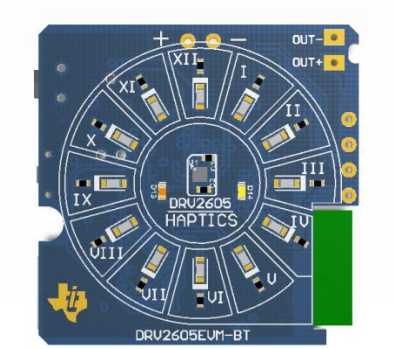
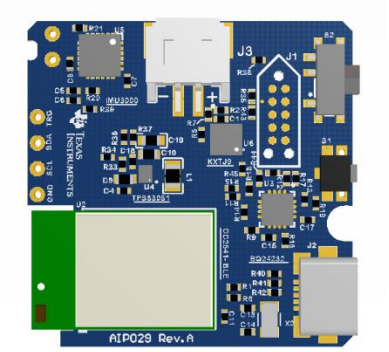
DRV2605EVM-BT Test Report

ABSTRACT

The DRV2605EVM-BT is a Bluetooth low energy controlled DRV2605 evaluation kit for prototyping and integrating haptics. This document briefly describes the output of the DRV2605EVM-BT.





Document History

Version	Date	Author	Notes
1.0	June 2014	B. Burk, G. Ramachandran	First release
2.0	October 2014	B. Burk	Updated App Menu Screen

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Contents

Figures

Tables

Bench Setup

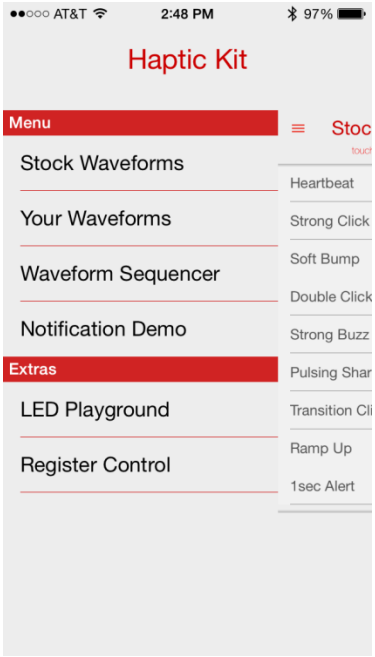
The DRV2605EVM-BT was measured on the bench with the linear resonant actuator mounted to a 100g aluminum block as shown in the figure below. Below the metal block is a silicone gel block, which allows the metal block to vibrate without being interrupted by the solid table surface below.

Lab Bench Setup

The acceleration was measured using an accelerometer that converts peak voltage to acceleration equal to 57mVp = 1Gp.

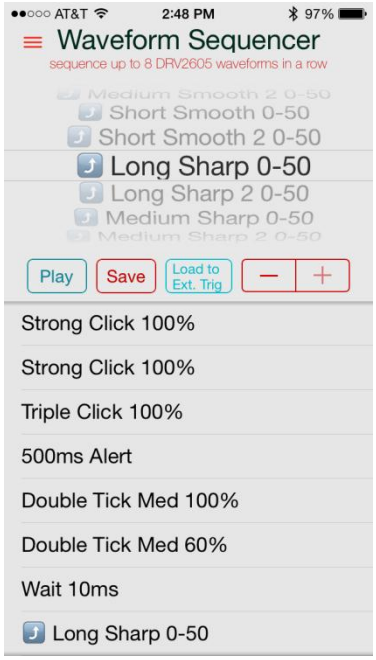
iOS App Setup

The Haptic Bluetooth Kit iOS app was used to control the DRV2605. See the Haptic Bluetooth Kit User's Guide for more information on connecting the app to the board.



App – Menu Screen

App – Stock Waveforms



App – Waveform Sequencer

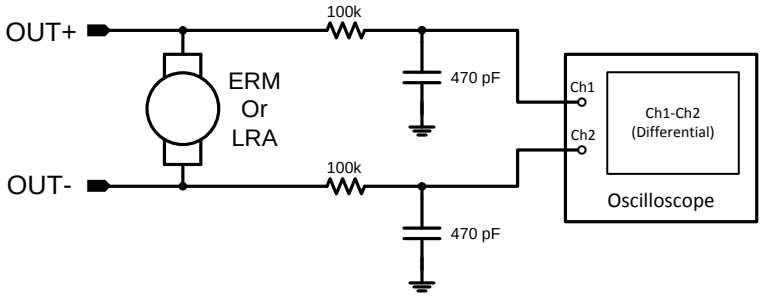
Graphs

The graphs in this document show three measurements: output voltage, supply current, and acceleration.

Table 1. Measurement Conditions

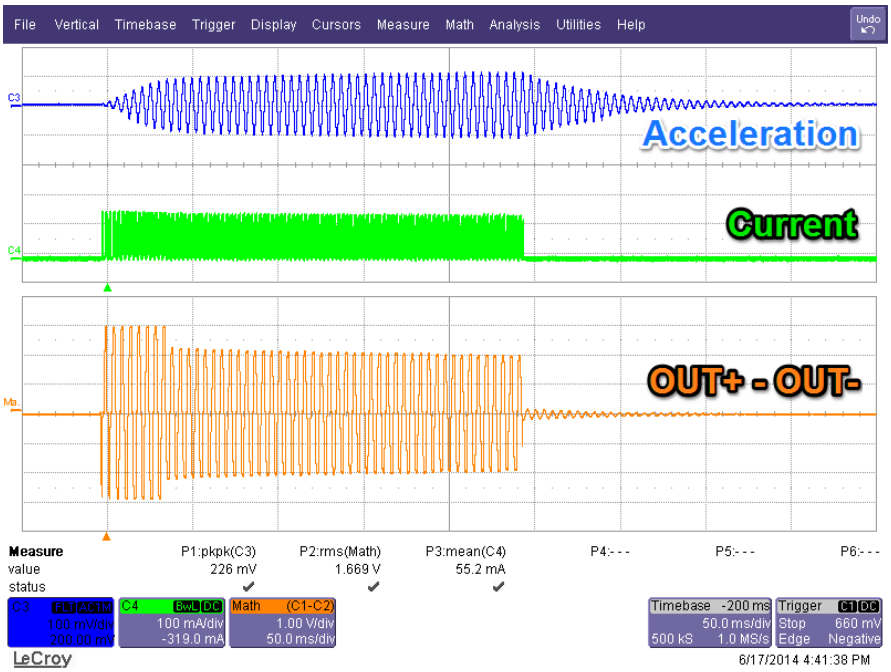
Measurement	Unit
Output Voltage	V_{rms}
Supply Current	A
Acceleration	mV_p

- Output Voltage is the differential output between OUT+ and OUT-. In the oscilloscope plots a low pass filter was used so that the underlying waveform could be identified easily.



DRV2605EVM-BT Measurements with Low Pass Filter

- Supply Current – the supply current was measured using an inductive current sensor.
- Acceleration – the accelerometer was used to obtain a quantifiable measure of acceleration. The accelerometer converts 1G of peak acceleration to 57mV of peak voltage. This means that if the oscilloscope show 114mV at the peak of the acceleration waveform then the acceleration is equal to 2G = 114mVp / 2. G represents the unit of gravity.



Oscilloscope Labels

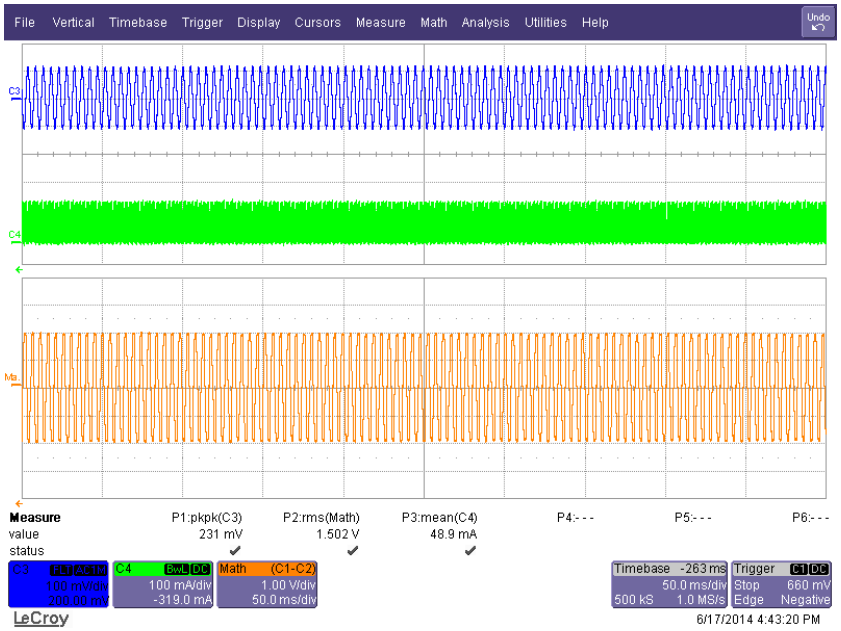
Haptic Waveforms

The sections below describe various waveforms and sequences that can be created using the DRV2605EVM-BT.

Effect – Alert

The alert waveform is a long buzz waveform used for alerting users. This is similar to a silent alert on a mobile phone.

Output Voltage	Acceleration	Supply Current (Avg.)
1.5 Vrms	2.02 G	48.9 mA

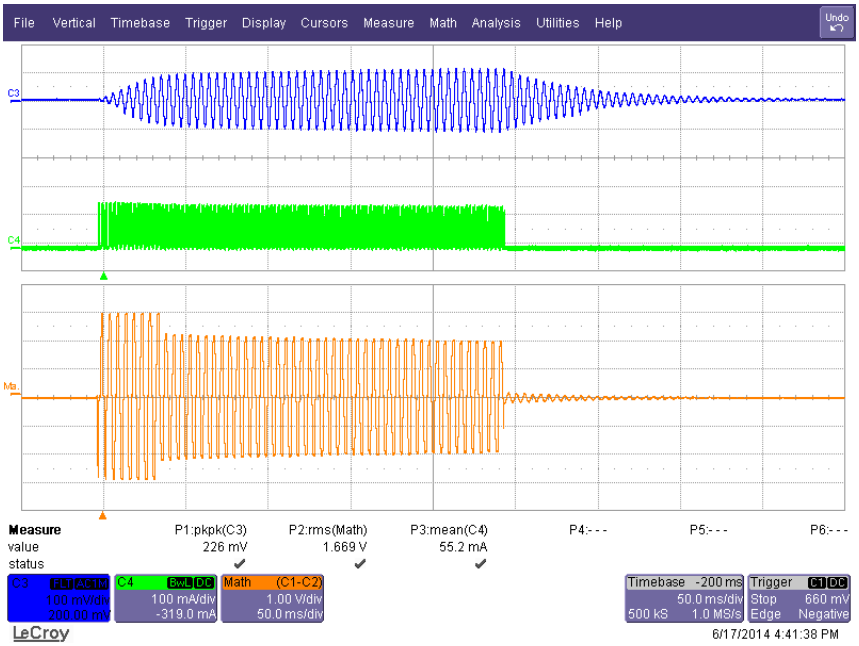


DRV2605 Alert Effect

Effect – Buzz

The buzz waveform is a short version of the alert. Notice the overdrive at the beginning of the output voltage waveform. This helps the actuator reach peak acceleration quick.

Output Voltage	Acceleration	Supply Current (Avg.)	Duration	Energy Consumption
1.67 Vrms	1.98 G	55.2 mA	240 ms	3.68 uAh



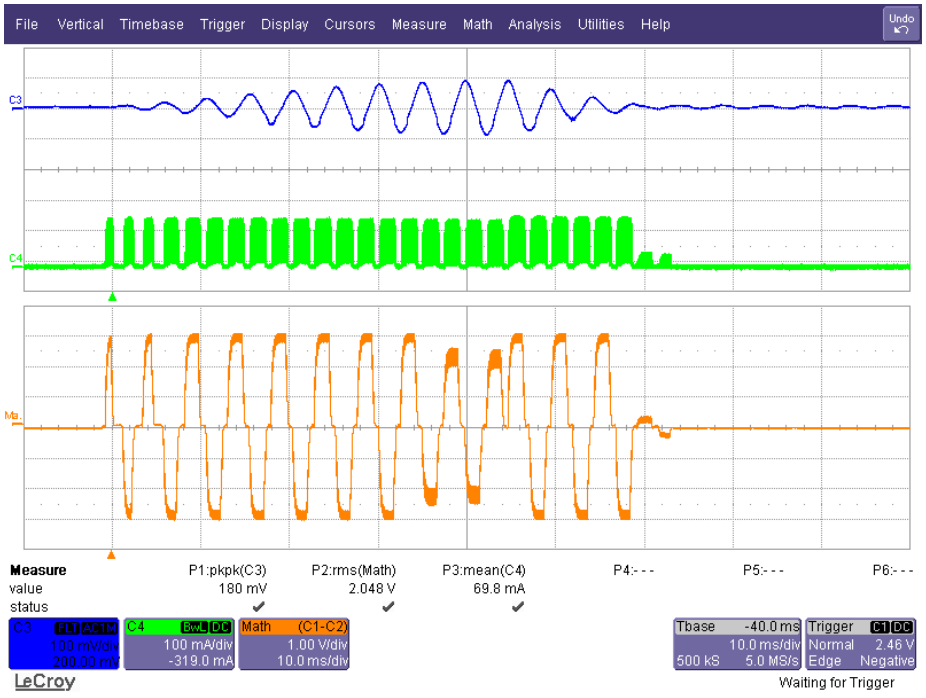
DRV2605 Buzz 1 Effect

Effect – Strong Click

The strong click waveform can be used to create feedback when a button is pressed or an action is triggered in an end application.

Notice that the acceleration is not as high as the buzz. This is a result of the short duration waveform. This is perfectly acceptable for a click. The DRV2605 overdrive feature helps speed the startup time of the actuator by applying a higher voltage at the beginning.

Output Voltage	Acceleration	Supply Current (Avg.)	Duration	Energy Consumption
2.05 Vrms	1.58 G	69.8 mA	60 ms	1.16 uAh

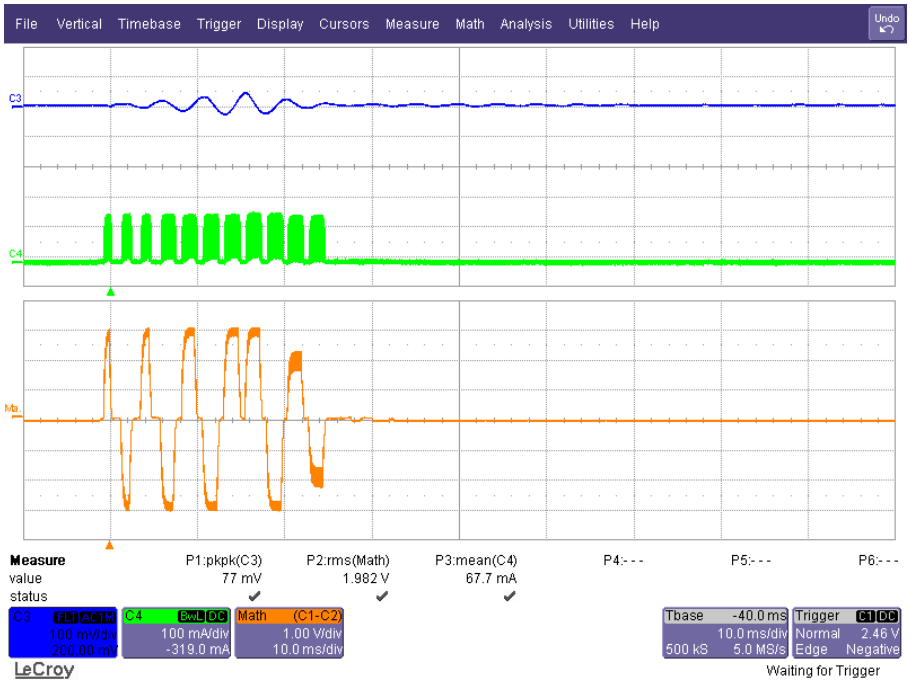


DRV2605 Strong Click Effect

Effect – Sharp Tick 100%

Sharp tick is similar to the Strong Click except the duration of the waveform is about half. This will result in a much sharp, but less powerful click.

Output Voltage	Acceleration	Supply Current (Avg.)	Duration	Energy Consumption
1.98 Vrms	0.68 G	67.7 mA	25 ms	0.47 uAh

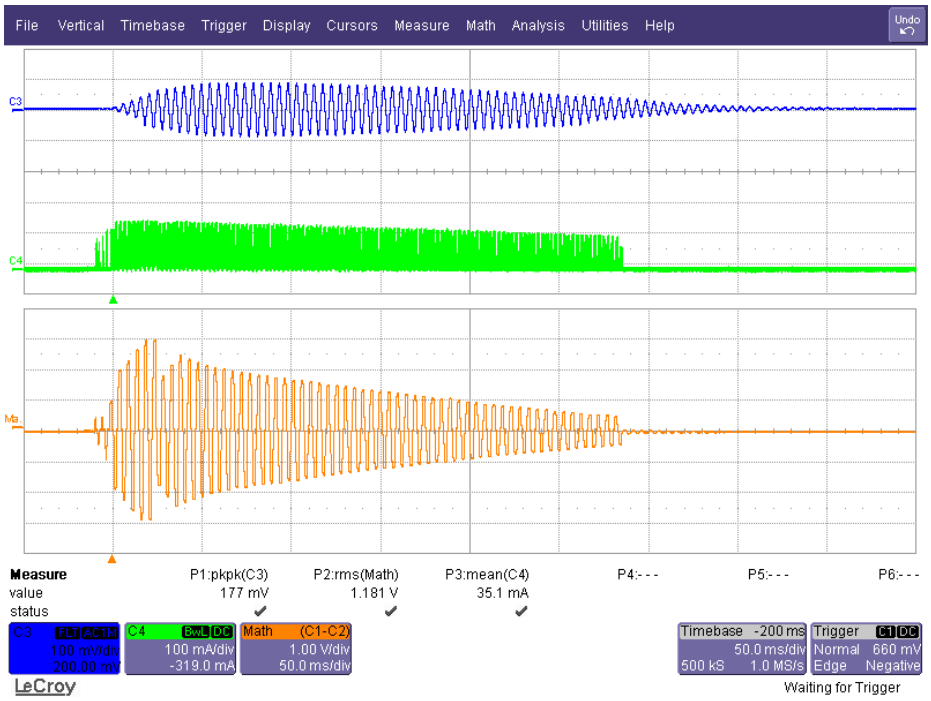


DRV2605 Sharp Tick 100% Effect

Effect – Transition Ramp Down Short Smooth 1 – 100 %

The waveform below shows a ramp down (also known as a transition).

Output Voltage	Acceleration	Supply Current (Avg.)	Duration	Energy Consumption
1.18 Vrms	1.55 G	35.1 mA	275 ms	2.68 uAh



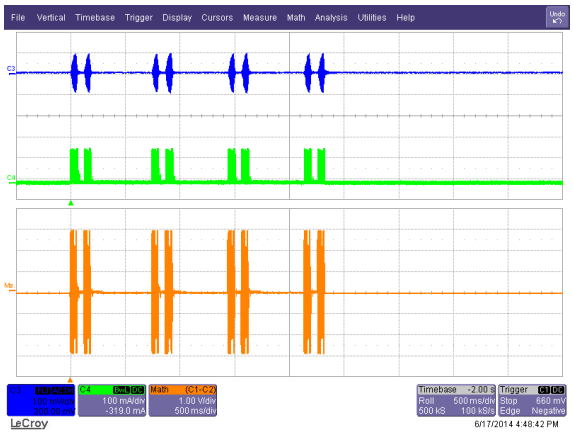
DRV2605 Transition Ramp Down Short Smooth 1-100%

Effect Sequence – Heart Beat

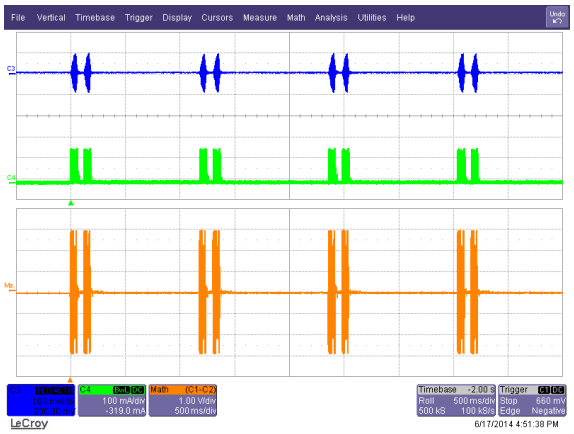
The Heart Beat in the Stock Waveforms section of the iOS app is a sequence of effects. The Heart Beat effect is a combination of double click effects with different timing intervals depending on the beats per minute selected.

Heartbeat Waveform Control in iOS App

The graphs below show two different speeds of the heart beat effect. The image on the left shows a double click every 510 millisecond and the image on the right shows a double click every 1 second.



Heart Beat every 510ms



Heart Beat every 1ms

The DRV2605 can control the timing between effects and even allows the use of different timing within the same sequence. The image below shows the timing was changed between four double click effects.

Heart Beat Transition

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