

# TDES9640 V<sup>3</sup>Link™ Deserializer Hub With CSI-2 Output Ports for 8-MP+ Cameras and Other Sensors

## 1 Features

- Quad 7.55 Gbps deserializer hub aggregates data from up to 4 sensors simultaneously
  - Supports 8MP+ imagers
  - Single-ended coaxial or shielded twisted-pair (STP) cable
  - Power-over-coax (PoC) support
- Supports 3 data rates: 7.55 Gbps, 3.775 Gbps and 1.8875 Gbps
- 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 (D-PHY only)
  - 16 Virtual channels and VC-ID remapping
  - MIPI D-PHY and C-PHY configurable
- 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
- MIPI C-PHY v1.1 compatible
  - Up to 4 trios per port
  - Up to 5.7 Gbps per trio, 22.8 Gbps per port
- Quad CMLOUT output ports for off-board processing
  - 4 x CMLOUT ports replicated from 4 x V<sup>3</sup>Link 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 TSER9615, TSER953, and with the TSER4905 (when used in Enhanced Vision mode)
- Low power sleep mode with GPIO-state retention
- Wide temperature range: -20°C to 85°C

## 2 Applications

- [Appliances](#)
- [Video Surveillance](#)
- [Elevators and Escalators](#)
- [Industrial Robots](#)
- [Machine Vision](#)
- [Patient Monitoring and Diagnostics](#)
- [Imaging](#)

## 3 Description

The TDES9640 is a V<sup>3</sup>Link Enhanced Vision deserializer that delivers robust ultra-high-speed 7.55 Gbps forward channel and 47.1875 Mbps bidirectional control channel for connecting up to 4 data sensors to the processing unit over a coaxial or STP cable. When paired with the TSER9615 or the TSER4905 serializers, the TDES9640 receives video data from image sensors or video sources supporting ultra-high resolutions or multiple sensors in various topologies.

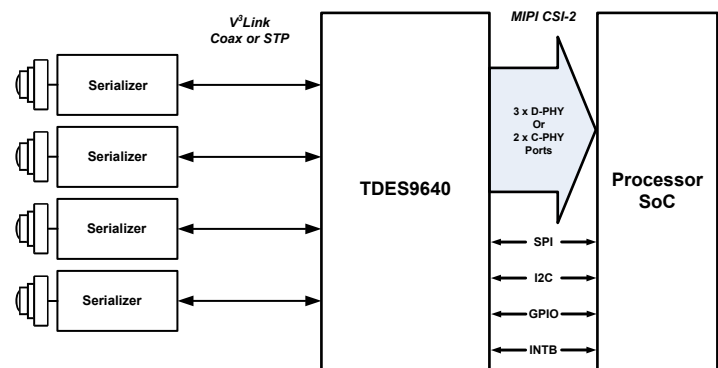
Data is received and aggregated into two MIPI CSI-2 D-PHY or C-PHY outputs for interfacing with a downstream processor. An additional CSI port is used for port replication in D-PHY mode only. The flexible MIPI CSI-2 outputs support multiple virtual channels interleaving per port to differentiate multiple 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.

The TDES9640 supports advanced data protection and diagnostic features, as well as multiple levels of data integrity checking and protection in conjunction with programmable health status interrupt, which helps achieve robust sensor module and link operation in the end application.

### Device Information

PART NUMBER	PACKAGE <sup>(1)</sup>	BODY SIZE (NOM)
TDES9640	VQFN (88)	12.00 mm × 12.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Typical Application Schematic

## 4 Device and Documentation Support

### 4.1 Documentation Support

#### 4.1.1 Related Documentation

For related documentation see the following:

- [I2C Communication Over FPD-Link III with Bidirectional Control Channel](#)
- [I2C Bus Pull-Up Resistor Calculation](#)

### 4.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Notifications* 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.

### 4.3 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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### 4.4 Trademarks

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### 4.5 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.

### 4.6 Glossary

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

**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
TDES9640RURR	ACTIVE	VQFNP	RUR	88	2500	RoHS & Green	NIPDAUAG	Level-3-260C-168 HR	-20 to 85	T9640	<a href="#">Samples</a>
TDES9640RURT	ACTIVE	VQFNP	RUR	88	250	RoHS & Green	NIPDAUAG	Level-3-260C-168 HR	-20 to 85	T9640	<a href="#">Samples</a>

(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 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
TDES9640RURR	VQFNP	RUR	88	2500	330.0	24.4	12.3	12.3	1.1	16.0	24.0	Q2
TDES9640RURT	VQFNP	RUR	88	250	330.0	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)
TDES9640RURR	VQFNP	RUR	88	2500	367.0	367.0	45.0
TDES9640RURT	VQFNP	RUR	88	250	211.0	193.0	46.0

## GENERIC PACKAGE VIEW

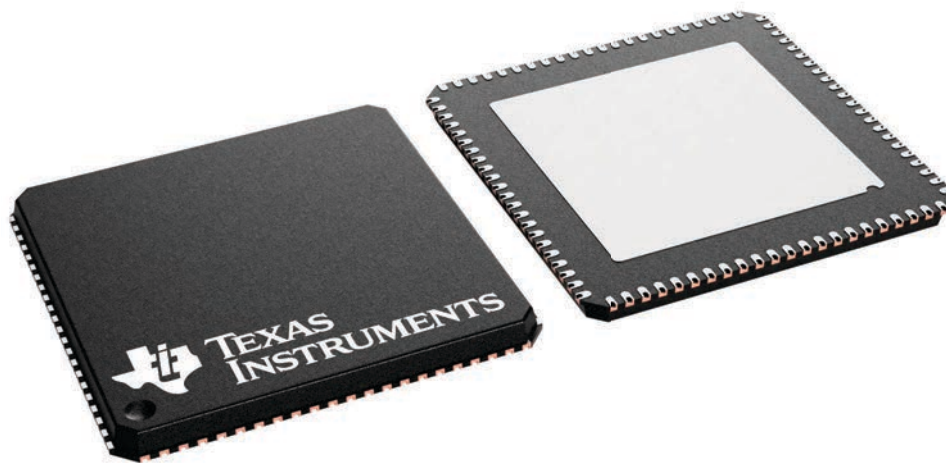
**RUR 88**

**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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