

ULC1001 Configurable Ultrasonic PWM Modulator With I/V Sense Amplifiers

1 Features

- Integrated Programmable Cleaning Modes
 - Water (expelling)
 - Deice (melting and expelling)
 - Mud (dehydrating and expelling)
 - Auto-Cleaning (detecting and expelling)
 - Custom Cleaning Modes
- Embedded Algorithms
 - Lens System Calibration
 - Automatic Material Detection
 - Power Regulation
 - System Diagnostics
- System Diagnostics
 - DRV290x Fault Reporting
 - Lens System Fault
 - Transducer Temperature Regulation
- Wide Drive Frequency Range
 - High-Efficiency Direct Drive (25 kHz - 5 MHz)
 - AD Modulation (<50 kHz)
- I²C User Interface
- Clock Source Required
 - External Oscillator (10 MHz, 5 ppm recommended)
- Power Supplies
 - IOVDD: 3.3 V
- 32-pin, QFN-HR Package

2 Applications

- Thermal Imaging Camera
- Traffic Monitoring Camera
- Machine Vision Camera
- Wireless Security Camera
- Drone Vision

3 Description

The ULC1001 is a configurable PWM modulator with current and voltage sensing capabilities specifically for piezo based lens cleaning systems.

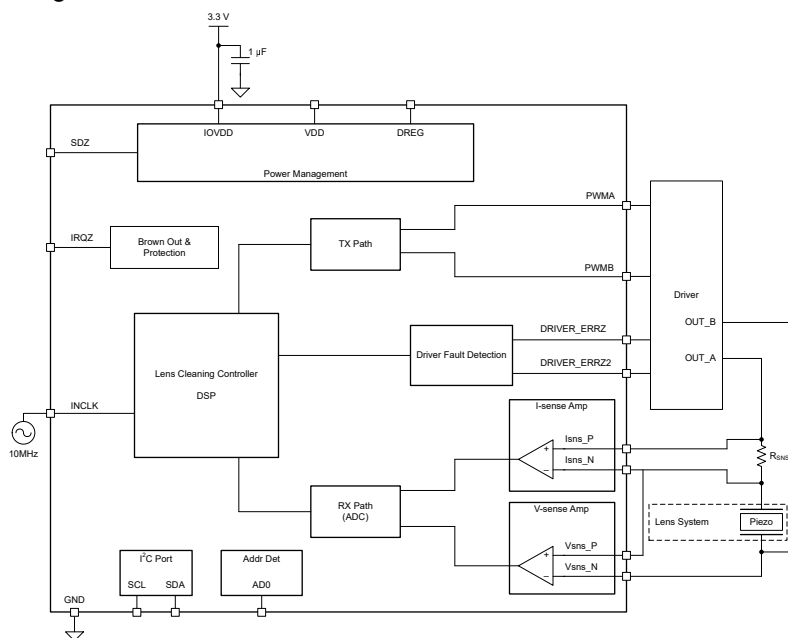
An on-chip, low-latency DSP supports Texas Instruments' proprietary algorithms designed for lens cleaning. The ULC1001 and DRV29xx work together to create an Ultrasonic Lens Cleaning system.

The ULC1001 device is available in a 32-pin QFN-HR package for a compact PCB footprint.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
ULC1001	HRQFN	4.5 mm × 5.0 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Simplified Block Diagram



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4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (December 2020) to Revision A (December 2022)	Page
• Updated device status to production data.....	1

5 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

5.1 Package Option Addendum

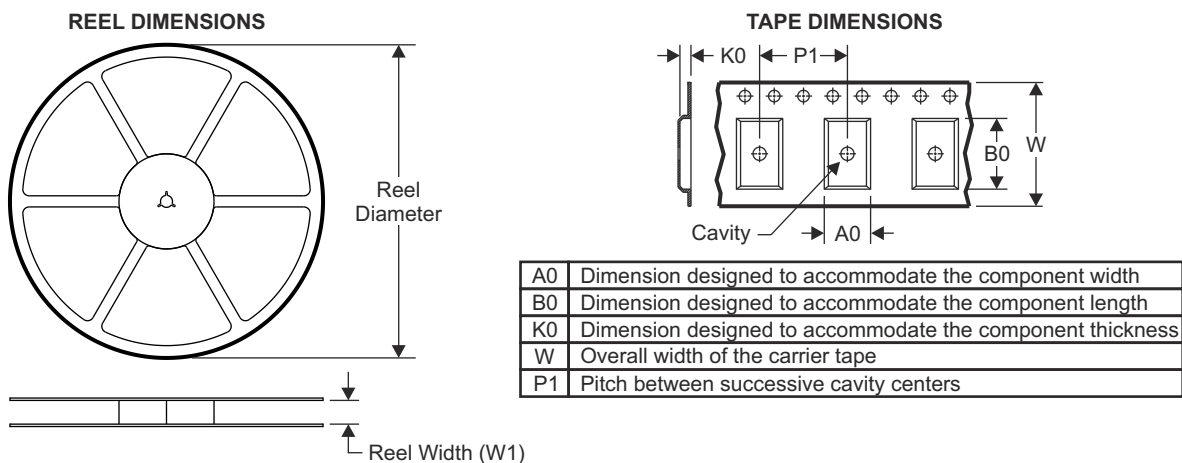
Packaging Information

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking
ULC1001RQTR	ACTIVE	VQFN-HR	RQT	32	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1001 , ULC

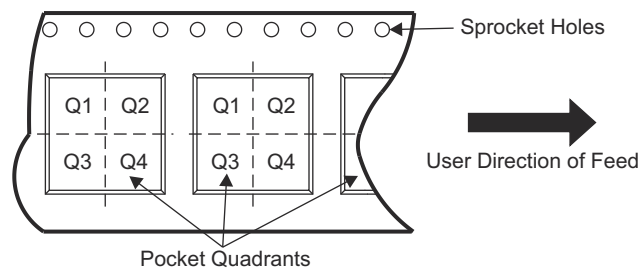
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5.2 Tape and Reel Information

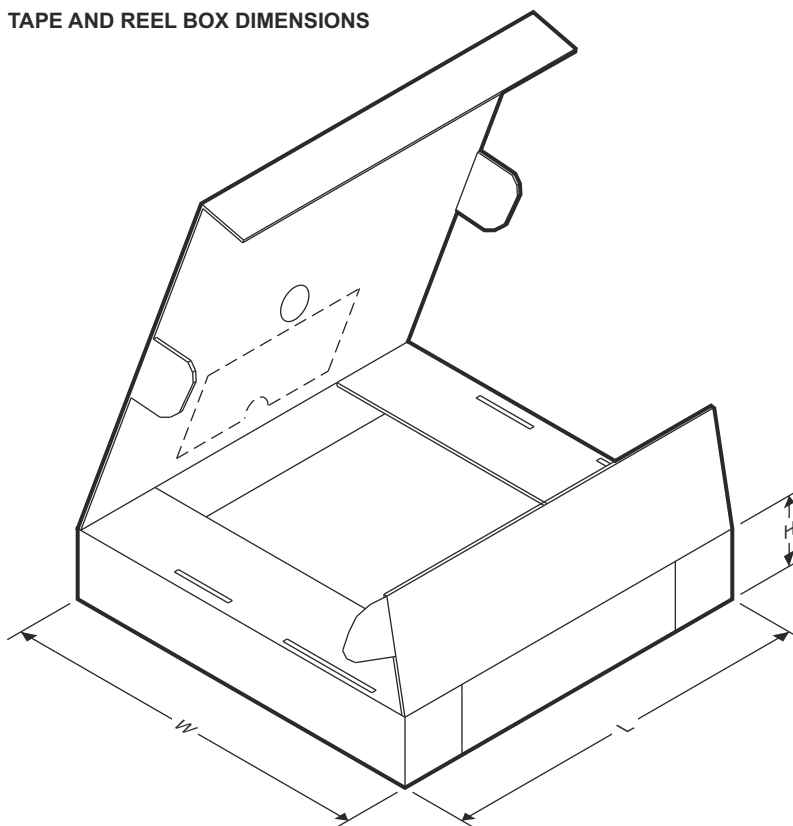


QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



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
ULC1001RQTR	VQFN-HR	RTQ	32		330.0	12.4	4.8	5.3	1.15	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

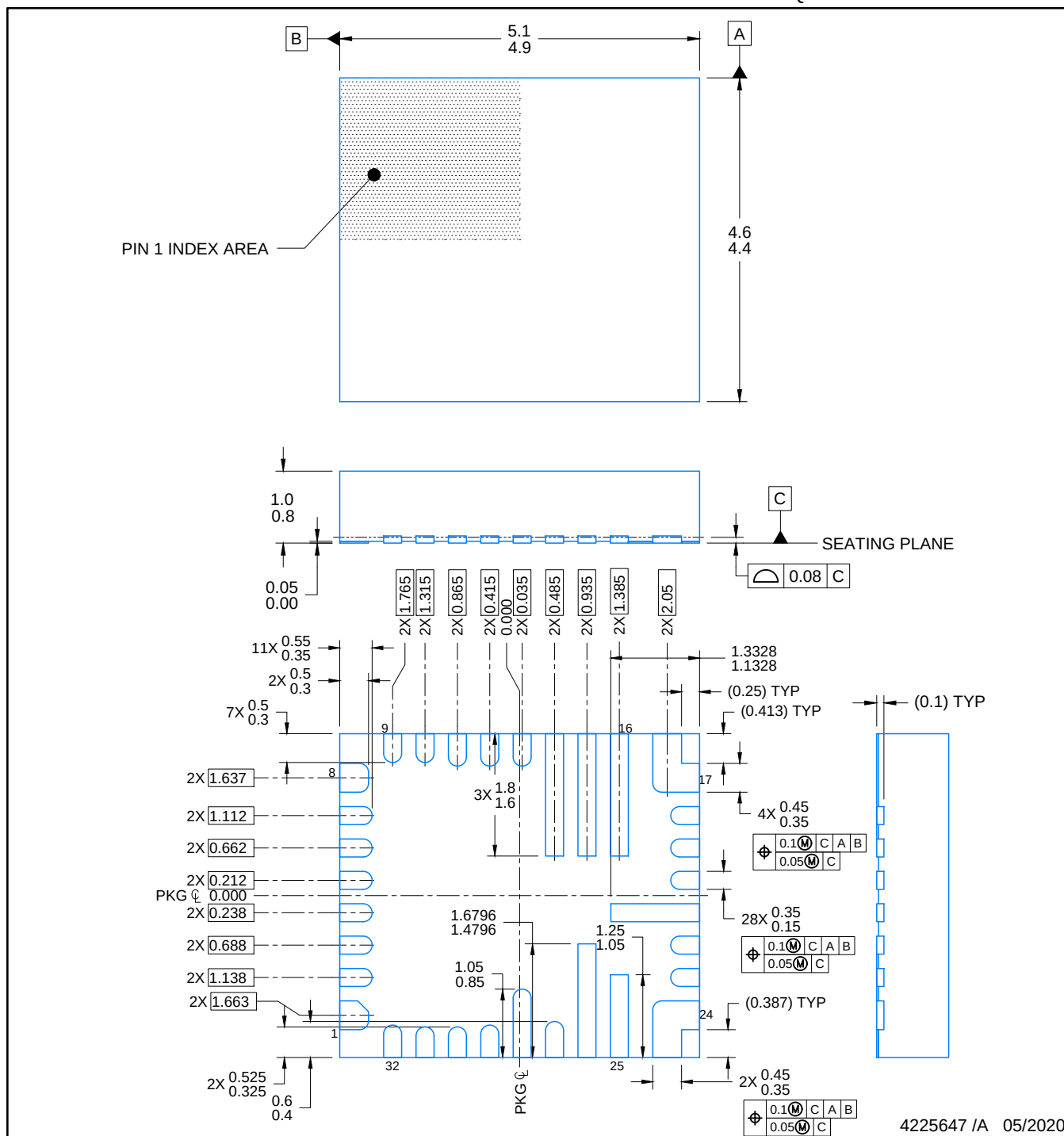


Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ULC1001RQTR	VQFN-HR	RTQ	32	3000	367.0	367.0	35.0

PACKAGE OUTLINE

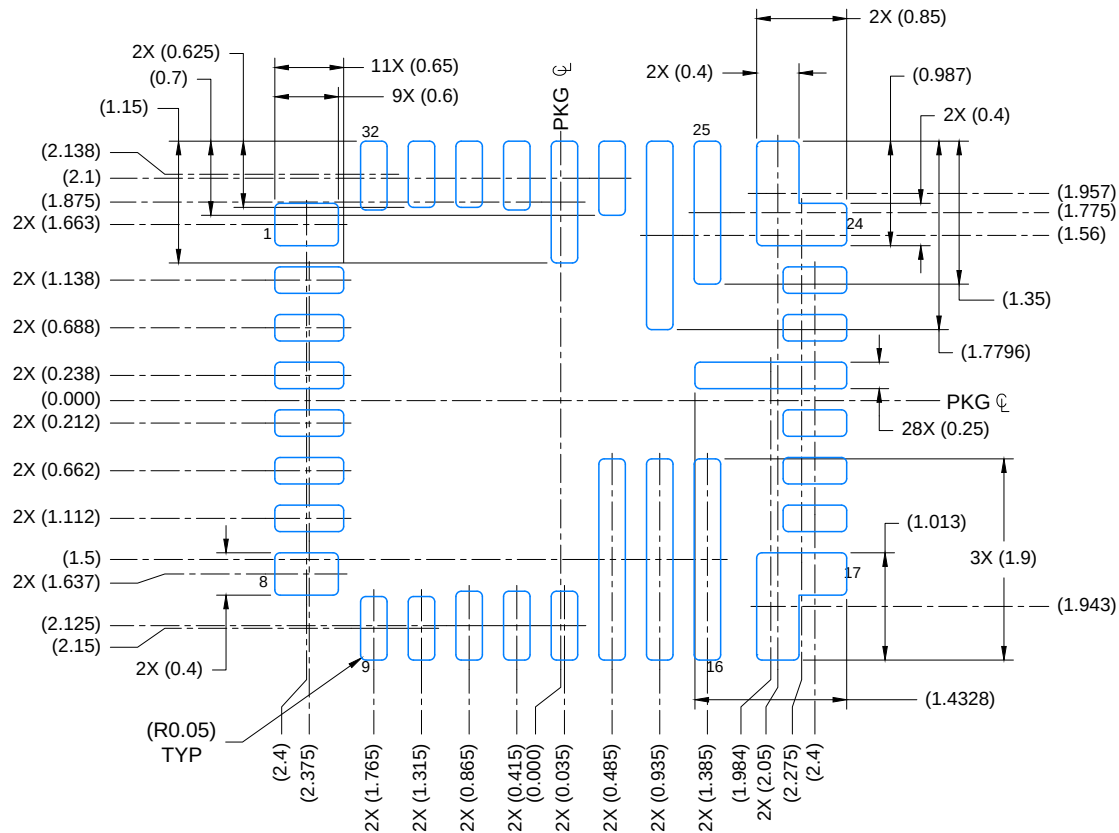
VQFN-HR - 1 mm max height

PLASTIC QUAD FLATPACK- NO LEAD



NOTES:

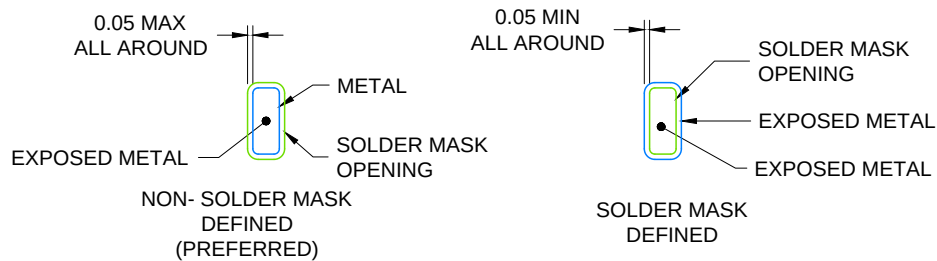
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.



LAND PATTERN EXAMPLE

EXPOSED METAL SHOWN

SCALE: 14X



SOLDER MASK DETAILS

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NOTES: (continued)

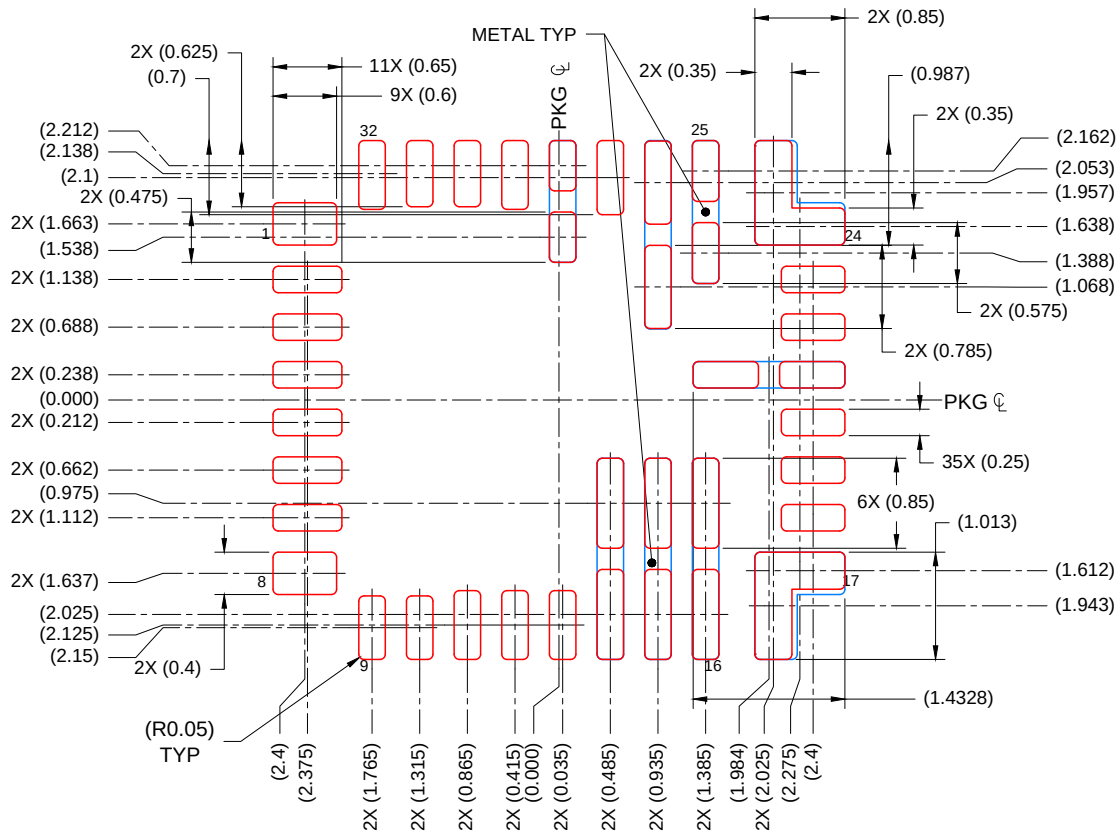
- For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sluea271).
- Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

RQT0032A

VQFN-HR - 1 mm max height

PLASTIC QUAD FLATPACK- NO LEAD



SOLDER PASTE EXAMPLE
 BASED ON 0.1 mm THICK STENCIL
 SCALE: 14X

PRINTED COVERAGE BY AREA
 PAD 14,15,16: 89%
 PAD 21: 85%
 PAD 17& 24: 90%
 PAD 25: 84%
 PAD 26: 88%
 PAD 28: 82%

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NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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