



## PSA User Manual

Last Updated: Dec 14, 2022

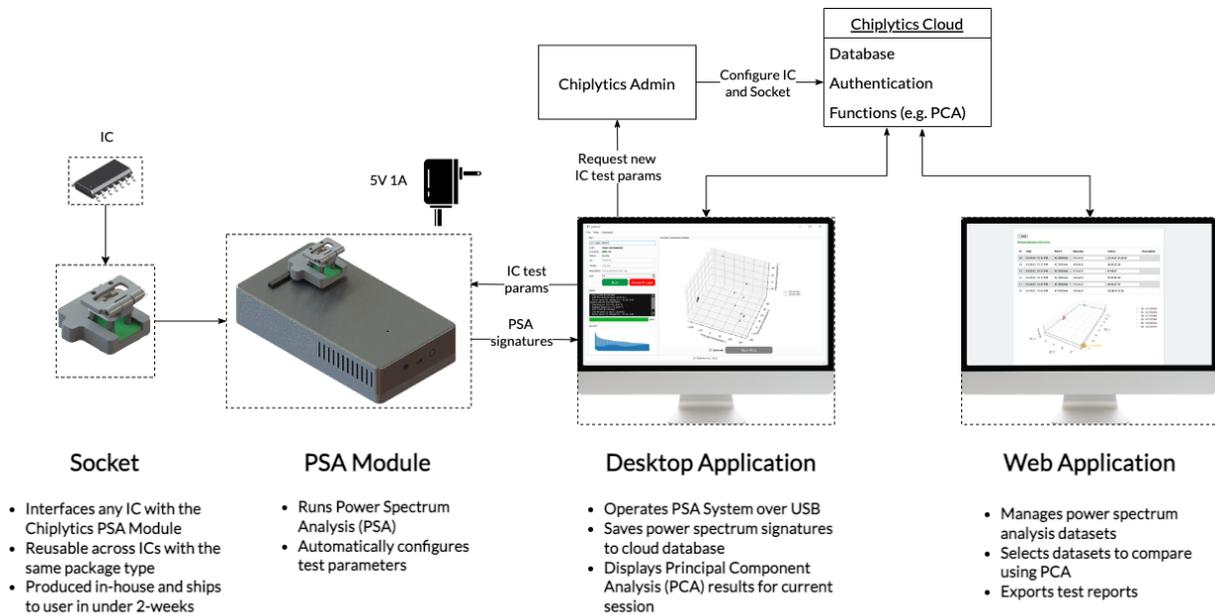
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# Overview

Chiplytics uses four main components for data collection and analysis:

1. **IC Socket:** Interfaces IC with the Chiplytics PSA Module
2. **PSA Module:** Captures power spectrum signature of the IC
3. **Desktop Application:** Operates the Chiplytics PSA Module, saves data to user's account, and runs Principal Component Analysis (PCA) on all samples collected during the session
4. **Web Application:** Manages user's data and runs PCA across any selected datasets

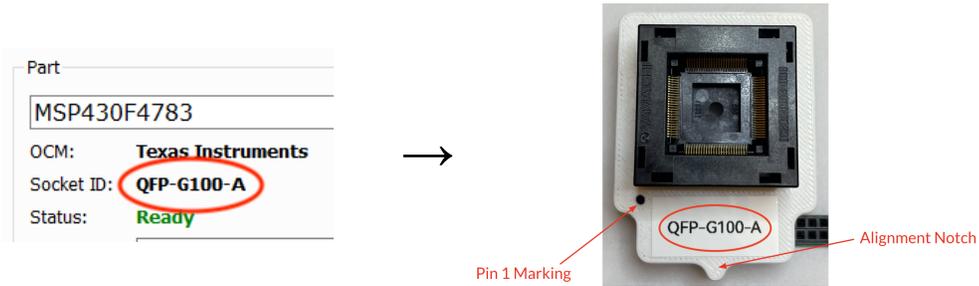
A diagram of each of these components and their feature sets is provided below.



Refer to the following sections for details pertaining to operating each of the four components.

# IC Socket

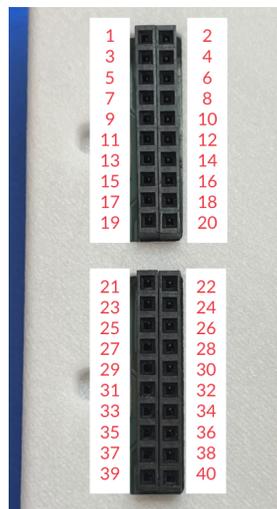
When testing an IC, the matching Socket ID is specified in the Desktop Application and is labeled on the top surface of the socket, as shown below. Some sockets have a letter added to the end of the package type (e.g. QFP-G100-**A**) specifying that the socket is custom for the given IC and may not be compatible with other ICs with the same package type but different pinout.



The socket must be inserted into the upper (primary) 2x10 header pins, as shown in the orientation below. For larger sockets, the lower (secondary) 2x10 headers may also be used for probing up to 40 pins. Use the alignment notch to help guide the socket into the header pins.

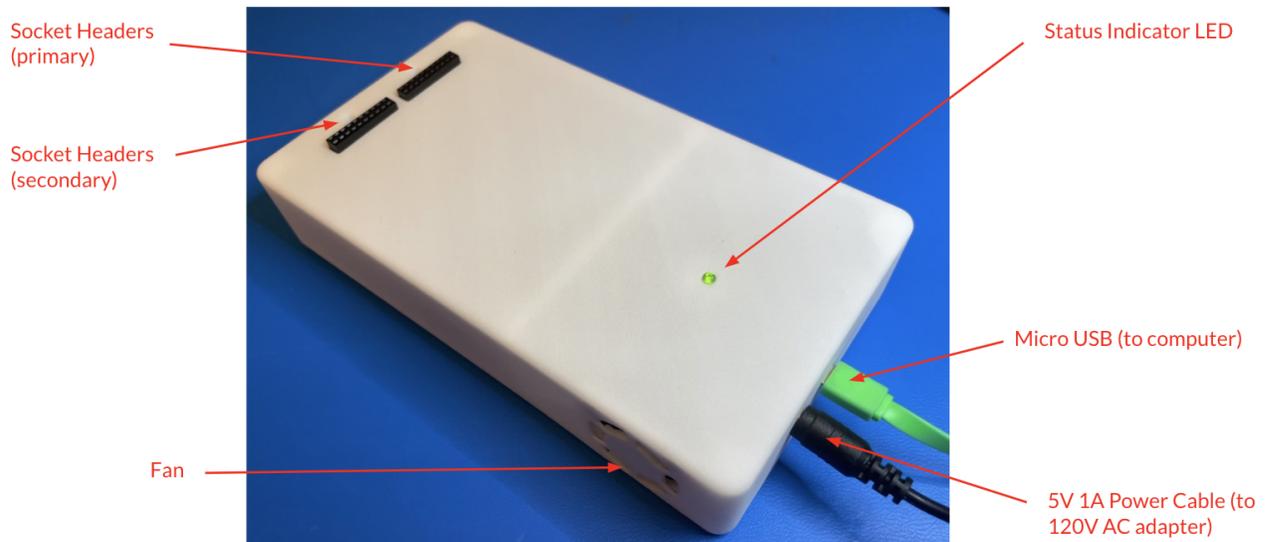


Ensure that the IC's Pin 1 is aligned with the circular Pin 1 marking located on the top surface of the socket. The pinout of the Chiplytics socket header pins is shown below for reference.



# PSA Module

Refer to the following diagram for key features of the Chiptytics PSA Module.



Plug in the Power Cable then connect the Micro USB cable to your computer.

Make sure to use electrostatic discharge (ESD) protection when testing ICs using the PSA Module.

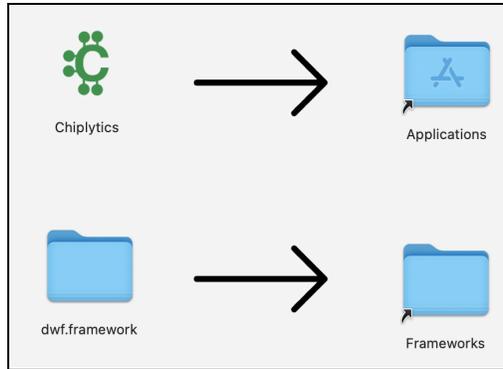
## Desktop Application

### Installation

Find the latest Chiptytics Desktop Application Software here: [chiptytics.io/download](https://chiptytics.io/download) (password required)

#### Mac

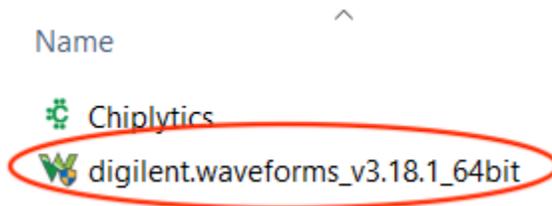
1. Download and mount the disk image
2. Drag the Chiptytics application file to your Applications folder and the dwf.framework file to your Frameworks folder



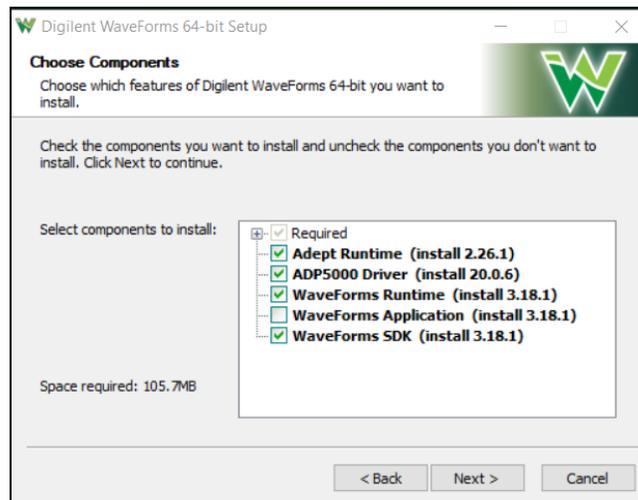
3. Right-click the Chiplytics app inside your Applications folder, then click “Open” (required by macOS to open an application downloaded from a web browser)

### Windows (64-bit)

1. Download the compressed folder and Extract All contents to a new folder
2. Launch the Digilent Waveforms installer



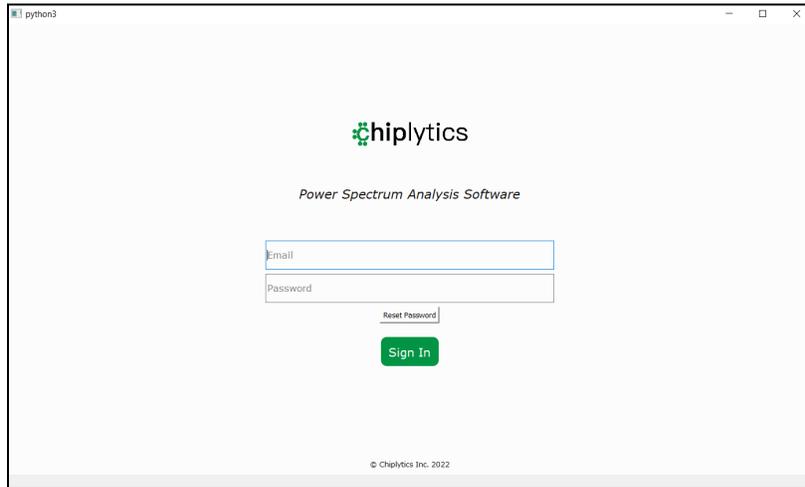
3. Install all components **except** for the WaveForms Application, which is optional.



4. The Chiplytics application is now ready to launch

# Authentication

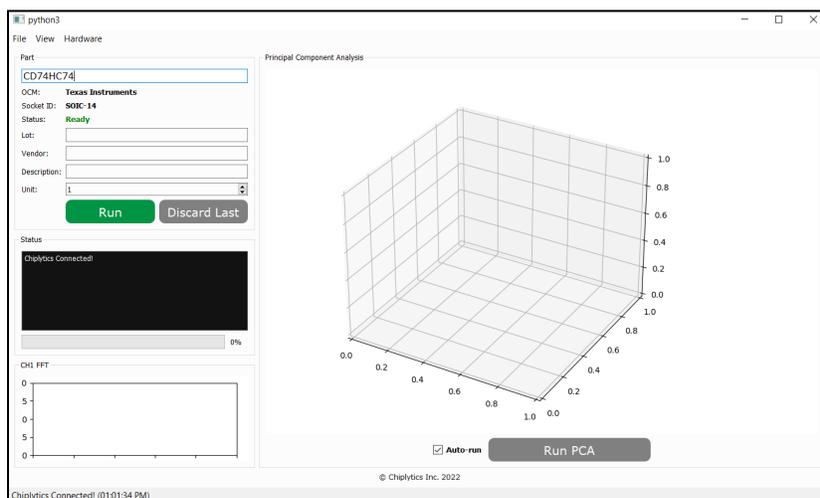
You must specify which email to use for your Chiplytics account. Then, the Chiplytics team will set up your account and provide you with a temporary password that can be reset by clicking the “Reset Password” button on the login screen, which will send an email to the account’s email address with password reset instructions.



Note that the same account is used for both the Desktop and Web Applications.

# Data Collection

After signing in, the data collection window will open, as shown below. Note that internet connectivity is required to sign in and use the application.



## Select Part

To begin a test, start typing in the part number then choose the part from the pre-populated list of parts registered in the Chiplytics app.

If your part does not exist, the part number field will turn red after pressing enter and will allow you to request the part to be added to the Chiplytics backend.



Part  
ATMEGA328P  
OCM:  
Socket ID:  
Status: **Not Available** Request Part

## Enter Test Information

Enter optional information about the part being tested such as the lot code, vendor, and a description of the test for future reference.

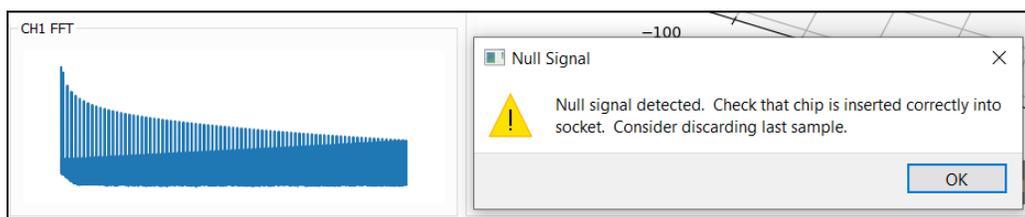
## Test the Part

Ensure that the IC is inserted correctly into the socket (with correct Pin 1 location) and that the socket is fully inserted into the header pins of the PSA Module. Then, click “Run” to begin data collection. The system will automatically run through all test parameters for the specified IC and save the PSA signature to the backend. Once complete, a preview of the PSA signature will be displayed in the bottom left corner of the window.

Repeat for each unit. The unit number will increment automatically after each run. Make sure to keep track of the unit number you assign to each IC. Once **at least three units** are tested, Principal Component Analysis (PCA) will run and plot the first three principal components.

## Check Signal Integrity

Confirm that the PSA signature does not look like the “null signal”, which is caused by insufficient electrical connection between the IC and the PSA Module. In most cases, the null signature will be automatically detected and the operator will be alerted (see below). If so, click “Discard Last” to remove the datapoint and redo the measurement.



## Test a New Part

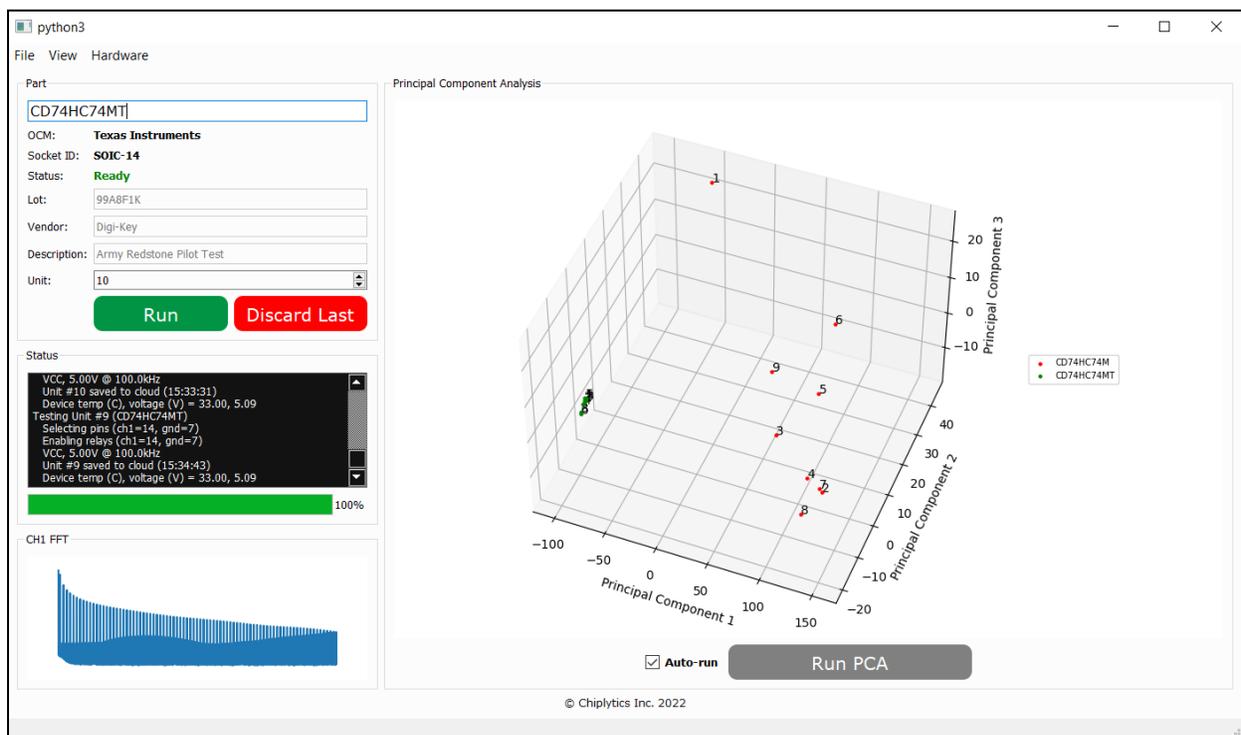
Begin a new test by selecting a new part or simply re-select the same part being tested (e.g. in the case of testing a known difference in vendor and/or date code). This will automatically reset the unit number and add a new entry to the PCA plot.

If you would like to start a new test unrelated to the previous tests and also reset the PCA plot, click **File > New Dataset** in the menu bar.

## Complete Testing

Test results are synced with your account in realtime, so there is no need to explicitly save anything. However, you can delete all results from the current session by clicking **File > Delete Dataset**.

An example of a completed test is shown below. Note that part number **CD74HC74MT** (which indicates the part came from a reel vs a tube) is grouped in a separate cluster from the other parts through the first three principal components, illustrating differentiation of parts by date code.



## Troubleshoot PSA Module Connection

The Chiplytics PSA Module should automatically connect after you sign in, as indicated by the status LED flashing green on the PSA Module and status messages inside the app. To connect to the PSA Module again, click **Hardware > Connect** in the menu bar.

If the PSA Module fails to connect, try the following:

1. Confirm that the 5V power supply is connected to the PSA Module
2. Confirm that the micro USB is connected between the PSA Module and the computer
3. Confirm that only a single Chiplytics Desktop Application is running on the computer
4. Power cycle the PSA Module by both unplugging the USB and the 5V power supply
5. Click **Hardware > Disconnect** then **Hardware > Connect** in the menu bar
6. Plug the USB cable into a different USB port
7. Restart the Desktop Application
8. Restart the computer

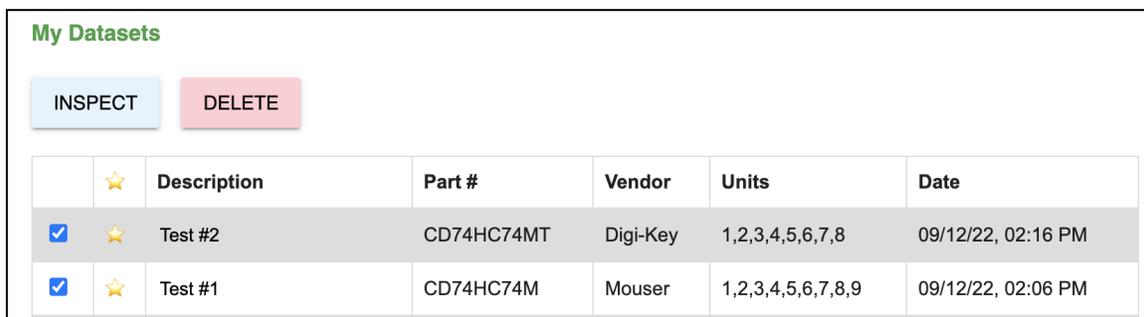
If you are still having issues, try running the application on a different computer or contact Chiplytics support.

## Web Application

You can access the Chiplytics web application by visiting:

<https://chiplytics.web.app/>

After signing in with your Chiplytics account, you will see each dataset collected through the Chiplytics Desktop Application. You may star important datasets, update test info such as the description, or select datasets to either “Inspect” or “Delete”.



My Datasets						
<input type="checkbox"/>		<input type="checkbox"/>				
<input type="checkbox"/>		<input type="checkbox"/>				
	★	Description	Part #	Vendor	Units	Date
<input checked="" type="checkbox"/>	★	Test #2	CD74HC74MT	Digi-Key	1,2,3,4,5,6,7,8	09/12/22, 02:16 PM
<input checked="" type="checkbox"/>	★	Test #1	CD74HC74M	Mouser	1,2,3,4,5,6,7,8,9	09/12/22, 02:06 PM

Click “Inspect” to compare PCA results among selected datasets and unit numbers within those datasets. Note that PCA clustering will differ depending on the full set of power spectrum signatures used in the analysis.

After clicking “Inspect”, you can choose specific unit numbers and PSA settings to compare within each dataset. In limited cases, you may also want to adjust the noise floor to pull out clusters. Once the desired units and settings are selected, click “Run PCA” to perform the analysis.

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**Select Units**

Description	Part #	Vendor	Lot	Units	Avg. Temp	Date
Test #2	CD74HC74MT	Digi-Key	99A8F1K	1,2,3,4,5,6,7,8	33.0°C	09/12/22, 02:16 PM
Test #1	CD74HC74M	Mouser	0ACPSGK	1,2,3,4,5,6,7,8,9	32.8°C	09/12/22, 02:06 PM

Instructions: Use comma-separated values

**Select PSA Settings**

Signal VCC ▾

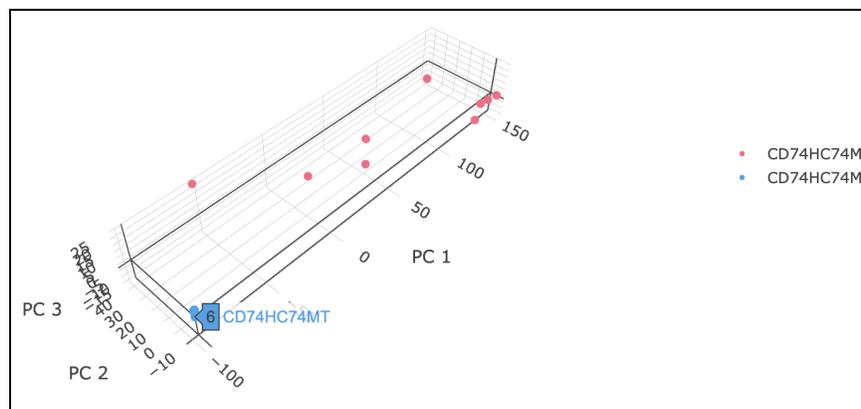
Frequency 100000Hz ▾

Amplitude 5000mV ▾

Noise Floor (dBm): -80

RUN PCA

PCA should finish computing after about 10 seconds. Scroll down on the page to view the PCA results and hover over each datapoint to view the unit number. Example results are shown below.



## Support

Email [steven@chiplytics.io](mailto:steven@chiplytics.io) or call Chiplytics at (505) 633-5639 regarding any questions or issues related to any of the Chiplytics products.