

Arduino/ESP 32 – ez_switch_lib Crib Sheet (v2.00)

Library Class Initiation

Class Name: **Switches**

Class Initiation Syntax: **Switches** my_switches(num_switches);

where 'my_switches' is any name you wish to use for your project and 'num_switches' is the number of switches you will be defining. For example:

```
1.  Switches my_switches(1); // define 1 switch
2.  #define  max_switches    8
    Switches console(max_switches);
3.  #define  num_buttons     4
    #define  num_toggles     3
    Switches ms(num_buttons + num_toggles);
4.  etc
```

declare the class instance early in your code, for example after any switch data but prior to the setup() function

Available User Accessible Library Macros Definitions

#define	Value	Associated Functions	Comments
button_switch	1	-	differentiates switch type
toggle_switch	2	-	differentiates switch type
circuit C1	INPUT	-	switch circuit requires an external pull down 10k ohm resistor
circuit C2	INPUT PULLUP	-	switch circuit requires no other components beyond the switch
circuit C3	INPUT PULLDOWN	-	switch circuit requires no other components beyond the switch
switched	true	read_switch, read_button_switch, read_toggle_switch	signifies switch has been pressed/switch cycle complete; note that not switched is !switched
on	true	-	used for toggle switch status; note that off is !on
not_used	true	-	helps self document code
add_failure	-1	add_switch	add_switch could not insert a given switch, i.e. no space left
bad_params	-2	add_switch	invalid add_switch parameters
link_success	0	link_switch_to_output	output successfully linked to given switch
link_failure	-1	link_switch_to_output	output pin could not be linked to given switch
none_switched	255	read_button_switch, read_toggle_switch	last_switched_id is initialised to this value and updated every time a switch is actuated

Available User Accessible Library Variables

Switch Control Struct(ure)	Purpose
struct switch_control {	the core of the library – configs and current status of all declared switches
byte switch_type;	type of switch connected
byte switch_pin;	digital input pin assigned to the switch
byte switch_circuit_type;	the type of circuit wired to the switch
bool switch_on_value;	used for BUTTON SWITCHES only - defines what "on" means
bool switch_pending;	records if switch in transition or not
long unsigned int switch_db_start;	records debounce start time when associated switch starts transition
bool switch_status;	used for TOGGLE SWITCHES only - current state of toggle switch
byte switch_out_pin;	the digital output pin mapped to this switch, if any
bool switch_out_pin_status;	the status of the mapped output pin
} *switches;	memory will be created when class is initiated

Other Variables	Purpose
byte last_switched_id;	the switch_id of the <u>last</u> switch to be actuated. Use this in any interrupt service routine to know which switch has been actuated

Available User Accessible Library Functions

Function	Parameters	Value(s) Returned By Functions	Comments
int add_switch	(byte sw_type, byte sw_pin, byte circ_type);	add_failure (-1), bad_params (-2)	will add the specified switch to the switch control struct(ure), after which it will be available for reading
int link_switch_to_output	(byte switch_id, byte output_pin, bool HorL);	link_success (0), link_failure (-1)	will link the specified digital output pin to the specified switch_id, setting the output to the specified initial value (HorL)
int num_free_switch_slots	none	>= 0	number of free switch slots remaining unused in the switch control structure
bool read_switch	(byte sw_id);	switched (true), !switched (!true)	will read the specified switch, irrespective of its type; will also switch(invert) ant linked output pin
bool read_button_switch	(byte sw_id);	switched (true), !switched (!true)	will read the specified button switch. NO linked output switching(inverting) will occur
bool read_toggle_switch	(byte sw_id);	switched (true), !switched (!true)	will read the specified toggle switch. NO linked output switching(inverting) will occur
void print_switch	(byte sw_id);	-	prints the switch control data for the specified switch_id
void print_switches	none	-	prints the switch control data for all declared switches
void set_debounce	(int period);	-	sets global debounce period to given millisecs

Switch Mapping & Linking Table/Documentation

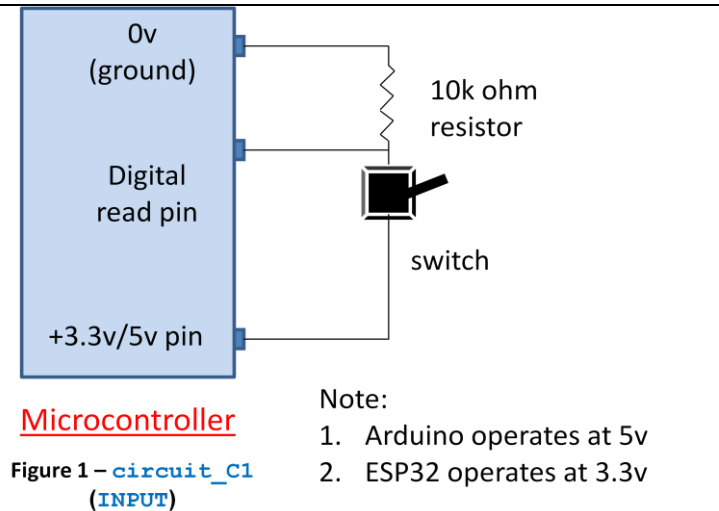
Project Name:								Date:	
Switch Configs						Linked Outputs		Notes	
Pin	Switch Type		Circuit Type			Pin	Initial Value		
	Button	Toggle	C1	C2	C3		LOW		HIGH

(add more rows as needed)

Standard & Simplest Switch & LED Wiring Schematics

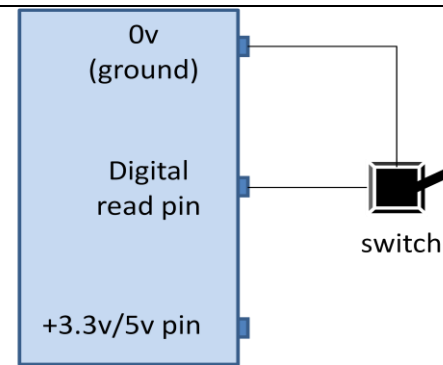
`circuit_C1` – incorporating button or toggle switch with 10k ohm pull down resistor.

Used with `pinMode` setting of `INPUT`, e.g.
`pinMode(pin_num, INPUT)`.



`circuit_C2` – incorporating button or toggle only, no external resistor.

Used with `pinMode` setting of `INPUT_PULLUP`, e.g.
`pinMode(pin_num, INPUT_PULLUP)`.



Microcontroller

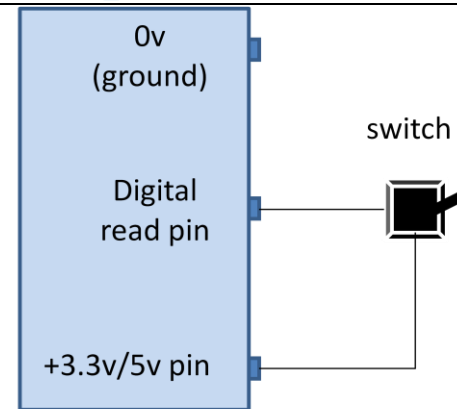
Figure 2 – `circuit_C2`,
(`INPUT_PULLUP`)

Note:

1. Arduino operates at 5v
2. ESP32 operates at 3.3v

`circuit_C3` – incorporating button or toggle only, no external resistor.

Used with `pinMode` setting of `INPUT_PULLDOWN`, e.g.
`pinMode(pin_num, INPUT_PULLDOWN)`



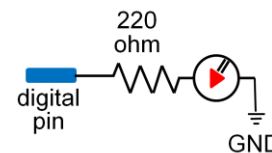
Microcontroller

Figure 3 – `circuit_C3`,
(`INPUT_PULLDOWN`)
ESP 32 boards only

Note:

1. Arduino operates at 5v
2. ESP32 operates at 3.3v

Standard wiring scheme for LED.



Examples

```
1.  Switches my_switches(1); // define 1 switch
    ...
    byte switch_id = my_switches.add_switch(toggle_switch, 8, circuit_C1);
    if (switch_id < 0){
        // error creating a switch!
        ...
    } else {
        if (my_switches.link_switch_to_output(switch_id, LED_BUILTIN, LOW)) == link_failure {
            // error linking to output!
            ...
        }
    }
    // switch successfully created and linked


---


2.  #define max_switches 8
    byte switch_ids[max_switches];
    Switches console(max_switches);
    ...
    for (byte sw = 0; sw < max_switches; sw++){
        // ESP 32 pins start at GPIO 25 and run to GPIO 32
        byte switch_id = console.add_switch(button_switch, 25 + sw, circuit_C3);
        if (switch_id >= 0){
            // switch added
            switch_ids[sw] = switch_id; // record switch's id for later use
        } else {
            // error creating a switch!
            ...
        }
    }


---


3.  do{
        if (my_switches.read_switch(switch_id) == switched){
            // switch has been actuated
            ...
        } while (true);


---


4.  do{
        if (my_switches.read_button_switch(switch_id) == switched){
            // switch has been actuated
            ...
        } while (true);


---


5.  if (console.switches[switch_id].switch_pending == true){
        // switch is in transition, waiting for completion of switching cycle
        ...
    }


---


6.  if (console.switches[switch_id].switch_type == toggle_switch &&
        console.switches[switch_id].switch_status == on){
        // this is a toggle switch which is currently on
        ...
    }
```