LM3429 Nuventix MR16 & PAR20, PAR25, PAR30, PAR38 LED Bulb Reference Design

National Semiconductor
RD-173
Matt Reynolds
June 19, 2009

1.0 Design Specifications

Inputs	Output #1
VinMin=9V	Vout1=16V
VinMax=36V	Iout1=.7A

2.0 Design Description

The demonstration board includes a LM3429 device that converts 9VDC to 36VDC input to a 700mA constant current output designed to operate a load of three to four series LEDs. This reference design is ideal for any LED application that runs off of a 12V or 24V rail. This is a 4-layer board having input voltage and ground as the two internal planes. The design has been made assuming there are analog dimming requirements.

This design works with the Nuventix SynJet module which serves as the cooling element for an LED luminaire or bulb replacement for the standard MR16, PAR20, PAR25, PAR30 or PAR38 form factors

This document is a design introduction. See the **Reference Design and Evaluation PCB document** for the design details, located in the RD-173 Reference Design Folder:

http://www.national.com/cgi-bin/rdfile.cgi/RD-173/other.pdf

3.0 Features

- The LM3429 buck-boost LED driver:
  - Allows input voltage capability of 9V-36V to accommodate 12V and 24V voltage rails for a variety of applications
  - Drives 1-12 series connected LEDs up to 1A
  - Enables analog dimming capability of 0 mA to 1A with a potentiometer or 1V to 10V dimming
- The LM2842 voltage regulator provides a regulated 5V power supply to the SynJet actuator

4.0 Schematic

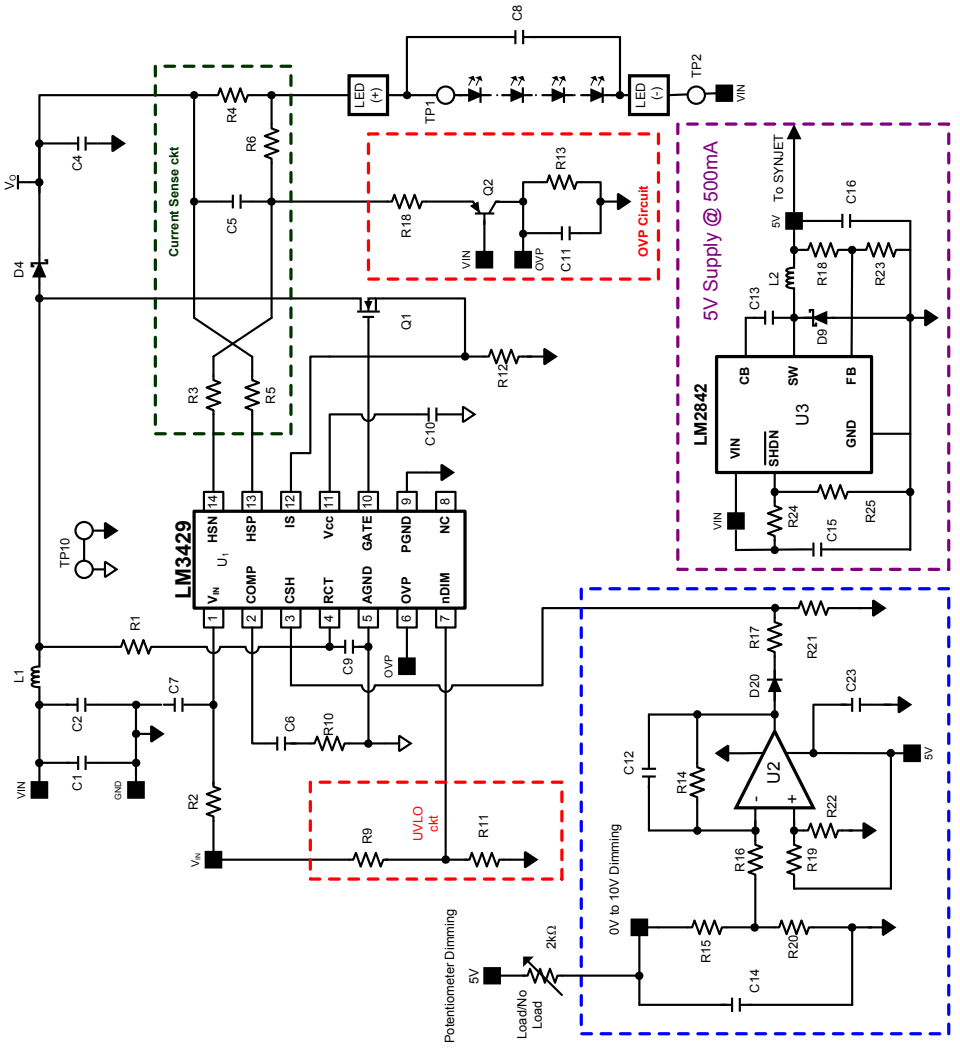


FIGURE 1. LM3429 LED driver, Dimming, Nuventix cooler schematic

5.0 Bill of Materials

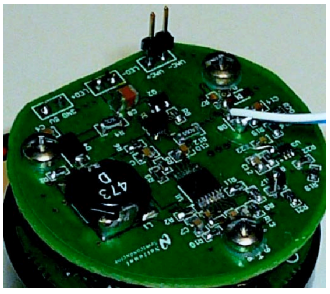
LM3429 Buck-Boost: High Side Current Sense (2kΩ Potentiometer Dimming)

Part ID (DESC)	Part Value	MFG	Part Number
U1	Buck-Boost controller, TSSOP14	NSC	LM3429
C1, C2	10uF, X7R, 50V	TDK	C5750X7R1H106
C4, C5, C7	0.1uF, 0805	TDK	C2012X7R1H104K
C6	0.22uF, 0603	TDK	C1608X5R0J225K
C8 (Output Cap)	22uF 25V, 1210	Panasonic	GRM32ER61E226KE15L
C9	1000pF, 0603	TDK	C1608X7R1H102K
C10 (Vcc Cap)	2.2µF, 16V	TDK	C2012X5R1C225K
C11	47pF, 50V 0603	Panasonic	ECJ-1VC2A470J
D4	60V 2A SMA	ST Micro	STPS2L60A
L1	47uH	Coilcraft	MSS1038-473MLB
Q1	Power-PAK 60V	Vishay	SI7414DN
Q2	PNP Small Signal XSTR SOT23	Fairchild	MMBT3906
R1 (RCT Res)	41.2kΩ, 0603, 1%	Vishay	CRCW06034122F
R2, R6, R10	10Ω, 0603, 1%	Vishay	CRCW060310R0F
R3, R5 (HSP, HSN)	1kΩ, 0603, 1%	Vishay	CRCW06031001F
R4 (I_{LED} SNS Res)	0.15Ω, 1206	Vishay	WSL1206R1500FEA
R8 (OVP Res)	174kΩ, 0603, 1%	Vishay	CRCW06031743F
R9 (UVLO Res)	90.9kΩ, 0603, 1%	Vishay	CRCW06039092F
R11 (UVLO Res)	20.0kΩ, 0603, 1%	Vishay	CRCW06032002F
R12 (Mosfet SNS Res)	0.06Ω, 1206	Vishay	WSL2512R0600FEA
R13 (OVP)	8.66kΩ, 0603, 1%	Vishay	CRCW06038661F
R21 (CSH Res)	11.82kΩ, 0603, 1%	Vishay	CRCW060311822F
Dimming Circuit			
U3	SOT23-6	NSC	
C12,C14,C23	0.1uF, 0805	TDK	C2012X7R1H104K
C24	No load		
D20	SOD123	Diodes Inc	1N4148W-7-F
R14	8.06kΩ, 0603, 1%	TDK	CRCW06038061F
R15, R16, R19, R22	2.0kΩ, 0603, 1%	TDK	CRCW06032001F
R17	22.1kΩ, 0603, 1%	TDK	CRCW06032212F
R20	2.61kΩ, 0603, 1%	TDK	CRCW06032611F
LM2842 Circuit			
U2	LM2842Y (1.25MHz), 600mA	NSC	
D9	40V 1A SMA	Diodes Inc	B140 -13
C15	4.7uF 1210, 50V	Murata	GRM32ER71H475KA88L
C16	47uF 6.3V	Kemet	C0805C476M9PACTU
C13	0.1uF, 0603, 16V	TDK	C1608X7R1C104K
L2	600mA	Coilcraft	LPS4018-153
R18	5.62kΩ, 0603, 1%	TDK	CRCW06035621F
R23	1.02kΩ, 0603, 1%	TDK	CRCW06031021F
R24	69.8kΩ, 0603, 1%	TDK	CRCW06036982F
R25	10.0kΩ, 0603, 1%	TDK	CRCW06031002F
V_{IN}, GND, LED+, LED-	Connector	Keystone	575-8
Test Points	Connector	Keystone	1502-2
J1, J3	Jumper	Molex	22-28-4023

other1

FIGURE 2. Nuventix Reference Board BOM

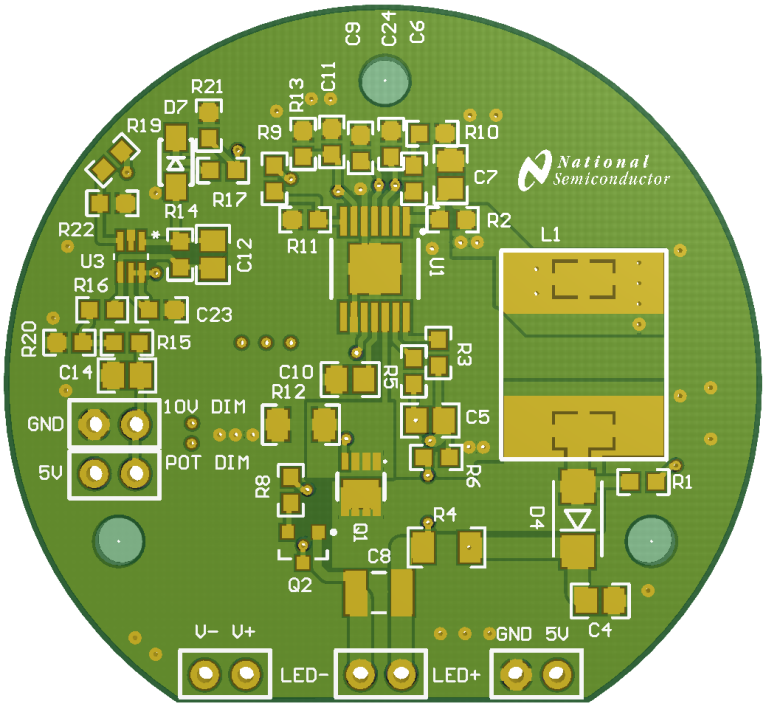
6.0 Board Photos



other

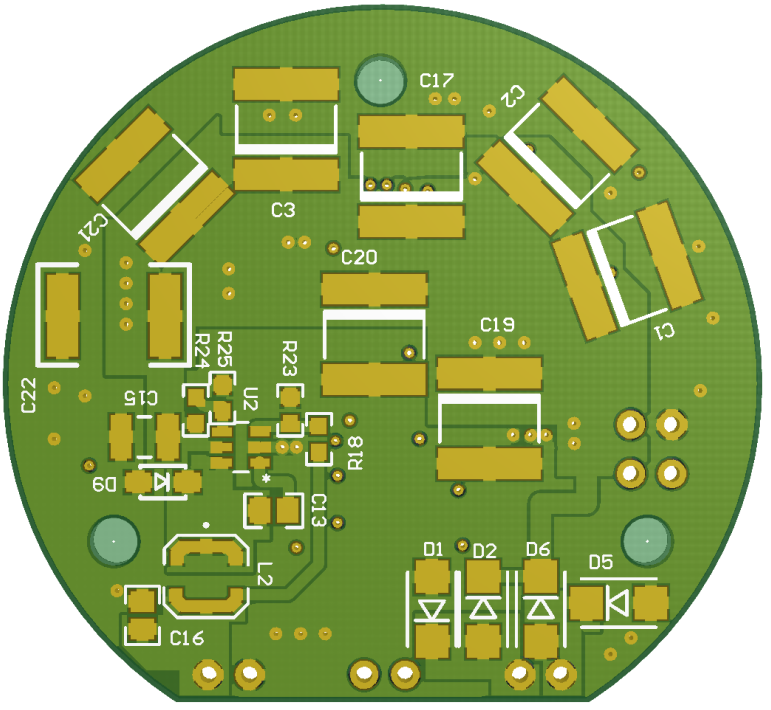
FIGURE 3. Board Photo

7.0 Layouts



layout3

FIGURE 4. Top View Gerber



layout4

FIGURE 5. Bottom View Gerber

Notes

National Semiconductor Americas Customer Support Center
Email: new.feedback@nsc.com
Tel: 1-800-272-9959

National Semiconductor Europe Customer Support Center
Fax: +49 (0) 180-530-85-86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 69 9508 6208
English Tel: +49 (0) 870 24 0 2171
Français Tel: +33 (0) 1 41 91 8790

National Semiconductor Asia Pacific Customer Support Center
Email: ap.support@nsc.com

National Semiconductor Japan Customer Support Center
Fax: 81-3-5639-7507
Email: jpn.feedback@nsc.com
Tel: 81-3-5639-7560