Electric Water Heater Design

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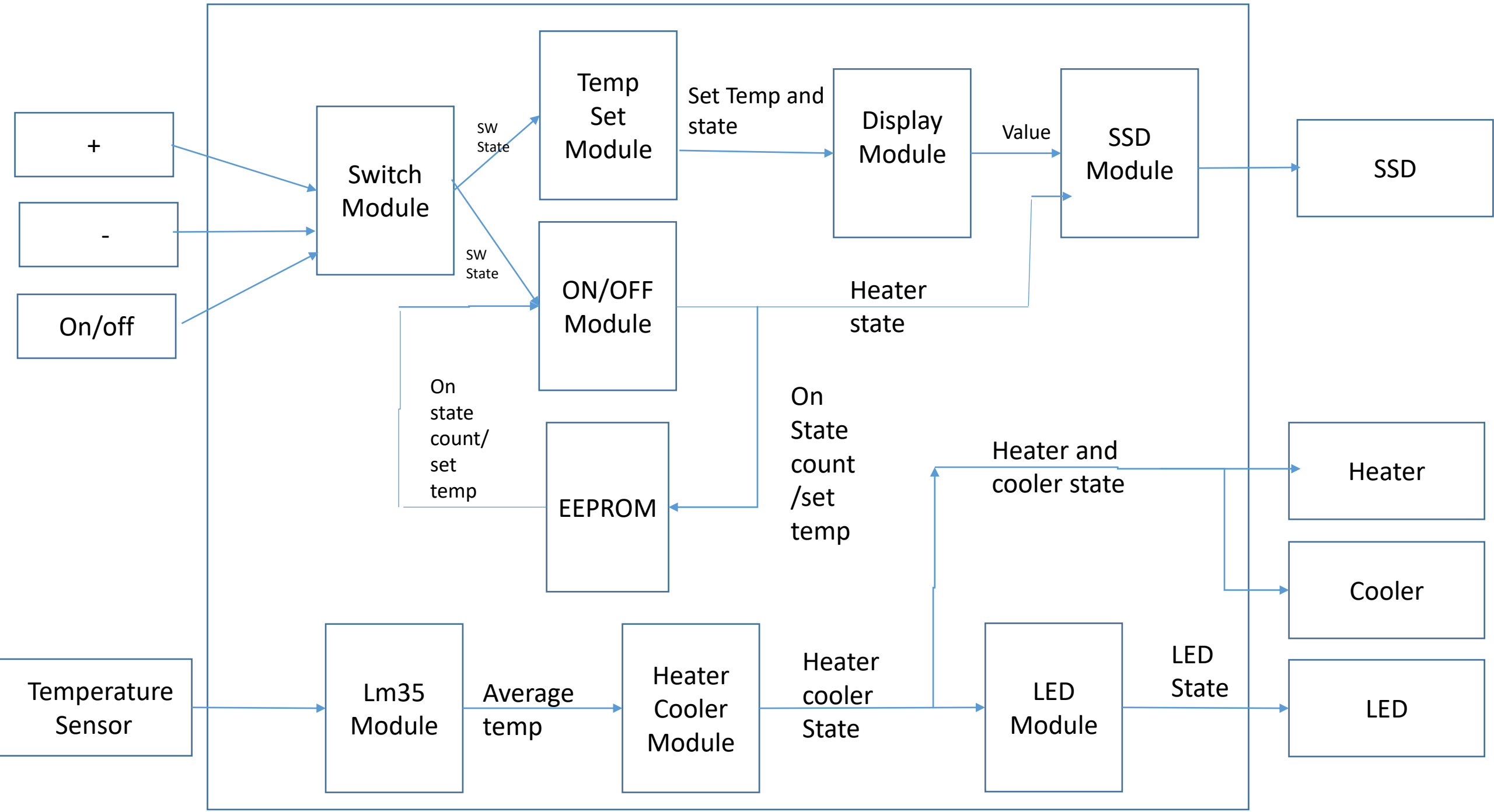
System Block diagram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-
On/off
Switch Module
SW State
SW State
Temp Set Module
ON/OFF Module
Set Temp and state
Display Module
Value
SSD Module
SSD
Heater state
On state count/ set temp
EEPROM
On State count /set temp
Heater and cooler state
Heater
Cooler
LED
Temperature Sensor
Lm35 Module
Average temp
Heater Cooler Module
Heater cooler State
LED Module
LED State

Static Design

Modules detailed design

SW module
- SW_Init
- SW_Get_state
- SW_update

Temp Set module
- Tempset_init
- Tempset_setstate
- Tempset_settemp
- Tempset_getstate
- Tempset_gettemp
- Tempset_update

On/Off module
- Heaterstate_init
- Heaterstate_setstate
- Heaterstate_getstate
- Heaterstate_update

LM35 module
- Lm35_init
- Lm35_set_currentTemp
- Lm35_get_currentTemp
- Lm35_update

EEPROM module
- EEPROM_read
- EEPROM_Write

Heater cooler module
- Heater_init
- Heater_set_state
- Heater_get_state
- Heater_update

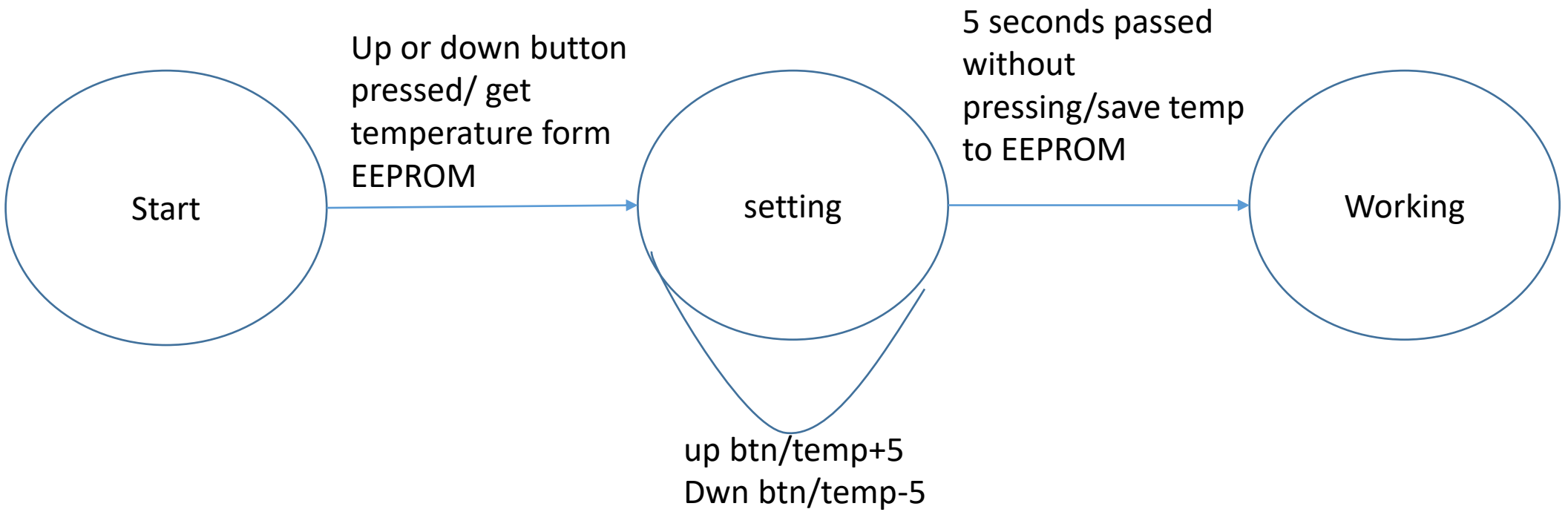
- cooler_init
- cooler_set_state
- cooler_get_state
- cooler_update

Display module
- Display_init
- Display_update

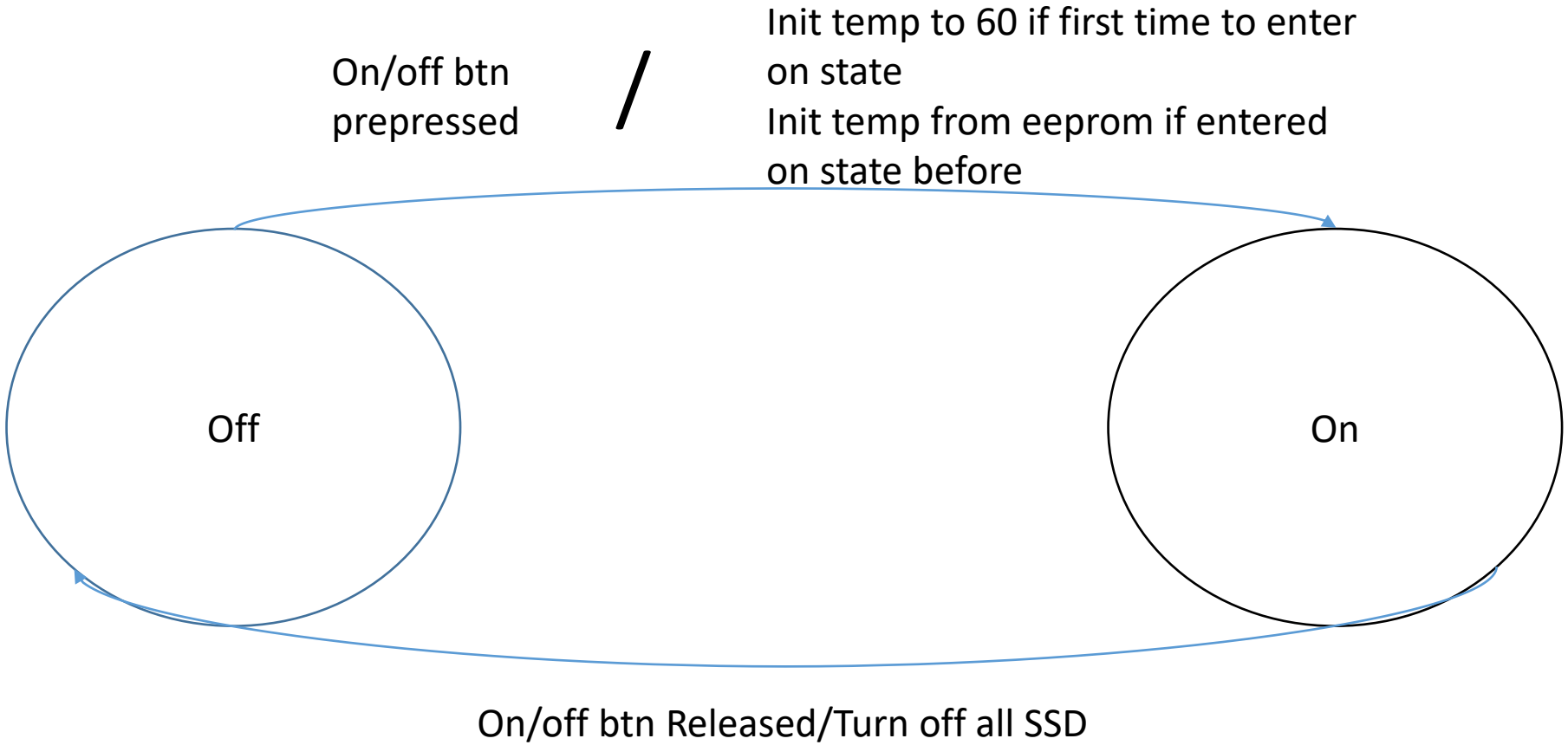
SSD module
- SSD_init
- SSD_setvalue
- SSD_getvalue
- SSD_setstate
- SSD_getstate
- SSD_update

LED module
- Led_init
- Led_setstate
- Led_getstate
- Led_update

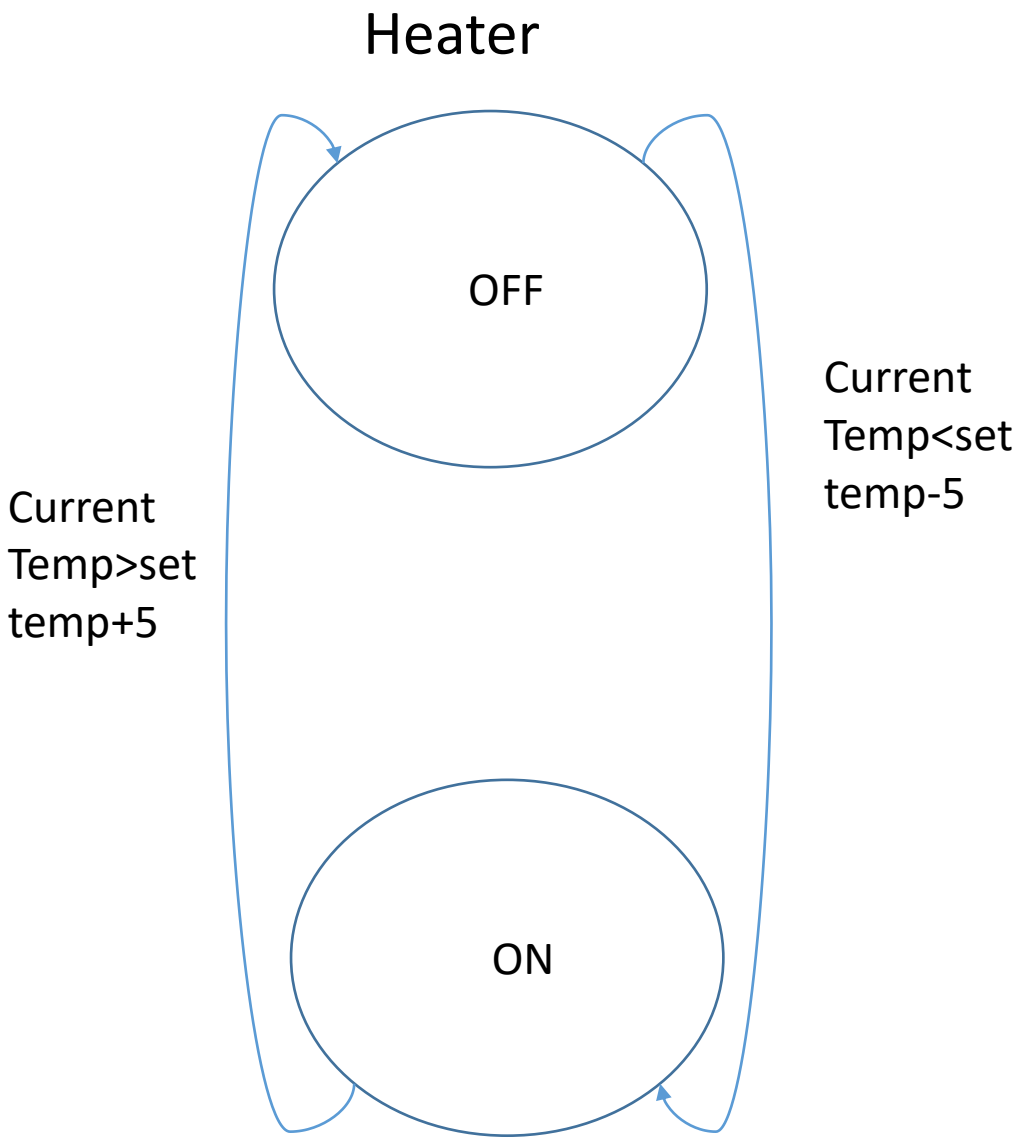
Temp set module state machine

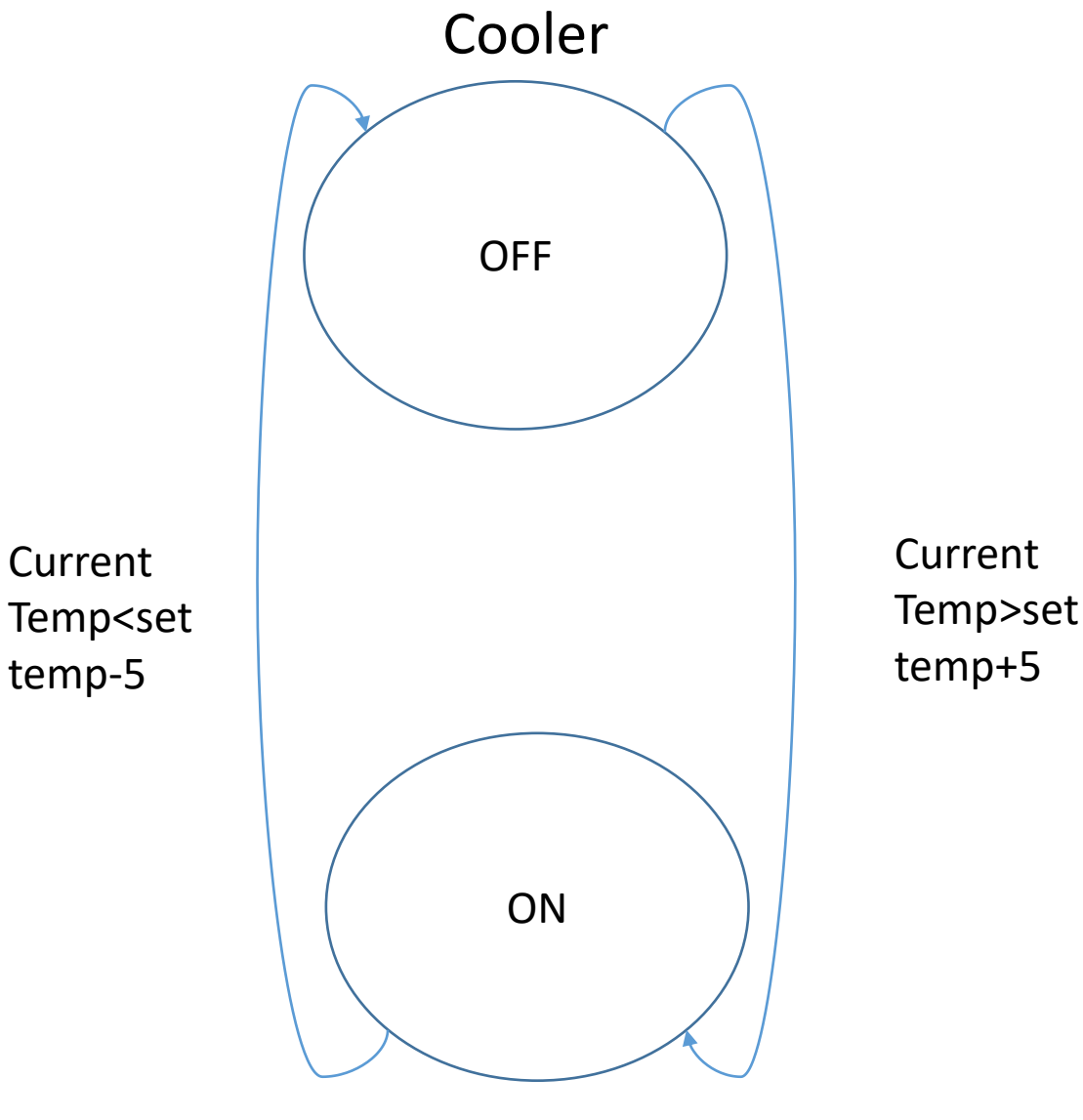


On/Off module state machine

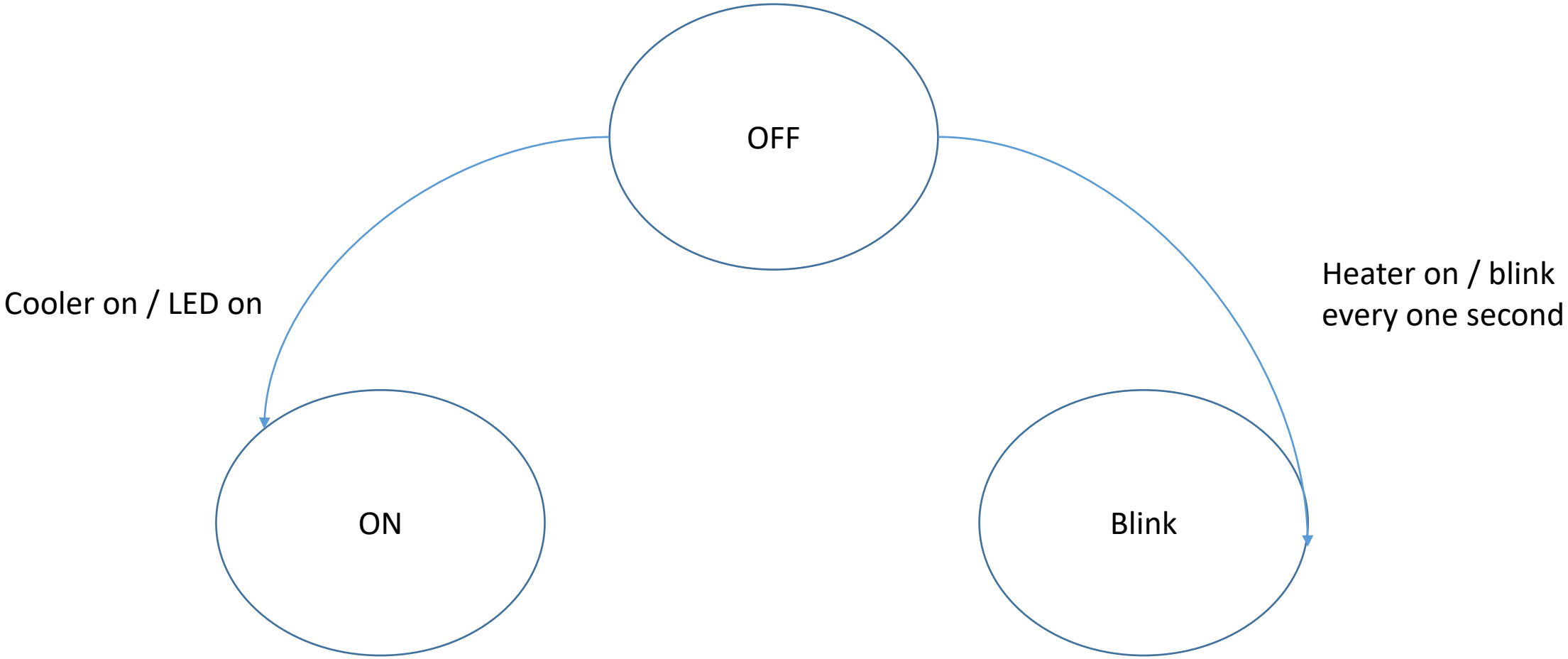


Heater Cooler module state machine





LED Module State machine



Dynamic Design

Timing analysis

Task	Actions	BCET ms	WCET ms	Period of action(ms)	Period(ms)
SSD	Update temp	0	0	20	20
SW	Update samples Update states	0 0	0 0	20 20	20
On/0ff	Update states	0	0	20	20
Temp set	Check SW state	0	0	20	20
Temp sense	Update water temp	0	0	100	100
Heater cooler	Update state	0	0	100	100
Display	Check heater state Blink Update Temp	0 0 0	0 0 0	20 1000 20	20

Tick(ms)=20 Major cycle(ms)=100

Schedulability Check

SSD @20

SW @20

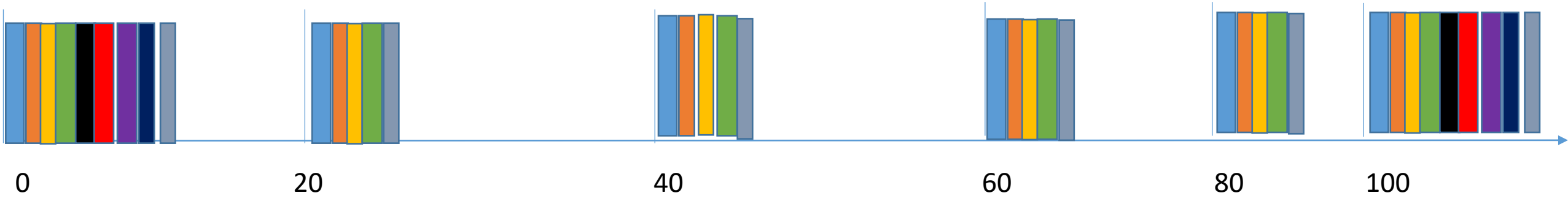
On/off @20

Tempset @20

Tempsense @100

Heater @100

cooler@100

Led @100

Display @20