

## OVERVIEW

The Kimat External Watchdog Timer (EXT WDT) module provides a reliable external signal to allow most microcontroller (MCU) boards including Arduino boards to reset whenever a software or hardware malfunction halts the microcontroller. This module simplifies external WDT implementation by providing the necessary hardware in a small package with standard 2.54mm headers.

While some microcontrollers already feature an internal watchdog timer, this module is 100% independent of the operation of the target microcontroller being monitored ensuring that the safety circuit operates regardless of internal microcontroller issues. Having an external WDT solution also eliminates all the issues related to the implementation of an internal watchdog timer.

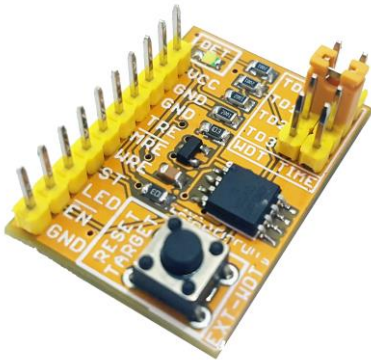


Figure 1 Kimat External WDT

The module follows typical WDT implementation plus other important features. The module accepts a simple digital strobe signal that is made to toggle between HIGH and LOW. This signal comes from any available GPIO from the target microcontroller. The signal is then used by the module to determine if the target is

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working normally. Whenever the strobe signal does not change state within the selected WDT timeout period, the target's reset pin is pulled low causing a hard reset on the target and promoting immediate recovery.

The module has a built-in LED (DET) that blinks every time a signal is received from the target microcontroller.

The module features a selectable WDT timeout via an onboard jumper. It also has a physical button that may be used to manually trigger a reset on the target. A digital control pin is also provided to allow the target microcontroller to temporarily disable the WDT function of the module should there be a need.

## FEATURES

- No external components required
- Minimum of one output from the target
- 4 user – selectable watchdog timeout periods
- Enable/Disable via EN pin
- 3.3V/5V operating voltage
- Current consumption of less than 100mA
- On board target reset button
- Strobe signal detection LED indicator
- Arduino compatible, Standard 2.54mm headers

## PIN FUNCTIONS

The module has a 10 pin 2.54mm pitched main header with the following functions.

Pin Label	Function/Operation/Remarks
VCC	Accepts input power source with +3.3Vdc to +5Vdc that can supply at least 100mA.
GND	Ground.
TRE	Connects to the target's reset pin. This open-drain output of the module pulls the targets reset pin to ground causing a hard reset on the target.

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MRE	Module reset. Pulling this low will reset the module.
WRE	Reserved. Do not use.
ST	Strobe input pin. Connect the digital strobe signal from the target MCU.
LED	Connected internally to the DET LED signal. This is normally not used by the target.
EN	Enable/Disable pin. This internally pulled-up input enables or disables the watchdog timer functions of the module. When signal is HIGH, the WDT functions normally. When signal is pulled low, the WDT will not function. The DET LED blinks fast to indicate that the watchdog timer is disabled. Connect this pin to a free output pin on the target if disabling/enabling is required. Care should be taken when disabling the module as this removes the protection function of the module
TD0 - TD3	WDT Time. User selectable watchdog timeout. Watchdog timeout is selected using a micro jumper. The default WDT time are as follows: TD0 = 100ms TD1 = 1000ms TD2 = 10000ms TD3 = 60000ms

Microjumper Setting	WDT timeout period
TD0	0.1 second
TD1	1 second
TD2	10 seconds
TD3	60 seconds

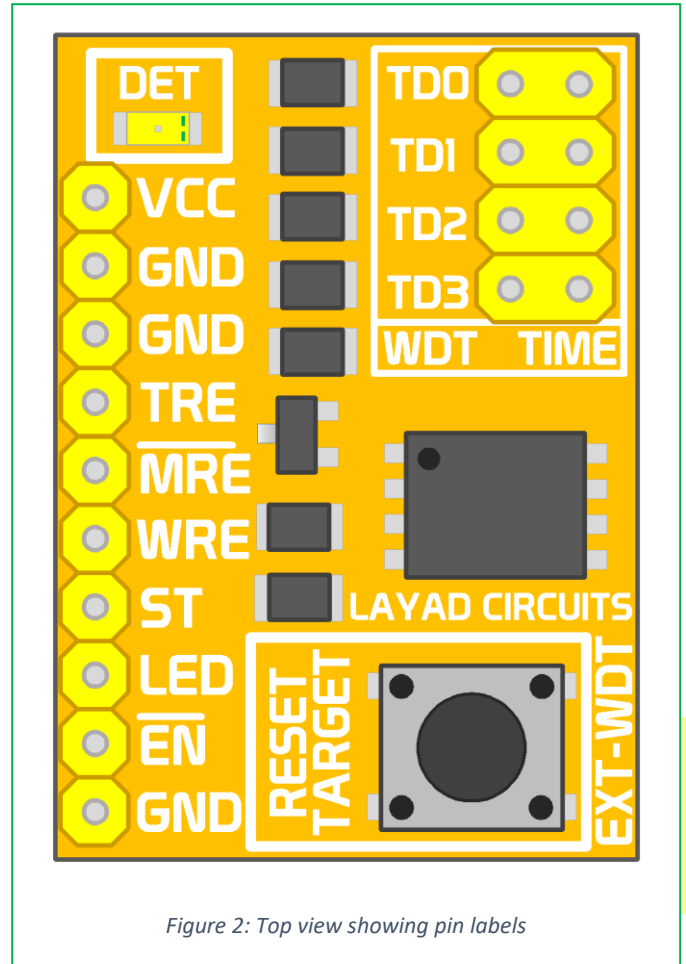


Figure 2: Top view showing pin labels

### WDT TIME SELECTION

The user can pre-select the watchdog timeout period using the microjumper on the WDT TIME header. This timeout is the time within which the module must receive a falling or rising edge on the strobe pin to keep the TRE pin high. If the strobe signal does not change within this period, the TRE pin is pulled LOW, and hence generating a reset on the target.

### APPLICATION NOTES

The Kimat External Watchdog Timer (WDT) ensures continuous run time of the target microcontroller. If target microcontroller fails to properly execute code due to any reason, the strobe signal may not change

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state triggering the EXT WDT module to reset the target automatically. Below is a typical application of this module.

**Wiring**

The VCC of the Kimat External WDT is coming from the Saleng Uno/Arduino Uno. The Saleng Uno is powered using the DC jack with a supply range of 6 to 9v. The pin connections of the Saleng UNO with Kimat External WDT is as follow:

Saleng Uno/Arduino Uno	Kimat External WDT
5V	VCC
GND	GND
RST	TRE
12	ST

The selected WDT TIME using the jumper is TD3 which has the default timeout of 1 minute.

**Arduino Code Notes**

- In the setup() function of the target, timing for the strobe may not yet be ready. Hence, the user may want to temporarily disable the WDT function until the target to completes initialization. This will require that an output from the target be connected to the EN pin of the module. The user must then set this pin to LOW upon power up and only set it HIGH at the end of the setup() function.
- The strobe signal may simply be toggle HIGH and LOW. Typically, that would mean a HIGH at the beginning of the loop() function and a LOW somewhere in the middle.

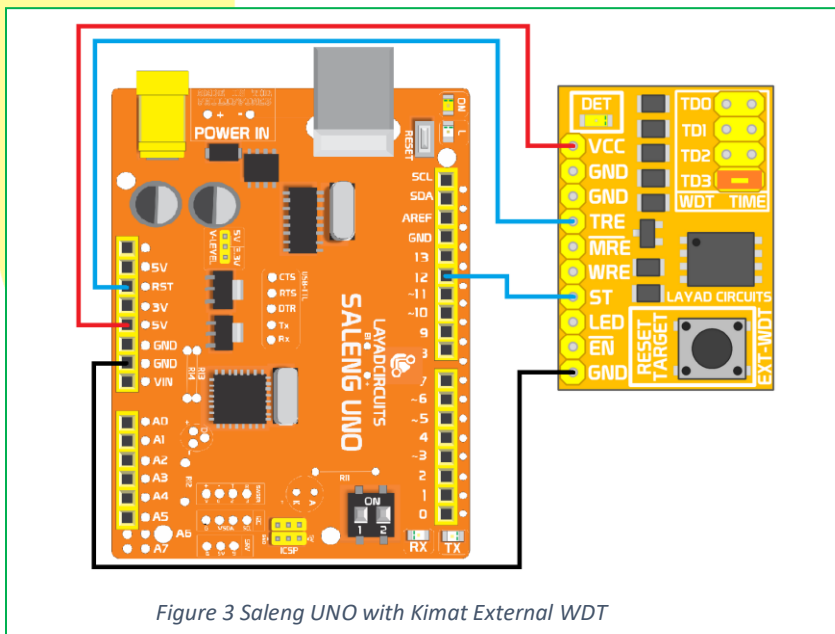


Figure 3 Saleng UNO with Kimat External WDT

### Sample Code

```
void setup() {  
  pinMode(LED_BUILTIN, OUTPUT);  
  pinMode(12, OUTPUT);  
}  
  
void loop() {  
  digitalWrite(12, HIGH); // toggle the strobe signal  
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)  
  delay(1000); // wait for a second  
  digitalWrite(12, LOW); // toggle the strobe signal  
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW  
  delay(1000); // wait for a second  
}
```

The sample code provided above uses the Arduino example code Blink. This code is modified to integrate the Kimat External WDT Module. The code is expected to provide a signal to the Kimat External WDT time every 1 second, well within the WDT timeout of 1 minute.

### DOCUMENT REVISION HISTORY

Revision:

v1.0.0 / 8 May 2020 / E.A.Binay-an/C.D.Malecchan

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