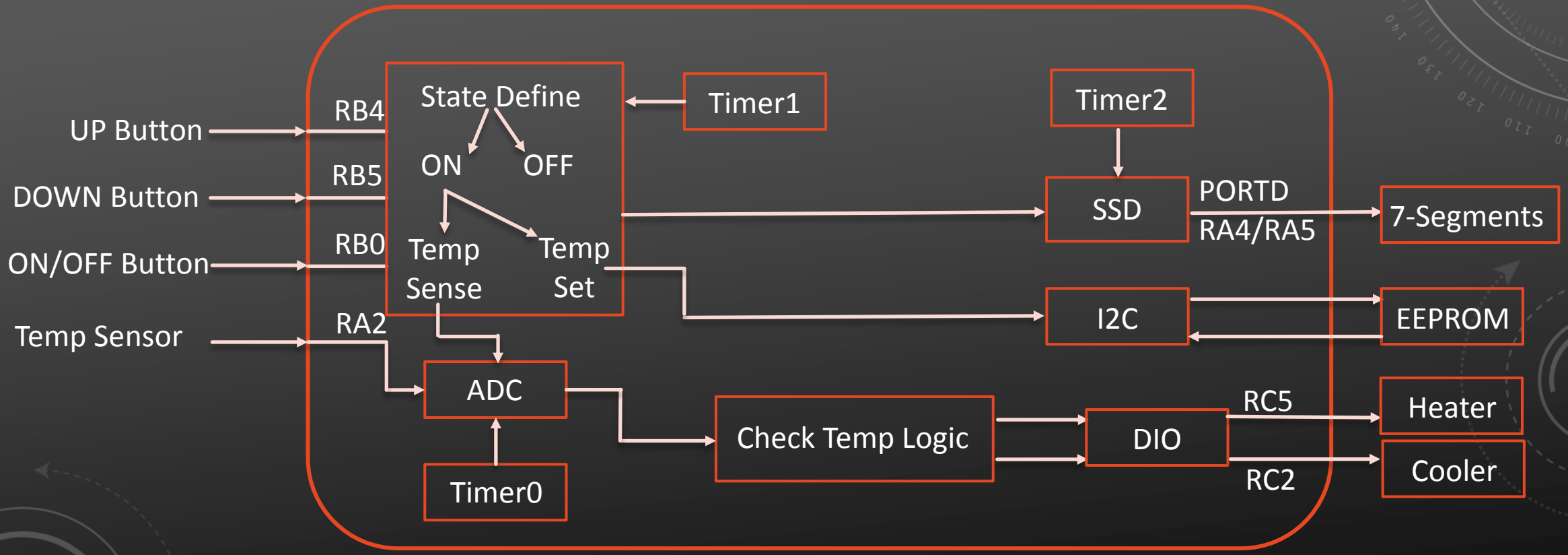
ELECTRIC WATER HEATER CONTROL

A CONCISE PRESENTATION ABOUT THE DESIGN AND TIMING PROCEDURE OF A PIC CONTROLLED WATER HEATER SIMULATED ON PIC GENIOS BOARD.

STATIC ARCHITECTURE



DETAILED DESIGN

EEPROM

- eeprom_external_vid_write
- eeprom_external_vid_read

Timer

- multiply
- set_timer1
- set_timer2
- set_timer0
- stop_timer
- restart_timer
- start_timer
- timer_ISR

Heater

- check_temp
- save_temp
- temp_setting_up
- temp_setting_down
- set_temp_off
- check_active_button

I2C

- i2c_vid_master_init
- i2c_vid_start
- i2c_vid_stop
- i2c_vid_restart
- i2c_vid_wait
- i2c_vid_ack
- i2c_vid_nack
- i2c_u8_master_write_slave_address_with_write_req
- i2c_u8_master_write_slave_address_with_read_req
- i2c_u8_master_write_byte
- i2c_u8_master_read_byte
- i2c_acktst

SSD

- Segment_display
- Segment_display_blink
- set_blink
- alternate

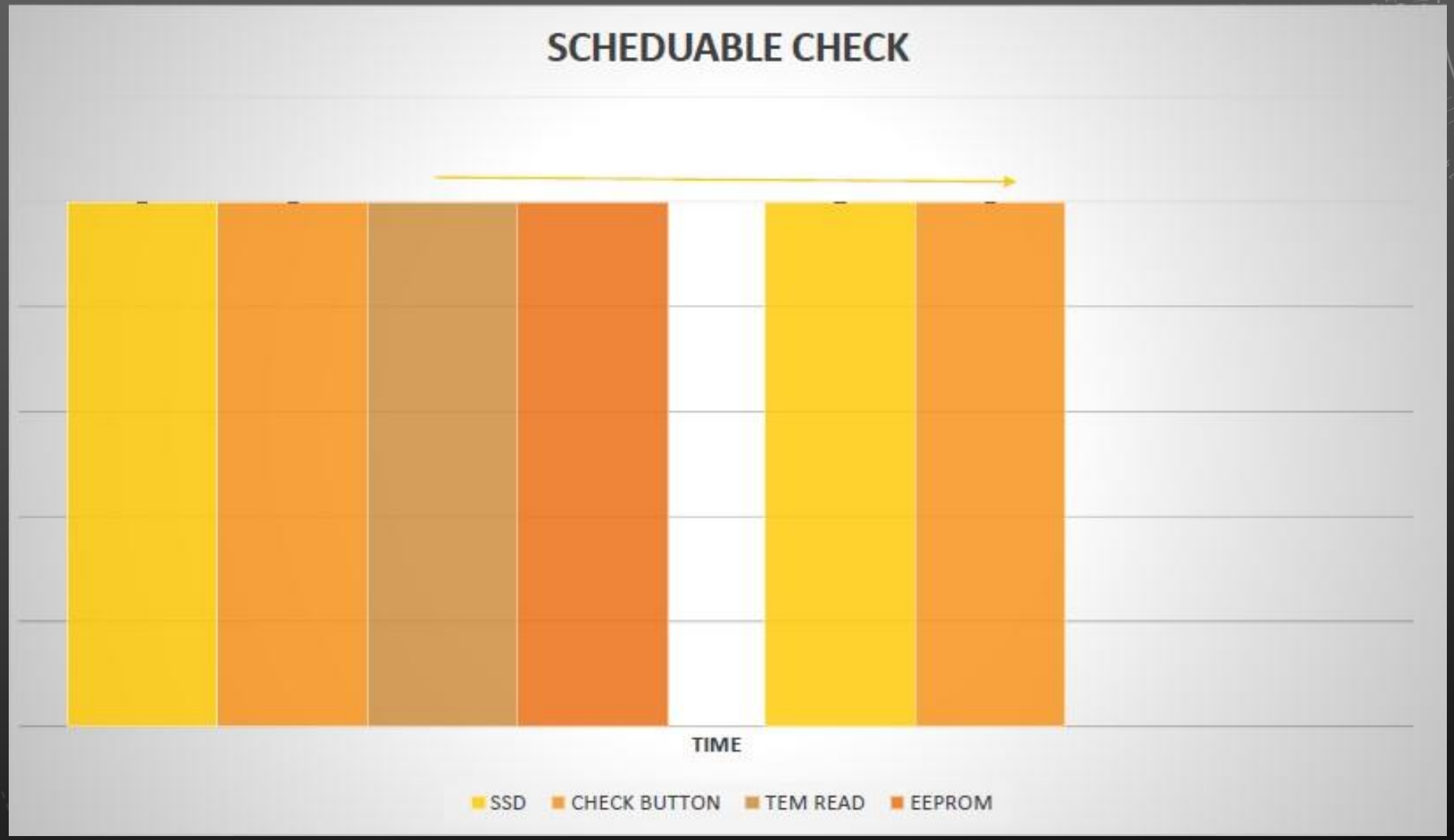
ADC

- ADC_Init
- ADC_Read
- temperature_read

TIMING ANALYSIS

Task	Actions	BCET (ms)	WCET(ms)	Period of Action (ms)	Period of task (ms)
Segment Display Blink	Blink (OFF) Delay Display (ON) Delay	As Action	As Action	20 1000 20 1000	2040
Check Active Button	Delay Start Timer (5s) Set Temp (↑/↓)	When no button pressed ≈ 0	When button pressed 160ms	100 60 30µs ≈ 0	160
EEPROM Save	Read Write	≈ 0	≈ 0		
Temperature Read/Save	Read Temperature Save Temperature	As Action	As Action	3 30µs ≈ 0	≈ 3
TICK	3 //the segment display blink will not work in the same cycle as the other functions				
CLOCK CYCLE	54				

SCHEDULABLE CHECK



WRITTEN DESCRIPTION

- Timer 1 is starts reset at every UP/DOWN push to be in temperature setting mode for 5 seconds after last button click
- Timer 2 is continuous and raises flag every second… seven segment syncs blink with this timer at temperature setting mode. Heater LED syncs with timer when heating element is ON
- Timer 0 is a continuous timer that controls the time interval between successive sensor readings
- EEPROM stores the desired temperature value at the end of the setting temperature mode.