

UM1760 User manual

STLUX™ SMED configurator 1.0

Introduction

The STLUX SMED configurator is a powerful graphical tool which allows to easily configure the SMED engine embedded in the STLUX family of devices. The tool allows the user to focus on creating new SMED algorithms while completely reduces the implementation time end efforts. Once the visual SMED configuration is in place, the SMED configurator can generate a C file and store the whole configuration, ready to be imported in STLUX projects.

The SMED configurator features:

- SMED configuration schemes
- Input configuration
- Clock settings
- FSM ("Finite State Machine") configuration
- C code generation

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UM1760 Home page

1 Home page

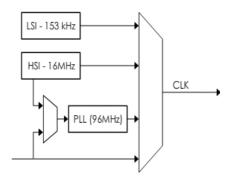
The initial view gives a visual overview of the STLUX architecture. The user can interact with all the elements of the home page and access more detailed views for each component.

Figure 1. SMED configurator - STLUX architecture view STLux SMED Configurator _ = X **STLux SMED Configurator** Options Help Project:UNTITLED Home | SMED Configuration Scheme | State Machine 6x SMEDs (state Machine) LSI - 153 kHz HSI - 16MHz CLK Hold PLL (96MHz) 6x PWMs 4x Analog Comparator 3x Events 6x Digital Inputs ADC with sequencer Registers Serial - I2C CPU DALI

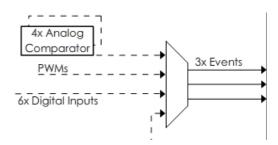
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The user can choose to configure:

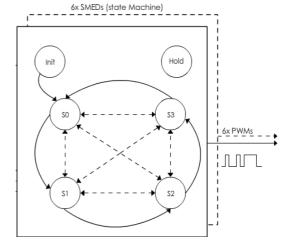
 The clocks: click on the image representing the SMED clocks.



 The inputs: click on the image representing the SMED inputs.



 The finite state machine (FSM): click on the image representing the FSM.



Alternatively, it is possible to use the top menu to jump into the desired view of the SMED configurator.

Figure 2. Menu bar

Home SMED configurator Scheme State Machine

2 SMED configuration scheme view

This view allows the user to establish how to use each SMED defining its working mode.

All the possible SMED configuration schemes are:

- Single SMED
- Synchronous coupled SMEDs
- Two synchronous coupled SMEDs
- Two asynchronous coupled SMEDs
- Asynchronous coupled SMEDs
- Externally controlled SMED

The page shows the six SMEDs and for each of them there is a button to enable it and a button to choose the control mode (internally/externally). Each SMED, if not coupled to another, will be configured respectively in the SINGLE mode or EXTERNAL depending on whether the control button is either "Int" (internal) or "Ext" (external).



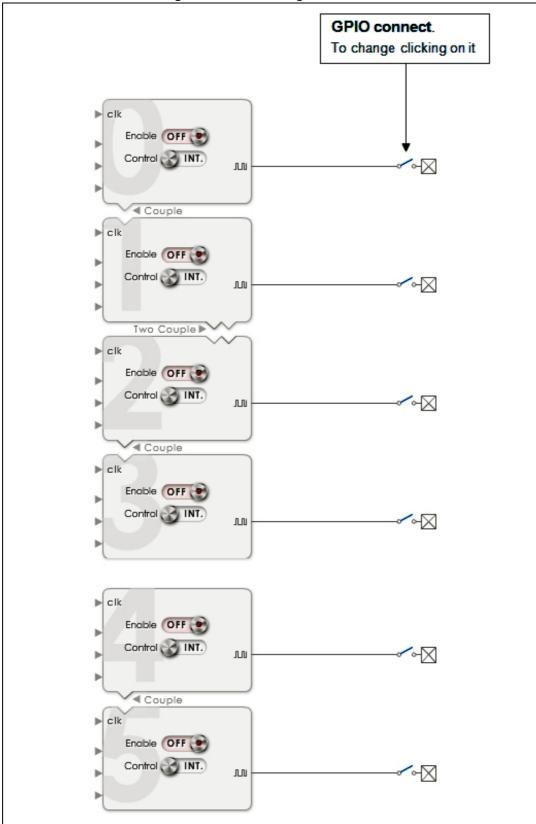
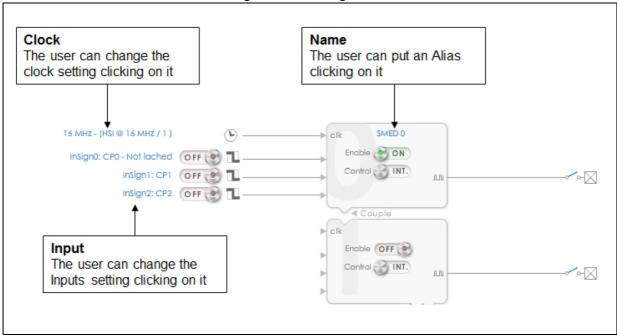


Figure 3. SMED configuration view

Enabling a SMED will be shown:

Figure 4. Enabling SMED





2.1 Synchronous/asynchronous coupled SMEDs

To configure 2 SMEDs in coupled mode, click the "couple" text between the 2 SMEDs required to be coupled.

Figure 5. Synchronous/asynchronous coupled SMEDs ▶ clk Enoble OFF JLJI ′⊶X **∢** Couple Enable OFF Control NT. JJJI Two Couple▶ ▶ clk Enable OFF JLJI ■ Couple Enable OFF ЛЛ ▶ clk Enable OFF JUI ¶ Couple Enable OFF M

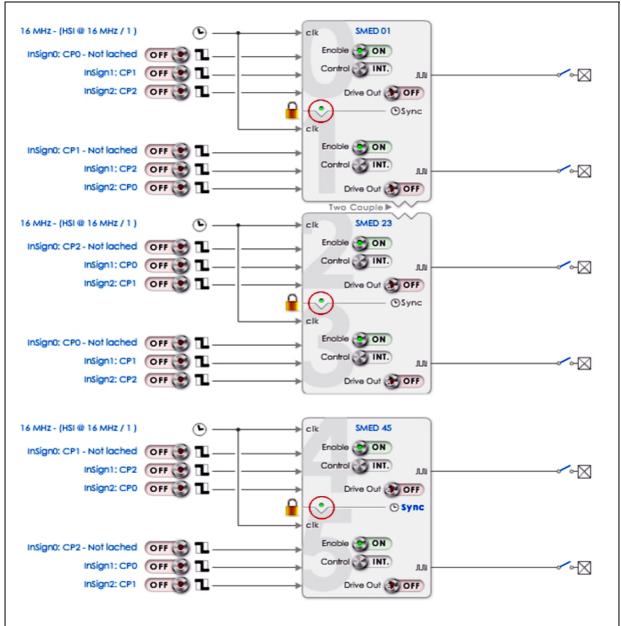
The result is that the tool shows graphically the 2 SMEDs coupled and allows the user to configure their features:

Drive Out. Unlock. To change clicking on it To change clicking on it 16 MHz - (HSI @ 16 MHz / 1) (b) -SMED 45 Enable ON InSign0: CP1 - Not lached OFF 💽 🔟 InSign1: CP2 OFF 💽 🔟 InSign2: CP0 OFF 💽 🔼 Drive Out OFF Sync Insign0: CP2 - Not lached OFF 1 InSign1: CPO OFF P Sync/Async. To change clicking on it. Only for SMEDs 4 and 5 coupled

Figure 6. Configuration of 2 coupled SMEDs

To remove the coupled mode click click on the symbol that shows the coupling of the SMEDs.

Figure 7. Removing coupled mode





2.2 Two synchronous/asynchronous coupled SMEDs

To configure 4 SMEDs (SMED0 - SMED 1 - SMED 2 - SMED 3) into the two coupled mode it's needed to click on the area representing this mode:

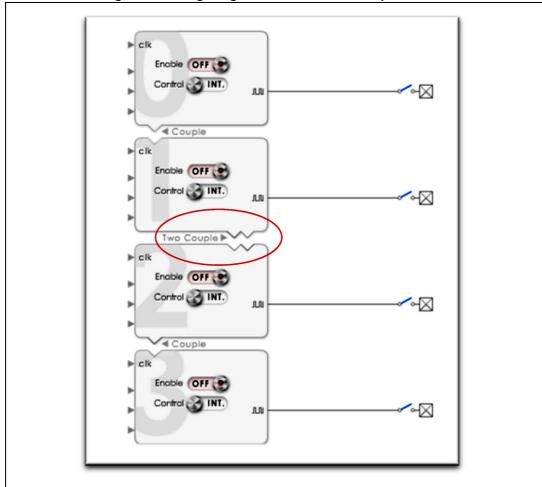
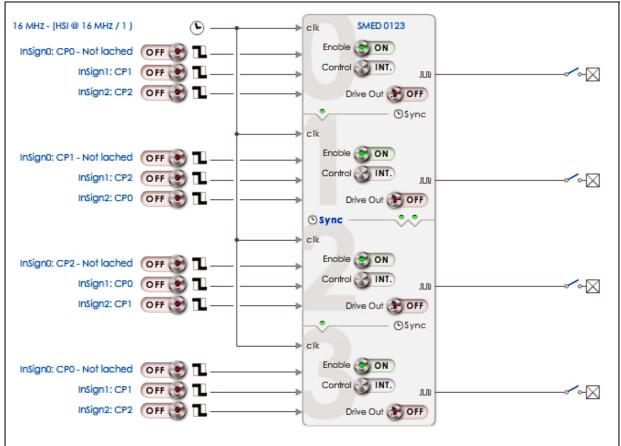


Figure 8. Configuring 4 SMEDs into two coupled mode

As a result, the SMED configurator shows graphically the 2 SMEDs coupled and allows the user to configure their features.

Figure 9. 2 SMEDs coupled



2.3 Clock setting

Once a SMED configuration scheme has been selected, it is possible to configure the clock of the used SMEDs clicking on the clock label.

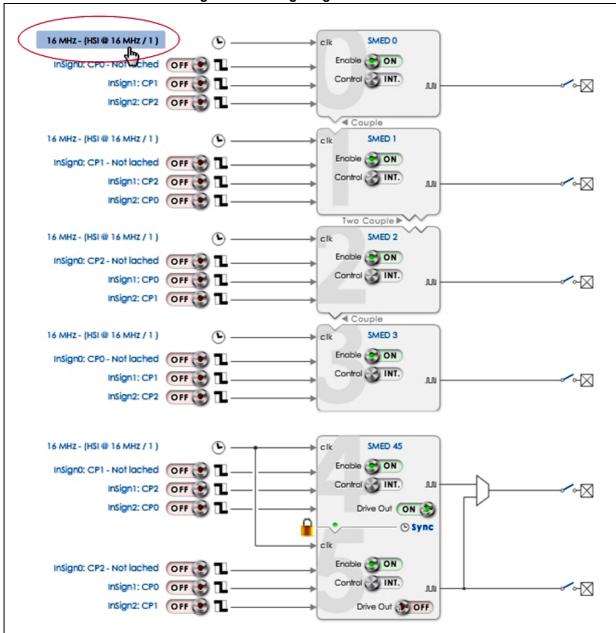


Figure 10. Configuring clock of SMEDs

A dialog will be open in order to select one of the all possible values for the clock:

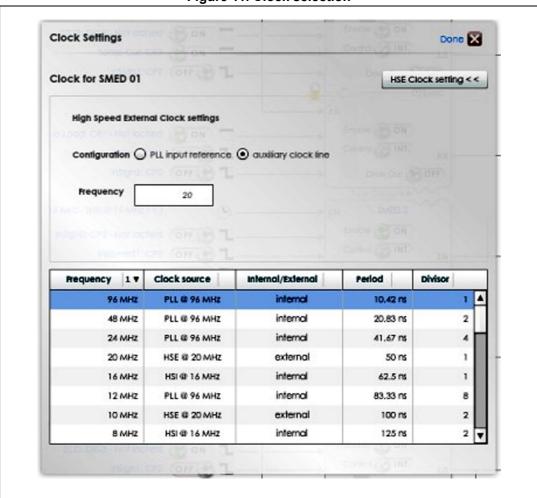


Figure 11. Clock selection

2.4 Input setting

Once a SMED configuration scheme has been selected, it is possible to configure the inputs of the used SMEDs by clicking the "input" label.

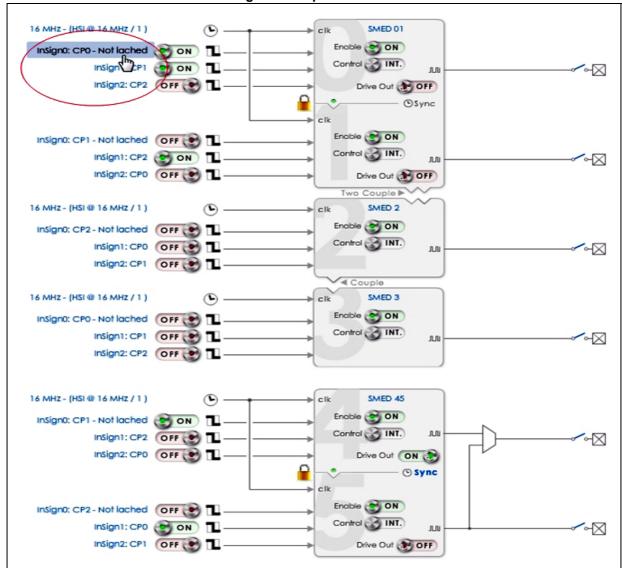


Figure 12. Input selection

A dialog will be open in order to configure the three inputs of the selected SMED.

Figure 13. Input selection dialog



It is possible to enable an input by clicking the ON/OFF button:

Also it is possible to change the input trigger level by clicking on the trigger icon:

A menu with the 4 possible values will be opened:



It is also possible to enable the InSig[0] input line supplementary latch functionality used to memorize occurrence of an InSig[0] capture condition.

Figure 14. Enabling Sig[0] latched mode



This allows a deferred event transition occurrence from any of the configured states to react to the InSig[0] input capture.

The latched information is selectively cleared by entering any of the S0 - S3 states if the latch reset for the state is set in the correspondent SMED state machine page.

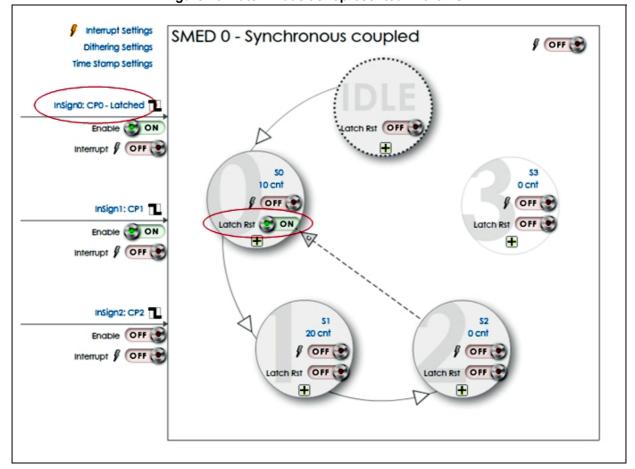


Figure 15. Latch mode as represented in the FSM



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UM1760 State machine page

3 State machine page

The machine states page is used to set the configuration of the SMED registers that control the finite state machine.

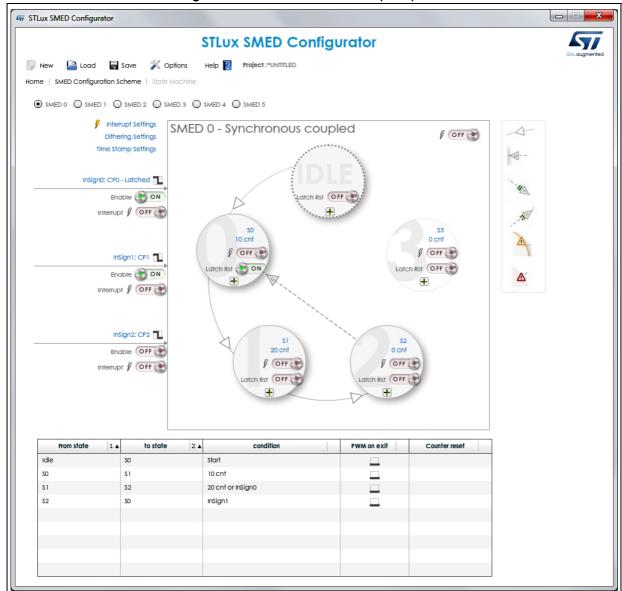


Figure 16. Finite state machine (FSM) view

This page is divided into 2 parts:

- 1. General settings
 - a) Interrupt
 - a) Dithering
 - a) Time stamp
- 2. Transitions

State machine page UM1760

3.1 General setting

3.1.1 Interrupt settings

The "interrupt settings" label is used to configure the interrupt handling.

Clicking on the label "Interrupt Settings" a dedicated window will be opened.

The interrupts are grouped in three blocks for the state timers compare events, external input events and counter overflow event.

SMED 0 - Synchronous coupled F OFF Interrupt Setting Done X Interrupt sources State Compare **Event Input** & OFF Insign0 P ON Insign1 0 cnt 👂 🎅 ON F OFF \$2 InSign2 F OFF F OFF tch Rst OFF FSM Counter Overflow & OFF 20 cnt Enable OFF 0 cnt OFF D F OFF Interrupt # OFF Latch Rst OFF Latch Rst OFF

Figure 17. Interrupt settings

UM1760 State machine page

3.1.2 Dithering settings

The "dithering settings" label is used to determine the SMED cycle(s) in which the temporary dithering increment is applied on the selected timer. Any number of cycles may be enabled/disabled.

Clicking on the label "Dithering Settings" a dedicated window will be opened.

Interrupt Settings SMED 0 - Synchronous coupled F OFF Dithering Settings **Dithering Setting** Done X Dithering configuration Temporary Increment: Time Register state 3 0 cnt OFF Latch Rst OFF Average time compare over 8 cycles: 23.44 ns InSign2: CP2 20 cnt 0 cnt 👂 🎅 ON 👂 🎅 ON Interrupt \$ OFF Latch Rst OFF Latch Rst OFF **± ±**

Figure 18. Dithering settings

State machine page UM1760

3.1.3 Time stamp settings

The "time stamp settings" label is used to control the dumping feature of the SMEDs. Clicking on the label "time stamp settings" a dedicated window will be opened.

Interrupt Settings SMED 0 - Synchronous coupled F OFF Dithering Settings Time Stamp Settings **Time Stamp Setting** Done 🔀 Time Stamp control OFF (Input 0 ON Input 1 10 cnt OFF 💽 F OFF ON Input 2 Latch Rst OFF st 💌 ON OFF (Lock InSign2: CP2 20 cnt 0 cnt Enable OFF 👂 🎅 ON 👂 🎅 ON Interrupt \$ OFF Latch Rst OFF Latch Rst OFF **± +**

Figure 19. Time stamp settings

3.2 Transitions

State transitions are represented as arrows connecting two states involved in a transition.

Interrupt Settings SMED 0 - Synchronous coupled OFF OF Dithering Settings Time Stamp Settings State Name Click to change Insigna: CPO - Latched 1 State Enable ON Interrupt \$ OFF DEAD Time 53 10 cnt 0 cnt Transition F OFF OFF O InSign1: CP1 Click to change Latch Rst OFF Latch Rst ON Enable ON Interrupt 9 ON Latched information InSign2: CP2 1 Enable OFF 20 cnt 0 cnt P ON P ON Interrupt # OFF Latch Rst OFF Latch Rst OFF State Timer **Transition summary** Click to change Interrupt on state timers compare events condition From state to state 2 4 PWM on exit Counter reset Idle DEAD Time Start DEAD Time 51 51 52 20 cnt or Insigno 52 DEAD Time Insign1

Figure 20. State transitions

State machine page **UM1760**

> To add a new transaction, click on the button \blacksquare relative to the initial state of the transition. A dedicated window will be opened to select the end state of the transition.

Transition settings - SMED 0 - Synchronous coupled Transition settings - SMED 0 - Synchronous coupled Path From State: SO To State: Condition Action

Figure 21. Selecting end state of the transition

To define a transition **three steps** are needed:

Path:

Determine the path of the transition from the initial state to the end state. The tool automatically determines the type of transition (sequential or controlled) or, in case of ambiguity, leaves the choice to the user.

2. Condition

> Determine which is the condition that generates the transition: the state compare timer, edgeX triggering event, edgeY triggering event and their combination.

Determine which is the action of the transition in term of the PWM value and reset counter.

UM1760 State machine page

Transition settings - SMED 0 - Synchronous coupled Transition settings - SMED 0 - Synchronous coupled Path From State: SO To State: S2 sequential > OFF Hold Jump and Hold Exit Hold Jump waking up when the same condition defined for this transition will be retriggered II 🔊 🌚 ON Hold Jump waking up when the corresponding coupledSMED will go in HOLD II OFF Condition Use if OFF Insign0 InSign 1 Insign 1 Insign2 Insign2 Action PWM: reset Counter 🕑 ON OK Cancel

Figure 22. Transition definition

For the controlled transition the user can enable the possibility to enter the hold state and decides which is the condition that determines the exit from the hold state to go on the end state of the transition.

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The tool uses four different symbols to identify the transition:



Sequential transition



Controlled transition



Controlled transition with the hold jump and exit from the hold when the same condition is retriggered.



Controlled transition with the hold jump and exit from the hold when a coupled SMED enters in hold.



UM1760 Menu bar

4 Menu bar

The menu bar contains the commands that can be used to manage the application.

The available menus are:

New

Create a new project

Load

Load existing project

- Save
 - Save

Save the active project

Save As...

Save the active project with a new name

Save C File

Save the text file, that contains the "C" source code of a simple function that initializes all the MIF and SMED registers conforming to the current configuration.

Option

Open the Option window

- Help
 - Help

Open this file

Release Note

Open the Release Note document

About

Open the About window.

Revision history UM1760

5 Revision history

Table 1. Document revision history

Date	Revision	Changes
14-May-2014	1	Initial release.

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