

LMH1297 12G UHD-SDI Bidirectional I/O With Integrated Reclocker

1 Features

- User-Configurable Adaptive Cable Equalizer or Cable Driver With Integrated Reclocker
- Supports ST-2082-1 (12G), ST-2081-1 (6G), ST-424 (3G), ST-292 (HD), and ST-259 (SD)
- Compatible With DVB-ASI and AES10 (MADI)
- Integrated Reclocker Locks to SMPTE Rates of 11.88 Gbps, 5.94 Gbps, 2.97 Gbps, 1.485 Gbps, or Divide-by-1.001 Sub-Rates and 270 Mbps
- On-Chip 75-Ω Termination and Return Loss Compensation Network
- EQ (Equalizer) Mode:
 - Adaptive Cable Equalizer With Integrated Reclocker
 - 100-Ω Output Driver With De-Emphasis
 - Reclocked 75-Ω Loop-Through Output
 - EQ Mode Cable Reach (Belden 1694A, SDI_OUT Disabled):
 - 75 m at 11.88 Gbps
 - 120 m at 5.94 Gbps
 - 200 m at 2.97 Gbps
 - 300 m at 1.485 Gbps
 - 600 m at 270 Mbps
- Cable Driver (CD) Mode:
 - Dual Differential Output Cable Drivers With Integrated Reclocker
 - Adaptive PCB Input Equalizer
 - Reclocked 100-Ω Loopback Output
- Automatic Pre-Emphasis and Slew Rate Control on 75-Ω Outputs
- Polarity Inversion on 75-Ω and 100-Ω Outputs
- Automatic Power Save in Absence of Input Signal
 - Power Dissipation: 25 mW (Typical)
- Power-Down Control Through ENABLE Pin
- Single 2.5-V Supply
 - EQ Mode Power Dissipation: 275 mW (Typical)
 - CD Mode Power Dissipation: 305 mW (Typical)
- Programmable Through Pins, SPI, or SMBus Interface
- –40°C to +85°C Operating Temperature Range
- 5-mm x 5-mm, 32-Pin QFN Package

2 Applications

- SMPTE Compatible Serial Digital Interface
- UHDTV/4K/8K/HDTV/SDTV Video
- IP Media Gateway
- Digital Video Processing and Editing

3 Description

The LMH1297 is a 12G UHD-SDI 75-Ω bidirectional I/O with integrated reclocker. This device can be configured either in input mode as an adaptive cable equalizer or in output mode as a dual cable driver, allowing system designers the flexibility to use a single BNC either as an input or output port, simplifying UHD video hardware designs. The integrated reclocker locks to all supported SMPTE data rates up to 11.88 Gbps in both modes. The bidirectional I/O has an on-chip 75-Ω termination and return loss compensation network that meets the stringent SMPTE return loss requirements.

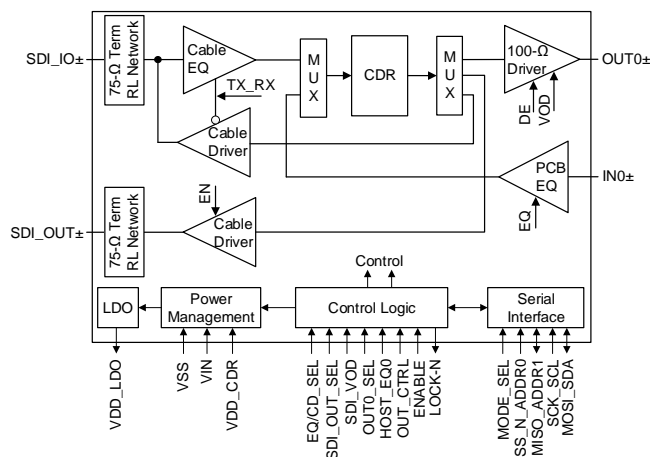
An additional 75-Ω driver output allows the LMH1297 to support a variety of system functions. In EQ (Equalizer) Mode, this second 75-Ω driver can be used as a loop-through output. In Cable Driver (CD) Mode, this 75-Ω driver can be used as a second fan-out cable driver. The host-side 100-Ω driver can also be used as a loop-back output in CD Mode for monitoring purposes.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LMH1297	QFN (32)	5.00 mm x 5.00 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

Changes from Revision A (June 2017) to Revision B	Page
• Added package drawings to the <i>Mechanical, Packaging, and Orderable Information</i> section	4

Changes from Original (March 2017) to Revision A	Page
• Changed typical power consumption in CD Mode from 315 mW to 305 mW based on updated characterization data	1

5 Description (continued)

The on-chip reclocker attenuates high-frequency jitter and fully regenerates the data using a clean, low-jitter clock. The reclocker has a built-in loop filter and does not require any input reference clock. The LMH1297 also has an internal eye opening monitor and a programmable pin for CDR lock indication, input carrier detect, or hardware interrupts to support system diagnostics and board bring-up.

The LMH1297 is powered from a single 2.5-V supply. It is offered in a small 5-mm × 5-mm, 32-pin QFN package.

6 Device and Documentation Support

6.1 Documentation Support

6.1.1 Related Documentation

For related documentation, see the following:

- [Absolute Maximum Ratings for Soldering](#) (SNOA549)
- [LMH1297 Programming Guide](#) (SNAU204)
- [QFN/SON PCB Attachment Application Report](#) (SLUA271)

6.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

6.3 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

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Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

6.4 Trademarks

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6.5 Electrostatic Discharge Caution



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.

6.6 Export Control Notice

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6.7 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

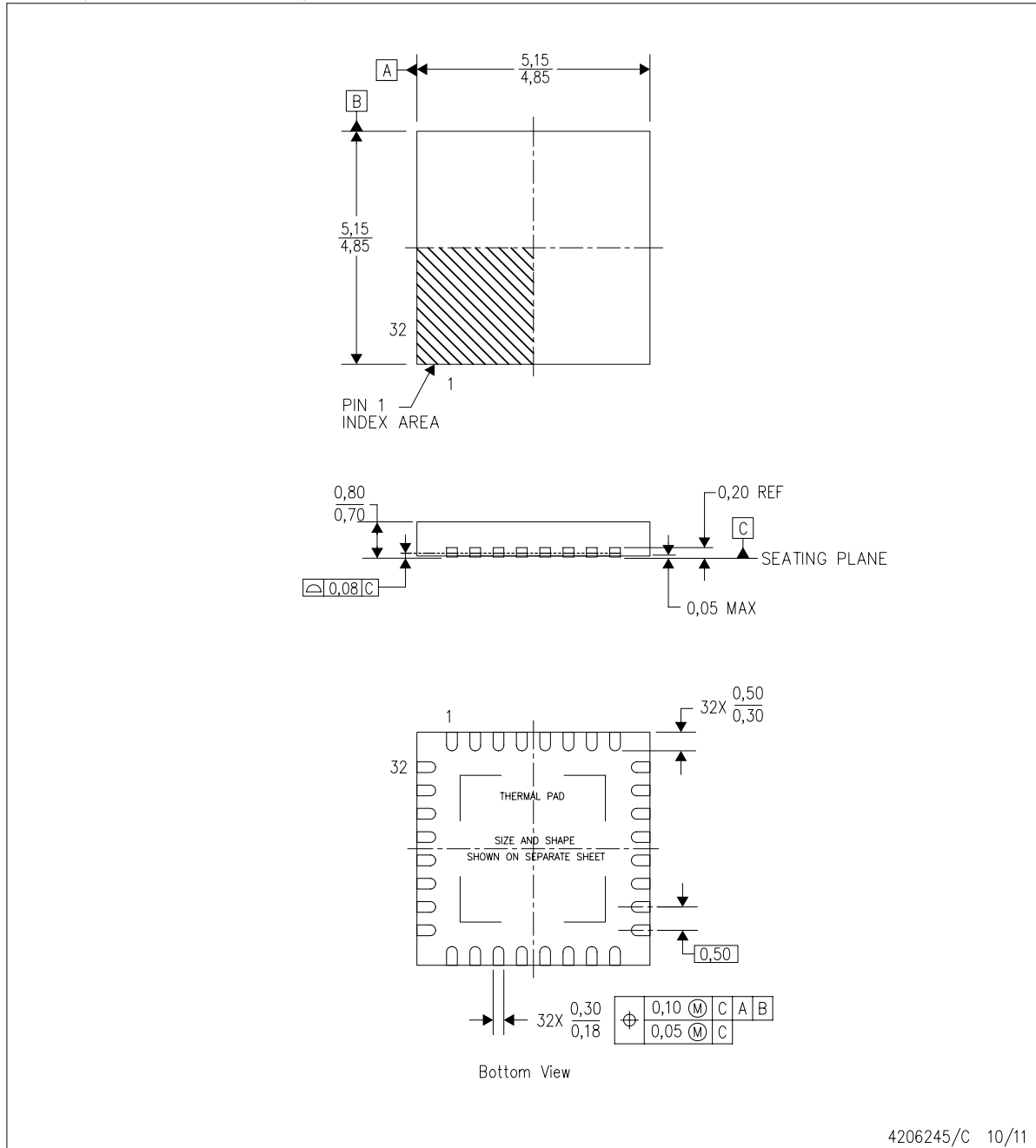
7 Mechanical, Packaging, and Orderable Information

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.

MECHANICAL DATA

RTV (S-PWQFN-N32)

PLASTIC QUAD FLATPACK NO-LEAD



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5–1994.
 - B. This drawing is subject to change without notice.
 - C. Quad Flatpack, No-Leads (QFN) package configuration.
 - D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
 - E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
 - F. Falls within JEDEC MO-220.

THERMAL PAD MECHANICAL DATA

RTV (S-PWQFN-N32)

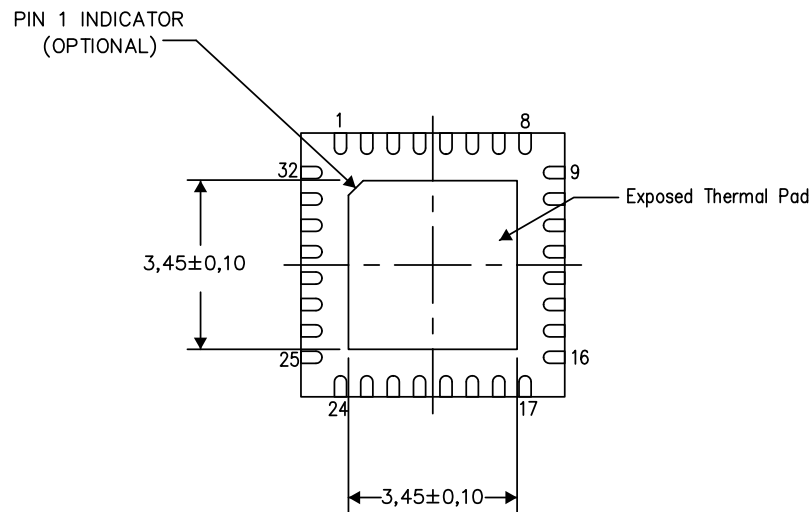
PLASTIC QUAD FLATPACK NO-LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

Exposed Thermal Pad Dimensions

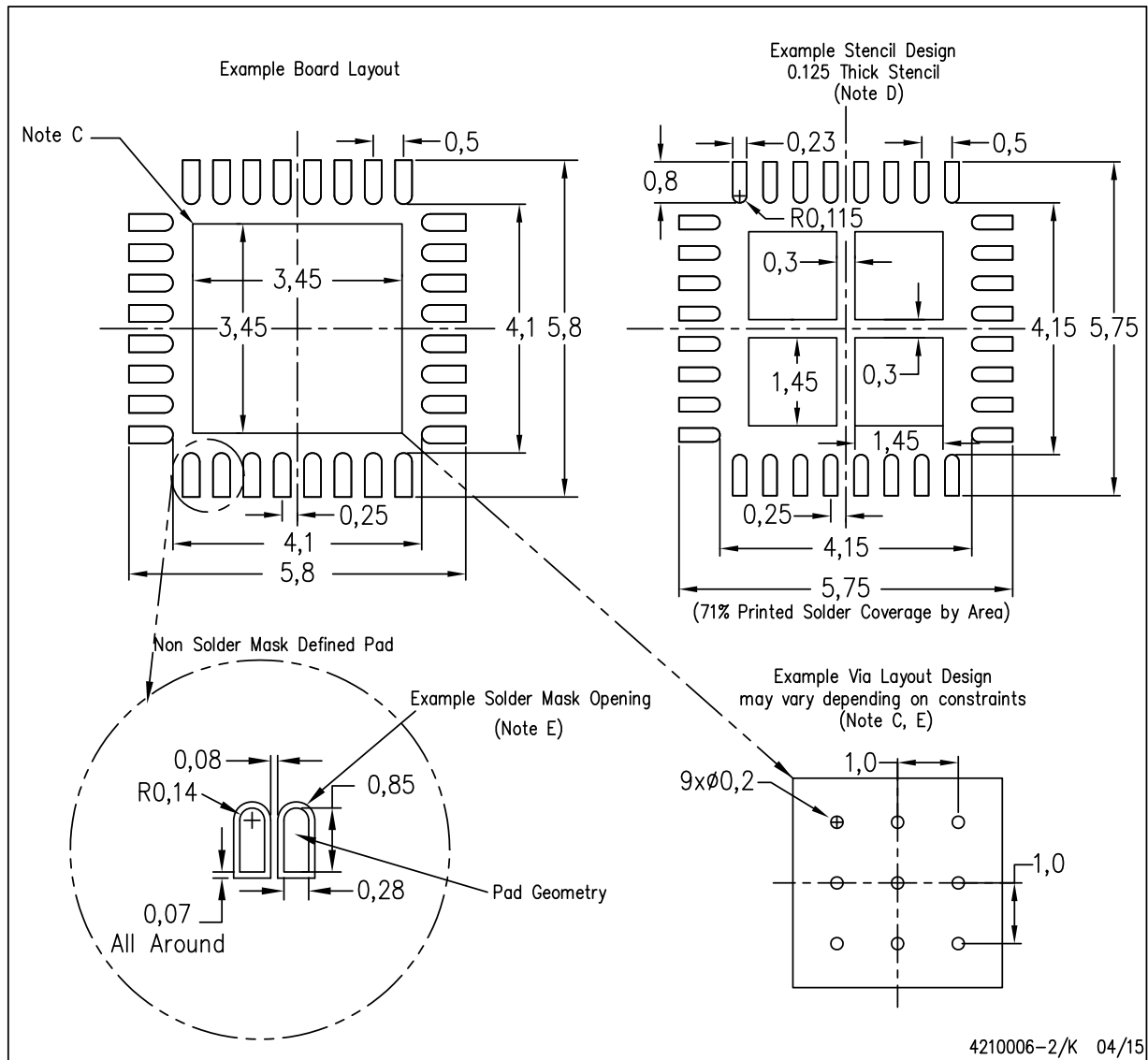
4206250–2/Q 05/15

NOTE: All linear dimensions are in millimeters

LAND PATTERN DATA

RTV (S–PWQFN–N32)

PLASTIC QUAD FLATPACK NO-LEAD



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat–Pack Packages, Texas Instruments Literature No. SCBA017, SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - Customers should contact their board fabrication site for recommended solder mask tolerances and via tenting recommendations for vias placed in the thermal pad.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LMH1297RTVR	ACTIVE	WQFN	RTV	32	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	L1297	Samples
LMH1297RTVT	ACTIVE	WQFN	RTV	32	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	L1297	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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

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Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device 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 Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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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
LMH1297RTVR	WQFN	RTV	32	1000	180.0	12.4	5.3	5.3	1.1	8.0	12.0	Q2
LMH1297RTVT	WQFN	RTV	32	250	180.0	12.4	5.3	5.3	1.1	8.0	12.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LMH1297RTVR	WQFN	RTV	32	1000	210.0	185.0	35.0
LMH1297RTVT	WQFN	RTV	32	250	210.0	185.0	35.0

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