

## DS30BA101 3.125 Gbps Differential Buffer

Check for Samples: [DS30BA101](#)

### FEATURES

- Data Rates from DC to 3.125 Gbps
- Supports SD and HD Video Resolutions
- Power Consumption: 165 mW Typical
- Industrial Temperature Range: -40°C to +85°C

### APPLICATIONS

- Cable Extension
- Signal Buffering and Repeating
- Security and Surveillance

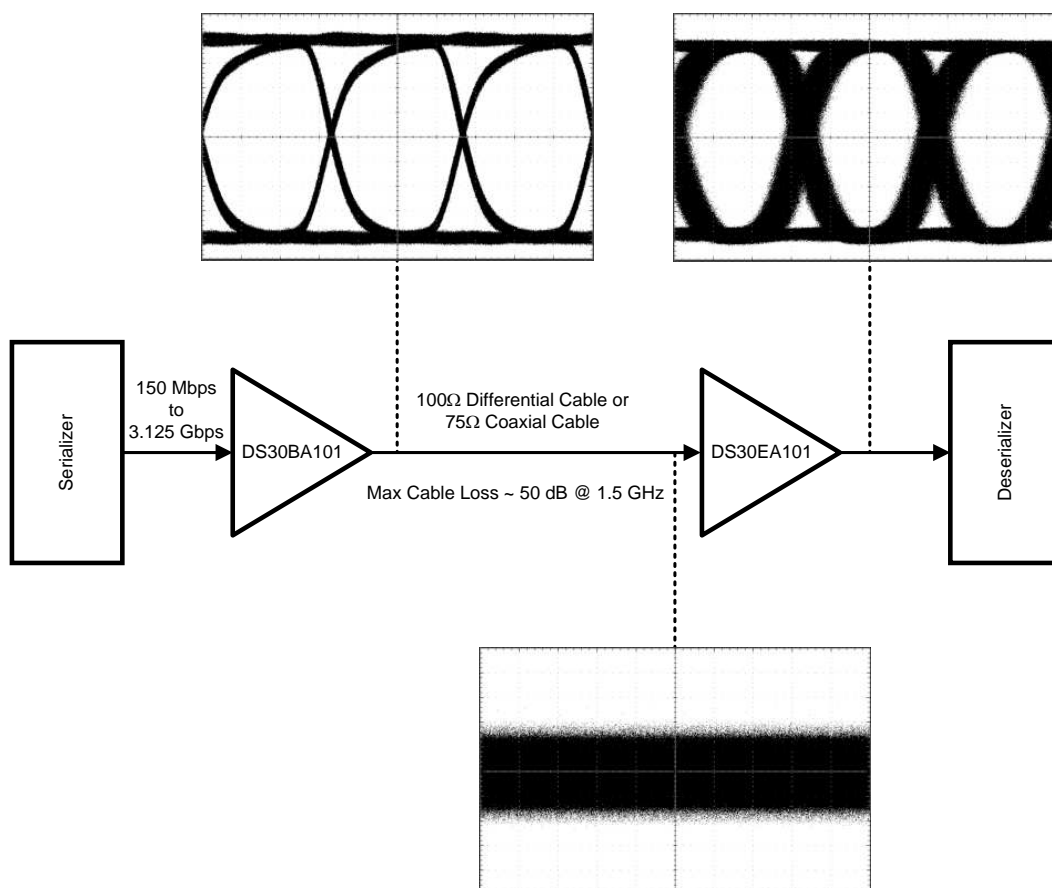
### DESCRIPTION

The DS30BA101 is a high-speed differential buffer for cable driving, signal buffering, and signal repeating applications. Its fully differential signal path ensures exceptional signal integrity and noise immunity. The DS30BA101 drives both differential and single-ended transmission lines at data rates up to 3.125 Gbps.

The output voltage amplitude is adjustable via a single external resistor for cable driving applications into 75Ω single-ended and 100Ω differential mode impedances.

The DS30BA101 is powered from a single 3.3V supply and consumes 165 mW (typical). It operates over the full industrial temperature range of -40°C to +85°C and is available in a 4 x 4 mm 16-pin WQFN package.

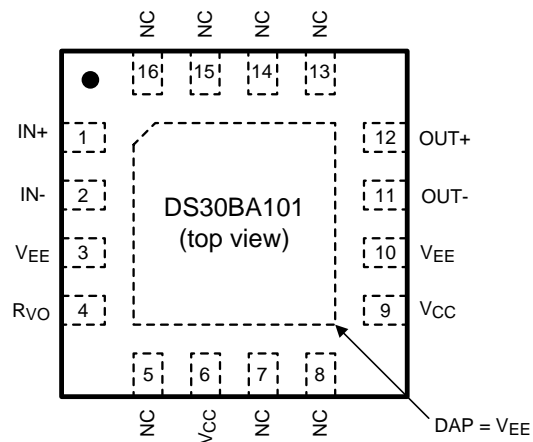
### Typical Application



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## Connection Diagram



The exposed die attach pad is a negative electrical terminal for this device. It should be connected to the negative power supply voltage.

**Figure 1. 16-Pin WQFN Package**  
See Package Number RUM0016A

### PIN DESCRIPTIONS

Pin	Name	I/O, Type	Description
1	IN+	I, CML	Non-inverting input.
2	IN-	I, CML	Inverting input.
3	V <sub>EE</sub>	Ground	Negative power supply (ground).
4	R <sub>VO</sub>	I, Analog	Output voltage level control. Connect a resistor between this pin and V <sub>CC</sub> to set the output voltage.
5	NC	N/A	No connect. Not bonded internally.
6	V <sub>CC</sub>	Power	Positive power supply (+3.3V).
7	NC	N/A	No connect. Not bonded internally.
8	NC	N/A	No connect. Not bonded internally.
9	V <sub>CC</sub>	Power	Positive power supply (+3.3V).
10	V <sub>EE</sub>	Ground	Negative power supply (ground).
11	OUT-	O, Data	Inverting output.
12	OUT+	O, Data	Non-inverting output.
13	NC	N/A	No connect. Not bonded internally.
14	NC	N/A	No connect. Not bonded internally.
15	NC	N/A	No connect. Not bonded internally.
16	NC	N/A	No connect. Not bonded internally.
DAP	V <sub>EE</sub>	Ground	Connect exposed DAP to negative power supply (ground).



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

## Absolute Maximum Ratings<sup>(1)</sup>

Supply Voltage:	3.6V
Input Voltage (all inputs)	-0.3V to $V_{CC}+0.3V$
Output Current	28 mA
Storage Temperature Range	-65°C to +150°C
Junction Temperature	+125°C
Package Thermal Resistance $\theta_{JA}$ 16-pin WQFN $\theta_{JC}$ 16-pin WQFN	+58°C/W +21°C/W
ESD Rating (HBM)	$\geq \pm 4.5$ kV
ESD Rating (MM)	$\geq \pm 250V$
ESD Rating (CDM)	$\geq \pm 2$ kV

- (1) "Absolute Maximum Ratings" indicate limits beyond which damage to the device may occur, including inoperability and degradation of device reliability and/or performance. Functional operation of the device and/or non-degradation at the Absolute Maximum Ratings or other conditions beyond those indicated in the Recommended Operating Conditions is not implied. The Recommended Operating Conditions indicate conditions at which the device is functional and the device should not be operated beyond such conditions.

## Recommended Operating Conditions

Supply Voltage ( $V_{CC}$ ):	3.3V $\pm 5\%$
Operating Free Air Temperature ( $T_A$ )	-40°C to +85°C

## DC Electrical Characteristics

Over recommended supply voltage and operating temperature ranges, unless otherwise specified. <sup>(1)</sup> <sup>(2)</sup>

Parameter		Test Conditions	Reference	Min	Typ	Max	Units
$V_{ICM}$	Input Common Mode Voltage		IN+, IN-	$1.1 + V_{ID}/2$		$V_{CC} - V_{ID}/2$	V
$V_{ID}$	Input Voltage Swing	Differential		100		2200	mV <sub>P-P</sub>
$V_{OCM}$	Output Common Mode Voltage		OUT+, OUT-		$V_{CC} - V_{OUT}$		V
$V_{OUT}$	Output Voltage	Single-ended, 75Ω load, $R_{VO} = 750\Omega$			800		mV <sub>P-P</sub>
		Single-ended, 50Ω load, $R_{VO} = 953\Omega$			400		mV <sub>P-P</sub>
$I_{CC}$	Supply Current				50	59	mA

- (1) The Electrical Characteristics tables list ensured specifications under the listed Recommended Operating Conditions except as otherwise modified or specified by the Electrical Characteristics Conditions and/or Notes. Typical specifications are estimations only and are not ensured.
- (2) Typical values represent most likely parametric norms at  $V_{CC} = +3.3V$ ,  $T_A = +25^\circ C$ , and at the Recommended Operating Conditions at the time of product characterization and are not ensured.

## AC Electrical Characteristics

Over recommended supply voltage and operating temperature ranges, unless otherwise specified. <sup>(1)</sup> <sup>(2)</sup>

Parameter		Test Conditions	Reference	Min	Typ	Max	Units
$DR_{IN}$	Input Data Rate		IN+, IN-			3125	Mbps
$t_{TLH}$	Transition Time Low to High	20% - 80% <sup>(3)</sup>	OUT+, OUT-		90	130	ps
$t_{THL}$	Transition Time High to Low				90	130	ps

- (1) The Electrical Characteristics tables list ensured specifications under the listed Recommended Operating Conditions except as otherwise modified or specified by the Electrical Characteristics Conditions and/or Notes. Typical specifications are estimations only and are not ensured.
- (2) Typical values represent most likely parametric norms at  $V_{CC} = +3.3V$ ,  $T_A = +25^\circ C$ , and at the Recommended Operating Conditions at the time of product characterization and are not ensured.
- (3) Specification is ensured by characterization and is not tested in production.

## DEVICE OPERATION

### INPUT INTERFACING

The DS30BA101 accepts either differential or single-ended input. DC-coupled inputs must be kept within the specified common-mode range.

### OUTPUT INTERFACING

The DS30BA101 uses current mode outputs. Single-ended output levels are 800 mV<sub>P-P</sub> into 75Ω AC-coupled coaxial cable with an R<sub>VO</sub> resistor of 750Ω, or 400 mV<sub>P-P</sub> (800 mV<sub>P-P</sub> differential) into 100Ω differential cable with an R<sub>VO</sub> resistor of 953Ω. The output voltage level is controlled by the value of the R<sub>VO</sub> resistor connected between the R<sub>VO</sub> pin and V<sub>CC</sub>.

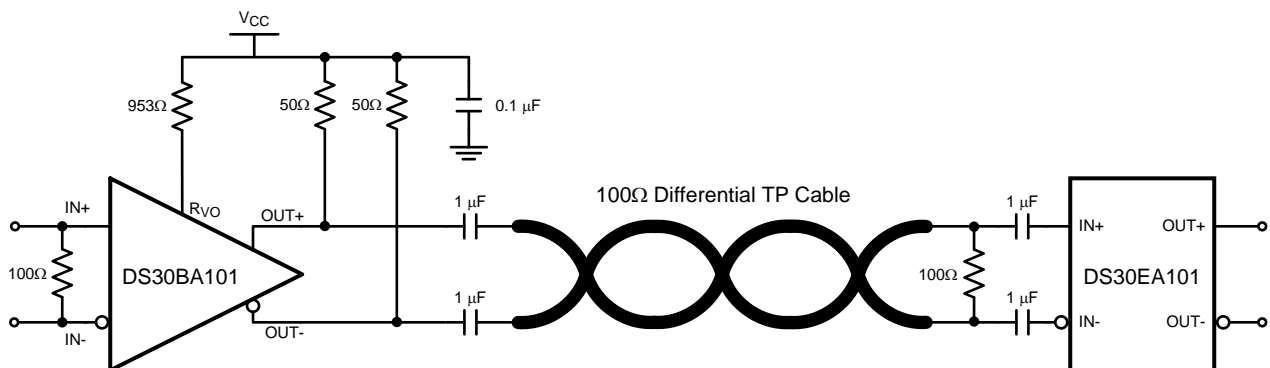
The R<sub>VO</sub> resistor should be placed as close as possible to the R<sub>VO</sub> pin. In addition, the copper in the plane layers below the R<sub>VO</sub> network should be removed to minimize parasitic capacitance.

Figure 2 and Figure 3 show the typical configurations for differential output and single-ended output, respectively. For single-ended output, the unused output must be properly terminated as shown.

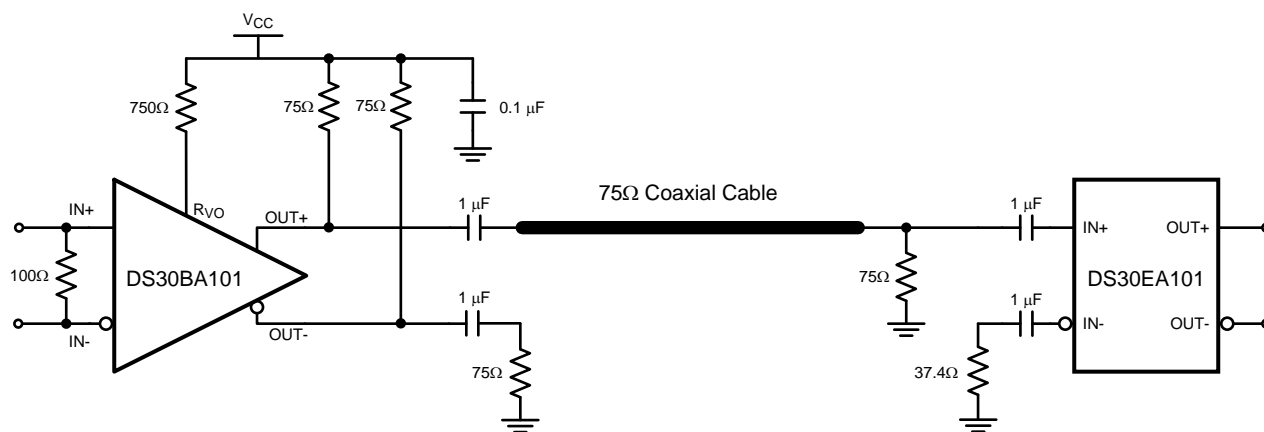
## APPLICATION INFORMATION

### CABLE EXTENDER APPLICATION

The DS30BA101 together with the DS30EA101 form a cable extender chipset optimized for extending serial data streams from serializer/deserializer (SerDes) pairs and FPGAs over 100Ω differential cables and 75Ω coaxial cables. Setting the correct DS30BA101 output amplitude and proper cable termination are essential for optimal operation. Figure 2 shows the recommended chipset configuration for 100Ω differential cable and Figure 3 shows the recommended chipset configuration for 75Ω coaxial cable.



**Figure 2. Cable Extender Chipset Application Circuit for 100Ω Differential Cable**



**Figure 3. Cable Extender Chipset Application Circuit for 75Ω Coaxial Cable**

REVISION HISTORY

Changes from Original (April 2013) to Revision A	Page
• Changed layout of National Data Sheet to TI format .....	<a href="#">5</a>

## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
DS30BA101SQ/NOPB	ACTIVE	WQFN	RUM	16	1000	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	-40 to 85	30BA101	<a href="#">Samples</a>
DS30BA101SQE/NOPB	ACTIVE	WQFN	RUM	16	250	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	-40 to 85	30BA101	<a href="#">Samples</a>
DS30BA101SQX/NOPB	ACTIVE	WQFN	RUM	16	4500	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	-40 to 85	30BA101	<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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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**TAPE AND REEL INFORMATION**


\*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
DS30BA101SQ/NOPB	WQFN	RUM	16	1000	178.0	12.4	4.3	4.3	1.3	8.0	12.0	Q1
DS30BA101SQE/NOPB	WQFN	RUM	16	250	178.0	12.4	4.3	4.3	1.3	8.0	12.0	Q1
DS30BA101SQX/NOPB	WQFN	RUM	16	4500	330.0	12.4	4.3	4.3	1.3	8.0	12.0	Q1



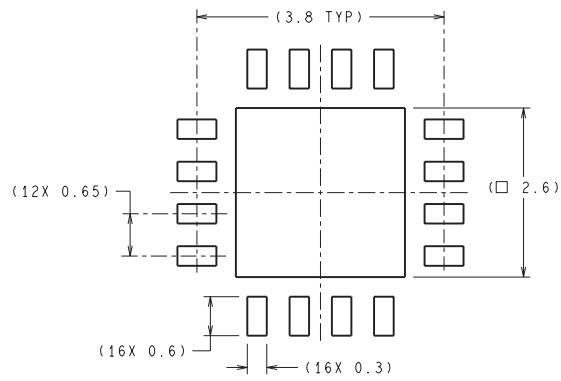
## TAPE AND REEL BOX DIMENSIONS



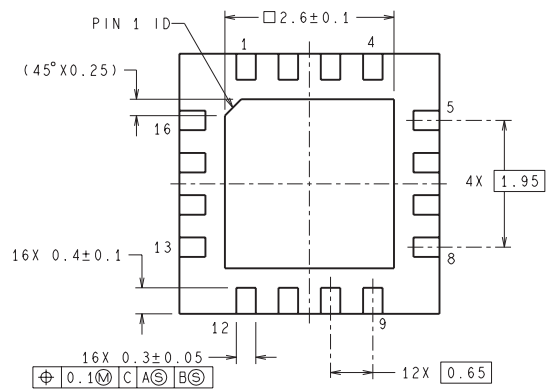
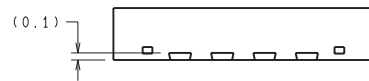
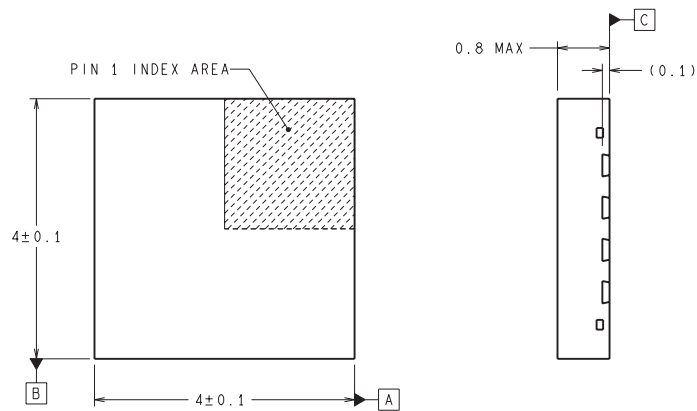
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DS30BA101SQ/NOPB	WQFN	RUM	16	1000	210.0	185.0	35.0
DS30BA101SQE/NOPB	WQFN	RUM	16	250	210.0	185.0	35.0
DS30BA101SQX/NOPB	WQFN	RUM	16	4500	367.0	367.0	35.0

RUM0016A



### RECOMMENDED LAND PATTERN



SQB16A (Rev A)

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