

DS90UB984-Q1 4K FPD-Link IV to Embedded DisplayPort Bridge Deserializer

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
 - 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 1.15V 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 DS90UB984-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 DS90UB984-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 .

Package Information

PART NUMBER	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾
DS90UB984-Q1	RUR (VQFNFP, 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.

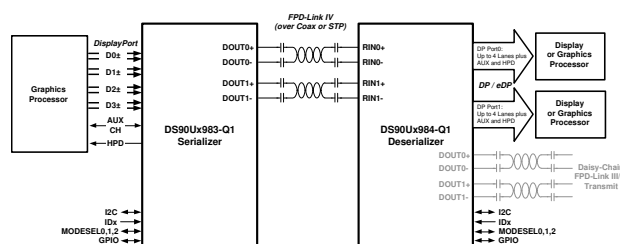


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4 Device and Documentation Support

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.

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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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DS90UB984RURRQ1	ACTIVE	VQFNP	RUR	88	2500	RoHS & Green	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UB984	Samples
DS90UB984RURRQ1	ACTIVE	VQFNP	RUR	88	250	RoHS & Green	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UB984	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.

OBSELETE: 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 finish/Ball material - Orderable Devices 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.

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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
DS90UB984RURRQ1	VQFNP	RUR	88	2500	330.0	24.4	12.3	12.3	1.1	16.0	24.0	Q2
DS90UB984RURQT1	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)
DS90UB984RURRQ1	VQFNP	RUR	88	2500	367.0	367.0	35.0
DS90UB984RURTQ1	VQFNP	RUR	88	250	210.0	185.0	35.0

GENERIC PACKAGE VIEW

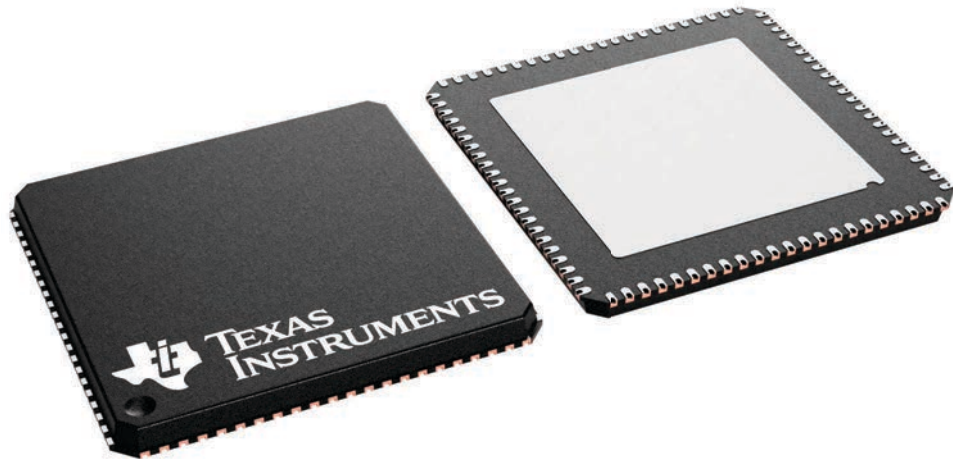
RUR 88

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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