

Fairchild Reference Design

The following reference design supports inclusion of FL7930B, FLS1800XS and FAN7346 in design of LED illumination. It should be used in conjunction with the FL7930B, FLS1800XS and FAN7346 datasheet as well as Fairchild's application notes and technical support team. Please visit Fairchild's website at www.fairchildsemi.com.

Application	Fairchild Device	Input Voltage Range	Rated Output Power	Output Voltage (Rated Current)
LED Illumination	FL7930B, FLS1800XS FAN7346	90 ~ 265V _{AC}	100W	100V (4-CH : 250mA/CH) (1-CH : 1.0A)

1. Key Features of Main Controller

1.1. FL7930B

- Additional OVP Detection Pin
- Input Voltage Absent Detection Circuit
- Internal Soft-Start without Overshoot
- Internal Total Harmonic Distortion (THD) Optimizer
- Precise Adjustable Output Over-Voltage Protection
- MOSFET Over-Current Protection

1.2. FLS1800XS

- Variable Frequency Control with 50% Duty Cycle High Efficiency through Zero Voltage Switching (ZVS)
- Up to 300 KHz Operating Frequency
- Auto-Restart Operation for All Protections with External LV_{CC}
- Protection Functions: Over-Voltage Protection (OVP), Over-Current Protection (OCP), Abnormal Over-Current Protection (AOCP), Internal Thermal Shutdown (TSD)

1.3. FAN7346

- Linear Balance Control for 4-Channel LED Arrays
- Wide input Voltage Range: 10V to 100V
- Precision Current Accuracy Trimmed to 1.5%
- Support Wide Dimming Ratio: 0.5% ~ 100%
- Protection Functions: Channel Individual Open LED Protection (OLP), Channel Individual Short LED Protection (SLPR), Channel Individual Over Current Protection (OCP), Thermal Shutdown Function (Auto-Recovery)

2. Schematic of the Evaluation Board

2.1 PFC Part

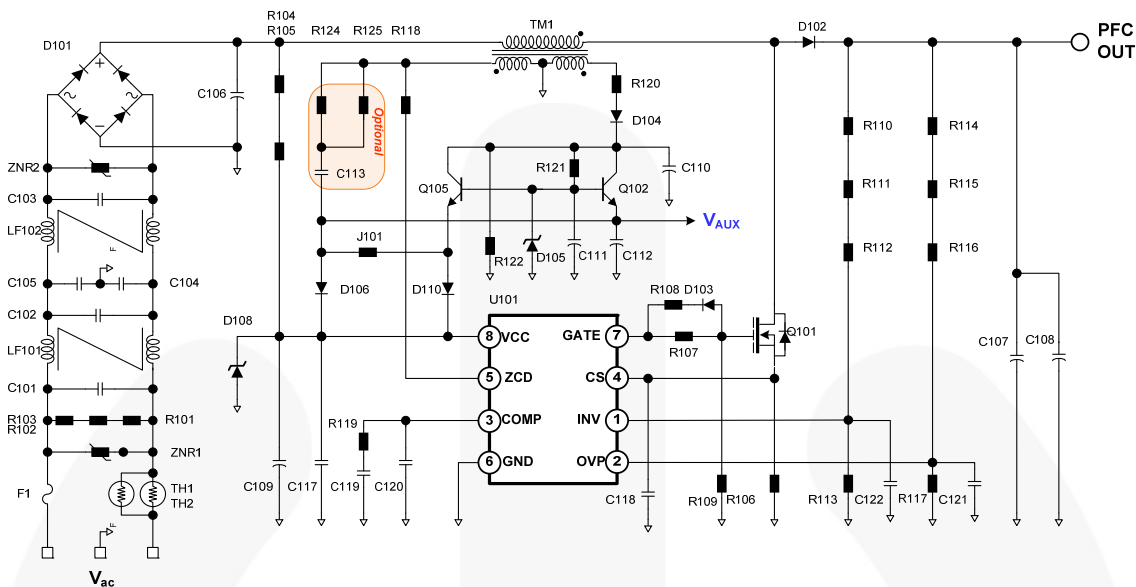


Figure 1. Schematic for PFC part

2.2 DC-DC Converter and Current Balance Controller Part

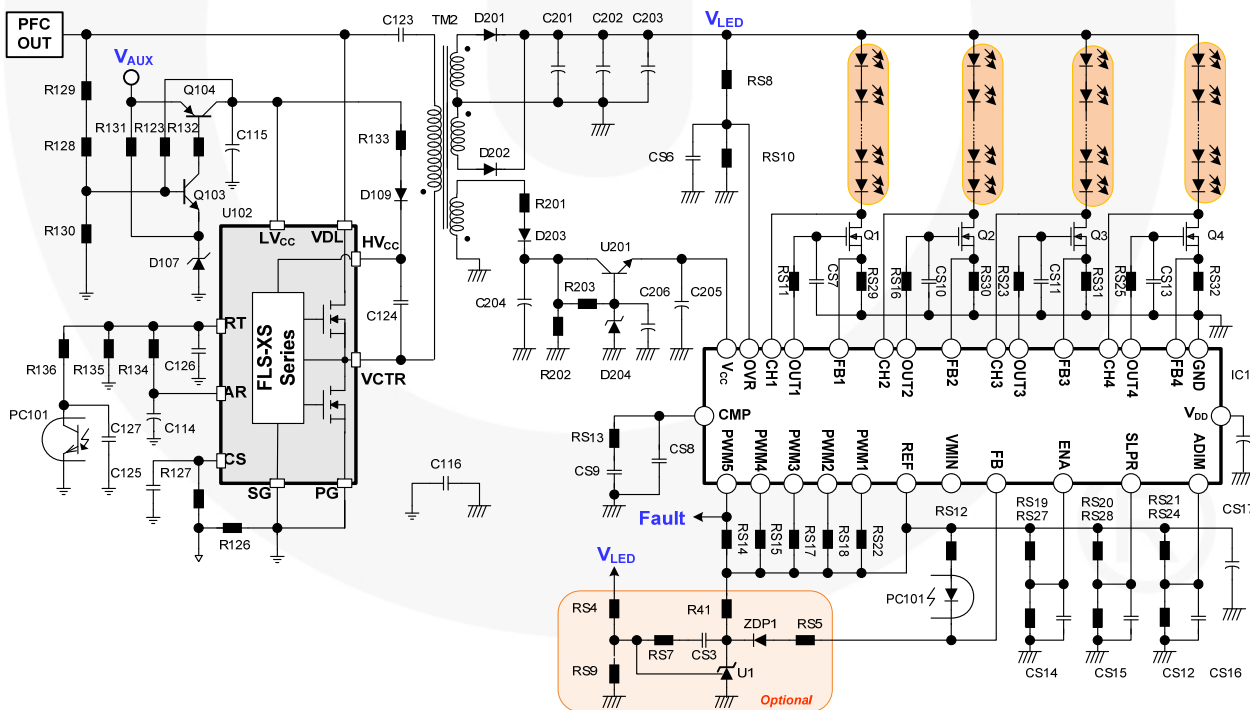


Figure 2. Schematic for DC-DC Converter and Current Balance Part for Multi Output

2.3 DC-DC Converter and CC/CV Part

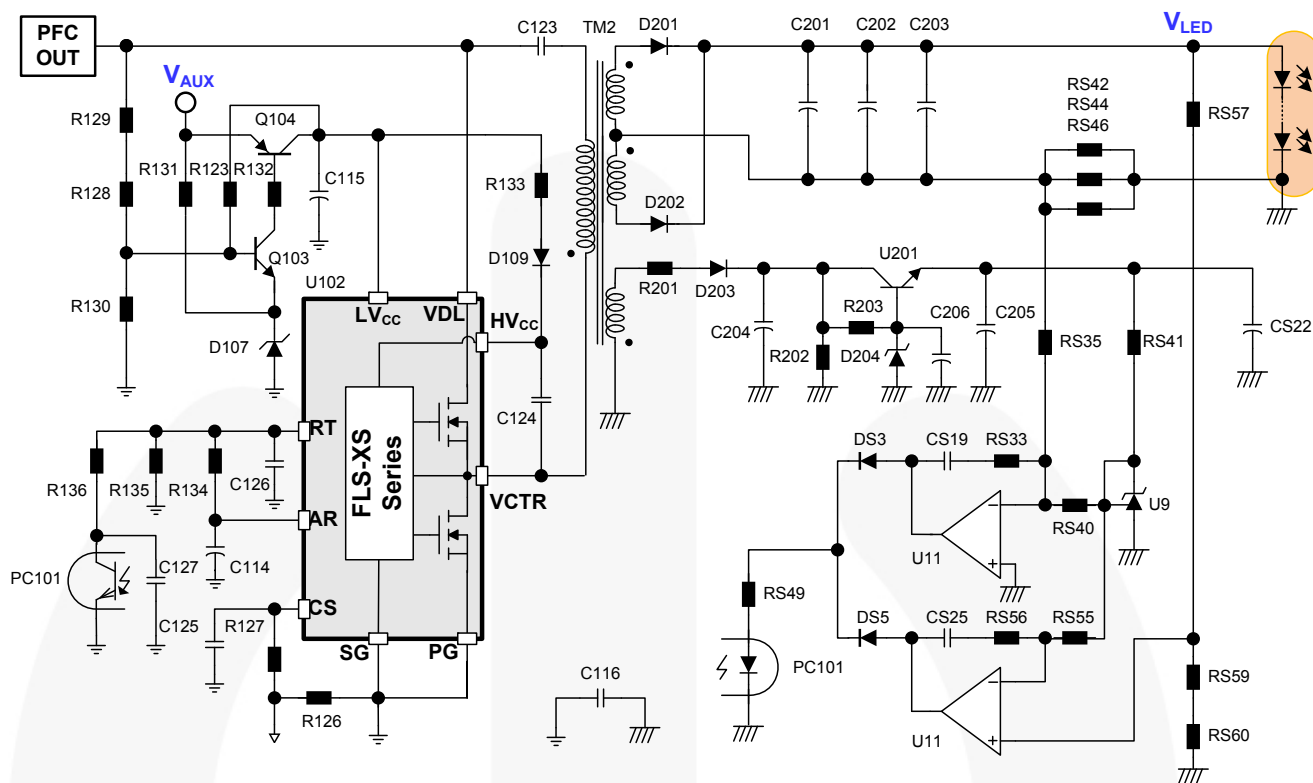


Figure 3. Schematic for DC-DC Converter and CC/CV part for Single Output

3. Magnetic Component Specifications

3.1 TM1 Specification for PFC

- ✓ Core : EER3019N (SAMHWA PL-7)
- ✓ Bobbin : 10pin

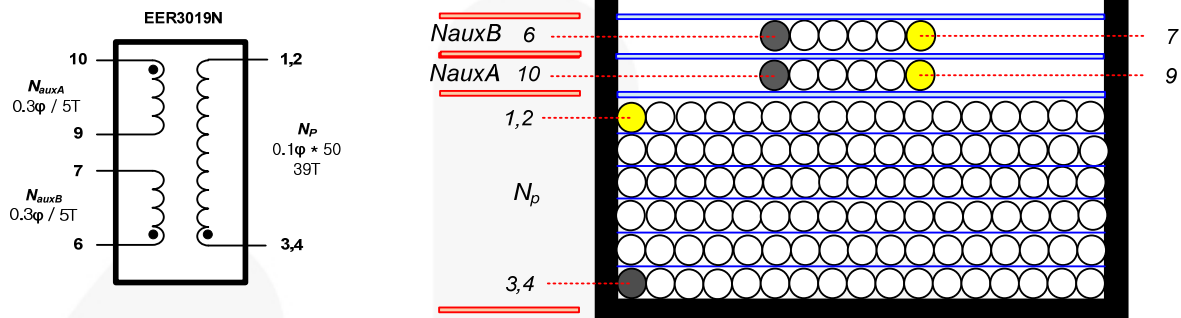


Figure 4. Transformer specifications & construction.

Table 1. Winding specifications.

No	Winding	Pin(S → F)	Wire	Turns	Winding Method
1	Np	3,4 → 1,2	0.1φ×50	39 Ts	Solenoid winding
2	Insulation : Polyester Tape t = 0.025mm, 3Layers				
3	NauxA	10 → 9	0.3φ	5 Ts	Solenoid winding
4	Insulation : Polyester Tape t = 0.025mm, 3Layers				
5	NauxB	6 → 7	0.3φ	5Ts	Solenoid winding
6	Insulation : Polyester Tape t = 0.025mm, 3Layers				

Table 2. Electrical Characteristics.

	Pin	Spec.	Remark
Inductance	3,4 → 1,2	280uH ±5%	100KHz, 1V

3.2 TM2 Specification for LLC Resonant Converter

- ✓ Core : EER3543
- ✓ Bobbin : 16pin

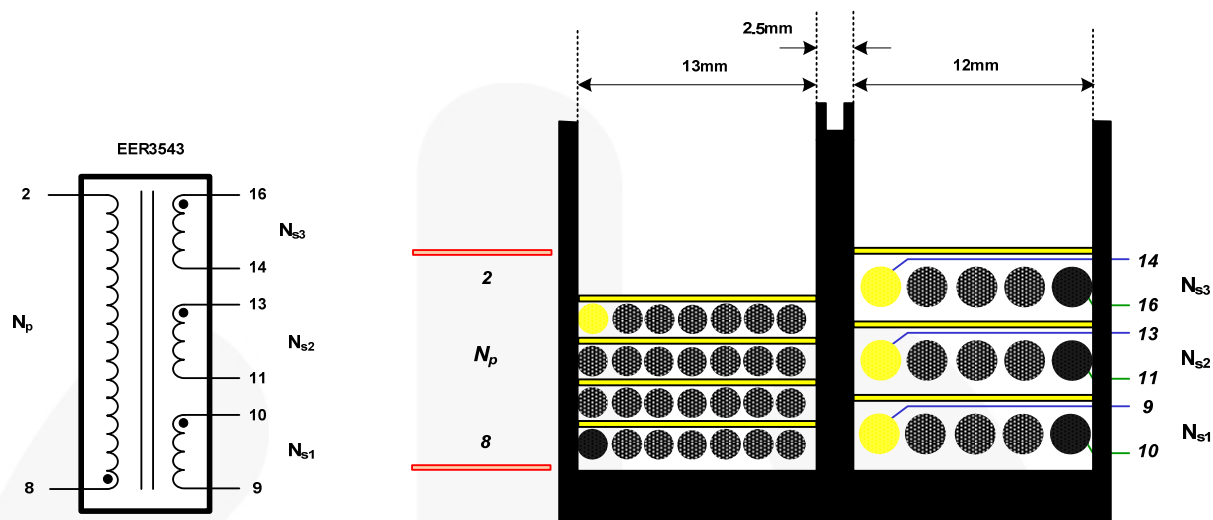


Figure 5. Transformer specifications & construction.

Table 3. Winding specifications.

No	Winding	Pin(S → F)	Wire	Turns	Winding Method
1	Np	8 → 2	0.1φ×20	38Ts	Solenoid winding
2	Insulation : Polyester Tape t = 0.025mm, 3Layers				
3	Ns1	10 → 9	0.3φ	2 Ts	Solenoid winding
4	Insulation : Polyester Tape t = 0.025mm, 3Layers				
5	Ns2	13 → 11	0.1φ×20	17 Ts	Solenoid winding
6	Insulation : Polyester Tape t = 0.025mm, 3Layers				
7	Ns3	16 → 14	0.1φ×10	17Ts	Center Solenoid winding
8	Insulation : Polyester Tape t = 0.025mm, 3Layers				

Table 4. Electrical Characteristics.

	Pin	Spec.	Remark
Primary-Side Inductance (Lp)	2 – 8	850uH ±5%	100KHz, 1V
Primary-Side Effective Leakage (LR)	2 – 8	170uH Max	Short one of the secondary windings

4. Electrical Performances

4.1 Overall System Efficiency

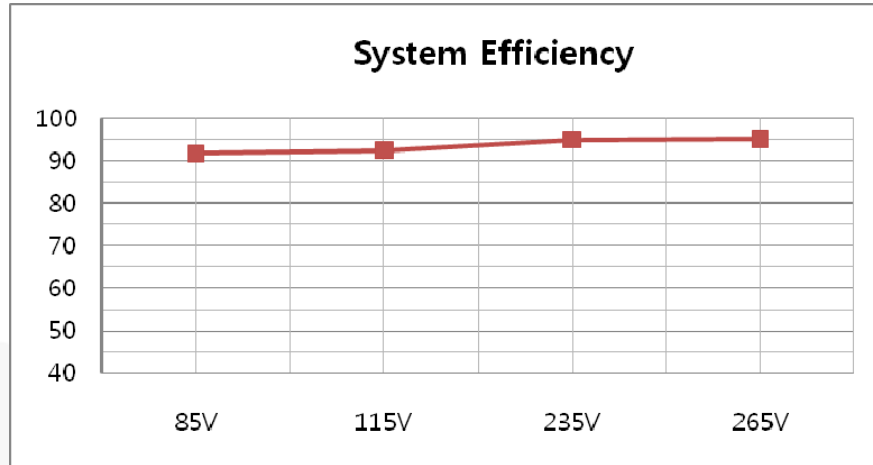


Figure 6. System Efficiency

4.2 Power Factor

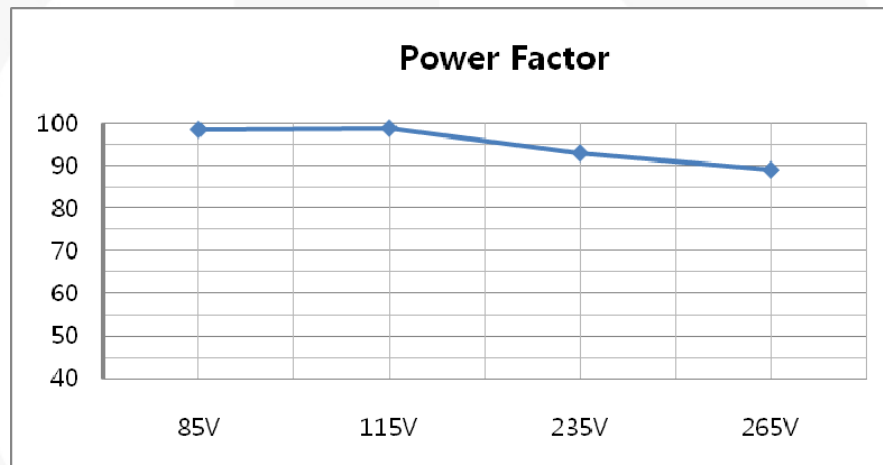


Figure 7. Power Factor (PF) Test Result

4.3 Current and Voltage Regulation Performance of Single Output

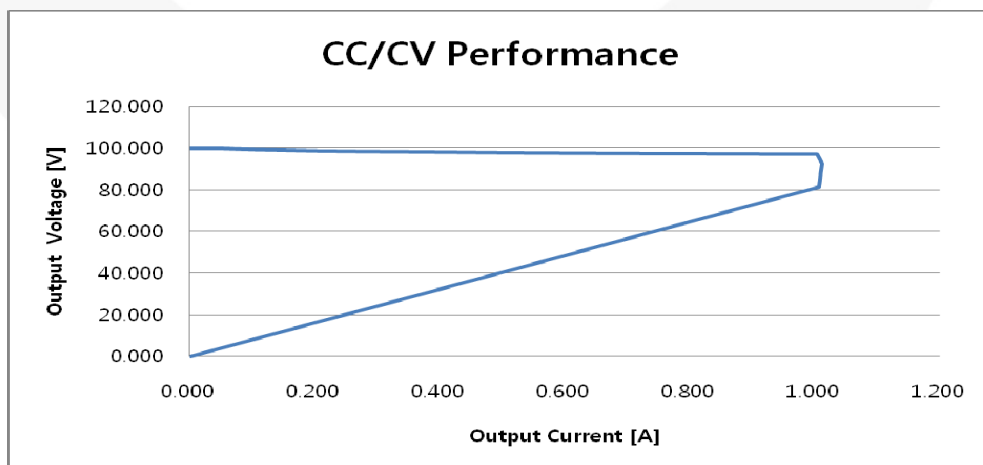


Figure 8. CC/CV Performance

4.4 Analog Dimming Performance of FAN7346

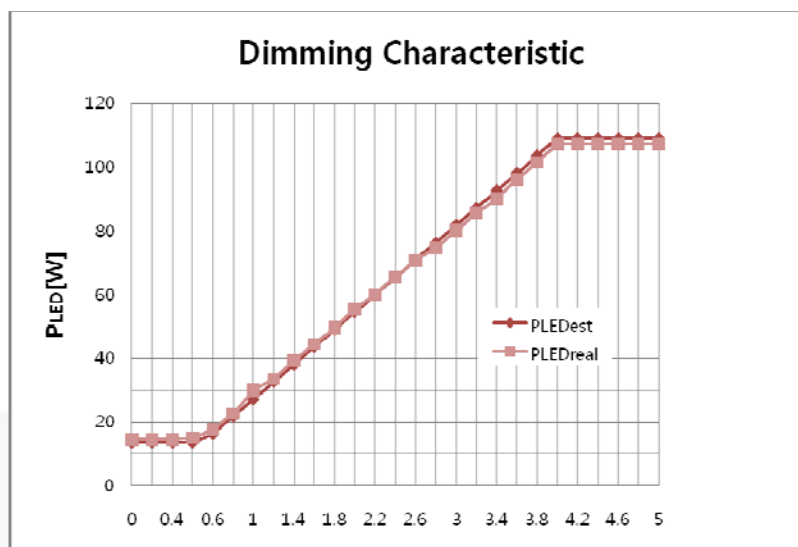


Figure 9. Dimming Characteristics Curve (PLED VS. VADIM)

4. Related Resources

[Datasheet link FL7930B](#)

[Datasheet link FLS1800XS](#)

[Datasheet link FAN7346](#)

<http://www.fairchildsemi.com/referencedesign/>

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