

8 bq77908A Circuit Module Physical Construction

This section contains the PCB layout, bill of materials, and schematic of the bq77908AEVM circuit module.

The bq77908AEVM-001 consists of two circuit module assemblies, the bq77908AEVM main board or HPA731, and the resistor simulator or HPA582.

8.1 Main Board

8.1.1 Board Layout

The bq77908AEVM circuit module is a 4.7-inch × 3.25-inch, 4-layer, printed-circuit board assembly. It is designed for easy connection with cell connections on the left side and load connection on the right using standard wires to the terminal blocks. The board was planned for a 30-A current flow. Wide trace areas are used to reduce voltage drops. The EVM layout and construction allows easy understanding of the connections for evaluation, but the connector area and programming features result in a large board. The main solution components are outlined on the silkscreen layer; the discharge FET can be envisioned moving into this area; and the area might further be reduced by careful layout.

See additional information in the configuration and operation sections of this document. [Figure 10](#) to [Figure 17](#) show the board layout.

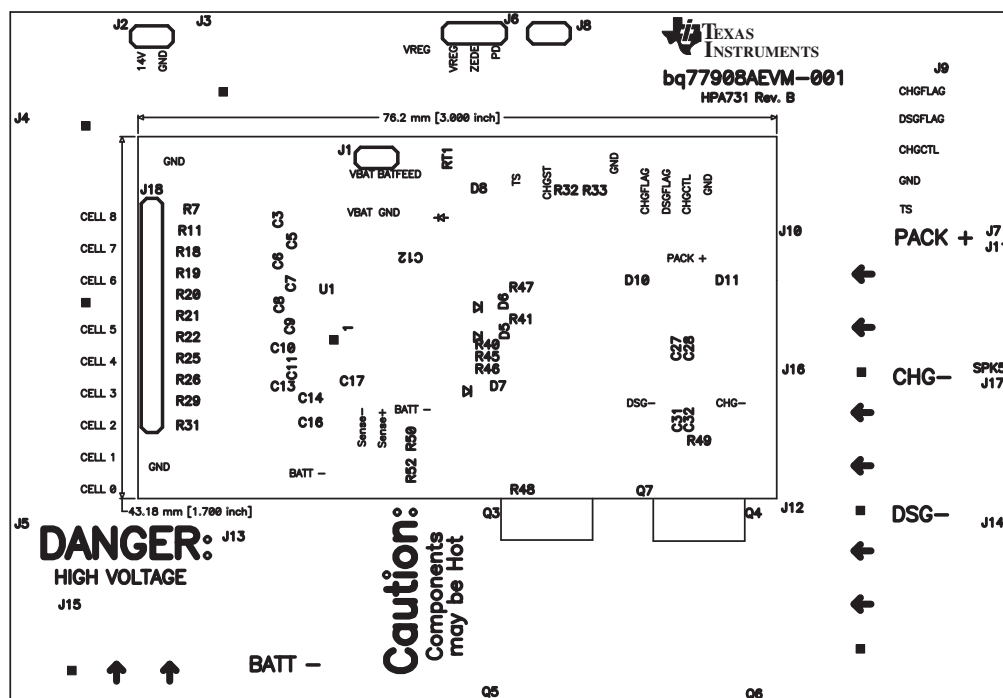


Figure 10. Top Silkscreen

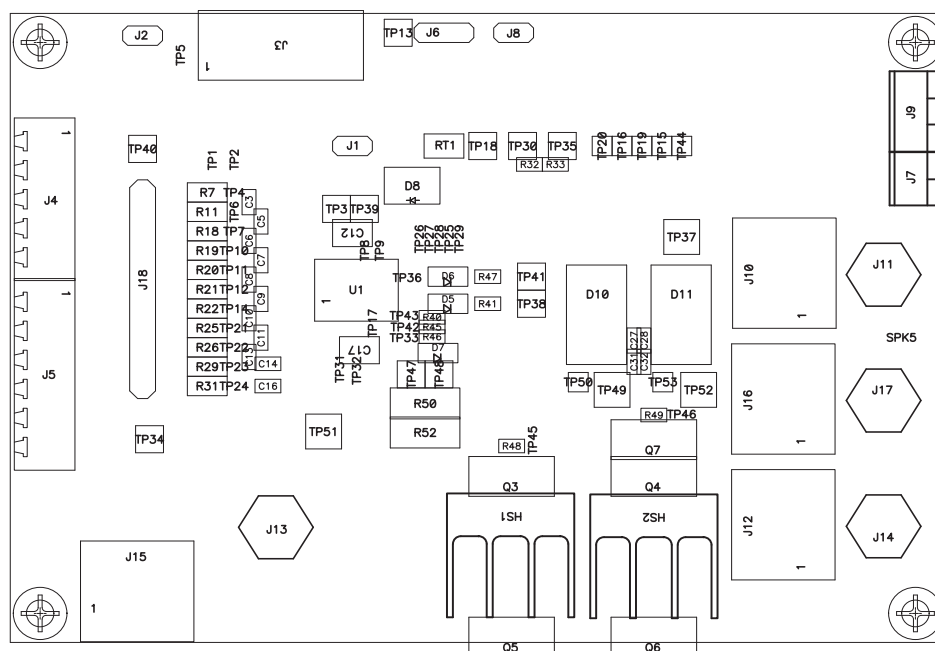


Figure 11. Top Assembly

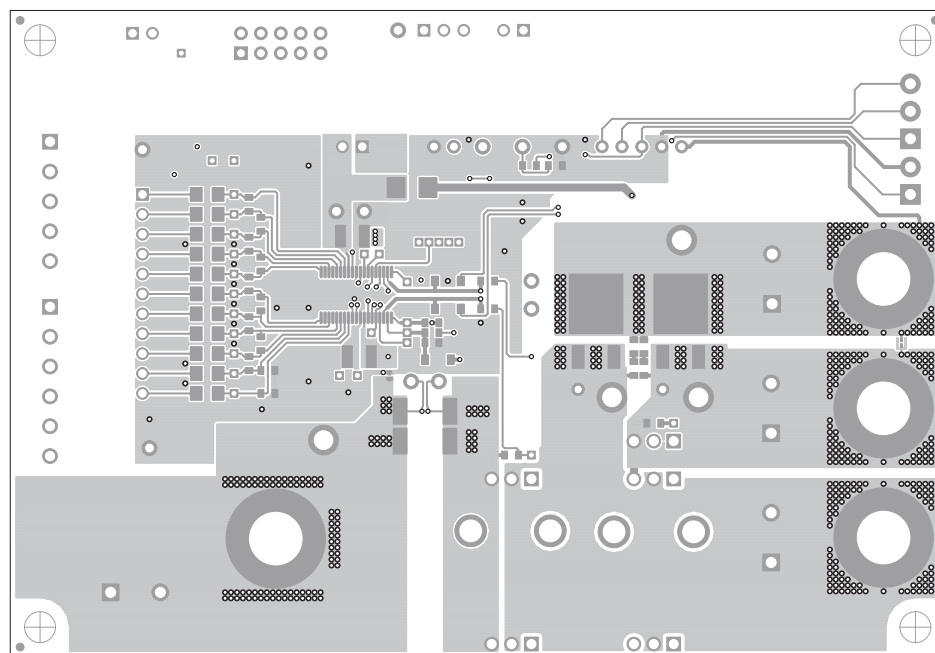


Figure 12. Top Layer

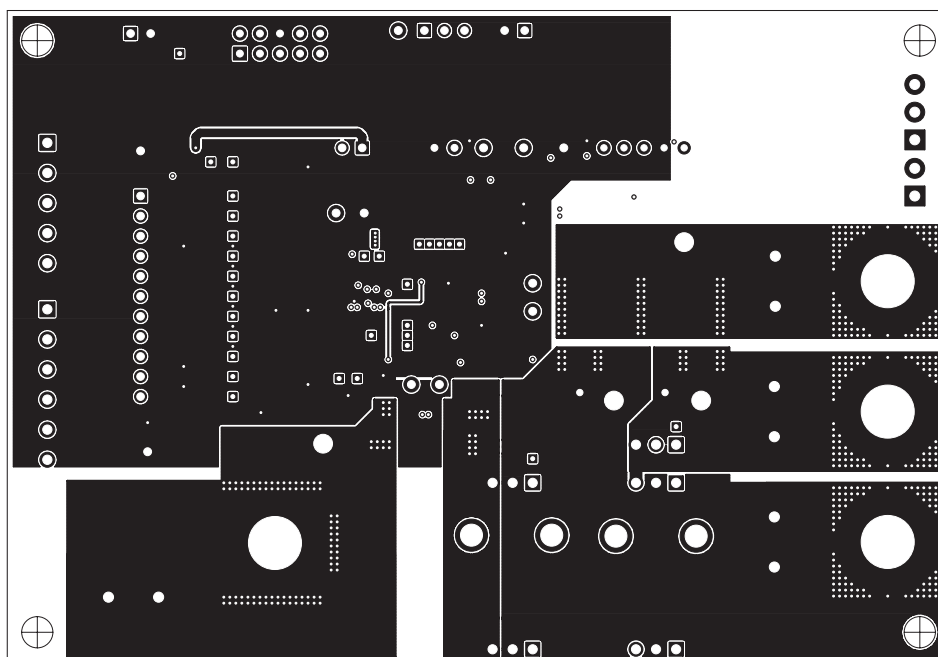


Figure 13. Layer 2

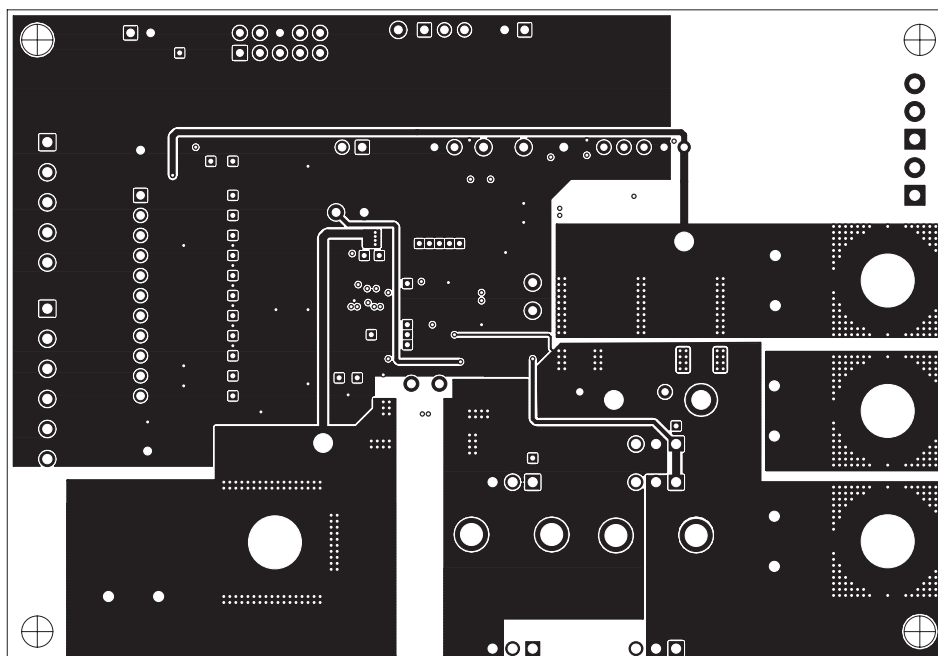


Figure 14. Layer 3

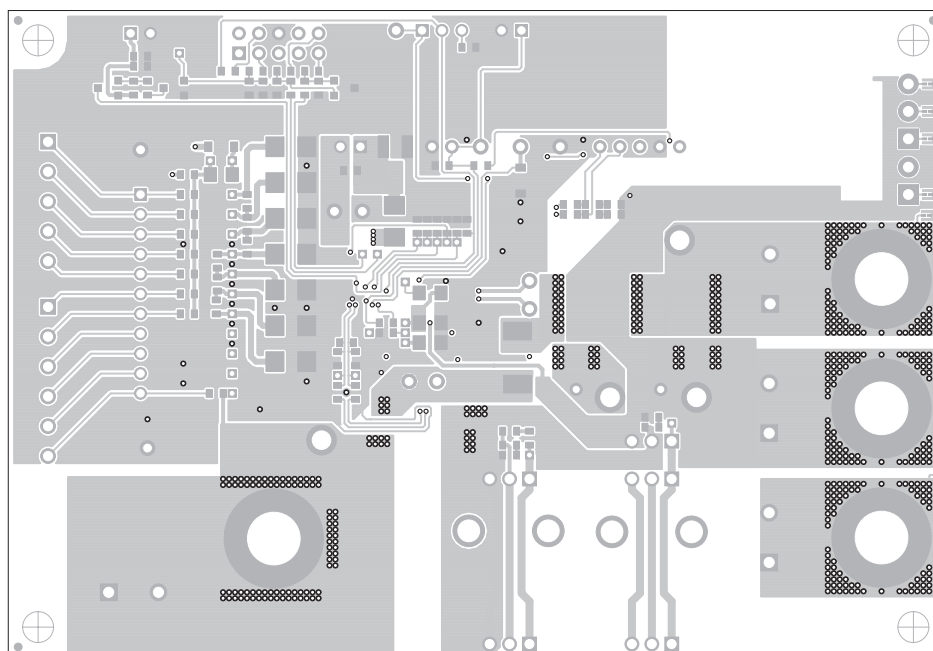


Figure 15. Bottom Layer

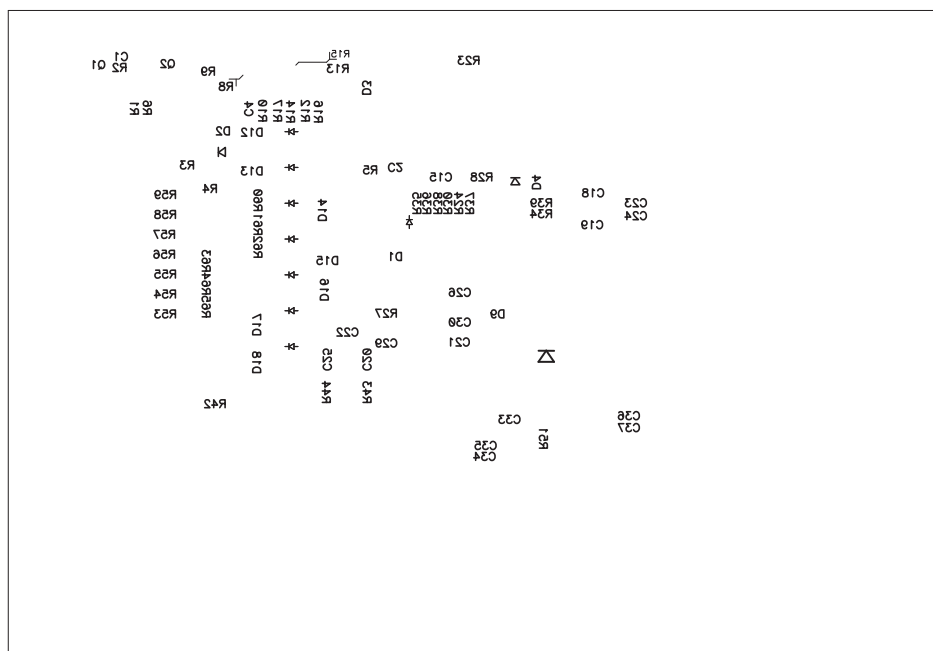


Figure 16. Bottom Silkscreen

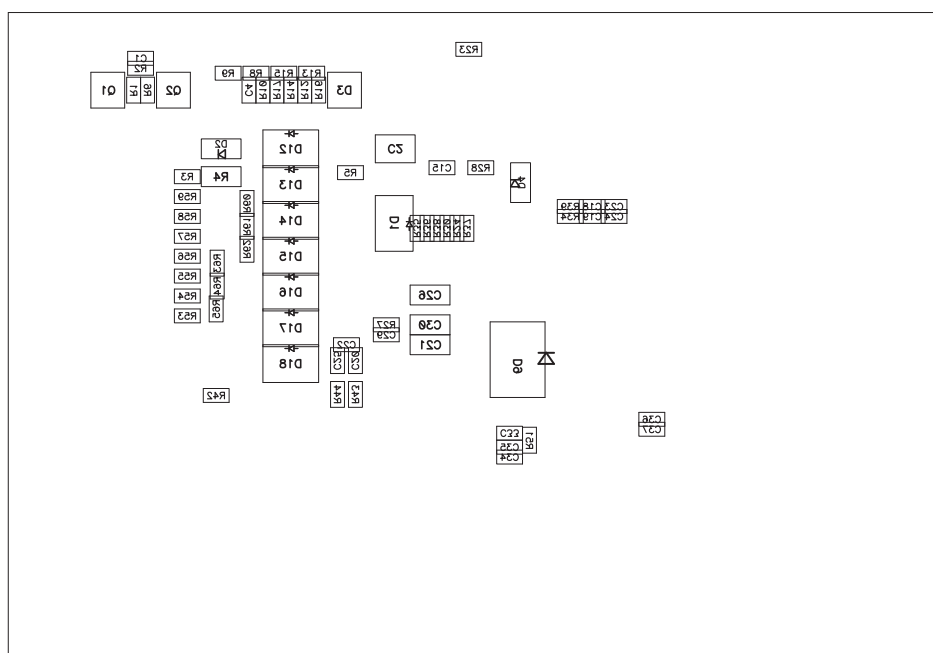


Figure 17. Bottom Assembly

8.1.2 Bill of Materials

The bill of materials for the circuit module is shown in [Table 10](#). Substitute parts may be used in the manufacturing of the assembly.

Table 10. bq77908A Circuit Module Bill of Materials

Count	Reference Design	Value	Description	Size	Part Number	Manufacturer
17	C1, C4, C18, C19, C20, C23, C24, C25, C27, C28, C29, C31, C32, C34, C35, C36, C37	0.1 μ F	Capacitor, Ceramic, 50V, X7R, 10%	0603	Std	Std
1	C12	0.1 μ F	Capacitor, Ceramic, 50V, X7R, 10%	1210	Std	Std
1	C15	10 nF	Capacitor, Ceramic, 50V, X7R, 10%	0603	Std	Std
1	C17	4.7 μ F	Capacitor, Ceramic, 50V, X7R, 10%	1210	Std	Std
1	C2	10 μ F	Capacitor, Ceramic, 50V, Y5V, 20%	1210	Std	Std
2	C21, C26	1 μ F	Capacitor, Ceramic, 25V, X5R, 10%	1206	Std	Std
0	C22		Capacitor, 0603, Not installed	0603		
0	C3, C5		Capacitor, Ceramic, 10V, X7R, 10%	0603		
0	C30		Capacitor, 1206, Not installed	1206		
0	C33		Capacitor, Ceramic, 50V, X7R, 10%	0603		
9	C6, C7, C8, C9, C10, C11, C13, C14, C16	1 μ F	Capacitor, Ceramic, 10V, X7R, 10%	0603	Std	Std
2	D1, D14 **	36V TVS	Diode, TVS, Unidirectional, 600-W	SMB	P6SMB36AT3G	ON Semiconductor
2	D10, D11	MURD620CT	Diode, Fast rectifier, 200V, 5A	D-PAK	MURD620CTG or UF5A400D1-13 or RF505B6STL	ON Semiconductor or Diodes or Rohm
0	D12, D13, D15, D16, D17		Diode, TVS, Pattern only, 600-W	SMB		
1	D18 **	17V TVS	Diode, TVS, Unidirectional, 600-W	SMB	1SMB17AT3G	ON Semiconductor
4	D2, D4, D5, D6	1N4148W	Diode, Signal, 300-mA, 75-V, 350-mW	SOD-123	1N4148W-7-F	Diodes
1	D3	5.6V	Diode, Dual, Zener, 5.6V, 300mW	SOT23	AZ23C5V6-V-G	Vishay-Telefunken
0	D7		Diode, Signal, 300-mA, 75-V, 350-mW	SOD-123		
1	D9 **	36V TVS	Diode, Unidirectional TVS, 1500W	SMC	1.5SMC36A	Littelfuse
1	HS1	581102B02500G	Heatsink, TO-220/218 vertical	0.640 x 0.640 inch	581102B02500G	Aavid Thermalloy
0	HS2		Heatsink, Pattern only, TO-220/218 vertical	0.640 x 0.640 inch		
2	J1, J2	PEC02SAAN	Header, Male 2-pin, 100mil spacing	0.100 inch x 2	PEC02SAAN	Sullins

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.