LM26420

Application Note 1870 LM26420 Evaluation Board



Literature Number: SNVA353A

LM26420 Evaluation Board

National Semiconductor Application Note 1870 Francis Houde April 14, 2009



Introduction

The LM26420 Evaluation board was designed to provide two 2A outputs, V_{OUT1} and V_{OUT2} . It is available in either the eTSSOP package option of the LM26420 for easier probing or the LLP version for evaluating the smaller package. The design emphasizes on the compactness of the LM26420 PCB layout and is thermally optimized. The total solution size is less than 35mm by 40mm. The board supports the conversion from an input voltage ranging from 3V to 5.5V down to output voltages of 0.8V for each channel. V_{OUT1} and V_{OUT2} are set to 1.2V and 2.5V respectively. The feedback resistor can be changed to support output voltages as low as 0.8V or as high at 4.5V, assuming $V_{\rm IN}$ is high enough to support it. The EN pins are pulled up to $V_{\rm IN}$ by jumpers for easy evaluation but can also be easily controlled by external logic.

The board's specifications are:

- Input Voltage: 3V to 5.5V
- Output Voltages: 1.2V_{OUT1} and 2.5V_{OUT2}
- Maximum load current: 2A/output
- Minimum load current: 0A
- Size: 1.35 in. x 1.6 in.

Typical Application Circuit

Peak Current Limit: ≈ 3.2A at 25°C

Nominal Switching Frequency: 550 kHz or 2.2MHz

Powering Up The Board

Since the EN pins are directly tied to the input voltage via jumpers J₁ and J₂, starting up the board is as simple as connecting a voltage supply from 3V to 5.5V between the V_{IN} and GND terminals. There should be 1.2V on V_{OUT1} and 2.5V on V_{OUT2}, assuming the jumpers connect V_{IN} to EN for each channel. Great care should be taken in powering up the supplies such that the input voltage, V_{IN}, does not exceed the Absolute Maximum Rating of 7V. If the part experiences voltages greater than 7V for a prolonged period of time, then damage to the part can occur and then the evaluation board may cease working.

The linear soft-start ramps for the two output voltages and should last about 600 μ s. Load can be applied prior to powerup. If an output is shorted either before or after start-up, removal of the short-circuit condition should bring the corresponding output back to normal voltage.



LLP Board Schematic

Connection Diagram



16-Pin LLP (TOP VIEW)

Pin Descriptions 16-Pin LLP

Pin	Name	Function
1,2	VIND ₁	Power Input supply for Buck1.
11, 12	VIND ₂	Power Input supply for Buck2.
15	VINC	Power Input supply for control circuitry.
4	PGND ₁	Power ground pin for Buck 1.
9	PGND ₂	Power ground pin for Buck 2.
14	AGND	Signal ground pin. Place the bottom resistor of the feedback network as close as possible to pin.
6	PG ₁	Power Good Indicator for Buck 1. Pin is connected through a resistor to an external supply (open collector output).
7	PG ₂	Power Good Indicator for Buck 2. Pin is connected through a resistor to an external supply (open collector output).
5	FB ₁	Feedback pin for Buck 1. Connect to external resistor divider to set output voltage.
8	FB ₂	Feedback pin for Buck 2. Connect to external resistor divider to set output voltage.
3	SW ₁	Output switch for Buck 1. Connect to the inductor.
10	SW ₂	Output switch for Buck 2. Connect to the inductor.
16	EN ₁	Enable control input. Logic high enable operation for Buck 1. Do not allow this pin to float or be greater than VIN + 0.3V.
13	EN ₂	Enable control input. Logic high enable operation for Buck 2. Do not allow this pin to float or be greater than VIN + 0.3V.
DAP	Die Attach Pad	Connect to system ground for low thermal impedance and as a primary electrical GND connection.

eTSSOP Board Schematic

Connection Diagram



Pin Descriptions 20-Pin eTSSOP

Pin	Name	Function
3, 4	VIND ₁	Power Input supply for Buck1.
17, 18	VIND ₂	Power Input supply for Buck2.
1	VINC	Power Input supply for control circuitry.
6,7	PGND ₁	Power ground pin for Buck 1.
14, 15	PGND ₂	Power ground pin for Buck 2.
20	AGND	Signal ground pin. Place the bottom resistor of the feedback network as close as possible to pin.
9	PG ₁	Power Good Indicator for Buck 1. Pin is connected through a resistor to an external supply (open drain output).
12	PG ₂	Power Good Indicator for Buck 2. Pin is connected through a resistor to an external supply (open drain output).
8	FB ₁	Feedback pin for Buck 1. Connect to external resistor divider to set output voltage.
13	FB ₂	Feedback pin for Buck 2. Connect to external resistor divider to set output voltage.
5	SW ₁	Output switch for Buck 1. Connect to the inductor.
16	SW ₂	Output switch for Buck 2. Connect to the inductor.
2	EN ₁	Enable control input. Logic high enable operation for Buck 1. Do not allow this pin to float or be greater than VIN + 0.3V.
19	EN ₂	Enable control input. Logic high enable operation for Buck 2. Do not allow this pin to float or be greater than VIN + 0.3V.
10,11	NC	No Connect.
DAP	Die Attach Pad	Connect to system ground for low thermal impedance, but it cannot be used as a primary GND connection.



Bill of Materials - X Version

Item	Designator	Description	Manufacturer	Part No.	Qty.
1	C1, C2, C3, C4, C6, C7	22µF, 6.3V, X5R, 1206	TDK	C3216X5R0J226(M or K)	6
2	C5	0.47µF, 16V, X7R, 0603	TDK	C2012X7R1C474K	1
3	L1, L2	1µH, 6.4A	ток	SPM6530T-1R0M120 or RLF7030T-1R0N6R4	2
4	R1	5.1k, 1%, 603	Vishay	CRCW06035K10F	1
5	R2	21.3k, 1%, 603	Vishay	CRCW060321K3F	1
6	R7, R8	49.9k, 1%, 603	Vishay	CRCW060349K9F	2
7	R3, R4, R5, R6	10k, 1%, 603	Vishay	CRCW060310K0F	4
8	R9	5.1 Ohm, 1%, 805	Vishay	CRCW06035R10F	1
9	J1, J2	Jumper for Enables	Sullins Connector Solutions	STC02SYAN	2
10	TP1-TP8	0.094" Diameter Solder Terminal	Keystone Electronics	5011	8
11	U1	Dual 2A, 2.2MHz PWM Switcher, eTSSOP-20 or LLP-16	National	LM26420XMH or LM26420XSQ	1



Bill of Materials - Y Version

Item	Designator	Description	Manufacturer	Part No.	Qty.
1	C1, C2, C3, C4, C6, C7	22µF, 6.3V, X5R, 1206	TDK	C3216X5R0J226(M or K)	6
2	C5	0.47µF, 16V, X7R, 0603	TDK	TMK105BJ104KV-F	1
3	L1, L2	3.3µH, 6.4A	TDK or Coilcraft	RLF7030T-3R3M4R1 or MSS7341-332NL_	2
4	R1	5.1k, 1%, 603	Vishay	CRCW06035K10F	1
5	R2	21.3k, 1%, 603	Vishay	CRCW060321K3F	1
6	R7, R8	49.9k, 1%, 603	Vishay	CRCW060349K9F	2
7	R3, R4, R5, R6	10k, 1%, 603	Vishay	CRCW060310K0F	4
8	R9	5.1 Ohm, 1%, 805	Vishay	CRCW06035R10F	1
9	J1, J2	Jumper for Enables	Sullins Connector Solutions	STC02SYAN	2
10	TP1-TP8	0.094" Diameter Solder Terminal	Keystone Electronics	5011	8
11	U1	Dual 2A, 550kHz PWM Switcher, eTSSOP-20 or LLP-16	National	LM26420YMH or LM26420YSQ	1

eTSSOP-20 PCB Layout

eTSSOP - Top Layer



30069725

eTSSOP - Layer 3





30069726



○ ○ ■
(C) 2009 NSC

CLC26420EX REV B

œ

ω

LM2642

ć

JL94V-0

TSS0P

(1)

00

NATIONAL Emiconductor

980600070

 \bigcirc

30069728

551600070-001 Rev B

œ

ω

С

MADE IN USA

Rev I



30069727

LLP-16 PCB Layout





 $\odot \odot \blacksquare$

• •

 \bigcirc

30069732

30069730



30069731

Typical Performance Characteristics





Typical Performance Characteristics



Start-up - V_{IN} Applied

2.5V_{OUT}

2Vout

200 µs/DIV

2.5 2.0

1.5 () 1.0 ^{LNO} / 0.5 /

30069712

0.5

0.0 -0.5

6.0 5.0 4.0 $\begin{cases} 2.0 \\ 2.0 \\ 2.0 \end{cases}$ 2.0

> 1.0 0.0

Vin



Notes

For more National Semiconductor product information and proven design tools, visit the following Web sites at:

Products		Design Support		
Amplifiers	www.national.com/amplifiers	WEBENCH® Tools	www.national.com/webench	
Audio	www.national.com/audio	App Notes	www.national.com/appnotes	
Clock and Timing	www.national.com/timing	Reference Designs	www.national.com/refdesigns	
Data Converters	www.national.com/adc	Samples	www.national.com/samples	
Interface	www.national.com/interface	Eval Boards	www.national.com/evalboards	
LVDS	www.national.com/lvds	Packaging	www.national.com/packaging	
Power Management	www.national.com/power	Green Compliance	www.national.com/quality/green	
Switching Regulators	www.national.com/switchers	Distributors	www.national.com/contacts	
LDOs	www.national.com/ldo	Quality and Reliability	www.national.com/quality	
LED Lighting	www.national.com/led	Feedback/Support	www.national.com/feedback	
Voltage Reference	www.national.com/vref	Design Made Easy	www.national.com/easy	
PowerWise® Solutions	www.national.com/powerwise	Solutions	www.national.com/solutions	
Serial Digital Interface (SDI)	www.national.com/sdi	Mil/Aero	www.national.com/milaero	
Temperature Sensors	www.national.com/tempsensors	SolarMagic™	www.national.com/solarmagic	
Wireless (PLL/VCO)	www.national.com/wireless	Analog University®	www.national.com/AU	

THE CONTENTS OF THIS DOCUMENT ARE PROVIDED IN CONNECTION WITH NATIONAL SEMICONDUCTOR CORPORATION ("NATIONAL") PRODUCTS. NATIONAL MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS PUBLICATION AND RESERVES THE RIGHT TO MAKE CHANGES TO SPECIFICATIONS AND PRODUCT DESCRIPTIONS AT ANY TIME WITHOUT NOTICE. NO LICENSE, WHETHER EXPRESS, IMPLIED, ARISING BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT.

TESTING AND OTHER QUALITY CONTROLS ARE USED TO THE EXTENT NATIONAL DEEMS NECESSARY TO SUPPORT NATIONAL'S PRODUCT WARRANTY. EXCEPT WHERE MANDATED BY GOVERNMENT REQUIREMENTS, TESTING OF ALL PARAMETERS OF EACH PRODUCT IS NOT NECESSARILY PERFORMED. NATIONAL ASSUMES NO LIABILITY FOR APPLICATIONS ASSISTANCE OR BUYER PRODUCT DESIGN. BUYERS ARE RESPONSIBLE FOR THEIR PRODUCTS AND APPLICATIONS USING NATIONAL COMPONENTS. PRIOR TO USING OR DISTRIBUTING ANY PRODUCTS THAT INCLUDE NATIONAL COMPONENTS, BUYERS SHOULD PROVIDE ADEQUATE DESIGN, TESTING AND OPERATING SAFEGUARDS.

EXCEPT AS PROVIDED IN NATIONAL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, NATIONAL ASSUMES NO LIABILITY WHATSOEVER, AND NATIONAL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY RELATING TO THE SALE AND/OR USE OF NATIONAL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS PRIOR WRITTEN APPROVAL OF THE CHIEF EXECUTIVE OFFICER AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

Life support devices or systems are devices which (a) are intended for surgical implant into the body, or (b) support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in a significant injury to the user. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

National Semiconductor and the National Semiconductor logo are registered trademarks of National Semiconductor Corporation. All other brand or product names may be trademarks or registered trademarks of their respective holders.

Copyright© 2009 National Semiconductor Corporation

For the most current product information visit us at www.national.com



National Semiconductor Americas Technical Support Center Email: support@nsc.com Tel: 1-800-272-9959

National Semiconductor Europe Technical Support Center Email: europe.support@nsc.com National Semiconductor Asia Pacific Technical Support Center Email: ap.support@nsc.com National Semiconductor Japan Technical Support Center Email: jpn.feedback@nsc.com

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI 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 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. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for 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, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps
DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
Logic	logic.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2011, Texas Instruments Incorporated