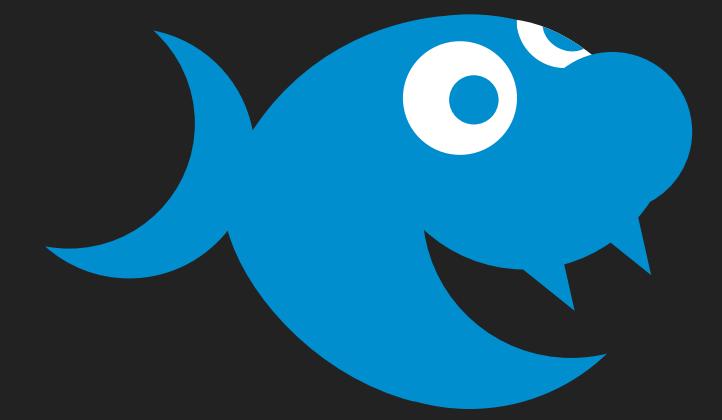


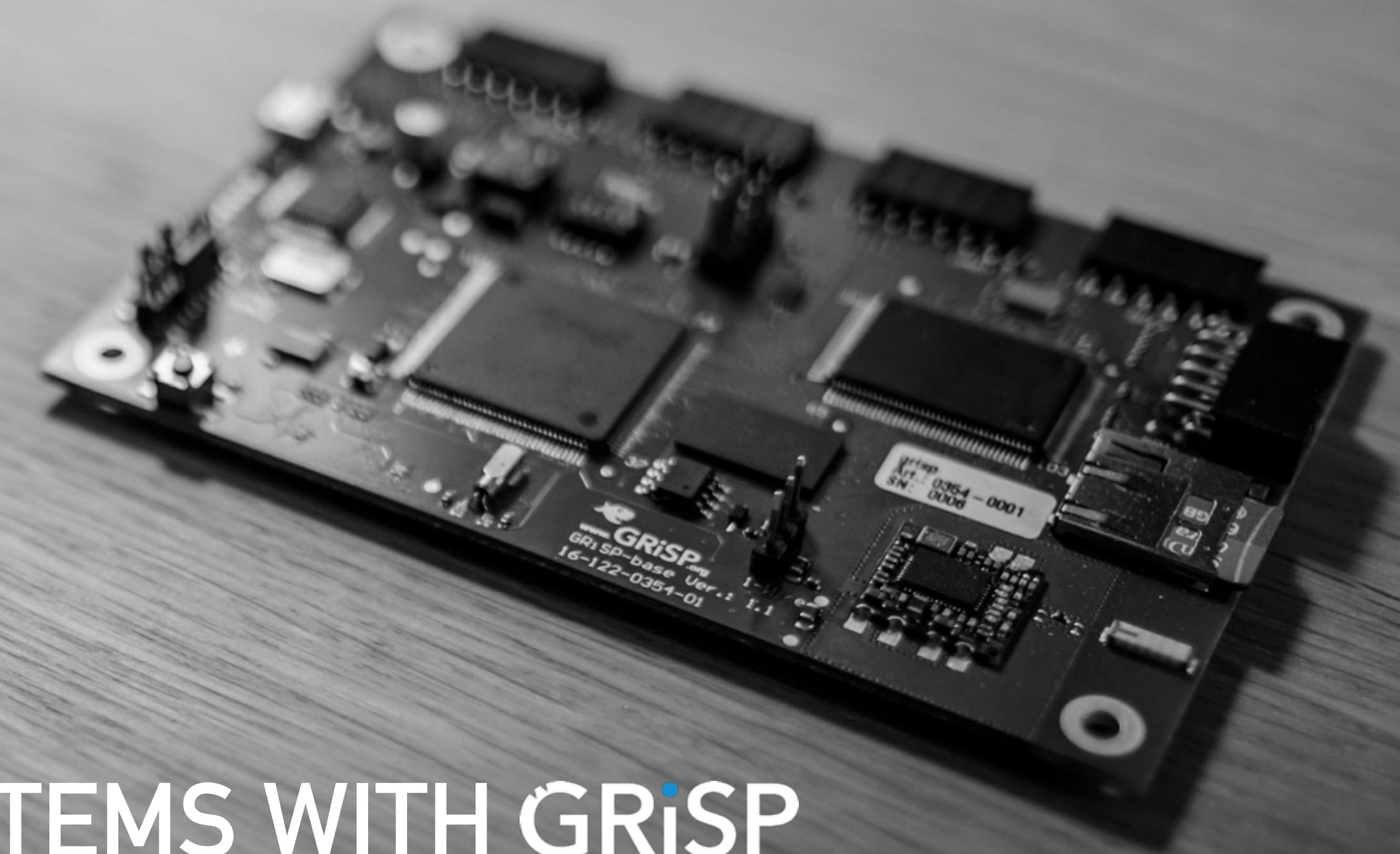
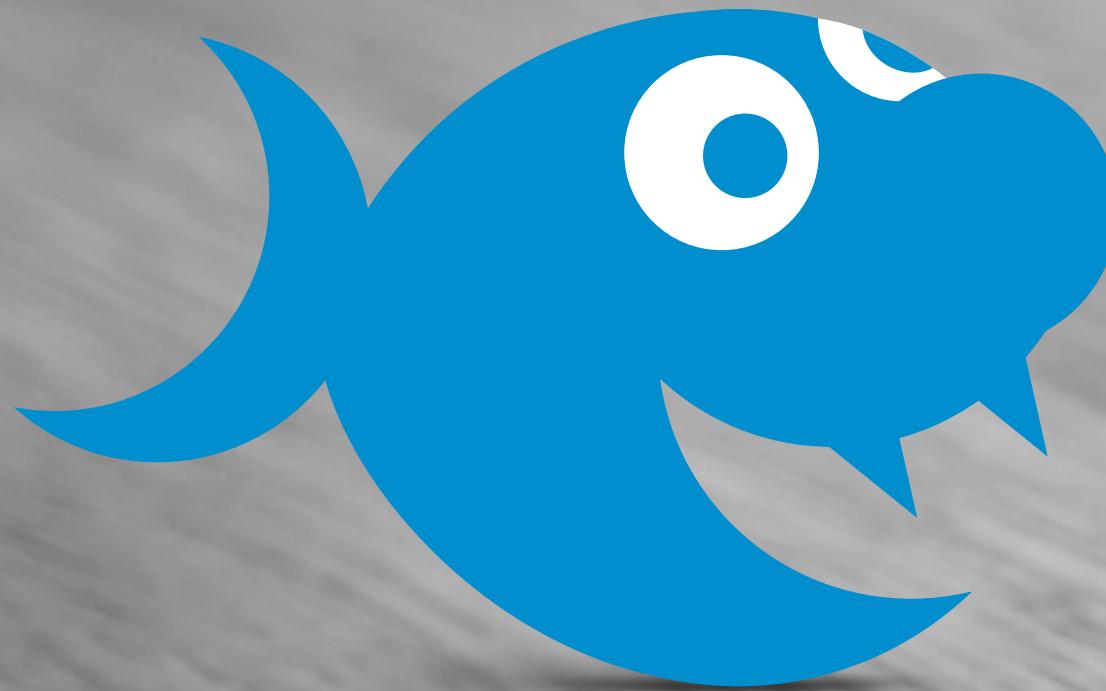
GRiSP



Nadia Zryanova



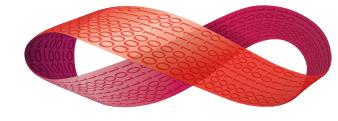
GRiSP

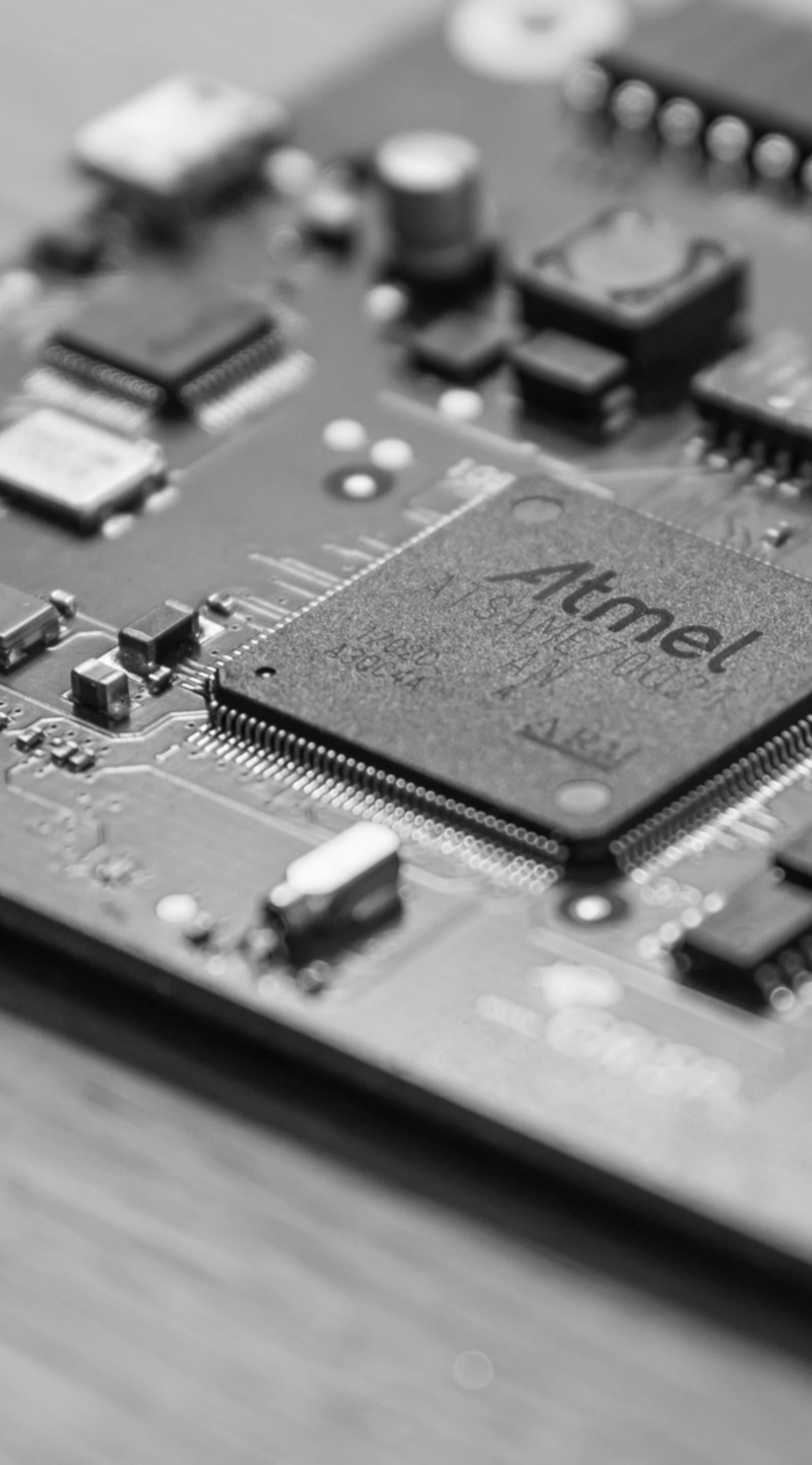


EMBEDDED SYSTEMS WITH GRiSP

ROBOTICS AND SENSORS USING ERLANG

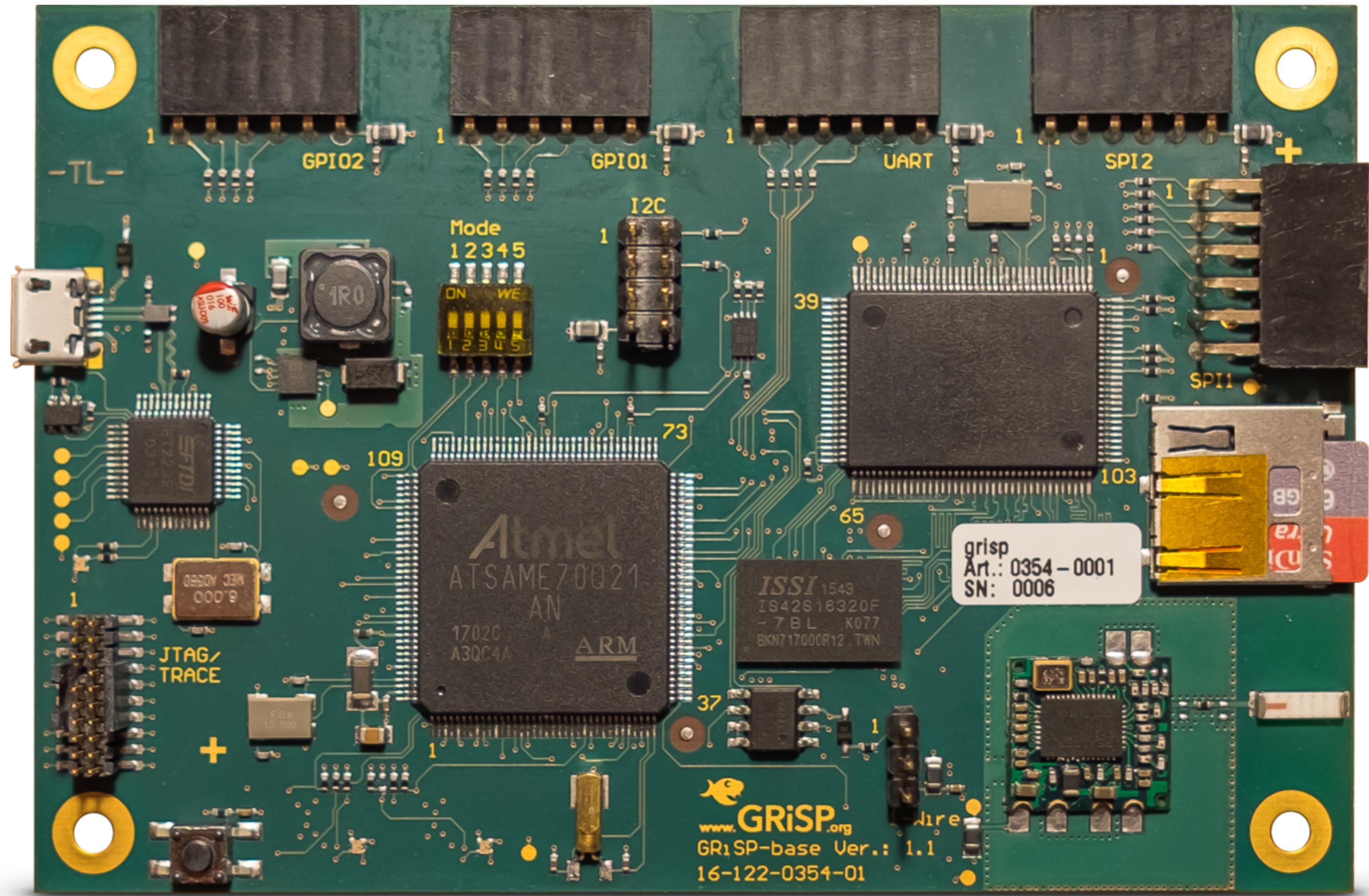
**HARDWARE
COMPONENTS
SOFTWARE
DEMO
FUTURE**





THE GRISP
BOARD

SPECS

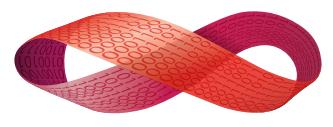


EMBEDDED

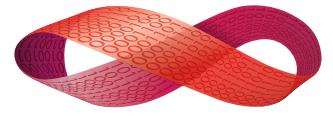
WIRELESS DEVICE



REAL ERLANG
ON
REAL BARE METAL

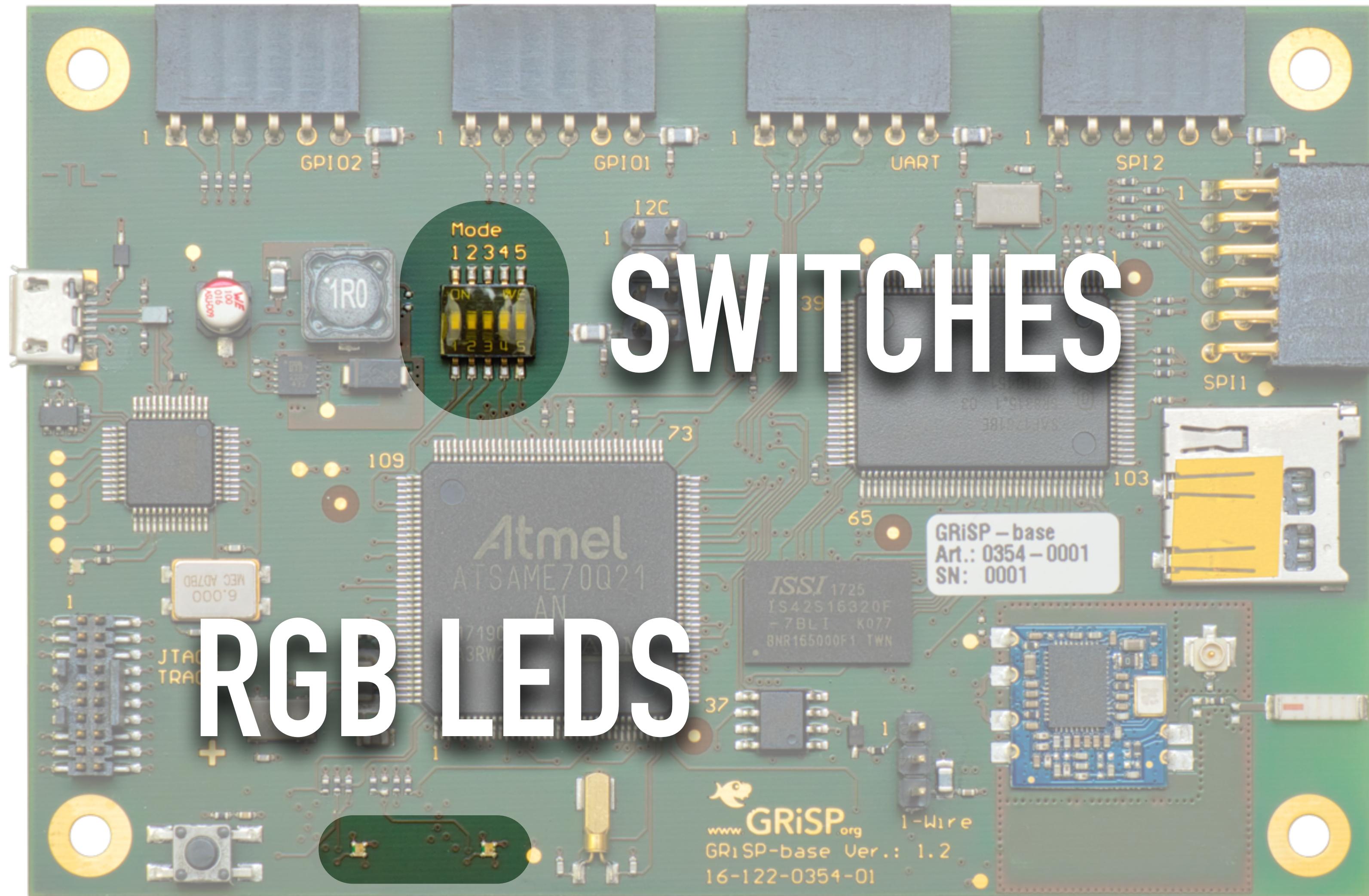


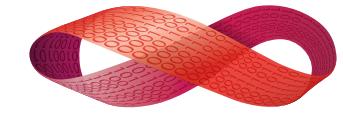
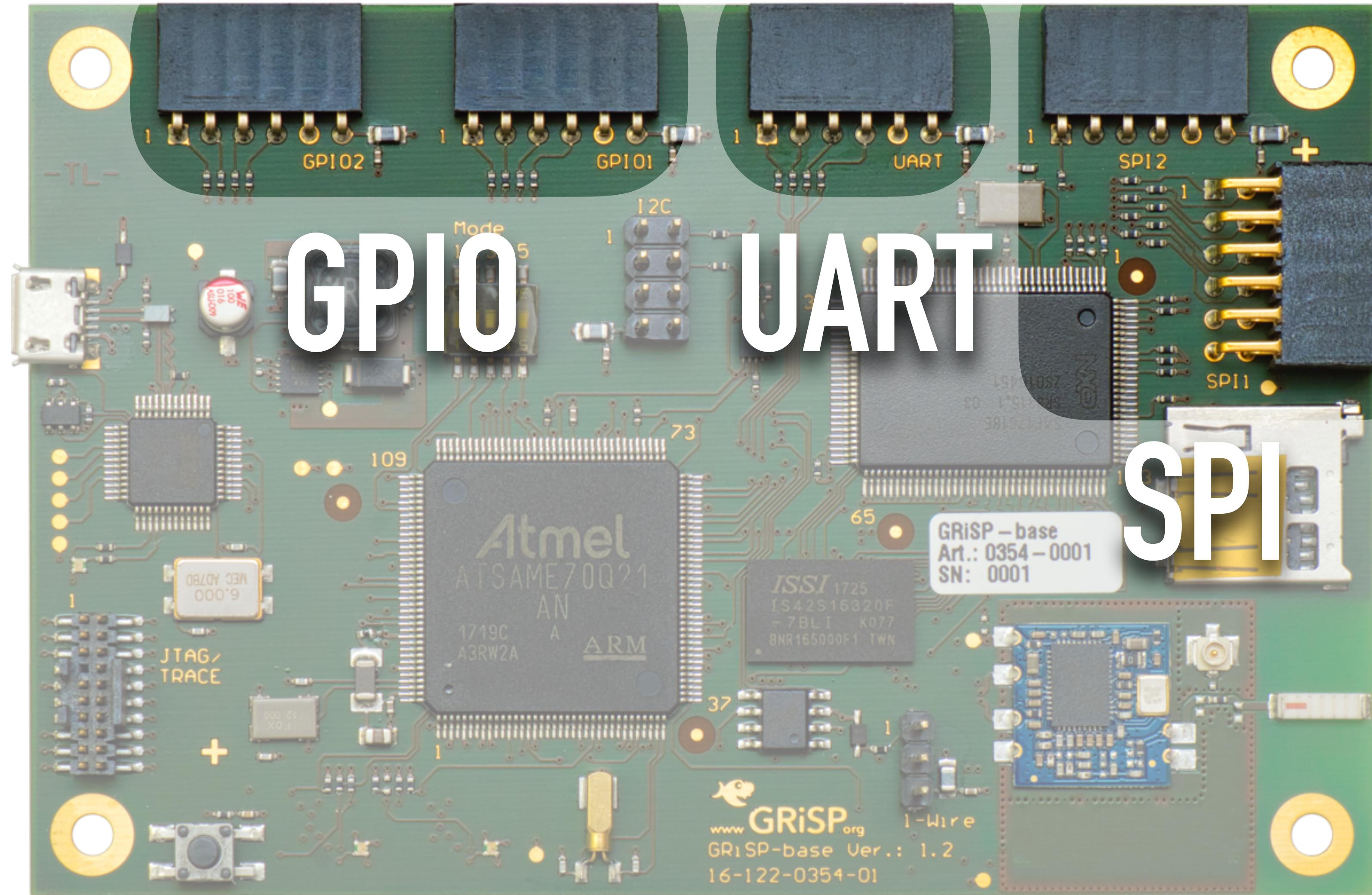
CONNECTORS FOR SENSORS & ACTUATORS

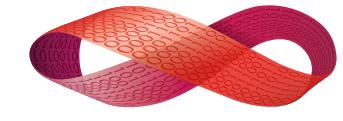
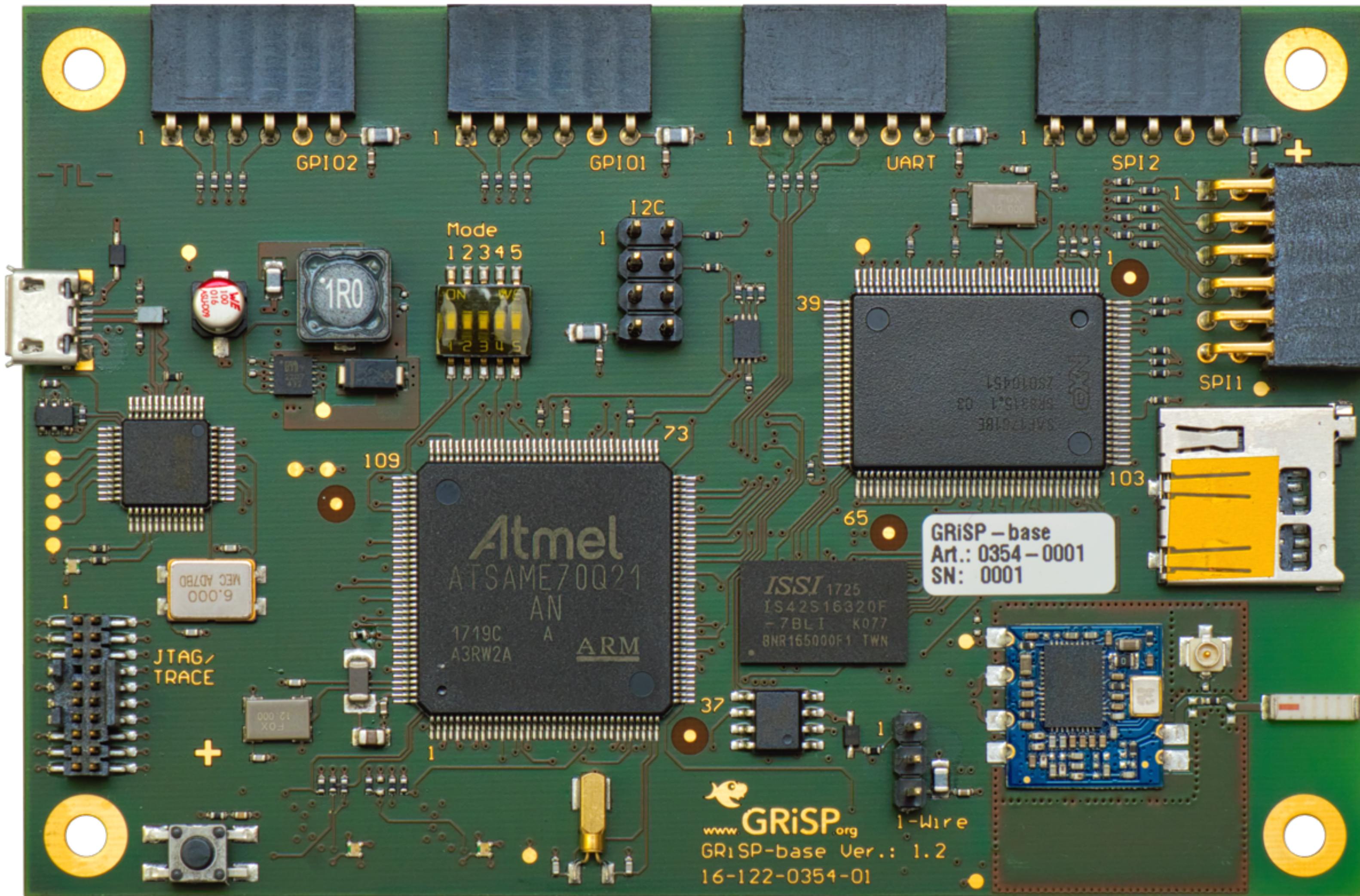


300 MHz
64 MiB RAM
WIFI
MICROSD









DIPL. PHYS. PEER STRITZINGER GMBH



MASTER SLAVE PROTOCOL

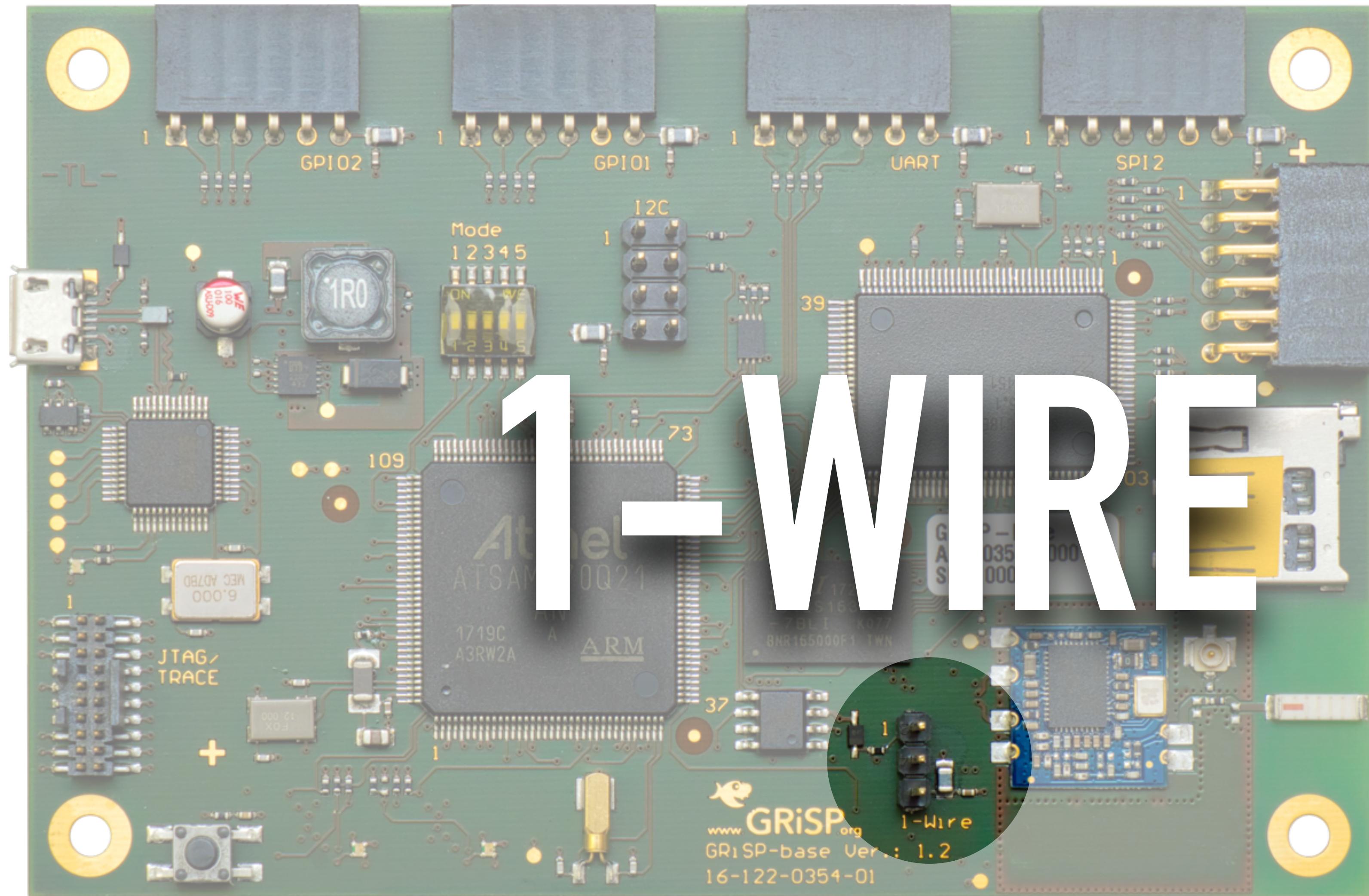
1 DATA LINE

1 CLOCK LINE

POWER & GROUND

ADDRESSABLE





DALLAS 1-WIRE
1 DATA + POWER LINE

GROUND

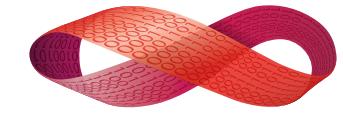
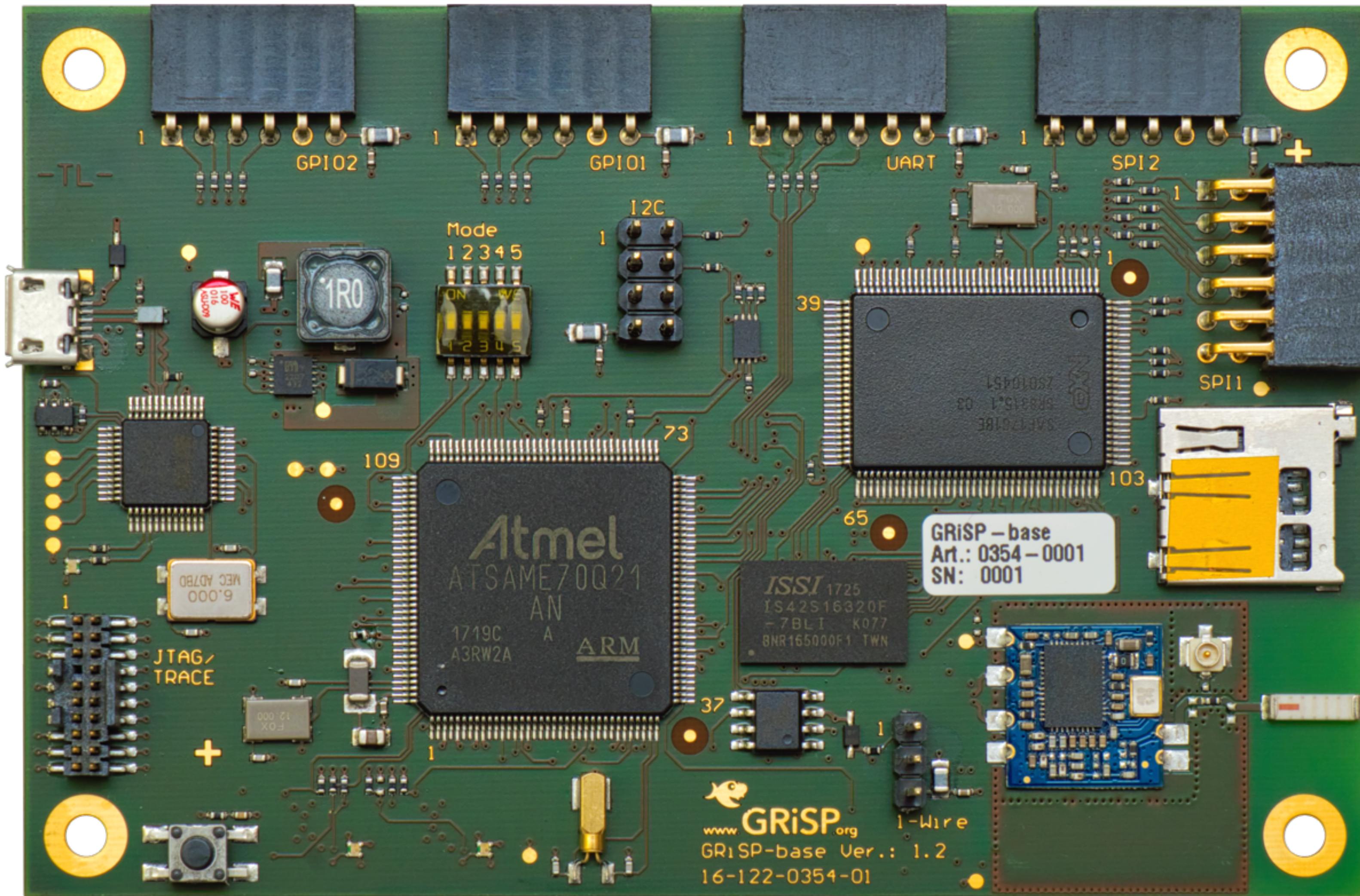
ADDRESSABLE MICROLAN



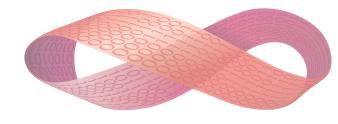
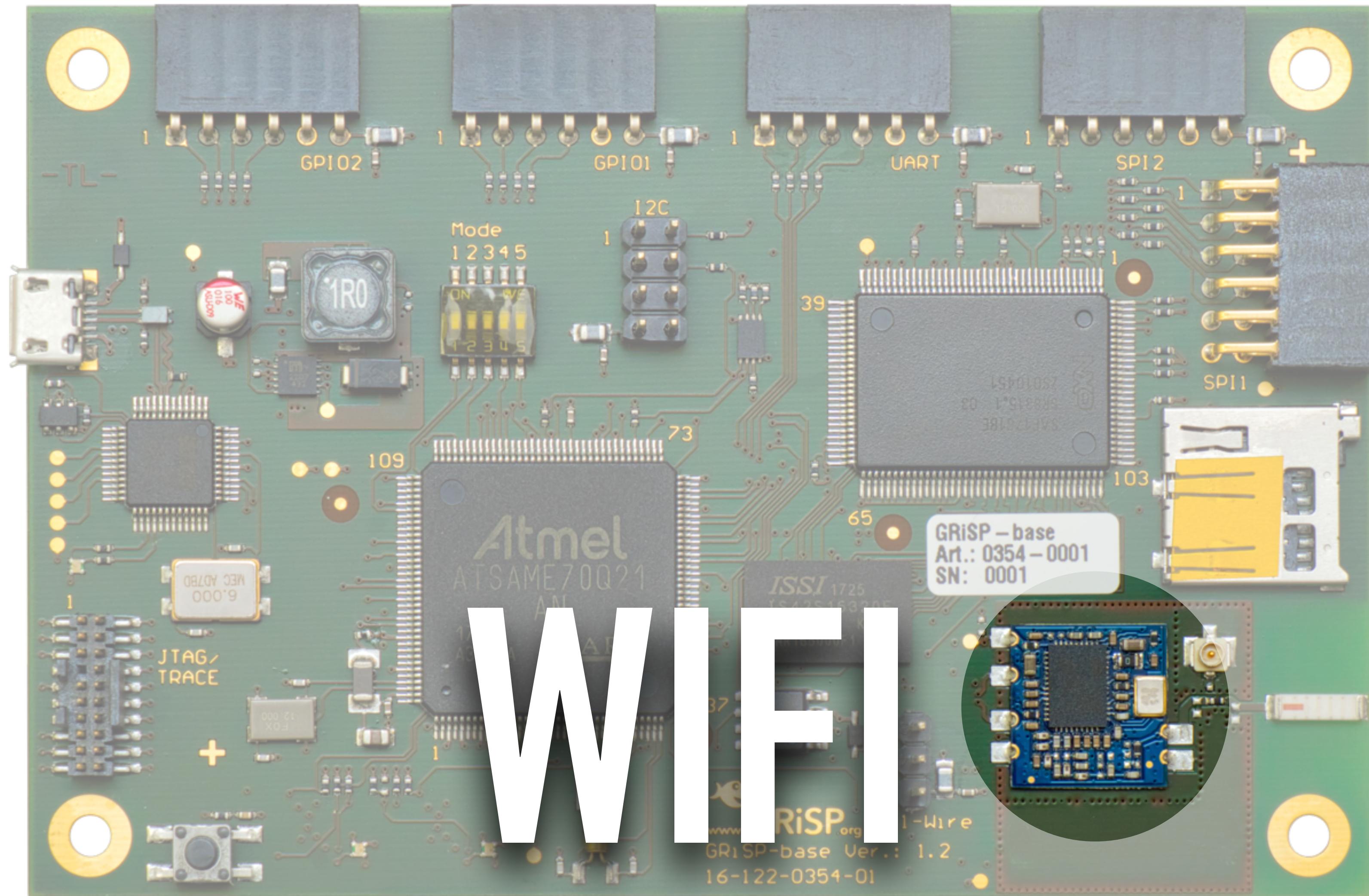
WIRELESS

COMMUNICATION





DIPL. PHYS. PEER STRITZINGER GMBH



802.11N 2.4 GHz

UP TO 150 MBPS

POWER SAVING

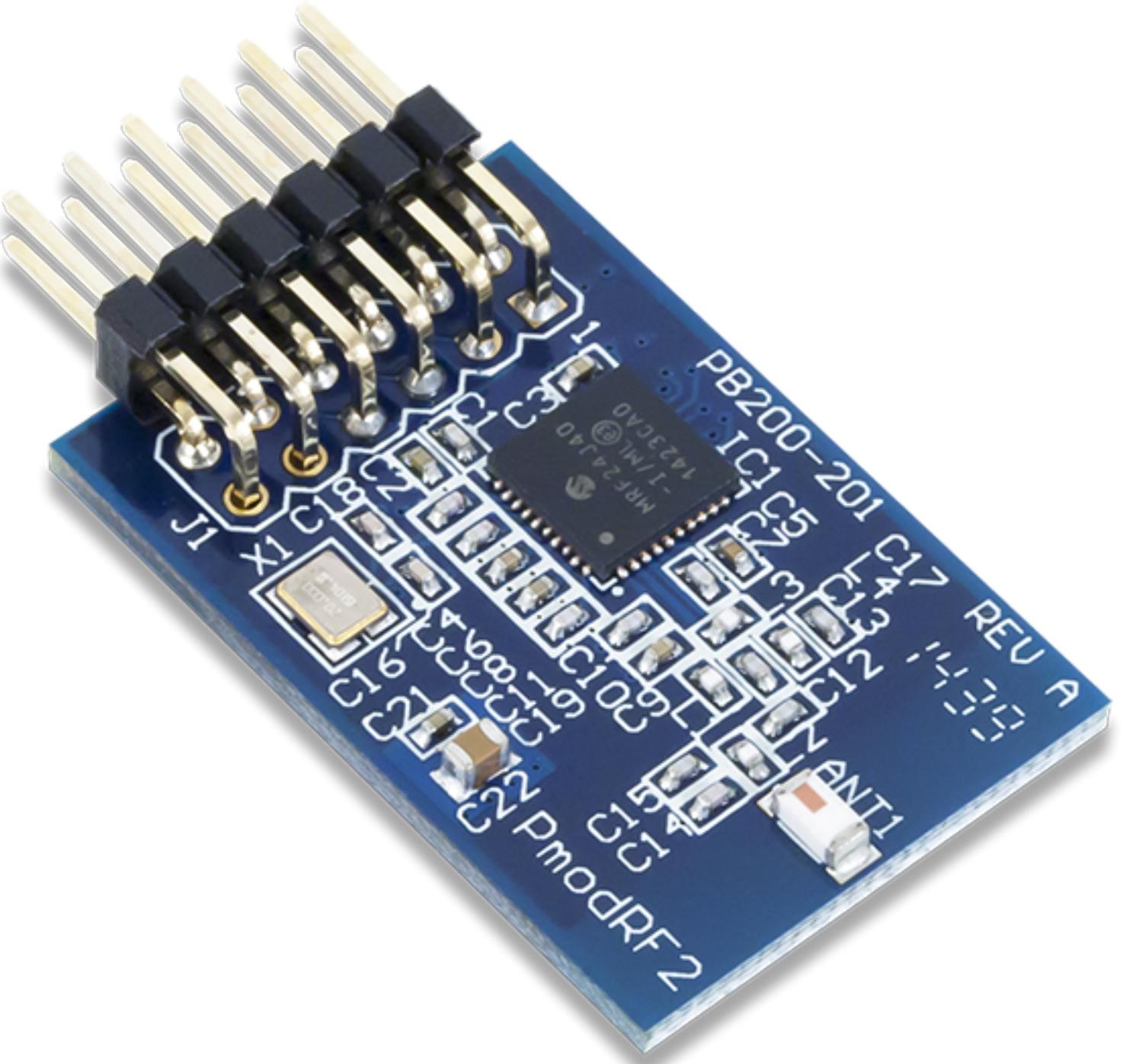


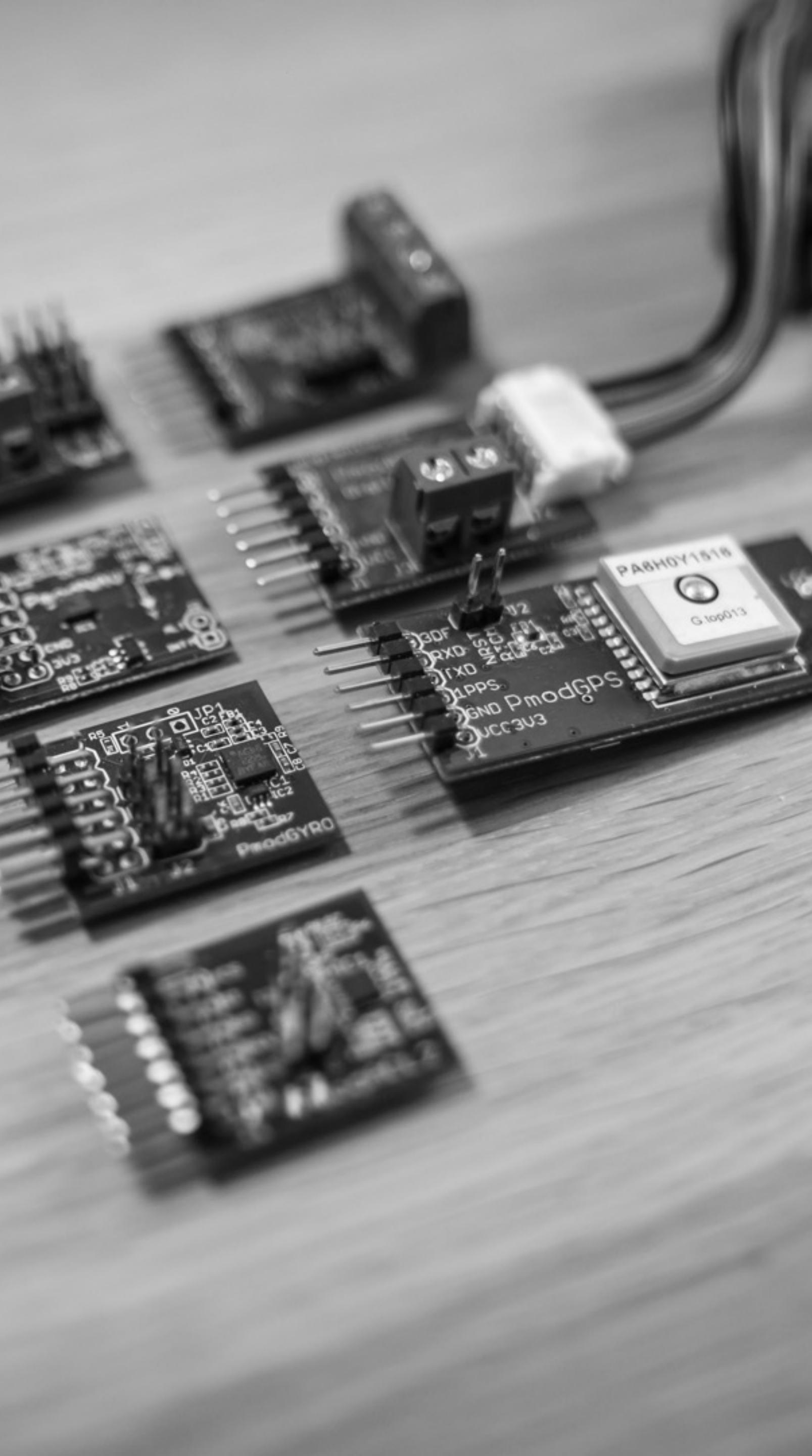
PMODRF2

IEEE 802.15.4

2.4GHz

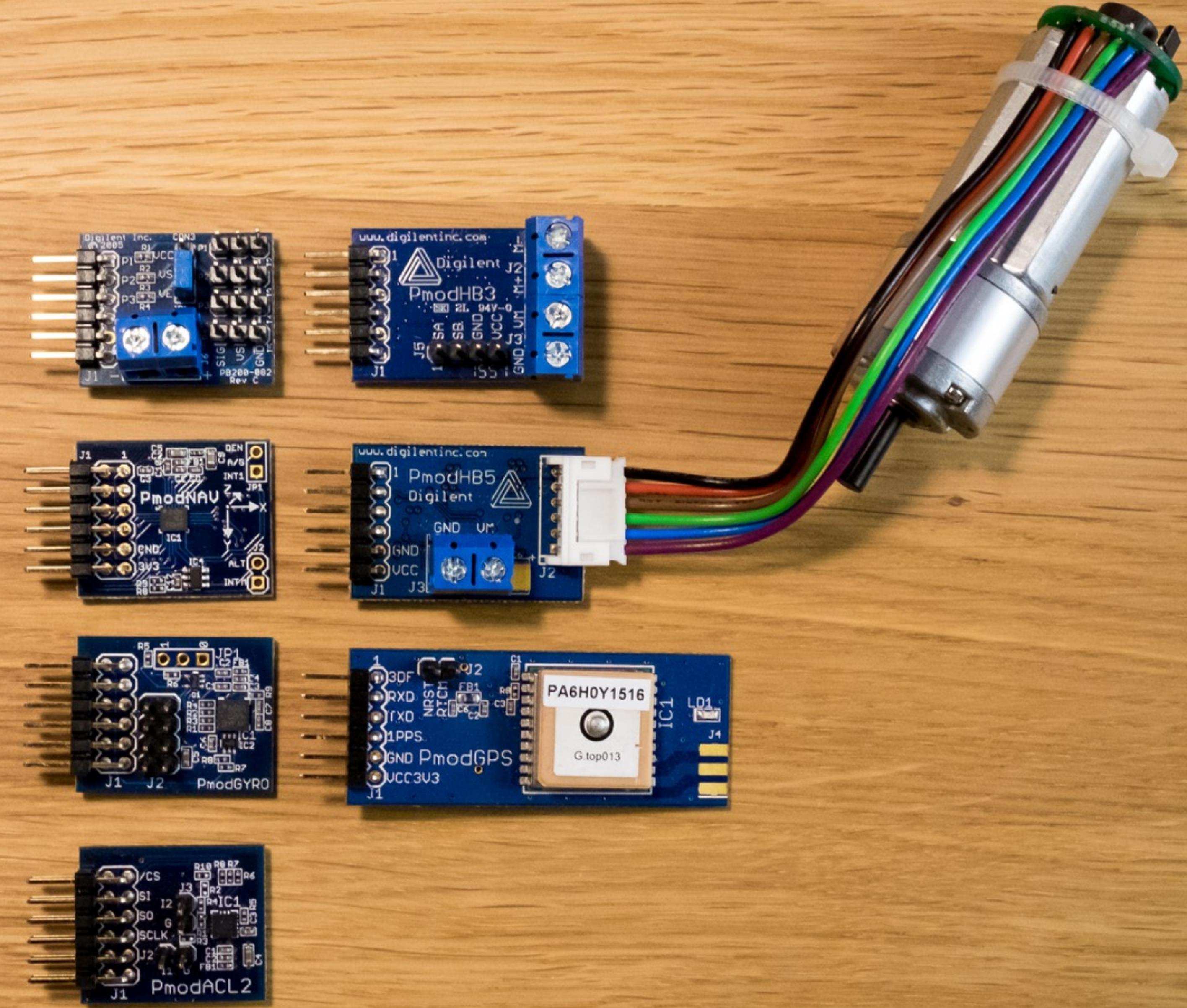
ZIGBEE, MIWI



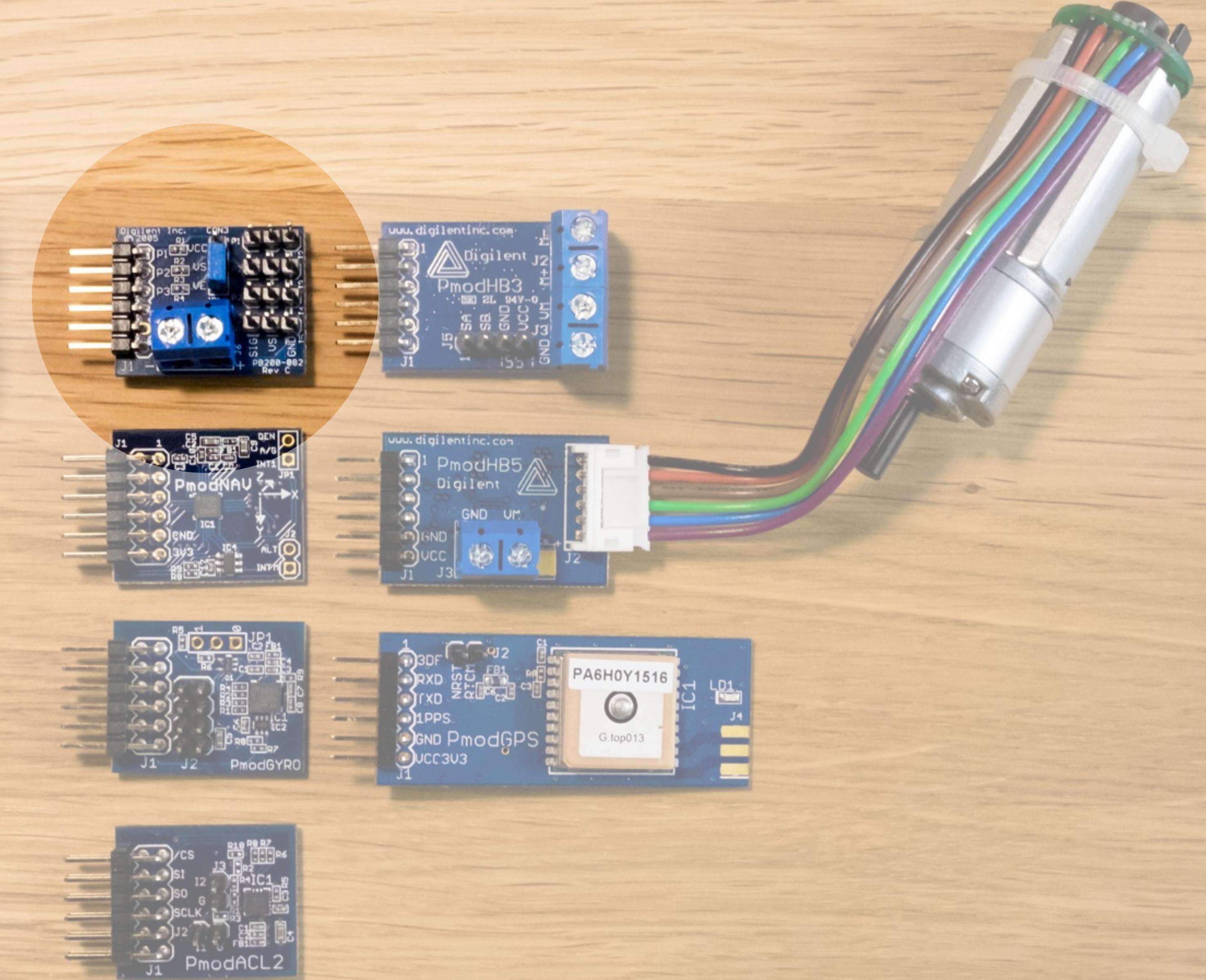


ACCESSORIES

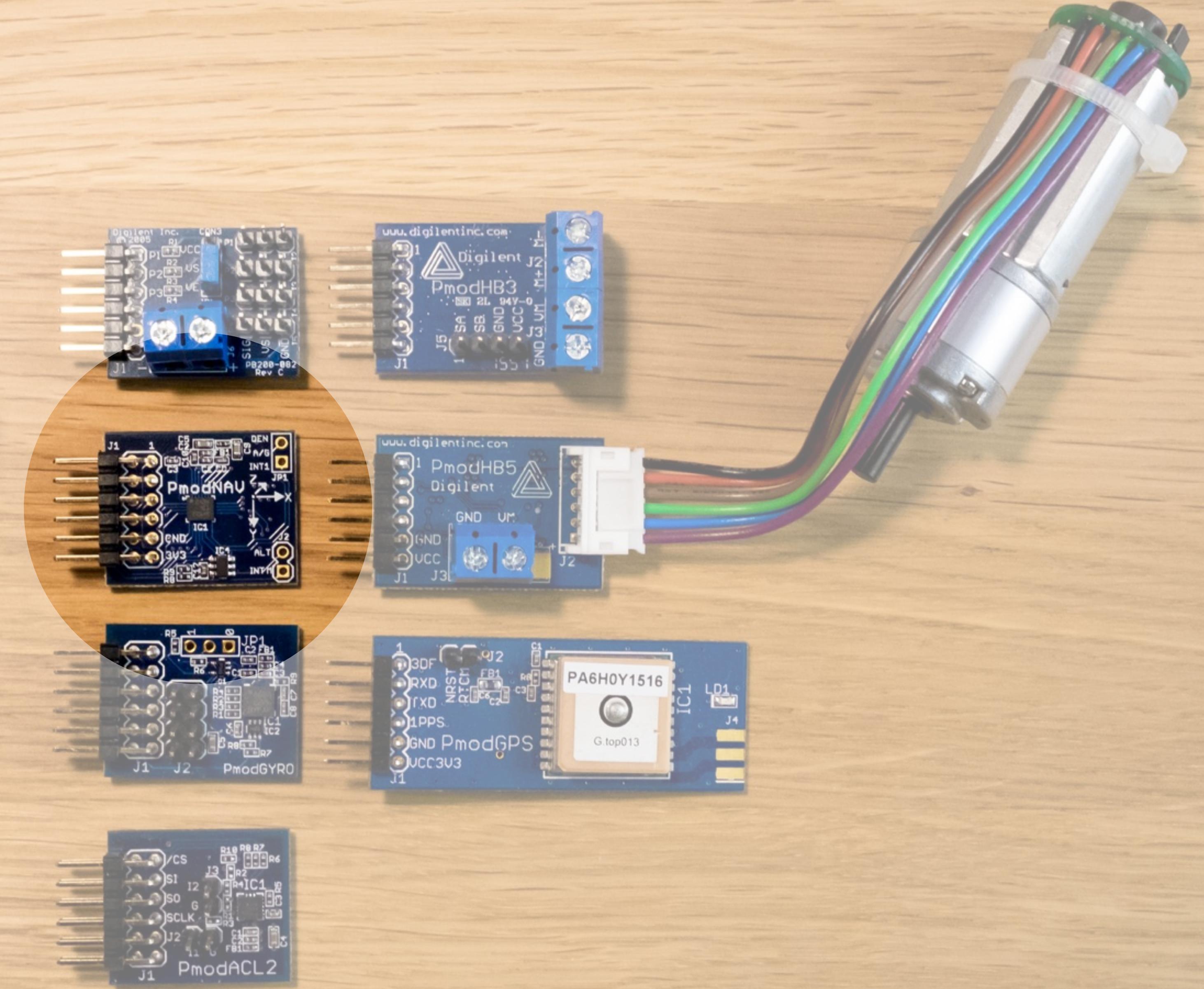
PMODS



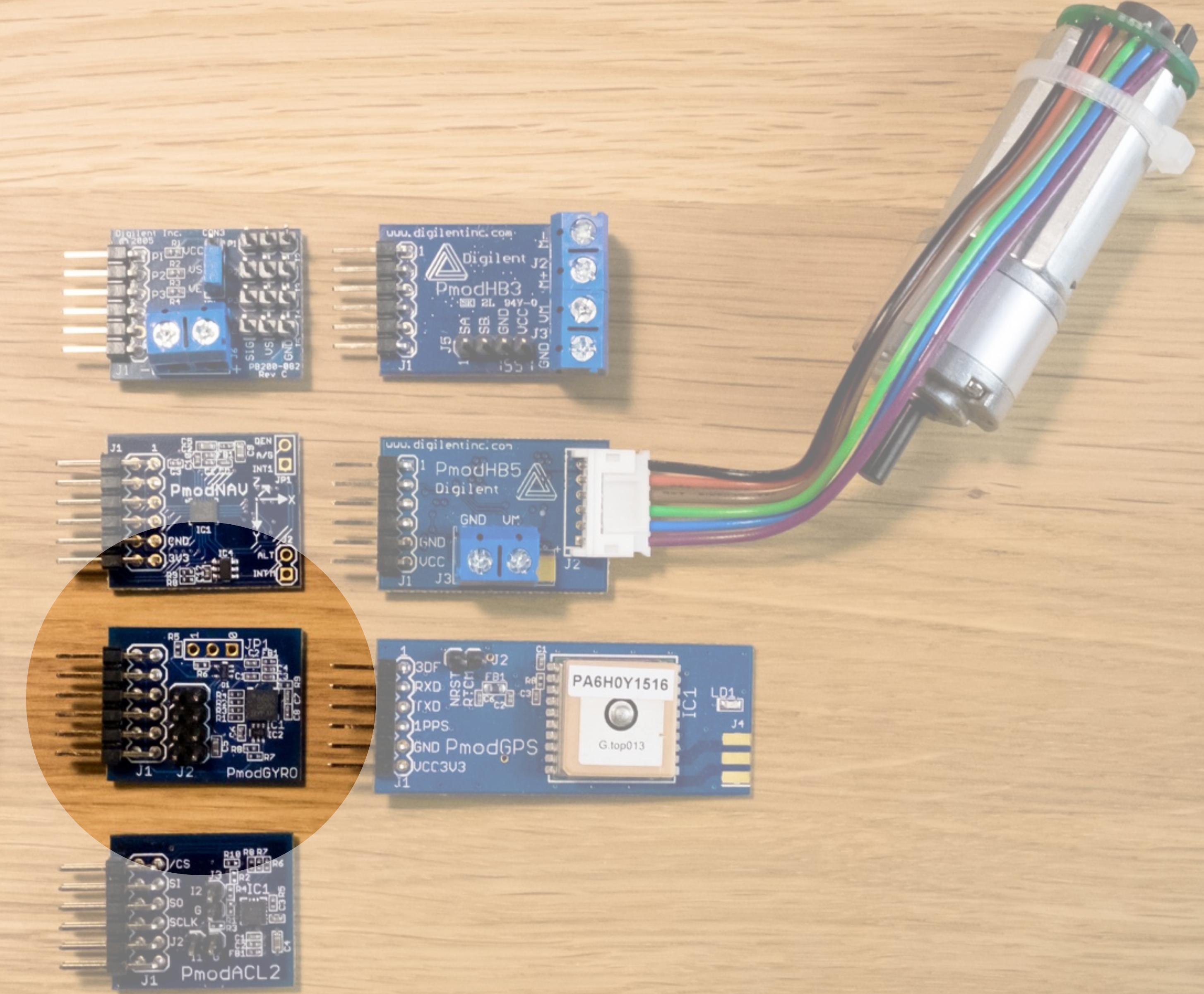
CON3



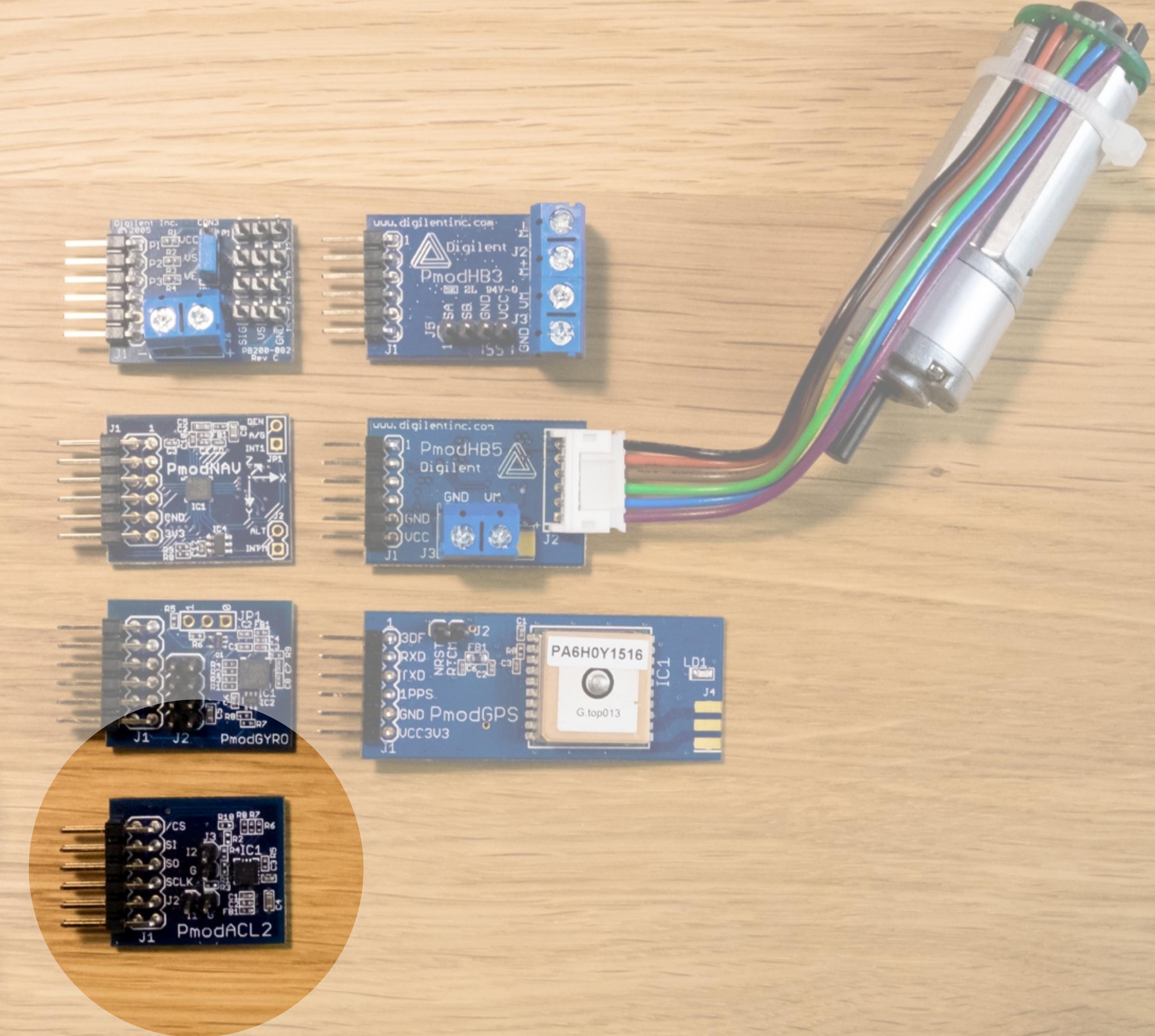
NAV



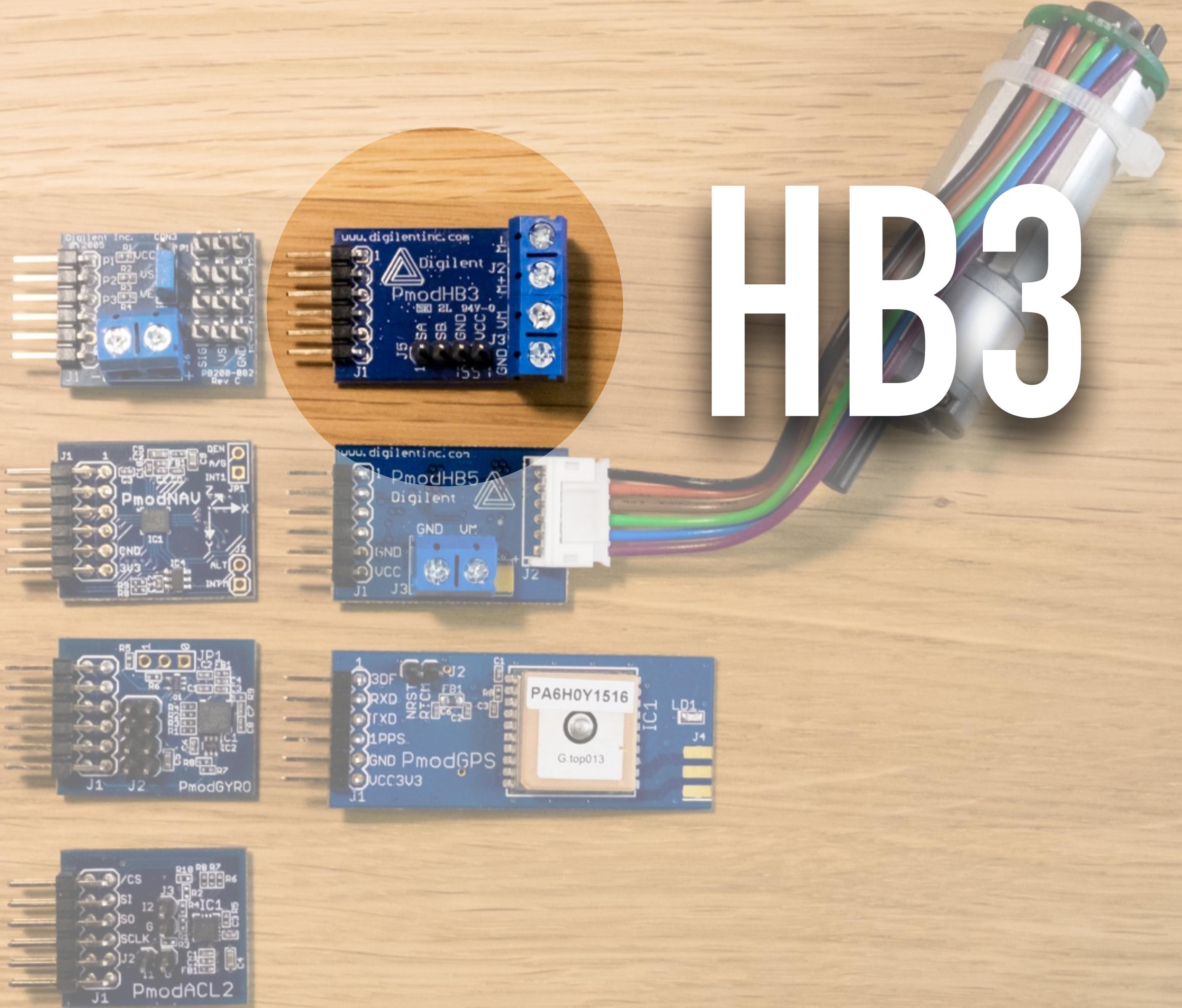
GYRO



ACL2



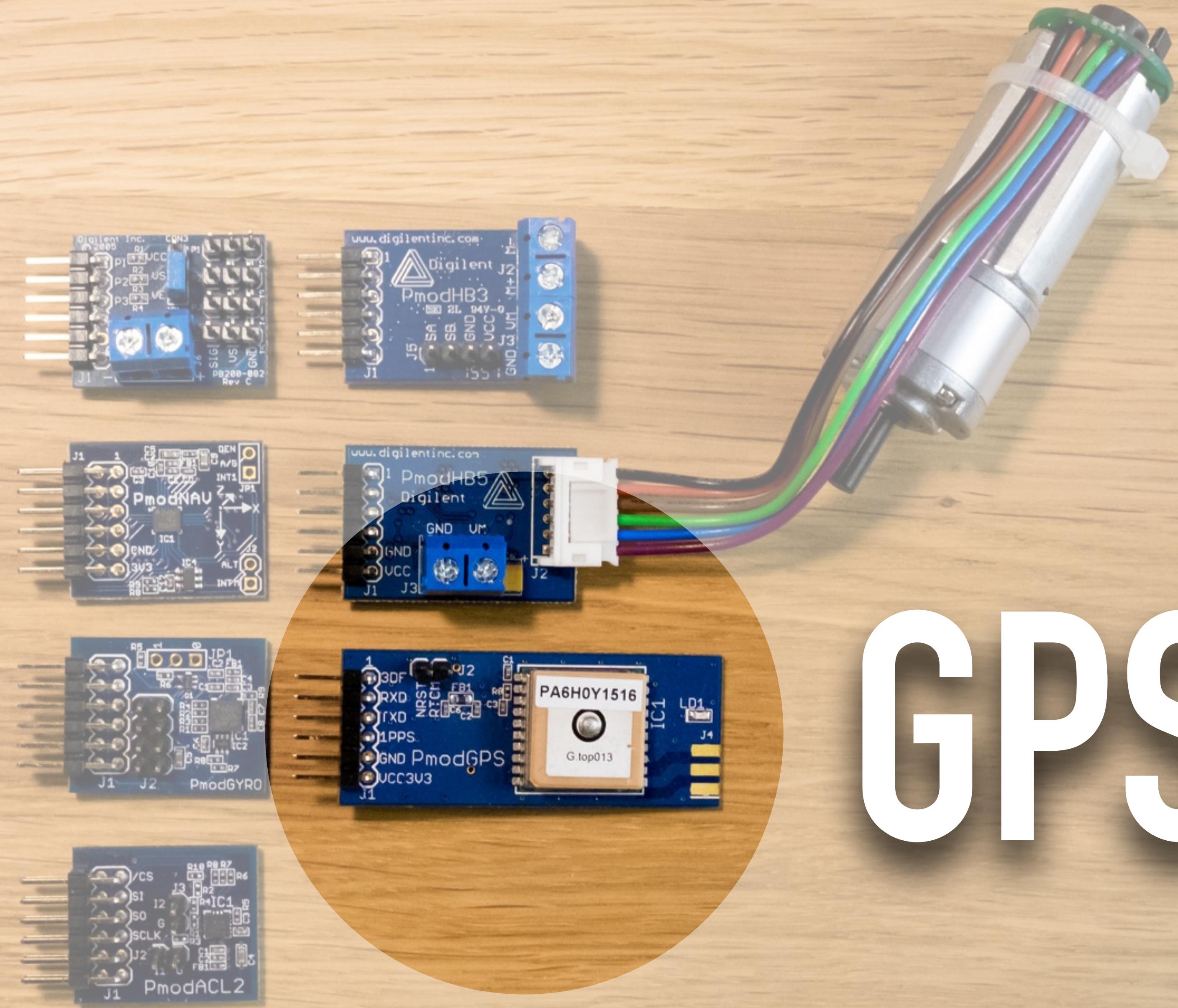
HB3

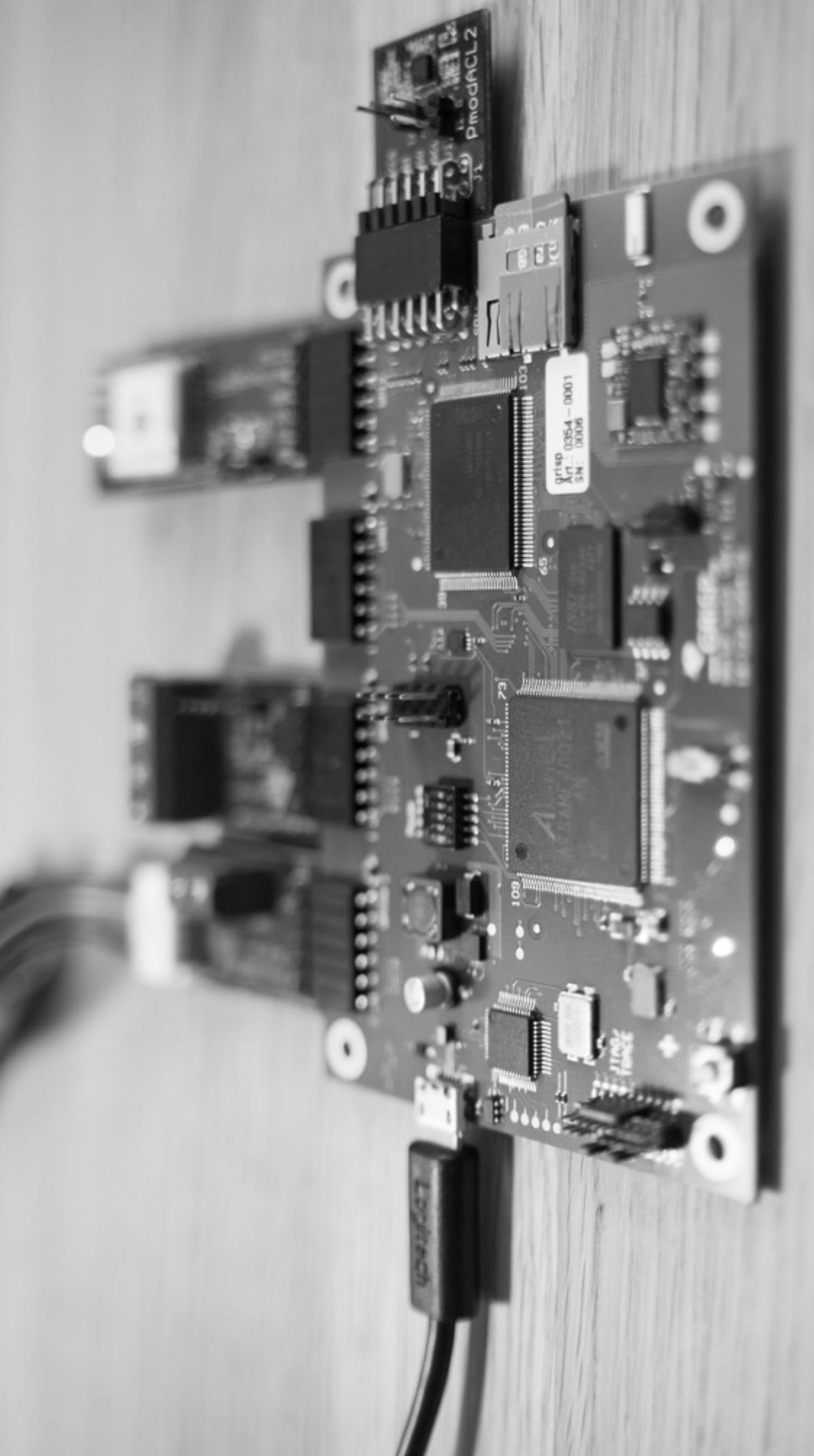


HB5



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 grispi_spi_output
(ErlDrvData drv_data, char *buf, ErlDrvSizeT 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);  
}
```

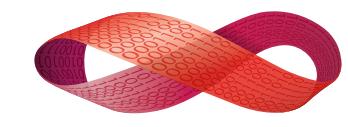


SPI DRIVER (ERLANG)

```
-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

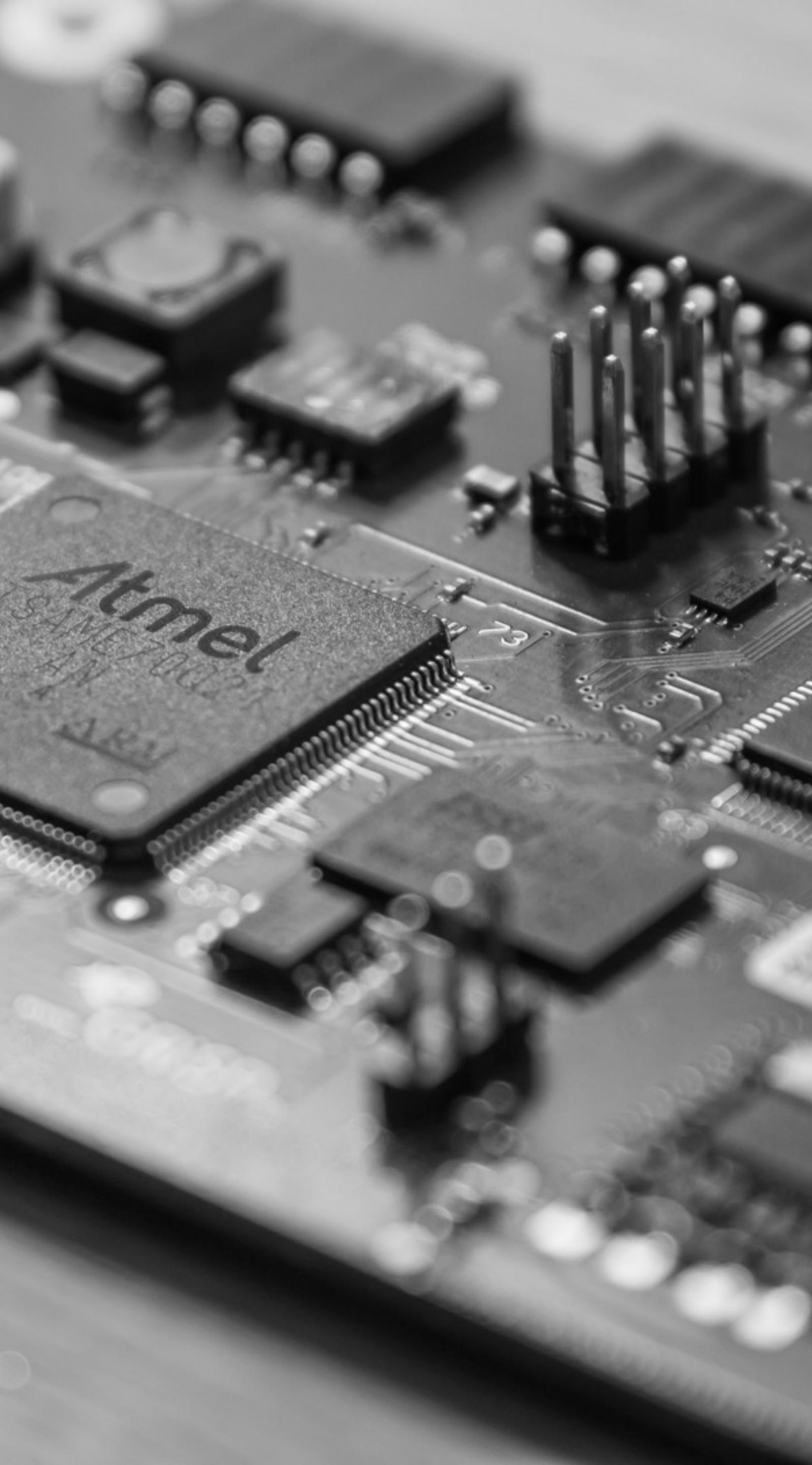
ISSUES

< . . . >



ROADMAP





WHAT WE'RE
WORKING ON

UPDATES

MQTT

MQTT SMART HOME

[https://github.com/mqtt-smarthome/
mqtt-smarthome](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



DIPL. PHYS. PEER STRITZINGER GMBH

ROADMAP

MORE DRIVERS

PREBUILT CROSS OTP

PREBUILT CROSS TOOLCHAIN

FIXING ERLANG DISTRIBUTION

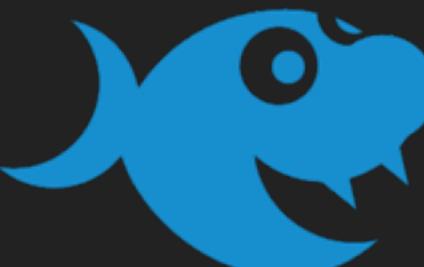


grisp.org

github.com/grisp

#grisp [irc.freenode.net](irc://irc.freenode.net)

#grisp erlang-slack.herokuapp.com

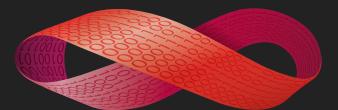


GRiSP

20% DISCOUNT WITH lambda2018

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

THANK YOU!



DIPL. PHYS PEER STRITZINGER GMBH