

# Haptic Driver for ERM and LRA with Internal Memory and Smart Loop Architecture

Check for Samples: [DRV2604](#)

## FEATURES

- **Flexible Haptic/Vibra Driver**
  - LRA (Linear Resonance Actuator)
  - ERM (Eccentric Rotating Mass)
- **I<sup>2</sup>C Controlled Digital Playback Engine**
  - Internal RAM for Customized Waveforms
  - Real-Time Playback Mode via I<sup>2</sup>C
- **Smart Loop Architecture<sup>(1)</sup>**
  - Automatic Overdrive/Braking (ERM/LRA)
  - Automatic Resonance Tracking (LRA)
  - Automatic Actuator Diagnostic (ERM/LRA)
  - Automatic Level Calibration (ERM/LRA)
- **Optional PWM Input with 0% to 100% Duty Cycle Control Range**
- **Optional Analog Input Control**
- **Optional Hardware Trigger Pin**
- **Efficient Output Drive**
- **Fast Start Up Time**
- **Constant Acceleration Over Supply Voltage**
- **1.8 V Compatible, VDD Tolerant Digital Pins**
- **Available in a 9-Ball, 0.5 mm Pitch WCSP**

<sup>(1)</sup> Patent pending control algorithm

## APPLICATIONS

- **Mobile Phones**
- **Tablets**
- **Touch-Enabled Devices**

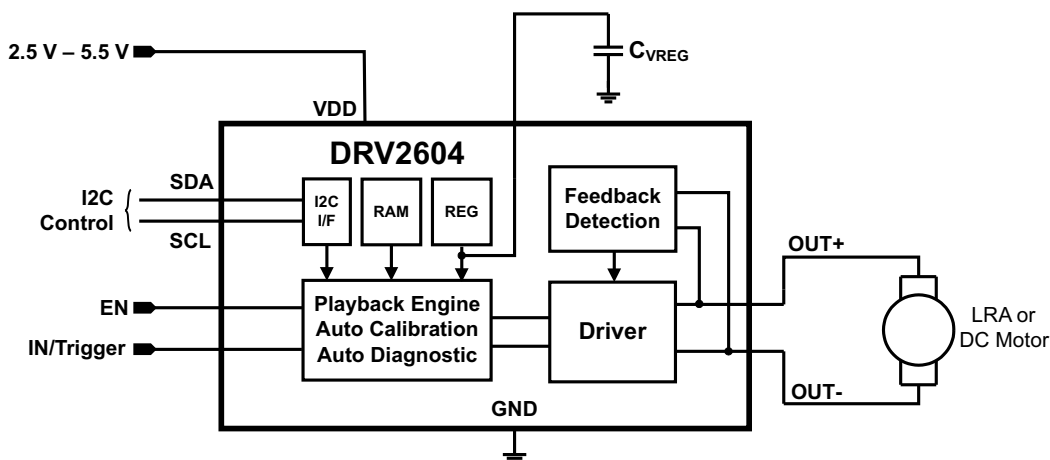
## DESCRIPTION

The DRV2604 is designed to give extremely flexible haptic control of ERM and LRA actuators over a shared I<sup>2</sup>C compatible bus. This relieves the host processor from ever generating pulse-width modulated (PWM) drive signals, saving both costly timer interrupts and hardware pins.

The DRV2604 includes enough integrated RAM to allow the user to pre-load over 100 customized waveforms. These waveforms can be instantly played back via I<sup>2</sup>C or optionally triggered via a hardware trigger pin. Additionally, the real-time playback mode allows the host processor to bypass the library playback engine and play waveforms directly from the host via I<sup>2</sup>C.

The DRV2604 also contains a smart loop architecture, which allows effortless auto resonant drive for LRA as well as feedback-optimized ERM drive. This feedback gives automatic overdrive and braking, which creates a simplified input waveform paradigm as well as reliable motor control and consistent motor performance.

The DRV2604 features a trinary-modulated output stage, providing greater efficiency than linear-based output drivers. The 9-ball WCSP footprint, flexible operation, and low component count make the DRV2604 the ideal choice for portable and touch-enabled vibratory and haptic applications.



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**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
DRV2604YZFR	ACTIVE	DSBGA	YZF	9	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	2604	<a href="#">Samples</a>
DRV2604YZFT	ACTIVE	DSBGA	YZF	9	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	2604	<a href="#">Samples</a>

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

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(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

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## TAPE AND REEL INFORMATION



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DRV2604YZFR	DSBGA	YZF	9	3000	180.0	8.4	1.65	1.65	0.81	4.0	8.0	Q1
DRV2604YZFT	DSBGA	YZF	9	250	180.0	8.4	1.65	1.65	0.81	4.0	8.0	Q1

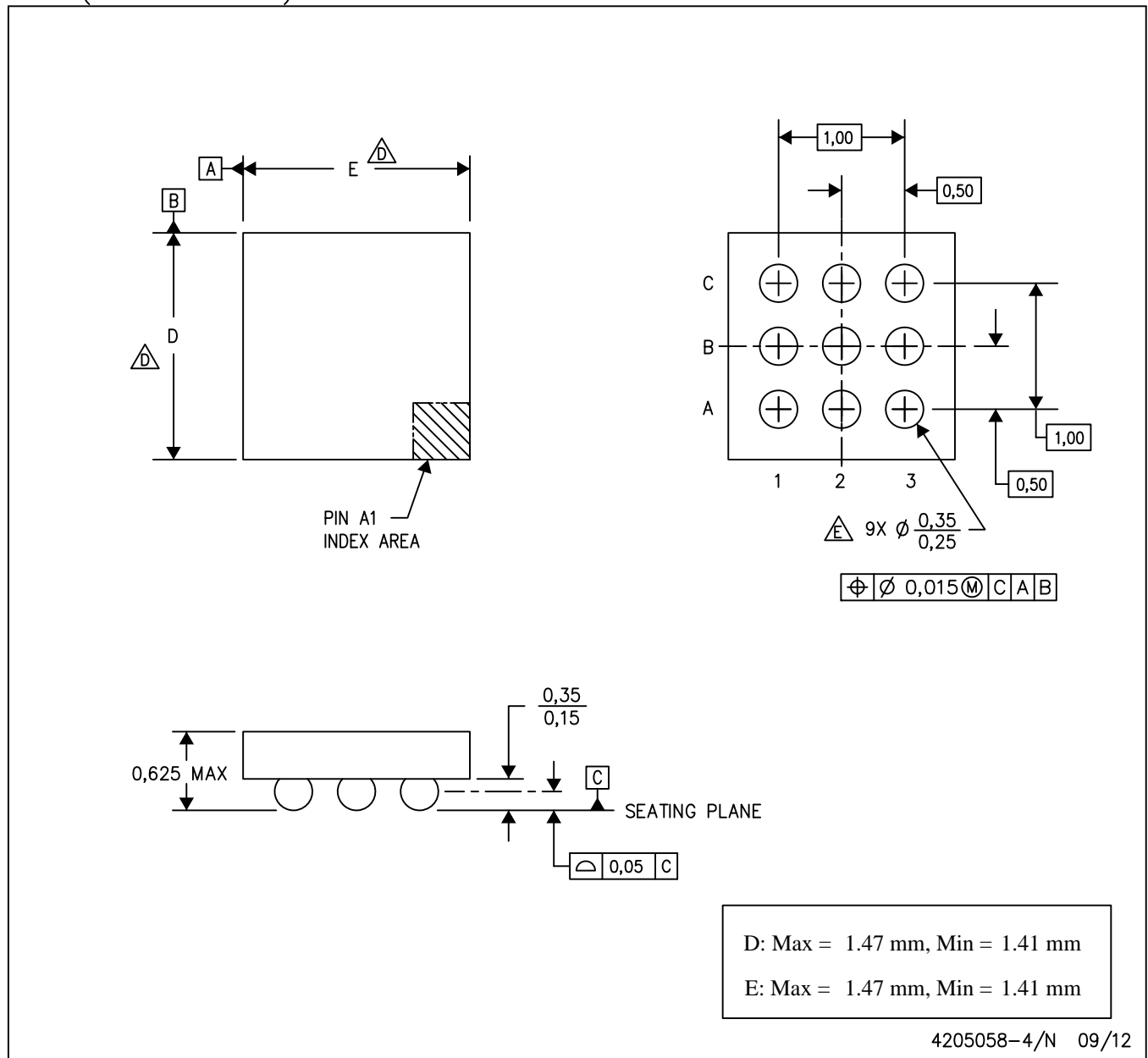
**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DRV2604YZFR	DSBGA	YZF	9	3000	210.0	185.0	35.0
DRV2604YZFT	DSBGA	YZF	9	250	210.0	185.0	35.0

YZF (S-XBGA-N9)

DIE-SIZE BALL GRID ARRAY



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.
  - $\triangle$  The package size (Dimension D and E) of a particular device is specified in the device Product Data Sheet version of this drawing, in case it cannot be found in the product data sheet please contact a local TI representative.
  - $\triangle$  Reference Product Data Sheet for array population.  
3 x 3 matrix pattern is shown for illustration only.
  - F. This package contains Pb-free balls.  
Refer to YEF (Drawing #4204181) for tin-lead (SnPb) balls.

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