Fairchild Reference Design

The following user guide supports the demonstration kit for the FLS3217M. It should be used in conjunction with the FLS3217M 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	FLS3217M	90-265V_{AC}	3.5W	35V(0.1A)

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 (19.5~36.3V) : <± 2.22%
- Constant current regulation vs line voltage change (90~265Vac) : <± 2.17%
- Output open & short circuit protection with auto restart
- System efficiency up to 87.4%
- PF and THD: PF(> 0.9), THD(< 30%)

1. Schematics

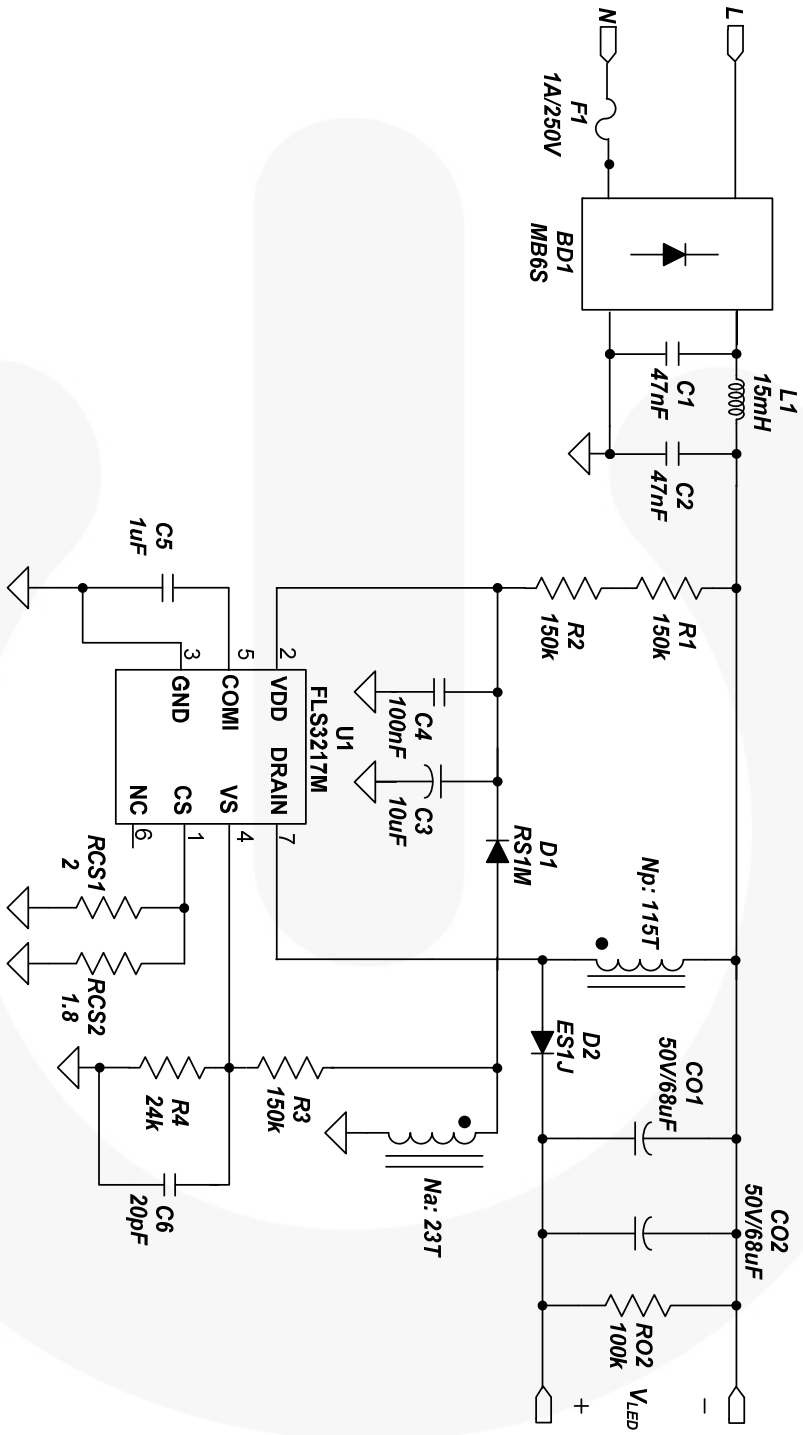

Figure 1. Schematic

2. Bill of Material

Item No.	Part Reference	Part number	Qty	Description	Manufacturer
1	BD1	MB6S	1	Bridge Diode	Fairchild
2	CO1,CO2	KMG 68uF/50V	2	68u/50V, Electrolytic Capacitor	Samyoung
3	C1, C2	B32560J473K	2	473/400V, Film Capacitor	EPCOS
4	C3	KMG 10uF/35V	1	10u/35V, Electrolytic Capacitor	Samyoung
5	C4	C0805C104K3RACTU	1	104/25V, SMD Capacitor 2012	Kemet
6	C5	C1206C105K3PACTU	1	105/25V, SMD Capacitor 2012	Kemet
7	C6	C0805C200M3GACTU	1	20/25V, SMD Capacitor 2012	Kemet
8	D1	RS1M	1	1A/1000V, Diode	Fairchild
9	D2	ES1J	1	1A/600V, Fast Rectifier	Fairchild
10	F1	SS-5-1A	1	1A/250V, Fuse	Bussmann
11	L1	R06153KT00	1	15mH, 8Ø Filter inductor	Bosung
12	R1,R2	RC1206JR-07150KL	2	150kΩ, SMD Resistor 3216	Yageo
13	RCS1	RC0805JR-072RL	2	2.0Ω, SMD Resistor 2012	Yageo
14	RCS2	RC0805JR-071R8L	2	1.8Ω, SMD Resistor 2012	Yageo
15	RO1	RC1206JR-07150KL	1	150kΩ, SMD Resistor 3216	Yageo
16	R3	RC0805JR-07150KL	1	150kΩ, SMD Resistor 2012	Yageo
17	R4	RC0805JR-0724KL	1	24kΩ, SMD Resistor 2012	Yageo
18	T1	RM6	1	Transformer	TDK
19	U1	FLS3217M	1	Main Driver	Fairchild

3. Transformer

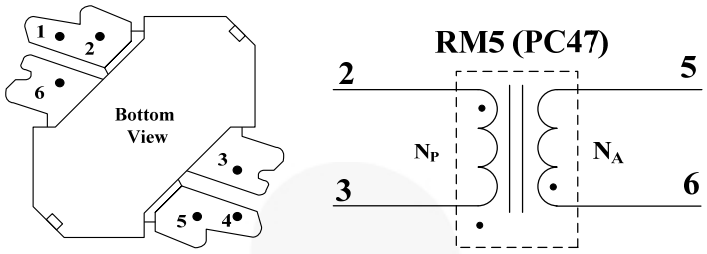

Figure 2. Transformer Bobbin Structure and Pin Configuration

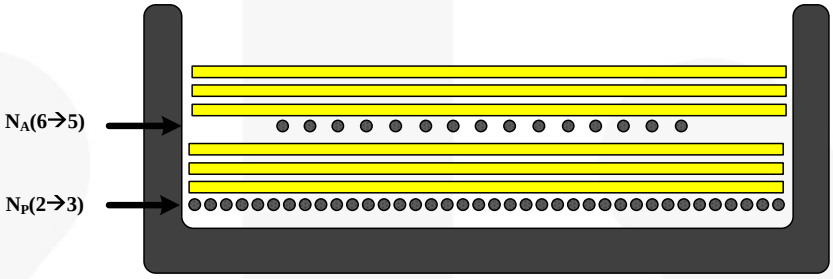

Figure 3. Transformer Winding Structure

Table 1. Winding specifications.

No	Winding	Pin(S → F)	Wire	Turns	Winding Method
1	Np	2→ 3	0.15Ø	160Ts	Solenoid Winding
2	Insulation : Polyester Tape t = 0.025mm, 3Layers				
3	Na	6→ 5	0.10Ø	74Ts	Solenoid Winding
4	Insulation : Polyester Tape t = 0.025mm, 3Layers				

Table 2. Electrical Characteristics.

	Pin	Spec.	Remark
Inductance	2 - 3	2.0mH ± 10%	60kHz, 1V
Leakage	2 - 3	30 uH	60kHz, 1V Short all output pins

4. Performance

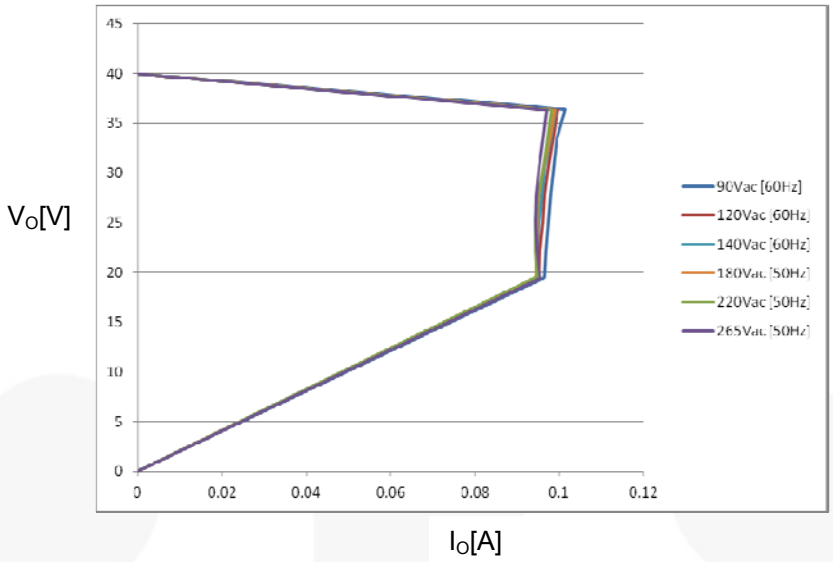

Figure 4. Constant Current Regulation – Measured by 7-LED to 13-LED

Table 3. Constant Current Regulation by Output Voltage Change

Input Voltage	Min Current[A]	Max Current[A]	Tolerance
$90V_{AC}$[60Hz]	0.097	0.102	±2.41%
$120V_{AC}$[60Hz]	0.095	0.100	±2.16%
$140V_{AC}$[60Hz]	0.095	0.099	±2.22%
$180V_{AC}$[50Hz]	0.095	0.099	±2.18%
$220V_{AC}$[50Hz]	0.094	0.098	±1.89%
$265V_{AC}$[50Hz]	0.0.94	0.097	±1.44%

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

Output Voltage	$90V_{AC}$ [60Hz]	$120V_{AC}$ [60Hz]	$140V_{AC}$ [60Hz]	$180V_{AC}$ [50Hz]	$220V_{AC}$ [50Hz]	$265V_{AC}$ [50Hz]	Tolerance
36.3V	0.102A	0.100A	0.099A	0.099A	0.098A	0.097A	±2.17%
33.5V	0.100A	0.099A	0.098A	0.098A	0.097A	0.096A	±1.66%
30.7V	0.099A	0.098A	0.097A	0.096A	0.096A	0.095A	±1.77%

Efficiency

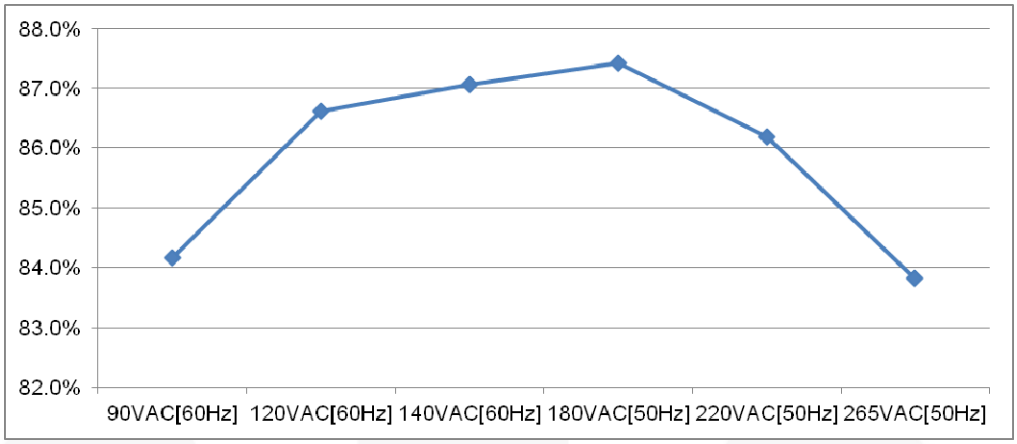

Figure 5. System Efficiency (13-LED)

Table 5. System Efficiency

Input Voltage	Input Power[W]	Output Current[A]	Output Voltage[V]	Output Power[W]	Efficiency
$90V_{AC}$[60Hz]	4.340	0.101	36.24	3.653	84.16%
$120V_{AC}$[60Hz]	4.180	0.100	36.2	3.621	86.62%
$140V_{AC}$[60Hz]	4.140	0.100	36.18	3.604	87.06%
$180V_{AC}$[50Hz]	4.140	0.100	36.17	3.619	87.42%
$220V_{AC}$[50Hz]	4.160	0.099	36.15	3.585	86.19%
$265V_{AC}$[50Hz]	4.210	0.098	36.12	3.529	83.81%

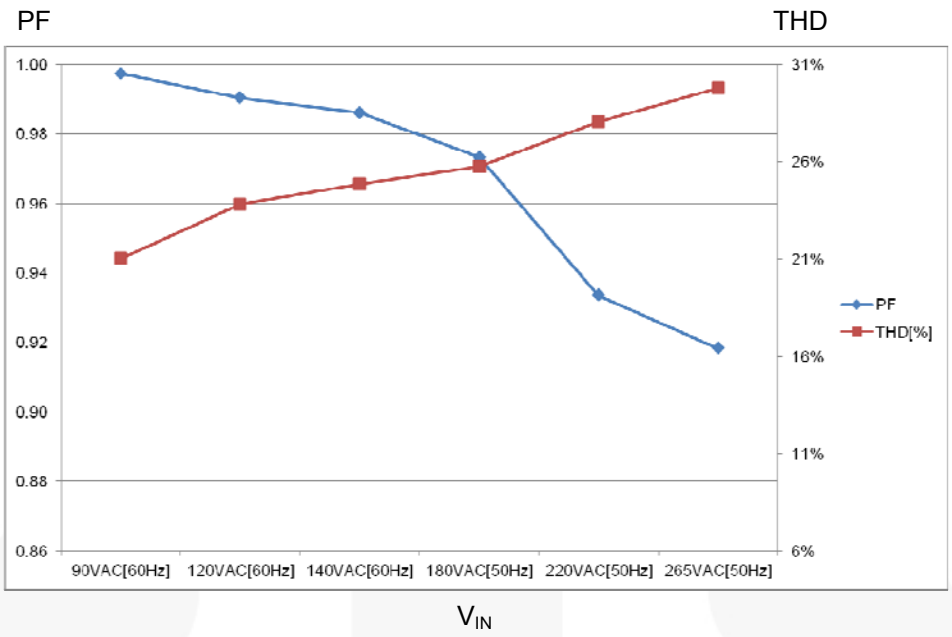

Figure 6. PF & THD

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Input Voltage	PF	THD
$90V_{AC}$[60Hz]	0.997	21.03%
$120V_{AC}$[60Hz]	0.990	23.81%
$140V_{AC}$[60Hz]	0.986	24.85%
$180V_{AC}$[50Hz]	0.973	25.74%
$220V_{AC}$[50Hz]	0.934	28.05%
$265V_{AC}$[50Hz]	0.918	29.78%

5. Related Resources

Datasheet link FLS3217

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

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