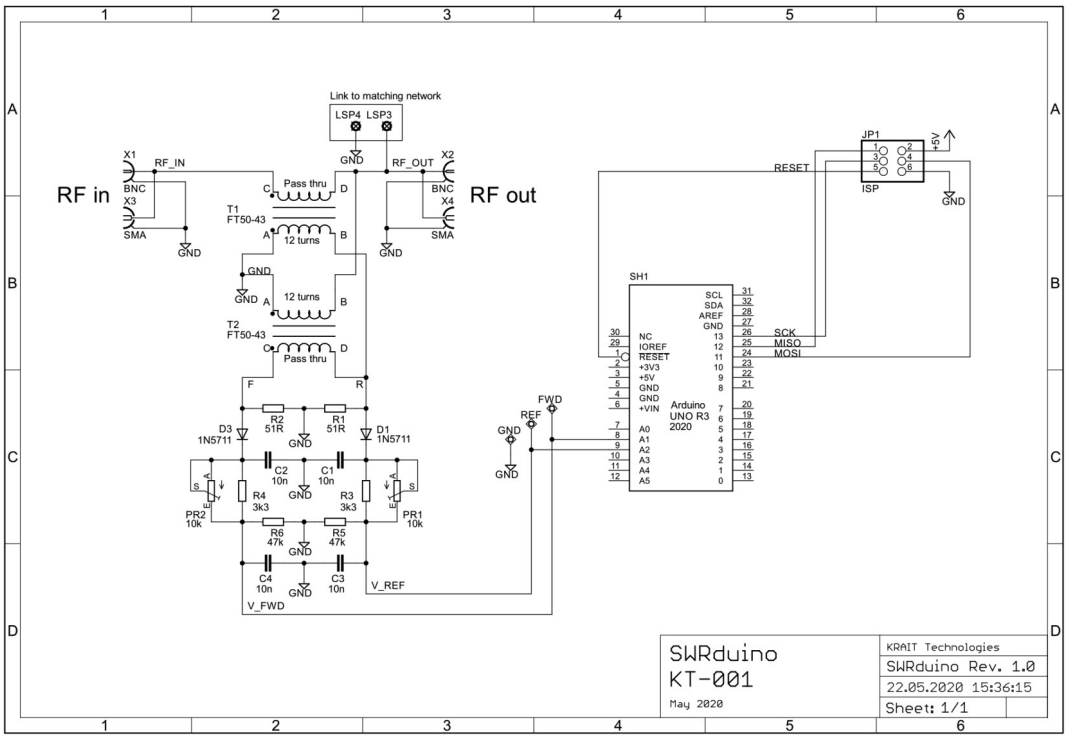



**FIGURE 3.** Schematic diagram

## Mechanical Details

SWRduino™ shield is fully compatible with the Arduino™ Uno footprint.
If the ferrite cores are assembled horizontally (flat), it is possible to install a next shield above, according to Arduino™ Uno standard.

Board dimensions: 68 x 54 x 12 mm
PCB specification: FR 4, 35 um layers, HAL

## Ordering Information

**Table 3.** Ordering information

| Description | Version | Ordering Code | QTY |
|---|---|---|---|
| Printed Circuit Board only | PCB | KT-001P | 1 |
| Kit for self assembly with BNC connectors (PCB and components included) | Kit | KT-001KB | 1 |
| Kit for self assembly with SMA connectors (PCB and components included) | Kit | KT-001KS | 1 |
| Assembled module with BNC connectors | Assembled | KT-001B | 1 |
| Assembled module with SMA connectors | Assembled | KT-001S | 1 |

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