

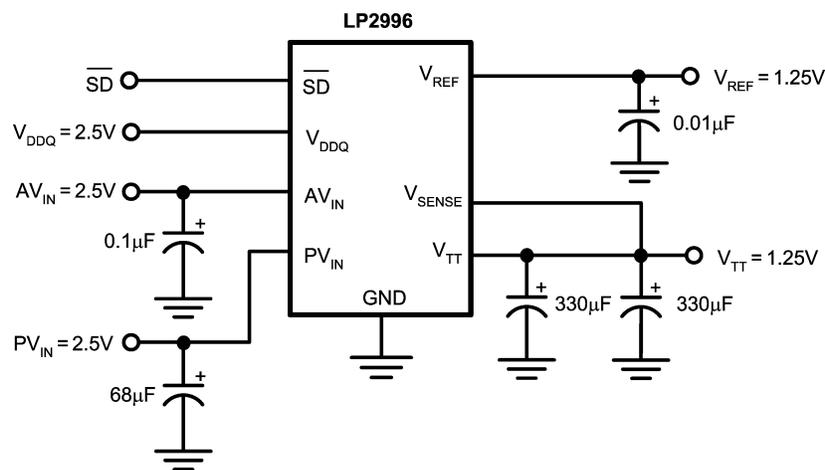
## AN-1268 LP2996 Evaluation Board

### 1 Introduction

The LP2996 evaluation board is designed to provide the design engineer with a fully functional prototype system in which to evaluate the LP2996 in both a static environment and with a complete memory system. There are two versions of the board, and while identical in functionality they differ in the package implemented; either a SO PowerPAD™-8 or WQFN-16 is used. This application note contains information regarding the board. For more information regarding the LP2996 please refer to the datasheet.

### 2 Schematic

The following schematic was used to create the layout.



**Table 1. Bill of Materials**

Name	Value	Description	Manufacturer	Model Number
U1		LP2996 DDR Linear Regulator	Texas Instruments	LP2996
CAVIN	0.1µF	1206 Ceramic Capacitor X7R 25V	Vishay Vitrammon	VJ1206Y104KXXAT
COU1	330µF	6.3V Electrolytic Radial FC Series	Panasonic	EEU-FC0J331S
COU2	330µF	6.3V Electrolytic Radial FC Series	Panasonic	EEU-FC0J331S
CREF	0.01µF	1206 Ceramic Capacitor X7R 25V	Vishay Vitrammon	VJ1206Y103KXXAT
CPVIN	68µF	6.3V Electrolytic Radial FC series	Panasonic	EEU-FC0J680

### 3 Application

The LP2996 evaluation board can be used immediately in either a static test environment to check functionality, or in a memory termination scheme on a motherboard. In either implementation, the following steps should be taken to ensure correct operation.

1. Connect leads from the evaluation board. The board layout has been designed to allow banana jack sockets to be directly soldered.
2. Connect AVIN and PVIN to a 2.5V power supply.

PowerPAD is a trademark of Texas Instruments.

3. The VDDQ input provides the internal divide by two reference voltage. Both VREF and VTT will track this internal voltage, nominally a 2.5V will be applied.
4. The VREF pad is the output for the VREF from the LP2996 after being bypassed by a ceramic capacitor. This can be connected either to a multimeter for confirmation or directly to the memory controller and DIMMS.
5. The SD pin can be initially left floating as it has an internal pull-up
6. The remaining two pads are for the force and sense leads of the VTT output. These should be connected directly to the termination plane or a multimeter if interested in verification. The output will be regulated where the VSENSE leads connect to the VTT leads permitting the connection to a motherboard without suffering from large resistance drops.

#### 4 Performance

The LP2996 has been designed to accommodate several different capacitor options to allow the designer to optimize the solution for the specific application. For most desktop systems, large aluminum electrolytic capacitors will be used for their low cost. However, in height limited situations such as laptops fewer high performance capacitors might be implemented such as specialty polymers. [Table 2](#) lists some of the capacitors that can be used and a vendor that offers that product line.

**Table 2. Capacitors and Available Vendors**

Capacitor Series	Vendor	Vendor Phone Number
Oscon	Vishay	(207)-324-4140
SP	Panasonic	(714)-373-7857
MLCC	Taiyo Yuden	(800)-348-2496
Aluminum	Panasonic	(714)-373-7857

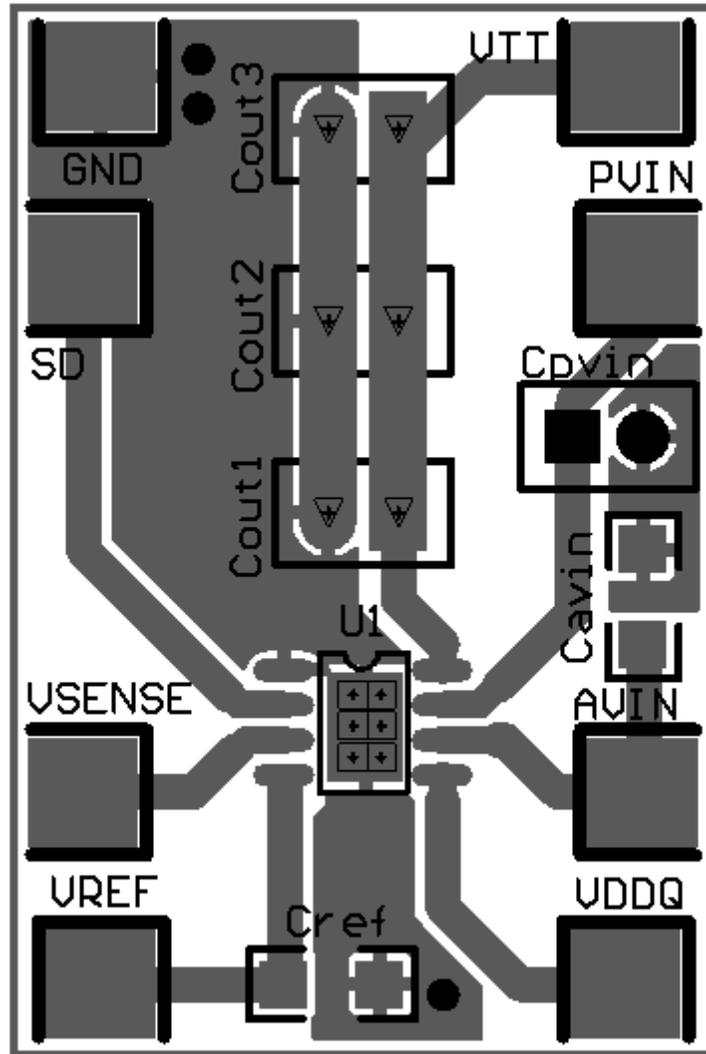


Figure 1. SO PowerPAD Top Layer

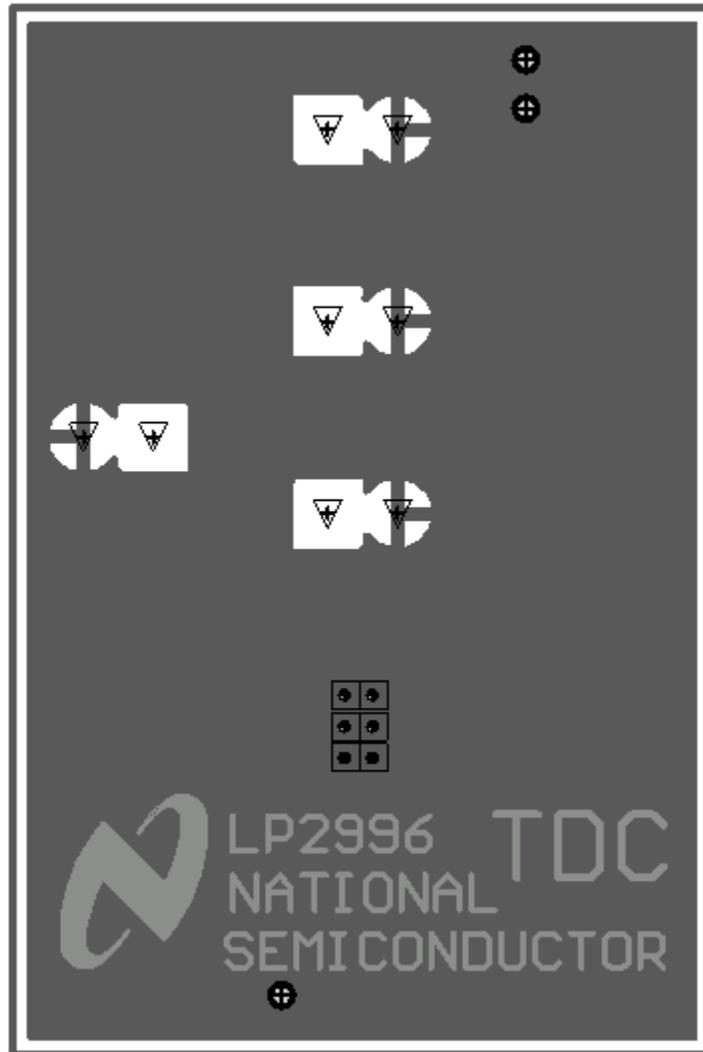


Figure 2. SO PowerPAD Bottom Layer

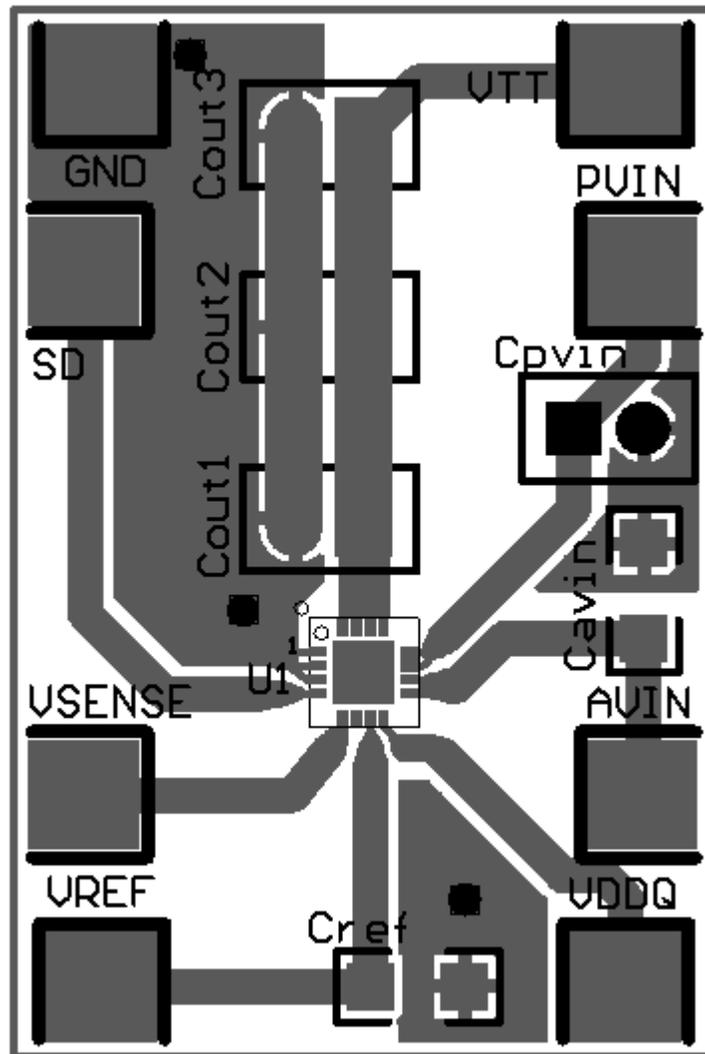
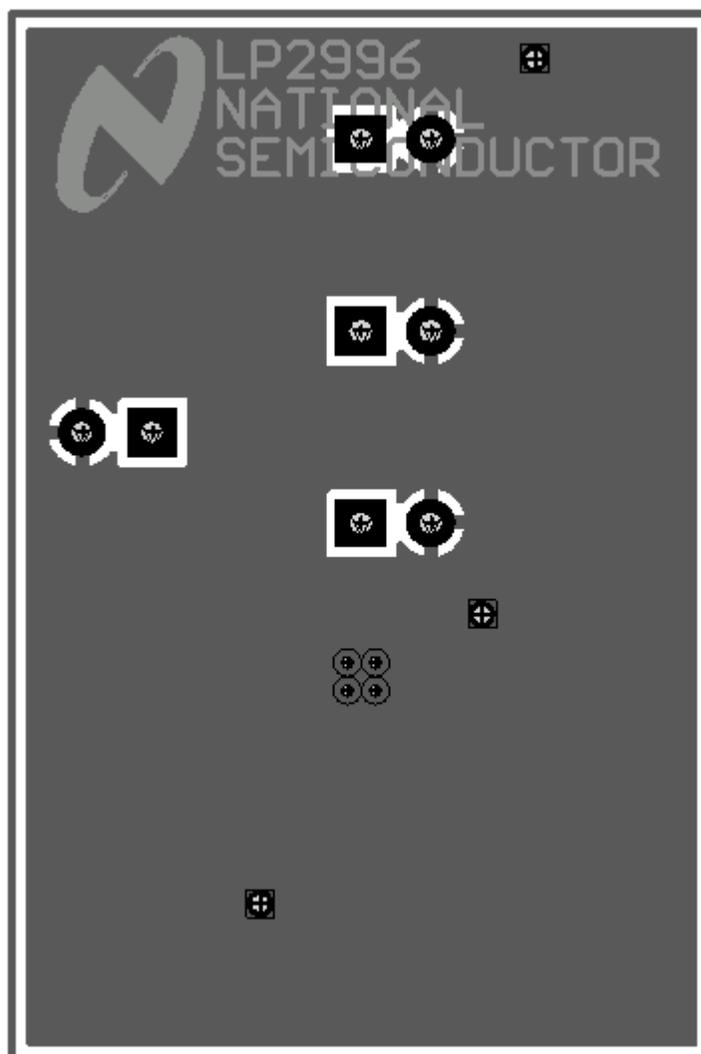


Figure 3. WQFN Top Layer


**Figure 4. WQFN Bottom Layer**

Information	SO PowerPAD-8 Board	WQFN-16 Board
Board Material	FR4	FR4
Size	1.0 x 1.5 inches	1.0 x 1.5 inches
Board Thickness	0.062 inch	0.062 inch
Layers	2	2
Copper Thickness	1oz.	1oz.
Plating	HASL	HASL
Thermal Vias	6	4
Thermal Vias Size	10 mil	13 mil
Board Thickness	0.062 inch	0.062 inch

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

### Applications

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

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)