

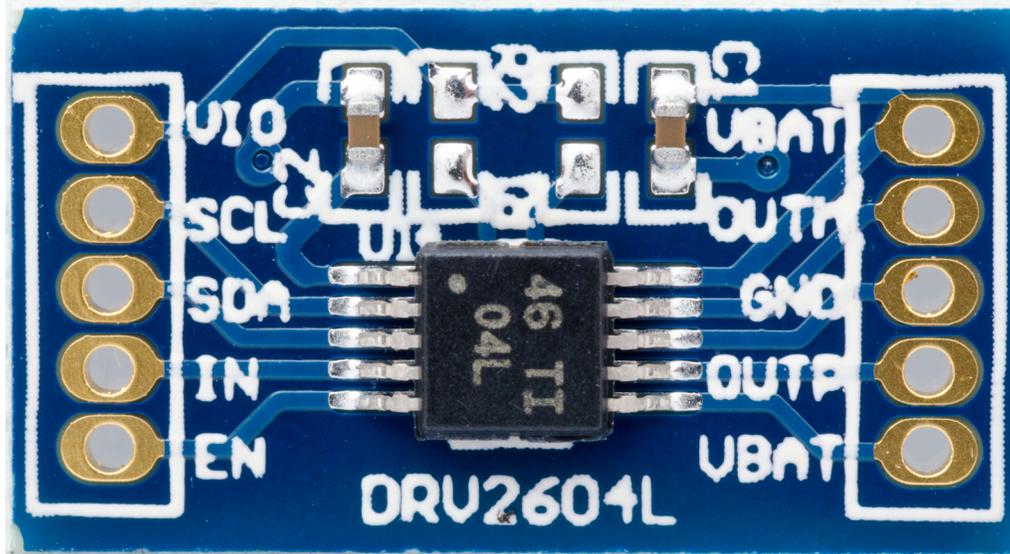
## **DRV2604LDGS Haptic Driver Mini Board**

The DRV2604L is a haptic driver designed for linear resonant actuators (LRA) and eccentric rotating mass (ERM) motors. It provides many features, which help eliminate the design complexities of haptic motor control including:

- Reduced solution size
- High-efficiency output drive
- Closed-loop motor control
- Quick device startup
- Embedded waveform library
- Auto-resonance frequency tracking

The DRV2604LDGSEVM-M is a breakout board that allows the user to gain access to each pin of the MSOP package type for quick evaluation of haptic driver. The board must be paired with a processor, microcontroller, MSP430 launchpad, or a DRV2604 EVM-CT to control the driver through I<sup>2</sup>C commands.

The user guide contains instructions to setup and operate the DRV2604LDGSEVM-M.



Evaluation Kit Contents:

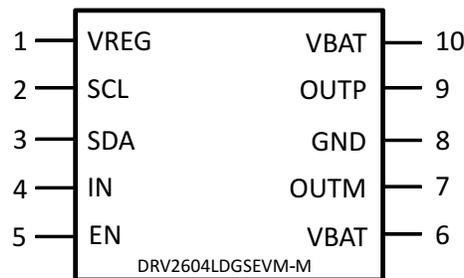
- DRV2604LDGSEVM-M breakout board

## 1 Overview

The DRV2604LDGSEVM-M is a breakout board that allows the user to have access to all of the pins on the DRV2604L MSOP package type. [Figure 1](#) shows the pin out of the part.

**NOTE:** The pin out of the part does not correspond directly to the pin out of the headers. VREG is replaced by VIO on the headers. All other header pins correspond to part pin out.

The board includes decoupling capacitors of 1  $\mu\text{F}$  on the VBAT and VREG pins. The 50 mil pitched headers and resistors R1 and R2 are not populated. Resistor pads R1 and R2 are included on the SCL and SDA lines if I<sup>2</sup>C pull-up resistors are required. The voltage level must be applied to the VIO header pin, and match the IO voltage of the host processor or microcontroller. To operate the DRV2604L, it must be paired with a processor, microcontroller, MSP430 launchpad, or a DRV2604LEVM-CT.

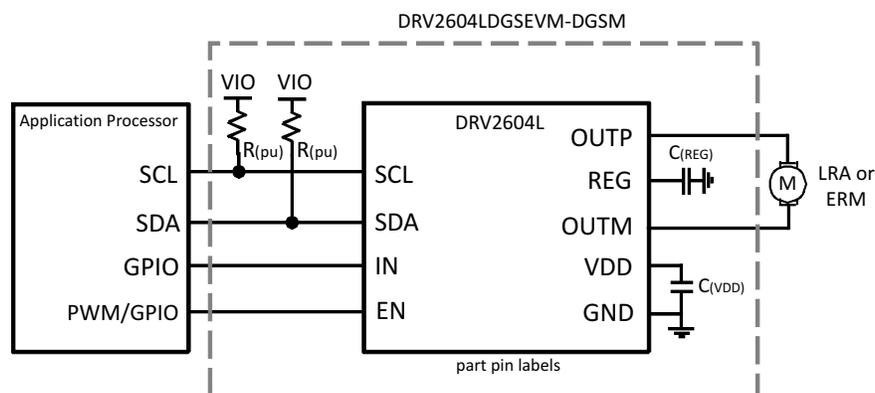


**Figure 1. Pin Out of the DRV2604LDGSEVM-M**

## 2 Typical Application

The typical application for a haptic driver is in a touch-enabled system that already has an application processor which makes the decision on when to execute haptic effects. The DRV2604L device can be used fully with I<sup>2</sup>C communications (either using RTP or the memory interface). A system designer can choose to use external triggers to play low-latency effects (such as from a physical button) or can decide to use the PWM interface. [Figure 2](#) shows a typical haptic system implementation. The system designer should not use the internal regulator (REG) to power any external load. The gray dashed box represents the components that are already integrated on to the DRV2604LDGSEVM-M.

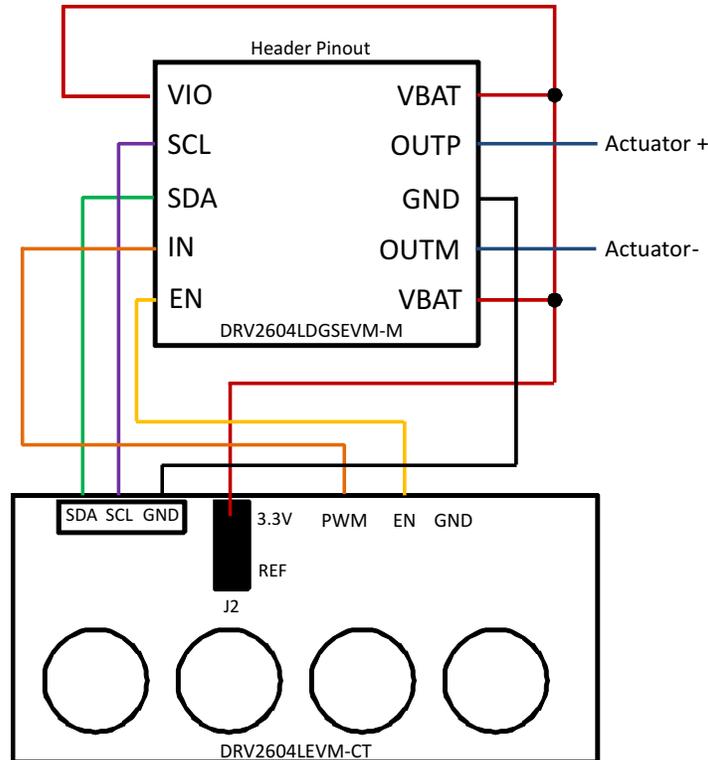
**NOTE:** The pull-up resistors R1 and R2 are not populated but can be added to the DRV2604LDGSEVM-M if there are no other pull-up resistors on the I<sup>2</sup>C bus lines in the system.



**Figure 2. I<sup>2</sup>C Control with Optional PWM Input or External Trigger**

### 3 Setup and Operation with a DRV2604LEVM-CT

This section describes how to setup and operate the DRV2604LDGSEVM-M with either the DRV2604LEVM-CT board. The "non-L" version of the EVM-CT boards can be used in place of the "L" version but the firmware needs to be updated to the "L" version. [Figure 3](#) shows the connection of the breakout board to the DRV2604LEVM-CT board.



**Figure 3. DRV2604LDGSEVM-M Connection to DRV2604LEVM-CT**

1. Connect the DRV2604LDGSEVM-M to the DRV2604LEVM-CT with IC test hook lead cables as shown in [Figure 3](#). If VIO header pin is not being used, it can be left floating. Connect a separate actuator to the OUTP and OUTM headers of the DRV2604LDGSEVM-M.
2. Make sure that the DRV2604LEVM-CT has the jumpers connected properly as shown in [Table 1](#).
3. Connect the mini-USB cable to the USB connector on the DRV2604LEVM-CT board.
4. Connect the other end of the USB cable to an available USB port on a computer.
5. If the DRV2604LEVM-CT is powered correctly, the four colored LEDs will turn on, the four mode LEDs will flash, and the LRA and ERM will perform auto-calibration, indicating the board has been successfully initialized.
6. Next, press buttons B1, B2, B3, and B4 observe that there is a different vibration on each.
7. If the vibrations are felt on the separate actuator (coming off from the EVM-M), then the breakout board is working properly.

**Table 1. Default Jumper Settings**

JUMPER	DEFAULT POSITION	DESCRIPTION
JP1	Shorted	Connect MSP430 GPIO or PWM output to DRV2604L IN/TRIG
JP2	Shorted	3.3V – reference for I <sup>2</sup> C
JP3, JP4	Shorted	Connect on-board actuators to DRV2604L
MSP	USB to MSP	Select USB (5V) or VBAT power for the MSP430
DRV	USB to DRV	Select USB (5V) or VBAT power for the DRV2604L

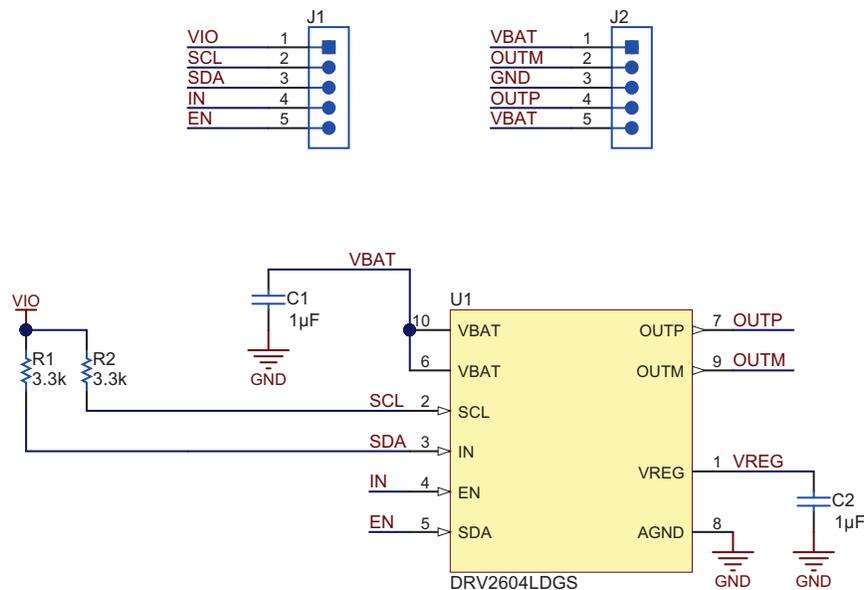
To program the DRV2604LEVM-CT and to gain more information on the demonstration and advanced featured modes that is possible with the DRV2604LEVM-CT.

#### 4 Bill of Materials

**Table 2. DRV2604L BOM**

Designator	Quantity	Value	Part Number	Description	Package	Manufacturer
C1, C2	2	1uF	C1005X5R1E105K050BC	CAP, CERM, 1uF, 25V, +/-10%, X5R, 0402	0402	TDK
U1	1		DRV2604LDGS	DRV2604LDGS, DGS0010A	DGS0010A	Texas Instruments
J1, J2	0		GRP051VWVN-RC	Header, 5x1, 50mil, Gold, TH	Header, 50mil, 5x1, TH	Sullins Connector Solutions
R1, R2	0	3.3k	CRCW04023K30JNED	RES, 3.3k ohm, 5%, 0.063W, 0402	0402	Vishay-Dale

#### 5 Schematic



**Figure 4. Schematic for the DRV2604LDGSEVM-M**

6 Layout

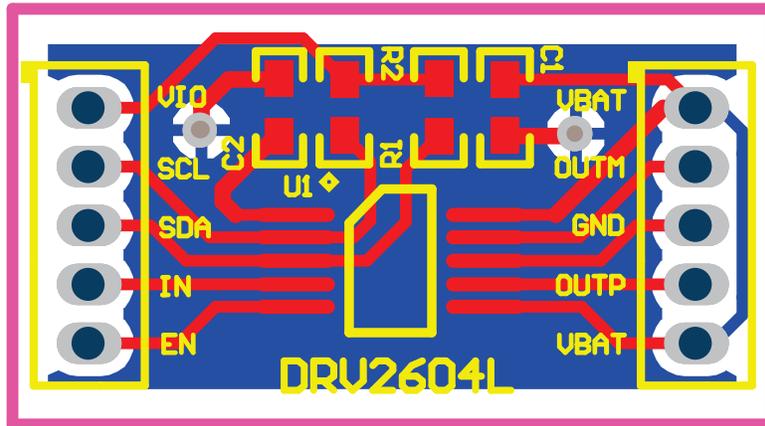


Figure 5. X-Ray View of Top (Red) and Bottom (Blue) Layers

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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2. Use EVMs only after user obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after user obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless user gives the same notice above to the transferee. Please note that if user does not follow the instructions above, user will be subject to penalties of Radio Law of Japan.

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