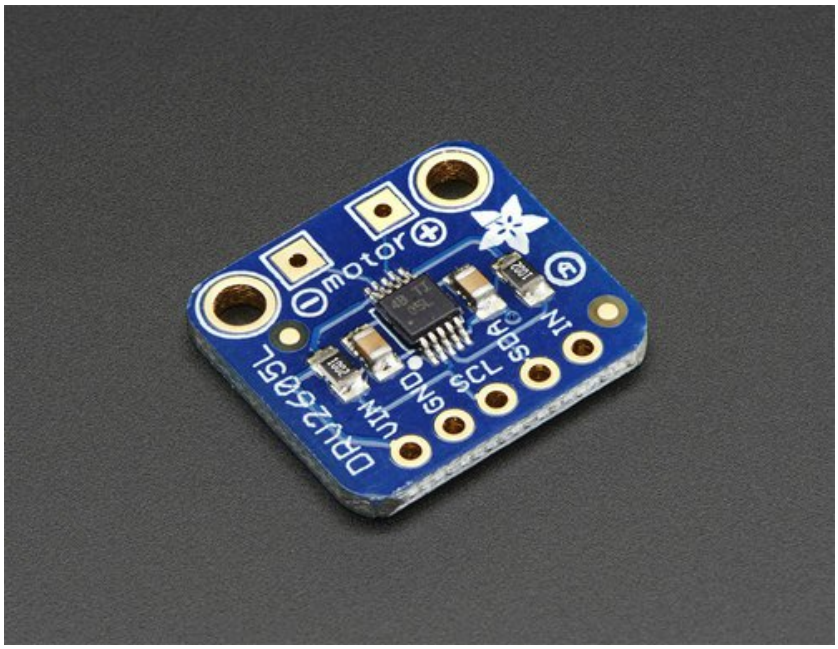
Adafruit DRV2605 Haptic Controller Breakout

Created by lady ada



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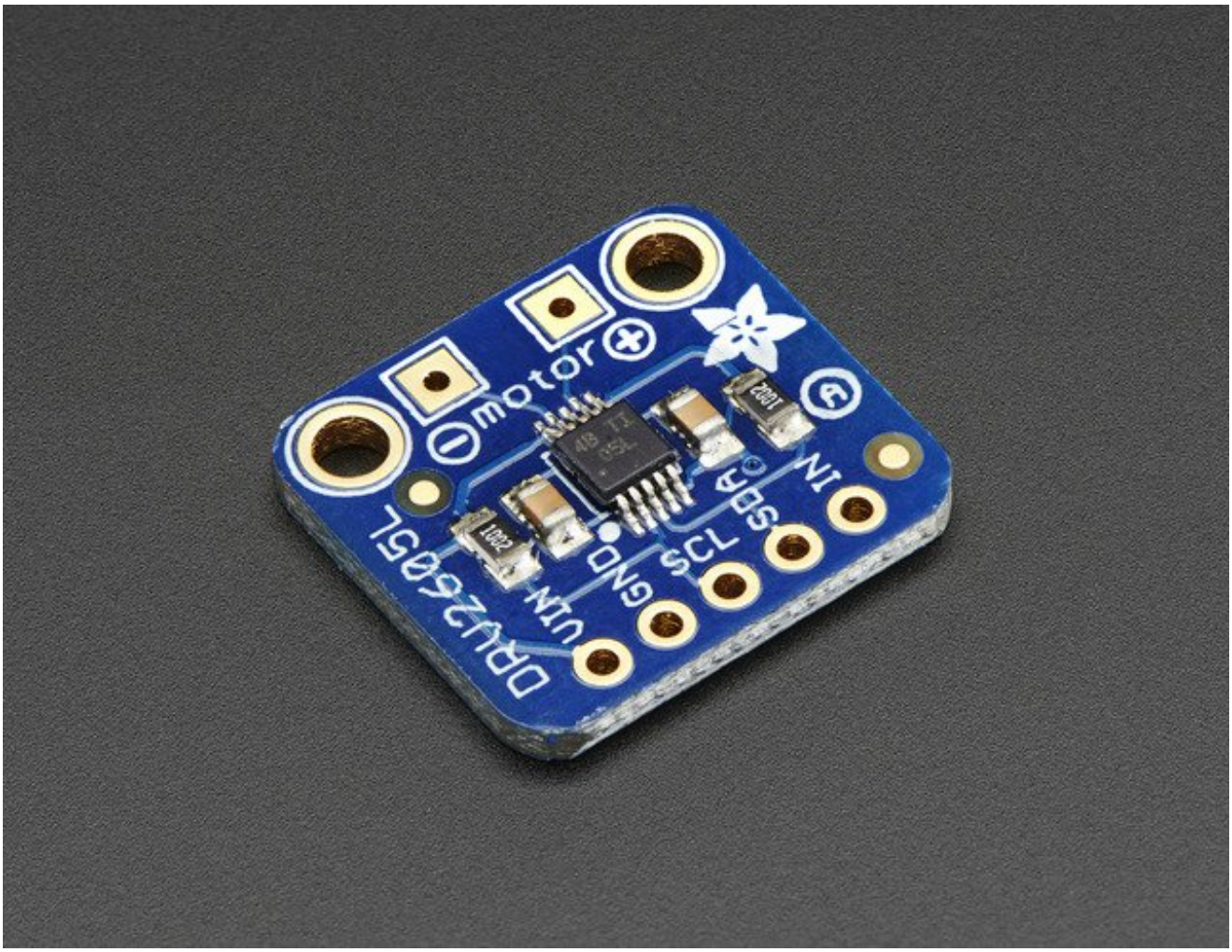
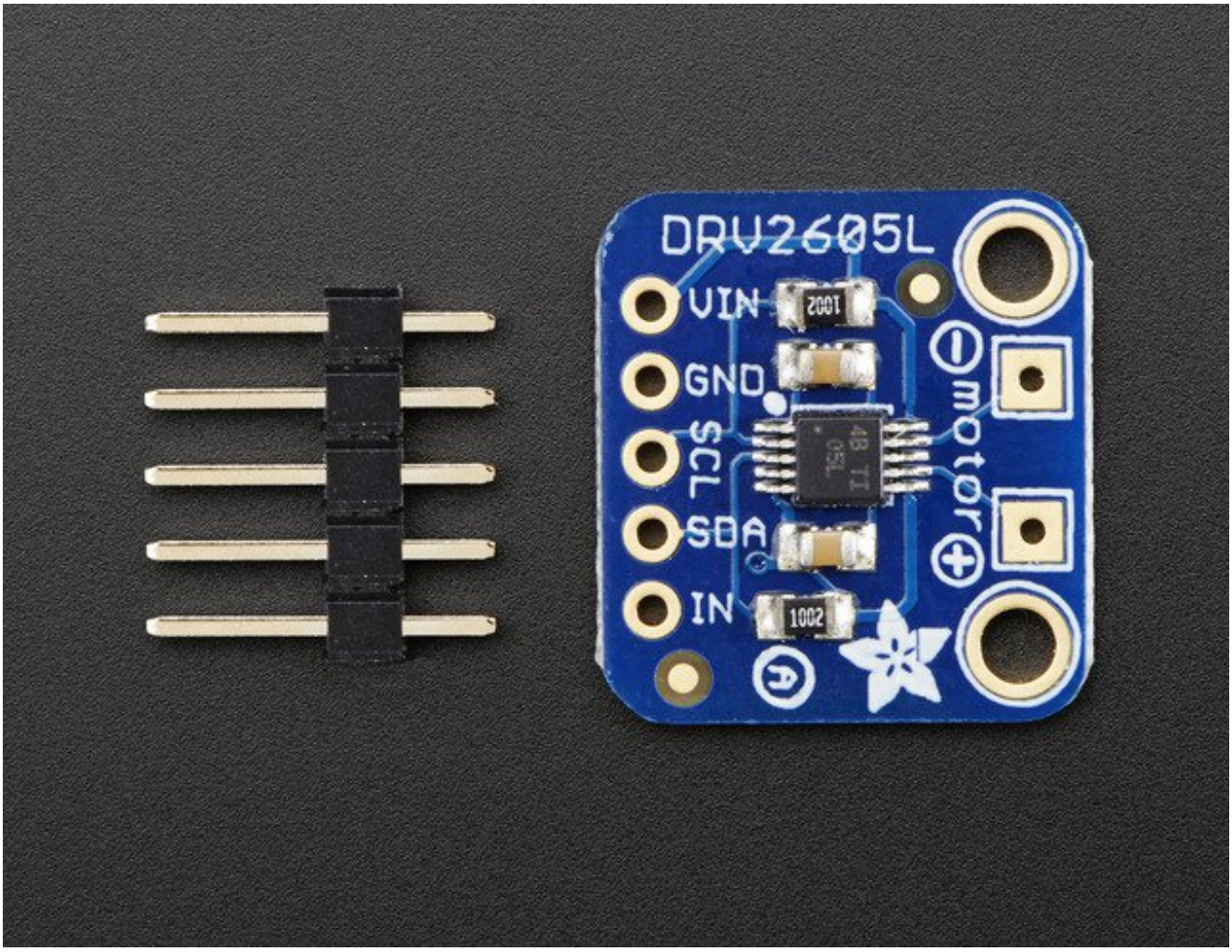
Guide Contents

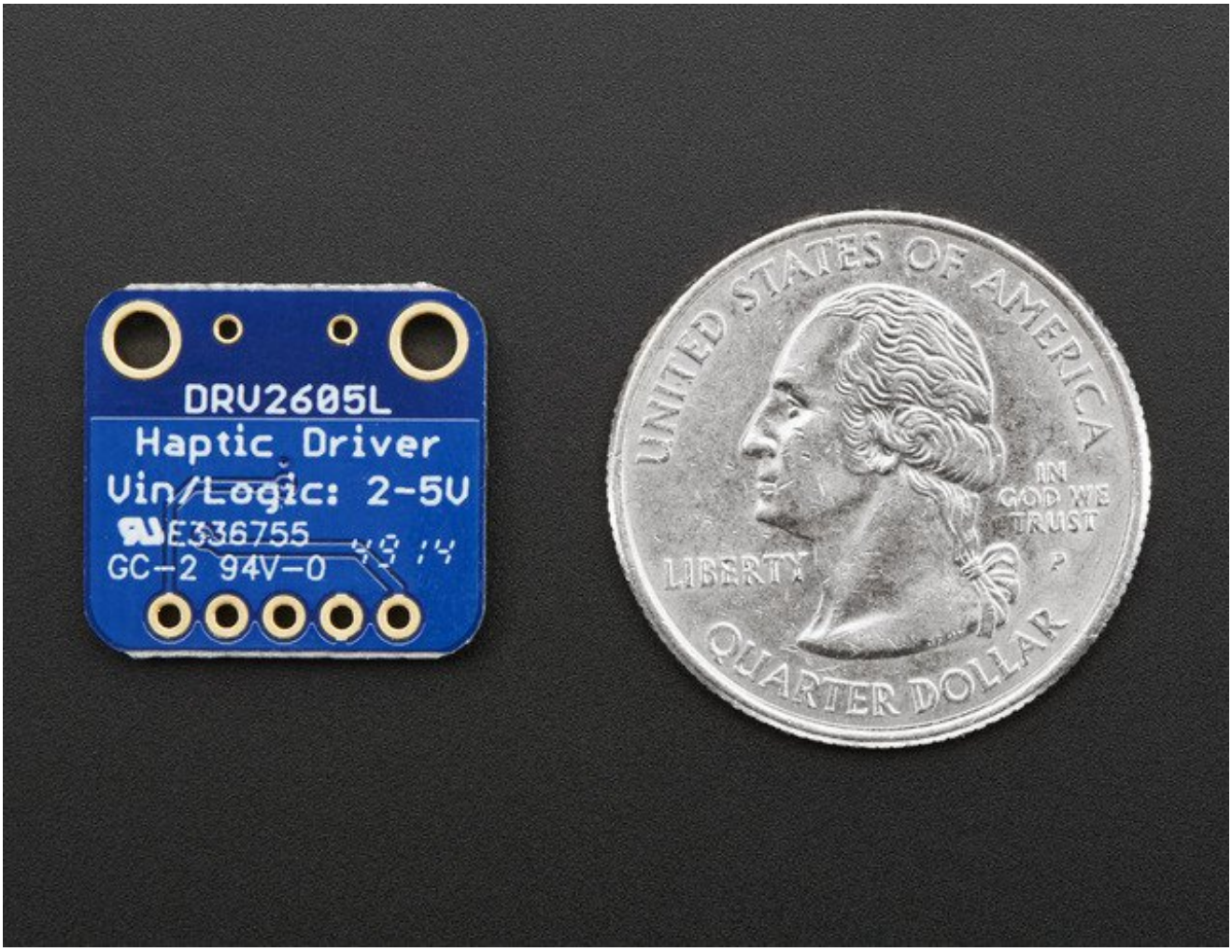
Overview



The DRV2605 from TI is a fancy little motor driver. Rather than controlling a stepper motor or DC motor, its designed specifically for controlling **haptic** motors - buzzers and vibration motors. Normally one would just turn those kinds of motors on and off, but this driver has the ability to have various *effects* when driving a vibe motor. For example, ramping the vibration level up and down, 'click' effects, different buzzer levels, or even having the vibration follow a musical/audio input.



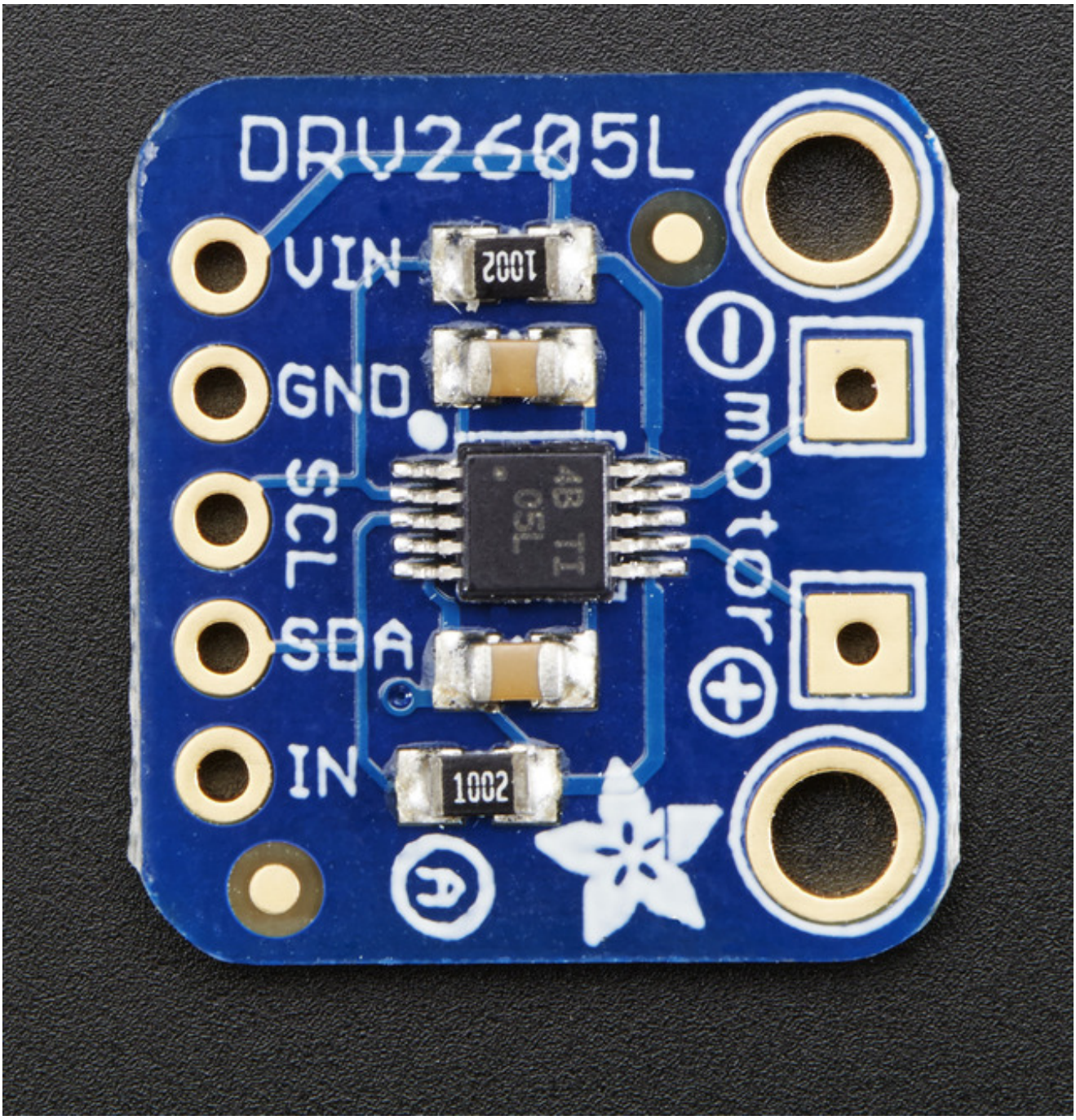
This chip is controlled over I2C - after initialization, a 'string' of multiple effects can be strung together in the chips memory and then triggered to actuate in a row. The built in effects are much much nicer than just 'on' and 'off' and will make your haptic project way nicer feeling.



According to the product page, it can be used with both LRA (Linear Resonance Actuator) and ERM (Eccentric Rotating Mass) type motors but we have only used it with our little vibration pancake ERM. (http://adafru.it/dDc)

We put this nice chip onto a breakout board. it works with both 3V and 5V power/logic, we have code specifically for Arduino but porting it to any I2C-capable processor should be quite simple. Check it out and get buzzing!

Pinouts



Power Pins

The motor driver/controller on the breakout requires 3-5V power. You can use either, whichever logic level you use on your embedded processor

- **Vin** - To power the board, give it the same power as the logic level of your microcontroller - e.g. for a 5V micro like Arduino, use 5V
- **GND** - common ground for power and logic

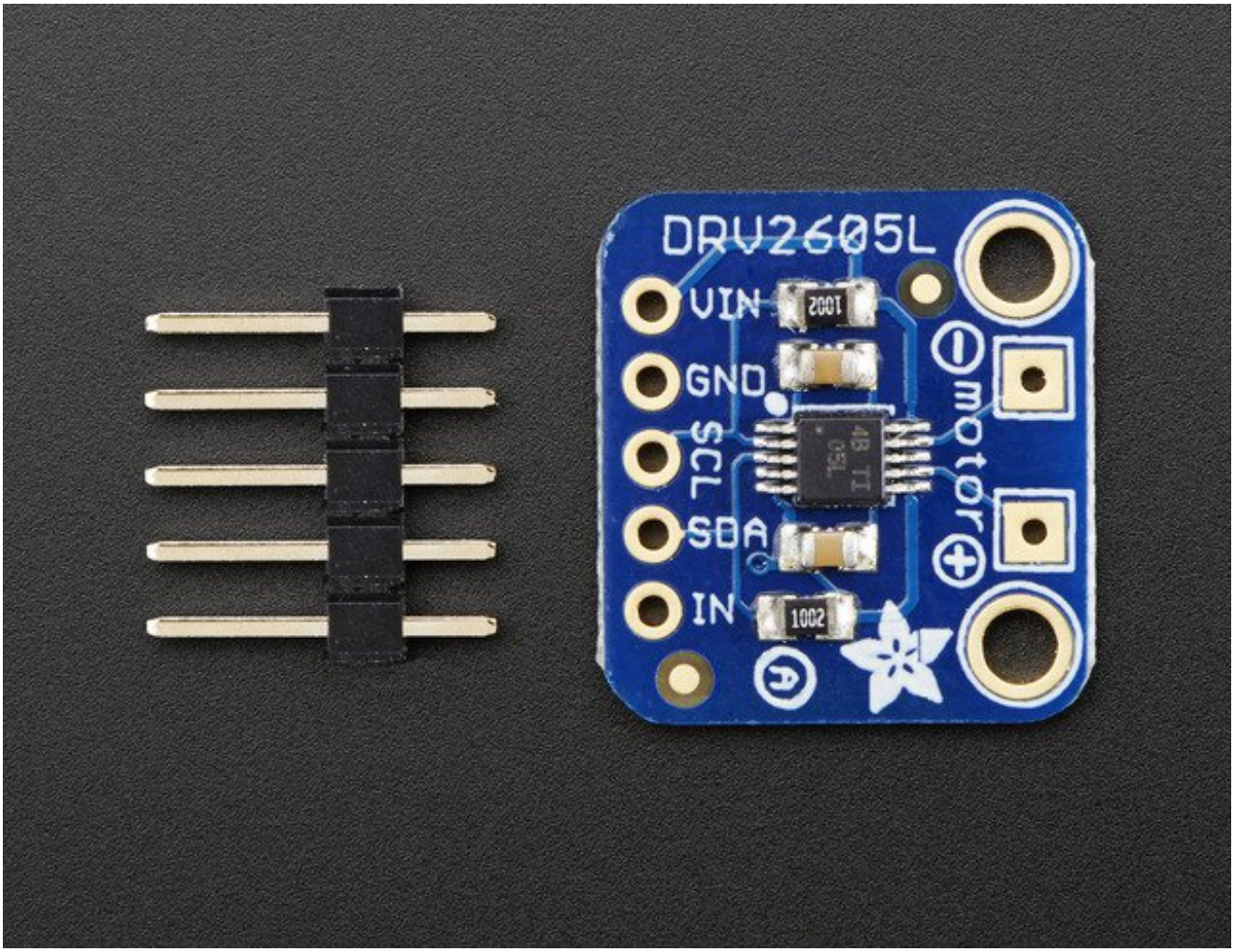
I2C Pins

- **SCL** - I2C clock pin, connect to your microcontrollers I2C clock line. This pin can be used with 3V or 5V logic, and there's a 10K pullup on this pin.
- **SDA** - I2C data pin, connect to your microcontrollers I2C data line. This pin can be used with 3V or 5V logic, and there's a 10K pullup on this pin.

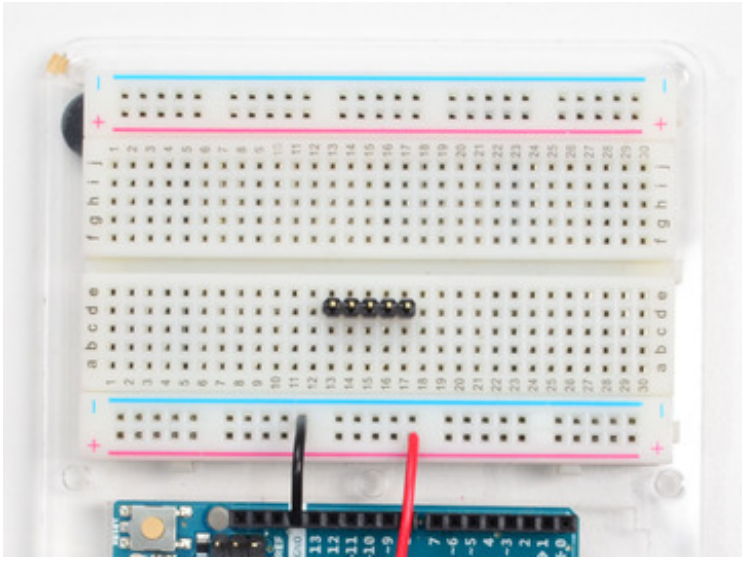
Other!

- **IN/TRIG** - This is a general purpose pin that can be used for a couple different uses. One use is to read analog audio in to control the audio-to-haptic code. Another use is to 'trigger' the effects to go rather than sending a I2C command.

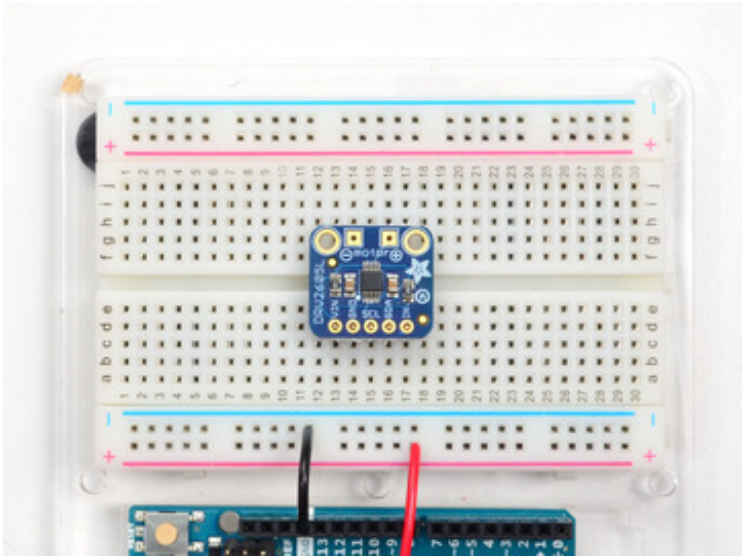
Assembly



Prepare the header strip:

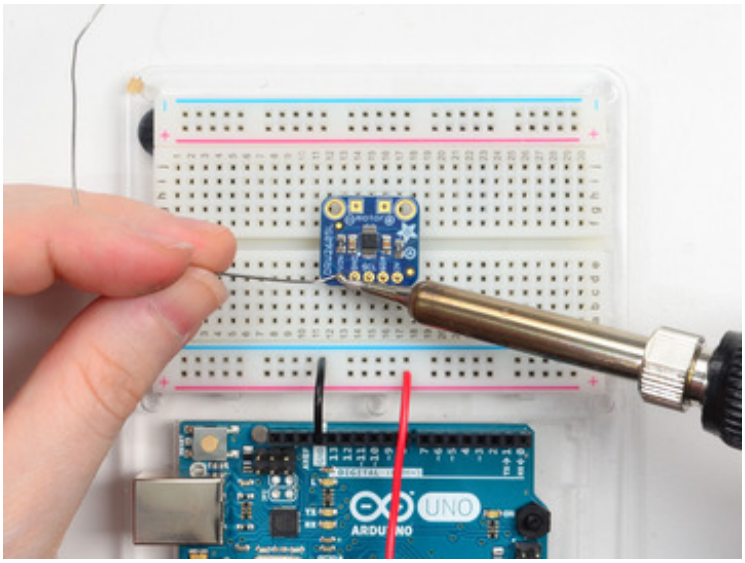
- 

Cut the strip to length if necessary. It will be easier to solder if you insert it into a breadboard - **long pins down**

- 

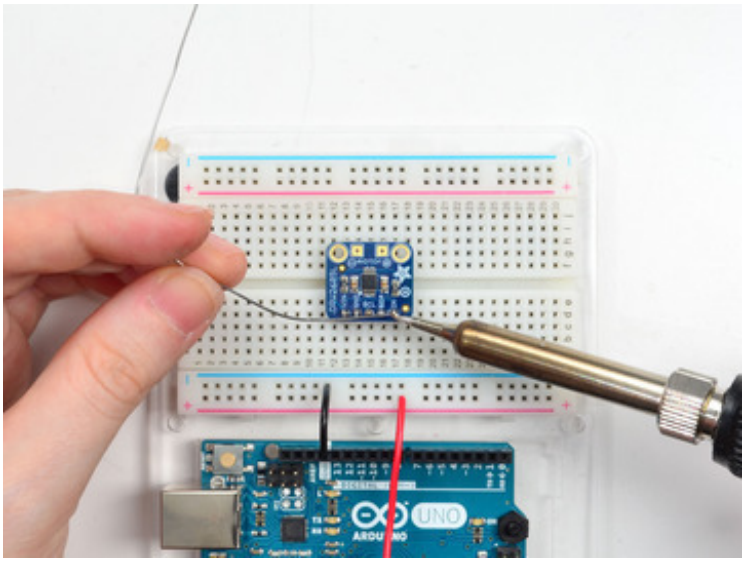
Add the breakout board:

Place the breakout board over the pins so that the short pins poke through the breakout pads

- 

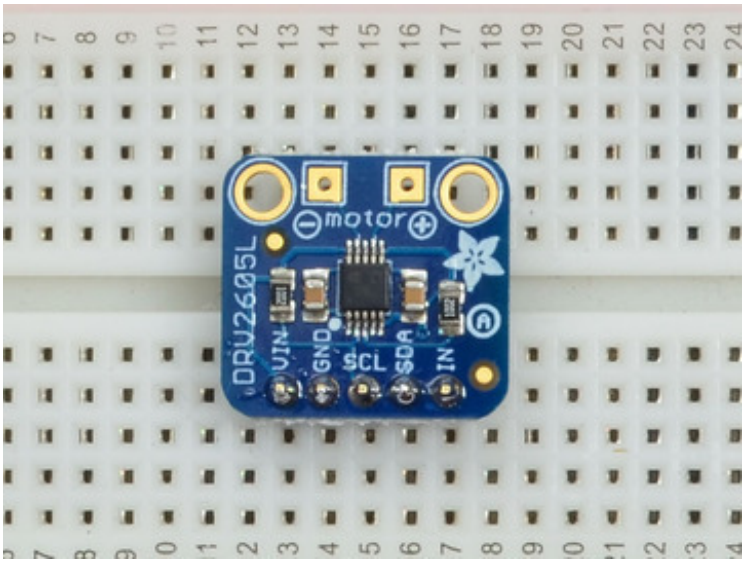
And Solder!

Be sure to solder all pins for reliable electrical contact.

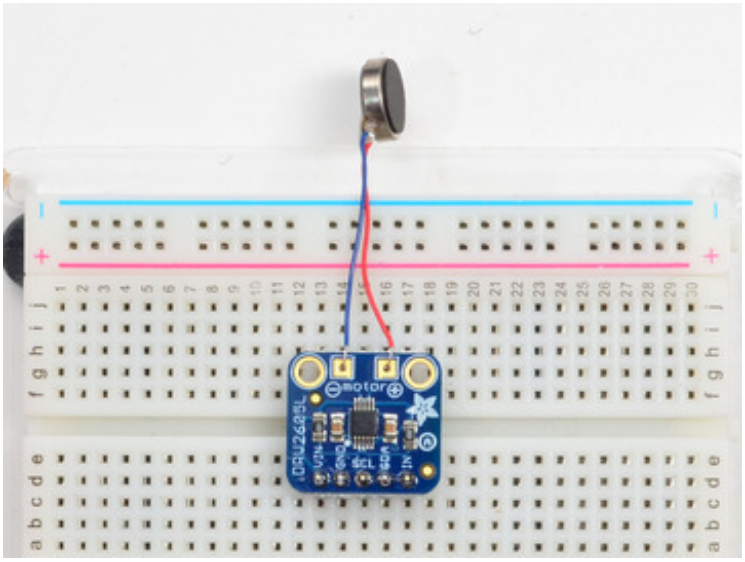
- 

Solder the longer power/data strip first

(For tips on soldering, be sure to check out our [Guide to Excellent Soldering](http://adafru.it/aTk) (http://adafru.it/aTk)).

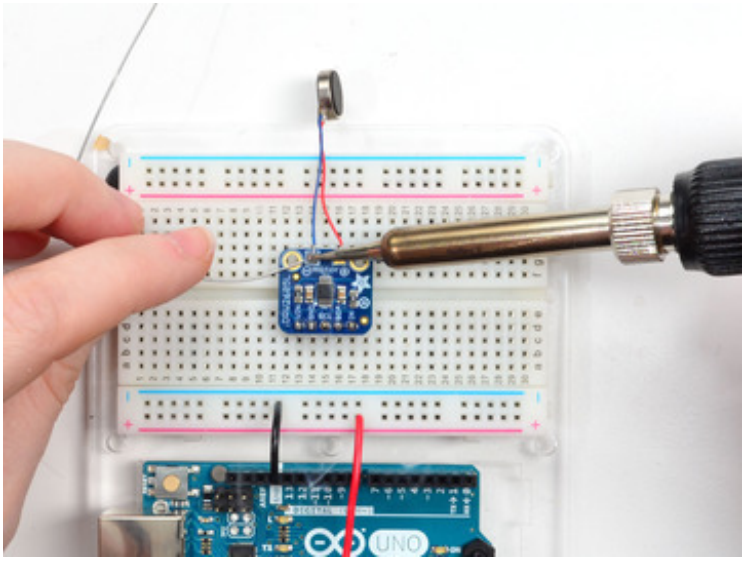


You're done! Check your solder joints visually and continue onto the next steps

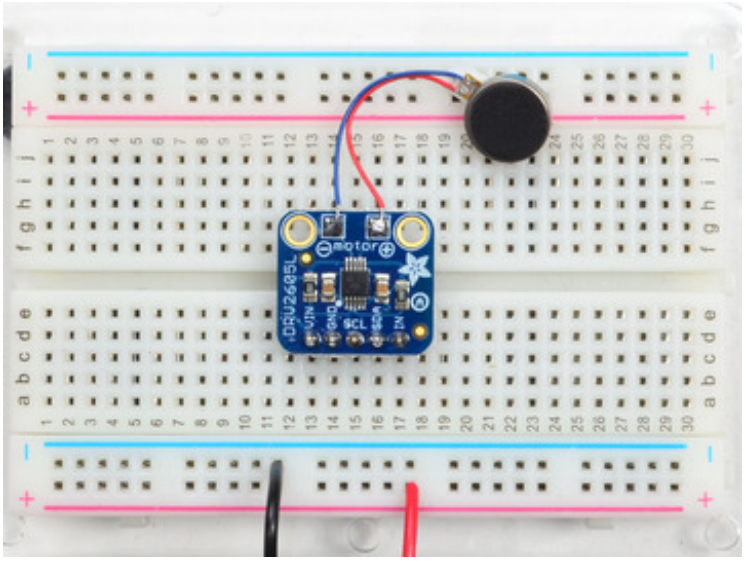


Attach Motor

We prefer to attach the little vibration motor directly to the Motor+ and Motor- pads



Solder in place

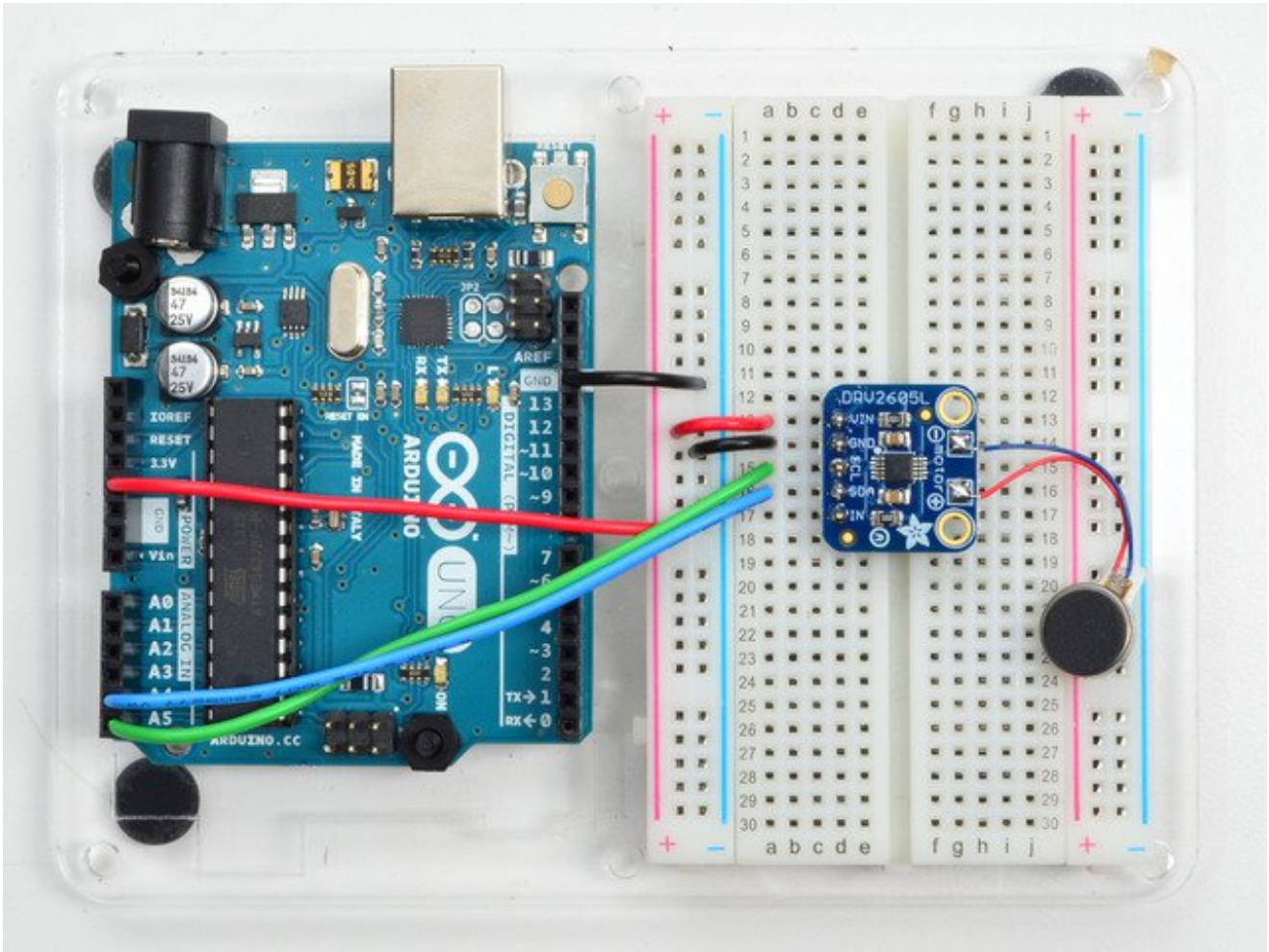
- 

Check your work and continue!

Wiring & Test

Wiring for Arduino

You can easily wire this breakout to any microcontroller, we'll be using an Arduino. For another kind of microcontroller, just make sure it has I2C capability, then port the code - its pretty simple stuff!



- Connect **Vin** to the power supply, 3-5V is fine. Use the same voltage that the microcontroller logic is based off of. For most Arduinos, that is 5V
- Connect **GND** to common power/data ground
- Connect the **SCL** pin to the I2C clock**SCL** pin on your Arduino. On an UNO & '328 based Arduino, this is also known as **A5**, on a Mega it is also known as**digital 21** and on a Leonardo/Micro, **digital 3**

- Connect the **SDA** pin to the I2C data**SDA** pin on your Arduino. On an UNO & '328 based Arduino, this is also known as **A4**, on a Mega it is also known as**digital 20** and on a Leonardo/Micro, **digital 2**

Download Adafruit_DRV2605

To begin controling the motor chip, you will need todownload the Adafruit_DRV2605 Library from our github repository (http://adafru.it/eh0). You can do that by visiting the github repo and manually downloading or, easier, just click this button to download the zip

Download Adafruit_DRV2605 Library
http://adafru.it/eh1

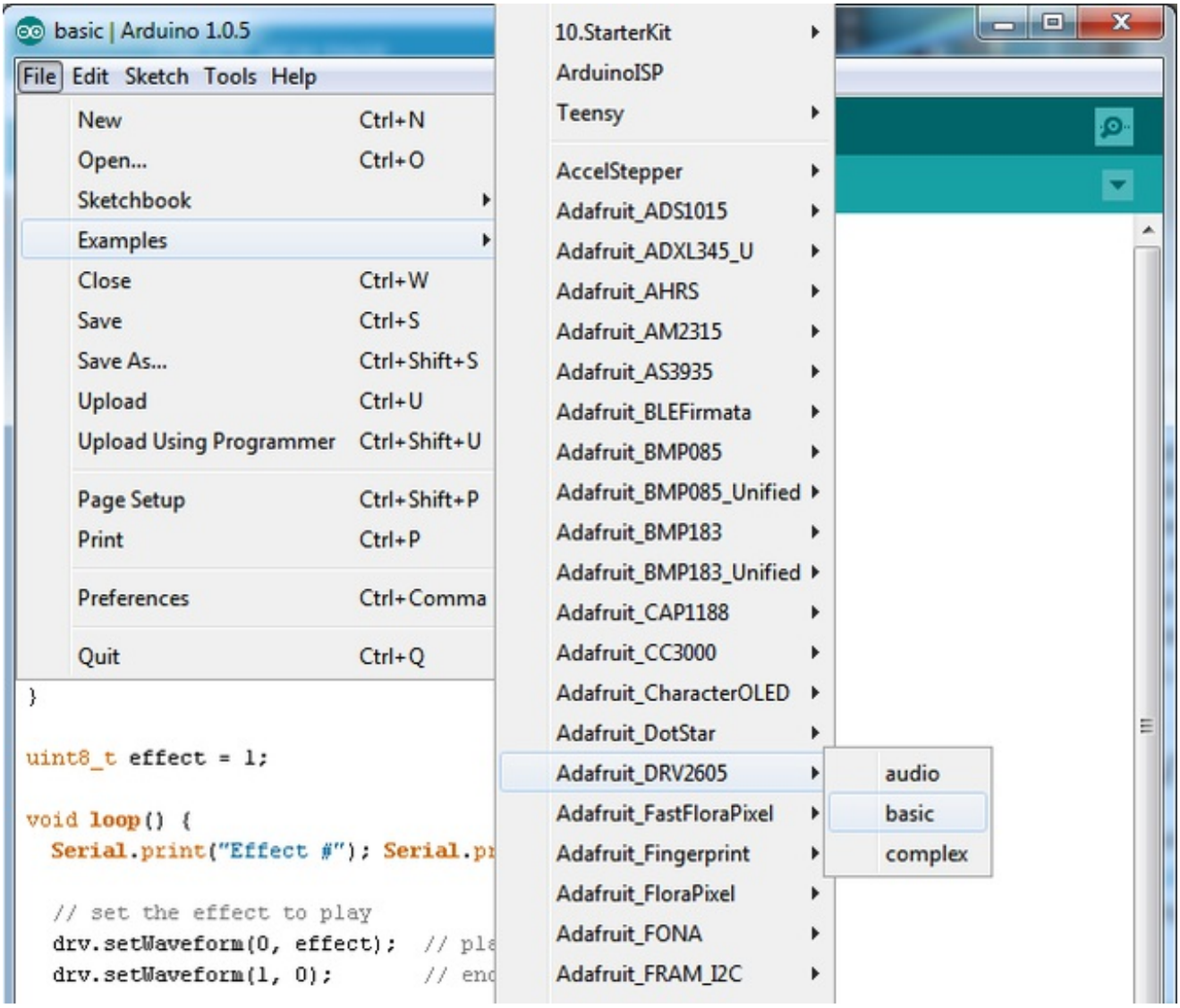
Rename the uncompressed folder **Adafruit_DRV2605** and check that the **Adafruit_DRV2605** folder contains **Adafruit_DRV2605.cpp** and **Adafruit_DRV2605.h**

Place the **Adafruit_DRV2605** library folder your **arduinosketchfolder/libraries/** folder. You may need to create the**libraries** subfolder if its your first library. Restart the IDE.

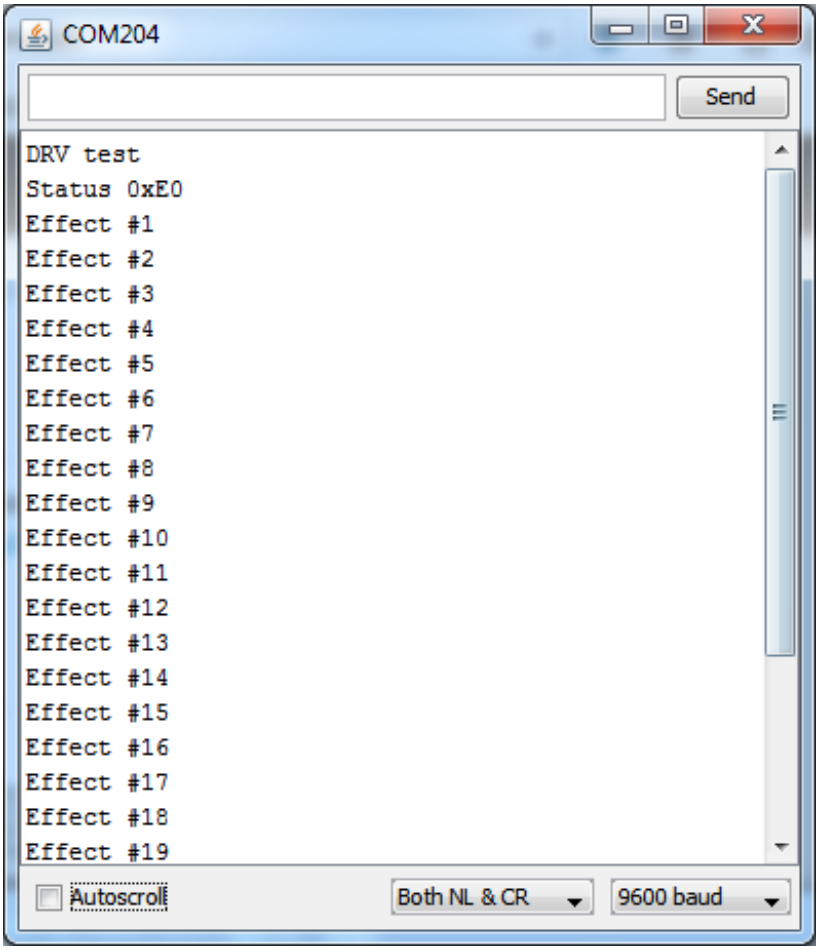
We also have a great tutorial on Arduino library installation at:
http://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use (http://adafru.it/aYM)

Load Demo Sketch

Now you can open up **File->Examples->Adafruit_DRV2605->basic** and upload to your Arduino wired up to the breakout



Open up the serial console and hold the vibration motor between your fingers.



The sketch will play all 117 built in vibration effects in order.The full list with names is available in the DRV2605 datasheet (http://adafru.it/eh2)

Here's a screenshot for quick reference

11.2 Waveform Library Effects List

EFFECT ID NO.	WAVEFORM NAME	EFFECT ID NO>	WAVEFORM NAME	EFFECT ID NO.	WAVEFORM NAME
1	Strong Click - 100%	42	Long Double Sharp Click Medium 2 – 80%	83	Transition Ramp Up Long Smooth 2 – 0 to 100%
2	Strong Click - 60%	43	Long Double Sharp Click Medium 3 – 60%	84	Transition Ramp Up Medium Smooth 1 – 0 to 100%
3	Strong Click - 30%	44	Long Double Sharp Tick 1 – 100%	85	Transition Ramp Up Medium Smooth 2 – 0 to 100%
4	Sharp Click - 100%	45	Long Double Sharp Tick 2 – 80%	86	Transition Ramp Up Short Smooth 1 – 0 to 100%
5	Sharp Click - 60%	46	Long Double Sharp Tick 3 – 60%	87	Transition Ramp Up Short Smooth 2 – 0 to 100%
6	Sharp Click - 30%	47	Buzz 1 – 100%	88	Transition Ramp Up Long Sharp 1 – 0 to 100%
7	Soft Bump - 100%	48	Buzz 2 – 80%	89	Transition Ramp Up Long Sharp 2 – 0 to 100%
8	Soft Bump - 60%	49	Buzz 3 – 60%	90	Transition Ramp Up Medium Sharp 1 – 0 to 100%
9	Soft Bump - 30%	50	Buzz 4 – 40%	91	Transition Ramp Up Medium Sharp 2 – 0 to 100%
10	Double Click - 100%	51	Buzz 5 – 20%	92	Transition Ramp Up Short Sharp 1 – 0 to 100%
11	Double Click - 60%	52	Pulsing Strong 1 – 100%	93	Transition Ramp Up Short Sharp 2 – 0 to 100%
12	Triple Click - 100%	53	Pulsing Strong 2 – 60%	94	Transition Ramp Down Long Smooth 1 – 50 to 0%
13	Soft Fuzz - 60%	54	Pulsing Medium 1 – 100%	95	Transition Ramp Down Long Smooth 2 – 50 to 0%
14	Strong Buzz - 100%	55	Pulsing Medium 2 – 60%	96	Transition Ramp Down Medium Smooth 1 – 50 to 0%
15	750 ms Alert 100%	56	Pulsing Sharp 1 – 100%	97	Transition Ramp Down Medium Smooth 2 – 50 to 0%
16	1000 ms Alert 100%	57	Pulsing Sharp 2 – 60%	98	Transition Ramp Down Short Smooth 1 – 50 to 0%
17	Strong Click 1 - 100%	58	Transition Click 1 – 100%	99	Transition Ramp Down Short Smooth 2 – 50 to 0%
18	Strong Click 2 - 80%	59	Transition Click 2 – 80%	100	Transition Ramp Down Long Sharp 1 – 50 to 0%
19	Strong Click 3 - 60%	60	Transition Click 3 – 60%	101	Transition Ramp Down Long Sharp 2 – 50 to 0%
20	Strong Click 4 - 30%	61	Transition Click 4 – 40%	102	Transition Ramp Down Medium Sharp 1 – 50 to 0%
21	Medium Click 1 - 100%	62	Transition Click 5 – 20%	103	Transition Ramp Down Medium Sharp 2 – 50 to 0%
22	Medium Click 2 - 80%	63	Transition Click 6 – 10%	104	Transition Ramp Down Short Sharp 1 – 50 to 0%
23	Medium Click 3 - 60%	64	Transition Hum 1 – 100%	105	Transition Ramp Down Short Sharp 2 – 50 to 0%
24	Sharp Tick 1 - 100%	65	Transition Hum 2 – 80%	106	Transition Ramp Up Long Smooth 1 – 0 to 50%
25	Sharp Tick 2 - 80%	66	Transition Hum 3 – 60%	107	Transition Ramp Up Long Smooth 2 – 0 to 50%
26	Sharp Tick 3 – 60%	67	Transition Hum 4 – 40%	108	Transition Ramp Up Medium Smooth 1 – 0 to 50%
27	Short Double Click Strong 1 – 100%	68	Transition Hum 5 – 20%	109	Transition Ramp Up Medium Smooth 2 – 0 to 50%
28	Short Double Click Strong 2 – 80%	69	Transition Hum 6 – 10%	110	Transition Ramp Up Short Smooth 1 – 0 to 50%
29	Short Double Click Strong 3 – 60%	70	Transition Ramp Down Long Smooth 1 – 100 to 0%	111	Transition Ramp Up Short Smooth 2 – 0 to 50%
30	Short Double Click Strong 4 – 30%	71	Transition Ramp Down Long Smooth 2 – 100 to 0%	112	Transition Ramp Up Long Sharp 1 – 0 to 50%
31	Short Double Click Medium 1 – 100%	72	Transition Ramp Down Medium Smooth 1 – 100 to 0%	113	Transition Ramp Up Long Sharp 2 – 0 to 50%
32	Short Double Click Medium 2 – 80%	73	Transition Ramp Down Medium Smooth 2 – 100 to 0%	114	Transition Ramp Up Medium Sharp 1 – 0 to 50%
33	Short Double Click Medium 3 – 60%	74	Transition Ramp Down Short Smooth 1 – 100 to 0%	115	Transition Ramp Up Medium Sharp 2 – 0 to 50%
34	Short Double Sharp Tick 1 – 100%	75	Transition Ramp Down Short Smooth 2 – 100 to 0%	116	Transition Ramp Up Short Sharp 1 – 0 to 50%

Multiple Waveforms

You can also string together multiple effects in a row, up to 7. Check out the **complex** example sketch, and setWaveform for each slot. The last slot should be set to 0 to indicate its the end.

When you are ready to place the full waveform sequence, send the **go()** command!

Audio

You can also turn the DRV2605 into an audio-to-vibration driver. Use a 1uF capacitor in series to line level voltage audio into the **IN** pin, then load up the **audio** example sketch. If you don't feel anything, try boosting up the source audio volume, it has to be pretty loud!

Downloads

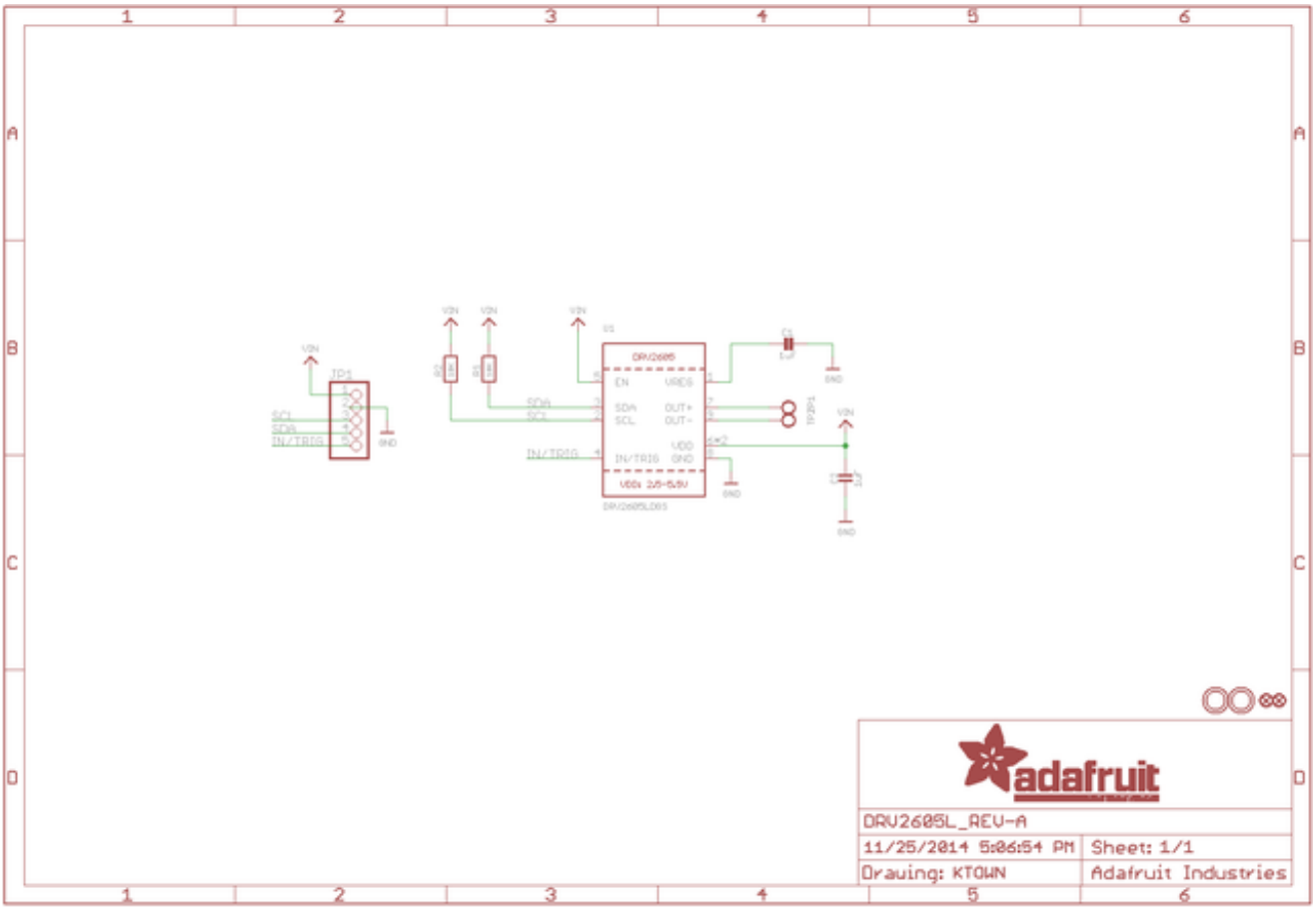
- EagleCAD PCB files on GitHub (http://adafru.it/oEt)
- Fritzing object in the Adafruit Fritzing Library (http://adafru.it/aP3)

Datasheets

- DRV2605 Datasheet (http://adafru.it/eh2)

Schematic

Click to embiggen



Fabrication print

Dimensions in Inches