APPLICATION NOTE 4983

Wide Input Flyback Converter Features 5V at 2.6A Output

Abstract: This reference design is for a highly efficient, flyback, 5V Class 3 powered device (PD) with a wide 9V to 57V auxiliary input. The design features the MAX5969B as its controller. The design also uses the MAX5974D, which controls current-mode PWM converters and provides frequency foldback for both the auxiliary input and power over Ethernet (PoE) applications. Using these devices, this reference design is IEEE® 802.3af/at compliant. It is also a high-performance, compact, and cost efficient solution for a Class 3 PD. The design can also support the wide auxiliary-input voltage range to provide 10W output power.
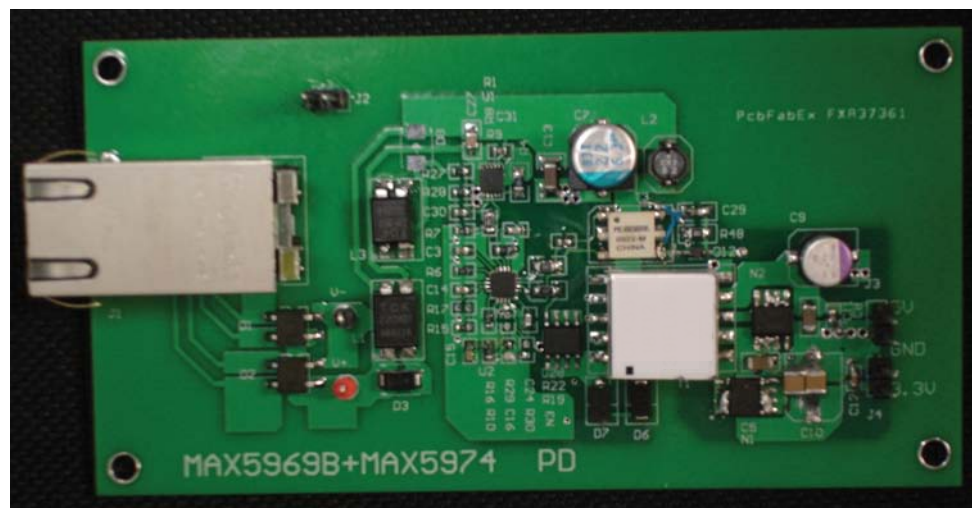
General Description

This reference design features the MAX5969B and MAX5974D. The MAX5969B controller is fully compliant with the IEEE 802.3af/at standard in a power-over-Ethernet (PoE) system. The device can also be powered from a wall adapter (WAD). The MAX5974D controls wide 9V to 57V input-voltage, active-clamped, current-mode PWM converters and provides frequency foldback. Using these devices, this reference design is IEEE 802.3af/at compliant. It is also a high-performance, compact, and cost-effective solution for a Class 2 PD or a Class 3 PD.
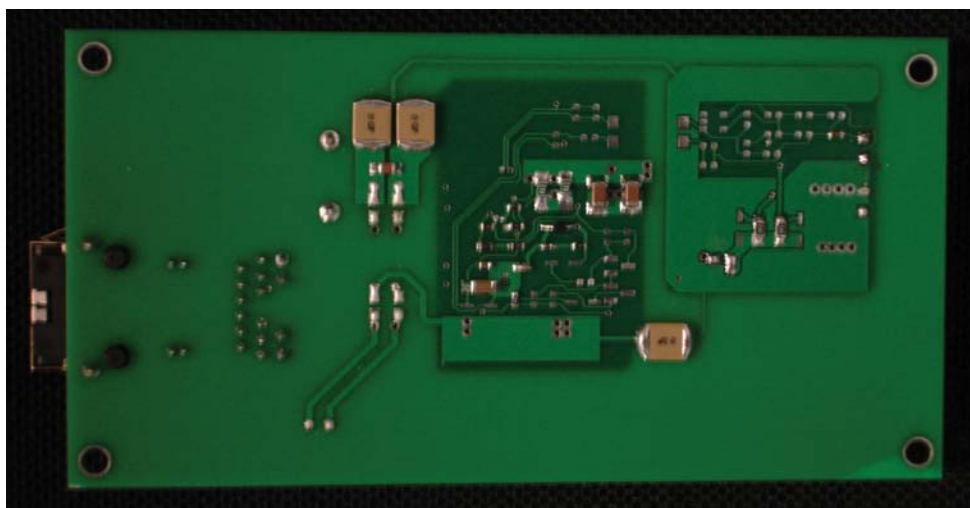
Specifications:
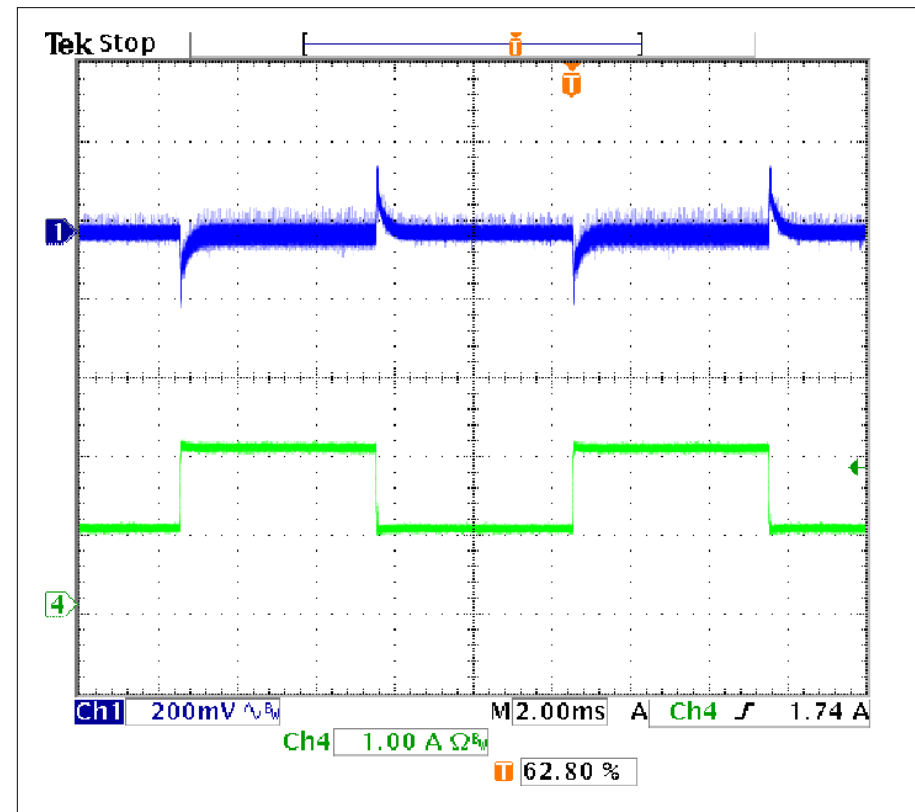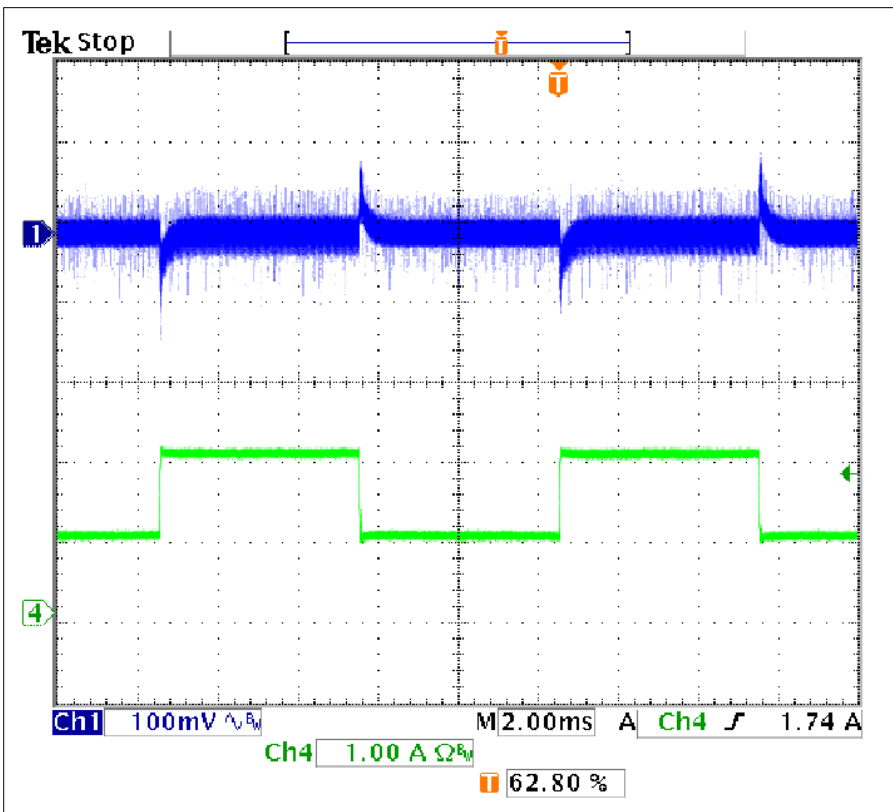
The 5V/2.6A PD meets the following specifications:

- Input voltage: 36V to 57V
- WAD input voltage: 9V up to 57V
- V_{OUT}: 5V/2.6A
- Output ripples: ±2%
- Load transient V_{P-P}: ±2% (50% step-load)
- Line and load regulation: ±0.2%
- Total efficiency with a load of 2.5A at 5V and a 48V input: 87.4% (not including input LAN transformer and diode bridge)

Top view of the reference design.

Bottom view of the reference design.

LINE REGULATION vs. POE INPUT VOLTAGE

5V LINE REGULATION(%)

INPUT VOLTAGE(V)

Pout=0.6W
Pout=12.55W

EFFICIENCY vs. OUTPUT CURRENT

EFFICIENCY (%)

OUTPUT CURRENT(A)

36V Input
57V Input

LOAD REGULATION vs. OUTPUT CURRENT
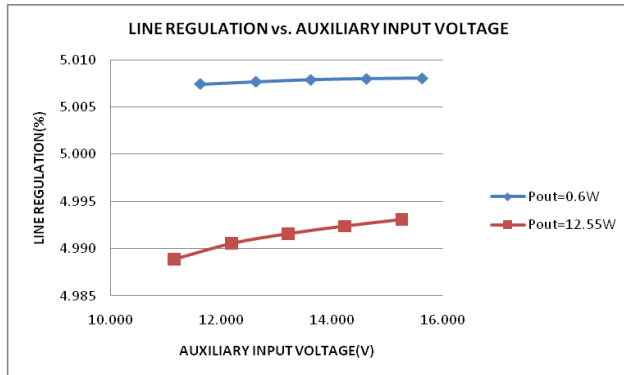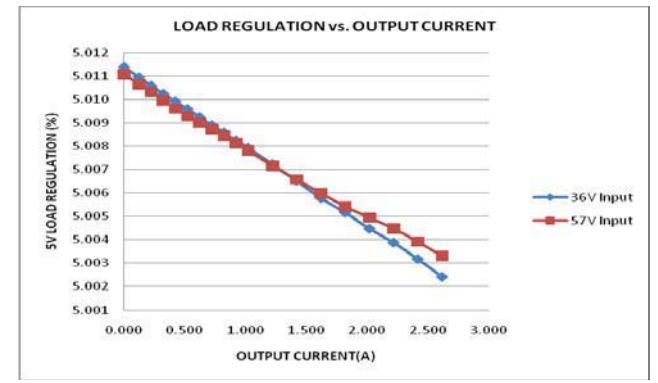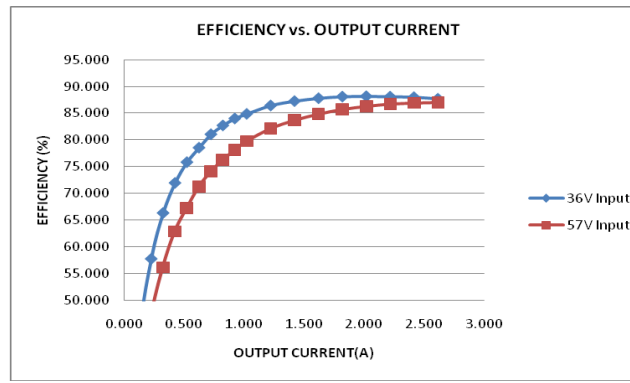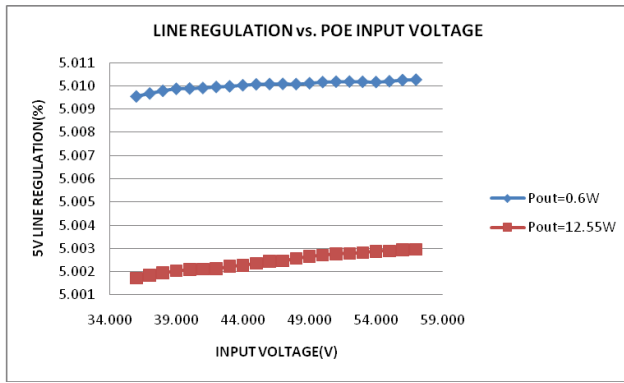
5V LOAD REGULATION (%)

OUTPUT CURRENT(A)

36V Input
57V Input

LINE REGULATION vs. AUXILIARY INPUT VOLTAGE

LINE REGULATION(%)

AUXILIARY INPUT VOLTAGE(V)

Pout=0.6W
Pout=12.55W

EFFICIENCY vs OUTPUT CURRENT

EFFICIENCY(%)

OUTPUT CURRENT(A)

9V Input
16V Input

LOAD REGULATION vs. OUTPUT CURRENT

5V LOAD REGULATION(%)

OUTPUT CURRENT(A)

9V Input
16V Input

Tek Stop

Ch1 100mV B W   M 2.00ms   A Ch4 ƒ   1.74 A
Ch4 1.00 A Ω B W
T 62.80 %

Tek Stop

Ch1 200mV B W   M 2.00ms   A Ch4 ƒ   1.74 A
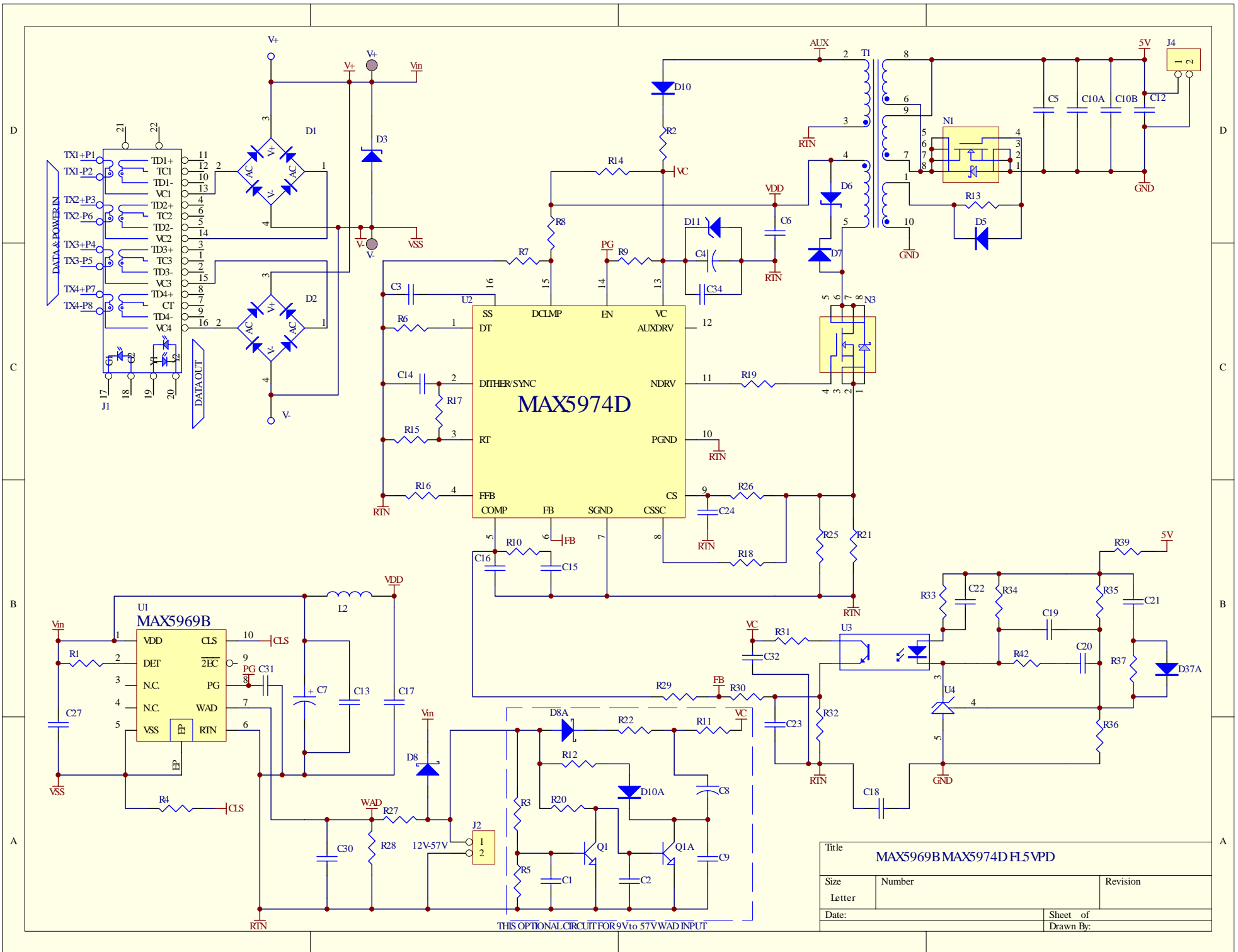Ch4 1.00 A Ω B W
T 62.80 %

Transient Response

V_{IN} = **40V**, I_{OUT2} = 1A–2.5A
Ch1: 100mV/div, 5V output voltage
Ch4: 1A/div, output current
Time base: 2ms/div

Transient Response

V_{IN} = **16V**, I_{OUT2} = 1A–2.5A
Ch2: 200mV/div, 5V output voltage
Ch4: 1A/div, output current
Time base: 2ms/div

MAX5969B MAX5974D FL5VPD

DATA & POWER IN

TX1+P1
TX1-P2
TX2+P3
TX2-P6
TX3+P4
TX3-P5
TX4+P7
TX4-P8

TD1+ 11
TC1 12
TD1- 10
VC1 13
TD2+ 4
TC2 6
TD2- 5
VC2 14
TD3+ 3
TC3 1
TD3- 2
VC3 15
TD4+ 8
TC4 7
TD4- 9
VC4 16

J1

21 22

17 18 19 20

DATA OUT

D1   D2

U2   MAX5974D

SS 16
DT 1
DITHER/SYNC 2
RT 3
FFB 4
COMP 5
FB 6
SGND 7
CSSC 8

DCLMP 15
EN 14
VC 13
AUXDRV 12
NDRV 11
PGND 10
CS 9

U1   MAX5969B

VDD 1
DET 2
N.C. 3
N.C. 4
VSS 5
EP

CLS 10
2EC 9
PG 8
WAD 7
RTN 6

C3 C6 C14 C15 C16 C24 R6 R7 R8 R9 R10 R14 R15 R16 R17 R18 R19 R21 R25 R26 R34

D10 D11 D6 D7 D5 D3 R2 R13

T1 N1 N3

AUX 5V J4 GND

L2 VDD

C5 C10A C10B C12

R1 C27 C7 C13 C17 C31 C30 R28 R27

Vin VSS RTN CLS WAD

D8 D8A D10A J2 12V-57V Q1 Q1A
R3 R20 R22 R11 R12 R5 C1 C2 C9 C8

THIS OPTIONAL CIRCUIT FOR 9V to 57V WAD INPUT

U3 U4 R29 R30 R31 R32 R33 R35 R36 R37 R39 R42
C18 C19 C20 C21 C22 C23 C32 D37A

VC FB RTN GND 5V

Title: MAX5969B MAX5974D FL5VPD

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Related Parts

MAX5969B IEEE 802.3af/at-Compliant, Powered Device Interface Controllers with Integrated Power MOSFET

MAX5974D Active-Clamped, Spread-Spectrum, Current-Mode PWM Controllers

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