

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

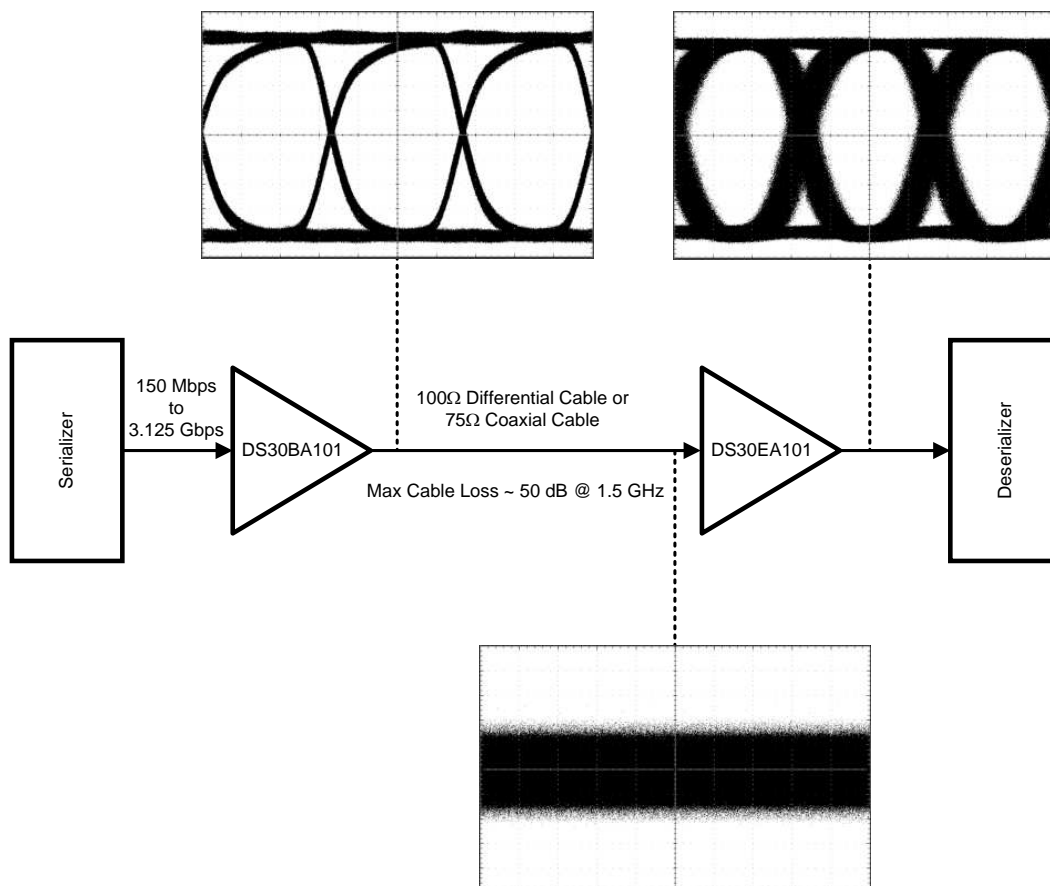
DESCRIPTION

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.

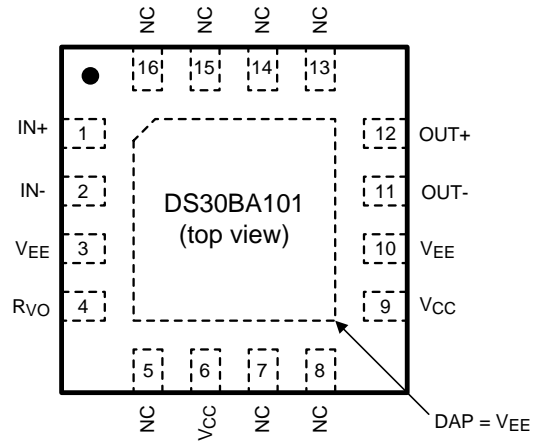
Typical Application



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

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 _{EE}	Ground	Negative power supply (ground).
4	R _{VO}	I, Analog	Output voltage level control. Connect a resistor between this pin and V _{CC} to set the output voltage.
5	NC	N/A	No connect. Not bonded internally.
6	V _{CC}	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 _{CC}	Power	Positive power supply (+3.3V).
10	V _{EE}	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 _{EE}	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⁽¹⁾

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 θ_{JA} 16-pin WQFN θ_{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. ⁽¹⁾ ⁽²⁾

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 _{P-P}
V_{OCM}	Output Common Mode Voltage		OUT+, OUT-		$V_{CC} - V_{OUT}$		V
V_{OUT}	Output Voltage	Single-ended, 75 Ω load, $R_{VO} = 750\Omega$			800		mV _{P-P}
		Single-ended, 50 Ω load, $R_{VO} = 953\Omega$			400		mV _{P-P}
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. ⁽¹⁾ ⁽²⁾

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% ⁽³⁾	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_{P-P} into 75Ω AC-coupled coaxial cable with an R_{VO} resistor of 750Ω, or 400 mV_{P-P} (800 mV_{P-P} differential) into 100Ω differential cable with an R_{VO} resistor of 953Ω. The output voltage level is controlled by the value of the R_{VO} resistor connected between the R_{VO} pin and V_{CC}.

The R_{VO} resistor should be placed as close as possible to the R_{VO} pin. In addition, the copper in the plane layers below the R_{VO} 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.

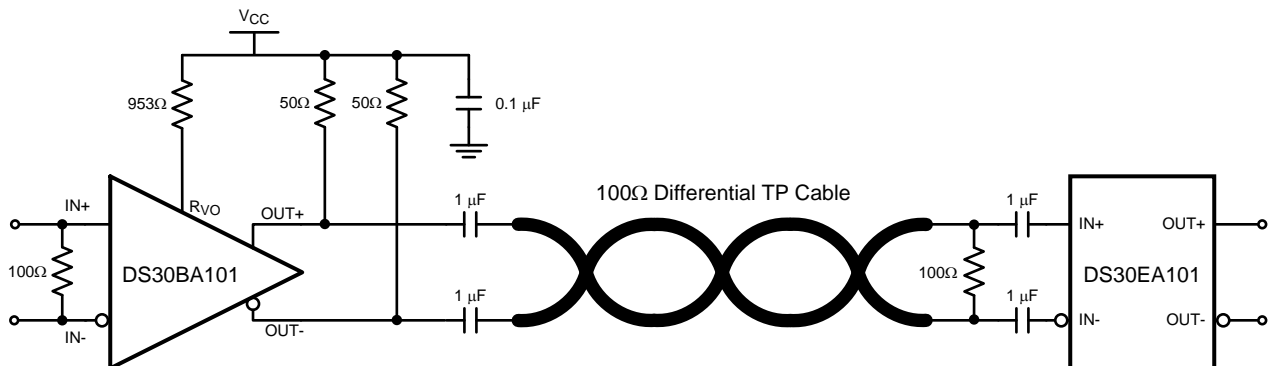


Figure 2. Cable Extender Chipset Application Circuit for 100Ω Differential Cable

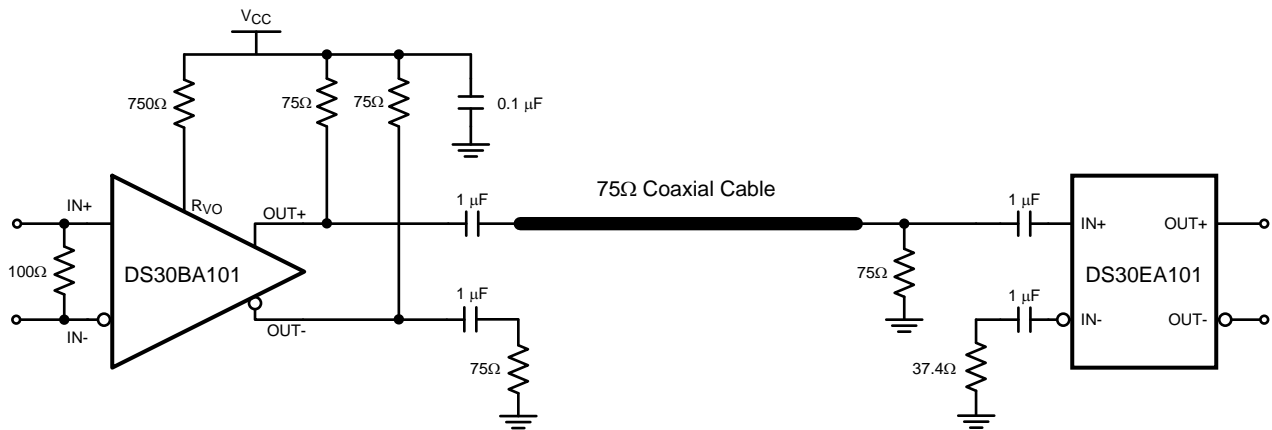


Figure 3. Cable Extender Chipset Application Circuit for 75Ω Coaxial Cable

REVISION HISTORY

Changes from Original (April 2013) to Revision A	Page
• Changed layout of National Data Sheet to TI format	5

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	Samples
DS30BA101SQE/NOPB	ACTIVE	WQFN	RUM	16	250	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	-40 to 85	30BA101	Samples
DS30BA101SQX/NOPB	ACTIVE	WQFN	RUM	16	4500	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	-40 to 85	30BA101	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) 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.

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.

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
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

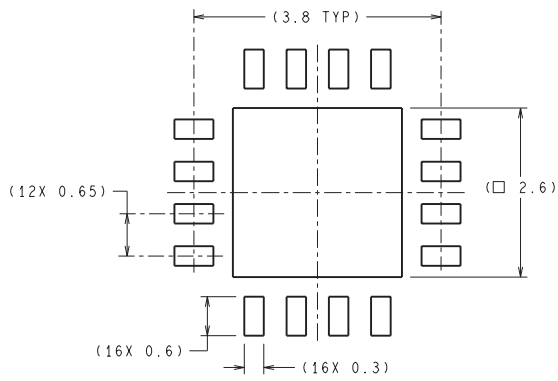
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

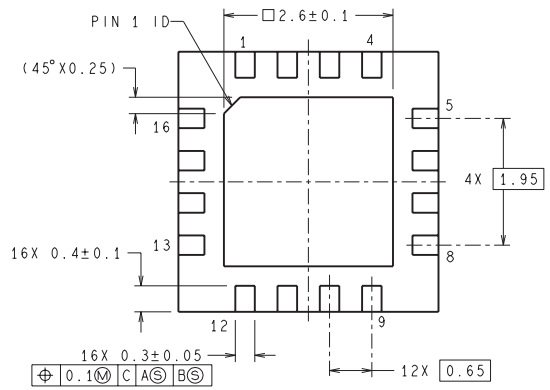
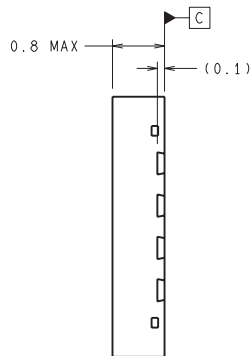
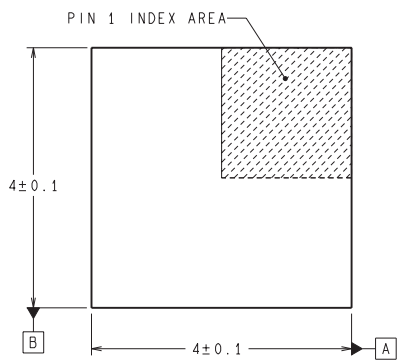
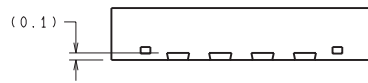
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DS30BA101SQ/NOPB	WQFN	RUM	16	1000	213.0	191.0	55.0
DS30BA101SQE/NOPB	WQFN	RUM	16	250	213.0	191.0	55.0
DS30BA101SQX/NOPB	WQFN	RUM	16	4500	367.0	367.0	35.0

RUM0016A



RECOMMENDED LAND PATTERN

DIMENSIONS ARE IN MILLIMETERS
DIMENSIONS IN () FOR REFERENCE ONLY



SQB16A (Rev A)

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com