

LMH1228 12G UHD-SDI Dual Output Cable Driver With Integrated Reclocker

1 Features

- 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
- Integrated Eye Opening Monitor (EOM)
- Dual Differential Output Cable Drivers
- On-Chip 75-Ω Termination and Return Loss Compensation Network
- Adaptive PCB Input Equalizer
- Reclocked 100-Ω Loop-Back Output
- Automatic Slew Rate Control on 75-Ω Outputs
- Automatic Pre-Emphasis and Output Amplitude on 75-Ω Outputs
- Programmable De-Emphasis and Output Amplitude on 100-Ω Output
- Polarity Inversion on 75-Ω and 100-Ω Outputs
- Automatic Power Save in Absence of Input Signal
 - Power Consumption: 25 mW (Typical)
- Power-Down Control Through ENABLE Pin
- Single 2.5-V Supply
 - Power Consumption: 305 mW (Typical)
- Programmable Through Pins, SPI, or SMBus Interface
- –40°C to +85°C Operating Temperature Range
- 5-mm × 5-mm, 32-pin WQFN Package

2 Applications

- SMPTE Compatible Serial Digital Interface
- UHDTV/4K/8K/HDTV/SDTV Video
- Broadcast Video Routers, Switchers, Distribution Amplifiers, and Monitors
- Digital Video Processing and Editing

3 Description

LMH1228 device is a 12G UHD-SDI low power dual output cable driver with integrated reclocker. It supports SMPTE video rates up to 11.88 Gbps, enabling UHD video for 4K/8K applications. With a wide range clock-and-data recovery (CDR) circuit, the on-chip reclocker automatically detects and locks to all SMPTE video rates up to 11.88 Gbps. The additional reclocked 100-Ω driver output on the host-side can be used for monitoring or signal distribution purposes.

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 LMH1228 also has an internal eye opening monitor and a programmable pin for CDR lock indication, input signal detect, or hardware interrupts to support system diagnostics and board bring-up.

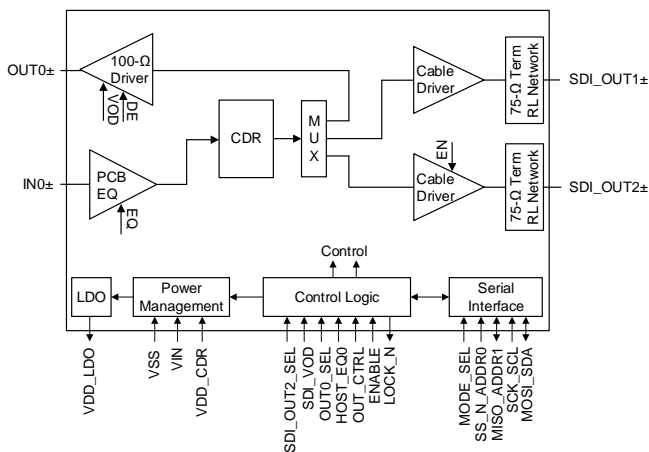
The LMH1228 is powered from a single 2.5-V supply. It is offered in a small footprint 5 mm × 5 mm 32-pin WQFN package. The LMH1228 is pin compatible with the LMH1208 (12G Dual Cable Driver).

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LMH1228	WQFN (32)	5.00 mm × 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 Original (March 2017) to Revision A	Page
<ul style="list-style-type: none"> • Changed typical power consumption from 315 mW to 305 mW based on updated characterization data 1 	1

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

For related documentation, see the following:

[QFN/SON PCB Attachment Application Report \(SLUA271\)](#)

5.2 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.

5.3 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](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

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

5.4 Trademarks

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5.5 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.

5.6 Export Control Notice

Recipient agrees to not knowingly export or re-export, directly or indirectly, any product or technical data (as defined by the U.S., EU, and other Export Administration Regulations) including software, or any controlled product restricted by other applicable national regulations, received from Disclosing party under this Agreement, or any direct product of such technology, to any destination to which such export or re-export is restricted or prohibited by U.S. or other applicable laws, without obtaining prior authorization from U.S. Department of Commerce and other competent Government authorities to the extent required by those laws.

5.7 Glossary

[SLYZ022](#) — *TI Glossary*.

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

6 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.

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
LMH1228RTVR	ACTIVE	WQFN	RTV	32	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	L1228	Samples
LMH1228RTVT	ACTIVE	WQFN	RTV	32	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	L1228	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".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

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
LMH1228RTVR	WQFN	RTV	32	1000	180.0	12.4	5.3	5.3	1.1	8.0	12.0	Q2
LMH1228RTVT	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)
LMH1228RTVR	WQFN	RTV	32	1000	210.0	185.0	35.0
LMH1228RTVT	WQFN	RTV	32	250	210.0	185.0	35.0

THERMAL PAD MECHANICAL DATA

RTV (S-PWQFN-N32)

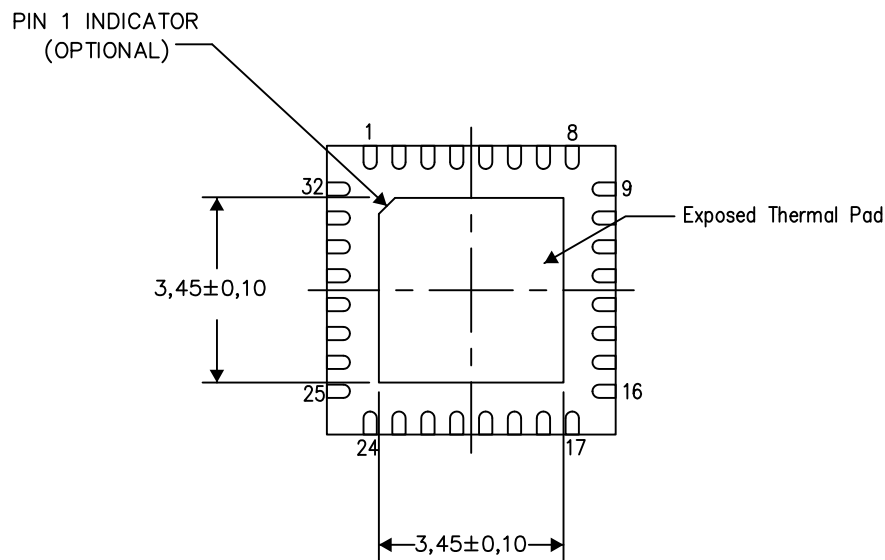
PLASTIC QUAD FLATPACK NO-LEAD

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

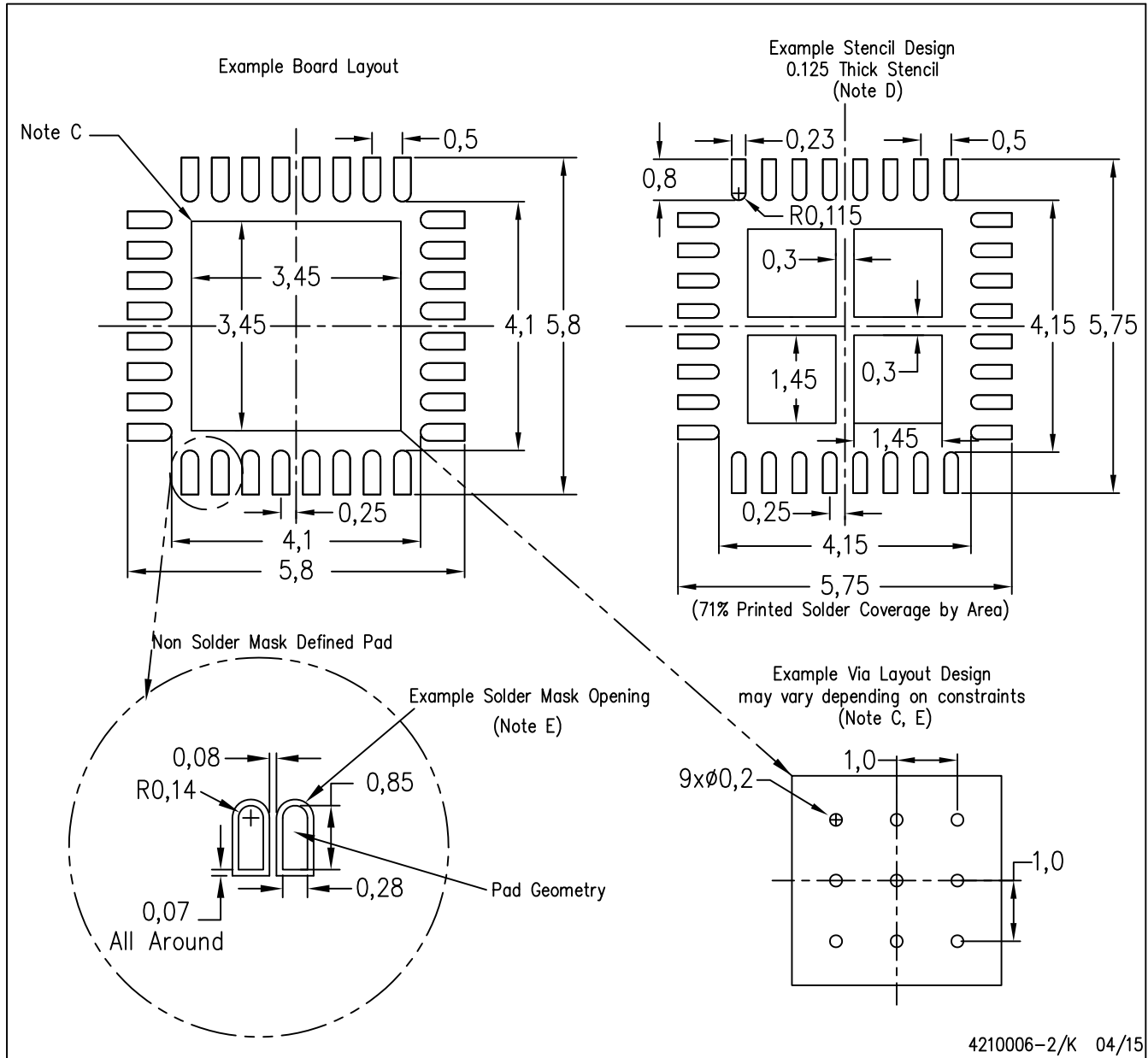
Exposed Thermal Pad Dimensions

4206250-2/Q 05/15

NOTE: All linear dimensions are in millimeters

RTV (S-PWQFN-N32)

PLASTIC QUAD FLATPACK NO-LEAD



4210006-2/K 04/15

- 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.

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