TEXAS INSTRUMENTS

DS90UB9702-Q1
SLUSFI7 – DECEMBER 2023

DS90UB9702-Q1 Automotive FPD-Link IV Deserializer Hub With D-PHY CSI-2 Output Ports for 8MP+ Cameras & Other Sensors

1 Features

- AEC-Q100 Qualified for automotive applications:
  - Device temperature grade 2: –40℃ to 105℃
- Deserializer aggregates data from up to 4 sensors simultaneously
  - Supports 7/8MP+ imagers
  - Line rate at 7.55 Gbps
  - Single-ended coaxial or Shielded Twisted-Pair (STP) cable
  - Power-over-Cable (PoC) support
- CSI v2.1 Compliant system interface
  - Supports up to 2 MIPI CSI-2 output ports and 1 replication port
    - CSI Port 0: MIPI CSI-2 output port
    - CSI Port 1: MIPI CSI-2 output port
    - CSI Port 2: replication port
  - 16 Virtual Channels and VC-ID remapping
- MIPI D-PHY v2.1 compatible
  - Up to 4 data lanes with 2 clocks per port
  - Up to 2.5 Gbps per lane, 10 Gbps per port
- Quad CMLOUT output ports for off-board processing
  - 4 x CMLOUT ports replicated from 4 x FPD RX ports
  - Capable of driving another deserializer at the same line rate
- 10 GPIO Pins for sensor synchronization and diagnostics
- Dual I2C ports
- Frozen frame detection
- Automatic receiver equalization
- Compatible with DS90UB971-Q1, DS90UB981-Q1, DS90UB953-Q1, DS90UB953A-Q1, DS90UB951-Q1, DS90UB935-Q1, DS90UB933-Q1, and DS90UB913A-Q1 serializers
- Low Power Sleep Mode with GPIO-state retention

2 Applications

- Automotive Driver Assistance Systems (ADAS)
- Security and surveillance
- Industrial and consumer remote cameras
- Medical imaging systems

3 Description

The DS90UB9702-Q1 is an FPD-Link deserializer that delivers robust ultra-high-speed 7.55 Gbps forward channel and 47.1875 Mbps Bidirectional Control Channel for connecting up to four raw data sensors to central processing units over an automotive coaxial or STP cable. When coupled with DS90UB971-Q1 serializer, the deserializer receives video data from imagers supporting ultra-high resolutions (8MP+/40fps) or multiple sensors in various topologies.

Data is received and aggregated into two MIPI CSI-2 D-PHY outputs for interfacing with a downstream processor. An additional CSI port is used for port replication. The flexible MIPI CSI-2 outputs support multiple virtual channels interleaving per port to differentiate multiple sensors, exposures, and data types. This functionality features video aggregation and replication modes and supports input-to-output port as well as virtual channel (VC-ID) remapping.

Advanced data protection and diagnostic features support overall system functional safety. Multiple levels of data integrity checking and protection in conjunction with programmable health status interrupt helps ensure robust sensor module and link operation in vehicles.

Device Information

PART NUMBER	PACKAGE [1]	PACKAGE SIZE [2]
DS90UB9702-Q1	VQFNP (88)	12.00 mm × 12.00 mm

(1) For more information, see Section 5.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.
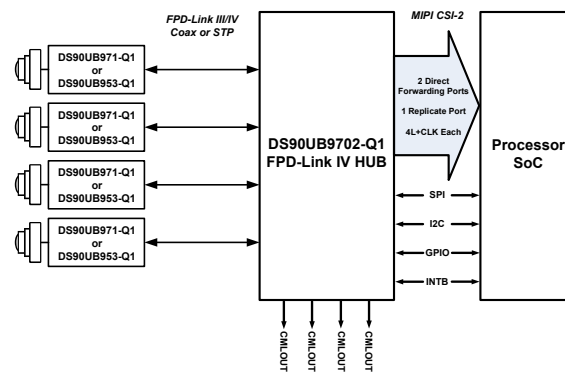
Typical Application Schematic

4 Device and Documentation Support

4.1 Documentation Support

4.1.1 Related Documentation

For related documentation see the following:
- Texas Instruments, *I2C Communication Over FPD-Link III with Bidirectional Control Channel*, application note
- Texas Instruments, *I2C Bus Pullup Resistor Calculation*, application note

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.

Linked content is 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.

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 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.

PACKAGE OPTION ADDENDUM

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)
DS90UB9702TRURRQ1	Active	Production	VQFNP (RUR) | 88	2500 | LARGE T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UB9702
DS90UB9702TRURRQ1.A	Active	Production	VQFNP (RUR) | 88	2500 | LARGE T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UB9702
DS90UB9702TRURTQ1	Active	Production	VQFNP (RUR) | 88	250 | SMALL T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UB9702
DS90UB9702TRURTQ1.A	Active	Production	VQFNP (RUR) | 88	250 | SMALL T&R	Yes	NIPDAUAG	Level-3-260C-168 HR	-40 to 105	UB9702

(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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

PACKAGE MATERIALS INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSIONS

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

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
DS90UB9702TRURRQ1	VQFNP	RUR	88	2500	330.0	24.4	12.3	12.3	1.1	16.0	24.0	Q2
DS90UB9702TRURTQ1	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)
DS90UB9702TRURRQ1	VQFNP	RUR	88	2500	367.0	367.0	45.0
DS90UB9702TRURTQ1	VQFNP	RUR	88	250	211.0	193.0	46.0

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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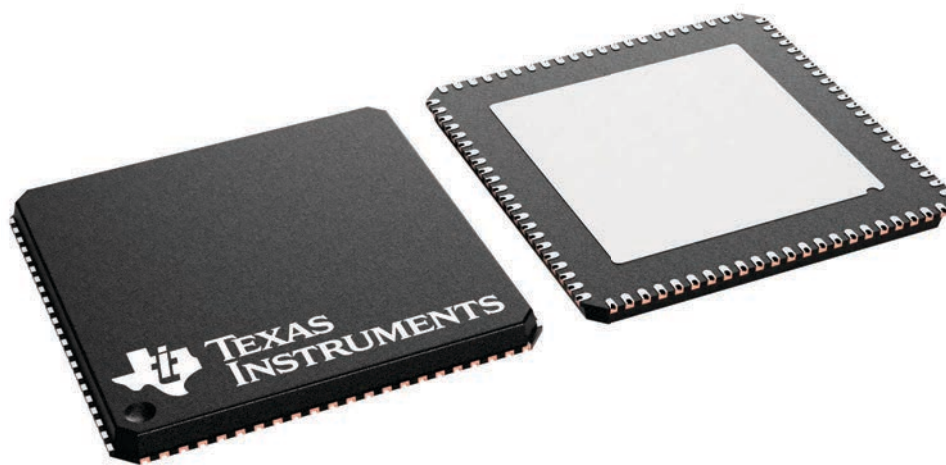
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