

Using the LP8755EVM Evaluation Module

User's Guide



Literature Number: SNVU290
NOVEMBER 2013

1	Overview	4
2	Quick Setup Guide	5
	2.1 Installing/Opening the Software	5
	2.2 Power Supply Setup	7
	2.3 Notes on Efficiency Measurement Procedure	8
3	GUI Overview	8
	3.1 Main Tab	8
	3.2 Other Tabs and Menus	9
	3.3 Console	10
4	Bill of Materials	11
5	LP8755 Schematic	12

List of Figures

1	LP8755EVM	4
2	Evaluation Software Graphical User Interface (GUI) When USB Board Connected.....	6
3	Evaluation Software GUI Showing Steps Needed to Power up the LP8755.....	7

List of Tables

1	Mode Information	9
2	I ² C-Compatible Bus Support.....	9
3	Console Macros	10

The LP8755 Evaluation Module

This user's guide describes the operation of the evaluation module for the LP8755 Multi-Phase 6-Core Step-Down Converter from Texas Instruments (TI). The user's guide also provides design information including the schematic and Bill of Materials (BOM).

1 Overview

The LP8755EVM customer evaluation module demonstrates the integrated circuit LP8755 from TI. The LP8755 is a high-performance, multi-phase step-down converter designed to meet the power management requirements of the latest applications processors in portable applications. The device contains six step-down converter cores, which are bundled together in a 6-phase buck converter. This document covers user software provided with the EVM and design documentation that includes schematics and parts list.

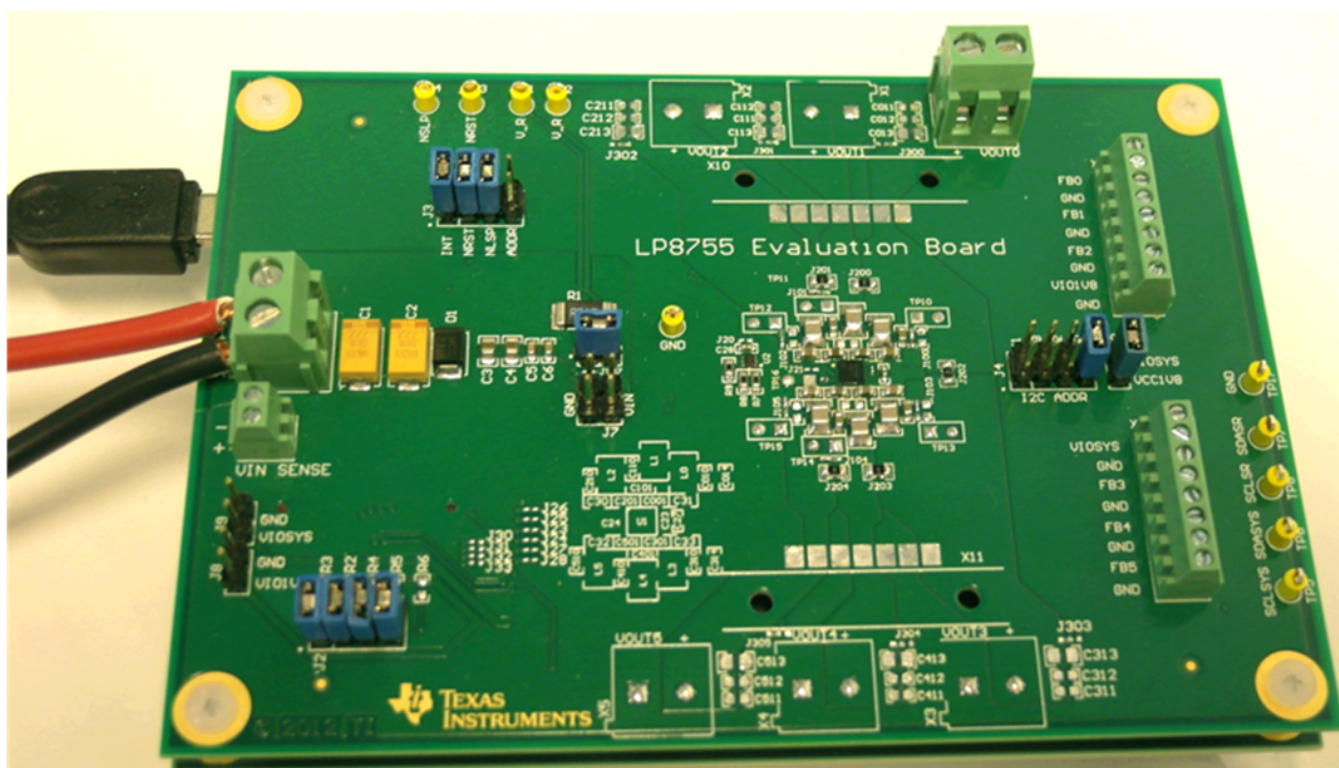


Figure 1. LP8755EVM

The evaluation module consists of two PCB boards, the LP8755 Evaluation Board, and the USB Interface Board. The boards are of the same size, and the LP8755 board is stacked on top of the USB Interface Board.

2 Quick Setup Guide

Many of the components on the LP8755 are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

On opening the LP8755EVM package, ensure that the following items are included:

- LP8755 Evaluation Board
- USB Interface Board
- USB Cable

If any of the items are missing, contact the closest Texas Instruments Product Information Center to inquire about a replacement.

2.1 Installing/Opening the Software

The EVM software is controlled through a graphical user interface (GUI). The software communicates with the EVM through an available USB port. The minimum hardware requirements for the EVM software are:

- IBM PC-compatible computer running a Microsoft Windows® XP or newer operating system
- Available USB port
- Mouse

The latest downloadable software is available at <http://www.ti.com/tool/lp8755evm>. Download the zip file onto your local hard drive, then unzip this folder. Make sure the USB Interface Board is connected to the Evaluation Board, and connect the USB Interface Board to the PC with the USB cable. Refer to [Figure 1](#).

1. With the power supply disconnected from the unit under test (UUT), open the un-zipped folder, and click on lp8755_nnn.exe (nnn is the version number) to start the software.
2. On the Evaluation SW window bottom right corner you should see text "USB Board connected". Refer to [Figure 2](#).

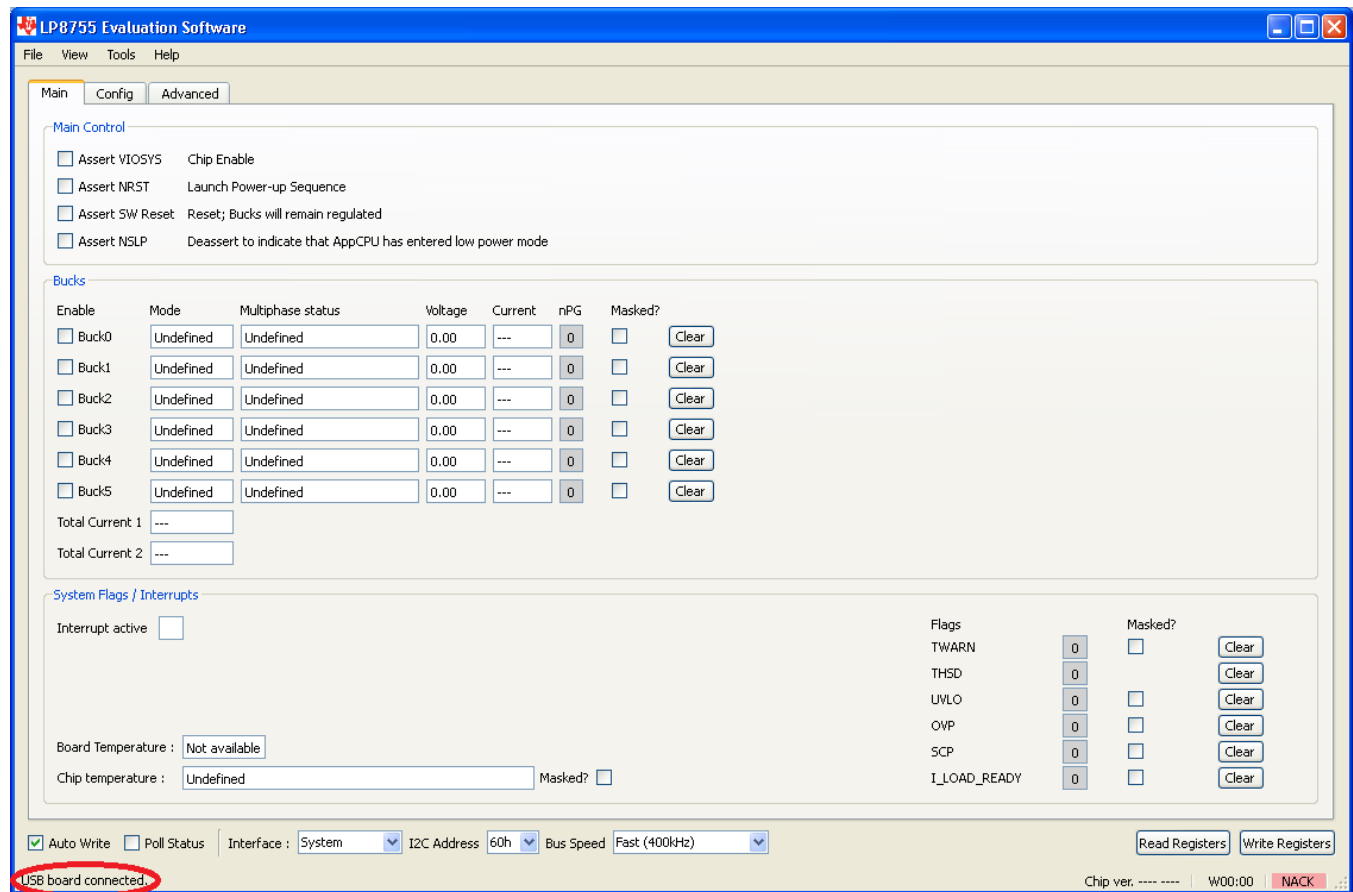


**Figure 2. Evaluation Software Graphical User Interface (GUI)
When USB Board Connected**

2.2 Power Supply Setup

To power up the EVM, one power supply is needed. For full-load testing of the LP8755EVM, a DC-power supply capable of at least 10A and 4V is required. 5A is suggested as a practical minimum for partial load. The power supply is connected to the EVM using connector X6. The power supply and cabling must present low impedance to the UUT; the length of power supply cables must be minimized. Remote sense, using connector X7, can be used to compensate for voltage drops in the cabling.

With the power supply disconnected from the UUT, set the supply to 3.7V DC and the current limit to 5A minimum. Set the power supply output OFF. Connect the power supply's positive terminal (+) to VIN and negative terminal (-) to GND on UUT (X6 Power-in terminal block). Check that jumpers on the boards are set as shown in [Figure 1](#) (factory default jumper configuration).

Set power supply output ON, and then continue with the following steps.

1. On Evaluation software GUI, click on Assert VIOSYS. See [Figure 3](#): Marking "1".
2. Click on Assert NRST. See [Figure 3](#): Marking "2".
3. Click on Read Registers button. You should see ready message on green background next to the Read Registers button. See [Figure 3](#): Marking "3".
4. Check that the GUI indicates "PFM" under "Mode" and "Master; 1/6 Phases Active" under "Multiphase" status. See [Figure 3](#): Marking "4". The EVM is now ready for testing with default register settings loaded.

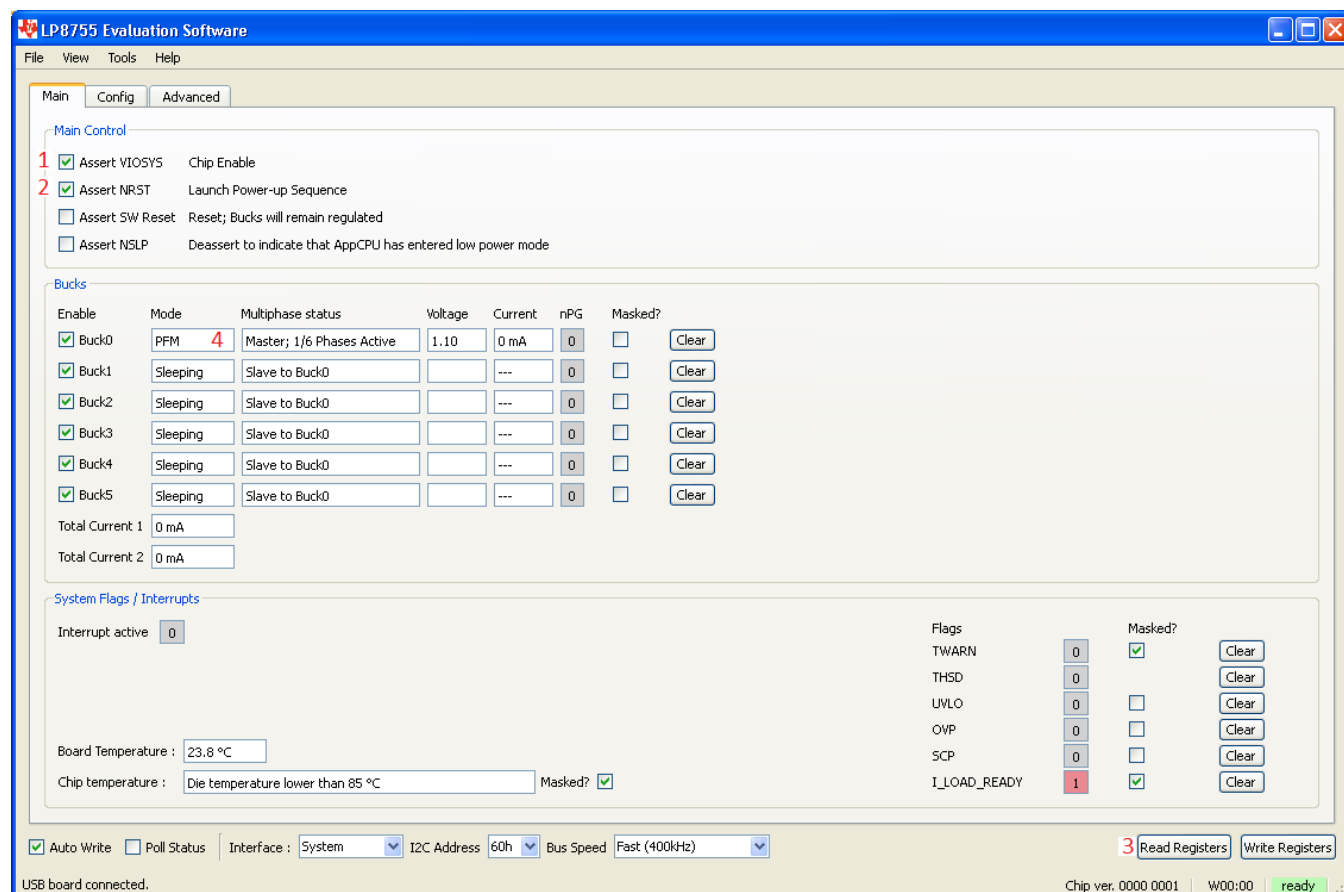


Figure 3. Evaluation Software GUI Showing Steps Needed to Power up the LP8755

2.3 Notes on Efficiency Measurement Procedure

Output Connections: An appropriate electronic load or high-power system source meter instrument, specified for operation down to 500 mV, is desirable for loading the UUT. The maximum load current is specified as 15A. Be sure to choose the correct wire size when attaching the electronic load. A wire resistance that is too high will cause a voltage drop in the power distribution path which becomes significant compared to the absolute value of the output voltage. Connect an electric load to X0. It is advised that, prior to connecting the load, it be set to sink 0A to avoid power surges or possible shocks.

Voltage drop across the PWB traces will yield inaccurate efficiency measurements. For the most accurate voltage measurement at the EVM, use TP16 to measure the input voltage and TP10 to measure the output voltage.

To measure the current flowing to/from the UUT, use the current meter of the DC power supply/electric load as long as it is accurate. Some power source ammeters may show offset of several milliamps and thus will yield inaccurate efficiency measurements. In order to perform very accurate I_q measurements on the UUT, remove the input protective Zener diode D1 from the board. When assembled, this diode will cause some leakage, especially on high VIN voltages. Also, the output voltage ADC on the USB Interface Board will load the output of LP8755 with a resistance in order of a hundred of k Ω . The 0 Ω resistors between the pads of J23 to J28 on the lower left corner of the EVB may also be removed (see [Section 5](#)).

3 GUI Overview

The evaluation software has the following tabs: Main, Config, and Advanced. The three tabs together provide the user access to the whole register map of LP8755.

3.1 Main Tab

The Main tab has the elemental controls for the EVM and provides a view to the chip status. Starting from top, the main controls are:

- **Assert VIOSYS:** This checkbox will assert 1.8V voltage to LP8755 VIOSYS pin (provided that jumper J6 is placed). This pin will enable the chip internal voltage reference and LDO, release POR, and launch OTP read cycle. The VIOSYS voltage is the reference voltage for the System I²C bus.
- **Assert NRST:** This checkbox will assert 1.8V voltage to LP8755 NRST pin. Asserting NRST will launch power-up sequence.
- **Assert SW Reset:** To perform a complete SW reset to the chip, assert and de-assert this checkbox. See the [LP8755 datasheet](#) for explanation of LP8755 reset scenarios.
- **Assert NSLP:** When this bit is asserted it tells LP8755 that the device it is powering is in a high-load condition state. On LP8755 this effectively prevents the bucks from entering the Low-Power PFM Mode (ECO).

NOTE: The recommended startup sequence for LP8755 is to first assert VIOSYS, then write all needed configuration bits by using the GUI, and then to assert NRST.

NOTE: The NRST pin is the reference for the DVS (Dynamic Voltage Scaling) bus (that is, SmartReflex™ bus). NRST needs to be asserted before the chip will acknowledge any transmission on the DVS bus.

The Bucks section provides status information for all the 6 buck cores. The Mode field provides information on each of the buck core and can have any of the values given in [Table 1](#):

Table 1. Mode Information

Buck Mode	
Disabled	Buck state machine in 'disable'
Soft Startup	Buck state machine in 'soft startup'. May occur when too much loading is present when powering-up the buck.
PWM	Pulse Width Modulation
PFM	Pulse Frequency Modulation
ECO	PFM with 'low power coasting' mode enabled. This means that lots of analog resources are disabled between PFM bursts. Reaction time to load transients is compromised, while Iq is minimized.
Sleeping	Multi-phase slave is passive.

The "Multi-phase Status" info field tells whether a buck core is configured as a master or slave. The field also tells how many phases are active.

An ADC on the USB interface card is connected to measure the output voltage of the buck converter, and this is displayed on GUI.

The "System Flags / Interrupts" section gives data on system faults and warnings. If the interrupt is set for any reason the Interrupt active field shall show '1' on red background. The flag causing the interrupt will also be set on the Main tab. Interrupts on LP8755 can only be cleared by writing '0' to associated registers. Any individual flag can be cleared by clicking the Clear button next to each flag field. The USB Interface Board uses an I²C-accessible temperature sensor IC to sense the EVB temperature near the LP8755 IC. This information is presented in the "Board Temperature" field. LP8755 register 0x0D provides a coarse temperature indication of the chip. This info is interpreted into the "Chip Temperature" field when the "Poll Status" option is selected.

At the bottom of the GUI window is the "Auto Write" checkbox. If "Auto Write" is checked (default) any checking, un-checking or pull-down menu selections will immediately launch I²C writes to the chip register(s). If not checked, the user can update the chip registers to correspond the configuration selected on the GUI by clicking "Write Registers".

If "Poll Status" is selected the software sends a query to the LP8755 at a fixed interval in order to detect the status of the chip, including operation mode, multi-phase status, and output current. If not selected, user can read the registers by applying "Read Registers". On the EVM both System I²C and DVS (Dynamic Voltage Scaling) (that is, SmartReflex) buses can be used to interface the chip. The interface to be used can be selected from the Interface pull-down menu. "Bus Speed" pull-down menu selections are given in Table 2 below and are instantly applied for both buses. Notice that for DVS bus to work, NRST needs to be high.

Table 2. I²C-Compatible Bus Support

Bus Speed Selection	Explanation
Fast (400 kHz)	Fast I ² C-compliant operation at 400 kHz
Fast++ (3.4 MHz)	I ² C protocol data transfer with 3.4 MHz clock rate. No writing of master code needed, but can done. Input filters correspond to HS lengths – 10 ns minimum filter length for SCL and SDA:
High-Speed (3.4 MHz)	HS I ² C-compliant data transfer with master codes.

3.2 Other Tabs and Menus

The "Tools" pull-down menu hosts another way of accessing the LP8755 registers. The "Direct Register Access" tool can be used to read or write any register. When using direct register access, un-checking the poll status checkbox is recommended. This way the GUI will only do the reads and writes commanded from the direct access dialog.

The "Config" and "Advanced" tabs provide the user with pull-down menus and check-boxes for the part of the register space that is not covered by the Main tab, such as output voltage control. These controls are self-explanatory. **Note that for the six-phase converter, only the Buck0 (Master) controls are effective.** Please refer to the [LP8755 datasheet](#) for explanation of the functions.

3.3 Console

To show or hide the console, toggle the option in View pull-down menu. The console can be used to access the LP8755 registers. Registers can be read or written simply by referring to the logical registers by their name. The console has a number of integrated macros that are listed in [Table 3](#).

Table 3. Console Macros

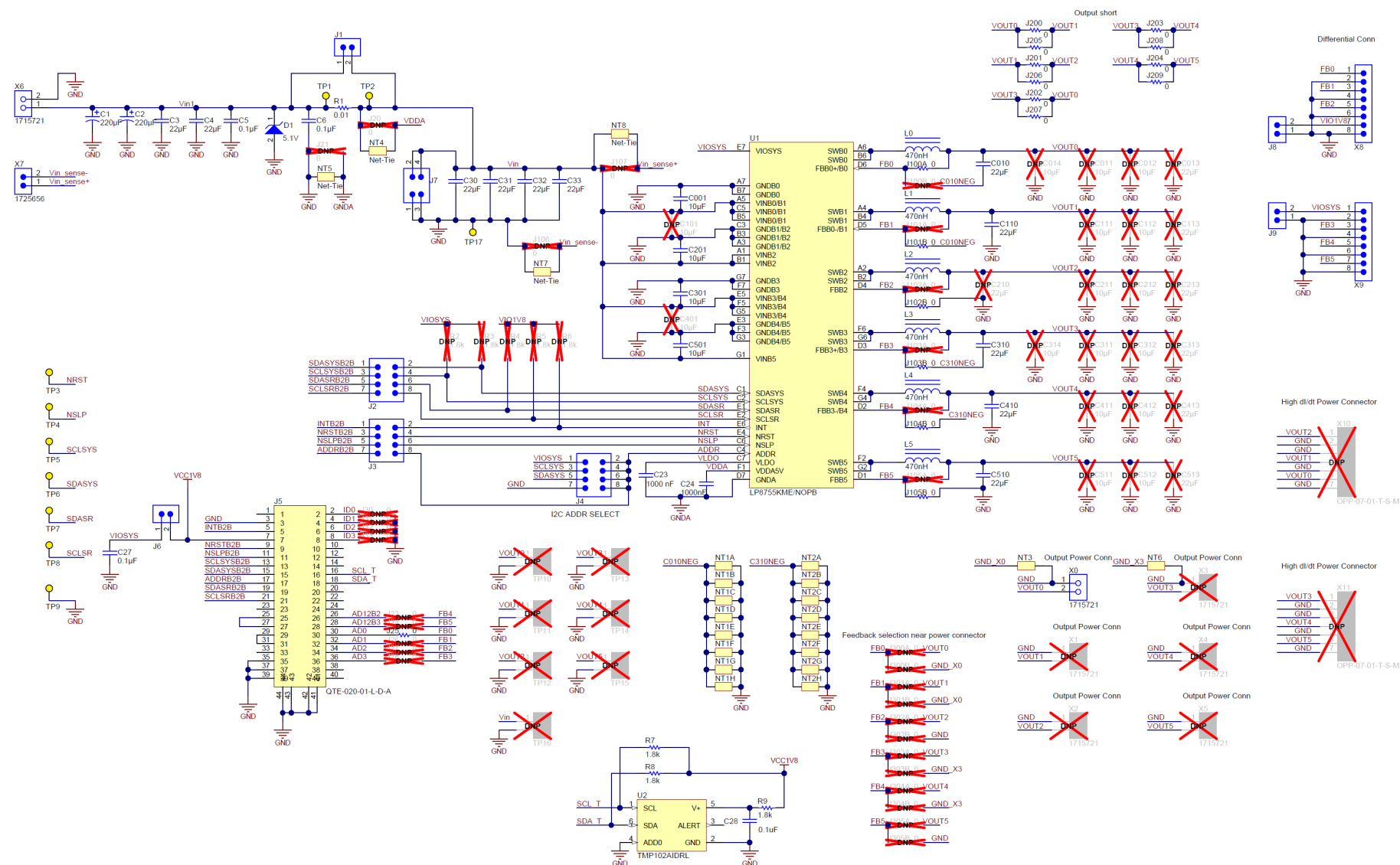
Command	Parameters	Explanation
register_name	= register value -	Write a value to writable I ² C register or logical register. If no parameter given, will return the current register value. The logical register names are the same as given in the datasheet, and must be in uppercase.
		Example: VSET_B0 = 40
wait	(time)	Wait for time given in ms. Useful in loops.
advanced		Change to advanced user mode.
user		Return from advanced to regular user mode.
vout	(buck number)	Use the ADC on the USB Interface Board to measure any buck output voltage. Return result to console in volts.
iout	(buck number)	Returns the measured load current of the chosen buck core.
i2c_bus	sr sys -	Change serial bus communications from the console and the GUI to be made with the specified bus. If called with no parameter treated as query and current selection is returned.
0x	address = data or address[bits] = data	I ² C read or write command. addr = value examples: 0x12 = 0xaa 0x12[7] = 1 0x12[3:0] = 15

The console supports use of scripts. If a text file containing commands supported by the console is stored in the same folder with the evaluation software executable, then the script can be launched from the console by typing the text file name, like script.txt. For demonstration purposes, the evaluation software comes with a set of scripts, which are loaded when Power Saver, Balanced, or High Performance buttons on the "Advanced" tab are clicked. These scripts (saved as script1.txt, script2.txt and script3.txt) will load a collection of register settings that will save energy, maximize load transient performance, or achieve a balance between the two. Clicking the User button will load a script "script4.txt". By default this file contains a demo which loops through all output voltage settings (VSET_B0). User can modify this file for specific register settings.

4 Bill of Materials

Designator	Description	Manufacturer	Part Number	Qty.
!PCB	Printed Circuit Board	Any	SV600763-001 REV A	1
C001, C201, C301, C501	CAP, CERM, 10 μ F, 10V, $\pm$ 10%, X5R, 0603	TDK	C1608X5R1A106M	4
C1, C2	CAP, TANT, 220 μ F, 10V, $\pm$ 10%, 0.05 Ω , 7343-31 SMD	AVX	TPSD227K010R0050	2
C3, C4	CAP, CERM, 22 μ F, 10V, $\pm$ 20%, X5R, 0805	Taiyo Yuden	LMK212BJ226MG-T	2
C5, C6	CAP, CERM, 0.1 μ F, 10V, $\pm$ 10%, X7R, 0603	Kemet	C0603C104K8RACTU	2
C010, C30, C31, C32, C33, C110, C310, C410, C510	CAP, CERM, 22 μ F, 10V, $\pm$ 20%, X5R, 0603	Samsung	CL10A226MP8NUNE	9
C23, C24	CL03 Series 0201 1000nF 6.3 V 20 % X5R SMD	Samsung	CL03A105MQ3CSNH	2
C27, C28	CAP, CERM, 0.1 μ F, 10V, $\pm$ 10%, X5R, 0402	MuRata	GRM155R61A104KA01D	2
D1	Diode, Zener, 5.1V, 5W, SMB	Micro Commercial Co	SMBJ5338B-TP	1
H1, H2, H3, H4	MACHINE SCREW PAN PHILLIPS 4-40	B&F Fastener Supply	NY PMS 440 0050 PH	4
H5, H6, H7, H8	Standoff, Hex, 0.5"L #4-40 Nylon	Keystone	1902C	4
H19, H20, H21, H22	M4 CIRC CLEARANCE SPACER 5MM	Harwin Inc	R40-6710594	4
J1, J6, J8, J9	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-102-07-G-S	4
J2, J3, J4	Header, TH, 100mil, 4x2, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-104-07-G-D	3
J5	Connector, SMT, High Speed, 20 pairs	Samtec, Inc.	QTE-020-01-L-D-A	1
J7	Header, TH, 100mil, 2x2, Gold plated, 230 mil above insulator	Samtec, Inc.	TSW-102-07-G-D	1
J25, J100A, J101B, J102B, J103B, J104B, J105B	RES, 0 ohm, 5%, 0.063W, 0402	Vishay-Dale	CRCW04020000Z0ED	7
J200, J201, J202, J203, J204, J205, J206, J207, J208, J209	RES, 0 ohm, 5%, 0.333W, 0805	Vishay-Dale	CRCW08050000Z0EAHP	10
L0, L1, L2, L3, L4, L5	Inductor, Shielded, Powdered Iron, 470nH, 3.9A, 0.028 ohm, SMD	TOKO	1276AS-H-R47M	6
R1	RES, 0.01 Ω , 1%, 3W, 2512 High Power Current Sense Chip Resistor	Bourns	CRA2512-FZ-R010ELF	1
R7, R8, R9	RES, 1.8k Ω , 5%, 0.1W, 0603	Vishay-Dale	CRCW06031K80JNEA	3
SH-J9, SH-J10, SH-J11, SH-J12, SH-J13, SH-J14, SH-J15, SH-J16, SH-J17, SH-J18	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA	10
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP17	Test Point, TH, Miniature, Yellow	Keystone	5004	10
U1	LP8755 Multi-phase 6-Core Step-Down Converter, YFQ0049AEAK	Texas Instruments	LP8755KME/NOPB	1
U2	Low Power Digital Temperature Sensor With SMBus/Two-Wire Serial Interface in SOT563, DRL0006A	Texas Instruments	TMP102AIDRL	1
X0, X6	PC terminal block, Pitch: 5.08 mm, Number of positions: 2	Phoenix Contact	1715721	2
X7	Phoenix Contact screw terminal 2 way, 2.54mm pitch	Phoenix Contact	1725656	1
X8, X9	Phoenix Contact screw terminal 8 way, 2.54mm pitch	Phoenix Contact	1725711	2

5 LP8755 Schematic



EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used. TI currently deals with a variety of customers for products, and therefore our arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.

REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

【Important Notice for Users of EVMs for RF Products in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

Texas Instruments Japan Limited
(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan

<http://www.tij.co.jp>

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】

本開発キットは技術基準適合証明を受けておりません。

本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。

日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿 6 丁目 2 4 番 1 号
西新宿三井ビル

<http://www.tij.co.jp>

EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated

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