

## Fairchild Reference Design

The following user guide supports the demonstration kit for the FLS3247N. It should be used in conjunction with the FLS3247N datasheet as well as Fairchild's application notes and technical support team. Please visit Fairchild's website at [www.fairchildsemi.com](http://www.fairchildsemi.com)

Application	Fairchild Device	Input Voltage Range	Output Power	Output Voltage (Rated Current)
LED Bulb	FLS3247N	90-265V <sub>AC</sub>	10W	25V(0.40A)

### Key Features

- Cost effective solution without input bulk capacitor and feedback circuitry
- Power Factor Correction
- Accurate constant-current (CC) Control
- Linear frequency control for better efficiency and easy design
- Constant current regulation vs. output voltage change (11~28V) :  $< \pm 2.85\%$
- Constant current regulation vs. line voltage change (90~265V<sub>AC</sub>) :  $< \pm 2.85\%$
- Output open & short circuit protection with auto restart
- System efficiency up to 86.8%
- PF and THD: PF ( $> 0.9$ ), THD( $< 20\%$ )

# 1. Schematics

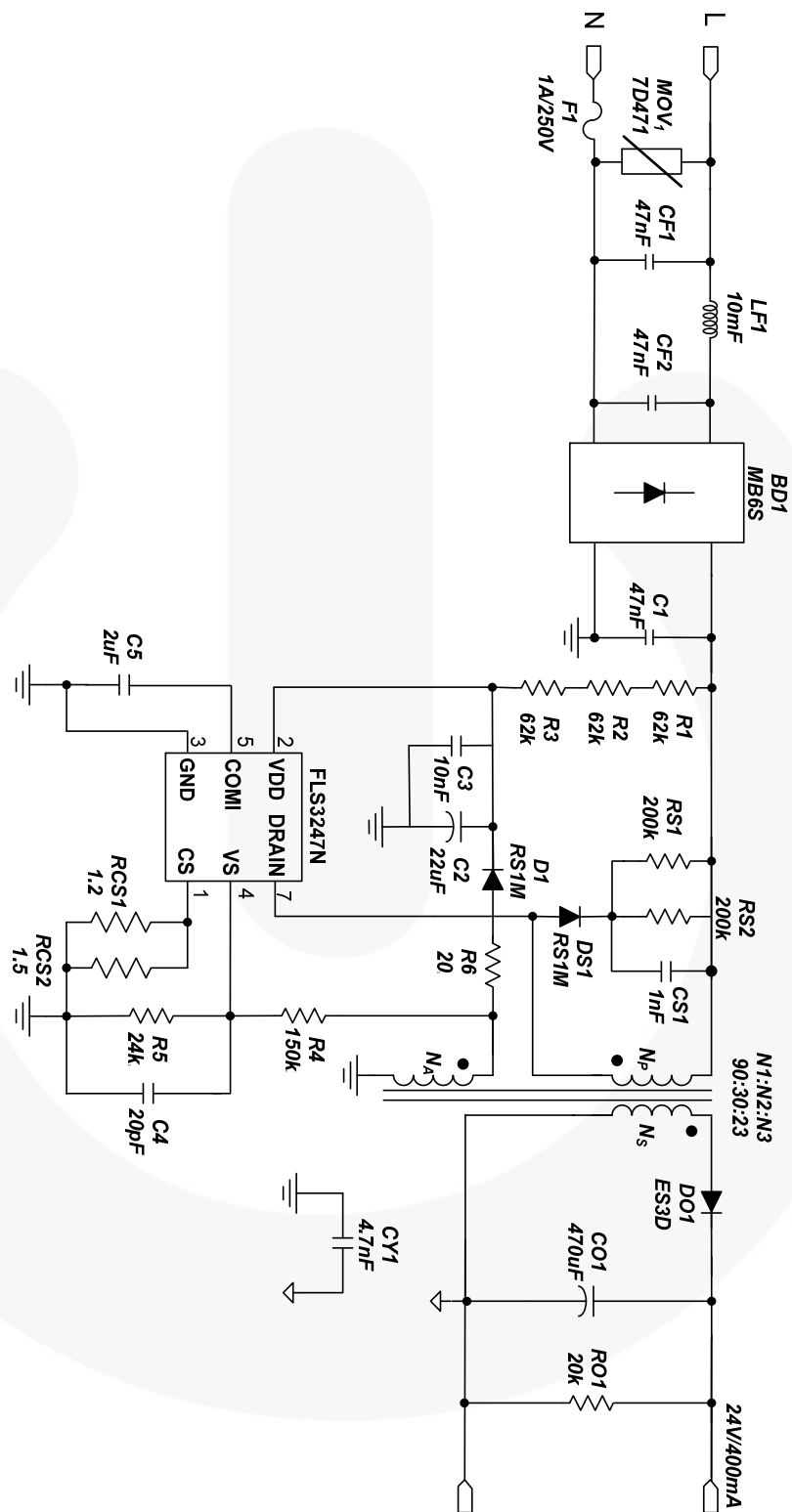


Figure 1. Schematic

## 2. Bill of Material

Item No.	Part Reference	Value	Qty	Description	Manufacturer
1	BD1	MB6S	1	Bridge Diode	Fairchild
2	CF1, CF2	PX473K3IC2	2	473/275V <sub>AC</sub> , X-Capacitor	Carli
3	CS1	C1206C102KDRACTU	1	102/1kV, SMD Capacitor 3216	Samwha
4	CY1	SCFZ2E472M10BW	1	472/250V, Y-Capacitor	Samwha
5	Co1	KMG 330uF/35V	1	330μ/35V, Electrolytic Capacitor	Samyoung
6	C1	MPE 630V473K	1	473/630V, Film Capacitor	Sungho
7	C2	KMG 22uF/35V	1	22μ/35V, Electrolytic Capacitor	Samyoung
8	C3	C0805C104K3RACTU	1	104/25V, SMD Capacitor 2012	Kemet
9	C4	C0805C200M3GACTU	1	200/25V, SMD Capacitor 2012	Kemet
10	C5	C1206C205K3PACTU	1	205/25V, SMD Capacitor 2012	Kemet
11	DS1, D1	RS1M	2	1A/1000V, Diode	Fairchild
12	Do1	ES3D	1	3A/200V, Fast Rectifier	Fairchild
13	F1	SS-5-1A	1	1A/250V, Fuse	Bussmann
14	LF1	R06103KT00	1	10mH, 8Ø Filter inductor	Bosung
15	MOV1	SVC 471D07	1	Varistor	Samwha
16	RS1,RS2	RC1206JR-07200KL	2	200kΩ, SMD Resistor 3216	Yageo
17	Rcs1	RC1206JR-071R5L	1	1.5Ω, SMD Resistor 3216	Yageo
18	Rcs2	RC1206JR-071R2L	1	1.2Ω, SMD Resistor 3216	Yageo
19	Ro1	RC1206JR-0720KL	1	20kΩ, SMD Resistor 3216	Yageo
20	R1,R2,R3	RC1206JR-0762KL	3	62kΩ, SMD Resistor 3216	Yageo
21	R4	RC1206JR-07150KL	1	150kΩ, SMD Resistor 3216	Yageo
22	R5	RC1206JR-0724KL	1	24kΩ, SMD Resistor 3216	Yageo
23	R6	RC1206JR-0720RL	1	20Ω, SMD Resistor 3216	Yageo
24	T1	RM6	1	Transformer	TDK
25	U1	FLS3247N	1	Main Controller	Fairchild

### 3. Transformer

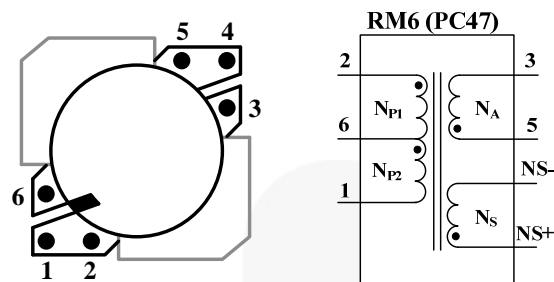


Figure 2. Transformer Bobbin Structure and Pin Configuration

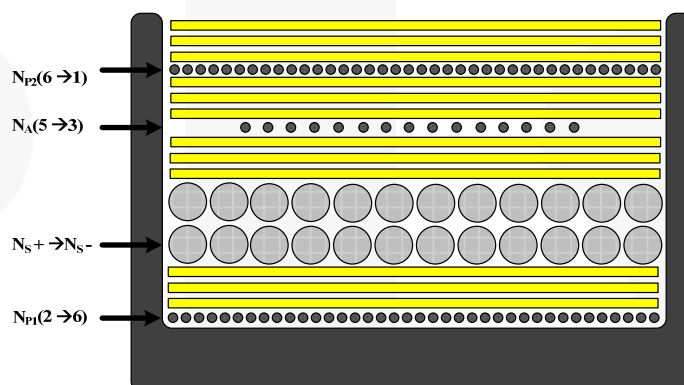


Figure 3. Transformer Winding Structure

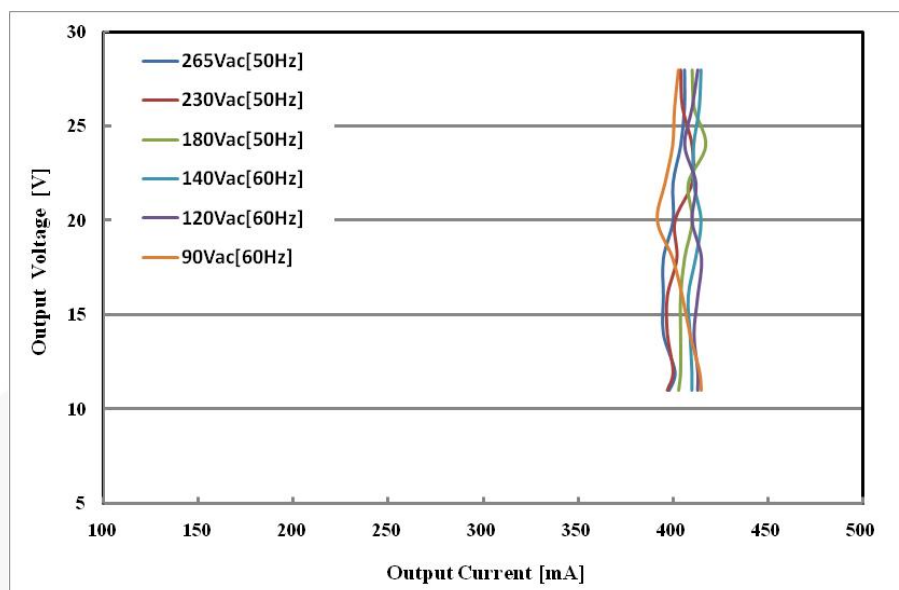
Table 1. Winding specifications.

No	Winding	Pin(S → F)	Wire	Turns	Winding Method
1	$N_{P1}$	2 → 6	0.15φ	60Ts	Solenoid winding
2	Insulation : Polyester Tape t = 0.025mm, 2Layers				
3	$N_S$	NS + → NS-	0.25φ (TIW)	30 Ts	Solenoid winding
4	Insulation : Polyester Tape t = 0.025mm, 2Layers				
5	$N_A$	5 → 3	0.13φ	23 Ts	Solenoid winding
6	Insulation : Polyester Tape t = 0.025mm, 2Layers				
7	$N_{P2}$	6 → 1	0.15φ	30 Ts	Solenoid winding
8	Insulation : Polyester Tape t = 0.025mm, 6Layers				

Table 2. Electrical Characteristics.

	Pin	Spec.	Remark
Inductance	2– 1	1.1mH ± 10%	60kHz, 1V
Leakage	2– 1	14μH	60kHz, 1V Short all output pins

## 4. Performance



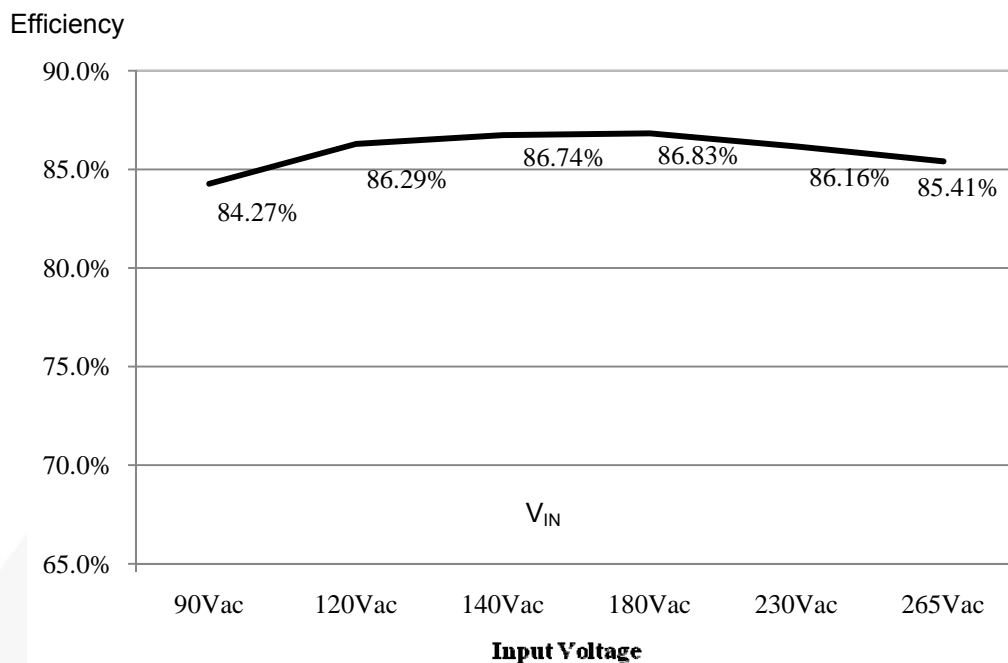
**Figure 4. Constant Current Regulation – Measured by E-load [CR mode]**

**Table 3. Constant Current Regulation by Output Voltage Change (11~28V)**

Input Voltage	Min Current	Max Current	Tolerance
90V <sub>AC</sub>	392mA	415mA	± 2.85%
120V <sub>AC</sub>	406mA	415mA	± 1.10%
140V <sub>AC</sub>	408mA	415mA	± 0.85%
180V <sub>AC</sub>	403mA	417mA	± 1.71%
220V <sub>AC</sub>	397mA	410mA	± 1.61%
265V <sub>AC</sub>	395mA	410mA	± 1.37%

**Table 4. Constant Current Regulation by Line Voltage Change (90~265Vac)**

Output Voltage	90V <sub>AC</sub> [60Hz]	120V <sub>AC</sub> [60Hz]	140V <sub>AC</sub> [60Hz]	180V <sub>AC</sub> [50Hz]	220V <sub>AC</sub> [50Hz]	265V <sub>AC</sub> [50Hz]	Tolerance
26V	401mA	410mA	414mA	411mA	405mA	406mA	±1.60%
24V	400mA	406mA	411mA	417mA	41 mA	404mA	±2.08%
22V	396mA	412mA	411mA	408mA	410mA	400mA	±1.98%
20V	392mA	410mA	415mA	410mA	401mA	400mA	±2.85%



**Figure 5. System Efficiency**

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Input Voltage	Input Power	Output Current	Output Voltage	Output Power	Efficiency
90Vac [60Hz]	11.80W	404mA	24.64V	9.94W	84.27%
120Vac [60Hz]	11.67W	408mA	24.67V	10.07W	86.29%
140Vac [60Hz]	11.84W	415mA	24.75V	10.27W	86.74%
180Vac [50Hz]	11.83W	415mA	24.74V	10.27W	86.83%
230Vac [50Hz]	11.62W	407mA	24.63V	10.01W	86.16%
265Vac [50Hz]	11.74W	407mA	24.63V	10.03W	85.41%

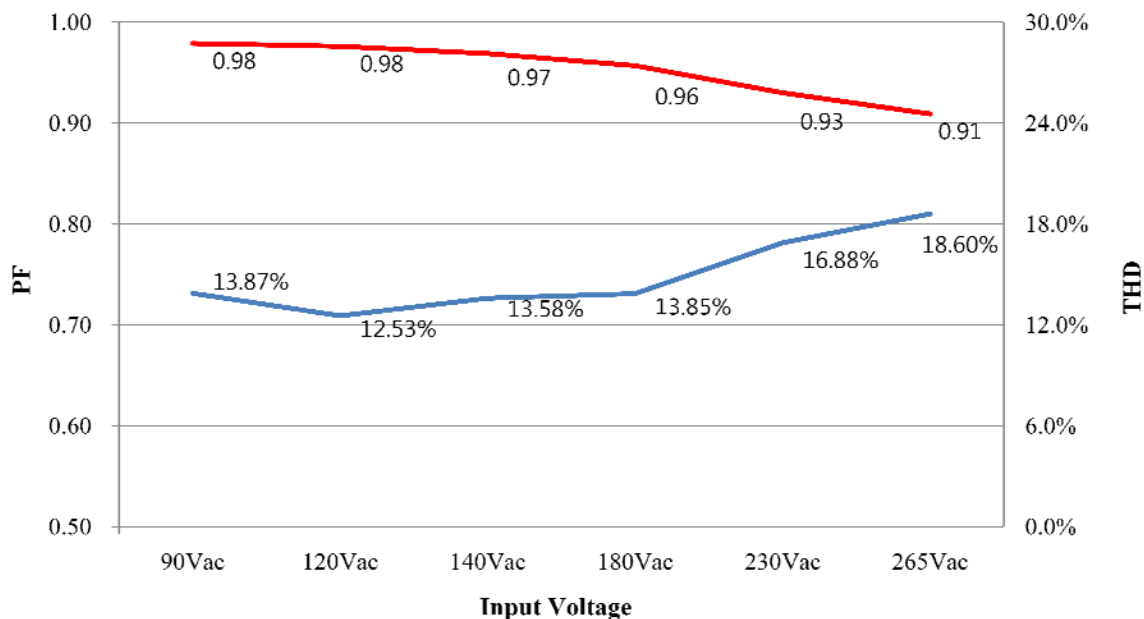


Figure 6. PF &amp; THD

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Input Voltage	Output Current	Output Voltage	Power Factor	THD
90Vac [60Hz]	404mA	24.64V	0.98	13.87%
120Vac [60Hz]	408mA	24.67V	0.98	12.53%
140Vac [60Hz]	415mA	24.75V	0.97	13.58%
180Vac [50Hz]	415mA	24.74V	0.96	13.85%
230Vac [50Hz]	407mA	24.63V	0.93	16.88%
265Vac [50Hz]	407mA	24.63V	0.91	18.60%

## 5. Related Resources

[\*Datasheet link FLS3217\*](#)

[\*http://www.fairchildsemi.com/referencedesign/\*](http://www.fairchildsemi.com/referencedesign/)

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