Fairchild Reference Design

The following user guide supports the demonstration kit for the FL7732. It should be used in conjunction with the FL7732 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	Output Power	Output Voltage (Rated Current)
LED Bulb	FL7732	90-265V_{AC}	8.4W	60V(0.14A)

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 (35~75V) : <± 2.19%
- Constant current regulation vs line voltage change (90~265Vac) : <± 3.27%
- Output open & short circuit protection with auto restart
- System efficiency up to 90.93%
- PF and THD at nominal voltages: PF(>0.9), THD(<25%)

1. Schematics

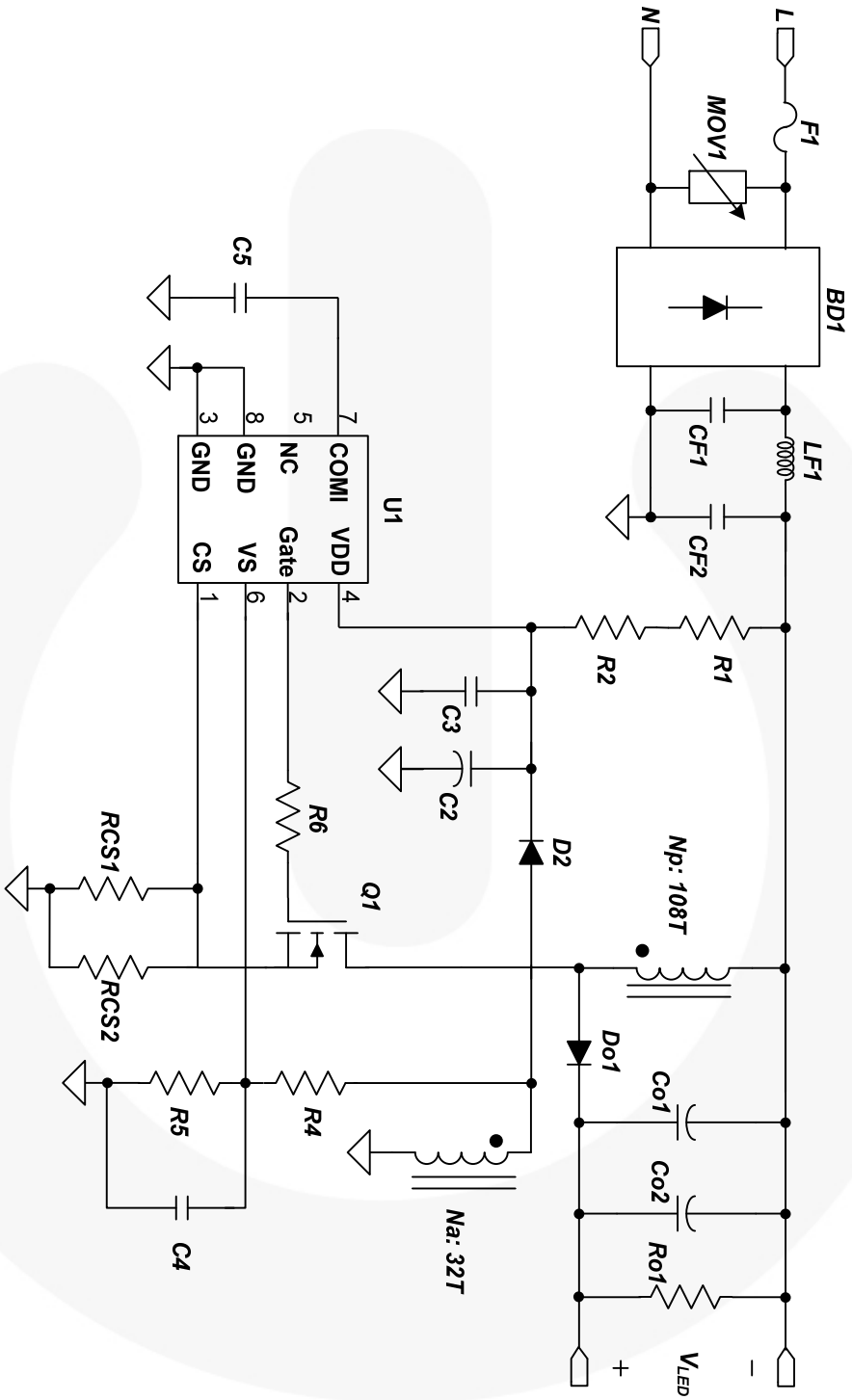

Figure 1. Schematic

2. Bill of Material

Item No.	Part Reference	Value	Qty	Description	Manufacturer
1	BD1	MB6S	1	Bridge Diode	Fairchild
2	CF1, CF2	MPE400V683K	2	683/400V, Film Capacitor	Sungho
3	Co1, Co2	KMG 47uF/100V	1	47u/100V, Electrolytic Capacitor	Samyoung
4	C2	KMG 10uF/35V	1	10uF/35V, Electrolytic Capacitor	Samyoung
5	C3	C0805C104K3RACTU	1	104/25V, SMD Capacitor 2012	Kemet
6	C4	C0805C200M3GACTU	1	200/25V, SMD Capacitor 2012	Kemet
7	C5	C1206C105K3PACTU	1	105/25V, SMD Capacitor 2012	Kemet
8	D2	1N4003	1	1A/200V, Diode	Fairchild
9	Do1	ES3J	1	3A//600V, Fast Rectifier	Fairchild
10	F1	SS-5-1A	1	1A/250V, Fuse	Bussmann
11	LF1	R06153KT00	1	10mH, 8Ø Filter inductor	Bosung
12	MOV1	SVC 471D07	1	Varistor	Samwha
13	C2	KMG 10uF/35V	1	10uF/35V, Electrolytic Capacitor	Samyoung
14	Rcs1	RC0805JR-071R2L	1	1.2Ω, SMD Resistor 2012	Yageo
15	Rcs2	RC0805JR-071R8L	1	1.8Ω, SMD Resistor 2012	Yageo
16	Ro1	RC1206JR-07220KL	1	220kΩ, SMD Resistor 3216	Yageo
17	R1,R2	RC1206JR-07100KL	2	100kΩ, SMD Resistor 3216	Yageo
18	R4	RC0805JR-07150KL	1	150kΩ, SMD Resistor 2012	Yageo
19	R5	RC1206JR-0724KL	1	24kΩ, SMD Resistor 3216	Yageo
20	R6	RC0805JR-0710RL	1	10Ω, SMD Resistor 2012	Yageo
21	T1	RM6	1	Transformer	TDK
22	Q1	FQU5N60C	1	2.8A/600V, MOSFET	Fairchild
23	U1	FL7732	1	Main Controller	Fairchild

3. Transformer

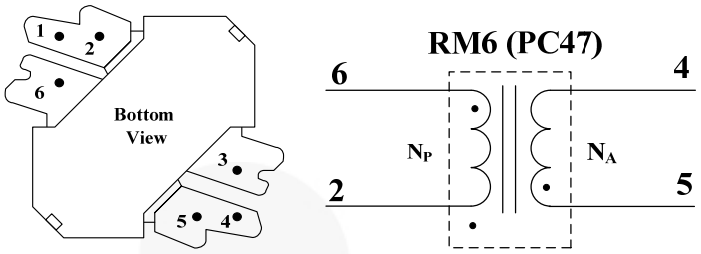

Figure 2. Transformer Bobbin Structure

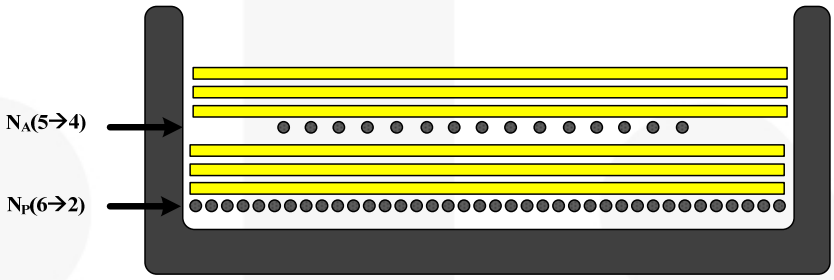

Figure 3. Configuration and Transformer Winding Structure

Table 1. Winding specifications.

No	Winding	Pin(S → F)	Wire	Turns	Winding Method
1	Np	6 → 2	0.25Ø	108Ts	Solenoid Winding
2	Insulation : Polyester Tape t = 0.025mm, 3Layers				
3	Na	5 → 4	0.13Ø	32Ts	Solenoid Winding
4	Insulation : Polyester Tape t = 0.025mm, 3Layers				

Table 2. Electrical Characteristics.

	Pin	Spec.	Remark
Inductance	6– 2	1.4mH ± 10%	60kHz, 1V
Leakage		15 uH	60kHz, 1V Short all output pins

4. Performance

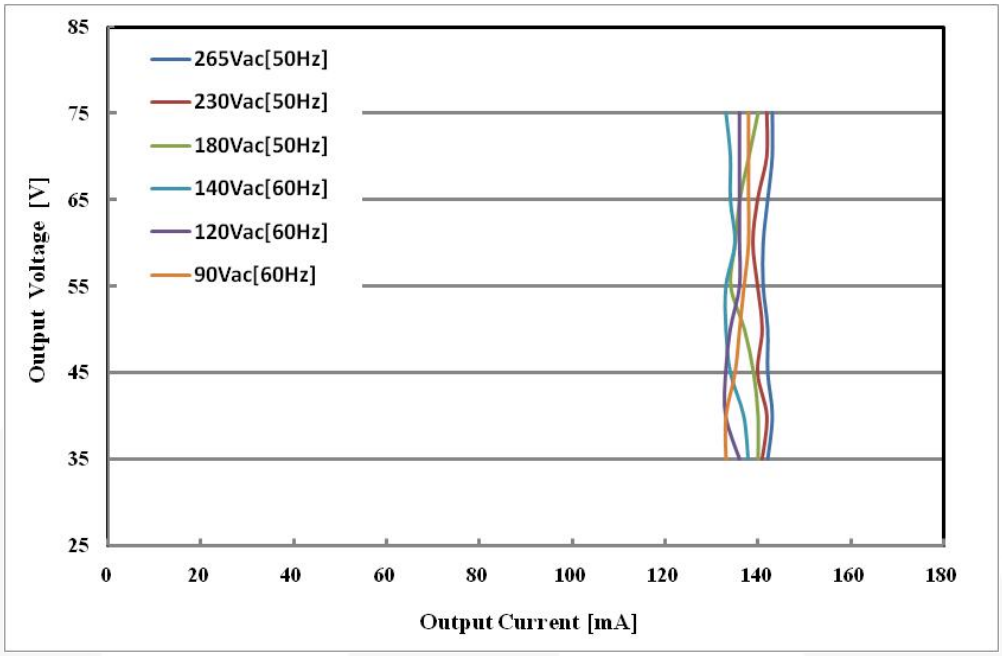

Figure 4. Constant Current Regulation – Measured by LED Load

Table 3. Constant Current Regulation by Output Voltage Change (35~75V)

Input Voltage	Min Current	Max Current	Tolerance
$90V_{AC}$[60Hz]	133mA	138mA	± 1.85%
$120V_{AC}$[60Hz]	133mA	136mA	± 1.12%
$140V_{AC}$[60Hz]	133mA	138mA	± 1.85%
$180V_{AC}$[50Hz]	134mA	140mA	± 2.19%
$230V_{AC}$[50Hz]	139mA	142mA	± 1.07%
$265V_{AC}$[50Hz]	141mA	143mA	± 0.70%

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

Output Voltage	90Vac [60Hz]	120Vac [60Hz]	140Vac [60Hz]	180Vac [50Hz]	220Vac [50Hz]	265Vac [50Hz]	Tolerance
65V	138 mA	136 mA	134 mA	138 mA	142 mA	143 mA	± 2.90%
60V	138 mA	136 mA	135 mA	136 mA	140 mA	142 mA	± 2.17%
55V	138 mA	136 mA	133 mA	135 mA	139 mA	141 mA	± 2.92%
50V	137 mA	136 mA	133 mA	134 mA	140 mA	141 mA	± 3.27%

Efficiency

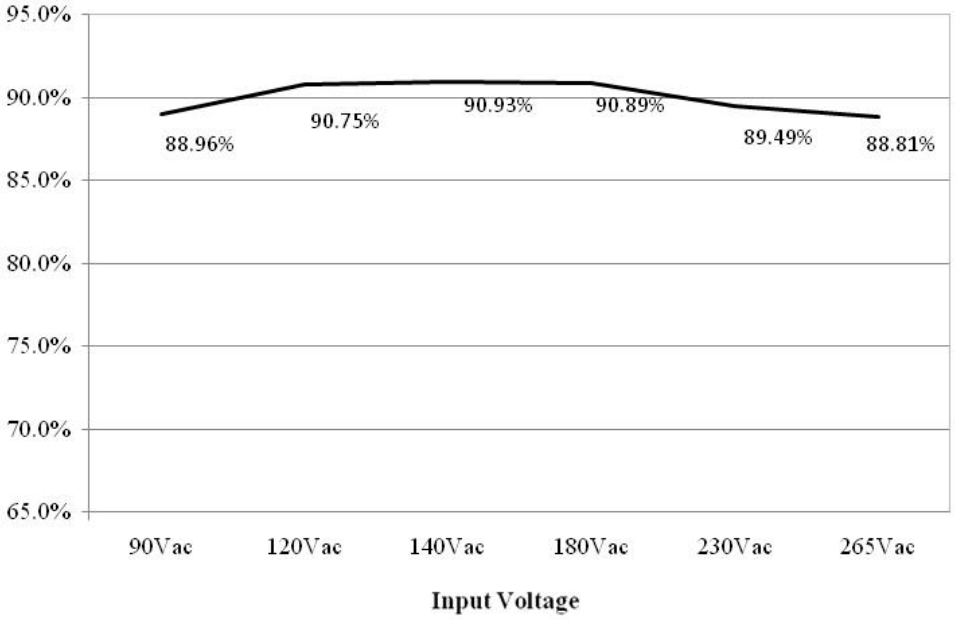

Figure 5. System Efficiency

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Input Voltage	Input Power	Output Current	Output Voltage	Output Power	Efficiency
90Vac [60Hz]	8.93 W	135 mA	58.84 V	7.94 W	88.96 %
120Vac [60Hz]	8.58 W	132 mA	58.78 V	7.79 W	90.75 %
140Vac [60Hz]	8.46 W	131 mA	58.72 V	7.69 W	90.93 %
180Vac [50Hz]	8.76 W	135 mA	58.81 V	7.96 W	90.89 %
230Vac [50Hz]	9.08 W	138 mA	58.91 V	8.13 W	89.49 %
265Vac [50Hz]	9.24 W	139 mA	58.95 V	8.21 W	88.81 %

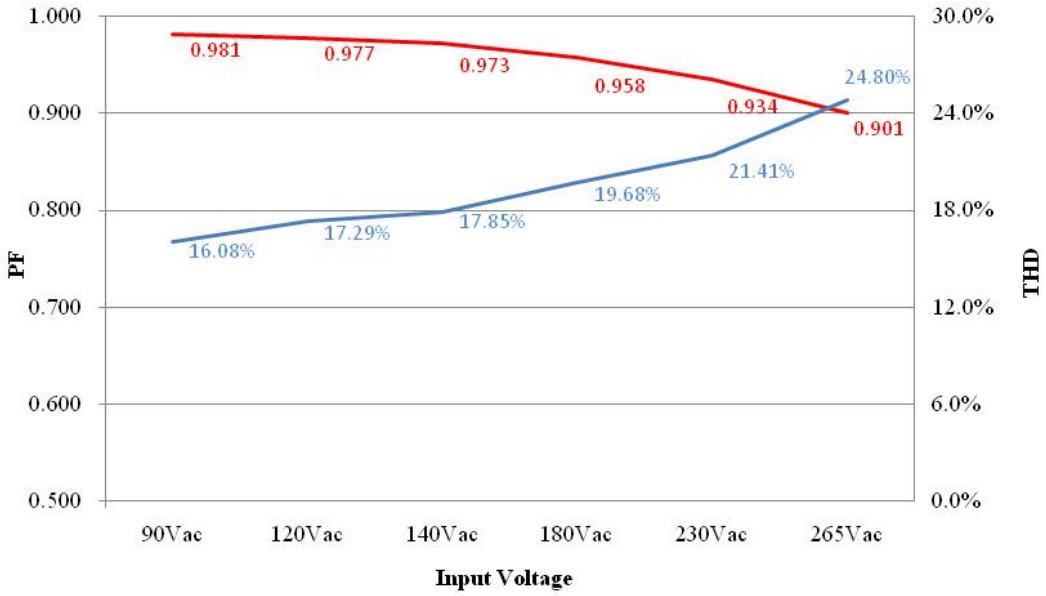

Figure 6. PF & THD

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Input Voltage	Output Current	Output Voltage	Power Factor	THD
90Vac [60Hz]	135 mA	58.84 V	0.981	16.08%
120Vac [60Hz]	132 mA	58.78 V	0.977	17.29%
140Vac [60Hz]	131 mA	58.72 V	0.973	17.85%
180Vac [50Hz]	135 mA	58.81 V	0.958	19.68%
230Vac [50Hz]	138 mA	58.91 V	0.934	21.41%
265Vac [50Hz]	139 mA	58.95 V	0.901	24.80%

5. Related Resources

Datasheet link FL7732

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

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