

# DS90UH984-Q1 4K FPD-Link IV to Embedded DisplayPort Bridge Deserializer with HDCP

## 1 Features

- DisplayPort (DP) / Embedded DisplayPort (eDP) transmitter
  - VESA DP v1.4a/eDP v1.4b transmitter
  - HBR3/HBR2/HBR/RBR link bit rates
  - Main Link: 1, 2, or 4 lanes
  - Each lane up to 8.1Gbps
  - AUX CH 1Mbps
  - Hot Plug Detect (HPD)
  - Extracts aggregated video streams to local eDP display
  - Designed for 4 K at 60Hz video resolution
  - Stream synchronization and splitting
- FPD-Link IV interface
  - 13.5/12.528/10.8/6.75/3.375Gbps per channel; Up to 27Gbps over dual channels
  - Coax/STP interconnect support
  - Selectable 1, 2 channels
  - Daisy-chain and splitting
  - Adaptive equalization
- Ultra-low Latency Control Channel
  - Two fast-mode plus I2C up to 1 MHz (up to 3.4MHz local bus access)
  - High-speed GPIOs
  - Supports SPI and UART pass-through GPIOs
- Backwards compatibility
  - Integrated HDCP v1.4 with on-chip keys
  - 720p 92x and 1080p/2K 94x FPD-Link III product families
- Security and diagnostics
  - Voltage and temperature monitoring
  - BIST and pattern generation
  - CRC and error diagnostics
  - ECC on control bits
  - Unique ID for counterfeit protection
- Advanced link robustness and EMC control
  - Spread Spectrum Clocking Generation (SSCG)
  - Adaptive Receiver Equalization (AEQ)
- Low power operation
  - 1.8V and 1.5V Dual power supply
- AEC-Q100 Qualified for automotive applications
  - AEC-Q grade-level 2, –40°C to 105°C
  - ISO 10605 and IEC 61000-4-2 ESD compliant

## 2 Applications

- Automotive Displays:
  - Central Information Displays (CID)
  - Rear Seat Entertainment (RSE)
  - Digital instrument clusters
  - Head units and HMI modules
  - Head Up Display (HUD)
  - Rear view and side mirror displays

## 3 Description

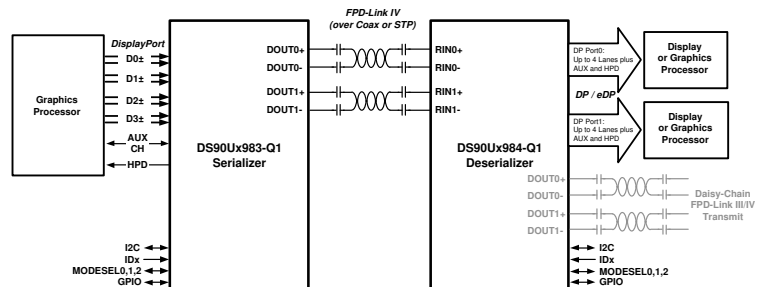
The DS90UH984-Q1 is an FPD-Link IV to DisplayPort (DP) / Embedded DisplayPort (eDP) bridge device. In conjunction with an FPD-Link IV serializer, the chipset receives a high-speed serialized interface over low-cost 50Ω coax or STP/STQ cables. The DS90UH984-Q1 is a VESA DP v1.4a/eDP v1.4b compatible device that supports advanced features such as HBR3, and SuperFrame formats. The device supports video resolutions of 4K 30-bit color and higher. The FPD-Link IV interface supports video and audio data transmission and full duplex control, including I2C, and GPIO data over the same link. Consolidation of video data and control over FPD-Link IV lanes reduces the interconnect size and weight and simplifies system design. EMI is minimized by the use of low voltage differential signaling, data scrambling, and randomization. In backward compatible FPD-Link III mode, the device supports up to 2K resolutions with 24-bit color depth over a single/dual link as well as HDCP v1.4 support when paired with an HDCP capable serializer.

### Package Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>
DS90UH984-Q1	RUR (VQFN, 88)	12mm × 12mm

(1) For all available packages, see [Section 6](#).

(2) The package size (length × width) is a nominal value and includes pins, where applicable.



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## 4 Device and Documentation Support

### 4.1 Documentation Support

#### 4.1.1 Related Documentation

For related documentation see the following:

- Texas Instruments, [Soldering Specifications](#) application note
- Texas Instruments, [Semiconductor and IC Package Thermal Metrics](#) application note
- Texas Instruments, [Leadless Leadframe Package \(LLP\)](#) application note
- Texas Instruments, [LVDS Owner's Manual](#)
- Texas Instruments, [I2C Communication Over FPD-Link III with Bidirectional Control Channel](#) application note
- Texas Instruments, [Exploring the Internal Test Pattern Generation Feature of 720p FPD-Link III Devices](#) application note
- Texas Instruments, [I2C Bus Pullup Resistor Calculation](#) application note
- Texas Instruments FPD-Link Learning Center, [FPD-Link Fundamental Material](#) video series
- Texas Instruments, [Ten tips for successfully designing with automotive EMC/EMI requirements](#)
- Texas Instruments, [Serial Line-Fault Detection](#) (Contact TI)

### 4.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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### 4.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 4.4 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.

### 4.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 5 Revision History

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

DATE	REVISION	NOTES
February 2024	*	Initial Release

## **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 part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
DS90UH984RURRQ1	Active	Production	VQFNP (RUR)   88	2500   LARGE T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UH984
DS90UH984RURRQ1.A	Active	Production	VQFNP (RUR)   88	2500   LARGE T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UH984
DS90UH984RURRTQ1	Active	Production	VQFNP (RUR)   88	250   SMALL T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UH984
DS90UH984RURRTQ1.A	Active	Production	VQFNP (RUR)   88	250   SMALL T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UH984

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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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
DS90UH984RURRQ1	VQFNP	RUR	88	2500	330.0	24.4	12.3	12.3	1.1	16.0	24.0	Q2
DS90UH984RURTQ1	VQFNP	RUR	88	250	180.0	24.4	12.3	12.3	1.1	16.0	24.0	Q2

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DS90UH984RURRQ1	VQFNP	RUR	88	2500	367.0	367.0	35.0
DS90UH984RURTQ1	VQFNP	RUR	88	250	210.0	185.0	35.0

## GENERIC PACKAGE VIEW

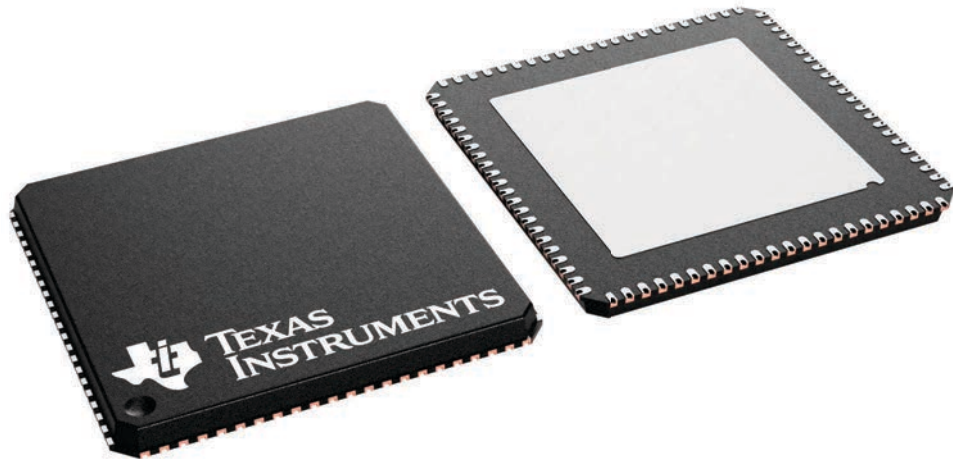
**RUR 88**

**VQFN - 0.9 mm max height**

12 x 12, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

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