1.2V to 3.6V, 12-Bit, Nanopower, 4-Wire TOUCH SCREEN CONTROLLER with I²C™ Interface

Check for Samples: TSC2014

FEATURES

- **4-Wire Touch Screen Interface**
- **Ratiometric Conversion**
- **Single 1.2V to 3.6V Supply**
- **Preprocessing to Reduce Bus Activity**
- **High-Speed I²C-Compatible Interface**
- **Internal Detection of Screen Touch**
- **Register-Based Programmable:**
  - **10-Bit or 12-Bit Resolution**
  - **Sampling Rates**
  - **System Timing**
- **On-Chip Temperature Measurement**
- **Touch Pressure Measurement**
- **Auto Power-Down Control**
- **Low Power:**
  - **430μW at 1.8V, 50SSPS**
  - **320μW at 1.6V, 50SSPS**
  - **190μW at 1.2V, 50SSPS**
  - **58μW at 1.6V, 8.2kSPS Eq. Rate**
  - **37μW at 1.2V, 8.2kSPS Eq. Rate**
- **Enhanced ESD Protection:**
  - **±8kV HBM**
  - **±1kV CDM**
  - **±25kV Air Gap Discharge**
  - **±11kV Contact Discharge**
- **1.5 x 2.0 WCSP-12 Package**

U.S. Patent No. 6,246,394; other patents pending.

APPLICATIONS

- **Cellular Phones**
- **Portable Instruments**
- **MP3 Players, Pagers**
- **Multiscreen Touch Control**

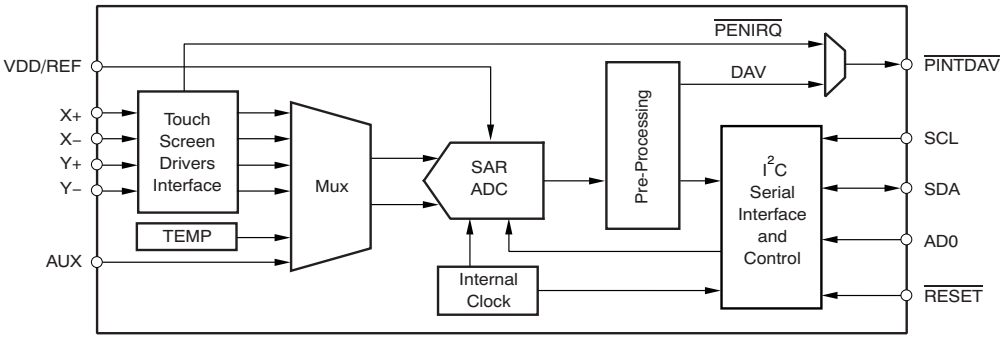
DESCRIPTION

The TSC2014 is a very low-power touch screen controller designed to work with power-sensitive, handheld applications that are based on advanced low-voltage processors. It works with a supply voltage as low as 1.2V, which can be supplied by a single-cell battery. It contains a complete, ultralow-power, 12-bit, analog-to-digital (A/D) resistive touch screen converter, including drivers and the control logic to measure touch pressure.

In addition to these standard features, the TSC2014 offers preprocessing of the touch screen measurements to reduce bus loading, thus reducing the consumption of host processor resources that can then be redirected to more critical functions.

The TSC2014 supports an I²C serial bus and data transmission protocol in all three defined modes: standard, fast, and high-speed. It offers programmable resolution of 10 or 12 bits to accommodate different screen sizes and performance needs.

The TSC2014 is available in a miniature, 12-lead, 3 x 4 array, (1.555 ±0.055)mm x (2.055 ±0.055)mm wafer chip-scale package (WCSP) package. The device is characterized for the –40°C to +85°C industrial temperature range.



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This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

ORDERING INFORMATION(1)

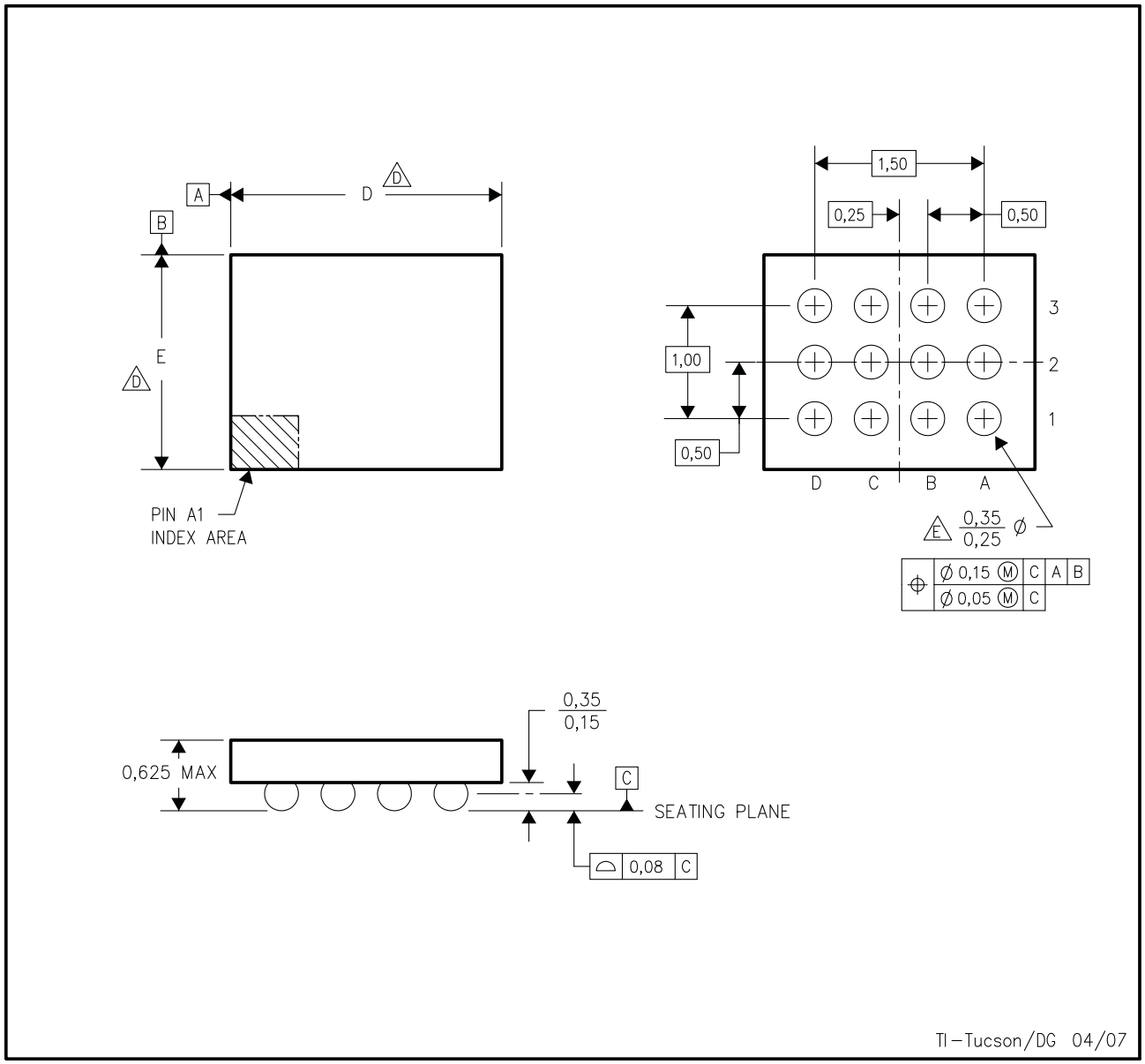
PRODUCT	TYPICAL INTEGRAL LINEARITY (LSB)	TYPICAL GAIN ERROR (LSB)	NO MISSING CODES RESOLUTION (BITS)	PACKAGE TYPE	PACKAGE DESIGNATOR	SPECIFIED TEMPERATURE RANGE	PACKAGE MARKING	ORDERING NUMBER	TRANSPORT MEDIA, QUANTITY
TSC2014I	–0.6 to +0.38	+0.32	11	12-Pin, 3 x 4 Matrix, 1.5 x 2.0 WCSP	YZG	–40°C to +85°C	TSC2014I	TSC2014IYZGT	Small Tape and Reel, 250
								TSC2014IYZGR	Tape and Reel, 3000

(1) For the most current package and ordering information, see the Package Option Addendum located at the end of this data sheet, or visit the device product folder at www.ti.com.

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MECHANICAL DATA

YZG (R–XBGA–N12) DIE–SIZE BALL GRID ARRAY



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. NanoFree™ package configuration.
D. Devices in YZG package can have dimension D ranging from 2.00 to 2.11 mm and dimension E ranging from 1.50 to 1.61 mm. To determine the exact package size of a particular device, refer to the device datasheet or contact a local TI representative.
E. Reference Product Data Sheet for array population. 4 x 3 matrix pattern is shown for illustration only.
F. This package contains lead–free balls. Refer to YEG (Drawing #4204182) for tin–lead (SnPb) balls.

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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
TSC2014IYZGR	ACTIVE	DSBGA	YZG	12	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	TSC2014I	Samples
TSC2014IYZGT	ACTIVE	DSBGA	YZG	12	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	TSC2014I	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.

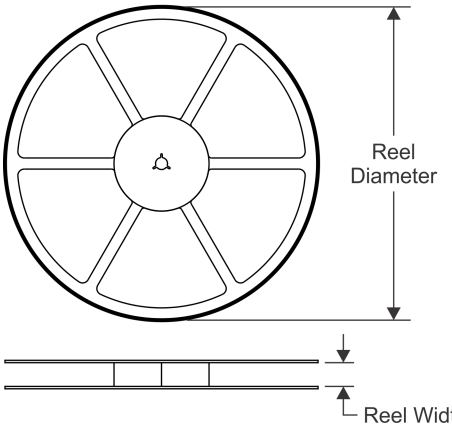
(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

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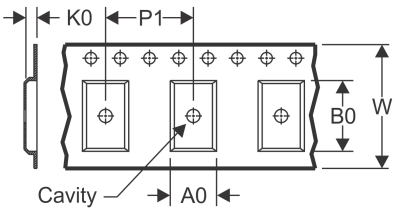
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TAPE AND REEL INFORMATION

REEL DIMENSIONS

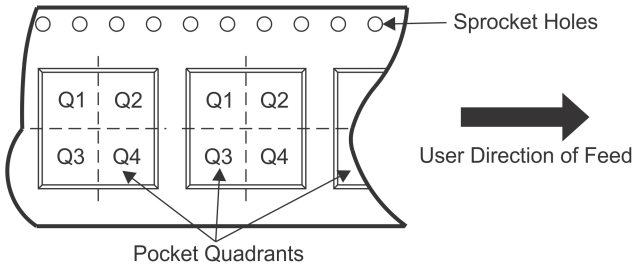


TAPE DIMENSIONS



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

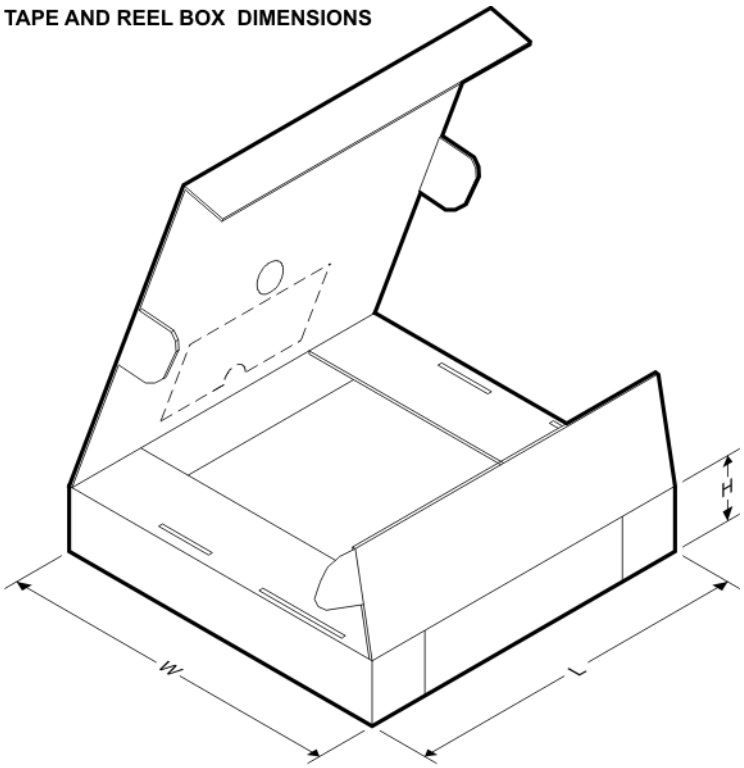
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TSC2014IYZGR	DSBGA	YZG	12	3000	180.0	8.4	1.75	2.25	0.81	4.0	8.0	Q1
TSC2014IYZGT	DSBGA	YZG	12	250	180.0	8.4	1.75	2.25	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)
TSC2014IYZGR	DSBGA	YZG	12	3000	182.0	182.0	17.0
TSC2014IYZGT	DSBGA	YZG	12	250	182.0	182.0	17.0

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