konashi

Hardware

INTRODUCTION

+ Concept
+ Architecture
+ Versions

SPECIFICATIONS

+ Supported devices
+ Appearance
+ Schematic

CORE FUNCTIONS

+ Digital
+ Analog
+ PWM
+ Communication
+ Bluetooth Low Energy
+ Event-driven

API Reference

CONSTANTS

+ Pin name
+ PIO
+ AIO
+ PWM
+ UART
+ I^2C
+ SPI
+ Function return
+ Events

BASE

+ initialize
+ find
+ findWithName
+ disconnect
+ isConnected
+ peripheralName

PROMISE

+ done
+ fail
+ then

EVENTS

+ addObserver
+ removeObserver

DIGITAL I/O (PIO)

+ pinMode
+ pinModeAll
+ pinPullup
+ pinPullupAll
+ digitalRead
+ digitalReadAll
+ digitalWrite
+ digitalWriteAll

+ digitalWriteAll

ANALOG I/O (AIO)

+ analogReference
+ analogReadRequest
+ analogRead
+ analogWrite

PWM

+ pwmMode
+ pwmPeriod
+ pwmDuty
+ pwmLedDrive

UART

+ uartMode
+ uartBaudrate
+ uartWrite

I^2C

+ i2cMode
+ i2cStartCondition
+ i2cRestartCondition
+ i2cStopCondition
+ i2cWrite
+ i2cReadRequest
+ i2cRead

SPI

+ spiMode
+ spiWrite
+ spiReadData
+ spiReadRequest

HARDWARE CONTROL

+ reset
+ batteryLevelReadRequest
+ batteryLevelRead
+ signalStrengthReadRequest
+ signalStrengthRead

Hardware

Introduction

Concept

Physical-computing is a concept which envisions new interactions between people and computers in our everyday environment. It was first proposed by by Dan O'Sullivan of New York University[1]. This concept is expected to make possible interactions which are beyond the limitations of current computer systems. For example, by measuring the movements of players, Kinect for Xbox360 changed the way people play games and experience entertaiment.

But there are some large difficulties faced when trying to design a physical-computing interface. Developing a device based on the concept of physical computing is an undertaking comparable to recreating the input-output system of a current personal computer. To such facilitate innovation cross-sector collaboration is a must. However, if designers and engineers cannot understand each others' field, it is very difficult to communicate complex ideas.

In order to address this difficulty, a device which can connect designers and engineers, and serve as a translator for their ideas is needed.

Some examples of such a device are “Gainer”, “Funnel” and “Arduino”, which have been developed as toolkits for a physical computing using a PC.

These toolkits are a small-size computer designed to be extension equipment for modern computer input and output systems. They are also designed to be easy to understand for designers who are not engineers. On the bounty of highly-modularized input and output systems, these toolkits are widely favoured among artists, designers and engineers as a tool for realising their physical computing ideas.

However, in recent years, it seems that the meaning of "computer in our lives is shifting from desktops and notebooks to smartphones and tablets. With that in mind, we developed Konashi as a physical computing toolkit tailored for smartphones and tablets. Anybody can take advantage of Konashi by using our open-source library "konashi-ios-sdk" and development environment for smartphone and tablet apps.

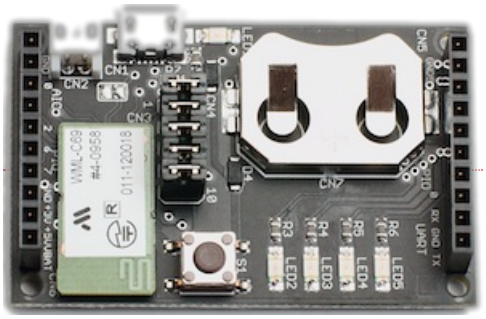
(※1) Tom I. and Dan O., Physical Computing: Sensing and Controlling the Physical World with Computers, Thomson, (May, 2004).

Specifications

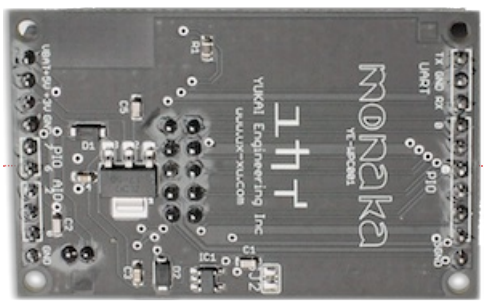
Supported devices

Series Name	Model	OS
iPhone	iPhone 4S, iPhone 5, iPhone 5S, iPhone 5C, iPhone 6, iPhone 6 Plus,iPhone 7,iPhone 8	iOS7.1 〜
iPad	iPad Air, iPad mini, iPad(4th Generation/ November 2012 Model), iPad(3rd Generation /March 2012 Model)	iOS7.1 〜
iPod touch	iPod touch(5th Generation) Please note: Not compatible with 4th generation iPod touch	iOS7.1 〜

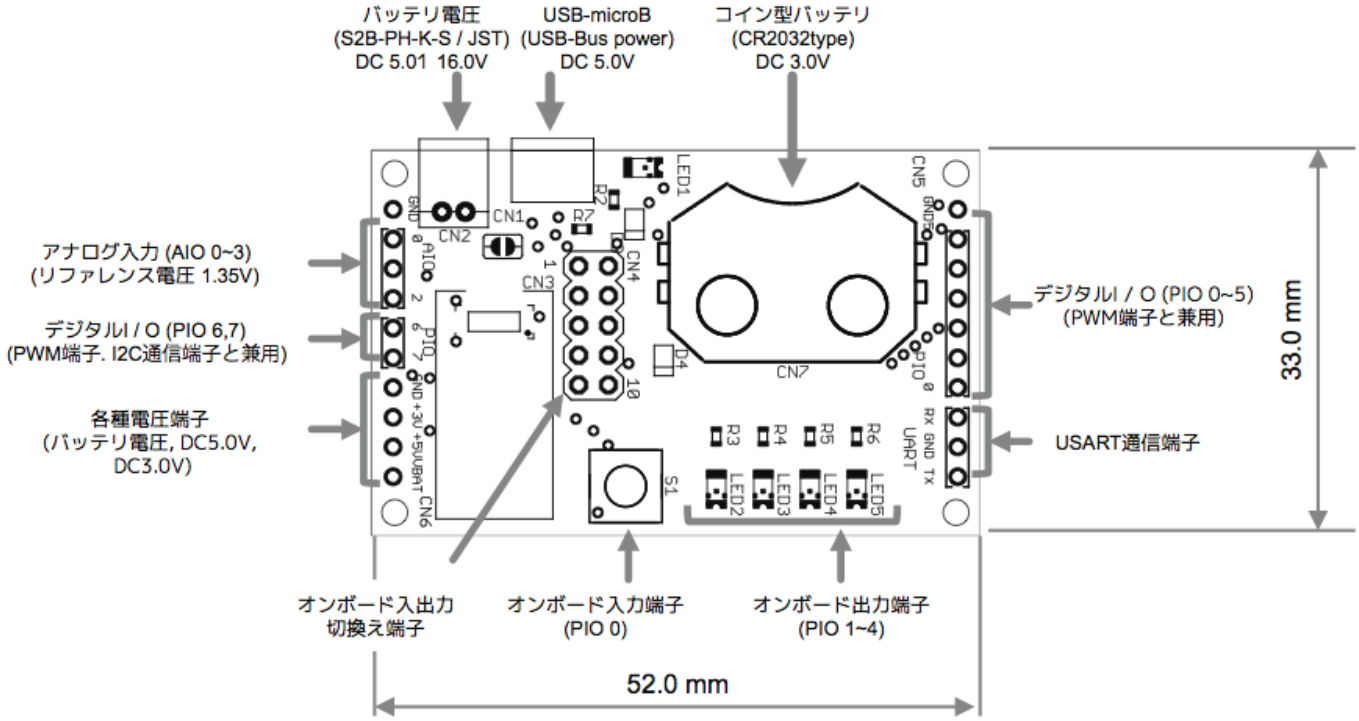
Appearance



Top view



Bottom view

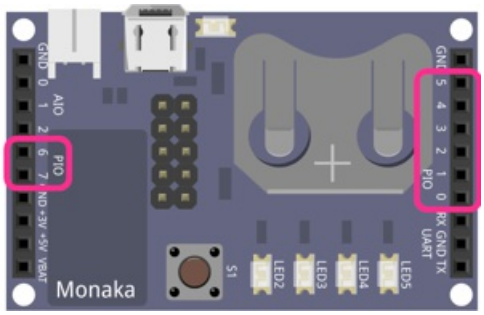


Layout

Schematic

Core functions

Digital



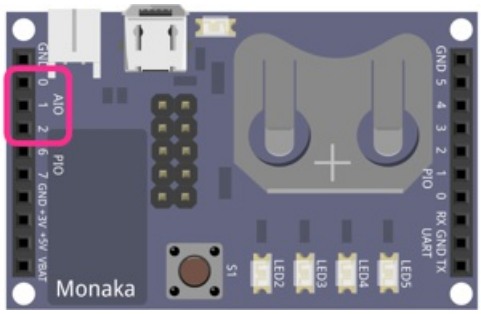
konashi is equipped with 8 digital I/O pins. With digital I/O pins, it is possible to input and output in two states, high and low.

In konashi's case, the standard voltage for the digital I/O is 3 volts, so it can input and output in either 3 or 0 volts.

Furthermore, in their initial state all of the digital I/O are set to input.

If the digital I/O pins are set to input, it is also possible to configure the internal pull-up resistors with pinMode, pinModeAll functions.

Analog



Konashi is equipped with 3 analog I/O pins. With analog I/O, voltage is inputted as microvolts, and it is possible to output a specified voltage (DAC).

The base voltage of konashi's analog I/O is 1.3 volts, so it can input and output in microvolts from 0 to 1.3 volts.

Furthermore, the initial state of the analog I/O is ADC (input).

Please be aware that ADC and DAC cannot be used at the same time.

Also, for DAC, only one pin can be used at a time. If you set other pins to DAC, another pin will be reset to input.

PWM

PWM(Pulse Width Modulation） is a system style which controls the ON time (duty cycle) of a pin, and generates pulses by turning it ON and OFF. This is a commonly-used method to control motor rotation speed or LED light strength.

On konashi, it is possible to set all of the digital I/O (PIO) pins to PWM mode.

When using PWM on konashi, in addition to the modes pwmMode, pwmPeriod, pwmDuty , which decide the duty cycle or period with a function, there is a mode which can easily specify the brightness of an LED from 0 to 100% (using the function pwmLedDrive). Which mode to use can be specified with the function pwmMode.

Because konashi's pulse width modulation is packaged with pwm software, if the duty cycle is modified multiple times in a short interval, konashi's ble systems will process each change consecutively, so it may not always output the specified duty cycle accurately.

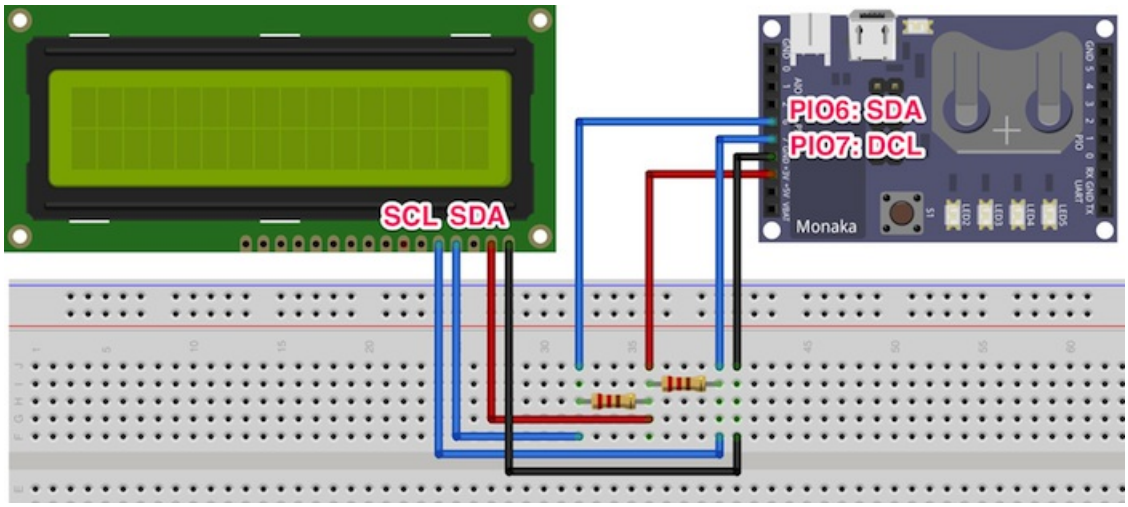
Therefore, please try not to access konashi with ble consecutively, or if the duty cycle does get out of sync, please target and control something which will not be damaged.

Also, the lowest PWM cycle rate it is possible to set is 1000 [us].

Communication

In order to enable serial communication with other devices, konashi is compatible with I^2C and UART.

I^2C



The signal types used with I^{2}C Serial Data (SDA) and Serial Clock (SDL) only.

This signal standard was developed as a simple bus system used for controlling electronics, and the standard's specifics can be found on the company NPX Semiconductor's website. (Please refer below for references.)

Reference: I^{2}C Bus Specification Documents Version 2.1 (NPX Semiconductors) (PDF File/780KB)

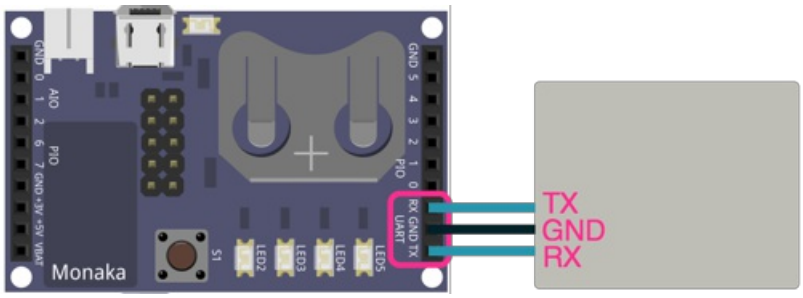
konashi operates as an I^{2}C master, and carries out communication with connected (slave) peripherals.

The two signal waves SDA and SDL are compatible with POI6(SDA) and POI7(SCL), respectively. They are connected as outlined in the above diagram, and programmed according to a device's signal protocol, so can communicate with LCDs and sensors which are compatible with I^{2}C.

Please note, be sure to use pull-up resistors with SDA and SDL.

By using the I^{2}C functions in konashi's library, it is possible to efficiently program I^{2}C communication.

UART



UART is a general term for a function which carries out serial communication through a start-stop synchronisation system, and by making use of this it is possible to carry out serial communication with konashi, conforming to RS-232(ANSI/TIA/EIA-232-F-1997).

Konashi uses two signal waves; one for sending data (TX) and one for receiving data (RX), and carries out serial communication with UART. It is connected as shown in the above diagram, and with UART it is possible to easily communicate with PCs and other peripherals.

The voltage of the signal is 3V.

To see which signal speeds it is possible to set, please look at Constants / UART.

Bluetooth Low Energy

Bluetooth Low Energy (here referred to as BLE), is a low-energy consumption version of Bluetooth as decided by Bluetooth SIG, and it is equipped in iPhones, iPads, and the latest MacBooks.

Konashi uses BLE to communicate with iPhones and iPads.

As konashi is designed to be simple for first-time users, the CPU does not often enter sleep mode and such, thus it is not designed for low energy consumption. Please note that it uses more energy than most BLE devices.

Following is an outline of the UUIDs for konashi's service and characteristics.

Services

Name	UUID
KONASHI_SERVICE_UUID	0xFF00

Characteristics

PIO

Name	UUID
KONASHI_PIO_SETTING_UUID	0x3000
KONASHI_PIO_PULLUP_UUID	0x3001
KONASHI_PIO_OUTPUT_UUID	0x3002
KONASHI_PIO_INPUT_NOTIFICATION_UUID	0x3003

PWM

Name	UUID
KONASHI_PWM_CONFIG_UUID	0x3004
KONASHI_PWM_PARAM_UUID	0x3005
KONASHI_PWM_DUTY_UUID	0x3006

Analog

Name	UUID
KONASHI_ANALOG_DRIVE_UUID	0x3007
KONASHI_ANALOG_READ0_UUID	0x3008
KONASHI_ANALOG_READ1_UUID	0x3009
KONASHI_ANALOG_READ2_UUID	0x300A

I^2C

Name	UUID
KONASHI_I2C_CONFIG_UUID	0x300B
KONASHI_I2C_START_STOP_UUID	0x300C
KONASHI_I2C_WRITE_UUID	0x300D
KONASHI_I2C_READ_PARAM_UIUD	0x300E
KONASHI_I2C_READ_UUID	0x300F

UART

Name	UUID
KONASHI_UART_CONFIG_UUID	0x3010

Name	UUID
KONASHI_UART_BAUDRATE_UUID	0x3011
KONASHI_UART_TX_UUID	0x3012
KONASHI_UART_RX_NOTIFICATION_UUID	0x3013

Hardware control

Name	UUID
KONASHI_HARDWARE_RESET_UUID	0x3014
KONASHI_HARDWARE_LOW_BAT_NOTIFICATION_UUID	0x3015

API Reference

Constants

Pin name

PIO0	0	PIO pin 0
PIO1	1	PIO pin 1
PIO2	2	PIO pin 2
PIO3	3	PIO pin 3
PIO4	4	PIO pin 4
PIO5	5	PIO pin 5
PIO6	6	PIO pin 6
PIO7	7	PIO pin 7
S1	0	Tact switch (When the jumper is short-circuited, connected to PIO0)
LED2	1	Red LED (When the jumper is short-circuited, connected to PIO1)
LED3	2	Red LED (When the jumper is short-circuited, connected to PIO2)
LED4	3	Red LED (When the jumper is short-circuited, connected to PIO3)
LED5	4	Red LED (When the jumper is short-circuited, connected to PIO4)
AIO0	0	AIO pin 0
AIO1	1	AIO pin 1
AIO2	2	AIO pin 2
I2C_SDA	6	I^2C SDA pin(PIO pin 6)
I2C_SCL	7	I^2C SCL pin(PIO pin 7)

PIO

HIGH	1	Changes the pin’s output to HIGH(3V)
LOW	0	Changes the pin’s output to LOW(0V)
TRUE	1	Changes the pin’s output to HIGH(3V) (Same as the above “HIGH”)
FALSE	0	Changes the pin’s output to LOW(0V) (Same as the above “LOW)
OUTPUT	1	Sets the pin’s input/output to output
INPUT	0	Set the pin’s input/output to input
PULLUP	1	Set the pin’s pull-up setting to ON
NO_PULLS	0	Set the pin’s pull-up setting to OFF

AIO

KONASHI_ANALOG_REFERENCE	1300	Reference voltage for analog input and output 1300mV

PWM

KONASHI_PWM_DISABLE	0	Do not use the specified PIO as PWM (Use as digital I/O)
KONASHI_PWM_ENABLE	1	Use the specified PIO as PWM
KONASHI_PWM_ENABLE_LED_MODE	2	Use the specified PIO as a PWM in LED mode
KONASHI_PWM_LED_PERIOD	10000	When in LED mode the PWM cycle is 10ms

UART

ObjectiveC | Android

KonashiUartModeDisable	0	UART Disabled
KonashiUartModeEnable	1	UART Enabled
KonashiUartBaudrateRate2K4	0x000a	2400bps
KonashiUartBaudrateRate9K6	0x0028	9600bps
KonashiUartBaudrateRate19K2	0x0050	19200bps
KonashiUartBaudrateRate38K4	0x00a0	38400pbs
KonashiUartBaudrateRate57K6	0x00f0	57600pbs
KonashiUartBaudrateRate76K8	0x0140	76800pbs
KonashiUartBaudrateRate115K2	0x01e0	115200pbs

I²C

KONASHI_I2C_DATA_MAX_LENGTH	19	The largest amount of bytes I²C can receive at one time
KONASHI_I2C_DISABLE	0	Disable I²C
KONASHI_I2C_ENABLE	1	Enable I²Cを有効にする(Default mode: 100kbps)
KONASHI_I2C_ENABLE_100K	1	Enable I2C in 100kbps mode
KONASHI_I2C_ENABLE_400K	2	Enable I2C in 400kbps mode
KONASHI_I2C_STOP_CONDITION	0	Stop Condition
KONASHI_I2C_START_CONDITION	1	Start Condition
KONASHI_I2C_RESTART_CONDITION	2	Restart Condition

Function return

KONASHI_SUCCESS	0	When successful
KONASHI_FAILURE	1	When failure

Events

KONASHI_EVENT_CONNECTED	When konashi is connected (The connection has not finished)
KONASHI_EVENT_READY	When the connection with konashi is finished
KONASHI_EVENT_UPDATE_PIO_INPUT	When PIO’s input status has changed
KONASHI_EVENT_UPDATE_ANALOG_VALUE	When the voltage for one of the AIO pins is acquired
KONASHI_EVENT_UPDATE_ANALOG_VALUE_AIO0	When the voltage for AIO0 is acquired
KONASHI_EVENT_UPDATE_ANALOG_VALUE_AIO1	When the voltage for AIO1 is acquired
KONASHI_EVENT_UPDATE_ANALOG_VALUE_AIO2	When the voltage for AIO2 is acquired
KONASHI_EVENT_I2C_READ_COMPLETE	When data is received from I²C
KONASHI_EVENT_UART_RX_COMPLETE	When data is recieved from UART’s Rx
KONASHI_EVENT_UPDATE_BATTERY_LEVEL	When konashi’s battery level is acquired
KONASHI_EVENT_UPDATE_SIGNAL_STRENGTH	When konashi’s signal strength is acquired

Base

initialize

Description

Initialising konashi.

Before using konashi, be sure to initialize viewDidLoad, and anything else which appears first on ViewController.

Syntax

```
[Konashi initialize];
```

Parameters

None

Returns

If successful: KONASHI*SUCCESS (0), If a failure: KONASHI*FAILURE (-1)

find

Description

Find a konashi near to your iPhone

After executing this function, a list of konashi around your phone will appear. If you click on one of them, you will connect to it automatically. After that, the events KONASHI_EVENT_CONNECTED and KONASHI_EVENT_READY will launch, so please arrange to catch these events on addObserver beforehand.

Syntax

```
[Konashi find];
```

Parameters

None

Returns

If successful: KONASHI*SUCCESS (0), If a failure: KONASHI*FAILURE (-1)

disconnect

Description

Disconnect konashi.

> Notice: In operating systems older than iOS6.1, there is a bug in the Core Bluetooth API, so this function will not work properly. Please use iOS6.1 or later.

Syntax

```
[Konashi disconnect];
```

Parameters

None

Returns

If successful: KONASHI*SUCCESS (0), If unsuccessful: KONASHI*FAILURE (-1)

isConnected

Description

Return if the iOS device is connected to konashi.

When the event KONASHI_EVENT_CONNECTED launches it becomes TRUE. Before that it is FALSE.

Syntax

```
[Konashi isConnected];
```

Parameters

None

Returns

BOOL

Events

addObserver

Description

You can catch events related to konashi.

Because konashi and the iPhone are connected by BLE, konashi's status and the status of pins are acquired asynchronously.

For example, to acquire the voltage of an AIO pin, send a request to konashi with analogReadRequest, and after receiving the aquisition complete event KONASHI_EVENT_UPDATE_ANALOG_VALUE , it becomes possible to reference the AIO pin's voltage.

To see what kind of events there are please reference Constants / Events.

Syntax

```
[Konashi addObserver:(id)notificationObserver selector:(SEL)notificationSelector name:(NSString*)notificationName];
```

Parameters

notificationObserver	id	Specify the observer
selector	SEL	Specify a function to call an event launch
name	NSString*	Specify an event name. For details, please reference Constants - Events

Returns

If successful: `KONASHI_SUCCESS` (0), If unsuccessful: `KONASHI_FAILURE` (-1)

Example

```
- (void)viewDidLoad
{
    [super viewDidLoad];

    [Konashi initialize];
    [Konashi addObserver:self selector:@selector(konashiConnected) name:KONASHI_EVENT_CONNECTED];
}

- (void) konashiConnected
{
    NSLog(@"CONNECTED");
}
```

removeObserver

Description

Cancel konashi event observation carried out byaddObserver.

Syntax

```
[Konashi removeObserver:(id)notificationObserver];
```

Parameters

notificationObserver	id	Specify the observer

Returns

If successful: `KONASHI_SUCCESS` (0), If unsuccessful: `KONASHI_FAILURE` (-1)

Example

```
- (void)viewDidLoad
{
    [super viewDidLoad];

    [Konashi initialize];
    [Konashi addObserver:self selector:@selector(konashiConnected) name:KONASHI_EVENT_CONNECTED];
}

- (void) konashiConnected
{
    NSLog(@"CONNECTED");
   [Konashi removeObserver:self];
}
```

Digital I/O (PIO)

pinMode

Description

Specify whether to use a PIO pin as input or output. For details please look at Core functions / Digital.

Syntax

```
[Konashi pinMode:(int)pin mode:(int)mode];
```

Parameters

pin	int	Specified PIO pin name. To see what pin names are possible please look at Constants / Pin name.
mode	int	Specified mode for that pin. You can specify whether it is `INPUT` or `OUTPUT`. For details please look at Constants / PIO.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set LED2 as OUTPUT

```
[Konashi pinMode:LED2 mode:OUTPUT];
```

pinModeAll

Description

Please specify whether to use the PIO pin for input or output. For details please see Core functions / Digital.

Syntax

```
[Konashi pinModeAll:(int)mode];
```

Parameters

mode	int	The settings of all 8 pins from PIO0 to PIO7. Please specify from 0x00 to 0xFF, with 1 as `OUTPUT`, and 0 as `INPUT`.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set all PIO pins as OUTPUT

```
[Konashi pinModeAll:0xFF];
```

pinPullup

Description

Specify whether to set pull-up for PIO pins.

In their initial state, no pull-up is applied to the PIO pins(NO_PULLS). Please look at Core Functions / Digital for details.

Syntax

```
[Konashi pinPullup:(int)pin mode:(int)mode];
```

Parameters

pin	int	The name of a specified PIO pin. Please see Constants / Pin name for possible pin names.
mode	int	Specify whether to set pull-up for the pin. `PULLUP` or `NO_PULLS` can be specified. For details, please look at Constants / PIO.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set pull-up for PIO7

```
[Konashi pinMode:PIO7 mode:PULLUP];
```

pinPullupAll

Description

Specify whether to implement a pull-up resistor for PIO pins. For details, please see Core Functions / Digital.

Syntax

```
[Konashi pinPullupAll:(int)mode];
```

Parameters

pin	int	Name of the specified PIO pin. For possible names please see Constants / Pin name.
mode	int	Settings for the pull-up resistors of all pins from PIO0 through to PIO7. Please specify from 0x00 to 0xFF.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set pull-up for All PIO pins

```
[Konashi pinPullupAll:0xFF];
```

digitalRead

Description

Acquire the input condition of a specific PIO pin.

Before acquiring the input condition of a pin, be sure to set the pin's mode to input with pinMode, pinModeAll . If the pin is in output mode the correct input condition cannot be acquired.

For details, please see Core functions / Digital.

Syntax

```
[Konashi digitalRead:(int)pin];
```

Parameters

pin	int	Name of the PIO pin. For possible names, please looks at Constants / Pin name.

Returns

`HIGH` or `LOW`

Example

Acquire the input condition of S1

```
[Konashi digitalRead:S1];
```

digitalReadAll

Description

Acquire the conditions of all PIO pins. For details, please see Core functions / Digital.

Syntax

```
[Konashi digitalReadAll];
```

Parameters

None.

Returns

Input information for the 8 PIO pins (0x00 to 0xFF)

Example

Acquire the input condition for all of the PIO pins.

```
[Konashi digitalReadAll];
```

digitalWrite

Description

Set the output condition for a specific PIO pin.

For details please see Core functions / Digital.

Syntax

```
[Konashi digitalWrite:(int)pin value:(int)value];
```

Parameters

pin	int	Name of the PIO pin. For possible pin names please see Constants / Pin name.
value	int	The output condition for theassigned PIO. `HIGH` or `LOW` can be specified. For details please see Constants / PIO.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set LED2 to HIGH

```
[Konashi digitalWrite:LED2 value:HIGH];
```

digitalWriteAll

Description

Set the output conditions for a specific PIO pin. For details, please look at Core functions / Digital.

Syntax

```
[Konashi digitalWriteAll:(int)value];
```

Parameters

value	int	A value set from output PIO0 to PIO7. It is posible to set it between 0x00 and 0xFF.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set all of the PIO pin on HIGH.

```
[Konashi digitalWriteAll:0xFF];
```

Analog I/O (AIO)

analogReference

Description

Return the analog output to the base voltage

Syntax

```
[Konashi analogReference];
```

Parameters

None

Returns

`KONASHI_ANALOG_REFERENCE`, return to 1300(mV)。

analogReadRequest

Description

Send a request to konashi to acquire the voltage of a specified AIO pin.

This is a function to send a request to konashi, so to acquire the value practically then after checking the voltage acquisition completion event, defined in `KONASHI_EVENT_UPDATE_ANALOG_VALUE` or Constants / Events, in addObserver, acquire the value with analogRead.

For features related to analog functions, please see Core functions / Analog .

Syntax

```
[Konashi analogReadRequest:(int)pin];
```

Parameters

pin	int	Name of an AIO pin. The possible pin names are `AIO0`, `AIO1` and `AIO2`. For details please see Constants / Pin name.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Acquire the input voltage of AIO0.

```
- (void)viewDidLoad
{
    [super viewDidLoad];

    [Konashi initialize];

    [Konashi addObserver:self selector:@selector(konashiReady) name:KONASHI_EVENT_READY];
    [Konashi addObserver:self selector:@selector(readAio0) name:KONASHI_EVENT_UPDATE_ANALOG_VALUE_AIO0];
}

// Tap action for the search for konashi button
- (IBAction)findKonashi:(id)sender {
    [Konashi find];
}

// Tap action for button to acquire voltage for AIO0
- (IBAction)requestReadAio0:(id)sender {
    [Konashi analogReadRequest:AIO0];
}

- (void) readAio0
{
    NSLog(@"READ_AIO0: %d", [Konashi analogRead:AIO0]);
}
```

analogRead

Description

Acquire the voltage for a specified AIO pin. The value which can be acquired with this function is the voltage acquired with analogReadRequest previously.

If you would like to acquire the voltage of konashi's AIO pins, first, send an acquisition request to konashi with analogReadRequest, then after checking the voltage acquisition complete event defined in KONASHI*EVENT*UPDATE*ANALOG*VALUE or Constants / Events with addObserver, then you can obtain the value with this function.

For functions related to analog features, please see Core functions / Analog.

Syntax

```
[Konashi analogRead:(int)pin];
```

Parameters

pin	int	Name of an AIO pin. The possible pin names are `AIO0`, `AIO1` and `AIO2`. For details please see Constants / Pin name.

Returns

A mV unit value from 0 to KONASHI*ANALOG*REFERENCE will be returned.

Example

Obtain input voltage for AIO0

```
- (void)viewDidLoad
{
    [super viewDidLoad];

    [Konashi initialize];

    [Konashi addObserver:self selector:@selector(konashiReady) name:KONASHI_EVENT_READY];
    [Konashi addObserver:self selector:@selector(readAio0) name:KONASHI_EVENT_UPDATE_ANALOG_VALUE_AIO0];
}

// Tap action for search for konashi button
- (IBAction)findKonashi:(id)sender {
    [Konashi find];
}

// Tap action for button to obtain voltage for AIO0
- (IBAction)requestReadAio0:(id)sender {
    [Konashi analogReadRequest:AIO0];
}

- (void) readAio0
{
    NSLog(@"READ_AIO0: %d", [Konashi analogRead:AIO0]);
}
```

analogWrite

Description

Output an unspecified voltage with a specified AIO pin.

The highest voltage which can be set is KONASHI *ANALOG*REFERENCE.

For analogue features, please see Core functions / Analog.

Syntax

```
[Konashi analogWrite:(int)pin milliVolt:(int)milliVolt];
```

Parameters

pin	int	Name of an AIO pin. The possible names are `AIO0` , `AIO1` , and `AIO2` . For details please see Constants / Pin name.
milliVolt	int	Set the specified voltage in mV. It is possible to set it from 0 to `KONASHI_ANALOG_REFERENCE`

Returns

If successful: `KONASHI_SUCCESS` , If unsuccessful: `KONASHI_FAILURE`

Example

Make AIO output 1.0V

```
[Konashi analogWrite:AIO0 milliVolt:1000];
```

PWM

pwmMode

Description

Set whether to use a specified PIO pin as PWM

Any PIO pin can be set to PWM mode.

When assigning `KONASHI_PWM_ENABLE` mode, please specify the cycle and ON period with pwmPeriod and pwmDuty beforehand.

For details on PWM, please see Core functions / PWM.

Syntax

```
[Konashi pwmMode:(int)pin mode:(int)mode];
```

Parameters

pin	int	The name of the pin set to PWM mode. It is possible to set from `PIO0` to `PIO7`
mode	int	The set PWM mode. It is possible to specify `KONASHI_PWM_DISABLE` , `KONASHI_PWM_ENABLE` , or `KONASHI_PWM_ENABLE_LED_MODE` . For details please see Constants / PWM.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set PWM with the LED cycle set to 10ms, and duty cycle to 5ms

```
[Konashi pwmMode:LED2 mode:KONASHI_PWM_ENABLE];
[Konashi pwmPeriod:LED2 period:10000];
[Konashi pwmDuty:LED2 duty:5000];
```

pwPeriod

Description

Set the PWM cycle of a specified pin.

Please specify the cycle units as microseconds (us).

For details on PWM please see Core functions / PWM.

Syntax

```
[Konashi pwmPeriod:(int)pin period:(unsigned int)period];
```

Parameters

pin	int	Name of a PIO pin. `PIO0` to `PIO7` can be set.
period	unsigned int	Please specify the units as microseconds (us) in 32 bits. The largest possible is 2^{32}us = 71.5 minutes.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set LED2's period to 10ms

```
[Konashi pwmPeriod:LED2 period:10000];
```

pwmDuty

Description

Set the duty cycle of a specified pin (when on).

Please specify the units in microseconds (us).

For details on PWM please see Core functions / PWM.

Syntax

```
[Konashi pwmDuty:(int)pin duty:(unsigned int)duty];
```

Parameters

pin	int	Name of a PIO pin. `PIO0` to `PIO7` can be set.
duty	unsigned int	Duty cycle. Please specify the units as microseconds (us) in 32bits. The largest possible is 2^{32}us, 71.5 minutes.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set the duty cycle for LED2 to 5ms

```
[Konashi pwmDuty:LED2 duty:5000];
```

pwmLedDrive

Description

Set the brightness of the LED of a specified pin from 0 to 100%

When using the function pwmLedDrive, please specify KONASHI*PWM*ENABLE*LED*MODE with pwmMode.

For details on PWM please see Core functions / PWM.

Syntax

```
[Konashi pwmLedDrive:(int)pin dutyRatio:(int)ratio];
```

Parameters

pin	int	Name of a PIO pin. It is possible to set from `PIO0` to `PIO7`.
ratio	int	Brightness of the LED. Please set from 0 to 100.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Set the brightness of LED2 to 30%

```
[Konashi pwmMode:LED2 mode:KONASHI_PWM_ENABLE_LED_MODE];
[Konashi pwmLedDrive:LED2 dutyRatio:30];
```

UART

uartMode

Description

Enable or disable UART.

Before enabling, please set the Baud Rate with uartBaudrate.

For details on UART, please see Core functions / Communication - UART.

Syntax

```
[Konashi uartMode:(int)mode];
```

Parameters

mode	int	The set UART mode. `KONASHI_UART_DISABLE` or `KONASHI_UART_ENABLE` can be set.ß

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Enable UART

```
[Konashi uartMode:KONASHI_UART_ENABLE];
```

uartWrite

Description

Send one byte of data with UART.

For details on UART, please see Core functions / Communication - UART.

Syntax

```
[Konashi uartWrite:(unsigned char)data];
```

Parameters

data	unsigned char	The data that will be sent. 1 byte.

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Send the character ‘A’ with UART

```
[Konashi uartWrite:'A'];
```

I2C

i2cMode

Description

Enable or Disable I2C.

Communication speed of I2C can be set to 100kbps or 400kbps, which is specified with `mode` argument.

For details on I2C please see Core functions / Communication - I2C.

Syntax

```
[Konashi i2cMode:(int)mode];
```

Parameters

mode	int	Set mode for I2C. `KONASHI_I2C_DISABLE` , `KONASHI_I2C_ENABLE` , `KONASHI_I2C_ENABLE_100K` , or `KONASHI_I2C_ENABLE_400K` can be set. `KONASHI_I2C_ENABLE` and `KONASHI_I2C_ENABLE_100K` are equivalent

Returns

If successful: `KONASHI_SUCCESS` , If unsuccessful: `KONASHI_FAILURE`

Example

Enable 100kbps(Default) communication speed on I2C

```
[Konashi i2cMode:KONASHI_I2C_ENABLE];
```

i2cStartCondition

Description

Raise I2C's start condition.

Please enable I2C with i2cMode beforehand.

For details on I2C, please see Core functions / Communication - I2C.

Syntax

```
[Konashi i2cStartCondition];
```

Parameters

None

Returns

If successful: `KONASHI_SUCCESS` , If unsuccessful: `KONASHI_FAILURE`

i2cRestartCondition

Description

Raise I2C's restart condition.

Please enable I2C with i2cMode beforehand.

For details on I2C, please see Core functions / Communication - I2C.

Syntax

```
[Konashi i2cRestartCondition];
```

Parameters

None

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

i2cStopCondition

Description

Raise I^{2}C's stop condition.

Please enable I^{2}C with i2cMode beforehand.

For details on I^{2}C, please see Core functions / Communication - I^{2}C.

Syntax

```
[Konashi i2cStopCondition];
```

Parameters

None

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

i2cWrite

Description

Write data to a specified address with I^{2}C.

Please enable I^{2}C with i2cMode beforehand.

For details on I^{2}C, please see Core functions / Communication - I^{2}C.

Syntax

```
[Konashi i2cWrite:(int)length data:(unsigned char*)data address:(unsigned char)address];
```

Parameters

length	int	Length of the data to be written (bytes). The longest possible, KONASHI_I2C_DATA_MAX_LENGTH is 19bytes.
data	unsigned char*	The date to be written
address	unsigned char	The address to be written to

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Write the data 'A' to the address 0x45

```
unsigned char data[] = {'A'};
[Konashi i2cWrite:1 data:data address:0x45];
```

i2cReadRequest

Description

Make a request to read data from the address specified with I^2C.

With this function, data cannot be obtain by only making a request. In order to gain the value, after checking `KONASHI_EVENT_I2C_READ_COMPLETE` with addObserver, obtain the value with i2cRead.

Syntax

```
[Konashi i2cReadRequest:(int)length address:(unsigned char)address];
```

Parameters

length	int	Length of the data to be read. The max length, `KONASHI_I2C_DATA_MAX_LENGTH` (19)
address	unsigned char	Address to read the data from

Returns

If successful: KONASHI*SUCCESS, If unsuccessful: KONASHI*FAILURE

i2cRead

Description

Konashi will obtain the data read by I^2C. The value obtained with this function is of the time when previous i2cReadRequest was issued.

Syntax

```
[Konashi i2cRead:(int)length data:(unsigned char*)data];
```

Parameters

length	int	The length of the data to be read. The longest possible, `KONASHI_I2C_DATA_MAX_LENGTH` (19)
data	unsigned char*	Memory pointer for the data read will be stored

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Hardware Control

reset

Description

Restart konashi.

If you restart konashi, the BLE connection will be automatically closed.

Syntax

```
[Konashi reset];
```

Parameters

None

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Restart konashi

```
[Konashi reset];
```

batteryLevelReadRequest

Description

Send a request to konashi to obtain the remaining battery level.

This function sends a request to konashi, so in order to acquire the value, after checking KONASHI*EVENT*UPDATE*BATTERY*LEVEL (Battery level acquisition complete event) in addObserver, you can obtain the value with batteryLevelRead.

Syntax

```
[Konashi batteryLevelReadRequest];
```

Parameters

None

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Obtain konashi's remaining battery level.

```
- (void)viewDidLoad
```

```
{
    [super viewDidLoad];

    [Konashi initialize];

    [Konashi addObserver:self selector:@selector(konashiReady) name:KONASHI_EVENT_READY];
    [Konashi addObserver:self selector:@selector(battery) KONASHI_EVENT_UPDATE_BATTERY_LEVEL];
}

// Tap function for button to search for konashi
- (IBAction)findKonashi:(id)sender {
    [Konashi find];
}

// Tap function for button to check battery level
- (IBAction)batteryLevelReadRequest:(id)sender {
    [Konashi batteryLevelReadRequest];
}

- (void) battery
{
    NSLog(@"READ_BATTERY: %d", [Konashi batteryLevelRead]);
}
```

batteryLevelRead

Description

konashi's battery level will be obtained. The value which can be obtained with this function is the value obtained before with batteryLevelReadRequest.

If you wish to obtain konashi's current battery level, first, send a request to konashi with batteryLevelReadRequest, and after checking KONASHI*EVENT*UPDATE*BATTERY*LEVEL with addObserver, you can obtain the value with this function.

Syntax

```
[Konashi batteryLevelRead];
```

Parameters

None

Returns

The remaining battery power level is returned as a percentage from 0 to 100.

Example

Acquire remaining battery power.

```
- (void)viewDidLoad
{
    [super viewDidLoad];

    [Konashi initialize];

    [Konashi addObserver:self selector:@selector(konashiReady) name:KONASHI_EVENT_READY];
    [Konashi addObserver:self selector:@selector(battery) KONASHI_EVENT_UPDATE_BATTERY_LEVEL];
}

// Search for konashi button tap action
```

```
- (IBAction)findKonashi:(id)sender {
    [Konashi find];
}

// Acquire remaining battery power button tap action
- (IBAction)batteryLevelReadRequest:(id)sender {
    [Konashi batteryLevelReadRequest];
}

- (void) battery
{
    NSLog(@"READ_BATTERY: %d", [Konashi batteryLevelRead]);
}
```

signalStrengthReadRequest

Description

Make a request to obtain konashi's signal strength.

With this function, data cannot be obtained only by making a request. In order to obtain the value, after checking KONASHI*EVENT*UPDATE*SIGNAL*STRENGTH (Signal strength accquisition complete event) with addObserver, the value can be obtained with signalStrengthRead.

Syntax

```
[Konashi signalStrengthReadRequest];
```

Parameters

None

Returns

If successful: `KONASHI_SUCCESS`, If unsuccessful: `KONASHI_FAILURE`

Example

Obtain konashi's signal strength

```
- (void)viewDidLoad
{
    [super viewDidLoad];

    [Konashi initialize];

    [Konashi addObserver:self selector:@selector(konashiReady) name:KONASHI_EVENT_READY];
    [Konashi addObserver:self selector:@selector(strength) KONASHI_EVENT_UPDATE_SIGNAL_STRENGTH];
}

// Search for konashi button tap action
- (IBAction)findKonashi:(id)sender {
    [Konashi find];
}

// Aquire signal strenght button tap action
- (IBAction)signalStrengthReadRequest:(id)sender {
    [Konashi signalStrengthReadRequest];
}
```

```
- (void) strength
{
    NSLog(@"READ_STRENGTH: %d", [Konashi signalStrengthRead]);
}
```

signalStrengthRead

Description

Obtain konashi's signal strength. The value which can be obtained with this function is the strength (db) of the time when the previous signalStrengthReadRequest was issued.

If you wish to obtain konashi's current signal strength, first, send a request to konashi with signalStrengthReadRequest, and after checking KONASHI*EVENT*UPDATE*SIGNAL*STRENGTH in addObserver, the value can be obtained with this function.

Syntax

```
[Konashi signalStrengthRead];
```

Parameters

None

Returns

Return signal strength in db

Example

Acquire konashi's signal strength

```
- (void)viewDidLoad
{
    [super viewDidLoad];

    [Konashi initialize];

    [Konashi addObserver:self selector:@selector(konashiReady) name:KONASHI_EVENT_READY];
    [Konashi addObserver:self selector:@selector(strength) KONASHI_EVENT_UPDATE_SIGNAL_STRENGTH];
}

// Search for konashi button tap action
- (IBAction)findKonashi:(id)sender {
    [Konashi find];
}

// Acquire signal strength button tap action
- (IBAction)signalStrengthReadRequest:(id)sender {
    [Konashi signalStrengthReadRequest];
}

- (void) strength
{
    NSLog(@"READ_STRENGTH: %d", [Konashi signalStrengthRead]);
}
```

Contact us: contact@ux-xu.com