

# LM3699EVM User Guide

## User's Guide



Literature Number: SNVU343  
MARCH 2014

<b>1</b>	<b>Introduction.....</b>	<b>4</b>
<b>2</b>	<b>Set-Up .....</b>	<b>4</b>
	2.1 Required Equipment .....	6
<b>3</b>	<b>LM3699EVM Component Placement .....</b>	<b>7</b>
<b>4</b>	<b>LM3699EVM Schematic.....</b>	<b>9</b>

## List of Figures

1	LM3699EVM Picture .....	4
2	HL1A-C, HL2A-C and HL3A-C Star Jumper Configuration Settings (Blue Line Indicates Jumper Position) ....	5
3	LM3699EVM Configuration (Top Side) .....	6
4	LM3699EVM Top and Bottom Layers.....	7

## List of Tables

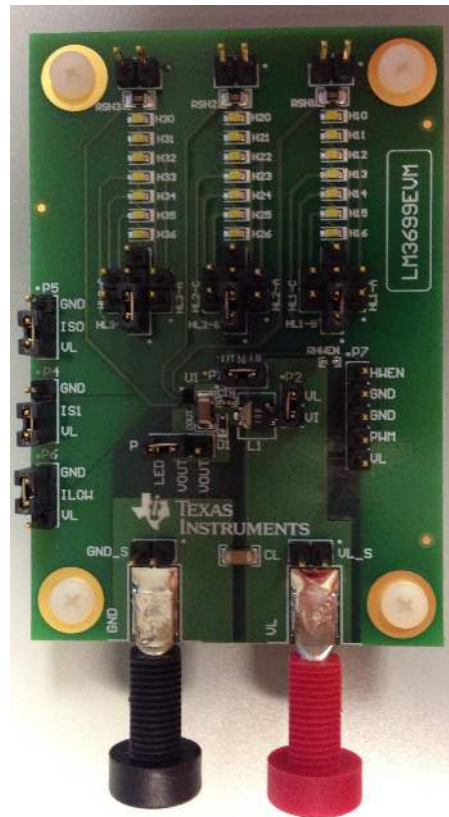
1	Device and Package Configurations .....	4
---	---	---

## 1 Introduction

The Texas Instruments LM3699EVM evaluation module (EVM) helps designers evaluate the operation and performance of the LM3699YFQ High-Efficiency PWM-only Three-String White LED Driver. The LM3699EVM can be easily configured to support 3 parallel LED strings with 2, 3, 4, 5, or 6 series LEDs.

**Table 1. Device and Package Configurations**

Component	IC	Package
U1	LM3699	DSBGA (YFQ)



**Figure 1. LM3699EVM Picture**

## 2 Set-Up

This section describes the jumpers and connectors on the LM3699EVM as well as how to properly connect, set up, and use the LM3699YFQ.

### Input/Output Connector Description

VL - INPUT is the power input terminal for the boost converter and the LM3699 VIN supply. This terminal provides a power (VBAT) connection to allow the user to attach the EVM to a power supply via a cable assembly with banana plugs.

GND - INPUT is the power input terminal for the boost converter and the LM3699 GND. This terminal provides a common ground (GND) connection to allow the user to attach the EVM to a power supply via a cable assembly with banana plugs.

P1 - Connector is the connection between the power input terminal VL and the LM3699 VIN supply. This connector allows the user to insert a current meter between terminals 1 and 2 to measure the LM3699 VIN current. A jumper must be installed when a current meter is not connected between terminals 1 and 2.

P2 - Connector is the connection between the power input terminal VL and the boost inductor. This connector allows the user to insert a current probe between terminals 1 and 2 to measure the inductor current. A jumper must be installed when a current probe is not connected between terminals 1 and 2.

P3 - Connector is the connection between the LM3699 boost convertor output and all three parallel LED strings. A jumper must be installed between terminals 1 and 2 for normal operation.

P4 - Connector provides access to the LM3699 S1 input terminal. This terminal, along with S0, is used to select one of four full-scale current settings. This input can not be left floating and a jumper must be installed between either terminals 1 and 2 (GND) or 2 and 3 (VL).

P5 - Connector provides access to the LM3699 S0 input terminal. This terminal, along with S1, is used to select one of four full-scale current settings. This input can not be left floating, and a jumper must be installed between either terminals 1 and 2 (GND) or 2 and 3 (VL).

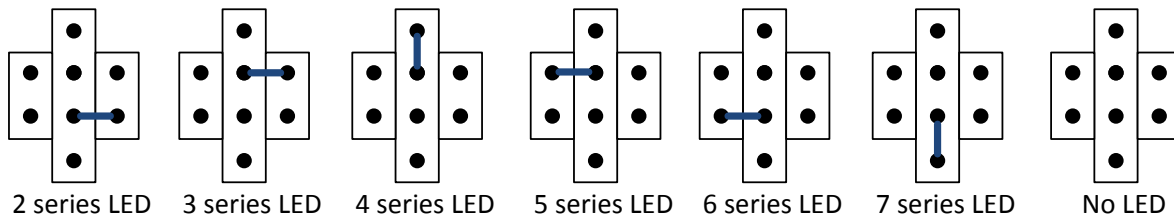
P6 - Connector provides access to the LM3699 ILOW input terminal. This terminal can be used to quickly reduce the LM3699 LED Brightness during camera flash operation. This input can not be left floating and a jumper must be installed between either terminals 1 & 2 (GND) to disable this feature or 2 and 3 (VL) to enable this feature.

P7 - Test Point Connector provides access to the LM3699 HWEN and PWM inputs. An extra jumper is provided between terminals 2 (GND) and 3 (GND). A jumper can be installed between terminals 3 and 4 or terminals 4 and 5 to connect the PWM input to GND or VL respectively. The PWM jumper must be removed if an external signal generator is used to control the PWM duty cycle.

HL1A, HL1B and HL1C - Connector provides a star connection to the HVLED1 string allowing the user to configure the HVLED1 string for 2, 3, 4, 5, or 6 series LEDs.

HL2A, HL2B and HL2C - Connector provides a star connection to the HVLED2 string allowing the user to configure the HVLED2 string for 2, 3, 4, 5, or 6 series LEDs.

HL3A, HL3B and HL3C - Connector provides a star connection to the HVLED3 string allowing the user to configure the HVLED3 string for 2, 3, 4, 5, or 6 series LEDs.

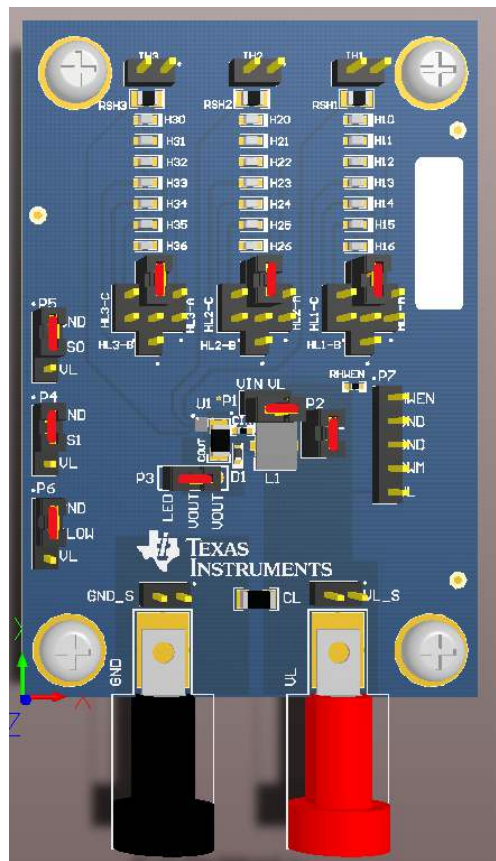


**Figure 2. HL1A-C, HL2A-C and HL3A-C Star Jumper Configuration Settings (Blue Line Indicates Jumper Position)**

Note: The 7 series LED configuration should not be used due to the LM3699 24-V OVP setting and the LED maximum forward voltage of 3.5 V.

### LM3699EVM Configuration

Figure 3 illustrates how to properly configure the LM3699EVM for three parallel four series (3p4s) LED string configuration.



**Figure 3. LM3699EVM Configuration (Top Side)**

## 2.1 Required Equipment

The following test equipment is required to evaluate the LM3699:

- 5.5-V, 1.0-A Power Supply
- Pulse Generator

After supplying power to the LM3699EVM VL and GND inputs from the external power supply the user can quickly verify the LM3699EVM operation by moving the jumper on P7 between terminals 3 and 4 to P7 terminals 4 and 5. This will set the PWM input to 100% duty cycle and turn on all three led strings. Connecting an external pulse generator to P7 terminals 3 and 4 allows the user to verify operation while varying the PWM duty cycle and frequency. Refer to the [LM3699 datasheet](#) to set the correct pulse generator signal levels ( $V_{ih}/V_{il}/ABS_{MAX}$ ).

### 3 LM3699EVM Component Placement

Figure 4 shows the component placement on the top and bottom PCB layers of the LM3699EVM.

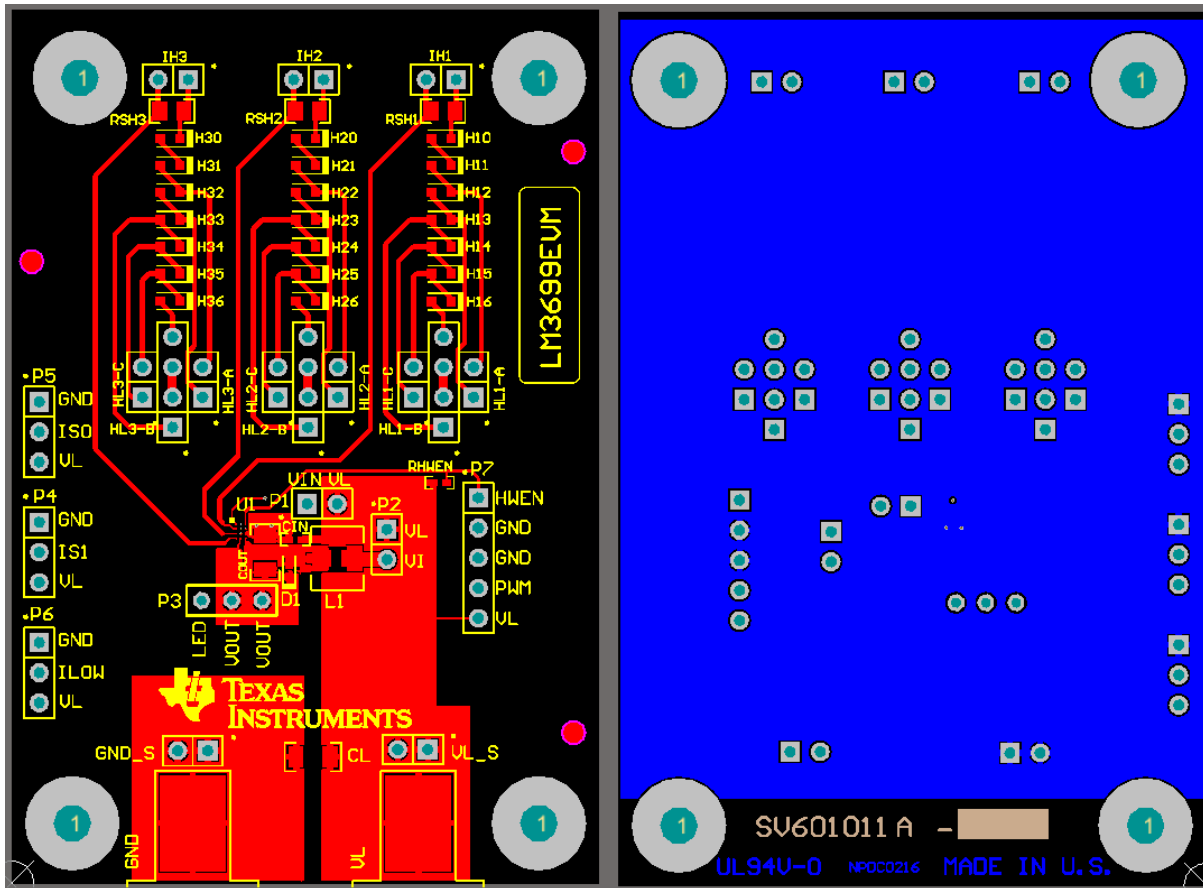


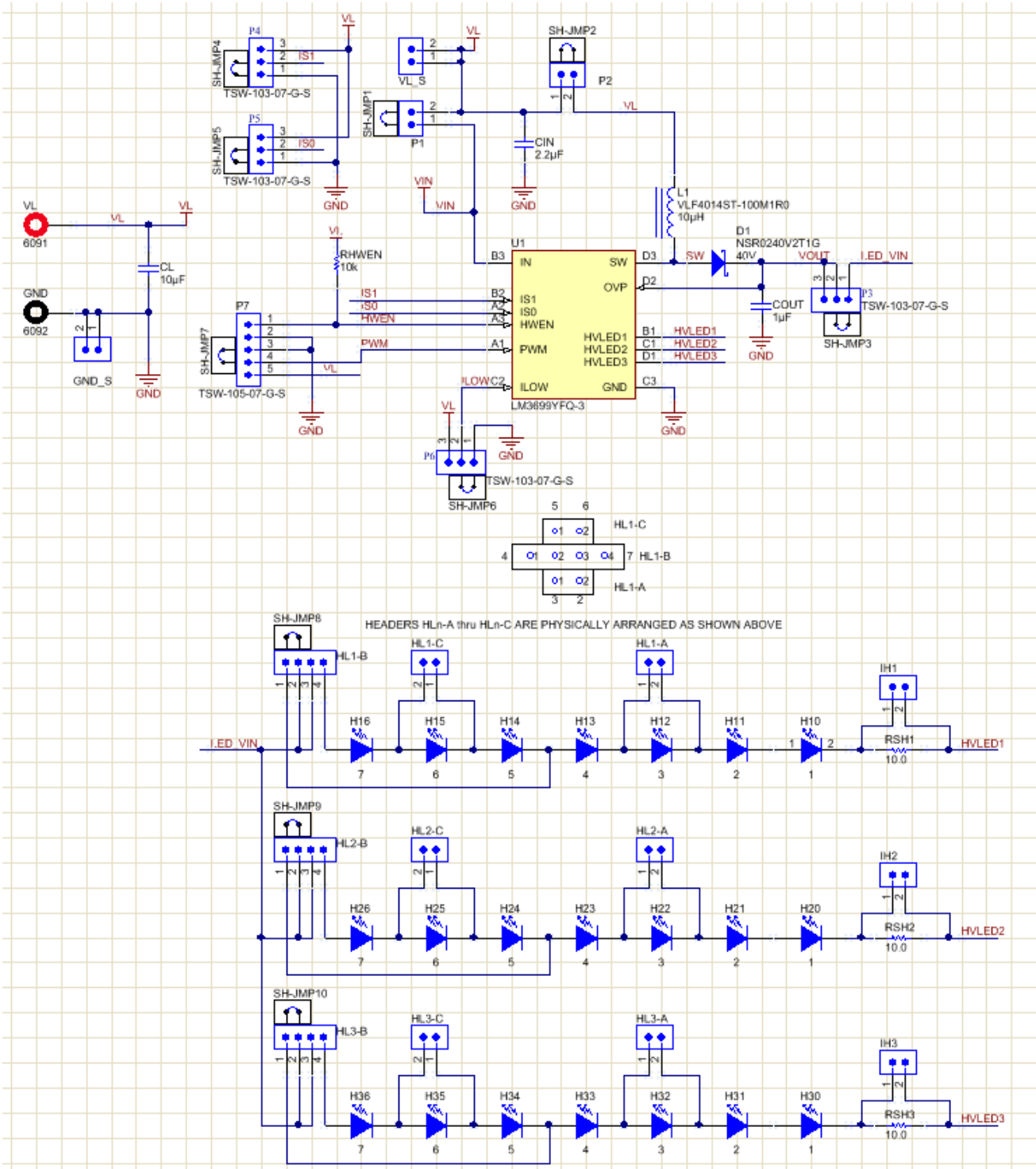
Figure 4. LM3699EVM Top and Bottom Layers

**LM3699EVM Component List**

Designator	Description	Manufacturer	PartNumber	Qty
!PCB	Printed Circuit Board	Any	SV601011A	1
CL	CAP, CERM, 10uF, 25V, +/-10%, X5R, 1206	MuRata	GRM31CR61E106KA12L	3
CIN	CAP, CERM, 2.2uF, 10V, +/-10%, X5R, 0402	TDK	C1005X5R1A225K050BC	1
COUT	CAP, CERM, 1uF, 50V, +/-10%, X7R, 1206	TDK	C3216X7R1H105K	1
P7	Header, TH, 100mil, 5x1, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-105-07-G-S	1
D1	Diode, Schottky, 40V, 0.25A, SOD-523	ON Semiconductor	NSR0240V2T1G	1
GND	Standard Banana Jack, Insulated, Black	Keystone	6092	1
GND_S, HL1-A, HL1-C, HL2-A, HL2-C, HL3-A, HL3-C, IH1, IH2, IH3, P1, P2, P3, VL_S	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-102-07-G-S	14
H1, H2, H3, H4	Machine Screw, Round, #4-40 x 1/4, Nylon, Phillips panhead	B and F Fastener Supply	NY PMS 440 0025 PH	4
H5, H6, H7, H8	Standoff, Hex, 0.5"L #4-40 Nylon	Keystone	1902C	4
H10, H11, H12, H13, H14, H15, H16, H20, H21, H22, H23, H24, H25, H26, H30, H31, H32, H33, H34, H35, H36	LED, White, SMD	Rohm	SML312WBCW1	21
HL1-B, HL2-B, HL3-B	Header, TH, 100mil, 4x1, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-104-07-G-S	3
P3, P4, P5, P6	Header, TH, 100mil, 3x1, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-103-07-G-S	3
L1	INDUCTOR POWER 10UH 1.0A SMD	TDK	VLF4014ST-100M1R0	1
LBL1	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	Brady	THT-14-423-10	1
RHWEN	RES, 10k ohm, 5%, 0.063W, 0402	Vishay-Dale	CRCW040210K0JNED	5
RSH1, RSH2, RSH3	RES 10 OHM 1/8W .1% 0805 SMD	Bourns	CRT0805-BY-10R0ELF	3
SH-JMP1, SH-JMP2, SH-JMP3, SH-JMP4, SH-JMP5, SH-JMP6, SH-JMP7, SH-JMP8, SH-JMP9	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA	9
U1	LM3699 High-Efficiency Three-String White LED Driver, YFQ0012AEAC	Texas Instruments	LM3699YFQ	1
VL	Standard Banana Jack, Insulated, Red	Keystone	6091	1



### 4 LM3699EVM Schematic



## 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)