

# DS99R124Q-EVK

## FPD-Link II to FPD-Link Converter

### Evaluation Kit

Rev 0.0  
April, 2010

---

#### General Description

The DS99R124Q-EVK converts FPD-link II to FPD-Link. It translates a high-speed serialized interface with an embedded clock over a single pair to three LVDS data/control streams and one LVDS clock pair. It is backward compatible for operation with older generation deserializer devices.

The DS99R124Q-EVK board has a space saving 20-position wall header as the FPD-Link output, and a Rosenberger Automotive HSD Connector as the input. USB or SMA connectors can also be configured as the input, based on the type of the cable to be used.

#### Features

- 5 – 43 MHz support (140 Mbps to 1.82 Gbps Serial Link)
- 4-channel (3 data + 1 clock) FPD-Link driver outputs
- AC Coupled STP Interconnect up to 10 meters in length
- Integrated input termination
- @ Speed link BIST Mode and reporting pin
- Optional I2C compatible Serial Control Bus
- RGB666 + VS, HS, DE converted from 1 pair
- Power down mode minimizes power dissipation
- FAST random data lock; no reference clock required
- Adjustable input receive equalization
- LOCK (real time link status) reporting pin
- Low EMI FPD-Link output
- SSCG option for lower EMI
- 1.8V or 3.3V compatible I/O interface
- Automotive grade product: AEC-Q100 Grade 2 qualified
- >8kV HBM ESD tolerance
- Backward compatible mode for operation with older generation devices

#### Applications

- Automotive Displays for Navigation
- Automotive Display for Entertainment

#### Ordering Information

**PART:** DS99R124QSQ  
**Demo board:** DS99R124Q-EVK  
[national.com](http://national.com)

1

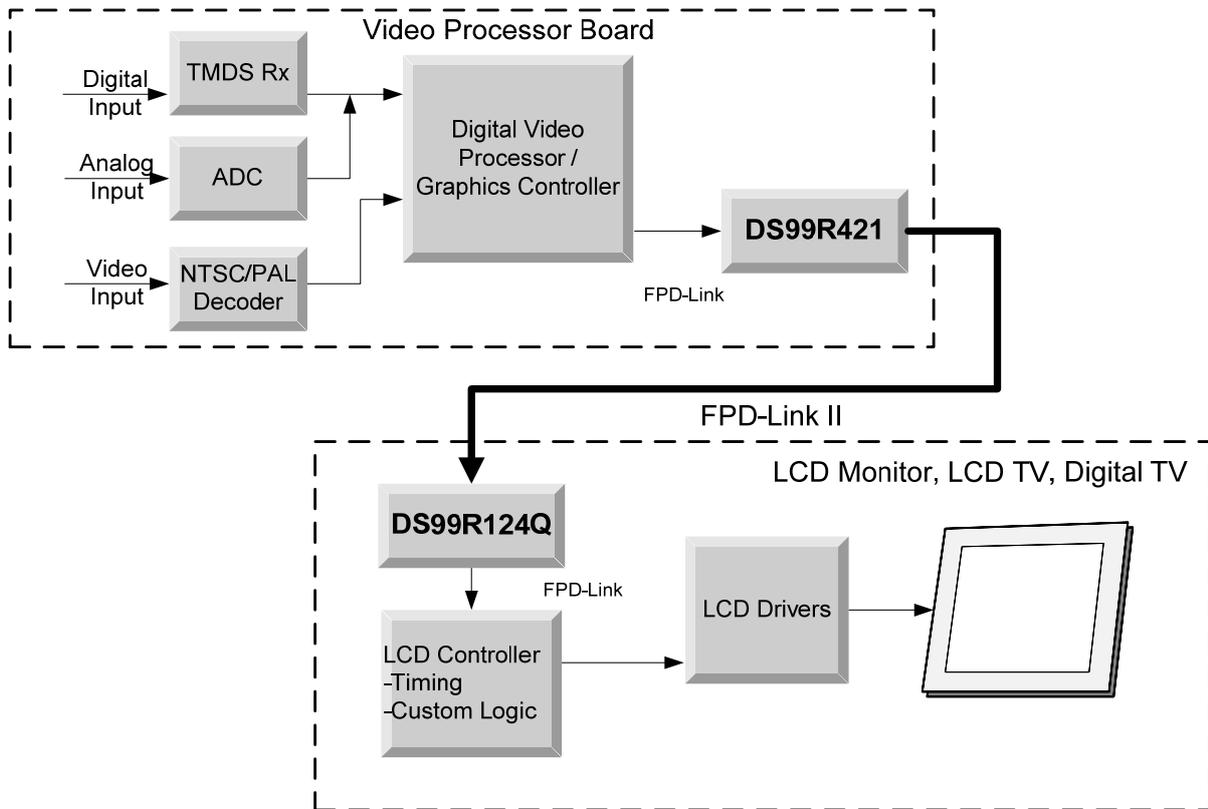


© National Semiconductor Corporation 2009



Printed in U.S.

## Typical Configuration



### Quick Start Guide:

1. Connect 3.3V DC power and ground of the board to the JP1 from the power supply. Connect 1.8V DC power and ground of the board to the J4 and J5 from the power supply.
2. Attach an applicable cable (not supplied – Rosenberger cable) to this RX board (DS99R124Q) input from a TX board (DS99R421) output.
3. From the Video Decoder board, connect a flat cable (not supplied) to the TX board and connect another flat cable (not supplied) from this RX board to the panel.
4. Jumpers and switches have been configured at the factory default; they should not require any changes for immediate operation of the board. See text on Configuration Settings and datasheet for more details.

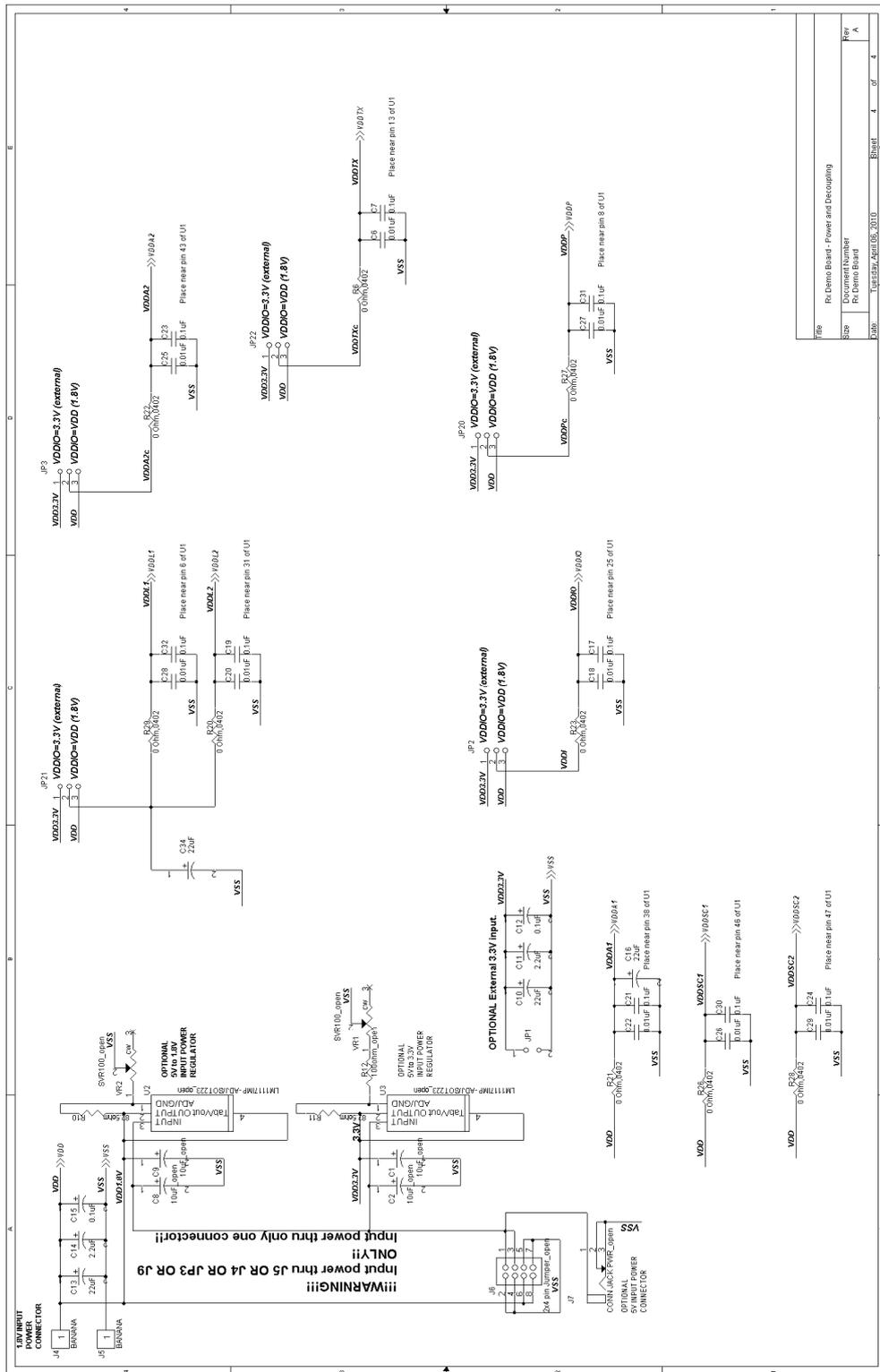
## Configuration Settings

Component	Name	Function
<b>Power Connections</b>		
J7	5V DC	Optional 5V DC Power Jack (Not Populated)
J4	1.8V DC	1.8V VDD Power.
JP1	3.3V DC	3.3V VDD Power.
J5	VSS	Ground.
JP2	VDDIO	Connect to 3.3V or 1.8V.
JP3	VDDA2	Always connect to 1.8V.
-	VDDPC	Always connect to 1.8V.
-	VDDL	Always connect to 1.8V.
-	VDDTXC	Always connect to 3.3V.
<b>Input and Output Connections</b>		
J8	20 position wall header	Connect to FPD-Link output.
J1	Automotive HSD Connector	Connect to FPD-Link II input (default).
J9 and J10	SMA Connector	Connect to FPD-Link II input. (When using these connectors, R3 and R4 should be placed with 0Ω resistors, the traces from R3 and R4 to the J1 should be cut).
J2	USB Connector	Connect to FPD-Link II input. (When using this connector, P1 should be removed, and R24 and R25 should be placed with 0Ω resistors)
JP12 and JP13	Power Wire in USB cable through J2	Connect to VSS is recommended.
<b>Control Connections</b>		
JP4	TESTEN	NSC test mode. Always connect it to "L" or leave it unconnected.
JP5	LF_MODE	Connect to "L" or "H" for the PCLK frequency select. See datasheet for detail information.
JP6	OSSEL	Connect to "L" or "H" for the Output State select. See datasheet for detail information.
JP7	OEN	Connect it to "L" or "H" for the FPD Link Output Enable. See datasheet for detail information.
JP8	VODSEL	Connect it to "L" or "H" for the FPD-Link VOD level select. See datasheet for detail information.
JP9	BISTM	Connect it to "L" or "H" for the BIST Mode. See datasheet for detail information.
JP10	BISTEN	Connect it to "H" for the BIST enable mode. See datasheet for detail information.
-	PDB	Connect it to "L" for the power down mode. Connect it to "H" for the enable mode. See datasheet for detail information.
-	SSC[2:0]	Connect them to "L" or "H" for the SSCG selection.
-	OS[2:0]	Over Sample Bit Outputs
JP24 and VR3	ID[x]	Connect JP24 to VSS to have the default device PHY address (h'DC). Connect JP24 to VR3; then adjust VR3 value to select desired device PHY address. See datasheet for detail information.
J3 and JP23	I2C Interface	Connect JP23 if the I2C power is not supplied on J6. Otherwise, leave it unconnected.
<b>Others</b>		
LED1	PASS	PASS output. "ON" when PASS is "H"
LED2	LOCK	LOCK output. "ON" when LOCK is "H"
JP11, JP25	Other options	Do not connect

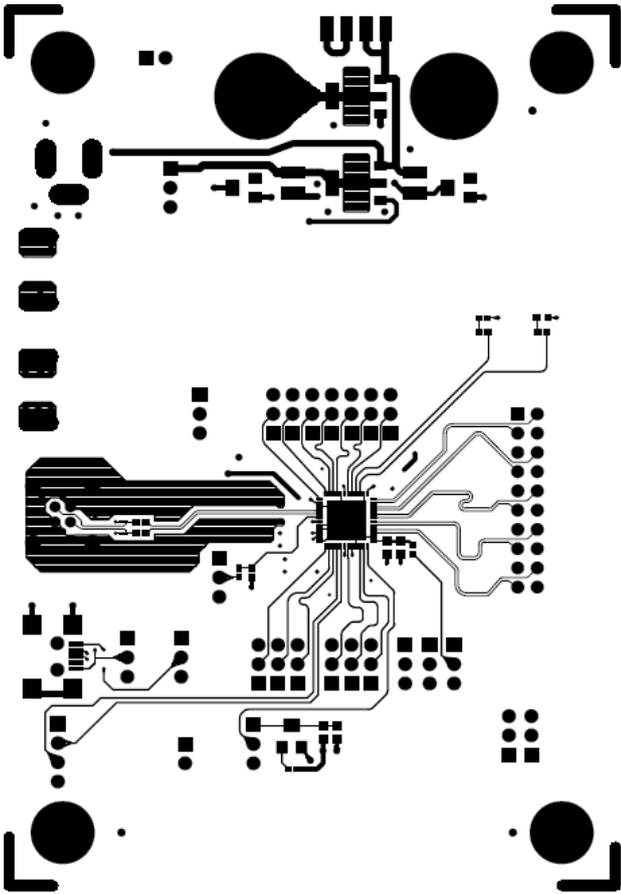
## Bill of Material

Item	Quantity	Reference	Part	Comments	Digi-Key P/N	Part Number
1	2	C3,C4	0.1uF	CAP CERAMIC .1UF25V X5R 0402	445-4964-1-ND	C1005X5R1E104K
2	1	C5	4.7uF	CAP .1UF 16V CERAMIC Y5V 0402.	PCC1731CT-ND	ECJ-0EF1C104Z
3	9	C6,C18,C20,C22,C25,C26, C27,C28,C29	0.01uF	CAP CERAMIC .01UF 100V X7R 0603	399-3189-1-ND	C0603C103K1RACTU
4	10	C7,C17,C19,C21,C23,C24, C30,C31,C32,C35	0.1uF	CAP .1UF ?0% 25V CERAMIC X7R 0603	PCC2277CT-ND	ECJ-1VB1E104K
5	2	C10,C13	22uF	CAP TANTALUM 22UF 25V 20% SMD	493-2391-1-ND	F931E226MNC
6	2	C11,C14	2.2uF	CAPACITOR TANT 2.2UF 20V 10% SMD	399-3714-1-ND	T491B225K020AT
7	2	C12,C15	0.1uF	CAP .10UF 50V CERAMIC X7R 1206	399-1249-1-ND	C1206C104K5RACTU
8	3	C16,C33,C34	22uF	CAPACITOR TANT 22UF 16V 20% SMD	399-3835-1-ND	T494B226M016AT
9	2	JP1,JP23	2-Pin Header	CONN HEADER VERT .100 2POS 30AU	A26542-ND	87220-2
10	24	JP2,JP3,JP4,JP5,JP6,JP7, JP8,JP9,JP10,JP12, JP13,JP14,JP15,JP16,JP17, JP18,JP19,JP20,JP21,JP22, JP24	3-Pin Header	CONN HEADER VERT .100 3POS 15AU	A26545-ND	87224-3
11	1	J2	mini USB 5pin	CONN RECEIPT MINI USB2.0 5POS.	H2959CT-ND	UX60-MB-5ST
12	1	J3	IDC1X4	CONN HEADER 4POS .100 VERT GOLD	WM2702-ND	22-11-2042
13	2	J4,J5	BANANA	BANANA-female (non-insulated) CONN HEADER 20 POS STRGHT GOLD.	J147-ND	108-0740-001
14	1	J8	2X10-Pin Header	End Launch Jack Receptacle - Tab Contact.	MHC20K-ND	N2520-6002RB
15	2	J9,J10	SMA	LED ORN/CLEAR 610NM 0402	J658-ND	142-0701-851
16	1	LED1	0402_orange_LED	SMD	67-1879-1-ND	SML-LX0402SOC-TR
17	1	LED2	0603_green_LED	LED GREEN CLEAR THIN 0603 SMD	160-1446-1-ND	LTST-C191KGKT
18	12	R1, R2, R6, R20, R21, R22, R23, R26, R27, R28, R29 R30	0 Ohm,0402	RES ZERO OHM 1/16W 5% 0402 SMD	P0.0JTR-ND	ERJ-2GEJ0R00X
19	1	R7	10K	RES 10.0K OHM 1/10W 1% 0402 SMD	P10.0KHCT-ND	ERJ-3EKF1002V
20	2	R10,R11	82.5ohm	RES 82.5 OHM 1/10W 1% 0603 SMD	P82.5HCT-ND	ERJ-3EKF82R5V
21	5	R13,R14,R15,R16,R17	100	RES 100 OHM 0201 SMD. 1/20W .5%	RR03P100DCT- ND	RR0306P-101-D
22	2	R31,R32	4.7K	RES 4.7K OHM 1/10W 5% 0603 SMD	P4.7KGCT-ND	ERJ-3GEYJ472V
23	1	U1	DS90UR908	11-Turn Trimming Potentiometer; Top Adjust	3224W-1- 104ECT-ND	DS90UR908
24	1	VR3	SVR100K			3224W-1-104E

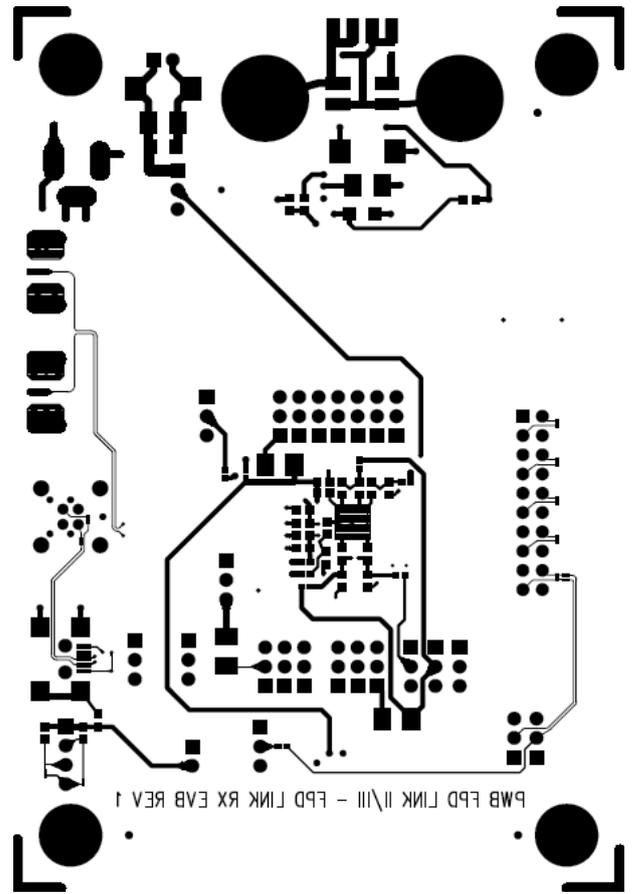




# Reference Layout



Top Layer



Bottom Layer

## IMPORTANT NOTICE FOR TI REFERENCE DESIGNS

Texas Instruments Incorporated ("TI") reference designs are solely intended to assist designers ("Buyers") who are developing systems that incorporate TI semiconductor products (also referred to herein as "components"). Buyer understands and agrees that Buyer remains responsible for using its independent analysis, evaluation and judgment in designing Buyer's systems and products.

TI reference designs have been created using standard laboratory conditions and engineering practices. **TI has not conducted any testing other than that specifically described in the published documentation for a particular reference design.** TI may make corrections, enhancements, improvements and other changes to its reference designs.

Buyers are authorized to use TI reference designs with the TI component(s) identified in each particular reference design and to modify the reference design in the development of their end products. HOWEVER, NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY THIRD PARTY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT, IS GRANTED HEREIN, including but not limited to 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.

TI REFERENCE DESIGNS ARE PROVIDED "AS IS". TI MAKES NO WARRANTIES OR REPRESENTATIONS WITH REGARD TO THE REFERENCE DESIGNS OR USE OF THE REFERENCE DESIGNS, EXPRESS, IMPLIED OR STATUTORY, INCLUDING ACCURACY OR COMPLETENESS. TI DISCLAIMS ANY WARRANTY OF TITLE AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUIET ENJOYMENT, QUIET POSSESSION, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS WITH REGARD TO TI REFERENCE DESIGNS OR USE THEREOF. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY BUYERS AGAINST ANY THIRD PARTY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON A COMBINATION OF COMPONENTS PROVIDED IN A TI REFERENCE DESIGN. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES, HOWEVER CAUSED, ON ANY THEORY OF LIABILITY AND WHETHER OR NOT TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, ARISING IN ANY WAY OUT OF TI REFERENCE DESIGNS OR BUYER'S USE OF TI REFERENCE DESIGNS.

TI reserves 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 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 for TI components 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.

Reproduction of significant portions of TI information in TI data books, data sheets or reference designs 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.

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 that anticipate dangerous failures, monitor failures and their consequences, lessen the likelihood of dangerous failures 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 Buyer's 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 an agreement specifically governing such use.

Only those TI components that 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 that have **not** been so designated is solely at Buyer's risk, and 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.