

AN-1899 LM3405A VSSOP Evaluation Board

1 Introduction

This evaluation board converts an input voltage of 5V to 18V, and can illuminate up to four 750 mA LEDs using the LM3405A VSSOP 1.6 MHz LED Driver samples. A bill of materials included describes the parts used on this evaluation board. A schematic and layout have also been included with measured performance characteristics of the evaluation board.

2 LM3405A VSSOP Evaluation Board Schematic

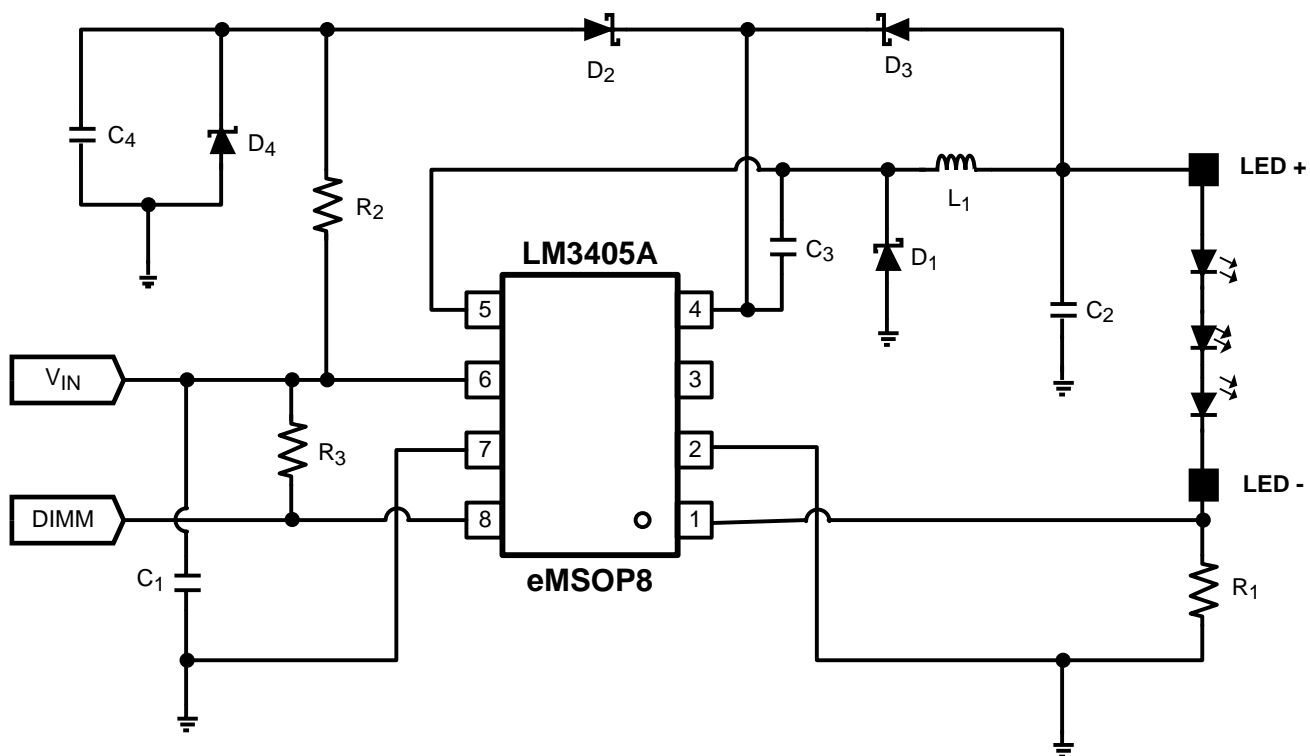


Figure 1. LM3405A VSSOP Evaluation Board Schematic

3 LM3405A VSSOP Pin-Out

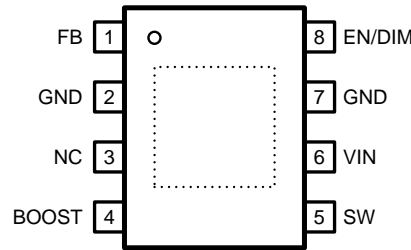


Figure 2. 8-Pin VSSOP Pin Out

4 Four Methods of Deriving V_{BOOST}

The standard evaluation board derives V_{BOOST} voltage using the “Shunt Zener” configuration, shown in Figure 1. Depending on the specific application, V_{BOOST} voltage can be derived by loading and no-loading external components on the evaluation PCB. The following four schematics show methods to derive V_{BOOST} .

4.1 V_{BOOST} Derived from Shunt Zener Configuration

This configuration, Figure 3, is recommended for distributed input voltages that have a wide voltage variation. The shunt zener acts as basic voltage regulator for the V_{BOOST} voltage. D_4 should have a typical value of 3.6V to 5.1V, $R_2 = (V_{IN} - V_{zener})/4 \text{ mA}$, $C_4 = 0.10 \mu\text{F}$.

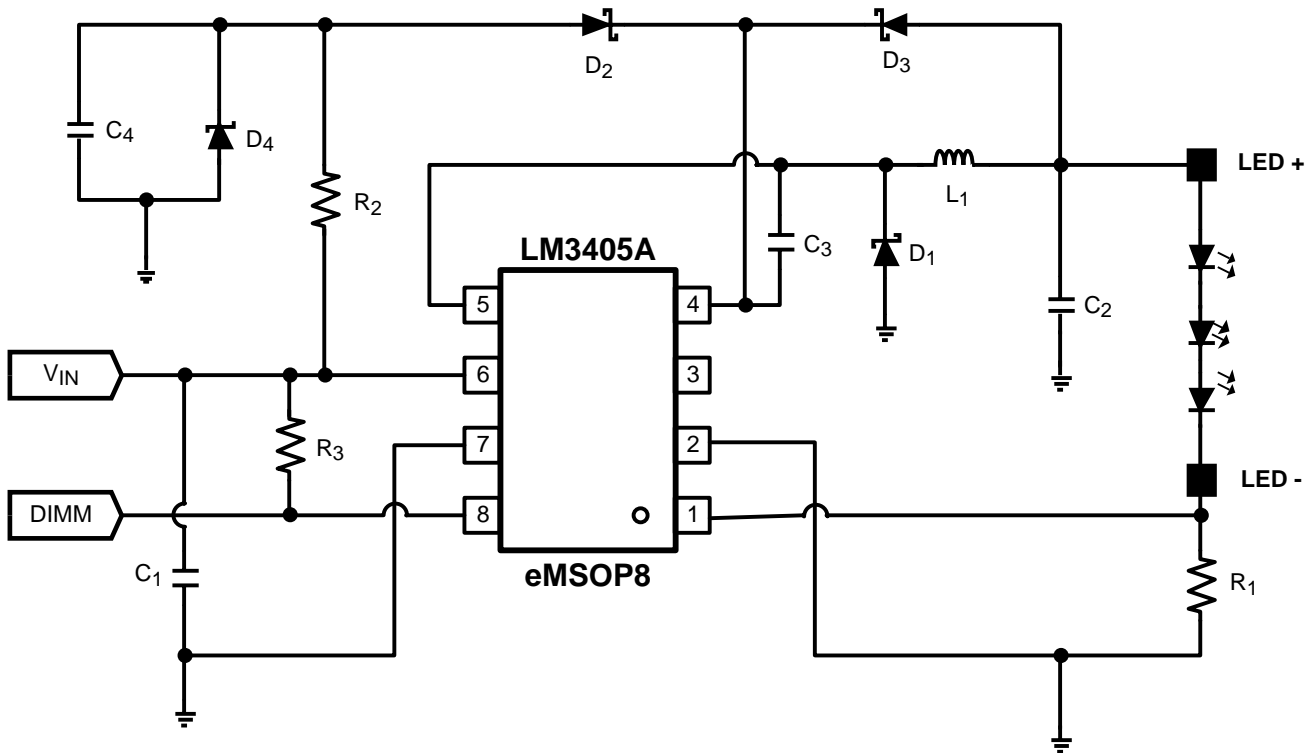


Figure 3. V_{BOOST} Derived from Shunt Zener Configuration

4.2 V_{BOOST} Derived from V_{OUT}

Use this configuration, Figure 4, for output voltages (V_{LED}) that are between 3V and 5.5V.

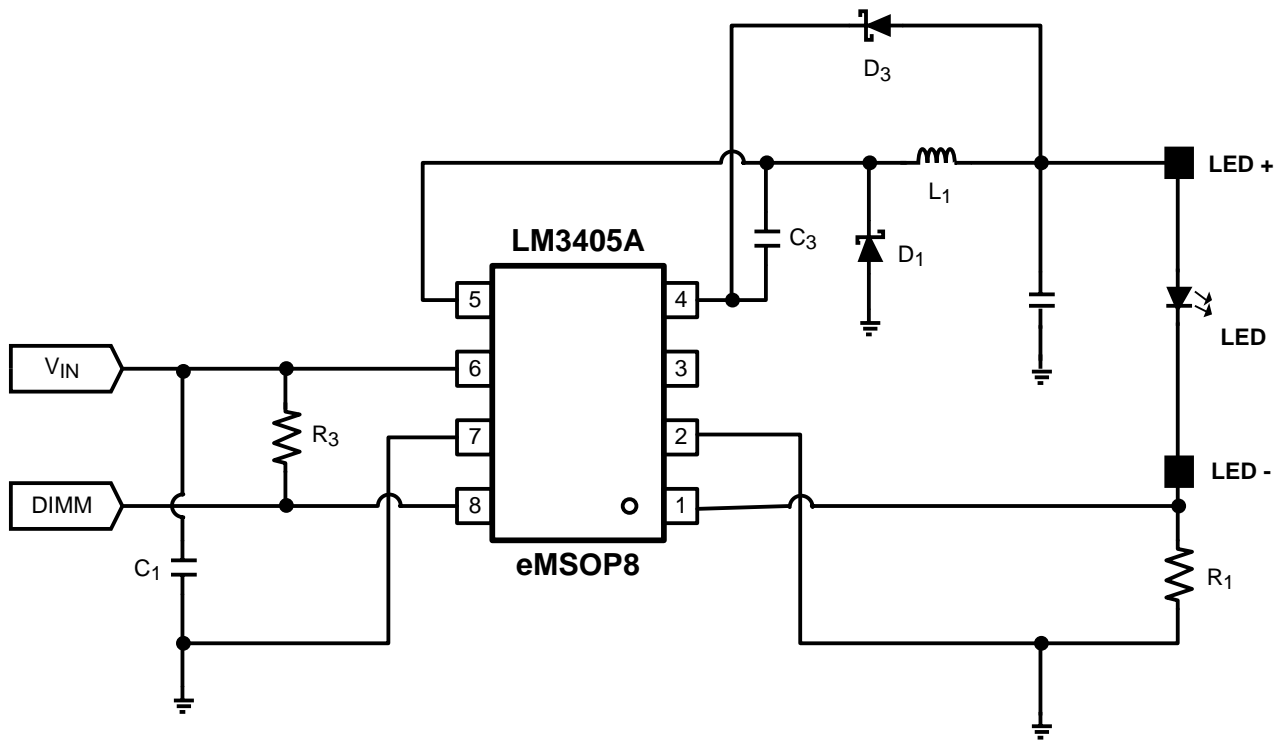


Figure 4. V_{BOOST} Derived from V_{OUT}

4.3 V_{BOOST} Derived from V_{IN}

Use this configuration, [Figure 5](#), for input voltages that are between 3V and 5.5V.

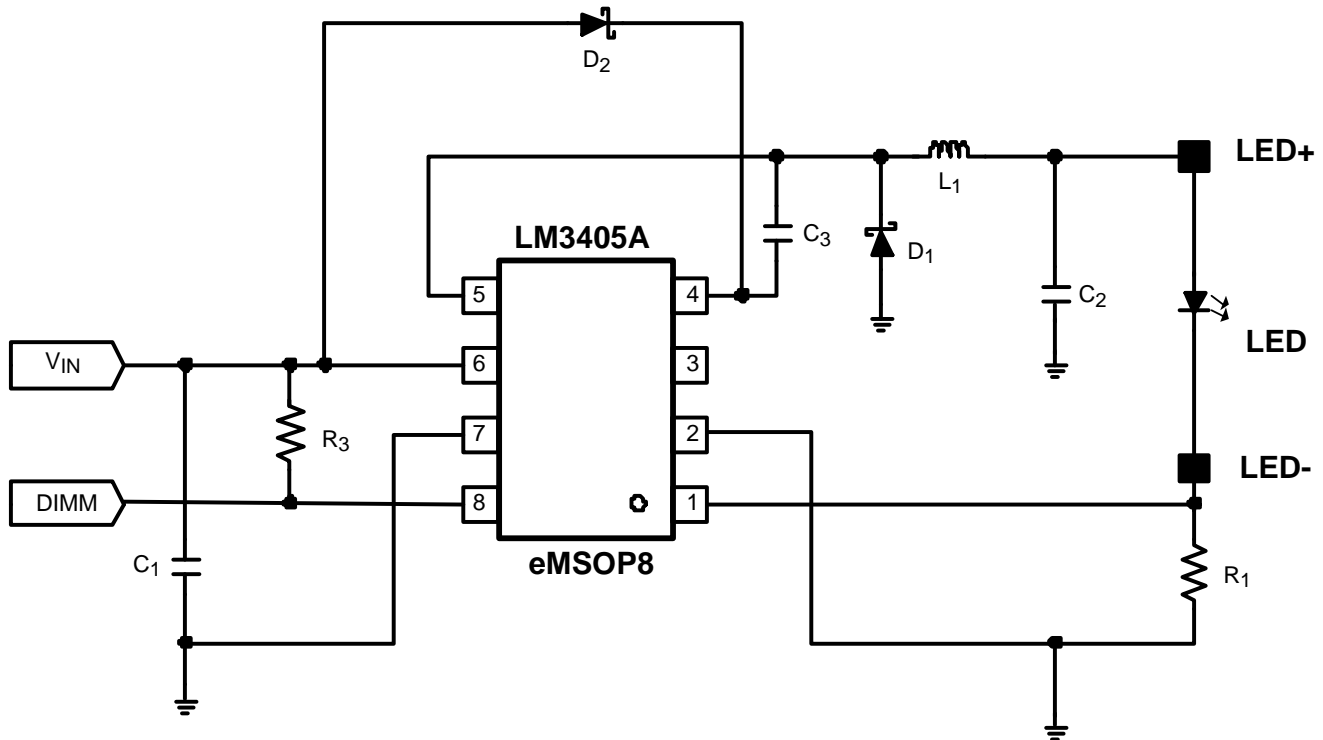


Figure 5. V_{BOOST} Derived from V_{IN}

4.4 V_{BOOST} Derived from External Supply

This method of deriving the V_{BOOST} voltage, Figure 6, is recommended if the distributed voltage used for point of load regulation is greater than 5V, but there is access to an external voltage between 3V and 5V. The typical current draw from the external supply would be approximately 2.50 mA.

$$5.5V > V_{EXTERNAL} > 3V$$

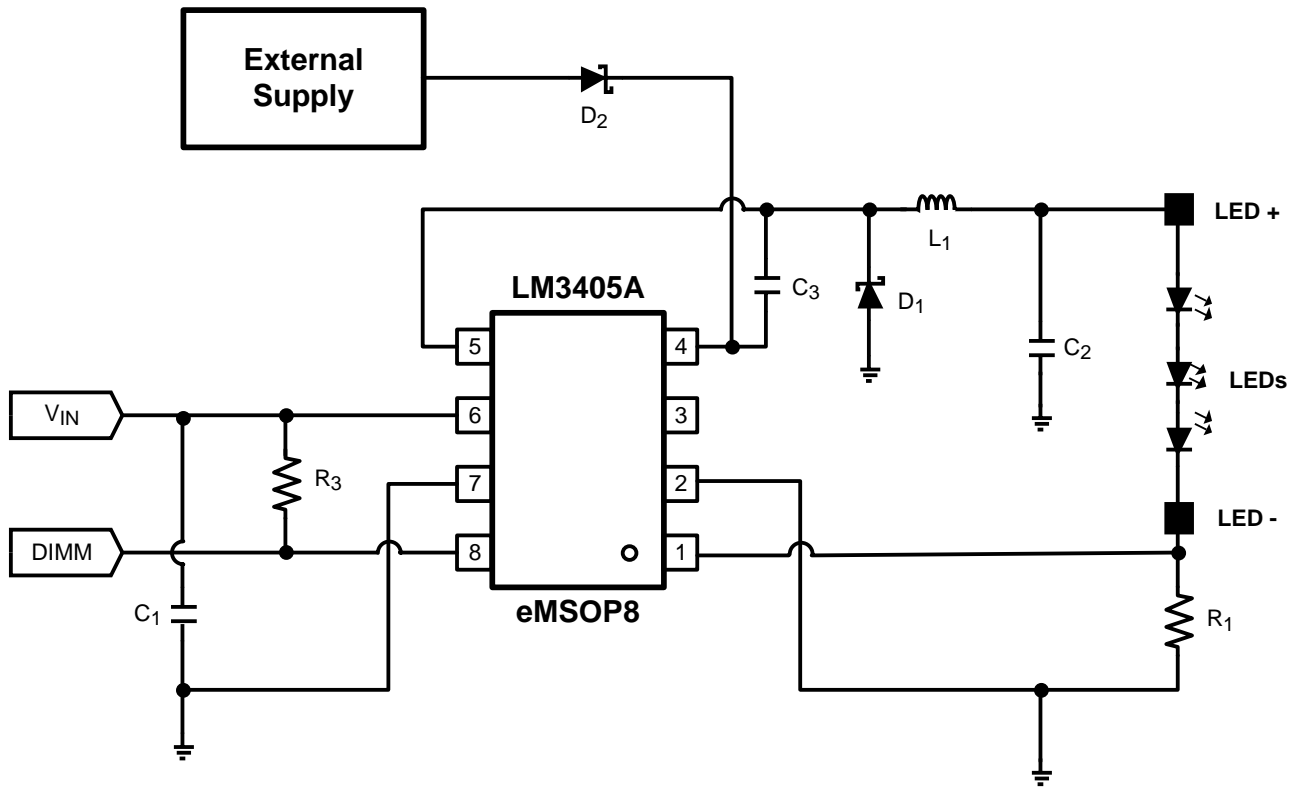


Figure 6. V_{BOOST} Derived from External Supply

5 PCB Top Layer

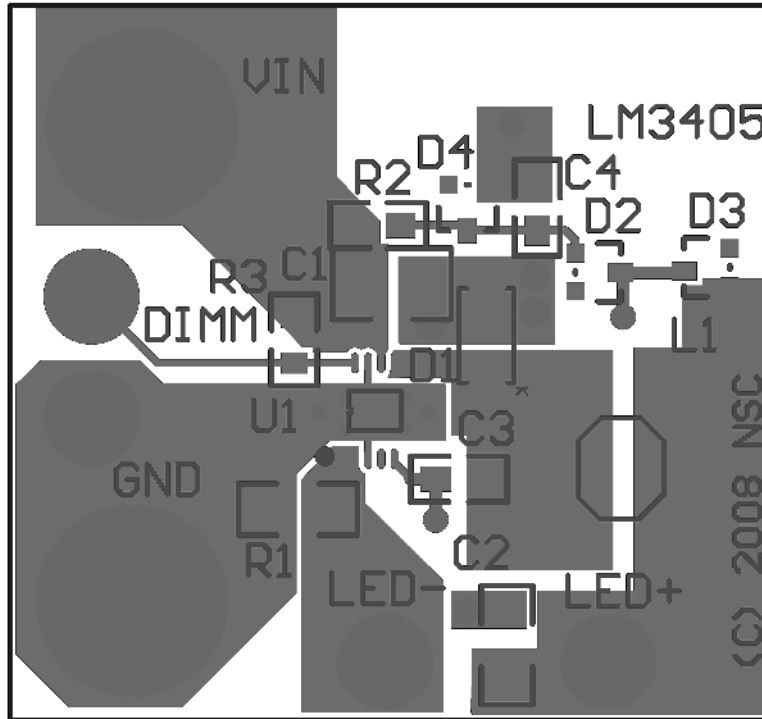


Figure 7. Layout, Top Layer

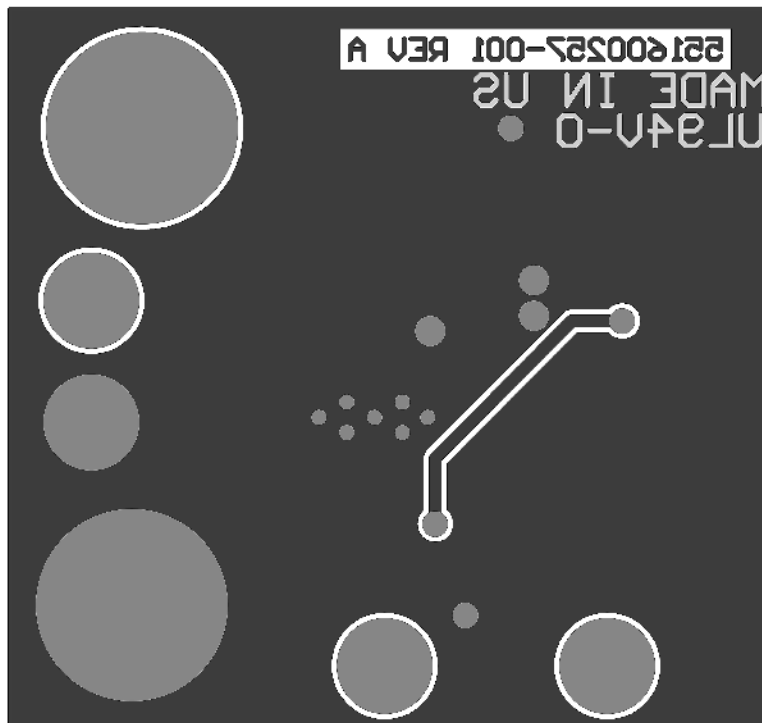


Figure 8. Layout, Bottom Layer

6 Bill of Materials

Table 1. Bill of Materials

Part ID	Part Value	Manufacturer	Part Number
U1	1A Buck LED Driver VSSOP	Texas Instruments	LM3405A
C1, Input Cap	10 μ F, 25V, X5R (1210)	TDK	C3225X5R1E106M
C2, Output Cap	4.7 μ F, 25V, X5R (1206)	TDK	C3216X5R1E475M
C3	2.2 μ F (0805)	TDK	C2012X5R1E225M
C4	1.0 μ F (0805)	TDK	C2012X5R1E105M
D1, Catch Diode	0.3V _f Schottky 1.5A, 30V _R	TOSHIBA	CRS08
D2	SOT23 Schottky	Vishay	BAT54-V
D3	SOT23 Schottky	Vishay	BAT54-V (No Load)
D4	4.3V Zenner SOT23	Vishay	BZX84C4V3-V
L1	4.7 μ H, 1.5A,	CoilCraft	MOS6020-472MLB
R1	267 m Ω (1206)	Vishay	
R2	1 k Ω , 1%	Vishay	CRCW08051001F
R3	10.0 k Ω , 1%	Vishay	CRCW08051002F

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