

Reference Design RD-269

PFC+PWM Combo Controller FAN6921 and Secondary-Side Synchronous Rectifier IC FSR510 - 90W Design

Featured Device	Application	Input Voltage Range	Output Voltage (Rated Current)	Rated Output Power	Topology
FAN6921 FSR510	Notebook Adaptor	90~264V _{AC}	19V (4.74A)	90W	BCM Boost PFC and Quasi-Resonant Flyback Converter

Key Features

FAN6921

BCM PFC Converter

- Zero-Current Detection
- Controlled On-Time Technique
- Cycle-by-Cycle Current Limiting
- Internal Leading-Edge Blanking for Current Sensing
- PFC Burst Mode Operation at Light-Load Condition (FAN6920)
- PFC Soft-Burst for Reducing Audible Noise
- Adjustable Burst Operation Voltage Range
- Minimum T_{OFF} for Frequency Limitation

Quasi-Resonant Converter

- Peak-Current-Mode Control
- Cycle-by-Cycle Current Limiting
- Internal Lead-Edge Blanking Time for Current Sensing
- Off-Modulation Technique
- Deep Extended Valley Switching
- Internal Minimum T_{OFF} for Frequency Limitation
- H/L Line Over-Power Compensation
- Internal 5ms Soft-Start

FSR510

- Highly Integrated Synchronous Rectification (SR) Combination Controller, Combining MOSFET and SR Controller
- Built-In Ultra-Low R_{DS-ON} MOSFET
- Internal Linear-Predict Timing Control Designed for Quasi-Resonant (QR) and Discontinuous Conduction Mode (DCM) Operation
- Internal Green-Mode Operation for Better No-Load Power Consumption
- PWM Frequency Tracking with Secondary-Side Winding Detection
- Ultra-Low V_{DD} Operating Voltage (5.3~25V) for Various Output Voltage Applications
- Ultra-Low Green-Mode Operating Current: 0.8mA (Typical)
- V_{DD} Over-Voltage Protection
- Gate Driver Clamp: 12V (Typical)
- TO220-6L Package

1. Schematic

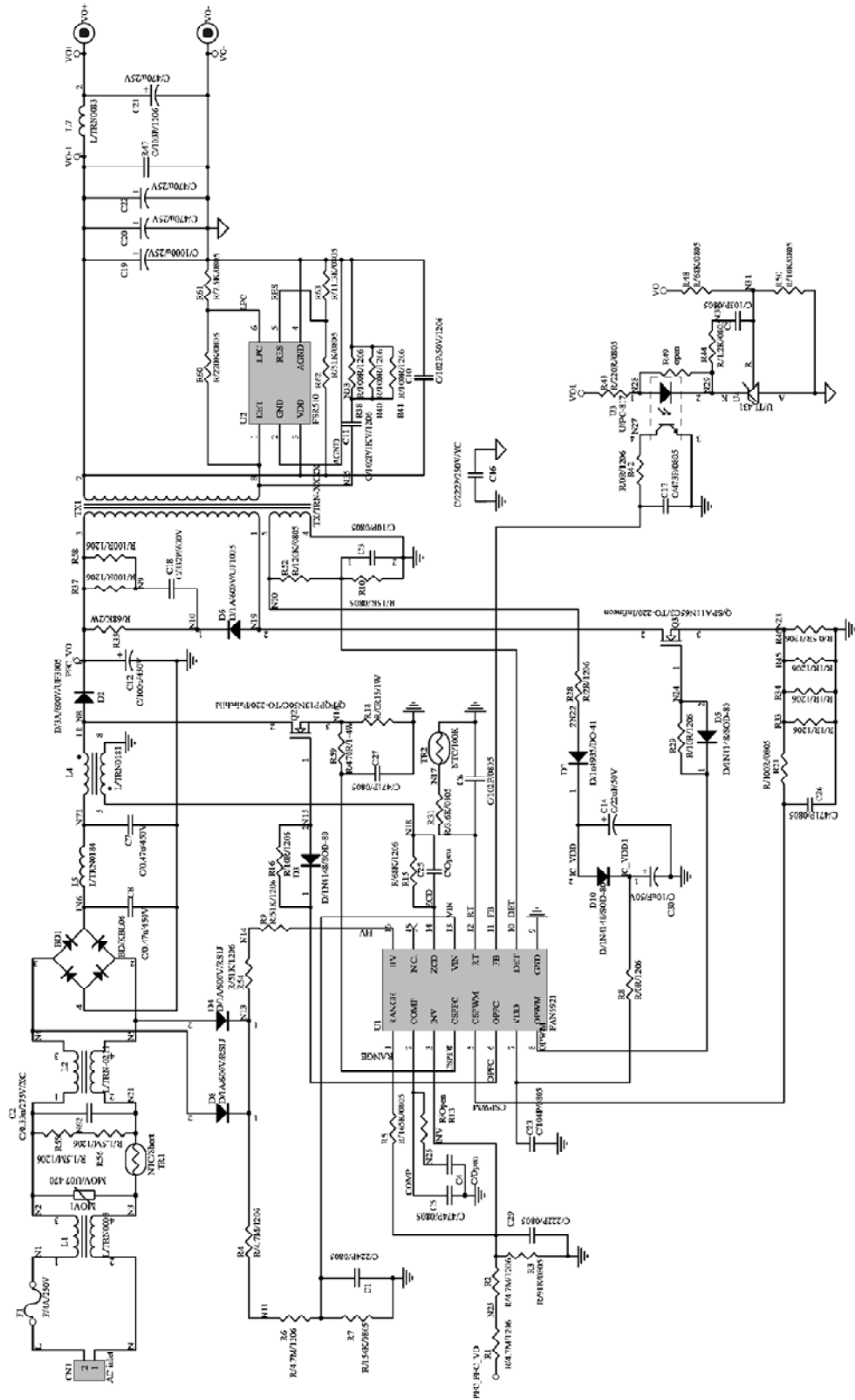


Figure 1. Schematic

2. Boost Inductor

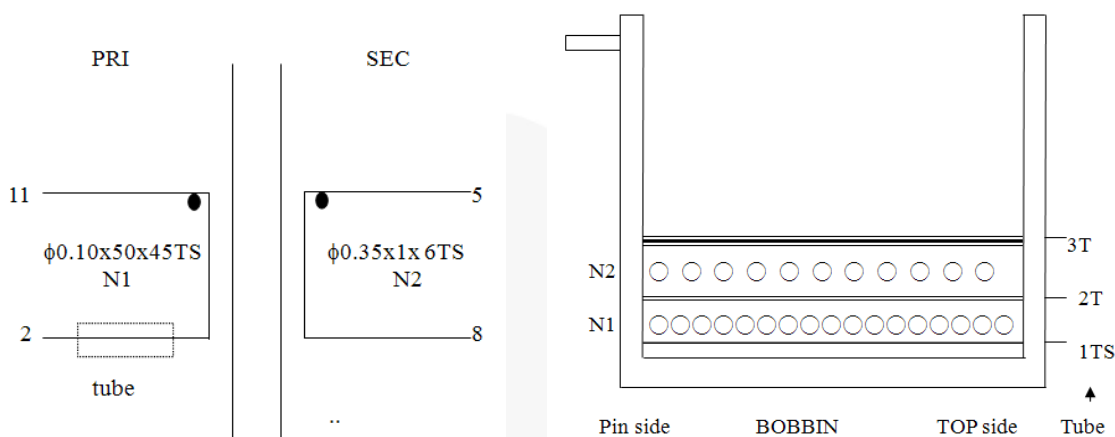


Figure 2. Inductor Schematic Diagram

2.1. Winding Specification

No	Pin (S - F)	Wire	Turns	Winding Method
N ₁	11→2	0.10Φ×50	45Ts	Solenoid Winding
Insulation: Mylar® Tape t = 0.03mm, 2 Layer				
N ₂	5→8	0.35Φ×1	6Ts	Solenoid Winding
Insulation: Mylar® Tape t = 0.03mm, 3 Layer				

Core: RM10
Bobbin: RM10

2.2. Electrical Characteristics

	Pin	Specification	Remark
Primary-Side Inductance	2 – 11	460μH ± 5%	100kHz, 1V

Mylar® is a registered trademark of Dupont Tejin Films

3. Flyback Converter Transformer

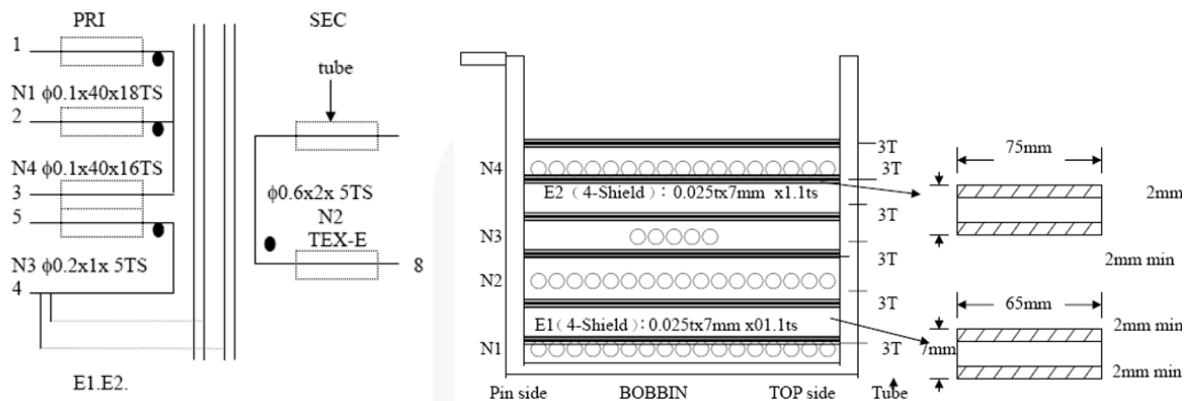


Figure 3. Transformer Schematic Diagram

3.1. Winding Specification

	Pin (S → F)	Wire	Turns	Winding Method
N1	1 → 2	0.1φ×40	18	Solenoid Winding
Insulation: Polyester Tape t = 0.025mm, 3 Layer E1 Shield : 0.025mm × 7 mm, 1.1 turns, one end should be connected to pin 4 Insulation: Polyester Tape t = 0.025mm, 3 Layer				
N2	8 → Flying	0.60φ×2	5	Solenoid Winding
Insulation: Polyester Tape t = 0.025mm, 3 Layer				
N3	5 → 4	0.20φ×1	5	Solenoid Winding
Insulation: Polyester Tape t = 0.025mm, 3 Layer E2 Shield : 0.025mm × 7mm, 1.1 turns, one end should be connected to pin 4 Insulation: Polyester Tape t = 0.025mm, 3 Layer				
N4	2 → 3	0.1φ×40	16	Solenoid Winding
Insulation: Polyester Tape t = 0.025mm, 3 Layer				

Core: PQ3220

Bobbin: PQ3220

3.2. Electrical Characteristics

	Pin	Specification	Remark
Primary-Side Inductance	1--3	700μH ± 5%	100kHz, 1V
Primary-Side leakage Inductance	1--3	15μH ± 5%	Short One of the Secondary Windings

4. Typical Performance

Table 1. Standby Power Consumption

Operating Condition	Input Watts
When $V_{IN} = 90V_{AC}$, with No Load	0.225W
When $V_{IN} = 115V_{AC}$, with No Load	0.227W
When $V_{IN} = 240V_{AC}$, with No Load	0.263W
When $V_{IN} = 264V_{AC}$, with No Load	0.280W

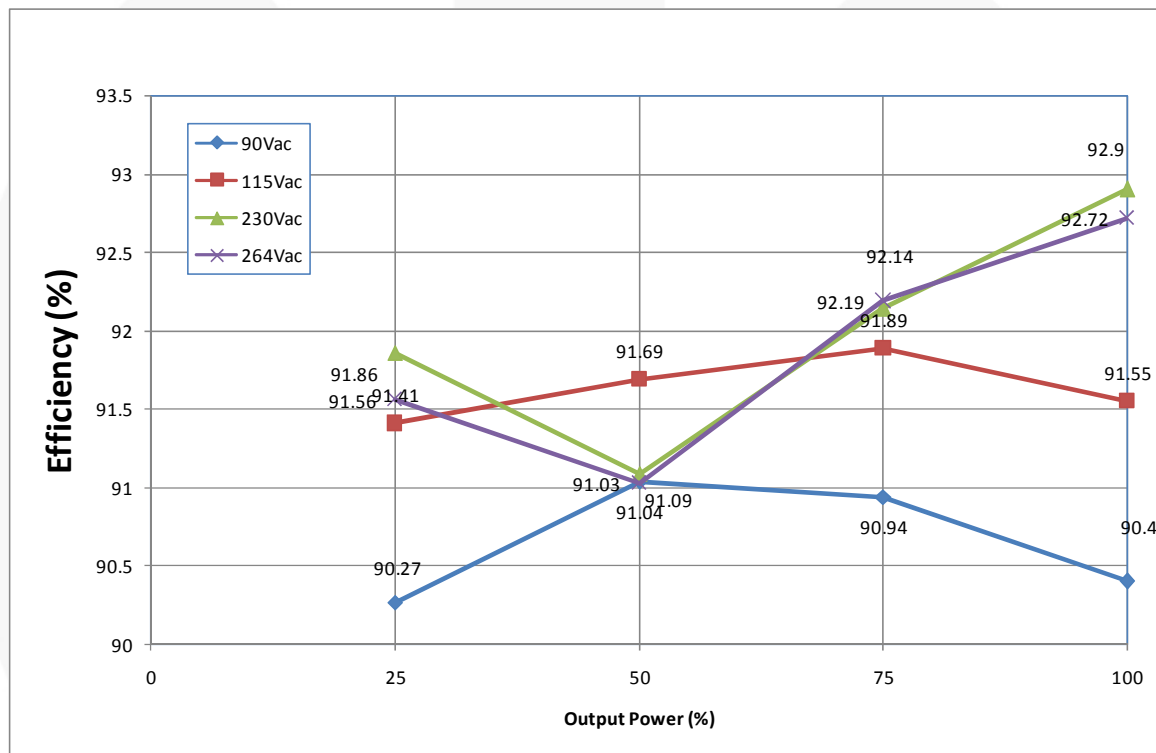


Figure 4. Efficiency

5. Related Resources

[FAN6921 — Integrated Critical Mode PFC and Quasi-Resonant Current Mode PWM Controller Datasheet](#)

[FSR510 Highly Integrated Synchronous Rectification Combination Controller for Quasi-Resonant PWM Controller Datasheet](#)

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