

TDES4940 4K V³Link Enhanced Video 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 @ 60 Hz video resolution
 - Stream synchronization and splitting
- V³Link enhanced video interface
 - 13.5/12.528/10.8/6.75/3.375 Gbps per Channel; Up to 27 Gbps 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 3.4 MHz local bus access)
 - High-speed GPIOs
 - Supports SPI and UART pass through GPIOs
- Compatibility
 - Integrated HDCP v1.4 with on-chip keys
 - V³Link video and V³Link enhanced video product families
- Image enhancement (white balance and dithering)
- 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
- Qualifications
 - ISO 10605 and IEC 61000-4-2 ESD compliant
 - Temperature: -20°C to +85°C

2 Applications

- High resolution display:
 - Operating room displays
 - Seat back entertainment displays
 - High resolution HMI

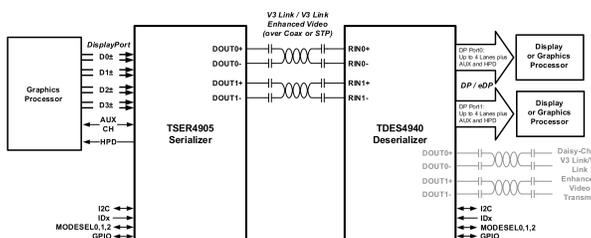
3 Description

The TDES4940 is a V³Link Enhanced Video to DisplayPort (DP) / Embedded DisplayPort (eDP) bridge device. In conjunction with a V³Link Enhanced Video serializer, the chipset receives a high-speed serialized interface over low-cost 50 Ω coax or STP/STQ cables. The TDES4940 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 V³Link Enhanced Video 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 V³Link Enhanced Video 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 compatible V³Link 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.

Device Information

PART NUMBER	PACKAGE (1)	BODY SIZE (NOM)
TDES4940	VQFNFP (88)	12 mm × 12 mm

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



4 Device and Documentation Support

4.1 Documentation Support

4.1.1 Related Documentation

For related documentation see the following:

- *Soldering Specifications Application Report*, [SNOA549](#)
- *IC Package Thermal Metrics Application Report*, [SPRA953](#)
- *Leadless Leadframe Package (LLP) Application Report*, [SNOA401](#)

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

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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.

5.1 Package Option Addendum

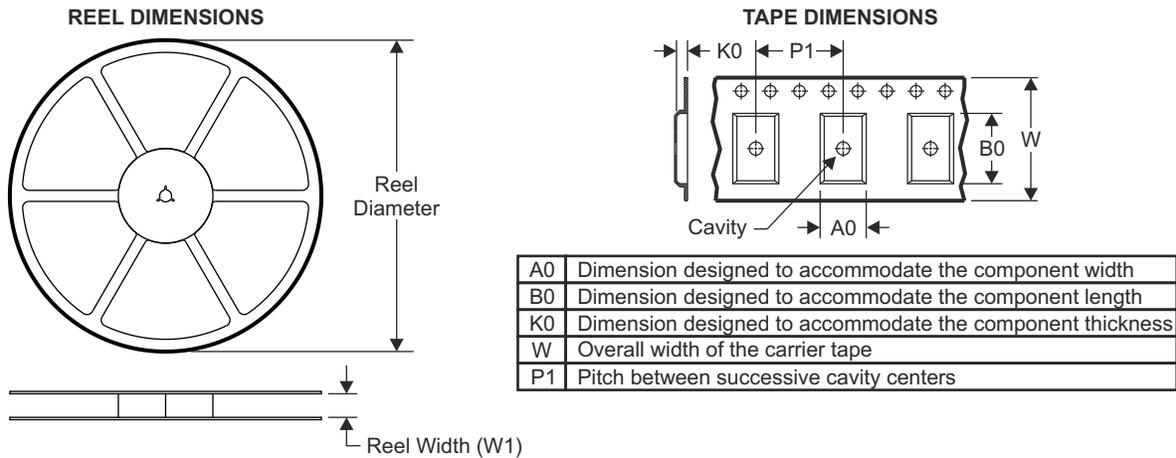
Packaging Information

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking
TDES4940RURTQ1	ACTIVE	VQFN	RUR0088D	88	250	RoHS & Green	NiPdAuAg	Level-3-260C-168 HR	-20 to 85	TDES4940
TDES4940RURRQ1	ACTIVE	VQFN	RUR0088D	88	2500	RoHS & Green	NiPdAuAg	Level-3-260C-168 HR	-20 to 85	TDES4940

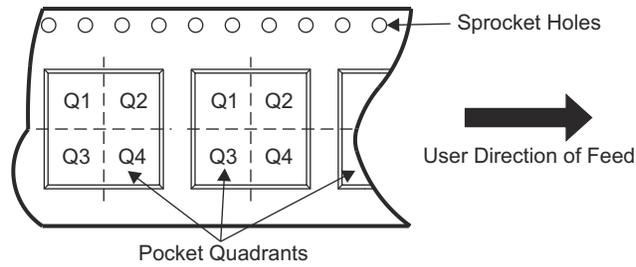
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5.2 Tape and Reel Information

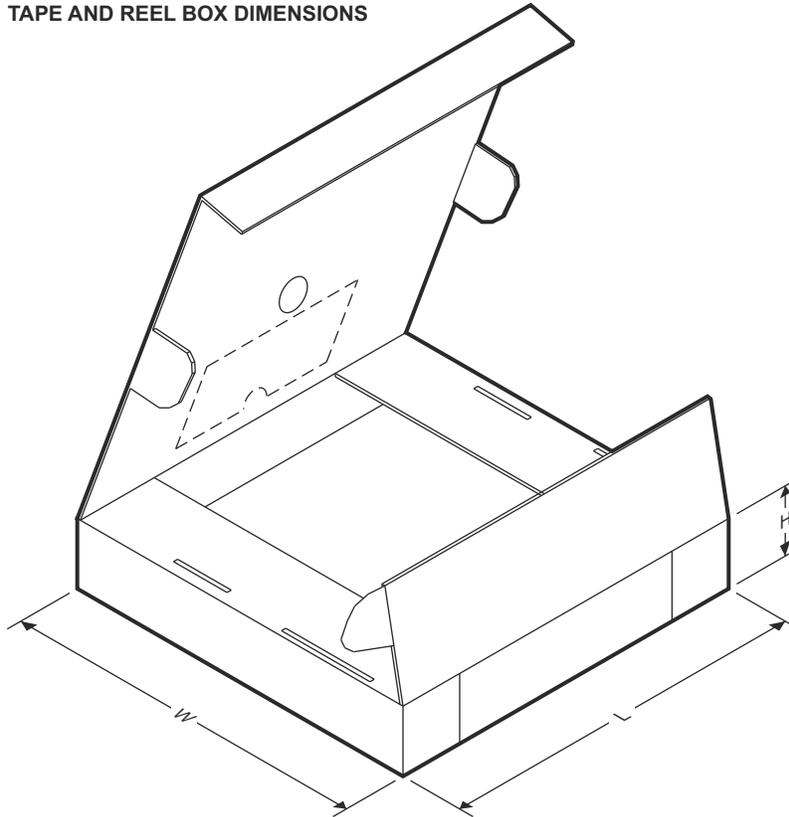


QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

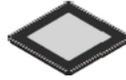


Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TDES4940RURQ1	VQFN	RUR0088 D	88	250	180	24.4	12.30	12.30	1.10	16.00	24.00	Q2
TDES4940RURRQ1	VQFN	RUR0088 D	88	2500	330	24.4	12.30	12.30	1.10	16.00	24.00	Q2

TAPE AND REEL BOX DIMENSIONS



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TDES4940RURRTQ1	VQFN	RUR0088D	88	250	210	185	35
TDES4940RURRQ1	VQFN	RUR0088D	88	2500	360	360	36
TDES4940RURRQ1	VQFN	RUR0088D	88	2500	367	367	35

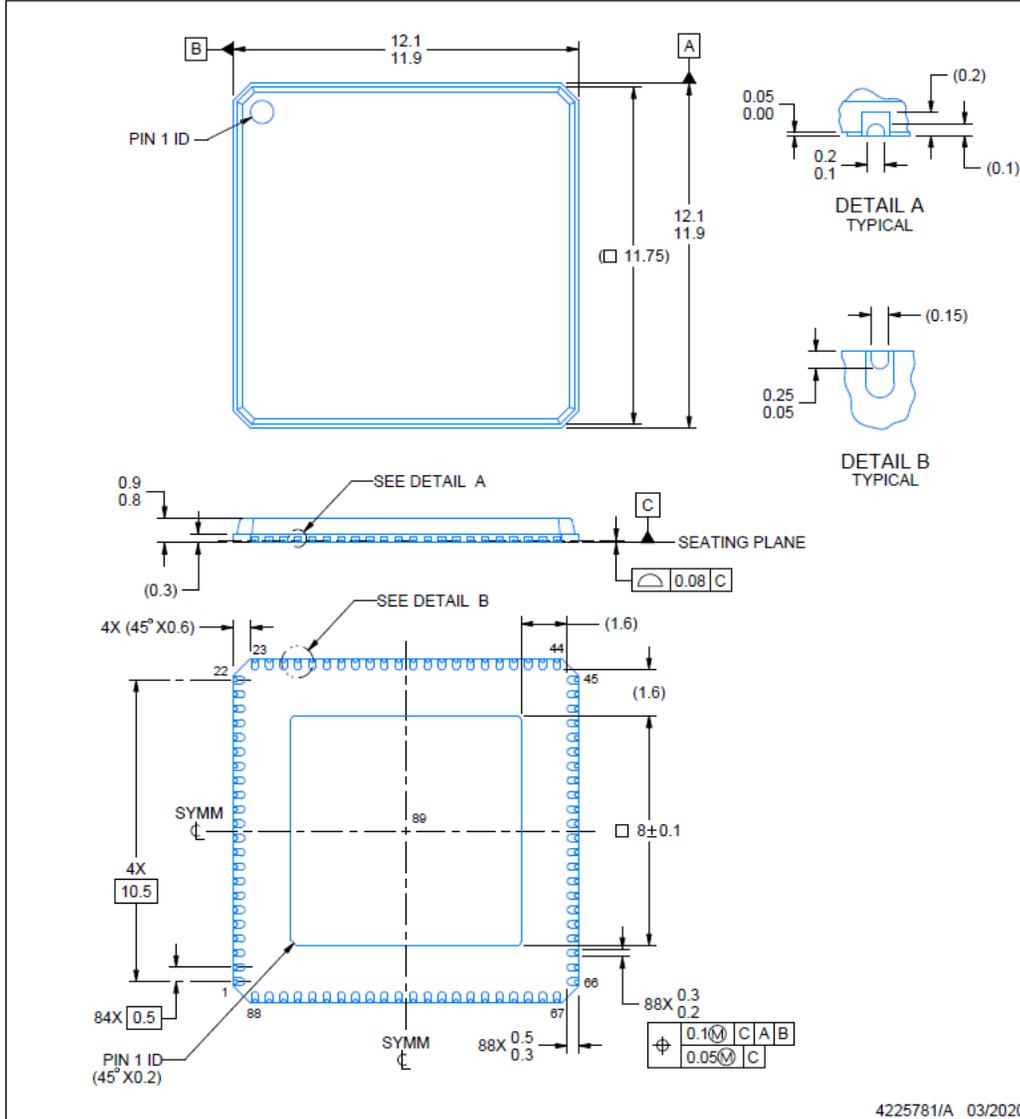


RUR0088D

PACKAGE OUTLINE

VQFN - 0.9 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

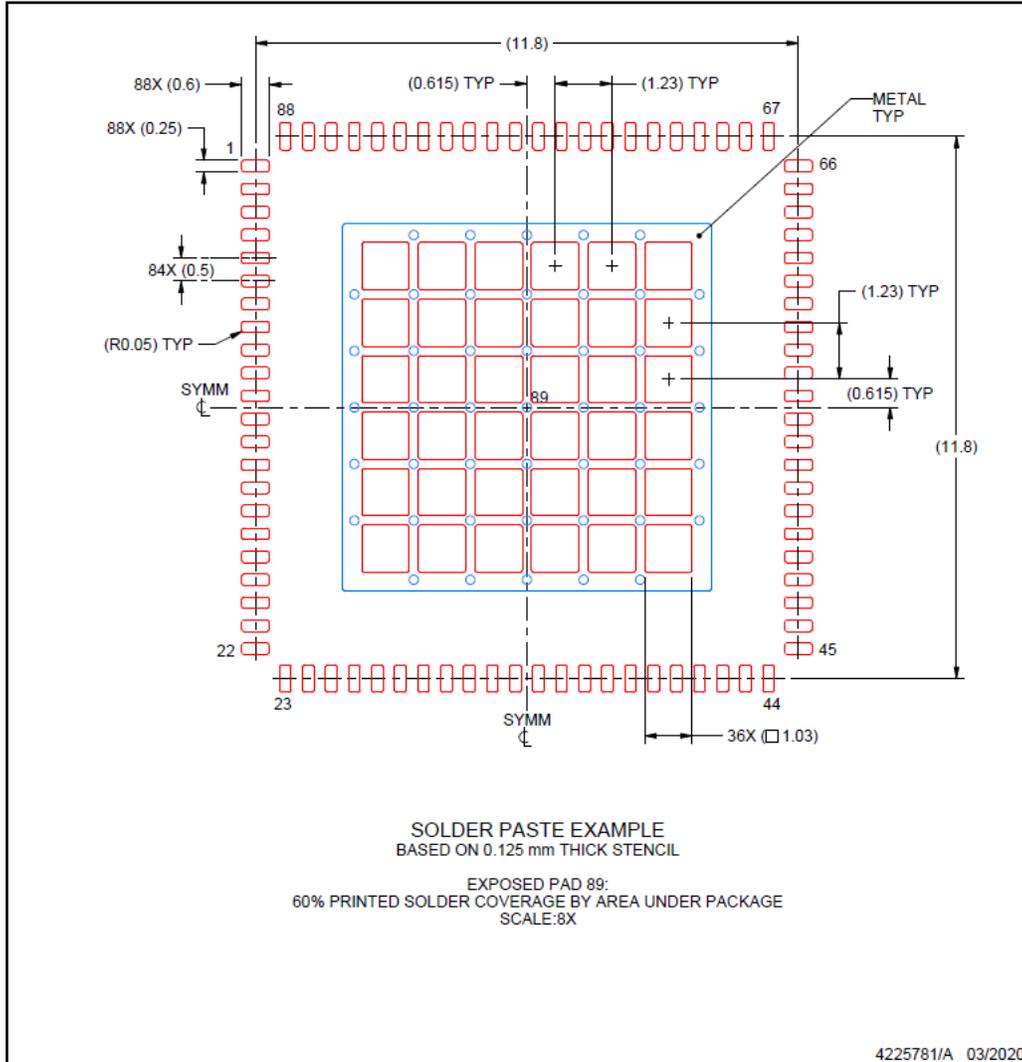
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE STENCIL DESIGN

RUR0088D

VQFN - 0.9 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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
TDES4940RURR	ACTIVE	VQFNP	RUR	88	2500	RoHS & Green	NIPDAUAG	Level-3-260C-168 HR	-20 to 85	TDES4940	Samples
TDES4940RURT	ACTIVE	VQFNP	RUR	88	250	RoHS & Green	NIPDAUAG	Level-3-260C-168 HR	-20 to 85	TDES4940	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.

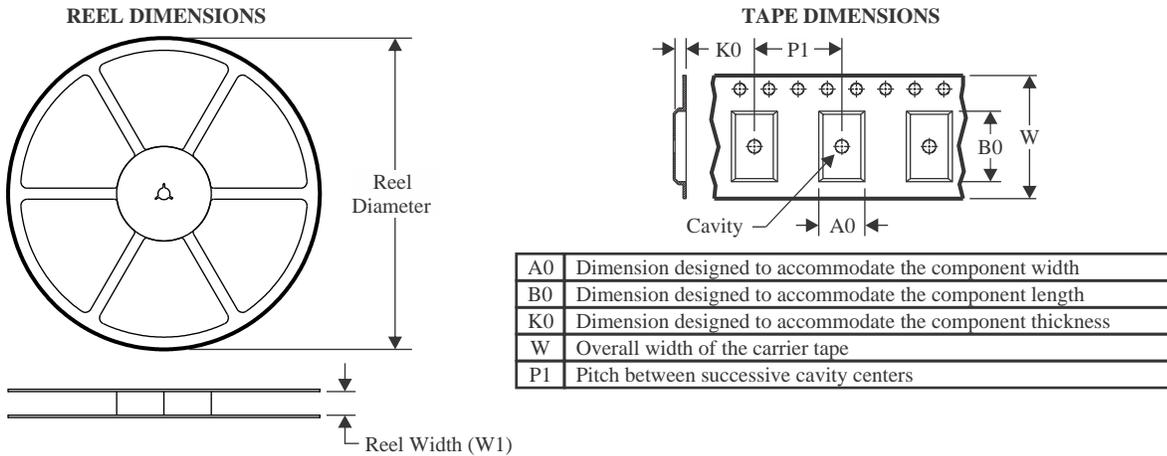
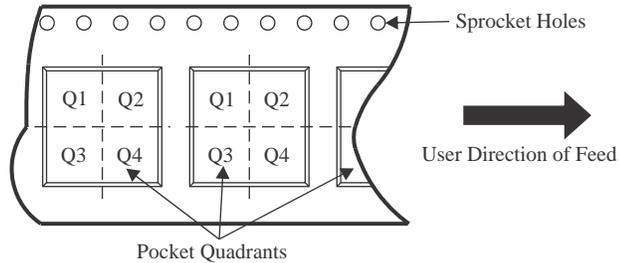
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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 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
TDES4940RURR	VQFNP	RUR	88	2500	330.0	24.4	12.3	12.3	1.1	16.0	24.0	Q2
TDES4940RURT	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)
TDES4940RURR	VQFNP	RUR	88	2500	367.0	367.0	35.0
TDES4940RURT	VQFNP	RUR	88	250	210.0	185.0	35.0

GENERIC PACKAGE VIEW

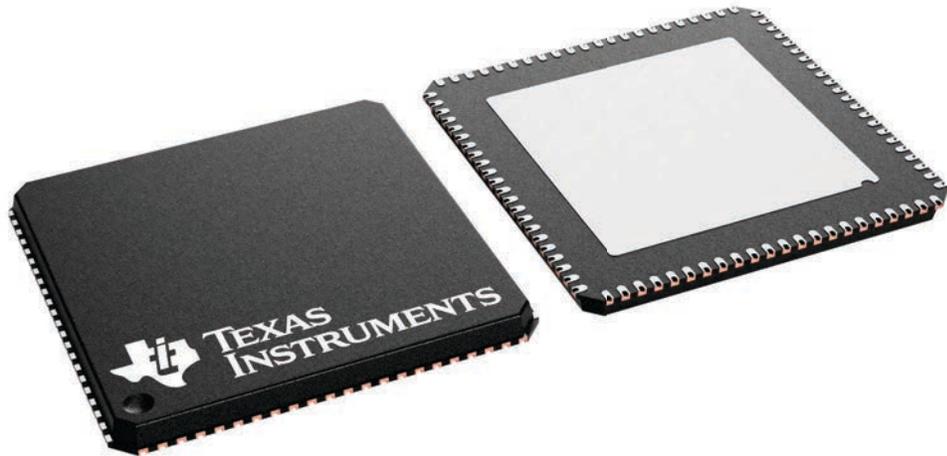
RUR 88

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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