TEXAS INSTRUMENTS

Haptic Solutions for Industrial Applications

Bring the consumer touch experience to industrial controls

Touch interface trends

As industrial human machine interfaces (HMI) start to develop more tablet-like control panels, the number of touch screens used in industrial applications is increasing. By using reliable touch interfaces, failure-prone moving parts can be removed, and moisture resistance is improved. Some of the industrial applications that have started to use more touch interfaces include point-of-sale devices, data terminals, ATMs, large home appliances, home automation systems, as well as industrial manufacturing machinery. Generally, these applications have control panels that provide visual and/or audible feedback. This can be a problem for individuals that are hearing impaired or individuals that are not used to using touch interfaces. By introducing tactile feedback to touch interfaces in these applications, users gain extra confidence that their input was received by the device, and task completion times are reduced. This ultimately increases the user's overall experience and the HMI system's efficiency.

Where does TI come in?

To include tactile feedback in industrial HMIs, haptic technology can be used. Haptics, by definition, refers to the sense of touch and is a technology that adds tactile feedback to electronic devices through the use of vibrations. Haptics can help emphasize the feeling of precision in touch controls. In addition, haptics can give that "mechanical-like" feel to a touch screen.

Texas Instruments offers a complete line of haptic drivers which have the ability to drive eccentric rotating mass (ERM), linear resonant actuator (LRA), and piezoelectric actuators. TI's haptic drivers have the ability to provide high quality haptic feedback that is consistent across time, environmental conditions and unit variations. This allows for maximum impact to the user. Within TI's haptic drivers is the ability to generate the waveform as well. With TI's haptic drivers you can add that extra sensory element that is missing in modern day touch interfaces.

Visit www.ti.com/haptics for more information.

7” Haptic Touch Module

- TI DRV8601
- Provides haptic effects through an industrial-grade ERM actuator
- 7” floating-screen LCD
- Produces localized haptics

LCD Thermostat/ Building Automation Panel

- Shows ‘floating screen’ haptics
- Provides haptic effects using TI haptics driver
- Multiple GUI apps show different usage cases
- Android based

Home Automation/Thermostat

Refrigerator Panel

Haptic Drivers

Device	Description	V_{OUT} (Max) (V)	Input Signal	I_Q (Typ) (mA)	Startup Time (ms)	Haptic Actuator Type	V_S (Max) (V)	V_S (Min) (V)	Operating Temp Range (°C)	Package	Price*
DRV2605L	Haptic Driver for ERM/LRA with Built-In Library and Smart Loop Architecture	5.5	I²C, PWM, Analog	0.5	0.7	ERM, LRA	5.2	2	-40 to 85	10VSSOP, 9DSBGA	1.65
DRV2604L	Low Voltage Haptic Driver for ERM and LRA with Internal Memory and Smart Loop Architecture	5.5	I²C, PWM, Analog	0.5	0.7	ERM, LRA	5.2	2	-40 to 85	10VSSOP, 9DSBGA	1.2
DRV2605	Haptic Driver for ERM/LRA with Built-In Library and Smart Loop Architecture	5.5	I²C, PWM, Analog	—	0.7	ERM, LRA	5.5	2.5	–40 to 85	9DSBGA, MSOP-10	1.60
DRV2603	Haptic Driver with Auto Resonance Tracking for LRA and Optimized Drive for ERM	—	PWM, Analog	1.5	1.3	ERM, LRA	5.2	2.5	–40 to 85	QFN-10	0.70
DRV2667	Piezo Haptic Driver with Boost, Digital Front End, and Internal Waveform Memory	200	I²C, PWM, Analog	0.13	2	Piezo	5.5	3	–40 to 85	QFN-20	2.95

**Suggested resale price in U.S. dollars in quantities of 1,000.*

Visit www.ti.com/haptics for more information.

Texas Instruments

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265