



*LOAD***SLAMMER**

*LoadSlammer User  
Guide  
LS25*

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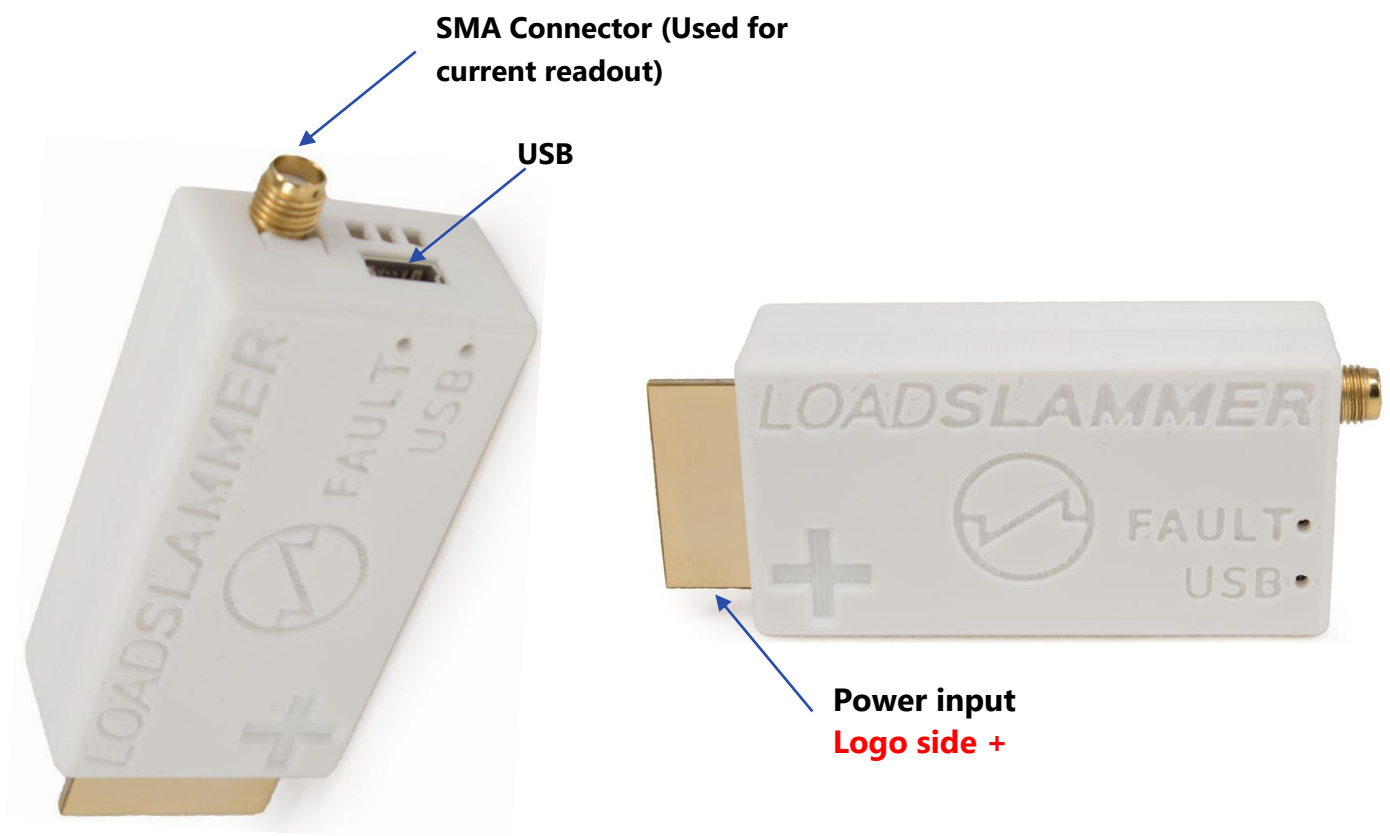
## 2 INTRODUCTION

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### 2.1 OVERVIEW

The LoadSlammer™ is used to test high transient high current loads as seen in CPU, GPU, FPGA, and ASIC power profiles. It is designed to be easy to use with a GUI and current sense output. The Bootloader feature ensures your ability to obtain firmware updates.

### 2.2 HARDWARE



## 2.3 SPECIFICATIONS LS25

Slew Rate (Selectable)	1, 2, 5, 10, 20, 50 (LS50)		A/μS
Current (100mA increments)	1 – 20		A
Frequency Range (100 Hz steps) <sup>1</sup>	100 – 2500		Hz
Duty Cycle (0.25% steps) <sup>2</sup>	Active window is divided into 100 steps Actual duration is based on frequency		%
Input Voltage	0.65 – 3.3		V
Current Sense Output	Conversion Ratio	10	A/V
	Max Current	20	A
	Bandwidth	10	MHz
	Accuracy	10	%
Voltage Readout	Sample Rate	2	MSPS
	Accuracy	1	%
Current Readout	Sample Rate	1	MSPS
	Accuracy	10	%
Protection Thresholds	Over Voltage	2.7	V
	Over Current	25	A
	Over Temperature	80	°C
Average Power Dissipation	3		W
Peak Power Dissipation (instantaneous)	250		W
Connector (optional)	Molex 45719-0007		
GUI	The GUI was developed on Windows 10 with Chrome web browser version 61 and newer.		
Non-Isolated	LoadSlammer™ must be used with a regulator that has a ground earth reference and positive voltage.		
Frequency Sweep	20kHz – 1mhz		

## 3

### 3.1 PHYSICAL CONNECTION TO DUT

#### 3.1.1 Placement Location

Placement of the LoadSlammer™ on the DUT (Device Under Test) is crucial. For best results, place the LoadSlammer™ as close to the load as possible to include the parasitic impedance of the PCB traces. Placing the LoadSlammer™ right near the output of the regulator doesn't adequately test the output filtering due to the lack of parasitic impedance in the PCB from regulator to load.

**Do not connect the LoadSlammer using wire. This increases the impedance of the system which prevents high slew rates.**

#### 3.1.2 Connector vs Soldering

Using a connector provides ease of use and reduces wear on the PCB, but adds inductance and resistance to the power path. These factors may limit your maximum slew rate.

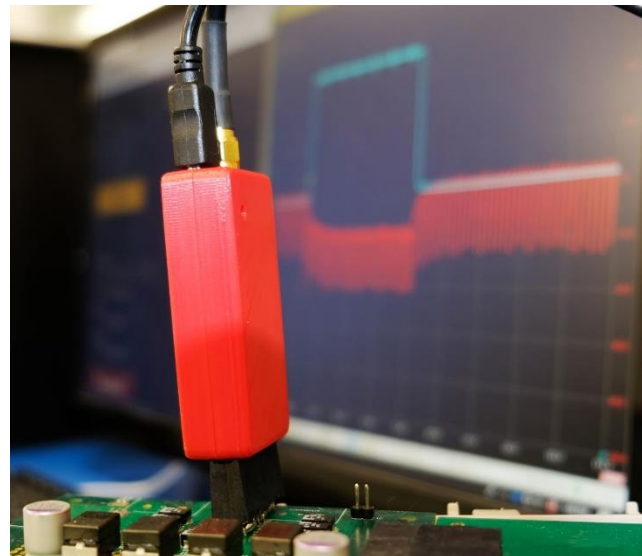
Soldering directly to the PCB helps minimize inductance which can provide a cleaner signal and a faster slew rate

To solder a slammer to the DUT, find a large ground and power plane butting up to each other, scrape some solder mask off, then solder it down with copper braid.

Alternatively, if your PCB has many ceramic capacitors in a row, it's possible to solder directly over them.

#### 3.1.3 Thermal Considerations

While not strictly required, a fan moving air over the LoadSlammer™ will allow for higher duty cycles. The Over Temperature feature is set to 80° C, at which point it will automatically turn off and alert the user both through the GUI and a red LED on the LoadSlammer™ board. To reset the OTP (Over Temperature Protection), you need to disable the output then reenale it.



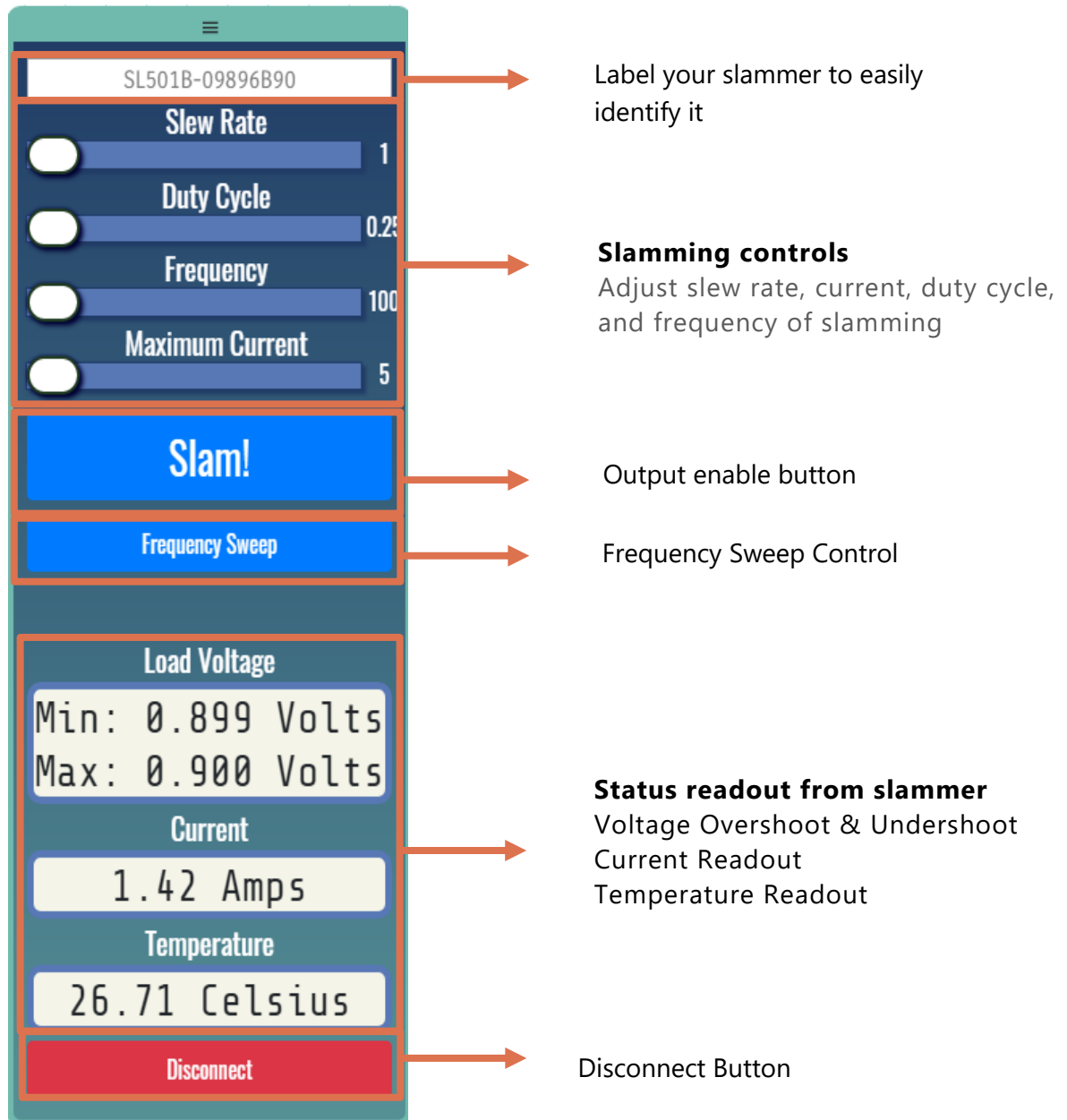
**Note:** For optimal performance when using a connector, ensure that the LoadSlammer™ is firmly seated and that the connector / blade are clear of debris. Failure to do so can result in unpredictable slewing behavior.

## 3.2 LOADSLAMMER™ GUI

### 3.2.1 Connecting to your LoadSlammer

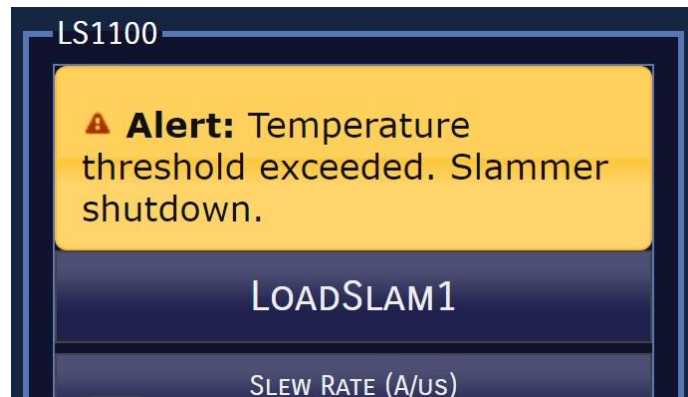
First, make sure a USB is cable is connecting the slammer to a PC/laptop and the computer has Google Chrome installed. No drivers are necessary. Simply load up <https://guipower.com/>, click connect, and choose the LoadSlammer model you are using.

### 3.2.2 GUI Overview



### 3.2.3 Protection Features

The LoadSlammer™ has built in protection to prevent over temperature, over voltage, and over current events. In the case of an overload event, the output is automatically turned off, and a warning is displayed. To re-enable the slammer, simply enable the output again.



### 3.2.4 Testing with multiple LoadSlammers™

It is possible to use several LoadSlammers at the same time to asynchronously test different voltage rails.

### 3.2.5 Frequency Sweep

A frequency Sweep test can identify changes in the frequency response of the circuit and approximate phase margin. Very fast slew rates can provide useful information regarding the regulator output decoupling solution.

To activate the function, simply set the current slider to the desired level, and press the "Frequency Sweep" button during testing."

## 4 OPERATION

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Use the following steps to get started with the LoadSlammer™:

1. Make sure system is powered off
2. Install LoadSlammer™ unit onto DUT (Device Under Test)  
*Note: Make sure you observe proper polarity. The case has polarity marked with + and GND*
3. Connect USB cable from LoadSlammer™ to PC
4. Attach current output of LoadSlammer™ to an oscilloscope channel set to 1M $\Omega$  input impedance (optional)
5. Adjust the current output to rest at 0 V
6. Connect to LoadSlammer™ through the GUI
7. Turn on DUT and verify voltage read from GUI is correct
8. Adjust GUI parameters to desired values
9. Hit the "Slam!" button to start slamming
10. Use appropriate conversion ratio on current monitor output (see table).

### 4.1 TEST EQUIPMENT SETUP

#### 4.1.1 Oscilloscope

The current output has an offset of a few mV, so it should be zeroed out before taking measurements. Also make sure the input impedance is set to 1M $\Omega$ .

#### 4.1.2 External DC Load

An external DC load unit can be connected to the DUT to keep the VR from entering power saving modes. A DC load may also simulate a more real-world scenario. Load stepping from 20A – 70A will show how the converter responds with a light load already applied.



## 5 CHANGE HISTORY

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Revision Number	Date	Reason for change
1.0	November 12, 2018	Initial Release
1.1	November 14, 2018	Updated product feature table (page 9)
1.2	February 6, 2019	<ol style="list-style-type: none"><li>1. Updated introduction by adding boot loader comment</li><li>2. Added Notes section</li><li>3. Changed document part number to match new process.</li><li>4. Updated product feature list</li><li>5. General text cleanup</li></ol>
1.3	June 14, 2019	Updated pictures to reflect new GUI and case

## 6 NOTES

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1. Minimum pulse width is 6 $\mu$ S
2. Active window >250 $\mu$ s
3. It should be noted that circuit inductance can significantly limit the performance of the LoadSlammer. Reduced performance has been noted when using connectors. For maximum performance the LoadSlammer should be soldered to the test board as close to the load as possible. It is recommended that the LoadSlammer is soldered down for testing over 500 A/ $\mu$ S.
4. High slew rates require high current for optimal results. (Ex 1V @ 85A load current can achieve 800 A/ $\mu$ S.
5. Always place your slammer as close to the load as possible.
6. Maximize current draw for optimal results.

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