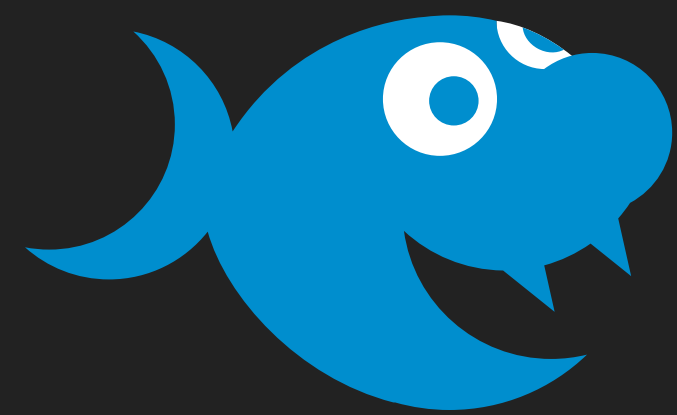


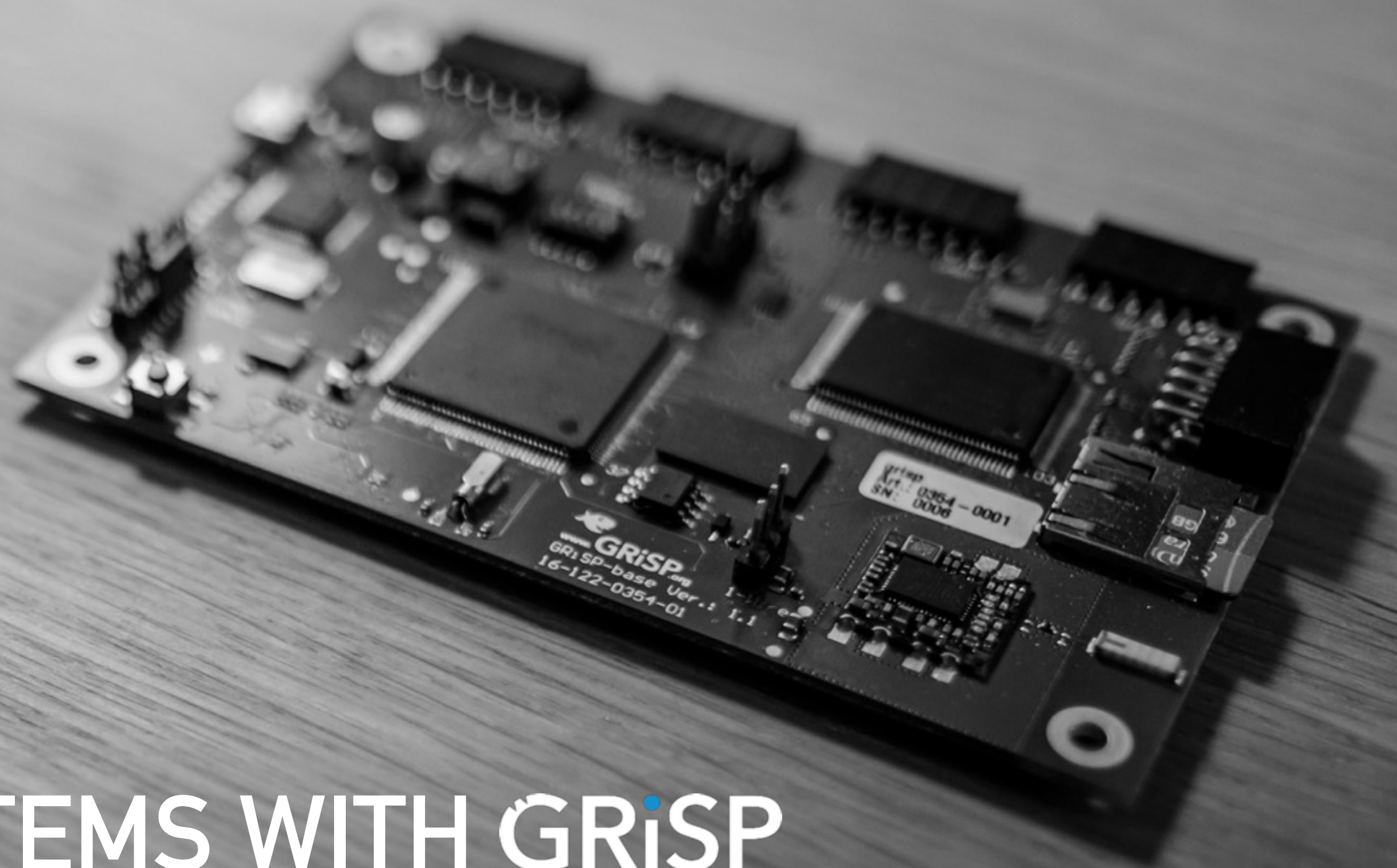
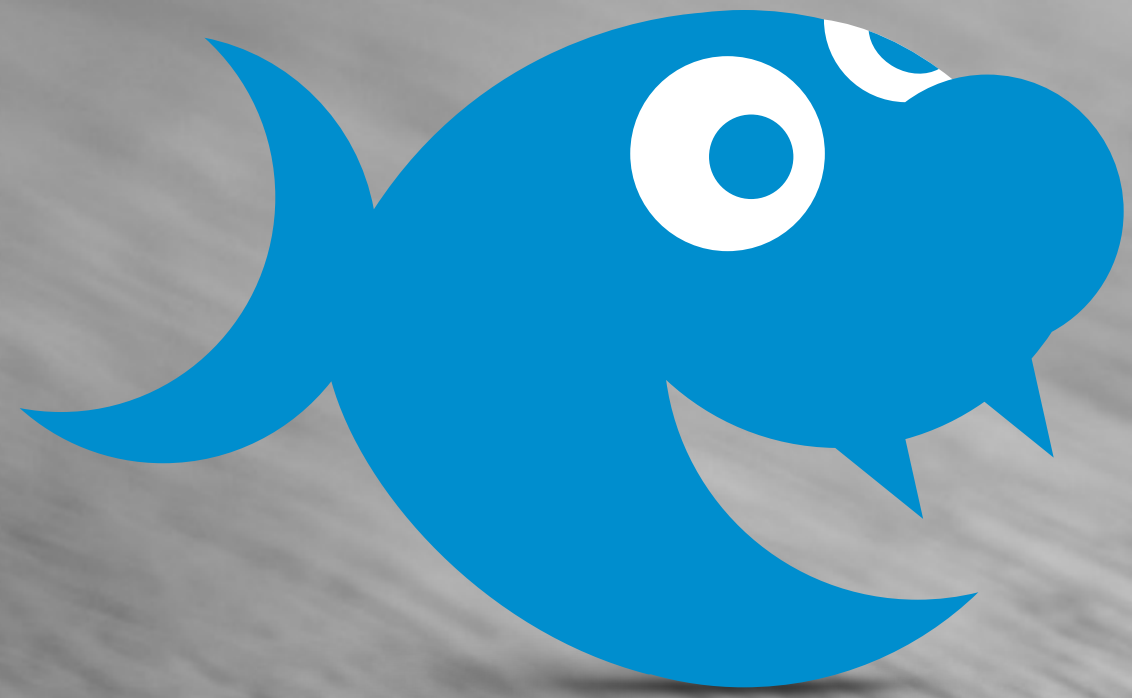
GRiSP



Nadia Zryanina



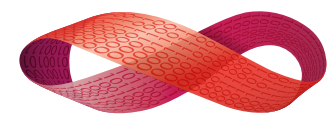
GRiSP

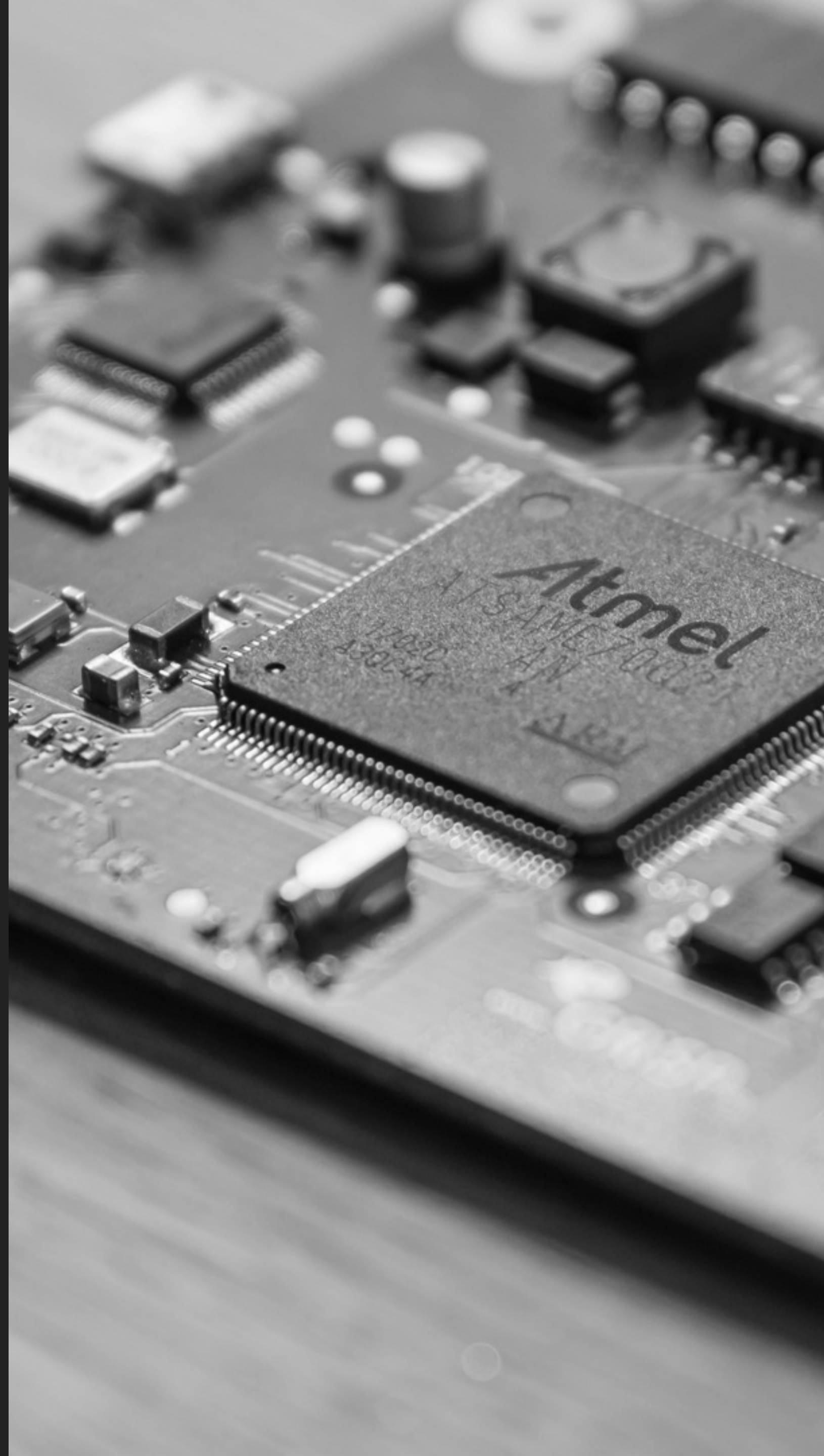


EMBEDDED SYSTEMS WITH GRiSP

**ROBOTICS AND SENSORS
USING ERLANG**

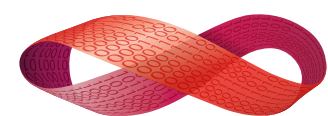
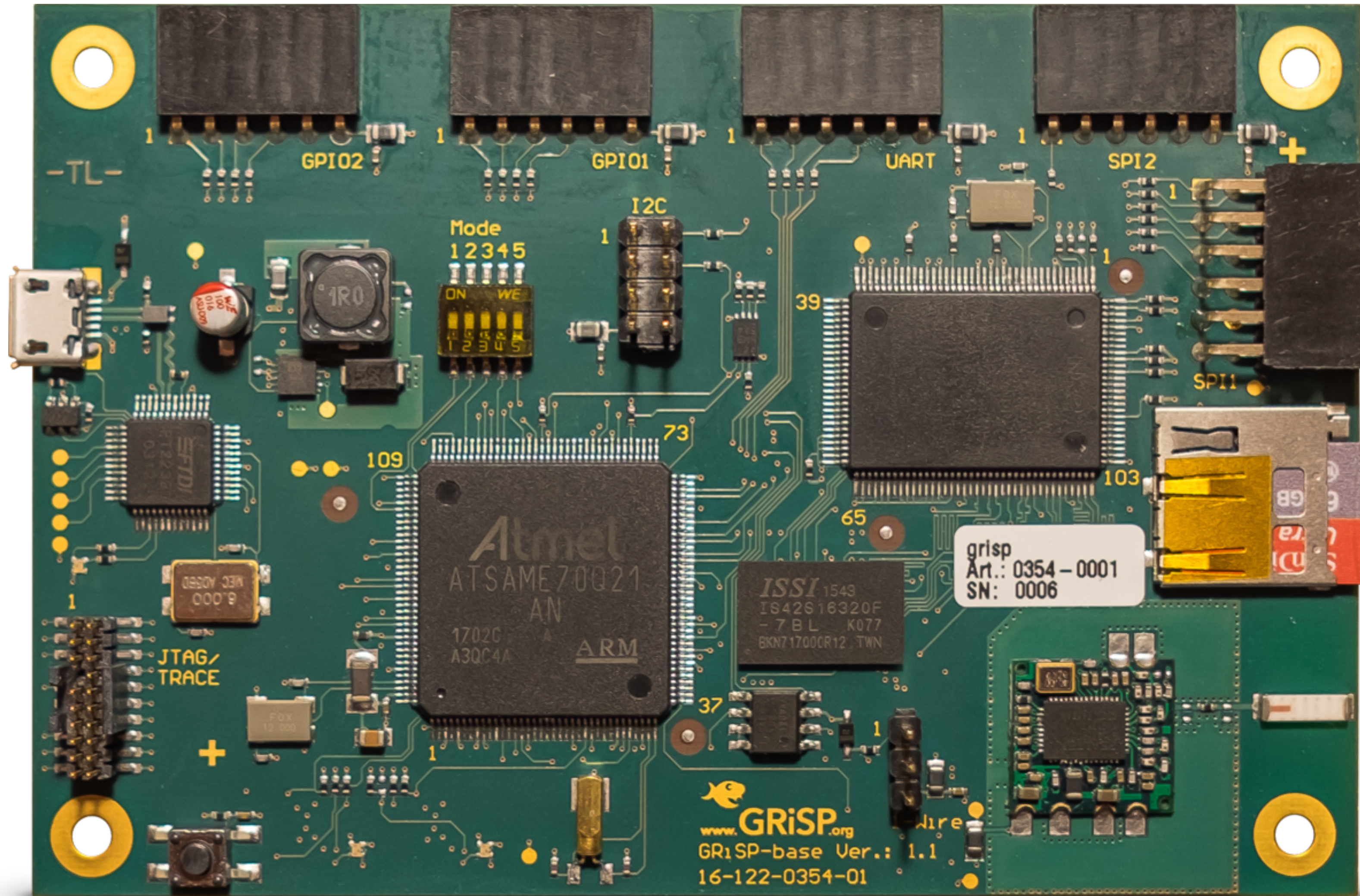
HARDWARE
COMPONENTS
SOFTWARE
DEMO
FUTURE



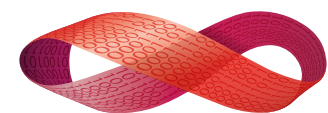


THE GRISP BOARD

SPECS



EMBEDDED WIRELESS DEVICE



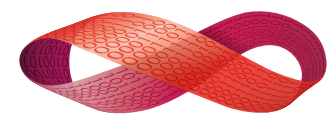
REAL ERLANG

ON

REAL BARE METAL



CONNECTORS FOR SENSORS & ACTUATORS

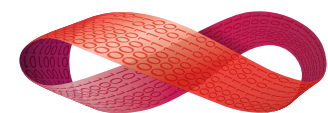


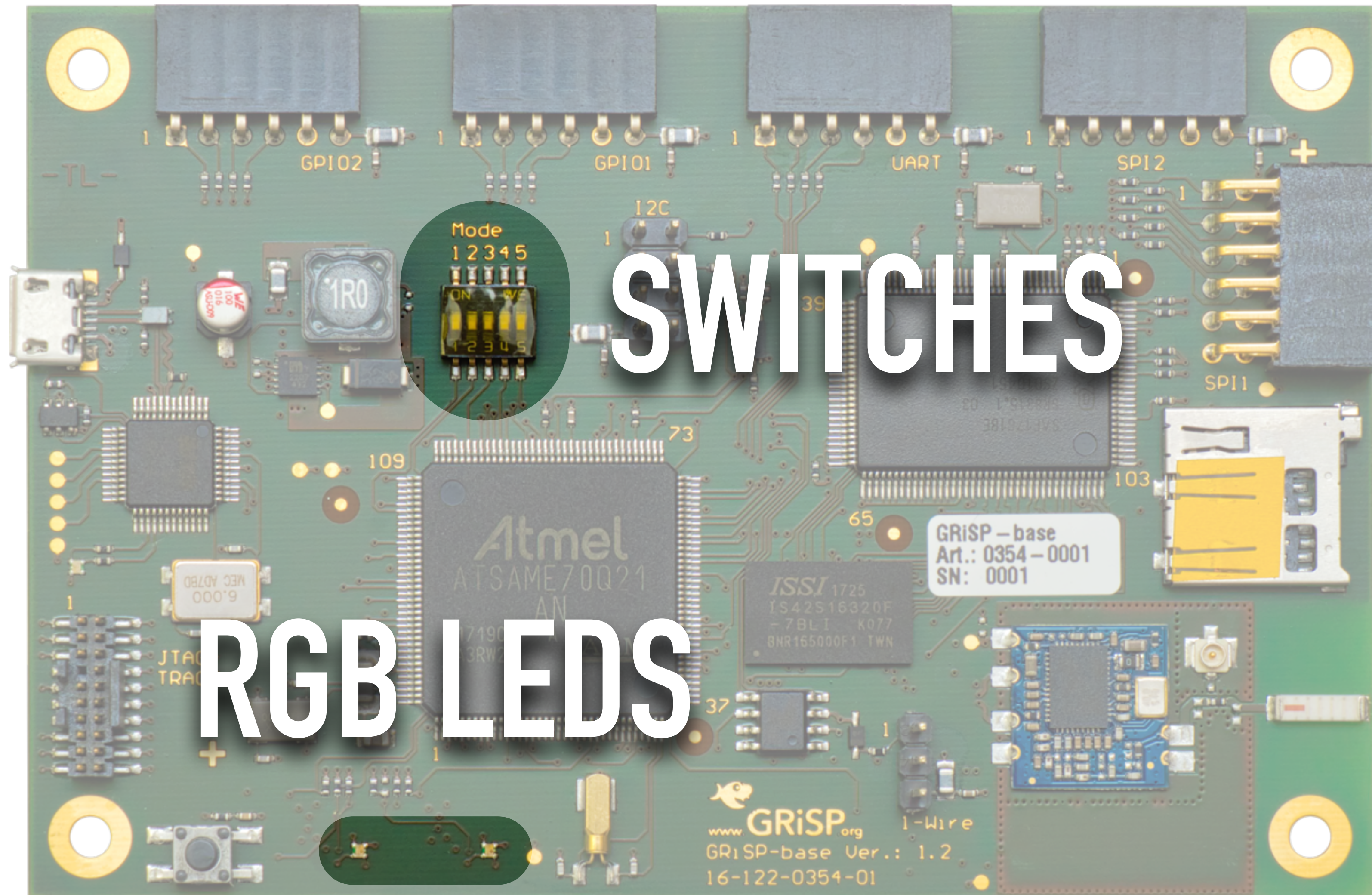
300 MHZ

64 MiB RAM

WIFI

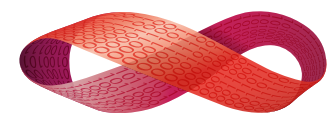
MICROSD

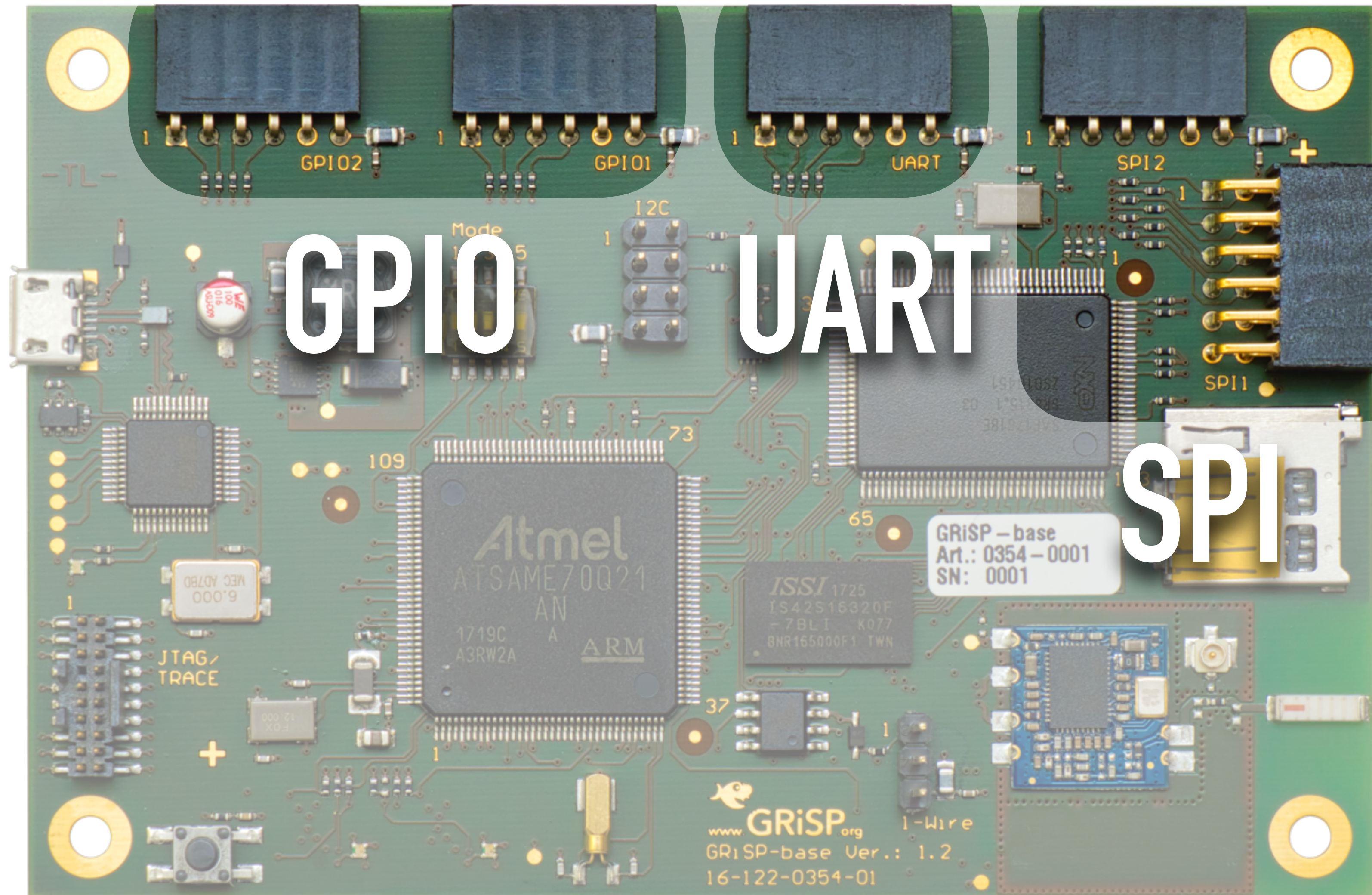


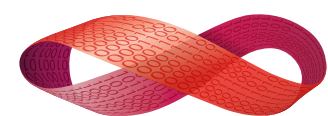
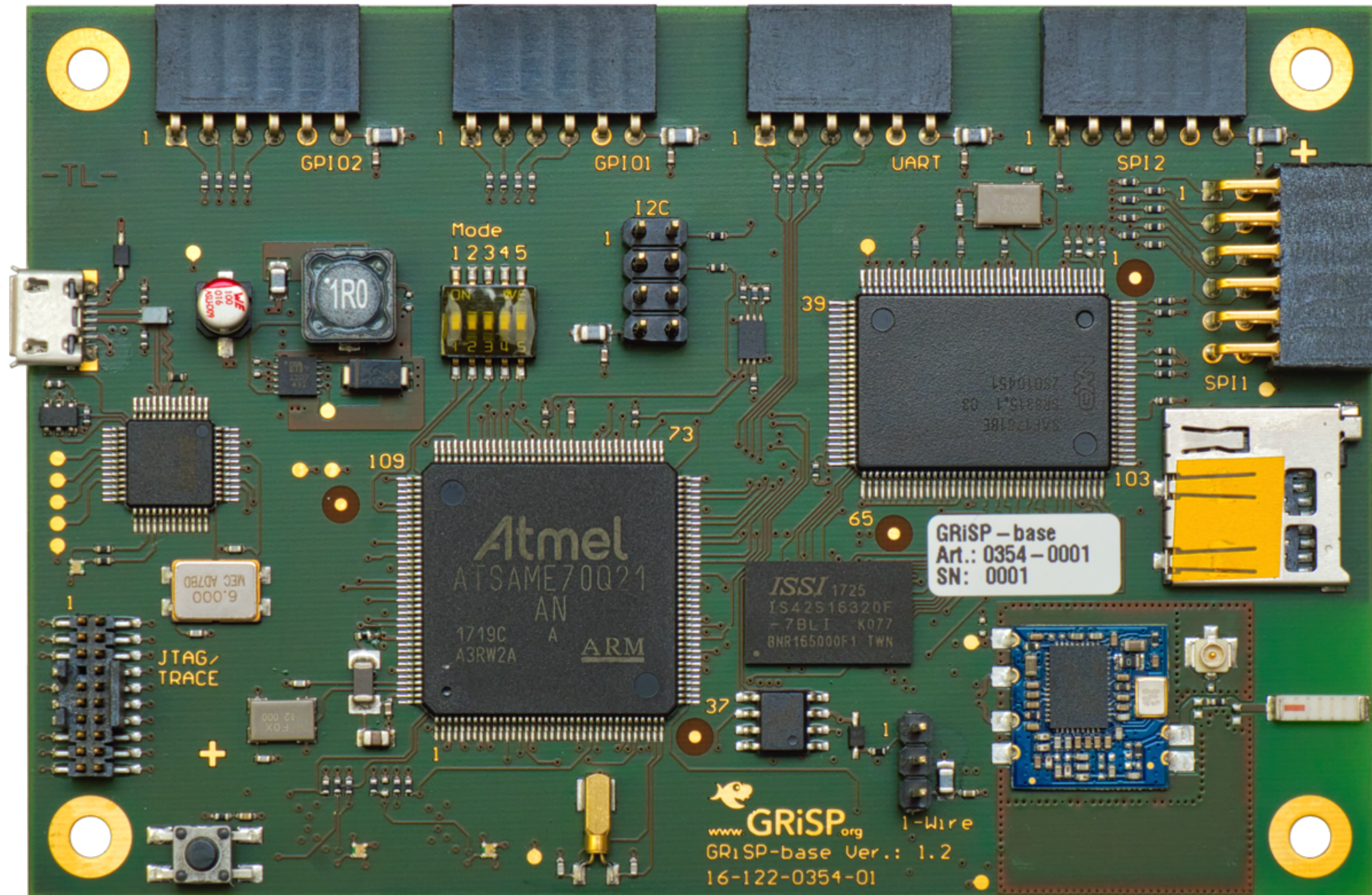


SWITCHES

RGB LEDs









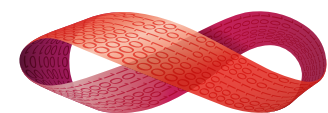
MASTER SLAVE PROTOCOL

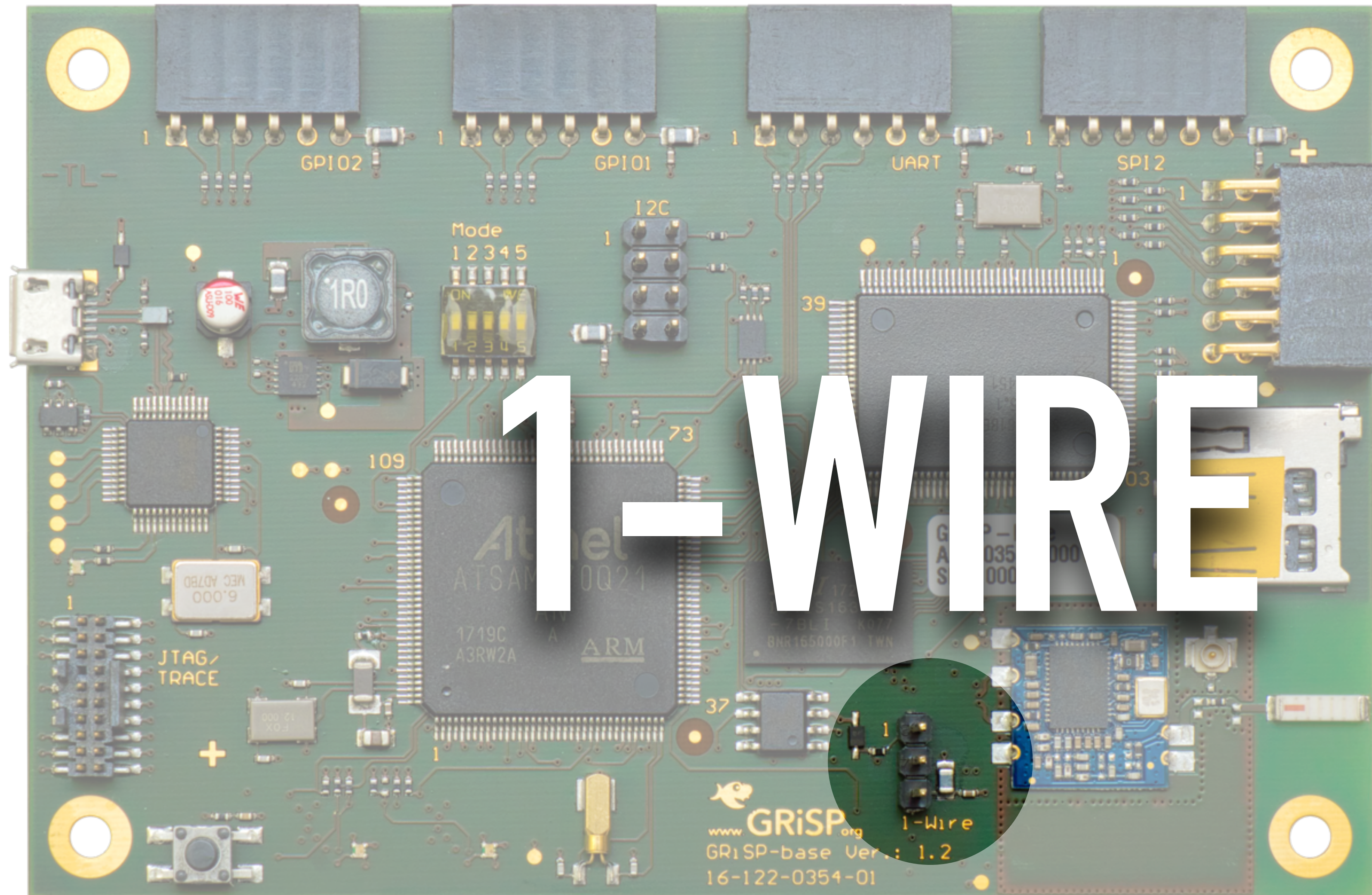
1 DATA LINE

1 CLOCK LINE

POWER & GROUND

ADDRESSABLE



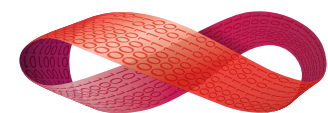


DALLAS 1-WIRE

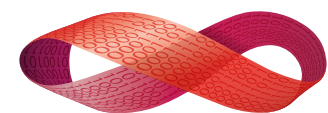
1 DATA + POWER LINE

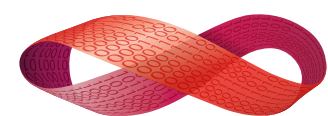
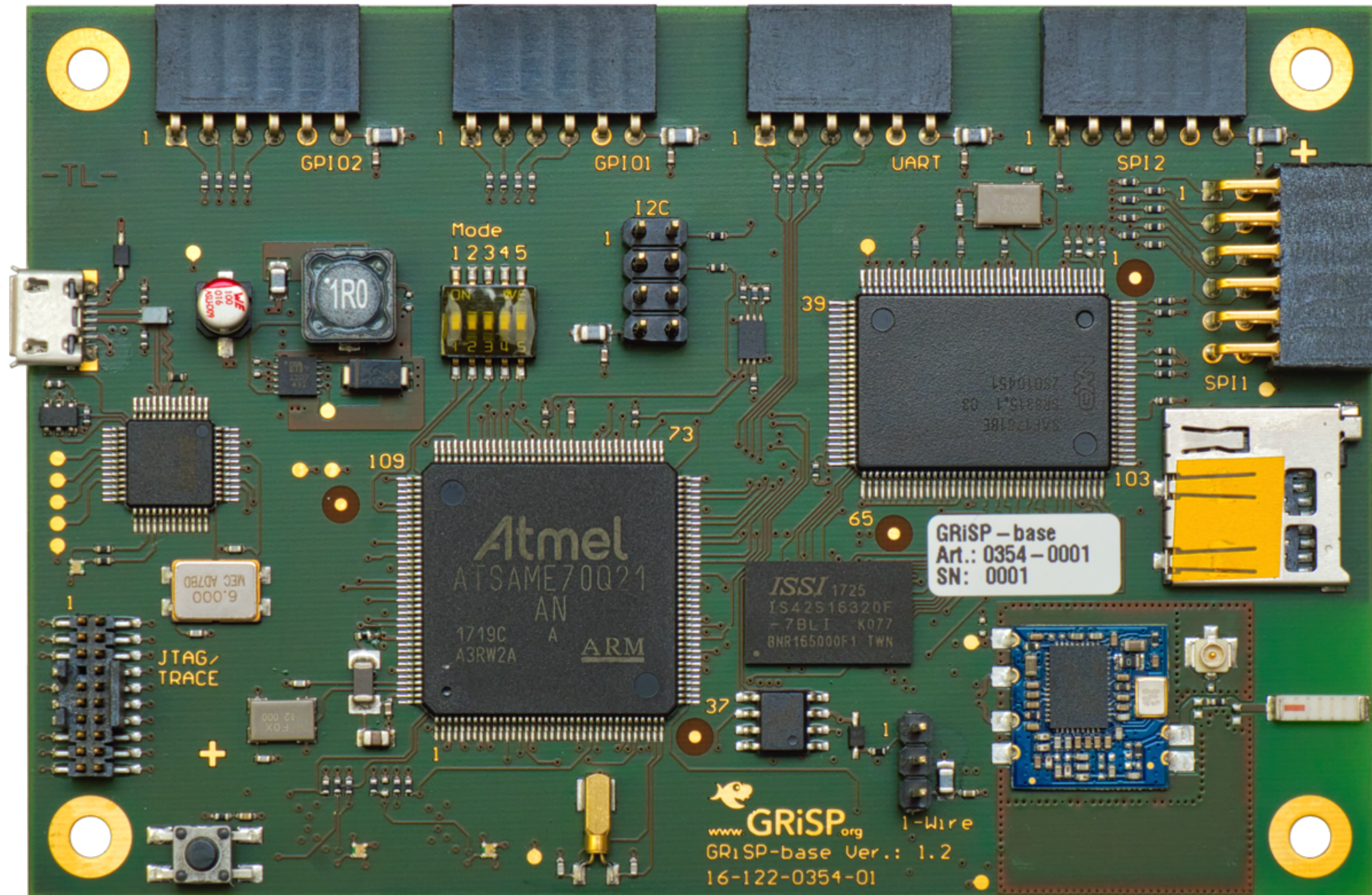
GROUND

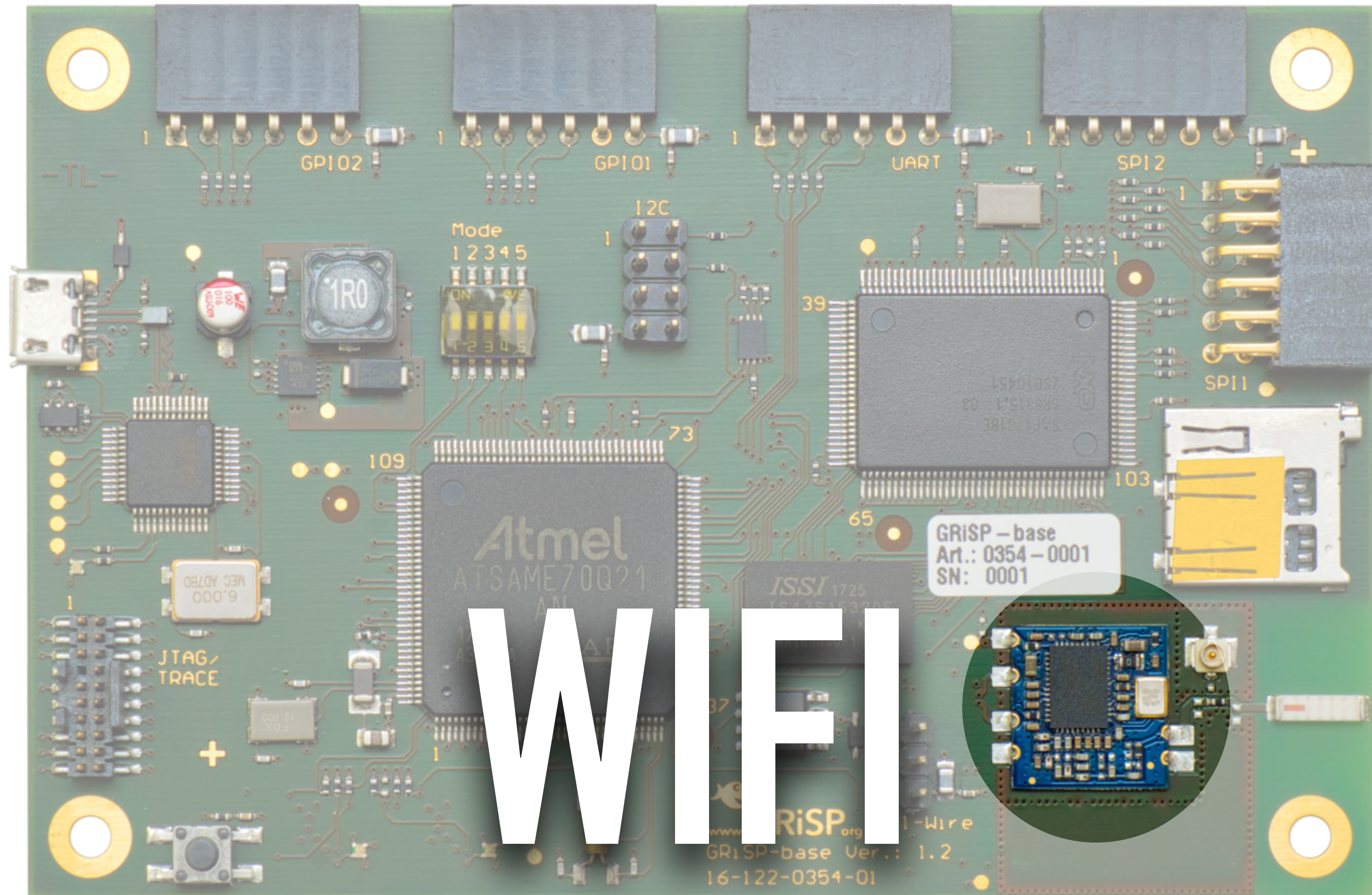
ADDRESSABLE MICROLAN



WIRELESS COMMUNICATION



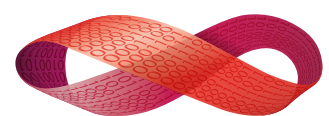


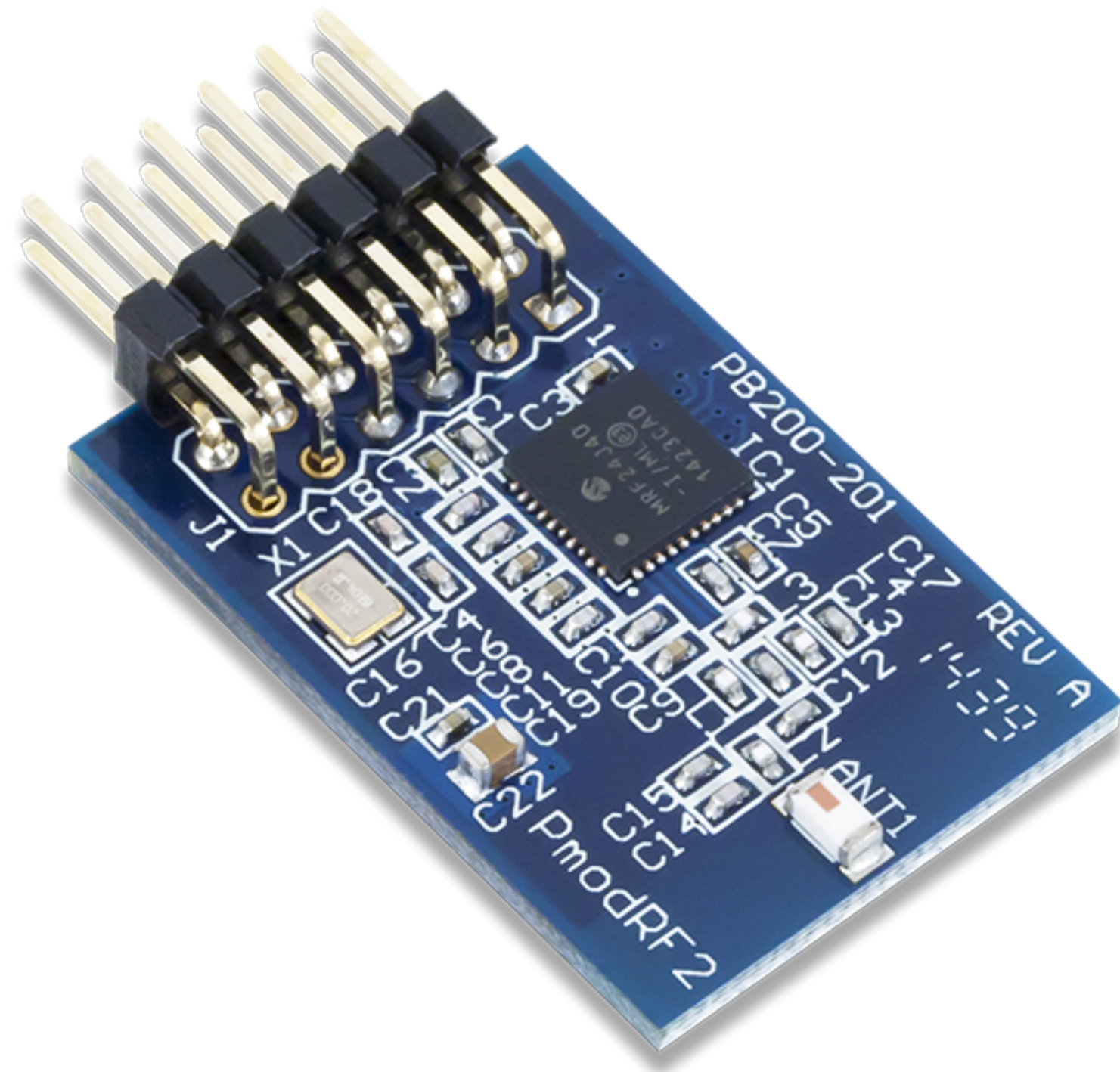


802.11N 2.4 GHZ

UP TO 150 MBPS

POWER SAVING



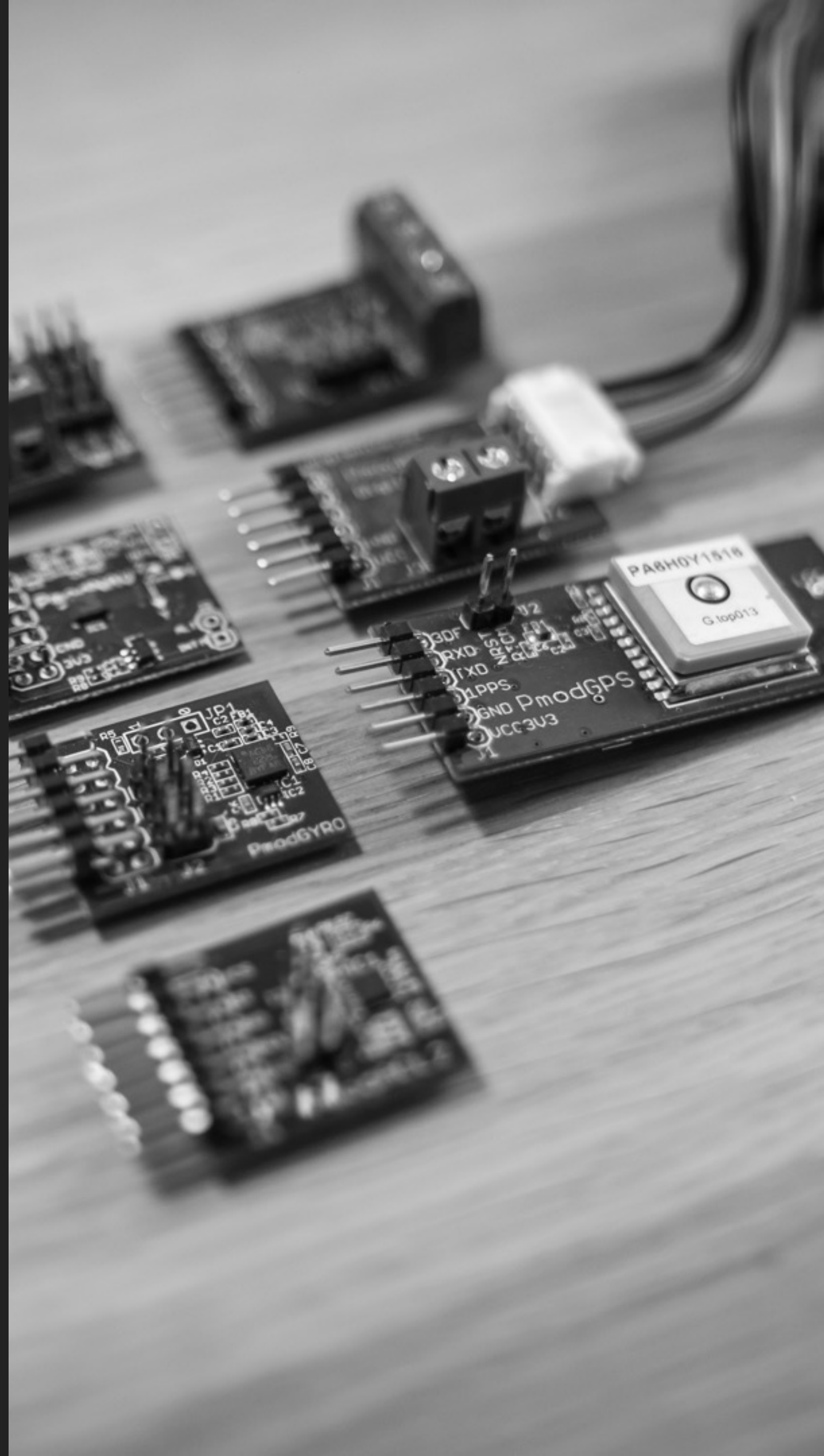


PMODRF2

IEEE 802.15.4

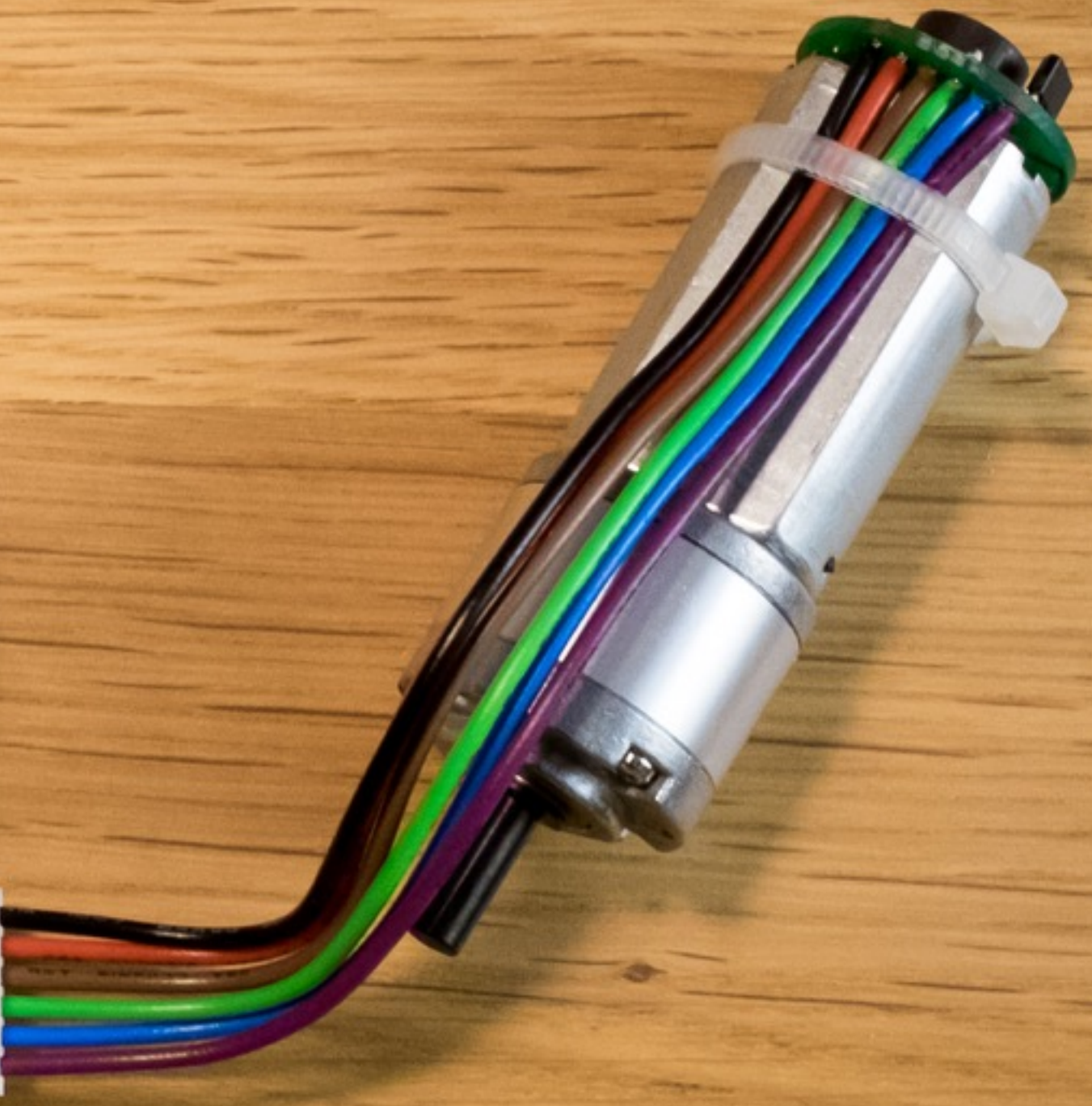
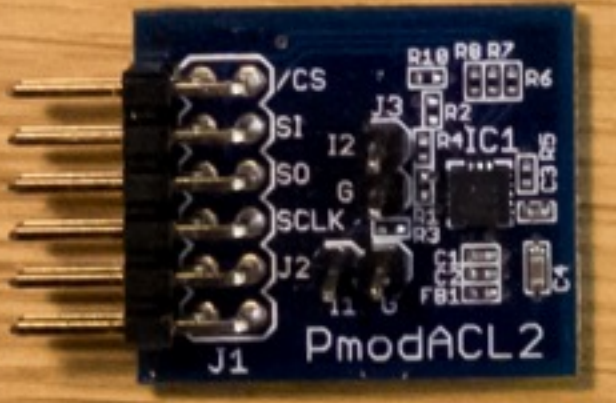
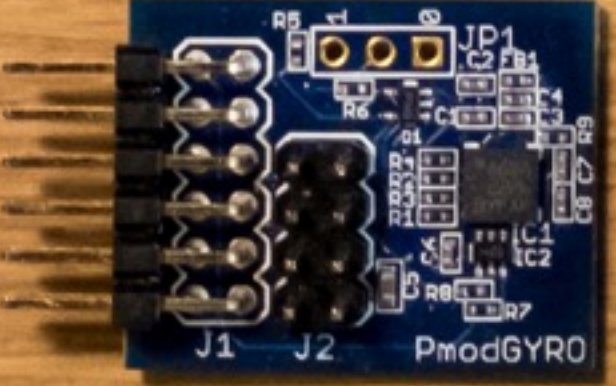
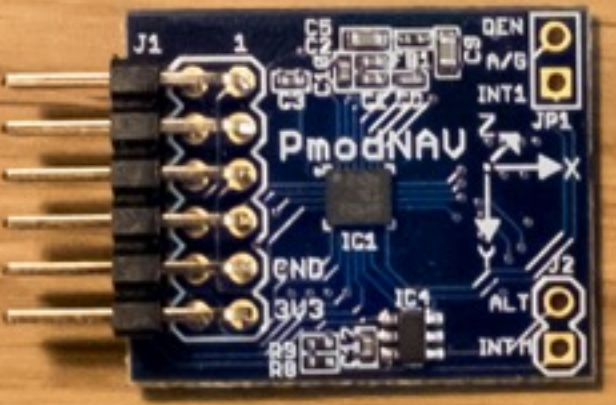
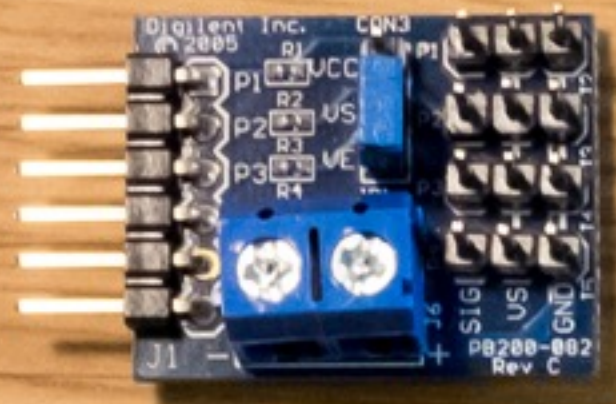
2.4GHZ

ZIGBEE, MIWI

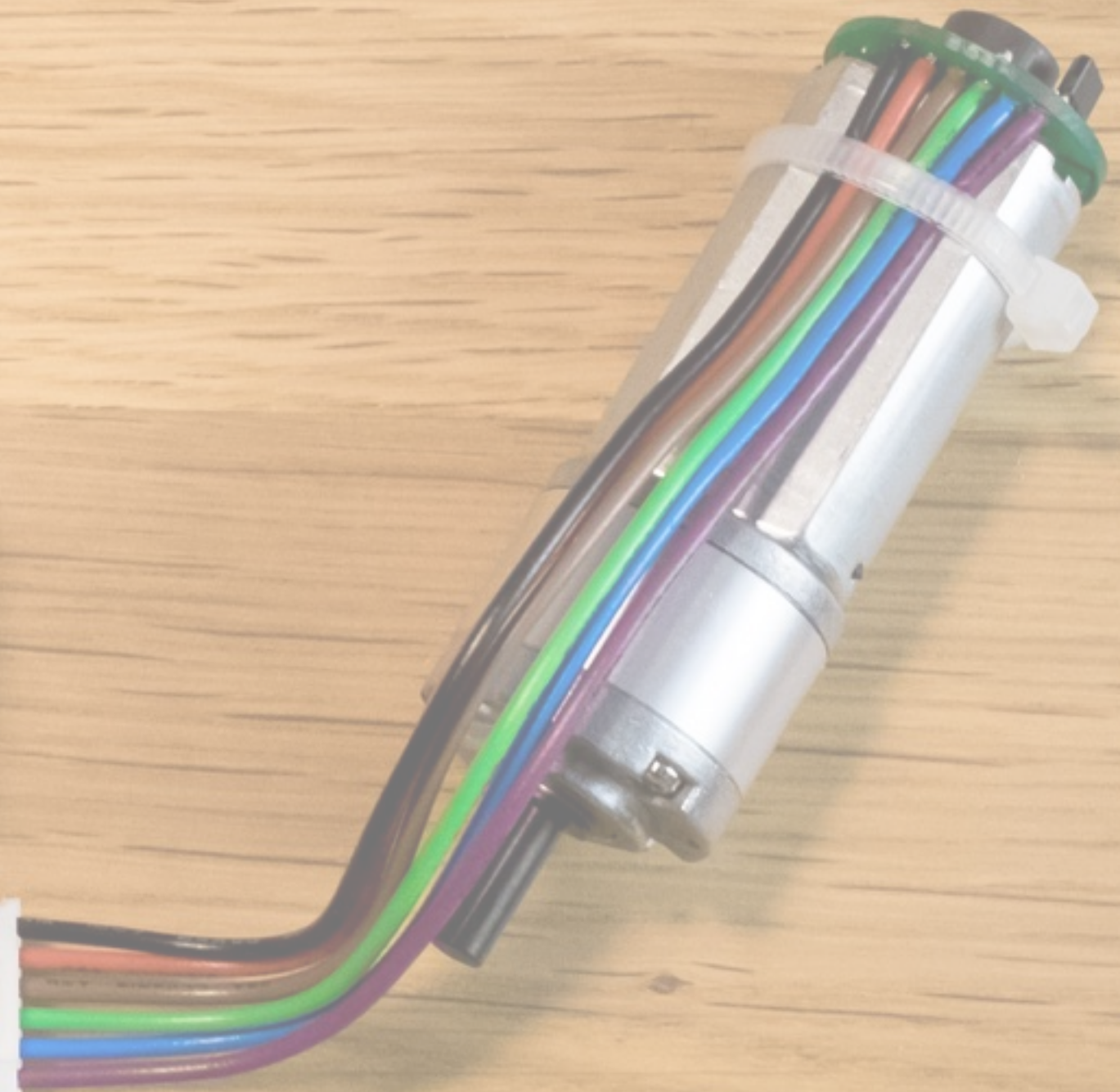
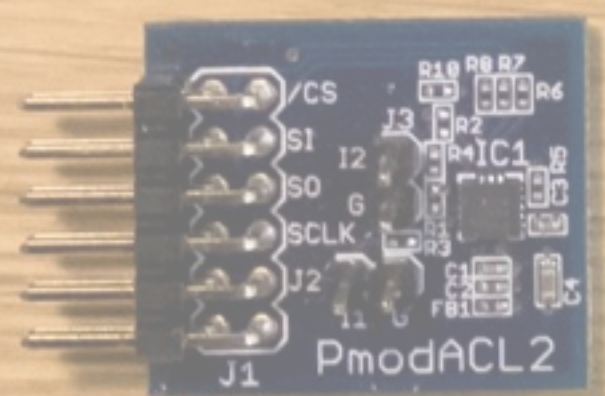
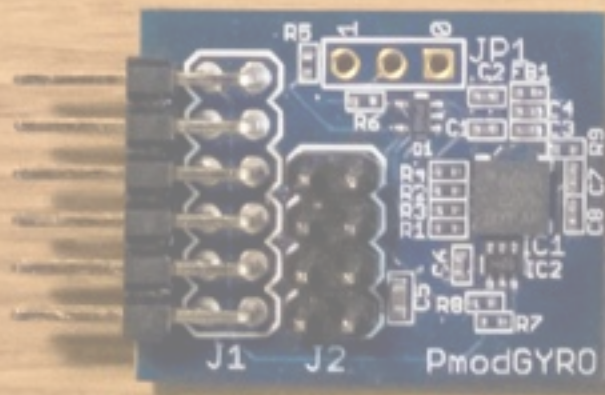
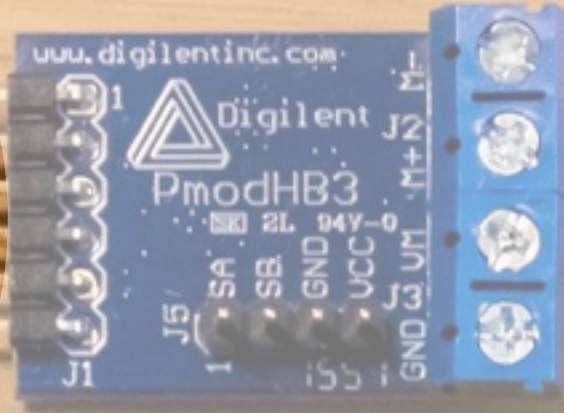
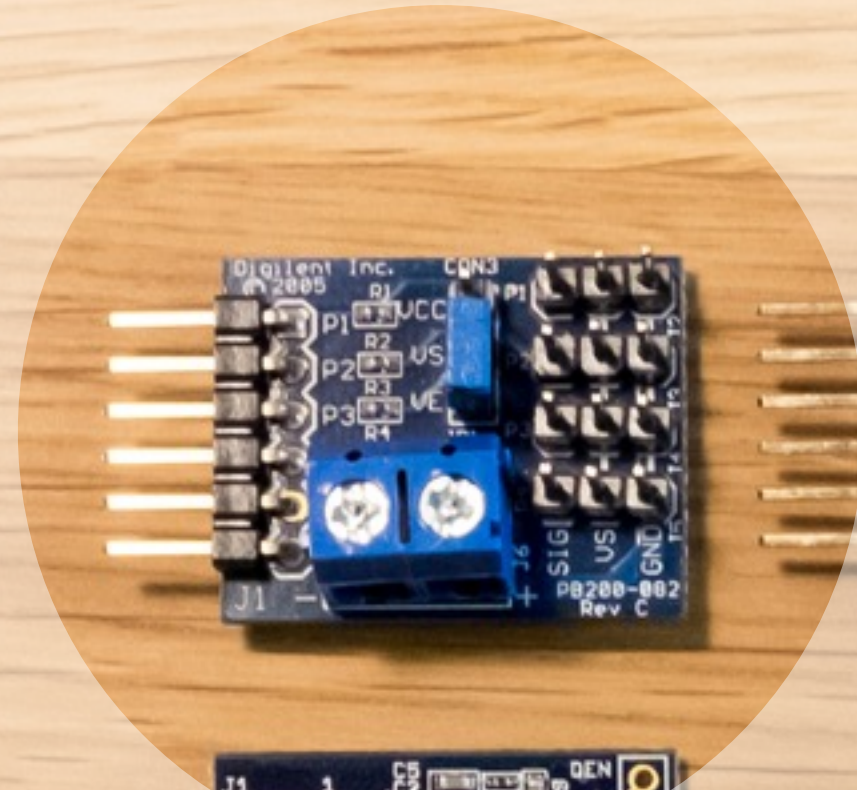


ACCESSORIES

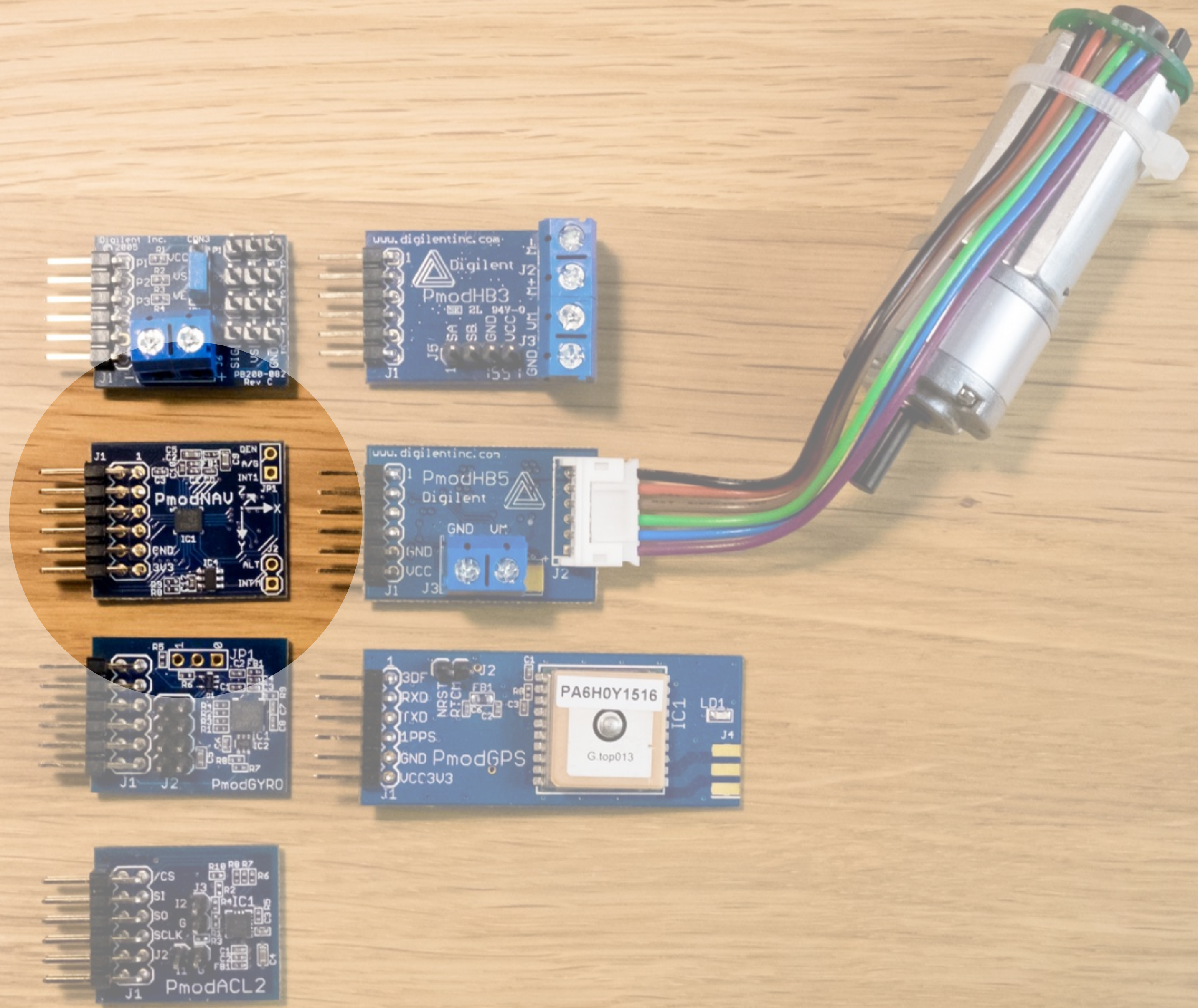
PMODS



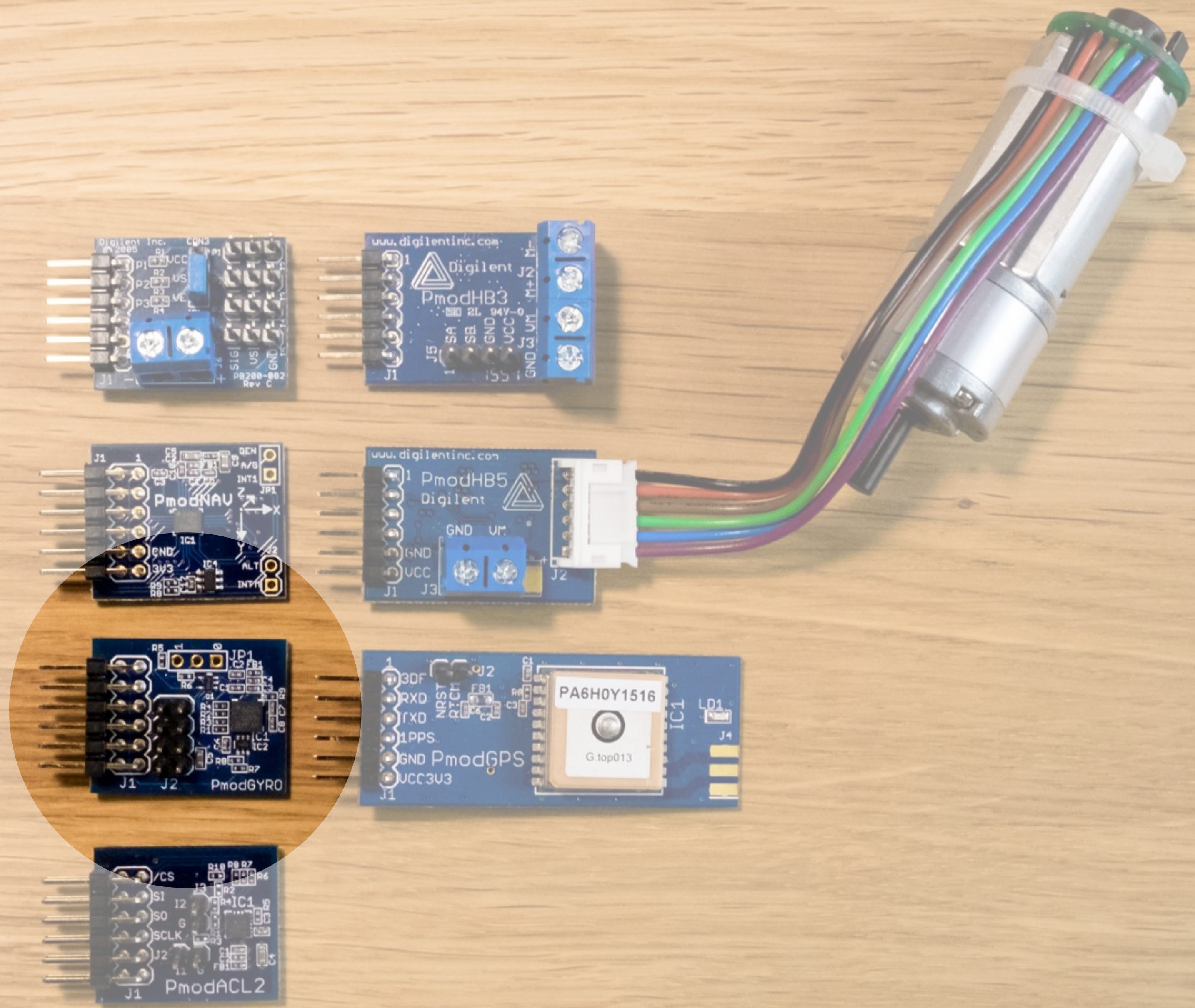
CON3



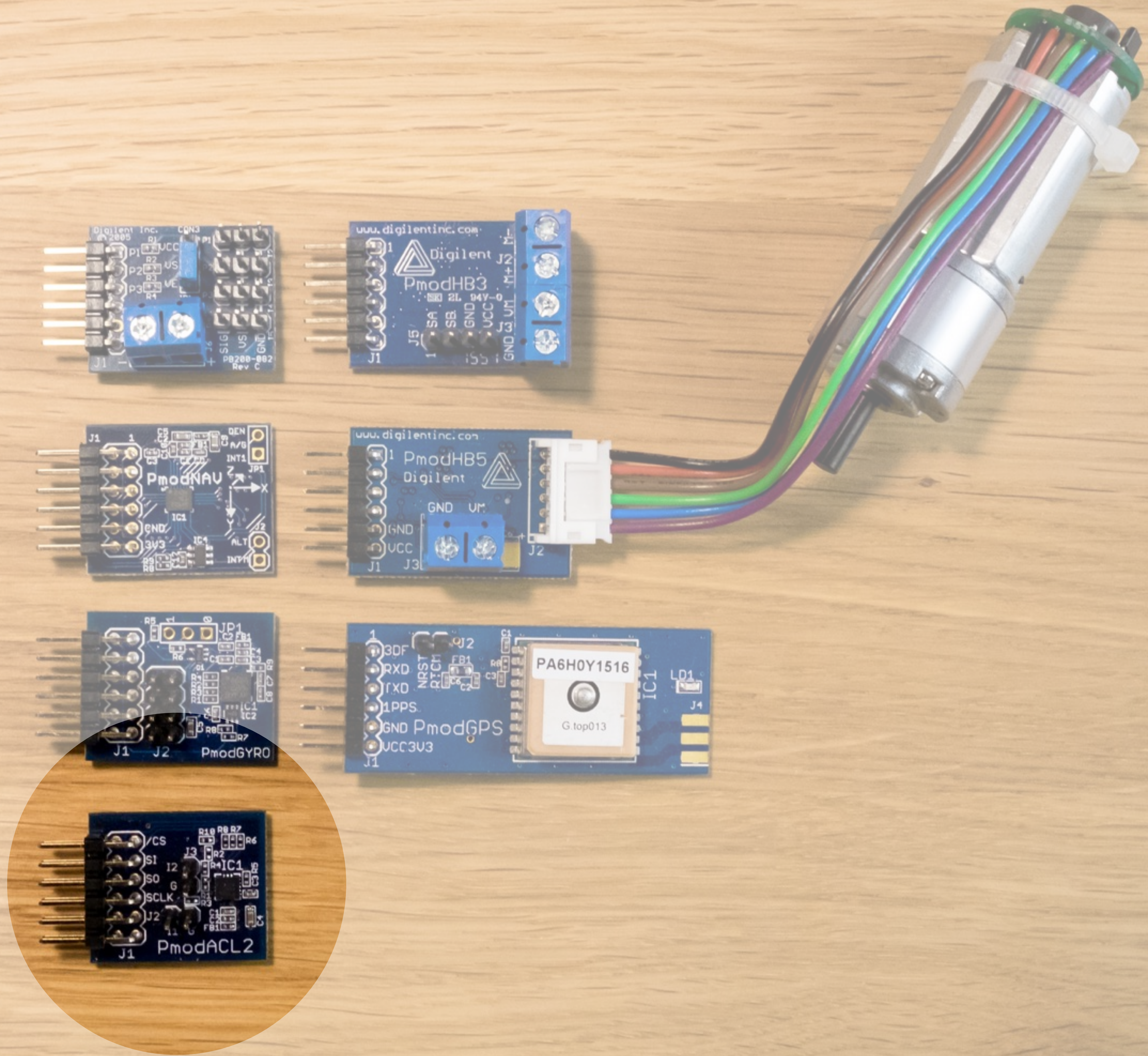
NAV



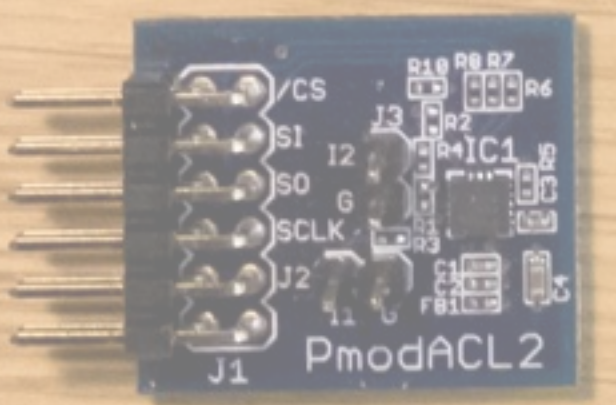
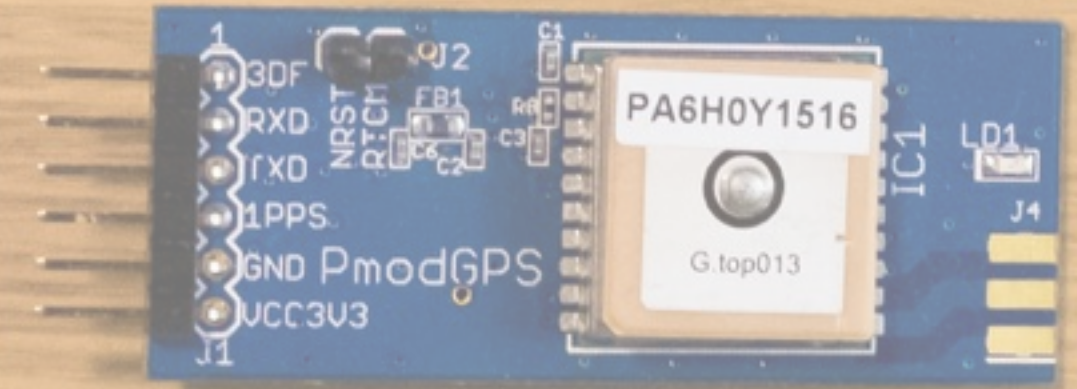
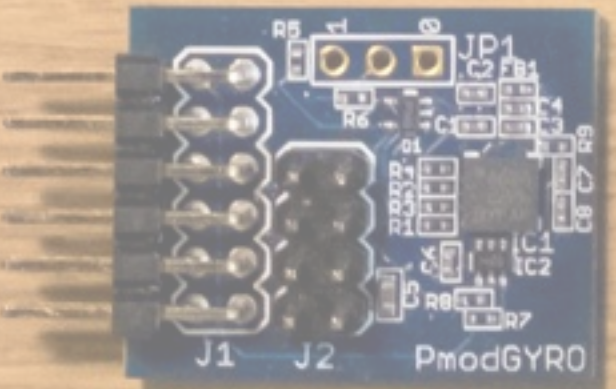
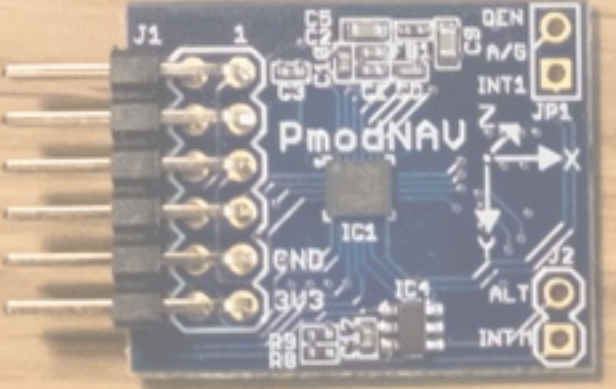
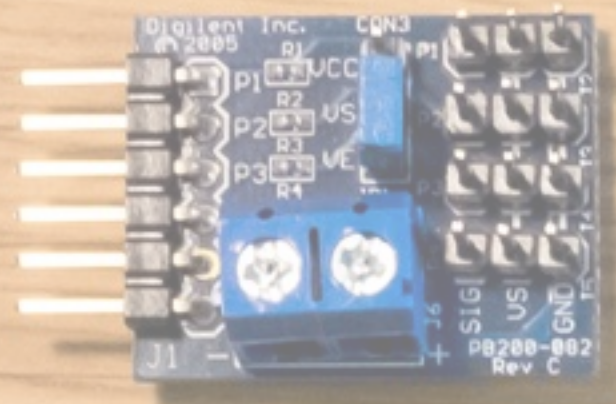
GYRO

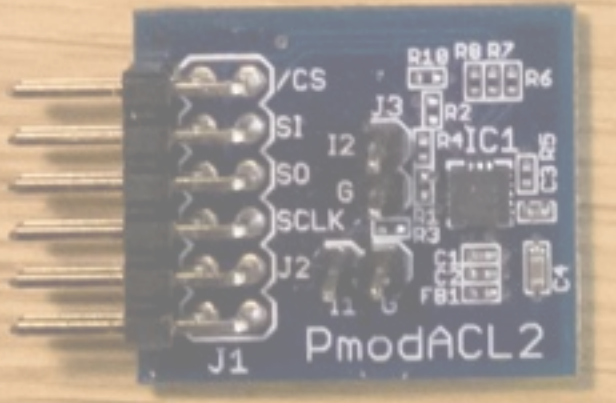
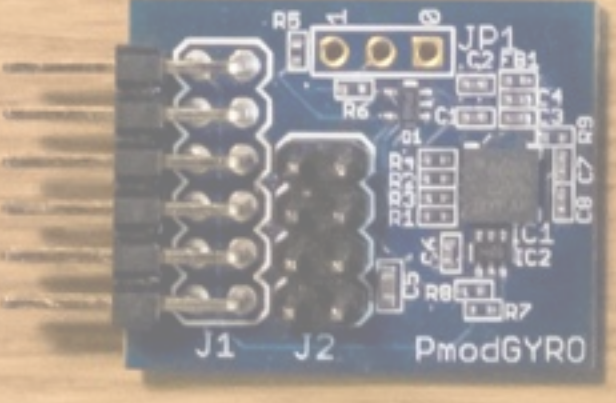
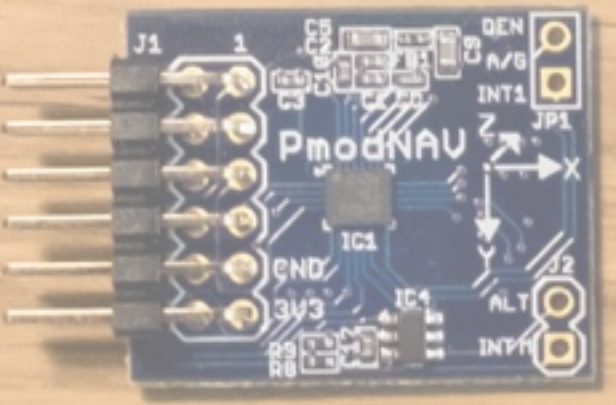
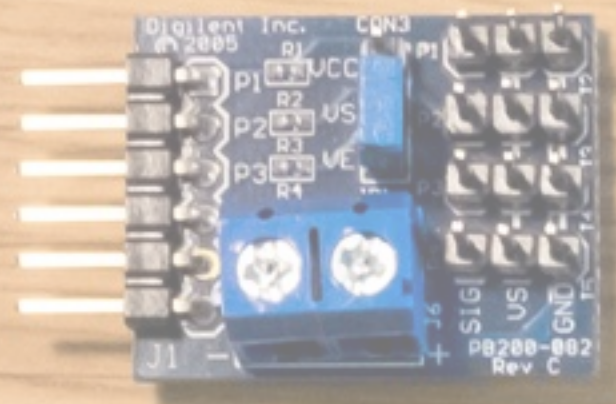


ACL2



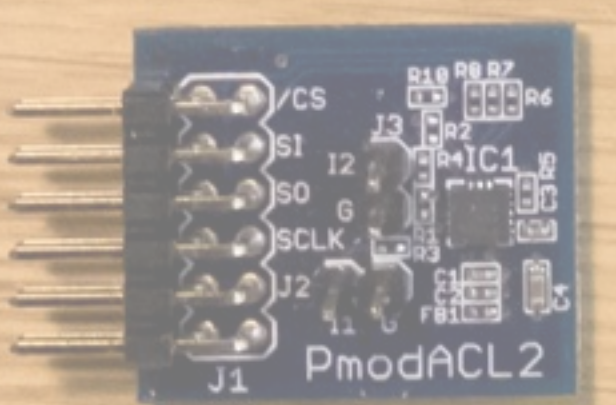
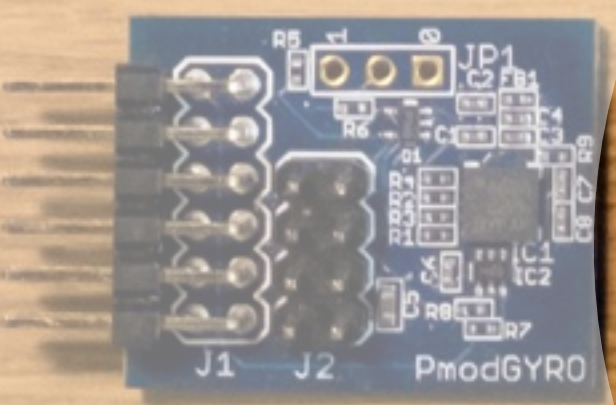
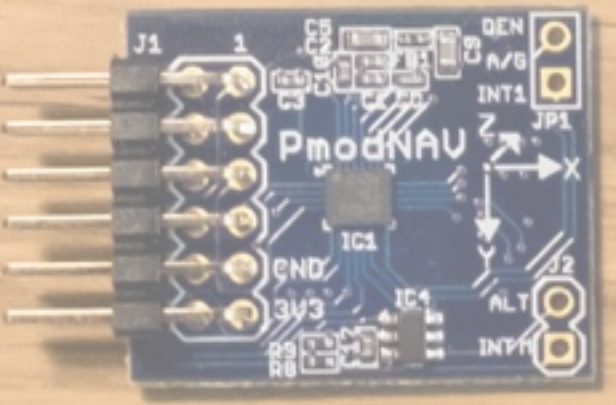
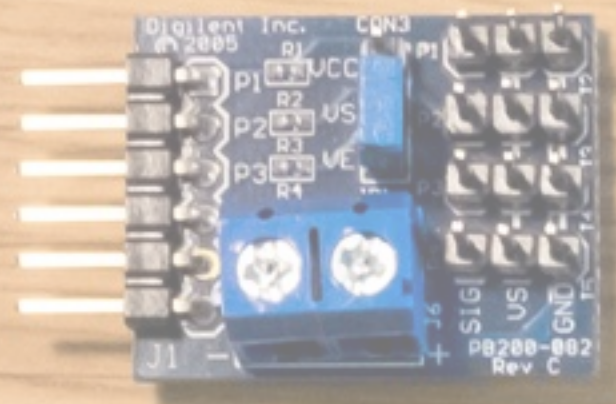
HB3





HB5





GPS



TOOLCHAIN,
OS
& RUNTIME

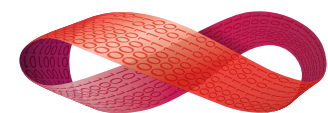
SOFTWARE

RTEMS

RTOS

“OS-AS-A-LIBRARY”

POSIX

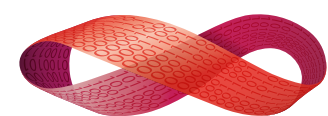


PERFORMANT

SMP

PROCESSES VIA THREADS

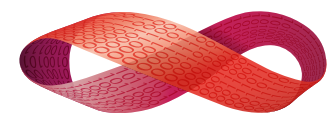
FREEBSD NETWORKING



BEAM COMPILED WITH
RTEMS

STARTS FROM BOOTLOADER

OS APIS PROVIDED BY
RTEMS



BEAM

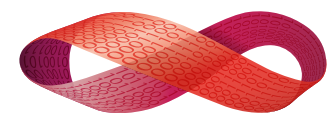
APPLICATION

OTP

GRiSP RUNTIME

RTEMS

HARDWARE

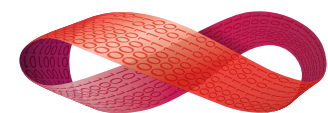


GRISP RUNTIME

HARDWARE ABSTRACTION

LOW LEVEL DRIVERS

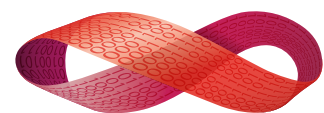
HIGH LEVEL DRIVERS



SPI DRIVER (C)

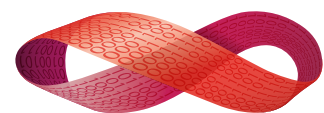
```
void grisp_spi_output
(ErIDrvData drv_data, char*buf, ErIDrvSizeT len)
{
    // ...

    // Grab first byte as chip select
    cs = buf[0];
    buf++;
    len -= 1;
}
```



SPI DRIVER (C)

```
// ...  
msg.cs = cs;  
msg.tx_buf = buf;  
msg.rx_buf = res;  
msg.len = len;  
rv = ioctl(grisp_spi_data.fd, SPI_IOC_MESSAGE(1),  
           &msg);  
assert(rv == 0);  
driver_output(grisp_spi_data.port, res, len);  
}
```



SPI DRIVER (ERLANG)

```
-module(grisp_spi_drv).  
-export([open/0, command/3]).
```

`open()` ->

```
open_port({spawn_driver, "grisp_spi_drv"},  
         [binary]).
```

`command(Port, Slot, Command)` ->

```
Slot = slave_select(Slot), # gpio1 -> 2
```

```
Command = <<Slot, Command/binary>>,  
Port ! {self(), {command, Command}}.
```



SPI DRIVER (SHELL)

1> Command = <<16#0B, 16#0E>>.

<<16#0B, 16#0E>>

2> Raw = <<Command/binary, 0>>.

<<16#0B, 16#0E, 0>>

3> grisp_spi_drv:command(Port, spi1, Raw).

{<0.132.0>,{command,spi1,<<11,14,0>>}}

4> flush().

Shell got {<0.127.0>,{data,<<0,0,172>>}}

ok

5> grisp_spi:send_recv(spi1, Command, 2, 1).

<<"¬">>



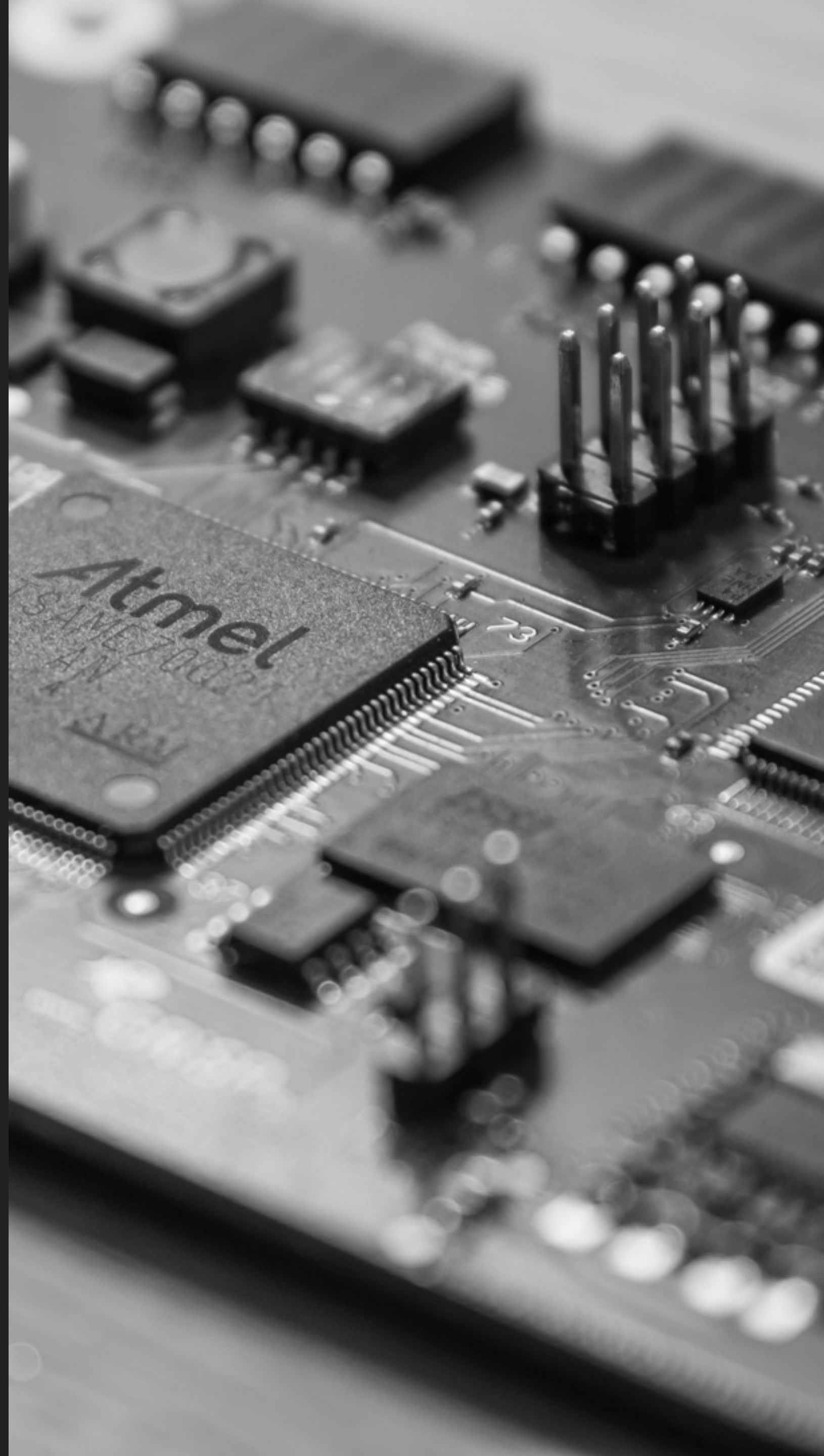
DEMO

ISSUES

< . . . >

ROADMAP

< . . . >



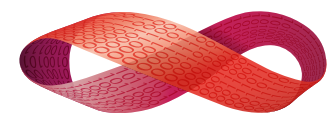
WHAT WE'RE
WORKING ON

UPDATES

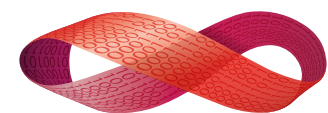
MQTT

MQTT SMART HOME

<https://github.com/mqtt-smarthome/mqtt-smarthome>



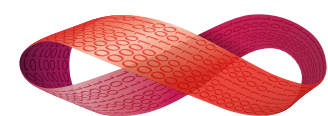
GENERIC LIBRARY
EDITABLE DASHBOARD
PERSISTED
MORE WIDGETS



FEBRUARY 2018

HARDWARE SHIPS

SOFTWARE 1.1



WIFI WPA2

ERLANG 20.2

ALL BASIC DRIVERS





Lightweight computation for networks at the edge

INTERNET OF THINGS

CRDTs

SYNCHRONIZATION-FREE PROGRAMMING

HYBRID GOSSIP PROTOCOLS

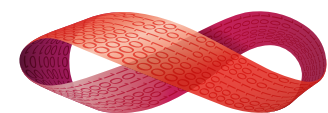
ROADMAP

MORE DRIVERS

PREBUILT CROSS OTP

PREBUILT CROSS TOOLCHAIN

FIXING ERLANG DISTRIBUTION



grisp.org

github.com/grisp

#grisp irc.freenode.net

#grisp erlang-slack.herokuapp.com



GRiSP

20% DISCOUNT WITH lambda2018

<https://www.grisp.org/shop.html>

THANK YOU!

