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.

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.

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
- VOUT: 5V/4.8A
- Output ripples: ±1%
- Load transient Vp_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)
Primary Stress Voltage

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

Transient Response

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