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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)**
- **I²C Controlled Digital Playback Engine**
  - **Internal RAM for Customized Waveforms**
  - **Real-Time Playback Mode via I²C**
- **Smart Loop Architecture(1)**
  - **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**

(1) Patent pending control algorithm

APPLICATIONS

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

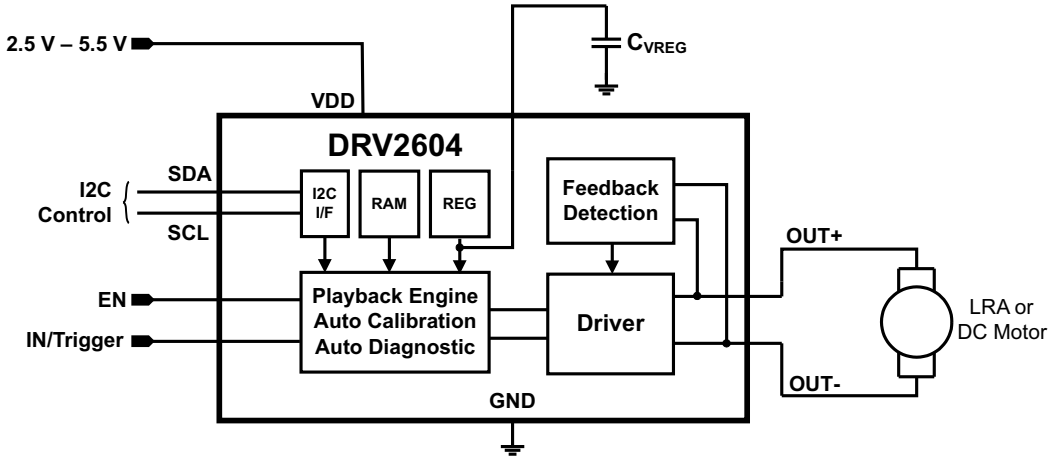
DESCRIPTION

The DRV2604 is designed to give extremely flexible haptic control of ERM and LRA actuators over a shared I²C 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 I²C 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 I2C.

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	Samples
DRV2604YZFT	ACTIVE	DSBGA	YZF	9	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	2604	Samples

(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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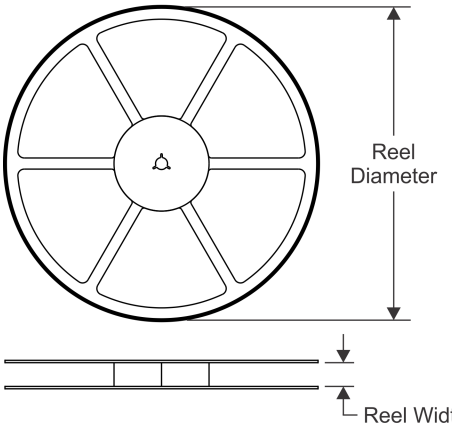
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

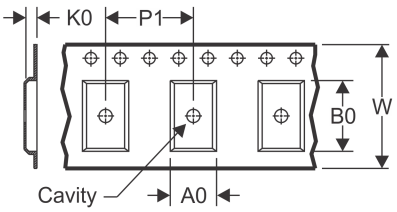
(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

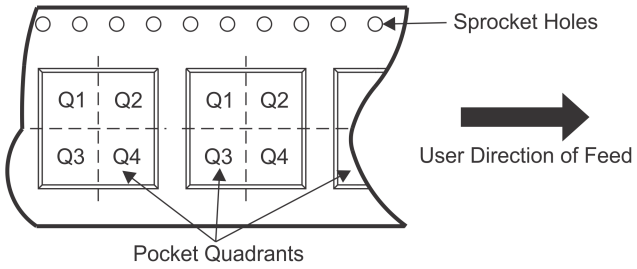


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

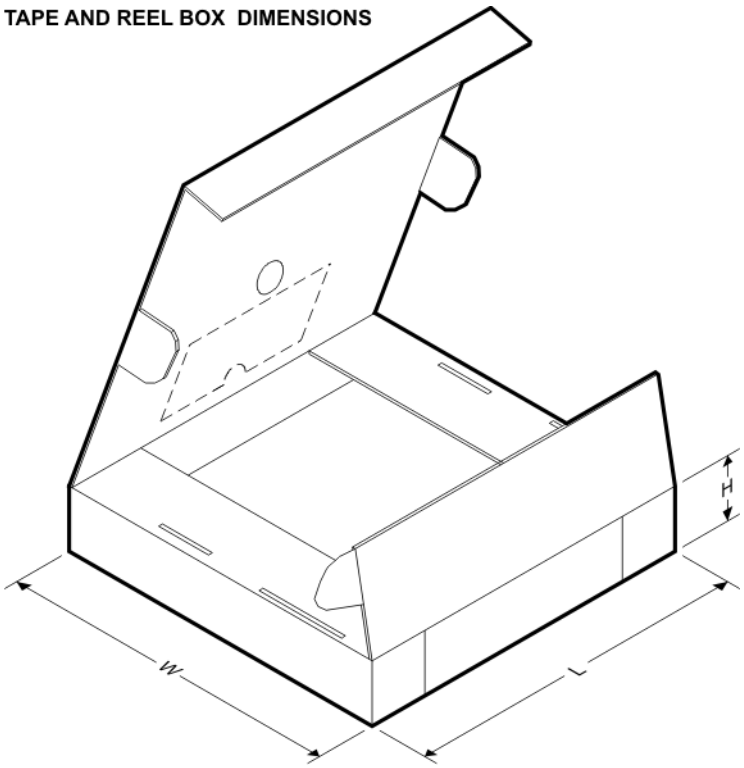
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
DRV2604YZFR	DSBGA	YZF	9	3000	178.0	9.2	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

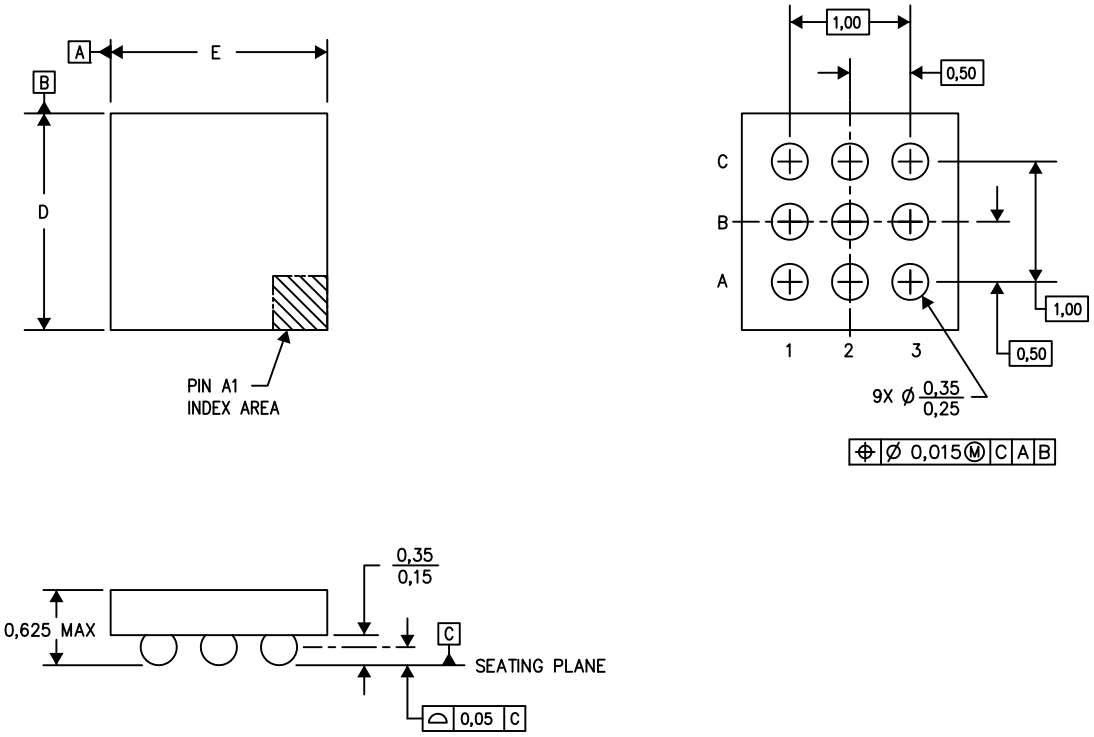
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DRV2604YZFR	DSBGA	YZF	9	3000	182.0	182.0	17.0
DRV2604YZFR	DSBGA	YZF	9	3000	270.0	225.0	227.0
DRV2604YZFT	DSBGA	YZF	9	250	182.0	182.0	17.0

YZF (S–XBGA–N9) DIE–SIZE BALL GRID ARRAY



D: Max = 1.47 mm, Min = 1.41 mm

E: Max = 1.47 mm, Min = 1.41 mm

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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.

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