Keywords: powered device, PD, Power over Ethernet, PoE, IEEE 802.3af, IEEE 802.3at, Class 2 PD, Class 3 PD, IP phones, IP cameras, security cameras, WAP, Wireless Access Point, Point of Sales, POS, Thin Client, Ethernet Repeater, active clamped forward, flyback

Apr 29, 2011

REFERENCE DESIGN 5044 INCLUDES: √Tested circuit √Schematic √BOM √Description √Test data √Layout

Low-EMI, Active-Clamped Forward, Class 4 Powered Device (PD) Provides High-Efficiency Solution for PoE Applications

*Abstract: This reference design is for a **highly efficient** and **low-EMI** active-clamped forward, 5V powered device (PD). The design features the MAX5969B as its controller. The design also uses the MAX5974A, which controls current-mode PWM converters and provides inductive feedback, zero-voltage switching (ZVS), and frequency foldback to reduce cost and enhance supply efficiency for PoE applications. Using these devices, this reference design is IEEE® 802.3af/at compliant, and is a high-performance, compact, and cost-efficient solution for a Class 4 PD. The design can also support the auxiliary input voltage to provide maximum 25W output power.*

More Information
- Wireless Home
- Application Notes and Tutorials
- EV Kit Software
- Technical Support

General Description

The design features the MAX5969B and MAX5974A. The MAX5969B controller is fully compliant with the IEEE 802.3af/at standard in a power-over-Ethernet (PoE) system. The device can also get power from a wall adapter (WAD). The MAX5974A provides control for wide-input-voltage, ZVS active-clamped, current-mode PWM converters and frequency foldback for PoE applications. Using these devices, this reference design is IEEE 802.3af/at compliant. It is also a high-efficiency and low-EMI solution for a Class 4 PD.

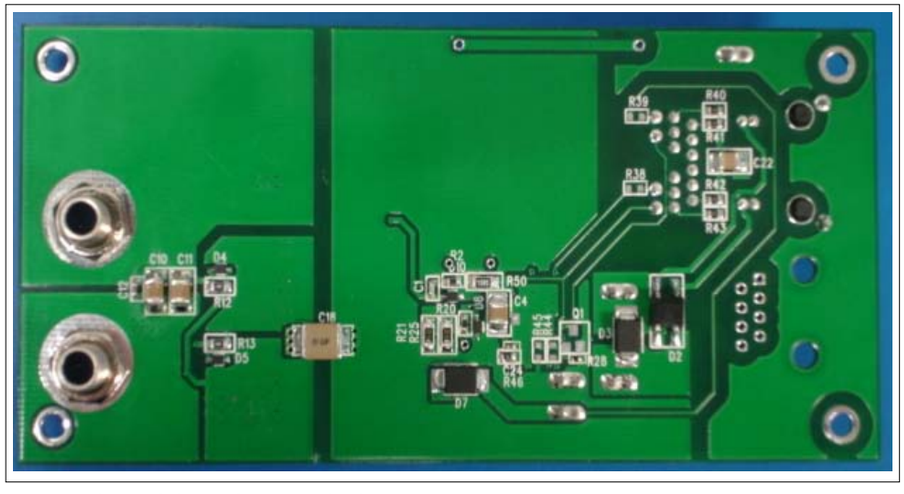
Click here for an overview of the wireless components used in a typical radio transceiver.

Specifications

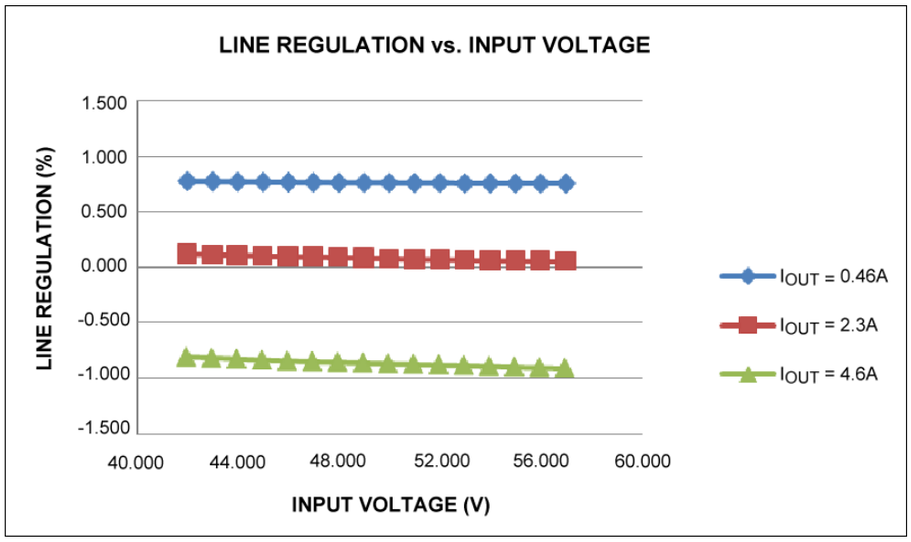
The 5V/4.8A PD is designed to meet the following specifications:

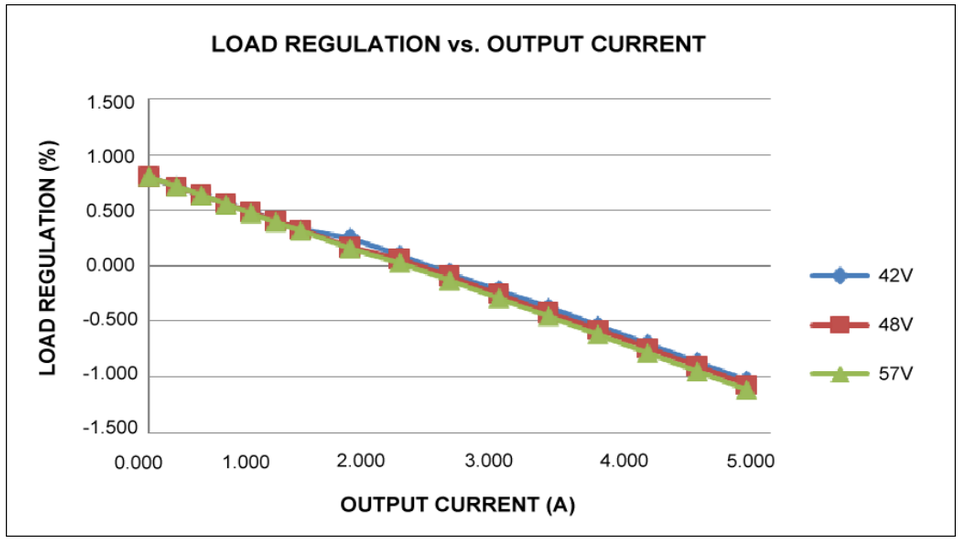
- Input voltage: 42V to 57V
- WAD input voltage: 30V up to 57V
- V_{OUT}: 5V/4.8A
- Output ripples: ±1%
- Load transient V_{P-P}: ±5% (25% step-load)
- Line and load regulation: ±1%
- Total efficiency with load of 4A at 5V and 42V input: 92.2% (not including input LAN transformer and diode bridge)

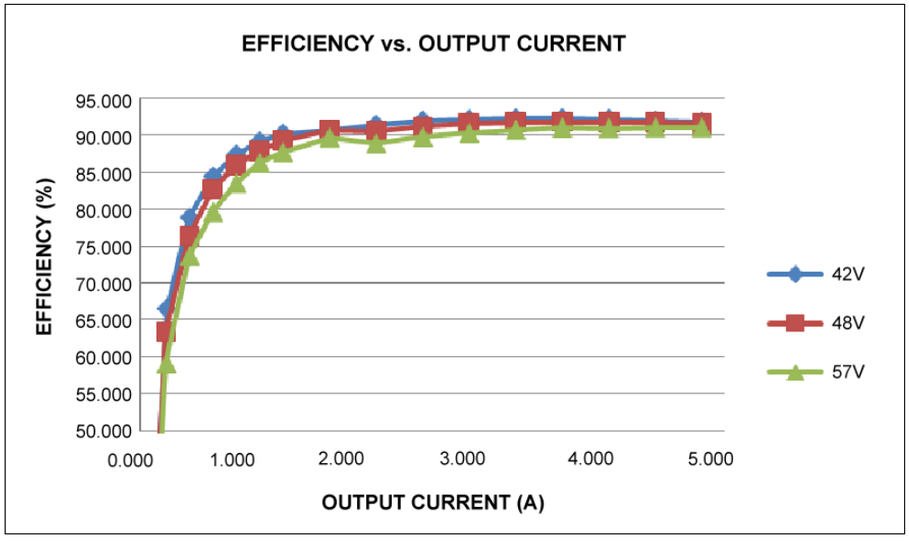
Top view of the reference design.

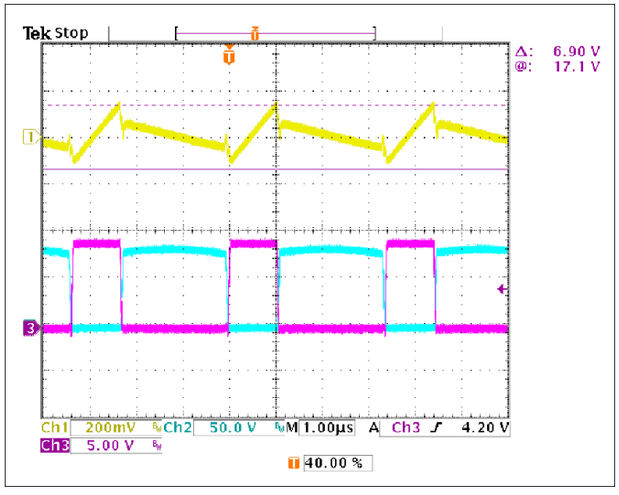


Bottom view of the reference design.



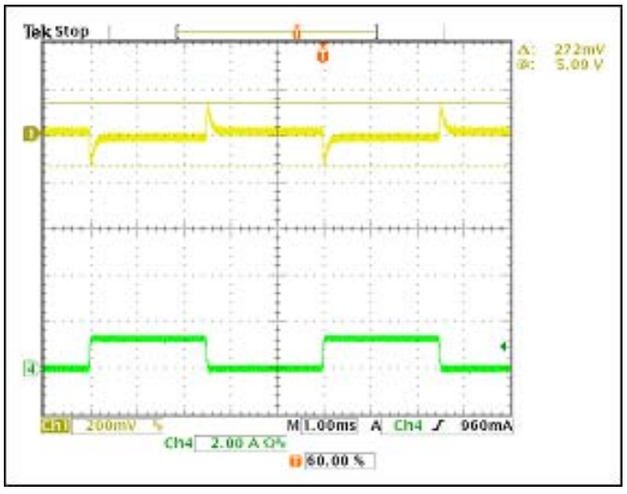






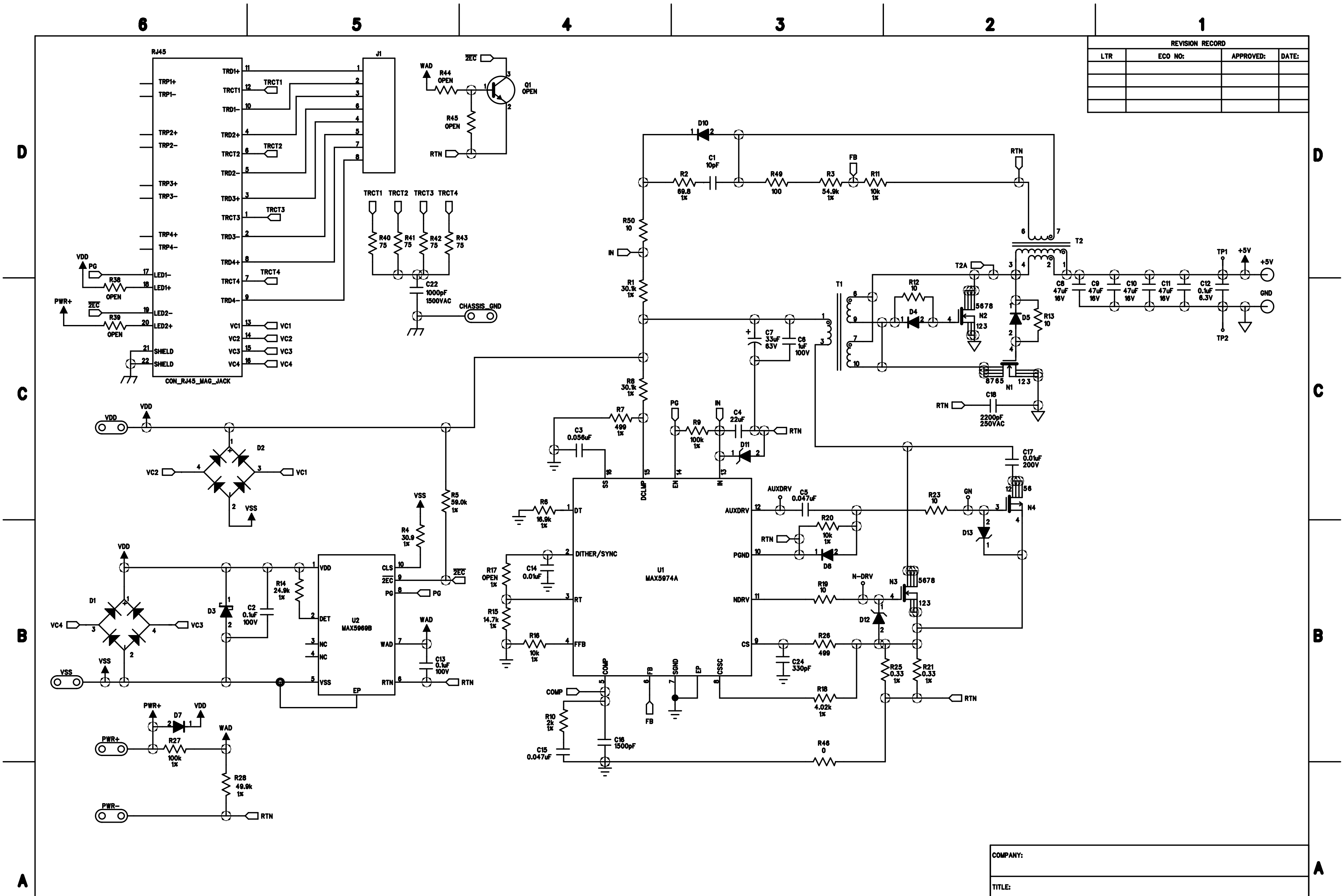
Primary Stress Voltage

V_{IN} = 57V, I_{OUT} = 0.1A
Ch1: 200mV/div, current sense voltage
Ch2: 50V/div, primary drain-source voltage
Ch3: 5V/div, NDRV driving
Time base: 1µs/div



Transient Response

V_{IN} = 48V, I_{OUT} = 0A–1.2A
Ch1: 200mV/div, 5V output voltage
Ch4: 5A/div, output current
Time base: 1ms/div



6
5
4
3
2
1
D
C
B
A
RJ45
CON_RJ45_MAG_JACK
TRP1+
TRP1-
TRP2+
TRP2-
TRP3+
TRP3-
TRP4+
TRP4-
TRD1+
TRCT1
TRD1-
TRD2+
TRCT2
TRD2-
TRD3+
TRCT3
TRD3-
TRD4+
TRCT4
TRD4-
LED1-
LED1+
LED2-
LED2+
SHIELD
VC1
VC2
VC3
VC4
J1
WAD
R44 OPEN
R45 OPEN
Q1 OPEN
2EC
RTN
R40 75
R41 75
R42 75
R43 75
C22 1000pF 1500VAC
CHASSIS_GND
VDD
PG
R38 OPEN
PWR+
R39 OPEN
D2
VSS
D1
D3
C2 0.1uF 100V
R14 24.9k 1%
U2 MAX5969B
DET
NC
CLS
PG
C13 0.1uF 100V
R4 30.9 1%
R5 59.0k 1%
EP
D7
R27 100k 1%
R28 49.9k 1%
PWR-
D10
R2 69.8 1%
C1 10pF
R49 100
FB
R3 54.9k 1%
R11 10k 1%
R50 10
IN
R1 30.1k 1%
R8 30.1k 1%
R7 499 1%
C3 0.056uF
R9 100k 1%
C4 22uF
D11
C7 33uF 63V
C6 1uF 100V
T1
T2
T2A
R12 10
D4
N2
D5
R13 10
N1
C18 2200pF 250VAC
C8 47uF 16V
C9 47uF 16V
C10 47uF 16V
C11 47uF 16V
C12 0.1uF 6.3V
TP1
TP2
+5V
GND
C17 0.01uF 200V
N4
U1 MAX5974A
SS
DCLMP
EN
DT
DITHER/SYNC
RT
FFB
COMP
SGND
CSSC
AUXDRV
PGND
NDRV
CS
R6 16.9k 1%
C14 0.01uF
R17 OPEN 1%
R15 14.7k 1%
R16 10k 1%
AUXDRV
C5 0.047uF
R20 10k 1%
D6
R23 10
GN
D13
N-DRV
R19 10
N3
D12
R26 499
C24 330pF
R25 0.33 1%
R21 0.33 1%
R18 4.02k 1%
R10 2k 1%
C15 0.047uF
C16 1500pF
R46 0

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

DRAWN:	DATED:	COMPANY:			
CHECKED:	DATED:	TITLE: MAX5974A EVALUATION KIT+			
QUALITY CONTROL:	DATED:	CODE:	SIZE:	DRAWING NO:	REV:
RELEASED:	DATED:	SCALE:		SHEET: 1 OF 1	

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Related Parts

MAX5969B	IEEE 802.3af/at-Compliant, Powered Device Interface Controllers with Integrated Power MOSFET	-- Free samples
MAX5974A	Active-Clamped, Spread-Spectrum, Current-Mode PWM Controllers	-- Free samples

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